GÉANT network infrastructure evolution

Sebastiano Buscaglione, GÉANT, April 2021

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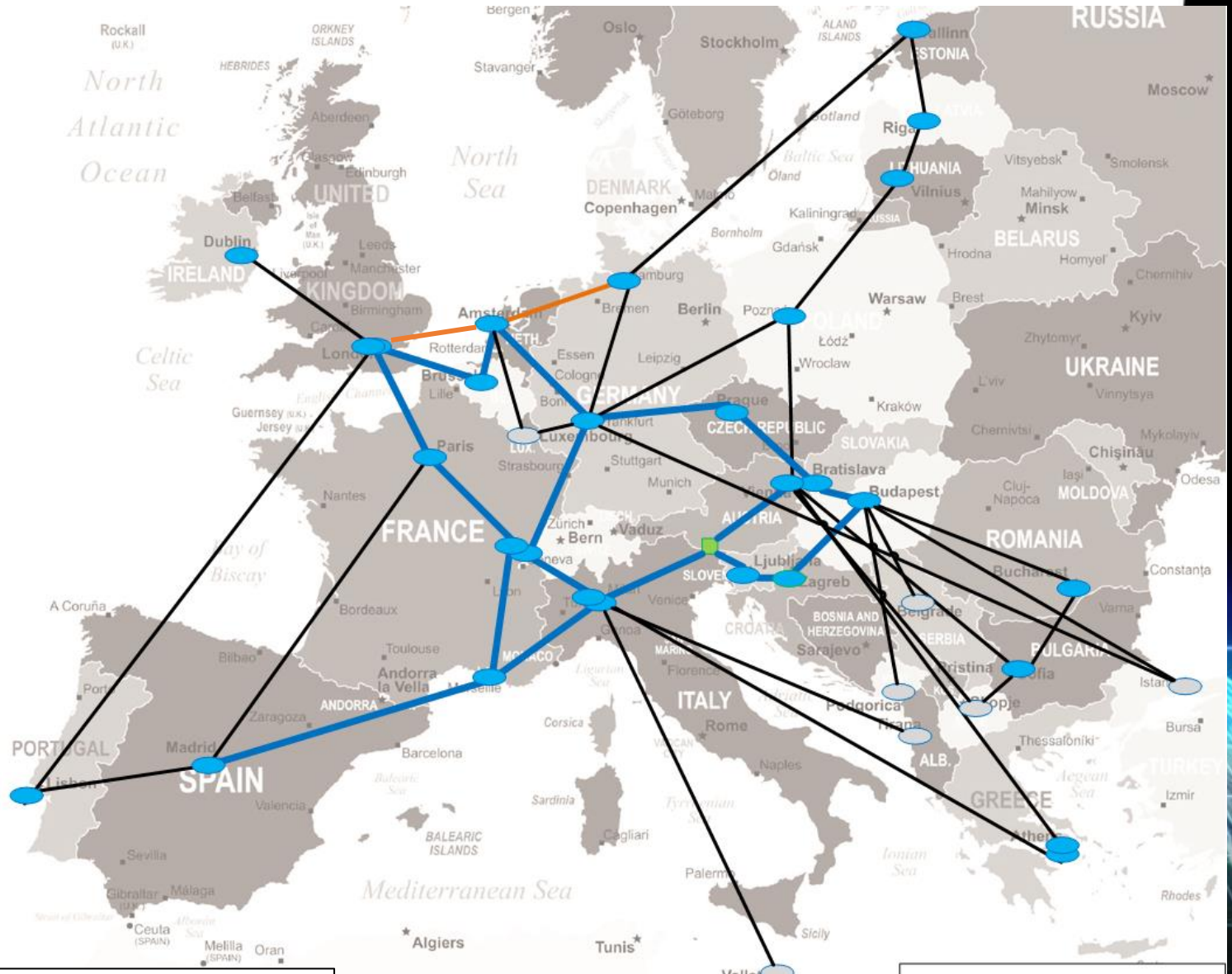
What is GÉANT

- A non for-profit organization
- Supports collaboration amongst researchers, the dissemination of information & knowledge, and provide access to a portfolio of services and infrastructure resources
- Among the main goals is the reduction of digital divide.
- Runs a pan-European network infrastructure - The GEANT Network

The GEANT network today

- Dark fibre in Central Europe
- Leased capacity for other regions
- Short procurement cycles
- Short term requirements
- Cost impact
- Hub and Spoke
- International links backhauled to fibre PoPs



The opportunity - IRU SGA

Go beyond the state-of-the-art by restructuring the backbone network through exploration and ***procurement of long-term IRUs and associated equipment to increase the footprint****, stimulating the market in cross-border communications infrastructure* ***whilst decreasing the digital divide and reducing costs.***

From EC objectives for IRU SGA

Amount available for infrastructure spend (DWDM and connectivity) –> **~48M EUR**

CAPEX investment is 100% funded by the EC

A vision for the new network

Bandwidth cost to be the same at every location

Bandwidth cost to be marginal

Infrastructure investment to cover as many countries as possible

Cost share reduction

Lowest latency between every pair of locations

Resiliency

Presence in strategic locations

Minimise infrastructure duplication within R&E community

How do we achieve it?

