

GigaPort

SURFnet 6 NetherLight and GLIF

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Questnet/APAN Cairns Australia, July 5th, 2004

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GigaPort

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- Provides the Dutch National Research Network
- Not for profit company, 50 employees
- 100% subsidiary of Stichting SURF
- 150 connected organizations, 750,000 users
- Turnover (2003): 30 million Euro
- Infrastructure services:
 - innovation paid for by government
 - cost effective exploitation for higher education and research

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- Research networking is innovation engine between research and market introduction of new services

– GigaPort (1999-2003):

- government grant: 70 million Euro
- Partnership with industry

– GigaPort Next Generation Network (2004-2008):

- consortium of 50 organizations
- government grant 40 million Euro
- Partnership with industry

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A bit of history

- 1972 First public demonstration of ARPANET
- 1982 Start of Eunet/UUCP via 9.6 Kbit/s dial up links
- 1992 Start of Ebone/native IP 256 Kbps
- 2002 Start of Lambda Networking 10 Gbit/s
- 2012 ???

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- Partners BT and Cisco
- 15 PoPs connected by thirty 10 Gbit/s lambdas
- Dual stack IPv4 and IPv6 since 2001
- More than 120 institutes connected at Gbit/s level
- 750,000 users

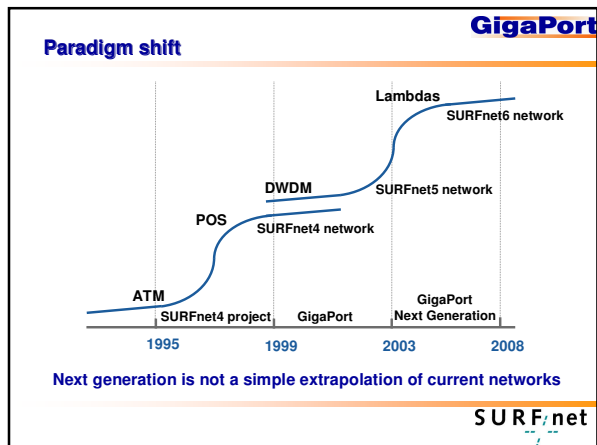
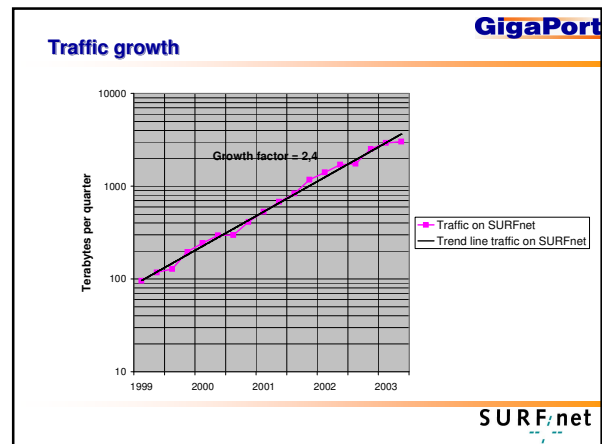
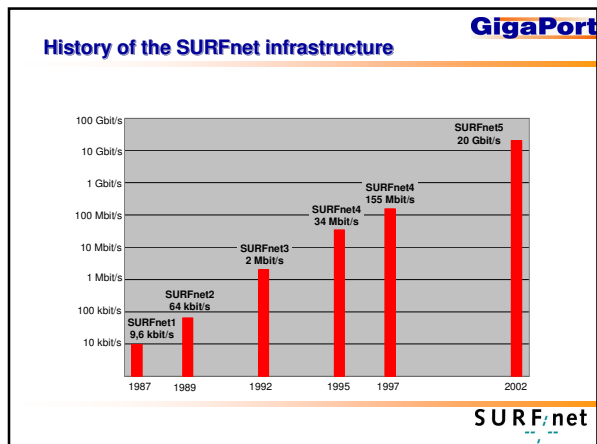
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GigaPort results (1999 - 2004)

