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TRILL: Vendor Specific TRILL Channel Protocol
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Abstract

The IETF TRILL (TRAnsparent Interconnection of Lots of Links) protocol is implemented by devices called TRILL switches or RBridges (Routing Bridges). TRILL includes a general mechanism, called RBridge Channel, for the transmission of typed messages between RBridges in the same campus and between RBridges and end stations on the same link. This document specifies a method to send vendor specific messages over the RBridge Channel facility.

Status of This Memo

This Internet-Draft is submitted to IETF in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

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1. Introduction

The IETF TRILL (TTransparent Interconnection of Lots of Links) protocol [[RFC6325](#)] [[RFC7780](#)] is implemented by devices called TRILL switches or RBridges (Routing Bridges). It provides efficient least cost transparent routing in multi-hop networks with arbitrary topologies and link technologies, using link-state routing and a hop count.

The TRILL protocol includes an RBridge Channel facility [[RFC7178](#)] to support typed message transmission between RBridges in the same campus and between RBridges and end stations on the same link. This document specifies a method of sending messages specified by a particular organization, indicated by OUI (Organizationally Unique Identifier) [[RFC7042](#)] or CID (Company Identifier) [[802](#)], over the RBridge Channel facility. Such organization specific messages could, for example, be used for vendor specific diagnostic or control messages.

However, note that a range of RBridge Channel protocol numbers are available based on RFC publication. Those intending to use the RBridge Channel facility are encouraged to document their use in a RFC and to use RBridge Channel protocol numbers based on such RFC publication.

1.1 Terminology and Acronyms

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](#)].

This document uses the acronyms defined in [[RFC6325](#)] supplemented by the following additional acronym:

CID - Company Identifier [[802](#)]

OUI - Organizationally Unique Identifier [[RFC7042](#)]

TRILL switch - An alternative term for an RBridge

2. Vendor Channel Packet Format

The general structure of an RBridge Channel packet on a link between TRILL switches (RBridges) is shown in Figure 1 below. When an RBridge Channel message is sent between an RBridge and an end station on the same link, in either direction, it is called a Native RBridge Channel message and the TRILL Header (including the Inner Ethernet Addresses and Data Label area) is omitted as show in Figure 2. The type of RBridge Channel packet is given by a Protocol field in the RBridge Channel Header that indicates how to interpret the Channel Protocol Specific Payload. See [[RFC7178](#)].

