Bi-directional 125Mbps PMD for FTTH Application (100BASE-BX-1310/1550)

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Purpose of Presentation

- To propose a baseline specification for 100Mbps P2P PMD for consideration

Why 100Mbps?

- Because…
  - 1000BASE-X SW ASP is still 5 times* higher than 100BASE-X SW
  - 100BASE-TX NIC is outselling 1000BASE-X/T NIC more than 100 times**
  - There is not many applications to justify 1Gbps link to each home
  - There is no backbone technology to sustain 1Gbps traffic from subscribers (100Gbps Ethernet)
  - Multiple vendors can make 100Mbps P2P 15 to 20km transceivers with off-the-shelf un-cooled (inexpensive) FP lasers

* Based on Fixed L2 SW ASP - Dell'Oro LAN 2001Q3
** Dell'Oro LAN 2001Q2

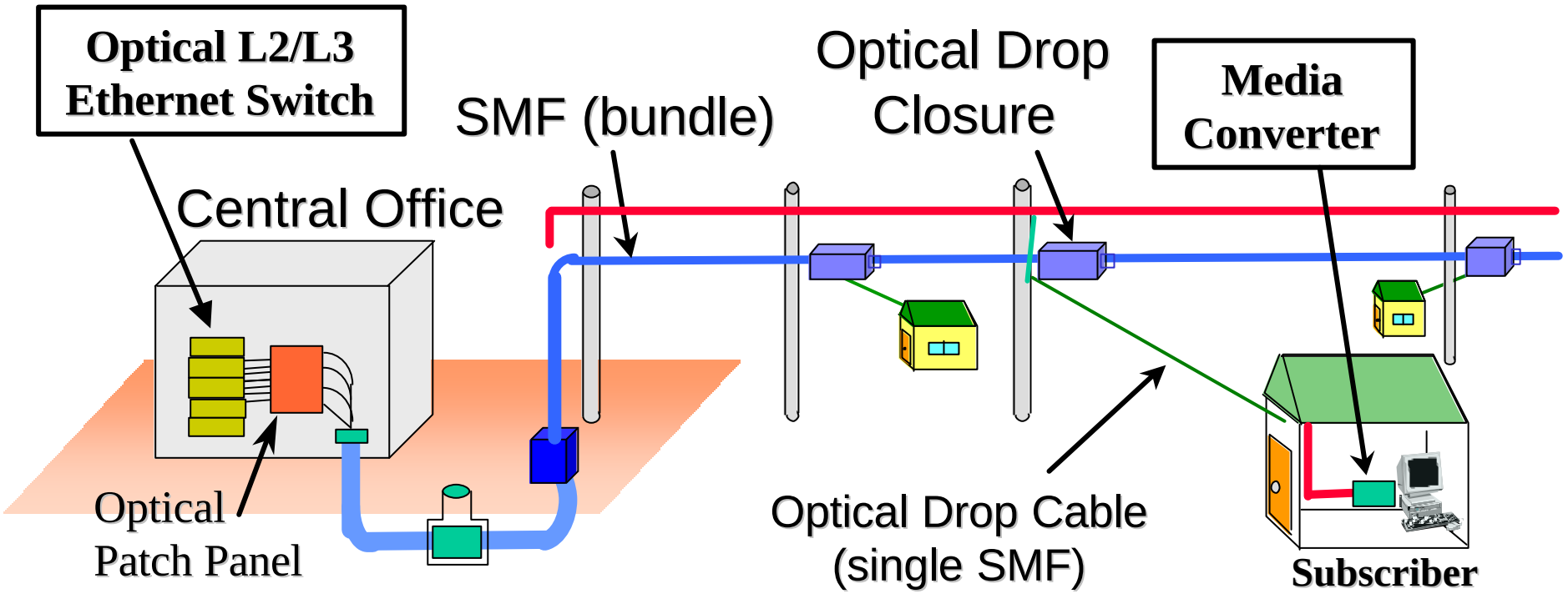
Why P2P?