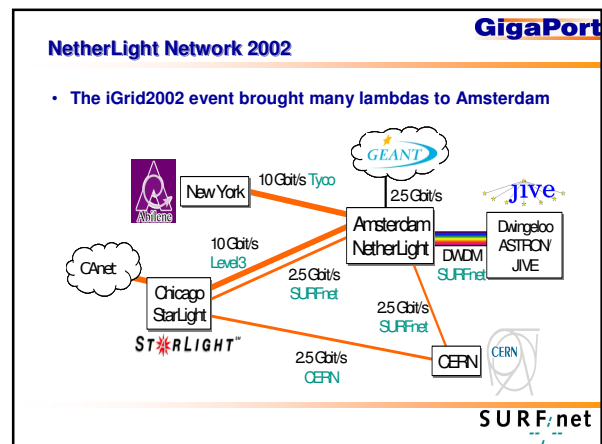
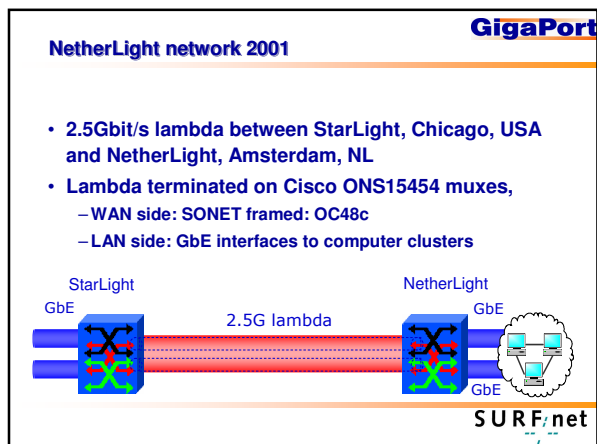
- SURFnet5 10 Gbit/s lambda based network up and running since mid 2001
- Fiber to the dormitories 20,000 students via 10/100 Mbit/s switched Ethernet
- GigaMAN development of market for managed dark fiber
- Access pilots mobility and middleware
- NetherLight international testbed for lambda networking
- Playground for new applications

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NetherLight

- Optical Internet exchange point in Amsterdam
- Built and operated by SURFnet
- Experiments with light path provisioning in a multi domain environment
- First Lambda Workshop in September 2001 in Amsterdam



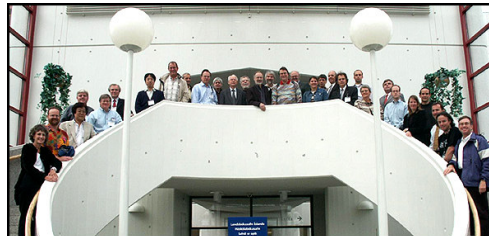
GLIF

- At the 3rd Lambda Workshop in Reykjavik in August 2003 with 33 participants from Europe, Asia and North America it was agreed to continue under the name:

GLIF: Global Lambda Integrated Facility

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GLIF Founding Members



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GLIF Website



Global Lambda Integrated Facility

[about](#) [meetings](#) [working groups](#) [publications](#) [members](#)

<http://www.glif.is>

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GLIF, Global Lambda Integrated Facility

- GLIF is a collaborative initiative among worldwide NRENs, consortia and institutions with lambdas
- GLIF is a world-scale Lambda-based Laboratory for application and middleware development
- GLIF will be managed as a cooperative activity

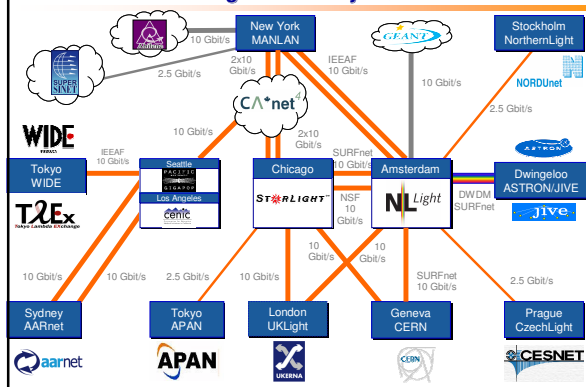
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GLIF vision

- To build a new grid-computing paradigm, in which the central architectural element is optical networks, not computers, to support this decade's most demanding e-science applications.
- It is no longer sufficient to connect researchers to the internet, they have to be connected to each other.

