10GFC Liaison Report

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10GFC Project Status

- 10GFC initially proposed to NCITS T11 in August, 1999
- Response to 10 Gigabit Ethernet project
- Intended as an alternative to 8X & possibly 4X FC
- Initial 10GFC project direction leverages 10GE
  - Adds Fibre Channel specific objectives
- Baseline proposals chosen, document started
  - 4 Optical and 1 Copper PMDs chosen in June
  - Additional Optical PMD chosen in August
  - All 10GE Logic proposals chosen in August
    - All necessary Fibre Channel extensions included

10GFC Objectives 1/2

August Changes

1. Preserve the Fibre Channel Frame Format including Size;
2. Support a Data/Payload rate of approximately 10 Gbps. An integer multiple of 1X FC is desired;
3. Support Media selected from ISO/IEC 11801;
4. Provide a family of Physical Layer specifications to meet the following requirements:
   (a) Short-haul copper;
   (b) Short-haul optical;
   (c) Medium-haul optical;
   (d) Long-haul optical.

10GFC Objectives 2/2

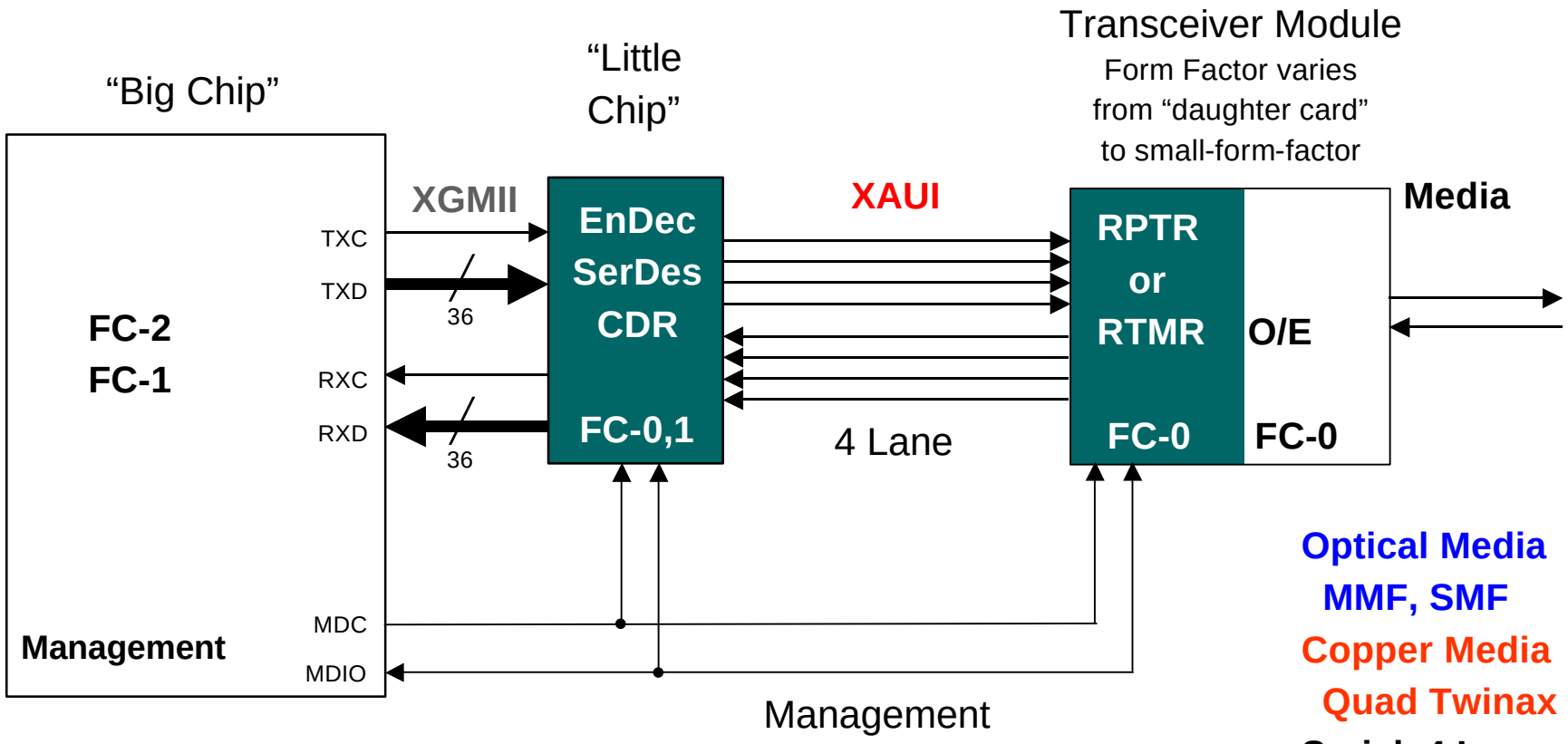
August Changes

5. Provide the following interfaces:
   a) Disk drive physical interface;
   b) Removable small form factor transceivers;
   c) New small form factor copper connector;
   d) Interfaces to enable migration from legacy FC rates.
6. Additional requirements discovered in the development of this standard.

