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Abstract	Fix the problem of Scan/Association related MAC management messages in referring BSs.
Purpose	Adoption
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Fix the problem of Scan/Association related MAC management messages in referring BSs

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Problem Definition

In the current IEEE P802.16e/D9, it defines the mechanism of three-level Scan/Association which is initiated by MOB_SCN-REQ/RSP management messages. Before the Scan/Association process, the MS could acquire the network topology by at least the following two modes:

(1)network topology advertisement Broadcasting message. A BS shall broadcast information about the network topology using the MON_NBR-ADV MAC management message.

(2)the history information which is recorded by MS previous ranging, registration and other interactions.

Currently, in the Scan/Association related MAC management messages such as MOB_SCN-REQ, MOB_SCN-RSP, MOB_SCN-REP, MOB_ASC-REPORT, MOB_MSHO-REQ, the "Comp_NBR_BSID_IND" bit is included to indicate whether the recommended neighbor BS_IDs are compressed or not. When the "Comp_NBR_BSID_IND" bit is set to "1", the BS_IDs included in the above MAC management message should be expressed as BS_index assigned in the order of appearance of the BS in the MOB_NBR-ADV message. Otherwise, it should be denoted by "48-bit" BSID. This recent change to the SCN-REQ message saved valuable bits in the message when the 8 bit BS_index could be used in place of the 48 bit BS ID.

However, the change is flawed. If not all the recommended neighbor BSs in the Scan/Association related message are acquired from one MON_NBR-ADV message, there is no provision for including both indexed and non-indexed BS IDs in the same SCN-REQ message. The MS would be forced to use all 48 bit BS IDs in the SCN-REQ message or to conduct two separate SCN-REQ/RSP transactions: one specifying all BS for which the MS had the BS_index; the other for all other BS for which the MS had only the BS ID. This problem would occur in any instance when the MS had at least partial knowledge of the BS_Index from the NBR-ADV message and also had other BS that the MS was aware of as potential candidates for HO, suitable for evaluation at the least, that were not included in the NBR-ADV message. MS mobility, lack of specification and consistency in BS inclusion of candidate BS in the NBR-ADV message, and fragmentation of the NBR-ADV message compound this problem tremendously.

In addition, in 6.3.2.3.51 Association Result Report (MOB_ASC-REPORT) message need clarifying language that message is sent to the MS by the Serving BS to report the aggregated Association information received from multiple Target BSs.

Proposed Text Changes

See the details as follows:

[In D9 subclause 6.3.2.3.48, page103, change table 108h Scanning Interval Allocation Request (MOB_SCN-REQ) message, as follows]

Table 108h – MOB_SCN-REQ message format

Syntax	Size (bits)	Notes
MOB_SCN_REQ_Message_Format() {		
Management Message Type = 54	8	
Scan duration	8	Units are frames
Association type	3	0b000:Scanning with association level 0: association without coordination. 0b001:Scanning with association level 1: association with coordination. 0b010:Scanning with association level 2: NW assistd association reporting. 0b011-0b111: Reserved
Interleaving interval	8	Units are frames
Scan iteration	8	In frames
~~Comp_NBR_BSID_IND~~	~~1~~	~~1 = use compressed BS ID~~
~~Padding~~	~~4~~	~~Shall be set to zero~~
~~If (Comp_NBR_BSID_IND ==1) {~~		
~~Configuration change count for MOB_NBR_ADV~~	~~8~~	~~Configuration Change Count value of referring MOB_NBR_ADV message~~
~~}~~		
~~N_Recommended_BS~~	~~8~~	~~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~~	~~BS index corresponds to position of BS in MOB_NBR_ADV message~~
~~}~~		
~~Else {~~		
~~Recommended BS_ID~~	~~48~~	
~~}~~		
N_Recommended_BS_Index	8	Number of neighboring BS to be scanned or associated, which are included in MOB_NBR_ADV message
If(N_Recommended_BS_Index!=0){		
Configuration change count for MOB_NBR_ADV	8	Configuration Change Count value of referring MOB_NBR_ADV message
}		
For(j=0;j< N_Recommended_BS_Index;j++){		
Neighbor_BS_Index	8	BS index corresponds to position of BS in MOB_NBR_ADV message
}		

N_Recommended_BS_Full	8	Number of neighboring BS to be scanned or associated, which are not included in MOB_NBR_ADV message
For(j=0;j< N_Recommended_BS_Full;j++){		
Recommended BS ID	48	
}		
Padding	*Variable*	If needed for alignment to byte boundary.
TLV encoded information	*Variable*	
}		

The following parameters shall be included in the MOB_SCN-REQ message.

