Why Preamble OAM ?

Presented by :

Yukihiro Fujimoto: NTT

Hiroshi Suzuki: Cisco System

List of Supporters

- Ben Brown: AMCC
- Dave Sorensen, Howard Baumer: Broadcom
- David Levi: Broadlight
- Hugh Barrass, Bruce Tolley, Norm Finn, Wael Diab: Cisco Systems
- Bob Barrett: Fiberintheloop
- Yannick Le Goff: France Telecom
- Satoshi Obara: Fujitsu
- Rich Taborek, Barry O'mahony, Don Alderrou, Robert Muir: Intel
- Martin Nuss: Internet Photonics
- Nafea Bishara: Marvell
- Samantha Blakey: Mindspeed
- Ken Murakami: Mitsubishi Electric Corp
- Arial Maislos, Onn Haran : Passave
- Richard Cam : PMC Sierra
- Shawn Rogers: TI
- Jian Song : Sarila Systems
- Julian Ho: Vitesse
- Tony Anderson: Zonu
- Fred Mohhamad: XLoptics

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 !!

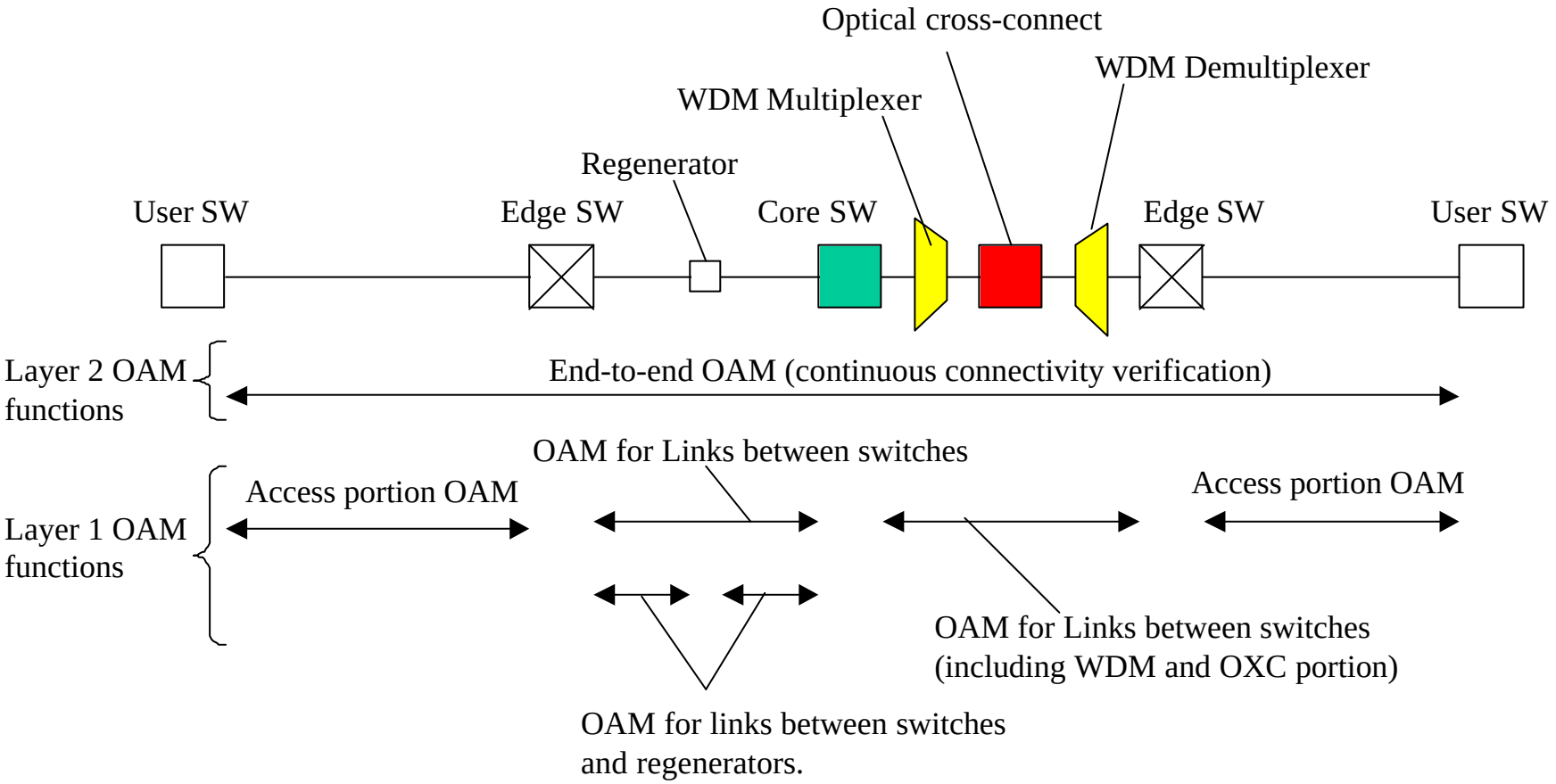
- **Ethernet over Dark Fiber / DWDM**
  - Ethernet Regenerator / Transponder for extended distance
  - Out-of-band is mandatory: Frames never inserted by optical nodes

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 DWDM support	Zero. Can support DWDM/Regen	Affect user traffic. Has to insert OAM frames between user frame. Can NOT be applied to 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.**