Best Practices for Cloud Provider Connectivity for R&E Users

Lars Fischer
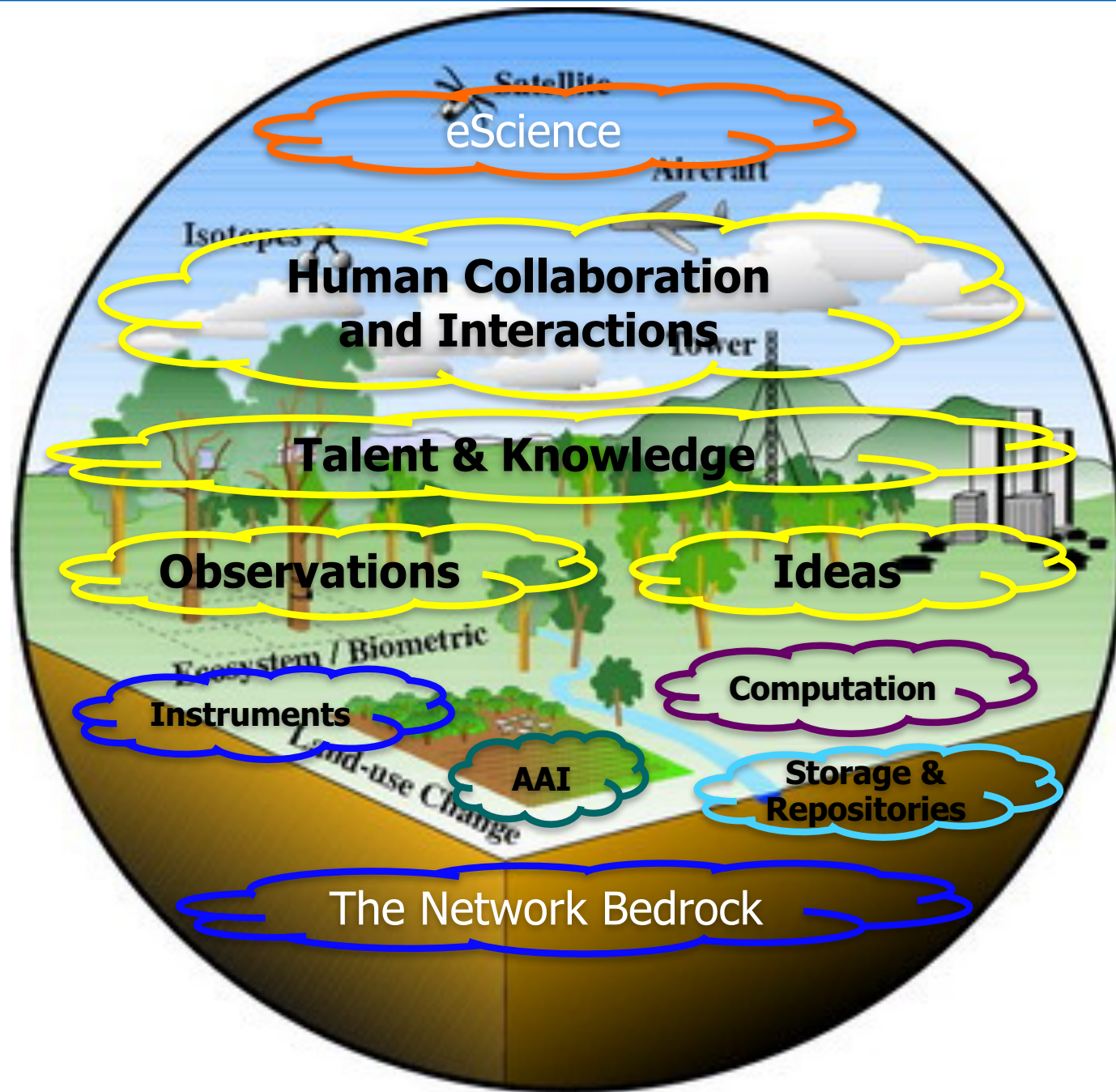
