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Generalized MPLS (GMPLS) Data Channel Switching Capable (DCSC) and  
Channel Set Label Extensions

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Abstract

This document describes two technology independent extensions to Generalized Multi-Protocol Label Switching. The first extension defines the new switching type Data Channel Switching Capable. Data Channel Switching Capable interfaces are able to support switching of the whole digital channel presented on single channel interfaces. The second extension defines a new type of generalized label and updates related objects. The new label is called the Generalized Channel\_Set Label and allows more than one data plane label to be controlled as part of an LSP.



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## **1. Introduction**

This document describes two technology independent extensions to Generalized Multi-Protocol Label Switching (GMPLS). Both of extensions were initially defined to in the context of Ethernet services, see [[GMPLS-ESVCS](#)] and [[GMPLS-MEF-UNI](#)], but are generic in nature and may be useful to any switching technology controlled via GMPLS.

The first extension defines a new switching type, which is called Data Channel Switching Capable, or DCSC. DCSC interfaces are able to support switching of the whole digital channel presented on single channel interfaces. The second extension defines a new type of generalized label and updates related objects. The new label is called the Generalized Channel\_Set Label and allows more than one data plane label to be controlled as part of an LSP.

### **1.1. 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. Data Channel Switching**

Current GMPLS switching types are defined in [[RFC3945](#)] and [[RFC3471](#)] and support switching at the packet (PSC), frame (L2SC), time-slot (TDM), frequency (LSC) and fiber (FSC) granularities. One type of switching that is not well represented in this current set switching that takes all data received on an ingress port and switches it through a network to an egress port. While there are similarities between this level of switching and the "opaque single wavelength" case described in [Section 3.5 of \[RFC4202\]](#), such port-to-port switching is not limited to the optical switching technology implied by the LSC type. Therefore, a new switching type is defined.

The new switching type is called Data Channel Switching Capable (DCSC). (Port switching seems a more intuitive name, but it collides with PSC so isn't used.) DCSC interfaces are able to support switching of the whole digital channel presented on single channel interfaces. Interfaces that inherently support multiple channels, e.g., WDM and channelized TDM interfaces, are specifically excluded from this type. Any interface that can be represented as a single digital channel are included. Examples include concatenated TDM and line encoded interfaces. Framed interfaces may also be included when they support switching on an interface granularity.



DCSC is represented in GMPLS, see [[RFC3471](#)] and [[RFC4202](#)], using the value TBA (by IANA).

Port labels, as defined in [[RFC3471](#)], SHOULD be used for LSPs signaled using the DCSC Switching Type.

### **3. Generalized Channel\_Set Label Related Formats**

This section defines a new type of generalized label and updates related objects. This section updates the label related definitions of [[RFC3473](#)]. The ability to communicate more than one label as part of the same LSP was motivated by the support for the communication of one or more VLAN IDs, but the formats defined in this section are not technology specific and may be useful for other switching technologies.

#### **3.1. Generalized Channel\_Set LABEL\_REQUEST Object**

The Generalized Channel\_Set LABEL\_REQUEST object is used to indicate that the Generalized Channel\_Set LABEL Object is to be used with the associated LSP. The format of the Generalized Channel\_Set LABEL\_REQUEST object is the same as the Generalized LABEL\_REQUEST object and uses of C-Type of TBA.

#### **3.2. Generalized Channel\_Set LABEL Object**

The Generalized Channel\_Set LABEL Object communicates one or more labels, all of which can be used equivalently in the data path associated with a single LSP. The format of the Generalized Channel\_Set LABEL Object is based on the LABEL\_SET object defined in [[RFC3473](#)]. It differs from the the LABEL\_SET object in that the full set may be represented in a single object rather than the multiple objects required by the [[RFC3473](#)] LABEL\_SET object. The object MUST be used on LSPs that use the Generalized Channel\_Set LABEL\_REQUEST object. The object MUST be processed per [[RFC3473](#)]. Make-before-break procedures, see [[RFC3209](#)], SHOULD be used when modifying the Channel\_Set LABEL object.



The format of the Generalized Channel\_Set LABEL object is:

- ```
0 Generalized Channel_Set LABEL object: Class = 16, C-Type = TBA (By IANA)
```

[illegible]

The Channel\_Set Sub-Object size is measured in bytes and MUST always be a multiple of 4, and at least 4, and has the following format:

[illegible]

Action: 8 bits

See [\[RFC3471\]](#) for definition of actions. Range actions SHOULD be used when possible to minimize the size of the Channel\_Set LABEL Object.





Number of Subchannels: 10 bits

Indicates the number of subchannels carried in the sub-object. When the number of subchannels required exceeds the limit of the field, i.e., 1024, multiple Channel\_Set Sub-Objects MUST be used. Note that the size of the sub-object may result in a Path message being larger than a single unfragmented IP packet. See [section 4.4](#) for an example of how this case may be handled.