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Global Lambda Integrated Facility 3Q2004



VLBI at JIVE in Dwingeloo, NL today

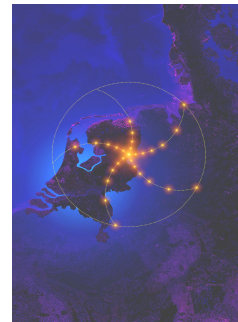
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Lambdas as part of instruments

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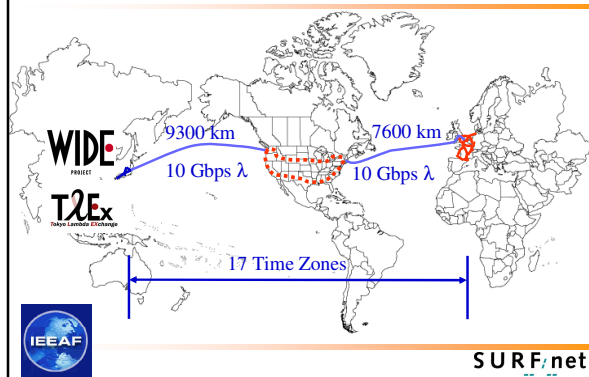


www.lofar.org

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IEEAF Global Quilt initiative

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IEEAF 7000 km dark fiber pair

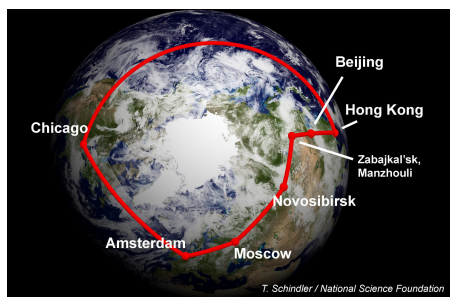
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GLIF 4th Annual Workshop

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- The GLIF 4th Annual Global LambdaGrid Workshop will be held in Nottingham, United Kingdom on September 3, 2004
- The GLIF Workshop is being co-located with the UK e-Science All Hands Meeting, to be held 1-3 September in Nottingham, UK
- Workshop organizers: Cees de Laat, University of Amsterdam and Maxine Brown, University of Illinois Chicago
- Workshop hosts: Peter Clarke of University College London and David Salmon of UKERNA

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Agenda 4th Annual Workshop

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- GLIF Governance and policy
- GLIF Lambda infrastructure and Lambda exchange implementations
- Persistent Applications
- Control plane and grid integration middleware

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GLIF 5th Annual Workshop

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- The GLIF 5th Annual Global LambdaGrid Workshop will be held in September 2005 in conjunction with iGrid 2005 meeting in the new UCSD Cal-(IT)² building in San Diego, California, USA,

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Why Lambda Services?

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- Lambdas form an excellent basis for IP networking
- Researchers are interested in lambdas
- Provides excellent quality on point to point connections at very high speed
- Protects the routed network
- Enables demanding applications to make use of the infrastructure in an economically sound way

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Light Path characteristics

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- A Light Path has the following characteristics:
 - No packet re-ordering
 - No jitter
 - No drops due to congestion
 - Known end points
- A Light Path that can therefore:
 - Bypass firewalls between trusted parties
 - Enables the use of alternate network or transport protocols

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What did we learn

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- Point to point lambdas are a powerful service
- Current Optical-Electrical-Optical equipment can allocate sub-lambdas to individual applications
- Management is still cumbersome

