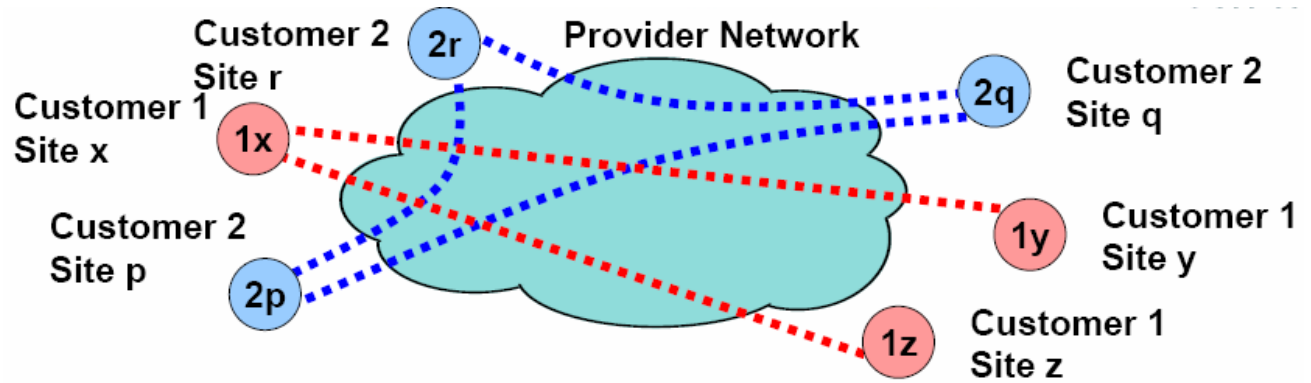


# Wide Area Ethernet Part II: Signalling and Control Plane

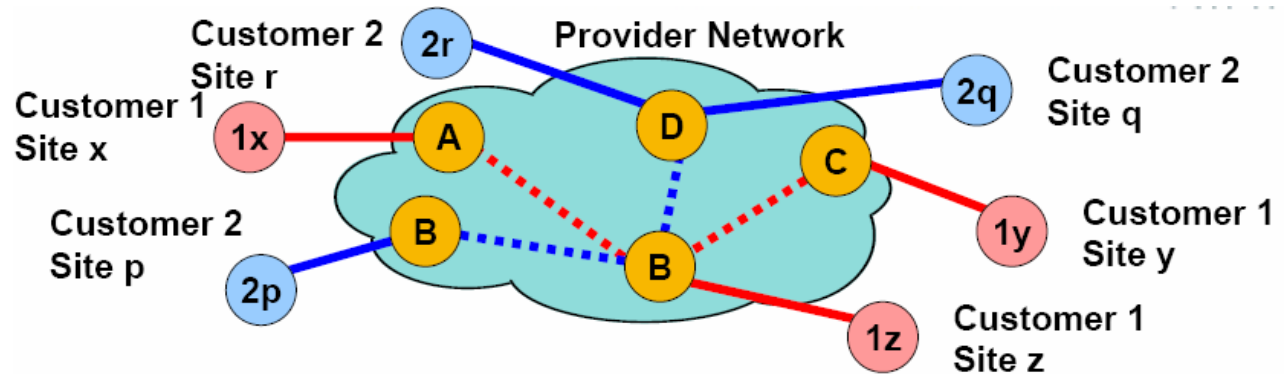
Dr. John S. Graham  
University of London Computer  
Centre

