Flexible Grid Label Format in Wavelength Switched Optical Network

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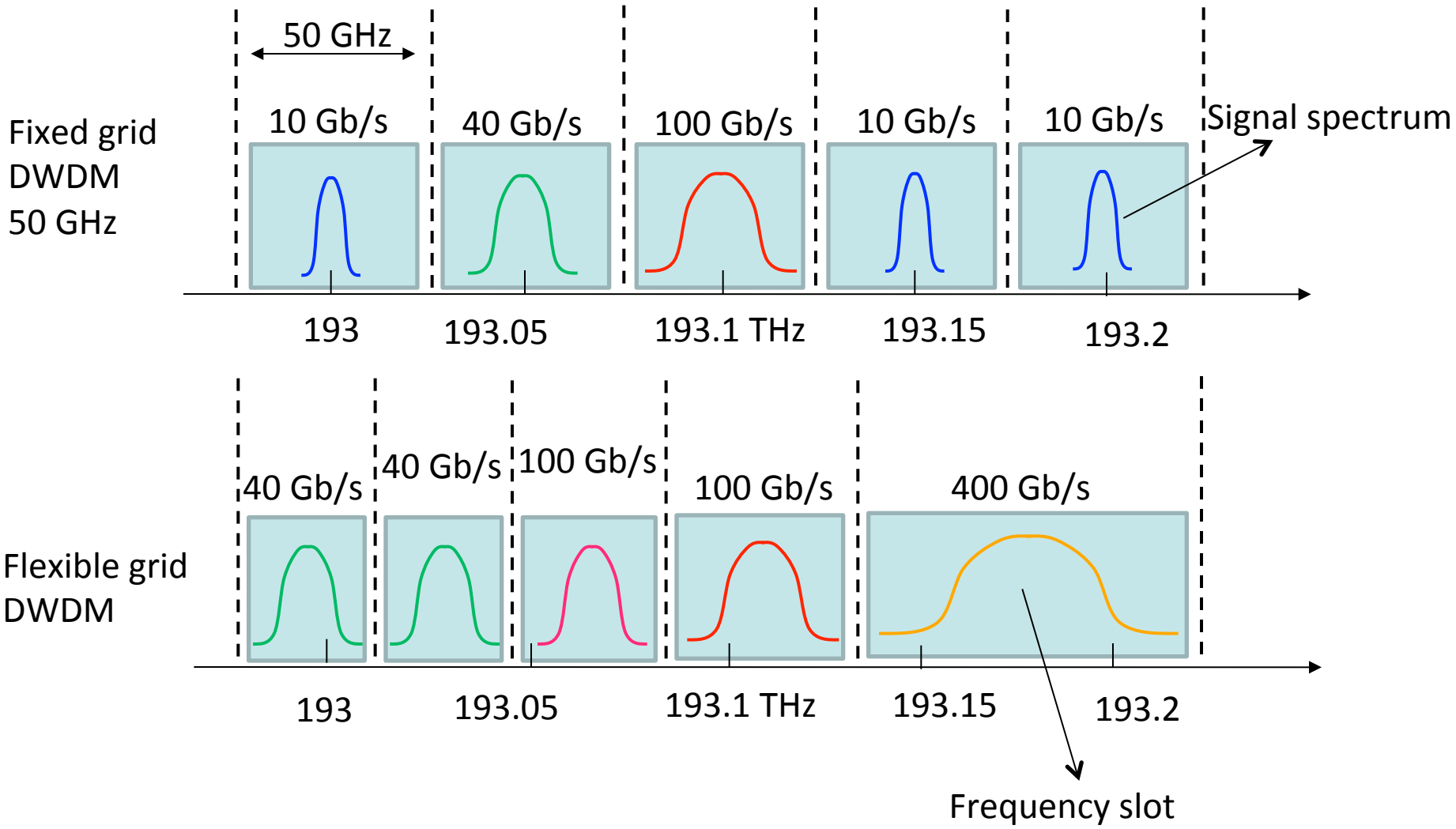
Motivation

- Limitations
  - In fixed grid (channel spacing) network, constant spectral resource is allocated to every channel with different bitrates, resulting relatively low resource unitization efficiency.
  - High Speed Signals beyond 100 Gb/s are not expected to adapt such narrow channel spacing like 50 GHz.
- Solutions

  High capacity and high efficiency utilization of optical network resource is required. Flexible grid technique is a candidate to accomplish this requirement.
  - High resource utilization efficiency for mixed bitrates systems.
  - Adaptive to transmission distance and optical impairments.
  - Support ultra-high speed modulation format like OFDM.

