

Further Details and Progress on CMIS-LT

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IEEE 802.3dj Task Force

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Overview

- ❑ **Problem statement**
- ❑ **Overview of CMIS-LT**
- ❑ **Status of CMIS-LT**
- ❑ **CMIS-LT transaction flow diagram**
- ❑ **Summary.**

Disclosure: This contribution is not endorsed or liaised from OIF, contribution is author sharing some of his OIF CMIS-LT base contributions with the IEEE802.3dj.

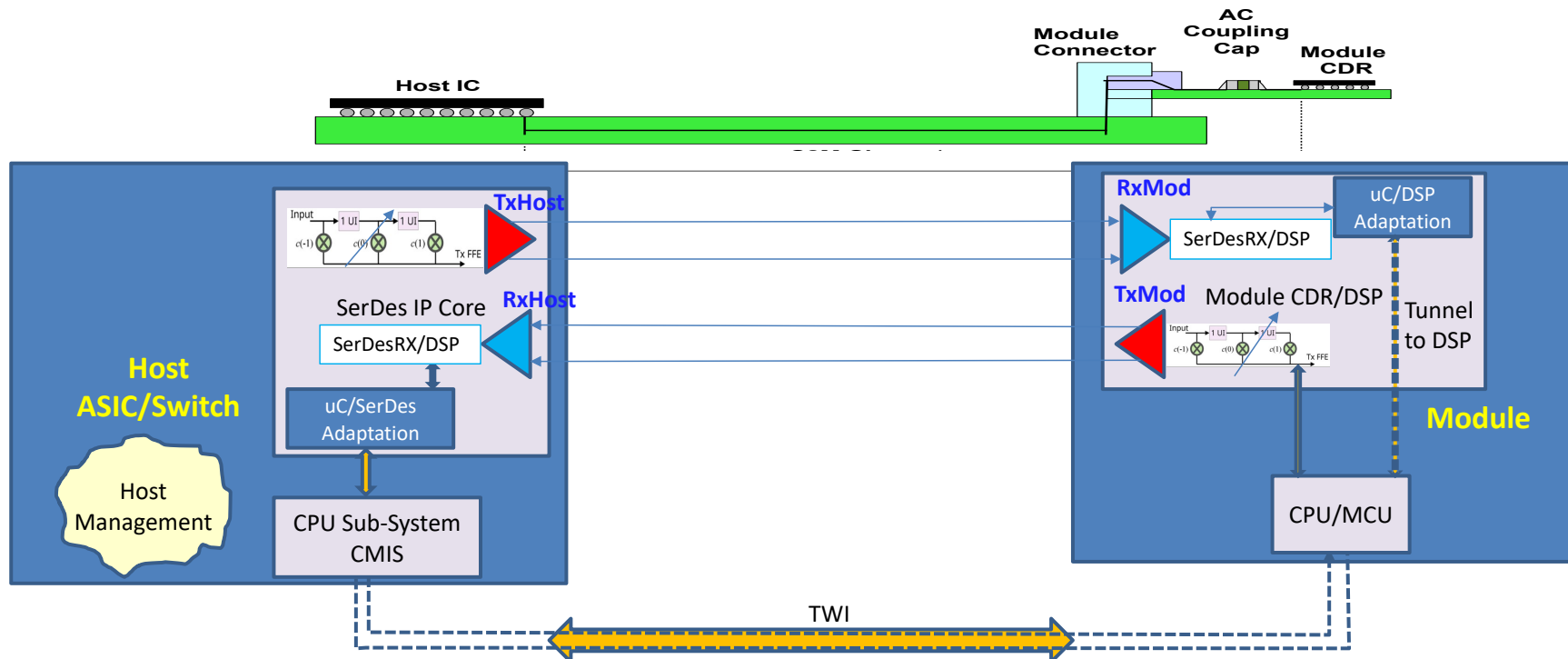
C2M Problem Statement

802.3ck CL 120G C2M recipe for tuning host and module

- Host SerDes TX FIR is tuned at manufacturing per given port
- Host management select AUI-S or AUI-L for TxMod setting

