Draft Minutes
of the Federal Networking Council
Advisory Committee(FNCAC) Meeting

April 14-15, 1997

National Science Foundation
4201 Wilson Blvd., Rm. 1235
Arlington, VA 22203

I. ATTENDEES

Attending FNCAC Members:

Sidney Karin, San Diego Supercomputer center (Chairperson, FNCAC); Alan Blatecky, MCNC; George Brandenburg, Harvard University; Susan Estrada, Aldea Communications; Ken Flamm, Brookings Institution; John Gage, Sun Microsystems; Carol Henderson, American Library Association; Ken Klingenstein, University of Colorado; Richard Liebhaber, MCI Communications-Retired; StuLoken, LBL; Bob Moskowitz, Chrysler Corporation; Ike Nassi, Consultant;Ed Oliver, ORNL; Stewart Personick, Bellcore; Mike Roberts, EDUCOM; Connie Stout, TENET; Harold Thompson, ICN; and Stephen Wolff, CISCO

Attending Members of the FNC and FNC Working Groups:

Javad Boroumand, NASA/ISI; Bruce Bottomley, NSA; Doug Gatchell, NSF; Dan Hitchcock, Dept. of Energy; Jim Hott, USGS; Hilarie Orman, DARPA; ; Mike Pierce, DISA; AlexPoliakoff, Dept of Education; George Seweryniak, Dept. of Energy; Stephen L. Squires, DARPA; George Strawn, Co-Chair FNC/NSF; Dennis Steinauer, NIST; Walter Wiebe, FNC, Tice DeYoung, NASA

Invited Speakers:

Guy Almes, Internet2; Charles Brownstein,XIWT; Randy Bush, Verio; Glee Cady, Netcom; Vint Cerf, AC forHPCC/IT/NGI; George Clapp, Bellcore; Patricia Edfors, Dept.

ofTreasury; Sherrilynne Fuller, AC for HPCC/IT/NGI; Don Heath, IAHC; Anita Jones, CCIC/DOD; Elliot Maxwell, FCC; Jim McConaughey, NTIA; Mike Nelson, FCC; Robert Pepper, FCC; Linda Roberts, Dept. ofEducation; Glenn Schlarmann, OMB; Tim Stevens, Bell Atlantic; Don Telage, NSI; John Toole, NCO; Kevin Webach, FCC

General Public:

Scott Anderson, CISCO; Gabe Battista,NSI; Kim Bayliss, NSI; William H. Baumer, PSI Net; Dan Van Belleghan,SURN; W. Black, NSI; Don Blake, NEA; Heather Boyles, Internet2;Carole Gomez Braere, NSF; Christopher Clough, NSI; David Conrad,APNIC; Mike Daniels, SAIC/NSI; Alan Davidson, CDT; Sean Donelan,DRA; Barbara Dooley, CIX; Angela Drolte, Bureau of National Affairs;Dan Dutko, NSI; D.W. Engebretson, DISA; Anders Fernstedt, AT&T;Ken Fockler, CA Net; R.J. Francis, NSI; James Gallegos, SterlingSoftware; Dave Graves, NSI; Kim Hubbard, NSI; Jeffrey Kaufman,INTA; Ron Kawchuk, CAIP; James Keller, Harvard; Jennifer Lucas,BNA; Eric Lee, CIX; David Maher, IAHC; Declan McCullagh, TIME; Cathy McDonald,NCO Contractor; Phil Melling, FDC; Ellen Messmer, Network World;Ann Miller, DOD; Tracie Monk, UCSD/NLANR; Chris Oneto, Treasury/DynCorp,Ray Plzak, DOD NIC; David Jemmett, GoodNet; Craig Johnson, TDRS;Robert Shaw, ITU; Graham Shumway, CIX; Margaret Simmons, NCO;G. Sisson, NSI; P. Startan, NSI; David Staudt, NSF; Mike Stephens,USTT; Albert Tramposch, IAHC/WIPO; Elizabeth Wasseman, San JoseMecury News; Darin Wayrynen, GoodNet; Lynn Wheeler, FDC; AnneWheeler, FDC; Greg Wood, Internet2

FNC Support Personnel:

Julio Andrade, DynCorp; Suzanne Burgess, DynCorp; Debra Summers, DynCorp;

Bonnie Wilson, DynCorp

II. RECOMMENDATIONS/ACTION ITEMS:

a. Recommendations

A recommendation related to cryptographic technology was passed during the FNCAC meeting:

The FNCAC endorses the IAB and IESG "Statement on Cryptographic technology and the Internet "of July 24, 1996, published as RFC 1984, with the exception of the language on complete and unlimited export of all cryptographic technology. This exception is a complex issue which brings into play multiple social objectives and which requires further consideration.

While it may be appropriate for national policy to limit the deployment of Federal production systems or exported private systems, it is inappropriate to constrain research or experimentation on security or privacy technologies.

Additional recommendations discussed at the meeting will be debated via e-mail.

b. Action Items

Transitions and Scalability:

- The working group on Transitions& Scalability has been asked to work on assessing a position for the FNCAC on the topic of Quality of Service (QoS).

- The FNCAC Working Group on Network Transitions and Scalability will formulate its recommendations on Internet governance, and Dial-up Internet usage via e-mail over the next month and will send them to the FNCAC for discussion and approval.

Education and Training:

- A primary focus of the next meeting of the FNCAC will be on the use of Internet resources for education and training.

General:

- The FNC will deliver a presentation on its agencies international connections at the next FNCAC meeting.

- The FNCAC is asked to review the Next Generation Internet (NGI) Concept Paper and provide comments on it.

- A subset of the FNC and FNCAC will work with the Presidential Advisory Committee to explore appropriate roles and topics for the FNC and FNCAC in consideration of the work of the new Advisory Committee.

III. AGENDA AND PROCEEDINGS

1. Opening and Overview

Sid Karin, FNCAC Chair, called the meeting to order, welcoming the returning members of the FNCAC, and members of the FNC. The work plan for the 1997 year was reviewed and approved as written, with a note that all members may join any working group they wish. The action items from the October1996 meeting were reviewed.

2. FNC Initiatives and Issues During 1997

George Strawn, FNC Co-Chair/NSF, apprised the committee of the FNC goals and activities for FY1997. The work of the FNC can be described as falling into three areas: Network Engineering and Operations, Transitional Issues, and Education and Training.

In the first area, Network Engineering and Operations, the FNC is working with a variety of groups such as the Coordinating Committee for Intercontinental Research Networking (CCIRN) to collaborate on international connections and research. Much of the inter-agency coordination today is in the area of Authorized Usage Policies and interconnections. (Historically, collaboration among agencies was most often seen through "pipesharing." However, since most agencies today are utilizing their own pipes to capacity, many no longer share pipes.). Currently, the Federal networks are working to create a tightly integrated research network of Federal agencies and universities, and then will extend to research partners overseas. One point that should be made clear is that Federal research networks are not transit networks; rather, to accomplish research, they are peering with each other. All Federal networks also maintain commercial connections for non-research activities.

