Ethernet Passive Optical Networks (EPON)

Gerry Pesavento
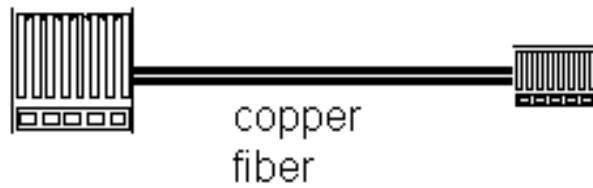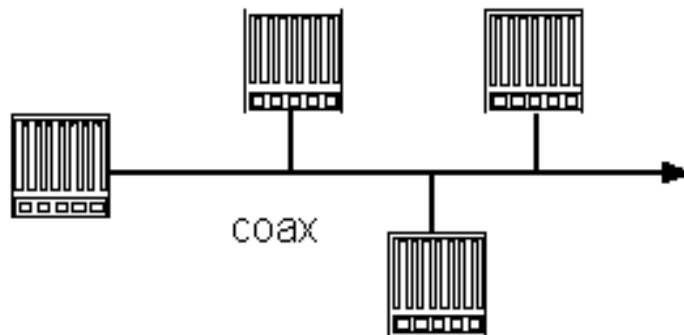
VP Research & Development

Alloptic, Inc.

Ethernet PON

- **Point-to-Multipoint (P2MP) optical Ethernet**
- **Single fiber feed to multiple fiber drops**
- **Passive optical splitting**
- **Gigabit Ethernet rate and frame format**
- **FTTB, FTTC and FTTH applications**
- **Voice, data, video (full services)**

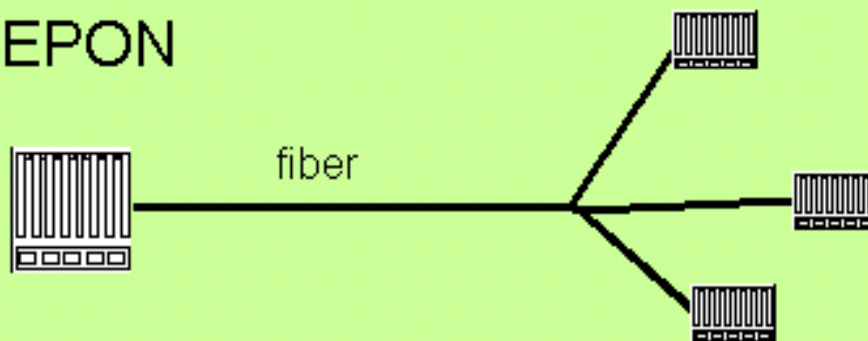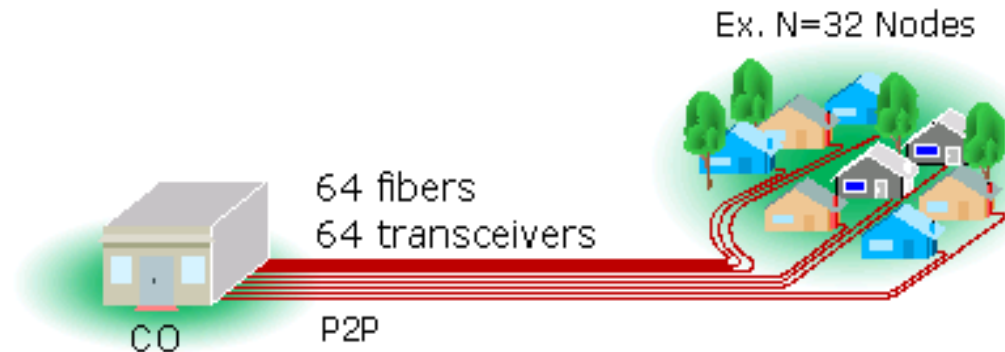Gigabit Ethernet + P2MP Optical = EPON