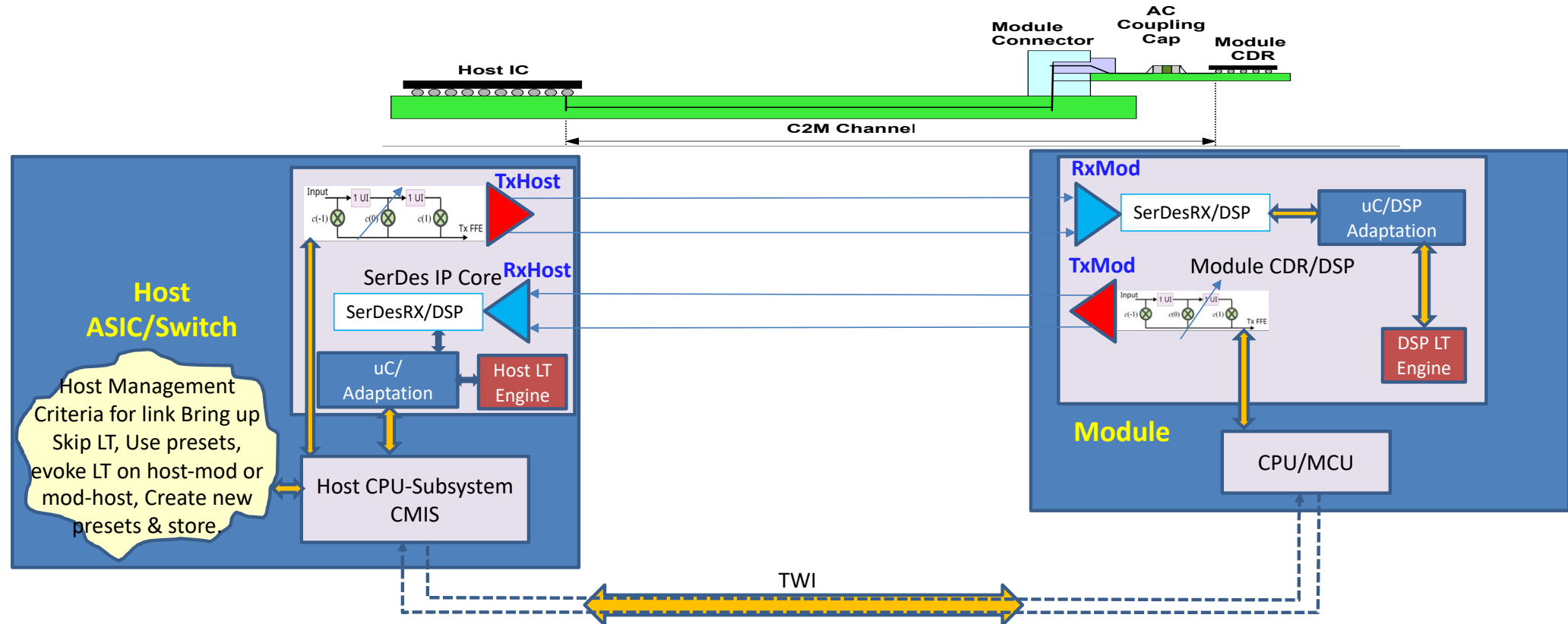
What is the problem with above approach?

- The scope optimized host measurement with HCB and module measurements with MCB are not identical to as plugging a module into a host
- Scope optimized Tx FFEs are based on an assumed reference equalizer and these setting can be wrong for the real equalizer!



Elements of CMIS-LT OB Controls

- Two independent LT engines optimize TxHost-RxMod and TxMod-RxHost links using single management entity in the host that engages the LT engines
 - RxMod and RxHost requests are relayed to the partner transmitter through TWI
 - Adaptation/LMS algorithms are self-contained in the host SerDes and module DSP SerDes.

