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EPON over Coax System Reference Models

Eugene Dai and Jeff Finkelstein
Cox Communications

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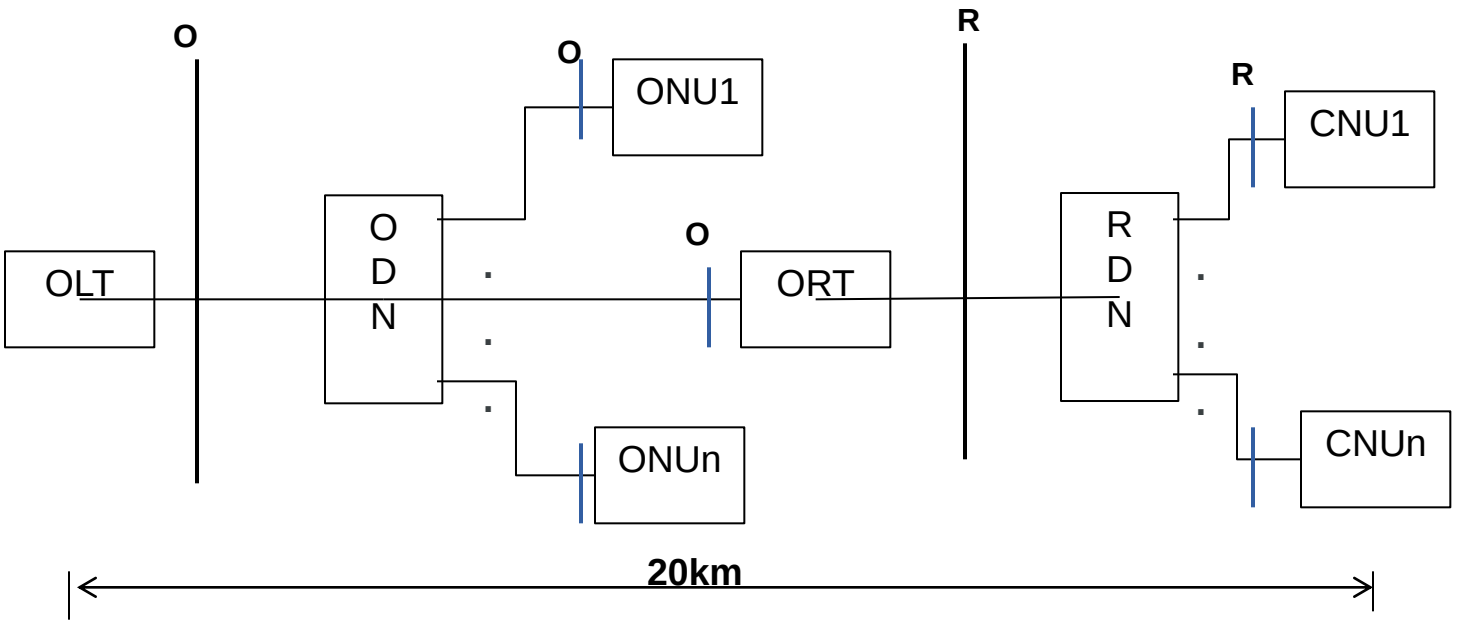
EPoC Reference Models

- IEEE 802.3 EPOC SG is targeted to define coax RF PHY to extend EPON to coax
- System definitions and implantations may out of scope, however the RF PHY should support various system options
- Therefore, EPOC system reference modes need to be kept in mind while defining the RF PHY
- EPOC system reference models and their implementation options are discussed

