MPLS Working Group
Internet Draft
Updates: 5036, 4447 (if approved)
Intended status: Standards Track
Expires: January 15, 2013

Kamran Raza
Sami Boutros
Luca Martini
Cisco Systems, Inc.

Nicolai Leymann
Deutsche Telekom

July 16, 2012

Applicability of LDP Label Advertisement Mode

draft-raza-mpls-ldp-applicability-label-adv-03.txt

Abstract

An LDP speaker negotiates the label advertisement mode with its LDP peer at the time of session establishment. Although different applications sharing the same LDP session may need different modes of label distribution and advertisement, there is only one type of label advertisement mode that is negotiated and used per LDP session. This document clarifies the use and the applicability of session's negotiated label advertisement mode, and categorizes LDP applications into two broad categories of negotiated mode-bound and mode-independent applications. The document also suggests an update to RFC 5036 and RFC 4447 to remove any ambiquity and conflict in the area of using correct label advertisement mode for a given application.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at http://www.ietf.org/ietf/1id-abstracts.txt

The list of Internet-Draft Shadow Directories can be accessed at
http://www.ietf.org/shadow.html

This Internet-Draft will expire on July 12, 2012.

Copyright Notice

Copyright (c) 2012 IETF Trust and the persons identified as the
document authors. All rights reserved.

This document is subject to BCP 78 and the IETF Trust's Legal
Provisions Relating to IETF Documents
(http://trustee.ietf.org/license-info) in effect on the date of
publication of this document. Please review these documents
carefully, as they describe your rights and restrictions with
respect to this document. Code Components extracted from this
document must include Simplified BSD License text as described in
Section 4.e of the Trust Legal Provisions and are provided without
warranty as described in the Simplified BSD License.

Table of Contents

1. Introduction

The MPLS architecture [RFC3031] defines two modes of label advertisement for an LSR:

1. Downstream-on-Demand

2. Unsolicited Downstream

The "Downstream-on-Demand" mode requires an LSR to explicitly request the label binding for FECs from its peer, whereas "Unsolicited Downstream" mode allows an LSR to distribute the label binding for FECs to LSR peers that have not explicitly requested them. The MPLS architecture also specifies that on any given label distribution adjacency, the upstream LSR and the downstream LSR must agree to use a single label advertisement mode.

Label Distribution Protocol (LDP) [RFC5036] allows label advertisement mode negotiation at time of session establishment (section 3.5.3 [RFC5036]). To comply with MPLS architecture, LDP specification also dictates that only single label advertisement mode is agreed and used for a given LDP session between two LSRs.

With the advent of new LDP applications, such as L2VPN [RFC4447], mLDP [RFC6388], ICCP [ICCP], there are situations when an LDP session is shared across more than one application to exchange label bindings for different types of FEC. Although different applications sharing the same LDP session may need a different type of label advertisement mode negotiated, there is only one type of label advertisement mode that is negotiated and agreed at the time of establishment of LDP session.

This document clarifies the use and the applicability of label advertisement mode of a session for each application using the session. It also categorizes LDP applications into two broad categories of mode-bound and mode-independent applications.

The document also suggests an update to RFC-5036 and RFC-4447 to remove any ambiguity and conflict in the area of using correct label advertisement mode for a given LDP application.

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 RFC-2119 [RFC2119].

The unqualified term "mode" used in document refers to "label advertisement mode".

Please also note that LDP specification [RFC5036] uses the term "Downstream Unsolicited" to refer to "Unsolicited Downstream". The LDP specification also uses the terms "label distribution mode" and "label advertisement mode" interchangeably. Like LDP specification document, this document also uses these terms interchangeably.

3. Label Advertisement Mode Applicability

3.1. Label Advertisement Mode Negotiation

Label advertisement mode is negotiated between LSR peers at the time of session establishment. The label advertisement mode is specified in LDP Initialization message's "Common Session Parameter" TLV by setting A-bit (Label Advertisement Discipline bit) to 1 or 0 for Downstream-on-Demand or Downstream-Unsolicited modes respectively. The negotiation of the A-bit is specified in section 3.5.3 of [RFC5036] as follows:

> "If one LSR proposes Downstream Unsolicited and the other proposes Downstream on Demand, the rules for resolving this difference is:
>
> - If the session is for a label-controlled ATM link or a label- controlled Frame Relay link, then Downstream on Demand MUST be used.
>
> - Otherwise, Downstream Unsolicited MUST be used."

Once label advertisement mode has been negotiated and agreed, both LSR peers must use the same mode for label binding exchange.

3.2. Mode-based Categorization of LDP Applications

The earlier applications, defined and identified at the time of standardization of LDP base specification RFC-3036, using LDP to exchange their FEC bindings were:

- Dynamic Label Switching for IP Prefixes
- Label-controlled ATM/FR

Since then, several new applications have emerged that use LDP to signal their FEC bindings and/or application data. These include:

- L2VPN P2P PW ([RFC4447])

- L2VPN P2MP PW ([P2MP-PW])
- mLDP ([RFC6388])
- ICCP ([ICCP])

We divide the LDP applications into two broad categories from label advertisement mode usage point of view:

1. Session mode-bound Applications

2. Session mode-independent Applications

3.2.1. Session mode-bound Applications

We define a "session mode-bound application" to be an application which uses the negotiated label advertisement mode. This means that the FEC-label binding exchange for such an LDP applications MUST use the label advertisement mode negotiated for the LDP session.

The early LDP applications "Dynamic Label Switching for IP Prefixes" and "Label-controlled ATM/FR" are included into this category.

