



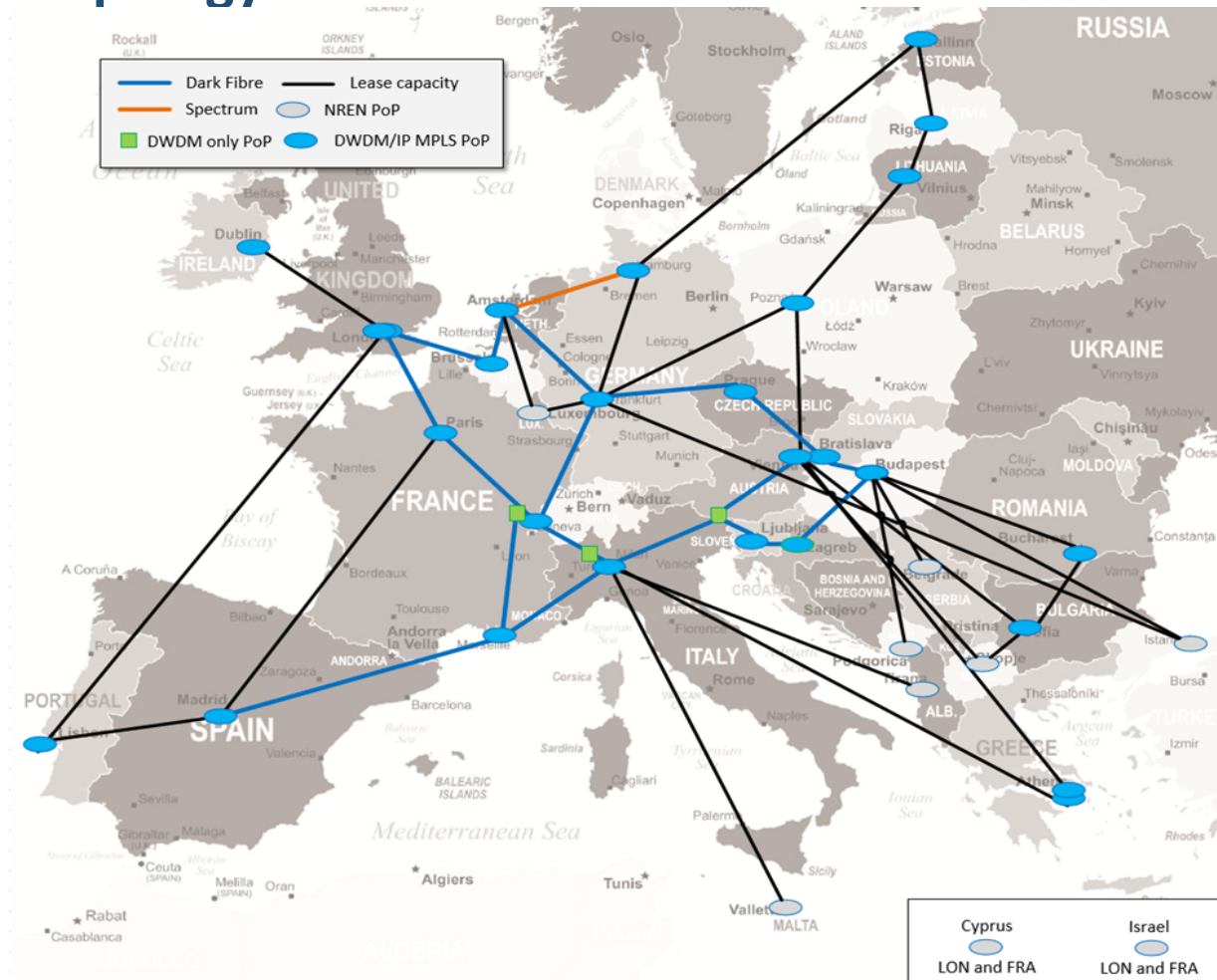
The GÉANT Network: a glimpse into the future

