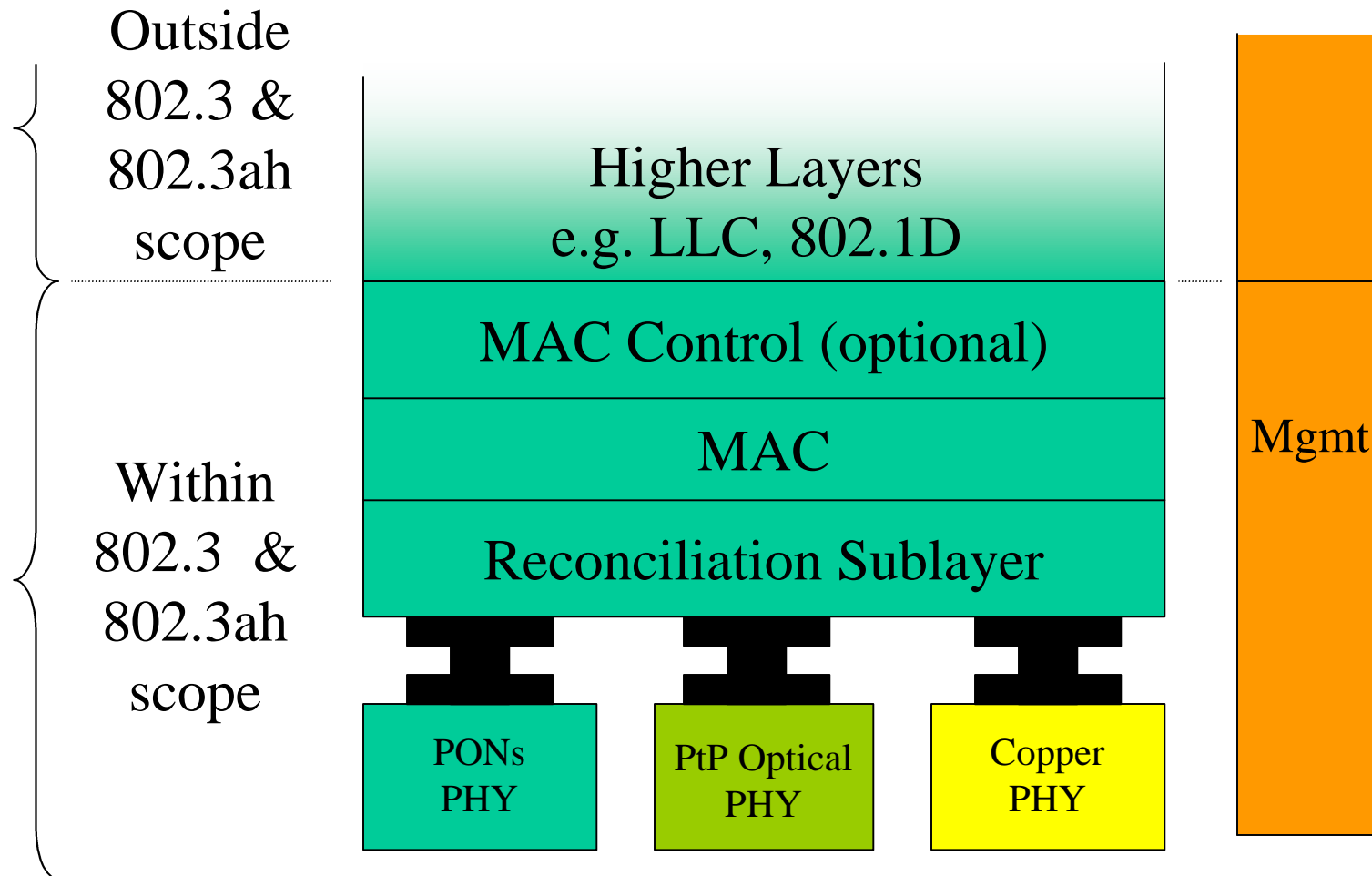


# Fitting EFM into the Ethernet Model



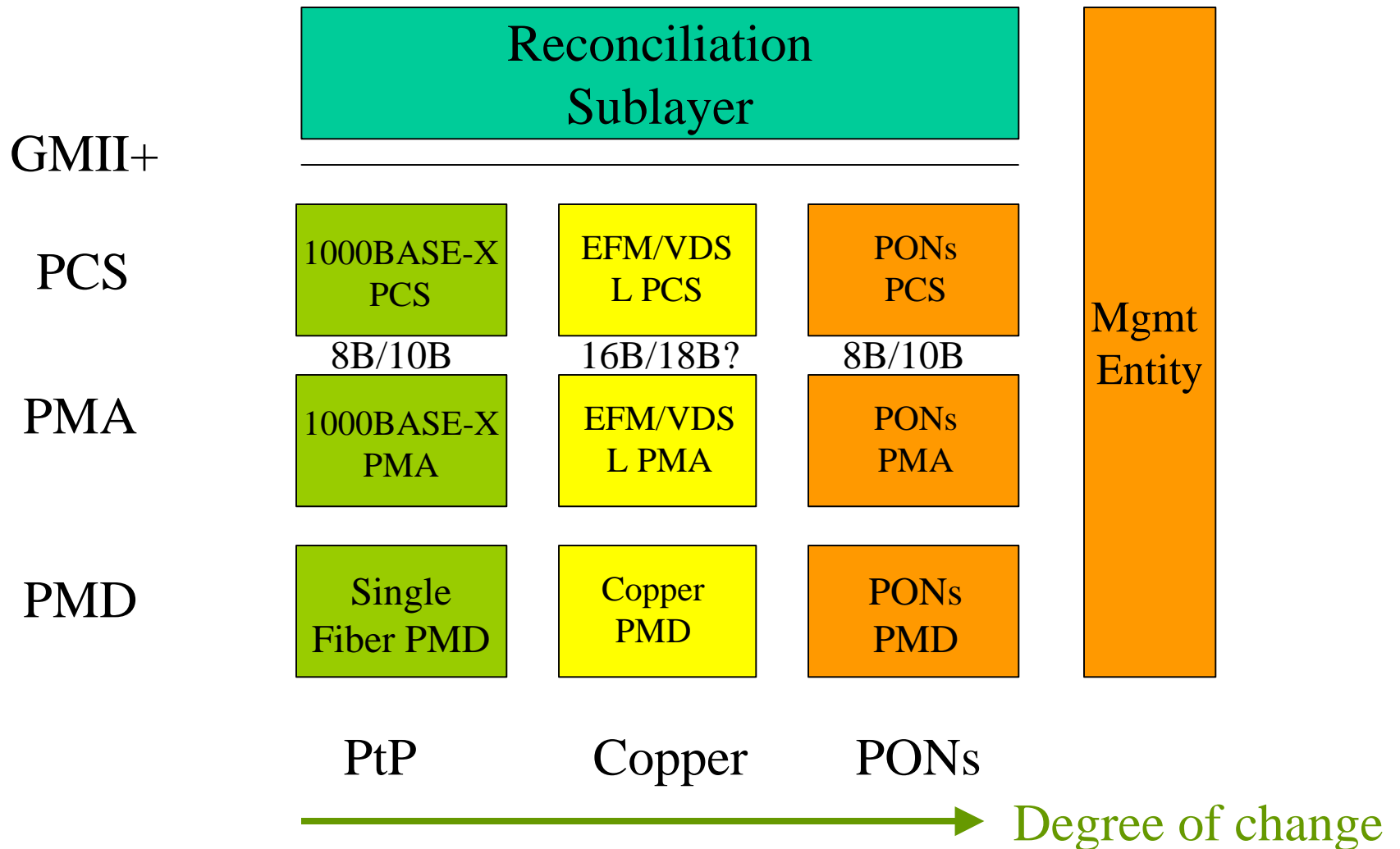
Martin Adams  
David Law

