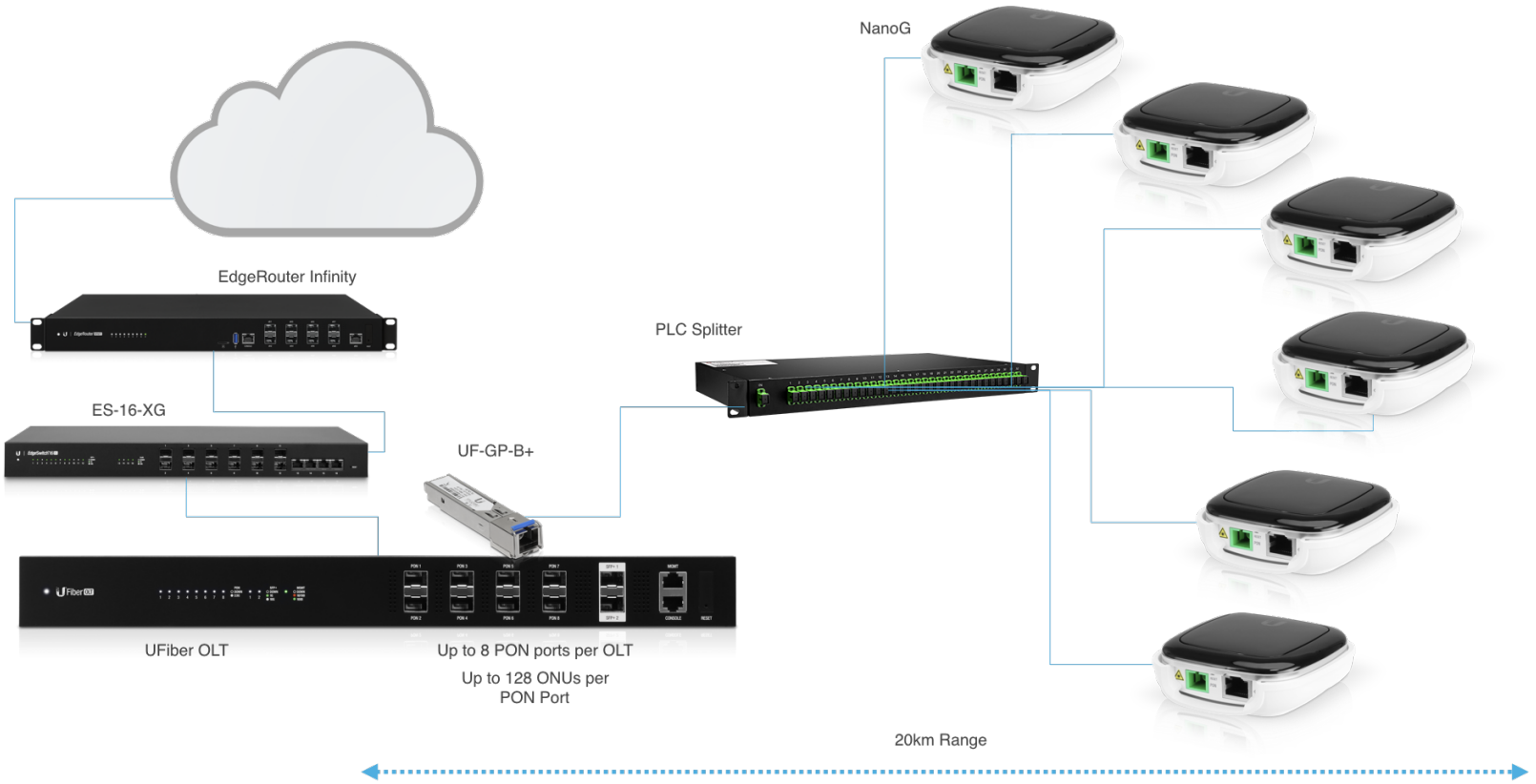
Future Proofing: The case for Passive Optical Networks

Oronti Adewale

Passive Optical Network

- Passive Optical Network (PON) is a system that brings optical fiber cabling to the end user.
- A telecommunication technology that implements a point-to-multipoint architecture, in which unpowered fiber optic splitters are used to enable a single optical fiber to serve multiple end-points.
- The system can be described as fiber-to-the-curb (FTTC), fiber-to-the-building (FTTB), or fiber-to-the-home (FTTH).

