

SC09 Holland Avond

The Power of Change!

Cees de Laat

University of Amsterdam

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

Alien light From idea to realisation!

40Gb/s alien wavelength transmission via a multi-vendor 10Gb/s DWDM infrastructure



Alien wavelength advantages

- Direct connection of customer equipment^[1] → cost savings
- Avoid OEO regeneration → power savings
- Faster time to service^[2] → time savings
- Support of different modulation formats^[3] → extend network lifetime

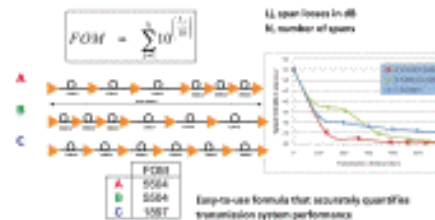
Alien wavelength challenges

- Complex end-to-end optical path engineering in terms of linear (i.e. OSNR, dispersion) and non-linear (FWM, SPM, XPM, Raman) transmission effects for different modulation formats.
- Complex interoperability testing.
- End-to-end monitoring, fault isolation and resolution.
- End-to-end service activation.

In this demonstration we will investigate the performance of a 40Gb/s PM-QPSK alien wavelength installed on a 10Gb/s DWDM infrastructure.

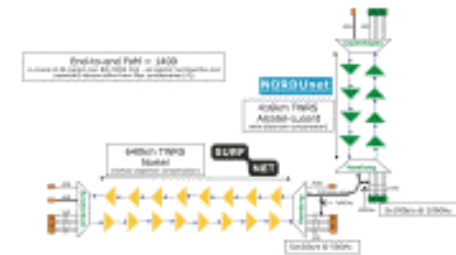
New method to present fiber link quality, FoM (Figure of Merit)

In order to quantify optical link grade, we propose a new method of representing system quality: the FOM (Figure of Merit) for concatenated fiber spans.

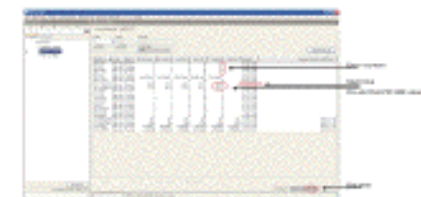


Transmission system setup

JOINT SURFnet/NORDUnet 40Gb/s PM-QPSK alien wavelength DEMONSTRATION.



Test results



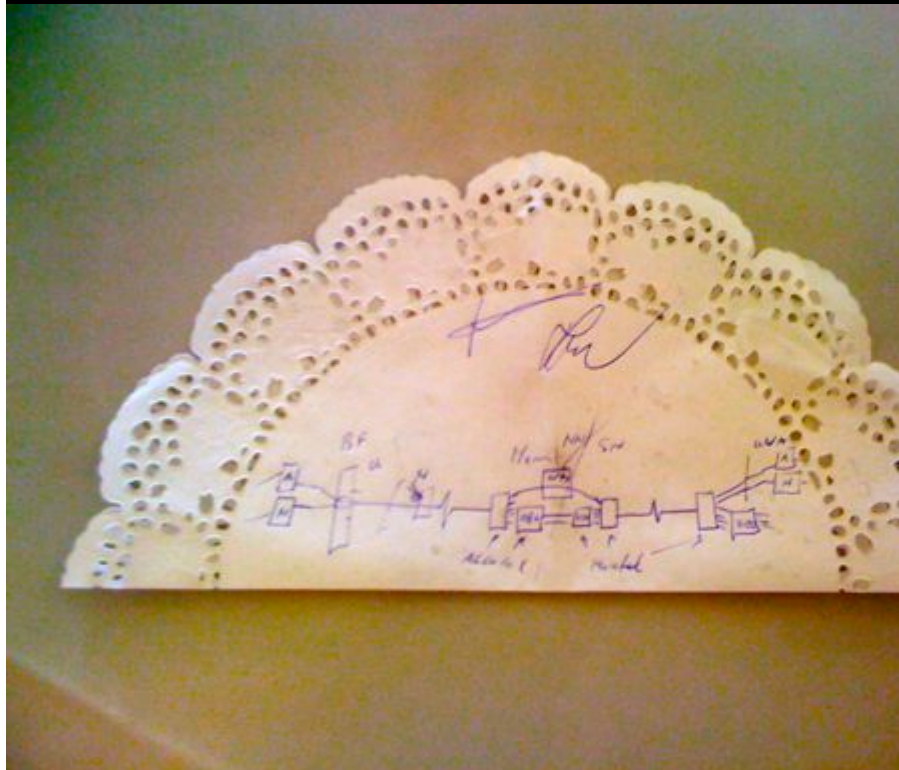
Error-free transmission for 23 hours, 17 minutes → BER < 3.0 · 10⁻¹⁵

