

SC08 Holland Avond

Next Generation Networks & eScience

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Hybrid Network Paradigm

- Capability to handle data transport on different OSI layers
- Most NREN's now offer end-to-end Lightpath services to their users
- Last 2 years tremendous progress in control plane implementations.
- Commercial Internet world has >20.000 WSS's (ECOC2008)
- Differentiating factor: put user in charge!



Quotes from OnVector 2008

prof. Ken-Ichi Sato:

- It is very difficult to predict future services, however, video is expected to be the king media used for bit rate demanding services. High-quality video technologies are rapidly advancing.
- TCP/IP bottleneck is becoming more and more tangible. It will limit the future envisaged network expansion -the energy bottleneck and throughput bottleneck need to be resolved.
- Fast optical circuit/path switching will play the key role to create cost effective and bandwidth abundant future networks.
- Hierarchical optical path network and the node technologies are very important, and hence they need to be fully developed soon.



Quotes from OnVector 2008

- dr. Kazuo Hagimoto:
- NTT is developing a system that automatically generates metadata such as title, summary, and key words that are extracted from voice or subtitles.

dr. Shimizu:

- Applications for Tbit networks:
 - High Resolution Simulation
 - Weather Forecast
 - Earthquake Forecast
 - City Planning
 - Digital Engineering
 - Nano Device Engineering
 - Protein Structural Analysis



Quotes from OnVector 2008

prof. Larry Smarr:

- Interconnecting Regional Optical Networks
Is Driving Campus Optical Infrastructure Deployment

prof. Ed Seidel:

- Petascale computing will not only provide huge data, but will demand new computing modalities
- Will place new demands on networking, data management, visualization, resource co- allocation
- Applications need to be configurable for the new type of infrastructure, need to be aware of environment
- If we don't solve these problems, people will use machines anyway, but science will suffer!

Bill s'Arnaud:

- “Optical networks (as opposed to electronic routed networks) have much smaller carbon footprint”



Sensor grid: instrumenting the dikes

First controlled breach occurred on sept 27th '08:



- 30000 sensors (microphones) to cover Dutch dikes
- focus on problem area when breach is to occur



Mathematica enables advanced graph queries, visualizations and real-time network manipulations on UPVNs

Topology matters can be dealt with algorithmically

Results can be persisted using a transaction service built in UPVN

Initialization and BFS discovery of NEs

```
Needs["WebServices`"]
<<DiscreteMath`Combinatorica`
<<DiscreteMath`GraphPlot`
InitNetworkTopologyService["edge.ict.tno.nl"]
```

Available methods:

```
{DiscoverNetworkElements, GetLinkBandwidth, GetAllIpLinks, Remote,
NetworkTokenTransaction}
```

```
Global`upvnverbose = True;
```

```
AbsoluteTiming[nes = BFSDiscover["139.63.145.94"];][[1]]
```

```
AbsoluteTiming[result = BFSDiscoverLinks["139.63.145.94", nes];][[1]]
```

