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A. Summary of Technical Activities

A.1. Euro-Link Network Status and Institutions

A.1.a. CERN

CERN's Olivier Martin and Paolo Moroni are working Ameritech on their 45Mb to OC-3/STM-1 upgrade, scheduled to be completed December 1. However, because of personnel changes at Ameritech, a UIC subcontract to Ameritech enabling payment of local loop charges for the past year has not yet been approved, threatening installation delays. The Ameritech STAR TAP account manager, Tony Haeuser, has now had their legal department review the UIC subcontract and return to UIC for approval and processing. In the interim, he is proceeding with CERN's installation.

A.1.b. IUCC

A US State Department warning to American citizens advising against travel to Israel due to regional tensions caused Jason Leigh, Greg Dawe and Michael Lewis to cancel plans to attend Telecom 2000, November 6-9 in Tel Aviv. Telecom 2000 is Israel's largest annual telecommunications conference.

EVL's ImmersaDesk, however, was shipped and received by Technion University engineers, who set it up. With real-time remote training using a Polycom system, they were able to conduct a tele-collaborative session with EVL staff on November 5. EVL researchers used their CAVERNsoft-based applications to remotely debug ImmersaDesk hardware. (The ImmersaDesk tracker connected to the wand – 3D input device – was not behaving correctly, but the Israelis didn't know how to explain the problem, never having worked with a wand and VR system before. By watching the erratic movements of the Israeli avatar's hand in the CAVE, Leigh, Dawe and EVL students were able to determine and fix the problem.) A real-time collaboration between Israel, EVL, SARA in Amsterdam and the Alliance booth at SC00 in Dallas, Texas, is scheduled for November 7-9. *[Note: The demonstrations proved successful; more information will be forthcoming in the Euro-Link December monthly report.]*

On October 16, IUCC began a changeover from satellite connectivity to STAR TAP to terrestrial T3 links, resulting in sporadic connectivity and multicast peering interruptions. Total October downtime: 36 hours, 3 minutes.

A.1.c. NORDUnet

NORDUnet's original plan to terminate its service to STAR TAP in January 2001 and take advantage of the Internet2/Abilene ITN service has been changed. The connection to STAR TAP will be maintained, as NORDUnet wants access to other US federal agency networks (to which Abilene will not carry transit traffic) and UIC will continue to assume the cost of NORDUnet's local loop.

A.1.d. RENATER2

No update on RENATER2's planned upgrade to OC-3.

A.1.e. SURFnet

On October 16, the IOS code was upgraded on SURFnet 12000 routers to correct previous bugs and increase the operating stability of the routers.

A.1.f. DANTE

No updates to report at this time.

A.1.g. BELNET

No updates to report at this time.

A.2. Engineering Services

A.2.a. STAR TAP International Transit Network (ITN)

CANARIE ITN and Internet2 ITN are new services currently being developed by STAR TAP, CANARIE and Internet2 to facilitate connectivity among international National Research Networks (NRNs) that now connect to one of the coasts of North America. We will soon update the STAR TAP web page with information and pointers to the CANARIE and Internet2 web pages that contain more information.

A.2.b. STAR TAP Router Peering

On October 2, NII peering with STAR TAP was removed. NII (SINET/NACSIS) is no longer a STAR TAP peer. An updated STAR TAP logical map has been posted to [http://www.startap.net/ENGINEERING/].

Saõ Paulo/Brazil Foundation for the Advancement of Research (FAPESP) intends to connect to STAR TAP and begin service in late November. They have signed with C&W to provide service to STAR TAP; connection pending NSF approval. FAPESP desires ATM PVC from Miami to STAR TAP, going into C&W Chicago PoP and using the existing local connection vacated by CERN several months ago.

Hyoung Soo Kim, of KOREN (Korea Research Network), contacted Tom DeFanti October 23, to request technical information about connecting to STAR TAP. He was advised about prices and procedures, and is developing a proposal for the NSF.

A.2.c. 6TAP

No updates at this time.

