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Title	Service Flow Based Dedicated Resource Update	
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Abstract	The dedicated UL channel resource allocation was adopted into the baseline in session #48. The per-link dedicated resource requirement can vary with time and the dedicated resource needs to be updated when necessary. This contribution completes the signaling needed to accurately update each link to enable fast convergence to the appropriate size. It also extends the dedicated resource concept for the downlink to minimize the DL MAP allocation signaling overhead.	
Purpose	To incorporate the proposed text into the P802.16j Baseline Document (IEEE 802.16j-06/026)	
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Service Flow Based Dedicated Resource Update

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1. Introduction

The dedicated channel resource allocation was adopted into the baseline in session #48. This contribution extends the signaling for this dedicated channel resource to dynamically support the varying traffic demand on each relay link. This contribution also extends the dedicated resource concept for the downlink to minimize the DL MAP allocation signaling overhead.

An uplink dedicated resource may be allocated to each RS along the multi-hop path for the purpose of transporting control messages or aggregated data traffic. The dedicated channel allocation is between an MR-BS/parent RS and a child RS. By using this dedicated channel, the RS can transmit control messages or data traffic whenever necessary without having to make individual bandwidth requests and wait for bandwidth grants. The dedicated uplink channel enables a tight coupling between MR-BS with its RSs to serve MSs effectively.

Within a multi-hop network, the total traffic on each link can be very different. The traffic can also vary with time and the dedicated resource link capacity needs to be updated when necessary. This contribution extends the signaling needed to dynamically update each link to enable fast convergence to the appropriate size for normal operation. It also makes an extension of the dedicated resource concept for the downlink to minimize the DL MAP allocation signaling overhead for the downlink subframe.

2. Proposed Signaling

The proposed signaling to support efficient dedicated resource update is based on the actions of service flow creation, change and deletion of the MS. This is the logical choice as the dedicated link requirement is a function of the established service flows of the MSs subtending at each RS. Each service flow imposes specific resource requirements to all the intermediate RSs that are supporting it.

The service flow creation is shown in Figure 1. In the example shown, the addition of a new MS service flow between the MR-BS and the specific MS will affect the resource requirements of relay link B and F. The needed adjustment in these links can be determined based on the service traffic characteristics included in the service flow creation signaling exchange. By using the service flow creation, change, and delete events to update the size of the dedicated channel, all necessary links that require update will be adjusted accordingly. This enables a smooth transition to the new required size promptly without the need to detect it through indirect means such as traffic analysis that can be slow. Minor dynamic update after the service flow creation or change allows final convergence to the new appropriate size for the normal operation of the dedicated channel.

As service flows can be established for either uplink or downlink, it is desirable to extend the dedicated resource allocation to the downlink and the same update process can be applied to reduce the DL MAP allocation signaling overhead.

