

The ADEC/Tachyon Test - Summer 2000

I. Purpose and Context of the Test

ADEC is looking for affordable ways to provide “pretty good Internet” to users and to provide distance learning opportunities throughout the world. Cost is an important issue for the ADEC community and our ultimate selection of provider services will certainly be cost driven. Tachyon is a wireless Internet service provider interested in building a global footprint and developing a successful business model. ADEC and the National Science Foundation have a growing interest in hybrid network alternatives that include wireless technologies. There is beginning conversation about developing an Internet 3 to resolve digital divide and last mile issues. Technologies such as satellite, radio, microwave, ADSL are all potentially possible parts of a hybrid network intended to extend the reach of the Internet.

An NSF proposal written by ADEC and supported by Tachyon is being considered by NSF. The goal of the project is to design an R&D network for testing and evaluating appropriate distance learning applications, media characteristics, and student learning. This preliminary test was conducted in anticipation of project funding by NSF.

II. Test Description

The ADEC/Tachyon network test was officially conducted from June 5 through August 4, 2000. Six land-grant institutions and ADEC participated in the test. Tachyon Access Points were installed at the following university/organizational locations with support from campus project leaders:

North Carolina State University / Project Leaders: Kevin Gamble, Mike Neaves
University of California-Davis / Project Leaders: Bob Sams, Claudia Myers, Damon DiPietro
University of Nebraska / Project Leaders: Dan Cotton, Cliff Ritz, Mark Hendricks
University of Illinois / Project Leaders: Ken Spelke, Jim Hamilton, Don Meyer
University of Maryland / Project Leaders: Valorie McAlpin, Brad Paleg
Washington State University / Project Leaders: Scott Fedale, Tony Wright

The Tachyon Support Team is composed of:

Michael Liebhold - Business Development;
Brian Carmichael - Chief Network Engineer;
Jeremy Guralnick - Programs;
Tom McCann - Director of Network Services;
Technical Support Help Desk: 877-582-2496.

Tachyon provided scheduled access to its three core service levels. To collect reasonable data each service level was scheduled as follows:

C1 (300K) service June 5 - July 2;

C2 (800K) service July 3 - 16;

C3 (2MB) service July 17- to end of the test (with on-demand level adjustment per request)

III. Tachyon Configuration and Equipment

The Tachyon network is carried on geostationary satellites supporting bi-directional communications. Physical characteristics of the technology feature “bursty” access to network resources. Given current Tachyon network management decisions, the network supports certain Internet applications very well (i.e., Web, POP3 e-mail, FTP). TAP forward channel speeds are offered in three different configurations: C1 (300Kbps); C2 (800Kbps); and C3 (2Mbps) service, with a return channel of ≤ 256 Kbps service. The return channel of ≤ 256 Kbps is a ceiling established by the FCC. The reverse channel uses a multi-carrier TDMA (time division multiple access) methodology to provide connectionless operation and maximize bandwidth allocation. The Tachyon network employs KU Band service which makes it somewhat susceptible to certain weather degradation (rain fade). Tachyon uses SATMEX transponder services that cover North America, and portions of Central and South America. Tachyon intends to provide global services by 2002, with second and third roll-out phases covering Mesoamerica, South America, Australia, South- east Asia, the Middle East and Africa. Tachyon is not an ISP.

All ADEC TAPs (Tachyon Access Points) access the public Internet via a DS3 connection to UUNET's commercial backbone. The local loop for this DS3 connection is provided by Time Warner, and runs from Time Warner's San Diego POP facility to the San Diego Super Computer Center.

The Tachyon Access Point (TAP) installed at each campus includes a small terminal that connects users to the Tachyon network/Internet. The outdoor unit includes a small satellite dish (<1 meter) and integrated transmit/receive electronics that send and receive satellite data (WSU is using a 1.2M dish). The indoor equipment includes a network server consisting of a PC enclosure with a custom satellite modem connected to local campus LAN equipment via a 10/100BaseT Ethernet interface. The Tachyon network server connects to the outdoor unit via a coaxial cable.

