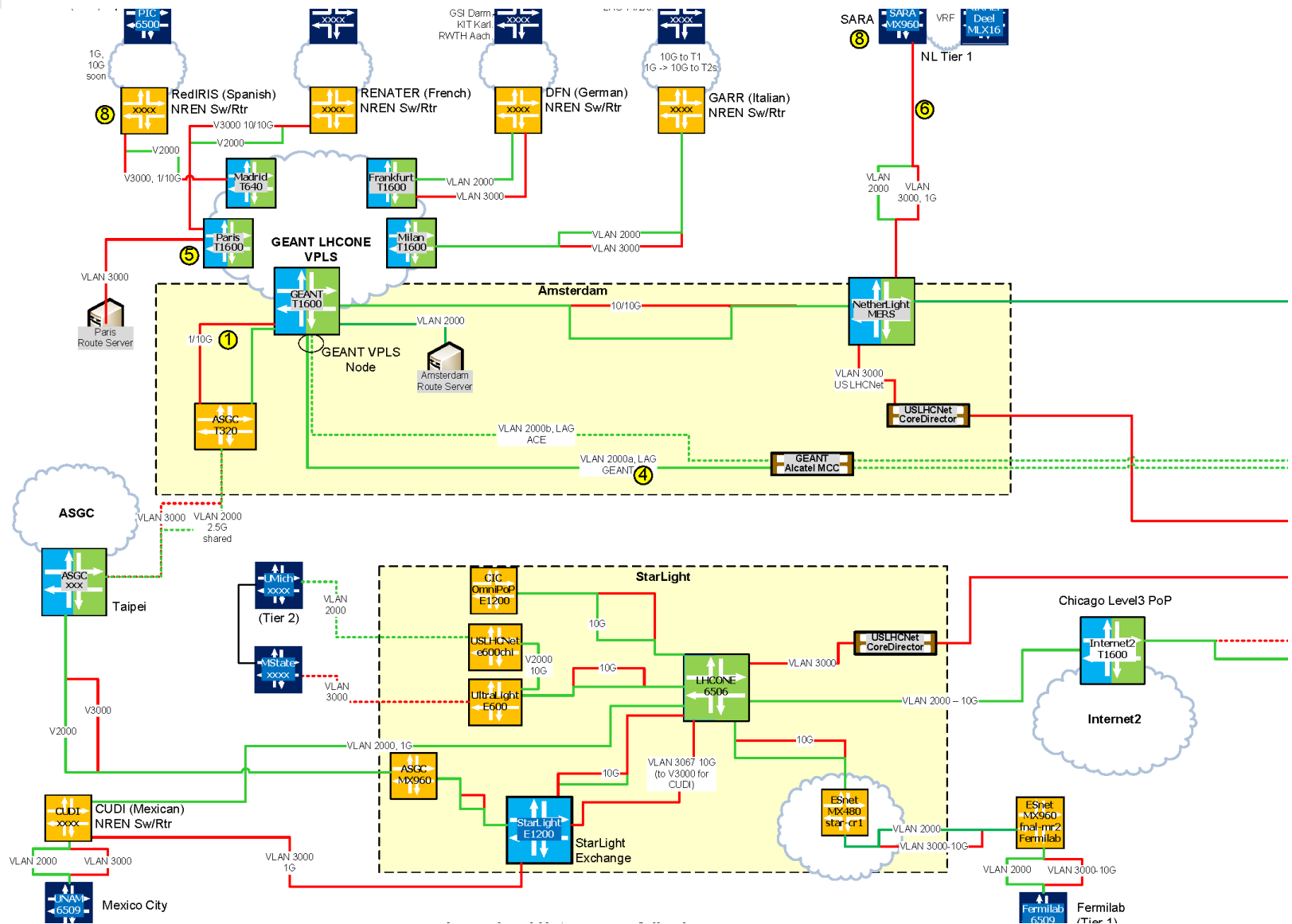# LHCONE: NORDUnet View

## Lars Fischer
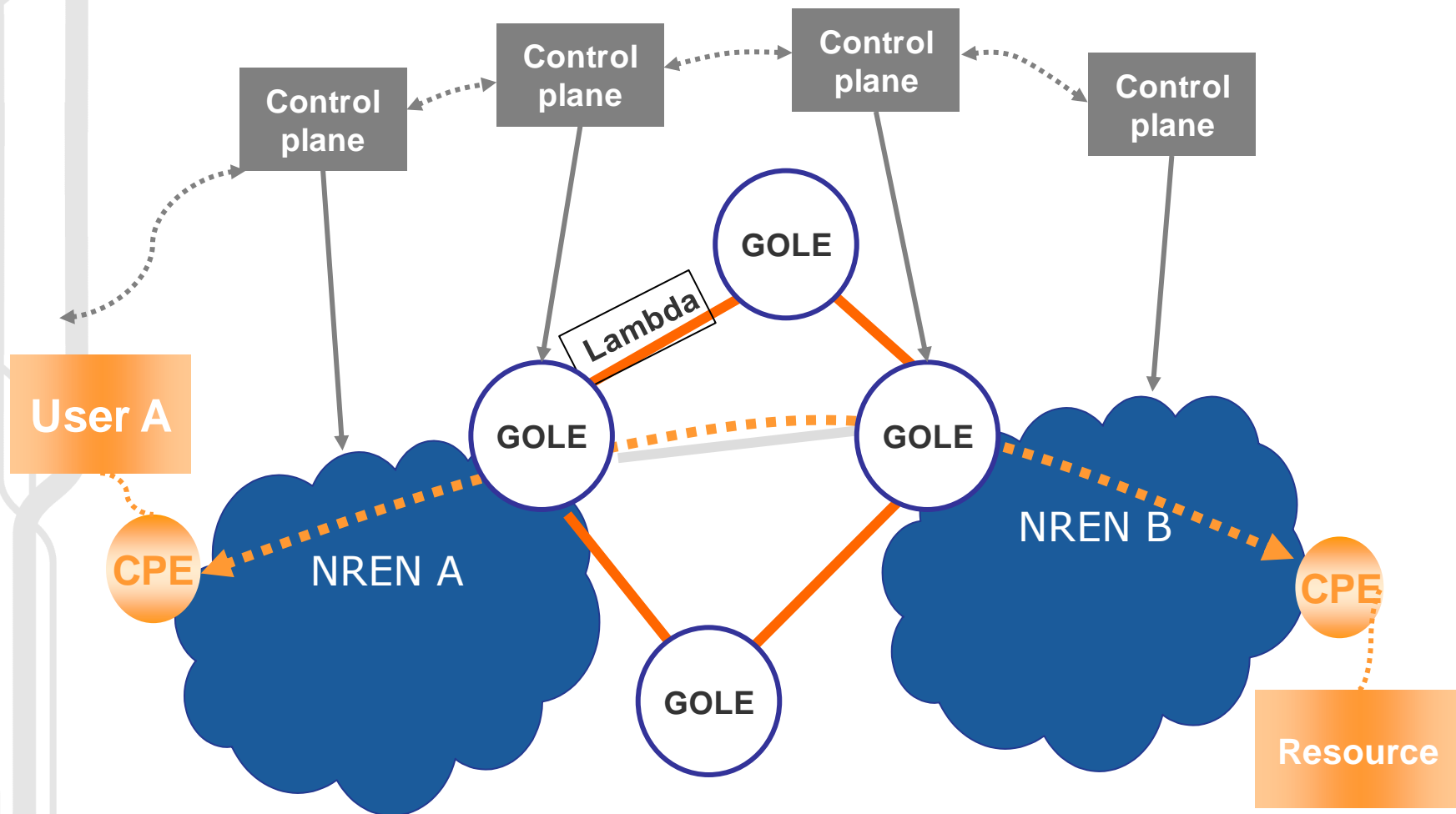### LHCONE Workshop
### Amsterdam, 1-2 December 2011

- LHCONE should
  - Interconnect T1/T2/T3
  - Avoid saturating general-purpose R&E IP backbone
  - Give users better connectivity

