

# Leyden Broadband Committee

## Presentation by MBI's Todd Corcoran and John Furey

August 3, 2016 at 10:00 am  
Leyden Town Hall

Committee members present: Bob Ryan, Bob Anson, David Curtis, Al Woodhull, Lance Fritz, Sheila Hourihan

Others present: Jeff Neipp of Leyden Select board, Michelle Giarusso and Ginger Robinson of Leyden's Finance Committee, David Devore from Rowe, Trevor Mackey from Charlemont, and other individuals.

Members of Leyden's Broadband Committee met with Todd Corcoran, (Technical Program Manager for MBI) and John Fury, (Readiness Coordinator for MBI) for a presentation on technology, topology and design considerations.

One of the committee's important decisions will involve choosing one of the two primary design types for our broadband network – Passive Optical Network (PON) or Active Optical Network (AON), also known as Active Ethernet.

Our Committee needs to make the decision about the technology that will be used in our network. Do we want to make a point to point (P2P) network or a point to multi-point (P2MP) network? The costs between those two types of systems differ considerably. Once that decision has been made, the Topology of how the fiber needs to be strung to accommodate the particular technology chosen is designed.

An Active Ethernet (AE) network uses Point-to-Point Topology (P2P) where dedicated fiber goes to the residence. The advantage of this type of network is that it can be tested by a technician from the Hut, potentially lowering maintenance costs. The disadvantage is that the labor to install and splice the fiber is far greater than in a P2MP network.

A Gigabit Passive Optical Network (GPON) uses Point-to-Multi-Point (P2MP) technology to share fiber among multiple residences. This type of network costs much less to install and troubleshoot. There are no electrically powered components along the span of fiber to the home. The disadvantage of a GPON network is that the light power in the bandwidth is shared among all of the residences in a particular run of fiber. This limits

the distance that the light signal can travel, but in Leyden the distances are so short that this GPON limitation would never come into play.

Below are several of the more significant slides presented to us by MBI in our meeting.

Respectfully submitted,

Robert Anson (Clerk)

Q: What is meant by a Central Office or a Hut?  
A: The location where all major electronics for the system are housed for a given town.

Q: What is topology?  
A: In a FTTH system, the word "topology" is most often used with the physical fiber plant or Outside Plant (OSP).

Q: What is splice closure or case?  
A: A fiber management product that protects and houses optical splices.

Q: What is PON?  
A: A Passive Optical Network that distributes an optical signal from the CO to the customer.

Q: What is Active Ethernet?  
A: A technique that uses Ethernet (a data communications protocol) as the main transmission method over fiber optics with data rates up to 1 Gb/s.

Q: What is meant by G-PON?  
A: Gigabit PON is a system that handles data rates up to 2.5 Gb/s.

Q: What is meant by an OLT, ONT, and splitter?  
A: OLT - Optical Line Terminal, located in the CO or hut, is the interface to the customer and provides the subscribed services.  
ONT - Optical Line Terminal, located at the customer/subscribers location, converts the optical media being sent by the OLT.  
Splitter - A passive device that splits the light source in separate paths.

## Understanding General Terms



# Fiber Optic Network Architectures

- The selection of FTTH networks revolves around two primary paths – Passive Optical Network (PON) and Active Optical Network (AON), a.k.a. Active Ethernet

- Passive Optical Network – Networks are classified as “passive” if they have no powered electrical devices between the laser source (OLT) and the end point (ONT). A splitter is used to divide the fiber for up to 128 subscribers, but the most common is 32 splits

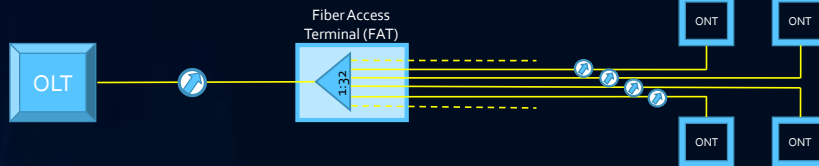
## *One Fiber Feeds Many (P2MP)*

- Active Ethernet (AE) – “Active” means these networks have electrical device endpoints with direct connections, or “Point-to-Point” connections, to the subscriber

## *One Fiber Feeds One (P2P)*

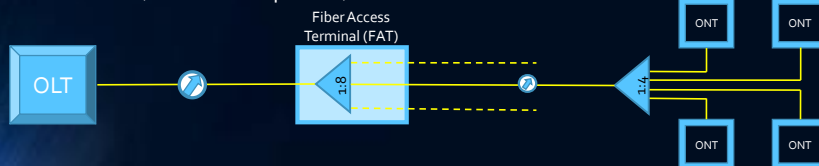
# PON Star Configurations

## Centralized Split (Single Splitter)



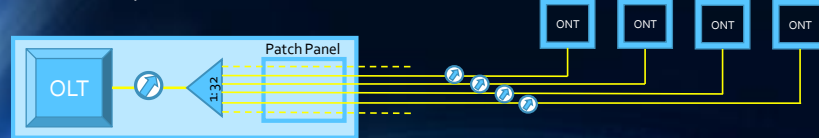
- Splitter is placed in a single location in the OSP and each drop cable is routed directly to the subscriber.
- Allows for maximum OLT utilization and future migration.
- Lower operational expenditure as all changes occur in one location

