

Project	IEEE 802.16 Broadband Wireless Access Working Group < http://ieee802.org/16 >
Title	Dedicated Relay Uplink Resource Assignment for Control Signaling and Data Transmission
Date Submitted	2007-01-12
Source(s)	Derek Yu, Hang Zhang, Peiying Zhu, Wen Tong, David Steer, Gamini Senarath, Mark Naden, G.Q. Wang Voice: +1 613 763-1315 [mailto:wentong@nortel.com] [mailto:pyzhu@nortel.com] Nortel 3500 Carling Avenue Ottawa, Ontario K2H 8E9
Re:	A response to a Call for Technical Proposal, http://wirelessman.org/relay/docs/80216j-06_034.pdf
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)
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.
Patent Policy and Procedures	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 >.

Dedicated Relay Uplink Resource Assignment for Control Signaling and Data Transmission

Hang Zhang, Derek Yu, Peiying Zhu, Wen Tong, David Steer, Gamini Senarath, Mark Naden, G.Q. Wang

Nortel

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.

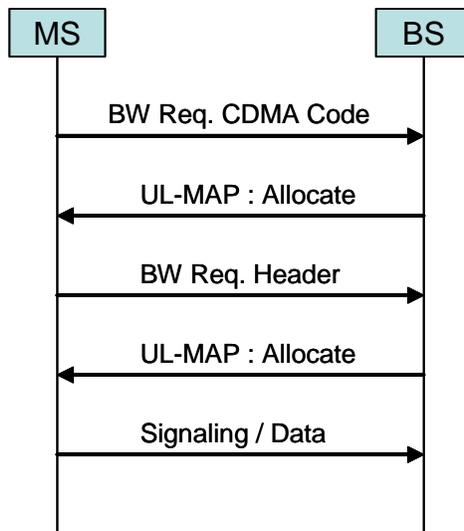


Figure 1: Contention based bandwidth request and allocation procedure

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.

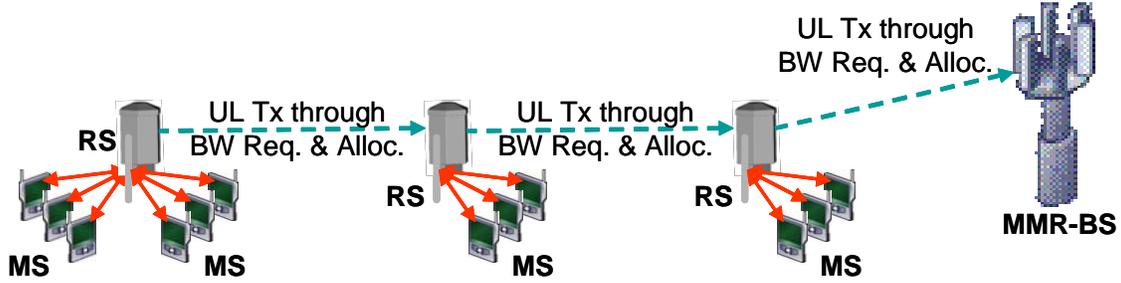


Figure 2: Multi-hop uplink transmission through bandwidth request and allocation procedure

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.

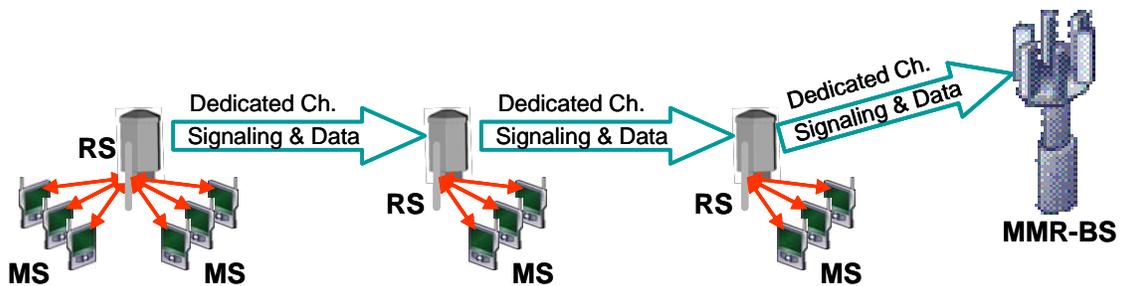


Figure 3: Multi-hop uplink transmission through dedicated channel allocation

During the initial network entry, the RS will be assigned the minimum or larger 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 RS-Zone. For details on the format of R-MAP, please refer to contribution [1]. The allocation is available starting in the same frame when the R-MAP IE is received by the RS.

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 or larger 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.

The dedicated channel allocation is achieved through RS_UL_DCH assignment IE within the R-MAP in the RS-Zone. The allocation is available starting in the same frame when the R-MAP IE is received by the RS.

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
--------	------	-------

<u>RS UL DCH assignment IE {</u>		
<u>Type</u>	<u>4 bits</u>	
<u>RSID</u>	<u>8 bits</u>	
<u>UL region ID</u>	<u>6 bits</u>	
<u>Frequency N</u>	<u>6 bits</u>	<u>Allocation repeats once every N frames</u>
<u>}</u>		

The region referred by this IE is defined and broadcast in RS zone region configuration IE.

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

4. References

[1] IEEE C802.16j-07/090 "Format of R-MAP within RS-Zone", IEEE 802.16 meeting #47, January 2007.