Project	**IEEE 802.16 Broadband Wireless Access Working Group** <http://ieee802.org/16>
Title	**Generic Packet Convergence Sub-layer for MBS**
Date Submitted	**2008-10-29**
Source(s)	Erik Colban Voice: NextWave Wireless Inc.* E-mail: ecolban@nextwave.com *<http://standards.ieee.org/faqs/affiliationFAQ.html>
Re:	P802.16 Sponsor Ballot Recirculation 1 (as announced in IEEE 802.16-08/052)
Abstract	IEEE 802.16 standard specifies a Generic Packet Convergence Sub-layer (GPCS). This CS, as currently defined, can only be used for uni-cast services. This contribution suggests some changes to GPCS that would make it applicable to Multicast Broadcast Services (MBS).
Purpose	Review and adopt.
Notice	*This document does not represent the agreed views of the IEEE 802.16 Working Group or any of its subgroups.* It represents only the views of the participants listed in the "Source(s)" field above. It is offered as a basis for discussion. It is not binding on the contributor(s), who 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	The contributor is familiar with the IEEE-SA Patent Policy and Procedures: <http://standards.ieee.org/guides/bylaws/sect6-7.html#6> and <http://standards.ieee.org/guides/opman/sect6.html#6.3>. Further information is located at <http://standards.ieee.org/board/pat/pat-material.html> and <http://standards.ieee.org/board/pat>.

Generic Packet Convergence Sub-layer for MBS

Erik Colban, Lei Wang, Yair Bourlas, Kenneth Stanwood
NextWave Wireless Inc.

Background

Section 5.3 specifies the Generic Packet Convergence Sublayer (GPCS). The motivation for having GPCS applies equally to unicast and multicast services. GPCS allows, e.g., classification and header compression to happen at layers above the MAC CS. However, the GPCS_DATA.Request primitive uses the MS MAC Address and the SFID to identify the service flow. Since a multicast service flow may be transmitted to a set of MS, which may vary over time and is not necessarily known to the upper layer function, the MS ID and SFID are not appropriate attributes to use in the GPCS_DATA.request primitive at the BS. Therefore, GPCS needs to be modified for it to be used for multicast services. Furthermore, in order to support MBS services, where outer decoding takes place above the GPCS, a new GPCS_PROTOCOL_TYPE needs to be defined to indicate that the receive data shall be forwarded to an outer-decoder.

Proposal

There are several considerations that need to be taken when amending GPCS for MBS:

1. The SFID does not identify uniquely an MBS flow, not even within an MBS Zone. The standard imposes only that the (MS MAC Address, SFID) *pair* shall uniquely identify a service flow. An implementation may, e.g., let the BS assign different SFIDs to different MSs that map to the same set of QoS parameters, Classification rules and multicast CID (MCID) as long as the "mapping of multicast and broadcast SFIDs to CIDs [is] known to all BSs belonging to the same MBS zone." (Section 6.3.22.1).

2. Multiple MBS flows may be mapped to the same MCID distinguishable through Logical CIDs (LCID). The LCIDs map to Contents IDs, which are known to the upper layer.

The GPCS_DATA.Request and GPCS_DATA.Indication primitives must include attributes in addition to the DATA and LENGTH attributes that serve as an indicator used by the BS and the MS to determine how to handle the data. For unicast services this indicator consists of the MS MAC address and the SFID. The purpose of the indicator in the GPCS_DATA.Request primitive is to allow the BS to determine to which CID it shall map the data. Likewise, the purpose of the indicator in the GPCS_DATA.Indication is to allow the MS to determine to which "protocol stack instance" it shall forward the received data. This instance may, for instance, be responsible for reconstructing compressed IP headers and/or perform outer-decoding before forwarding the data up the IP stack, or may be the IP protocol stack instance itself. Given that the indicator has a different purpose on the sender and the receiver side, there is nothing that precludes using different indicators on the sender and the receiver side.

