Recommendations on IEEE 802.16j

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. Propose recommendations on IEEE802.16j

Recommendations on IEEE 802.16j

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Outline

- Mobile multihop relay strategies
- Frame structure definition
- Traffic processing at RS
- Network entry and initialization
- Summary

RS Strategies: Throughput Enhancement & Coverage Extension

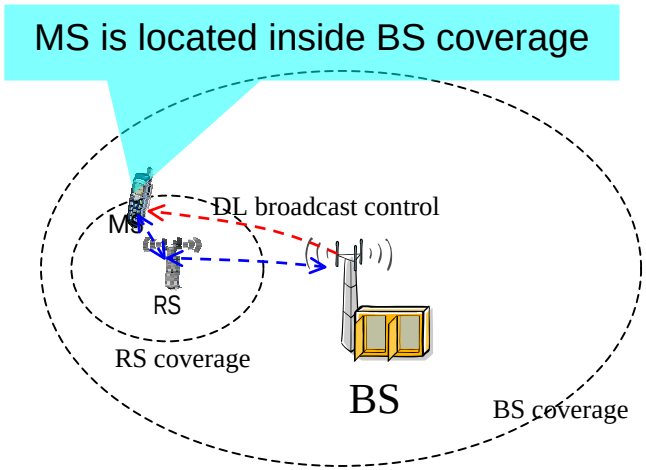


Fig. Throughput Enhancement Relay

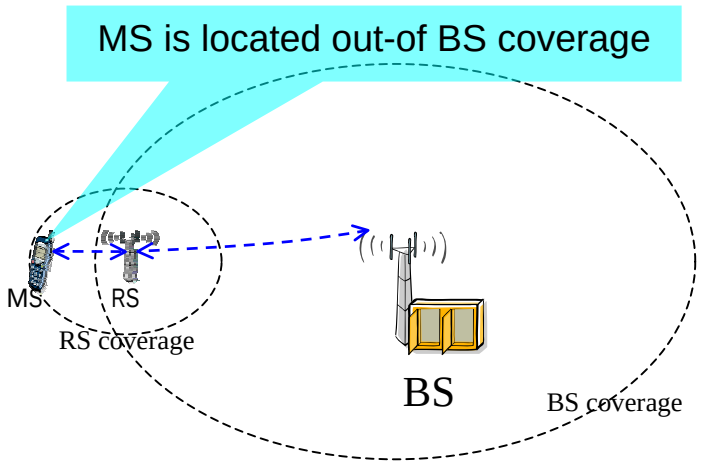


Fig. Coverage Extension Relay

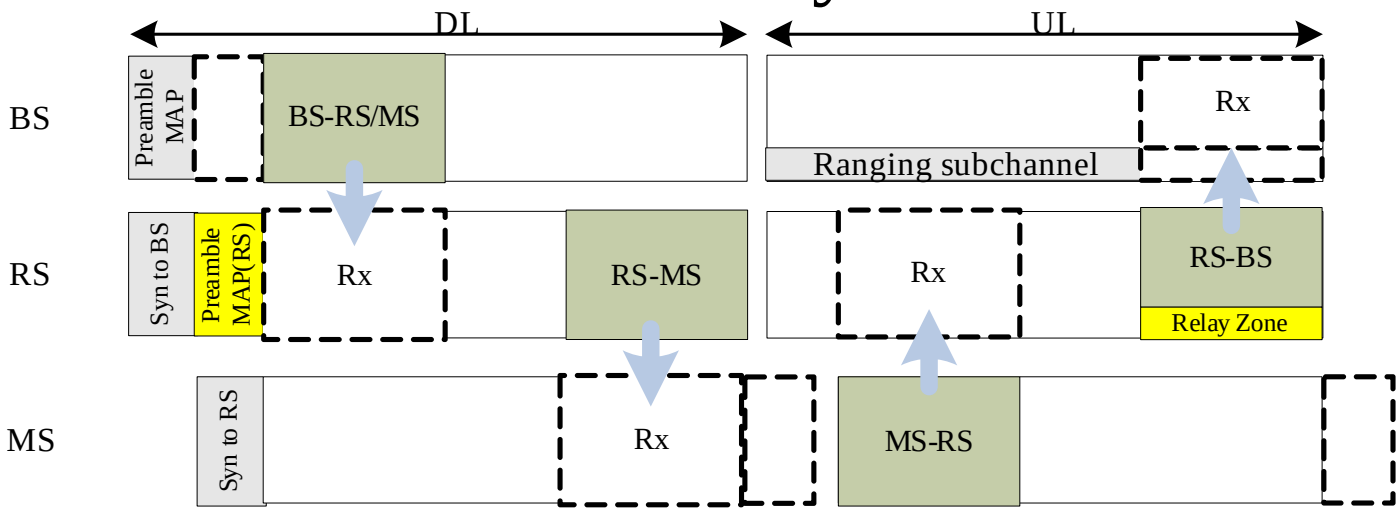
- MS receives BS broadcast messages directly
  - DL Preamble and MAP are transmitted from BS to MS directly.
  - All other DL and UL traffic is relayed for throughput enhancement
  - Ref. C80216mmr-05_023 in session #40

