

800GBASE-LR1 APSU Detailed Proposal Addressing comment I-314

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Introduction

- This contribution provides details for implementing the APSU signaling for an 800GBASE-LR1 PHY.
- A contribution providing similar details was presented at the 22 April 2026 Clause 178B ad hoc meeting:
https://www.ieee802.org/3/dj/public/adhoc/178b/26_0422/brown_178b_01_260422.pdf
- A straw poll taken at the ad hoc meeting indicated unanimous support.
- This contribution summarizes the straw poll and provides a few additions and corrections.

Straw poll @ 22 April 2026 Clause 178B ad hoc meeting

Straw Poll #3 (Brown)

I support adopting the APSU approach proposed by brown_178b_01_260422.pdf

Yes

No

Results:

Yes: 16

No: 0

5

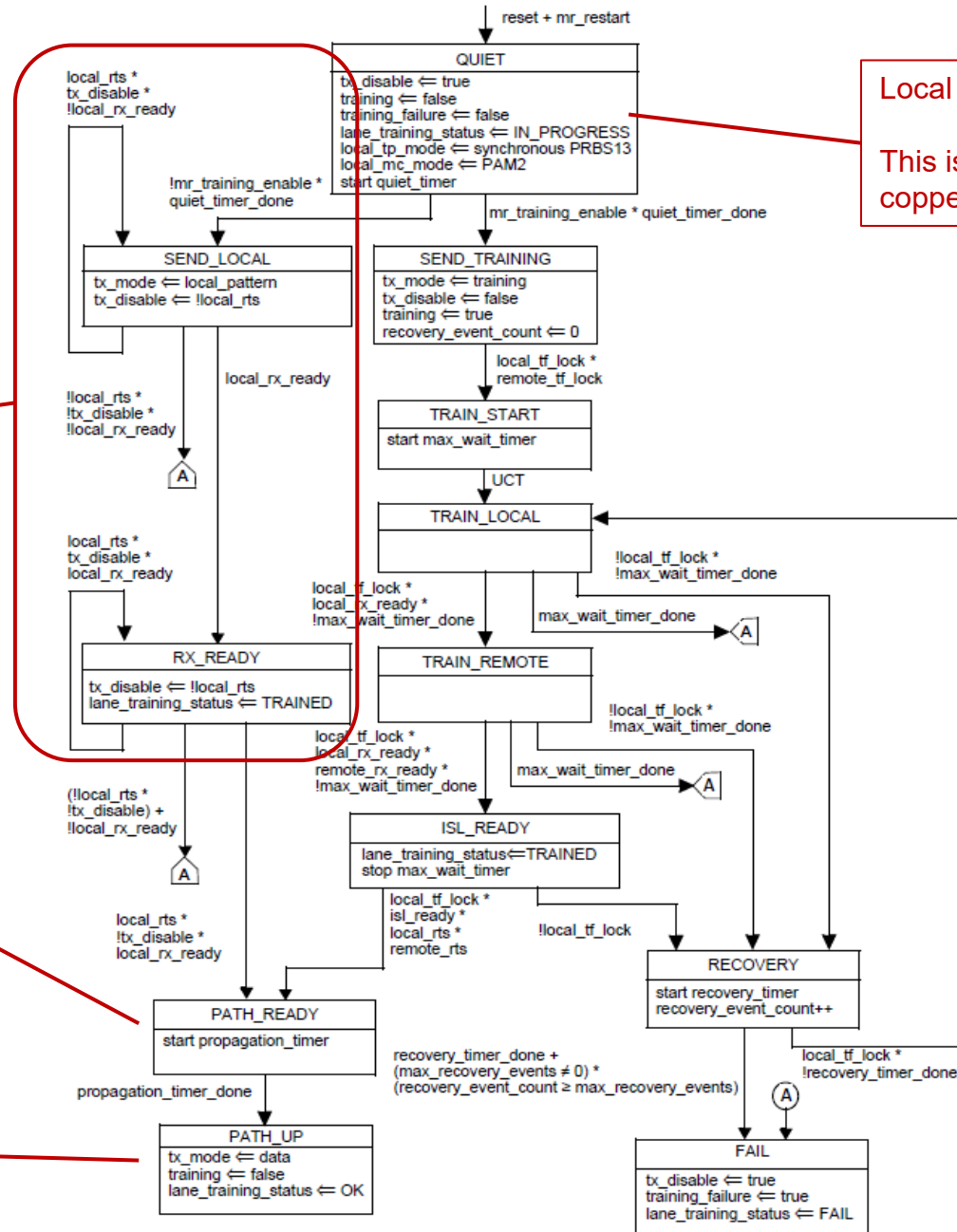
Based on this straw poll, amongst the attendees at the ad hoc meeting there was unanimous support for the proposed changes.

