Project	**IEEE 802.16 Broadband Wireless Access Working Group <http://ieee802.org/16>**
Title	**Fix for MBS Classification Rule**
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Re:	LB26b, Working Group Letter Ballot on P802.16REV2/D3
Abstract	
Purpose	Modify the text to fix problems for MBS Classification method
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Fix for MBS Classification Rule

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Problem 1

802.16 Classification of MBS flows has a lack of specification which likely will result in failure of the 802.16 classification function to consistently perform.

P802.16REV2/D3, page 455, line 53 says 'Mapping of multicast and broadcast SFIDs to CIDs shall be known to all BSs belong[sic] to the same MBS zone.' Yet nothing in the standard indicates that MBS flows do not follow the standard rule for SFID uniqueness: Service Flow is only unique per SS.

Nothing in the standard says that these MS unique MBS Service Flows, for each MS, must have the same SFID, same QoSParameterSet, and same Classification Rule(s), when referencing the same MBS flow.

While having different SFIDs identifying the same MBS flow across two or more MS is unlikely to cause interoperability problems, the same cannot be said for QoSParameterSet, and certainly not for Classification Rule(s).

As an example, MS#1 identifies the specific MBS flow with SFID 1, while MS#2 identifies the same MBS flow with SFID 5. No problem.

But Classification is certainly confusing if both MS#1 and MS#2 use different Classification Rules for the same flow. Which classification rule is actually correct? Are they all correct? The standard is mute.

The same problem exists for the scheduler when the QoSParameterSets differ between the two service flows for the two MS.

And it gets more involved.

802.16 says that MBS flows may be transmitted even if no MS are in Normal Operation at the specific transmitting BS. This feature is intended to support Idle Mode MS that may be listening for the transmissions but to which the transmitting BS is unaware of any presence in its transmission area. What Classification Rule attached to what Service Flow is used to classify the DL ingressing MBS protocol SDUs when there is no MS active at the BS? What QoSParameterSet is used to guide the scheduler in programming the transmissions of the flow to meet the service requirements?

The Classification clause in 802.16, Clause 5, is substantially detailed. Yet there is nothing in Clause 5 or anywhere else in the 802.16 standard that presents an exception or alternate method of classification for MBS flows. Right now in 802.16 the only Classification that is specified is based on the unique Classification Rules identified in the Service Flows of active SS on the BS. Clearly this will not work for MBS flows, especially considering Idle Mode operation. But any remedy must be consistent with the existing concepts in 802.16. For instance, SS know which service flows are mapped to which CIDs, consequently which CIDs the SS should listen for transmissions/the SS may make UL transmissions, by exchanging DSx messaging with the BS. Any remedy must preserve this basic method of the standard.

Finally, the standard says that in Multi-BS MBS, MCID shall be the same for all MBS service flows within an MBS Zone.

Note that this rule for Multi-BS MBS does not violate the standard requirement that 'the relationship between SFID and Transport CID, when present, is unique. An SFID shall never be associated with more than one Transport CID, and a Transport CID shall never be associated with more than one SFID.' The specified MBS behavior does not violate the rule because, per Table 528, MCID is not a Transport CID. So Transport CID is

never 'present' for a MBS Service Flow.

Unfortunately, the same is not true for Single-BS MBS. The standard says that for Single-BS MBS, 'any available traffic CID value may be used for the single-BS MBS service. The CID used for the service is the same for all MS on the same channel that participate in the connection.' Since Single-BS MBS uses regular transport CIDs, this mandate is in conflict with the rule presented in the 6.3.14.2 Service Flow definitions clause.

Resolution of this conflict is not clearly presented in the standard. Obviously the intent is that for MBS flows the behavior defined in the MBS clause takes precedence. But without making special reference, this is unclear.

