

Problem Statement

Signaling extensions for Media Channel sub-carriers configuration in Spectrum Switched Optical Networks (SSON) in Lambda Switch Capable (LSC) Optical Line Systems.

draft-ggalimbe-ccamp-flexigrid-carrier-label-03

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Motivation

- Generalised Multiprotocol Label Switched (GMPLS) is widely used in Wavelength Switched Optical Network (WSON) to support the optical circuits set-up through the signalling between Core Nodes and Edge Nodes.
- Spectrum Switched Optical Networks (sson) are in advanced development phase or even ready to be deployed.
- No information is available in signalling to support the sub-carriers definition / reservation in sson
- RFC7698 Ch.3.3 defines the concept of Media Channel and the associated carriers set needed for Spectrum Switched Optical Network (SSON).
- The new labels are related to the Media Channel and the carriers routed with it and keep the backward compatibility with the WSON signalling. In particular this informational memo wants do address the use cases where the SSON LSP (the Media Channel in RFC7698) carries multiple carrier (OTSi) containing same Payload. The set of the carriers can be seen as single Logical circuit.

Document Scope

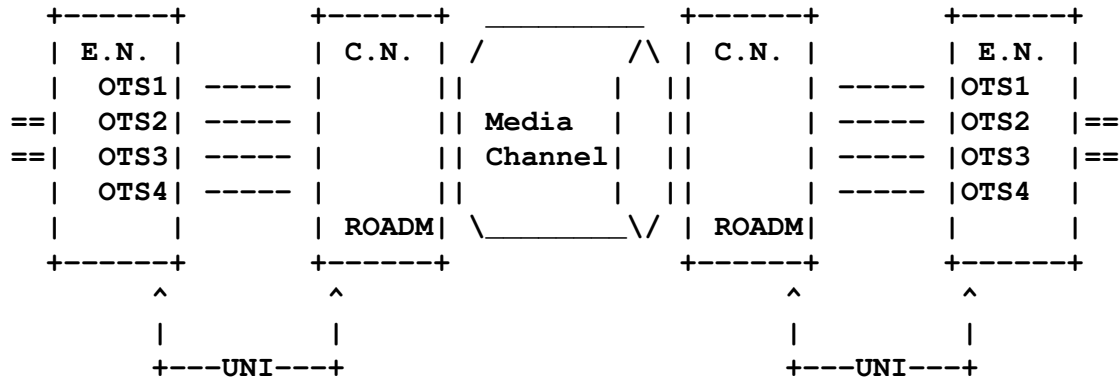
- This document proposes the experimental results from the GMPLS implementation supporting the Spectrum Switched Optical Network
- This memo can be considered as the "companion" of [RFC7699] The contents and the parameters reflect the experimental activity on IP over SSON recently done.
- Or can be and extension of [RFC7792] (TSPEC/FLOW_SPEC)

Changes from the previous version

- Addressed the comments from ccamp IETF 100
- Fixed typos
- Added some description text
- TLVs did NOT change from -02 version

The application

Multiple carrier are mapped into a Media Channel. A set of parameters must be shared on the UNI to allow the GMPLS to do the proper routing and Spectrum Assignment and decide the carrier position.



E.N. = Edge Node - UNI Client

C.N. = Core Node - UNI Network

ROADM = Lambda/Spectrum switch

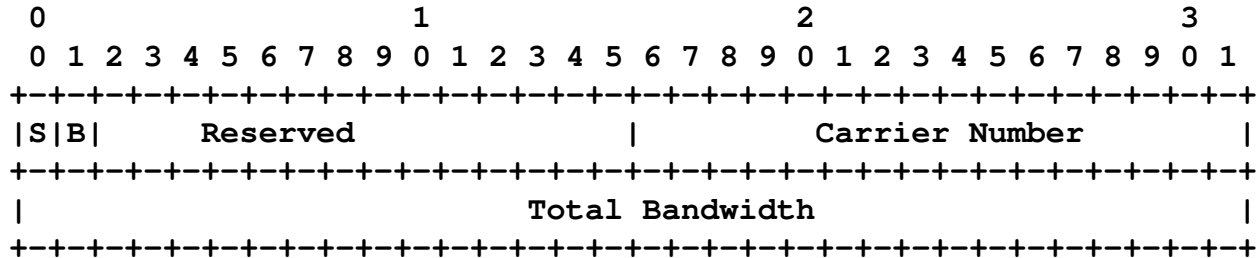
Media Channel = the optical circuit

OTS_i = Carriers belonging to the same Network Media Channel (or Super Channel)