(with Erik-Jan Bos, David Foster, Josva Kleist)
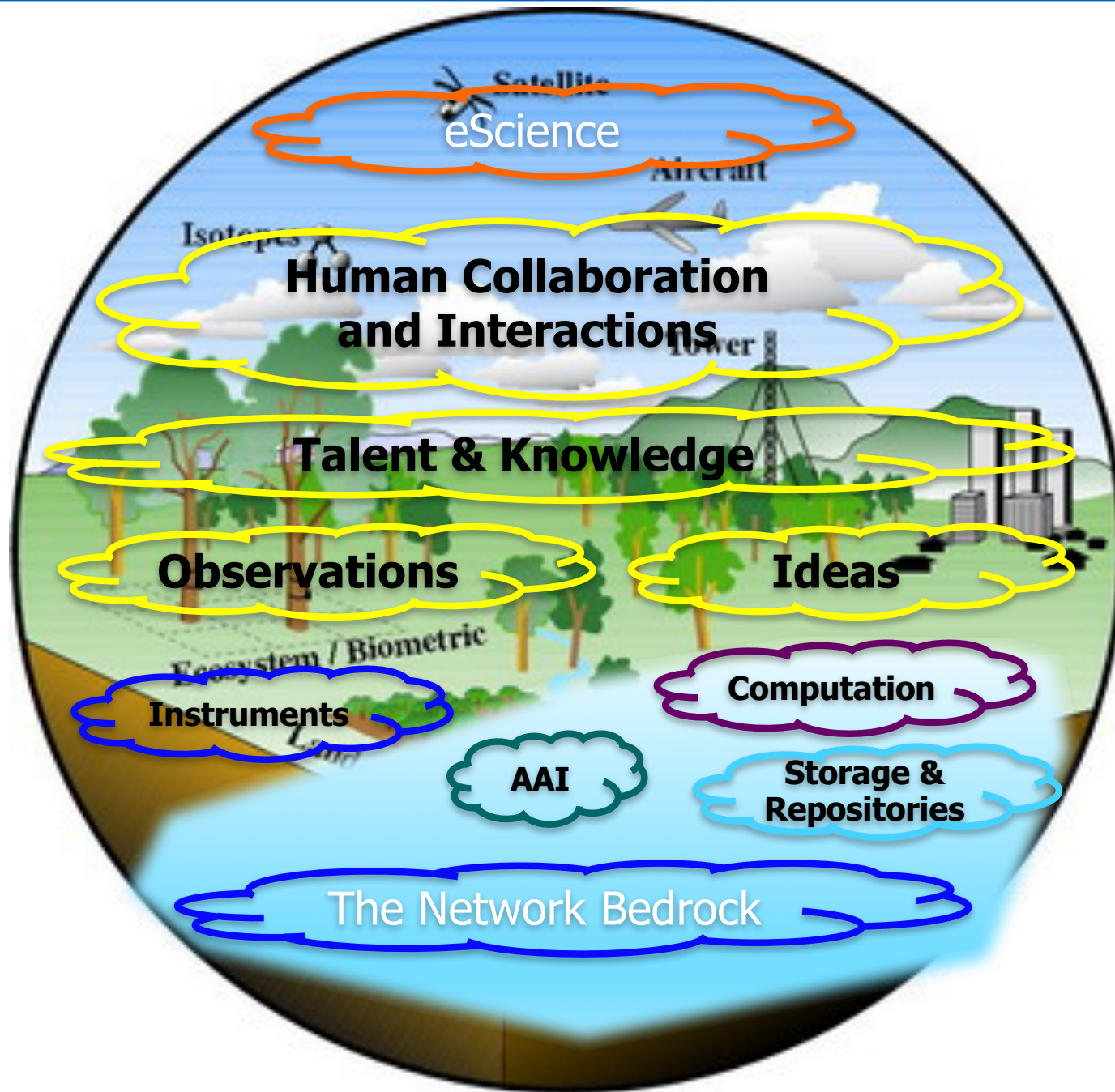
GLIF TECH

