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Traffic Engineering Extensions to OSPF for Generalized MPLS (GMPLS)
Control of SONET/SDH Networks
draft-ong-ccamp-gmpls-ospf-sdh-00

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Abstract

This draft defines an optimization for bandwidth advertisement for SONET/SDH that removes the need to carry multiple copies of the ISCD sub-TLV and has been designed to be consistent with the work on Technology Agnostic OSPF Traffic Engineering Extensions for Generalized MPLS (GMPLS) [[BA-TLV](#)].

These formats are based on previous experience prototyping and testing control plane for ASON networks and are proposed for adoption as a Standards Track RFC for support of ASON routing.

Requirements Language

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](#)].

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1. Introduction

The ITU-T defines the architecture of the Automatically Switched Optical Network (ASON) in [G.8080].

[RFC4258] details the routing requirements for the GMPLS suite of routing protocols to support the capabilities and functionality of ASON control planes identified in [G.7715] and in [G.7715.1].

[RFC4652] evaluates the IETF Link State Routing Protocols against the requirements identified in [RFC4258]. [Section 7.1 of \[RFC4652\]](#) summarizes the capabilities to be provided by OSPFv2 [RFC2328] in support of ASON routing. [RFC5787] is an Experimental RFC that defines extensions to OSPFv2 to support these requirements. It notes that the Interface Switching Capability Descriptor may be included for each layer of a multi-layer link [RFC4202] to meet ASON needs. However, for some types SONET/SDH links there can be several data plane layers supported by a single link, and as a result a need to carry several copies of the ISCD.

This draft defines the application of the Bandwidth Accounting sub-TLV defined in [\[BA-TLV\]](#) for SONET/SDH, to address the issues identified above.

2. Optimization of bandwidth advertisement for SONET/SDH

2.1 Requirements for Multi-layer SONET/SDH Links

[RFC4652] notes that in the ASON context, bandwidth accounting representations are possible, taking the form of a set of tuples <signal_type; number of unallocated timeslots>, and that this representation may also require definition of additional signal types (from those defined in [RFC4606]) to represent support of contiguously concatenated signals, i.e., STS-(3xN)c SPE / VC-4-Nc, N = 4, 16, 64, 256.

It notes that the ISCD defined in [RFC4202] can be used to support ASON without requiring any bandwidth accounting change from an LSR perspective. However, the ISCD defined in [RFC4202] must be advertised once per signal type (identified by the Minimum Reservable Bandwidth value) in order to provide an accurate advertisement of bandwidth

for each signal. For SONET/SDH links, it is common to support 4-5 signal types (e.g., STS-1, 3c, 12c, 48c and 192c) at once,

and advertisement of 4-5 ISCD sub-TLVs would consume about 200 bytes as compared to 20-30 bytes for a tuple format.

Most of the ISCD bytes are required to advertise 8 levels of priority. We believe this overhead can be reduced as (a) ASON specifications do not identify priority as an ASON service; and (b) TDM networks generally do not support preemption priority and do not require 8 levels of priority.

2.2. Bandwidth Accounting Sub-TLV for SONET/SDH

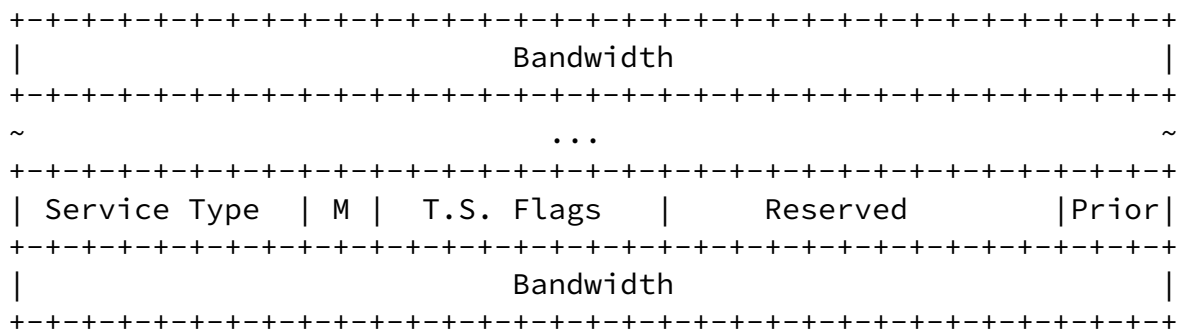
[BA-TLV] defines a Bandwidth Accounting Sub-TLV that can be used to carry SONET/SDH bandwidth availability at multiple link component signal types as supplementary information to the ISCD sub-TLV.

When multiple SONET/SDH signal types are advertised, a single ISCD is given for the smallest bandwidth signal type and the BA sub-TLV is also advertised to provide compact bandwidth availability advertisement for all signal types.

The type used for the sub-TLV is TBD.

[BA-TLV] defines this format:

| 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 | | | | | | | | |
| Switching Cap | | | | | | | | | | Encoding | | | | | | | | | | Reserved | | | | | | | | | | | | | | | | | | | |
| Service Type | | | | | | | | | | M | T.S. Flags | | | | | | | | | | Reserved | | | | | | | | | | Prior | | | | | | | | |
| Bandwidth | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Service Type | | | | | | | | | | M | T.S. Flags | | | | | | | | | | Reserved | | | | | | | | | | Prior | | | | | | | | |
| Bandwidth | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Service Type | | | | | | | | | | M | T.S. Flags | | | | | | | | | | Reserved | | | | | | | | | | Prior | | | | | | | | |



For SONET/SDH networks, the Switching Capability field and the Encoding field MUST take the following values: Switching Capability (8 bits)=100 (TDM). Encoding (8 bits)=5 (Sonet/SDH).

If no priority is supported, just the 0 priority MUST be advertised.

Service Type (8 bits) takes values as below for SONET/SDH Signal Type:

| Value | Type (Elementary Signal) |
|-------|--------------------------|
| ----- | ----- |
| TBD | STS-1 SPE / VC-3 |
| TBD | STS-3c SPE / VC-4 |
| TBD | STS-12c SPE/VC-4-4c |
| TBD | STS-48c SPE/VC-4-16c |
| TBD | STS-192c SPE/VC-4-64c |

Bandwidth (32 bits) is used to specify the number of identical unallocated timeslots per Service Type and per TE Link. As such, the initial value(s) of this TLV indicates the total capacity in terms of number of timeslots per TE link. The service type included in the BW sub-TLV is specific to the layer link being reported and is not derived from some other signal type (e.g. STS-48c is not announced as 16 x STS-3c).

For instance on an OC-192/STM-64 interface the bandwidth for service type STS-3c SPE/VC-4 may be initially equal to 64, and the bandwidth for service type STS-48c SPE/VC-4-16c may be equal to 4 depending on the interface capabilities. Once one timeslot is occupied by being allocated for a connection at the same or a larger service type or being blocked due to the allocation of part of the timeslot for a connection at a smaller service type, the bandwidth is decreased by the number of timeslots

this connection implies.

[3.](#) IANA Considerations

IANA will allocate codepoints for the Service Type of the Bandwidth Availability sub-TLV for SONET/SDH from the standard range. Five Service Type values are requested.

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[4.](#) Security Considerations

This document defines an optimization for SONET/SDH link bandwidth advertisement consistent with the requirements in [[RFC4258](#)] and [[RFC4652](#)]. No additional security issues are identified.

[5.](#) Acknowledgements

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