



## TransLight / StarLight

NSF Cooperative Agreement OCI-0441094

[www.startap.net/translight](http://www.startap.net/translight)

QUARTERLY REPORT February 1, 2010 – April 30, 2010

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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, focuses on managing the link procurement process, network engineering, budgets and accounts payable, interfacing with personnel from Internet2, ESnet, NLR and DANTE/GEANT2, coordinating project management and oversight activities with the NSF, and performing day-to-day project management. He participates in regularly scheduled IRNC phone calls and attends meetings as requested.
- (2) Maxine Brown, co-PI, focuses on managing documentation and education and outreach activities, and is responsible for TransLight/StarLight quarterly and annual reports, web pages and events planning. She also participates in regularly scheduled IRNC phone calls and attends meetings as requested.

### 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 (3)	Professional staff	Yes
Laura Wolf (4)	Professional staff	Yes
Steve Sander (5)	Professional staff	Yes
Patrick 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 many years Verlo has also been a member of the SC conferences' SCinet committee, focusing on enabling international SC research demos that have network connections at StarLight 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 Tech meetings.
- (4) Laura Wolf was responsible for TransLight/StarLight technical writing and web documentation; she left UIC in August 2009 for a position at Argonne National Laboratory.
- (5) Steve Sander is the TransLight/StarLight budget, accounts payable and equipment procurement person.
- (6) Patrick 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 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, helping enable international SC research demos with network connections at StarLight in Chicago. She was also co-chair of the iGrid 2005 international cyberinfrastructure team, responsible for clusters and international networking.
- (9) Rick Summerhill was the Internet2 Chief Technology Officer and, while not compensated by UIC, was one of the stewards of the TransLight/StarLight link that connects the Internet2 network at MAN LAN to the GEANT2 POP at the Amsterdam Internet Exchange. Summerhill retired June 2009.
- (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 GEANT2 POP at the Amsterdam Internet Exchange.

- (11) Erik-Jan Bos is SURFnet Chief Technology Officer. While not compensated by UIC, he is one of the stewards of the TransLight/StarLight link connecting StarLight in Chicago to NetherLight in Amsterdam.
- (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, he 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**

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### **Argonne National Laboratory**

Argonne National Laboratory's Mathematics and Computer Science Division (MCS) <[www.mcs.anl.gov](http://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 network engineering since its inception, and continues to serve as a senior 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](http://www.icair.org)>, also runs the StarLight facility <[www.startup.net/starlight](http://www.startup.net/starlight)>, and assists with connectivity issues.

### **SURFnet**

SURFnet, the national network for research and education in the Netherlands <[www.surfnet.nl](http://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**

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### **CANARIE**

The Canadian Network for the Advancement of Research, Industry and Education (CANARIE) <[www.canarie.ca](http://www.canarie.ca)> is Canada's advanced Internet development organization. It operates the CANARIE Network, 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, the DANTE <[www.dante.net](http://www.dante.net)> organization plans, builds and operates pan-European networks for research and education. The GÉANT2 project is a collaboration among 30 National Research & Education Networks representing 34 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 <[www.geant2.net](http://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](http://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

DOE 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](http://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](http://www.gloriad.org)> is constructing a dedicated lightwave round-the-world connecting scientific organizations in the US, Russia, China, Korea, Canada, the Netherlands and the Nordic countries. GLORIAD currently has 3x1Gbps VLANs on the TransLight/StarLight CHI/AMS link to NetherLight. Russia, a GLORIAD partner, connects to NetherLight in Amsterdam from Moscow via Stockholm.

### **Internet2**

Internet2 <[www.internet2.edu](http://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/](http://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 by Internet2, initially the Internet2-DCN (Dynamic Circuit Network) and now the Internet2-ION (Interoperable On-demand Network).

### **National LambdaRail (NLR)**

NLR <[www.nlr.net](http://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 encourages 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 use by NLR FrameNet.

### **TransLight/PacificWave**

TransLight/PacificWave <[www.pacificwave.net/participants/irnc](http://www.pacificwave.net/participants/irnc)> is an IRNC-supported distributed exchange facility on the West Coast (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**

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### **2.A. Research Activities**

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#### **2.A.1. Accomplishments and Milestones**

In Year 6, TransLight/StarLight continues to fund two international links, which were both delivered July 2005: an OC-192 routed connection between MAN LAN in New York City and NetherLight at the Amsterdam Internet Exchange (AMS-IE) connecting the US Internet2, NLR and ESnet networks to GÉANT2, and an OC-192 switched connection between StarLight in Chicago and NetherLight that is part of the GLIF fabric.

