802.3by CR PHY designation issue

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With thanks to many for discussion and input

Background

802.3by has two copper twin axial cable objectives

- Define a single-lane 25 Gb/s PHY for operation over links consistent with copper twin axial cables, with lengths up to at least 3m

- Define a single-lane 25 Gb/s PHY for operation over links consistent with copper twin axial cables, with lengths up to at least 5m

This is first IEEE project (I believe) that is trying to define 2 twin-ax cables reaches.

- New ground here with two reaches (for copper twin ax) and on a media where we specify AN.
- Original target with the 3m was intra-rack. Low latency desired, so no-FEC was considered an option. So far data doesn't support the feasibility of that, so a 3rd mode of operation with no FEC is being considered with a cable definition TBD (but <3m) to offer minimal latency.
- General desire to not modify 802.3bj compliant serdes/overall channel definition

PHY designation proving an issue to resolve

- Two objectives can be met with:
  - a single PHY (25GBASE-CR) and different FEC modes,
  - two PHYS (25GBASE-CR-S & 25GBASE-CR-L).

Both options have issues.

- Assumption that 3 cable types will be defined:
  - 25GBASE-CA-L (for inter-rack applications)
  - 25GBASE-CA-S (for intra-rack applications)
  - 25GBASE-CA-N (for no-FEC operation)

Considerations

- Auto-negotiation is used to advertise capabilities. Not guarantee link operation
  - Typically used to resolve speeds of different LPs
  - Given different reaches/FEC modes it is being assumed it will resolve those for 802.3by
  - AN is not the issue, AN will be defined once the PHY designations are defined.

- Mandatory and Optional:
  - Some things are mandatory or optional to implement
  - Some things are mandatory or optional to configure in operation

802.3by PHY designation options

Single 25GBASE-CR PHY

- Optional RS-FEC implementation
- Mandatory KR-FEC implementation
- Optional no-FEC mode implementation
- Mandatory AN implementation

Two PHYs 25GBASE-CR-L & 25GBASE-CR-S

- 25GBASE-CR-L
  - Mandatory RS-FEC implementation
- 25GBASE-CR-S
  - Mandatory KR-FEC implementation
  - Optional no-FEC mode implementation
- Mandatory AN implementation

Pro/Con (not complete)

- Guaranteed LP interop (w/3m cable)
  - But not with 5m if one LP doesn't have RS-FEC
- Does it satisfy 5m objective?
- Optional to implement RS-FEC
  - Some prefer not to implement to save power/area
- Mandatory to implement KR-FEC
  - Some might prefer to not implement KR-FEC to save power/area

Pro/Con (not complete)

- Ability to implement either/both
- No interoperability between PHYs
  - With any cable reach
  - Risk to user experience?
- Clarity on cable reach that will work with each PHY
- Risk of lack of clarity by users on difference between PHYs

Implementation and Operational Configuration

25GBASE-CR

Capability	Implement	Operate
RS-FEC	O	O
BASE-R FEC	M	O
No FEC	O	O
AN	M	O

25GBASE-CR-L

Capability	Implement	Operate
RS-FEC	M	M
AN	M	O

25GBASE-CR-S

Capability	Implement	Operate
BASE-R FEC	M	M
No FEC	O	O
AN	M	O

Deciding between the two options

- Both have drawbacks

- Both have advantages

- We need to pick one… consensus building necessary
  - Please bring contributions into March meeting.

Next Steps

We need proposal(s) for adoption covering these areas:

- One, two, or three PMD types.

- Mandatory vs optional to implement per PMD type.

- No FEC cable insertion loss (informative).
  - reference to a presentation if necessary

- AN advertisement parameters and resolution hierarchy/method.
  - Well covered

Need to adopt a proposal within Task Force to direct editorial team to include into current draft