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Re:	Call for comments, Sponsor Ballot on 802.16e/D6	
Abstract	This contribution describes coordinated association, a method to pre-schedule association attempts between the MS and the neighboring BS's	

Purpose	In some systems, association may be an important part of pre-HO operations. Prescheduled association will allow minimization of each association attempt with each target BS, thus also minimizing the period the MS is unavailable at the Serving BS, which is especially crucial when MS is in an active UGS service flow (such as VoIP).
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Coordinated Association during scanning

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1. Motivation

Association is a process in which the MS performs frequent CDMA ranging with neighboring basestations. Following that, HO may be performed without ranging the designated Target BS, thus shortening the NW reentry process. It is particular beneficial to shorten the actual HO duration, to allow continuity of active services, such as VoIP.

Currently, there are two types of association, non-contention based association and contention based association.

In non-contention based association, the standard provides some level of coordination between the MS and Target BS; during the MOB_SCN-REQ/RSP exchange, the BS provides a " rendezvous time" (in frames) where the Target BS will allocate a non-contention based CDMA ranging opportunity. At that time, the Target BS issues a FAST_RANGING_IE in the UL-MAP, where it provides allocation size and offset.

The main problems with the existing non-contention based association method and related messages:

- FAST_RANGING_IE may include a CDMA ranging allocation. As there are no constrictions on its place in the UL-MAP. It may be situated at a position, where it doesn't allow enough time for UL scheduling.
- Allocating a whole (non-contention based) ranging window for each MS for association imposes unacceptable BW overhead.
- The MS knows the frame number, before the association attempt, but has no knowledge of other ranging window info, such as size and offset.
- Ranging (for association) may take several frames to complete, as the following example may demonstrate (Frame N = "rendezvous frame")
  - Frame N: The MS switches to the Target BS, but only in the next frame it completes DL PHY synchronization.
  - Frame N+1: The MS searches for FAST_RANGING_IE in the UL-MAP.
  - Frame N+2: MS transmits CDMA code for ranging
  - Frame N+3: BS calculates PHY offsets
  - Frame N+4: BS sends RNG_RSP with required PHY corrections.

  This sequence is too long, if the MS is currently in an intense UGS session (e.g. VoIP) with the Serving BS where only 2 frames may be disposed for "off-line" activities such as association.
- As association is always with neighboring BS's, association related messages should use compressed BS_ID's to reduce messages lengths.

~~In contention based association, MS transmits initial ranging code for association in the UL initial ranging interval. However, initial ranging code and initial ranging interval are used not only for association but for network entry. Therefore, the BS receiving initial ranging code from the MS can not tell whether the MS is attempting network entry or association, until it receives RNG-REQ including Serving BS ID TLV. This causes all MSs to perform the procedure for Basic/Primary management CID allocation, UL-BW Request to transmit Serving BS ID TLV, and so on. The BS can determine MSs' Service Level Prediction only after receiving Serving BS ID for the MS. Current association mechanism describes that MS keeps the association parameters only after receiving RNG-RSP message including Service Level Prediction parameter set to 2. If Service Level Prediction is 0 or 1, the procedure for allocation of management CIDs and bandwidth request to transmit Serving BS ID was unnecessary and caused delay for association.~~

2. Proposed solution

We propose a comprehensive association mechanism, comprised of 4 different association levels:

- ~~Level 0 – No association (i.e. scan without association)~~
- Level ~~1~~ 0 – Scan/Association without coordination
- Level ~~2~~ 1 – Association with coordination
- Level ~~3~~ 2 – Network assisted association reporting

During the basic capabilities negotiation phase the MS and BS exchange info on the supported association levels.
The level to actually be used by the MS and BS will be negotiated during the SCN-REQ/RSP exchange session.
~~In association level 1, association ranging code is used by MS so that BS may differentiate initial ranging for association from network entry and allocate adequate UL BW for MS to transmit RNG-REQ with TLV parameters related to association ranging.~~

~~2.1.Association Level 0 - No association~~

~~When this association level is chosen, no pre-HO ranging of neighboring BS's will be performed and any HO to a Target BS will most likely include ranging to adjust transmitter PHY parameters.~~

~~No modifications to the current standard are required (except negotiating the supported association level during the basic capabilities negotiation phase)~~

~~2.2.~~2.1. Association Level ~~1~~ 0 – Association without coordination

~~This is the basic (correctly supported in the standard) contention based CDMA association procedure.~~
When this association level is chosen by the network, the Serving BS and the MS negotiate about the association duration and intervals (via MOB_SCN-REQ and MOB_SCN-RSP). The Serving BS ~~will~~ allocates periodic intervals where the MS may range neighboring BS, however the Target BS has no knowledge of the MS and ~~will~~ provides only ~~allocate~~ contention-based ranging ~~windows~~allocations.
~~An MS chooses randomly a ranging code from the association ranging domain of the Target BS and sends it in the contention-based ranging interval of the Target BS.~~ After the BS ~~receiving~~successfully receives ~~association~~ ranging code and sends RNG-RSP message with ranging status 'success', it will ~~allocate~~ provide uplink allocation of adequate uplink ~~bandwidth~~ size for the MS to transmit RNG-REQ message with TLV parameters (Serving BS ID, MS MAC address) related to the association ranging.
~~This association type will typically be used during or immediately after initialization.~~
~~[note : I can not understand what the above sentence means. How about deleting above line?]~~
~~No modifications to the current standard are required (except negotiating the supported association level during the basic capabilities negotiation phase)~~

