Vera Rubin Observatory to UK & France Data Transfer Infrastructure

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AMLIGHT SA3CC Virtual Meeting

1-2 August 2023

GÉANT

Infrastructure and Services to advance Research, Education, and Innovation on a global scale:

GÉANT Association

Membership Association of Europe's National Research & Education Networks (NRENs)

GÉANT Network

Pan-European e-Infrastructure

Edu-x services

Portfolio of services for Research and Education

Projects

Coordinates and participates in EC-funded projects

Community

Conferences, Task Forces, Special Interest Groups

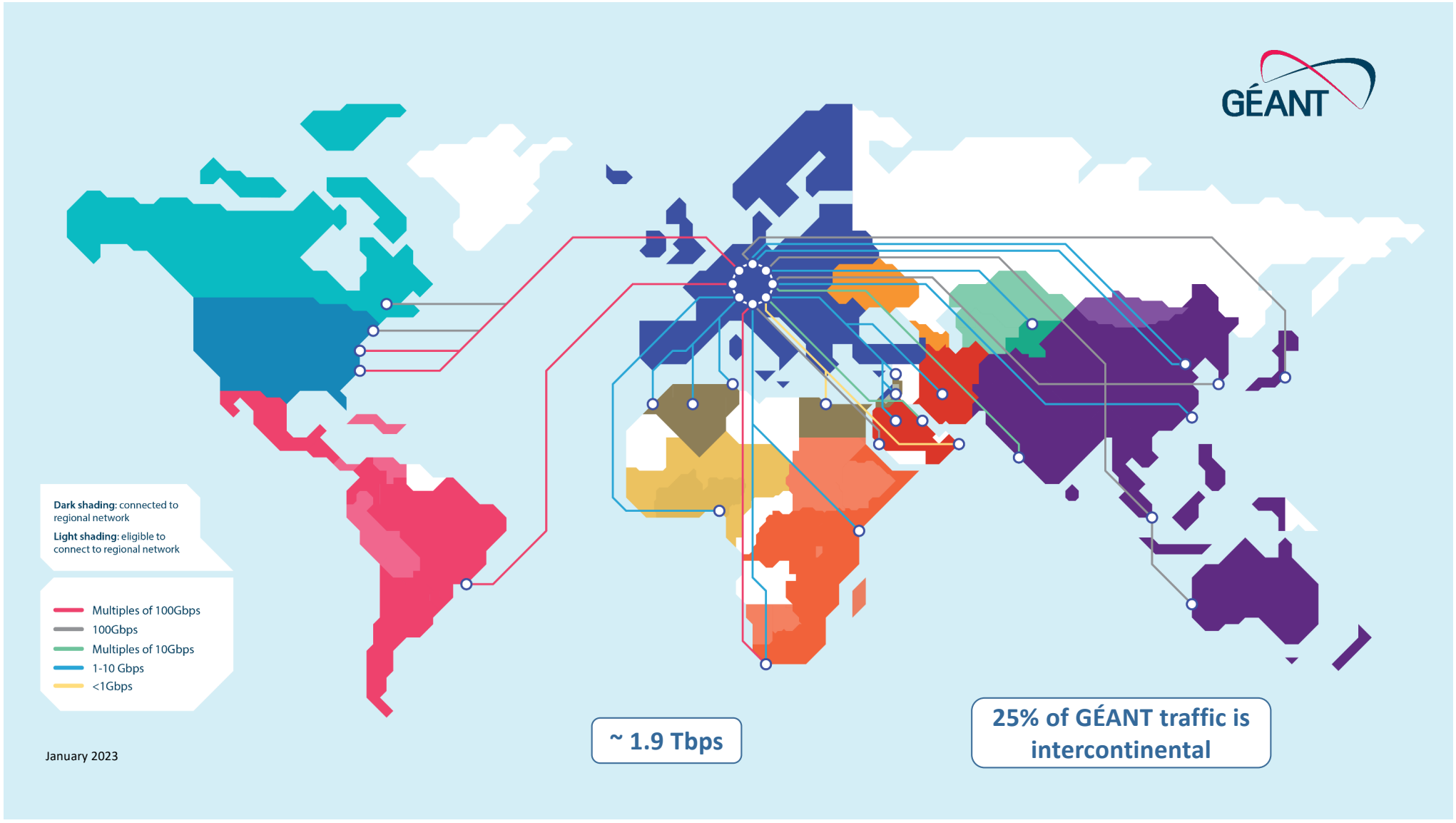
GÉANT: European Membership Association

38 National Research and Education Networks (NRENs)

+ NORDUnet (5 Nordic NRENs)

