
10 Gb/s Ethernet on FDDI-grade MM Fiber Study Group Closing Session

**Bruce Tolley
Cisco Systems**

Ground Rules

- 802.3 Rules apply
 - Foundation based upon Robert's Rules of Order
- Anyone in the room may speak
- Anyone in the room may vote
- **RESPECT**... give it, get it
- NO product pitches
- NO corporate pitches
- NO prices!!!
 - This includes costs, ASPs, etc. no matter what the currency
- NO restrictive notices

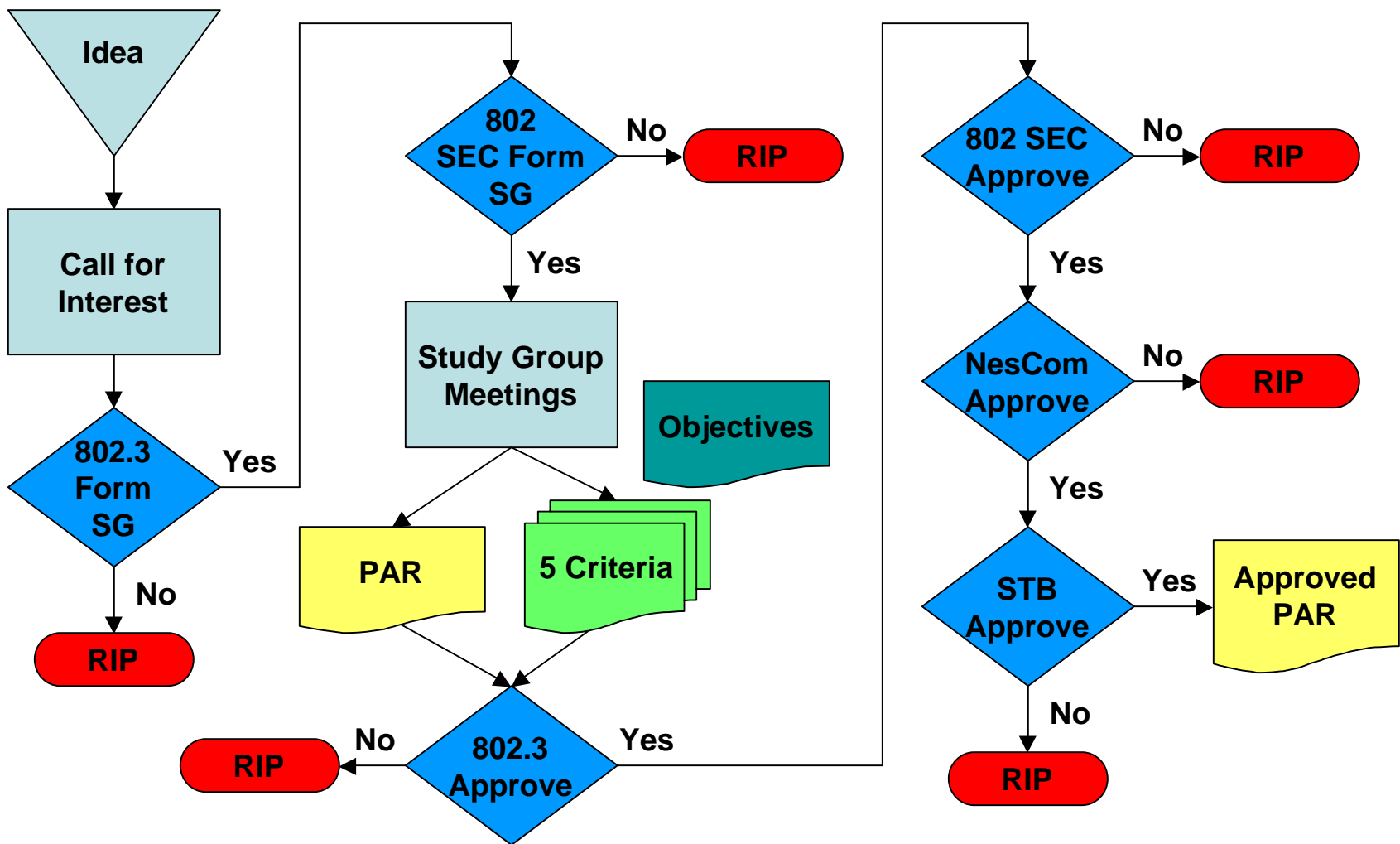
Agenda

- Approval of the minutes
- Moving from SG to TF: Bruce Tolley
- Strawman Schedule: John Jaeger/David Cunningham
- Feedback from 802.3: Bruce Tolley
- Nomenclature and choice of port type name
- Motion Madness
- Preparing baselines: David Cunningham
- Meeting planning for May Interim

