



# IETF - SONET/SDH Emulation Draft-malis-pwe3-sonet-02.txt

IEEE 802.17 RPR

May 6, 2002

Tom Johnson  
Litchfield Communications, Inc  
[www.litchfieldcomm.com](http://www.litchfieldcomm.com)

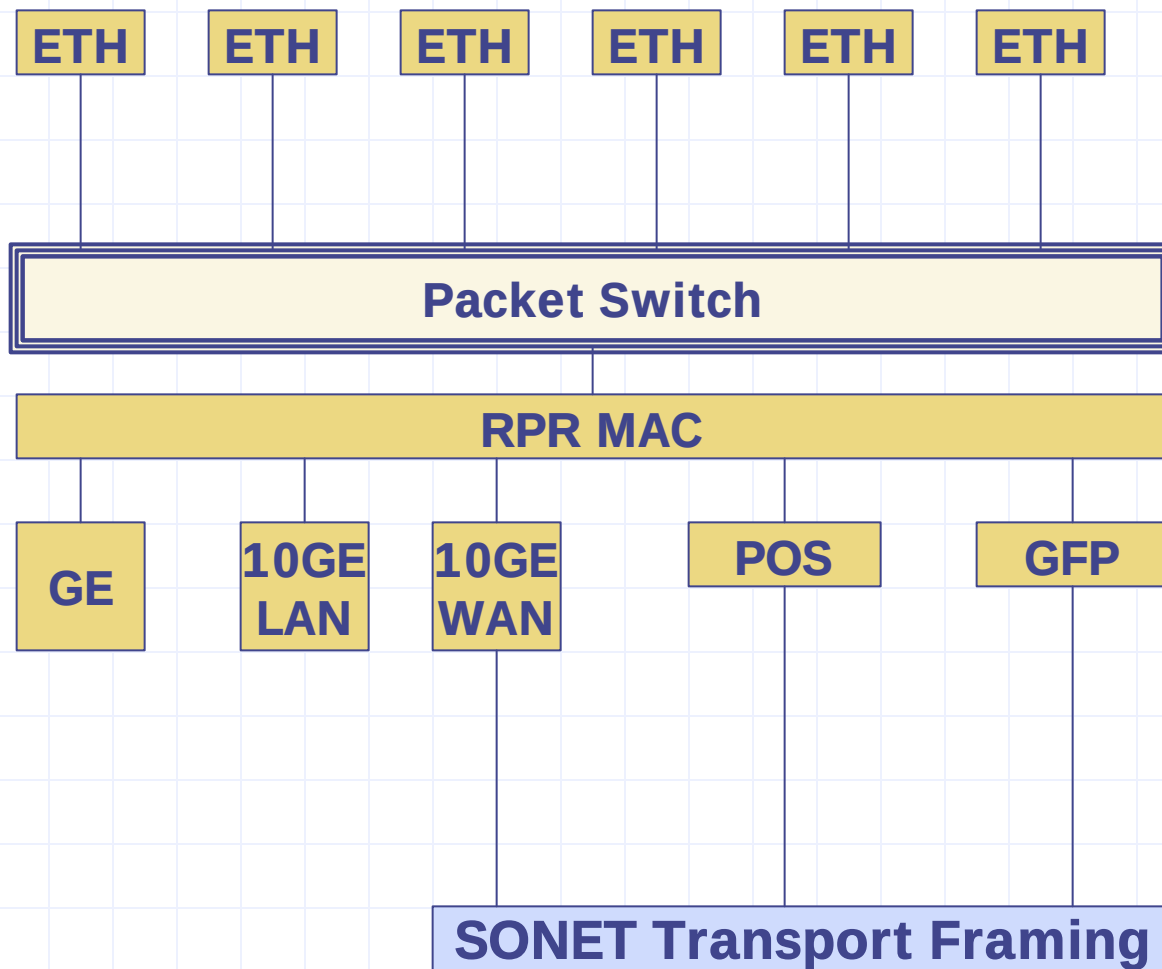
# Motivation for Presentation

- ◆ SONET Emulation Work in IETF  
Targeting IP/MPLS Switch/Routers
- ◆ RPR Participants Using SONET Em
- ◆ Suggested that SONET Emulation  
be presented to RPR as informational

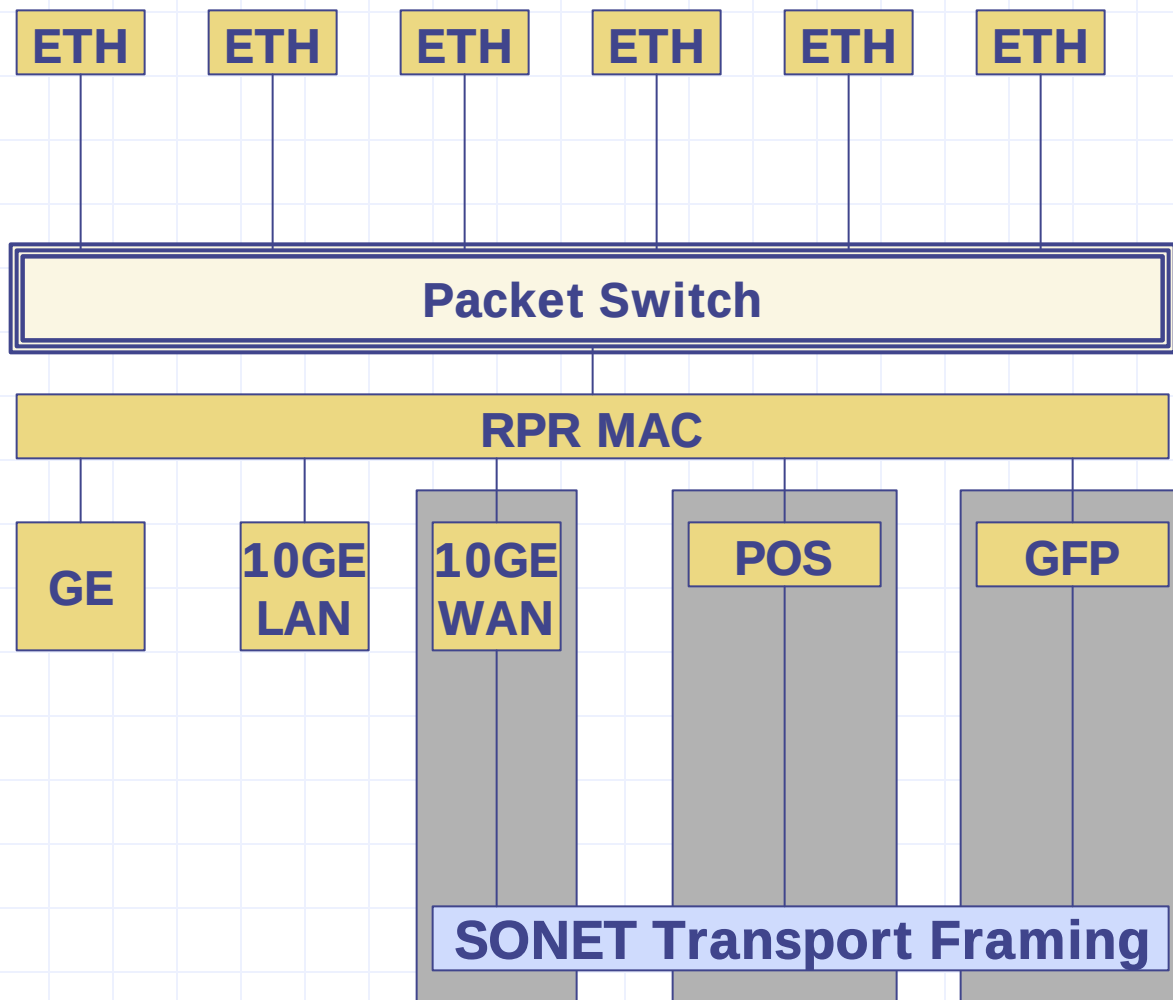
# Presentation Goals

- ◆ Introduce RPR WG to SONET Em
- ◆ Review Motivation for SONET Emulation
- ◆ Describe SONET Emulation Protocol
- ◆ Discuss IETF PWE3 WG Background
- ◆ Illustrate Application of SONET Em to RPR
- ◆ Note Summary/Status
- ◆ Questions/Answers