Conclusions

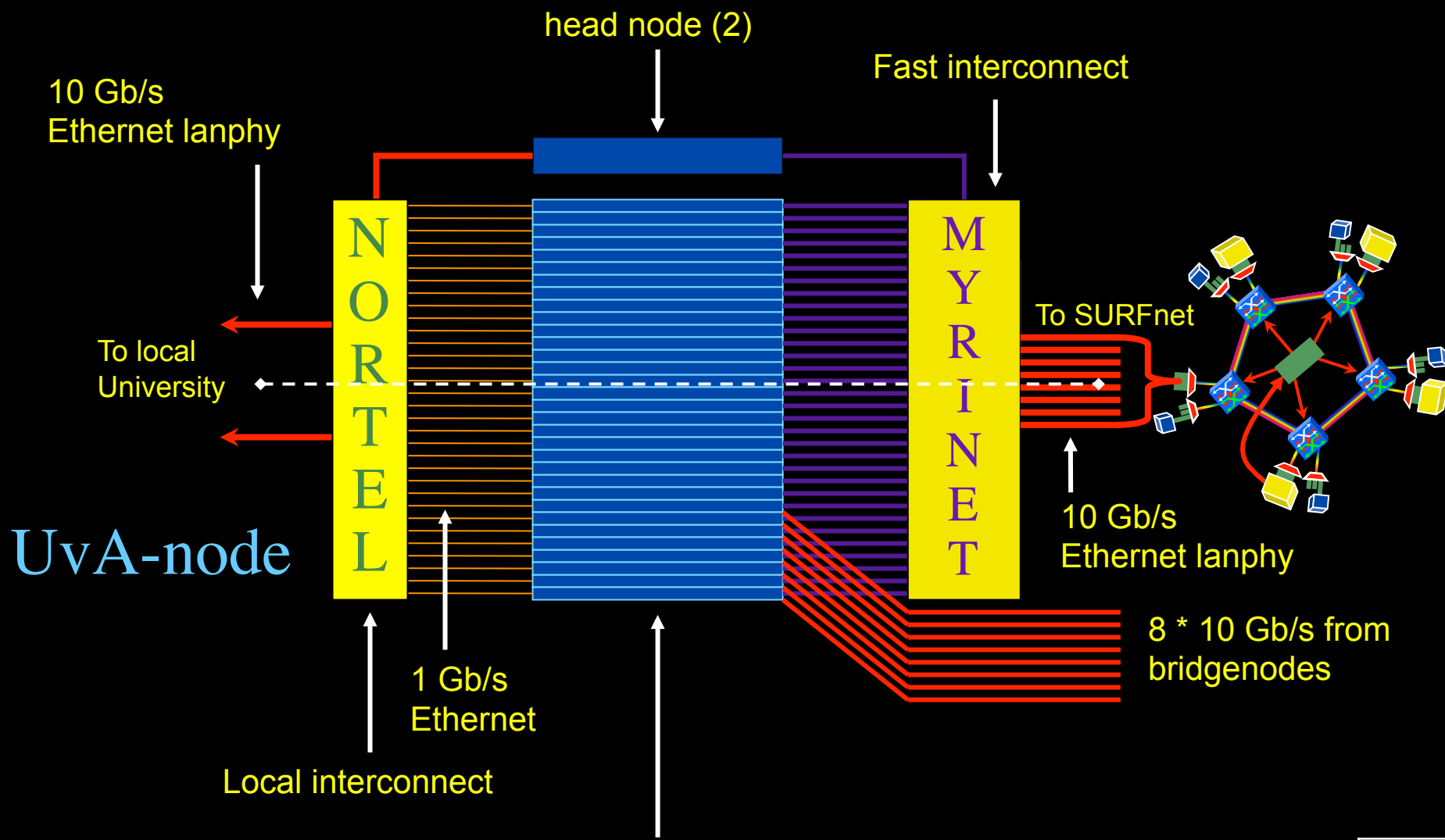
- We have investigated experimentally the all-optical transmission of a 40Gb/s PM-QPSK alien wavelength via a concatenated native and third party DWDM system that both were carrying live 10Gb/s wavelengths.
- The end-to-end transmission system consisted of 1056 km of TWRS (TrueWave Reduced Slope) transmission fiber.
- We demonstrated error-free transmission (i.e. BER below 10⁻¹⁵) during a 23 hour period.
- More detailed system performance analysis will be presented in an upcoming paper.



