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| Project                      | <b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >   |  |
| Title                        | <b>Method for usage of handover ranging code and handover ranging region in handover initial ranging</b>   |  |
| Date Submitted               | [2004-11-04]   |  |
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| Re:                          | This contribution is for call for contribution IEEE P802.16e/D5  |  |
| Abstract                     | This contribution proposes the usage of handover ranging code and handover ranging region for handover initial ranging.  |  |
| Purpose                      | Propose the usage of handover ranging code and handover ranging region for the IEEE802.16e Handoff Ad hoc group  |  |
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# Method for Usage of Handover Ranging Code and Handover Ranging Region in Handover Initial Ranging

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## 1. Introduction

In current IEEE P802.16e/D5, when Target BS received a handover notification from Serving BS over the backbone, the Target BS may reserve a non-contention based initial ranging opportunity for an MSS in handover. The MSS uses the reserved ranging opportunity to transmit an initial ranging request (RNG-REQ) message to the Target BS during network re-entry procedures. This non-contention based initial ranging opportunity facilitates fast connection re-establishment for the MSS.

For some reasons, however, MSS may not receive any non-contention based initial ranging opportunity from its Target BS. Then MSS shall perform a contention based initial ranging, which may introduce significant delay for re-establishing its connection with its Target BS due to possible collisions and back-offs. In order to solve this problem, we propose a handover ranging method using handover ranging code on a handover ranging region for MSS in handover. This can help reducing network entry delay by collisions with normal initial ranging MSSs and dropped/paged MSSs as well.

## 2. Overview of Proposed Solution

In IEEE P802.16e/D5, one among the handover ranging codes specified in UCD channel encodings is used by MSS for initial ranging after dropping or receiving MOB\_PAG-ADV message with action code '01' or '10'. We propose that these handover ranging codes can be used by a MSS which obtains no contention free initial ranging opportunity from its Target BS. This simple usage extension of the handover ranging codes may cause additional collisions among dropped/paged/handover MSSs. Thus, we also propose a ranging region in which the handover MSS transmits its handover ranging code.

The ranging region for handover MSS shall be assigned in the UL-MAP IE (UIUC=12 and dedicated ranging indicator=1). However, this region is already assigned for the paged MSSs, so there needs a way to avoid possible collisions among paged MSSs and handover MSSs. In order to do that, we propose that a handover MSS randomly selects a code from handover ranging code set. On the contrary, a paged MSS is assigned a code randomly selected from initial ranging code set.

### 3. Proposed Text Changes

We propose the following remedies in IEEE P802.16e/D5 to provide a handover ranging operation.

Remedy 1:

[Change the followings in line 31-46 page 88 section 6.3.2.3.55 BS Broadcast Paging message]

When a BS pages multiple MSSs, the BS may assign dedicated CDMA codes to one or more MSS being paged. The assigned CDMA codes shall be selected from the code sub-group for initial ranging. The BS shall first list the MAC Address Hash of those MSSs that are assigned dedicated CDMA codes, followed by the MSSs that are not assigned dedicated CDMA codes.

For OFDMA PHY, one of the following TLV may be included in the MOB\_PAG-ADV management message:

CDMA code assignment (~~11.14.11.18.1~~)

OFDMA-PHY specific parameter used to indicate CDMA code assignment to one or more MSS being paged in this message. The assigned CDMA codes shall be selected from the code sub-group for initial ranging. One CDMA code assignment in the TLV corresponds to one MSS paged. The order of the assignments is the same as the order of appearance of MSS MAC address hash in this message.

[Change the following in line 8 page 309 section 11.18.1 CDMA code assignment]

This field indicates the assigned code for a MSS who is paged to use over CDMA ranging channel. This code shall be selected from the code sub-group for initial ranging.

Remedy 2:

[Change the followings in line 29-36 page 114 section 6.3.20.2 HO process]

Target BS Scanning – MSS shall scan Target BS for downlink channel & synchronization and uplink channel & synchronization. If MSS had previously decoded a MOB\_NBR-ADV message including Target BS ID, Physical Frequency, DCD and UCD, then the scanning and synchronization process may be shortened. If the Target BS had previously received HO notification from Serving BS over the backbone (see section Backbone network HO procedures), then Target BS may place a non-contention based Fast\_UL\_ranging\_IE MSS Initial Ranging opportunity in the UL-MAP. Target BS may allocate initial ranging region for a handover MSS which does not receive a non-contention based Fast\_UL\_ranging\_IE. The ranging region shall be assigned in UL-MAP IE with UIUC =12 and Dedicated ranging indicator =1. MSS shall scan Target BS for UL-MAP that includes either a contention or non-contention based MSS Initial Ranging opportunity.

