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| Re:                          | The document accompanies a comment submitted to 802.16e Sponsor Ballot  |  |
| Abstract                     | The document suggests changes in Handover section to make possible shortening of traffic interruption time  |  |
| Purpose                      | The document should be considered during resolution of 802.16e Sponsor Ballot comments  |  |
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## Network re-entry optimization

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### 1. Background

One of the most time consuming operations in Network Re-Entry is CDMA Initial ranging. In case ranging (as a part of Association) has been previously conducted between the MS and potential Target BS short time before the actual handover, results of that ranging are most probably still valid and therefore phase of CDMA ranging request / response may be skipped. The following explains sequence of events:

- MS performs Scanning with addition of ranging (i.e. Association) with respect to neighbor BS. During this procedure MS may estimate duration of validity interval for results of ranging (frequency, time and transmit power offsets). The MS supplies this estimation to Serving BS as a part of Scanning Report (this signaling is absent in 802.16e/D7).
- Shortly MS decides to initiate handover and provides in HO-REQ message estimated time interval for which results of ranging are still valid (needs clarification in 802.16e/D7)
- Serving BS negotiates with neighbor BS possibility of accommodation of the MS and timing of a dedicated allocation that will be provided for the MS to transmit RNG-REQ message during actual handover.
- Serving BS responds with BSHO-RSP message where provides information on that allocation (Action Time)
- MS sends HO-IND and leaves to Target BS
- Target BS allocates dedicated transmission opportunity for the MS to send RNG-REQ message

To provide for such procedure, definitions in HO section and formats of HO related messages should be slightly changes. There is a need also for some clarification.

### 2. Specific changes in 802.16e/D7

*[Change at p.99, line 23]*

|                                |                 |                 |
|--------------------------------|-----------------|-----------------|
| Relative delay                 | 8               | —               |
| }                              | 8               |                 |
| <u>TLV encoded information</u> | <u>Variable</u> | <u>Optional</u> |
| }                              | 8               |                 |

*[Add at p. 100 line 8]*

TLV tuples specified in 11.20 may be included into MOB\_SCAN-REPORT message. Information provided by Nth TLV of this type is related to Nth BS listed in the message.

*[Change at p. 157 line 7]*

When MOB\_MSHO-REQ is sent by an MS, the MS may indicate one or more possible Target BS. When MOB\_BSHO-REQ is sent by a BS, the BS may indicate one or more possible Target BS. MS may evaluate possible target BS through previously performed Scanning, ~~ranging,~~ and Association activity.

Serving BS criteria for recommendation of target BS may include factors such as expected ~~target BS MS QoS~~-performance at potential Target BS and MS QoS requirements. Serving BS may obtain expected ~~Target BS QoS MS~~ performance at potential Target BS ~~indication~~ through the exchange of backbone ~~messaging messages~~ with ~~Neighbor that~~ BS.

Dedicated allocation for transmission of RNG-REQ means that channel parameters learned by the MS during Association of that BS are considered valid during sufficient time and can be reused for actual Network Re-entry without preceding CDMA Ranging. This parameter is provided to the Serving BS over the backbone.

~~The MOB\_MSHO-REQ message may also include an indication of the estimated time for performing the HO.~~ If Network Assisted HO supported flag is set to "1" in MOB\_BSHO-REQ message, MS may perform a hand-over to any BS among the recommended BSs in MOB\_BSHO-REQ (for which Action Time is specified) without notifying the serving BS of a selected target BS. As an acknowledgement to the MOB\_BSHO-REQ message, the MS may send a MOB\_HO-IND message with its target BSID set to "0x00000000".

When the serving BS, transmitted MOB\_BSHO-REQ with ~~Network~~ Assisted HO supported flag = "1", receive MOB\_HO-IND with target BS ID = "0x00000000", it may neglect target BS ID included in MOB\_HO-IND message.

~~The serving BS may send messages to the recommended BSs even before receiving the MOB\_HO-IND message in order to make the BSs to reserve Fast\_UL\_ranging\_IE for the MS. This reserved UL resource may be released by a backbone message.~~

MS actual pursuit of hand-over to one of BSs specified target BS in MOB\_BSHO-RSP is recommended, but not required. MS may ~~elect~~ decide to attempt hand-over to a different ~~target BS, a target BS that may or may not have been included in MOB\_BSHO-RSP, with the understanding that the different target BS may not receive notification of the pending hand-over from the serving BS over the backbone network prior to MS Initial Ranging of target BS.~~

If the MS signals rejection of serving BS instruction to HO through HO\_IND\_type field in the MOB\_HOIND set value of 0b10 (HO reject option), the BS may reconfigure the target BS list and retransmit MOB\_BSHO-RSP message including a new target BS list.

