



EU NREN & GEANT for CTAO Data transfer

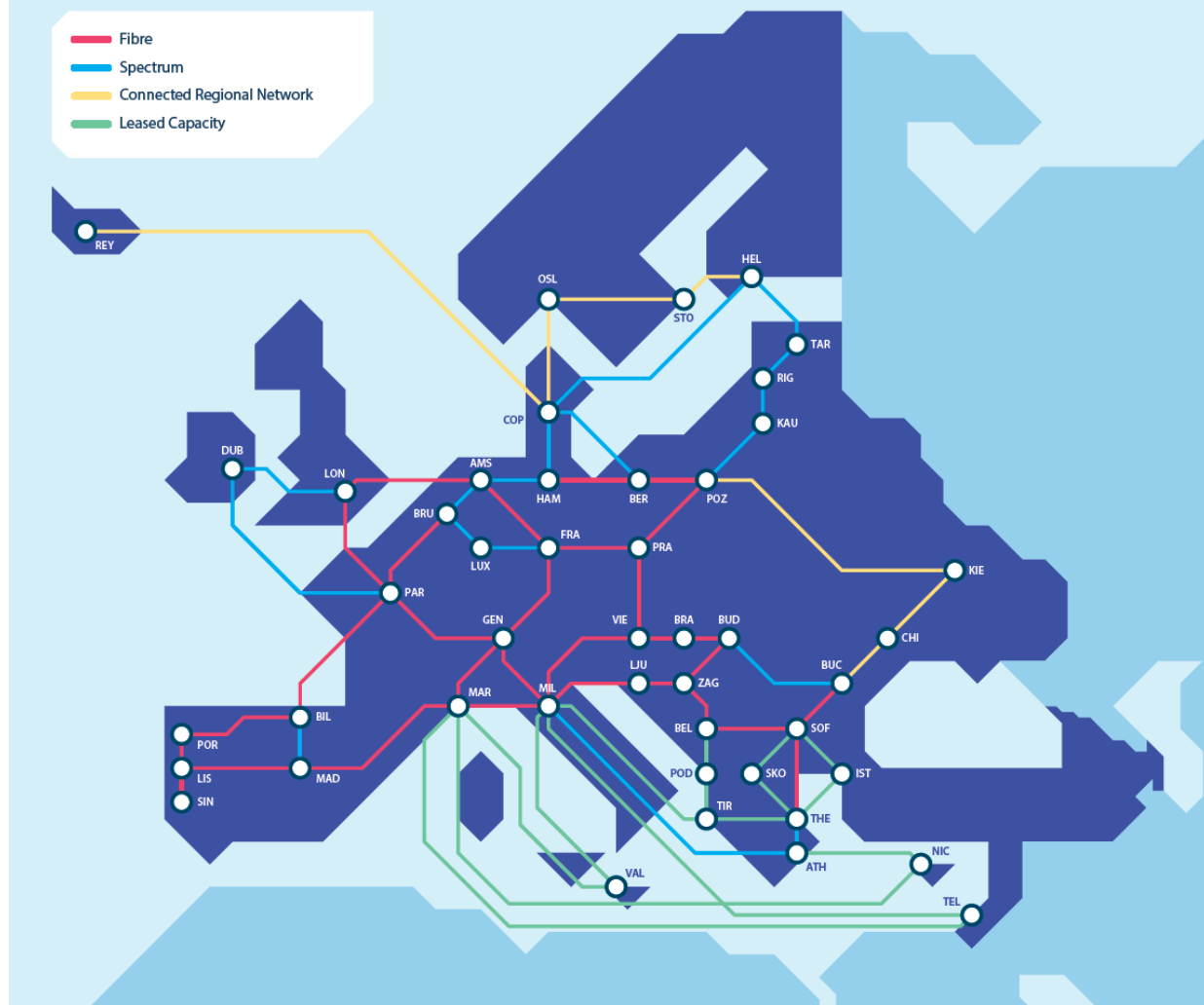
Enzo Capone
Head of Research Engagement and Support