[Change the followings in line 17-27 page 119 section 6.3.20.2.4 Target BS scanning and synchronization]

MSS shall scan Target BS for downlink channel & synchronization and uplink channel & synchronization. If MSS had previously decoded a MOB\_NBR-ADV message including Target BS ID, Physical Frequency, DCD and UCD, then the scanning and synchronization process may be shortened. If the Target BS had previously received HO notification from Serving BS over the backbone (see section Backbone network HO procedures), then Target BS may place a non-contention based Fast\_UL\_ranging\_IE() (see 8.2.1.5.5.3.3 Fast ranging (Paging) Information Element, 8.3.6.3.4 Fast ranging (Paging) Information Element, and 8.4.5.3.5 & 8.4.5.3.6 Fast ranging (Paging) Information Element) MSS Initial Ranging opportunity in the UL-MAP. Target BS may allocate initial ranging region for a handover MSS which does not receive a non-contention based Fast UL ranging IE. The ranging region shall be assigned in UL-MAP IE with UIUC=12 and Dedicated ranging indicator=1. MSS shall scan Target BS for UL-MAP that includes either a contention or non-contention based MSS Initial Ranging opportunity.

Remedy 3:

[Add the followings after line 25 page 124 section 6.3.20.4 Network entry/re-entry]

If a non-contention based MSS Initial Ranging opportunity is not provided, the MSS may use ranging opportunity, which is ranging region allocated in UL-MAP IE (with UIUC=12 and Dedicated ranging indicator bit set to 1). The MSS shall randomly select a code from code sub-group for handover ranging and transmit the code in the ranging region. Receiving handover ranging code in the ranging region, the Target BS shall allocate bandwidth to the MSS for sending RNG-REQ similar to the case in non-contention based Fast UL ranging IE.

[Change the following in line 9 page 161 section 8.4.4.5 Uplink transmission allocations]

The BS shall not allocate more than three ranging allocation IE(UIUC 12) per frame, one for initial ranging and one for periodic ranging, and one for initial ranging for the paged/handover MSS.

[Change the followings in line 42-63 page 176 section 8.4.5.4 UL-MAP IE format]

| Syntax                      | Size | Note   |
|-----------------------------|------|--|
| Dedicated ranging indicator | 1bit | 1 – the OFDMA region and Ranging Method defined are used for the purpose of ranging using dedicated CDMA code assigned in the MOB-PAG-ADV message <u>or ranging for handover MSS which does not receive non-contention based Fast UL ranging IE.</u><br>0 – the OFDMA region and Ranging Method defined are used for the purpose |

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|--|--|--------------------|
|  |  | of normal ranging. |
|--|--|--------------------|

Dedicated ranging indicator

BS shall set this field to 1 to indicate that the defined region is dedicated to page-response ranging or handover initial ranging in case that MSS does not get non-contention based Fast UL ranging IE(). Otherwise, the BS shall set this field to 0 to indicate that the defined region is for normal ranging.

[Change the followings in line 17-21 page 177 section 8.4.5.4.1 UIUC Allocation]

UIUC = 12 is used for allocation of initial ranging and/or periodic ranging/BW request. A frame may include all types of allocation simultaneously, each with same or different sizes. There may be a maximum of one initial ranging allocation and one periodic ranging/BW request allocation and one initial ranging for paged MSS/handover MSS per frame.

[Change the followings in line 27-31 page 234 section 8.4.7 OFDMA ranging]

An MSS at some circumstance such as trying network re-entry to another new BS in the drop situation, handover to a Target BS without receiving Fast UL Ranging IE, location update in idle mode or fast call recovery, which needs more UL resources for RNG-REQ because of additional 23bytes long HMAC Tuple, may use the HO ranging code. The BS receiving HO ranging code or initial ranging code in dedicated ranging region for paged MSS shall allocate more bandwidth to the MSS, enough to send RNG-REQ with HMAC Tuple.