Other Network Engineering and Operations activities pursued by the FNC agencies include formulating an ATM addressing scheme, refining the FedNet architecture, and exploring various statistics and metrics tools.

Under the auspices of Transitional issues, the FNC is refining the .GOV policy, continuing to work on the Collaborations in Internet Security (CIS) project, and collaborating with other Internet networking groups (e.g., Internet2)in the area of Next Generation Internet technologies and statistics/metrics monitoring and analysis. To better inform people on policies for a .GOV top-level domain, the FNC is revising the governing RFC and working with Federal agencies on the numerous requests for special consideration. The CIS project has held two workshops since the last AC meeting and is beginning to include industry in the security testbed activities. Plans are underway for FedNet cooperation with NGI and Internet2 communities to develop operational relationships. Lastly, in the area of statistics and metrics, several FedNets agencies are exploring more simplified ways of sharing trouble tickets. The statistics/metrics work of CNRIand ISPs is also being closely monitored with regard to a possible FedNet role in the discussions.

Strawn also provided a brief update on the Intellectual Property study proposed by the National Research Council (NRC). FNC agencies continue to seek funding for the study, and currently, the proposal is under review by NSF's Information, Robotics, and Intelligent Systems Division.

3. FNC/FNCAC Roles & Relationships

Anita Jones, Co-Chair of the Committee on Computing, Information, and Communications (CCIC), briefed the AC on the status, structure, and current activities of that committee's working groups. To enhance interagency cooperation on a range of topics from broader communications issues to new applications, a new structure was introduced three years ago. In the last nine to ten months, that focus has led to the creation of five working groups under the CCIC Computing, Information, and

Communications R&D Subcommittee. One of those subcommittees, the Large Scale Networking (LSN) group, is focused on the NGI initiative.

The NGI initiative was described as a new paradigm for network communications as a managed resource. This initiative is a high priority for DoD, and Jones requested that the AC members lend their support to the effort and provide feedback on its initiatives. The NGI Draft Concept Paper, which can be found at http://www.ccic.gov/ngi-concept-08Apr97, details these initiatives. A Presidential Advisory Committee for High-performance Computing and Communications, Information Technology, and the Next Generation Internet (HPCC/IT/NGI) was established in February and has been actively advising the LSN group with concern to their work on the NGI.

The existence of this newly appointed Advisory Committee led to discussion of the roles of and the relation between the Advisory Committees for the FNC and the HPCC/IT/NGI. In general, the work of the FNCAC is closer to practical and fundamental internetworking issues, in particular research and engineering networks, while the new Presidential AC will focus more on overarching R&D and programmatic issues. The FNC and its AC continue to work on pressing issues related to the transition of the Internet from the U.S. government to the commercial sector.

Action Item:

- A subset of the FNC and FNCAC will work with the Presidential Advisory Committee to explore appropriate roles and topics for the FNC and FNCAC in consideration of the work of the new Advisory Committee.

4. Internet of the Future

NGI Initiative

George Strawn provided an update on the work of the Large Scale Networking (LSN) group on the Next Generation Internet (NGI) Initiative. On October 10, 1996, President Clinton and Vice President Gore announced their commitment to the Next Generation Internet (NGI) Initiative, based upon strong research and development programs across Federal agencies. The NGI initiative has as its vision a look toward long-range research to develop and test advanced network technology. It also strives to develop testbeds of sufficient scale to support technology scaling issues and provide critical mass for applications. The initiative will seek partners to cost-share the development and to facilitate technology transfer for the future commercial Internet. The NGI has as its goals to:

1. Connect research universities and federal research institutions with high-performance networks(connecting at least 100 organizations at speeds of 100 times

today's Internet, and at least 10 organizations at speeds of 1000times today's Internet.)
2. Promote experimentation with the next generation of networking technologies.
3. Demonstrate new applications that meet important national goals and missions.

The LSN has drafted a paper that outlines the concepts and goals of the NGI Initiative as part of the process for building the strongest possible program among academia, industry, and the government. This draft has been released for public comments and discussion and is available at http://www.hpcc.gov/ngi-concept-08Apr97.Comments received by 15 May 1997 will be used in preparing a final version of the document shortly thereafter.

The initiative is planned to last five years. The Administration has made an initial three-year$300 million funding commitment of $100million per year, and will seek bipartisan Congressional support in its budget submissions. Built on the base of current Federally-funded research and development, the initiative will also call on substantial matching funds from private sector partners, as well as seek commitments from major applications developers.

Currently, five funded agencies are working together to make the NGI a reality: DARPA, DOE, NASA,NSF, and NIST. NIH/NLM may join the group as well. Each participating agency brings specific skills and experience to the initiative. These skills and experience provide an essential base upon which the initiative is built. Specific agency strengths include:

DARPA: long-term, general expertise in networking research, general skill in high-end network technology and testbeds, experience in managing networks.

DOE: long-term experience in managing production and research networks, specialized skills in networking technology, great strength in mission-driven applications and in system integration.

NASA: experience in network management and in specialized network testbeds, strength in mission-driven applications involving high data rates, great strength in system engineering and integration.

NSF: special relationships with the academic community, experience in network research and in managing networks, great strength in scientific applications.

NIST: long experience in standards development, networking research, and in testbeds involving many industrial partners.

The strategic approach is to build on existing high-end networks, and each of the agencies above is expected to bring a high-performance application to fruition.

A workshop entitled Research Directions for the Next Generation Internet is planned for May 13 and 14to bring researchers together to discuss the research agenda needed to accomplish the goals of the NGI.

Internet2

Guy Almes representing Internet2(I2) reviewed the status of this university-based project. At this time, the preliminary work of both the NGI and I2 initiatives are very similar and will overlap in the support of research and education. The work of I2 is based on six fundamental principles:

- Buy rather than build
- Open rather than closed
- Redundancy rather than reliance
- Basics before complexity
- Production, not experimentation
- Services to end users, not among commercial providers.

I2 can be described as a collaborative effort joining over 100 U.S. universities, with the primary goal to develop the next generation of computer network applications to facilitate the research and education missions of universities. At each of the member universities a team of developers and engineers is working to develop and enable I2 applications. At the same time, each team coordinates its efforts with similar teams at other I2 universities. I2 is also working with computer networking corporations and non-profit organizations to ensure that the developments of I2 are used to improve all computer networks, including the existing Internet.

I2 has seen rapid membership growth, which is currently at 106 members. Their 1997 budget is $2.5M,and the project supports a full time staff of 10. 1998 is the target year for many of I2's aspirations to be realized. Current priorities of the I2 are to create an Applications & Engineering team, adopt a phase 1 technical architecture, confirm the Giga PoP sites and partners, establish industry partnerships, build working relationships with NGI agencies, and recommend a permanent organization.

