SOLARFLARE Communications

Filling the 10GBASE-T TBDs: WAKE & SLEEP (revised)

G. Zimmerman

Solarflare Communications

12 August 2008

Revisions

- Per discussion with group:
  - **Granularity of T_s and T_w will be by PHY frame (320nsec)**
  - **WAKE can be either Normal IDLE or Local Fault (for wake on error condition)**
  - **Valid SLEEP or WAKE are 1 full 64/65b block of LPI or Normal IDLE/Local Fault, respectively**
  - **Maximum T_w is for further study**
  - **Maximum T_s is for further study (request system vendor feedback)**
  - **Nomenclature updated per hayes_02_0508.pdf to have T_w_PHY**
- New text is in color

SLEEP Signalling

- Transmitting PHY initiates sleep signalling upon receiving LP_IDLE at the XGMII, Define SLEEP, Ts
- Choices
  - **Inband:**
    - PRO – natural choice of signal is simply passing LP_IDLE
    - CON – requires waiting for receiver latency before powering down
  - **Out-of-band: (including non-PAM16 signalling)**
    - PRO – can receive and react rapidly, shutting down the pipeline
    - CONS – requires new signal to be specified, including
      - requires latency specification for transmitter and detector of out-of-band signal
      - Requires specification of extra state transitions to orderly shut-down of data
        - increases probability of data corruption, likely requires extra circuitry

Proposal – InBand SLEEP

- Signal SLEEP by passing LP_IDLE as 64/65b encoded stream
  - Minimal complexity – simply pass the PCS words on, and add state-machine to detect at receiver XGMII
- Additional Requirements:
  - **Receiver shall consider detect a full 64/65b block of 8 LP_IDLE signals as a valid SLEEP (8-15 LP Idle symbols)**
  - **T_s > 25600 + 120 BT (2.5720usec) to avoid corruption of packets in transit**
    - Granularity shall be in 320nsec PHY frames (3200BT)
      - Therefore T_s min = 9 PHY frames
    - Transmitter continuously sends SLEEP for at least T_s before shutting off and going into REFRESH IDLE mode
    - Receiver can demand greater T_s through AutoNeg or LLDP,
    - Maximum T_s is for further study

WAKE Signalling

- Transmitting PHY initiates wake up signalling upon receiving IDLE following LP_IDLE at the XGMII – other than LP_IDLE or IDLE triggers Wake on Error
  - **Note – Transmitter has already sent, and receiving PHY has seen ALERT and activated receiver**
- Choices
  - **Inband:**
    - PRO – natural choice of signal is simply passing IDLE or Local Fault (wake on error)
    - CON – requires waiting for receiver latency before successful confirmation
      - Relies on REFRESH IDLE to keep the receiver trained for quick resumption of data
  - **Out-of-band: (including non-PAM16 signalling)**
    - PRO – can receive and react rapidly, outside of pipeline
      - May allow final training (this should not be an issue due to refresh)
    - CONS – requires new signal to be specified
      - requires latency specification for transmitter and detector of out-of-band signal
      - Requires specification of extra state transitions to orderly resumption of data
      - Fully out-of-band signally may require additional flushing of receiver pipeline

Proposal – InBand WAKE

- Confirm WAKE by passing (normal) IDLE or Local Fault (LF) as 64/65b encoded stream
  - Minimal complexity – transmitter flushes pipe by passing the PCS words on, and receiver adds state-machine to detect at receiver XGMII
- Additional Requirements:
  - **Receiver shall consider detect a full 64/65b block of 8 IDLE or LF signals as a valid WAKE (8-15 IDLE symbols)**
  - **T_w_PHY > 120 BT (0.0064usec) to detect**
    - Transmitter must send at least 8 normal IDLE/LF before resuming transmission (depending on 64/65b blocking)
    - Receiver can demand greater T_w_PHY through LLDP or autoneg
    - Granularity shall be in 320nsec PHY frames (3200BT)
      - Therefore T_w_PHY min = 1 PHY frame
      - Maximum T_w_PHY is for further study and system vendor feedback is requested.

SOLARFLARE Communications