

PHY Link Frame adjustments to align with US Superframe

This presentation is a follow up to one given in
Norfolk

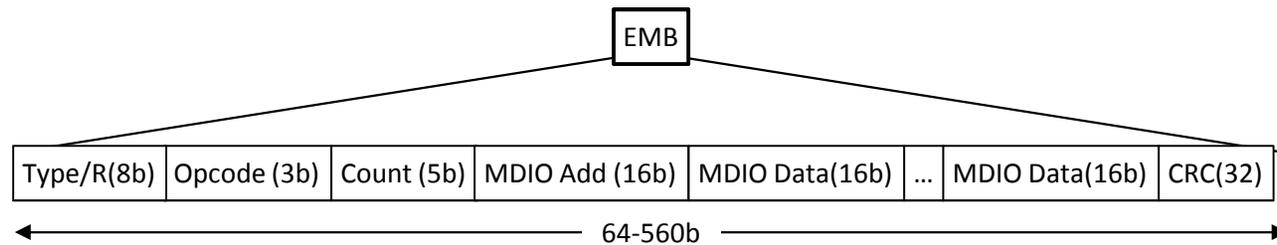
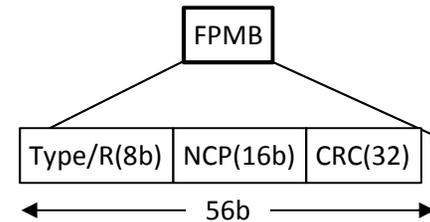
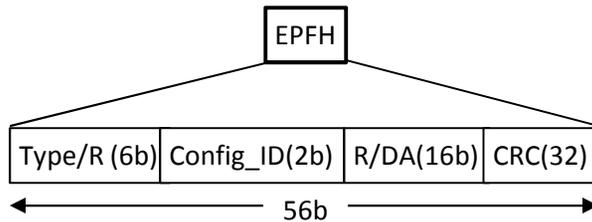