Proposed changes

Starting point

- The 800BASE-LR1 APSU signaling capability leverages the ILT function “LOCAL PATTERN” mode of operation (see 178B.7).
- This mode comprises the left-most path, from the QUIET state to the PATH_UP state, in the training control state diagram (Figure 178B-10), as described on the following slide.
- Note that a set of contributions are proposing to “refactor” the RTS update (Figure 178B-9) state diagram and the training control state diagrams to better segregate the link training capabilities from the path coordination (RTS) capabilities.
 - See [huber_178b_01_260414.pdf](#)
 - If the intended “refactoring” changes are adopted, then some details in this proposal may need to be reworked to align.

Walk through state diagram (no changes)



Local transmitter is squelched.
This is same behavior as copper and IMDD PMDs.

Waiting for adjacent interface then enable TX and send PRBS31 within Inner FEC. Waiting for peer to transmit, then Rx to adapt. Could happen in either order.

Transmitter is not squelched. Sending PRBS31 encoded by Inner FEC. Tx clock is derived from adjacent interface. Rx is receiving a good signal and has completed adaptation.

Note comment #I-368 proposes Tx continues to send PRBS31 encoded by Inner FEC until 800GBASE-LR1 Inner FEC achieves alignment marker lock in the transmit direction.

Inner FEC now encodes the data from the adjacent interface (mission data).

New APSU subclause (proposed changes)

Add a new subclause in Clause 185 as follows:

185.x.x Autonomous path startup functions (APSU) functions

A PMD shall provide the ready-to-send (RTS) function and the ILT function as specified in Annex 178B.

The variable `mr_training_enable` is always set to false.

When `tx_mode` is `local_pattern` (see 178B.8.3.1), the PMD transmits PRBS31 encoded by the 800GBASE-LR1 Inner FEC as defined for the test pattern generator in 184.6.1.

Transmit disable (proposed changes)

Currently in D3.0

185.5.7 PMD global transmit disable function (optional)

The PMD global transmit disable function is optional and allows the optical transmitter to be disabled.

When the PMD_global_transmit_disable variable is set to one, this function shall turn off the optical transmitter so that it meets the requirements of the average launch power of the OFF transmitter in Table 185-5.

If a PMD fault is detected (see 185.5.8), then the PMD may set the PMD_global_transmit_disable variable to one, turning off the optical transmitter.

Proposed updates to 185.5.7, based on text in 179.8.7, adds mandatory tx_disable control for ILT but leaves management control optional (185.x.x is the new APSU subclause, see previous slide)

185.5.7 PMD global transmit disable function

The PMD global transmit disable function enables the optical transmitter to be disabled. This function is used by the ILT function. It may optionally be provided through the control variable PMD_global_transmit_disable.

If either PMD_global_transmit_disable or the variable tx_disable of the ILT function (see 185.x.x) is set to one, this function shall turn off the optical transmitter so that the transmitter meets the requirements of the average launch power of the OFF transmitter in Table 185-5.

If a PMD fault is detected (see 185.5.8), then the PMD may set the PMD_global_transmit_disable variable to one, turning off the optical transmitter.

179.8.6 PMD global transmit disable function

The PMD global transmit disable function is optional. If this function is supported, it shall meet the following requirements.

Setting the Global_PMD_transmit_disable variable to 1 has the same effect as if tx_disable (see 179.8.7) is set to 1 on all lanes ($i = 0$ to $n-1$). Global_PMD_transmit_disable does not overwrite the tx_disable or PMD_transmit_disable_{*i*} variables.

