IEEE 802.3WG
Closing Plenary Report

IEEE P802.3bj

100 Gb/s Backplane and Copper Cable

Task Force

John D'Ambrosia

Dell

San Antonio, TX, USA, Nov 2012

The Team

John D'Ambrosia	Task Force Chair
Adam Healey	Chief Editor, Clauses 1, 69, 73, 91, 93, Annexes 91A, 93A, 93B
Hugh Barrass	Clauses 30, 45, 74, 78–85, Annexes 83A, 83C
Matt Brown	Clause 94
Chris DiMinico	Clause 92, Annex 92A
Kent Lusted	Task Force Secretary

Reflector and Web

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- Task Force web page URL:

  http://www.ieee802.org/3/bj/index.html

IEEE P802.3bj 100 Gb/s Backplane and Copper Cable Task Force Project Documents

- PAR
  - http://www.ieee802.org/3/bj/PAR_approved_0911.pdf
  - Draft PAR modification (pending 802 EC/SA-STDBD approval)- http://www.ieee802.org/3/bj/P802_3bj_PAR_modification_101012.pdf
  - Approved by TF this mtg - http://www.ieee802.org/3/bj/public/nov12/P802_3bj_PAR_modification_12_1114.pdf
- 5 Criteria (pending 802 EC Approval)
  - http://www.ieee802.org/3/bj/5C_0712.pdf
  - Approved by TF this mtg - http://www.ieee802.org/3/bj/public/nov12/5C_1112.pdf
- Objectives
  - http://www.ieee802.org/3/bj/objectives_0712.pdf

Task Force Private Area

- URL: http://www.ieee802.org/3/bj/private/index.html
  - Username: XXXXXX
  - Password: XXXXXXXX
- Write it down…
- Note - The drafts within are posted for your review only, and neither the drafts nor access information should be copied or redistributed to others in violation of document copyrights.

IEEE P802.3bj Task Force Objectives: Update

- Support full-duplex operation only
- Preserve the 802.3 / Ethernet frame format utilizing the 802.3 MAC
- Preserve minimum and maximum FrameSize of current 802.3 standard
- Support a BER of better than or equal to 10^{-12} at the MAC/PLS service interface
- Define a 4 lane PHY for operation over a printed circuit board backplane with a total channel insertion loss of <= 35 dB at 12.9 GHz
- Define a 4 lane PHY for operation over a printed circuit board backplane with a total channel insertion loss of <= 33 dB at 7.0 GHz
- Define a 4-lane 100 Gb/s PHY for operation over links consistent with copper twin-axial cables with lengths up to at least 5m.
- To define optional Energy-Efficient Ethernet operation for 100G Backplane and Twinaxial cable PHYs specified in P802.3bj
- To define optional Energy-Efficient Ethernet operation for 100GBASE-CR10
- To define optional Energy-Efficient Ethernet operation for 40GBASE-CR4 and 40GBASE-KR4

This Week's Progress

- 61 attendees
- Responded to comments received against PAR / 5C
  - Modified
    - PAR: Section 8.1
    - 5C Responses: Compatibility
- Comment Resolution
  - Resolved 408 comments
  - Heard 21 technical presentations
- Generation of D1.3
- Adopted new timeline
- Lay the ground work for the next meeting

Following Comments Received
WG11 Review – posted by Jon Rosdahl

Nov 2012

802.3bj

- **The Note for Item 0 is not necessary in 8.1.**
- **Suggest that you don't add the 5.2 comment in 8.1.**
- **Include in 8.1 an explanation of the changes being requested.**
- **5C: Suggest that you change the answer to the Compatibility question from Yes to No, and delete "The P802.3bj PAR mandates that" from the start of that bullet.**

- **Addressing the compatibility in one place should be sufficient.**

Response

Accept all comments

- Remove Note in 8.1 for Item 0
- Remove Note in 8.1 for Item 5.2b
- Add the following note in 8.1 “Item 5.2b – scope has been expanded to allow the addition of optional Energy Efficient Ethernet (EEE) for 40 Gb/s and 100 Gb/s operation over backplanes and copper cables.”
- In 5C Compatibility Response –
  - Change “The P802.3bj PAR mandates that the amendment shall comply with IEEE Std 802, IEEE Std 802.1D and IEEE Std 802.1Q.” to “The amendment shall comply with IEEE Std 802, IEEE Std 802.1D and IEEE Std 802.1Q.”

