National Science Foundation, Directorate for Computer Information Science and Engineering
Division of Advanced Networking Infrastructure & Research (ANIR)

EuroLink

High Performance International Internet Services between Research and Education Institutions in the United States and Europe/Israel

NSF Cooperative Agreement No. ANI-9730202
Quarterly Status Report
April 1, 1999-June 30, 1999

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A. Significant Results or Events in the Past Quarter

- Received "EuroLink" cooperative agreement and wrote press release for STAR TAP and EVL web pages. See http://www.startap.net and http://www.evl.uic.edu
- Successfully facilitated the connection of two of EuroLink's charter National Research Networks (NRNs)—SURFnet and RENATER2—to STAR TAP. (See Section C.1)
- Working with the two remaining EuroLink charter NRNs—NORDUnet and Israel IUCC—to complete connectivity to STAR TAP. (See Section C.1)
- Working with CERN to complete connectivity to STAR TAP. (See Section C.1)
- Started work on Applications-Level Network Performance Tests with SARA, the Amsterdam Supercomputing Center, in the Netherlands. (See Section C.4)

B. Expected Results or Events in the Coming Quarter

- Successfully connect NORDUnet, Israel IUCC and CERN to STAR TAP.
- Develop EuroLink web site.
- Statistics reports from Indiana University NOC.

C. Summary of Technical Activities

C.1. EuroLink Network Peering Status and Institutions

C.1.a. CERN

Status

Requested turn up date: 7/28/99
Confirmed turn up date: Pending

Topology and Other Technical Details

IP Address on point-to-multipoint subnet: 198.32.120.32
Hostname: Ar1-chicago-startap.cern.ch.
NOC-phone: +41-22-7675011
NOC-email: noc@cern.ch
TC-Name: Paolo Moroni
TC-Phone: +41-22-7676827
TC-EMail: extip@dxcoms.cern.ch
VPI/VCI: 3/41
ASN: 513

Contacts

CERN Policy:
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Olivier.Martin@cern.ch

CERN Engineering:
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Paolo.Moroni@cern.ch

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C.1.b. IUCC (Israel)

Note: IUCC is sometimes erroneously referred to as Q-MED on Ameritech documentation.

Status

Circuit to Ameritech is up and running.
Jumpers in the NAP.NET PoP still need to be installed.
IUCC co-located equipment and missing jumpers scheduled to be installed July 20-21

Topology and Other Technical Details

IUCC (Israel) from Gilat ⇒ T3 Satellite Link to NYC ⇒ Level 3 - T3 to Chicago ⇒ MFS Local Loop to GTE/ NAP.NET ⇒ Local Loop to Ameritech NAP

Carriers:
Gilat: T3 Satellite Israel - NYC
Level3: Circuit NYC to Chicago
MFS: OC-3 Local Loop from Level3 to NAP.NET Local Loop Circuit ID: 3x-sar-2wj-001
GTE/NAP.NET provides IUCC with co-location for a pair of Cisco 7507s
(NAP.NET PoP address is: 216 W Jackson, Suite 1020)
Ameritech Circuit ID: JJGS702207LB
Ameritech NAP assigned VPI/VCI: 3/42

Contacts

IUCC Policy:
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Local contact at GTE/NAP.NET:
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GTE Internetworking/ISP Direct division
Implementation Coordinator/Provisioning
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+1 414 747-8778 fax
ghelchen@bbn.com

Kay Sears is IUCC's Point of Contact (POC) for the entire USA DS-3 hookup: ksears@atcteleports.com

C.1.c. NORDUnet (Nordic Consortium)

Status

Requested turn up date: 7/8/99
Confirmed turn up date: Pending

Topology and Other Technical Details

Ameritech NAP assigned VPI/VCI: 2/58

Contacts

NORDUnet Policy:
Peter Villemoes
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NORDUnet Engineering:
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Carrier:
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Chicago PoP:
Excel Communications
717 South Wells, 6th Floor
Chicago, IL 60607
Contact: Allan Bradly
+1 312 939 7933

C.1.d. RENATER2 (France)

Note: RENATER2 is referred to as FRANCE TELECOM on Ameritech documentation.