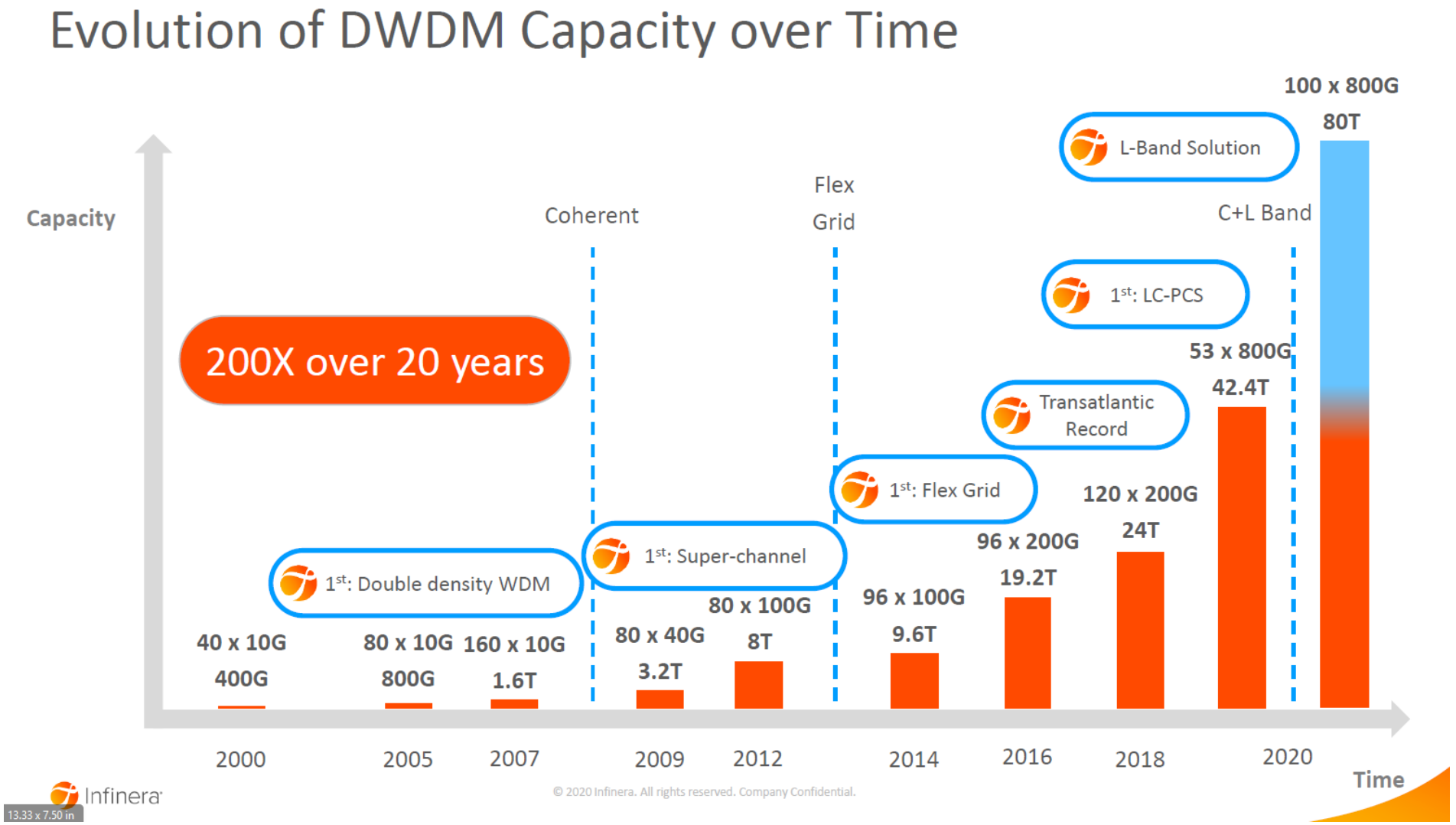
A combination of:

Dark Fibre / Spectrum IRUs

+

Open Line System (OLS)

Why Fibre? – a resource that keeps on giving



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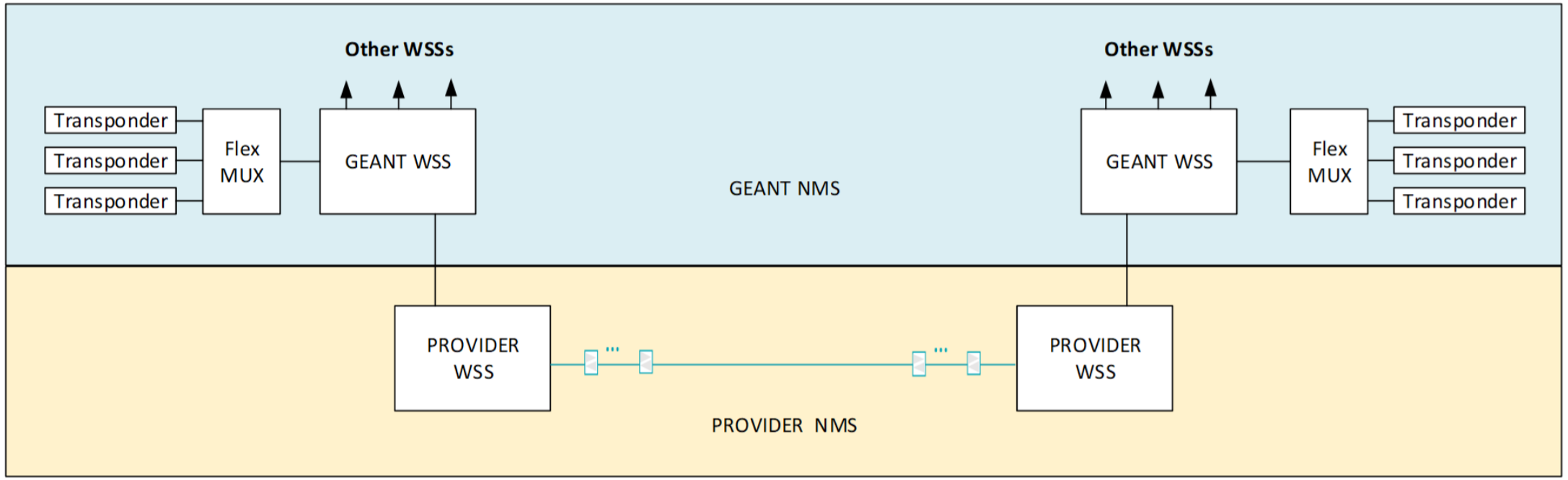
What is Spectrum, and why it matters?

