

# Auto-Negotiation Status Update

IEEE 802.3bp - Plenary Meeting - July 2014

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## Agenda

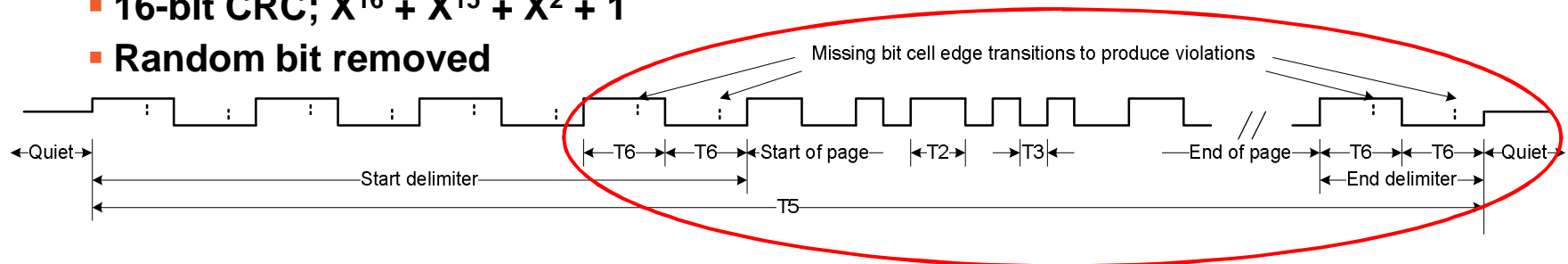
- ▶ **General points of agreement**
- ▶ **Tentative items**
- ▶ **Open items**
- ▶ **Some additional improvements not discussed**
- ▶ **Next steps**

## What occurred thus far

- ▶ **March 2014 - Details of single pair auto-negotiations presented**
  - Lo\_3bp\_03\_0314.pdf
  - Lo\_3bp\_04\_0314.pdf
- ▶ **May 2014 – Improvements on above**
  - Thaler\_01\_0514.pdf
- ▶ **May 2014 – Added auto-negotiation to 1000BASE-T1 objectives**
  - Lo\_Thaler\_Tazebay\_01\_0514.pdf
- ▶ **June 2014 – Offline discussions**
- ▶ **July 2014 – Additional work**

## Agreed items in June discussions

- ▶ **Use Clause 73 as starting point – ok**
  - Lo\_3bp\_04\_0314.pdf
- ▶ **Half duplex concept for auto-negotiations - ok**
- ▶ **Circled portion of page below agree upon**
  - 64-bit page
  - 48-bit data
  - 16-bit CRC;  $X^{16} + X^{15} + X^2 + 1$
  - Random bit removed



## Agreed items in June discussions

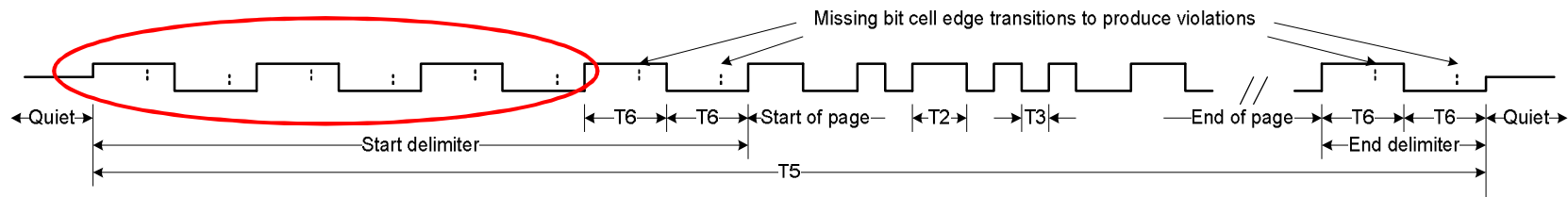
- ▶ **Starting polarity will be randomized instead of using random bit**
- ▶ **Base period T3 will be 8ns if 750MHz baud rate selected and 10ns if 700MHz baud rate selected**
- ▶ **Delimiter T6 will be 3 T3 periods instead of 4 T3 periods**
- ▶ **Single CRC match instead of 3 matching pages**
  - **ability\_match and acknowledge\_match redefined**

