

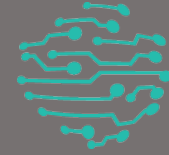
# Advances in the Global Network Architecture

Jim Williams & Erik-Jan Bos

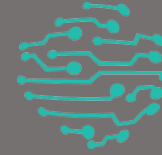
NORDUnet Conference 2016

Helsinki, Finland – Wednesday, 21 September 2016



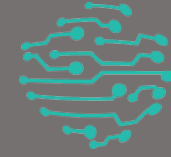


1. Introduction to the GNA
2. The Works of the GNA Technical WG
3. Zooming in to the Architecture
4. Making the GNA Tangible
5. Conclusions and Q & A

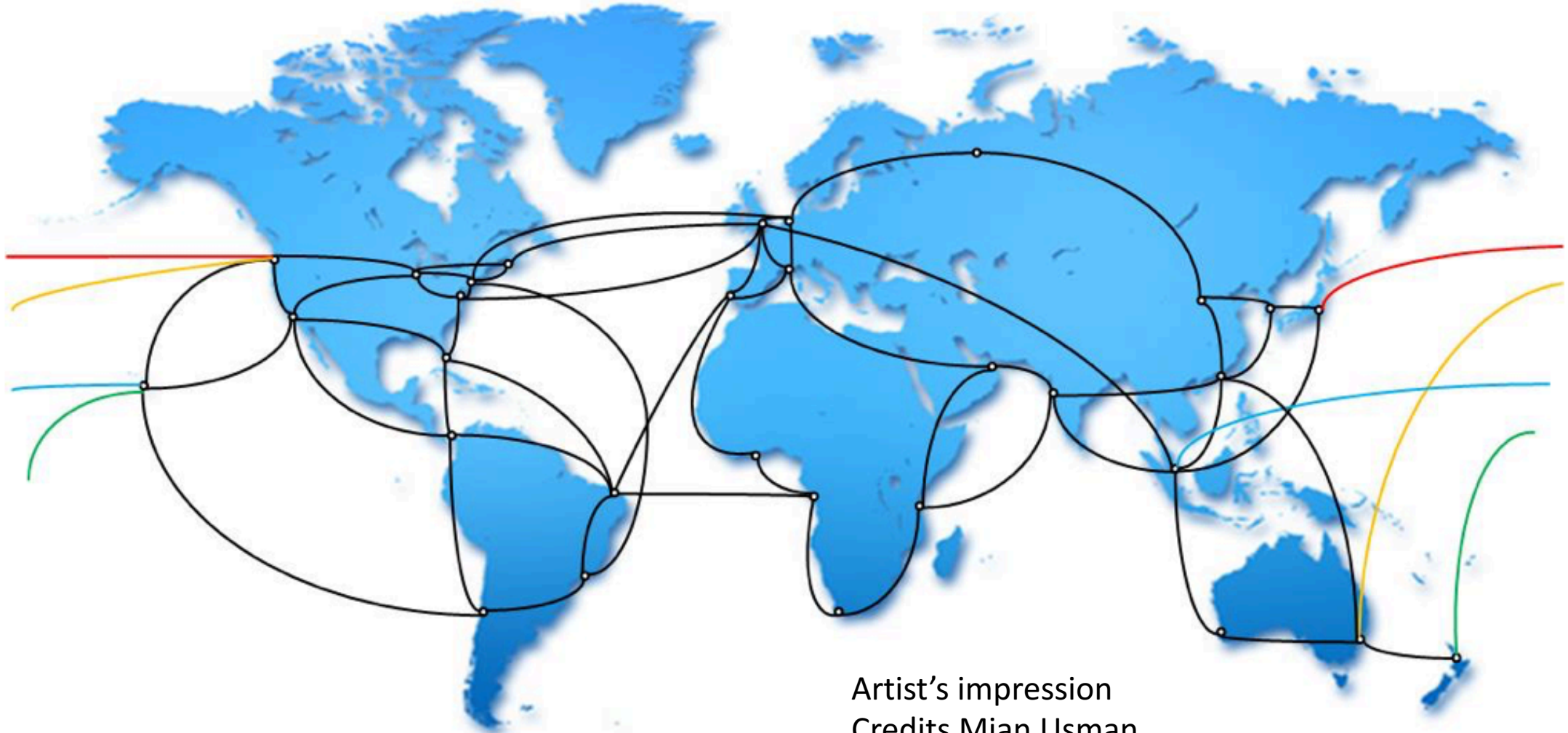


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# 1. Introduction to the GNA