A.2.d. STAR TAP NLANR Web Cache

In mid-October, Duane Wessels reported that the web cache machine appears to have a hardware problem; it has not yet been replaced.

A.2.e. DiffServ

DiffServ experiments between EVL and Argonne National Laboratory have been completed. One major finding is that while DiffServ is able to provide bandwidth guarantees to applications, it is unable to provide latency recovery. A report is being drafted for submission to a journal.
See http://www.evl.uic.edu/cavern/EMERGE/ and http://www.icair.org/inet2000

A.3. NOC Services

On October 9, the Global NOC launched the newly designed Euro-Link and STAR TAP NOC web pages [http://noc.startap.net and http://noc.euro-link.org]. The Global NOC web site ties together all NOC-supported network services [http://globalnoc.iu.edu/]. A demonstration of the new Global NOC web pages was well received at the October 24-25 HPIIS Review in San Diego.

Jim Williams reported that no accurate or useful statistics beyond MRTG graphs could be gathered for Euro-Link without closer cooperation and coordination among Euro-Link NRN members and the NOC. John Hicks is looking into adapting MIRnet-type traffic graphs for the Euro-Link and TransPAC projects.

The NOC plans to post an edited half-hour streaming video program of iGrid 2000 by mid-November. [http://www.indiana.edu/~video/igrid2000/home.html#litton]

A.4. Euro-Link Performance Analysis Tools

A.4.a. Network QoS of Real-Time Multimedia

Design is underway to combine CAVERNsoft's network monitoring and EVL's QoSIMoTo (QoS Internet Monitoring Tool) [www.evl.uic.edu/cavern/qosimoto] visualization, to form an integrated problem solving collaboratory (collaborative laboratory) that supports network management, monitoring, visualization and active testing. The goal is to create the equivalent of the "Microsoft Office" suite, for applications developers, network students and researchers to collectively solve network problems.

A.4.b. Network Monitoring

Jason Leigh recently contacted NLANR's Basil Irwin to get an alpha release of Web100 software to test over international networks.

EVL is developing new software (currently named "iCAN"), to enable several remote network researchers and application developers to collaboratively execute an application and monitor network utilization, as well as other application specific parameters. This will allow them to correlate, in real time, how the actions taken by an application directly impact the underlying networks, and vice-versa. The network researcher may also alter router configurations, such as a router's queuing algorithm, to determine how it may improve application throughput.

A.4.c. Low Latency State Transmission Over Long Distance Networks

In the area of high-throughput networking, Jason Leigh has performed experiments on CAVERNsoft's parallel socket library between EVL and SARA; and EVL and CERN. Parallel sockets performed extremely well in maximizing bandwidth utilization. It was also shown that overuse of parallel sockets did not have a significant detriment on throughput. We are now examining a network bottleneck between EVL and SARA that is limiting TCP bandwidth to 32Mbps over the 155Mbps link.

Jason Leigh has also begun work on a reliable UDP transmission scheme designed to accelerate reliable data transmission over fat networks. Caltech's Harvey Newman has expressed interest in employing this technology.

B. Accomplishments

B.1. Euro-Link Applications

Active US/European collaborations utilizing high-performance research networks have been documented for CERN, IUCC, Renater2, SURFnet and NORDUnet, and appear at [http://www.euro-link.org/APPLICATIONS/].

A major tele-immersive VR demonstration between Israel, SARA (Amsterdam), SC'2000 (Dallas) and EVL (Chicago) is being prepared.

B.2. Meetings Attended

October 29-30, 2000. Tom DeFanti and Maxine Brown attended the International Task Force and Application Strategy Council meetings at Internet2. Maxine gave presentations on iGrid 2000. During the week of the Fall meeting, Joel Mambretti gave a talk on iGrid 2000 in one of the conference sessions focused on applications. In all cases, the presentation was well received.

