

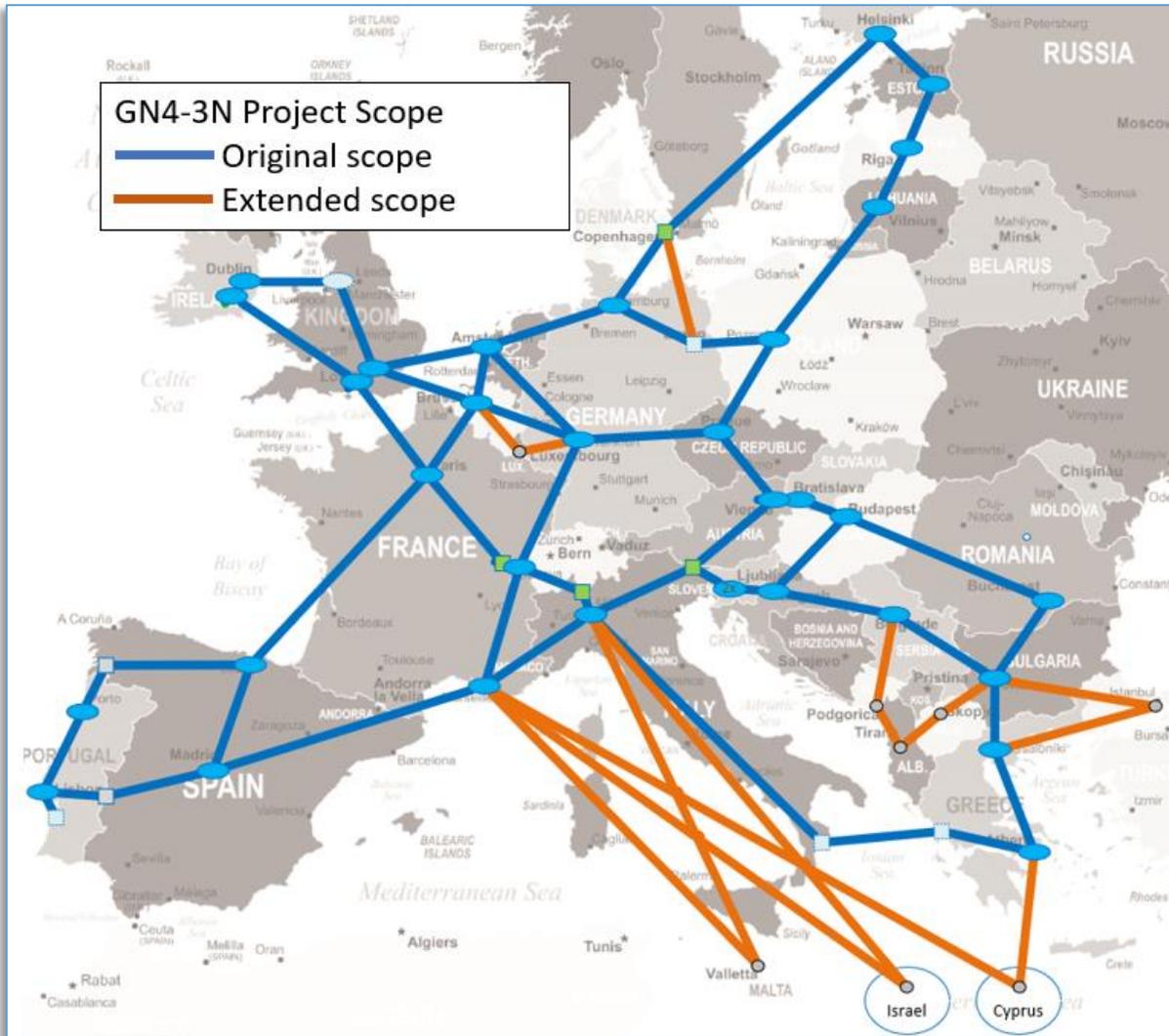
GÉANT backbone updates

Enzo Capone
Head of Research Engagement and
Support

LHCOPN/ONE Virtual Meeting
11 October 2021



GN4-3N Extended Scope

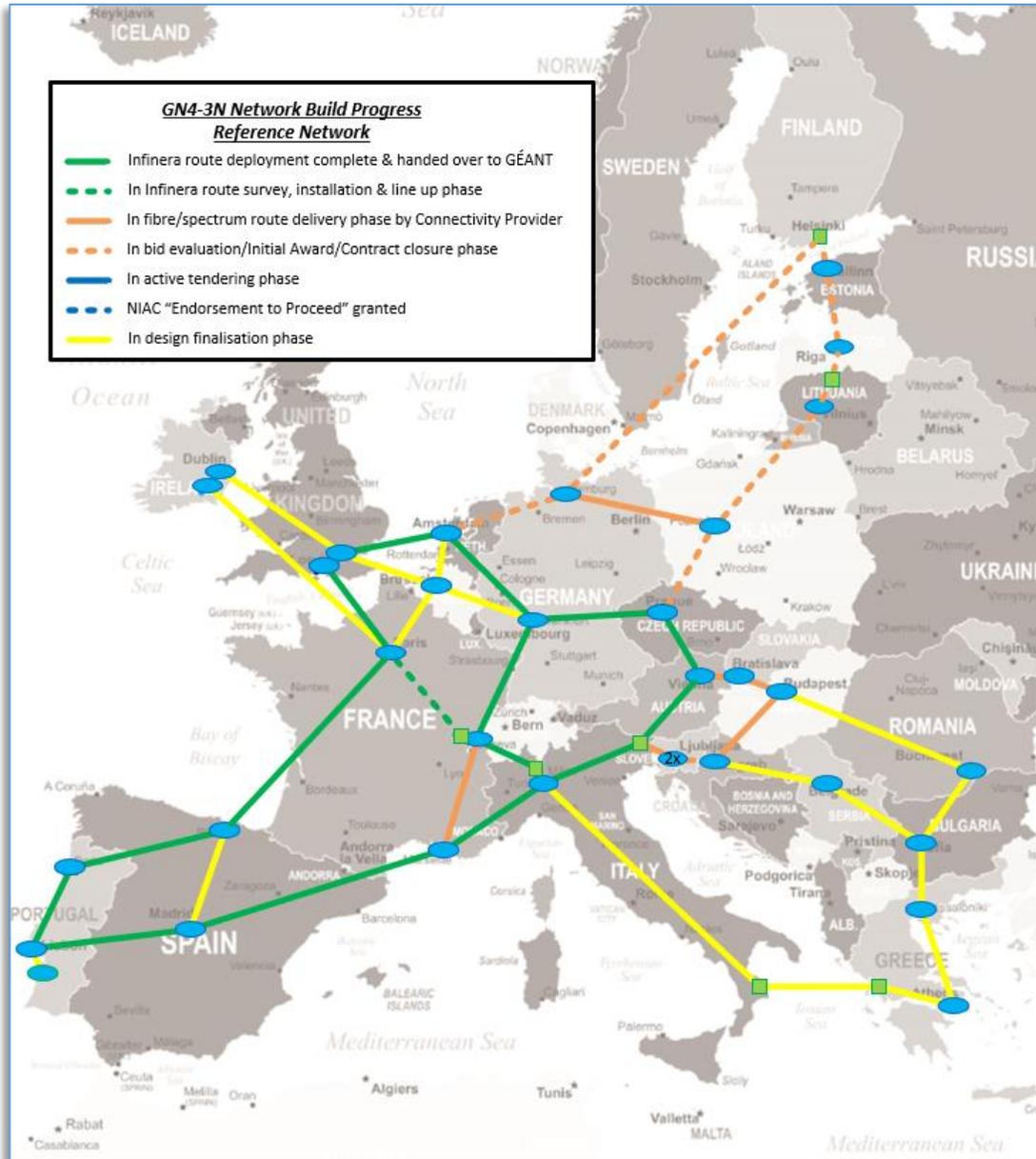


GÉANT Board agreed a Resolution in June 2021 to extend the scope of GN4-3N

Potential extended scope routes include mix of fibre, spectrum & long term leased connectivity

Longer term planning ongoing to review impact on project end dates

Route Procurement/build status summary



Current GN4-3N route deployment status:

- 14 x routes fully deployed, E2E testing completed by Infinera & accepted by GÉANT