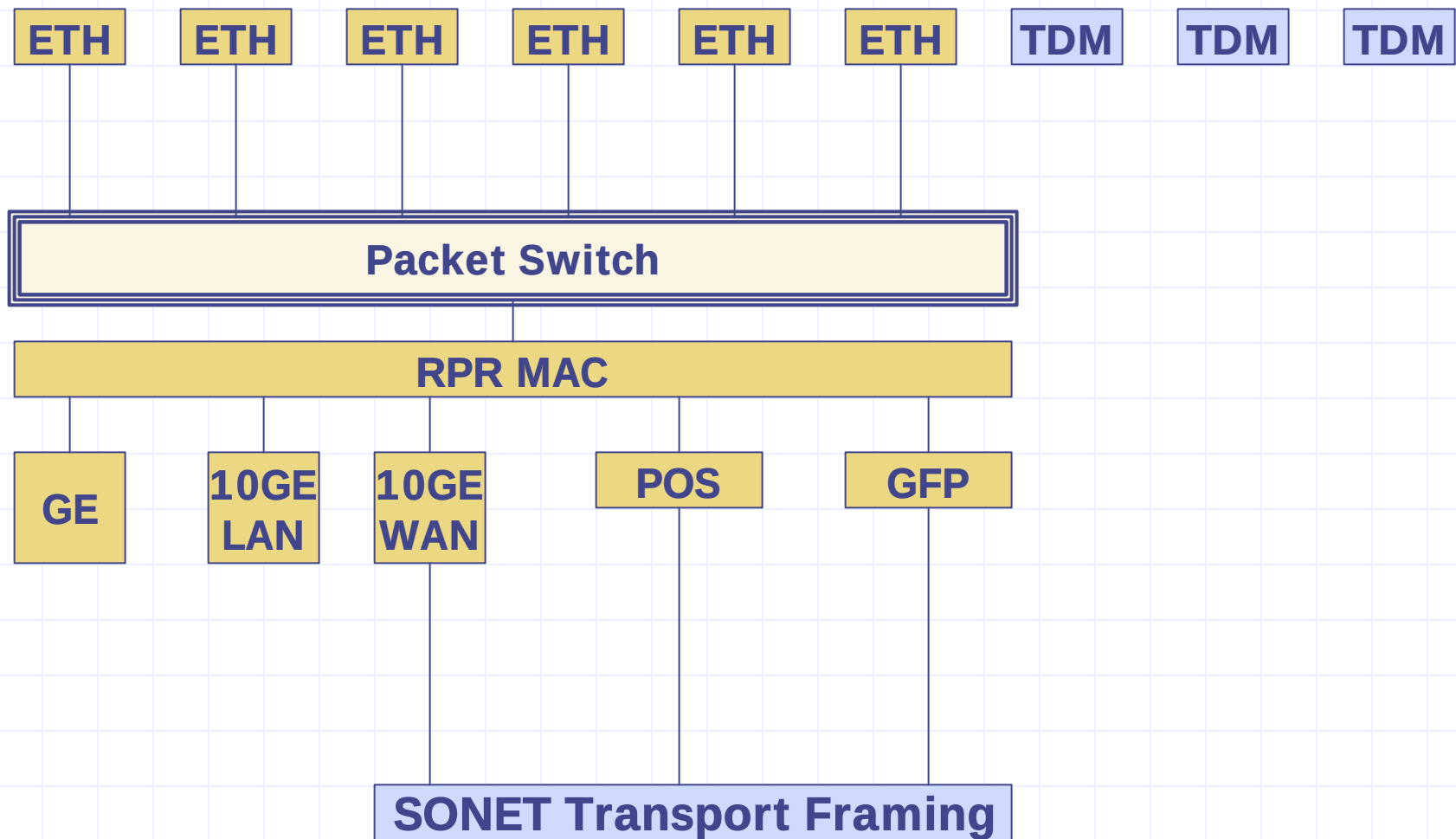
# RPR



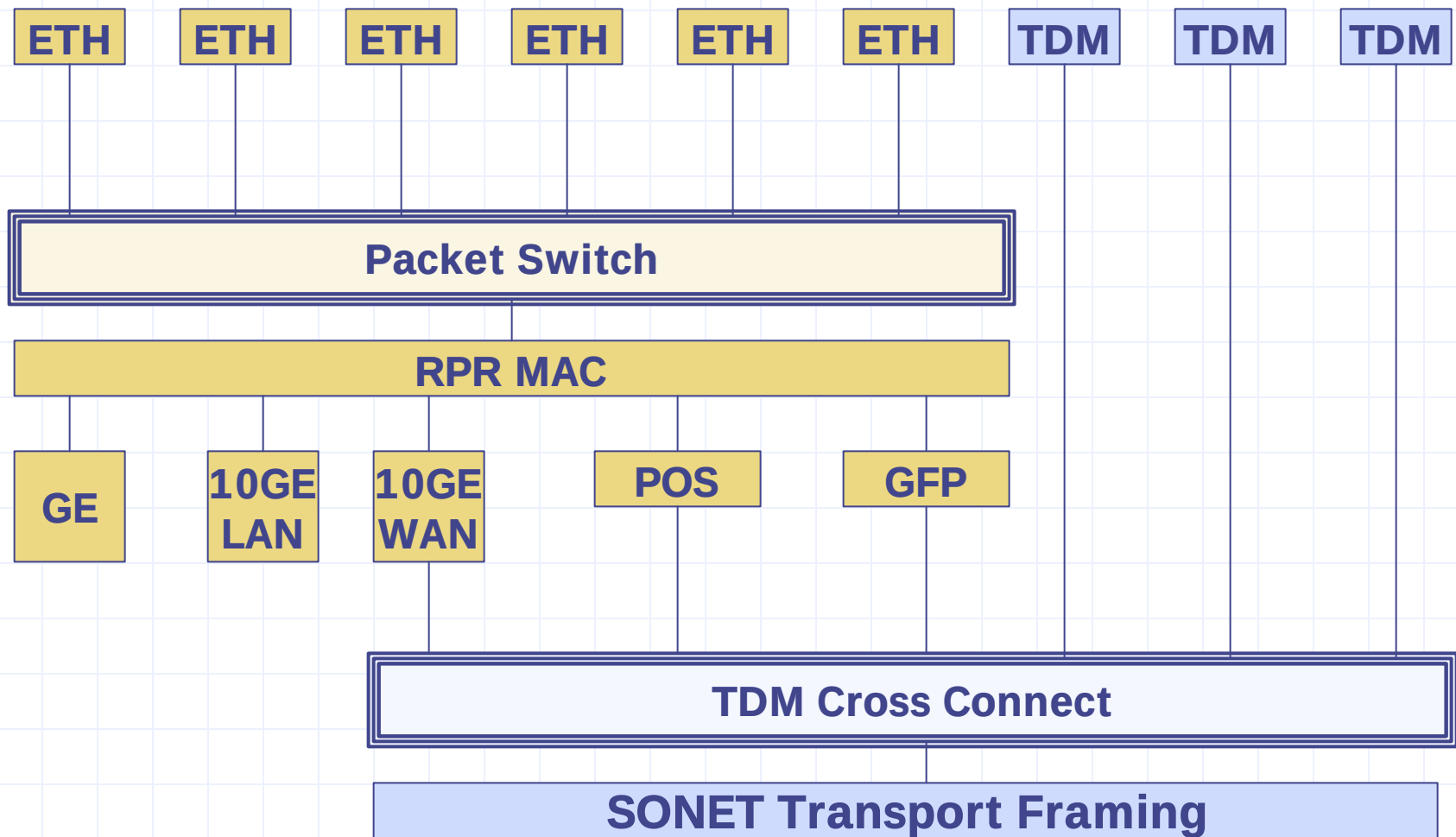
# RPR



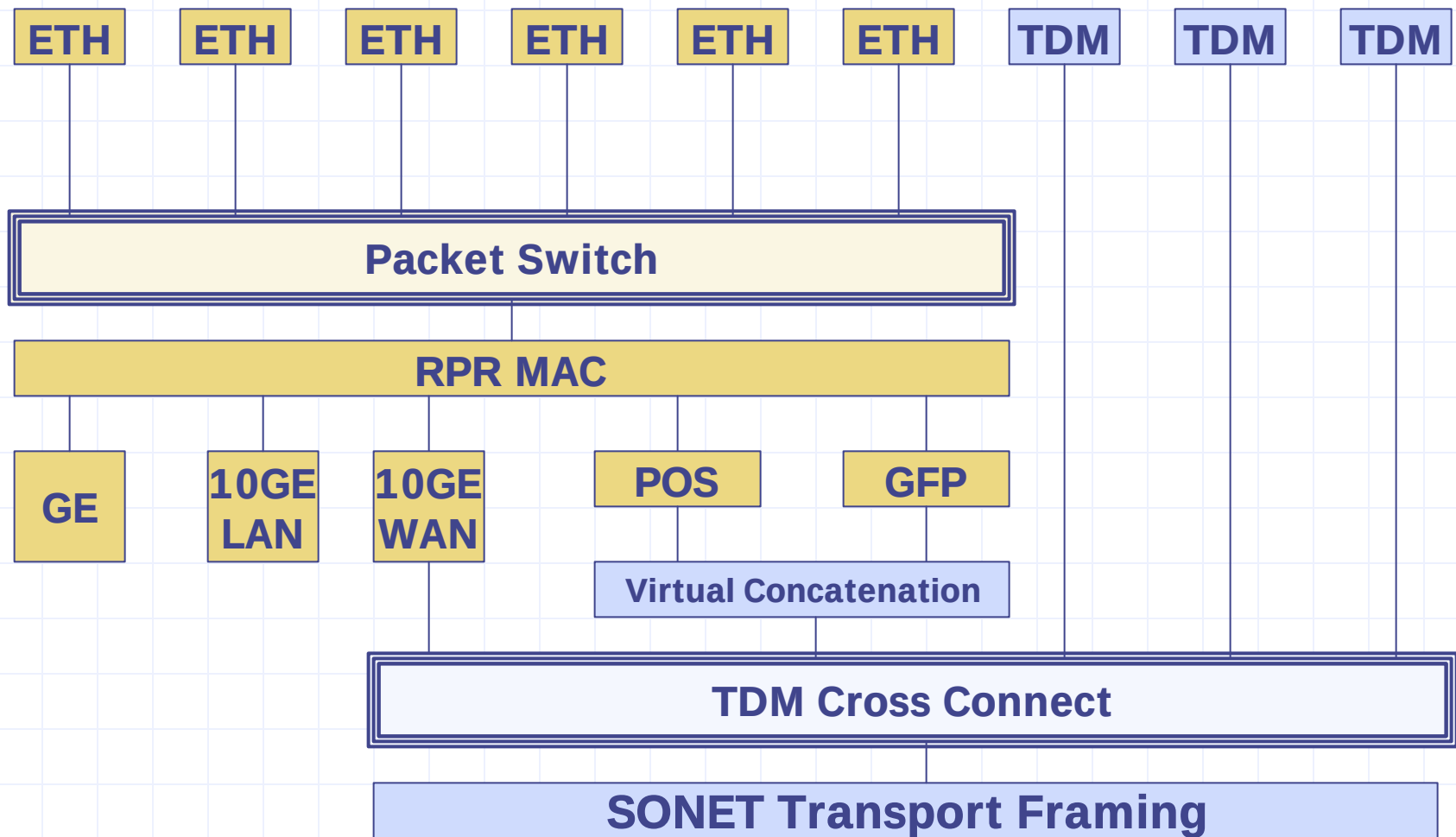
# RPR + TDM (?)