Topology Overview



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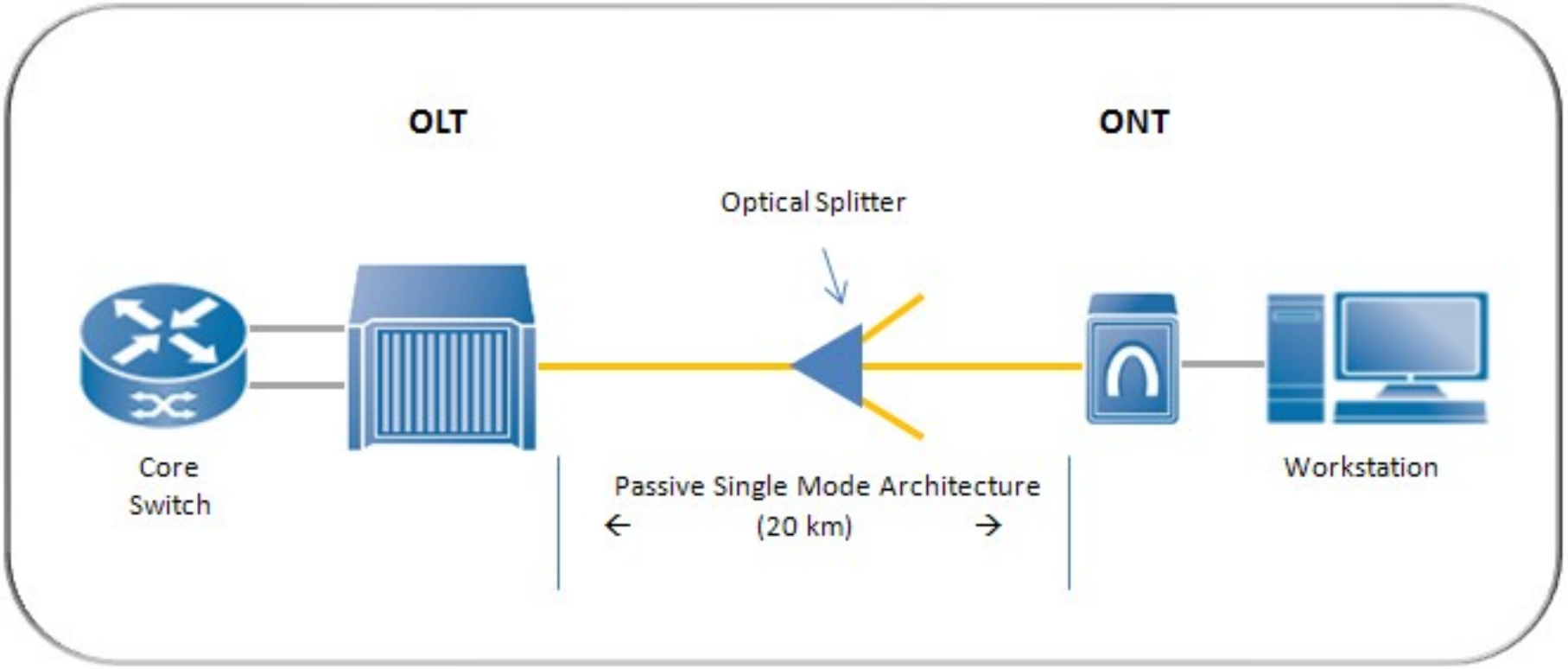
Characteristics and Advantages of PON

- The purpose of PON is to carry Ethernet packets across much further distances with less noise and greater bandwidth.
- Consider the GPON network as a high-bandwidth, long distance carrier for Ethernet Packets.
- PON allows for Triple Play such as providing Internet, Voice, & TV also known Triple Play.
- PON uses a Passive Optical Network with Single-Mode Fiber which allows long distances without the need for “active” distribution points.
- Mass deployment scenarios are capable for multi-dwelling units (MDUs)

Components of PON

- Optical Line Terminal (OLT) that converts the sources into light
- Passive splitters of single mode fiber that carry the signal
- Optical Network Terminal (ONT): converts light back to a standard Ethernet connection.

Components of PON



Optical Line Terminal

- Resides in the datacenter or core network.
- Connects to the core switch using traditional Ethernet pluggables.
- Consists of modular PON cards.
- Provides redundant switching, control, and power capability.
- Each PON port typically connects 32 ONTs.
- Utilizes 128 bit AES encryption for downstream (broadcast) traffic
- Utilizes Time-Division-Multiple-Access (TDMA) for upstream traffic.

Passive Optical Splitter

- Passive Optical Splitters connect to each PON port and replicate traffic downstream (to the end user's ONT) while combining end user traffic in the upstream direction.
- Requires no power or cooling (hence the word "passive")
- Can be placed anywhere in the midspan of the fiber network
- Typically deployed in above-ceiling fiber zone boxes near end user work areas
- The splitters and fiber components will last for decades

