

Proposal for 100BASE-T1L Auto-Negotiation

Niall Fitzgerald
Brian Murray
Philip Curran
Jacob Riesco

Introduction

- ▶ This is a proposal for 100BASE-T1L Auto-Negotiation

100BASE-T1L Auto-Negotiation

- ▶ Use Clause 98 Auto-Negotiation for 100BASE-T1L
 - In common with other SPE PHY technologies, including 10BASE-T1L
 - Support low-speed mode (LSM) of Clause 98 Auto-Negotiation to cover longer cable length
 - High-speed mode (HSM) optional for 100BASE-T1L

- ▶ Make Auto-Negotiation mandatory for 100BASE-T1L
 - Auto-Negotiation will provide robust synchronization of PHYs' link startup processes
 - Will not specify separate link synchronization mechanism for 100BASE-T1L PHY, which might introduce corner cases
 - Auto-Negotiation will resolve LEADER/FOLLOWER configuration
 - Clause 98 Auto-Negotiation is silicon proven
 - Clause 98 Auto-Negotiation is mandatory for APL

- ▶ 100BASE-T1L to include low and high transmit level operating modes as for 10BASE-T1L
 - 100BASE-T1L transmit level should be resolved by Auto-Negotiation, before 100BASE-T1L transmission starts
 - Low transmit level for 100BASE-T1L of 1.0 Vpp, same as 10BASE-T1L for Intrinsically Safe applications
 - Propose high transmit level for 100BASE-T1L of 2.0 Vpp
 - Consistent with other high speed PHYs using echo cancelling
 - 1000BASE-T, 2.5GBASE-T, 5GBASE-T, 10GBASE-T, 100BASE-T1, 1000BASE-T1, (2.5GBASE-T1, 5GBASE-T1, and 10GBASE-T1)
 - Achieving the transmit linearity required at 80 MSym/s is more complex at higher than 2.0 Vpp

Technology Ability Field bit assignments

▶ IEEE Std 802.3-2022 Table 98B-1

- Currently 15 of 27 bits unused

▶ Use 2 bits:

- A10 – 100BASE-T1L ability
- A21 – 100BASE-T1L increased transmit level ability

▶ 100BASE-T1L InfoField for:

- Sequence ordered sets support
- EEE ability
- Reed-Solomon error-correcting code ability

bit	Selector description
...	...
A9	10BASE-T1L capability
A10	100BASE-T1L ability
A11 through A20	Reserved
A21	100BASE-T1L increased transmit level ability
A22	10BASE-T1S half-duplex capability
A23	10BASE-T1L increased transmit level request
A24	10BASE-T1L increased transmit/receive level capability
A25	10BASE-T1L EEE ability
A26	Reserved

100BASE-T1L transmit level negotiation

- ▶ 100BASE-T1L link will use high transmit level when both sides advertise 100BASE-T1L increased transmit level ability in bit A21
- ▶ 100BASE-T1L link will use low transmit level when either side (or both) does not advertise 100BASE-T1L increased transmit level ability
 - For intrinsically safe application this ability will not be advertised
 - For other applications not desiring/needing high transmit level this ability will also not be advertised
- ▶ Simplified approach compared to 10BASE-T1L (which used two bits for transmit level negotiation)
- ▶ More consistent approach compared to other negotiated abilities and uses fewer bits

Priority Resolution

- ▶ 100BASE-T1L PHY to be added to priority resolution function described in IEEE Std 802.3-2022 Annex 98B.4
- ▶ New order, listed from highest to lowest priority:
 - 10GBASE-T1
 - 5GBASE-T1
 - 2.5GBASE-T1
 - 1000BASE-T1
 - **100BASE-T1L**
 - 100BASE-T1
 - 10BASE-T1S full duplex
 - 10BASE-T1S half duplex
 - 10BASE-T1L

Link startup time

- ▶ Low-speed mode Auto-Negotiation completes in less than ~12 ms
 - Time for Arbitration state machine of IEEE Std 802.3-2022 Figure 98-7 to enable PHY technology, in AN GOOD CHECK state
 - Includes break_link_timer duration of 8.133 ms

- ▶ Target overall link startup time of 100 ms
 - Leaves 88 ms for 100BASE-T1L link startup
 - Propose 85 ms duration for link_fail_inhibit_timer for 100BASE-T1L
 - link_fail_inhibit_timer sets the maximum time allowed for the PHY link startup to complete

Questions ?

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Move that the IEEE P802.3dg Task Force adopt slides 2 to 7 of Fitzgerald_3dg_01_11132024.pdf

M: Brian Murray

S:

Technical (>75%)