A Rose by any Other Name Would Smell as Sweet …

but may not get standardized!

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What are our Objectives? (a review)

- "Support subscriber access networks using point to multipoint topologies on optical fiber"
- "PHY(s) to have a BER better than or equal to 10-12 at the PHY service interface"
- "Provide physical layer specifications:"
  - "PHY for PON, 10 Gbps downstream/1 Gbps upstream, single SM fiber"
  - "PHY for PON, 10 Gbps downstream/10 Gbps upstream, single SM fiber"
- "Define up to 3 optical power budgets that support split ratios of 1:16 and 1:32, and distances of at least 10 and at least 20 km."

Also from our PAR

- "The scope of this project is to amend IEEE Std 802.3 to add physical layer specifications and management parameters for symmetric and/or asymmetric operation at 10 Gb/s on point-to-multipoint passive optical networks."

Whats All This Stuff About Access Networks Anyway?

Traditional data access networks are asymmetrical

- DSL
- Cable Modem
- Credible Rumors
  - "lowest-asymmetry point when Kazaa and Napster became popular (1:1.4), but now with introduction of IP video like YouTube it is becoming more asymmetric …"
  - In July of last year, YouTube reported 65,000 uploads per day and 100 Million (!) downloads. This is roughly 1:1500 traffic ratio.

But not all

- P2P Ethernet

This has not been the case with Enterprise networks (dominant market of Ethernet systems)

We need to be consistent with our earlier efforts from EFM

What have we used in 802 before?

PON

- 1000BASE-PX10 full duplex 10 km (20dB) 1 Gbps PON
- 1000BASE-PX20 full duplex 20 km (24dB) 1 Gbps PON
- 1000BASE-PX10-D OLT interface for 10 km (20dB) 1 Gbps PON, 1490 nm (tx)
- 1000BASE-PX10-U ONT interface for 10 km (20dB) 1 Gbps PON, 1310 nm (tx)
- 1000BASE-PX20-D OLT interface for 20 km (24dB) 1 Gbps PON , 1490 nm (tx)
- 1000BASE-PX20-U ONT interface for 20 km (24dB) 1 Gbps PON , 1310 nm (tx)

10G

- 10GBASE-S 850 nm, 300 m
- 10GBASE-L 1310 nm, 10 km
- 10GBASE-E 1550 nm, 40 km
- 10GBASE-X 8B/10B coded
- 10GBASE-R 64B/66B coded

1G

- 1000BASE-L 1310 nm, < 5 km
- 1000BASE-S 850 nm, < 500 m
- 1000BASE-X 8B/10B coded

Introducing the Simplex PMD

Every communication link must have at least one transmitter and one receiver.

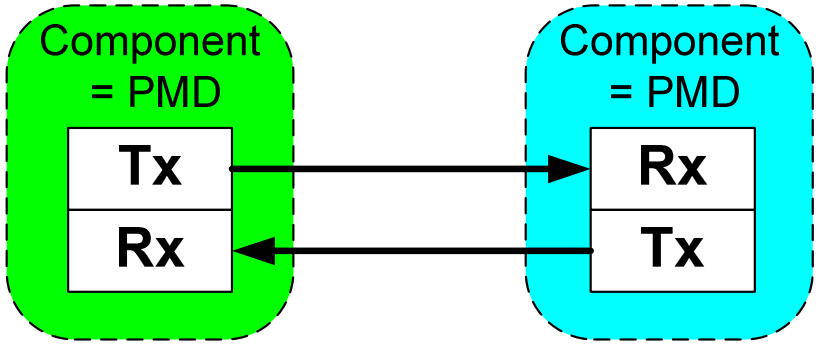
- In order to achieve bi-directional communications both nodes must have at least one transmitter and one receiver

It is proposed that, for 10G EPON we define PMDs as Simplex links

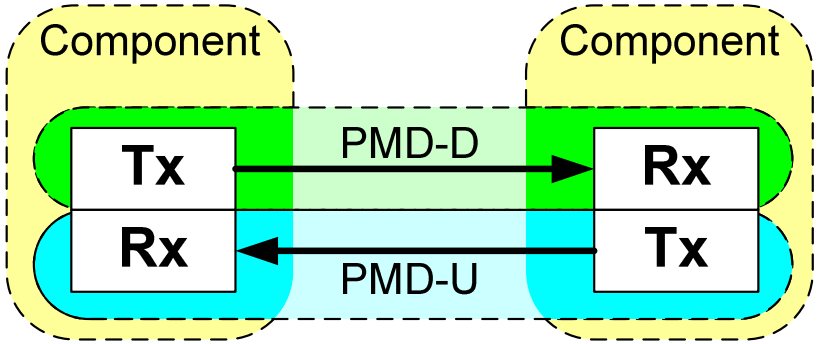
- one transmitter paired with one receiver that, when coupled via a PON ODN form a simplex communications link.