# RPR + TDM + DCS

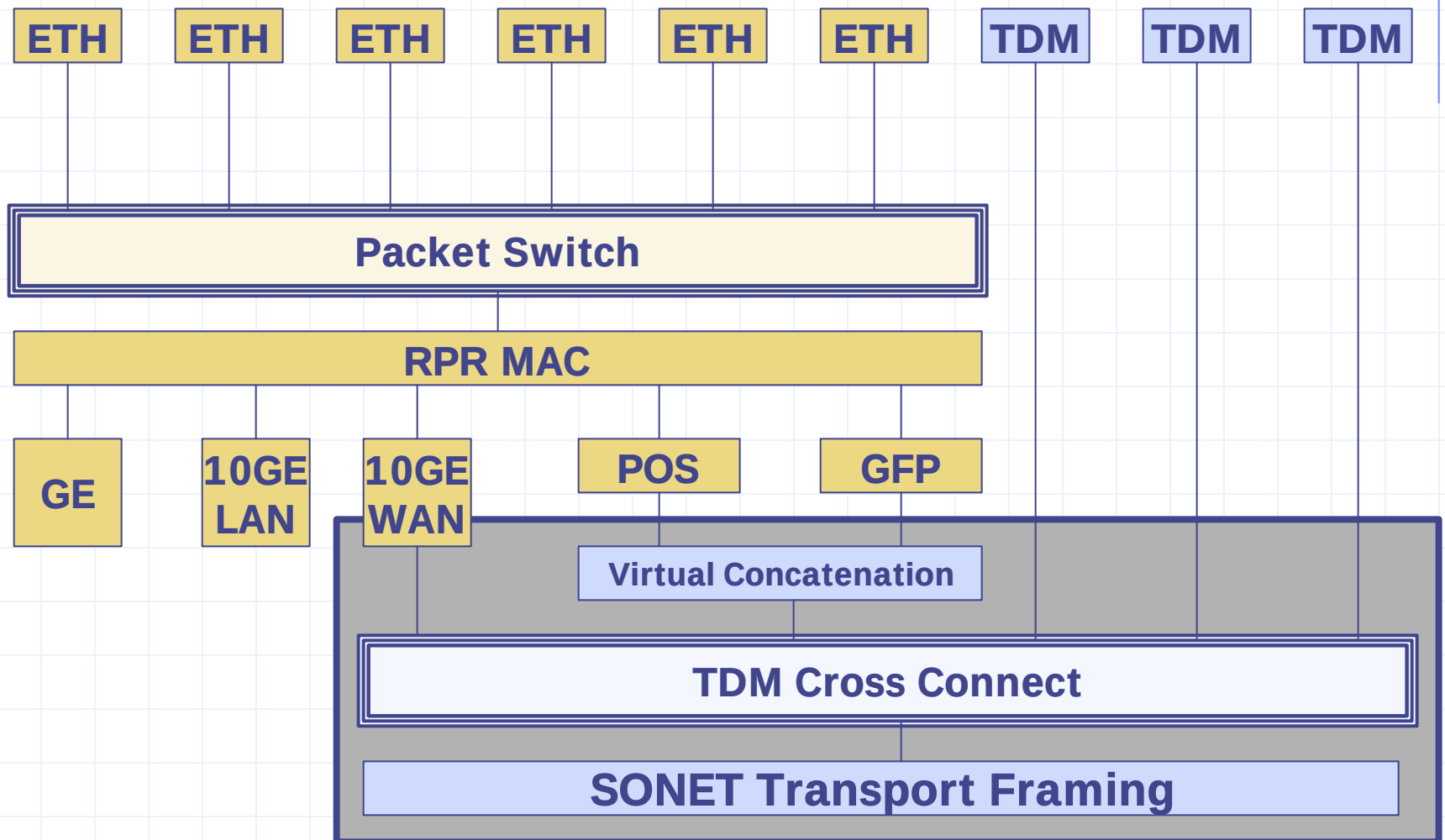


# RPR + TDM + DCS + VC

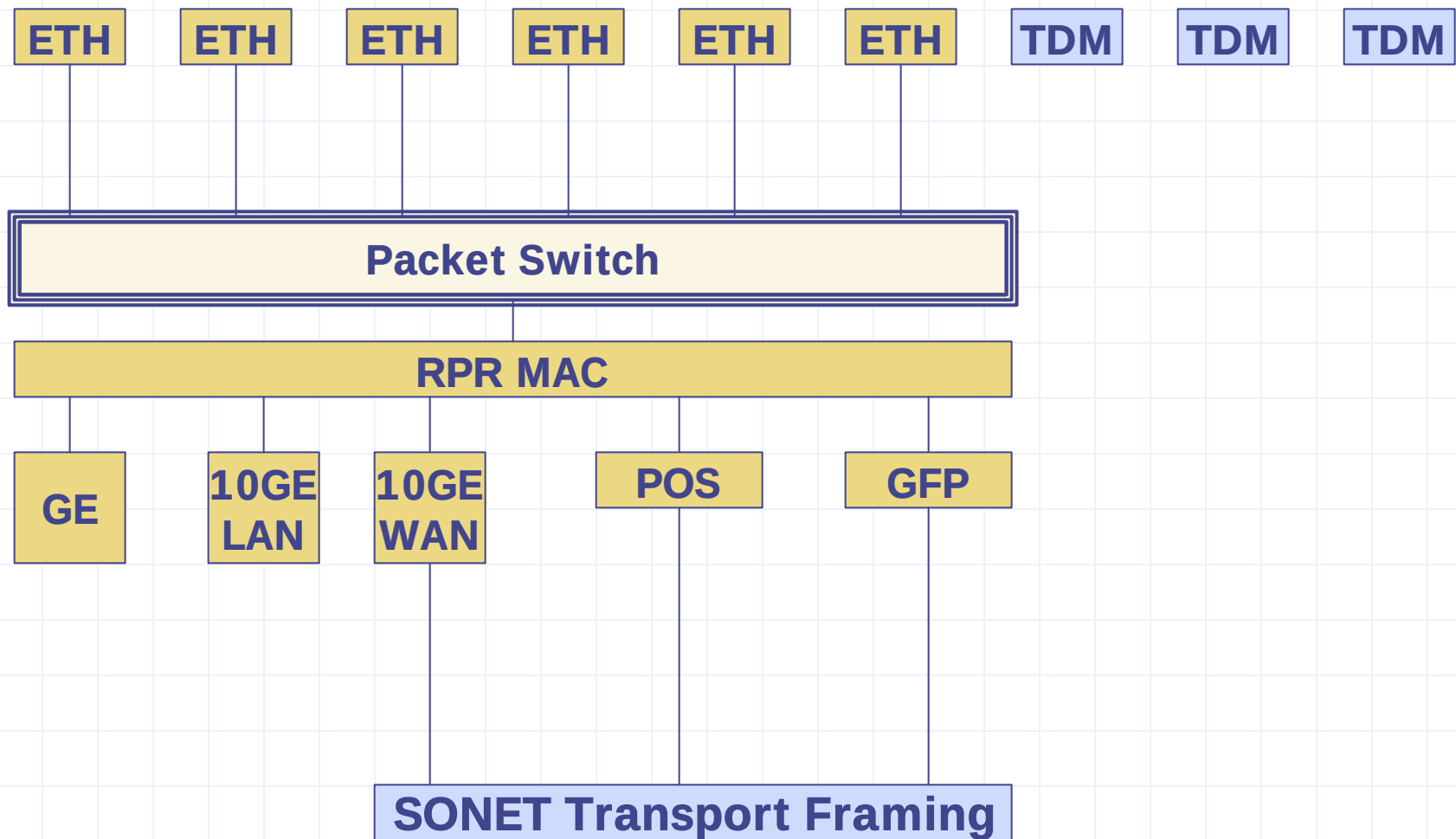




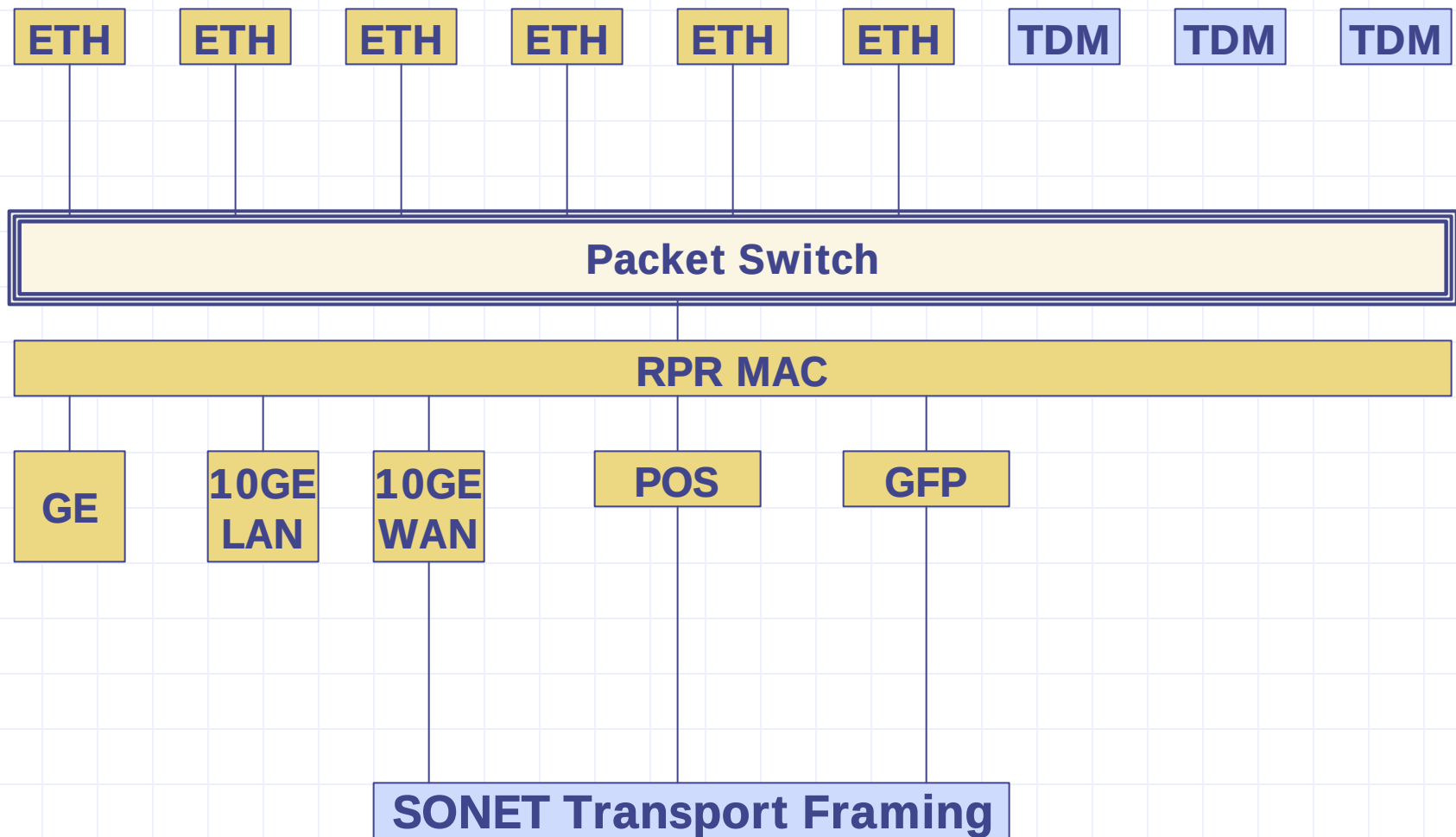
