NORDUnet
Nordic Infrastructure for Research & Education

NORDUnet
A European Regional Network

Lars Fischer

SEERA-EI Workshop
Belgrade, 18 January 2012

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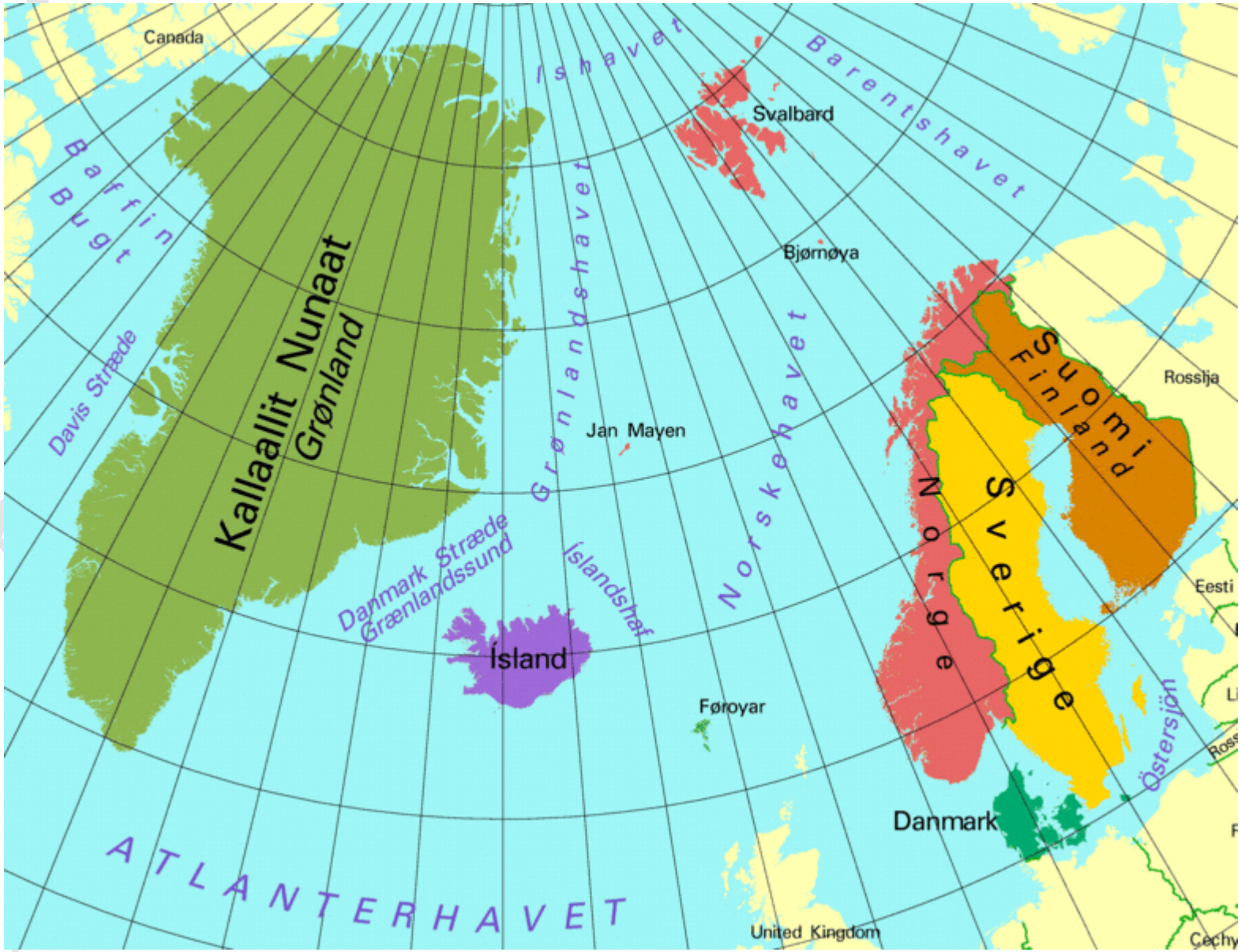
Connecting the North Atlantic



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NORDUnet

Is the Nordic Infrastructure for Research and Education providing the Nordic backbone to the Global Infrastructure for Research and Education.

NORDUnet is the result of the NORDUNET program (1985 to 1991) financed by the Nordic Council of Ministers.

Danish limited company owned by the governments or government institutions in Scandinavian.

1 Mill Users

14 Mill €

Denmark Finland Iceland Norway Sweden

NORDUnet

GÉANT CERN

GLORIAD

Global Ring Network for Advanced Applications Development

e-Science Future Network e-Business Super Computing

glif

Global Lambda Integrated Facility

National Science Foundation

SURF NET

canarie

POZNAN

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NORDUnet Vision and Strategy

- It is the Vision of NORDUnet to be the
  NORDIC Infrastructure for Research and Education
- NORDUnet shall provide a common world-class network infrastructure, services, support and collaboration platform for the Nordic NRENs and research and education community.
- NORDUnet shall likewise facilitate other common eInfrastructure as requested by the Nordic national eInfrastructure stakeholders.

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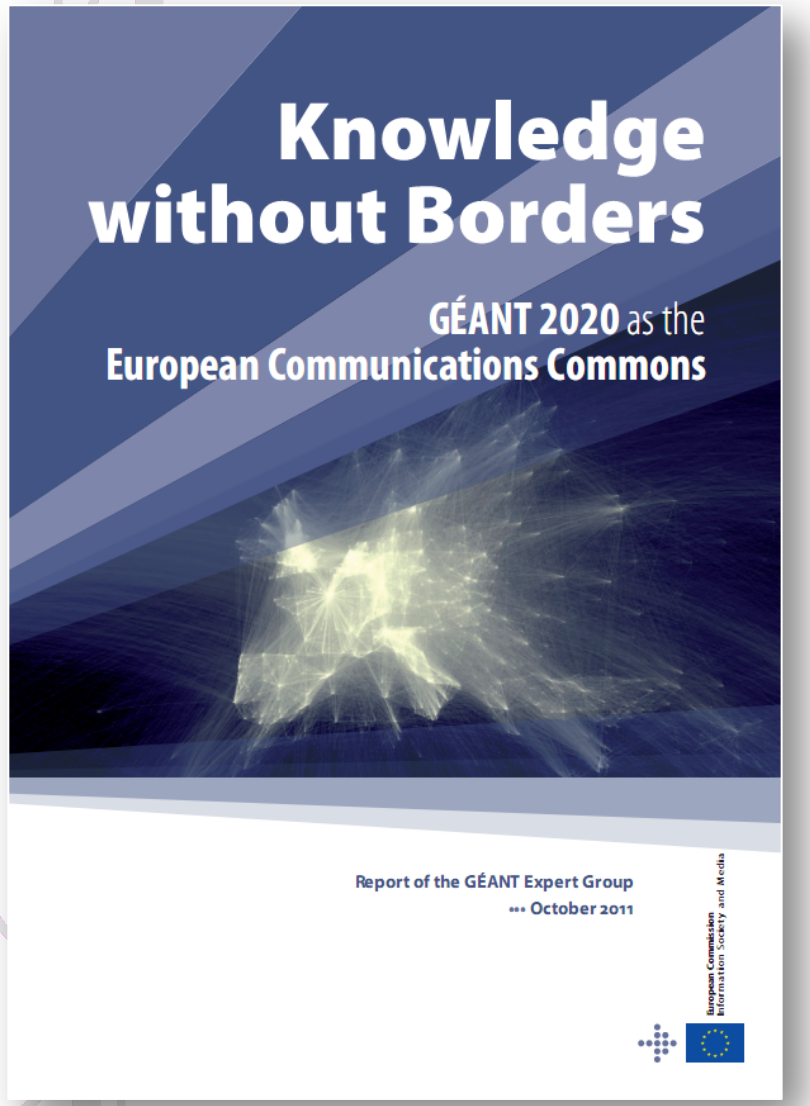
The European Vision



- "GÉANT 2020" is the European communications commons
- Where talent anywhere is able to collaborate with their peers around the world and
- To have instantaneous and unlimited access to any resource for knowledge creation, innovation and learning,
- Unconstrained by the barriers of the pre-digital world.