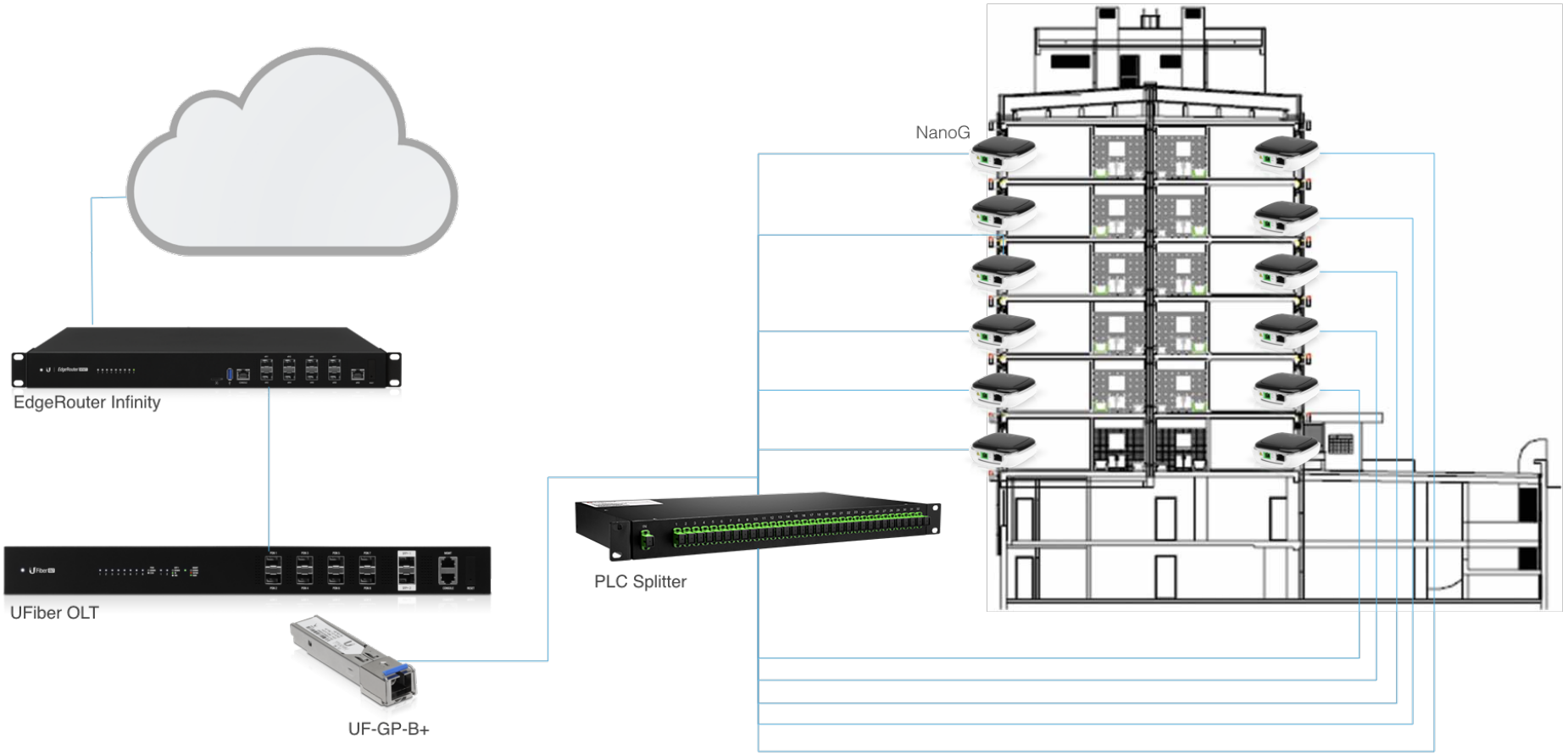
Optical Network Terminal

- The ONT serves as the end user interface to the network.
- Typically powered by a low voltage power brick.
- Converts the single mode fiber optical signal to RJ-45 Ethernet interfaces.
- Various models provide anywhere from 1 to 24 Ethernet Ports.
- Various models support Power-over-Ethernet (POE).
- Supports VLAN, 802.1x, and QoS.
- Can be deployed on the desktop, wall-mounted, or rack-mounted.

PON Use Cases

- Hotels
- Housing Estates
- Apartments and Domitories
- Triple Play Capabilities – Ethernet, Voice and Cable TV

PON Deployment Example



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Economic Advantages

- Passive Optical LAN provides substantial savings in CapEx and OpEx compared to legacy LAN designs
- Can eliminate wiring closets
- Eliminates the need for midspan electronics, power, and cooling infrastructure
- Uses smaller, lighter, less expensive cables to reduce pathway and space requirements
- Virtually eliminates the need to refresh cabling infrastructures
- As technology evolves, only the active endpoints need a refresh.

Limitations

Passive, no full control of bandwidth allocation.

- Not truly symmetrical. GPON has slower upload speeds.
- Difficult to update and scale if your business needs more bandwidth in the future.
- No Quality of Service (QoS) or Class of Service (CoS), unable to prioritize critical data.
- Less secure when all subscribers’ data is sent over the same connection.
- Scattered connections make it difficult to pinpoint failures.
- Speeds can slow down during peak usage times.
- Can’t support speeds over 1Gb.

Summary

Gigabit Passive Optical Network (GPON) is a cost-effective point-to-multipoint access network, which brings great improvement in data transmission distance (up to 20km) and bandwidth (an downstream capacity of 2.5Gbit/s and an upstream capacity of 1.25Gbit/s). However, GPON’s higher bandwidth and split ratios are only achievable by using GPON-capable optical transceivers. It is well positioned to help meet the needs for higher bandwidth in FTTx applications, and continues to fuel growth in demand for GPON SFP modules.

Questions.