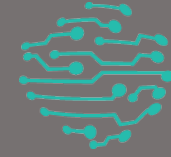


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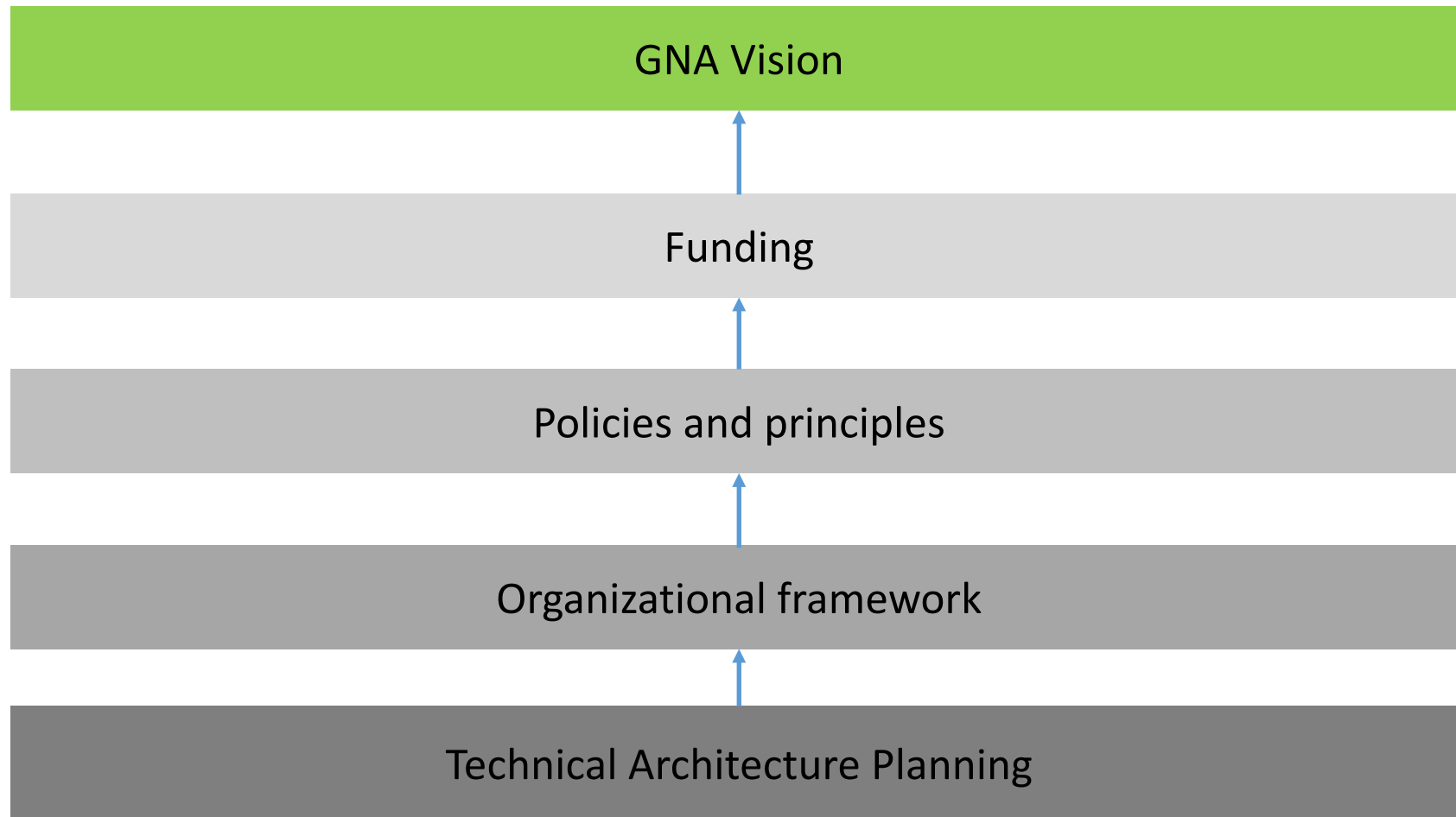


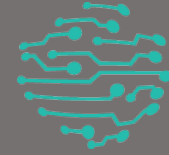
Artist's impression  
Credits Mian Usman

# Dimensions of GNA



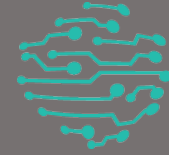
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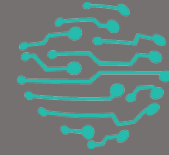


- Recognizing that networking is the foundation of many, if not all, R&E collaborations around the world, the GNA is:

A coordinated worldwide effort that efficiently interconnects national and multi-national R&E Networks around the world in a manner which increases the international reach, capacity, and capability of the global R&E network for the benefit of all countries.

