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TRILL: RBridge Channel Support
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Abstract

   This document specifies a general channel mechanism for sending
   messages, such as BFD (Bidirectional Forwarding Detection) messages,
   between RBridges (Routing Bridges) and between RBridges and end
   stations in an RBridge campus through extensions to the TRILL
   (TRansparent Interconnection of Lots of Links) protocol.

Status of This Memo

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[1](#). Introduction

RBridge campuses provide transparent least-cost path forwarding using the TRILL (TRansparent Interconnection of Lots of Links) protocol that builds on IS-IS (Intermediate System to Intermediate System) routing [IS-IS] [RFC1195] [RFC6326bis]. Devices that implement TRILL are called RBridges (Routing Bridges) or TRILL Switches. However, the TRILL base protocol standard [RFC6325] provides only for TRILL Data messages and TRILL IS-IS messages.

This document specifies a general channel mechanism for the transmission of other messages within an RBridge campus, such as BFD (Bidirectional Forwarding Detection, [RFC5880]) messages, between RBridges and end stations that are directly connected on the same link and between RBridges. This mechanism supports a requirement to be able to operate with minimal configuration.

Familiarity with [RFC6325] and [RFC6327] is assumed in this document.

[1.1](#) RBridge Channel Requirements

It is anticipated that various protocols operating at the TRILL level will be desired in RBridge campuses. For example, there is a need for rapid response continuity checking with a protocol such as BFD [RFC5880] [RFC5882] and for a variety of optional reporting.

To avoid the requirement to design and specify a way to carry each such protocol, this document specifies a general channel for sending messages between RBridges in a campus at the TRILL level by extending the TRILL protocol. To accommodate a wide variety of protocols, this RBridge Channel facility accommodates all the regular modes of TRILL Data transmission including single and multiple hop unicast as well as VLAN scoped multi-destination distribution.

To minimize any unnecessary burden on transit RBridges and to provide a more realistic test of network continuity and the like, RBridge Channel messages are designed to look like TRILL Data frames and, in the case of multi-hop messages, can normally be handled by transit RBridges as if they were TRILL Data frames; however, to enable processing at transit RBridges when required by particular messages, they may optionally use the RBridge Channel Alert TRILL extended header flags [RFCext] that causes a transit RBridge implementing the flag to more closely examine a flagged frame.

This document also specifies a format for sending RBridge Channel messages between RBridges and end stations that are directly connected over a link, in either direction, when provided for by the protocol involved. For the most part, this format is the same as the

format that is TRILL Data encapsulated for inter-RBridge channel
messages.

Each particular protocol using the RBridge Channel facility will
likely use only a subset of the facilities specified herein.

1.2 Relation to the MPLS Generic Channel

The RBridge Channel is similar to the MPLS Generic Channel specified
in [RFC5586]. Instead of using a special MPLS label to indicate a
special channel message, an RBridge Channel message is indicated by a
special multicast Inner.MacDA and inner Ethertype.

1.3 Terminology

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].

The terminology and acronyms of [RFC6325] are used in this document
with the additions listed below.

    BFD - Bidirectional Forwarding Detection

    CHV - Channel Header Version

    MH - Multi-Hop

    NA - Native

    SL - Silent

2. Inter-RBridge Channel Messages

Channel messages between RBridges are transmitted as TRILL Data frames. (For information on channel messages that can be transmitted between RBridges and end stations that are directly connected by a link, see Section 4.) Inter-RBridge Channel messages are identified as such by their Inner.MacDA, which is the All-Egress-RBridges multicast address, together with their Inner Ethertype, which is the RBridge-Channel Ethertype. This Ethertype is part of and starts the RBridge Channel Header.

