Passive Optical LAN
A Game Changer for Enterprise Networks

Larry Johnson
Director & Founder

Presented by
The LIGHT BRIGADE
www.lightbrigade.com

What is a POLAN?

Passive Optical Local Area Network
POLAN’s Legacy

- Based on the International Telecommunications Union Standards (ITU-T) and used for fiber to the building designs.
  - G.984 Gigabit PON.
  - G.671 fiber optic passive components.
  - G.652 standard single-mode fiber.
- The IEEE 802.3ah standard uses most of the same baseline standards and their values.

What Makes POLAN Unique?

- Single-mode fibers.
  - High bandwidth.
- Bidirectional transmission.
  - Saves fibers.
- Optical splitters.
  - Allows sharing bandwidth.
- Standard performance levels.
- QoS, BER.
- Secure.
- Options for redundancy.
Additional Advantages

- Power is only required at hub sites and at end user’s locations (FTTD).
- Centrally located and managed.
  - Addresses easy adds, moves and changes.
- Distributed option based on application.
- Saves space in risers and cabling infrastructure.

FTTH Centralized Splitter Management

- Splitter in one location.
- Consolidates subscriber access to one location.
- Maximizes OLT card take rates.
- Design to handle maximum future density.
- Build as you grow.
Centralized Splitter in FTTB

- Indoor FDH.
- Optional FDH on the outside of the building.
- Splitters based on density.
- Patch panels on each floor.

FTTH Distributed Topology

- Splitters in multiple locations.
- Fiber management products.
- Distribution cable.
- Target to limited churn and high take rates.
- Limited flexibility.
Distributed Splitter in FTTB

- Splitters distributed.
  - Based on floors.
  - Based on density.
- Multiple options.
- Wall-mounted panels.

Services

- Triple play.
  - Voice.
    - VoIP, POTS.
  - Video.
    - IPTV, RF video.
  - Data.
    - All types.
- Applications.
  - Smart buildings.
  - Security.
  - Automation.
Optical LAN Outperforms LAN Evolution

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Distance Limited –
MMF – 550m
Copper – 100m

Local Provisioning & Management

Building Aggregation
Communication Closet
End User

Building Aggregation

Optical LAN is Simple, Secure, Stable, Scalable, Sustainable and Saves Money!

Legacy Copper-based LAN
- Active Ethernet switches for LAN core, aggregation and access functions
- Cable infrastructure per service
  - CATx
  - Coax
  - Some Multi-mode Fiber (MMF)

Passive Optical LAN
- Passive Optical Network (PON)
  - Optical Line Terminal (OLT)
  - Passive optical distribution splitters
  - Optical Network terminations (ONT)
- Single mode fiber converges all building ICT services over single infrastructure

Centralized Provisioning & Management

Up to 30km/18mi Distance
300x Greater Reach

Legacy Copper-based LAN (2,000 End-points)

Optical LAN (8,000 End-points)

Optical LAN can offer 90% greater density compared to traditional copper-based LANs

Which architecture would you rather purchase, power & operate?

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MDUs and MTUs

- Splitter topology.
  - Home run.
  - Centralized.
  - Distributed.
- Multiple dwelling unit.
  - Townhouses, apartments.
- Multiple tenant unit.
  - Business configuration.
- Four types.
  - High-rise.
  - Medium-rise.
  - Low-rise.
  - Horizontal.

FTTB/MDU Premises Installations

- Secured entrance site.
- Fiber management.
- Centralized cabling.
- G.657 bend-insensitive fiber.
- Customized FTTB products available.
- Preconnectorized options available.
FTTB Panels

- Wall mounted.
- Provides inbound splice capability.
- Routes drop cables to client’s ONTs.
- Provides transition point per NEC.
- Secured access.

FTTB Design Goals

- Density.
- Bandwidth requirements.
- Fiber access.
- Hub/splitter location.
- Fiber management.
### FTTB MDU Existing Infrastructure

- Evaluate infrastructure and limitations.
  - Entrance facilities.
  - Risers, space.
  - Communication wiring.
  - Types.
  - Telecom/equipment rooms.
  - Power.
  - Building codes.
  - Building ownership.

- Design considerations.
  - Deployment philosophies.
  - Topology.