REFERENCES
ACKNOWLEDGMENTS



DAS-3 Cluster Architecture

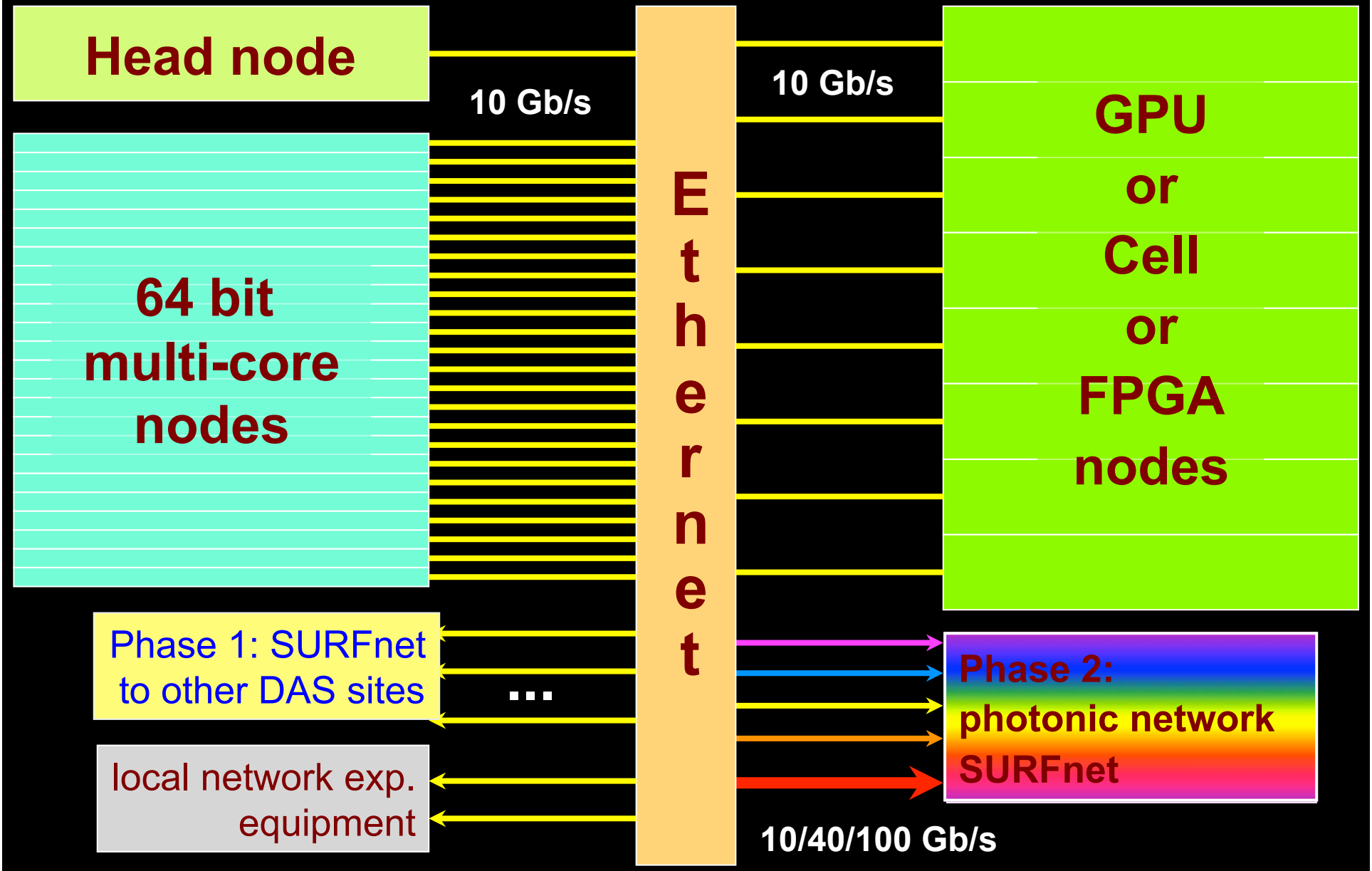


Power is a big issue

- UvA cluster uses (max) 30 kWh
- 1 kWh ~ 0.1 €
- per year -> 26 k€/y
- add cooling 50% -> 39 k€/y
- Emergency power system -> 60 k€/y
- over 4 year = 240 kEuro for a 500 kEuro set.
- per rack 15 kWh is now normal
- **YOU BURN HALF THE CLUSTER OVER ITS LIFETIME!**