- 5 x routes are currently in the Infinera deployment phase
- 9 x routes are currently in the connectivity delivery phase from contracted providers
- 8 x routes are in the response evaluation or MSER/contract finalisation stage
- 0 x routes are in the active tendering phase

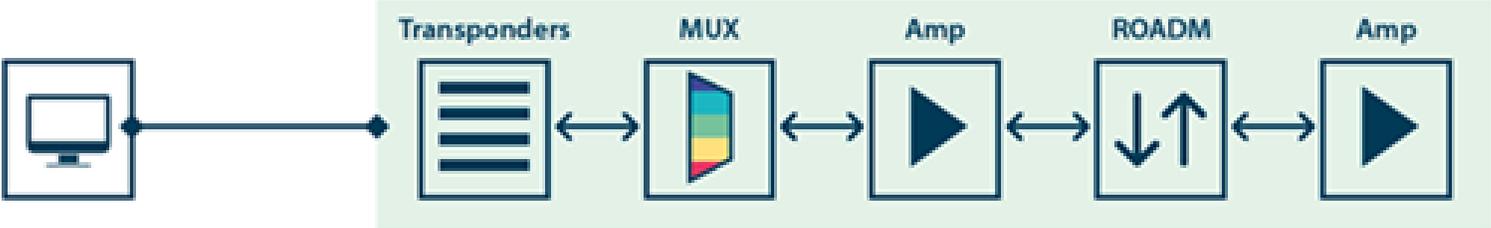
New Route Implementation Status

- Despite continuing COVID-19 restrictions, good progress continues to be made with Infinera carrying out implementation work in Portugal, Spain, France, Italy, Switzerland, Germany, Austria, Czech Republic, The Netherlands, Denmark, Finland and the UK to date