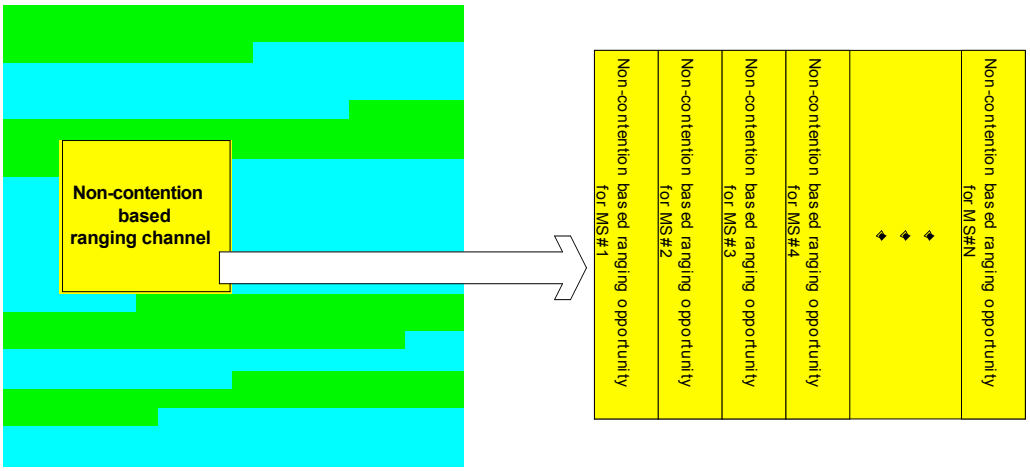
~~2.3.~~2.2. Association Level ~~2~~ 1 – Association with coordination

When this association level is chosen by the network, the Serving BS ~~negotiates~~ provides association parameters ~~with~~ to the MS and coordinates association between the MS and neighboring BS's.

Each neighboring BS will ~~allocate~~ provide a ~~non-contention based~~ ranging ~~window~~ allocation for association, but unlike the existing situation, we propose that each BS, in addition to ~~the frame number of~~ the "rendezvous time", (~~where it will allocate the ranging window~~in terms of relative frame number), will also assign:

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

Thus, one non-contention base ranging ~~window~~ region may be shared and used by a multiple number of MS's; thereby reducing BW overhead.



The Target BS may assign the same code or transmission opportunity to more than one MS, but not both (otherwise it cannot distinguish between MS's). In case all allocated transmission opportunities in current region are different, there is no potential for collision of transmissions form 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 Target BS may also provide info on the multicast ranging allocation (size and offset) to be used at "rendezvous time". This way, when dwelling at the Target BS, the MS does not waste one frame to read the UL-MAP in order to transmit in the next (UL-MAP relevance). When the ranging allocation info is absent from the assigned parameters, the MS must – one frame prior to "rendezvous time" - read the UL-MAP of the Target BS, before any ranging transmission.

It is up to the Serving BS (of the associating MS), as the coordinator of this process, to assure that the neighboring BS's 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).

As the proposed ranging window is allocated in a multicast fashion, FAST_RANGING_IE, which is a unicast IE, can no longer be used for that purpose. Thus, the ranging window will be allocated via UIUC=12 in the UL-MAP, using the "unicast ranging indicator" bit.

When "unicast ranging indicator" is 0, then the ranging allocation window shall be used for normal ranging, i.e. it may be used by all MS's that have normal operations with the BS and wish to perform contention based ranging or by MS's from neighboring cells that wish to perform non-coordinated association (level 0).

When "unicast ranging indicator" is 1, then the ranging allocation is for the purpose of ranging using dedicated CDMA codes and transmit opportunities 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 in this case.
~~Hence, the multicast ranging window will be allocated by UIUC=12 in the UL-MAP, by assigning the reserved bit to "multicast ranging" (if "multicast ranging"=0 (default) the ranging window is contention based and is to be used by all MS's within the Serving BS and if "multicast ranging"=1, the ranging window is non-contention based and is to be used only by MS's from neighboring BS's (for association).~~

~~It is up to the Serving BS (of the associating MS), as the coordinator of this process, to assure that the neighboring BS's 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 process in summary:

- The MS negotiates association parameters with the Serving BS and is assigned a frame number ("rendezvous time"), CDMA code and transmission opportunity to use when ranging the Target BS. Optionally, the ranging allocation size and offset may also be provided.
- The MS is in normal operation at the Serving BS
- If the multicast ranging allocation size and offset was provided in advance, the MS may range the Target BS at the "rendezvous time" without reading the UL-MAP of the Target BS first. Otherwise, it shall acquire the ranging allocation via the UL_MAP of the Target BS one frame prior to "rendezvous time".
- ~~At "rendezvous time" (predefined frame number) the MS switches to the Target BS and transmits a CDMA sequence with the assigned code at the assigned transmission opportunity within the non-contention based ranging wondow.~~
- The Target BS responds to the CDMA transmission via RNG_RSP with required PHY corrections (ranging status=success)

Modifications will be required to the following messages: MOB_SCN-REQ/RSP, UL-MAP_IE (UIUC=12), FAST_RANGING_IE ~~and SBC-REQ/RSP~~.

~~2.4.~~2.3. Association Level ~~3~~ 2 – NW Assisted Association Reporting

This association type functions in a way very much similar to the previous one (level 2). However, 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 aggregates all the RNG_RSP messages to a single message, namely "association report", which the Serving BS then sends to the MS. This is a new message; MOB_ASC_REPORT (resembles MOB_SCAN_REPORT).
When receiving this message, the MS updates its association database (PHY offsets) and timers for each associated BS.

Using this association type, the MS is required only to transmit the CDMA ranging code, thus is may be unavailable to the Serving BS for a very short time (up to two frames).

Modifications will be required to the following messages: MOB_SCN-REQ/RSP, UL-MAP (UIUC=12), FAST_RANGING_IE and SBC-REQ/RSP.

A new MAC message ~~Addition~~ will be required: MOB_ASC_REPORT

3. Changes summary

[In "6.3.20.1.3 Association Procedure",
After the first paragraph ending with the words "in future ranging events", add the following:

There are ~~4~~ 3 levels of association:

- ~~Association Level 0 – No association (i.e. scan without association)~~
- Association Level ~~1~~ 0 – Scan / Association without coordination
- Association Level ~~2~~ 1 – Association with coordination
- Association Level ~~3~~ 2 – Network assisted association reporting

~~6.3.20.1.3.1Association Level 0 – No association~~

~~When this association level is chosen, no pre-HO ranging of neighboring BS's will be performed and any HO to a Target BS will most likely include ranging to adjust transmitter PHY parameters.~~

~~6.3.20.1.3.2~~6.3.20.1.3.1 Association Level ~~1~~ 0 – Scan / Association without coordination

When this association level is chosen by the network, the Serving BS and the MS negotiate about the association duration and intervals (via MOB_SCN-REQ with ASSOCIATION_TYPE = 0b000) and MOB_SCN-RSP). The Serving BS ~~will~~ allocates periodic intervals where the MS may range neighboring BS, however the Target BS has no knowledge of the MS and ~~will~~ provides only ~~allocate~~ contention-based ranging ~~windows~~allocations. An MS chooses randomly a ranging code from the association ranging domain of the Target BS and sends it in the contention-based ranging interval of the Target BS. After the BS ~~receiving~~ successfully receives ~~association~~ ranging code and sends RNG-RSP message with ranging status 'success', it will ~~allocate~~ provide uplink of adequate ~~uplink bandwidth~~ size for the MS to transmit RNG-REQ message with TLV parameters (Serving BS ID, MS MAC address) related to the association ranging.
~~This association type will typically be used during or immediately after initialization.~~

~~6.3.20.1.3.3~~6.3.20.1.3.2 Association Level ~~2~~ 1 – Association with coordination

When this association level is chosen, the Serving BS ~~negotiates~~ provides association parameters ~~with~~ to the MS and coordinates association between the MS and neighboring BS's.

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 will then coordinate the association procedure with the requested neighboring BS's.

Each neighboring BS will ~~allocate~~ provide a ~~non-contention based~~ ranging window for association at a predefined "rendezvous time", ~~(the~~ in terms of relative frame number ~~where it will allocate the ranging window)~~. The neighboring BS will also assign:

- a unique code number (from within the initial ranging codeset)
- a ~~unique~~ transmission opportunity within the allocated ~~ranging window~~ region (in ~~units~~ terms of ~~symbols~~ offset from ~~window~~ 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 neighboring BS may also provide info on the multicast ranging allocation (size and offset) to be used at "rendezvous time". When the ranging allocation info is absent, the MS must – one frame prior to "rendezvous time" - read the UL-MAP of the Target BS, before any ranging transmission. Pre-allocation of the ranging window size and offset is optional.

The Serving BS (of the associating MS), will coordinate to assure that the neighboring BS's 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 non-contention base ranging window may be shared and used by a multiple number of MS's. The Target BS may assign the same code or transmission opportunity to more than one MS, but not both.~~

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

When "unicast ranging indicator" is set to 0, then the ranging region shall be used for normal ranging (initial/handover/association without coordination).

