Relay Handover

IEEE 802.16 Presentation Submission Template (Rev. 8.3)

Document Number:
IEEE S802.16j-06/190

Date Submitted:
2006-11-07

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Venue:
Session #46; Dallas, TX, USA.

Base Document:
IEEE C80216j-06_190.doc

Purpose:
This contribution proposes relay handover procedure.

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Introduction

• This contribution proposes Hard Handover procedures for the relay network

• Two aspects are covered
  – MS Handover in Relay Network
  – Mobile RS Handover
MS Handover in Relay Network

- Introduces two levels of mobility mgmt (MS<>RS, and RS<>MMR-BR)
- Makes RS and system more complex
- HO are more often, as RS changes more frequently than the BS.

- Less complex and cheaper RS
- No change from the 16e mobility model, where BS holds the mobility state.
- Less handovers in the system, as the BS is a higher entity in the air interface hierarchy.

Keep HO states in MMR-BS, unchanged from 802.16e-2005
Ranging with target RS

- MS performs handover as in 16e by exchanging same Mobility signaling with serving and target BS/MMR-BS.
- MS need to do Ranging with the RS. Refer to Ranging in 802.16j (MMR) System, IEEE C80216j-06_193.doc.
Summary of different MS Handover Scenarios

1 = 16e mobility procedure
2 = 16e mobility procedure + Ranging with RS & MMR-BS

<table>
<thead>
<tr>
<th>Serving \ Target</th>
<th>BS</th>
<th>FRS</th>
<th>MRS</th>
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<tr>
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<tr>
<td>MRS</td>
<td>1</td>
<td>2</td>
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</tbody>
</table>
Mobile RS Handover

- This contribution proposes Hard Handover procedure for mobile RS
- Mobile RS introduces another leg of mobility between RS and MMR-BS links
## Mobile RS Handover

- When a mobile RS moves, it moves all the attached MS using existing Mobility messages from 16e.
- It gets a list of MAC addresses or HO_ID identifying all the attached MS during HO preparation.
- The target BS allocates CIDs using the MAC Address or HO_ID list.
- If the target MMR-BS shares security association (SA) with the MSs and RS, the following occurs:
  - Calculates HMAC/CMAC for each station
  - Encodes RNG-RSP for each MS with full MAC header
  - Encapsulates the above RNG-RSPs in RS_RNG-RSP and sends it to RS
  - RS verifies own HMAC/CMAC, decapsulates individual RNG-RSP and forwards them to MS
  - MSs verifies their own HMAC-CMAC and accepts CID
Mobile RS Handover Procedure

- MOB_MSHO-REQ
- MOB_BSHO-RSP (MAC Addresses or HO_IDs of MS1, and MS2)
- MOB_HO-IND
- RNG-REQ (MAC Addresses of MS1, and MS2; BS-s ID)
- RS_RNG-RSP with HMAC/CMAC
  (RNG-RSP for MS1 with HMAC/CMAC; RNG-RSP for MS2 with HMAC/CMAC)

If BS-t shares security association with RS and MSs, it calculates HMAC/CMAC for each station accordingly.
MS handover in/out of Mobile RS

• Handover state stays anchored in the BS as in 16e
• RS transparently relays the MAC Mobility messages
Mobile RS HO to Fixed RS

- Ranging procedure is same as slide-4
- FRS transparently relays the MAC Mobility messages
Conclusion

• Contribution provides text for
  – MS Handover in Relay
  – mobile RS handover

• MS Handover in Relay
  – Not different from 16e; adopt ranging from IEEE C80216j-06_193.doc

• Mobile RS Handover
  – It is faster, as only one station (RS) is involved instead of multiple MS. Easier and faster to schedule one station for the fast ranging.
  – It is bandwidth efficient. There is only one set of signaling message over the RS-BS link for all the MS attached through the RS.
  – It introduces minor changes to the existing mobility related messages from 802.16e-2005.
    • Existing messages are used with the addition of few TLVs
    • One new message is needed between MMR-BS and MRS
  – The proposal does not change any MS behavior

• More details and proposed spec changes are in C80216j-06_190.ppt