> **Scan duration**
> > Duration (in units of frames) of the requested scanning period.
>
> **Association type**
> > Type of scanning or 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 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 MS plans to scan with or without association
>
> **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
>
> **N_Recommended_BS_Index**
> > Number of neighboring BS to be scanned or associated, which are included in MOB_NBR_ADV message. The number could be larger than zero only when NBR_BS_Index_Validity_Time is larger than the difference of MOB_SCN-REQ message transmitting time and MOB_NBR_ADV message receiving time (MOB_NBR_ADV message should be referred).
>
> **Neighbor_BS_Index**
> > BS index corresponds to position of BS in MOB_NBR_ADV message
>
> **N_Recommended_BS_Full**
> > Number of neighboring BS to be scanned or associated, which are not included in MOB_NBR_ADV message
>
> **Recommended BS ID**
> > BS IDs of those BSs the MS plans to scan with or without association.

The MOB_SCN-REQ message shall include the following parameters encoded as TLV tuples:

> HMAC Tuple (See 11.1.2.)

[In D9,Page104, change table 108i in subclause 6.3.2.3.49, Scanning Interval Allocation Response (MOB_SCN-RSP) message, as follows]

Table 108i – MOB_SCN-RSP message format

Syntax	Size (bits)	Notes
MOB_SCN-RSP_Message_Format() {	—	—
Management Message Type = 55	8	—
Scan duration	8	In units of frames. When Scan Duration is set to zero, no scanning parameters are specified in the message. When MOB_SCN-RSP is sent in response to MOB_SCN-REQ, setting Scan Duration to zero denies MOB_SCN-REQ.
Report mode	2	0b00: no report 0b01: periodic report 0b10: event triggered report 0b11: reserved
reserved	6	Shall be set to zero
Report period	8	Available when the value of Report Mode is set to 0b01. Report period in frames.
Report metric	8	Bitmap indicating metrics on which the corresponding triggers are based: Bit 0: BS CINR mean Bit 1: BS RSSI mean Bit 2: Relative delay Bit 3: BS RTD; this metric shall be only measured on serving BS/anchor BS. Bits 4-7: reserved; shall be set to zero
If (Scan Duration !=0) {	—	—
Start frame	4	—
reserved	1	Shall be set to zero
Interleaving interval	8	Duration in frames
Scan iteration	8	—
~~Comp_NBR_BSID_IND~~	~~1~~	~~—~~
~~*padding*~~	~~3~~	~~Shall be set to zero~~
~~If (Comp_NBR_BSID_IND ==1) {~~	~~—~~	~~—~~
~~Configuration change count for MOB_NBR_ADV~~	~~8~~	~~Configuration Change Count value of referring MOB_NBR_ADV message~~
~~}~~	~~—~~	~~—~~
~~N_Recommended_BS~~	~~4~~	~~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~~	~~BS index corresponds to position of BS in MOB_NBR_ADV message~~
~~} Else {~~	~~—~~	~~—~~
~~Recommended BS ID~~	~~48~~	~~BS IDs of BSs that MS shall scan~~
~~}~~	~~—~~	~~—~~
N_Recommended_BS_Index	8	Number of neighboring BS to be scanned or associated, which are included in MOB_NBR_ADV message
If(N_Recommended_BS_Index!=0){		