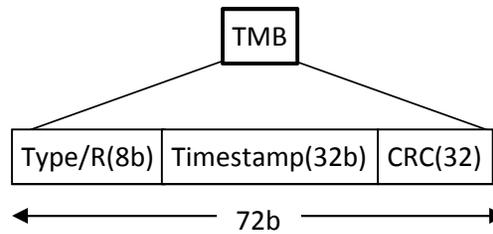
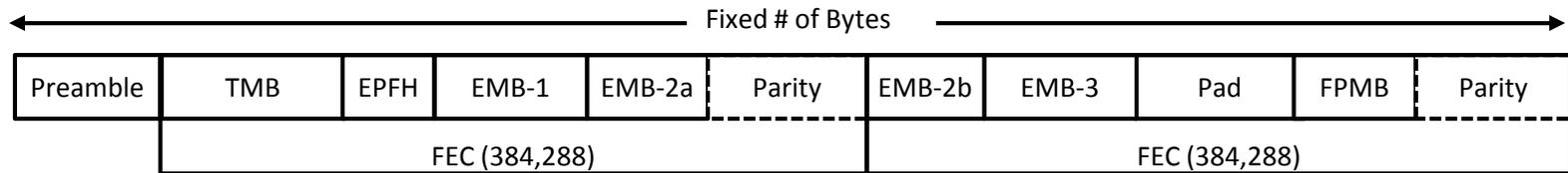
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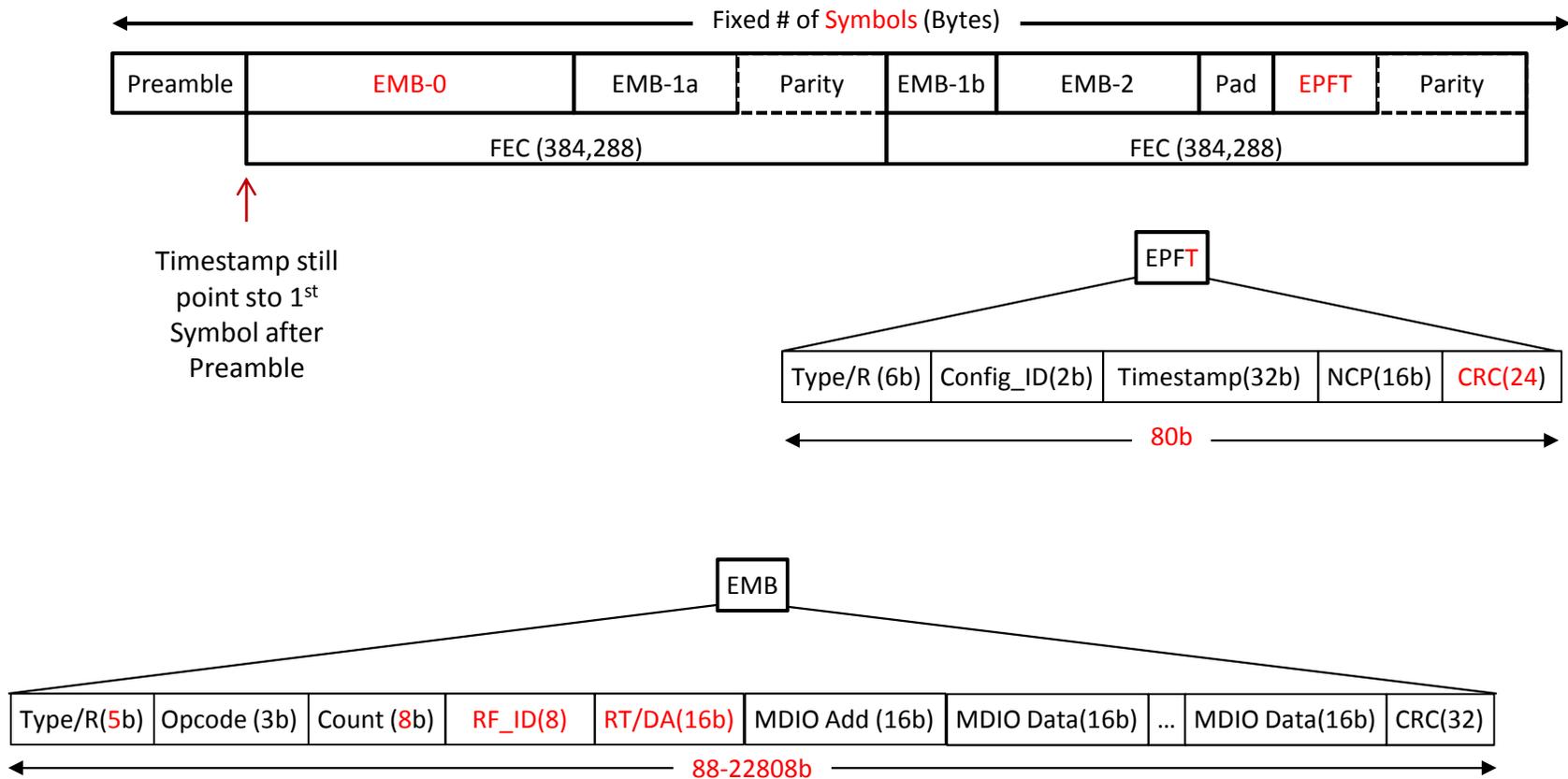
Problems with current DS PHY link Frame

