Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**The management operationsMulticast for Multi-RSs when using Tunnel CID**
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Re:	IEEE 802.16j-06/034:"Call for Technical Proposals regarding IEEE Project P802.16j"
Abstract	This contribution describes how to perform multicasting management operation for multi-RSs in one tunneling connection
Purpose	Propose method of multicasting operations for support managing multi-RSs in one tunneling connection
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Multicast The management operations for multi-RSs when using Tunnel CID

1. Introduction

To utilize the radio resources for MR network, the concept of "tunnel" is introduced to reduce the MAC overhead and process in the relay link [1]. There are two modes for tunnel connections. In Tunnel Burst mode, only station at egress of tunnel would read the encapsulated MPDU and other stations along tunnel would directly forward MPDU after decoding the MAP_IE with destination T-CID. Alternatively, in Tunnel Packet mode, every station along tunnel would receive the encapsulated MPDU and read the relay MAC header to see whether a T-CID is placed or not. If a destination T-CID is appeared, intermediated stations would forward the MPDU without reading payload and only station at egress of tunnel would read the contents of payload.

In MR network, MR-BS always needs to control and manage several RSs at the same time. Compared to unicasting identical control message for every RS individually, the usage of multicasting transmitting control message by MR-BS to multi-RSs within one tunnel connection will be more suitable and efficient. In this contribution, we propose to perform multicasting along tunnelthese operations by Tunnel Packet mode. With this scheme, it can achieve multicasting along tunnel connection withperform the management operations for multi-RSs with less processing overhead and resources.

2 Proposal

To support multicasting managing multi-RSs within one tunnel connection, every station along this tunnel shall be responsible to forward the encapsulated MPDU to next-hop station and read the associated payload (control message) until the egress of tunneling. When systematic T-CID allocation is used, it is unable to assign a common systematic multicast CID for the multicast groupmulti-RSs. Instead, establishing multiple unicast connections with different systematic T-CIDs is employed. Figure 1 shows this case and it can be observed that a lot of resources are wasted. Alternatively, if explicit path management is used (non-systematic T-CID allocation), and then a common multicast CID can be assigned for the members of multicast group; howeverall RSs along a tunnel. However, multicast routing tables shall be maintained for members of multicast group intermediate RSs and conduct them forward the multicastesethese packets. Figure 2 shows this case and it can be founded that it needs a lot of overhead.

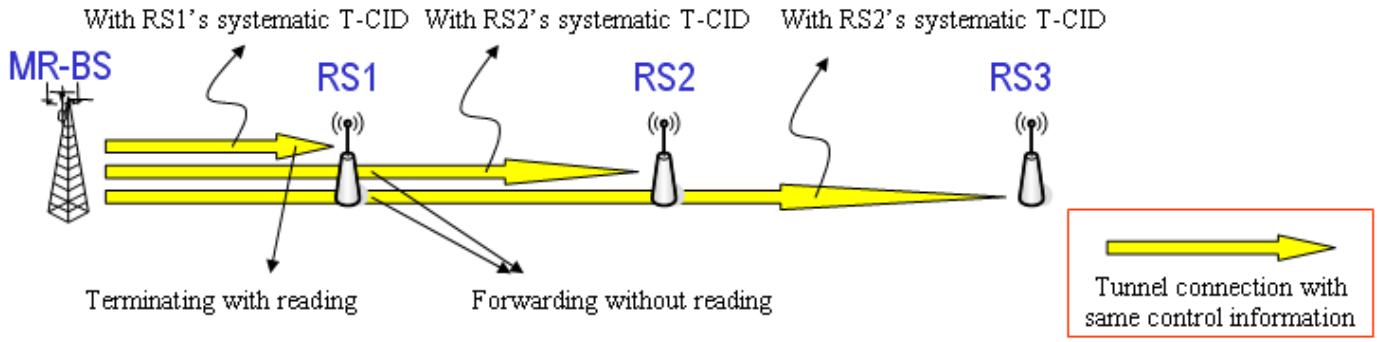

Figure 1, an example of ~~multicasting~~ management operations for multi-RSs when systematic CID is used