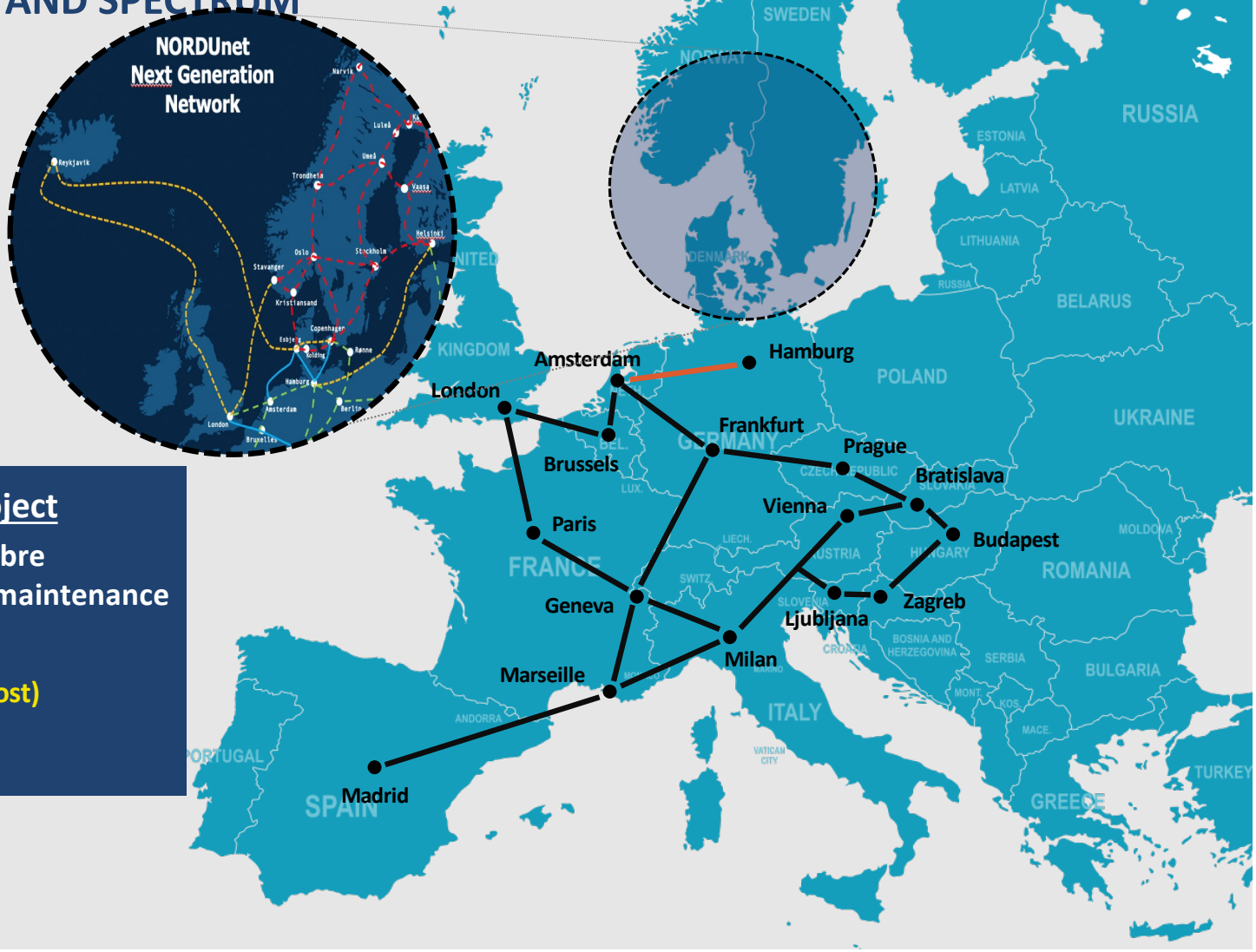
Reach:

over 10,000 institutions and 50 million academic users


GÉANT
Dark shading: connected to regional network
Light shading: eligible to connect to regional network
Multiples of 100Gbps
100Gbps
Multiples of 10Gbps
1-10 Gbps
<1Gbps
January 2023
~ 1.9 Tbps
25% of GÉANT traffic is intercontinental

GN4-3N PROJECT: FIBRE AND SPECTRUM

FIBRE INFRASTRUCTURE AT START OF GN4-3N (2019)



Fibre Network at start of project

14 countries (+NORDUnet) on fibre

Short term contracts => higher maintenance costs, to be replaced

Other countries on (typically high cost) leased lines

Commercial Dark Fibre	NREN Spectrum

GN4-3N: CURRENT EXPECTATION (END OF 2023)

