Ethernet in the First Mile

Point to Multipoint
Ethernet Passive Optical Network (EPON)
Tutorial

Optical First Mile

Point to Point Ethernet

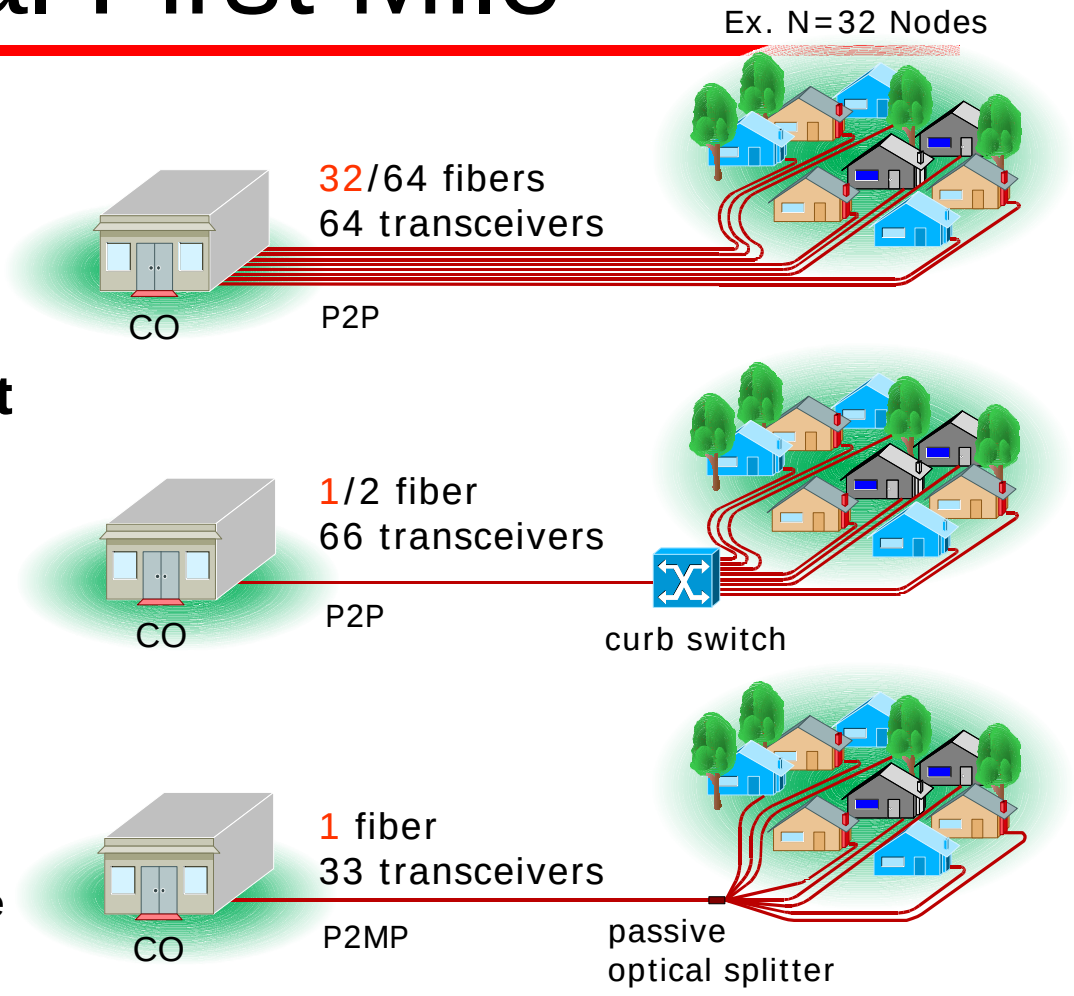
- → N fibers
- → 2N optical transceivers