I2 has developed a list of Strategic Objectives:

- Enable advanced applications
- Strengthen the Universities in their research and education mission
- Pioneer the introduction of Quality of Service, Advanced Multicast Support and IPv6
- Establish the giga PoP's as effective service points

When speaking of "advanced "engineering, Almes voiced these thoughts: The purpose of "advanced "engineering is to support "advanced" applications, which in turn motivates the development of advanced engineering. Advanced applications transform high-speed plumbing into value, and advanced plumbing enables advanced

applications. A common misunderstandings that an application that uses large amounts of bandwidth is thought of as "advanced", when in actuality it may not be. The same applies for "advanced" plumbing; it is not "advanced" solely because of its high capacity.

There are currently efforts underway for establishing a global procurement process that would provide broad band connectivity to all users. Due to their teaching mission, researchers are scattered all over the country, and every academic research plan is in need of a large capacity network. Therefore, faculty and students have a disproportionate need to be able to collaborate at a distance. Currently, there is little end to end support for their networks or for all applications.

I2 hopes to further the employment of three key advanced concepts: Quality of Service, Advanced Multicast Support, and IPv6. Achieving Quality of Service (QoS) is one of I2's primary advanced technical objectives, and is currently the subject of an initiative designed to more deeply explore the concept. QoS will be a key enabler for advanced applications and, in particular, for real-time applications. The concern now is whether QoS should be looked at from the perspective of applications needs, or from the perspective of issues surrounding practicality of engineering. Though several solutions/approaches have been submitted, each has complexities that will slow the process. Application needs that should be taken into consideration include items such as bandwidth requirements, packet loss, delay, and jitter. Furthermore, how near is the network to end-to-end support? Concern remains on how to evenly support all applications over the network. A suggestion was to implement a mechanism to reserve capacity for advanced applications between certain giga PoPs. This will allow for the support of a certain number of advanced applications, with capacity and packet loss being assured, and delay improved with "weighted queuing". There are also QoS issues of admission control, usage measurement (billing), and marking packets.

Because many advanced applications are naturally multicast, Advanced Multicast Support will facilitate the broadcasting of information as easily from a single source to a large group (one-to-many), as it will from a small group to a secondary small group (few-to-few). The issue of scaling is quite relevant to Multicast, and raises questions such as whether the network should be optimized for transmission lines or for packet forwarding.

Finally, implementing IPv6 over the network will be essential for enabling growth and for other advanced features. IPv6 products are expected to become available beginning in 1997.

Efforts towards establishing giga PoPs as effective service points are also well under way at this time. There is great diversity among the giga PoPs, both geographically (campus, metro area, or state) and technologically (ATM, SONET, or IP). Despite this diversity, some standardization is needed in order to maintain stability. For instance, required items include a common Inter-giga PoP routing policy and design,

measurement policies, designs, and implementation along with admission controls for QoS. Security will also need to be coordinated, and Inter-NOC trouble tickets monitored. Admissions controls will be the most difficult due to differences in university financial structures.

On April 29th and 30th, giga PoP technical and business planners will be meeting in San Diego to discuss the importance of the measurement of utilization, performance, and flow properties. The majority of given examples of emerging giga PoPs are beginning to be realized, and will be offering access to a variety of services. Also, the number of giga PoPs is expected to grow along with the number of institutions connected to I2. These giga PoPs will be using diverse approaches to providing service, such as using IP over ATM, SONET ADM, and LAN over fiber. In order to gain high-speed uncongested connectivity,I2 will be using T3 and OC3 rates, with some sites using up toOC12 rates. Approximately 12 vBNS connect points are expected. Demand for the giga PoPs is going to be concentrated in local universities, while attracting supply from competitive Internet Service Providers. The plan for 1997 is to have 45 universities connected.

The initial interconnect will take place on the vBNS. The core of this network will be in the way of Vector ATM switches in 8 MCI PoPs, with OC12 provisioned among them. Access to the network will be through FORE ATM switches in 10 sites, with a full PVP mesh among the FORE switches. Throughout this network, UBR ATM will be used in conjunction with Cisco and Ascend Routers. Furthermore, Cisco routers will be used in engineering new connections.

Following the presentation, the AC members raised the issue that neither the NGI nor the I2 presentation addressed the issue of routing. In particular, there is a significant concern that routing tables are full and not being monitored, which will slow paths from end to end. They also expressed concern for who is going to fund the initial development. In response, Almes commented that the challenge is to start this in a sufficiently controlled environment. Universities involved in this program need to realize that they must pay for this access out of their own funds. Applications must also be monitored in order to make sure that they are useful to all participants.

5. Governance of the Internet

This topic item follows up from the October FNCAC meeting, at which Governance of the Internet was a major discussion item. Please see http://www.fnc.gov/FNCAC_10_96_minutes.html for background material. At the October FNCAC meeting, the AC members recommended that the FNC and the NSF transition out of their DNS and addressing responsibilities. They also passed a resolution "reiterating and underscoring the urgency of transferring responsibility for supporting U.S. commercial interests in ITLD administration from the NSF to an appropriate entity." George Strawn informed the AC that NSF has not followed through on this recommendation due to the wide breadth of the current discussion on the issue. To identify how to best accomplish this task, the FNC Co-Chair participated as a

member of the IAHC and is participating in the Federal Interagency Working Group on Domain Names. DNS issues have continued to attract significant attention from the Internet community at large, and can now be characterized as a "multimillion dollar problem."

Federal Interagency Working Groupon Domain Names

Glenn Schlarman of OMB briefed the group on the recently established Federal Interagency WorkingGroup on Domain Names. At this time, there is no agreement over what the government should do, if anything, with regard to domain name space. A number of government agencies are interested in this issue, because domain name issues cross numerous agency boundaries and disciplines. The Federal Interagency Working Group on Domain Names was established to generate input from multiple sources and government agencies. The working group is comprised of members from the FCC, DoD, NTIA, NSF, FNC, DOE, NASA, PTO, OMB, NEC, and the White House Science Advisor.

Brian Kahin will be brought in to the White House Office of Science and Technology, which will oversee the Interagency group. This group is not only addressing the immediate concerns of the IAHC proposal, but also is working towards the formulation of a US policy on Internet governance and domain name issues. Towards that end, the group will thoroughly examine the issues and has many questions.

FCC's Role in Networking

Bob Pepper (FCC) reported that the FCC has no role in the DNS issue, but does have significant involvement in bandwidth and access issues. The FCC is concerned that sufficient bandwidth be available when needed, and at reasonable rates. Internet issues of concern for the FCC include such items as:

- Policy and legal questions arising from the fact that Internet-based services do not fit easily into the existing classifications for communications services under federal law or FCC regulations.
- Policy questions arising from the economics of Internet access, including assertions by local telephone companies that current Internet pricing structures result in network congestion, and arguments by Internet service providers that telephone companies have not upgraded their networks to facilitate efficient transport of data services.
- Availability of bandwidth--regulatory and technical issues affecting the deployment of technologies promising to enable high-speed Internet access to the home and to businesses, including the implications for the Internet of the FCC's role in promoting universal service.

