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**Title**  | Tunnel Establishment  
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**Re:**  | This is a response to Call for Technical Proposals issued by IEEE 802.16j.  
**Abstract**  | We suggest the procedure of tunnel establishment.  
**Purpose**  | The objective of this contribution is to propose the procedure of tunnel establishment in MMRs.  
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Tunnel Establishment

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Introduction

Baseline document, IEEE 802.16j-06/026r3, includes the way to bind the path with CID. In this method, explicit DSA*-REQ is used to notify the information of connection to intermediate RSs and access RS, and contains the CIDs of connection, the path-id and optionally the SFID and the service flow parameter for the connection. So this method is suitable for the distributed scheduling.

But in the centralized scheduling, the bandwidth is unnecessarily wasted to process DSA*-REQ. So we propose more efficient method to bind CIDs to the path.

The procedures

If new tunnel is established as depicted in Figure 1, the MR-BS sends response message encapsulated with encapsulation subheader to the MS or RS. Then intermediate and access RS add CIDs in encapsulation subheader to its own routing table. Finally the access RS eliminates the encapsulation subheader and forwards it to the MR or RS.

If any tunnel eliminated as depicted in Figure 2, the MR-BS sends response message encapsulated with encapsulation subheader to the MS or RS. Then intermediate and access RS remove CIDs in encapsulation subheader from its own routing table. Finally the access RS eliminates the encapsulation subheader and forwards it to the MR or RS.

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**Figure 1**—Addition of tunnel CID (initial ranging or service flow addition)

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The encapsulation

A MAC management messages from the MR-BR to the access RS is encapsulated with an encapsulation subheader depicted as Figure 3. The encapsulation subheader could be added to one MPDU or several MPDUs.

The encapsulation subheader includes CIDs related to the tunnel. Especially the tunnel CID is used for the access RS and intermediate RSs to manage the tunnel.
**Proposed Text**

6.3.2.1. MAC header formats

*Insert the following at the end of 6.3.2.1:*

The location of the EI (Encapsulation Indicator) field in the MAC header is to be determined.

6.3.2.2. MAC subheaders and special payloads

*Insert new subclause 6.3.2.2.8 at the end of 6.3.2.2:*

6.3.2.2.8 Encapsulation subheader

Encapsulation subheader is used to establish a tunnel and is added to MAC management message from/to multi-hop RS and MS. This subheader is solely used, so other subheader and extended subheader shall be not followed. The format of the encapsulation subheader is as described in Table 13m.

<table>
<thead>
<tr>
<th>Table 13m—Encapsulation subheader</th>
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<tbody>
<tr>
<td>Syntax</td>
</tr>
<tr>
<td>Encapsulation subheader_format()</td>
</tr>
</tbody>
</table>
| TYPE | 2 bits | 0b00 : Addition of tunnel CID  
0b01 : Deletion of tunnel CID  
0b10 – 0b11 : reserved          |
| N_CID | 6 bits | Number of CIDs                                          |
| For(i=0; i<N_CID; i++) {         |      |                                                         |
| CID | 16 bits | Basic, Primary, Tunnel CID                              |
| }                                 |      |                                                         |

6.3.25 Relay path management and routing

*Insert the following at the end of 6.3.25:*

6.3.25.2.3 Tunnel establishment in centralized scheduling

In centralized scheduling, if new tunnel is established by the MR-BS, its CIDs are forwarded to intermediate RSs and the access RS by encapsulation subheader.

For example, in the last step of initial ranging of multi-hop RS or MS, the MR-BS allocates some new CIDs to it and forwards it RNG-RSP with encapsulation subheader to add new allocated CIDs to the routing table of the intermediate and access RS.

On the contrary, if any CID has to be eliminated, the MR-BS forwards intermediate and access RS MAC management message with encapsulation subheader to delete CID from the its routing table.
References


[3] IEEE 802.16j-06/026r3