Components would then be composed of at least one transmitter and one receiver

- for PON these will always be from different PMDs (the downstream direction is always continuous whereas the upstream is always burst mode)



Old PMD definition



Proposed PMD definition

Some Definitions

From the Worlds Leading WEBpedia

- Half Duplex
  - "A half-duplex system provides for communication in both directions, but only one direction at a time (not simultaneously)."
- Full Duplex
  - "A full-duplex system allows communication in both directions, and unlike half-duplex, allows this to happen simultaneously."
- Simplex
  - "There are two (contradictory) definitions that have been used for the term. In both cases, the opposite of simplex is referred to as half duplex."
  - 1) "One way at a time: According to the ITU-T definition, a simplex circuit is one where all signals can flow in only one direction at a time."
  - 2) "One way only: According to the ANSI definition, a simplex circuit is one where all signals can flow in only one direction."

Ref:

- http://en.wikipedia.org/wiki/Half_duplex
- http://en.wikipedia.org/wiki/Simplex_communication

Some More Definitions

From Other (more credible) Sources:

- IEEE – Half Duplex: “A mode of operation of a CSMA/CD local area network (LAN) in which DTEs contend for access to a shared medium. Multiple, simultaneous transmissions in a half duplex mode CSMA/CD LAN result in interference, requiring resolution by the CSMA/CD access control protocol.”
- ITU – Simplex: “a simplex circuit is one where all signals can flow in only one direction at a time”
- ANSI – Simplex: “a simplex circuit is one where all signals can flow in only one direction”

What is it we want to convey?

Rate

- 1000 (1 x 10e9)
- 10G (10 x 10e9)
- But 1000/10G is a bit awkward

Line Code

- X 8B/10B coded
- R 64B/66B coded
- We will use both, but never for the same rate

Wavelength

- L 1310 nm
- E 1550 nm
- ? 1490 nm
- 1490 seems to have been orphaned, and what of 1530 nm or 1580 nm?

Reach

- 10 10 km
- 20 20 km
- 30 extended CHIL

Transmit Location

- D OLT (Downstream)
- U ONU (Upstream)

This is after all PON

- P PON
- BASE Some traditions are inviolate

Suggestions

Keep rate information but lets admit we've entered the Gigabit world and have no intention of turning back!

- **1G** 1 x 10e9
- **10G** 10 x 10e9

Keep the Direction – PONs are not symmetrical beasts, this provides a point of reference

- **D** Located in OLT (i.e. Downstream Transmitter)
- **U** Located in ONU (i.e. Upstream Transmitter)

Keep the nominal reach

- 10 10 km
- 20 20 km
- 30 extended CHIL

ALWAYS DEFINE A SIMPLEX TRANSMITTER/RECEIVER PAIR!

Legacy Names (see IEEE 802.3ah)

1000BASE-PX10-D	OLT I/F for 10 km (20dB) 1 Gbps PON, 1490 nm (tx)
1000BASE-PX10-U	ONT I/F for 10 km (20dB) 1 Gbps PON, 1310 nm (tx)
1000BASE-PX20-D	OLT I/F for 20 km (24dB) 1 Gbps PON , 1490 nm (tx)
1000BASE-PX20-U	ONT I/F for 20 km (24dB) 1 Gbps PON , 1310 nm (tx)

IEEE 802.3av PMD Names Option 1

OLT Transmitters/ONT Receiver

- 10GBASE-PD10 10G Downstream 10 km
- 10GBASE-PD20 10G Downstream 20 km
- 10GBASE-PD30 10G Downstream extended CHIL

ONT Transmitters/OLT Receiver

- 1GBASE-PU10 1G Upstream 10 km – use legacy 1000BASE-PX10-U
- 1GBASE-PU20 1G Upstream 20 km – use legacy 1000BASE-PX20-U
- 1GBASE-PU30 1G Upstream extended CHIL
- 10GBASE-PU10 10G Upstream 10 km
- 10GBASE-PU20 10G Upstream 20 km
- 10GBASE-PU30 10G Upstream extended CHIL

- Note some may drop out due to optical budget optimization, (e.g. some 10G ports may be merged into a single class), but 99% of the Editors agree: fewer is better!

