802.3df
Proposal for additional optical objective

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• Kohichi Tamura, CIG
• Jeffery Maki, Juniper
• Paul Brooks, Viavi
• Flavio Marques, Furukawa
• David Ofelt, Juniper Networks
## 802.3df Adopted Objectives

<table>
<thead>
<tr>
<th>Ethernet Rate</th>
<th>Assumed Signaling Rate</th>
<th>AUI</th>
<th>BP</th>
<th>Cu</th>
<th>Cable</th>
<th>MMF 50m</th>
<th>MMF 100m</th>
<th>SMF 500m</th>
<th>SMF 2km</th>
<th>SMF 10km</th>
<th>SMF 40km</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 Gb/s</td>
<td>200 Gb/s</td>
<td>Over 1 lane</td>
<td>Over 1 pair</td>
<td>Over 1 Pair</td>
<td>Over 1 Pair</td>
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<td></td>
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</tr>
<tr>
<td>400 Gb/s</td>
<td>200 Gb/s</td>
<td>Over 2 lanes</td>
<td>Over 2 pairs</td>
<td>Over 2 Pair</td>
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<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>800 Gb/s</td>
<td>100 Gb/s</td>
<td>Over 8 lanes</td>
<td>Over 8 pairs</td>
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<td>Over 8 pairs</td>
<td>Over 8 pairs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>200 Gb/s</td>
<td></td>
<td>Over 4 lanes</td>
<td>Over 4 pairs</td>
<td>Over 4 pairs</td>
<td>1) Over 4 pairs</td>
<td>2) Over 4 1/2’s</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TBD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Over single SMF in each direction</td>
<td>Over single SMF in each direction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6 Tb/s</td>
<td>100 Gb/s</td>
<td>Over 16 lanes</td>
<td>Over 8 pairs</td>
<td>Over 8 pairs</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>200 Gb/s</td>
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</table>

### Objectives

- **Leverage existing or work-in-progress** 100 Gb/s per lane (e.g. 3cu, 3ck, 3db) to higher lane counts
- **Develop 200 Gb/s per lane electrical signaling** for 1/2/4/8 lane variants of AUIs and electrical PMDs
- **Develop 200 Gb/s per optical fiber** for 1/2/4/8 fiber based optical PMDs and 4 lambda WDM optical PMD
- Potential for either direct detect and / or coherent signaling technology

### 13 Optical PMD Objectives
Potential new objective

- Originally raised in nowell_3df_01_011822
- 400 Gb/s objective with extended reach to 2km for parallel SMF
- Subset of the already adopted 800 GbE baseline (8x100Gb/s 2km parallel SMF)
  - No additional technical work
  - But some editorial work
- Industry demand exists for, and is already deploying, “400G-DR4+” in an ad hoc way. Numerous network operator RFQ’s call for this interface
- IEEE P802.3df adoption of an objective for this would be codifying an ad hoc spec that exists in the industry.
What is being proposed?

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<tr>
<td>400 Gb/s</td>
<td>100 Gb/s</td>
<td>802.3ck ✓</td>
<td>802.3bs/cd ✓</td>
<td>Over 4 pair</td>
</tr>
<tr>
<td>200 Gb/s</td>
<td>Over 2 lanes</td>
<td>Over 2 Pair</td>
<td></td>
<td></td>
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- Proposed objective highlighted (green square)
- Supporting specs in flight (AUI)
- Technical/Editorial work of proposed objective is a subset of adopted 800 Gb/s objective (green arrow)

Market support:
- Current market analysts do not call out the different reach split for “400G-DR4” even though 500m/2km variants are shipping today.
Interest in adding an objective was tested

**Straw Poll #2**

I support the adoption of the following objective
- Define a physical layer specification that supports 400 Gb/s operation:
  - over 4 pairs of SMF with lengths up to at least 2 km

**Results**
- Yes: 45
- No: 1
- Need more information: 17
- Abstain: 7

From Feb 22, 2022 meeting

Procedural considerations

Step 1) Confirm that adding objective is within project scope and aligns with current adopted CSD
  • PAR: https://www.ieee802.org/3/df/proj_doc/IEEE_P802.3df_PAR_11122021.pdf
  • CSD: https://mentor.ieee.org/802-ec/dcn/21/ec-21-0306-00-ACSD-p802-3df.pdf

Step 2) Adopt objective in Task Force

Step 3) Adopt objective in 802.3 Working Group

Step 4) back to work in Task Force…
PAR and CSD

PAR

• **5.2.b Scope of the project:** Define Ethernet MAC parameters, physical layer specifications, and management parameters for the transfer of Ethernet format frames at 800 Gb/s and 1.6 Tb/s over copper, multi-mode fiber, and single-mode fiber, and use this work to define derivative physical layer specifications and management parameters for the transfer of Ethernet format frames at 200 Gb/s and 400 Gb/s.

CSD

• No identified impact to current responses. Some highlights:
  
  • Technical Feasibility: *The proposed project will build on the array of Ethernet component and system design experience, and the broad knowledge base of Ethernet network operation.*
  
  • ...For example, some combination of the following approaches could be used to address 800 Gb/s and 1.6 Tb/s Ethernet, as well as to address reduced lane count solutions for 200 Gb/s and 400 Gb/s Ethernet: pulse-amplitude modulation, parallel transmission techniques,...
  
  • Economic Feasibility: “*The deployment of 800 Gb/s and 1.6 Tb/s Ethernet standards and derivatives at 200 Gb/s and 400 Gb/s will allow economies of scale to reduce cost for all solutions.*”

No identified issues for adding this objective found with our existing PAR and CSD language.
Proposed Motion

Move to adopt the following objective:

- Define a physical layer specification that supports 400 Gb/s operation over 4 pairs of SMF with lengths up to at least 2 km
Thanks