When "unicast 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.

~~The ranging allocation will be provided to the MS in the MOB_SCN-RSP from the Serving BS. MS's to whom the Target BS is their Serving BS, the multicast ranging window is prohibited for use and will be allocated by UIUC=12 in the UL-MAP, with "multicast ranging" bit set to 1.~~

~~The Serving BS (of the associating MS), assures that the neighboring BS's 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).~~

~~6.3.20.1.3.4~~6.3.20.1.3.3 Association Level ~~3~~ 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 BS's with which the MS wishes to perform association.

The Serving BS will then coordinate the association procedure with the requested neighboring BS's in a fashion similar to association level 2. However, w~~W~~hen 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 aggregates 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.

In 6.3.20.1.3 delete the following paragraph:

~~MSS may perform scheduled Association through non-contention based initial ranging opportunity using the method provided in 6.3.20.1.2.~~

[In 6.3.2.3.48 Scanning Interval Allocation Request (MOB_SCN-REQ) message, change table 106g as follows:

Table 106g – MOB_SCN-REQ message format

Syntax	Size	Notes
MOB_SCN_REQ_Message_Format() {		
Management Message Type = 54	8 bits	
Scan duration	8 bits	In frames
Association type	3 bits	0b000: Scanning with association level 0: scanning and ~~without~~ association without coordination. ~~0b001: Scanning with association level 1: association without coordination.~~ 0b0010~~0~~: Scanning with association level 12~~2~~: association with coordination. 0b0101~~1~~: Scanning with association level 23~~3~~: NW assisted association reporting. 0b011~~100~~-0b111: Reserved
Padding	1 bit	Shall be set to zero
~~If (Scan type = 0) {~~		
Interleaving interval	8 bits	Units are frames
Scanning iteration	8 bits	
~~If NOT (Scan type = 000) {~~		
Comp_NBR_BSID_IND	1 bit	
Padding	3 bits	Shall be set to zero
If (Comp_NBR_BSID_IND ==1) {		
Configuration change count for MOB_NBR_ADV	8 bits	Configuration Change Count value of referring MOB_NBR_ADV message
}		
N_Recommended_BS	8 bits	Number of neighboring BS's to be scanned/associated
For (j=0;J<N_Recommended_BS;j++) {		
If (Comp_NBR_BSID_IND ==1) {		
Neighbor_BS_index	8 bits	BS index corresponds to position of BS in MOB_NBR_ADV message
}		
Else {		
Neighbor_BS_ID	48 bits	
}		
}		
~~}~~		
Padding	variable	Padding bits to complement message length to an integer number of bytes
HMAC tuple		Full size or truncated
}		

Scan duration

Duration (in units of frames) of the requested scanning period. ~~If the BS sets this field to zero to disappove the MSS' scan or association request, all other parameters except HMAC Tuple shall be omitted in the message.~~

Association_type
Type of association to be used by the MS and coordinated by the Serving BS (if Association type >=0b010).

Comp_NBR_BS_ID_IND
Indicates whether to use BS index (8 bits) or BS_ID (48 bits) or.

BS_index
BS_index is a compressed identifier of a neighboring BS, with the index assigned in the order of appearance of the BS in the MOB_NBR_ADV message.

HMAC Tuple (see 11.1.2)
The HMAC Tuple Attribute contains a keyed Mmessage digest (to guarantee the origin and integrity of the message).

Interleaving Interval
The period of MS's Normal Operation which is interleaved between Scanning Durations.

Scan Iteration
The requested number of iterating scanning interval by an MS

N_Recommended_BS
Number of BSs which the MSS plans to scan with or without association

Recommended BS ID
BS IDs of those BSs the MSS plans to scan with or without association. This field may be included only if an MS has a candidate available BS. It means that MSS calls Serving BS for assistance to make appointment with the Recommended BS for non-contention based ranging opportunity to perform association.

[In 6.3.2.3.49 Scanning Interval Allocation Response (MOB_SCN-RSP) message, change table 106h as follows:

Table 106h – MOB_SCN-RSP message format

Syntax	Size	Notes
MOB_SCN_RSP_Message_Format() {		
Management Message Type = 55	8 bits	
Scan duration	8 bits	In frames
If (Scan Duration != 0) {		
Start frame	4 bits	

