802.3cd Next Steps

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Where are we now?

- 802.3cd project fully approved with a set of objectives, CSD and PAR (5/2) enabling first TF meeting in May (Whistler)
- Project Documentation
  - PAR: http://www.ieee802.org/3/cd/P802.3cd.pdf
  - CSD: https://mentor.ieee.org/802-ec/dcn/16/ec-16-0060-00-ACSD-802-3cd.pdf
  - Objectives: http://www.ieee802.org/3/cd/P802d3cd_objectives_v3.pdf
  - Timeline: http://www.ieee802.org/3/cd/P802d3cd_timeline.pdf

Adopted Objectives (1 of 2)

- Support full-duplex operation only
- Preserve the Ethernet frame format utilizing the Ethernet MAC
- Preserve minimum and maximum FrameSize of current IEEE 802.3 standard
- Support optional Energy-Efficient Ethernet operation
- Provide appropriate support for OTN
- Support a MAC data rate of 50 Gb/s and 100 Gb/s
- Support a BER of better than or equal to 10^{-12} at the MAC/PLS service interface (or the frame loss ratio equivalent) for 50 Gb/s and 100 Gb/s operation
- Support a MAC data rate of 200 Gb/s
- Support a BER of better than or equal to 10^{-13} at the MAC/PLS service interface (or the frame loss ratio equivalent) for 200 Gb/s operation

Adopted Objectives (2 of 2)

50 Gb/s Ethernet PHYs

- Define single-lane 50 Gb/s PHYs for operation over
  - copper twin-axial cables with lengths up to at least 3m.
  - printed circuit board backplane with a total channel insertion loss of <= 30dB at 13.28125 GHz.
  - MMF with lengths up to at least 100m
  - SMF with lengths up to at least 2km
  - SMF with lengths up to at least 10km

** added after TF began

100 Gb/s Ethernet PHYs

- Define a two-lane 100 Gb/s PHY for operation over
  - copper twin-axial cables with lengths up to at least 3m.
  - printed circuit board backplane with a total channel insertion loss of <= 30dB at 13.28125 GHz.
  - MMF with lengths up to at least 100m
  - SMF with lengths up to at least 500m ** adopted by TF 5/16, approved by WG 7/16
- Define a 100 Gb/s PHY for operation over SMF with lengths up to at least 2 km ** adopted by TF 5/16

200 Gb/s Ethernet PHYs

- Define four-lane 200 Gb/s PHYs for operation over
  - copper twin-axial cables with lengths up to at least 3m.
  - printed circuit board backplane with a total channel insertion loss of <= 30dB at 13.28125 GHz.
- Define 200 Gb/s PHYs for operation over MMF with lengths up to at least 100m

Where are we now?

- Many baselines proposed, reviewed and adopted so far:
  - 50 Gb/s and 100 Gb/s RS/MII, PCS, FEC and PMA;
  - EEE;
  - Auto-Negotiation;
  - AUIs: 50GAUI; CAUI-2 C2C & C2M;
  - PMDs: 50GBASE-LR; 50GBASE-FR; 50GBASE-SR; 200GBASE-SR4; Copper twin-axial cable, MDI, TX/RX PCB IL, and test fixture;
- Still to go:
  - PMDs: Electrical cable/backplane COM baseline; ← consensus building underway
  - 100G 100m MMF; ← consensus building underway
  - 100G 500m SMF; 100G 2km SMF;← consensus building underway – next slides

Towards 100GE SMF consensus

The situation so far… presentations towards the objectives

Objective: Define a two-lane 100 Gb/s PHY for operation over SMF with lengths up to at least 500m

- http://www.ieee802.org/3/cd/public/July16/welch_3cd_01a_0716.pdf

Objective: Define a 100 Gb/s PHY for operation over SMF with lengths up to at least 2 km

- Two proposals
- http://www.ieee802.org/3/cd/public/July16/cole_3cd_01a_0716.pdf
- http://www.ieee802.org/3/cd/public/July16/stassar_3cd_01a_0716.pdf
- http://www.ieee802.org/3/cd/public/July16/palkert_3cd_01_0716.pdf
- http://www.ieee802.org/3/cd/public/July16/traverso_3cd_01a_0716.pdf
- http://www.ieee802.org/3/cd/public/July16/lewis_3cd_01a_0716.pdf
- http://www.ieee802.org/3/cd/public/July16/maki_3cd_01a_0716.pdf

Straw Polls in San Diego

Objective: Define a two-lane 100 Gb/s PHY for operation over SMF with lengths up to at least 500m

Straw Poll #4: I would support adopting welch_3cd_01a_0716 as a baseline for the 100 Gb/s 500m two lane SMF objective

Yes/No/Abstain: 18 / 3 / 57

Objective: Define a 100 Gb/s PHY for operation over SMF with lengths up to at least 2 km

Straw Poll #1: For the 100 Gb/s 2km SMF baseline (pick one):

