	IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>
Title	**Messages for Requesting and Providing Location Information in 802.16j**
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Source(s)	Rakesh Taori, Mi-Sun Do Samsung Advanced Institute of Technology Hyunjeong Kang, Sungjin Lee, Hyoung Kyu Lim, Jungje Son Samsung Electronics Voice: +82-31-280-9635 Fax: +82-31- mail to: rakesh.taori@samsung.com
Re:	IEEE 802.16j Technical Contribution
Abstract	This contribution proposes the messages for requesting and providing location information in 802.16j
Purpose	Discussion and Adoption in IEEE 802.16j
Notice	
Release	
Patent Policy and Procedures	

Messages for requesting and providing Location Information in 802.16j

Rakesh Taori, Mi-Sun Do
Samsung Advanced Institute of Technology

Hyunjeong Kang, Sungjin Lee, Hyoung Kyu Lim, Jungje Son
Samsung Electronics

Introduction

The 802.16j amendment is aimed at extending the 802.16 specification in order to provide multi-hop relaying capabilities in the network [PAR document as reference]. The usage scenarios developed in the context of 802.16j amendment envisages the use of relay stations that will be fixed, nomadic as well as mobile. Under a variety of situations, it may be quite helpful for the infrastructure stations to know the location of the other infrastructure stations. Two examples are provided below:

- One use of the location information is the transmission of a "relevant" set of neighbors in the MOB_NBR-ADV messages. The need for the selection of a relevant set of neighbors is foreseen because the length of the MOB_NBR-ADV message is likely to grow as more and more RSs are added to the network. As argued in contribution c80216j-07_139.doc titled 'Reduced Neighbor Information Generation and Customized Delivery', it is irrelevant for each MS in every RS cell to receive channel access parameters about each and every RS in the MR-network. Location information may be useful for infrastructure stations in selecting the relevant neighbors for any given RS for composing customized neighborhood information.
- Another application in 802.16j where location information may be helpful is Interference Management. By using the location information, the MR-BS may be able to perform coarse resource allocation. Details are provided in Contribution c80216j-07_140.doc titled 'Radio Resource Reuse in Access Zone and Relay Zone'.

The current specification does not cater for a standardized method for requesting or providing location information. In this contribution, simple messages for requesting and providing the location information are suggested.

Proposed Text Change

Insert new subclause 6.3.2.3.62:

6.3.2.3.62 MR_LOC-REQ message

The MR_LOC-REQ message may be transmitted by an MR-BS to an RS to request the location information of the RS. This message can also be transmitted by an RS to the MR-BS to request the location of other RSs. The sender of the MR_LOC-REQ message can include the identity of those access stations for which it wishes to know the location information. The MR_LOC-REQ message shall be generated in the format shown in Table 1.

The MR_LOC-REQ message can be set to any report type as specified in Table 1. When an RS sends the MR_LOC_REQ message, the report type field shall be set to '00' (meaning non-periodic).

Syntax	Size	Notes
MR_LOC-REQ_ Message_Format() {		
Type = xx	8 bits	
Report Mode	2 bits	0b00: Once 0b01: Periodic report 0b10 ~0b11 : *reserved*
Report period	8 bits	Available when the value of Report Mode is set to 0b01. Report period in frames.
Coordinate Type	2 bits	Coordinate type to be used for location information 0b00: Geodetic (Latitude/Longitude/Altitude) 0b01~0b11 : *reserved*
N_RS_index	8 bits	Number of stations for which the transmitter of this message wants to know the location information. MR-BS can be a RS in MR_LOC-REQ message.
For (j=0;j<N_RS_index; j++) {		
RS_ID	48 bits	
}		
}		

Table 1.MR_LOC-REQ message format

The following parameters shall be included in the MR_LOC_REQ message:

Report mode

Action code for an RS's report of location information:
0b00: The RS only sends a single response to the location request message.
0b01: The RS reports the location periodically
0b10~0b11: *Reserved*

Report period

This field represents the period with which an RS shall report the location information, if the Report mode option is set to periodic reporting.

