Fix for Problems in UL Allocation

The current UL allocation has many ambiguities. Since there are many optional extended IEs that are used to allocation UL resources, a MS/SS that doesn’t support all features will not be able to correctly determine the position of its UL allocation. Propose to use UL Allocation Start in normal UL MAP to address this problem.

To incorporate the text changes proposed in this contribution into the 802.16e/D8 draft.

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Fix for Problems in UL Allocation

Mary Chion, Sean Cai, Yunsong Yang, Irving Wang

ZTE San Diego Inc. USA

Mo-Han Fong

Nortel Netowrks

1. Problem Statement

There are many optional features included in the current standard document. Associated with the optional features, there are many extended/extend-2 UL MAP IEs and several types of MAP messages. In the current standard, it is not clearly stated that the MSs/SSs support of these IE and MAP message are mandatory. However, from optional nature of the features, and following text from the standard, we conclude that MS/SS support of these IEs/MAP messages can be optional. The standard text regarding extended IE is as the following:

“A UL-MAP IE entry with a UIUC value of 15, indicates that the IE carries special information and conforms to the structure shown in Table 291. A station shall ignore an extended IE entry with an extended UIUC value for which the station has no knowledge. In the case of a known extended UIUC value but with a length field longer than expected, the station shall process information up to the known length and ignore the remainder of the IE.” Which allows the MS to not read any UL-MAP extended IE that it does not support”.

UL allocations are included in many of the optional extended/extended-2 UL IEs and optional MAP messages. We have identified the following IEs, MAP messages and MAC headers included in IEEE P802.16e-D8-2005 which contain UL allocations:

- Extended IE allocation
- Feedback Polling IE
- UL PUSC Burst Allocation in Other Segment IE
- HO Anchor Active UL MAP IE
- HO Active Anchor UL MAP IE
- MIMO UL Enhanced IE format
- OFDMA Fast_Ranging_IE format IE
- HARQ UL MAP IE
- HARQ ACK Region Allocation IE
- HARQ MAP
- SUB DL UL MAP
- Feedback Request Extended Subheader

Since most of the UL allocation is defined as sequential slot allocation with duration and the understanding that the new bursts start from where the previous burst ends is used, a MS will not be able to correctly compute the slot offset for its UL allocation when its UL allocation is after an allocation included in an IEs or MAP message it does not support. This problem already exists in IEEE802.16-2004. However, with the number of optional extended IEs and messages added in the current 16e standard, this problem becomes much worse and is impossible to avoid by any BS scheduling implementation. Also, a comment and contribution will be submitted to 16d/Cor1/D3 to correct this problem in 16d.
2. Proposed Solutions

We propose the following changes to resolve the UL allocation problem:
- Modify the existing UL Allocation Start IE to be included by normal UL-MAP as well as SUB-DL-UL-MAP. This IE specifies a start offset that is to be used by all subsequence UL allocations (including allocations defined by UL-MAP_IE and extended UL-MAP_IE).
- Change the type of UL Allocation Start IE from Extended-2 UIUC to Extended UIUC since this IE should be supported by not only 16e MSs but also 16d SSs.
- This extended UL-MAP-IE is supported by all MSs.
- The BS may include this UL Allocation Start IE to help MSs that do not support HARQ MAP, SUB-DL-UL-MAP or an extended IE with allocation to skip the UL allocation that defined by those optional messages.
- The BS only needs to include this new IE when necessary, i.e. where there are MSs don’t not support all features supported by the system.

3. Specific Text Changes

[Modify the following section:]

8.4.5.4.4.1 UL-MAP extended IE format

.....

<table>
<thead>
<tr>
<th>Extended UIUC</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x08</td>
<td>UL_PUSC_Burst_Allocation_in_Other_Segment_IE</td>
</tr>
<tr>
<td>0x09</td>
<td>Fast_Ranging_IE</td>
</tr>
<tr>
<td>0x0A</td>
<td>UL_Allocation_Start_IE</td>
</tr>
<tr>
<td>0x0A ... 0x0F</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

[Modify the following section:]

8.4.5.4.4.2 UL-MAP Extended-2 IE Format

.....

<table>
<thead>
<tr>
<th>Extended-2 UIUC</th>
<th>Usage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x08</td>
<td>HARQ_ACKCH_Region_Allocation_IE</td>
</tr>
<tr>
<td>0x09</td>
<td>UL_Allocation_start_IE</td>
</tr>
<tr>
<td>0x0A9 ... 0x0D</td>
<td>Reserved</td>
</tr>
<tr>
<td>0x0E</td>
<td>AAS_SDMA_UL_IE</td>
</tr>
</tbody>
</table>
8.4.5.4.26 UL Allocation start IE

The UL Allocation Start IE indicates the start offset of all subsequent UL allocation including allocation done by UL-MAP_IE and extended UL-MAP_IE. When this IE is included in UL-MAP or SUB-DL-UL-MAP, a MS shall determine all subsequent UL allocations based on the start offset defined in this IE except when the UL allocation already specified a start offset. This IE shall be supported by all MS.

This IE can be used in UL-MAP and SUB-DL-UL-MAP.

Table 302v—UL Allocation start IE

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Size</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL Allocation start IE ()</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Extended-2 UIUC</td>
<td>4</td>
<td>UL_Allocation_start_IE () = 0x09A</td>
</tr>
<tr>
<td>Length</td>
<td>84</td>
<td>Length in bytes</td>
</tr>
<tr>
<td>OFDMA Symbol offset</td>
<td>8</td>
<td>This value indicates start Symbol offset of <strong>all</strong> subsequent <strong>sub-bursts in this UL Allocation start IE</strong> <strong>UL allocations in this MAP message (UL-MAP or SUB-UL-DL-MAP)</strong></td>
</tr>
<tr>
<td>Subchannel offset</td>
<td>7</td>
<td>This value indicates start Subchannel offset of <strong>all</strong> subsequent <strong>sub-bursts in this UL Allocation start IE</strong> <strong>UL allocations in this MAP message (UL-MAP or SUB-UL-DL-MAP)</strong></td>
</tr>
<tr>
<td>reserved</td>
<td>1</td>
<td>Shall be set to 0</td>
</tr>
</tbody>
</table>

This IE shall not be used in UL-MAP; it may be used in SUB-DL-UL-MAP.

This MAP IE can be used to indicate the start position UL burst in SUB-DL-UL-MAP.

4. References