- Because…
  - Some service providers have P2P fibers to subscribers
  - It is easy to upgrade to 1Gbps P2P and/or 1Gbps P2MP once service providers have P2P fiber to subscribers
  - Fiber will last more than 20 years
  - …and in 20 years, each home will need 10Gbps connection to Internet!!

Why Single Fiber Solution?

- Because…
  - Single Fiber solution will serve for both Dual and Single Fiber installations
  - Service Providers can halve the fiber cost should they wish so
  - The cost difference between Single Fiber and Dual Fiber Optics can be minimal
  - There is less chance for mis-connection when there is only single connector at subscribers

100Mbps P2P network example



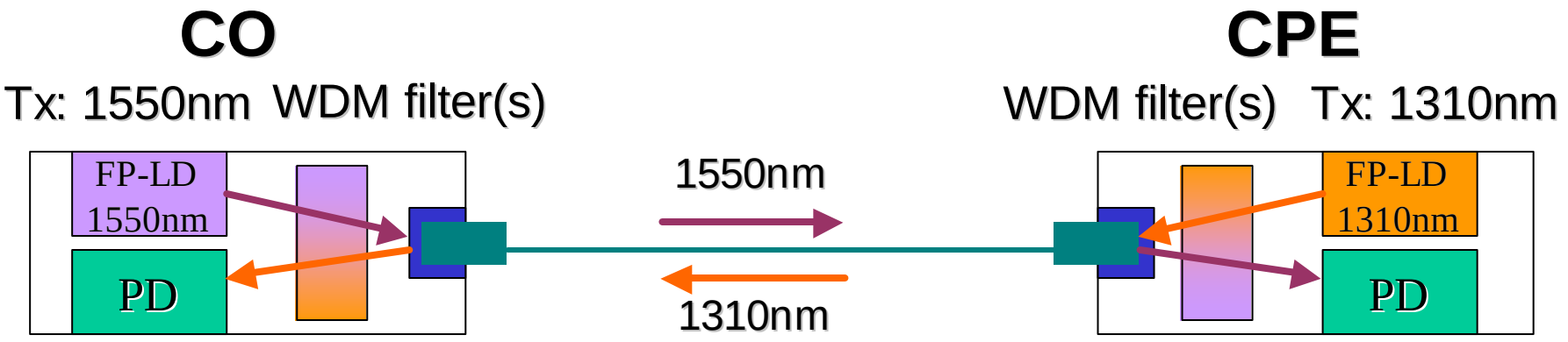
- Features and Benefits
  - End-to-End Ethernet Solution, no Data-Link protocol conversion
  - Accommodates subscribers at 100Mbps Full Duplex Speed
  - Distance over 15km (15dB Loss Budget), no out-side plant necessary
  - Video stream services can be supported by L2 technology such as IGMP snooping

Goal for 100BASE-BX Specification

- Invent minimum set of new specs
  - Leverage Existing 100Mbps MAC (no change to 802.3 MAC)
  - Leverage 100BASE-FX PCS and PMA (no change to 802.3 Clause 24)
  - Leverage OC-3 IR Specifications
- Leverage existing 1.3/1.5 FP lasers and PDs for OC-3 (155Mbps) IR-1/IR-2 (15km) with minimum modifications
  - SMF OC-3 is in volume shipment
    - 1.3 FP laser: in volume production from multiple laser manufacturer
    - 1.5 FP laser: in early volume production
      - No price difference to 1.3 FP once in volume

100BASE-BX PMD Overview

- SMF bi-directional PMD
  - P2P only
  - Downstream (CO to CPE): 1550nm FP-LD
  - Upstream (CPE to CO): 1310nm FP-LD
  - Internal WDM filter(s)
  - Support receptacle and pig-tail implementation