3.2.2. Session mode-independent Applications

We define a "session mode-independent application" to be an application which does not care about the negotiated label advertisement mode. This means that the FEC-label binding, or any other application data, exchange for such an LDP application does not care about, nor tied to the "negotiated" label advertisement mode of the session; rather, the information exchange is driven by the application need and procedures as described by its specification document. For example, [RFC6388] specifies procedures to advertise P2MP FEC label binding in an unsolicited manner, irrespective of the negotiated label advertisement mode of the session.

The applications, PW (P2P and P2MP), MLDP, and ICCP, are included into this category of LDP applications.

3.2.2.1. Upstream Label Assignment

As opposed to downstream assigned label advertisement defined by [RFC3031], [RFC6389] specification defines new mode of label advertisement where label advertisement and distribution occurs for upstream assigned labels.

As stated earlier in this document, LDP base specification RFC-5036 only allows specifying Downstream-Unsolicited or Downstream-on-Demand mode. This means that any LDP application that requires upstream assigned label advertisement also falls under the category of Session mode-independent application.

3.3. Unacceptable label advertisement mode

The procedures related to unacceptable label advertisement mode, as defined in RFC-5036 section 3.5.3, continue to apply for any "mode-bound" FEC/application. For a "mode-independent" FEC/application, mode negotiation does not apply and hence both LSRs MUST operate in the mode specified for the given application by the respective specification.

If a session is jointly shared amongst mode-bound and mode-independent FEC/applications, session will not be established if the label advertisement mode is unacceptable (between the LSRs) for a given mode-bound FEC/application type. This is inline with RFC-5036 section 3.5.3 specification for unacceptable mode.

4. Clarification on Mode Applicability

To remove any ambiguity and conflict amongst different specifications with regards to the use of LDP session's label advertisement mode, we propose an update to LDP base specification RFC-5036 to clarify the applicability of session's negotiated mode.

Furthermore, RFC-4447 specifies LDP extensions and procedures to exchange label bindings for P2P PW FECs [RFC4447], and dictates the use of Downstream-Unsolicited mode for an LDP session related to L2VPN PW. This mode dictation creates a direct conflict in situations when a PW LDP session is shared with an LDP application with Downstream-on-Demand mode (such as Label switching Application for IP prefixes). To remove such a conflict, we also propose an update to a section of RFC-4447.

4.1. Update to RFC-5036

The section 3.5.3 of [RFC5036] is updated to add following two statements under the description of "A, Label Advertisement Discipline":

- The negotiated label advertisement discipline only applies to FEC label binding advertisement of "Address Prefix" FECs;

- Any new document specifying a new FEC MUST state the applicability of the negotiated label advertisement discipline for that FEC.

4.2. Update to RFC-4447

The section 3 of [RFC4447] states:

"LDP MUST be used in its downstream unsolicited mode."

Since PW application falls under session mode-independent application category, the above statement in [RFC4447] should be read to mean as follows:

"LDP MUST exchange PW FEC label bindings in downstream unsolicited manner, independent of the negotiated label advertisement mode of the LDP session".

5. Security Considerations

This document specification only clarifies the applicability of LDP session's label advertisement mode, and hence does not add any LDP security mechanics and considerations to those already defined in LDP specification [RFC5036].

6. IANA Considerations

None.

7. References

7.1. Normative References

[RFC5036] L. Andersson, I. Minei, and B. Thomas, "LDP Specification", RFC 5036, September 2007.

[RFC4447] L. Martini, Editor, E. Rosen, El-Aawar, T. Smith, G. Heron, "Pseudowire Setup and Maintenance using the Label Distribution Protocol", RFC 4447, April 2006.

[RFC3031] E. Rosen, A. Viswanathan, and R. Callon, "Multiprotocol Label Switching Architecture", RFC 3031, January 2001.

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

7.2. Informative References

[P2MP-PW] S. Boutros, L. Martini, S. Sivabalan, G. Del Vecchio, Kamite, L. Jin, "Signaling Root-Initiated P2MP PWs using LDP", draft-ietf-pwe3-p2mp-pw-04.txt, Work in Progress, March 2012.

[RFC6388] I. Minei, I. Wijnand, K. Kompella, B., "LDP Extensions for P2MP and MP2MP LSPs", RFC 6388, November 2011.

[ICCP] L. Martini, S. Salam, A. Sajassi, and S. Matsushima, "Inter-Chassis Communication Protocol for L2VPN PE Redundancy", draft-ietf-pwe3-iccp-08.txt, Work in Progress, June 2012.

[RFC6389] R. Aggarwal, and J.L. Le Roux, "MPLS Upstream Label Assignment for LDP", RFC 6389, November 2011.

8. Acknowledgments

We acknowledge the authors of [RFC5036] and [RFC4447] since some of the text in this document is borrowed from their specification. We also acknowledge Eric Rosen and Rajiv Asati for their review and input.

This document was prepared using 2-Word-v2.0.template.dot.

Authors' Addresses

Kamran Raza
Cisco Systems, Inc.
2000 Innovation Drive,
Ottawa, ON K2K-3E8, Canada.
E-mail: skraza@cisco.com

Sami Boutros

Cisco Systems, Inc.
3750 Cisco Way,
San Jose, CA 95134, USA.
E-mail: sboutros@cisco.com

Luca Martini
Cisco Systems, Inc.
9155 East Nichols Avenue, Suite 400,
Englewood, CO 80112, USA.
E-mail: lmartini@cisco.com

Nicolai Leymann
Deutsche Telekom,
Winterfeldtstrasse 21-27,
10781 Berlin, Germany.
E-mail: N.Leymann@telekom.de