

Project	<b>IEEE 802.16 Broadband Wireless Access Working Group</b> < <a href="http://ieee802.org/16">http://ieee802.org/16</a> >	
Title	Dedicated Relay Uplink Resource Assignment for Control Signaling and Data Transmission	
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Abstract	In this contribution, we propose the use of dedicated uplink channel as the main bandwidth resource for relay to transmit upstream control signaling and data traffic. It can provide a more effective transport mechanism in simplifying operation, minimizing delay and protocol overhead when comparing with extending the existing bandwidth request and allocation mechanism for MMR network operation.	
Purpose	To incorporate the proposed text into the P802.16j Baseline Document (IEEE 802.16j-06/026r1)	
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# Dedicated Relay Uplink Resource Assignment for Control Signaling and Data Transmission

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## 1. Introduction

The common mechanism for a MS to acquire bandwidth resource for uplink control signaling and data transmission is through the contention based bandwidth request and allocation procedure shown in Figure 1.

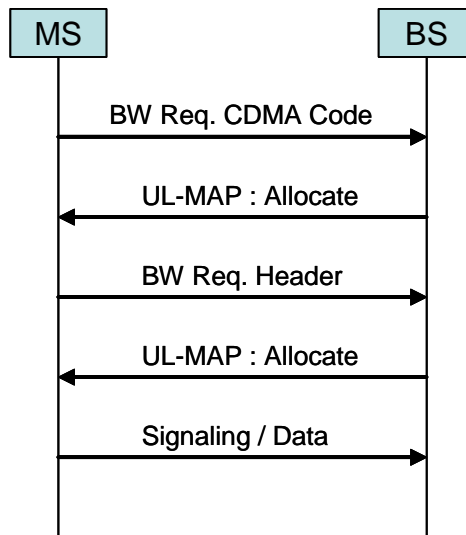


Figure 1: Contention based bandwidth request and allocation procedure

First, the MS needs to transmit a contention based bandwidth request CDMA code to the BS to indicate its intention to send in the request details. Secondly, the BS allocates resource for the MS to send in the bandwidth request header. Thirdly, the MS transmit the request header to provide the details. Fourthly, the BS then schedule and allocate the necessary resources through the UL-MAP in the required number of frames to the MS. Finally, the MS can send in the intended signaling message or data traffic. If this procedure is simply extended to be used by each relay sequentially in the mobile multi-hop relay (MMR) environment shown in Figure 2, the significant increase in delay can greatly impact the usefulness of relay in the MMR network.

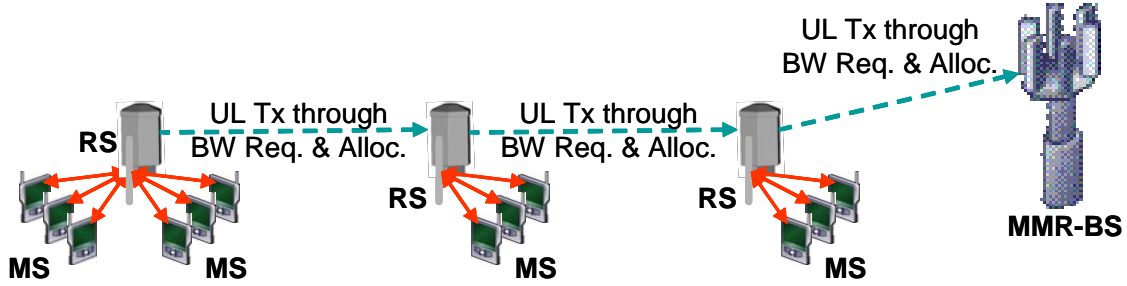


Figure 2: Multi-hop uplink transmission through bandwidth request and allocation procedure

The efficiency of the multi-hop uplink can be improved through the polling mechanism. Fundamentally, it eliminates the need to transmit the contention based bandwidth request CDMA code, instead the upstream serving station (MMR-BS or RS) periodically polls the RS by allocating resource for the RS to send in the bandwidth request header. However, it still requires a polling bandwidth allocation followed by the bandwidth request before the actual bandwidth is granted.

The original design of the bandwidth request and allocation procedure is based on the characteristics and requirements of MS. As relay will be serving a number of MS(s) and maybe relays, it will require frequent UL transmission. Its behaviors and requirements are expected to be different from that of a MS.

