

# Handover Schemes in IEEE802.16j

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- . Propose handover schemes for IEEE802.16j

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# Handover Schemes in IEEE 802.16j

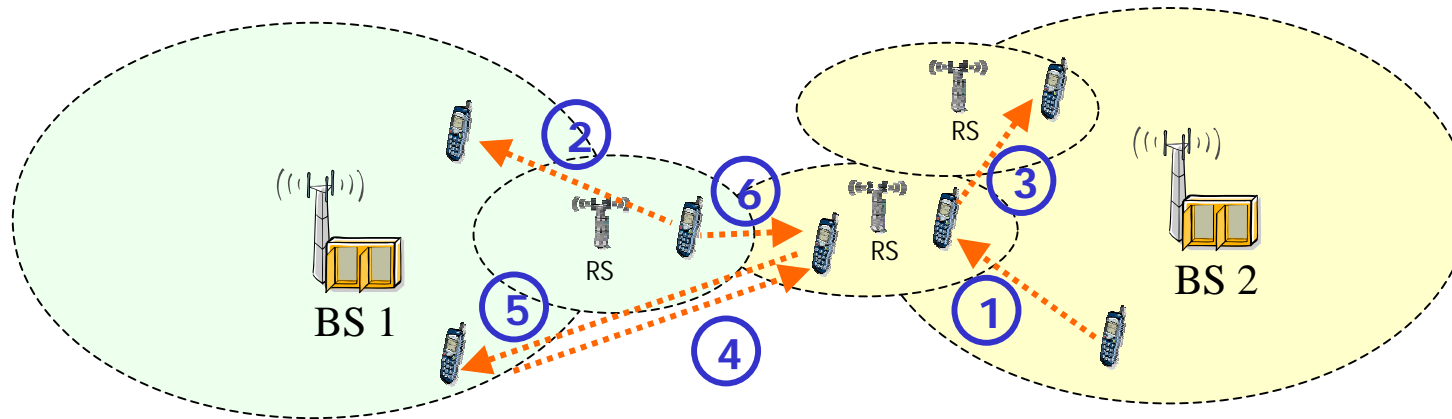
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# Outline

- Handover scenarios with RS involvement
- Classification of handover scenarios
- Handover target selection
- RS mobility
- Summary

# Handover Scenarios with RS involvement



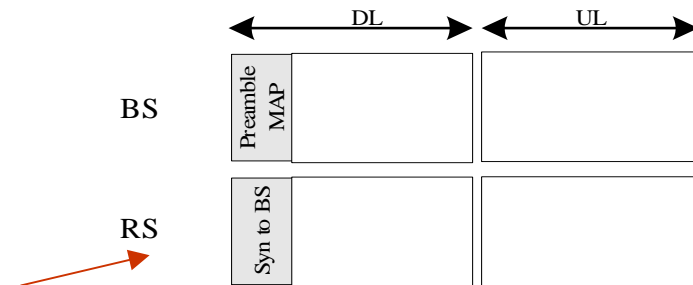
- Intra-BS handover with RS involvement
  - Within one BS coverage
  - $BS \rightarrow RS$ ,  $RS \rightarrow BS$ ,  $RS \rightarrow RS$
- Inter-BS handover with RS involvement
  - Across BS
  - $BS \rightarrow RS$ ,  $RS \rightarrow BS$ ,  $RS \rightarrow RS$
- Different relay frame structure definition leads to different handover procedures

# Possible Relay Frame Structure Definition

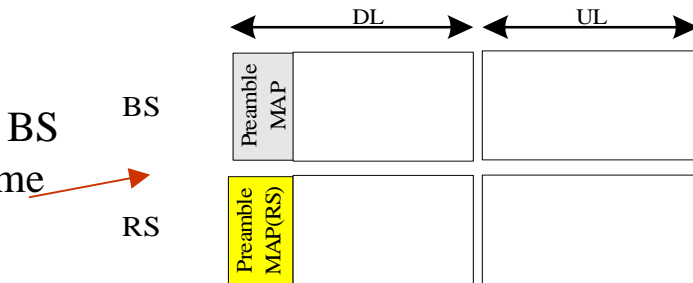
- Two strategies of relay frame structure