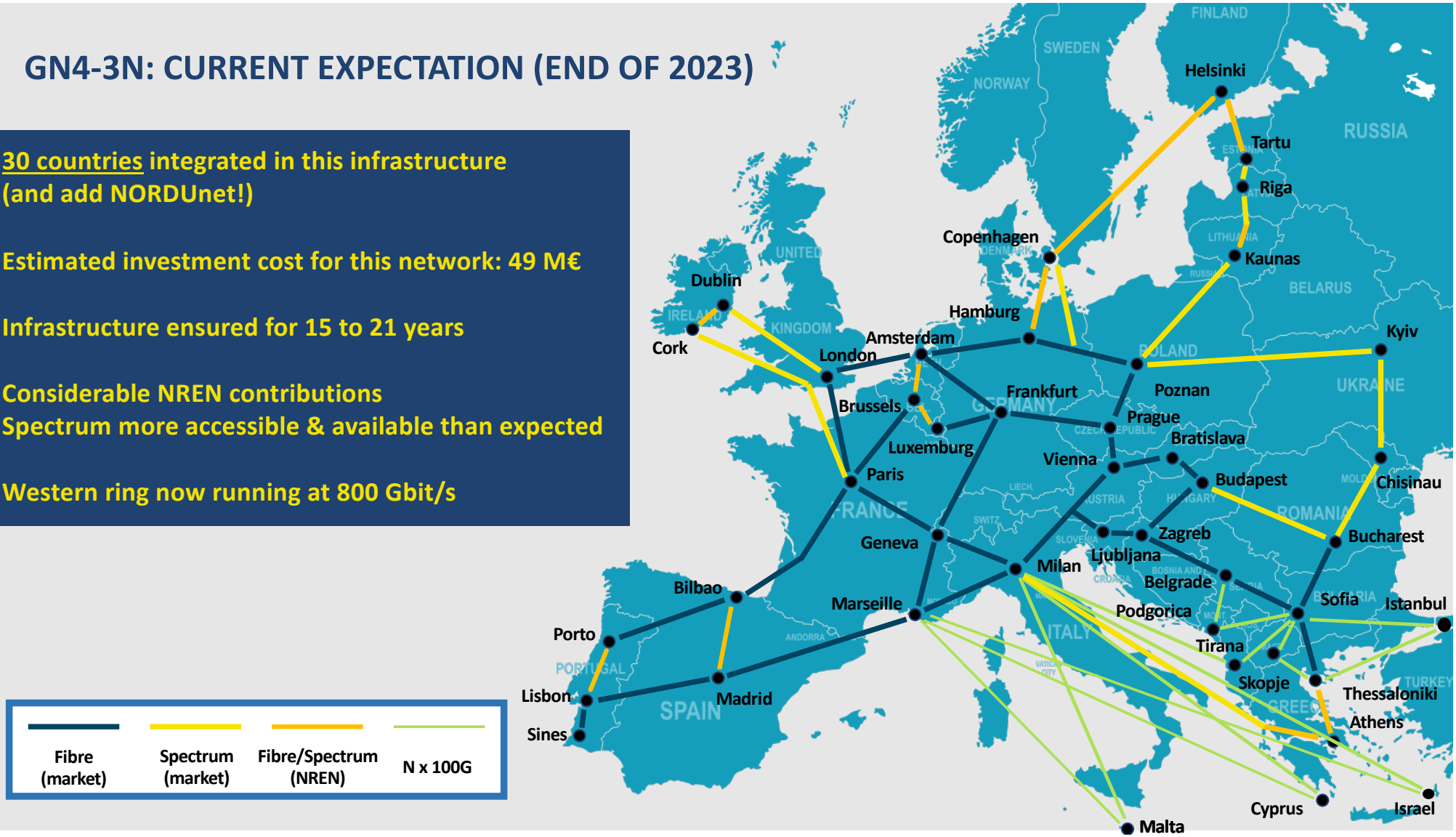
30 countries integrated in this infrastructure (and add NORDUnet!)

Estimated investment cost for this network: 49 M€

Infrastructure ensured for 15 to 21 years

Considerable NREN contributions
Spectrum more accessible & available than expected

Western ring now running at 800 Gbit/s



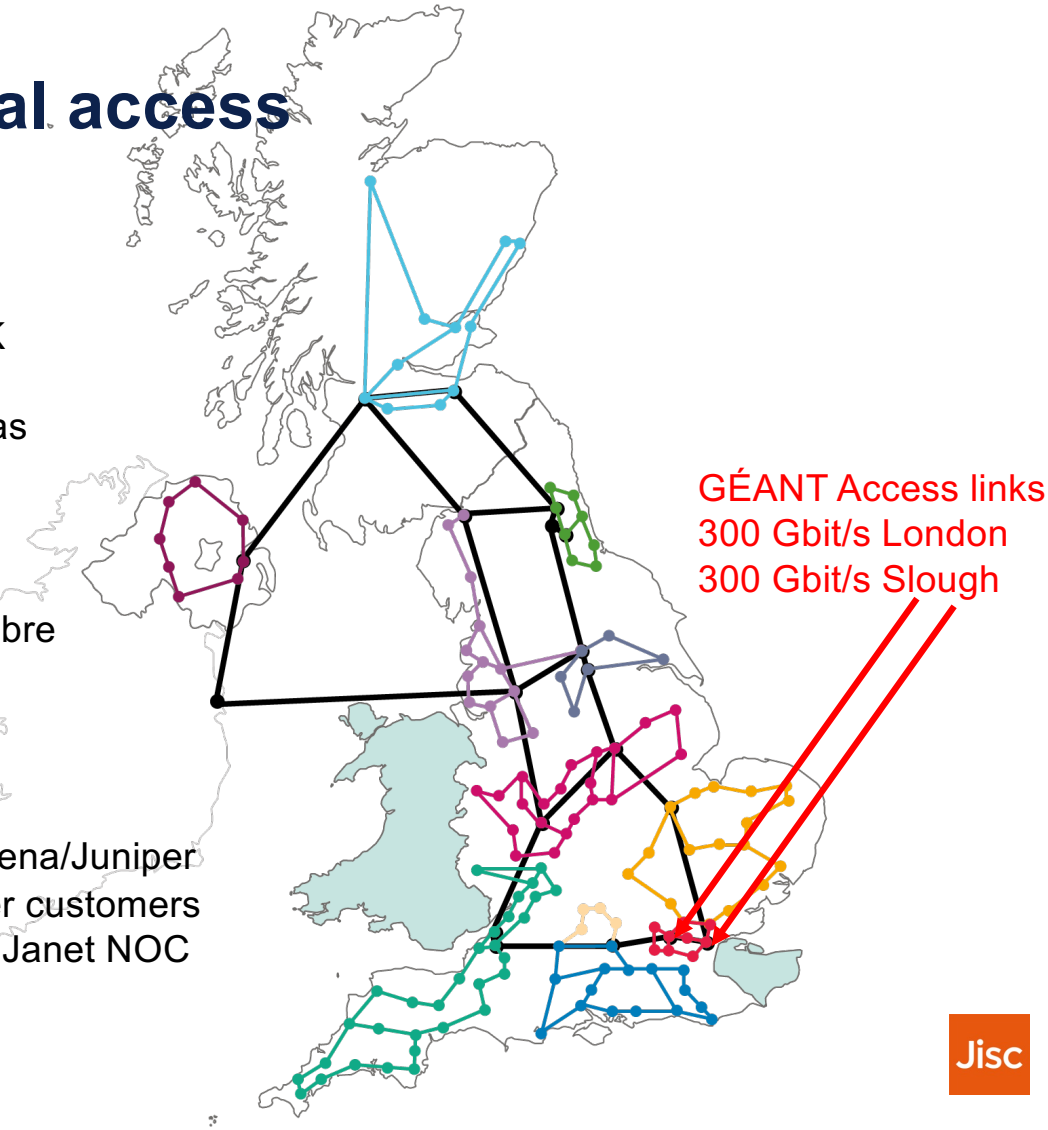
Janet backbone and regional access infrastructure

