

IEEE Access Standards, 802.3ah GE-PON Status

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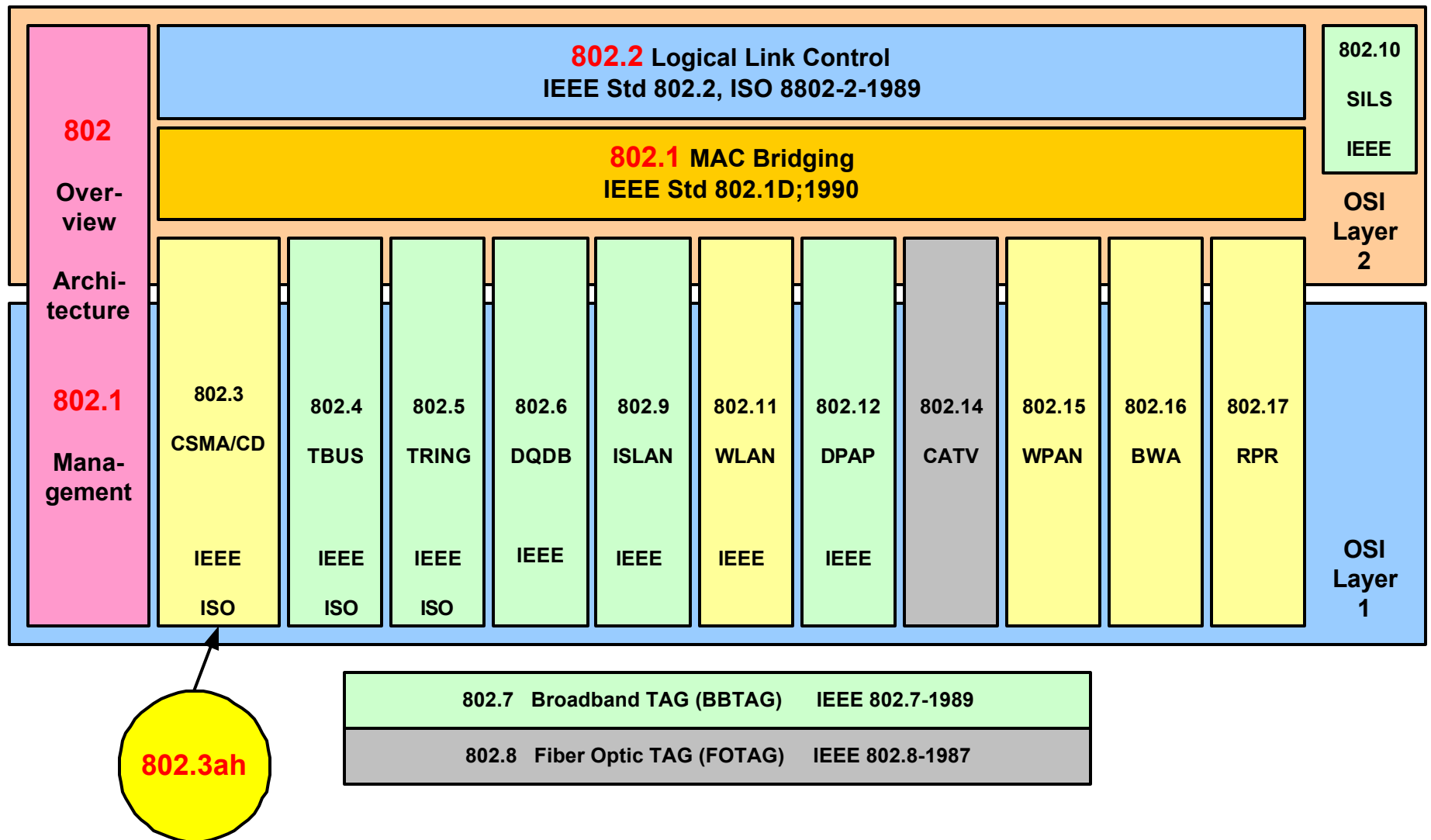
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802.3ah Task Force in 802

