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**LDP Extensions for FEC elements sharing label
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Abstract

Label Distribution Protocol (LDP) is defined in [[RFC5036](#)] for distribution of labels inside one MPLS domain. It defined how to associate a Forwarding Equivalence Class (FEC) with each label it distributes. A FEC is a list of one or more FEC elements, but it does not describe operations how to achieve one or more FEC element share the same label.

Currently Label resources are getting more and more nervous, and it is necessary to save the label resources. This document defines extensions to the LDP protocol to achieve one or more FEC element share the same label.

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1. Introduction

Label Distribution Protocol (LDP) is defined in [[RFC5036](#)] for distribution of labels inside one MPLS domain. It defined how to associate a Forwarding Equivalence Class (FEC) with each label it distributes. A FEC is a list of one or more FEC elements, but it does not describe operations how to achieve one or more FEC element share the same label.

Currently Label resources are getting more and more nervous, and it is necessary to save the label resources. This document defines extensions to the LDP protocol to achieve one or more FEC element share the same label.

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 [RFC2119](#).

3. LDP Extension

3.1. Host-parasitism FEC Relationship TLV

The following section describes the protocol extensions required to support one or more FEC element share the same label.

Labels are bound to Forwarding Equivalence Classes (FECs). A Host-parasitism FEC Relationship is a list of one or more FEC elements. The FEC Relationship TLV encodes FEC items.

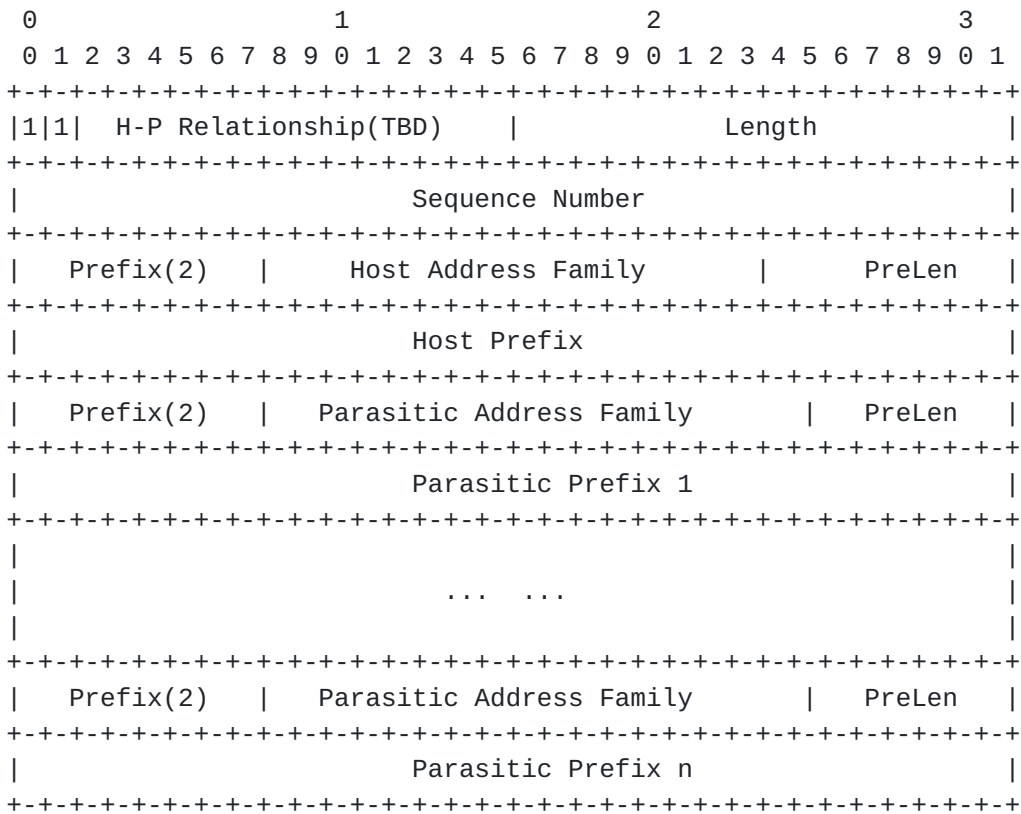


Figure 1

The FEC Relationship TLV contains a Host-FEC element, and 0 or many Parasitic-FEC elements. Both Host-FEC element and the Parasitic-FEC element are use the same format as defined in [RFC5036].

The type of the FEC Elements is 0x02(prefix).The Host-FEC indicates Label Lender, and the Parasitic-FEC indicates Label borrowing.

Sequence Number Specifies a 4 octet unsigned sequence number that identifies the sequence number of the Host-parasitism FEC Relationship. The greater the Sequence Number, the more new the Host-parasitism FEC Relationship. if the difference between the larger one and the smaller one is more than half of the value of a 4

octet unsigned integer, it indicates that there is a turnover, and the smaller value of the Sequence Number, the more new the Host-parasitism FEC Relationship.

3.2. Label Borrowing Message

The document defines a new LDP message: Label Borrowing Message. An LSR sends a Label Borrowing message to an LDP peer to advertise label borrowing relationship to the peer. The Label Borrowing message Must include a Host-parasitism FEC Relationship TLV.