- No direct link between MS and BS
  - All the information exchange between BS and MS should be relayed

Considerations on Relay

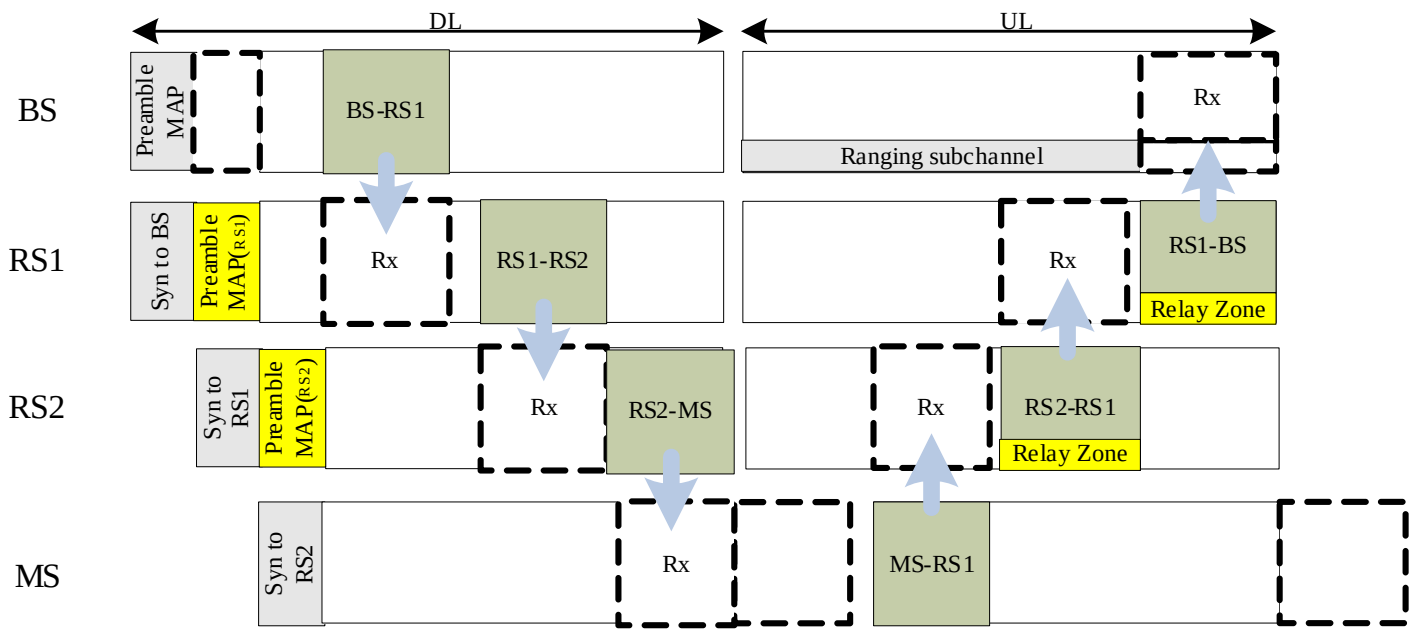
- Broadcast message relay: RS needs to transmit preamble and MAP for MSs out of BS coverage
  - Two schemes to relay broadcast messages
    - Asynchronous scheme: RS transmits preamble and MAP after BS does
    - Synchronous scheme: RS and BS transmit preamble and MAP simultaneously
- Data and management message relay
  - Forwarding process at RS
  - Low extra latency
- Low complexity of RS
- Backward compatibility

