Multi Topology Encoding within TRILL data frames

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Abstract

Two alternate methods of encoding Multi Topology Identifier within the TRILL data frames are presented. Methods proposed herein do not require overloading TRILL RBridge nickname to encode Multi Topology Identifier. A method that expands TRILL nickname space from 16bits to 24 bits is also presented in this draft.
1. Introduction

Multi Topology is an attractive concept that allows creating different virtual topologies or overlays on top of a single physical topology. There are several important applications. Few such applications are listed below. The list below is by no means an exhaustive list and there are other applications that may utilize the MT framework.

Application specific topology (Storage topology vs. data topology)

Virtual topologies for different customers

Expansion of TRILL nickname space

Traffic Engineering

[RFC5120] presents Multi topology (MT) framework for IS-IS. MT has two important parts; IS-IS control plane extensions and Data plane encoding. [RFC5120] presents IS-IS control plane extensions. [TRILL-MT1] and [TRILL-MT2] presents required IS-IS sub-TLV definitions and the data plane encoding for TRILL.

In this document we propose methods that facilitate encoding of 16 bit Multi topology ID in to TRILL frames without reducing the effective TRILL nickname space. Additionally, the proposed scheme does not require definition of new Topology mapping sub-TLV. In other words, IS-IS control plane is similar to [RFC5120] and does not require additional complexity of mapping absolute Topology ID to abbreviated topology ID.

Methods proposed in this document encode the MT topology ID into TRILL data frames without modifying the TRILL header. Hence, MT capable, R Bridges interfacing with non-MT capable R Bridges can selectively not encode the proposed MT extensions on interfaces with non-MT capable R Bridges. Non MT capable R Bridges do not required to be in the base topology. They can be in any valid topology. Only restriction is non-MT capable R Bridges can belong to a single topology only. In its IS-IS HELLO messages, R Bridges exchange its MT capability and topology information. R Bridges that are not capable of supporting proposed MT extension in data plane, MUST announce itself as non MT capable, but MAY advertise its association to a topology other than the base topology by including MT extensions proposed in [RFC5120]. MT encoding capability is announced by setting the proposed MT encoding capability bit in Port TRILL Version sub-TLV [rfc6326bis]. Presence of IS-IS Multi Topology TLV [RFC5120], indicates only the associated topology. MT encoding
capability indicates RBRidges ability to support proposed data plane extensions. When MT capability is not set RBridge MUST not use the proposed data plane encoding methods, instead it must associate the announcing RBRidge to the advertised topology or base topology in the absence of Multi-Topology TLV [RFC5120].

TRILL protocol, as defined in [RFC6325], defines 16bit nickname space. 16bit nickname space allows up to 65536 unique nicknames. However, it has been discussed in the working group that, more the 65536 unique names are required in certain large deployments. Possible usage of Upperbits of Nickname is also being considered for encoding Multitoplogy, which further reduces the available nick name space. Presented in this document is a method that allows expanding the 16bit nickname space to a 24bit nickname space, without modifying the TRILL header defined in [RFC6325].

2. Conventions used in this document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC-2119 [RFC2119].

3. Multi Topology Encoding

[RFC6325] TRILL Base Protocol, proposes encoding scheme of TRILL frames. TRILL frames contain outer MAC Header, 802.1QTAG, TRILL header and user Data. We propose to include multi topology ID after the 802.1Q TAG. Multi Toplogy ID is preceded by Ethernet Type MT-ETHTYPE.
Outer Ethernet Header:

```
+----------------------------------------+
| Outer Destination MAC Address          |
+----------------------------------------+
| Outer Destination MAC Address | Outer Source MAC Address |
+----------------------------------------+
| Outer Source MAC Address             |
| Ethertype = C-Tag [802.1Q-2005] | Outer.VLAN Tag Information |
| Ethertype = MT-ETHTYPE         |          MT-ID                |
|                                | TRILL Header               |
|                                |                            |
|                                |                            |
|                                |                            |
|                                |                            |
|                                |                            |
|                                |                            |
|                                |                            |
```

Figure 1  MT ID extensions in TRILL

Ethtype-MT : 16 bit Ethtype to encode Multi Topology ID.

MT-ID : 16bit Multi Topology ID

NICKN-Ethtype : 16 bit Ethtype to encode nickname expansion.

3.1. Nickname construction

Each RBridge that is compatible with the proposed scheme, First check for presence of Nick-Ethtype, if present extract the EG-NICKN-MSB and IG-NICKN-MSB. EG-NICKN-MSB and IG-NICKN-MSB are then concatenated with the Egress TRILL nickname and the Ingress TRILL nickname to form 24bit nickname space. The derived nickname MUST be utilized for forwarding.