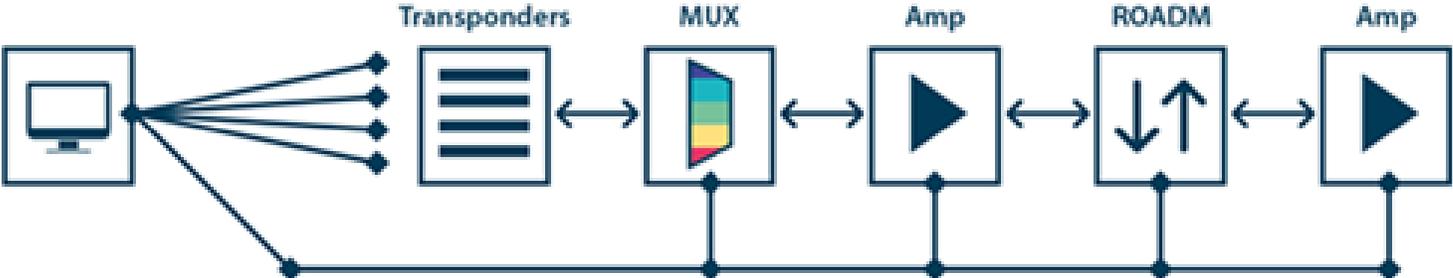
Route	Status	% complete	Comments
LIS – POR	Completed	100%	Route fully accepted & invoiced
LIS – MAD	Completed	100%	Route fully accepted & invoiced
POR – BIL	Completed	100%	Route fully accepted & invoiced
PAR – BIL	Completed	100%	Route fully accepted & invoiced
MAD – MAR	Completed	100%	Route fully accepted & invoiced
MIL2 – MAR	Completed	100%	Route fully accepted & invoiced
MIL1 – MIL2	Completed	100%	Route fully accepted & invoiced
MIL2 – VIE	Completed	100%	Route fully accepted & invoiced
GEN1 – MIL1	Completed	100%	Route fully accepted & invoiced
FRA – GEN1	Completed	100%	Route fully accepted & invoiced
PRA – VIE	Completed	100%	Route fully accepted & invoiced
FRA – AMS	Completed	100%	Route fully accepted & invoiced
FRA – PRA	Completed	100%	Route fully accepted & invoiced
GEN1 – GEN2	In Progress	75%	Route line up completed, requires G30 from PAR – GEN to be ready to complete E2E testing (Oct 21)
LON1 – AMS	Completed	100%	Route fully accepted – awaiting invoices
LON1 – LON2	In Progress	90%	Route line up & E2E testing completed, awaiting Infinera acceptance documents for review
LON2 – PAR	In Progress	90%	Route line up & E2E testing completed, awaiting Infinera acceptance documents for review
COP – HEL	In Progress	90%	Spectrum Pilot Trial with NORDUnet – line up completed & final E2E testing completed. Awaiting docs
PAR – GEN2	In Progress	5%	Deployment & decom surveys in progress

Optical Line System

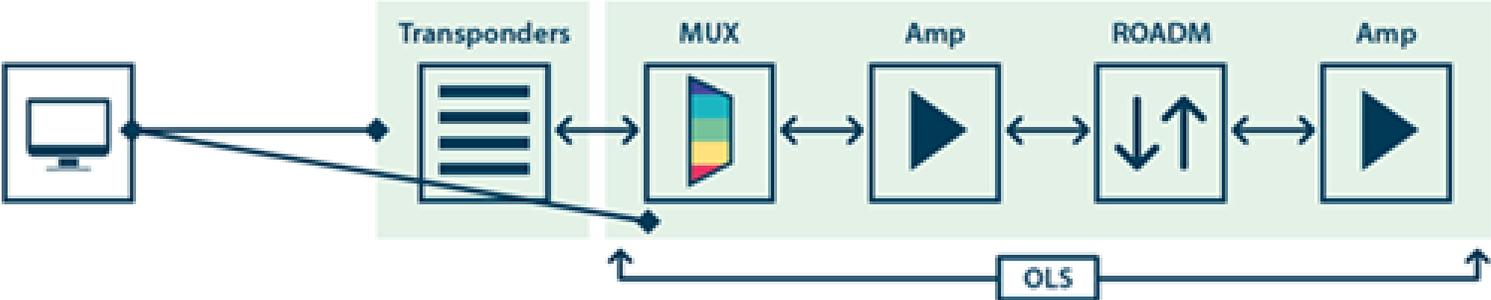
Aggregated^[1]



Fully Disaggregated^[2]

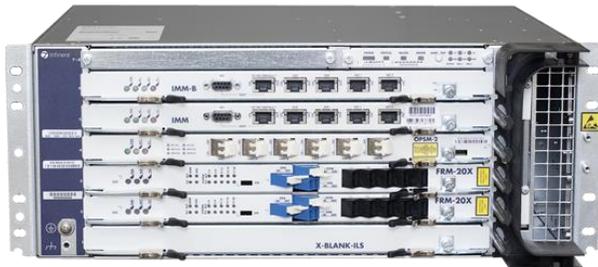


Partially Disaggregated^[3]



Optical Line System

- GÉANT selected Infinera FlexILS for the Open Line System (OLS) and Infinera Grooves G30s DCIs as transponders.
- Ability to slice Spectrum with much more granularity
- Grooves G30s are in use in GÉANT for about 2 years carrying all traffic in the central portions of the network.



