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Re:	IEEE P802.16e/D8
Abstract	This contribution discusses the procedures for scanning with association that have been newly introduced in D8 and suggests some clarifications
Purpose	Discuss and approve.
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Clarifications on Coordinated Association during scanning

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Introduction

In the latest draft of the 802.16e specification the text in section 6.3.21.1.3 Association Procedure has been significantly revised and new types of Association have been added. While the new procedures are definitely useful and provide for an increased level of flexibility, some parts of the newly introduced text are ambiguous and need further clarification.

In the following we mention the ambiguities in the text for each section.

It is mentioned in the beginning of section 6.3.21.3.2 "Association Level 1 – Association with coordination" that "The MS may request to perform association with coordination by sending the MOB_SCN-REQ message to the Serving BS with ASSOCIATION_TYPE = 0b001. This message will include a list of neighboring BS's with which the MS wishes to perform association." Also, in the beginning of section 6.3.21.3.3 "Association Level 2 – NW Assisted Association Reporting" specifies that "The MS may request to perform association with NW assisted association reporting by sending the MOB_SCN-REQ message to the Serving BS with ASSOCIATION TYPE = 0b010. This message will include a list of neighboring BSs with which the MS wishes to perform association."

The wording in both sited sections suggests that association of the corresponding level (level 1 or 2) can only be requested by the MS, and cannot be initiated by the BS. It should be possible for the BS to send an unsolicited MOB_SCN_RSP message in which ASSOCIATION_TYPE = 0b001 or 0b010 is indicated, without having received an explicit request from the MS.

Furthermore, for both association levels 1 and 2, it is specified that the each neighboring BS (with which the MS will be associating) provides the following parameters to assist the association process:
- A "rendezvous time"
- a unique code number (from within the initial ranging code-set?)
- a transmission opportunity within the allocated region (in terms of offset from the start of the region)

What is not clear from the provided description is the following:
- The provided "rendezvous time" is in units of frames, and refers to the frame in which the neighboring BS will start assigning a ranging region with "Dedicated Ranging Indicator" bit set to 1, in which the MS can use the dedicated CDMA code that it has been assigned. The fact that the "rendezvous time" is specified in number of frames implies that the serving BS and the neighbor BS have synchronized frame structures. If that is not the case then the rendezvous time cannot be determined in terms of number of frames since the MS has to spend an unspecified amount of time when switching from one BS to the other. What is also not clear, is if the "rendezvous time" specifies the first frame in which the dedicated ranging region will appear and where the MS can use the dedicated CDMA code, or if it points at the frame in which the UL_MAP describing the dedicated ranging region will appear (which is at least one frame before the frame in which the region appears, depending on the value of the resource allocation start time).
- The transmission opportunity is defined as an offset from the start of the dedicated ranging region in the neighboring BS. However, the MS can only learn the location of the dedicated ranging region in the neighboring BS by reading the UL_MAP of that BS.

In order to resolve the above issues we propose the addition of text that clarifies what actions the MS should take when provided with the above mentioned parameters. We specifically suggest the following.
- When interpreting "rendezvous time", the frames structures of the serving BS and the neighboring BS should be assumed to be synchronized (note that this is a restrictive condition).
- If we name "rendezvous frame" the earliest frame in which the dedicated CDMA code can be used, then "rendezvous time"

2

should be interpreted as the frame in which the UL_MAP describing the "rendezvous frame" will appear.
- The MS should switch to the neighbor BS at the specified "rendezvous time", read the UL_MAP and use the dedicated CDMA code at the frame described by that UL_MAP, i.e., the "rendezvous frame" which will appear "Allocation Start Time" later than the UL_MAP.

Lastly, at the end of the sections 6.3.21.3.2 "Association Level 1 – Association with coordination" and 6.3.21.3.3 "Association Level 2 – NW Assisted Association Reporting" it is specified that "If no ranging window exist with "Dedicated ranging indicator" is set to 1 but Fast ranging IE for this MS is allocated by the BS at the Rendezvous time, then MSS may use this allocation for the coordination process"

What is probably meant here is that the neighbor BS, instead of providing a dedicated ranging region it provides a Fast ranging IE for the MS in the UL_MAP that describes the "rendezvous frame". Two issues arise from the above mentioned paragraph:
It should be clarified in the text if this is an option for the neighbor BS when association type 1 or 2 has been negotiated and indicated to the MS, or if this is a general "back up" option to be used in case something fails.
The phrase "MSS may use this allocation for the coordination process" is ambiguous and does not adequately describe what the MS should do in this case. The allocation provided by Fast ranging IE mostly refers to the transmission of an RNG_REQ MAC Management Message and not transmission of a ranging CDMA code. Should the mobile use the allocation indicated by the Fast Ranging IE to transmit the uniquely assigned ranging code or attempt to transmit an RNG_REQ MAC management message? Furthermore, in the case of association type 2, should it immediately switch to the serving BS, or should it consider association type 2 aborted and try to perform full fledged association (i.e. wait for an RNG_RSP message from the neighboring BS)?

We propose the following solution:
When association type 1 or type 2 has been negotiated and indicated to the MS, the MS expects to find a dedicated ranging region in which it will use the CDMA code that has been assigned to it. If no such region exists but a Fast Ranging IE is provided then the MS should transmit the CDMA code it has been assigned in the region that is defined by the Fast Ranging IE. The MS should ignore the value of the "transmission opportunity offset" that was given to it in the MOB_SCN_RSP message. The neighbor BS, when, instead of a dedicated ranging region, it includes a Fast Ranging IE in the UL_MAP, assigned to an MS with which association type 1 or 2 has been arranged, it should expect a CDMA code to be transmitted in the region defined by the Fast Ranging IE and not an RNG_REQ MAC Management message.

