# TransLight / StarLight

## NSF Cooperative Agreement OCI-0441094
### www.startap.net/translight

**QUARTERLY REPORT February 1, 2007 – April 30, 2007**
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# 1. Participants

## 1.A. Primary Personnel

| Participant's Name(s) | Project Role(s) | >160 Hours/Yr |
|---|---|---|
| Thomas A. DeFanti (1) | Principal Investigator | Yes |
| Maxine Brown (2) | Co-Principal Investigator | Yes |

(1) Tom DeFanti, PI, primarily focuses on managing the link procurement process, network engineering, budgets and accounts payable, interfaces with personnel from Internet2 and DANTE/GÉANT2, coordination of project management and oversight activities with the NSF, and day-to-day project management. He participates in monthly IRNC phone calls and attends meetings as requested.

(2) Maxine Brown, co-PI, primarily focuses on managing documentation and education and outreach activities, and is responsible for TransLight/StarLight quarterly and annual reports, web pages and events planning. The co-PI also participates in monthly IRNC phone calls and attends meetings as requested.

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

Additional people who contributed greatly to the project, and received a salary, wage, stipend or other support from this grant:

| Participant's Name(s) | Project Role(s) | >160 Hours/Yr |
|---|---|---|
| Alan Verlo (3) | Professional staff | Yes |
| Laura Wolf (4) | Professional staff | Yes |
| Steve Sander (5) | Professional staff | Yes |
| Pat Hallihan (6) | Professional staff | Yes |
| Lance Long (7) | Professional staff | Yes |
| Linda Winkler (8) | Professional staff | Yes |
| Rick Summerhill (9) | Professional staff | Yes |
| Roberto Sabatino (10) | Professional staff | Yes |
| Erik-Jan Bos (11) | Professional staff | Yes |
| Kees Neggers (12) | Other Senior Personnel | Yes |
| Joe Mambretti (13) | Other Senior Personnel | Yes |

(3) Alan Verlo is the TransLight/StarLight network engineer, and is a member of the StarLight engineering team. For several years, Verlo has also been a member of the SC conferences' SCinet committee, focusing on enabling international SC research demos that have connections in Chicago. He was also co-chair of the iGrid 2005 international cyberinfrastructure team, responsible for clusters and international networking. Verlo regularly participates in JET and GLIF GOLE meetings.

(4) Laura Wolf is responsible for TransLight/StarLight technical writing and web documentation.

(5) Steve Sander is the TransLight/StarLight budget, accounts payable and equipment procurement person.

(6) Pat Hallihan reports to Alan Verlo and is technical support staff.

(7) Lance Long reports to Alan Verlo and is technical support staff.

(8) Linda Winkler of Argonne National Laboratory, while not compensated by the University of Illinois at Chicago (UIC), serves as part-time StarLight engineer with Alan Verlo, and assists with TransLight/StarLight. For many years, Winkler has been a member of the SCinet committee, focusing on enabling international SC research demos that have connections in Chicago. She was also co-chair of the iGrid 2005 international cyberinfrastructure team, responsible for clusters and international networking.

(9) Rick Summerhill is the Internet2 Director of Network Research, Architecture, and Technologies and, while not compensated by UIC, is one of the stewards of the TransLight/StarLight link that connects the Internet2 network at MAN LAN to GÉANT2 at the DANTE POP at the Amsterdam Internet Exchange.

(10) Roberto Sabatino is the DANTE Chief Technology Officer and, while not compensated by UIC, is one of the stewards of the TransLight/StarLight link that connects the Internet2 network at MAN LAN to the GÉANT2 POP at the Amsterdam Internet Exchange.

(11) Erik-Jan Bos is the SURFnet chief network engineer and, while not compensated by UIC, is one of the stewards of the TransLight/StarLight link connecting StarLight in Chicago to NetherLight at the Amsterdam Internet Exchange.

