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Support for Swanson comments on D1.2

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Premise

- In swanson_3db_adhoc_01_040920, I noted:

- We have two distinct market needs for the 100G Short Reach MMF SG
  - Interconnects between switches
  - Interconnects between switches and servers

- These two market needs cannot be met with a single PMD operating at 50m on OM4 and 30m on OM3
  - One should be based on supporting the maximum link length MMF 100G switch-to-switch interconnect
    - 100m desired at a cost lower than 100GBASE-DR
  - One should be based on supporting the minimum cost MMF 100G switch-to-server interconnects
    - Cost competitive with AOCs and Copper

Expressed market needs

- Short-reach interconnect between switches
- Low-cost interconnect for 100G serial servers
- Distances:
  - 100 meters desired
  - 50 meters required
  - 30 meters is currently a space for AOCs
- Breakout desired
- Cost < 50%of DR desired
- Power consumption ~ 50% of DR desired

I recommended replacing the current objectives

- **One set of objectives supporting 100m switch-to-switch**
  - Define a physical layer specification that supports 100 Gb/s operation over 1 pair of MMF with lengths up to at least **100 m (TBD)**
  - Define a physical layer specification that supports 200 Gb/s operation over 2 pairs of MMF with lengths up to at least **100 m (TBD)**
  - Define a physical layer specification that supports 400 Gb/s operation over 4 pairs of MMF with lengths up to at least **100 m (TBD)**

- **One set of objectives supporting lowest cost switch-to-server**
  - Define a physical layer specification that supports 100 Gb/s operation over 1 pair of MMF with lengths up to at least **20 m (TBD)**
  - Define a physical layer specification that supports 200 Gb/s operation over 2 pairs of MMF with lengths up to at least **20 m (TBD)**
  - Define a physical layer specification that supports 400 Gb/s operation over 4 pairs of MMF with lengths up to at least **20 m (TBD)**

Current status of D1.2

- Two variants are included
  - VR supporting 30m on OM3 and 50m on OM4
  - SR supporting 60m on OM3 and 100m on OM4

- I believe that the SR variant supports the goal for the maximum link length MMF 100G switch-to-switch interconnect

- I **DO NOT** believe that the VR variant supports the goal for the minimum cost MMF 100G switch-to-server interconnects

Concerns with D1.2 – inclusion of 940nm

- My understanding is that the motivation for the inclusion of 940nm VCSELs is the belief that it will lower costs because it expands the number of VCSEL suppliers
- 940nm 3D sensing VCSELs must be redesigned for this application
- Inclusion of both 850nm and 940nm VCSELs will require an InGaAs detector
  - Requires AR coating that is not trivial
  - Adds cost
  - Is not backward compatible
- **Does the inclusion of 940nm VCSELs really lower costs?**

Concerns with D1.2 – VR vs. SR

- Key differences
  - Tx center wavelength is 842-948nm for VR and 844-863nm for SR
    - This seems to complicate the VR solution and could result in higher cost for VR
  - Spectral width on VR is 0.65nm vs 0.60nm on SR
    - Does this result in a significant cost difference?
  - Rx center wavelength is 842-948nm for both VR and SR
    - There are other subtle differences, e.g. average receiver power and receiver sensitivity but I don't know the cost impact of these differences
    - This seems to complicate both the VR and SR solutions and could result in higher cost for both VR and SR

- **Is VR really needed?**
  - VR supports 30m on OM3 and 50m on OM4
  - SR supports 60m on OM3 and 100m on OM4
  - What costs more?
    - VR on 50m of OM4 or SR on 60m of OM3?

Concerns with D1.2 – Specified chromatic dispersion

- In abbott_3db_adhoc_01_080620 noted that
  - Round robin results measuring chromatic dispersion used OM3 and OM4 fiber in the development of OM5 that allowed for tighter bounds on chromatic dispersion
  - The results were incorporated into the standards specifications for OM5 fiber
- The results also apply to the OM3 and OM4 fiber measured but were not modified at the time
  - A contribution has been submitted to revise IEC 60793-2-10 to reflect the updated values
- The revision of the fiber specification is currently at CDV and closes 10/1/2021 (final stage of balloting) with publication to follow
  - It is supported by all fiber manufacturers
  - It will be complete before IEEE 802.3db is completed

- **We need to reflect the actual chromatic dispersion specifications for OM3, OM4 in IEEE 802.3db (essentially the current OM5 specification applies to all fiber types)**

Concerns with D1.2 – MPO connector options

- In IEEE 802.3cm, we decided to only allow flat connector interfaces
  - Despite request from Google to specify angled on 400GBASE-SR8 for improved BER performance

- Now in IEEE 802.3db, we have decided to allow two options for the MDI requirement for 200GBASE-VR2, 400GBASE-VR4, 200GBASE-SR2 and 200GBASE-SR4
  - Option A for angled physical contact fiber interface
  - Option B for flat physical contact fiber interface
- It is believed that this will cause problems in the market if there is no means to distinguish between the options

- **We should pick one MDI interface, either flat or angled**

Summary

- The requirement to support multiple wavelengths seems to increase costs not lower costs
  - A single wavelength is preferred
- It is not clear that our current VR variant will address minimum cost MMF 100G switch-to-server interconnects
  - If it cannot be demonstrated that VR is substantially lower cost, we should only specify SR
- We should correct the chromatic dispersion specification in D1.2 to be the same across OM3, OM4 and OM5
- The specification of both flat and angled connectors in the standard is not recommended
  - While it is believed that both will exist in the market, IEEE 802.3db should recommend one or the other but not both


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