NORDUnet
Nordic Gateway for Research & Education

Global Research Networking

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UNINETT Konferansen

Trondheim, 21. November 2017

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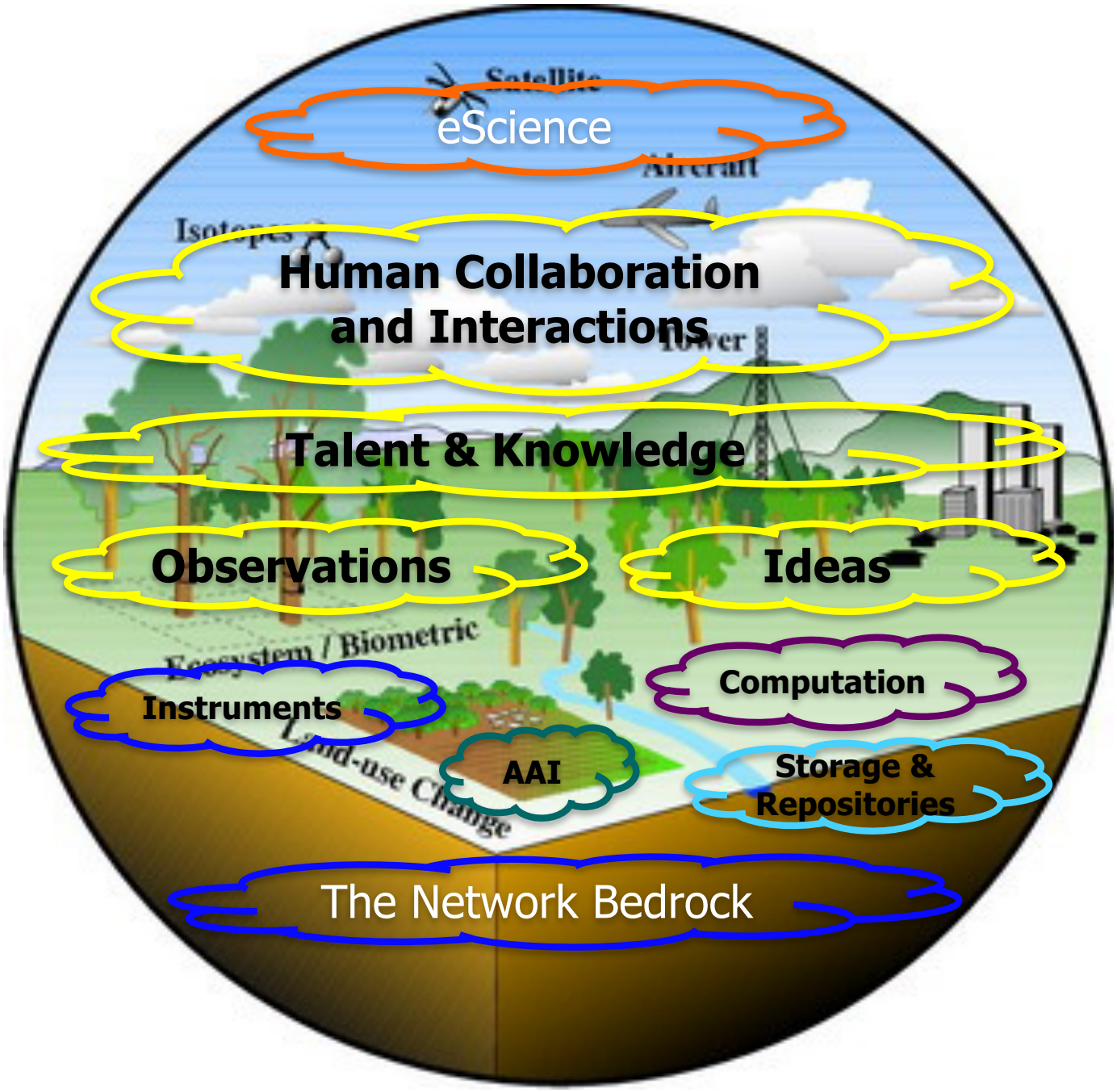
R&E Infrastructure



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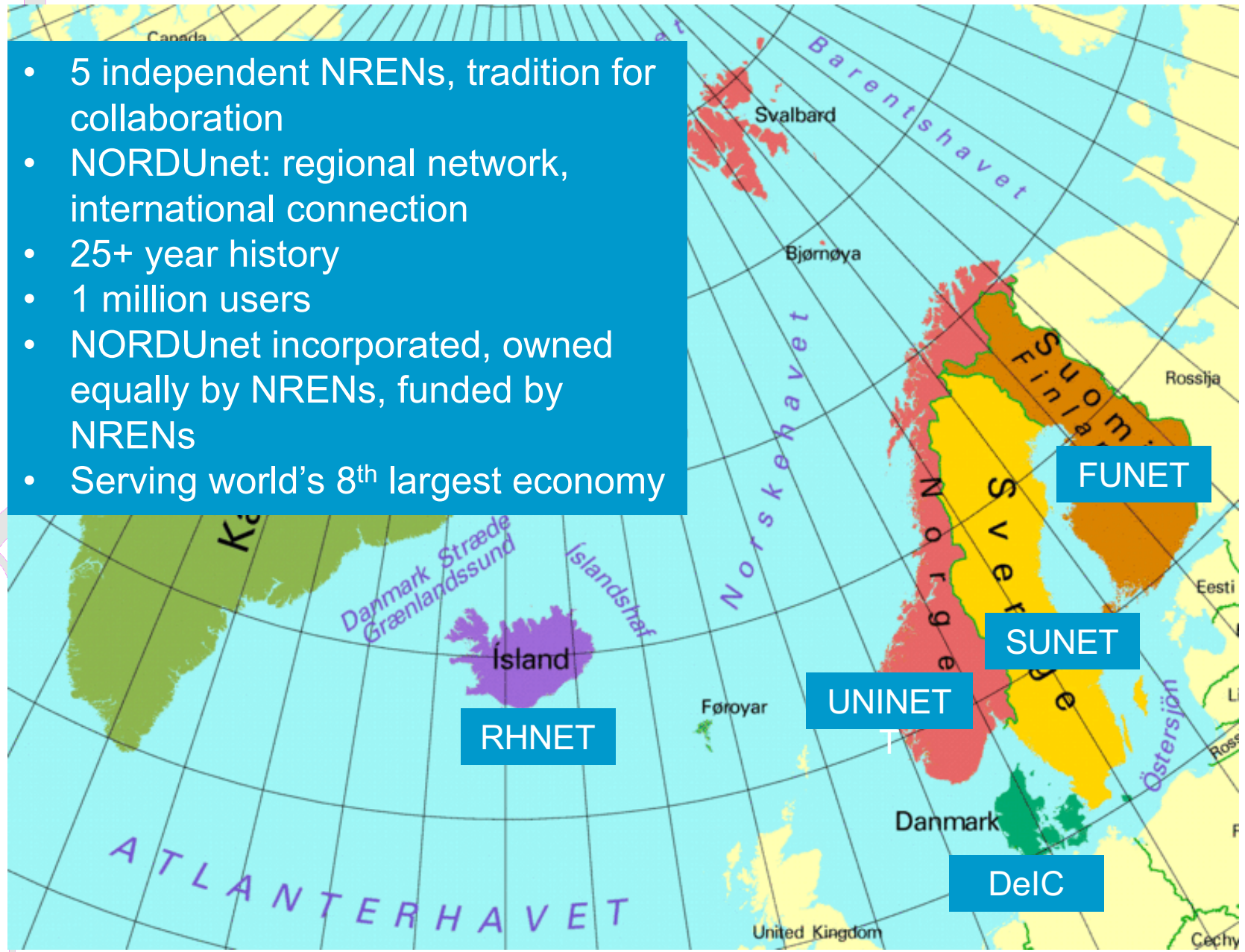
Nordic Partnership

- 5 independent NRENs, tradition for collaboration
- NORDUnet: regional network, international connection
- 25+ year history
- 1 million users
- NORDUnet incorporated, owned equally by NRENs, funded by NRENs
- Serving world's 8th largest economy



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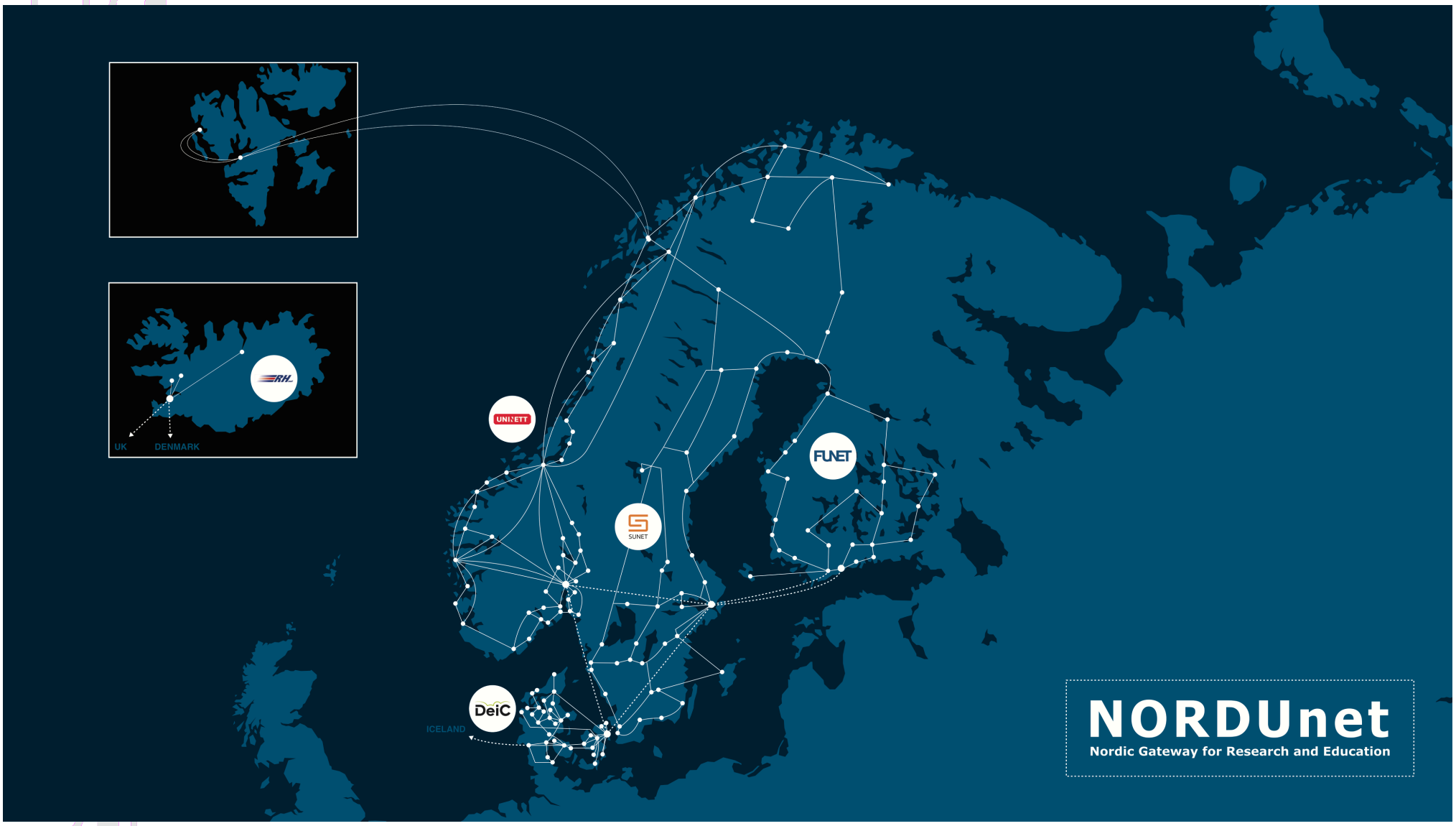
Nordic R&E Networks