Curb Switched Ethernet

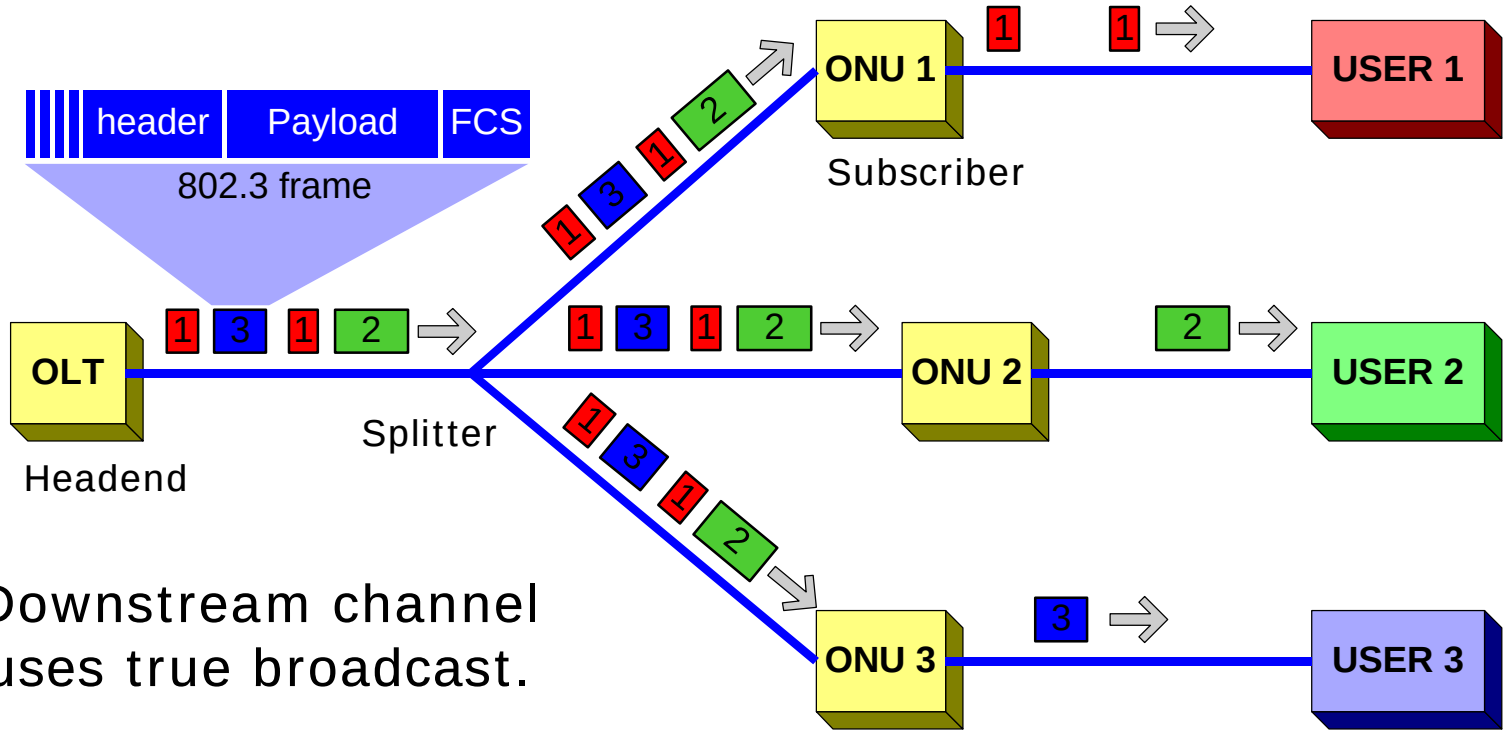
- → 1 fiber
- → Minimum fiber/space in CO
- → 2N+2 optical transceivers
- → Electrical power in the field

Ethernet PON (EPON)

- → 1 fiber
- → Minimum fibers/space in CO
- → N+1 optical transceivers
- → No electrical power in field
- → Drop throughput up to trunk rate
- → Downstream broadcast (video)



