Actelis Networks

ML650

2007 FROST & SULLIVAN
Global
Ethernet in the First Mile Over Copper
Market Leadership Award

Carrier Ethernet Over Copper™

The ML650 Ethernet Access Devices (EADs) from Actelis Networks® enable simultaneous delivery of T1/E1s (MEF 8 CESoETH) and high-speed carrier Ethernet services. With up to 4 T1/E1s and 100 Mbps* of fiber-quality symmetrical Ethernet traffic over existing copper pairs, the ML650 EADs provide a cost-effective solution for mobile or PBX backhauling applications. Available in 8 copper pairs and fiber configurations, the ML650 EADs can be deployed in a Point-to-Point configuration or as the CPE in a 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 T1/E1 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 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 T1/E1 backhaul circuits. All ML650 EAD models provide 802.1q VLAN-aware wire-speed 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. The ML650 lets service providers create an intelligent Ethernet access edge with advanced bandwidth control and traffic management features that are fully compliant with 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 has the highest available packet throughput efficiency. Powered by Actelis Networks' award-winning EFM*plus*™ technology, the rate, reach and reliability are increased significantly using advanced Dynamic Spectrum Management (DSM), Dynamic Spectral Shaping (DSS), and Cross Talk Cancelation (CTC)* techniques. These technologies provide the best rate/reach performance and most resilient fiber-quality transmission, ensuring carrier-class service availability.

The ML650 EAD can be used with Actelis' XR239 EFM Repeaters to increase the loop length using remote powering units, PFU-8 or PFU-8E. The ML650 EAD platforms can be managed In- and Out-of-Band by the MetaASSIST™ View graphical craft application and via the multi-platform 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 8 CESoETH, MEF 9, 14 & 18 Certified
- Low CESoETH Delay
- Standards-based IEEE 802.3ah EFM) 2Base-TL transport
- Rapid Service Deployment
- Superior Rate, Reach & Reliability
- Worldwide Spectral Compliance
- OSMINE, NEBS III, FCC, UL, CE

Applications

- Leased Lines Replacement
- Seamless Migration from all TDM to all Ethernet / Packet
- 2G and 3G backhaul
- 4G LTE backhaul
- WiMAX backhaul
- WiFi backhaul
- PBX backhaul

Markets Served

- Mobile Operators, RBOCs, PTTs, Independent Operators, Competitive Operators

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Specifications

Interfaces

TDM

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

TDM Synchronization

- Clock Source — T1/E1 interface 1 and 2, BITS*, IEEE1588v2* and Synchronous Ethernet*
- Clock — Accuracy better than ±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 — Typical < 5 ms

Ethernet (Network/User)

- 10/100Base-T — 4 ports
  - Connector: RJ45, Auto-MDIX
- 100Base-FX — 1 port
  - Connector: SFP-based, MSA compliant

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 — 8
  - Connector: RJ45 (per modem/pair)
- End-to-end Delay — 2-4 ms (typical)
- Spectral Compliance — Worldwide
- Sealing Current — 48VDC/1.5mA 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

Management Protocols

- ITU-T G.826 — Performance Monitoring for Line and Path
- ITU-T G.704/G.707 — Synchronization Status Message*
- SNMP — SNMP v1 and v2c
- Command Line Interface — TL1
- Remote Access — Telnet
- Secure Access (option) — SSH v2
- Time Synchronization — SNTP v3
- File transfer — FTP, TFTP
- Web Access — HTTP
- User Authentication — RADIUS and/or local passwords
- EFM & OAM — IEEE 802.3ah clause EFM OAM
- CFM — IEEE 802.1ag

Metro Ethernet Forum – 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 and/or WFQ
- Classification — L2 802.1p/Q priorities, L3 ToS/Diff Serv

Applications

- EMS — MetaASSIST EMS
- Craft GUI — MetaASSIST View

Front Panel Indicators (LEDs)

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

Environmental

- Operating Temp. — -40° to +65°C
- Storage Temp. — -40° to +70°C
- Relative humidity — Up to 95%, non-cond.

Regulatory Approval/Certifications

Metro Ethernet Forum

- MEF 9, 14, 18 Certified

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

*Note: * Planned for future release*

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