



PCEP EXTENSION FOR FLEXIBLE GRID NETWORKS

[HTTPS://TOOLS.IETF.ORG/HTML/DRAFT-LEE-PCE-FLEXIBLE-GRID-00](https://tools.ietf.org/html/draft-lee-pce-flexible-grid-00)

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OVERVIEW

- It is the right time to introduce PCEP extension for flexible grid networks.
 - [RFC7698] provides Framework and Requirements for GMPLS-Based Control of Flexi-Grid DWDM.
 - Maturity of IETF protocols such as OSPF-TE and RSVP-TE for flexible grid networks.
 - Deployment of this technology in operators' commercial networks.
- What are Flexible Grid Networks?
 - To allow efficient allocation of optical spectral bandwidth for systems that have high bit-rates, the International Telecommunication Union Telecommunication Standardization Sector (ITU-T) has extended its Recommendations G.694.1 and G.872 to include a new Dense Wavelength Division Multiplexing (DWDM) grid by defining a set of nominal central frequencies, channel spacings, and the concept of the "frequency slot".
 - In such an environment, a dataplane connection is switched based on allocated, variable-sized frequency ranges within the optical spectrum, creating what is known as a flexible grid (flexi-grid).

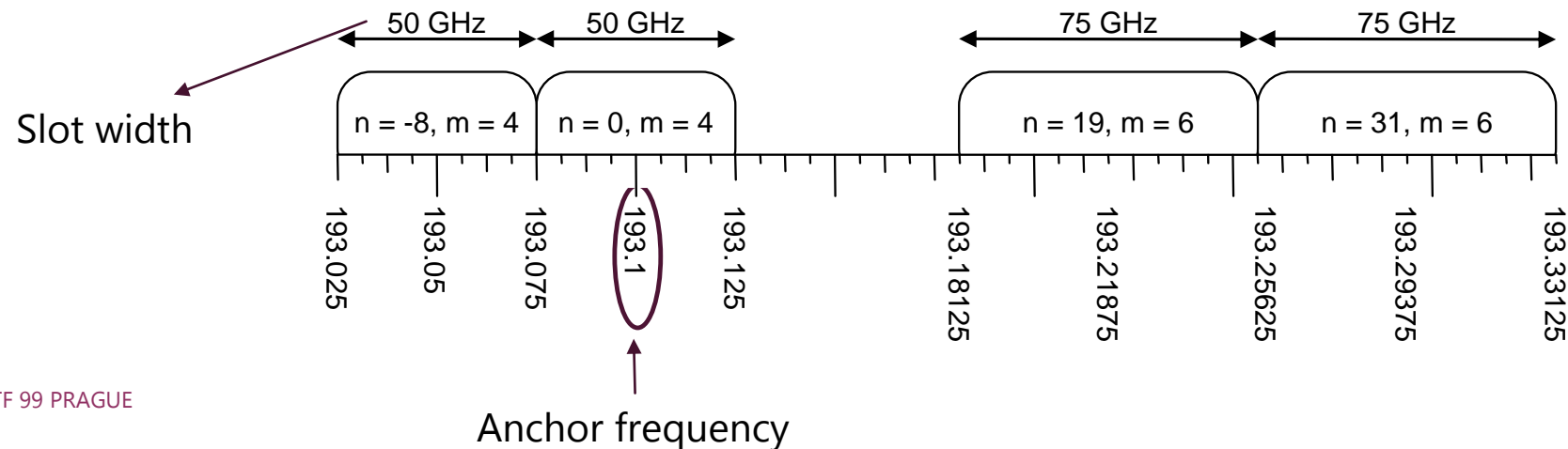
FLEXIBLE GRID EXAMPLE

For the flexible DWDM grid, the allowed **frequency slots** have a nominal central frequency (in THz) defined by:

$193.1 + n \times 0.00625$ where **n** is a positive or negative integer including 0
and 0.00625 is the **nominal central frequency** granularity in THz

and a **slot width** defined by:

$12.5 \times m$ where **m** is a positive integer and 12.5 is the **slot width granularity** in GHz.



