Internet Engineering Task Force (IETF)
Request for Comments: 7074
Updates: 3471, 4202, 4203, 5307
Category: Standards Track
ISSN: 2070-1721

L. Berger
LabN
J. Meuric
Orange

November 2013

Revised Definition of the GMPLS Switching Capability and Type Fields

Abstract

GMPLS provides control for multiple switching technologies and for hierarchical switching within a technology. GMPLS routing and signaling use common values to indicate the type of switching technology. These values are carried in routing protocols via the Switching Capability field, and in signaling protocols via the Switching Type field. While the values used in these fields are the primary indicators of the technology and hierarchy level being controlled, the values are not consistently defined and used across the different technologies supported by GMPLS. This document is intended to resolve the inconsistent definition and use of the Switching Capability and Type fields by narrowly scoping the meaning and use of the fields. This document updates all documents that use the GMPLS Switching Capability and Types fields, in particular RFCs 3471, 4202, 4203, and 5307.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 5741.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at http://www.rfc-editor.org/info/rfc7074.

1. Introduction

Generalized Multiprotocol Label Switching (GMPLS) provides control for multiple switching technologies. It also supports hierarchical switching within a technology. The original GMPLS Architecture, per [RFC3945], included support for five types of switching capabilities. An additional type was also defined in [RFC6002]. The switching types defined in these documents include:

1. Packet Switch Capable (PSC)

2. Layer-2 Switch Capable (L2SC)

3. Time-Division Multiplex Capable (TDM)

4. Lambda Switch Capable (LSC)

5. Fiber-Switch Capable (FSC)

6. Data Channel Switching Capable (DCSC)

Support for the original types was defined for routing in [RFC4202], [RFC4203], and [RFC5307], where the types were represented in the Switching Capability (Switching Cap) field. In general, hierarchy within a type is addressed in a type-specific fashion, and a single Switching Capability field value is defined per type. The exception to this is PSC, which was assigned four values to indicate four levels of hierarchy: PSC-1, PSC-2, PSC-3, and PSC-4. The same values used in routing are defined for signaling in [RFC3471], and are carried in the Switching Type field. Following the IANA registry, we refer to the values used in the routing Switching Capability field and signaling Switching Type field as Switching Types.

In general, a Switching Type does not indicate a specific data-plane technology; this needs to be inferred from context. For example, L2SC was defined to cover Ethernet and ATM, and TDM was defined to cover both SONET/SDH [RFC4606] and G.709 [RFC4328]. The basic assumption was that different technologies of the same type would never operate within the same control, i.e., signaling and routing domains.

The past approach in assignment of Switching Types has proven to be problematic from two perspectives. The first issue is that some examples of switching technologies have different levels of switching that can be performed within the same technology. For example, there are multiple types of Ethernet switching that may occur within a provider network. The second issue is that the Switching Capability field value is used in Interior Gateway Protocols (IGPs) to indicate the format of the Switching Capability-specific information (SCSI) field, and that an implicit mapping of type to SCSI format is impractical for implementations that support multiple switching technologies. These issues led to the introduction of two new types for Ethernet in [RFC6004] and [RFC6060], namely:

7. Ethernet Virtual Private Line (EVPL)

8. 802_1 PBB-TE (Provider Backbone Bridge Traffic Engineering)

An additional value is also envisioned to be assigned in support of G.709v3 by [GMPLS-G709] in order to disambiguate the format of the SCSI field.

While a common representation of hierarchy levels within a switching technology certainly fits the design objectives of GMPLS, the definition of multiple PSC Switching Types has also proven to be of little value. Notably, there are no known uses of PSC-2, PSC-3, and PSC-4.

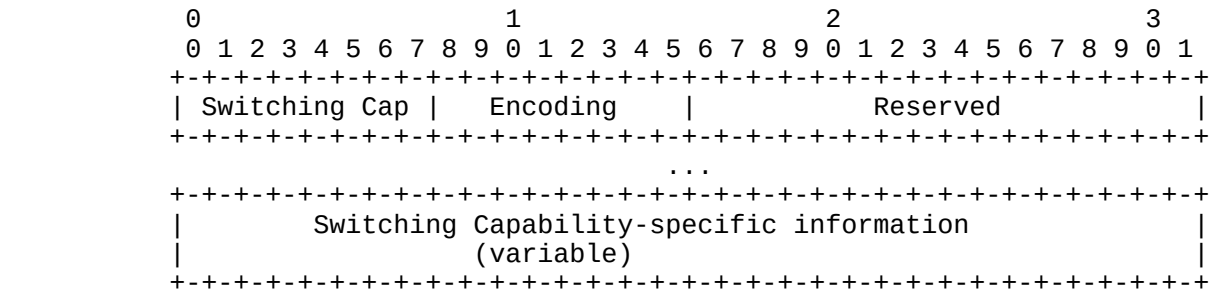
This document proposes to resolve such inconsistent definitions and uses of the Switching Types by reducing the scope of the related fields and narrowing their use. In particular, this document deprecates the use of the Switching Types as an identifier of hierarchy levels within a switching technology and limits its use to the identification of a per-switching technology SCSI field format.