    *-- David Foster*

**NORDUnet**

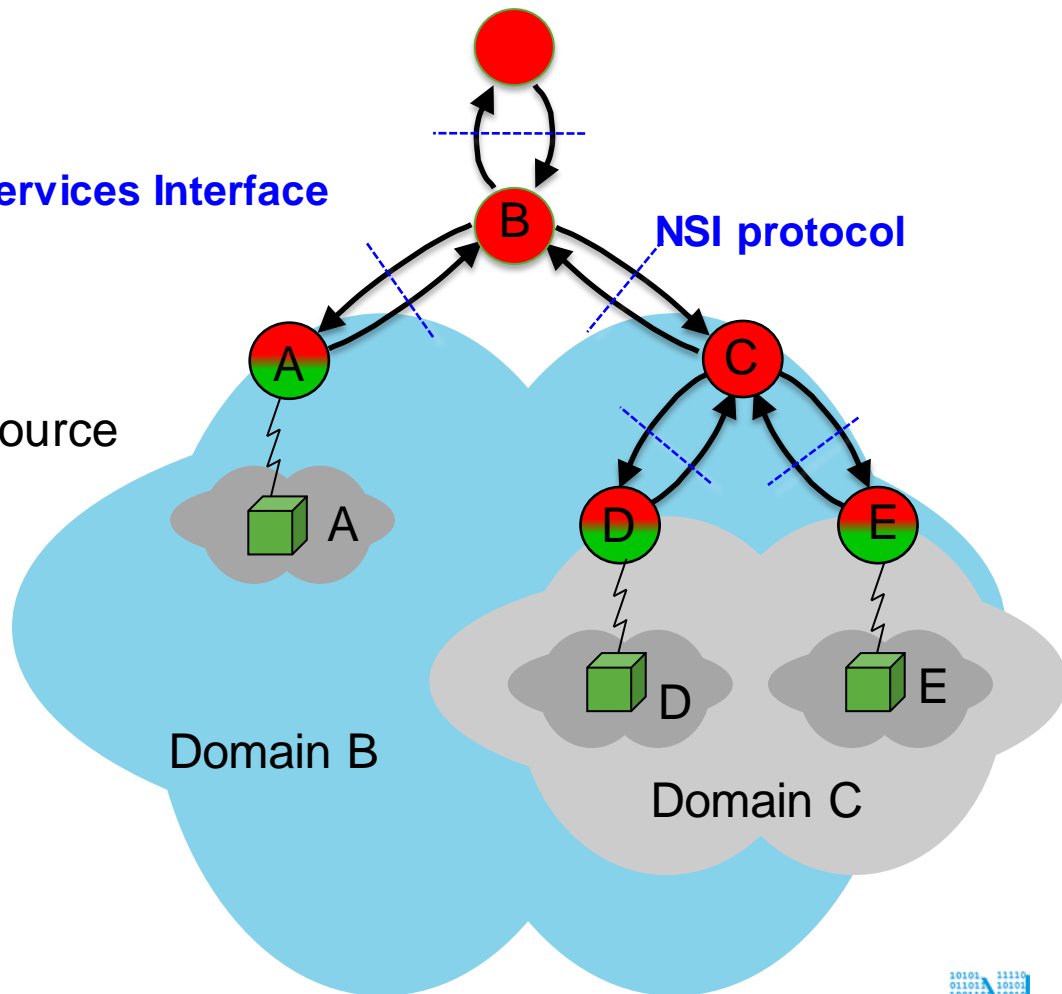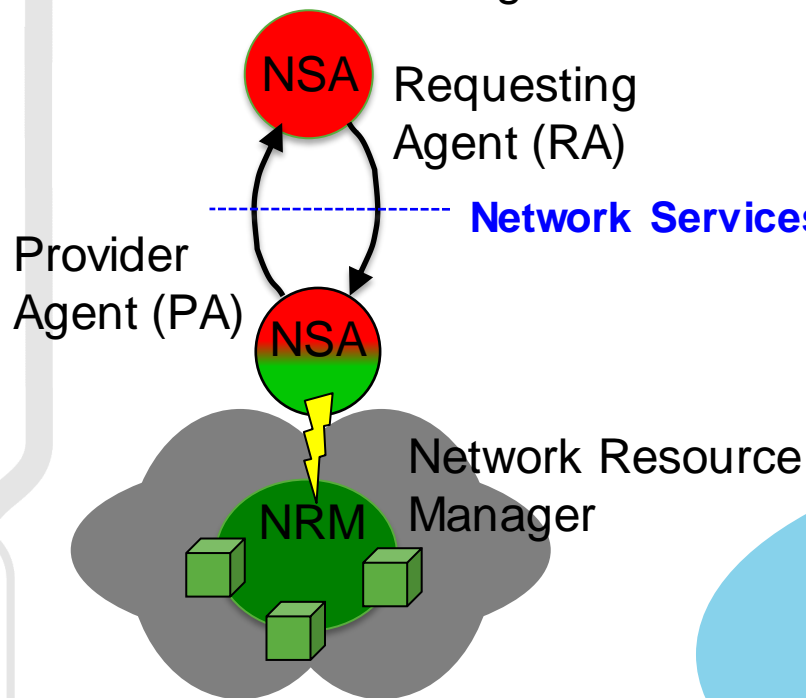Nordic infrastructure for Research & Education

