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Optimization of GMPLS BW advertisement for SONET/SDH  
draft-ong-gmpls-ason-routing-exper-02

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Abstract

IETF CCAMP WG has defined a set of extensions to OSPFv2 to support ASON routing requirements in [[RFC5787](#)]. No extensions were defined for bandwidth advertisement as the Interface Switching Capability Descriptor may optionally be included for each layer of a multi-layer link [[RFC4202](#)]. 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 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 advertisement of bandwidth for OTN.

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](#)].

## Table of Contents

<a href="#">1.</a>	Introduction . . . . .	<a href="#">3</a>
<a href="#">2.</a>	Optimization of bandwidth advertisement for SONET/SDH. . . . .	<a href="#">3</a>
<a href="#">2.1.</a>	Requirements for Multi-layer SONET/SDH Links . . . . .	<a href="#">3</a>
<a href="#">2.2.</a>	Link Component Availability Sub-TLV. . . . .	<a href="#">4</a>
<a href="#">3.</a>	IANA Considerations . . . . .	<a href="#">5</a>
<a href="#">4.</a>	Security Considerations . . . . .	<a href="#">6</a>
<a href="#">5.</a>	Acknowledgements . . . . .	<a href="#">6</a>
<a href="#">6.</a>	References. . . . .	<a href="#">6</a>
<a href="#">6.1.</a>	Normative References. . . . .	<a href="#">6</a>
<a href="#">6.2.</a>	Informative References. . . . .	<a href="#">6</a>
	Authors' Addresses . . . . .	<a href="#">7</a>
	Intellectual Property and Copyright Statements . . . . .	<a href="#">7</a>

Internet-Draft [draft-ong-gmpls-ason-routing-exper-02](#)

July 2010

## 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 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 advertisement of bandwidth for OTN.

## 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. Link Component Availability Sub-TLV

A Link Component Availability Sub-TLV is defined that carries an indication of SONET/SDH bandwidth 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 LCA sub-TLV is also advertised to provide compact bandwidth availability advertisement for all signal types.

The type used for the sub-TLV is TBD.

The following format is defined:

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	2	3	4	5	6	7	8	9																								
Type (tbd)																Length = 8 + n*4																																															
Switching Cap								Encoding								Reserved																																															
7 6 5 4 3 2 1 0								Reserved								Reserved																																															
Signal Type								Number of Unallocated Timeslots																																																							
Signal Type								Number of Unallocated Timeslots																																																							
//																...																//																															

Signal Type	Number of Unallocated Timeslots

Note: n defines the number of signal types supported on this link, and thus has a value greater than or equal to 1. Inherited from [RFC4202], the Switching Capability field and the Encoding field MUST take the following values for Sonet/SDH interfaces: Switching Capability (8 bits)=100 (TDM). Encoding (8 bits)=5 (Sonet/SDH).

Ong & Theillaud

Expires January 12, 2011

[Page 4]

Internet-Draft

[draft-ong-gmpls-ason-routing-exper-02](#)

July 2010

Priority flags (8 bits): Indicate the priorities supported on the advertised link (0 is highest and 7 is lowest). When the flag is set, the corresponding priority is supported and for each signal type, a "row" (i.e. signal type + unreserved bandwidth field) is included, in order from the highest to the lowest priority.

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

Signal Type (8 bits) (as defined in [RFC4606]):

Value	Type (Elementary Signal)
5	STS-1 SPE / VC-3 [RFC4606]
6	STS-3c SPE / VC-4 [RFC4606]
TBD	STS-12c SPE/VC-4-4c
TBD	STS-48c SPE/VC-4-16c
TBD	STS-192c SPE/VC-4-64c

Number of Unallocated Timeslots (24 bits):

Specifies the number of identical unallocated timeslots per Signal 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 signal type included in the BW announcement 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 either the number of STS-3c SPE/VC-4 unallocated timeslots is initially equal to 64, or the number of STS-48c SPE/VC-4-16c unallocated timeslots is equal to 4 or even a combination of both type of signals depending on the interface capabilities. Once one of these timeslots is occupied either by being allocated for a connection at the same or a larger

signal type or by being blocked due to the allocation of part of the timeslot for a connection at a smaller signal type, the number of unallocated timeslots is decreased by the number of timeslots this connection implies.

### [3.](#) IANA Considerations

IANA will allocate codepoints for the new Link Component Allocation sub-TLV and its associated sub-fields from the standard range. Three new Signal Type values are needed.

Ong & Theillaud

Expires January 12, 2011

[Page 5]

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Internet-Draft [draft-ong-gmpls-ason-routing-exper-02](#)

July 2010

### [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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Ong & Theillaud

Expires January 12, 2011

[Page 6]

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Internet-Draft

[draft-ong-gmpls-ason-routing-exper-02](#)

July 2010

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