Standardizing 40Gb Ethernet

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Outline

- Assumptions

- Defining an Additional Speed for a Standard
  - > MAC
  - > PCS
  - > PMA
  - > PMD
  - > MDI
  - > Management

- Summary

Assumptions

- **The work on 100Gb is a given**
  - > Adding 40Gb is considered here as an incremental effort

- **The following relevant objectives are evaluated**
  - > **Support a speed of 100Gb/s at the MAC/PLS interface**
  - > **Support a speed of 40Gb/s at the MAC/PLS interface**
  - > **Provide a family of physical layer specifications for 100Gb/s operation:**
    - > **Support at least *TBD* meters on Cu cable**
    - > **Support at least 100 meters on OM3 MMF**
    - > **Support at least 10km on SMF**
    - > **Support at least 40km on SMF**
  - > **Provide a family of physical layer specifications for 40Gb/s operation:**
    - > **Support at least *TBD* meters on Cu cable**
    - > **Support at least 100 meters on OM3 MMF**

MAC

- **The MAC is (sort of) speed independent**
  - > There is no speed notion anywhere in the Pascal code
  - > The only places where a MAC rate is mentioned is in the descriptive text

- **Implications:**
  - > Very few changes are anticipated to Clauses 1-4 for 100Gb operation
  - > For whatever changes/additions that are made to the text:
    - > Use "40Gb and 100Gb" instead of "100Gb"

PCS

- **Involves the definition of physical coding and framing**

- **For 100Gb operation:**
  - > 64b/66b or 8b/10b coding per lane
  - > 10-lane configuration option
    - > To support 10x10Gb
  - > 4-lane configuration option
    - > To support 4x25Gb

- **For 40Gb operation:**
  - > Will use the same coding per lane as 100Gb
  - > Will use the 4-lane configuration option from 100Gb
    - > To support 4x10Gb

- **Implications:**
  - > The 100Gb PCS specification will also specify the 40Gb PCS, by definition
  - > No 40Gb-specific action required

PMA

- **Defines the electrical specification for serial transmission over a single lane**

- **For 100Gb operation:**
  - 10Gb rate option
    - To support 10x10Gb
  - 25Gb rate option
    - To support 4x25Gb

- **For 40Gb operation:**
  - Will use the 10Gb option from 100Gb
    - To support 4x10Gb

- **Implications:**
  - The 100Gb PMA specification will also specify the 40Gb PMA, by definition
  - No 40Gb-specific action required

PMD

- **Defines the optical (fiber) and electrical (Cu) specifications for transmission over selected medium**

- **For 100Gb operation:**
  - > 4-lane WDM option
    - > To support 10km and 40km over SMF (4x25Gb)
  - > 10-lane parallel option
    - > To support 100m over OM3 MMF (10x10Gb)
  - > Cu option

- **For 40Gb operation:**
  - > Will use a variant of the 10-lane parallel option from 100Gb
    - > To support 100m over OM3 MMF (4x10Gb)
  - > Cu option
    - > Whatever works for 100Gb will work for 40Gb, perhaps for a longer reach

- **Implications:**
  - > The 100Gb OM3 and Cu PMD optical and electrical specifications will also apply to 40Gb, by definition
  - > The 40Gb-specific PMD may be defined in the same clause, or in a separate clause almost identical to the 100Gb PMD

MDI

- **Defines the medium attachment**
  - > We don't do connectors

- **For 100Gb operation:**
  - > Single-mode fiber option
    - > To support 10km and 40km over SMF (4x25Gb)
    - > One fiber in each direction
  - > Multi-mode fiber option
    - > To support 100m over OM3 MMF (10x10Gb)
    - > 10 fibers in each direction
    - > Two 12-ribbon MPO cables

- **For 40Gb operation:**
  - > Will use a variant of multi-mode fiber option from 100Gb
    - > To support 100m over OM3 MMF (4x10Gb)
    - > One 12-ribbon MPO cable

- **Implications:**
  - > The 100Gb OM3 solution will also apply to 40Gb, by definition
  - > No 40Gb-specific action required

Management

- **Defines the Layer Management specifications in Clause 30**

- **Implications:**
  - > The same changes/additions needed for 100Gb will be needed for 40Gb

Summary

- **Defining a standard for 100Gb Ethernet operation will also define almost entirely the 40Gb Ethernet operation**
  - > **At least as it relates to server connectivity in the datacenter**

- **The incremental effort to make 40Gb Ethernet an "official" standard is essentially trivial**

- **The standard's time line will be gated by the SMF PMDs for 100Gb operation**