# Provider Backbone Transport

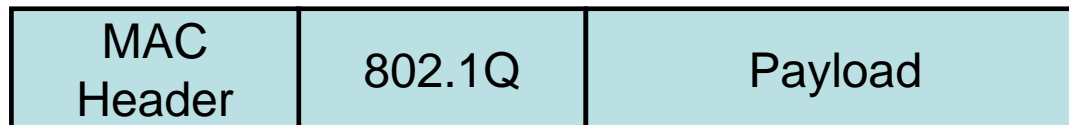
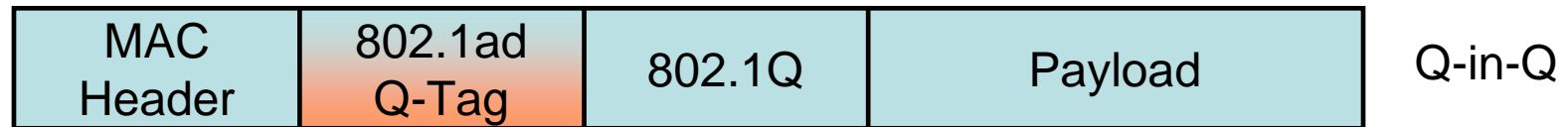
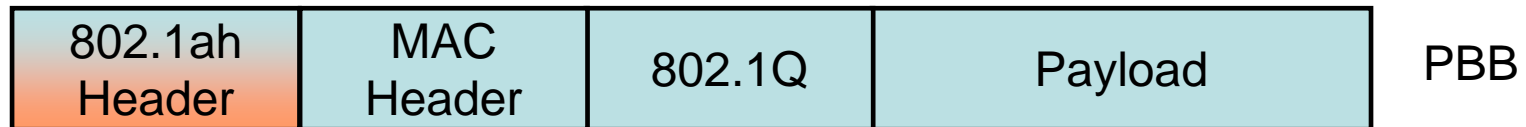
Ethernet over SDH or OTN



