
Why Preamble OAM ?

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IEEE802.3ah EFM Task Force
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Needs on OAM for Ethernet

- **Ethernet Subscriber Access Networks (EFM)**

CO to CPE,

Mainly remote link monitoring



- **Metro Ethernet Network / High-end Router Network**

CO to CO

Mainly Protection & Fault Defect Indication (Line & End-End)

Transparent LAN service management / Replacement of POS

*Already
Happening !!*



- **Ethernet over Dark Fiber / DWDM**

Ethernet Regenerator / Transponder for extended distance

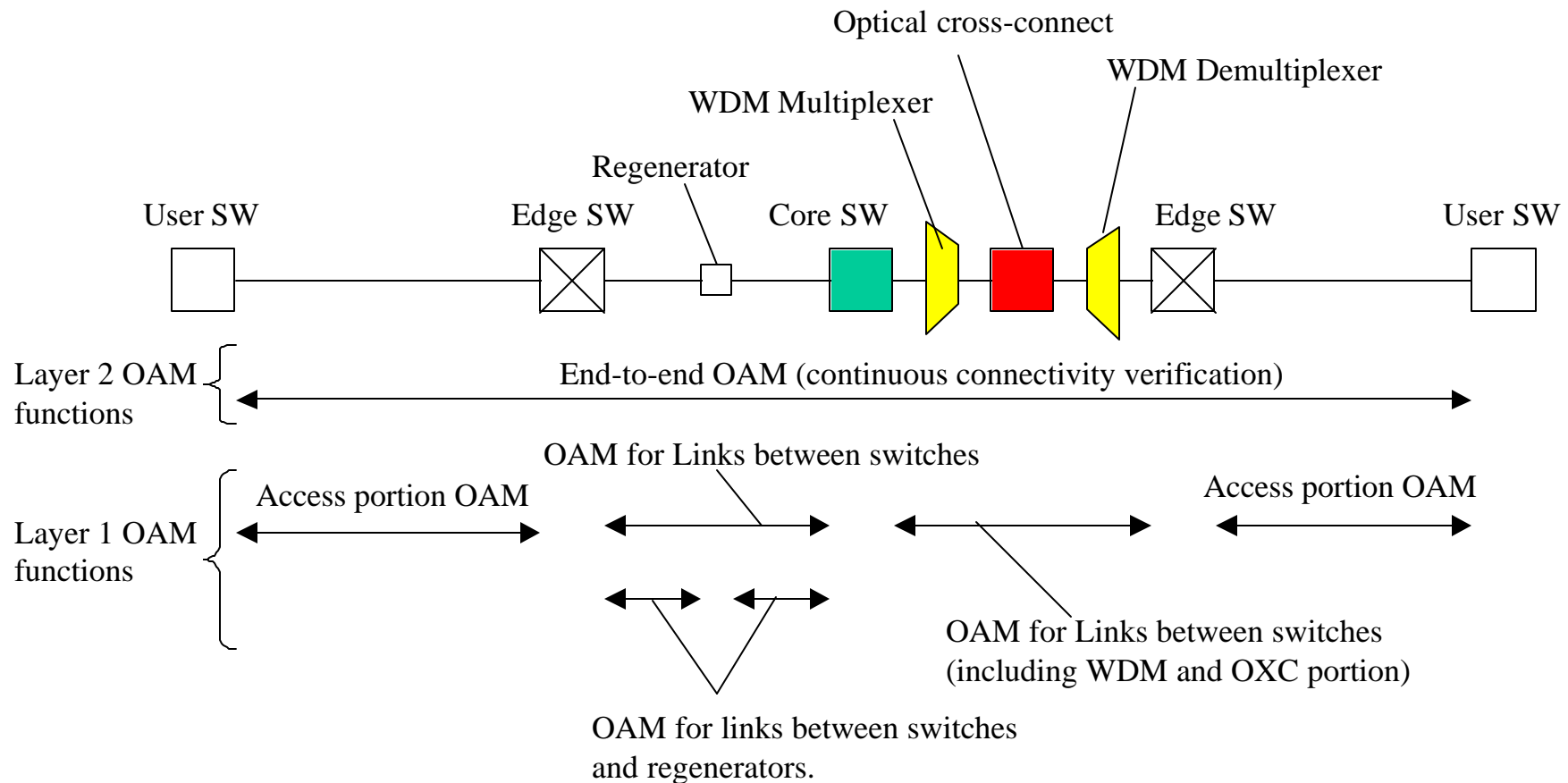
Out-of-band is mandatory: Frames never inserted by optical nodes