3.2. Use of Next-Hop VLAN for MT Encoding

Alternatively, Next-Hop VLAN may be utilized to encode MT ID in point to point only networks. Next Hop VLAN on TRILL outer header is
independent of the inner VLAN. On Point-Pont links Next Hop VLAN is only required to be of local significance. Hence, we propose to map topologies to Next-Hop VLAN per link basis.

For sake of simplicity, we propose to map topology-id to Next-VLAN based on local policies such as configuration.

4. Multi Topology Interoperability

There are three possible scenarios of Interoperability with RBridges that are non-MT capable.

1. Interoperability During migration.
2. Interoperability with RBridges that are non-MT capable in the data plane. (i.e. Software is MT aware and supports the extensions specified here-in but, data plane is not capable of supporting the proposed encoding methods).
3. Interoperability with RBridges that are MT unaware in both Control and data planes.

4.1. Interoperability during Migration

We recommend upgrading from the core to the edge, as depicted in the figure below. With this approach, different clusters of RBridges may belong to different topologies or to the same topology. RBridges in the core provide connectivity to RBridge clusters at the edge in a topology aware manner.
In the above diagram Core may be configured to connect Edge 1 and Edge 2 to a different Topology than the topology of Edge 3 and Edge 4.

RBRidges in Edge 1 - 4 are not required to be MT capable or aware. RBRidges in the core associate the corresponding links to the appropriate topology.

4.2. Interoperability with RBRidges with Non MT capable data plane

RBRidges with Non MT capable data plane may implement MT support by dedicating a separate link for each topology.

Alternatively, RBRidges, on point-point links may assign a different next hop VLAN for different topologies and derive topology ID based on VLAN. Use Next-Hop VLAN reduces the need for multiple physical
links. This method may be utilized as a permanent method for MT encoding in Point-Pont only networks.

4.3. Interoperability with MT unaware RBridges

MT aware RBridges identify MT unaware RBridges with either not presence of capability flags (pre RFC6326bis) or MT capability flags not being set (Section 6.1.). In such an event MT aware RBridges MUST only forward traffic related to the base topology to MT unaware RBridges. Additionally, proposed encoding MUST be removed prior to forwarding to MT unaware RBridges.

5. Backward compatibility

The proposed methods are encoded as part of the outer header of the TRILL frame. An RBridge that is aware of the proposed extensions when interfacing with an RBridge that is not capable of the proposed extensions MUST remove the proposed encoding from the outer header, prior to transmission of TRILL frames on those links that has RBridges that are not capable of the proposed extensions.

6. IS-IS sub-TLV definition

6.1. MT capability

We propose to define two MT capability flags within Port TRILL Version sub-TLV.

1. MT Encoding capability
2. MT to NH-VLAN Encoding capability

MT Encoding capability flag indicates the RBridge is capable encoding MT ID using ETHTYPE-MT as defined in section 3.

MT to NH-VLAN Encoding capability flag indicates the announcing RBridge is capable of using NH-VLAN to MT ID mapping as presented in section 3.2.

When both of the flags are set RBridge SHOULD select MT Encoding capability.
7. Security Considerations

TBD

8. Assignment Considerations

8.1. IANA Considerations

IANA is requested to allocate MT Encoding capability Flag, MT to NH-VLAN Encoding capability Flags and Nickname MSB capability flag under Port TRILL version sub-TLV.

8.2. IEEE Considerations

IEEE is requested to assign new Ether Type to represent MT-ETHTYPE defined in section 3.

9. References

9.1. Normative References


9.2. Informative References


10. Acknowledgments

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Authors’ Addresses

Tissa Senevirathne
CISCO Systems
375 East Tasman Drive,
San Jose, CA 95134

Phone: +1-408-853-2291
Email: tsenevir@cisco.com

Les Ginsberg
CISCO Systems
510 McCarthy Blvd,
Milpitas, CA 95035.

Email: ginsberg@cisco.com

Satya Dillikar
CISCO Systems
375 East Tasman Drive,
San Jose, CA 95134

Email: dsatya@cisco.com

Ayan Banerjee
Consultant

Email: ayabaner@gmail.com
Sam Aldrin
HuaWei Technologies
2330 Central Expressway
Santa Clara, CA 95951, USA

Email: aldrin.ietf@gmail.com

Naveen Nimmu
Broadcom
9th Floor, Building no 9, Raheja Mind space
Hi-Tec City, Madhapur,
Hyderabad - 500 081 India.

Email: naveen@broadcom.com