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100G intercontinental: The Next Network Frontier

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Global Programs, Internet2

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Networks for R&E today

Advanced North Atlantic 100G Pilot

- Why?
- How?
- What?

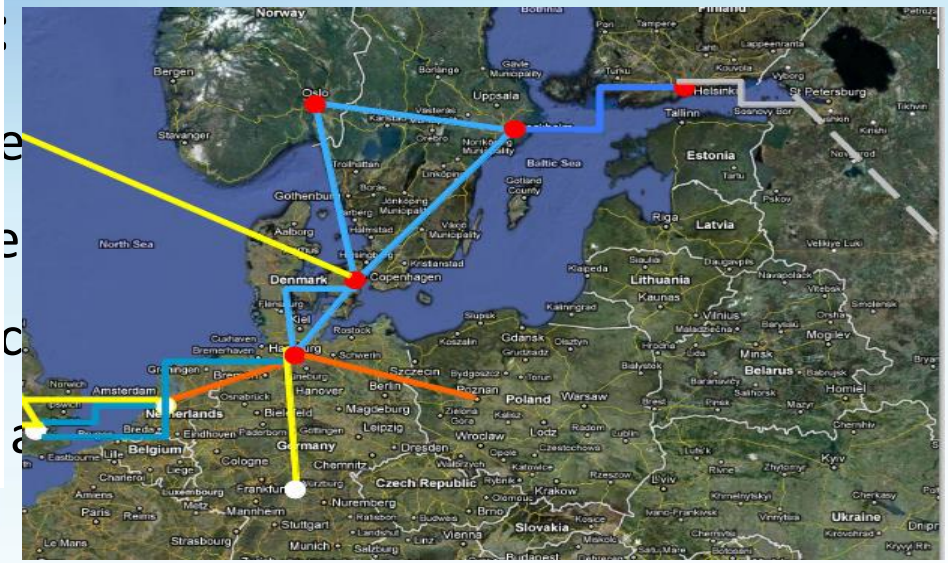
Demos @ TNC2013

Onwards, 100G post-TNC2013

A few words on me...

- Worked at SURFnet, the Dutch NREN
  - >23 years (August 1987 – February 2011)
  - Worked on SURFnet[123456]
  - Engineered AMS-IX, NetherLight
- Now working for (as a consultant):
  - NORDUnet (European Nordics NREN) [2 days/week]
  - Internet2 (USA NREN) [2 days/week]
  - My wife's company (primary healthcare) [1 day/week]

