



TransLight / StarLight

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www.startap.net/translight

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Thomas A. DeFanti, Maxine Brown, Alan Verlo, Laura Wolf
Electronic Visualization Laboratory
University of Illinois at Chicago
851 S. Morgan St., Room 1120
Chicago, IL 60607-7053
tom@uic.edu

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1. Participants

1.A. Primary Personnel

Participant's Name(s)	Project Role(s)	>160 Hours/Yr
Thomas A. DeFanti	Principal Investigator	Yes
Maxine Brown	Co-Principal Investigator	Yes

1.B. Other Senior Personnel (Excluding PI and Co-PI)

Additional people who contribute greatly to the project are listed below. While some receive a salary from this grant, others provide in-kind services:

Participant's Name(s)	Project Role(s)	>160 Hours/Yr
Alan Verlo	Professional staff	Yes
Laura Wolf	Professional staff	Yes
Steve Sander	Professional staff	Yes
Pat Hallihan	Professional staff	Yes
Lance Long	Professional staff	Yes
Linda Winkler	Professional staff	Yes
Rick Summerhill	Professional staff	Yes
Roberto Sabatino	Professional staff	Yes
Erik-Jan Bos	Professional staff	Yes
Kees Neggers	Other Senior Personnel	Yes
Joe Mambretti	Other Senior Personnel	Yes

1.C. Other Organizations That Have Been Involved as Partners

Argonne National Laboratory

Argonne National Laboratory's Mathematics and Computer Science Division (MCS) <www.mcs.anl.gov> has been, and continues to be, a strong supporter of US international networking activities. Linda Winkler has facilitated STAR TAP/StarLight engineering since its inception, and is the lead engineer today; her salary comes from Argonne.

Northwestern University

Joe Mambretti, director of Northwestern's International Center for Advanced Internet Research (iCAIR) <www.icair.org>, also runs the StarLight facility <www.startap.net/starlight>, and assists with connectivity issues.

SURFnet

SURFnet, the national network for research and education in the Netherlands <www.surfnet.nl>, is a TransLight/StarLight "key institutional partner," responsible for negotiating, procuring and implementing the TransLight OC-192 circuit(s) between Open Exchanges in the US and in Europe, which UIC pays for upon receipt of an invoice from SURFnet, as has been our practice since our previous NSF HPIIS Euro-Link award.

1.D. Other Collaborators or Contacts

CANARIE

The Canadian Network for the Advancement of Research, Industry and Education (CANARIE) <www.canarie.ca> is Canada's advanced Internet development organization. It operates CA*net 4, a series of point-to-point optical wavelengths, most of which are provisioned at 10Gbps speeds, interconnecting Canada's provincial research networks with each other and international peer networks, and forming an innovative framework to support grids and e-Science.

DANTE

Owned by European NRENs, DANTE <www.dante.net> is an organization that plans, builds and operates pan-

European networks for research and education. The GÉANT2 project is a collaboration among 26 National Research & Education Networks representing 30 countries across Europe, the European Commission, and DANTE. Its principal purpose is to develop the GÉANT2 network -- a multi-gigabit pan-European data communications network for research and education; see <www.geant2.net>. TransLight/StarLight funding provides a 10Gbps routed infrastructure to connect the Internet2 network, NLR PacketNet and DOE/ESnet with DANTE/GÉANT2. TransLight/StarLight also makes a 10Gbps switched infrastructure available for use.

ESnet

The Energy Sciences Network, (ESnet) <www.es.net> is funded by the DOE Office of Science to provide network and collaboration services in support of the agency's research missions, serving thousands of Department of Energy scientists and collaborators worldwide. ESnet provides direct connections to all major DOE sites with high-performance speeds, as well as fast interconnections to more than 100 other networks. TransLight/StarLight funding provides a 10Gbps routed infrastructure to connect the Internet2 network, NLR PacketNet and DOE/ESnet with DANTE/GÉANT2. TransLight/StarLight also makes a 10Gbps switched infrastructure available for use.