- Need to urgently identify LHC-related bottlenecks in general-purpose R&E networks – and provide fixes or workarounds

- Make VLAN solution operational

- Evolution of VLAN model
  - Evolve into a Routed VPN over P2P?
  - Evolve into L3 service?
  - …
  - Many good proposals on the table

- We are dealing with the short-term issue

- NORDUnet prefer to focus on the long-term architecture for LHCONE

- According to WLCG, reasonable timeline objective for LHCONE is the 2014 LHC startup / restart

- Action
  - We need to work on the architecture
  - We need to test new paradigms and tools
  - Need for urgency, but no need to rush an implementation

Network Services Agent

NSA

Requesting Agent (RA)

Network Services Interface

Provider Agent (PA)

NSA

NRM

Network Resource Manager

B

NSI protocol

A

C

D

E

A

D

E

Domain B

Domain C

- OGF NSI-CS version 1.0 is in final draft

- Demonstrations
  - Sep 2011: NSI CS Interop Plugfest – GLIF 2011 Rio de Janeiro, BR
  - Oct 2011: First NSI Transport Provisioning, Future Internet Assembly 2011 Poznan, PL
  - Nov 2011: Global NSI + AutoGOLE Demonstration Supercomputing 2011 Seattle, US

**NORDUnet**

Nordic infrastructure for Research & Education

- Open
  - NSI is an open community effort
- Framework
  - It is a *Framework* for distributed network services – not simply the next signaling protocol
- Standard
  - It is now a standard (OGF), and gaining increasing support and adoption

**NORDUnet**
Nordic infrastructure for Research & Education

- NSI Connection Service (CS)
  - inter-domain, scalable, and secure
- NSI Topology Exchange (DToX)
  - Dynamic distributed topology exchange. Required to automated the local maintenance of local topology and to enable scalable global pathfinding.
- NSI Performance Verification (PFVM)
  - An architecture for automated service verification and fault localization/remediation
- Common Service Definitions
  - Enabling interoperable transport services

