Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**	
Title	Corrections and clarifications on scheduling services.	
Date Submitted	**2005-03-11**	
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Re:	IEEE P802.16REVd/D5-2004	
Abstract	This contribution proposes some corrections and clarifications on the description of scheduling services	
Purpose	Adopt changes.	
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Corrections and clarifications on scheduling services.

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1. Introduction

The QoS framework applies to both uplink and downlink service flows. However, there are several occurrence of the text (probably vestige from DOCSIS) that imply that QoS applies only to uplink service flows. Also, section 6.3.5.2 called "Uplink request/grant scheduling" defines the various scheduling services which is misleading.
Also the spec defines a best-effort scheduling type which is misleading because it can be associated with a minimum reserved traffic rate, a traffic priority, etc… The spec should be clarified and show the how to define well known data delivery services (RT-VR, NRT-VR, BE, etc…) within the QoS framework of 802.16-2004.

2. Text changes

[Modify 6.3.5]

6.3.5 Scheduling services

Scheduling services represent the data handling mechanisms supported by the MAC scheduler for data transport on a connection. Each connection is associated with a single data service. Each data service is associated with a set of QoS parameters which quantify aspects of its behavior. These parameters are managed using the DSA and DSC message dialogs. Four services (11.13.11) are supported: Unsolicited Grant Service (UGS), Real-time Polling Service (rtPS), Non-real-time Polling Service (nrtPS), and Best Effort (BE). The following text provides a brief description of each of the supported scheduling services, including the mandatory QoS parameters that shall be included in the service flow definition when the scheduling service is enabled for a service flow. A detailed description of each QoS parameter is provided in 11.13.

The UGS is designed to ~~support~~ transport in the uplink direction real-time data streams consisting of fixed-size data packets issued at periodic intervals, such as T1/E1 and Voice over IP without silence suppression. The mandatory QoS service flow parameters for this scheduling service are Maximum Sustained Traffic Rate (11.13.6), Maximum Latency (11.13.14), Tolerated Jitter (11.13.13), and Request/Transmission Policy (11.13.12). If present, the Minimum Reserved Traffic Rate parameter (11.13.8) shall have the same value as the Maximum Sustained Traffic Rate parameter.

The rtPS is designed to ~~support~~ transport in the uplink direction real-time data streams consisting of variable-sized data packets that are issued at periodic intervals, such as moving pictures experts group (MPEG) video. The mandatory QoS service flow parameters for this scheduling service are Minimum Reserved Traffic Rate (11.13.8), Maximum Sustained Traffic Rate (11.13.6), Maximum Latency (11.13.14), and Request/Transmission Policy (11.13.12).

The nrtPS is designed to ~~support~~ transport in the uplink direction delay-tolerant data streams consisting of variable-sized data packets for which a minimum data rate is required, such as FTP. The mandatory QoS service flow parameters for this scheduling service are Minimum Reserved Traffic Rate

(11.13.8), Maximum Sustained Traffic Rate (11.13.6), Traffic Priority (11.13.5), and Request/Transmission Policy (11.13.12).
The BE service is designed to support data streams for which no minimum service level is required and therefore may be handled on a space-available basis. The mandatory QoS service flow parameters for this scheduling service are Maximum Sustained Traffic Rate (11.13.6), Traffic Priority (11.13.5), and Request/Transmission Policy (11.13.12).

[Renumber 6.3.5.2.1 to 6.3.5.3 and modify]
~~6.3.5.2.1~~ **6.3.5.3 UGS**
The UGS is designed to support real-time uplink service flows that generate fixed size data packets on a periodic basis, such as T1/E1 and Voice over IP without silence suppression. The service offers fixed size grants on a real-time periodic basis, which eliminate the overhead and latency of SS requests and assure that grants are available to meet the flow's real-time needs. The BS shall provide Data Grant Burst IEs to the SS at periodic intervals based upon the Maximum Sustained Traffic Rate of the service flow. The size of these grants shall
be sufficient to hold the fixed length data associated with the service flow (with associated generic MAC header and Grant management subheader) but may be larger at the discretion of the BS scheduler. In order for this service to work correctly, the Request/Transmission Policy (see 11.13.12) setting shall be such that the SS is prohibited from using any contention request opportunities for this connection. The key service IEs are the Maximum Sustained Traffic, Maximum Latency, the Tolerated Jitter, and the Request/Transmission Policy. If present, the Minimum Reserved Traffic Rate parameter shall have the same value as the Maximum Sustained Traffic Rate parameter.

[Renumber 6.3.5.2.2 to 6.3.5.4 and modify]
~~6.3.5.2.2~~ **6.3.5.4 rtPS**
The rtPS is designed to support real-time uplink service flows that generate variable size data packets on a periodic basis, such as moving pictures experts group (MPEG) video. The service offers real-time, periodic, unicast request opportunities, which meet the flow's real-time needs and allow the SS to specify the size of the desired grant. This service requires more request overhead than UGS, but supports variable grant sizes for optimum data transport efficiency.
The BS shall provide periodic unicast request opportunities. In order for this service to work correctly, the Request/Transmission Policy setting (see 11.13.12) shall be such that the SS is prohibited from using any contention request opportunities for that connection. The BS may issue unicast request opportunities as prescribed by this service even if prior requests are currently unfulfilled. This results in the SS using only unicast request opportunities in order to obtain uplink transmission opportunities (the SS could still use unsolicited Data Grant Burst Types for uplink transmission as well). All other bits of the Request/Transmission
Policy are irrelevant to the fundamental operation of this scheduling service and should be set according to network policy. The key service IEs are the Maximum Sustained Traffic Rate, the Minimum Reserved Traffic Rate, the Maximum Latency and the Request/Transmission Policy.

[Renumber 6.3.5.2.3 to 6.3.5.5 and modify]
~~6.3.5.2.3~~ **6.3.5.5 nrtPS**

The nrtPS offers unicast polls on a regular basis, which assures that the uplink service flow receives request opportunities even during network congestion. The BS typically polls nrtPS CIDs on an interval on the order of one second or less.
The BS shall provide timely unicast request opportunities. In order for this service to work correctly, the Request/Transmission Policy setting (see 11.13.12) shall be set such that the SS is allowed to use contention request opportunities. This results in the SS using contention request opportunities as well as unicast request opportunities and unsolicited Data Grant Burst Types. All other bits of the Request/Transmission Policy are irrelevant to the fundamental operation of this scheduling service and should be set according to network policy.

[Renumber 6.3.5.2.4 to 6.3.5.6 and modify]

~~6.3.5.2.4~~ 6.3.5.6 BE service

The intent of the BE service is to provide efficient service for best effort traffic in uplink and downlink. In the case of an uplink service flow, in order for this service to work correctly, the Request/Transmission Policy setting shall be set such that the SS is allowed to use contention request opportunities. This results in the SS using contention request opportunities as well as unicast request opportunities and unsolicited Data Grant Burst Types. All other bits of the Request/Transmission Policy are irrelevant to the fundamental operation of this scheduling service and should be set according to network policy. In the case of a downlink service flow, the Request/Transmission Policy parameter is irrelevant and shall be omitted.