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Governance & Funding

- NORDUnet is
  - Jointly owned – each Nordic country owns 20% of the shares
  - Jointly governed – each Nordic NREN has a seat on the board
  - Jointly funded – the Nordic NREN share base cost according to GDP
- NORDUnet provides
  - Core services to all owner
  - Asymmetric to one or more owner, at cost
- NORDUnet operate under the close guidance of out owners

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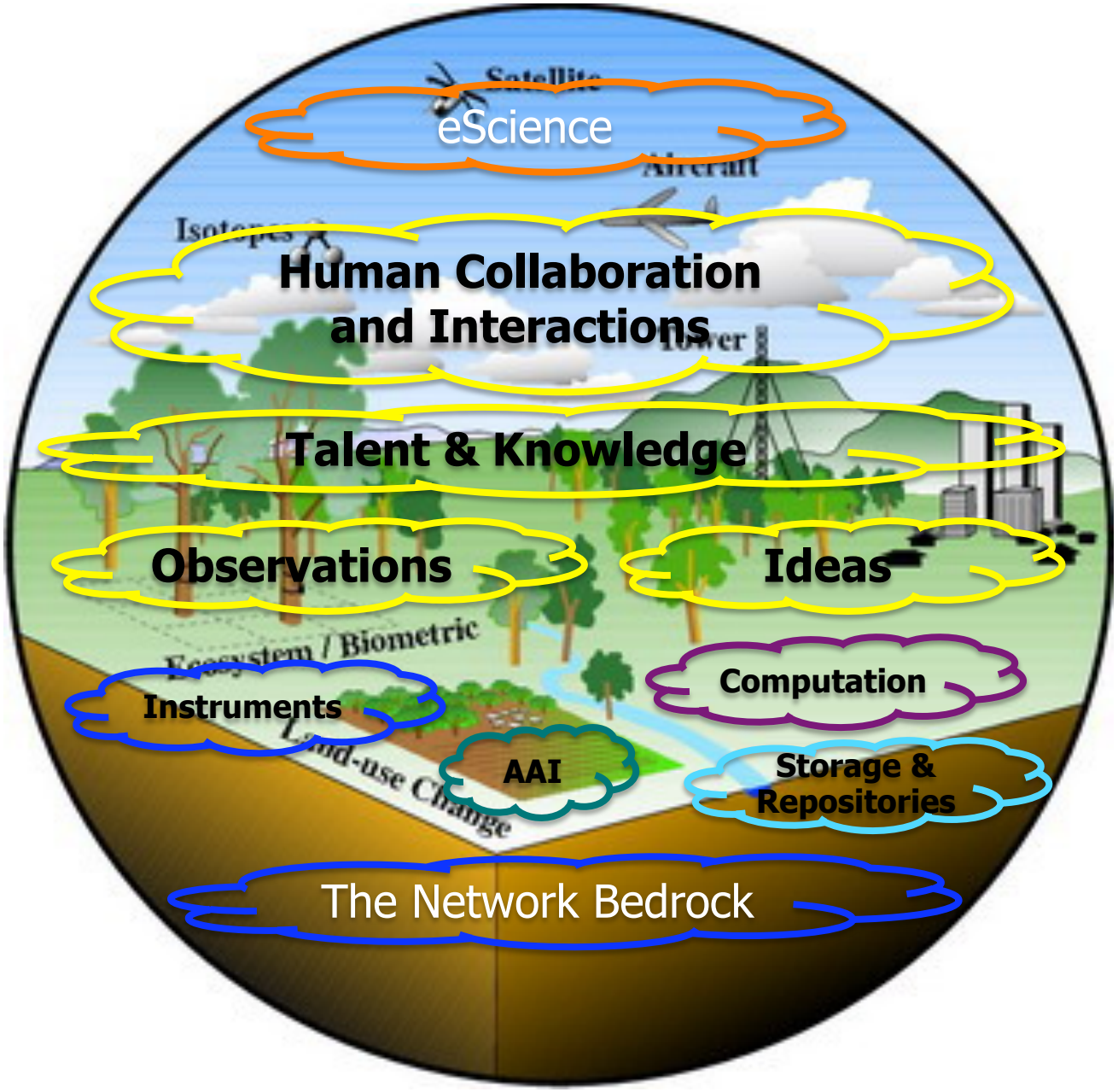
eScience ecosystem



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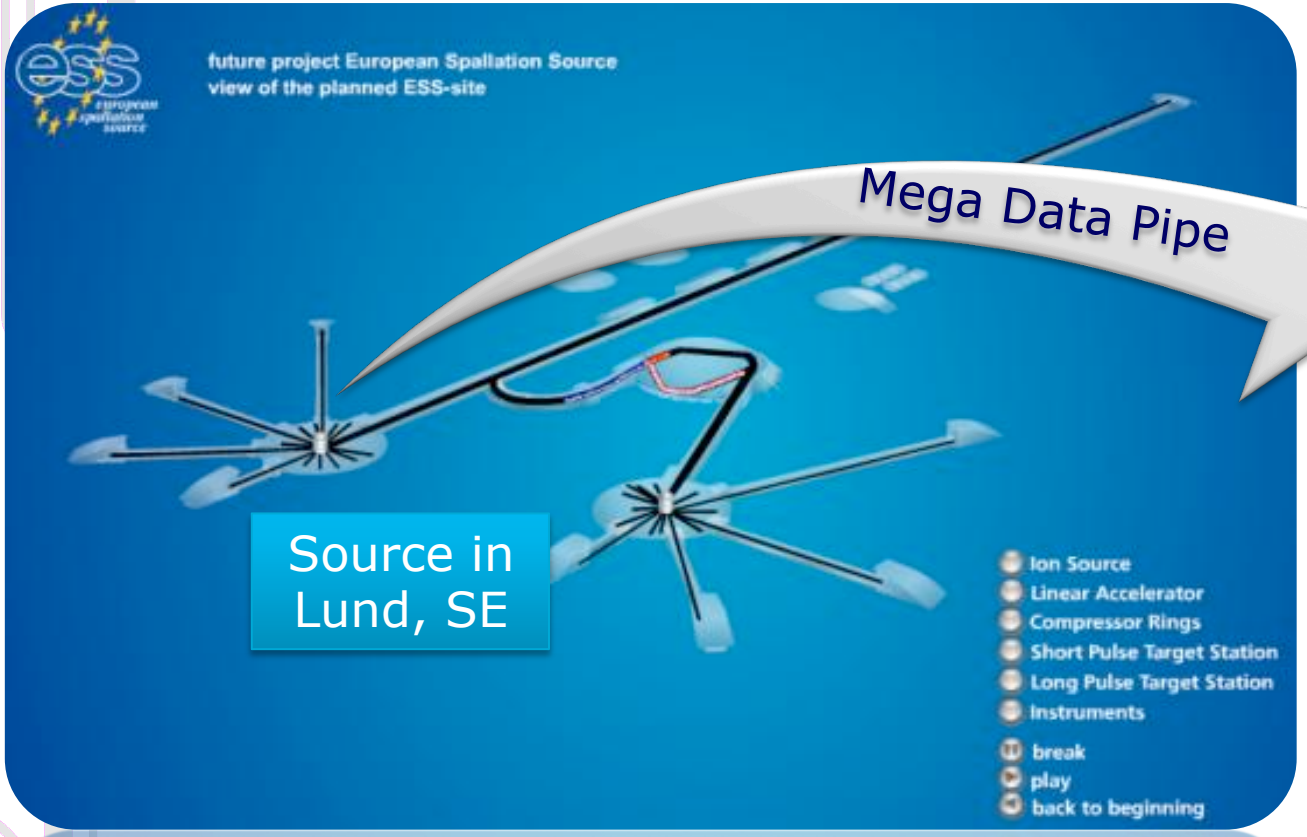
European Spallation Source

