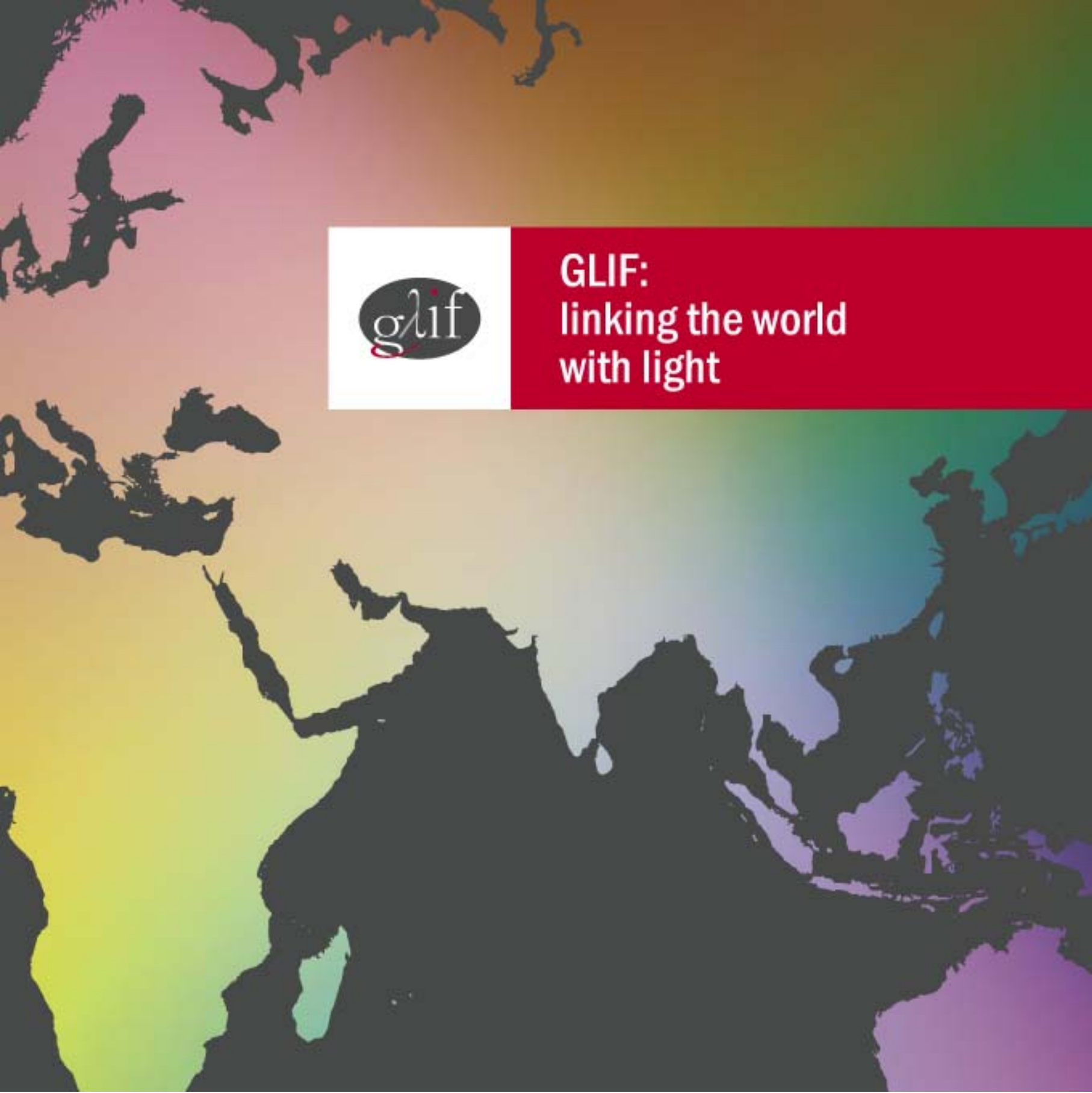


GLIF:
linking the world with light

g the world with light

What does GLIF do?

- GLIF stands for Global Lambda Integrated Facility. GLIF promotes the paradigm of lambda networking to support demanding scientific applications.
- GLIF makes lambdas available as an integrated global facility for use by scientists and projects involved in data-intensive scientific research.
- GLIF brings together leading networking engineers from across the world, who learn from each other's experiences. They seek to establish best practices, work together to enable the development, testing and implementation of new lambda networking technologies, middleware and applications, and generally collaborate to take the technology forward.

GLIF: linking the world with light

GLIF is an international virtual organisation that promotes and supports optical networking. It is a collaborative initiative of research networks across the world, as well as institutions and consortia working with lambdas.

