

IEEE 802.3 EFM

EFM Fault Detection & Isolation

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Problem Scope

- Fault detection
- Fault isolation
- Link restoration

- Analysis of cause-effect
 - Medium independent
 - Protocol independent
 - Implementation independent



Presentation Outline

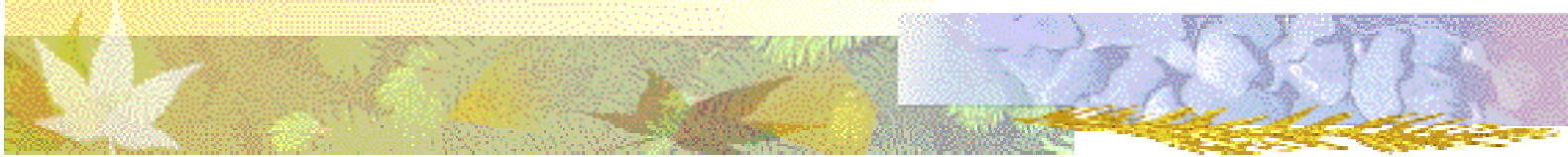
- Fault domains
- Failure modes
- Failure flow diagrams

- Conclusions



Fault Domains

- Device fault
 - Medium fault
 - PHY fault
 - MAC fault
- Network fault
 - Wire rip/bend
 - Loose connector
 - Dirt contamination



Failure Modes

- Isolated to single device
- Semi-isolated
- Network wide

- Constant
- Bursty



Failure Symptoms

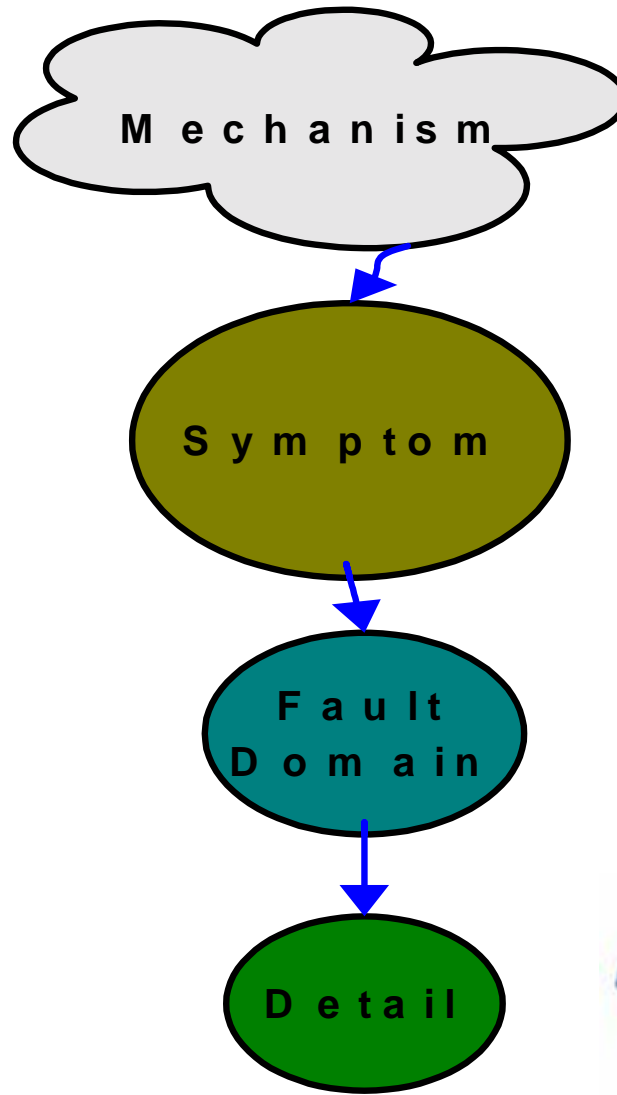
- Carrier loss
 - Disrupted transmission
- Packet loss
 - Disrupted reception
- No acknowledgement to OAM messages
 - Disrupted management

