

10G EPON: Market Requirements & Economic Feasibility

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Market Requirements

10G EPON has many applications

- FTTH
- FTTx / DSL
- FTT-Business
- Wireless backhaul

HDTV, etc, will require more BW per customer

- Question: When will 10 Gb/s really be needed for FTTH, all else being equal?
- Answer #1: We don't know; 5 years?
- Answer #2: We will need more than 1 Gb/s soon.

Strong demand for asymmetric broadband access solutions

- Worldwide, 98% of broadband is asymmetric (DSL, cable modem, BPON, GPON)*
- Asymmetric EPON would be used

High-level objectives for 10G EPON

- Low cost
- Available soon
- Includes an asymmetric solution
- Seamless upgrade → backwards compatibility (equipment & **outside plant**)

If 10G EPON meets these objectives, it will capture a large part of the FTTH market.

Economics

For new deployments, service-provider business cases have many components

Business Issues

- Service & financial models

- Can I afford to enter this business?
- Can I afford not to?

Architectural Issues

- Capital costs per subscriber
 - Equipment
 - Infrastructure

- In a perfect world, what would I do?
 - One 1 x 128 10G EPON? *or*
 - Eight 1 x 16 1G EPONs? *or*
 - Etc.

Deployment Issues

- Regulatory constraints
 - National / State / Provincial level
 - Municipal level
- Time-to-market

- In the real world, what can I do?
 - Reuse existing designs & infrastructure?
or
 - New designs & infrastructure?

In the real world, deployment requirements often outweigh architectural perfection

- Competitive pressure
 - ➔ reuse of existing designs & infrastructure is almost always mandatory

10G EPON must include a solution optimized for the optical requirements of 1G EPON.

1G EPON: Consequences of Success

Millions of subscribers and growing

- Fiber → More bandwidth → New services → Happy customers

Adopted by many carriers & deployed using a variety of fiber plants

- Approximately 25 service providers worldwide and growing
- PTTs, cable companies, IOCs, municipalities, etc.
- EPON optical specification flexibility → Carriers are developing individual solutions

