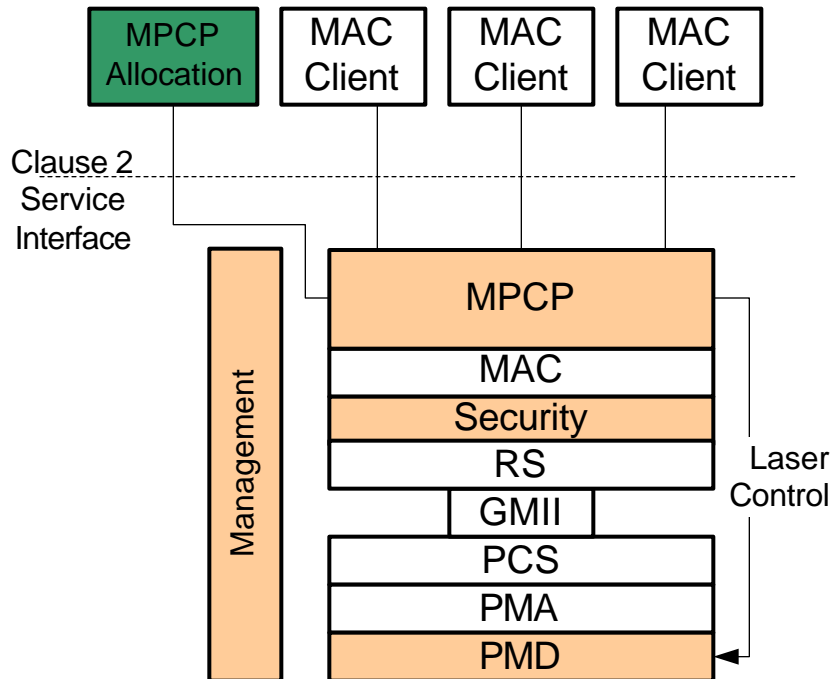

EPON Layering

Layering Requirements

- **Architecture should guarantee zero jitter below MPCP**
- **Support of multiple LLIDs per ONU**
- **Ability to grant per ONU**
- **Ability of multiple LLIDs transmitting in the same grant**
- **Counters per LLID**
- **Need to decide if Pause as defined in clause 31 is a requirement**

Layering Architecture



- Use of standard interfaces
- MPCP as a single control layer with global view of the system
- MAC with no modifications
- New layers use standard interfaces
- Security below MAC to include in the encryption MAC addresses and FCS
- Define the new management entities for the added functionality

MPCP needs additions in shaded areas

OLT Upstream View

- **Link Management**

- OLT MAC counters are updated for global state
- Independent LLID counters can be supported if desired
- For some counters, the sum of LLID counters does not equate to OLT counter
 - If error in the tag, LLID is not known

- **Demultiplexing**

- Since there is only one MAC, frame goes up the stack
- The tag is stripped and information is stored in a variable (similar to the laser control signal)

- **MPCP flow**

- The MAC passes up to MPCP
- MPCP processes REPORT frames
- MPCP passes the frames to the appropriate LLID interface

OLT Downstream View

- **Link Management**

- OLT MAC counters are updated for global state
- Independent LLID counters can be supported if desired
- In this case, the sum of LLID counters does equate to OLT counter

- **Arbitration**

- At a given time only one entity of MAC control is enabled transmission. Since there is only one MAC control, only one frame is delivered.
- Tag is added based on MAC client entity

- **MPCP flow**

- MPCP adds time stamp when frame is passed to MAC
- MPCP generates GATEs with the appropriate tag information (LLID, mode bit)

ONU Upstream View

- **Link Management**

- ONU MAC counters are updated for global state
- Independent LLID counters can be supported if desired
- In this case, the sum of LLID counters does equate to OLT counter

- **Demultiplexing**

- At a given moment only one ONU is enabled, within the ONU the MAC control enables only one MAC client for transmission.
- Tag is added based on MAC client entity