Materials research facility using the neutron scattering technique



Mega Data Pipe

Data Facility in Copenhagen, DK

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The Arctic Region

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NORDUnet in Europe

- NORDUnet & Nordic NRENs is
  - a strong global partner
  - a strong partner in European networking
  - a major contributor to GÉANT – 3rd largest contributor of man-hours in GN3
- NORDUnet firmly
  - believe in and support a strong European infrastructure
  - understand that world-class European networking is essential to Nordic R&E
  - believe that through regional collaboration we offer the best support for European networking – for the benefit of all

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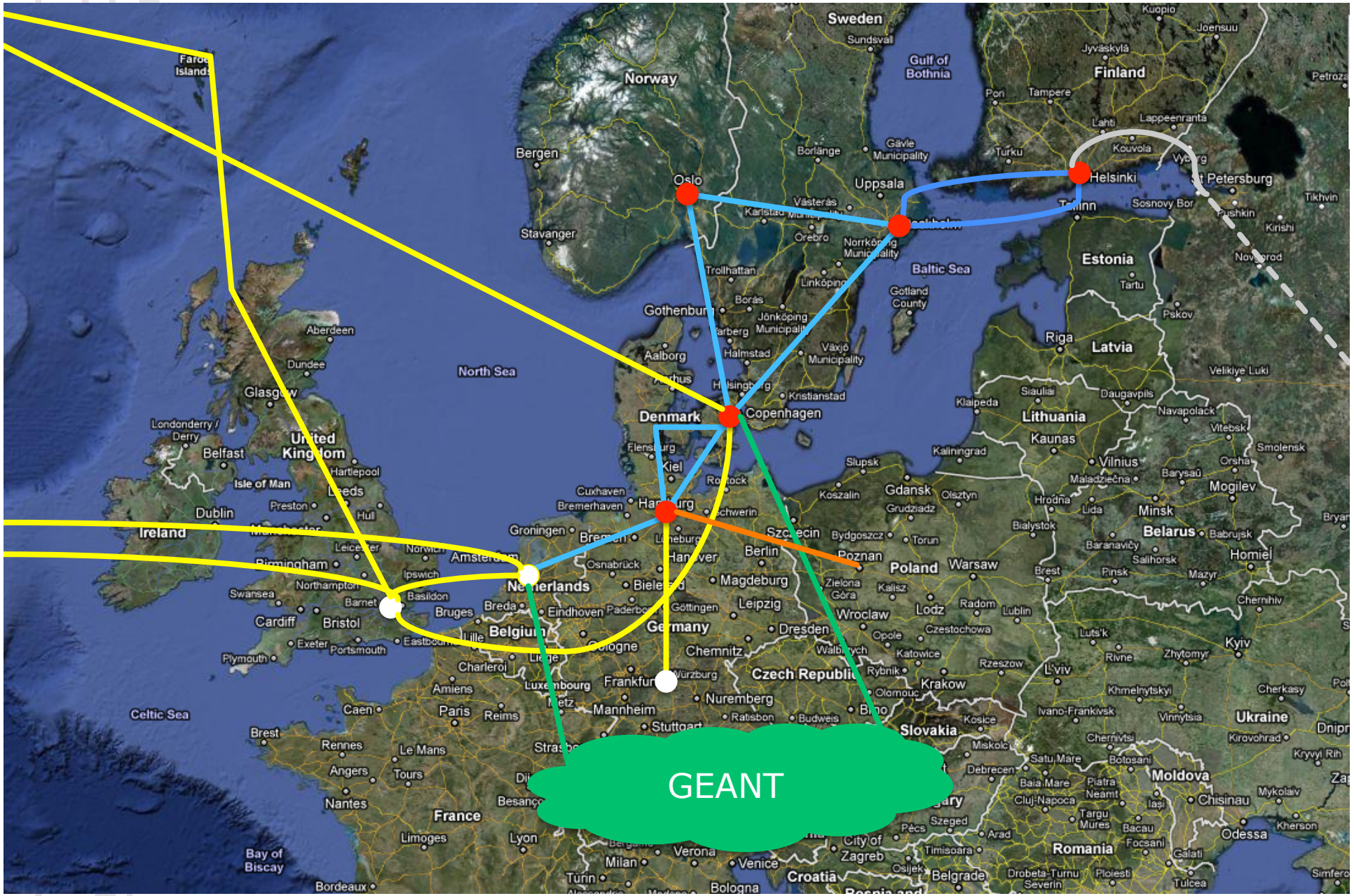
NORDUnet Network 2011



