



## TransLight / StarLight

NSF Cooperative Agreement OCI-0441094

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

QUARTERLY REPORT August 1, 2007 – October 31, 2007

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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

### Table of Contents

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1. Participants	3
1.A. Primary Personnel	3
1.B. Other Senior Personnel (Excluding PI and Co-PI)	3
1.C. Other Organizations That Have Been Involved as Partners	3
1.D. Other Collaborators or Contacts	3
2. Activities and Findings	5
2.A. Research Activities	5
2.A.1. Accomplishments and Milestones	5
2.A.2. Infrastructure Topology	5
2.A.3. NYC/AMS Network Operations and Engineering	5
2.A.4. CHI/AMS Network Operations and Engineering	5
2.A.5. Meeting and Conference Participation	6
2.B. Research Findings	8
2.B.1. E-Science Application Identification and Support	8
2.B.2. E-Science Support (Quantified Science Drivers)	8
2.B.3. Plans for the Coming Quarter (Quarterly Reports Only)	8
2.C. Research Training	9
2.D. Education/Outreach	9
3. Publications and Products	10
3.A. Journals/Papers	10
3.B. Books/Publications	10
3.C. Internet Dissemination	10
3.D. Other Specific Products	10
4. Contributions	11
4.A. Contributions within Discipline	11
4.B. Contributions to Other Disciplines	11
4.C. Contributions to Human Resource Development	11
4.D. Contributions to Resources for Research and Education	11
4.E. Contributions Beyond Science and Engineering	11
5. Special Requirements	12
5.A. Objectives and Scope	12

5.B. Special Reporting Requirements	12
5.C. Animals, Biohazards, Human Subjects	12

## 1. Participants

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### 1.A. Primary Personnel

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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)

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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

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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 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](http://www.icair.org)>, also runs the StarLight facility <[www.startap.net/starlight](http://www.startap.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 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](http://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](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 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](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 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](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.

### **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 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](http://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

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### 2.A. Research Activities

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

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

- Provisioning VLANs on TransLight/StarLight CHI/AMS for e-science applications (ongoing)
- 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.
- Completed updating TransLight/StarLight website <[www.startap.net/translight](http://www.startap.net/translight)> with information contained in 2006-2007 Annual Report
- Contributed to the GLIF Applications website <[www.glif.is/apps](http://www.glif.is/apps)>
- Begin preparations for SC07 international application demonstrations
- 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.startap.net/translight/pages/measurement.html](http://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

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](http://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...**No new VLANs created.

**LightPath Services...**DRAGON and LHC/CERN VLANs are still pending.

## NOC Operations

See <[www.startup.net/starlight/ENGINEERING/network\\_operations.html](http://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:*

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

**October 23-25, 2007.** NSF OCI sponsored an IRNC Workshop, organized by Alan Blatecky. Unfortunately, Tom DeFanti and Maxine Brown had unexpected emergencies and were unable to attend. Chip Cox represented TransLight/StarLight on a Workshop panel. The resulting IRNC Workshop report has been posted to the TransLight/StarLight website.

**October 22, 2007.** Fang-Pang Lin of the NCHC supercomputer center in Taiwan visited Jason Leigh and Maxine Brown (EVL) to learn more about OptIPuter technologies.

**October 19, 2007.** Alan Verlo participated in the IRNC Measurement Group phone call.

**October 16, 2007.** Alan Verlo and Linda Winkler participated in the monthly JET meeting at NSF.

**October 9-10, 2007.** Larry Smarr gave the presentation “New Applications of SuperNetworks and the Implications for Campus Networks” at the Fall 2007 Internet2 Member Meeting, Town and Country Resort and Convention Center, San Diego, CA. The next day, Tom DeFanti orchestrated demos for Internet2 attendees at Calit2; demos included iHDTV teleconferencing between Calit2 and U Washington; 4K streaming from EVL in Chicago to the Calit2 auditorium; stereo movies; and, 4K movies playing locally. Kevin Thompson, while he could not attend the Calit2 portion of the meeting, sent an email saying “...while I got tied up and sadly missed your demos yesterday afternoon, word among folks I’ve talked to at the I2 meetings is that people were ‘blown away’.”