(12) Kees Neggers is SURFnet Managing Director and a founder and current chair of GLIF. While not compensated by UIC, he does the tenders and procures both TransLight/StarLight links on UIC's behalf, and is one of the stewards of the TransLight/StarLight link connecting StarLight in Chicago to NetherLight in Amsterdam.

(13) Joe Mambretti is the StarLight managing director and head of the International Center for Advanced Internet Research (iCAIR) at Northwestern University. While not compensated by UIC, Joe has been a strong supporter and advisor regarding our IRNC efforts. Mambretti has assisted with connectivity issues, not only at StarLight, but also at MAN LAN.

## 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 ANL.

**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 with 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 between 26 National Research & Education Networks representing 30 countries across Europe, the European Commission, and DANTE. Its principal purpose has been to develop the GÉANT2 network -- a multi-gigabit pan-European data communications network for research and education; see <www.geant2.net>. TransLight/StarLight funding makes a 10Gbps link available to connect the Internet2 network, NLR, DOE/ESnet and DANTE/GÉANT2.

**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 thoUSnds 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 makes a 10Gbps link available to connect the Internet2 network, NLR, DOE/ESnet and DANTE/GÉANT2.

**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 link 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 it Russia has a 10Gbps link to Moscow.

**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/> (to replace Abilene <http://abilene.internet2.edu>), a hybrid optical and packet network, is being designed in collaboration with Level 3 Communications to provide next-generation production services as well as a platform for the development of new networking ideas and protocols. TransLight/StarLight funding makes a 10Gbps link available to connect the Internet2 network, NLR, DOE/ESnet and DANTE/GÉANT2.

**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 and international links for schedulable production services not available with "best effort" networks.

**TransLight/Pacific Wave**

TransLight/Pacific Wave <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/Pacific Wave 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 first quarter of year 3 of the grant:

- Provisioning VLANs on TransLight/StarLight CHI/AMS for demanding applications (DRAGON/eVLBI, GLORIAD, LHC and CMS/LHC, Teraflow Testbed, and OptIPuter/GLVF)
- Giving presentations on TransLight/StarLight at major conferences and workshops
- Participating in network engineering JET and GOLE meetings
- Working with IRNC Measurement Group to better understand and implement measurement and performance utilities and best practices.
- Learning about and investigating possible Cybersecurity best practices of benefit to the IRNC community
- Continuing to identify and develop production applications on both IRNC circuits.
- Updating TransLight/StarLight website <www.startap.net/translight> with information contained in 2006-2007 Annual Report, and contributing to GLIF Applications website <www.glif.is/apps>

### 2.A.2. Infrastructure Topology

No updates to report.

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

### PoP Connectivity and Peering – NYC/AMS

Internet2 and DANTE want to replace DANTE's router at MAN LAN with an Alcatel MCC1678 switch to enable more flexible connections to the Internet2 network, NLR and ESnet, but experienced interoperability problems between the Alcatel and the Nortel OME6500. The Nortel OME6500 sits, along with a Nortel HDXc, in the MAN LAN facility. Interoperability testing by Internet2 and DANTE on the Nortel HDXc (at MAN LAN) and Alcatel (GÉANT2 POP in Amsterdam) equipment is underway in March and April, 2007. This testing needs to take place in order to move the IRNC circuit to the configuration illustrated in Phase 2 below.

*Note: On March 15, Alcatel-Lucent and DANTE announced the successful roll out of a new converged optical-data network linking NRENs across Europe. For details, see <www.hpcwire.com/hpc/1321139.html>.*

### Usage

See <www.startap.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

See <www.startap.net/translight/pages/NOC.html>.

### RENOG: Global NOC-NOC Communications

No updates to report.

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

### PoP Connectivity and Peering – CHI/AMS

**Point-to-point connection with i2CAT L2 (Barcelona)…**i2CAT's 10Gbps link to NetherLight became operational April 20, 2007. This link will be used for several projects, including Phosporus and CineGrid.