Lowest cost
IP network

Lowest cost
optical infrastructure
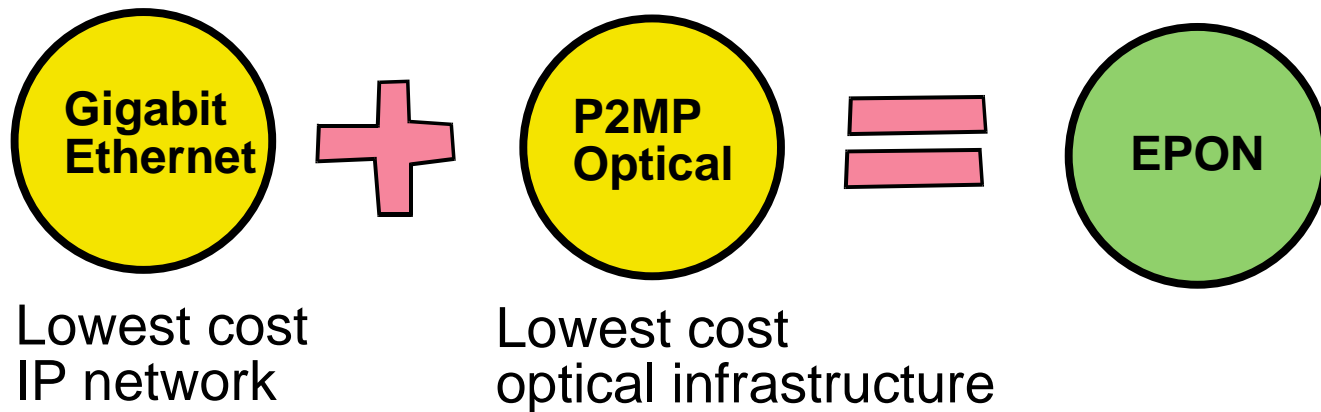
Ethernet

P2MP Coax

P2P Copper
P2P Fiber

802.3

P2MP Optical

coax

copper
fiber

EPON

fiber

Optical Ethernet in the First Mile

Ex. N=32 Nodes

Point to Point Ethernet
→ N fibers
→ 2N optical transceivers

64 fibers
64 transceivers

CO   P2P

Curb Switched Ethernet
→ 2 fibers
→ Minimum fiber/space in CO
→ 2N+2 optical transceivers
→ Electrical power in the field