- Out of a Dark Fibre, for data transmission, we have ~4.8THz of band for DWDM signals transmission
- In several cases is this is more capacity than we will need, even looking at 15+ years
- Where this is the case we are looking at acquiring the right to use a portion of these frequencies rather than the DF itself, generally 25%
- This significantly reduces costs with marginal loss of capabilities (ie. Time and Fequency distribution or other special use case only possible with fully owned DF)

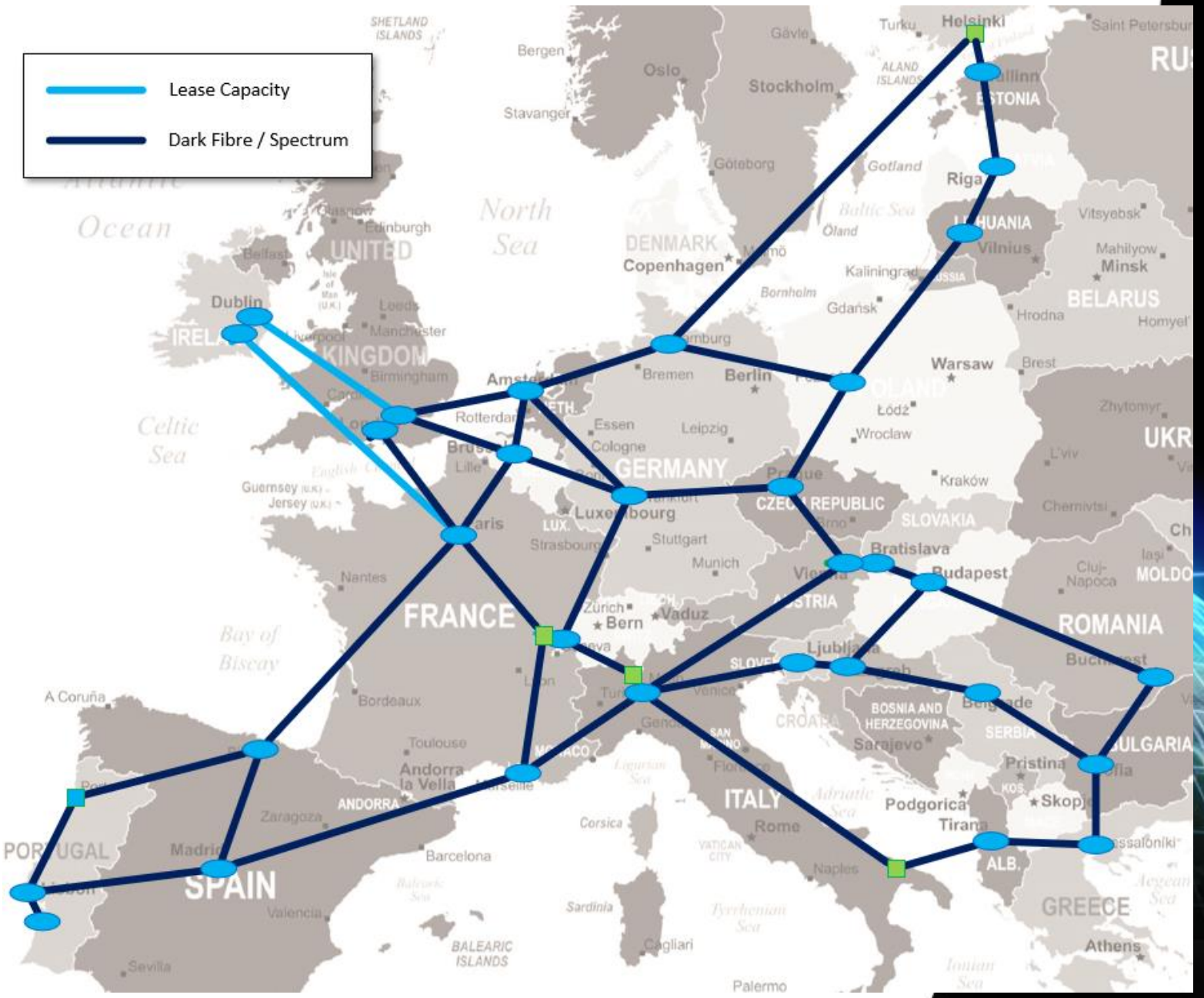
How do we interface with Spectrum



- GÉANT plans to overlay its DWDM system to both Spectrum as well as DF links.
- A full ROADM direction (WSS) will be dedicated for each Spectrum link

A new fibre based topology

- Built together with NRENs from ground up
- Based on long term Fibre/spectrum IRUs
- Increase of meshing
- Better regional connectivity
- Large increase of DF connected NRENs
- PoPs in strategical locations

