IEEE P802.3av «10GEPON» Task Force

Opening Report to IEEE 802.3 WG

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May TF Meeting Report

- 10G EPON TF had a 3-day meeting in Geneva, Switzerland
- 41 participant attended
- Reviewed 25 presentations

- Approved 4 baseline proposals:
  - 10 Gbps upstream signal
  - Handling of XAUI errors
  - FEC Codeword Structure
  - FEC Framing

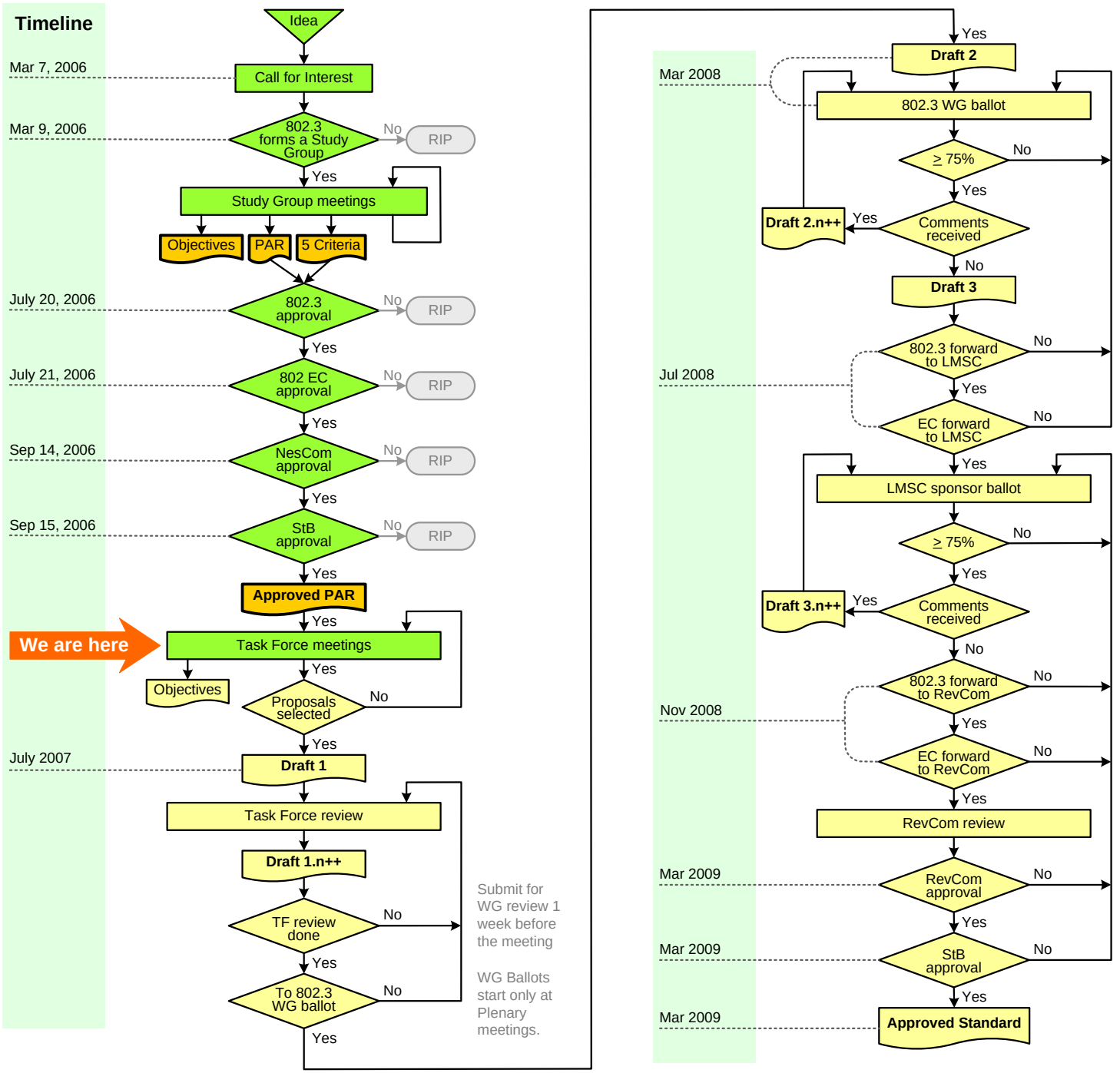
Schedule for July Meeting

We have 18 presentations to review

- **Tue AM:**
  - 10G/1G Coexistence
- **Tue PM:**
  - Optical Power Budget
- **Wed AM:**
  - FEC
- **Wed PM:**
  - Wavelength Assignment
- **Thu AM:**
  - Clauses overview from Editors
  - Tutorial on Commenting Procedure

- **Today:**
  - FEC ad hoc 8PM-9:30PM ????

Task Force Timeline



Reflector and Web

- To subscribe to 10GEPON reflector, send email to:

  listserv@ieee.org

  and include this line in the *body of the message:*

  subscribe stds-802-3-10GEPON *firstname lastname*

  (Currently 326 subscribers on 10GEPON TF reflector)

- Our web site is located at:

  http://www.ieee802.org/3/av/

- No private area yet

Simplex PMD

Presented to 802.3 WG on behalf of P802.3av TF

P802.3av TF Objectives

- Support subscriber access networks using point to multipoint topologies on optical fiber

  (Passed by voice vote without opposition)

- PHY(s) to have a BER better than or equal to 10^{-12} at the PHY service interface

  (Passed by voice vote without opposition)

- 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**

    (Y:34, N:0, A:2)