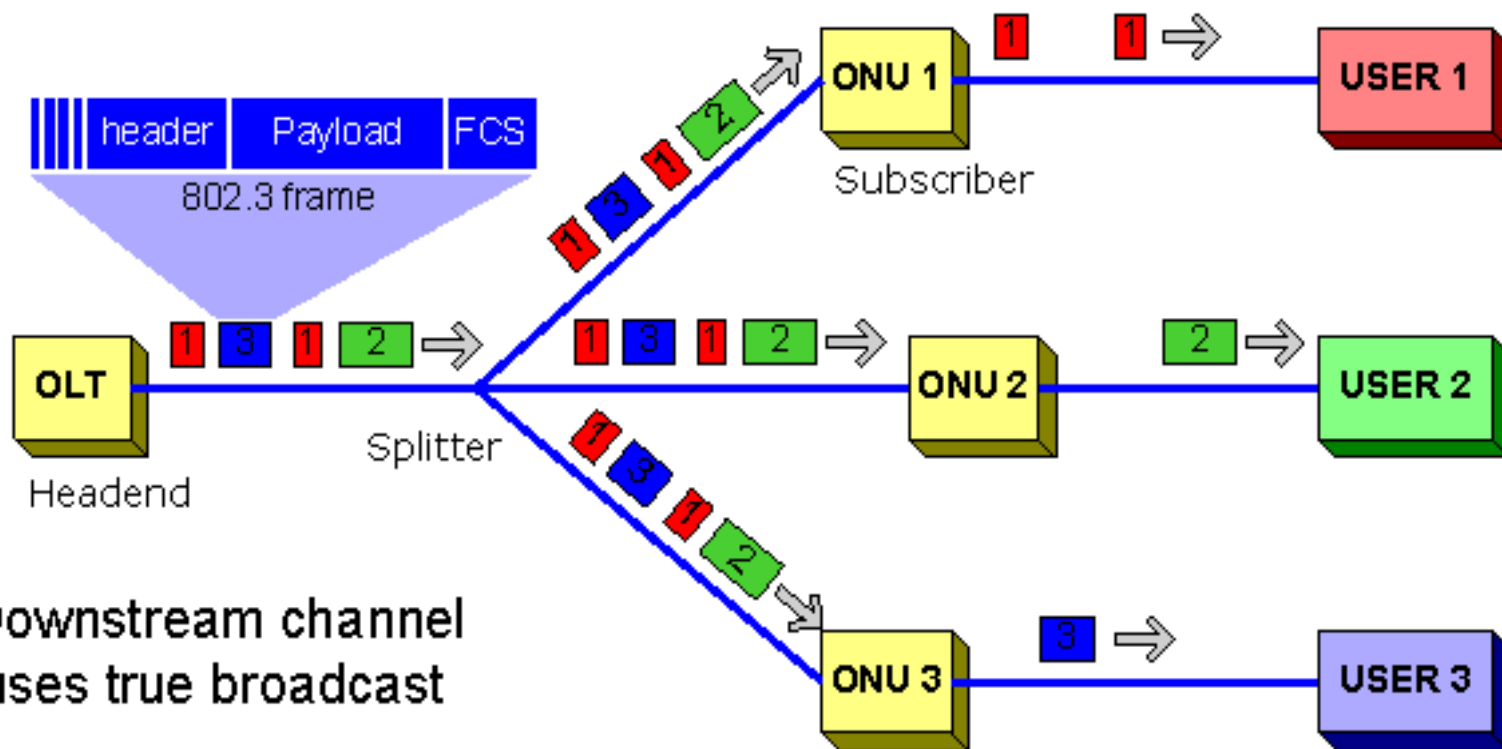2 fiber
66 transceivers

CO   P2P

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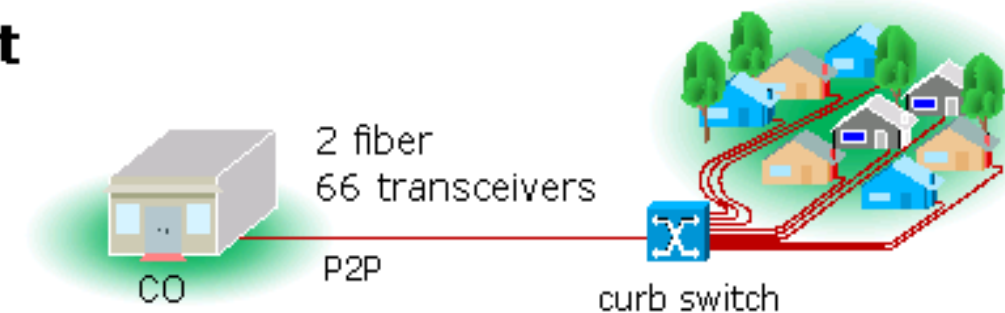
Ethernet PON (EPON)
→ 1 fiber
→ Minimum fibers/space in CO
→ N+1 optical transceivers
→ No electrical power in field
→ Drop throughput up to trunk rate
→ Downstream broadcast (video)