On April 16, 2010, the NYC/CHI segment of the AMS/CHI IRNC circuit from Global Crossing was switched over to NLR.

We have been working on the following activities during the first quarter of Year 6 of the grant:

- Preparing TransLight/StarLight quarterly report
- Provisioning VLANs on TransLight/StarLight CHI/AMS for e-science applications
- Representing TransLight/StarLight at major conferences and workshops, as members of the program committee and/or as participants
- Identifying and assisting applications on both IRNC circuits
- Updating the TransLight/StarLight website <[www.startap.net/translight](http://www.startap.net/translight)>
- Contributing to the GLIF applications website <[www.glif.is/apps](http://www.glif.is/apps)>
- Preparing for GLIF and SC'10 international application demonstrations

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

##### **PoP Connectivity and Peering**

No updates to report.

##### **Usage**

No updates to report.

##### **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**

No updates to report.

## **2.A.3. CHI/AMS Network Operations and Engineering**

### **PoP Connectivity and Peering**

**CHI/AMS...**In Chicago, the TransLight/StarLight OC-192 previously connected to a CANARIE-owned HDXc box at StarLight and then to StarLight's Force10 switch. From there, it peered with numerous international R&E networks, as well as the Internet2, NLR, ESnet, and regional optical networks. In March 2010, CANARIE consolidated the GOLE SONET infrastructure at StarLight. They decommissioned the HDXc and Cisco ONS15454. This had little impact on the existing connections except for the IRNC 10Gbps connection, which was re-terminated to connect straight into the Force10, bypassing the HDXc. The HDXc configuration of the IRNC connection took up two 10Gbps ports, which was necessary because the Force10 WANPHY port required full OC-192 capacity. It made more sense to terminate the IRNC 10Gbps straight into the Force10, as there was no other way to sub-rate the 10Gbps SONET circuit.

In Amsterdam, the TransLight/StarLight circuit connects to a SURFnet-owned HDXc box and Nortel NERS8600R switch at NetherLight.

### **Usage**

No updates to report.

### **Routing Policies**

No updates to report.

### **Peering Policies**

No updates to report.

### **Security**

No updates to report.

### **Engineering**

No updates to report.

### **Engineering: LightPath Services**

The following VLANs on the TransLight/StarLight CHI/AMS were recently put in place:

- **Masaryk University (Czech Republic)** has a VLAN from the Czech Republic (Brno) over CESNET to NetherLight, then over TransLight/StarLight to StarLight, and then over Internet2-ION to LSU. (For description of application use, see EAVIV, Section 2.B.2.)

### **NOC Operations**

No updates to report.

## 2.B. Research Findings

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

Tom DeFanti and Maxine Brown were involved with the following organizations and conferences:

- **9th Annual ON\*VECTOR Photonics Workshop**, sponsored by NTT and hosted by Calit2 at UCSD, February 7-9, 2010. Tom DeFanti and Maxine Brown were co-organizers and members of the Program Committee; Joe Mambretti and Alan Verlo participated.
- **ON\*VECTOR Terabit LAN Working Group**, sponsored by NTT and hosted by Calit2 at UCSD, February 10, 2010. Tom DeFanti and Maxine Brown were co-organizers, with others, and members of the Program Committee; Joe Mambretti and Alan Verlo participated.

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

#### International Applications 2010



#### **CosmoGrid: The Gravitational Billion Body Problem 2010**

<http://modesta.science.uva.nl/Projects/2008/CosmoGrid/>  
<http://wiki.2048x2048x2048.org/>

#### *Collaborators:*

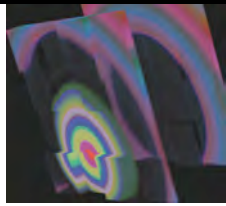
- Drexel University; Vanderbilt University; StarLight; US
- CANARIE; Canada
- Department of General Sciences and Department of Astronomy, University of Tokyo; National Astronomical Observatory of Japan (NAOJ)/Center for Computational Astrophysics; JGN2plus; SINET3; T-LEX; Japan
- Astronomical Institute (“Anton Pannekoek”), Computational Science and System and Network Engineering Science, University of Amsterdam (UvA); University of Leiden/Leiden Observatory (Sterrewacht Leiden); SARA; SURFnet; The Netherlands
- University of Edinburgh/School of Mathematics; UK
- Ludwig-Maximilians Universität at München; Germany

***Researchers in Tokyo and Amsterdam are building an intercontinental supercomputer grid to run cosmological N-body simulations of 10 billion particles. This collaboration began last year, and early progress was reported in previous TransLight/StarLight reports. This is an update of 2010 activities.***

In December 2009, NAOJ, SINET and JGN2plus began reconfiguring the networks. On February 10, 2010, Japan’s SINET officially approved use of its network by NAOJ for this experiment so testing could continue.

