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LDP Typed Wildcard FEC

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Abstract

The LDP specification [RFC3036] for the Wildcard FEC element has several deficiencies. This document corrects those deficiencies. In addition, it specifies the Typed Wildcard FEC for the Prefix FEC Element Type defined in RFC3036.

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1. Introduction

LDP [RFC3036] distributes labels for Forwarding Equivalence Classes (FECs). LDP uses FEC TLVs in LDP messages to specify FECs. An LDP FEC TLV includes 1 or more FEC Elements. A FEC element includes a FEC type and an optional type-dependent value.

RFC3036 specifies two FEC types (Wildcard and Prefix), and other documents specify additional FEC types; e.g., see [PWE3] [MLDP].

As specified in RFC3036 the Wildcard FEC Element refers to all FECs relative to an optional constraint. The only constraint RFC3036 specifies is one that limits the scope of the Wildcard FEC Element to "all FECs bound to a given label".

The RFC3036 specification of the Wildcard FEC Element has the following deficiencies which limit its utility:

1. The Wildcard FEC Element is untyped. There are situations where it would be useful to be able to refer to all FECs of a given type.

2. Use of the Wildcard FEC Element is limited to Label Withdraw and Label Release messages only. There are situations where it would be useful in Label Request messages.

This document addresses these deficiencies by defining a Typed Wildcard FEC Element and procedures for its use. Note that this document does not change procedures specified for the LDP Wildcard FEC Element by RFC3036.

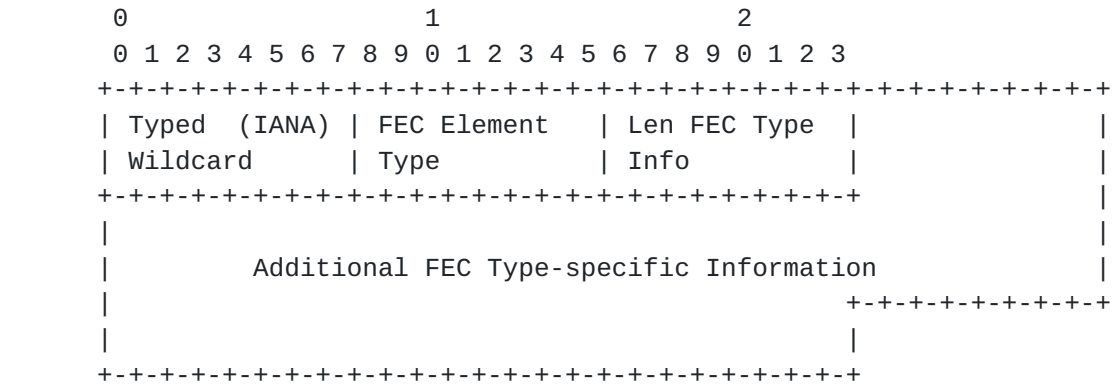
2. Specification Language

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].

3. The Typed Wildcard FEC Element

The Typed Wildcard FEC Element refers to all FECs of a given type relative to an optional constraint. The constraint, if present, is determined from the context in which the Typed Wildcard FEC Element appears.

The format of the Typed Wildcard FEC Element is:



where:

Typed Wildcard: One octet FEC Element type to be assigned by IANA.

FEC Element Type: One octet FEC Element Type that specifies the FEC Element Type to be wildcarded.

Len FEC Type Info: One octet that specifies the length of the FEC Type Specific information field. MUST be 0 if there is no Additional FEC Type-specific Information.

Additional FEC Type-specific Information: Additional information specific to the FEC Element Type required to fully specify the Typed Wildcard.

Specification of the length and format of Additional FEC Type Specific Information for particular FEC Element Types is outside of the scope of this document.

4. Procedures for the Typed Wildcard FEC Element

It is the responsibility of the designer of the FEC Element Type to specify whether typed wildcarding is required for the FEC Element Type. When typed wildcarding is supported for a FEC Element Type it is the responsibility of the designer to specify the length and format of any Additional FEC Type Specific Information.

When a FEC TLV contains a Typed Wildcard FEC Element the Typed Wildcard FEC Element MUST be the only FEC Element in the TLV.

An LDP implementation that supports the Typed Wildcard FEC Element MUST support its use in Label Request, Label Withdraw and Label Release messages.

Receipt of a Label Request message with a FEC TLV containing a Typed Wildcard FEC Element is interpreted as a request to send a Label Mapping for all FECs of the type specified by the FEC Element type field in the Typed Wildcard FEC Element encoding.

