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**Information Encoding for WSON with Impairments Validation**  
**draft-martinelli-ccamp-wson-iv-encode-02**

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.

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## Table of Contents

<a href="#">1.</a>	<a href="#">Introduction</a>	<a href="#">2</a>
<a href="#">1.1.</a>	<a href="#">Requirements Language</a>	<a href="#">2</a>
<a href="#">2.</a>	<a href="#">Encoding</a>	<a href="#">3</a>
<a href="#">2.1.</a>	<a href="#">Optical Parameter</a>	<a href="#">3</a>
<a href="#">2.2.</a>	<a href="#">Impairment Vector</a>	<a href="#">4</a>
<a href="#">2.3.</a>	<a href="#">Impairment Matrix</a>	<a href="#">5</a>
<a href="#">3.</a>	<a href="#">Acknowledgements</a>	<a href="#">6</a>
<a href="#">4.</a>	<a href="#">Contributing Authors</a>	<a href="#">6</a>
<a href="#">5.</a>	<a href="#">IANA Considerations</a>	<a href="#">7</a>
<a href="#">6.</a>	<a href="#">Security Considerations</a>	<a href="#">7</a>
<a href="#">7.</a>	<a href="#">References</a>	<a href="#">7</a>
<a href="#">7.1.</a>	<a href="#">Normative References</a>	<a href="#">7</a>
<a href="#">7.2.</a>	<a href="#">Informative References</a>	<a href="#">7</a>
	<a href="#">Authors' Addresses</a>	<a href="#">8</a>

## [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](#)].



### 2.1. Optical Parameter

[illegible]

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.

```

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
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|0|           Reserved           | Number of Parameters           |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               Optical Param sub-TLV(s)           |
:                               |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

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](#).

```

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
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|1|           Reserved           | Number of Parameters           |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               Label Set                           |
:                               |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                               Optical Param sub-TLV(s)           |
:                               |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

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.

[Xian's note]: (1) Similar problem as mentioned above applies, the structure differs when N is set to different values; so they should be described separately; (2) I would prefer the "w" stay with the previous structure. (3) Since the format of impairment matrix does not follow exactly as the connectivity matrix. i would suggest revising the sentence above to reflect this.

```

      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
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| 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
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| 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 group 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.

### **3. Acknowledgements**

TBD

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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.
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