This document updates all documents that use the GMPLS Switching Capability and Switching Type fields, in particular RFCs 3471, 4202, 4203, and 5307.

1.1. Current Switching Type Definition

The Switching Type values are carried in both routing and signaling protocols. Values are identified in IANA's "Generalized Multi-Protocol Label Switching (GMPLS) Signaling Parameters" registry, which is currently located at <http://www.iana.org/assignments/gmpls-sig-parameters/>.

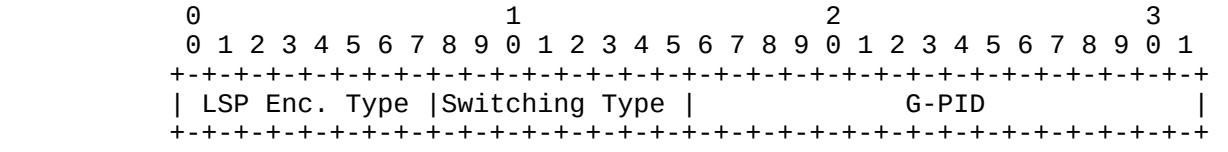
For routing, a common information element is defined to carry Switching Type values for both OSPF and IS-IS routing protocols in [RFC4202]. Per [RFC4202], Switching Type values are carried in a Switching Capability (Switching Cap) field in an Interface Switching Capability Descriptor. This information shares a common formatting in both OSPF as defined by [RFC4203] and in IS-IS as defined by [RFC5307]:



...

The content of the Switching Capability-specific information field depends on the value of the Switching Capability field.

Similarly, the Switching Type field is defined as part of a common format for use by GMPLS signaling protocols in [RFC3471] and is used by [RFC3473]:



Switching Type: 8 bits

Indicates the type of switching that should be performed on a particular link. This field is needed for links that advertise more than one type of switching capability. This field should

> map to one of the values advertised for the corresponding link in the routing Switching Capability Descriptor ...

1.2. 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 [RFC2119].

2. Revised Switching Type Definition

This document modifies the definition of Switching Type. The definitions are slightly different for routing and signaling and are described in the following sections.

2.1. Routing -- Switching Cap Field

For routing [RFC4202] [RFC4203] [RFC5307], the following definition should be used for Switching Cap field:

> The Switching Cap field indicates the type of switching being advertised via GMPLS Switching Type values. A different Switching Type value SHOULD be used for each data-plane technology, even when those technologies share the same type of multiplexing or switching. For example, Time Division Multiplexing (TDM) technologies that have different multiplexing structures, such as Synchronous Digital Hierarchy (SDH) [G.707] and Optical Transport Network (OTN) [G.709], should use two different Switching Types.
>
> As the format of the Switching Capability-specific information field is dependent on the value of this field, a different Switching Type value MUST be used to differentiate between different Switching Capability-specific information field formats.
>
> This definition does not modify the format of the Interface Switching Capability Descriptor.

Note that from a practical standpoint, this means that any time a new switching technology might use a different Switching Capability-specific information field format, a new Switching Type SHOULD be used.

2.2. Signaling -- Switching Type Field

For signaling [RFC3471], which is used by [RFC3473], the following definition should be used for the Switching Type field:

> Indicates the type of switching that should be performed on a particular link via GMPLS Switching Type values. This field maps to one of the values advertised for the corresponding link in the routing Switching Capability Descriptor, see [RFC4203] and [RFC5307].

Note that from a practical standpoint, there is no change in the definition of this field.

2.3. Assigned Switching Types

This document deprecates the following Switching Types:

Value	Name
2	Packet-Switch Capable-2 (PSC-2)
3	Packet-Switch Capable-3 (PSC-3)
4	Packet-Switch Capable-4 (PSC-4)

These values SHOULD be treated as unsupported types and, in the case of signaling, processed according to Section 2.1.1 of [RFC3473].

3. Compatibility

For existing implementations, the primary impact of this document is deprecating the use of PSC-2, 3, and 4. At the time of publication, there are no known deployments (or even implementations) that make use of these values, so there are no compatibility issues for current routing and signaling implementations.

4. Security Considerations

This document impacts the values carried in a single field in signaling and routing protocols. As no new protocol formats or mechanisms are defined, there are no particular security implications raised by this document.

For a general discussion on MPLS- and GMPLS-related security issues, see the MPLS/GMPLS security framework [RFC5920].

