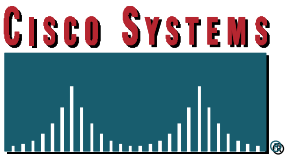
# Packet-Over-SONET (POS)
# A Technical Primer

IEEE 802.3 HSSG
November 8-12, 1999
Hawaii

Gary Nicholl
gnicholl@cisco.com



# What is POS ?

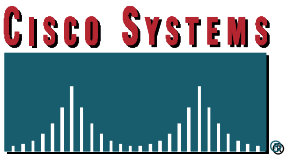
**Packet-over-SONET (POS) is a standardized way for mapping IP packets into SONET/SDH frames.**

# Overview

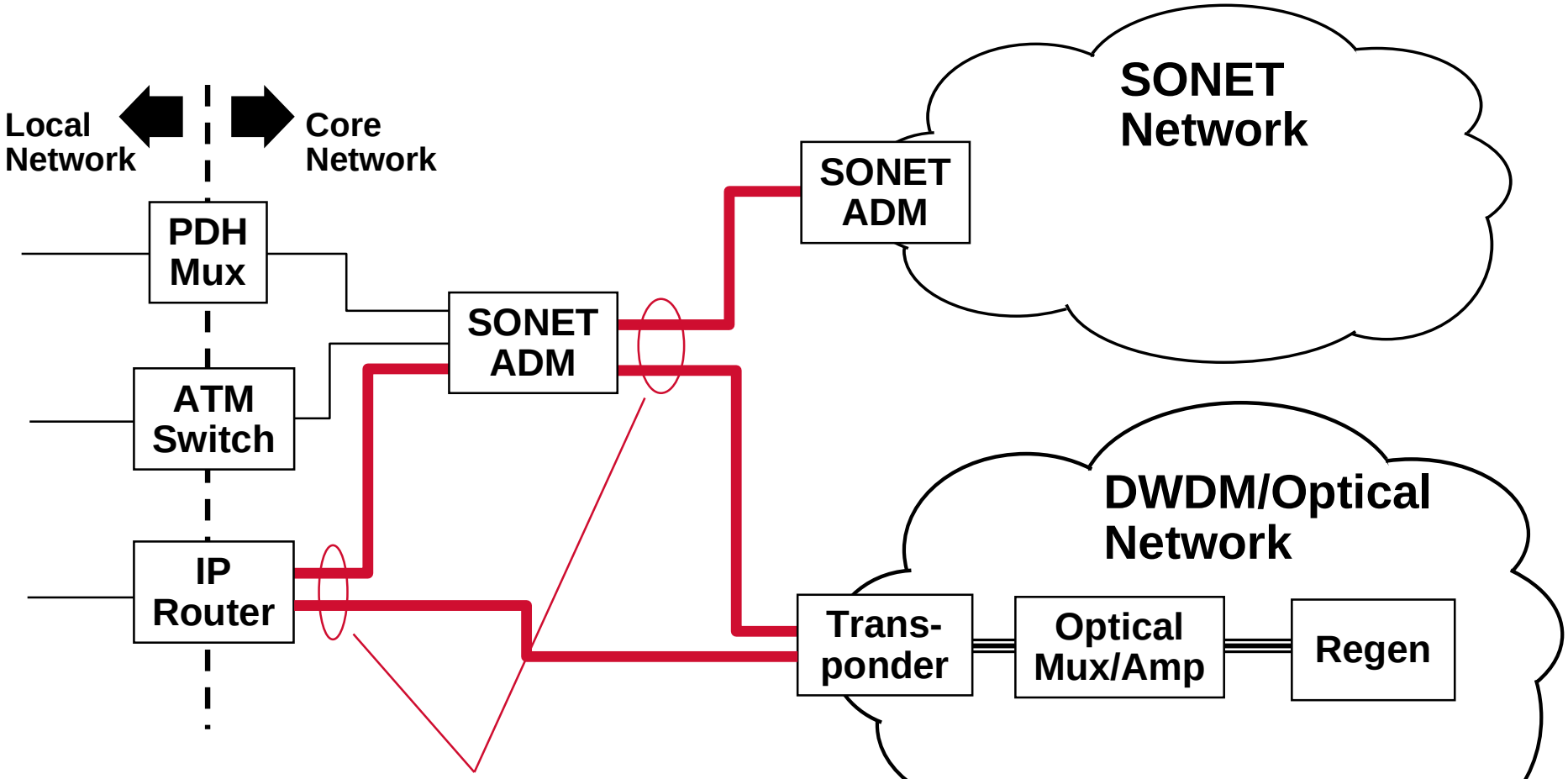
- Network Model
- Encapsulation
- SONET Overhead Usage
- Performance Monitoring
- Synchronization
- Jitter Requirements
- OC-192 PHYs