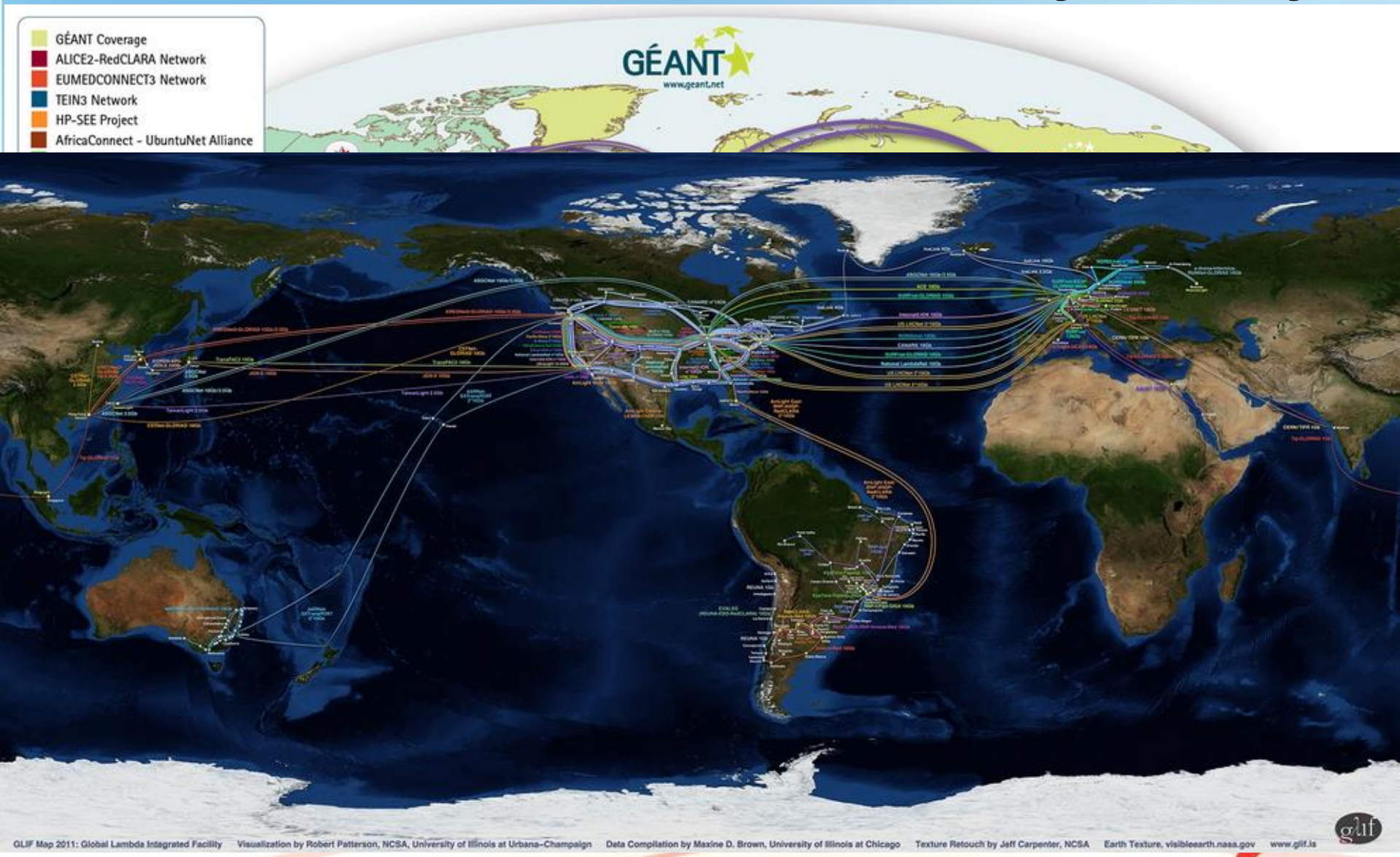
Networks for R&E today



Between continents:

- Leased capacity as a service
- Often mission oriented, limited in time
- 10G production as the norm

Intercontinental connectivity today



The problem statement

New links so far are incremental additions, with limited scope, purpose and/or timeline

Hard (if not impossible) to coordinate routing → suboptimal use

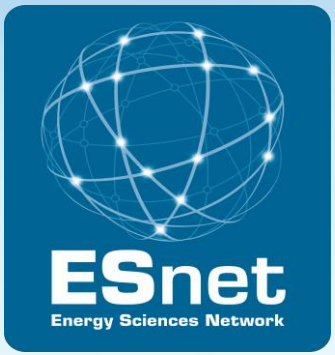
Big science applications generate flows >10G and (soon) >40G

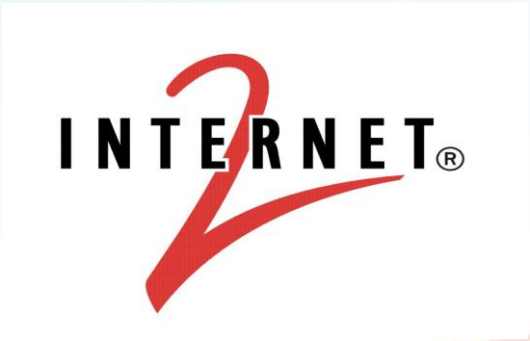
No market for 100G or above yet

Introducing ANA-100G

Collaboration between six R&E Networks

Announced on April 24, 2013





ANA-100G aims to test...

