

High Performance

High Quality

Specifications

Interfaces

Ethernet (Network/User)

- 10/100Base-T Connector: RJ45, Auto-MDIX
- 100Base-FX/1000Base-FX Connector: 1 or 2 per model 100/1000 FX Base 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: 2-8
- 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 48VDC/1.5mA nominal

- Sealing Current

Management (Out-of-Band)

- 10/100Base-T Connector: RJ45, Auto-MDIX
- Craft Connector: EIA RS-232 (DCE) DB9

TDM (ML650 model)

- T1/E1: 4 ports
- Connector: RJ45/RJ48c
- Line Codes: ITU-T G.703 + G.704 Short & Long
- Framing: Unframed / Framed / Fractional
- Service Loopback: Facility and Equipment

LAN Protocols

- Dynamic Bridging: IEEE 802.1, 8K MAC addresses
- Discovery Mechanisms: LLDP
- VLAN Tagging: IEEE 802.1Q
- Double Tagging: Q-in-Q
- MSTP, RSTP, STP: IEEE 802.1d
- OAM: IEEE 802.3ah clause 57 (EFM OA&M) IEEE 802.1ag

Quality of Service

- Classes of Service: 4,8 (in ML640-ML650 models)
- Scheduler: WFQ, SP
- Classification: L2 802.1p/Q priorities L3 ToS/DiffServ

TDM (ML650 Model)

TDM Synchronization

- Clock Source: 2 interfaces either T1/E1, 2MHz, 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

TDM Protocols

- ITU-T G.703, G.704, GR-499-CORE, GR-253-CORE

CES Protocols

- CESoETH: According to MEF 8
- CES Delay: Typical <5 ms

Metro Ethernet Forum – Advanced Service Provisioning and Traffic Management

- EVCs: 8
- Mapping Rules: 32 ingress rules (Port/VLAN/z 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

Management

Protocols

- SNMP: SNMP v1 and v2c
- Command Line Interface: TL1
- Remote Access: Telnet
- Secure Access (option): SSH v2
- Time Synchronization: SNTP v3
- Web Access: HTTP
- File transfer: FTP, TFTP
- IEEE 802.3ah EFM OAM: Dying Gasp
- User Authentication: RADIUS and/or local passwords

Applications

- EMS: MetaASSIST EMS
- Craft GUI: MetaASSIST View

Front Panel Indicators (LEDs)

- Power
- Status
- Alarm
- LED - 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 port (ML658 model)

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, 13.5-17 Watt (per model) AC: 90-264 VAC, 47-63 Hz, 17-21 Watt (per model)

Environmental

- Operating Temp: -40° to +65°-74°C*
- Storage Temp: -40° to +70°-74°C*
- Relative humidity: Up to 95%, non-cond.

Regulatory Approval/Certifications

- Metro Ethernet Forum: MEF 9, 14, 18

Safety

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

EMC

- FCC Part 15 Class B
- ICES-003 Class B
- ETSI EN 300 386 Class B
- ETSI ETS 300 132-2
- VCCI Class B
- ITU-T K.20, K.21 Enhanced level

NEBS

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

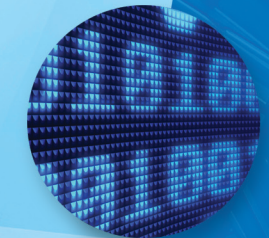
CE

- EMC and Safety

Environmental

- GR-63-CORE
- ETSI ETS 300 019

* Temperature varies depending on ML6xx model. Tested in accordance with NEMA requirements.



