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Re:	This document is the reply of the call for contribution IEEEP802.16e/D2-2004
Abstract	This proposal is about Sector handover considering movement to the other sector in the same cell according to the sector architecture of 802.16d.
Purpose	Propose the sector HO scenario, method and enhanced management message using sector architecture of 802.16d for the IEEE802.16e Handoff Ad hoc group
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Inter-sector HO scenario

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Introduction

This proposal is about intersector handover considering movement to the other sector in the same cell according to the sector cell according to the sector architecture of 802.16d. The sector architecture is not clear and only inter BS handover is described in 802.16e system. The existing handover scenario and BS ID format in the 802.16e cannot support efficient handover between adjacent sector or cannot distinguish neighbor sector in the same cell when MSS moves from own serving sector to neighbor sector in the same cell. Therefore we propose Sector HO scenario, modified HO message and BS ID format considering those of 802.16e.

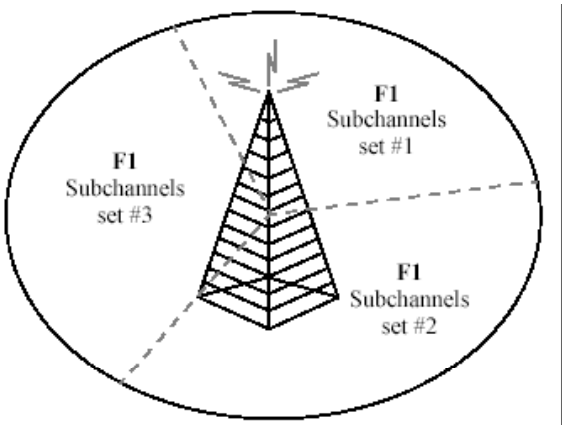

Figure 1. Sector architecture of 802.16d

Proposed Mechanism

The sector architecture in 802.16d is described in the Figure1. We propose the intersector HO considering the sector architecture which has one center frequency and divides the total bandwidth with sectors in the same cell. In this case the Sector is characterized by antenna beam pattern and there is just one Base station. So Initial ranging or Fast ranging don't be needed by MSS and serving BS if MSS moves from own serving sector to neighbor sector in the same cell. In addition to, Network re-entry process also don't be necessary because serving BS have known all of the information about MSS and just control channel allocation. The backbone network message flow doesn't be needed, also.

But the frame structure in the 802.16d/e cannot support sector architecture perfectly. The figure 1, sector architecture in the 802.16d, just show that each individual sector use sub channel set divided by 3 sectors and don't; describe how the sub-channel set is allocated.

There is two case of frame structure for sector architecture supporting downlink control plane (ex. DL MAP/ UL MAP/UCD/DCD). First, the total bandwidth is divided as the number of sectors in one cell except preamble and each sector has individual downlink control plane. Second, the remained bandwidth is divided as the number of sector in the one cell except preamble and control plane, so each sector has common downlink control plane. BS shall allocate sub channel to MSS in the regard to sector region if BS use the

second frame structure. The interference to neighbor sector in other cell may not exist using the first frame structure and efficiency of bandwidth is more effective than the first frame structure using second frame structure.

Intersector HO can be combined with interBS HO to distinguish between own sector and neighbor sector if BS-ID is encoded as table 1 in the 802.16e

<Table 1> BS-ID encoding

BS_ID{	
Basestation ID	40 bit
Sector ID	8 bit
}	

The different preamble sequence pattern shall be allocated to each sector and MSS shall scan the CINRs of preamble of neighbor sectors. MS shall request handover to BS by sending MSSHO REQ message if there is more higher received CINR of neighbor sector than the CINR of serving sector. BS and MSS shall process as the case of intersector HO if the sector having the biggest CINR is neighbor sector in the same cell. MSS and BS shall send and receive air message and BS has no necessary to send backbone messages. Then BS shall re-allocate sub-channel in the regard to changed sector region.

Proposed Text Changes

3.75 BS-ID

BS ID must be composed of Basestation ID and Sector ID as Table 1 to distinguish neighbor sector from own sector in the same cell.