*Given that JGN2plus now terminates in Los Angeles (JGN2plus previously came to StarLight in Chicago), the project now uses the IRNC TransLight/StarLight from Amsterdam to Chicago, then Cisco’s C-Wave from Chicago to Los Angeles, where JGN2 connects.*





## EAVIV

<https://wiki.cct.lsu.edu/eaviv>

<http://www.internet2.edu/presentations/spring10/20100427-applications-hutanu.pdf>

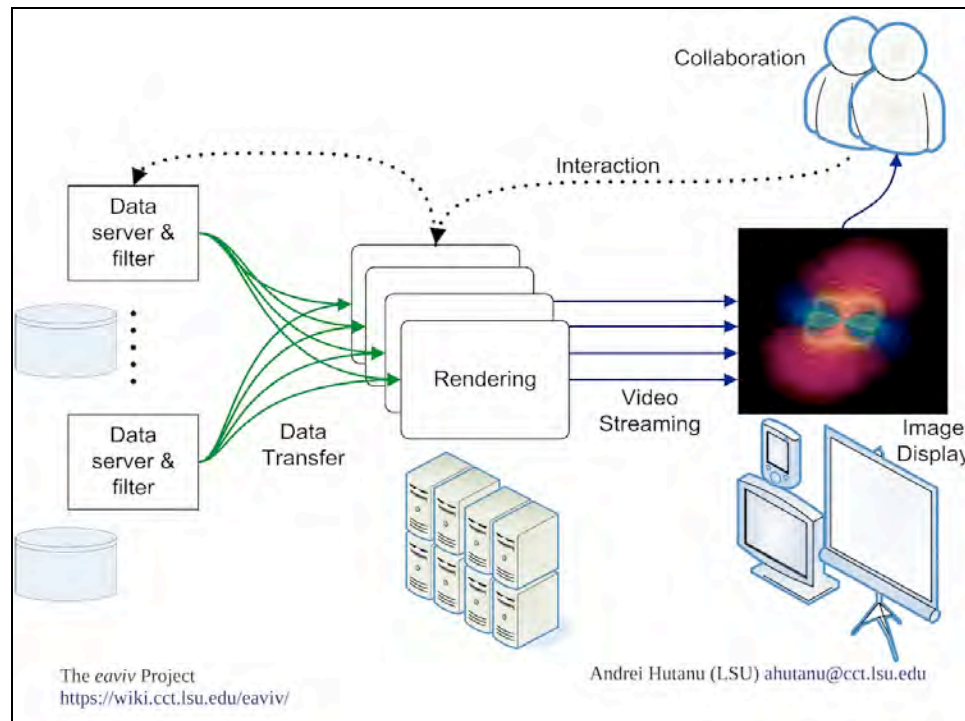
### Collaborators:

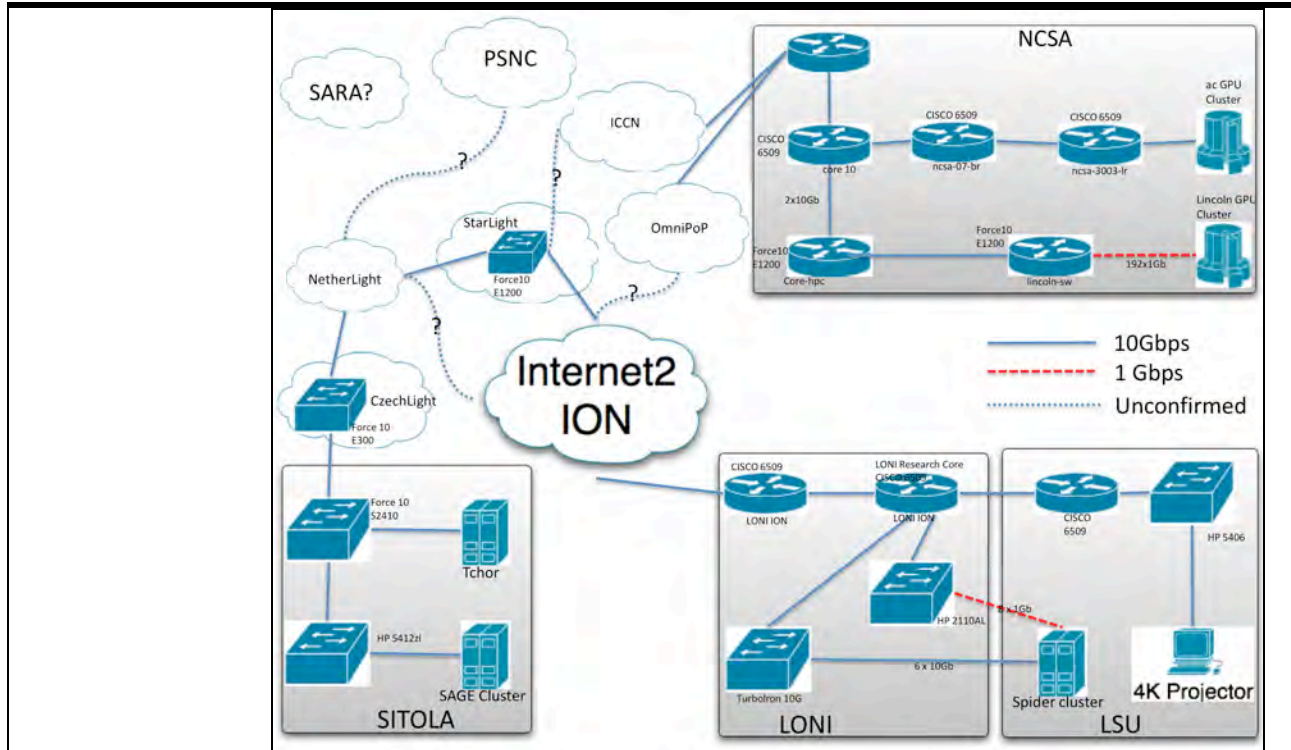
- Louisiana State University (LSU); National Center for Supercomputing Applications (NCSA); Oak Ridge National Laboratory (ORNL); Texas Advanced Computer Center (TACC); Internet2; LONI; OmniPoP; ESnet; US
- Masaryk University; Czech Republic
- Poznan Supercomputing and Networking Center (PSNC); Poland

The NSF EAGER-funded EAVIV project (Strategies for Remote Visualization on a Dynamically Configurable Testbed), is building a research testbed on which to experiment with distributed visualization scenarios on high-speed networks. It is deployed by LSU, NCSA and Masaryk University, in cooperation with ORNL and TACC, as well as network providers (Internet2, LONI, OmniPoP, ESnet). Most recently, PSNC joined the Testbed.

EAVIV develops and tests applications that distribute computing, storage and visualization, and that take advantage of dynamically provisioned optical networks and services. Images are streamed from remote rendering machines using SAGE.

*EAVIV uses the IRNC TransLight/StarLight circuit. VLANs have been provisioned at StarLight for interfacing Masaryk University and PSNC to Internet2 ION.*





### SAGE: 9th Annual ON\*VECTOR International Photonics Workshop



[http://www.sagecommons.org/index.php?option=com\\_content&view=article&id=87:pragma18&catid=1:latest-news&Itemid=50](http://www.sagecommons.org/index.php?option=com_content&view=article&id=87:pragma18&catid=1:latest-news&Itemid=50)

#### Collaborators:

ON\*VECTOR (Optical Networked Virtual Environments for Collaborative Trans-Oceanic Research) is a joint project of NTT Network Innovation Laboratories, Keio University's Institute for Digital Media and Content (DMC), the University of Tokyo's Morikawa Laboratory, the University of Illinois at Chicago's (UIC) Electronic Visualization Laboratory (EVL), and the California Institute for Telecommunications and Information Technology (Calit2) at the University of California, San Diego (UCSD), and managed by Pacific Interface Inc (PII).

This year's meeting took place February 7-9, 2010 at Calit2/UCSD. EVL's Ratko Jagodic gave the presentation "Improving SAGE Capabilities for Computer Supported Cooperative Work (CSCW)." EVL's Sungwon Nam worked with NTT Network Innovation Laboratories to stream input from multiple sources to a tiled display at Calit2/UCSD, including high-definition video of people in Japan.