The diagram below shows the overall structure of a RBridge Channel Message frame on a link between two RBridges:

```
        Frame Structure                  Section of This Document
                                         ------------------------
  +--------------------------------+
  |          Link Header           |    Section 2.3 if Ethernet Link
  +--------------------------------+
  |          TRILL Header          |    Section 2.2
  +--------------------------------+
  |      Inner Ethernet Header     |    Section 2.1.2
  +--------------------------------+
  |      RBridge Channel Header    |    Section 2.1.1
  +--------------------------------+
  |     Protocol Specific Payload  |    See specific channel protocol
  +--------------------------------+
  | Link Trailer (FCS if Ethernet) |
  +--------------------------------+
```

Optionally, some channel messages may require examination of the frame by transit RBridges that support the RBridge Channel feature, to determine if they need to take any action. To indicate this, such messages use a RBridge Channel Alert extended TRILL header flags as further described in Section 3 below.

The Sections 2.1 and 2.2 below describe the Inner frame and the TRILL Header for frames sent in an RBridge Channel. As always, the Outer link header and trailer are whatever is needed to get a TRILL Data frame to the next hop RBridge, depending on the technology of the link, and can change with each hop for multi-hop messages. Section 2.3 describes the outer Link Header for Ethernet. And Section 2.4 discusses some special considerations for the first hop transmission of RBridge Channel messages.

Section 3 describes some details of RBridge Channel message processing. Section 4 provides the specifications for native RBridge Channel frames between RBridges and end stations that are directly connected over a link.

2.1 The RBridge Channel Message Inner Frame

The encapsulated inner frame within an RBridge Channel message frame
is as shown below.

```
 Inner Ethernet Header:
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |          Special Inner.MacDA = All-Egress-RBridges           |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |   Special Inner.MacDA cont.   |          Inner.MacSA         |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |                       Inner.MacSA cont.                      |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |      VLAN Tag Ethertype       |  Priority, DEI, VLAN ID      |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 RBridge Channel Header:
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |    RBridge-Channel Ethertype  |  CHV  |   Channel Protocol   |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |         Flags         |  ERR  |
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 RBridge Channel Protocol Specific Information:
    +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
    |                                                              |
    +             Channel Protocol Specific Data
    |  ...
```

The Channel Protocol Specific Data contains the information related
to the specific channel protocol used in the channel message. Details
of that data are outside the scope of this document, except in the
case of the RBridge Channel Error protocol specified below.

2.1.1 RBridge Channel Header

As shown in the diagram above, the RBridge Channel header starts with
the RBridge-Channel Ethertype (see Section 6.2). Following that is a
four-byte quantity with four sub-fields as follows:

   CHV: A 4-bit field that gives the RBridge Channel Header Version
        and MUST be zero.

   Channel Protocol: A 12-bit unsigned integer that specifies the
        particular RBridge Channel protocol to which the message
        applies.

   Flags: Provides 12 bits of flags described below.

ERR: A 4-bit unsigned integer used in connection with error
     reporting at the RBridge Channel level as described in
     Section 3.

The flag bits are numbered from 0 to 11 as shown below.

```
     0  1  2  3  4  5  6  7  8  9 10 11
    +--+--+--+--+--+--+--+--+--+--+--+--+
    |SL|MH|NA|        Reserved          |
    +--+--+--+--+--+--+--+--+--+--+--+--+
```

Bit 0, which is the high order bit in network order, is defined as
     the SL or Silent bit. If it is a one, it suppresses RBridge
     Channel Error messages (see Section 3).

Bit 1 is the MH or Multi-Hop bit. It is used to inform the
     destination RBridge protocol that the message may be multi-hop
     (MH=1) or was intended to be one-hop only (MH=0).

Bit 2 is the NA or Native bit. It is used as described in Section 4
     below.

Reserved: Bits reserved for future specification that MUST be sent as
     zero and ignored on receipt.