Global Lambda Integrated Facility (GLIF)

GLIF <www.glif.is> is an international virtual organization of NRENs, consortia and institutions that promotes lambda networking. GLIF provides lambdas internationally as an integrated facility to support data-intensive scientific research, and supports middleware development for lambda networking. It brings together premier networking engineers to develop an international infrastructure by identifying equipment, connection requirements, and necessary engineering functions and services.

GLORIAD

GLORIAD, the Global Ring Network for Advanced Applications Development, <www.gloriad.org> is currently constructing a dedicated lightwave round-the-world connecting scientific organizations in the United States, Russia, China, Korea, Canada, the Netherlands and the Nordic countries. GLORIAD currently has 3x1Gbps VLANs on the TransLight/StarLight CHI/AMS link to NetherLight, where Russia has a 10Gbps link to Moscow. (This will soon change, and Russia will connect from Moscow to Stockholm, and then to Amsterdam via NORDUnet.)

Internet2

Internet2 <www.internet2.edu> is a consortium of leading US research universities working in partnership with industry and government to develop and deploy advanced network applications and technologies. In Spring 2007, the new Internet2 network <www.internet2.edu/network/>, a hybrid optical and packet network, designed in collaboration with Level 3 Communications, came online. TransLight/StarLight funding provides a 10Gbps routed infrastructure to connect the Internet2 network, NLR PacketNet and DOE/ESnet with DANTE/GÉANT2. TransLight/StarLight also makes a 10Gbps switched infrastructure available for use.

National LambdaRail (NLR)

NLR <www.nlr.net> is a major initiative of US research universities and private sector technology companies to provide a national-scale infrastructure for research and experimentation in networking technologies and applications. TransLight/StarLight considers itself, in part, to be the international extension of NLR, and wants to encourage data-intensive e-science drivers needing gigabits of bandwidth to use NLR FrameNet and international links for schedulable production services not available with "best effort" networks. TransLight/StarLight funding provides a 10Gbps routed infrastructure to connect the Internet2 network, NLR PacketNet and DOE/ESnet with DANTE/GÉANT2. TransLight/StarLight also makes a 10Gbps switched infrastructure available for NLR FrameNet use.

TransLight/PacificWave

TransLight/PacificWave <www.pacificwave.net/participants/irnc> is developing a distributed exchange facility on the West Coast (currently in Seattle, Sunnyvale, and Los Angeles) to allow interconnection of international research and education networks with US research networks. TransLight/PacificWave is the sister project to TransLight/StarLight.

2. Activities and Findings

2.A. Research Activities

2.A.1. Accomplishments and Milestones

We have been working on the following activities during the second quarter of year 3 of the grant:

- Provisioning VLANs on TransLight/StarLight CHI/AMS for e-science applications (ongoing) (GLORIAD, Teraflow Testbed, OptIPuter/GLVF), DRAGON/eVLBI, LHC, etc.)
- Continue to represent TransLight/StarLight at major conferences and workshops (as members of the program committee and/or as participants); continue to participate in network engineering JET and GOLE meetings; continue to participate in the IRNC Measurement Group; and, continue to learn/design cybersecurity best practices for IRNC
- Continue to identify and develop production applications on both IRNC circuits.
- Finish updating TransLight/StarLight website <www.startup.net/translight> with information contained in 2006-2007 Annual Report
- Contribute to the GLIF Applications website <www.glif.is/apps>
- Facilitate new GLIF network map

2.A.2. Infrastructure Topology

No updates to report.

2.A.3. NYC/AMS Network Operations and Engineering

PoP Connectivity and Peering – NYC/AMS

No updates to report.

Usage

See <www.startup.net/translight/pages/measurement.html>.

Routing Policies

No updates to report.

Peering Policies

No updates to report.

Security

No updates to report.

Engineering

No updates to report.

NOC Operations

No updates to report.

