

Ethernet deployments towards Service providers

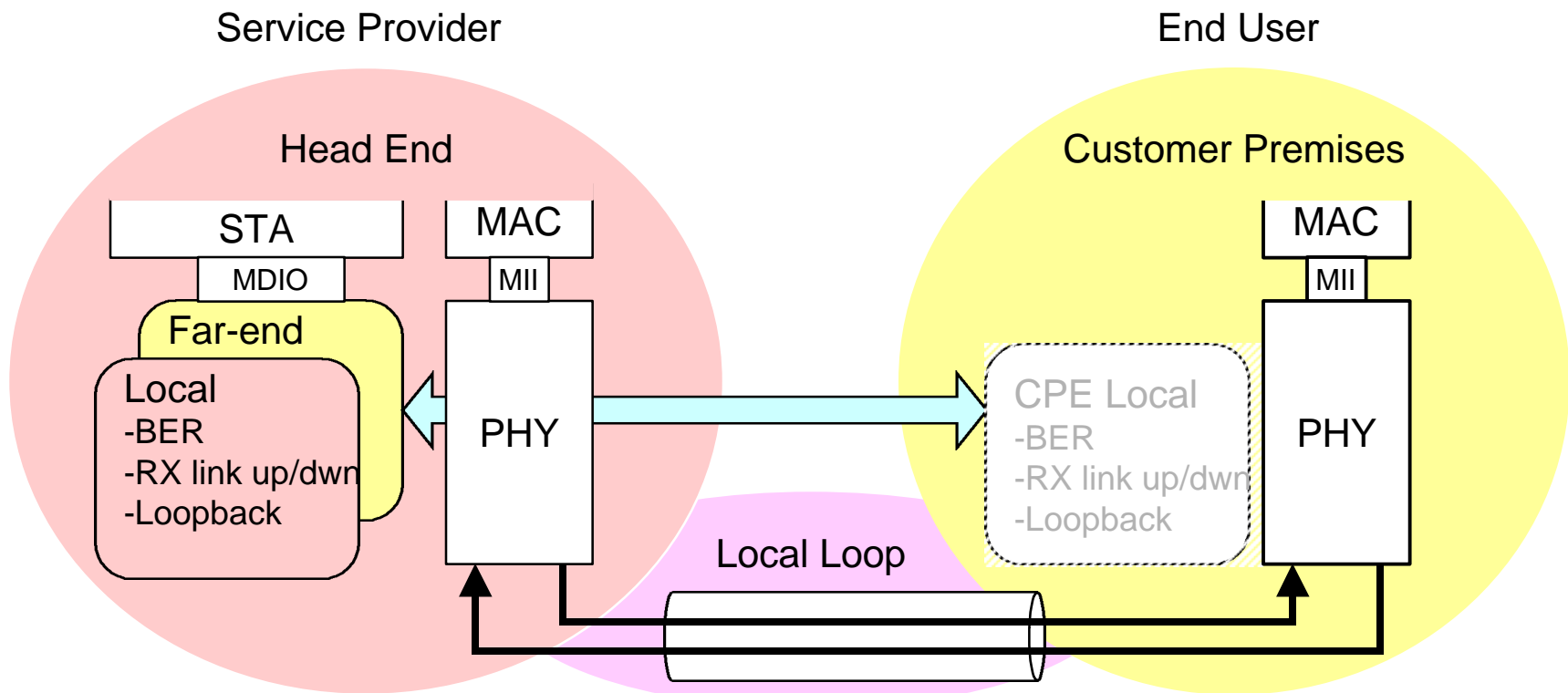
- In Campus: 10/100, GbE, 10GE
- In Metro: GbE, 10GE
10Km, 40Km and beyond
- In Access : EFM
Up to 10Km
 - Ethernet over Copper
 - P-P GbE
 - Ethernet PON

Why we need OAM for Ethernet ?