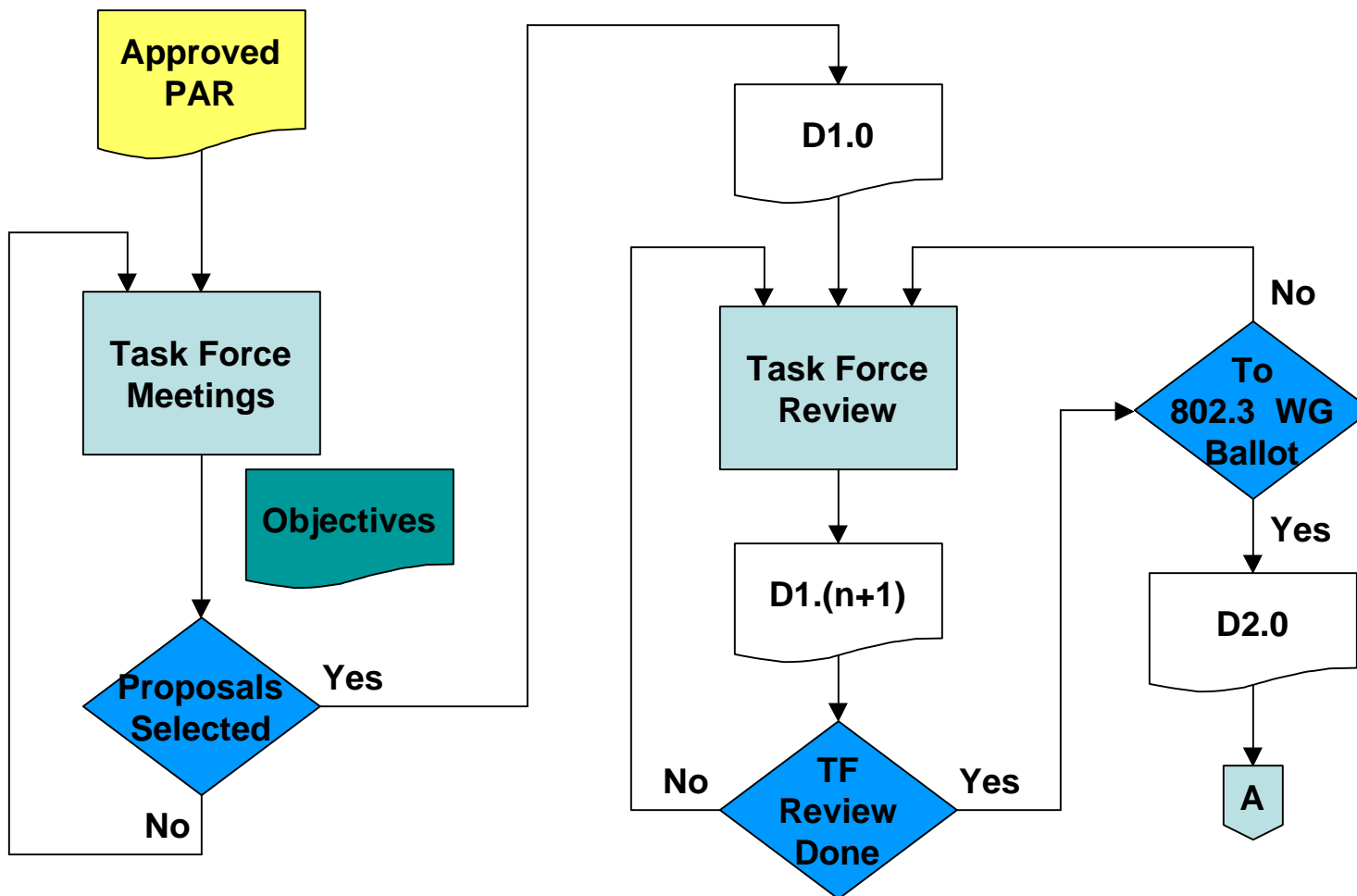
Minutes

- Move to approve the minutes of the 10G MMF SG Vancouver Interim
- M:
- S:
- Approved by acclamation