## 2. Proposed Dedicated Relay Uplink Resource Assignment

In this contribution, as shown in Figure 3, we propose the use of dedicated uplink channel as the main bandwidth resource for relay to transmit upstream control signaling and data traffic. It can provide a more effective transport mechanism in simplifying operation, minimizing delay and protocol overhead when comparing with extending the existing bandwidth request and allocation mechanism for MMR network operation.

The dedicated uplink channel enables a tight coupling between MMR-BS with its RS(s) to serve MS effectively. It is applicable to both distributed and centralized resource managements. For centralized management, it is more like a backhaul of control signaling messages and data traffic to the MMR-BS. For distributed management, signaling that can be handled locally are managed by the RS and requests can be aggregated to further reduce the amount of signaling messages needed to go through the RS hops towards the MMR-BS.

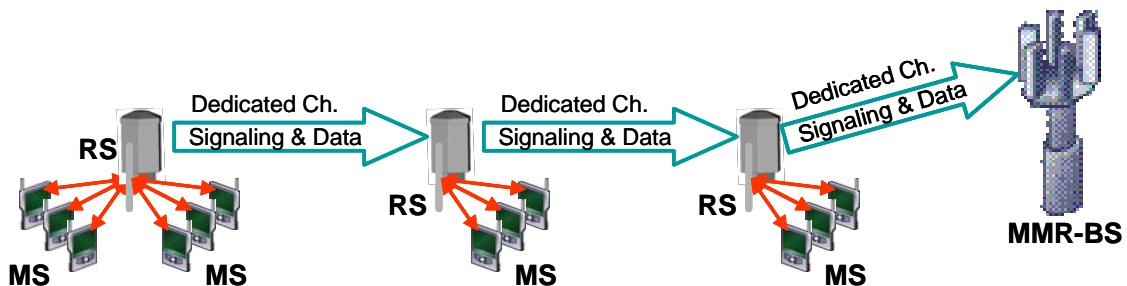


Figure 3: Multi-hop uplink transmission through dedicated channel allocation

During the initial network entry, the RS will be assigned the minimum size of dedicated uplink resource by its upstream serving station (MMR-BS or RS). 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 appropriated, to a larger size for both signaling and data traffic according to the average BW requirement of the relay. The average BW requirement can be computed periodically by the RS to ensure smooth signaling and data traffic flows. For centralized resource management, the initial assignment and all subsequent updates are done by the MMR-BS only.

The dedicated channel allocation is achieved through R-MAP IE within the R-MAP message. For details on the format of R-MAP, please refer to contribution [1].

### 3. Text Proposal

#### 3.1 Dedicated relay uplink channel allocation

+++++ Start Text Proposal +++++

*[Add the following section]*

##### 6.3.9.16 Network entry and initialization

##### 6.3.9.16.1 RS network entry and initialization

##### 6.3.9.16.1.1 Dedicated relay uplink channel allocation for control signaling and data transmission

As part of the RS network entry and initialization, the RS will be assigned the minimum size of dedicated uplink resource RS\_UL\_DCH by its upstream serving station (MMR-BS or RS). 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 appropriated, to a larger size for both signaling and data traffic according to the average BW requirement of the relay. The average BW requirement can be computed periodically by the RS to ensure smooth signaling and data traffic flows. For centralized resource management, the initial assignment and all subsequent updates are done by the MMR-BS only.

#### 3.2 R-MAP IE definition for dedicated relay uplink channel allocation

*[Add the following section]*

##### 8.4.5.9 R-MAP IE

##### 8.4.5.9.1 RS\_UL\_DCH assignment IE

This IE is used for the initial allocation and subsequent updates of the dedicated relay uplink channel. The channel can be used to transmit uplink control signaling messages and data traffic.

Table XXX. RS\_UL\_DCH assignment IE format.

Syntax	Size	Notes
RS_UL_DCH assignment IE {		
<u>Type</u>	4 bits	
<u>RSID</u>	8 bits	

<u>Frame Number</u>	<u>24 bits</u>	<u>The frame number of the first allocation of the dedicated UL channel</u>
<u>Number of UL BAU</u>	<u>6 bits</u>	
<u>Frequency N</u>	<u>6 bits</u>	<u>Allocation repeats every N frames</u>
<u>↓</u>		

The BAU size referred in this IE is a system parameter broadcast in RS zone BAU configuration IE.

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

#### 4. References

[1] IEEE C802.16j-07/090 “Format of R-MAP within RS-Zone”, IEEE 802.16 meeting, January 2007.