# POS Deployment

- First deployed in 1996 (OC-3c)
- Used in 100s of networks worldwide
- Over 15,000 POS interfaces deployed
- Defacto for building large IP backbones
- Available for OC-3c, OC-12c, and OC-48c today
- OC-192c demonstrated last week !
- Standards based:  IETF, Bellcore, ITU, ANSI



# Network Model - POS




**POS - Packet over SONET/SDH**

- OC-3c (155.52 Mbps)
- OC-12c (622.08 Mbps)
- OC-48c (2488.32 Mbps)
- OC-192c (9953.28 Mbps)

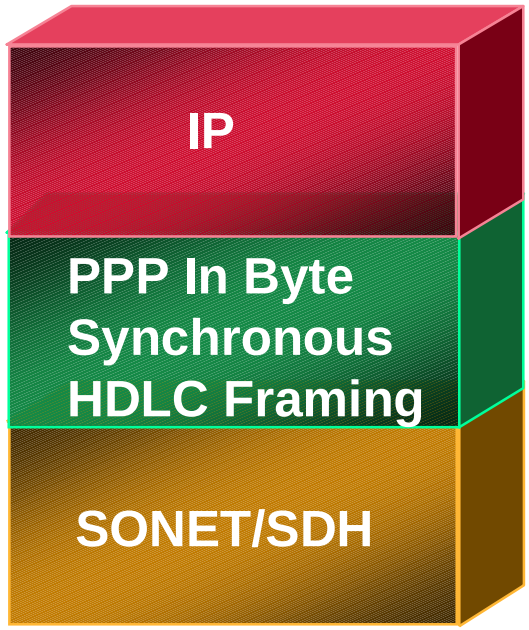
# Packet-over-SONET/SDH (PoS)

Datagrams

Protocol encapsulation
Link Initialization

PPP Packet Delineation
Error Control

Byte Delineation




Network Layer

Data Link Layer

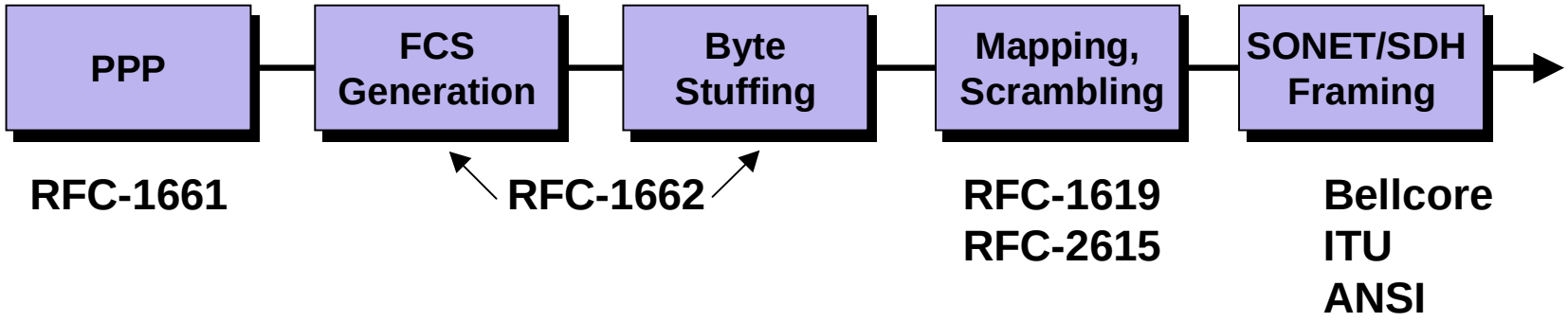
Physical Layer

- Point-to-Point Protocol, IETF RFC 1661
- PPP in HDLC- Like Framing, IETF RFC 1662
- PPP over SONET/SDH, IETF RFC 1619/2615