### SAGE: APAN 29

[www.computerworld.com.au/article/336056/apan\\_claims\\_domestic\\_world\\_firsts/?fpid=1](http://www.computerworld.com.au/article/336056/apan_claims_domestic_world_firsts/?fpid=1)

[www.aarnet.edu.au/News/2010/02/11/APAN-claims-domestic-and-world-firsts.aspx](http://www.aarnet.edu.au/News/2010/02/11/APAN-claims-domestic-and-world-firsts.aspx)

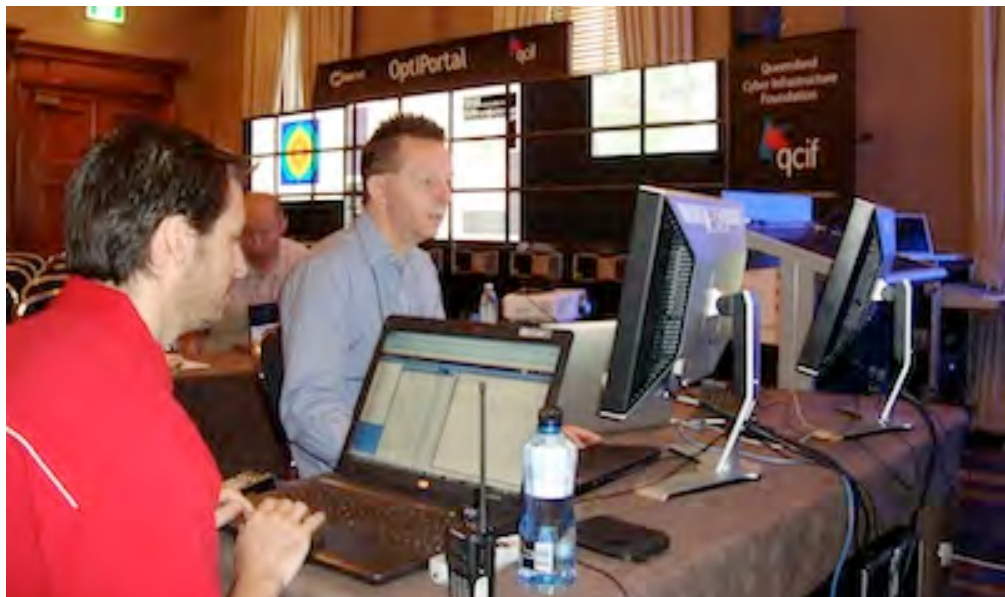


#### Collaborators:

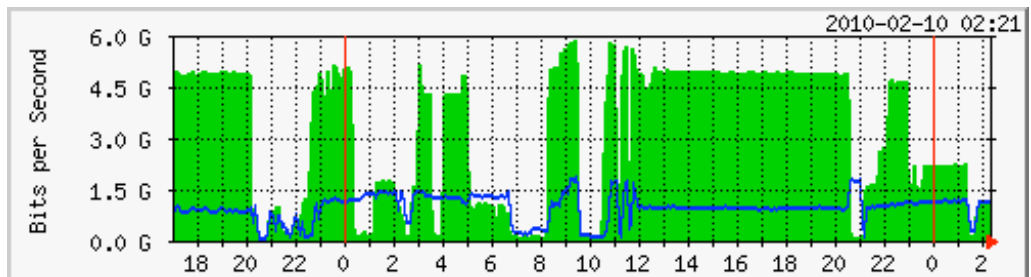
- Texas Advanced Computing Center (TACC); UIC/EVL; US
- University of Queensland; University of Melbourne; AARNet; Australia
- Gwangju Institute of Science and Technology (GIST), Korea

The Asia-Pacific Area Network (APAN) 29th conference was held February 8-11, 2010, in Sydney, Australia, and hosted by AARNet, Australia's Academic and Research Network. It featured two major SAGE demonstrations; it was featured Australia's first SAGE Visualcasting demonstration.

Demo participants included the conference site in Sydney, the University of Queensland in Brisbane, Australia, University of Melbourne in Victoria, Australia, GIST in South Korea, and TACC at University of Texas, Austin, in the US. The goal of these demos was to educate attendees on how network-based delivery of high-definition video and super-high-definition (4K) images and animations can promote global collaboration and advance scientific and engineering research in a variety of disciplines, such as telemedicine, environmental studies, and industrial design. UIC/EVL provided technical support for SAGE. *During prior demos with Australia, UIC/EVL was also involved in network engineering.*

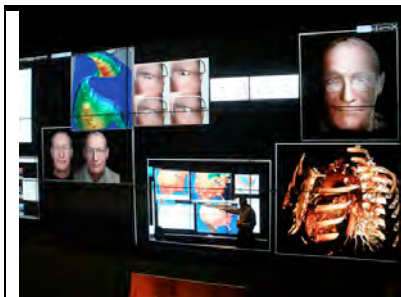


SAGE Visualcasting sustained throughput of over 5Gbps, which was measured from UQ Vislab in Brisbane to the APAN29 conference site at the Hotel InterContinental in Sydney; MRTG graph is below. Note that TACC was sending DXT compressed 4K animations, utilizing 600Mbps over R&E networks.



