REPORT OF THE
STATE LIBRARY BOARD AND THE
DEPARTMENT OF INFORMATION TECHNOLOGY ON

ASSESSING THE NEED TO ESTABLISH PROTOCOLS AND GUIDELINES REGARDING IN-STATE ACCESS TO THE MYRIAD FILES AND COMPONENTS AVAILABLE THROUGH THE INTERNET

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

HOUSE DOCUMENT NO. 15

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December 12, 1994

TO: The Honorable George F. Allen, Jr., Governor of Virginia
Members of the General Assembly

House Joint Resolution 76, which was agreed to by the 1994 General Assembly, directed the Board of The Library of Virginia and the Department of Information Technology to study "whether the Commonwealth needs to establish protocols and guidelines regarding in-state access to the myriad files and components available through the Internet." Accordingly, the Board and the Department convened a Committee to study the issue. As Committee Chair I have the honor to submit our Report and Recommendations regarding what Internet guidelines and protocols we believe either have been or should be established.

Our Report has been submitted to Assistant Attorney General Alison Paige Landry for review. Late last week, Ms. Landry informed me that while her first reading of it raised no problems, she would be unable to review it thoroughly until later this month. Therefore, I have asked that she submit any recommendations she may have directly to the Governor's Office and to Members of the General Assembly. She has agreed to this procedure.

Respectfully submitted,

Patricia Wilson Berger
Chair, Committee on Internet Guidelines and Protocols

COMMITTEE TO IDENTIFY INTERNET GUIDELINES AND PROTOCOLS
REPORT TO THE GOVERNOR AND THE GENERAL ASSEMBLY
DECEMBER, 1994

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COMMITTEE TO IDENTIFY INTERNET GUIDELINES AND PROTOCOLS
REPORT TO THE GOVERNOR AND THE GENERAL ASSEMBLY
EXECUTIVE SUMMARY, DECEMBER, 1994

In March of 1994, the General Assembly passed HJR 76, which requested "the State Library Board and the Department of Information Technology to study whether the Commonwealth needs to establish protocols and guidelines regarding in-state access to the myriad files and components available through the Internet." A copy of HJR 76 is included as Appendix I to this Report. In May of 1994, the principals met and decided that broader participation in the Committee's deliberations was necessary. A list of Committee members and participants is included as Appendix II to this Report.

The Committee held its first meeting in June of 1994 and its last in November. We focused on existing or possible *State-sponsored* Internet access to four sectors:

- State government agencies
- State-supported educational institutions
- Small and emerging businesses
- The general public

The Committee determined that five clusters of issues can affect all four sectors:

- Three First Amendment Issues
- Two liability issues
- Acceptable Use Policies
- Equitable access issues
- Network and database security issues

On pages 8 and 9 of the Report are listed four definitions, which describe how the Committee chose to interpret certain terms. Pages 8 and 9 also include seven caveats, which describe how and why the Committee limited the scope of its deliberations. One example: Given the global span and worldwide ownership of the Internet, whether or not Virginians will be able to access the Internet is *not* an issue which falls to the Commonwealth, or even the United States of America to decide.

For a full understanding of what issues the Committee's Recommendations address, pages 8 and 9 of the Report are *must* reading.

Access to the Internet throughout Virginia is an important issue. Consider:

> During one month, from 15 August to 15 September 1994, Virginia ranked 7th throughout the *entire* North American Hemisphere for the largest number of *new* commercial accounts registered that month on the Internet. Only California (428), Colorado (140), the entire nation of Canada (110), Texas (110), Massachusetts (87) and New York (84) had more registrations. Of Virginia's 74 new commercial accounts 63 were in the 703 area code region and 11 were in the 804 area code region.

While the Committee's Recommendations are integral to the Issues considered in this Report, each Recommendation specifies either a decision or an action, which falls into one of three sequential Tiers:

Tier I. Policy Recommendations, which become relevant *after* the initial policy decision has been made that a State agency or a State-supported institution will provide some level of access to the Internet for certain populations.

> Recommendations 1, 2, and 3 [page 12 of the Report] address three First Amendment Issues:
>
> > Recommendation 1 cautions State agencies not to deny access to Internet resources "on the basis of viewpoint, message or possible controversial content."
> >
> > Recommendation 2 states that citizens and Internet users should be advised "that State-supported gateways to the Internet cannot shield them or their children from unpleasant or offensive material."
> >
> > Recommendation 3 advises that should State government "decide to expand the range of topic or issues beyond those available over the Internet, the State must treat evenly all viewpoints and perspectives."
> >
> > Recommendation 14 [page 18 of the Report] advises that "all State government data and information released to the public online [be] accessible to all citizens and residents of Virginia."

Recommendation 16 [page 20 of the Report] has policy, procedural and financial elements. The key policy phrase is "*if* the Governor and the General Assembly determine that some level of State-supported Internet access service should be provided to the general public and/or to specified new and emerging businesses." Should such a determination *not* be made, then the rest of Recommendation 16 is moot.

Tier II. Procedural Recommendations, which become relevant *after* a policy decision has been made which obliges one or more State agencies or State-supported institutions to provide some level of access to the Internet for certain persons, groups or purposes.

Recommendation 4 [page 13 of the Report] advises State agencies to continue to develop and apply policies and procedures to guarantee "that agency data or information accessible over the Internet is.reliable, valid and accurate."

Recommendation 5 [page 13 of the Report] advises "each State-supported Internet gateway [to] develop a network disclaimer statement" and to submit those statements to the Attorney General's Office for approval, after which each statement should be "prominently and permanently displayed."

Recommendations 6, 7, and 8 [pages 14-15 of the Report] set out minimum contents for State agencies' adequate Acceptable Use Policies [AUPs], recommend their review and approval by the Attorney General's Office, advise that they be "prominently displayed and .....available to all users of a State-supported Internet access service covered by [a specific] AUP." Recommendation 8 would require users of a State-supported Internet access service to sign a statement stipulating that "they understand and do not dispute...[the Internet provider's] Disclaimer Statement" and that they will abide by the conditions stipulated in the State provider's AUP.

Recommendation 9 [page 15 of the Report] advises State agencies to "develop guidelines and/or regulations" spelling out the "specific conditions and acceptable uses for agency staff access to the Internet.

Recommendation 10 [page 16 of the Report] urges State agencies and State-supported institutions to work with the Attorney General's Office to "define, establish and apply appropriate sanctions for violations of agencies' AUPs or other violations of State-supported Internet access services."

Recommendations 11 and 12 [page 17 of the Report] first, tasks the Department of Information Technology to "decrease [the] user training burden and costs on State-supported Internet access providers" by identifying or developing "appropriate user interfaces (front-ends)" to Internet and second, "until such time as front-ends and Graphic User Interfaces (GUIs) become widely available and affordable, urges State agencies to "collaborate with both for-profit and not-for-profit Internet access providers to develop and conduct training [for] users of State-supported Internet access providers and gateways."

Recommendation 16 [page 20 of the Report] stipulates that *if* the Governor and the General Assembly determine "that some level of State-supported Internet access service should be provided to the general public and/or to specified new and emerging businesses" then certain guidelines need to be formulated regarding who is eligible for what assistance and under what conditions.

Recommendation 18 [page 24 of the Report] urges the Council on Information Management [CIM] to issue "standards and guidelines" to help State agencies and State-supported institutions to protect the integrity, reliability and validity of their networks and the information resident on those networks "from unwarranted or destructive incoming Internet traffic.

Tier III. Financial Recommendations, which become relevant *after* a decision has been made that the Commonwealth will fund some level of access to the Internet for certain persons and purposes.

Recommendation 13 [page 17 of the Report] urges the Governor and the General Assembly to task "the State Corporation Commission to initiate discussions with appropriate industries and companies to develop a plan to establish reasonable Internet connect costs for all Virginians."

Recommendation 15 [page 19 of the Report] advises that the State first, "continue its negotiations with the private sector to explore strategies to stabilize both the architecture and the capitalization of Va.Pen and VERNet" and second, "that the future financing and architecture of VLIN be included in those discussions."

