

Framework for GMPLS and PCE Control of Spectrum Switched Optical Networks

draft-zhang-ccamp-sson-framework-00.txt

CCAMP WG, IETF 83

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Introduction

- [draft-zhang-ccamp-sson-framework-00.txt](#)
 - Previously submitted as draft-zhang-ccamp-flexible-grid-requirements
 - Minor update : FWK wording, editorial changes, refine requirements
- **Goals**
 - Establish a framework for SSON @ CCAMP / PCE
 - data plane elements model for the purposes of GMPLS control
 - flexi-grid [G.694.1 version 1.6]
 - flexi-enabled ROADMs / transponders
 - Terminology
 - Define Routing and Spectrum Assignment models
 - R&SA, R+SA, R-DSA, ...
 - Set of initial requirements
- **Non Goals**
 - Define protocol extensions / encodings

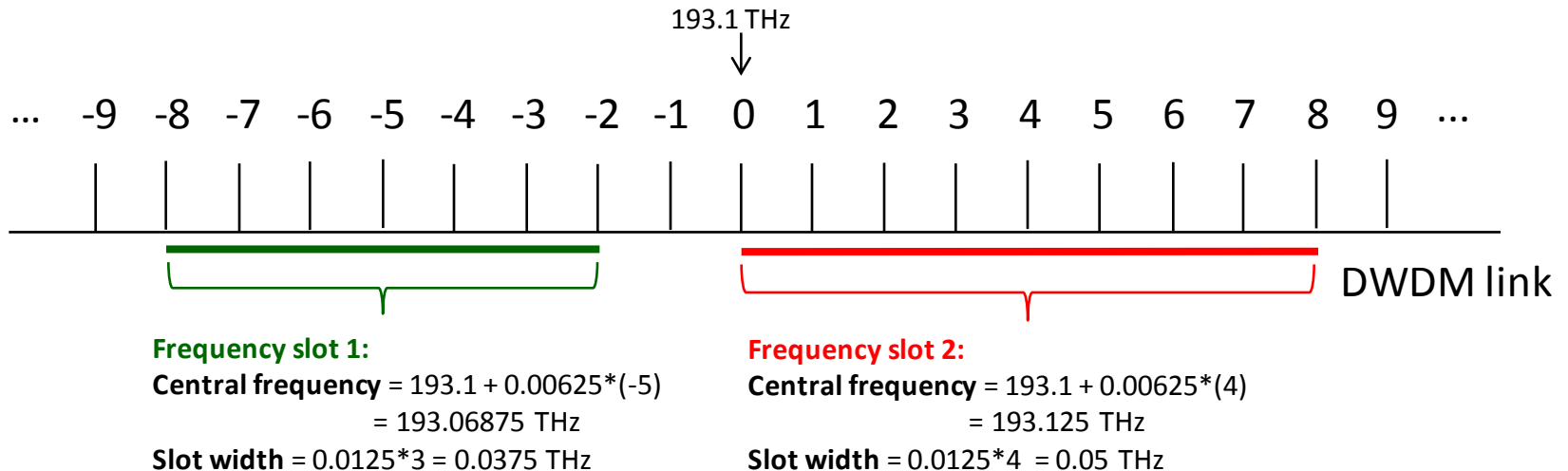
Draft initial assumptions w/ SSON

- Extend WSON to SSON
 - *WSON-like* data plane architecture with optical connections over a contiguous optical spectrum “chunk”, represented by a single control plane construct.
 - Non-contiguous spectrum slices not considered.
- Considering the same LSC switching capability
 - Evolution of WSON
 - allow cases with heterogeneous optical spectrum requirements (m)

Terminology

- **SSON**: Spectrum-Switched Optical Network.
 - Data plane connection is switched based on an optical spectrum frequency slot of a variable slot width, rather than based on a fixed grid and fixed slot width.
 - Wavelength Switched Optical Network (WSO) ~ particular case of SSON in which all slot widths are equal and depend on the used channel spacing.
- **Flexi-LSP**:
 - A control plane construct that represents a data plane connection in which the switching involves a frequency slot of a variable (flexible) slot width
- **RSA**: Routing and Spectrum Assignment
- **SCC**: Spectrum Continuity Constraint

Flexi-Grid - SSON



Flexi-Grid: a new WDM frequency grid defined with the aim of allowing flexible optical spectrum management, in which the Slot Width of the frequency ranges allocated to different channels are flexible (variable sized).

Frequency Slot: The frequency range allocated to a channel and unavailable to other channels within a flexible grid. A frequency slot is defined by its **nominal central frequency** and its **slot width**.

Central Frequency = $193.1 \text{ THz} + n * 0.00625 \text{ THz}$

Slot Width : the full width (in Hz) of a frequency slot, a multiple (m) of 12.5 GHz, 12.5 is the **slot width granularity** in GHz).