IEEE 802.3 Five Criteria

The IEEE 802 Criteria for Standards Development (Five Criteria) are defined in subclause 12.5 of the ‘IEEE project 802 LAN/MAN Standards Committee (LMSC) operations manual’. These are supplemented by subclause 7.2 ‘Five Criteria’ of the ‘Operating Rules of IEEE Project 802 Working Group 802.3, CSMA/CD LANs’.

Broad Market Potential

A standards project authorized by IEEE 802 LMSC shall have a broad market potential. Specifically, it shall have the potential for:

a) Broad sets of applicability.
b) Multiple vendors and numerous users.
c) Balanced costs (LAN versus attached stations).

- Ethernet has become widely deployed as a preferred backplane solution. Examples include Modular Servers and Enterprise and Telecom Network Equipment. Ethernet is also widely deployed over twinaxial copper cables for both intra-rack and inter-rack connections.
- Internet, cloud, and higher performance computing applications, along with advances in processors, server virtualization and converged networking, are driving the need for higher bandwidth blade and rack server connections. Increasing the backplane data rate to 100 Gb/s and providing cost effective 100 Gb/s rack server solutions are required to maintain pace with new demands.
- 120 participants attended the “100 Gb/s Ethernet Electrical Backplane and Twinaxial Copper Cable Assemblies” Call-For-Interest, representing at least 43 companies. This level of interest indicates that a standard will be developed by a large group of vendors and users.
- A 100 Gb/s Ethernet interface will maintain a favorable cost balance for backplane and twinaxial copper cable applications.
- Energy Efficient Ethernet will reduce the operational costs and the environmental footprint of Ethernet Systems.

Compatibility

- **IEEE 802 LMSC defines a family of standards. All standards should be in conformance : IEEE Std 802, IEEE 802.1D, and IEEE 802.1Q. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with IEEE 802.1 Working Group. In order to demonstrate compatibility with this criterion, the Five Criteria statement must answer the following questions. Each standard in the IEEE 802 family of standards shall include a definition of managed objects that are compatible with systems management standards.**
  - **a) Does the PAR mandate that the standard shall comply with IEEE Std 802, IEEE Std 802.1D and IEEE Std 802.1Q?**
  - **b) If not, how will the Working Group ensure that the resulting draft standard is compliant, or if not, receives appropriate review from the IEEE 802.1 Working Group**
- **Compatibility with IEEE Std 802.3**
- **Conformance with the IEEE Std 802.3 MAC**
- **Managed object definitions compatible with SNMP**

- The P802.3bj PAR ~~mandates that the amendment~~ shall comply with IEEE Std 802, IEEE Std 802.1D and IEEE Std 802.1Q.
- As an amendment to IEEE Std 802.3, as amended by IEEE Std 802.3ba-2010, the proposed project will remain in conformance with clause 80 introduced by IEEE Std 802.3ba-2010.
- The proposed amendment will conform to the full-duplex operating mode of the IEEE 802.3 MAC.
- The proposed amendment will conform to the 40 Gb/s and 100 Gb/s Media Independent Interfaces (XLGMII, CGMII) specified by IEEE Std 802.3ba-2010 with optional additions for Energy Efficient Ethernet.
- The project will include a protocol independent specification of managed objects with SNMP management capability to be provided in the future by an amendment to or revision of IEEE P802.3.1.

Distinct Identity

Each IEEE 802 LMSC standard shall have a distinct identity. To achieve this, each authorized project shall be:

a) Substantially different from other IEEE 802 standards.

b) One unique solution per problem (not two solutions to a problem).

c) Easy for the document reader to select the relevant specification.

d) Substantially different from other IEEE 802.3 specifications/solutions.

