100G intercontinental: The Next Network Frontier

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Networks for R&E today

Advanced North Atlantic 100G Pilot
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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

Within a country or a region:
- Dark fiber infrastructures
- Self-owned and operated optronics
- Operations under own control
- 100G production, trials at 400G

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
ANA-100G Time Line

- **Apr '12**: GLIF2012: Initial group formed
- **Feb '13**: 1st design draft
- **Mar '13**: Contracts signed
- **Apr '13**: I2AM13: Partnership announced
- **Jul '13**: TNC2013: 100G live
TNC2012: Reykjavik-Amsterdam @ 100G

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

Lightweight Memorandum of Understanding

Steering Group and Project Group

Subgroups on PR, demos, operations
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
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
ANA-100G TNC2013 implementation
What is out there for ANA-100G?
ANA-100G @ TNC2013

100G to MAN LAN

Juniper MX-960
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
100G Visualization Demo (ESnet)

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

Special thanks to Inder Monga and Team
Rocket science?

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

“It’s time we face reality, my friends. ... We’re not exactly rocket scientists.”
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!)
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