The RBridge Channel Protocol field specifies the protocol that the
channel message relates to. The initial defined value is listed
below. See Section 6 for IANA Considerations.

```
    Protocol  Name - Section of this Document
    --------  ------------------------------

     0x001    RBridge Channel Error - Section 3
```

2.1.2 Inner Ethernet Header

The special Inner.MacDA is the All-Egress-RBridges multicast MAC
address to signal that the frame is intended for the egress
(decapsulating) RBridge itself (or the egress RBridges themselves if
the frame is multi-destination). (This address is called the All-
ESADI-RBridges address in [RFC6325].) The RBridge-Channel Ethertype
indicates that the frame is an RBridge Channel message. The only
other Ethertype currently specified for use with the All-Egress-
RBridges Inner.MacDA is L2-IS-IS to indicate an ESADI frame
[RFC6325]. In the future additional Ethertypes may be specified for
use with the All-Egress-RBridges multicast address.

The RBridge originating the channel message selects the Inner.MacSA.

   The Inner.MacSA MUST be set by the originating RBridge to a MAC
   address unique within the campus owned by the originating RBridge.
   This MAC address can be considered, in effect, the MAC address of a
   virtual internal end station that handles the RBridge Channel frames
   originated by or destined for that RBridge. It MAY be the same as the
   Inner.MacSA used by the RBridge when it originates ESADI frames
   [RFC6325].

2.1.3 Inner.VLAN Tag

   As with all frames formatted to be processed as a TRILL Data frame,
   an Inner.VLAN tag is present. Use of a VLAN tag Ethertype other than
   0x8100 or stacked tags is beyond the scope of this document but is an
   obvious extension.

   Multi-destination RBridge Channel messages are, like all multi-
   destination TRILL Data messages, VLAN scoped so the Inner.VLAN ID
   MUST be set to the VLAN of interest. To the extent that distribution
   tree pruning is in effect in the campus, such channel messages may
   only reach RBridges advertising that they have connectivity to that
   VLAN.

   For channel messages sent as known unicast TRILL Data frames the
   default value for the Inner.VLAN ID is VLAN 1 but particular RBridge
   Channel protocols MAY specify other values.

   The Inner.VLAN also specifies a three-bit frame priority for which
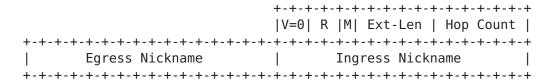   the following recommendations apply:

      1. For one-hop channel messages critical to network connectivity,
         such as one-hop BFD for rapid link failure detection in support
         of TRILL IS-IS, the RECOMMENDED priority is 7.

      2. For single and multi-hop known unicast channel messages
         important to network operation but not critical for
         connectivity, the RECOMMENDED priority is 6.

      3. For other known unicast channel messages and all multi-
         destination channel messages, it is RECOMMENDED that the
         default priority zero be used. In any case, priorities higher
         than 5 SHOULD NOT be used for such frames.

   There is one additional bit in a VLAN tag value between the 12-bit
   VLAN ID and 3-bit priority, the Drop Eligibility Indicator (DEI,
   [ClearCorrect]). It is RECOMMENDED that this bit be zero for the
   first two categories of channel messages listed immediately above.
   The setting of this bit for channel messages in the third category
   may be dependent on the channel protocol and no general

recommendation is made for that case.