- There is no standard that supports Ethernet on backplane media at operating speeds of 100 Gb/s. While IEEE Std 802.3ba-2010 does include a specification for 100 Gb/s Ethernet on twinaxial copper cables (100GBASE-CR10) the cables are bulky and relatively costly due to the fact that they are constructed with twenty twinaxial wire pairs.
- The standard will define one PHY for twinaxial copper cables, one PHY as an upgrade path for 40 Gb/s backplane applications targeting existing channel loss specifications within IEEE Std 802.3 and one PHY for next generation backplane media with a reduced insertion loss.
- The proposed amendment to the existing IEEE 802.3 standard will be formatted as a collection of new clauses, making it easy for the reader to select the relevant specification.
- IEEE Std 802.3 does not define Energy Efficient Ethernet for 40 Gb/s or 100 Gb/s operation

Technical Feasibility

For a project to be authorized, it shall be able to show its technical feasibility. At a minimum, the proposed project shall show:

a) Demonstrated system feasibility.
b) Proven technology, reasonable testing.
c) Confidence in reliability.

- Systems with an aggregate bandwidth of greater than or equal to 100 Gb/s have been demonstrated and deployed in operational networks.
- The proposed project will build on the array of Ethernet component and system design experience, and the broad knowledge base of Ethernet network operation.
- Component vendors have presented data on the feasibility of the necessary components for this project. Proposals, which either leverage existing technologies or employ new technologies, have been provided.
- The reliability of Ethernet components and systems can be projected in the target environments with a high degree of confidence.

Economic Feasibility

For a project to be authorized, it shall be able to show economic feasibility (so far as can reasonably be estimated) for its intended applications. At a minimum, the proposed project shall show:

a) Known cost factors, reliable data.
b) Reasonable cost for performance.
c) Consideration of installation costs.

- The cost factors for Ethernet components and systems are well known. The proposed project may introduce new cost factors which can be quantified.
- Prior experience in the development of backplane and twinaxial physical layer specifications for Ethernet indicates that the specifications developed by this project will entail a reasonable cost for the resulting performance.
- 100 Gb/s backplane and twinaxial copper links will make it possible to achieve the desired density, power and cost targets for computer systems and network equipment.
- In consideration of installation costs, the project is expected to use proven and familiar media, including electrical backplanes, and twinaxial copper cabling technology.
- Network design, installation and maintenance costs are minimized by preserving network architecture, management, and software.

TF Motion Related to PAR / 5C Changes

- Move to:
  - Approve responses to comments received against P802.3bj PAR as stated in dambrosia_3bj_01_1112.pdf on slide 3
  - Approve the changes to PAR as noted in P802_3bj_PAR_modification_12_1114.pdf
  - Approve changes to 5 Criteria as noted on Slide 3 (Compatibility) of 5C_1112.pdf

M: K. Lusted
S: A. Healey
Technical (75%)
All in the room --- Y: 32 N: 0 A: 0
Results: PASSES!