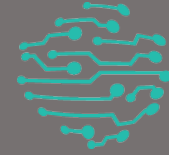


- How are international links funded?
  - NRENs & Governments
- Opportunities to explore:
  - Cost sharing
  - Fibre swaps
  - Spectrum swaps
  - Private sector partnerships
  - Operational support (op ex funding)



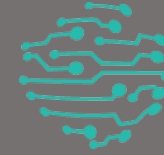
- Pathfinding:
  - Learning (from what we implement)
  - Adjusting (with the lessons learned)
- Pathfinders:
  - ANA Collaboration and ANA-300G
  - Development of OXPs in:
    - Montreal
    - Cape Town
    - Guam





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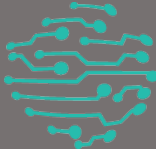
## 2. The Works of the GNA Techn WG



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- Network engineers from R&E Network organizations around world (Europe, Australia, North & South America, Asia, and Africa), working on:
  - Architecture document (six)
  - Network Services Definitions (four)
  - Information Architecture Framework
  - White Papers (The Commons, Global Virtualization Architecture)
- Creation of publicly reviewed framework documents
- Web site (background and documents)

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



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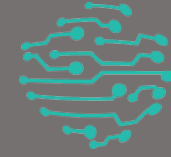
HOME ABOUT OUR PLAN **RESOURCES** MEETINGS GET INVOLVED

White paper:  
Global R&E Network Architecture Program

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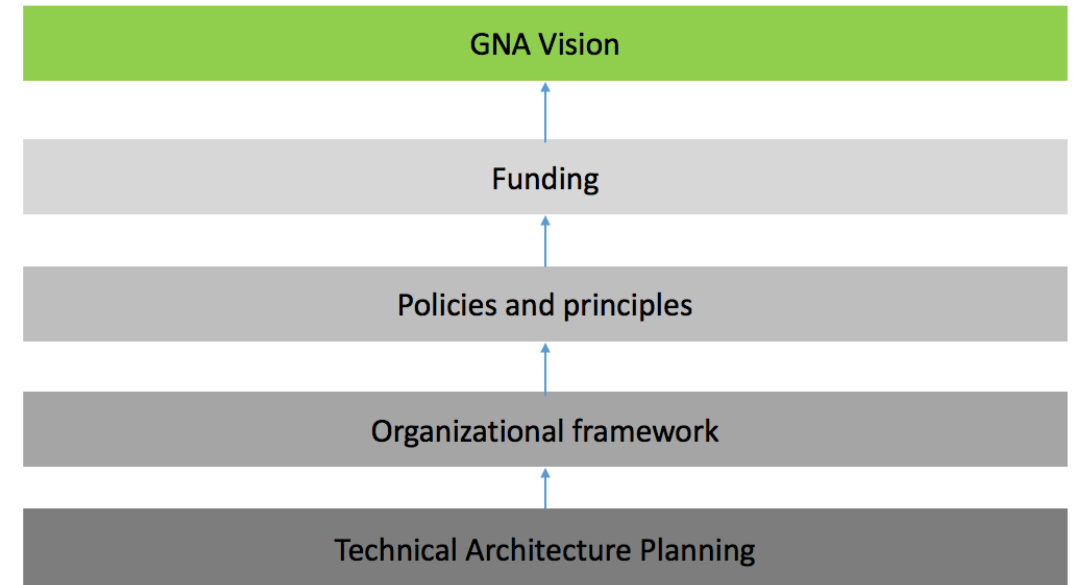
Developing a blueprint for global  
R&E network architecture