Characterizing SSON

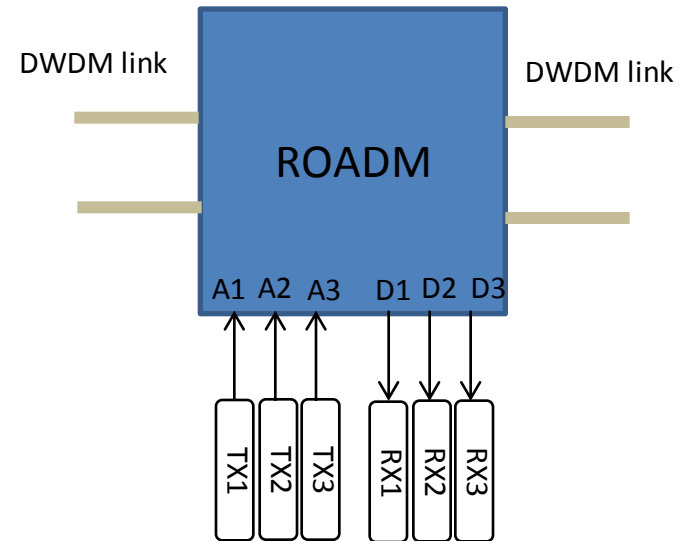
DWDM Links

Available frequency ranges: the set or union of frequency ranges that are not allocated.

Central frequency granularity: the step granularity of nominal central frequency.

Slot width granularity: the step granularity of slot width.

Slot width range: the minimal and maximal slot width a link supported.



Transmitters/Receivers

Available central frequencies: The set of central frequencies which can be used by an optical transmitter/receiver.

Slot width: The slot width needed by a transmitter/receiver.

GMPLS Requirements for SSON Control

◆ Routing Aspects:

- ✓ WSON related information (except wavelength availability) (See Section 6.2 of RFC6163)
 - Eg. connectivity matrix, signal compatibility and processing...
- ✓ Available Frequency Ranges of each link (Link information)
- ✓ Port restriction information (central frequency granularity, slot width granularity, slot width range)

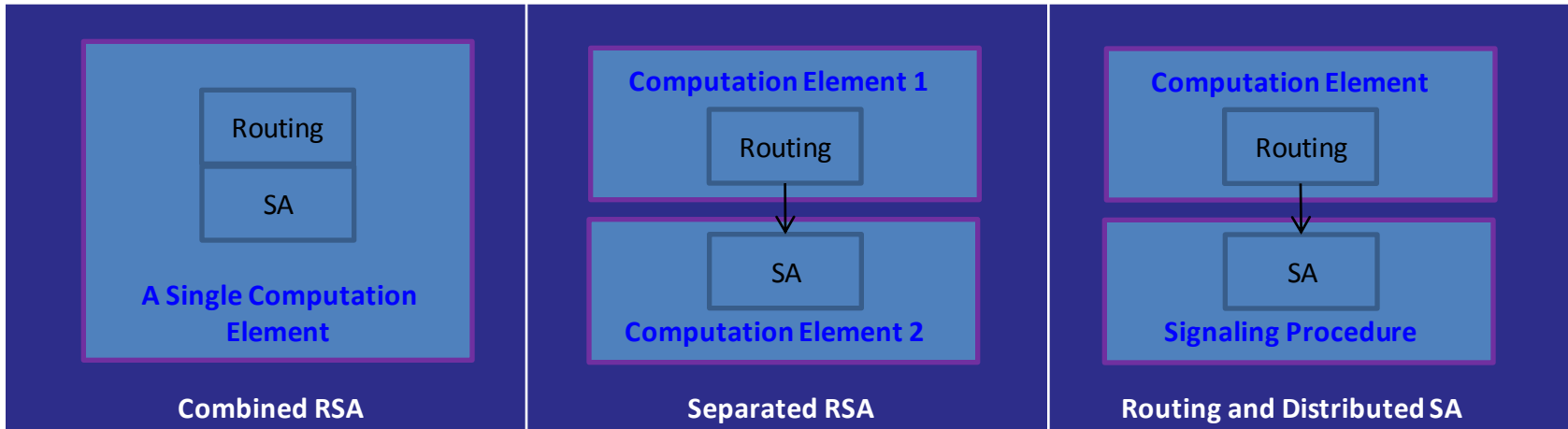
◆ Signaling Aspects:

- ✓ Identifying the Slot Width Requirement
- ✓ Identifying the Central Frequency assigned to a LSP
- ✓ Signal compatibility information defined in WSON drafts

◆ PCE Aspects:

- ✓ Depends on the RSA models
- ✓ Signal compatibility constraints
- ✓ Frequency Constraints (slot width, Available central frequencies)

RSA Models



Both of the route and frequency slot are determined before the signaling procedure. With Separate RSA, Routing may suggest candidate frequency slot to SA which will allocate final slot assignment from the candidate pool.

Only the route is determined before the signaling procedure, frequency slot is allocated by the signaling procedure

In all cases, the computation element(s) could reside on PCE(s) or ingress nodes.

Next Steps

- WG feedback on
 - Data plane assumptions & scope ?
 - Multi-carrier /Super-channel?
 - Non-contiguous frequency slots ?
- Further refinement of:
 - RSA models
 - Flexi-grid enabled transponders & ROADMs models
 - Requirements
- Coordination/Integration with other Fwk / Reqs drafts
 - Framework for GMPLS Control of Flexible Grid Network
 - draft-wang-ccamp-gmpls-flexigrid-framework-01
 - A Framework for control of Flex Grid Networks
 - draft-syed-ccamp-flexgrid-framework-ext-00