

## ML690ES Aggregation Unit

**The ML690ES Ethernet Aggregation Unit from Actelis® is an advanced intelligent Ethernet service delivery unit. Using the existing copper network, the ML690ES can support up to 16 pairs / 4 HSLs and up to 230 Mbps of symmetrical Ethernet traffic at fiber quality over existing voice-grade copper as well as SyncE capabilities. Two models are supported ML698ES and ML6916ES capable of supporting 8 or 16 copper pairs. ML690ES has two optional SFP interfaces supporting 100/1000Base-FX ports. It offers CE 2.0 services on all its ports - both copper and fiber.**

The ML690ES Aggregation Unit can be deployed in a Multi-Point topologies with Actelis' ML600/E Ethernet Access Devices. ML690ES uplink can be fiber or bonded copper when connected to Actelis Ethernet aggregation switches ML230/ML2300 or fiber when connected to any standard Ethernet Switch. With its superior performance, extensive functionality and low cost, the ML690ES offers rapid CE 2.0 service delivery, SyncE and allows for further utilization of the existing network infrastructure.

The ML690ES is interoperable with any standard Ethernet switch, router or hub. Compliant with Metro Ethernet Forum (MEF) CE 2.0 specifications, ML690ES seamlessly integrate into carrier Ethernet networks. Equipped with four 10/100/1000Base-T Ethernet interfaces and two optional 100/1000Base-FX Small Form Factor (SFP) ports, the ML690ES allows assignment of a service or a customer per port. DS3/E3 uplinks can be used to connect to legacy networks instead of the 100/1000Base-FX SFPs.

Service providers utilizing the ML690ES intelligent can offer up to 4 CE 2.0 based services with comprehensive bandwidth control and traffic management features. The ML690ES's flexible service provisioning using Ethernet Virtual Connections (EVCs), along with its advanced mapping and Hierarchical Quality of Service (H-QoS) capabilities, allows carriers to maximize the efficiency of the access bandwidth on all their ports and configurations. Service Level Agreements (SLAs) can be easily enforced per each subscriber enabling service providers to safely aggregate multiple services or

multiple subscribers, on the same Ethernet access uplink. For higher density two ML690ES can be stacked in 1 RU 19" sleeve.

All ML690ES models provide 802.1q VLAN-aware wire-speed bridging, double tagging (VLAN stacking) for end-user VLAN transparency, VLAN translation, L2, L3 and L4 classification with eight traffic classes, RSTP/STP, ERPS, bandwidth monitoring, Multicast/Broadcast limiting, as well as IGMP snooping for video distribution applications.

Powered by Actelis' award-winning, patented EFM*plus*™ technology, the rate, reach and reliability are increased significantly using advanced Dynamic Spectrum Management (DSM) and Dynamic Rate Boost (DRB) techniques. EFM*plus* technology provides the best rate/reach performance and most resilient fiber-quality transmission, ensuring carrier-class reliability. When combined with Actelis' industry-leading XR239 EFM Repeaters, these technologies can extend reach even further.

The ML690ES provide proactive and dynamic tools for enhanced trouble shooting and monitoring capabilities. Advanced Carrier-class OAM, including EFM OAM per 802.3ah, CFM (802.1ag) and Y.1731 are supported by the product, offering both physical link as well as service level end to-end advanced troubleshooting mechanisms.

The ML690ES 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 command line interface, Telnet and SNMP using standard MIBs for seamless integration with third-party Network Management Systems.



### Highlights

- Standards-based IEEE 802.3ah Ethernet in the First Mile (EFM) 2Base-TL transport
- MEF CE 2.0 compliant
- H-QoS
- Rapid Service Deployment
- Superior Rate, Reach & Reliability
- Low Delay and Jitter for Voice and Video Transmission
- Carrier Class OAM, including Y.1731, CFM, EFM OAM
- Worldwide Spectral Compliancy
- NEBS, FCC, UL, CE
- Environmentally Hardened

### Applications

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

### Markets Served

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



## Specifications

### Interfaces

#### Ethernet (Network/User)

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

#### TDM Synchronization\*

- **Clock Source:** 4x Synchronous Ethernet per G.8261, G.8262
- **Clock Quality:** EEC-option1, EEC-option2
- **Clock APS:** Automatic Protection Switch from Primary to Secondary per GR-1244-CORE