Our SG Job: IEEE Standards Process



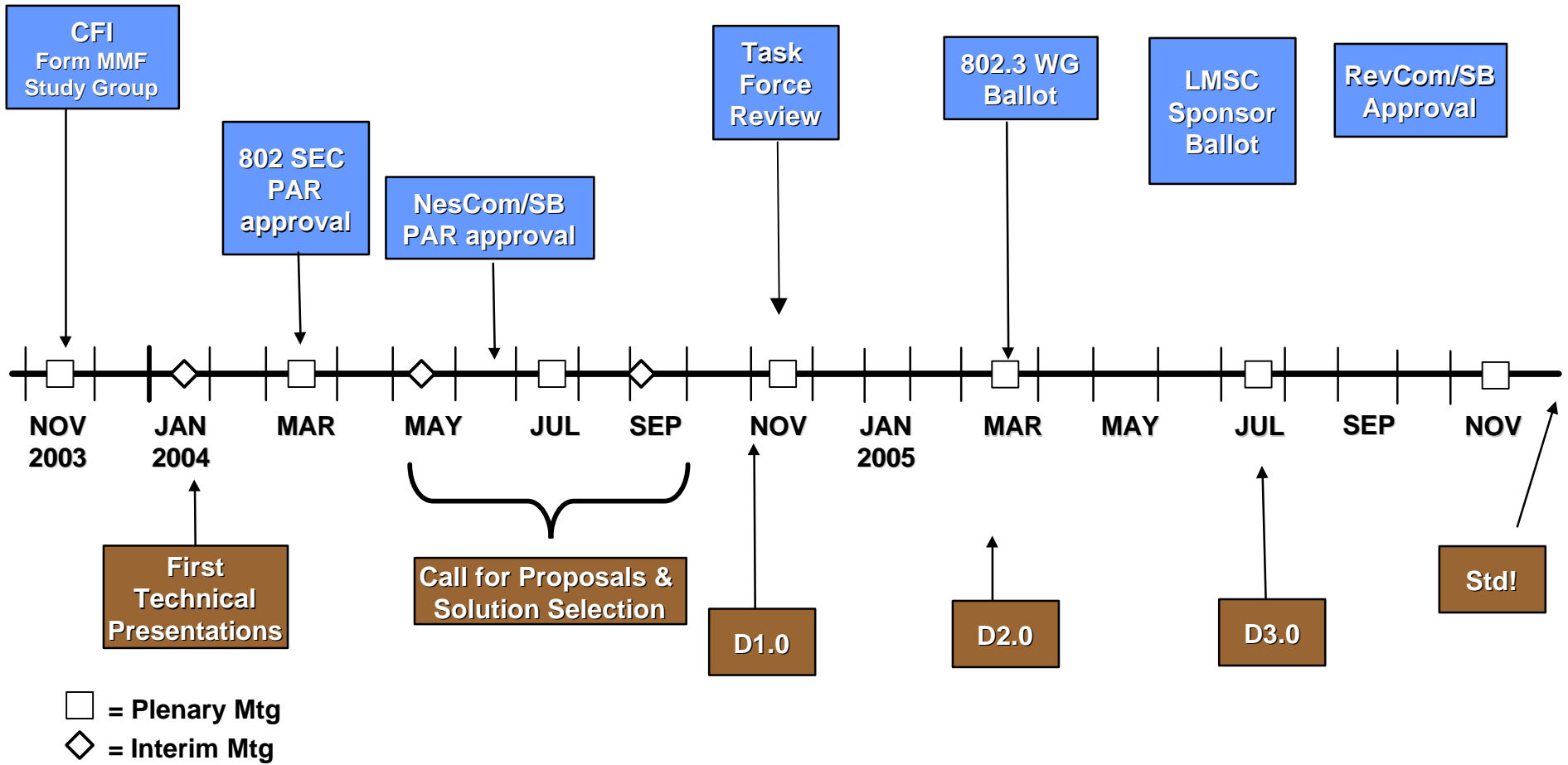
IEEE Standards Process (cont.)