SA3CC Meeting 2025

7th May 2025

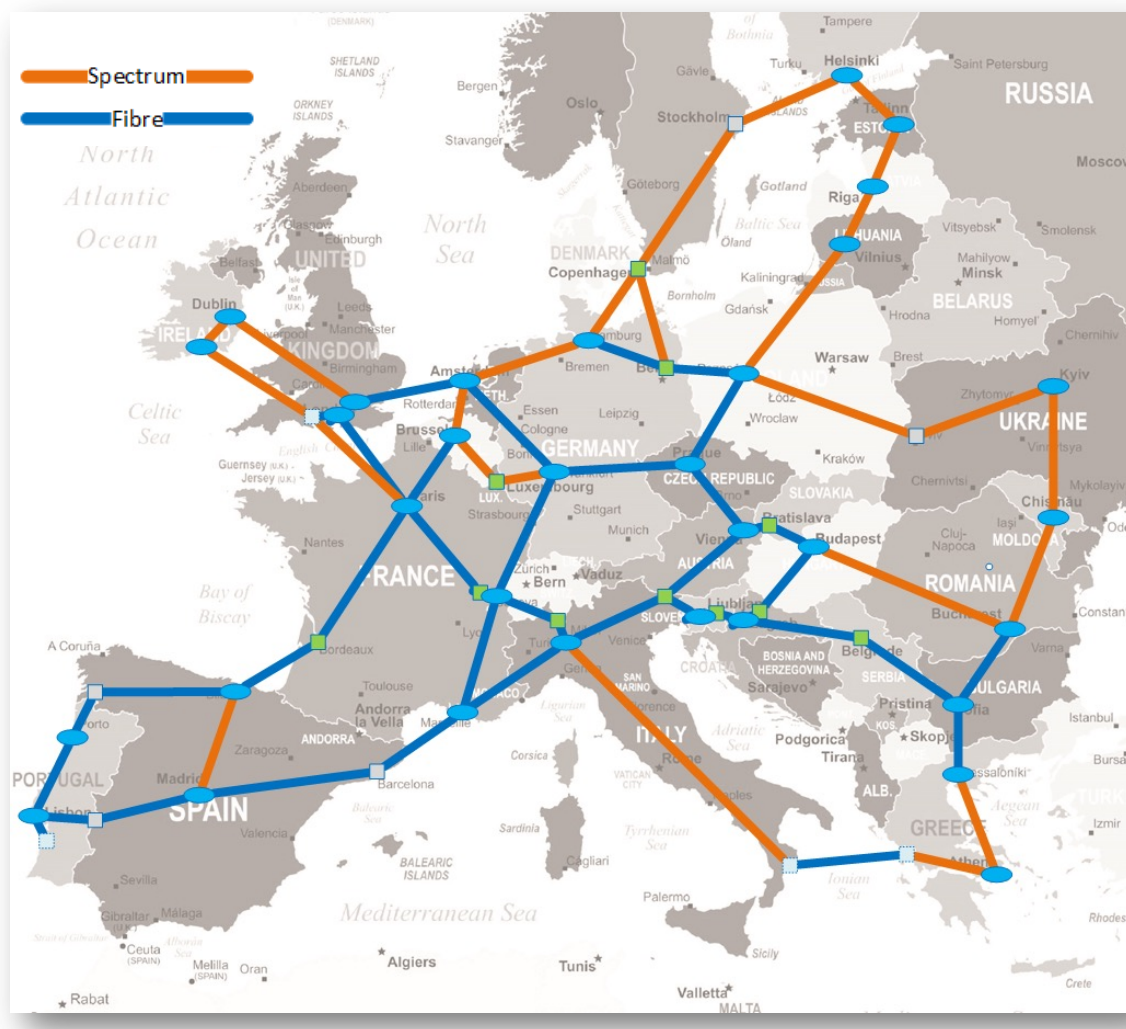
The GÉANT backbone

 RASH	 Belnet	 cesnet	 IRIS	 grnet
AL Albania	BE Belgium	CZ Czech Republic	ES Spain	GR Greece
 Asnet	 BULNET	 DFN	 NORDUnet	 CARNET
AM Armenia	BG Bulgaria	DE Germany	FI Finland*	HR Croatia
 aonet	 SWITCH	 NORDUnet	 RENATER	 KIFÜ
AT Austria	CH Switzerland	DK Denmark*	FR France	HU Hungary
 AzerNet	 CYNET	 EENet	 GRENA	 HEAnet
AZ Azerbaijan	CY Cyprus	EE Estonia	GE Georgia	IE Ireland
 IsraelNet	 restena	 MARnet	 PSNC	 NORDUnet
IL Israel	LU Luxembourg	MK F.Y.R Macedonia	PL Poland	SE Sweden*
 NORDUnet	 Latvian	 L-Università ta' Malta	 FCGN	 arnes
IS Iceland*	LV Latvia	MT Malta	PT Portugal	SI Slovenia
 GARR	 RENAM	 SURF	 RoiNet	 sanet
IT Italy	MD Moldova	NL Netherlands	RO Romania	SK Slovakia
 LITNET	 CMREN	 NORDUnet	 AMRES	 BLAKBIM
LT Lithuania	ME Montenegro	NO Norway*	RS Serbia	TR Turkey
 Jisc				
UK United Kingdom				
 UkrNet				
UA Ukraine				



Extending the reach - Spectrum

- About **30%** of the new network **Spectrum based**
- Typically, spectrum using **25%** of a **dark fibre** at about **40%** of the **cost** of a full fibre
- Capacity of **2.4 to 6Tbps**



Network Services

GEANT operates an advanced, high-performance network supporting Europe's NRENs with cost-effective, highly available, high-capacity services customised for and dedicated to research and education

GEANT network services

GEANT IP – Ultra-high performance uncontended IP connectivity at up to 100Gbps or multiple 100Gbps connections

GEANT VPN – VPN services for NRENs and institutions supporting private networking needs

GEANT Point-to-Point – High performance dedicated connectivity up to 100Gbps for the most demanding applications

GEANT Open – Allows NRENs and approved commercial organisations to exchange connectivity in a highly efficient and flexible manner