# Overview of a EFM Model



How do we make the minimal changes we need for EFM?

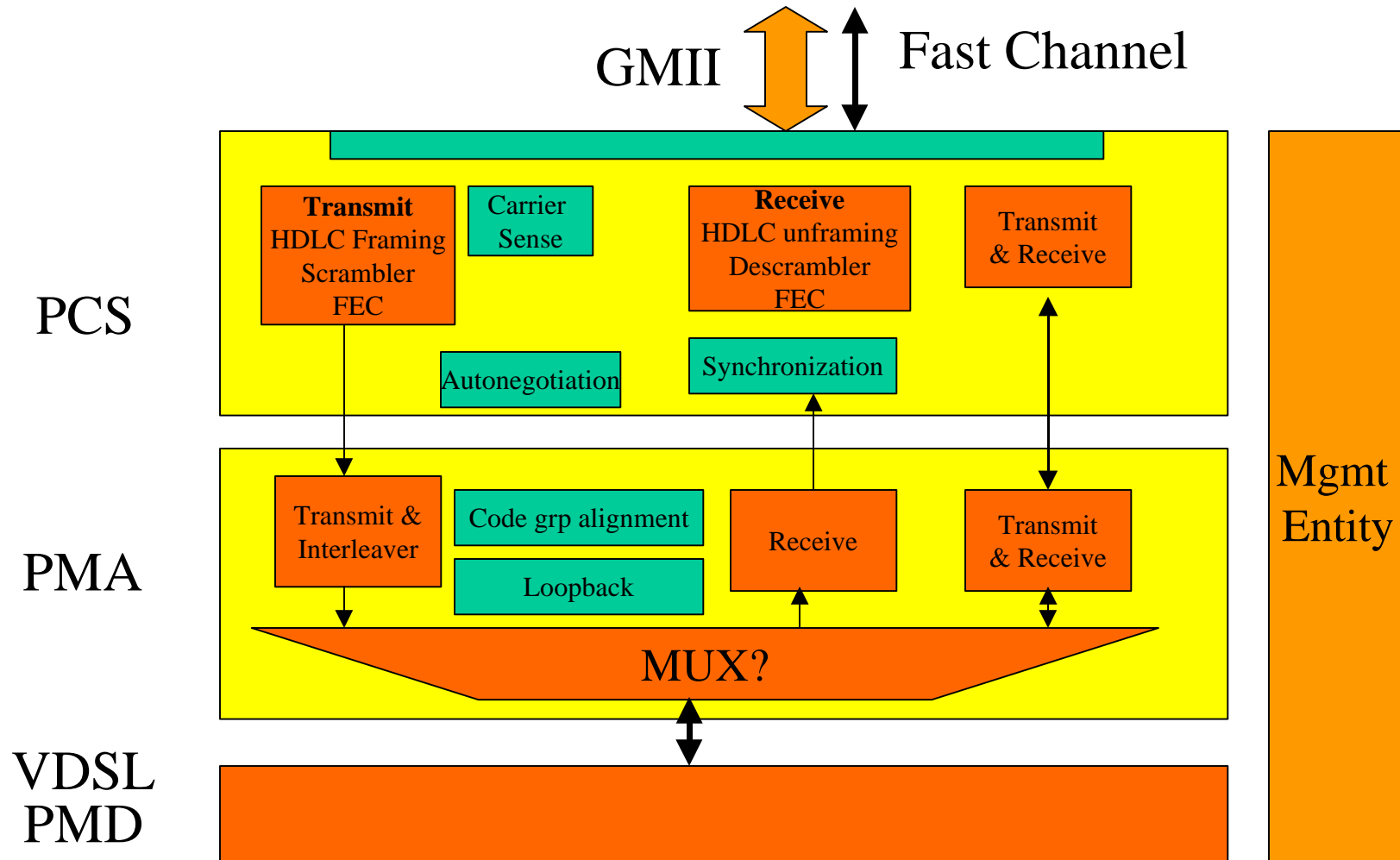
# EFM Physical Layer?