# RPR + TDM + DCS + VC



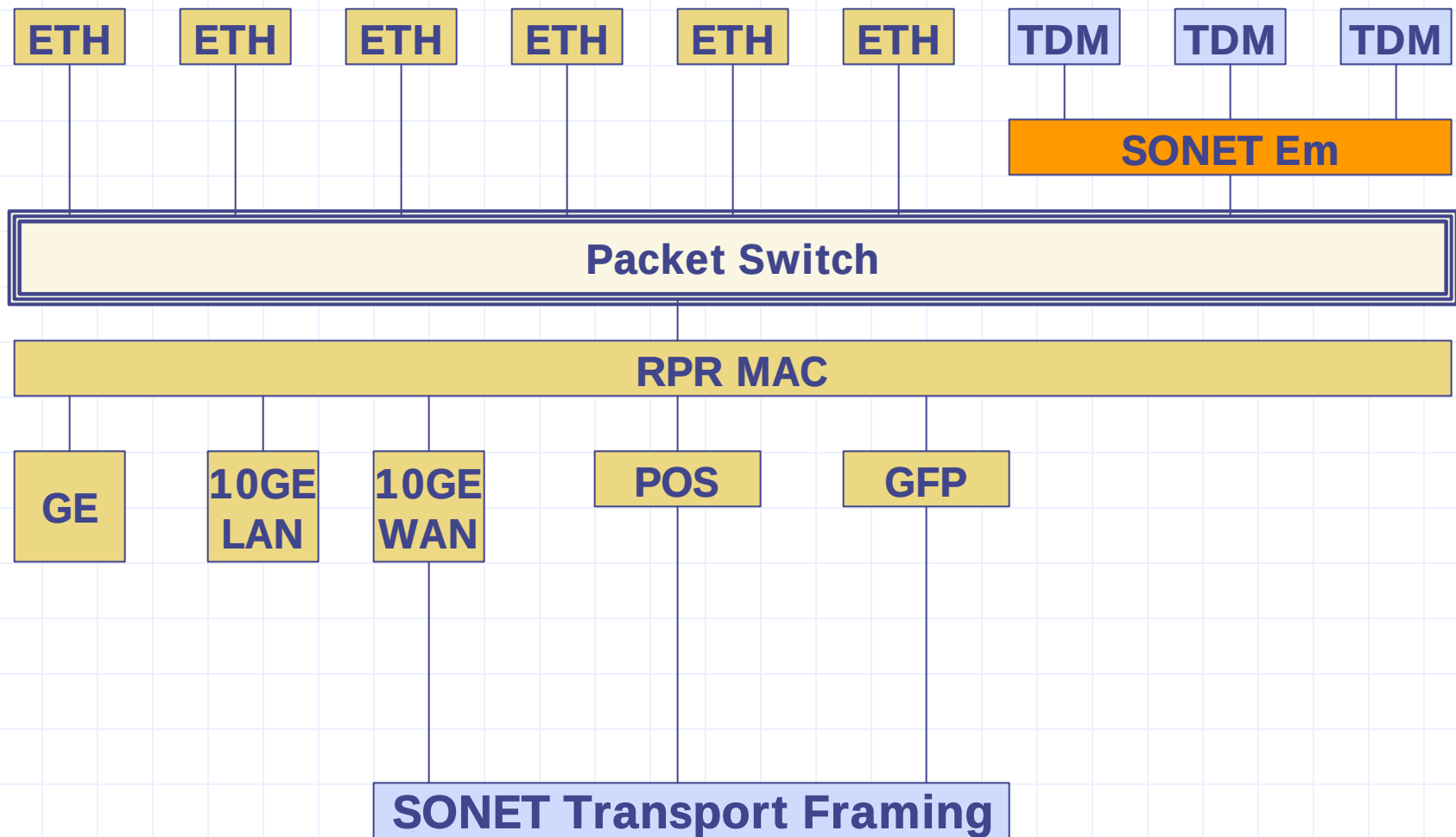
# RPR + TDM (?)



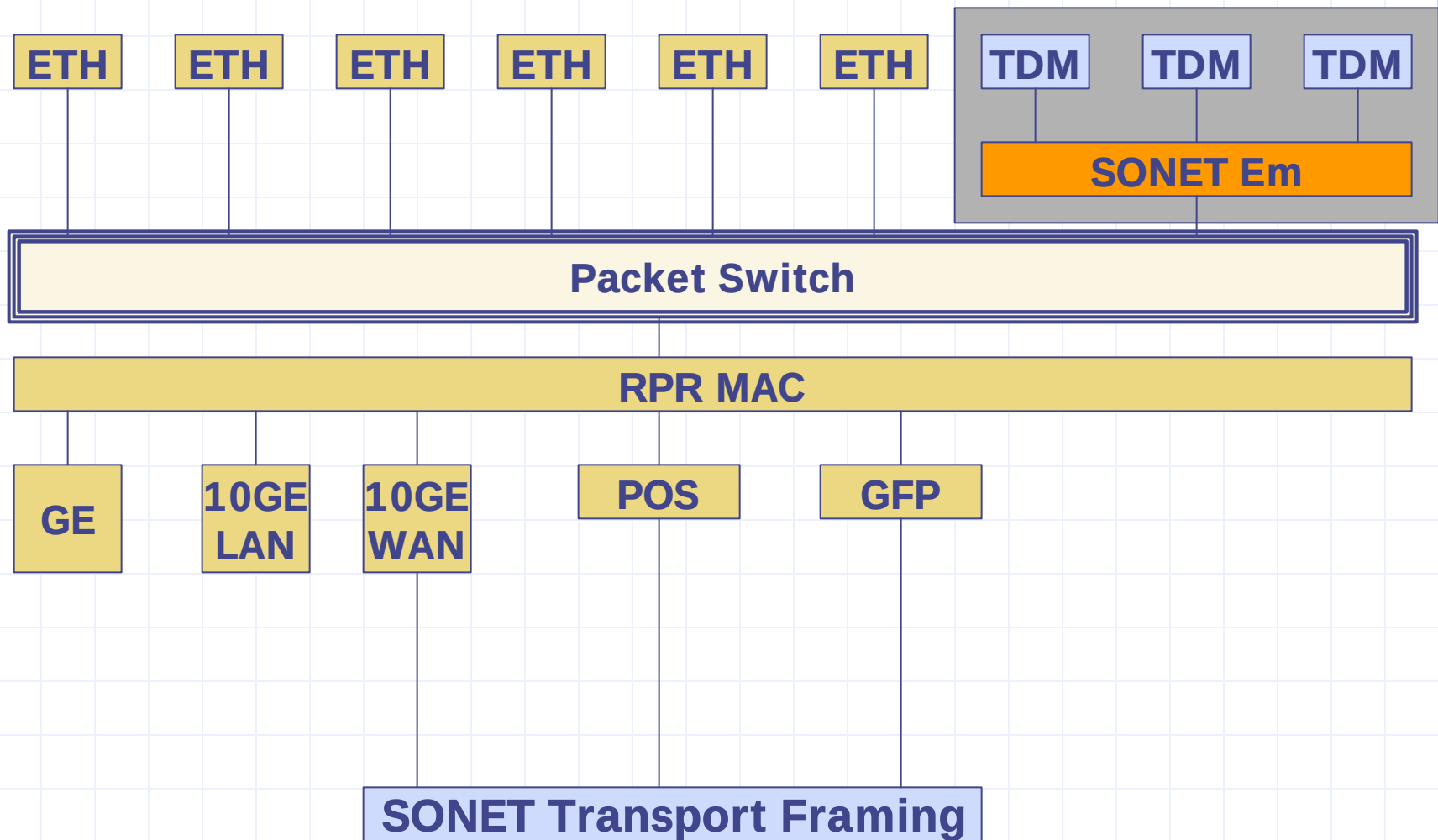
# RPR + TDM w/o DCS (?)