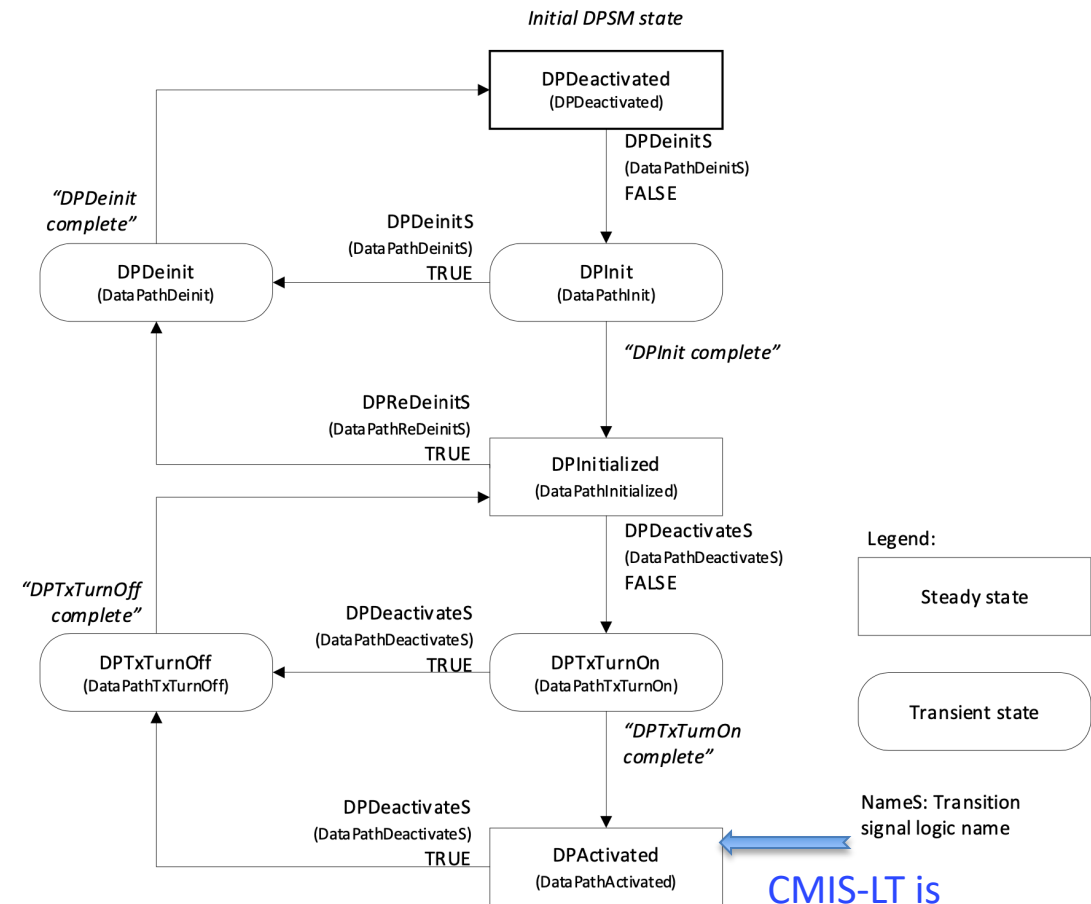


Any LT Must Interact with Data Path/Module State Machine*

CMIS-LT is an optional feature in CMIS and is added after completion of ModulePwrUp as an additional step in the ModuleReady

- CMIS-LT is built on top of CMIS and preserves initiator-target system architecture
- CMIS-LT basic SerDes adaption/MMSE is identical to Ethernet (CL72/136) LT but the messages are sent on out-of-band (OB)TWI, but the advance mode “Smart-LT” makes jumps
- CMIS-LT advance LT capabilities are possible due to availability of OB management channel
- Any type of module LT must interact with CMIS state machine, data-path initialization, and AppSel
 - CMIS 5.2 support 16 AppSel advertising but # of AppSel are being increased to 256!

CMIS Data Path State Machine (DPSM)*



* For detail operation of DPSM and MSM, see CMIS 5.2 <https://www.oiforum.com/wp-content/uploads/OIF-CMIS-05.2.pdf>