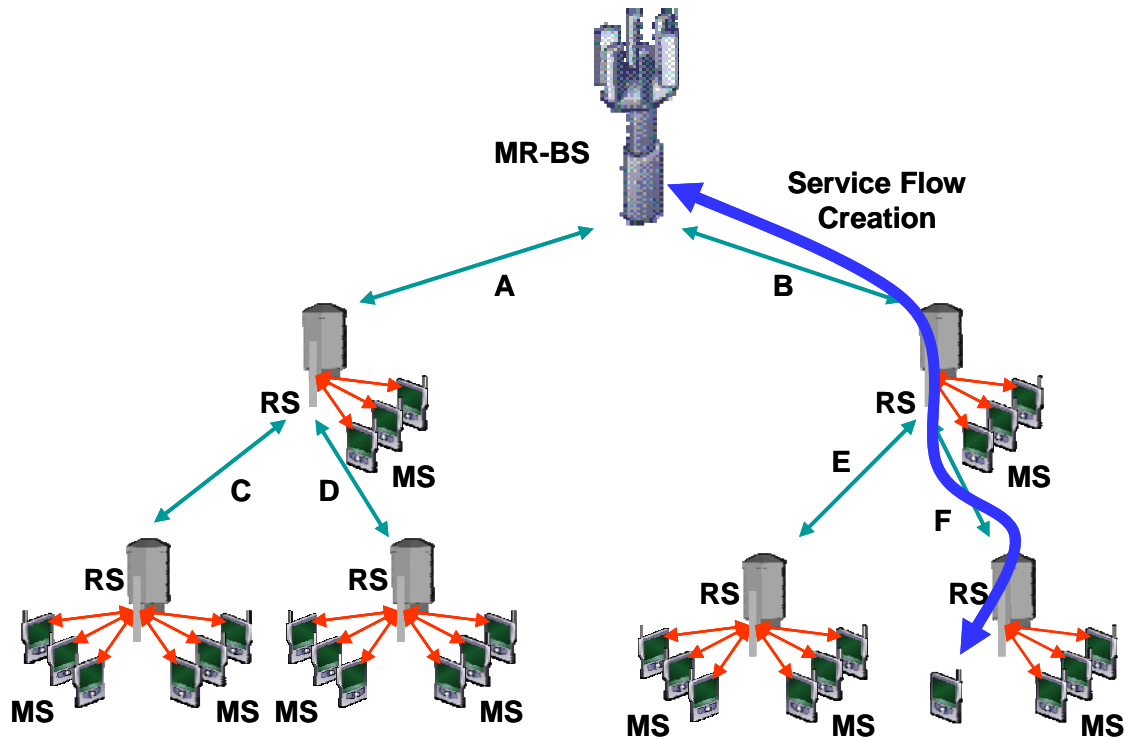


Figure 1: Service flow creation and corresponding dedicated resource update to relay links

Figure 2 and 3 depict respectively the signaling flow of downlink and uplink dedicated channel update in response to a service flow creation or change. The MRBS determines the size of the update based on the detailed service traffic information TLVs in the signaling exchange of DSA, DSC and DSD processes. The MRBS adjust the allocation to RS1 by sending the corresponding RS_DL_DCH assignment IE or RS_UL_DCH assignment IE. Upon receiving the assignment IE and the associated update information, in the next frame, RS1 can adjust its allocation to RS2 using the appropriate assignment IE.

