global network architecture

Advances in the Global Network Architecture

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NREN CEO Forum

16th Annual Global LambdaGrid Workshop | 29 September 2016

Agenda

- Introduction
- GNA Technical Working Group Responsibilities
- A Focus on Architecture
- Making the GNA Tangible
- Conclusions and Q&A

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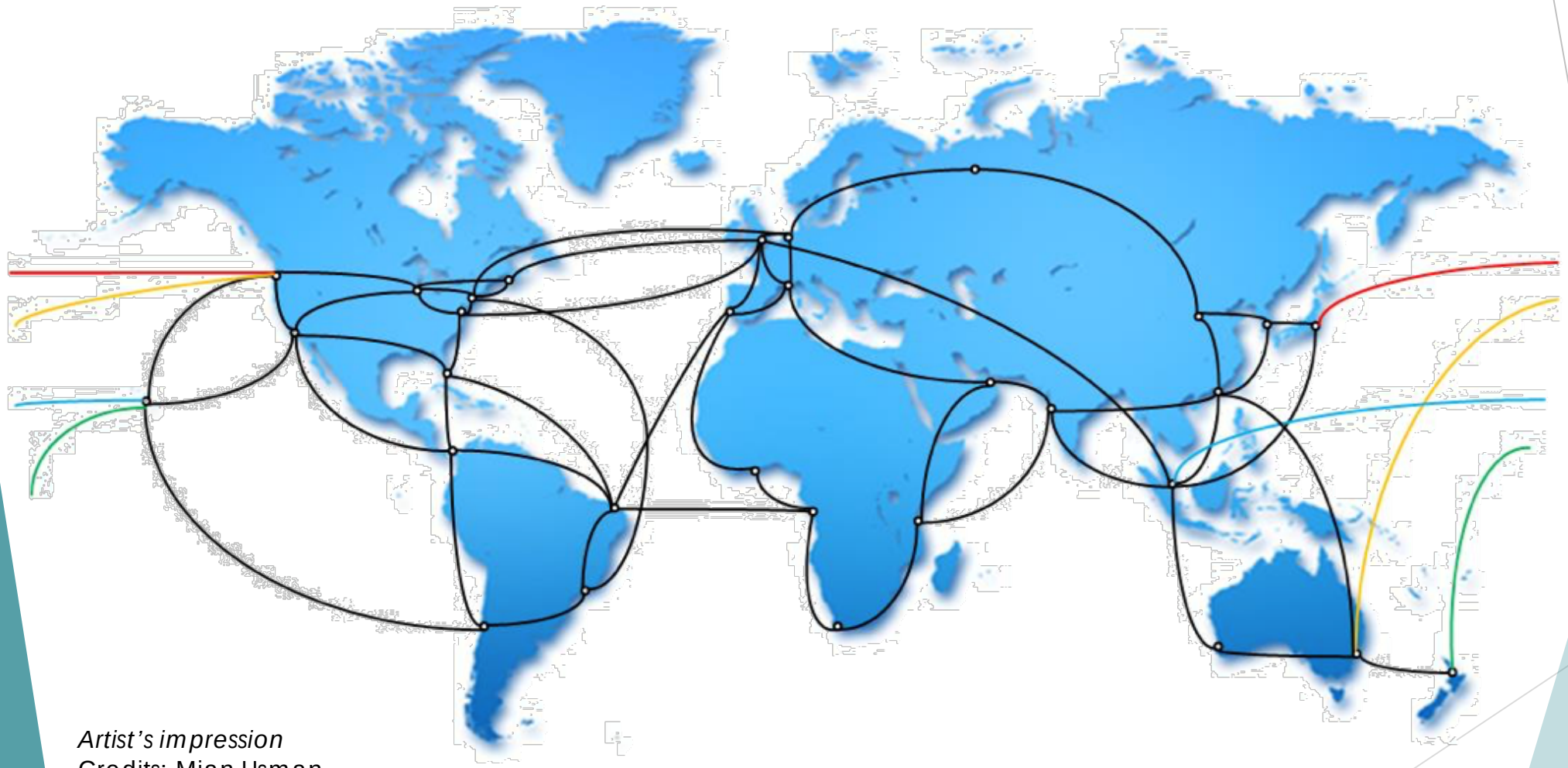
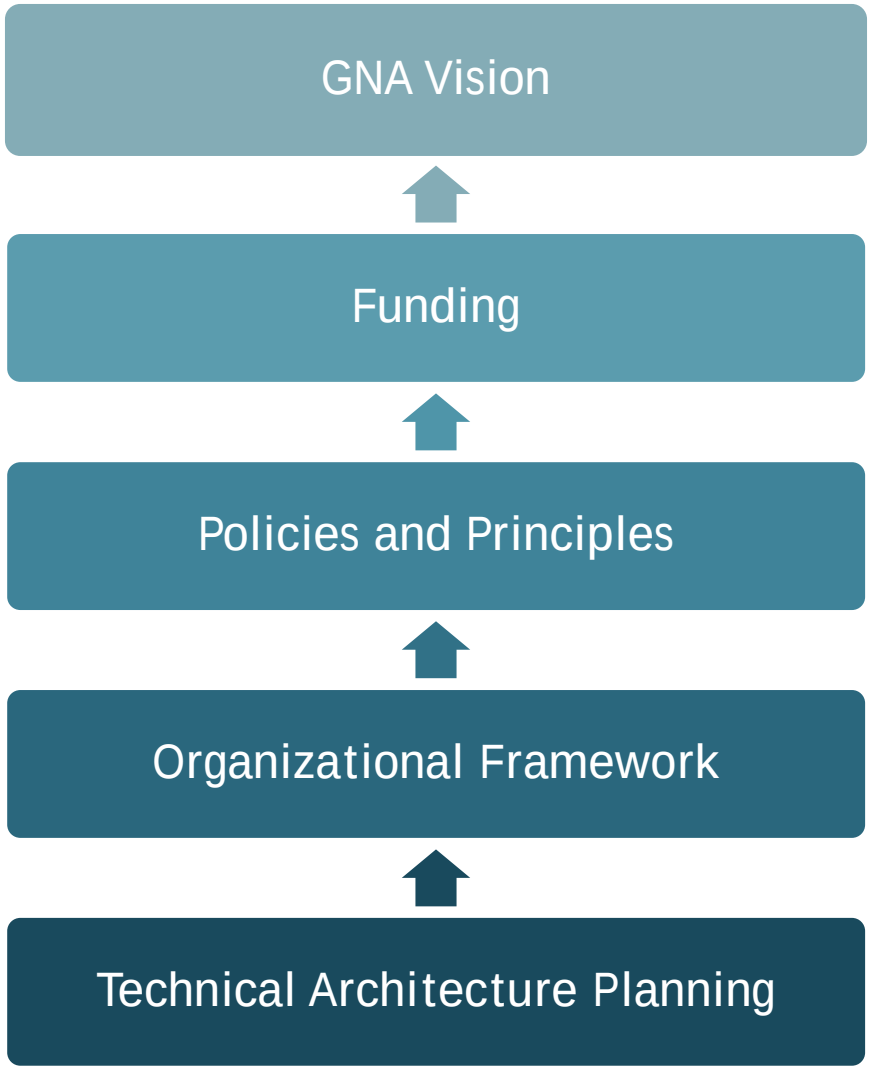
World View