Recommendations 16 [page 20 of the Report] stipulates that *if* the Governor and the General Assembly determine "that some level of State-supported Internet access service should be provided to the general public and/or specified new and emerging businesses" then the Governor and the General Assembly should consider "funding one-time Internet access grants for key new and emerging businesses in the Commonwealth."

Recommendation 17 [page 21 of the Report] urges that "in order to provide equitable, affordable Internet connect costs throughout Virginia State agencies develop a coordinated contracting approach for all state-supported Internet access services" and that "the State explore... contracting for such services with all potential Internet access providers."

HJR 76 stipulates that the Committee's principals include only the Board of The Library of Virginia and the Department of Information Technology. While the principals expanded participation to include other agencies and points of view, this Report represents the consensus of the two principals on all of the issues the Committee and its participants addressed, save two. First, the principals discussed but could not agree that tax advantages should be offered telecommunications companies or other Internet access providers which can provide reduced Internet access rates to remote and rural areas of the State. Second, the principals discussed, ad nauseam, but failed to agree on what guidelines, protocols or standards are needed to assure the confidentiality of personal information and data the State makes available online. There is discussion of both matters in the Report. There are no recommendations on either issue.

Finally, Appendix III. to this Report includes a description and an analysis of the Commonwealth's present information infrastructure. Appendix III. also includes one Scenario for further developing and improving the current infrastructure.

COMMITTEE TO IDENTIFY INTERNET GUIDELINES AND PROTOCOLS
REPORT TO THE GOVERNOR AND THE GENERAL ASSEMBLY
DECEMBER, 1994

I. Scoping the Study, Identifying the Issues

A. Getting Started

In March of 1994, the General Assembly passed House Joint Resolution 76, which requested "the State Library Board and the Department of Information Technology to study whether the Commonwealth needs to establish protocols and guidelines regarding in-state access to the myriad files and components available through the Internet." HJR 76 directs the Board and the Department to "complete their work in time to submit their findings and recommendations to the Governor and the 1995 Session of the General Assembly." A copy of HJR 76 is included in Appendix I to this Report.

In May, representatives of the State Library Board and the Department of Information Technology met to determine how to proceed. It was clear that other points of view needed to be represented; therefore, representatives from the Commonwealth's Departments of Education and Transportation, the Council on Information Management (CIM), State-supported academic institutions, interested municipalities, The Thomas Jefferson Center for Protection of Free Expression and a Federal library were invited to participate. In addition, the Chair wrote to all of the Cabinet Secretaries and the Superintendent of Public Instruction to inform them of the Committee's work and to invite their participation in our deliberations.

A list of Committee members and participants is included in Appendix II to this Report.

B. What Is the Internet ? Why Should Virginians Care ?

(1.) Who Started the Internet In the First Place?

In the 1960's the Department of Defense's Advanced Research Project Agency (ARPA) created a computer network which they named "ARPANet" to enable scientists and engineers working in or for the Department of Defense to exchange online mail and files related to their tasks. AT&T was asked to provide the "backbone communications" which, in those days was a "T-1 line" and one of the most advanced

wide bandwidth landline carriers available at the time. In the 1970's ARPANet was taken over by the National Science Foundation (NSF) and became "NSFNet." NSF expanded the Net to link not only DOD scientists and engineers but also scientists, engineers and scholars in major research institutions throughout the United States. By the middle 1980's, NSFNet- equivalent nodes had been established in many other countries.

Soon, governments, businesses, research and educational institutions and individuals in many nations, including the U.S., realized that -- in addition to satisfying the requirements of scientists, engineers and scholars- - the NSFNet held enormous potential to satisfy many of the educational, research, personal communications, financial, business, marketing, shopping and entertainment needs of citizens. Thus the term and the concept of the "Internet" evolved, developed and flourished.

(2.) What Is the Internet Today?

Today, the Internet is an international network of computer networks in 130 countries carried over a combination of commercial and government-owned trunks (such as AT&T, Sprint, MCI, ComSat, IT&T, Regional Bells, and foreign government Post-Telephone-and-Telegraph systems (PTTs) and satellites.). Internet is the largest conglomerate of its kind in the world, one which continues to expand rapidly (annually, it increases at a rate of 81%), and one which is accessible worldwide. As configured, the Internet is not the creature of any one country, because pieces and links of the Internet belong to 130 nations. Therefore the whole Internet is not subject to either unilateral control or regulation by any single country.

In August, 1994, there were 3,200,000 "online" computers on the Internet, 63% of which were located in the United States. (By contrast, in August,1989, *all* of the Internet's online computers were located in the United States.) The present 3.2 million online nodes provide access to over 25 million computers located throughout the world, and the most rapidly expanding sectors of the Internet are located outside the U.S, in the Pacific Rim nations of Australia and New Zealand.

The Internet holds special promise for remote, isolated countries and communities worldwide. The Internet levels the playing field because it transcends the boundaries of geography and time and opens up enormous opportunities for growth, learning and interactions among peoples, institutions and governments, which may be separated by miles or even whole continents. It is no accident that today, the greatest concentration of Internet access points per capita is in Norway.

The Internet enables students and scholars, regardless of where they live, work or study to use many educational materials formerly available only to faculty and students at institutions such as the U. S.'s Harvard and England's Oxford Universities. In Alaska, for example, students in remote villages can, by way of the State's educational network and the Internet, pursue college degrees and graduate studies without leaving home.

Entire communities use the Internet to exchange ideas and share information. Some of these groups coalesce around ideas, experiences or needs they have in common. Some are bound by faith and ideals, while others come together because they share a common geography or national origin. For example, the President of the Central Virginia Freenet says that his Net provides the population it serves an electronic bulletin board and "a community-based ramp to the information superhighway."

In addition to scientific, educational and other research activities on the Internet, there are health-interest communities which exchange information, share experiences and swap advice about most major diseases, such as cancer, diabetes and heart disorders. Participants in these groups include health care professionals, scientists, patients, former patients and family members who live and work all over the world.

There are other communities on Internet with less compelling messages. Some of these communities focus on topics which most people consider deviant and abnormal.

(3.) How Is the Internet Governed?

The second edition of Ed Kroll's book, entitled, The Whole Internet, User's Guide & Catalog (O'Reilly & Associates, Inc., Sebastapol, CA, 1992 and 1994) describes Internet "governance" very well indeed. On pages 16 and 17 Kroll says that:

> "In many ways the Internet is like a church: it has its council of elders, every member has an opinion about how things should work, and you can take part in it or not. It's your choice. The Internet has no president, chief operating officer or Pope. The constituent networks may have presidents and CEOs, but that's a different issue. There's no single authority figure for the Internet as a whole.
>
> "The ultimate authority for where the Internet is going rests with the Internet Society, or ISOC. ISOC is a voluntary membership organization whose

purpose is to promote global information exchange through Internet technology. The ISOC appoints a council of elders, which has responsibility for the technical management and direction of the Internet.

"The council of elders is a group of invited volunteers called the *Internet Architecture Board,* or the IAB.... The IAB ... decides when (an Internet standard) is necessary and what it should be.

"As in church, everyone has ideas about how things ought to be. Internet users express their opinions through meetings of the Engineering Task Force (IETF). The IETF is another volunteer organization; it meets regularly to discuss operational and near-term technical problems of the Internet. ... Anyone can attend IETF meetings and be on ... (IETF) working groups, the important thing is that they work. ... A working group usually produces a report. Depending on the kind of recommendation, it could be documentation that is made available to anyone who wants it, it could be accepted voluntarily as a good idea which people will follow, or it could be sent to the IAB to be declared a standard.

"If you go to church and accept its teachings and philosophy, you are accepted by it, and receive the benefits. If you don't like it, you can leave. The church is still there, and you get none of the benefits. Such is the Internet. If a network accepts the teachings of the Internet, is connected to it, and considers itself part of it, then it is part of the Internet."