5. IANA Considerations

IANA has deprecated some values and redefined the related values in the "IANA-GMPLS-TC-MIB" definitions. In particular, the Switching Types portion of the "Generalized Multi-Protocol Label Switching (GMPLS) Signaling Parameters" registry been revised to read:

Switching Types

Registration Procedures

Standards Action

Reference
[RFC3471][RFC4328][This Document]

Value	Name	Reference
0	Unassigned	
1	Packet-Switch Capable-1 (PSC-1)	[RFC3471]
2	Deprecated	[This Document]
3	Deprecated	[This Document]
4	Deprecated	[This Document]
5-29	Unassigned	
30	Ethernet Virtual Private Line (EVPL)	[RFC6004]
31-39	Unassigned	
40	802_1 PBB-TE	[RFC6060]
41-50	Unassigned	
51	Layer-2 Switch Capable (L2SC)	[RFC3471]
52-99	Unassigned	
100	Time-Division-Multiplex Capable (TDM)	[RFC3471]
101-124	Unassigned	
125	Data Channel Switching Capable (DCSC)	[RFC6002]
126-149	Unassigned	
150	Lambda-Switch Capable (LSC)	[RFC3471]
151-199	Unassigned	
200	Fiber-Switch Capable (FSC)	[RFC3471]
201-255	Unassigned	

A parallel change to IANA-GMPLS-TC-MIB was also made. In particular, under IANAGmplsSwitchingTypeTC a reference to this document has been added as item 3. The following changes have also been made to the related values:

```
psc2(2),      -- Deprecated [This Document]
psc3(3),      -- Deprecated [This Document]
psc4(4),      -- Deprecated [This Document]
```

6. Acknowledgments

We thank John Drake for highlighting the current inconsistent definitions associated with the Switching Capability and Type fields. Daniele Ceccarelli and Adrian Farrel provided valuable feedback on this document.

7. References

7.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC3471] Berger, L., Ed., "Generalized Multi-Protocol Label Switching (GMPLS) Signaling Functional Description", RFC 3471, January 2003.

[RFC4202] Kompella, K., Ed., and Y. Rekhter, Ed., "Routing Extensions in Support of Generalized Multi-Protocol Label Switching (GMPLS)", RFC 4202, October 2005.

[RFC4203] Kompella, K., Ed., and Y. Rekhter, Ed., "OSPF Extensions in Support of Generalized Multi-Protocol Label Switching (GMPLS)", RFC 4203, October 2005.

[RFC5307] Kompella, K., Ed., and Y. Rekhter, Ed., "IS-IS Extensions in Support of Generalized Multi-Protocol Label Switching (GMPLS)", RFC 5307, October 2008.

7.2. Informative References

[G.707] ITU-T Recommendation G.707/Y.1322 (2007), "Network node interface for the synchronous digital hierarchy (SDH)".

[G.709] ITU-T Recommendation G.709/Y.1331 (2009), "Interfaces for the Optical Transport Network (OTN)".

[GMPLS-G709] Zhang, F., Li, D., Li, H., Belotti, S., and D. Ceccarelli, "Framework for GMPLS and PCE Control of G.709 Optical Transport Networks", Work in Progress, September 2013.

[RFC3473] Berger, L., Ed., "Generalized Multi-Protocol Label Switching (GMPLS) Signaling Resource ReserVation Protocol-Traffic Engineering (RSVP-TE) Extensions", RFC 3473, January 2003.

[RFC3945] Mannie, E., Ed., "Generalized Multi-Protocol Label Switching (GMPLS) Architecture", RFC 3945, October 2004.

[RFC4328] Papadimitriou, D., Ed., "Generalized Multi-Protocol Label Switching (GMPLS) Signaling Extensions for G.709 Optical Transport Networks Control", RFC 4328, January 2006.

[RFC4606] Mannie, E. and D. Papadimitriou, "Generalized Multi-Protocol Label Switching (GMPLS) Extensions for Synchronous Optical Network (SONET) and Synchronous Digital Hierarchy (SDH) Control", RFC 4606, August 2006.

[RFC5920] Fang, L., Ed., "Security Framework for MPLS and GMPLS Networks", RFC 5920, July 2010.

[RFC6002] Berger, L. and D. Fedyk, "Generalized MPLS (GMPLS) Data Channel Switching Capable (DCSC) and Channel Set Label Extensions", RFC 6002, October 2010.

[RFC6004] Berger, L. and D. Fedyk, "Generalized MPLS (GMPLS) Support for Metro Ethernet Forum and G.8011 Ethernet Service Switching", RFC 6004, October 2010.

[RFC6060] Fedyk, D., Shah, H., Bitar, N., and A. Takacs, "Generalized Multiprotocol Label Switching (GMPLS) Control of Ethernet Provider Backbone Traffic Engineering (PBB-TE)", RFC 6060, March 2011.

8. Authors' Addresses

Lou Berger
LabN Consulting, L.L.C.
Phone: +1 301 468 9228

EMail: lberger@labn.net

Julien Meuric
Orange
Research & Development
2, Avenue Pierre Marzin
22307 Lannion Cedex -- France

Phone: +33 2 96 05 28 28
EMail: julien.meuric@orange.com