TRANSMITTER CONTROL FOR THE AUI-C2C INTERFACES (COMMENT #59)

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Supporters

Comment

Cl **120F** *SC* **120F.1** *P* **202** *L* **31** # 59

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"If implemented, the transmitter equalization feedback mechanism described in 120D.3.2.3 may be used to identify an appropriate setting"

As presented in ran_3ck_adhoc_02_021920, that mechanism supports the equalizer that was specified in the original CAUI-4 C2M (Annex 83D), which has only 3 taps with 5% coefficient resolution. The PAM4 AUIs defined in 802.3.bs (120D.3.1.5) and re-used in 802.3cd have kept this structure. However, we now have a 5-tap equalizer with a finer resolution. Even if pre-cursor tap c(-3) is removed as suggested in 120F.3.1.4 it would not be identical to the FFE in Annex 83D.

Therefore, re-using this method for 100GAUI-1 is impossible and new method should be defined. Possible solutions include a training protocol as in the PMD control function, new management variables and registers, or combinations of the two approaches.

SuggestedRemedy

A presentation with possible solutions is planned.

Proposal

- Add a new top level subclause in annex 120F (e.g. 120F.5) titled “Transmitter control function”.
- The possible options are:
  1. Register-based control:
     - Define a pair of registers (“request” and “response”) in each direction (“local” and “remote”) per lane (total 2*2*4=16 registers).
     - Content of registers based on the PMD control function “request” and “status” fields. For management, the “local” registers are RO, and the “remote” registers are writeable.
     - Effect of writing to the “remote” registers is as specified in clause 136 for incoming training frames.
     - The “local” register updates (requests and responses) are relayed to the link partner’s corresponding “remote” registers by management.
     - The value “PAM2” is not allowed for the modulation and precoding fields (local/remote, request/status).
  2. Training protocol:
     - Each lane shall implement the control function identical to the one specified in 162.8.11.
     - Define a AUI-C2C transmit function with two operational modes, TRAINING and DATA, as in 162.8.2.
     - Update the PMA service interface in 120.3 such that the PMA:IS_SIGNAL.indication primitive is generated based also on the TRAINING/DATA mode.
- Editorial license will be given to implement the changes.

Details – option 1

- With a register-based control function
  - **The C2C interface is always "functional"**, in both directions, although it may have excessive BER (up to 0.5) until Tx settings are correct.
  - **Management is responsible for reading/writing registers in sequence**, in all lanes, in order to "bring up" the AUI-C2C link. Implementation is not within the scope of the standard.
  - **Continuous adaptation is possible**: the AUI-C2C receiver can signal adequate signal quality using the "receiver ready" flag, but management can continue handling requests regardless of this flag.
  - **No pattern generator or protocol logic is required** in the AUI-C2C.
  - **Initial NRZ signaling cannot be used**; bad equalization setting can prevent CDR lock.
  - There is **no well-defined startup sequence**.

Details – option 2

- With a training protocol
  - **The C2C interface is initially logically off**, in both directions, until training is completed. When it is logically on, it is required to operate with the specified BER.
  - **Management intervention is not required**: The AUI-C2C has state diagram logic which is responsible for managing the protocol on all lanes in parallel and bringing up the AUI-C2C link without management intervention.
  - **Initial NRZ signaling can be used** to achieve CDR lock with unknown channel and initial equalization setting.
  - **Training pattern generator and protocol logic is required** in the AUI-C2C.
    - May be used also to indicate faults, e.g. no signal on the adjacent C2M link.
  - There is a **well-defined startup sequence**.
  - **Training can be disabled** and Tx equalization can be forced by management, e.g. if optimal setting is known.
    - This can also be a fallback to option 1 if link partner does not support the protocol.

Why?

- To enable a simple AUI-C2C receiver, some of the equalization must be done in the transmitter.
- Optimal Tx setting is channel and device dependent, so has to be controlled.
- The control interface from previous AUIs is inadequate for Tx equalizer with 5 (or possibly 4) taps and fine steps, as required for 100G per lane.
  - Something else has to be defined.
- The control function in clause 136 (and re-used in 162) defines the necessary information that should be passed between receiver and transmitter. It is a good foundation for equalization control
  - We have to choose whether to use an in-band training protocol as in the PMD, or to avoid it and exchange information out-of-band using management.

Plan (to be removed)

- Note: this presentation currently has two options. It is likely that only one will be implemented.
- This presentation is circulated over email to collect support for either of the approaches, and/or improvements or changes, preferably prior to the teleconference meeting.
- Your response is important! Please indicate which option you would support. (possibly both)
- If one of the options shows clear support:
  - I will propose resolving comment #59 with instruction to implement with editorial license.
  - Missing details and improvements can be handled in future comments.
- Otherwise:
  - I will ask for a straw poll to find a direction.
  - And work offline to build consensus on an updated proposal.