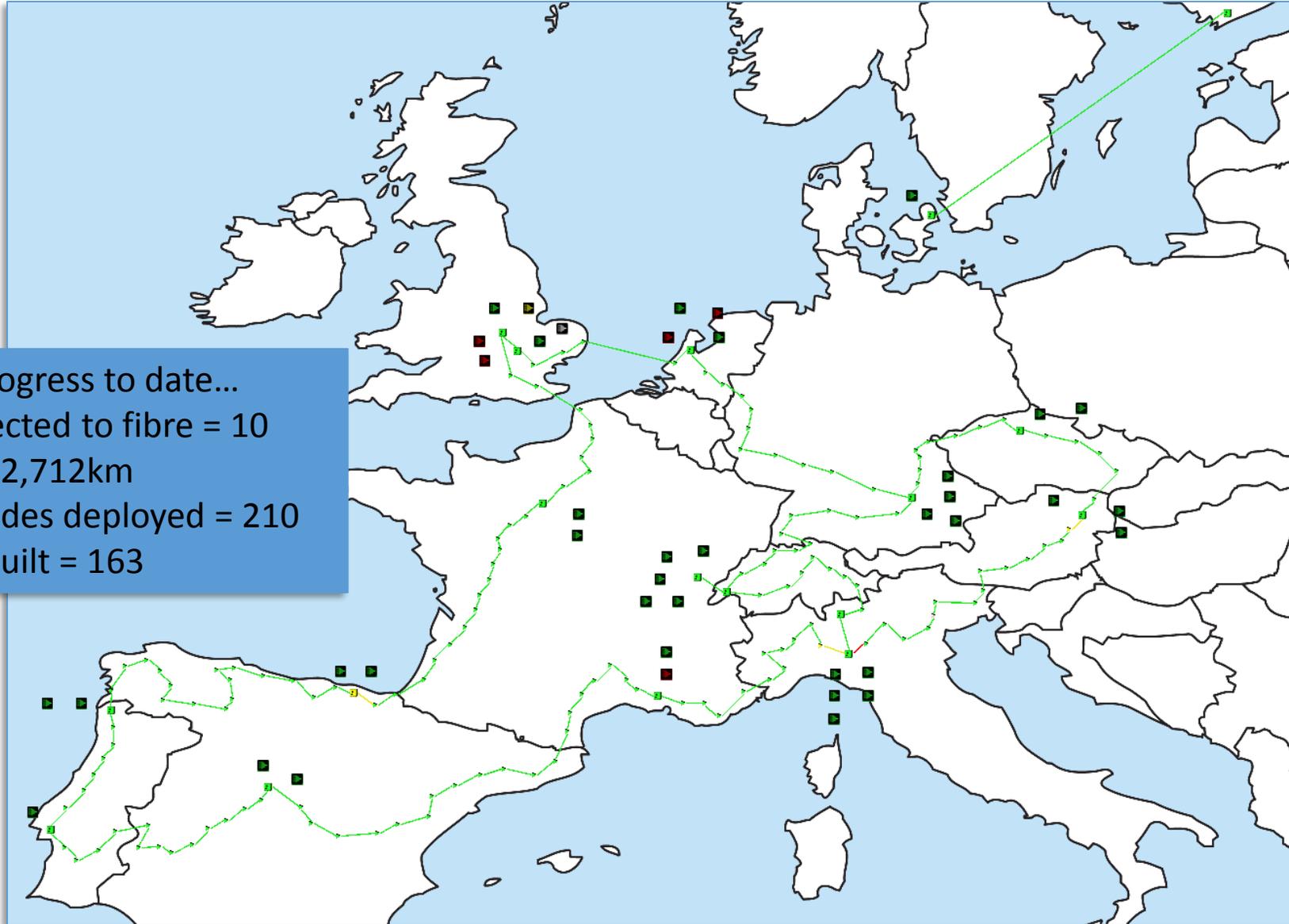
FlexILS MTC6 chassis with cards



Groove G30

Infinera deployment progress – 20th Sept 21

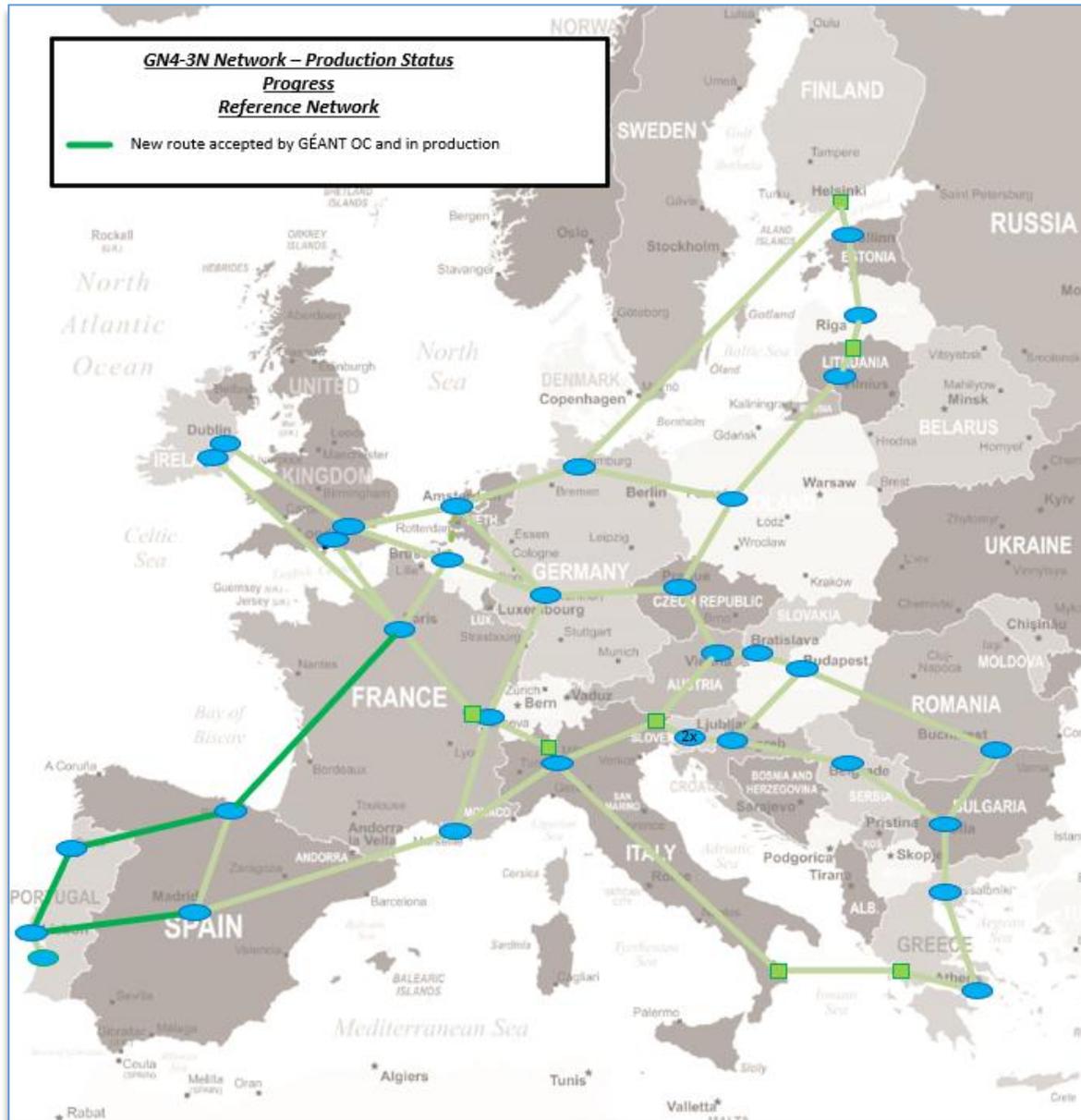
Includes all completed dark fibre routes + COP – HEL (spectrum trial)



Some figures on progress to date...

- Countries connected to fibre = 10
- Dark fibre lit = 12,712km
- New Infinera nodes deployed = 210
- Physical spans built = 163

