HE-SIG-B Structure

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Discussion on HE-SIG B Structure

- The current SFD [1] defines HE-SIG-B as follows:
  - Downlink HE MU PPDU shall include HE-SIG-B field, and the number of OFDM symbols of HE-SIG-B field is variable.
    - NOTE—The HE-SIG-B field includes information required to interpret HE MU PPDU, and detail is TBD.
  - HE-SIG-B shall use a DFT period of 3.2 μs and subcarrier spacing of 312.5 kHz.
- Background
  - The structure of HE-SIG-B has to be defined with following details
    - How to sort the contents in sequence
      - Encoding sequence is discussed in another presentation [4]
    - For wider bandwidth than 20MHz, how to arrange over frequency bands
    - What information to be signaled
  - In this presentation, we propose a HE-SIG-B structure

Topic 1: Duplicate or Non-duplicate

- HE SIG-A is proposed to have 2 OFDM symbol [2]
  - HE SIG-A is duplicated over operating bandwidth, like 11n/ac
  - HE SIG-B exists only for DL-MU
- For MU, contents in HE SIG-A and HE SIG-B can be separated as follows:
  - HE SIG-A can deliver the information about the PPDU to all STAs
    - STAs do not know about the operating bandwidth yet; so better to be duplicated
  - HE SIG-B sends the information for designated receiving STAs for MU operation
- The remaining question is whether we have duplicated part in HE SIG-B if there is any
  - We may not need another duplicated portion in HE SIG-B, given that HE SIG-A has 48~52 information bits
  - Unless we are lack of number of bits in HE SIG-A to be fully duplicated, we do not need to duplicate any OFDM symbol of HE SIG-B over full bandwidth

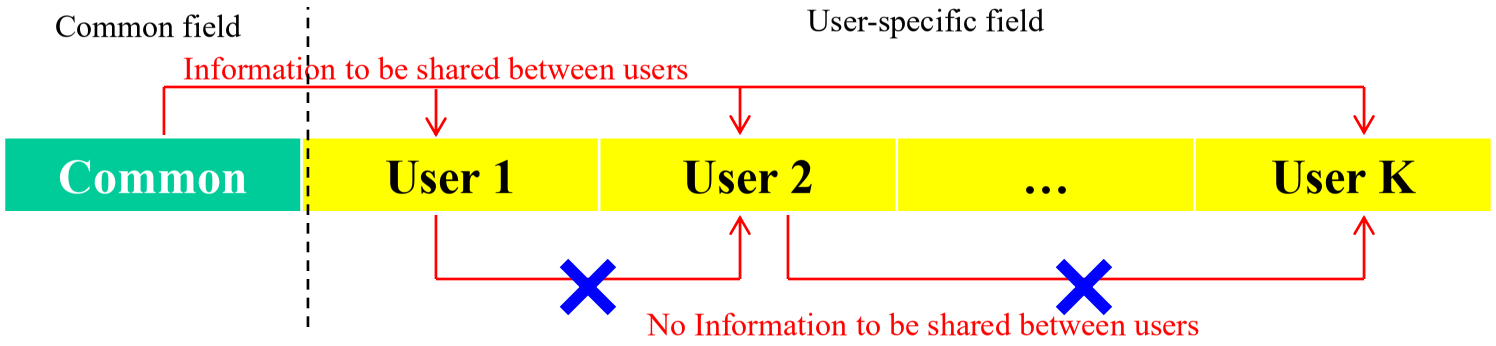
Topic 2: Common & User-specific

- There are some information, which needs to be decoded by a group of STAs, as common information for DL-MU
  - For example, Resource Unit (RU) allocation needs to be decoded, not by only one specific STA, but by a group of STAs
  - A group includes TBD number of STAs. It can be all or a subset of designated receiving STAs.
  - Those information may not be necessary for the other group of STAs when it is signaled for a subset of STAs
- Common information for a group of receiving STAs can be signaled at once
  - These information may need to be located up front in HE SIG-B, before user-specific information (MCS, Nsts etc. for each user)
  - If the group is a subset of STAs, those information is better to be aligned with the designated group of receiving STAs, so that decoding error does not affect for other group of receiving STAs, in terms of sub-bands
    - We can minimize the impact of OBSS interference, which may occupy some of sub-bands

Common Field in SIG-B

- The information for non-designated STAs to avoid the further un-necessary decoding process can be included in L-SIG & HE SIG-A
- HE SIG-B includes control signaling for recipients of DL-MU PPDU
  - The common field in HE SIG-B has the information which is needed for recipients in common
    - E.g., RU allocation is common information to all or sub-set of recipients
  - The user-specific field in HE SIG-B has the information for a specific user, which is not needed for other users