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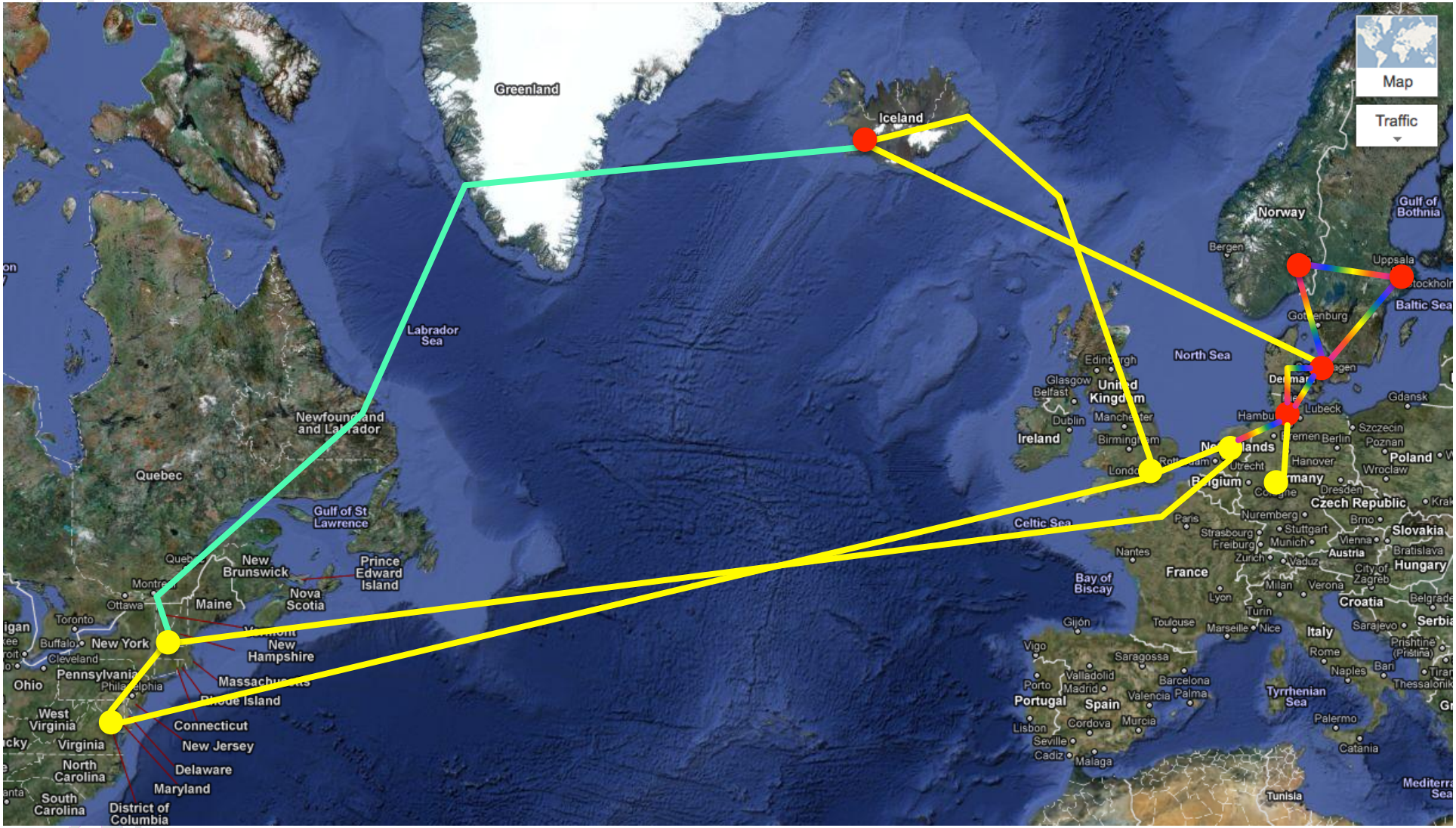
NORDUnet Network 2011



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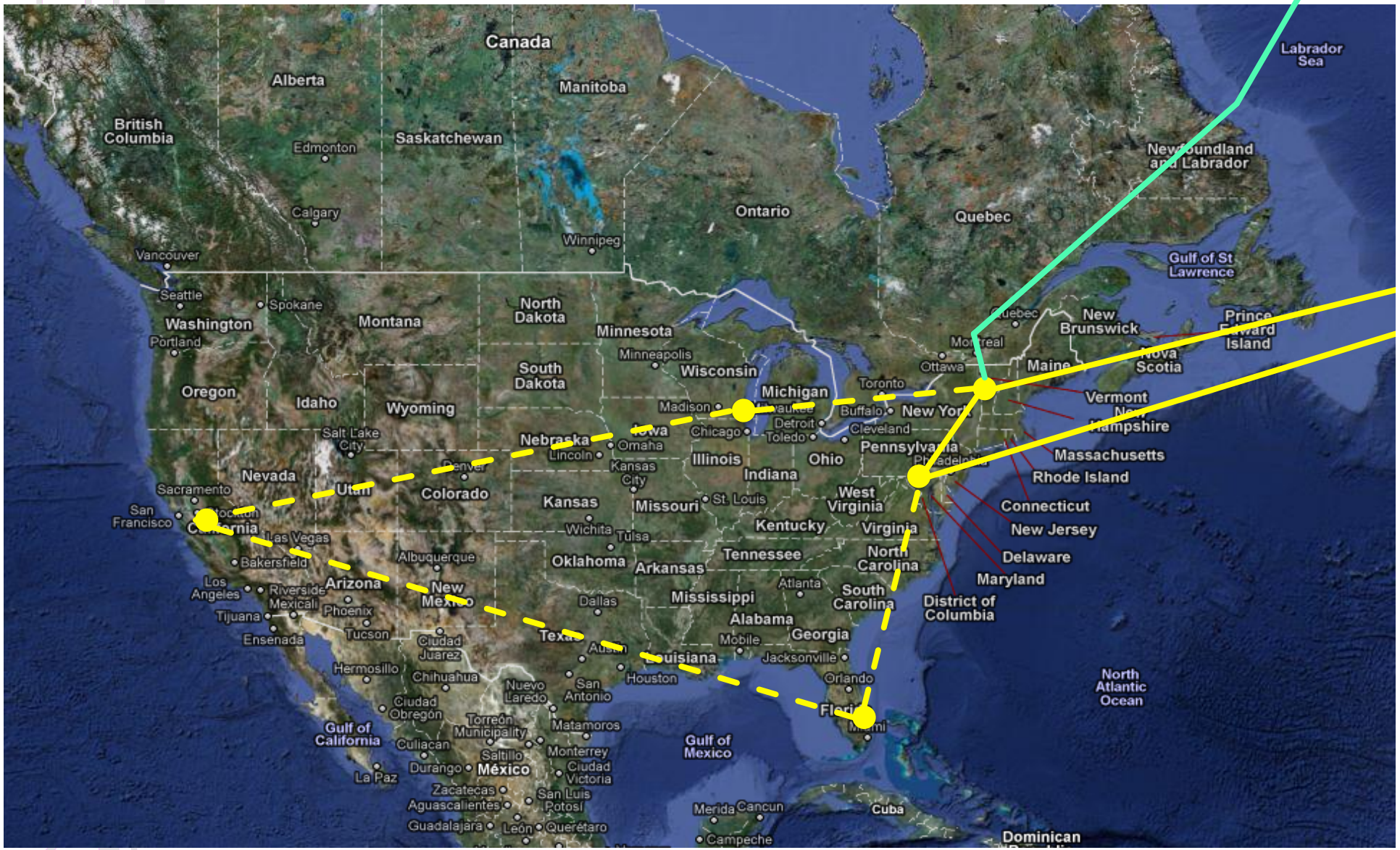
NORDUnet North America 2012