**October 8-12, 2007.** APAC07, the biennial Australian Partnership for Advanced Computing (APAC) Conference and Exhibition on Advanced Computing, Grid Applications and eResearch <[www.apac.edu.au/apac07](http://www.apac.edu.au/apac07)>, was held in Perth. As part of this event, there was a workshop entitled “Driving eResearch Collaboration Across the Pacific (DeRCAP)” <[www.apac.edu.au/apac07/dercap/](http://www.apac.edu.au/apac07/dercap/)> that was organized by John Silvester’s TransLight/PacificWave Application group, with Maxine Brown representing TransLight/StarLight.

**October 5, 2007.** Alan Verlo participated in the IRNC Measurement Group phone call.

**October 1, 2007.** Russia’s Space Research Institute used EVL’s SAGE to stream 4K animations from EVL and StarLight to Moscow as part of the October 1, *50th Anniversary of Sputnik* celebrations, to show government officials how they were using Moscow’s 10Gbps connection from Moscow to Amsterdam. Bob Grossman’s NCDM/TeraFlow/SDSS project was also part of the demonstrations.

**September 27-28, 2007.** Jason Leigh (EVL) attended the NSF Workshop “Enabling Science Discoveries Through Visual Exploration” in Arlington, VA <[www.visualizingscience.org](http://www.visualizingscience.org)>. Maxine Brown provided NSF OCI program manager Lucy Nowell with copies of the 1987 NSF-funded report *Visualization in Scientific Computing*, edited by

Bruce McCormick, Tom DeFanti and Maxine Brown, as Nowell was interested in providing this document to attendees to show what progress has taken place over the past 20 years. Note: This report mentioned networking.

**September 26, 2007.** Maxine Brown attended the PRAGMA-13 Workshop, at the Advanced Computing Applications and Technologies Institute, UIUC/NCSA, Champaign, IL.

**September 22, 2007.** Tom DeFanti is a member of the SURFnet Scientific Advisory Committee and attended the annual meeting in Utrecht, The Netherlands.

**September 17-18 2007.** Tom DeFanti, Maxine Brown, Alan Verlo, Joe Mambretti and Linda Winkler participated in the 7th Annual Global Lambda Grid Workshop (GLIF), Prague, Czech Republic.

- *Streaming 4K at GLIF 2007...* During GLIF 2007, CineGrid participants streamed 4K digital cinema material “on demand” in real time from seven playback servers in Japan, Europe and North America to both audiences at Charles University in central Prague, and then at CinePOST, a cinema post-production facility within Barrandov Studios, one of the largest and oldest film production centers in Europe. Playback nodes were located at: Keio University (Japan); University of Amsterdam/SARA (The Netherlands); Calit2/UCSD; UIC/EVL; UIUC/NCSA; USC/School of Cinematic Arts; and, U Washington/ResearchChannel.
- *4K Remote Production & Color Correction...* On September 18, CineGrid members demonstrated a prototype workflow for remote color-grading of digital rushes from a 4K digital camera shoot in Prague to a specialized rendering processor located nearly 10,000 km away in San Diego, and a 4K color correction system in Prague operated by a colorist working 7000 km away in Toronto. Calit2 and EVL participated.
- Maxine Brown chaired the GLIF Applications Working Group sessions. Jason Leigh and Luc Renambot of EVL gave a presentation on the OptIPuter “SAGE Visualcasting” experiment between Chicago, Amsterdam and the Czech Republic the week prior to the GLIF event. Laurin Herr of CineGrid gave a presentation on the CineGrid experiments taking place in Prague during the GLIF meeting (for which Alan Verlo provided major network engineering support).
- Joe Mambretti, Cees de Laat, Michel Savoie, et. al., demonstrated “International Dynamic Optical Multicast and the HPDM Testbed.”