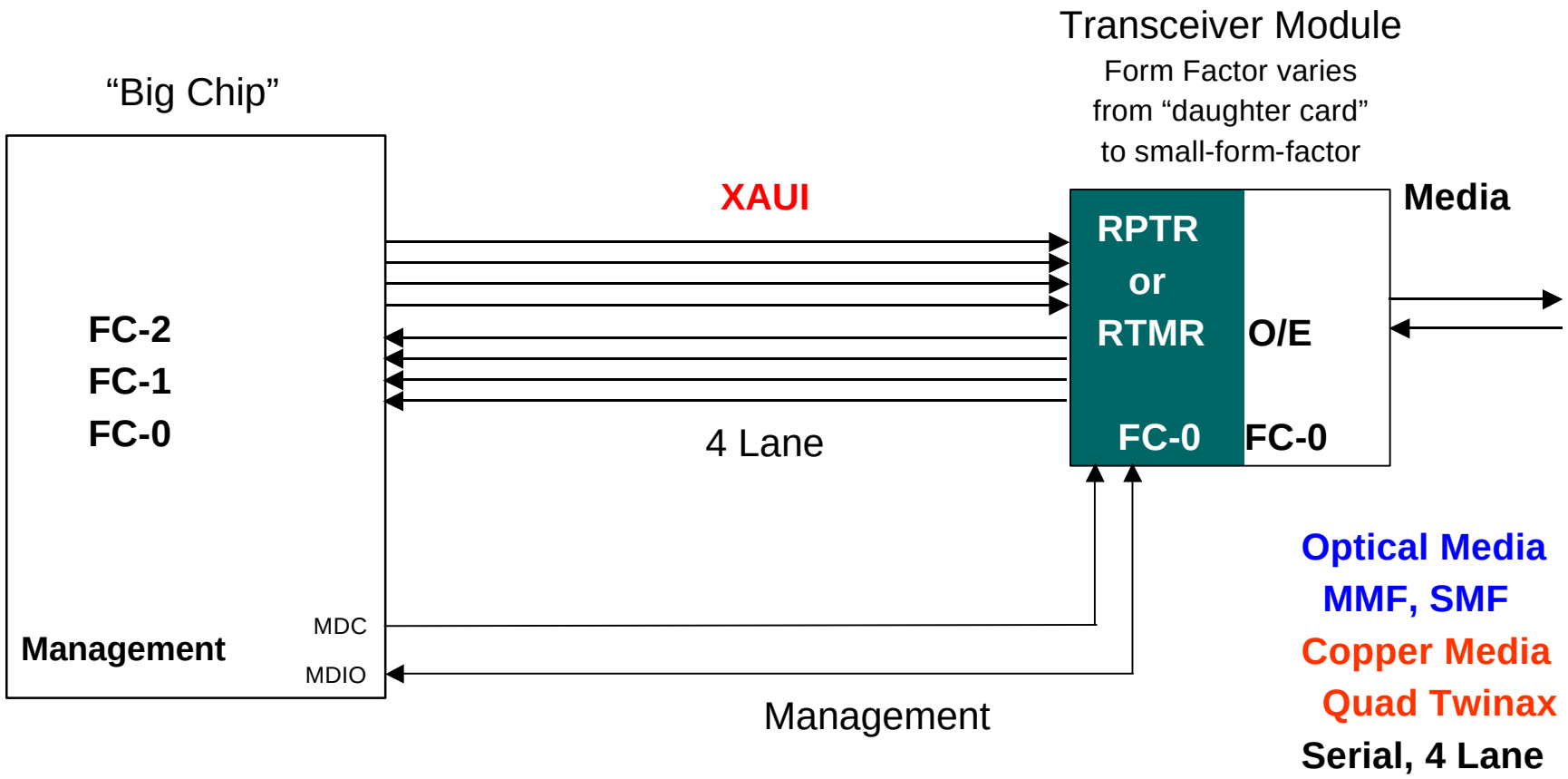
10GFC Activity

- 10GFC work split between T11.2 and T11.3
  - 10GFC document assigned to the 10GFC WG
  - T11.2 works physical layer issues
  - T11.3 works protocol, ULP and management issues
- Bob Snively, Brocade, 10GFC chair
- Rich Taborek, nSerial, 10GFC editor
  - Craig Stuber, JNI, 10GFC co-editor
- Bi-monthly meetings on even months currently
  - May go to monthly meetings to handle workload if necessary

10GFC Implementation Example



10GFC Integrated XAUI Example



Accepted 10GFC PMD Baseline

- 1310 nm Serial
- 1310 nm WDM
- 850 nm Serial
- 850 nm WDM
- 850 nm Parallel (4 lane) Optics
- Parallel (4 lane) Copper

Yes, there are too many PMDs, but none are clear winners.
All need further development. All have committed workers.
PMD selection process may be implemented at a later date

Accepted 10GFC Logic Baseline

- XAUI - 4 Lane Serial Coding & Signaling
- XGMII - Optional FC-1 Parallel Interface
- 64B/66B - 1 Lane Serial Coding
- XBI - Optional Serial FC-0 Parallel Interface
- Management Interface and Register Set
- LSS - Link/Cable Management Signaling
- FC Compatibility: Data/Line Rate, Initialization, Ordered-Sets, Primitive Sequences, Retiming
- Parallel (4-lane) Copper Equalization