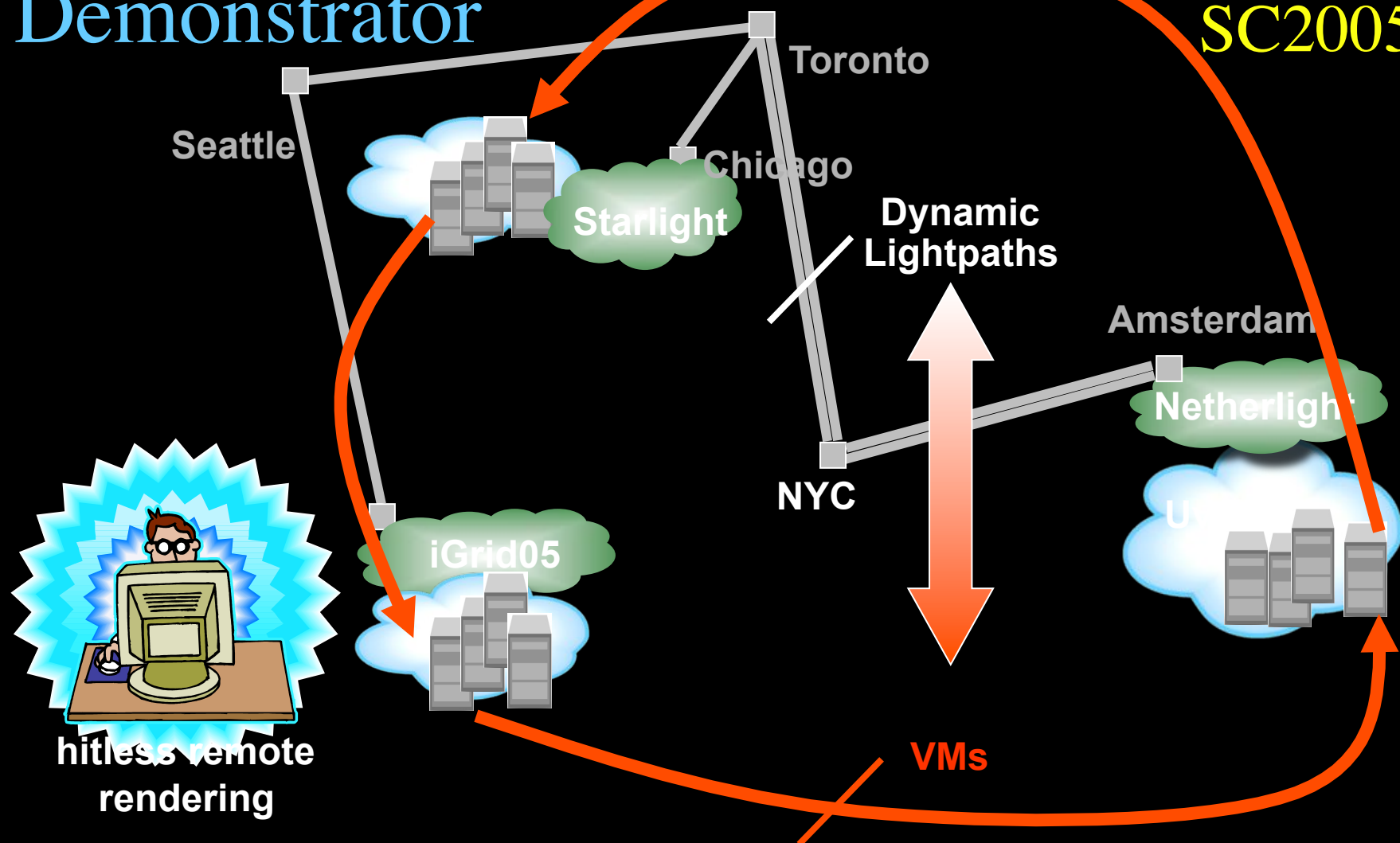


DAS-4 Proposed Architecture



The VM Turntable Demonstrator

iGrid2005
SC2005



The VMs that are live-migrated run an iterative search-refine-search workflow against data stored in different databases at the various locations. A user in San Diego gets hitless rendering of search progress as VMs spin around



GLIF 2008

**Visualization courtesy of Bob Patterson, NCSA
Data collection by Maxine Brown.**

CosmoGrid

Supercomputing Grid across Continents and Oceans

And yes,
it works!