[2.2](#) **The TRILL Header for RBridge Channel Messages**

After the outer Link Header (that, for Ethernet, ends with the TRILL
Ethertype) and before the encapsulated frame, the channel message's
TRILL Header initially appears as follows:

```
                              +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
                              |V=0| R |M| Ext-Len | Hop Count |
     +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
     |        Egress Nickname        |        Ingress Nickname       |
     +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

The TRILL Header version V MUST be zero, the R bits are reserved, the
M bit is set appropriately as the channel message is to be forwarded
as known unicast (M=0) or multi-destination (M=1) regardless of the
fact that the Inner.MacDA is always the All-Egress-RBridges multicast
address, and Ext-Len is set appropriately for the length of the TRILL
Header extensions area, if any, all as specified in [RFC6325] (where
the extensions area is referred to as the options area and this field
as Op-Len).

When an RBridge Channel message is originated, the Hop Count field
defaults to the maximum value, 0x3F, but particular RBridge Channel
protocols MAY specify other values. For messages sent a known number
of hops, such as one-hop messages or a two-hop self-addressed message
intended to loop back through an immediate neighbor RBridge, setting
the Hops field to the maximum value and checking the Hop Count field
on receipt provides an additional validity check as discussed in
[RFC5082].

The RBridge originating a channel message places a nickname that it
holds into the ingress nickname field.

There are several cases for the egress nickname field. If the channel
message is multi-destination, then the egress nickname designates the
distribution tree to use. If the channel message is a multi-hop
unicast message, then the egress nickname is a nickname of the target
RBridge; this includes the special case of a message intended to loop
back from an immediate neighbor where the originator places one of
its own nicknames in both the ingress and egress nickname fields. If
the channel message is a one-hop unicast message, there are two
possibilities for the egress nickname.

o The egress nickname can be set to a nickname of the target
   neighbor RBridge.

o The special nickname Any-RBridge may be used. RBridges supporting
   the RBridge Channel facility MUST recognize the Any-RBridge
   special nickname and accept TRILL Data frames having that value in
   the egress nickname field as being sent to them as the egress.
   Thus, for such RBridges, using this egress nickname guarantees
   processing by an immediate neighbor regardless of the state of
   nicknames.

2.3 Ethernet Link Header and Trailer

An RBridge Channel frame has the usual link header and trailer
depending on the type of link on which it is sent.

For an Ethernet link [RFC6325] the Outer.MacSA is the MAC address of
the port from which the frame is sent. The Outer.MacDA is the MAC
address of the next-hop RBridge port for unicast RBridge Channel
messages or the All-RBridges multicast address for multi-destination
RBridge Channel messages. The Outer.VLAN tag specifies the Designated
VLAN for that hop and the priority should be the same as in the
Inner.VLAN tag; however, the output port may have been configured to
strip VLAN tags, in which case no Outer.VLAN tag appears on the wire.
And the link trailer is the Ethernet FCS.

2.4 Special Transmission and Rate Considerations

If a multi-hop RBridge Channel message is received by an RBridge, the
criteria and method of forwarding it are the same as for any TRILL
Data frame. If it is so forwarded, it will be on a link that was
included in the routing topology because it was in the Report state
as specified in [RFC6327].

However, special considerations apply to single hop messages because,
for some RBridge Channel protocols, it may be desirable to send
RBridge Channel messages over a link that is not yet fully up. In
particular, it is permissible, if specified by the particular channel
protocol, for the source RBridge that has created an RBridge Channel
message to attempt to transmit it to a next hop RBridge when the link
is in the Detect or Two-Way states, as specified in [RFC6327], as
well as when it is in the Report state. Such messages can also be
sent on point-to-point links that are not in the Up state.

RBridge Channel messages represent a burden on the RBridges and links
in a campus and should be rate limited, especially if they are sent
as high priority, multi-destination, or multi-hop frames or have an
RBridge Channel Alert extended header flag set.

[3](#). **Processing RBridge Channel TRILL Data Messages**

RBridge Channel TRILL Data messages are designed to look like and, to
the extent practical, be forwarded as regular TRILL Data frames. On
receiving a channel message, the initial tests on the Outer.MacDA,
Outer Ethertype, TRILL Header V and Hop Count fields and the Reverse