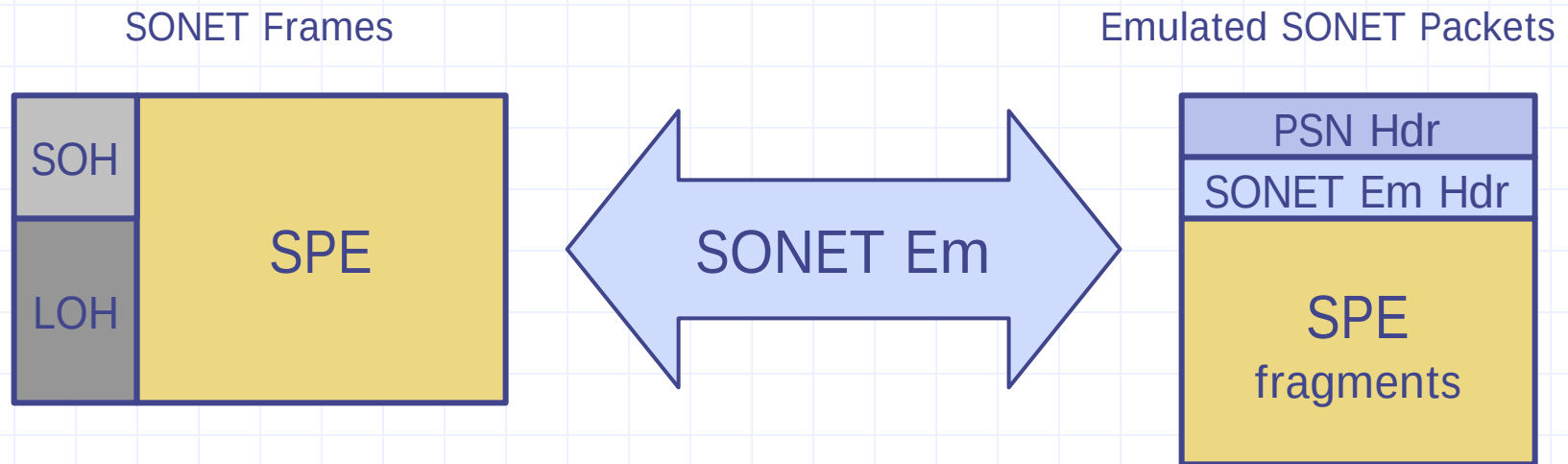
# RPR + TDM + SONET Em



# RPR + TDM + SONET Em



# SONET Em Protocol



- Terminates SONET Section and Line
- SPE Fragmented into Packets
- SONET Em HDR – See next slide
- Logical channel (STS-1/Nc) identified by Bottom Label of MPLS Label Stack (Martini)

# SONET Em Header



- Sequence # - Detects dropped or mis-ordered packets
- Structure Ptr - Locates Start of SPE
- N/P - Indicates neg/pos byte stuffing & AIS-P
- D - Dynamic bandwidth allocation
- R - Remote Defect Indication
- E - Extended Header Indication

# SPE Timing Options

## ◆ Synchronous

- Common Reference at PW End-Points
- Pointer Adj at Ingress Relayed to Egress
- SPE Wander  $\sim$  = Reference Wander

## ◆ Adaptive

- Common Reference not Available at End-Points
- SPE Rate determines TX Pkt Rate
- Therefore RX Pkt Rate  $\rightarrow$   $\sim$  SPE Rate
- SPE Wander Dependent on  
PSN Behavior, Specific Algorithm Used



# IETF PWE3 WG

## ◆ History of WG

- Formed In response to several I-D
  - ◆ Martini L2 Transport over MPLS drafts
  - ◆ SONET over IP/MPLS drafts
  - ◆ TDM Emulation Drafts
  - ◆ ATMF/ITU-T ATM/MPLS drafts
- CEOT/PWOT BOFs in 2000/2001
- PWE3 Charter May 2001

## ◆ Pseudo-Wire Emulation Edge to Edge

- Services
  - ◆ Frame Relay, ATM, Ethernet, TDM, SONET/SDH
- PSNs
  - ◆ IP, MPLS, L2TP