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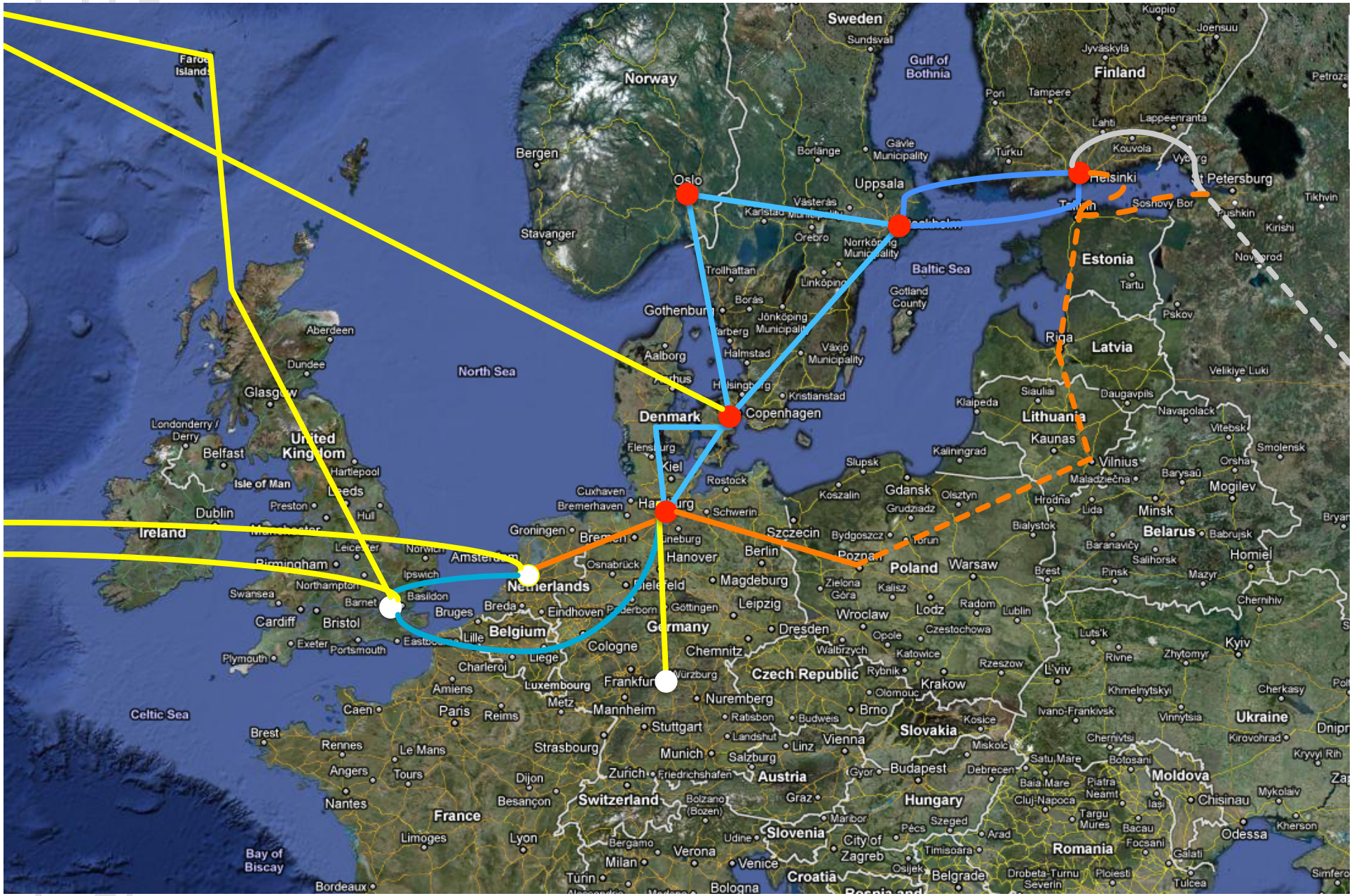
2012 Optical Tender



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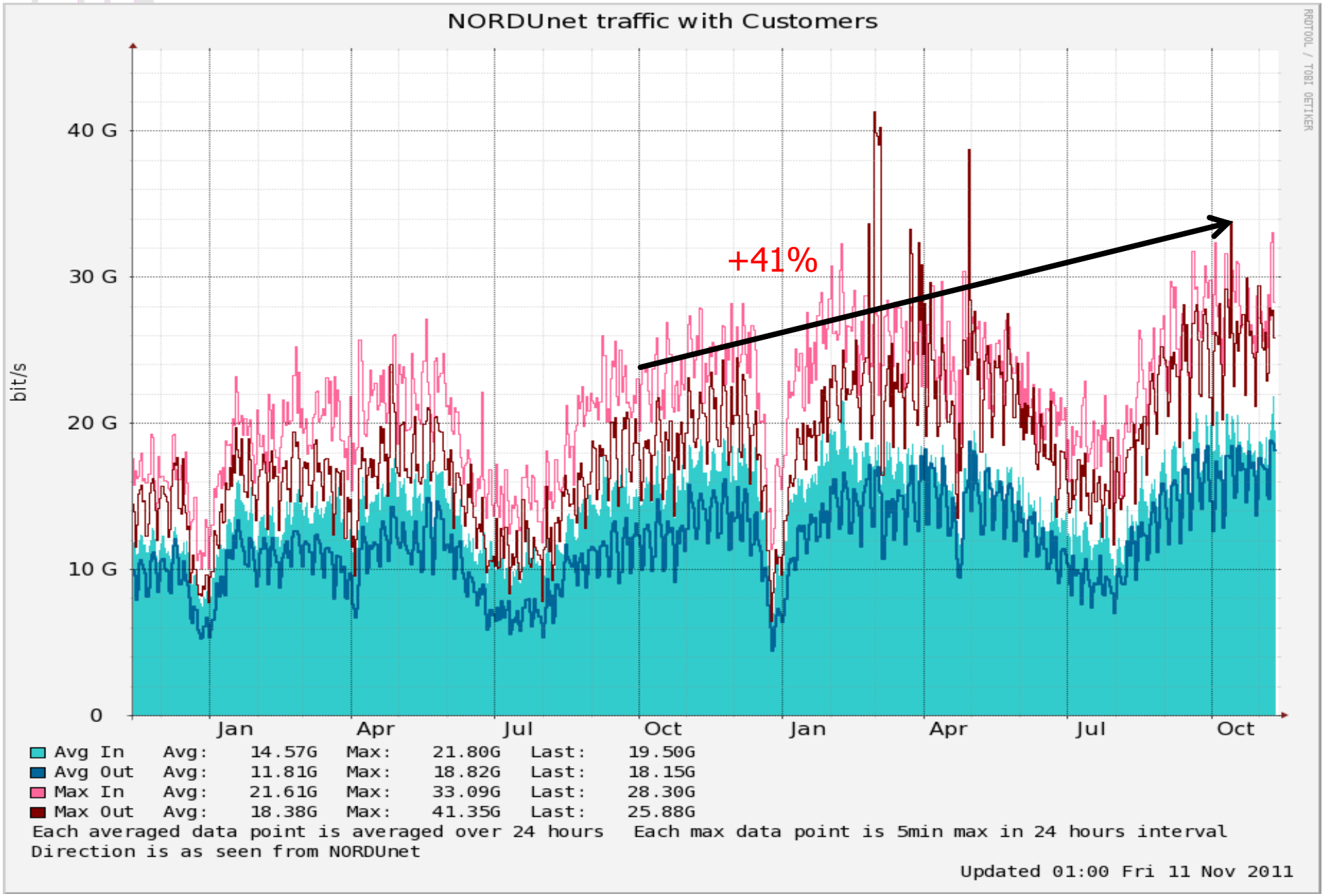
Traffic - Nordic NRENs