## Agreed items in June discussions

- ▶ **Most bits of base DME page defined**
  - D[4:0] = S[4:0] = 00001 – IEEE 802.3
  - D[9:5] = E[4:0] = Echoed Nonce
  - D[13] – RF
  - D[14] – Ack
  - D[15] – Next page
  - D[20:16] = T[4:0] = Transmitted Nonce
  - D[47:21] = TBD – Ability fields
  - D[63:48] = CRC16
  
- ▶ **Receive state machine can be optimized not to waste first received page**
  
- ▶ **Silence limits of +/- 50mV**

## Tentative items

### ▶ What pattern to use in circled portion below



- ▶ remaining\_ack\_cnt – tentatively set to 3
- ▶ Number of page(s) transmitted per turn – original proposal was 1
- ▶ DME Page bits
  - D[11:10] – Do we keep or eliminate pause bits
  - D[12] – Force Master/Slave – do we support force mode

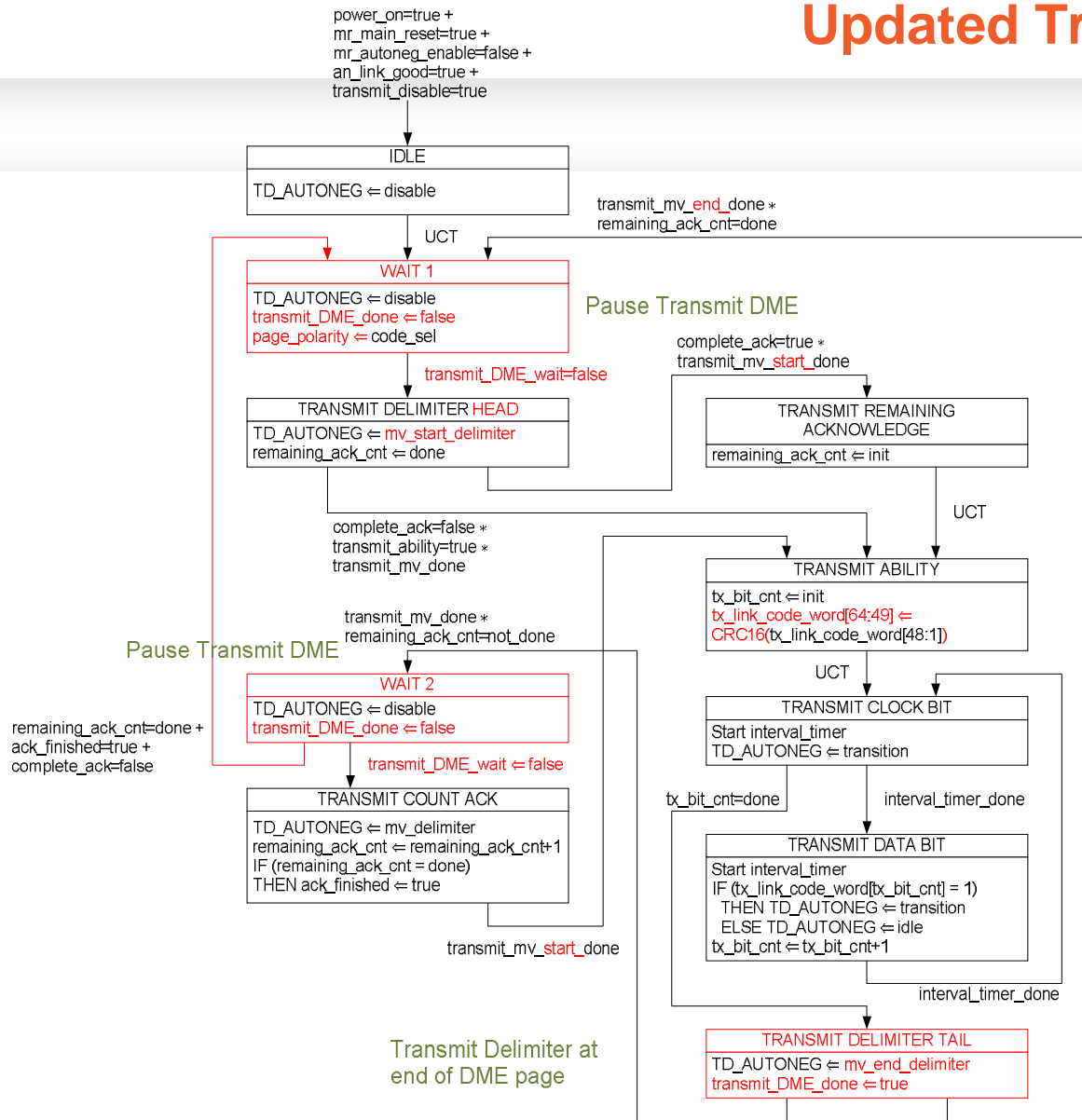
## Open item dependent on other parts of 1000BASE-T1

