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# Study Group Objectives Discussion

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Acting Study Group Chair

Ad hoc meeting 1/6/16

# Topics

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- Background
- Survey results
- Discussion

# Study Group Work

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- Goal of a Study Group is to study the problem and develop the following:
  - Objectives
  - Responses to The Criteria for Standard Development (CSD) – aka 5 Criteria
  - PAR
- Solving the problem, developing solutions, writing specifications are all Task Force activities

# On-line straw poll (completed on Survey Monkey)

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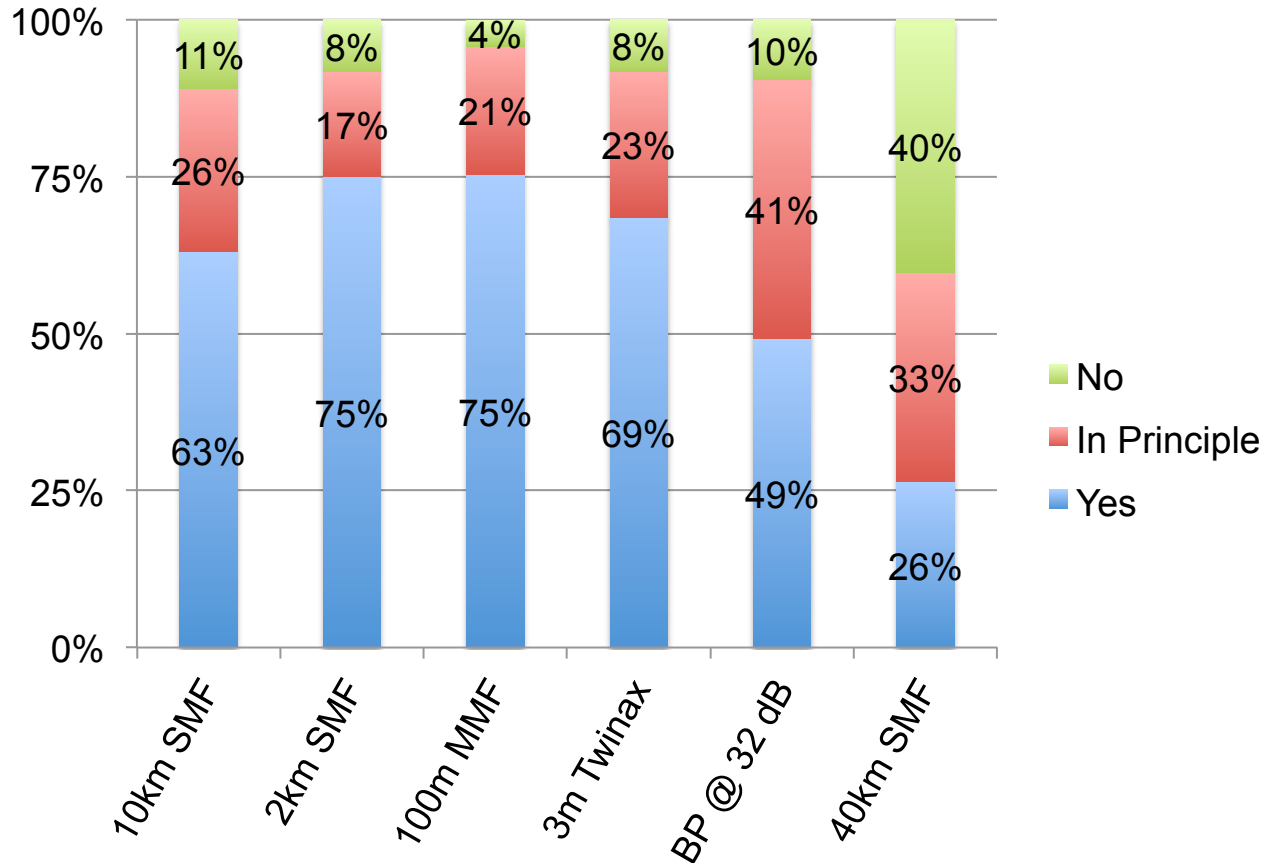
- 75 respondents
  - 23 Questions soliciting feedback on objectives
  - Requested support for specific objectives at specific rates to be adopted with a Yes, No, or “In Principle” response
  - Open ended question on what has been missed at each rate
  - A couple of questions on where the work would be done
  - ...plus comments
- Caveat: This was an “open” poll. No restriction on who responded so treat results accordingly. We will need to re-affirm any consensus positions (or lack) at Interim meeting. These have no official weight at all. But these can be treated as an insight into people’s views