# Some copper EFM Requirements?

- FEC
- Fast path/slow path (high/low latency)
- 16B/18B Coding?

# A Copper EFM PHY?

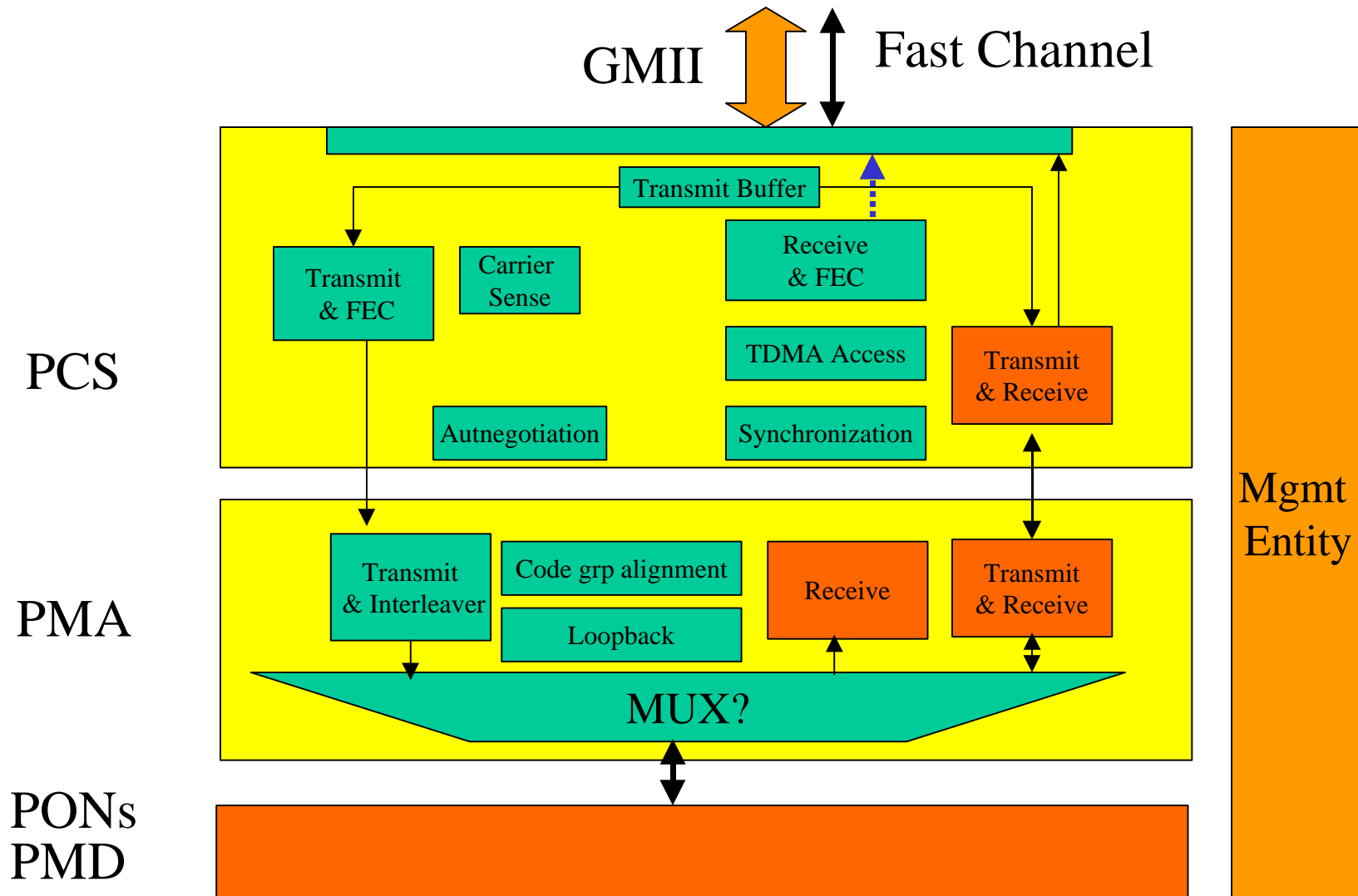


Assumes a VDSL based solution, as an example

# Some PONS Requirements?

- PHY level access mechanism
- PHY ID for OLT
- Security system
- Ranging Facility
- Bandwidth Allocation system
- Fast and slow path?

# Mapping PONs to Ethernet?



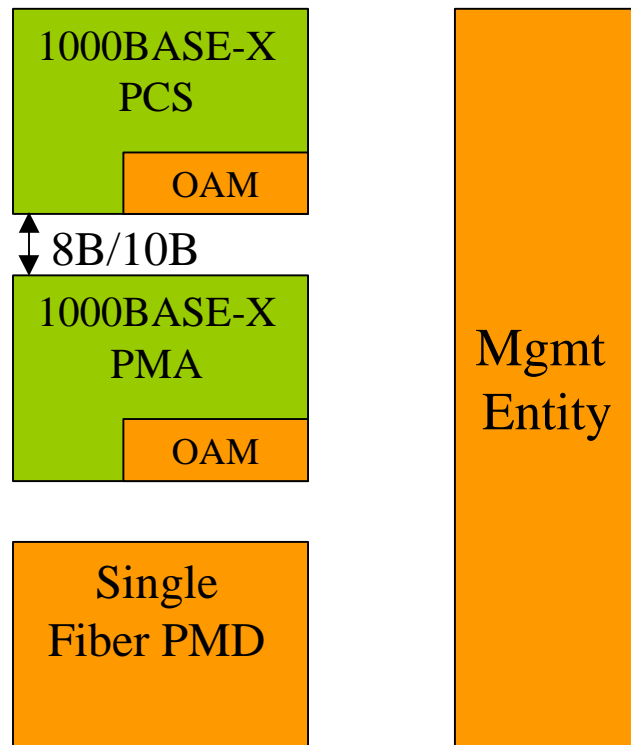
Assumes a TDMA based solution, as an example

# Some PtP Optical Requirements?

- 1000BASE-X > 10km over a single fiber
- 1000BASE-X Extended Temperature Range Optics



# Mapping PtP Optical to Ethernet?



PtP

Minimal changes needed?