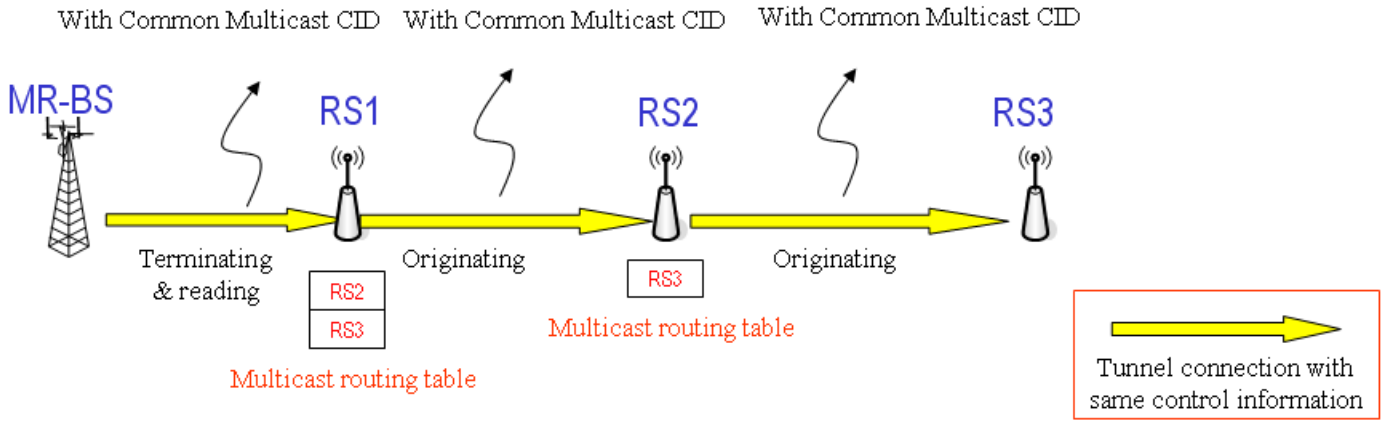

Figure 2, an example of management operations for multi-RSs~~multicasting~~ when non-systematic CID is used

To avoid these problems, a refinement of Tunnel Packet mode is proposed. We will endow the relay MAC header with an additional functionality: One bit called Owner-ship type in relay MAC header will be used to indicate whether intermediated station needs to read the contents of payload or not after its forwarding. The total operations are as follow: one tunnel connection with last-hop station's T-CID (can be systematic or non-systematic) is used and "Owner-ship type" bit in the header will be set to '1' to indicate intermediate RSs to read and forward the payload (the contents of payload shall be all read or all not be read by intermediate RSs) ~~can realize the multicasting along this tunnel at once time~~. An example of the proposed scheme is shown in Figure 3. With this application, to ensure the CMAC/HMAC validation; a general method is assigning a group key for multi-RSs in advance. When intermediate RSs check "Owner-ship type" bit be enabled (set to '1'), then it will use this group key for this PDU. Besides, other new security approaches for IEEE 802.16j may be also employed (TBD) in this method.

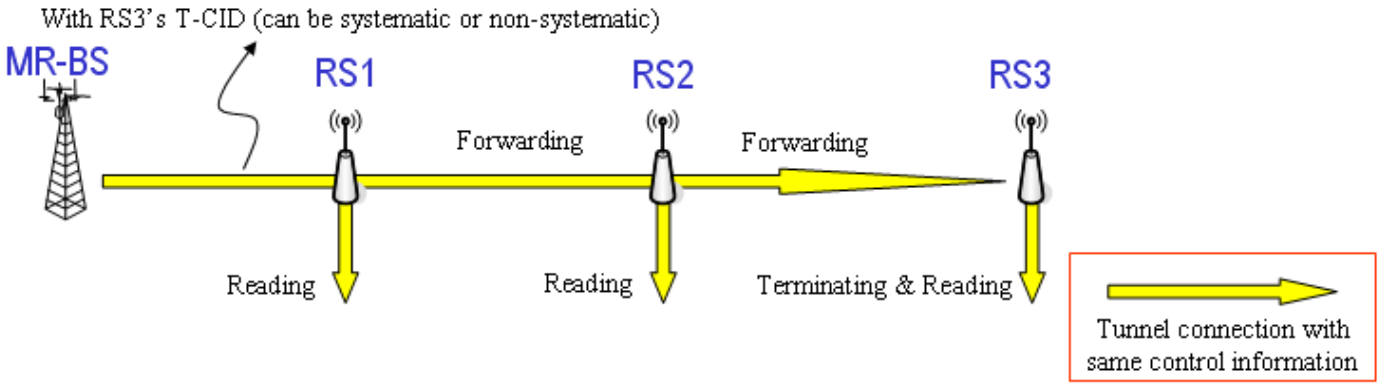

Figure 3, Perform management operations for multi-RSsmulticasting by proposed scheme

This scheme provides following benefits:

- More efficient transmission – the radio resources regarding multicasting Transmission for multi-RSs can be achieved by one tunnel connection within less radio resources.
- Less signaling overhead– with this scheme, no additional siganling is required to maintain the mutlicasting routing tables for management operations of multi-RSs.

3 Proposed Text Change

----------Start of the Text----------

[Add following text into session 6.3.3.8.1]

6.3.3.8.1 Transmission using tunnels

For multicasting control messagemanaging multi-RSs along a tunnel path, the MR-BS can arrange a tunnel connection by Tunnel Packet mode. In this relay MAC header, the T-CID of last-hop station would be placed and the "Owner-ship" bit would be set to "1" to let intermediate RSs along this tunnel can forward and read the associated management message.

[Add the following text to the end of 6.3.2.1.1.1; please refer to C802.16j-07_198r8]

6.3.2.1.1.1 Relay MAC PDU header format

For managing operations of multi-RSs when using Tunnel CID, the bit #1 (2th MSB in the header) in the first byte of relay MAC header is used as "Ownership type". If this bit is set, the intermediate RS shall read the associated payload.

----------End of the Text----------

References

[1] IEEE 802.16j-06/026r3, "P802.16j Baseline Document".

1[2] IEEE C802.16j-06/241r5, “Connection Management and Relay Path Configuration”.

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