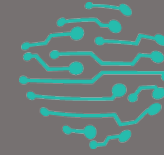
# Six Architecture Documents



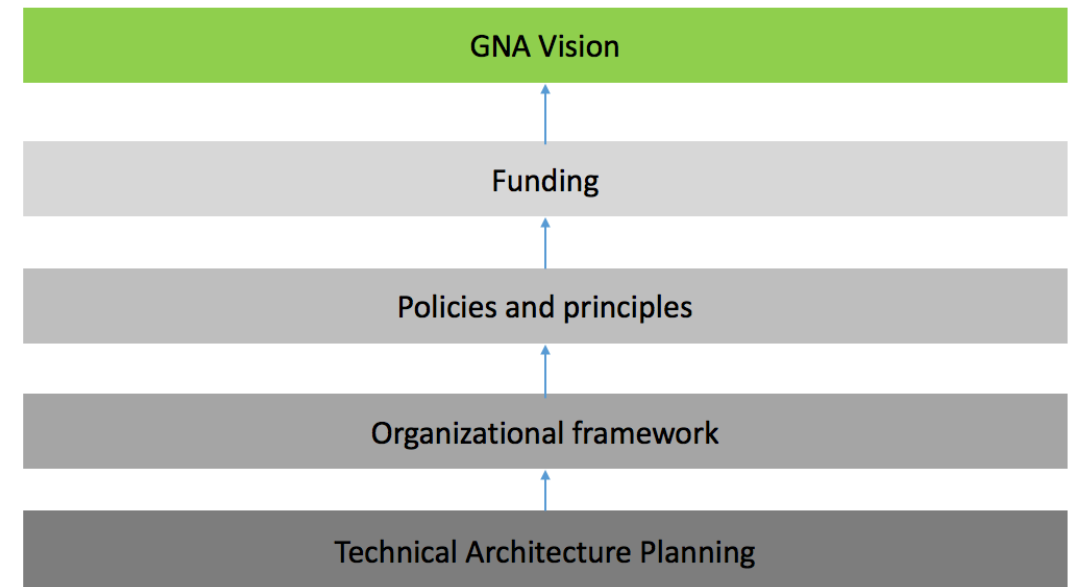
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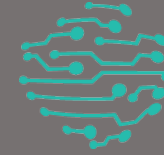
- Reference Architecture
- Network Services
- Operations
- Open Exchange Points
- AUPs
- Privacy



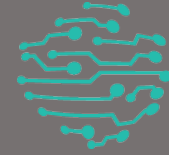


- Network Transport Service
- Monitoring & Measurements & Trouble Tickets
- Encryption
- Security



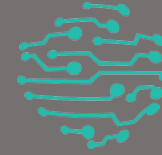


- Most recent GNA Technical WG F2F meeting: 19 September 2016
  1. Review and restructuring of architecture documents
  2. Detailed discussion of white papers
  3. Agreement on:
    1. Creation of a glossary
    2. Development of an Information Architecture knowledge exchange prototype
  4. Timeline for finishing work



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# 3. Zooming in to the Architecture

