GMPLS OSPF-TE Extensions in support of Flexible-Grid in DWDM Networks

CCAMP WG, IETF 82nd, Taipei, Taiwan

draft-zhang-ccamp-flexible-grid-ospf-ext-00.txt

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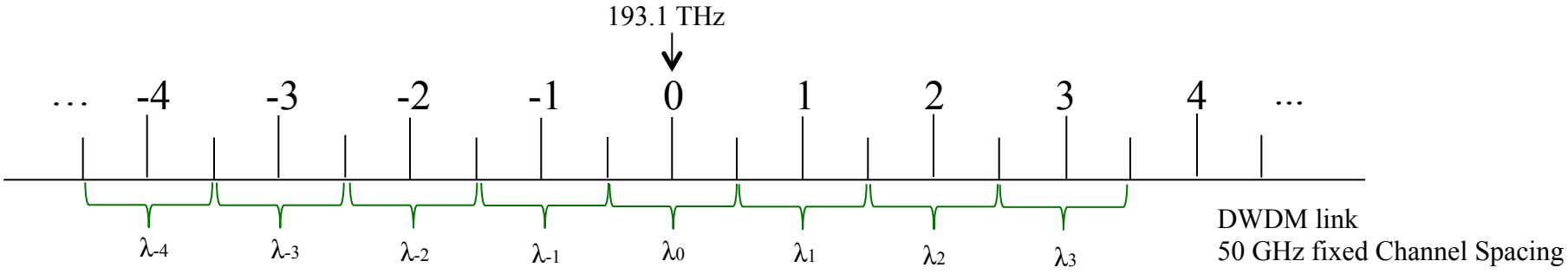
Objective

- Defines OSPF-TE extensions in support of GMPLS control for Flexible-Grid

What information to be advertised?

- WSON related information (except wavelength availability) (See [draft-ietf-ccamp-rwa-info-13])
  - (old) Node info: Connectivity Matrix, Signal Compatibility (FEC Type, Modulation Type, Resource Pool…)
  - (old) Link info: Administrative Group, SRLG, Link Protection Type, TE Metric, Port Restrictions…
- (new) Available Frequency Ranges of each link (Link information)
  - This is the significant difference between WSON(fixed grid) and flexi-grid. See next slide.
  - This draft focuses on this information.

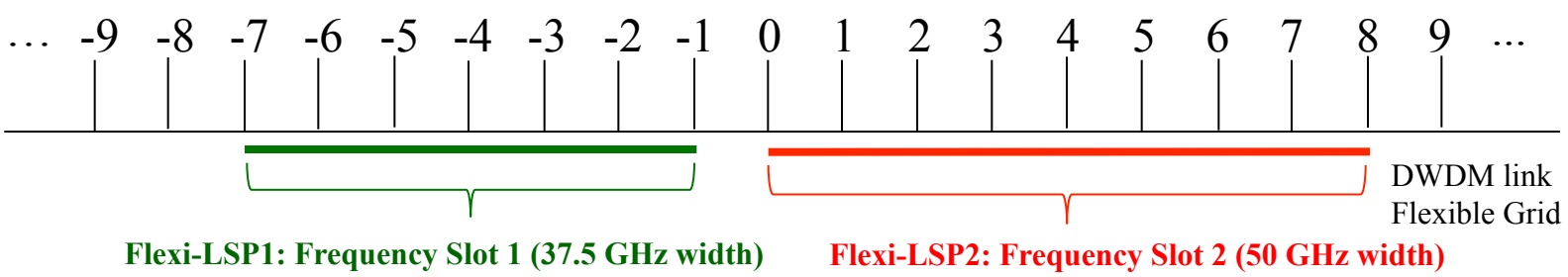
Compared to WSON



WSON (Fixed Grid):