Frame structure 1 for Asynchronous Scheme



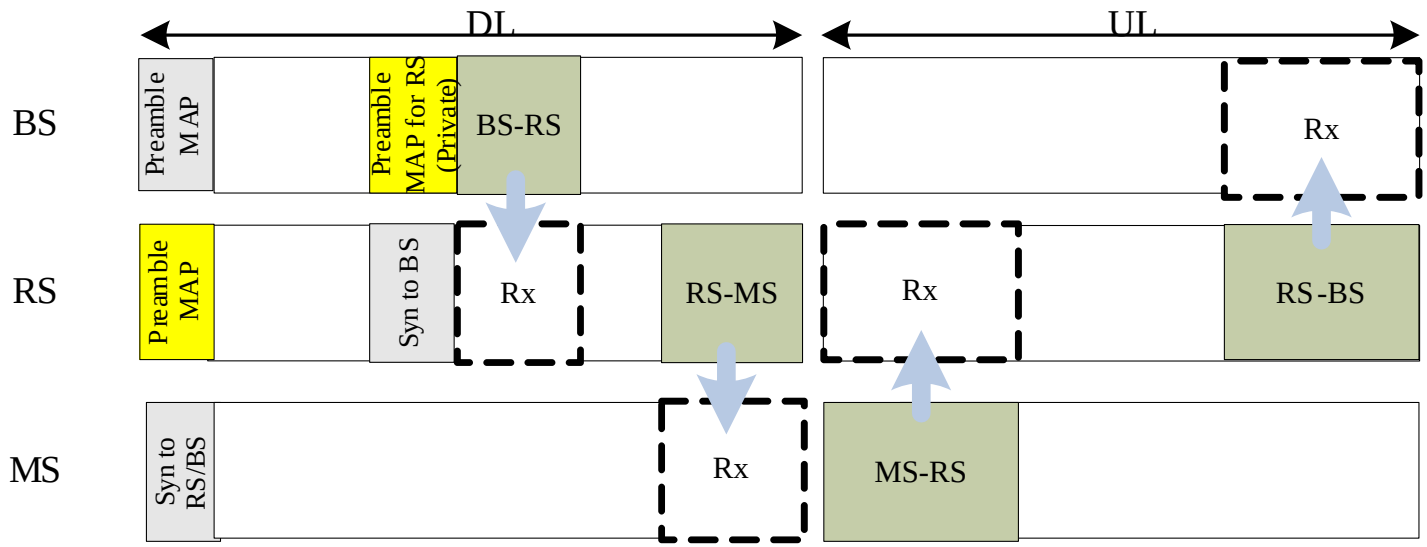
- Extension on C80216mmr-05_023
- RS re-transmits preambles and MAP information for MS
- A dedicated area (relay zone) is for RS-BS UL control info. transmission
  - MSs' signal quality report to BS (CINR, timing advance, power level, etc.)
  - Forwarding some MS's messages, such as ranging request, BW-request and etc.
- One ranging sub-channel for all MSs and RS
  - Located preceding the relay zone.
- Data burst relay within one frame
  - No extra delay after the introduction of relay
  - In UL, the period of RS transmission and MS transmission can not overlap.