Kevin Werbach of the FCC has prepared paper addressing these issues which can be viewed at http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp29.pdf.As stated in the paper, a central theme of the FCC is that they, and other government agencies,

should seek to limit regulation of Internet services. Werbach states that "Because it is not tied to traditional models or regulatory environments, the Internet holds the potential to dramatically change the communications landscape. The Internet creates new forms of competition, valuable services for end users, and benefits to the economy. Government policy approaches toward the Internet should therefore start from two premises: avoid unnecessary regulation, and question the applicability of traditional rules."

Other questions looked at by the FCC include the role of government in bringing the right incentives forward to increase bandwidth, what incentives might be available to get local traffic off of the phone lines, and what products are being developed to minimize the burden on the network.

Non-Federal Activities

International Ad-Hoc Committee(IAHC)

Don Heath of the Internet Society and Chair of the IAHC provided a presentation describing the IAHC proposal on Internet Domain Name Service (DNS). Heath began by stating that if the Internet is to achieve what is hoped, than it must have self-governance, and control by no single nation. The Internet transcends nations, and must be self-governing. He stated that the IAHC achieves these principles by defining the generic top level domains (gTLDs) such as .COM, .ORG, .NET as international resources and proposed a set of competing systems with oversight and a centralized database to store the new gTLDs.

He briefly described the process and some of the thinking that led to the IAHC plan and the gTLDMOU, which calls for the creation of seven additional top level names and a structure that allows competing companies to register Internet domain names. (More information on the IAHC can be found on its webpage http://www.iahc.org.) Heath stated that it was felt that this effort should be international and should examine intellectual property issues. To meet the first, those who served on the IAHC were brought in from all over the world; to address the latter concern, the World Intellectual Property Organization(WIPO) was included in the process. Heath stated that since telecos will be involved in the future of the Internet, the IAHC also included the International Telecommunications Union (ITU).

To draft the IAHC proposal and related documents, the Committee relied on a variety of methods to gather information and input. Heath stated that it was not possible to hold public hearings, so the IAHC relied on the tools available through the Internet - mail lists and web sites. In addition, the IAHC members met with a variety of groups to brief them on the IAHC plan and to gather input. The feedback from those groups and the comments submitted via the mail list led to modifications of the plan. The IAHC is moving ahead with the implementation of the gTLD-MOU; however, the process will need continual feedback and evolution. The more buy-in there is to the gTLD-MOU, the

more dynamic it will be. Heath stated that while governments were welcome to join the process, they must not take over the process.

Robert Shaw of ITU who also served on the IAHC provided a brief overview of the gTLD Memorandum of Understanding, which is designed to set up a structure and establish policies and procedures for responsible administration of the Internet domain name space. Under the term of the MoU, registrars will compete directly, covering the same range of Top Level Domain names, with a Council of Registrars (CORE) running a neutral, shared database repository. Initially, 28 new registrars from around the world (four from each of seven world regions) will be set up. Daily activities are expected to be handled by the registrars themselves and by CORE. Public interest concerns will be handled by a small Policy Oversight Committee, assisted by a much larger Policy Advisory Body, made up of signatories of the MoU. Both the public and private sectors are invited to sign the MoU, which can be viewed at http://www.gTLD-MoU.org. It is hoped that this structure would ensure efficient management of daily operations, and that policy concerns and issues surrounding the future evolution of the Internet Domain Name System would receive sufficient and diverse public review and input.

Critical Administrative Servicesand Enhanced Competition for Internet Domain Name Services

Don Telage, President of NSI, presented an alternative to the IAHC and other proposals regarding DNS and Internet governance. Telage stated that the debate needs to be broadened, and he proposed a non-competitive approach for secure administration of key Internet services. (A copy of his proposals available at http://www.netsol.com/papers/internet.html) Telage identified those key administrative services that would benefit from enhanced competition and then proposed a structure for transition of Internet management.

As background, Telage reviewed the current structure of Internet DNS and the relationships between NSI, the InterNIC, the IANA and NSF. When the Internet was just beginning and the volume of registrations were small, the relationship between these groups was well-defined and worked well. Telage stated that for years, the IANA has been the single point of authority for DNS, IP and network identifiers. By the end of1994, real growth in the commercial Internet began, with the number of new second-level domains growing and companies being charged fees to register those domains. Telage stated that NSI's experience in meeting this increased demand and in domain name registration through the cooperative agreement with NSF is being replicated in other parts of the world.

With that background, Telage pointed out five areas where he feels the IAHC proposal is lacking:

- It does not provide the incentive for TLD Registrars to invest in improved services

- It risks the fragile stability of the Internet.
- It is too bureaucratic
- It is narrow and does not address the total situation.
- Its approach to domain names disputes appears unworkable, will create increased conflicts, and is unfair to registrants in remote regions.

NSI proposed five principles to put together a proposal on the future Internet:

- Limit regulation
- Limit bureaucracy
- Minimize requirements
- Protect critical functions
- Establish legal sponsorship

Telage summarized the proposal by defining the steps that would transition the Internet to a new governance structure while protecting critical Internet functions. The first step would be to move Internet governance functions now performed by the IANA to a Federal authority, preferably the FCC, for a transition period of two years. Telage favors the FCC, with advise from an advisory committee, because that agency is familiar with using committees to manage resources. He stated that in order for the governance functions of the Internet to be institutionalized, the U.S. government must stay involved. To separate out the functions currently performed by InterNIC/NSI, the IP address functions should be moved to its own registry. A contractor would be selected to perform the day-to-day functions of managing the "dot" and the root servers, and the competition for this contract would be open.

Telage closed his remarks by stating that Internet registries are for-profit ventures and therefore, must have incentives to remain in business.

American Registry of Internet Numbers (ARIN)

Randy Bush, member of the proposed Board of Trustees of ARIN, began his presentation by describing DNS as a technology that maps domain names to IP numbers. He emphasized that IP addresses are not names, and should be viewed separately from the name controversy. Names are commercial and are not limited, while IP number addresses are a public trust of a finite resource. IP addresses and names are two separate groups at the InterNIC, and are already separate in similar organizations in Europe and Asia.

Bush then described ARIN as a proposed, non-profit organization (501(c)6) designed to manage and conserve an Internet resource, and to educate Internet users on how to efficiently utilize the resource as a service to the entire Internet community. ARIN is meant to provide a North American counterpart to the other international IP registries (APNIC and RIPE) in order to ensure adequate representation of North American interests. It would also ensure continuity of Internet address stewardship and administration after NSF withdraws itself, and would provide a clear forum for all

stakeholders (end-user, industry, government)to determine Internet address allocation policy. Finally, it would provide the IP registration function on a self-funded basis to eliminate DNS cross-subsidy.

NSI would offer start-up support to ARIN, such as financial, operational, logistical, transferring personnel, database and software. ARIN would have a 7-member volunteer Board of Trustees, a 15 member Advisory Council, membership, and an operational staff. ARIN would be funded through registration services, annual maintenance fees for individual assignments, and annual membership fees. Three types of registration services would be available:

- Annual subscription for bulk registration services for ISPs
- Individual assignment registration services
- ASN registration fees

Bush believes that there is consensus for ARIN, with support coming from the IANA, NSF, both large and small ISPs, and the international community.

