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MPLS Capability Set

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Abstract

Several protocols might be used for Label Distribution in an MPLS network, e.g. Label Distribution Protocol (LDP), including the part of LDP described in Constraint-Based LSP Setup using LDP, the BGP-4 and RSVP.

The functionality defined in those protocols are to some extent overlapping, but also complementary. This document specifies a number of MPLS Capability sets that can be used to define what is needed from an MPLS implementation in order to interwork with other implementations. The number of Capability sets might change in the

future.

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[1](#). Introduction

The set of documents that constitute the MPLS standard, as it is being specified by the MPLS Working Group of IETF, offers several ways of setting up Label Switched Paths (LSP) for a number of applications, including support for traffic engineering and Virtual Private Networks.

The Label Distribution Protocol (LDP) has been developed by the MPLS WG for the explicit task of doing Label Distribution. Other protocols, already in existence and originally developed for other purposes, have been adapted or extended to support Label Distribution.

This draft addresses unicast functionality only, multicast is for further study.

[2](#). Overview

It has been frequently noted that the functionality supported by the most of the specifications of how you do Label Distribution, for most applications, are richer than necessary. MPLS implementations implementing parts of one specification or a mix of parts from several specifications will be viable.

As all implementations won't support all of the specified mechanisms for Label distribution specified in the MPLS standard. This introduces the requirement of a tool for describing the compliance between MPLS implementations.

3. MPLS Capability set

This draft introduces the MPLS Capability set as a method of specifying the compliance of an implementation to the set of MPLS specifications and to other implementations. This draft gives an overview of what is needed, in terms of protocols and mechanism, to support the MPLS capability sets.

4. Protocol and functional components

The following functional and protocol component are available in the protocols developed for and/or extended to do label distribution, [1], [2], [3] and [4]. All the specification listed below are worked on by the MPLS WG, and is still work in progress.

Carrying Label Information in BGP-4 [1]

Defines mechanisms for:

- assigning labels to BGP routes

Constraint based routing with LDP (CR-LDP) [2]

Defines mechanisms for:

- explicit routed LSPs
- LSP set up with defined QoS

Label Distribution Protocol (LDP) [4]

Defines mechanisms for:

- basic LDP mechanisms
 - LDP neighbor detection
 - LDP session initiation, maintenance and termination
 - loop detection
- modes of label distribution defined in [5]
 - Downstream Unsolicited Independent Control
 - Downstream Unsolicited Ordered Control
 - Downstream On Demand Independent Control
 - Downstream On Demand Ordered Control

Extensions to RSVP for LSP Tunnels [3]

Defines mechanisms for:

- explicit routed LSPs
- dynamic distribution of labels (hop-by-hop mechanism)

5. Defined MPLS Capability set

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An MPLS Capability set defines the set of components that has to be supported by an implementation claiming compatibility with the capability set. Currently there are 10 Capability sets defined. Although there sometimes/frequently is an obviously a relationship between the Capability set and an intended use, this draft doesn't state the intended use of or the application possible to support by the capability set.

The intention is instead to give a reference framework that offers a possibility to classify compatibility of MPLS implementations. The Capability sets is atomic, i.e. it is not possible for an application to be compliant to part of a capability set. However it is possible for an application to be compliant with one or more capability sets.

5.1 MPLS Capability set #1

MPLS Capability set #1 includes the following components:

- LDP basic mechanisms
 - LDP neighbor detection
 - LDP session initiation, maintenance and termination
- CR-LDP strict explicit routed LSPs

This Capability set supports explicit routed LSP set up, but does not allow loosely routed segments on an explicit route. Note that this capability set do not require the loop detection mechanism.

5.2 MPLS Capability set #2

MPLS Capability set #2 includes the following components:

- LDP basic mechanisms
- CR-LDP explicit routed LSPs
- modes of label distribution defined in [5]
 - Downstream On Demand Ordered Control

This Capability set supports explicit routing and allows loosely routed segments of an explicit route.

5.3 MPLS Capability set #3

MPLS Capability set #3 includes the following components:

- LDP basic mechanisms
- CR-LDP explicit routed LSPs
- CR-LDP LSP set up with QoS
- modes of label distribution defined in [5]
 - Downstream On Demand Ordered Control

This Capability set supports explicit routing and allows loosely

routed segments of an explicit route.

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5.4 MPLS Capability set #4

MPLS Capability set #4 includes the following components:

- LDP basic mechanisms
- All the modes of label distribution defined in [5]

This Capability set is label distribution as defined in [4].

5.5 MPLS Capability set #5

MPLS Capability set #5 includes the following components:

- LDP basic mechanisms
- All the modes of label distribution defined in [5]
- CR-LDP explicit routed LSPs
- CR-LDP LSP set up with QoS

This Capability set is label distribution as defined in [4] and [2] combined.

5.6 MPLS Capability set #6

MPLS Capability set #6 includes the following components:

- LDP basic mechanisms
- Downstream unsolicited independent control

This Capability set emulates the behavior of a legacy best effort IP network.

5.7 MPLS Capability set #7

MPLS Capability set #7 includes the following components:

- RSVP explicit routed LSPs
- RSVP based dynamic distribution of labels

This Capability set is label distribution as defined in [3].

5.8 MPLS Capability set #8

MPLS Capability set #8 includes the following components:

- RSVP explicit routed LSPs
- LDP basic mechanisms
- All the modes of label distribution defined in [5]

This Capability set gives explicit routed LSPs and a hop-by-hop mechanism.

5.9 MPLS Capability set #9

MPLS Capability set #9 includes the following components:

- Assigning label to BGP routes as defined in [1].

This Capability set could be used with any of capability set 1 through 7, and will in that case give a possibility to support network hierarchy. It could also be used alone.

5.10 MPLS Capability set #42

MPLS Capability set #42 includes all of the components listed in [section 4](#) of this draft.

An LSR claiming 42 compliance should, with proper configuration, be able to inter work with any other LSR compliant with any of the capability sets.

5.11 Future extensibility

The number of capability sets are not static, but might be increased or reduced as required, e.g. if the number of protocols specification that defines label distribution changes. If there is a need for any Capability set that has not been specified here it will be added. Likewise, if any of the defined Capabilities sets fall out of use it will be removed.

6. Security

This draft does not introduce any new security issues to the various label distribution protocols.

7. Acknowledgements

We would like to thank the members of the MPLS working group of the IETF, whose input and scrutiny of this document has been invaluable.

8. References

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