

# DOWNSTREAM BASELINE PROPOSAL



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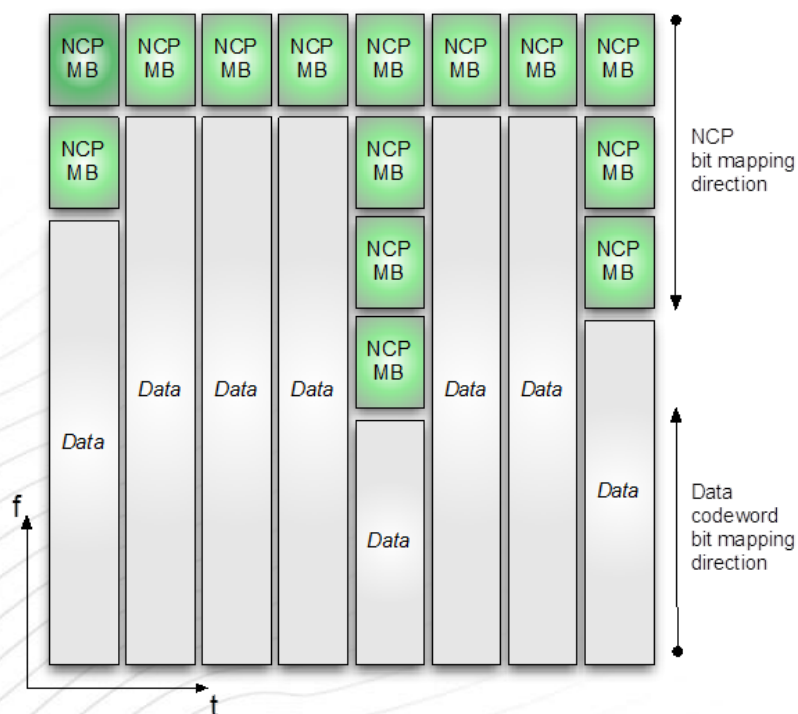
- **Matt Schmitt, CableLabs**

- **We laubach\_3bn\_04\_1113.docx (also as .pdf) for consideration as Baseline Proposal for the P802.3bn downstream.**
- **This contribution follows the spirit expressed at the York interim meeting of submitting elements for P802.3bn technical consideration from the DOCSIS 3.1 PHY with a goal to enable “common component architecture” in the industry:**
  - Downstream PHY data and PLC (portions of Section 7.5)
    - Note: some elements are shared with the D3.1 upstream PHY, those text subsections have been rolled into this baseline proposal for completeness
  - Downstream NCP (Section 8.3)
  - Only FDD mode is detailed at this time
- **Past P802.3bn Task Force decisions are represented in this baseline proposal**
  - One difference will be a proposal for changing the existing PLC Next Codeword Pointer (NCP) method to a different NCP approach

- **Downstream PHY functional diagram as presented in [kliger\\_3bn\\_01\\_1113.vsd](#)**
- **Downstream line encoding and LDPC FEC**
  - Already in PCS work in progress in the Task Force
- **Scrambler / Randomizer and Frequency Interleaver**
  - T.B.D. next meeting pending coordination with individuals from other affiliations
- **Symbol Mapper**
  - Constellations as per [prodan\\_3bn\\_02\\_1113.pdf](#) to align with EPoC LDPC FEC decisions
- **Downstream Profiles**
  - Reduced to single profile for FDD
- **Windowing adds extra value as per [montreuil\\_01a\\_0113.pdf](#)**
- **Fidelity and Electrical requirements in progress by another proposal effort: [rahman\\_saif\\_3bn\\_01\\_1113.pdf](#)**

- **Proposal to use a new NCP architecture**
  - Moves data codeword processing within the demodulation processing pipeline of the system
  - Separation from PLC content
    - PLC remains as providing the configuration of “where/how to (de)modulate” and for downstream frame alignment, time stamp, etc.
  - EPoC FDD will use a single profile; i.e., Profile A
    - All other Profile ID values, as well as update functions will be reserved
    - NCP fields remains for alignment to “common component architecture”
  - Adds FEC and 24-bit CRC (to PMA)
    - Note: shares LDPC mother code with Initial Ranging
- **PLC channel structure details**
  - Preamble updated as per [montreuil\\_3bn\\_01\\_0713.pdf](#)
  - PLC FEC as per [shen\\_3bn\\_01\\_0713.pdf](#)
    - Note: shares LDPC mother code with Fine Ranging
  - PHY coding only and spectrum details.
    - No PLC content in this baseline proposal,

