



Consensus Ad Hoc

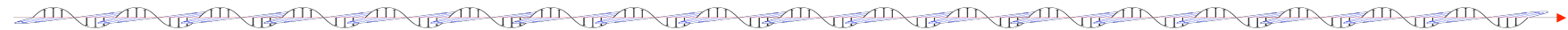
IEEE P802.3bm

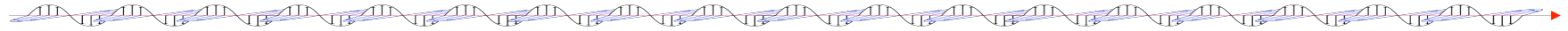
40 Gb/s and 100 Gb/s Fiber Optic Task Force

Dan Dove - Applied Micro

Pete Anslow - Ciena

25 July 2013

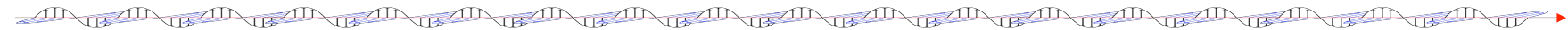


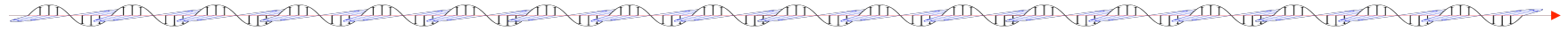


Patent Policy Review

Please see

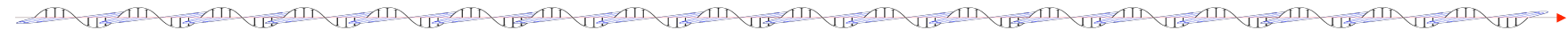
- <http://www.ieee802.org/3/patent.html>
- Notify organizer if you are unaware of the specifics



