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GSMP Packet Encapsulations for ATM, Ethernet and TCP

<draft-ietf-gsmp-encaps-01.txt>

Abstract

   This memo specifies the encapsulation of GSMP packets in ATM,
   Ethernet and TCP.

1. Introduction

GSMP packets are defined in [1] and may be encapsulated in several
different protocols for transport. This memo specifies their
encapsulation in ATM AAL-5, in Ethernet or in TCP. Other
encapsulations may be defined in future version of this document
or in other documents.

2. ATM Encapsulation

GSMP packets are variable length and for an ATM data link layer
they are encapsulated directly in an AAL-5 CPCS-PDU [3] with an
LLC/SNAP header as illustrated:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                 LLC (0xAA-AA-03)            |                 |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+                 +
|                 SNAP (0x00-00-00-88-0C)                      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                              |
~                        GSMP Message                          ~
|                                                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                    Pad (0 - 47 octets)                       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                              |
+             AAL-5 CPCS-PDU Trailer (8 octets)                +
|                                                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

(The convention in the documentation of Internet Protocols [4] is
to express numbers in decimal. Numbers in hexadecimal format are
specified by prefacing them with the characters "0x". Numbers in
binary format are specified by prefacing them with the characters
"0b". Data is pictured in "big-endian" order. That is, fields are
described left to right, with the most significant octet on the
left and the least significant octet on the right. Whenever a
diagram shows a group of octets, the order of transmission of
those octets is the normal order in which they are read in
English. Whenever an octet represents a numeric quantity the left
most bit in the diagram is the high order or most significant bit.
That is, the bit labelled 0 is the most significant bit.

Similarly, whenever a multi-octet field represents a numeric
quantity the left most bit of the whole field is the most
significant bit. When a multi-octet quantity is transmitted, the
most significant octet is transmitted first. This is the same
coding convention as is used in the ATM layer [1] and AAL-5 [3].)

The LLC/SNAP header contains the octets: 0xAA 0xAA 0x03 0x00 0x00
0x00 0x88 0x0C. (0x880C is the assigned Ethertype for GSMP.)

The maximum transmission unit (MTU) of the GSMP Message field is
1492 octets.

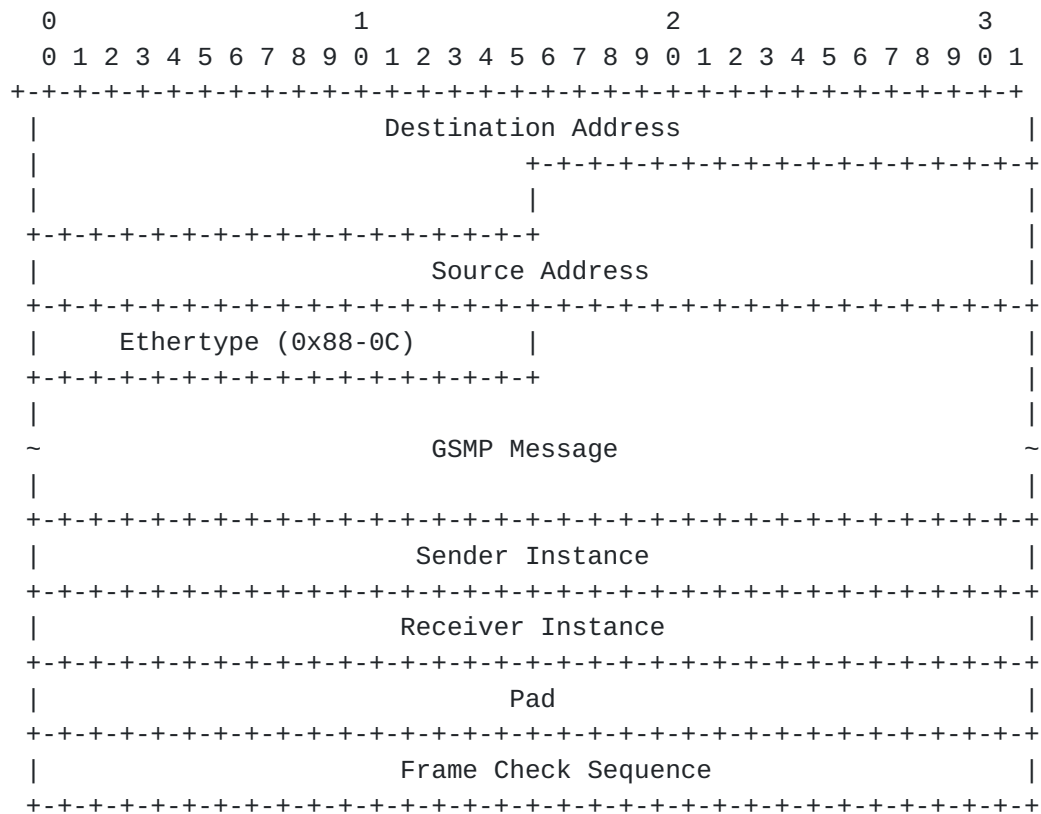The virtual channel over which a GSMP session is established
between a controller and the switch it is controlling is called
the GSMP control channel. The default VPI and VCI of the GSMP
control channel for LLC/SNAP encapsulated GSMP messages on an ATM
data link layer is:

   VPI = 0
   VCI = 15.

