Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Some issue to be fixed up for the working document of 80216h-05_017**
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Re:	80216h-05_018：Call for Contributions IEEE 802.16's License-Exempt (LE) Task Group. 2005-08-18
Abstract	Fixing up some issue about neighbor and initialization in the working document text description
Purpose	Consolidate the concept of neighbor in the working document and some fixing up for the text
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Some issue to be fixed up for the working document of 80216h-05_017

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Considering Issues

There are some ambiguous term and some description mismatch in the current working document. Here is some proposed text changes trying to fixed some of the problems.

Acronyms

CoNBR— Coexistence Neighbor

INBR — Interference Neighbor

IBS — Initializing Base Station

OBS — Operating Base Station

Reference:

[1] *IEEE802.16-2004: IEEE standard for Local and metropolitan area networks Part16: Air Interface for Fixed Broadband Wireless Access Systems 2004-10-01*

[2] *IEEE 802.16-05/017: working document Amendment for Improved Coexistence Mechanisms for License-Exempt Operation 2005-08-15*

Neighbor terminology issue

(To be discussed).

Neighbor vs. Coexistence Neighbor

We proposed a abbreviation to the term of "coexistence neighbor", to distinguish it from the term "neighbor" in mesh & mobile. Such as "Co-NBR" "INBR"(Interference Neighbor),etc.

Neighbor vs. Potential Neighbor

And there is difference between the potential neighbors and "real" neighbors, ***potential neighbors*** are estimated by the server using the GPS coordinates, but ***neighbors*** mean the real interference occurs.

[Change the first paragraph in 2.1.3 as indicates]

2.1.3 Community Entry of new BS

Figure11 explains how one new entry BS discovers its neighbor BSs. The new entry BS-5 uses its GPS coordinates (x5, y5) and its maximum coverage radius in LOS, Rm, at allowed maximum transmission power. A BS is *potential* neighbor BS of another BS if:

- In co-channel operation the LOS maximum coverage area resulting for the allowed maximum transmission power overlaps one with each other. As depicted in Figure11,the regional LE DB will return BS-1, BS-2 and BS-3 as the *potential* neighbor BSs of the new entry BS.
- in first or alternate adjacent channels operation, the BS should consider the attenuation of the transmitted power, corresponding to the actual operation channels of different Base Stations

Once a LE BS has learnt its *potential* neighbor topology from the regional LE DB, it evaluates the coexisting LE BSs and identifies which BSs might create interferences. The Adaptive Channel selection will select the actual operating frequency, such that the probability of interference will be minimized. Each LE BS tries to form its own community. By including the neighbor BSs that ~~*might*~~ create interferences to the associated SSs The members of community will change when the working frequency of any BSs changes or new interfering neighbor BS comes in.

~~*In summary, w*~~*W*ith the regional LE DB a LE BS can construct its neighbor topology and acquire the IP addresses of its neighbor securely. ~~*With the neighbor topology and corresponding IP addresses, the coexistence detection, avoidance and resolution is easier.*~~

In any case that the new coming BS could not find the region LE DB, it should start a ad-hoc method to find the neighbor topology. The new coming BS use the coexistence time slot to broadcast its IP address to the reachable SSs in the neighbor network. Once the SSs received this message, they will report to their serving BS one by one unsolicitedly, the information of the new BS and the interference status that they record during the receiving will be reported to there serving BS.

The serving BS will get all the information from the related SSs and saved the useful content to their database. After that, the serving BS will contact new BS using the IP address reported by the SS and transfer the parameter of its own to the new coming one with authorization and negotiation, thereafter the serving BS will also get the parameter and other corresponding information from the new coming BS.

In general, the coexistence detection, avoidance and resolution are performed in two stages, initialization stage and operating stage.