- **Synchronous-broadcast frame structure**

- **No broadcast info. relay:** RS does not relay broadcast information
  - Refer to C80216mmr-05\_023 in session #40

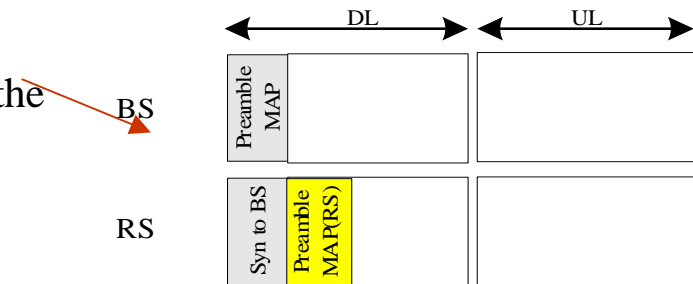


- **Synchronized broadcast info. relay:** RS and BS send the same broadcast information at the same time



- **Asynchronous-broadcast frame structure**

- RS and BS send the broadcast information at the different time

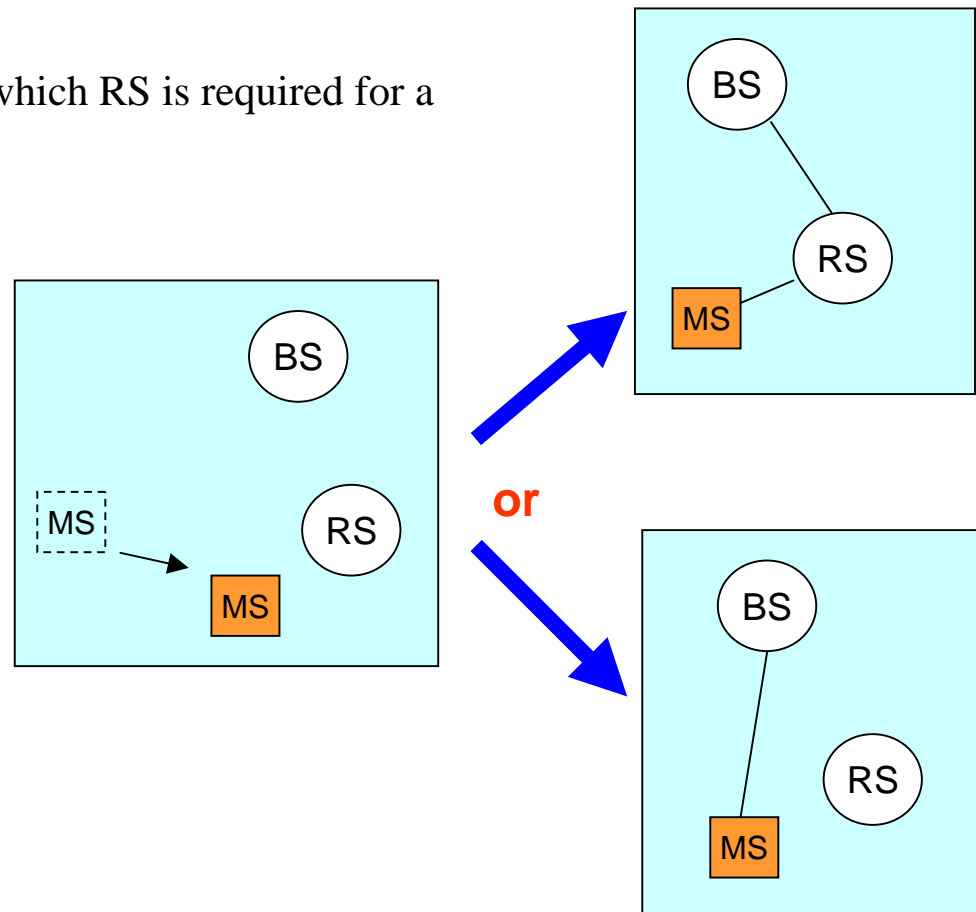


# Classification of Handover Scenarios

- Synchronous-broadcast frame structure
  - Intra-BS roaming
    - Synchronized to the same preamble
    - BS selects suitable RS for relaying
    - This RS selection or termination process is invisible to MS
  - Inter-BS roaming
    - MS first performs legacy inter-BS handover procedure
    - The target BS evaluates and selects suitable RS for relaying at network re-entry
- Asynchronous-broadcast frame structure
  - RS has its own preamble at the different time from BS
    - MS regards RS as a BS
  - For any roaming between RS and BS, MS has to re-synchronize to the target preamble.
    - MS performs legacy handover procedures in both Intra-BS and Inter-BS roaming