EPoC Reference Model A - Hybrid model



ORT – Optical RF termination

RDN – RF Distribution Network

CNU – Cable Network Unit

OLT – Optical Line Termination

ONU – Optical Network Unit

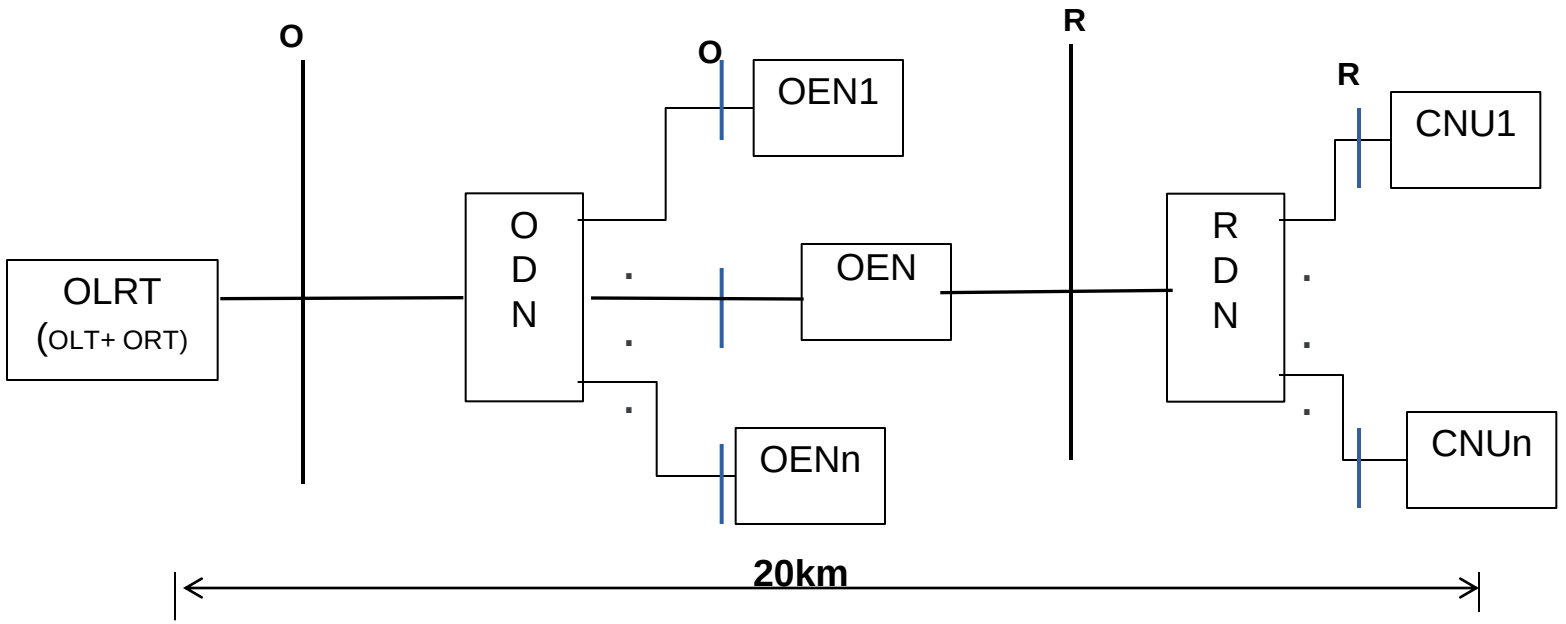
ODN – Optical distribution Network

O – Optical interface

R – RF interface

- Hybrid system
  - Digital signal on fiber
  - RF modulation on coax
- ORT functions as repeater and signal converter
- Easy migration to FTTH