Association type	3 bits	0b000: Scanning with association level 0: scanning and association without coordination~~without association.~~ ~~0b001: Scanning with association level 1: association without coordination.~~ 0b0010~~0~~: Scanning with association level 12~~2~~: association with coordination. 0b0101~~1~~: Scanning with association level 23~~3~~: NW assisted association reporting. 0b01100~~00~~-0b111: Reserved
Padding	1 bit	Shall be set to zero
~~If (Scan type = 0) {~~		
Interleaving interval	8 bits	Units are frames
Scanning iteration	8 bits	
Report mode		
Scan report period	8 bits	Available when the value of Scan report is set to 0b01. Scan report period in frames
~~If NOT (Scan type == 000) {~~		
Comp_NBR_BSID_IND	1 bits	
Padding	3 bits	Shall be set to zero
If (Comp_NBR_BSID_IND ==1) {		
Configuration change count for MOB_NBR_ADV	8 bits	Configuration Change Count value of referring MOB_NBR_ADV message
}		
N_Recommended_BS	8 bits	Number of neighboring BS's to be scanned/associated
For (j=0;J<N_Recommended_BS;j++) {		
If (Comp_NBR_BSID_IND ==1) {		
Neighbor_BS_index	8 bits	BS index corresponds to position of BS in MOB_NBR_ADV message
}		
Else {		
Neighbor_BS_ID	48 bits	
}		
If (Scan type == 001) OR (Scan type == 010) {		
Rendezvous time	8 bits	Units are frames
CDMA_code	8 bits	From initial ranging codeset
Transmission_opportunity	8 bits	Units are symbols
}		
~~}~~		

}		
Padding	variable	Padding bits to complement message length to an integer number of bytes
HMAC tuple		Full size or truncated
}		

The following parameters shall be included in the MOB_SCN-RSP message:

Scan duration
Duration (in units of frames) where the MS may perform scanning or association for Available BS. If the BS sets this field to be zero to disapprove the MSS's request, all other parameters except HMAC Tuple shall be omitted in the message.

Start Frame
The number of start frame for first scanning interval allocation.
~~Measured from the frame in which this message was received. A value of zero means that first Scanning Interval starts in the next frame.~~

Association_type
Type of association to be used by the MS and coordinated by the Serving BS (if Association type >=0b010).

Comp_NBR_BS_ID_IND
Indicates whether to use BS index (8 bits) or BS_ID (48 bits) or.

BS_index
BS_index is a compressed identifier of a neighboring BS, with the index assigned in the order of appearance of the BS in the MOB_NBR_ADV message.

Interleaving interval
The period interleaved between Scanning Intervals when MS shall perform Normal Operation.

Scan iteration
The number of iterating scanning interval

Report mode
Action code for an MS's report of CINR measurement:
00: The MS measures channel quality of the Available BSs without reporting.
01: The MS reports the result of the measurement to Serving BS periodically. The period of reporting is different from that of scanning.
10: The MS reports the result of the measurement to Serving BS after each measurement.
11: *reserved*

Scan report period
The period of MS's report of CINR measurement when the MS is required to report the value periodically.

N_Recommended_BS
Number of BSs which the BS recommends to scan with or without scanning

Recommended BS ID
Recommended BS ID list for scan with or without association.

If association type > 0 then Serving BS may request, over the backbone, from Recommended BS allocation of non-contention based ranging opportunity for MS Association activity. When conducting initial ranging to Recommended BS, MS shall use allocated noncontention based ranging opportunity, if available.

Rendezvous time
This is offset, measured in units of frame duration (of Serving BS), when the corresponding Recommended BS is expected to provide non-contention based ranging opportunity for the MSS. The offset is calculated from the frame where MOB_SCN-REQ message is transmitted. In case Scan type = 0 the parameter is not applicable and shall be encoded as 0. The Recommended BS is expected to provide non-contention based Ranging opportunity within 5 frames interval starting from the frame specified by Rendezvous time parameter.
When Association type ==0b000 or 0b001, this field shall be set to zero.

CDMA code
A unique code assigned to the MS, to be used for association with the ~~Target~~ neighbor BS. Code is from the initial ranging codeset.

Transmission opportunity offset
A unique transmission opportunity assigned to the MS, to be used for association with the Target BS in units of symbol duration~~. Units are symbol~~.

[Change table 298g as follows:

Table 298g – FAST_UL_RANGING_IE message format

Syntax	Size	Notes
FAST_UL_RANGING_IE {		
Extended UIUC	4 bits	0x06
Length	4 bits	variable
HO ID indicator	1 bit	0: MAC Address is present 1: HO ID is present
Padding		Shall be set to zero
if (HO ID indicator == 1) {		
HO ID	8 bits	
} else {		
MAC address	48 bits	MSS MAC address as provided on the RNG_REQ message on initial system entry
}		
UIUC	4 bits	UIUC °¡ 15. A four-bit code used to define the type of uplink access and the burst type associated with that access.
~~if (UIUC == 12) {~~		
~~OFDMA Symbol offset~~	~~8 bits~~	
~~Subchannel offset~~	~~7 bits~~	
~~No. OFDMA Symbols~~	~~7 bits~~	
~~No. Subchannels~~	~~7 bits~~	
~~Ranging Method~~	~~2 bits~~	~~0b00 - Initial Ranging over two symbols~~ ~~0b01 - Initial Ranging over four symbols~~ ~~0b10 - BW Request/Periodic Ranging over one symbol~~ ~~0b11 - BW Request/Periodic Ranging over three symbols~~
~~reserved~~	~~1 bit~~	~~Shall be set to zero~~
~~} else {~~		
Duration	10 bits	In OFDMA slots (see 8.4.3.1)
Repetition coding indication	2 bits	0b00 - No repetition coding 0b01 - Repetition coding of 2 used 0b10 - Repetition coding of 4 used 0b11 - Repetition coding of 6 used
}		
}		