# POS Packet Flow

**Standard PPP Encapsulation**
- **Magic Number Recommended**
- **No Address and Control Compression**
- **No Protocol Field Compression**

**Special Data Scrambler**
- **1+ x43 Polynomial**
- **Protects Against Transmitted Frames Containing Synch Bytes Or Insufficient Ones Density**

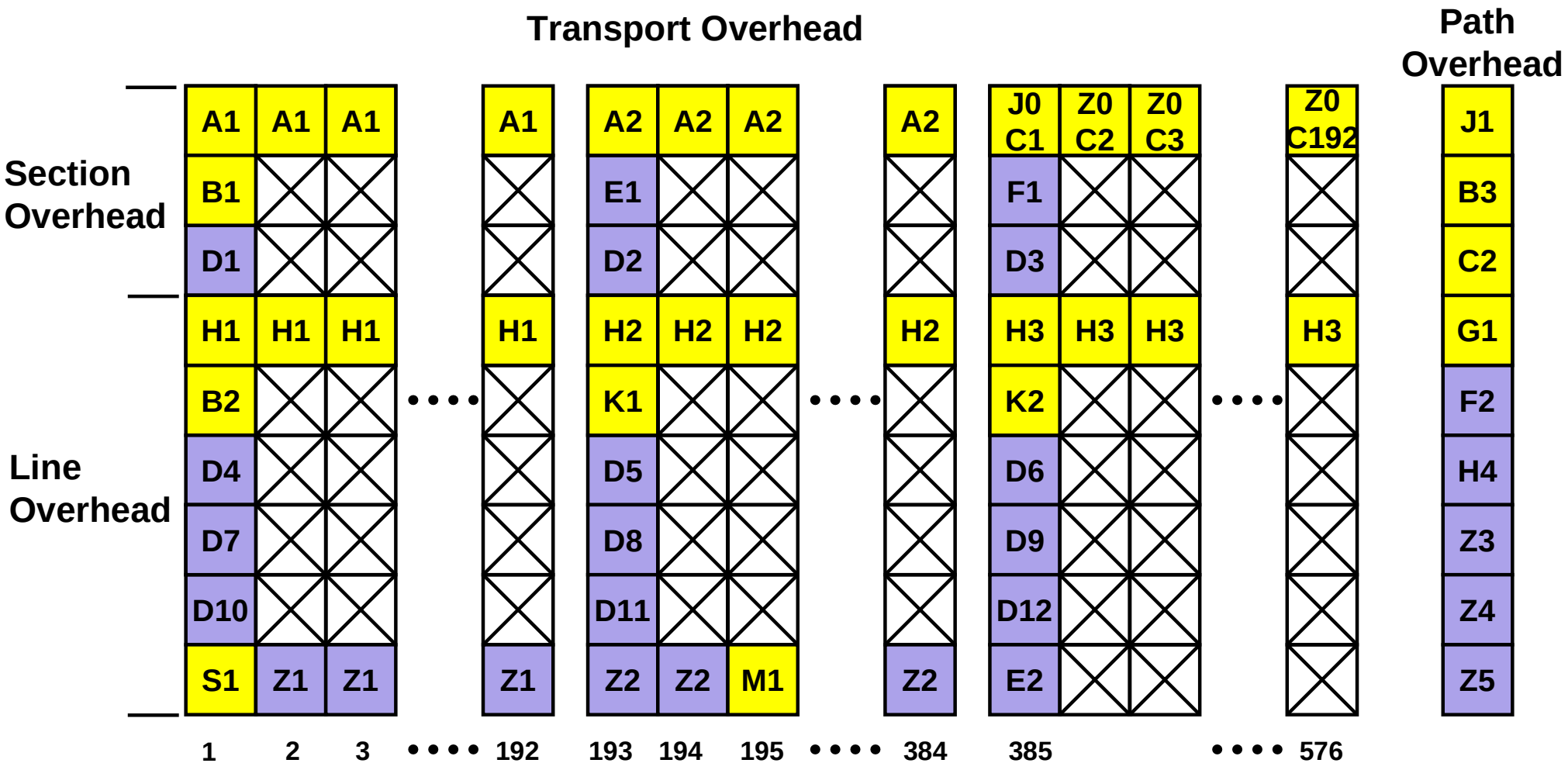



**Standard CRC Computation**
- **OC3 May Use CRC-16**
- **Other Speeds Use CRC-32**

**SONET Framing**
- **OC3, OC12, OC48, OC192 Defined**
- **C2 Byte = 0x16 With Scrambling**
- **C2 Byte = 0xCF Without (OC-3)**