Route Operational Status – 20th Sept 2021

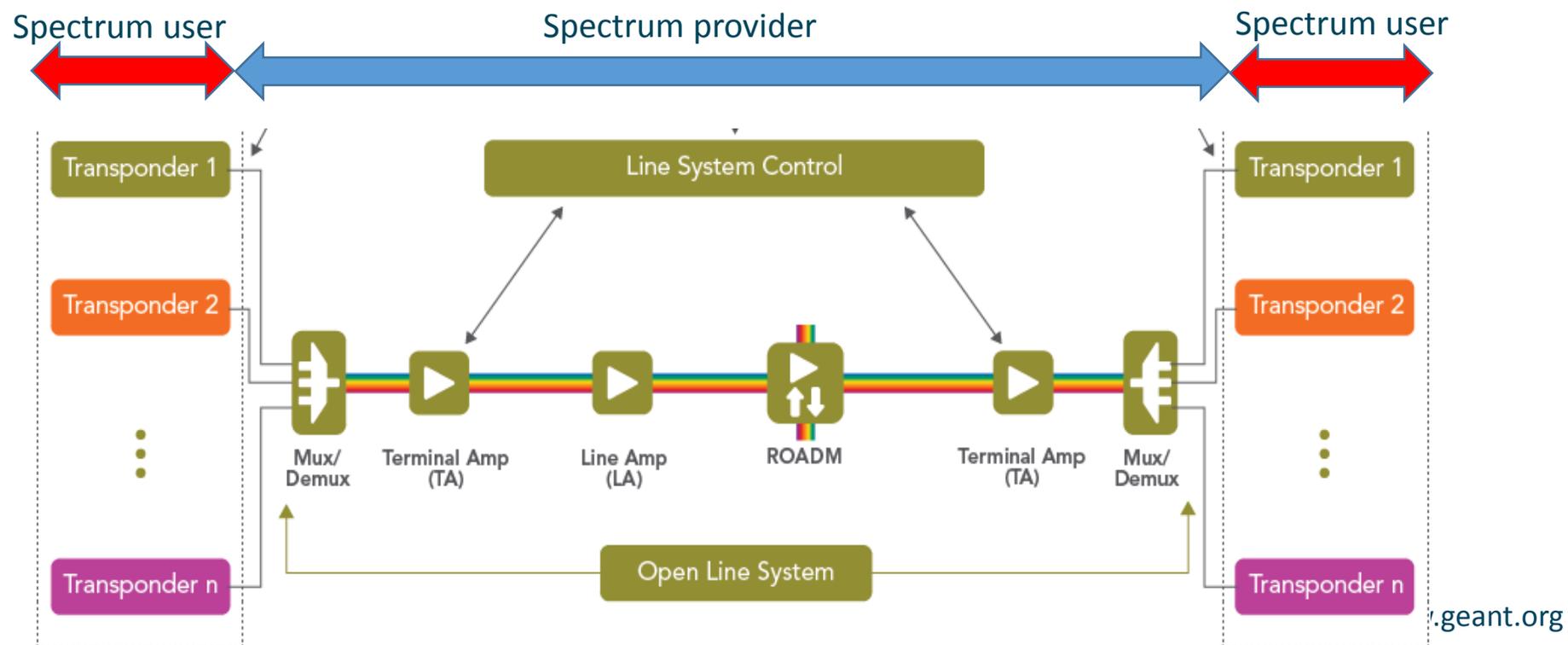


The following new GN4-3N routes have been accepted by the GÉANT Operations Centre (GOC) and are now in production:

- Paris – Bilbao (300G DWDM capacity)
- Bilbao – Porto (300G DWDM capacity)
- Porto – Lisbon (200G DWDM capacity)
- Lisbon – Madrid (300G DWDM capacity)

Spectrum sharing

- Spectrum sharing is the ability to share available optical spectrum on a DWDM transmission system between different organizations
- Difference with OLS is the ownership of the transponders
- Spectrum customers (cooperators) will have access to inject light directly into the host line system.