October 25, 2000. HPIIS Performance Review meeting was held in San Diego, CA to review the merits of the High Performance International Internet Services (HPIIS) program, notably the US/international scientific applications enabled, in order to recommend the program's continued support. PI's from TransPAC, Euro-Link and MIRnet presented data and fielded questions before a multi-disciplinary review panel chaired by UCSD's Larry Smarr.

October 24, 2000. Tom DeFanti gave a presentation describing the Star Light switching state concept and international science-oriented wavelengths, to NSF officers and networking experts assembled for the October 24 HPIIS Performance Review Meeting in San Diego, CA. In attendance were Steve Goldstein, Aubrey Bush, Tom Greene and Karen Sollins from NSF. Harvey Newman (Caltech), Larry Smarr (UCSD), Ian Foster (Argonne) and Kim Mish (NTON) were also in attendance.

October 5, 2000. Networking people from STAR TAP, Ameritech, Argonne National Laboratory, MREN and UIC met at EVL to discuss I-WIRE, fiber co-location space possibilities and configuration specifications for Optical STAR TAP.

B.3. Publications

Park, K., Cho, Y., Krishnaprasad, N., Scharver, C., Lewis, M., Leigh, J., Johnson, A., "CAVERNsoft G2: A Toolkit for High Performance Tele-Immersive Collaboration," Proceedings of the ACM Symposium on Virtual Reality Software and Technology 2000, Oct 22-25, 2000, Seoul, Korea, pp. 8-15.

Y. Zhou, T. Murata, T. DeFanti, "Modeling and Performance Analysis Using Extended Fuzz-Timing Petri Nets for Networked Virtual Environments," IEEE Transactions on Systems, Man and Cybernetics, Part B, Vol. 30, No. 5, pp. 737-756, October 2000. [http://www.euro-link.org/PUBLICATIONS/Yi_CollabVirtualEnv_IEEE.pdf]

Y. Zhou, T. Murata, T. DeFanti, and H. Zhang, "Fuzzy-Timing Petri Net Modeling and Simulation of a Networked Virtual Environment – NICE," Institute of Electronics, Information and Communication Engineers (IEICE) Transactions, Fundamentals, Special Section on Concurrent Systems Technology, Vol. E83-A, No. 11, November 2000. [http://www.euro-link.org/PUBLICATIONS/FuzzyTiming_IEICE_Murata_June00.pdf]

B.4. Software Releases

CAVERNsoft G2, version 1.2 was released in time for the October 17-19 CAVERNUS workshop at Old Dominion University (broadcasted over the Access Grid). [http://www.evl.uic.edu/cavern/cavernG2/]. CAVERNsoft is an open source C++ toolkit for building collaborative, networked VR applications. The new version offers the following features:

- Graphical modules now all work under Linux as well, with Linux version of Performer. All other modules work in Windows, IRIX, Solaris, Linux and FreeBSD

- Inverse kinematic articulated avatars with two-arm support (provided the user has an additional tracker)
- Update of coanim (collaborative animator/flip-book program) and LIMBO (application shell) with new inverse kinematic articulated avatars
- Bug fixes to networking modules
- Remote File IO classes with the ability to read the contents of remote directory trees
- CAVERNsoft Database class now supports UDP data reflection as well as TCP
- Performance monitoring added to the parallel TCP classes
- TCP client class provides setsockopt to give more user control of underlying networks
- The networking module can be downloaded separately from higher level graphical modules so that updates can progress independently of each other.

Details at http://www.evl.uic.edu/cavern/cavernG2/changes.html

QoSIMoTo (QoS Internet Monitoring Tool) [www.evl.uic.edu/cavern/qosimoto] is available on the web for IRIX and Linux.

C. Collaboration Activities

- Working with SARA in The Netherlands to experiment with an EVL-designed packet-level Forward Error Correction scheme.
- Working with Harvey Newman at Caltech and Olivier Martin at CERN on DiffServ tests.
- Working with Hank Nussbacher and associates at the Technion University on Telecom 2000.

D. Summary of Award Expenditures (October)

Spending is within budget.