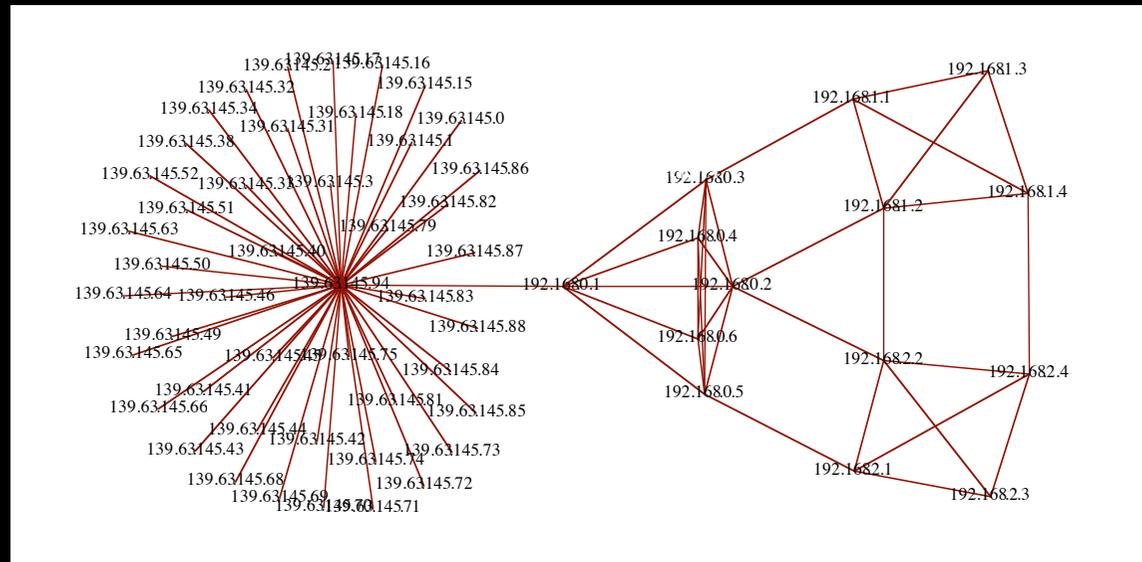
Getting neighbours of: 139.63.145.94

Internal links: {192.168.0.1, 139.63.145.94}

(...)

Getting neighbours of: 192.168.2.3

Internal links: {192.168.2.3}



Transaction on shortest path with tokens

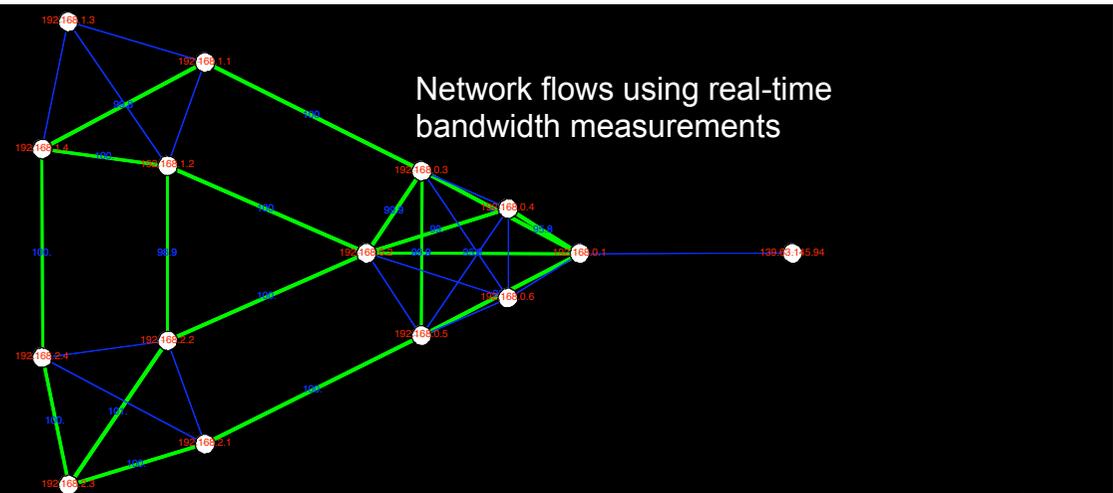
```
nodePath = ConvertIndicesToNodes[
  ShortestPath[ g,
    Node2Index[nids, "192.168.3.4"],
    Node2Index[nids, "139.63.77.49"],
    nids];
```

```
Print["Path: ", nodePath];
If[NetworkTokenTransaction[nodePath, "green"]==True,
  Print["Committed"], Print["Transaction failed!"]];
```

Path:

```
{192.168.3.4, 192.168.3.1, 139.63.77.30, 139.63.77.49}
```

Committed



ref: Robert J. Meijer, Rudolf J. Strijkers, Leon Gommans, Cees de Laat, User Programmable Virtualized Networks, accepted for publication to the IEEE e-Science 2006 conference Amsterdam.