New models for collaboration

New governance

New technologies

In public-private partnership with Industry

ciena

TATA COMMUNICATIONS

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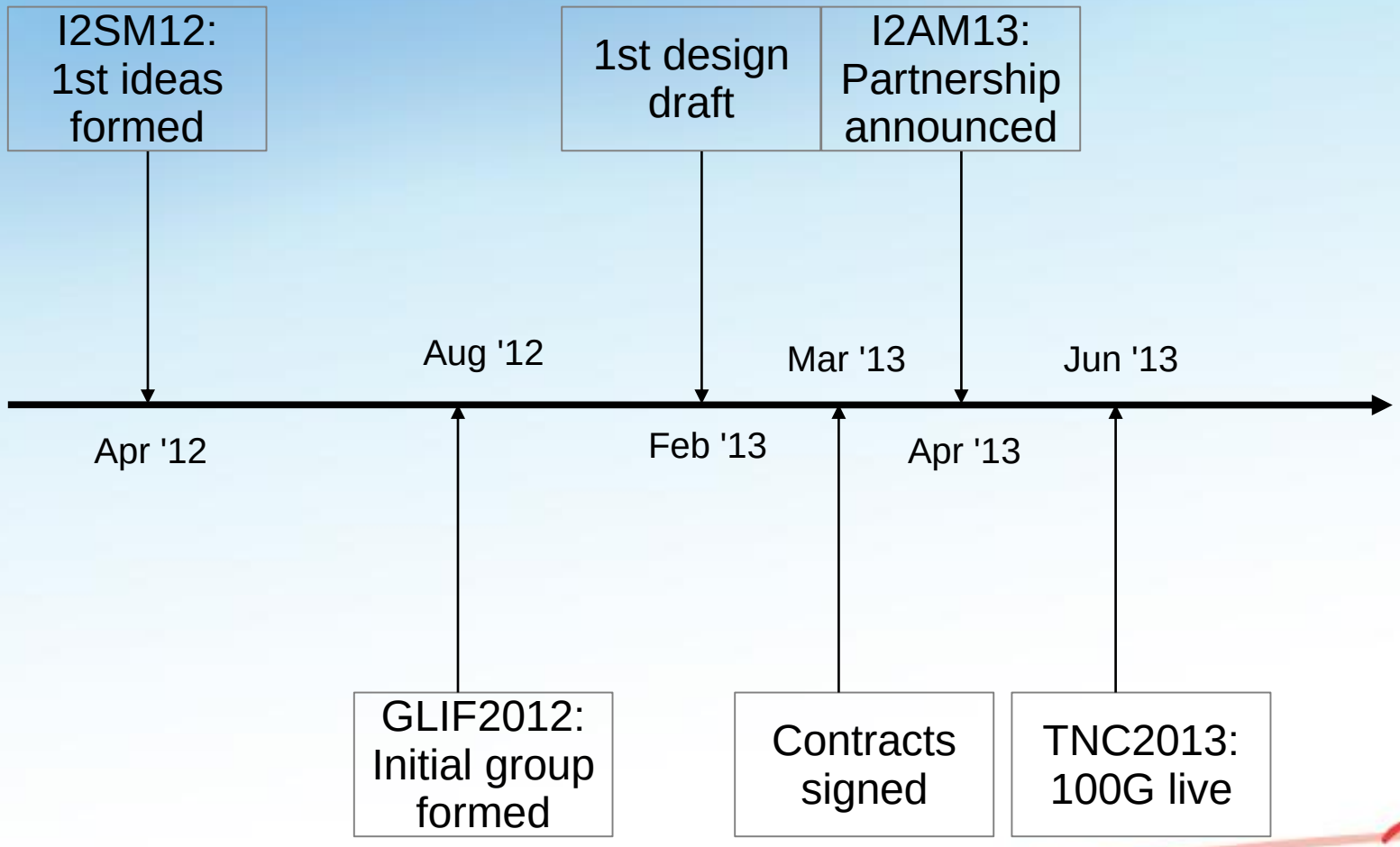
ANA-100G Time Line



TNC2012: Reykjavik-Amsterdam @ 100G

Inspiration for ANA-100G from talks with Tony Breach (NORDUnet)

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Collaboration & Governance

Lightweight Memorandum of Understanding

Steering Group and Project Group

Subgroups on PR, demos, operations

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Technology

Historic: Leased capacity

Today: Dark fiber nationally/regionally & leased capacity between continents

Future?: Owned spectrum & open exchanges & rings around the world

ANA-100G is path finder, today using:

- Spectrum
- Open Exchanges

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ANA-100G and TNC2013

TNC2013 provided focus for ANA-100G

Ambitious deadline:

“get a first 100G operational for pilot purposes before June 3, 2013”

See also Erik Huizer's blog “Pushing the limits by Innovating Together” at: https://blog.surfnet.nl/?p=1952

