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| Project | **IEEE 802.16 Broadband Wireless Access Working Group <**<http://ieee802.org/16>**>** |
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| Re: | Call for Contributions: Multi-tier Networks (16-13-0108-01-000q) |
| Abstract | This contribution proposes to change mobility management functions in IEEE P802.16q |
| Purpose | To discuss and adopt the proposed texts in IEEE P802.16q AWD |
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# Proposed Modification of Mobility Management in IEEE P802.16q

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# Introduction

This contribution provides more detailed procedure required for mobility management in Multi-tier networks.

# Proposed changes

## Network topology advertisements

In the current AWD, network topology can be advertised using a broadcast and unicast MOB\_NBR-ADV message. In this contribution, we have defined more detailed procedure and contents of each messages and differences are summarized in the table below.

|  |  |  |
| --- | --- | --- |
|  | broadcast | unicast |
| Contents of the message | * System info. of Macro BS
* System info. of OSG small BS
* Info. for existence of OSG/CSG small BS (neighbor FA information TLV)
 | * System info. of OSG/CSG small BS
 |
| Transmission of the message | * Periodic
 | * Upon request from an MS (neighbor request TLV in MOB\_SCN-REP)
* Unsolicited transmission by a BS
 |

## MS scanning neighbor small BSs

In general, an MS performs scanning for neighbor BSs based on information included in a MOB\_NBR-ADV message. However, a BS may not incude system information of all neighbor BSs in multi-tier networks to decrease message overhead of the MOB\_NBR-ADV message. So, 16q standard shall provide a efficient mechanim for the MS to perform scanning for neighbor BSs that are not included in MOB\_NBR-ADV message. In this contribution, we propose to add the following 3 more scanning scenarios into the 16q AWD.

* MS-initiated scanning for small BSs using ‘neighbor FA information’ TLV in broadcast MOB\_NBR-ADV
* This scenario can be used for scanning for small BSs that are deployed on a different frequency and not included in the MOB\_NBR-ADV message.
* Neighbor FA information TLV contains FA index and preamble index range of neighbor small BSs deployed on other FAs.
* MS-initiated scanning for small BSs using an information in white list at the MS
* This scenario can be used for scanning for CSG/OSG small BSs that are not included in the MOB\_NBR-ADV message but included in the MS’s white list.
* BS-initiated scanning for small BSs using full BS ID in MOB\_SCN-RSP message

# Editorial Instruction

* Black text: the text is existing in the base standard
* ~~Red text: with strike-through~~: the texts is removed from the amendment standard
* Blue text without underline:the text is added in the amendment standard without underline
* Blue text with underline: the text is added in the amendment standard and underline shall be added under the added text

# Proposed Texts

----------------- Start of the text proposal --------------------------------------------------------------------------------------

[*Remedy 1: Change subclause 17.2 on page 26 as follows:*]

**17.2 Mobility management**

**17.2.1 Handover (HO)**

This subclause contains the procedures performed during HO. The HO procedures shall be the same described in 6.3.20 with the exception of procedures specified in this subcluase.

**17.2.1.1 Network topology acquisition**

**17.2.1.1.1 Network topology advertisement**

A BS shall periodically broadcast the system information of the neighboring BSs using an MOB\_NBR-ADV message. A broadcast MOB\_NBR-ADV message may include the information of Open Subscriber Group (OSG) small BSs, but shall not include information of neighbor Closed Subscriber Group (CSG) small BSs.

A serving BS may unicast a list of accessible neighboring small BSs through the MOB\_NBR-ADV message. The accessible small BSs may contain CSG-closed small BSs serving CSGs to which the MS belongs to, and CSG-open small BSs. The MS may request the accessible small BS list from the BS by sending the MOB\_SCN-REP message.

~~A S-BS may unicast the MOB\_NBR-ADV message to an MS upon reception of TBD message or in an unsolicited manner. When the MS needs to obtain the system information of CSG or OSG BS, it may indi­cate it through the TBD message. Upon receiving this TBD message, the S-BS may send the neighboring CSG or OSG BS information through the MOB\_NBR-ADV message to the MS in an unicast manner.~~

**17.2.1.1.2 MS scanning neighbor small BSs**

For neighbor small BSs, an MS performs the scanning procedure as per 6.3.20.1.2 with exceptions described in this subclause. An MS may scan small BSs according to the neighbor FA information TLV included in the broadcast MOB\_NBR-ADV message. In addition, an MS may scan allowed small BSs based on the CSG white list, which may include the absolute or relative location information of the CSG small BS, such as the GPS information or BSID of the overlay macro BS, respectively. Based on location information and/or speed, the MS may initiate the scanning procedure (see 6.3.20.1.2). For example, the MS may use the absolute or relative location information of the CSG BS to initiate scanning when the distance between the MS and the CSG small BS is less than a pre-configured threshold or the MS detects the overlay macro BS. Details of the threshold configuration are vendor specific and outside the scope of this specification. The MS may request an additional scanning opportunity by sending MOB\_SCN-REQ including the detected preamble index and FA information. Upon reception of the MOB\_SCN-REQ, the BS shall respond with an MOB\_SCN-RSP, which may include a neighbor-accessible small ABS list based on the preamble index and FA information.

When the MS has to scan the small BSs belonging to a CSG, the MS may provide the desired CSGID(s) in the MOB\_SCN-REQ message to the serving BS. The serving BS responds with a list of BSs, addressed by full BSID belonging to the requested CSGID(s), with BS’s FA, preamble index, in the MOB\_SCN-RSP message.