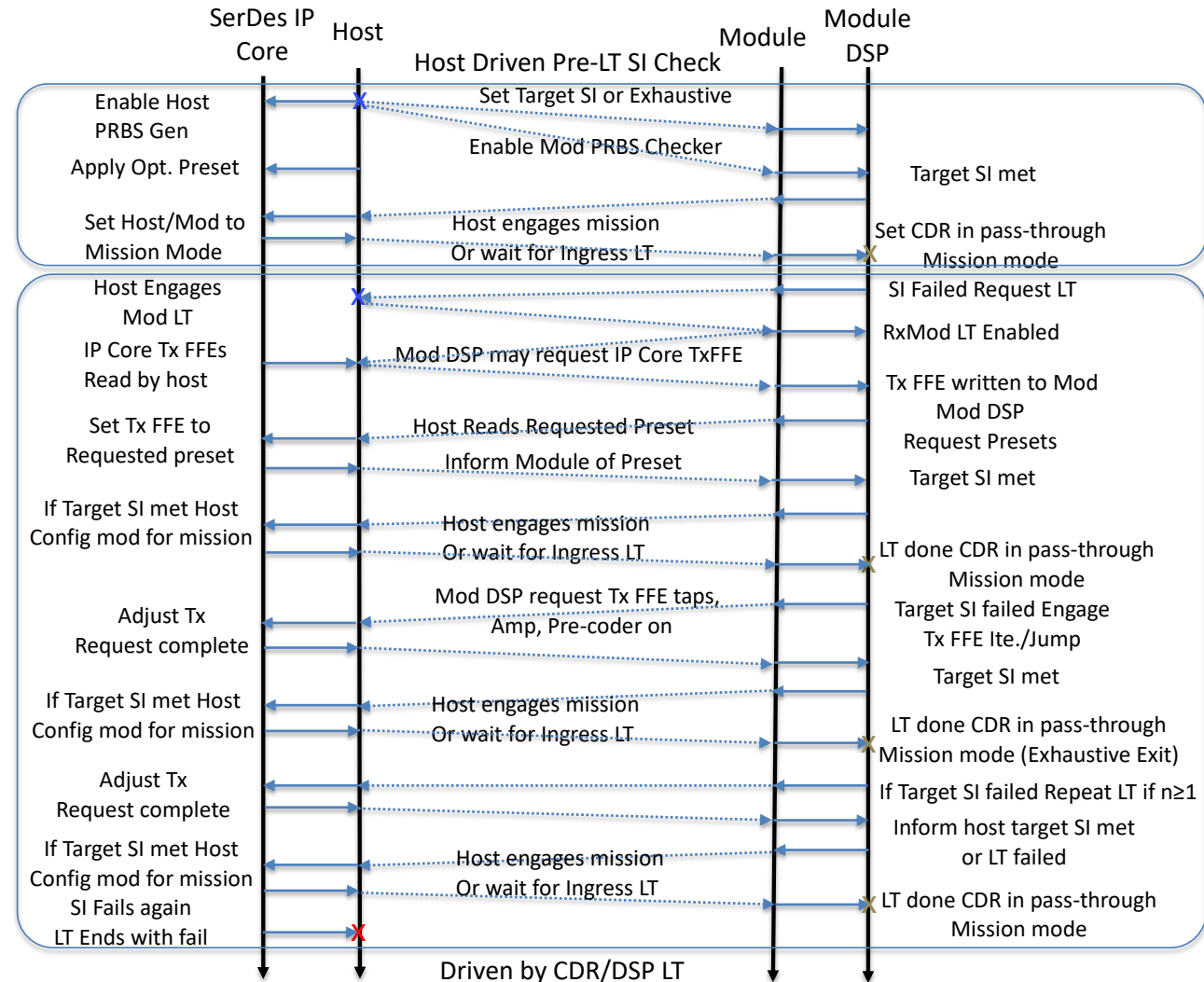
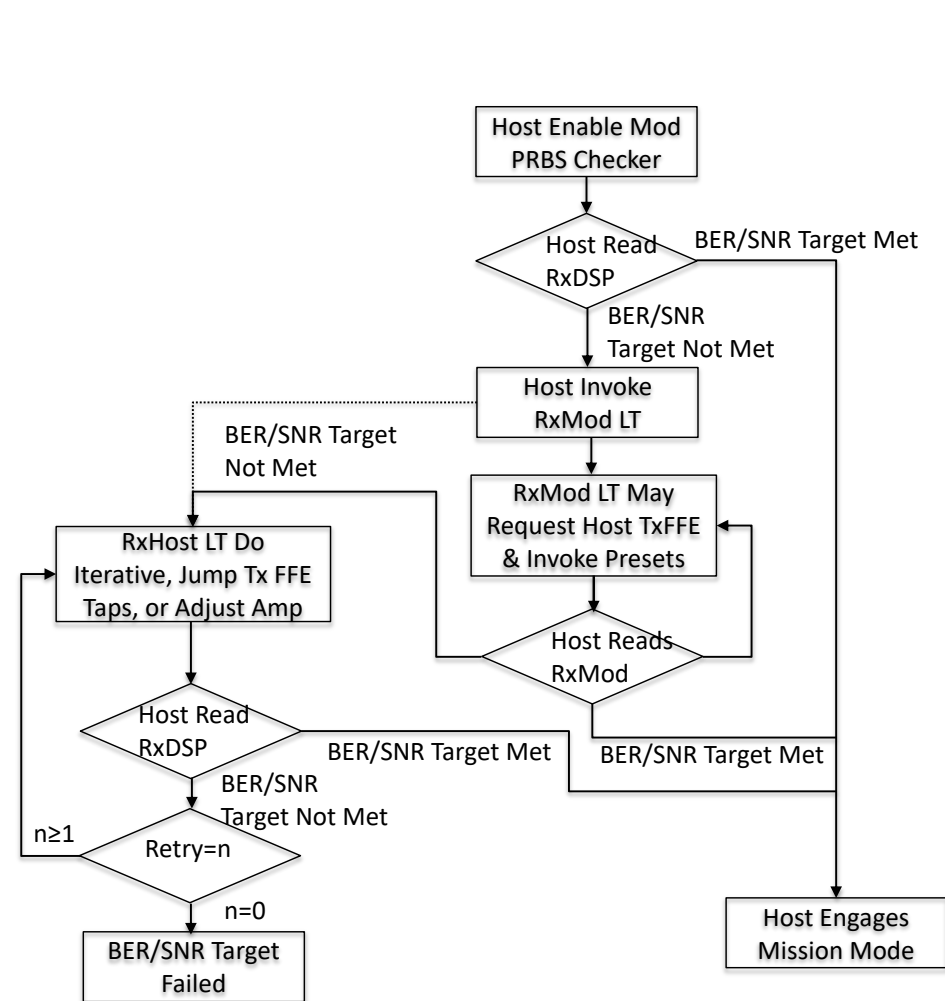
Status of CMIS-LT

