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M. Chen
Huawei Technologies Co., Ltd
P. Pan
Infinera
C. Pignataro
R. Asati
Cisco

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Label Switched Path (LSP) Ping for Pseudowire Forwarding Equivalence Classes (FECs) Advertised over IPv6

Abstract

The Multiprotocol Label Switching (MPLS) Label Switched Path (LSP) Ping and traceroute mechanisms are commonly used to detect and isolate data-plane failures in all MPLS LSPs, including LSPs used for each direction of an MPLS Pseudowire (PW). However, the LSP Ping and traceroute elements used for PWs are not specified for IPv6 address usage.

This document extends the PW LSP Ping and traceroute mechanisms so they can be used with PWs that are set up and maintained using IPv6 LDP sessions. This document updates RFC 4379.

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 5741.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at http://www.rfc-editor.org/info/rfc6829.

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1. Introduction

Multiprotocol Label Switching (MPLS) Label Switched Path (LSP) Ping and traceroute are defined in [RFC4379]. These mechanisms can be used to detect data-plane failures in all MPLS LSPs, including Pseudowires (PWs). However, the PW LSP Ping and traceroute elements are not specified for IPv6 address usage.

Specifically, the PW Forwarding Equivalence Class (FEC) sub-TLVs for the Target FEC Stack in the LSP Ping and traceroute mechanism are defined only for IPv4 Provider Edge (PE) routers and are not applicable for the case where PEs use IPv6 addresses. Three PW-related Target FEC sub-TLVs are currently defined (FEC 128 Pseudowire-Deprecated, FEC 128 Pseudowire-Current, and FEC 129 Pseudowire, see Sections 3.2.8 through 3.2.10 of [RFC4379]). These sub-TLVs contain the source and destination addresses of the LDP session, and currently only an IPv4 LDP session is covered. Despite

the fact that the PE IP address family is not explicit in the sub-TLV definition, this can be inferred indirectly by examining the lengths of the Sender's/Remote PE Address fields or calculating the length of the sub-TLVs (see Section 3.2 of [RFC4379]). When an IPv6 LDP session is used, these existing sub-TLVs cannot be used since the addresses will not fit. Additionally, all other sub-TLVs are defined in pairs, one for IPv4 and another for IPv6, but not the PW sub-TLVs.

This document updates [RFC4379] to explicitly constrain the existing PW FEC sub-TLVs for IPv4 LDP sessions and extends the PW LSP Ping to IPv6 LDP sessions (i.e., when IPv6 LDP sessions are used to signal the PW, the Sender's and Receiver's IP addresses are IPv6 addresses). This is done by renaming the existing PW sub-TLVs to indicate "IPv4" and also by defining two new Target FEC sub-TLVs (FEC 128 Pseudowire IPv6 sub-TLV and FEC 129 Pseudowire IPv6 sub-TLV) to extend the application of PW LSP Ping and traceroute to IPv6 usage when an IPv6 LDP session [MPLS-LDP] is used to signal the Pseudowire. Note that FEC 128 Pseudowire (Deprecated) is not defined for IPv6 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].

2. Pseudowire IPv4 Target FEC Stack Sub-TLVs

This document updates Section 3.2 and Sections 3.2.8 through 3.2.10 of [RFC4379] as follows and as indicated in Sections 4 and 6. This is done to avoid any potential ambiguity and confusion and to clarify that these TLVs carry only IPv4 addresses. Note that the changes are limited to the names of fields; there are no semantic changes.

Sections 3.2.8 through 3.2.10 of [RFC4379] list the PW sub-TLVs and state:

"FEC 128" Pseudowire (Deprecated)

"FEC 128" Pseudowire

"FEC 129" Pseudowire

These names and titles are now changed to:

"FEC 128" Pseudowire - IPv4 (Deprecated)

"FEC 128" Pseudowire - IPv4

"FEC 129" Pseudowire - IPv4

Additionally, when referring to the PE addresses, Sections 3.2.8 through 3.2.10 of [RFC4379] state:

Sender's PE Address

Remote PE Address

These are now updated to say:

Sender's PE IPv4 Address

Remote PE IPv4 Address

3. Pseudowire IPv6 Target FEC Stack Sub-TLVs

3.1. FEC 128 Pseudowire

The FEC 128 Pseudowire IPv6 sub-TLV has a structure consistent with the FEC 128 Pseudowire sub-TLV as described in Section 3.2.9 of [RFC4379]. The encoding of the FEC 128 Pseudowire IPv6 sub-TLV is as follows:

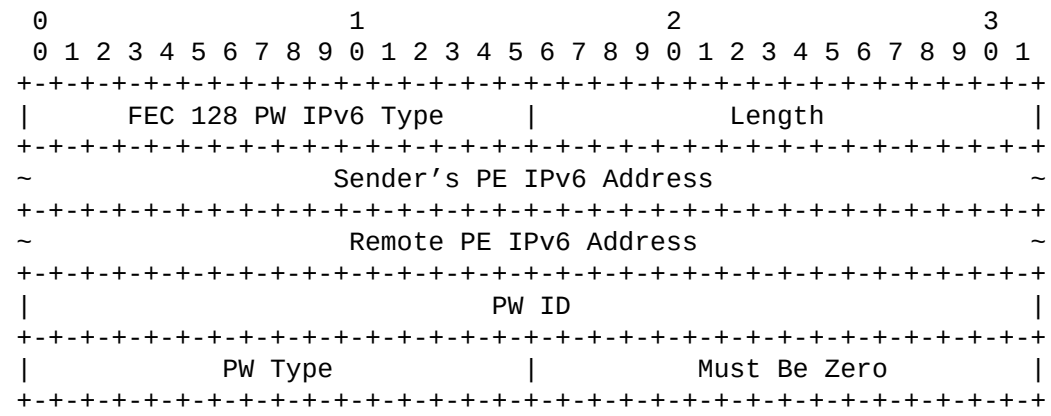

Figure 1: FEC 128 Pseudowire - IPv6

FEC 128 PW IPv6 Type: 24. 2 octets.

Length: Defines the length in octets of the value field of the sub-TLV and its value is 38. 2 octets.

Sender's PE IPv6 Address: The source IP address of the target IPv6 LDP session. 16 octets.

Remote PE IPv6 Address: The destination IP address of the target IPv6 LDP session. 16 octets.

PW ID: Same as FEC 128 Pseudowire IPv4 [RFC4379].

PW Type: Same as FEC 128 Pseudowire IPv4 [RFC4379].

3.2. FEC 129 Pseudowire

The FEC 129 Pseudowire IPv6 sub-TLV has a structure consistent with the FEC 129 Pseudowire sub-TLV as described in Section 3.2.10 of [RFC4379]. The encoding of FEC 129 Pseudowire IPv6 is as follows:

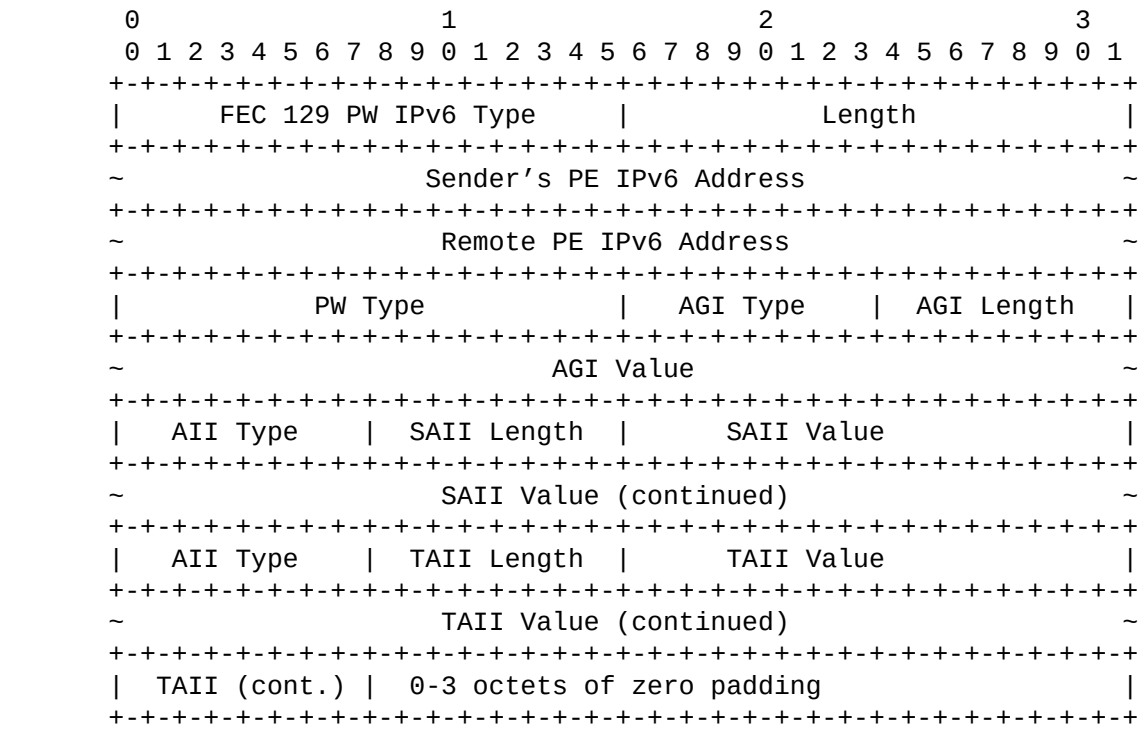

Figure 2: FEC 129 Pseudowire - IPv6

FEC 129 PW IPv6 Type: 25. 2 octets.

Length: Defines the length in octets of the value field of the sub-TLV. 2 octets

The length of this TLV is 40 + AGI (Attachment Group Identifier) length + SAII (Source Attachment Individual Identifier) length + TAII (Target Attachment Individual Identifier) length. Padding is used to make the total length a multiple of 4; the length of the padding is not included in the Length field.

Sender's PE IPv6 Address: The source IP address of the target IPv6 LDP session. 16 octets.

Remote PE IPv6 Address: The destination IP address of the target IPv6 LDP session. 16 octets.

The other fields are the same as FEC 129 Pseudowire IPv4 [RFC4379].

4. Summary of Changes

Section 3.2 of [RFC4379] tabulates all the sub-TLVs for the Target FEC Stack. Per the change described in Sections 2 and 3, the table would show the following:

Sub-Type	Length	Value Field
...		
9	10	"FEC 128" Pseudowire - IPv4 (Deprecated)
10	14	"FEC 128" Pseudowire - IPv4
11	16+	"FEC 129" Pseudowire - IPv4
...		
24	38	"FEC 128" Pseudowire - IPv6
25	40+	"FEC 129" Pseudowire - IPv6

5. Operation

This document does not define any new procedures. The process described in [RFC4379] MUST be used.

6. IANA Considerations

IANA has made the following assignments in the "Multi-Protocol Label Switching (MPLS) Label Switched Paths (LSPs) Ping Parameters" registry.

The following sub-TLV changes, which comprise three updates and two additions, are made for the TLV Type 1 "Target FEC Stack" in the "TLVs and sub-TLVs" sub-registry.

The names of the Value fields of these three Sub-TLVs have been updated to include the "IPv4" qualifier (see Section 2), and the Reference has been updated to point to this document:

Type	Sub-Type	Value Field
1	9	"FEC 128" Pseudowire - IPv4 (Deprecated)
1	10	"FEC 128" Pseudowire - IPv4
1	11	"FEC 129" Pseudowire - IPv4

Two new entries for the Sub-Type field of the Target FEC TLV (see Section 3) have been created:

Type	Sub-Type	Value Field
1	24	"FEC 128" Pseudowire - IPv6
1	25	"FEC 129" Pseudowire - IPv6

7. Security Considerations

This document does not introduce any new security issues; the security mechanisms defined in [RFC4379] apply here.

8. Acknowledgements

The authors gratefully acknowledge the review and comments of Vanson Lim, Tom Petch, Spike Curtis, Loa Andersson, and Kireeti Kompella.

9. References

9.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

[RFC4379] Kompella, K. and G. Swallow, "Detecting Multi-Protocol Label Switched (MPLS) Data Plane Failures", RFC 4379, February 2006.

9.2. Informative References

[MPLS-LDP] Asati, R., Manral, V., Papneja, R., and C. Pignataro, "Updates to LDP for IPv6", Work in Progress, June 2012.

Authors' Addresses

Mach(Guoyi) Chen
Huawei Technologies Co., Ltd
No. 3 Xinxi Road, Shang-di, Hai-dian District
Beijing 100085
China

EMail: mach@huawei.com

Ping Pan
Infinera
US

EMail: ppan@infinera.com

Carlos Pignataro
Cisco Systems
7200-12 Kit Creek Road
Research Triangle Park, NC 27709
US

EMail: cpignata@cisco.com

Rajiv Asati
Cisco Systems
7025-6 Kit Creek Road
Research Triangle Park, NC 27709
US

EMail: rajiva@cisco.com