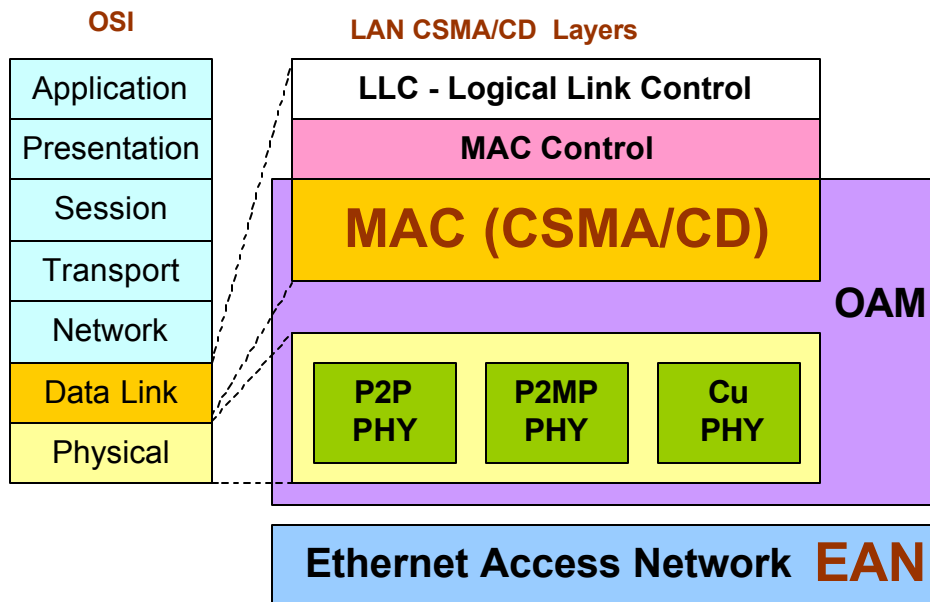


802.3ah Purpose and Scope

Purpose

To expand the application of Ethernet to include subscriber access networks in order to provide a significant increase in performance while minimizing equipment, operation, and maintenance costs.

Scope



Define 802.3 Media Access Control (MAC) parameters and minimal augmentation of MAC operation, physical layer specifications, and management parameters for the transfer of 802.3 format frames in subscriber access networks at operating speeds within the scope of the current IEEE Std 802.3 and approved new projects

802.3ah Objectives

Support subscriber access network topologies:

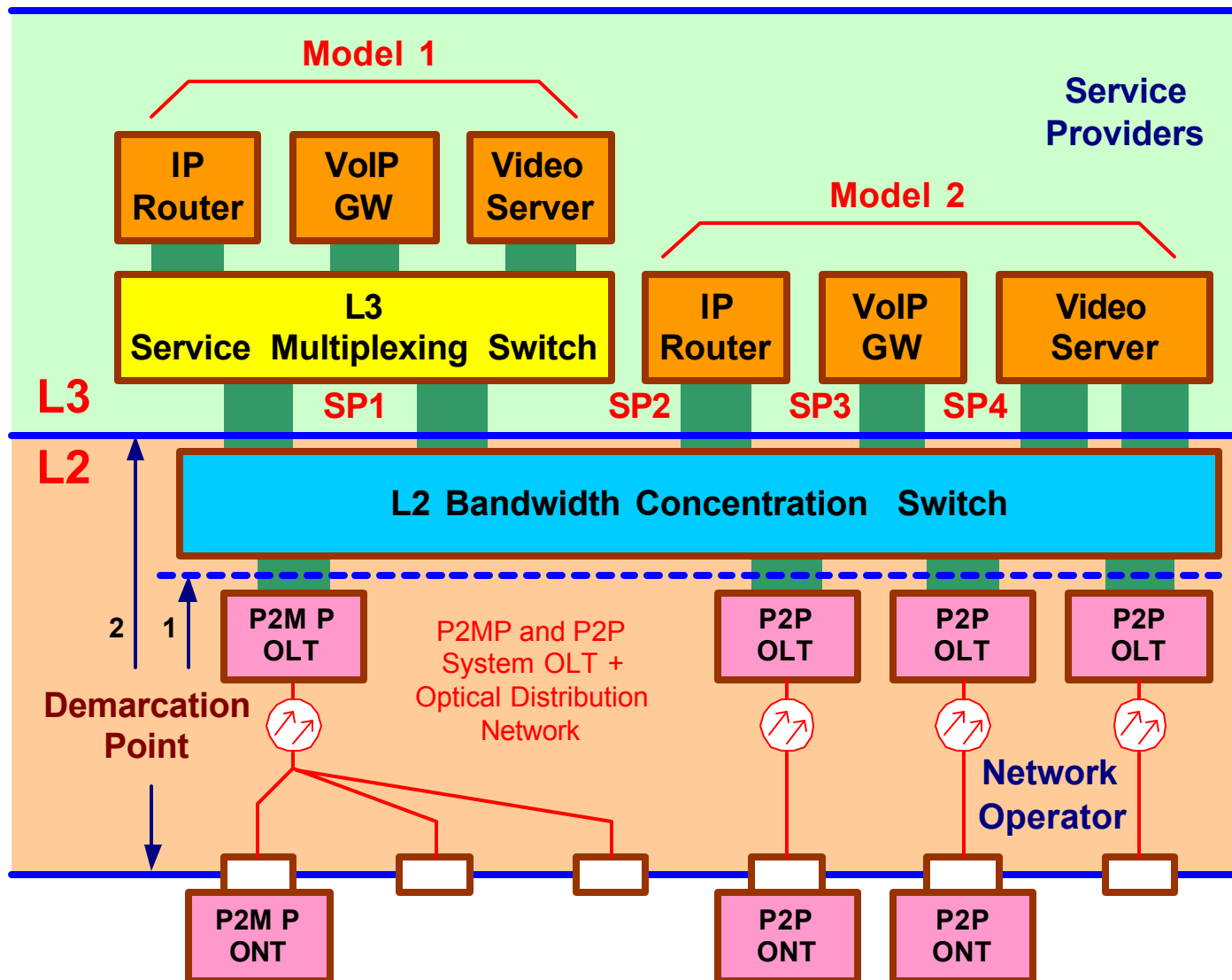
- Point to multipoint on optical fiber
- Point to point on optical fiber
- Point to point on copper

Provide a family of physical layer specifications:

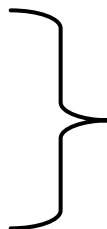
- 1000BASE-LX extended temperature range optics
- 1000BASE-X \geq 10km over single SM fiber
- 100BASE-X \geq 10km over single SM fiber
- PHY for PON, \geq 10km, 1000Mbps, single SM fiber, \geq 1:16
- PHY for PON, \geq 20km, 1000Mbps, single SM fiber, \geq 1:16
- PHY for single pair non-loaded voice grade copper, distance \geq 750m and speed \geq 10Mbps full duplex

(802.3ah Objectives are as of May 2002)

Optical Ethernet First Mile



Not included in 802.3ah EPON

- Bandwidth allocation algorithm (DBA)
 - TDM and ATM support
 - Security, Authentication
 - WDM Overlay Plan
 - Analog Video
 - Outside Plant
 - Protection, Diagnostics, Monitoring
- 
- Reference FSAN

Focus is P2MP Ethernet (narrow scope)

Multi-Point Control Protocol (MPCP)

- EPON uses Multi-Point Control Protocol (MPCP) to control Point-to-Multipoint (P2MP) fiber network
- MPCP performs bandwidth assignment, bandwidth polling, auto-discovery process and ranging, and is implemented in the MAC Control Layer.
- New 64 byte MAC Control messages are introduced. GATE and REPORT are used to assign and request bandwidth. REGISTER messages are used to control the auto-discovery process.
- MPCP provides hooks for network resource optimization:
 - ranging is performed to reduce slack
 - reporting of bandwidth requirements by ONTs for DBA
 - optical parameters are negotiated to optimize performance