Application

We designed a novel MPI to manage the long distance network latency in the CosmoGrid project. This is a large-scale cosmological project whose primary goal is to perform a full matter distribution using supercomputers in the CosmoGrid.

In this presentation, we use the CosmoGrid 1.0 full three-body model to illustrate the full matter distribution using a single over-parallelized MPI across multiple sites. The MPI is designed to be a distributed MPI architecture across different sites after each iteration. This architecture reduces the network latency of 2000-3000 sites.

The CosmoGrid 1.0 full three-body model is a single MPI application, it is not a distributed MPI application in different sites.


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Motivation

We use MPI to manage the long distance network latency in the CosmoGrid project. This is a large-scale cosmological project whose primary goal is to perform a full matter distribution using supercomputers in the CosmoGrid. This architecture reduces the network latency of 2000-3000 sites.

The CosmoGrid 1.0 full three-body model is a single MPI application, it is not a distributed MPI application in different sites.

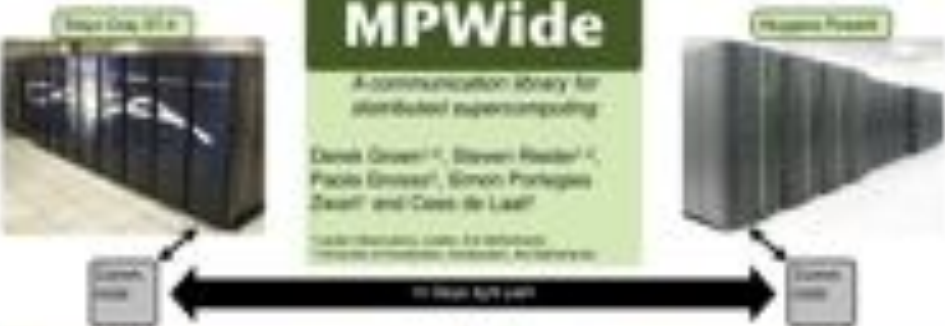


MPWide

A communication library for distributed supercomputing


David Green†, Steven Rieder†, Paolo Grassi†, Simon Porteus†, Geoff and Cass de Laiff†