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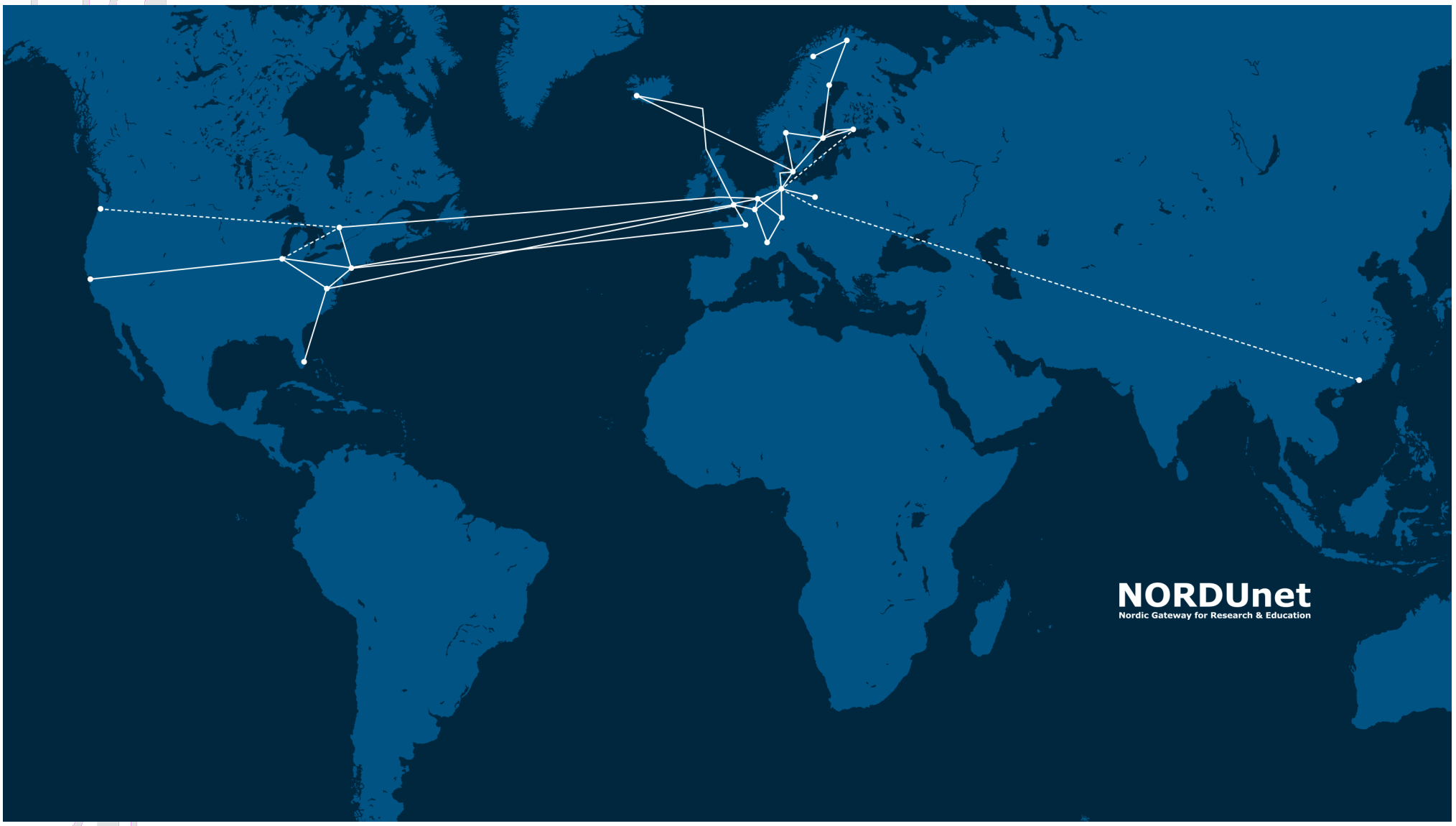
NORDUnet 2017



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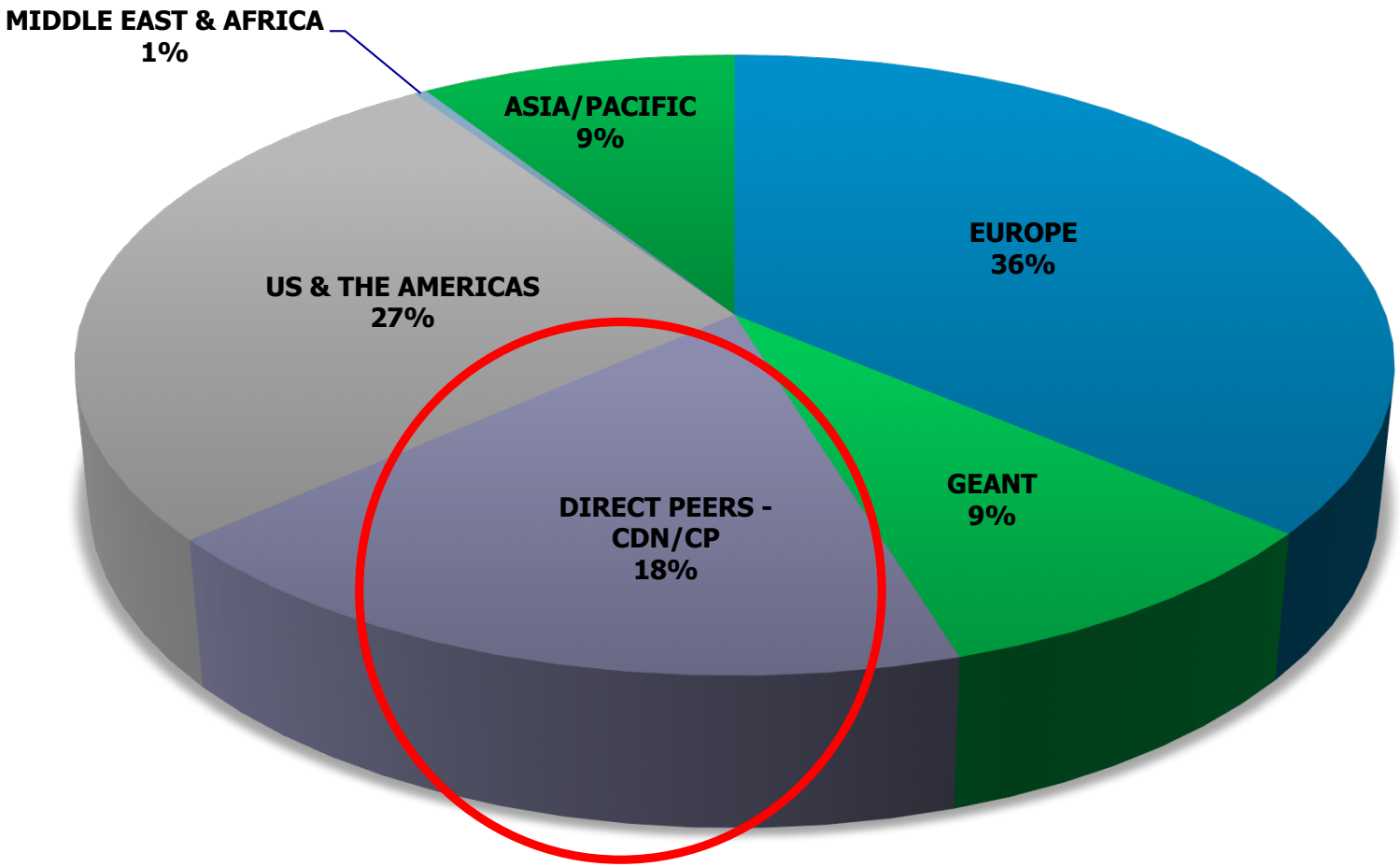
Where is the traffic going?