- 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.

  (Y:51, N:0, A:10)

P802.3av Objectives Call for 12 New Port Types

- **ONU and OLT ports are different**
  - Burst mode reception at OLT
  - Burst mode transmission at ONU
  - Different upstream and downstream wavelengths
- **Symmetric and Asymmetric ports are different**
  - 10 Gb/s TX + 10 Gb/s RX
  - 10 Gb/s TX + 1 Gb/s RX or 1 Gb/s TX + 10 Gb/s RX
- **Different Power Budgets require different PMD parameters**

$$2\begin{bmatrix}\text{ONU}\\\text{OLT}\end{bmatrix}\times 2\begin{bmatrix}\text{Symmetric}\\\text{Asymmetric}\end{bmatrix}\times 3\begin{bmatrix}\text{Power Budget 1}\\\text{Power Budget 2}\\\text{Power Budget 3}\end{bmatrix}=12$$

Notation

- Asymmetric PMD (10G downstream and 1G upstream) is designated **10/1GBASE-**

- PHY that uses 64b/66b in one direction and 8b/10b in another direction is designated **"PY"**
  Also note:
  – 64b/66b in both directions – "PR"
  – 8b/10b in both directions – "PX"

- Power budget class for 1:32 split @ 20 km is designated **"30"**
  Also note:
  – 1:16 @ 10 km is called "PX10" in IEEE 802.3ah
  – 1:16 @ 20 km is called "PX20" in IEEE 802.3ah

- Example: PMD in asymmetric ONU with power budget for 1:32 split at 20 km: **10/1GBASE-PY30-U**

- The above notation is not approved by the TF
- Used only in this presentation for clarity

How Many is Too Many?

- 1 Gb/s EPON defined 4 PMDs for 2 power budgets
  - 1000BASE-PX10-D
  - 1000BASE-PX10-U
  - 1000BASE-PX20-D
  - 1000BASE-PX20-U

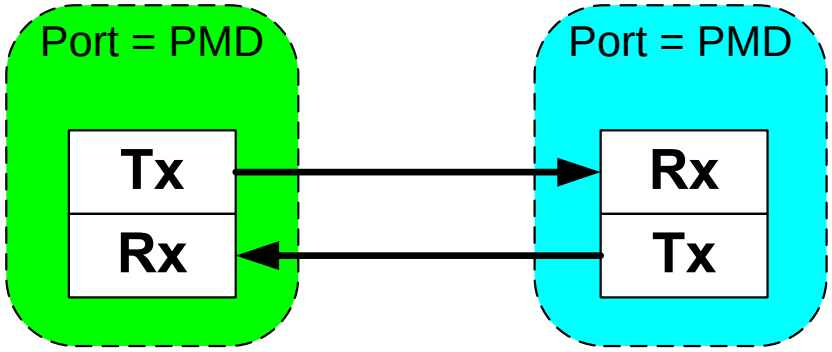
- Is 12 new PMDs for 10GEPON too many?