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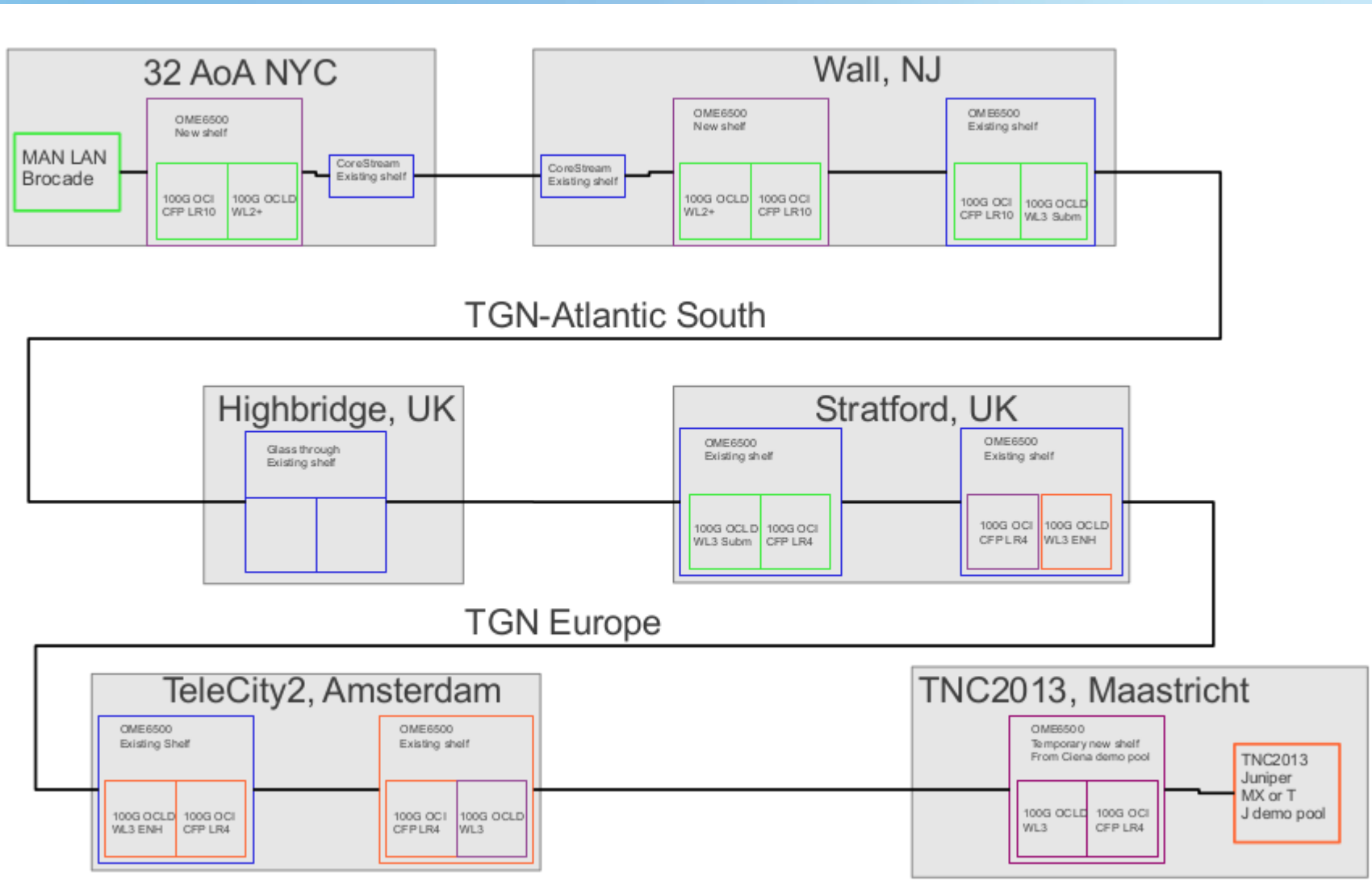
