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An Inband Data Communication Network For the MPLS Transport Profile

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Abstract

A Generic Associated Channel (G-ACH) has been defined as an extension of the pseudowire Associated Channel Header (ACH) to enable the realization of a control/communication channel associated with Multiprotocol Label Switching (MPLS) Label Switched Paths (LSPs), MPLS pseudowires (PWs), MPLS LSP segments, and MPLS sections between adjacent MPLS-capable devices.

The MPLS Transport Profile (MPLS-TP) is a profile of the MPLS architecture that identifies elements of the MPLS toolkit that may be combined to build a carrier grade packet transport network based on MPLS packet switching technology.

This document describes how the G-ACH may be used to provide the infrastructure that forms part of the Management Communication Network (MCN) and a Signaling Communication Network (SCN). Collectively, the MCN and SCN may be referred to as the Data Communication Network (DCN). The document explains how MCN and SCN packets are encapsulated, carried on the G-ACH, and demultiplexed for

delivery to the management or signaling/routing components on a label switching router (LSR).

It should be noted that the use of the G-ACH to provide connectivity for the DCN is intended for use only where the MPLS-TP network is not capable encapsulating or delivering native DCN messages.

Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC-2119](#) [[RFC2119](#)].

1. Introduction

The associated channel header (ACH) is specified in [[RFC4385](#)]. It is a packet header format for use on pseudowire (PW) packets in order to identify packets used for OAM and similar functions.

The ACH is generalized for use on any Multiprotocol Label Switching (MPLS) Label Switching Path (LSP) in [[GAL-GACH](#)]. The generalized concept is referred to as the Generic Associated Channel (G-ACH) and is intended to create a control/communication channel associated with the LSP that can be used to carry packets used for OAM and similar functions (e.g. control plane messages).

The purpose of a packet carried on the G-ACH is indicated by the value carried by the PW Associated Channel Type field of the G-ACH and a registry of values is maintained by IANA.

The MPLS transport profile (MPLS-TP) is described in [[MPLS-TP](#)]. MPLS-TP is the application of MPLS to construct a packet transport network. It constitutes a profile of MPLS that enables operational models typical in transport networks, which includes additional OAM, survivability and other maintenance functions not previously supported by MPLS.

Label Switching Routers in MPLS networks may be operated using management protocols or control plane protocols. Messaging in these protocols is normally achieved using IP packets exchanged over IP-capable interfaces. However, some LSRs in MPLS-TP networks may be constructed without support for direct IP encapsulation on their line-side interfaces and without access to an out-of-fiber data communication network. In order that such LSRs can communicate using management plane or control plane protocols channels must be provided and the only available mechanism is to use an MPLS label.

The G-ACH provides a suitable mechanism, and this document defines processes and procedures to allow the G-ACH to be used to build a management communication network (MCN) and a signaling communication network (SCN) together known as the data communication network (DCN) [[G.7712](#)].

1.1. Requirements

The requirements presented in this section are based on those communicated to the IETF by the ITU-T.

1. A packet encapsulation mechanism must be provided to support the transport of MCN and SCN packets over the G-ACh.
2. The G-ACh carrying the MCN and SCN packets shall support the following application scenarios:
 - a. The G-ACh interconnects two adjacent MPLS-TP nodes (used when the server layer does not provide a Management Communication Channel (MCC) or a Signalling Communication Channel (SCC)).
 - b. The G-ACh is carried by a MPLS-TP tunnel that traverses another operator's domain (carrier's carrier scenario)
3. The G-ACh shall provide two independent channels: a MCC to build the MCN and a SCC to build the SCN. The G-ACh packet header shall indicate whether the packet is a MCC or an SCC packet in order to forward it to the management or control plane application for processing.
4. The channel separation mechanism shall allow the use of separate rate limiters and traffic shaping functions for each channel (MCC and SCC) ensuring that the flows do not exceed their assigned traffic profile. The rate limiter and traffic shaper are outside the scope of the MCC and SCC definition.
5. The G-ACh that carries the MCC and SCC shall be capable of carrying different OSI layer 3 (network layer) PDUs. These shall include IPv4, IPv6, and OSI PDUs. The G-ACh header of the MCC/SCC packet shall indicate which layer 3 PDU is contained in the payload field of the packet such that the packet can be forwarded to the related layer 3 process within the management and control plane application, respectively, for further processing.
6. The G-ACh is not required to provide specific security mechanisms. However, the management or control plane protocols that operate over the MCC or SCC are required to provide adequate security mechanisms in order not to be susceptible to security attacks.

2. Procedures

Figure 1 depicts the format of an MCC/SCC packet that is sent over the G-ACH. To send an MCC/SCC packet on the G-ACH, the MCC/SCC packet is prepended with the extended G-ACH header. This extended G-ACH header is composed of the G-ACH header as defined in [GAL-GACH] and is extended by four bytes providing an 8-bit protocol identifier (PID) field. The remaining 24 bits of the header extension are reserved.