(4.) Who Pays for the Internet ?

On page 17 Kroll tells his readers that:

"The old rule for when things are confusing is 'follow the money.' Well, this won't help you to understand the Internet. No one pays for 'it'; there is no Internet, Inc. that collects fees from all Internet networks and users. Instead, everyone pays for their part. The NSF pays for NSFNet. NASA pays for the NASA Science Internet. Networks get together and decide how to connect themselves together and fund these interconnections. A college or corporation pays for its connection to a regional network, which in turn pays a national provider for access.

"There is a myth that the Internet is free. It's not; someone pays for every connection to the Internet. Many times these fees aren't passed on to the actual users, which feeds the illusion of 'free access.' But there are also plenty of users who know very well that the Internet isn't free Right now, the fastest growth areas for the Internet are small businesses and individuals, and these users are very aware of the price."

In recent years, funding for the U.S. segment of the Internet has shifted from Federal sources to state and local governments, state-supported universities, and private companies. All three groups continue to develop and to finance local and regional "ramps to the information highway." Since 1990, National Science Foundation dollars for Internet have been cut sharply. By 1999, external Federal funding for Internet access will disappear altogether.

(5.) How Do I Access The Internet ?

Today, anyone wishing to "cruise" the Internet needs access to a personal computer, a modem, and a connection to an Internet access provider, via either a local or a long-distance telephone call. Internet access providers include commercial firms, freenets, and subsidized providers. Subsidized providers can be located in government agencies, state-supported educational institutions, and public libraries. There are hundreds of commercial Internet access providers throughout the United States, competition is keen and rates for dial-up access range between $18 to $28 per month, exclusive of telephone connect charges. In the Commonwealth's urban centers, the cost to connect to an Internet access provider rarely exceeds the cost of a local telephone call.

In rural parts of Virginia however, where one or more of the State's 23 local telephone companies provide exclusive communications links to Internet access providers, the connect costs can be prohibitively high, and Internet sessions can result in hefty long distance telephone charges.

(6.) Why Should The Internet Matter To Virginians ?

Within the United States, the Internet sector showing greatest growth is the commercial sector. Between August 15th and September 15th of 1994, 1,839 new Internet commercial primary accounts were reported for various types of firms, including law and legal services, advertising agencies, manufacturers, pharmaceutical and chemical companies, financial institutions and services, entertainment organizations, newspapers, hospitals, publishers and bookstores, radio and TV

outlets, cable companies, florists, accounting firms and one church. Each and every primary account on the Internet can provide access for from one to several hundred separate computers and users.

During this *one month,* 15 August to 15 September 1994, Virginia ranked 7th throughout the North American hemisphere for the largest number of *new* commercial accounts registered on the Internet. Only California (428), Colorado (140), the entire nation of Canada (110), Texas (110), Massachusetts (87) and New York (84) had more registrations. Of Virginia's 74 new commercial accounts during that month, 63 were in the 703 area code region, and 11 were in the 804 area code region.

In addition, for several years, the Commonwealth has supported various levels of Internet access for State agencies, State-supported academic institutions, K through 12 public schools and public library systems.

C. Focus

The Committee consulted with several Internet access providers. We heard from the Manager of InfiNet, a commercial Internet provider in the Commonwealth, and we were briefed by the President of the Central Virginia Freenet as well. We learned about another state's Internet efforts from the Manager of Maryland's SAILOR Project. (In the spring of 1994, the SAILOR staff instituted Internet access for all Maryland citizens and residents via the State's public library systems.) The Committee received papers and/or briefings from staff of the Council on Information Management (CIM), from the Center for Innovative Technology (CIT), and from Virginia's four statewide networks, viz.,the Department of Information Technology's (DIT) Commonwealth Telecommunications Network (CTN), VERNet, Va.Pen and The Library of Virginia's Virginia Library and Information Network (VLIN).

The Director of the Essex County's Public Library told the Committee about the difficulties that rural county has encountered as it has tried to expand its current Internet access. Finally, the Committee was briefed by the Executive Director of the Coalition on Networked Information (CNI) on the future of, and future developments in, networking in the United States. Membership in the CNI includes the major institutions of higher learning in this country, a number of Federal government agencies, the major publishers of scientific and engineering books and journals in the English language, and several information hardware and information systems manufacturers, including IBM, Xerox and Hewlett-Packard.

Unfortunately, the Committee was never briefed on the status of Internet access service in remote parts of the Commonwealth. Therefore, at some future time, guidelines or protocols may need to be formulated for three communications systems (telephone, satellite and cable), depending on the present and future capacities of each to provide reasonable, reliable Internet access service to Virginians who live and work in rural and remote parts of the State.

D. The Issues

The Committee focused on existing or potential *State-sponsored* Internet access in four sectors:

- State Government agencies
- State-supported educational institutions
- Small and emerging businesses
- The general public

The Committee believes that five clusters of issues can affect all four sectors:

- Three First Amendment issues
- Two liability issues
- Acceptable Use Policies
- Equitable access issues
- Network and database security issues

E. The Environmental Scan

To understand what is possible now for Virginians on the Internet and what may be possible in the future, one must understand the present composition of the State's information infrastructure. Section III of this Report includes brief descriptions of some major Internet activities currently underway throughout the Commonwealth. In addition, Appendix III to this Report describes one Scenario for further developing and improving the Commonwealth's existing information infrastructure. This Scenario is based on an extensive scan of the State's information infrastructure as it exists today. The results of that scan constitute the text of a Committee Discussion Paper, which is also included in Appendix III.

F. The Recommendations

While the Committee's Recommendations are integral to the Issues considered in this Report, each Recommendation specifies either a decision or an action, which falls into one of three sequential Tiers:

Tier I. Policy Recommendations, which become relevant *after* the initial policy decision has been made that a State agency or a State-supported institution will provide some level of Internet access for certain populations.

Tier II. Procedural Recommendations, which become relevant *after* a decision has been made which obliges one or more State agencies or State-supported institutions to provide some level of access to the Internet for certain persons, groups or purposes.

Tier III. Financial Recommendations, which become relevant *after* a decision has been made that the Commonwealth wili fund some level of access to the Internet for certain persons and purposes.

G. Definitions

(1) *Basic Internet access* refers to those functions which, routinely, an Internet access provider furnishes over a voice-grade line. Such functions can include E-mail, Gopher, File Transfer Protocol (FTP), Telnet and access to Usenet Newsgroups.

(2) *Internet access service provider* refers to commercial, academic, government and freenet entities that provide telecommunications access to the Internet.

(3) *Network* and *networks* refers to either: (a) constellations of interconnected and/or interrelated telecommunications systems; or (b) integrated computer systems which rely on external telecommunications for Internet access.

(4) *On line services* refers to commercial vendors, such as America Online and CompuServe, that provide: (a) limited and controlled access to the Internet via the individual vendor's computers; (b) access to specific, vendor-selected and/or created value-added information files and databases; and (c) subject-specific forums, for information exchange among communities which subscribe to a specific commercial vendor's service.

H. Caveats To Bear In Mind

First, the Committee did not consider the *content of* resources and files on the Internet, except where content might dictate Internet access policy.

Second, except for three First Amendment issues and two liability issues, the Committee did not review legal issues concerning the Internet. For example, we did not consider: (1) the jurisdiction of one state's pornography laws over material sent via the Internet from another state; (2) whether medical opinions or advice transmitted across state lines violate in-state licensing laws; (3) whether making legally protected intellectual property available over the Internet constitutes a violation of copyright law.

Third, insofar as possible, the Committee relied on current Virginia law and regulations governing paper media to frame recommendations about electronic media. While the "fit" is not perfect, certain sections of the Code and some regulations appear to apply in the electronic environment.

Fourth, lacking both the time and the resources to do so, the Committee did *not* study the Internet needs of the disabled and institutionalized. The Committee recognizes that Internet access for these two groups is important and we recommend that their requirements be the focus of a future study.