[Delete the following text from the message:

~~OFDMA symbol offset~~
~~The offset of the OFDMA symbol in which the burst starts, the offset value is defined in units of OFDMA symbols and is relevant to the Allocation Start Time field given in the UL-MAP message.~~

~~Subchannel offset~~
~~The lowest index subchannel used for carrying the burst, starting from subchannel 0. When allocation of mini-subchannels is used this offset will always be even numbered and will point to the first subchannel of the couple splitted into mini-subhcnannels and used in the allocation.~~

~~No. OFDMA symbols~~
~~The number of OFDMA symbols that are used to carry the uplink Burst.~~

~~No. subchannels~~
~~The number of subchannels with subsequent indices~~

~~Ranging method~~
~~Specifies option of CDMA code transmission according to 8.4.7~~

[add the following after section 6.3.2.3.50

6.3.2.3.51 Association Result Report (MOB_ASC-REPORT) message
This message is transmitted using primary management CID

Table 107h – MOB_ASC-REPORT message format

Syntax	Type	Size	Notes
MOB_ASC_REPORT_Message_Format() {			
Management Message Type = 66		8 bits	
Report mode			0: Event triggered
Comp_NBR_BSID_IND		1 bits	
Padding		3 bits	Shall be set to zero
If (Comp_NBR_BSID_IND ==1) {			
Configuration change count for MOB_NBR_ADV		8 bits	Configuration Change Count value of referring MOB_NBR_ADV message
}			
N_Recommended_BS		8 bits	Number of neighboring BS's to be scanned/associated
For (j=0;J<N_Recommended_BS;j++) {			
If (Comp_NBR_BSID_IND ==1) {			
Neighbor_BS_index		8 bits	BS index corresponds to position of BS in MOB_NBR_ADV message
}			
Else {			
Neighbor_BS_ID		48 bits	
}			
~~Basic CID~~		~~16 bits~~	
Primary management CID		16 bits	
Timing adjust	1	32 bits	
Power level adjust	2	8 bits	
Offset frequency adjust	3	32 bits	
Ranging status	4	8 bits	
Service level prediction	5	8 bits	
}			
}			
Padding		4 bits	Padding bits to complement message length to an integer number of bytes
}			

Report mode

The offset of the OFDMA symbol in which the burst starts, the offset value is defined in units of OFDMA symbols and is relevant to the Allocation Start Time field given in the UL-MAP message.

Comp_NBR_BSID_IND

This bit indicates whether neighbor BS IDs are compressed or not. MSS can compress BS ID, only when NBR_BS_Index_Validity_Time is larger than the difference of MOB_SCAN_REPORT message transmitting time and MOB_NBR_ADV message receiving time (MOB_NBR_ADV message should be referred in order to compress neighbor BS IDs). This difference time is calculated from Frame number of DL-MAP PHY Synchronization Field.

BS_index

BS_index is a compressed identifier of a neighboring BS, with the index assigned in the order of appearance of the BS in the MOB_NBR_ADV message.

NBR BS_ID

BS_ID of the neighboring BS with which the MS is associated.

Configuration Change Count for MOB_NBR_ADV
The value of Configuration Change Count in MOB_NBR_ADV message referred in order to compress neighbor BSID

~~Basic CID~~
~~The Basic CID assigned by the Target BS to the MS during association~~

Primary management CID
The primary management CID assigned by the ~~Target~~ neighbor BS to the MS during association

Timing adjust
The time required to advance MS transmissions so frames arrive at the expected time instance at the neighbor ~~Target~~ BS.

Power level adjust
The power level offset adjustment required so that MS transmissions arrive at the desired level at the neighbor ~~Target~~ BS.

Frequency offset adjust
The relative frequency adjustment required so that MS transmissions arrive at the desired frequency at the neighbor ~~Target~~ BS.

Ranging status
Used to indicate whether MS ranging attempt is within acceptable limits of the neighbor ~~Target~~ BS.

N_Recommended_BS
Number of BSs included in this association report.

[add the following to SBC_REQ/RSP messages

11.8.X.X Association type supported

Type	Length	Notes	Scope
XXX	1	Bit #0: Scanning with association level 0: scanning without association. Bit #1: Scanning with association level 1: association without coordination. Bit #2: Scanning with association level 2: association with coordination. Bit #3: Scanning with association level 3: NW assisted association reporting. Bit #4 – Bit #7: Reserved	SBC-REQ (see 6.3.2.3.23) SBC-RSP (see 6.3.2.3.24)

Type	Length	Value	Scope
XXX	1	0: level 0: Scanning or association without coordination. 1: level 1: association with coordination. 2: level 2: NW assisted association reporting. 4-255 reserved	SBC-REQ (see 6.3.2.3.23) SBC-RSP (see 6.3.2.3.24)

[Modify the text in 11.3 UCD management message encodings, page 473, line 61, as follows :]

Table 351a—UCD PHY-specific channel encodings - WirelessMAN-OFDMA

Name	Type (1 byte)	Length	Value (variable length)
Handover Ranging Codes	173	1	Number of handover ranging CDMA codes. Possible values are 0-255.