Miami, 29-30 September 2016

![NORDUnet — Nordic Gateway for Research & Education]

This is not technical

Whitepaper: https://goo.gl/MtFSx7

NORDUnet
Nordic Gateway for Research & Education

... is moving to the cloud

eScience

Satellite

Aircraft

Human Collaboration and Interactions

Isotopes

Tower

Talent & Knowledge

Observations

Ideas

Ecosystem / Biometric

Instruments

Computation

AAI
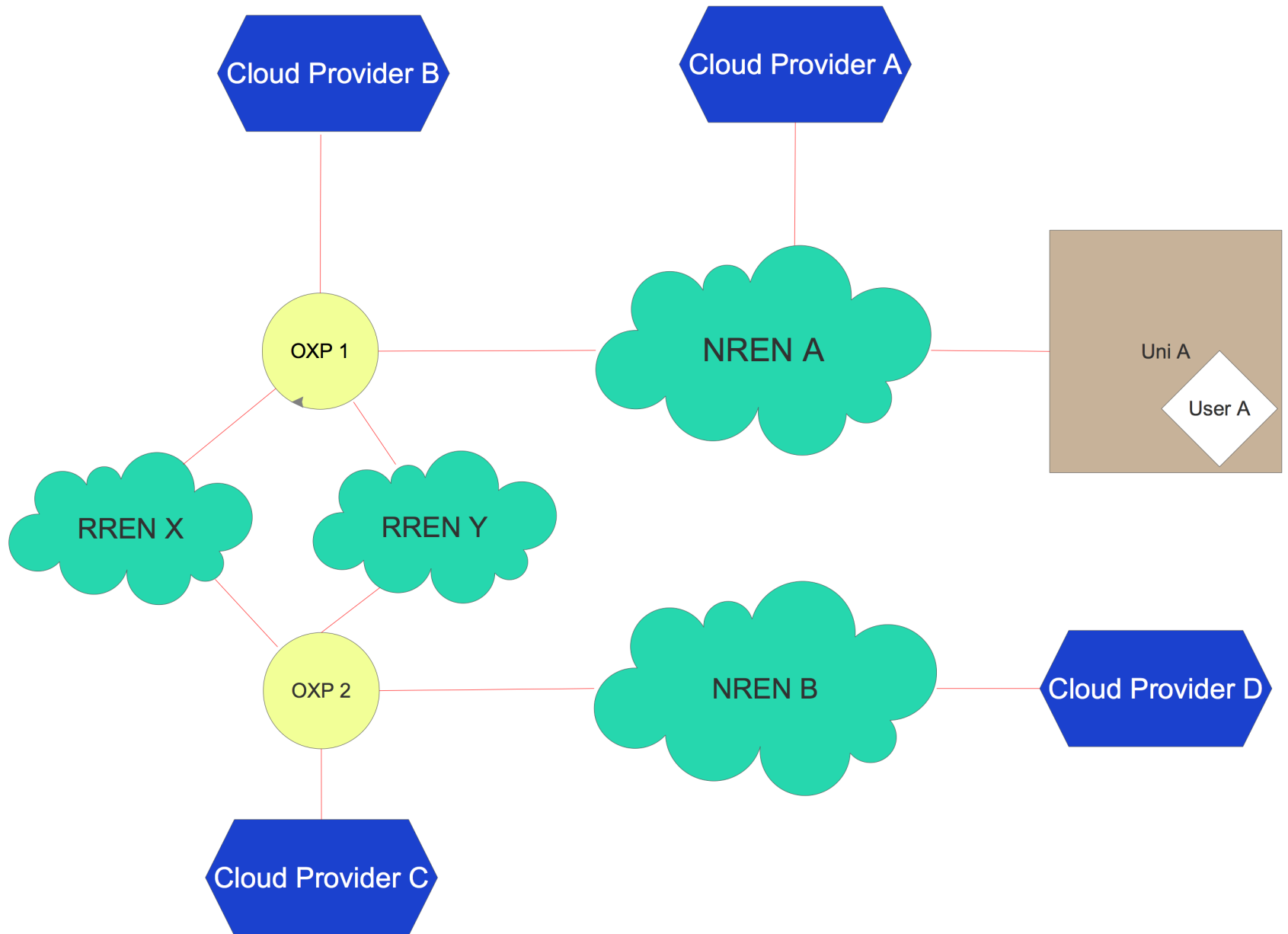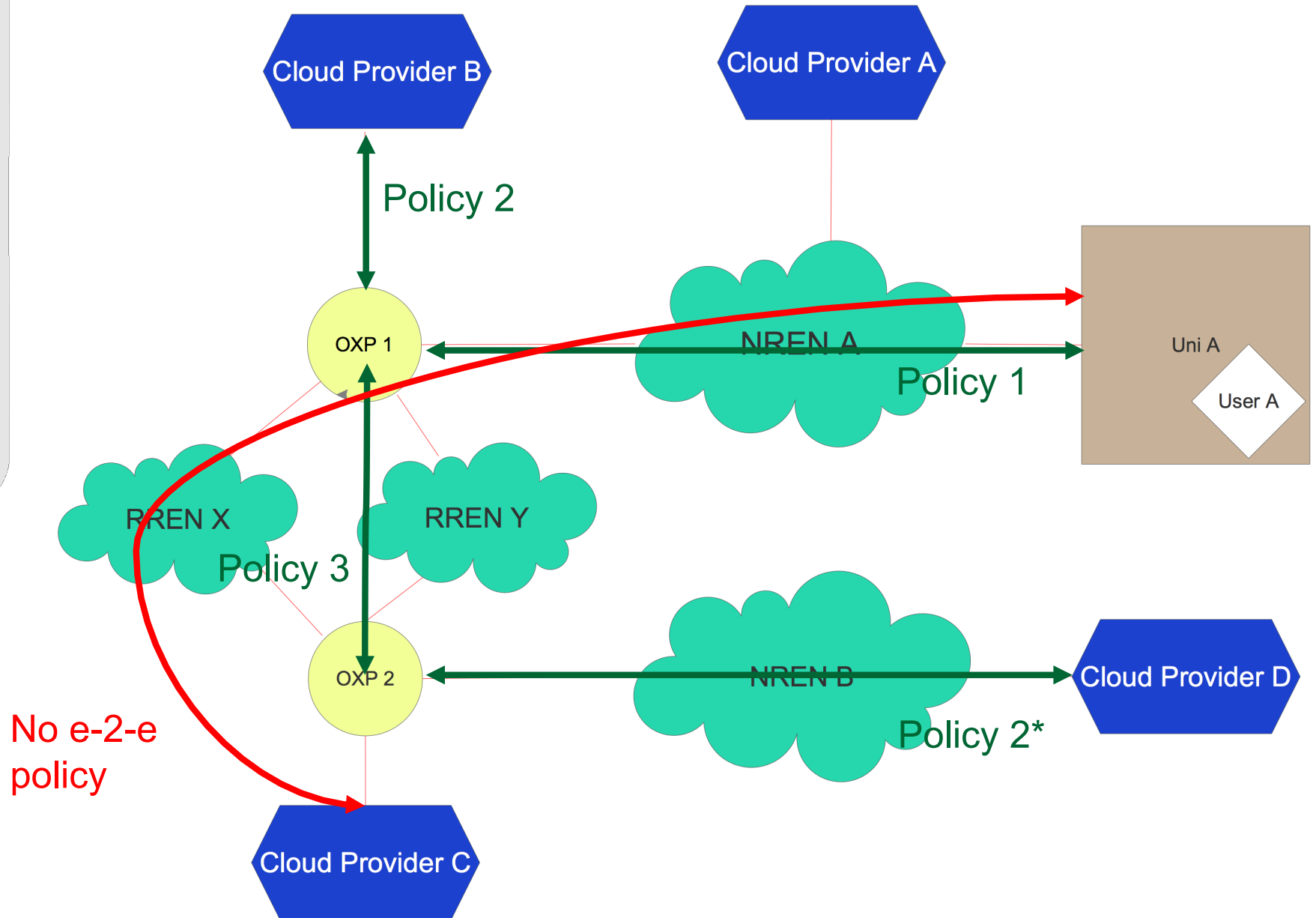
Storage & Repositories