- **MPCP flow**

- MAC control adds time stamp when frame is passed to MAC
- MPCP generates REPORTs with the appropriate tag information (LLID, mode bit)

ONU Downstream View

- **Link Management**

- ONU MAC counters are updated for global state
- Independent LLID counters can be supported if desired
- For some counters, the sum of LLID counters does equate to OLT counter
 - A broadcast frame can be sent once but is received by all LLIDs

- **Demultiplexing**

- Frame is dropped if LLID does not exist in ONU
- Tag is stripped
- Frame is forwarded to the appropriate client based on LLID

- **MPCP flow**

- The MAC passes up the frame to MPCP
- MPCP processes GATE frames
- MPCP passes the frames to the appropriate LLID interface

Summary

- **An architecture design that offers a global view for the MPCP to control the PON**
- **It can be specified with no changes in service interface**
- **It supports**
 - A single MAC control layer to collect and distribute information from/to the entire PON
 - ONU granting with multiple LLIDs sharing the same burst
 - Management of ONU and OLT as global entities
 - Management of LLIDs as individual entities
 - Accurate management counters

Clause 30: Current Specification

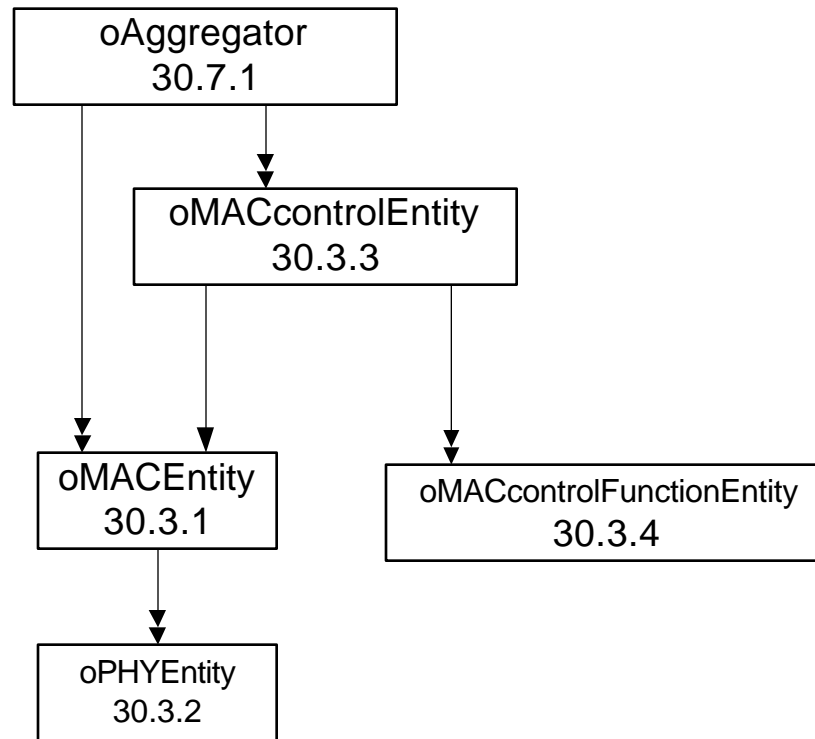
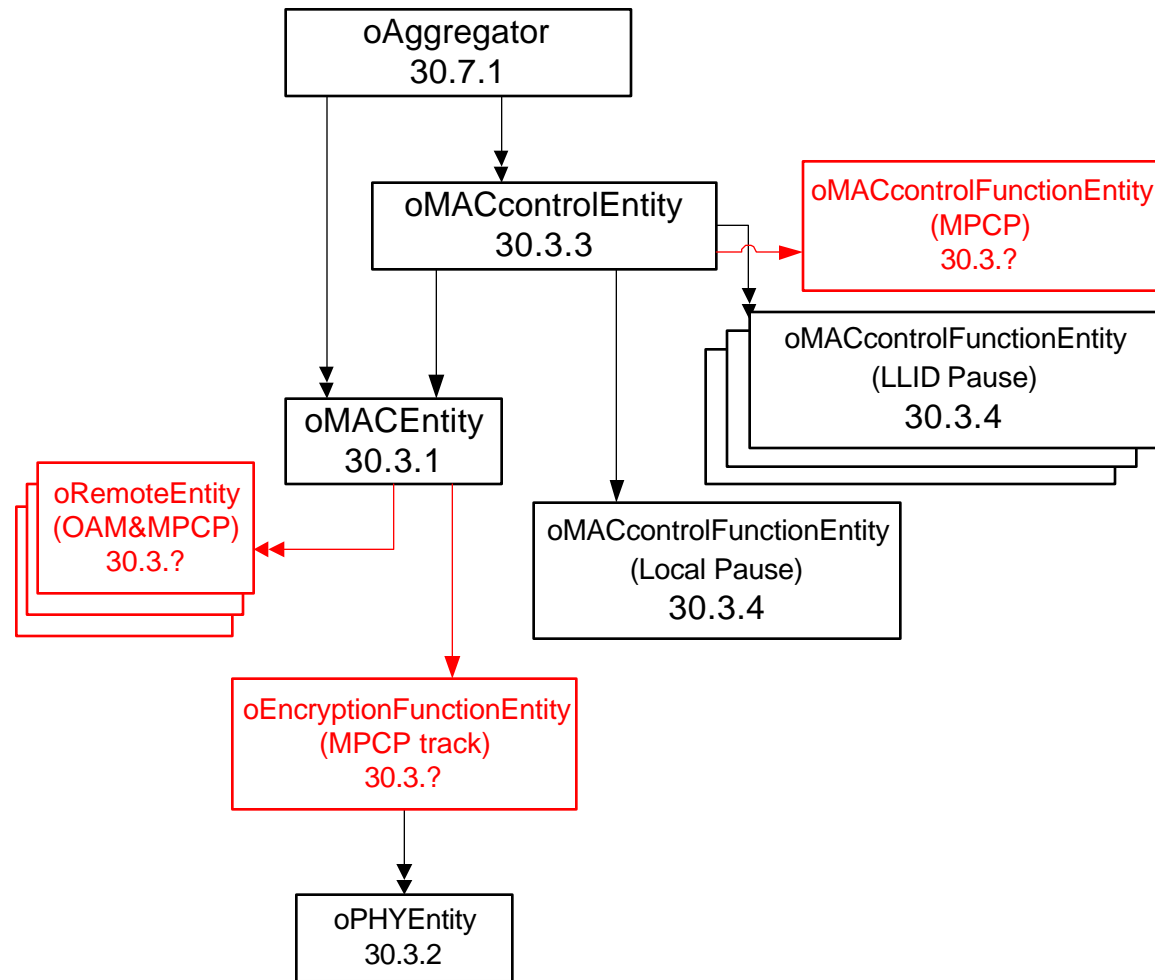


Fig. 30-3 Ethernet Spec 2000

Clause 30: Additions



Added objects shown in red. At least an entity of each object is needed in both layering approaches

Tagging Operation

- **The baseline attaches a tag to a frame in the preamble. Several mechanisms to internally pass tag information across layers within a device:**
- **Option 1: Similar to Laser control signal**
 - Define registers and decide who writes and reads them
 - TxLLID, TxEncOn, TxEncIndex, written by MAC-control and seen by all lower layers
 - RcvLLID, RcvEncOn, RcvEncIndex written by RS layer and seen by all upper layers
- **Option 2: Let information travel with frame across layers using existing interface**
 - The first few bytes of the msdu can be fields used for the tag
 - CRC is computed including this tag in the middle of the frame
 - CRC is recompute and replaced at the RS without considering the tag information
- **Option 3: Let information travel with frame across layers by extending existing interface**
 - Add a tag field to TransmitFrame, ReceiveFrame to pass information from MAC control to RS
 - MAC only needs to transparently pass this information
- **Option 4: Use of multiple MACs**