Enzo Capone

Head of Research Engagement and Support

www.geant.org

GÉANT topology



www.geant.org

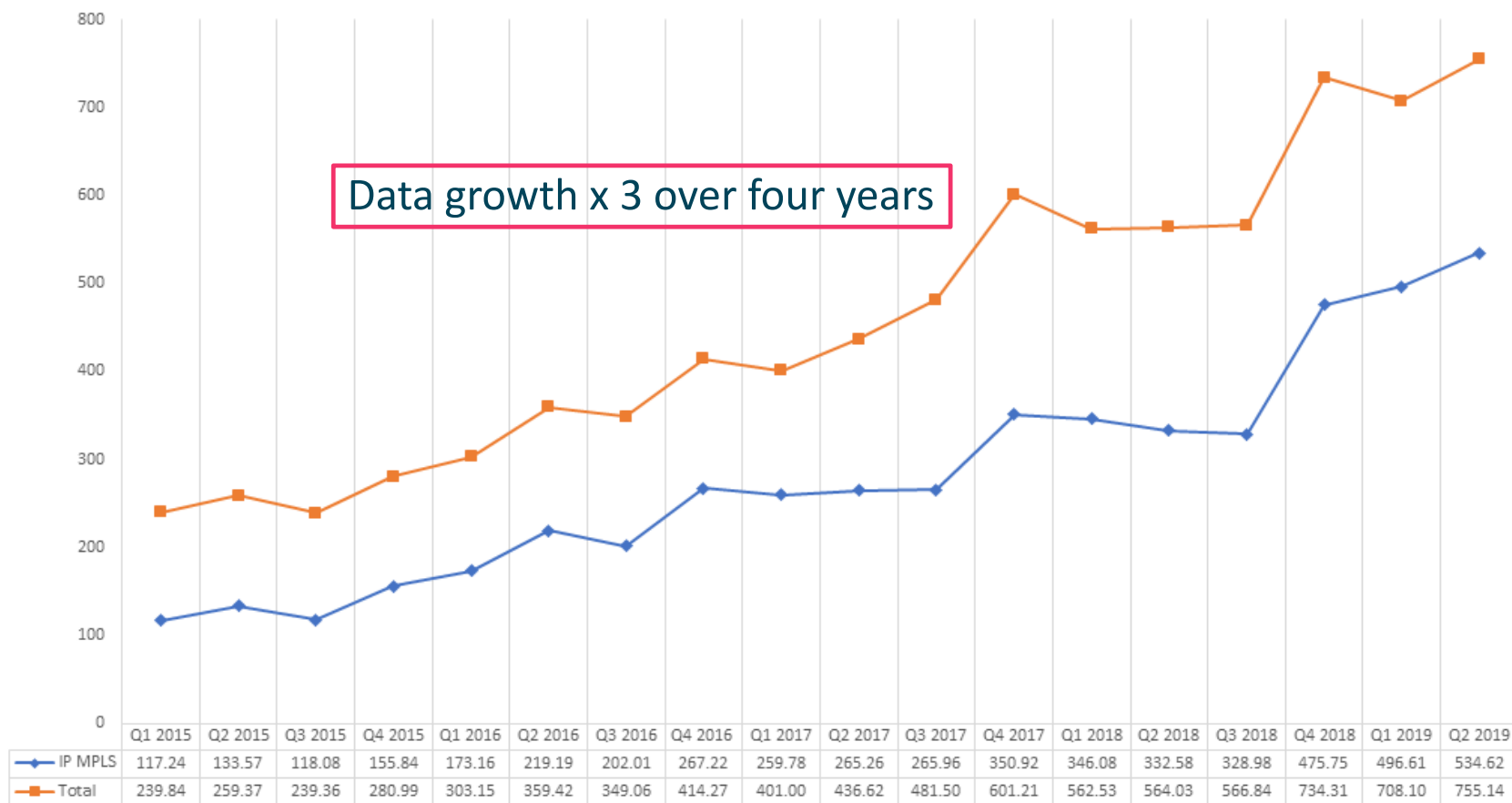
GÉANT

Challenges

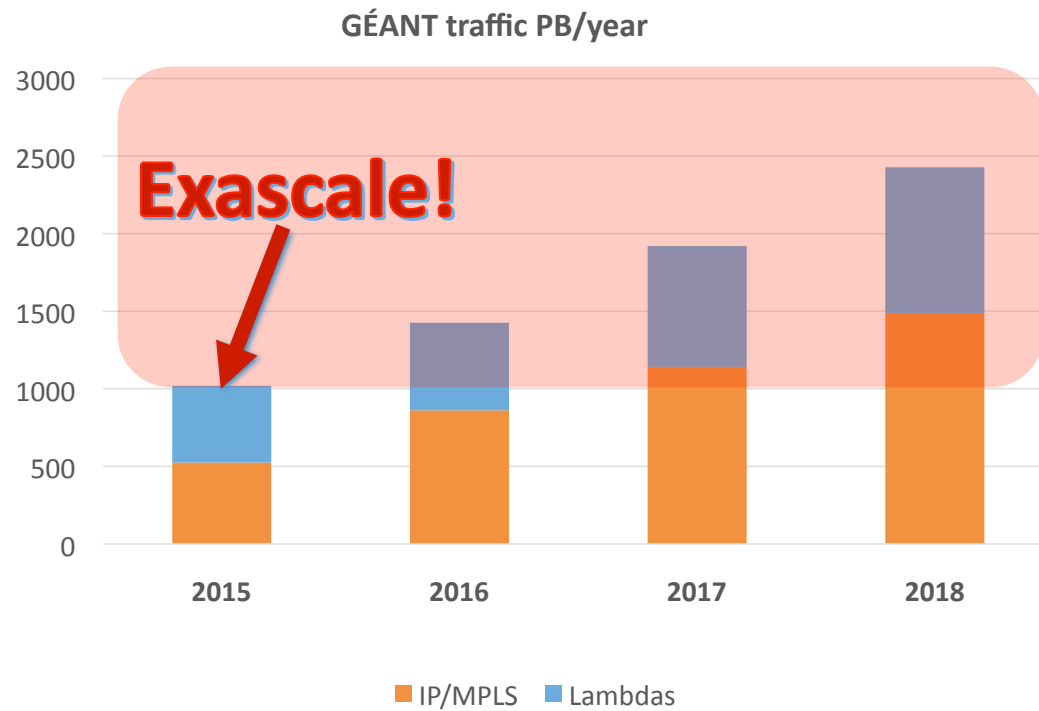
- Exponential traffic increase
- Flat (or shrinking) budget
- Need for programmability
- Reduce vendor lock-in
- Keep the existing mission and design rationale

Traffic trends

QUARTERLY VIEW PB OF DATA RECEIVED BY GÉANT



Network and Capacity Growth



- 2.4 EB of data received in 2018
- Long-term trend ~30% YoY

Enter the GN4-3N project (formerly known as IRU-SGA)

- EC created a funding vehicle to procure infrastructure on long terms contracts **and with 100% funding.**

*“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**”*

*“**Improve the minimum service level** of the smaller European NRENs and their users by ensuring connectivity speeds **of 100 Gbps** (where technically and economically feasible)”*

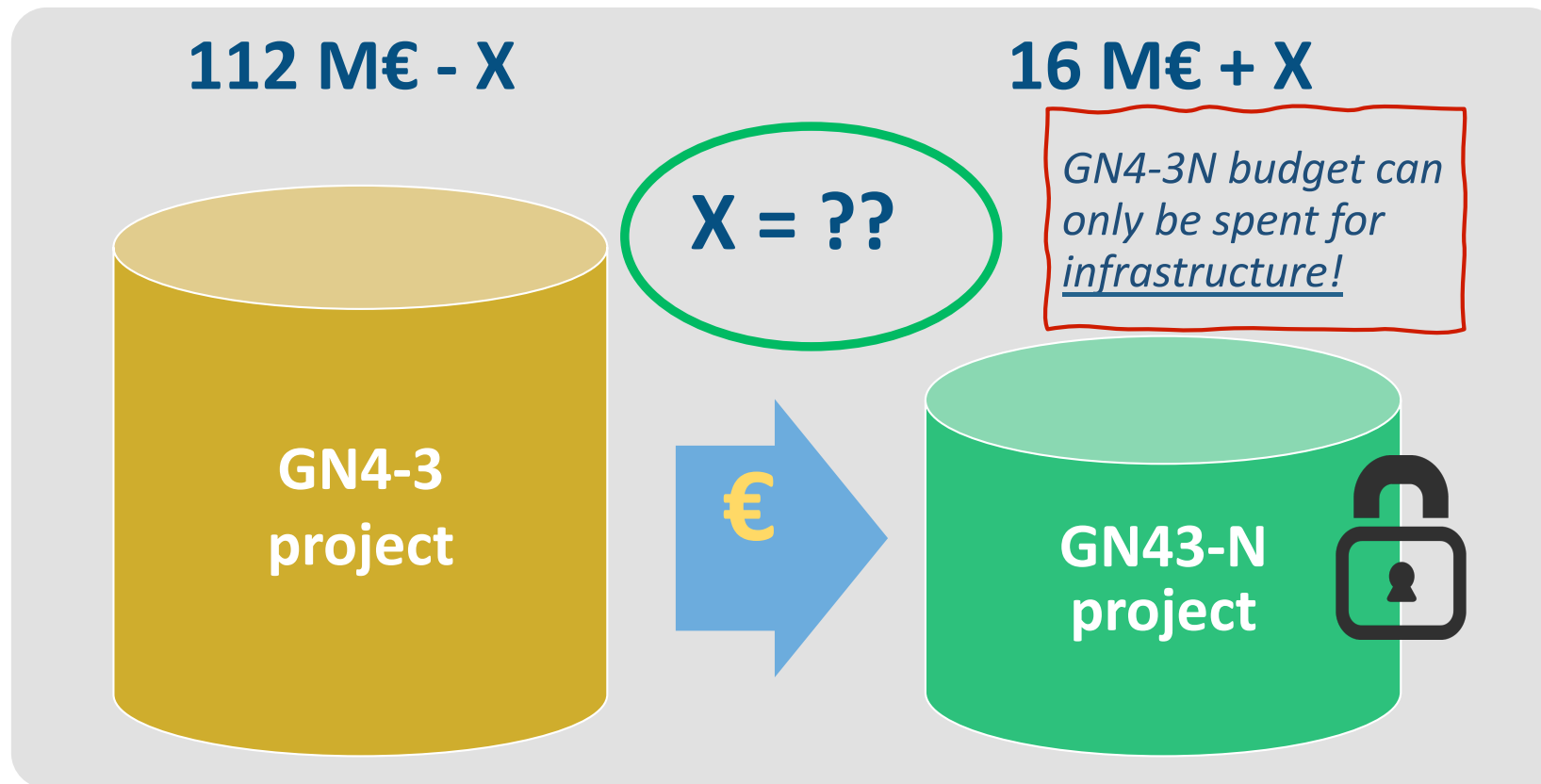
Extract from objective for the IRU SGA

- Funding cycle 2019-2022
- Budget at least 16M€, out of total 4-year GÉANT project budget of 128M€