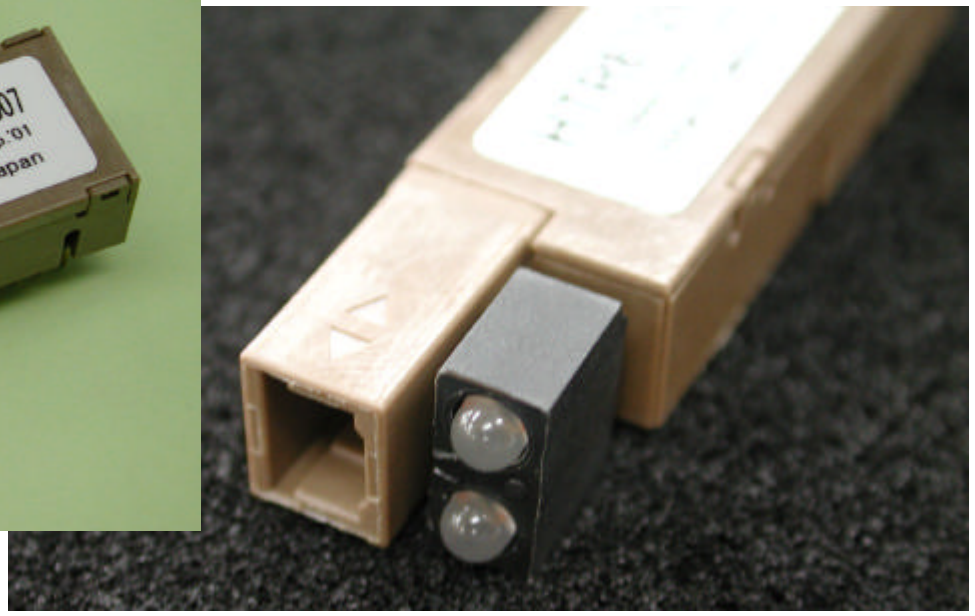
100BASE-BX baseline specification

Item	Specification	
Transmit Speed	125Mb/s (100BASE-FX)	
Wavelength (range)	downstream 1500-1600 (note1)	upstream 1261-1330
Spectrum Width (RMS)	< 3nm (note2)	< 7.7nm
Transmit Power	-8dBm - -15dBm	
Receive Sensitivity	-8dBm - -30dBm (note3)	
Extinct Ratio	>9dB	
BER	<10^-12	
Acceptable Return Loss	-11dB	

Note1: Changed from OC-3 IR2 based on 1.5um FP laser availability and to relax a WDM filter specification.
Note2: Relaxed from OC-3 IR2 based on reduced speed
Note3: Enhancement from OC-3 to support distance over 15km

100BASE-BX implementation (1)

- Small Form Factor (2x10) implementation
  - Suitable for high density applications (i.e. FTTH DSLAM)
  - Low profile 8.5mm (h) x 13.54mm (w)
  - Low power (0.35W typical)



100BASE-BX implementation (2)

