An example of designing a Coax Convergence Layer in EPoC

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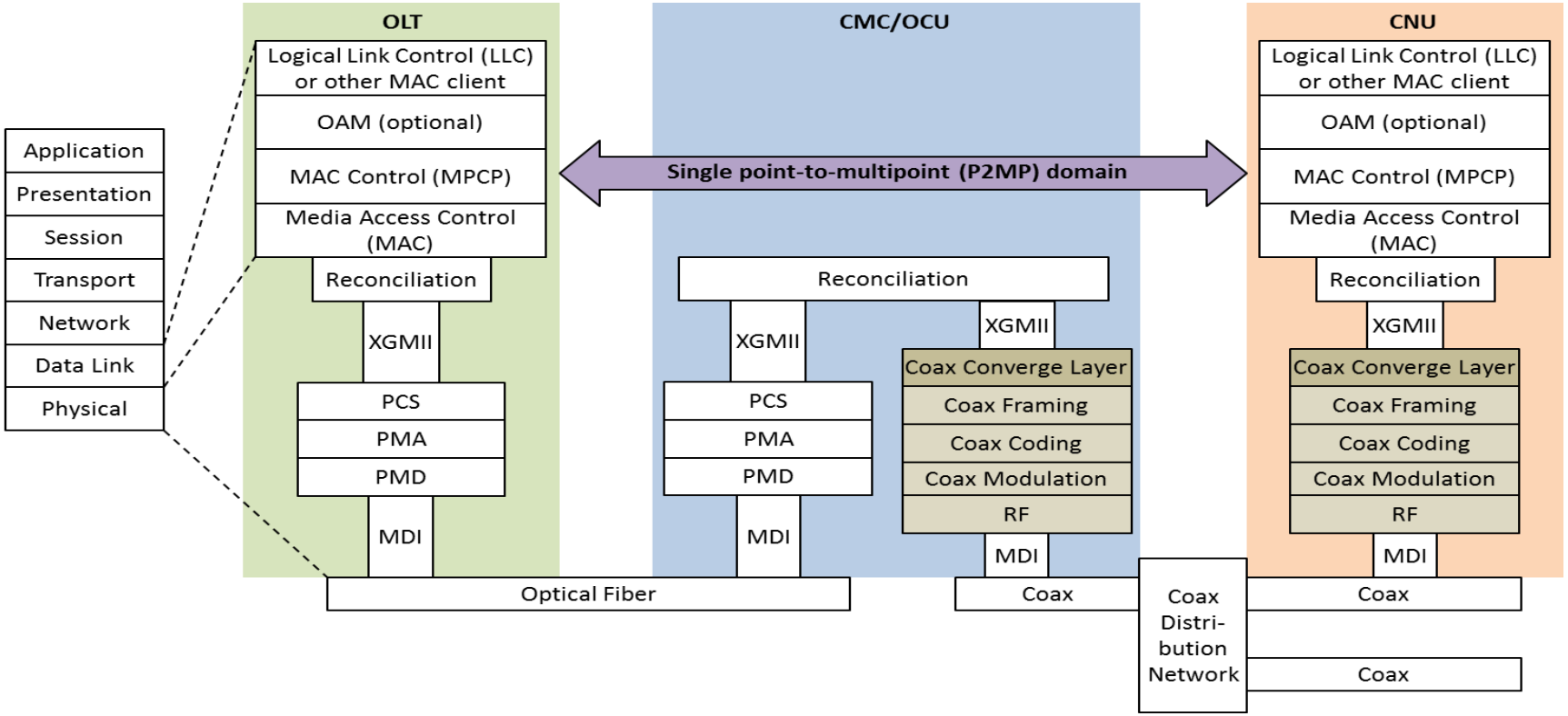
Overview

- There was discussion on EPoC CMC/OCU to be bridge or Repeater
- This presentation shows that a simple EPoC CMC/OCU can be designed to support the required optical to coax convergence
- It is an example of designing a Coax Convergence Layer in EPoC
- This is not a proposal to EPoC