Symmetric 10G/10G	**Asymmetric (10G/1G)**
– 10GBASE-PR10-D	- 10/1GBASE-PY10-D
– 10GBASE-PR10-U	- 10/1GBASE-PY10-U
– 10GBASE-PR20-D	- 10/1GBASE-PY20-D
– 10GBASE-PR20-U	- 10/1GBASE-PY20-U
– 10GBASE-PR30-D	- 10/1GBASE-PY30-D
– 10GBASE-PR30-U	- 10/1GBASE-PY30-U

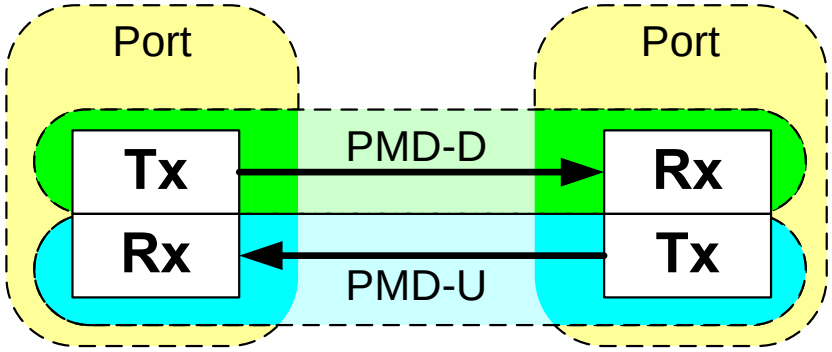
What is simplex PMD anyway?

- **Traditional PMD** defines Tx and Rx parameters at one end of a link
  - Traditional PMD type has a one-to-one correspondence with port type

- **Simplex PMD** defines Tx and Rx parameters in one direction of a link (Rx opposing the Tx)
  - A port type can be defined as a combination of Tx from simplex PMD ***X*** and Rx from simplex PMD ***Y***.



Traditional PMD

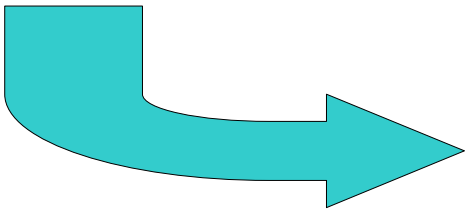


Simplex PMD

Why Simplex PMDs?

- **Port is a combination of 2 Simplex PMDs at one end of a link**
- **Only 7 simplex PMDs are required to define all 12 port types**

PMD A	10Gb/s downstream, PR10
PMD B	10Gb/s downstream, PR20
PMD C	10Gb/s downstream, PR30
PMD D	10Gb/s upstream, PR10
PMD E	10Gb/s upstream, PR20
PMD F	10Gb/s upstream, PR30
PMD G	1Gb/s upstream, PX30



Port type	Defined in
OLT, 10/10 symmetric, PR10	TX: PMD **A** RX: PMD **D**
ONU, 10/10 symmetric, PR10	TX: PMD **D** RX: PMD **A**
OLT, 10/10 symmetric, PR20	TX: PMD **B** RX: PMD **E**
ONU, 10/10 symmetric, PR20	TX: PMD **E** RX: PMD **B**
OLT, 10/10 symmetric, PR30	TX: PMD **C** RX: PMD **F**
ONU, 10/10 symmetric, PR30	TX: PMD **F** RX: PMD **C**
OLT, 10/1 asymmetric, PY10	TX: PMD **A** RX: 1000BASE-PX10-D
ONU, 10/1 asymmetric, PY10	TX: 1000BASE-PX10-U RX: PMD **A**
OLT, 10/1 asymmetric, PY20	TX: PMD **B** RX: 1000BASE-PX20-D
ONU, 10/1 asymmetric, PY20	TX: 1000BASE-PX20-U RX: PMD **B**
OLT, 10/1 asymmetric, PY30	TX: PMD **C** RX: PMD **G**
ONU, 10/1 asymmetric, PY30	TX: PMD **G** RX: PMD **C**

