

Recommendations on IEEE 802.16j

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Comments on IEEE 802.16j

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Recommendations on IEEE 802.16j

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Outline

- Relay station strategies
- Frame structure
- Traffic processing at RS
- Network entry and initialization

RS Strategies: Throughput Enhancement & Coverage Extension

MS is located inside BS coverage

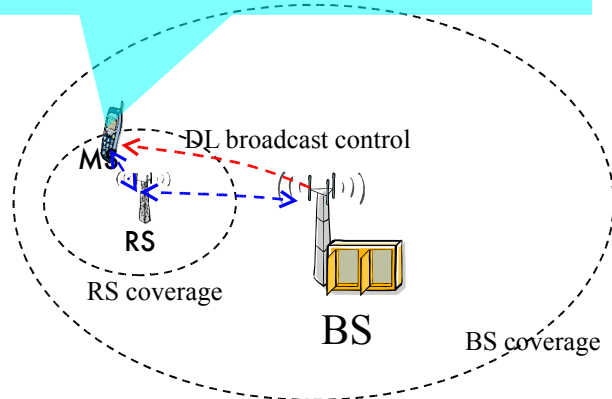


Fig. Throughput Enhancement Relay

MS is located out-of BS coverage

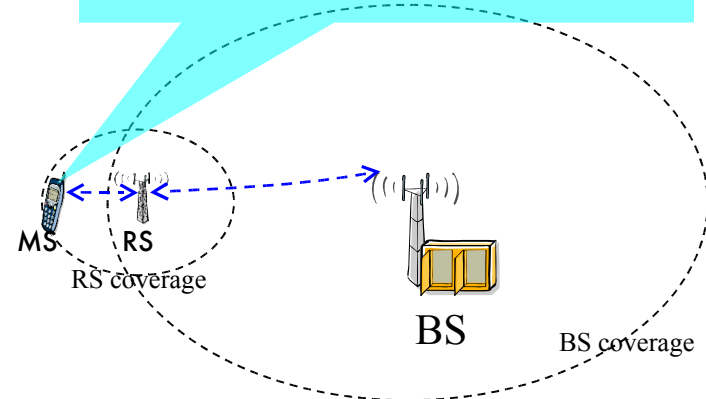


Fig. Coverage Extension Relay

> DL broadcast information directly reach MS

- Refer to C80216mmr-05_023 in session #40
- DL Preamble and MAP are transmitted from BS to MS directly. Data and other control messages are relayed

> No direct link between MS and BS

- All the information exchange between BS and MS should be relayed
- Two approaches to relay broadcast messages
 - Asynchronous: RS transmits preamble and MAP after BS does
 - Synchronous: RS and BS transmit preamble and MAP simultaneously

Considerations on Relay

- Broadcast messages relay: RS need to transmit preamble and MAP for MSs out of BS coverage
- Data and control message relay
 - Forwarding process at RS
 - Low latency and low complexity are expected
- Backward compatibility

Frame structure 1 for Asynchronous Scheme



- Extension on C80216mmr-05_023
- BS and RS transmit preambles and MAP asynchronously
- A dedicated area (relay zone) is for RS-BS UL control information relaying
 - 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.
- Bearer data relay within one frame
 - No extra delay after the relay
 - In UL, the period of RS transmission and MS transmission can not overlap.
 - In MS transmission period, RS is keeping receiving or monitoring.

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 be transmitted one by one
 - Bearer data 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 scenario

Variation of Frame Structure 2 Definition



- BS sends private preamble and MAP for RS just before the start of the frame
- RS retransmit preamble and broadcast messages at the same time of BS does

Forwarding Processing at RS

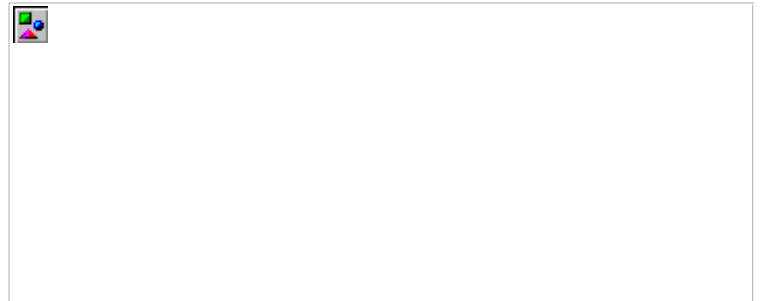
- Define mapping relation between BS-RS and RS-MS connection

