The Road to Draft 1.0

IEEE P802.3cg 10 Mbps Single Pair Ethernet Task Force

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Vancouver, BC, Canada, March 13-16, 2017

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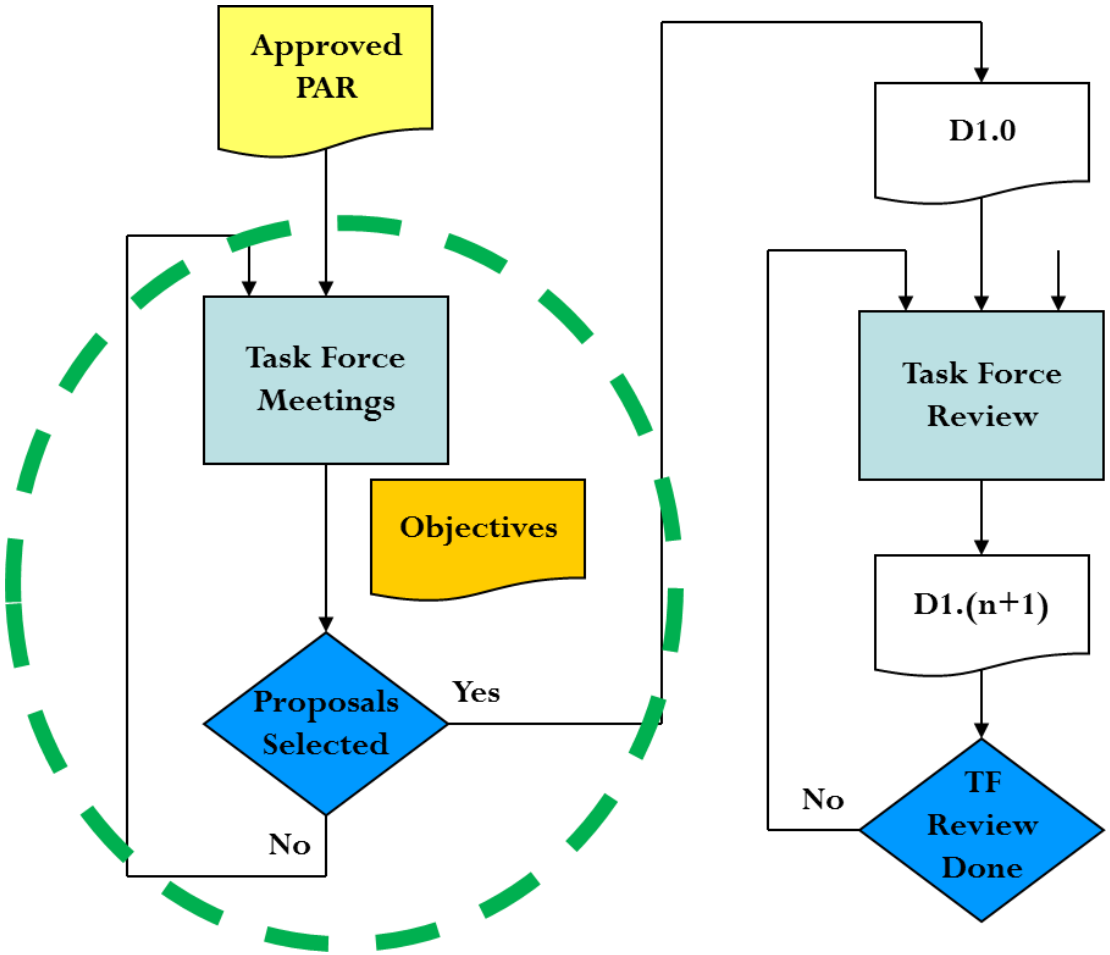


- We have “studied”
- We have objectives and a PAR
- We will always have questions

- Q: How do we get to D1.0?
- A: Make proposals and select them

Baseline Proposals – What are they?

- Proposals take many forms:
  - Concepts – a little more than an objective

    Example: '802.3cg will use a baseband PHY'
  - Equations – good for known parameters

$$IL(f) \leq 10 \times \left(1.23\sqrt{f} + 0.01 \times f + \frac{0.2}{0.02\sqrt{f}} \right) \text{dB}$$

  - Specifications to translate into IEEE Std 802.3 format
  - Precise Text & Figures for Inclusion in the standard
- All require a statement/motion to be adopted
  - "Move to: Adopt page 3 of zimmerman_3cg_01_0317.pdf as baseline for 802.3cg PHY link segment IL"
  - Making the statement makes it clear

Standards Development is:

- NOT: a Spectator Sport:
  - If everyone sits back, there will be no standard
  - Single presenter/proposers make mistakes
- NOT: a Review Board:
  - If you have an issue with a proposal:
    - Express the concern, be prepared to bring data to show the problem and bring an alternative---***don't just say you don't like it!***
- NOT: Purely Technical:
  - Just about anything can be the best technical solution given the proper context
- NOT: Purely Political:
  - "Technical Considerations remain our primary focus"

- **IS:** A ***CONSENSUS BUILDING*** ENTERPRISE
  - Consensus happens when you have broad participation

What if there is more to know?