IEEE 802.3 Process

- Goal: creation of a document that is backed by sound technical consensus
- Consensus:
 - Proposal driven
 - Proposals with multiple contributor names and multiple company names
 - Backed by data
 - Build on past work
 - Persuade others that your position is technically sound
 - Gain the backing of over 75% of the room
 - **In the end there should and can be only one**

Strawman: 10GBASE-LRM Draft Timeline



Feedback from 802.3 Members

- Priority 1:
- Project title must include port type name
- Other questions/concerns
 - Distance statement in PAR
 - 300 meter on MM fiber goal undermines distinct identity
 - Reference to lower power??
 - Others?

Nomenclature

- 10GBASE-LX4
 - L = wavelength or long reach
 - X = 8B/10B encoding
 - 4 = 4 wavelengths
- 10GBASE-LR
 - L = wavelength or long reach
 - R = LAN PHY
- 1000BASE-LX10
 - 10 = 10 km reach
- # – number of wavelengths, number of pairs, or for reach ($\# * 100\text{m}$ or $\# * \text{km}$)

- BASE – baseband transmission
- BROAD – broadband transmission
- PASS – passband transmission
- A – unused
- B – bidirectional long wavelength (1310nm & 1490nm) optics (was used for backbone in 10BASE-FB)
- C – coax copper
- D – downstream
- E – extended wavelength (1550nm)
- F – fiber
- G – gigabit
- H – unused

Nomenclature

- I – do not use
- J – unused
- K – unused
- M – unused
- N – unused
- O – do not use
- P – passive optical network
- Q – do not use
- R – 64B/66B coding scheme
- S – short wavelength (850nm) or short reach
- T – twisted-pair copper
- U – upstream
- V – unused
- W – WAN
- X – block coding scheme
- Y – unused
- Z – unused

Options

- We have to use R
 - because we are using 10GBASE PCS

Options

- 10GBASE-LRQ
- 10GBASE-LRM
- 10GBASE-LRZ
- 10GBASE-MR
- 10GBASE-FR

Criteria for Port Type Choice

- Consistency with 10GbE
 - Use L and R, not M
- Clear communication of interoperability
 - Will someone expect to be able plug LRQ into LR?
- Legible labels / manufacturing friendly
 - Will Q be legible as a Q when stamped on metal or printed on label?

Straw Poll: Chicago rules

- 10GBASE-LRQ: Yes 8
- 10GBASE-LRM Yes 29
- 10GBASE-LRZ Yes 17
- 10GBASE-MR Yes 19
- 10GBASE-FR Yes 0
- 10GBASE-MMR Yes 1
- 10GBASE-SMR Yes 0
- 10GBASE-LMR Yes 16
- 10GBASE-LM Yes 5

Straw Poll: vote for one

- 10GBASE-LRM Yes 24
- 10GBASE-LRZ Yes 6
- 10GBASE-MR Yes 16
- 10GBASE-LMR Yes 6

Title of PAR

- 4. Title of Document: Information technology -- Telecommunications and information exchange between systems -- Local and metropolitan area networks -- specific requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Amendment: Physical Layer and Management Parameters for 10 Gb/s Operation, Type 10GBASE-xx

Motion 1: Port Type Name

Move that the SG amend the title of the PAR
[http://grouper.ieee.org/groups/802/3/10GMMFSG/
draft_par_0104.pdf](http://grouper.ieee.org/groups/802/3/10GMMFSG/draft_par_0104.pdf) by deleting the letters -XX and
inserting the suffix -LRM

M: Ed Cornejo

S: Ali Ghiasi

Technical (>75%)

All: Yes: 53 No: 0 Abstain 0

802.3 Voters: Yes: 16 No: 0 Abstain: 0

Passes

Title of PAR as amended 18 March 04

- 4. Title of Document: Information technology -- Telecommunications and information exchange between systems -- Local and metropolitan area networks -- specific requirements Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications Amendment: Physical Layer and Management Parameters for 10 Gb/s Operation, Type 10GBASE-LRM

Motion 2: PAR

Move that SG request the 802.3 WG to approve the 10GBASE-LRM PAR as amended and to forward the PAR to the 802 SEC and NESCOM for approval (please consider under continuous process).