The encoding for the Label Borrowing message is:

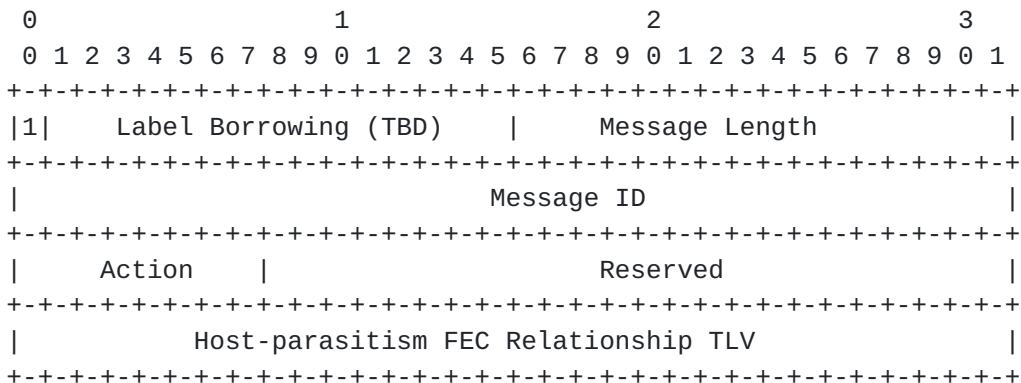


Figure 2

U-bit: The value is set to 1, it indicates the unknown TLV MUST be silently ignored and the rest of the message processed as if the unknown TLV did not exist.

Message ID: 32-bit value used to identify this message.

Action: Set to 1, it indicates Label borrowing. Set to 0, it indicates Label does not borrow.

4. Operations

4.1. Egress Operation

The Egress may involve one or more of the following actions:

- o A Egress node advertises Label Mapping messages for the Host-FEC label to one or more LDP peers, The LDP label distribution procedures is the same as described in [[RFC5036](#)].

- o According to local policy that is configed on Egress node, all or part of the Parasitic-FECs can share the same label with the Host-FEC. The Egress node MUST advertises a Label Borrowing Message included the Host-parasitism FEC Relationship TLV with action set to 1. If the local policy is coarsness-grained that enforced all Parasitic-FECs to share the Host-FEC's label, the Host-parasitism FEC Relationship TLV can only contain the single Host-FEC element, and Parasitic-FECs elements are empty. Otherwise, the Host-parasitism FEC Relationship TLV need contain not only the Host-FEC element, but also specific Parasitic-FECs elements who need to share Host-FEC's label due to a local fine-grained policy.
- o When the Host-FEC label is available, and if due to a local coarsness or fine-grained policy that all Parasitic-FECs which borrowed label from the Host-FEC didnt borrow again, the Egress node MUST advertises a Label Borrowing Message included the Host-parasitism FEC Relationship TLV with action set to 0, only contain that single Host-FEC element, and Parasitic-FECs elements are empty. Otherwise, if due to a local fine-grained policy, some Parasitic-FECs didnt want to borrow the Host-FEC's label, but there are always any other Parasitic-FECs left to share label, an updated Label Borrowing Message included the Host-parasitism FEC Relationship TLV with action set to 1 need to be advertised, contain the Host-FEC element and the specific Parasitic-FECs elements.

4.2. Ingress/Transit Operation

An LSR which received a Label Borrowing Message from an LDP peer may involve one or more of the following actions:

- o Maintain the up-to-date Host-parasitism FEC Relationship. It will compare the sequence number in the received Label Borrow Message and the existed locally maintained Host-parasitism FEC Relationship data. If the Label Borrow Message is newer than the locally maintained data, it will overwrite the later, otherwise it will be ignored. If the Host-parasitism FEC Relationship only contained a single Host-FEC, the Parasitic-FECs could be determined by checking IGP/BGP prefixes whose original advertised router-id are same as the Host-FEC, and also by local FEC-policy(i.e. which IGP/BGP prefix could be installed as an LDP FEC due to local FEC-policy).
- o Based on the borrowed label get from the up-to-date Host-parasitism FEC Relationship data, Install ILM entries at the transit node and FTN entries at the ingress node for Parasitic-FECs. The outgoing label of the Parasitic-FEC's FTN entry will be same as the one of the Host-FEC's FTN entry. Both the incoming

label and outgoing label of the parasitic-FEC's ILM entry will be same as the ones of the Host-FEC's ILM entry.

- o Transmission of the up-to-date Label Borrowing message to one or more other LDP peers;

Note that the traditional process of received Label Mapping/Withdraw Message for an FEC MUST NOT be affected by the process of the Label Borrow Message if the FEC is also a Parasitic-FEC according to the up-to-date Host-parasitism FEC Relationship data. That is, the priority of the traditional process is higher.

5. Security Considerations

TBD.

6. Acknowledgements

TBD.

7. IANA Considerations

TBD.

8. Normative references

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<http://www.rfc-editor.org/info/rfc2119>>.
- [RFC3031] Rosen, E., Viswanathan, A., and R. Callon, "Multiprotocol Label Switching Architecture", [RFC 3031](#), DOI 10.17487/RFC3031, January 2001, <<http://www.rfc-editor.org/info/rfc3031>>.
- [RFC5036] Andersson, L., Ed., Minei, I., Ed., and B. Thomas, Ed., "LDP Specification", [RFC 5036](#), DOI 10.17487/RFC5036, October 2007, <<http://www.rfc-editor.org/info/rfc5036>>.
- [RFC7794] Ginsberg, L., Ed., Decraene, B., Previdi, S., Xu, X., and U. Chunduri, "IS-IS Prefix Attributes for Extended IPv4 and IPv6 Reachability", [RFC 7794](#), DOI 10.17487/RFC7794, March 2016, <<http://www.rfc-editor.org/info/rfc7794>>.

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