ONT and OLT Operation

ONT

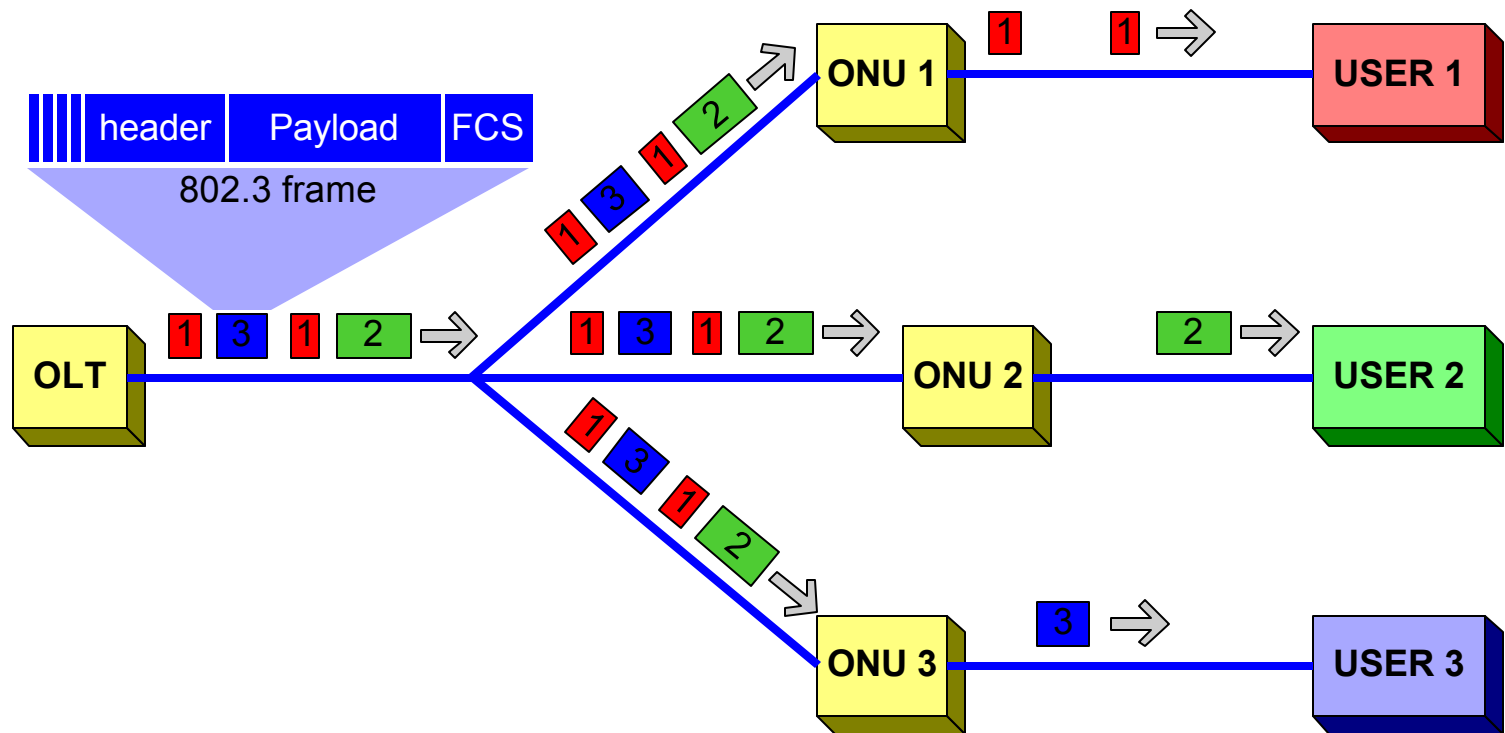
- performs auto-discovery process which includes ranging, assignment of Logical Link Ids, assignment of bandwidth
- synchronizes to OLT timing through timestamps on the downstream GATE MAC Control Message
- receives GATE Message and transmits in permitted time period