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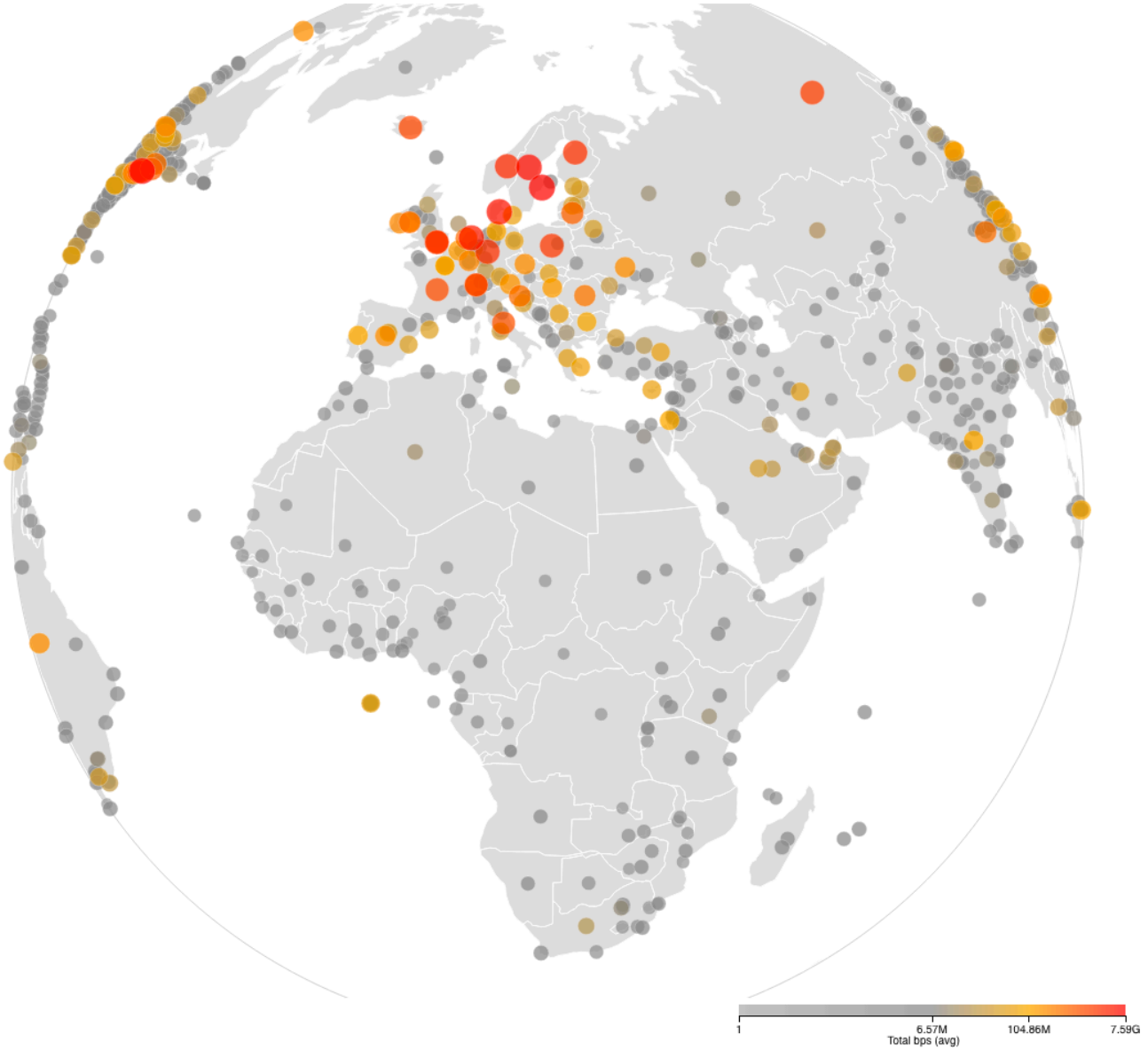
Europe, Africa, Middle East



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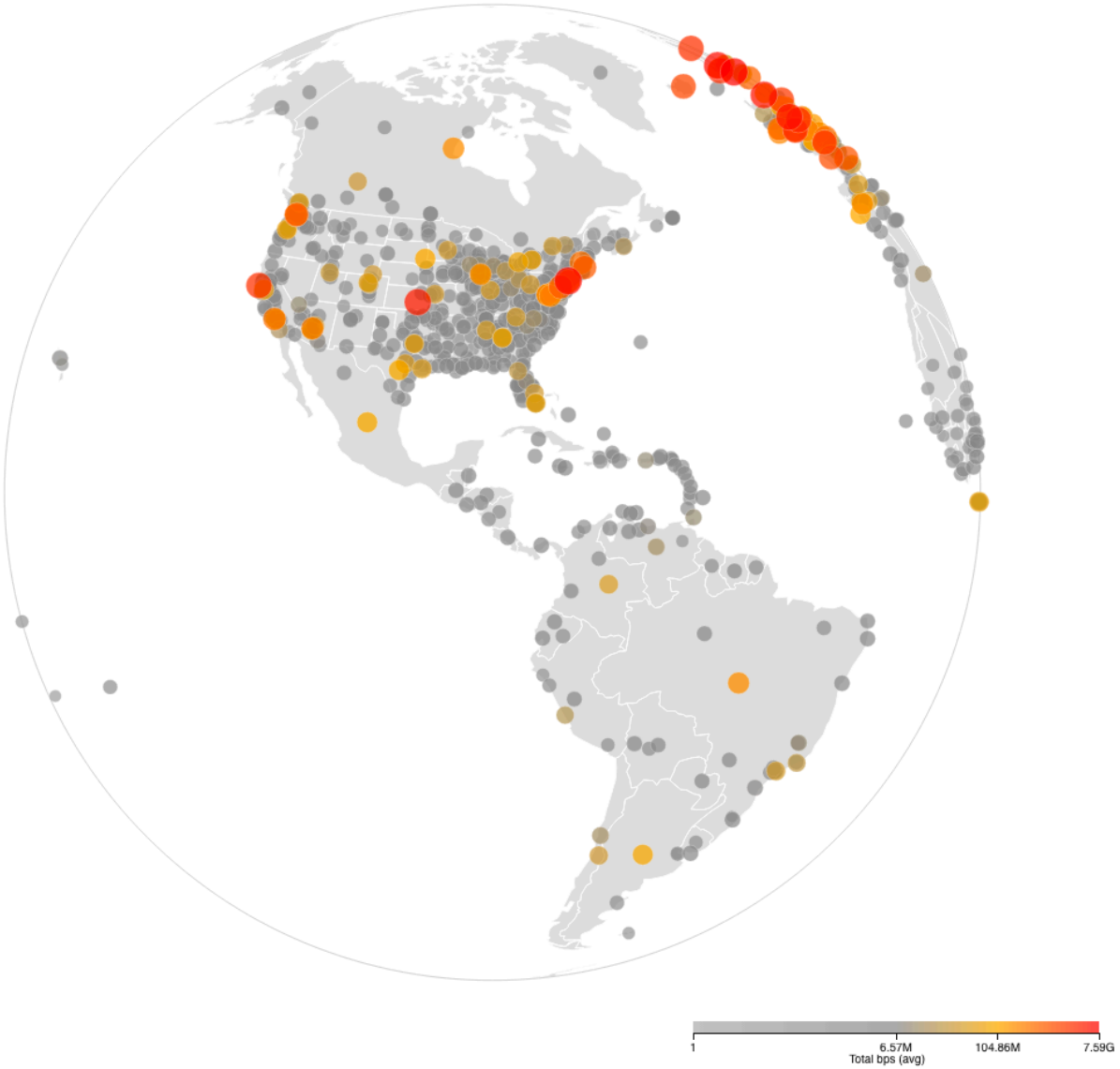
The Americas



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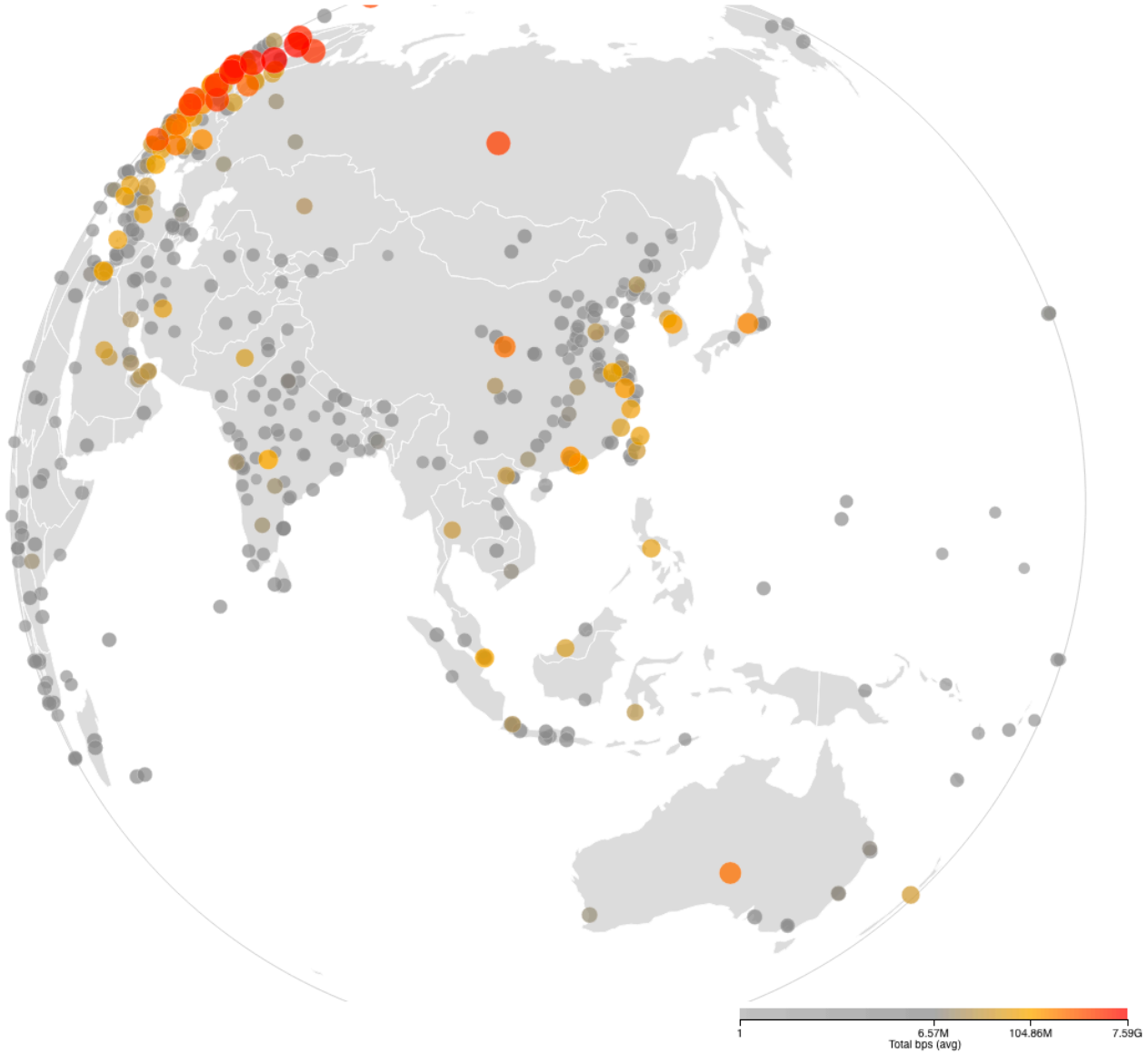
Asia - Pacific