Status

Currently up and running. Peering with the vBNS

Topology and Other Technical Details

Ameritech NAP assigned VPI/VCI: 2/47 (FRANCE TELECOM)

Contacts

RENATER2 Policy:
Dany Vandromme
Dany.Vandromme@renater.fr

REANTER2 Engineering:
Jean-Marc Uze
uze@renater.fr

C.1.e. SURFnet (The Netherlands)

Status

Currently up and running. Peering with Abilene in NYC and some Chicago area schools at STAR TAP. Not yet peering with vBNS.

Topology and Other Technical Details

SURFnet Topology: 75 Mbps from The Netherlands into NYC (60 Hudson St.) At 60 Hudson there is a SURFnet ATM switch and router. SURFnet peers with Abilene at 60 Hudson and runs a 45 Mbps to link to STAR TAP.

IP Address on point-to-multipoint subnet: 198.32.120.27
Hostname: BR1.NewYork.surf.net
NOC-phone: +31 20 5928000
NOC-email: nic@sara.nl
TC-Name: Erik-Jan Bos
TC-Phone: +31 30 2305305
TC-EMail: bos@surfnet.nl

Contacts

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SURFnet Engineering:

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C.2. Engineering Services

- Bill Owens of NYSERNET expressed interest in connecting to STAR TAP; JJ Jamison put him in touch with Andy Schmidt.
- Matt Zekauskus of Advanced Network & Services wants to put a Surveyor box at STAR TAP for performance monitoring. JJ has provided him with information on Ameritech's GPS feed. Matt is looking into whether or not this feed can be used by Surveyor. [This will benefit all STAR TAP-connected countries, including the EuroLink countries. It also facilitates UIC's research on application-level network performance monitoring.]
- Duanne Wessels of NLANR agreed to install and manage a Web Cache box at STAR TAP. [This will benefit all STAR TAP-connected countries, including the EuroLink countries.]
- Jamshid Mahdavi of Novell and Micha Beck of Internet2's Distributed Storage Working Group expressed interested in putting a Web Cache at STAR TAP. This is in the planning stages.
- Abha Ahuja of MERIT/University of Michigan and JJ Jamison discussed the Internet2 Routing Registry (RR) and using it to configure the STAR TAP router's routing filters.
- Brent Sweeny of Indiana University and JJ Jamison discussed the fact that the STAR TAP rack does not have the same equipment as a standard Abilene rack (e.g., the port selector and Ethernet hubs are different). JJ will work with Brent and Linda Winkler to standardize STAR TAP equipment. This will make STAR TAP/EuroLink/TransPAC troubleshooting a lot easier for Indiana's NOC. JJ will also talk to Brent about getting on the same Cisco maintenance contract as Abilene, which would be good if STAR TAP ever needed to replace a component (e.g. a router card).
- Both Andy Germain (of NASA/NISN) and Phil Dykstra (of DREN and iDREN) have agreed to peer with the STAR TAP router, and hence EuroLink countries.

C.3. NOC Services

- Indiana University is responsible for EuroLink Network Operation Center (NOC) services. Since our first quarter has been spent focused on NRN connectivity, there is no information to report at this time.
- Currently working on executing the subcontract to Indiana University for NOC services.

C.4. EuroLink Performance Analysis Tools

EVL/UIC is working on various methods of visualizing network characteristics within an immersive space. This will involve the instantaneous visualization of the latency and jitter directly on top of each avatar in a collaboration. We also plan to work with Tamara Munzner from Stanford to extend CAIDA tools—in particular, the hyperbolic tree visualizer—to visualize complex network topologies.

More specifically, EVL is currently working on constructing predictive performance models for networked virtual-reality applications, which should allow us to predict the tele-immersive capabilities of various international network connections. These models will be constructed at three levels:

- Network packet routing level
- Tele-immersion data flow level (tracker data, audio, video, simulation data, etc.)
- Tele-immersive application level, where a single application makes use of multiple simultaneous data flows.