www.geant.org

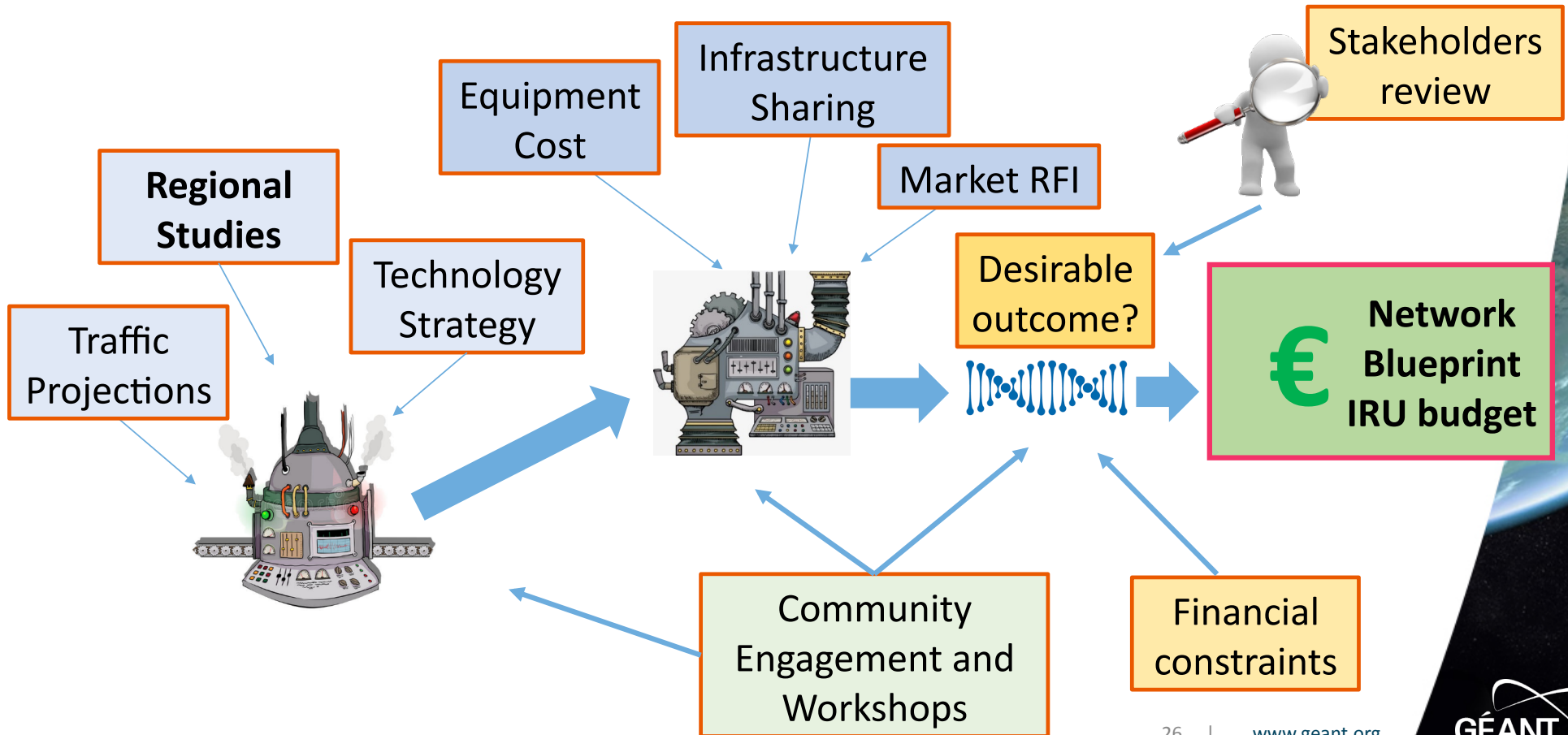


First things first: what's the budget?

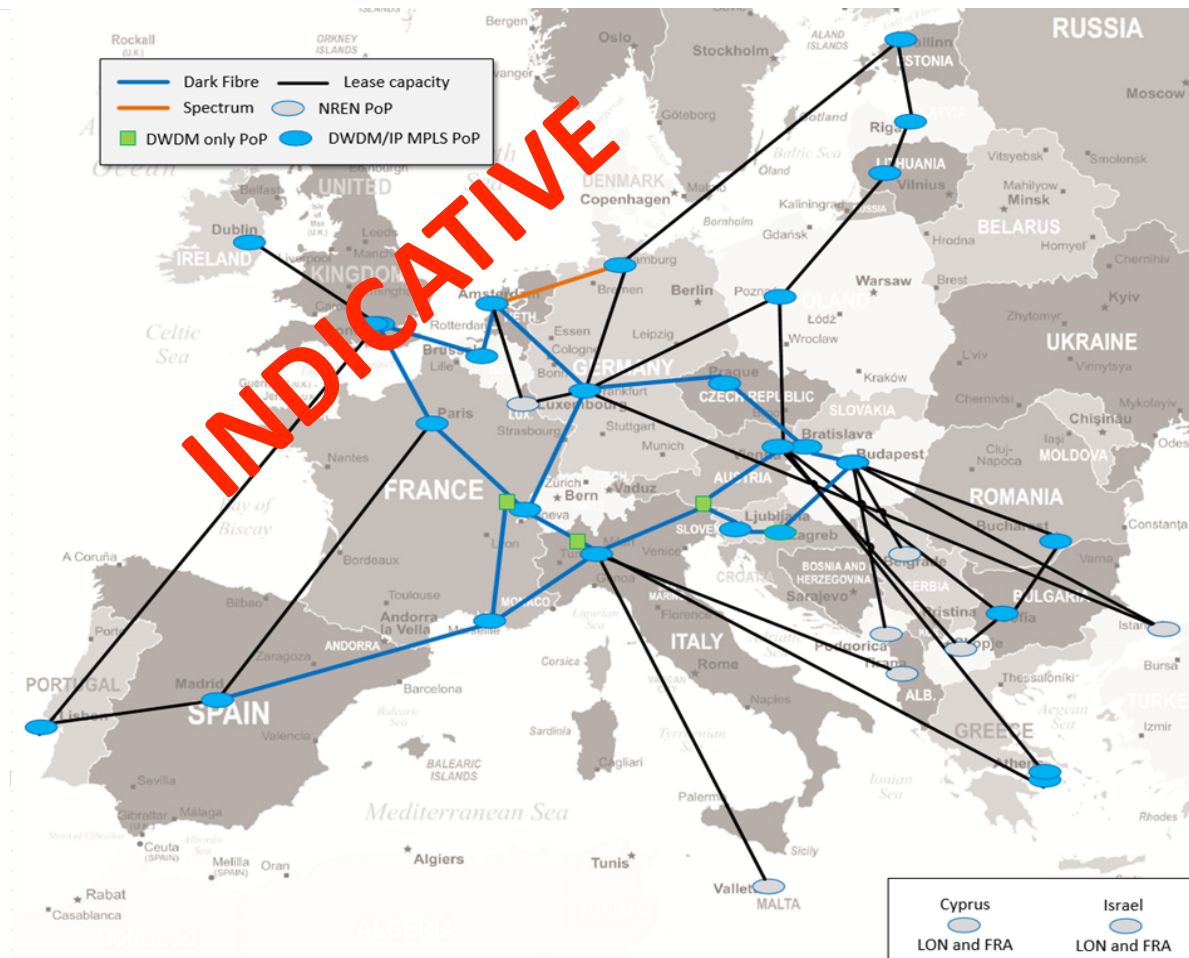


www.geant.org

How to decide...



GÉANT future topology (in progress)



24 countries for 40TbE (X10)

Juniper MX Platform

UK, IE, PT, ES, FR, BE, NL, DE, EE, LV,

14 Countries connected, on

to BG, GR, RS

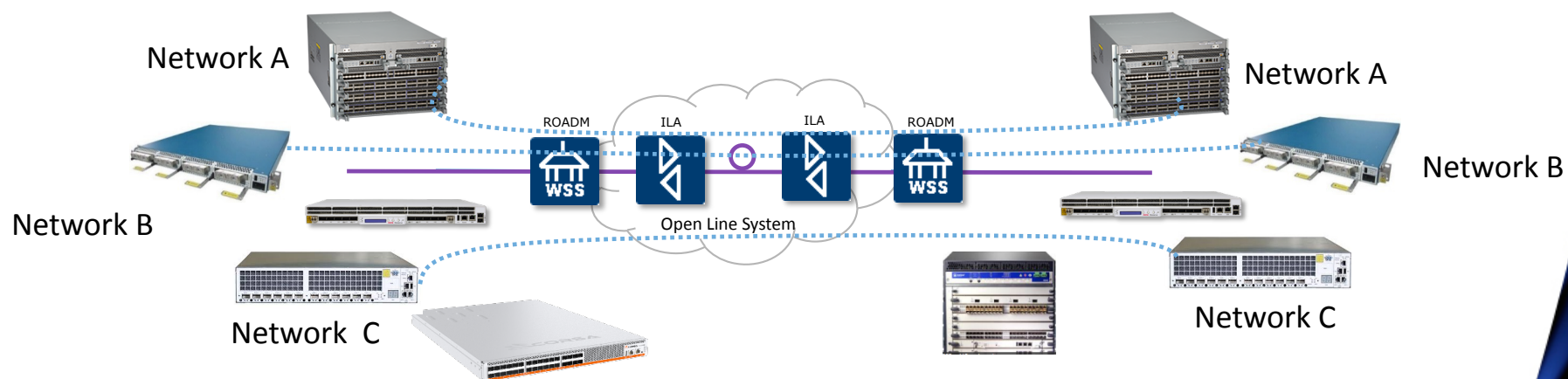
• UK, BE, FR, CH, DE, AT, NL,
HU, HR, IT, SI, SK, CZ, ES

• standard leased capacity
(minimal 10GE, might be 100GE
by end of project)