UNI = Signaling interface

Model proposal

New LSP set-up parameters: SSON LSP set-up request



Carrier Number: number of carrier to be allocated for the requested channel (16-bit unsigned integer)

If Carrier Number == 0 no constraint set on the number of carriers to be used

S strict number of subcarrier

- S = 0 the number of requested carriers is the maximum number that can be allocated (a lower value can be allocated if the requested bandwidth is satisfied)
- S = 1 the number of requested carriers is strict (must be > 0)

Total Bandwidth: the requested total bandwidth to be supported by the Media Channel (32-bit IEEE float, bytes/s)

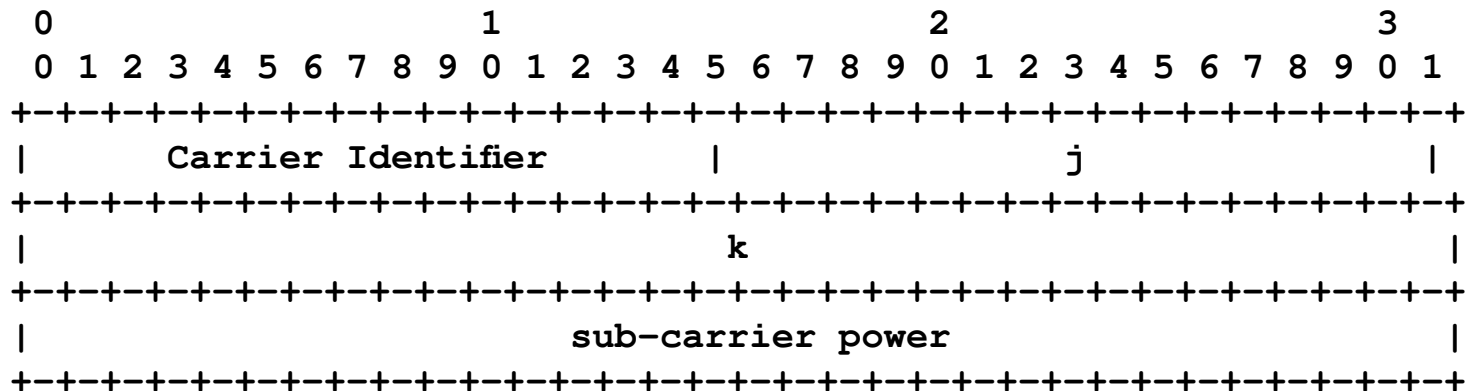
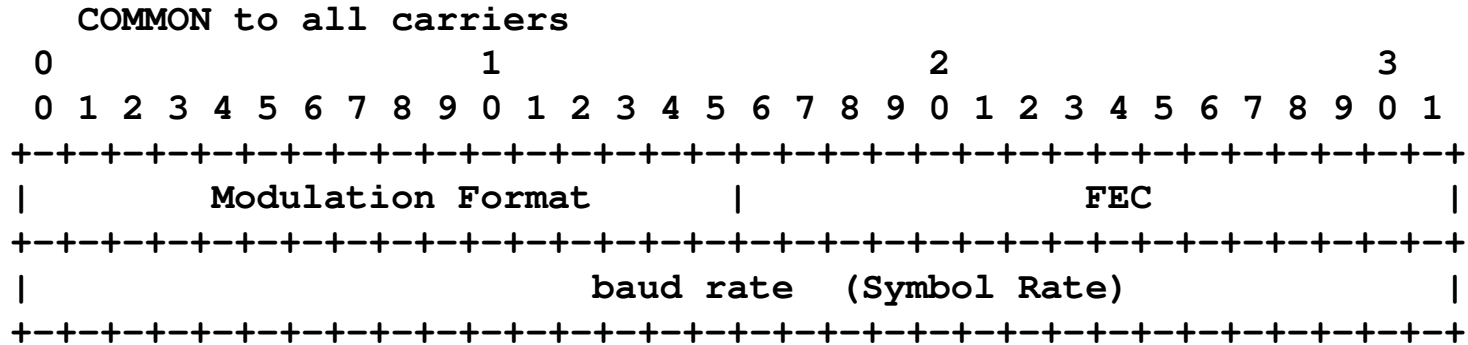
If Total Bandwidth == 0: no bandwidth constraint is defined (B must be 0) B Bandwidth constraints