ML600

Ethernet Access Devices



526R60010E-0906
Updated 03.22.10

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GLOBAL SUPPLIER OF EFM OVER COPPER



High Bandwidth

Extended Rate, Reach & Reliability

ML600 Ethernet Access Devices (EADs) from Actelis Networks® enable delivery of high-speed carrier Ethernet services over existing copper and fiber network infrastructures. The ML600s are compact, cost-effective Ethernet in the First Mile (EFM) EADs that deliver up to 100 Mbps of symmetrical Ethernet traffic at fiber quality over existing copper pairs. Incorporating Actelis' unique EFMplus™ technology, the ML600 series provide superior rate, reach and reliability. Available in 2 to 8 copper pairs and fiber configurations, Actelis' ML600 EADs can be deployed in a Point-to-Point configuration, Copper Add-Drop Chain, or as the CPE in a Point-to-Multi-Point configuration with any Actelis' EFM Aggregation Platforms (ML2300, ML130, ML690). In addition, Actelis' XR239 EFM Repeaters are fully interoperable with any ML600 EAD, enabling Ethernet services to be extended up to 15 miles beyond the central office (CO).

Actelis' ML600 EADs are interoperable with any standard Ethernet switch, router or hub. Compliant with Metro Ethernet Forum (MEF) specifications, our ML600 EADs seamlessly integrate into Carrier Ethernet networks. Equipped with 4 10/100Base-T Ethernet interfaces, up to 2 100Base-FX or 1000Base-FX Small Form Factor (SFP) ports as well as 4 T1/E1s (specific models) and a DS3/E3 uplink can be used to connect to legacy networks (using a 100/1000Base-FX SFP port).

Multiple services and customers can be supported per ML600 EAD as well as 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 four traffic classes, RSTP/STP, bandwidth monitoring and Multicast/Broadcast limiting.

The Actelis ML640 and ML650 EAD models allow service providers to create an intelligent Ethernet access edge with advanced bandwidth control and enhanced traffic management features, fully compliant with MEF 9 and 14 specifications. The ML640 and ML650 EADs enable flexible service provisioning using Ethernet Virtual Connections (EVCs) with flexible mapping and Quality of Service (QoS) capabilities that maximize the efficiency of access bandwidth. QoS strictly enforces Service Level Agreements (SLAs) for each subscriber/service and Class of Service using VLAN or CoS-based rate limiting, allowing service providers to safely aggregate multiple services or multiple subscribers on the same access port or EAD.

The ML600 series of EADs 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).

ML650 EADs for DSLAM, Mobile and PBX Backhaul Applications

With up to 4 T1/E1s and with high-speed fiber quality symmetrical Ethernet traffic over existing copper pairs, the Actelis ML650 and ML650S EADs provide cost-effective solutions for various applications, including DSLAM, Mobile

and PBX backhauling. Available in 8 copper pairs and fiber configurations, the ML650 EADs are MEF 8 CESoETH and MEF 9, 14 and 18 certified. 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.

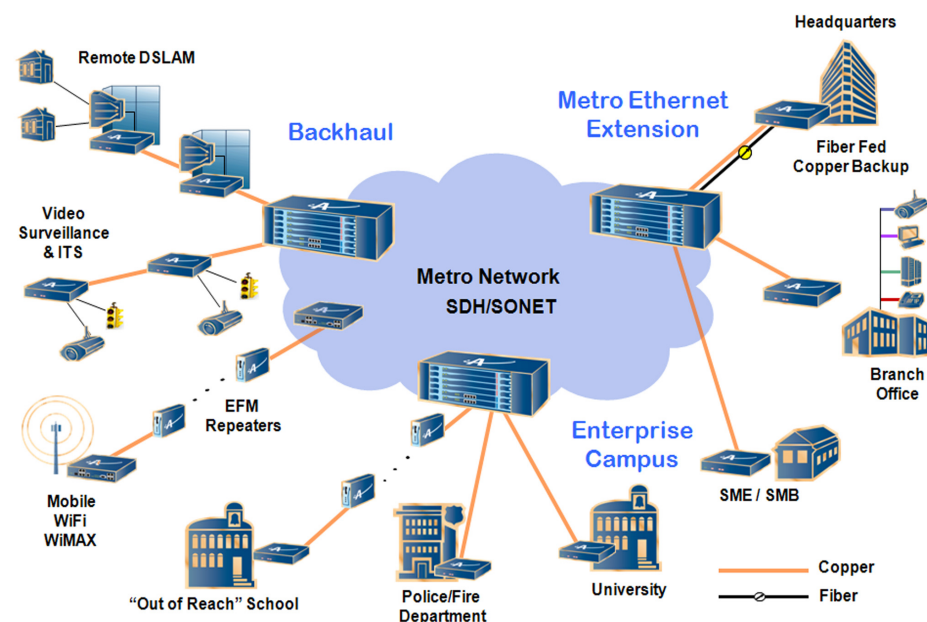
The Actelis ML650 EADs also introduce a novel resilient clocking solution, with timing accuracy better than that provided by traditional T1/E1 circuits. This solution complies with wander and jitter requirements of ITU-T G.823/G.824 for synchronization interfaces. Actelis has developed this advanced clock transmission mechanism to eliminate all carrier concerns related to clock recovery over pseudo wire. This unique architecture ensures that the ML650 EADs provide Actelis customers with the best clock accuracy and reliability of any copper-based backhauling solution. The ML650S series supports clock synchronization through either Synchronous Ethernet, 2MHz clock interface, or the existing T1/E1 lines.