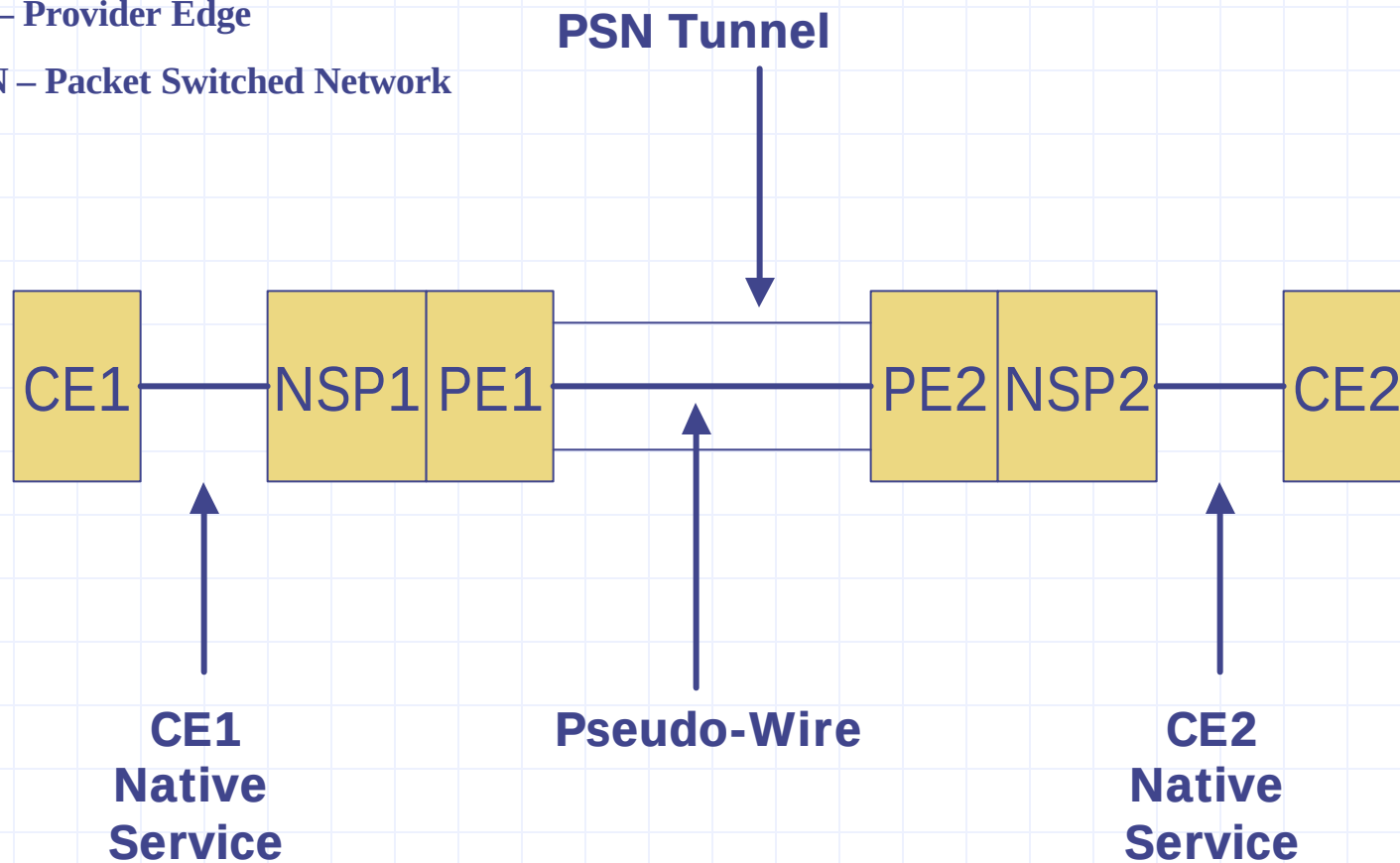
# PWE3 Architecture

**CE – Customer Edge**

**NSP – Native Service Processing**

**PE – Provider Edge**

**PSN – Packet Switched Network**



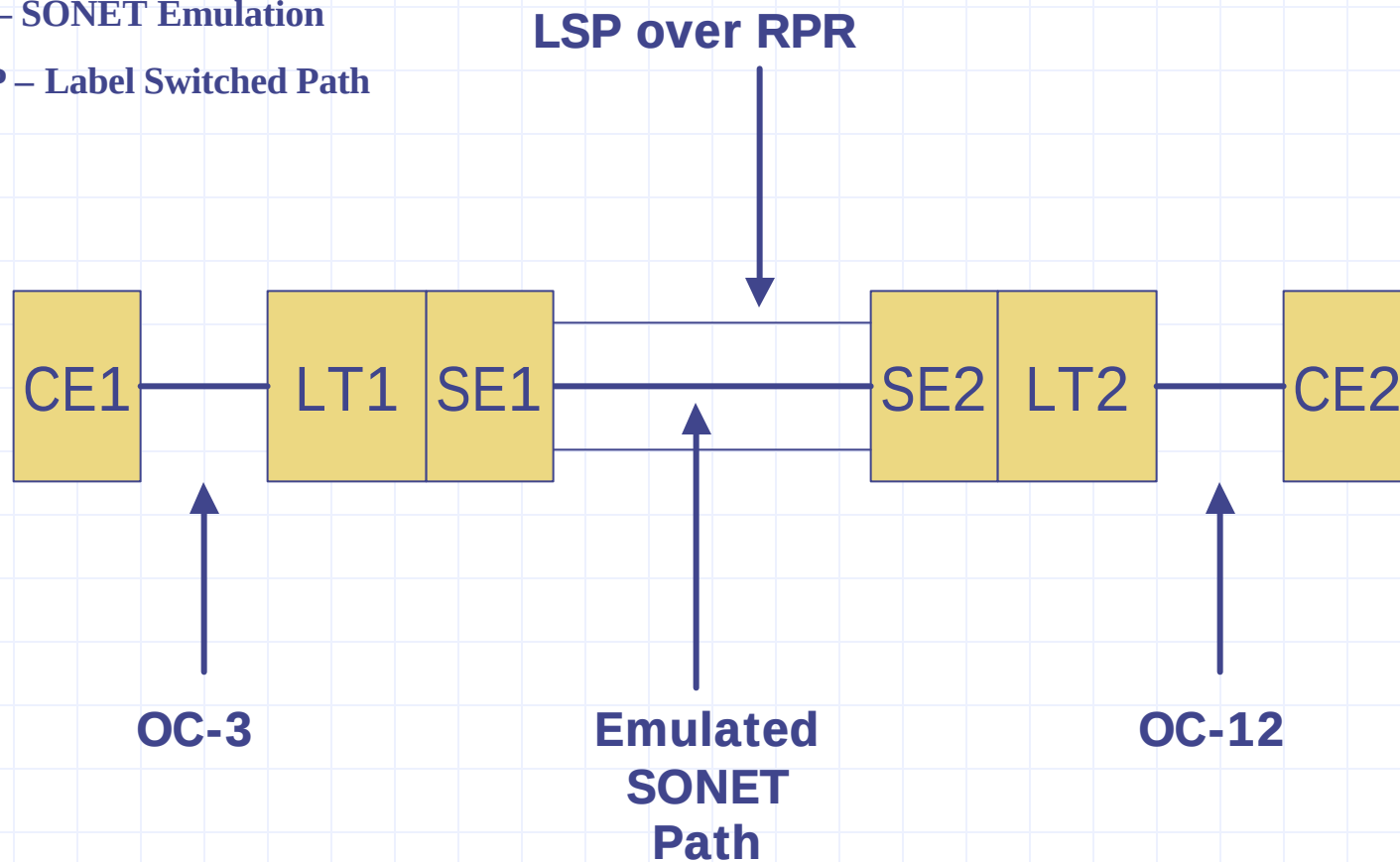
# SONET Aggregation

**CE – Customer Edge**

**LT – Line Termination**

**SE – SONET Emulation**

**LSP – Label Switched