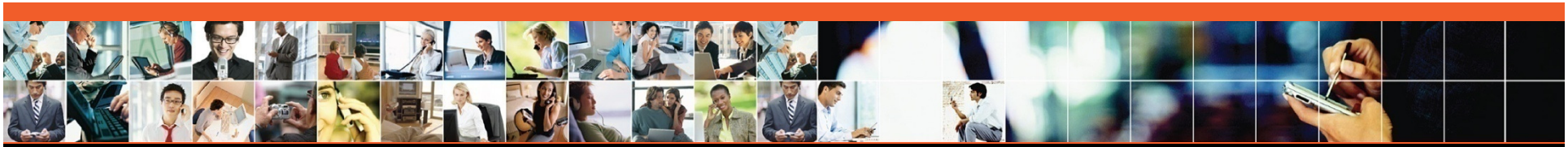


xBASE-T1 Auto-Negotiation

IEEE 802.3 10 Mbps Single Pair Ethernet Study Group
January 2017

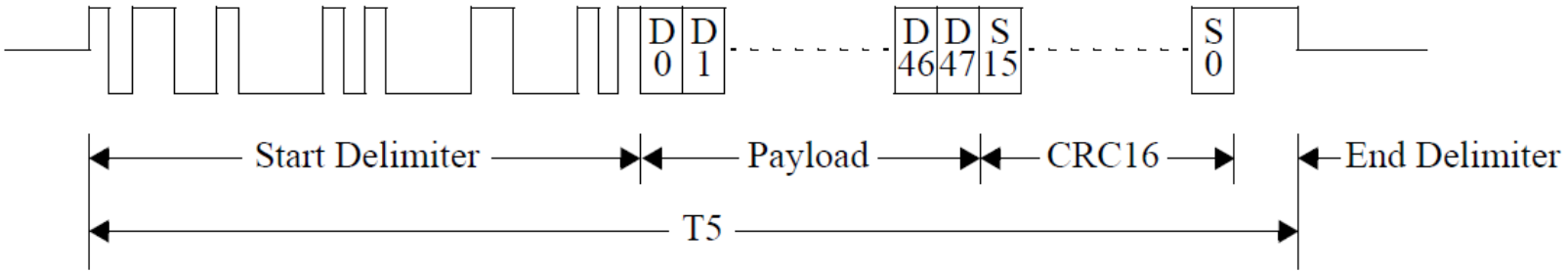
Brett McClellan, Marvell

Auto-Negotiation for single differential-pair media

- 802.3bp Clause 98: Auto-Negotiation for single differential-pair media
  - Exchange information between two devices that share a link segment and automatically configure both devices to take maximum advantage of their abilities.
  - Common synchronization time between two devices prior to link training.
    - Starts the 100 millisecond timeout for link training
  - Advertise enhanced modes of operation and to detect corresponding enhanced operational modes that the other device may be advertising.
  - Standardized mechanism to restart link training in case PHYs cannot link up on initial attempt.
    - Escape path from lock up due to any reason
    - Eliminates incompatible vendor dependent re-try implementation
  - Completes negotiation in less than 1 millisecond

Differential Manchester Encoded Pages

- Differential Manchester encoded (DME) pages.
  - DC balanced signal.
  - Polarity insensitive
  - Simple and robust decoding
  - Half-duplex over the single twisted-pair copper cable.
  - 48-bit data, 16-bit CRC