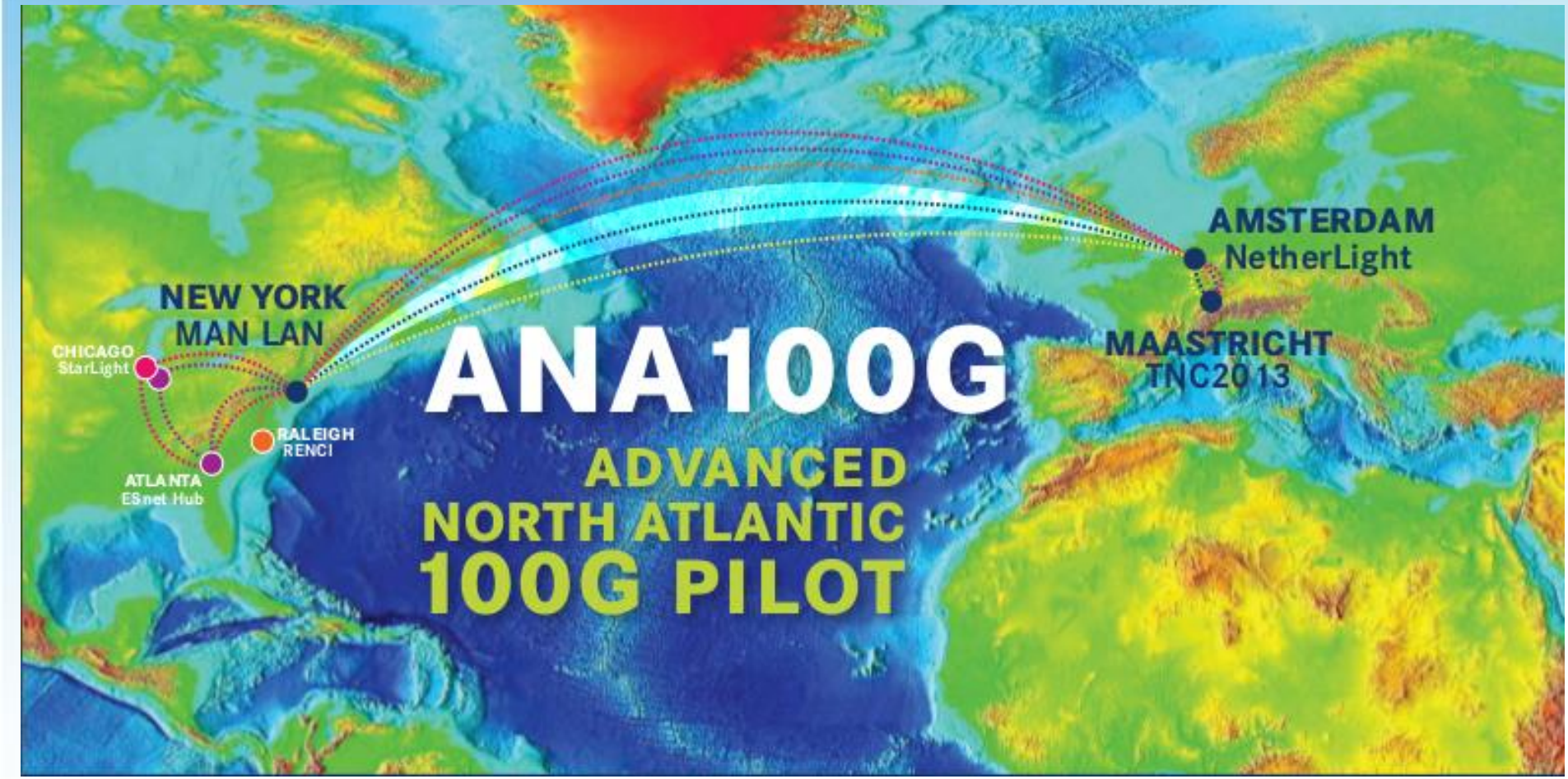
ANA-100G TNC2013 implementation