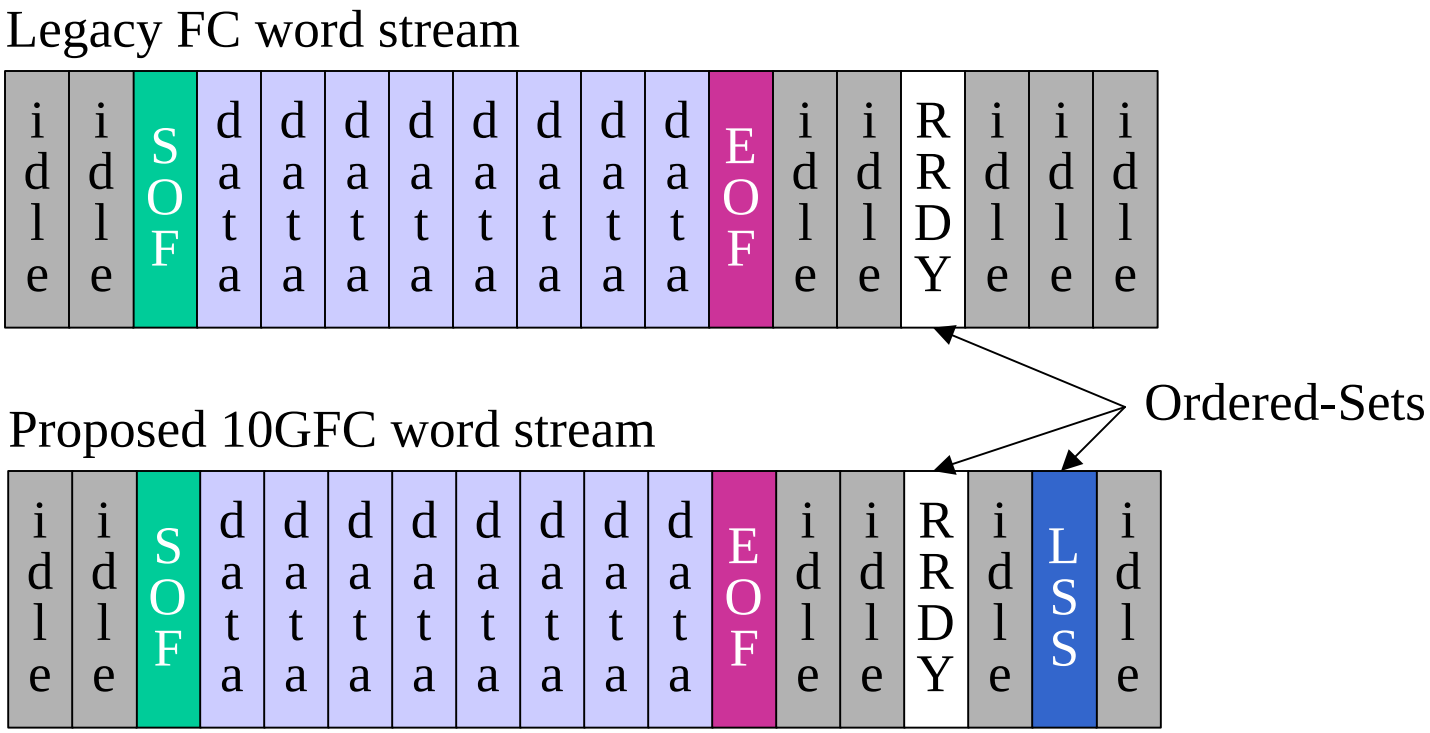
10GFC Baseline Complete. Ready for 10GFC draft 1

10GFC Data/Line Rate

- Get the most out of 10GFC: 10 Gbps or more
  - Leverage highest rate of new 10 Gbps components
  - Desire to move forward in integral multiples of FC 1X rate
  - 12 x 1.0625 Gbps = 12.75 Gbps line, 10.2 Gbps data rate
  - 2% faster than 10GE rates; identical components.
  - It's 12X FC, not 10X FC. Corresponds to FC2400.
- 1 Lane Serial medium line rate is 10.51875 Gbps/GBaud
- 4 Lane medium/PCB line rate is 3X FC per Lane
  - 3.1875 Gbps/GBaud

Ordered-Sets, FC-1 Word Streams

- 10GFC compatibly at FC-1 Signal level



Related Work

- Loop Support:
  - 10GFC Baseline provide full Loop support
- Transceiver Module Form Factor
  - SFF feasible now for 850 nm Parallel Optics and Copper
  - Feasible for other Physical variants in due time
  - XGP activity to develop SFF modules with XAUI interface underway
- 10GFC Parallel Optics and Copper connectors
  - None in FC currently. Call for proposals.

FC Disk Drive Interfaces

- Marketing direction to keep increasing disk drive interface speeds.
  - 10GFC inside the cabinet proposal uses 4-3X FC lanes
  - 4X FC optical specs in FC-PI. No 4X FC copper specs.
  - Joint T11.2/T11.3 direction supports 4X Cu investigation
  - FCIA supports 4X FC Cu to the disk drive
- Dual data rate direction:
  - Intracabinet (disk drive): 1X, 2X, 4X
  - Intercabinet: 1X, 2X, 12X (10GFC)