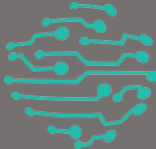


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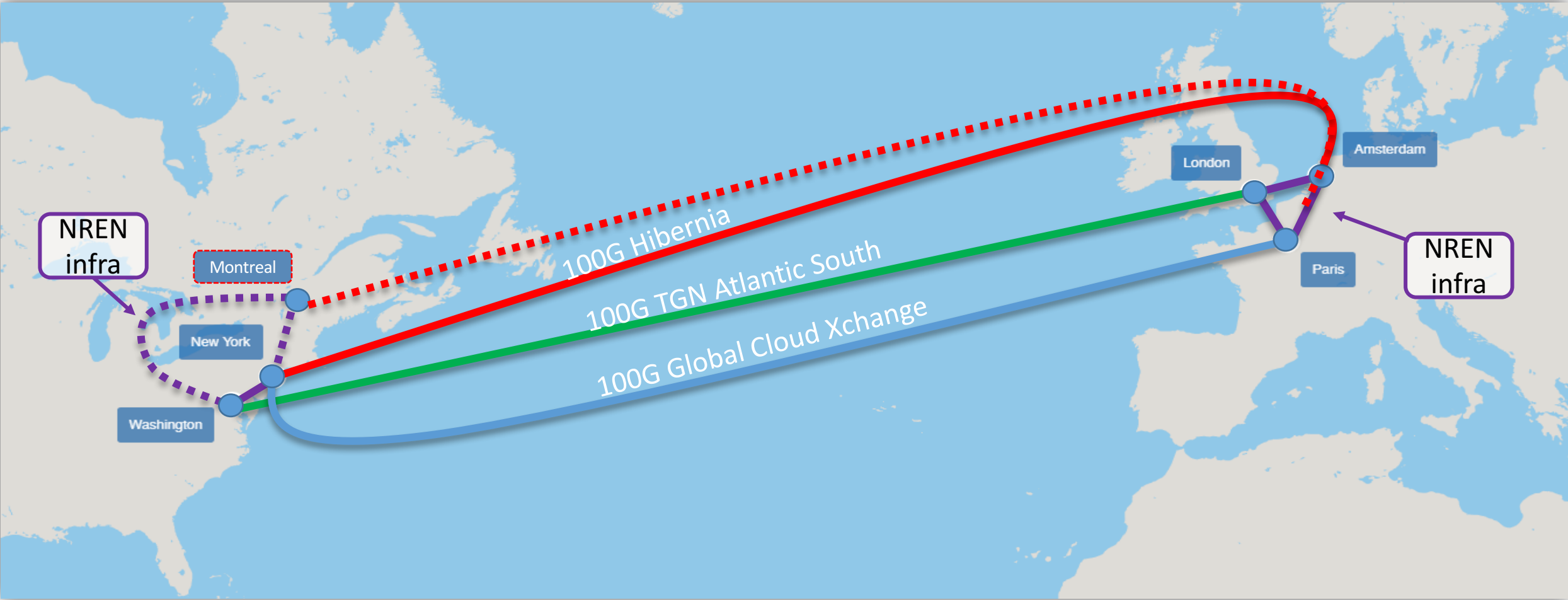
- No rocket science, but coordination on:
  - Technology
  - Topology
  - Bandwidth acquisition
  - Key components:
    - OXPs
    - Fat pipes
    - Networks serving R&E organizations
- Service Aspects:
  - The Commons
  - Deterministic Services
  - Virtualization



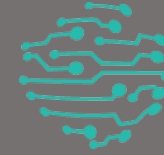
# OXP's and Fat Pipes



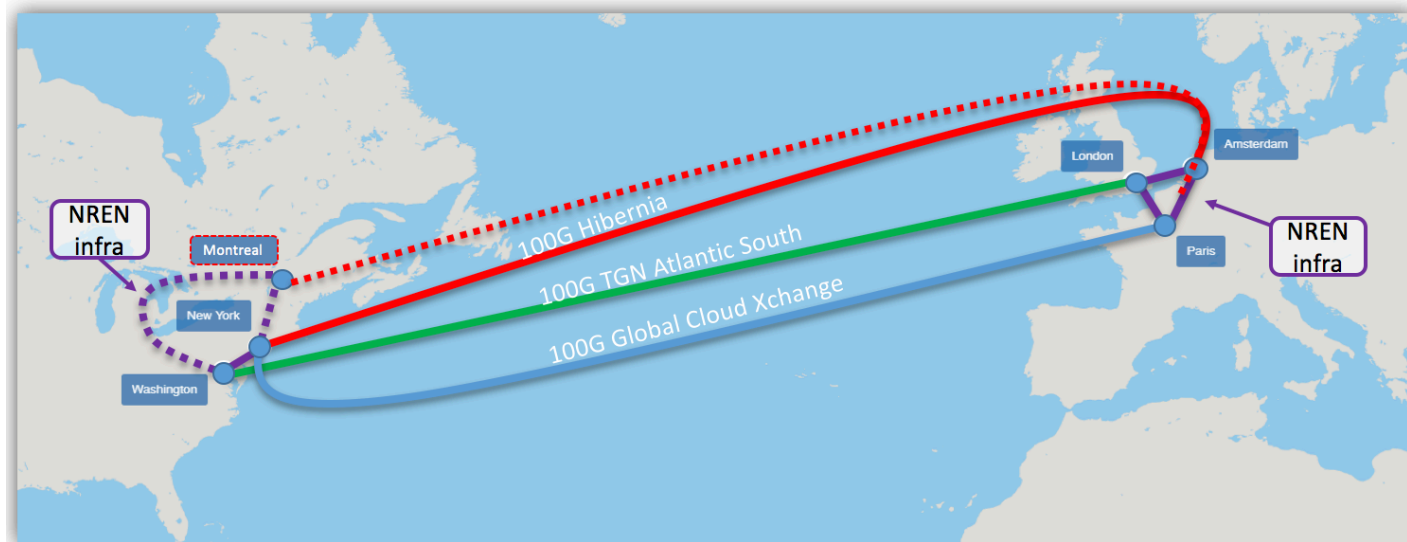
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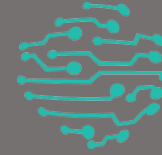