<Table . 1> BS-ID encoding

BS_ID{	
Basestation ID	40 bit
Sector ID	8 bit
}	

6.3.2.3.56 HO Indication (MOB-HO-IND) message

An MSS shall transmit a MOB_HO-IND message for final indication that it is about to perform a HO. When the MSS cancels or rejects the HO, the MSS shall transmit a MOB-HO-IND message with appropriate HO_IND_type field. In the intersector HO, the MSS shall transmit a MOB-HO-IND message with HO_type is intersector HO serving BS not to release the MSS resource. The message shall be transmitted on the basic CID.

Syntax	Size	Notes
MOB_HO_IND_Message_Format(){		
Management Message Type = 56	8 bits	
HO type	2 bits	00: Inter BS HO 01: Inter-sector HO 10-11: reserved
Reserved	~~6~~4 bits	Shall be set to zero

HO_IND_type	2 bits	00: Serving BS release 01: HO cancle 10: HO reject 11: reserved
Target_BS_ID	48 bits	Applicable only when HO_IND type is set to 00
HMAC Tuple	21 bytes	
}		

6.3.20.2 HO process

The section defines the HO process in which an MSS migrates from the air interface provided by one BS to the air interface provided by another BS. The HO process consists of the stages:

Cell Reselection — MSS may use Neighbor BS information acquired from a decoded MOB_NBRADV message, or may make an independent decision to schedule scanning intervals or sleep intervals to scan, and possibly range, Neighbor BS for the purpose of evaluating MSS interest in handover to potential Target BS. The Cell Reselection process need not occur in conjunction with any specific, contemplated HO Decision.

HO Decision & Initiation —A handover begins with a decision for an MSS to handover its air interface, service flow, and network attachment from a Serving BS to a Target BS. The decision may originate either at the MSS, the Serving BS, or the network manager. The HO Decision consummates with a notification of MSS intent to handover through MOB_xxxHO-REQ.

Target BS Scanning —MSS shall scan Target BS for downlink channel & synchronization and uplink channel & synchronization. If MSS had previously decoded a MOB-NBR-ADV message including Target BS ID, Physical Frequency , DCD and UCD, then the scanning and synchronization process may be shortened. If the Target BS had previously received HO notification from Serving BS over the backbone (see section Backbone network HO procedures), then Target BS may place a non-contention based Fast_UL_ranging_IE MSS Initial Ranging opportunity in the UL-MAP. MSS shall scan Target BS for UL-MAP that includes either a contention or non-contention based MSS Initial Ranging opportunity. In the case of sector handover, MSS doesn't need to perform ranging or fast ranging since the synchronization of both downlink channel & uplink channel are maintained in the same cell.

—Network Re-entry —
MSS and Target BS shall conduct Ranging per 6.2.9.5 to begin network re-entry. If MSS RNG-REQ includes an unexpired Serving BS ID and Target BS had not previously received MSS information over the backbone (see section Backbone network HO procedures), then Target BS may make an MSS information request of Serving BS over the backbone network and Serving BS may respond. Regardless of having received MSS information from Serving BS, Target BS may request MSS information from an Authorizing Station via the backbone network. Network re-entry proceeds per 6.2.9.5 except as may be shortened by Target BS possession of MSS information obtained from Serving BS over the backbone network. Network re-entry process completes with establishment of MSS normal operations. MSS doesn't need to perform network re-entry in the case of intersector HO because serving BS already knows all information about MSS.

—**Termination of Service** — The final step in hand over is any termination of MSS services with previous Serving BS. Termination of Service is defined as Serving BS termination of all connections belonging to the MSS and the context
associated with them (i.e. information in queues, ARQ state-machine, counters, timers, etc…, is discarded).
But the termination of service shall not be performed in the case of intersector HO because the target BS is coincident with the serving BS.

The HO process, and its similarity to the initial network entry process, is depicted in Figure 141h.

6.3.20.2.2 HO decision & initiation

[Insert the flowing text at the page 46, Line 24-25]
When MOB-MSSHO-REQ is sent by an MSS, the MSS may indicate one or more possible Target BS. The target BS may be a neighbor sector in the same cell. When MOB-BSHO-REQ is sent by a BS, the BS may indicate the recommended Target BS. MSS may evaluate possible Target BS through previously performed scanning, ranging, and Association activity.