Packet Structure

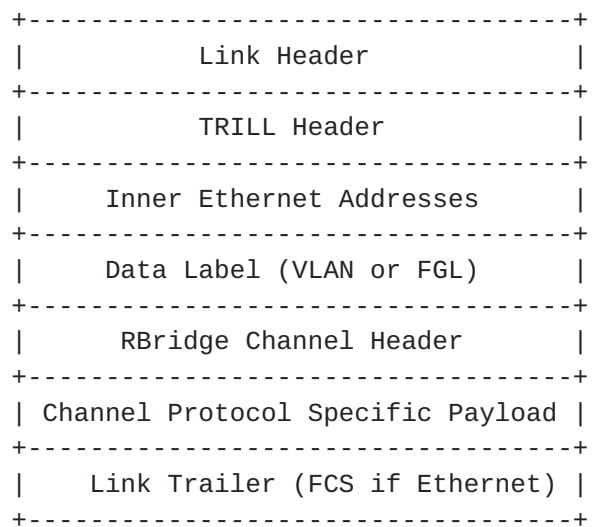


Figure 1. RBridge Channel Packet Structure

Message Structure

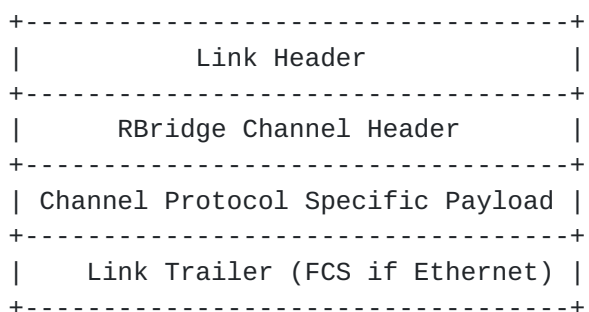


Figure 2. Native RBridge Channel Message Structure

Figure 3 below expands the RBridge Channel Header and Channel Protocol Specific Payload above for the case of the Vendor Specific RBridge Channel Tunnel Protocol. 0x8946 is the Ethertype [[RFC7042](#)] assigned by the IEEE for the RBridge Channel protocol.

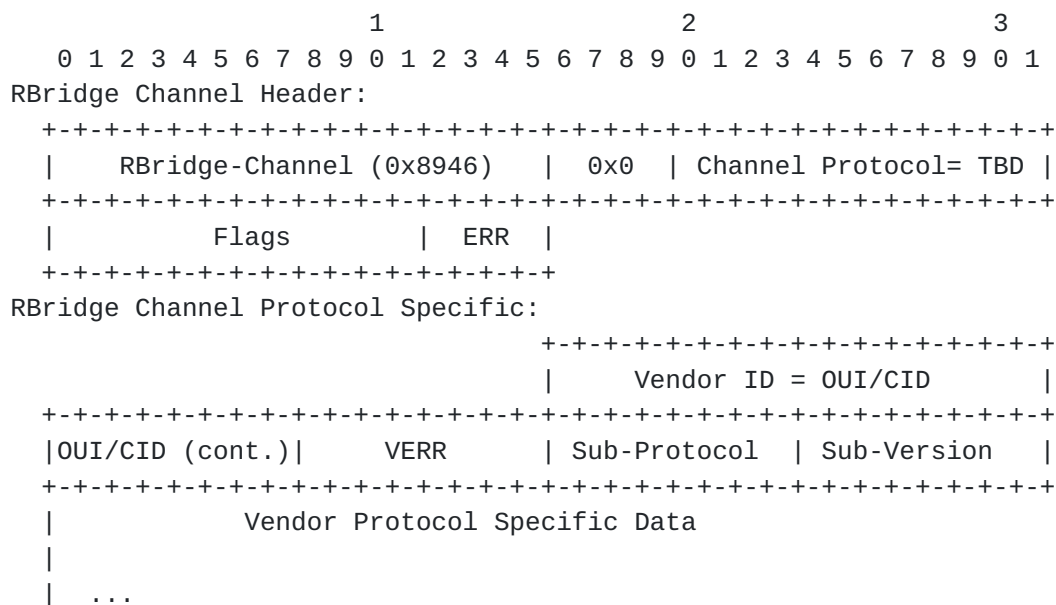


Figure 3. Channel Tunnel Message Structure

The fields in Figure 3 related to the Vendor RBridge Channel Protocol are as follows:

Channel Protocol: The RBridge Channel Protocol value allocated for Vendor Channel (see [Section 4](#)).

Vendor ID: This field indicates the vendor specifying the particular use or uses of the Vendor Channel. The vendor to whom the OUI or CID in this field has been allocated is in charge of specifying Vendor Channel messages using their

identifier. Depending on the first byte of this field as

follows:

OUI: When the bottom two bits of the first byte of the Vendor ID are zero, that is, the first byte is 0bXXXXXX00, then the Vendor ID is an OUI.

CID: When the bottom two bits of the first byte are a one followed by a zero, that is, the first byte is 0bXXXXXX10, the Vendor ID is a CID.

Other: Other values of the bottom two bits of the first byte of the Vendor ID are invalid and a VERR of 2 MUST, subject to possible rate limiting, be returned (see [Section 3](#)).

VERR: Vendor Channel Error. See [Section 3](#).

Sub-Protocol: Actually, the vendor specifying their use of the Vendor Channel can do whatever they want with the bits after the VERR field. But it is strongly RECOMMENDED that they use the sub-protocol / sub-version fields indicated so that multiple and evolving uses can be specified based on a single OUI.