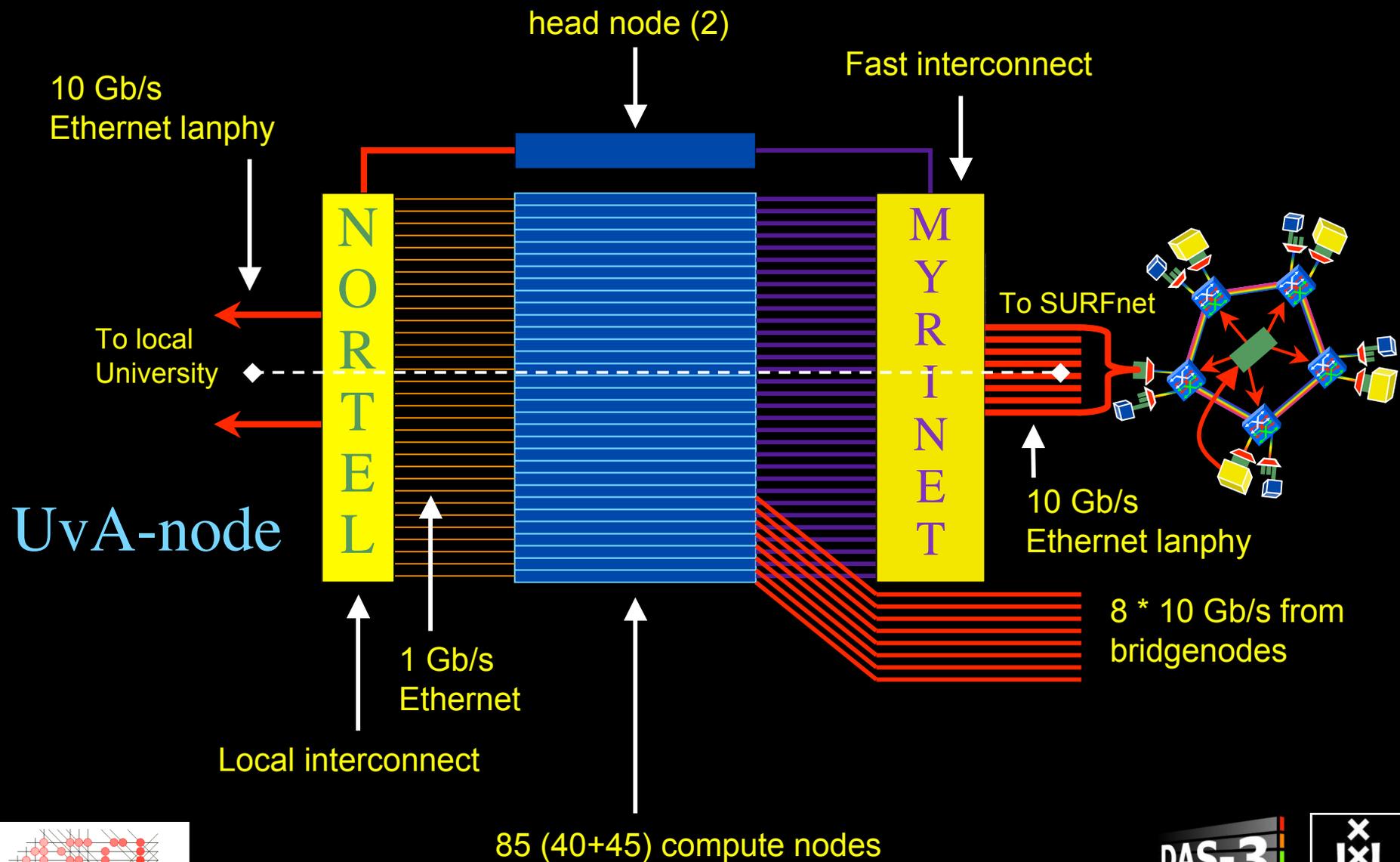
StarPlane



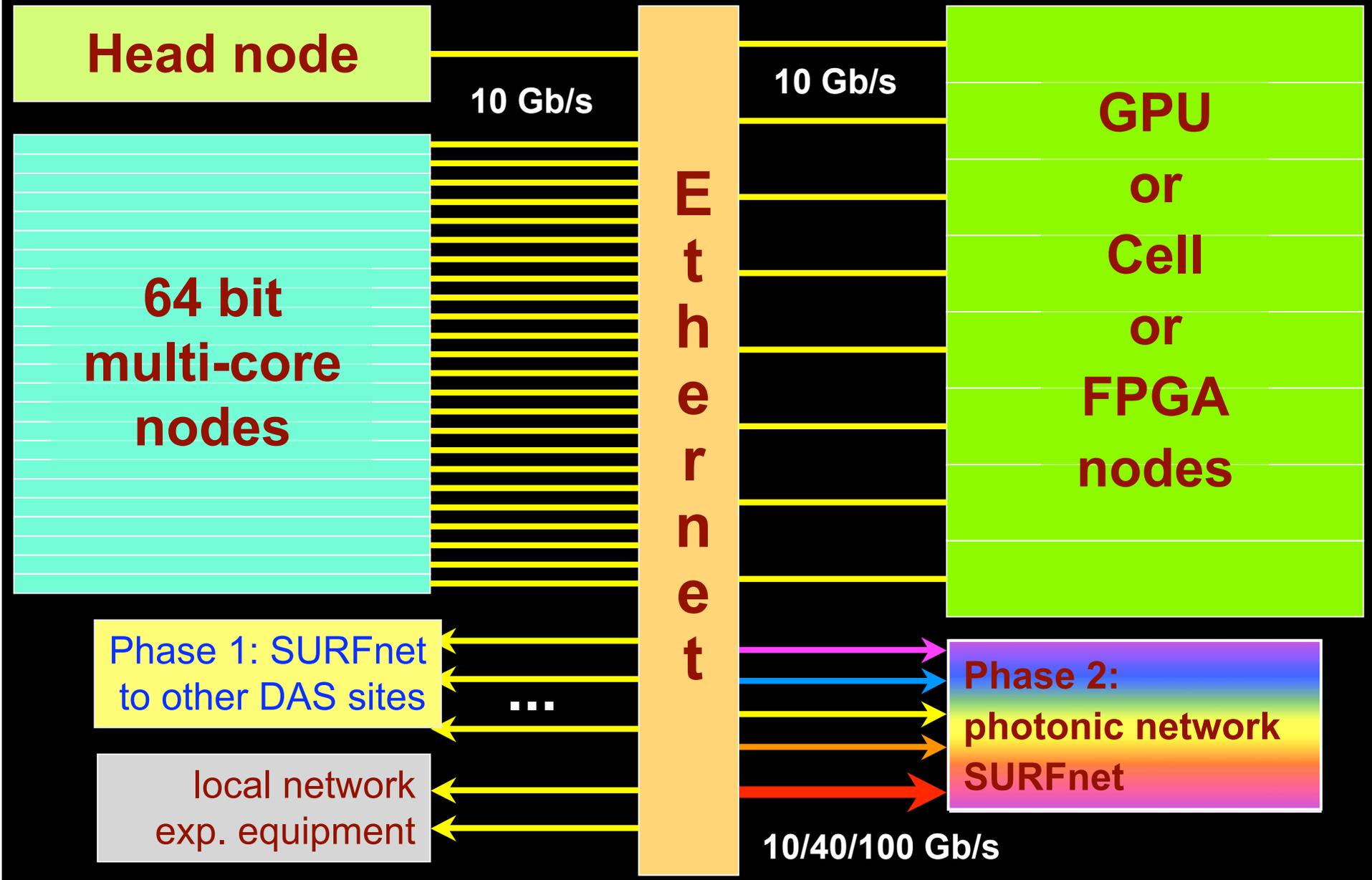
TouchTable Demonstration @ SC08