For Multiple RSs or Multihop (Hop Counts >2)



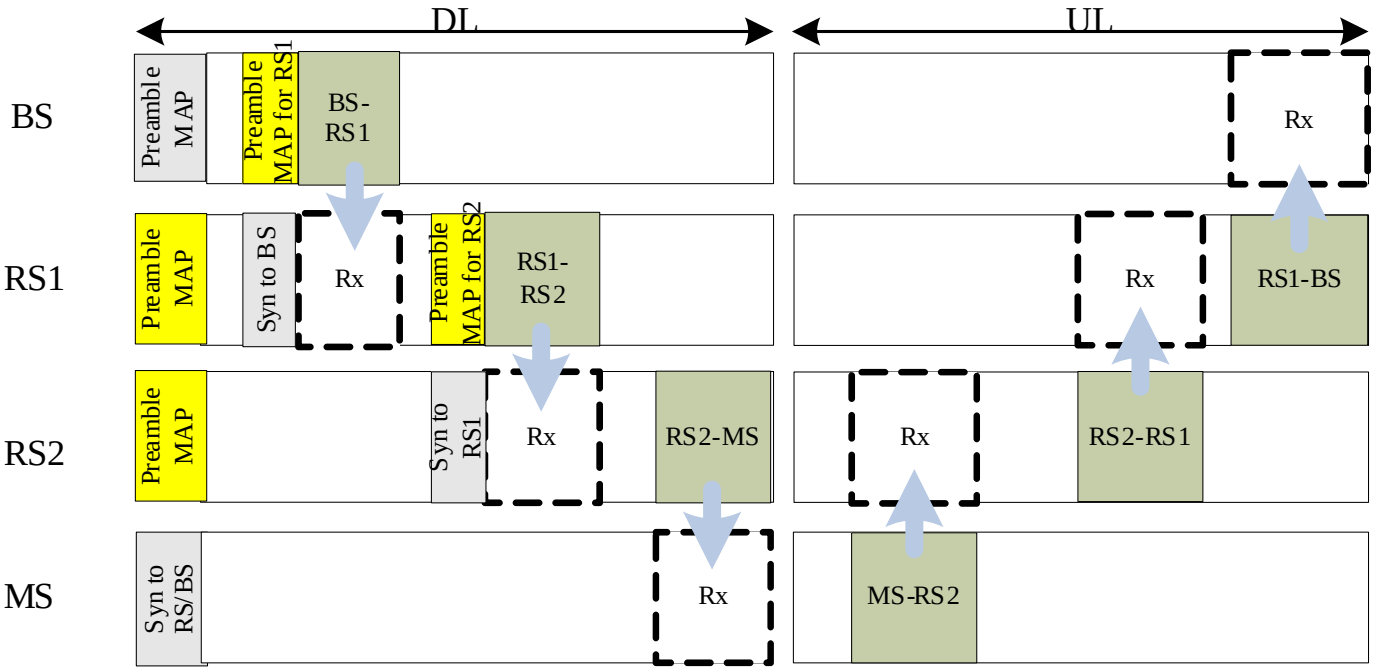
- For multiple RSs
  - RSs could transmit preamble and MAP at the same time
    - May cause interference problem
  - Or transmit them at different slots
- For multihop
  - Preamble and MAP information must transmitted one by one
  - Data burst is still relayed to the destination within one frame
    - No extra delay after the introduction of relay