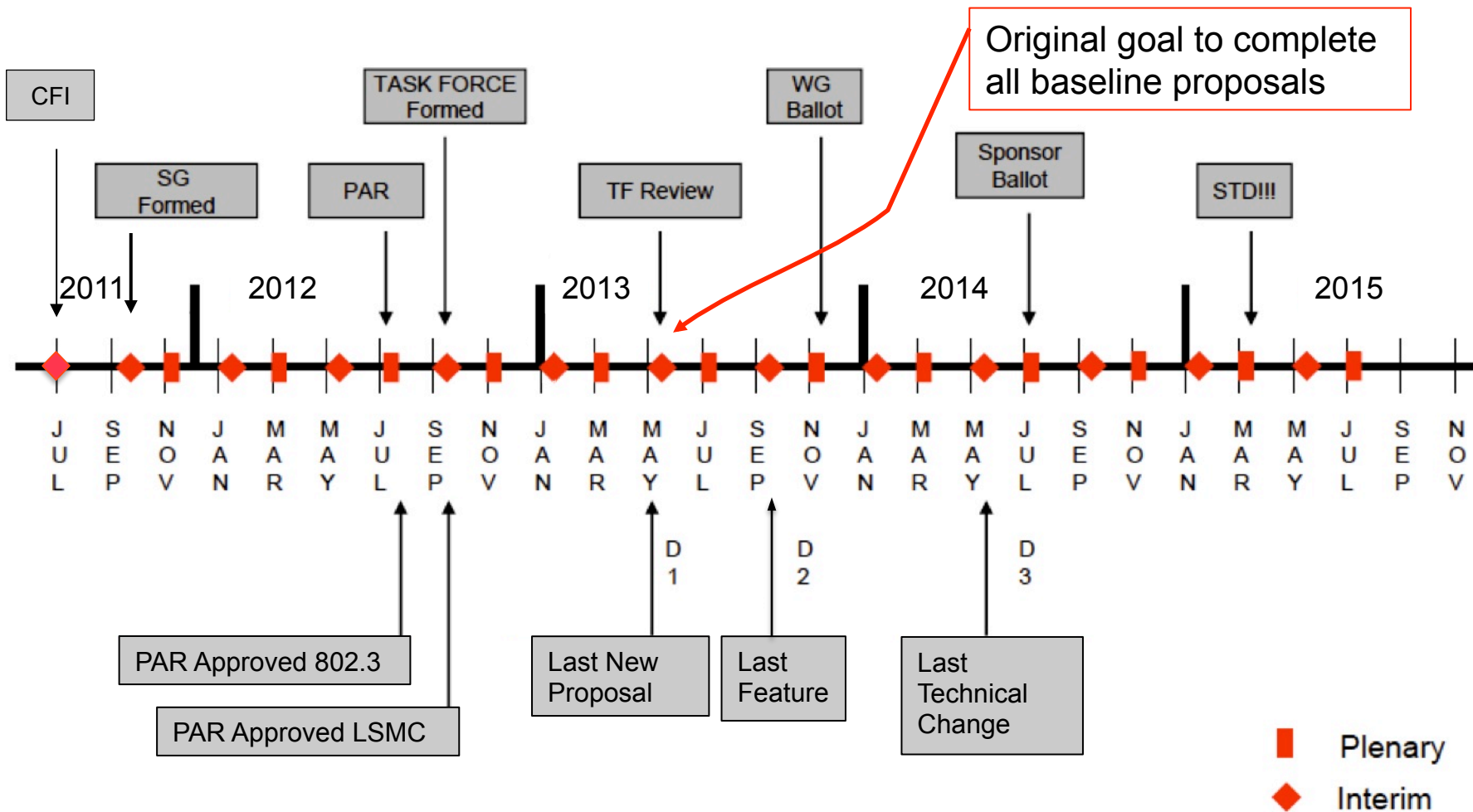


Mission of Consensus Ad Hoc

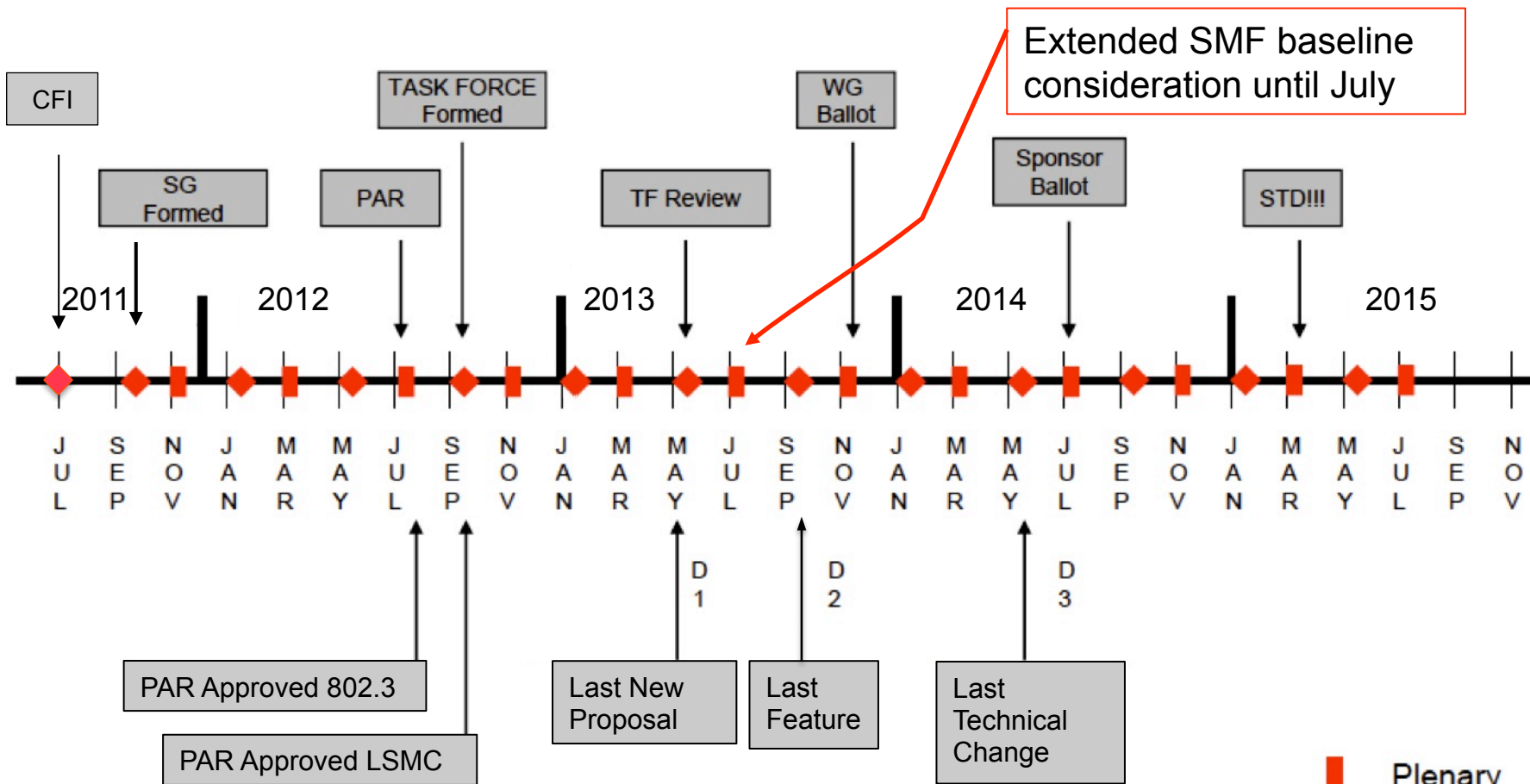
- Identify changes to 5C Responses and Objectives to bring documents into alignment with project