Astronomy/Physics



Earth Observation



eInfras



Life Science



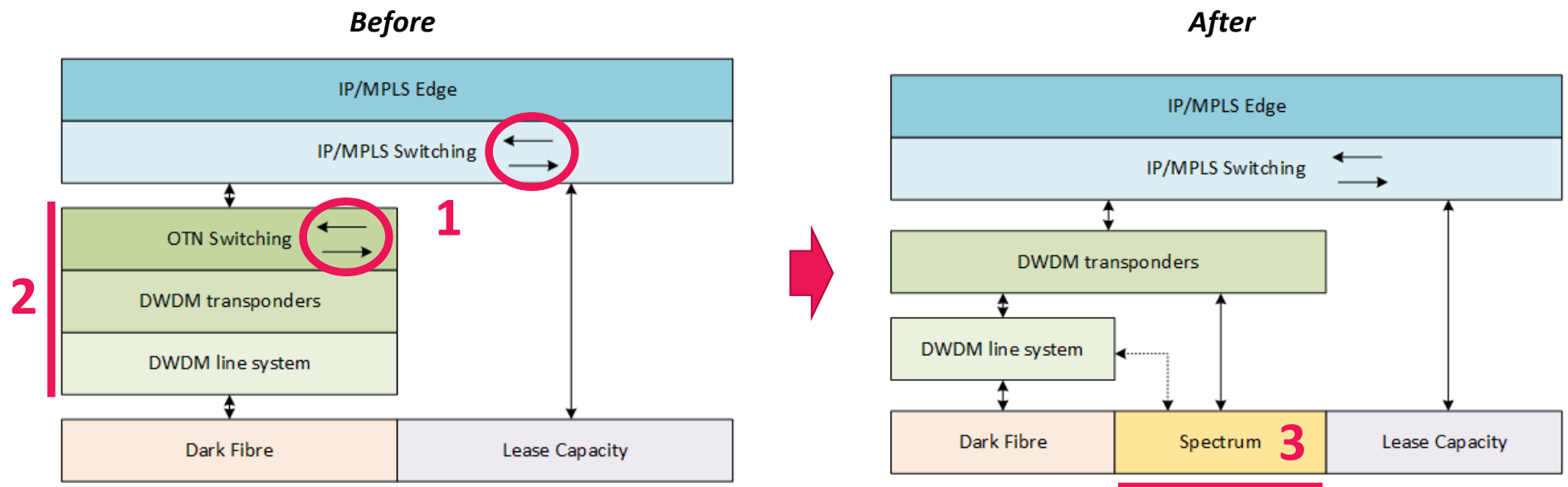
Arts and Humanities



Outreach



Optical transmission stack optimization

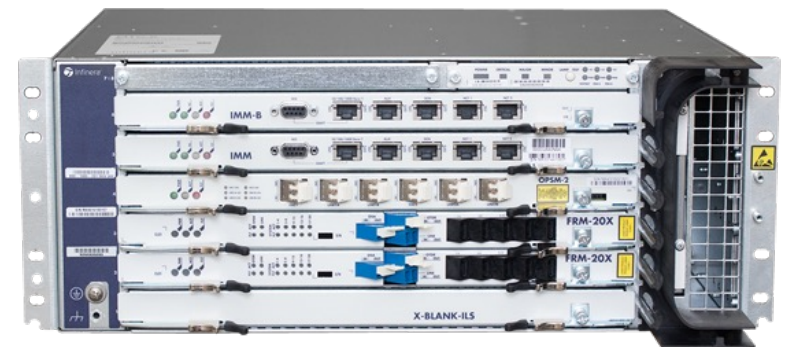


1. Electronic Switching at MPLS layer only with removal of OTN switching
2. Disaggregation at DWDM layer between Transponders and Line System (OLS)
3. Use of Spectrum as connectivity option for the substrate

Open Optical Line System

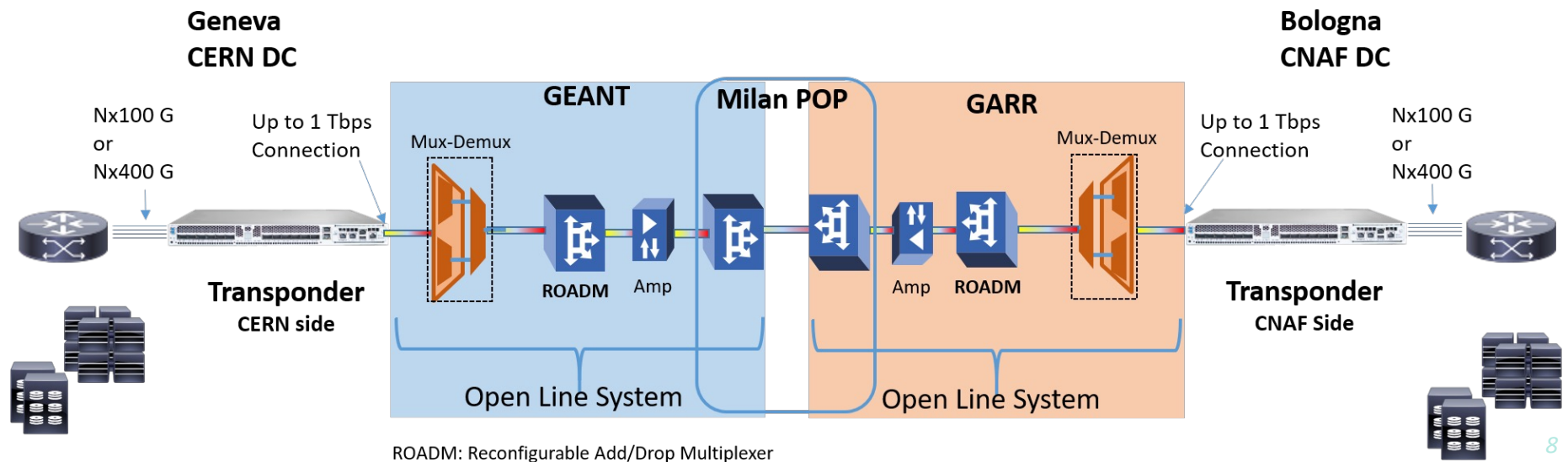
Optical Line System is now being deployed across the GÉANT backbone

- **Infinera FlexILS** will be the basis for next generation optical network
- **Framework Agreements** with four vendors available to NREN community
- **Modular, state of the art system**
 - Native support for 'alien waves' and spectrum



CNAF to CERN spectrum service

- Use Case: CNAF Tier1 to CERN Tier0 via GARR and GEANT SCS service
- GARR-GÉANT connection in Milan is now in place
- DCI equipment is housed in end-site racks, but managed by GARR
- Main benefit is significant cost reduction for users