- **CMIS-LT project was authorized during OIF Q1-2022 meeting**
 - Project is owned by the OIF management to include the CMIS register in support of CMIS-LT
 - Based on number of joint PLL/Management meeting the group converged on an adaptation method identical to Ethernet CL72/136 where the receive DSP drives the adaptation decision
- **Author has created CMIS-LT WP (Q4-22) and detail CMIS register (Q1-23) as bases to incorporating CMIS-LT into future draft of CMIS**
 - CMIS-LT provide protocol and rate agnostic mechanism to tune TX FFEs, TX amplitudes, and store optimized Presets using CMIS without requiring dedicated hardware
 - Dynamic degrade will signal link partner to either bring down link for service or make small tweaks
- **Recommend that IEEE 802.3dj to establish liaison with the OIF management regarding CMIS-LT to receive document update as well as providing input into the project**
 - Example of inputs DJ task force may provide OIF management:
 - Define required # of pre/post cursors (CMIS-LT allow up to 7 pre and 8 post) for AUI
 - Define DJ specific TX FFE presets
 - Granularity of amplitude control or range (250-1000 mV in 50 mV increment)
 - Step size (currently supporting 0.01, 0.02, 0.025, and 0.04) default value can also be changed for DJ applications
 - CMIS-LT is built on flexible platform and above request can be accommodated as part of DJ application initialization similar to AUI-S/AUI-L in support of 802.3ck.

CMIS-LT Key Features

- **CMIS-LT simplified solution to the complex DSP adaptation is to let the host RxDSP and module RxDSP adjust their partners TX FFE/AMPs through a set of CMIS control registers**
 - Make it simple, predictive, and deterministic regardless who builds the module
 - Optimized stored in-service presets enable pre-check so tedious Inc/Dec/hold can be avoided
 - RxDSP aware of partner TxFFE may utilize channel estimator enabling “Smart LT” to jump to an optimum solution with just few coordinated jumps
 - Other key features re pre-coder, create user optimized presets, BER/SNR reporting
 - CMIS-LT can be engaged on Egress, Engress, or both
 - Provide flexibility how RxDSP may choose to adjust its’ partner TX FFE and TX Amplitude
 - Increments/decrements/hold, and support variable step sizes or RxDSP may request a jump based on smart LT
 - Ability to store prior optimized setting on the host that can be used after reset/power down
 - Read/write and store optimized in-service presets
 - Dynamic degrade can provide advance warning/adjustment for link due to aging/temperature etc.