- Change the PMD
- Add OAM as needed

# Some OAM Requirements?

- **MAC**

- Channel and bandwidth management
- Service Provider Health Check for MAC
- CRC Errors
- PONs Security Management

- **PHY**

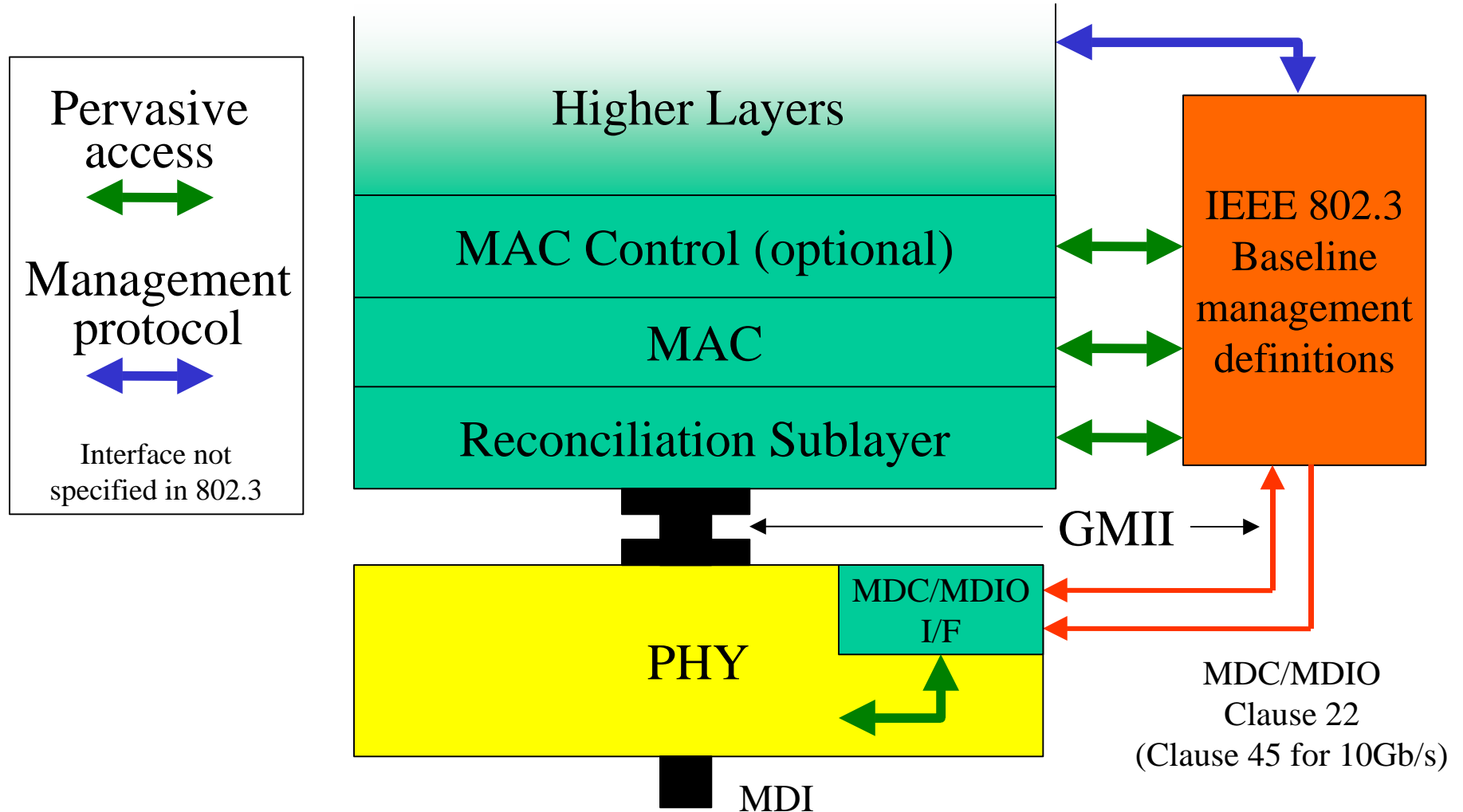
- Service Provider Health Check for PCS/PMA
- Service Provider Dying Gasp indication
- OLT ID
- TDMA Control Status Monitor
- Code violations
- FOT Power monitoring