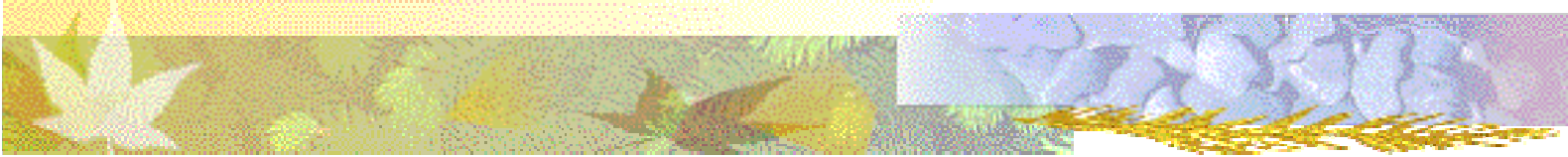


Alarm Mechanisms

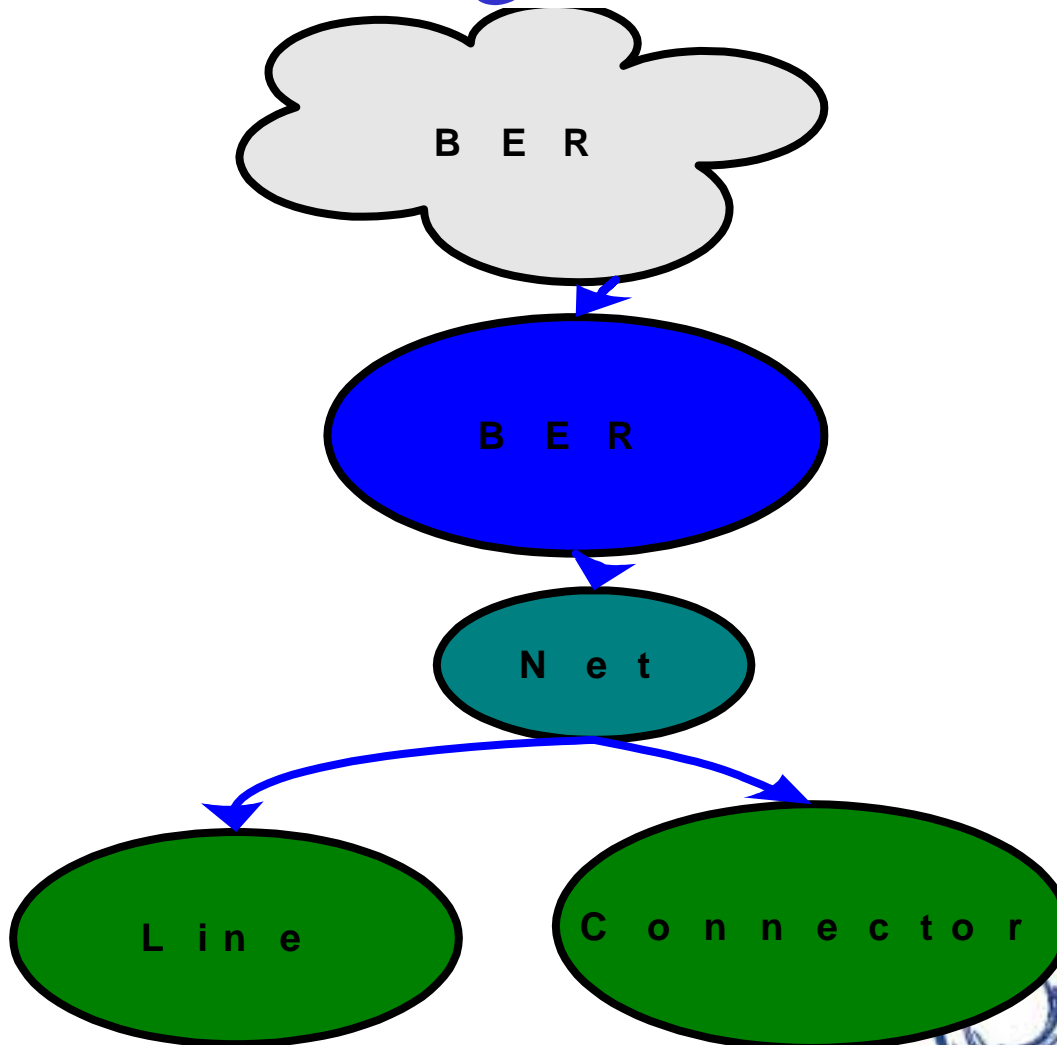
- LOS – medium power loss sensor
- BER – 8/10 code violations
- FER – FCS failure
- OWD – OAM message watchdogs