OLT

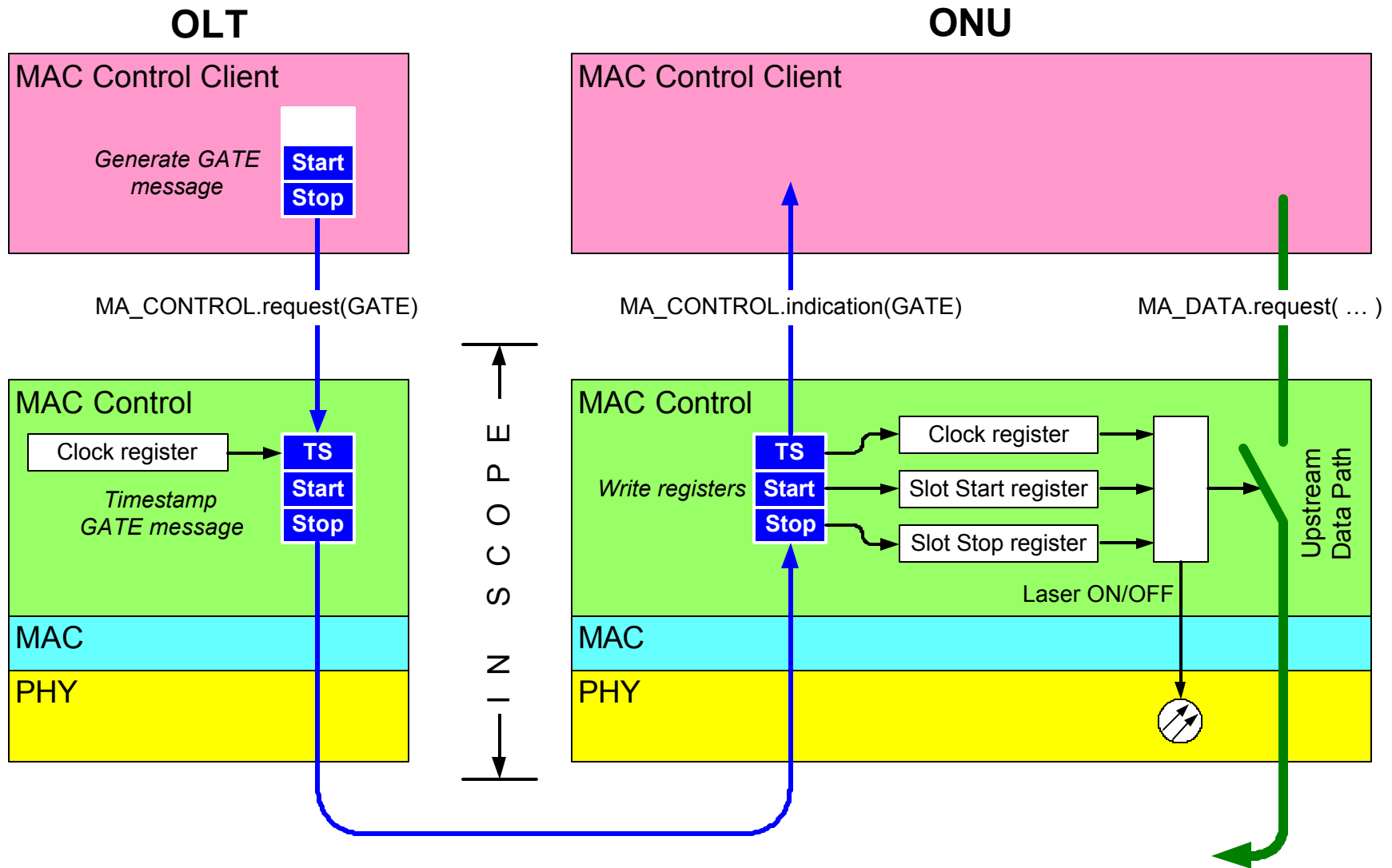
- generates time stamped messages to be used as global time reference
- generates discovery windows for new ONTs, and controls registration process
- assigns bandwidth and performs ranging

EPON Downstream

- Physical broadcast of 802.3 Frames
- 802.3 Frames extracted by Logical Link ID in Preamble
- 64 byte GATE messages sent downstream to assign bandwidth