Frame Structure 2 for Synchronous Scheme



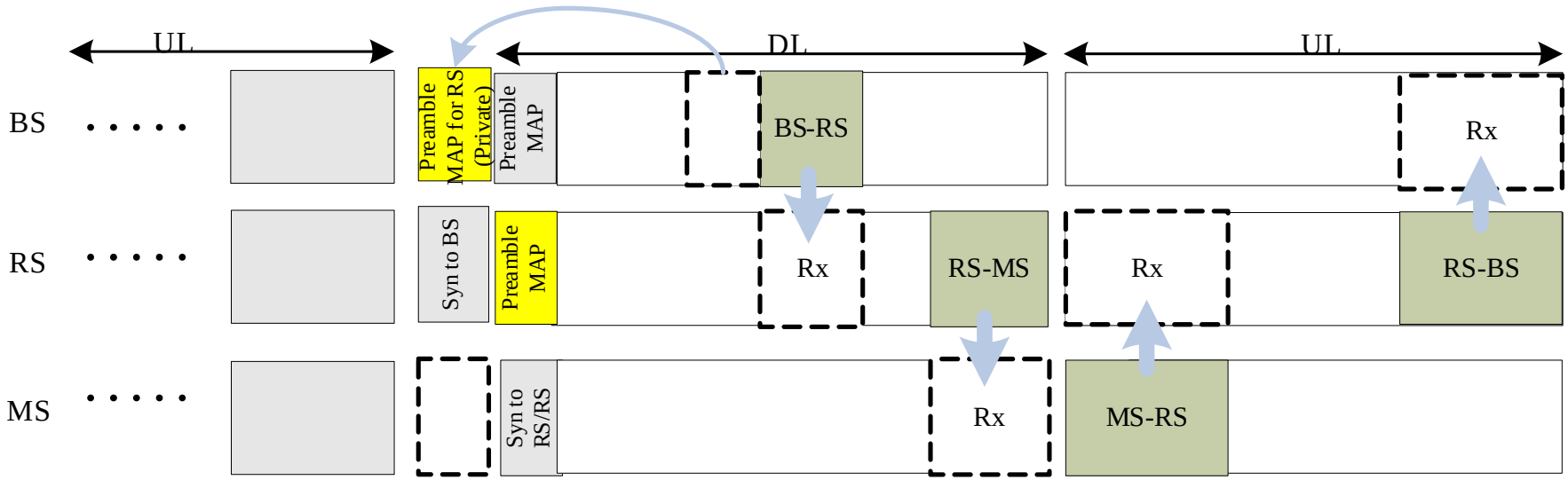
- BS and RS transmit the preamble and MAP simultaneously
- Private preamble and broadcast messages inserted to let RS synchronize with BS and also get MAP
- Features
  - All MSs are synchronized to one preamble
  - No intra-BS HO process between RS and BS, or RS and RS

Frame structure 2 with Multi-hop Support



- Easily extended to multi-hop support

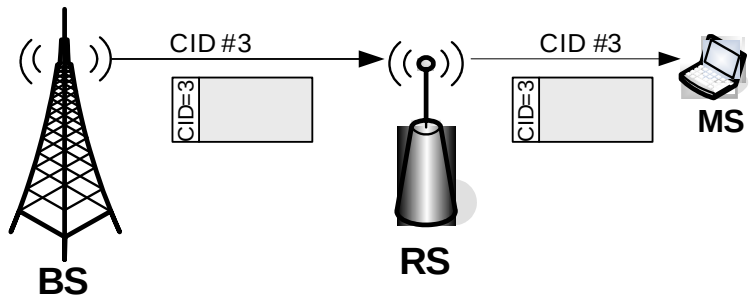
Variation of Frame Structure 2 Definition



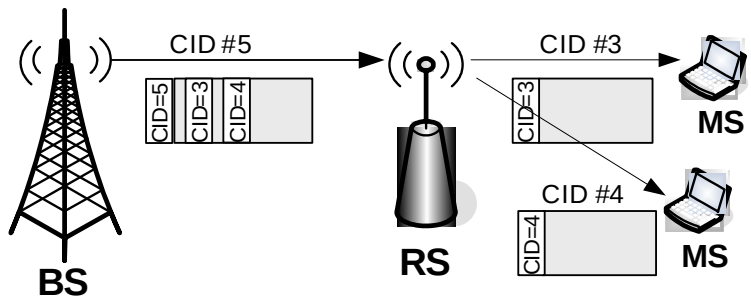
- Private preamble and MAP for RS are transmitted just before the start of the frame

Forwarding Processing at RS

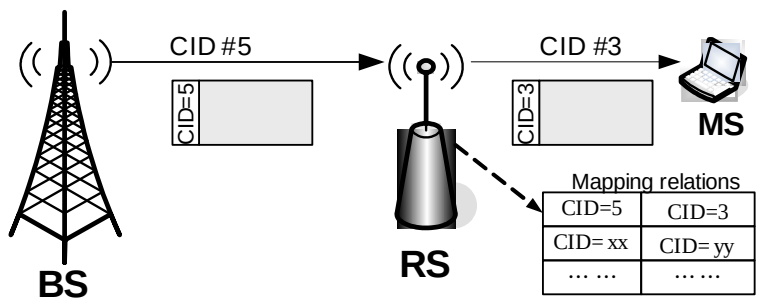
- Define mapping relation between BS-RS and RS-MS connection
- Three potential types of schemes:
  - Case 1: Simple PDU copy
    - RS relays PDU without any change