Assumption and Functions

- Same EPON OLT schedules ONUs or CNUs end to end
- A coax convergence layer designed in EPoC CMC/OCU and CNU to support a seamless conversion between Fiber and Coax domain of the EPoC network
- In upstream, LLID based buffers are designed to accommodate coax symbol delays
- In downstream, PON buffer and Coax buffer are designed to perform Optical to Coax conversion

EPoC Coax Convergence Layer



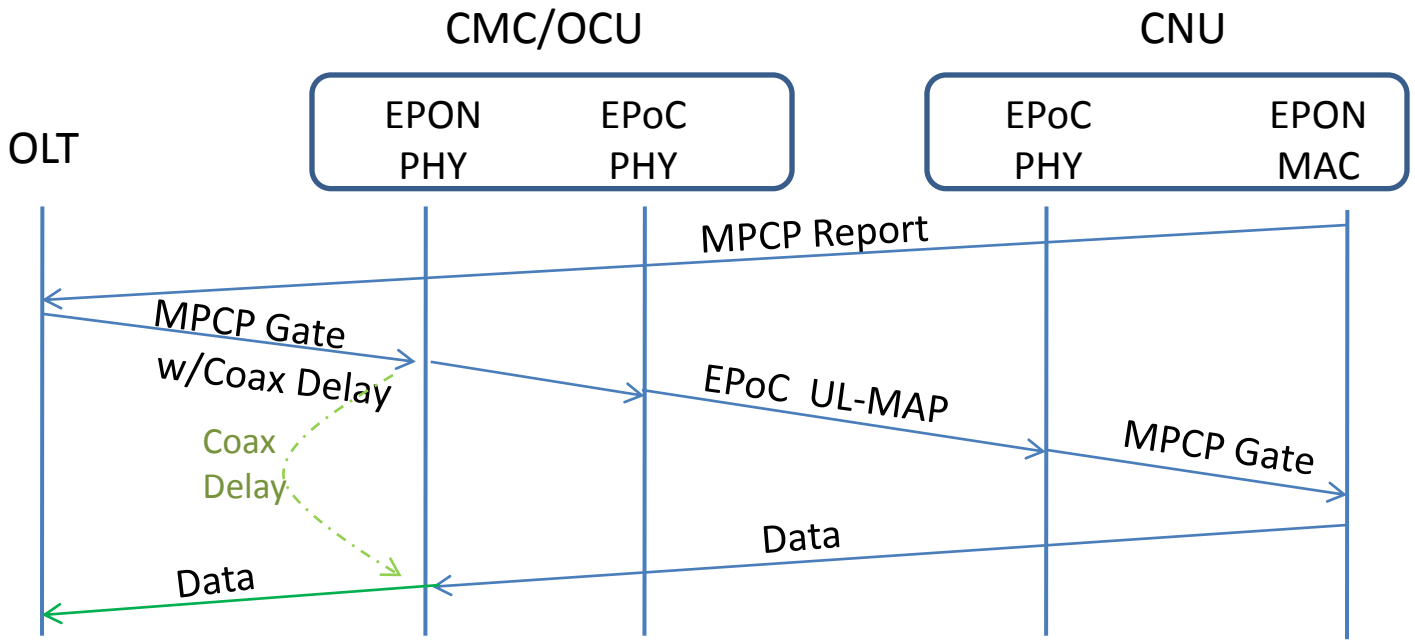
OLT – Optical Line Terminal
OCU – Optical-coax Converter Unit
CNU – Coax Network Unit

OAM – Operations, Administration and Maintenance
XGMII – 10 Gigabit Media Independent Interface
MDI – Medium Dependent Interface

