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Transparent Interconnection of Lots of Links (TRILL): Multi-Topology

Abstract

This document specifies extensions to the IETF TRILL (Transparent Interconnection of Lots of Links) protocol to support multi-topology routing of unicast and multi-destination traffic based on IS-IS (Intermediate System to Intermediate System) multi-topology specified in RFC 5120. This document updates RFCs 6325 and 7177.

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1. Introduction

This document specifies extensions to the IETF TRILL (Transparent Interconnection of Lots of Links) protocol [RFC6325] [RFC7177] [RFC7780] to support multi-topology routing for both unicast and multi-destination traffic based on IS-IS (Intermediate System to Intermediate System) [IS-IS] multi-topology [RFC5120]. Implementation and use of multi-topology are optional, and use requires configuration. It is anticipated that not all TRILL campuses will need or use multi-topology.

Multi-topology creates different topologies or subsets from a single physical TRILL campus topology. This is different from Data Labels (VLANs and Fine-Grained Labels (FGLs) [RFC7172]). Data Labels specify communities of end stations and can be viewed as creating virtual topologies of end station connectivity. However, in a single topology TRILL campus, TRILL Data packets can use any part of the physical topology of TRILL switches and links between TRILL switches, regardless of the Data Label of that packet's payload. In a multi-topology TRILL campus, TRILL data packets in a topology are restricted to the TRILL switches and links that are in their topology, regardless of the Data Label of their payload.

The essence of multi-topology behavior is that a multi-topology router classifies packets as to the topology within which they should be routed and uses logically different routing tables for different topologies. If routers in the network do not agree on the topology classification of packets or links, persistent routing loops can occur. It is the responsibility of the network manager to consistently configure multi-topology to avoid such routing loops.

The multi-topology TRILL extensions can be used for a wide variety of purposes, such as maintaining separate routing domains for isolated multicast or IPv6 islands, routing a class of traffic so that it avoids certain TRILL switches that lack some characteristic needed by that traffic, or making a class of traffic avoid certain links due to security, reliability, or other concerns.

It is possible for a particular topology to not be fully connected, either intentionally or due to node or link failures or incorrect configuration. This results in two or more islands of that topology that cannot communicate. In such a case, end stations connected in that topology to different islands will be unable to communicate with each other.

Multi-topology TRILL supports regions of topology-ignorant TRILL switches as part of a multi-topology campus; however, such regions can only ingress to, egress from, or transit TRILL Data packets in the special base topology zero.

1.1. Terminology

The terminology and abbreviations of [RFC6325] are used in this document. Some of these are paraphrased below for convenience. Some additional terms are also listed.

campus: The name for a TRILL network, like "bridged LAN" is a name for a bridged network. It does not have any academic implication.

DRB: Designated RBridge [RFC7177].

FGL: Fine-Grained Labeling or Fine-Grained Labeled or Fine-Grained Label [RFC7172]. By implication, an "FGL TRILL switch" does not support Multi-Topology (MT).

IS: Intermediate System [IS-IS].

LSP: Link State PDU (Protocol Data Unit) [IS-IS]. For TRILL, this includes Level 1 LSPs and Extended Level 1 Flooding Scope LSPs [RFC7780].

MT: Multi-Topology [RFC5120].

MT TRILL Switch: A TRILL switch supporting the multi-topology feature specified in this document. An MT TRILL switch MUST support FGL in the sense that it MUST be FGL safe [RFC7172].

RBridge: Routing Bridge; an alternative name for a TRILL switch.

TRILL: Transparent Interconnection of Lots of Links or Tunneled Routing in the Link Layer [RFC6325].

TRILL Switch: A device implementing the TRILL protocol. TRILL switches are Intermediate Systems (routers) [IS-IS].

VL: VLAN Labeling or VLAN Labeled or VLAN Label [RFC7172]. By implication, a "VL RBridge" or "VL TRILL switch" does not support FGL or MT.