I believe the correct remedy is to provide additional specification that:

- For All MS provisioned with the same MBS flow in an MBS Zone, the Service Flow encodings for the flow shall have the same CID (the standard actually already says that), the same QoSParameterSet, and the same Classification Rule(s);

- The method of making all BS in the same MBS Zone aware of MBS flows and associated MBS Service Flows—including CID assignment, QoSParameterSet, and Classification Rule(s)—is outside the scope of the standard;

- For Multi-BS MBS, the standard assumes that BS in the same MBS Zone will maintain MBS Service Flow information sufficient to do scheduling and classification of received MBS flows, even when no MS participating in the service is active on the BS;

- For Single-BS MBS unlike for unicast service flows, transport CID is not unique per SFID. Alternately, we can simply require that every MS provisioned with the Single-BS MBS service flow be given the same SFID.

Remedy 1a

In P802.16REV2/D3, section 6.3.23 Multicast and broadcast service (MBS), page 454, line 30, modify the text as:

6.3.23 Multicast and broadcast service (MBS)

Some globally defined service flows may carry broadcast or multicast information that should be delivered to a plurality of SS or MS. Such service flows have certain QoS parameters and may require encryption performed using a globally defined sequence of TEKs. Since a multicast connection is associated with a service flow, it is associated with the QoS and traffic parameters for that service flow. Some MS are registered to certain BS while some are in idle mode and not currently served by any specific BS.

Two types of access to MBS may be supported: single-BS access and multi-BS access. Single-BS access is implemented over multicast connections within one BS, while multi-BS access is implemented by transmitting data from service flow(s) over multiple BS. MS may support both single-BS and multi-BS access. ARQ is not applicable to either single-BS-MBS or multi-BS-MBS. Initiation of MBS with respect to specific MS is always performed in ~~registered state~~Normal Operation by creation of service flows with multicast CID connections, carrying MBS data. During such initiation the MS learns the SFID that identifies the service. All service flows to transmit the same MBS flows, created on any MS, shall have the same service flow management encodings for QoSParameterSet. For multi-BS-MBS, each BS capable of providing MBS belongs to a certain MBS Zone, which is a set of BSs where the same CID and same SA is used for transmitting content of certain service flow(s). MBS Zone is identified by a unique MBS_Zone ID.

Remedy 1b

In P802.16REV2/D3, section 6.3.23.1 Single-BS access, page 454, line 51, modify the text as:

6.3.23.1 Single-BS access

The BS may provide the MS with single-BS access by creating a multicast traffic connection with each MS to be associated with the service connection. Any available traffic CID value may be used for the single-BS-MBS service. For Single-BS MBS unlike for unicast service flows, transport CID is not required to be unique per SFID. The CID used for the service is the same for all MS on the same channel that participate in the connection on the BS. All service flows to transmit the same MBS flows, created on any MS and transmitted on the BS, shall have the same service flow management encodings for Classification. The data transmitted on the connection with the given CID shall be received and processed by the MAC of each involved MS. Thus, each multicast MAC SDU is transmitted only once per BS channel.

If a DL multicast connection is to be encrypted, each MS participating in the connection shall have an additional security association (SA), allowing that connection to be encrypted using certain keys that are independent of those used for other encrypted transmissions between the MS and BS.

Remedy 1c

In P802.16REV2/D3, section 6.3.23.2.1 Establishment and maintenance of MBSs, page 455, line 38, modify the text as:

6.3.23.2.1 Establishment and maintenance of MBSs

Establishment of MBSs with respect to certain service flow is always performed when MS is registered in Normal Operation with to a certain serving BS. Such establishment is specified in 6.3.23.1.

MBSs are associated with multicast and broadcast service flows. Multicast and broadcast service flows are not dedicated to the specific MS and are maintained even though the MS is either in awake/sleep mode or in the idle mode. When an MS is registered at a BS for receiving MBS, multicast and broadcast service flows shall be instantiated as multicast connections. Data of multicast and broadcast service flows may be transmitted from BS and received at MS also regardless of what mode the MS is currently in. The method of making all BS in the same MBS Zone aware of MBS flows and associated MBS Service Flows—including multicast CID assignment, QoSParameterSet, and Classification Rule(s)—is outside the scope of the standard. As the Classification and transmission of MBS flows may be supported on a BS in an MBS Zone regardless of the presence or absence of any MS in Normal Operation receiving the service, the BS may retain MBS service flow management encodings sufficient to do classification and scheduling of received MBS flows, even when no MS participating in the service is active on the BS.