RENOG: Global NOC-NOC Communications

No updates to report.

2.A.4. CHI/AMS Network Operations and Engineering

PoP Connectivity and Peering – CHI/AMS

No updates to report.

Usage

See <www.startup.net/translight/pages/measurement.html>.

Routing Policies

No updates to report.

Peering Policies

No updates to report.

Security

No updates to report.

Engineering

LightPath Services...The following 1Gbps VLANs on the TransLight/StarLight CHI/AMS link are in place:

- **NOAA...** A 1Gbps lightpath on the TransLight/StarLight-GLORIAD infrastructure was put in place from NOAA's National Geophysics Data Center (NGDC) in Boulder, CO, to Chicago (via NLR FrameNet), from Chicago to Amsterdam (via TransLight/StarLight), and from Amsterdam to Moscow (via RBnet) to the Center of Geophysical Data Studies of the Russian Academy of Sciences.
- **OptIPuter/Global Lambda Visualization Facility (GLVF)...** The UIC Electronic Visualization Laboratory (EVL) founded the GLVF¹ at iGrid 2005, to develop and standardize on networked collaboration and scientific visualization tools and techniques for the benefit of e-science. Many GLVF partners are also OptIPuter partners, and are using OptIPuter-developed SAGE technologies as a platform for scientific collaborations. EVL has VLANs to SARA and University of Amsterdam in place for GLVF collaboration. EVL also has a VLAN on the TransLight/StarLight-GLORIAD infrastructure for OptIPuter/SAGE research with Moscow.

LightPath Services...The following VLANs are pending:

- **DRAGON...**We are waiting for DRAGON project (Jerry Sobieski) to send equipment (a small switch and a PC) to StarLight.
- **Large Hadron Collider/CERN...** Tom DeFanti has been talking with Harvey Newman (Caltech), Don Petravick (Fermilab) and Bill Johnston (ESnet) about using a portion of TransLight/StarLight links for Large Hadron Collider (LHC) data grid production.

NOC Operations

See <www.startup.net/starlight/ENGINEERING/network_operations.html>.

2.A.5. Meeting and Conference Participation

TransLight/StarLight principals have participated in the following meetings and conferences to promote IRNC:

July 20-21, 2007. EVL hosted the WIDE/CAIDA measurement workshop, and treated attendees to demonstrations of OptIPuter technologies. Alan Verlo and Matt Zekauskas participated.

July 15-19, 2007. Alan Verlo and Linda Winkler attended the Summer 2007 ESCC/Internet2 Joint Techs Workshop <<http://jointtechs.es.net/Illinois2007>>, held at Fermilab in Batavia, IL. The JET meeting was held July 17.

July 10, 2007. Alan Verlo participated in the IRNC Measurement Group phone call.

July 9-11, 2007. Maxine Brown attended the NSF CI-TEAM Community Building Workshop in Arlington, VA.

June 29, 2007. Tom DeFanti and Maxine Brown participated in the monthly NSF IRNC phone call.

June 26, 2007. Alan Verlo participated in the IRNC Measurement Group phone call.

¹ GLVF <www.evl.uic.edu/cavern/glvf> is a group of international researchers collaborating on the design and development of complementary, distributed visualization and collaboration technologies. GLVF's primary goals are to create de-facto international standards and integrated tools to enable advanced, real-time, interactive visualization and distance collaboration; to work with global scientific teams on the social science of collaboration; to both learn from and educate them on how to use these new technologies to transform the ways they do science; and, to globally train our students and junior faculty, the next-generation, globally-engaged workforce.

June 21, 2007. The first successful demonstration of transatlantic streaming over photonic IP networks of 4K digital motion pictures and 5.1 surround sound was achieved by the international research consortium, CineGrid. The CineGrid @ Holland Festival 2007 project transmitted the live performance of the opera “Era la Notte” in Amsterdam’s concert hall, part of the Holland Festival, nearly 10,000 kilometers, in real time, to UCSD where it was viewed in 4K (which is four times the resolution of HDTV) in the Calit2 auditorium, delivering an audience experience of unprecedented quality across long distances over photonic networks. Calit2, EVL, SARA, UvA and SURFnet participated.

