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Title	**Handoff text clarifications and enhancements**
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Re:	Contribution on comments to IEEE P802.16e/D2
Abstract	Contribution elaborating on HO process optimization
Purpose	To be integrated into IEEE P802.16e/D2 document
Notice	
Release	
Patent Policy and Procedures	

HO text clarifications and enhancements

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1   Introduction

The OFDMA PHY defined in the 802.16e uses a HO process that has been mostly inherited from 802.16a initial network entry procedure. This contribution attempts to reduce the number of over-the-air-link message exchanges, to speed-up the HO process.

2   Message exchanges during HO that may be optimized

Figure 1 below depicts the current initial network entry and HO process. Several message exchanges having to do with HO can be streamlined or postponed in order to speed-up the HO process.

1. RNG-REQ/RSP exchange – A Non-contention RNG-REQ/RSP (otherwise known as 'invited ranging') should by the target BS. This should be possible by using the timing estimation fields in the HO messages. One RNG-REQ/RSP exchange should suffice, because the SS has most of the information required to send the RNG-REQ message with nearly correct parameters (i.e. timing and power).

2. SBC-REQ/RSP exchange – This exchange can be postponed until after the MSS completes the HO process and settles back in Normal mode. In the meanwhile the BS and MSS will only communicate using mandatory features of the standard.

3. PKM-REQ/RSP exchange – This exchange could be skipped if we do pre-authentication before HO, via the backbone. In such case, the MSS and the target BS will share a secret, that can be used after HO to derive a TEK, such that PKM can continue its operation seamlessly.

4. BW allocation for the MSS for message exchanges – It may be worthwhile to add text describing what is expected of the BS during the HO process in terms of allocating UL BW for the MSS for speedy HO.
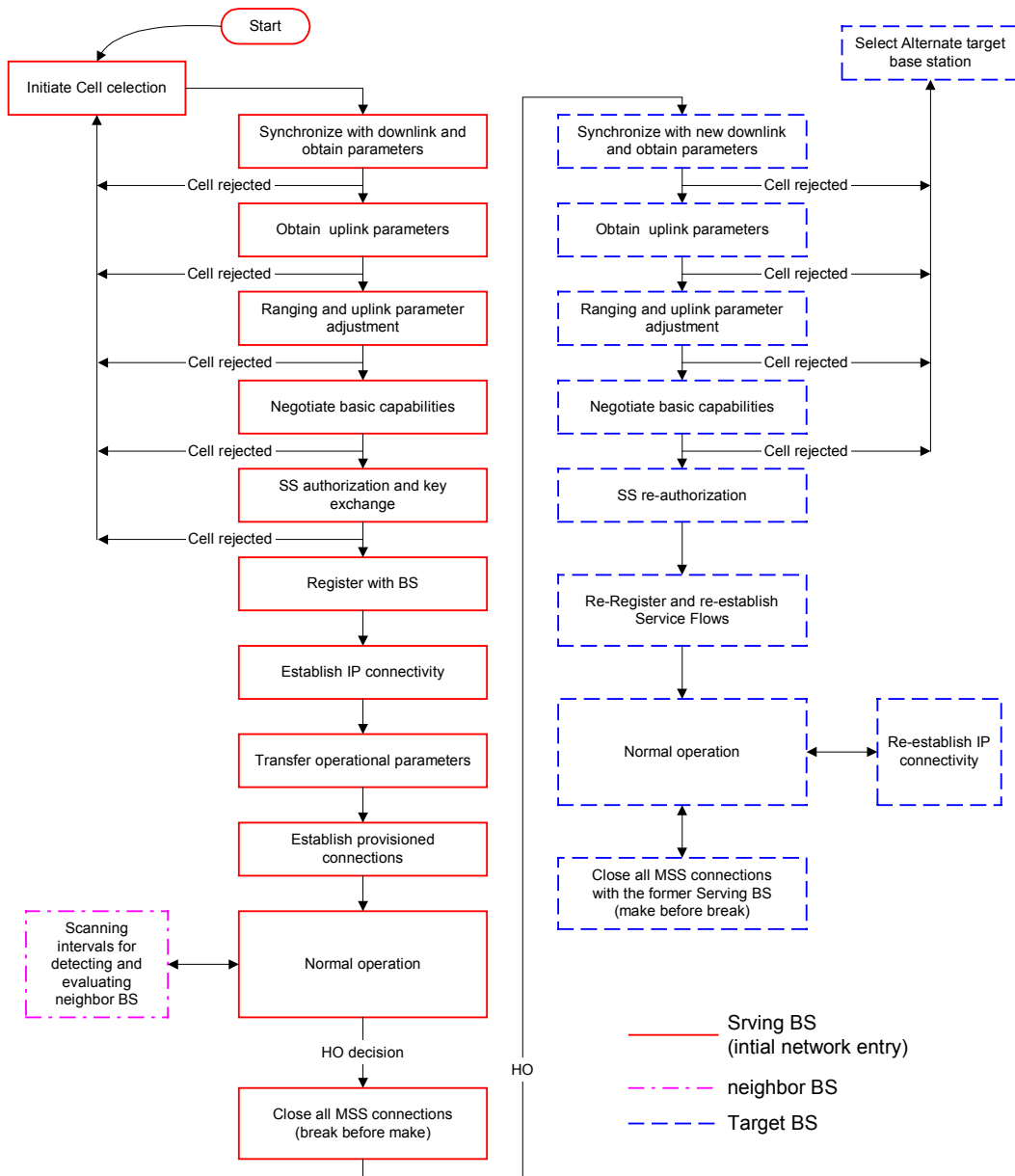
Figure 1: HO process