Fifth, the Committee did not second-guess certain political decisions which have yet to be made. For example: (1) the Committee suggests a model for State-subsidized Internet access to small and emerging businesses, but we took no position on whether the Commonwealth should make such businesses eligible for access; (2) while the Committee noted that taxpayer dollars for State-supported networks are almost depleted, the Committee did not stipulate what the future mix should be (government, commercial, freenet) of Internet providers to the Commonwealth; (3) the Committee is aware that the fastest growing sector of the Internet in the United States is the commercial sector, but we took no position on whether the Commonwealth or the private sector should be the preferred provider for Internet services financed by State and local governments.

Sixth, given the global span of the Internet, the Committee limited its deliberations to those access issues which fall to the Commonwealth to decide. Continuing access to the Internet by Virginians is *not* one of those issues.

Seventh, the Committee did not develop a list of the specific data and information State agencies should, or should not, make available to the public over the Internet. Such a list may be useful, but its development is outside the scope of the Committee's charge from the General Assembly.

II. The Issues

A. Three First Amendment Issues

The Committee believes that there are three law and policy questions with First Amendment implications which need attention, that the answer to all three questions is the same and that this answer applies to any sector of society which is, or may be, a recipient of State-supported or State-subsidized Internet access service. These questions are:

(1) When government provides Internet access to its citizens does it have a duty to protect users from exposure to material that may be offensive or might be harmful? The Committee believes the answer is "no," for three reasons. First, a government which merely provides or facilitates Internet access cannot logically be deemed a sponsor or guarantor of the vast array of material accessible through Internet. Second, gaining access to material via the Internet requires a voluntary user initiative, far more clearly than turning on a radio or television set. Any suggestion of assault upon a "captive audience" would badly misconceive the access path. Third, unless government engages in unconstitutional censorship, it would be impossible for government to monitor the availability of offensive or harmful material in ways that would enable an element of government to shield some or all users from such material.

(2) Does government have a duty to guarantee citizens access to controversial materials accessible through the Internet, which they might wish to view, but to which access has been restricted or blocked by some other entity or system? The Committee believes the answer is "no" again, because even if the controversial materials are protected by the First Amendment, so that government may not prevent citizens from obtaining access, nothing in the First Amendment compels government to subsidize that access. In addition, helping citizens gain access to information controlled by someone else is not government's responsibility. However, if government has a program to subsidize or facilitate access to otherwise unavailable electronic material, that

program *must be content-neutral*. Government may not provide grants or other assistance only for "good" or "safe" materials and not provide similar help for controversial materials from the same source. Such aided access may be limited to specific users or even specific materials, but not in ways that draw lines between "good" and "bad" content.

(3) Does government have a duty to post or to arrange the posting of a topic or subject of interest to citizens but not currently accessible through the Internet? Here too, the Committee believes the answer is "no." The Constitution imposes no duty on government to create material, or to make available any materials at all, much less to provide access to materials on a subject not currently available on the Internet. Freedom of Information laws may compel government to provide access to certain documents, but such laws represent a legislative judgement, and not a constitutional imperative. Yet to say that access is not a matter of right does not confer blanket authority to limit it or deny it. If government does create avenues of access, whether in print or in electronic form, such access may not be withdrawn or restricted because persons in authority find the viewpoint or the language offensive or distasteful, or the message controversial. Government has no constitutional duty to create material or to make possible communication on a subject that is not currently available via the Internet. Government may wish to expand citizens' knowledge base, but that is a matter of grace and not of duty. However, should government choose to post or to create means for discussing materials not accessible via the Internet, it must do so even-handedly, and not in ways that import content judgements among messages or viewpoints.

Discussions of free expression must recognize certain limits as defined by the Supreme Court. Speech that creates a grave or imminent threat or lawless action ("clear and present danger") may be restrained, as may obscenity or child pornography, and one message, threatening the life of the President, may be suppressed. Speech that defames a private individual may give rise to civil damages and commercial speech (advertising) is only partly protected by the First Amendment. Even the most protected speech may be regulated as to its "time, place and manner" so long as its content or viewpoint is not suppressed.

Finally, it is clear that free speech principles do not preclude an Acceptable Use Policy that limits access to certain defined uses and users, rather than confining access to certain "approved" messages or materials. Such a Policy should be couched

in terms that are content-neutral and consistent with freedom of expression.

Recommendation Number 1: The Committee recommends that any State agency which provides or facilitates access to the Internet take care not to deny access to some material (while granting access to other material), on the basis of viewpoint, message or possible controversial content. [The Committee recognizes there is no Constitutional imperative that State government provide access to the Internet or to any resource resident on the Internet. The Committee recognizes also that State government can and should determine the purposes for which, and to whom, State-supported Internet access will be provided.]

Recommendation Number 2: The Committee recommends that citizens and users be advised that State-supported gateways to the Internet cannot shield them or their children from unpleasant or offensive material.

Recommendation Number 3: The Committee recommends that should the State decide to expand the range of topics or issues beyond those available over Internet, the State must treat evenly all viewpoints and perspectives.

B. Two State Liability Issues

The Committee believes that State agencies should exercise care with regard to two liability issues.

- First, just as they do with their "paper" documents and data compilations, State agencies need to assure the validity and reliability of any of *their* agency's information or data which is made available over Internet. That is, for the same legal reasons, State agencies need to observe the same precautions in the electronic environment that they observe in the paper environment.

- Second, if a State agency is an Internet gateway provider, it needs to post a statement, prominently, making it clear that the agency, *as a gateway to external materials accessible via the Internet*, cannot and does not assume responsibility for the content or accuracy of those external materials.

The Committee believes that any State-supported Internet gateway provider should adopt a Network Disclaimer Statement, similar to the one adopted by the staff of Maryland's SAILOR Project, which reads:

> "SAILOR cannot censor your access to material nor protect you from information you find offensive. There are many sites that carry sexually explicit and other controversial or inappropriate information resources."

Similar language, reviewed and approved by the Attorney General's Office, would be helpful, not only to individual users, but also to libraries and other channels in the information dissemination process. The Committee believes that the following Recommendations apply, regardless of which of the four sectors is the recipient of State-supported Internet access service:

> *Recommendation Number 4: The Committee recommends that State agencies formulate and adopt procedures which guarantee that agency data and information accessible over the Internet is, to the best of an agency's knowledge, reliable, valid and accurate. (The Committee believes that such policies and procedures as are presently in place to guarantee the reliability, validity and acccuracy of State information in the paper format should be extended to cover the electronic format.)*

> *Recommendation Number 5: The Committee recommends that each State-supported Internet gateway develop a network disclaimer statement, similar to the one issued by the staff of Maryland's SAILOR Project. The texts of these statements should be submitted to the Attorney General's Office for review, and, after approval, should be prominently and permanently displayed.*

C. Acceptable Use Policies (AUPs)

The Committee believes that State agencies and State-supported institutions which are either Internet access providers or Internet gateways must develop and promulgate Acceptable Use Policies (AUPs) which, at a minimum, define the following conditions *for external users of a State agency's/institution's Internet access service:*

- The purpose of the Internet access service
- The provider's liability

- The eligibility requirements for access to the service
- Sanctions for non-compliance with the AUP

In addition, State agencies and State-supported institutions need to develop in-house regulations which set out specific conditions and acceptable uses for agency staff access to the Internet. These regulations are internal, administrative guidelines and should *not* be incorporated into agencies' external AUPs.

Obviously, the acceptable uses stipulated in an individual AUP must be geared to the population which can be expected to use a specific Internet access service. For example, an AUP which covers Internet access service for public library patrons may need to include a limit on the amount of time a single Internet session can last, or limits on the number of sessions a user is entitled to conduct over a specific period of time. Similarly, an AUP covering Internet access for K through 12 students may need to rule out playing games online, or monopolizing bandwidth to display large numbers of pictures or maps. Finally, *all* AUPs of State-supported Internet providers need to spell out which Internet resources will be made available, to whom, and for what purposes or uses.