† Perseus Digital Publishing, 2008




Benchmarks

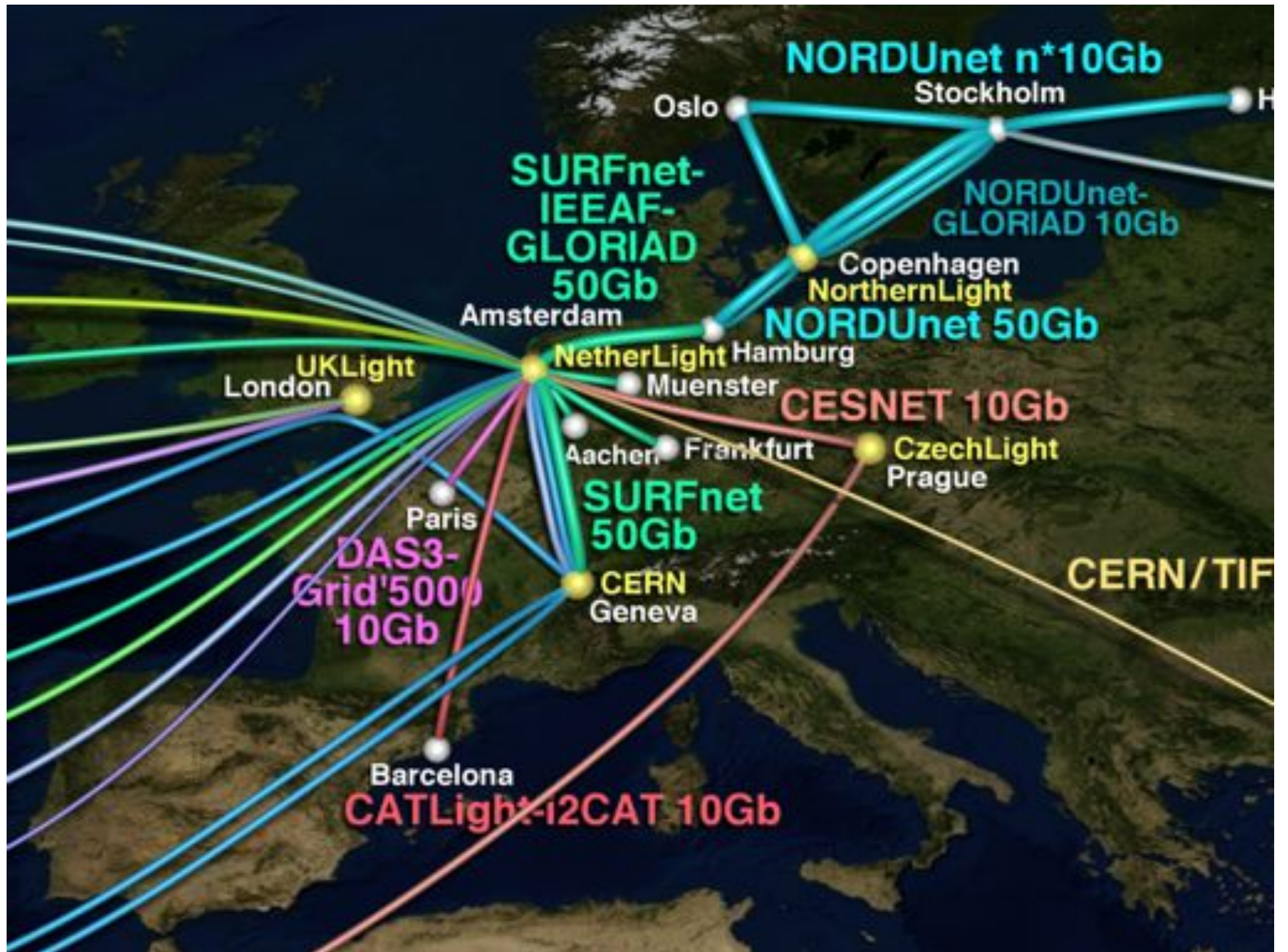
We measured the performance of MPI in the CosmoGrid project. This is a large-scale cosmological project whose primary goal is to perform a full matter distribution using supercomputers in the CosmoGrid. This architecture reduces the network latency of 2000-3000 sites.



Related work and future

The MPI architecture that we used in the CosmoGrid project is a distributed MPI application. This architecture reduces the network latency of 2000-3000 sites.





