Flex-grid enabled Elastic Optical Networks

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Two main issues in current optical networks:

- increasing capacity vs. increasing demand
- more heterogeneous demands
- deploying above 100 Gbps channels
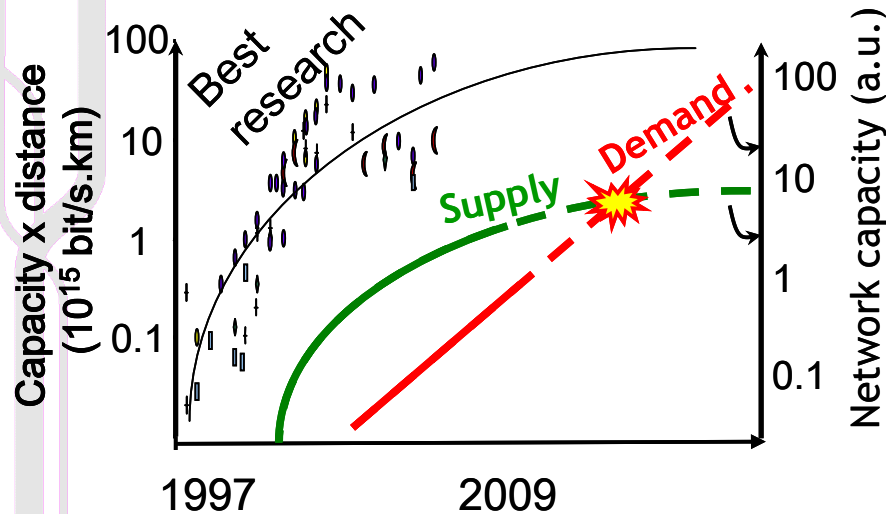
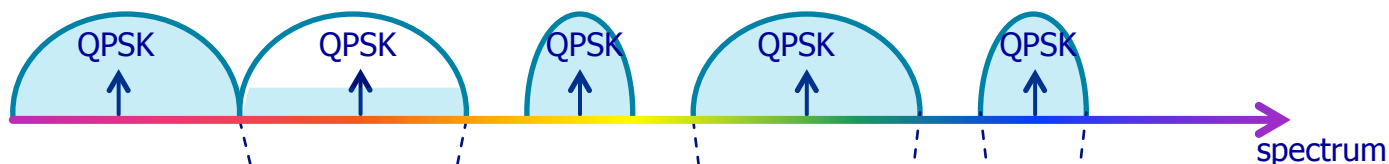Trend is to enable <u>elasticity</u> when deploying optical resources

[1] EO-Net, Elastic Optical Networks CELTIC project, CP07-006

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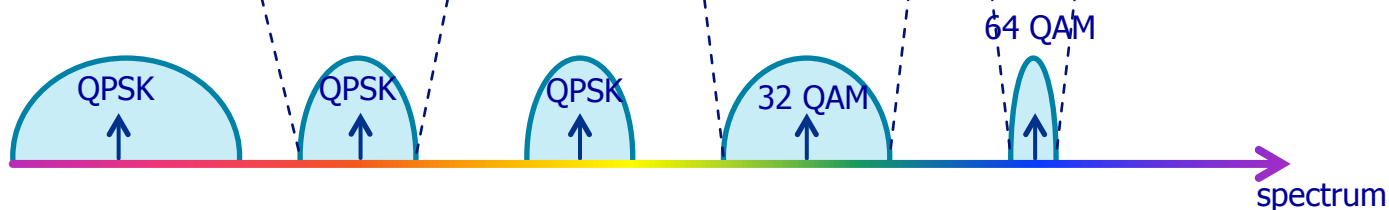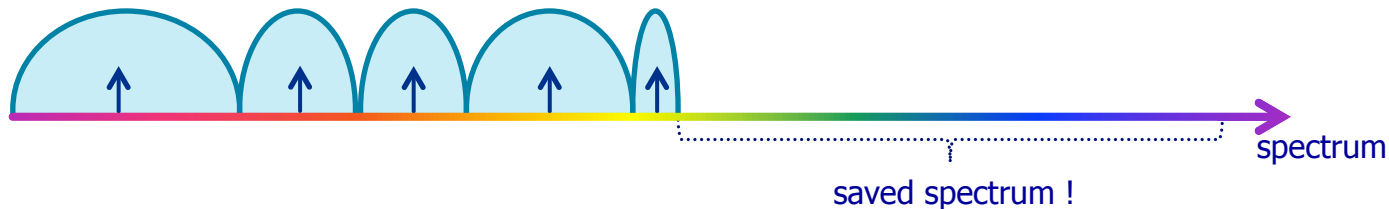
From fix-grid to flex-grid networks:

- Decrease channel spacing from 50 GHz down to 6.25 GHz (acc. to ITU-T specs)

- Allocate **Spectrum Slices** as a multiple number of contiguous **Spectrum Slots**

Fixed width

Fixed Grid

n=-1   n=0   n=1

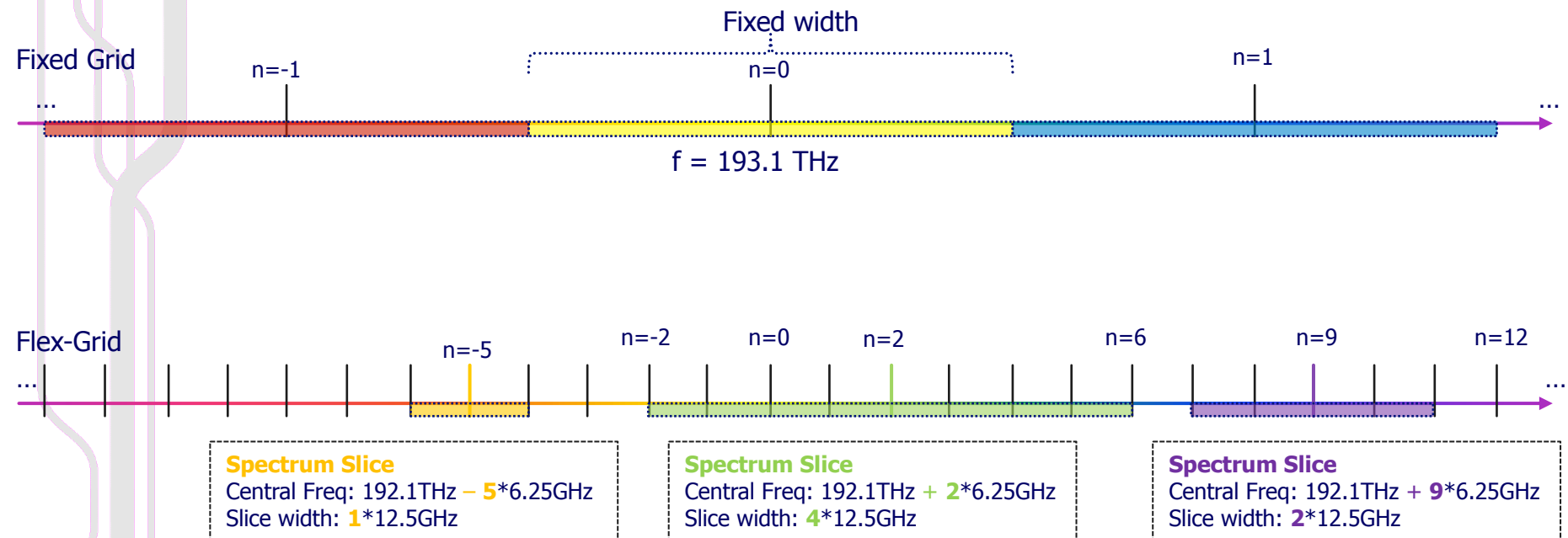...   ...

f = 193.1 THz

Flex-Grid

n=-5   n=-2   n=0   n=2   n=6   n=9   n=12

...   ...

Spectrum Slice
Central Freq: 192.1THz − **5***6.25GHz
Slice width: **1***12.5GHz

Spectrum Slice
Central Freq: 192.1THz + **2***6.25GHz
Slice width: **4***12.5GHz

Spectrum Slice
Central Freq: 192.1THz + **9***6.25GHz
Slice width: **2***12.5GHz

Summary

- Elastic-Optical Networks is the current trend towards optimizing the deployment of optical resources

- Flex-grid is key enabler for elasticity

- Flex-grid imposes increased complexity for the control plane

Challenges

- Providing an elastic transponder (tuning modulation format, symbol rate, spectrum resources and FEC codes)

- Providing flexible data plane (ROADMs, BV-WSSs etc.)

- Enabling elasticity within a reliable control plane

Question

- To what degree deploying elastic optical infrastructure represents a solution for the NRENs in 3-5 years from now?