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Requirements for automatic configuration of control adjacencies
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Abstract

A set of requirements and a proposed solution for the control of hierarchical Label Switched Paths (LSPs) is found in [HIER]. However, support of multiple client layer networks and address separation as allowed by the Automatically Switched Optical Network (ASON) architecture [G.8080] are not covered by [HIER]. This internet draft describes additional requirements to consider for the use of LSP hierarchy in ASON networks.

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1. Introduction and Problem Statement

This problem statement applies to the operation of multilayer networks according to the ASON architecture.

[HIER] defines a set of extensions for the control of hierarchical Label Switched Paths (LSPs).. This internet draft describes

additional requirements for the use of LSP Hierarchy in ASON networks.

1.1. Separate control plane instances at different layers

In ASON architecture, the control plane instance in a client layer may be a separate instance than the control plane instance for the client layer. This requires that when a server layer link is created, sufficient information must be passed to allow a new control (signaling and optionally routing) association to be created between the client control instances at the ends of the new link. This includes identification and addressing information for both the signaling control instance and routing control instance at each end.

This draft identifies the additional requirements for ASON multi-layer control in addition to those in [HIER].

The ASON architecture [G.8080] allows for separate control plane instances for each controlled layer. In a real deployment, this can be seen in a few scenarios. For example, in networks mixing legacy equipment and emerging technologies, existing legacy control plane for some layers and new control plane for other layers may be based on different protocols, requiring different instances.

Additionally, some equipment may be entirely under management plane control whereas other is under control plane. There might also be business boundaries due to mergers and acquisitions or due to internal company organization. In these cases, the result is multiple instances of control plane.

Another scenario is that different instances may be used to solve scalability problems.

1.2. Address and identifier separation within a layer

Separate identification of routing controller instances, signaling controller instances and resource identifiers is required in order to support ASON signaling and routing. Separation of routing controller and resource identifier is already addressed as a requirement in [RFC4652], as referenced by the terms "Li" and "Pi" for the logical control plane entity and physical node identifiers, respectively. This allows 1:n relationships between the control entity and the physical resources being controlled, for example.

Separation of routing and signaling controller identifiers and their respective reachable addresses allows the routing and signaling controller identifiers to be independent of the specific network

address by which they are reached. This allows the operator to modify the signaling communications network addressing scheme without impacting the control plane protocols. Routing controller addressing is further discussed in [RFC4258].

2. Requirements

2.1. Client Layer Identification

In order to support flexible adaptation where a server layer provides services to multiple client layers, it is necessary to identify to which layer the information carried in the LSP_TUNNEL_INTERFACE_ID applies to.

New Requirement: For each client layer supported, it should be possible to exchange both the layer identification and a separate set of control plane identifiers associated with the client layer.

2.2. Routing Controller Identification

In ASON architecture, a routing controller possesses two identifiers. The first is the Routing Controller Protocol Controller Identifier (RC PC ID). The second is the IPv4 address at which the routing controller can be reached, the Routing Controller Signaling Control Network address (RC PC SCN address).

New requirement: Since different client layers may have different routing controllers, it must be possible to exchange RC PC IDs and RC PC SCN addresses for each client layer that needs to advertise the link.

2.3. Signaling Controller Identification

In ASON architecture, signaling controller identifiers cannot be automatically derived from routing controller identifiers. In order to establish an RSVP-TE signaling adjacency between two client signaling controllers, a signaling mechanism is required in the server layer to identify the signaling controller. Each signaling controller requires two identifiers. The first is the Signaling Controller Protocol Controller Identifier (SC PC ID). The second is the IPv4 address at which the signaling controller can be reached.

New Requirement: Since different client layers may have different signaling controllers, it must be possible to exchange SC PC IDs and SC PC SCN addresses for each client layer.

2.4. Link Identification

The following information is required for each link: area identifier, node identifier and interface identifier. Optionally, a bundle identifier may also be specified if a link is to be advertised as part of a bundle in the client layer.

It should be noted that the node identifier is not the same as a routing controller or signaling controller identifier. It is the control plane identifier for the network element resources, i.e., the Pi identified in [RFC4652].

New requirement: Since different client layers may use different addressing spaces to name their resources, it must be possible to exchange separate link identification for each client layer.

2.5. Requirements Summary

The following table summarizes the information that is proposed to be exchanged on a per client layer basis as well as coverage in [HIER].