## Distributed Star (Distributed Splitters)



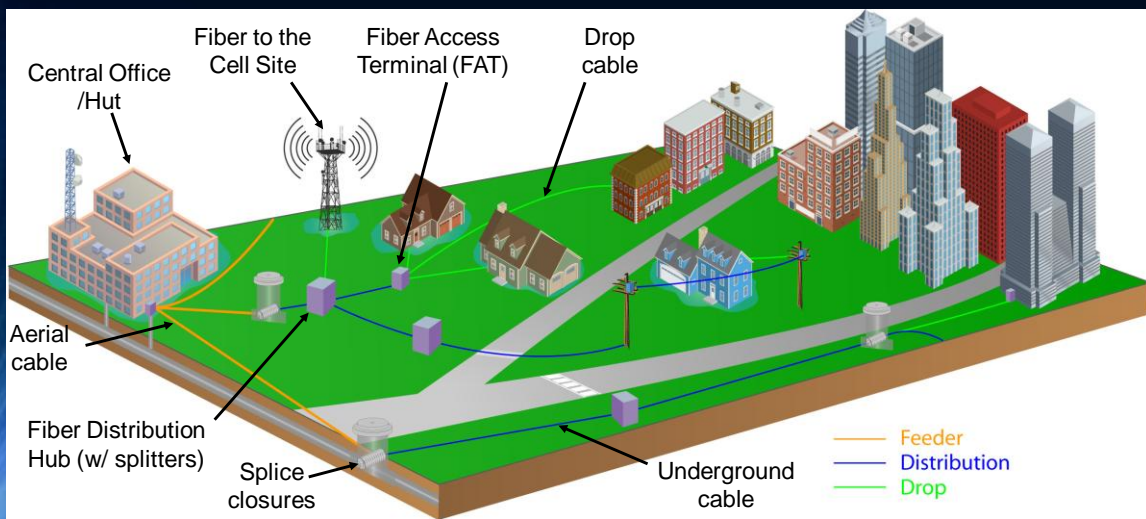
- Uses multiple splitters that are concatenated together along the length of one or more legs.
- Minimizes amount of distribution, but requires careful planning and migration for growth.

## Central Office Split (Home Run)



- Splitters are located at the CO (hut).
- Requires fiber rich system throughout
- Most costly to deploy
- Lowest operational expenditures due to reduced need for truck rolls
- Interchangeable for GPON and AE

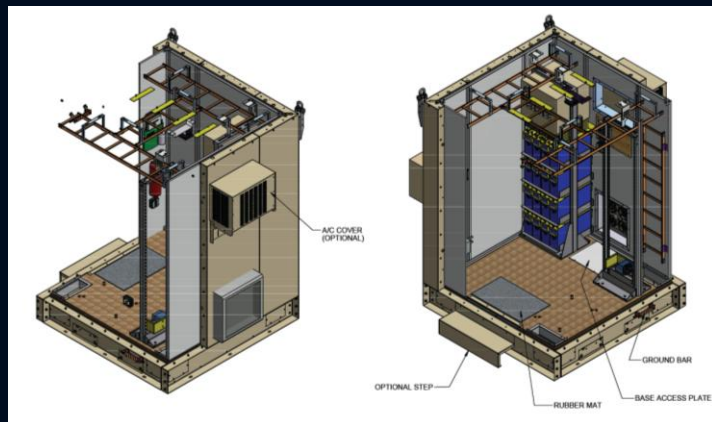
## The FTTx Network – Macro View



Courtesy of Zhone

## 6 x 6 Modular Enclosure (CO or Hut)

- High efficiency "free air" system
- R12 insulation, 120MPH wind rated, 200PSF live load rated roof
- NetSure 721 DC Power system
- 2 x 19" equipment racks included
- 200A Power Transfer Switch with 24pos load center, surge arrestor & camlok style generator connector
- Wall and floor cable entrance
- DC Lighting w/ motion controlled outside light
- Door contact for intrusion
- Smoke detector



Courtesy of Emerson Network Power

# G-PON and Active Ethernet

Both Great Access Technologies

## G-PON is more flexible, lower cost to deploy

- 2.5 Gb/s of shared bandwidth
- Can be home-run with splitter in CO/Hut or splitter in the field (P2MP)
- Can be deployed in areas with limited fiber cable
- Optical reach is out to 35 km
- Great port/subscriber density – 256 subscribers/8-port G-PON card
- Consumes less CO space and 1/3 as much power

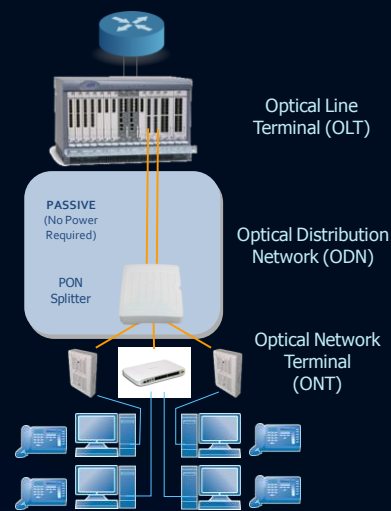
## AE has higher, dedicated bandwidth

- Delivers up to 1 Gb/s to every home and business served
- P2P fiber topology required
- Symmetrical bandwidth better suited for high bit-rate services (100 Mb/s+) to medium and large businesses
- Optical reach out to 60 km
- Consumes more CO space and power than G-PON

## Applications



## Passive Optic Network (PON)



Courtesy of Zhone