An LDP implementation that supports the Typed Wildcard FEC Element MUST support the following constraints whenever a Typed Wildcard FEC appears in a Label Withdraw or Label Release message:

1. If the message carries an optional Label TLV the Typed Wildcard FEC Element refers to all FECs of the specified FEC type bound to the specified label.

2. If the message has no Label TLV the Typed Wildcard FEC Element refers to all FECs of the specified FEC type.

Backwards compatibility with a router not supporting the Typed Wildcard FEC element is ensured by the FEC procedures defined in RFC3036. Quoting from RFC3036:

> "If it" [an LSR] "encounters a FEC Element type it cannot decode, it SHOULD stop decoding the FEC TLV, abort processing the message containing the TLV, and send an "Unknown FEC" Notification message to its LDP peer signaling an error."

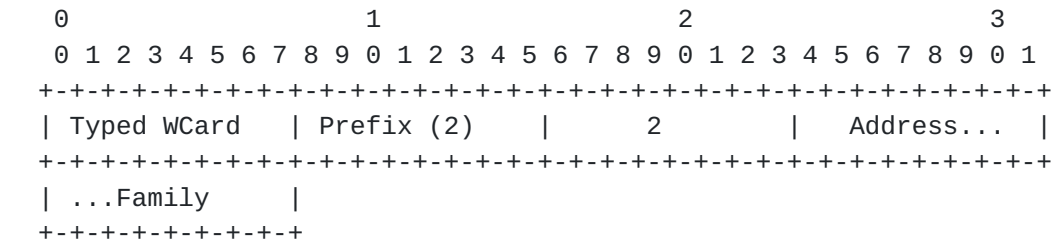
A router receiving a FEC TLV containing a Typed Wildcard FEC element for a FEC Element Type that it either doesn't support or for a FEC Element Type that doesn't support the use of wildcarding MUST stop

decoding the FEC TLV, abort processing the message containing the TLV, and send an "Unknown FEC" Notification message to its LDP peer signaling an error.

5. Typed Wildcard FEC Element for RFC3036 Prefix FEC Element

RFC3036 defines the Prefix FEC Element but it does not specify a Typed Wildcard for it. This section specifies the Typed Wildcard FEC Element for RFC3036 Prefix Elements.

The format of the Prefix FEC Typed Wildcard FEC ("Prefix FEC Wildcard" for short) is:



Address Family: Two octet quantity containing a value from ADDRESS FAMILY NUMBERS in [IANA-AF].

The procedures of Section 4 apply to the Prefix FEC Wildcard.

6. RFC3036 Host and Wildcard FEC Elements

There is no need to specify Typed Wildcard FEC Elements for the Host and Wildcard FEC Elements specified by RFC3036. The RFC3036 Host FEC Element has been removed from rfc3036bis [RFC3036bis], and the Wildcard FEC Element is untyped by definition.

7. IANA Considerations

The Typed Wildcard FEC Element requires a code point from the LDP FEC Type Name Space. IANA manages the FEC TYPE name space as recommended by the following from [RFC3036]:

"FEC Type Name Space

The range for FEC types is 0 - 255.

Following the policies outlined in [RFC3036], FEC types in the range 0 - 127 are allocated through an IETF Consensus action, types in the range 128 - 191 are allocated as First Come First

Served, and types in the range 192 - 255 are reserved for Private Use."

The authors recommend that the code point 0x05 from the IETF Consensus range be assigned to the Typed Wildcard FEC Element.

8. Security Considerations

No security considerations beyond those that apply to the base LDP specification and described in [RFC3036] apply to use of the Typed Wildcard FEC Element defined in this document.

9. Acknowledgements

The authors wish to thank Yakov Rehkter for suggesting that the deficiencies of the Wildcard FEC be addressed.

10. References

Normative References

[RFC3036] Andersson, L., Doolan, P., Feldman, N., Fredette, A. and Thomas, B., "LDP Specification", RFC 3036, January 2001.

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

[IANA-AF] http://www.iana.org/assignments/address-family-numbers

Informative References

[PWE3] Martini, L., Editor, "Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP)", RFC 4447, April 2006.

[MLDP] Minei, I., Wijnamds, I., Editors, "Label Distribution Protocol Extensions for Point-to-Multipoint and Multipoint-to-Multipoint Label Switched Paths", draft-ietf-mpls-ldp-p2mp-02.txt, Work in Progress, October 2006.

[RFC3036bis] Andersson, L., Minei, I., Thomas, B., Editors, "LDP Specification", draft-ietf-mpls-rfc3036bis-04.txt, Work in Progress, September 2006.

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