Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**	
Title	**Optimization of Scanning procedure**	
Date Submitted	**12-Jan-05**	
Source(s)	Vladimir Yanover Alvarion Ltd. 21 A Habarzel St. Ramat - Hahayal Tel - Aviv 69710 P.O. Box 13139, Tel-Aviv 61131, Israel	Voice: +972-36457834 Fax: +972-36456222 mailto: vladimir.yanover@alvarion.com
	Kiseon Ryu, Beomjoon Kim, Ronny(Yong-Ho) Kim LG Electronics 533,Hogye-1dong,Dongan-gu, Anyang-shi,Kyongki-do,Korea	Voice: +82-31-450-4387 Fax: +82-31-450-7912 mailto:ksryu, beom, ronnykim@lge.com
Re:	This document accompanies a comment on IEEE 802.16e/D5a	
Abstract	The document contains changes suggested for Scanning Request and Response message to improve Scanning procedure	
Purpose	The contribution accompanies comment to be considered within the P802.16e/D5a Ballot Resolution Committee Recirculation	
Notice	This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.	
Release	The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE's name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE's sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.	
Patent Policy and Procedures	The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures <http://ieee802.org/16/ipr/patents/policy.html>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <mailto:chair@wirelessman.org> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <http://ieee802.org/16/ipr/patents/notices>.	

Optimization of Scanning procedure

Vladimir Yanover (Alvarion Ltd.)
Kiseon Ryu, Beomjoon Kim, Ronny Kim (LG Electronics)

1. Background

Section 6.3.20.1.2 "MSS Scanning of available BS" of 802.16e/D5a says:

"In the MOB_SCN-REQ MAC management message the MSS, and in the MOB_SCN-RSP MAC management message the BS shall indicate either Scanning, Scan type = 0, or Association, Scan type = 1, as the intended MSS activity during the Scanning Interval. If Scan type = 1, Association, then the MSS and BS may include, in their respective messages, one or more Association Test BSID. The BS may send over the backbone to the Association Test BS request to allocate non-contention based ranging opportunity, at the appropriate timing interval, for MSS to conduct Association ranging with the Association Test BS. When conducting initial ranging to Association Test BS, MSS shall use allocated non-contention based initial ranging opportunity, if available. Regardless of value of Scan type and the presence of one or more Association Test BSID, MSS may determine and perform any scanning or ranging or Association activities during Scanning Interval at its own discretion."

There are several problems with this procedure.

1. How they neighbor BS may predict when MSS arrives to their channel? Even MSS itself does not know precisely as worst case of DL synchronization latency is large: is it product of (# of frequencies to scan) x (# of GIs to try) x (# of preambles to try etc.) x (estimated # of frames to get synchronized to DL at proper frequency). For the first BS in the list of Test BSs it may be disputable, but certainly not for next BSs where latency of ranging is added by each previous BS.

2. Why should MSS request (and BS approve) for either scanning-only for all BSs or scanning-and-ranging for all BSs?

2. Suggested remedy

[Change Table 106g and following text]

Syntax	Size	Notes
MOB_SCN-REQ_Message_Format() {		
Management Message Type = 54	8 bits	
Scan duration	8 bits	Units are frames
~~Scan type~~	~~1 bit~~	~~0: Scanning~~ ~~1: Association~~
reserved	3 bites	Shall be set to zero
~~If (Scan type = 0) {~~	~~8 bits~~	
Interleaving interval	8 bits	Units are frames
Scan Iteration	8 bits	

~~}~~		
~~Else {~~		
For (j=0; j<N_Recommended_BS; j++) {		
Scan type	1 bit	0: Scanning 1: Association
Reserved	7 bit	
~~Association~~ Recommended ~~Test~~ BS ID	48 bits	Only included in case of Scan type = 1 “Association”
}		
~~}~~		
HMAC Tuple	21 bytes	
}		

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

Scan duration
Duration (in units of frames) of the requested scanning period.

~~**Scan type**~~
~~Operation that a MSS intends during Scanning Interval (0) Scanning (1) Association.~~

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

~~If Scan type is set to ‘0’, the following parameters shall be included in the MOB-SCN-REQ message:~~

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

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

Scan type
Operation that a MSS intends during Scanning Interval:
0 = Scanning
1 = Association.