Hybrid network architecture seems to be the only valuable NREN option for the future:

- Packet switched internet for regular many-to-many usage
- Light Paths for new high speed few-to-few usage

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SURFnet6 Design Choices

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- Keep it Simple
- Provide connectivity at the lowest available OSI layer

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SURFnet6 overview

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• Realization of a next generation hybrid network with seamless end-to-end communication:

- Based on customer-owned managed dark fiber
- IP Services and Lambda Services over a single transmission infrastructure, managed via a single control plane
- Multi-domain networking
- Ethernet services as part of the WANs
- Intelligence of networks and the associated responsibilities at the edges

• Paving the way to a ubiquitous and scalable Services Grid

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SURFnet's new Industry Partners (2004-2010)

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NORTEL
NETWORKS™

- Optical equipment
- Ethernet equipment
- Network management equipment

AVICI
SYSTEMS

- Routing equipment

TELINDUS

- Installation services
- Maintenance services

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SURFnet6 will be based on dark fiber

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- Over 4000 km fiber pairs available today; average price paid for 15 year IRUs: 7 EUR/meter per pair
- Managed dark fiber infrastructure will be extended with new routes, approx. 1000 km more to be ready for SURFnet6

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Nortel Networks Common Photonic Layer

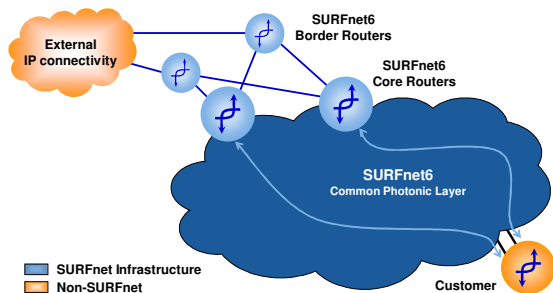
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- Modular architecture for end to end networking
- Automatic continuous dynamic system optimization
- Management on a per wavelength granularity
- Remotely configurable
- Flexible optical add/drop without OEO conversion

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IP service provisioning model

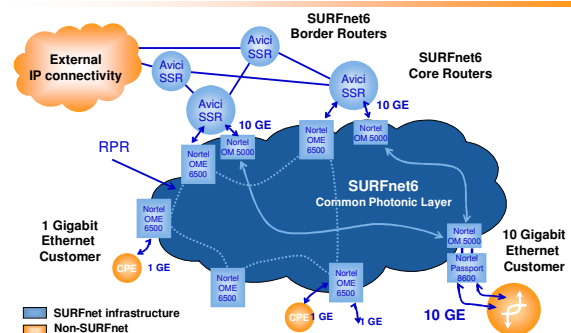
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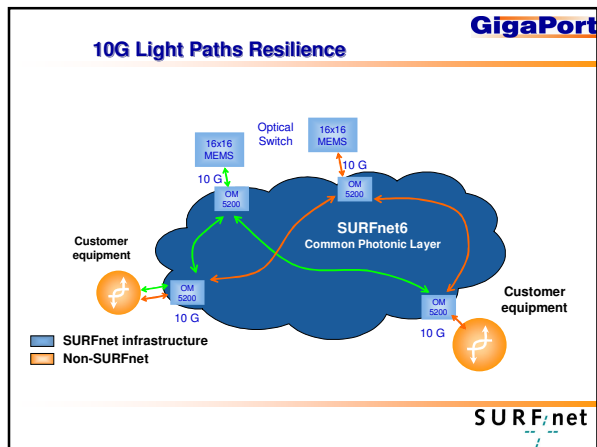
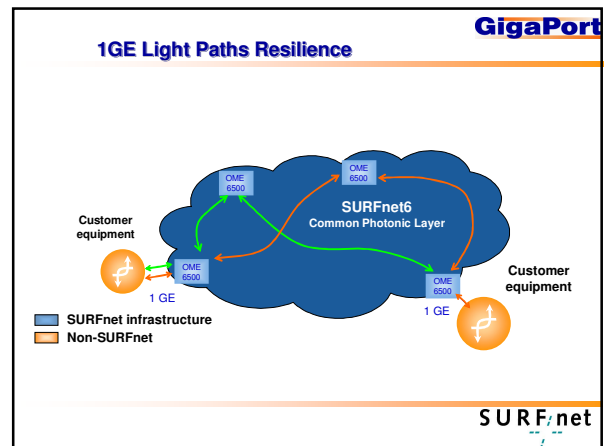
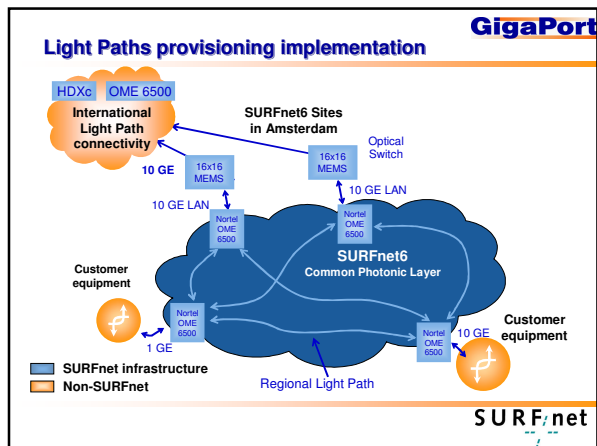
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IP network implementation