Established in 2001, GLIF provides a global-scale laboratory to facilitate the development of applications and middleware, and to build distributed systems. It is also a forum for making contacts, exchanging information and experiences and resolving technical problems. Those taking part in GLIF are working towards the harmonisation of policy, service and fault-management processes.

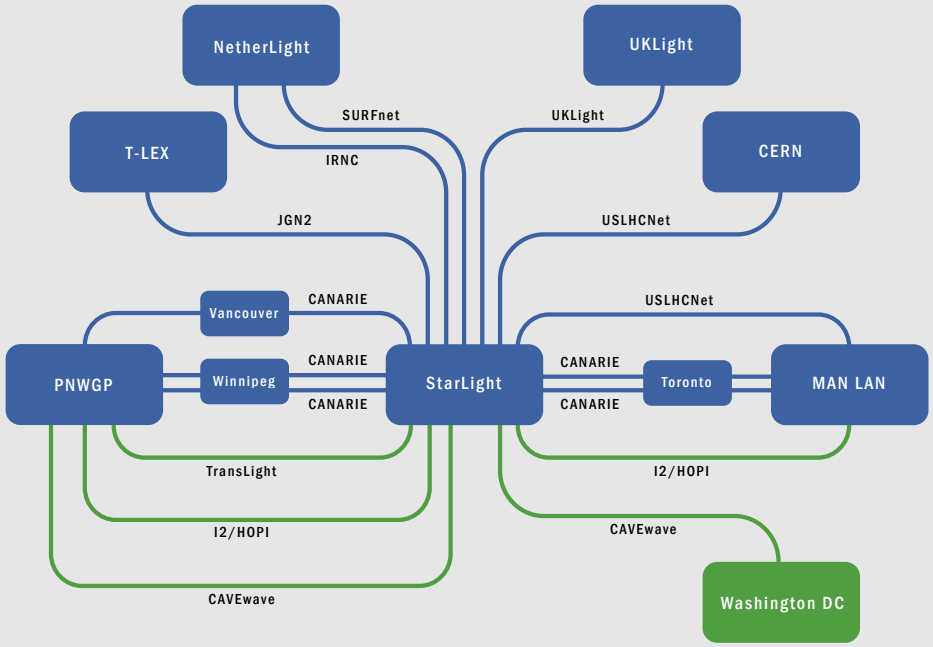
In fibre optic telecommunications, wavelength-division multiplexing is a technology that enables a single optical fibre to carry multiple signals by using different wavelengths (or lambdas) of laser light. This allows for a significant increase in transmission capacity, as well as physical separation of channels.

GLIF makes use of the cost and capacity advantages offered by optical multiplexing, in order to build an infrastructure for powerful distributed systems that utilise processing power, storage and instrumentation at various sites around the globe. The aim is to encourage the shared use of resources by eliminating the traditional performance bottleneck caused by a lack of network capacity.

GLIF makes use of the advantages offered by optical multiplexing to eliminate the bottlenecks caused by lack of network capacity

Optical networks are the main architectural element in support of this decade's most demanding e-science applications. Research should not have any geographical boundaries. Hybrid networks are the next-generation networks offering both packet-switched Internet for regular many-to-many usage and dedicated lightpaths for guaranteed, reliable, high-speed few-to-few usage.

bdas and lightpaths



Example of a GOLE topology

Current GOLEs include:

AMPATH	Miami	NetherLight	Amsterdam
CENIC	Los Angeles	NorthernLight	Stockholm
CERN	Geneva	Pacific Northwest GigaPoP	Seattle
CzechLight	Prague	StarLight	Chicago
HKOEP	Hong Kong	T-LEX	Tokyo
KRLight	Seoul	UKLight	London
MAN LAN	New York		

GOLEs, lambdas and lightpaths

The GLIF network is currently based around a number of lambdas contributed by the GLIF participants who own or lease them. These are interconnected through a series of exchange points known as GOLEs (GLIF Open Lightpath Exchanges). Together, these lambdas and GOLEs are referred to as the GLIF resources.

GOLEs are usually operated by GLIF participants, and are comprised of equipment that is capable of managing lambdas and performing lightpath switching. This allows different lambdas to be connected together to create end-to-end lightpaths.

A lightpath is a channel established over designated lambdas that connects two end-points in the network

A lightpath is a communications channel (virtual circuit) established over designated lambdas that connects two end-points in the network. It can take up some or all of the capacity of these lambdas, or indeed can be concatenated across several lambdas. Lightpaths can be established using different protocol mechanisms, depending on the application.