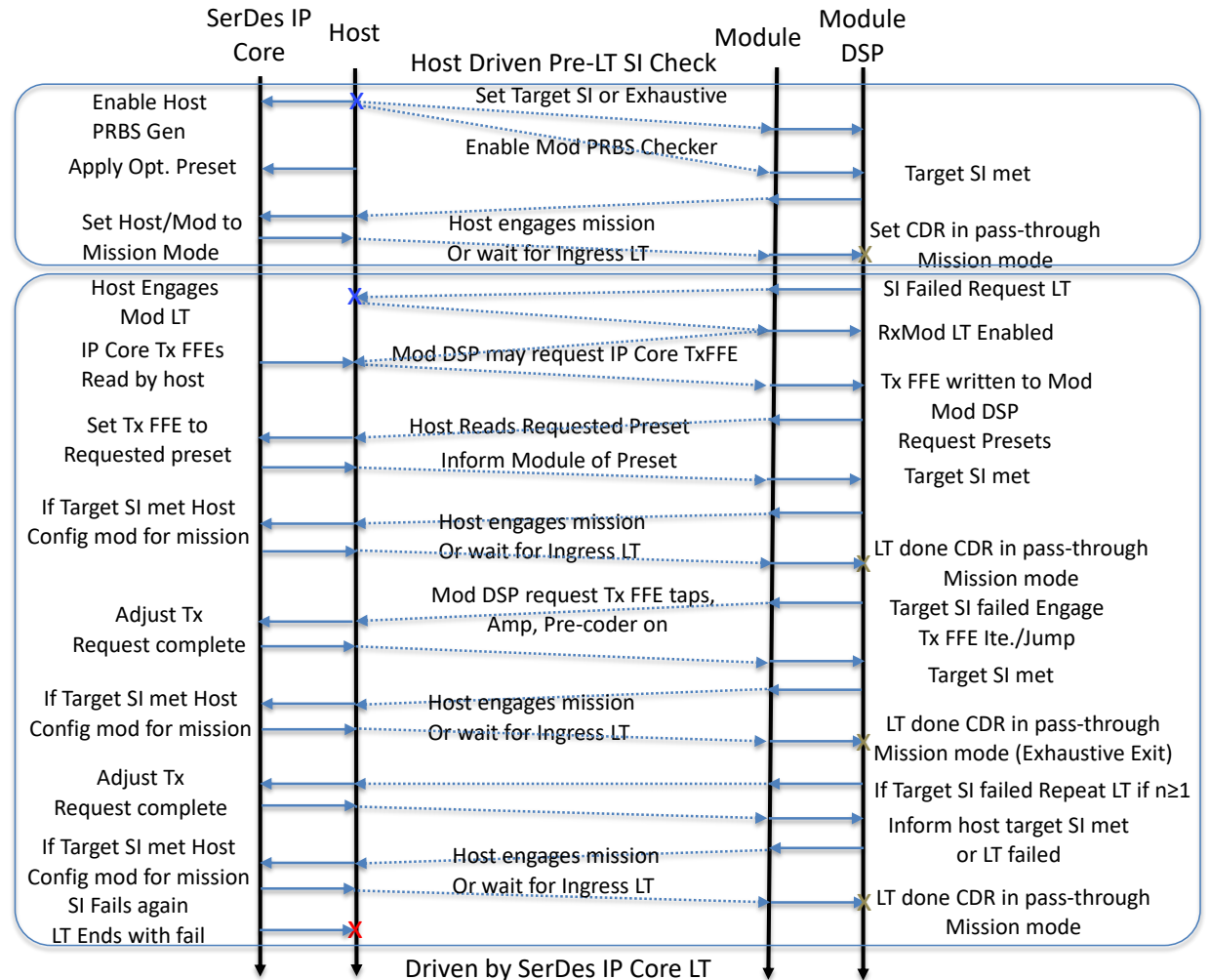
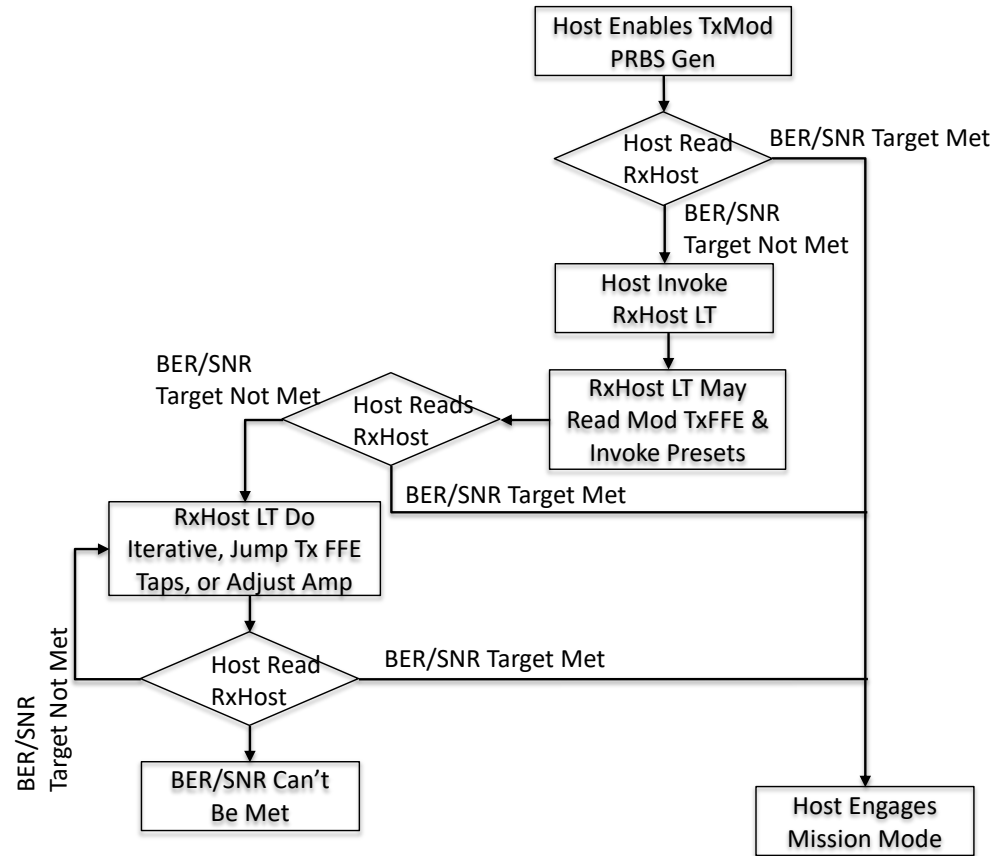
CMIS-LT Host to Module Transaction Flow Diagram



