Reservation Tools for 802.16.3

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Source:
Vladimir Yanover et al.
BreezeCOM
Atidim Technology Park, Bldg. 1
P.O. Box 13139, Tel-Aviv 61131, Israel

Voice: +972-36457834
Fax: +972-36456290
E-mail: vladimiry@breezecom.co.il

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Reservation Tools for 802.16.3

Naftali Chayat, Vladimir Yanover, Inbar Anson
BreezeCOM
Traffic Features Specific to 802.16.3

- Total demand per Base Station (sector) is an integration of (tens or even hundreds) streams passing to/from CPEs
- Burstiness: the demand might be triggered by an arrival of a single upper layer PDU such as an IP datagram encapsulated into an Ethernet packet
- Demand duty cycle might be very low, especially for residential subscribers
Reservation Tools

- Parallel Polling
- Flexible Frame Size
- Improved Piggybacked Requests
- SS Decision on the Transmission Rate
Flexible Frame Size

- The 802.16.3 residential and similar applications may expose considerable changes in the number of serviced SSs and their demand e.g. associated with busy hours.
- The variable frame size provides more flexibility in the tradeoff between the channel utilization and the response time.
Flexible Frame Size-cont.

Frame Definition

Frame: A frame is a fixed duration of time, which contains both transmit and receive intervals [D1-2000draft, 3. Definitions ]

This is not consistent

— If there is DL Tx, then it is UL Rx
— If we change to Tx and Rx of BS it is still wrong: [t0, t0+T] is the frame then [t0, t0 + 2T] also
— For FDD we may have all the time Tx and Rx at BS
Flexible Frame Size-cont.

Frame Definition

¥ Actually the D1-2000 draft implicitly assumes that the frame = interval between two consequent BS acts of broadcasting control information

¥ It is proposed to make it a definition
Flexible Frame Size-cont.

Frame Definition

¥ New definition:
  —**Frame** = interval that starts from the beginning of transmission of the message management X [e.g. SYNC - Subir]

¥ This message has to contain
  —Time Stamp element
  —BS Frame Size element

¥ For that new TLV parameters are required. The frame length is expressed in TBD (PHY dependent) units

¥ Note that the SSs need Frame Size for information only
Flexible Frame Size-cont.

TG1: fixed, TG3/4: Flexible

¥ For TG1 this parameter will be requested to be a constant

¥ It is proposed for the 802.16.3/4 MAC simply to exclude the requirement of constant frame size. It means that potentially the frame size may change from frame to frame
Flexible Frame Size-cont.

Undefined frame Size

¥ New Undefined Frame Size element means that the actual frame time will be defined simply by the next management message with Time Stamp / Frame Size parameter
Flexible Frame Size-cont.

MAP Relevance

¤ The change in the definition of the frame affects the definition of the relevance interval of MAP messages [see Subir s IEEE 802.16.4c-01/02]

¤ The problem may be solved simply by making the intervals in MAP relative to the start of the frame where the MAP is transmitted
### Flexible Frame Size-cont.

#### TDD

<table>
<thead>
<tr>
<th>Frame #1</th>
<th>DL</th>
<th>UL</th>
<th>Frame #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Management Message</td>
<td>Time Stamp</td>
<td>Frame Size</td>
<td>DL</td>
</tr>
<tr>
<td></td>
<td>MAP Message</td>
<td></td>
<td>Management Message</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time Stamp</td>
<td>Frame Size</td>
</tr>
</tbody>
</table>
Flexible Frame Size-cont.

FDD

Time Base for the MAP IEs

Frame # 1

<table>
<thead>
<tr>
<th>DL</th>
<th>Management Message</th>
<th>MAP Message</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time Stamp</td>
<td>Frame Size</td>
</tr>
</tbody>
</table>

Frame # 2

<table>
<thead>
<tr>
<th>DL</th>
<th>Management Message</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Time Stamp</td>
</tr>
</tbody>
</table>

UL

UL
Flexible Frame Size-cont.

New UIUC

- The new definition would allow to employ such a scheduling process that BS allocates a time slot for the SS, then SS does not use all the interval, BS sees the end of SS transmission and starts the next frame with new allocations

- Table 4 in 6.2.1.2.4: A new UIUC needed to figure LIMITED type of time allocation for the specific SS. This UIUC means: the offset value in the UL-MAL IE provides the maximum time to be used by the given SS
Parallel Polling

✓ Needs a support from PHY (provided e.g. by OFDM — see e.g. 802.16.3c-00/01 OFDM-based Physical Layer submission to 802.16.3 FWA Naftali Chayat et al.)

✓ New Message

— A set of time slots, one symbol length each, is assigned to every SSs using multicast CID. For such an assignment a **new message** will be used, PPA-REQ
Parallel Polling-cont.

¥ New UIUC
   —SSs are invited to transmit by a UL-MAP message that contains the record with the given multicast CID and the new UIUC

¥ SSs chooses to transmit or not in each of the assigned time / subcarrier slot thus transferring a binary code to the BS. The coding table allows to transmit either simple signal (1 bit = there is a demand) or complex (# of symbols the SS needs for transmission)