Before any person is granted access to a State-supported Internet access service he/she should be required to sign a statement that he/she: (1) has read and understands the State Internet provider's Disclaimer Statement, and (2) has read, understands and will abide by the requirements set out in the State Internet access provider's AUP. The statement should be signed *before* first use of the State-supported Internet access service.

The Committee believes that AUPs should be required of:

- Any host computer owned by the Commonwealth
- All Commonwealth owned or operated information networks
- Any person or legal entity receiving network and/or Internet service through Commonwealth supplied resources.

Recommendation Number 6: The Committee recommends that the Commonwealth require that any State agency or State-funded institution that provides connectivity to the Internet establish and promulgate an Acceptable Use Policy (AUP) for its service. At a minimum, AUPs should define the following:

- *The purpose of the Internet access service*
- *The limits of the provider's liability*

•The eligibility requirements for access to the service

•Sanctions for non-compliance with the AUP.

AUPs should be required of:

•Any host computer owned by the Commonwealth

•All Commonwealth owned or operated information networks

•Any person or legal entity receiving network and / or Internet service through Commonwealth supplied resources

Recommendations Number 7: The Committee recommends that all AUPs be submitted to the Attorney General's Office for review and approval prior to their public release. Once approved, an AUP should be prominently displayed and readily available to all users of the State-supported Internet access service covered by that AUP.

Recommendation Number 8: The Committee recommends that State-supported Internet gateways and Internet access service providers require that , prior to a first use of a specific Internet access service, potential users be required to sign a statement which stipulates:

•That they understand and do not dispute the content of that Disclaimer Statement

•That they will abide by all of the provisions of that AUP.

Recommendation Number 9: The Committee recommends that, if they have not already done so, State agencies and State-supported institutions develop guidelines and / or regulations setting out the specific conditions and acceptable uses for staff access to the Internet. The Committee further recommends that, because such guidelines and regulations are internal, administrative documents, they should <u>not be</u> included in an agency's AUP.

Access to the Internet is governed by a series of protocols, most of them unpublished, which can be called "rules of the road." Some users take advantage of this relatively open access to post advertisements for personal services, send obscene or forged messages, "hack" computers, networks and individual files, pirate material under copyright, tap into e-mail between individuals, insert worms or viruses into the system and cause widespread havoc on an international basis. Any Virginia resident or citizen who engages in such conduct over a State-supported Internet access provider or gateway *must* be penalized ,and the State Internet access provider or gateway *must* control such violations.

Recommendation Number 10: The Committee recommends that State agencies and State-supported institutions work with the Attorney General's Office to define, establish and apply appropriate sanctions for violations of agencies' AUPs or other violations of State-supported Internet access services.

D. Equitable Access Issues

The Committee believes there are three equitable access issues which affect State-supported Internet access services and which intersect all four sectors of Internet users. These are:

- The costs and time required to train potential users of the Internet
- Internet communications connect costs in rural parts of the State
- The ability of both individuals and new or emerging businesses either to afford or to access computer systems

(1) As to the *costs and time to train* Internet users:

Between now and the time when Graphic User Interfaces (GUIs) are available widely, Internet access will continue to be difficult. Virtually all Internet access service providers use variants of the UNIX system and the associated command line interface (CLI) "shells" that have been developed to interact with UNIX. There is *nothing friendly or intuitive* about this system. One does not simply dial up an Internet service provider and blithely peruse what's out there. Specialized training is an absolute must for those accessing Internet via the UNIX world, and such training is not necessarily limited to a one-time event. However, there are two reasons why, beyond training their own staff, State-supported institutions and agencies should consider not embarking on individual Internet training programs. First, teaching the external user to navigate UNIX is not an-agency-specific problem and second, there is at least one commercial provider (InfiNet) in Virginia which exists to help people who wish to access Internet to do so with minimum pain and frustration. While differences in the security and privacy requirements among State agencies must be observed, as well as differences in the needs and capacities of a State- provider's Internet users, there seems to be no reason why State government cannot work with the private sector to establish Internet access training programs which satisfy the needs of State agencies and users of State-supported Internet access services.

The Committee revisited this issue several times. During the Committee's final discussion it became clear that the Department of Information Technology

could contribute to lowering the time and money spent on Internet training by identifying, developing or causing to be developed, appropriate user interfaces to the Internet.

Recommendation Number 11: The Committee recommends that, in order to decrease user training burden and costs on State-supported Internet access providers, the Department of Information Technology identify or develop appropriate user interfaces (front-ends).

Recommendation Number 12: The Committee recommends that, as necessary, and until such time as front-ends and GUIs become widely available and affordable, State agencies collaborate with both for-profit and not-for-profit Internet access providers to develop and conduct training programs for external users of State-supported Internet access providers and gateways.

(2) As to *Internet connect costs in rural areas:*

The dilemma facing rural Virginians has the proverbial two horns. On the one hand, rural Virginians stand to profit most from the resources and discourse available over Internet. On the other hand, many of these same citizens cannot afford the connect costs to the Internet -- costs which are set by one or more of the State's 23 telephone companies. The situation is further exacerbated by Virginia law, which does not allow either cable or satellite companies to compete with telephone companies for the same or similar service. This is a complex problem, one well beyond the reach of this Committee. The Committee believes that the matter requires the attention of the Governor, members of the General Assembly,Virginia's the telephone companies, as well as representatives from the State Corporation Commission and the cable and satellite industries.

Recommendation Number 13: The Committee recommends that the Governor and the General Assembly task the State Corporation Commission to initiate discussions with appropriate industries, companies and other concerned parties in order to develop a plan to establish reasonable Internet connect costs for all Virginians. (The Committee recognizes that, ultimately, this matter may well be settled by the Congress and implemented by the Federal Communications Commission. Nevertheless, we believe that it is important for the Commonwealth to establish its own plan to address this issue.)

(3) As to the ability of *individuals and new or emerging businesses* to afford or to gain access to computers:

With regard to the information and data created or collected by State agencies, within the Commonwealth, a bifurcated society of information "haves" and "have nots" could develop, based on citizens' ability to pay commercial Internet provider rates to access State government information online. In the Fall of 1994, State government and a commercial online service announced jointly that the commercial service would make information and data compiled or collected by State agencies available over the service's computers. Since that time, some State agencies have mounted their data on that service. Later, State government announced that any Agency data made available to that service would also be made available to the Commonwealth's freenets. (As of this writing [November,1994], there is a single freenet in Virginia.)

This latter action by State government is an important, necessary first step, because it recognizes that citizens' access to online State government information must *not* be confined to just those Virginians who can afford subscriptions to commercial online services.

> *Recommendation Number 14: The Committee recommends that the Governor and the General Assembly assure that all State government data and information released to the public online is accessible to all citizens and residents of Virginia. This can be accomplished by assuring that such data and information is available through various sources, to include commercial vendors, freenets, The Library of Virginia, the State's 90 public library systems and State-supported schools and institutions of higher learning.*

With regard to *State-supported schools and institutions of higher learning,* it is clear that for some time both the Executive and the Legislature have recognized the need for State government to support Internet access for students and faculty, as both Va.Pen and VERNet, which provides VaPen's telecommunications links, continue to be funded with tax dollars. Together, they provide a measure of Internet access to Virginia's public schools and State-supported colleges and universities. Both are severely undercapitalized, and since tax dollars are in short supply, discussions are underway to forge partnerships with the private sector. Funding for the Commonwealth's other educational Network, The Library of Virginia's Virginia Library and Information Services Network (VLIN), is equally shaky. In fact, the

financial status of all three organizations is unstable, which is alarming, especially in the case of VERNet, because both Va.Pen and VLIN depend on VERNet to provide all of their telecommunications links, including their telecommunications links to the Internet.

Recommendation Number 15: The Committee recommends that the State continue its negotiations with the private sector to explore strategies to stabilize both the architecture and the capitalization of Va.Pen and VERNet. The Committee further recommends that the future financing and architecture of VLIN be included in those discussions. [The Committee recognizes that this Recommendation may appear to exceed the limits of our charter as set out in HJR 76. However, we believe that if the present foundations for State supported Internet access are not stabilized, further discussion of protocols and guidelines for State-supported Internet access may well be moot.]