June 20-22, 2007. Natasha Bulashova (GLORIAD) visited Jason Leigh and Maxine Brown at UIC/EVL on June 20, Joe Mambretti (NU/StarLight) on June 21 and Robert Grossman (UIC/NCDM) on June 22, to discuss US/Russia research collaborations, particularly with the Russian Academy of Sciences’ Space Research Institute. Her report is available on the web <www.gloriad.org/gloriad/news/chicago-meeting-2007.html>.

June 19, 2007. Alan Verlo and Linda Winkler participated in the monthly JET meeting at NSF.

June 18, 2007. Tom DeFanti and Joe Mambretti participated in the GLIF North America (GLIF-NA) Meeting, Denver, Colorado. Mambretti gave the presentation “Next Generation Network Services.”

June 12, 2007. Alan Verlo participated in the IRNC Measurement Group phone call.

June 9, 2007. Joe Mambretti presented “Next Generation Advanced Networks,” SingAREN, Singapore.

June 5-8, 2007. Joe Mambretti presented “21st Century Communications, Services, Architecture and Technology” at GridAsia 2007, Singapore.

June 4-8, 2007. Maxine Brown attended the TeraGrid ’07 conference in Madison, WI.

June 4, 2007. Alan Verlo participated in the IRNC Measurement Group phone call.

June 2007. Larry Smarr gave the presentation “Why Researchers are Using Advanced Networks” remotely, over HDTV, from Calit2 in La Jolla, CA, to participants at the *Building KAREN Communities for Collaboration Forum*, sponsored by the KIWI Advanced Research and Education Network at University of Auckland, New Zealand.

May 31, 2007. Joe Mambretti presented “Major Networking Research Themes, US Testbeds, and the GENI Initiative” to NICT, Tokyo, Japan.

May 30, 2007. Tom DeFanti and Maxine Brown participated in the monthly NSF IRNC phone call.

May 22, 2007. Alan Verlo participated in the IRNC Measurement Group phone call.

May 16, 2007. Bernard Pailthorpe of the University of Queensland, Australia, visited EVL and gave a presentation on HPC and cyberinfrastructure developments and applications in Australia.

May 15, 2007. Alan Verlo and Linda Winkler participated in the monthly JET meeting at NSF.

May 15, 2007. Alan Verlo participated in the IRNC Measurement Group phone call.

May 2, 2007. Alan Verlo and Linda Winkler participated in a phone call of network engineers from the major GLIF Open Lightpath Exchanges (GOLEs) worldwide.

May 1, 2007. Alan Verlo participated in the IRNC Measurement Group phone call.

2.B. Research Findings

2.B.1. E-Science Application Identification and Support

Maxine Brown has been involved with the following organizations and conferences throughout the past year, whose goals are to find and encourage application and middleware development.

