25G Architecture Consensus

IEEE 802.3 25 GB/S Study Group

Summary of Submitted Options Meeting
Objectives & Supporting Technology Feasibility

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25GbE PHY Justification

- Spec reuse of 802.3-2012, 802.3bj-2014, & P802.3bm
  - Along with resulting implemented solutions
- Assumed layer architecture is similar to those of 10G/100G
  - RS, PCS, FEC, PMA, AN, & management specs likely to be based on specs of one of those rates or both
  - PMD, MDI & Medium specs probably based on 4x25 100G specifications
- 802.3 25G consistent with 802.3bj specs on crosstalk paths, test points/fixtures, channel loss budgets, cable assemblies, & COMS

Use of Only 10GbE 64b/66b PCS

- Leverage 40/100GBASE-R
  - But run at 25.78125G
- No alignment markers
- 64b alignment for encoding
  - Taking advantage of Clause 82
- Employ 256B/257B transcoding
  - Defined in 802.3bj
- Always RS-FEC encoded data
  - Sync up FEC correctable match with transcoding
  - Bit slips until n FEC correctable blocks discovered
    - Loses lock after m FEC blocks are uncorrectable
  - Similar to Clause 74 KR FEC

Two Other Options with Only 64b/66b

- One choice is using 10GBASE-R
  - 32b alignment for encoding
  - Includes all other specs of first choice
- Third option is with 40GBASE-R
  - Again, operating at 25.78125G
  - Single alignment marker
    - Could be single group of five or one PCS lane
  - 64b alignment for coding
  - Same transcoding & encoded data as others
    - No remapping of AMs required
    - Alignment markers permit syncing up similar to 100G

25GbE Extension Sublayer/Interface Options

- In cases of PHY implementations across 2 or more devices
  - Choice I
    - Use PMA service interface extension
      - Such as XLAUI & CDAUI
  - Choice II
    - Use an XXVMII extension service interface
      - Similar to the XAUI spec for 10G
      - Spec source from Clause 46 or Clause 81
  - Choice III
    - Combo of first two options

25GbE FEC & Latency Options

- RS-FEC encoding/decoding mandatory
  - Ensures interoperability
    - Introduced in 802.3bj & adopted for P802.3bm
- Clause 74 is still an option
  - Latency-sensitive apps with good signal integrity
- Stronger protection with even lower latency than Clause 74 FEC achieved using transcoding & a new shorter, RS-FEC code
  - But needs at least 1 code word for error marking to be MTTFPA-safe
- 66b encoded data without encoding
  - Simplification for ultra-low latency applications
  - Yet, no error counters
    - Unless AMs and BIP introduced

25G CR Copper PMD

- Cable lengths optimized up to 5m
  - Electrical specs same as 100G CR4
    - 25G “single lane” version of 100G KR4 RS-FEC
      - Clause 91
- Cable lengths optimized up to 3m
  - No need for FEC & its latency
- Loss budget same as 100G CR4
  - Potential reduction with shorter cables
    - MTTFPA concern from DFE burst errors without FEC
      - » Use COM procedure to verify acceptability of BER & MTTFPA
      - » Use 10G KR FEC to correct DFE burst errors
        - Latency 82 ns

END