Reference Model B - EPON Over HFC



ORT – Optical RF termination

RDN – RF Distribution Network

CNU – Cable Network Unit

OLT – Optical Line Termination

OEN – Optical Electrical Node

ODN – Optical distribution Network

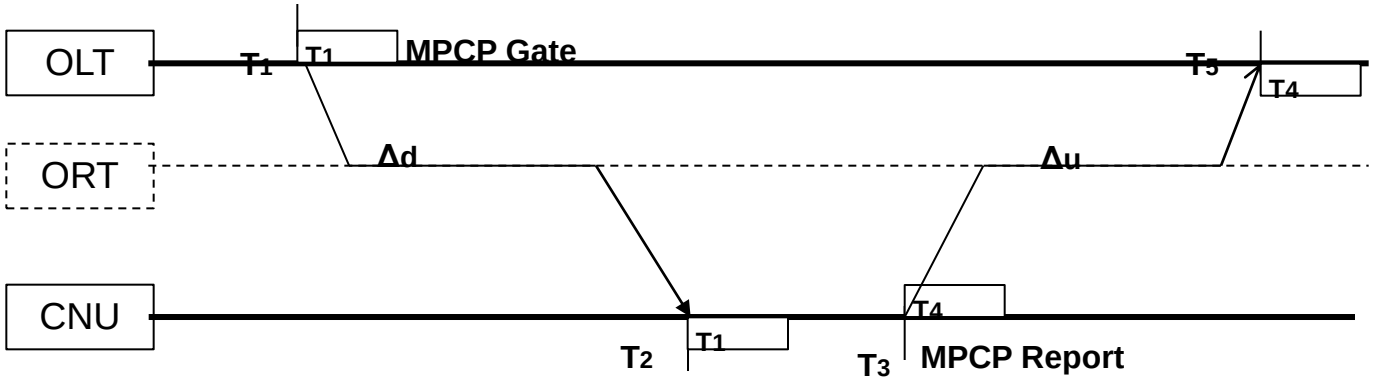
O – Optical interface

R – RF interface

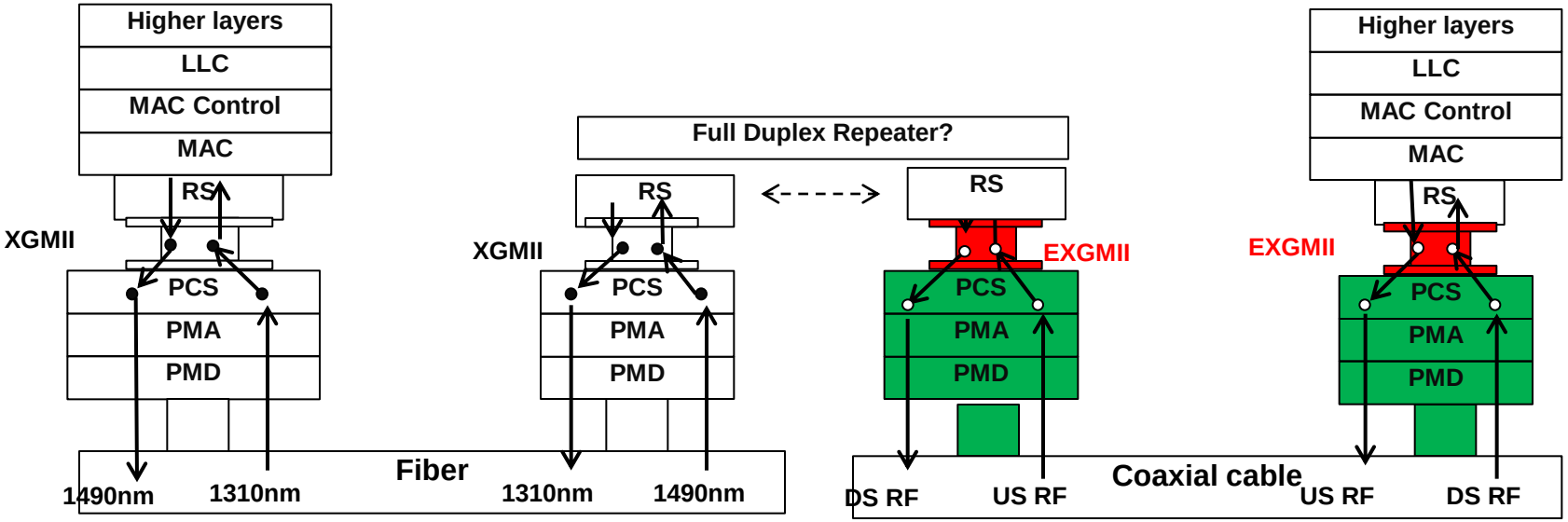
- Analog system
- RF modulated optical signal on fiber
- OEN functions as OE conversion
- Does not directly migrate to FTTH
- May not work in TDD mode

