

CCAMP Working Group  
Internet Draft  
Intended status: Standards Track

Vishnu Pavan Beeram (Ed)  
Juniper Networks  
Igor Bryskin (Ed)  
ADVA Optical Networking

Expires: August 18, 2013

February 18, 2013

Mutually Exclusive Link Group (MELG)  
draft-beeram-ccamp-melg-00.txt

#### Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

The list of current Internet-Drafts can be accessed at <http://www.ietf.org/ietf/lid-abstracts.txt>

The list of Internet-Draft Shadow Directories can be accessed at <http://www.ietf.org/shadow.html>

This Internet-Draft will expire on August 18, 2013.

#### Copyright Notice

Copyright (c) 2013 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in

Internet-Draft

MELG

February 2013

Section 4.e of the [Trust Legal Provisions](#) and are provided without warranty as described in the Simplified BSD License.

## Abstract

This document introduces the concept of MELG ("Mutually Exclusive Link Group") and discusses its usage in the context of mutually exclusive Virtual TE Links.

## 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](#)].

## Table of Contents

<a href="#">1.</a>	Introduction.....	<a href="#">2</a>
<a href="#">2.</a>	Mutually Exclusive Virtual TE Links.....	<a href="#">3</a>
<a href="#">3.</a>	Mutually Exclusive Link Group.....	<a href="#">5</a>
<a href="#">4.</a>	Protocol Extensions.....	<a href="#">6</a>
<a href="#">4.1.</a>	OSPF.....	<a href="#">6</a>
<a href="#">4.2.</a>	ISIS.....	<a href="#">7</a>
<a href="#">5.</a>	Security Considerations.....	<a href="#">8</a>
<a href="#">6.</a>	IANA Considerations.....	<a href="#">8</a>
<a href="#">6.1.</a>	OSPF.....	<a href="#">8</a>
<a href="#">6.2.</a>	ISIS.....	<a href="#">8</a>
<a href="#">7.</a>	Normative References.....	<a href="#">8</a>
<a href="#">8.</a>	Acknowledgments.....	<a href="#">9</a>

## [1.](#) Introduction

A Virtual TE Link (as defined in [[RFC6001](#)]) advertised into a Client Network Domain represents a potentiality to setup an LSP in the Server Network Domain to support the advertised TE link. The Virtual TE Link gets advertised like any other TE link and follows exactly the same rules that are defined for the advertising, processing and use of regular TE links [[RFC4202](#)]. However, "mutual exclusivity" is one attribute that is specific to Virtual TE links. This document

discusses the need to advertise this information and the means to do so.

## 2. Mutually Exclusive Virtual TE Links

Consider the network topology depicted in Figure 1a. This is a typical packet optical transport deployment scenario where the WDM layer network domain serves as a Server Network Domain providing transport connectivity to the packet layer network Domain (Client Network Domain).