DME Message Pages

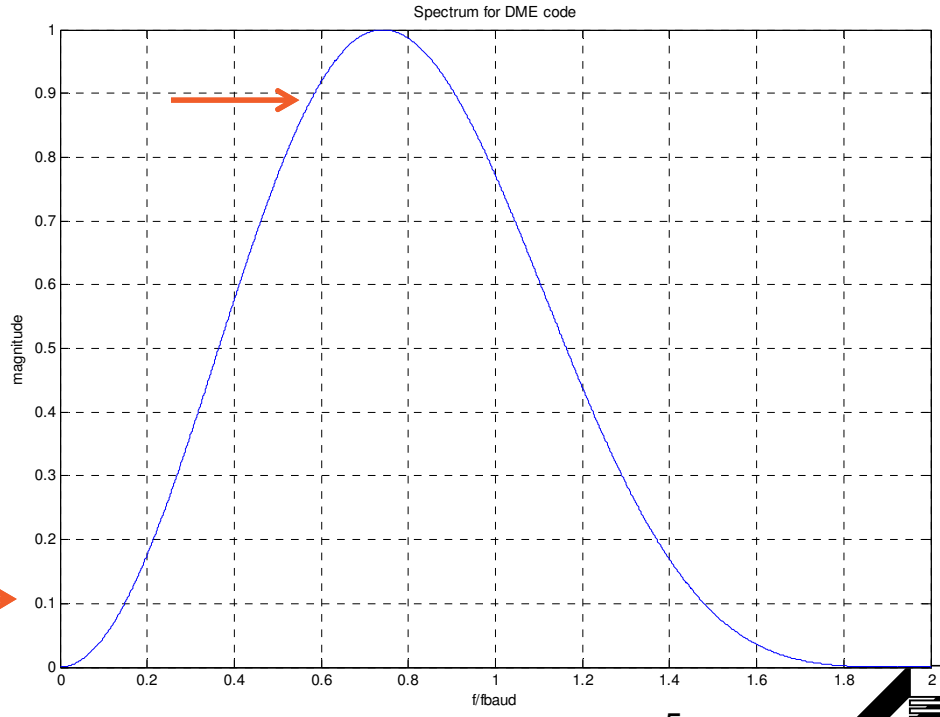
- Base Page message – 48 bits
  - 100BASE-T1 ability
  - 1000BASE-T1 ability
  - Master / Slave configuration
  - Flow control ability
- Optional Next Page messages – 48 bits
  - Organizationally Unique Identifier Tagged Message - exchange OUI and user defined message
  - AN device Identifier Tag Code - exchange AN device identifier tag code and user defined message

DME Signaling

- 16 2/3 MHz symbol rate - 33 1/3 MHz clock
  - At least one transition per symbol
  - within the pass band of 100M and 1G
    - Below the ~33 MHz bandwidth of 100M
  - common clock divider from 100M and 1G
  - above the 1MHz and 10MHz high pass corners for PoDL

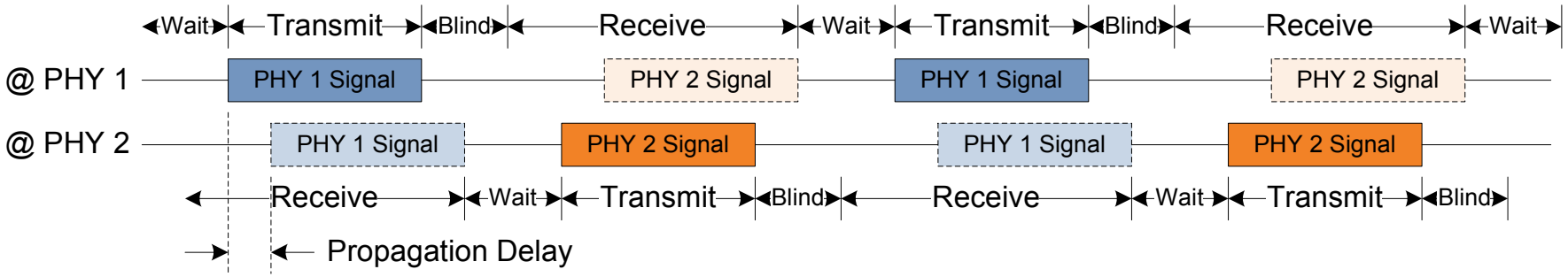
HP=10MHz

HP=1MHz



Half Duplex Over Single Pair

- PHYs take turns sending and receiving DME pages
- Blind period to avoid seeing echo from self
- After page received Wait (Silent) period needed since link partner may be in Blind period
- Timers were defined to support propagation delay for ~200 meters



see Lo_3bp_04_0314.pdf

Potential Issues for 10M SPE

- Half Duplex Timers designed for up to ~200 meters
- 16 2/3 MHz symbol rate - 33 1/3 MHz clock
  - May be out of band for 10M SPE
- Insertion loss of 1000 meters
  - will degrade DME detector performance

THANK YOU