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

2. Topologies

In TRILL multi-topology, a topology is a subset of the TRILL switches and of the links between TRILL switches in the TRILL campus. TRILL Data packets are constrained to the subset of switches and links corresponding to the packet's topology. TRILL multi-topology is based on IS-IS multi-topology [RFC5120]. See Appendix A for differences between TRILL multi-topology and [RFC5120].

The zero topology is special, as described in Section 2.1. Sections 2.2, 2.3, and 2.4 discuss the topology of links, TRILL switches, and TRILL Data packets, respectively.

2.1. Special Topology Zero

The zero topology is special as the default base topology. All TRILL switches and links are considered to be in, and MUST support, topology zero. Thus, for example, topology zero can be used for general TRILL switch access within a campus for management messages, Bidirectional Forwarding Detection (BFD) messages [RFC7175], RBridge Channel messages [RFC7178], and the like.

2.2. Links and Multi-Topology

Multi-topology TRILL switches advertise the topologies for which they are willing to send and receive TRILL Data packets on a port by listing those topologies in one or more MT TLVs [RFC5120] appearing in every TRILL Hello [RFC7177] they send out that port, except that they MUST handle topology zero, which it is optional to list.

A link is usable for TRILL Data packets in non-zero topology T only if:

(1) all TRILL switch ports on the link advertise topology T support in their Hellos, and

(2) if any TRILL switch port on the link requires explicit TRILL Data packet topology labeling (see Section 2.4) every other TRILL switch port on the link is capable of generating explicit packet topology labeling.

2.3. TRILL Switches and Multi-Topology

A TRILL switch advertises the topologies that it supports by listing them in one or more MT TLVs [RFC5120] in its LSP, except that it MUST support topology zero, which is optional to list. For robust and rapid flooding, MT TLV(s) SHOULD be advertised in core LSP fragment zero.

There is no "MT capability bit". A TRILL switch advertises that it is MT capable by advertising in its LSP support for any topology or topologies with the MT TLV, even if it just explicitly advertises support for topology zero.

2.4. TRILL Data Packets and Multi-Topology

The topology of a TRILL Data packet is commonly determined from either (1) some field or fields present in the packet itself or (2) the port on which the packet was received; however, optional explicit topology labeling of TRILL Data packets is also proved. This can be included in the data labeling area of TRILL Data packets as specified below.

Examples of fields that might be used to determine topology are values or ranges of values of the payload VLAN or FGL [RFC7172], packet priority, IP version (IPv6 versus IPv4) or IP protocol, Ethertype, unicast versus multi-destination payload, IP Differentiated Services Code Point (DSCP) bits, or the like.

Multi-topology does not apply to TRILL IS-IS packets or to link level control frames. Those messages are link local and can be thought of as being above all topologies. Multi-topology only applies to TRILL Data packets.

2.4.1. Explicit Topology Labeling Support

Support of the topology label is optional. Support could depend on port hardware and is indicated by a 2-bit capability field in the Port TRILL Version sub-TLV [RFC7176] appearing in the Port Capabilities TLV in Hellos. If there is no Port TRILL Capabilities sub-TLV in a Hello, then it is assumed that explicit topology labeling is not supported on that port. See the table below for the meaning of values of the Explicit Topology capability field:

Value	Meaning
0	No support. Cannot send TRILL Data packets with an explicit topology label and will likely treat as erroneous and discard any TRILL Data packet received with a topology label. Such a port is assumed to have the ability and configuration to correctly classify TRILL Data packets into all topologies for which it is advertising support in its Hellos, either by examining those packets or because they are arriving at that port.
1	Capable of inserting an explicit topology label in TRILL Data packets sent and tolerant of such labels in received TRILL Data packets. Such a port is capable, for all of the topologies it supports, of determining TRILL Data packet topology without an explicit label. Thus, it does not require such a label in received TRILL Data packets. On receiving a packet whose explicit topology label differs from the port's topology determination for that packet, the TRILL switch MUST discard the packet.
2 & 3	Require an explicit topology label in received TRILL Data packets except for topology zero. Any TRILL Data packets received without such a label are classified as being in topology zero. Also capable of inserting an explicit topology label in TRILL Data packets sent. (Values 2 and 3 are treated the same, which is the same as saying that if the 2 bit is on, the 1 bit is ignored.)