IV. The ADEC/Tachyon Application/Communication Server

The server (Linux-based) supplied by the University of Nebraska on behalf of ADEC for satellite link testing is co-located at the Super Computer center in a Tachyon-leased rack, and sits behind a Tachyon-managed Cisco router. It was configured with Chariot endpoint software to accommodate Chariot testing. It provided the consortium with data collection services in support of general user testing, and a discussion group/ sharing capability. The server is supported by Mark Hendricks at the University of Nebraska, a network and multimedia specialist.

V. ADEC Institutional Configurations

Each state located their TAP on or near their respective campus. Tachyon provided, at their cost, TAP installation services and support. Tachyon agreed to install each institution's TAP in up to two locations during the test, but no campus opted for a second install. Each campus configuration is somewhat unique, yet together the configurations provide a good opportunity for a variety of different users to access and test the system. Between 120 - 130 users have accessed the network at one time or another, with nearly 30 using the system on a semi-regular basis. Following is a short description of each campus configuration. A more complete description of these configurations is included at the end of the report.

University of Nebraska - Lincoln: The Tachyon network was configured as a VLAN within the University of Nebraska network. The VLAN provides access to approximately 10 ports with 7/24 service.

University of Illinois, Urbana - Champaign: The Illinois testbed is a 15-machine network on a single 10Mb Ethernet physical segment. The testbed supports a computer training lab.

University of California - Davis: The TAP is set in the UC Cooperative Extension for Yolo County office in Woodland, CA. The office is wired with category 5 Ethernet wiring from workstations to a 10BaseT hub. There are five computers on the satellite network. The reason they chose such a varied setup in an extension office was to put the system in a working environment that is beyond the everyday reach of IT staff at UC Davis. They wanted to see how the system would handle users of various computer skills and backgrounds with very little contact from network staff

University of Maryland - College Park: The TAP is installed at the University of Maryland's State 4-H Office, a couple of blocks off the College Park campus. This office houses six specialists and six support staff. Maryland's concept was similar to California's; however, the staff at Maryland had previous experience using an ISDN line at 56K, so office staff ultimately chose to stop using the Tachyon network during the C1 service test period. Subsequent, C2 and C3 level testing occurred using a dedicated desktop.

Washington State University: The system installed at Washington State University is located on the Pullman Campus in the College of Agriculture Information Department. They are using a 1.2m dish, the larger dish was needed due to weak signal strength from SATMEX. The TAP is connected to a local computer with no other net connections at this time.

North Carolina State University: The TAP is located on ground adjacent to the building currently housing computer support personnel at NC State.

VI. Testing the Network

Testing was organized into two categories: (1) programmed testing with specific technical data being collected; and (2) general testing by users.

Programmed testing involved collecting specific statistical data relative to network performance. General testing involved users at institutional sites and activities considered outside the programmed tests.

The University of Nebraska led the programmed testing using Chariot client software that generated specific system performance information (data rates, error rates, and latency). Chariot also was installed on the ADEC/TACHYON server. Cliff Ritz, a University of Nebraska network engineer, was responsible for coordinating and conducting the Chariot testing.

A Web form and discussion environment was used to collect both programmed and general test results. Maintaining group communication was key throughout the testing period. One-hour audio conference calls were scheduled each Friday morning from 11 a.m. to noon CDT throughout the test. The calls kept people informed, monitored progress, and discussed technical issues.

Programmed Testing

1. Testing included an ongoing PING test to test services such as FTP, SMTP, HTTP, and Telnet. The test helped determine network “up” time. Testing was reported each week.
2. The following applications were tested throughout each of the Tachyon service levels.
 - a. File send long connection, file send short connection (multiple non-persistent connections). This was to determine characteristics of different transaction oriented data flows.
 - b. E-mail services (POP3).
 - c. Real Media - audio; we checked data rates for this type of data stream.
 - d. Real Media - video; we checked data rates for this type of data stream.
3. A TTCP throughput test was conducted to measure the TCP data rate. It helped determine levels of throughput and discern any rate limitations being applied.
4. Testing was reported by event.

General Testing

The reporting template included many of the tests listed in the programmed test specifications. There also was interest in testing other applications. Following is a list of the types of applications and activities suggested:

1. H.323/T.120 applications: NetMeeting/C-U-See-Me
TAP to TAP
TAP to institutional network
Multipoint conferencing

2. Real Media (audio / video): We were interested in knowing if it worked, and if audio and video were in sync.
3. E-mail: Could e-mail be sent and received, including file attachments?
4. Web services: HTTP, FTP, Telnet: Testing Web services.
5. Other testing: States were asked to test applications per their individual needs.
6. Users were asked to keep a users log using the automated form provided via the ADEC/TACHYON Web server, and to report per event. See the Web data form for what was collected.

