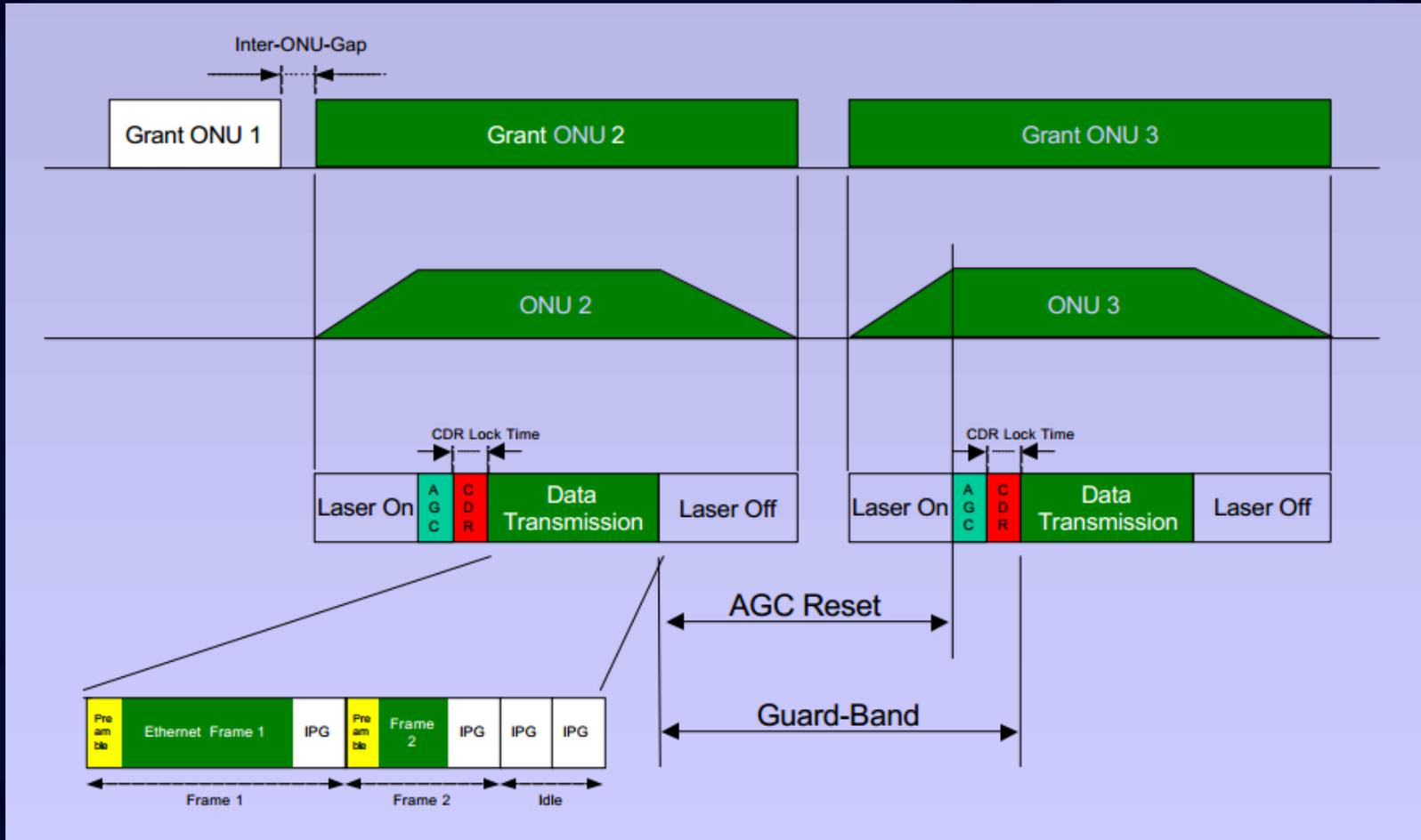


Concurrent Upstream Transmission from Multiple CNU's in Single EPoC Coax Segment

*IEEE 802.3 EPoC Study Group
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*Rick Li
Cortina Systems*

EPON burst mode upstream* - Sequential



* Bob Gaglianella

EPoC burst mode upstream – Concurrent (OFDMA)



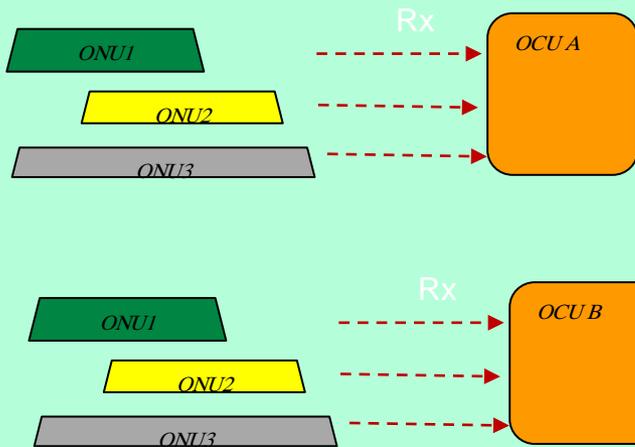
One way to avoid frame fragmentation in upstream for TDD is for CNU to report on frame boundary within each TDD upstream phase