Sub-Version: See explanation above of the Sub-Protocol field. This field is provided to indicate the version of the particular vendor's Sub-Protocol.

3. Vendor Channel Errors

The VERR field values from 0x0 through 0xF inclusive and value 0xFF are reserved for specification by the IETF. See [Section 4](#). All other values of VERR are available for whatever use the vendor specifies except that a Vendor Channel implementation MUST NOT send a Vendor Channel Error in response to a Vendor Channel message with a non-zero VERR.

The VERR values thus far specified by the IETF are as follows:

0. The VERR field is zero in Vendor Channel messages unless the Vendor Channel packet is reporting an error.
1. The value one indicate that the length of the RBridge Channel Specific Data is less than 4 bytes. This means that at least the VERR byte and possible part or all of the OUI is truncated. If an RBridge that implements the Vendor Channel facility receives such a Vendor Channel message, it MUST expand it to extend through the VERR field, set that field to one, and returns the packet as described in [Section 3.1](#).
2. The OUI/CID field value is unknown. If an RBridge implements the Vendor Channel facility and receives a Vendor Channel packet with a zero VERR field and an OUI/CID field it does not recognize and the SL flag is zero in the RBridge Channel Header, it MUST set the VERR field to the value two and returns the packet as described in [Section 3.1](#).
3. The value 3 indicates that the Sub-Protocol field value is unknown. If an RBridge implements the Vendor Channel facility and receives a Vendor Channel packet with a zero VERR field and zero SL flag in the RBridge Channel Header, an OUI/CID that it implements, but a Sub-Protocol field value it does not recongize even though it implements and uses the Sub-Protocol field, it SHOULD set the VERR field to 3 and returns the packet as described in [Section 3.1](#).
4. The value 4 indicates that the Sub-Version field value is unknown. If an RBridge implements the Vendor RBridge Channel facility, the Sub-Protocol field, and the Sub-Version field and receives a Vendor Channel packet with a zero VERR field and zero SL flag in the RBridge Channel Header, an OUI/CID and Sub-Protocol that it implements, but a Sub-Version fields value it does not recongize, it SHOULD set the VERR field to 4 and returns the packet as described in [Section 3.1](#).

Uniform error handling is generally advisable from a maintenance and understandability point of view; however, "SHOULD" is chosen for

errors 3 and 4 above because, as long as the messages are all

distinguished by a vendor's OUI/CID, it is up to that vendor to decide between standard and non-standard error handling.

3.1 Sending an Error Response

The IETF specified Vendor Channel errors are sent in response to a received RBridge Channel packet by setting the VERR field as specified above and modifying the packet as specified below. (The ERR field will be zero because, if it was non-zero, the packet would have been handled at the general RBridge Channel level rather than being passed down to the Vendor Channel level.)

The RBridge Channel Header is modified by setting the SL flag. (The flags in the Channel Header and the semantics of the SL flag are specified in [[RFC7178](#)].)

- o If an error 1 is being generated because of truncation, the RBridge Channel Specific Data area is extended to include the VERR byte.
- o If Vendor Channel message was sent between RBridges, the TRILL Header is modified by (1) clearing the M bit, (2) setting the egress nickname to the ingress nickname as received, (3) setting the ingress nickname to a nickname held by the TRILL switch sending the error packet, and (4) setting the hop count to the usual value on TRILL Data packets used by the TRILL switch sending the error packet.
- o If Vendor Channel message was sent between an RBridge and an end station in either direction, the outer MAC addresses are modified by setting the Outer.MacDA to the Outer.MacSA as received, and the Outer.MacSA is set to the MAC address of the port of the TRILL switch or end station sending the error packet.
- o The priority of the error response message MAY be reduced from the priority of the Vendor Channel message causing the error, unless it was already minimum priority, and the Drop Eligibility Indicator bit MAY be set in an error response. (See [Section 4.1.1 of \[RFC6325\]](#).)
- o Vendor Channel error responses MAY be rate limited.