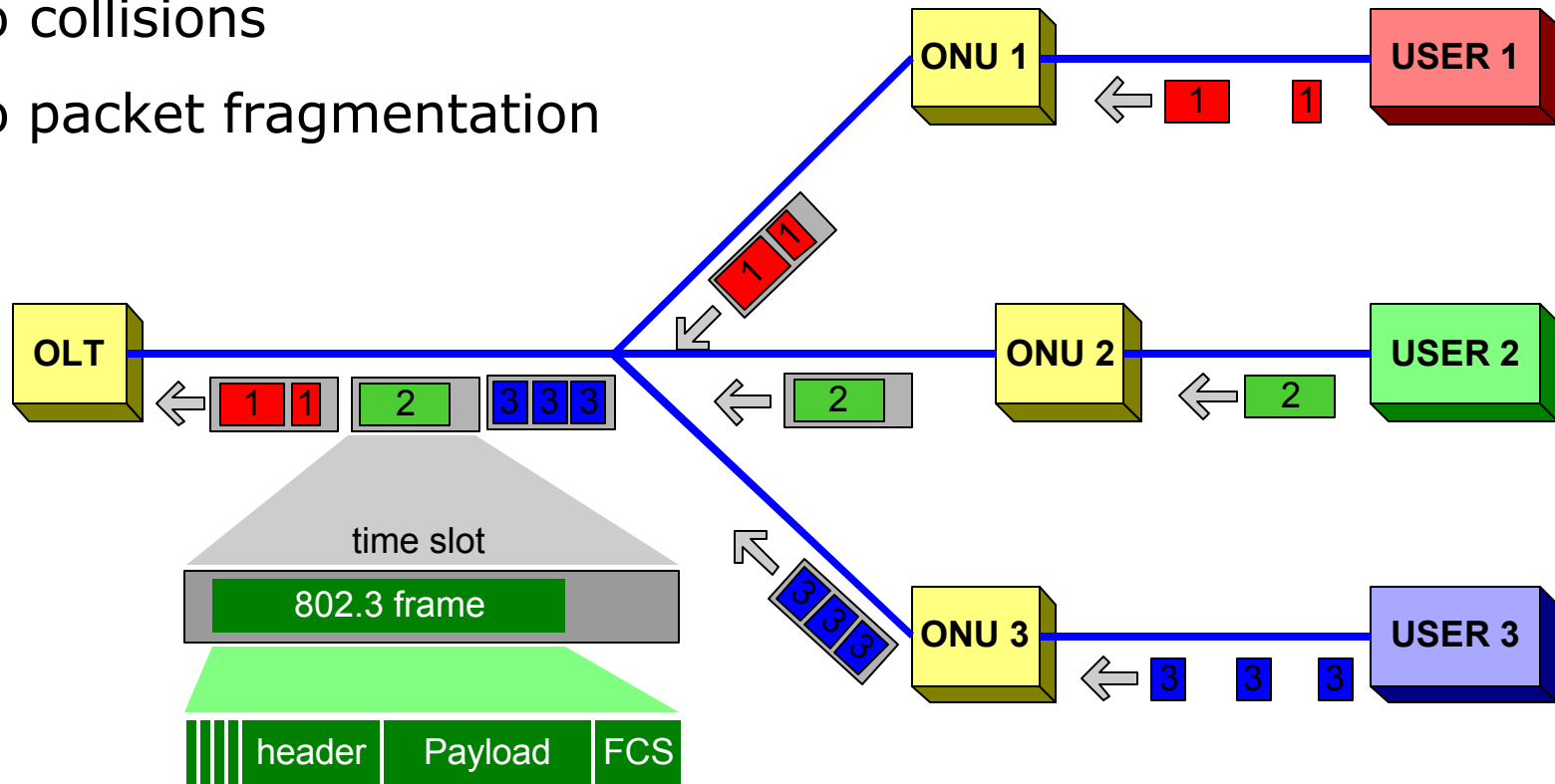


EPON Downstream: GATE Message

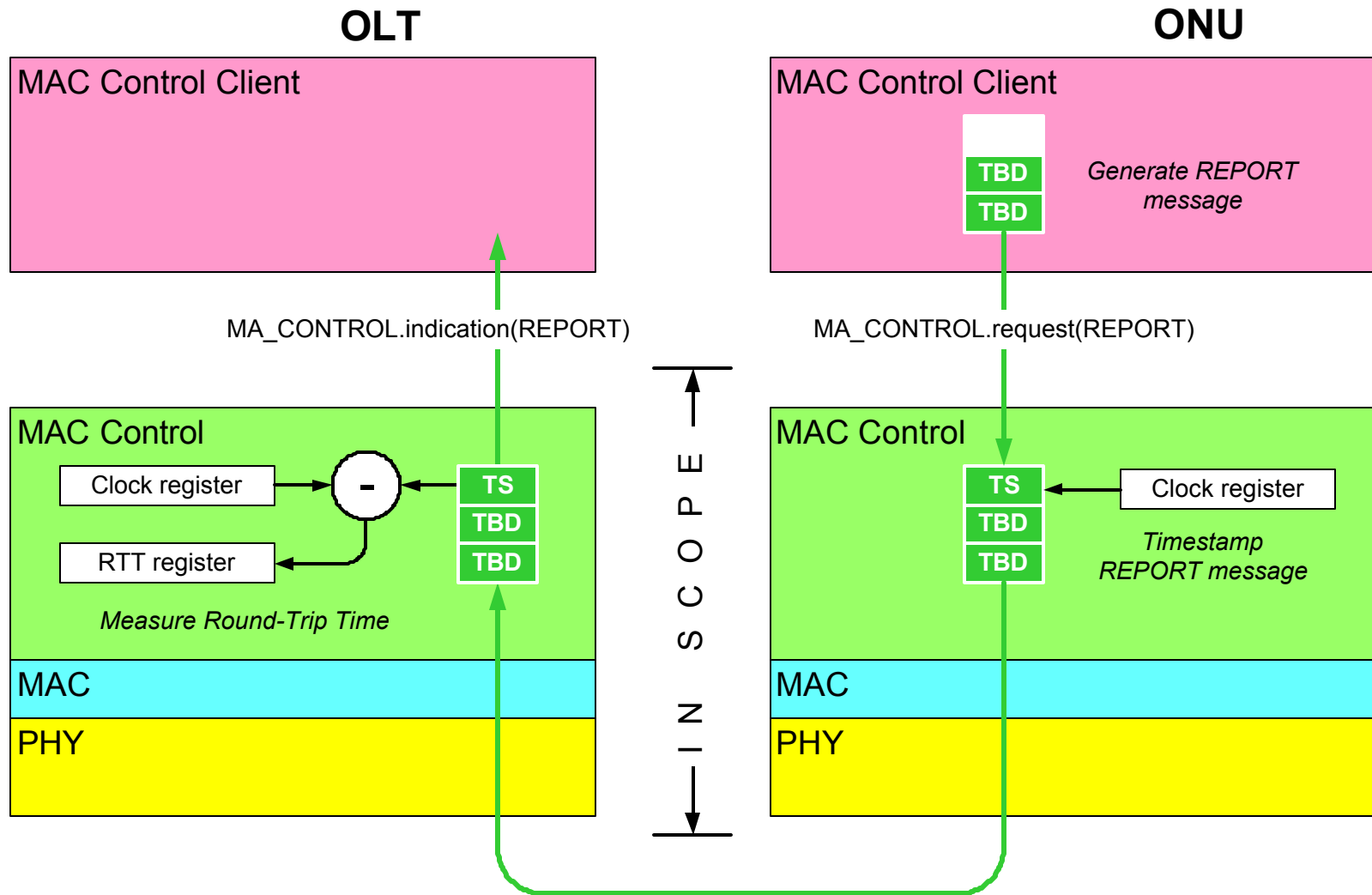


EPON Upstream

- Upstream control managed by MPCP protocol
- Time slots contains multiple 802.3 Ethernet frames
- 64 byte REPORT Message sends ONU state to OLT
- No collisions
- No packet fragmentation

