              OSPF-TE extensions for MLNMRN based on OTN
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Abstract

   This document specifies OSPF extensions for multi-layer/multi-region
   where one of the regions is OTN.

Status of this Memo

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1 Introduction

This document specifies the OSPF extensions required to work in multi-region networks involving OTN. The specification is based on the requirement as specified in RFC 5212. As per the said RFC, ISCD characterizes the information associated to one or more network layers. Same RFC also says that the information about the adjustment capabilities of the nodes in the network allow the path computation process to select an end-to-end multi-layer or multi- region path that includes links with different switching capabilities joined by LSRs that can adapt (i.e., adjust) the signal between the links. By inference, information about the adjustment capabilities should be able to identify a layer in ISCD, if ISCD specifies more than one layer.

RFC6001 specifies how to advertise adjustment capabilities between two switching regions. IACD definition has provision to extend it for a specific technology through Adjustment Capability Specific information (ACSI) field, if required. ACSI field can be used to identify a layer in the multi-layer ISCD. OTN being defined as multi-layer ISCD, the corresponding IACD needs to be extended to be able to carry layer identification so as to enable multi-layer/multi-region path computation.

2. OTN Layer Identification

[GMPLS-OTN-OSPF] defines attributes that identifies a layer in multi-layer OTN ISCD. These attributes are part of Bandwidth sub-TLV in Switch capability specific information of ISCD. These attributes are reproduced here for completeness sake.

* Signal Type: Layer for which bandwidth is being advertised.
* Hierarchy : also called as multiplexing branch that specifies all
               the layers between server layer and signal type.
* TSG   : Time Slot Granularity

3. Interface Adjustment Capability Extensions for OTN

RFC6001 defines IACD sub-TLV as follows. Please refer to the RFC for
definition of individual fields of the sub-TLV.

```
  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
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 | Lower SC      | Lower Encoding| Upper SC      | Upper Encoding|
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                 Max LSP Bandwidth at priority 0               |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                 Max LSP Bandwidth at priority 1               |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                 Max LSP Bandwidth at priority 2               |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                 Max LSP Bandwidth at priority 3               |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                 Max LSP Bandwidth at priority 4               |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                 Max LSP Bandwidth at priority 5               |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                 Max LSP Bandwidth at priority 6               |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |                 Max LSP Bandwidth at priority 7               |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |            Adjustment Capability-specific information         |
 |                          (variable)                          |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Adjustment Capability-specific information abbreviated as ACSI
henceforth for OTN G.709v3 carries LayerID Sub-TLV which is defined
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
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 | Type = 1 (LayerID TLV)        |            Length             |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |  Signal type  | Num of stages |TSG |   Res    |    Stage#1    |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
 |    Stage#2    |      ...      |   Stage#N    |    Padding     |
 +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

The definition & meaning of fields used in the above sub-TLV is same
as in bandwidth sub-TLV of ISCD as defined in [GMPLS-OTN-OSPF]. This
LayerID sub-TLV is applicable only when one of the regions is OTN,
which means either lower or upper SC and Encoding type MUST have
Switch Cap as OTN-TDM and encoding type as G.709 ODUk. The 8

priorities of the BW as defined in main IACD structure, is adjustment
capability between the two regions where one of the region is
identifies by LayerID sub-TLV.

4 Procedure

A node advertising IACD for the bandwidth between a non-OTN interface
and an OTN interface MUST include the Layer ID TLV as part of ACSI as
defined above. For multi-region path computation, the path computing
node MUST look at the LayerID sub-TLV (in ACSI part of IACD) if
lower/upper SC and encoding type is OTN-TDM and G.709 ODUk
respectively to identify the layer in OTN ISCD.

5 IANA Considerations

TBD

6 Security Considerations

TBD

7 References

[RFC5212] K. Shiomoto, Papadimitriou, D.,JL. Le Roux, Vigoureux, M.,
           Brungard, D., "Requirements for GMPLS-Based Multi-Layer
           and Multi-Region Networks (MLN/ MRN)",RFC 5212, July 2008.

[RFC6001] Papadimitriou, D., Vigoureux, M., Shiomoto, K., Brungard,
           D., and JL. Le Roux, "Generalized MPLS (GMPLS) Protocol
           Extensions for Multi-Layer and Multi-Region Networks
           (MLN/MRN)", RFC 6001, October 2010.

[GMPLS-OTN-OSPF] Traffic Engineering Extensions to OSPF for
           Generalized MPLS (GMPLS)

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