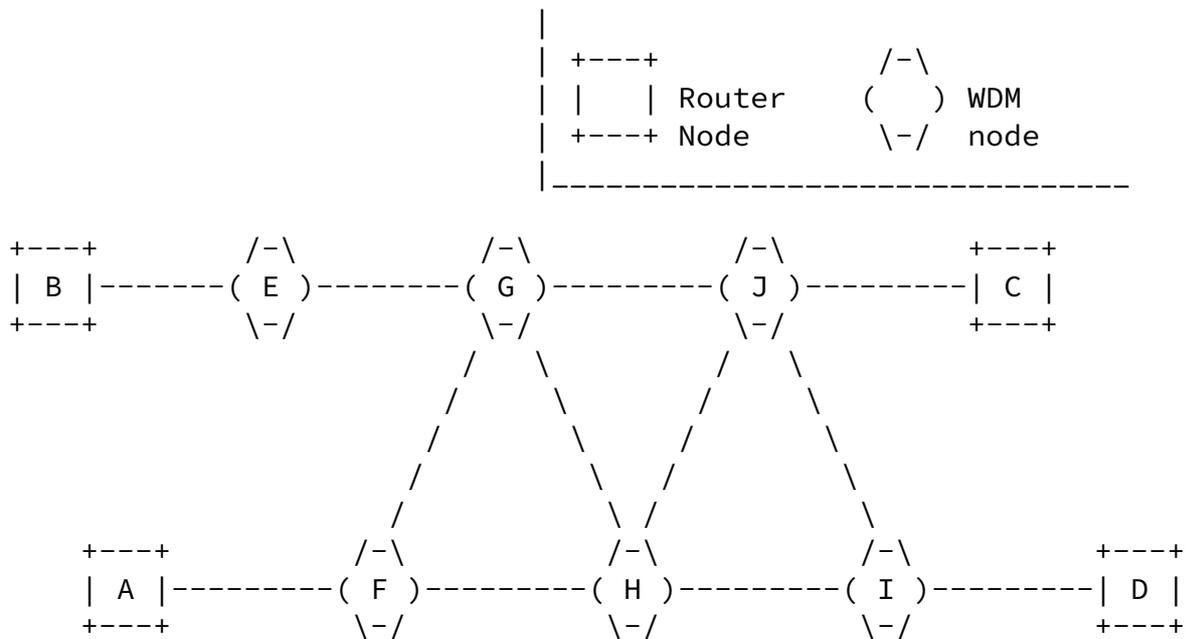


Figure 1a: Sample topology

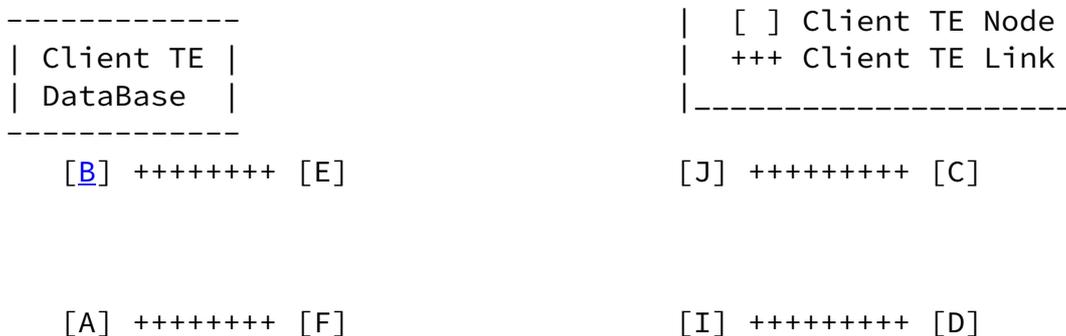


Figure 1b: Client TE Database

Nodes A, B, C and D are IP routers that are connected to an Optical WDM transport network. E, F, G, H, I and J are WDM nodes that constitute the Server Network Domain. The border nodes (E, F, I and J) operate in both the server and client domains. Figure 1b depicts how the Client Network Domain TE topology looks like when there are no Client TE Links provisioned across the optical domain.