- Can only address a single CNU or a single group of CNUs in a frame
 - It would be advantageous to be able to address multiple CNUs individually (or multiple groups or CNUs) within a single frame for short instructions
- Can only transfer 31 Registers per instruction.
 - Type/Cnt/Opcode/Add & CRC account for 64 bits of overhead per instruction
 - Limits frames to ~148 registers per frame
 - Some transactions (e.g., Pre-emphasis Registers for new CNUs) are VERY large (8k registers)
- No capacity to schedule US responses
 - US & DS have no aligned frame (async)

Current Downstream Frame



Proposed downstream frame



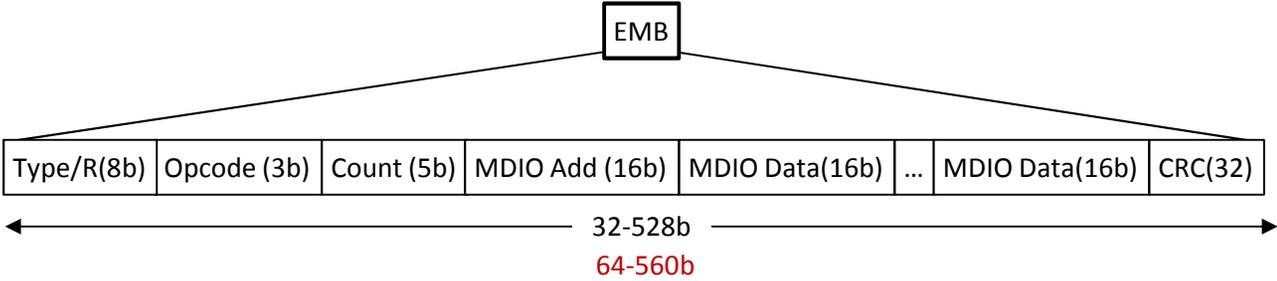
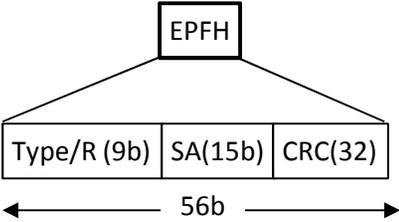
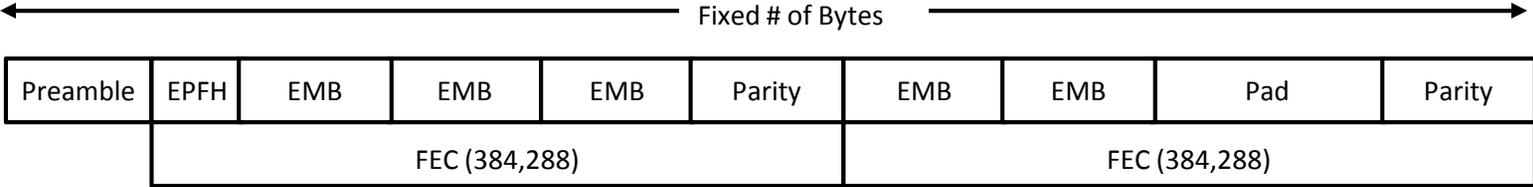
Proposed solution

- Consolidate all fields that are broadcast and only need to be sent once per frame into a single message block
 - Config_ID, Timestamp, NCP
- Expand EMB to include:
 - Larger Count field (8b)
 - Destination Address
 - New Fields
 - Response Type field (1b)
 - New Response Frame ID field (8b)
 - Together schedule US transmissions

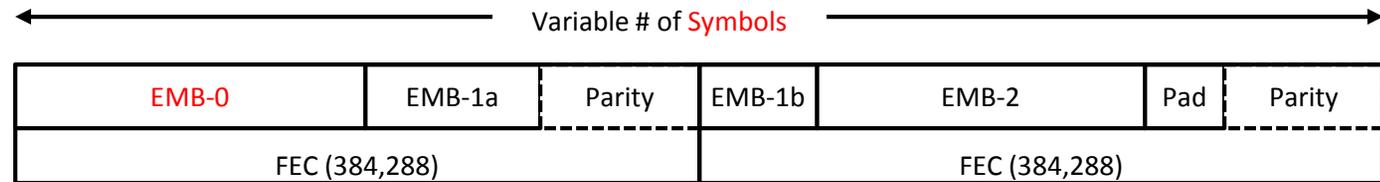
Proposed changes to US PHY Link frame

- Change response to match instruction
 - Larger Count field (8b)
 - Echo Destination Address
 - Echo Response Frame ID field (8b)
- No reason not to consolidate into a single message block to avoid unnecessary overhead
 - A single CNU should be able to concatenate multiple responses into a single burst if so instructed by the CLT