Impacts and Requirements to ONU

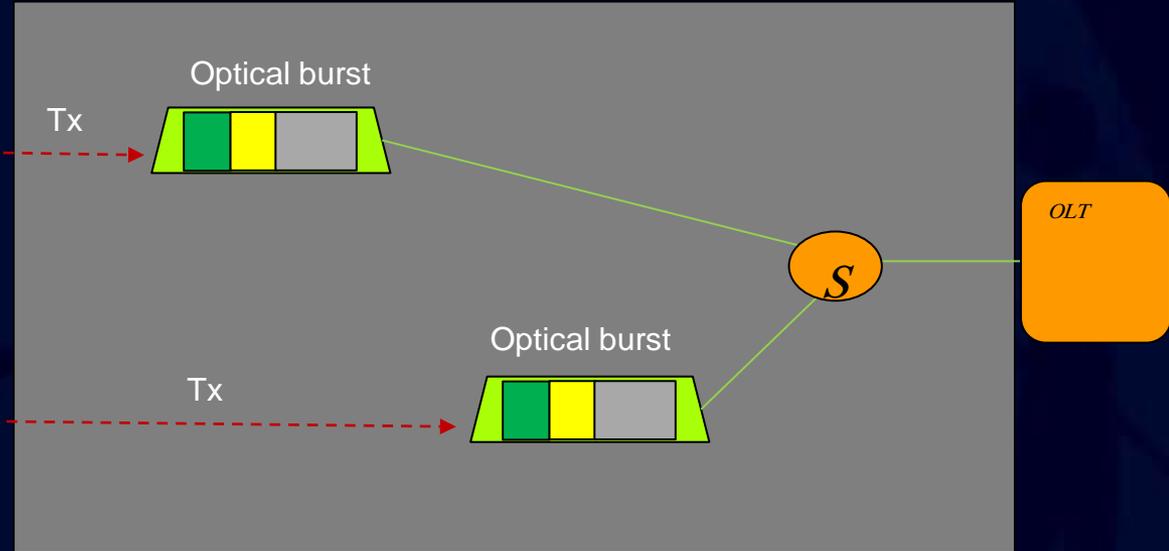
- ✓ Each CNU sees “a virtual coax link” formed by the corresponding OFMDA subcarrier group assigned to this CNU
- ✓ Minimal impact to CNU MAC operation



Concurrent/Sequential upstream



Sequential upstream



- ✓ OCU to buffer data from CNUs and send on a single optical burst
- ✓ OCU must maintain data sequence order from the CNUs
- ✓ Potentially introduce variable delay, indirectly affecting RTT calculation
- ✓ May need a local OCU scheduler

Impacts and Requirements to OLT

- ✓ Will OLT combine all REPORTS from CNUS subtending from a specific OCU for that OCU's upstream transmission?
- ✓ Will OCU be controlled by OLT's DBA from EPON link perspective?
- ✓ Or OCU will self regulate its upstream optical transmission (laser on/off)? If so, OCU needs to do MPCP snooping

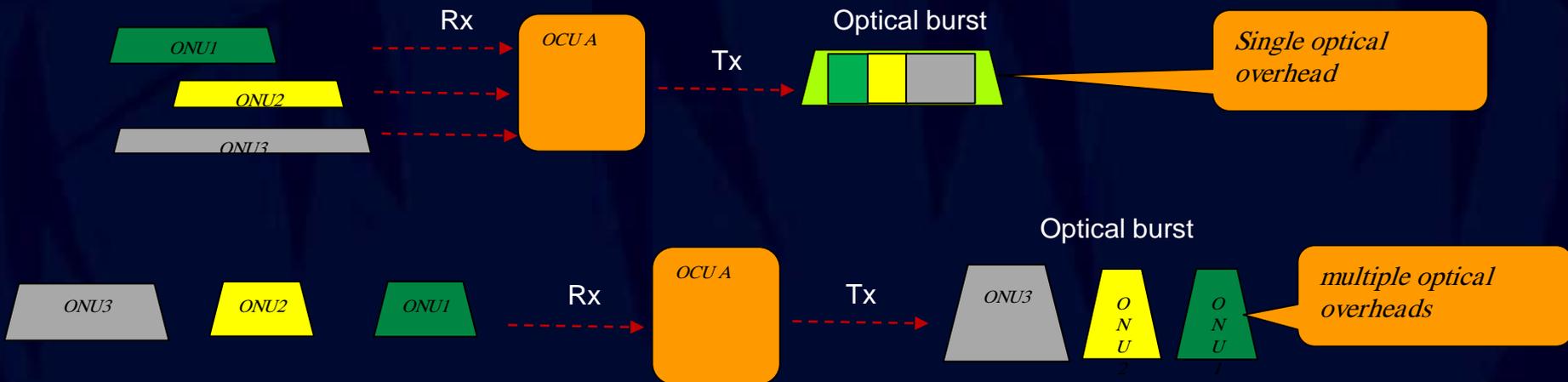
Bandwidth Efficiency: Sequential vs. Concurrent

Coax EPoC Link utilization

- a) This is largely determined by the bandwidth scheduler efficiency
- b) Independent of sequential or concurrent transmission

Optical EPON link utilization

- a) Sequential ONU upstream will have higher optical overhead (laser on/off)
- b) OCU must perform concatenation of data from multiple ONUs to a single optical burst



Delay Efficiency: Sequential vs. Concurrent

- ✓ Concurrent will reduce scheduling delay, but incur higher transmission delay due to lower 'virtual link' speed
- ✓ Sequential will incur higher scheduling delay, but have lower transmission delay due to full coax link speed
- ✓ Allow a limited number of CNU's for concurrent upstream transmission or all registered CNU's can have concurrent upstream transmission?
- ✓ Assuming 32 CNU's per OCU on a coax segment, the 'virtual link speed' reduces to "1Gbps/32" when the subcarriers are evenly divided
- ✓ More study is required to quantify

Thank You