ITU-T Q.2/15
Physical Layer

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Outline

- Background of ITU-T Q.2/15 standards
- Rationale of re-using the physical layer
- Optical Distribution Network
- Figuring the loss budget
- Distance and addressing capabilities
- Wavelength plan
- Ongoing work in Q.2/15

Background of Q.2/15 standards

- Broadband Passive Optical Network (B-PON)
- G.982 was first standard to describe PON in detail
  - Focus was on an early ISDN-type equipment
- G.983.1 was broadband extension of 982
  - Physical layer is well described
  - ATM was used as carrier service
- G.983.2 describes management functionalities
- G.983.3 refines wavelength plan for future services
- G.983.dba describes dynamic bandwidth allocation
- G.983.sur describes protection protocols

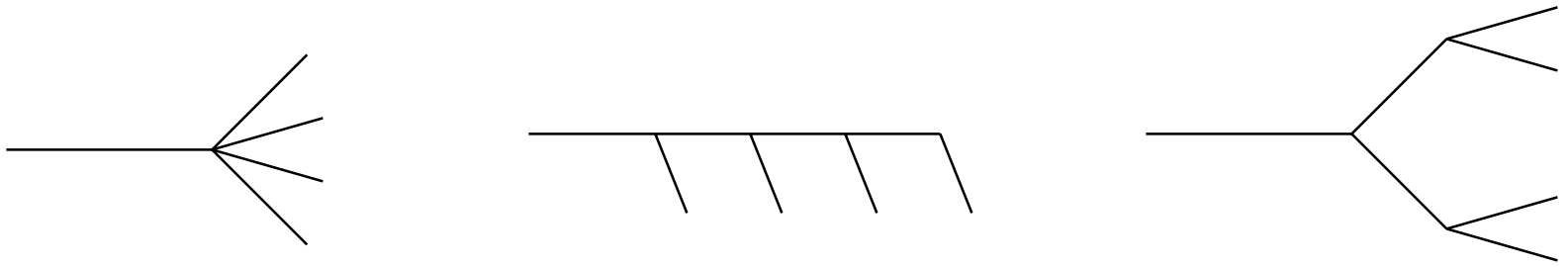
Rationale of re-using the PHY

- Network Operators need to manage the outside plant
  - Many operators already have PONs in place
  - All operators have large base of fiber in the ground
  - Operators don't want plant deployments to be linked to technology choices
- Network Nirvana would be that one PON outside plant could serve all equipment
- Same physical layer would carry other benefits
  - Shared market in components
  - Compatibility with other systems
  - Larger operator market for both systems

Optical Distribution Network

Quantum Bridge

- Totally passive plant composed of fiber, splitters, splices, and connectors
- Fiber is single G.652A (a.k.a. SMF-28)
- Plant must be reciprocal and wavelength blind
- All types of branching structures are allowed
  - Star
  - Bus
  - Branch



Figuring the Loss Budget

Quantum Bridge

- Telecom philosophy is used
  - Tighter system margins
  - Looser element specs
- PON is specified by three major parameters
  - Attenuation range (the three classes)
  - Differential optical loss :15 dB
  - Maximum distance :20 km
  - Differential logical range :20 km
- Three classes defined
  - Class A: 5-20 dB loss
  - Class B: 10-25 dB loss
  - Class C: 15-30 dB loss

Distance and Addressing

Quantum Bridge

- Maximum and differential distance specifications are parameters of ranging process
  - Customer may be at maximum range (20 km)
  - Customer may be across the street (0 km)
- Addressing requirements on the PON
  - 32 is requirement, 64 is an option

- Note: simultaneous satisfaction of loss, distance, and addressing limits is not required
  - You can use all your budget on splits and go short distance
  - You can go long, but then not split so much

Wavelength Plan

- Original G.983.1
  - Upstream: 1260 nm – 1360 nm (Cheap F-P laser)
  - Downstream: 1480 nm – 1580 nm (F-P or DFB laser)
- Additional requirement for more services
  - Broadcast video overlay
  - DWDM point-to-point services
- New G.983.3
  - Upstream: 1260 nm – 1360 nm (same)
  - Downstream: 1480 nm – 1500 nm (Uncooled DFB laser)
  - Enhancement: 1539 nm – 1565 nm (Cooled DFB lasers)

Ongoing work in Q.2/15

- Enhancing B-PON to greater service capabilities
- Higher Speed PONs
  - 622 Mb/s
  - 1244 Mb/s
  - 2488 Mb/s
- New transmission convergence layer
  - Frame-friendly TC-layer
- Revised physical layer
  - Environmental requirements (outside plant operation)
  - Better loss, addressing, and reach specifications