What is out there for ANA-100G?



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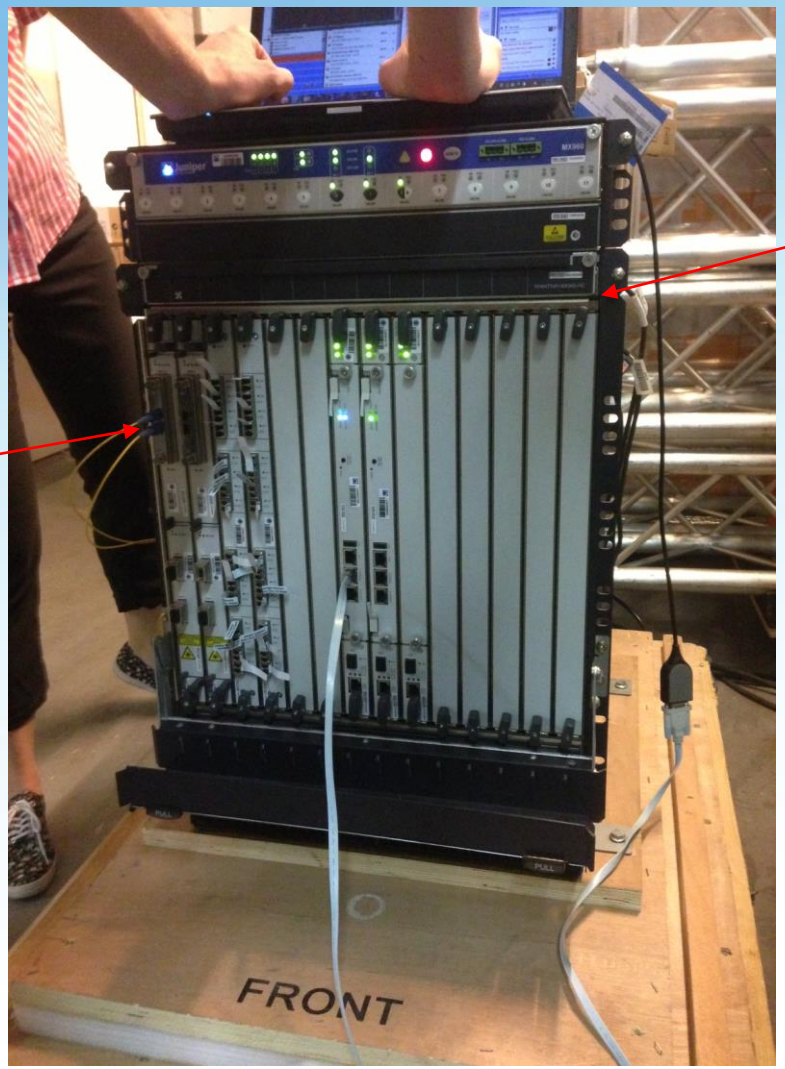
ANA-100G @

ANA-100G @ TNC2013



Juniper
MX-960

100G to
MAN LAN

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ANA-100G TNC2013 demos

Big data transfers with multipathing, OpenFlow and MPTCP

Visualize 100G traffic

How many modern servers can fill a 100Gbps Transatlantic Circuit?