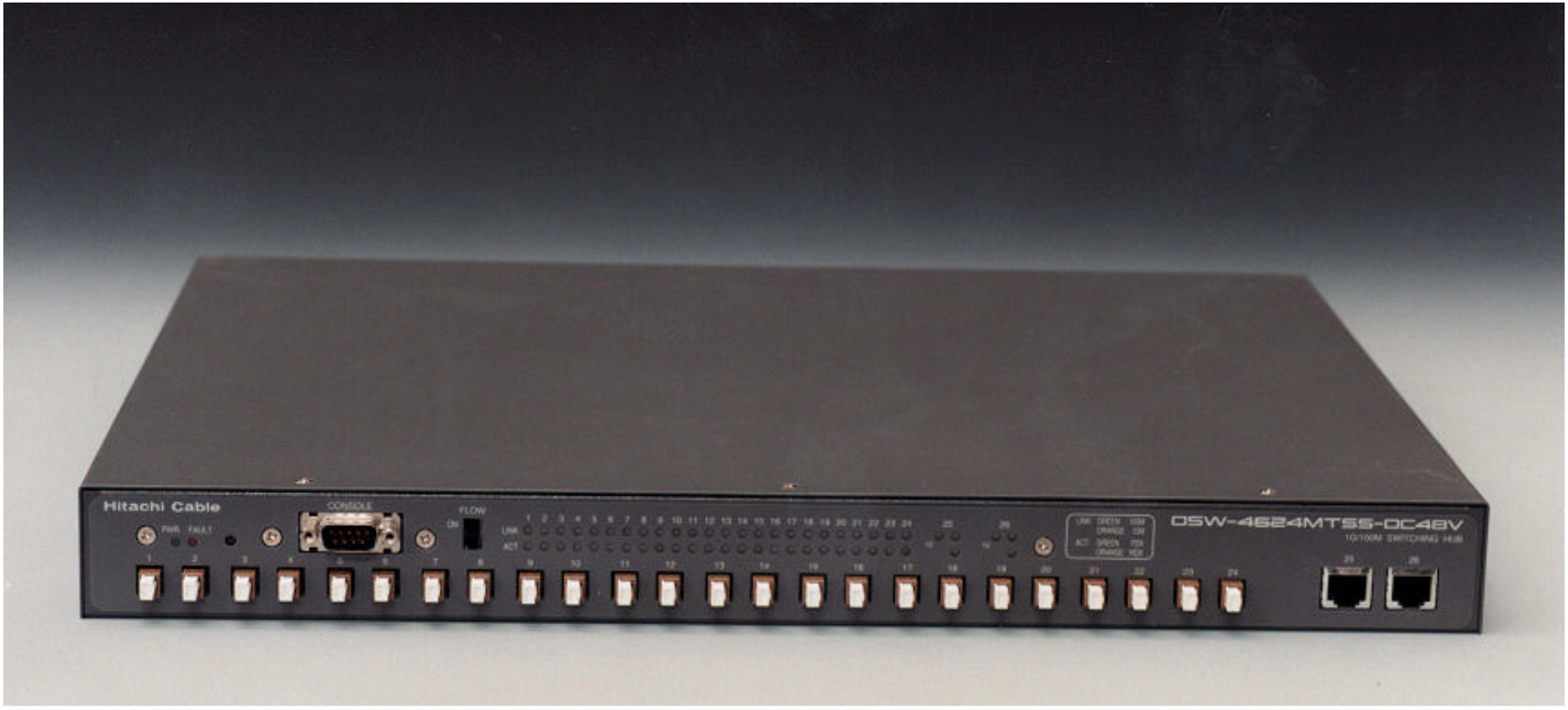
- 1x9 implementations
  - Suitable for CPE and CO equipment
  - Both SC receptacle and SC pig-tail available

100BASE-BX implementation (3)

- Small Form Factor (2x5) implementation
  - Suitable for high density and single port applications
  - SC receptacle connector