### ▶ DME transmit electrical levels

- Most likely some threshold easily met by 1000BASE-T PAM3 and 1TPCE PAM3 +1 / -1 levels

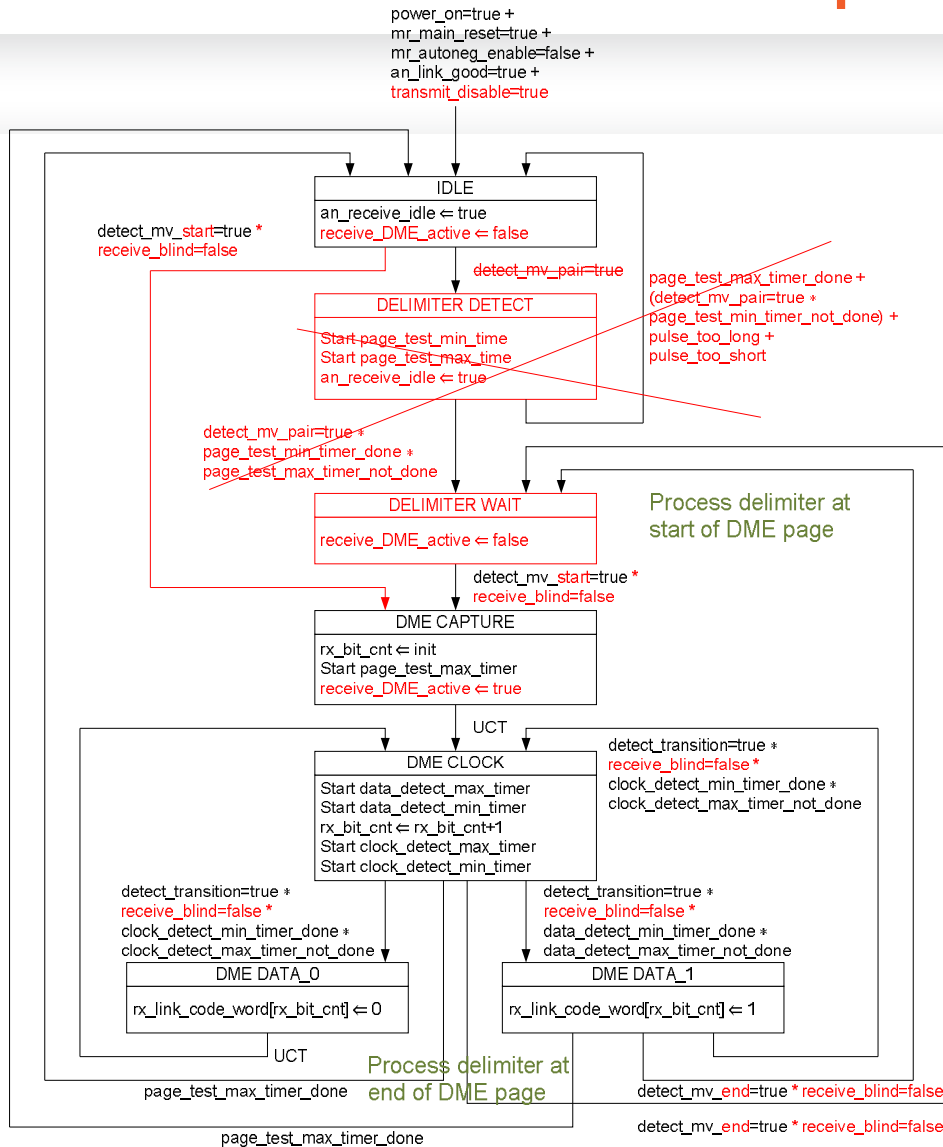


# Updated Transmit State Machine



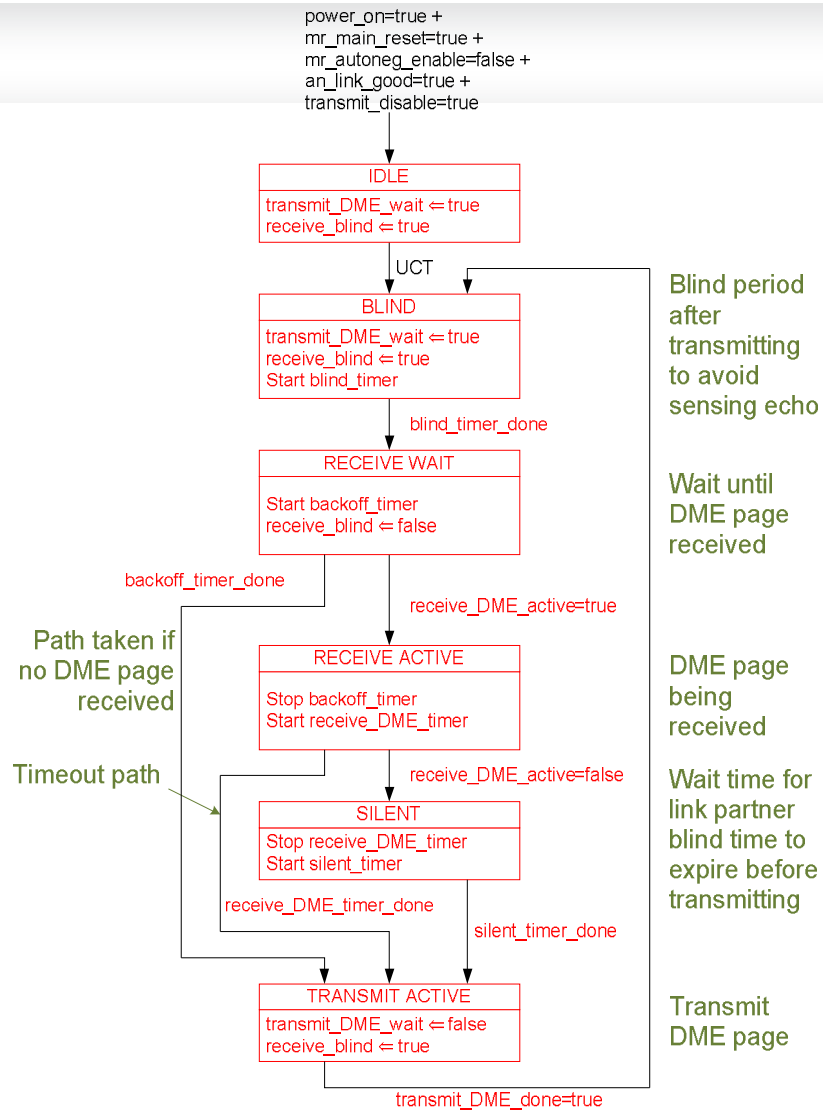
- ▶ Differentiate start and end delimiters
- ▶ Incorporate CRC16
- ▶ Randomize starting polarity

# Updated Receive State Machine



- ▶ Differentiate start and end delimiters
  - detect\_mv\_pair becomes
  - detect\_mv\_start
  - detect\_mv\_end
  