CISCO SYSTEMS

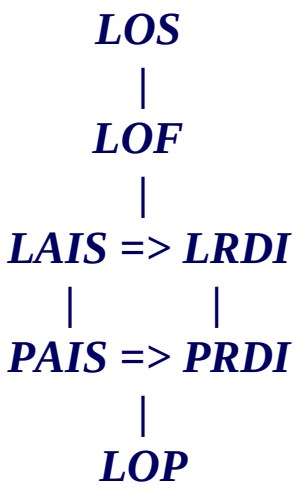
# POS - Overhead Usage



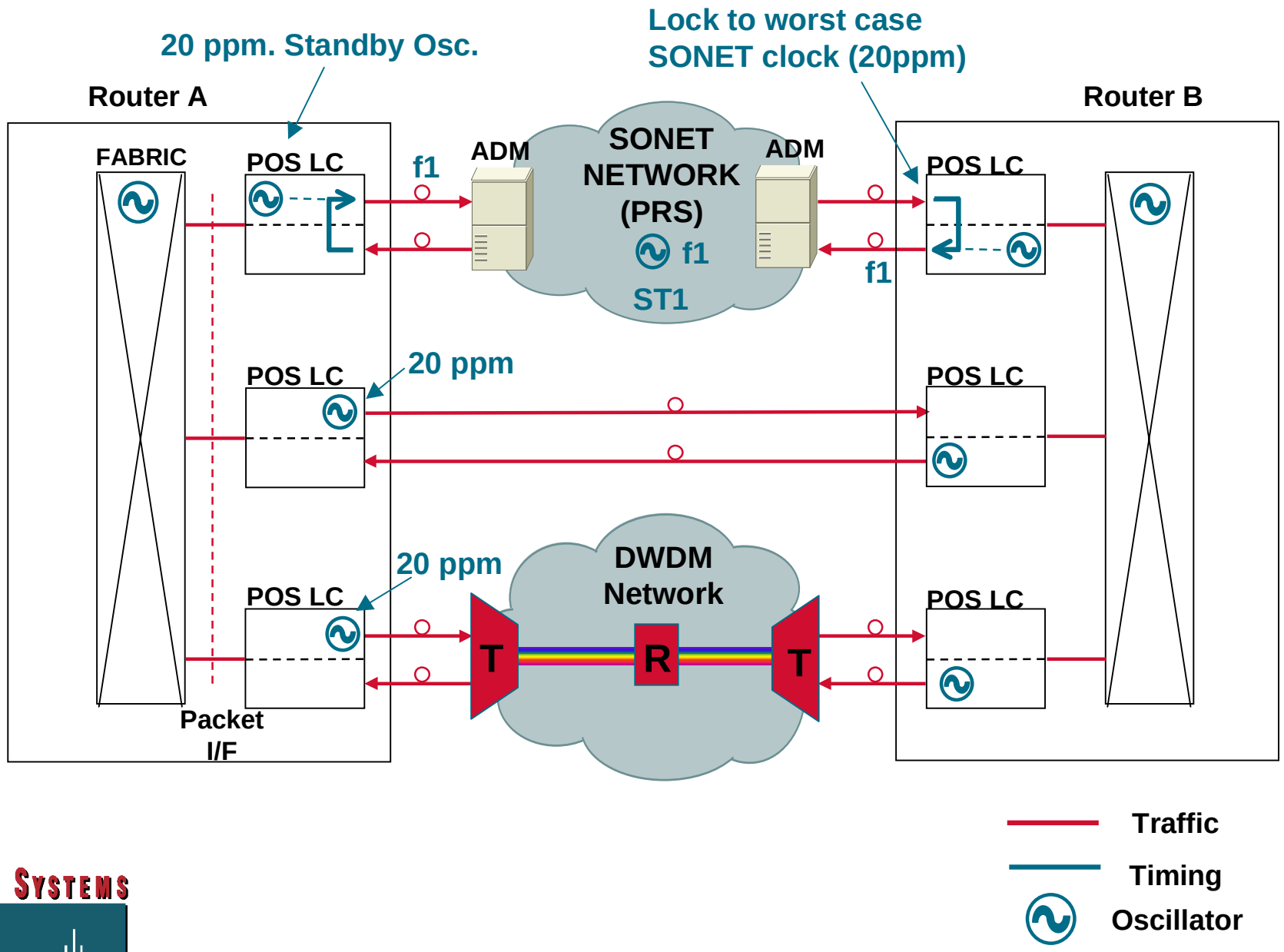
# Performance Monitoring & Fault Management

