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| Project | **IEEE 802.16 Broadband Wireless Access Working Group <**<http://ieee802.org/16>**>** | |
| Title | **Additional parameters for neighbor small BS scanning** | |
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| Source(s) | Jaesun Cha, Eunkyung Kim, Jae-joon Park, Hyun Lee, Kwangjae Lim, Sungcheol Chang  ETRI | E-mail: [jscha@etri.re.kr](mailto:jscha@etri.re.kr)  \*<<http://standards.ieee.org/faqs/affiliationFAQ.html>> |
| Re: | Call for Contributions: Multi-tier Networks (16-13-0191-02-000q) | |
| Abstract | This contribution proposes some additional parameters used for neighbor small BS scanning. | |
| Purpose | To discuss and adopt the proposed texts in IEEE P802.16q AWD | |
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# Additional Parameters for Neighbor Small BS Scanning

Jaesun Cha, Eunkyung Kim, Jae-joon Park, Hyun Lee, Kwangjae Lim, Sungcheol Chang

ETRI

# Introduction

In general, a BS transmits MOB\_NBR-ADV message to provide information on neighbor BSs and an MS performs scanning based on information received from the BS. In multi-tier networks where a BS has many neighbor small BSs, the BS may not provide system information of the neighbor small BSs to decrease the volume of a broadcast message. In this case, the MS needs more time for scanning and the BS can’t request the MS to scan a specific neighbor small BS because neighbor BS information such as BSID is not shared between the BS and the MS.

The following is an example of a general scanning procedure defined in IEEE Std 802.16-2012.

* Step 1: a BS broadcast MOB-NBR-ADV message which includes the following information for each neighbor BS
* BSID, FA index, preamble index, center frequency
* Step 2-1 (BS-initiated scanning): the BS requests an MS to scan specific BSs by using BSIDs included in MOB\_SCN-RSP.
* BSID is used for the MS to derive required information for scanning from the previously received MOB\_NBR-ADV message
* Step 2-2 (MS-imitated scanning): the MS requests a scanning interval to scan specific BSs by using BSIDs included in MOB\_SCN-REQ.
* BSID is used for the MS to derive required information from the previously received MOB\_NBR-ADV message
* Step 3: the MS reports scanning results to the BS
* Each BS is identified by BSID

As shown in the previous example, the MS and BS use BSID to indicate target BSs for scanning and to derive necessary information from the MOB\_NBR-ADV message. If the system information of neighbor small BSs, especially BSID, is not included in the MOB\_NBR-ADV message, the scanning procedure defined in the base standard can not be used by MSs and the scanning performance will be degraded.

In this contribution, we propose to add some additional TLVs in MOB\_SCN-REQ/RSP messages to allow the MS to scan neighbor small BSs through the existing scanning procedure.

# Proposed Texts

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

[*Remedy 1: Change the texts on page 17 as follows:*]

**6.3.2.3.43 MOB\_SCN-REQ (scanning interval allocation request) message**

***Insert the following texts at the end of subclause 6.3.2.3.43 as indicated:***

The following TLV may be included in the MOB\_SCN-REQ message to indicate CSGID of BSs to be scanned.

**CSGID**

CSGID is a common identifier used to identify the BSs belonging to the same CSG. (see 17.1.3)

The following TLVs may be included in the MOB\_SCN-REQ message to indicate neighbor small BSs of which BSIDs are not defined in the MOB\_NBR-ADV message or not shared with the serving BS.

**Recommended small BS information**

Information of the recommended small BS that the MS plans to scan. (see 11.20.4)

**6.3.2.3.44 MOB\_SCN-RSP (scanning interval allocation response) message**

***Insert the following texts at the end of subclause 6.3.2.3.44 as indicated:***

The following TLV may be included in the MOB\_SCN-RSP message to indicate CSGID of BSs to be scanned.