(1) Initialization stage

In initialization stage the LE BSs may avoid the co-channel or adjacent channel interference by scanning the available frequencies. But this method cannot avoid the hidden LE BS problem, i.e. the BS that cannot be heard directly but may have overlapping service coverage. *Thus, with the knowledge of neighbor topology the LE BSs can detect the hidden LE BSs and can, therefore, avoid the possible interferences from coexisting neighbors. Alternatively, if the country/region database is not valid in this phase, the initializing BS will use the coexistence time slot to broadcast its IP address to its coverage using its maximum power. In this way, the SSs in the reachable zone of the new BS's interference will receive the message and forward the address to its serving BS. And after the neighbor BSs get the address via the SSs' reports, they will contact with their new coming neighbor via IP network and updating the database on both side. Thus, in ad-hoc fashion, it will avoid the hidden neighbor BS issue by the SSs in the neighbor network.* The procedures are described inFigure12. If the LE BS finds that there is no "free" channel, the neighbor topology provides the guidelines of with whom it should negotiate.

(2) Operating stage

In operating stage the LE BS has SS associated with it, however, even the operating system parameters has decided, the co-channel or adjacent channel interference from LE BSs of different network may still have a

chance to happen due to the detection of interference from primary user, channel switching of neighbor BS or the entry of new neighbor BS makes the community so crowded that there is no enough channels. If the LE BS finds that there is no “free” channel at that moment, the neighbor topology provides the guidelines of with whom it should negotiate. [detailed procedures are to be defined]

Figure12 shows the initialization procedures for the 802.16 LE BSs. Note that the procedures that BS tries to create a Master slot are also applicable for operating stage. The detailed negotiation and update procedures are described in section 2.2.3.

Message between BS & SS

Some message define in the recent contributions is between BS & SS, these message is IP message and accept as part of coexistence protocol. Current description of coexistence protocol doesn’t have the message type for BS & SS. These message need to transmit between BS & SS through the normal link between BS and its registered SS. So we need to change the text in 6.1 as below:

[Change the first paragraph and table2 in 6.1 as indicates:]

Coexistence Protocol employs two MAC message types: LE CP Request (LE_CP-REQ) and LE CP Response (LE_CP-RSP), as described in Table .

Table 2 LE_CP MAC messages

Type Value	Message name	Message description
0	*LE_CP-REQ*	*LE Coexistence Resolution and Negotiation Request ~~[BS -> BS/BSIS]~~*
1	*LE_CP-RSP*	*LE Coexistence Resolution and Negotiation Response ~~[BS/BSIS -> BS]~~*

These MAC management messages are exchanged between peers, e.g. BS and BSIS or BS and BS *or BS and SS.*~~,~~ and distinguish between CP requests (BS -> BS/BSIS*/SS or SS-> BS*) and CP responses (BS/BSIS*/SS* -> BS *or SS->BS*). Each message encapsulates one CP message in the Management Message Payload. Coexistence Protocol messages exchanged between the BS and BS or between BS and BSIS *or between BS and SS* shall use the form shown in **Error! Reference source not found.**

Ad-hoc fashion of communication

Changes into the General Principles according to last meeting:

[Change the first paragraph of 2.1.1 as indicates]

2.1.1 General Principles

A possibility of 802.16h usage is in close relation with ~~a~~ database, including both deployment information and an IP identifier for allowing the operation of a technology-independent coexistence approach. It is assumed that:

- *In some circumstances, ~~T~~t*here is country/region data-base, which includes, for every Base Station:
  - Operator ID
  - Base Station ID
  - Base Station GPS coordinates
  - IP identifier

—The local Radio Administration may use, for light licensing procedure, its own database, generally not including the Base Station ID and IP identifier information.

—There is a Server that manage the write/reading of this Data Base, using the 802.16h standardized procedures including secure access procedures; the Server and the country/region data base can be hosted by one of the operators or a trusted entity, like the local Radio Administration.

Otherwise, if the region/country database is not available, the base stations should try to find its neighbor and the community topology in a coordinatively distributed fashion.

- Every Base Station includes a data base, open for any other Base Station; the BS data-base contains information necessary for spectrum sharing, and includes the information related to the Base station itself and the associated SSs; a Base Station and the associated SSs form a System. Other Base Stations can send queries related to the information in the database to the DRRM entity, located in a Base Station (see Figure12);
- ……