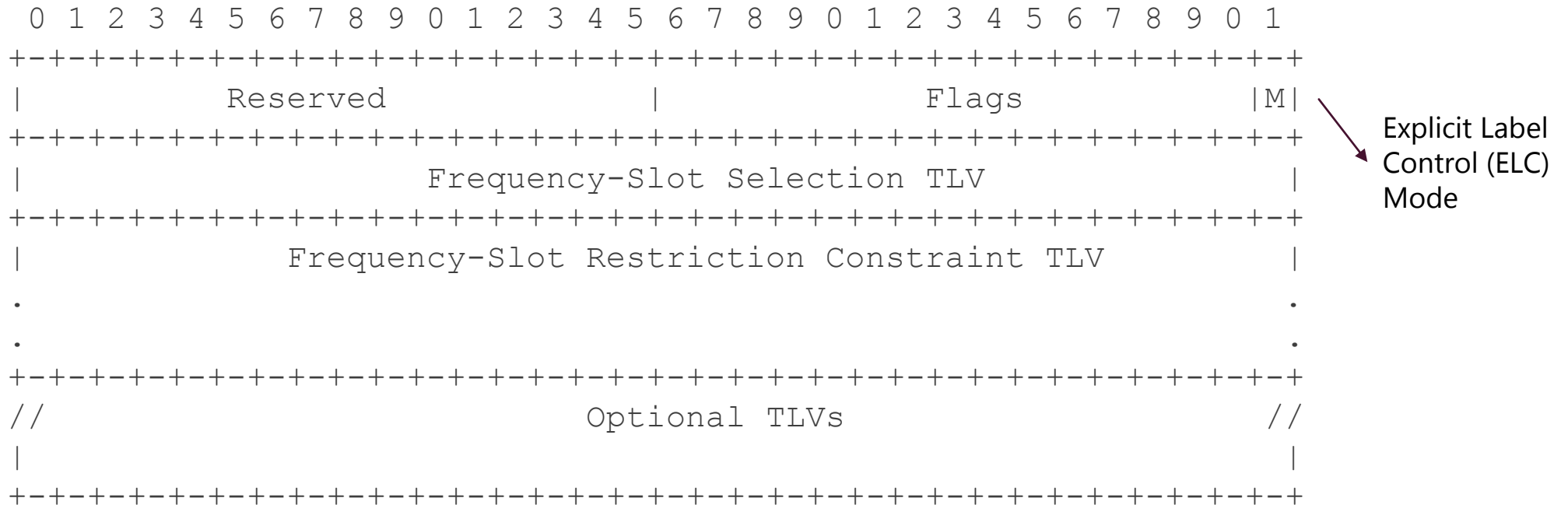
HIGH-LEVEL DESCRIPTION

<PCReq Message> ::= <Common Header> [<svec-list>] <request-list>

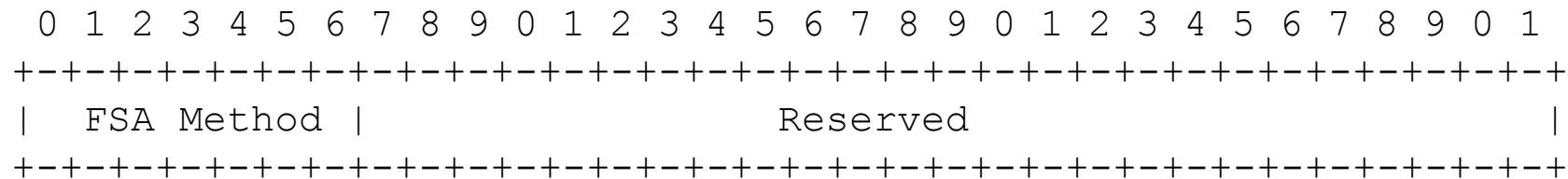
Where: <request-list> ::= <request> [<request-list>]

<request> ::= <RP> <ENDPOINTS> [<**SA**>] [other optional objects...]