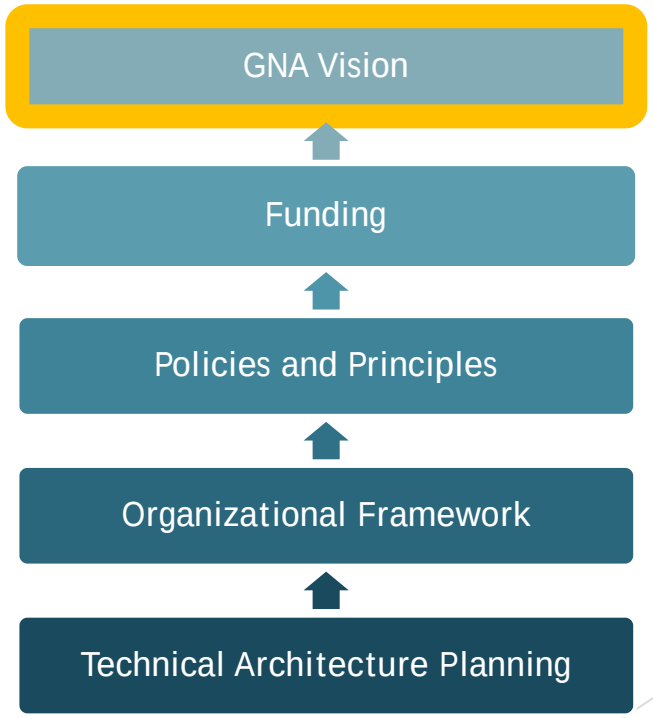
Artist's impression
Credits: Mian Usman

GNA Dimensions



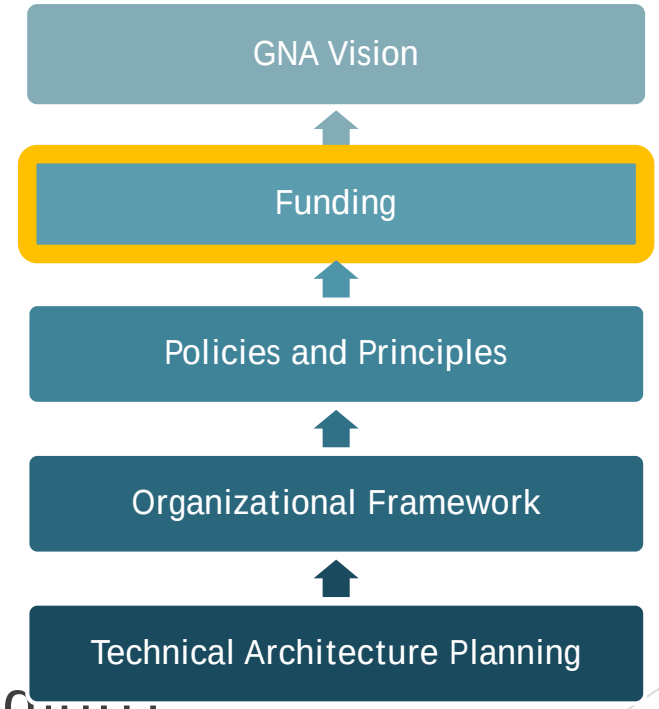
GNA Vision

A coordinated worldwide effort that efficiently interconnects national and multinational R&E networks around the world in a manner which increases the international reach, capacity, and capability of the global R&E



