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Special Purpose Label terminology
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Abstract

This document discusses and recommends a terminology that may be used when MPLS Special Purpose Labels (SPL) are specified and documented.

This document applies that terminology change to the relevant IANA registry and also clarifies the use of the Entropy Label Indicator (7) when immediately preceded by the Extension Label (15).

This document updates [RFC 7274](#) and [RFC 3032](#).

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SPL Terminology

January 2021

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[1.](#) Introduction

[RFC 7274](#) [[RFC7274](#)] made some changes to the terminology used for MPLS Special Purpose Labels, but did not define consistent terminology.

One thing that [RFC 7274](#) did was to deprecate use of the term "reserved labels" when describing a range of labels allocated from a registry maintained by IANA. The term "Reserved" in such a registry means "set aside, not to be used", but that range of labels was available for allocation according to the policies set out in that registry. The name "Special Purpose Labels" was introduced in [RFC 7274](#) in place of the previous term, and the abbreviation SPL was recommended.

At the time of writing the first version of this document, the IETF was in the process of allocating the very first SPLs from the Extended SPL (eSPL) range [[RFC8595](#)]. This document discusses and recommends terminology and abbreviations to be used when talking about and documenting Special Purpose Labels.

This document updates [RFC 3032](#) [[RFC3032](#)] and [RFC 7274](#) [[RFC7274](#)] in that it changes the terminology for both Base SPLs and Extended SPLs.

This document applies that terminology change to the relevant IANA registry and also clarifies the use of the Entropy Label Indicator (7) when immediately preceded by the Extension Label (15).

[1.1](#). Terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [BCP 14](#) [[RFC2119](#)] [[RFC8174](#)] when, and only when, they appear in all capitals, as shown here.

[2](#). Background

Two sets of SPLs are defined for use in MPLS:

The range of 0-15, Base Special Purpose Labels (bSPLs), is specified in [RFC 3032](#) [[RFC3032](#)].

The range 0-1048575 of eSPLs is specified in [RFC 7274](#) [[RFC7274](#)].

- * the values 0-15 have been reserved never to be allocated
- * the values 16-239 are available for allocation
- * the values 240-255 are for experimental use
- * the values 256-1048575 are currently not available for allocation. A standard track RFC will be needed to allocate any labels from this range.

[2.1](#). GMPLS Special Purpose Labels

Note that IANA maintains a registry called "Special Purpose Generalized Label Values". Labels in that registry have special meaning when present in certain signalling objects, are 32 bits long,

and are not to be confused with MPLS forwarding plane labels. This document does not make any changes to the GMPLS registry or to how labels from that registry are described.

3. Terminology and Abbreviations

IANA maintains a name space for 'Special-Purpose Multiprotocol Label Switching (MPLS) Label Values' code points [[SPL-NAME-SPACE](#)]. Within this name space there are two registries. One is called the 'Special-Purpose MPLS Label Values' registry [[bSPL](#)]. The other is called 'Extended Special-Purpose MPLS Label Values' registry [[eSPL](#)].

The difference in the name of the name space and the first registry is only that the MPLS abbreviation is expanded. This document changes the name of the first registry to 'Base Special-Purpose MPLS Label Values', but leaves the name of the latter registry unchanged as 'Extended Special-Purpose MPLS Label Values'.

The following conventions will be used in specifications and when talking about SPLs.

- o Collectively, the two (unrelated) ranges (0-15 and 16-1048575) are known as Special Purpose Labels (SPL).
- o Special purpose labels from the range 0-15 are called Base Special Purpose Labels (bSPL).
- o Special purpose labels from the range 16-1048575 are called Extended Special Purpose Labels (eSPL). (Note that the reserved values 0-15 from the 'Extended Special-Purpose MPLS Label Values' registry do not need a name as they are not available for allocation and MUST NOT be used.)
- o The combination of the Extension Label (XL) (value 15 which is a bSPL, and which is also called the xSPL) and an eSPL is called a Composite Special Purpose Label (cSPL).

This results in a label stacks such as the illustrative examples shown in Figure 1 and Figure 2.