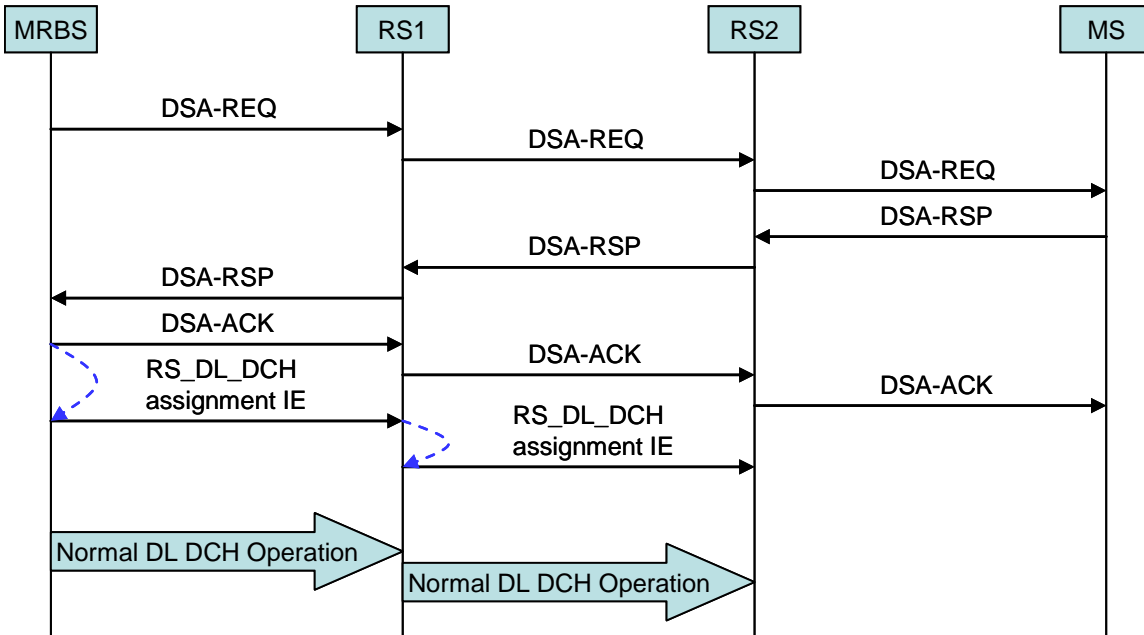


Figure 2: Downlink dedicated channel update after service flow creation

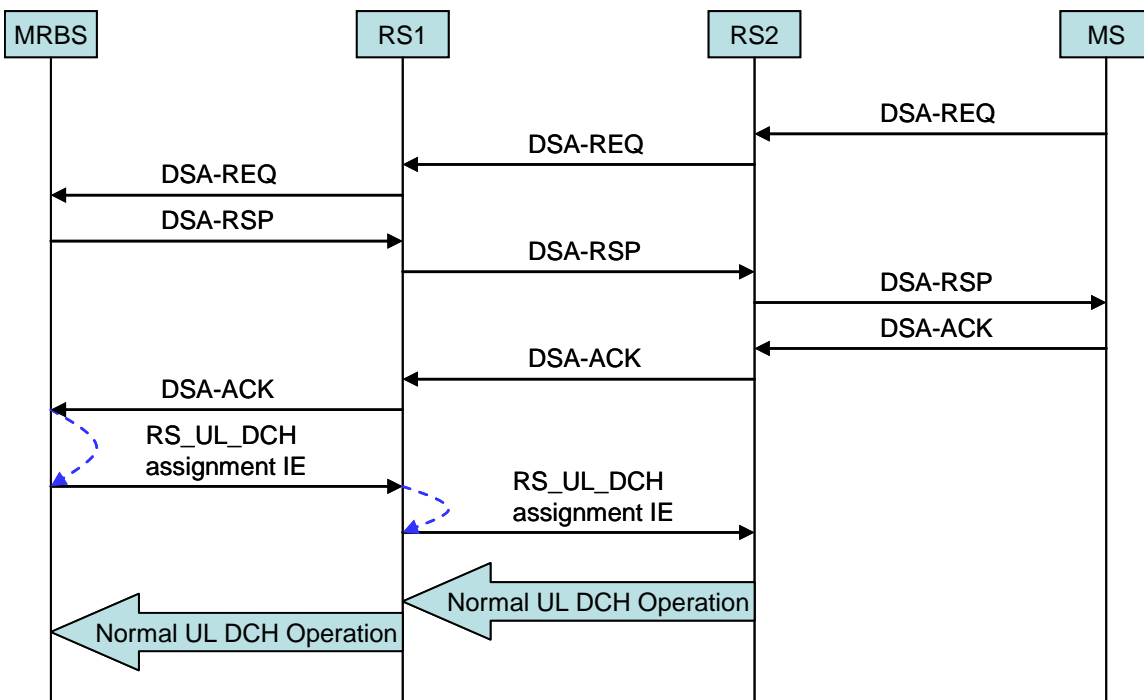


Figure 3: Uplink dedicated channel update after service flow creation

3. Text Proposal

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[Change subclause 6.3.6.7.3 as indicated]

6.3.6.7.3 Dedicated relay **uplink** channel allocation

After the RS network entry and initialization, the RS may be assigned an uplink dedicated channel (RS_UL_DCH) resource by its upstream serving station (MR-BS or RS). If the MR BS does not allocate an uplink dedicated channel to an RS, the RS may request an allocation.

The minimum size is large enough for a signaling message, it is available once every N frames. This initial resource is used by the RS to initiate the continuous operations of the dedicated channel. For example, the size can be updated, when appropriate, to a larger (or smaller) size according to the traffic requirement of the relay. The traffic requirement can be computed, periodically or as needed by events, by the RS to ensure adequate flows. For centralized resource management, the initial assignment and all subsequent updates may be done by the MR-BS only. In distributed resource management, the dedicated channel assignment may be done jointly by the MR-BS and the RS.

The dedicated channel allocation is assigned through MAP IE within the RS-Zone, i.e. R-MAP. The allocation is available starting in the **samenext** frame **whenafter** the R-MAP IE is received by the RS.

The upstream serving station (MR-BS or RS) may also assign a downlink dedicated channel (RS_DL_DCH) resource to its subordinate RS by sending the RS_DL_DCH assignment IE. The RS_DL_DCH operates with a periodic allocation without the need to send R-MAP IE every time and may be used for the transport of control signaling and data traffic.

[Add the following section]

6.3.6.7.3.1 Service flow based dedicated resource update

The ongoing dynamic adaptation of the dedicated channels may be in response to the events of service flow creation, change and deletion of the MS. As the per-link dedicated resource requirement is a function of the established service flows of each MS, each service flow change imposes resource changes to all the intermediate RSs that are supporting it. The creation, deletion or change of each service flow sets the change in resources needed for each affected relay link. By using the service flow creation, change, and delete events to update the size of the dedicated channel, all necessary links that require update can be adjusted accordingly. This assures a smooth transition to the new required size promptly without the need for detection using other means such as through traffic analysis. Minor dynamic update after the service flow creation or change allows the final convergence to the new appropriate size for the normal operation of the dedicated channel.

The MR-BS determines the size of the update to the dedicated channels based on the service traffic information TLVs in the signaling exchange of DSA, DSC or DSD process. The MR-BS adjusts the allocation to the affected first hop RS by sending the corresponding RS_DL_DCH assignment IE or RS_UL_DCH assignment IE. Within the assignment IE, the RS is also provided with the actual throughput size of the update and the CID of the access RS that is serving the specific MS. With this information the RS can determine which subordinate link needs to be updated and by how much. Upon receiving the assignment IE, in the next frame, the RS can adjust its allocation to its next hop link and so on until all the links to the specific access RS are updated.