1 fiber
33 transceivers

CO   P2MP
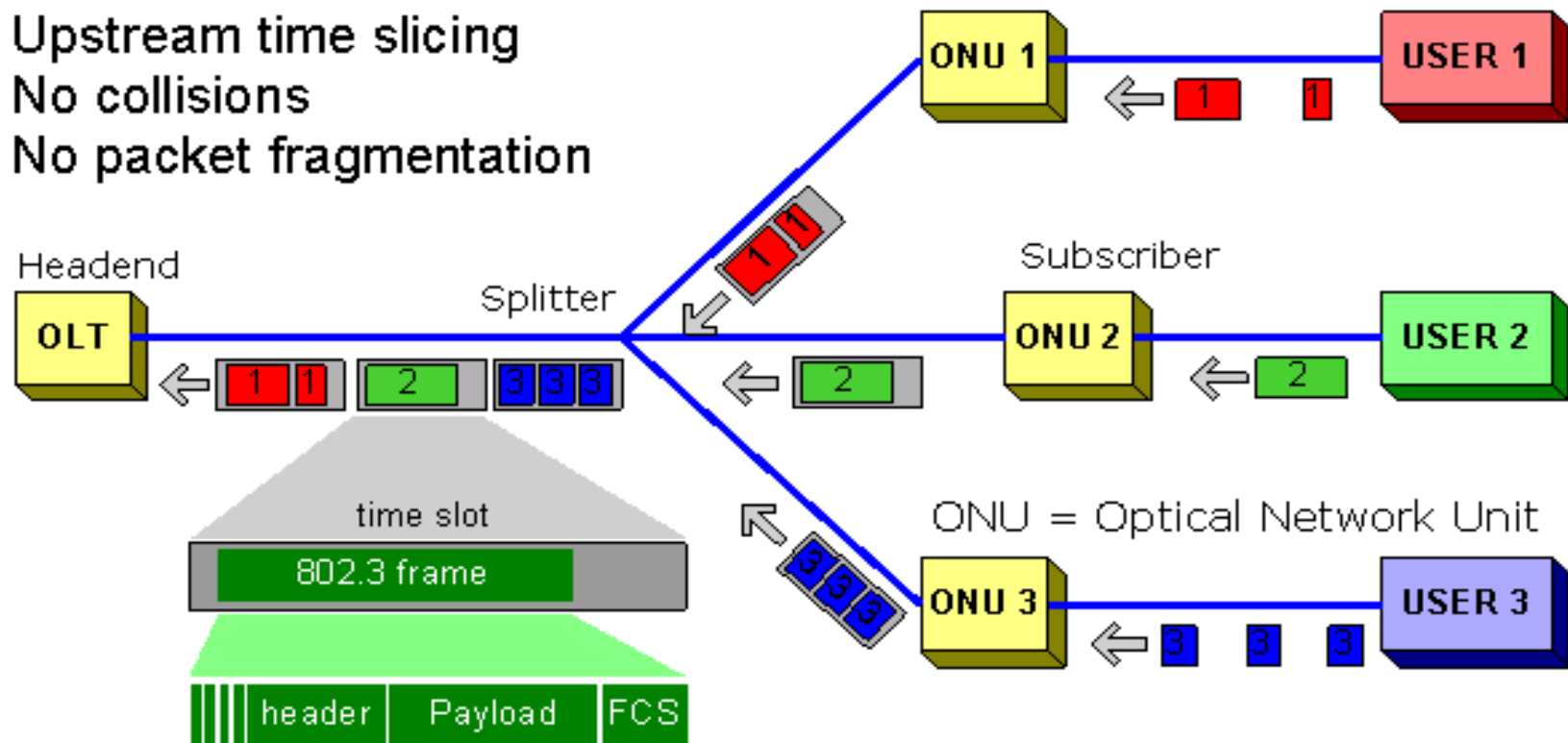
passive
optical splitter
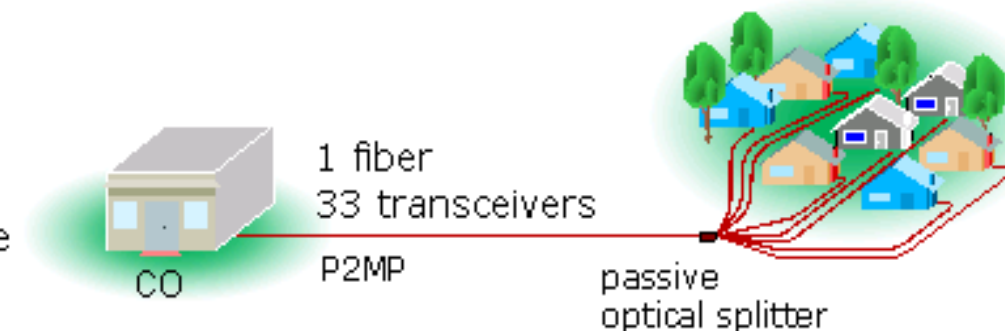
EPON Downstream

- Downstream channel uses true broadcast
- 802.3 Frames extracted by local address