- **A common OAM for all PHYs**

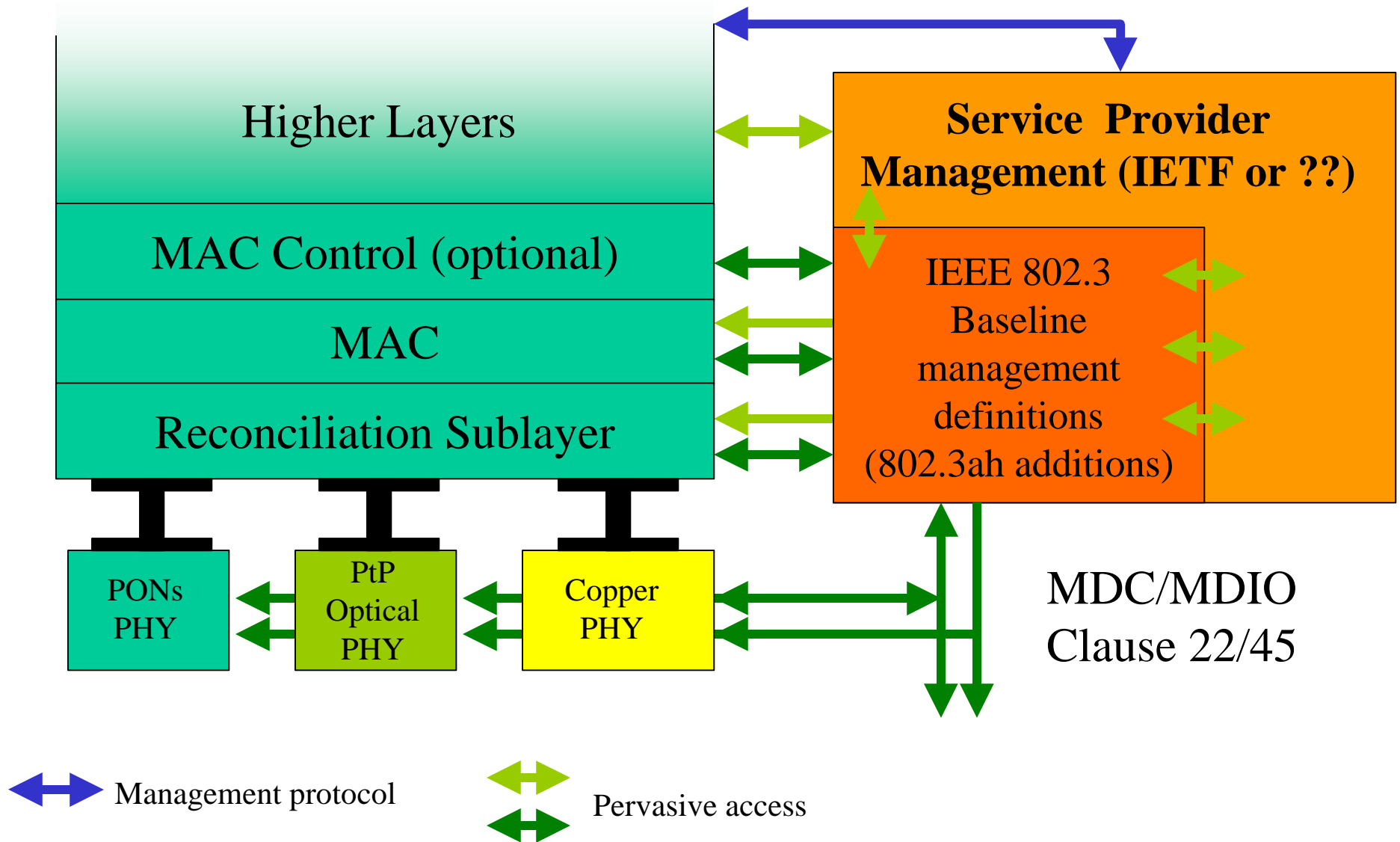
- Would this add too much cost to the copper solution?

Copper	PtmP	PtP
No	Yes	No
No	Yes	No
Yes	No	Yes
No	Yes	No
Yes	Yes	Yes
No	Yes	Yes
No	Yes	No
No	Yes	No
Yes	Yes	No
No	Yes	Yes

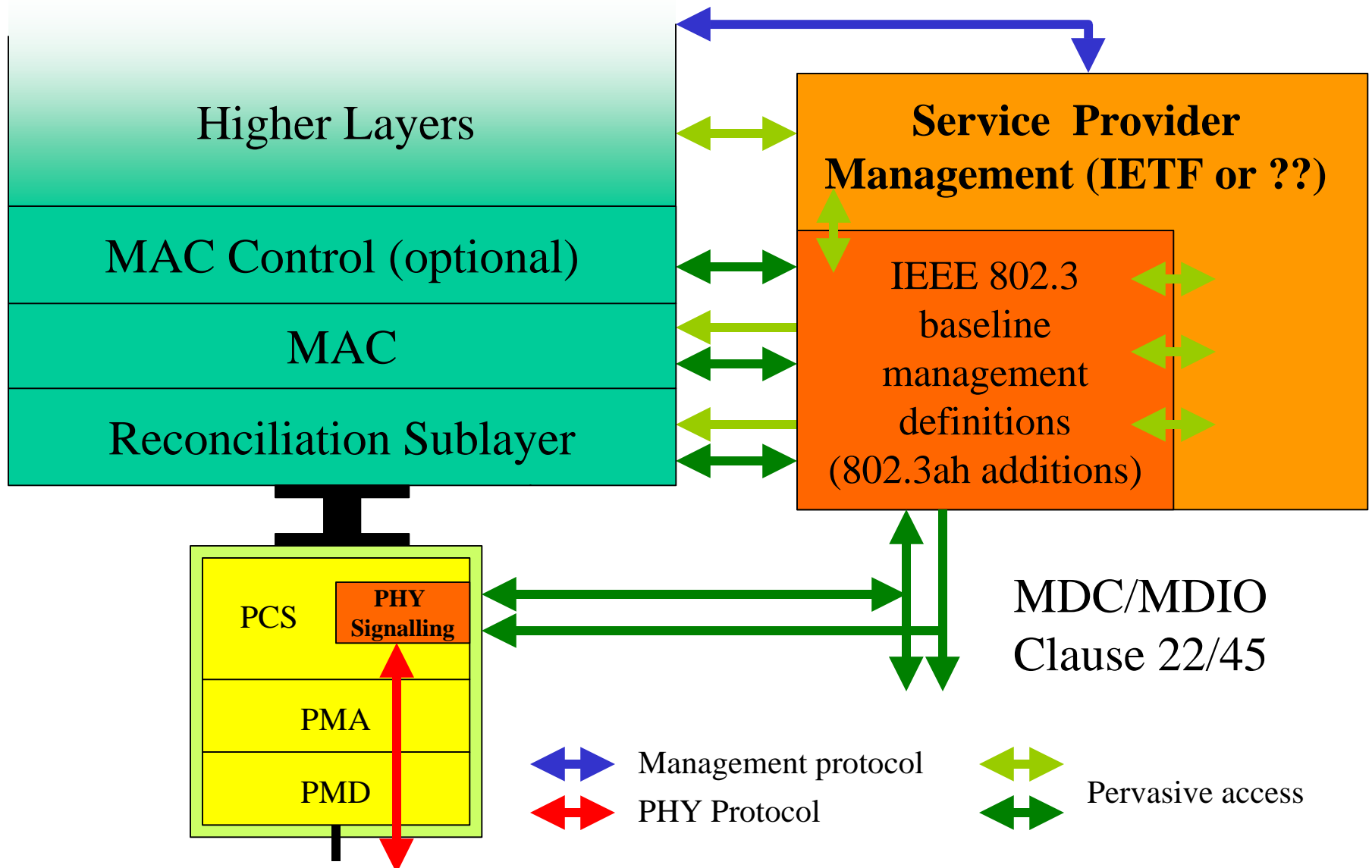
# Existing Management (Clause 30)