6. Network Transitions & Scalability

a. Internet QoS

XIWT Status on Uniting ISP's

Charles Brownstein of the Cross Industry Working Team (XIWT) reported on the development of an organization for commercial Internet service providers (ISPs) dedicated to improving Internet operations and performance. The mission of this solely private organization will be to promote engineering efforts required to maintain and enhance an operational global Internet, with some initial areas of interest being measurement and trouble tickets. The XIWT is very close to announcing the formation of group, pending completion of some legal arrangements. Currently, eight very large ISPs, each serving over 500,000 customers, make up the initial charter membership. Membership is open only to National Providers, with the results and data available to the general public.

This group does not want to overlap with the Internet Society but rather are focused on working with large companies. They will also not deal with standards issues or perform as a lobbying organization. At this time the XIWT is looking to hire a director. Ira Richter will be the interim director and CNRI will provide the initial money for the organization. They intend to have a small staff with most work being done collaboratively by company members. Non-ISP persons will also be invited to participate in meetings. This group can be characterized as vendors working to make the "general network" better.

[Note: The group was announced shortly after the FNCAC meeting and its name is IOPS.ORG. For more information on this effort, please see http://www.iops.org/.]

Measuring QoS

George Clapp of Bellcore reported on the issue of Quality of Service (QoS) , and in particular, Bellcore's vision of QoS as it works to design the Automotive Network Exchange (ANX) for the Automotive Industry Action Group(AIAG). The AIAG is determined to include QoS in the design ofANX based on past experience with inconsistent or non-functional end-to-end service quality in a multi-service provider environment, for example in the areas of trouble resolution and security. To solve this problem, the AIAG chose to adopt an "overseer "model as opposed to a shared industry practice, which is found in organizations like NANOG and the XIWT.

In the overseer model, AIAG and Bellcore have developed a certification process. The process begins with an assessment based on public criteria of the application, which if it passes, leads to a monitoring period. The monitoring period may lead to a probation period and then to re-certification, if events determine that further work is required on the application. Through this learning process, AIGA and Bellcore are exploring different QoS issues, especially security. Millions of dollars are involved for multiple entities, therefore, network security must be tight with no backdoors or spoofing.

In looking at Quality of Service issues, Clapp finds that QoS is often determined and defined by the applications under use, and hence the definition varies according to the community of interest, for it is more than throughput, delay, and loss. It also involves characteristics such as service definition, performance, interoperability, reliability, disaster recovery/business continuity, security, and customer care. QoSalso differs depending on the point of view of the group examining the issue (i.e., the customer often views QoS differently than the service provider). For instance, in terms of routing, the customer sees reachability as a QoS factor; the service provider sees number of destinations reachable via a route as defining QoS. While in terms of performance, the customer sees throughput as a QoS issue, while the service provider measures QoS by packetloss.

Clapp broadly characterized QoS as having 5 dimensions: metric, criteria, measurement technique, tool set, and measurer. The metrics of QoS, or what can be measured, include a service definition, performance and reliability criteria, interoperability specifications, disaster recovery/business continuity plans, security guidelines, and customer care. Both the user and the service provider must also determine who will monitor these metrics and whether the monitoring will be intrusive or passive. Once the metric criteria and collection methods are established constant assessment and ongoing monitoring is required. Both groups are also planning to work with IPPM to ensure consistent measurements.

He ended his talk by discussing the need to combine the business model with the technical requirements of QoS. Both are equally important because distribution of technical functionality impacts business investment and risk. QoS is abroad topic and issues and expectations of both the customer and the ISP must be resolved before the QoS model is implemented. Currently, both AIAG and Bellcore are discussing business issues such as payment responsibilities, and technical issues concerning interoperable trouble tickets, and security.

Automotive Industry Action Group(AIAG) efforts in Internet QoS

Bob Moskowitz, Chrysler Corporation, presented an update on the progress of the Automotive Network Exchange (ANX). The ANX plans to control QoS by certification, monitoring, and management of Service Providers. Through this plan, each participating service provider will be a Certified Service Provider (CSP). Security is the responsibility of the trading partners, with Ipsec (ISAKMP/Oakley and X.509 certs) chosen as the standard.

Design of the ANX was awarded to Bellcore, which is currently in Phase 1 of design. Phase 1 completion is targeted by the end of April 1997, with build-out of the pilot by mid July 1997 and running through October 1997. The pilot will include 30 trading partners and 5 service providers. Controlled rollout will follow in October 1997. The ANX Design Phase will then follow with development of Certification Requirements and Process. Following this will be development of metrics to track adherence to the Certification, and finally development of a Private Key Infrastructure.

QoS in this effort will be broken into 3 categories:

- Performance (Latency, Packet Loss, Throughput Capacity, and Routing Protocols)

- Reliability (Network description, busy hours, routing table stability, CSP Unavailability Metric for Individual Users, Secure Router Management)

- Manageability (Problem Isolation, Customer Care, Disaster Recovery)

QoS will be monitored by using measurement devices at Trading Partner sites, and within CSP's, all of which will be reporting to the ANX Overseer. The detailed information will only be available to network subscribers, but overall information, similar in nature to the FAA "on-time arrival" statistics will be publicly disseminated.

Since the size of this network preclude the use of just one ISP, concerns were raised about the ISP certification process, differentiated class of service, and security. To prevent de-certification of a participating ISP, there will be considerable pressure on the ISP to conform and a public probationary period is considered. A major goal for the ANX is to produce different classes of service through participating ISPs, therefore bringing this choice of services to the public at large. "ANX"is trademarked in 20 countries, and

will be used to identify this service. Finally security is still being discussed and planned by all participants worldwide.

b. Dial-up Internet usage on the public switched networks

Tim Stevens, Bell Atlantic, addressed the FNCAC about the congestion and strain on Bell Atlantic's network by the growing number of dial-up users. His concerns begin with the fact that ISPs are considered "enhanced service providers "under the FCC, therefore exempting them from usage charges. ISPs have taken advantage of this position with the FCC and growth has been phenomenal. Responding to this overwhelming growth, Bell Atlantic is asking the FCC to reconsider their decision and begin charging ISPs for their networks.

Bell Atlantic has two primary goals:

1. To be the first layer of the Internet, being the #1 Access provider
2. To earn a fair return on their investment

In reference to the first goal, Bell Atlantic does not expect to be the ultimate choice in ISPs, but rather the premium choice among all ISPs. Their main reason for this thought is their belief that their network is creating the Internet for everyone. Therefore, they feel that as the foundation of the Internet they should be the nation's leading provider. The second goal follows naturally from the first by wanting to earn a fair return on their investment.

Bell Atlantic networks were optimized for voice at 3khz per call, with 3 calls per hour during peak usage hours. The Internet, however, exceeds this structural design, with customers demanding longer connection times and more calls per hour. Such Internet usage has resulted in a change in the peak usage hours, making peak time between 7 and 11 in the evening. Due to the overwhelming growth of Internet users, local phone companies are forced to constantly make modifications and upgrades to their networks. The question of whether these costs can be covered by the additional lines being ordered by customers for Internet services was raised. Mr. Stevens responded that these additional lines are not being ordered in the mass quantities once predicted. Sales of second telephone lines, specifically for Internet use, applies only a third of the time for families and business. At the Internet's current growth rate it will soon equal the amount of long distance traffic on the network.