3   Specific proposed text changes

In page 47, line 61, to page 48, line 36, modify the text as shown below:

6.3.20.4 Network entry/re-entry

~~Unless otherwise indicated in this section, MSS mobile network entry/re-entry is processed according to 6.4.9. For purposes of this process, MSS network re-entry and hand-over are synonymous.~~

Systems shall support the applicable procedures for re-entering the network. The procedure for re-entering the network is shown in Figure 141h. This figure shows the overall flow between the stages of network re-entry in an SS. It shows no error paths and is shown simply to provide an overview of the process. The more detailed finite state machine representations of the individual sections (including error paths) are shown in the subsequent figures. Timeout values are defined in 10.1.

The procedure can be divided into the following phases:

a) Synchronize with new downlink and obtain parameters

b) Obtain uplink parameters

c) Perform ranging

d) Authorize SS and perform key exchange

e) Re-register and re-establish service flows

f) Operational state

f.1) Negotiate basic capabilities

f.2) Optional: Re-establish IP connectivity

f.3) Optional: Re-establish time of day

Implementation of phases (f.2) and (f.3) at the MSS is optional. These phases shall only be performed if the MSS has indicated in the REG-REQ message that it is a managed MSS.

6.3.20.4.1 Synchronize with new downlink and obtain parameters

After switching to the target BS channel, the MSS shall acquire the downlink channel. Once the PHY has achieved synchronization, as given by a PHY Indication, the MAC shall attempt to acquire the channel control parameters for the downlink and then the uplink. The procedures define in 6.3.9.2 shall apply for obtaining DL parameters. Note that the information provided during initial network entry via the DCD message is typically available to the MSS by virtue of previous receptions MOB-NBR-ADV.

6.3.20.4.2 Obtain uplink parameters

After synchronization, the MSS shall wait for a UL-MAP message from the BS. Unless the MSS has received a MOB-NBR-ADV message with a 'UCD_settings' TLV whose 'UCD Count' field matches the 'UCD Count' field in the UL-MAP, the MSS shall also wait for a UCD message from the BS in order to retrieve a set of transmission parameters for a possible uplink channel. The process of obtaining uplink parameters is illustrated in Figure 56 (in 6.3.9.3).

6.3.20.4.3 Initial ranging and automatic adjustments

MSS and Target BS shall conduct Ranging per 6.43.9.5 and 6.3.9.6 to begin network entry/re-entry except as MSS may take advantage of a non-contention based MSS Initial Ranging opportunity if present. Such non-contention based opportunity to send a RNG-REQ message may be granted by the target BS. The target BS may rely for this purpose on the 'Estimated HO start' field present in the MOB-MSSHO-REQ/RSP messages, as provided to the it from a former serving BS (possibly via the backbone). If MSS RNG-REQ includes an 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 another network management entity via the backbone network. Network re-entry proceeds per 6.4.9.5 except as may be shortened by Target BS possession of MSS information obtained from Serving BS over the backbone network.

Following the initial-ranging process, during initial-network entry, the MSS and the BS negotiate basic capabilities (6.3.9.7). During network reentry this negotiation is postponed. Communications between the BS and the MSS shall only use mandatory PHY capabilities until the basic capabilities negotiation is executed.

6.3.20.4.4 SS authorization and key exchange

The BS and MSS shall perform authorization and key exchange as described in 7.2. If the BS and MSS performed the pre-authorization procedure described in 7.xx, the BS and MSS already share an AK, which shall be used in the authorization exchange.

If MSS RNG-REQ included an Serving BS ID and Target BS had previously received an backbone message (see section Backbone network HO procedures) containing MSS information, MSS and Target BS shall use the embedded TLV PKM-REQ information and the re-authorization process as defined in 7.2.

6.3.20.4.5 Registration

If Target BS had previously received a~~n~~ backbone message (see section Backbone network HO procedures), Target BS may use the embedded TLV REG-REQ & DSA-REQ information to build and send an unsolicited REG-RSP message. The REG-RSP message may include a <u>CID_update</u> ~~New_CID, Old_CID and Connection_Info~~ TLV~~s~~. Target BS may ignore only the first REG-REQ message received if it sends an unsolicited REG_RSP message. MSS is not required to send an REG-REQ if it receives an unsolicited REG-RSP prior to MSS attempt to send REG-REQ.

If MSS RNG-REQ included a~~n~~ Serving BS ID, MSS and Target BS may skip Time of day process.

If MSS RNG-REQ included a~~n~~ Serving BS ID, MSS may skip the MSS configuration file download procedure.

If MSS received a REG-RSP message that included <u>CID_update</u> ~~New_CID, Old_CID and Connection_Info~~ TLV~~s~~, MSS and Target BS may skip the establish connections procedure.

Network entry/re-entry process completes with establishment of MSS Normal Operations.

On page 44, line 6, replace figure 141h with the figure below,