#### High Speed Link (Bonded Copper Pairs)

- **Number of HSLs:**  
CO unit: 1xHSL or 4xHSL  
CPE unit: 1xHSL  
Mixed (Drop&Cont): 1x-R HSL +3x-O HSL
- **Protocol:** IEEE 802.3ah 2Base-TL
- **Line code:** ITU-T G.991.2 rev. 2
- **Bandwidth per HSL:** 1-230 Mbps (symmetrical) up to **15 Mbps per pair**, bonding up to 16 pairs
- **Number of Copper Pairs per unit:** 8 or 16
- **Copper Pairs per HSL:** 1-16 / 1-8 (per model type)  
Connector: RJ45 (per modem/pair) ML698ES, 2 modems/pairs per connector with ML6916ES
- **Line code:** ITU-T G.991.2 rev. 2
- **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)\*\*
- **Sealing Current** 48 VDC/1.5 mA nominal

#### Management (Out-of-Band)

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

### Ethernet Bridge Features

- **Bridging:** IEEE 802.1q
- **Forwarding Database size:** 16K MAC addresses
- **MTU:** 1518 – 2048 Bytes (configurable per system)
- **TPID:** up to 4 settable per inner/outer tag
- **Aging:** Configurable
- **MAC Limiting and Filtering**
- **Multicast/Broadcast Control**
- **Port based VLAN Stacking (Q-in-Q)**
- **Conditional VLAN Stacking**

- **VLANs:** 4K, supports VLAN translations
- **RSTP, STP:** IEEE 802.1d
- **Link Aggregation:** IEEE 802.3, L2/L3 balancing
- **Provider Bridges:** IEEE 802.1ad
- **LLDP:** IEEE 802.1ab
- **IGMP Snooping:** RFC 4541, V1/V2 RFC 1112/2236
- **ERPS:** ITU-T G.8032
- **EFM OAM:** IEEE 802.3ah clause 57 inc. Dying Gasp
- **CFM/MEF OAM:** IEEE 802.1ag, ITU Y.1731

### Quality of Service Features

- **Classes of Service** (queues per port): 8
- **Two Levels Hierarchical Scheduler (H-QOS)**, up to 64 queues per port, WFQ, SP, Hybrid
- **Bandwidth Control:** 32 profiles, 2 rate, 3 color metering (CIR, CBS, EIR, EBS)
- **EVCs:** 32 Services
- **Classification:** 128 rules (Port/VLAN/L2 L3/L4)
- **Shaping:** per queue/port
- **Color Mode Awareness** by COS or DEI
- **CoS Marking:** by COS or DEI, per Service

### Management

#### Applications

- **EMS:** MetaASSIST EMS
- **Craft GUI:** MetaASSIST View

#### Protocols

- IPV4 and IPV6
- **DHCP Client:** RFC 2132
- **ACS Client, CWMP:** TR-069
- **Command Line Interface:** TL1, CLI
- **Remote Access:** Telnet
- **SNMP:** V3, V2C, V1
- **Radius Authentication:** RFC 2865
- **Secure Access (option):** SSH v2
- **Time Synchronization:** SNTP v3
- **Web Access:** HTTP
- **File transfer:** FTP, TFTP
- **Syslog:** RFC 3164

### Front Panel Indicators (LEDs)

- **Power**
- **Status**
- **Alarm**
- **MLP** per modem/pair
- **ACT (Activity)** - per Ethernet port
- **LNK (Link)** per Ethernet/HSL port

### Alarm Contacts

- **Terminal Block:** 2 Input, 1 Output Physical

### Physical

- **Dimensions Height:** 1.6" / 40 mm (1U)  
**Depth:** 11.0" / 280 mm, **Width:** 8.4" / 213 mm
- **Weight:** 3.75 lbs / 1.7 Kg
- **Mounting Rack:** 2 units in 19", 23" or ETSI racks  
Desktop, Wall Mount
- **Power**  
**DC:** 24/48 Vdc nominal (20-60 Vdc range),  
15-24 Watt (per model)  
**AC:** 90-264 VAC, 47-63 Hz, up to 30 Watt

### Environmental

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

### Regulatory and Compliance

#### Metro Ethernet Forum

- CE 2.0

#### Safety

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

#### EMC

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

#### NEBS

- GR-1089-CORE, GR-63-CORE

#### CE

- EMC and Safety

#### Environmental

- GR-63-CORE
- ETSI ETS 300 019

\* -R HSL configurations do not support : SyncE and DRB

\*\* DRB on ML6916E is supported on PTP topologies, PTMP future release

Preliminary



**denk-stein:net**  
MEASUREMENT TECHNOLOGY

Kaiserin-Augusta-Allee 8 ■ 10553 Berlin ■ Germany

+49-(0)30-398981-0 +49-(0)30-398981-39

sales@denk-stein.com www.denk-stein.com

Vertrieb und technische Beratung in D-A-CH