TRILL: Vendor Specific TRILL Channel Protocol
<draft-eastlake-trill-vendor-channel-03.txt>

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.

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[1](). **Introduction**

   The IETF TRILL (TRansparent 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 diagnotic 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](#)].
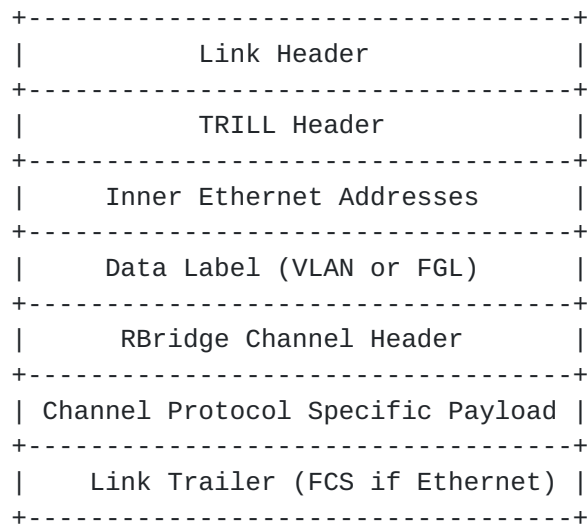
```
                       Packet Structure


            +-----------------------------------+
            |            Link Header             |
            +-----------------------------------+
            |            TRILL Header            |
            +-----------------------------------+
            |      Inner Ethernet Addresses     |
            +-----------------------------------+
            |      Data Label (VLAN or FGL)      |
            +-----------------------------------+
            |       RBridge Channel Header       |
            +-----------------------------------+
            | Channel Protocol Specific Payload |
            +-----------------------------------+
            |     Link Trailer (FCS if Ethernet) |
            +-----------------------------------+


        Figure 1. RBridge Channel Packet Structure
```

Message Structure

```
+-----------------------------------+
|             Link Header           |
+-----------------------------------+
|        RBridge Channel Header     |
+-----------------------------------+
| Channel Protocol Specific Payload |
+-----------------------------------+
|     Link Trailer (FCS if Ethernet)|
+-----------------------------------+
```
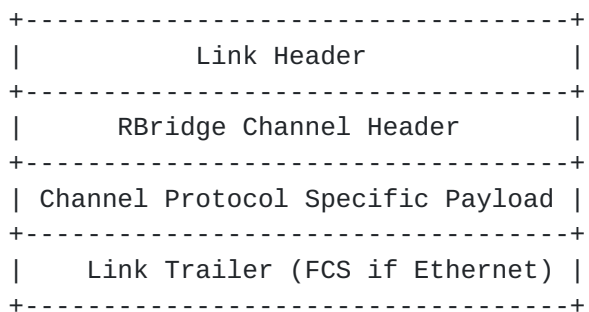
Figure 2. Native RBridge Channel Message Structure

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.

```
                        1                   2                   3
    0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
 RBridge Channel Header:
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |     RBridge-Channel (0x8946)   |  0x0  | Channel Protocol= TBD |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |           Flags         | ERR  |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 RBridge Channel Protocol Specific:
                                +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                                |      Vendor ID = OUI/CID       |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |OUI/CID (cont.)|     VERR      | Sub-Protocol  | Sub-Version   |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |            Vendor Protocol Specific Data
    |
    |  ...
```
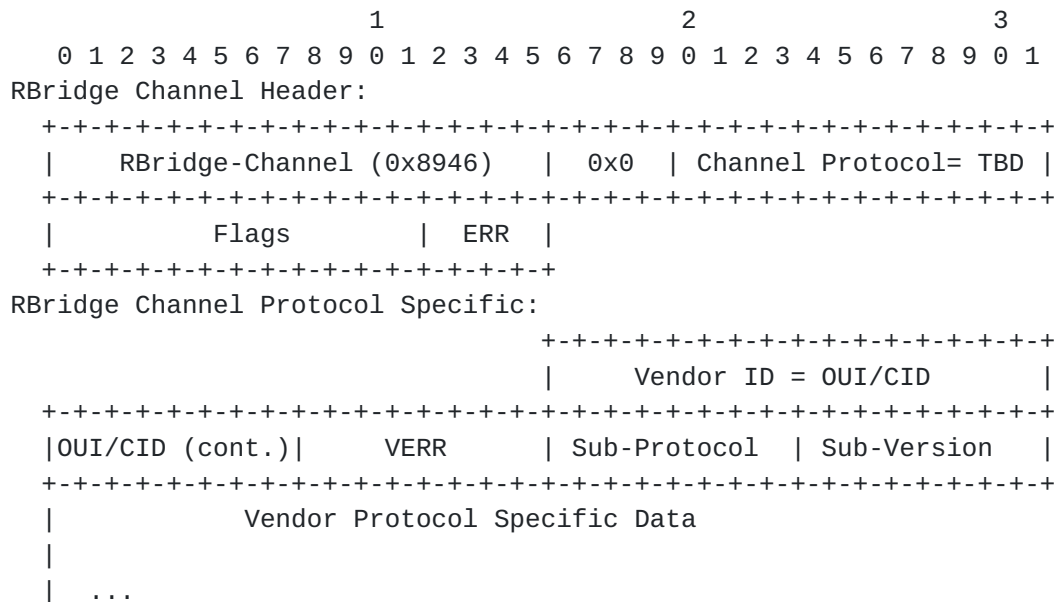
Figure 3. Channel Tunnel Message Structure

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 particuar
   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 RBridge Channel Header is modified by setting the SL flag.
      (The ERR field will be zero because, if it was non-zero, the
      packet would have been handled at the RBridge Channel rather than
      being passed down to the Vendor Channel level.)

      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 Chanel messge 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
   specifc 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
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   [RFC6325] - Perlman, R., Eastlake 3rd, D., Dutt, D., Gai, S., and A.
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   [RFC7042] - Eastlake 3rd, D. and J. Abley, "IANA Considerations and
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   [RFC7178] - Eastlake 3rd, D., Manral, V., Li, Y., Aldrin, S., and D.
         Ward, "Transparent Interconnection of Lots of Links (TRILL):
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         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
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         Header Extension", RFC 7978, DOI 10.17487/RFC7978, September
         2016, <http://www.rfc-editor.org/info/rfc7978>.

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

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