**NORDUnet**
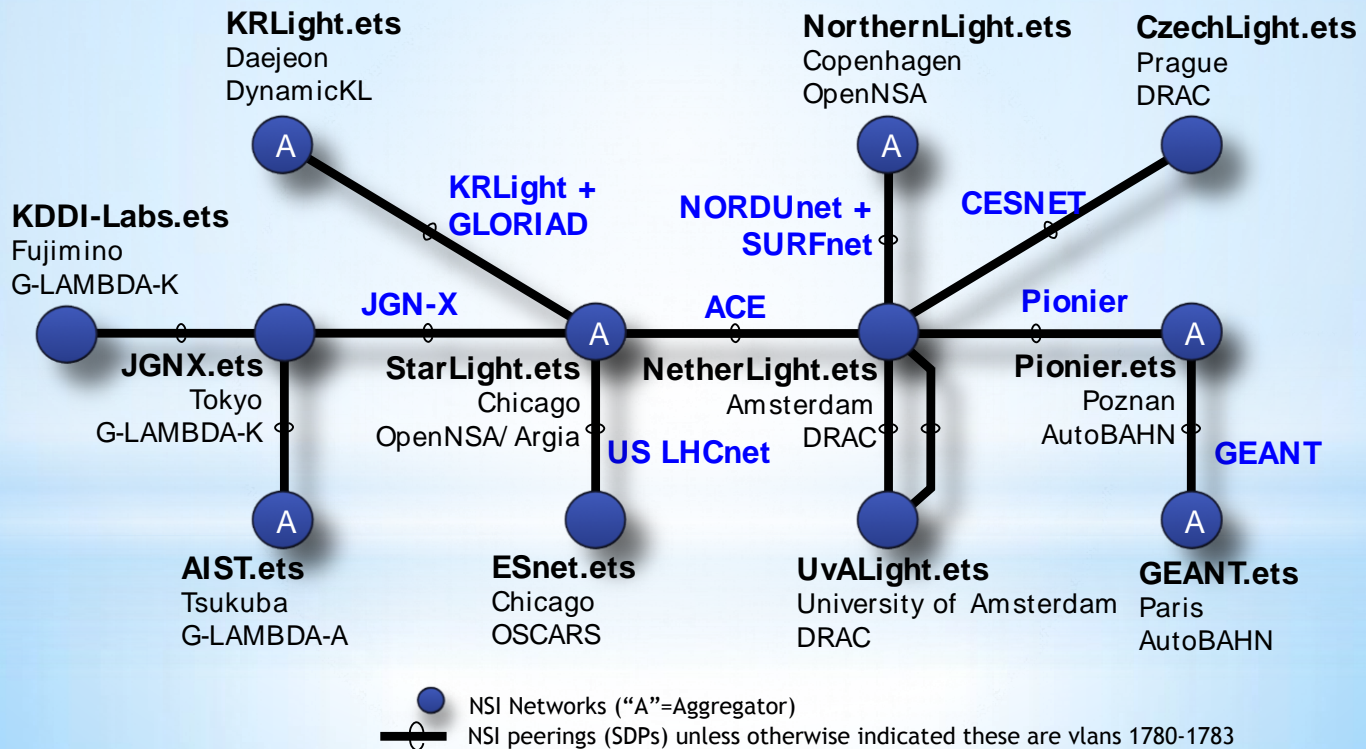Nordic infrastructure for Research & Education

- The OGF NSI WG is an *open* working group
  - Comprehensive community participation

- You can get active
  - If you have ideas you would like to see incorporated
  - Pick the brain of an active WG member
  - Join mailing list, lurk and learn, then join the calls…
  - Contribute – ask, comment, propose…

- Highly active community, standardizing *and* developing code

# NSI Software Implementations

- **OpenNSA** – NORDUnet
- **DRAC** – SURFnet
- **AutoBAHN** – GÉANT / PSNC
- **G-LAMBDA-A** - AIST
- *G-LAMBDA*-K – KDDI Labs
- **DynamicKL** – KISTI
- **OSCARS** – ESnet