It is generally anticipated that the entire packet in which an error was detected would be sent back, modified as above, as the protocol specific payload, so that, for example, error responses could more easily be matched with messages sent; however, except for errors 1

and 2, this is up to the vendor specifying how their Vendor RBridge

Channel messages are to be used.

Note that if you receive a Vendor Channel error message with error 1, indicating a truncation error, you cannot trust the apparent "OUI/CID" in that Vendor Channel error message.

4. IANA Considerations

IANA is requested to allocate TBD for the Vendor Specific RBridge Channel Protocol from the range of RBridge Channel protocols allocated by Standards Action.

IANA is requested to establish a registry as follows on the TRILL Parameters web page indented under RBridge Channel Error Codes after RBridge Channel SubError Codes:

Registry: Vendor RBridge Channel Error Codes

Registration Procedures: Standards Action

Reference: (This document)

| Code | Description | Reference |
|-----------|-------------------------|---------------|
| ---- | ----- | ----- |
| 0 | No error | This document |
| 1 | Message too short | This document |
| 2 | Unknown OUI/CID | This document |
| 3 | Unknown Sub-Protocol | This document |
| 4 | Unknown Sub-Version | This document |
| 0x05-0x0F | Unassigned | - |
| 0x10-0xFE | Reserved for vendor use | This document |
| 0xFF | Reserved | This document |

5. Security Considerations

See [[RFC6325](#)] for general TRILL Security Considerations.

See [[RFC7178](#)] for general RBridge Channel Security Considerations.

The Vendor Specific RBridge Channel Protocol provides no security assurances or features. Any needed security could be provided by fields or processing within the Vendor Protocol Specific Data, which is outside the scope of this document. Alternatively or in addition, use of Vendor Channel MAY be nested inside the RBridge Channel Header Extension Protocol [[RFC7978](#)] which can provide some security services.

Normative References

- [802] - IEEE Std 802-2014, "IEEE Standard for Local and Metropolitan Area Networks: Overview and Architecture", June 2014.
- [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>>.
- [RFC6325] - Perlman, R., Eastlake 3rd, D., Dutt, D., Gai, S., and A. Ghanwani, "Routing Bridges (R Bridges): Base Protocol Specification", [RFC 6325](#), DOI 10.17487/RFC6325, July 2011, <<http://www.rfc-editor.org/info/rfc6325>>.
- [RFC7042] - Eastlake 3rd, D. and J. Abley, "IANA Considerations and IETF Protocol and Documentation Usage for IEEE 802 Parameters", [BCP 141](#), [RFC 7042](#), DOI 10.17487/RFC7042, October 2013, <<http://www.rfc-editor.org/info/rfc7042>>.
- [RFC7178] - Eastlake 3rd, D., Manral, V., Li, Y., Aldrin, S., and D. Ward, "Transparent Interconnection of Lots of Links (TRILL): R Bridge Channel Support", [RFC 7178](#), DOI 10.17487/RFC7178, May 2014, <<http://www.rfc-editor.org/info/rfc7178>>.
- [RFC7780] - Eastlake 3rd, D., Zhang, M., Perlman, R., Banerjee, A., Ghanwani, A., and S. Gupta, "Transparent Interconnection of Lots of Links (TRILL): Clarifications, Corrections, and Updates", [RFC 7780](#), DOI 10.17487/RFC7780, February 2016, <<http://www.rfc-editor.org/info/rfc7780>>.

Informative References

- [RFC7978] - Eastlake 3rd, D., Umair, M., and Y. Li, "Transparent Interconnection of Lots of Links (TRILL): R Bridge Channel Header Extension", [RFC 7978](#), DOI 10.17487/RFC7978, September 2016, <<http://www.rfc-editor.org/info/rfc7978>>.

Acknowledgements

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

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