In a Hello on Port P, a TRILL switch advertising support for topology T but not advertising that it requires explicit topology labeling is assumed to have the ability and configuration to correctly classify TRILL Data packets into topology T by examination of those TRILL Data packets and/or by using the fact that they are arriving at port P.

When a TRILL switch transmits a TRILL Data packet onto a link, if any other TRILL switch on that link requires explicit topology labeling, an explicit topology label MUST be included unless the TRILL Data packet is in topology zero, in which case, an explicit topology label MAY be included. If a topology label is not so required, but all other TRILL switches on that link support explicit topology labeling, then such a label MAY be included.

2.4.2. The Explicit Topology Label

This section specifies the explicit topology label. Its use by TRILL is specified in Section 2.4.3. This label may be used by other technologies besides TRILL. The MT Label is structured as follows:

```
 0                   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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     MT Ethertype 0x9A22       | V | R |         MT-ID         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Figure 1: MT Label

Where the fields are as follows:

MT Ethertype: The MT Label Ethertype (see Section 6.1).

V: The version number of the MT Label. This document specifies version zero.

R: A 2-bit reserved field that MUST be sent as zero and ignored on receipt.

MT-ID: The 12-bit topology using the topology number space of the MT TLV [RFC5120].

2.4.3. TRILL Use of the MT Label

With the addition of the version zero MT Label, the four standardized content varieties for the TRILL Data packet data labeling area (the area after the Inner.MacSA -- or Flag Word if the Flag Word is present [RFC7780] -- and before the payload) are as show below. TRILL Data packets received with any other data labeling are discarded. {PRI, D} is a 3-bit priority and a drop eligibility indicator bit [RFC7780].

All MT TRILL switches MUST support FGL, in the sense of being FGL safe [RFC7172]; thus, they MUST support all four data labeling area contents shown below. (This requirement is imposed, rather than having FGL support and MT support be independent, to reduce the number of variations in RBridges and simplify testing.)

1. C-VLAN [RFC6325]

```
                        1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 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
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |  C-VLAN = 0x8100              | PRI |D|  VLAN ID              |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

2. FGL [RFC7172]

```
                        1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 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
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |  FGL = 0x893B                 | PRI |D|  FGL High Part        |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |  FGL = 0x893B                 | PRI |D|  FGL Low Part         |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

3. MT C-VLAN [RFC8377]

```
                        1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 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
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |  MT Ethertype = 0x9A22        | 0 | R |  MT-ID                |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |  C-VLAN = 0x8100              | PRI |D|  VLAN ID              |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