- Janet backbone
- Scotland
- North West
- Yorkshire
- Northern Ireland
- North East
- Midlands
- East
- South West
- Thames
- South
- London
- Public sector networks

Jisc is the ISP for UK HE/FE, and many research sites such as RAL (WLCG Tier 1)

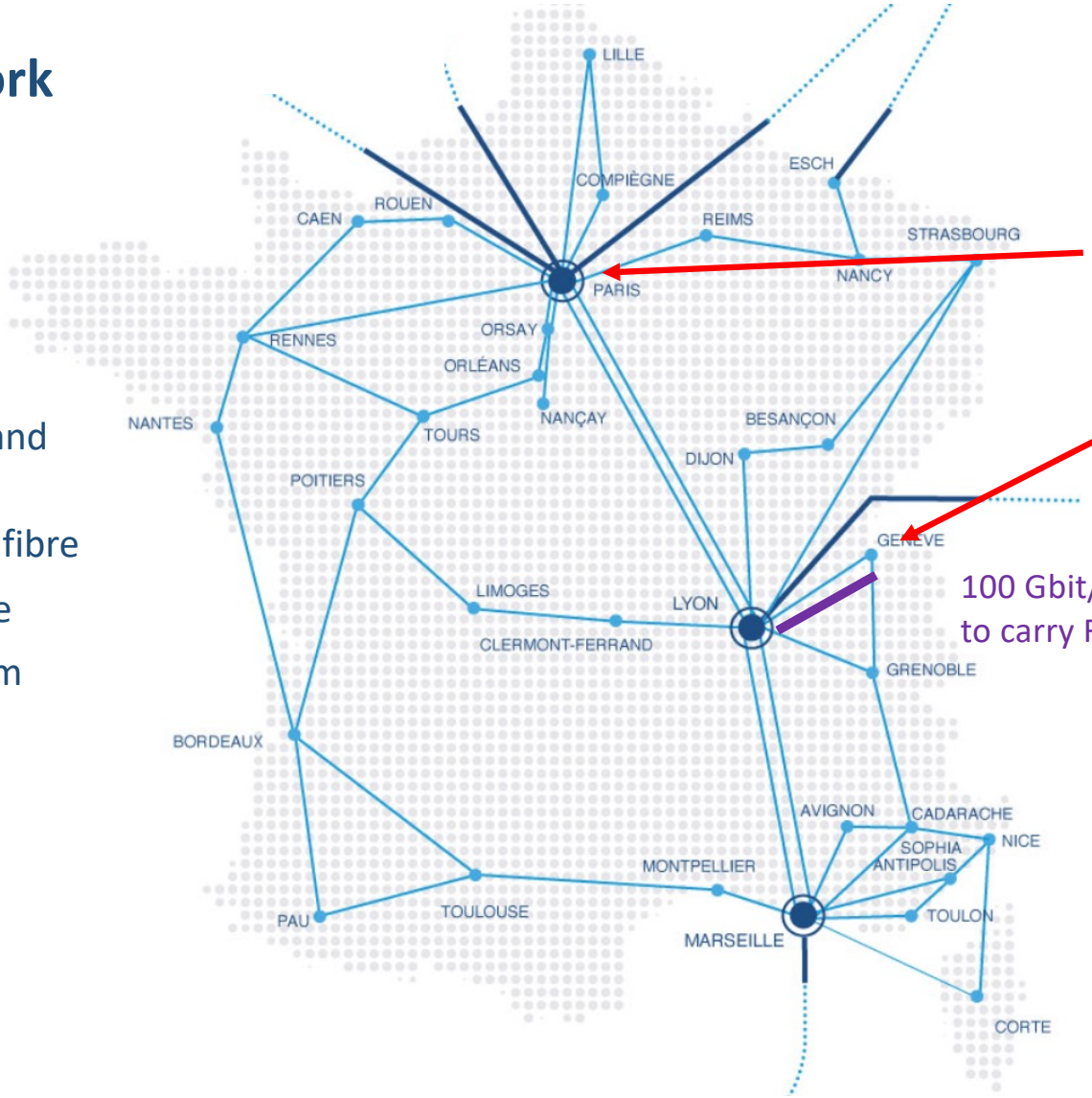
800G in main core
Around 9,000km of fibre
~1,000 customers
~1,500 connections