- B = 0: the value is the maximum requested bandwidth (a lower value can be allocated if resources are not available)
- B = 1: the requested bandwidth is the minimum value to be allocated (a higher value can be allocated if requested by the physical constraints of the ports)

Reserved: unused bit (for future use, should be 0)

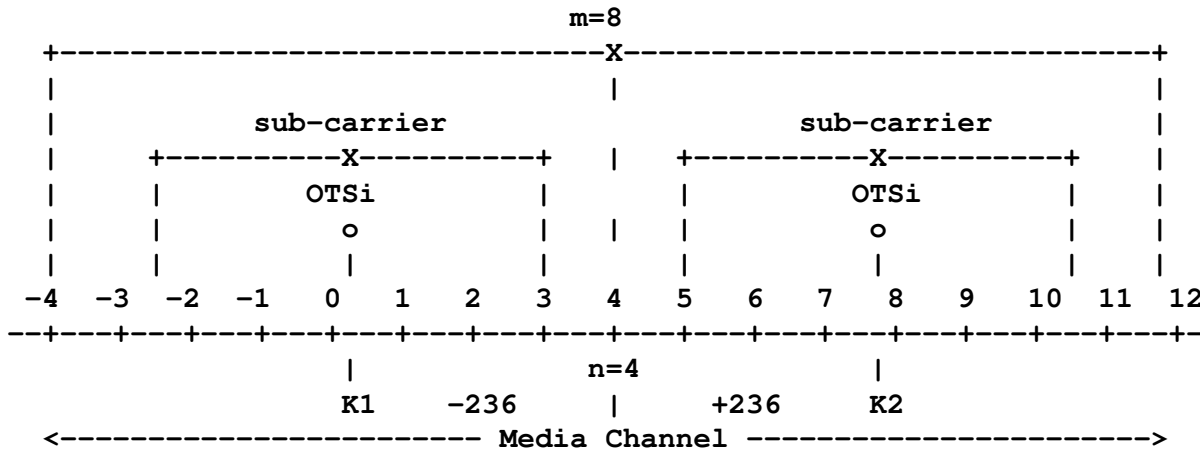
Model proposal

Extension to LSP set-up reservation:



Model Proposal cont'

- m Media Channel width
- n Media channel central frequency
- Sub carrier identifier field: sub-carrier identifier inside the Media Channel
- J field: granularity of the channel spacing, can be a multiple of 0.01GHz. default value is 0.1GHz.
- K field: positive or negative integer (including 0) to multiply by J and identify the S.C. Position inside the Media Channel, J can be set at default value = 0.1GHz.