### Backbone Hierarchical Star Topology

- Either one cable backbone or several.
- Design engineer must verify cable specifications.
- OFNR (NEC) or LSZH requirements.
- Structural engineer must verify open shaft use, floor penetrations, and support beams.
Did I Mention Space Savings?

Legacy Copper-based LAN
- CAT3
  - Voice only
  - Serving 120 end-points
  - Capacity in Kbps

CAT5e
- Data only
- Serving 120 end-points
- Capacity in Mbps

Optical LAN
- Single Mode Fiber
  - Voice, Data, Video & Other
  - Serves 128 with PON
  - Capacity measured in Tbps

Single mode fiber provides the best future-proof infrastructure today

Cable Structure and Fiber Counts

- Based on density.
  - Per floor.
  - Building total.

- Cables commonly based on counts of 6 or 12.

- Patch panel or FDH must accommodate total fiber count.
### Passive Optical LAN

#### Get Cabling to Each User

- Existing risers and available space.
- Locations and routes.
- OFNR/OFNP/LSZH tight buffered distribution cables.
- Microduct cabling.
- Bend radius concerns (G.657).
- Slack storage.
- Multiple utility spaces available.
- MDU splitter terminal.
- Indoor drop cables (IDC).
- Stubbed pigtails.
- Fiber distribution terminal (FDT).
- Multifiber terminals (MFT).
- Physical protection.

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#### OmniReach™ Solution

- Minimizes termination costs.
  - MPO ribbon terminations.
- Slack storage on panel.
- Up to 432 fibers.
- Various fiber management options.
- G.657 fiber and cable.
One Pass™ Solution

- Aesthetics.
- 1-12 fiber units.
- Transition hardware.
- Tooling.
- Passthrough.
- Hallways and inside.
- NPC and terminations.

Invisilight™ Solution

- 900-micron coated G.657 fibers.
- Aesthetic horizontal solution.
- Vertical integration.
- Fiber management products with slack storage.
- Multiple termination options using MPO, SC, or bare fiber.
**End User Locations**

- What is the density?
- How many floors?
- How many units per floor?
- Total units.
- Retail or business units on various floors. High bandwidth users.
- Possible MTU (businesses).
- Existing media, e.g., Cat5, coax.

**FTTB Systems**

- FTTB systems.
  - Active system.
  - Centralized PON.
  - Decentralized PON.
  - Interfaces with contracted services.
  - Solutions vary for indoor MDUs.
- Aesthetics.
  - Where visible, e.g., surface molding.
  - Residences.
  - MUTOA outlets.
Optical LAN networks serves a variety of different architectures:

- **A (A) Communications Closet or Zone Box or Work Group Switch or MDU**
  - Rack mounted in communications closets or zone boxes

- **B (B) Desktop**
  - Free-standing, above or below desk and/or wall mounted

- **C (C) In-wall or Cubicle**
  - In-wall using mud-ring or electrical gang box, or in-cubicle raceway

- **D (D) Outdoor**
  - Environmentally hardened ONT mounted outside building

- **E (E) Campus or Private LAN**
  - All the above architectures can be deployed simultaneously from single OLT

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**Desktop**

- **ONT form factor and interfaces**
  - Small form factor with four GbE, option for two POTS, and RF video

- **ONT location / mounting**
  - Located right at end-user or IP/Ethernet device served
  - ONT can be free-standing, above or below desk and/or wall mounted

- **ONT service delivery**
  - Analog voice, VoIP, high-speed data, IP video and/or RF video
  - Wireless access, surveillance, security and building automation services

- **ONT powering**
  - Both local and remote powering options with battery backup
  - PoE+ with automated provisioning and energy savings management

- **OLT Location**
  - Rack mounted in the main data center or any building within 30km
Desktop

- ONT of choice when -
  - Fiber can be installed all the way to the IP/Ethernet end-point
  - Lowest CapEx solution assumes ONT sharing
  - Installation cost slightly higher compared to In-Wall deployment

- Typical uses are -
  - Dense cubicles and offices configurations
  - However, remember there are many mounting options other than just desktop
  - Specialized purposes such as PoE+, analog Voice and RF video

In-wall or Cubicle

- ONT form factor and interfaces
  - Mini form factor with two Gigabit Ethernet data interfaces (but with expansion option)

