RS Network Entry, Topology Establishment and Initialization for IEEE 802.16j

IEEE 802.16 Presentation Submission Template (Rev. 8.3)
Document Number: IEEE S802.16j-06_167
Date Submitted: 2006/11/14
Source: Chie Ming Chou, Wern-Ho Sheen, Fang-Ching Ren, Jen-Shun Yang, Tzu-Ming Lin, I-Kang Fu, Ching-Tarng Hsieh

Industrial Technology Research Institute (ITRI)/ National Chiao Tung University (NCTU)
195,Sec. 4, Chung Hsing Rd.
Chutung, Hsinchu, Taiwan 310, R.O.C

Venue:
IEEE 802.16 Session#46, Dallas, TX, USA

Base Document:
C802.16j-06_167

Purpose:
- Propose RS network entry, topology establishment and initialization for IEEE802.16j

Notice:
This document has been prepared to assist IEEE 802.16. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.

Release:
The contributor grants a free, irrevocable license to the IEEE to incorporate material contained in this contribution, and any modifications thereof, in the creation of an IEEE Standards publication; to copyright in the IEEE’s name any IEEE Standards publication even though it may include portions of this contribution; and at the IEEE’s sole discretion to permit others to reproduce in whole or in part the resulting IEEE Standards publication. The contributor also acknowledges and accepts that this contribution may be made public by IEEE 802.16.

IEEE 802.16 Patent Policy:
The contributor is familiar with the IEEE 802.16 Patent Policy and Procedures <http://ieee802.org/16/ipr/patents/policy.html>, including the statement "IEEE standards may include the known use of patent(s), including patent applications, provided the IEEE receives assurance from the patent holder or applicant with respect to patents essential for compliance with both mandatory and optional portions of the standard." Early disclosure to the Working Group of patent information that might be relevant to the standard is essential to reduce the possibility for delays in the development process and increase the likelihood that the draft publication will be approved for publication. Please notify the Chair <mailto:chair@wirelessman.org> as early as possible, in written or electronic form, if patented technology (or technology under patent application) might be incorporated into a draft standard being developed within the IEEE 802.16 Working Group. The Chair will disclose this notification via the IEEE 802.16 web site <http://ieee802.org/16/ipr/patents/notices>.
General Description (1)

- A network entry procedure is proposed for RSs. We focus on the MR network where RSs act like BS to MSs.
- In addition to the functionalities of network entry and Initialization, a relay path selection is considered necessary. The path selection shall be done at the MR-BS because it has the full knowledge of the network condition, including traffic load, topology etc.
- Firstly, the new coming RS performs an initial network entry as an MS to
  - obtain a temporal relay path in order to communicate with the MR-BS
  - obtain authorization and registration from the MR-BS
General Description (2)

• However, the temporary relay path may not be the best for the MR network
  – RS makes a decision by itself based only on RSSI at this stage.
• Secondly, the path selection is done by the BS through topology establishment procedure after the initial network entry, and the RS performs an network re-entry if necessary. Finally, the RS initialization follows.
• New messages and signaling flows have been designed to achieve the purpose.
• The proposed path-selection procedure can also be used for RS reconfiguration.
The proposed RS network entry procedure

A new RS arrival

RS network entry
- Scan for downlink channel
- Downlink channel synch. established
- Obtain uplink parameters
- Ranging and automatic adjustments
- Negotiate basic capabilities
- RS authorization and key exchange
- Register with MR-BS

RS topology establishment
- RS scanning & report
- Topology Decision by MR-BS
- RS network re-entry

RS initialization
- Establish time of day
- MR-BS set up the configuration file
- Transfer operational parameters

Operational
## Proposed MAC Messages (1)

<table>
<thead>
<tr>
<th>Type</th>
<th>Message name</th>
<th>Message description</th>
<th>Connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>69</td>
<td>RLY_SCN-REQ</td>
<td>Relaying mode RS scanning interval allocation request</td>
<td>Basic</td>
</tr>
<tr>
<td>70</td>
<td>RLY_SCN-RSP</td>
<td>Relaying mode RS scanning interval allocation response</td>
<td>Basic</td>
</tr>
<tr>
<td>71</td>
<td>RLY_SCN-REP</td>
<td>Relaying mode RS scanning result report message</td>
<td>Primary management</td>
</tr>
<tr>
<td>72</td>
<td>RLY_TPY-IND</td>
<td>Relaying mode topology indication message</td>
<td>Basic</td>
</tr>
<tr>
<td>73</td>
<td>RLY_CFG-IND</td>
<td>Relaying mode configuration indication message</td>
<td>Basic</td>
</tr>
</tbody>
</table>
Proposed MAC messages(2)

- **RLY.SCN-REQ**
  - transmitted by an RS to trigger the neighborhood discovery
  - Modified from the legacy MOB.SCN-REQ
- **RLY.SCN-RSP**
  - transmitted by the MR-BS in response to RLY.SCN-REQ or unsolicited trigger of the scanning
  - Modified from the legacy MOB.SCN-RSP
- **RLY.SCN-REP**
  - Transmitted by an RS to report the scanning results
  - Modified from the legacy MOB.SCN-REP
- **RLY.TPY-IND**
  - Transmitted by the MR-BS to indicate the network re-entry
- **RLY.CFG-IND**
  - Transmitted by the MR-BS to indicate RS the operational parameters
Messages Exchange for RS scanning and report

RS
Access-RS
Neighbor RS#2
Neighbor RS#3
MR-BS

RLY_SCN-REQ
RLY_SCN-REQ
RLY_SCN-REQ

RLY_SCN-RSP
RLY_SCN-RSP
RLY_SCN-RSP

Synchronize with neighbor RS#2, measure metrics
Synchronize with neighbor RS#3, measure metrics