VII. Test Results

Programmed Test Results

The following is a summary of the Programmed Testing results performed at the University of Nebraska-Lincoln. The testing involved the collection of specific performance data relating to the availability and throughput of the Tachyon Satellite network. Tests were performed at different times and on different dates within each service level in order to obtain an overall performance average.

1. Availability - WHATSUP Summary:

UNL used a product called WHATSUP (<http://www.ipswitch.com/>) to monitor the Tachyon network uptime. WhatsUp is an inexpensive graphical network monitoring tool that initiates both visual and audible alarms when monitored network elements do not respond to polling. It will even notify you remotely by digital beeper, alphanumeric pager, or e-mail!

A WHATSUP monitor was placed on a test computer (host77) on the Tachyon net. This WHATSUP program monitors the ADEC server at Tachyon, every 15 seconds. This test basically checks the availability of the Satellite network. A WHATSUP monitor was also placed on a computer in the UNL main computer room. This monitors the ADEC server, the test computer (host77), and the RAQ test unit (used for Chariot testing). This test depends more on Internet availability as the pings travel from UNL to the Internet, to Tachyon, and then to the Satellite and down.

The results through July 28, 2000 are as follows:

Tests from the host77 test computer running WHATSUP:

PC	ADEC Server
Uptime %	97.93 %
Avg. Delay	1174 ms.
Max. Delay	1249 ms.
Min. Delay	647 ms.

The delay times indicate the amount of time in milli-seconds, that it took the ping to travel from the host77 computer running WHATSUP to the ADEC server at Tachyon and back.

Tests from UNL Computer room WHATSUP monitor:

PC	ADEC Server	RAQ computer	host77
Uptime %	99.42 %	97.70 %	97.72 %
Avg. Delay	98 ms	1292 ms	1305 ms
Max. Delay	3836 ms	9774 ms	5487 ms
Min. Delay	60 ms	591 ms	587 ms

The delay times indicated above indicate the amount of time, in milli-seconds, that it took the ping to travel the route from the UNL main WHATSUP computer to the three listed computers, and back. The pings to the ADEC server in this case were not via the Satellite network, but via the Internet. The pings to the RAQ and host77 were via the Satellite.

2. Network Performance Tests:

Network Performance tests were conducted using a product called Chariot by NETIQ <http://www.netiq.com/>. The following is a brief description of the tests run:

Filesndl and Filesnds

These scripts emulate sending a file from Endpoint 1 to Endpoint 2, and getting a confirmation back. Filesndl sends more data per session than does the Filesnds. The default file size is 100,000 bytes.

POP3

This script emulates receiving a POP3 type mail file from Endpoint1 to Endpoint2. The default file size is 1000 bytes, with a 20 byte header. The default data type for the e-mail message is NEWS.CMP.

Realaudio

The Realaudio script emulates the RealAudio application that is multicasting audio content from a multimedia CD-ROM. The send data rate defaults to an average rate of 80kbps.

Realmedia

This script emulates a RealNetworks server streaming a combined audio and video file. The send data rate variable defaults to an average of 300kbps.

a. C1 (300k) service

Test	Avg. Throughput (Mbps)	Avg. Transaction Rate (#/sec)	Avg. Response Time (sec)	Lost Data %
Filesndl	.282	.358	2.79	na
Filesnds	.258	.322	3.10	na
POP3	0.004	0.398	2.51	na

Realaudio	0.080	na	na	0.03
Realmedia	0.276	na	na	7.78

b. C2 (800k) service

Test	Avg. Throughput (Mbps)	Avg. Transaction Rate (#/sec)	Avg. Response Time (sec)	Lost Data %
Filesndl	0.335	0.426	2.84	na
Filesnds	0.315	0.393	2.58	na
POP3	0.003	0.365	2.78	na
Realaudio	0.080	na	na	0.49
Realmedia	0.298	na	na	0.65

c. C3 (2M) service

Test	Avg. Throughput (Mbps)	Avg. Transaction Rate (#/sec)	Avg. Response Time (sec)	Lost Data %
Filesndl	0.395	0.502	1.99	na
Filesnds	0.337	0.422	2.37	na
POP3	0.003	0.387	2.58	na
Realaudio	0.080	na	na	0.00
Realmedia	0.300	na	na	0.024