# The Automated GOLE Testbed
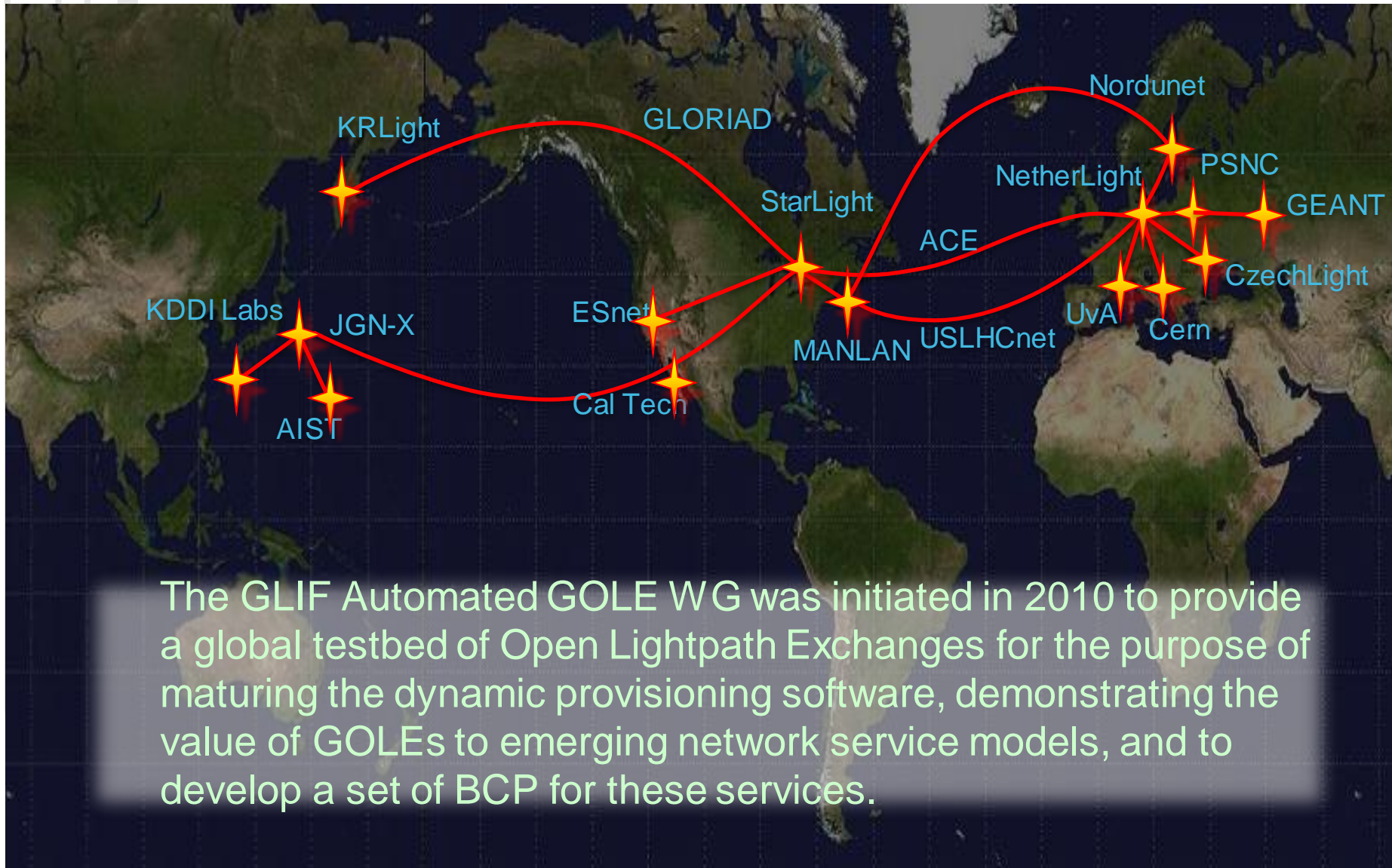
The GLIF Automated GOLE WG was initiated in 2010 to provide a global testbed of Open Lightpath Exchanges for the purpose of maturing the dynamic provisioning software, demonstrating the value of GOLEs to emerging network service models, and to develop a set of BCP for these services.

Automated GOLE / NSI Demo Network Supercomputing 2011

**KRLight.ets**
Daejeon
DynamicKL

**NorthernLight.ets**
Copenhagen
OpenNSA

**CzechLight.ets**
Prague
DRAC

**KRLight + GLORIAD**

**NORDUnet + SURFnet**

**CESNET**

**KDDI-Labs.ets**
Fujimino
G-LAMBDA-K

**JGN-X**

**ACE**

**Pionier**

**JGNX.ets**
Tokyo
G-LAMBDA-K

**StarLight.ets**
Chicago
OpenNSA/ Argia

**NetherLight.ets**
Amsterdam
DRAC

**Pionier.ets**
Poznan
AutoBAHN

**US LHCnet**

**GEANT**

**AIST.ets**
Tsukuba
G-LAMBDA-A

**ESnet.ets**
Chicago
OSCARS

**UvALight.ets**
University of Amsterdam
DRAC

**GEANT.ets**
Paris
AutoBAHN

NSI Networks ("A"=Aggregator)
NSI peerings (SDPs) unless otherwise indicated these are vlans 1780-1783