A value of zero (0) has special meaning and MAY be used in either the LABEL or UPSTREAM\_LABEL object. A value of zero (0) is used in a LABEL or UPSTREAM\_LABEL object to indicate that the subchannel(s) used in the corresponding (downstream or upstream) direction MUST match the subchannel(s) carried in the reverse directions label object. When value of zero (0) is used, no Subchannels are included in the Channel\_Set Sub-Object and only one Channel\_Set Sub-Object may be present. The zero (0) value MUST NOT be used in both the LABEL and UPSTREAM\_LABEL object of the same LSP.

Label Type: 14 bits

See [[RFC3473](#)] for a description of this field.

Subchannel: Variable

See [[RFC3471](#)] for a description of this field. Note that this field may not be 32 bit aligned.

Padding: Variable

Padding is used to ensure that the length of a Channel\_Set Sub-Object meets the multiple of 4 byte size requirement stated above. The field is only required when the Subchannel field is not 32 bit aligned and the number of included Subchannel fields result in the Sub-Object not being 32 bit aligned.

The Padding field MUST be included when the number of bits represented in all the Subchannel fields included in a Generalized Channel\_Set Sub-Object result in the Sub-Object not being 32 bit aligned. When present, the Padding field MUST have a length that results in the Sub-Object being 32 bit aligned. When present, the Padding field MUST be set to a zero (0) value on transmission and MUST be ignored on receipt. These bits SHOULD be passed through unmodified by transit nodes.



### **3.3. Other Label related Objects**

The previous section introduces a new LABEL object. As such the formats of the other label related objects are also impacted. Processing of these objects is not modified and remain per their respective specifications. The other label related objects are defined in [[RFC3473](http://tools.ietf.org/html/rfc3473)] and include:

- SUGGESTED\_LABEL object
- LABEL\_SET object
- ACCEPTABLE\_LABEL\_SET object
- UPSTREAM\_LABEL object
- RECOVERY\_LABEL object

## **4. IANA Considerations**

IANA is requested to administer assignment of new values for namespaces defined in this document and reviewed in this section.

### **4.1. Data Channel Switching Type**

Upon approval of this document, the IANA will make the assignment in the "Switching Types" section of the "GMPLS Signaling Parameters" registry located at <http://www.iana.org/assignments/gmpls-sig-parameters>:

| Value | Type                                  | Reference       |
|-------|---------------------------------------|-----------------|
| ----- | -----                                 | -----           |
| 125*  | Data Channel Switching Capable (DCSC) | [This document] |

(\*) Suggested value.

### **4.2. Generalized Channel\_Set LABEL\_REQUEST Object**

Upon approval of this document, the IANA will make the assignment in the "Class Names, Class Numbers, and Class Types" section of the "RSVP PARAMETERS" registry located at <http://www.iana.org/assignments/rsvp-parameters>.



A new class type for the existing LABEL\_REQUEST Object class number (19) with the following definition:

Class Types or C-Types:

5\* Generalized Channel\_Set [This document]

(\*) Suggested value.

#### **4.3. Generalized Channel\_Set LABEL Object**

Upon approval of this document, the IANA will make the assignment in the "Class Names, Class Numbers, and Class Types" section of the "RSVP PARAMETERS" registry located at <http://www.iana.org/assignments/rsvp-parameters>.

A new class type for the existing RSVP\_LABEL Object class number (16) with the following definition:

Class Types or C-Types:

4\* Generalized Channel\_Set [This document]

(\*) Suggested value.

### **5. Security Considerations**

This document introduces new message object formats for use in GMPLS signaling [[RFC3473](#)]. It does not introduce any new signaling messages, nor change the relationship between LSRs that are adjacent in the control plane. As such, this document introduces no additional security considerations. See [[RFC3473](#)] for relevant security considerations.

### **6. References**

#### **6.1. Normative References**

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels," [RFC 2119](#).
- [RFC3209] Awduche, D., Berger, L., Gan, D., Li, T., Srinivasan, V. and G. Swallow, "RSVP-TE: Extensions to RSVP for LSP Tunnels", [RFC 3209](#), December 2001.



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

## **6.2. Informative References**

- [GMPLS-ESVCS] Berger, L., Papadimitriou, P., Fedyk, D., "Generalized MPLS (GMPLS) Support For Metro Ethernet Forum and G.8011 Ethernet Service Switching", Work in Progress, [draft-ietf-ccamp-gmpls-ether-svcs-02.txt](#), August 2008.
- [GMPLS-MEF-UNI] Berger, L., Papadimitriou, P., Fedyk, D., "Generalized MPLS (GMPLS) Support For Metro Ethernet Forum and G.8011 User-Network Interface (UNI)", Work in Progress, [draft-ietf-ccamp-gmpls-mef-uni-01.txt](#), August 2008.

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