### 2.B.3. Education, Outreach and Broader Participation

*EVL and Calit2 do a number of tours for high-school students and undergraduate students to excite them about going to college and to encourage them to pursue careers in science and/or engineering. Most tours consist of an overview presentation of collaborative research, including IRNC/GLIF activities, followed by hands-on demonstrations of advanced, networked visualization technologies. EVL and Calit2 participated in the following broader outreach activities over the past year:*



**April 30, 2010.** EVL hosted 23 journalism students from Northwestern University's Medill School. Their professor, Donna Leff, takes her students to visit a variety of places, with the goal of having the students write articles about subjects they find interesting. This visit subsequently resulted in a story about EVL's unique and advanced classroom, and particularly how UIC physicist David Hofman uses it to teach with colleagues from remote locations <<http://news.medill.northwestern.edu/chicago/news.aspx?id=164805>>.

**February 15, 2010.** UIC/EVL participated in the campus' National Engineers Week, a yearly national event that celebrates the positive contributions engineers make to our quality of life and helps create the future engineering and technology workforce by promoting pre-college interest in math, science and technical literacy. EVL gave an overview presentation of its research, including IRNC/GLIF activities, followed by hands-on demonstrations of its advanced, networked visualization technologies.

**February 15, 2010.** UIC/EVL hosted high-school students participating in the UIC Computer Science Open House.

### 2.B.4. Community Partnerships: Meetings and Events

*TransLight/StarLight principals have participated in the following meetings and events, promoting IRNC efforts.*



**April 28, 2010.** UIC physics professor David Hofman was one of eleven recipients of the 2010 Silver Circle Award, which recognizes the university's best teachers, as selected by a committee of graduating seniors. At the time, Hofman was working in Geneva, Switzerland, with CERN's Large Hadron Collider; however, he didn't let distance get in the way of his teaching responsibilities. With help from EVL, he used EVL's large tiled display wall in its Cyber-Commons room, plus collaboration software called EVO that is popular among physicists, to continue to teach his students back in Chicago. When Hofman learned he was to receive the Silver Circle Award and that UIC NEWS was sending a photographer to take a picture of him teaching his Physics 594 class, he emailed his students to say, "...this is also an opportunity to showcase the cutting-edge facilities that EVL has created, to

get some good publicity for Physics, and to show how different departments/groups can come together to really offer something unique." The complete UIC NEWS article can be found at <<http://www.uic.edu/htbin/cgiwrap/bin/uicnews/articledetail.cgi?id=14145>>. Though this physics class did not use SAGE, it leverages EVL's investment in tiled display walls and high-speed networking to promote high-performance teleconferencing over networks.

**April 20, 2010.** Alan Verlo participated in a JET meeting.

**April 16, 2010.** Tom DeFanti visited Harvey Newman and Julian Bunn at Caltech to discuss USLHCnet, EVO and IRNC.



**March 31, 2010.** UIC published *Impact* magazine, showcasing UIC's endeavors, "...that have made and will continue to make lasting contributions to Chicago, the nation and the world." One of the articles profiles Maxine Brown for her efforts in helping build StarLight – North America's largest research and education networking hub – which is located in downtown Chicago. For the article, see <<http://www.uic.edu/depts/omc/impact/visionary.html>>. This article is based on recognition Brown received in March 2009, when she was selected as one of 10 Global Visionaries and featured in the multi-media public affairs series *Chicago Matters: Beyond Burnham* created by WBEZ Chicago

Public Radio and WTTW Chicago Public Television. The TV interview can be found at <[http://www.wttw.com/main.taf?p=42.8.80.3&player=LKuixhzDPK&rel=eqYiqJWcF3pSuT7ep2fHgCivZuLI6p\\_Q](http://www.wttw.com/main.taf?p=42.8.80.3&player=LKuixhzDPK&rel=eqYiqJWcF3pSuT7ep2fHgCivZuLI6p_Q)>. The radio interview can be found at <<http://www.chicagopublicradio.org/Content.aspx?audioID=32845>>.