Currently, *the general public gains access to the Internet* in several ways: via one or more subscriptions to Internet access services offered by commercial providers or via one of three other Internet access providers in the Commonwealth,which (as of November 1994) are the Central Virginia Freenet, the University of Virginia's Alderman Library and VLIN. All of the Commonwealth's 90 public library systems have access to VLIN and through VLIN, to the Internet. In recent years VLIN financing has come from either Federal dollars allocated to the State under the Library Services and Construction Act (LSCA) or from special dollar allocations from The Library of Virginia's Foundation. Except for its support of the University of Virginia's Library, to date, State government has made no *direct* commitment to provide Internet access for the general public.

At the present time, private citizens who have neither the resources nor the training to use the Internet can obtain help from two sources, namely, State-supported educational institutions and public libraries with dial-up access to the Internet. Should the Governor and the General Assembly determine that, as a matter of public policy, all citizens will be afforded basic Internet access, then the General Assembly and local governments will need to appropriate annual funds to supply the necessary telecommunications links, computer equipment (including recurring modernization) and training in order to establish and maintain such access. What must *not* happen is that the General Assembly legislate basic Internet service for all citizens, while leaving a trail of unfunded mandates for local governments to absorb.

There are established procedures in place for allocating such aid. For example, a line item similar to the current "State Aid to Public Libraries" could be established in future biennial budgets to provide citizens Internet access. Such aid could be administered in a manner similar to that employed by The Library of Virginia to apportion State Aid to Libraries. Guidelines could be written to provide relatively more assistance to small and remote communities, and the General Assembly could create special tax-advantage formulas to persuade major players in the telecommunications and service provider communities to offer significantly reduced rates to less affluent, smaller and more remote areas and institutions of the Commonwealth.

If citizens' access to the Internet is to be supplied via the State's public, academic and school libraries, the staffs of these libraries may need to expand, in order to handle both increased reference loads and questions about the Internet's foibles. Over time, adequate library staff to provide even basic Internet access may well become a major resource allocation issue for State and local governments.

Should the General Assembly and the Governor decide to fund *Internet access for key new and emerging businesses,* such assistance could be limited to one time grants. Grantees would be expected to arrange for their telecommunications services and to acquire the necessary hardware, software and training. One-time grants could be made by the State's economic development agencies. Grantors would need to develop guidelines stipulating the kinds, sizes and key business factors (credit rating, yearly growth, etc.) of eligible applicants. Grantees would be required to use local and/or regional Internet access providers and the Commonwealth would fund only dial-up access to the Internet. Today (October, 1994), monthly fees for dial-up access range from $18 to $28 per month, exclusive of telephone connect charges. The State need not underwrite telephone costs because, routinely, they are written off as the cost of doing business.

Recommendation Number 16: The Committee recommends that if the Governor and the General Assembly determine that some level of State-supported Internet access service should be provided to the general public and/or to specified new and emerging businesses: (a.) guidelines be formulated similar to those which now regulate State Aid to Libraries to stipulate that more assistance be rendered to small and remote communities in the Commonwealth, and (b.) the Governor and the General Assembly consider

funding one-time Internet access grants for key new and emerging businesses in the Commonwealth. State agencies which are designated as grantor-agencies should develop guidelines stipulating specific eligibility requirements.

If decisions are made to provide basic Internet access for the general public, for key new and emerging businesses or for both sectors, State and local governments will need to forge new agreements with the telephone companies, large telecommunications corporations (Bell Atlantic), service providers (Suranet, NetComm, PSI, ClarkNet, etc.) computer resellers and network training experts operating within the Commonwealth.

Recommendation Number 17: The Committee recommends that, in order to provide equitable, affordable Internet connect costs throughout Virginia, State agencies develop a coordinated contracting approach for all State-supported Internet access services. The Committee recommends further that the State explore coordinated contracting for such services with all potential Internet access providers, including local and long distance telephone companies as well as satellite and cable companies.

E. Network and Database Security Issues

Given the global nature of the Internet, State government can neither control nor vouch for its contents, nor can State government provide the individual Internet user measures to ward off intrusions from either computer viruses or computer hackers. What State government *can and should control* is first, the validity and the reliability of the information and data it makes available over the Internet and second, the relative stability and reliability of State owned and/or operated computer and telecommunications systems which store, manipulate, and transmit that information and data.

In an open network system like the Internet, where multiple computer systems access and process information among diverse sites, agencies must be careful about the authenticity and confidentiality of their data. Within Virginia, each agency and institution is obliged to determine the appropriate security strategy to guard against destructive intrusions via Internet traffic. To do this, an agency must determine the possible threats to each element of its network and then identify and implement those levels of security which will adequately secure the information resources resident in each element.

One way to protect an organization's information resources is through the design of the network itself. Several architectures exist to accomplish this, the most common being to create both an internal and a perimeter network and separate them by a "firewall." In such an environment, the perimeter network consists of those network elements which are most vulnerable to compromise via the Internet, such as World-Wide Web, FTP and Gopher servers. The internal network includes secure hosts, such as mainframe computers and Local Area Networks (LANs). Depending on the sensitivity of an agency's information and data, the internal network can be further secured via an additional firewall and/or router. For example, Maryland citizens who use that State's system to access State government information are directed to an information server that resides in a perimeter network, rather than on a State mainframe.

Firewalls can protect LANs, mainframes and entire networks. They do this by providing a single point of entry, by means of hardware, software and a combination of hardware and software controls. When they are dedicated to a single system, commercial packet-filtering routers are effective firewalls, because they limit inbound access to an internal network while simultaneously providing users outbound access to the Internet. Firewalls can take the form of: (a.) dedicated authentication servers, (b.) secure gateways, or (c.) dual-homed Unix running specialized software packages. Many servers run on Unix platforms. To protect access to these servers, most Unix operating systems provide several optional security controls. Moreover, the most secure way to configure the Unix operating system has been documented and is available in Unix standards and guidelines publications.

For individual workstations, there are a number of security features which can be implemented, depending on the level of security required. These include:

- Diskette and drive controls
- Password protection
- Key and card systems
- Biometrics
- Callback systems
- Network operating systems with built-in security features
- Virus protection

In addition, each State agency must protect its LANs and mainframes against taps and interceptions of data transmissions via eavesdropping techniques. Sensitive data, including data covered by the Virginia Privacy Protection Act of 1976, may need

to be protected prior to transmission, for example, by encryption.

For years, mainframes and mainframe applications have relied on either "native" or vendor supplied access control software to prevent, restrict and monitor access to data. Several mainframe-resident products provide individual user accountability, user authentication and comprehensive audit trails. In today's environment of open systems and internetwork operability security administrators should refocus their attention from the "comfortably" secure mainframe environment to the "true" networking environment.

Accounting and audit trail information that can identify individuals who gain access to State agency information, as to the dates and time they were online and the content(s) of the information they accessed, *must* be kept confidential. In addition , access to State agencies' Internet accounting and audit trail information may require new procedures, to permit citizens and residents to review who has had access to their records, what information was divulged, and when the access occurred.

Recommendation Number 18: The Committee recognizes that State agencies and State-supported institution are responsible for the proper securing of their information resources. The Committee recommends that, pursuant to the Code of Virginia, Section 2.1-563.31, the Council on Information Management issue standards and guidelines to assist State agencies and State-supported institutions in protecting the integrity, reliability, and validity of both their networks and the information resident on those networks, from unwarranted or destructive Internet traffic.

III. The Environmental Scan

A. Who Does What In State Government?

Within State government the Council on Information Management (CIM) is responsible for structure and policy matters regarding State agency information and data and the Department of Information Technology (DIT) has authority over the architecture and implementation of the Commonwealth's information systems.