[Change Table yyy. R-link specific IE types in subclause 8.4.5.9 as indicated]

Table yyy. R-link specific IE types.

Type (hexadecimal)	Usage
0x00	RS_UL_DCH assignment IE
<u>0x01</u>	<u>RS_DL_DCH assignment IE</u>
0x0 <u>2</u> -1F	Reserved

[Change subclause 8.4.5.9.1 as indicated]

8.4.5.9.1 RS UL DCH assignment IE

This IE is used for the initial allocation and subsequent updates of the uplink dedicated channel on the R-link.

Table XXX. RS_UL_DCH assignment IE format.

Syntax	Size	Notes
RS_UL_DCH assignment IE {		
Type	<u>45</u> bits	
<u>Length</u>	<u>4</u> bits	
RSCID	8 bits	Reduced basic CID of the RS
<u>Update type</u>	<u>2</u> bits	<u>00 = Normal</u> <u>01 = Service flow based</u> <u>10 to 11 = Reserved</u>
<u>If (Update type == 01) {</u>		<u>If service flow based update</u>
<u>Throughput size</u>	<u>24</u> bits	<u>Amount of throughput update in byte/s</u>
<u>Access RSCID</u>	<u>8</u> bits	<u>Reduced basic CID of the access RS of the MS that completed the service flow event</u>
<u>}</u>		
<u>Assignment type</u>	<u>2</u> bits	<u>00 = Incremental (Add the specified resource to UL DCH)</u> <u>01 = Removal (Remove the specified resource from UL DCH)</u> <u>10 = Aggregate (An aggregate assignment with no resource means UL DCH removal)</u> <u>11 = Reserved</u>
<u>UL Resource allocation</u> <u>UIUC</u>	<u>*4</u> bits	<u>Resources allocated to DCH</u>
<u>Repetition coding indication</u>	<u>2</u> bits	
<u>Slot offset</u>	<u>15</u> bits	<u>Offset from start of UL subframe, specified in slots</u>
<u>Duration</u>	<u>10</u> bits	<u>Resources allocated to DCH, specified in slots</u>
Frequency (N)	4 bits	Allocation repeats once every N frames
}		

The coding for the UL resource allocation to the DCH is TBD

[Add the following section]

8.4.5.9.2 RS DL DCH assignment IE

This IE is used for the initial allocation and subsequent updates of the downlink dedicated channel on the R-link.

Table XXX. RS_DL_DCH assignment IE format.

<u>Syntax</u>	<u>Size</u>	<u>Notes</u>
<u>RS_DL_DCH assignment IE {</u>		
<u>Type</u>	<u>5 bits</u>	
<u>Length</u>	<u>4 bits</u>	
<u>RSCID</u>	<u>8 bits</u>	<u>Reduced basic CID of the RS</u>
<u>Update type</u>	<u>2 bits</u>	<u>00 = Normal</u> <u>01 = Service flow based</u> <u>10 to 11 = Reserved</u>
<u>If (Update type == 01) {</u>		<u>If service flow based update</u>
<u>Throughput size</u>	<u>24 bits</u>	<u>Amount of throughput update in byte/s</u>
<u>Access RSCID</u>	<u>8 bits</u>	<u>Reduced basic CID of the access RS of the MS that completed the service flow event</u>
<u>}</u>		
<u>Assignment type</u>	<u>2 bits</u>	<u>00 = Incremental (Add the specified resource to DL DCH)</u> <u>01 = Removal (Remove the specified resource from DL DCH)</u> <u>10 = Aggregate (An aggregate assignment with no resource means DL DCH removal)</u> <u>11 = Reserved</u>
<u>DIUC</u>	<u>4 bits</u>	
<u>Boosting</u>	<u>3 bits</u>	
<u>Repetition coding indication</u>	<u>2 bits</u>	
<u>Num_region_id</u>	<u>4 bits</u>	<u>Number of region IDs in the assignment list of resources allocated to DCH</u>
<u>For (i=0; i<Num_region_id; i++) {</u>		
<u>Region_ID</u>	<u>6 bits</u>	<u>Index to the DL region defined in DL region definition TLV in DCD</u>
<u>}</u>		
<u>Frequency (N)</u>	<u>4 bits</u>	<u>Allocation repeats once every N frames</u>
<u>}</u>		

+++++ End Text Proposal +++++