

# The Path Forward

*Including Foundational Objectives*

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IEEE 802.3 Next-gen 200G & 400G PHYs over fewer MMF Pairs Study Group

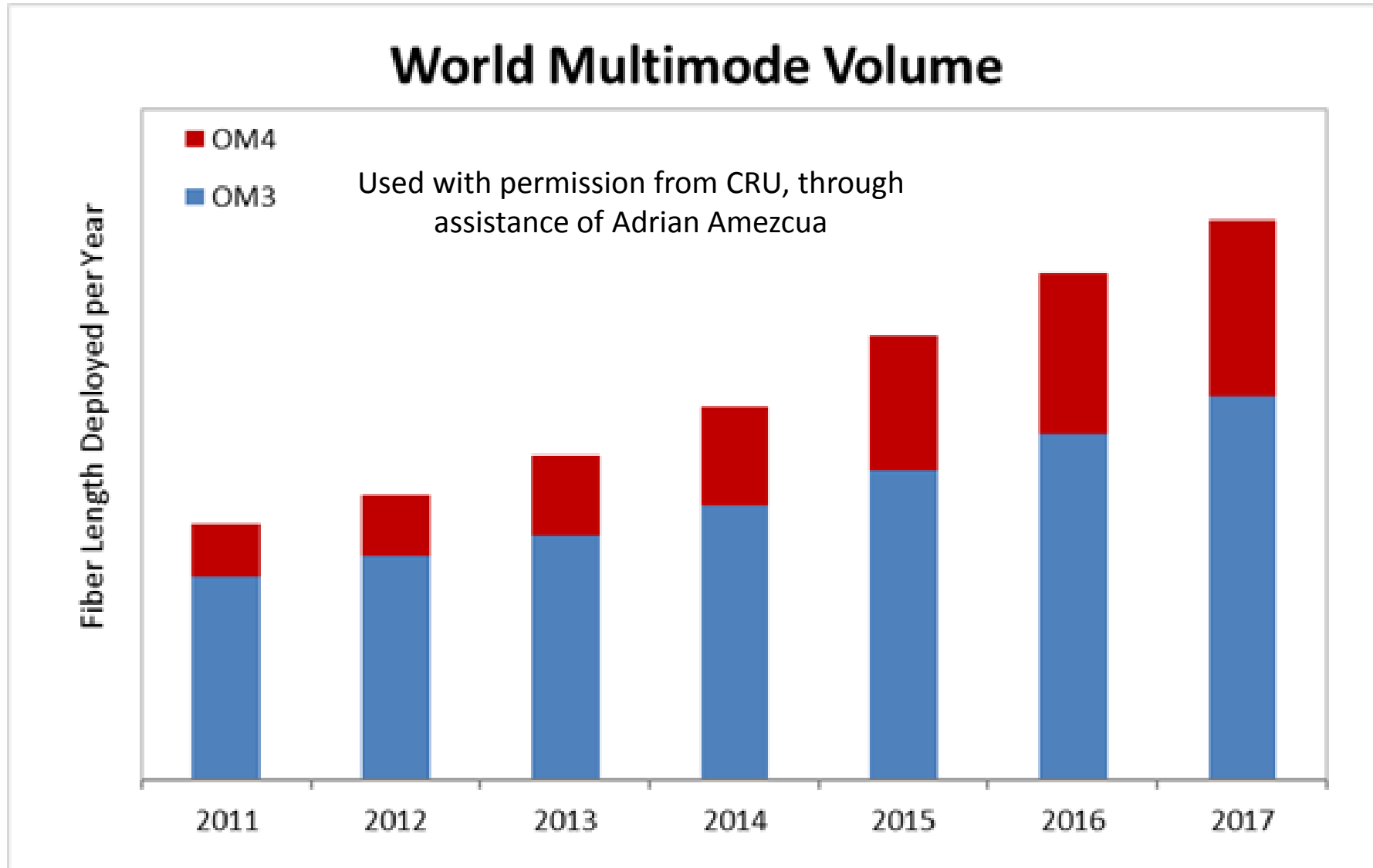
Employer & Affiliation: OFS

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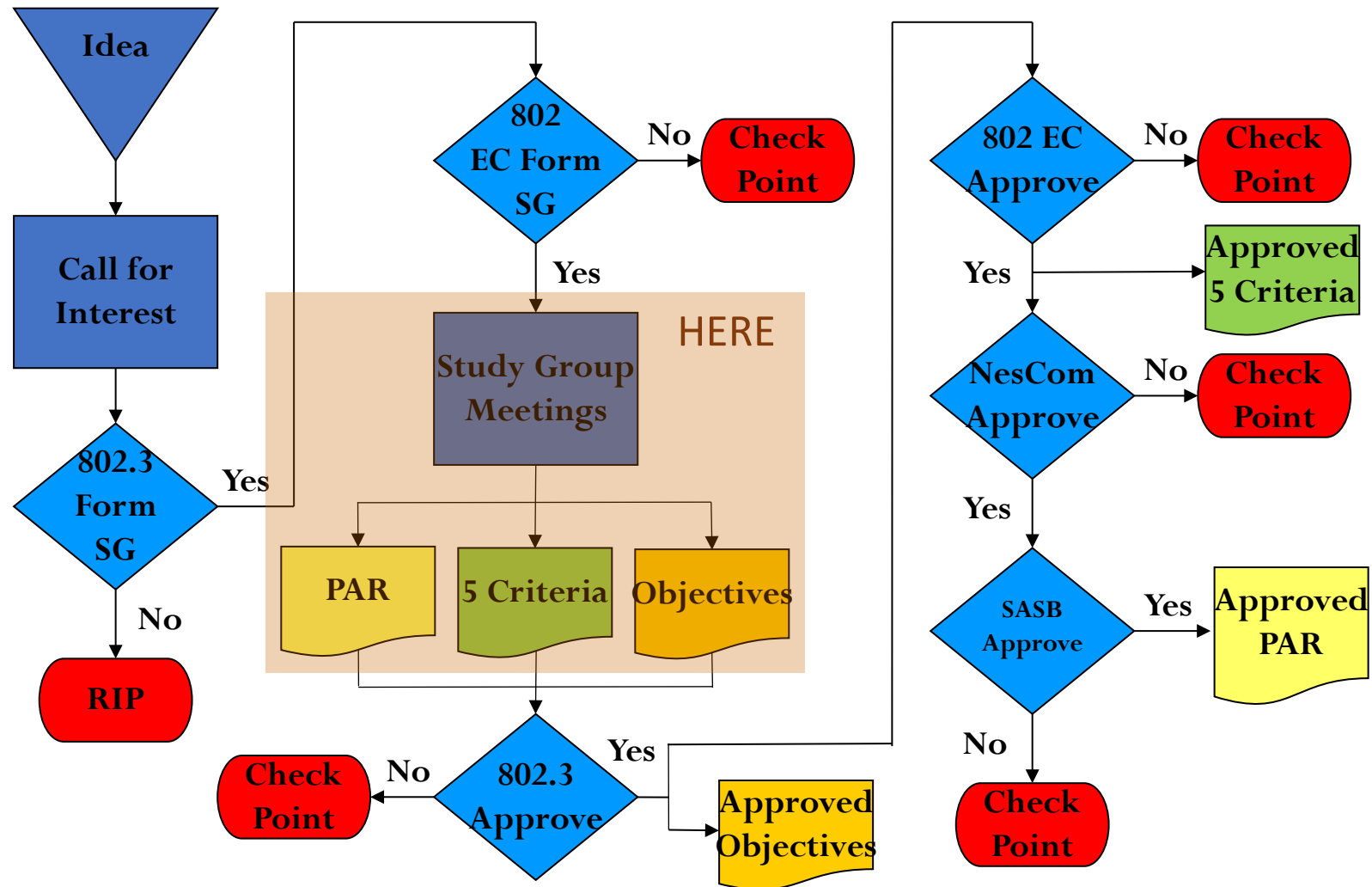
# Study Group Chartering Motion

Move that the IEEE 802.3 Ethernet Working Group authorizes the formation of a study group to develop a Project Authorization Request (PAR) and Criteria for Standards Development (CSD) responses for "Next-generation 200 Gb/s and 400 Gb/s PHYs over fewer MMF pairs than in existing Ethernet projects and standards."

# It is a good time to work on MMF PHYs and PMDs!



# Overview of IEEE 802.3 Standards Process (1/5)- Study Group Phase



Note: At "Check Point", either the activity is ended, or there may be various options that would allow reconsideration of the approval.

# The Task Force is delayed by six months (rather than four) if we miss the opportunity to advance in March

- [http://www.ieee802.org/3/100GEL/public/adhoc/dec20\\_17/kochuparambil\\_100GEL\\_adhoc\\_01\\_1217.pdf](http://www.ieee802.org/3/100GEL/public/adhoc/dec20_17/kochuparambil_100GEL_adhoc_01_1217.pdf)

## Option 1

PAR, CSD, and Objectives in January  
March Plenary  
March 9<sup>th</sup> (Plenary)

## May Interim

(starts May 21<sup>st</sup>)

## Approval Steps

Study Group  
Working Group  
WG Executive Committee  
NesCom recommendation  
Standards Board

## First Task Force Meeting

## Option 2

PAR, CSD, and Objectives in March or May  
July Plenary  
July 13<sup>th</sup> (Plenary)

## Nov Plenary

(misses Sept interim, 10-14<sup>th</sup>)