Path Forwarding Check if the frame is multi-destination, are all
performed as usual. The forwarding and/or decapsulation decisions are
the same as for a regular TRILL Data frame with following exceptions
for RBridges implementing the RBridge Channel facility:

1. An RBridge implementing the RBridge Channel facility MUST
   recognize the Any-RBridge egress nickname in TRILL Data frames,
   decapsulating such frames if they meet other checks. (Such a
   frame cannot be a valid multi-destination frame because the
   Any-RBridge nickname is not a valid distribution tree root.)

2. If an RBridge Channel Alert extended header flag is set, then
   the RBridge MUST process the RBridge Channel message as
   described below even if it is not egressing the frame. If it is
   egressing the frame, then no additional processing beyond
   egress processing is needed even if an RBridge Channel Alert
   flag is set.

3. On decapsulation, the special Inner.MacDA value of All-Egress-
   RBridges MUST be recognized to trigger checking the
   Inner.Ethertype and processing as an RBridge Channel message if
   that Ethertype is RBridge-Channel.

RBridge Channel messages SHOULD only be sent to RBridges that
advertise support for the channel protocol involved as described in
[Section 5](#).

All RBridges supporting the RBridge Channel facility MUST recognize
the RBridge-Channel inner Ethertype.

[3.1](#) **Processing the RBridge Channel Header**

Knowing that it has an RBridge Channel message, the egress RBridge,
and any transit RBridge if an RBridge Channel Alert bit is set in the
TRILL Header, looks at the CHV (RBridge Channel Header Version) and
Channel Protocol fields.

If any of the following conditions occur at an egress RBridge, the
frame is not processed, an error may be generated as specified in
[Section 3.2](#), and the frame is discarded. The behavior is the same if
the frame is being processed at a transit RBridge because the
critical RBridge Channel Alert flag is set [[RFCext](#)]. However, if

these conditions are detected at a transit RBridge examining the
message because the non-critical RBridge Channel Alert flag is set
[RFCext] but the critical flag is not set, no error is generated and
the frame is still forwarded normally.

   1. The Ethertype is not RBridge-Channel and not any other
      Ethertype known to the RBridge as usable with the All-Egress-
      RBridges Inner.MacDA, or the frame is so short that the
      Ethertype is truncated.

   2. The CHV field is non-zero or the frame is so short that the
      version zero Channel Header is truncated.

   3. The Channel Protocol field is a reserved value or a value
      unknown to the processing RBridge.

   4. The ERR field is non-zero and Channel Protocol is a value other
      than 0x001.

   5. The RBridge Channel Header NA flag is set to one indicating
      that the frame should have been received as a native frame
      rather than a TRILL Data frame.

If the CHV field and NA flag are zero and the processing RBridge
recognizes the Channel Protocol value, it processes the message in
accordance with that channel protocol. The processing model is as if
the received frame starting with and including the TRILL Header is
delivered to the Channel protocol along with a flag indicating
whether this is (a) transit RBridge processing due to an RBridge
Channel Alert flag being set or (b) egress processing.

Errors within a recognized Channel Protocol are handled by that
channel protocol itself and do not produce RBridge Channel Error
frames.

3.2 RBridge Channel Errors

A variety of problems at the RBridge Channel level cause the return
of an RBridge Channel Error frame unless (a) the "SL" (Silent) flag
is a one in the channel message for which the problem was detected,
(b) the processing is due to the non-critical RBridge Channel Alert
bit being set, (c) the frame in error appears, itself, to be an
RBridge Channel error frame (has a non-zero ERR field or a Channel
Protocol of 0x001), or (d) the error is suppressed due to rate
limiting.

An RBridge Channel Error frame is a multi-hop unicast RBridge Channel
message with the ingress nickname set to the nickname of the RBridge

detecting the error, and the egress nickname set to the value of the
ingress nickname in the channel message for which the error was
detected. No per-hop transit processing is specified for such error
frames, so the RBridge Channel Alert extended header flags SHOULD, if
an extension is present, be set to zero. The SL and MH flags SHOULD
be set to one, the NA flag MUST be zero, and the ERR field MUST be
non-zero as described below. For the protocol specific data area, an
RBridge Channel Message Error frame has at least the first 256 bytes
(or less if less are available) of the erroneous decapsulated channel
message starting with the TRILL Header. (Note: The TRILL Header does
not include the TRILL Ethertype that is part of the Link Header on
Ethernet Links.)

The following values for ERR are specified:

```
ERR    Meaning
---    -------
 0     - Not an RBridge Channel error frame.
 1     Frame too short (truncated Ethertype or RBridge Channel Header)
 2     Unrecognized Ethertype
 3     Unimplemented value of CHV
 4     Wrong value of NA flag
 5     Channel Protocol is reserved or unimplemented
6-14    - Available for allocation, see Section 6.
15     Reserved
```

All RBridges implementing the RBridge Channel feature MUST recognize
the RBridge Channel Error protocol value (0x001). They MUST NOT
generate an RBridge Channel Error message in response to a RBridge
Channel Error message, that is, a channel message with a protocol
value of 0x001 or with a non-zero ERR field.

[4](). **Native RBridge Channel Frames**

   Other sections of this document specify non-native RBridge Channel
   messages and their processing, that is, RBridge Channel messages
   formatted as TRILL Data frames and sent between RBridges. This
   section specifies the differences for native RBridge Channel
   messages.

   If provided for by the channel protocol involved, native RBridge
   channel messages may be sent between end-stations and RBridges that
   are directly connected over a link, in either direction. On an
   Ethernet link, such native frames have the RBridge-Channel Ethertype
   and are like the encapsulated frame inside an RBridge Channel message
   except as follows:

   1. TRILL does not require the presence of a VLAN tag on such
      native RBridge channel frames. However, port configuration,
      link characteristics, or the channel protocol involved may
      require such tagging.

   2. If the frame is unicast, the destination MAC address is the
      unicast MAC address of the RBridge or end-station port that is
      its intended destination. If the frame is multicast by an end
      station to all the RBridges on a link that support an RBridge
      Channel protocol that uses this transport, the destination MAC
      address is the All-Edge-RBridges multicast address (see [Section
      6]()). A native RBridge Channel frame received at an ingress
      RBridge with a destination MAC address that is a unicast
      address different from that of the port or multicast address
      different from All-Edge-RBridges, is discarded. If the frame is
      multicast by an RBridge to all the devices that TRILL considers
      to be end stations on a link that support an RBridge Channel
      protocol that uses this transport, the destination MAC address
      is the TRILL-End-Stations multicast address (see [Section 6]()). A
      native RBridge Channel frame received at an end station with a
      destination MAC address that is a unicast address different
      from that of the port or multicast address different from
      TRILL-End-Stations, is discarded.

      3. The RBridge-Channel outer Ethertype must be present. In the
      future there may be other protocols using the All-Edge-RBridges
      and/or TRILL-End-Stations multicast addresses on native frames
      distinguished by different Ethertypes.

   4. The NA or native bit in the RBridge Channel Header flags must
      be a one.

   5. There might be additional tags present between the Outer.MacDA,
      Outer.MacSA pair and the RBridge-Channel Ethertype.

The RBridge Channel protocol number space for native RBridge Channel
messages and TRILL Data formatted RBridge Channel messages is the
same. If provided for by the channel protocol involved, the receipt
of a native RBridge Channel frame MAY lead to the generation and
transmission of one or more Inter-RBridge Channel frames. The
decapsulation and processing of a TRILL Data RBridge Channel frame
MAY, if provided for by the channel protocol involved, result in the
sending of one or more native RBridge channel frames to one or more