The BS may send an unsolicited MOB\_SCN-RSP for the MS to scan the small BS.

After scanning and identifying the existence of any small BSs, the MS may report FA, preamble index or BS IDs and measurement results according to the Trigger conditions included in the DCD message by sending MOB\_SCN-REP. The MOB\_SCN-REP may contain a neighbor request TLV. If the BS receives the MOB\_SCN-REP that contains the neighbor request TLV, the BS unicast an MOB\_NBR-ADV message that includes a system information of neighbor small BSs indicated by the neighbor request TLV in the MOB\_SCN-REP.

**17.2.1.2 Trigger condition definitions**

**17.2.1.3 HO decision**

After a decision of HO, a serving BS recommends target BS list by including one or more possible target BSs in MOB\_BSHO-REQ or MOB\_BSHO-RSP messages. In case of macro BS only networks, serving BS criteria for recommendation of target BS may include factors such as expected MS performance at potential target BS, BS and network loading conditions, and MS QoS requirements. In case of multi-tier networks, serving BS criteria for recommendation of target BS may also include MS BS type preference, CSG membership, and MS moving speed in addition to the criteria above.

An MS may access unsubscribed CSG-Open small BS if no candidate BSs are available at the MS after scanning macro BS and accessible small BSs.

**17.2.1.4 HO from Macro BS to small BS**

~~[Notes: this subcluase includes HO from Macro BS to OSG small BS as well as HO from Macro BS to CSG small BS]~~

When an MS performs HO from a macro BS to a small BS, the MS shall follow the procedure in 6.3.20 with the exceptions as defined in 17.2.

**17.2.1.5 HO from small BS to Macro BS**

When an MS performs HO from a macro BS to a small BS, the MS shall follow the procedure in 6.3.20.

**17.2.1.6 HO between small BSs**

~~[Notes: this subcluase includes HO between OSG small BSs as well as HO from OSG small BS to CSG small BS]~~

When an MS performs HO from a macro BS to a small BS, the MS shall follow the procedure in 6.3.20 with the exceptions as defined in 17.2.

**17.2.2 Idle mode**

~~All types of small BSs shall support idle mode by use of the same procedures as specified in 6.3.22 for for macro BSs with the exception of procedures described in this subcluase.~~

A small BS may support idle mode.

A small BS that supports idle mode shall follow the same procedure as specified in 6.3.22 for macro BSs with the exceptions given in this subclause.

A CSG-Closed BS shall not broadcast paging for a non-member MS.

An MS with CSG white list shall not attach to an unsubscribed CSG-Closed small BS in Idle mode.

[*Remedy 2: Change the subclause 6.3.2 on page 15 as follows:*]

**6.3.2 MAC PDU formats**

**6.3.2.3 MAC management messages**

**6.3.2.3.42 MOB\_NBR-ADV (neighbor advertisement) message**

***Insert the following texts at the end of 6.3.2.3.43***

The MOB\_NBR-ADV message may include the following TLV.

**Neighbor FA information**

This TLV is used to provide the information required for the MS to scan neighbor small BSs deployed on a different frequency.

**6.3.2.3.45 MOB\_NBR-SCN-REP (scanning result report) message**

***Insert the following texts at the end of 6.3.2.3.45***

The MOB\_SCN-REP message may include the following TLV.

**Neighbor request**

This TLV is included in the MOB\_SCN-REP to request a serving BS to unicast MOB\_NBR-ADV message that contains system information of the neighbor BSs indicated by this TLV.

[*Remedy 3: Insert the following texts at the end of clause 11 on page 8 as follows:*]

**11.18 MOB\_NBR-ADV management message encodings**

***Insert the following new subclause 11.18.3***

**11.18.3 Neighbor FA information**

Neighbor FA information TLV may be included in MOB\_NBR-ADV message to provide the information required for an MS to scan neighbor small BSs deployed on a different frequency.

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Type | Length | Value |
| Neighbor FA information | 23 | variable |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Type | Length | Value |
| FA index | 23.1 | 1 | Index of FA on which small BSs are deployed. The bit-by-bit definition shall be determined by a service provider or a governmental body like FCC. |
| Preamble index range | 23.2 | 2 | The preamble index range of neighbor BSs deployed on the same FA.Bits 0-7: preamble index range startBits 8-15: preamble index range end |

**11.19 MOB\_SCN-REP management message encodings**

***Insert the following new subclause 11.19.3***

**11.19.3 Neighbor request**

Neighbor request TLV may be included in MOB\_SCN-REP to request a serving BS to unicast MOB\_NBR-ADV message that contains system information of the neighbor BSs detected during scanning. The neighbor request TLV may include request BS type and CSGID(s) and the serving BS may include a list of BSs that is formed based on the reported BS type and CSGID(s).

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Type | Length | Value |
| Neighbor request | 3 | variable |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Type | Length | Value |
| Request BS type | 3.1 | 1 | Type of neighbor small BSs for which system information is requested.Bit 0: CSG-closed small BSBit 1: CSG-open small BSBit 2: OSG-small BSBits 3-7: Reserved |
| CSGID | 3.2 | TBD | Identifier of CSG to which the BS belongs |

----------------- Start of the text proposal --------------------------------------------------------------------------------------