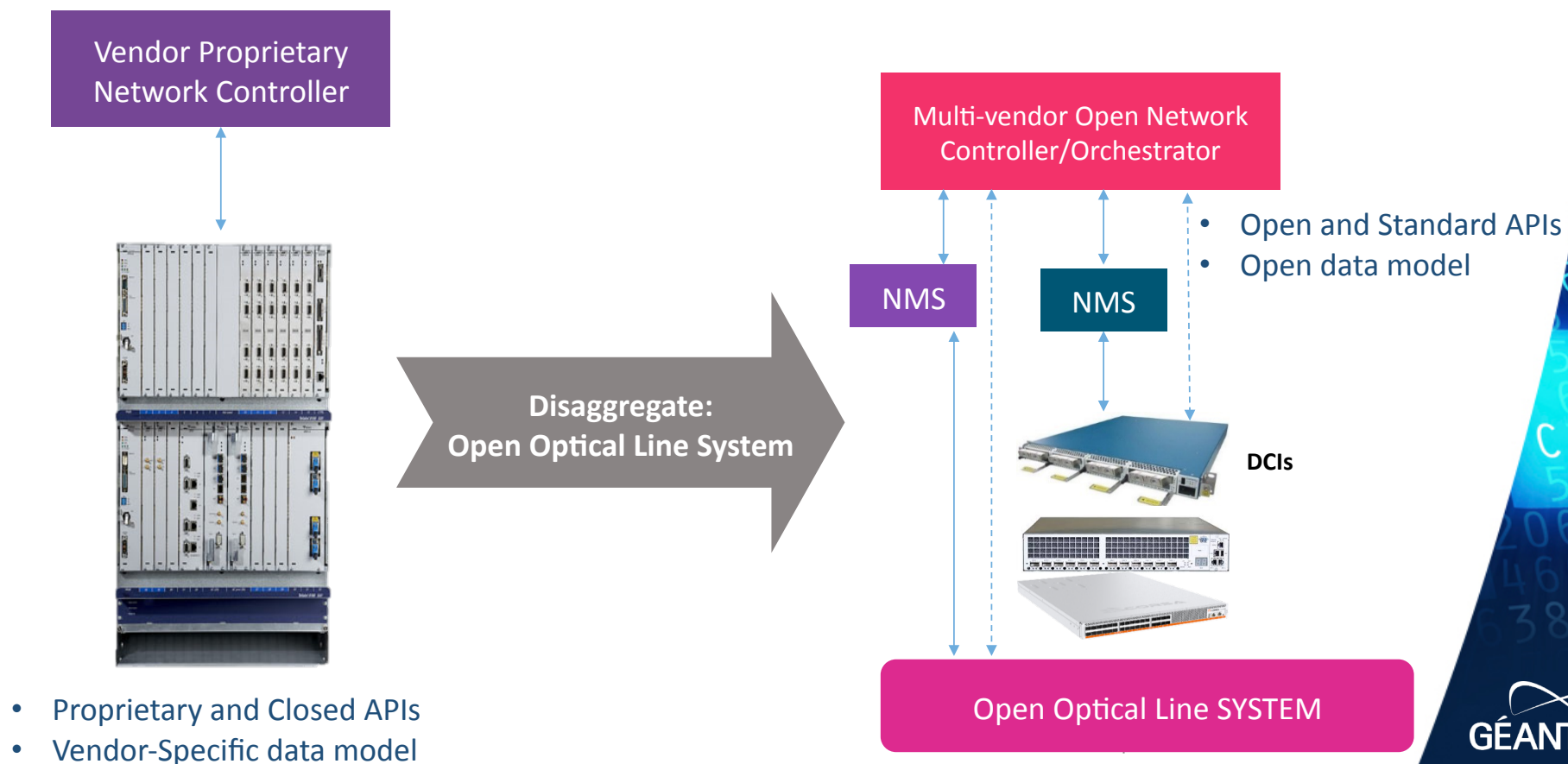
• or additional DF/spectrum as part
of regional extension

Estimated NRC: 50 M€

Technological Enabler – Open Line System



Revolution of the transport



Options for the packet layer

Option 1

Keep using the existing platform where high-density line cards are needed



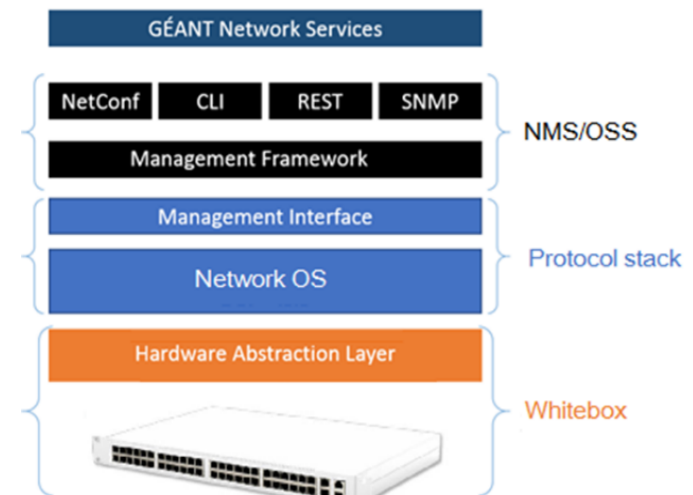
Option 2

Replace medium-sized MX-480 devices in smaller PoPs with MX-204s



Option 3 ?

White/Brite Boxes: Open Hardware and Open Network Operating System
Fully decoupled evolution
New Ecosystems



Bigger is not always better

Enter the MX204



4x QSFP – 1x100G or 4x10G

8x SFP – 1G or 10G

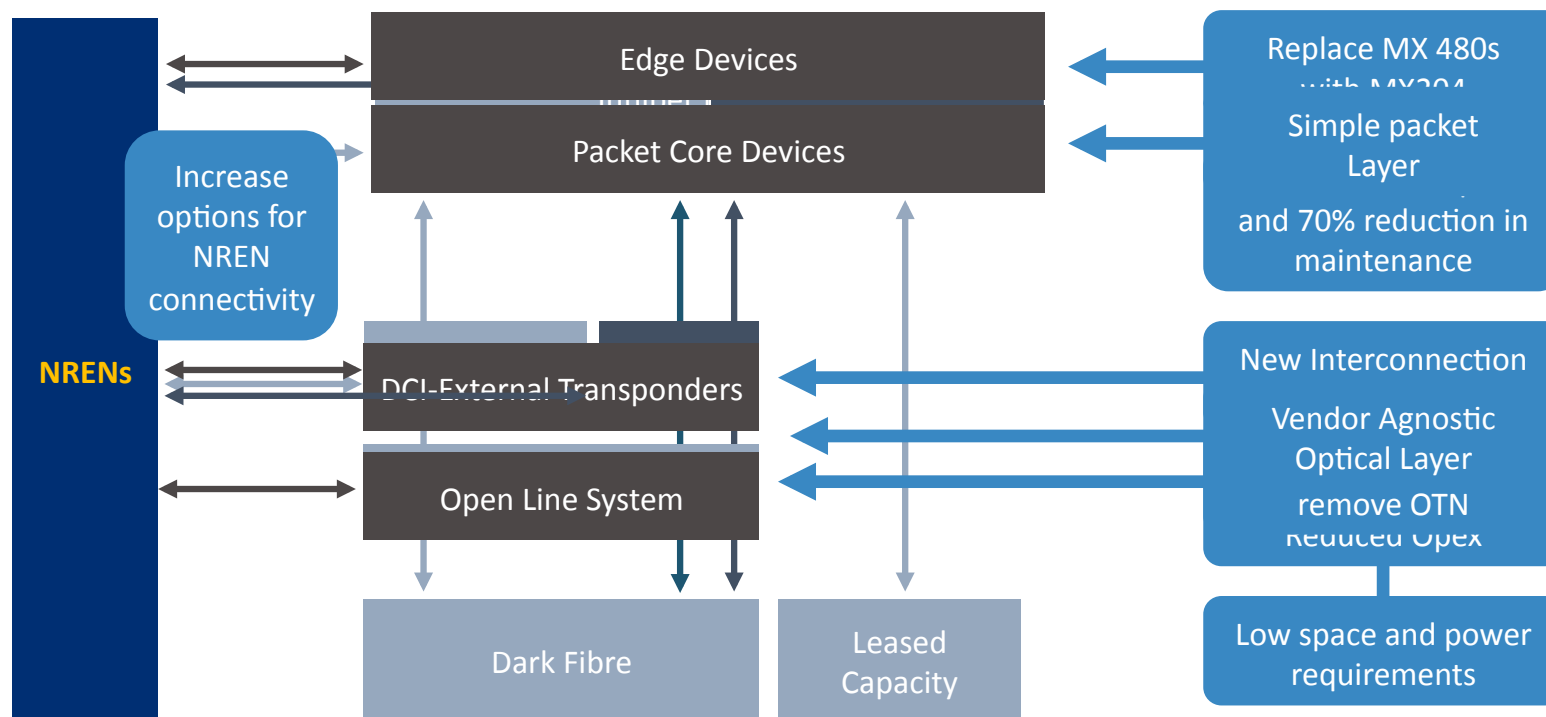
400G total switching capacity
Enhanced QoS
PTP support
Dual PSU
Single routing engine

