ACT startup sequence

Contribution to 802.3dm Task Force

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Introduction

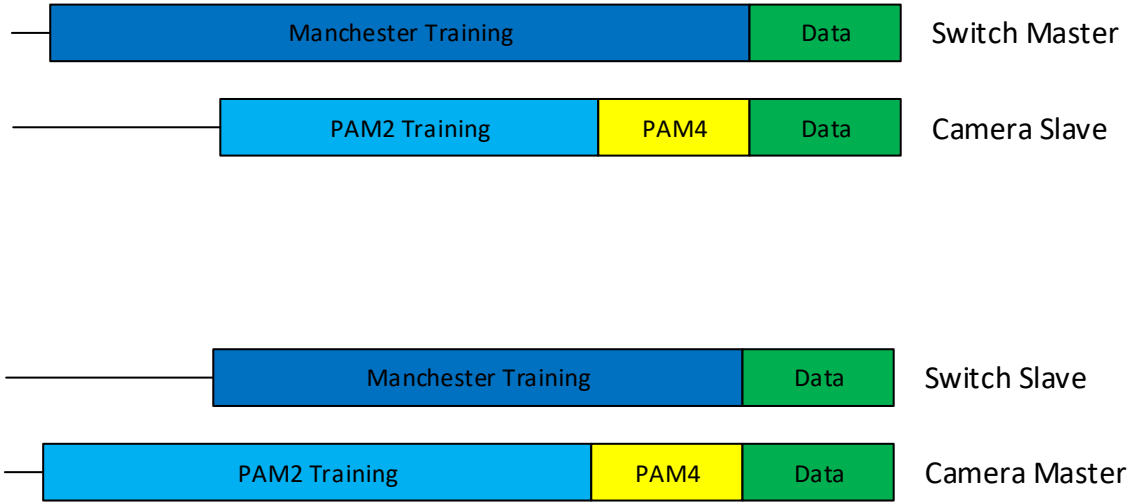
- This presentation gives a high-level view of the ACT startup sequence, focusing on the training signals
- Specific structure is proposed for the training signals:
  - Low data rate direction uses Differential Manchester Encoding (DME) for the training signal
  - High data rate direction uses 802.3ch like training signal
- Remaining question is how are the transitions controlled in the training sequence state machine

Basic ACT Startup Sequence

- The basic ACT startup sequence should be structured similar to the startup sequence for 802.3ch
- The startup sequence is initiated with link-sync (or auto-negotiation)
- Master starts transmitting in half-duplex mode
- After some time in half-duplex mode the slave starts transmitting
- The final training stage is to switch from PAM2 to PAM4 in the high data rate direction, and then go into data mode

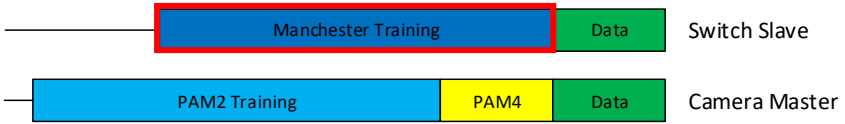
Structure of Training Sequence

- In 802.3dm, the training starts with PAM2 training signal and then switches to PAM4 training signal before starting data mode
- For ACT it is reasonable to use same structure for the high data rate transmission from the camera
- For the 100Mbps signal the training should be done with Differential Manchester Encoded signal, transmitting training frames



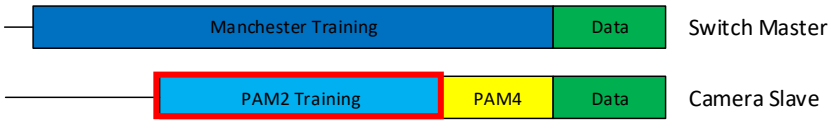
Manchester Training Signal

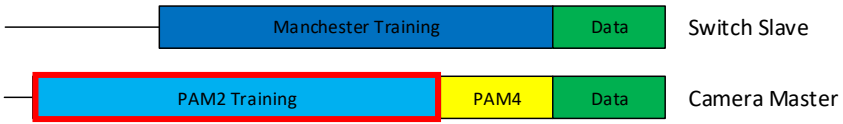
- When switch is the master, the primary purpose of the 100Mbps DME training signal is to allow the camera PHY to lock on to the master clock
  - Once the camera PHY has locked to the clock, it is ready to start transmitting
- When camera is the master, the primary purpose of the 100Mbps DME training signal is to allow the camera PHY to acquire the sampling phase
  - The camera PHY needs relatively short time to acquire the sampling phase



PAM2 Training Signal

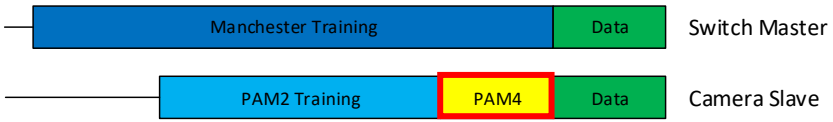
- When camera is the master, the primary purpose of the PAM2 training signal is to allow the switch PHY to lock on to train its equalizers and lock on to the master clock
  - Once the switch PHY has trained its equalizers and locked to the clock, it is ready to start transmitting
- When switch is the master, the primary purpose of the PAM2 training signal is to allow the camera PHY to train its equalizers

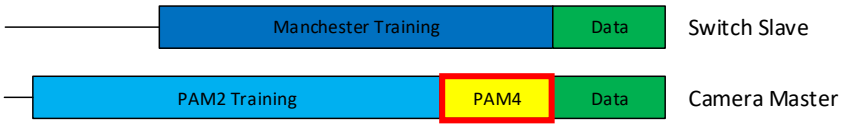




PAM4 Training Signal

- The purpose of the PAM4 training signal is to prepare for a seamless transition into data mode
- The switch PHY needs to be ready receive the PAM4 signal, when the camera PHY starts transmitting PAM4
  - There is a need for some form of handshake to indicate that the switch PHY is ready for PAM4





Why Have Half-Duplex Training?

- The half-duplex transmission from the master allows the slave to lock on to the receive signal without interference from its own echo
- In echo canceled systems the half-duplex transmission also allows the master to train its echo cancelers without interference from the remote transmitter
- For ACT both above reasons are less important, because echo is much lower than in full echo canceled system

Training State Transitions

- How are the state transitions in the training sequence controlled?
- What prompts the slave to start transmitting?
  - Should it be based on internal status and signaling from master, like is done in 802.3ch?
  - Should it be based on internal signaling and timer, instead of signaling from master?
  - Should it only be based on a timer?
- How does the camera PHY know that the switch PHY is ready to switch to PAM4?

Summary

- It is reasonable to base the high data rate training sequence on the 802.3ch training signals
- It is reasonable to use DME signal (with training frames) for the low data rate training
- The main open question is how transitions between training stages are triggered?

Comments and Collaborators Wanted

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