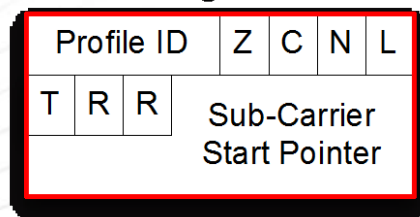
- **Move to the following NCP architecture:**
  - NCP located in data sub-carriers
  - Processed by data channel processing pipe-line
  - NCP blocks start from “top down”
  - User data codewords from “bottom up”



**Figure 2-7 - Data and NCP Prior to Interleaving**

- **NCP Message Block (MB) has two parts:**
  - 24-bit flag and pointer fields
  - 24-bit CRC
- **Each 24-bit sub-block is protected by an LDPC (48, 24) FEC**
  - Shares LDPC mother code with proposed upstream ranging FEC. See [shen\\_3bn\\_01\\_1113.pdf](#)

**Next Codeword Ptr (NCP)  
Message Block**



**Figure 2–8 - NCP Message Block**

# NCP MB FIELD DETAILS FOR EPOC

- Profile ID – Only value “0” Profile A to support a single FDD profile, other values reserved
- Data Profile Update C-bit – set to “0”, other value reserved
- Use of Z, N, T, and R fields for further study.

Field	Size	Description
Profile ID	4 bits	Profile ID for the data channel  0 = Profile A    1 -15 = reserved
Z	1 bit	Zero Bit Loading  0 = subcarriers follow profile    1 = subcarriers are all zero-bit-loaded
C	1 bit	Data Profile Update  0 = set to 0    1 = reserved
N	1 bit	NCP Update  0 = use even profile    1 = use odd profile  This bit is equal to the LSB of the NCP profile change count. This bit refers to the NCP profile usage for the next symbol rather than the current symbol.
L	1 bit	Last NCP Block  0 = This NCP is followed by another NCP. 1 = This is the last NCP in the chain and is followed by a CRC.
T	1 bit	Directed Test  0 = this codeword is not suitable for directed profile testing by CNUs  1 = this codeword is suitable for directed profile testing by CNUs
R	1 bit	Reserved
Subcarrier pointer	13 bits	This is the number assigned to the first subcarrier used by the codeword. The maximum value is 0x1FFE = 8190. The value 0x1FFF is reserved as a null pointer.



- **Codeword alignment completely in data channel processing**
  - Separation from PLC content
  - NCP Message Block is a PMA -> peer PMA protocol element
- Supports TDD requirement for multiple profiles (TD #19) – if needed
- Lays groundwork for future proofing
- Aligns “common component architecture” element with D3.1 PHY

Example:

- NCP moves as part of Symbol Mapper. See [kliger\\_3bn\\_02\\_1113.vsd](#).
  - Calculates Subcarrier Pointer, L field, CRC-24, and NCP FECs
- Appropriate NCP flags/fields passed with codeword request and indication

**NOTE:**

- Future work can investigate reducing overhead for FDD operation

- **The attached baseline proposal contains functional descriptions for aspects of the downstream EPoC PHY and an NCP update proposal**
  - Uses past P802.3bn technical decisions
  - Leverages “common component architecture” where possible
  - Includes detailed NCP description that is a change from previous technical decision
    - Asking that the TF adopt this proposed NCP approach
    - Can look at efficiency improvements going forward
  - Ongoing updates and modifications via the comment process and/or other proposals
  - Informational text and stylistic differences can be “expunged” and/or copy-edited by the Editors, different subsections will move to different IEEE normalized sections.

- **Adopt laubach\_3bn\_03\_1113.docx as a baseline proposal for P802.3bn downstream PHY.**
- **Moved: Avi Kliger**
- **Second: Richard Prodan**



Thank you