M: John Jaeger

S: Bob Zona

Technical (>75%)

All:	Yes:	53	No:	0	Abstain	0
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802.3 Voters:	Yes:	16	No:	0	Abstain:	0
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Passes

Objectives from Vancouver

- Use the existing 10GBASE-R PCS
- Support a BER of better than or equal to 10^{-12} .
- Support fiber media selected from IEC 60793-2-10: 2003
 - 62.5 μ m
 - 160/500 MHz-km (A1b, 60793-2-10: 2003)
 - 200/500 MHz-km (A1b, 60793-2-10: 2003)
 - 50 μ m
 - 500/500 MHz-km (A1a.1, 60793-2-10: 2003)
 - 400/400 MHz-km (A1a.1, 60793-2-10: 2003)
 - 1500/500 MHz-km (A1a.2, 60793-2-10: 2003)
- Provide a Physical Layer specification which supports link distances of:
 - At least 220m on installed 500MHz.km multimode fiber
 - At least 300m on multimode fiber

Motion 3

- To amend the list of objectives to insert the word “selected” before the word MM in the last bullet
- M Dan Dove
- S John Jaeger

Technical (>75%)

All: Yes: 49 No: 0 Abstain 2

802.3 Voters: Yes: 16 No: 0 Abstain:0

Passes

Objectives as amended 18 Mar 04

- Use the existing 10GBASE-R PCS
- Support a BER of better than or equal to 10^{-12} .
- Support fiber media selected from IEC 60793-2-10: 2003
 - 62.5 μ m
 - 160/500 MHz-km (A1b, 60793-2-10: 2003)
 - 200/500 MHz-km (A1b, 60793-2-10: 2003)
 - 50 μ m
 - 500/500 MHz-km (A1a.1, 60793-2-10: 2003)
 - 400/400 MHz-km (A1a.1, 60793-2-10: 2003)
 - 1500/500 MHz-km (A1a.2, 60793-2-10: 2003)
- Provide a Physical Layer specification which supports link distances of:
 - At least 220m on installed 500MHz.km multimode fiber
 - At least 300m on **selected** multimode fiber

Motion 4: Objectives

Move that the SG request 802.3 to approve the objectives document as amended

M: John Jaeger

S: Bob Zona

Technical (>75%)

All: Yes: 48 No: 0 Abstain 0

802.3 Voters

Yes: 16 No: 0 Abstain:0

Passes

10Gb/s on FDDI-grade MMF Cable

Five Criteria

Adopted by SG 14 Jan 2004

Motion 5: BMP Criterion

Move that the SG request 802.3 to approve
the broad market potential criterion per

http://grouper.ieee.org/groups/802/3/10GMMFSG/5_criteria_1_0104.pdf

M: John Jaeger

S: Bob Zona

Technical (>75%)

All: Yes: 40 No: 0 Abstain:3

802.3 Voters

Yes: 12 No: 0 Abstain:2

Passes

Compatibility with IEEE Standard 802

- IEEE 802 defines a family of standards. All standards shall be in conformance with the IEEE 802.1 Architecture, Management and Interworking documents as follows: 802. Overview and Architecture, 802.1D, 802.1Q and parts of 802.1f. If any variances in conformance emerge, they shall be thoroughly disclosed and reviewed with 802.
- Each standard in the IEEE 802 family of standards shall include a definition of managed objects which are compatible with systems management standards.

The proposed standard will conform to the full-duplex operating mode of the 802.3 MAC. In a manner similar to the 10GBASE fiber standards, a Physical layer will be defined for operation at 10Gb/s over structured fiber cabling.

The proposed standard will conform to the requirements of IEEE Std 802-2001. Conformance with 802.1 and 802.2 is provided by use of the overlying 802.3 MAC sub-layer.

The Management Information Base (MIB) for the 10Gb/s on FDDI-grade multimode fiber PHY will maintain compatibility with the current 802.3 MIB, allowing a consistent management model at all operating speeds.

Motion 6: Compatibility Criterion

Move that the SG request 802.3 to approve
the compatibility potential criterion per

http://grouper.ieee.org/groups/802/3/10GMMFSG/5_criteria_1_0104.pdf

M: John Jaeger

S: Bob Zona

Technical (>75%)

All: Yes: 45 No: 0 Abstain 0

802.3 Voters

Yes: 14 No: 0 Abstain:0

Passes

Distinct Identity

- Substantially different from other IEEE 802 & 802.3 standards
- One unique solution per problem (not two solutions to a problem)
- Easy for the document reader to select the relevant specification

The proposed standard is a 10Gb/s upgrade for 802.3 users based on the 802.3 CSMA/CD MAC.

Currently the industry is moving towards smaller form factor serial solutions, and it is expected that with time these will become dominant. This multimode PHY will be the only one that supports a link distance of at least 220m over installed FDDI-grade multimode fiber and pluggability at the 10GBASE-R PMA interface.