In December, 1993, CIM adopted strategies designed to minimize the "constraints of time and location as they relate to serving the citizens of Virginia." CIM's report on this issue sets out a plan to promote "the equitable development of a competitive information infrastructure, offering high bandwidth services...in support of...education, criminal justice, health care and other government programs....[CIM]

set up a task force...with the Center for Innovative Technology (CIT) to develop a more detailed plan..."

B. Major Virginia Online Initiatives (As Of October, 1994)

(1.) America Online -- Virginia Forum

American Online - Virginia Forum is a project initiated by Governor Allen's Commission on Government Reform. Making information available on America Online (AOL) is intended to give citizens more access to current information about Virginia State Government, the Governor's programs, Virginia business and industry, tourism information, current events and additional topics of interest to Virginians and others around the country and the world. This service is available to all America Online subscribers. The Virginia Forum also is committed to making the information available to other service providers.

(2.) Blacksburg Electronic Village (BEV)

The Blacksburg Electronic Village (BEV) is a project linking Blacksburg's citizens to each other and to the worldwide Internet. The BEV project is the product of a partnership between Bell Atlantic of Virginia, Virginia Tech, and the Town of Blacksburg. BEV members use standard Internet tools including electronic mail, Usenet news readers, Gopher software, and World Wide Web browsers such as Mosaic to navigate the Internet.

(3.) Central Virginia's Free-Net (CVanet)

Central Virginia's Free-Net (CVanet) reflects the interests, needs, and diversity of the Central Virginia community. It offers electronic mail, local community information and news groups, and limited Internet telnet and gopher access, all through the Lynx system interface.

(4.) Commonwealth Telecommunications Network (CTN)

The Department of Information Technology's (DIT) Commonwealth Telecommunications Network project establishes a statewide Internet network using TCP/IP as the integrating protocol. Some of the networks available to CTN subscribers through the Internet include: Commercial Internet Exchange, Federal

Internet Exchange, National Science Foundation Network, NASA Science Network and Energy Sciences Network. A full Usenet news feed will be implemented for CTN customers in the Fall of 1994.

(5.) Southeastern Virginia Net (SEVAnet)

SEVAnet is a community-based electronic network that provides public access to a wide range of computerized information services for citizens of the Southeastern Virginia Region. Any person, business, government, school, college or university with a computer connected to the Internet can easily access the information on SEVAnet. The mission of SEVAnet is to promote the use of electronic communications technology in improving the economic health and quality of life in the Southeastern Virginia Region.

(6.) Virginia Education and Research Network (VERNet)

The Virginia Education and Research Network (VERNet) is a state-wide computer network that interconnects the Commonwealth's educational institutions and several state agencies, industrial sites, and research facilities. VERNet supports these activities by providing the architecture for electronic mail, file transfer, remote computer access, and a host of other services to educators and researchers across the Commonwealth.

(7.)Virginia Library and Information Network (VLIN)

The Virginia Library and Information Network (VLIN) is the only statewide public electronic information service which seeks to provide equal access to the library and information resources of the Commonwealth for all Virginia residents. The network's goal is to link over 3,000 academic, public, school and special libraries to each other and to the resources of the Internet. By linking the resources of Virginia libraries and information centers and The Library of Virginia in Richmond to the global information community, the Commonwealth seeks a greater return on local, state and federal investments in the state's libraries in order to more efficiently share the wealth of information in each library with all others serving Virginia's communities.

(8.) Virginia Public Education Network (Va.PEN)

Virginia's Public Education Network is a telecomputing network that links all 2,000 of Virginia's public schools. The network consists of terminal servers distributed across the state which link users to a central computer in Richmond. The distributed network provides educators in every school division with toll-free access to the network. Virginia's PEN is intended to assist in the collaboration and exchange of information between and among schools, school offices, the Virginia Department of Education, and other State and educational entities.

C. Virginia's Information Infrastructure -- Present and Future

Development and expansion of Virginia's existing information infrastructure is absolutely critical to the future prosperity of the Commonwealth's citizens, institutions, businesses and industries.

In an article written by Erv Blythe and Bob Heterick the authors observe that:

> "In every age, a core technology becomes the basis for economic revitalization. Information technology has become the basis for renewal in today's economy ...Competitive advantage will go to those communities that have a technical edge in accessing, processing, storing and transporting digital information...The information-processing capabilities of our citizens will determine our place among the highly developed economies of the world. Virginia is not ready for the Information Age. Relative to other states -- Michigan, Ohio, Pennsylvania, North Carolina, New York, Texas, California -- Virginia does not have the communications, computer and digital information infrastructure that will empower its citizens and businesses, its cities and towns. Perhaps more critical, Virginia's public sector -- its local and state agencies --appear to be just sensing how basic these technologies, and the knowledge to use them, are to efficient administration and effective service. In.other states, it has been public-private partnerships that are leading their citizens and communities into this new world." [1

Based on that assessment and the Committee's discussions of how conditions might be improved, Appendix III. to this Report includes the full text of the Committee's Discussion Paper on this subject and one possible Scenario for further development and improvement of the Commonwealth's present information infrastructure.

[1] "Is Virginia Ready For the Information Age?", by Erv Blythe and Bob Heterick. Virginia Issues and Answers, Summer, 1994, vol. 1, no.2, pp.20-25. (Blacksburg, Office of University Relations, Virginia Polytechnic Institution and State University.)

COMMITTEE TO IDENTIFY INTERNET GUIDELINES AND PROTOCOLS
REPORT TO THE GOVERNOR AND THE GENERAL ASSEMBLY
APPENDIX I.

General Assembly of Virginia - 1994 Session
House Joint Resolution No. 76

Requesting the State Library Board and the Department of Information Technology to study whether the Commonwealth needs to establish protocols and guidelines regarding in-state access to the myriad files and components available through the Internet.

Agreed to by the House of Delegates, March 10, 1994

Agreed to by the Senate, March 8, 1994

GENERAL ASSEMBLY OF VIRGINIA -- 1994 SESSION

HOUSE JOINT RESOLUTION NO. 76

Requesting the State Library Board and the Department of Information Technology to study whether the Commonwealth needs to establish protocols and guidelines regarding in-state access to the myriad files and components available through the Internet.

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WHEREAS, at present the Internet, an international telecommunications network of educational, commercial, governmental and research entities, depends upon self-generated procedures and protocols that are accepted throughout the world; and

WHEREAS, it has a volunteer, independent multi-national governing body and an international technical standards body that are not subject to the dictates of any national government; and

WHEREAS, over half of the registered Internet networks are commercial in nature; and

WHEREAS, today's subscribers to the Internet or to one of its host computers number over 15 million individuals and institutions worldwide; and

WHEREAS, the number of Internet subscribers is growing at a rate of 15 percent per month; and

WHEREAS, the number of networks within the Internet at mid-1993 was over 13,000; and

WHEREAS, in 1993, this amalgam of educational, commercial, scientific and governmental networks has been accessible to Virginians through many public, academic, and private libraries throughout the Commonwealth; and

WHEREAS, individual Virginians have private access to the Internet through commercial hosts; and

WHEREAS, in 1993, Internet subscribers had access to over 5,000 discrete USENET Newsgroups and over 2,000 Listservs, and could access Internet through 1,776,000 international hosts within the various networks; and

WHEREAS, these Newsgroups and Listservs provide access to information on topics ranging from weather reports and recreation to the arts and sciences; and

WHEREAS, these systems not only provide access to information, but permit discussion among individuals and the formation of groups of people sharing specialized interest; and

WHEREAS, the subject of control, censorship, and suitability of information that is introduced into the Internet is one which is international in scope, where each nation and each educational, commercial, and governmental provider has its own rules and its own standards for applicability of subject matter on the Internet; and

WHEREAS, the federal government is proceeding with the creation of a "National Information Interface" to control the development, governance and availability of the emerging "information highway" within the United States; and

WHEREAS, such an interface could control and determine how Virginians access on-line information, and could require the Commonwealth to comply with federal guidelines, protocols, standards and operating rules; and

WHEREAS, the wishes of the citizens of the Commonwealth of Virginia need to be expressed; and

WHEREAS, all Virginians must recognize the ever-present conflicts between individual rights and privacy granted by the First Amendment to the United States Constitution and the responsibility of society as a whole to provide for the education of younger citizens in a proper environment; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the State Library Board and the Department of Information Technology be requested to determine whether the Commonwealth needs to establish protocols and guidelines regarding in-state access to the myriad files and components available through the Internet. The Board and the Department shall develop specific proposals and draft guidelines, if deemed necessary.