# Question format

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- I support the adoption of <rate> Gb/s Ethernet objective for <some reach/loss> of <some media>
  - Yes
  - In principle I support this rate and media objective, but need more specific information on the reach target
  - No
- “In principle...” intended to indicate that you still were not definite on the specific reach/loss target for that media but generally supported the rate/media objective
  - ...therefore “Yes” + “In principle...” → approximate level of support

# 50 Gb/s Ethernet Objectives



## Notes:

- Resistance to 40km SMF
- Generally high level support for all others
- Backplane objective has strongest need for more technical input

# Question: What other 50 Gb/s Ethernet PMD Objectives would you consider proposing?

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- 50 Gb/s no-FEC option for low-latency applications. KP4 FEC has at least 160ns latency. PMD modulation and FEC schemes should be discussed.
- 500m over SMF
- None
- Speed negotiation with 25 Gb/s PMDs.
- I would like to see a discussion on the feasibility of 50Gb/s channels being multiplexed into 100Gb/s, 200Gb/s or even 400Gb/s channels as networks grow and they interconnect between client and network devices they would be able to operate just as 10 Gb/s with an DWDM network.
- A low cost 200m - 500m SMF solution would be worthwhile investigating for building backbone cabling.
- FEC.

# 50Gb/s objective questions: comments

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All comment available in raw spreadsheet. Some highlights:

10 km SMF → market need and timing needs supportive data

2km SMF → On the usual assumption that a single phy can be used to cover both 2km and 10km variants.

100m MMF → Application in datacenter server access.

3m Twinax → 50Gb/s no-FEC option for low-latency applications.

→ We should be open to a slightly shorter reach to ensure practicality.

→ need confirmation of technical feasibility

Backplane → The numbers 32 and 12.9 are wrong. Nyquist frequency for the likely encoding is approx. 13.3 GHz. The work done in OIF suggests that an insertion loss of 27-28 dB is the limit for reasonable PAM4 transceivers at this rate, far less than 32 dB.

<snip> I intend to propose an objective for "PCB backplane consistent with a total insertion loss equivalent to 3m of Twinax cable".