~~The start of ranging code groups~~	~~155~~	~~1~~	~~Indicates the starting number, S, of the group of codes used for this uplink. All the ranging codes used on this uplink will be between S and ((S+O+N+M+L+K) mod 256). Where, O is the number of handover-ranging codes, N is the number of initial-ranging codes, M is the number of periodic-ranging codes, L is the number of bandwidth-request codes the range of values is. K is the number of association-ranging codes.~~
~~Initial ranging interval~~	~~180~~	~~1~~	~~Number of frames between initial ranging interval allocation.~~
~~Association Ranging Codes~~	~~181~~	~~1~~	~~Number of association ranging CDMA codes. Possible values are 0-255.~~

[Modify the text in 8.4.5.4 UL-MAP IE format, page 269, line 38, as follows :]

Syntax	Size	Notes
UL-MAP_IE() {		
CID	16 bits	
UIUC	4 bits	
if (UIUC == 12) {		
OFDMA Symbol offset	8 bits	
Subchannel offset	7 bits	
No. OFDMA Symbols	7 bits	
No. Subchannels	7 bits	
Ranging Method	2 bits	0b00 – Initial Ranging/Handover Ranging/Association Ranging over two symbols 0b01 – Initial Ranging/Handover Ranging/Association Ranging over four symbols 0b10 – BW Request/Periodic Ranging over one symbol 0b11– BW Request/Periodic Ranging over three symbols

~~*reserved*~~~~Dedicated~~Unicast ranging indicator	1 bit	~~shall be set to zero~~ 0: the OFDMA region and Ranging Method defined are used for the purpose of normal ranging 1: the OFDMA region ~~and Ranging Method defined are~~ is ~~used~~ for the purpose of ranging using dedicated CDMA codes and transmit opportunities assigned in the MOB-PAG-ADV or in the MOB_SCN-RSP messages.
} else if (UIUC == 14) {		
CDMA_Allocation_IE()	32 bits	
} else if (UIUC == 15) {		
Extended UIUC dependent IE	*variable*	See subclauses following 8.4.5.4.3
} else {		
…	…	…

[Modify the text in 8.4.7.1 Initial-ranging/handover-ranging transmissions, page 407, line 37, as follows :]

8.4.7.1 Initial-ranging/handover-ranging~~/association-ranging~~ transmissions

[Change the text in 8.4.7.1 as indicated:]

~~The initial-ranging/handover-ranging/association-ranging transmission shall be used by any MS that wants to synchronize to the system channel for the first time. An initial-ranging/handover-ranging/association-ranging transmission shall be performed during two consecutive symbols. The same ranging code is transmitted on the ranging channel during each symbol, with no phase discontinuity between the two symbols. A time-domain illustration of the initial-ranging/handover-ranging/association-ranging transmission is shown in Figure 239.~~

The initial ranging codes shall be used for initial network entry and association. Handover ranging codes shall be used for ranging against a Target BS during handover. An initial-ranging/handover-ranging CDMA transmission shall be performed during two consecutive symbols. The same ranging code is transmitted on the ranging channel during each symbol, with no phase discontinuity between the two symbols. A time-domain illustration of the initial-ranging/handover-ranging~~/association-ranging~~ transmission is shown in Figure 239.

~~[Change the title of Figure 239 as indicated:]~~

~~Figure 239-Initial-ranging/handover-ranging/association-ranging transmission for OFDMA~~

~~[Change the text above Figure 240 as indicated:]~~

~~The BS can allocate two consecutive initial-ranging/handover-ranging slots, onto those the MS shall transmit~~
~~the two consecutive initial-ranging/handover-ranging codes (starting code shall always be a multiple of 2), as illustrated in Figure 240:~~

~~[Change the title of Figure 240 as indicated:]~~
~~Figure 240-Initial-ranging/handover-ranging/association-ranging transmission for OFDMA, using two consecutive initial ranging codes~~

~~*[Modify the text in 8.4.7.3 Ranging codes, page 408, line 23, as follows :]*~~

~~The number of available codes is 256, numbered 0..255. Each BS uses a sub-group of these codes, where the~~
~~sub-group is defined by a number S, 0 <= S <= 255. The group of codes will be between S and ((S+O+N+M+L+K) mod 256).~~