4. MT FGL [RFC8377] [RFC7172]

```
                        1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 2 3 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
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |  MT Ethertype = 0x9A22        | 0 | R |  MT-ID                |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |  FGL = 0x893B                 | PRI |D|  FGL High Part        |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
   |  FGL = 0x893B                 | PRI |D|  FGL Low Part         |
   +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Inclusion or use of S-VLAN or further stacked tags are beyond the scope of this document, but, as stated in [RFC6325], are obvious extensions.

3. TRILL Multi-Topology Adjacency and Routing

Routing calculations in IS-IS are based on adjacency. Section 3.1 specifies multi-topology TRILL adjacency. Section 3.2 describes the handling of nicknames. Sections 3.3 and 3.4 specify how unicast and multi-destination TRILL multi-topology routing differ from the TRILL base protocol routing.

3.1. Adjacency

There is no change in the determination or announcement of adjacency for topology zero, which is as specified in [RFC7177]. When a topology zero adjacency reaches the Report state, as specified in [RFC7177], the adjacency is announced in core LSPs using the Extended Intermediate System Reachability TLV (#22). This will be compatible with any legacy topology-ignorant RBridges that might not support E-L1FS FS-LSPs [RFC7780].

Adjacency is announced for non-zero topologies in LSPs using the MT Reachable Intermediate Systems TLV (#222) as specified in [RFC5120]. A TRILL switch reports adjacency for non-zero topology T if and only if that adjacency is in the Report state [RFC7177] and the two conditions listed in Section 2.2 are true, namely:

1. All the ports on the link are announcing support of topology T.

2. If any port announces that it requires explicit topology labeling (Explicit Topology capability field value 2 or 3), all other ports advertise that they are capable of producing such labeling (Explicit Topology capability field value of 1, 2, or 3).

3.2. TRILL Switch Nicknames

TRILL switches are usually identified within the TRILL protocol (for example, in the TRILL Header) by nicknames [RFC6325] [RFC7780]. Such nicknames can be viewed as simply 16-bit abbreviation for a TRILL switch’s (or pseudo-node’s) 7-byte IS-IS System ID. A TRILL switch or pseudo-node can have more than one nickname, each of which identifies it.

Nicknames are common across all topologies, just as IS-IS System IDs are. Nicknames are determined as specified in [RFC6325] and [RFC7780] using only the Nickname sub-TLVs appearing in Router Capabilities TLVs (#242) advertised by TRILL switches. In particular, the nickname allocation algorithm ignores Nickname sub-TLVs that appear in MT Router Capability TLVs (#144). (However, Nickname sub-TLVs that appear in MT Router Capability TLVs with a non-zero topology do affect the choice of distribution tree roots as described in Section 3.4.1.)

To minimize transient inconsistencies, all Nickname sub-TLVs advertised by a TRILL switch for a particular nickname, whether in Router Capability or MT Router Capability TLVs, SHOULD appear in the same LSP PDU. If that is not the case, then all LSP PDUs in which they do occur SHOULD be flooded as an atomic action.

3.3. TRILL Unicast Routing

TRILL Data packets being TRILL unicast (those with TRILL Header M bit = 0) are routed based on the egress nickname using logically separate forwarding tables per topology T, where each such table has been calculated based on least cost routing within T: that is, only using links and nodes that support T. Thus, the next hop when forwarding TRILL Data packets is determined by a lookup logically based on {topology, egress nickname}.

3.4. TRILL Multi-Destination Routing

TRILL sends multi-destination data packets (those packets with TRILL Header M bit = 1) over a distribution tree. Trees are designated by nicknames that appear in the "egress nickname" field of multi-destination TRILL Data packet TRILL Headers. To constrain multi-destination packets to a topology T and still distribute them properly requires the use of a distribution tree constrained to T. Handling such TRILL Data packets and distribution trees in TRILL MT is as described in the subsections below.

3.4.1. Distribution Trees

General provisions for distribution trees and how those trees are determined are as specified in [RFC6325], [RFC7172], and [RFC7780]. The distribution trees for topology zero are determined as specified in those references and are the same as they would be with topology-ignorant TRILL switches.

The TRILL distribution tree construction and packet handling for some non-zero topology T are determined as specified in [RFC6325], [RFC7172], and [RFC7780] with the following changes:

- o As specified in [RFC5120], only links usable with topology T TRILL Data packets are considered when building a distribution tree for topology T. As a result, such trees are automatically limited to and separately span every internally connected island of topology T. In other words, if non-zero topology T consists of disjoint islands, each distribution tree construction for topology T is local to one such island.

- o Only the Nickname sub-TLV, Trees sub-TLV, Tree Identifiers sub-TLV, and Trees Used sub-TLV occurring in an MT Router Capabilities TLV (#144) specifying topology T are used in determining the tree root(s), if any, for a connected area of non-zero topology T.

  + There may be non-zero topologies with no multi-destination traffic or, as described in [RFC5120], even topologies with no traffic at all. For example, if only known destination unicast IPv6 TRILL Data packets were in topology T and all multi-destination IPv6 TRILL Data packets were in some other topology, there would be no need for a distribution tree for topology T. For this reason, a Number of Trees to Compute field value of zero in the Trees sub-TLV for the TRILL switch holding the highest priority to be a tree root for a non-zero topology T is honored and causes no distribution trees to be calculated for non-zero topology T. This is different from the base topology zero where, as specified in [RFC6325], a zero Number of Trees to Compute field value causes one tree to be computed.

- o Nicknames are allocated as described in Section 3.2. If a TRILL switch advertising that it provides topology T service holds nickname N, the priority of N to be a tree root is given by the tree root priority field of the Nickname sub-TLV that has N in its nickname field and occurs in a topology T MT Router Capabilities TLV advertised by that TRILL switch. If no such Nickname sub-TLV can be found, the priority of N to be a tree root is the default for an FGL TRILL switch as specified in [RFC7172].

  + There could be multiple topology T Nickname sub-TLVs for N being advertised for a particular RBridge or pseudo-node, due to transient conditions or errors. In that case, any advertised in a core LSP PDU are preferred to those advertised in an E-L1FS FS-LSP PDU. Within those categories, the one in the lowest numbered fragment is used and if there are multiple in that fragment, the one with the smallest offset from the beginning of the PDU is used.

- o Tree pruning for topology T uses only the Interested VLANs sub-TLVs and Interested Labels sub-TLVs [RFC7176] advertised in MT Router Capabilities TLVs for topology T.

An MT TRILL switch MUST have logically separate routing tables per topology for the forwarding of multi-destination traffic.

3.4.2. Multi-Access Links

Multi-destination TRILL Data packets are forwarded on broadcast (multi-access) links in such a way as to be received by all other TRILL switch ports on the link. For example, on Ethernet links they are sent with a multicast Outer.MacDA [RFC6325]. Care must be taken that a TRILL Data packet in a non-zero topology is only forwarded by an MT TRILL switch.

For this reason, a non-zero topology TRILL Data packet MUST NOT be forwarded onto a link unless the link meets the requirements specified in Section 2.2 for use in that topology even if there are one or more MT TRILL switch ports on the link.

4. Mixed Links

There might be any combination of MT, FGL, or even VL TRILL switches [RFC7172] on a link. DRB (Designated RBridge) election and Forwarder appointment on the link work as previously specified in [RFC8139] and [RFC7177]. It is up to the network manager to configure and manage the TRILL switches on a link so that the desired switch is DRB and the desired switch is the Appointed Forwarder for the appropriate VLANs.

Frames ingressed by MT TRILL switches can potentially be in any topology recognized by the switch and permitted on the ingress port. Frames ingressed by VL or FGL TRILL switches can only be in the base zero topology. Because FGL and VL TRILL switches do not understand topologies, all occurrences of the following sub-TLVs MUST occur only in MT Port Capability TLVs with a zero MT-ID. Any occurrence of these sub-TLVs in an MT Port Capability TLV with a nonzero MT-ID is ignored.

Special VLANs and Flags Sub-TLV
Enabled-VLANs Sub-TLV
Appointed Forwarders Sub-TLV
VLANs Appointed Sub-TLV

Native frames cannot be explicitly labeled (see Section 2.4) as to their topology.

5. Other Multi-Topology Considerations

5.1. Address Learning

The learning of end station Media Access Control (MAC) addresses is per topology as well as per label (VLAN or FGL). The same MAC address can occur within a TRILL campus for different end stations that differ only in topology without confusion.

5.1.1. Data Plane Learning

End station MAC addresses learned from ingressing native frames or egressing TRILL Data packets are, for MT TRILL switches, qualified by topology. That is, either the topology into which that TRILL switch classified the ingressed native frame or the topology that the egressed TRILL Data frame was in.