$$\text{Media Channel CF} = 193.1 + n * 0.00625 \text{ (THz)}$$

$$\text{Media Channel Width} = m * 0.0125 \text{ (THz)}$$

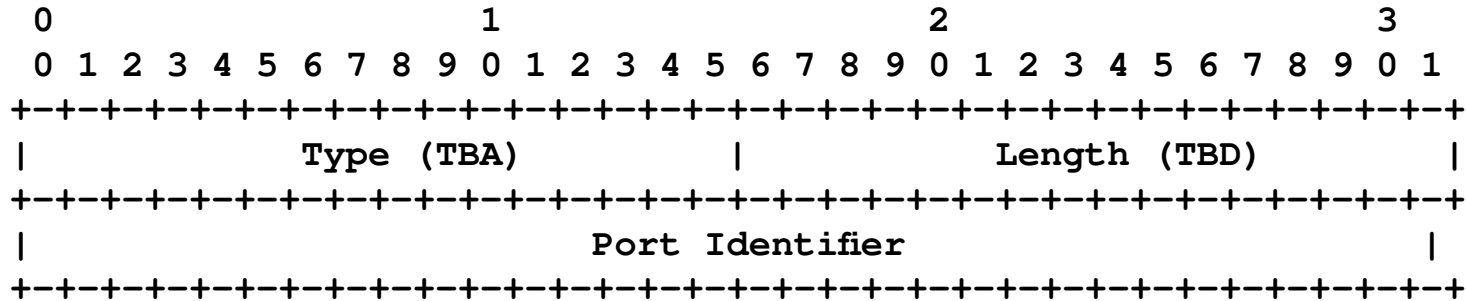
$$\text{SC-1} = \text{MC-CF} + k1 * 0.1 \text{ GHz. (j) (GHz)}$$

$$\text{SC-2} = \text{MC-CF} + k2 * 0.1 \text{ GHz. (j) (GHz)}$$

Model proposal

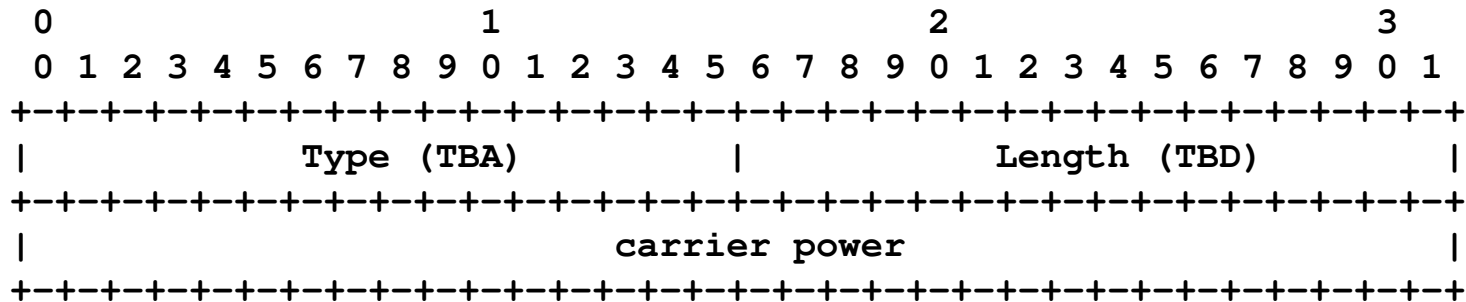
The defined sub-TLVs are:

Port Identifier



Port Identifier: the local upstream optical logical identifier (32-bits integer, ifindex) SPECIFIC to each carrier

Carrier Power:



Next steps

- Collect feedbacks on the proposal
- Address feedbacks and comments
- Start discussion how to progress with the adoption of the new objects

IETF 101 – CCAMP WG

draft-ggalimbe-ccamp-flex-if-Imp-04

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LMP Considerations

- LMP address the discovery/parameter-negotiation use case
- LMP is neither used for configuration nor provisioning and there is no mentioning of configuration or provisioning in these drafts
- Discovery determines the limitations of the single channel interface to a WDM line system
- The parameter extension to SSON technology is needed
- Discovery determines the limitations of the multiple channel interface to a SSON line system

Changes from the previous versions

Draft-ggalimbe-ccamp-flex-if-Imp-04

- Corrected few typo
- Reshaped reference documents section
- Fixed some reference