• VIZ



• DATA

Management

Backup

Mining

Media

Web2.0

Visualisation



Security

Meta

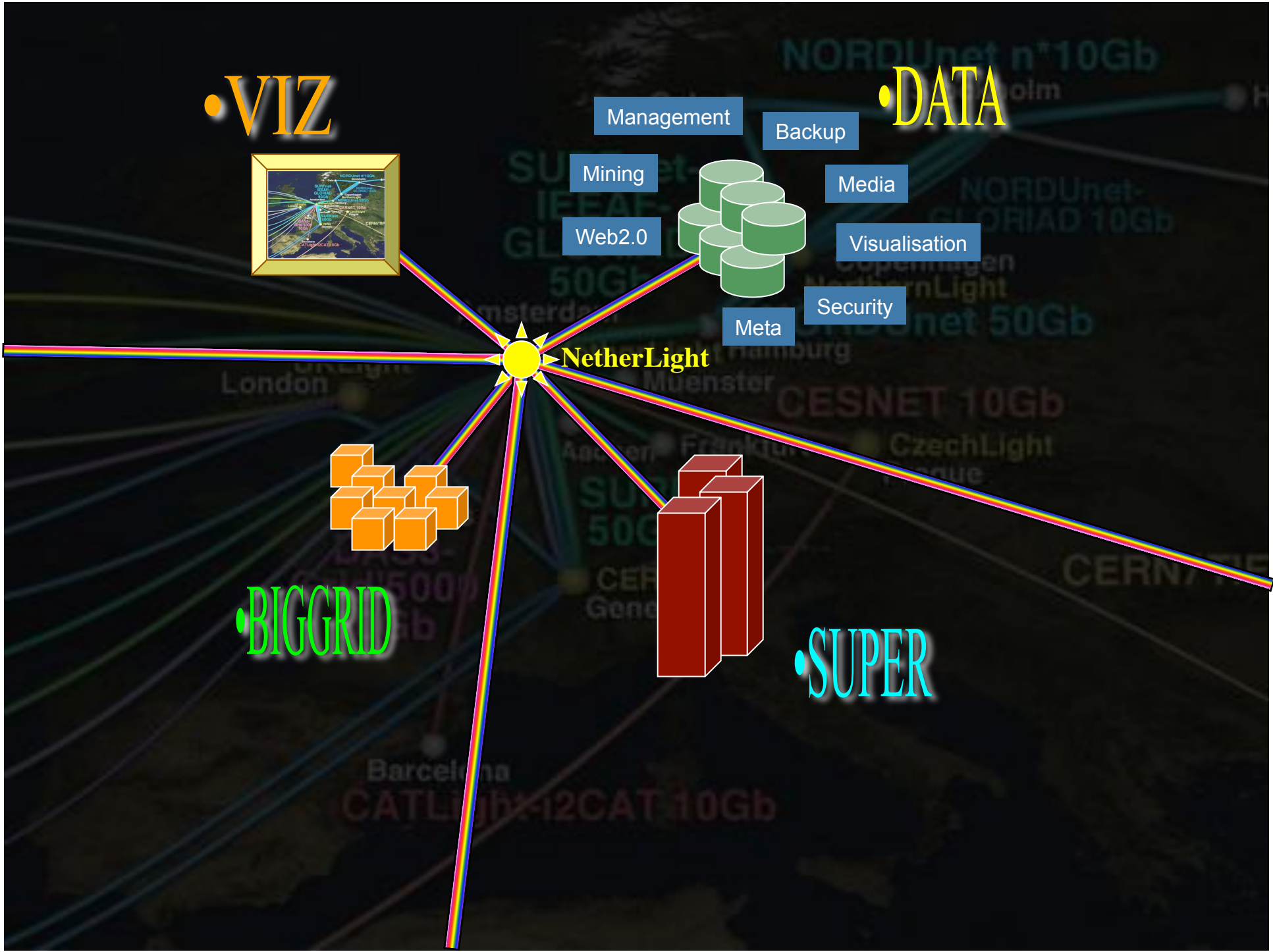
NetherLight



• BIGGRID

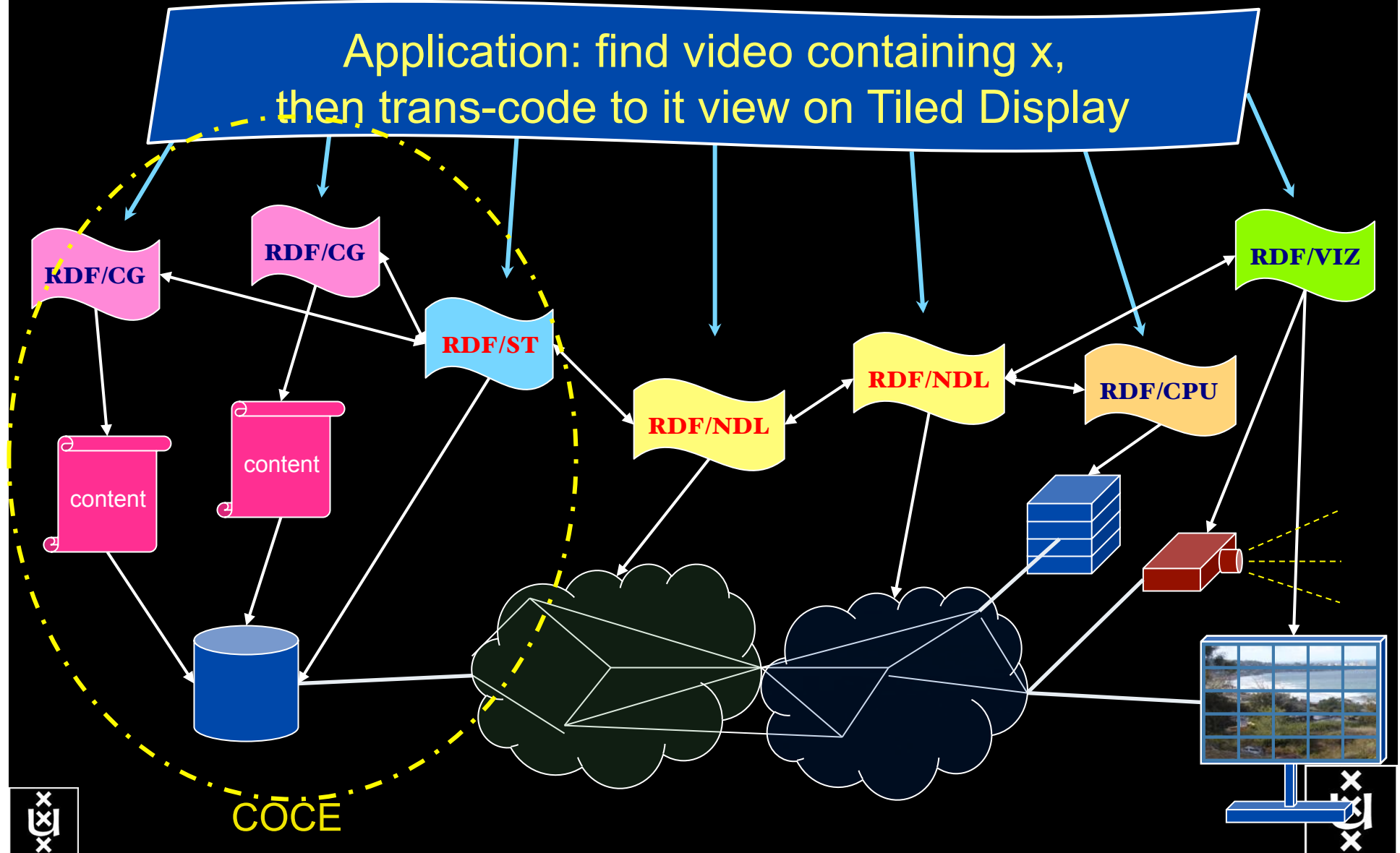


• SUPER



RDF describing Infrastructure “I want”

Application: find video containing x,
then trans-code to it view on Tiled Display



Applications and Networks become aware of each other!

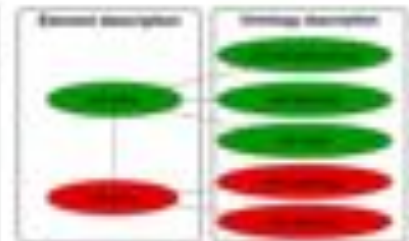
CineGrid Description Language

CineGrid is an initiative to facilitate the exchange, storage and display of high-quality digital media.

The CineGrid Description Language (CDL) describes CineGrid resources. Streaming, display and storage components are organized in a hierarchical way.

CDL has bindings to the NDL ontology that enables descriptions of network components and their interconnections.

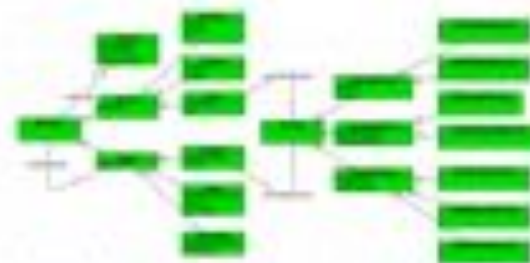
With CDL, we can reason on the CineGrid infrastructure and its services.



SQL is used to query the Ontology.



UML representation of CDL



CDL links to NDL using the *owl:isA* property. CDL defines the services, NDL the network interfaces and links. The combination of the two ontologies identifies the host pairs that support matching services via existing network connections.



Interactive programmable networks



SCARIE Programmable networks to distribute work

Network Control in Distributed Computing

The poster is titled "Network Control in Distributed Computing" and features several key elements:

- Top Left:** A diagram showing a network topology with nodes and connections.
- Top Right:** A blue text box with text describing network control concepts.
- Middle Left:** A blue text box with text describing network control concepts.
- Middle Right:** A diagram showing a network topology with nodes and connections.
- Center:** A central diagram showing a network topology with nodes and connections, labeled "SCARIE".
- Bottom Left:** A diagram showing a network topology with nodes and connections.
- Bottom Center:** A graph showing network performance metrics over time.
- Bottom Right:** A red text box with text describing network control concepts.

Logos at the bottom include the University of Southampton, JIVE, and other partners.

Last Thoughts

- Energy consumption is the main issue
- Cloud Computing as solution
- We did Hybrid networking
 - now hybrid computing, what else?
- Network photonics developments

The Power of Change?

OR

The Change of Power!

sc09.delaat.net

Questions ?



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