5

Configuration change count for MOB_NBR_ADV	8	Configuration Change Count value of referring MOB_NBR_ADV message
}		
For(j=0;j< N_Recommended_BS_Index;j++) {		
Neighbor_BS_Index	8	BS index corresponds to position of BS in MOB_NBR_ADV message
Association type	3	0b000: Scanning with association level 0: association without coordination 0b001: Scanning with association level 1: association with coordination. 0b010:Scanning with association level 2: NW assisted association reporting. 0b011-0b111: Reserved
If (Association type == 0b001) OR (Association type == 0b010) {	—	—
Rendezvous time	8	Units are frames
CDMA_code	8	From initial ranging codeset
Transmission_opportunity offset	8	Units are transmission opportunity
}		
}		
N_Recommended_BS_Full	8	Number of neighboring BS to be scanned or associated, which are not included in MOB_NBR_ADV message
For(j=0;j< N_Recommended_BS_Full;j++){		
Recommended BS ID	48	BS IDs of BSs that MS shall scan
Association type	3	0b000:Scanning with association level 0: association without coordination 0b001:Scanning with association level 1: association with coordination. 0b010:Scanning with association level 2: NW assisted association reporting. 0b011-0b111: Reserved
If (Association type == 0b001) OR (Association type == 0b010) {	—	—
Rendezvous time	8	Units are frames
CDMA_code	8	From initial ranging codeset
Transmission_opportunity offset	8	Units are transmission opportunity
}	—	—
}	—	—
Padding	variable	
}		
TLV encoded information	variable	
}		

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 MS's request, all other parameters

6

except TLV encoded information shall be omitted in the message.

Start Frame

> 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

~~**Comp_NBR_BS_ID_IND**~~

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

~~**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.

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

N_Recommended_BS_Index

> Number of neighboring BS to be scanned or associated, which are included in MOB_NBR_ADV message. The number could be larger than zero only when NBR_BS_Index_Validity_Time is larger than the difference of MOB_SCN-RSP message transmitting time and MOB_NBR_ADV message receiving time (MOB_NBR_ADV message should be referred).

Neighbor_BS_Index

> BS index corresponds to position of BS in MOB_NBR_ADV message

Report mode

> Action code for an MS's report of CINR measurement:
> 0b00: The MS measures channel quality of the Available BSs without reporting.
> 0b01: The MS reports the result of the measurement to Serving BS periodically. The period of reporting is different from that of scanning.
> 0b10: The MS reports the result of the measurement to Serving BS after each measurement.
> 0b11: *reserved*

Report metric

> Bitmap indicator of trigger metrics that the serving BS requests the MS to report. Serving BS shall indicate only the trigger metrics agreed during SBC-REQ/RSP negotiation. Each bit indicates whether reports will be initiated by trigger based on the corresponding metric:
> Bit 0: BS CINR mean
> Bit 1: BS RSSI mean
> Bit 2: Relative delay
> Bit 3: BS RTD; this metric shall be only measured on serving BS/anchor BS.
> Bits 4-7: *reserved*; shall be set to zero.

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~~

N_Recommended_BS_Full

Number of neighboring BS to be scanned or associated, which are not included in MOB_NBR_ADV message

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 non-contention 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 MS. The offset is calculated from the frame where MOB_SCN-RSP message is transmitted. In case Association 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 at the frame
specified by Rendezvous time parameter.

CDMA code

A unique code assigned to the MS, to be used for association with the 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.

The MOB_SCN-REQ message shall include the following parameters encoded as TLV tuples:

HMAC Tuple (See 11.1.2.)

[In D9, page108, change table 108j in subclause 6.3.2.3.50, Scanning Result Report (MOB_SCN-REP) message, as follows]

Table 108j – MOB_SCN-REP message format

Syntax	Size (bits)	Notes
MOB_SCN-REP_Message_Format() {	—	—
Management Message Type = 60	8	—
Report Mode	1	0: Event-triggered report 1: Periodic report
Report metric	8	Bitmap indicating presence of certain metrics (threshold values) on which the corresponding triggers are based: Bit 0: BS CINR mean Bit 1: BS RSSI mean Bit 2: Relative delay Bit 3: BS RTD; this metric shall be only measured on serving BS/anchor BS. Bits 4-7: reserved; shall be set to zero
~~Comp_NBR_BSID_IND~~	~~1~~	~~—~~
~~If (Comp_NBR_BSID_IND == 1){~~	~~—~~	~~—~~