Example: ANA-300G & mutual backup agreement between ESnet and ANA

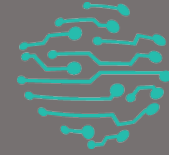


- Interworking NOCs
- NOCs of the OXPs front and center to the operations
- Example:
  - NORDUnet 100G in ANA-300G

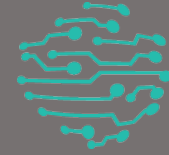




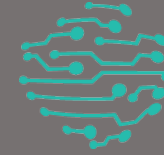
- Idea derived from the concept of Common Land in medieval English Law
- In the GNA this is about Shared Capacity:
  - Fairly
  - Efficiently
- Making explicit a fundamental feature of NREN collaboration and the development of the Internet
- Continuing work on the existing white paper
- If we all contribute a little to the Commons we all benefit



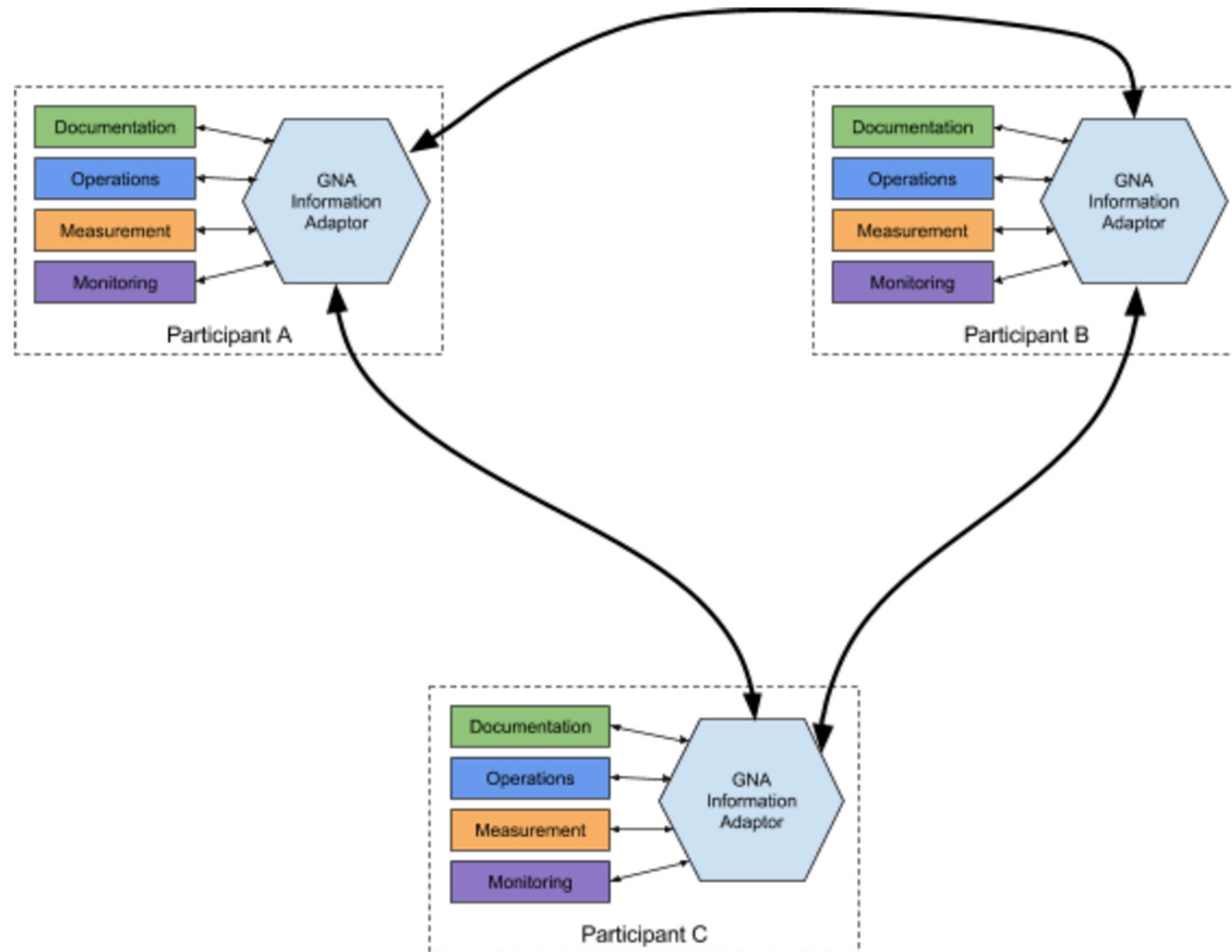
- Non-Deterministic network services:
  - Best-effort network service
- Deterministic network services:
  - Guaranteed bandwidth service
  - Service parameters well defined
  - Provisioning and deprovisioning process deterministic