- ONT location / mounting
  - In-wall using mud-ring or electrical gang box, or in-cubicle raceway
  - Extension ring (bezel) available when electrical box depth is a concern

- ONT service delivery
  - VoIP, WAP, surveillance, security and building automation services
  - Future expansion for additional services such as POTS, WiFi, RF video

- ONT powering
  - Both local and remote powering options with battery backup
  - PoE with automated provisioning and energy savings management

- OLT Location
  - Rack mounted in the main data center or any building within 30km

*** Patent Pending ***
In-wall or Cubicle

- **ONT of choice when** -
  - Fiber can be installed all the way to the IP/Ethernet end-point
  - Eliminates cords, local power and local battery back-up clutter
  - Aesthetically pleasing with only flush faceplate exposed
  - Lowest installation cost
- **Typical uses are** -
  - Match today’s Ethernet LAN deployment practices
  - Up-scale buildings and executive offices
  - High security zones
    - Deploy with All-Secure PON solution
  - Areas where theft, vandalism, movement or damage is probable
    - Hotel rooms, college dorms, public common areas
  - As expansion modules are developed there will be less demand for desktop ONTs

- **Tellabs 120W mini ONT**
- **Tellabs 120C mini ONT**

**Ethernet port goes into a “sleep” mode when no data is being sent**
- **Low-power-idle (LPI) indication signal is sent for a specified time**
- **LPI is sent periodically to refresh the sleep mode**
- **When there is data to transmit a normal idle signal is sent to wake the transmit**

Outdoor

- **ONT form factor and interfaces**
  - 11”X11” ONT electronics and 13”x13” outside enclosure
- **ONT location / mounting**
  - Mounted outside building or inside telecommunications closet
- **ONT service delivery**
  - Analog voice, VoIP, high-speed data, IP video and/or RF video
  - Wireless access, surveillance, security, building automation services
- **ONT powering**
  - Local powering options with local battery backup
- **OLT same as before**
  - Rack mounted in main building where data center is located

- **Remote Buildings**
  - **Outdoor ONTs**
    - 1. Tellabs 702 ONT
    - 2. Tellabs 703 ONT
    - 3. Tellabs 714G ONT
Outdoor

- ONT of choice when -
  - Mounting outside
  - Harsh environments

- Typical uses are -
  - Remote buildings or warehouses
  - Security office such as remote guard office
  - Exterior corporate resources such as outdoor security, surveillance and WAP
  - Residential housing, military housing or student dormitory

Tellabs 714G ONT

Ontologies and Access Points

- Physical location (inside/outside).
- Electrical power.
- Protection.
- Aesthetics.
### Aesthetics

- MDU/MTU subscriber.
  - Space is premium.
  - Aesthetics is personal for MDUs.
  - Aesthetics is professional for MTUs.
  - Power is required.
  - Access is to be scheduled.
    - Non disruptive to operations.
  - Backup power is optional.
  - Protection may be critical.

### FTTB Premises

#### Considerations

- Cable installation requires cooperation between the building owners, network design engineer, structural engineer, and contractor.
- Codes must be followed.
- Older buildings may require upgrades.
- Telecom rooms.
  - Access for maintenance.
  - Power and protection.
  - Multimedia interface.
  - Aesthetics.
Proven fiber technology provides:
- Carrier class 99.9999% service.
  - Five minutes of downtime per year.
- With network 2:n physical and 1:1 network 99.9999%.
  - 30 seconds of downtime per year.
- Easy migration to G.987 10G-PON standard using same physical plant.

Insert AFL slide #3 here

Retitle POLAN advantages
Passive Optical LAN

What is Passive Optical LAN (POL or POLAN)?

- **Technical advantages.**
  - Flattens the local area network.
  - Simplifies moves, adds, changes.
  - More bandwidth/longer distances versus copper.
  - Secure by design (optical fiber and encryption).

- **Economic advantages.**
  - Reduces both CapEx and OpEx.
  - Eliminates wiring closets.
  - Less electronics, less power, less cooling.
  - Reduces pathway and space requirements.
  - Future proof.

Why Deploy POL?

**Passive Optical LAN Advantages**

![Passive Optical LAN Diagram](Courtesy AFL)

Passive Optical LAN

Question and Answer Session

Visit us in the registration area to pick up your FTTx wavelength allocation chart.

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