The Network Bedrock

- Integrating…
  - Diverse resource into a single infrastructure
  - Commercial resources
- Providing network connectivity
  - In support integration
  - Using existing R&E network resources in a coherent way
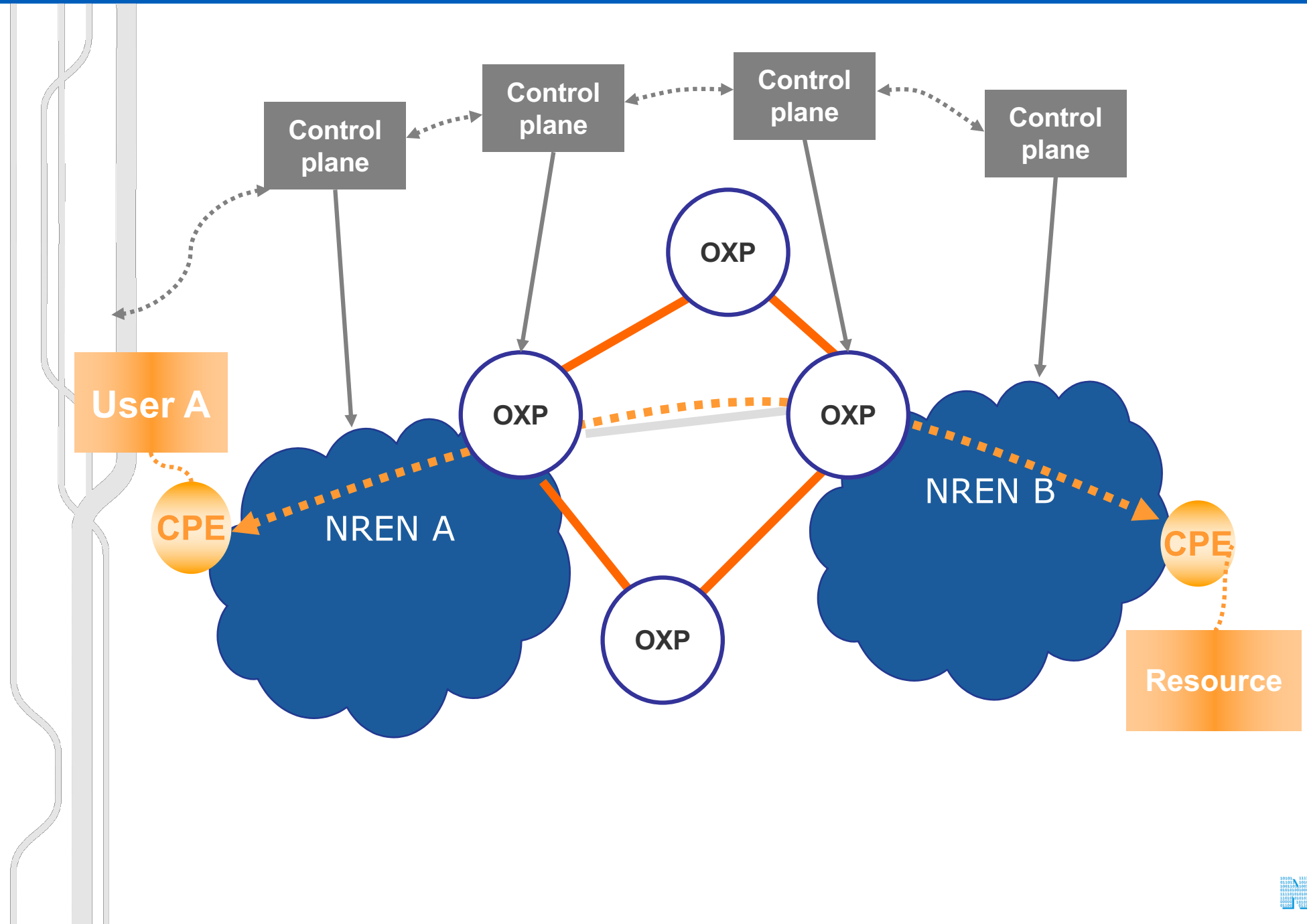- Procuring commercial resources with integration in mind