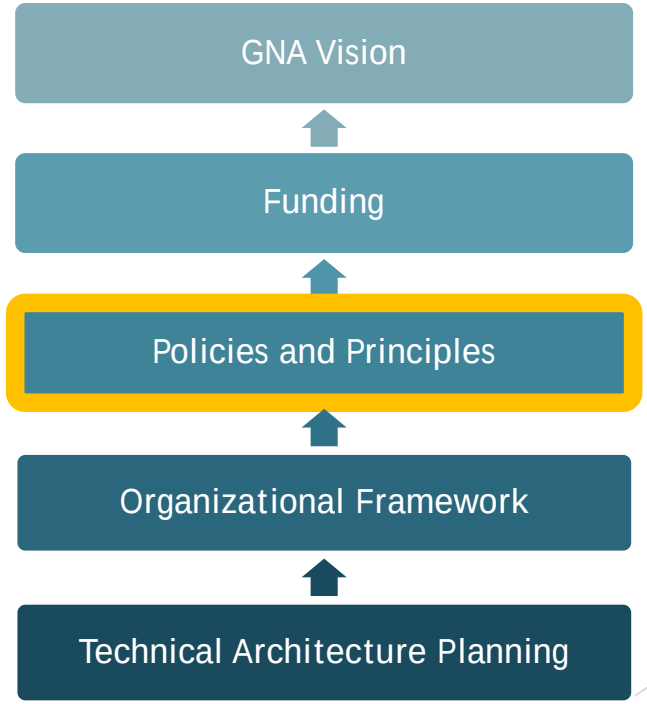
Funding

- How are international links funded?
  - NRENs and governments
- Opportunities to explore:
  - Cost sharing
  - Fibre swaps
  - Spectrum swaps
  - Private sector partnerships
  - Operational support (op ex funding)



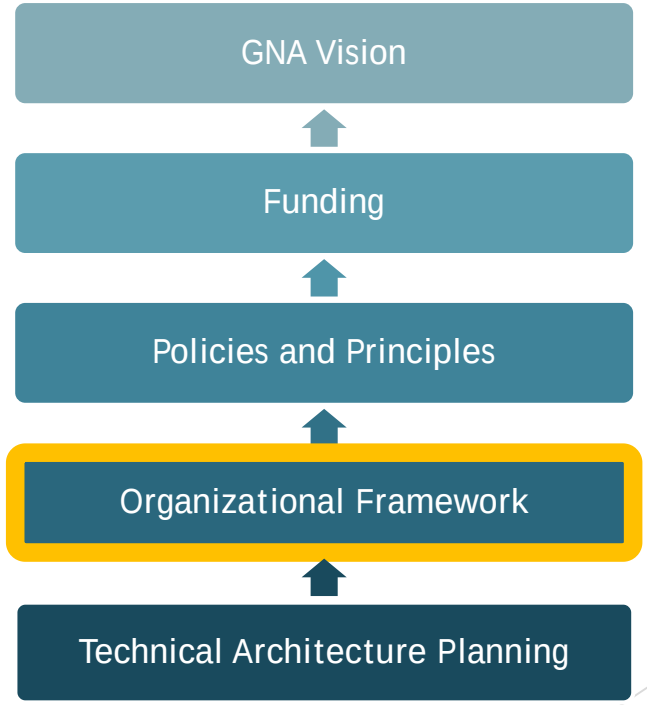
Policies and Principles

- Equity
  - Value for contribution (what an NREN gets for what it pays)
- Architectural framework
  - Open exchanges
- Work items
  - Usage policies
  - Link restrictions
  - Open exchange policies
  - Accepted practices



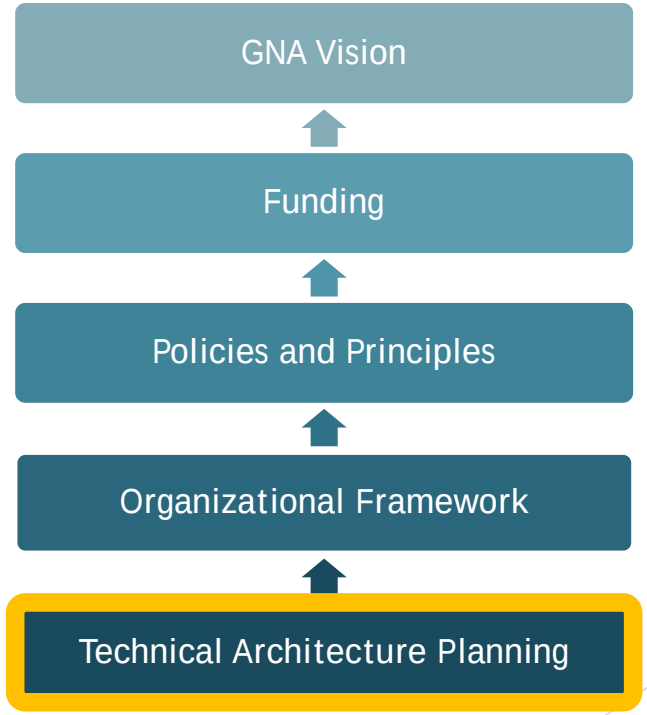
Organizational Framework

- Currently organized around:
  - Technical Working Group
  - Executive Action Team
  - Global R&E Network CEO Forum sponsorship
- Rethinking the Organizational Framework. Input welcome.