Bell Atlantic has recently introduced packet switch network specifically designed to handle data traffic. However, ISP's continue to purchase circuit switched lines to provide their services. Mr. Stevens suggested the creation ofa set of standardized prices that will determine the quality of service delivered.

In closing, Stevens emphasized that Bell Atlantic fully supports the growth of the Internet, and does not wish to slow it down in anyway.

Glee Cady of Netcom provided an ISP's perspective of the growing usage of the public switched networks. Netcom is the first of many providers to use tiered pricing to pair the right set of services with the right customers. Netcomis implementing a "fair use" policy in areas where local congestion is high. This policy allows Netcom to "bump "customers who have been logged on for the longest period of time. One of Netcom's primary concerns is that they are not able to buy the service they would like from local carriers. This is due largely to lack of equipment from local carriers in areas where demand is high for faster Internet services. Using the new packet switched network being offered by Bell Atlantic is not an option because Netcom would incur tariff pricing.

Another option being offered by local carriers is the Digital Access Gateway Product. This is essentially an outsourcing of support for modem racks. The modems are supplied and supported by the local carrier and the ISP is charged for this service. This solution is not cost effective for Netcom and threatens their bottom line. This additional cost will take away from Netcom's expansion of their network. Moreover, the reliability of this Gateway cannot be measured because it lacks a call fail mechanism.

Following the presentations was a brief discussion by the AC members. A major topic was the packaging of services and incentives for changing fees. This shows progress being made on the part of both the ISPs and local carriers to bringing quality service to their customers. Another highlight in this discussion was that the local carriers are using quality as well as price to provide QoS. The AC commented that in order to remedy the system, more that just ISPs need to make changes to provide a solution. There were suggestions that the FCC should consider QoS when dealing with local carriers. It was pointed out that the concept of QoS is so broad that metrics and other measurement devices for QoS need to be developed.

Action Item: The working group on Transitions & Scalability has been asked to work on determining a position for the FNCAC on the topic of QoS.

7. Internet Security & Privacy

Administration's Position on Encryption

Bruce McConnell of the Office of Management and Budget (OMB) summarized the Administration's position on the encryption issue. The administration has determined three goals for Encryption:

- Providing strong security Tobe used for electronic commerce
- Providing strong position for U.S. computer companies globally
- Safeguarding of public safety

As stated by McConnell, in order for electronic commerce to be successful, a trusted environment in which to do business is required. The Administration recognizes the

need for advanced encryption technology to stay competitive as well as secure. Required is the ability to send signed documents and confidential information securely, without questioning the identity of the recipient and the possibility of interception.

The Administration feels that security is a large market that has yet to be penetrated by the U.S., especially in the area of key recovery systems. They would like to see the U.S. be a strong player in this new industry, but want to proceed with caution. Currently, the Administration does not support the export of encryption technology. The Administration has drafted legislation (http://www.cdt.org/crypto/970312_admin.html) to control the domestic use of encryption technologies and compel participation in key recovery systems open to the government. The bill would:

- Create a vast new government-dominated "key management infrastructure" designed as a prerequisite for participation in electronic commerce.

- Compel people to use key recovery as a condition of participating in the key management infrastructure.

- Require the disclosure of all private keys held by third parties, without a court order and upon written request of any law enforcement or national security agency.

The introduction of this legislation elicited several comments from the AC members. Questions arose about the "mandatory" use of key recovery. Will the use of key recovery be necessary to do work with the federal government? McConnell stressed that the participation in key recovery is voluntary.

The Administration also recognizes the need to support law enforcement. Concerns over the use of encryption by criminals is growing at an alarming rate. This is causing a significant obstacle to law enforcement as it tries to counter criminal activity, especially in terrorism where many materials ceased are not negotiable. In addition, with such rapid advancements in encryption, law enforcement officials need the latest tools to assist them in their struggle against this new arena of crime. Another concern raised was the possibility of the type of security being used on the Internet's internal structure being comprised.

AC members also raised the issue of privacy, in terms of the individual person and that of a free society, which seems to have been left out of the Administration's three goals. The Administration is requested to give heavy consideration to the issue of privacy for the individual citizen.

Emergency Access Project

Patricia Edfors, chair for Interagency Working Group on Cryptography (IWG), summarized their current exploration of different encryption possibilities. This group has been asked to demonstrate the reliability of key recovery as a security service for

federal business applications, and to demonstrate the practicability of key recovery as an element of a key management infrastructure/public key infrastructure (KMI/PKI).The Task Group is formed jointly of representatives from the Government Information Technology Services Board (GITS) and the IWG. The Task Group is chaired by a representative from the Department of the Treasury, who also serves as the Champion for Security and Privacy for the GITS Board with participation from NIST, FBI, NSA, and GSA and each agency with a pilot selected from this demonstration.

Ten Federal agency pilots will test the elements of the vision laid out in the white paper, "Enabling Privacy, Commerce, Security and Public Safety in the Global Information Infrastructure." In addition, the pilots have been selected based on their ability to:

- be scalable in size and breadth to other applications;
- be a meaningful and readily understood application, but not necessarily mission-critical;
- allow for a diversity of user community technology sophistication;
- be capable of being implemented and evaluated in 9 - 15 months;
- assure extensive involvement of industry in design and implementation; and
- use commercial products, to the extent available.

At this time all the pilots are working on establishing an implementation plan. There is also going to be a final evaluation on costs versus benefits, and a look into the impacts of these activities.

In order to further the growth of this project, the agency has reached out for industry participation. Some of the participating companies are VISA, MasterCard, Novell, ATT, General Electric, and Microsoft. Source File is offering a key recovery system starting in source code storage. SourceFile does not want to prescribe a key recovery solution but rather works to develop individual solutions for their clients. Key recovery in the business industry is growing; Netscape, for instance, is one of the first companies that expressed interest in being a partner in these key recovery efforts.

Edfors noted that they have identified three key recovery agents at this time, and requested that suggestions for additional agents in key recovery be forwarded to her at patricia.edfors@cio.treas.gov. At this time, certifying authorities in key recovery will be tested using the Trusted Information Systems (TIS) model. Their goal is to meet the need for public safety. These agents will not be recovering signatures or creating a key management infrastructure. If the business applications work well then the foundation of key management infrastructure will be available for review. Every pilot is currently using key recovery data, with a database that has the key encrypted. The end users will always have access to their key. Efforts are also in place to provide a means to access an individual's information while absent. Privacy and security issues need to be considered when providing this solution.

Concerns from the AC members revolved around where the keys were going to be kept and how secure they would be. Also raised was how limits will be put on those who do have access to keys and how to keep them from entering other secure portions of the network. There was a recommendation that an audit trail be used to monitor activity while using these keys. Another concern was for the view of forcing key encryption on the private sector. Finally, measurements of quality was raised by the committee. There are no devices in place yet to determine the satisfaction of users of the key recovery system.