Network is largely Ciena/Juniper
~430 managed router customers
~700 devices run by Janet NOC



RENATER Network

- Based on dark fibre and DWDM hardware.
- 12,000 km of optical fibre
- 72 points of presence
- 150 wavelengths from 10 to 200 Gbit/s



GÉANT Access links
300 Gbit/s Paris
300 Gbit/s Geneva

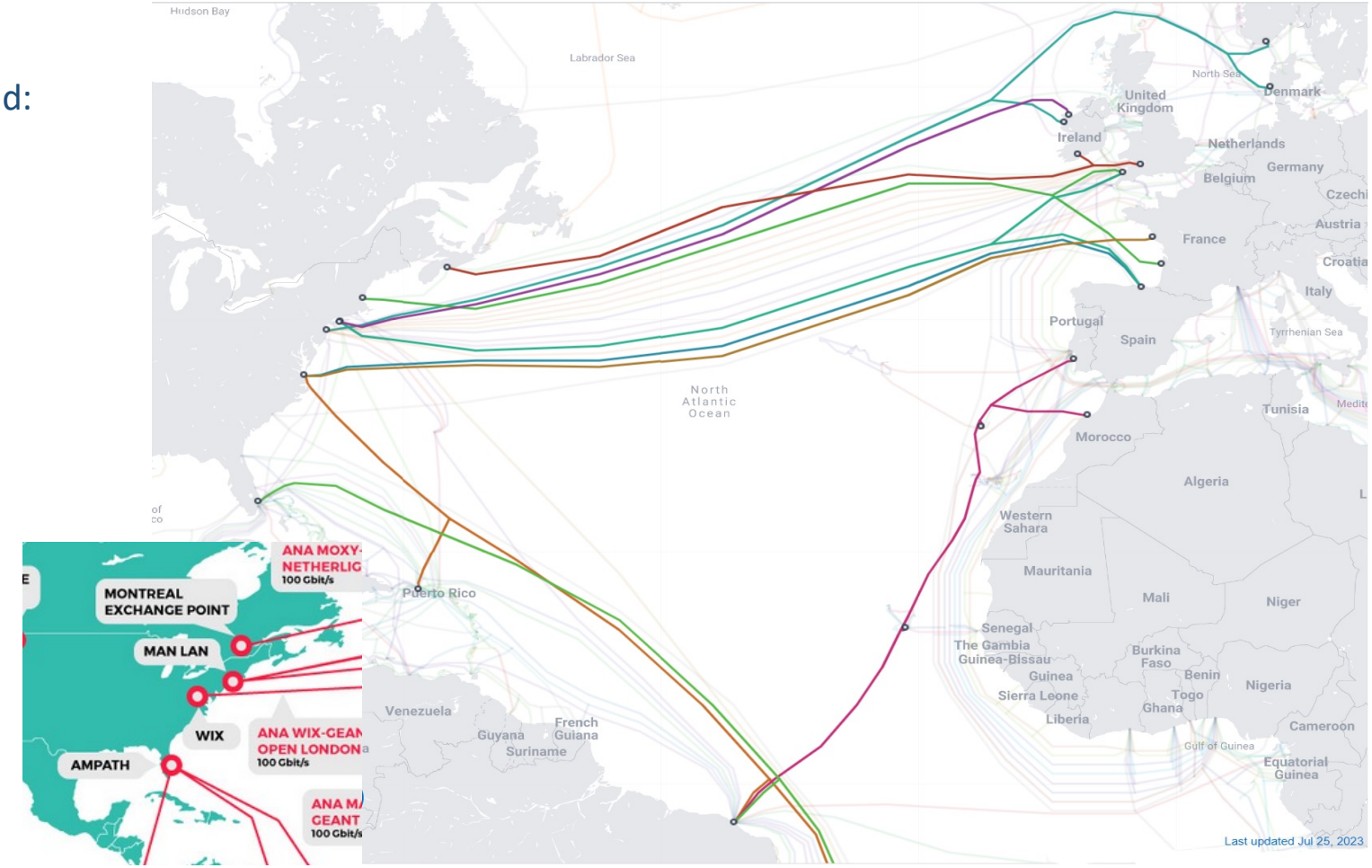
100 Gbit/s CCIN2P3 Lyon to Geneva to carry Rubin traffic