Metro Ethernet Forum

- **Metro Ethernet Networks for business market**
 - CO – CO (NNI) and
 - CO to CPE Switch (UNI)
- **Focus on**
 - Transparent LAN Service
 - Ethernet Protection
- **Protection includes Line and End-End (Ethernet Path) < 50msec**
- **Try to leverage IEEE802.3 EFM OAM work.**

ITU-T SG13 : OAM for Ethernet Service

- ITU-T SG13 just started OAM discussion for Carrier Ethernet Service



ITU-T SG13 : OAM features

- Only link between SP Ethernet Switches
- Include Optical Switch / DWDM / Regenerator nodes
- Link OAM and End-end OAM (Transparent LAN service)
- Concerns about IEEE802.3 EFM only focus on “access market”
- ITU-T OAM work assumes Out-of-Band OAM for Link management

Only care about Access OAM ?

- **If we only care about access market OAM, IEEE or other standardization organization will need to work on yet another OAM for Metro Ethernet / Ethernet over Dark Fiber / DWDM**
- **802.3 EFM OAM transport scheme must cover these requirements more seriously**
- **EFM Task Force needs to specify OAM functionality only for Access networks, but OAM transport protocol should cover extension to the above markets.**

Preamble vs Frame

- **Preamble OAM :**
 - Can be applied to pure Optical market
 - Can support Inter-Switch Optical Link Fast Failover < 50msec
 - Out-of-band meet SP expectation in core networks
 - Can be applied to PHY only low cost demac device
- **Frame OAM:**
 - Can NOT be applied to pure Optical market.
 - 50msec protection would anyway need HW support.
 - Slow protocol (5pkt/sec) can not support such fast fail over.
 - In-band does not meet SP expectation in core networks

Side by Side Comparisons

| | Preamble | MAC Control Frame |
|-------------------------------|---|--|
| Backward Compatibility | Yes (small change in only GE PCS TX) | Yes |
| Security Level | Higher since no MAC client access, terminated below MAC | Lower w/o MAC layer encryption, w/o bridge/router Can be forwarded to/from malicious attacker |
| Overhead | Zero. | Affect user traffic. Has to insert OAM frames between user frame. Can NOT be applied to DWDM / Regen |
| DWDM support | Can support DWDM/Regen | |
| Bandwidth | 0.13% BW < 2.4% of PHY speed No impact on User Bandwidth | Needs BW control, otherwise Unlimited impact Need buffering & scheduling of OAM frames |
| Flexibility | Yes | Yes |
| Commonality | Yes for all Full Duplex modes | Yes |
| Implementation | Min HW & Firmware | Firmware, Frame Scheduling complexity |
| Latency/Protection | Fast for 50msec Protection | Slow Limited only up to 5pkt/sec. |
| Demarc Req | Media Converter, Bridge and Router | Only limited to Bridge/Router Can not support simple media converter |
| Complexity | Moderate HW | Open Ended SW flexibility: interoperability concern |

Comparisons with SONET OAM

| SONET | Preamble | MAC Control Frame |
|---------------------------------------|----------------------------------|---|
| Out-of-band & PHY Layer OAM | Out-of-band & PHY Layer OAM | In-Band (affecting user traffic) MAC layer OAM |
| Line / Section and Path OAM | Hop-by-hop and End-End OAM | Only End-End (MAC-MAC) OAM |
| Defect Indication | Yes. (Flags on every preamble) | Too Slow for Defect Indication (5pkt/sec, SW) |
| Protection | Yes (< 50msec) | No |
| DCC channel | Yes (using Msg Byte) | Only In-band Frame (need packet switch) |
| Support Optical Node (Regenerators) | Yes. | Can not support Optical Node |

Extension to Metro / Core Optical Ethernet

- **Ethernet Optical Transport Element is incapable of inserting OAM frames. Only solution for OAM in Ethernet over Dark fiber is Preamble based scheme.**
- **Possible extensions for OAM on Preamble:**
 - IP over PPP over HDLC for Optical Management Channel (GMPLS etc)
 - Defect Indication Hop-by-hop & End-to-End Level
 - Linear Automatic Protection Switch (SONET K1/K2 byte)
 - End-End (SONET Path like) OAM functions (Path Tracing)
 - 802.17 RPR over Ethernet PHY with OAM

Conclusion

- Service Providers need “**Carrier Class OAM**” not “Enterprise Class OAM”.
 - Out-of-band / No impact on User traffic
 - 50msec Fail-over support
 - Can be applied to Optical / DWDM / Regen / PHY demac device
 - More Secure
- **Preamble OAM** does support all OAM requirements for Service Provider Ethernet Market, especially Metro Ethernet CO-CO and Ethernet over DWDM as well as EFM.