Edfors referenced a web site with a live target date of April 23 that shows the design of the testbeds. For more information, please see http://gits-sec.dyniet.com/krdpsum.htm.

CIS Update

Dennis Steinauer gave a brief update on the Collaboration in Internet Security (CIS) project. This collaboration works in support and implementation of multiagency Security Testbeds, and includes participation by the Dept. of Energy (multiple labs), the Department of Defense/Army Research Lab, the Advanced Research Projects Agency, the National Institutes of Health, the National Institute of Standards and Technology, the National Science Foundation, the National Security Agency, and the National Aeronautics and Space Administration. Other Federal entities will participate indirectly through FNC outreach efforts. Academic and Private Sectors are also invited to participate in this pilot.

A minimum of two agencies are assigned to focus on one given area of security. There are five major areas of research:

- Secure Web
- Advanced Authentication
- Secure Messaging
- Kerberos
- Fortezza

Workshops have been held at MIT, Oak Ridge National Lab, and Argonne National Lab. More information about this effort, including status reports submitted to GITS, can be found at http://www.fnc.gov/cis_page.html.

ACTION ITEMS:

- The FNCAC requests that the Privacy& Security Working Group further examine the exception made in their resolution regarding legislation on exportation of cryptographic technology.

Resolutions:

The FNCAC endorses the IAB and IESG "Statement on Cryptographic technology and the Internet" of July 24,1996, as published as RFC 1984, with the exception of the language on complete and unlimited export of all cryptographic technology, This exception is a complex issue which brings into play multiple social objectives and which requires further consideration. While it may be appropriate for national policy to limit the deployment of Federal production systems or exported private systems, it is inappropriate to constrain research or experimentation on security or privacy technologies.

8. Education & Training

a. Universal Service: E-rate

Linda Roberts, Department of Education

Linda Roberts of the Department of Education summarized their national plan which revolves around four specific goals:

- Teacher training for Global Connections
- Modern computers - upgrading slow or outdated computers
- Every classroom tied to the Global Network
- Effective Software and On-line Curricula

Thanks was extended to NSF for providing powerful software to the educational community which has helped in the rapid growth of new web sites.

Roberts reviewed the current initiatives in which the Dept. of Education is participating. Currently there is a plan to secure 4.5 million dollars from the Technology Literacy Challenge Fund to fund this year's activities, which would be facilitated by the submission of supporting agreements by all50 states. These agreements would be submitted within the next two months. This year's funding will also come from the FCC in the form of 2.25 billion dollars a year as part of their growing Universal Service Fund. Technology Innovation Challenge Grantswill be increasing from 57 million dollars in 1997 to 75 million dollars in 1998. There is also a third fund that supports the upgrading of the internal networks, electrical systems, and building of new schools with the latest technology in networks.

Roberts also reviewed the status of the current educational situation within the United States'K-12 schools. There is growing concern about the high turnover of teachers in this country. Within the next five years, 2 million of a required 3 million teachers will be new.

An immediate need for all students is Internet access. Currently, only 65% of America's schools, mostly in rural areas or large cities, have Internet access. A large number of the schools in the Midwest do not have connectivity. There was also a question as to

how many students have Internet access at home. Roberts indicated that this information was not available, but speculates that the number is low. According to a recent study, the value of this technology is high for all income levels and efforts are being made to make computers available to all children.

One effort in particular is the computer donation program, established to help companies donate their old desktop computers and servers for school use. However, these computers usually require significant repair and updated software. This requires technical support that is usually not available to most schools. Without the availability of this added support, motivation to move forward is taken away. The computers are then not used and those that were once willing to help have lost faith in getting any assistance in making the computers operational.

This brings to light a major concern that there is no mechanism in place to implement the proliferation of computers in the world of education. In San Diego, a request was submitted to train teachers to install software and provide technical support. The request was approved, but the money was not provisioned out to the schools. Moreover, when the computers and software are delivered to the schools, there is no follow through with the installation of this new equipment.

The Technology Innovation Challenge Grant Program is making significant progress. Roberts complemented the work of the Program for developing and refining new applications of technology that make significant contributions to school improvement. This program runs testbeds that generate new learning applications and proven practices that may be successfully used in schools and communities. Since 1995, the Program has implemented 43 projects in 26 states. The average grant is one million dollars per year for five years. This program has over 850 Partners including school districts, local business, universities, and government agencies, as well as other local institutions. This program received over 500 applications last year and 21 were awarded grants.

Anticipation of a final ruling from the FCC is expected in May for the Joint Board Decision. The Joint Board Decision will be a very powerful tool for the world of Education by providing significant discounts on a sliding scale for all schools and libraries for telecommunications services, Internet access and internal connections.

Roberts reported that NetDay 96 (http://www.netday96.com)was a vast success. With the participation of 250,000 volunteers, over 25,000 schools were wired. All fifty states, including the District of Columbia, participated in the event.

Roberts also mentioned that the Twenty-First Century Teachers, a nationwide volunteer initiative encouraging 100,000 teachers to work with their colleagues to develop new skills for using technology in their teaching and learning activities, is not working as planned. There seems to be lack of motivation on the part of the teachers to train 5 other colleagues.

Finally, Roberts reviewed goals for the future of Education. She suggests school districts begin making political stands for education, as some have already begun to do. Furthermore, in the School Construction Bill, a recommendation for a change in language has been suggested to include the description of a specific type of wiring to be installed in schools and that a federal guideline for this be implemented.

Jim McConaughey, NTIA

Jim McConaughey of NTIA reviewed their current status in universal service and its focus on the public interest. In 1934, the Communications Act was passed stating that "communications services are to be provided for every person in the United States….with adequate facilities at reasonable charges." At this time, the U.S. holds third place for making telephone lines available to its population. In 1996,the average annual percentage of households with telephones was93.9%, which is up from the 1984 percentage of 91.6%. For those with incomes under $5,000, the percentage was only 75.6%.

McConaughey feels a redefinition of the Universal Telecommunications Service (UTS) is needed. These changes are needed due to the vitality of information as an economic resource and a source of individual empowerment. As well, there is the ongoing technological changes with the convergence of computers and communications, plus deployment of high capacity, digital transmission facilities.

The National Information Infrastructure (NII) initiative was mentioned and noted the significant progress it has made to include Universal Service. There is currently 50 billion dollar private investment annually in the telecommunications infrastructure. This initiative is opening countless doors to a successful future through higher productivity and new products and services. This will bring high-skilled and better paying jobs, economic growth, and an increase in the standard of living. Moreover, there will be new educational opportunities, expanded medical applications, and community empowerment. The percentage of U.S. households with a computer is growing, but the question, as noted by AC members, is "what percentage of homes have connectivity?" This is the current focus of the NII.

There have now been new Universal Service criteria established with four major points. Universal Service is:

1. essential to education, public health, or public safety
2. subscribed to by a substantial majority of telecom carriers
3. deployed in public telecom networks by telecom carriers
4. consistent with the public interest, convenience, and necessity.