OLT = Optical Line Terminal
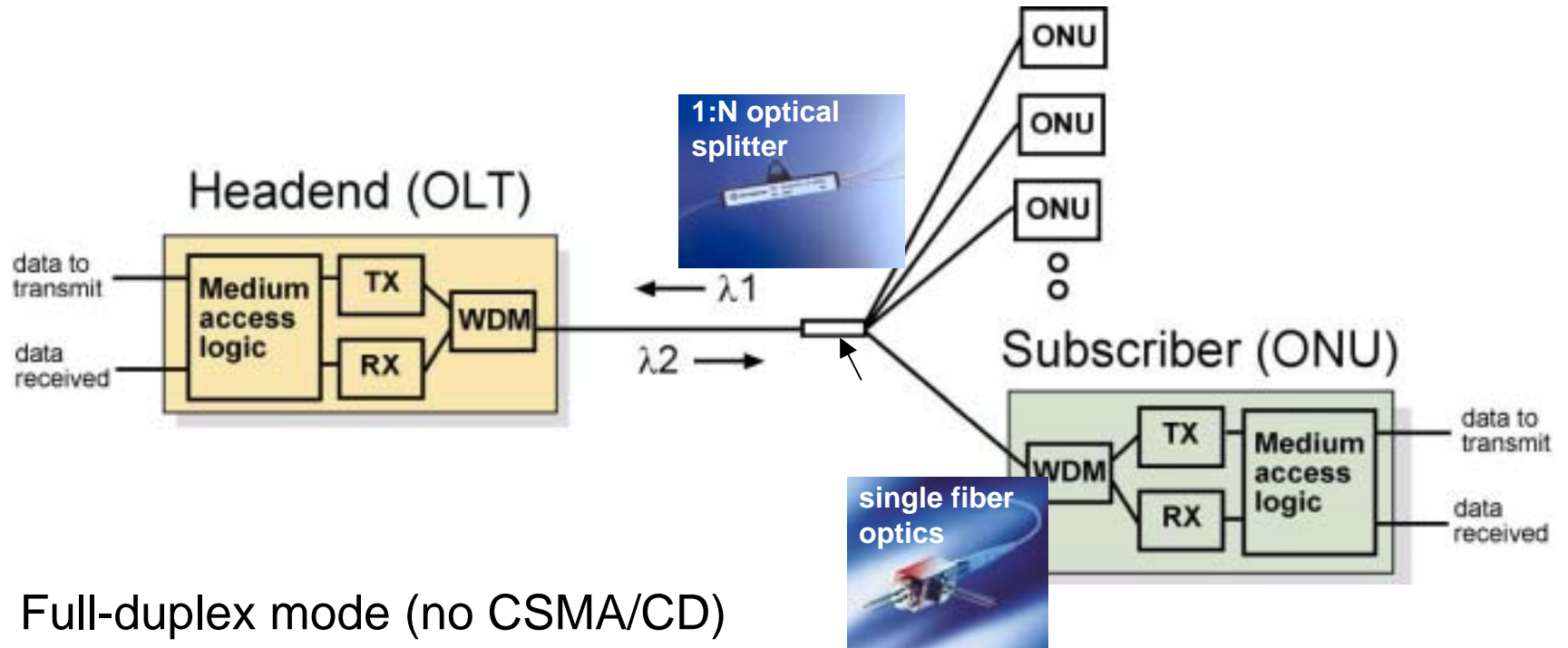ONU = Optical Network Unit

EPON Upstream

Upstream time slicing
No collisions
No packet fragmentation

Headend

Splitter

Subscriber

ONU = Optical Network Unit

An ONU is assigned a slot, and sends multiple Gigabit Ethernet 802.3 frames during its slot time, which becomes available every few milliseconds.