3. Ethernet Encapsulation

GSMP packets may be encapsulated on an Ethernet data link as
illustrated:

```
  0                   1                   2                   3
  0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                     Destination Address                      |
 |                         +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                         |                                     |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+                                     |
 |                       Source Address                         |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |      Ethertype (0x88-0C)        |                             |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+                             |
 |                                                              |
 ~                         GSMP Message                         ~
 |                                                              |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                       Sender Instance                        |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                      Receiver Instance                       |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                            Pad                               |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                    Frame Check Sequence                      |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Destination Address
          For the SYN message of the adjacency protocol the
          Destination Address is the broadcast address
          0xFFFFFFFFFFFF. (Alternatively, it is also valid to
          configure the node with the unicast 48-bit IEEE MAC
          address of the destination. In this case the configured
          unicast Destination Address is used in the SYN message.)
          For all other messages the Destination Address is the
          unicast 48- bit IEEE MAC address of the destination.
          This address may be discovered from the Source Address
          field of messages received during synchronisation of the
          adjacency protocol.

Source Address
          For all messages the Source Address is the 48-bit IEEE
          MAC address of the sender.

Ethertype The assigned Ethertype for GSMP is 0x880C.
GSMP Message
          The maximum transmission unit (MTU) of the GSMP Message
          field is 1492 octets.

   Sender Instance
            The Sender Instance number for the link obtained from
            the adjacency protocol. This field is already present in
            the adjacency protocol message. It is appended to all
            non- adjacency GSMP messages in the Ethernet
            encapsulation to offer additional protection against the
            introduction of corrupt state.

   Receiver Instance
            The Receiver Instance number is what the sender believes
            is the current instance number for the link, allocated
            by the entity at the far end of the link. This field is
            already present in the adjacency protocol message. It is
            appended to all non-adjacency GSMP messages in the
            Ethernet encapsulation to offer additional protection
            against the introduction of corrupt state.

   Pad
            The minimum length of the data field of an Ethernet
            packet is 46 octets. If necessary, padding should be
            added such that it meets the minimum Ethernet frame
            size. This padding should be octets of zero and it is
            not considered to be part of the GSMP message.

   After the adjacency protocol has achieved synchronisation, for
   every GSMP message received with an Ethernet encapsulation, the
   receiver must check the Source Address from the Ethernet MAC
   header, the Sender Instance, and the Receiver Instance. The
   incoming GSMP message must be discarded if the Sender Instance and
   the Source Address do not match the values of Sender Instance and
   Sender Name stored by the "Update Peer Verifier" operation of the
   GSMP adjacency protocol. The incoming GSMP message must also be
   discarded if it arrives over any port other than the port over
   which the adjacency protocol has achieved synchronisation. In
   addition, the incoming message must also be discarded if the
   Receiver Instance field does not match the current value for the
   Sender Instance of the GSMP adjacency protocol.

4. TCP/IP Encapsulation

   GSMP messages may be transported over an IP network using the TCP
   encapsulation. TCP provides reliable transport, network flow
   control, and end-system flow control suitable for networks that
   may have high loss and variable or unpredictable delay. The GSMP
   encapsulation in TCP/IP also provides sender authentication using
   an MD5 digest.

For TCP encapsulations of GSMP messages, the controller runs the
client code and the switch runs the server code. Upon
initialisation, the server is listening on GSMP's (proposed) well
known port number. The controller establishes a TCP connection
with each switch it manages. Adjacency protocol messages, which
are used to synchronise the controller and switch and maintain
handshakes, are sent by the controller to the switch after the TCP
connection is established. GSMP messages other than adjacency
protocol messages may be sent only after the adjacency protocol
has achieved synchronisation.

4.1 Message Formats

GSMP messages are sent over a TCP connection. A GSMP message is
processed only after it is entirely received. A four-byte TLV
header field is prepended to the GSMP message to provide
delineation of GSMP messages within the TCP stream.

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|        Type (0x60-68)         |             Length            |
|-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                               |
~                         GSMP Message                          ~
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Type

        This 2-octet field indicates the type code of the
        following message. The type code for GSMP messages is
        0x00-0C (i.e. the same as GSMP's Ethertype).

Length:

        This 2-octet unsigned integer indicates the total length
        of the GSMP message only. It does not including the 4-
        byte TLV header.

4.2 Security consideration

To ensure the authenticity and security of GSMP messages which are
transported through an IP network, standard security measures as
defined by IP-Sec (RFC 2401) [5] MUST be used.

5. Security Considerations

The security of GSMP's TCP/IP control channel has been addressed
in Section 4.2. Security over ATM and Ethernet must be provided at
the link layer.

References

    [1] T. Worster, "General Switch Management Protocol,"
            Internet-Draft draft-ietf-gsmp-03, Jan 2000.

    [2] "B-ISDN ATM Layer Specification," International
            Telecommunication Union, ITU-T Recommendation I.361, Mar.
            1993.

    [3] "B-ISDN ATM Adaptation Layer (AAL) Specification,"
            International Telecommunication Union, ITU-T
            Recommendation I.363, Mar. 1993.

    [4] Reynolds, J., and J. Postel, "Assigned Numbers," STD 2,
            RFC 1700, October 1994.

    [5] IP Sec

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