end stations. Thus, there could be an RBridge Channel protocol that
involved an RBridge Channel message sent from an origin RBridge where
the message is created, through one or more other RBridges and from
the last as a native RBridge channel message to and end station or
the reverse of such a path; however, to do this the RBridge channel
protocol involved must be implemented at the RBridge where the
channel message is changed between a native frame and a TRILL Data
format frame and must change the channel message itself, at a minimum
complementing the NA flag in the Channel Header and making
appropriate MAC address changes.

An erroneous native channel message results in a native RBridge
channel error message under the same conditions for which an TRILL
Data RBridge Channel message would result in a TRILL Data RBridge
channel error message. However, in a native RBridge Channel error
message, the NA flag MUST be one. Also, since there is no TRILL
Header in native RBridge Channel protocol frames, the beginning part
of the frame in which the error was detected that is included in
native RBridge Channel error frames starts with the RBridge Channel
Header (including the RBridge-Channel Ethertype). The destination MAC
address of such error messages is set to the source MAC address of
the native RBridge Channel message that was in error.

5. Indicating Support for RBridge Channel Protocols

   Support for RBridge Channel protocols is indicated by the presence of
   one or more TLVs and/or sub-TLVs in an RBridge's LSP as documented in
   [RFC6326bis].

   RBridge Channel protocols 0 and 0xFFF are reserved and protocol 1,
   the RBridge Channel error protocol, MUST be implemented as part of
   the RBridge Channel feature. Thus, if an RBridge supports the RBridge
   Channel feature, it should be advertising support for protocol 1 and
   not advertising support for protocols 0 or 0xFFF in its LSP.
   However, indication of support or non-support for RBridge Channel
   protocol 1 is ignored on receipt and support for it is always
   assumed, if support for any RBridge Channel is indicated in the
   RBridge's LSP.

6. Allocation Considerations

The following subsections give IANA and IEEE allocation
considerations. In this document, the allocation procedure
specifications are as defined in [RFC5226].

6.1 IANA Considerations

IANA is requested to allocate a previously unassigned TRILL Nickname
as follows:

        Any-RBridge   TBD (0xFFCO suggested)

IANA is requested to add "All-Egress-RBridges" to the TRILL Parameter
Registry as an alternative name for the "All-ESADI-RBridges"
multicast address.

IANA is requested to allocate two previously unassigned TRILL
Multicast address as follows:

        TRILL-End-Stations   TBD (01-80-C2-00-00-45 suggested)
        All-Edge-RBridges   TBD (01-80-C2-00-00-46 suggested)

IANA is requested to create an additional sub-registry in the TRILL
Parameter Registry for RBridge Channel Protocols, with initial
contents as follows:

        Protocol   Description   Reference
        --------   -----------   ---------

        0x000   Reserved   (This document)
        0x001   RBridge Channel Error   (This document)
        0x002-0x0FF   Available (1)
        0x100-0xFF7   Available (2)
        0xFF8-0xFFE   Private Use
        0xFFF   Reserved   (This document)

(1) RBridge Channel protocol code points from 0x002 to 0x0FF require
a Standards Action, as modified by [RFC4020], for allocation.

(2) RBridge Channel protocol code points from 0x100 to 0xFF7 require
RFC Publication to allocate a single value or IETF Review to allocate
multiple values.

IANA is requested to create an additional sub-registry in the TRILL
Parameter Registry for RBridge Channel Header Flags with initial
contents as follows:

```
     Flag Bit  Mnemonic  Allocation
     --------  --------  ----------

        0        SL      Silent
        1        MH      Multi-hop
        2        NA      Native
      3-11       -       Available for allocation
```

   Allocation of an RBridge Channel Header Flag is based on Standards
   Action as modified by [RFC4020].

   IANA is requested to create an additional sub-registry in the TRILL
   Parameter Registry for RBridge Channel Error codes with initial
   contents as listed in Section 3.2 above and with available values
   allocated by Standards Action as modified by [RFC4020].

6.2 IEEE Registration Authority Considerations

   The IEEE Registration Authority has been assigned the Ethertype <TBD>
   for RBridge-Channel.

[7](#). Security Considerations

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

   No general integrity, authentication, or encryption mechanisms are
   provided herein for RBridge Channel messages. If these services are
   required for a particular RBridge Channel protocol, they must be
   supplied by that channel protocol. See, for example, the BFD
   Authentication mechanism [[RFC5880](#)].

   If indication of RBridge Channel Protocol support are improperly
   absent from an RBridge's LSP, it could deny all RBridge Channel
   services, for example some BFD services, for the RBridge in question.
   If a particular RBridge channel protocol is incorrectly not
   advertised as supported, it would deny the service of that channel
   protocol to the RBridge in question.

   Incorrect presence of indication of RBridge Channel Protocol support
   or incorrect assertion of support for a channel protocol could
   encourage RBridge channel messages to be sent to an RBridge that does
   not support the channel feature or the particular channel protocol
   used. The inner frame of such messages could be decapsulated and that
   inner frame could be sent out all ports that are appointed forwarders
   for the frame's Inner.VLAN. However, this is unlikely to cause much
   harm; in particuclar, there are two possibilities as follows: (a) If
   end stations do not recognize the RBridge-Channel Ethertype of the
   frame, they will drop it. (b) If end stations do recognize the
   RBridge-Channel Ethertype and the channel protocol indicated in the
   frame, they should refuse to process the frame due to an incorrect
   value of the RBridge Channel Header NA flag.

   No protection is provided against forging or the ingress nickname in
   a TRILL Data formatted channel message or the Outer.MacSA in a native
   RBridge Channel frame. This may result in misdirected return
   responses or error messages.

[8](#). References

   The following sections list normative and informative references for
   this document.

[8.1](#) Normative References

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          "MPLS Generic Associated Channel", RFC 5586, June 2009.

   [RFC5880] - D. Katz, D. Ward, "Bidirectional Forwarding Detection
          (BFD)", June 2010.

   [RFC5882] - D. Katz, D. Ward, "Generic Application of Bidirectional
          Forwarding Detection (BFD)", June 2010.

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

Appendix: Change History

   RFC Editor: please delete this appendix before publication.

Changes from -00 to -01

   1. Spell out more acronyms.

   2. Add reference to "Guidelines for the Use of OAM" draft.

   3. Move definition of Alert flag to draft-ietf-trill-rbridge-options
      and refer to it as an extended header flag.

   4. Change name of "Egress-RBridges" multicast address to "All-Egress-
      RBridges". Merge with All-ESADI-RBridges (i.e., they are two names
      for the same MAC address).

   5. Add detailed bit vector description for indicating support of
      RBridge channel protocols. Add GENAPP and an APPsub-TLV to hold
      one or more bit vectors.

   6. Assorted editorial changes.

Changes from -01 to -02

   1. Update for drafts that have been issued as RFCs.

   2. Change to specification of Inner.VLAN in RBridge channel messages.

   3. Remove GENAPP and move RBridge Channels supported information to
      another document.

   4. Clarify native RBridge Channel error messages.

   5. Assorted editorial changes.

Changes from -02 to -03

   1. Liberalize restrictions on RBridge acceptance of native RBridge
      Channel messages. These are typically messages and should
      generally be accepted unless in a VLAN not enabled at the port or
      the like.

   2. Change multi-cast address used by end stations in sending a native

   RBridge Channel message to all RBridges on the link from All-
   Egress-RBridges to All-Edge-RBridges to avoid possible confusion
   if such a frame were encapsulated resulting in an All-Egress-
   RBridges Inner.MacDA.

   3. Reword references to "two-hop echo" and the like for clarity.
      (This meant an echo frame that went to an immediate neighbor and
      back.)

   4. Add reference to and move some material to the RFC 6326bis draft.

   5. Assorted editorial changes.

Changes from -03 to -04

   1. Update for the replacement of the CFI bit by the DEI bit (see
      [ClearCorrect]).

   2. Update for the existence of both critical and non-critical RBridge
      Channel alert flags.

   3. Update author information.

   4. Assorted editorial changes.

Changes from -04 to -05

   1. Clarify the distinction between native and non-native RBridge
      Channel messages and that native channel messages are only
      intended to be transmitted between RBridge and end stations on the
      same link.

   2. Add a paragraph to the Security Considerations section about
      forged ingress nicknames / source MAC addresses in channel
      messages.

   3. Add acknowledgements section.

   4. Replace "OAM" references with "BFD" references in Abstract and
      Introduction.

   5. Very minor editorial changes.

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