Trans-Atlantic – systems and landing points

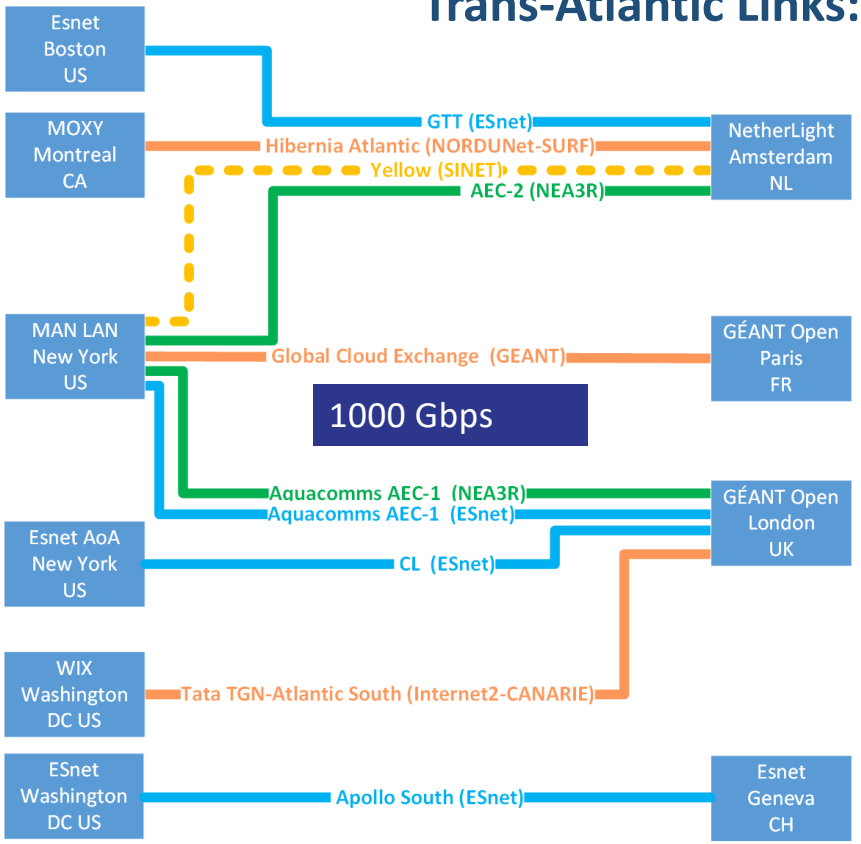
Cables less than 10y old:

- AEC-1
- AEC-2 / Havfrue
- AEC-3 / Amitie
- Dunant
- EXA Express
- Grace Hopper
- MAREA

- BRUSA
- EllaLink
- Monet



Trans-Atlantic Links: ANA-*n*00, SINET, ESnet, NEA³R



Montreal - Amsterdam
Washington - London
New York - Paris

Boston - Amsterdam
New York - London
New York - London
Washington - Geneva

New York - Amsterdam

New York - London
New York - Amsterdam

European Network Connectivity: Trans-Atlantic, GÉANT, RENATER and JANET

Processing Split:

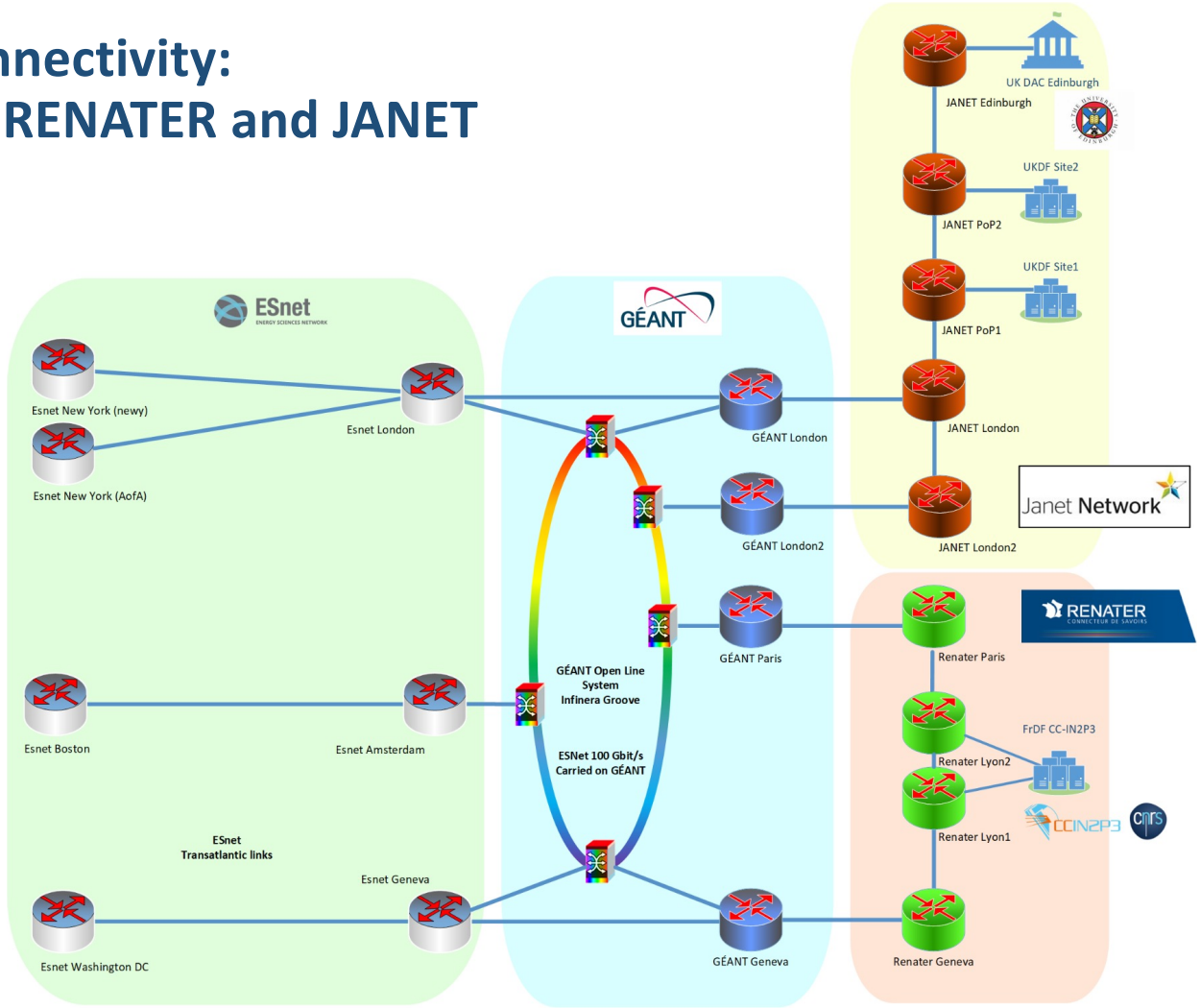
- SLAC 25%
- CCIN2P3 50%
- UK 25%

Trans-Atlantic traffic:

- Raw Data
  SLAC → Europe 100% 1.5 Gbit/s
- Processed Data
  SLAC → Europe 25% 1.8 Gbit/s
  Europe → SLAC 75% 5.6 Gbit/s
- Co-Add Data
  SLAC → Europe 12 Gbit/s
  Europe → SLAC 36 Gbit/s
- DRP 8 Gbit/s Y1 to 75 Gbit/s Y10

European traffic

- 25% of Raw and Processed between France and UK
- Co-Add Data
- DRP 8 Gbit/s Y1 to 75 Gbit/s Y10



Disk-Disk Concurrent Flows between Paris and Cambridge davix-put and xrootd (http)

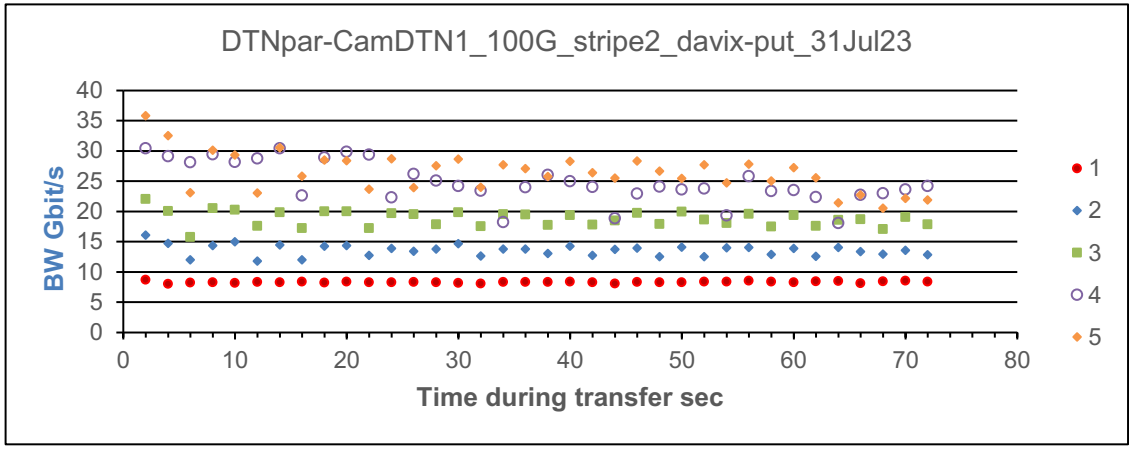
- CamDTN1 xrootd v 5.6.1

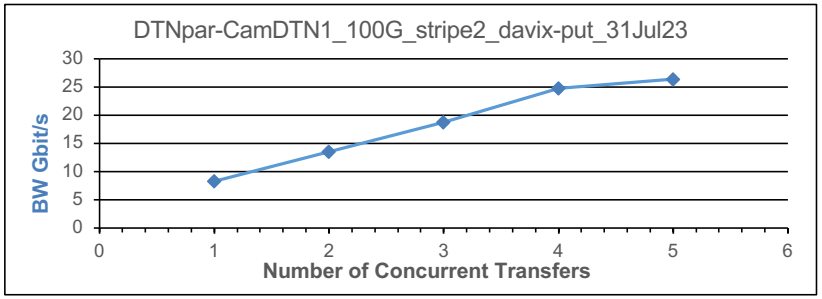
```
xrootd-http.cfg
xrd.protocol XrdHttp:5201 /home/dc-hugh3/Xrootd/build-5.6.1/src/libXrdHttp-5.so

[dc-hugh3@cpu-p-167 build-5.6.1]$ src/xrootd  -c ../xrootd-http-5.6.1.cfg
```