Proposed text changes:

[Change section 6.3.21.1.3.2, page 172, lines 23, 60 and 63 of D8 as indicated]

6.3.21.1.3.2 Association Level 1 – Association with coordination
When this association level is chosen, the Serving BS provides association parameters to the MS and coordinates association between the MS and neighboring BSs.

The MS may request to perform association with coordination by sending the MOB_SCN-REQ message to the Serving BS with ASSOCIATION_TYPE = 0b001. This message will include a list of neighboring BS's with which the MS wishes to perform association. The serving BS may also arrange for this type of association unilaterally, i.e., without an explicit request from the MS.

The Serving BS will then coordinate the association procedure with the requested neighboring BSs.

Each neighboring BS will provide a ranging window for association at a predefined "rendezvous time", in terms of relative frame number. The neighboring BS will also assign:

- a unique code number (from within the initial ranging codeset)
- a transmission opportunity within the allocated region (in terms of offset from the start of the region)

The neighboring BS may assign the same code or transmission opportunity to more than one MS, but not both. In case all allocated transmission opportunities in current region are different, there is no potential for collision of transmissions from different MSs. In case Serving BS allocates same transmission opportunity to several MSs there is some probability of collision and then neighbor BS may fail to identify transmitted codes.

The Serving BS (of the associating MS), will coordinate to assure that the neighboring BSs do not assign overlapping "rendezvous times" to the MS, i.e. allocating ranging windows in frames that are too close in time to each other (or even concurrent).

The Serving BS will provide the pre-assigned association ranging info via the MOB_SCN-RSP message.

The ranging window will be allocated via UIUC=12 in the UL-MAP, when the "Dedicated ranging indicator" bit is set to 1.

When " Dedicated ranging indicator" is set to 1, then the ranging region and ranging method defined shall be used for the purpose of ranging using dedicated CDMA code and transmit opportunity assigned in the MOB-PAG-ADV message (for location update in idle mode) or in the MOB-SCN-RSP message (for coordinated association).

MSs registered to this BS are prohibited from use of the named ranging region.

Upon receiving the MOB_SCN_RSP message, the MS should interpret the provided "rendezvous time", dedicated code and transmission opportunity as follows:
- "Rendezvous time" specifies the earliest frame in which the neighbor BS will transmit a UL_MAP containing the definition of the dedicated ranging region where the MS can use the assigned CDMA ranging code. "Rendezvous time" is provided in units of frames, beginning at the frame where the MOB_SCN_RSP message is transmitted. For the calculation of "rendezvous time" the MS shall assume that the serving BS and the neighbor BS, to which "rendezvous time" refers, have synchronized frame structures.
- The MS should synchronize to the neighbor BS at the frame indicated by "rendezvous time", read the UL_MAP transmitted at this frame, and extract the description of the dedicated ranging region (ranging region with "Dedicatd ranging indicator" bit set to 1). The dedicated ranging region will appear after the time specified by the Resource Allocation Start Time field in the UL_MAP. The MS shall determine the specific region it should use for transmission of the dedicated CDMA code by applying the offset defined by the "transmission opportunity offset" field in MOB_SCN_RSP, which was received from the serving BS, to the dedicated ranging region definition in the UL_MAP of the neighbor BS.

If no ranging window exist with "Dedicated ranging indicator" is set to 1 but Fast ranging IE for this MS is allocated by the BS at the Rendezvous time, then MSS may use this allocation for the coordination process. In this case, the MS may transmit the allocated CDMA code in the region defined in the Fast Ranging IE. The MS shall ignore the value of the "transmission opportunity offset" field of the MOB_SCN_RSP message it received from the serving BS during the association negotiation. The neighbor BS that decides to provide a Fast Ranging IE instead of a ranging region with "Dedicated ranging indicator" set to 1, should expect to receive a CDMA code in the region defined by the Fast Ranging IE, instead of an RNG_REQ MAC management message.

[Change section 6.3.21.1.3.3, page 173, lines 6 and 23 of D8 as indicated]

6.3.21.1.3.3 Association Level 2 – NW Assisted Association Reporting
The MS may request to perform association with NW assisted association reporting by sending the MOB_SCN-REQ message to the Serving BS with ASSOCIATION TYPE = 0b010. This message will include a list of neighboring BSs with which the MS wishes to perform association. The serving BS may also arrange for this type of association unilaterally, i.e., without an explicit request from the

MS.

The Serving BS will then coordinate the association procedure with the requested neighboring BS's in a fashion similar to association level 2. However, when using this association type, the MS does not have to wait for RNG-RSP from the Target BS. Instead, the RNG-RSP info (i.e. PHY corrections) will be sent by each Target BS to the Serving BS (over the backbone). The Serving BS may aggregate all the RNG-RSP messages to a single message, namely MOB_ASC_REPORT, which the Serving BS then sends to the MS.

When receiving this message, the MS updates its association database (PHY offsets and CID's) and timers for each associated BS.

Using this association type, the MS is required only to transmit the CDMA ranging code at the Target BS.

If no ranging window exist with "Dedicated ranging indicator" is set to 1 but Fast ranging IE for this MS is allocated by the BS at the Rendezvous time, then MS may use this allocation for the coordination process. In this case, the MS may transmit the allocated CDMA code in the region defined in the Fast Ranging IE. The MS shall ignore the value of the "transmission opportunity offset" field of the MOB_SCN_RSP message it received from the serving BS during the association negotiation. The neighbor BS that decides to provide a Fast Ranging IE instead of a ranging region with "Dedicated ranging indicator" set to 1, should expect to receive a CDMA code in the region defined by the Fast Ranging IE, instead of an RNG_REQ MAC management message.