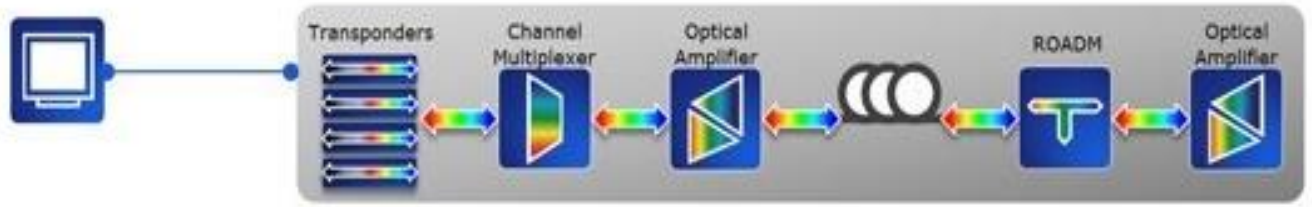


Line system choices

Infinera

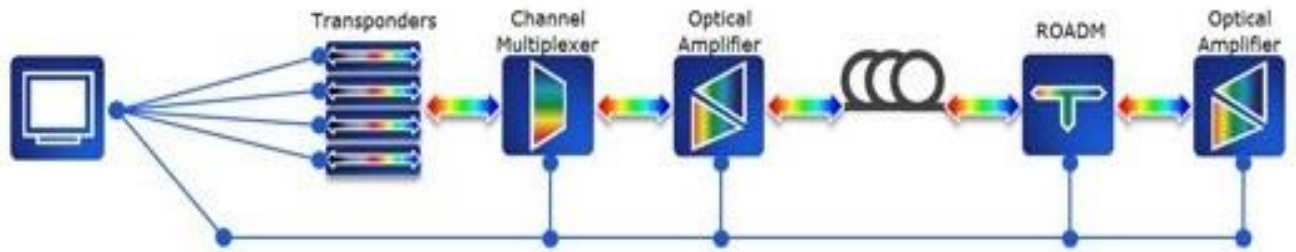
Selected by GÉANT to provide the DWDM system for GN4-3N

- No Disaggregation: Entire transport network acts as one element



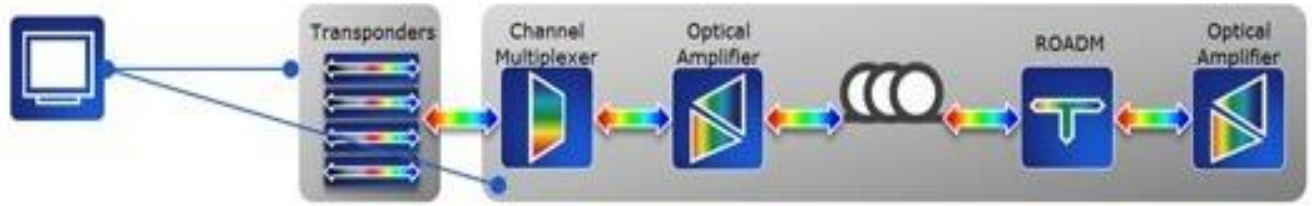
Current closed interop model

- Fully Disaggregated: Everything is a separate network element



Long-term vision. But open standards and management under development

- Partially: Transponding is one element, OOLS is second.



Medium term solution. Open access, single management plane for OLS

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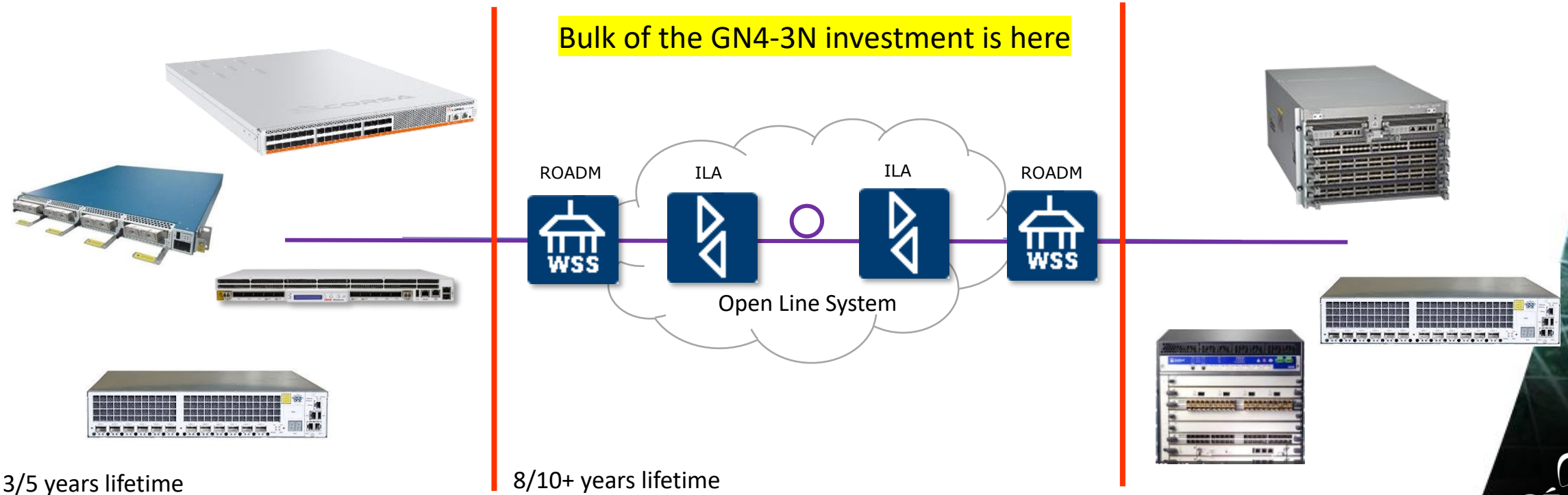
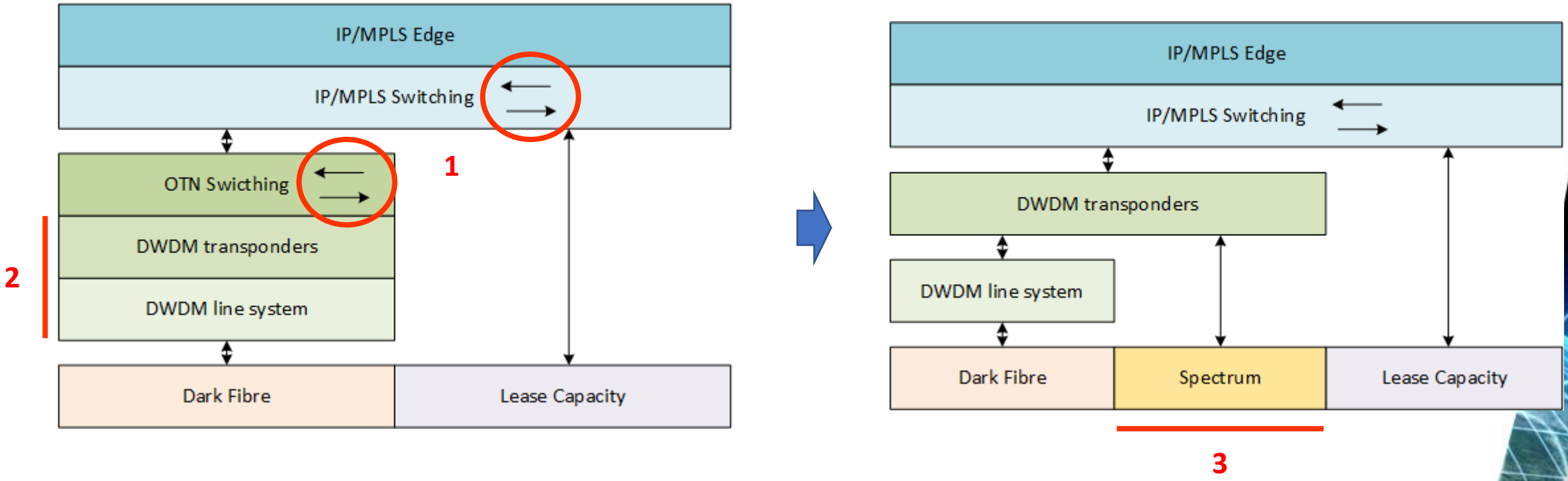
The Open line System