Connecting to GLIF

The network resources that make up GLIF are provided by independent network operators who collaborate to provide end-to-end lightpaths across their respective optical domains. GLIF does not provide any network services itself, so research users need to approach a GLIF network resource provider if they wish to obtain lightpath services.

Source: SURFnet, Jac Kloots

ion: Space Research

Space Research

International collaboration resulted in the successful data transfer of the signal from the Huygens space probe as it plunged through the clouds of Titan, the largest of Saturn's moons, on 14 January 2005. GLIF participants AARNet (Australia), CANARIE (Canada) and SURFnet (the Netherlands) joined forces to transfer the signal data from two Australian radio telescopes to the JIVE data processing centre in the Netherlands. The connection involved 1 Gbps and 10 Gbps lightpaths.

ESA: Saturn in Titan's Sky

GLIF working groups

GLIF's collaborative activities are currently organised in four working groups. The managers, networking engineers and researchers participating in these groups are working together using mostly electronic means of communication, complemented by a small number of face-to-face meetings each year.

GOVERNANCE WORKING GROUP

The Governance Working Group sets objectives, formulates policies and defines the conditions for participation in GLIF. It supervises the work of the GLIF secretariat and adopts its budget.

TECHNICAL ISSUES WORKING GROUP

The Technical Issues Working Group identifies what the connection requirements are, which equipment is being used, and which functions and services should be provided. It maintains a database of GLIF resources and documents best practices.

CONTROL PLANE WORKING GROUP

The Control Plane Working Group agrees on the interfaces and protocols for communication between the GLIF resources. The group determines which control information needs to be exchanged, and investigates automation of the controlling mechanisms. The new model foresees automatic delivery and on-demand provisioning over optimised network paths, made possible by optical control plane technologies.

RESEARCH & APPLICATIONS WORKING GROUP

The Research & Applications Working Group identifies applications that can benefit from optical networks and defines the services that the user communities need. The group also aims to train a new generation of scientists on the use of super-networks.

tion: Arts and Media

Arts and Media

At the CineGrid@AES event in October 2006, 2k and 4k resolution digital motion pictures and 24-channel digital audio were streamed from Los Angeles, San Diego and Tokyo in real time. The demonstration involved more than 10,000 miles of network connections using 1 Gbps and 10 Gbps lightpaths. Overseen by Pacific Interface, joint CineGrid research between Calit2, the Research Institute for Digital Media and Content at Keio University in Japan and the University of Southern California School of Dramatic Arts laid the groundwork for the demonstrations.

Source: Pacific Interface, Inc.

GLIF participation

GLIF is open to any organisation that shares the GLIF vision and is willing and able to make resources (e.g., equipment and lambdas) available on an agreed basis when they are not required for its own needs. GLIF is also open to organisations whose experts contribute actively to the technical work in the GLIF working groups.

GLIF participants include:

AARNet	Indiana University	StarLight
AMPATH	Internet2	SURA
Argonne National Laboratory	JGN-II	SURFnet
Calit2	KISTI	TeraGrid
CANARIE	KRLight	TERENA
CERN	Massachusetts Institute of Technology	TransLight
CERNET	MCNC	TWAREN
CESNET	Mid-Atlantic Crossroads	UKERNA
DFN	National LambdaRail	University of Amsterdam
FAST	Northwestern University	University College London
Fermilab	National Science Foundation	University of Illinois at Chicago
GLORIAD	NetherLight	University of Maryland
HEAnet	NORDUnet	University of Washington
i2CAT Foundation	Nortel	UltraLight
iCAIR	Pacific Northwest Gigapop	WIDE
IEEAF	SARA	

lication: Biomedical

Biomedical

Enabled by OptiPuter and Telescience technologies, including high-bandwidth networks and advanced information technology resources, research scientists can now collaboratively explore and interact with large-scale data. Shown in the figure are scientists from the National Center for Microscopy and Imaging Research (NCMIR) interacting with HeLa cells in a mosaic pictured on the “BioWall”.

Source: University of California, San Diego

GLIF sponsors

The GLIF secretariat is provided by TERENA and funded by the voluntary sponsorship of GLIF participants. In recent years, the following organisations have contributed to the funding of the GLIF secretariat:

aarnet · Calit2 · CANARIE · CERN · CESNET

HEAnet (Ireland's National Education & Research Network) · GLAIR · Indiana University · Internet2 · KiSTi

NLR · NORDUnet · Northwestern University · Pacific Northwest GigaPop · StarLight

SURFnet · TERENA · Universiteit van Amsterdam · UIC University of Illinois at Chicago · UKERNA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