~80% OPEX
reduction
~70% less
power

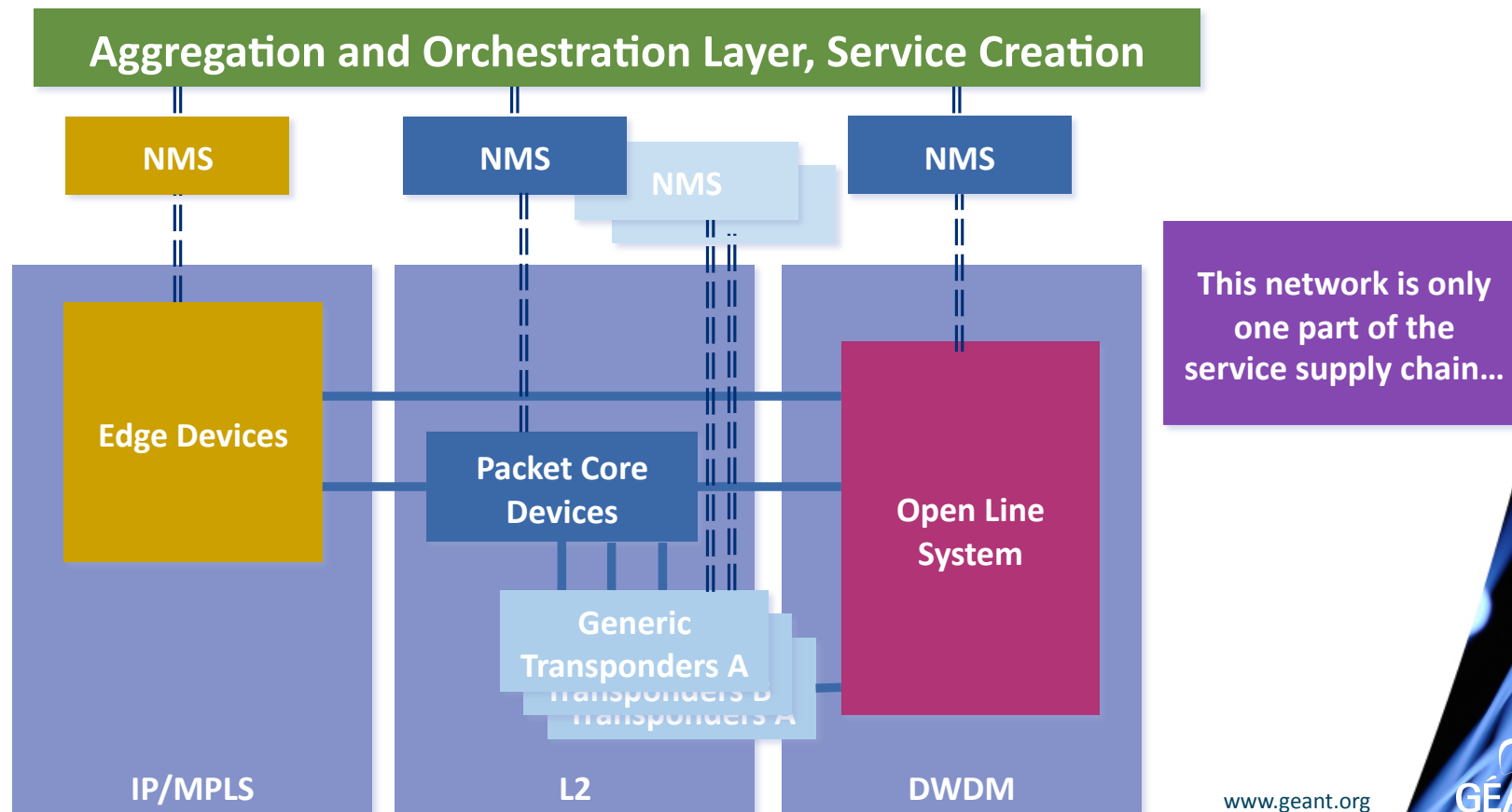
www.geant.org

GÉANT

Putting it all together



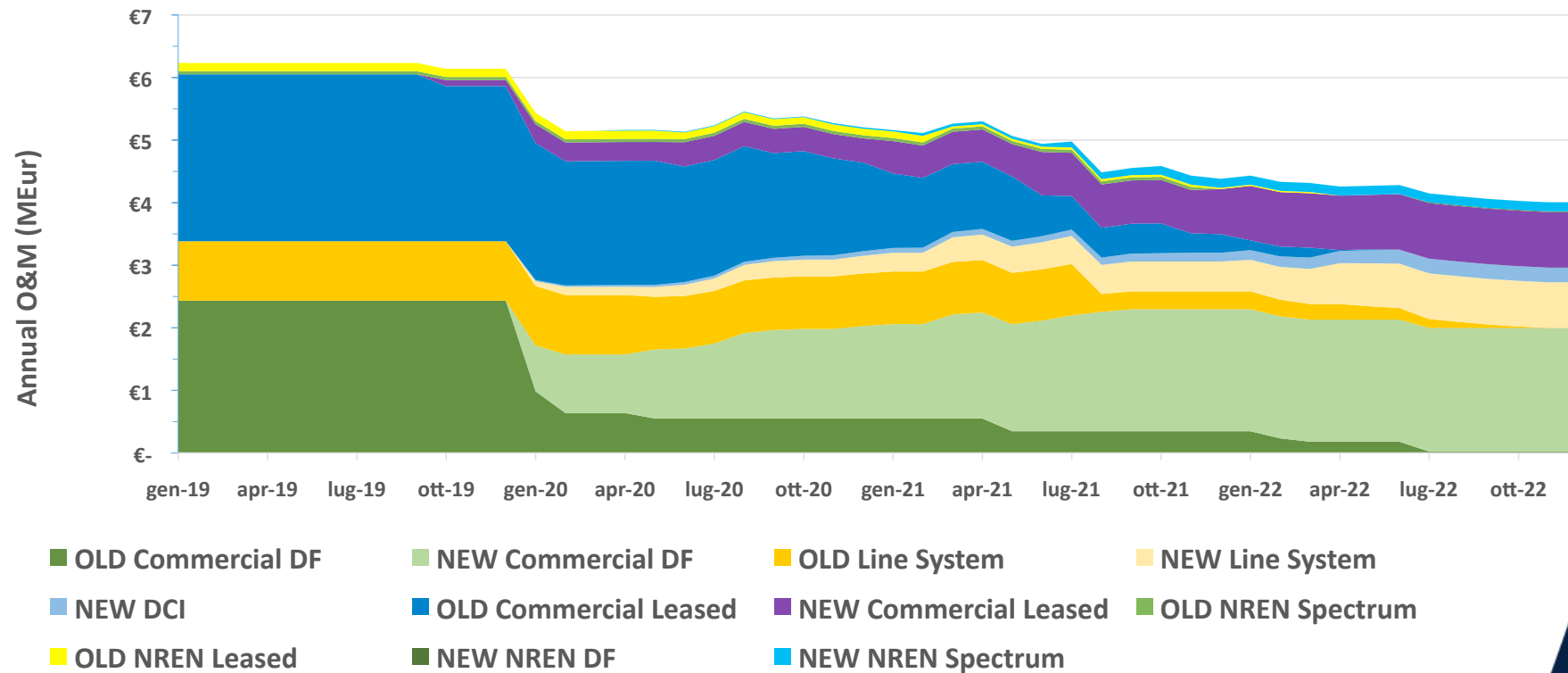
Managing a Disaggregated Network



www.geant.org

GÉANT

Costs projection



GN4-3N Planning

Phase 1

Phase 2

2022

2019

2020

2021

1 Project Set-up

2 Procurement Frameworks

3 Technical Readiness

4 Link definition, procurement and transition

5 Finalisation

Define

Procure & Accept

Transition

Define

Procure & Accept

Transition

Define

Procure & Accept

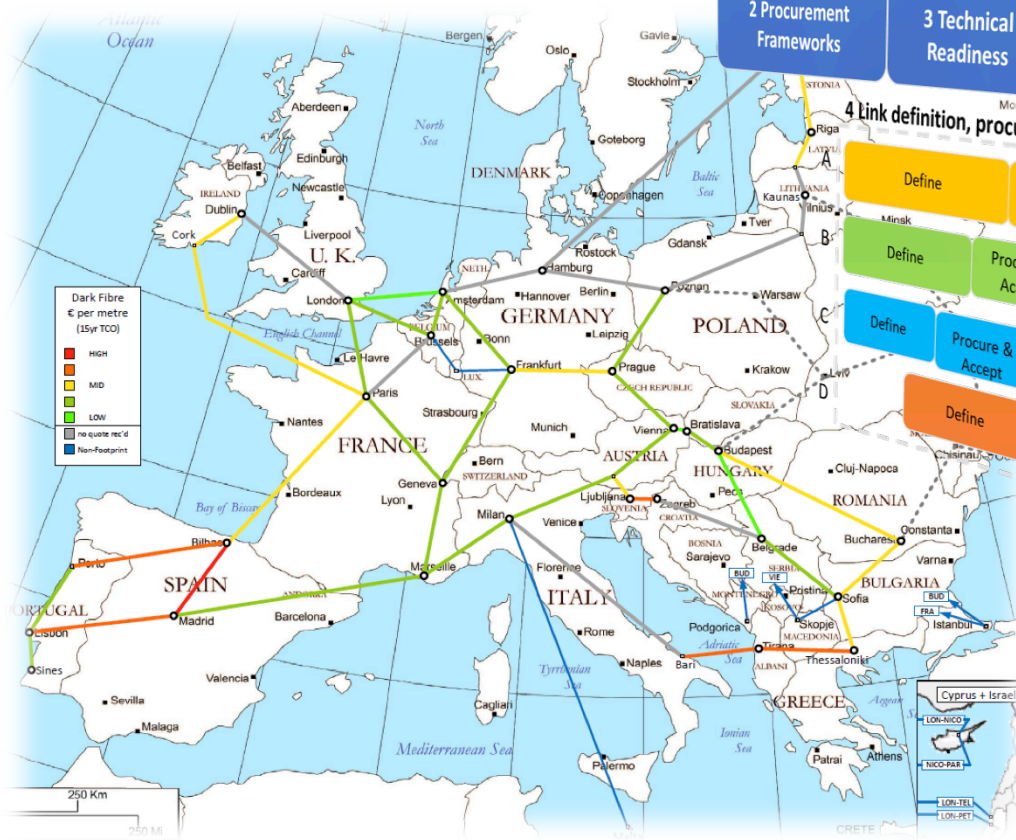
Transition

Define

Procure & Accept

Transition

www.geant.org



Flexibility and control