→ Need technical feasibility data

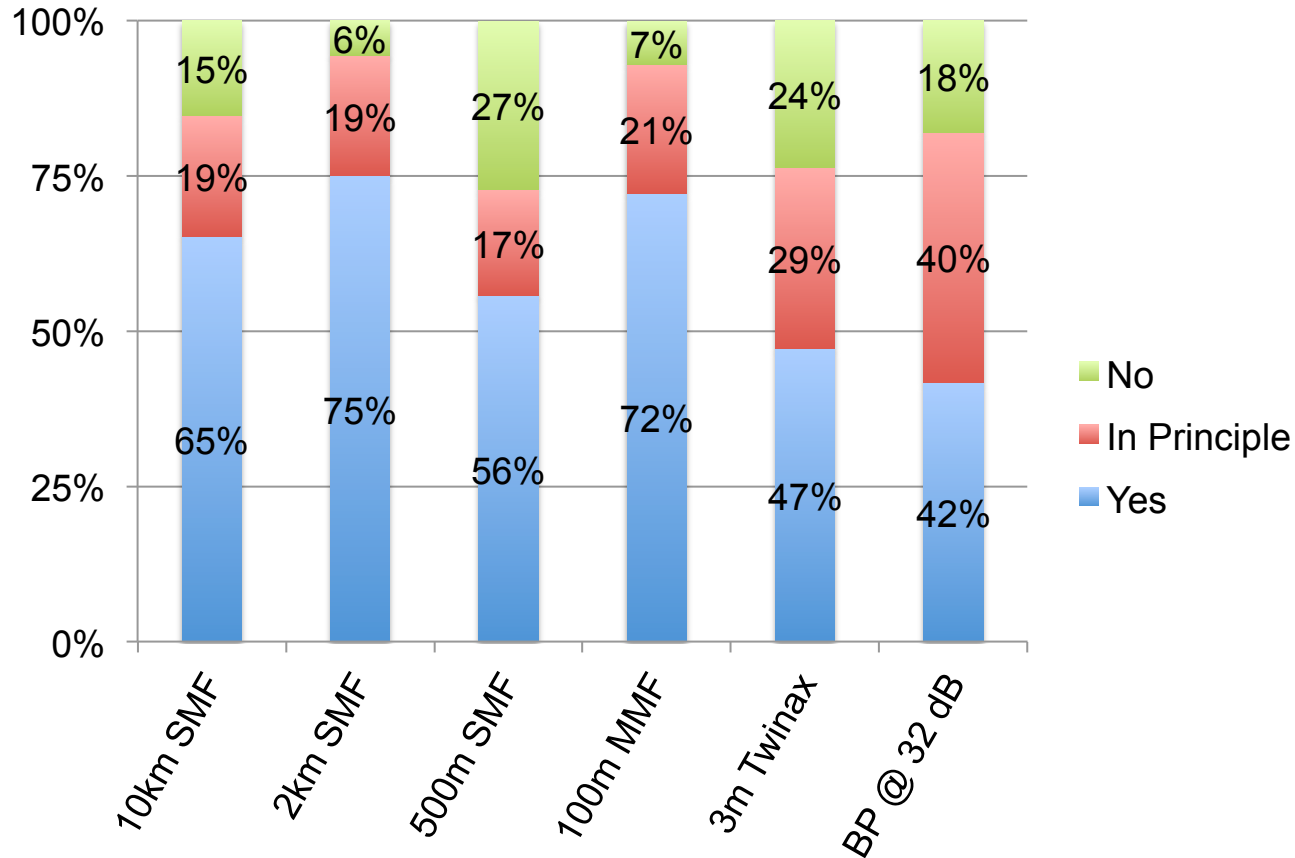
→ I think an insertion loss in the range of 28 to 30dB is more realistic.

→ More detailed work on Channel loss

→ uncertain of the 32 dB limit.



# 200 Gb/s Ethernet Objectives



## Notes:

- MMF strong
- Strong SMF interest, more clarity on reach(es) needed
- Twinax objective needs technical and market support
- BP objective technical support

# Question: What other 200 Gb/s Ethernet PMD Objectives would you consider proposing?

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- None
- None. Any 40 km objective should be pushed to a new CFI on optics for 40 km that might also include 400G Gb/s Ethernet.
- 40km of SMF
- 20km
- Chip-to-module CCAUI
- Breakout, 200Gb/s breakout to 2x100Gb/s and 4x50Gb/s.
- KP4 FEC only, as same as 400Gb/s Ethernet
- I would like to see a discussion on the feasibility of 200Gb/s channels being multiplexed into 400Gb/s or Tb/s channels as networks grow and they interconnect between client and network devices they would be able to operate just as 10Gb/s with a DWDM network.

# 200 Gb/s objective questions: comments

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## All comment available in raw spreadsheet. Some highlights:

**10 km SMF** → 200 Gb/s for 10km SMF is an intermediate step before adoption of 400GBASE-LR8. Would need to see significantly lower cost for the 200Gb/s version to make sense.

**2km SMF** → Need to study the subject if 2 km reach will be have significantly lower cost and could not be met with 10 km PMD

**500m SMF** → Should be part of the 2km objective.

→ Specify parallel vs. duplex in objective

**100m MMF** → more supportive of this based on 4x50, than on 8x25

→ Need to distinguish between 4 x 50G and 8 x 25G

**3m Twinax** → I see no reason to define a 200G copper PMD at this point in time. The primary purpose for such PMDs would be to connect servers to TOR switches...

→ We should be open to a slightly shorter reach to ensure practicality.

→ Only reach should be defined. Strongly recommend to consider high performance computing applications where latency is critical and Active cable may be needed.

**Backplane** → The numbers 32 and 12.9 are wrong. Nyquist frequency for the likely encoding is approx. 13.3 GHz. The work done in OIF suggests that an insertion loss of 27-28 dB is the limit for reasonable PAM4 transceivers at this rate, far less than 32 dB. [<snip>](#) I intend to propose an objective for "PCB backplane consistent with a total insertion loss equivalent to 3m of Twinax cable".

