Classification of RS Type in Mobile Multi-hop Relay System

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Classification of RS Type in Mobile Multi-hop Relay System

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September, 2005
Outline

• RS Types in MMR SG
• Strategy of Multi-hop Relay
• RS Capability
• Operating Scenario
• Backward Compatibility
• Summary
RS Types in MMR SG

- Refer to C802.16-05/013

<table>
<thead>
<tr>
<th>Topology/Mobility</th>
<th>Ownership</th>
<th>Infrastructure</th>
<th>Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mesh</td>
<td></td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Fixed</td>
<td>Yes</td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Nomadic</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Mobile</td>
<td>Yes</td>
<td></td>
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- **MMR** stands for Mobile Multi-hop Relay.
- Inter-SS/MS communication like ad-hoc network is out of scope.
Strategy of Multi-hop Relay

• For coverage extension
  - Target MS being located out-of BS coverage
  - Hence, all types of cell coverage shall be extended
    ▪ DL: preamble, broadcast channel, and unicast channel coverages
    ▪ UL: ranging channel, and unicast channel coverages

• For throughput enhancement
  - Target MS being located inside BS coverage
  - Increase channel data rate rather than extend any type of coverage
  - Provide a higher rate channel to MS through multi-hop path
RS Capability

• For coverage extension
  - RS shall relay Broadcast Channel as well as Unicast Channel
  - On downlink,
    ▪ Shall relay control messages such as MAP Msg, DCD, and UCD
  - On uplink,
    ▪ Shall provide MS with Network Entry procedure including Ranging process with the help of BS

• For throughput enhancement
  - RS has only to relay DL/UL unicast messages (for data traffic)
  - All control messages should be delivered on direct single-hop path
RS Type 1 (High Capability)

- **Purpose:** Extend cell coverage (BS cell edge, dead spot)

- **Required capability**
  - Transmitting RS own preamble and relaying DL control messages
  - Providing MS with Network Entry procedure
    - Keep monitoring and detect UL Ranging code from MS

- **Considered features**
  - TX power Amp: smaller than BS, but higher than MS
  - A directional antenna as well as omni antenna can be considered for RS on BS-RS\textsubscript{type1} link
  - RS\textsubscript{type1} may have a limited authority to control MS (e.g., scheduling)

- **RS\textsubscript{type1}** \iff Fixed / Nomadic / Mobile Infrastructure RS
RS Type 2 (Low Capability)

- Purpose: Enhance capacity (no coverage extension)
  - Provide higher throughput to MS having low SINR
  - Relay unicast message (for data traffic) only
  - All DL/UL Control messages are provided through a direct single-hop path from BS

- Considered features
  - TX power Amp: equal to or higher than MS
  - RS antenna type: omni
  - BS direct controls MS whose data traffic is relayed by RS_{type2}

- RS_{type2} ⇔ Nomadic Infrastructure / Client RS
Example: Operating Scenario

- BS High Rate Coverage
- BS Low Rate Coverage
- RS_{type1}
- Out of BS Coverage

- DL Broadcast (MAP Msg, DCD, ...) / UL Random Access (Ranging Code)
- DL / UL Unicast Data Traffic & Unicast Control Msg
RS Classification

- Consideration: ownership, mobility, capability

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Type 1 (High Capability)

Type 2 (Low Capability)
Backward Compatibility

- With PMP Mode in IEEE TGe
Summary

• Simple classification of RS capability

<table>
<thead>
<tr>
<th>RS</th>
<th>Purpose</th>
<th>Handling &amp; Relaying capability of DL Broadcast / UL Ranging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1</td>
<td>Coverage</td>
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</tr>
<tr>
<td>Type 2</td>
<td>Capacity</td>
<td>No</td>
</tr>
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• Backward compatibility with PMP Mode in IEEE TGe
  - MMR BS should be able to accommodate TGe MS’s
  - MMR MS should be able to be connected to TGe BS