- First, there ALWAYS is….
- So, grab progress when you can:
  - Define what you know – is it enough to adopt something?
  - Define what you need to know:
    - Tell the group
    - Get feedback if it is really needed
    - Propose how to find it out
    - Get help! – this builds consensus.

Steps to Specify a PHY

- PHY specs in 802.3 are rarely adopted as a whole ‘Blue Book’ spec
  - We can make changes if the consensus is we made a mistake
- Specify the link segment
  - Check against the objectives/desired uses
  - Try some proposed PHYs on it to see if it can work, then adopt
- Specify the transmission constraints & noise environment
  - Build the noise incrementally
  - Get the main parts, don’t ‘boil the ocean’
- Try some line coding, modulation, FEC, then present performance, adopt and build on work
  - Simulate, use theory, predict performance
  - Review, add more noise & constraints
  - Repeat until satisfied there is enough confidence to adopt
  - Continue to test as the specification is refined.
- Define next level of specifications: (usually at draft 1.x)
  - Jitter, linearity, noise tests get filled out in Task Force review

Example: 802.3bz

- Build consensus in ad hocs
  - Propose outline
  - Reference other specifications where possible
  - Document at a high level, with enough detail filled in
  - Then present to the TF and adopt!

Example: 802.3bz (cont'd)

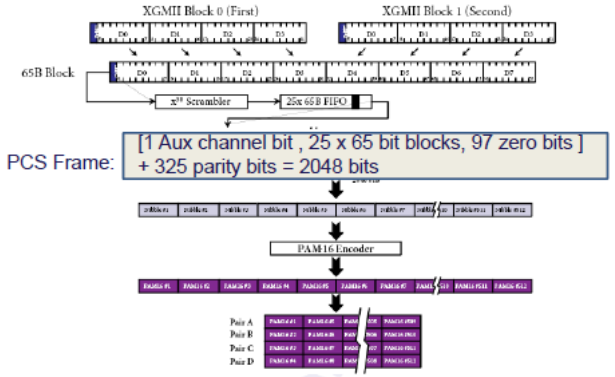
PCS/PMA Base Coding

- Start from 10GBase-T
- Use PAM 16 signaling per symbol
  - PAM 16 = 4 bits per symbol
  - 8 bits per 2 symbols
  - All 8 bits over 2 symbols are used
  - 325 of additional bits are used for protecting previously un-coded bits
  - 97 bits are set to zero (known transmitted bits help LDPC gain)
- All bits are protected by LDPC
- Otherwise, a scaled version of 10GBase-T
- All other electrical specs are scaled versions of 10GBase-T
  - Minor enhancement is total transmit power: 1.0 to 3.0 dBm
    - 2.2 dB below 10GBASE-T bounds to limit emission on CAT5e while still allows good SNR

Modulation and Encoding

- 5Gb/s via fully LDPC coded PAM 16 running at 400Ms/s
- 2.5Gb/s via fully LDPC coded PAM 16 running at 200Ms/s
- LDPC Frames
  - 5G = 320ns
  - 2.5G = 640ns
- Training is the same as 10GBASE-T training sequence at 400 MS/s and 200 MS/s

Frame structure



- Follows 10GBase-T XGMII → 64b/65b → Scrambling (master/slave)
- PCS frame adjusted to accommodate all bit encoding
  - 320ns @ 5Gb/s ; 640ns @ 2.5Gb/s
- PAM encoder(Grey Coded PAM-16) → THP → Lane Transmission

Motion

- Move to: adopt PMA/PCS Consensus Baseline Proposal as defined in Shirani_3bz_02_0515.pdf pages 3 to 5 as the basis of PMA / PCS for 802.3bz draft

•M:R. Shirani
•S: Ron Cates
•Technical (75%)
•Y: 49 N: 0 A: 1
•MOTION PASSES

Example: 802.3bq PHY baseline

- Baseline proposal outlined and discussed in multiple ad hocs
- Consensus built around strawman
- Additional areas for improvement identified, not closed
- ***Editor drafted text adopted at subsequent meeting***

Baseline Proposal

- Baseline PHY proposal:
  - Use PCS, Framing and Line Coding from Clause 55
  - Increase symbol rate 4X to 3200 Mbaud
  - Drop transmit power to ~ 0 dBm at MDI
- Areas for improvement/consideration:
  - Backchannel for THP dynamic update?
  - Revised FEC to cover uncoded bits?
    - Multiple ways of doing this
  - Faster startup?
  - Negotiated patch-cord operational mode?
  - Remove PBO?