RF – Radio Frequency

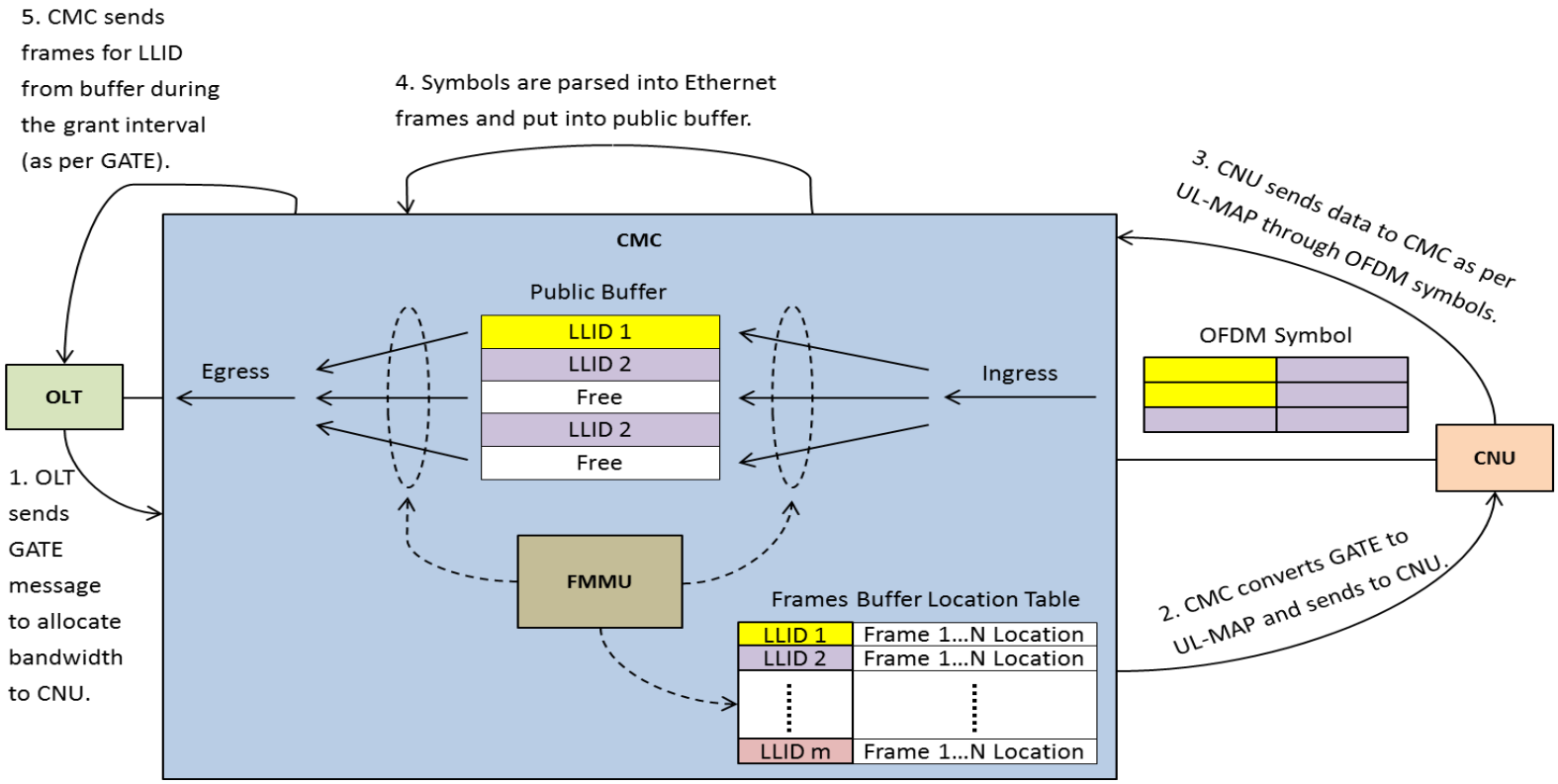
- Same EPON MAC control or MPCP and Ethernet MAC are applied in EPON OLT and EPoC CNU
- Same EPON Reconciliation Sub-Layer is unchanged in EPON OLT and EPoC CNU