- Three potential types of schemes:

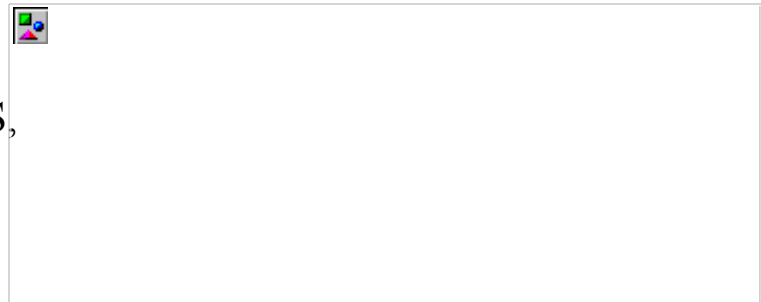
- Case 1: Simple PDU copy
 - RS receives PDU without any change



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



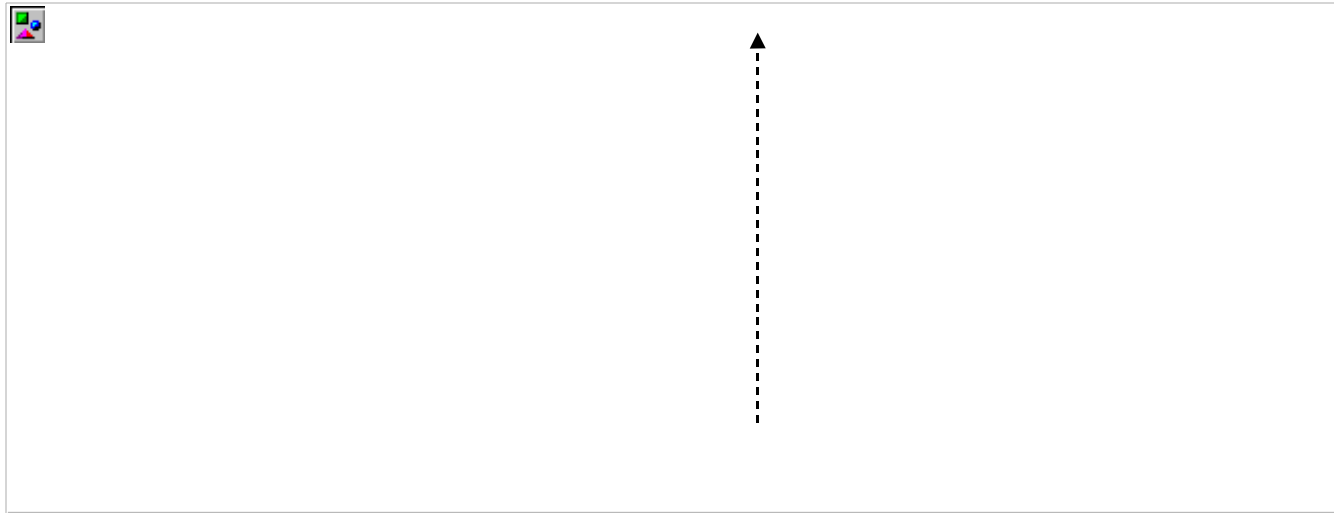
- Case 3: CID translation
 - Two CID for each service flow, one over BS-RS, the other over RS-MS
 - Mapping relations in RS to accomplish traffic forwarding



Network Entry and Initialization

- RS and MS network entry and initialization
 - Share one ranging sub channel
- RS entry and initialization process
 - Similar to that of a conventional MS, except that
 - RS identifies itself as a relay by:
 - BS recognizes it and consequently allocate special CIDs to it
- MS entry and initialization process
 - In MS initialization, BS should decide whether RS or which RS is required for the MS.
 - Determination based on MS ranging signal

MS Network Entry with RS involvement



- One ranging sub-channel allocated by BS
- RS monitor ranging requests
 - Measure the signal quality.
 - RS only report measurement results and forward ranging request to BS
 - Forwarded to BS in the dedicated relay zone (no extra delay)
 - Other weaker ranging requests are omitted by RS.
- BS measures ranging request directly from MS and compare it with the reports from RS
 - Make a decision of RS selection

Summary

- Two approaches to relay broadcast messages
 - Asynchronous: RS transmits Preamble and MAP after BS does
 - Synchronous: RS and BS broadcast preambles 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
 - No impact to MS initialization
- All controls and schedules are located in BS