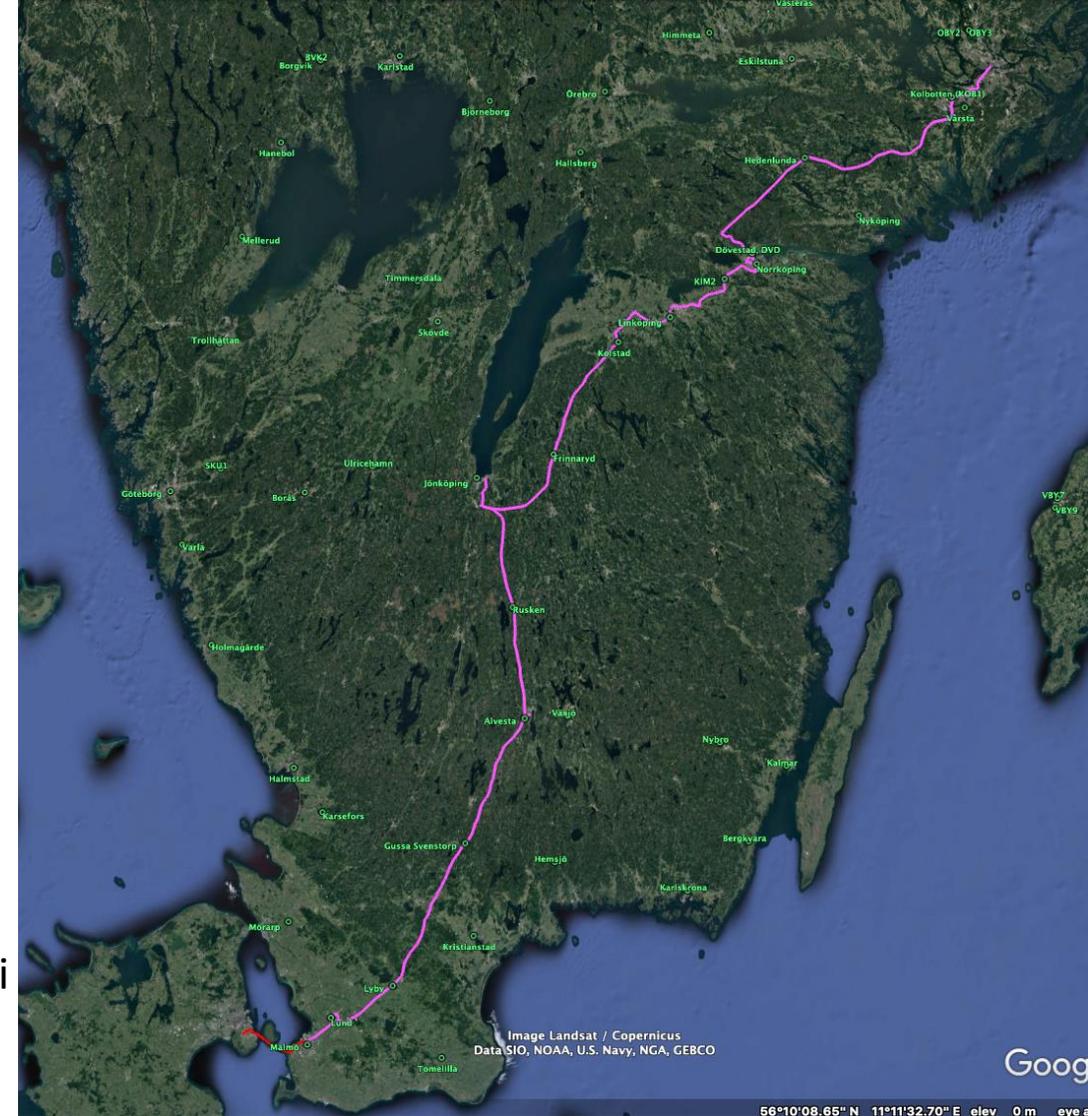
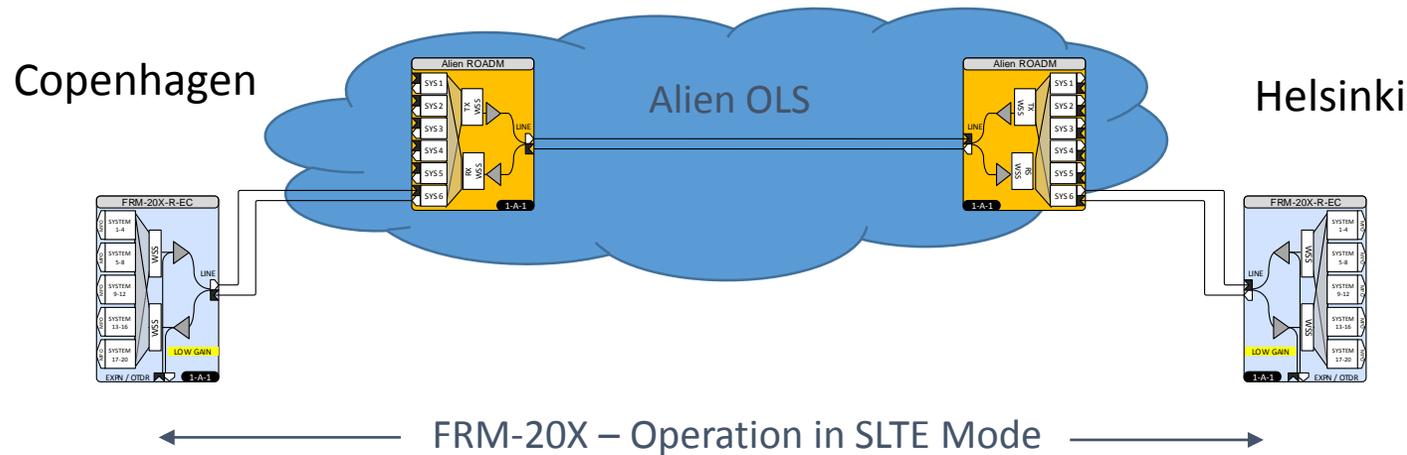


Alien wave licenses

- Vendors charge licence fees to use third-party transponders
- GEANT mandated in our procurement that we would commit to buying an agreed number of transponders from the vendor for the first build
- After three years the system would become free of licence fees for AWs
- The cost of license fees during the first 3 years were included in the system TCO