# Handover Target Selection with RS Involvement

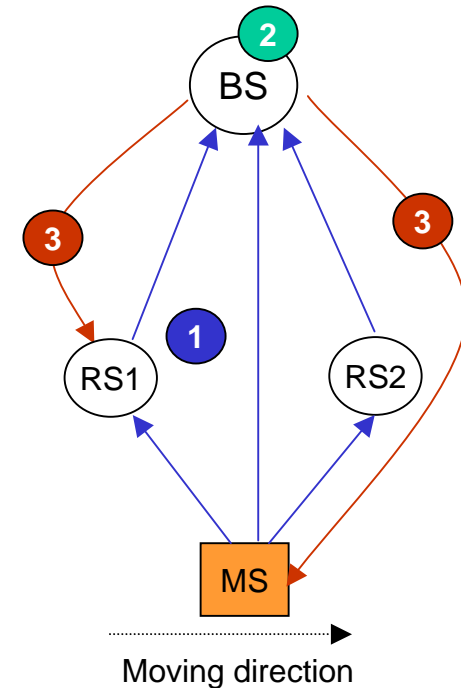
- **What is handover target selection**
  - BS decides whether RS or BS, and which RS is required for a specified MS relaying
- **Target selection strategies**
  - Comparison between MS-BS and MS-RS is not sufficient to decide the handover target
  - Possible complete paths comparison (e.g. MS-RS-BS vs. MS-BS)
- **Target selection metrics**
  - Link quality (CINR,...)
  - MS power level
  - Multi-hop bandwidth efficiency
  - QoS requirement
  - Traffic load
  - etc.



# Handover Target Selection

(Synchronous-broadcast relay, intra-BS roaming)

- Handover target selection is transparent to MS.
  1. Link quality monitoring
    - MS signal quality monitored by RS, and also by BS if the signal can reach BS
      - UL data burst, ranging
    - RS selects MSs with high signal quality and reports related measurement results to BS
  2. Handover target selection
    - BS makes the decision as to handover target selection based on the comparison of possible paths
      - E.g.  $MS \leftrightarrow BS$ ,  $MS \leftrightarrow RS1 \leftrightarrow BS$ ,  $MS \leftrightarrow RS2 \leftrightarrow BS$
  3. Notification to MS and RS
    - RNG-RSP for MS adjustment
      - Power level, timing offset, etc.
    - BS notifies RS the handover target selection



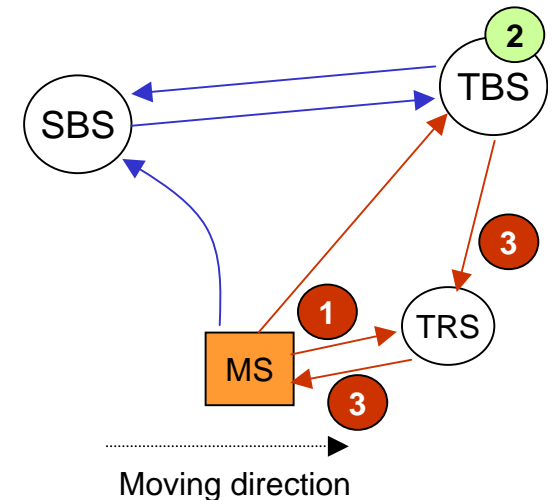


# Handover Target Selection

(Synchronous-broadcast relay, inter-BS roaming)

- MS first performs legacy inter-BS handover procedures
- The target BS evaluates and selects suitable RS for relay at network re-entry