PBT or VPLS



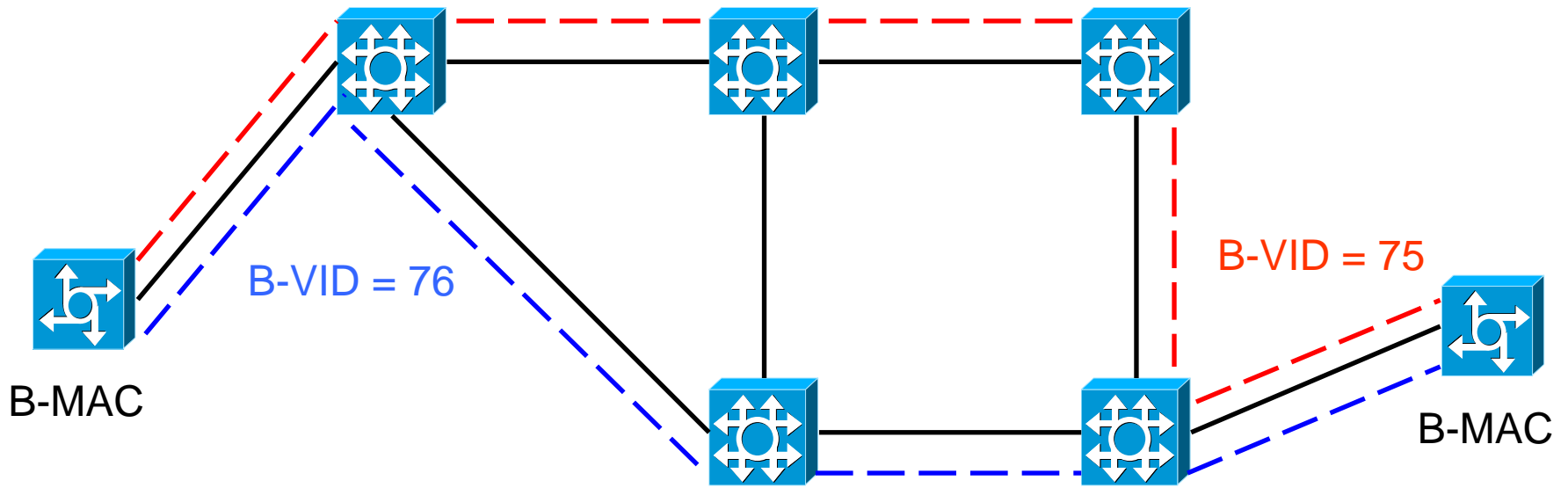
# Ethernet Hierarchies



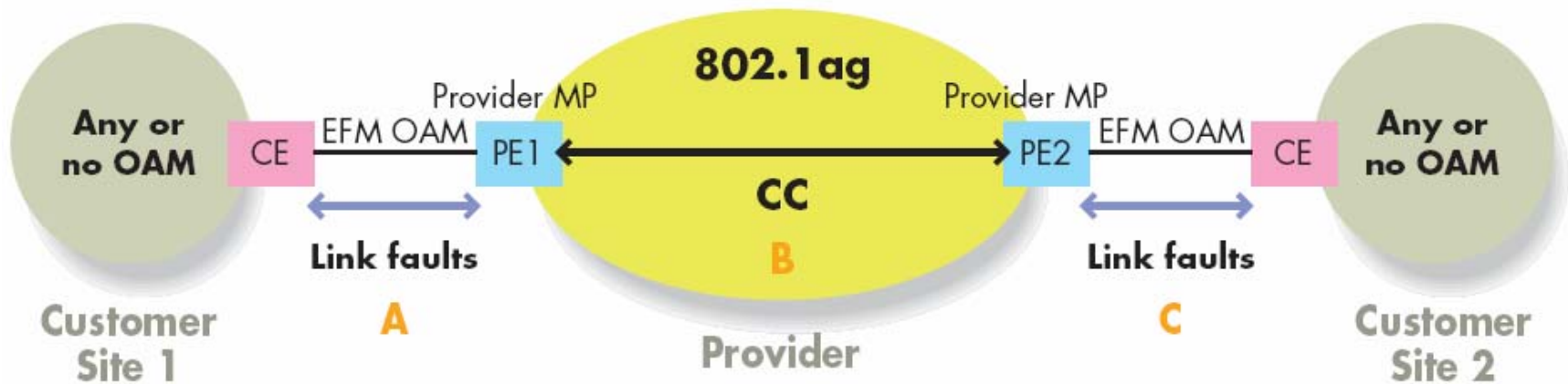
# PBT = Deterministic Ethernet

- Dispense with flood and learn
  - No more spanning tree
  - Distribute bridging tables using control plane
- Carrier switching uses 802.1ah at the edge
  - Carrier protected from customer's loops & storms
- Fast Reroute
  - Uses reserved set of 802.1ad B-VID tags