Field	Length	Description
~~Configuration Change Count for MOB_NBR_ADV~~	~~8~~	~~Configuration Change Count value of referring MOB_NBR_ADV message~~
~~}~~	~~—~~	~~—~~
N_current_BSs	3	When FBSS/SHO is supported, N_current_BSs is the number of BSs currently in the active set; when FBSS/SHO is not supported or the MS has an empty active set, N_current_BSs is set to 1 (= serving /anchor BS).
Reserved	~~3~~4	Shall be set to zero
For (j=0; j<N_current_BSs; j++) {	—	—
Temp BSID	4	Active set member ID assigned to this BS. When the MS has an empty active set or FBSS/SHO is not supported, Temp BSID shall be set to 0.
Reserved	4	Shall be set to zero
If(Report metric[Bit 0]==1)		
BS CINR mean	8	—
If(Report metric[Bit 1]==1)		
BS RSSI mean	8	—
If(Report metric[Bit 2]==1)		
Relative delay	8	In case FBSS/SHO is in progress, this field will include the relative delay of BSs currently in the active set, except for that of the Anchor BS
If(Report metric[Bit 3]==1)		
BS RTD	8	This field will include the RTD of the serving BS/anchor BS.
}	—	—
~~N_NEIGHBORS~~	~~8~~	~~—~~
~~For (i=0; i<N_NEIGHBORS; i++) {~~	~~—~~	~~—~~
~~If (Comp_NBR_BSID_IND == 1){~~	~~—~~	~~—~~
~~Neighbor BS index~~	~~8~~	~~—~~
~~}~~	~~—~~	~~—~~
~~Else {~~	~~—~~	~~—~~
~~Neighbor BSID~~	~~24~~	~~The least significant 24 bits of the Neighbor BSID~~
~~}~~	~~—~~	~~—~~
N_Neighbor_BS_Index	8	Number of neighboring BS which are included in MOB_NBR_ADV message
If(N_Neighbor_BS_Index!=0){		
Configuration change count for MOB_NBR_ADV	8	Configuration Change Count value of referring MOB_NBR_ADV message
}		
For(j=0;j< N_Neighbor_BS_Index;j++){		
Neighbor_BS_Index	8	BS index corresponds to position of BS in MOB_NBR_ADV message
If(Report metric[Bit 0]==1)		
BS CINR mean	8	—
If(Report metric[Bit 1]==1)		

BS RSSI mean	8	—
If(Report metric[Bit 2]==1)		
Relative delay	8	
}		
N_Neighbor_BS_Full	8	Number of neighboring BS which are not included in MOB_NBR_ADV message
For(j=0;j< N_Neighbor_BS_Full;j++){		
Neighbor BSID	48	
If(Report metric[Bit 0]==1)		
BS CINR mean	8	—
If(Report metric[Bit 1]==1)		
BS RSSI mean	8	—
If(Report metric[Bit 2]==1)		
Relative delay	8	
}	—	—
TLV encoded information	*variable*	Optional
}	—	—

A MS shall generate MOB_SCN-REP messages in the format shown in Table 106gj. The following parameters shall be included in the MOB_SCN-REP message.

~~Comp_NBR_BSID_IND~~
~~This bit indicates whether neighbor BS IDs are compressed or not. MS 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.~~
~~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~~
Report mode
Action code for an MS's scan report of its measurement:
0: Event triggered report
1: Periodic report according to Scan report period of MOB_SCN-RSP
Report metric
Bitmap indicator of trigger metrics that the serving BS requests the MS to report. Serving BS shall indicate only the trigger metrics agreed during SBC-REQ/RSP negotiation. For each bit location, a value of '0' indicates the trigger metric is not included, while a value of '1' indicates the trigger metric is included in the message. The bitmap interpretation for the metrics shall be:
Bit 0: BS CINR mean
Bit 1: BS RSSI mean
Bit 2: Relative delay
Bit 3: BS RTD; this metric shall be only measured on serving BS/anchor BS.
Bits 4-7: reserved; shall be set to zero.