IEEE 802.3av PMD Names Option 2 – a slight rearrangement

OLT Transmitters/ONT Receiver

- 10GBASE-DP10 10G Downstream 10 km
- 10GBASE-DP20 10G Downstream 20 km
- 10GBASE-DP30 10G Downstream extended CHIL

ONT Transmitters/OLT Receiver

- 1GBASE-UP10 1G Upstream 10 km – use legacy 1000BASE-PX10-U
- 1GBASE-UP20 1G Upstream 20 km – use legacy 1000BASE-PX20-U
- 1GBASE-UP30 1G Upstream extended CHIL
- 10GBASE-UP10 10G Upstream 10 km
- 10GBASE-UP20 10G Upstream 20 km
- 10GBASE-UP30 10G Upstream extended CHIL

- Note some may drop out due to optical budget optimization, (e.g. some 10G ports may be merged into a single class), but 99% of the Editors agree: fewer is better!

IEEE 802.3av PMD Names Option 3

Keep Line Coding also

OLT Transmitters/ONT Receiver

- 10GBASE-PR10-D 10G Downstream 10 km
- 10GBASE-PR20-D 10G Downstream 20 km
- 10GBASE-PR30-D 10G Downstream extended CHIL

ONT Transmitters/OLT Receiver

- 1GBASE-PX10-U 1G Upstream 10 km – use legacy 1000BASE-PX10-U
- 1GBASE-PX20-U 1G Upstream 20 km – use legacy 1000BASE-PX20-U
- 1GBASE-PX30-U 1G Upstream extended CHIL(new, 1G 29 dB @ 1310 nm)
- 10GBASE-PR10-U 10G Upstream 10 km
- 10GBASE-PR20-U 10G Upstream 20 km
- 10GBASE-PR30-U 10G Upstream extended CHIL

- Note some may drop out due to optical budget optimization, (e.g. some 10G ports may be merged into a single class), but 99% of the Editors agree: fewer is better!

How then do we refer to components (Transceivers)

Designation:

1) Downstream data rate
2) Upstream data rate
3) “G” stands for 10e9 bps
4) “BASE” because some traditions shouldn’t be tampered with
5) “P” for PON
6) PMD class (10, 20 or 30)
7) Location (U – ONU / D - OLT)

Example: ONU based transceiver with 10Gbps downstream and 1Gbps upstream data rates, 20 km PMC class

But Wait! What about Dual Receive Rate Transceivers in the OLT?

Designation:

1) Downstream data rate
2) Upstream data rate (higher)
3) Upstream data rate (lower)
4) “G” stands for 10e9 bps
5) “BASE” because some traditions shouldn’t be tampered with
6) “P” for PON
7) PMD class (10, 20 or 30)
8) Location (U – ONU / D - OLT)

Example: ONU based transceiver with 10Gbps downstream and 10/1Gbps upstream data rates, 20 km PMC class

How then do we refer to components (Transceivers) – with link coding

Designation:

1) Downstream data rate
2) Upstream data rate
3) “G” stands for 10e9 bps
4) “BASE” because some traditions shouldn’t be tampered with
5) “P” for PON
6) Downstream channel coding (R – 64B/66B, X – 8B/10B)
7) Upstream channel coding (R – 64B/66B, X – 8B/10B)
8) PMD class (10, 20 or 30)
9) Location (U – ONU / D - OLT)

Example: ONU based transceiver with 10Gbps downstream and 1Gbps upstream data rates, 20 km PMC class

Dual Receive Rate Transceivers in the OLT – with link coding

Designation:

1) Downstream data rate
2) Upstream data rate (higher)
3) Upstream data rate (lower)
4) "G" stands for 10e9 bps
5) "BASE" because some traditions shouldn't be tampered with
6) "P" for PON
7) Downstream channel coding (R – 64B/66B, X – 8B/10B)
8) Upstream channel coding (higher data rate) (R – 64B/66B, X – 8B/10B)
9) Upstream channel coding (lower data rate) (R – 64B/66B, X – 8B/10B)
10) PMD class (10, 20 or 30)
11) Location (U – ONU / D - OLT)

Example: ONU based transceiver with 10Gbps downstream and 10/1Gbps upstream data rates, 10 km PMC class

Component Names Option 2 Example

OLT Devices

- 10/1GBASE-P10-D
- 10/1GBASE-P20-D
- 10/1GBASE-P30-D
- 10/10GBASE-P10-D
- 10/10GBASE-P20-D
- 10/10GBASE-P30-D
- 10/10/1GBASE-P10-D
- 10/10/1GBASE-P20-D
- 10/10/1GBASE-P30-D

ONU Devices

- 10/1GBASE-P10-U
- 10/1GBASE-P20-U
- 10/1GBASE-P30-U
- 10/10GBASE-P10-U
- 10/10GBASE-P20-U
- 10/10GBASE-P30-U
- 10/10/1GBASE-P10-U
- 10/10/1GBASE-P20-U
- 10/10/1GBASE-P30-U

Straw Poll

"Chicago Rules"; vote early, vote often

I would support:

- Option 1 [ ] supporters
- Option 2 [ ] supporters
- Option 3 [ ] supporters
- I don't like any of these [ ] supporters