Extend EPON MPCP End to End



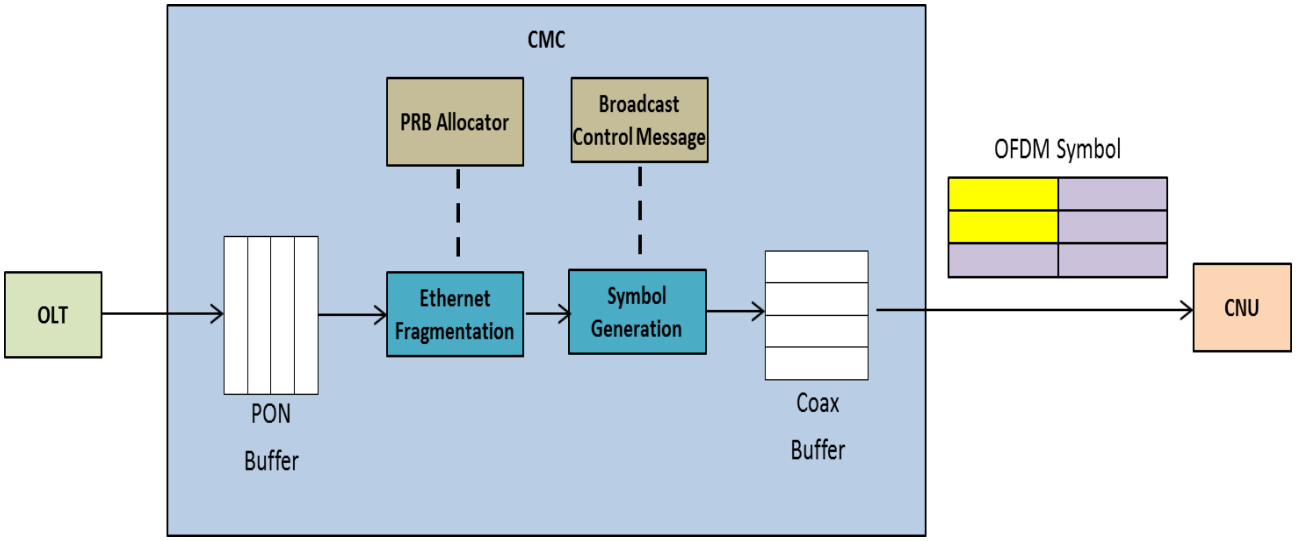
- EPON MPCP Gate message with added Coax Delay to accommodate for the coax delay
- CMC/OCU logs (Start Time, LLID) from the EPON MPCP Gate message
- CMC/OCU performs resource conversion from Optical to Coax (with Coax Up-Link MAP)
- Optics window opens up when the optics timer in the CMC reaches the logged start time and arrived Data from the CNU is transmitted to the OLT

Upstream Buffering in CMC/OCU



- OLT adds an extra coax delay to the start time of the EPON MPCP GATE message to accommodate for the coax delay and the {Start Time, LLID) in GATE message is logged in the CMC/OCU
- Frame Memory Management Unit manages the LLID based buffer locations for the frames coming in from CNUs