1. Link quality monitoring of MS ranging signal at re-entry of TBS
  - MS ranging signal quality monitored by TRS, and also by TBS if the signal can reach TBS
  - TRS forward MS ranging request and also report measurement results to TBS
2. Handover target selection decision
3. Notification to MS and RS

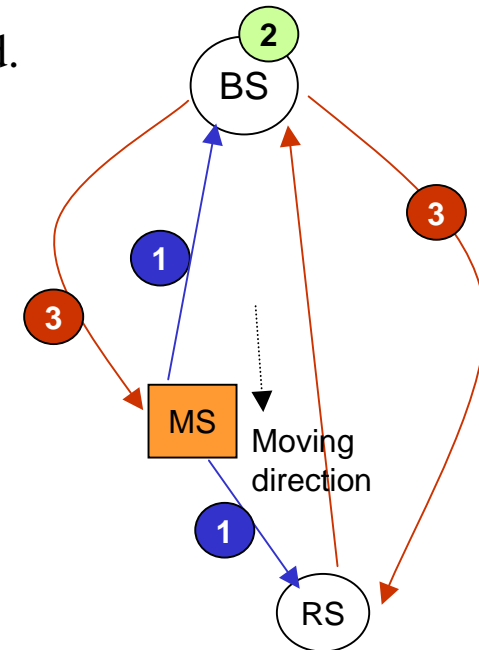


*Handover Target selection  
in HO re-entry phase*

# Handover Decision

(Asynchronous-broadcast relay, intra-BS roaming)

- MS performs legacy handover procedures in intra-BS roaming
  - BS evaluates and selects handover target in HO decision period.
1. Link quality monitoring
  2. Handover trigger and decision
    - Considering RS measurement reports, BS compares possible paths with / without RS to select suitable handover target in handover decision
  3. Complete the legacy handover process
    - Synchronization to target, ranging, and network re-entry
    - If the handover target is RS, MS just takes it as a BS to conduct legacy handover process



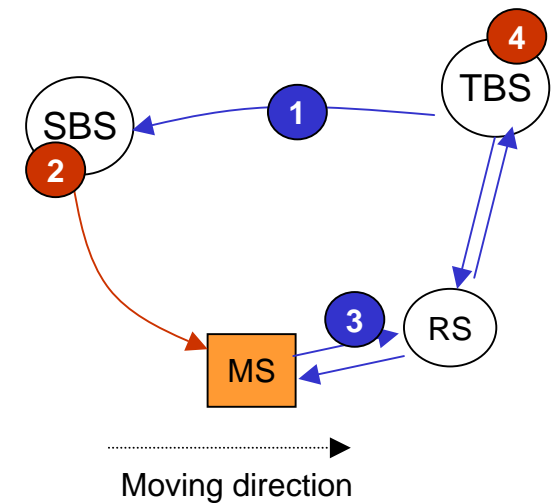
*Handover Target selection  
in HO decision phase*

# Handover Decision

(Asynchronous-broadcast relay, inter-BS roaming)

- MS performs legacy handover procedures
- BS evaluates and selects handover target in HO decision period.