- Reduce uncertainty
  - Of networking for cloud resources
  - Of cloud resource tenders
- By
  - Offering are reference model for connectivity
  - Summarizing Best Practice
  - Give guidelines for network providers
  - Give guidance for cloud procurement

- We are not
  - proposing new designs
  - proposing new networks or functions
  - offering complex middleware
- We are offering
  - A way to think about cloud connectivity
  - An approach to simplify policy issues
  - A way to integrate commercial resources into existing networks
- Ongoing work at CERN, GÉANT, …

NORDUnet
Nordic Gateway for Research & Education

Reference Model

Cloud Provider B

Cloud Provider A

OXP 1

NREN A

Uni A

User A

RREN X

RREN Y
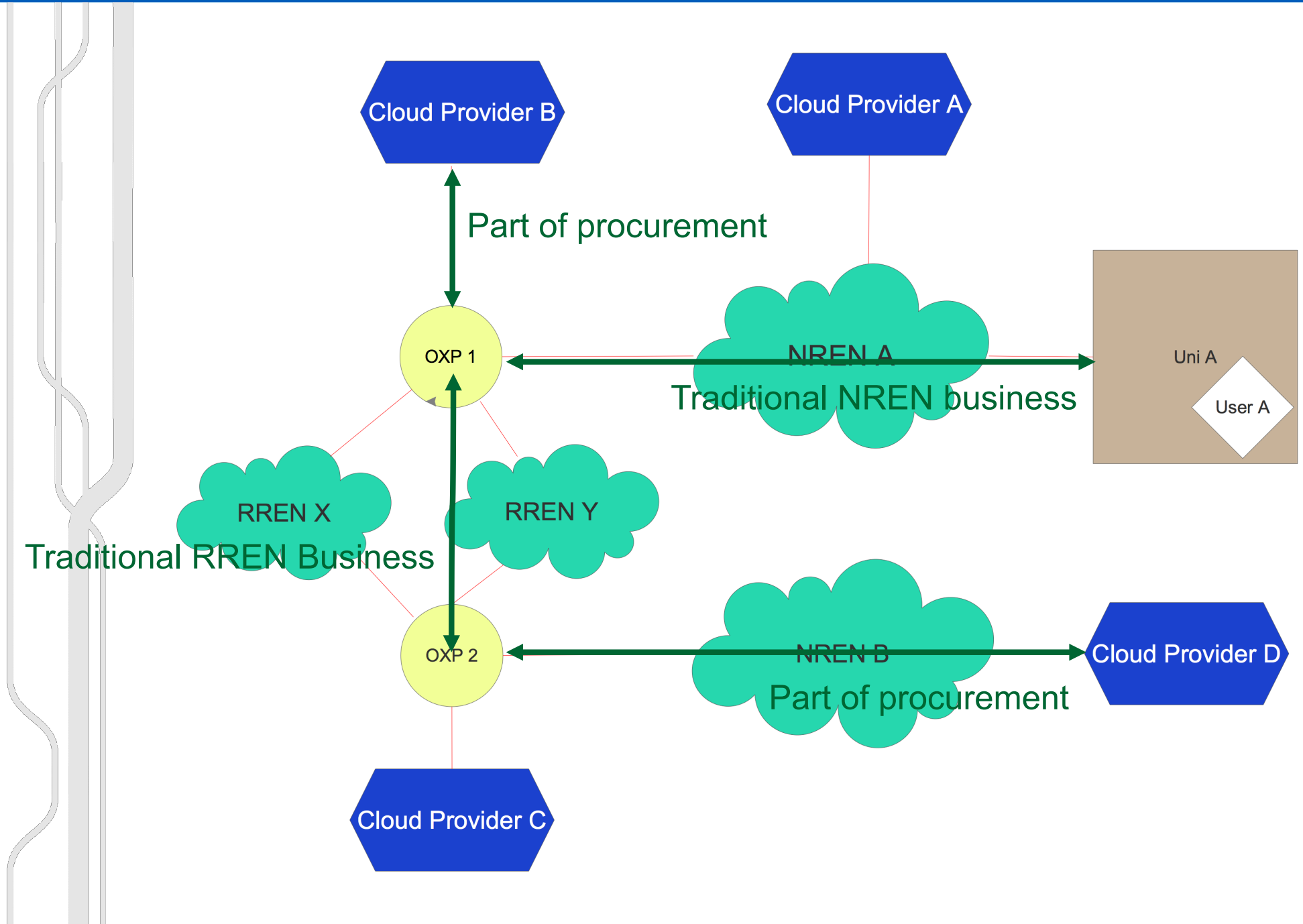
OXP 2

NREN B

Cloud Provider D

Cloud Provider C

- End-to-end policy or business case is not useful
- Instead, consider separately
  - Connecting a user institution, typically through an NREN, to an open exchange,
  - Connecting a cloud provider (commercial or private) to an open exchange,
  - Creating trunks between open exchanges.

NORDUnet
Nordic Gateway for Research & Education

Policy

Cloud Provider B

Cloud Provider A

Policy 2

OXP 1

NREN A

Uni A

User A

Policy 1

RREN X

RREN Y

Policy 3

OXP 2