We are investigating both probabilistic and non-probabilistic models using Petri Nets. As part of this process, EVL is collecting data on the properties of the various legs and routers between EVL and SARA in Amsterdam, which is our initial testbed. These properties will be used to generate accurate probabilistic distributions, to be used as inputs for the various network performance models. EVL has developed TCP and UDP models for CAVERNsoft and we are currently evaluating these on local networks while extending them to cover higher level data flows. These models will be initially tested with SARA's SARANav application to evaluate the quality of the performance models. We worked with SARA to add a collaborative component to this application and they are integrating their real-time radiosity code, which will allow us to look at tracker, audio, video, and simulation data in a single

application with multiple collaborators across EuroLink. EVL is currently confirming time synchronization issues before we start testing, making sure all our time servers are correct.

Jason Leigh of EVL visited SARA on June 14. Agreed upon action items include:

- EVL will help SARA by putting CAVERNsoft into SARANav. The particulars of who will do the integration will depend on the results of the exchange of detailed information about CAVERNsoft and SARANav with each other.
- SARA will make SARANav's source available to EVL for download. CAVERNsoft is already available in binary distribution form but source can be arranged too.
- We will try and perform a pilot integration for SARANav/CAVERNsoft by August 9 in time for SARA to freeze the demo for the Telecom '99 conference. The functionalities will include the ability to see shared avatars and the ability to see what others are pointing to. Audio streaming may be added but is not immediately necessary.
- The second phase of this project will include the network performance monitoring of the SARANav/ CAVERNsoft application over STAR TAP/EuroLink. The specifics will be determined at a later time. This will also include a test of the future annotation capabilities of SARANav that EVL will provide at a later date.
- EVL and SARA will determine the accuracy of each of our own time servers to ensure that future networking tests guarantee accurate results.

D. Accomplishments

D.1. Meetings Attended

April 6, 1999. HPIIS Team Meeting, Chicago, IL. Status reports of STAR TAP, TransPAC, MIRnet and EuroLink where presented. Tom DeFanti, Maxine Brown, Alan Verlo, and JJ Jamison attended. Tom DeFanti chaired the meeting. Meeting organized by Maxine Brown.

April 14, 1999. STAR TAP Connectivity/ Internet2 MOU meeting with CERN at Fermi National Accelerator Laboratory, Chicago, IL. Attendees: David Williams, Harvey Newman, Manuel DelFino, CERN; Matthias Kasemann, FermiLab; Michael Ernstein, DESY; Tom DeFanti, Maxine Brown, STAR TAP/EuroLink; Linda Winkler, STAR TAP/TransPAC; Heather Boyles, UCAID Internet2.

April 26-28, 1999. Internet2 Spring Member Meeting, Washington DC. Internet2 International Task Force Meeting attended by Tom DeFanti and Maxine Brown.

May 3-4, 1999. USA/Israel NGI Workshop, Tel Aviv, Israel. Hosted by the Israeli Ministry of Science. Tom DeFanti attended and presented two lectures, "The CAVE and Virtual Reality," and "The Internet2, Next Generation Internet, and STAR TAP."

June 1-4, 1999. First Joint European Commission/National Science Foundation Advanced Research Workshop on "Research Frontiers in Virtual Environments and Human-Centered Computing," Chateau de Bonas, France. Tom DeFanti participated. Organized by Andy van Dam (Brown University, USA) and Rae Earnshaw (University of Bradford, UK).

June 7-10, 1999. TERENA NORDUnet Networking Conference TNNC99. Maxine Brown attended and presented "CAVERN: The CAVE Research Network."

June 6-10, 1999. NLANR/Internet2 Techs Workshop, Carnegie Mellon University, Pittsburgh, PA. JJ Jamison attended and gave the presentation "STAR TAP Engineering Update."

June 10, 1999. JET (Joint Engineering Team) meeting, Pittsburgh, PA. JJ Jamison attended.