Another View

		New Simplex PMDs (Tx Side)							1000BASE-	
		PMD A	PMD B	PMD C	PMD D	PMD E	PMD F	PMD G	PX10-U	PX20-U
New Simplex PMDs (Rx Side)	PMD A				ONU, 10/10, PR10				ONU, 10/1, PY10	
	PMD B					ONU, 10/10, PR20				ONU, 10/1, PY20
	PMD C						ONU, 10/10, PR30	ONU, 10/1, PY30		
	PMD D	OLT, 10/10, PR10								
	PMD E		OLT, 10/10, PR20							
	PMD F			OLT, 10/10, PR30						
	PMD G			OLT, 10/1, PY30						
1000BASE-	PX10-D	OLT, 10/1, PY10								
	PX20-D		OLT, 10/1, PY20							

Simplex PMD vs. Traditional PMD

Simplex PMD	Traditional PMD
• Always has the same speed for Tx and Rx.	• Can send and receive at different speeds • Asymmetric EPON: 10G down/1G up
• Both Rx and Tx always operate in the same mode: both burst mode or both continuous mode.	• Rx and Tx may operate in the different modes • ONU receives continuously, but sends in bursts.
• Always has the same line coding for Tx and Rx (PCS issue).	• Tx and Rx can use different line coding.
• **How to designate components (ports) defined in two simplex PMDs?**	• **How to designate PMDs that have asymmetric speeds and different line coding schemes?**
• **How simplex PMD can be integrated in the 802.3 layering diagram?** • **PMD is a sublayer. Simplex PMD is half of a sublayer?**	

Possible Directions for 802.3av TF

Method 1: - Keep traditional PMD definition.
- Define 12 new PMD types.

Method 2: - Define Simplex PMD.
- Define 7 new simplex PMD types.
- Define 12 port types by referring to new and old PMDs.

Other Options

- **Reduce the number of optical power budgets to 2**
  - Let's say, we keep low budget (PR10/PY10) and high budget (PR30/PY30)

- **This will require defining**
  5 simplex PMDs or
  8 traditional PMDs

Simplex PMDs	
1	10Gb/s downstream, PR10
2	10Gb/s downstream, PR30
3	10Gb/s upstream, PR10
4	10Gb/s upstream, PR30
5	1Gb/s upstream, PX30

Traditional PMDs	
1	10GBASE-PR10-D
2	10GBASE-PR10-U
3	10GBASE-PR30-D
4	10GBASE-PR30-U
5	10/1GBASE-PY10-D
6	10/1GBASE-PY10-U
7	10/1GBASE-PY30-D
8	10/1GBASE-PY30-U

2 {PR10,PR30} × 2 {OLT,ONU} × 2 {sym, asym}

More Directions for 802.3av TF

Method 3: - Reduce number of optical power budgets to 2.

- Keep traditional PMD definition.
- Define 8 new PMD types.

Method 4: - Reduce number of optical power budgets to 2.

- Define 5 new simplex PMD types.
- Define 8 port types by referring to new and old PMDs.

Straw Poll

- P802.3av should define …

	All	802.3
Method 1: 12 traditional PMDs:	_3_	_3_
Method 2: 7 simplex PMDs:	_4_	_1_
Method 3: 8 traditional PMDs:	_4_	_3_
Method 4: 5 simplex PMDs:	_21_	_21_
No opinion / Don't care:	_61_	_34_