DAS-3 Cluster Architecture

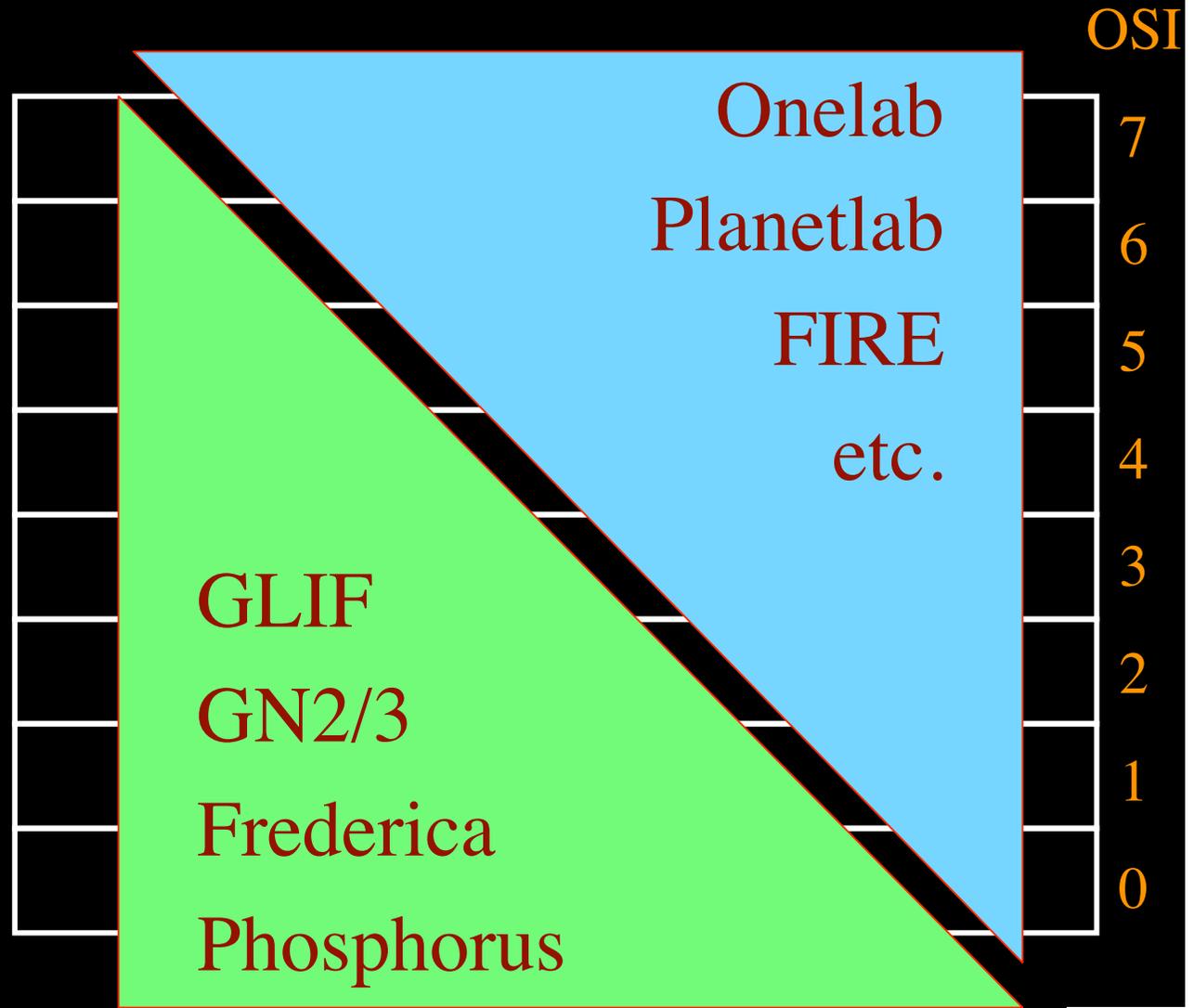


DAS-4 Proposed Architecture



My view

- needs repeatable experiment
- needs QoS & lightpaths
- needs capacity and capability
- needs infrastructure descriptions