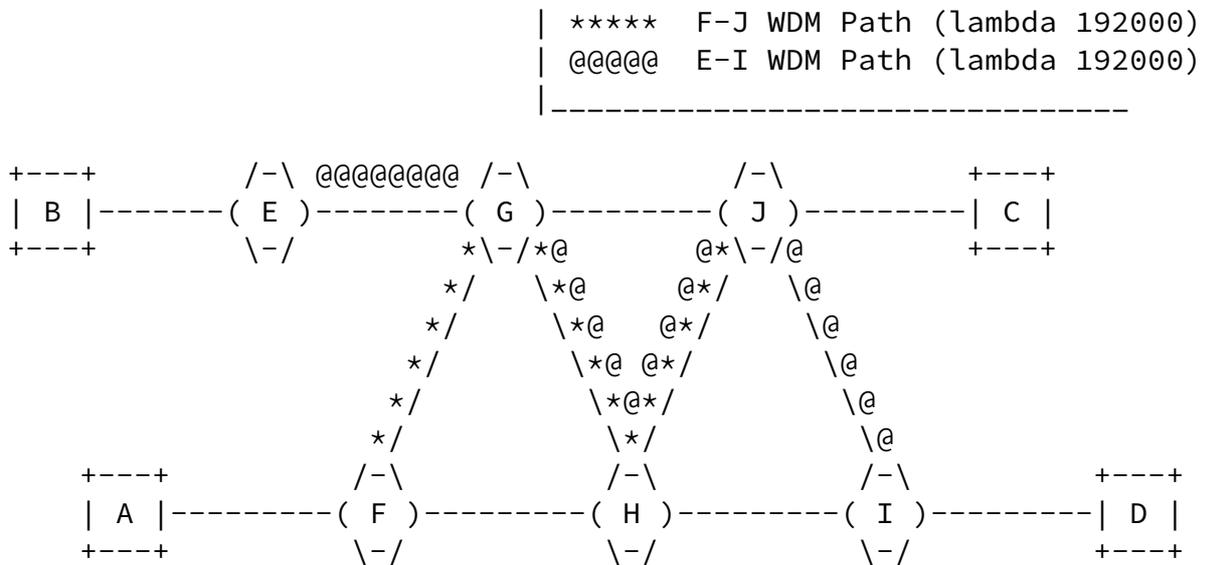
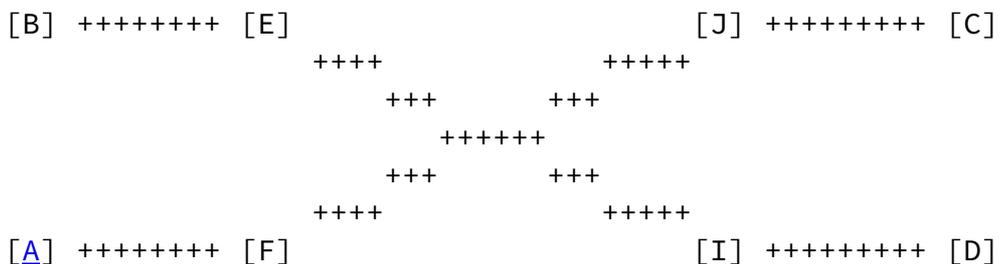


Figure 2a: Mutually Exclusive potential WDM paths

```

----- | TE-Links E-I and F-J are mutually exclusive
| Client-TE | | Advertised with MELG-ID - 25/192000
| Database | | [SRLG-ID 25; Shared Resource ID 192000]
----- |-----

```



Now consider augmenting the Client TE topology by creating a couple of Virtual TE Links across the optical domain. The potential paths in the WDM network catering to these two virtual TE links are as shown in Fig 2a and the corresponding augmented Client TE topology is as illustrated in Fig 2b.

In this particular example, the potential paths in the WDM layer network supporting the Virtual TE Links not only intersect, but also require the usage of the same resource (lambda channel 192000) on the intersection. Because the Virtual TE Links depend on the same uncommitted network resource, only one of them could get activated at any given time. In other words they are mutually exclusive. The same scenario is encountered when the potential paths depend on a common physical resource (e.g. transponder, regenerator, wavelength converter, etc.) that could be used by only one Server Network Domain LSP at a time.

For a Client Network Domain path computation function (especially a centralized one capable of concurrent computation of multiple paths) it is important to know the existence of such mutually exclusive relationship between Virtual TE Links. Absent this information, there exists the risk of yielding erroneous concurrent path computation results where only a subset of the computed paths can get successfully provisioned. This document introduces the concept of Mutually Exclusive Link Group to address this problem.