IEEE 802.3bq 40GBASE-T Task Force, Dec 5 2013 PHY Baseline Proposal Ad Hoc Page 6

Proposal to Move Forward

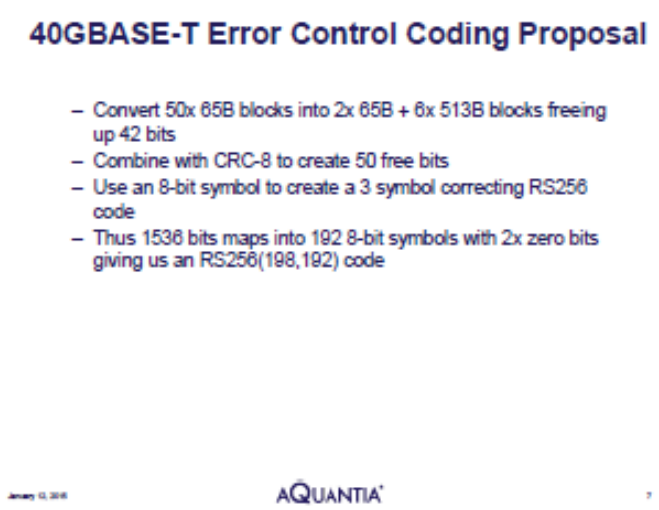
- At least 2 PHY vendors have contributed analysis of strawman
  - 3 have confirmed symbol rate is in sweet spot for AFE power
- 2 meeting cycles, 4 ad hoc calls, general consensus, no contributed alternatives
- Consider adopting skeleton of PHY baseline and move forward with refinements at this meeting or setting it up for decision at the May meeting, and consider refinements
- Proposed Motion:
  - Move to adopt the proposal on page 6 of zimmerman_3bqah_1213.pdf, based on a 4X rate scaling of Clause 55 signaling, as a baseline PHY specification with future consideration of the proposed modifications listed on the same slide.

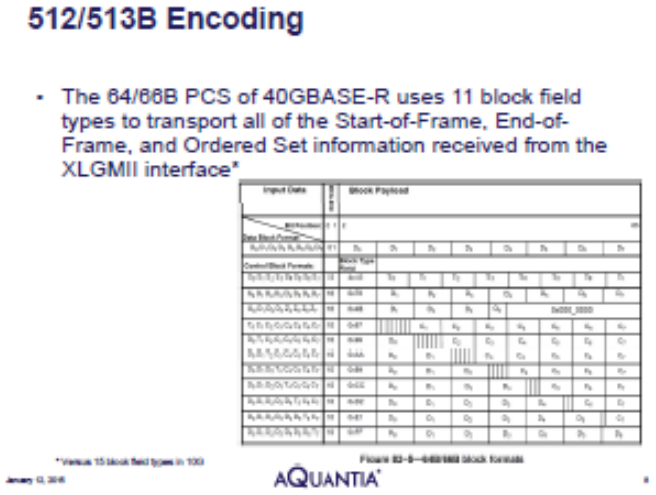
IEEE 802.3bq 40GBASE-T Task Force, March 2014 Plenary Meeting, Beijing, China Page 8

Example: Add-on: 802.3bq RS-FEC

- Additional features adopted as draft developed (specifics):

  <u>Motion #3:</u> Adopt the 512/513b transcoding & 8-bit RS FEC proposal in langner_3bq_01a_0115.pdf





Presentation with technical specifics, but not standards text

Example 802.3bp – small steps

- Frequency range
- Link Segment
- Modulation
- Mapping scheme
- etc…

- Then text:
  - PCS
  - FEC
  - Test specs

Motion #3

- Move that the IEEE P802.3bp Task Force adopts PAM3 as the modulation scheme for 1000BASE-T1 PHY.
- M: Mehmet Tazebay S: William Lo
- MOTION PASSES (Technical >=75%)
- Y:33 N: 0 A: 5

Proposed Baseline Text for PCS
IEEE 802.3bp 1000BASE-T1 Task Force 6th January 2015

97.3.4 PMA training side-stream scrambler polynomials

The PCS Transmit function employs side-stream scrambling. If the parameter config provided to the PCS by the PMA PHY Control function via the PMA_CONFIG.indication message assumes the value MASTER, PCS Transmit shall employ

$$g_M(x) = 1 + x^{13} + x^{33}$$

as transmitter side-stream scrambler generator polynomial. If the PMA_CONFIG.indication message assumes the value of SLAVE, PCS Transmit shall employ

$$g_S(x) = 1 + x^{20} + x^{33}$$

What if we have competing proposals?

- Good for us!
- Analyze, look for important points
- Enable analysis by non-proponents
  - Slugfests between proponents help no one
- Look for points of commonality and adopt
- Downselect if there are too many choices
  - Pluralities make consensus hard

Best Ways to a Fast Draft

- Don’t start from a blank sheet of paper
- Projects move faster once there is a draft
  - (unless you happen to be in PoE ☺)
- Find similar 802.3 text
  - If no 802.3 text, use similar standards/specs
- Look for low hanging fruit
  - Common points in existing proposals
  - Broad concepts (Symbol rate (baud))
- Focus on which questions are interoperability standard answers and which are ‘product specs’
- Work with your editors

Thank You!