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Corrections and Clarifications on Bandwidth Request and Allocation Mechanism

1 Current text ambiguities and inconsistencies

The behavior of the system with regards the use of bandwidth by an SS suffers from several ambiguities. In particular, Figure 37 clearly implies that transmission can only be performed for CIDs that have previously requested bandwidth. This statement is not echoed in the text.

If this is not made clear in the standard, the BS cannot rely on bandwidth requests to control the uplink transmission. Indeed, a SS could use grants for high priority connections to send low priority traffic. If this argument was pushed to the limit, an SS could request bandwidth for its basic CID only and use it to transmit PDUs for any of its transport connections. This would break the QoS system-wide because traffic on the basic connection must be maintained at all cost and has higher scheduling priority than any other connection, even transport connections with UGS scheduling.

To take care of the time-urgent aspect of the basic connection (as stated in §6.3.1.1), the proposed requirement shall state that it does not apply to the Basic Connection. With this restriction, an SS can use any grant to transmit time-urgent MAC management messages without explicitly requesting bandwidth, thus reducing the latency to send this kind of messages.

It is also important to clarify the meaning of the concept of bandwidth stealing. Indeed there are only 3 references to this concept in the whole standard. From its definition, it refers to sending a bandwidth request for a connection in a grant for another connection. From its name, it could refer to sending data on a connection for which no prior bandwidth request was made or whether it. Some additional clarity would be useful.

There are also a few references in the text to “unsolicited Data Grant Burst Type”, which is an outdated concept, originating from DOCSIS, where a special Up-Link IE could be used to grant bandwidth to UGS service flows. The text should be corrected to remove these misleading references.

2 Proposed Text Changes

[Modify §3]

3.4 **bandwidth stealing**: The use, by a subscriber station (SS), of a portion of the bandwidth allocated in response to a Bandwidth Request for a connection to send ~~another~~ a Bandwidth Request for any of its connections. See §6.3.6. ~~rather than sending data.~~

[Modify §6.3.5.2.2]

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 and data transmission 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.

[Modify §6.3.5.2.3]

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 data transmission opportunities. ~~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.

[Modify §6.3.5.2.4]

The intent of the BE service is to provide efficient service for best effort traffic. 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 data transmission opportunities. ~~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.

[Modify §6.3.6.2]

6.3.6.2 Grants

For an SS, bandwidth requests reference individual connections while each bandwidth grant is addressed to the SS's Basic CID, not to individual CIDs. Since it is nondeterministic which request is being honored, when the SS receives a shorter transmission opportunity than expected (i.e., scheduler decision, request message lost, etc.), no explicit reason is given. In all cases, based on the latest information received from the BS and the status of the request, the SS may decide to perform backoff and request again or to discard the SDU.

An SS shall not use Data Grants directed at its basic CID to transmit MAC PDUs for connections with no request pending. This requirement does not apply to transport connections with UGS scheduling for which bandwidth request is implicit nor to the Basic Connection which is used to transmit delay-critical MAC management messages.

An SS may use Request IEs that are broadcast, directed at a multicast polling group it is a member of, or directed at its Basic CID. In all cases, the Request IE burst profile is used, even if the BS is capable of receiving the SS with a more efficient burst profile. To take advantage of a more efficient burst profile, the SS should transmit in an interval defined by a Data Grant IE directed at its Basic CID. Because of this, unicast polling of an SS would normally be done by allocating a Data Grant IE directed at its Basic CID. ~~Also note that, in a Data Grant IE directed at its Basic CID, the SS may make bandwidth requests for any of its connections.~~

Also note that Bandwidth Stealing is possible: in a Data Grant IE directed at its Basic CID, the SS may make bandwidth requests for any of its connections.

The procedure followed by SSs is shown in Figure 37.