- Technology is moving faster in the packet and transponders than the amplifiers and WSS.
- Alien waves allow transponders from multiple vendors (and parties!) to operate on a single line system.
- Line System to be Flexible Grid to support variety transponder signals.
- Still benefit from a single vendor providing end-to-end optical management: Channel & span equalization, DCN connectivity (OSC), ALS, Alarm reporting etc.

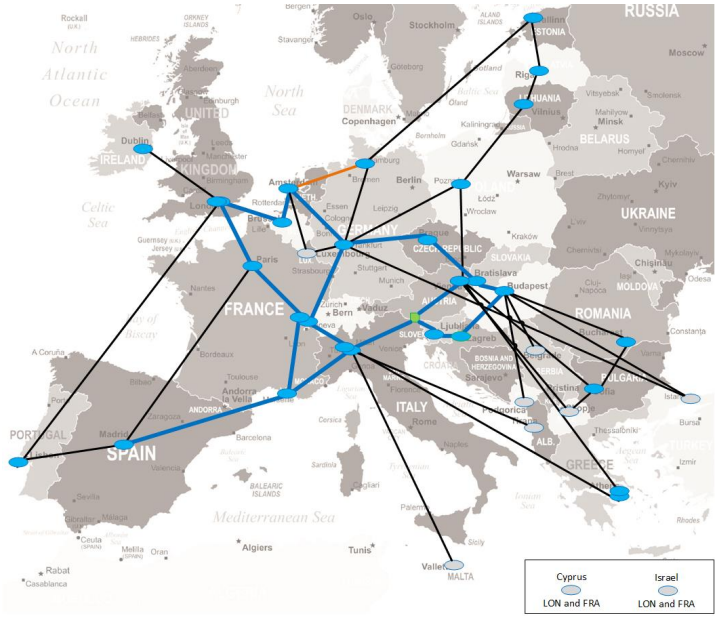


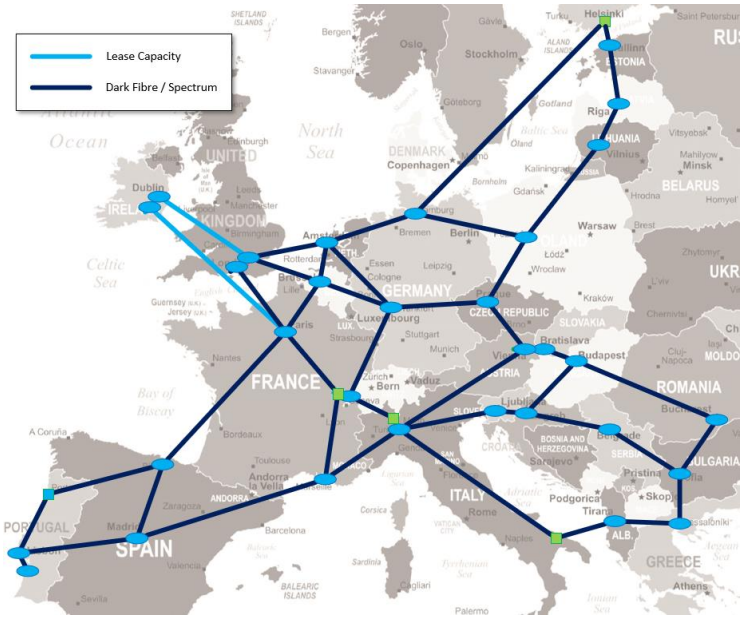
The new stack



1. Electronic switching twice adds significantly to costs for a marginal gain
2. Transponders and line system in a single block reduces flexibility / creates vendor lock-in
3. Use of spectrum allows for scaling down from full DF with small sacrifice to flexibility