- **Vendor and Technology Agnostic Architecture**
- **Disaggregate:** de-couple innovation cycles and accelerate innovation
- **Increase options:** connect NRENs to different platform depending on the needs

Differentiate from commercial providers

Deliver advanced services for R&E users

What it means for the end users

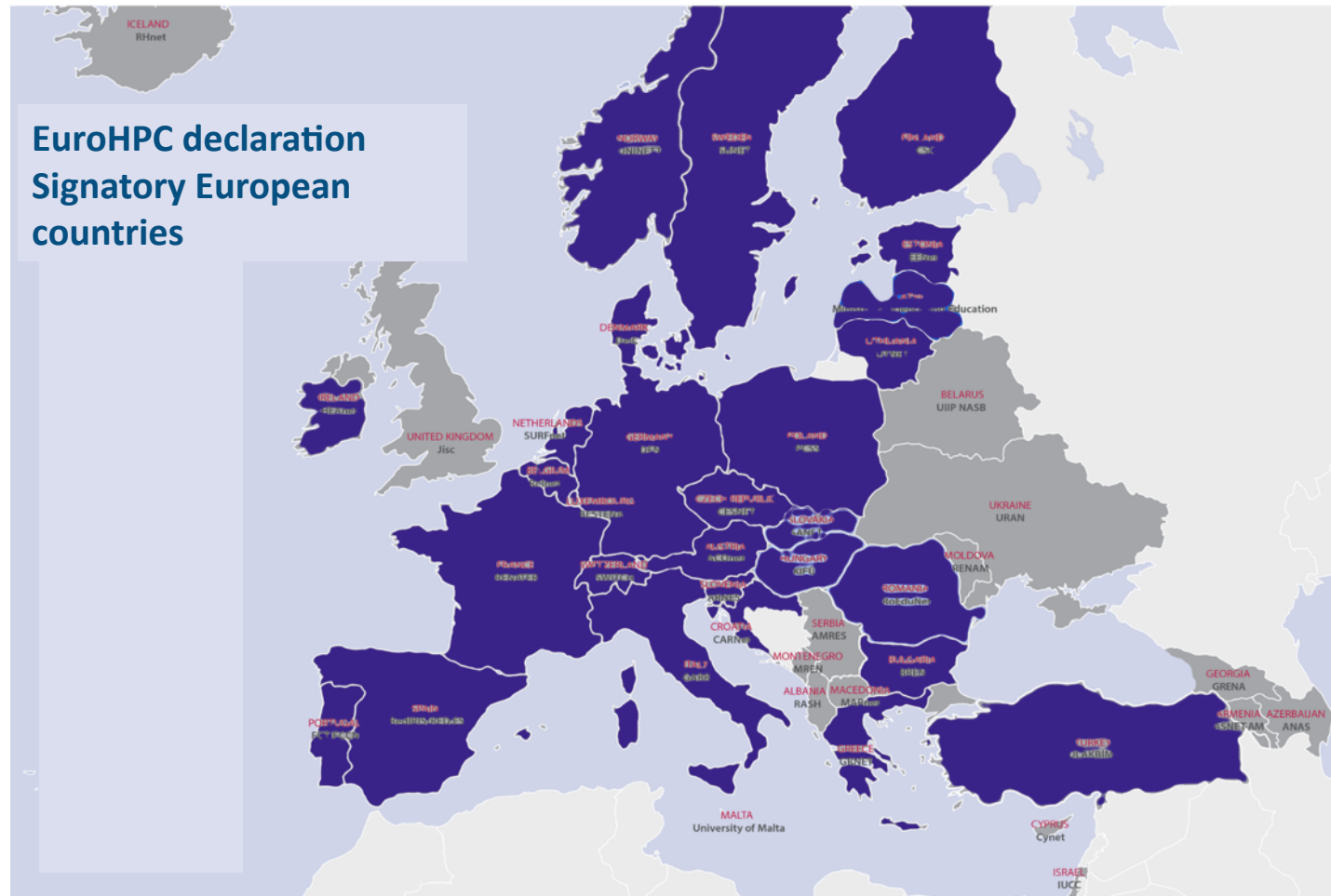
- **Very large capacity available from day 1**
- **Additional capacity very cheap to add**
- **Advanced capabilities and rapid deployment**
- **Uncontested and unrestricted data flow**

(Avg user):
mmhhh, ok...
So what?



EuroHPC

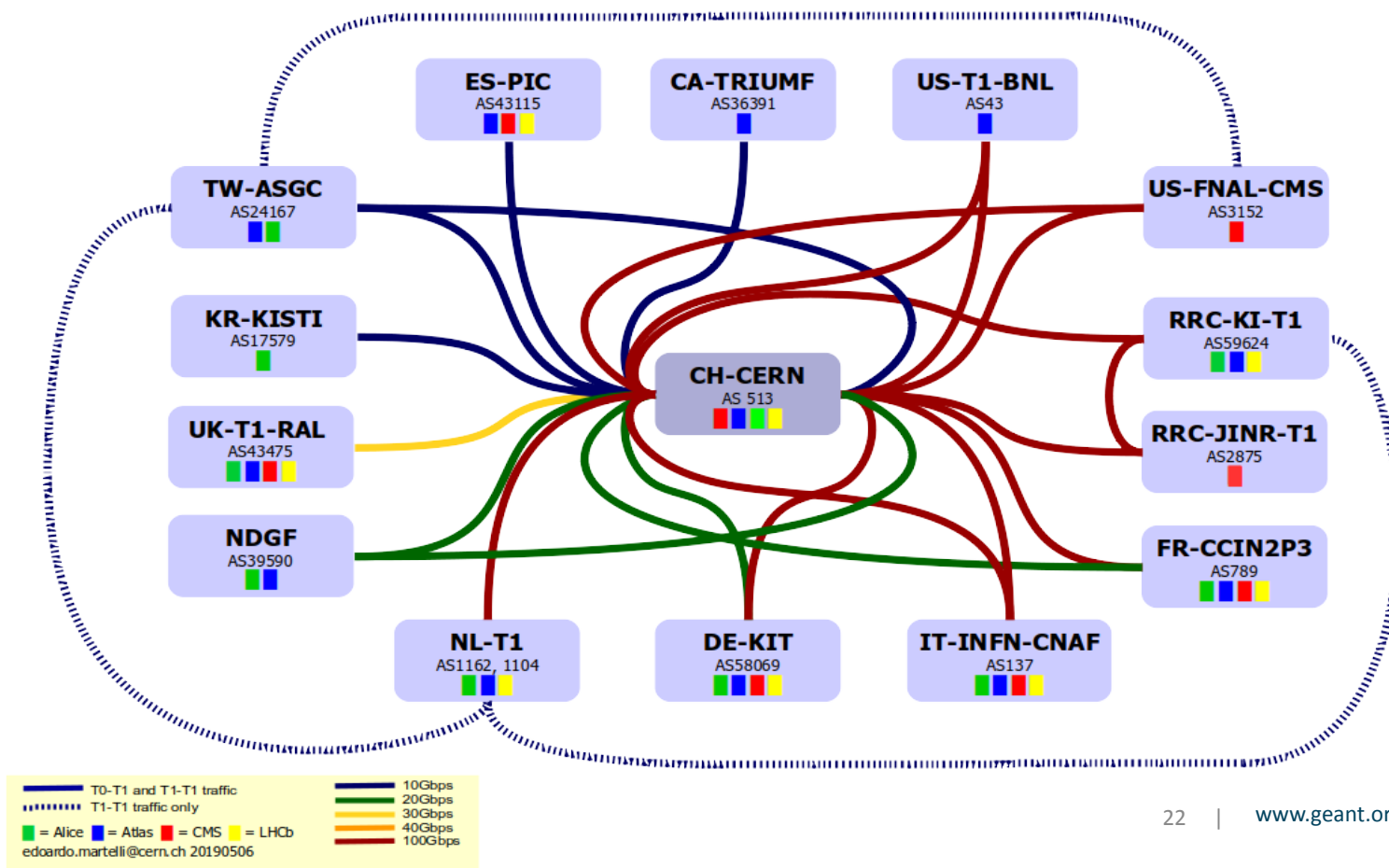
EuroHPC declaration
Signatory European
countries