5.1.2. Multi-Topology ESADI

In an MT TRILL switch, End Station Address Distribution Information (ESADI) [RFC7357] operates per label (VLAN or FGL) per topology. Since ESADI messages appear, to transit TRILL switches, like normal multi-destination TRILL Data packets, ESADI link state databases and ESADI protocol operation are per topology as well as per label and local to each area of multi-destination TRILL data connectivity for that topology.

5.2. Legacy Stubs

Areas of topology-ignorant TRILL switches can be connected to and become part of an MT TRILL campus but will only be able to ingress to, transit, or egress from topology zero TRILL Data packets.

5.3. RBridge Channel Messages

RBridge Channel messages [RFC7178], such as BFD over TRILL [RFC7175] appear, to transit TRILL switches, like normal multi-destination TRILL Data packets. Thus, they have a topology and, if that topology is non-zero, are constrained by topology like other TRILL Data packets. Generally, when sent for network management purposes, they are sent in topology zero to avoid such constraint.

5.4. Implementations Considerations

MT is an optional TRILL switch capability.

Experience with the actual deployment of Layer 3 IS-IS MT [RFC5120] indicates that a single router handling more than eight topologies is rare. There may be many more than eight distinct topologies in a routed area, such as a TRILL campus; in that case, many of these topologies will be handled by disjoint sets of routers and/or links.

Based on this deployment experience, a TRILL switch capable of handling eight or more topologies can be considered a full implementation while a TRILL switch capable of handling four topologies can be considered a minimal implementation but still useful under some circumstances.

6. Allocation Considerations

IEEE Registration Authority and IANA considerations are given below.

6.1. IEEE Registration Authority Considerations

The IEEE Registration Authority has allocated Ethertype 0x9A22 for the MT Label (see Section 2.4).

6.2. IANA Considerations

IANA has assigned a field of two adjacent bits (14-15) of the Capabilities bits of the Port TRILL Version Sub-TLV for the Explicit Topology capability field and updated the "PORT-TRILL-VER Sub-TLV Capability Flags" registry as follows.

Bit	Description	Reference
14-15	Topology labeling support.	[RFC8377]

IANA has created the informational "TRILL Ethertypes" subregistry in the "Transparent Interconnection of Lots of Links (TRILL) Parameters" registry.

Name: TRILL Ethertypes
Registration Procedure(s): Ethertypes are assigned by the IEEE Registration Authority. Updates to this registry are coordinated with the designated expert.
Reference: [RFC8377]

Note: This registry provides centralized documentation of Ethertypes that were assigned by the IEEE for initial use with TRILL. In some cases, particularly L2-IS-IS and MT, they may be used with other protocols.

Value	Mnemonic	Explanation	Reference
0x22F3	TRILL	TRILL data	[RFC6325]
0x22F4	L2-IS-IS	IS-IS	[RFC6325]
0x893B	FGL	Fine Grained Labeling	[RFC7172]
0x8946	-	TRILL RBridge Channel	[RFC7178]
0x9A22	MT	Multi-Topology	[RFC8377]

7. Security Considerations

Multiple topologies are sometimes used for the isolation or security of traffic. For example, if some links were more likely than others to be subject to adversarial observation, it might be desirable to classify certain sensitive traffic in a topology that excluded those links.

Delivery of data originating in one topology outside of that topology is generally a security policy violation to be avoided at all reasonable costs. Using IS-IS security [RFC5310] on all IS-IS PDUs and link security appropriate to the link technology on all links involved, particularly those between RBridges, supports the avoidance of such violations.

For general TRILL security considerations, see [RFC6325].

8. References

8.1. Normative References

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8.2. Informative References

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Appendix A. Differences from RFC 5120

TRILL multi-topology, as specified in this document, differs from RFC 5120 as follows:

1. [RFC5120] provides for unicast multi-topology. This document extends that to cover multi-destination TRILL data distribution (see Section 3.4).

2. [RFC5120] assumes the topology of data packets is always determined implicitly, that is, based on the port over which the packets are received and/or preexisting fields within the packet. This document supports such implicit determination, but it extends this by providing for optional explicit topology labeling of data packets (see Section 2.4).

3. [RFC5120] makes support of the default topology zero optional for MT routers and links. For simplicity and ease in network management, this document requires all TRILL switches and links between TRILL switches to support topology zero (see Section 2.1).

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