Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**	
Title	**Network re-entry optimization**	
Date Submitted	**3-May-05**	
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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. For example, time location for dedicated transmission opportunity must be per potential HO target, not a single value for all of them.

2. Specific changes in 802.16e/D7

[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.

MOB_BSHO-REQ/RSP message may contain per neighbor BS Action Time defined as number of frames until the BS allocates for the MS a dedicated transmission opportunity for either CDMA ranging or RNG-REQ message using UL-MAP_IE with allocation of dedicated ranging region or Fast_Ranging_IE respectively. Dedicated allocation for transmission of RNG-REQ means that channel parameters learned by the MS during Scanning (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 ~~Netowrk~~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.~~ T~~his reserved UL resource may be released by a backbone message.~~

MOB_MSHO-REQ messages may contain per neighbor BSs Ranging_Parameters_Validity_Time value for estimated number of frames in which channel parameters learned by the MS during Scanning (Association) of the specific BS are considered valid and can be reused in Network Re-entry to the BS without additional CDMA-based Initial Ranging.

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 either CDMA ranging or RNG-RSP message from the MS~~S~~ using Fast_Ranging_IE. Dedicated allocation for transmission of RNG-

REQ means that channel parameters learned by the MS during Scanning (Association) of that BS stay valid and can be reused during actual Network Re-entry without preceding CDMA-based Initial Ranging. This parameter is provided to the Serving BS 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.107, line 34, section 6.3.2.3.52 MS HO Request (MOB_MSHO-REQ) message]

BS CINR mean	8	—
Ranging_Parameters_Validity_Time	8	
Service level prediction	3	—
Arrival Time Difference Indication	1	If the MS is transmitting this message to request HO or SHO/FBSS is not supported by either BS or MS, this bit shall be set to 0

[Change at p.108, line 6]

~~Estimated HO start~~	~~8~~	~~The estimated HO time shall be the time for the recommended target BS~~
HMAC Tuple	168 (21 bytes)	See 11.1.2

[Change at p.108, line 23]

~~Estimated HO start~~ Ranging_Parameters_Validity_Time
Estimated number of frames starting from the frame following the reception of the ~~MOB_BSHO-RSP~~ MOB_MSHO-REQ message, in which channel parameters learned by the MS during Scanning (Association) of the specific BS stay valid and can be reused during future Network Re-entry to the BS without additional CDMA-based Initial Ranging ~~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-RSP message from the MS~~S~~ using Fast_Ranging_IE. Non-zero value of this parameter means that potential Target BS estimates that channel parameters learned by the MS during Scanning (Association) of that BS stay valid and can be reused during actual Network Re-entry without preceding CDMA-based Initial Ranging. This parameter is provided to the Serving BS 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.99 line 21 section 6.3.2.3.50 Scanning Result Report (MOB_SCAN-REPORT) message]

Relative delay	8	
Assoc_results_indicator	1	--
if (Assoc_results_indicator == 1)		--
Service level prediction	3	--
Ranging_Parameters_Validity_Time	8	--
Else		--
Reserved	3	--

[Change at p.100 line 3 section 6.3.2.3.50 Scanning Result Report (MOB_SCAN-REPORT) message]

Relative delay
This parameter indicates the delay of neighbor DL signals relative to the serving BS, as measured by the MSS for the particular BS. The value shall be interpreted as a signed integer in units of samples.

Service level prediction
The service level prediction value indicates the level of service the MS can expect from this BS. The following encodings apply:
0 = No service possible for this MS
1 = Some service is available for one or several service flows authorized for the MS.
2 = For each authorized service flow, a MAC connection can be established with QoS specified by the AuthorizedQoSParamSet.
3 = No service level prediction available.

Ranging_Parameters_Validity_Time
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