**NORDUnet**
Nordic infrastructure for Research & Education

NSA
Client RA

NSA
Aggregator

1
3
2
4
5
6

QA

VZ

1. Reservation Request
2. Segmentation of Reservation to children
3. Reservation confirmed
4. ConnectionID registered with Query Agent
5. Query Agent walks tree to discover Path and Polls for state (10 sec interval)
6. Path and state info sent to vizualization app.
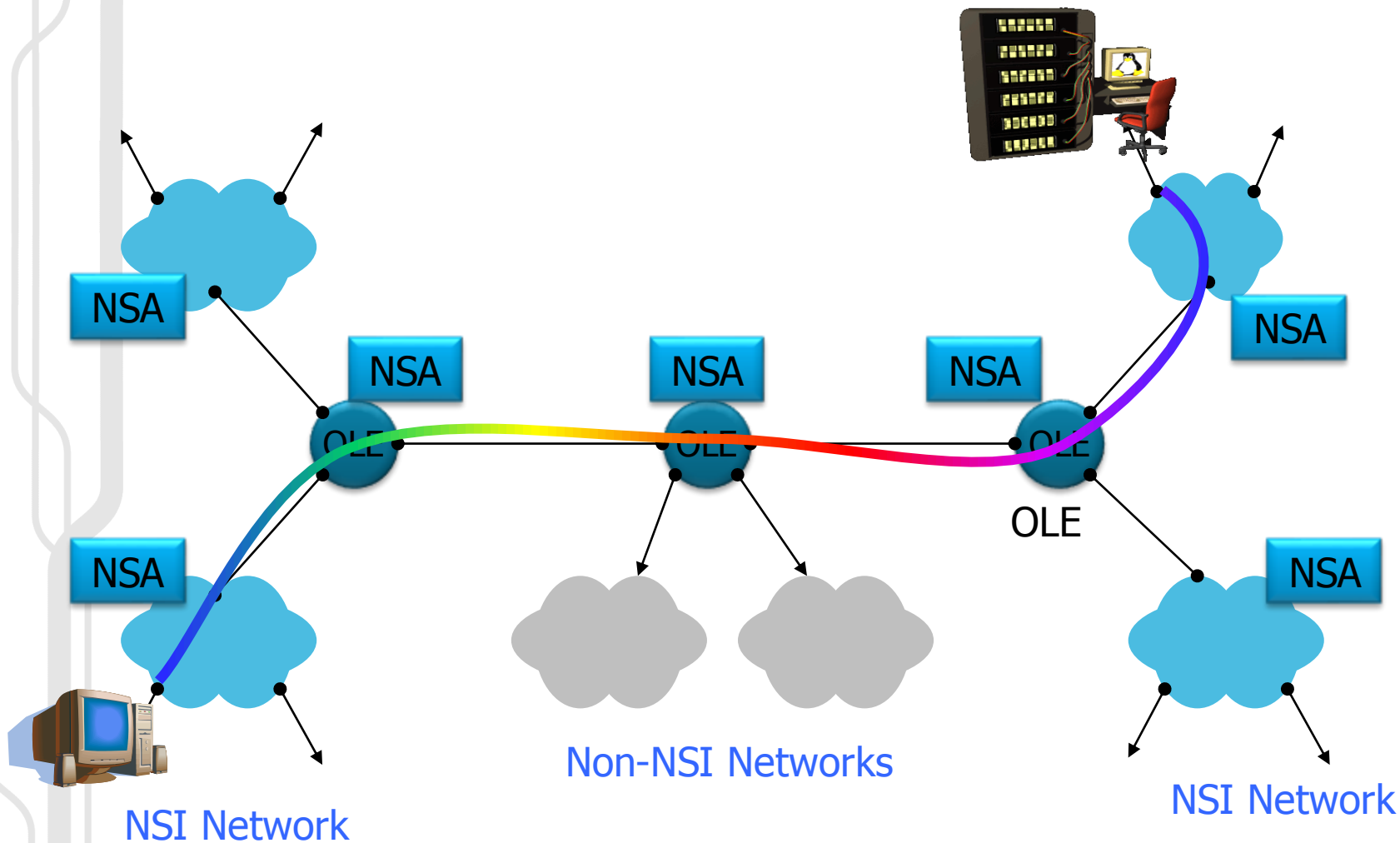7. Viz app renders realtime image