[Insert the flowing text at the page 46, Line 38-39]

MSS actual pursuit of hand-over to Target BS in MOB_xxxHO-RSP is recommended, but not required. MSS may elect to attempt hand-over to a different Target BS, a Target BS that may or may not have been included in MOB_xxxHO-RSP, with the understanding that the different Target BS may not receive notification of the pending handover from the Serving BS over the backbone network prior to MSS Initial Ranging of Target BS (see section Backbone network HO procedures). If the target BS of the biggest CINR is neighbor sector in the same cell, BS has no need to communication with backbone network. If the MSS signals rejection of Serving BS instruction to HO through HO_IND_type field in the MOB_HO-IND set value of 10 (HO reject option), the BS may reconfigure the Target BS list and retransmit MOB_BSHO-RSP message including a new Target BS list.

[Insert the following paragraph at the end of page 46 , line 52]
If the MSS sends MOB_HO-IND with option HO_type = 01, it shows that target BS is neighbor sector in the same cell. Then, BS has no need to allocate raging code or fast ranging IE to MS. Serving BS may reallocate the air resource in own bandwidth for MS in the case of intersector HO.

6.3.20.2.5 Termination with the Serving BS

[Insert the following paragraph at the end of page 47 , line 23]
But the termination of service shall mot be performed in the case of intersector HO because the target BS is the serving BS.

6.3.20.4 Network entry/re-entry

[Insert the following paragraph at the end of page 48 , line 36]

But the ranging or fast ranging process of target BS shall not be performed in the case of intersector HO because downlink channel & synchronization and uplink channel & synchronization is maintained in the same cell. And the network re-entry and also shall not be performed because the serving BS already knows all information about MSS.

Figure 141j shows the SDL of an MSS initiating handoff with the BS.

[Insert the following scenario at the end of Figure E.13]

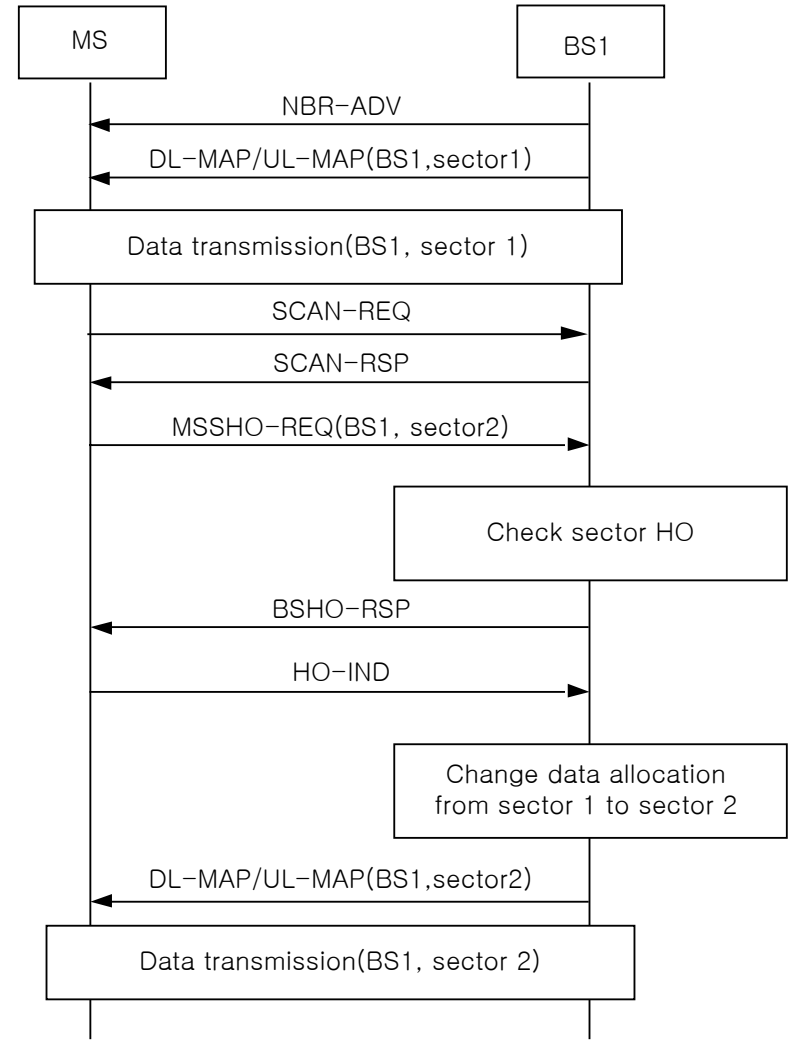

Figure E.14—Example Intersector HO process by MSS's request and decision of Target BS