Also, there is another section which entails "special services." This section says that the commission may designate additional support services for schools, libraries, and health care providers. These services will be made available to:

- eligible telecommunications carriers(ETC's)
- low income consumers
- consumers in rural insular and high cost areas
- disabled citizens
- rural health
- public schools and libraries

Through this new service, the FCCshall establish competitive neutral rules to enhance technically feasible and economically reasonable access to advanced telecommunications and information services for all public and non-profit K-12 classrooms, health care providers, and libraries. Elementary, secondary schools, and libraries will receive any "universal services "at rates less than the amounts charged for similar services to other parties from all telecom carriers. These carriers will receive reimbursement or an offset to their universal service obligations. In addition to this, there are two other sections that specify new "services." First, Sec 706 states that the FCC and each PSC will strive to keep their networks updated with the latest available technology in particular to all educational facilities. Secondly, in Sec 708, there is note of the "creation of the National Education Technology Funding Corporation to leverage resources and stimulate private investment in education technology infrastructure, such as interactive high capacity networks, and promote innovative technology-based learning through loans, grants, and other assistance to States."

McConaughey gave a brief overview of the Joint Board Decision in CC Docket 96-45, and its recommendations with respect to schools and libraries to provide:

- Support to eligible schools &libraries for all telecom services, Internet access, and internal connections.
- 20-90% discounts based on need.
- Competitive bids; "lowest corresponding price"; self-certification
- $2.25 billion spending cap per year; "rules of priority" triggered at $2 billion in favor of economically disadvantaged.
- Ability for schools & libraries to enter conditionally into consortia with other entities in order to aggregate purchases.

McConaughey went on to quote President Clinton in his various speeches to the public addressing the need for connectivity for every classroom and home, and the value of technology to every American. There is an ever growing need for technology according to recent studies presented by McConaughey. By the year 2000, 6 out of 10 new jobs will require computer skills. There are also signs of a great deal of public support. 2/3 of Americans are willing to pay an extra $18/month to ensure that K-12 students have access to a PC. This support is expressed again through strong support of connecting libraries with online services so that those without access at home may use these services.

Following this, McConaughey wanton to present findings from the NCES Survey of Advanced Telecommunications in U.S. Public Elementary and Secondary Schools, 1996.

These findings showed that 65% of public schools have access to the Internet - but only 14% of all instructional rooms. Out of this65% of schools, only 20% of the teachers use advanced telecommunications for teaching. The barriers that are keeping these numbers low are funding, too few access points in the buildings, difficult access to telecommunication equipment, and a general lack of good equipment overall.

A second survey was conducted by the NCLIS's of U.S. Public Libraries and the Internet. This survey found that only 45% of public libraries have access to the Internet, with 28% allowing their users to directly access the Internet through public terminals. These libraries are only serving 45%of the U.S. population. The largest barriers for libraries having access were found to be the cost of communication, state and federal funding, and staff time.

McConaughey also provided a briefing on the general plans for the future. The Administration is going to continue to promote Clinton's goals for technology in education, as outlined below:

- All teachers will have the training and support they need to help students learn through computers and the NII.
- All teachers & students will have modern computers in their classrooms, and every classroom will be connected to the NII.
- Effective and engaging software and online resources will be an integral part of every school curriculum.

Furthermore, McConaughey recommends a long term national strategy that provides a means for electronic access for all Americans. This new strategy, at least for an interim period, should also include educational and community structures providing access. Public-private partnerships will continue to play a vital role in advancing these goals as well.

In closing, McConaughey mentioned that the telecommunications industry is being effected by tremendous economic, technological, and social forces in the U.S. and abroad. This can be seen by the evolving policy perspectives in the Communications Act started almost 60 years ago. As well, policy makers believe that competition, global competitiveness, and universal service are not incompatible. With schools and libraries playing a critical role, they are the ones that are going to educate our students and create a more skilled labor force. This will make the U.S. a competitive player in the information industry, and effective competition can drive down costs and prices and spur innovation.

b. Professional Internet/Information Education

John Cavallini of DynCorp discussed some current efforts in Information Technology Education by the "Power Tools" partners, a group of federal agencies/labs and industry representatives working to improve US economic competitiveness through a better

vocational training work force and to accelerate application of network information technology in public education. There are an estimated 15,000 high tech job openings in the Washington D.C. area alone, and few qualified candidates available to fill these positions. ITAA studies indicate 190,000 current openings nationwide and that IT employment will double to 5 million workers over the next 5 years. The education community appears least able to compete for qualified IT candidates.

In order to fulfill these goals, a strategy has been implemented. Vocational schools will be asked to participate in order to help them achieve sustainability. Teachers and students alike will be engaged to generate enthusiasm by using mentors, lab partners, hosting apprenticeships, and summer Co-ops. Partnerships and alliances will be established to promote integration in Federal labs, state school systems, and special industries. There will also be efforts to implement training for lab and vocational curricula and for using multimedia Internet technology to evaluate and address the skill sets needed. Itis hoped that advanced information equipment will be deployed into schools, but the concern there is that a mechanism is needed to maintain this equipment.

What the Power Tools Partners are asking of the FNCAC is an endorsement of both the need expressed above and an endorsement of their concept of using higher technologies, not a specific project. The Power Tools partners will provide an integrated national sustainable model, an evaluation of Internet tools used in dozens of schools districts, and the development of skill sets and certifications.

Connie Stout (TENET) gave a short presentation to the group on the network training needs of educators, especially in the K12 arena. Currently, teachers cannot access a single source for their training needs and Federal assistance in this area has been random. For example, there are hundreds of studies performed on the issue of training K12 educators but this information is not being disseminated to the community for their use. When states provide greater overall training assistance, they find that a higher percentage of K12 teachers and students have and use network access. There was a request that the AC hold a working group for the K-12 sector to determine what information technology activities and projects are being implemented to ensure that information regarding these programs is reaching the appropriate audiences.

One example of K12 use of network technology Stout cited was in the area of intellectual property and textbooks on the Internet. Developing and using this resource raises multiple questions, from how to charge for a "virtual "textbook, to protecting the intellectual property of the textbook authors. Several groups and states are studying this issue, and a report on this subject will be distributed to the FNCAC when it is completed.

9. Wrap-up and Action Plan

Update on Intellectual Property Study

Carol Henderson reported on the progress of the Intellectual Property study proposed by the FNCAC and planned by the National Research Council. Currently, NSF Information, Robotics, and Intelligent Systems (IRIS) group is taking the lead in securing funding for the study. Henderson reported that the peer review of the NRC proposal is underway and further action with regard to funding was not required from the FNC Advisory Committee. To hasten the project, though, the FNCAC can provide names of researchers to the NRC.

General Business

Sid Karin concluded the FNCAC meeting by stating that use of Internet resources for education and training would be a focus of the next FNCAC meeting. This meeting would provide an opportunity to work with current efforts/program in this area.

The next meeting of the FNCAC is tentatively scheduled for October 14 and 15.

The meeting was adjourned.