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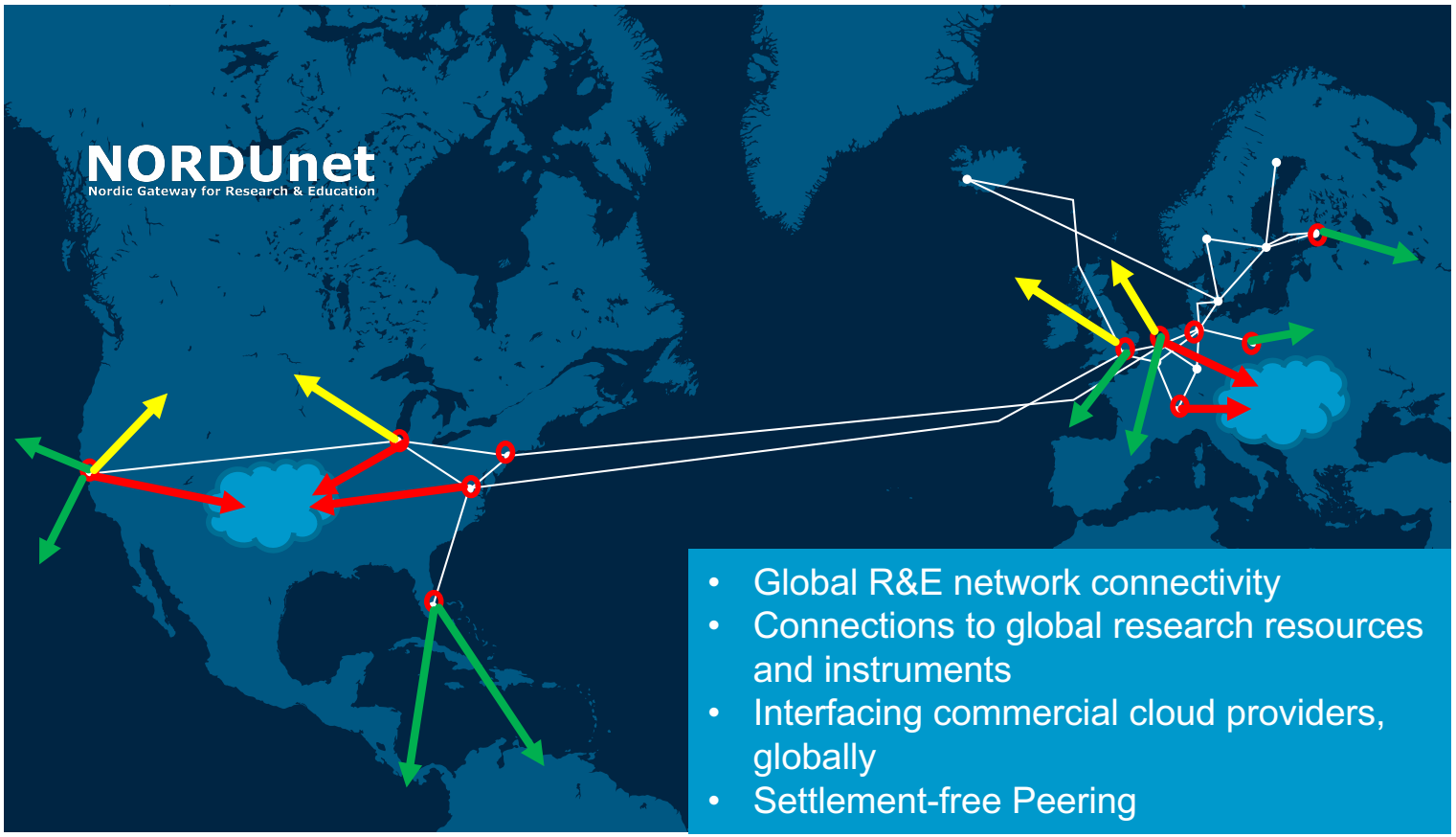
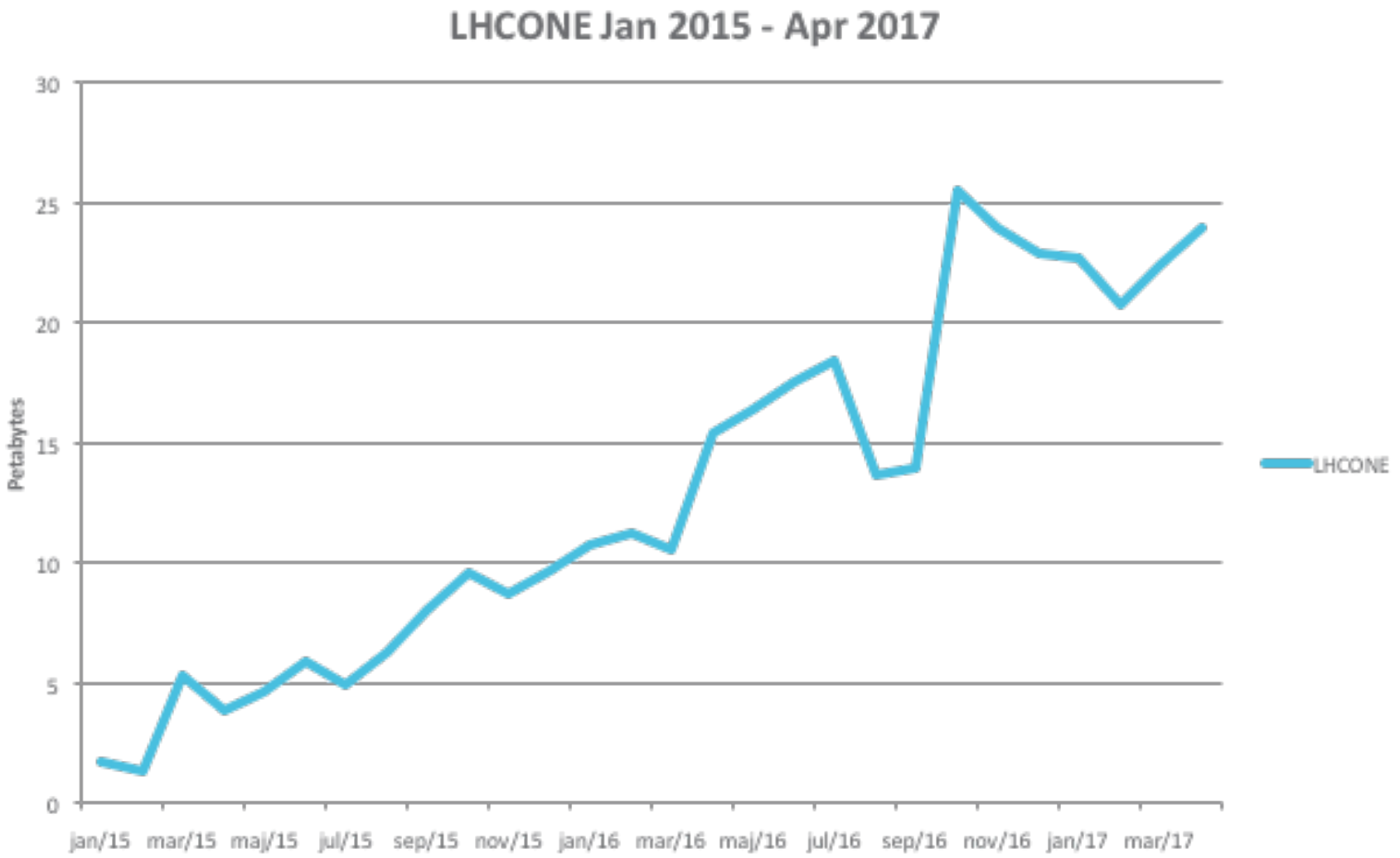
Serving the Traffic



- Global R&E network connectivity
- Connections to global research resources and instruments
- Interfacing commercial cloud providers, globally
- Settlement-free Peering

x5 in < 24 months



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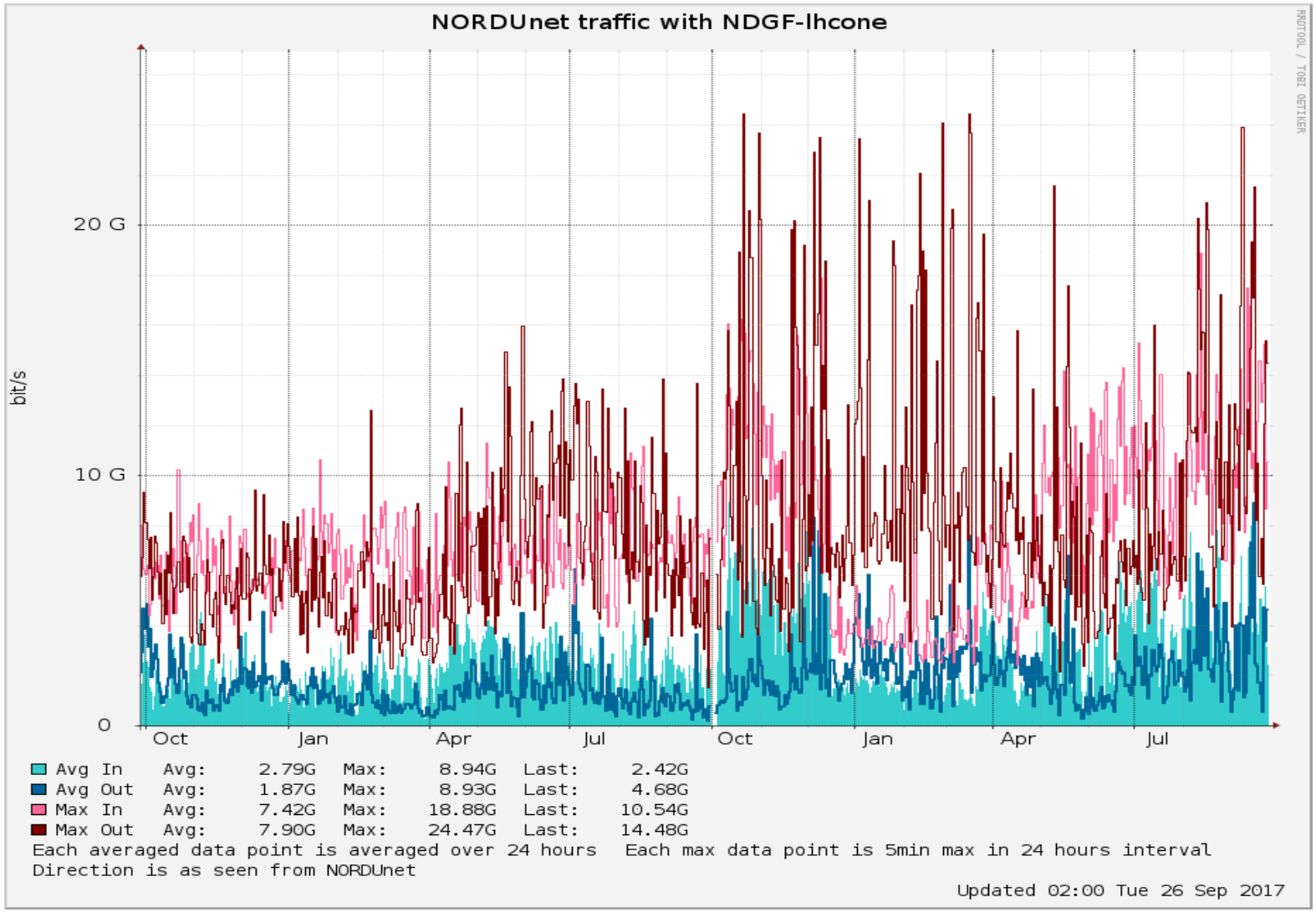
Year on Year Growth