Coordinate Type

This field indicates the type of coordinate system that is requested to be used in the response message.

N_RS_index

Number of RSs whose location the receiver is requested to report.

RS_ID

Relay station identifier.

Insert new subclause 6.3.2.3.63

6.3.2.3.63 MR_LOC-RSP message

The MR_LOC-RSP message shall be transmitted in response to a MR_LOC-REQ message. The transmitter sends MR_LOC-RSP message based on the report mode indicated in the MR_LOC-REQ message. The transmitter of this message shall generate the MR_LOC-RSP message in accordance with the format shown in Table 2.

Syntax	Size	Notes
MR_LOC-RSP_Message_Format(){		
Type = xx	8 bits	
Report Mode	2 bits	0b00: Once 0b01: Periodic report 0b10~0b11 : *reserved*
Coordinate Type	2 bits	Coordinate type to be used for location information 0b00: Geodetic (Latitude/Longitude/Altitude) 0b01~0b11 : *reserved*
N_RS_index	8 bits	Number of stations whose location information is included in the current MR_LOC-RSP message. MR-BS can be a RS in MR_LOC-RSP message.
For (j=0;j<N_RS_index;j++) {	variable	
RS_ID	48 bits	The RS ID requested in MR_LOC-REQ message.
If (Coordinate Type == 0)		The location coordinates of the "j"th relay station according to the coordinate type
Latitude	24 bits	Specifies the latitude on which the RS is located in units of 0.0625 seconds, a value between -5184000 to 5184000 corresponding to a range of -90° to +90°...
Longitude	24 bits	Specifies the longitude on which the RS is located in units of 0.125 seconds, a value between -5184000 to 5184000 corresponding to a range of -180° to +180°.
Altitude Type	2 bits	Represents which type of altitude is used. 0b00 = Height in meters above sea level. 0b01 – 0b11: *reserved*
If (Altitude Type == 0) {		The altitude of the "j"th relay station according to the altitude type
Altitude	14 bits	Specifies the altitude at which the RS is located in units of 0.5 m, a value between 0 and 16383 corresponding to a range of 0 to 8191m.
}		
}		
padding	4 bits	Padding bits to ensure byte aligned.
}		

Table 2:MR_LOC-RSP message format.

The following parameters shall be included in the MR_LOC_RSP message:

Report Mode

Action code for an RS's report of location information:
0b00: The RS only sends a single response to the location request message.
0b01: The RS reports the location periodically
0b10~0b11: *Reserved*

Coordinate Type
The type of coordinate system that is used in the response message.

N_RS_index
Number of RSs whose location the receiver responses.

RS_ID
Relay station identifier

Location information:
Location information may be classified a three-dimensional coordinate systems according to the Coordinate Type. If Coordinate Type is set to '0b01' then the representation in terms of the geodetic coordinate system comprising the latitude, longitude and altitude is used:
Latitude: Specifies the latitude using 24 bits corresponding to a range of -90° to +90°. The value is expressed as a two's complement signed integer whereby the positive values signifies the North latitudes.
Longitude: Specifies the longitude using 24 bits corresponding to a range of -180° to +180°. The value is expressed as a two's complement signed integer such that the positive values signify the East latitides .
Altitude Type: Specifies the type of altitude used. This can be height in meters (as used here). Alternatively it can also represent the floor number in a building (not specified here). Three other types can be specified in the future.
Altitude: In case of height in metres, the remaining 14 bits are used for representing a value between 0 and 16383 corresponding to a range from 0 to 8191.5m in units of 0.5m.

Insert new sub clause 11.7.8.14: 11.7.8 SS capabilities encodings

11.7.8.14 Location Support

Name	Type	Length	Value	Scope
Location Support	19	1	0: no location support 1: location support	REG-REQ REG-RSP

(Note: If there will be "RS capabilities encodings" in 11.7.27 then the Location Support TLV will be inserted in the new subclause 11.7.27.)