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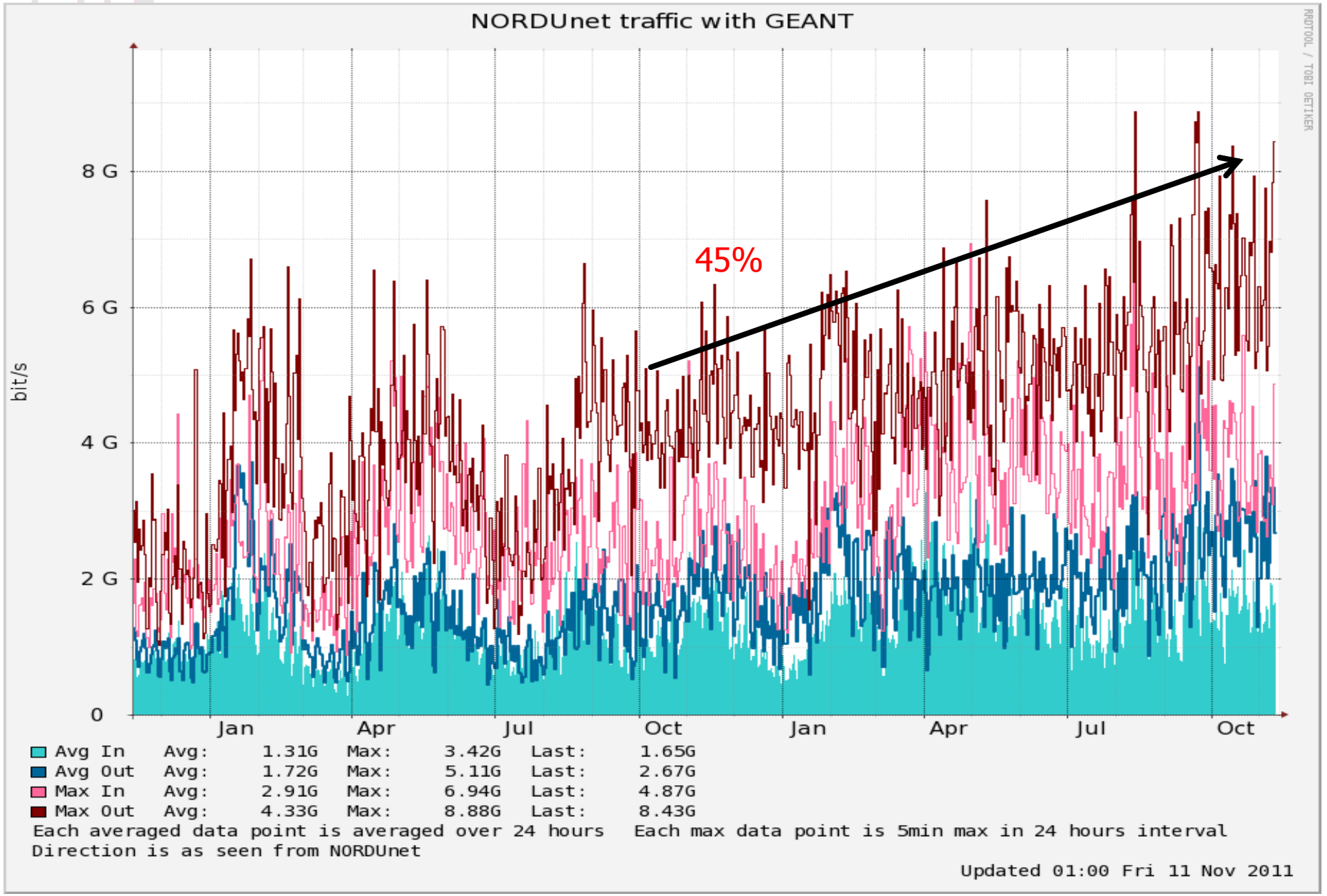
Traffic - GN3



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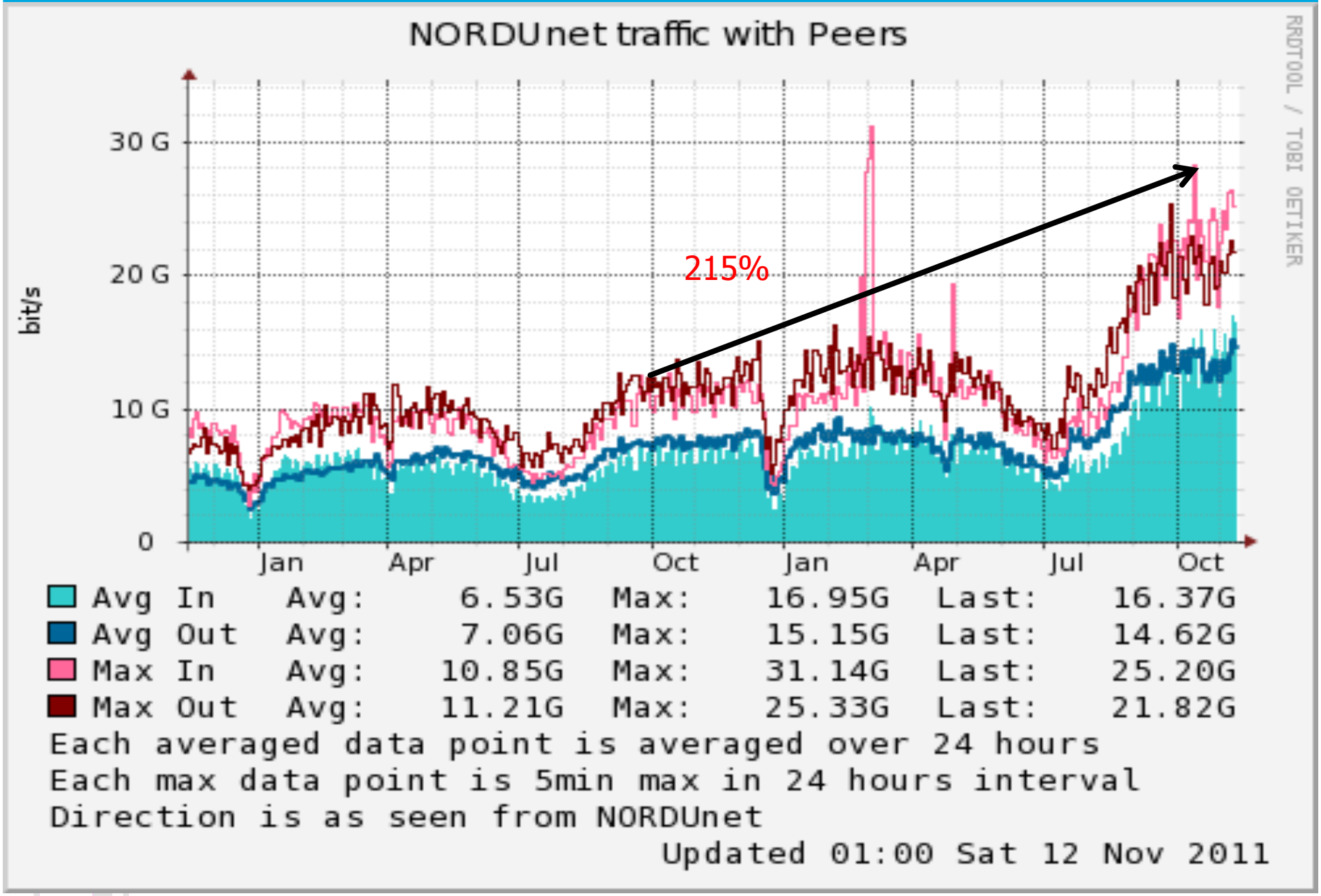
Traffic - Peering