~~If Scan type is set to ‘1’, the following parameters may be included in the MOB-SCN-REQ message:~~

~~**Association Test BS ID**~~ Recommended BS ID
~~Association Test~~ Recommended BS ID field may be included only if an MSS has a candidate available BS. If Scan type = 1 is encoded for specific Recommended BS, it means that MSS calls Serving BS for assistance to make appointment with the Recommended BS for Fast Ranging opportunity to perform association- ~~to associate~~. Multiple ~~Association Test~~ Recommended BS IDs may be included in the MOB-SCN-REQ message.

[Change Table 106h and following text]

Syntax	Size	Notes
MOB_SCN-RSP_Message_Format() {		
Management Message Type = 55	8 bits	
Scan duration	8 bits	Units are frames
if (Scan Duration ==0) {		
HMAC Tuple	21 bytes	
}		
else {		
Start frame	4 bits	
~~Scan type~~	~~1 bit~~	~~0: Scanning~~ ~~1: Association~~
~~reserved~~	~~7 bites~~	~~Shall be set to zero~~
~~If (Scan type = 0) {~~		
Interleaving interval	8 bits	Units are frames
Scan iteration	8 bits	
Report mode	2 bits	
Scan report period	8 bits	
Reserved	2 bits	
~~}~~		
~~Else {~~		
For (j=0; j<N_Recommended_BS; j++) {		N_Recommended_BS can be derived from the known length of the MAC message
Scan type	1 bit	0: Scanning 1: Association
Rendezvous time	15 bit	
~~Association Test BS ID~~ Recommended BS ID	48 bits	Only included in case of Scan type = 1 “Association”
~~}~~		
}		
HMAC Tuple		
}		
}		

Scan duration

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

Start Frame

Measured from the frame in which this message was received. A value of zero means that ~~it~~ first Scanning Interval starts ~~will start~~ in the next frame. ~~If Scan type=1 and multiple Association Test BS IDs are included in MOB_SCN-RSP message. The MSS may perform Association with the first Association Test BS at Start Frame and sequentially perform Association with each following Association Test BS in the message.~~

~~**Start type**~~
~~0 : BS approval of requested/directed Scanning operation~~
~~1 : BS approval of requested/directed Association operation~~

~~The Scan type field in MOB_SCN-RSP message shall have the same value as Scan type in MOB_SCN-REQ.~~

~~If Scan type is set to '0', the following parameters shall be included in the MOB_SCN-REQ message:~~

Interleaving interval
The period interleaved between Scanning Intervals when MSS ~~may~~ shall perform Normal Operation.

Scan iteration
The number of iterating scanning intervals

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

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

~~If Scan type is set to '1', the following parameters may be included in the MOB_SCN-REQ message,~~

Scan type
0 : BS approval of requested/directed Scanning operation
1 : BS approval of requested/directed Association operation

Rendezvous time
In case Scan Type = 1 this is an offset, measured in units of frame duration (of Serving BS), when the corresponding Recommended BS is expected to provide Fast 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 Fast Ranging opportunity within 5 frames interval starting from the frame specified by Rendezvous time parameter.

~~**Association Test BS ID**~~ Recommended BS ID
~~Recommended Association Test BS~~ Recommended BS ID list for Association. ~~If multiple Association Test BS IDs are included in the message, the MSS may perform Association in ascending order of the sequence of Association Test BS ID presented in the message.~~ Serving BS may request, over the backbone, ~~Association Test BS~~ from Recommended BS allocation of non-contention based initial ranging opportunity for MSS Association activity. When conducting initial ranging to ~~Association Test~~ Recommended BS, MSS shall use allocated non-contention based initial ranging opportunity, if available.

[Change in 6.3.20.1.2, p. 128 line 43]

In the MOB_SCN-REQ MAC management message the MSS, and in the MOB_SCN-RSP MAC management message the BS shall indicate either Scanning, Scan type = 0, or Association, Scan type = 1, as the intended MSS activity during the Scanning Interval. If Scan type = 1, Association, then the MSS and BS may include, in their respective messages, one or more ~~Association Test BSID~~ Recommended BS IDs. The BS may negotiate ~~send~~ over the backbone with ~~to~~ the ~~Association Test BS~~ Recommended BS ID ~~request to allocate~~ allocation of non-contention based ranging opportunity, at the appropriate timing interval, for MSS to conduct Association ranging with the ~~Association Test BS~~ Recommended BS ID. When conducting initial ranging to ~~Association Test BS~~ Recommended BS ID, MSS shall use allocated non-contention based initial ranging opportunity, if available. Regardless of value of Scan type and the presence of one or more ~~Association Test BSID~~ Recommended BS IDs, MSS may determine and perform any scanning or ranging or Association activities during Scanning Interval at its own discretion.