The proposed standard will be formatted as a new clause to the 802.3 standard.

Motion 7

- To amend the distinct identity criterion by replacing the words “pluggability at “with the words “compatibility with” and add at the end of the sentence “which will be the attachment unit interface (AUI) for this PMD.”

- M Dan Dove
- S Lew Aronson

Technical (>75%)

All: Yes: 41 No: 0 Abstain 2

802.3 Voters: Yes11: No: 0 Abstain:2

Passes

Motion 8

- To amend the distinct identity criterion by replacing the words “pluggability at “ with the words “compatibility with” and add at the end of the sentence “which will be the attachment unit interface (AUI) for this PMD.”

- M Dan Dove
- S Lew Aronson

Technical (>75%)

All: Yes: 41 No: 0 Abstain 2

802.3 Voters: Yes11: No: 0 Abstain:2

Passes

Distinct Identity as Amended

- Substantially different from other IEEE 802 & 802.3 standards
- One unique solution per problem (not two solutions to a problem)
- Easy for the document reader to select the relevant specification

The proposed standard is a 10Gb/s upgrade for 802.3 users based on the 802.3 CSMA/CD MAC.

Currently the industry is moving towards smaller form factor serial solutions, and it is expected that with time these will become dominant. This multimode PHY will be the only one that supports a link distance of at least 220m over installed FDDI-grade multimode fiber **and compatibility with the 10GBASE-R PMA interface which will be the attachment unit interface (AUI) for this PMD.**

The proposed standard will be formatted as a new clause to the 802.3 standard.

Distinct Identity Amended 2 withdrawn

- Substantially different from other IEEE 802 & 802.3 standards
- One unique solution per problem (not two solutions to a problem)
- Easy for the document reader to select the relevant specification

The proposed standard is a 10Gb/s upgrade for 802.3 users based on the 802.3 CSMA/CD MAC.

Currently the industry is moving towards smaller form factor serial solutions, and it is expected that with time these will become dominant **as port densities increase and lower power dissipation per port is required**. This multimode PHY **will meet these system requirements. This PHY will be distinct because it supports** a link distance of at least 220m over installed FDDI-grade multimode fiber **and is compatible with the 10GBASE-R PMA interface which will be the attachment unit interface (AUI) for the PMD**.

The proposed standard will be formatted as a new clause to the 802.3 standard.

Motion 1D withdrawn

Move to replace second paragraph of distinct ID criterion with the paragraph:

Currently the industry is moving towards smaller form factor serial solutions, and it is expected that with time these will become dominant **as port densities increase and lower power dissipation per port is required**. This multimode PHY **will meet these system requirements. This PHY will be distinct because it supports** a link distance of at least 220m over installed FDDI-grade multimode fiber **and is compatible with the 10GBASE-R PMA interface which will be the attachment unit interface (AUI) for the PMD**.

- M: Ed Cornejo
- S: Bob Zona

Technical (>75%)

All:	Yes:	No:	Abstain
802.3 Voters:	Yes:	No:	Abstain:

Passes

Motion 9: Distinct Identity Criterion

- Move that the SG request 802.3 to approve
- the distinct identity criterion as amended

M: John Jaeger

S: Bob Zona

Technical (>75%)

All: Yes: 44 No: 3 Abstain 0

802.3 Voters

Yes:13 No: 3 Abstain:0

Passes

Technical Feasibility

- Demonstrated system feasibility
- Proven technology, reasonable testing
- Confidence in reliability

Presentations made to the 10Gb/s on FDDI-grade multimode fiber Study Group illustrate the technical feasibility of 10Gb/s signaling using structured fiber cabling as defined by IEC 60793-2. These presentations included several different technical approaches, covered numerous aspects of feasibility including simulation and theoretical analysis based on known technology, specified cabling technology, and state of the art process technology; and demonstrated that there is sufficient channel capacity for the transmission of 10Gb/s.

The technology to be utilized in the realization of the 10Gb/s on FDDI-grade multimode fiber PHY will rely on the work of previous 802.3 standards and activities; both extension to the multimode efforts of 1000BASE-SX/LX, and the PHY is expected to leverage available 10GBASE-R technology. It is recognized that the relevant technologies have greatly advanced at every level since the inception of work on the 1000BASE-SX/LX standard over six years ago and the original 802.3ae work from 3 years ago.