A proposition that works on all fronts

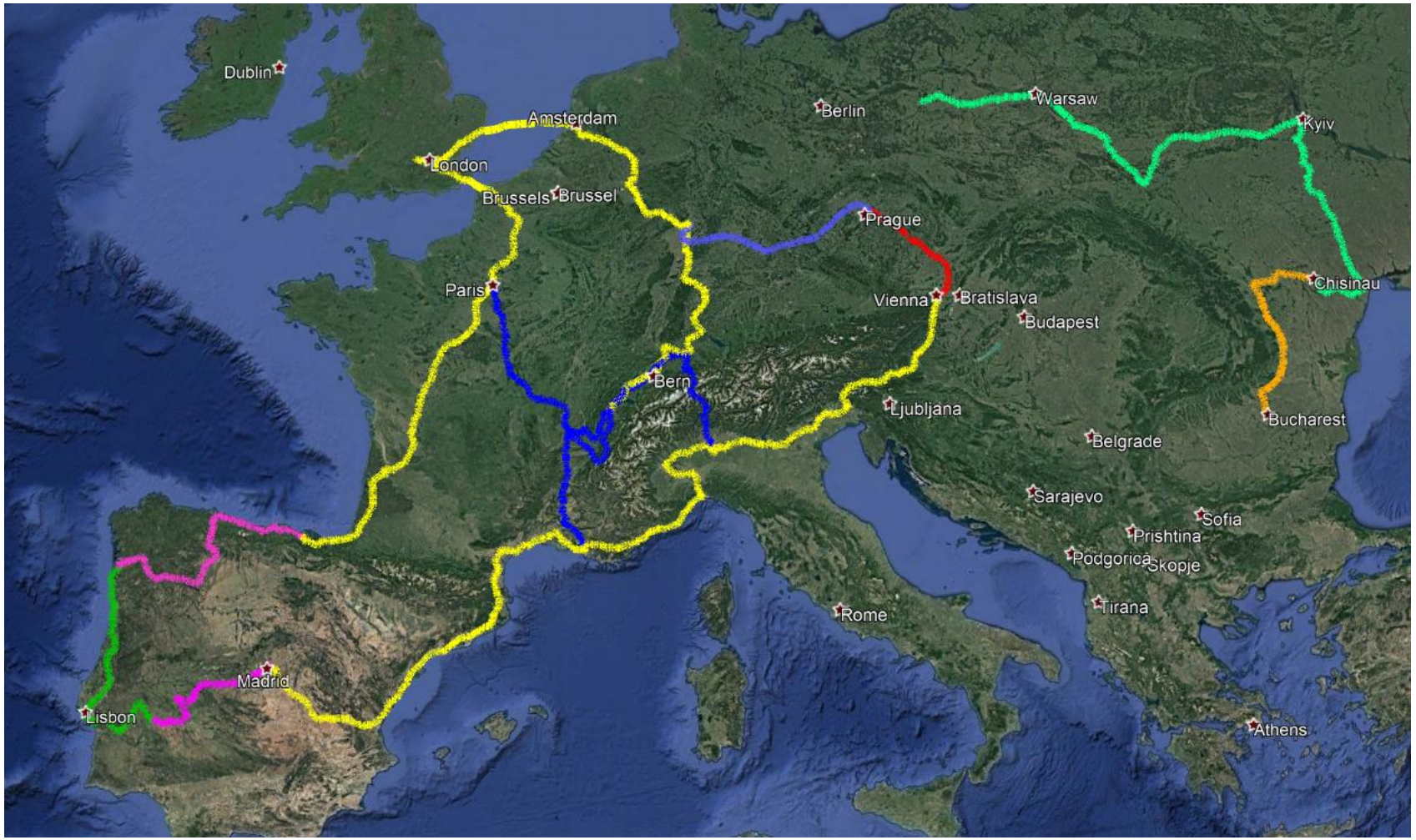




Moving from the “Old” to “New” GÉANT we get:

- Improved cost efficiency – running costs several x0% lower
- Stable and (lease capacity) market independent infrastructure
- Much increased footprint where equal cost per bit applies
- “Virtually unlimited” capacity thanks to modern DWDM system on fibre
- Fully owned infrastructure to a number of strategical locations
- Improved response time for all NRENs to any destination