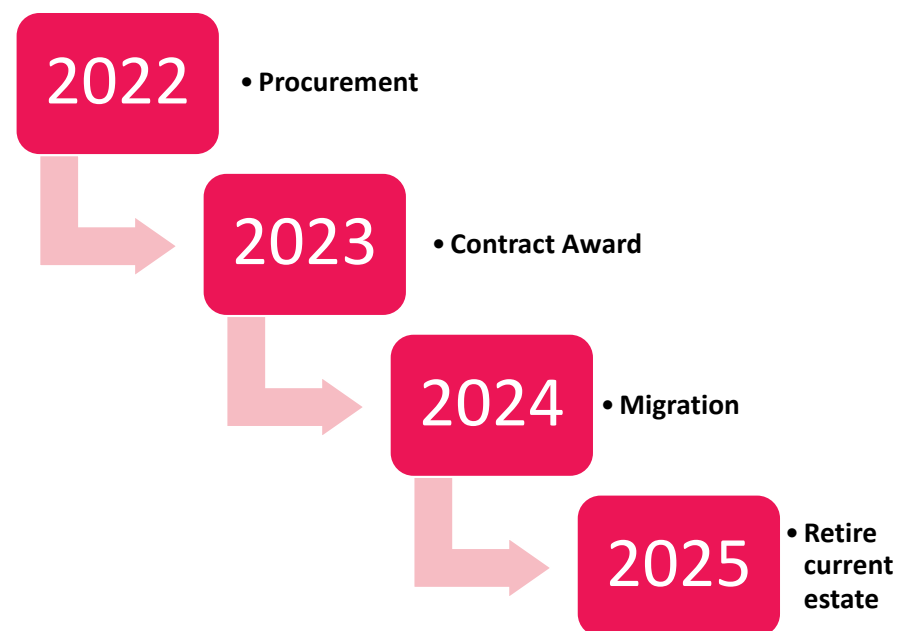
Packet Layer Renewal

3 years project started early 2022

**400G availability throughout the whole
GÉANT footprint**

Highspeed network availability to the
edges of Europe

Enabling global partners to connect at
or close to landing stations



The new IP-MPLS platform

NOKIA



The 7750 SR family

Your route to the remarkable



Nokia 7750 SR-1se

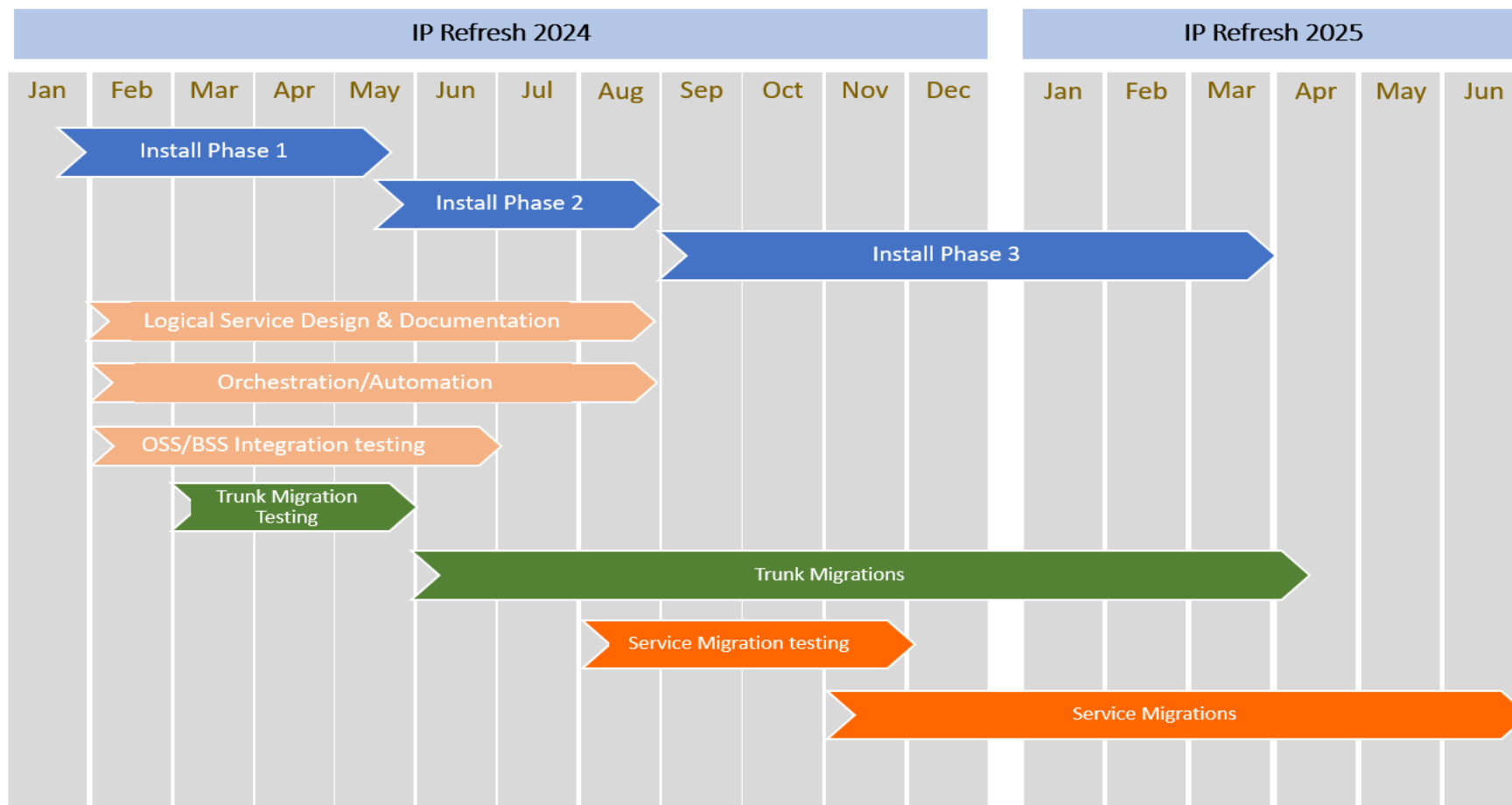


Nokia 7750 SR-2se



Nokia 7750 SR-7s

Timeline Summary



Current IP network

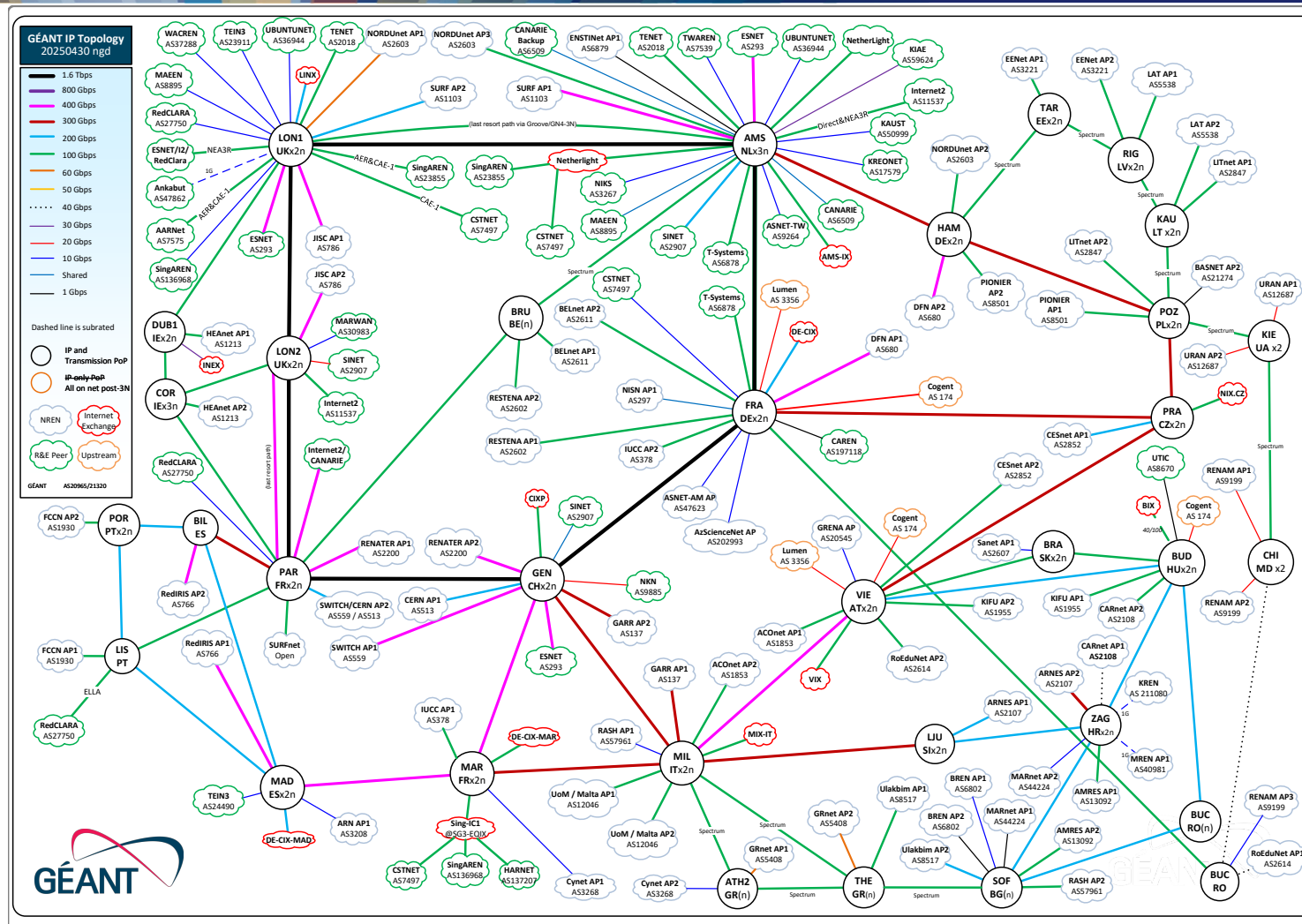
1.6Tb western ring

(LON-AMS-FRA-GVA-PAR)

NRENs upgraded to 400G access (redundant):

- DFN, SURF, RedIRIS, RENATER, JISC, SWITCH

Esnet peering upgraded to 3 x 400G (complete diversity)



Latin America

GÉANT Connects To:	• RedCLARA - https://www.redclara.net/ • Latin American Research and Education Network • 10 NREN members across the region; other countries across the regional eligible to join RedCLARA
EU-funded projects	• BELLA-T • Previous Projects • BELLA-S (2016-2021) • ALICE & ALICE2 (2003-2012) • ELCIRA (2012-2014) • MAGIC (2015-2017)