**PERN (Pakistan) expressing interest in joining GLIF fabric…**Pakistan's Higher Education Commission (HEC) is interested in high-speed connectivity, and HEC Chairman Atta-ur-Rehman was scheduled to visit NSF in February to discuss possible large-scale collaborative projects; HEC has also started to build PERN2, a high-speed interconnect among higher-education institutions in Pakistan. Subsequently, Anwar Amjad, consultant IT to HEC, and Arshad Ali (NIIT), met with NSF on April 25, 2007 and visited Joe Mambretti at StarLight on April 27, 2007.

### Usage

See <[www.startap.net/translight/pages/measurement.html](http://www.startap.net/translight/pages/measurement.html)>.

Note: Effective March 23, 2007, UvA removed its Nortel switch and replaced it with a Force10.

### Routing Policies

No updates to report.

### Peering Policies

No updates to report.

### Security

No updates to report.

### Engineering

**LightPath Services…**We are talking with several projects about providing 1Gbps VLAN connections on the TransLight/StarLight CHI/AMS link in support of production science.

- **DRAGON…**In progress.
- **Large Hadron Collider/CERN…**Request still pending.
- **GLORIAD…**3x 1Gbps VLANs was operational and in use as of April 10, 2007.
- **Teraflow Testbed…**Operational on March 28, 2007.
- **OptIPuter/GLVF… OptIPuter/Global Lambda Visualization Facility (GLVF)…** Request still pending.

**Measuring Lightpath Services…**Much remains to be learned about how to measure and report traffic on hybrid networks, which deliver lightpath services as well as routed IP services. On February 6, 2007, SURFnet distributed a draft document describing the problem space of measurement in a hybrid network as a starting point for discussions among GLIF TECH Working Group participants. <[http://www.glif.is/working-groups/tech/lightpath-measurement-0.9.pdf](http://www.glif.is/working-groups/tech/lightpath-measurement-0.9.pdf)>.

### NOC Operations

See <[www.startap.net/translight/pages/NOC.html](http://www.startap.net/translight/pages/NOC.html)>.

### 2.A.5. Meeting and Conference Participation

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

**May 2, 2007.** Alan Verlo and Linda Winkler participated in a monthly 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.

**April 27, 2007.** Anwar Amjad, consultant IT to Pakistan's Higher Education Commission (HEC) and Arshad Ali (NIIT) met with Joe Mambretti at StarLight. HEC has started to build PERN2 (Pakistan Education & Research

Network), a high-speed interconnect among higher-education institutions in Pakistan, and is interested in funding an extension from Islamabad to Amsterdam in order to be part of the GLIF fabric.

**April 22-27, 2007.** John Silvester represented TransLight/StarLight at the Internet2's Spring Member Meeting, in Arlington, VA. In particular, he participated in the International group's Breakfast Roundtable session on April 23.

**April 17-18, 2007.** Alan Verlo attended the Internet2 IPv6 Workshop – Merit in Ann Arbor, MI <http://events.internet2.edu/2007/ipv6/unicast4-07/index.html>.

**April 17, 2007.** Linda Winkler participated in the monthly JET meeting at NSF.

**March 26-April 2, 2007.** To ensure utilization of its 10Gbps link from Barcelona to NetherLight (and then to the US via IRNC TransLight/StarLight and/or SURFnet), the i2CAT Foundation sent engineer Francisco Iglesias to learn more about EVL's SAGE software (developed under OptIPuter). i2CAT is interested in combining SAGE with the Ultragrid system to create a new system: V3 (Visualization, Video and HD Videoconferencing). Iglesias will return to EVL for 3-4 months this summer.

**March 23, 2007.** Joan Frye, NSF MRI program manager, visited EVL to review accomplishments from MRI funding, particularly EVL's "LambdaVision" award CNS-0420477. LambdaVision is multi-gigabit network enabled, so there was much discussion of applications using/requiring large tiled displays, particularly international applications being developed by the Global Lambda Visualization Facility <www.evl.uic.edu/cavern/glvf>.