Technical Architecture Planning

- Principles
  - Open and inclusive
- Work items
  - Architecture
    - Open exchanges
    - Documented rules to qualify as an open exchange
  - Leveraging GLIF



Pathfinding

- Learning from what we implement
- Adjusting to the lessons learned

- Pathfinders:
  - ANA collaboration and ANA-300G
  - OXP development in:
    - Montreal
    - Cape Town
    - Guam

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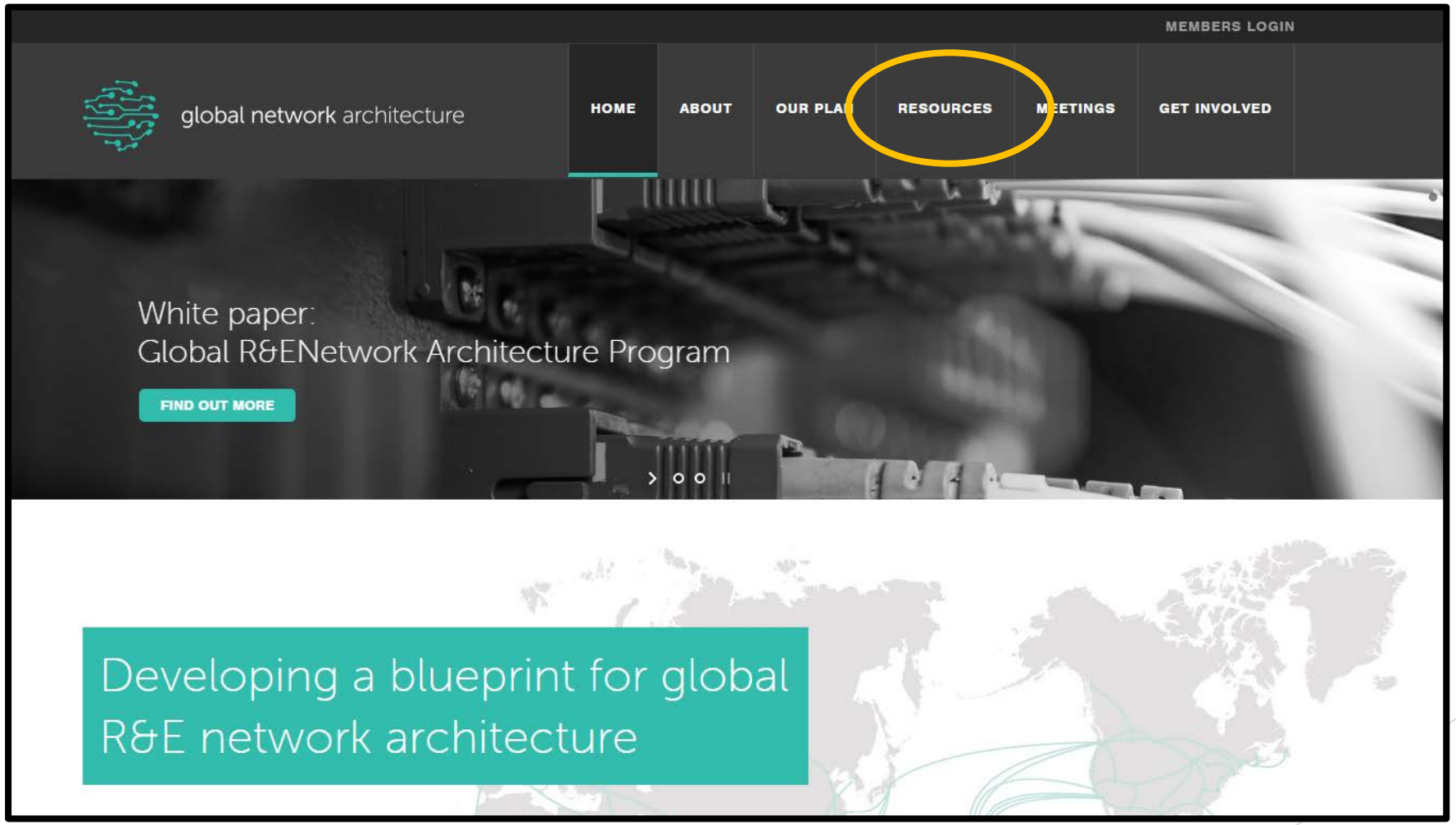
Technical Working Group Responsibilities

- Network engineers from European, Australian, North & South American, Asian, and African NRENs are working on:
  - 6 Architecture documents
  - 4 Network services definitions
  - Information architecture framework
  - White papers (*The Commons, Global Virtualization Architecture*)
- Creation of publicly-reviewed framework documents
- Development of website

GNA Website: http://gna-re.net



Network Services Documents

- Network Transport Service
- Monitoring, Measurement and Trouble Tickets
- Encryption
- Security