Serving BS may notify one or more target BS over the backbone network of MS intent to hand-over to target BS. Serving BS may also send MS information to target BS over the backbone ~~that can to~~ expedite hand-over.

Once MS sends MOB\_HO-IND with option HO\_IND\_type = 0b00 indicating commitment to HO and intent to release the serving BS, the MS shall not be expected to monitor serving BS DL traffic after expiration of Resource retain timer.

*[Change at p.105, line 31]*

**Action Time**

For HO, this value is defined as number of frames until the Target BS allocates a ~~non-contention based ranging~~ dedicated transmission opportunity for RNG-REQ message to be transmitted by the MSS using Fast Ranging IE. Dedicated allocation for transmission of RNG-REQ means that channel parameters learned by the MS during Association of that BS stay valid and can be reused during actual Network Re-entry without preceding CDMA-based Initial Ranging. This parameter is decided by the Serving BS based on the information obtained from potential Target BSs over the backbone.

For SHO/FBSS, this is the time of update of Anchor BS and/or Active Set. A value of zero in this parameter signifies that this parameter should be ignored.

*[Change at p.108, line 6]*

|                               |                |  |
|-------------------------------|----------------|--|
| <del>Estimated HO start</del> | 8              | <del>The estimated HO time shall be the time for the recommended target BS</del> |
| HMAC Tuple                    | 168 (21 bytes) | See 11.1.2   |

*[Change at p.108, line 23]*

**~~Estimated HO start~~**

~~Estimated number of frames starting from the frame following the reception of the MOB\_BSHO RSP message until the HO may take place. A value of zero in this parameter signifies that this parameter should be ignored~~

*[Change at p.114, line 35]*

**Action Time**

For HO, this value is defined as number of frames until the Target BS allocates a ~~non-contention based ranging~~ dedicated transmission opportunity for RNG-REQ message to be transmitted by the MSS using Fast Ranging IE. Non-zero value of this parameter means that potential Target BS estimates that channel parameters learned by the MS during Association of that BS stay valid and can be reused during actual Network Re-entry without preceding CDMA-based Initial Ranging. This parameter is decided by the Serving BS based on the information obtained from potential Target BSs over the backbone.

For SHO/FBSS, this is the time of update of Anchor BS and/or Active Set. A value of zero in this parameter signifies that this parameter should be ignored.

*[Change at p.116, line 11]*

|                     |   |  |
|---------------------|---|--|
| if (Mode == 0b00) { | — | —  |
| HO_IND_type         | 2 | 0b00: serving BS release<br>0b01: HO cancel<br>0b10: HO reject<br>0b11: reserved |

|  |          |   |
|--|----------|---|
| <u>Ranging_Params_valid_indication</u> | <u>2</u> | <u>00: No indication. BS ignores this field (Default)</u><br><u>01: MS ranging parameters for Target BS, which is specified in this message are valid</u><br><u>10: MS has no valid ranging parameters for Target BS, which is specified in this message</u><br><u>11: Reserved</u> |
| <u>Reserved</u>                        | <u>4</u> | <u>Reserved</u>   |
| if (HO_IND_type == 0b00) {             | —        | —   |
| Target_BS_ID                           | 48       | Applicable only when HO_IND-type is set to 0b00   |
| }                                      | —        | —   |
| }                                      | —        | —   |

*[Insert at p.117, line 30]*

#### Ranging\_Params\_valid\_indication

Indicator that shows whether ranging parameters acquired by the MS during preceding Association with selected Target BS are still valid. This indicator may be used by Target BS in decision to allocate dedicated transmission opportunity by Fast Ranging IE.

00: No indication. BS ignores this field (Default)

01: MS ranging parameters for Target BS, which is specified in this message are valid

10: MS has no valid ranging parameters for Target BS, which is specified in this message

11: Reserved

*[Add new section 11.20]*

11.20. MOB\_SCAN-REPORT message encodings

| Name                             | Type | Length | Value   |
|----------------------------------|------|--------|---|
| Ranging_Parameters_Validity_Time |      | 1      | Estimated number of frames starting from the frame following the reception of the MOB_SCAN-REPORT message, in which channel parameters learned by the MS during Association of specific BS stay valid and can be reused during future Network Re-entry to the BS without additional CDMA-based Initial Ranging. A value of zero in this parameter signifies that this parameter should be ignored |