Generalized Failure Flow

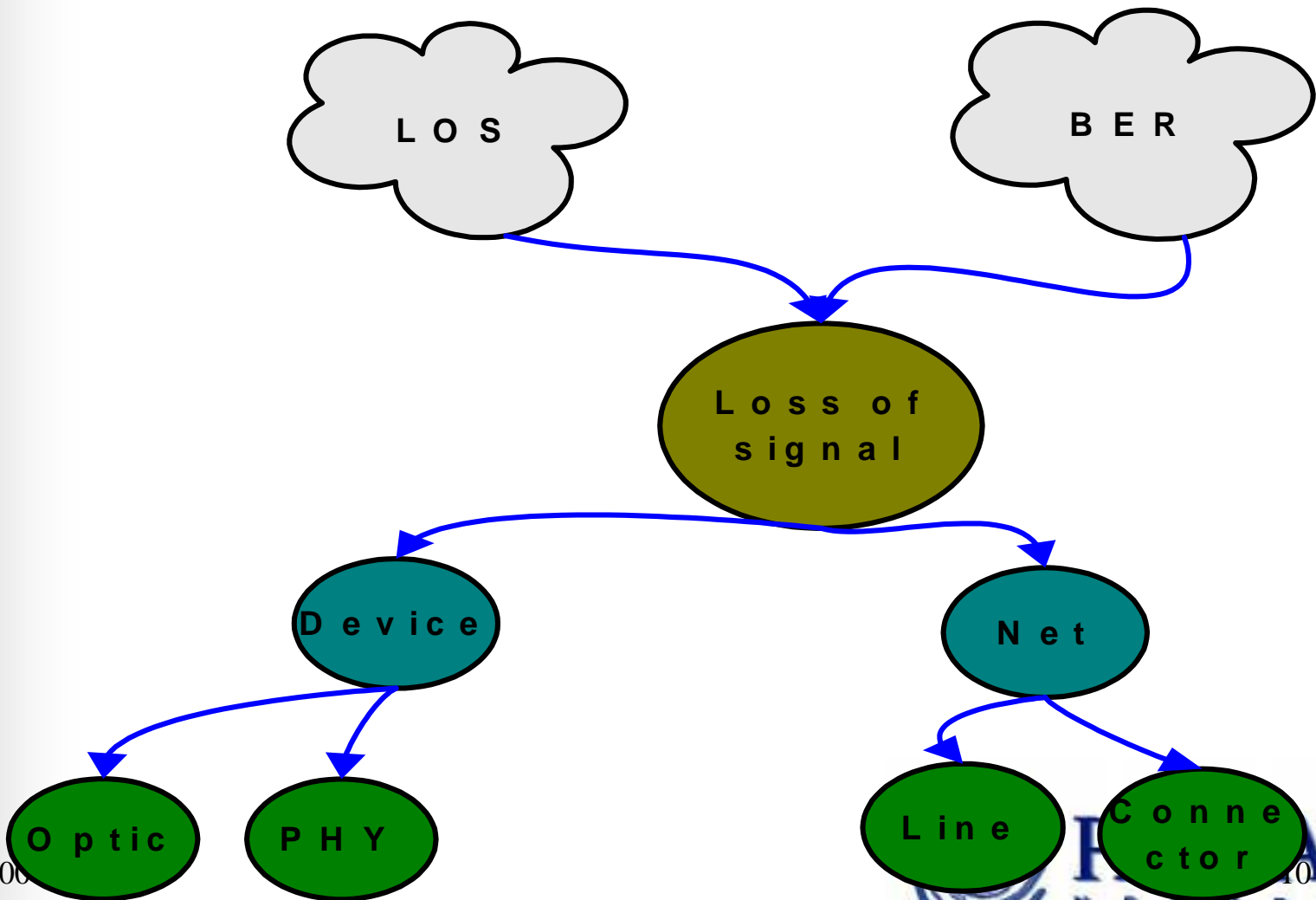




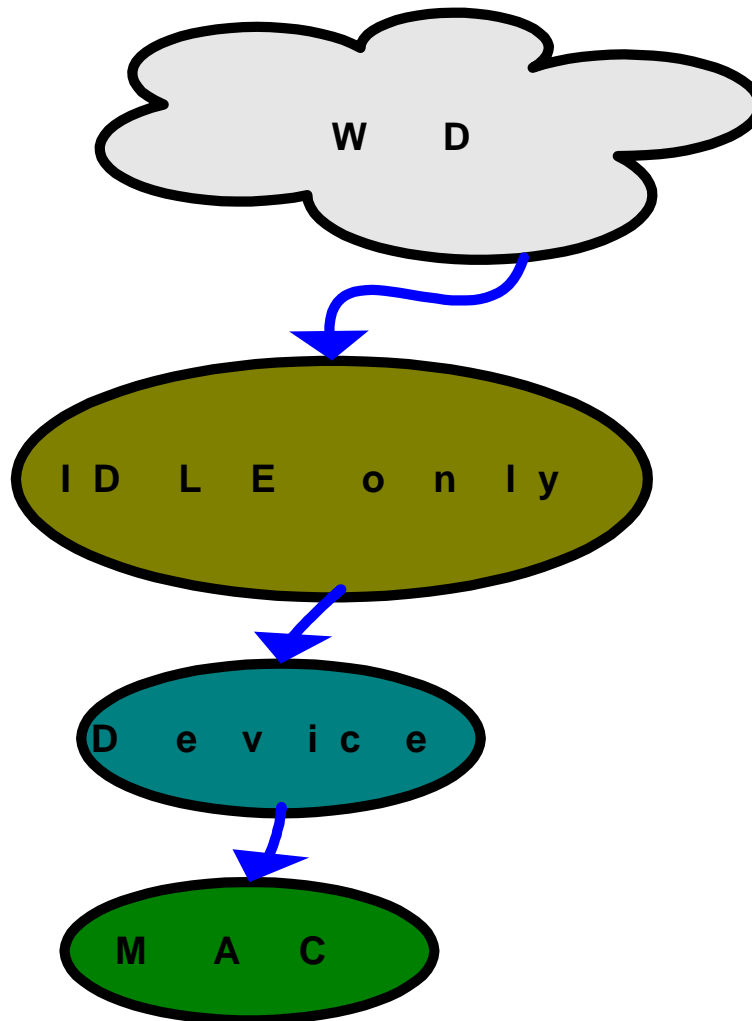
High BER



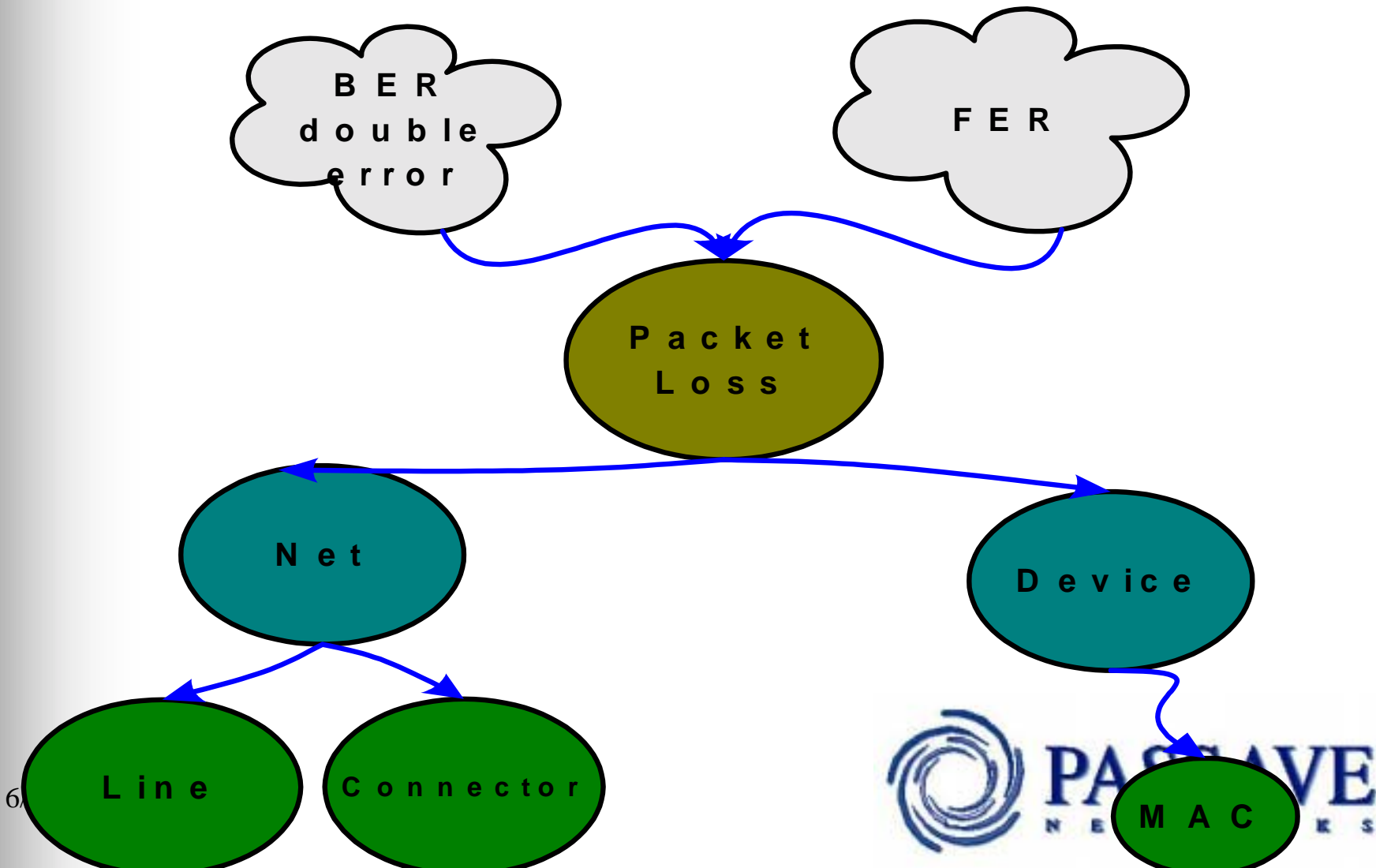