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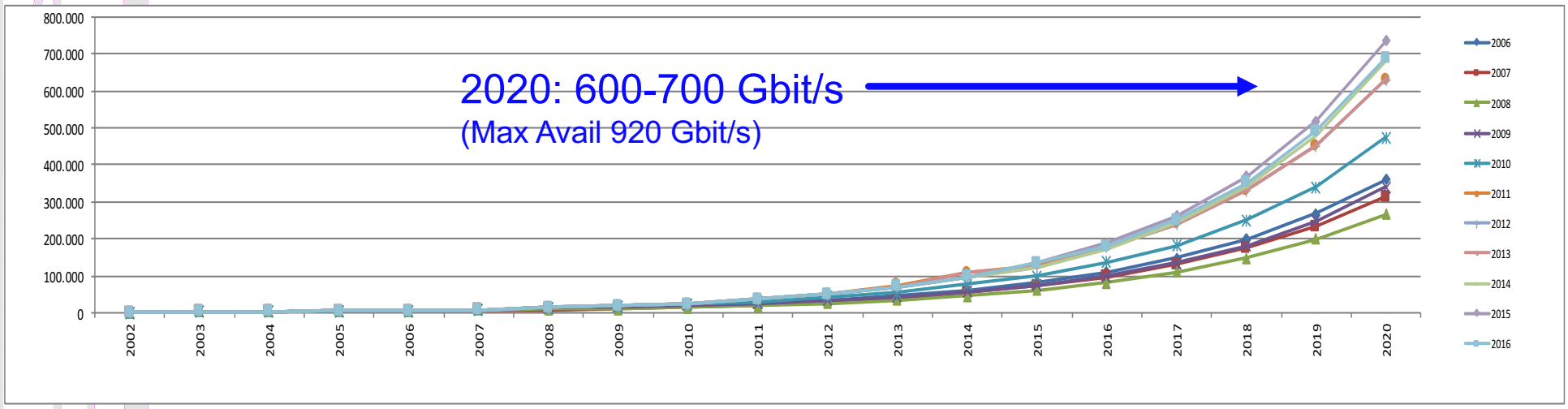
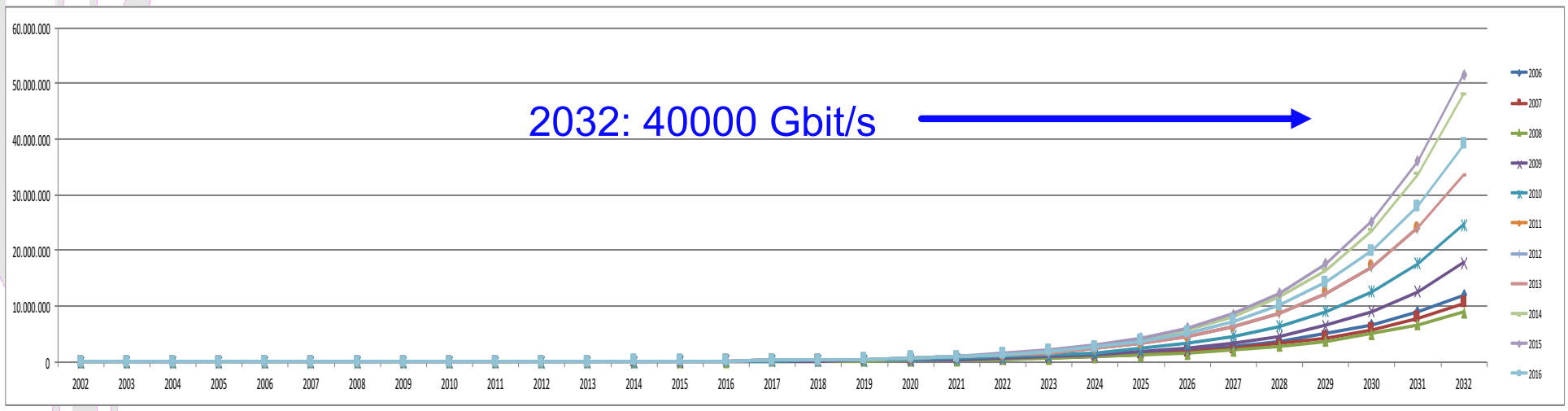
The Terabit Challenge





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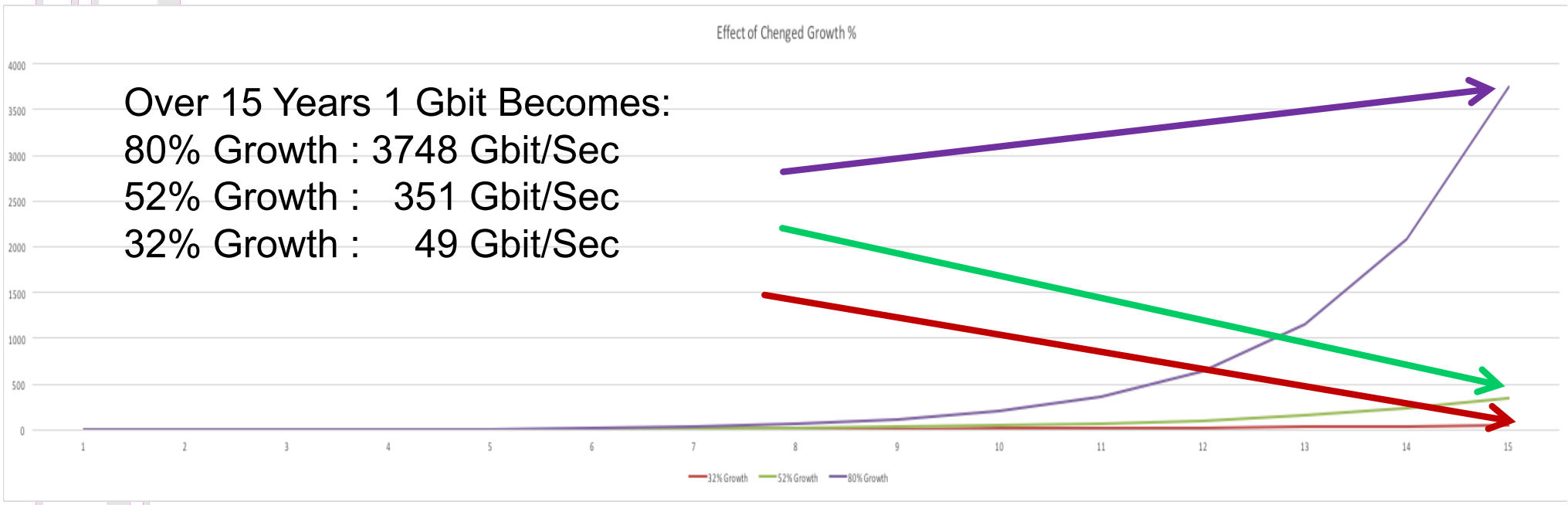
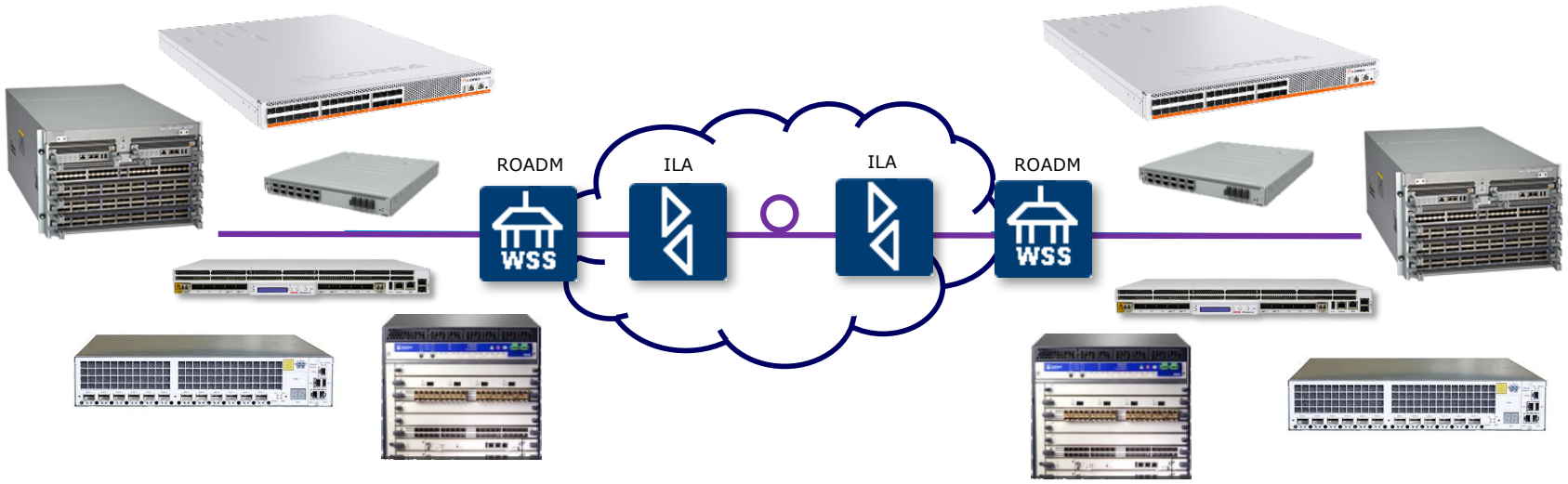
Rate of Change?