For each neighbor BS, the following parameter shall be included:
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
N_Recommended_BS_Index
    Number of neighboring BS to be scanned or associated, which are included in MOB_NBR_ADV
    message. The number could be larger than zero only when NBR_BS_Index_Validity_Time is
    larger than the difference of MOB_SCN-REP message transmitting time and MOB_NBR_ADV
    message receiving time (MOB_NBR_ADV message should be referred).
Neighbor_BS_Index
    BS index corresponds to position of BS in MOB_NBR_ADV message
N_Recommended_BS_Full
    Number of neighboring BS to be scanned or associated, which are not included in
    MOB_NBR_ADV message
Neighbor BSID
    The least significant 24 bits of the Base Station ID parameter in the DL-MAP message of
    neighbor BS.
~~**Neighbor BS index**~~
    ~~The position in the list of neighbor BSs in MOB-NBR-ADV message of which Configuration
    Change Count is equal to "Configuration Change Count for MOB_NBR_ADV". BS should
    keep mapping-table of neighbor BS MAC address and neighbor BS index transmitted through
    MOB-NBR-ADV message, for each Configuration Change Count.~~

According to Report metric that MS indicates, the MOB_SCN-REP message may include the following
parameters:
BS CINR mean
    The BS CINR mean parameter indicates the CINR measured by the MS from the particular BS.
    The value shall be interpreted as a signed byte with units of 0.5 dB. The measurement shall be
    performed on the frame preamble and averaged over the measurement period.
BS RSSI mean
    The BS RSSI mean parameter indicates the Received Signal Strength measured by the MS
    from the particular BS. The value shall be interpreted as an unsigned byte with units of -0.25
    dB, and have 40 dBm subtracted from it (such that 0xff is interpreted as -103.75 dBm), an MS
    shall be able to report values in the range -103.75 dBm to -40 dBm. The measurement shall be
    performed on the frame preamble and averaged over the measurement period.
Relative delay
    This parameter indicates the delay of neighbor DL signals relative to the serving BS, as
measured
    by the MS for the particular BS. The value shall be interpreted as a signed integer in units
    of samples.
BS RTD
    The BS RTD parameter indicates the round trip delay (RTD) measured by the MS from the
    serving BS. RTD is calculated by using RTD = (TTG - SSRTG - timing offset), where timing
    offset is given by the accumulated value of Time Adjusts in RNG-RSP messages received from
    the serving BS through ranging. The value shall be interpreted as an unsigned byte with units of
    1/Fs (see Section 10.3.4.3). This parameter shall be only measured on serving BS/anchor BS.
    TLV tuples specified in 11.20 may be included into MOB_SCN-REP message. Information
    provided by Nth TLV of this type is related to Nth BS listed in the message.

The MOB_SCN-REP message shall include the following parameters encoded as TLV tuples:
    HMAC Tuple (See 11.1.2.)

[In D9, change the text and table in subclause 6.3.2.3.51 as follows]

6.3.2.3.51 Association Result Report (MOB_ASC-REPORT) message

When association level 2 is used, the MS does not have to wait for RNG-RSP from the Target BS after sending RNG-REQ or ranging code to the Target BS. Instead, the RNG-RSP info 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 MOB_ASC_REPORT message, which the Serving BS then sends to the MS. This message is transmitted using primary management CID.

Table 108k – MOB_ASC-REPORT message format

Syntax	Type	Size	Notes
MOB_ASC_REPORT_Message_Format() {			
Management Message Type = 66		8	
~~Comp_NBR_BSID_IND~~		~~1~~	
~~Padding~~		~~3~~	~~Shall be set to zero~~
~~If (Comp_NBR_BSID_IND ==1) {~~			
~~Configuration change count for MOB_NBR_ADV~~		~~8~~	~~Configuration Change Count value of referring MOB_NBR_ADV message~~
~~}~~			
~~N_Recommended_BS~~		~~8~~	~~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~~	~~BS index corresponds to position of BS in MOB_NBR_ADV message~~
~~}~~			
~~Else {~~			
~~Neighbor_BS_ID~~		~~4 8~~	
~~}~~			
~~Timing adjust~~	~~1~~	~~3 2~~	
~~Power level adjust~~	~~2~~	~~8~~	
~~Offset frequency adjust~~	~~3~~	~~3 2~~	
~~Ranging status~~	~~4~~	~~8~~	
~~Service level prediction~~	~~5~~	~~8~~	
~~}~~			
N_Recommended_BS_Index		8	Number of neighboring BS which are included in MOB_NBR_ADV message
If(N_Recommended_BS_Index!=0){			
Configuration change count for MOB_NBR_ADV		8	Configuration Change Count value of referring MOB_NBR_ADV message
}			
For(j=0;j< N_Recommended_BS_Index;j++){			
Neighbor_BS_Index		8	