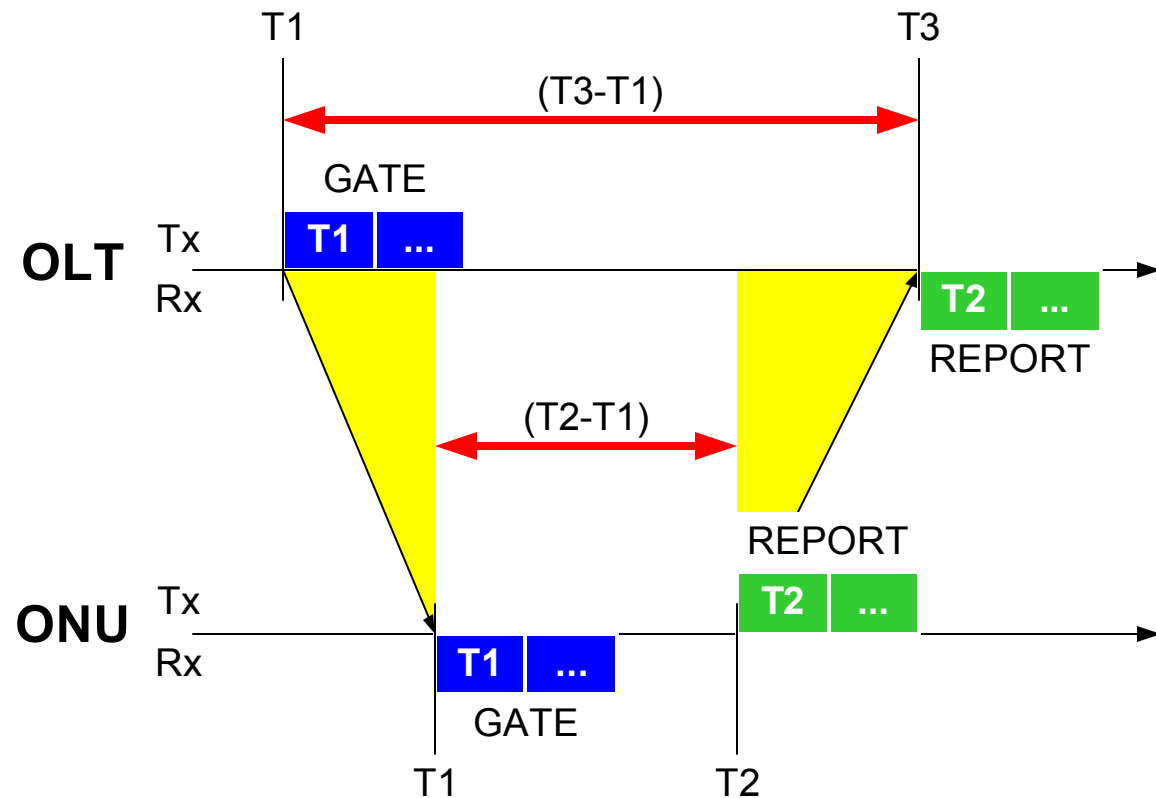


EPON Upstream: REPORT Message



RTT Measurement

1. OLT sends GATE at T1
2. ONU receives GATE at T1
3. ONU sends REPORT at T2
4. OLT receives REPORT at T3
5. OLT calculates $RTT = T3 - T2$



$$RTT = (T3 - T1) - (T2 - T1) = T3 - T2$$

Summary

- EPON specification will include Multi-Point Control Protocol, Point-to-Point Emulation, and two PMDs for 10 and 20 km using 1490/1310 nm.
- Several issues are outstanding and are being discussed, including hooks for security and authentication. Consensus layer model anticipated to be approved this week in Vancouver.
- 802.3ah EPON standard moving to Draft phase July 2002. EFM standards anticipated by September 2003
- ITU-T G.983 documents have been provided to 802.3ah

802.3ah Information

802.3ah Ethernet First Mile Task Force

<http://www.ieee802.org/3/efm/>

802.3ah Baseline Technical Proposals

<http://www.ieee802.org/3/efm/baseline/index.html>