Over 15 Years 1 Gbit Becomes:
80% Growth : 3748 Gbit/Sec
52% Growth : 351 Gbit/Sec
32% Growth : 49 Gbit/Sec



Meeting the BW Challenge



- Data Center Interconnects
- Open Line systems, Pluggable Merchant optics
- Disaggregating the network
- Blurring the line between DWDM and routers
- Enables network resource sharing
- Dramatic reduction of (total) cost
- … but adds complexity

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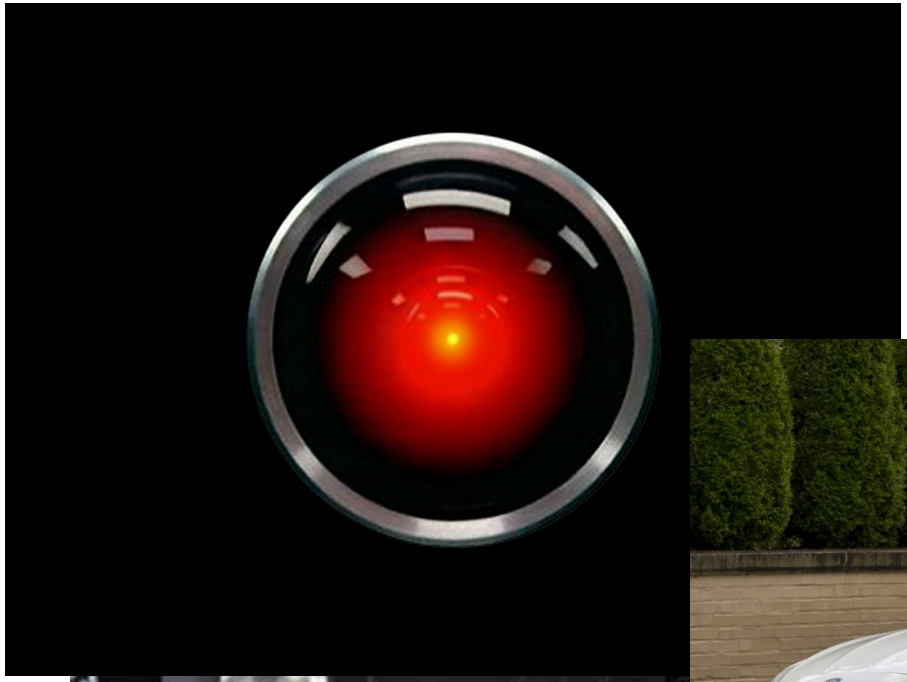
Zero-Touch Networking



UK could have driverless government by 2020, say experts

TECH experts have confirmed that the UK could have a driverless government as soon as 2020.

Our Reality

Research and education will be **completely unconstrained**

by the physical location of instruments, people, computational resources, or data.

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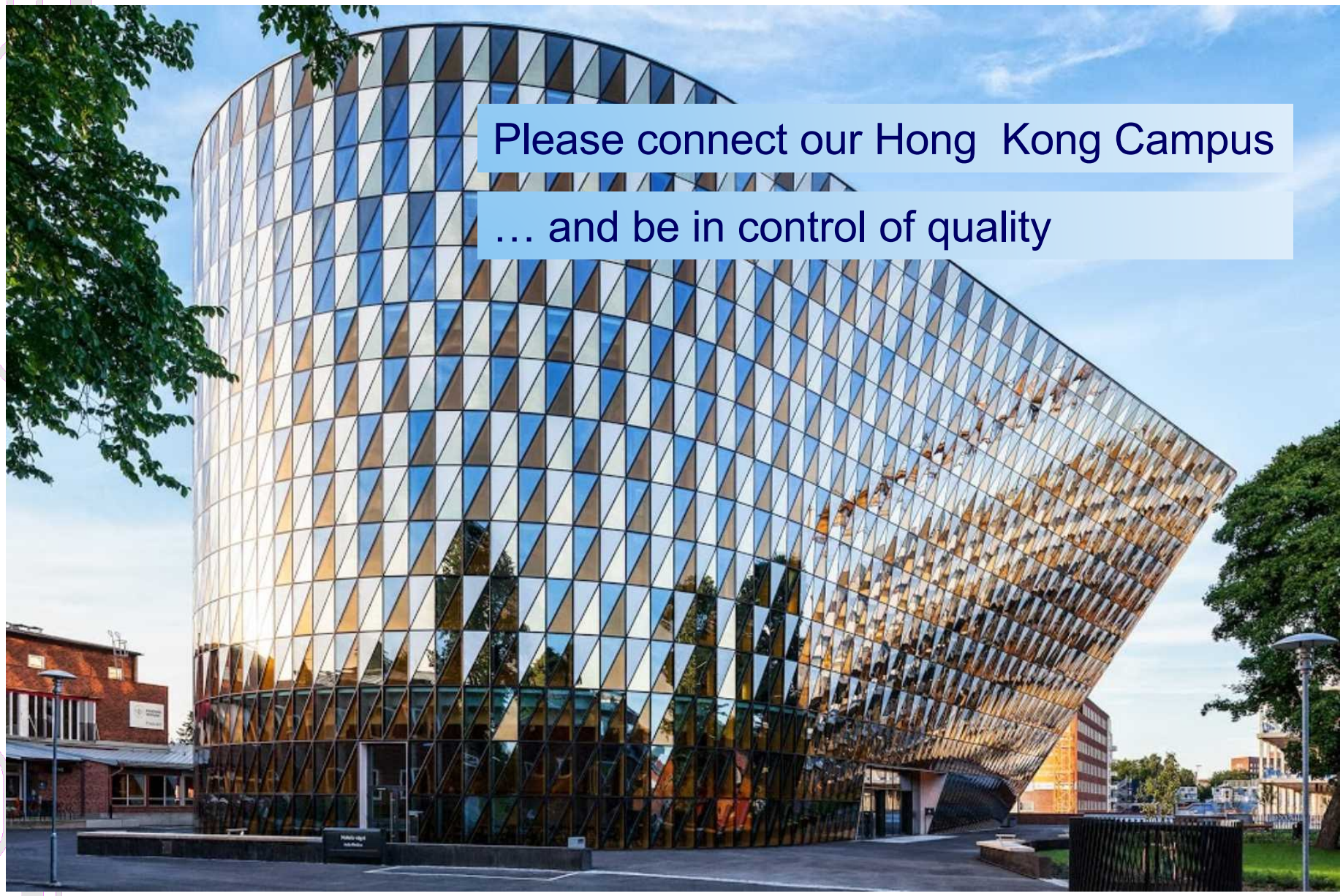
Example



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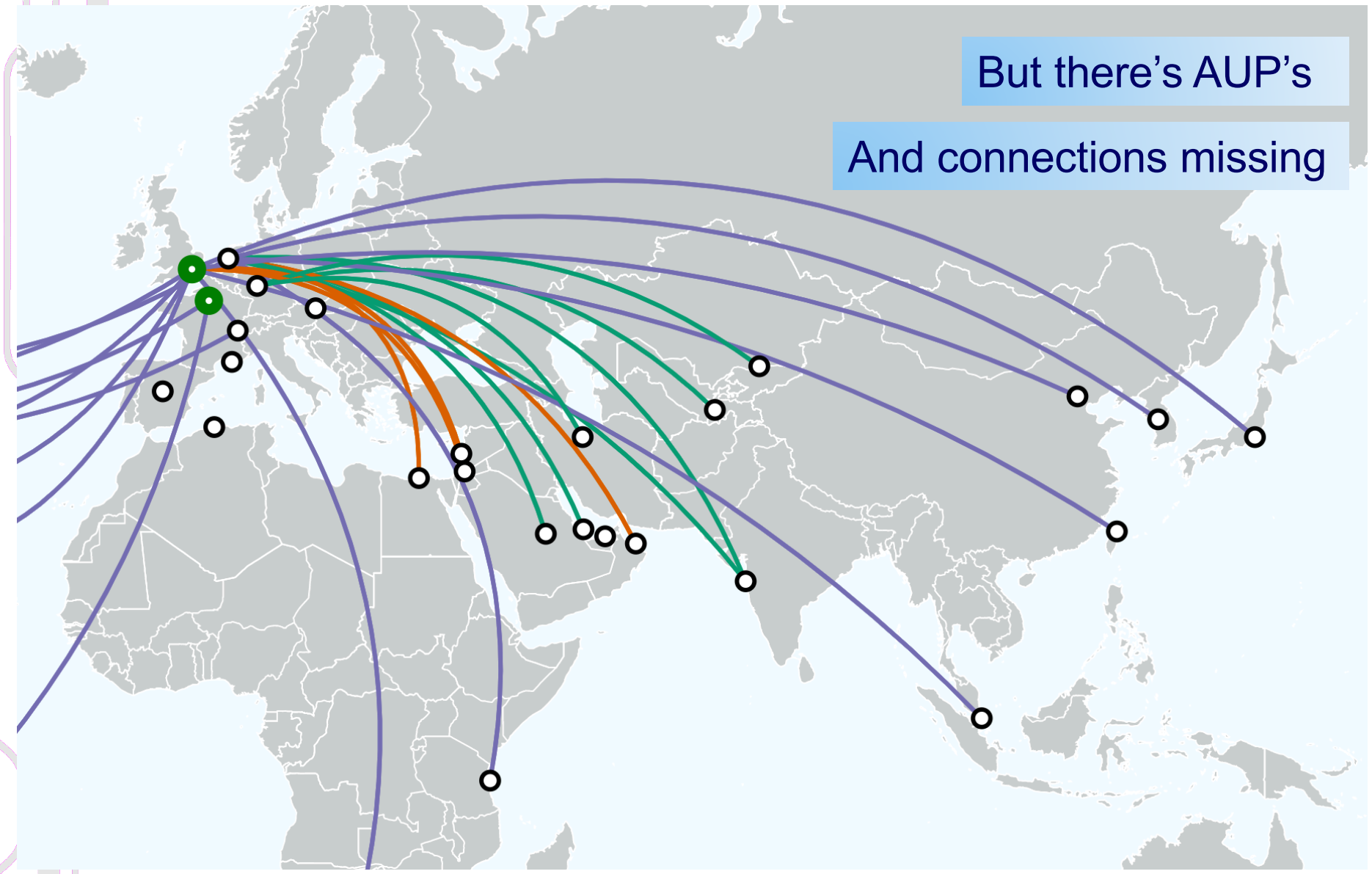
Our Global Partners