- **Performance Monitoring (Proactive)**
  - Error counts B1, B2, B3
  - Errors counts Line (M1) and Path (G1) REI
  - Threshold crossing alerts (TCA) for B1,B2,B3
- **Alarm Reporting (Reactive)**
  - LOS, LOF, LAIS, LRDI
  - PLOP, PAIS, PRDI
  - SF, SD based on B2 with selectable threshold
- **Signal Label (C2: CF or 16)**
- **Path Trace (J1) insertion and monitoring**
- **Sync Status (S1) set to ‘don’t use for sync’**

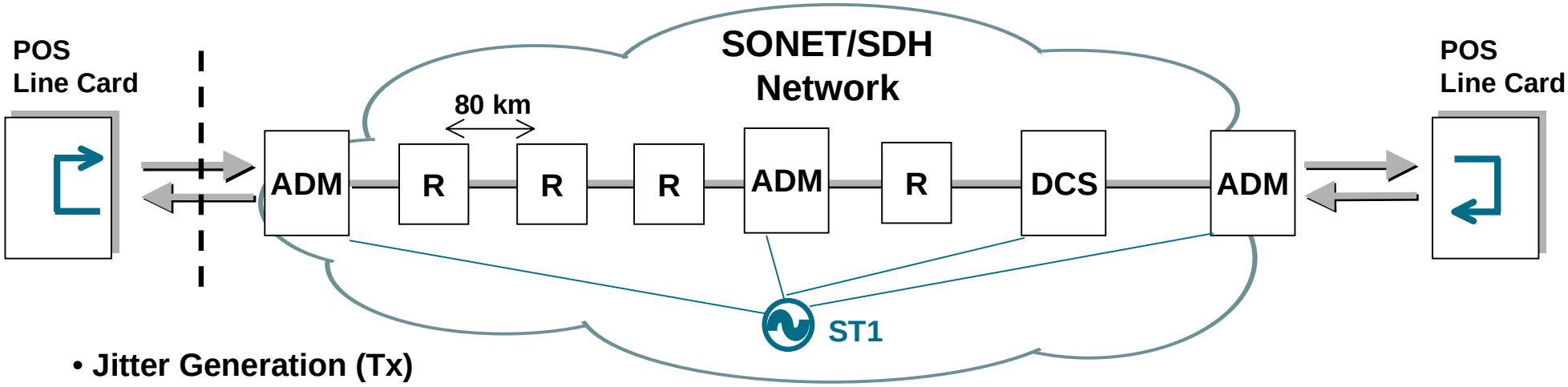
**Alarm Hierarchy**



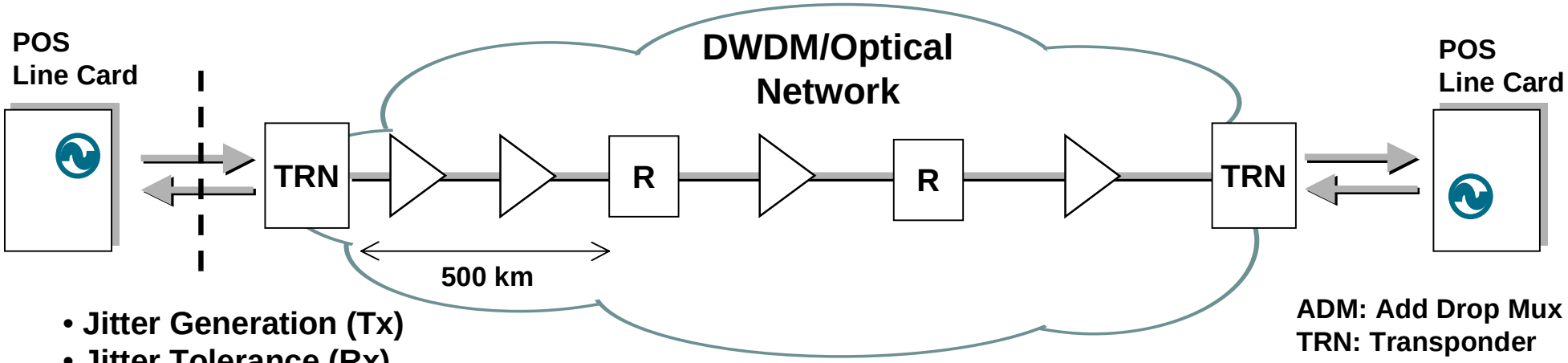
# POS - Synchronization



# POS Jitter Requirements




- Jitter Generation (Tx)
- Jitter Tolerance (Rx)
- Jitter Transfer

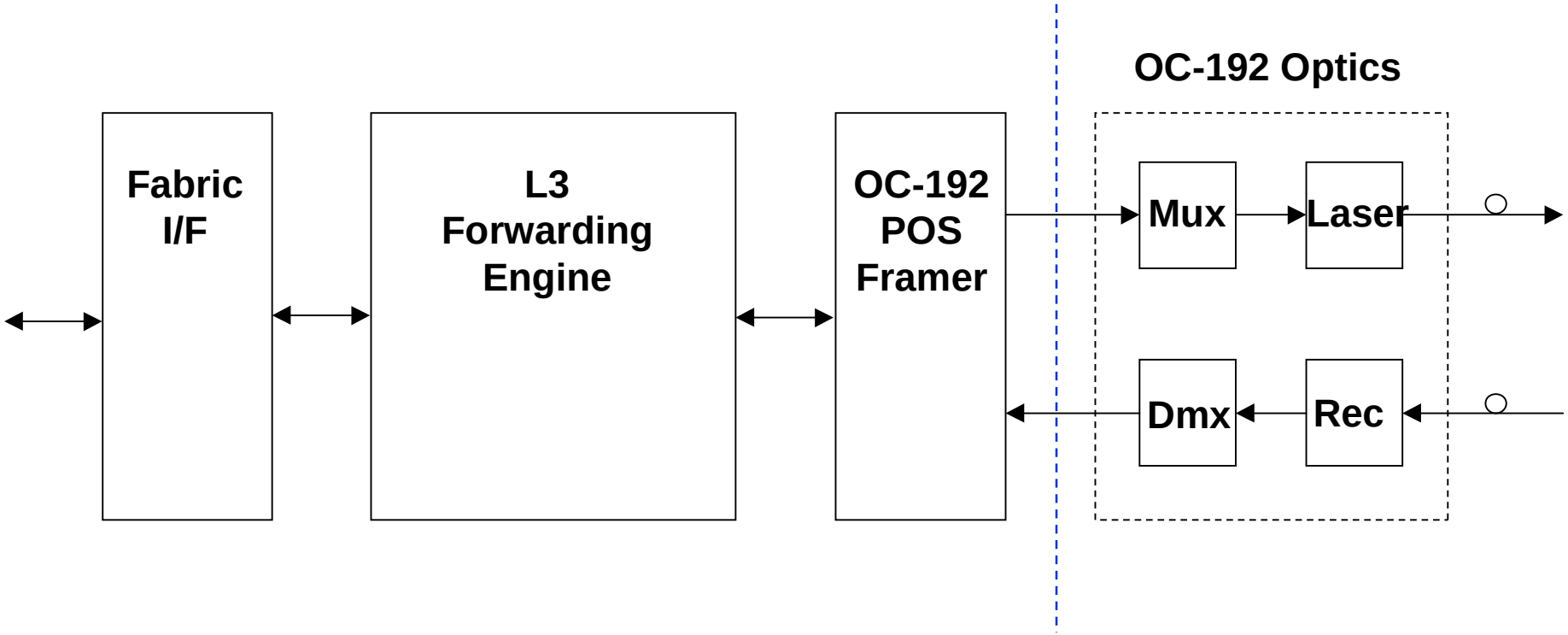



- Jitter Generation (Tx)
- Jitter Tolerance (Rx)