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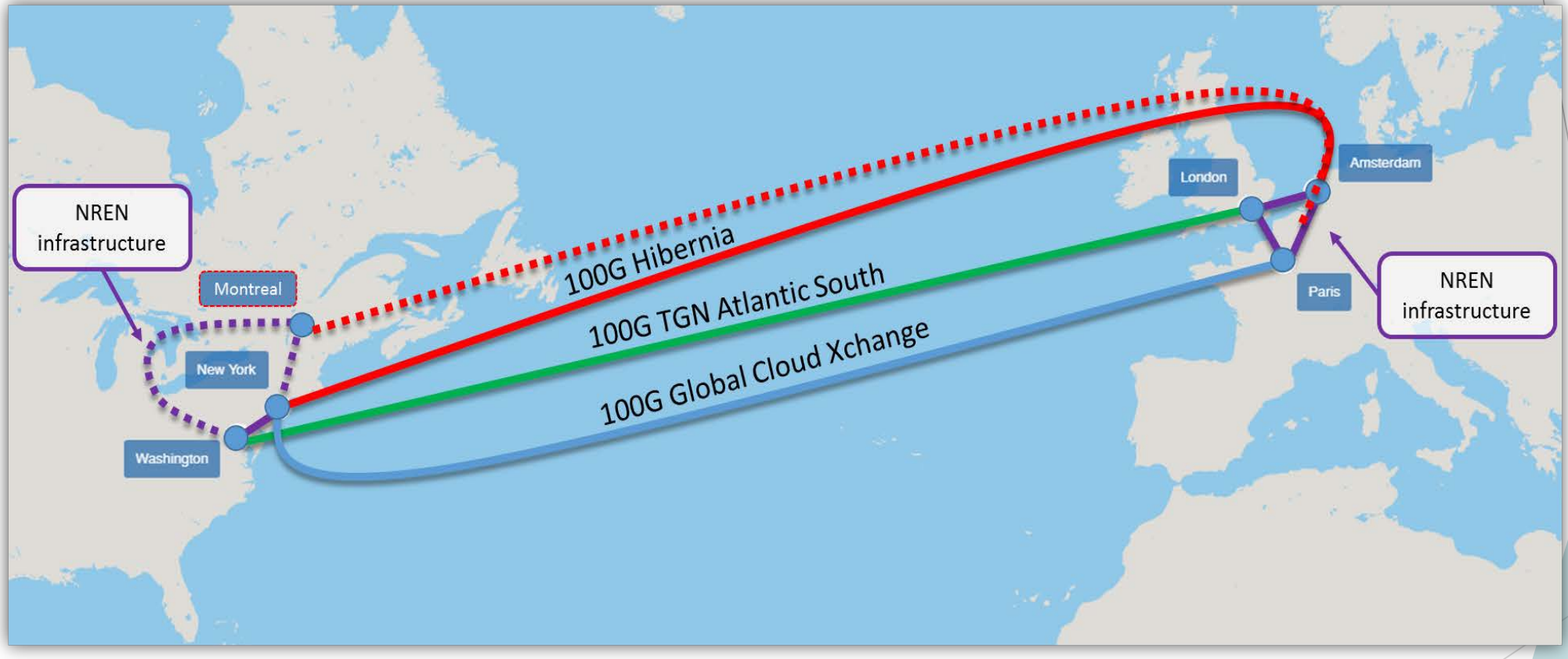
A Focus on Architecture

- Coordination on:
  - Technology
  - Topology
  - Bandwidth acquisition
  - Key components:
    - OXPs
    - Fat pipes
    - Networks serving R&E organizations
- Service aspects:
  - The Commons
  - Deterministic services
  - Virtualization