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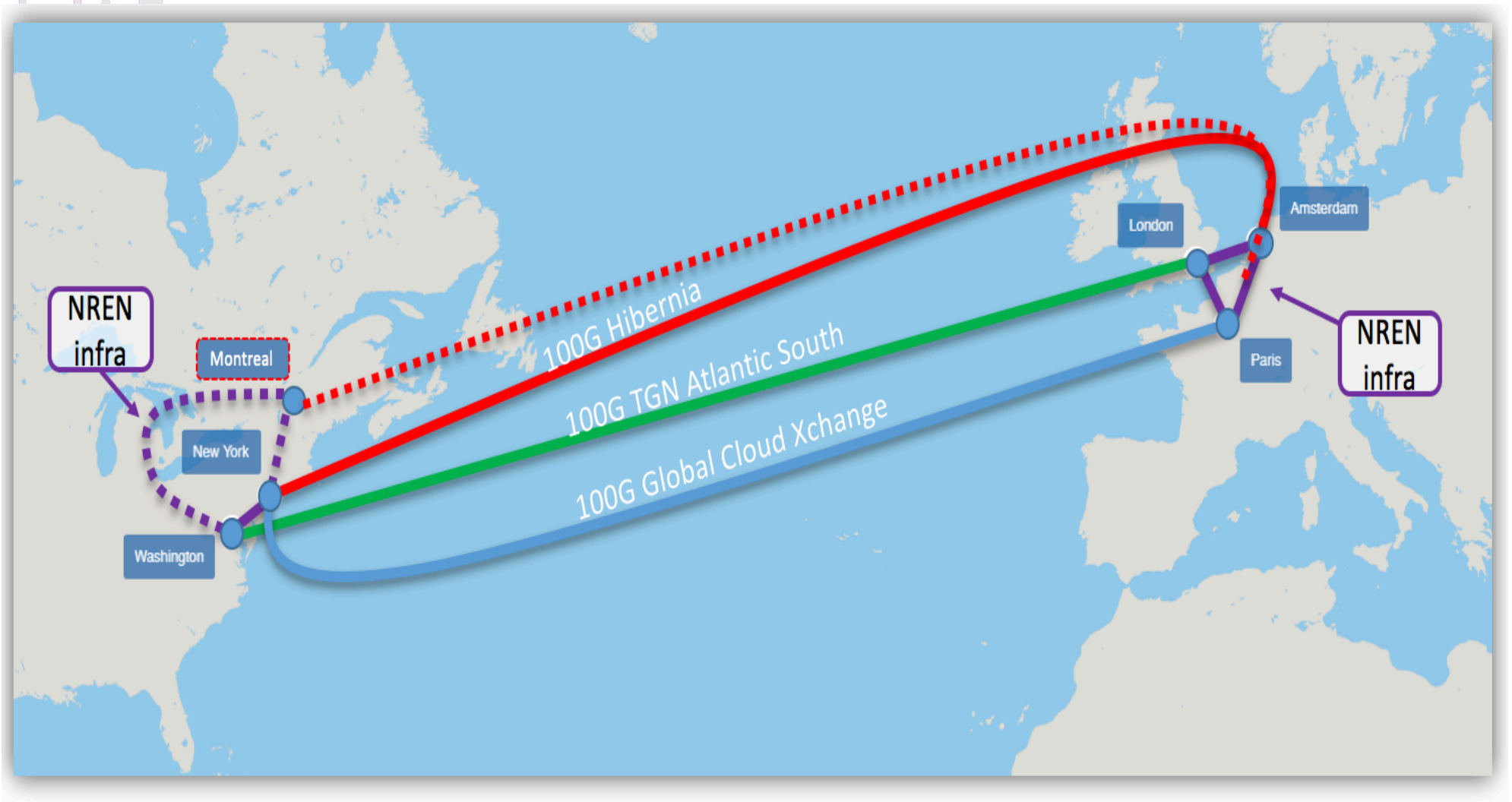
Shared Infrastructure



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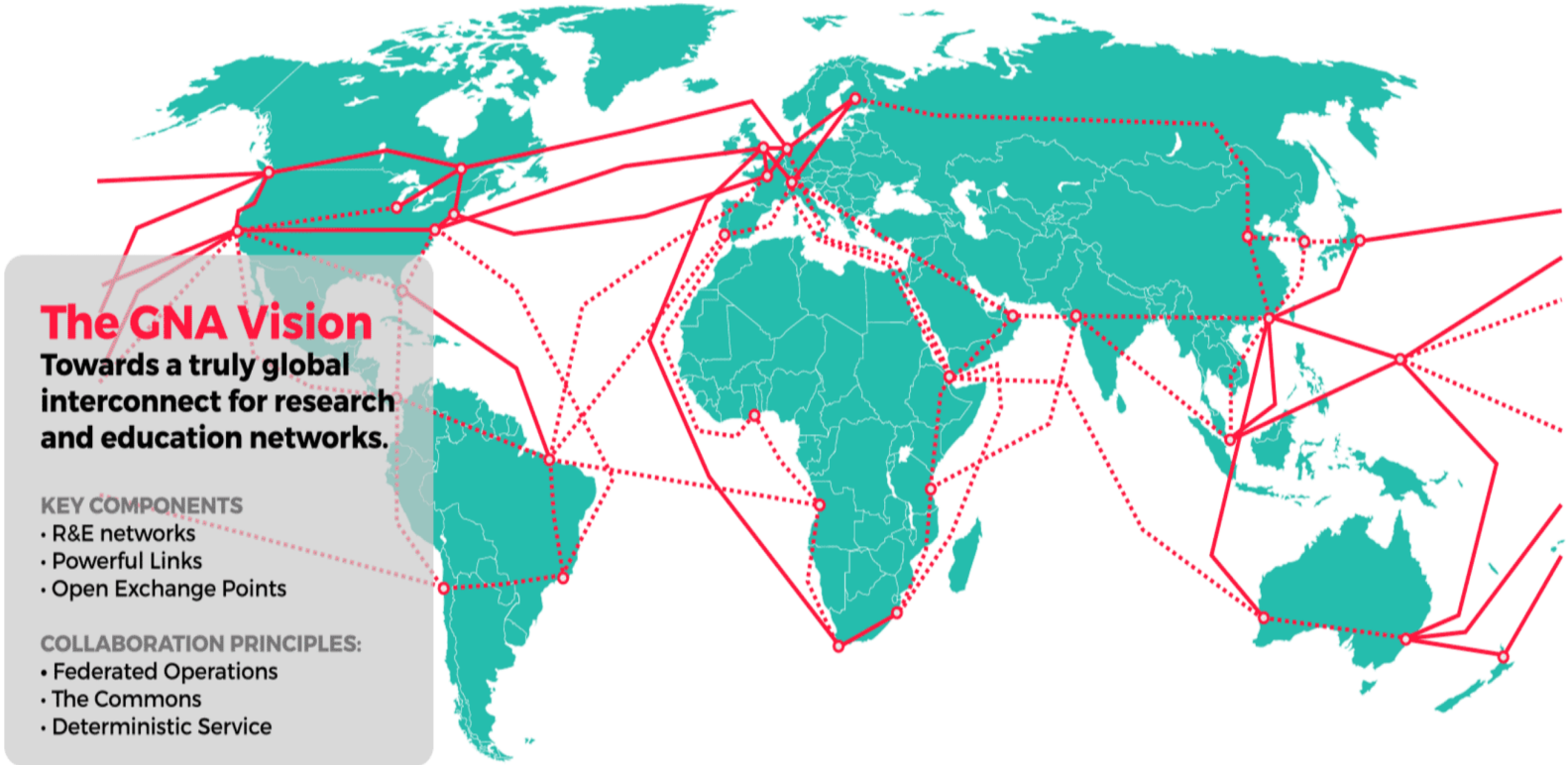

The GNA Vision

Towards a truly global interconnect for research and education networks.

KEY COMPONENTS

- R&E networks
- Powerful Links
- Open Exchange Points

COLLABORATION PRINCIPLES:

- Federated Operations
- The Commons
- Deterministic Service

TIMELINE

GNA VISION 2013 2014 2015 2016 2017 2018 2020 2025

I LIKE HOW WE'VE HAD THE INTERNET FOR DECADES, YET "SENDING FILES" IS SOMETHING EARLY ADOPTERS ARE STILL FIGURING OUT HOW TO DO.