### 3. Mutually Exclusive Link Group

The Mutually Exclusive Link Group (MELG) construct defined in this document has 2 purposes

- To indicate via a separate network unique number (MELG ID) an element or a situation that makes the advertised Virtual TE Link belong to one or more Mutually Exclusive Link Groups. Path computing element will be able to decide on whether two or more Virtual TE Links are mutually exclusive or not by finding an overlap of advertised MELGs (similar to deciding on whether two or more TE links share fate or not by finding common SRLGs)

- To indicate whether the advertised Virtual TE Link is committed or not at the moment of the advertising. Such information is important for a path computation element: Committing new Virtual TE links (vs. re-using already committed ones) has a consequence of allocating more server layer resources and disabling other Virtual TE Links that have common MELGs with newly committed Virtual TE Links; Committing a new Virtual TE Link also means a

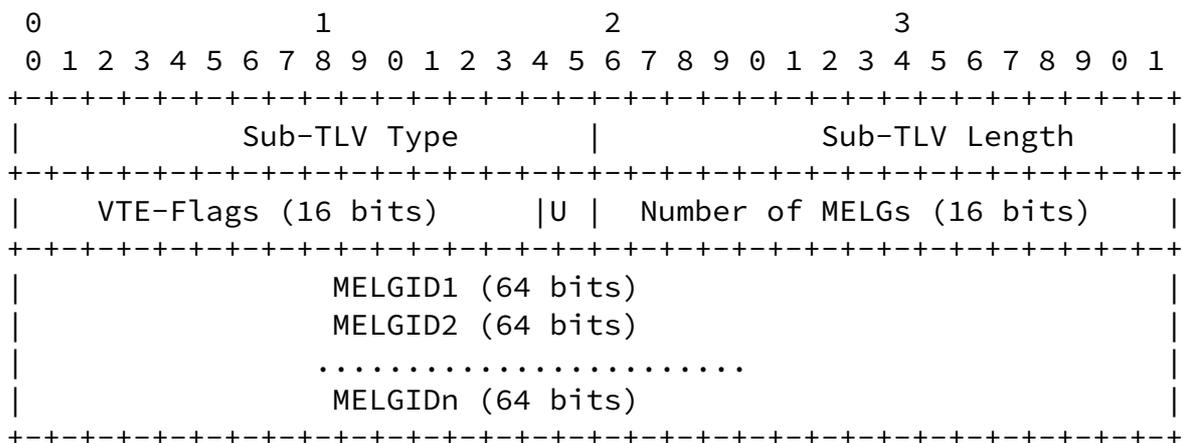
longer setup time for the Client LSP and higher risk of setup-failure.

#### 4. Protocol Extensions

##### 4.1. OSPF

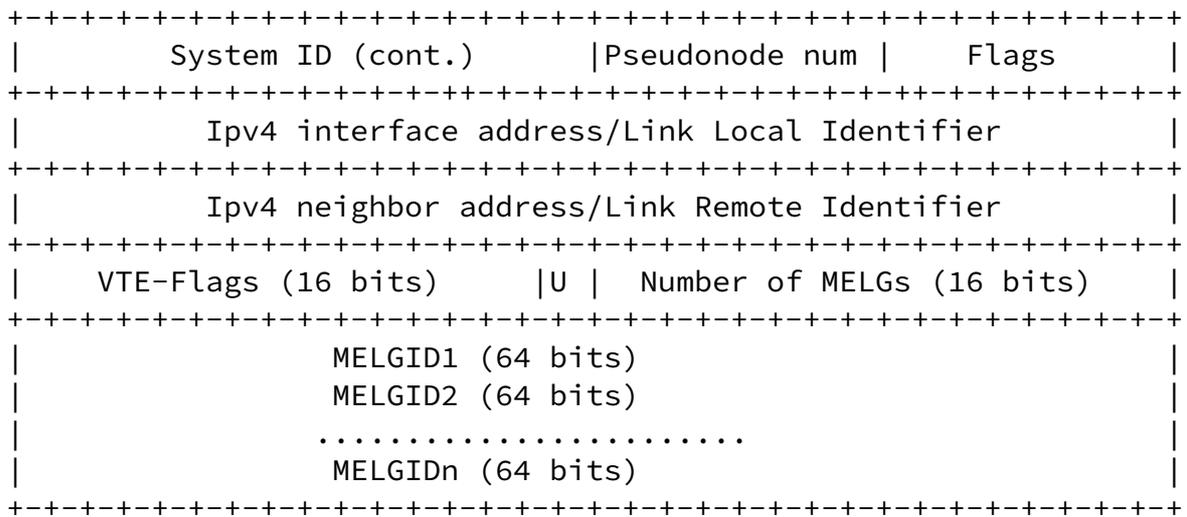
The MELG is a sub-TLV of the top level TE Link TLV. It may occur at most once within the Link TLV. The format of the MELGs sub-TLV is defined as follows:

Name: MELG  
 Type: TBD  
 Length: Variable



Number of MELGs: number of MELGS advertised for the Virtual TE Link;  
 VTE-Flags: Virtual TE Link specific flags;  
 MELGID1,MELGID2,...,MELGIDn: 64-bit network domain unique numbers associated with each of the advertised





The neighbor is identified by its System ID (6 octets), plus one octet to indicate the pseudonode number if the neighbor is on a LAN interface.

The least significant bit of the Flag octet indicates whether the interface is numbered (set to 1) or unnumbered (set to 0). All other bits are reserved and should be set to 0.

The length of the TLV is  $20 + 8 * (\text{number of MELG values})$ .

The semantics of "VTE-Flags", "Number of MELGs" and "MELGID Values" are the same as the ones defined under OSPF extensions.

The MELG TLV MAY occur more than once within the IS-IS Link State Protocol Data Units.

## 5. Security Considerations

TBD

## 6. IANA Considerations

### 6.1. OSPF

IANA is requested to allocate a new sub-TLV type for MELG (as

defined in [Section 4.1](#)) under the top-level TE Link TLV.

## [6.2](#). ISIS

IANA is requested to allocate a new IS-IS TLV type for MELG (as defined in [Section 4.2](#)).

## [7](#). Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC4202] K.Kompella, Y.Rekhter, "Routing Extensions in Support of Generalized Multi-Protocol Label Switching (GMPLS)", [RFC4202](#), October 2005.
- [RFC6001] D.Papadimitriou, M.Vigoureaux, K.Shiomoto, D.Brungard and JL. Le Roux, "GMPLS Protocol Extensions for Multi-

Beeram, et al

Expires August 18, 2013

[Page 8]

---

Internet-Draft

MELG

February 2013

Layer and Multi-Region Networks", [RFC 6001](#), October 2010.

## [8](#). Acknowledgments

Chris Bowers [[cbowers@juniper.net](mailto:cbowers@juniper.net)]

### Authors' Addresses

Vishnu Pavan Beeram  
Juniper Networks  
Email: [vbeeram@juniper.net](mailto:vbeeram@juniper.net)

Igor Bryskin  
ADVA Optical Networking  
Email: [ibryskin@advaoptical.com](mailto:ibryskin@advaoptical.com)

John Drake  
Juniper Networks  
Email: [jdrake@juniper.net](mailto:jdrake@juniper.net)

Gert Grammel

Juniper Networks  
Email: ggrammel@juniper.net

Wes Doonan  
ADVA Optical Networking  
Email: wdoonan@advaoptical.com

Manuel Paul  
Deutsche Telekom  
Email: Manuel.Paul@telekom.de

Ruediger Kunze  
Deutsche Telekom  
Email: Ruediger.Kunze@telekom.de

Oscar Gonzalez de Dios  
Telefonica  
Email: ogondio@tid.es

Cyril Margaria  
Nokia Siemens Networks  
Email: cyril.margaria@nsn.com

Beeram, et al

Expires August 18, 2013

[Page 9]

---

Internet-Draft

MELG

February 2013

Friedrich Armbruster  
Nokia Siemens Networks  
Email: friedrich.armbruster@nsn.com

Daniele Ceccarelli  
Ericsson  
Email: daniele.ceccarelli@ericsson.com