NREN B

Cloud Provider D

No e-2-e policy

Policy 2*

Cloud Provider C

NORDUnet
Nordic Gateway for Research & Education

GLIF networking model

Control plane

Control plane

Control plane

Control plane

OXP

OXP

OXP

OXP

User A

CPE

NREN A

NREN B

CPE

Resource

NORDUnet
Nordic Gateway for Research & Education

- User <-> OXP
  - Traditional NREN business
- Cloud Providers <-> OXP
  - Cloud provider private network
  - NREN Layer 2.5
  - NREN Layer 3
- Inter-exchange bandwidth
  - Business of regional, continent, or trans-oceanic networks
- None of this is new

NORDUnet
Nordic Gateway for Research & Education

Cost Sharing

Cloud Provider B

Cloud Provider A

Part of procurement

OXP 1

NREN A
Traditional NREN business

Uni A

User A

RREN X

RREN Y

Traditional RREN Business

OXP 2

NREN B
Part of procurement

Cloud Provider D

Cloud Provider C

- Policy may get in the way
  - For some users
  - Local or transit network
  - … but we keep it localized
- Allow for Cloud <-> Researcher traffic
  - Links and networks used
- Allow for Cloud <-> Cloud traffic
  - On behalf of research
  - OXPs and any links used to connect commercial cloud providers
- Peering with a cloud providers essential
  - For R&E network users
  - Transit between R&E networks