First European ExoGENI at Work

Up and down North Atlantic @ 100G

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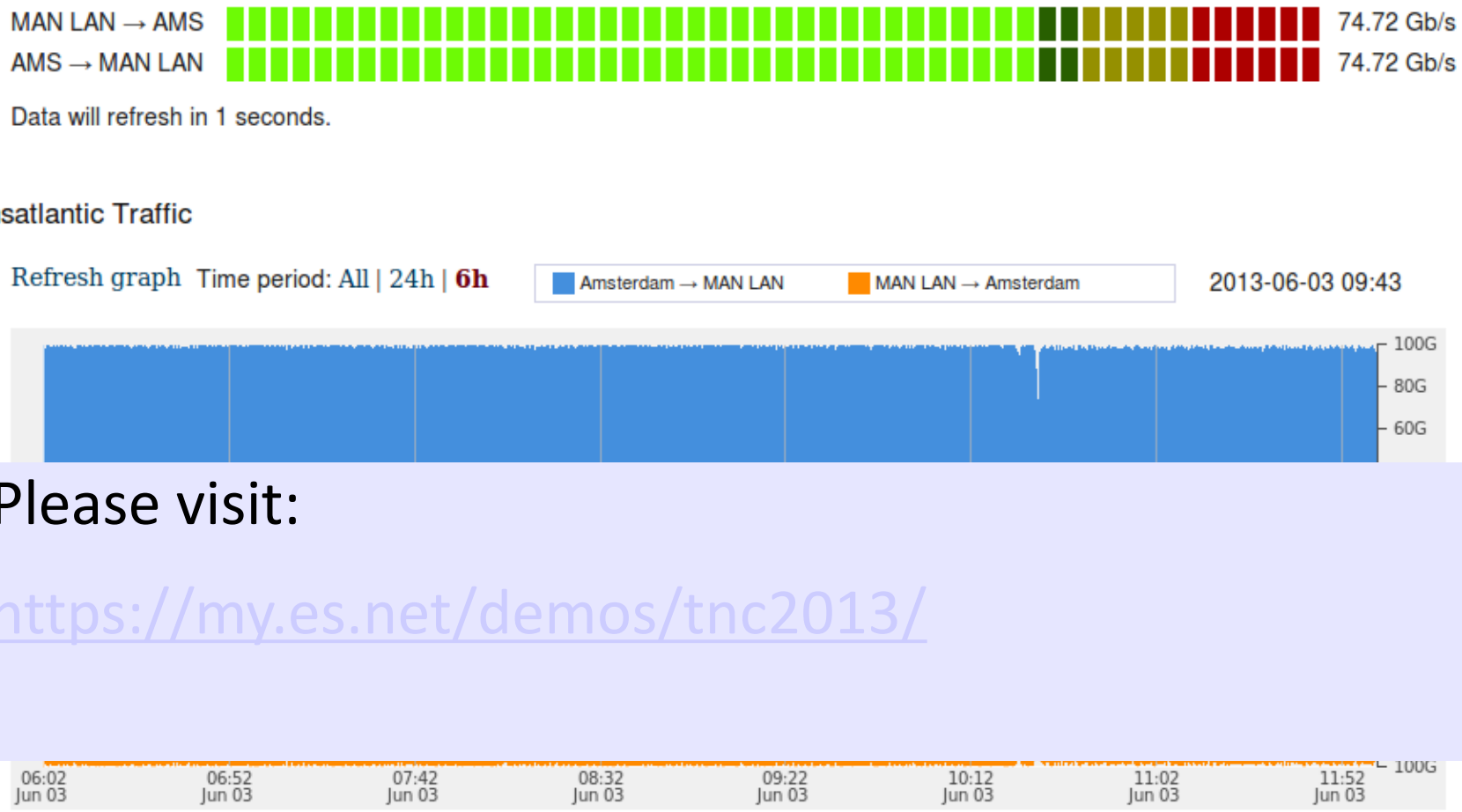
100G Visualization Demo (ESnet)

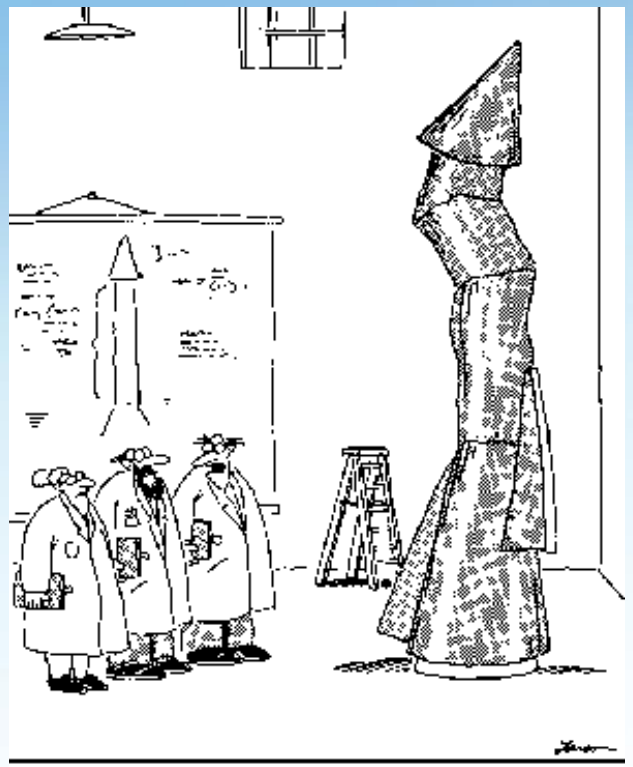


Please visit:

https://my.es.net/demos/tnc2013/

Special thanks to Inder Monga and Team

Rocket science?



"It's time we face reality, my friends. ...We're not exactly rocket scientists."

- Technology is awesome, but GA
- Planning is important
- Creativity, dedication & teamwork are king

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Future plans post-TNC2013

The 100G will remain for at least 12 more months:

- Looking into service delivery
- Enabling and supporting applications development

Research for a second 100G link:

- Fully resilient
- Using more Open Exchange Points
- Could use a extra collaborator (or two!)

Acknowledgements

ANA-100G Collaborators

Ciena

Tata Communications

Juniper

University of Amsterdam

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