**CSGID**

CSGID is a common identifier used to identify the BSs belonging to the same CSG. (see 17.1.3)

The following TLVs may be included in the MOB\_SCN-RSP message to indicate neighbor small BSs of which BSIDs are not defined in the MOB\_NBR-ADV message or not shared with the MS. If Recommended BSIDs of which BSIDs are not included in the MOB\_NBR-ADV message or not shared with the MS is included in the MOB\_SCN-RSP message, the following TLVs shall be included in the MOB\_SCN-RSP message to provide further information of the neighbor small BSs.

**Recommended small BS information**

Information of the recommended small BS to be scanned. (see 11.20.4)

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

***Insert the following texts at the end of subclause 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.

The following TLVs may be included in the MOB\_SCN-REP message to indicate neighbor small BSs reported in this message and of which BSIDs are not shared with the serving BS.

**Scanning result**

Information of the scanning measurement of the recommended BS to be scanned. (see 11.19.4)

[*Remedy 2: Change texts on page 22 as follows:*]

**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 formed based on the reported BS type and CSGID(s).

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

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| --- | --- | --- | --- |
| 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 BS  Bit 1: CSG-open small BS  Bit 2: OSG-small BS  Bits 3-7: Reserved |
| CSGID | 3.2 | TBD | Identifier of CSG to which the BS belongs |

**11.19.4 Scanning result**

Scanning result TLV may be included in MOB\_SCN-REP message to report scanning result of neighbor small BSs BSIDs are not shared with the serving BS. If the MS acquires BSID from the neighbor small BS during scanning, BSID TLV shall be present in this compound TLV. Otherwise, FA index TLV, Center frequency TLV and Preamble index TLV shall be present in this compound TLV instead of the BSID TLV to indicate the neighbor BS reported.

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| Name | Type | Length | Value |
| Scanning result | 4 | variable |  |

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| --- | --- | --- | --- |
| Name | Type | Length | Value |
| BSID | 4.1 | 1 | BSID of the neighbor small BS reported in MOB\_SCN-REP message. If BSID TLV is present, FA index TLV, Center frequency TLV and Preamble index TLV are not present in this compound TLV. |
| FA index | 4.2 | 1 | See 6.3.2.3.42 |
| Center frequency | 4.3 | 4 | See 11.4.1 |
| Preamble index | 4.4 | 1 | See 6.3.2.3.42 |
| BS CINR mean | 4.5 | 1 | See 6.3.2.3.45 |
| BS RSSI mean | 4.6 | 1 | See 6.3.2.3.45 |
| Relative delay | 4.7 | 1 | See 6.3.2.3.45 |

**11.20 MOB\_SCN-REQ/RSP message encodings**

***Insert the following new subclause 11.20.4 at the end of 11.20:***

**11.20.4 Recommended small BS information**

This compound TLV may be included in the MOB\_SCN-REQ/RSP message to indicate neighbor small BSs of which BSIDs are not defined in the MOB\_NBR-ADV message or not shared between the MS and the serving BS.

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| Name | Type | Length | Value |
| Recommended small BS information | 4 | variable |  |

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| --- | --- | --- | --- |
| Name | Type | Length | Value |
| BSID | 4.1 | 1 | BSID of the neighbor small BS. |
| FA index | 4.2 | 1 | If Recommended BS information TLV is included in MOB\_SCN-REQ message and BSID TLV is present in the Recommended BS information TLV, FA index TLV is not present. (See 6.3.2.3.42) |
| Center frequency | 4.3 | 4 | If Recommended BS information TLV is included in MOB\_SCN-REQ message and BSID TLV is present in the Recommended BS information TLV, Center frequency TLV is not present. (See 11.4.1) |
| Preamble index | 4.4 | 1 | If Recommended BS information TLV is included in MOB\_SCN-REQ message and BSID TLV is present in the Recommended BS information TLV, Preamble index TLV is not present. (See 6.3.2.3.42) |

----------------- End of the text proposal --------------------------------------------------------------------------------------