www.geant.org

GÉANT

LHCOPN

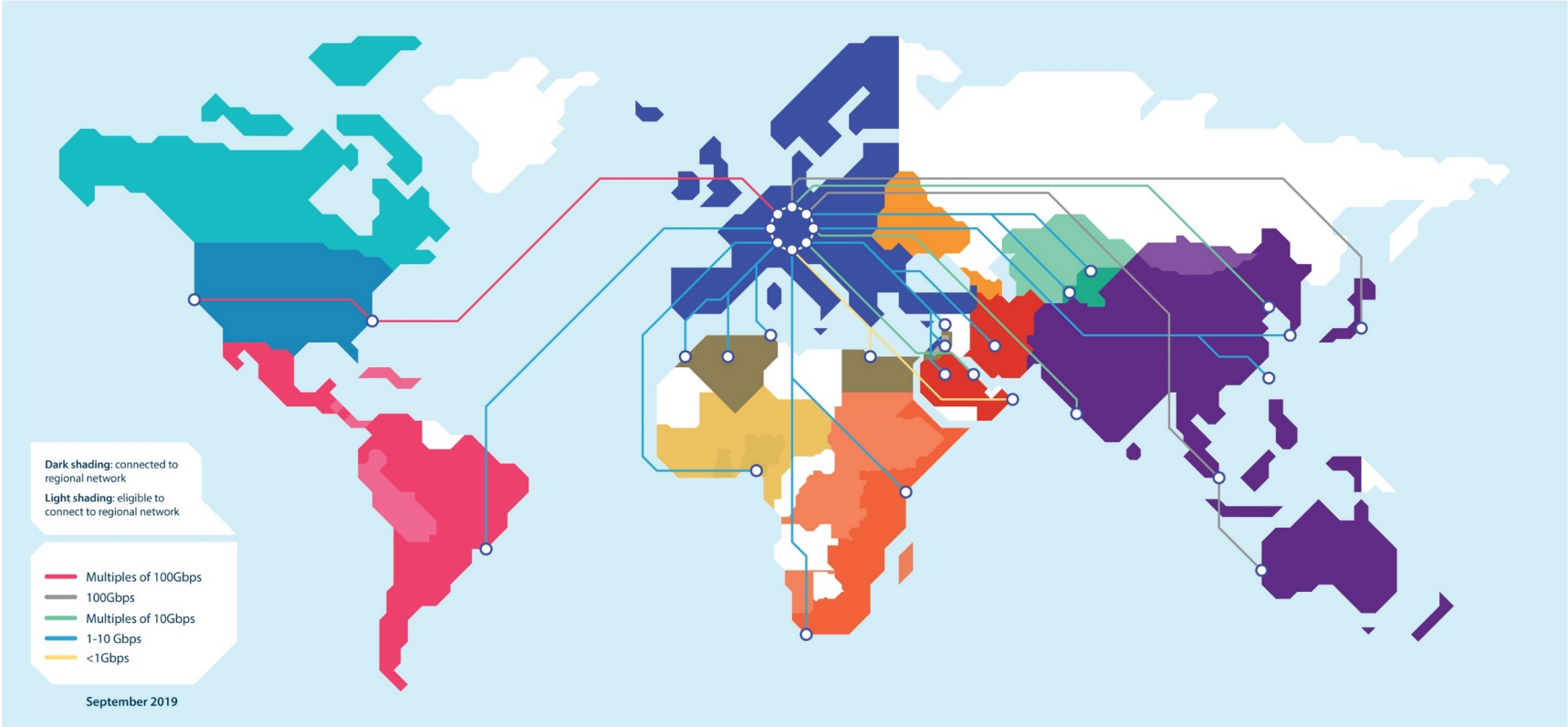


Novel use-cases

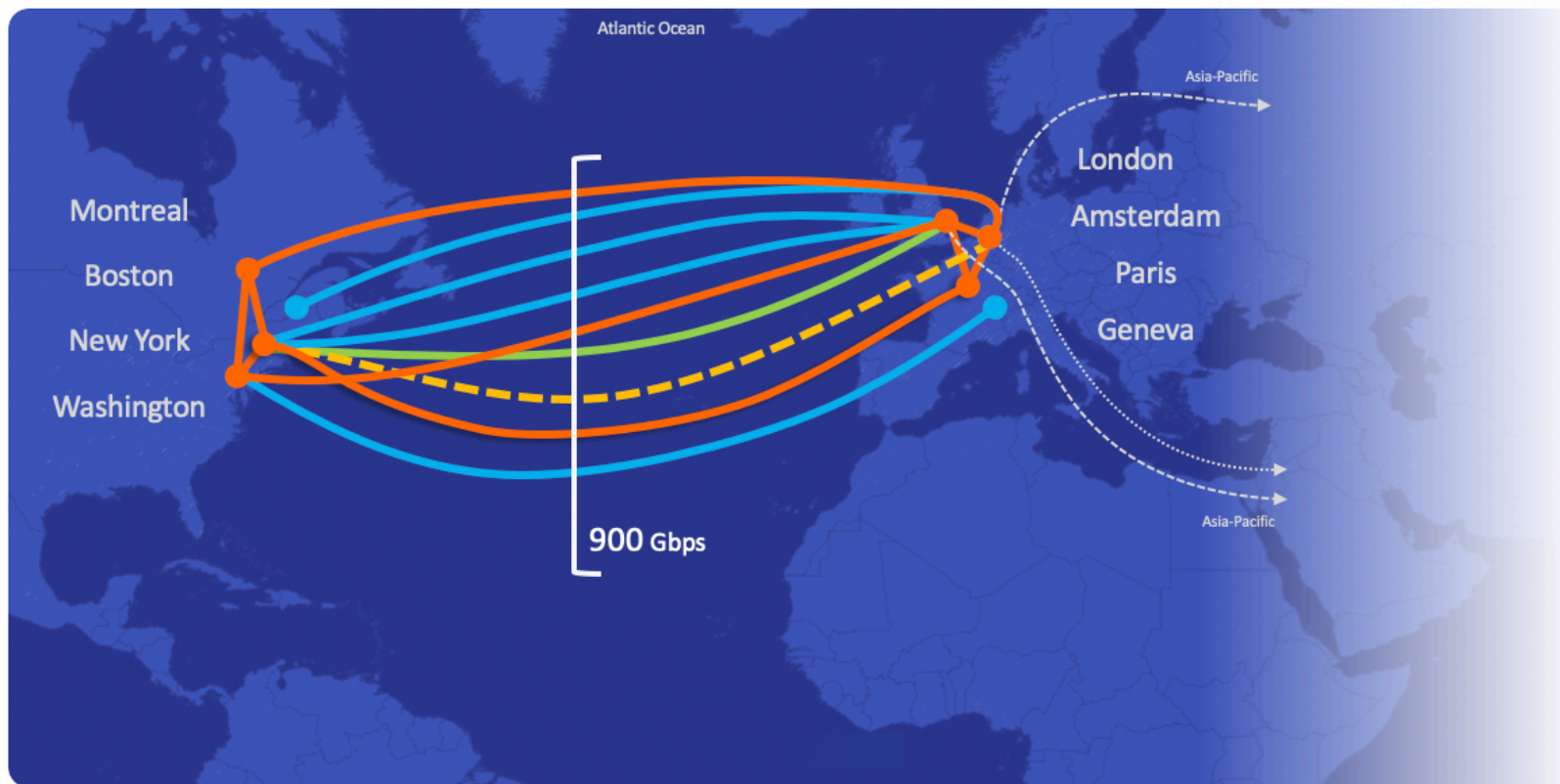
- Ultrahigh-speed DC interconnection
- Distributed data centres
- Disaster recovery/high availability