Path**



# DS3 Aggregation

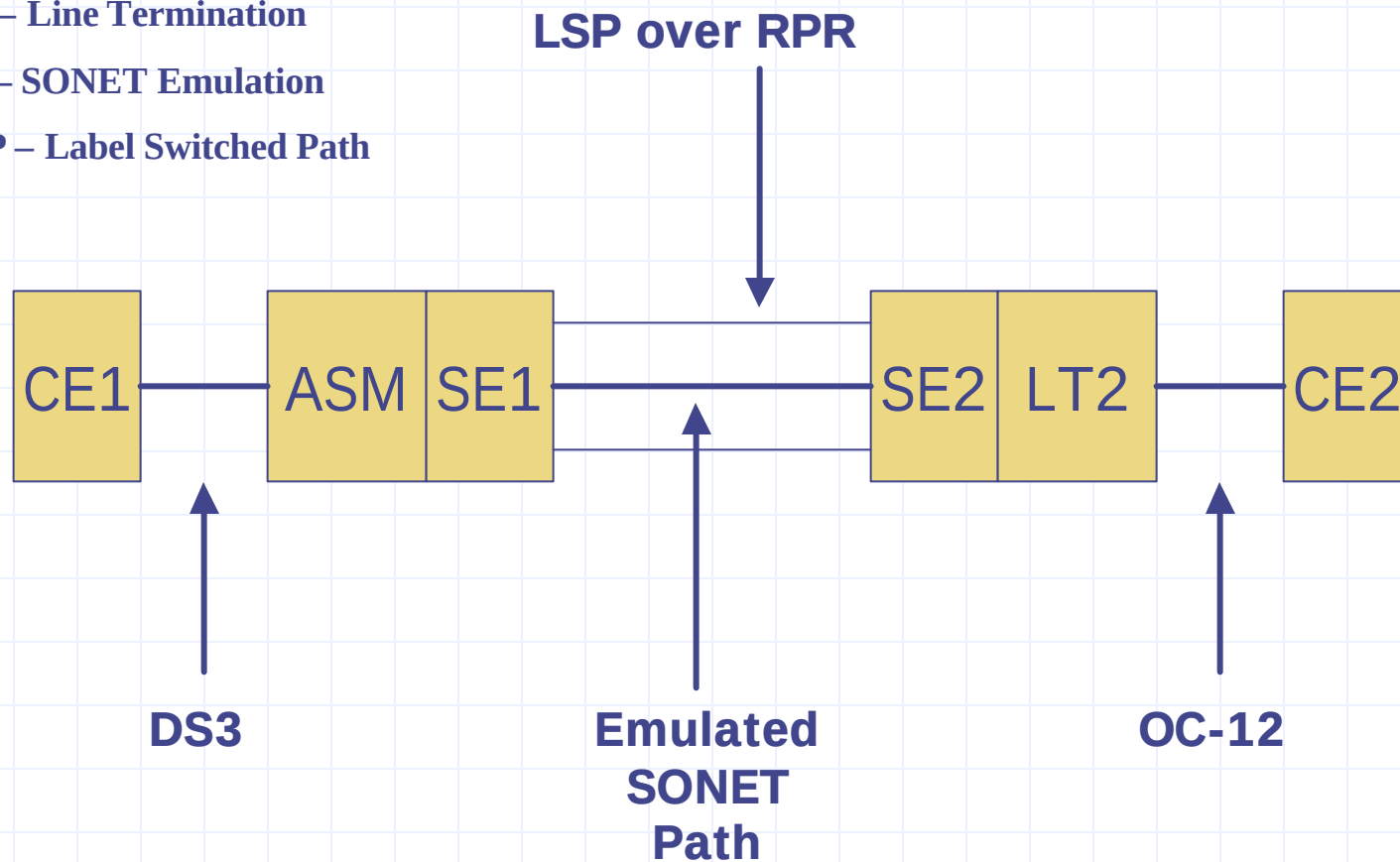
**CE – Customer Edge**

**ASM – Asynchronous Mapper**

**LT – Line Termination**

**SE – SONET Emulation**

**LSP – Label Switched Path**



# DS1 Aggregation

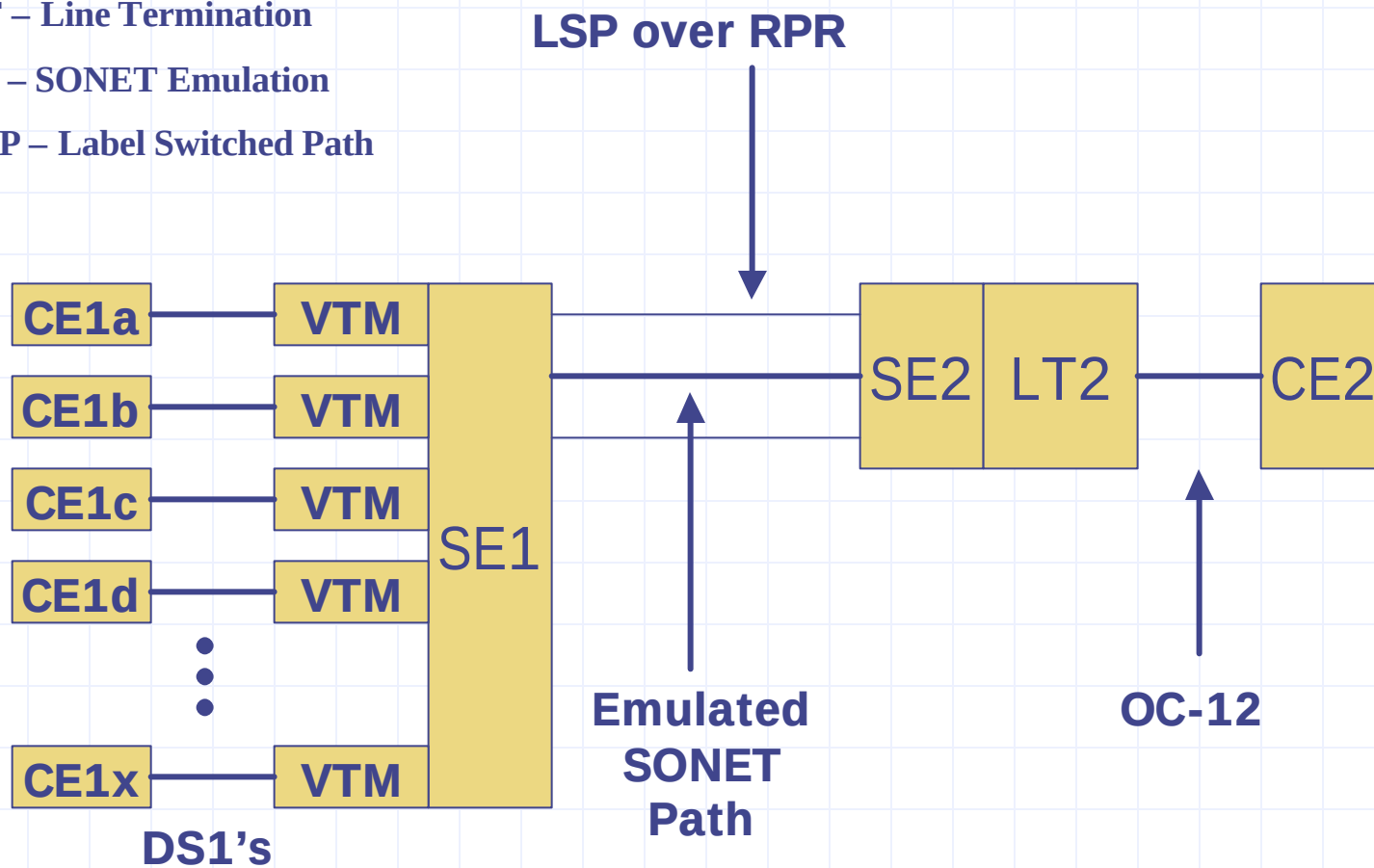
CE – Customer Edge

VTM – VT Mapper

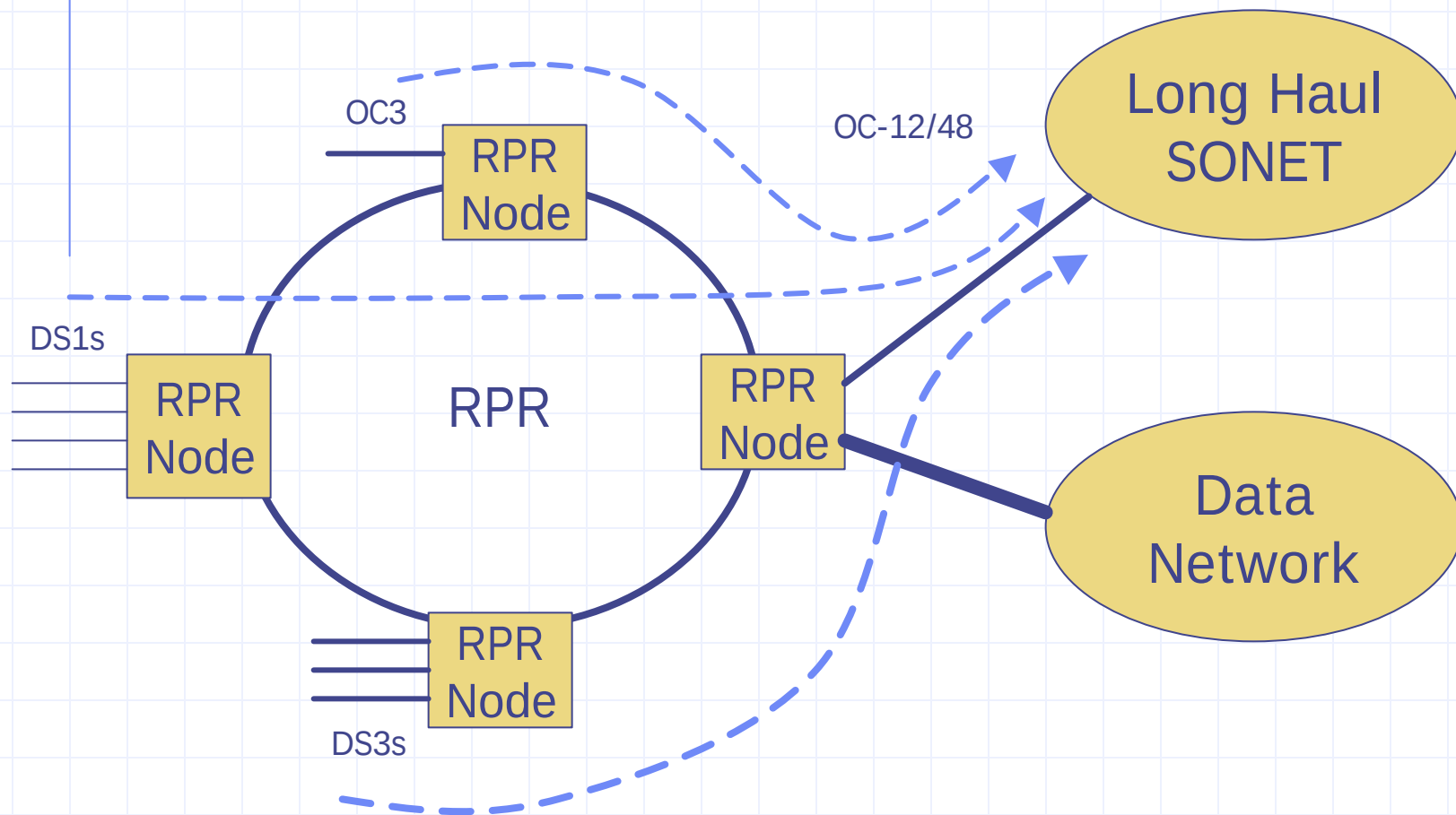
LT – Line Termination

SE – SONET Emulation

LSP – Label Switched Path



# Example RPR Application



# Summary/Status

- ◆ SONET Em being defined in IETF
- ◆ I-D Stable since 8/2001
  - 'draft-malis-pwe3-sonet-02'
- ◆ Multiple Implementations Underway
- ◆ Interoperability Testing Later this Year
- ◆ Allows RPR to Emulate SONET

# Thank You

◆ Q/A?