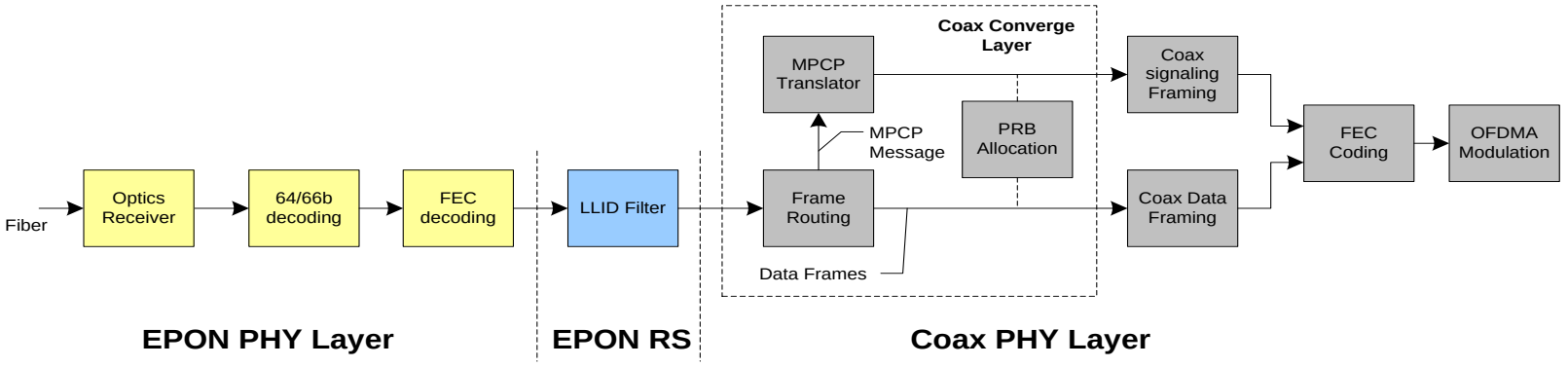
Downstream Buffering in CMC/OCU



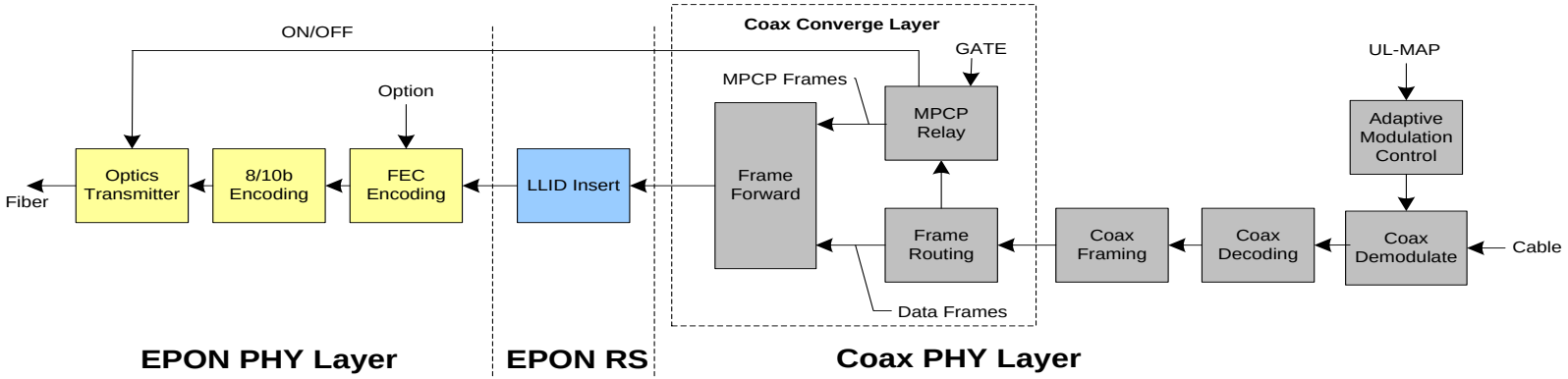
- Ethernet frames in the PON buffer are fragmented by the coax physical resource block allocator and stored in the coax buffer where they are transmitted to the CNU through coax symbols
- Function of PON Buffer is to store burst data from the OLT and the Coax Buffer is to store the OFDM symbols

EPoC Coax Convergence Layer in CMC

Downstream Communications



Upstream Communications



Main Functions are MPCP translation, Coax Physical Resource Block Allocation and Frame Routing

Conclusion

- Build a deterministic model for EPoC communication
- Extend EPON MPCP end to end from OLT to CNU
- Achieve End to End scheduling from OLT to CNU/ONU
- Coax symbol delay can be accommodated
- Same EPoC Coax Convergence Layer can be applied to FDD/TDD