Timing adjust	1	32	
Power level adjust	2	8	
Offset frequency adjust	3	32	
Ranging status	4	8	
Service level prediction	5	8	
}			
N_Recommended_BS_Full		8	Number of neighboring BS which arenot included in MOB_NBR_ADV message
For(j=0;j< N_Recommended_BS_Full;j++){			
Neighbor_BS_ID		48	
Timing adjust	1	32	
Power level adjust	2	8	
Offset frequency adjust	3	32	
Ranging status	4	8	
Service level prediction	5	8	
}			
Padding		4	Padding bits to complement message length to an integer number of bytes
}			

The following parameters shall be included in the MOB_ASC-REPORT message:

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

N_Recommended_BS_Index
> Number of neighboring BSs to be scanned or associated, which are included in MOB_NBR_ADV message. The number could be larger than zero only when NBR_BS_Index_Validity_Time is larger than the difference of MOB_ASC-REPORT message transmitting time and MOB_NBR_ADV message receiving time (MOB_NBR_ADV message should be referred).

Neighbor_BS_Index
> BS index corresponds to position of BS in MOB_NBR_ADV message

N_Recommended_BS_Full
> Number of neighboring BSs to be scanned or associated, which are not included in MOB_NBR_ADV message

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

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

Primary management CID

The primary management CID assigned by the 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 BS.

Power level adjust

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

Frequency offset Offset frequency adjust

The relative frequency adjustment required so that MS transmissions arrive at the desired frequency at the neighbor BS.

Ranging status

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

Service level prediction

The service level prediction value indicates the level of service the MS can expect from this neighbor BS. The following encodings apply:

0 = No service possible for this MS

1 = Some service is available for one or several service flows authorized for the MS.

2 = For each authorized service flow, a MAC connection can be established with QoS specified by the AuthorizedQoSParamSet.

3 = No service level prediction available.

N_Recommended_BS

Number of BSs included in this association report.

[In D9, change table 108m in subclause 6.3.2.3.53, MS HO Request (MOB_MSHO-REQ) message, as follows]

Table 108m – MOB_MSHO-REQ message format

Syntax	Size (bits)	Notes
MOB_MSHO-REQ_Message_Format() {	—	—
Management Message Type = 57	8	—
Comp_NBR_BSID_IND	1	—
Report metric	8	Bitmap indicating presence of metric in message Bit 0: BS CINR mean Bit 1: BS RSSI mean Bit 2: Relative delay Bit 3: BS RTD; this metric shall be only measured on serving BS/anchor BS. Bits 4-7: reserved; shall be set to zero
if (Comp_NBR_BSID_IND == 1){	—	—
Configuration Change Count for MOB_NBR_ADV	8	Configuration Change Count value of referring MOB_NBR_ADV message
}	—	—

~~N_new_BSs~~	~~3~~	~~Number of new BSs that are recommended by the MS~~
~~Padding~~	~~4~~	~~Shall be set to zero.~~
~~for (j=0; j<N_New_BSs; j++){~~	~~—~~	~~—~~
~~if (Comp_NBR_BSID_IND == 1){~~	~~—~~	~~—~~
~~Neighbor BS index~~	~~8~~	~~—~~
~~}~~	~~—~~	~~—~~
~~else {~~	~~—~~	~~—~~
~~Neighbor BSID~~	~~48~~	~~—~~
~~}~~	~~—~~	~~—~~
N_New_BS_Index	8	Number of new recommended BSs which are included in MOB_NBR_ADV message
If(N_New_BS_Index!=0){		
Configuration change count for MOB_NBR_ADV	8	Configuration Change Count value of referring MOB_NBR_ADV message
}		
For(j=0;j< N_New_BS_Index;j++){		
Neighbor_BS_Index	8	
Preamble index/ Preamble Present & Subchannel Index	8	For the SCa and OFDMA PHY this parameter defines the PHY specific preamble for the neighbor BS. For the OFDM PHY the 5 LSB contain the active DL subchannel index for the neighbor BS. The 3 MSB shall be Reserved and set to '0b000'
If(Report metric[Bit#0]==1)		
BS CINR mean	8	—
If(Report metric[Bit#1]==1)		
BS RSSI_mean	8	—
If(Report metric[Bit#2]==1)		
Relative delay	8	—
Service level prediction	3	—
Arrival Time Difference Indication	1	If the MS is transmitting this message to request HO or SHO/FBSS is not supported by either BS or MS, this bit shall be set to 0
If (Arrival Time Difference Indication == 1) {	—	—
Arrival Time Difference (t)	4	Relative difference in arrival time between the neighbor BS and the anchor BS, in terms of fraction of CP
}	—	—
}	—	—
N_New_BS_Full		
For(j=0;j< N_New_BS_Full;j++){		
Neighbor_BS_ID	8	
Preamble index/ Preamble Present & Subchannel Index	8	For the SCa and OFDMA PHY this parameter defines the PHY specific preamble for the neighbor BS. For the OFDM PHY the 5 LSB contain the active DL subchannel index for the neighbor BS. The 3 MSB shall be Reserved and set to '0b000'