Notes on the Performance Tests:

- The Performance tests were conducted at different times of the day and on different days during the test period, in order to get a better overall view of the performance of the Tachyon network. Tests were generally performed during the 8-5 workday.
- Ten samples were taken of each test during the C1 service level, 6 for the C2 level, and 4 samples of each were taken during the C3 service level.
- The Average Transaction rate is the number of transactions completed per second.

Observations on the Performance Tests:

- The baseline numbers showed good throughput from the RAQ test computer to the ADEC server, in excess of 6 Mbps, nearly 8 transactions per second and very low response time.
- Throughput generally improved for the file sending tests, as the bandwidth increased.
- POP3 and Realaudio performed very well at all service levels.
- Relamedia performed much better at the C2 and C3 levels, as the lost data went from nearly 8% to less than 1 percent. This may be due to a Tachyon policy in effect at the C1 level.

- The Filesnd and POP3 tests are representations of actual transactions. At the C1 level, the Filesnd tests used most of the available bandwidth, but at C2 and C3, they did not. This was most likely due to the transactional nature of the tests, that is, the latency caused by the satellite link most likely played a larger role.
- The realaudio test was set to stream at 80kbps (0.80 Mbps), thus the throughput did not increase at the higher service levels.

3. TTCP Throughput test results:

Test TCP (TTCP) is a sockets-based benchmarking tool for measuring TCP and UDP performance between two systems. More information on TTCP can be found at: <http://www.ccci.com/tools/ttcp/>. Following are results from this testing.

Service Level	Avg. data rate download (from satellite)	Avg. data rate upload (to satellite)
C1 (300k)	275.2k bps	239.9k bps
C2 (800k)	701.5k bps	239.7k bps
C3 (2M)	1093k bps	235.9k bps

Observations and notes on the TTCP testing:

- Because no TTCP client was located on the ADEC server at Tachyon, one half of the testing environment was located at a UNL Internet connected computer. This may have introduced delays or slower data rates due the increased complexity.
- Eight TTCP tests were performed at each service level.
- At the lower service levels (C1 & C2), more of the download bandwidth could be used, but at the C3 (2M level, less throughput was seen, that is, only about 55% of the bandwidth was used. The exact cause of this is not known, but may have been due partially to the latency of the satellite, the Internet, or possibly other factors.
- The upload data rate, from the end location up to the satellite and down was very consistent.

General Test Results

Project summaries and state feedback were collected to provide the following summary.

FTP: File downloads worked very well across all service level. Small to medium size file uploads worked; however, as expected large file uploads were problematic. This is due to a full 4MB TAP buffer coupled with the 256K return channel. Tachyon is looking for options to improve large file uploads.

E-MAIL: POP3 email worked very well, occasionally, latency affected the echoing of key strokes. IMAP e-mail was problematic at Maryland, less so at North Carolina State

(unknown whether MA and NCSU were using the same version of IMA). Tachyon intends to optimize for better performance.

WEB: As expected, Web applications worked well across all service levels.

REALNETWORK AUDIO/VIDEO: Audio and video streaming worked well across all service levels.

OTHER APPLICATIONS: H.323 applications did not function very well, but software and hardware configurations, and a lack of standards were factors. While chat, whiteboard applications worked, audio and video were problematic, especially when attempting multipoint conferencing. Slow performance was experienced when testing ICA thin clients. Tachyon has no plans to optimize the network to accommodate the application at this time. One state did successfully use a data conferencing application. Also, states accessed and tested many of their own Web applications and they worked fine.

Tachyon is working on a streaming video service that would work via the 256Kbps return channel. They expect the service to be available by the end of the year. Their business plan will include a metered rate.

VIII. Summary and Conclusions

Tachyon felt testing went very well, and that ADEC did a good job of organizing the test. Institutional feedback concerning network service was consistent with what Tachyon expected to hear. Also, they felt the ADEC server with discussion group and data collection services were very valuable to the test. Tachyon has been working with NLANR to measure network traffic and performance. Data has been collected, but is yet to be analyzed. They expect the data analysis to be finished by mid-August.