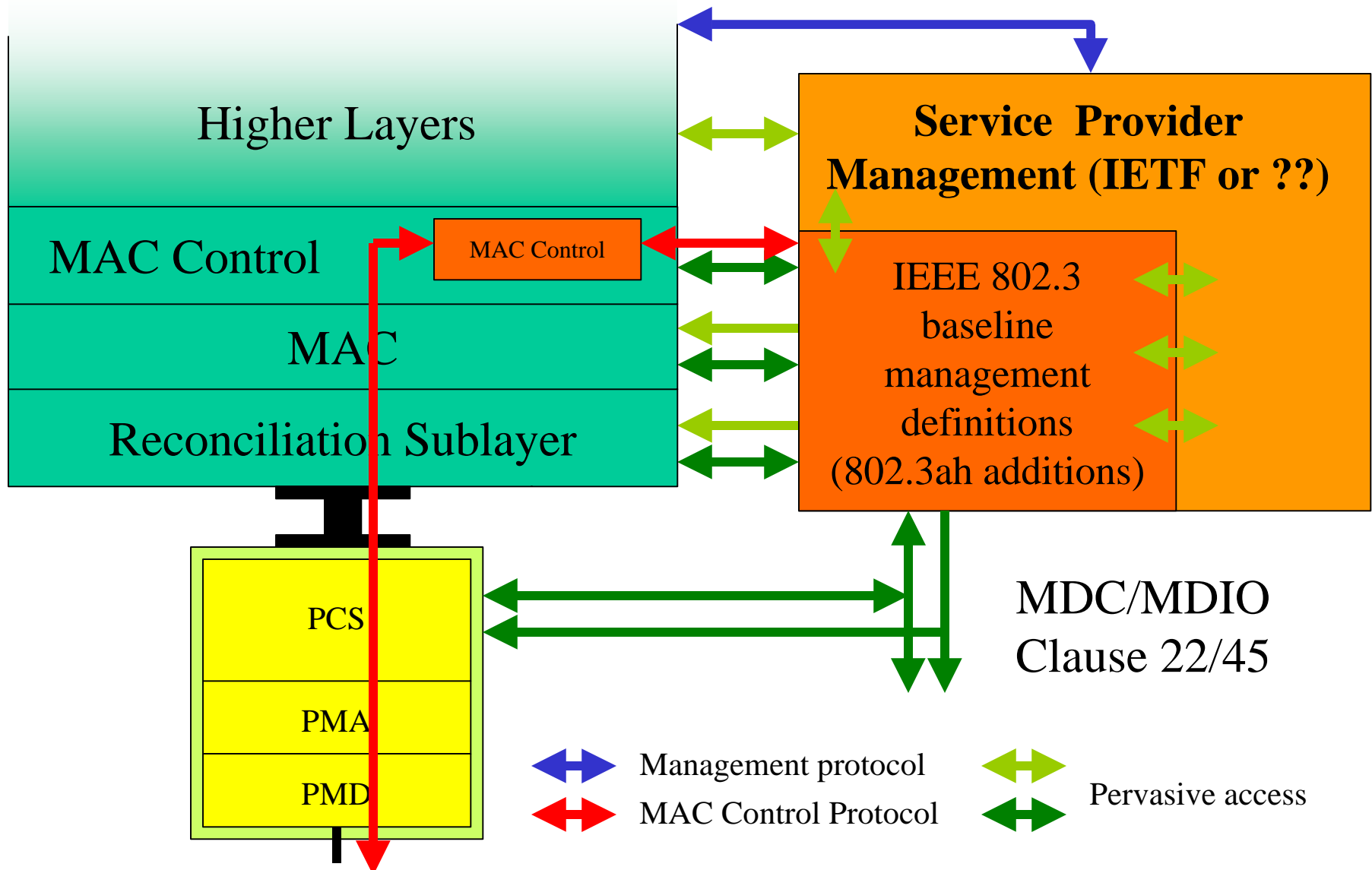
# EFM Management



# EFM Management- PHY Signalling model

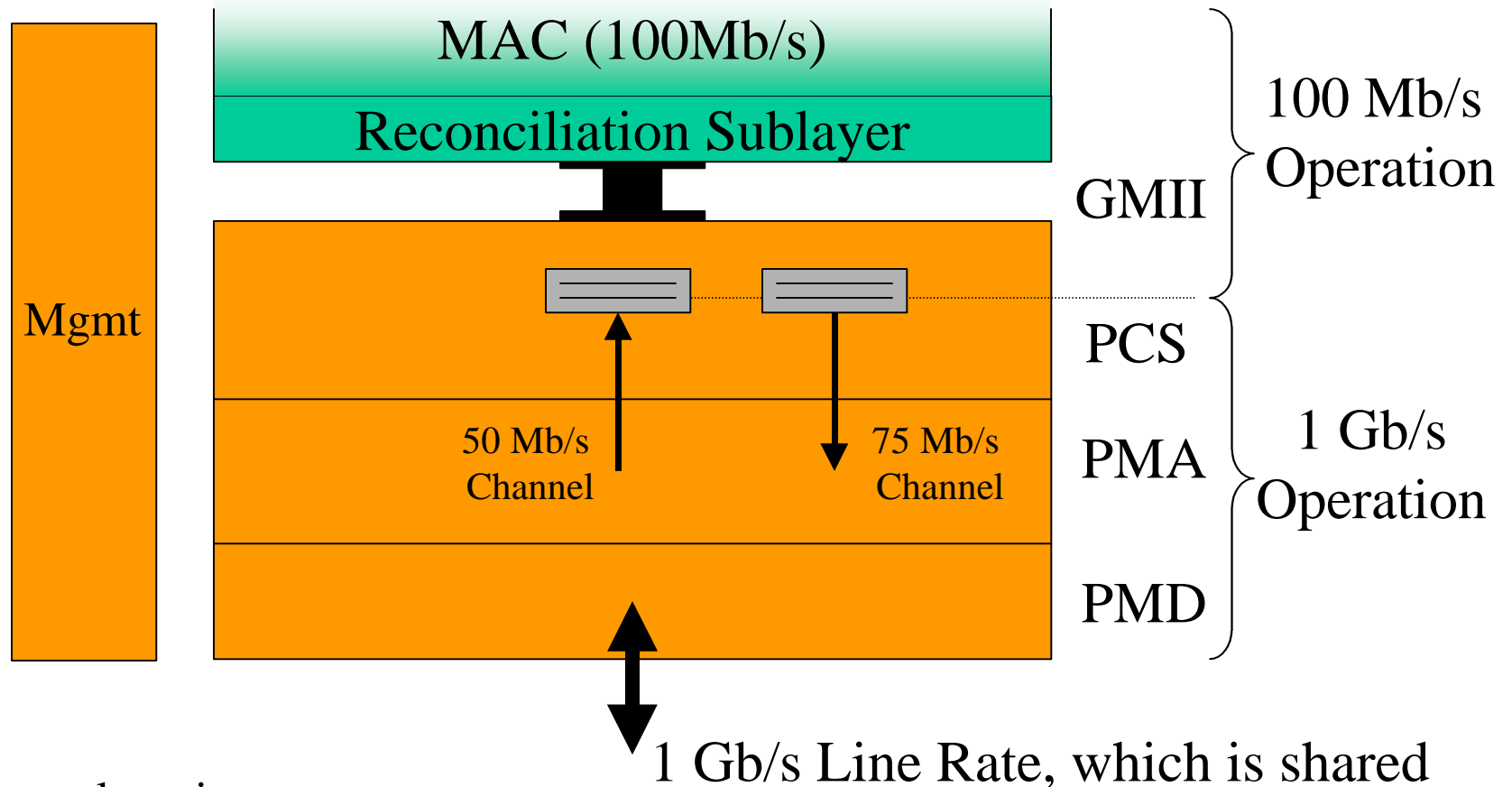