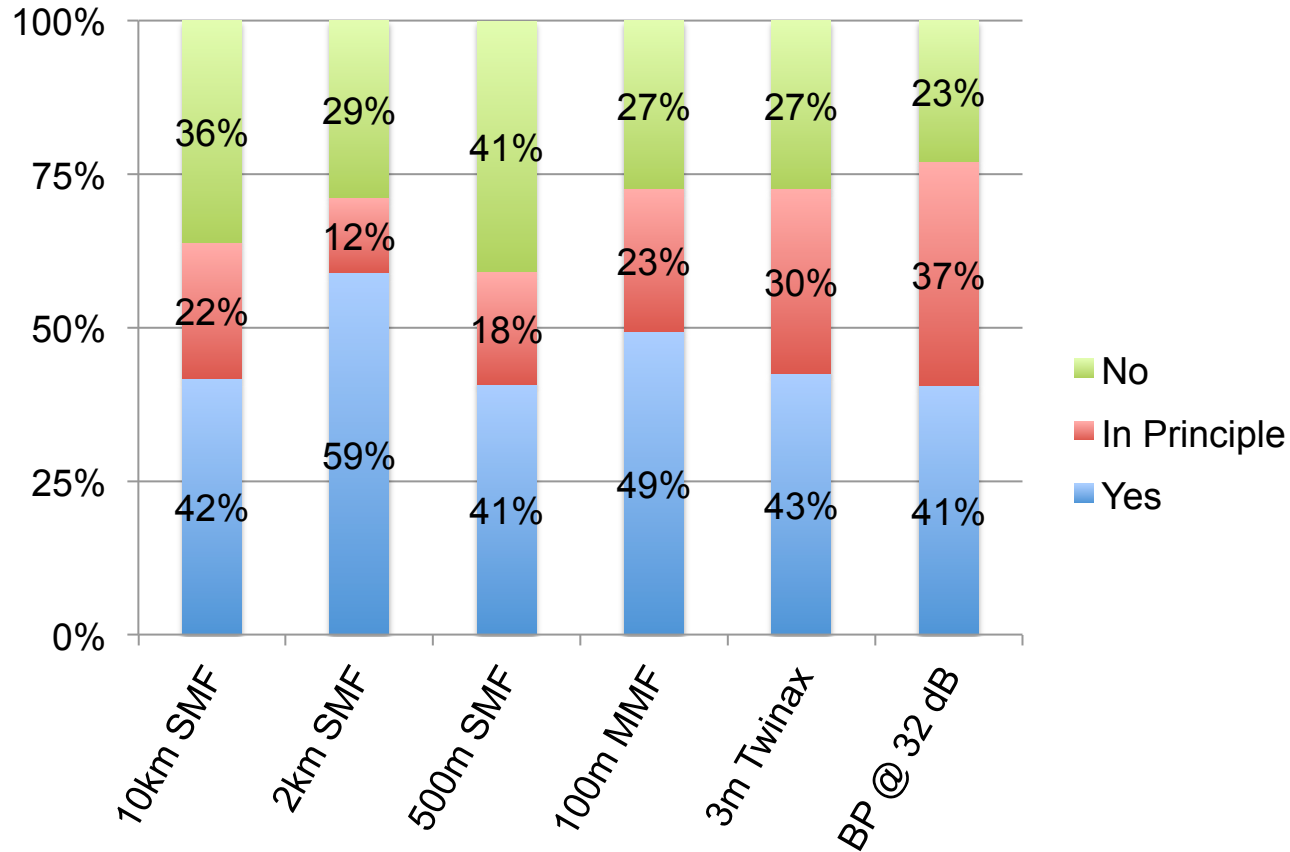
→ Same reason as above. I see no need for a 200GE backplane interface at this point in time

→ I think an insertion loss in the range of 28 to 30dB is more realistic.

→ More detailed work on Channel loss

→ uncertain of the 32 dB limit.