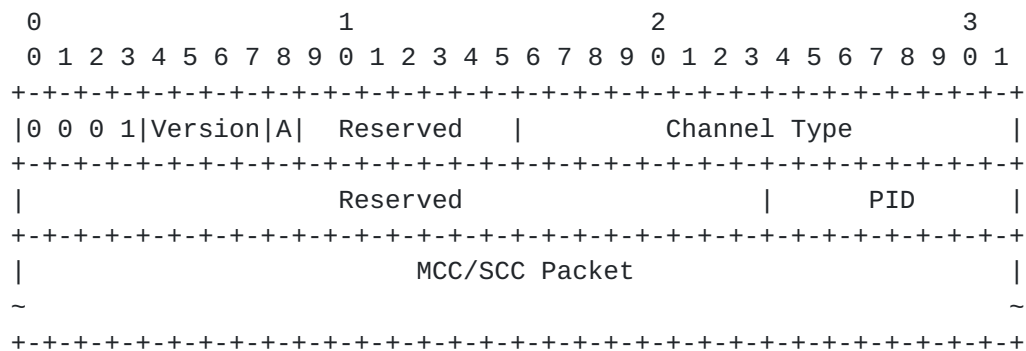


Figure 1: MCC/SCC Packet with Associated Channel Header

- o The Channel Type field determines whether the message is an MCC or an SCC message. See [Section 4](#) for the codepoint assignments.
- o The PID field indicates the PDU type of the MCC/SCC message

The following PID values are defined:

0x00	IPv4
0x01	IPv6
0x02	OSI
0x03-0xFF	Reserved

Editor Note: This approach may be changed to use the G-ACH Protocol Identifier TLV if that work is progressed.

If the PID is OSI, the first octet of the OSI PDU header (Network Layer Protocol Identifier) as defined in [IS08473] indicates the network layer PDU which can be CLNP (0x81), ES-IS (0x82), or IS-IS (0x83) as specified in [IS09577].

When the G-ACH sender receives an MCC message from the management application that is supposed to be sent over the MCC, the sender creates the extended the G-ACH header depending on the MCC layer 3 PDU, sets the Channel Type field to MCC, and prepends the MCC message

with the extended G-ACH header. The same procedure is applied when a control plane message is supposed to be sent over the SCC. In this case, the sender sets the Channel Type field to SCC.

If the MPLS section G-ACH is used, the GAL is added to the packet as defined in [[GAL-GACH](#)], i.e., the TTL field SHOULD be set to 1, and the S-bit of the GAL MUST be set to 1.

If the G-ACH is associated with an LSP, the GAL is added to the packet and the LSP label is pushed on top of the GAL as defined in [[GAL-GACH](#)], i.e., the TTL field of the GAL SHOULD be set to 1, and the S-bit of the GAL MUST be set to 1.

It should be noted that the G-ACH MUST NOT be used to carry user data and SHALL only be used to carry management or control plane messages. Procedures that ensure this such as e.g. deep packet inspection are outside the scope of this specification.

When a receiver has received a G-ACH packet with the G-ACH Channel Type set to MCC or SCC, it SHALL look at the PID field of the extended G-ACH header. If the PID value is known by the receiver it SHALL deliver the entire packet including the MCC/SCC message to the appropriate processing entity. If the PID value is unknown, the receiver SHALL silently discard the received Packet and MAY increment a counter that counts discarded packets.

It must be noted that a receiver MUST NOT forward a GAL packet based on the GAL label as is normally the case for MPLS packets. If the GAL appears at the bottom of the label stack, it MUST be processed as described in the previous paragraph.

Note that there is no requirement for MPLS-TP devices to support IP or OSI forwarding in the fast or slow paths. Thus, if a message is received on the MCC or SCC and is not targeted to an address of the receiving LSR, the LSR MAY discard the message as incorrectly received.

3. Security Considerations

The G-ACH provides a virtual link between LSRs and might be used to induce many forms of security attack. Protocols that operate over the MCN or SCN are REQUIRED to include adequate security mechanisms and implementations MUST allow operators to configure the use of those mechanisms.

4. IANA Considerations

Channel Types for the Generic Associated Channel are allocated from the IANA PW Associated Channel Type registry defined in [[RFC4446](#)] and updated by [[GAL-GACH](#)].

IANA is requested to allocate two further Channel Types as follows:

xx Management Communication Channel (MCC)
yy Signaling Communication Channel (SCC)

5. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC4385] Bryant, S., et al., "Pseudowire Emulation Edge-to-Edge (PWE3) Control Word for Use over an MPLS PSN", [RFC 4385](#), February 2006.
- [RFC4446] Martini, L., "IANA Allocations for Pseudowire Edge to Edge Emulation (PWE3)", [RFC 4446](#), April 2006 .
- [GAL-GACH] Vigoureux, M., Bocci, M., Ward, D., Swallow, G., and R. Aggarwal, "MPLS Generic Associated Channel", [draft-ietf-mpls-tp-gach-gal](#), work in progress.

6. Informative References

- [MPLS-TP] Bryant, S., Bocci, M., Lasserre, M., "A Framework for MPLS in Transport Networks", [draft-ietf-mpls-tp-framework](#), work in progress.
- [G.7712] ITU-T Recommendation G.7712, "Architecture and specification of data communication network", June 2008.
- [IS08473] ISO/IEC 8473-1, "Protocol for providing the connectionless-mode network service: Protocol specification - Part 1: ISO/IEC JTC 1/SC", 1998-11-01.
- [IS09577] ISO/IEC TR 9577, "Protocol identification in the network layer ISO/IEC JTC 1/SC 6", 1999-12-15.

7. Acknowledgements

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