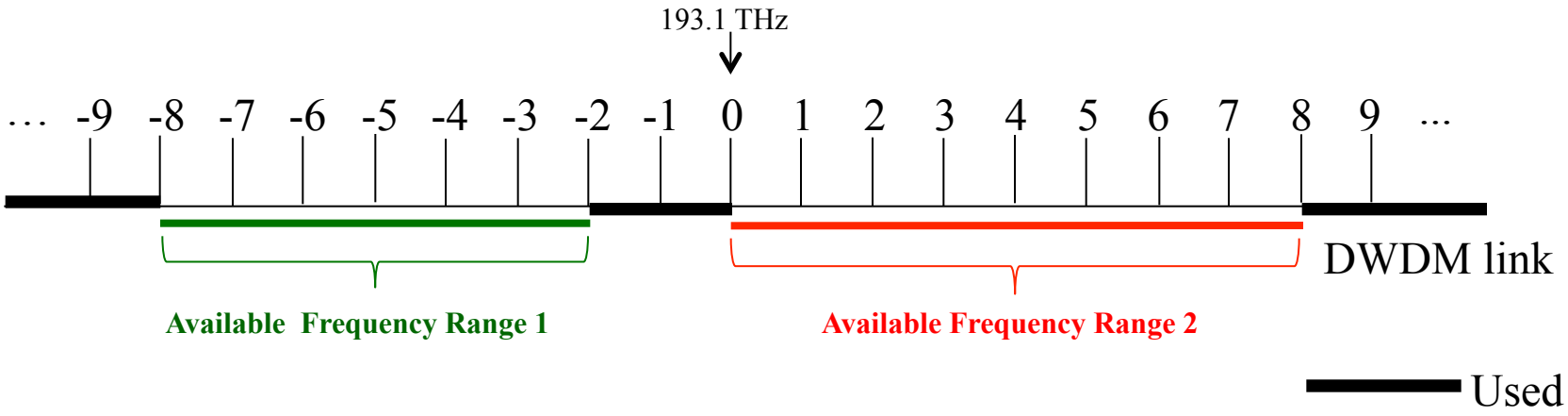
◆each wavelength has a pre-defined central frequency and all the wavelengths occupy the same frequency range (channel spacing)(one of 12.5GHz,25GHz, 50GHz, 100GHz).

◆All the wavelengths in the DWDM links can be identified uniquely and the status (available or not) of the wavelengths can be advertised.



Flexi-Grid: the slot width of the wavelengths are flexible on a flexible-grid DWDM link (ie. the slot width is uncertain before a frequency slot is allocated), so the available frequency ranges instead of the specific "wavelengths" should be advertised

Available Frequency Ranges



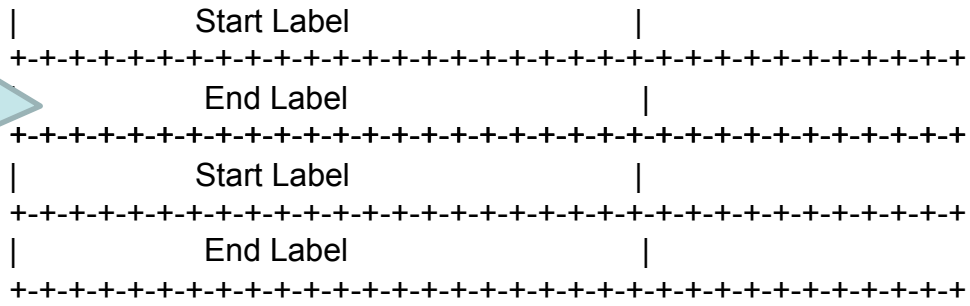
The available resource (ie., available frequency ranges) of each Flexi-Grid link MUST be advertised.

Note: The frequency slots of the LSC flexi-LSPs on a fiber must not overlap with each other, so the frequency slots of the existing flexi-LSPs are unavailable frequency ranges for other flexi-LSPs.

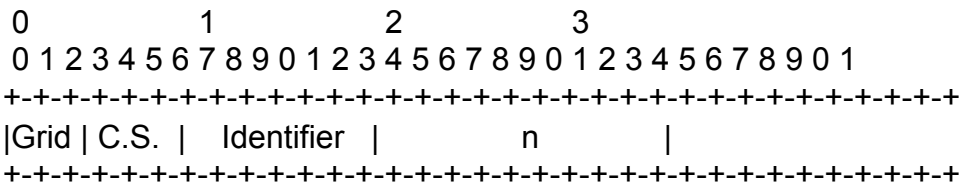
Extensions

The Available Labels Set sub-TLV defined in [GEN-OSPF] is re-used to advertise the available frequency ranges for the flexible-grid DWDM links.