**March 24-29, 2010.** Tom DeFanti and others from UCSD visited Riyadh, Saudi Arabia, to meet with the country's national science agency, the national laboratory King Abdulaziz City for Science and Technology (KACST), and Saudi Telecom Company (STC), to discuss collaborating on the development of information technology systems and advanced communications. At the conclusion of this trip, UCSD signed an initial three-year agreement with KACST and STC. The goal is to give Saudi researchers and industry specialists the opportunity to collaborate

with some of the world's best engineers as they look for solutions that can work in the global context.

**March 16, 2010.** Alan Verlo participated in a JET meeting.

**March 9, 2010.** People from Google's Chicago office visited UIC/EVL. Google very much understands the need for broadband high-speed networks and streaming media, as explained in its solicitation for proposals from small towns in the US, as published on the Google Blog in February 2010

<<http://googleblog.blogspot.com/2010/02/think-big-with-gig-our-experimental.html>>. To quote:

*"Imagine sitting in a rural health clinic, streaming three-dimensional medical imaging over the web and discussing a unique condition with a specialist in New York. Or, downloading a high-definition, full-length feature film in less than five minutes. Or, collaborating with classmates around the world while watching live 3-D video of a university lecture. Universal, ultra high-speed Internet access will make all this and more possible. We've urged the FCC to look at new and creative ways to get there in its National Broadband Plan – and today we're announcing an experiment of our own. We're planning to build and test ultra high-speed broadband networks in a small number of trial locations across the United States. We'll deliver Internet speeds more than 100 times faster than what most Americans have access to today with 1 gigabit per second, fiber-to-the-home connections. We plan to offer service at a competitive price to at least 50,000 and potentially up to 500,000 people."*

**February 10, 2010.** Tom DeFanti and Maxine Brown were co-organizers, with others, of the ON\*VECTOR Terabit LAN Working Group. Participants included DeFanti, Brown, Alan Verlo and Joe Mambretti.

**February 7-9, 2010.** Tom DeFanti and Maxine Brown were co-organizers, with others, of the 9th Annual ON\*VECTOR Photonics Workshop, sponsored by NTT, and hosted by Calit2 at UCSD. DeFanti, Brown and Alan Verlo attended. Several IRNC national/international collaborators also attended and participated; including: Joe Mambretti, Tajana Rosing, Erik-Jan Bos (SURFnet), Greg Cole (GLORIAD), Jan Gruntorad (CESNET), Lars Fischer (NORDUnet - via VTC), Sebastia Sallent (i2CAT), Michael Stanton (RNP), Brian Tierney (ESnet), and Dave Reese (NLR). EVL's Ratko Jagodic gave the

presentation “Improving SAGE Capabilities for Computer Supported Cooperative Work (CSCW),” explaining the new SAGE user-interaction schemes. EVL’s Sungwon Nam participated in demonstrations of SAGE and multi-rail aware, flexible data-transfer applications using TLAN technologies.

**February 3-4, 2010.** Alan Verlo attended a GLIF Technical Working Group meeting, held in conjunction with the Joint Techs Workshop in Salt Lake City, UT. GLIF made progress in some of its Working Groups and created others (see list below). Notably, Alan Verlo is implementing the Dynamic GOLE project for StarLight. The short-term objective is to implement a prototype infrastructure at a few GOLEs (NetherLight, StarLight, MAN LAN, NORDUnet) to enable demos for the GLIF meeting in October 2010 as well as for SC10. The prototype infrastructure would persist for further development for another 12-18 months after that. The long-term objective is to develop implementation and models to enable inter-domain dynamic lightpath control as permanent infrastructure at GOLEs.

- **GNI API Task Force**, headed by Evangelos Chaniotakis (ESnet), is developing a generic network interface (GNI) for making lightpath reservation requests, as well as building a software framework called Fenius to facilitate translation between GNI and different reservation control systems. The aim is to converge various existing initiatives (e.g., the EU Phosphorus project’s Harmony, Japan’s G-lambda, GÉANT2’s IDC), in order to standardize and enhance lightpath resource management.
- **Dynamic GOLE Task Force**, headed by John Vollbrecht (Internet2), is defining common policies and best practices for GLIF Open Lightpath Exchanges (GOLEs), and to investigate how to provision these. The MAN LAN, NetherLight, NorthernLight and StarLight GOLEs will be implementing Fenius to translate bandwidth requests to the underlying control mechanisms such as DRAC and OSCARS. The goal is to make automated GOLE capabilities available for demos in the 4Q 2010.
- **perfSONAR Task Force**, headed by Thomas Tam (CANARIE), is showing the usability and functionality of perfSONAR as a lightpath monitoring tool. While successfully demonstrated at previous Global LambdaGrid Workshops, further enhancements are required to support dynamic circuit configuration and topology services.
- **Global Identifiers Task Force**, headed by Ronald van der Pol (SARA), published a scheme to uniquely name lightpaths, which has been adopted by NetherLight, StarLight and KRLight.
- **Three new task forces were also developed:** (1) the Distributed Topology Exchange Task Force, led by Jeroen van der Ham (UvA), to investigate how to exchange inter-domain topology information based on existing intra-domain solutions; (2) the Resource Allocation Task Force, led by Gigi Karmous-Edwards (NCSU), to focus on how to exchange policy and authorization information; and, (3) the Campus Networking Task Force, led by Ronald van der Pol (SARA) to reach out to campus networkers by determining their needs and requirements, producing information on how to setup and use lightpaths, and encouraging and supporting tests and demos.