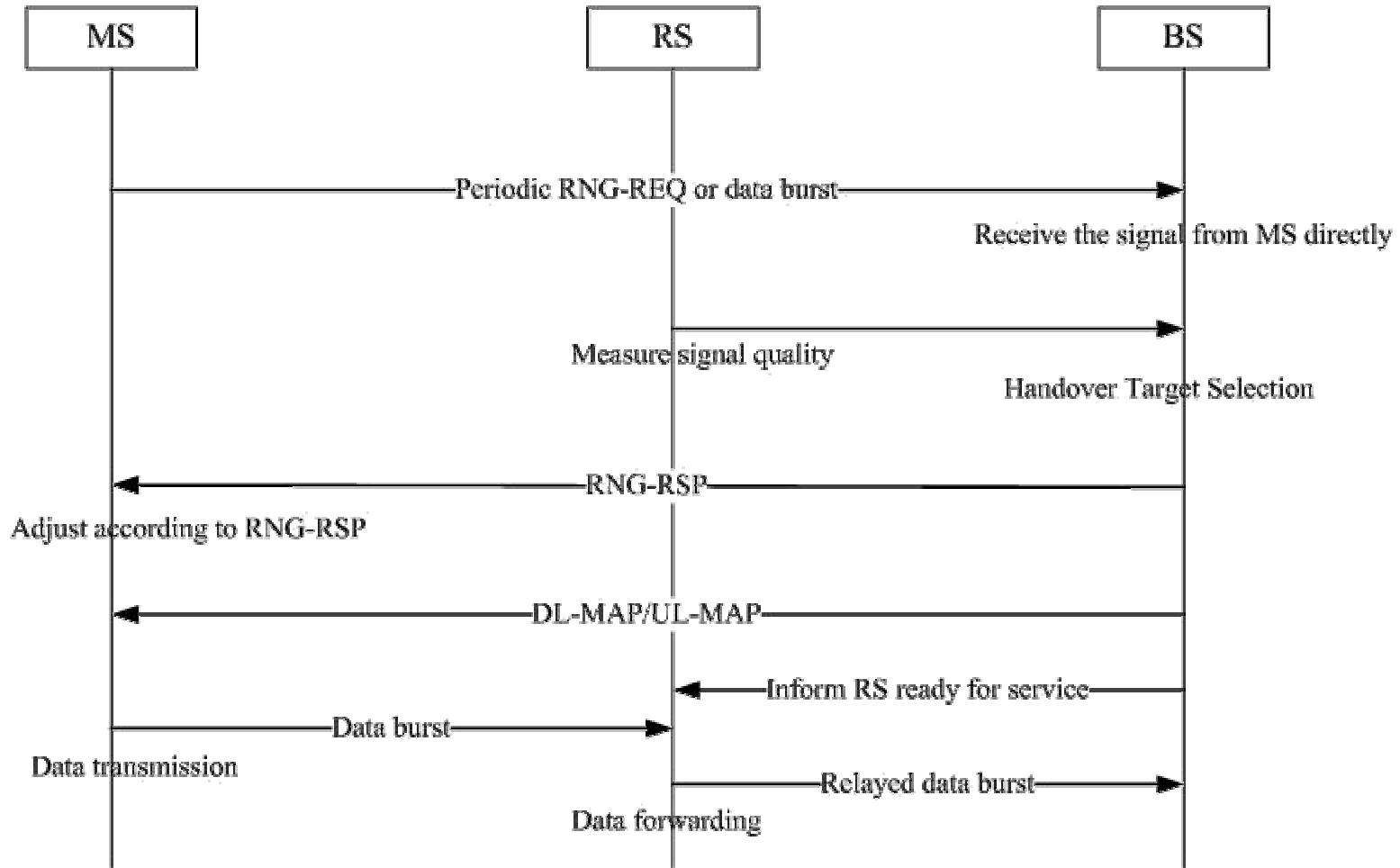
1. Neighbor BS reports to serving BS
  - Channel information of RSs in its coverage
  - RS-BS link quality
2. Handover trigger and decision
  - Considering neighbor BS reports, and also MS trigger information, BS compares possible paths with / without RS to select suitable handover target in handover decision
3. Complete the legacy handover process



*Handover Target selection  
in HO decision phase*

# Example: Intra-BS handover (BS->RS)

(Synchronous-broadcast Frame Structure)



# RS mobility

- RS roam among BSs acts as a legacy MS does
- In roaming, RS exercise the same handover procedure as MS does except that target BS allocates a specific CID to RS for identification
- MS in RS coverage
  - Not move with RS
    - Exercise handover from RS to serving BS
  - Move with RS
    - Exercise inter-BS handover after RS handover

# Summary

- Different frame structure schemes introduce different handover procedures
  - Handover target selection for synchronous-broadcast relay frame structure
    - Intra-BS handover: RS-BS, or RS-RS handover is transparent to MS
    - Inter-BS handover: MS performs a legacy inter-BS handover, and then a intra-BS handover for suitable RS selection occurs in re-entry phase
  - Handover target selection for asynchronous-broadcast relay frame structure
    - For any handover between RS-BS or RS-RS, MS has to perform a legacy inter-BS handover.
    - BS compares possible paths and conducts target selection in handover decision.