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Title | Improving HARQ Map Decoding Efficiency
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Re: | IEEE P802.16e/D9

Abstract | This contribution proposes a method for improving HARQ map decoding efficiency by inserting some fields in HARQ DL/UL MAP IE that enable omission of decoding some parts of the IE that belong to the HARQ modes the MS does not support.

Purpose | Review and Adopt the suggested changes into P802.16e/D9

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1 Introduction

This contribution proposes a method for improving HARQ map decoding efficiency by inserting some fields in HARQ DL/UL MAP IE that enable omission of decoding some parts of the IE that belong to the HARQ modes the MS does not support.

In P802.16e/D9 there are seven different HARQ modes, and an MS may support any subset of them. The capability of an MS on which HARQ modes are supported is negotiated through the SBC-REQ/RSP.

In general, multiple HARQ modes can exist in a HARQ DL MAP IE, and according to P802.16e/D9 an MS that supports a certain subset of HARQ modes has to decode all the fields of the IE that belong to the other HARQ modes that it does not support. This is because it does not know the length of the corresponding sub-burst IEs. As a result, the MS may experience unnecessary decoding delay and energy consumption.

Therefore, in this contribution we propose to insert the length field before the sub-burst_IE which indicates the size of the sub-burst IE in nibbles so that the MS can skip the fields while decoding the HARQ DL MAP IE.

In HARQ UL MAP IEs, a similar problem exists, so we propose to insert the length field in the HARQ UL MAP IE as well. In this case, however, if some of the sub-burst IEs are skipped then the MS is unable to learn the starting position of its own burst. Therefore, we propose to insert a field ‘Duration’ that indicates the sum of the duration in units of OFDMA slots (or Nsch) that belong to the HARQ region that corresponds to each HARQ mode.

The following section describes the proposed text changes in P802.16e/D9.

2 Proposed text changes

[Insert the following field in Table 286l as indicated below]

Table 286l—HARQ DL MAP IE format

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Size (bits)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region_ID</td>
<td>8</td>
<td>Index to the DL region defined in DL region definition TLV in DCD</td>
</tr>
<tr>
<td>}</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Mode        | 4           | Indicates the mode of this HARQ region  
0b0000 = Chase HARQ  
0b0001 = Incremental redundancy HARQ for CTC  
0b0010 = Incremental redundancy HARQ for Convolutional Code  
0b0011 = MIMO Chase H-ARQ  
0b0100 = MIMO IR H-ARQ  
0b0101 = MIMO IR H-ARQ for Convolutional Code  
0b0110 = MIMO STC H-ARQ  
0b0111-0b1111 Reserved     |
| Boosting    | 3           | 000: normal (not boosted); 001: +6dB; 010: -6dB; 011: +9dB; 100: +3dB; 101: -3dB; 110: -9dB; 111: -12dB; |
| Length      | 8           | Length in nibbles to indicate the size of the sub-burst IE in this HARQ mode |
If (Mode == 0b0000) {
    — —
    DL HARQ Chase sub-burst IE() variable —
} else if (Mode == 0b0001) {
    — —
    DL HARQ IR CTC sub-burst IE() variable —
} else if (Mode == 0b0010) {
    — —
    DL HARQ IR CC sub-burst IE() variable —
} else if (Mode == 0b0011) {
    MIMO DL Chase H-ARQ Sub-Burst IE () variable
} else if (Mode == 0b0100) {
    MIMO DL IR H-ARQ Sub-Burst IE () variable
} else if (Mode == 0b0101) {
    MIMO DL IR H-ARQ for CC Sub-Burst IE () variable
} else if (Mode == 0b0110) {
    MIMO DL STC H-ARQ Sub-Burst IE () variable
}
}
{ — —
Padding variable Padding to byte; shall be set to 0
}

[Insert the following fields in Table 302i as indicated below]

<table>
<thead>
<tr>
<th>Syntax</th>
<th>Size (bits)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocation Start Indication</td>
<td>1</td>
<td>0: No allocation start information 1: Allocation start information follows</td>
</tr>
<tr>
<td>If (Allocation Start Indication == 1) {</td>
<td>— —</td>
<td>— —</td>
</tr>
<tr>
<td>OFDMA Symbol offset</td>
<td>8</td>
<td>This value indicates start Symbol offset of subsequent sub-bursts in this HARQ UL MAP IE</td>
</tr>
<tr>
<td>Subchannel offset</td>
<td>7</td>
<td>This value indicates start Subchannel offset of subsequent sub-bursts in this HARQ UL MAP IE</td>
</tr>
<tr>
<td>Reserved</td>
<td>1</td>
<td>— —</td>
</tr>
<tr>
<td>}</td>
<td>— —</td>
<td>— —</td>
</tr>
</tbody>
</table>
| **Mode** | 3 | Indicates the mode of this HARQ region  
0b000 = Chase HARQ  
0b001 = Incremental redundancy HARQ for CTC  
0b010 = Incremental redundancy HARQ for convolutional code  
0b011 = MIMO Chase H-ARQ  
0b100 = MIMO IR H-ARQ  
0b101 = MIMO IR H-ARQ for Convolutional Code  
0b110 = MIMO STC H-ARQ  
0b111 = Reserved |
| **N sub Burst** | 4 | Indicates the number of bursts in this UL MAP IE |
| **Duration** | 12 | Indicates the sum of the duration (or Nsch), in units of OFDMA slots, of sub-burst IEs in this HARQ region |
| **Length** | 8 | Length in nibbles to indicate the total size of all the sub-burst IEs in this HARQ mode |

```
For (i = 0; i < N Sub-burst; i++) {
    if (Mode == 000) {
        UL HARQ Chase Sub-Burst IE ()
    } else if (Mode == 001) {
        UL HARQ IR CTC Sub-Burst IE ()
    } else if (Mode == 010) {
        UL HARQ IR CC Sub-Burst IE ()
    } else if (Mode == 011) {
        MIMO UL Chase HARQ Sub-Burst IE ()
    } else if (Mode == 100) {
        MIMO UL IR H-ARQ Sub-Burst IE ()
    } else if (Mode == 101) {
        MIMO UL IR HARQ for CC Sub-Burst IE ()
    } else if (Mode == 110) {
        MIMO UL STC HARQ Sub-Burst IE ()
```