EPON Downstream

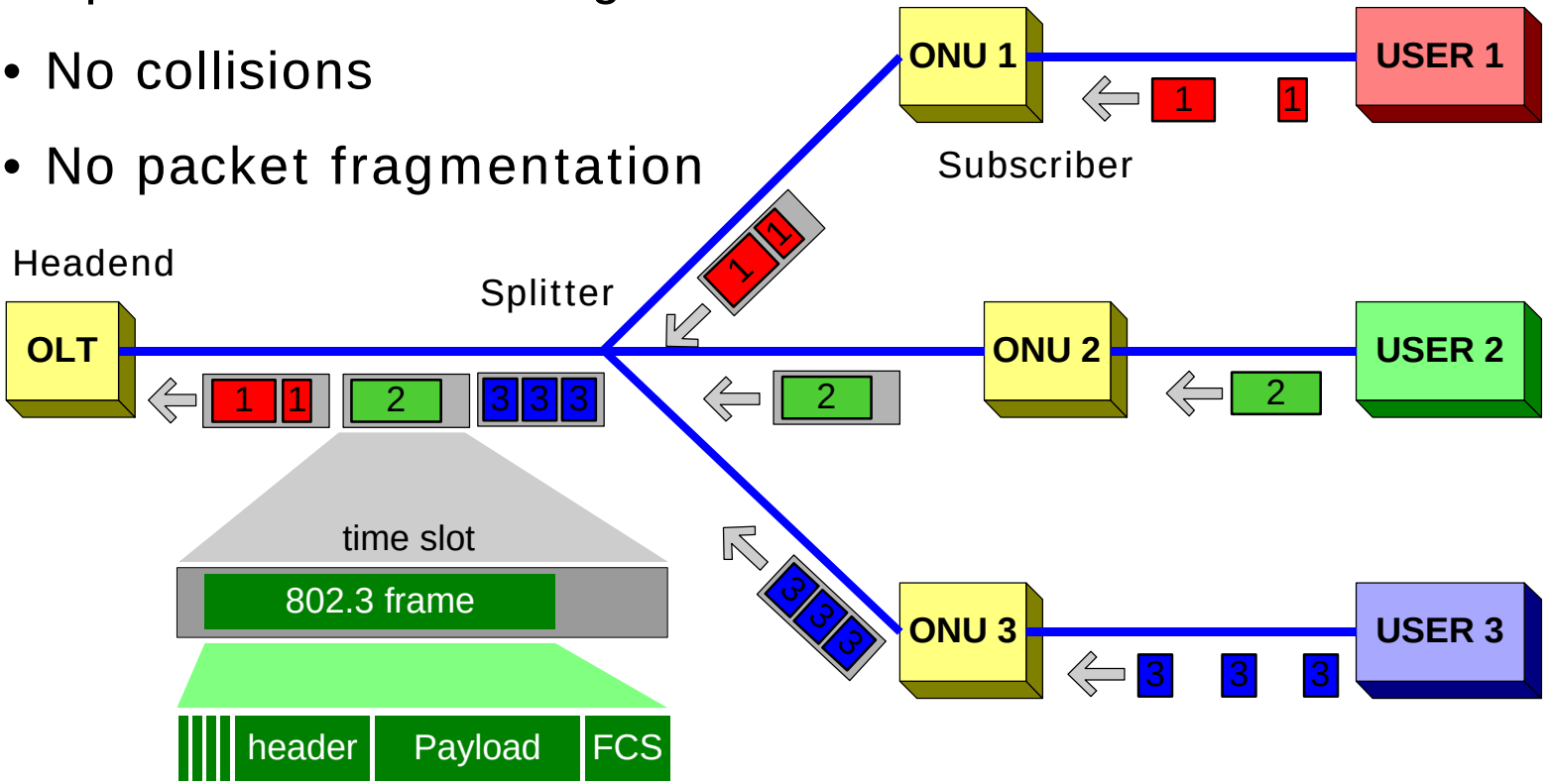


- Downstream channel uses true broadcast.
- 802.3 Frames extracted by MAC addresses.