# 100 Gb/s Ethernet Objectives



## Notes:

- No clear consensus areas
- Some are close
- Work needed across the board if anyone is wanting to have these adopted

# Question: What other 100 Gb/s Ethernet PMD Objectives would you consider proposing?

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- None
- None at this point in time. For fiber it should be 100G/Lambda or go home.
- We should consider low-latency option (for example, without FEC).
- 100Gb/s Single lane with PAM4 modulation
- I believe it is too soon to reconsider 100G standards.
- If a 2-lane optical PMD is adopted, there should be a 2-lane chip-to-module CCAUI
- Breakout, 200Gb/s breakout to 2x100Gb/s and 4x50Gb/s

# 100 Gb/s objective questions: comments

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## All comment available in raw spreadsheet. Some highlights:

**10 km SMF** → The market is not ready for 100GBASE-LR4 to be replaced. The market will only accept the change when it shall be to move to 100G Serial, the 100GBASE-LR. ([many variants on this theme](#))

**2km SMF** → Assuming this is based on 2 lambda solution. It is better to wait for single lambda 100G because 2 lambda solution can be too small incremental step between 4 lambda and single lambda. ([many variants on this theme](#))

**500m SMF** → as above....

**100m MMF** → Support an approach of using 2 wavelengths rather than two pairs of fibers.

→ Only if the form factor and power are significantly improved compared to existing 100G 100m solution.

**3m Twinax** → need BMP data

→ We should be open to a slightly shorter reach to ensure practicality.

→ Only reach should be defined. Strongly recommend to consider high performance computing applications where latency is critical and Active cable may be needed.

**Backplane** → Adoption of a backplane objective is fine. It is not clear what an appropriate insertion loss target should be.

→ With serial 100 Gb/s not technically feasible it does not make sense to define 2x50G Cu

→ technical feasibility and should mirror 50G objective.

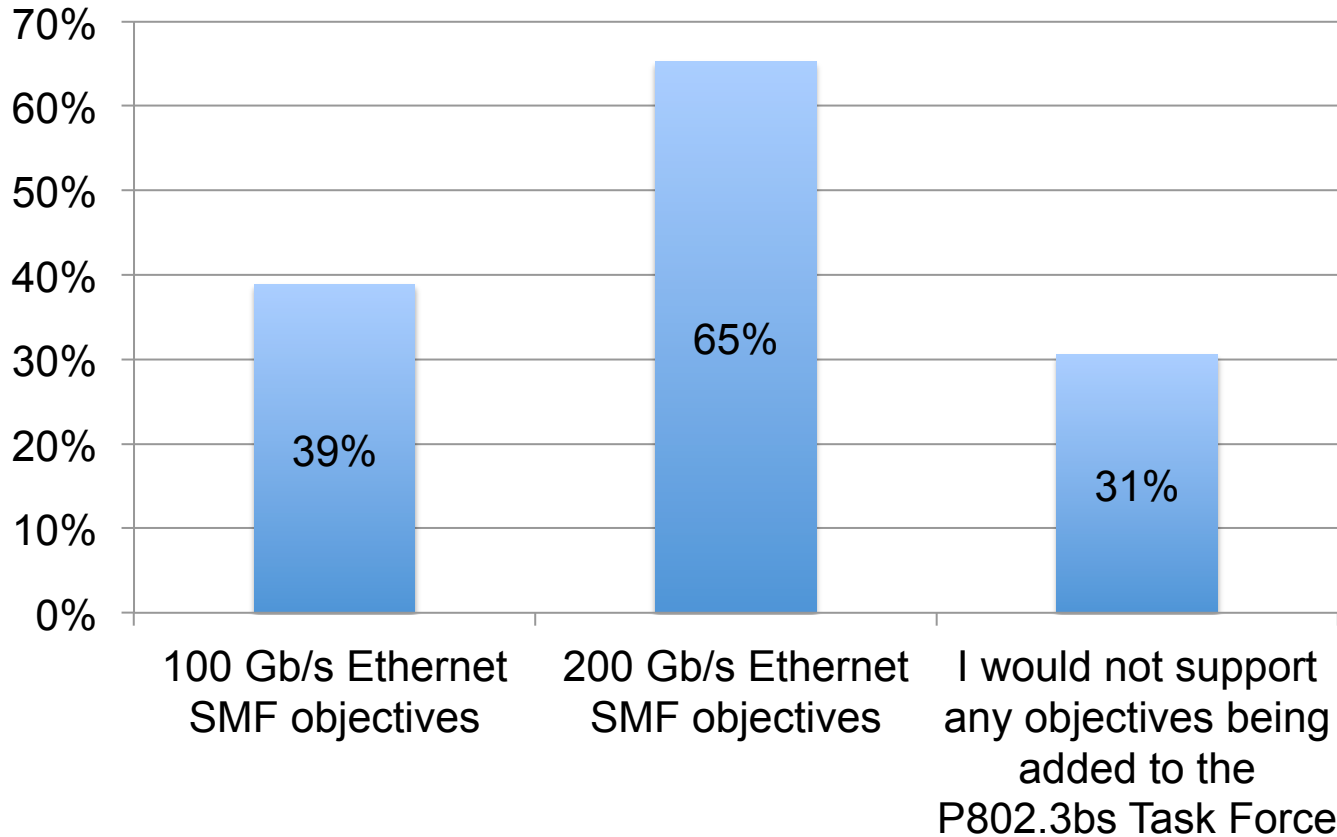
→ uncertain of the 32 dB limit.