# EFM Management- MAC Control Frame model



# EFM Rate Control

## Problem example in PONs

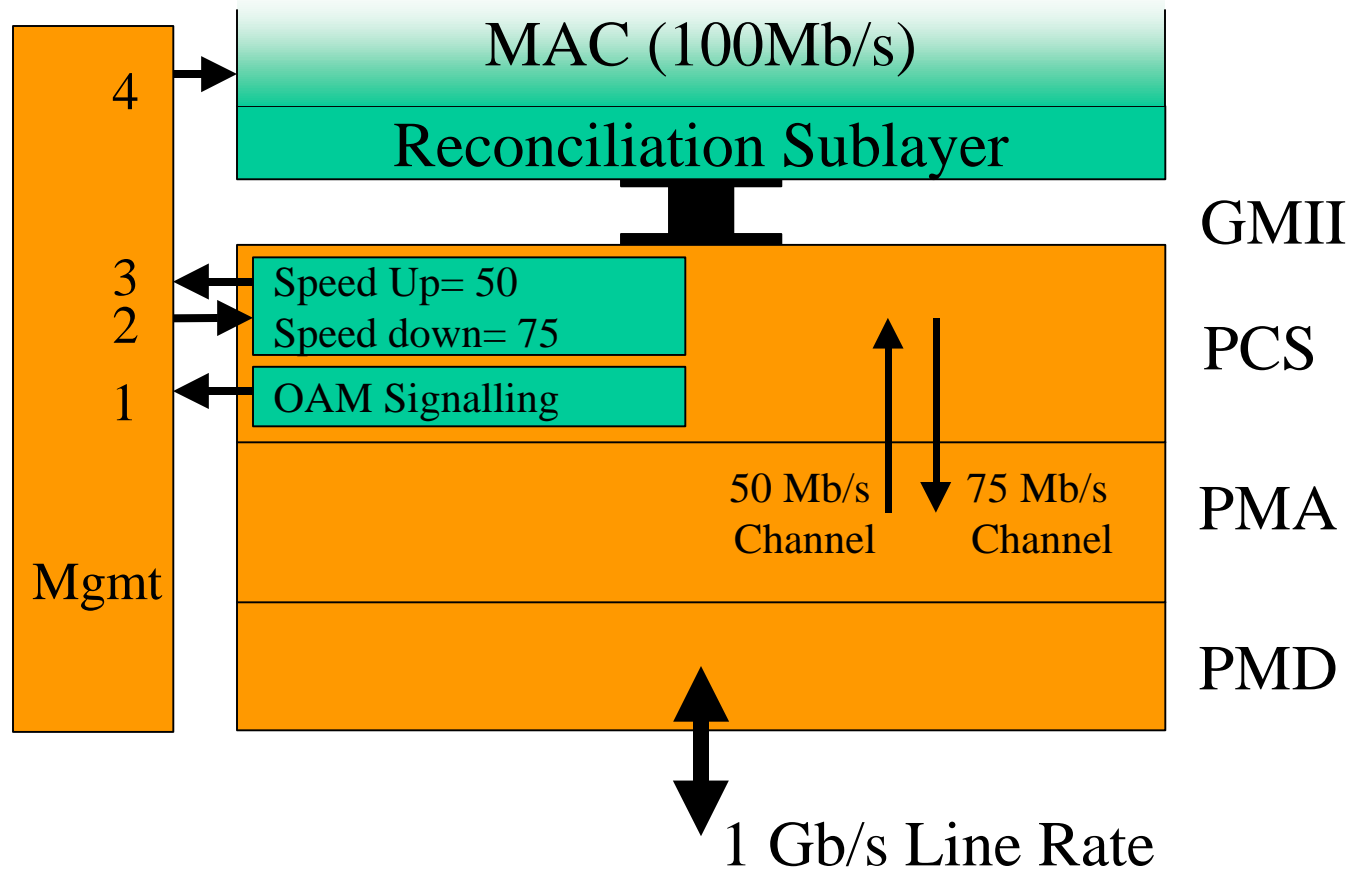


Rate Control, options:

- 1 - Buffer in the PHY - Extend 10Gb/s `ifsStretchRatio` to all MAC speeds (See IEEE P802.3ae Clause 4 for details).
- 2 - Set the MAC to the channel rate - Approach not used in 10Gb/s

# EFM Rate Control

## Solution similar to Auto-Negotiation



### Setting the MAC rate

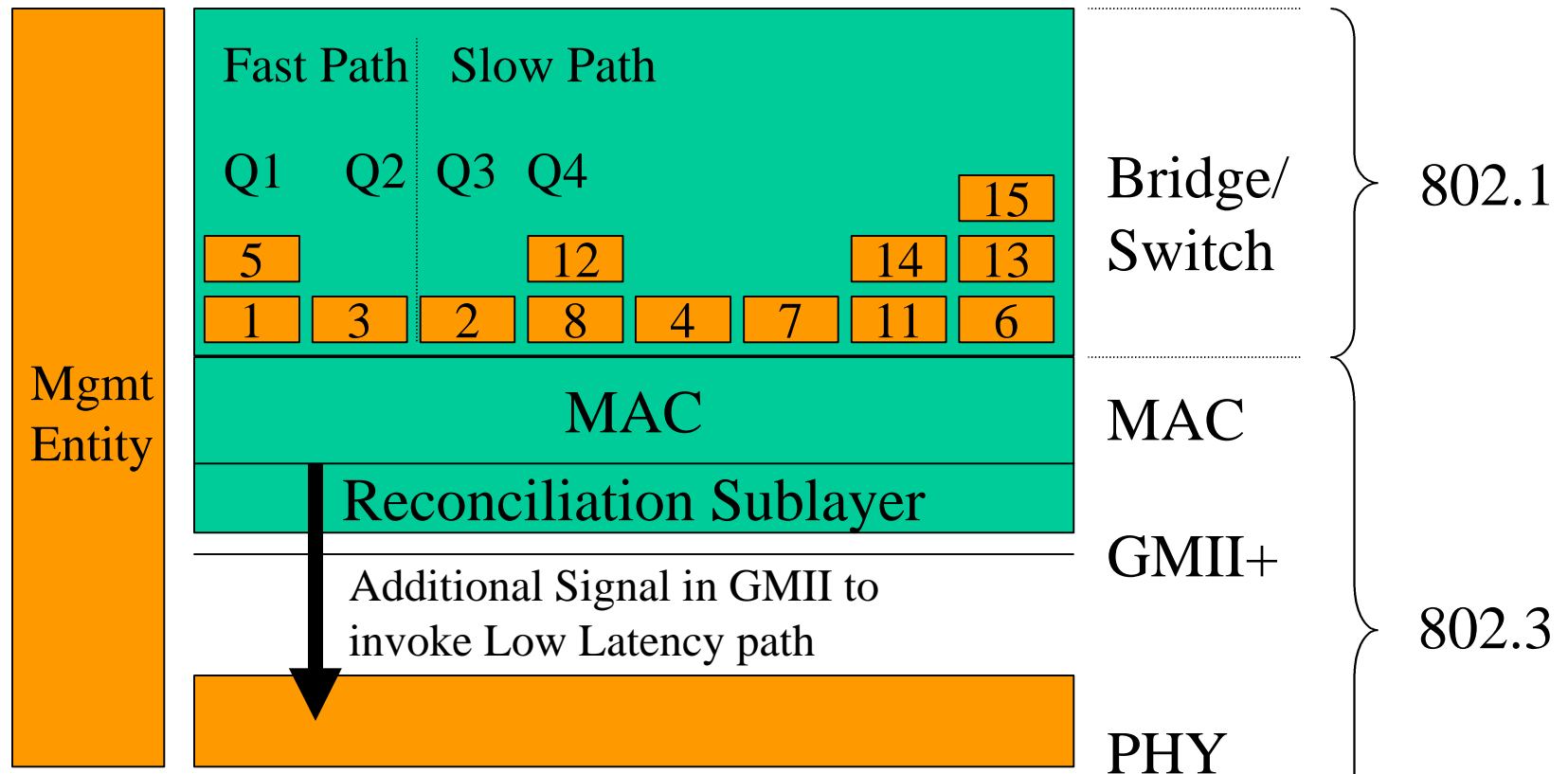
Step 1- OAM Signalling negotiates bit rates, which mgmt entity reads

Step 2 Management entity writes into register

Step 3 & 4 Management Entity reads from register and sets MAC



# EFM Fast Path/Slow Path



- Changes to IEEE 802.1 to pass latency requirement to MAC
- Changes to IEEE 802.3 to pass latency requirement across MAC
- Need a method to communicate priority to PHY across GMII
- Does not match scope of this project

# Summary

- EFM Reflector proposals requires substantial changes for PONs and Copper solution
  - Need to consider compromises to simplify the overall picture
- OAM Reflector proposals could impact PHY and MAC
  - Protocol can be PHY signalling or MAC control frames
- Need OAM solution that minimises cost for Copper solution
  - Define wider solution for PONS, & have Copper and PtP as a small subset
- EFM may need a fast and slow channel, hence changes to GMII

# Questions

- ?