IEEE P802.3bm Next Generation 40 Gb/s and 100 Gb/s Optical Ethernet Timeline (Adopted 28th, September 2012)



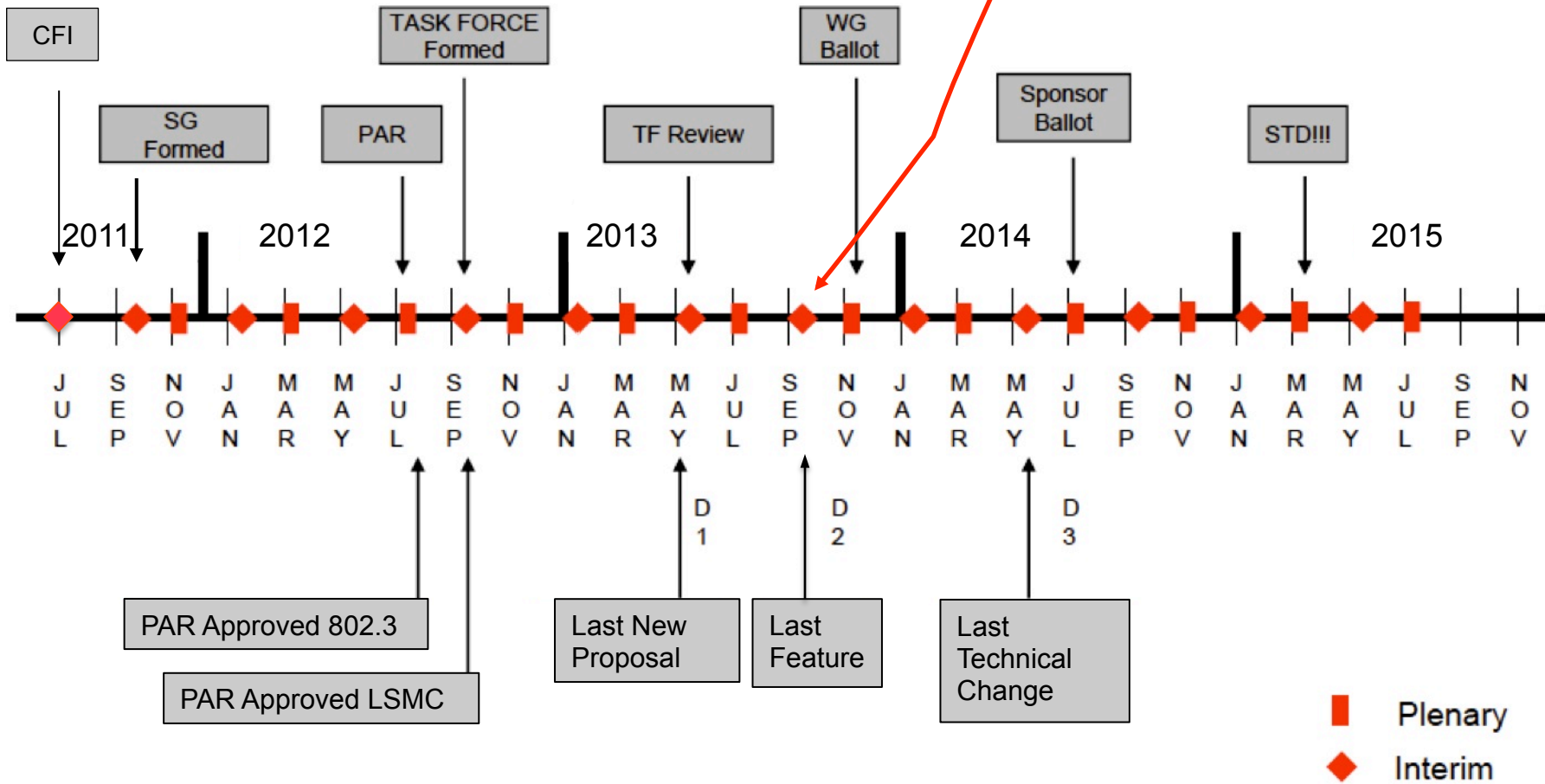
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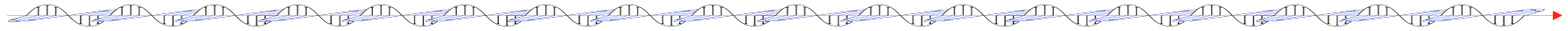