Pre-Check Allow Direct Transition to Mission Mode

CL72 Style LT With Inc/Dec. Or Smart LT With RX DSP Requesting Jumps

CMIS-LT Module to Host Transaction Flow Diagram



Pre-Check
Allow Direct
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CL72 Style LT
With Inc/Dec.
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Summary

- ❑ **CMIS-LT will be available as an option to train 100G or 200G AUI links**
 - CMIS-LT is compatible with current CDR/DSP implantations operating with egress/ingress recovered clocks
 - CMIS-LT does not require a PCS and does not require PCS data after the link is trained
- ❑ **CMIS-LT follows Ethernet LT adaption model but with numerous enhancement given the availability of OB COM link**
 - RxDSP channel estimator may compute optimum TX FFE enabling Smart-LT convergence with just a few jumps making TWI bus transaction negligible in overall LT time
 - As part of CMIS-LT link bring each link is test with prior optimized presets “Pre-Check” to engaged the link avoiding tedious exhaustive link training after reset/shutdown
 - Amplitude tuning allow reduce receiver VGA gain and save power and improve linearity
 - CMIS-LT can be used as a diagnostic/compliance tool during product manufacturing, bring up, and deployment
- ❑ **CMIS-LT offers a flexible host-module OB LT and diagnostics for any C2M applications**
 - CMIS-LT leverages existing SerDes/DSP capabilities without requiring any dedicated hardware to create a flexible and Smart-LT
 - P802.3dj task force should consider using CMIS-LT if C2M link training is required.