- *“ I want Low Cost Ethernet for my networks. But you do not have what Service Providers really need: OAM”: Mr. Roy Bynum, MCI Worldcom*
OAM :Operation, Administration & Maintenance
- Low cost, service provider / customer demarcation, CPE
- Reduced network complexity
- Common protocol across LAN / MAN / Access
- While keeping the comparable level of **OAM** capability with existing transport / access networks (ADSL,T1/T3, OC-N, ATM etc).

Operation Model: Head End to manage CPE

- CPE local stats/status is read/written by Head End



EFM OAM Objectives Agreed

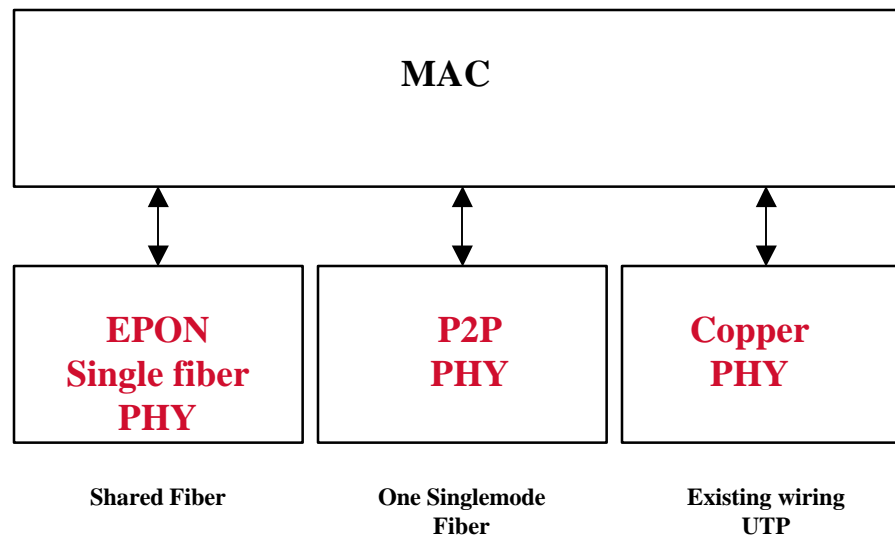
- **Support Far-end OAM in EFM, which includes :**
 - Link Monitoring**
 - Remote Failure Indication**
 - Remote Loop back**

Non-Goals

- **Provisioning is excluded.**
 - OAM at MAC/PHY level only.
 - Provisioning is for services.

Common OAM for all EFM PHYs

- What OAM (Link monitor, Failure Indication, Remote Loopback) means for each EFM PHY ?
- Preferable to have a common OAM capability for all EFM PHYs.



Link Monitoring

Examples for each EFM-PHY

	P-P Copper	P-P GbE	EPON
MAC	Tx/Rx PKT CRC Error		
PCS / PMA	<i>SNR (Inter Symbol Error)</i> <i>Corrected Error</i>	8B10B Code Violation	8B10B Code Violation <i>Upstream Access Control Monitor</i>
PMD (Optical / Analog)	<i>Tx Power</i> <i>AGC gain (Rx)</i>	Loss of Signal (Rx Power)	Loss of Signal (Tx/RX Power)

Remote Defect Indication

Examples for each EFM-PHY

	Copper	P-P GbE	EPON
MAC	MAC Control PKT option		
PCS / PMA	<i>Local/Remote Fault Indication</i> <i>Dying Gasp</i>		
PMD (Optical / Analog)	n/a		

Remote Loop Back

- Reduce / Eliminate “truck rolls”
- Loop back is important for
 - Failure Isolation
 - Remote problem resolution
- Per subscriber unit

OAM for EFM: Summary

- **OAM is mandatory requirement for Ethernet in the First Mile**
- **OAM operations**
 - Link Monitoring at MAC/PHY/PMD
 - Failure Indication at MAC/PHY
 - Remote Loop-back at MAC/PHY
 - EPON needs Upstream Access Control Monitoring
 - Failure Isolation by combination of these operations
- **OAM Mechanism will be built in PHY and/or MAC layer**
 - New attributes to be added to 802.3 Clause 30