WG Motion #6

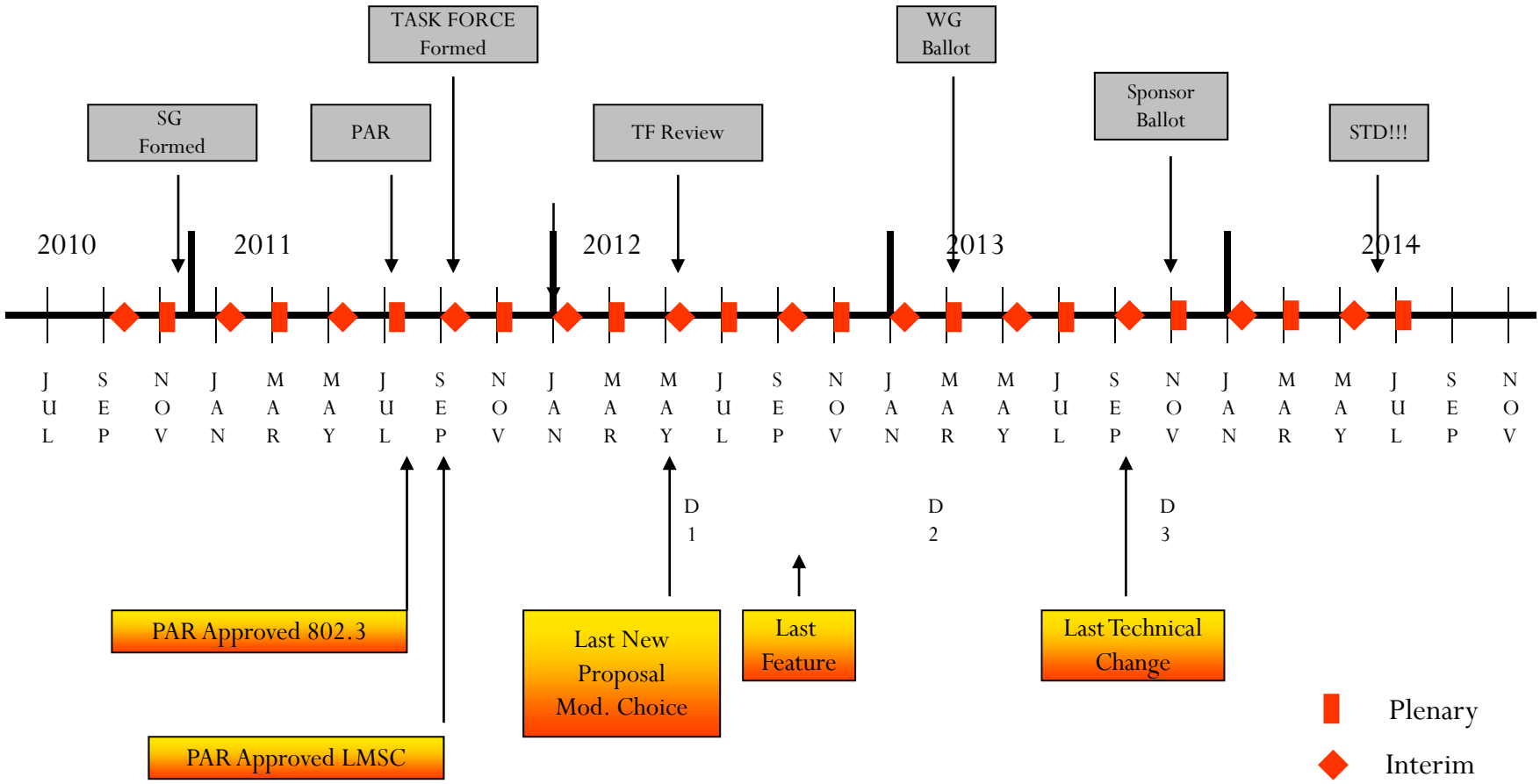
Move that 802.3 approve the revisions to

- IEEE P802.3bj PAR, as per http://www.ieee802.org/3/bj/public/nov12/P802_3bj_PAR_modification_12_1114.pdf
- IEEE P802.3bj Task Force 5 Criteria Responses, as per 1112_bj_close_report.pdf

Technical (>=75%)
Moved by: John D'Ambrosia on behalf of the Task Force

802.3 Voters (Y/N/A): 83/0 / 2
Motion Passes

Adopted Timeline



TF Motion

- Move to:
  - Adopt proposed responses to remaining “non-controversial” comments as indicated in healey_3bj_01_1112.pdf
  - Generate Draft 1.3 from Draft 1.2 and closed comments
  - Initiate fourth Task Force review

- M: K. Lusted
- S: M. Brown
- Technical (> 75%)
- All in the room Y: 33, N: 0, A: 1
- Results: PASSES

Moving Forward

- Generate D1.3
- Schedule D1.3 Pending Editorial Review
- Prepare offline consensus on refinement of D1.3

Thank You!