# Monitoring & visualization
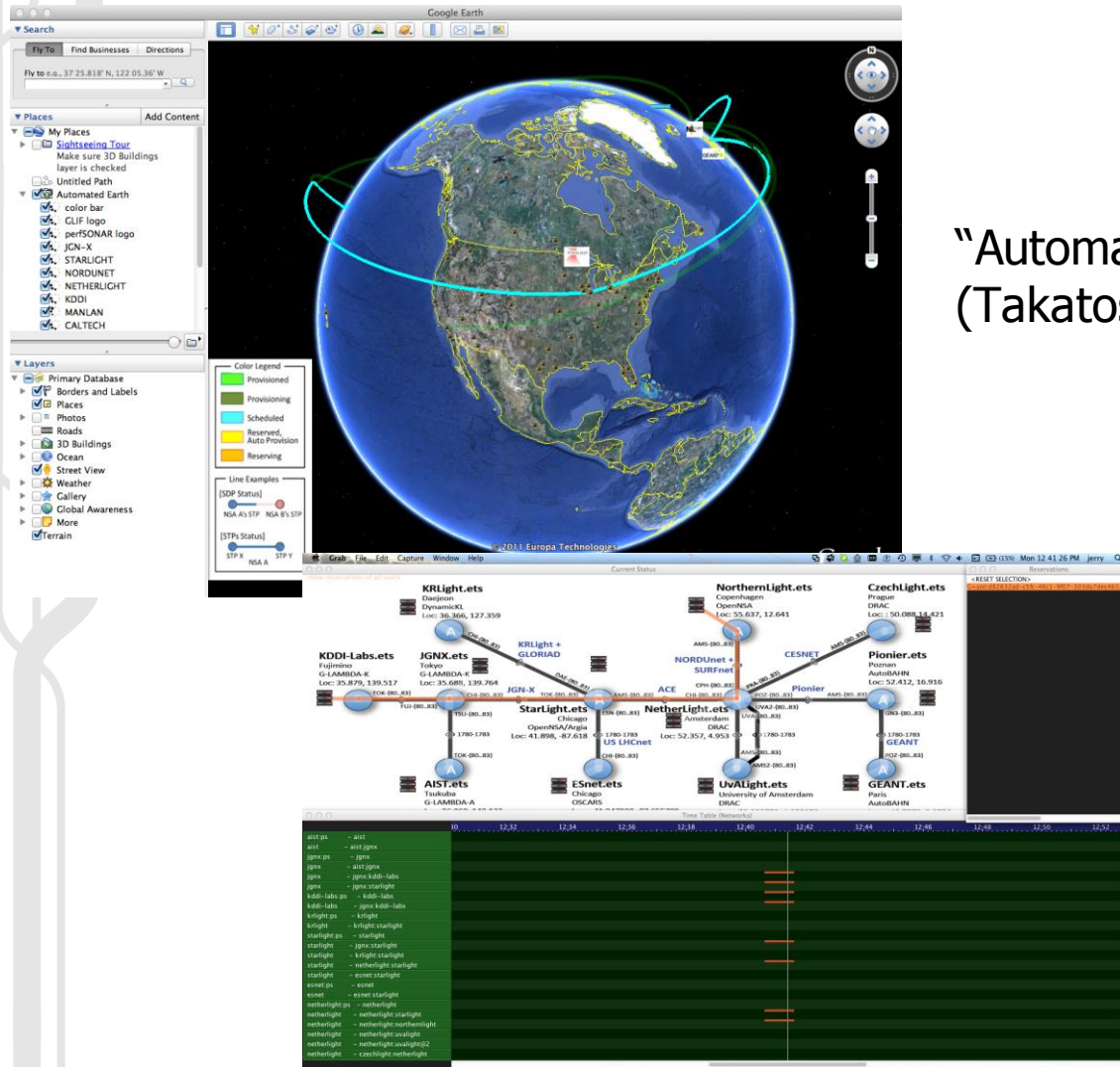


"Automated Earth" viz
(Takatoshi Ikeda, KDDI-Labs)

"NSI Monitor" viz
(Tomohiro Kudoh, AIST)

# Dynamic GOLE LHC Pilot

- Déjà vu
  - …but now we have the standards, an infrastructure, an engaged community, and a vision for dynamic lightpath exchanges

- Proposal
  - In parallel to the phase-1 effort…
  - Form a team representing
    - A few T1 / T2 / T3
    - A few key applications
    - Members of the Dynamic GOLE WG
  - Try it out

NSA

NSA

NSA

NSA

NSA

OLE

OLE

OLE

OLE

Non-NSI Networks

NSI Network

NSI Network

NSA

NSA

# **Issues to be considered**

- Capacity
  - Dynamic GOLE testbed – sufficient for testing connectivity, but need expansion for serious data
- Getting to the sites
  - The last-mile problem
- L3 integration
  - Announcing L3 connections on internal networks or to applications when dynamic lightpaths are provisioned
- Getting to the applications
  - Software stack
  - Do applications (and their users) want to know about networking?

# Wanna play?

## NSI + Dynamic OLE + LHCONE group
### Now open for membership
### Limited time exclusive offer