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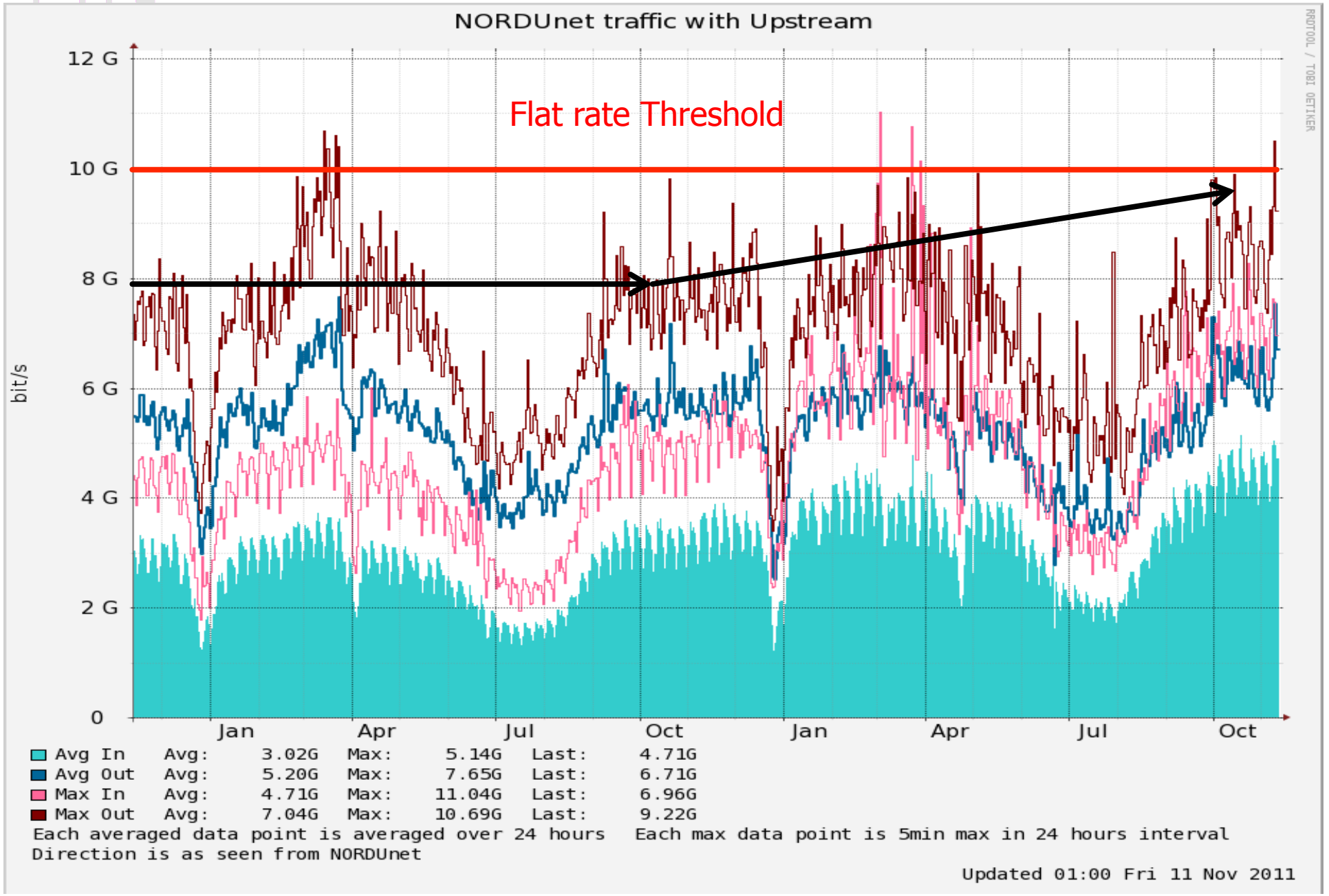
Traffic - Global Transit



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NORDUnet Services

	Reseach Network Connectivity	Global IP transit	OPN Lambda	Cross Border Fibre Coordination	Central NOC	End User NOC	GN3 Project Coordination	Project Hosting & Coordination	Software Development	AAI Community Serrvices	Equipment Hosting	Virtual Server Hosting	Network Media Transcoding & Distribution	Adobe Connect	VCONF MCU Service	WEB based Vconf Service	Telepresence Gateway Service	EU project Coordination	File Sharing Service	Spam Filtering Service	Community Communication
2005																					
FORSKNINGSNETTET	■	■																			
FUNET	■	■																			
Rhnet	■	■																			
SUNET	■	■																			
UNINETT	■	■																			
WAYF																					
NDGF																					
GEANT 3																					
RUNNET																					
NCM																					
NORDUnet																					

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2011																					
FORSKNINGSNETTET	■	■					■			■					■	■					■
FUNET	■	■	■	▒			■			■					■	■					■
Rhnet	■	■					■			■					■	■					■
SUNET	■	■	■	■	■	■	■		■	■	■	■	■	■					■	■	■
UNINETT	■	■	■	■			■			■	■			■							■
WAYF					■					■		■									
NDGF	■		■		■			■	■									■			
GEANT 3									■												
RUNNET		■							■		■										
NCM		■						■	■						■	■					
NORDUnet	■	■			■		■	■	■	■	■	■	■		■	■	■	■			■

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Shared IP service

- Nordic NREN interconnect
  - 40G transit, 10G & 40G interconnect
- R&E connectivity
  - GÈANT
  - Direct peering with (some) European NRENs
  - Russian R&E networks
  - R&E networks globally, where reachable
- IP transit service
  - Peering at Key IX'es in Europe, North America; open peering strategy key to cost control
  - Commercial upstream
- Transport on NREN-owned and operated dark-fiber & optical network where possible

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Static E2E Network Services

- Static Lightpath services
  - 10G lambda, Ethernet and OC192/STM64
  - 40G lambda, OC768/STM256
  - Ethernet over MPLS
- Interconnect
  - Nordic NREN lightpath services
  - GÉANT – 10G lambda and GN+ service
  - European CBF interconnect – 40/10G lambda, sub-rate 10G, incl. Russia
  - Open Lightpath Exchange connections, Europe and North America
  - Lightpath transit for partners

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Dynamic E2E Network Services

- Dual transport
  - SDH / SONET on top of DWDM backbone, SONET or Ethernet presentation
  - Ethernet over MPLS – over dedicated 10G / 40G transport and routers, or over shared IP infrastructure, 100G coming
- On-demand Service
  - EoMPLS circuit service (OSCARS, OpenNSA)
  - SDH / SONET lightpath (OpenNSA)
- Services experimental
  - Platforms are being developed and evaluated
  - Final service model and tools not decided on

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Baltic Ring

2009-2010

Feasibility study

Definition

Design

Baltic Ring Project
2010-2011

Implementation

2012-?