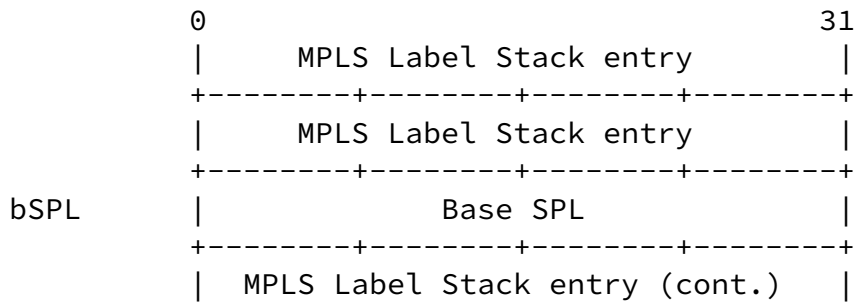


Figure 1: Example of Label Stack

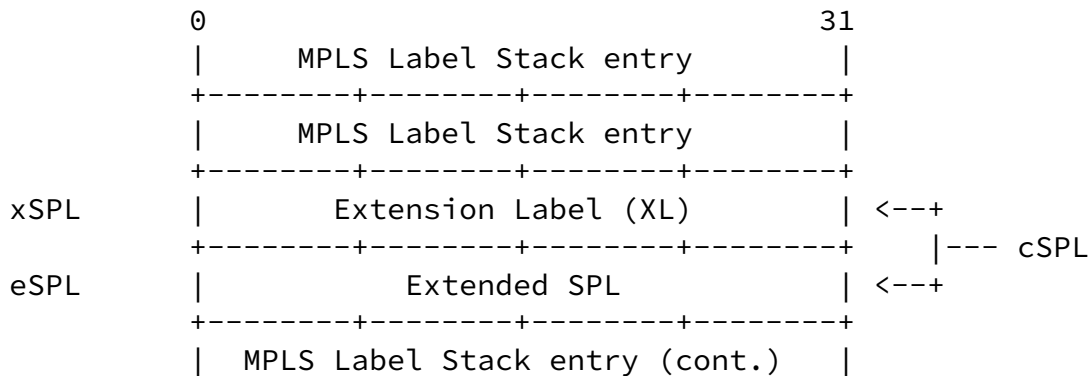


Figure 2: Example of Label Stack

4. Clarification on Handling of the Entropy Label Indicator

[Section 3.1 of \[RFC7274\]](#) contains two paragraphs that describe the handling of the Entropy Label Indicator (label 7). These paragraphs have introduced some confusion about whether the Entropy Label Indicator can be present when immediately preceded by the Extension Label. This document updates [\[RFC7274\]](#) by replacing those paragraphs as follows.

OLD

Values 0-15 of the "Extended Special-Purpose MPLS Label Values" registry are set aside as reserved. Furthermore, values 0-6 and 8-15 MUST NOT appear in the data plane following an XL; an LSR processing a packet with an XL at the top of the label stack followed by a label with value 0-6 or 8-15 MUST drop the packet.

Label 7 (when received) retains its meaning as Entropy Label Indicator (ELI) whether a regular special-purpose label or an ESPL; this is because of backwards compatibility with existing implemented and deployed code and hardware that looks for the ELI without verifying if the previous label is XL or not. However, when an LSR inserts an entropy label, it MUST insert the ELI as a regular special-purpose label, not as an ESPL.

NEW

Values 0-15 of the "Extended Special-Purpose MPLS Label Values" registry are set aside as reserved. Furthermore, an implementation MUST NOT place a label with value 0-15 in the label stack immediately following an XL; an LSR processing a packet with an XL at the top of the label stack immediately followed by a label with value 0-15 MUST drop the packet.

When inspecting a label stack to find an Entropy Label Indicator (ELI - label 7) a pre-existing implementation may fail to inspect the previous label, and so not notice that it is an XL. Such systems can continue to process the entropy information and forward the packet when the previous label is an XL without causing harm. However, the packet will be dropped when the XL reaches the top of the stack at another LSR.

END

[5.](#) Security Considerations

The document describes the terminology to be used when describing and specifying the use of SPLs. It does not effect the forwarding in the MPLS data plane, nor does it have any effect on how LSPs are

established by an MPLS control plane or by a centralized controller.

This document does not aim to describe existing implementations of SPLs or potential vulnerabilities of SPLs.

6. IANA Considerations

IANA is requested to change the name of the registry that today is called "Special-Purpose MPLS Label Values" is changed to "Base Special- Purpose MPLS Label Values".

7. Acknowledgements

We like to thank the Routing Directorate reviewer Eric Gray for a detailed, careful and insightful review, and Tom Petch for pointing out several issues of clarity.

8. Contributors

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9.1. Normative References

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[eSPL] "Extended Special-Purpose MPLS Label Values",
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[label-values.xhtml#extended/](#)>.

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[SPL-NAME-SPACE]

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[9.2](#). Informative References

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