Loss of Signal

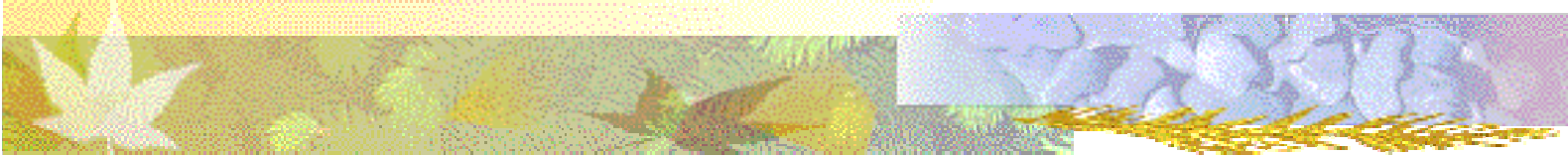


Logical Loss of Signal

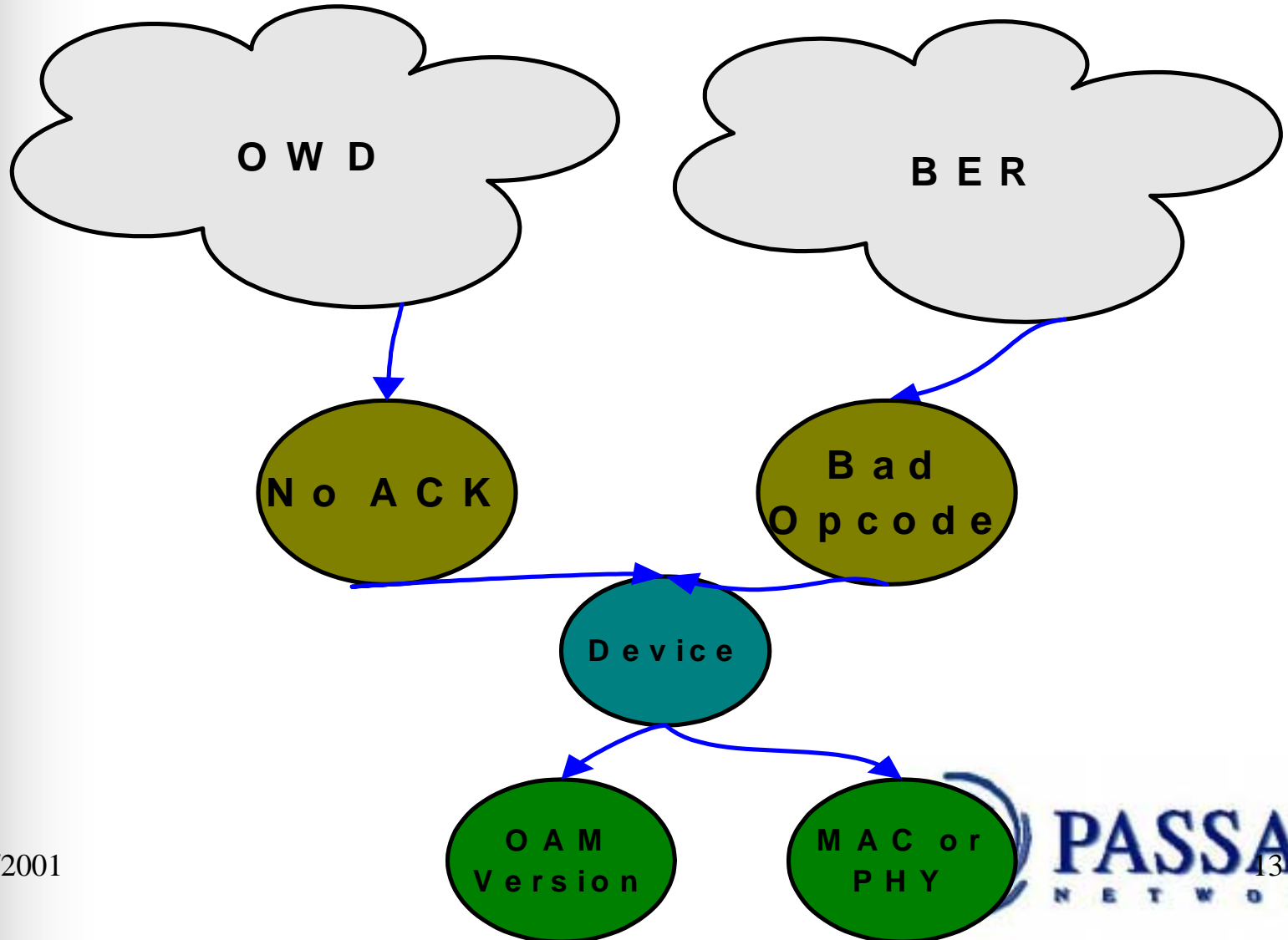


Loss of Packet