EPoC Timing for reference Model A-1

ORT does not change time stamp

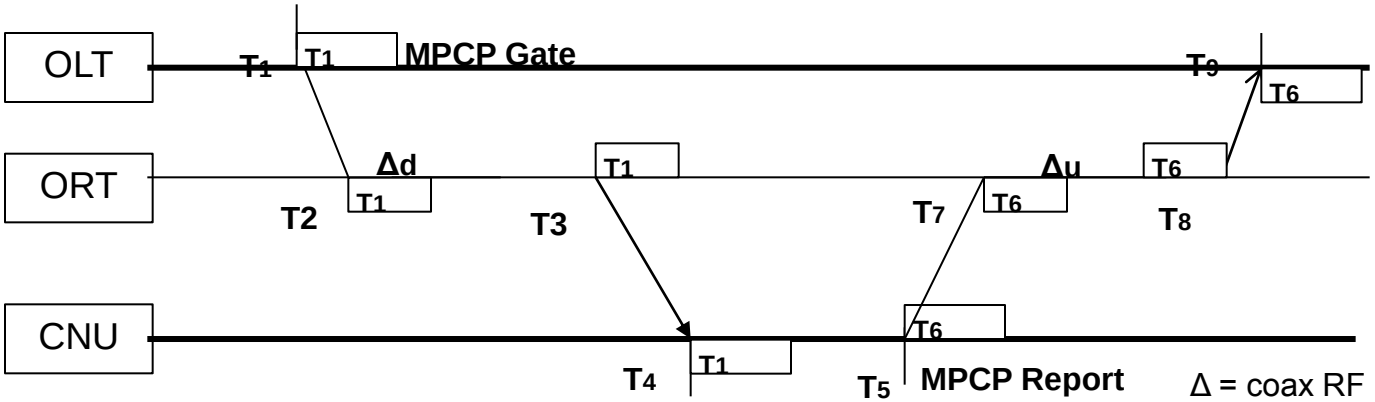


T3 - T2 = T4 – T1 **RTT = (T2 – T1) + (T5 – T3) = T5-T4**



EPoC Timing for Reference Model A-2

ORT change time stamp



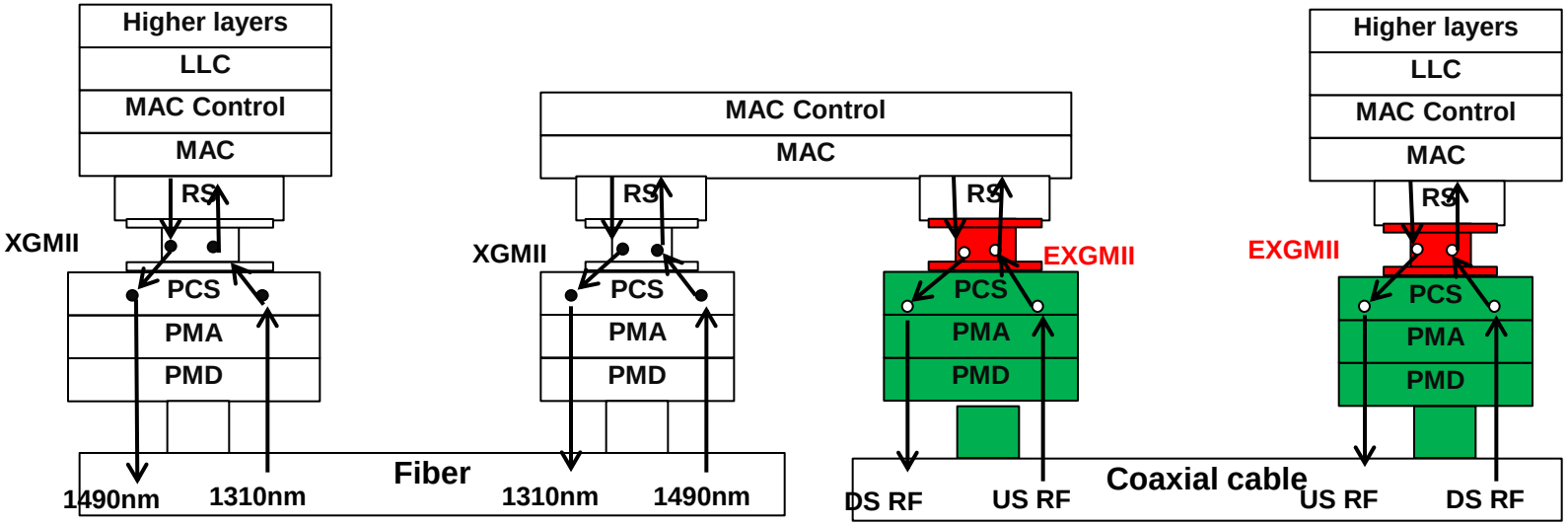
$T5 - T4 = T6 - T1$

$RTT = (T4 - T1) + (T9 - T5) = T9 - T6$

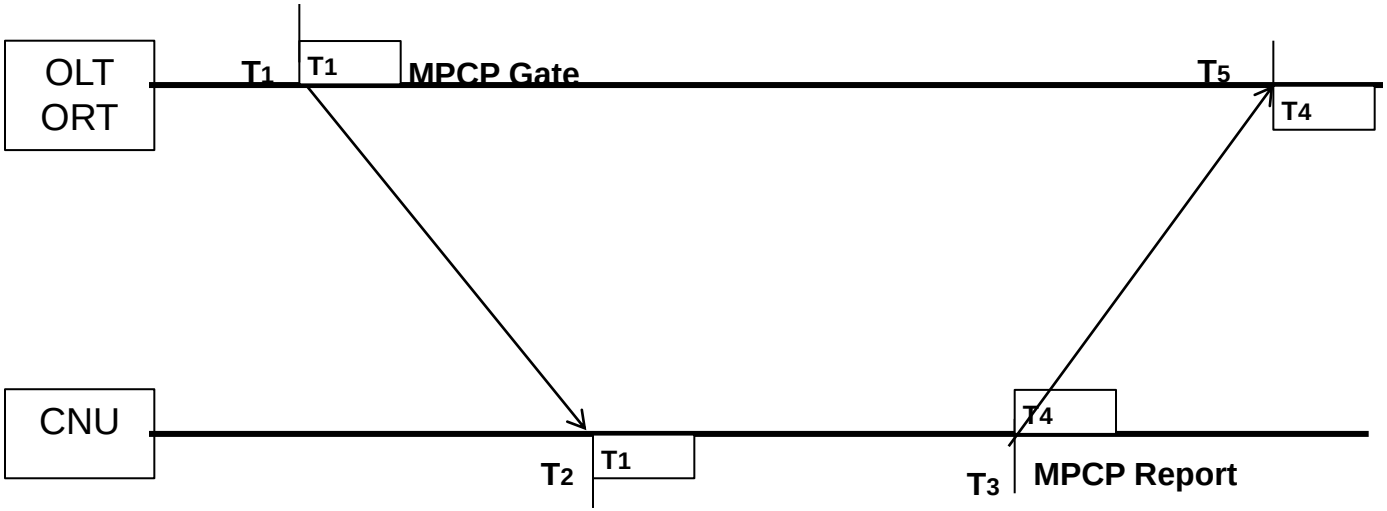
Δ = coax RF PHY delay

Δu = upstream coax PHY delay

Δd = downstream coax PHY delay



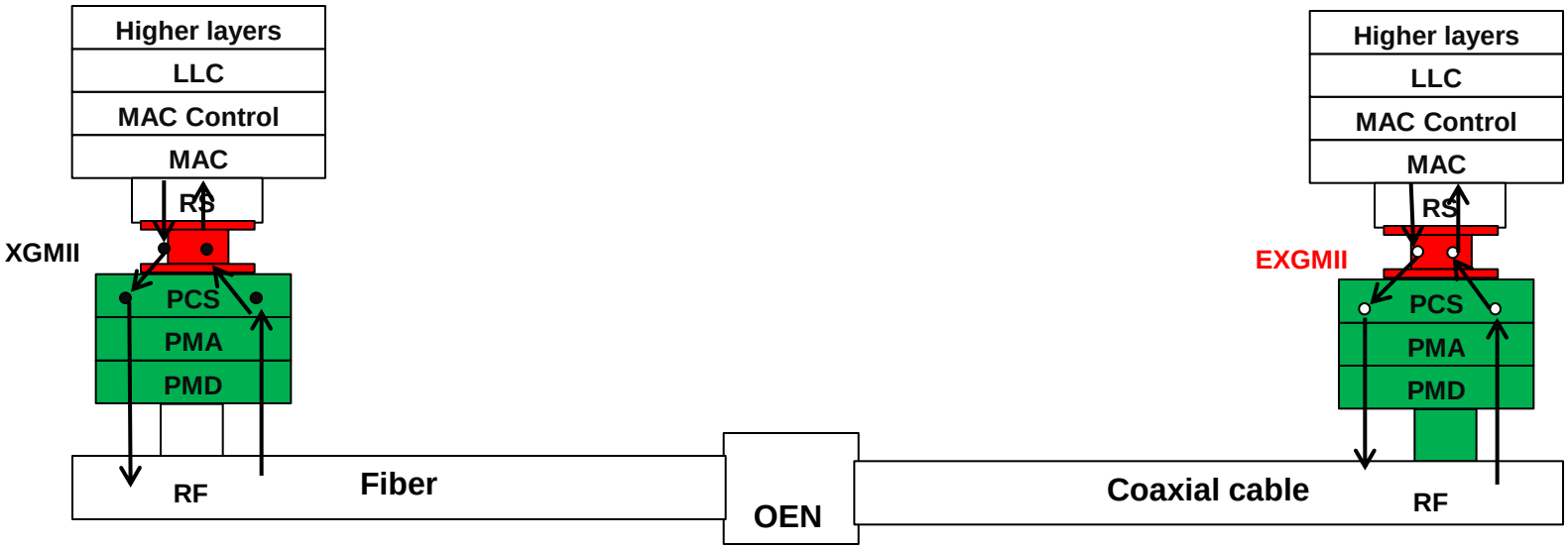
EPoC Timing for reference Model 2



T3 - T2 = T4 – T1 RTT = (T2 – T1) + (T5 – T3) = T5-T4

- OEN is a transparent O/E converter; it does not has time information
- OLT and ORT shares the same clock
- EPoC reference model 2 timing diagram is the same as that of EPON

Layering Diagram with Timing Model 2



- OEN upstream: Analog burst mode, similar to that of RFoG
- Upstream rate is limited by analog burst mode
- Need define analog burst mode transmitter and receiver
- FDD on both fiber and coax
- TDD mode requires TDD-like MAC on fiber which is not simple

Conclusions

- Reference model A is a hybrid system model
  - Hybrid TDM and OFDM
- Timing for reference model A-1 represents a repeater
  - ORT is transparent to MAC and above
- Timing for reference model A-2 is similar to MAC forwarding/relay
  - ORT could preform LLID and MAC forwarding and filtering to optimize RF PHY
  - ORT is transparent to LLC and above
- Reference model B represents EPON over HFC
  - OEN upstream operates in analog burst mode, similar to RFoG
  - Upstream rate is limited by analog burst mode
  - Need a place to standardized the upstream analog burst mode transmitter
  - TDD mode requires TDD on fiber- not a simple solution
- Timing for reference model B is identical to EPON

Thanks