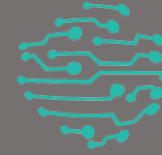


- Currently a new white paper for discussion
- Idea well received, as an ambition for the GNA to grow towards
- Needs more discussion
- A developing area for you to contribute!



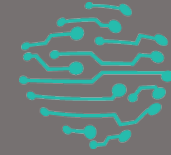
- “Towards an Information Architecture for the GNA” v0.6
- Currently a draft architecture document
- Planned to be tested in real life





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# 4. Making the GNA Tangible

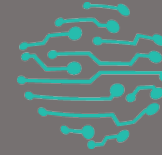


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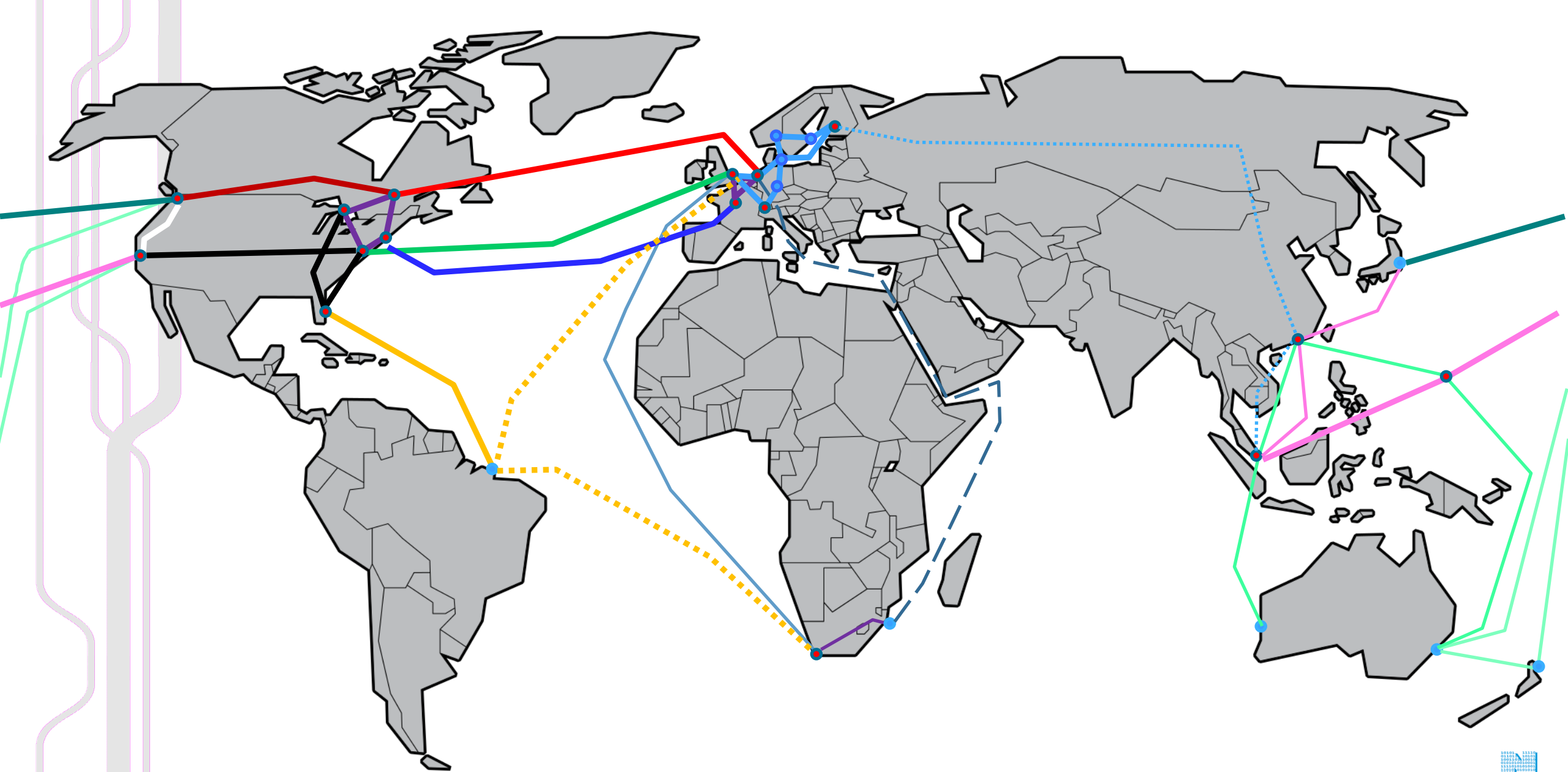
- ANA-300G is running production for 1.5 years+
- Expansion to the east, west and south deemed low hanging fruit
- Aim: Creation of infrastructure based on GNA principles and architecture, version 1.0, with “Round 1” ambitiously set for Q1 2017