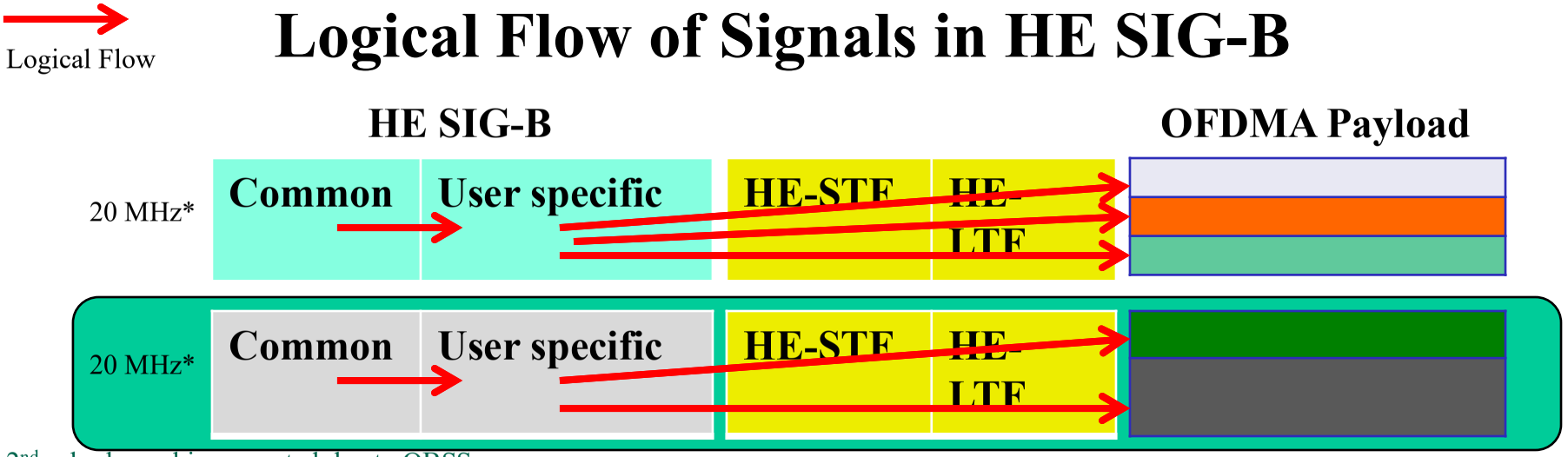
User-specific Field in HE SIG-B



- User-specific field consists of multiple sub-fields
- Per-STA information, one specific subfield may deliver some information for a specific STA, which may not be useful for some other STAs
  - i.e., Information is isolated between designated receiving STAs
- The boundary between common & user-specific field is in the bit-level, not OFDM symbol boundary

* 20MHz is an example

Logical Flow of Signals in HE SIG-B



- Information in SIG-B common field is shared between users within the same sub-band channel
  - E.g., Resource Unit Allocation
- Common/User specific signaling applies to the same sub-band channel
  - In this way, signaling in corrupted sub-band channel does not affect on decoding the PPDU in another sub-band channel
  - We can isolate the signaling to operate the OFDMA PPDU, so that partial interference does not corrupt the whole OFDMA PPDU reception

RU Allocation

- In MU (OFDMA or MIMO (SDMA)) operation, there are many combinations of RUs per bandwidth. Possible RUs [3], depending on the size of operating bandwidth, are
  - 26, 52,106, 242, 484, 996 and 996 x 2 data tones
- Receiving STAs need to know which RU needs to be decoded for themselves in HE SIG-B
- These RU allocation mapping is better to be up front, at common field, in HE SIG-B, because
  - Signaling for RU allocation for all receiving STAs can save the overhead, than individual signaling per STA, and
  - Receiver can prepare for decoding accordingly with early identified RU structure
- We propose to include RU allocation information in the common field of HE SIG-B
  - How to signal RU allocation is TBD

Summary

- We propose the HE signal field structure as follows
  - HE SIG-B does not have any OFDM symbol that is fully duplicated over the operating BW
    - Some part of an OFDM symbol may be duplicated if necessary
  - In HE SIG-B, which exists for DL-MU PPDU
    - We need to signal the control information for designated receiving STAs
    - For DL-MU, we need following information
      - Resource allocation (OFDMA or MU-MIMO)
      - Per-STA information, e.g.,
        - STA-ID
        - MCS
        - Nsts
    - We propose to have two fields in SIG-B
      - Common field, where RU allocation info is included
      - User-specific field, where per-STA info belongs to

Straw poll #1

- Do you agree to add to 11ax SFD that HE SIG-B does NOT have any OFDM symbol duplicated in each 20 MHz of the PPDU bandwidth?

Straw poll #2

- Do you agree to add to 11ax SFD that HE SIG-B has the common field followed by the user-specific field, where
  - The common field includes the information for all of designated STAs to receive the PPDU in corresponding bandwidth
  - The user-specific field consists of multiple sub-fields that do not belong to the common field, where one or multiple of those sub-fields are for each designated receiving STA
  - The boundary between the common & the user-specific field is in the bit-level, not the OFDM symbol-level

Straw poll #3

- Do you agree to add to 11ax SFD that the common field in HE SIG-B contains Resource Unit (RU) allocation?

Reference

[1] 11-15-0132-06-00ax-spec-framework

[2] 11-15-0822-00-00ax-HE-SIG-A-Structure

[3] 11-15-0330-04-00ax-OFDMA-numerology-and-structure

[4] 11-15-0873-00-00ax-HE-SIG-B-encoding-structure