15

If(Report metric[Bit#0]==1)		
BS CINR mean	8	—
If(Report metric[Bit#1]==1)		
BS RSSI mean	8	—
If(Report metric[Bit#2]==1)		
Relative delay	8	—
Service level prediction	3	—
Arrival Time Difference Indication	1	If the MS is transmitting this message to request HO or SHO/FBSS is not supported by either BS or MS, this bit shall be set to 0
If (Arrival Time Difference Indication == 1) {	—	—
Arrival Time Difference (t)	4	Relative difference in arrival time between the neighbor BS and the anchor BS, in terms of fraction of CP
}	—	—
}	—	—
N_current_BSs	3	When FBSS/SHO is supported and the MS has non-empty active set, N_current_BSs is the number of BSs that are currently in the Active Set of the MS. When FBSS/SHO is not supported or the MS has an empty active set, N_current_BSs is set to 1
Padding	1	Shall be set to zero.
For (j=0 ; j<N_current_BSs ; j++) {		
Temp BSID	4	Active Set member ID assigned to this BS. When the MS has an empty active set or FBSS/SHO is not supported, Temp BSID shall be set to 0
If(Report metric[Bit#0]==1)		
BS CINR mean	8	—
If(Report metric[Bit#1]==1)		
BS RSSI mean	8	—
If(Report metric[Bit#2]==1)		
Relative delay	8	Only when FBSS/SHO is in progress, this field will include the relative delay of BSs currently in the active set, except anchor BS.
If(Report metric[Bit#3]==1)		
BS RTD	8	This field will include the RTD of the serving BS/anchor BS.
}	—	—
Padding	*variable*	Padding bits to ensure byte aligned.
TLV encoded information	*variable*	
}	—	—

An MS shall generate MOB_MSHO-REQ messages in the format shown in Table 108m. The following parameters shall be included in the MOB_MSHO-REQ message:

Report metric
> Bitmap indicator of trigger metrics that the MS reports in this message. MS shall indicate only the trigger metrics agreed during SBC-REQ/RSP negotiation For each bit location, a value of '0' indicates the trigger metric should not be included, while a value of '1' indicates the trigger metric should be included in the message. The bitmap interpretation for the metrics shall be:
> Bit 0: BS CINR mean
> Bit 1: BS RSSI mean

~~**Comp_NBR_BSID_IND**~~
> ~~This bit indicates whether neighbor BSIDs are compressed or not. MS can compress BSID, 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 BSIDs). This difference time is calculated from Frame number of DL-MAP PHY Synchronization field.~~