- Most OXPs are self supporting (port charges)
- Connection Cloud Provider to OXP
  - Should be part of procurement and service delivery
  - Can often happen at major hubs
- OXP interconnect is
  - No different then inter-NREN traffic
  - A challenge already solved and cost-shared
  - Understood Inter- and intra-continentally
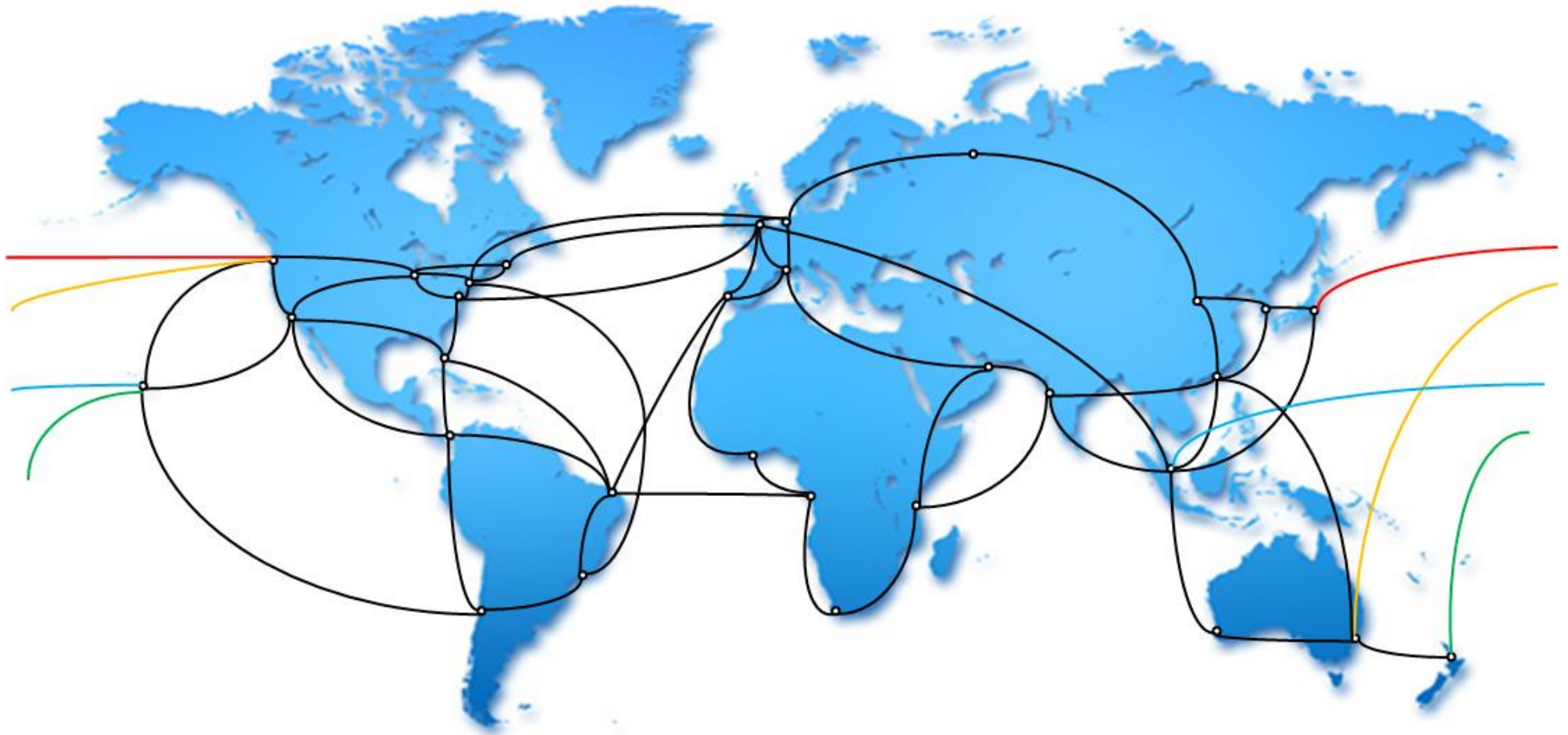
- Use the Reference Model for cloud connectivity
  - Always connect through OXPs
  - Establish Cloud Provider connections at OXPs
  - Apply to Cloud service procurements
- Build intra- and inter-continent with inter-OXP connectivity in mind
- Adapt policies where needed

- Procurement Boilerplate
  - Establish specific recommendations for cloud procurements
  - Publish boilerplate for tenders etc.
  - GÉANT is ideally positioned to do this
- Continue work on advanced cloud use-cases
  - IP routing and addressing
  - High-quality cloud connectivity
  - Virtualization

- *Best Practices for Cloud Provider Connectivity for R&E Users*
  - Bos, Fischer, Foster, Kleist
  - https://goo.gl/MtFSx7
  - (also as CERN-IT-Note-2016-008, https://cds.cern.ch/record/2216466)

- lars@nordu.net