Deployment

2012-?

norden

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Joint Baltic Ring

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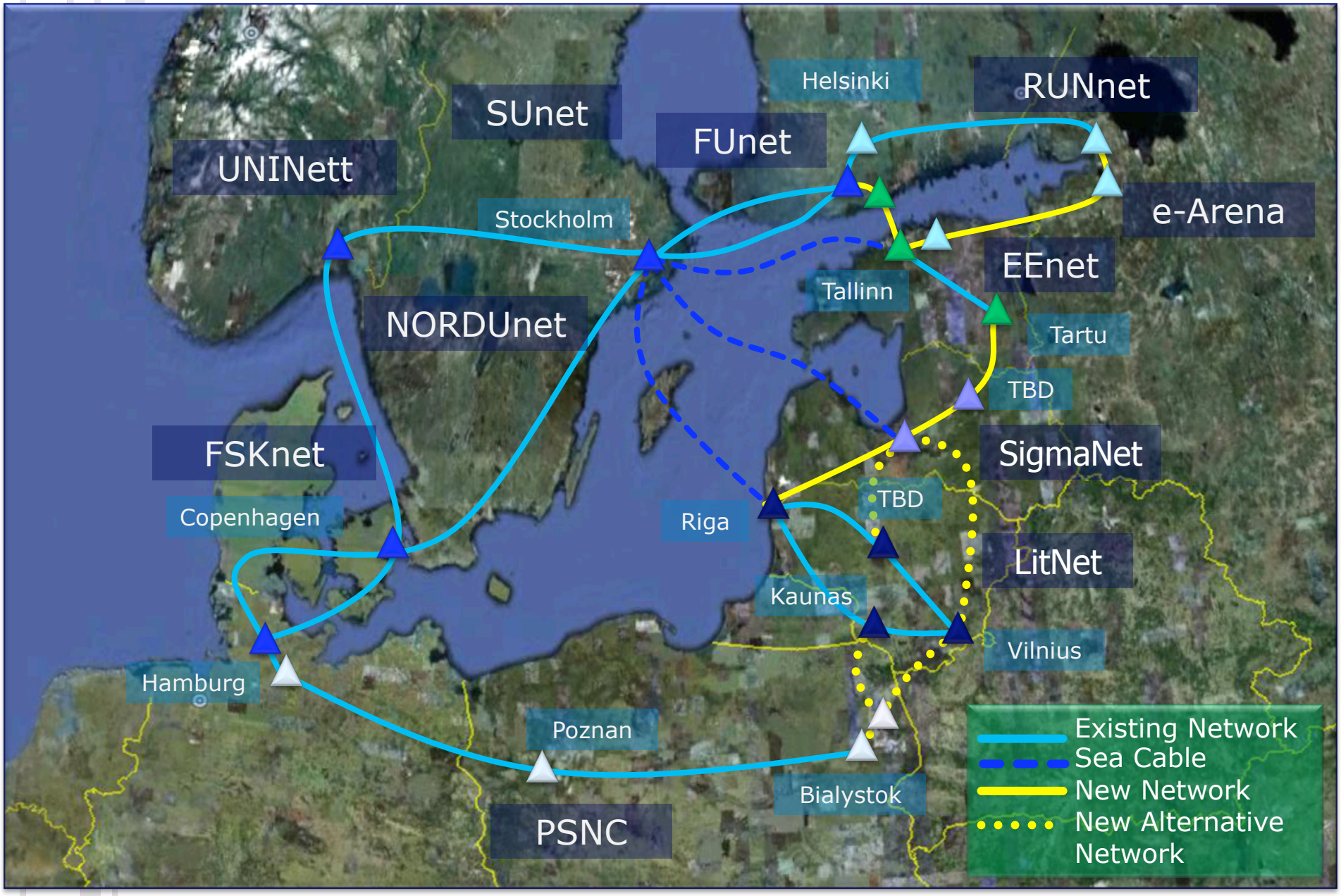
Baltic NREN Summary



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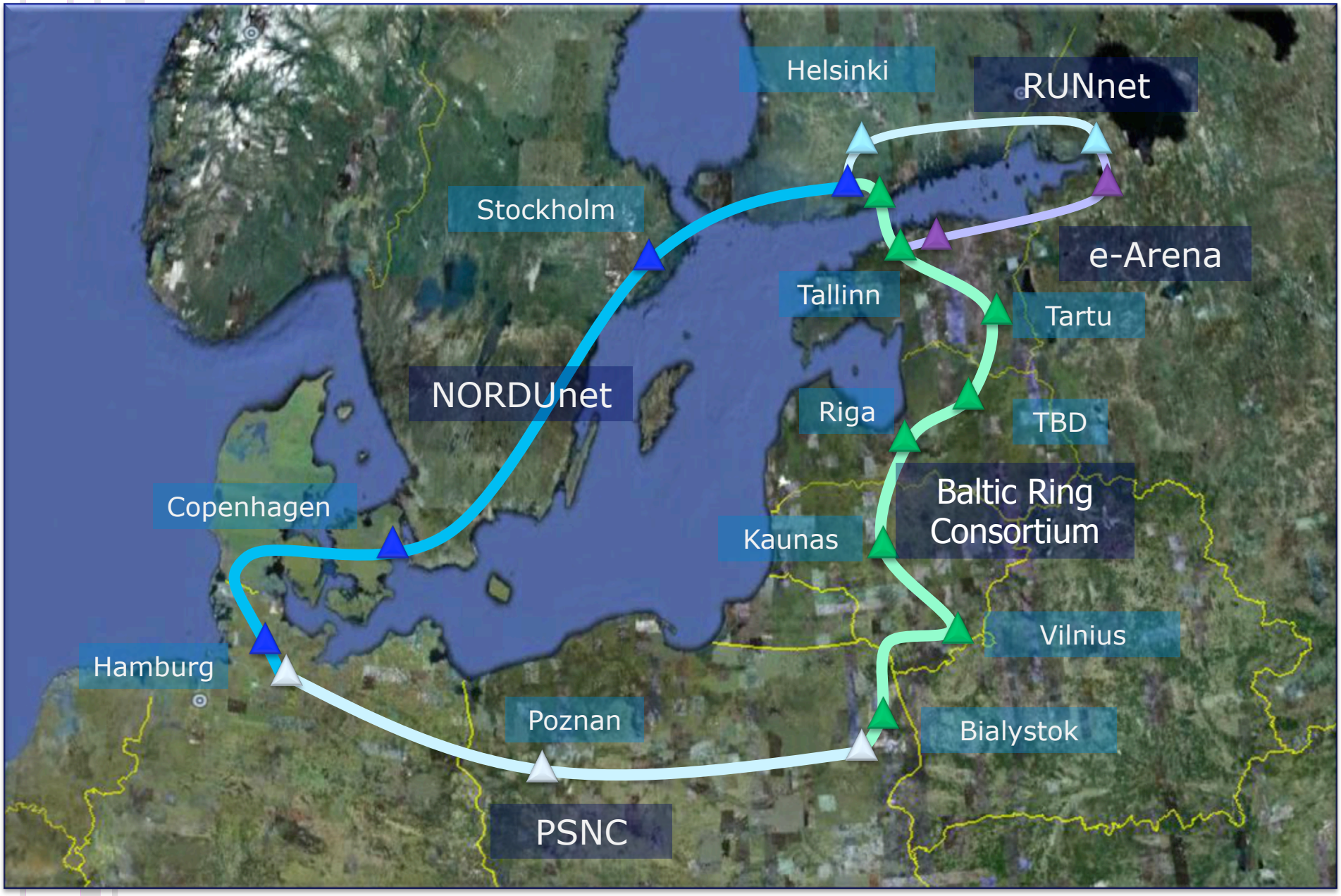
Baltic Ring Topology Proposal



Thank You

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