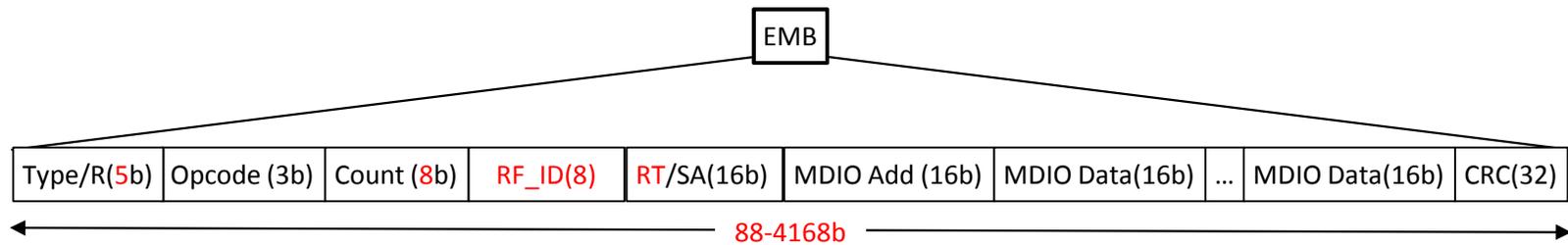
Current Upstream Frame



Proposed Upstream Frame



Response Frame ID field
points to frame number
that burst begins in



New PHY Link Fields

- Response Frame ID
 - 8 bits
 - Identifies the OFDMA Frame (i.e., RB column within a Superframe) in which the target CNU is to begin an US PHY Link response (PHY Link or Fine Ranging)
- Response Type
 - 1 bit
 - Indicates to the CNU the type of response expected (PHY Link or Fine Ranging/PHY Discovery)
 - Note PHY Discovery window starts based on a specific DS Message which includes a the timestamp at which to start the window and a duration, in OFDMA Frames ([see 102.4.1.3](#))
 - Response Precedence
 - 1st PHY Discovery Window
 - 2nd Fine Ranging Response
 - 3rd US PHY Link

US PHY Link

- Consists of a integer number of normal RB's
 - Number message dependent
 - Spectrum fixed at 400 kHz
 - Starting subcarrier fixed by provisioning
- Bit Loading not necessarily restricted to 16-QAM
- Aligns to same boundary and placement conditions as RBs
- Precedent
 - 1st PHY Discovery Window
 - 2nd Fine Ranging
 - 3rd US PHY Link transmission
- Signaling (PHY Link, Fine Ranging & PHY Discovery Window) limited during SFs containing these signals so MAC Data resources in a SF is constant

Bring-up process

- Establish DS PHY Link
 - CNU synchronizes (frequency & time) to DS signal
 - gathers US OFDMA Channel Descriptor & Profile Descriptor
- PHY Discovery
 - Initial ranging, roughly align CNU to US OFDMA timing/frame using timing offset and set tx power
 - Assign CNU_ID
- Fine Ranging
 - OFDMA fine tuning using timing offset
 - OFDMA Symbol alignment
 - Superframe alignment
- Fine Ranging (cont)
 - Verify CNU_ID set
 - CLT may iterative Fine Ranging until CNU is properly synchronized to the US network timing
 - Number of iterations are not defined in the spec and are implementation dependent
- Establish US PHY Link
 - Channel/Profile descriptor verification & update
- Probe
 - Channel Estimation
 - Precision power setting
 - Precision timing setting
 - Set Pre-equalizer Coef for all subcarriers

Questions?

Comments?

THANK YOU