- **TransLight/PacificWave's Applications group (ongoing)**, organized by John Silvester, stimulates application development. This group meets occasionally via telephone and at conferences. Maxine Brown is a member of this group, representing TransLight/StarLight. This group has provided advice and support to several of the projects listed below.
- **NCO Optical Networking Testbed 4 (ONT-4) Workshop** – Bill Wing invited Maxine Brown, Tom DeFanti, Joe Mambretti and Kees Neggers to be members of the planning committee.
- **Cyberinfrastructure (CI) Days** is an effort for groups providing CI resources to educate campuses about what is available; this ongoing effort is organized a consortium consisting of TeraGrid, Educause, Internet2, Open Science Grid, National LambdaRail and IRNC. Maxine Brown represents IRNC. There was one event at UC Davis on April 5-6, 2007, prior to NLR and IRNC participation <<http://vpnet.ucdavis.edu/cyberinfrastructure.cfm>>.
- **Workshop on Driving eResearch Collaboration Across the Pacific (DeRCAP)** will be held at the Australian Partnership for Advanced Computing (APAC) 2007 Conference in Perth, October 8-12, 2007, designed to stimulate e-science usage of AARNet links to the US <www.apac.edu.au/apac07/dercap/>. Organized by John Silvester's TransLight/PacificWave Applications group, with Maxine Brown representing TransLight/StarLight, the group is working with John O'Callaghan, APAC Executive Director, and Chris Hancock, Chief Executive Officer of AARNet, on this US-Australia Workshop.
- **PRAGMA-13 Workshop** will be held at NCSA, September 23-25, 2007. Maxine Brown is a member of the Technical Program Committee <www.ncsa.uiuc.edu/Conferences/PRAGMA13>.
- **The Chinese-American Network Symposium (CANS) 2007** will take place August 25-26, 2007, in Xi'An, China <www.canscouncil.net/cans2007>. Maxine Brown is a member of the program committee.
- **The annual eVLBI Network Technologies Workshop** was hosted by the CSIRO Australia National Telescope Facility <www.atnf.csiro.au/research/workshops/2007/eVLBI>. It was held at the QUESTnet (Queensland Education Science & Technology Network) 2007 conference, July 10-13, 2007, in Cairns. Jerry Sobieski attended. The TransLight/PacificWave Applications group was kept aware of activities.
- **A New Zealand-US Workshop "Building KAREN Communities for Collaboration"** was hosted by Charles Jarvie, Development Manager of REANNZ, in New Zealand, July 2-4, 2007 <www.karen.net.nz/recordings>. TransLight/PacificWave's Ron Johnson and John Silvester participated.

2.B.2. E-Science Support (Quantified Science Drivers)

While many international collaborations are ubiquitous and difficult to track, several major international collaboration projects are documented on the TransLight/StarLight website <www.startup.net/translight/pages/applications.html>. Applications utilizing GLIF links are publicized at <www.glif.is/apps>.

2.B.3. Plans for the Coming Quarter (Quarterly Reports Only)

TransLight/StarLight plans for August 1 – October 31, 2007, include:

- Continue provisioning VLANs on TransLight/StarLight CHI/AMS for e-science applications (ongoing)
- Continue representing TransLight/StarLight at major conferences and workshops (as members of the program committee and/or as participants); continue to participate in network engineering JET and GOLE meetings; continue to participate in the IRNC Measurement Group; and, continue to learn/design cybersecurity best practices for IRNC
- Continue identifying and developing production applications on both IRNC circuits.
- Finish updating TransLight/StarLight website <www.startup.net/translight> with information contained in 2006-2007 Annual Report

- Contribute to the GLIF Applications website <www.glif.is/apps>
- Facilitate new GLIF network map
- Start preparations for SC'07 international demonstrations (sometimes have to schedule international usage)

2.C. Research Training

National Research Network (NRN) management and engineers from Internet2, ESnet, NLR and DANTE work closely with IRNC management and engineers at UIC and SURFnet, as well as at MAN LAN, StarLight, and NetherLight, to facilitate connectivity and greater advances in global networking than a single-investigator effort can afford. In addition, numerous researchers, middleware developers, network engineers and international NRNs are involved as users of TransLight/StarLight. This global, dedicated community has elected to work together, on a persistent basis, to further the goals of international e-science collaboration.

2.D. Education/Outreach

TransLight/StarLight's primary education and outreach activities include web documentation, journal articles, and conference presentations and demonstrations. We also provide PowerPoint presentations and other teaching materials to collaborators to give presentations at many conferences, government briefings, etc.