Note: Motion #15 in May 2013 extended “>500 m SMF” consideration one meeting with a condition that **baseline draft clause must be produced and reviewed in parallel**

IEEE P802.3bm Next Generation 40 Gb/s and 100 Gb/s Optical Ethernet Timeline (Adopted 28th, September 2012)

September meeting will be focused on D1.1 resolution and preparation for D1.2 which goes to 802.3 for WG ballot preview





Editorial Challenges

- D1.0 had 222 comments requiring resolution (did not include 100G SMF clause)
- D1.1 will have additional comments to be resolved
 - Significant CAUI-4 work to be done
 - Important MMF work to be done
 - Since no 100G SMF clause has been adopted, a full TF review of an SMF clause would not be possible in the existing timeline.
 - D1.2 planned for submittal to 802.3 for WG ballot.
 - minor edits will have to be reviewed at closing plenary in November
- Our adopted timeline does not allow further consideration of an SMF baseline without substantial schedule adjustments

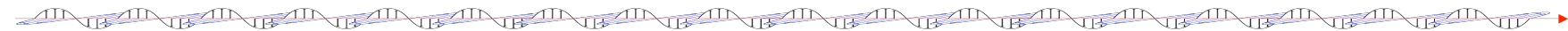
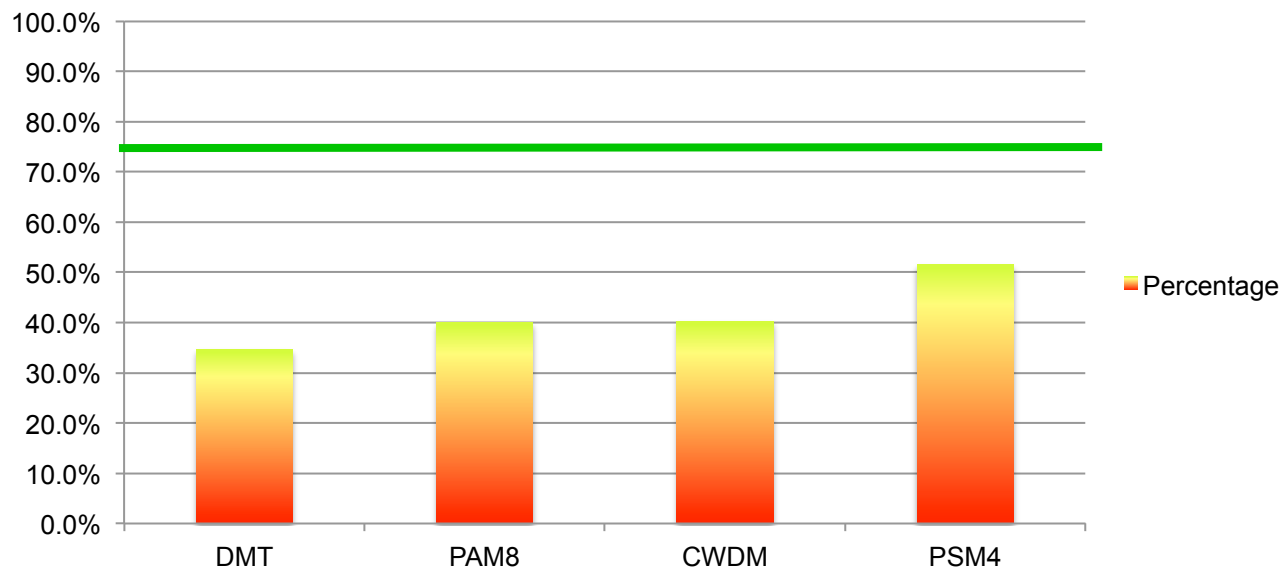


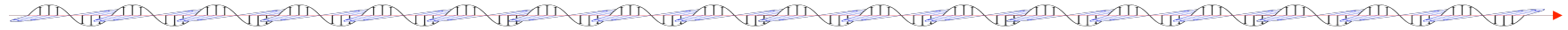


Consensus Viewpoints

- MMF ad hoc concluded no cost/power/size benefit of 20 m PMD but project documents still communicate a possible 2nd PMD
 - Apr 11, 2013 ad hoc meeting
- If anything, the only consensus likely on SMF baseline is that we cannot achieve consensus within the P802.3bm adopted timeline