# PBT: Ethernet Trunks

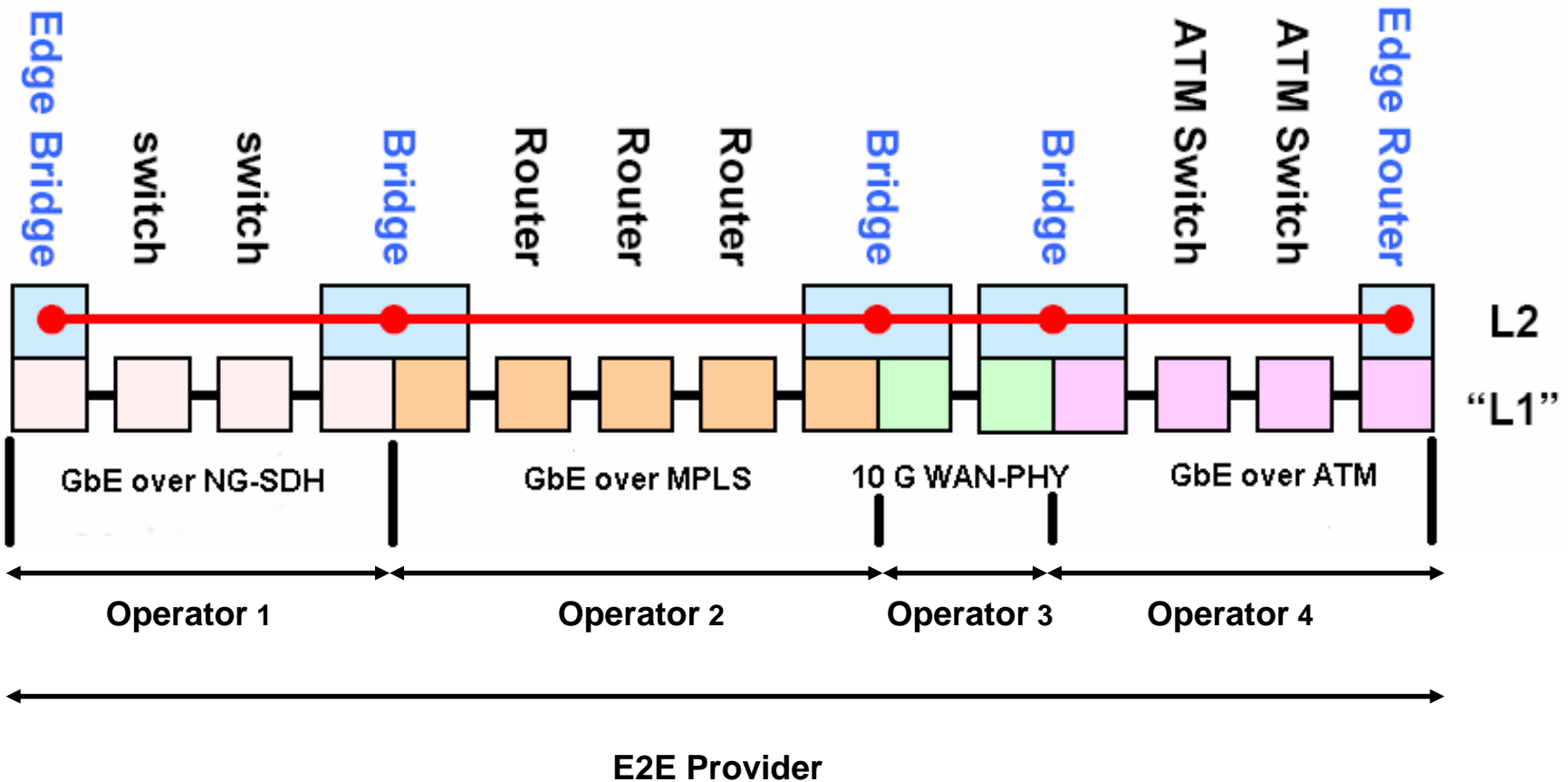


# Metro Ethernet OAM



- 802.3ah = Ethernet in the First Mile OAM
- 802.1ag = Ethernet Connectivity Fault Management (CFM)

# Context for Ethernet CFM

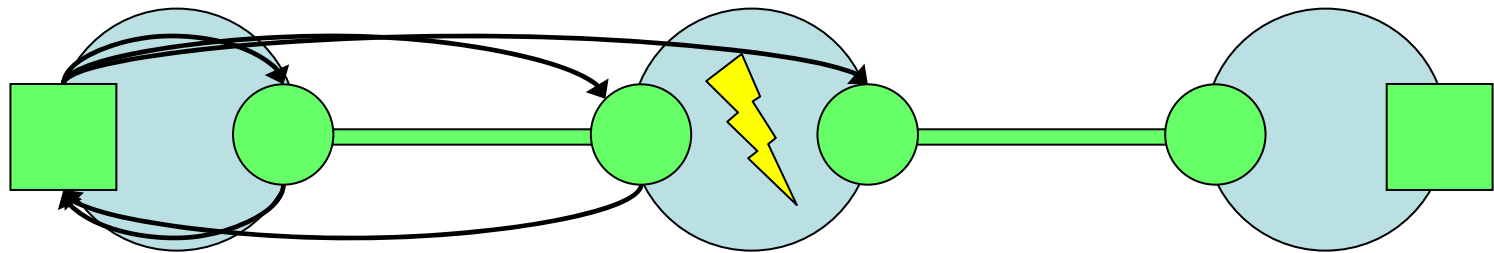


# Connectivity Fault Management

- Continuity Check (CC)
  - multicast from MEPs
  - catalogued by receiving MEP and MIPs
- Link Trace (traceroute)
- Loopback (ping)
- AIS capability recently removed from standard (huh??).