Since 1986, EVL has partnered with NCSA, ANL, and more recently NU/iCAIR, in ongoing efforts to develop national/international collaborations at major professional conferences, notably ACM/IEEE Supercomputing (SC), IEEE High Performance Distributed Computing (HPDC), and Internet2 and GLIF meetings. We have participated in European conferences, NORDUnet annual meetings and a UKERNA seminar on optical networking. Our success has been in the development of teams, tools, hardware, system software, and human interface models on an accelerated schedule to enable multi-site collaborations for complex problem solving.

We participate in the annual SC conferences, to promote the goals of IRNC and TransLight/StarLight. We also organized the iGrid 2005 in San Diego in September 2005 to showcase international advanced applications and middleware developments.

3. Publications and Products

3.A. Journals/Papers

None.

3.B. Books/Publications

Maxine Brown and Thomas A. DeFanti, "United States' Transatlantic R&E Connections to Europe: The History of TransLight/StarLight and Euro-Link," The History of European Research Networking, Howard Davies (editor), TERENA, 2007 (to appear)

3.C. Internet Dissemination

www.startap.net/translight

3.D. Other Specific Products

Other than the information reported here, we have not developed any other specific product of significance.

4. Contributions

4.A. Contributions within Discipline

TransLight/StarLight, by its very nature, is interdisciplinary. There is clearly a fine team of computer scientists, computational scientists and networking engineers involved with TransLight/StarLight, facilitating greater advances in global networking than single-investigator efforts can afford. TransLight/StarLight developed its management team in the Chicago area (UIC/EVL), and leverages the efforts of its IRNC partners (particularly TransLight/Pacific Wave and GLORIAD), national networking groups (Internet2, ESnet and NLR) and foreign NRN (DANTE and SURFnet) technical and administrative contacts.

4.B. Contributions to Other Disciplines

Within the Computational Science and the Computer Science communities, TransLight/StarLight efforts help lead 21st century discipline science and computer science innovation. TransLight/StarLight's OC-192 L3 circuit among the Internet2 network, NLR, ESnet and GÉANT2 provides greater transatlantic connectivity, and the OC-192 L2 circuit between StarLight and NetherLight provides long-distance, high-bandwidth capability for demanding data-intensive applications.

4.C. Contributions to Human Resource Development

We promote TransLight/StarLight through web documentation, journal articles, demonstrations and presentations at major networking conferences (e.g., Supercomputing, HPDC, Internet2) and workshops (GLIF), PowerPoint presentations and other instructional material. We teach the infrastructure, the grid advancements, the technological innovations and the application advancements that global connectivity enables. In fact, thanks to previous NSF funding of STAR TAP, StarLight and Euro-Link, we have a mailing list of ~1,000 <stars@startup.net> individuals, from academia, government and industry, interested in information about international advanced networking developments.

4.D. Contributions to Resources for Research and Education

TransLight/StarLight is a necessary and integral part of application advances and technological innovations for the US Computational Science and Computer Science research and education communities, as well as of major interest to network engineers. In particular, the TransLight/StarLight L2 circuit between StarLight and NetherLight is part of the GLIF LambdaGrid fabric and represents a major resource for science and technology.

4.E. Contributions Beyond Science and Engineering

Because of TransLight/StarLight's interest in advanced applications and lightpath provisioning, we often get inquiries from network equipment manufacturers and telecommunication providers about partnering with us to create and showcase a marketplace for wavelength-based network services and products. We look forward to working with these companies and introducing them to the Nation's foremost university and Federal laboratory networking engineers, computer programmers and applications scientists, who are developing and using today's evolving grid technologies. Our users expect us to grow in capacity and sophistication, and we look forward to the engineering challenges ahead.

5. Special Requirements

5.A. Objectives and Scope

A brief summary of the work to be performed during the next year of support if changed from the original proposal.
Our scope of work has not changed.

5.B. Special Reporting Requirements

Do special terms and conditions of your award require you to report any specific information that you have not yet reported?

No.

5.C. Animals, Biohazards, Human Subjects

Has there been any significant change in animal care and use, biohazards, or use of human subjects from what was originally approved (or approved later)?

No.