Figure 1 illustrates the data path of unicast transmissions. At the sender, the SFID and MS MAC Address (MSID), which are determined by some classification function above the MAC CS, are used to determine the service flow to which the data belongs and thereby map the data to the correct connection. At the receiver side, the SFID and MSID are used to determine the service flow to which the data belongs and, using the GPCS_PROTOCOL_TYPE associated with that service flow, the data is forwarded to the correct protocol stack.
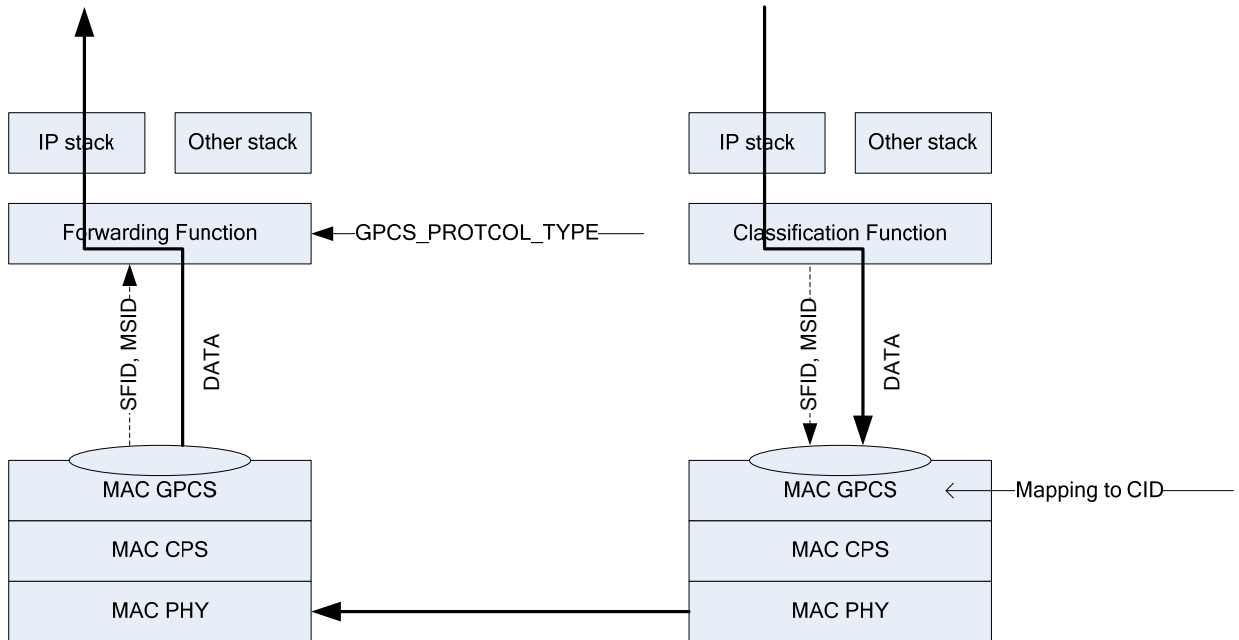
Figure 1 – Data path for unicast transmission using GPCS

In light of these observations, a possible modification of GPCS would be to add a new attribute to the GPCS_DATA.Request, which is called the Logical Flow ID (LFID). For GPCS_DATA.Indication, no changes are needed.

The LFID uniquely identifies a multicast connection (or [multicast connection, logical channel] pair, when logical channels are used). The identity of the multicast connection/logical channels need not be known to the upper layer. When the LFID is used, the GPCS may ignore the SFID and MS MAC Address and use the LFID to identify the MCID (and LCID). Since this indicator is not exchanged between the sending and receiving entities, the format and encoding of the LFID need not be specified. For instance, at the sending entity, the LFID could be derived from the IP source address and port number (and/or Contents ID), or by a tunnel ID (GRE KEY) if each MBS flow is transmitted to the BS in a separate tunnel, or other. It is outside the scope of this standard to provide further specifics. The MAC GPCS at the BS should maintain a binding between LFID and MCIDs (or [MCID, LCID] pairs, when LCIDs are used) and shall map the data to be sent over the air to the MCID (or [MCID, LCID] pair) to which the LFID is bound. The upper layer at the BS should not map different MBS flows to the same LFID, which would impair the MS's ability of selectively decoding data belonging to particular MBS flows. During connection / service flow establishment, any necessary exchange of service flow parameters between the upper layer GPCS client and the 802.16 BS is assumed to take place over the management plane.

Outer-coding Support

When an MBS data flow is outer-coded, each flow is forwarded to a separate outer-decoder before it is passed to the IP layer. Hence, a new GPCS_PROTOCOL_TYPE is needed to indicate outer-coded data.

Proposed Changes

[Page 41, line 16: Correct the reference as indicated]

• With GPCS, the upper layer protocol that is immediately above the 802.16 GPCS is identified by a TLV parameter, GPCS protocol type, as defined in 11.13.189.5.1. The GPCS protocol type shall be included in C-SFM primitives and DSx messages during connection establishment.

[Page 43, line 32: Insert the following text:]

Logical Flow ID (LFID): This attribute is included to uniquely identify an MBS flow. A GPCS implementation shall map the LFID to an MCID or [MCID, LCID]-pair. A GPCS implementation should not map different LFIDs to the same MCID or, if logical channels are used, [MCID, LCID]-pair. When this attribute is present, the 802.16 entity may ignore the SFID and MS MAC Address attributes.

[Page 43, line 43: Modify the text as follows:]

GPCS_DATA.request

(

        SFID,

        MS MAC Address,

        LFID,

        length,

        data

)

[Page 43, line 55: Modify the paragraph as follows:]

The parameters SFID, MS MAC Address, LFID, length, and data are described in section 5.3.3.

[Page1310, line 17: Insert a new row into the table as follows and reduce the range of reserved values in the following row by 1.]

| 0x0006 | Outer-decoder | Outer-coded data blocks are fragmented and transmitted as a sequence of GPCS SDUs. Fragmentation and outer-decoding protocol information is transmitted to the SS on the data plane. |