Motion to Adopt Baseline

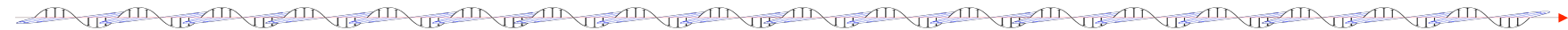


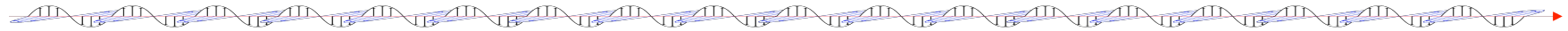


IEEE P802.3bm Next Generation 40 Gb/s and 100 Gb/s Optical Ethernet Adopted Objectives

- ✧ Support full-duplex operation only
 - ✧ Preserve the IEEE 802.3 / Ethernet frame format utilizing the IEEE 802.3 MAC
 - ✧ Preserve minimum and maximum FrameSize of current IEEE 802.3 standard
 - ✧ Support a BER better than or equal to 10^{-12} at the MAC/PLS service interface
 - ✧ Provide appropriate support for OTN
 - ✧ Define re-timed 4-lane 100G PMA to PMA electrical interfaces for chip to chip and chip to module applications
 - ✧ Define a 40 Gb/s PHY for operation over at least 40 km of SMF
 - ✧ **Define a 100 Gb/s PHY for operation up to at least 500 m of SMF (1)**
 - ✧ Define a 100 Gb/s PHY for operation up to at least 100 m of MMF
 - ✧ **Define a 100 Gb/s PHY for operation up to at least 20 m of MMF (1)**
 - ❑ Specify optional Energy Efficient Ethernet (EEE) for 40 Gb/s and 100 Gb/s operation over fiber optic cables.
-
- ✧ (approved by 802.3 July 2011)
 - ❑ (approved by 802.3 November 2012)

(1) Language in the 5C responses clearly articulates that this PHY may not require a new PMD





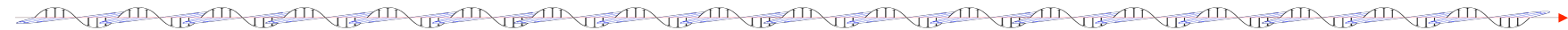
Distinct Identity (1 of 2) (edits for MMF)

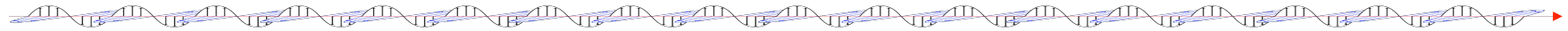
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- c) Easy for the document reader to select the relevant specification.**
- d) Substantially different from other IEEE 802.3 specifications/solutions**

The Study Group considered a possibility of “more than one MMF PMD”.

1. While IEEE Std 802.3 does include specifications for 40 Gb/s and 100 Gb/s Ethernet on MMF and SMF cables there is a demand for reduced power, increased density and reduced cost with respect to these solutions.
2. The proposed 100 Gb/s SMF PHY(s) would use four 25 Gb/s electrical interconnect lanes in each direction (not currently defined in IEEE Std 802.3.)
3. The proposed 100 Gb/s MMF PHY(s) would use four lanes in each direction, allowing an 8 fiber link (rather than the 20 fiber link used by 100GBASE-SR10) and avoiding the need for a gearbox to/from the 25 Gb/s electrical interconnect.
4. The proposed 40 Gb/s SMF PHY would provide the only Ethernet solution at this rate for operation over distances above 10 km.





Distinct Identity (2 of 2) (edits for MMF)

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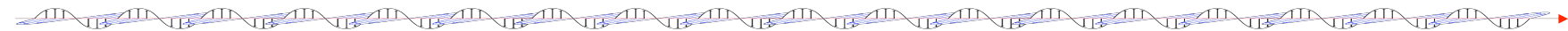
The Study Group intended to communicate that we understood a possible outcome of this project was "only one MMF PMD".

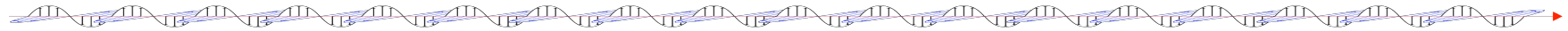
5. The amendment will define one or two PMD types over MMF depending on whether one PMD type with short reach and a second with longer reach have sufficient cost, density, or power difference to justify two PMD types.