**Biomarkers en
liganden**

Biobanking

**Fundamenteel
onderzoek der
materie**

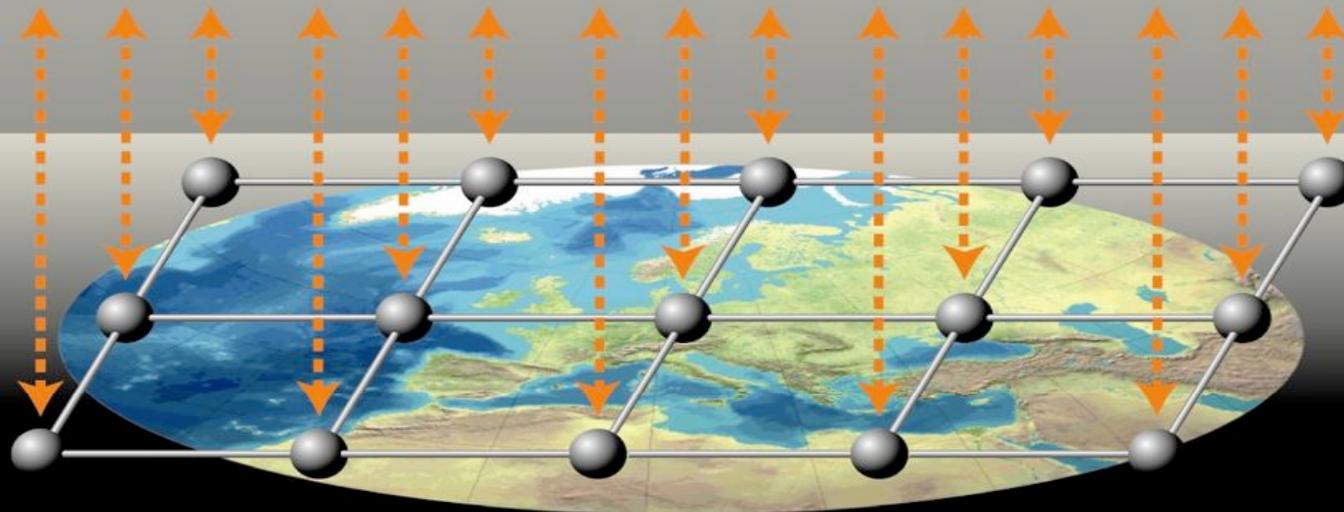
**Virtuele
Kennis Studio**

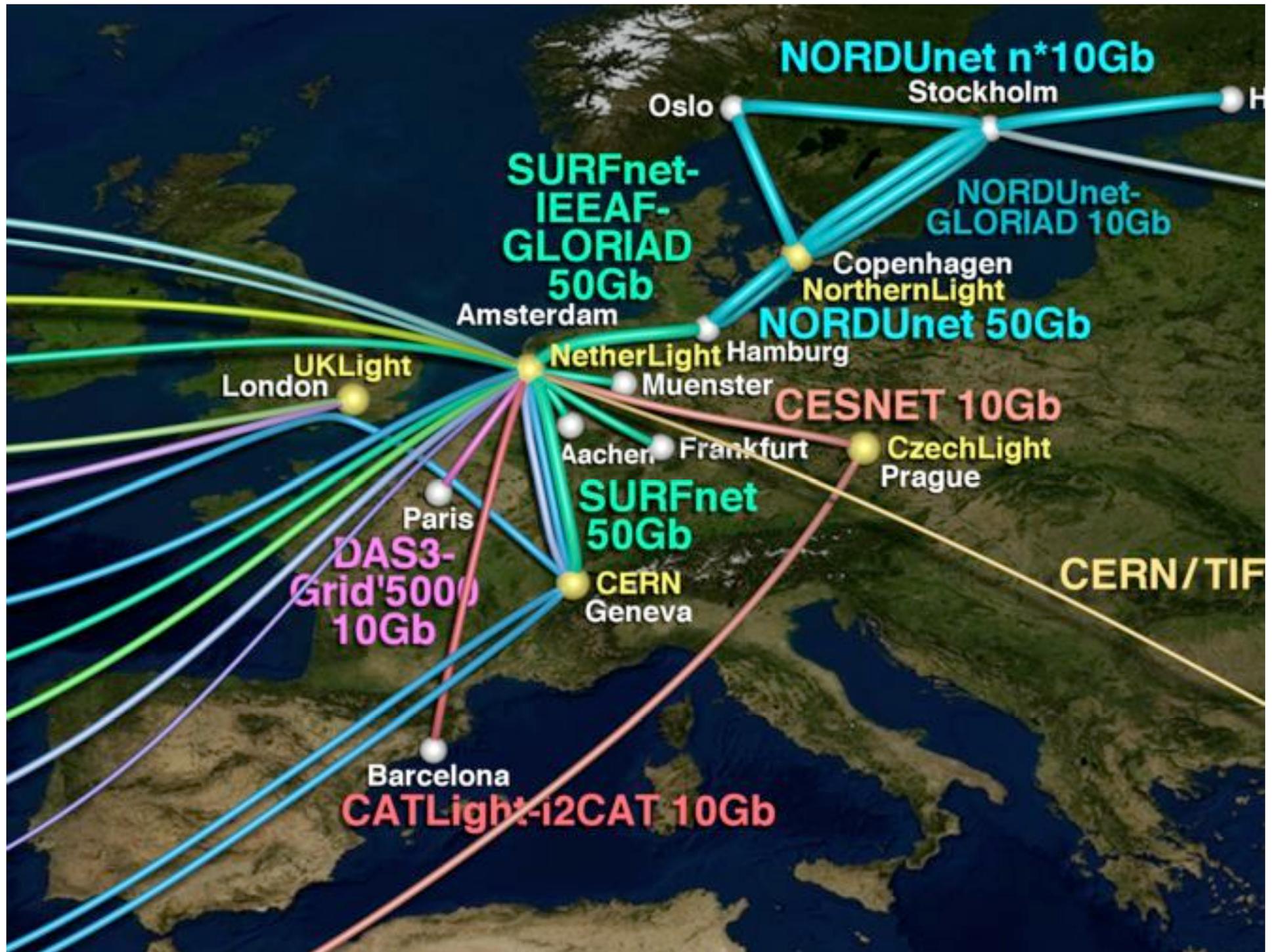
**Cognitie
wetenschap**

**Water- en
luchtvervuiling**

**Virtueel Laboratorium
(generieke e-Science services)**

**High Performance Distributed Computing,
web en grid**





