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Transport of TRILL Using Pseudowires
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Abstract

This document specifies how to interconnect a pair of TRILL (Transparent Interconnection of Lots of Links) switch ports using pseudowires under existing TRILL and PWE3 (Pseudowire Emulation End-to-End) standards.

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1. Introduction

The IETF has standardized the TRILL (Transparent Interconnection of Lots of Links) protocol [RFC6325] that provides optimal pair-wise data frame routing without configuration in multi-hop networks with arbitrary topology. TRILL supports multipathing of both unicast and multicast traffic. Devices that implement TRILL are called TRILL Switches or RBridges (Routing Bridges).

Links between TRILL Switches can be based on arbitrary link protocols, for example PPP [RFC6361], as well as Ethernet [RFC6325]. A set of connected TRILL Switches together form a TRILL campus which is bounded by end stations and layer 3 routers.

This document specifies how to interconnect a pair of TRILL Switch ports using a pseudowire under existing TRILL and PWE3 (Pseudowire Emulation End-to-End) standards.

1.1 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].

Acronyms used in this document include the following:

IS-IS - Intermediate System to Intermediate System [IS-IS]

MPLS - Multi-Protocol Label Switching

PPP - Point-to-Point Protocol [RFC1661]

PW - Pseudowire [RFC3985]

PWE3 - PW Emulation End-to-End

RBridge - Routing Bridge, an alternative name for a TRILL Switch

TRILL - Transparent Interconnection of Lots of Links [RFC6325]

TRILL Switch - A device implementing the TRILL protocol

2. PWE3 Interconnection of TRILL Switches

When a pseudowire is used to interconnect a pair of TRILL Switch ports, a PPP [RFC4618] pseudowire is used as described below. The pseudowire between such ports can be auto-configured [RFC4447] or manually configured. In this context, the TRILL Switch ports at the ends of the pseudowire are acting as native service processing elements (NSP [RFC3985]) and, assuming the pseudowires are over MPLS or IP [RFC4023] networks, as label switched or IP routers at the TRILL Switch ports.

Pseudowires provide transparent transport and the two TRILL Switch ports appear directly interconnected with a transparent link. With such an interconnection the TRILL adjacency over the link is automatically discovered and established through TRILL IS-IS control messages [RFC6327bis].

A pseudowire is carried over a packet switched network tunnel [RFC3985]. For example, an MPLS or MPLS-TP label switched path tunnel in MPLS networks. Either a signaling protocol or manual configuration can be used to configure a label switched path tunnel between two TRILL Switch ports. This application needs no additions to the existing pseudowire standards.

2.1 PWE3 Type Independent Details

The sending pseudowire TRILL Switch port MUST copy the priority of the TRILL Data packets being sent to the 3-bit Traffic Class field of the pseudowire label [RFC5462] so the priority will be visible to pseudowire transit devices and they can take the priority into account. TRILL IS-IS PDUs critical to establishing and maintaining adjacency (Hello and MTU PDUs) SHOULD be send with Traffic Class 7 while other TRILL IS-IS PDUs SHOULD be sent with Traffic Class 6.

If a pseudowire supports fragmentation and re-assembly, there is no reason to do TRILL MTU testing on it and the pseudowire will not be a constraint on the TRILL campus wide Sz (see Section 4.3.1 [RFC6325]). If the pseudowire does not support fragmentation, then the available TRILL IS-IS packet payload size over the pseudowire (taking into account MPLS encapsulation with a control word) or some lower value, MUST be used in helping to determine Sz (see Section 5 [ClearCorrect]).

An intervening MPLS label switched router or similar packet switched network device has no awareness of TRILL. Such devices will not change the TRILL Header hop count.

2.2 PPP PWE3 Transport of TRILL

For a PPP pseudowire (PW type = 0x0007), the two TRILL Switch ports being connected are configured to form a pseudowire with PPP encapsulation [RFC4618]. After the pseudowire is established and TRILL use is negotiated within PPP, the two TRILL Switch ports appear directly connected with a PPP link [RFC1661] [RFC6361].

If pseudowire interconnection of two TRILL Switch ports is auto-configured [RFC4447], the initiating TRILL Switch port MUST attempt the connection set-up with pseudowire type PPP (0x0007).

Behavior for TRILL with a PPP pseudowire continues to follow that of TRILL over PPP as specified in Section 3 of [RFC6361].

3. IANA Considerations

No IANA actions are required by this document. RFC Editor: Please remove this section before publication.

