1000BASE-T1 Line Baud Rate Selection

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Objective

- Choose line rate that is $\frac{N}{M} \times 25 \text{ MHz}$ to leverage existing Ethernet infrastructure, lower costs, and simplify design.
Agenda

- Historical Ethernet Interfaces
- Benefits of N x 25MHz
- Recommendation
Existing 1000BASE-* Infrastructure

- 1000BASE-T1 is new physical layer for automotive applications
- Ideally existing off-the-shelf MACs, switches, controllers do not have to change to work with 1000BASE-T1 PHY.

Historically 1000BASE and 100BASE interfaces run off multiples of 25MHz reference clock
- GMII – 5 x 25 MHz = 125 MHz
- RGMII – 5 x 25 MHz clock, 10 x 25 MHz data
- MII – 25 MHz
- SGMII - 50 x 25 MHz = 1.25 GHz
- 1000BASE-T (4 x PAM5) – 125 MHz line baud rate
- 100BASE-TX (MLT-3) – 125 MHz line baud rate
- 1000BASE-X – 1.25 GHz line baud rate
Core Follows N x 25MHz Reference Clock

- MACs, switches, controllers designs tend to use same N x 25 MHz reference clock
  - Driven by integrated PHY
  - Do not need 2 separate reference clocks into device

- Cost effective if 1000BASE-T1 PHY and MAC/switch/controller can share N x 25 MHz reference clock
Consider 25 MHz as a base for 1000BASE-T1 line baud rate

- 1000BASE-T1 host interface will be some form of GMII, RGMII, or SGMII so N x 25 MHz needed.

- Simplify PHY design if line baud rate can be N x 25 MHz
  - PAM3 – 675, 700, 725 MHz
  - PAM2 – 1100, 1125 MHz

- Can consider N / M x 25MHz where M is small integer.
  - Need to have good reason for it – i.e. 666.67 MHz for PAM 3 (80 / 3 * 25)

- Leverage existing Ethernet infrastructure that already run on N x 25 MHz.
Proposal

- Recommend 1000BASE-T1 adopt \( \frac{N}{M} \times 25 \text{ MHz} \) line baud rate when defining PCS, PMA, FEC, Modulation.
- \( N \) in an integer to be defined
- \( M \) is a small integer to be defined and ideally 1
Summary

Choosing line rate that is 25Mhz reference clock friendly

- Allows leveraging of existing gigabit Ethernet infrastructure with minimal modification
- Lowers system cost
- Simplifies PHY design
THANK YOU