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# The Task Force is delayed by six months (rather than four) if we miss the opportunity to advance in March

From kochuparambil\_100GEL\_adhoc\_01\_1217.pdf

## Option 1

PAR, CSD, and Objectives in January

### May Interim Task Force

- Make educated start for Objectives/CSD/PAR.
- May need further study and modification to objectives in Task Force,
- Allows us to move into baseline proposals when ready
- Will need to drive to high level consensus quickly

## Option 2

PAR, CSD, and Objectives in March or May

### Nov Plenary Task Force

- Do deeper study prior to Objectives/CSD/PAR
- Have more firm Objectives
- Head straight into baseline proposals once a Task Force.
- May need to wait a meeting cycle or two after consensus is formed due to scheduling/process

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# A desirable timeline

- January 2018 – Approve PAR & CSD Responses to pre-submit before the March Plenary.
- March 2018 – Request to become TF
- May 2018 – First TF meeting
- November 2018 - Baseline proposals in D1.0 and comments
- March 2019 – Generate D2.0 for WG ballot and comments
- November 2019 – Generate D3.0 for Sponsor ballot and comments
- June 2020 – Standard complete

# Some questions we need to answer

- From past year's discussion in NEA Ad Hoc, believe there is good consensus for adopting an objective consistent with 400GBASE-SR4.2, based on 400GAUI-8 interface of 802.3bs, operating over 100m of four MMF pairs.
- Will we recommend any solutions that require changes to the logic, FEC, PCS? The timeline on the previous page assumes we will not.
- Will we adopt an objective for a 200 Gb/s PMD over one pair MMF?
- Will we adopt, or leave open the possibility for further study of, any other MMF pair count, possibly with a shorter reach, at 400 Gb/s?
- Should objectives specify the grade of fiber for which the reach requirement must be met?
- Can we approve the PAR and CSD Responses at this meeting? (for pre-submittal)
- Which objectives must be passed to support PAR & CSD responses? In January? In March?



# Foundational objectives

- These objectives are typically adopted for projects and are deemed relevant to this project, relating to Compatibility
- Recommend that we adopt these objectives
- `gustlin_NGMMF_01_jan18` indicates that meeting objective 6 would allow PMDs defined in this project to re-use 802.3bs architecture and PCS
  1. Support full-duplex operation only
  2. Preserve the Ethernet frame format utilizing the Ethernet MAC
  3. Preserve the minimum and Maximum FrameSize of current Ethernet standard
  4. Provide appropriate support for OTN
  5. Specify optional Energy Efficient Ethernet (EEE) capability
  6. Support a BER of better than or equal to  $10^{-13}$  at the MAC/PLS service interface (or the frame loss ratio equivalent)
    - [NOTE the lower BER target value of  $10^{-13}$  was adopted for 200Gb/s and 400 Gb/s Ethernet in 802.3bs and 802.3cd, whereas  $10^{-12}$  has been used for 100 Gb/s and lower speeds]

# The MMF PMD landscape by fiber count, Baud rate, and modulation format

Technology (per fiber)	1 fiber pair	2 fiber pairs	4 fiber pairs	8 fiber pairs	16 fiber pairs
25G- $\lambda$ NRZ	25G-SR		100G-SR4		400G-SR16
50G- $\lambda$ NRZ				400G-SR8	
50G- $\lambda$ PAM4	50G-SR	100G-SR2	200G-SR4	400G-SR8	
100G- $\lambda$ PAM4	200G-SR1.2	200G-SR2	400G-SR4		
2x50G- $\lambda$ PAM4		200G-SR2.2	400G-SR4.2	The module types shown in red would be formally within the scope of the SG, but many would lack technical feasibility or broad market potential	
4x25G- $\lambda$ NRZ		200G-SR2.4	400G-SR4.4		
4x50G- $\lambda$ PAM4	200G-SR1.4	400G-SR2.4			
8x50G- $\lambda$ PAM4	400G-SR1.8				

Existing or in-progress IEEE standard

## Multi-Wavelength Nomenclature

SRm.n

m = # fiber pairs

n = # wavelengths

# Proposal for specific objectives for this project

## Rationale

- Proposed objectives are intended to maintain the most broad consensus possible at this stage of the process, to help us to become a TF as soon as possible.
  - Permits TF to write one 200G spec
  - Permits TF to write one or two 400G specs. Presume one is SR4.2. Leaves open possibility of SR8 or SR1.8, subject to TF 75% approval
- Re-uses the traditional 100m reach target without specifying which grade of MMF; this may be a subject of discussion and debate.
- Provide a physical layer specification which supports 200Gb/s operation over fewer than 4 pairs of MMF with channel lengths up to at least 100 m.
- Provide not more than two physical layer specifications which support 400Gb/s operation over fewer than 16 pairs of MMF with channel lengths up to at least 100 m.