**September 16, 2007.** Joe Mambretti, Tom DeFanti, Maxine Brown, Alan Verlo and Linda Winkler participated in the GLIF-North America (NA) meeting, held in Prague, Czech Republic.

**August 25-26, 2007.** The Chinese-American Network Symposium (CANS 2007) was held in Xi’an, China. Although she did not attend, Maxine Brown was on the program committee and recommended several presentations describing advanced networking applications.

**August 24, 2007.** Tom DeFanti (Calit2) met with Dr. Velikhov of the Russian Academy of Sciences regarding future Calit2/EVL collaborations.

**August 21, 2007.** Alan Verlo and Linda Winkler participated in the monthly JET meeting at NSF.

**August 16, 2007.** Tom DeFanti and Maxine Brown participated in the monthly NSF IRNC phone call.

**August 14, 2007.** Alan Verlo participated in the IRNC Measurement Group phone call.

**August 13-14, 2007.** Joe Mambretti and Maxine Brown participated in the ONT-4 Planning Meeting, FermiLab, Batavia, Illinois

**August 9, 2007.** Maxine Brown (EVL) hosted a tour of EVL for representatives from the University of Electronic Science and Technology of China (UESTC), a leading university in China on communication and networking.

**August 3, 2007.** Alan Verlo participated in the IRNC Measurement Group phone call.

## 2.B. Research Findings

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### 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** <cidays.org> 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. While Brown has asked IRNC-funded people to participate in these events, no one has volunteered; Russ Hobby of Internet2, who coordinates these events, has presented IRNC Powerpoints that Brown prepared. During this quarter, there was a CI Days held October 3, 2007, at the ND/SD EPSCoR 6th Biennial Joint Conference <[www.ndsu.edu/epscor/news/NDSDJointEPSCoRConf2007.htm](http://www.ndsu.edu/epscor/news/NDSDJointEPSCoRConf2007.htm)>. The Educause 2007 conference held a seminar “CyberInfrastructure: What, Why, How, and Who’s Already Doing It” at its annual meeting in Seattle on October 23 <[www.educause.edu/E07/Program/11073?PRODUCT\\_CODE=E07/SEM03A](http://www.educause.edu/E07/Program/11073?PRODUCT_CODE=E07/SEM03A)>. And, a presentation about CI Days took place at the Internet2 Fall Member Meeting in San Diego on October 9 <<http://events.internet2.edu/2007/fall-mm/sessionDetails.cfm?session=3531&event=273>>.
- **Workshop on Driving eResearch Collaboration Across the Pacific (DeRCAP)** was 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/](http://www.apac.edu.au/apac07/dercap/)>. Organized by John Silvester’s TransLight/PacificWave Applications group, with Maxine Brown representing TransLight/StarLight, the group worked with John O’Callaghan, APAC Executive Director, and Chris Hancock, Chief Executive Officer of AARNet, on this US-Australia Workshop.
- **PRAGMA-13 Workshop** was held at NCSA, September 23-25, 2007. Maxine Brown was a member of the Technical Program Committee <[www.ncsa.uiuc.edu/Conferences/PRAGMA13/](http://www.ncsa.uiuc.edu/Conferences/PRAGMA13/)>.
- **The Chinese-American Network Symposium (CANS) 2007** took place August 25-26, 2007, in Xi’An, China <[www.canscouncil.net/cans2007/](http://www.canscouncil.net/cans2007/)>. Maxine Brown was a member of the program committee.

### 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](http://www.startup.net/translight/pages/applications.html)>. Applications utilizing GLIF links are publicized at <[www.glif.is/apps/](http://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.
- Facilitate new GLIF network map
- Continue preparations for SC’07 international demonstrations



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

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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**

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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**

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

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None.

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

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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**

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

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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 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**

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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**

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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 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**

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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. Special Requirements**

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### **5.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.

### **5.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.

### **5.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.