What we have done so far



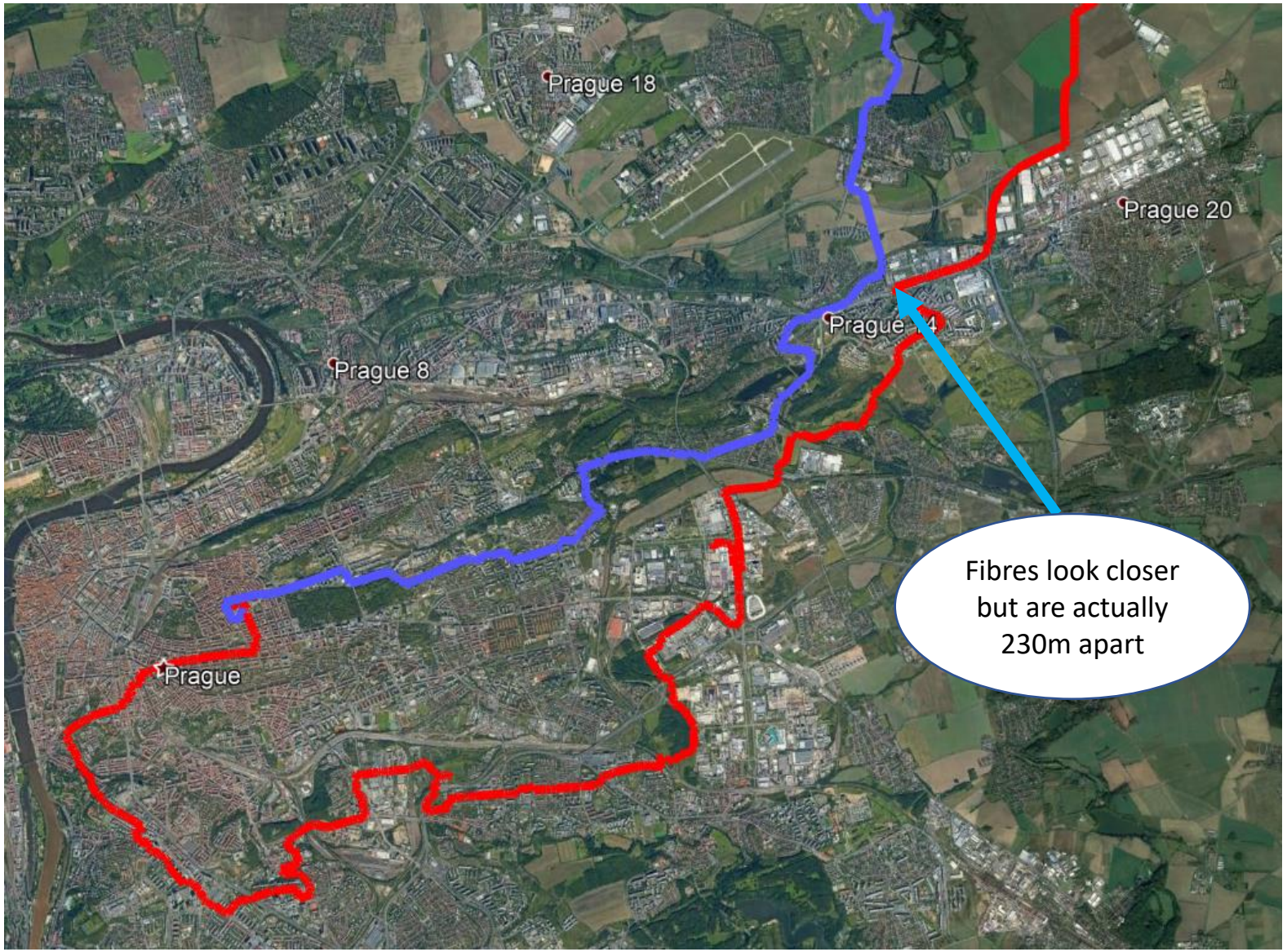
GN4-3N

- Established a framework accessible to all NRENs for procurement of WDM equipment
- Elected a vendor – Infinera – to provide the new Open Line System
- Established 15years IRU contracts for 17 European routes
- A total of 11,800Km of Dark Fibre
- 6 Providers / 9 Countries

EAP

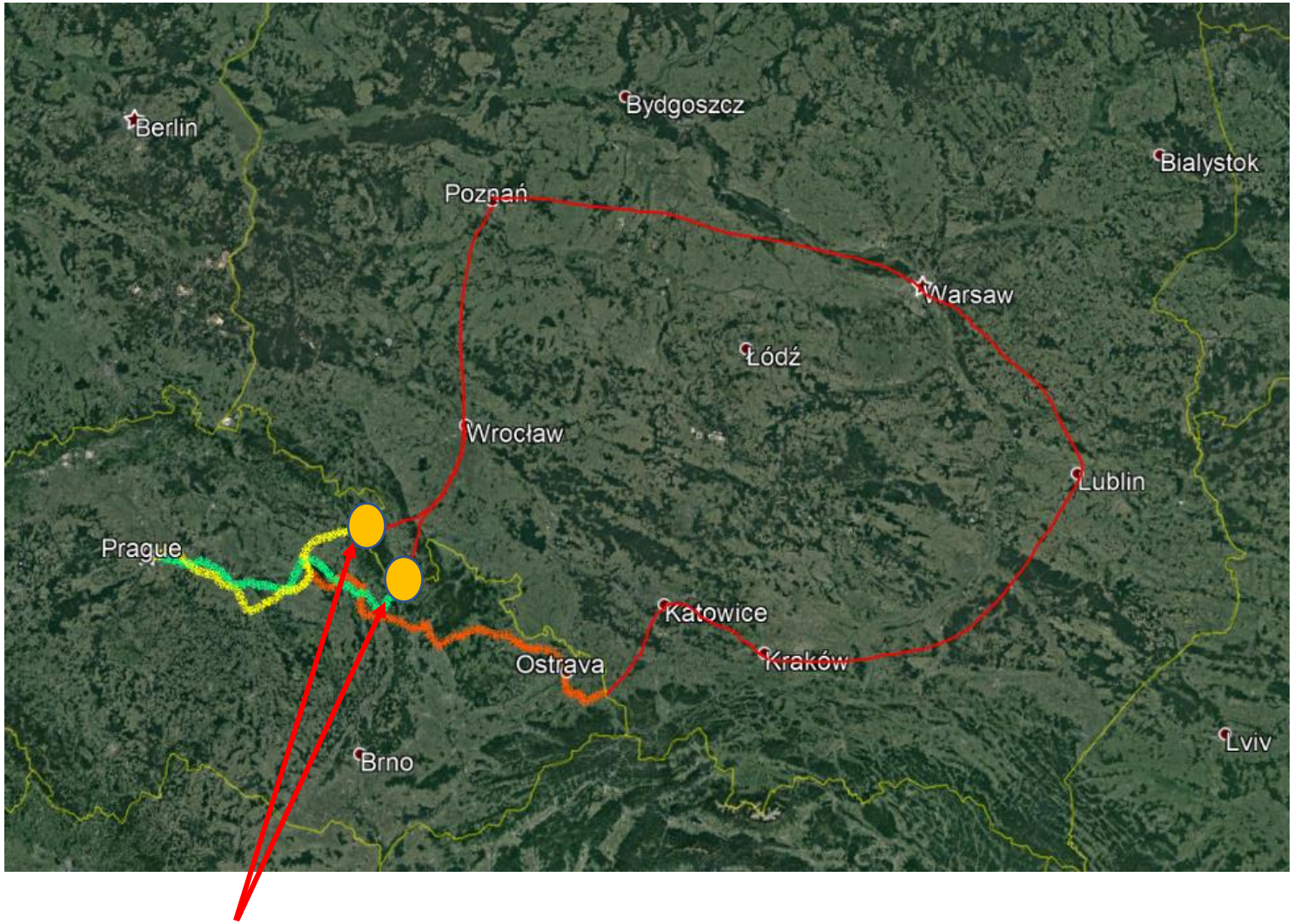
- Acquired 2,700Km of Spectrum (100GHz)
- Max 400Gbps ring
- Existing ~600Km of Fibre
- Total of 3,300 Km