June 14, 1999. Jason Leigh visited the Academic Computing Services Amsterdam (SARA) center to discuss collaborative research. (See Section C.4)

June 15-17, 1999. Academic School of Computing and Imaging '99 (ASCI '99) conference, Boxmeer, Heijen, The Netherlands. Jason Leigh gave keynote presentation "A Tele-Immersive Environment for Collaborative Exploratory Analysis of Massive Data Sets."

June 22, 1999. STAR TAP International Advisory Committee and Technical Advisory Committee meetings, INET'99, San Jose, CA. Tom DeFanti, Maxine Brown, JJ Jamison, and Alan Verlo attended. Also attended by Danny Dolev and Ari Cohen (Israel IUCC), and Dany Vandromme (RENATER2). Tom DeFanti chaired the morning session (International Advisory Committee meeting) and JJ chaired the afternoon session (Technical Advisory Committee meeting). Meetings and agenda organized by Maxine Brown, and hosted by Teleglobe.

June 29-30, 1999. Measurement and Analysis Collaborations Workshop Among Measurement Host Sites, San Diego Supercomputer Center, San Diego, CA, sponsored by NLANR/MOAT. JJ Jamison and Alan Verlo attended. JJ gave presentation entitled "Planned Performance Measurement @ STAR TAP."

D.2. Publications

Jason Leigh, Andrew Johnson, Tom DeFanti, Stuart Bailey, Robert Grossman, "A Tele-Immersive Environment for Collaborative Exploratory Analysis of Massive Data Sets," ASCI 99, pp. 3-9, Heijen, the Netherlands, June 15-17, 1999, http://www.evl.uic.edu/cavern/TIDE/tide.pdf

Maxine Brown, "CAVERN: The CAVE Research Network" (abstract), TERENA NORDUnet Networking Conference 1999: The Challenge of Gigabit Networking, Lund, Sweden, June 7-10, 1999, http://www.terena.nl/tnnc

E. Problems

- NORDUnet has been ready to pass packets for some time, although changes in the physical location of the Chicago Teleglobe circuit and misdelivery of routing equipment has caused delays. Ameritech's serial way of dealing with problems like these is the topic of an upcoming meeting with AADS management.
- CERN has expressed frustration at the time it takes Ameritech to turn up a circuit. We will address this at the AADS meeting on July 28.
- Israel IUCC's routing in Chicago runs through a NAP.NET terminal where traffic is to be split into high performance/meritorious traffic bound for the STAR TAP/AADS and commodity traffic bound for the Internet. NAP.NET has run into problems with cabling, which has caused delays of a couple of weeks. Packets should be passing by the end of July.

F. Collaboration Activities

- Tom DeFanti attended the Israel Internet2 Conference, May 3-4, 1999, and also met with professors from Hebrew University and Haifa regarding applications.
- Andy Johnson, Jason Leigh, and Dan Sandin are working with SARA in The Netherlands on network performance modeling. (See section C.4.)
- In addition to working with SARA on performance modeling, EVL/UIC is working with SARA on a collaborative application. SARA is working with the architectural company in Amsterdam who is redesigning Illinois Institute of Technology's campus in Chicago. The collaborative version of their SARANav application, called SARACOL, will be used for this project. This software will also be demoed at the Telecom '99 conference on August 9. In the future, SARA wants to add radiosity code to SARACOL and run their codes internally, on their IBM SPs, as well as on the NCSA Origins so we can monitor and compare traffic.

G. Any Proposed Changes in Future Plans

No changes to date.

H. Summary of Award Expenditures (April-June)

- Currently working with UIC to execute the subcontract to Indiana University for NOC Services.
- Received Israel IUCC invoice for annual $400,000 payment and UIC is processing it.
- Received a Letter of Support from RENATER (missing from the EuroLink proposal), which UIC requested in order to process subsequent invoices.
- Working with RENATER2, NORDUnet, and SURFnet on wording of their respective invoices for their annual $400,000 payments.
- No NSF reimbursement for this fiscal year is expected by CERN.

EuroLink Expenditures, Year to Date	
Expenditures for current quarter (April-June 1999)	$0
Total Expenditures	$0