ADM: Add Drop Mux
TRN: Transponder
R: Regenerator

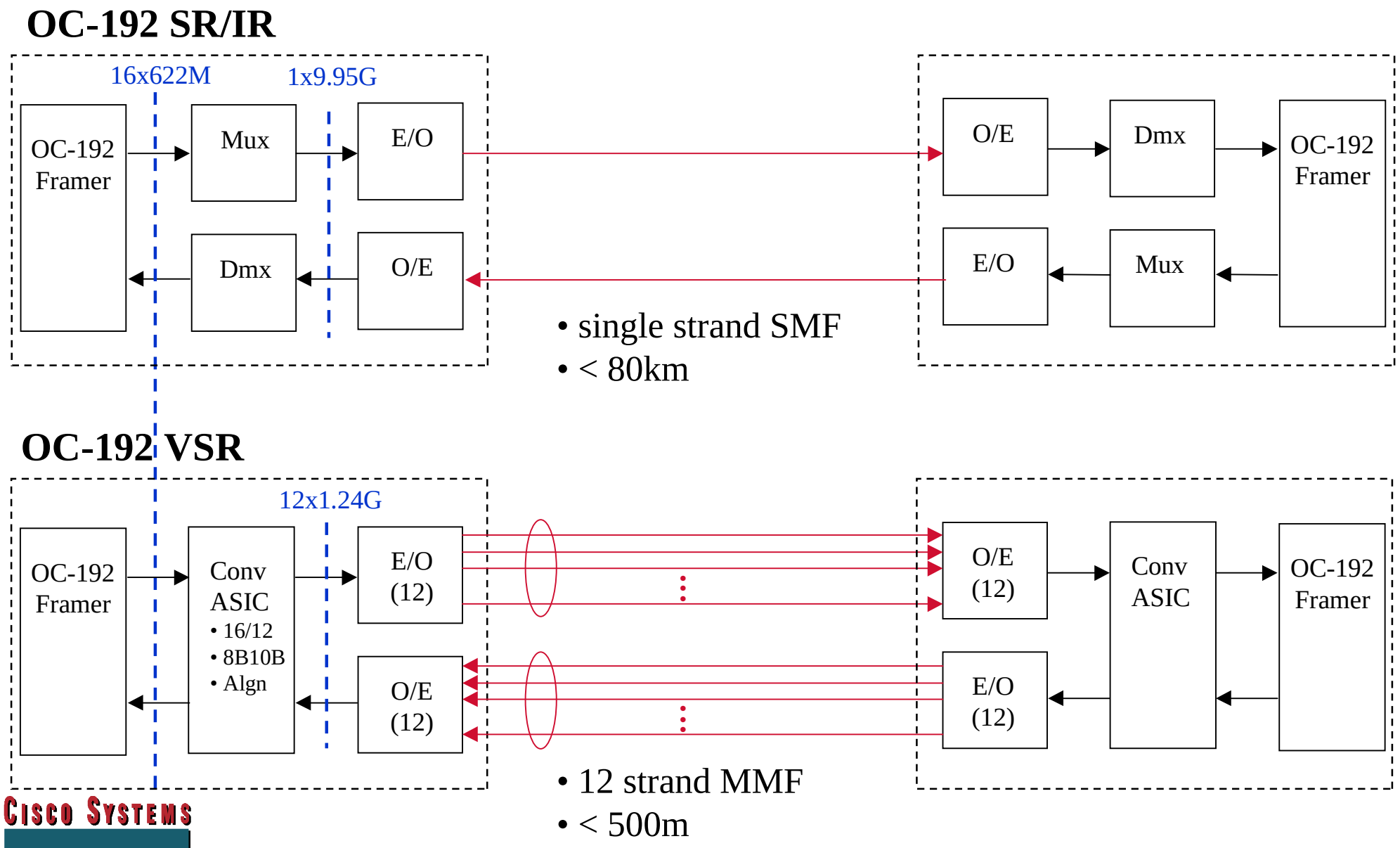
**POS Interfaces are SONET/SDH Jitter Compliant**

# OC-192 POS LC Architecture




**SONET Framed**
**16 x 622 Mb/s**
**LVDS**
**(OIF 99.102)**

# POS OC-192 Interface Options



# Summary

- **POS is a widely deployed, standardized mapping of IP into SONET/SDH**
- **The HSSG could draw upon the experience of POS to speed up the definition of the 10GE WAN PHY.**