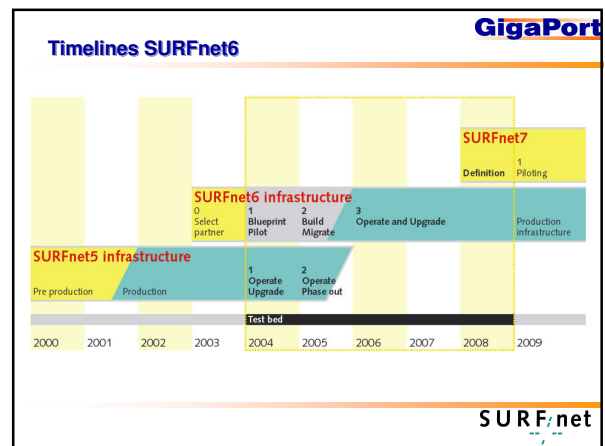
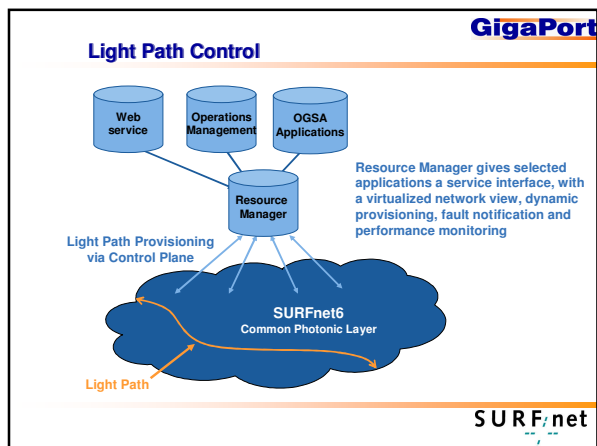
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- ### Light Path Provisioning
- Initially the provisioning is point- and click oriented
 - During the later phase of the SURFnet6 the light path provisioning will be fully application directed and hands-free



Conclusion

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- NREN users need new services that current networks cannot support
- Telecommunication infrastructures will become part of the Grid and will be integrated in scientific instruments
- Hybrid networks delivering IP and Lambda Services can meet user demand within budget constraints
- SURFnet6 will be a showcase for hybrid networks

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Thank you

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 - www.surfnet.nl
 - www.gigaport.nl
 - www.glif.is

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