Action=2,3 means inclusive or exclusive

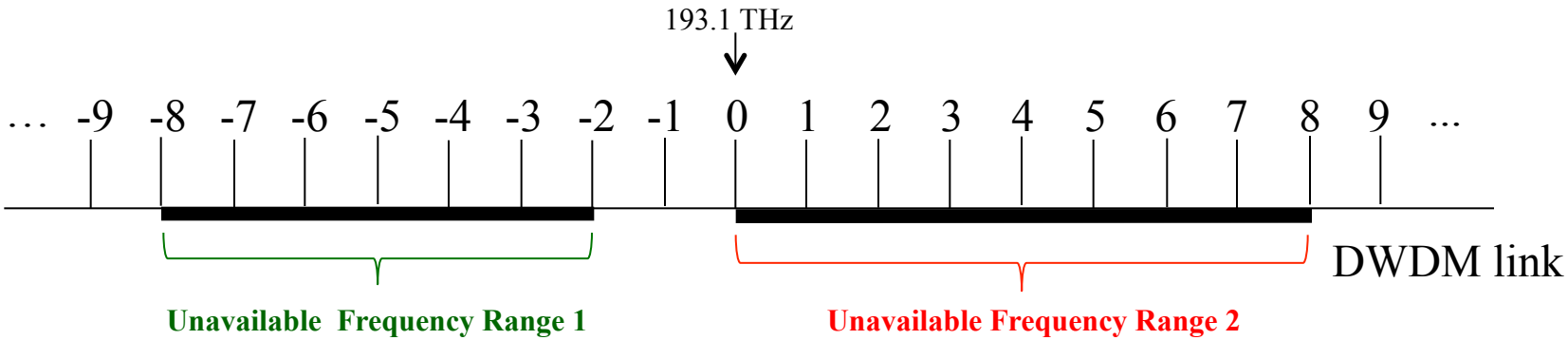


Available Labels Set sub-TLV (Inclusive/Exclusive Label Range)



- Label format defined in [flexible-grid-rsvp-te-ext]
- No “m”, because the value of “m” is uncertain before a frequency slot is allocated

Example 1: Exclusive

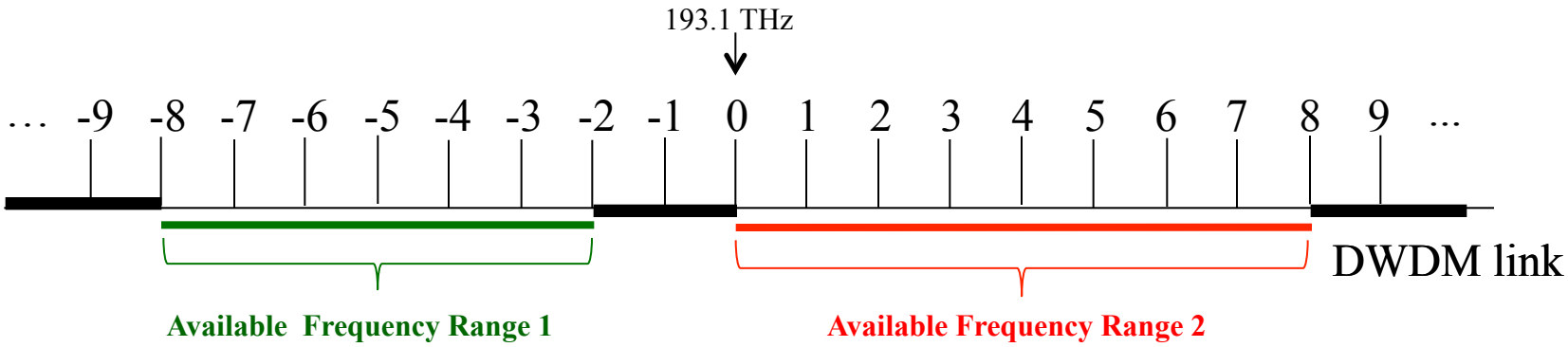


Exclusive Range 1: [Start label = 193.1 + (-8)*0.00625,
End Label = 193.1 + (-2)*0.00625]

Exclusive Range 2: [Start label = 193.1 + 0*0.00625,
End Label = 193.1 + 8*0.00625]

Highest frequency = (central frequency) + (slot width)/2
Lowest frequency = (central frequency) - (slot width)/2
= (193.1 + n * 0.00625) - (0.0125 * m)/2
= (193.1 + (n - m) * 0.00625) THz;
Highest frequency = (central frequency) + (slot width)/2
= (193.1 + n * 0.00625) + (0.0125 * m)/2
= (193.1 + (n + m) * 0.00625) THz;

Example 2: Inclusive



Inclusive Range 2: [Start label = 193.1 + 0*0.00625,
End Label = 193.1 + (-2)*0.00625]

Inclusive Range 2: [Start label = 193.1 + 0*0.00625,
End Label = 193.1 + 8*0.00625]

Open Discussions

- How to deal with bandwidth (bit rate in bps) per priority and other bandwidth sub-TLV(e.g., Unreserved Bandwidth, Maximum Bandwidth…)?
  - It seems that the bandwidth in bps is meaningless in flex-grid (fixed-grid as well ?)
  - The only resource is the available frequency ranges on each link
  - Your opinions?
- Does it need to define a new switching type for flexi-grid (ie., different from WSON)?
  - Not quite sure

Next Steps

- Coordinate with WSON work
- Refine it according to the feedback from the meeting or mailing list