**February 2, 2010.** Alan Verlo participated in a JET meeting, which was collocated at the Internet2/ESnet Joint Techs Workshop.

**January 31 - February 4, 2010.** Alan Verlo attended the Winter 2010 ESCC/Internet2 Joint Techs in Salt Lake City, UT.



**January 25 – February 4, 2010.** Tom DeFanti and Calit2 and EVL staff traveled to Saudi Arabia to participate in the KAUST Winter Enrichment Program (WEP). WEP is a month-long semester designed for the entire KAUST community to enlarge its intellectual horizons and stretch its collective imaginations. The WEP featured more than 100 courses, workshops, seminars, lectures and recreational events that enriched faculty/student minds and lives. Visualization Workshops took place during a one-week period. In particular, Luc Renambot of

UIC/EVL and Greg Wickham, KAUST, taught the “Streaming Televisualization (SAGE) Workshop,” that covered high-resolution visualization displays connected to high-speed networks, remote rendering and parallel pixel streaming with ParaView and SAGE.

### **2.B.5. Plans for the Coming Quarter**

TransLight/StarLight plans for May 1 – July 31, 2010, include:

- Continue provisioning VLANs on TransLight/StarLight CHI/AMS for e-science applications
- Continue representing TransLight/StarLight at major conferences and workshops, as members of the program committee and/or as participants
- Continue identifying and developing production applications on both IRNC circuits
- Continue updating the TransLight/StarLight website
- Continue to contribute to the GLIF applications website
- Continue preparations for GLIF 2010 and SC’10 international demonstrations

## **2.C. Research Training**

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National Research & Education Network (NREN) 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 NRENs 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**

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

EVL has partnered with NCSA and ANL since 1986, with NU/iCAIR since 1994, and with Calit2/UCSD since 2000, in ongoing efforts to develop national/international collaborations at major professional conferences, notably ACM/IEEE Supercomputing (SC), IEEE High Performance Distributed Computing (HPDC), Internet2 Member Meetings and GLIF Workshops. 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 GLIF workshop and SC conference, and have participated in AAAS 2008 and 2009, 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**

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#### **3.A. Journals/Papers**

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None.

#### **3.B. Books/Publications**

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None.

#### **3.C. Internet Dissemination**

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[www.startup.net/translight](http://www.startup.net/translight)

#### **3.D. Other Specific Products**

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

## **4. Contributions**

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### **4.A. Contributions within Discipline**

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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/PacificWave, GLORIAD and WHREN-LILA), and technical and administrative contacts at national NRENs (Internet2, ESnet and NLR) and foreign NRENs (DANTE and SURFnet).

### **4.B. Contributions to Other Disciplines**

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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 10Gbps routed circuit connecting Internet2, NLR, ESnet and GÉANT2 provides greater transatlantic connectivity, and the 10Gbps switched circuit between StarLight and NetherLight provides long-distance, high-bandwidth capability for demanding data-intensive e-science applications.

### **4.C. Contributions to Human Resource Development**

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We promote TransLight/StarLight through web documentation, articles, demonstrations and presentations at major networking conferences (e.g., SC, HPDC, Internet2), workshops (GLIF, PFLDNet), scientific conferences (AAAS), as well as 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 current mailing list of ~400 <[stars@startap.net](mailto:stars@startap.net)> individuals, from academia, government and industry, interested in information about international networking developments.

### **4.D. Contributions to Resources for Research and Education**

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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 switched 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**

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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. Conference Proceedings**

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None.

## **6. Special Requirements**

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### **6.A. Objectives and Scope**

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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.

### **6.B. Special Reporting Requirements**

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

No.

### **6.C. Animals, Biohazards, Human Subjects**

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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.