Data Plane Reference Model

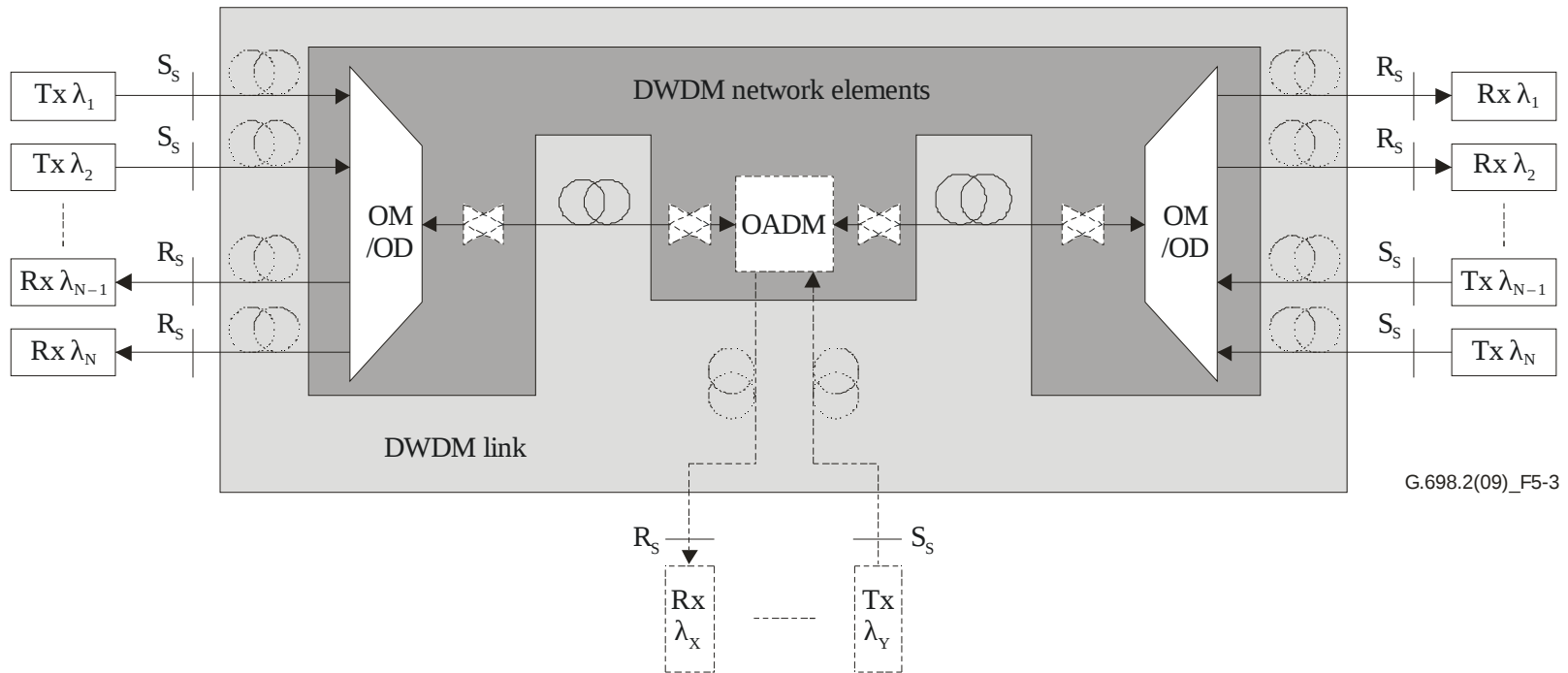


Figure 5-3 – Linear "black link" approach for bidirectional applications

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The parameters added for SSON are:

1. **Modulation identifier:** indicates the Transceiver capabilities to support a single or multiple modulation format like: BPSK, DC-DP-BPSK, QPSK, DP-QPSK, QAM16, DP-QAM16, DC-DP-QAM16, QAM64, etc.
2. **FEC:** indicates the FEC types the transceiver can support
3. **baud rate:** number of symbols rate, basically this identifies the channel frequency
4. **Number Carriers:** number of subcarriers the transceiver can support and can be "mapped" in a Media Channel
5. **Bits/symbol:** number of bit per symbol (aka spectral efficiency)
6. **Subcarrier band** (minimum distance between subcarriers) in GHz required by the transceiver
7. **Guard band** (required guard band at the side of media channel)
8. **Sub-carrier TX Power:** output optical power the transceiver can provide
9. **Sub-carrier RX Power:** Input optical power Range the transceiver can support, this is known also as Sensitivity
10. **Sub-carrier OSNR robustness**
11. **Max-pol-power-difference**
12. **Max-pol-skew-difference**

Next Steps

- Solicit feedback/comments from the group.
- Achieve consensus

Keep in mind: LMP is not for configuration!