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Big Science

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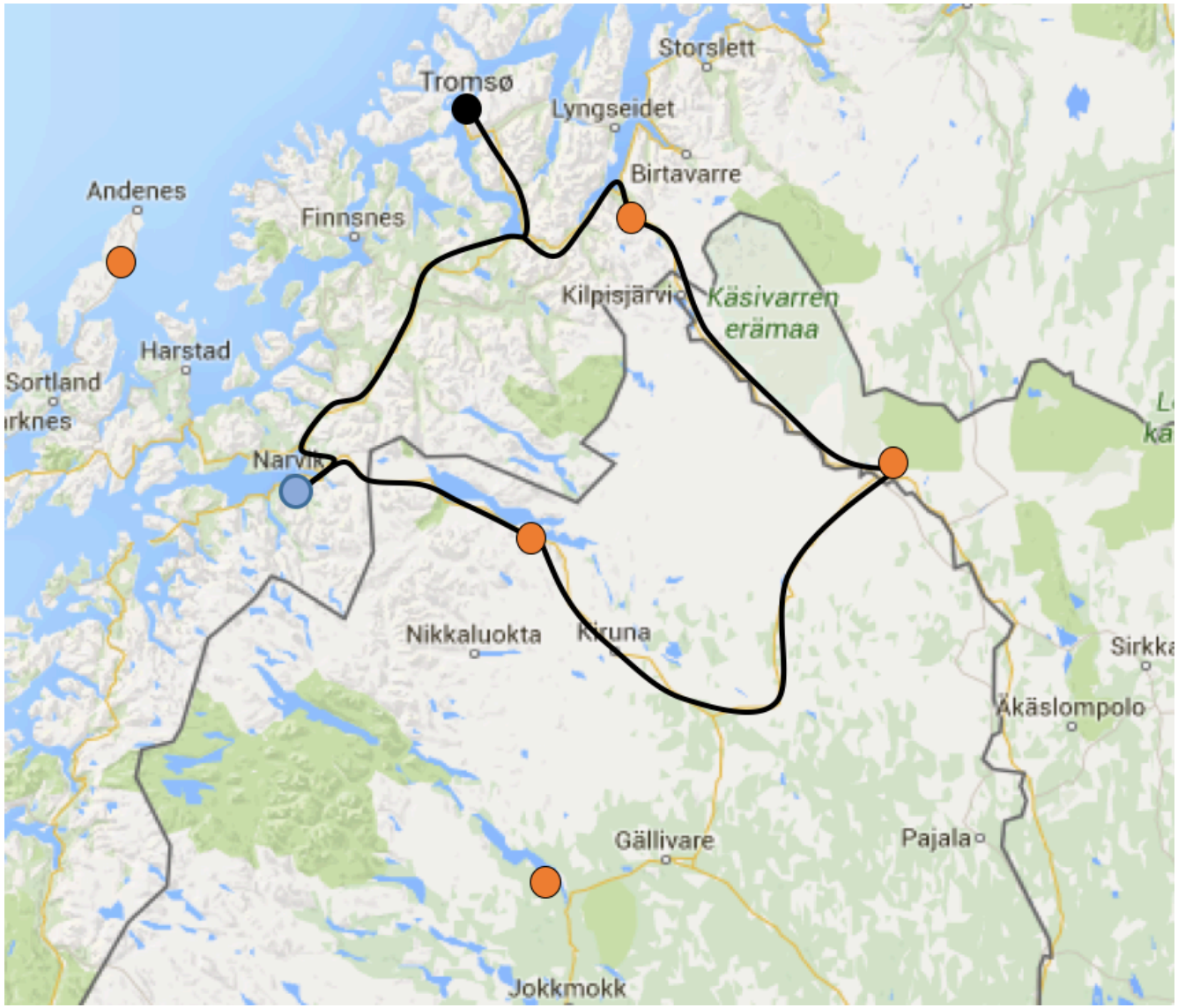
Specialize Infrastructure



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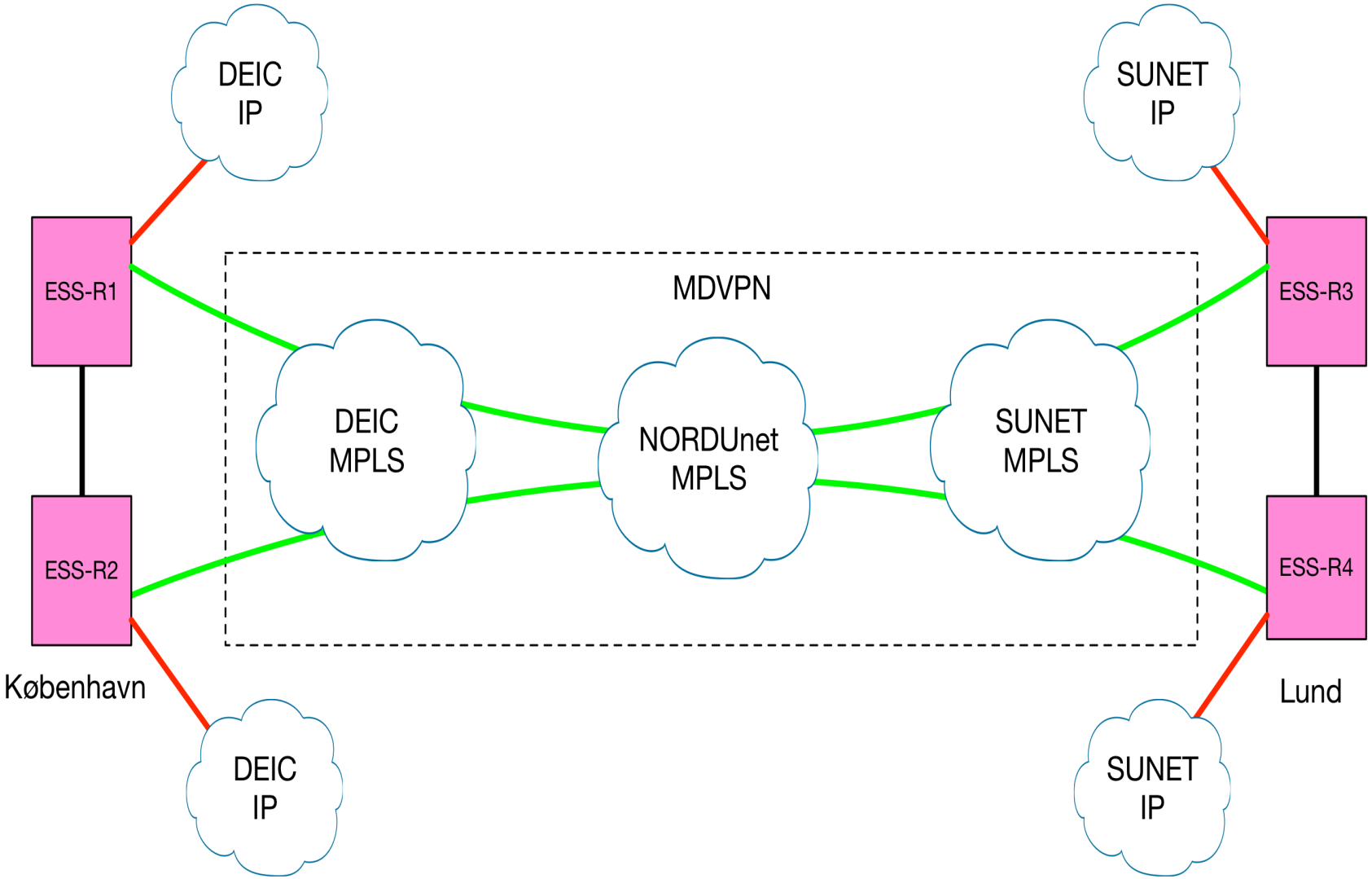
Wide-Area LAN



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Being There

Data Transfer Nodes

- Optimized disk-to-disk performance
- Optimized at OS and HW level

- Focus on campus-to-campus data movement
- 1Gbps, 10Gbps, 40Gbps, 100Gbps

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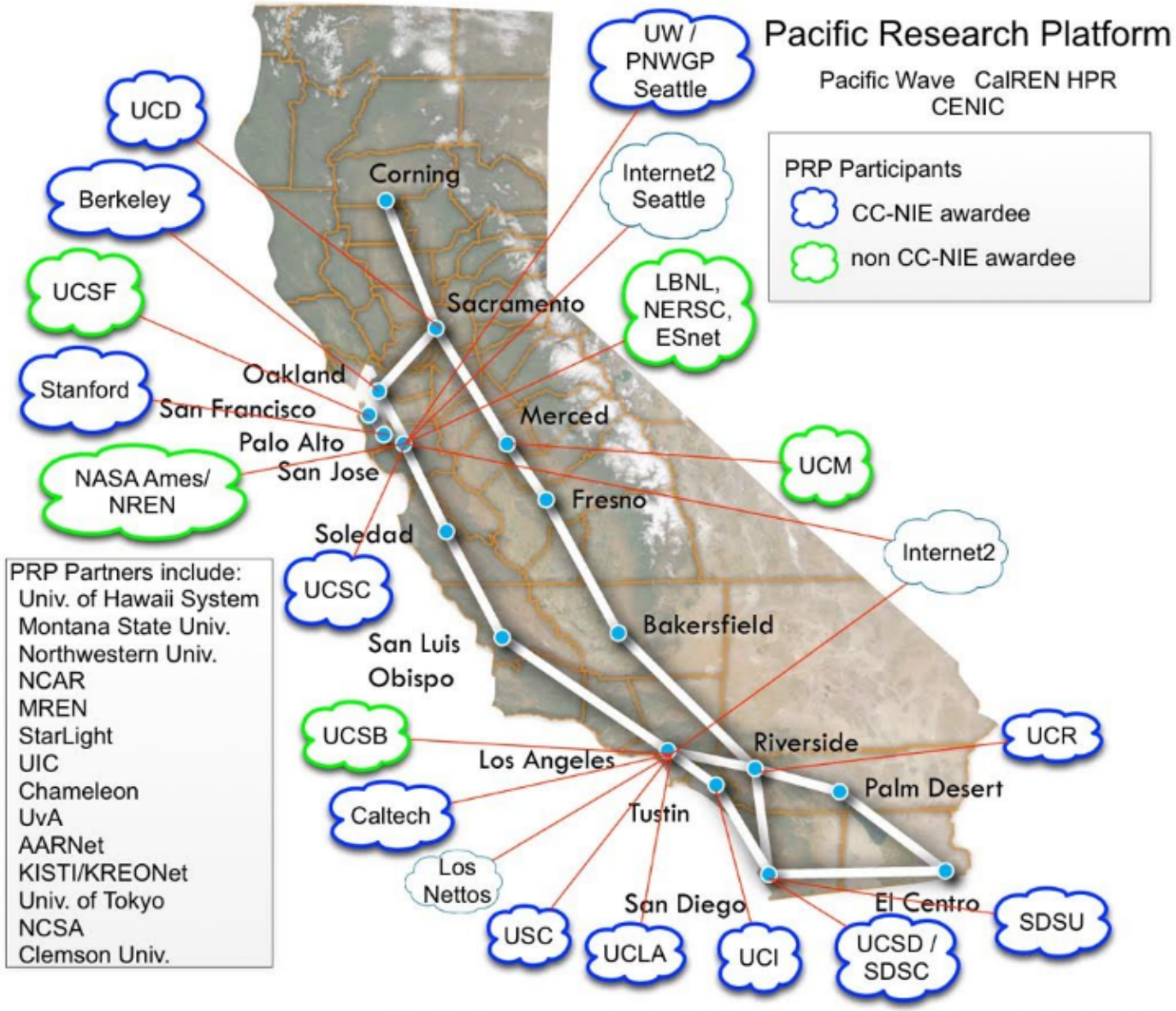
Pacific Research Platform



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Enabling Data-Driven Work

Anyone
Anywhere
Any time

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IRONY & SARCASM CAN OCCUR