**March 21, 2007.** Maxine Brown and Alan Verlo met with Randy Shelton and John Sharkey of Force10 about UIC/EVL/StarLight hosting an educational meeting for potential and existing Force10 customers, describing some of the advanced applications and international networking that takes place at StarLight. Specifics to be determined.

**March 20, 2007.** Alan Verlo and Linda Winkler participated in the monthly JET meeting at NSF.

**March 20, 2007.** Alan Verlo participated in the IRNC Measurement Group phone call.

**March 20, 2007.** Laura Wolf organized a Taipei visit to UIC/EVL. Taiwanese visitors included:

- Chin-Tay Shih, Dean, College of Technology Management, National Tsing Hua University
- Kung Wang, Institute of Industrial Economics, National Central University, former Director General of Hsinchu Science-based Industrial Park *(Note: Taiwan's National Center for High-performance Computing, NCHC, is located at the Hsinchu Industrial Park and responsible for the country's R&E national and international networking. Taiwan connects to Pacific Wave in Seattle, but then connects to StarLight via CA\*net4 and UCLP.)*
- Paul Lin, Computer Communications Laboratories of ITRI, the Industrial Technology Research Institute
- Ian C. Hsu, Department of Biomedical Engineering and Environmental Science, NTHU
- Yi-Ling Wei, Industrial Researcher, Industrial Economics and Knowledge Center, Industrial Technology Research Institute (IEK/ITRI)

**March 15, 2007.** Tom DeFanti participated in the monthly NSF IRNC phone call.

**February 26-27, 2007.** Tom DeFanti and Maxine Brown were co-organizers, with others, of the 6th Annual Photonics Workshop, sponsored by NTT, in San Diego. Tom DeFanti and Alan Verlo attended. Several IRNC members and national/international collaborators attended and participated.

**February 22-23, 2007.** Alan Verlo attended the Cybersecurity Summit 2007 for NSF Large Research Facilities in Arlington, VA. <http://www.educause.edu/cyb07>

**February 19, 2007.** Maxine Brown participated in a planning meeting with TransLight/Pacific Wave, AARnet and the Australian Partnership for Advanced Computing (APAC) for a US-Australia Workshop, tentatively planned to be held at APAC '07, October 8-12, 2007 in Perth.

**February 14-15, 2007.** Alan Verlo attended GLIF TECH and Joint Techs meetings in Minneapolis.

**February 11-13, 2007.** Alan Verlo attended the Winter 2007 ESCC/Internet2 Joint Techs Workshop, Minneapolis. He (and Linda Winkler) also participate din the JET meeting on February 13.

**February 2, 2007.** Tom DeFanti participated in the monthly NSF IRNC phone call.

## 2.B.  Research Findings

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

John Silvester's TransLight/Pacific Wave Application group (with participation from Maxine Brown representing TransLight/StarLight) is working with John O'Callaghan, Executive Director of the Australian Partnership for Advanced Computing (APAC) and Chris Hancock, Chief Executive Officer of AARNet, on a US-Australia Workshop at APAC '07, October 8-12, 2007 in Perth, to stimulate e-science usage of AARNet links to the US. Given that science is global, this workshop may include collaborators from Asia and Europe.

The VLBI community has an international workshop annually, and this year the CSIRO's Australia National Telescope Facility will host the meeting in Australia. One of the days is devoted to networking issues, and there is discussion about holding the meeting either at APAC '07 or at QUESTnet (Queensland Education Science & Technology Network) 2007 conference, July 10-13, 2007, in Cairns, which Jerry Sobieski will be attending.

Similarly, Charles Jarvie, Development Manager of REANNZ in New Zealand, proposed hosting a NZ/US application and middleware workshop in New Zealand in June/July 2007.