Flexible grid Vs fixed grid



G.694.1 flexible grid definition

- For the flexible DWDM grid, the allowed " frequency slots" have

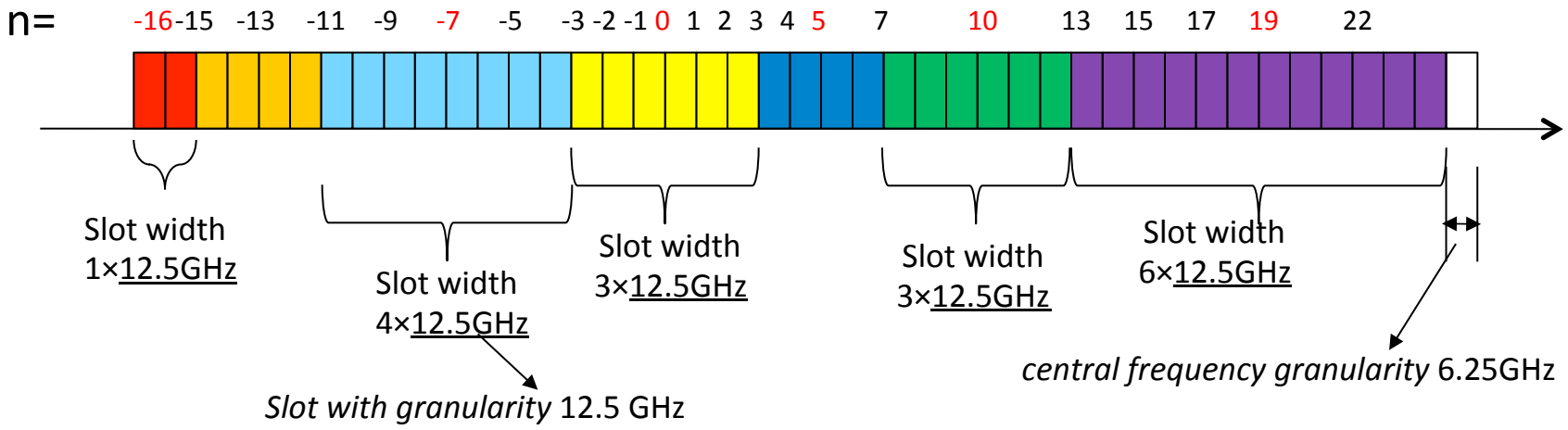
a **nominal central frequency** (in THz) defined by:

193.1 + n × 0.00625 where n is a positive or negative integer including 0.

and **a slot width** (GHz) defined by:

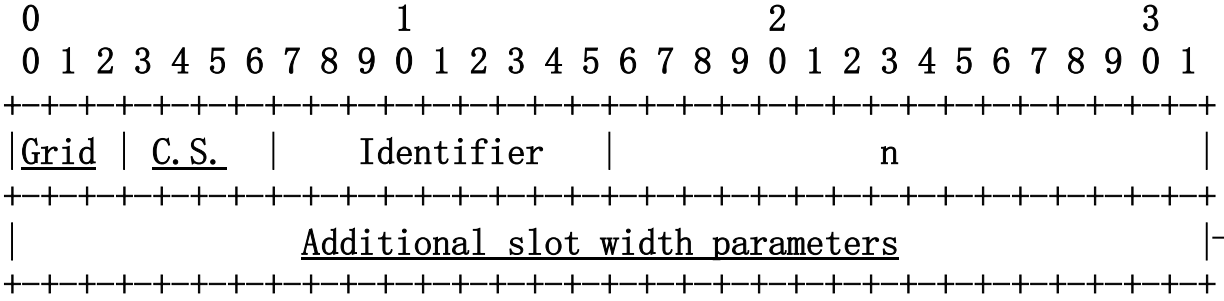
12.5 GHz × m where m is a positive integer.

- Note: *the values of 6.25 GHz is called "central frequency granularity" and 12.5 GHz "slot width granularity"*



Flexible label format

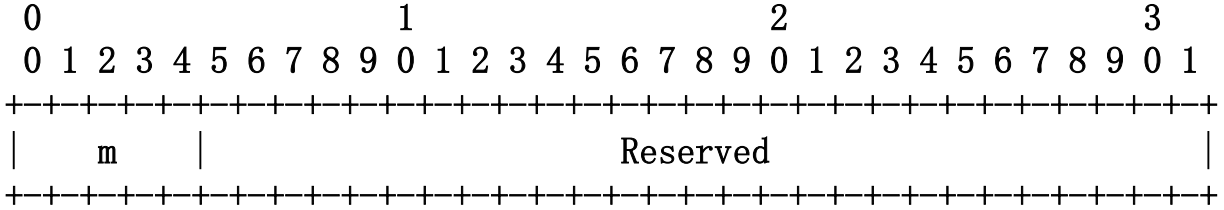
In WSON, the control plane allocates the wavelength label(RFC 6205) represented by center frequency for the LSP. While in flexible grid network, wavelength label represented by spectral resource or “frequency slot” should be assigned.



Grid	Value
DWDM	1
CWDM	2
Flexible DWDM	*3*

C.S. (GHz)	Value
100	1
50	2
…	…
6.25	*5*

Additional slot width parameters:



“m” represents how many slot width granularities the label has occupied

Backward compatibility

- Routing
  - Spectral range (frequency slots) constraints and available Spectral resources, etc. by label set: Inclusive list; excusive list; inclusive range; exclusive range; bitmap set (two bit for a flexible label).
  - *New switching capability (ISCD), spectrum bandwidth limits.etc? , out of scope.*
- Signaling
  - Assigning available spectral resource by flexible label. However, wavelength/ spectrum continuity still need to be satisfied.
- PCE
  - PCEP message indicating the spectral constraints and available resources by label set .
  - *Other constraints (new swcap, modulation formats, etc?), out of scope.*

Comments
Thanks!