This study group has received contributions from PHY, system and cabling vendors; end users; and industry/academic experts.

Motion 10: TF Criterion

Move that the SG request 802.3 to approve
the technical feasibility criterion per

http://grouper.ieee.org/groups/802/3/10GMMFSG/5_criteria_1_0104.pdf

M: John Jaeger

S: Bob Zona

Technical (>75%)

All: Yes: 36 No: 0 Abstain: 2

802.3 Voters

Yes: 13 No: 0 Abstain: 0

Passes

Economic Feasibility

- Known cost factors, reliable data
- Reasonable cost for performance
- Consideration of installation costs

The implementation cost of the 10Gb/s on FDDI-grade multimode fiber PHY device is estimated to be lower than that of 10GBASE-LR devices. The experience curve of the industry ensures the future reduction of the size and the cost of implementations. With production volume and anticipated relaxation of optical component requirements, the 10Gb/s on FDDI-grade multimode fiber PHY device is projected to meet the 3x-4x cost versus 10x performance guidelines applied to comparable previous advanced Ethernet standards. Additionally, it is expected that serial solutions will have the highest volumes and this standard will therefore have economies of scale.

The continued use of the installed multimode structured fiber cabling systems supports economic feasibility with regards to total cost of upgrades to 10Gb/s and takes into considerations the constraints of industry IT budgets.

Motion 11: Economic Feasibility Criterion

Move that the SG request 802.3 to approve the economic feasibility criterion per

http://grouper.ieee.org/groups/802/3/10GMMFSG/5_criteria_1_0104.pdf

M: John Jaeger

S: Bob Zona

Technical (>75%)

All: Yes: 38 No: 0 Abstain3

802.3 Voters

Yes: 13 No: 0 Abstain:2

Passes

Motion 12

Move that the SG request the 802.3 WG to forward the 10GBASE-LRM Five Criteria to the 802 SEC for approval

M: John Jaeger

S: Bob Zona

Technical (>75%)

All: Yes: 40 No: 2 Abstain: 1

802.3 Voters

Yes: 13 No: 3 Abstain: 0

Passes

Motion 13: SG Interim

Move that the SG request the 802.3 WG to approve
10GBASE-LRM SG interim meeting(s)

M: John Jaeger

S: Bob Zona

Procedural

All: Yes: 43 No: 0 Abstain 0

Passes/Fails

Motion 14: Extension of SG

Move that the SG request the 802.3 WG to approve the extension of the 10GBASE-LRM SG until the close of the July Plenary.

M: John Jaeger

S: Bob Zona

Technical (>75%)

All: Yes: 49 No: 0 Abstain 0

802.3 Voters

Yes: 17 No: 0 Abstain:0

Passes/

Initial Task Force Activities and Modus Operandi

- Focus on bringing in draft **SPECIFICATION** proposals:
 - Use the 10Gigabit PMD clause as template.
 - In slide format show how your proposal would look:
 - Optical transmit and receive specifications
 - Major tables and figures
 - Outline conformance tests
 - Remember standard specifications are implementation independent:
 - » Number of taps will **not** be specified
 - » Optical launch hardware will **not** be specified
 - » Electrical power will **not** be specified.....

Task Force Activities

- **Bring in presentations documenting supporting technical evidence for the draft specification**
- **History shows that proposals with multiple supporters win:** Form interest groups: Within interest groups show a united front at standards meetings, work as a team
- **Be ready to critique competing proposals – in the end there shall be only one!**

Work Items for May Interim

- Some common issues will require team work:
- Form a Channel Definition Sub Task Force
 - *Launch conditions and static impulse response (IPR)*
 - Dynamics of IPR
 - Methods to simplify channel characterization parameters
 - **Associated implementation-independent specifications and conformance tests**

Motion 15: TF Interim

Move that the SG request the 802.3 WG authorize 10GBASE-LRM TF interim meeting(s), contingent upon approval of the PAR by 802 SEC, NESCOM, and Standards Board

M: John Jaeger

S: Bob Zona

Procedural

All: Yes: 45 No: 0 Abstain 1

802.3 voters Yes 13 No 0 Ab 2

Passes

Meeting Planning

- How many will attend a meeting the week of May 24 in Long Beach? 3
- How many will attend a meeting the week of May 24 in Monterey 25
- How many will also attend other SG or TF meetings during the Interim? 7

END