  - Case 2: PDU encapsulation
    - In DL, BS packs relayed PDUs into one with CID of RS
    - In UL, RS packs relayed PDUs into one



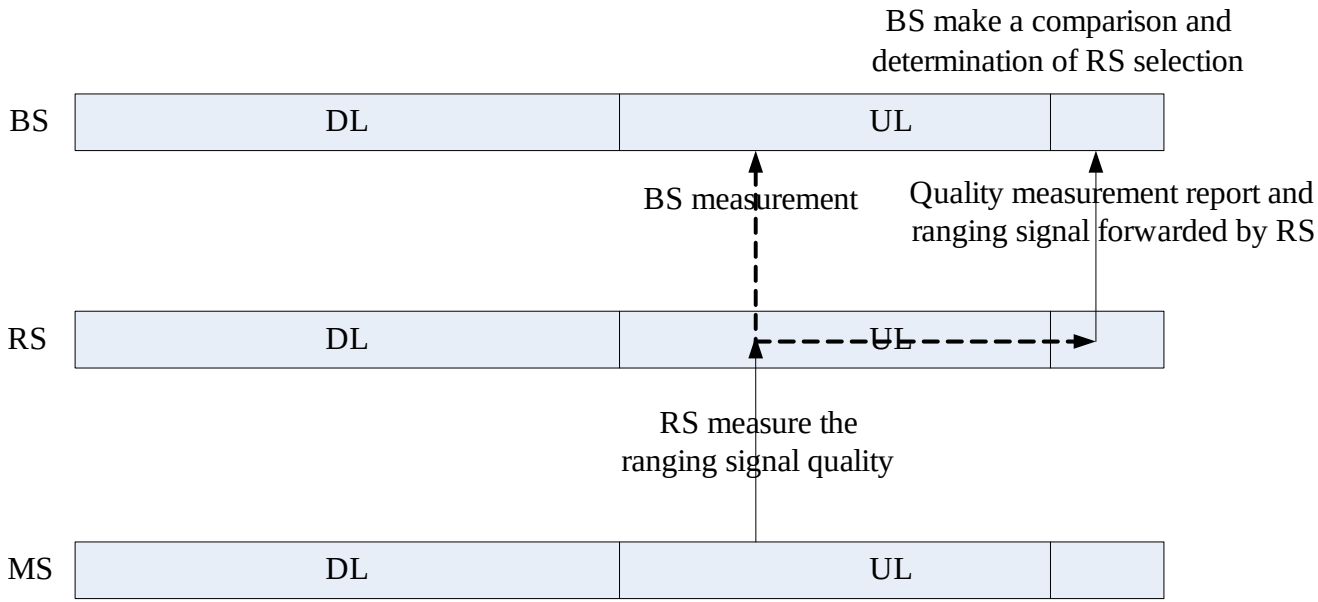
  - Case 3: CID translation
    - Two CID for each service flow, one for BS-RS, the other for RS-MS
    - Conduct CID translation



Network Entry and Initialization

- RS entry and initialization process
  - Same to that of a legacy MS, except that
    - RS identifies itself as a relay
    - BS recognizes it and allocates special CIDs to it
- MS entry and initialization process with RS involvement
  - In MS initialization, BS should decide whether RS or which RS is required for the MS.

MS Network Entry with RS involvement



- One ranging sub-channel allocated by BS
- RS monitor ranging requests
  - Measure the ranging signal (quality, power level, timing offset, etc.)
  - Forward ranging signal to BS in the dedicated relay zone
    - No extra delay
- BS measures ranging request directly from MS and compare it with the reports from RS
  - Make a decision of RS selection
- RNG-RSP for MS

Summary

- Two approaches to relay broadcast messages
  - Asynchronous: RS transmits Preamble and MAP after BS does
  - Synchronous: RS and BS transmit the same preamble and messages simultaneously
- Dedicated relay zone reserved for UL control information
- Data and control message are relayed within one frame
  - No extra latency
- Traffic processing at RS
  - PDU copy, PDU encapsulation, CID translation
- Network entry and initialization with RS involvement
  - RS selection based on ranging signal measurement