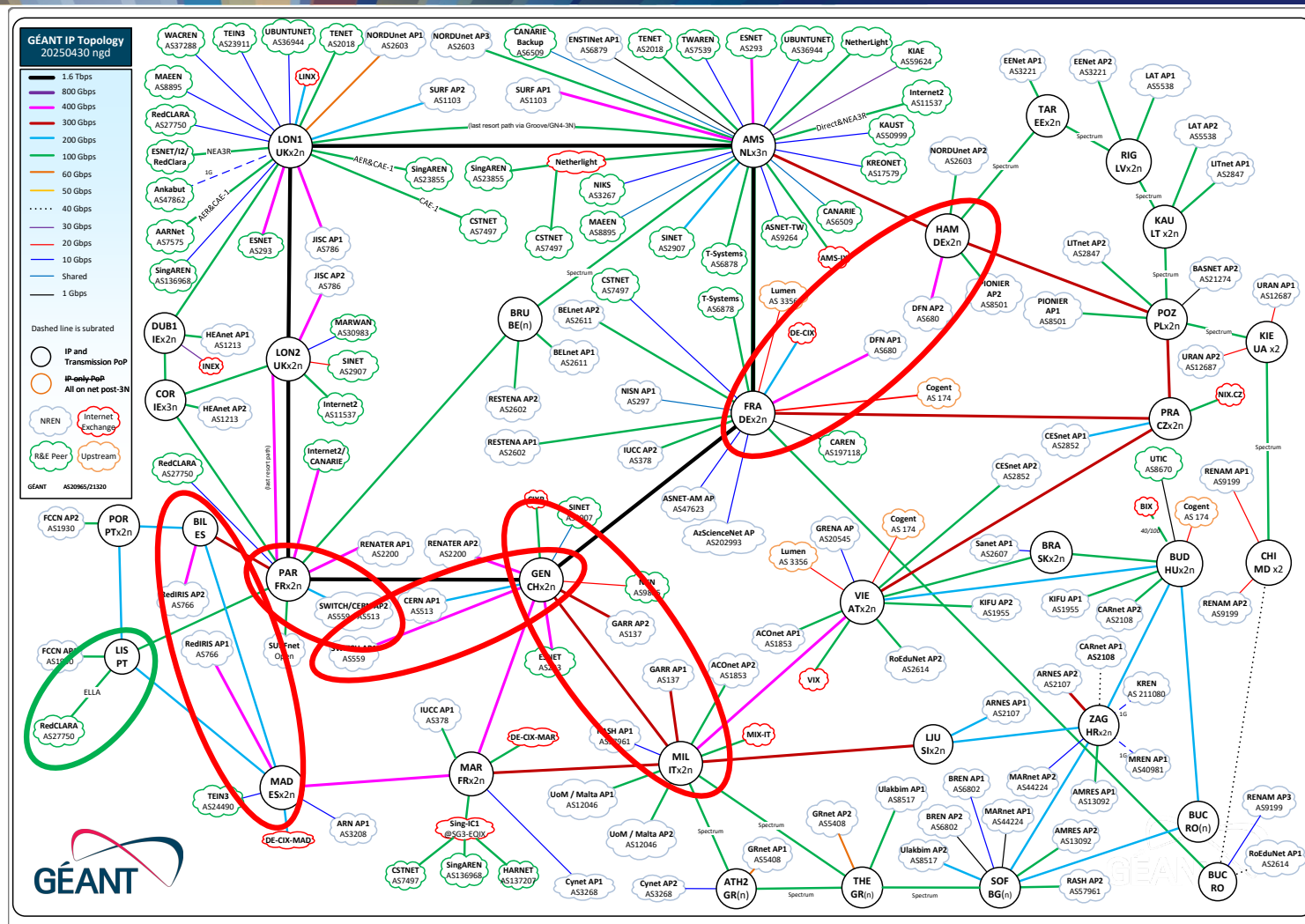
BELLA II

Building the Europe Link to Latin America and the Caribbean



CTA-related paths

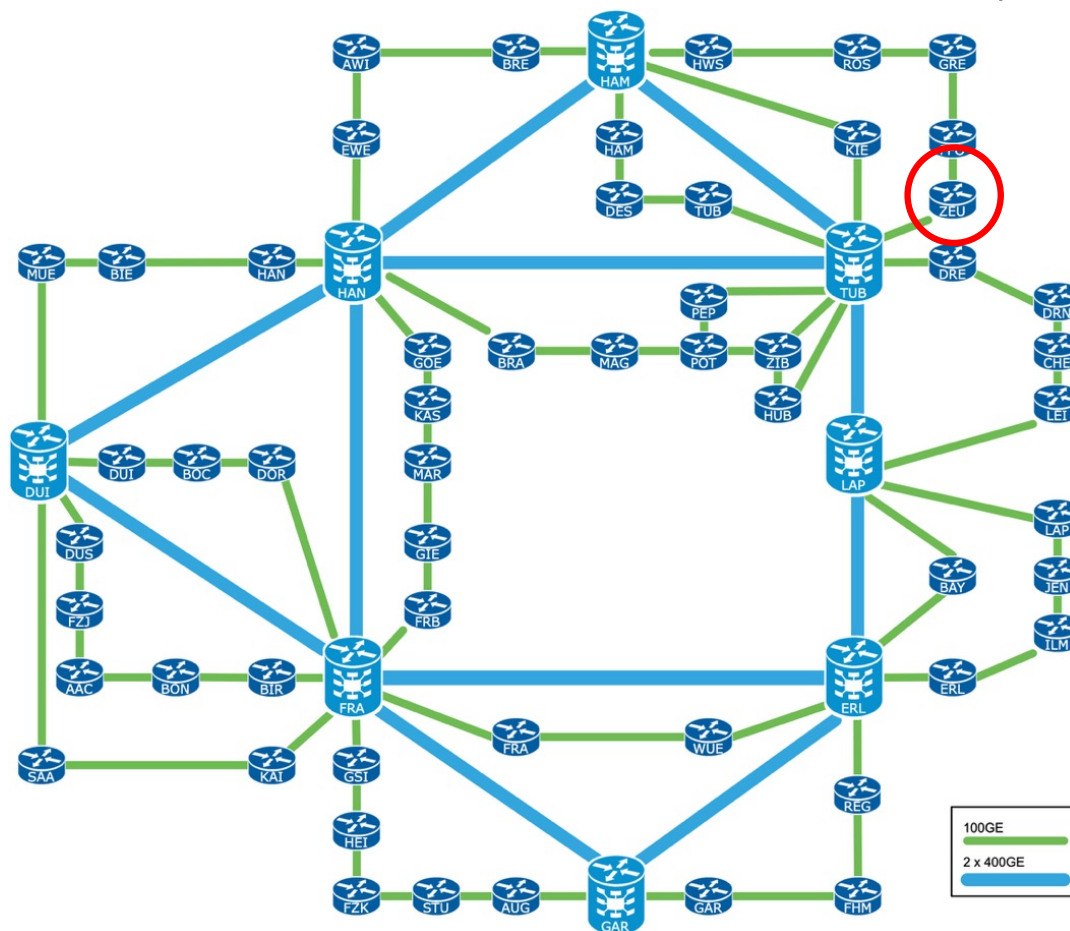
- **BELLA peering**
 - 100G to Sines/Lisbon
 - 2x200G + 100G Lisbon to other GÉANT nodes
- **NRENs connections**
 - RedIRIS (400G redundant)
 - DFN (400G redundant)
 - GARR (300G redundant)
 - SWITCH (400G + 200G)