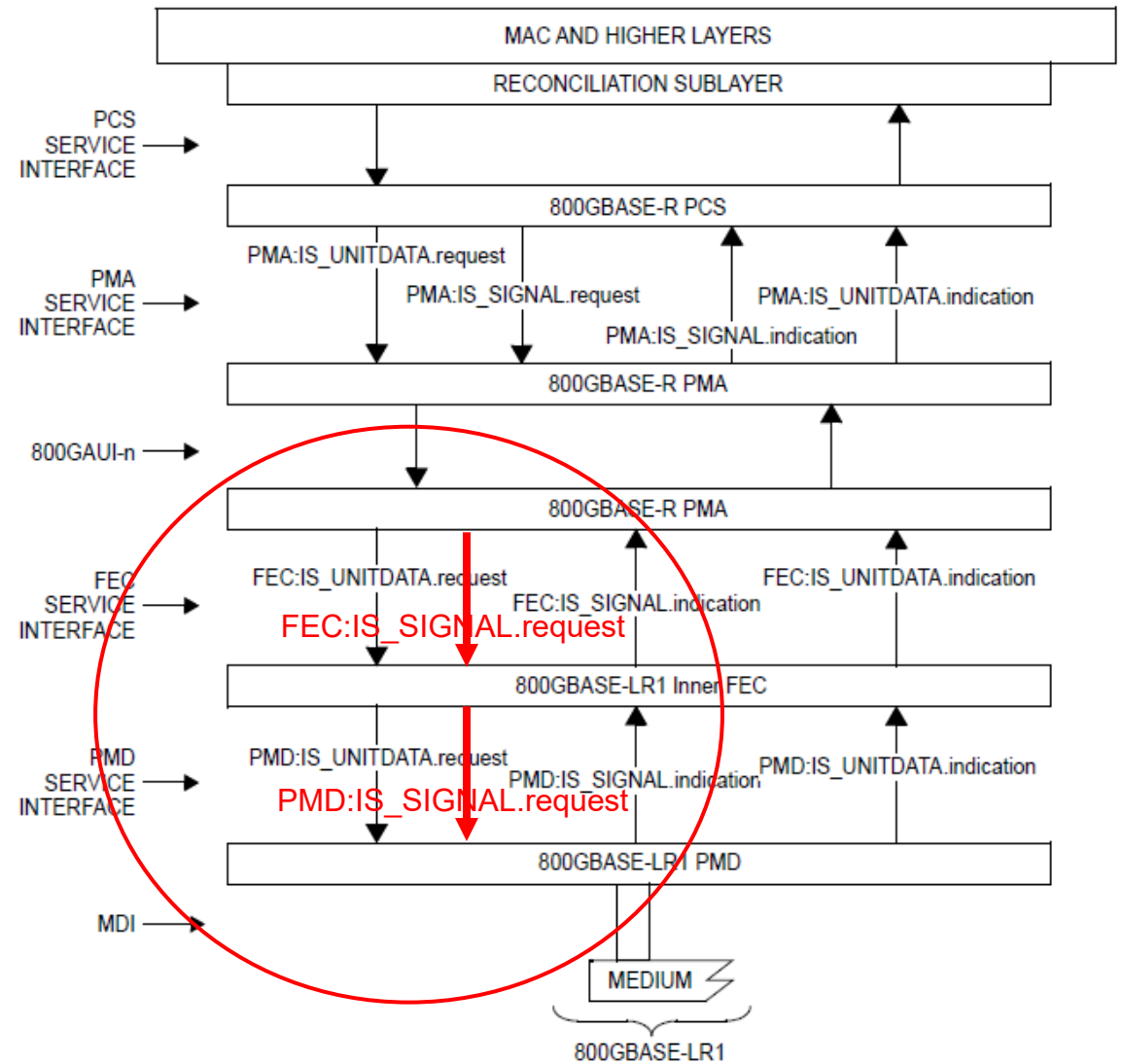
179.8.7 PMD lane-by-lane transmit disable function

The PMD lane-by-lane transmit disable function enables selective disabling of the transmitters in each lane. This function is used by the ILT function. It may optionally be provided through control variables PMD_transmit_disable_{*i*}.

If either PMD_transmit_disable_{*i*} or the variable tx_disable in lane *i* of the ILT function (see 178B.8.2.1) are set to one, the transmitter output on lane *i* of the PMD shall not exceed the differential peak-to-peak output voltage (max) with Tx disabled in Table 179-7.