Zooming closer to Prague



- GÉANT relocating at DC Tower in Prague
- Two fully diverse fibre routes acquired to the new site on 15 + 2x3 years IRU contracts

Next steps for Prague

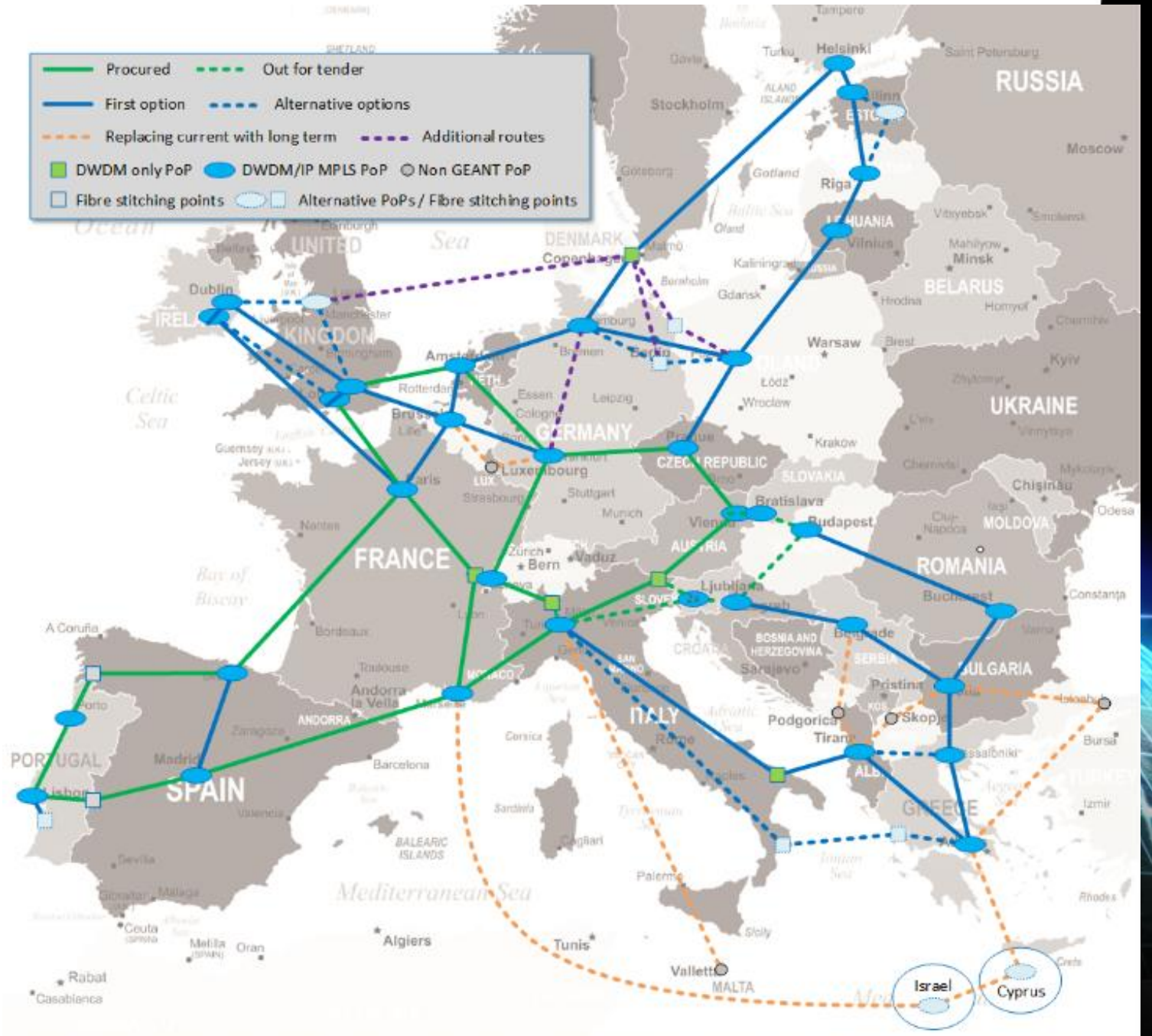


Areas where new fibre will be deployed.

- For the third link to Poznan, no fibre border crossing exists between northern CZ and PL
- All corssings are around Ostrava (South East)
- GÉANT has been working with providers to create a new northern crossing connecting CZ providres network with Polish ones
- This new path, if successful, will be much shorter than the ones available today

We want to do more

As infrastructure sharing and improved market outreach keeps providing cost improvements for the reference map, we are looking at expanding the investment to cover as many countries as possible with an infrastructure investment as part of GN4-3N.



Full engagement map showing most of the improvements and options currently explored for GN4-3N scope expansion. Also status of procurement of the various link is displayed.

Thank you!

Any questions?

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The research leading to these results has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 731122 (GN4-2).