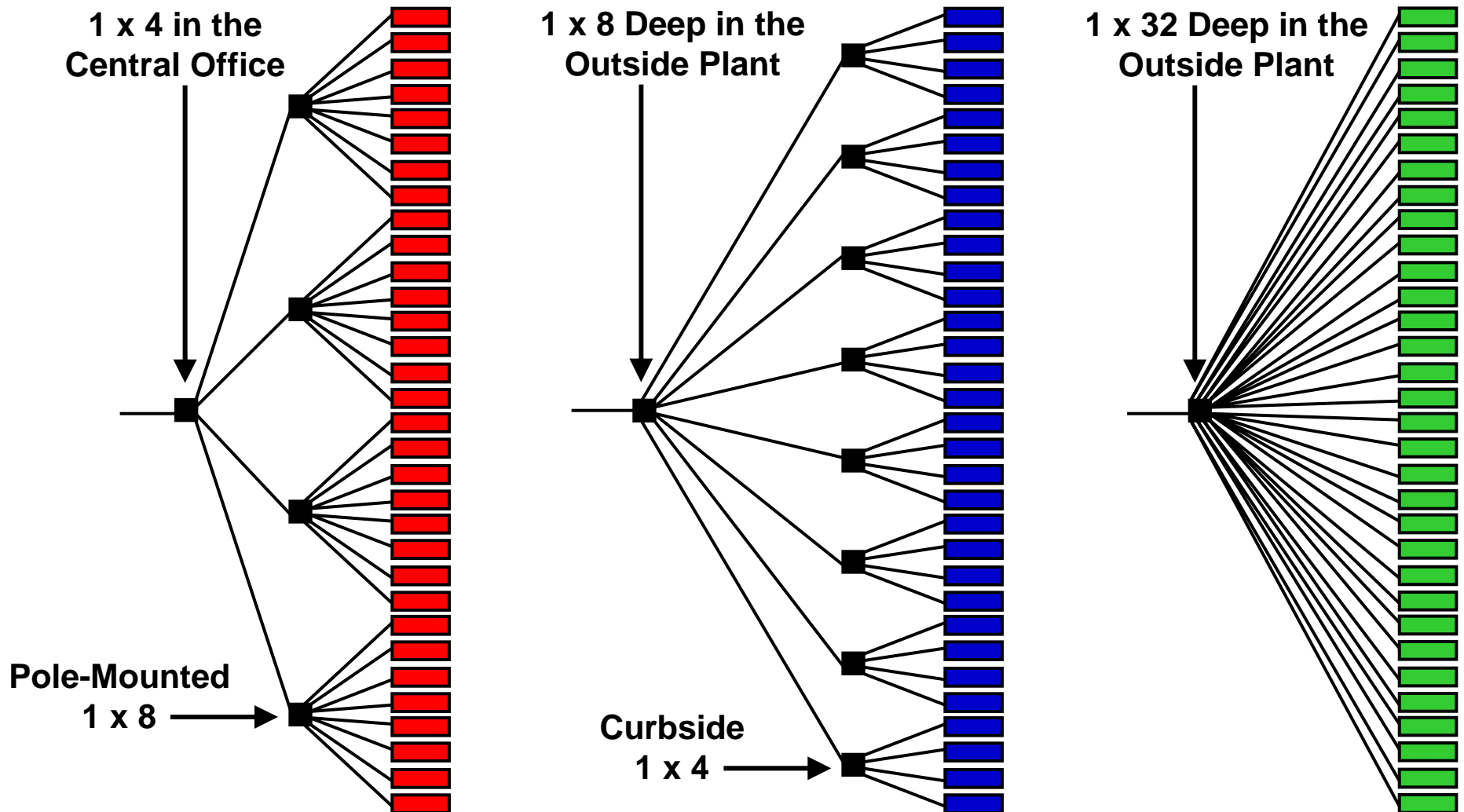
The fiber plant for 1G EPON is now a legacy solution in carrier networks

- Inventory, provisioning, & surveillance systems have been upgraded for 1G EPON
- A canonical PON has been designed, typically unique to a given carrier
- Methods & Procedures (“M&Ps”) have been developed
- Technicians have been trained to build and trouble-shoot this design
- Passive components have been selected, purchased, and placed in stock
- Ditto test equipment, splicing engines, etc.,
- Once a major construction project like EPON has started, assume the architecture is fixed.

Adding 10G EPON to a 1G EPON network should require minimal operational disruption

- Fundamental requirement: 10G EPON & 1G EPON must use the same fiber-plant design in many networks.
→ The 10G EPON specification must include 1G EPON optical specification.

Real 1x32 PONs in Real Networks



Network rearrangement varies from easy to impossible.

Bonus Question: Is your network built with connectors or is it fusion spliced?

Summary

- **10G EPON will be needed sooner, not later**
 - There is nothing wrong with a partially filled 10G EPON to start with
 - A basic solution early in the game is very desirable (complies with 1G optical spec)
 - An asymmetric solution is very desirable (10G down, 1G up?)
- **Once an FTTH network is built or under construction, significant design changes should not be expected**
 - A carrier must extract all possible value from this major, new investment
 - Technicians should be turning up new customers, not rearranging working lines
 - A single, network-wide architecture is much easier to manage (“One size fits all”)
- **10G EPON must be capable of operating on a fiber plant designed for 1G EPON**
 - ➔ **Compatible with the current optical specification**
 - Power budget
 - Wavelength plan
 - Etc.
- **Seamless evolution from 1G EPON to higher-speed, more capable systems**
 - E.g., (1G down / 1G up) ➔ (10G down / 1G up) ➔ (10G down / 10G up)
- **Improvements are welcome, provided “basic” 10G EPON is included and optimized**