DFN network



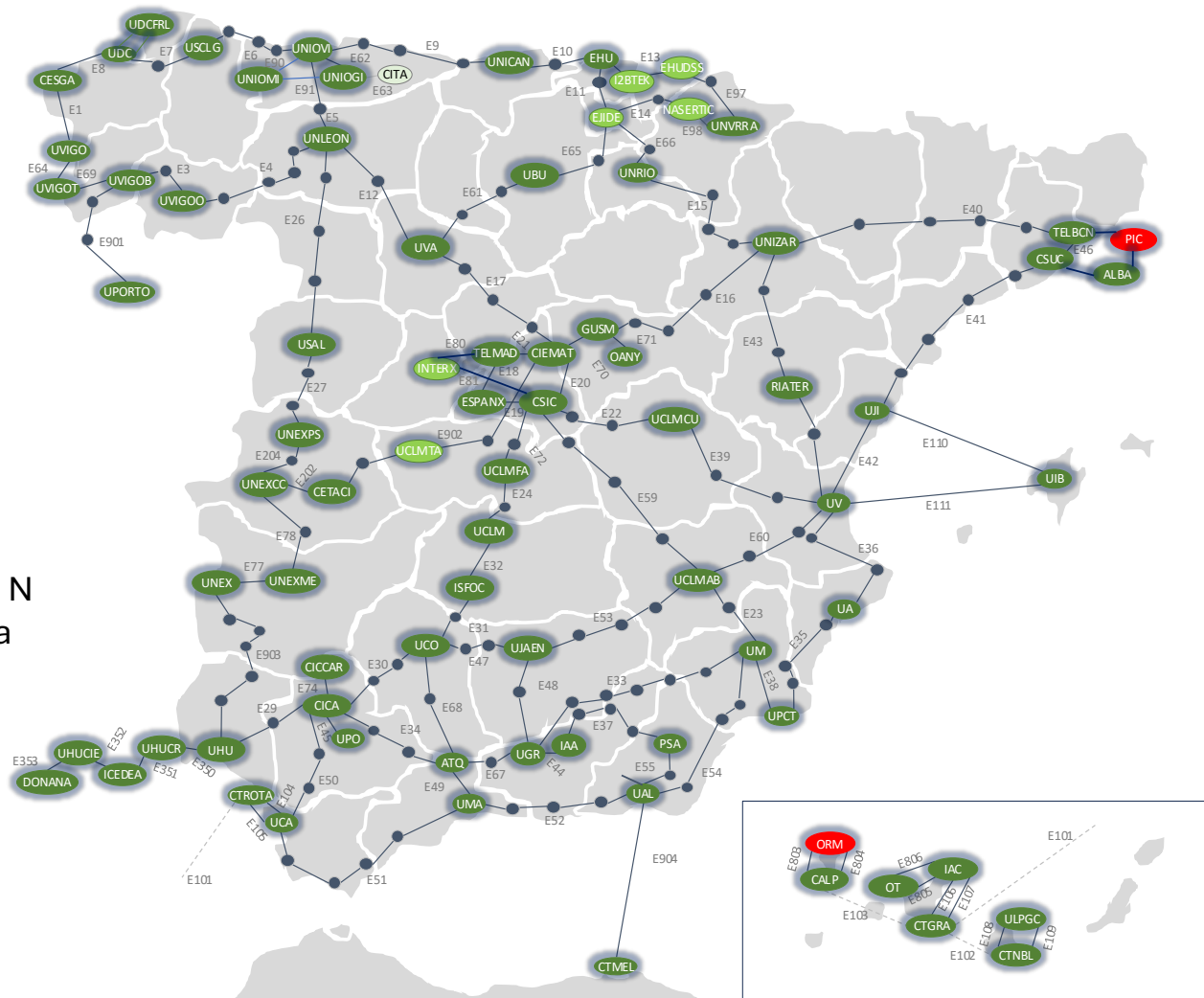
2x20G links to DESY in Zeuthen over redundant paths



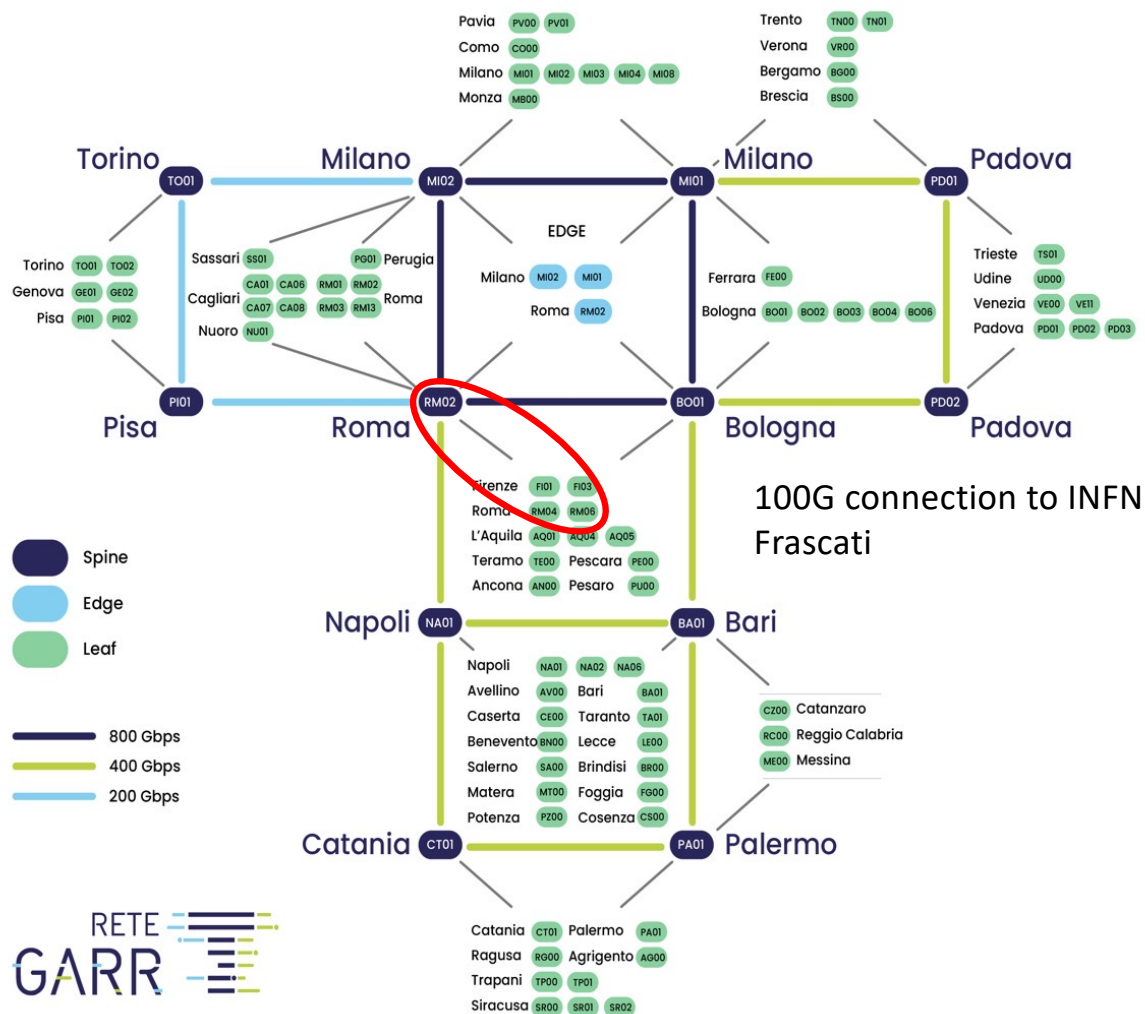
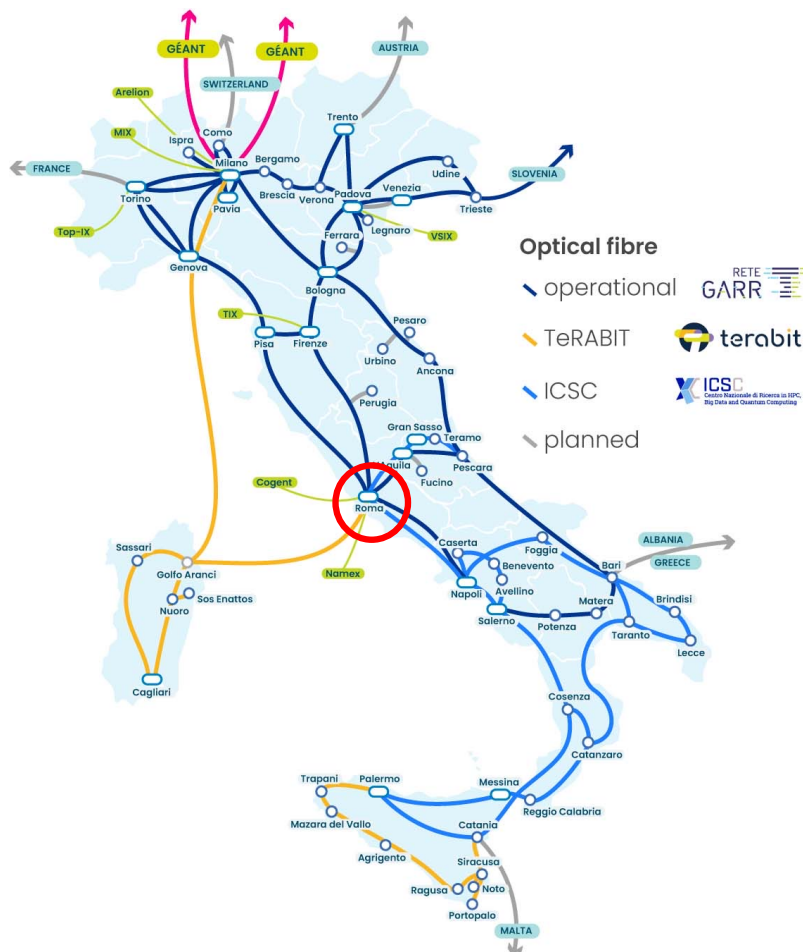
RedIRIS network