[Insert the following scenario at the end of Figure F.5]

F.1.3 Intersector Handover by MSS request

Figure F.6—InterSector HO process block diagram in MSS by MSS request

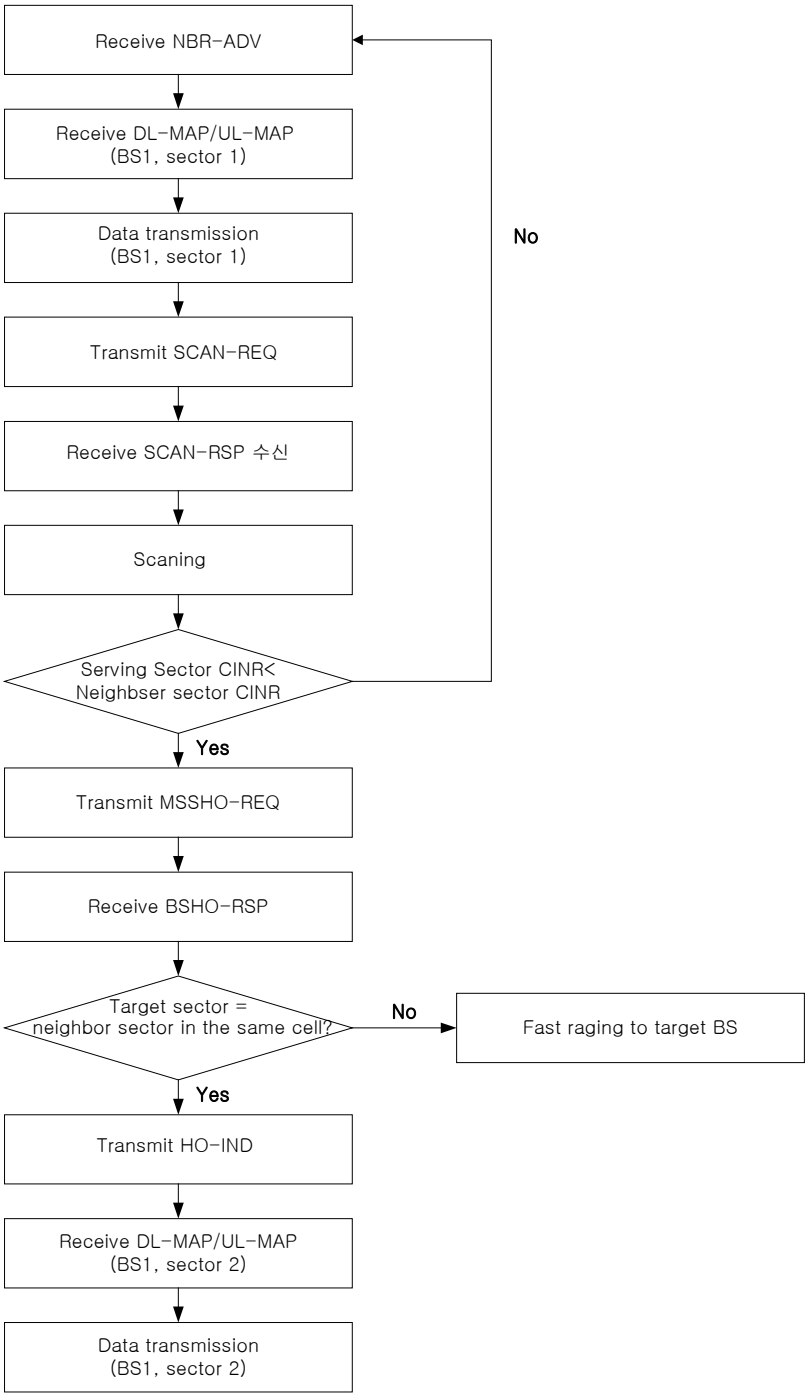

Figure F.7—InterSector HO process block diagram in BS by MSS request