~~— The first N codes produced are for initial-ranging. For example, for the default case of two sub-channels~~
~~in the ranging channel, clock the PRBS 144 x (S mod 256) times to 144 x ((S + N) mod 256) – 1 times.~~
~~— lThe next M codes produced are for periodic-ranging. For example, for the default case of two subchannels~~
~~in the ranging channel, clock the PRBS 144 x ((N + S) mod 256) times to 144 x ((N + M +S) mod 256) -1 times.~~
~~— The next L codes produced are for bandwidth-requests. For example, for the default case of two subchannels~~
~~in the ranging channel, clock the PRBS 144 x ((N + M + S) mod 256) times to 144 x ((N +M + L + S) mod 256) -1 times.~~
~~— The next O codes produced are for handover-ranging. For example, for the default case of two subchannels~~
~~in the ranging channel, clock the PRBS 144 x ((N + M +L+ S) mod 256) times to 144 x ((N +M + L + O+S) mod 256) -1 times.~~
~~— The next K codes produced are for association-ranging. For example, for the default case of two subchannels~~
~~in the ranging channel, clock the PRBS 144 x ((N + M + L + O + S) mod 256) times to 144 x ((N +M + L + O + K + S) mod 256) -1 times.~~

~~*[Modify the text in 6.3.10.3.3 CDMA handover ranging and automatic adjustment, page 407, line 37, as follows :]*~~

~~6.3.10.3.3 CDMA handover ranging and automatic adjustment~~

An MS that wishes to perform handover/association ranging shall take a process similar to that defined in the initial ranging section with the following modifications.

In CDMA handover/association ranging process, the CDMA handover/association ranging code is used instead of the initial ranging code. The code is selected from the handover-ranging/association-ranging domain as defined in 8.4.7.3.

Alternatively, if the BS is pre-notified for the upcoming handover/association MS, it may provide BW allocation information to the MS using Fast_Ranging_IE to send an RNG-REQ message.

Change section 6.3.21.8.1

6.3.21.8.1 MS side

An MS may terminate MS Idle Mode at any time.

An MS shall terminate Idle Mode and re-enter the network if it decodes a BS Broadcast Paging message that contains the MS own MS MAC Address hash and an Action Code of 10, enter network. In the event that an MS decodes a BS Broadcast Paging message that contains the MS own MS MAC Address hash and an Action Code of 01, Perform Ranging, the MS shall conduct and complete Idle Mode Location Update to establish location to the network and acknowledge message decoding. In both cases for the OFDMA PHY, if a PHY specific ranging code is assigned to the MS in the MOB_PAG-ADV message, the MS shall perform Idle Mode Location Update by transmitting the code assigned in the MOB_PAG-ADV message on the dedicated ranging region assign specified by the transmit opportunity parameter in the MOB_PAG-ADV in the UL-MAP-IE (UIUC = 12 and unicast ranging indicator bit set to '1').

[e1]

[Insert new sub-clause 11.18.1:]

11.18.1 CDMA code assignment

This field indicates the assigned code and the transmit opportunity for a MS who is paged to use over CDMA ranging channel.

Type	Length	Notes	Scope

150	variable; N_assign + N_assign x 8) bits	Bit #0 - #7: N_assign
		Subsequent (N_assign x 8)16) bits:
		for (i = 0, i < N_assign, i++) {
		8-bits code index assigned to a MS who is paged
		8-bits transmit opportunity assigned to a MS who is paged
		}
			OFDMA
			)

Table 345—CIDs

CID	Value	Description
Initial Ranging	0x0000	Used by SS and BS during initial ranging process
Basic CID	0x0001 - m	The same value is assigned to both the DL and UL connection.
Primary management	m+1 - 2m	The same value is assigned to both the DL and UL connection.
Transport CIDs, Secondary Mgt CIDs	2m+1 - 0xFE9F	For the secondary management connection, the same value is assigned to both the DL and UL connection.
Multicast CIDs	0xFEA0 - 0xFEFE	For the downlink multicast service, the same value is assigned to all MSSs on the same channel that participate in this connection.

~~AAS initial ranging CID~~	~~0xFEFF~~	~~BS supporting AAS shall use this CID when allocating a Initial Ranging period for AAS devices.~~
~~Multicast polling CIDs~~	~~0xFF00 – 0xFFFA~~	~~A BS may be included in one or more multicast polling groups for the purposes of obtaining bandwidth via polling. These connections have no associated service flow.~~
~~Normal mode multicast CID~~	~~0xFFFB~~	~~Used for transmission of DL broadcast information to normal mode MSS.~~
~~Sleep mode multicast CID~~	~~0xFFFC~~	~~Used for transmission of DL broadcast information to Sleep mode MSS~~
~~Idle mode multicast CID~~	~~0xFFFD~~	~~Used for transmission of DL broadcast information to Idle mode MSS.~~
~~Padding CID~~	~~0xFFFE~~	~~Used for transmission of padding information by SS and BS.~~
~~Broadcast CID~~	~~0xFFFF~~	~~Used for broadcast information that is transmitted on a downlink to all SS.~~