From ADEC's perspective the Tachyon technology worked as advertised. Tachyon was easy to work with, interested in feedback and very supportive of the test. Institutions did a good job of testing the network and providing feedback. Key applications worked. The test group believes that C1 level service is a viable product for remote areas with limited or no service. The group was impressed with system performance at the C2 and C3 levels. The test was successful and we are ready to move forward within the parameters described within the proposed NSF program.

The infrastructure will remain in place until at mid-August when ADEC expects to hear about the future of the NSF proposal. Meanwhile, institutions are strongly encouraged to demonstrate the technology/network to additional audiences. Some additional application testing will take place. We expect the NSF project will allow for a variety of application tests not included in this preliminary testing period (i.e., multicast, etc.)

Attachments:

ADEC Institutional Configurations

University of Nebraska - Lincoln: The dish is located on the top of Walter Scott, with a cable run to the TAP located in the computer machine room at the University of Nebraska - Lincoln. The TAP is connected to a Cisco switch connected to the campus backbone (ATM/Ethernet) via a special Virtual Local Area Network. The VLAN propagates the Tachyon network throughout the UNL campus without actually being part of the UNL domain. The VLAN is connected through another switch that routes the Tachyon network into three campus buildings. Approximately 10 ports are included in the Nebraska/Tachyon test network with 7/24 service throughout the test period. Client machines included Windows-based computers and a Linux client. *Submitted by Dan Cotton and Cliff Ritz, dcotton1@unl.edu, Institute of Agriculture and Natural Resources, University of Nebraska, Lincoln.*

University of Illinois, Urbana - Champaign: The Illinois testbed is a 15-machine network on a single 10Mb ethernet physical segment. The testbed features a computer training lab. Two computers connected to the TAP provide IP subnet – an NT4 Server running as BDC on the statewide extension domain and a Linux NAT (Network Address Translation) gateway/router/firewall for the remaining machines. The NT4 Server serves files and authenticated logons for the other workstations on the local physical segment. Replication with the Domain's PDC necessarily occurs via the TAP. The remaining 13 workstations are Win95 machines, all running on a 192.168.0.0/24 subnet routed/translated through the NAT gateway to the TAP and beyond. Local file and print services are carried over standard Netbeui services on the shared ethernet segment. The gateway/firewall allows IP connections out from the protected workstations, but does not allow connections to be initiated in to the protected workstations (probably the source of the one-way nature of NetMeeting tests.) The gateway/firewall serves to squeeze the entire lab onto the limited allocation of Tachyon IP addresses (were only assigned 5 Tachyon IP addresses). It has proven to be a highly effective security device as well as a mechanism to reduce the number of IP addresses leased from ISPs for the various offices. Machine levels include: P166 workstations (win95 machines), PII/333 NT Server, PPro/200 Linux gateway. *Submitted by Don Meyer, dlmeyer@uiuc.edu, Network Manager, ACES Academic Computing Facility UIUC College of ACES, Information Technology and Communication Services, University of Illinois, Urbana-Champaign.*

University of California - Davis: The TAP is set in the UC Cooperative Extension for Yolo County office in Woodland, CA. The office is wired with category 5 ethernet wiring from workstations to a 10BaseT hub. The Tachyon router is hooked into the hub, as well. The office has no server, no firewall, and static IP addresses on the workstations. There are five computers on the satellite network. The first is the county director's Pentium II running Win98. The second, third and fourth machines belong to administration staff and are composed of Pentium II's running Win98. The final computer is a PowerMac 7200 that belongs to a UC farm advisor. The reason we chose such a varied setup in an extension office was to put the system in a working environment that is beyond the everyday reach of our IT staff here at UC Davis. We wanted to see how the system would handle users of various computer skills and backgrounds with very little contact from

network staff. *Submitted by Damon DiPietro and Claudia Myers, ANR Communication Services, University of California at Davis.*