~~**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~~

For each recommended neighbor BS, the following parameters shall be included,

> ~~**Neighbor BSID**~~
> > ~~Same as the Base Station ID parameter in the DL-MAP message of the Neighbor BS.~~
> ~~**Neighbor BS index**~~
> > ~~The position in the list of neighbor BSs in MOB-NBR-ADV message of which Configuration Change Count is equal to " Configuration Change Count for MOB_NBR_ADV ". BS should keep mapping-table of neighbor BS MAC address and neighbor BS index transmitted through MOB-NBR-ADV message, for each Configuration Change Count.~~
> **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
> **N_New_BS_Index**
> > Number of neighboring BSs to be scanned or associated, which are included in MOB_NBR_ADV message. The number could be larger than zero only when NBR_BS_Index_Validity_Time is larger than the difference of MOB_MSHO-REQ message transmitting time and MOB_NBR_ADV message receiving time (MOB_NBR_ADV message should be referred).
> **Neighbor_BS_Index**
> > BS index corresponds to position of BS in MOB_NBR_ADV message
> **N_New_BS_Full**
> > Number of neighboring BSs to be scanned or associated, which are not included in MOB_NBR_ADV message
> **Neighbor_BS_ID**
> > BS_ID of the neighboring BS with which the MS is associated.
> **Preamble index/ Subchannel Index**
> > For the SCa and OFDMA PHY this parameter defines the PHY specific preamble for the neighbor BS. For the OFDM PHY the 5 LSB contain the DL subchannel index (as defined in Table 211) used in the Neighbor BS' sector. The 3 MSB shall be Reserved and set to 0.

According to Report metric that MS indicates, the MOB_MSHO-REQ message includes the following parameters.

2005-07-14 IEEE C802.16e-318

BS CINR mean

> The BS CINR mean parameter indicates the CINR in dB measured at the MS on the downlink signal of a particular BS. The value shall be interpreted as a signed byte with the resolution of 0.5 dB. The measurement shall be performed on the frame preamble and averaged over the measurement period.

BS RSSI mean

> The BS RSSI mean parameter indicates the Received Signal Strength measured by the MS from the particular BS. The value shall be interpreted as an unsigned byte with units of -0.25 dB, and have 40 dBm subtracted from it (such that 0xff is interpreted as -103.75 dBm), an MS shall be able to report values in the range -103.75 dBm to -40 dBm. The measurement shall be performed on the frame preamble and averaged over the measurement period.

Relative delay

> This parameter indicates the delay of neighbor DL signals relative to the serving BS, as measured by the MS for the particular BS. The value shall be interpreted as a signed integer in units of samples.

BS RTD

> The BS RTD parameter indicates the round trip delay (RTD) measured by the MS from the serving BS. RTD is calculated by using RTD = (TTG - SSRTG - timing offset), where timing offset is given by the accumulated value of Time Adjusts in RNG-RSP messages received from the serving BS through ranging. The value shall be interpreted as an unsigned byte with units of 1/Fs (see Section 10.3.4.3). This parameter shall be only measured on serving BS/anchor BS.

Service level prediction

> The service level prediction value indicates the level of service the MS can expect from this BS. The following encodings apply:
>> 0 = No service possible for this MS
>> 1 = Some service is available for one or several service flows authorized for the MS.
>> 2= For each authorized service flow, a MAC connection can be established with QoS specified by the AuthorizedQoSParamSet.
>> 3 = No service level prediction available.

Arrival Time Difference

> The Arrival Time Difference parameter indicates the delay of downlink signal relative to the serving BS, as measured by the MS for the neighbor BS. For SCa PHY mode, this value shall be interpreted as a signed byte with the resolution of PS. For OFDM and OFDMA PHY mode, this value shall be interpreted as a signed fraction with a range of +7/8 to –1 one cyclic prefix time of the serving BS. A positive value indicates that the signal of the neighbour BS arrived after that of the serving BS (for example, the value of 0x02 indicates that the neighbour signal is delayed by 25% ±6.25% of the CP).

When the MS supports FBSS/SHO and has a non-empty active set, the MS shall include the following parameters for each active BS. When the MS does not support FBSS/SHO or has an empty active, the MS shall include the following parameters for the current serving BS.

Temp BSID

> When the MS support FBSS/SHO and has a non-empty active set, Temp BSID is the active set member ID. When the MS doesn't support FBSS/SHO or has an empty active set, Temp BSID shall be set to 0.

BS CINR mean

> The BS CINR mean parameter indicates the CINR in dB measured at the MS on the downlink Signal of a particular BS. The value shall be interpreted as a signed byte with the resolution of

0.5 dB. The measurement shall be performed on the frame preamble and averaged over the measurement period.

The MOB_MSHO-REQ message shall include the following parameters encoded as TLV tuples:

HMAC Tuple (See 11.1.2.)

Operator Operator
Network Network