6. The amendment will enable new PHY types over SMF which consist of the existing 100GBASELR4 and 100GBASE-ER4 optical PMDs with four electrical interconnect lanes in each direction. The amendment will define a new 100 Gb/s SMF PMD in addition to these if it can be shown that a SMF PMD with a shorter reach than 100GBASE-LR4 has sufficient cost, density, or power difference to justify an additional SMF PMD type.

7. The proposed amendment to the existing IEEE 802.3 standard will be formatted as a collection of new clauses and amendments of existing clauses as appropriate, making it easy for the reader to select the relevant specification.

8. IEEE Std 802.3 does not define Energy Efficient Ethernet for 40 Gb/s or 100 Gb/s operation.





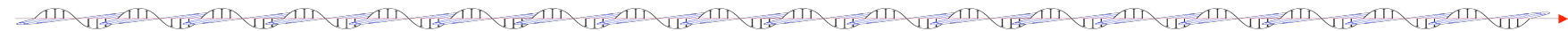
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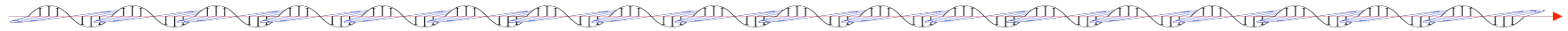
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Proposed Changes to MMF Distinct Identity Response

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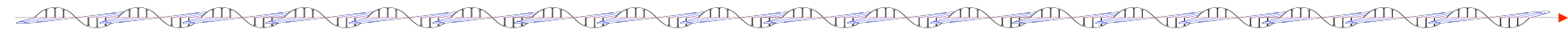
Proposed Changes
to MMF Distinct
Identity Response

~~5. The amendment will define one or two PMD types over MMF depending on whether one PMD type with short reach and a second with longer reach have sufficient cost, density, or power difference to justify two PMD types.~~

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8. IEEE Std 802.3 does not define Energy Efficient Ethernet for 40 Gb/s or 100 Gb/s operation.





Distinct Identity (2 of 2) (edits for 100G SMF)

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

It has been argued that the use of the word "types" here is incorrect.

- 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
- The Study Group intended to communicate that we understood a possible outcome of this project was "no new 100G SMF PMD".

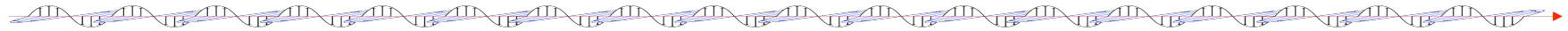
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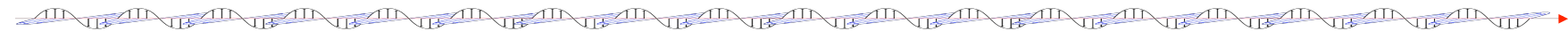
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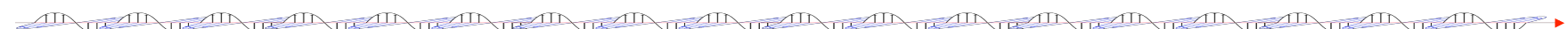
Broad Market Potential (edits for 100G MMF/SMF)

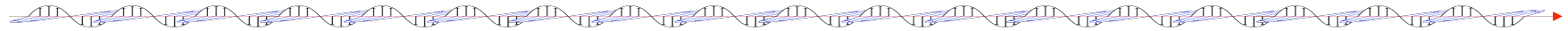
A standards project authorized by IEEE 802 LMSC shall have a broad market potential. Specifically, it shall have the potential for:

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

Proposed Changes to SMF Broad Market Potential Response

1. Optical Ethernet interfaces have been widely deployed. Examples include Data Centers, Enterprise and Telecom Network Equipment for edge, distribution and core connections.
2. Internet, cloud, and higher performance computing applications, along with advances in processors, server virtualization and converged networking, are driving the need for increasing numbers of high throughput LAN connections. As the market for 100 Gb/s LAN connections grows, lower cost, higher density, and lower power alternatives become necessary.
3. There has been wide attendance and participation (avg 108 persons, 71 companies) in the study group by equipment manufacturers, component suppliers and other stakeholders. It is anticipated that there will be sufficient participation to effectively complete the standardization process.
4. 100 Gb/s Ethernet optical PHY types utilizing a 4 x 25 Gb/s electrical interface, and optimized MMF interfaces will reduce cost, size and power for links in the growing Data Center market and provide a balance in cost between network equipment and attached stations.
5. 100 Gb/s Ethernet optical PHY types utilizing a 4 x 25 Gb/s electrical interface, and optimized existing SMF interfaces will reduce cost, size and power for links in the growing Data Center market and provide a balance in cost between network equipment and attached stations.
6. 40 Gb/s Ethernet has been deployed beyond its originally envisioned application space of server interconnect. Extending the reach of 40 Gb/s Ethernet will allow Ethernet to continue to address markets (such as telecom) as 10 Gb/s links are upgraded to 40 Gb/s.
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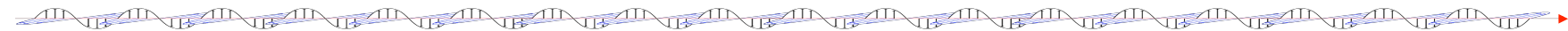
Economic Feasibility