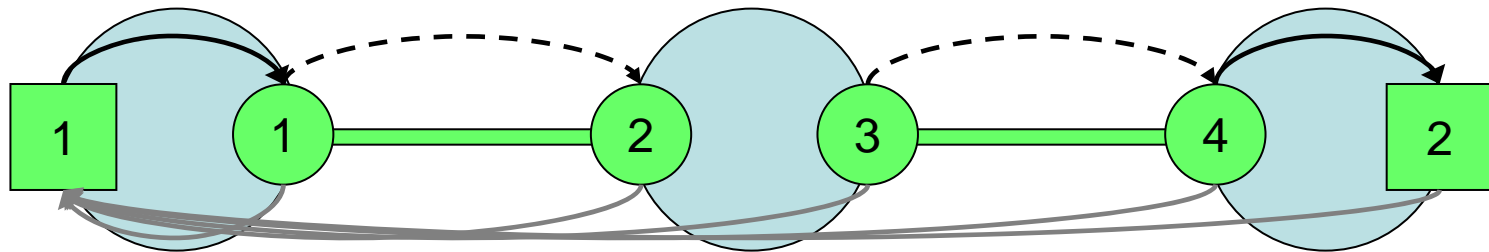


# 802.1ag Loopback



# 802.1ag Link Trace

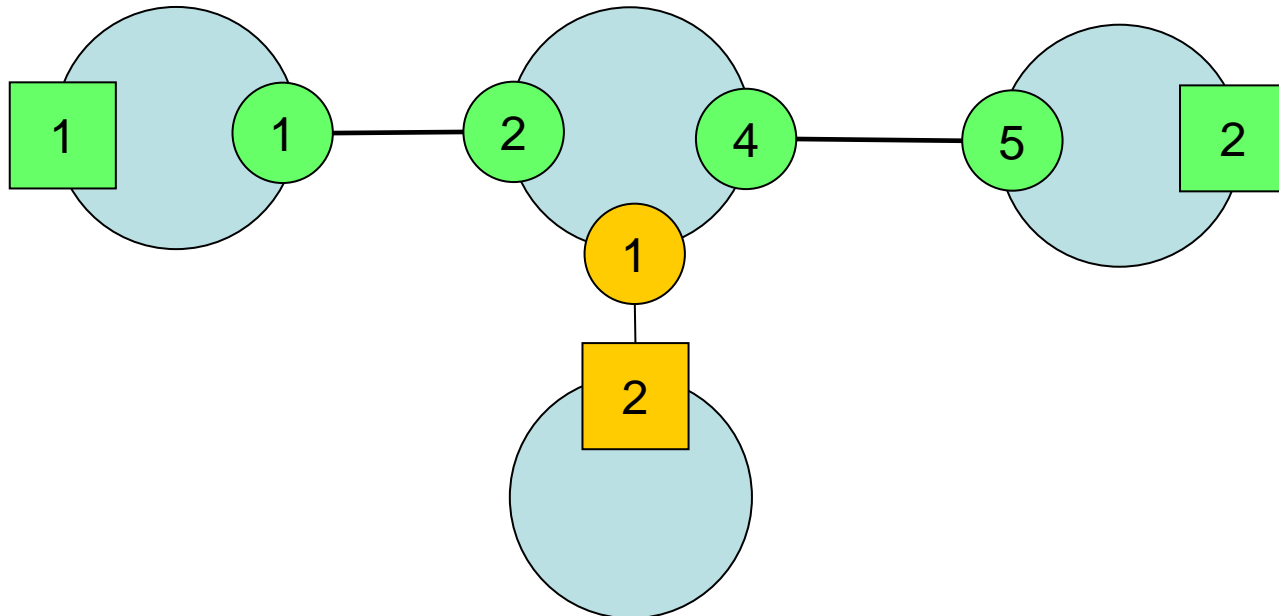
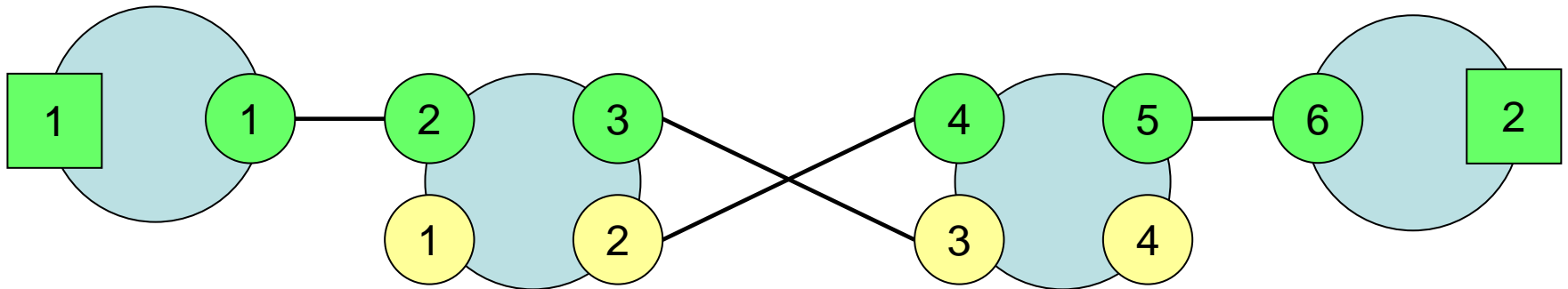
Multicast Trace Queries