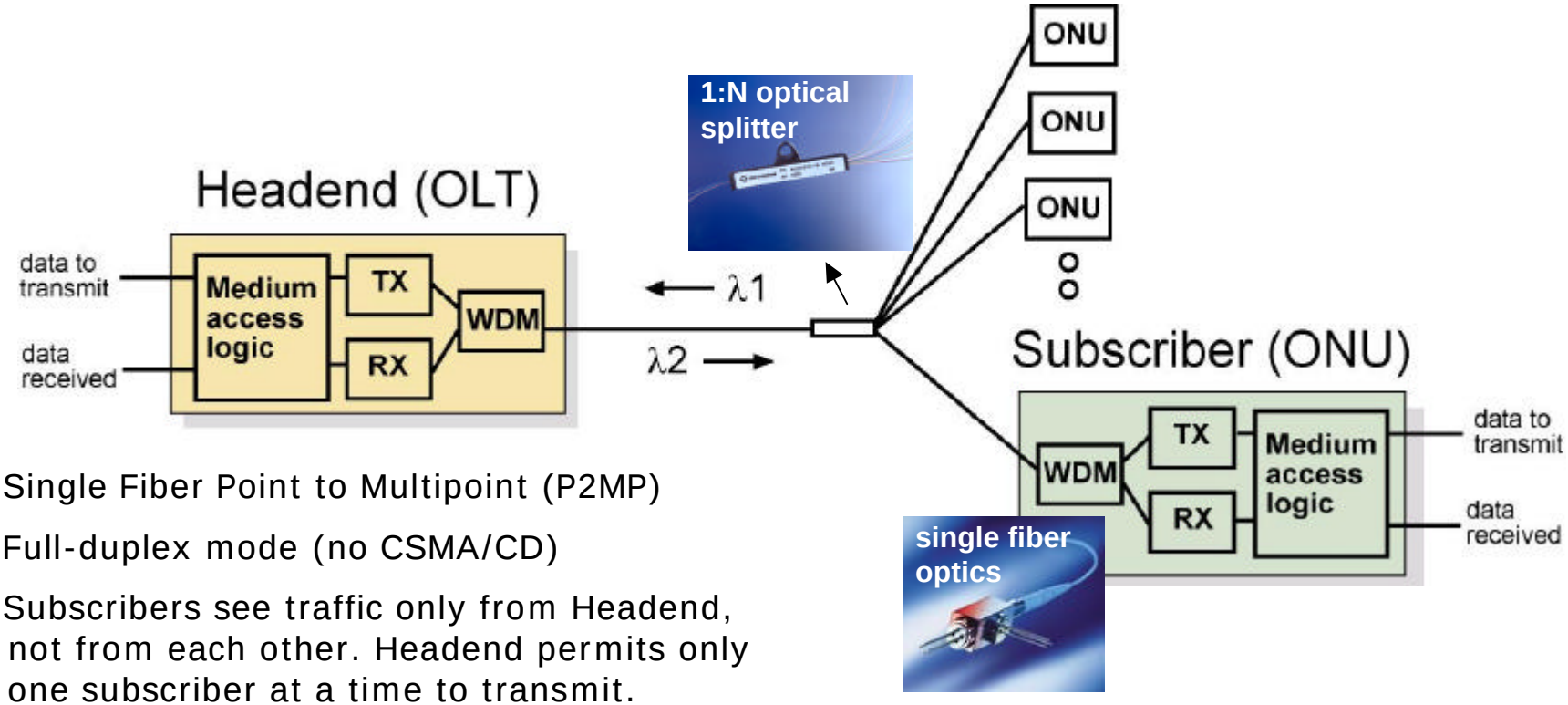
OLT = Optical Line Terminal
ONU = Optical Network Unit

EPON Upstream

- Upstream time slicing
- No collisions
- No packet fragmentation



EPON Configuration



- Single Fiber Point to Multipoint (P2MP)
- Full-duplex mode (no CSMA/CD)
- Subscribers see traffic only from Headend, not from each other. Headend permits only one subscriber at a time to transmit.
- Flexible optical splitter architectures
- PMD investigate 1550/1310, 1310+/1310- and 1490/1310

EPON Compatibility

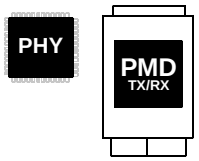
EPON preserves the 802.3 frame format, MAC and GMII/TBI. Two methods have been proposed:

(1) PHY Layer

8B/10B, SERDES, and Multiple Access Manager

(2) MAC Control Layer

Utilize existing PAUSE control frame or other control messages.



Point to multipoint:

Focus, simplify, and preserve the integrity of Ethernet

EPON Applications

EPON supports a broad range of EFM applications:

- Fiber to the Home (FTTH)
- Fiber to the Building (FTTB)
- Fiber to the MDU, MTU
- Fiber to the Curb (FTTC)

Local Exchange Carriers trialing/deploying PON

Market Research Supporting PON ($2.2B NA 2004)

Favorable EFM SG voting: 59-3 Mar vote, 85-0 May vote

EPON Summary

- Point-to-Point (P2P) and Point-to-Multipoint (P2MP) Optical Ethernet are important for local subscriber access networks.

- EPON Objective:

  PHY for

  PON - Point-to-Multipoint Passive Optical Network

  >=10 km - Covering local subscriber network distances

  1000 Mbps - Using standard Gigabit Ethernet rates

  SMF - Singlemode Fiber

  >=1:16 - Covering minimum 16-to-1 split ratio