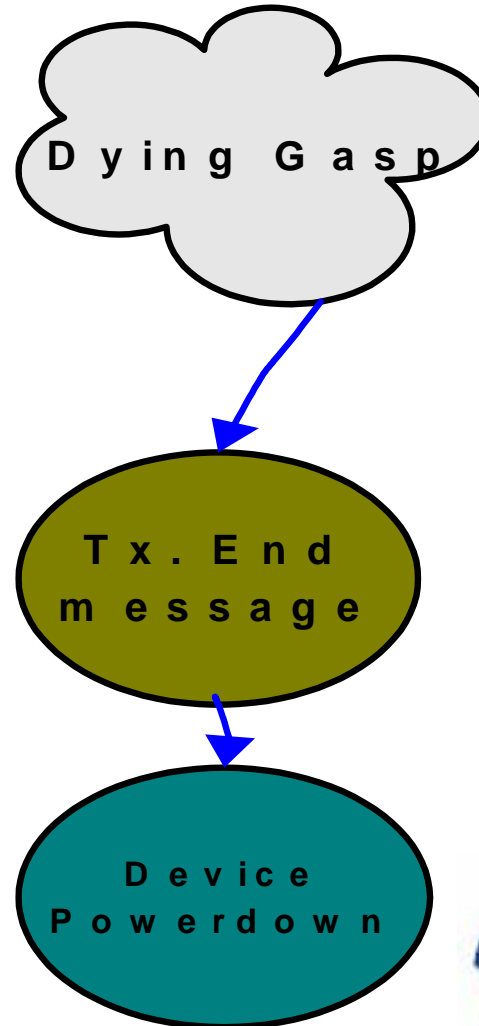




OAM Error



End of Transmission

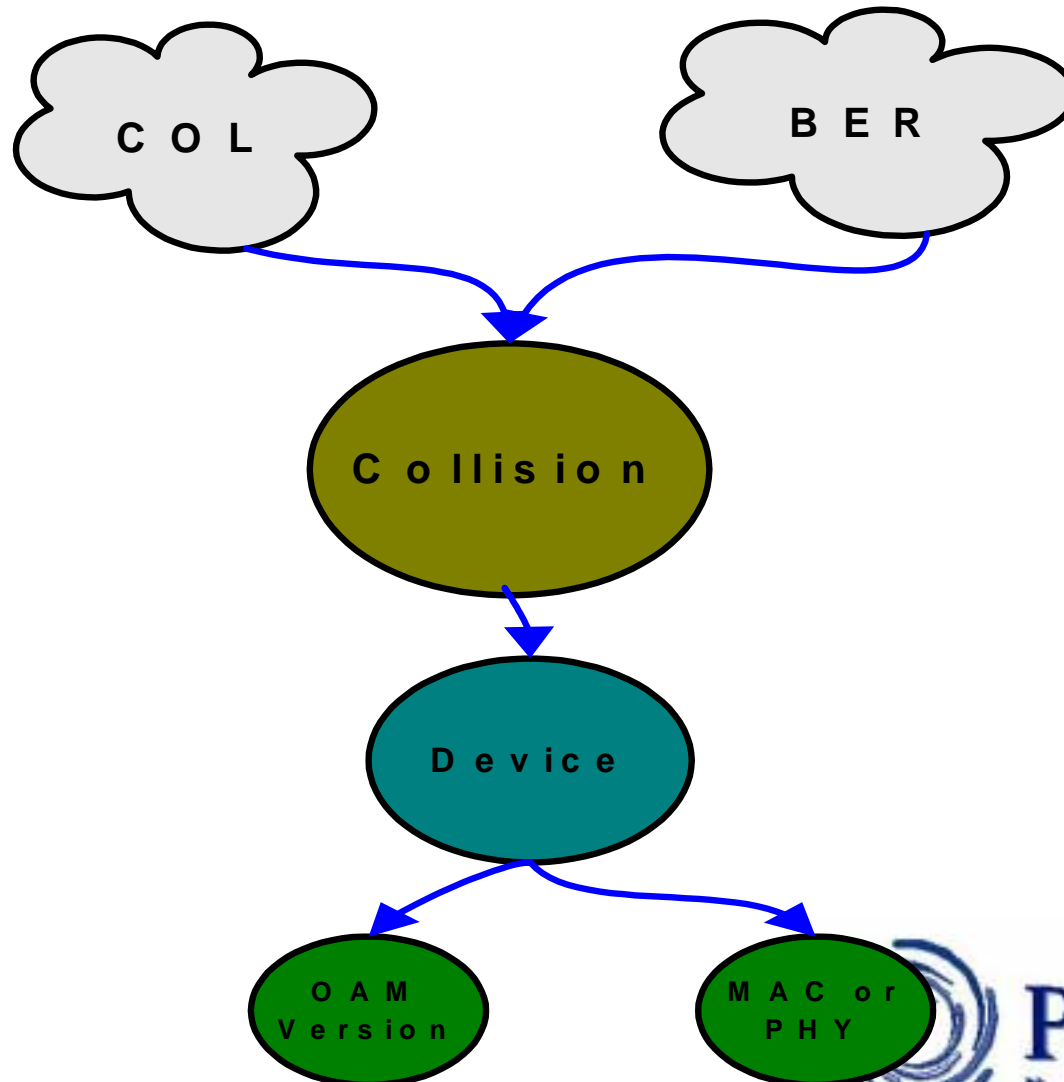


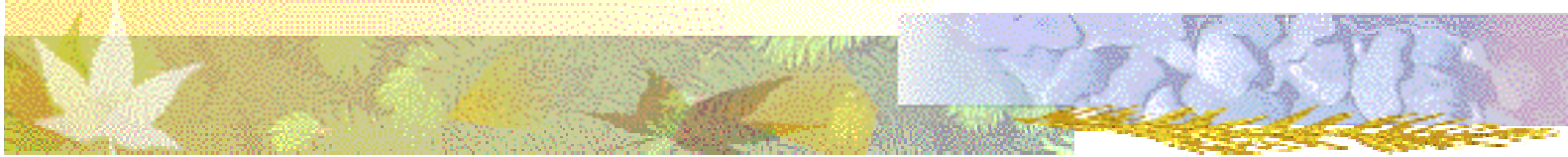


EPON Generalization

- All error schemes are correlated against the active grant to discover faulty ONU
- New sensor
 - COL – collision detector

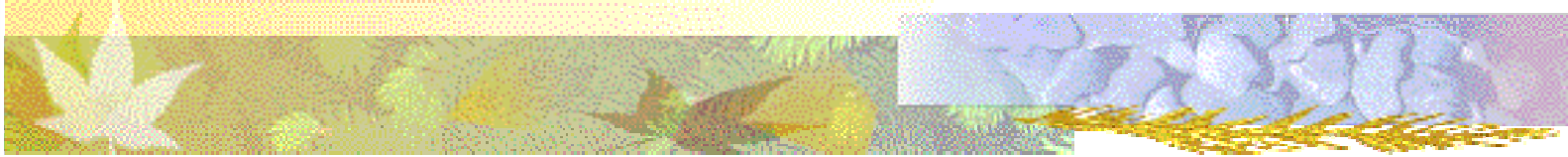
Collision





Future Work

- Isolation and recovery procedures
- OAM messaging support for reporting and interrogation
 - Loop-back
 - Far end failure
 - Far end measurements



Conclusions

- EFM requires failure detection, isolation and restoration
- Fault detection and isolation mechanisms shown