4. Security Considerations

For PPP link TRILL security considerations, see [RFC6361].

For security considerations introduced by carrying PPP TRILL links over pseudowires, see [RFC3985].

Not all implementations need to include specific security mechanisms at the pseudowire layer, for example if they are designed to be deployed only in cases where the networking environment is trusted or where other layers provide adequate security. A complete enumeration of possible deployment scenarios and associated threats and options is not possible and is outside the scope of this document. For applications involving sensitive data, end-to-end security should always be considered, in addition to link security, to provide security in depth. In this context, such end-to-end security should be between the end stations involved so as to protect the entire path to, through, and from the TRILL campus.

For general TRILL protocol security considerations, see [RFC6325].

Appendix A: Use of Other Pseudowire Types

This informational Appendix briefly discusses use of pseudowire types other than PPP.

The use of Ethernet pseudowires [RFC4448] was examined by the authors and would be possible; however, they would require an additional 12 or 16 bytes per packet.

It would also be possible to specify a new pseudowire type for TRILL traffic but the authors feel that any efficiency gain over PPP pseudowires would be too small to be worth the complexity of adding such a specification. Furthermore using PPP pseudowire encoding means that any traffic dissector that understands TRILL PPP encoding [RFC6361] and understands PPP pseudowires [RFC4618] will automatically be able to recursively decode TRILL transported by pseudowire.

Appendix Z: Change History

From -00 to -01

Add information on Traffic Classes that should be used for TRILL IS-IS PDUs.

Other changes to resolve WG Last Call comments:

Change title from "TRILL Over Psuedowires".

Change "Class of Service" to "Traffic Class".

Expand informational paragraph about the consideration of using other pseudowire types for the transport of TRILL and make that paragraph into Appendix A.

Add this Change History Appendix Z.

Acknowledgements

Thanks for the valuable comments from the following:

Yakov Stein

The document was prepared in raw nroff. All macros used were defined within the source file.

Normative References

[RFC1661] - Simpson, W., Ed., "The Point-to-Point Protocol (PPP)", STD 51, RFC 1661, July 1994.

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

[RFC4447] - Martini, L., Ed., Rosen, E., El-Aawar, N., Smith, T., and G. Heron, "Pseudowire Setup and Maintenance Using the Label Distribution Protocol (LDP)", RFC 4447, April 2006.

[RFC4618] - Martini, L., "Encapsulation Methods for Transport of PPP/High-Level Data Link Control (HDLC) over MPLS Networks", BCP 116, RFC 4618, September 2006.

[RFC5462] - Andersson, L. and R. Asati, "Multiprotocol Label Switching (MPLS) Label Stack Entry: "EXP" Field Renamed to "Traffic Class" Field", RFC 5462, February 2009.

[RFC6325] - Perlman, R., Eastlake 3rd, D., Dutt, D., Gai, S., and A. Ghanwani, "Routing Bridges (RBridges): Base Protocol Specification", RFC6325, July 2011.

[RFC6361] - Carlson, J., and D. Eastlake, "PPP Transparent Interconnection of Lots of Links (TRILL) Protocol Control Protocol", RFC6361, August 2011.

[ClearCorrect] - Eastlake, D., M. Zhang, A. Ghanwani, V. Manral, and A. Banerjee, "TRILL: Clarifications, Corrections, and Updates", draft-ietf-trill-clear-correct, in RFC Editor's queue.

Informative References

[IS-IS] - International Organization for Standardization, "Intermediate system to Intermediate system intra-domain routing information exchange protocol for use in conjunction with the protocol for providing the connectionless-mode Network Service (ISO 8473)", ISO/IEC10589:2002, Second Edition, Nov 2002

[RFC3985] - Bryant, S., Ed., and P. Pate, Ed., "Pseudo Wire Emulation Edge-to-Edge (PWE3) Architecture", RFC 3985, March 2005.

[RFC4023] - Worster, T., Rekhter, Y., and E. Rosen, Ed., "Encapsulating MPLS in IP or Generic Routing Encapsulation (GRE)", RFC 4023, March 2005.

[RFC4448] - Martini, L., Ed., Rosen, E., El-Aawar, N., and G. Heron, "Encapsulation Methods for Transport of Ethernet over MPLS Networks", RFC 4448, April 2006.

[RFC6327bis] - Eastlake 3rd, D., Perlman, R., Ghanwani, A., Howard, Y., and V. Manral, "TRILL: Adjacency", draft-ietf-trill-rfc6327bis, work in progress.

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