- ▶ Optimized
  - First received page not discarded

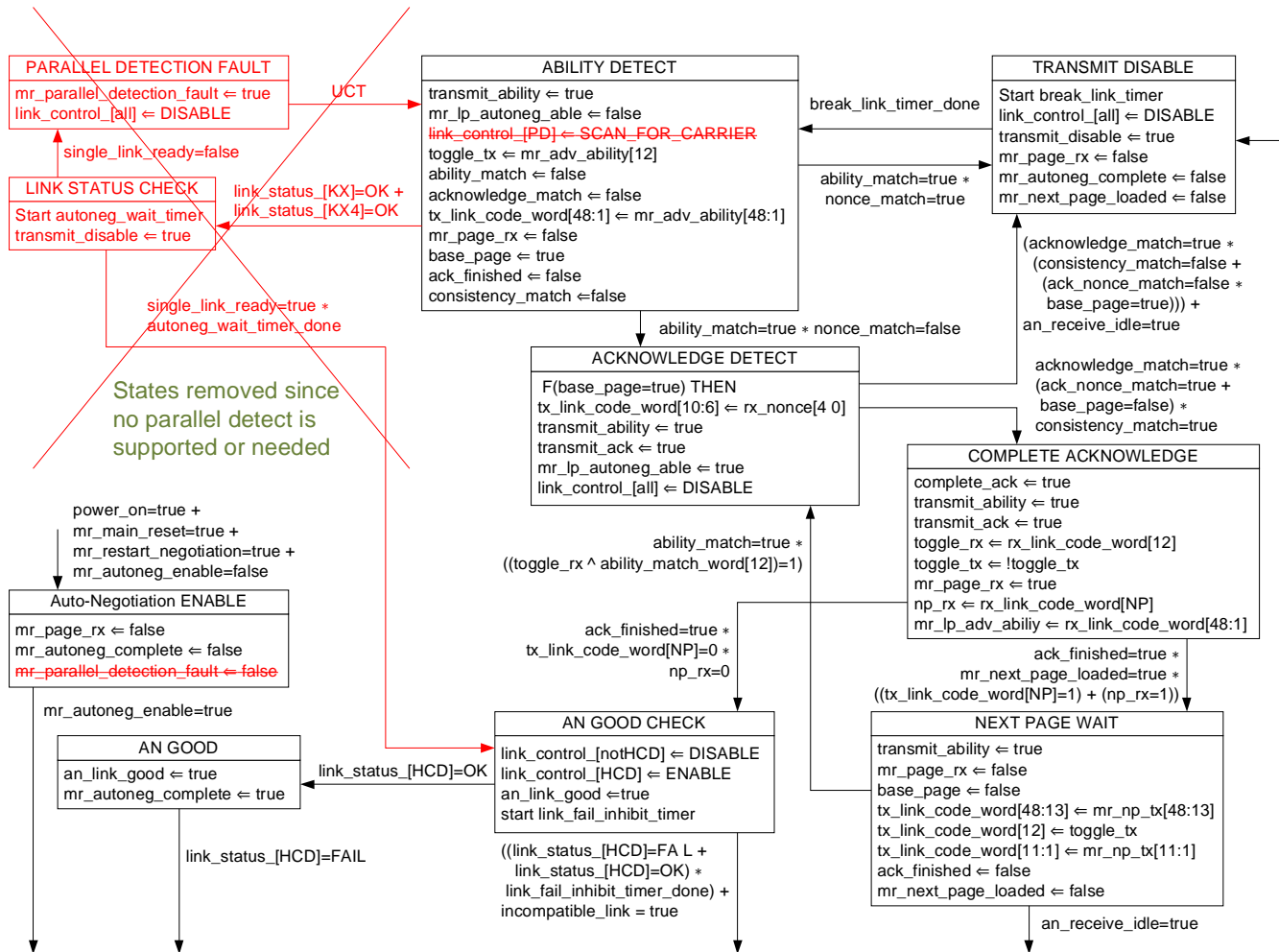
# Updated Half Duplex State Machine



- ▶ **No behavioral change**
  - **Rewrote timer expression to conform with IEEE style.**

# Arbitration State Machine

## ▶ No behavioral change



## Improve Collision Resolution Time

- ▶ On collision each PHY will randomly wait 0 to 15 wait (silent\_timer) periods to avoid transmitting at the same time .
- ▶ There is 1/16 probability that collision will occur again
- ▶ Typically one PHY will prefer to be master, and the other prefer to be slave
- ▶ Guarantee there will be zero probability of second collision with the following enhancement
  - PHY that prefers master – no change
  - PHY that prefers slave – add silent\_timer / 2 additional wait period
- ▶ Offset guarantees PHYs will never pick the same backoff time in this case

## Next Steps

- ▶ **Adopt Lo\_3bp\_04\_0314.pdf with changes in this presentation (Lo\_3bp\_02a\_0714.pdf) as auto-negotiation baseline with the understanding that additional changes will be needed once tentative items firm up**
- ▶ **Encourage multiple vendors to build simulations based on adopted baseline to root out hidden issues and refine specification**

# THANK YOU