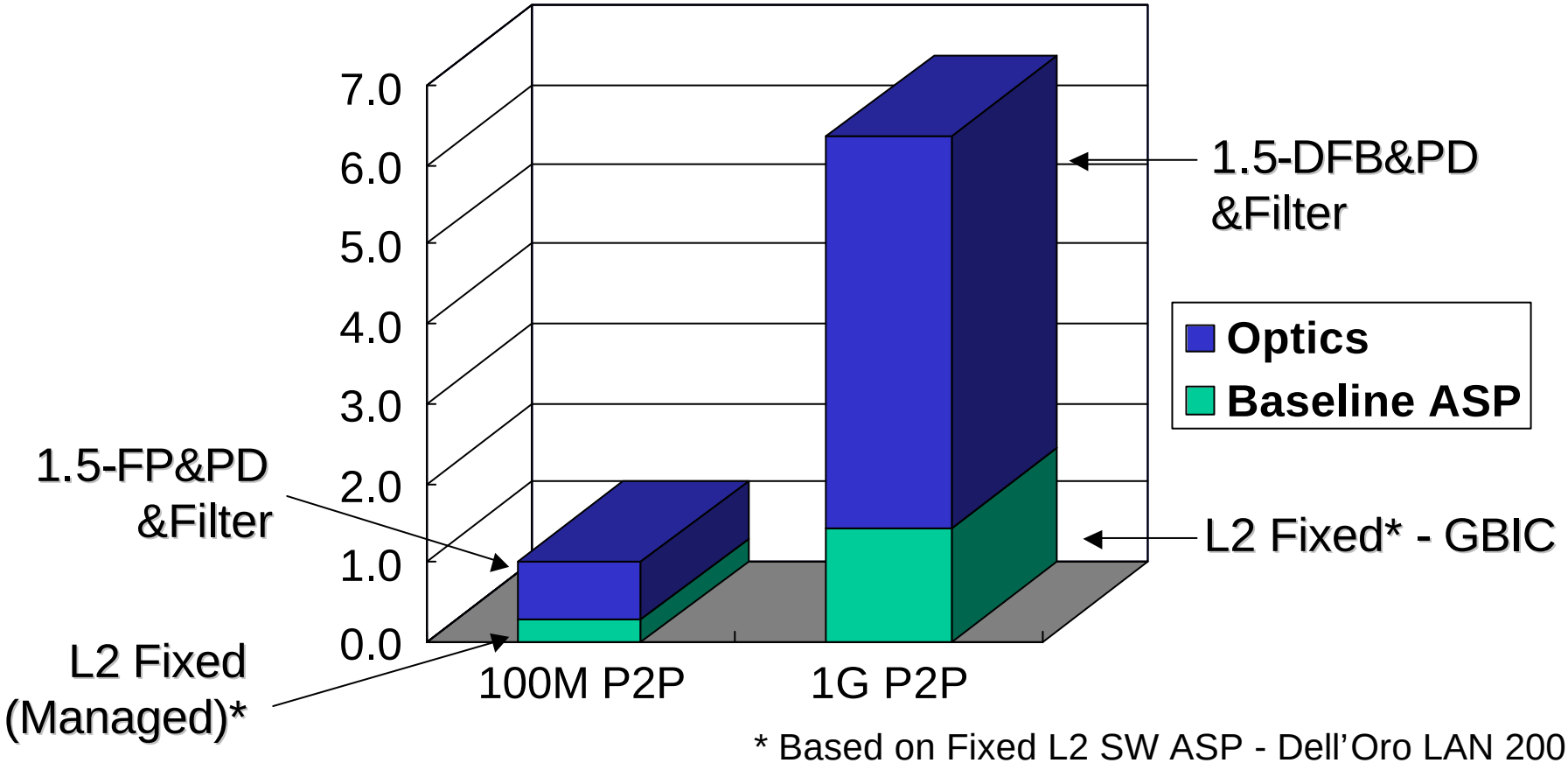
A 100BASE-BX Application (1)

- Optical Ethernet switch for FTTH
  - Rack mount 1U
  - 24 subscriber ports + 2 uplink port (1000BASE-T)



Cost comparison

- 100Mbps P2P vs. 1Gbps P2P
  - Per-Port ASP of FTTH aggregation switch



* Based on Fixed L2 SW ASP - Dell'Oro LAN 2001Q3

Conclusion

- There are markets for 100Mbps P2P as well as 1Gbps P2MP/P2P, depending on service providers' fiber installation
- 100Mbps P2P PMD can be specified based on existing standards
- OC-3 IR based 100Mbps Single Fiber PMD can support distance over 15km
- 100Mbps P2P can be lowest cost alternative to xDSL solution and provide upgrade paths to 1Gbps solutions