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

Below are new and/or updates to applications we are tracking; more are documented on the TransLight/StarLight website <www.startap.net/translight/pages/applications.html>. Applications utilizing GLIF links are publicized at <www.glif.is/apps/>.

| US/European Applications 2007 |
| --- |

**Data Reservoir**

http://data-reservoir.adm.s.u-tokyo.ac.jp
https://mail.internet2.edu/wws/arc/i2-news/2007-04/msg00003.html

*Collaborators – 2006-2007 Land Speed Record participants*
- University of Tokyo; WIDE Project; JGN2 network; APAN; Fujitsu Computer Technologies; NTT Communications; Japan Chelsio Communications; Japan
- Major support from StarLight, Pacific Northwest GigaPoP, IEEAF, CANARIE, SURFnet, SARA and University of Amsterdam

*At the Internet2 Spring 2007 meeting in April 2007, the Data Reservoir project won two consecutive new LSRs in the IPv6 single and multi-stream categories. For the first set of IPv6 records, the Project created a network path over 30,000 kilometers in distance, crossing 6 international networks – over ¾ the circumference of the Earth. In doing so, the team successfully transferred data in the single and multi-stream categories at a rate of 7.67Gbps, which is equal to 230,100 terabit-meters per second (Tb-m/s). This record setting attempt leveraged standard TCP to achieve the new mark. The next day, the team used a modified version of TCP to achieve an even greater record. Using the same 30,000 km path, the network was able to achieve a throughput of 9.08Gbps, which is equal to 272,400 Tb-m/s for both the IPv6 multi and single stream categories. In doing so, the team surpassed the current IPv4 records, proving that IPv6 networks are able to provide the same, if not better, performance as IPv4. These performance studies were conducted between Christmas and New Year's in December 2006. The IRNC TransLight/StarLight link would have been used, but the Project wanted a completely dedicated network during the test period, which TransLight/StarLight could not provide, so SURFnet links were used instead.*

## Large Hadron Collider: UltraLight Data Analysis Tools

http://ultralight.caltech.edu/web-site/igrid

*Collaborators*
- CERN, Switzerland
- Department of Physics and Netlab, Caltech; Stanford Linear Accelerator Center (SLAC); Fermi National Accelerator Laboratory (Fermi); University of Florida; University of Michigan; Vanderbilt University; Cisco Systems; US
- Korea Advanced Institute of Science and Technology; Kyungpook National University; Korea
- University of Manchester; UK
- Universidade do Estado do Rio de Janeiro; Universidade Estadual Paulista; Universidade de São Paulo; Brazil

In April 2007 Harvey Newman expanded Tier-2/Tier-1 connectivity to encompass the Western Hemisphere (not just the US) and Europe, starting with Brazil. IRNC WHREN-LILA and IRNC TransLight/StarLight network engineers are starting discussions on how best to do this. Engineers need to see what issues there are with routing the traffic to and from the HEPGrid Tier-2 and Rio and SPRACE in Sao Paulo, over the IRNC Translight/StarLight links (in NYC and CHI) to/from the European Tier-1s. This might require that specific subnets at UERJ (Rio) and UNESP (Sao Paulo) have special subnets. When traffic arrives at the SURFnet PoP, it can go over GÉANT2 to various European Tier-1s, or over Newman's dedicated AMS/GVA link to CERN in Geneva.

