

# **EFM Overhead Management: Requirements From A Diverse Services Provider**

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# Data Transmission Service Provider

## OAM

- Need to support wide diversity of services
- Use existing OH where possible, add where not
- Single level of service overhead
- Bidirectional performance monitoring/reporting
- Bidirectional fault monitoring/reporting
- Configuration management from head-end
- Remote link management
- Remote “facilities alarms”
- Comm channel for upper layer functions
- Inband to PHY – Out-of-band to Data traffic

# Need to Support a Wide Diversity of Services

- Private Line – extend management edge of enhanced private line services (P2P/Cu)
- Virtual Private Line – extend management edge of segregated data services over shared bandwidth (P2MP)
- Best Effort – extend management edge of shared “Internet” type shared access services (P2P/P2MP/Cu)
- Virtual Private Network – extend management edge of data insulated traffic over best effort facilities
- Value added content services – manage facilities and user service insertion/interfaces (TV, HDTV, Pay/View)
- High value interactive services – voice (VOIP/POTS), video (broadcast quality video conferencing)

# Use Existing OH where possible, add where not

- Existing subscription network service infrastructure uses inserted frames or inserted bits to provide OAM functionality as overhead on revenue bearing traffic
- For Copper PHY use existing xDSL management overhead
- For Optical GbE add overhead to existing coding/signaling sublayers

# Single Level Of Service Overhead

- Closed System from Head-end (OLT) Master System to tail end (CPE/ONU) Slave System
  - No encapsulation through multiple topology layers: “Path” level only, no “Section” or “Line” level functional topology support for P-2-P
  - Separate “Section” layer for P-2-MP may be needed if active optics (DWDM, amplifier, or other optical signal segregation) is put in “splitter” (repeater)
- (Currently no full duplex repeater defined in 802.3)

# Bidirectional performance monitoring/reporting

- Bit Error Rate to determine media signal quality
  - Physical signal level only
  - Fixed bit count required for BER detection
- Frame Error Rate to determine data transmission quality
  - Data link signal level
  - Monitoring relative to data stream frame count
- BER and FER are both required; BER/FER comparison enables trouble-shooting that's otherwise impossible:
  - distinction between constant single bit errors indicates degradation of media signal
  - burst errors are normal in even high reliable systems

# Bidirectional fault monitoring/reporting

- Simplex reporting from tail end to head end systems: indicates link loss, fault, etc.
- Remote physical and services layer reporting – status, conditions, etc.
- “Last Gasp” Fault/conditions reporting
- Key aspect of SLA requirements
- Potential future integration with upper layer fault reporting schemes (voice traffic isolation, etc.)

# Configuration management from head-end

- Head end system is master of tail end systems for all OAM functionality and reporting
  - All remote systems provisioning, admin, functionality are through head end system, whether p-p or p-mp
  - Tail end systems must be slaves for administrative purposes



# Remote “facilities alarms”

- Equivalent to ‘order wire’ in existing dta com services/transmission systems
- Physical environment points
- Lets system implementors ID physical facilities problem without truck rolls (ref. Grant County presentation)
- Consumes very little overhead bandwidth

# Comm channel for upper layer functions

- Equivalent to DCC in existing data com/services transmission systems
- Physical system config./provisioning such as remote data link ports on/off
- Provides upper layer alarming outside of Ethernet data channel
- Low to moderate bandwidth ~64kbps

# Inband to PHY – Out-of-band to Revenue Data traffic

- P802.3ah defines physical layer functionality only
- Many service definitions and SLAs demand all overhead to be segregated out of band from the revenue service payload
- No performance or cost penalties are accrued when isolation of overhead & payload traffic is unnecessary

# Common Requirements for Diverse Services

- Duplicate or enhance existing service provider management capability
- Most stringent services management requirements can support less stringent services – Less stringent service requirements can not support the most stringent services
- Use existing 802.3 technology where possible, borrow where can, add to as needed