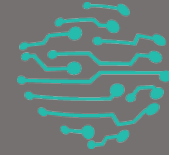






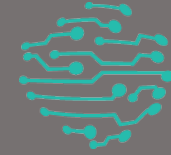
- Montreal OXP:
  - Onwards to Chicago (StarLight) and the North American West Coast
- Cape Town OXP:
  - Plus Amsterdam/London – Cape Town bandwidth
- NOX-HEL:
  - A possible gateway to the East
- Guam OXP:
  - AARNet, Internet2, Asian NRENs, and others working together, including plans for additional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





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# 5. Conclusions (and Q & A)

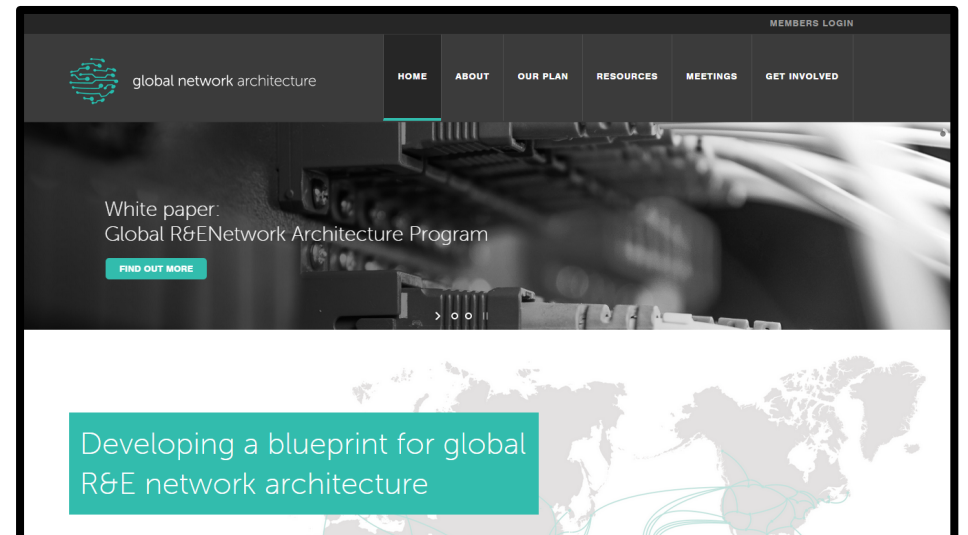


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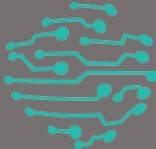
- The GNA work is ongoing
- You can help!
  
- Towards a more coordinated infrastructure for Research & Education

## GNA Website:

<http://gna-re.net/>



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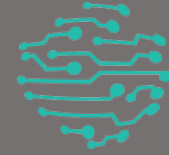
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White paper:  
Global R&E Network Architecture Program

FIND OUT MORE

Developing a blueprint for global  
R&E network architecture



Thank you! Questions?

Please contact the co-chairs for more information:

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