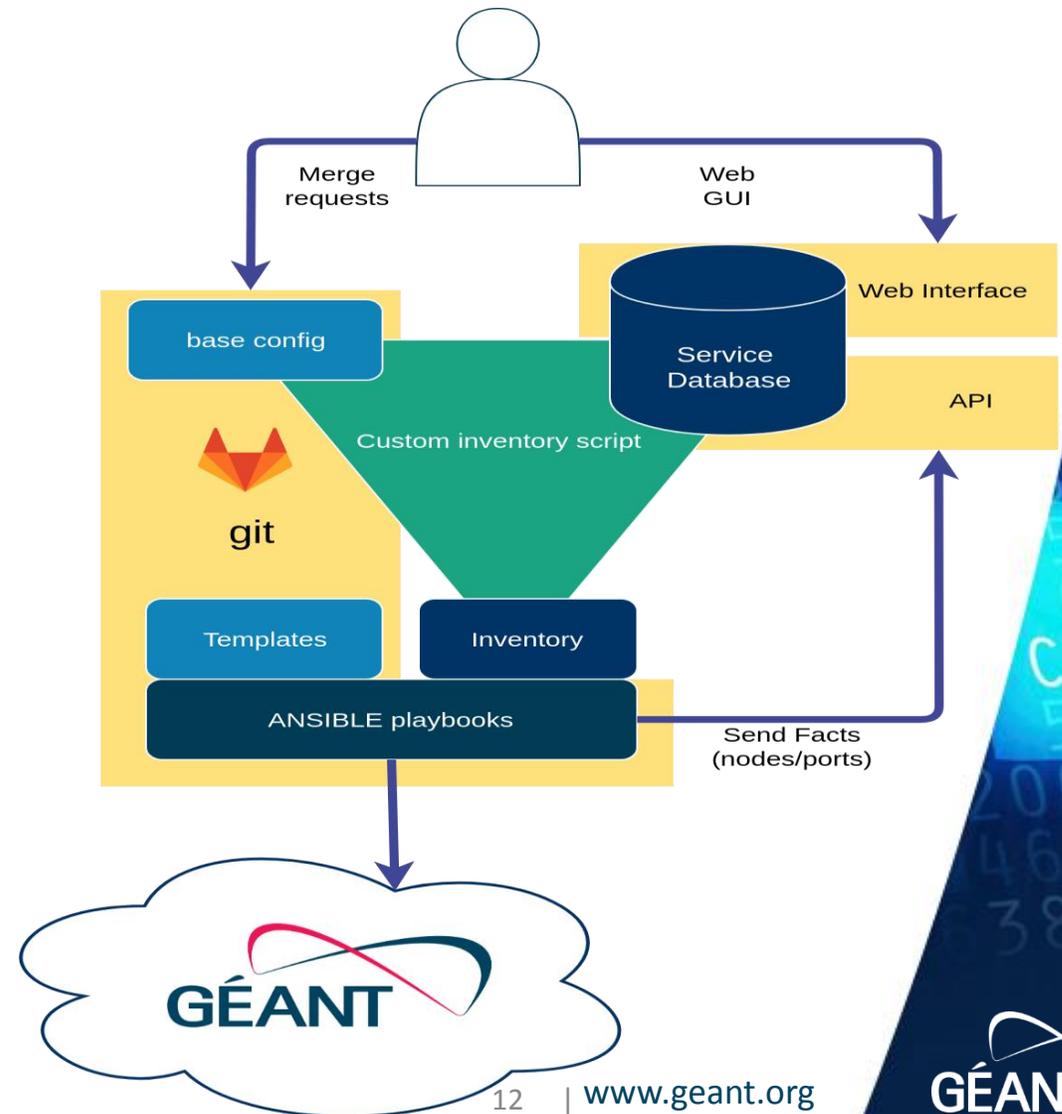
Spectrum Connection Service

- Trial of Spectrum Connection Service – Q3/4 2021
 - Helsinki – Copenhagen
 - GÉANT Infinera FlexILS over NORDUnet Adva line system
 - Carry multiple wavelengths from GÉANT over Nordic NRENs fibre systems
- GÉANT will be providing a managed Spectrum service between Amsterdam and London
 - Carry multiple wavelengths from SURFnet and NORDUnet over GÉANT Fibre



Network Configuration Automation

- The production routers were brought under automated configuration control
- Configuration management system based on Saltstack migrated to Ansible
- Base configuration, is now under version control



Top Project Risk – Hardware availability



Risk	RAG	Risk	RAG
Infinera extended lead times for FlexILS equipment due to semiconductor shortage has potential to impact deployment programme		Hardware availability issues – extended lead times of key FlexILS modules due to semiconductor shortages	
Re-introduction of regional/national COVID-19 restrictions impacting multiple activities that delay connectivity & route build		COVID-19 – destination countries declared as high risk impacting use of pan EC resourcing and challenges moving around	
COVID-19 restrictions impacts site visits by GÉANT Implementation Team for critical enabling works or service migration support		Line Fibre readiness – No OTDR fibre data shared with the System Engineer or lack of design data	
Extended lead times for Juniper HW has potential to delay migration completion		Site readiness – e.g. power, space, infrastructure. Leading to aborted or additional site visits	

In other news

- New monitoring tool. Enter BRIAN <https://public-brian.geant.org>
- New network-centric website: <https://network.geant.org>
- New flow analysis tool (Kentik)
- Dropped support for 10G lambda service (optical links)
 - Moved to a RSVP-based reserved capacity service for up to 10G capacity
 - Keeping the 100G lambda service

Thank you

Any questions?

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© GÉANT Association on behalf of the GN4 Phase 3 Network project (GN4-3N). The research leading to these results has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No. 856728 (GN4-3N).