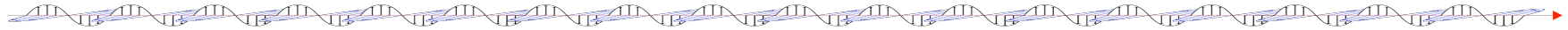
For a project to be authorized, it shall be able to show economic feasibility (so far as can reasonably be estimated) for its intended applications. At a minimum, the proposed project shall show:

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

Proposed Changes to Economic Feasibility Response

1. The cost factors for Ethernet components and systems are well known. The proposed project may introduce new cost factors which can be quantified.
2. Prior experience in the development of optical Physical Layer specifications for Ethernet indicates that the specifications developed by this project will entail a reasonable cost for the resulting performance.
3. The proposed 100 Gb/s optical PHYs will make it possible to achieve the desired density, power and cost targets for computer systems and network equipment.
4. The proposed 40 Gb/s optical PHY will enable upgrade of existing 10 Gb/s 40 km links to 40 Gb/s operation at significantly lower cost than current solutions.
5. In consideration of installation costs, the project is expected to use proven and familiar media, including multi-pair MMF, and duplex SMF. ~~and possibly multi-pair SMF cabling technology.~~
6. Network design, installation and maintenance costs are minimized by preserving network architecture, management, and software.

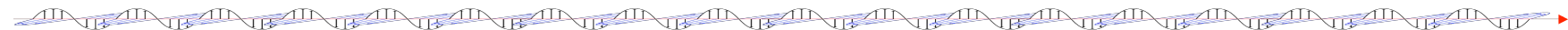


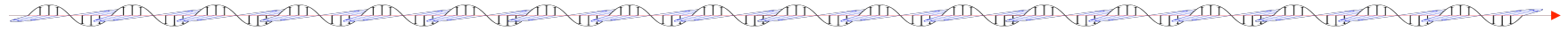


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Proposed Changes
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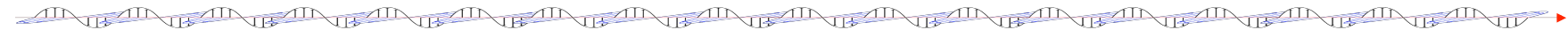




Proposed Plan of Action

- Review changes proposed and get consensus on the proposed document changes
- Hold one more ad hoc meeting to discuss & confirm.
- Bring them into the York Interim (Sept 2013) for consideration by the Task Force
- Continue on existing timeline to bring P802.3bm to completion on plan

✧ Note: A future Data Center 100G SMF PMD may be derived from work in the 400G Study Group





Resulting 5C responses and objectives



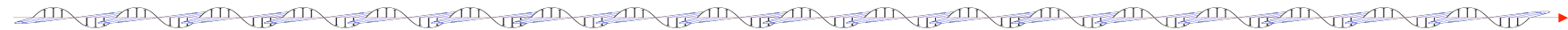


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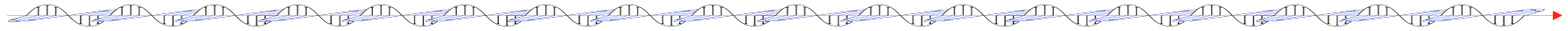
Compatibility

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**

1. As an amendment to IEEE Std 802.3 (as amended by IEEE Std 802.3ba-2010) the proposed project will remain in conformance with the IEEE 802 Overview and Architecture, the bridging standards IEEE Std 802.1D and IEEE Std 802.1Q
2. The proposed amendment will conform to the full-duplex operating mode of the IEEE 802.3 MAC.
3. The proposed amendment will conform to the 40 Gb/s and 100 Gb/s Media Independent Interfaces (XLGMII and CGMII) specified by IEEE Std 802.3.with optional additions for Energy Efficient Ethernet.
4. The proposed amendment will follow the existing format and structure of IEEE 802.3 management definitions by providing a protocol-independent specification of managed objects.
5. SNMP management capability to be provided in the future by an amendment to or revision of IEEE Std 802.3.1.
6. The PAR mandates the resulting standard will comply with IEEE Std 802, IEEE Std 802.1D, and IEEE Std 802.1Q.