PIC is located on the UAB campus (Autonomous University of Barcelona), connected to 100G.

ORM (Roque de los Muchachos Observatory) located on the island of La Palma connected with Nx10G (upgrade to Nx100G is planned) to the backbone, plus a 10G circuit to PIC.



GARR network



Switch LAN



CSCS is connected to 400G to SWITCH

DTN Testing Facility Service



Based on the DTN testing tools developed by the RES team



100 Gb/s servers in London and in Paris, 10 Gb/s server in Hamburg



Offered to network experts from supported projects



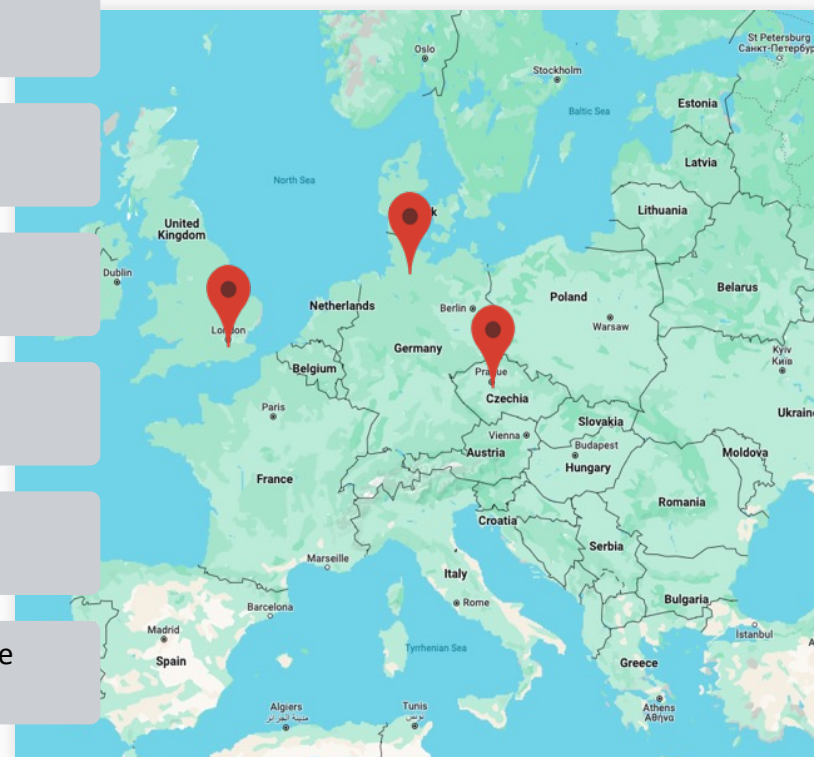
Use cases included: protocol/application validation, data transfer performance, troubleshooting



Users included: SKA, VRO, ITER/NII, CERN, LRZ, LHCONE, Belle-II/KAK



The DTN Testing Facility is created to offer to NRENs, projects and researchers the provision of data transfer testing capabilities





Thank You

Any questions?

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www.geant.org



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