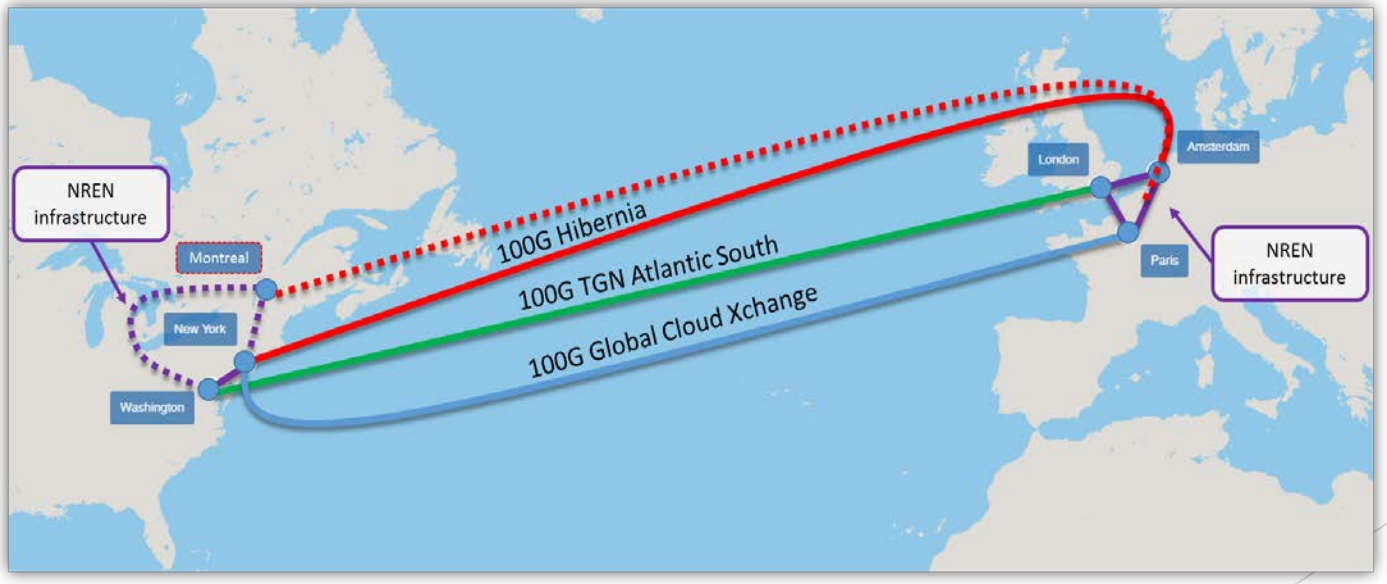
OXPs and Fat Pipes



Example: ANA-300G & mutual backup agreement between ESnet and ANA

Federated Operations

- Interworking NOCs
- OXP NOCs are central to operations
- Example: NORDUnet 100G in ANA-300G



The Commons

- Sharing capacity in the GNA **fairly** and **efficiently**
- Making a fundamental feature of NREN collaboration and the development of the Internet explicit
- Continuing work on the existing white paper

- We all benefit if we contribute a little to the Commons.

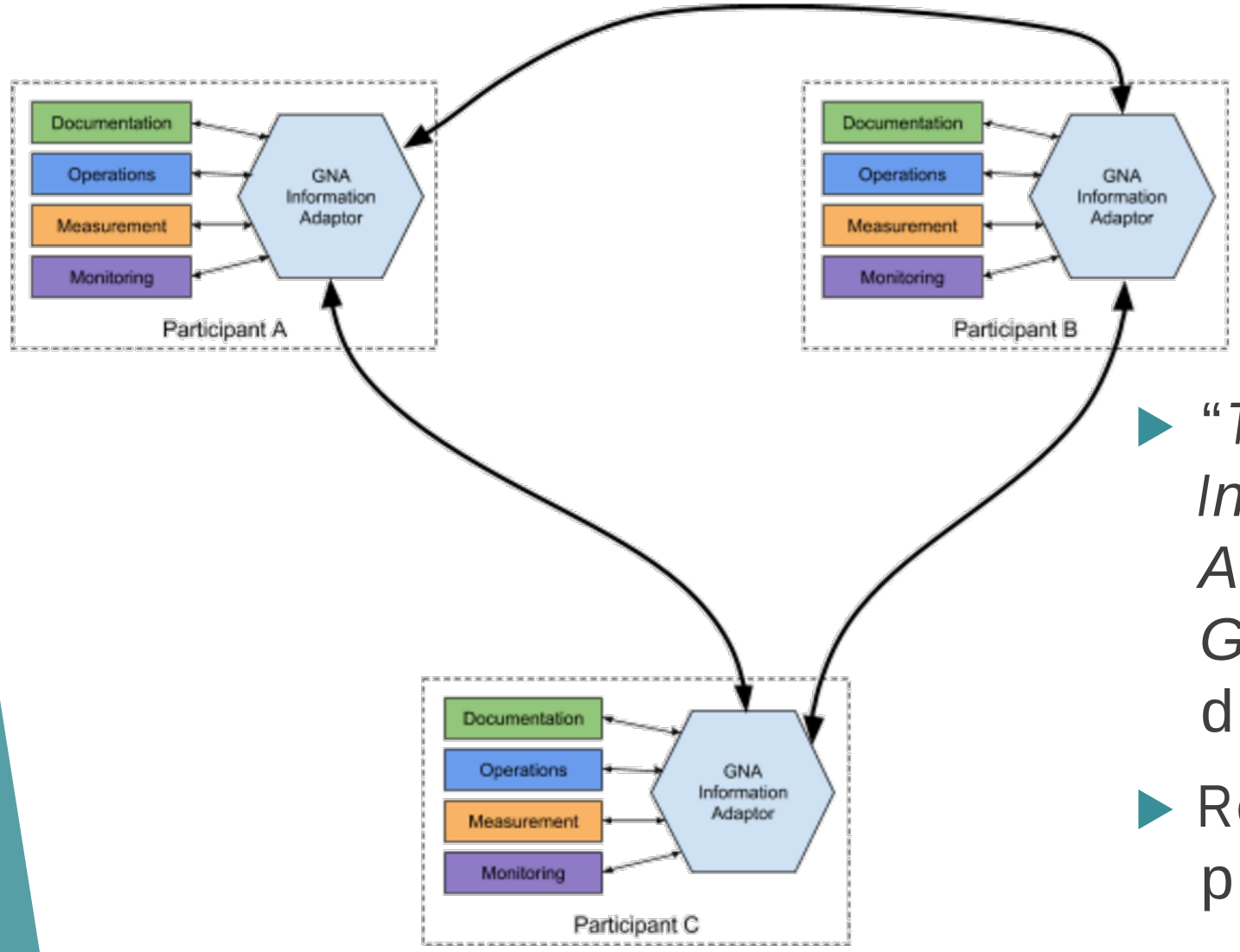
Service Definitions

- Non-deterministic network services:
  - Best-effort network service
- Deterministic network services:
  - Guaranteed bandwidth service
  - Well-defined service parameters
  - Deterministic provisioning and de-provisioning process

Global Virtualization Architecture

- Currently a new white paper for discussion
- Idea well-received, as an aspiration for the GNA
- A developing area that needs your contributions

Information Architecture



- "*Towards an Information Architecture for the GNA*" draft developed
- Real-world testing planned