Unicast Replies



# Fault Scenarios Detected by CC



# Ethernet in the First Mile

- Discovery
- Remote Loopback
- Remote Failure Indication
  - Link Fault
  - Dying Gasp
  - Critical Event
- Threshold Crossing Events
- MIB Variable Retrieval

# GMPLS Control of Ethernet

- Nortel
  - Don Fedyk
  - David Allen
- Bell Canada
  - Greg Sunderwood
- Ciena
  - Himanshu Shah

<http://www.ietf.org/internet-drafts/draft-fedyk-gmpls-ethernet-pbt-00.txt>

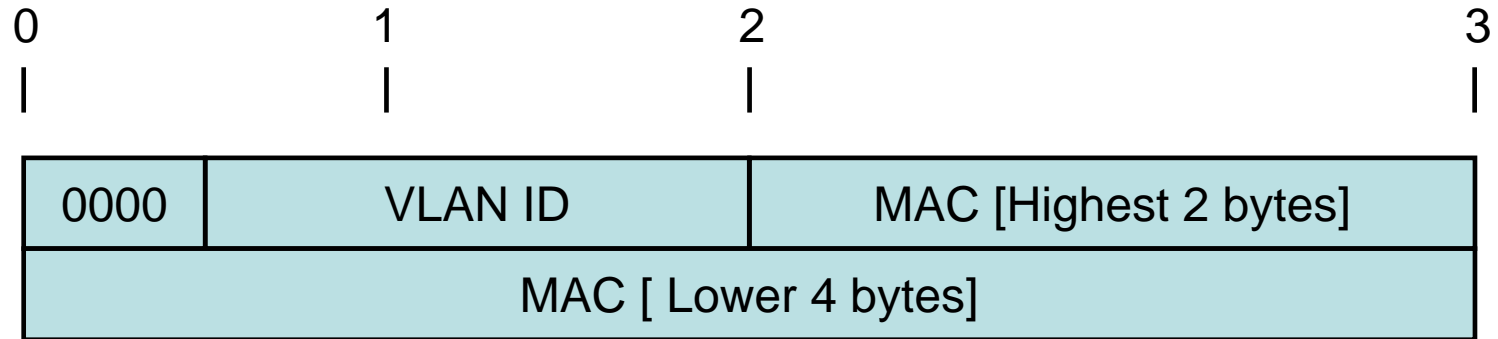
# GMPLS Control for PBT

- Control Plane Network
  - In-band using special reserved VLAN
  - Wholly out-of-band
- Neighbour discovery
  - Use 802.1AB → LMP information model
- Signalling
  - Generalized Path Message
  - Generalized RESV Message

# Generalized Path Message

- Generalized Label Request
  - LSP Encoding Type → Ethernet
  - LSP Switching Type → MAC
  - G-PID → Unknown
- Upstream Label → (VID, SMAC)
- Sender TSpec
  - Queuing → FIFO
  - Bandwidth

# Suggested Label Format





# Evolution of Carrier Grade Ethernet

- Various Ethernet Standards
  - 802.1AB
  - 802.3AH
  - 802.1AG
  - 802.1AD
  - 802.1AH
  - G.8031
- New Ethernet Forwarding Methodology
- GMPLS Signalling for Ethernet (Proposal)