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Information Encoding for WSON with Impairments Validation
draft-martinelli-ccamp-wson-iv-encode-03

Abstract

Impairment-Aware (IA) Routing and Wavelength Assignment (RWA) function might be required in Wavelength Switched Optical Networks (WSON) that already support RWA. This document defines proper encoding to support this operation. It goes in addition to the available impairment-free WSON encoding and it is fully compatible with it.

As the information model, the encoding is independent from control plane architectures and protocol implementations. Its definitions can be used in related protocol extensions.

Status of This Memo

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1. Introduction

In case of WSON where optical impairments play a significant role, the framework document [RFC6566] defines related control plane architectural options for Impairment Aware Routing and Wavelength Assignment (IA-RWA). This document provides a suitable encoding for the related WSON impairment information model as defined [I-D.martinelli-ccamp-wson-iv-info].

This document directly refers to ITU recommendations [ITU.G680] and [ITU.G697] as already detailed in the information model.

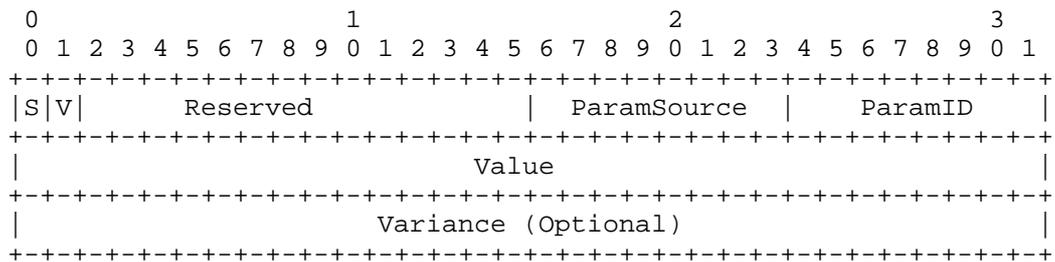
1.1. Requirements Language

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].

2. Encoding

2.1. Optical Parameter

The OPTICAL_PARAM is defined as a sub TLV object.



The following flag is defined:

S. Standard bit.
 S=1 identifies a set of parameters standardized by ITU; while S=0 identifies a non-standardized set of parameters.

V. Variance bit.
 V=0 only parameter value, V=1 parameter value and variance.

With the flag S=1 the following parameters are defined:

ParamSource. Where this parameter is defined. Currently only [ITU.G697] has defined this with value 1.

ParamID. Parameter identifier according to the source. [ITU.G697] table V.3 defines the following identifiers:

1. Total Power (dBm)
2. Channel Power (dBm)
3. Reserved (Defined in [ITU.G697] but not used)
4. Reserved (Defined in [ITU.G697] but not used)
5. OSNR (db)

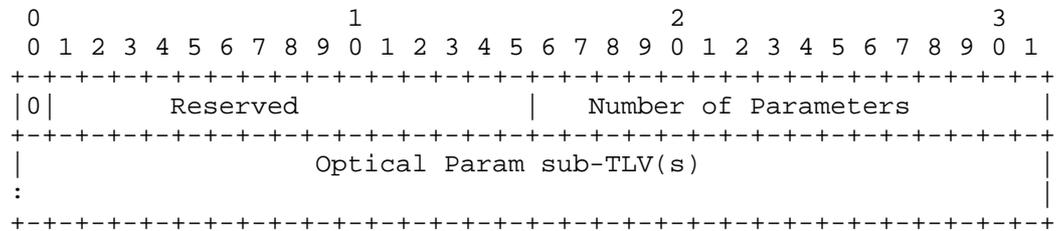
- 6. Q Factor (a pure number)
- 7. PMD (ps)
- 8. Residual Chromatic Dispersion (ps/nm)

Value. Value for the parameter. As defined by [ITU.G697], it is a 32 bit IEEE floating point number.

Variance. Variance for the parameter, a 32 bit IEEE floating point number.

2.2. Impairment Vector

This sub-TLV is a list of optical parameters and they MAY have a wavelength dependency information.

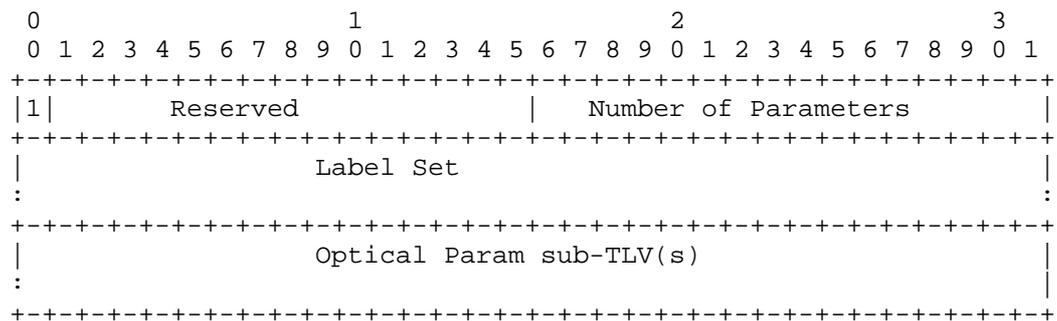


Where:

W = 0. Wavelength Dependency flag. There is no wavelength dependency.

Number of Parameters contained in this vector.

Optical Param sub-TLV(s) present a list of Object as defined in Section 2.1.



Where:

W = 1. Wavelength Dependency flag. There is wavelength dependency.

The Label Set object is defined in [I-D.ietf-ccamp-general-constraint-encode] Section 2.1. Likely an inclusive range will be the only option required by the Action defined in the Label Set.