EPON

- 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 (tree, tree + branch, etc)

- Single fiber 1550/1310 nm or 1490/1310 nm

EPON: Example System
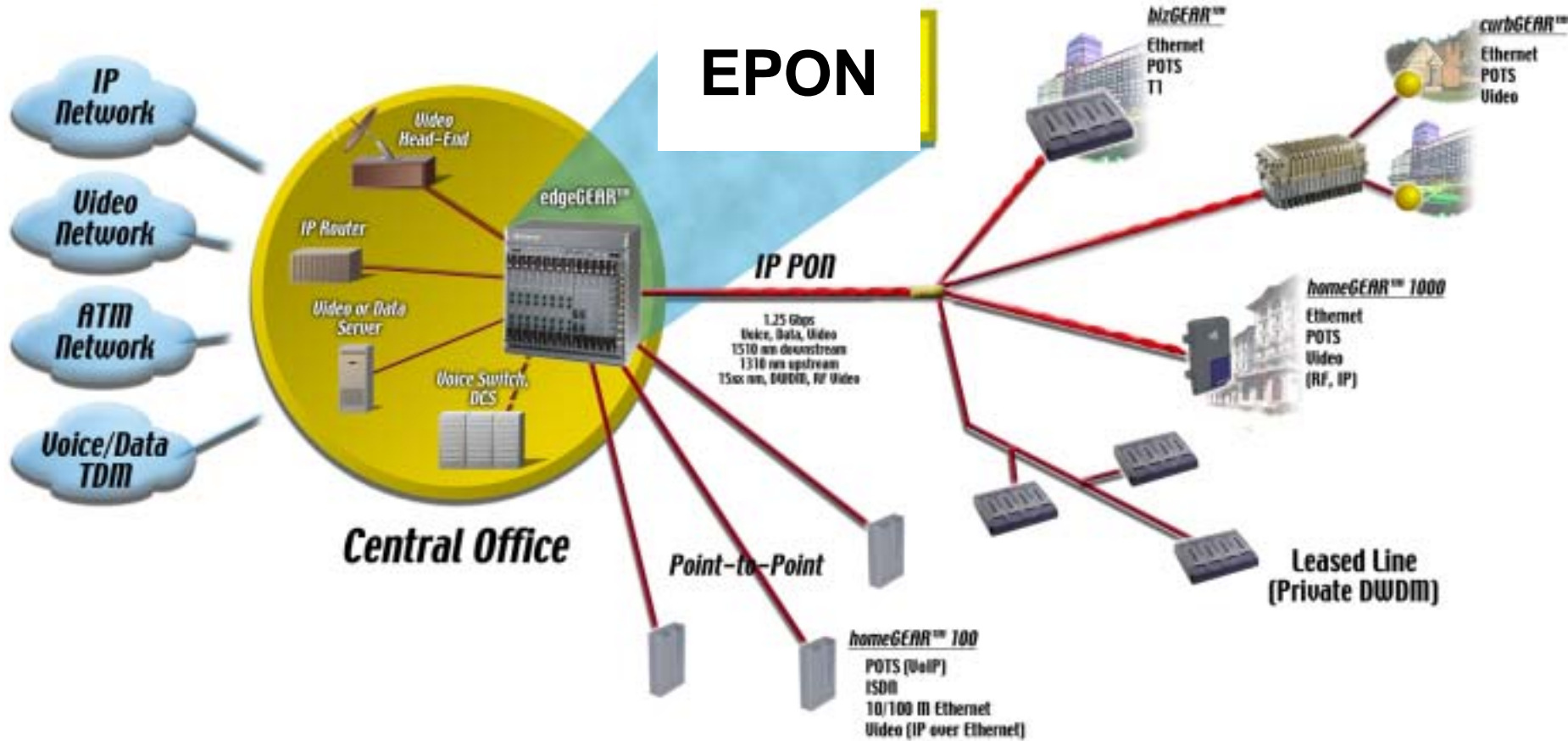
EPON Summary

- **EPON = Gigabit Ethernet over Point-to-Multipoint Optical**

- **EPON standards work is expected to be done in 802.3ah Ethernet in the First Mile Task Force**

- **The broadband first mile will be a combination of Ethernet over P2P Copper, P2P Fiber, P2MP Fiber**

- **Ethernet will dominate the First Mile because it offers: very high bandwidth, low cost, IP efficiency, full services (voice, data, video), and simplicity**

- **Additional EPON information: contact gerry.pesavento@alloptic.com**