University of Maryland - College Park: The TAP is installed at the University of Maryland's State 4-H Office, a couple of blocks off the College Park campus. This office houses six specialists and six support staff. Prior to the installation of the TAP, the office's Internet connectivity was accomplished by a single ISDN line at 56K. During the C1 test period, the TAP was connected via a hub to three computers (two used by specialists and one computer dedicated for testing of the TAP). Subsequent C2 and C3 level testing occurred using a dedicated desktop (Pentium III 450 MHz) connected via the hub to the TAP. *Submitted by Brad Paleg, BP2@umail.umd.edu, Coordinator, Communications & Information Technology/IT, University of Maryland College Park, MD 20742.*

Washington State University: The system installed at Washington State University is located on the Pullman Campus in the College of Agriculture Information Department. The actual physical location is on Hulbert Hall, using a 1.2m dish, with the receiver located in the Computer Resources Unit, room 303. The larger dish was needed due to a weak signal strength resulting from being located at the edge of SATMEX coverage. The unit is under the direction of Tony Wright at 509.335.2814. The TAP is connected to a local computer with no other net connections at this time. *Submitted by: Jim Shelden, shelden@wsu.edu, Broadcast Engineer, CAHE-Information Dept., Washington State University, Pullman, Wa. 99164.*

North Carolina State University: The TAP is located on ground adjacent to the building currently housing computer support personnel at NC State. Cabling runs from the TAP through crawl space into our network closet. We have a separate hub installed to partition the TAP traffic from our campus network. A windows NT 4.0 workstation is connected on the TAP network and serves as Chariot endpoint and general testing station. Other Windows CE Thin Clients (ICA) and PCs are connected as desired/required for testing. *Submitted by: Mike Neaves, neaves@ces.ncsu.edu, North Carolina State University.*

INSTITUTIONAL PROFILES:

We would like each institution/state to develop a profile describing various characteristics. Please include the following information.

- a. Location of TAP: During the test an institution may locate their TAP in up to two locations. Please indicate the location for each installation and the dates located at that site.
- b. Topology of each installation: Provide a description (at least two if you are moving TAP) of how the TAP is being connected to other network services (Ethernet, virtual LAN, backbone characteristics, etc.) Provide a graphic, if possible. Indicate the number of users participating in each aspect of the test (be specific). Provide user names, titles, skills, etc. if relevant to the test. Locate the users within the topology as appropriate.
- c. Identify how you intend to measure system performance. While most of this will be captured within the context of the test, a short description of what you intend to test and how you will measure it will be helpful.

Please e- mail this description to Janet Poley, jpoley@unl.edu at your earliest convenience.

ADEC/TACHYON TEST:

Following is a draft of the proposed test to be conducted throughout the ADEC/TACHYON test, period, June 5 -August 4, 2000. The recommended tests are organized into two categories: (1) programmed testing with specific technical data being collected, and (2) general testing.

Programmed testing should involve the collection of specific performance data where sites are working together. General testing involves individual sites and other activities outside the programmed tests and is for recording descriptions of participant observations.

The University of Nebraska will lead the programmed testing using Chariot client software which will generate specific system performance information (data rates, error rates, and latency). Chariot has been installed on the ADEC/TACHYON server. For more information on Chariot software visit the Chariot web site at <http://gsweb01.interpath.net/products/chariot/evaluation.phmtl> or contact Cliff Ritz at critz1@unl.edu, or call 402-472-5533. We hope to arrange for all sites possible to use Chariot Client software in both the programmed test and general as possible.

During the general testing, we encourage the institution and its users to collect as much objective data (statistical information) as possible. We have included some questions to help people report information.

To report both programmed and general test results, we will prepare a Web site to collect the information. This will be operational by June 8. We will communicate access information to you as soon as we have it.

On behalf of ADEC, the University of Nebraska-Lincoln and Tachyon are hosting a server (Linux 6.1) at the Tachyon gateway (head end). If institutions want accounts on the system to do applications such as FTP, Telnet, etc., please contact Mark Hendricks at mdh@mark-hendricks.com or mhendricks1@unl.edu. Mark will provide you an account and password. The address of the ADEC/TACHYON server is <http://204.216.248.166>.

Testing Recommendations:

PROGRAMMED TESTING:

1. We need to identify network availability on a 24 hour basis. We recommend you place a machine on the network 7/24 and PING the ADEC/TACHYON server to test services such as FTP, SMTP, HTTP, and Telnet.
2. Following is a list of tests intended to measure network performance. These tests should be organized and conducted by technical staff at your institution. To record the desired statistical information institutions will need a Chariot server (license), since the ADEC/TACHYON server has been configured as a Chariot client.