Per layer information	Format	[HIER]
Area ID	32-bit	Yes?
Node ID	32-bit/16-bytes	Yes?
Link ID	32-bit	Yes
Bundle ID	32-bit	Yes
Layer Identifier	TBD	No
SC PC ID	32-bit/16-bytes	No
SC PC SCN Address	IPv4/v6	No
RC PC ID	32-bit/16-bytes	No
RC PC SCN	IPv4/v6	No

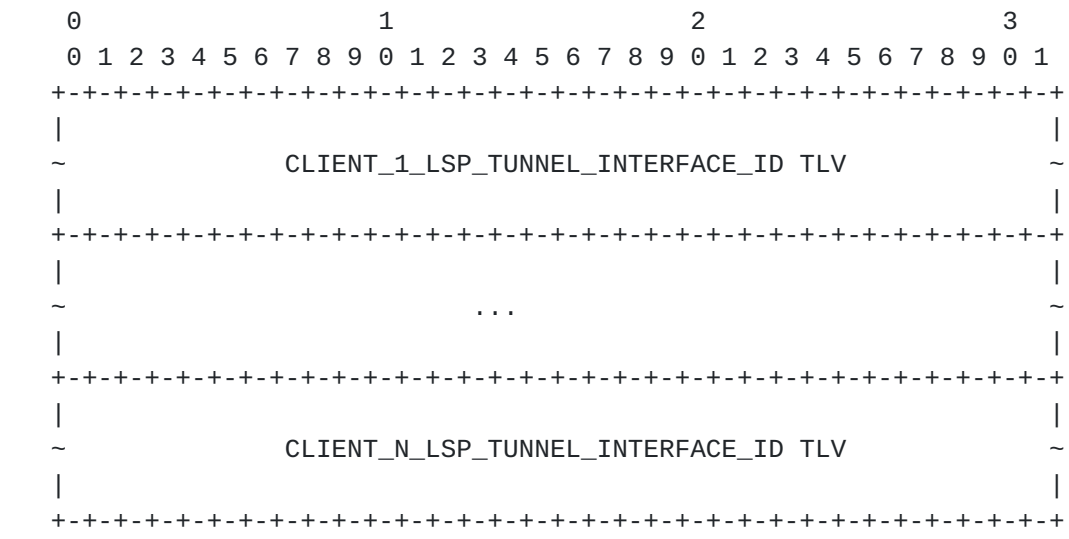
3. Mechanisms and Protocol Extensions

This section defines protocol extensions to address the requirements described in the previous section.

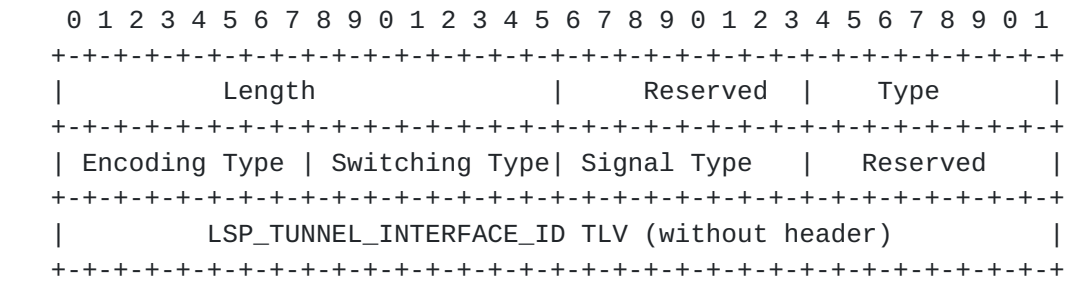
3.1. MULTI_CLIENT_LSP_TUNNEL_INTERFACE_ID Object

A new MULTI_CLIENT_LSP_TUNNEL_INTERFACE_ID Object is defined for multiple client support. The format of the object is shown below. It supports the exchange of information for several client layers in a single TLV.

C-NUM=193, C-Type = TBD



Each CLIENT_LSP_TUNNEL_INTERFACE_ID TVL has the following format.



Reserved: MUST be set to 0 when sending and ignored when receiving.

Type: C-Type corresponding to the format used for the LSP_TUNNEL_INTERFACE_ID TLV as described in [HIER].

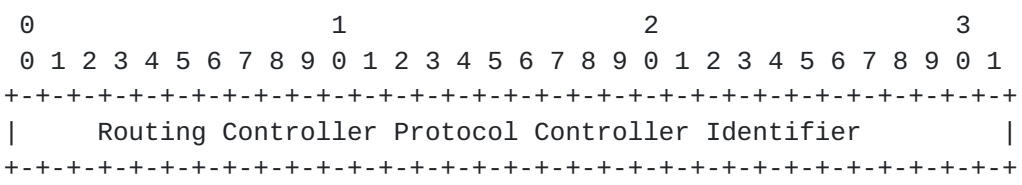
LSP_TUNNEL_INTERFACE_ID TLV: Format as described in 3.1.2 of [HIER], omitting the header (length, C-NUM and C-Type).

