# Overall HO procedures for IEEE 802.16

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This document is to explain overall scanning and HO operation for the IEEE 802.16e. This document describes a call flow and flow chart to assist understanding of HO operation for IEEE802.16e

## Purpose
Propose overall scenarios of scanning and handoff for IEEE 802.16

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Overall Handoff procedures for IEEE 802.16e

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1 Introduction
The document, which is a response contribution to commentary # 112 in the last meeting, is to describe overall scanning and HO operation in IEEE802.16e. We show the operation of scanning by MSS request, scanning by BSS request, periodic scanning during HO process, HO by MSS request and HO by BSS request. However, current draft does not specify and contain the procedures previously proposed and introduced. Therefore, here we propose changed parameters, call flow diagram and some miscellaneous changes in order to make firm the IEEE802.16e specification for supporting the mobility.

2 Proposed Scenarios of Scanning and Handoff

2.1 Functionality

2.1.1 Request to scan neighbors by BS
—HO by BS request may be generated. If the quality of received power of MSS is bad BS may request MSS to scan neighbor BSs and to handoff to the neighbor BS having better S/(I+N). So, BS must be able to request MSS to send SCAN_RSP message and scan neighbor BSs without requesting to scan by MSS.

2.1.2 Periodic scanning during HO process
—During HO process, MSS can return to the cell coverage of serving BS. So the periodic scanning neighbor BSs during HO process is necessary to detect this situation. If MSS detect that S/(N+I) of serving BS is better than S/(N+1) of target BS during certain time MSS shall cancel HO process.

2.1.3 HO by BS request
BS may request MSS to handoff in the case of heavy load or requesting to handoff by force. BS must choose one target BS among neighbor BSs having enough of S/(N+1) to handoff. So, MSS receiving of BSHO_REQ message shall scan neighbor BSs and send HO_RSP message including neighbor BSs having enough of S/(N+1) to handoff. Then BS choose the target BS among the list selected by MSS and know the target BS to handoff.

3 Text to be inserted into standard

6.2.2.3.45 Scanning Interval Allocation Response (MOB_SCN-RSP) message
A MOB_SCN-RSP message shall be transmitted by the BS in response to an MOB_SCN-REQ message sent by an MSS and may be transmitted by the BS to request of MSS scanning neighbor in unsolicited manner. The format of the MOB_SCN-RSP message is depicted in Table 56af.

6.2.2.3.46 BS HO Request (MOB_BSHO-REQ) message
The BS may transmit a MOB_BSHO-REQ message when it wants to initiate an HO. A MSS receiving this message shall scan recommended neighbor BSs in this message. The message shall be transmitted on the basic CID.
Annex D Messages sequence charts (MSCs)
This annex provides MSCs for the procedures of handoff and sleep mode operations.

D.1 Handoff MSCs
D.1.1 Neighbors advertisement and scanning of neighbors
The following figures describes the messages flow for neighbors advertisement and scanning of neighbors by the MSS request, BSS request and periodic scanning of neighbors during Handoff.
Figure D.2—Example of BS advertisement and MSS scanning (with association) by MSS request.
MOB_NBR_ADV
(N_Neighbors = 2)

MOB_SCAN_RSP
(start in M frames)
(duration = N frames)

Receive parameters for BS#2 and BS #3

Synchronize with BS#2
measure S/(N+I)

Synchronize with BS#3
measure S/(N+I)

Figure D.3—Example of BS advertisement and scanning (without association) by BSS request
Receive parameters for BS #2 and BS #3

MOB_NBR_ADV
(N_Neighbors = 2)

MOB_SCAN_RSP
(start in M frames)
(duration = N frames)

Synchronize with BS #2
measure S/(N+I)

Synchronize with BS #3
measure S/(N+I)

Association-Initial-Ranging

RNG-RSP(with service level)

Association-pre-registration

Association-Initial-Ranging

RNG-RSP(with service level)

Association-pre-registration

Scanning Interval
Duration = N frames

M frames

Figure D.4—Example of BS advertisement and scanning (with association) by BSS request
D.1.2 Handoff

Figure D.5—Example of periodic scanning during Handoff process
Figure D.3—BS Initiated HO

MOB_MSS_HO_REQ

(MOB_HO_REQ)

(Release of MSS)

Fast Ranging_IE (UL_MAF)

RNG_REQ

RNG_RSP

Complete Initial Network Entry (after Handoff)
Figure D.4—MSS Initiated HO
Figure D.6 HO process by MSS request
MOB_BSHO_REQ
(Recommended BS = BS#2, BS#3, BS#4)

Trigger to release MSS

BS #1
(serving)

BS #2
(target)

BS #3
(target)

BS #4
(target)

MOB_HO_RSP
(recommended BS = BS#2, BS#3)

HO-notification
(MSS identifier, connection parameter, capabilities, required BW and QoS)

MOB_HO_RSP
(recommended BS = BS#2, BS#3)
(BS#2 service level prediction = 1)
(BS#3 service level prediction = 2)

MOB_HO_IND
(target BS = BS#3)

Release of MSS

Fast_Ranging_IE(UL_MAP)

RNG_REQ

RNG_RSP

Complete Initial Network Entry (after Handoff)
Annex E Block Diagram
This annex provides Block Diagram for the procedures of handoff

E.1 Handoff Block Diagram
E.1.1. Handoff by MSS request

Figure E.1 HO process block diagram in MSS by MSS request
Send NBR_ADV to MSS

Receive SCAN_REQ?
- YES
  - Send SCN_RSP to MSS
  - NO
    - Receive MSSHO_REQ?
      - YES
        - Send HO-notification to all recommended target BSs
        - Receive HO-notification-response from all recommended target BSs
        - Select Target BS to HO
        - Send HO-notification-confirm to selected target BS
        - Send HO_RSP to MSS
        - Receive HO_IND from MSS
        - Release MSS
      - NO

Figure E.2 HO process block diagram in Serving BSS by MSS request
E.1.2. Handoff by BSS request

HO process block diagram in Target BSS by BSS request is same to HO process block diagram in Target BSS by MSS request.
Receive NBR_ADV (serving BS)

NO

Receive BSHO_REQ(serving BS)?

YES

Scanning neighbor BSs

Select recommended BSs list

Send HO_RSP(serving BS)

Receive HO_RSP(serving BS)

Send HO_IND(serving BS)

Receive Fast_Ranging_IE (target BS)

Send RNG_REQ(target BS)

Receive RNG_RSP(target BS)

Figure E.4 HO process block diagram in MSS by BSS request
Figure E.5 HO process block diagram in Serving BSS by BSS request