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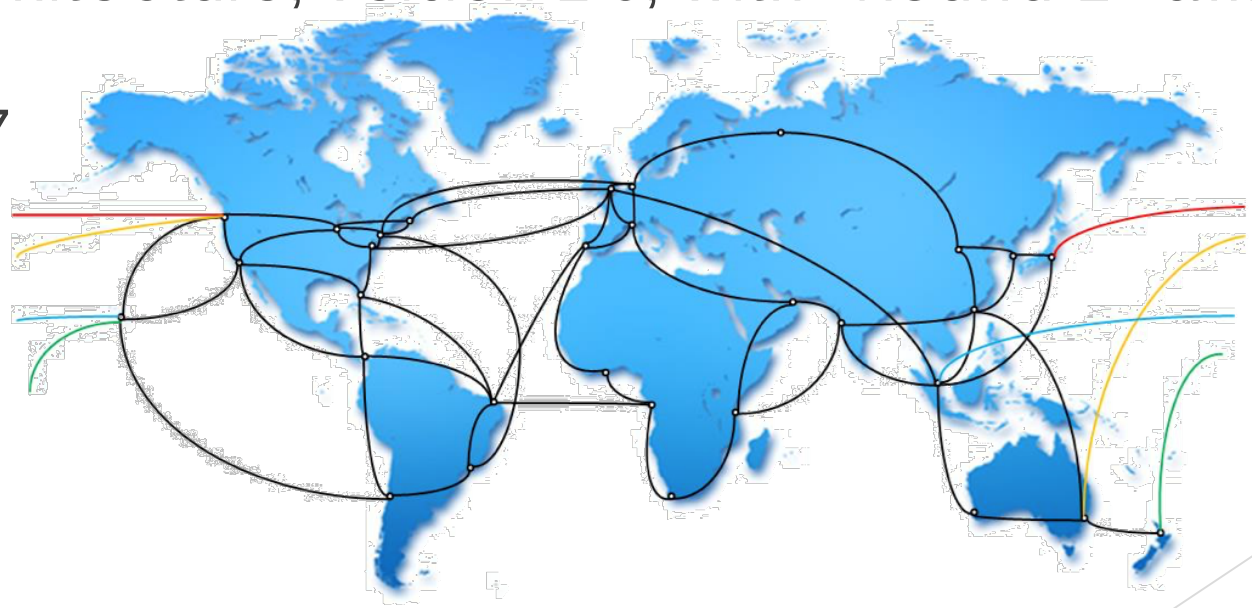
Making the GNA Tangible

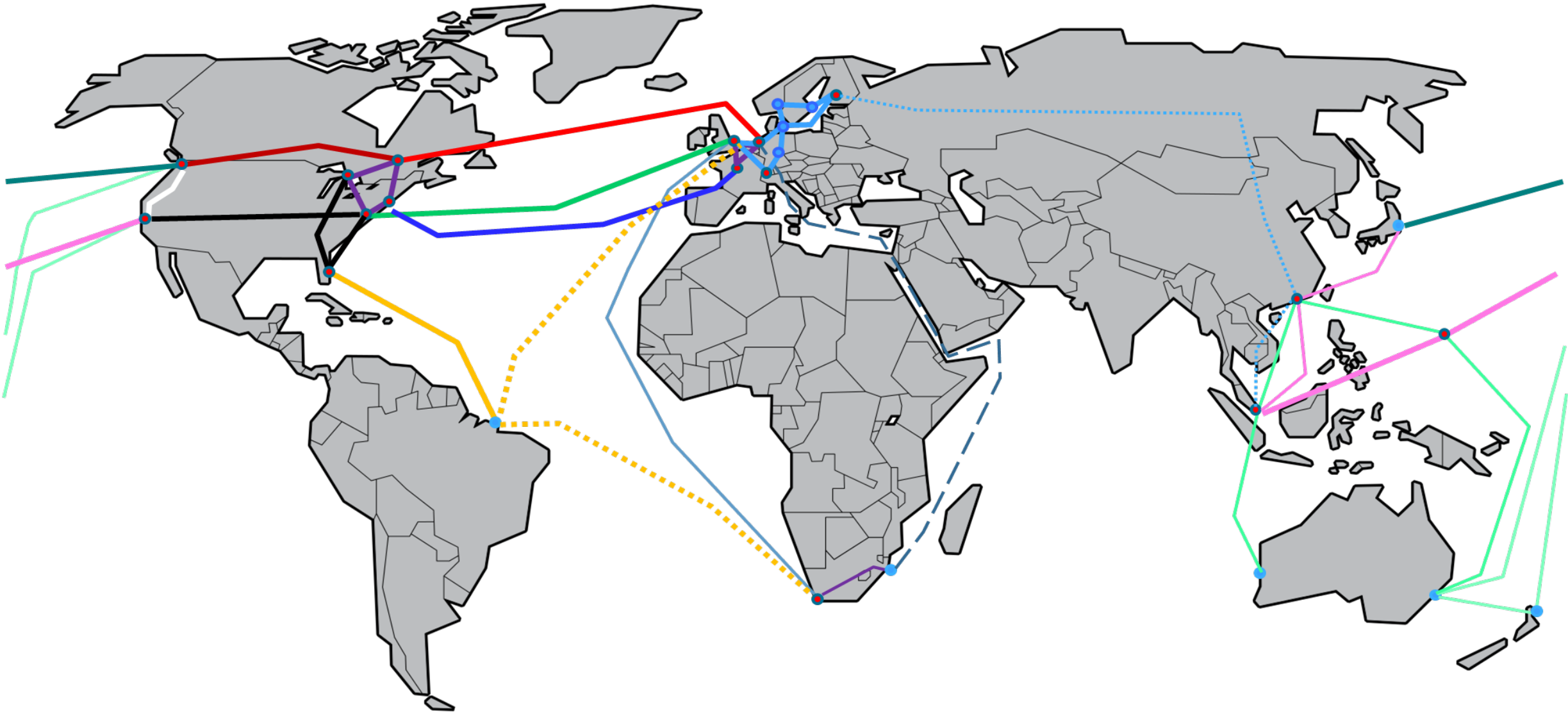
- ANA-300G in production for 1.5+ years
- Expansion to the east, west and south deemed low hanging fruit
- Aim: Creation of infrastructure based on GNA principles and architecture, version 1.0, with “Round 1” ambitiously set for
  Q1 2017