3.2. LSP_TUNNEL_INTERFACE_ID sub-TLVs

The following sub-TLVs are optional sub-TLVs of the LSP_TUNNEL_INTERFACE_ID, in addition to already defined Target IGP Identifier and Component Link Identifier TLV. These sub-TLVs allow the client layer to use separate routing and signaling controller identifiers and reachable addresses.

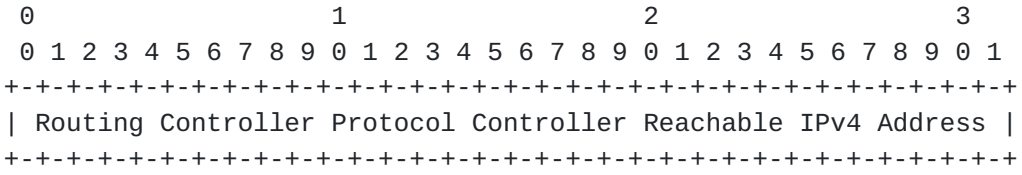
3.2.1. Routing Controller Protocol Controller (RC PC) Identifier

The following sub-TLV is included to identify the RC PC associated with the client layer. The TLV is formatted as described in Section 3.1.2 of [HIER]. The Type field has the value 3, and the Value field has the following content:



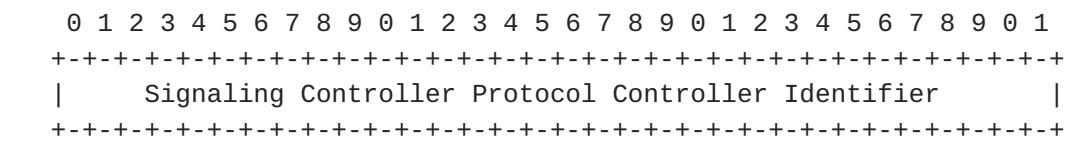
3.2.2. Routing Controller Protocol Controller (RC PC) Reachable Address

The following sub-TLV is included to provide the reachable address for the RC PC associated with the client layer. The TLV is formatted as described in Section 3.1.2 of [HIER]. The Type field has the value 4, and the Value field has the following content:



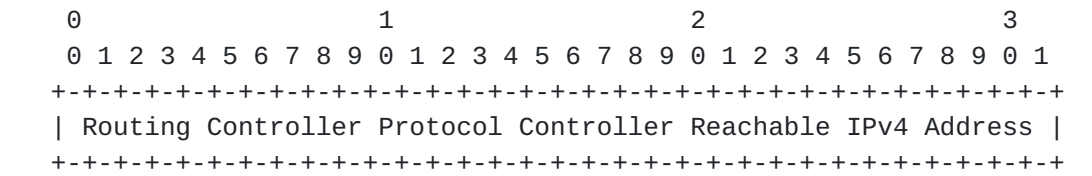
3.2.3. Signaling Controller Protocol Controller (SC PC) Identifier

The following sub-TLV is included to identify the SC PC associated with the client layer. The TLV is formatted as described in Section 3.1.2 of [HIER]. The Type field has the value 5, and the Value field has the following content:



3.2.4. Signaling Controller Protocol Controller (SC PC) Reachable Address

The following sub-TLV is included to provide the reachable address for the RC PC associated with the client layer. The TLV is formatted as described in Section 3.1.2 of [HIER]. The Type field has the value 4, and the Value field has the following content:



4. Security Considerations

TBD

5. IANA Considerations

TBD

6. References

6.1. Normative References

[HIER] Shiomoto, K., and Farrel, A. (Editors), "Procedures for Dynamically Signaled Hierarchical Label Switched Paths", draft-ietf-ccamp-lsp-hierarchy-bis-08.txt, February 2010

[RFC4258] Brungard, D, Ed. "Requirements for Generalized Multi-Protocol Label Switching (GMPLS) Routing for the Automatically Switched Optical Network (ASON)", RFC4258, November 2005

[RFC4652] Papadimitriou, D., Ed. "Evaluation of Existing Routing Protocols against Automatic Switched Optical Network (ASON) Routing Requirements", RFC4652, October 2006

6.2. Informative References

[G.8080] ITU-T Rec G.8080/Y.1304 "Architecture for the Automatically Switched Optical Network (ASON)", June 2006

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