2.3. Impairment Matrix

As defined by the [I-D.martinelli-ccamp-wson-iv-info], the impairment matrix follows the same structure as the connectivity matrix.

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
Connectivity										MatrixID										Reserved										0									
Link Set A #1																														:									
Link Set B #1																														:									
Impairment Vector sub-TLV(s)																														:									
Additional Link Set pairs and Impairment Vector(s)																														:									

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
Connectivity										MatrixID										Reserved										1									
Impairment Vector sub-TLV(s)																														:									

Where:

Connectivity: value MUST be 2 for the impairment matrix (Values 0 and 1 are already defined by [I-D.ietf-ccamp-general-constraint-encode]).

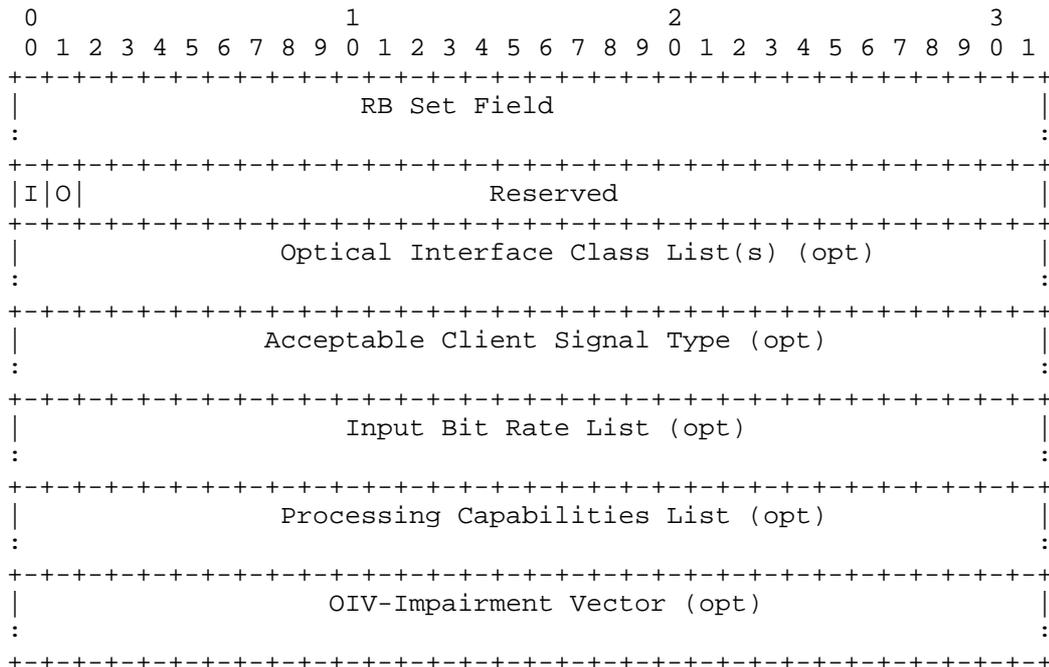
MatrixID: matrix identifier, the scope of this integer number is shared with [I-D.ietf-ccamp-rwa-info].

N: Node scope flag. With this flag set there's no Link Set information but only a list of optical parameters TLVs that apply to the whole optical node.

The usage of multiple matrixes with connectivity type equal to 2 (Impairment Matrix) MIGHT be used to grup optical parameters by connectivity. For example, if a subset of parameters apply to the whole node, a unique matrix with flag N=1 is used. At the same some another subset of parameters applies only to some LinkSet pairs, a specific Impairment Matrix will be added.

2.4. Resource Block Information

As defined by [I-D.martinelli-ccamp-wson-iv-info], the concept of resource block is extended to support the description of the impairments related to that block. The encoding follows the same structure as the one defined in [I-D.ietf-ccamp-rwa-wson-encode], with the addition of an optional Impairment Vector sub-object:



The Impairment Vector is defined within Section 2.2. All the other fields are defined within [I-D.ietf-ccamp-rwa-wson-encode].

3. Acknowledgements

TBD

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This document was the collective work of several authors. The text and content of this document was contributed by the editors and the co-authors listed below (the contact information for the editors appears in appropriate section and is not repeated below):

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5. IANA Considerations

This document does not contain any IANA request.

6. Security Considerations

This document defines an protocol-neutral encoding for an information model describing impairments in optical networks and it does not introduce any security issues. If such a encoding is put into use

within a network it will by its nature contain details of the physical characteristics of an optical network. Such information would need to be protected from intentional or unintentional disclosure.

7. References

7.1. Normative References

- [ITU.G680] International Telecommunications Union, "Physical transfer functions of optical network elements", ITU-T Recommendation G.680, July 2007.
- [ITU.G697] International Telecommunications Union, "Optical monitoring for dense wavelength division multiplexing systems", ITU-T Recommendation G.697, February 2012.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

7.2. Informative References

- [I-D.ietf-ccamp-general-constraint-encode] Bernstein, G., Lee, Y., Li, D., and W. Imajuku, "General Network Element Constraint Encoding for GMPLS Controlled Networks", draft-ietf-ccamp-general-constraint-encode-13 (work in progress), November 2013.
- [I-D.ietf-ccamp-rwa-info] Lee, Y., Bernstein, G., Li, D., and W. Imajuku, "Routing and Wavelength Assignment Information Model for Wavelength Switched Optical Networks", draft-ietf-ccamp-rwa-info-19 (work in progress), November 2013.
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[RFC6566] Lee, Y., Bernstein, G., Li, D., and G. Martinelli, "A Framework for the Control of Wavelength Switched Optical Networks (WSONs) with Impairments", RFC 6566, March 2012.

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