DTNlon davix-put

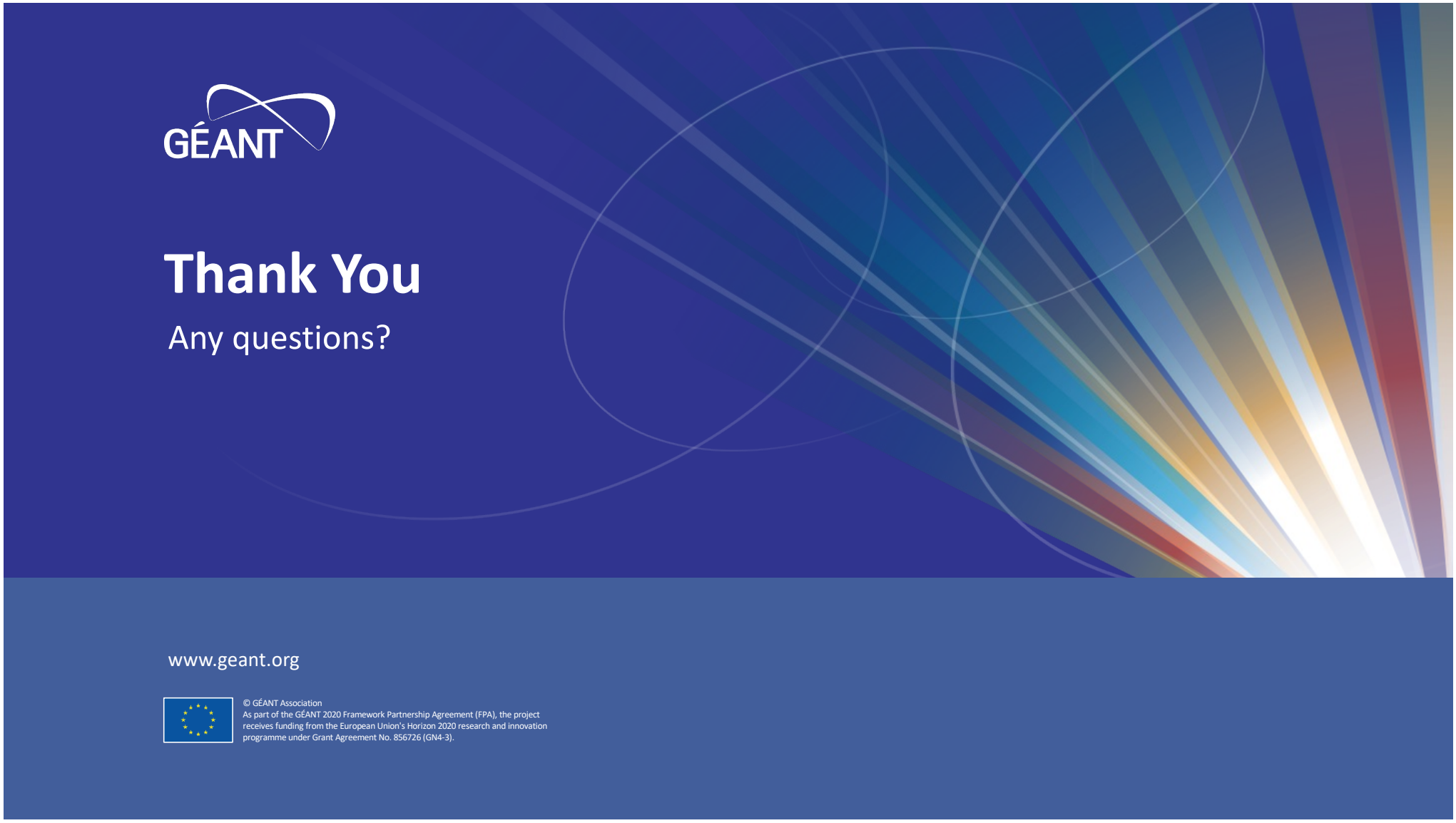
```
[richard@DTNpar davix_tests]$ ./cmd_run_davix-put_multiflow.py  --bufsize 1048576 --srcfile /mnt/raid0disks5/DTNFILE100000 --dstfile /rds-d7/project/rds-bRdYdViqoGA/rhj/stripe2/davix-put100000 -A 6 -d 192.84.5.1 -p 5201 -o  DTNpar-CamDTN1_100G_stripe2 -n 5
```

- Each davix-put client on a different core
- Test with 1 File, 2 Files … n Files Concurrent
- Plot the total transfer rates
- Flows generally smooth as function of time.
- Very few TCP re-transmits





- Scales well from 1 flow 8 Gbit/s to 5 flows 26 Gbit/s



Thank You

Any questions?

www.geant.org

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