To collect reasonable data these tests should be conducted using each Tachyon service level (C1 - 3). We will ask Tachyon to configure the network as follows:

C1 (300K) service from June 5 - 25
C2 (800K) service from June 26 - July 16
C3 (2MB) service from July 17 - August 4

To be tested:

- a. File send long connection, file send short connection (multiple non-persistent connections). This will help determine the characteristics associated with long FTP's and short Web connections. Trying to measure data flow and how streams work across the network.
- b. POP3 - checking the data stream and performance
- c. Real Media - Audio; we are interested in checking data rates for this type of data stream
4. Real Media - Video; we are interested in checking data rates for this type of data stream

3. We suggest you run a TTCP throughput test which will measure the TCP data rate. It will help us determine levels of throughput and discern any rate limitations that may be applied.

GENERAL TESTING

4. We are interested in users testing these applications to determine if they work. Institutions may wish to measure such activities, but we most importantly want to know if they work.
 - a. NetMeeting - an institution may test this themselves with one connection though Tachyon, the other through the Internet; we will work to schedule a collaborative activity among institutions to the degree possible. Protocols being tested include T.120, H.323.
 - b. C-U-See-Me - an institution may test this themselves with one connection though Tachyon, the other through the Internet; we will work to schedule a collaborative activity among institutions to the degree possible. Protocols being tested include T.120, H.323.
 - c. Real Media (Audio / Video): We are interested in the knowing the following:
 1. Did it work?
 2. Were the audio and video in sync?
 - d. E-Mail
 1. Were you able to send and receive mail including attachments?
 - e. Web services: HTTP, FTP, Telnet: Most of the testing in this category will involve access of Web services.
 1. Did the services you try work?
5. Other testing (as others have needs):

NFS - North Carolina, Nebraska
Other applications

6. Keeping a User Log:

Each user should keep a weekly log of their network and application use. Please be prepared to answer the following:

 1. Identify date and general time of use.
 2. What applications did you use?
 3. Did the application(s) work?
 4. Did you experience any problems? If so, please describe.

REPORTING:

Reporting our experiences will be vital to the success of the project and what is ultimately shared with others in the ADEC consortium. A Web site will be created to help you record your findings. We hope to have the site created by June 8th. We would encourage participants to report per the following schedule.

1. The 7/24 test using PING to test various servers should be done continually throughout the testing period; however, we would like those contacts responsible for the server to report on a weekly basis. Was the system available 7/24, did we experiences problems, of so, what.
2. PROGRAMMED testing: The contact(s) responsible for conducting programmed tests should report their findings as the events take place.
3. GENERAL testing: Experiences with applications should be included in a user log and reported on a weekly basis.

If you have questions or comments please provide feedback ASAP. We would like to move forward with a solid set of test recommendations.

The ADEC/Tachon server contact is Mark Hendricks at the University of Nebraska. Mark's phone number is 402-472-4280, email is mhendricks1@unl.edu. If you have questions about the server, its configuration, etc., please contact Mark. Mark will be working with Brian Carmichael of Tachyon to configure and maintain the server through the test.

Universities involved in the test include:

North Carolina State University

Project Leader: Kevin Gamble

Phone: 919-515-8447; Fax -3777; e-mail: kevin_gamble@ncsu.edu

University of California - Davis

Project Leader: Bob Sams

Phone: 530-754-8539; FAX -8541; e-mail: rwsams@ucdavis.edu

University of Nebraska

Project Leader: Dan Cotton

Phone: 402-472-2821; FAX -0025; e-mail: dcotton1@unl.edu

University of Illinois

Project Leader: Ken Spelke

Phone: 217-244-1179; FAX -5964; e-mail: spelke@uiuc.edu

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ATTACHMENTS (Continued)

Additional attachments can be located at the following URLs:

ADEC/TACHYON TEST SERVER

<http://63.103.96.228/>

TACHYON GENERAL TESTING USER LOG

<http://63.103.96.228/test/>

ADEC WEB BOARD

<http://63.103.96.228:8080/ADEC/>