***On April 24, 2007, UltraLight was a recipient of the 2007 Internet2 Driving Exemplary Applications (IDEA) Awards program, which seeks to recognize leading innovators who have created and deployed advanced network applications that have enabled transformational progress in research, teaching and learning. Winning submissions were judged on the depth of their positive impact on their primary users, their technical merit, and the likelihood the application would be more broadly adopted. UltraLight provides the foundation and services for linking thousands of physicists and scientists around the world who together are investigating the origins of the universe.***
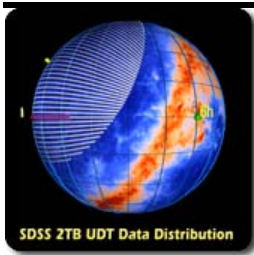
## Teraflow Testbed: High Performance Flows for Large Distributed Data Archives

www.ncdm.uic.edu
www.teraflowtestbed.net

*Collaborators*
- University of Illinois at Chicago, National Center for Data Mining (NCDM); Johns Hopkins University; University of California, San Diego; NASA Goddard Space Flight Center; US
- University of Melbourne; Australia
- Chinese Academy of Sciences (CAS), Computer Network Information Center; National Astronomical Observatory; China
- Max Plank Institute for Plasma Physics, Garching Computing Centre; Germany
- University of Tokyo, Institute for Cosmic Ray Research; Japan
- Korea Astronomy & Space Science Institute; Korea Institute of Science and Technology Information; Korea
- SARA Computing and Networking Services; University of Amsterdam; The Netherlands
- With support from StarLight (US); TransPAC2 (US); JGN2 (Japan); KREONet2 (Korea)

The Teraflow Testbed was recently extended to Russia. GLORIAD involved its Russian partners in the Teraflow project now that there are several gigabits of bandwidth between Chicago and Moscow (3x1Gb VLANs on TransLight/StarLight from Chicago to Amsterdam, and 10Gb from Amsterdam to Moscow funded by the Russians). Collaborating on the Teraflow Testbed is Mikhail Zhizhin, Head of Data and Information Technologies Department, of the Geophysical Center and Institute of the Physics of the Earth, Russian Academy of Sciences (RAS). The first experiment was to download and create a mirror site for SDSS data on a data server at the RAS Institute of Space Research.

## Whole Atmosphere Community Climate Model

http://waccm.acd.ucar.edu

*Collaborators*
- National Center for Atmospheric Research (NCAR), Atmospheric Chemistry Division (ACD); NCAR Climate and Global Dynamics (CGD) Division; NCAR High Altitude Observatory (HAO); US
- Barcelona Supercomputer Center (BSC); Universidad Complutense de Madrid; Spain

At present, using NLR/GÉANT2 L3 peering, transfer rates from Barcelona average about 5 MBps for a single stream. NCAR principal investigator Rolando Garcia is investigating using NLR FrameNet (1-10Gbps) to Chicago, and then using TransLight/StarLight to get to NetherLight, where i2CAT has a 10Gbps link from Amsterdam to Barcelona. He is also talking with UIC/EVL about using its Reliable Blast UDP protocol to transfer data at higher rates. Also, BSC requires scp/sftp encryption, which complicates matters somewhat.

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

TransLight/StarLight plans for May 1 – July 31, 2007, include:

- Finish updating TransLight/StarLight website <www.startap.net/translight> with information contained in 2006-2007 Annual Report, and contribute to GLIF Applications website <www.glif.is/apps>
- Provision 1Gbps VLANs on TransLight/StarLight CHI/AMS to demanding e-science applications (ongoing)
- Continue to represent TransLight/StarLight at major conferences and workshops; 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 working to identify and develop production applications on both circuits.
- Begin facilitating new GLIF networking map

## 2.C. Research Training

National Research Network (NRN) management and engineers from Internet2, ESnet, DANTE and NLR 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 would 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 organized the iGrid 2005 in San Diego in September 2005, and we participate in the annual SC conferences to promote the goals of IRNC and TransLight/StarLight.

# 3. Publications and Products

## 3.A. Journals/Papers

None this quarter.

## 3.B. Books/Publications

None this quarter.

## 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), 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'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 a unique infrastructure to study the effects of long-distance, high-bandwidth networks on advanced 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) 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@startap.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 Computational Science and Computer Science communities, as well as of major interest to network engineers. In particular, the L2 TransLight/StarLight 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.