Service interface (proposed changes)

- In Clause 184 and 185, add the following SI primitives to include signal_ok in the downward direction.
- In Clause 184
 - FEC service interface (above the 800GBASE-LR1 FEC)
 - FEC:SIGNAL.request(SIGNAL_OK)
 - base definition on Clause 177 Inner FEC (177.2)
 - PMD service interface (below the 800GBASE-LR1 FEC)
 - PMD:SIGNAL.request(SIGNAL_OK)
 - base definition on Clause 177 Inner FEC (177.3)
- In Clause 185
 - PMD service interface (above the 800GBASE-LR1 PMD)
 - PMD:SIGNAL.request(SIGNAL_OK)
 - base definition on Clause 180 PMD (180.3)



800GMII = 800 Gb/s MEDIA INDEPENDENT INTERFACE
 FEC = FORWARD ERROR CORRECTION
 MAC = MEDIA ACCESS CONTROL
 MDI = MEDIUM DEPENDENT INTERFACE

PCS = PHYSICAL CODING SUBLAYER
 PMA = PHYSICAL MEDIUM ATTACHMENT
 PMD = PHYSICAL MEDIUM DEPENDENT

Figure 185–2—800GBASE-LR1 inter-sublayer service interfaces including 800GMII Extender

800GBASE-LR1 FEC mapping to service interface (proposed changes)

- In Clause 184...
- Define/redefine the SIGNAL_OK parameters based on the mapping tables in Clause 177.
- See tables from Clause 177 to the right modified appropriately for Clause 184.
- Table 184-x is the same as Table 177-1 except Replace “all_synced (see 177.7.2.1)” with “alignment_valid (184.7.2.1)”
- Table 184-x is the same as Table 177-2 except Replace “all_locked_demux (see 176.4.4.2.1)” with “all_locked (119.2.6.2.2)”
- ***NEW*** Update related text appropriately.

Table 184-x

~~Table 177-1~~—FEC:IS_SIGNAL.indication(SIGNAL_OK) generation

PMD:IS_SIGNAL.indication SIGNAL_OK value	all_synced (see 177.7.2.1) alignment_valid (184.7.2.1)	FEC:IS_SIGNAL.indication SIGNAL_OK
OK	true	OK
OK	false	READY
READY	don't care	READY
IN_PROGRESS	don't care	IN_PROGRESS
FAIL	don't care	FAIL

Table 184-y

~~Table 177-2~~—PMD:IS_SIGNAL.request(SIGNAL_OK) generation

FEC:IS_SIGNAL.request SIGNAL_OK value	all_locked_demux (see 176.4.4.2.1) all_locked (see 119.2.6.2.2)	PMD:IS_SIGNAL.request SIGNAL_OK
OK	true	OK
OK	false	READY
READY	don't care	READY
IN_PROGRESS	don't care	IN_PROGRESS
FAIL	don't care	FAIL

Redefine local_rx_ready (proposed changes)

Currently in Annex 178B...

local_rx_ready

Boolean variable that is set to true when the receiver on a lane of the interface has determined that the peer interface transmitter is transmitting a PAM4 signal, that the remote transmit has been optimized if mr_training_enable is true, the local receive equalizers have been optimized, and that no further adjustments are required for normal data transmission.

For 800GBASE-LR1, DP-16QAM is expected rather than PAM4. The definition of local_rx_ready needs to be updated. Would be clearer with separate criteria for mr_training is true and false. The last sentence is relevant to the use of the left path (mr_training = false) of the state diagram.

The following was presented at the April 22 meeting. There were comments that although this was corrected it made unnecessary changes and could be made similar to the original (Option A)

Boolean variable that is set to true when the receiver on a lane of the interface has determined that lane is ready for normal data transmission and is otherwise set to false. If mr_training is true, a value of true indicates that the peer interface transmitter is transmitting a PAM4 signal, the remote transmitter has been optimized, the local receive equalizers have been optimized, and no further adjustments are required for normal data transmission. If mr_training is false, a value of true indicates that the peer interface transmitter is transmitting the expected signal format, the local receive equalizers have been optimized, and no further adjustments are required for normal data transmission.

The following is provided as an alternative (Option B)

Boolean variable that is set to true when the receiver on a lane of the interface has determined that the peer interface transmitter is transmitting ~~a PAM4 signal~~ the expected signal format, that the remote transmit has been optimized if mr_training_enable is true, the local receive equalizers have been optimized, and that no further adjustments are required for normal data transmission.

NEW

Future considerations

- Update text and tables in Clause 169.

Backup slides