The BS may establish a DL MBS by creating a multicast and broadcast service flows when the service commences.

Mapping of multicast and broadcast SFIDs to CIDs shall be known to all BSs belong to the same MBS zone. All service flows to transmit the same MBS flows, created on any MS and transmitted on any BS within the same MBS Zone, shall have the same service flow management encodings for Classification.

When the MS registers at the BS for receiving multicast and broadcast services, the BS or MS may initiate the DSA procedure with respect to multicast and broadcast connections. Such knowledge may be used to initiate bi-

directional upper layers communication between the MS and the network for the purpose of configuration of multicast/broadcast service. After ~~the~~ successful configuration, the MS may reuse the same configuration when it moves to another BS without re-configuration.

During communication to the BS the MS may learn MBS_Zone ID. The MS may continue to receive DL MBS transmissions from any BS that is part of the MBS Zone, regardless of the MS operating mode—Normal Operation, Idle Mode—without need for update to any service flow management encoding for the MBS flow.

Should the MS transit to a new MBS Zone while in Normal Operation, as part of the handover the BS may include CID_Update in REG-RSP endcoding TLV in the RNG-RSP to provide updated service flow management encodings for any affected MBS flow.

~~If MS acquired MBS_Zone and goes to idle mode, then the MS may continue receiving MBS content from any BS that advertises the same MBS_Zone. By doing this, the MS uses the same CID and SA that were used in registered state.~~ In case MS~~, still~~ in Idle ~~state~~Mode~~,~~ migrates to BS advertising another MBS_Zone, ~~it~~ the MS is expected to ~~register~~ have the MBS service flow management encodings updated at that BS~~,~~ ~~and~~ to acquire update on one or more of ~~a new~~ multicast CID~~,~~ ~~and SA~~Target SAID parameter, Packet Classification Rule parameter(s), MBS Zone Identifier Assignment parameter, and MBS contents IDs, to provide for further reception of MBS content. The MS may conduct location update for MBS update to signal to the BS need to acquire updated MBS service flow management encodings. The BS may include CID_Update in REG-RSP endcoding TLV in the RNG-RSP to provide updated service flow management encodings for any affected MBS flow.

Multicast and broadcast service flows are encrypted at the application layer or MAC or both. Upper layer encryption may be employed to prevent non-authorized access to multicast and broadcast content. MBS may provide access control against theft of service by enforcing data encryption based on advanced encryption standard with counter mode encryption (AES-CTR) defined in NIST Special Publication 800-38A and FIPS 197. Details of MBS security is defined in 7.8.3.

Remedy 1d

In P802.16REV2/D3, section 6.3.23.2.4 Multicast and broadcast zone (MBS_Zone), page 456, line 32, modify the text as:

6.3.23.2.4 Multicast and broadcast zone (MBS_Zone)

Different CIDs or different SAs may be used in different regions for the same multicast and broadcast service flow. A multicast and broadcast zone identifier (MBS_ZONE) is used to indicate a region through which a CID and SA for a broadcast and multicast service flow are valid. A BS that supports Multi-BS Access MBS shall advertise MBS_ZONE in the DCD message. In case BS sends DSA for establishment of connection for MBS, MBS_ZONE shall be encoded in the DSA message. If an MS in Idle mode moves into BSs in the same MBS zone, the MS does not have to re-enter the network ~~and~~ to re-establish a connection or a connection defined by MBS Contents Identifier to monitor the multicast and broadcast service flow. However, if an MS moves into a different MBS zone, the MS may need to ~~re-establish~~update service flow management encodings ~~a connection or a virtual connection~~ for the multicast and broadcast service flow.

One BS may have multiple MBS zone ID