AT THE HEART OF GLOBAL RESEARCH
AND EDUCATION NETWORKING



ANA-n00



canarie



NORDUnet
Nordic Infrastructure for Research & Education

SURF NET



25 | www.geant.org



EU-China



中国科技网
China Science & Technology Network

10G terrestrial route (BIJ-FRA)



10G sea-cable (BIJ-LON)

CAE-1



BELLA programme

- BELLA-S
 - Transatlantic spectrum IRU for 25 years
 - BELLA –T
 - Builds long-term 100Gbps backbone in South America
- 100Gbps GÉANT-RedCLARA interconnection
 - 100Gbps for Copernicus
 - Ability to light up to 43 more channels

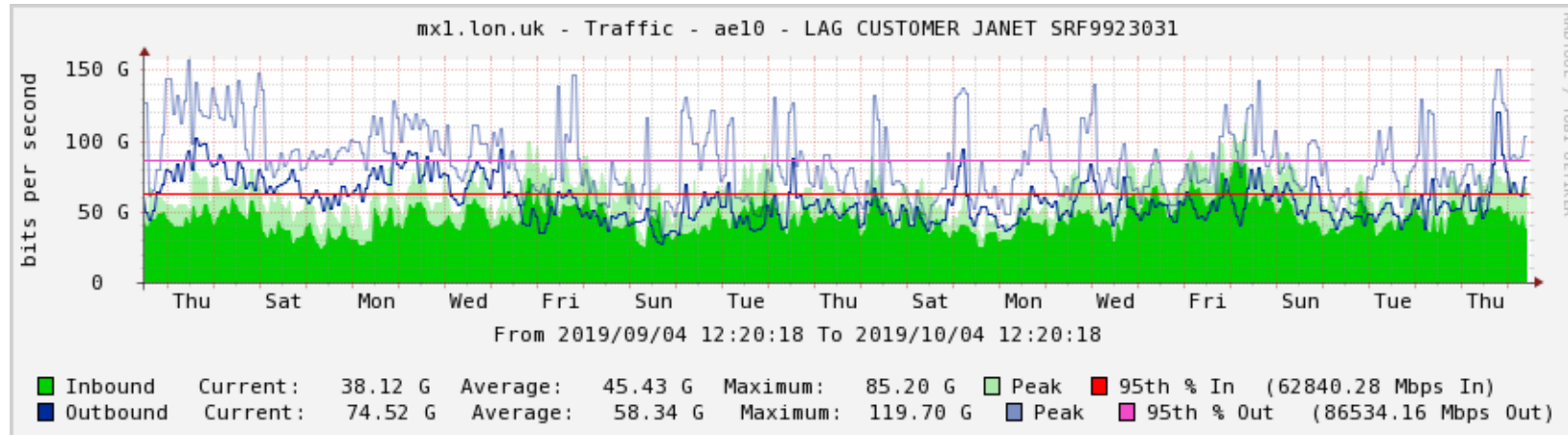
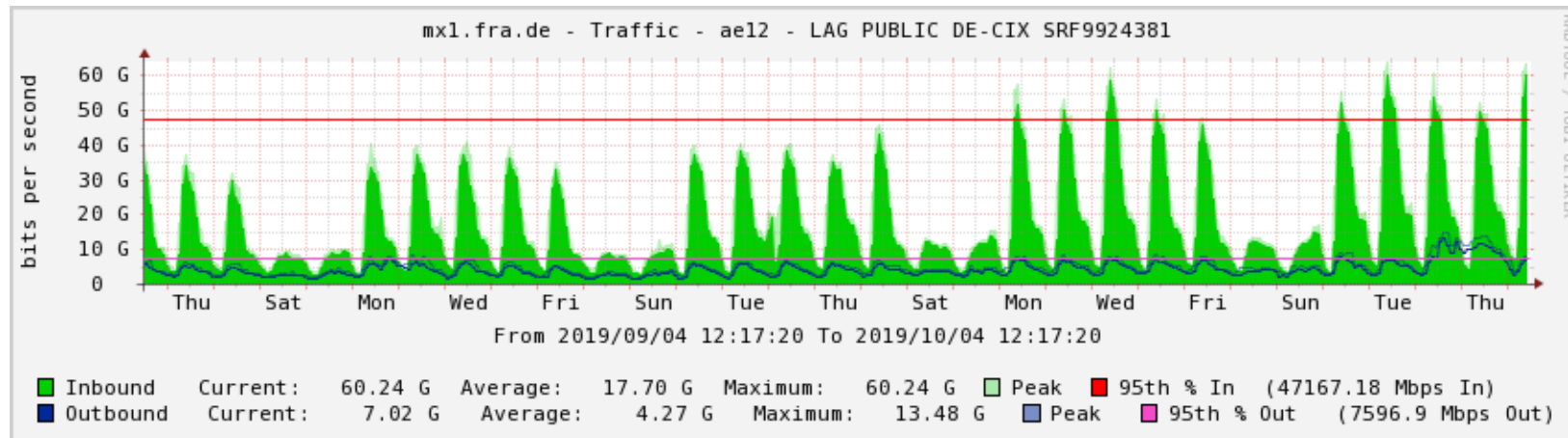


All BELLA connectivity is on schedule to go live by end of 2020.

Who's going to benefit from all this?



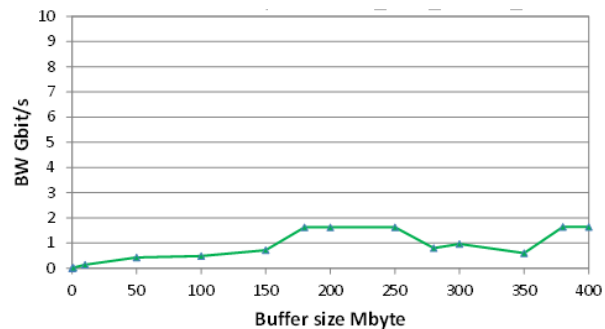
Not the usual internet traffic



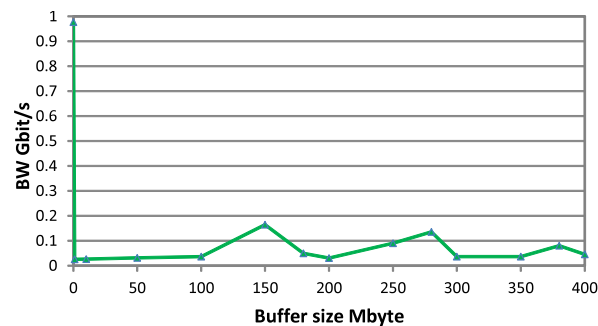
“My Network is different”

Public Internet

Geneva to Canberra

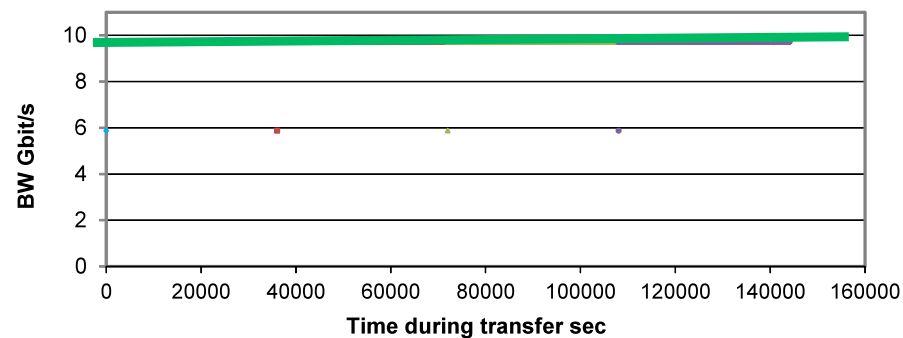


Geneva to Canberra



GÉANT and R&E partners

Geneva to Canberra GÉANT + R&E networks US to Australia



R&E networks are designed for different goals than the Internet

Comparative Times for a 100TByte data transfer.

File Size (TB)	Data rate (Gbit/s)	Time taken (Hours)	Time Taken (Days)
NREN 100	9.27	34.0	1.4
ISP A 100	1.72	183.2	7.6
ISP B 100	0.11	2864.3	119.3



Grazie!

vincenzo.capone@geant.org

@EnzinoCapone 

www.geant.org

@GEANTnews 



© GEANT Limited on behalf of the GN4 Phase 2 project (GN4-2).
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).