VIZ



Management

Backup

DATA

Mining

Media

Web2.0

Visualisation



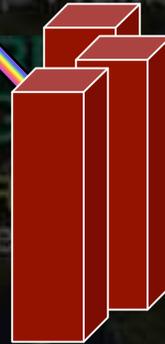
Security

Meta

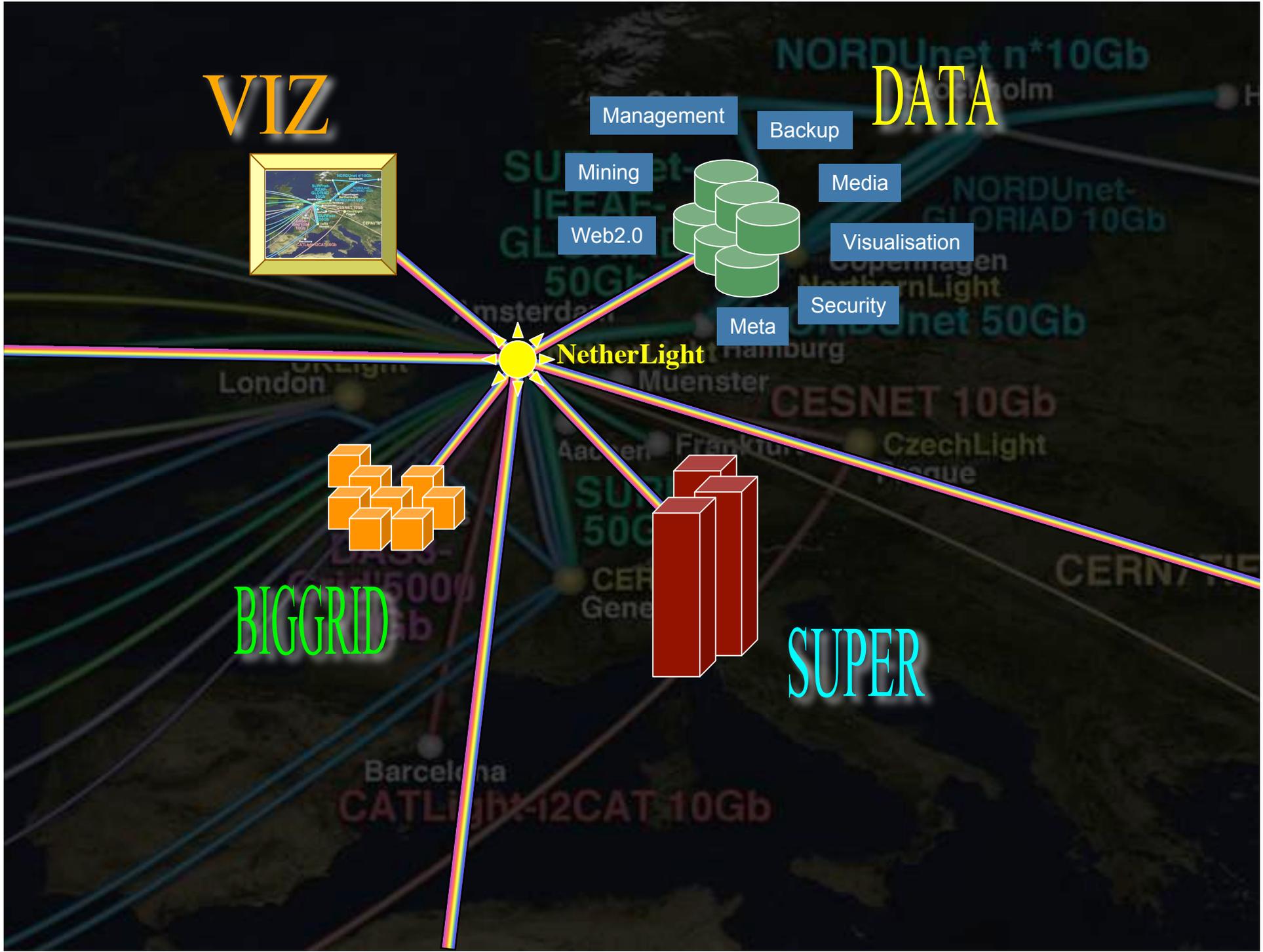
NetherLight



BIGGRID



SUPER



Themes for next years

- 40 and 100 gbit/s
- Network modeling and simulation
- Cross domain Alien Light switching
- Green-Light
- Network and infrastructure descriptions & WEB2.0
- Reasoning about services
- Cloud Data - Computing
- Web Services based Authorization
- Network Services Interface (N-S and E-W)
- Fault tolerance, Fault isolation, monitoring
- eScience integrated services
- Data and Media specific services

Questions ?