A. I support the 1x100G proposal per lewis_3cd_01a_0716.pdf

B. I support the 2x50G proposal per cole_3cd_01a_0716.pdf

C. I want more information

- Results: A:34 B:25 C:36

Key takeaway: we have work ahead

Main issues raised

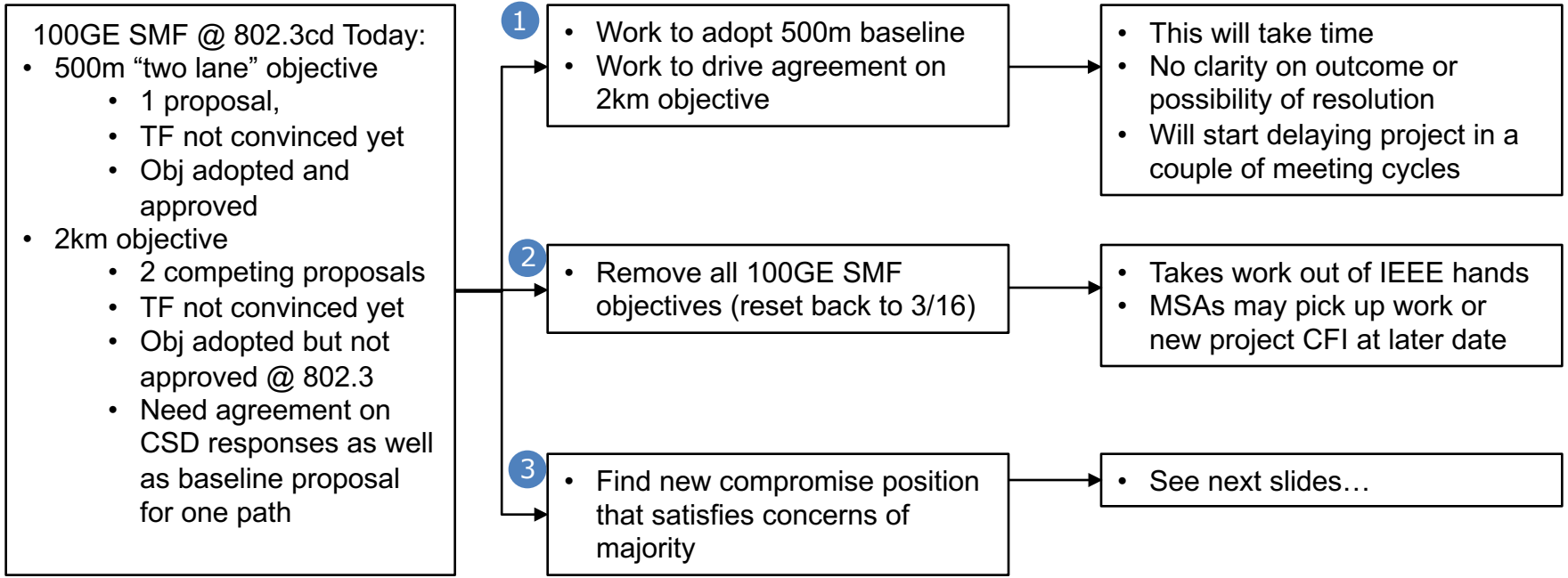
Objective: Define a two-lane 100 Gb/s PHY for operation over SMF with lengths up to at least 500m

- Some questions on target infrastructure – mostly needing more information

Objective: Define a 100 Gb/s PHY for operation over SMF with lengths up to at least 2 km

- Technical Feasibility on 100G/λ
  - PRO: incremental 1.2dB budget increase over 400G DR4
  - CON: pushing technical feasibility
- Process adherence, documentation support
  - Project documentation written when no 100GE SMF objectives were adopted in .3cd
  - CSD language therefore references 50 Gb/s per lane technology leverage
  - While the PAR does not rule any 100 Gb/s per lane technology out of scope for .3cd, many are concerned that it does not conform to the expectations set with the 802.3 WG and 802 EC.

Possible paths forward



Considerations for a compromise position

- Technical concerns about 100G/λ achieving manufacturable 2km solution
  - 100G/λ for 500m (in 802.3bs) in process and being worked
  - Technical concerns tied are also tied to the process concerns
- Two-lane 500m baseline seems to have multiple questions (per discussion in San Diego – see minutes)
- Original proposal to add new objectives (booth_3cd_01a_0516.pdf) requested 500m single lane to support breakout implementations for 400G-DR4

Potential compromise path forward 3

- Restart/refresh the 100GE SMF objectives in 802.3cd
  - 500m objective changes to single lane
    - Justification is support of 400G-DR4 breakout implementations
  - Remove 2km objective
    - Subject of future CFI or other industry activity

100 Gb/s Ethernet PHYs

- Define a two-lane 100 Gb/s PHY for operation over
  - copper twin-axial cables with lengths up to at least 3m.
  - printed circuit board backplane with a total channel insertion loss of <= 30dB at 13.28125 GHz.
  - MMF with lengths up to at least 100m
  - ~~SMF with lengths up to at least 500m~~
- Define a 100 Gb/s PHY for operation over SMF with lengths up to at least 500m

Next steps (if this path to be successful)

- First requirement – do we have general agreement on the approach?
- If no… Option 1 or 2 need proposals/contributions/support
- If yes...
  - Proposal to change objectives
  - Proposal to update/modify and support the CSD responses
  - Probably a joint motion to adopt all together
  - Request approval @ 802.3 WG meeting (followed by EC approval)
  - Stretch goal (adopt a baseline – leveraging a single-lane of 802.3bs 400G-DR4)

Questions?