SA (SPECTRUM ASSIGNMENT) OBJECT



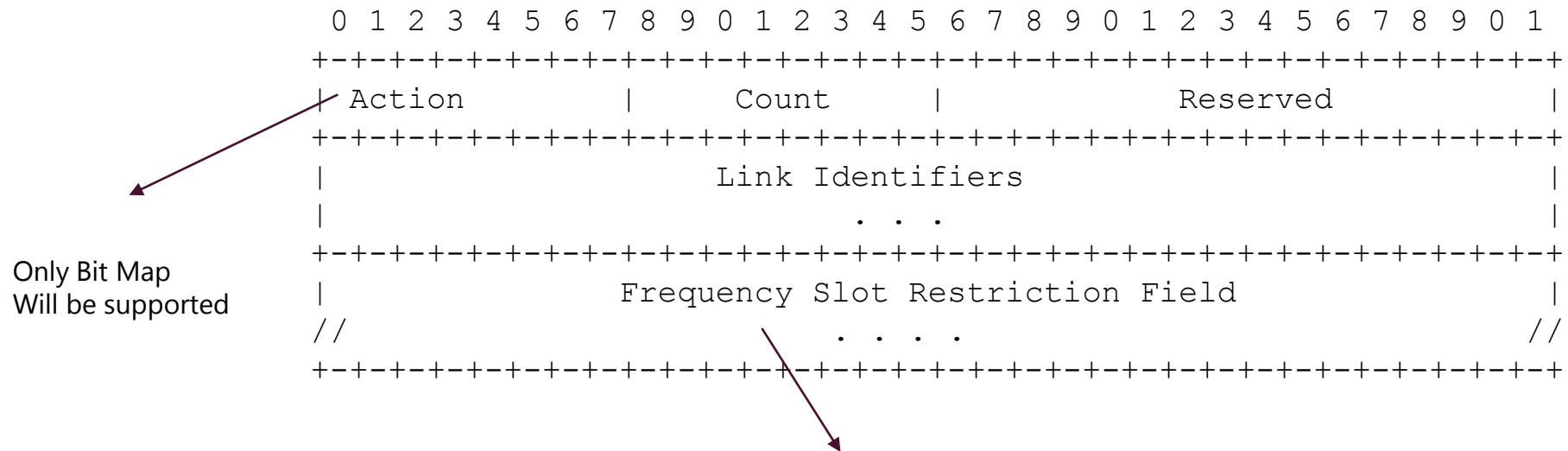
FREQUENCY SLOT SELECTION TLV



Frequency-Slot Assignment (FSA) Method (7 bits):

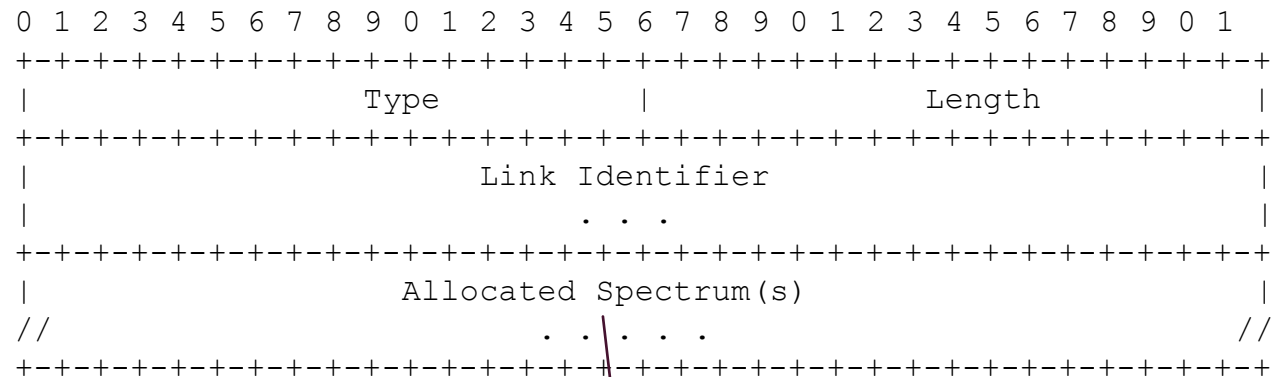
- 0: Unspecified (any); This does not constrain the SA method used by a specific node.
This value is implied when the Frequency-Slot Selection sub-TLV is absent.
- 1: First-Fit; All the feasible frequency slots are numbered (based on "n" parameter), and this SA method chooses the available frequency-slot with the lowest index (of "n" parameter).
- 2: Random; This SA method chooses an feasible frequency-slot ("n" parameter) randomly.
- 3-127: Unassigned.

FREQUENCY SLOT RESTRICTION CONSTRAINT TLV



The Frequency-Slot Restriction Field of the Frequency slot restriction TLV is encoded as defined in <https://tools.ietf.org/html/draft-ietf-ccamp-flexible-grid-ospf-ext-09#section-4.1.1>.

FREQUENCY SLOT ALLOCATION TLV (IN PC REPLY)



TDB

Note: This TLV may not be necessary for ELC.

SUMMARY AND NEXT STEPS

- Open Issues:
 - Bit mapping encoding only be sufficient?
 - The need for the Frequency Slot Allocation TLV is to be determined.
 - Other issues?
- Any interest in this draft?
- Continue to mature the draft.