OXP Opportunities

- Montreal
  - Onwards to Chicago (StarLight) and the West Coast
- Cape Town
  - Plus Amsterdam/London – Cape Town bandwidth
- NOX-HEL
  - A possible gateway to the east
- Guam
  - AARNet, Internet2, Asian NRENs and others working together, including plans for additional 100G lambdas

From Vision to Reality



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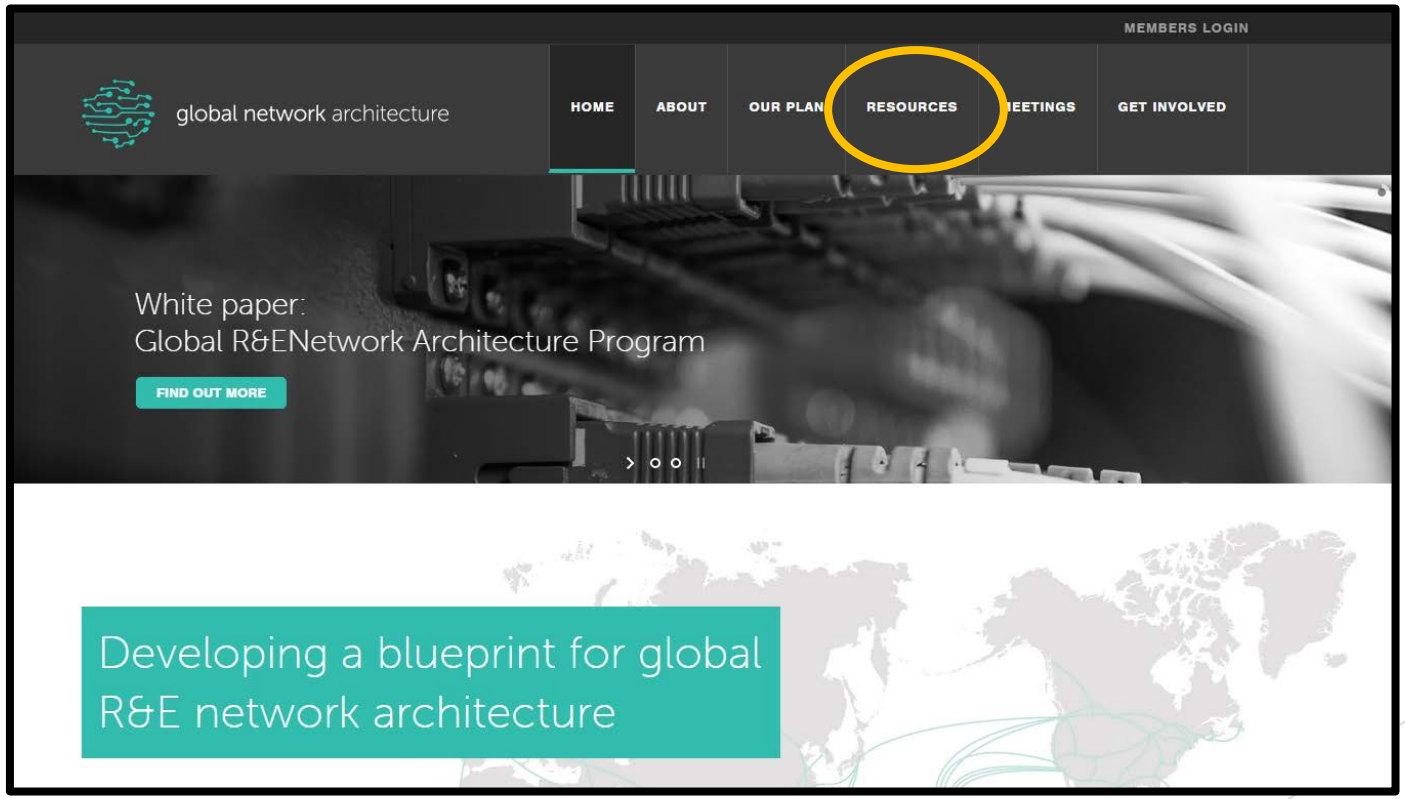
Conclusions and Q&A

You can help the ongoing work of the GNA, toward a more coordinated infrastructure for research and education.

http://gna-re.net



Thank you.

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