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Other Questions...

Question: I would support having the following objectives (if adopted) being included into the P802.3bs (400GbE Task Force) since they are variants of the work already being consider by that Task Force (Chicago Rules - pick as many as you like):

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Notes:

- Consistent with earlier questions and feedback on 100 Gb/s vs. 200 Gb/s
- Chicago rules so the percentages have different meanings
- Concerns about 802.3bs schedule impact exist

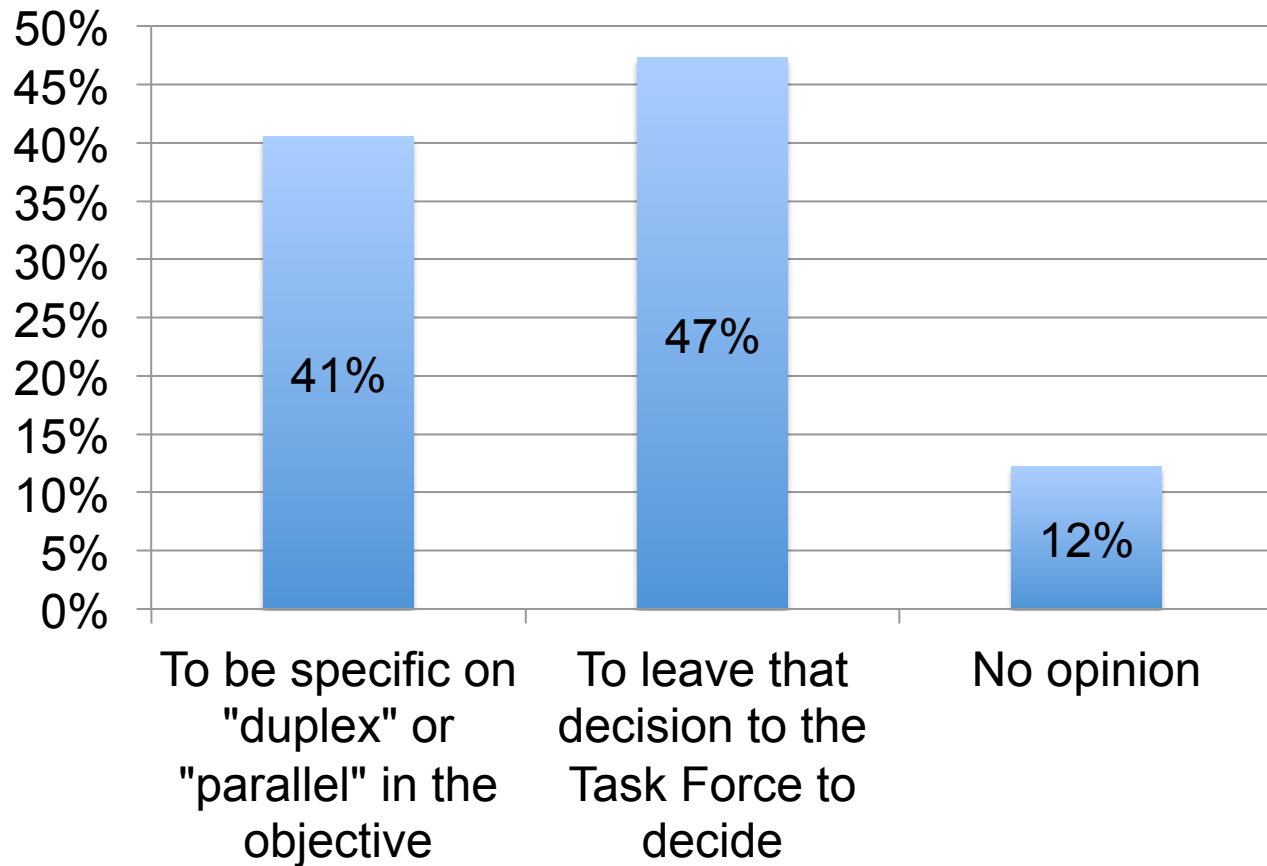


# Comments on inclusion question

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- Providing they are just lane number variations only
- Do we need a logic objective also?
- I would also add the 50GE SMF objectives into 802.3bs. In my opinion it would make sense to address any new (irrespective of rate) optical objectives in 802.3bs , and any new copper objectives in a new 50GE task force.
- There has already been one major 400GE program slip. Opening up the objectives to modification will impact the program. The risk of a major impact is high.
- Only supports 200G-FR4 and 200G-LR4 which is relaxation of 400 GbE specifications
- The bs group is lacking sufficiently succinct objectives and current goals appear shortsighted.
- We cannot delay completion of 400G standard.
- This would of course being dependent on the amount of reuse from the current 802.3bs content.
- In general I support this, but the wording of the strawpoll is misleading - neither of these has to be done as a variant of the current 400GbE solutions. This is a key point. Need to see consensus on that topic.
- Inclusion of 100G depends on projections of work complexity and timeliness of decision convergence.
- I do not see these as variants as others do. There is actually too much that is different. For the PMDs, new loss budgets need to be supported and new wavelength grids may be chosen such as CWDM or even a new grid that is just broad enough to preclude the need for TEC stabilization of wavelength. FEC needs extensive review and decision of what to adopt.

# Question: For 100 Gb/s or 200 Gb/s Ethernet SMF Objectives I prefer:



# Comments on duplex/parallel question

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- I think whether the solution is duplex or parallel is a critical part of the objective. It is probably as critical as defining the reach objective.