Copper Add-Drop EADs

The Actelis ML680 Copper Add-Drop EAD allows multiple nodes to be connected to each other over copper in a linear chain or ring configuration. Each node has the full switching capabilities of the ML600 EAD and can drop and add Ethernet traffic at each location while passing the rest of the traffic through. With up to 50 Mbps (over 4 pairs) aggregated traffic, this Copper Add-Drop EAD is a powerful tool for distribution of Ethernet traffic across linear/ring copper networks supporting various applications, such as a chain of DSLAMs/BLCs/MSAPs and Video Surveillance for IP-based Intelligent Transportation Systems (ITS).

Optional Optical Interfaces for Growth Potential and Investment Protection

A choice of optical interfaces accommodates short and long distances, at speeds of 100 Mbps or 1,000 Mbps, with connections over the existing copper and fiber infrastructure. These optical interfaces provide an evergreen investment by allowing a smooth migration to higher service speeds over fiber without changing the EADs at the customer premises.



Product	Product Group	Model	Number of Pairs	Description
Ethernet Access Devices	ML620	ML622	2	4x10/100M copper Ethernet ports
		ML624	4	4x10/100M copper Ethernet ports and a 100Base-FX optical SFP* port
		ML628	8	
	ML630	ML638	8	4x10/100M copper Ethernet ports and a 100/1000-FX optical SFP* port
		ML644	4	4x10/100M copper Ethernet ports & 2 100/1000Base-FX optical SFP ports with Advanced QoS features supporting 3-tiered hierarchical QoS, two-rate three-color traffic management per EVC
	ML648	8		
	ML650	ML654S	4	4x T1/E1 ports, 4x10/100M copper Ethernet ports and two 100/1000Base-FX optical SFP* ports with Advanced QoS features supporting 3-tiered hierarchical QoS, two-rate three-color traffic management per EVC
		ML658S	8	
Copper Add-Drop EAD	ML680	ML688	8	4x10/100M copper Ethernet ports and a 100/1000-FX optical SFP* port
				*SFP modules - optional, including DS3/E3 SFP

Carrier Ethernet over Copper™
Ethernet Solutions

Highlights

- IEEE 802.3ah Ethernet in the First Mile (EFM) 2Base-TL Solution
- Fiber Quality Transmission
- MEF Certified Ethernet Capabilities
- Rapid Service Deployment
- Superior Rate and Reach
- Low Delay and Jitter for Voice and Video Transmission
- Worldwide Spectral Compliancy
- OSMINE, NEBS III, FCC, UL, CE
- Environmentally Hardened

Applications

- DSLAM Backhaul
- Fast Internet Access
- Leased Lines Replacement
- MDU/MTU Backhaul
- Metro Ethernet Extension
- PBX Backhaul
- Private Campus Network Intra-Connection
- Transparent LAN Service
- WiFi and Cellular Backhaul (Radio Access Network)

Markets Served

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