

Non-contiguous Channel Bonding in 11ax

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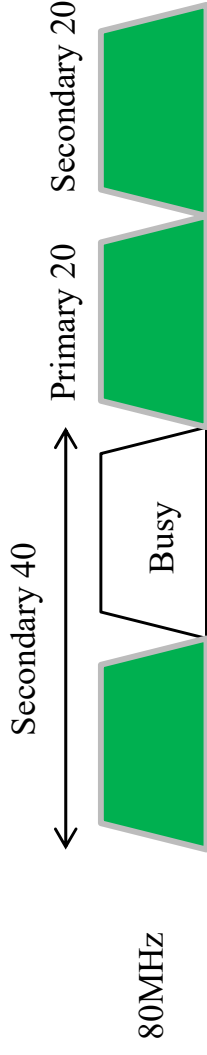
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Introduction

- **Non-contiguous channel bonding is discussed in a number of presentations [1~8]. It can potentially increase the system efficiency;**
- **The non-contiguous channels will happen in 11ax mainly because of**
 - Coexistence with legacy BSSs supporting narrower band;
 - Introduction of UL OFDMA transmissions;
- **In this proposal, non-contiguous channel bonding is proposed for 11ax to achieve,**
 - Increased the system efficiency;
 - Keep changes to the required minimum.

Basic Concept of Non-contiguous Channel Bonding

- **Non-contiguous channel bonding allows data transmission to 802.11ax STAs over non-contiguous channels**
 - Leverage unused “non-primary” channels to transmit data to the STAs.
- **The granularity of non-contiguous channel bonding is TBD;**
- **The non-contiguous channel modes always include primary 20MHz channel**
 - Same as the existing channel bonding modes;
- **An example as shown below:**



Non-contiguous Channels and OFDMA

- **Single FFT in each 80MHz is proposed in non-contiguous channel modes**
 - Multiple FFT (one for each contiguous channel segments) will cause interference between each other;
 - Large change from current spec for multiple FFT;
- **It is proposed that DL OFDMA PPDU transmission will be used in non-contiguous channel bonding;**
- **Just simply nulling the tones of non-available channels in 80MHz and 160 (80+80)MHz;**

MU Transmission Only

- **SU transmission for non-contiguous channels should be disallowed**
 - Only 242/484/996/2x996-RU is supported in current spec;
 - RU with non-contiguous CHs may require new PHY modules (e.g. interleaver);
- **MU transmission is easy to support in non-contiguous channels**
 - Agreed RU in current spec is within one of the contiguous channel segments for each STA;
 - Multiple RU allocation for one STA is not allowed for sake of simple complexity;
 - Equivalent to allocate RU in non-available channel to a dummy STA;
- **As a result, each STA has a contiguous RU allocation.**

Summary

- **Non-contiguous channel bonding is proposed in 11ax to increase the system efficiency**
- **Proposal requires minor changes in current spec**
 - Implemented by nulling the tones of non-available channel(s)
 - Only MU transmission will be supported in non-contiguous channel bonding

References

- [1] IEEE 802.11-09/0022r0 “Multi-channel transmissions”
- [2] IEEE 802.11-10/0103r1 “Gains Provided by Multichannel Transmissions”
- [3] IEEE 802.11-10/0385r1 “80Mhz and 160Mhz Channel Access Modes”
- [4] IEEE 802.11-10/1274r3 “Non-contiguous 40-40Mhz for Europe, Japan and Global”
- [5] IEEE 802.11-13/1058r0 “Efficient Wider Bandwidth Operation”
- [6] IEEE 802.11-13/1382r0 “Discussion on OFDMA in HEW”
- [7] IEEE 802.11-15/0035r1 “Scalable Channel Utilization”
- [8] IEEE 802.11-15/0353r1 “OFDMA Non-contiguous Channel Utilization ”

Straw Poll 1

- **DO you agree to add to the TG SFD:
The non-contiguous channel bonding will be supported
in 802.11ax by:**
 - Transmitting using OFDMA PPDU format by nulling the tones of one or more secondary channels in 80MHz and 160 (80+80)MHz;
 - Modes for non-contiguous channel bonding are TBD;
 - Non-contiguous channels within primary or secondary 80MHz only exists at AP side.