Activities Since March Plenary

- **2-day interim meeting in Tokyo (802.3av only)**
  - April 13-14, 2008
  - Hosted by NTT
  - 70 participants
  - Resolved 163 comments against D1.2

- **3-day interim meeting in Munich**
  - 33 participants
  - Resolved 267 comments against D1.3

- **Draft 1.8023 was released June 23, 2008**
  - Submitted for WG preview in anticipation of initiation WG Ballot at the end of July meeting
TF Approved Project Timeline

Approved by TF on November 15, 2007

Y:29  N:0  A:4
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 ~390 subscribers on 10GEPON TF reflector)

Our web site is located at:
http://www.ieee802.org/3/av/

Private Directory
- Username: 802.3av
- Password: *******
Plan for July

- Review 46 comments
  - E – 15
  - T – 21
  - TR – 10

- Plan to hold joint meeting with 802.3az
  - Wednesday, 2:00PM-3:30PM

- Produce draft 2.0 at this meeting

- At the closing session, we will ask WG to initiate WG Ballot for P802.3av
  - Changes, if any are made to the previewed version of the draft, will be presented for WG review during the closing plenary immediately prior to the vote for approval to go to WG ballot (According to Section 2.8.2 of the IEEE 802.3 Operating Rules)
Overview of IEEE Draft P802.3av
Objectives

- 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.
Affected Clauses

Modified Clauses

Clause 1: Introduction
Clause 30: Management
Clause 45: Management Data Input/Output (MDIO) Interface
Clause 56: Introduction to Ethernet for subscriber access networks
Clause 66: Extensions of the 10 Gb/s Reconciliation Sublayer (RS), 100BASE-X PHY, and 1000BASE-X PHY for unidirectional transport
Clause 67: System considerations for Ethernet subscriber access networks

New Clauses

Clause 91: Physical Medium Dependent (PMD) sublayer and medium, types 10GBASE-PR and 10/1GBASE-PRX
Clause 92: Reconciliation Sublayer (RS), Physical Coding Sublayer (PCS), and Physical Media Attachment (PMA) for point-to-multipoint media, types 10GBASE-PR and 10/1GBASE-PRX
Annex 92A: FEC frame encoding example
Clause 93: Multipoint MAC Control for 10Gb/s EPON
PMD Names

Legacy (1G/1G) PMD: 1000BASE-PX10-D
- P for PON
- X for 8B/10B
- Power Budget {10, 20}
- Location {D=OLT, U=ONU}

Symmetric (10G/10G) PMD: 10GBASE-PR-D1
- P for PON
- R for 64B/66B
- Location {D=OLT, U=ONU}
- Configuration {1, 2, 3}

Asymmetric (10G/1G) PMD: 10/1GBASE-PRX-U1
- P for PON
- R for 64B/66B
- X for 8B/10B
- Location {D=OLT, U=ONU}
- Configuration {1, 2, 3}
### Three Power Budgets

#### Symmetric power budgets
(10G down/10G up)

<table>
<thead>
<tr>
<th>Distance</th>
<th>1:16</th>
<th>1:32</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 km</td>
<td>PR10</td>
<td>PR20</td>
</tr>
<tr>
<td>20 km</td>
<td>PR20</td>
<td>PR30</td>
</tr>
</tbody>
</table>

- **PR10 and PRX10**
  - Channel insertion loss = 20 dB
  - Specified for the same outside plant as PX10

- **PR20 and PRX20**
  - Channel insertion loss = 24 dB
  - Specified for the same outside plant as PX20

#### Asymmetric power budgets
(10G down/1G up)

<table>
<thead>
<tr>
<th>Distance</th>
<th>1:16</th>
<th>1:32</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 km</td>
<td>PRX10</td>
<td>PRX20</td>
</tr>
<tr>
<td>20 km</td>
<td>PRX20</td>
<td>PRX30</td>
</tr>
</tbody>
</table>

- **PR30 and PRX30**
  - Channel insertion loss = 29 dB
PMD Combinations

Symmetric (10G/10G) PMDs

<table>
<thead>
<tr>
<th>OLT PMD</th>
<th>PR10</th>
<th>ONU PMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10GBASE-PR-D1</td>
<td></td>
<td>10GBASE-PR-U1</td>
</tr>
<tr>
<td>10GBASE-PR-D2</td>
<td>PR20</td>
<td>10GBASE-PR-U3</td>
</tr>
<tr>
<td>10GBASE-PR-D3</td>
<td>PR30</td>
<td></td>
</tr>
</tbody>
</table>

Asymmetric (10G/1G) PMDs

<table>
<thead>
<tr>
<th>OLT PMD</th>
<th>PRX10</th>
<th>ONU PMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>10/1GBASE-PRX-D1</td>
<td></td>
<td>10/1GBASE-PRX-U1</td>
</tr>
<tr>
<td>10/1GBASE-PRX-D2</td>
<td>PRX20</td>
<td>10/1GBASE-PRX-U2</td>
</tr>
<tr>
<td>10/1GBASE-PRX-D3</td>
<td>PRX30</td>
<td>10/1GBASE-PRX-U3</td>
</tr>
</tbody>
</table>

- Downstream channel is the same as 10GBASE-PR-D1
- Downstream channel is the same as 10GBASE-PR-D2
- Downstream channel is the same as 10GBASE-PR-D3

- Upstream channel is the same as 1000BASE-PX10
- Upstream channel is the same as 1000BASE-PX20

The same ONU PMD is used to achieve two power budgets.
Strong FEC is specified to achieve the required power budgets
  - RS(255, 223) - stronger than 802.3ah FEC
  - Stream-based
  - Overhead is 12.9%

Overhead is accommodated without increasing rate on any interface
  - XGMII rate is preserved (312.5M transfers/s)
  - Line rate is preserved (10.3125 Gb/s)
  - Data throughput is reduced (inter-frame gaps are increased)
1. By controlling CARRIER_STATUS signal, the RS precisely increases the gap between frames to accommodate the FEC parity.

2. **Idle Deletion** process deletes the number of 72-bit vectors corresponding to the number of parity blocks to be added later.

3. **FEC Encoder** adds the parity blocks, closing the gap. 4 parity blocks are added per 27 payload blocks.
1. **FEC Decoder**

   - Removes the parity blocks, leaving gaps in the Rx data stream.

2. **Idle Insertion**

   - Process inserts the correct number of idles (in front of the frame) to close the gaps.

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**Diagram Details**

- ** PCS**
  - Idle Insertion
  - 66B/64B decoding
  - Descrambler
  - FEC Decoder
  - Synchronizer

- **MAC**
  - Reconciliation

- **PMA**

- **PMD**