- The 802.3 working group seems to want quite specific objectives. Open objectives inevitably lead to adoption issues.
- Consideration should be made for compatibility with existing 400G PSM PMDs (i.e. breakout).
- For duplex cases breakout is not a consideration.
- I think carrying out a study on 100Gb/s and 200Gb/s should be done in tandem/parallel as they 100Gb/s is a fractional multiplex carrier of 200Gb/s and vice versa so working on the 100Gb/s should lead directly into the 200Gb/s and advantages and issues learned will be duplicated and ironed out for the 200Gb/s channels.
- I would support being specific for 200G but think that for 100G the task force should evaluate all the options.

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# Discussion

# Study Group considerations

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- If anything is to be included into the 802.3bs TF, it needs to be included procedurally as soon as possible (March adoption in WG for May TF work)
- To achieve March adoption of SG documentation (PAR, CSD), they need to be pre-submitted before meeting, so need to be completed in January
- Objectives can be tweaked up to and including March meeting before WG adoption so further consideration is possible (e.g. reach/loss specifics)

# Key takeaway's from on-line straw polls

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## 50GE

- Strong indication of consensus on objectives
- Indication of clarity on market need

## 200GE

- Pretty clear indication on objectives
- Some work needed to justify/clarify market need and technical targets
- Some decisions need on where work gets done

## 100GE

- Lack of indication on consensus for any objectives
- Significant work needed to build consensus if interest exists

## Work partitioning

- Most interest in the 200GE SMF objectives being pulled into P802.3bs
- But strong concerns against it too.

# Next steps

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- Converge on objectives
  - We have until at least March to finalize
- Determine work partitioning
  - Enables CSD and PAR definitions to be finalized (first drafts presented earlier 12/2/15 adhoc  
[http://www.ieee802.org/3/50G/public/adhoc/archive/nowell\\_120215\\_50GE\\_NGOATH\\_adhoc.pdf](http://www.ieee802.org/3/50G/public/adhoc/archive/nowell_120215_50GE_NGOATH_adhoc.pdf) )