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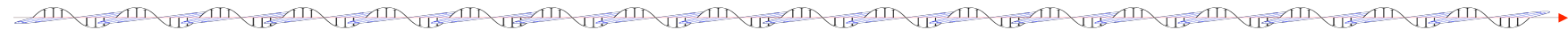
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4. The proposed 40 Gb/s SMF PHY would provide the only Ethernet solution at this rate for operation over distances above 10 km.





Distinct Identity (2 of 2)

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.**

5. The amendment will enable new PHY implementations over SMF which consist of the existing 100GBASE-LR4 and 100GBASE-ER4 optical PMDs with four electrical interconnect lanes in each direction.

6. The proposed amendment to the existing IEEE 802.3 standard will be formatted as a collection of new clauses and amendments of existing clauses as appropriate, making it easy for the reader to select the relevant specification.

7. IEEE Std 802.3 does not define Energy Efficient Ethernet for 40 Gb/s or 100 Gb/s operation.



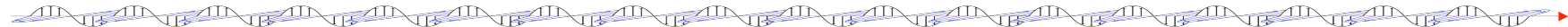


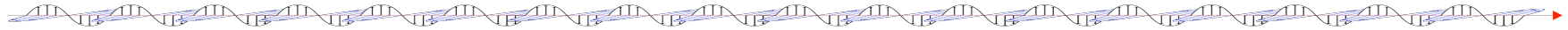
Technical Feasibility

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.**

1. The operation of Ethernet at 40 Gb/s and 100 Gb/s has been established by deployment of devices compliant with IEEE Std 802.3 in operational networks.
2. The proposed project will build on the array of Ethernet fiber-optic component and sub-system design experience, and the broad knowledge base of Ethernet network operation.
3. Component vendors have provided presentations on the feasibility of the necessary components for this project, which either leverage existing technologies or employ new technologies.
4. The reliability of Ethernet components and systems can be projected in the target environments with a high degree of confidence based on existing 40 Gb/s and 100 Gb/s deployment experience.



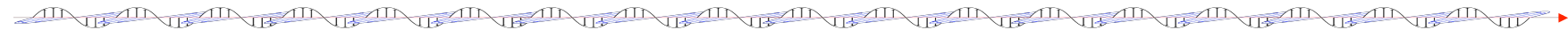


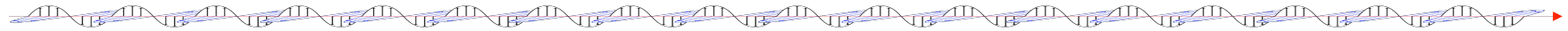
Economic Feasibility

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.**

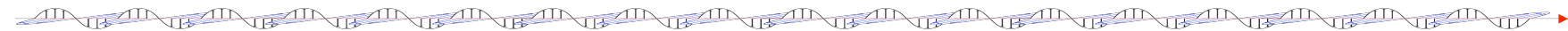
1. The cost factors for Ethernet components and systems are well known. The proposed project may introduce new cost factors which can be quantified.
2. Prior experience in the development of optical Physical Layer specifications for Ethernet indicates that the specifications developed by this project will entail a reasonable cost for the resulting performance.
3. The proposed 100 Gb/s optical PHYs will make it possible to achieve the desired density, power and cost targets for computer systems and network equipment.
4. The proposed 40 Gb/s optical PHY will enable upgrade of existing 10 Gb/s 40 km links to 40 Gb/s operation at significantly lower cost than current solutions.
5. In consideration of installation costs, the project is expected to use proven and familiar media, including multi-pair MMF, and duplex SMF.
6. Network design, installation and maintenance costs are minimized by preserving network architecture, management, and software.





IEEE P802.3bm Next Generation 40 Gb/s and 100 Gb/s Optical Ethernet Objectives

- Support full-duplex operation only
- Preserve the IEEE 802.3 / Ethernet frame format utilizing the IEEE 802.3 MAC
- Preserve minimum and maximum FrameSize of current IEEE 802.3 standard
- Support a BER better than or equal to 10^{-12} at the MAC/PLS service interface
- Provide appropriate support for OTN
- Define re-timed 4-lane 100G PMA to PMA electrical interfaces for chip to chip and chip to module applications
- Define a 40 Gb/s PHY for operation over at least 40 km of SMF
- Define a 100 Gb/s PHY for operation up to at least 100 m of MMF
- Specify optional Energy Efficient Ethernet (EEE) for 40 Gb/s and 100 Gb/s operation over fiber optic cables.





Thank you