1000BASE-T1 Line Baud Rate Selection

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Supporters

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▶ **Mehmet Tazebay – Broadcom**

▶ **Thomas Hogenmueller – Bosch**

▶ **Tom Brown - Vitesse**

▶ **Xiaofeng Wang - Qualcomm**

Objective

▶ **Choose line rate that is N / M x 25 MHz to leverage existing Ethernet infrastructure, lower costs, and simplify design**
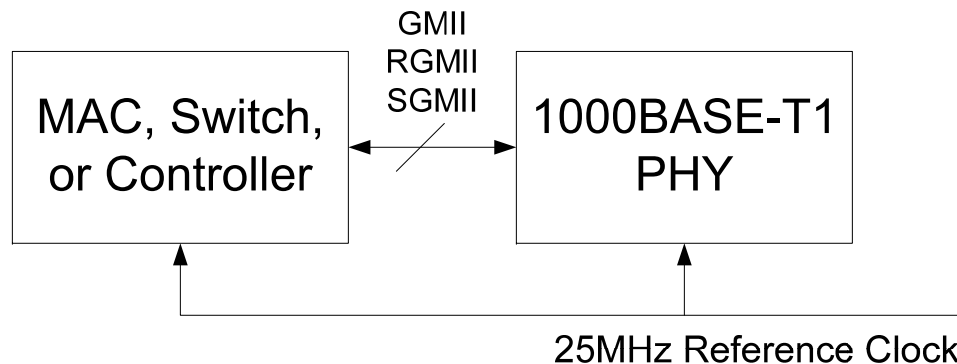
Agenda

▶ **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**

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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**

```
                          GMII
                          RGMII
                          SGMII
   ┌──────────────┐                 ┌──────────────┐
   │ MAC, Switch, │◄──────/────────►│ 1000BASE-T1  │
   │ or Controller│                 │     PHY      │
   └──────────────┘                 └──────────────┘
           ▲                                 ▲
           └─────────────────┬───────────────┘
                    25MHz Reference Clock
```

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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.**

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Proposal

▸ **Recommend 1000BASE-T1 adopt N / M x 25 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