All agencies of the Commonwealth shall provide assistance to the Board and the Department, upon request.

The Board and the Department shall complete their work in time to submit their findings and recommendations to the Governor and the 1995 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.

COMMITTEE TO IDENTIFY INTERNET GUIDELINES AND PROTOCOLS
REPORT TO THE GOVERNOR AND THE GENERAL ASSEMBLY
APPENDIX II.

Roster of Committee Members and Study Participants

Committee to Identify Internet Guidelines and Protocols
Roster of Committee Members and Study Participants

I. The Principals

Department of Information Technology (DIT)
James Adams, DIT staff
Martha Gillespie, DIT staff
Thomas Kusiak, DIT staff
Charles Livingston, Director, DIT

The Library of Virginia Board
Patricia Berger, Committee Chair
Kay Cutler, The University of Virginia Alderman Library
Margaret Forehand, Director, Chesapeake Public Library

II. Other Committee Members and Study Participants

Joseph Aulino, Department of Education
George Berger, Communication Systems Consultant
Peter Blake, Council on Higher Education
Carolyn Caywood, Director, Bayside Area Library, Virginia Beach
Vinod Chachra, President, VTLS, Inc.
Cindy Church, NASA Research Center Technical Library, Langley
Hudnall Croasdale, Director, Council on Information Management (CIM)
Bette Dillehay, CIM staff
Charlene Hurt, Chair, State Networking Users Advisory Board (SNUAB) and Director, The George Mason University Library
Robert O'Neil, Founding Director, The Thomas Jefferson Center for the Protection of Free Expression
Charles Smith, Softwar, Inc. (representing the Division of Motor Vehicles)
Douglas Wells, Department of Education
Nolan Yelich, Acting State Librarian

COMMITTEE TO IDENTIFY INTERNET GUIDELINES AND PROTOCOLS
REPORT TO THE GOVERNOR AND THE GENERAL ASSEMBLY
APPENDIX III.

An Environmental Scan of the Commonwealth's Current Information Infrastructure; A Scenario For Its Further Development and Improvement

COMMITTEE TO IDENTIFY INTERNET GUIDELINES AND PROTOCOLS
REPORT TO THE GOVERNOR AND THE GENERAL ASSEMBLY
DECEMBER, 1994

Appendix III. The Commonwealth's Information Infrastructure. A Scenario for Its Further Development and Growth

Step 1: *Facilitate or create a high bandwidth network backbone for Virginia, with gateways to the Internet, of speeds between 45 and 100 MBS which allows network access through non-metered communications connections (local calls) to either:*

50% of all citizens by the year 1996
65% of all citizens by the year 1998
80% of all citizens by the year 2000

Or:

all cities > 40,000 & counties > 70,000 by the year 1996
all cities and countries > 30,000 by the year 1998
all cities and counties > 15,000 by the year 2000

Such a Virginia Network Backbone will define the points-of-presence to which everyone else in Virginia can connect.

Step 2: Develop a system of Local Area Networks (LANs) to interconnect all government offices, public libraries, State-supported institutions of higher education, high and middle schools and district courts. Each LAN should have a gateway to the Virginia Network Backbone described in Step 1. Implement this program via seed-funding projects and matching and challenge grants to the institutions and agencies that will benefit from the LANs.

Step 3: Fund the Commonwealth's public library systems to purchase workstations to provide the public free access to the Internet. Each public library system should offer a limited number of private mail boxes to the public at nominal cost.

Step 4: Businesses, industries, professional people and private citizens who desire to do so should be allowed to connect to the points-of-presence on the Virginia Network Backbone for relatively low, fixed monthly fees. Such connections can be dedicated circuits or switched lines, depending on the needs of the subscriber. In this context, a connection can mean one or more Internet addressable nodes.

Step 5: Fund The Library of Virginia to create and maintain the Commonwealth's World Wide Web Server Home Page, with linkages to other sources of information about Virginia, including linkages to other home pages. The Commonwealth's Home Page should include general information about Virginia, and pointers to other sources of State-agency data and legislative material.

Step 6: Authorize State agencies to create and maintain home pages to provide the public online access to information about the agencies' work. In addition, each school district and State-supported institution of higher learning should be encouraged to create and maintain its own home page.

Step 7: As affordable and feasible, the following digitization projects could be funded by a combination of public and private money, in the form of competitive grants, and undertaken over the next ten years by the appropriate agencies and institutions:

> *(a.) Virginia's courts should digitize their records, in order to make them accessible by electronic means, via public and governmental law libraries and similar public institutions. The public records of all courts in the Commonwealth should be digitized and automated in order to make them readily retrievable by members of the bar, citizens and the media. The appropriate legal forms, etc., should be digitized, so that initiation of a legal proceeding is possible by electronic filing from any remote location.*

(b.) Virginia's libraries and museums should digitize and automate all historically significant, fragile materials and archives which will not be accessible to or useable by scholars, students or the public in the next century. Unique collections of archival, library and museum materials not covered by copyright which cannot survive another century of handling should be digitized and automated as well.

Step 8: While at present, the electronic records of some State agencies do not qualify legally as "official records," a system for the proper security and backup of electronic information, documents and data, whether stored, collected or created by State agencies, should be developed and should be deployed.

COMMONWEALTH OF VIRGINIA
INFORMATION INFRASTRUCTURE
DISCUSSION PAPER
October 6, 1994

Vinod Chachra

There are six different aspects of the Information Infrastructure that deserve consideration:

1. Access
2. Content
3. Processes and functions
4. Statistics
5. Management (including evaluation and maintenance)
6. Expansion

There are at least four purposes an Information Infrastructure serves:

a. Economic Development
b. Education and Research
c. Life-long learning
d. Entertainment

1. Access

- 1.1 Network Technical Considerations
  - Topology
  - Bandwidth
  - Points of Presence
  - Connection Options
- 1.2 Users
  - Organizations
    - Libraries
    - Government agencies
    - Courts
    - Professional groups
      - Lawyers
      - Doctors and Health Care specialists
      - Engineers
      - Writers and Journalists
    - Businesses
      - Small businesses
      - All businesses
    - Industry
  - Individuals
    - College students
    - K-12 students
    - All citizens
- 1.3 Costs to users

2. Content

- 2.1 Virginia Government
  - Governor
  - Legislature
    - People
    - Bills
      - Text
      - Status
    - Calendars
    - Agendas for committee work
    - Committee Reports
  - Purchases
    - Bids and related topics
    - Procurement lists
    - Vendors
  - Commissions and Advisory Boards
    - Charters
    - Agendas and calendars

2.2 Personnel systems
- Vacancy announcements
- Personnel movements
- Directories

2.3 Virginia Information
- History
- Geography
- Art and Music
- Literature
- Who's Who
- Health and Medicine
- Weather
- Education
- Science and research
- Tourism and travel
- Life and life-style
- Outdoors
- News
- Telecommunications
- Budgets
- Natural resources

2.4 Business Information
- Human Capital
- Industry
- Transportation

2.4 Information Technology
- Standards
- Requirements and procedures
- LAN and WAN information
- Service agreements
- Data connection service options
- System Integration Services

2.5 Universities
- Academic Information
  - Departments and programs
  - Study Centers
- Research Information
  - Current projects
  - Position papers/ research papers
- Clubs and social activities
- Events
- University presses

2.6 Libraries
- Library Catalogs

Union services
- Bibliographic
- Union list of serials
- Inter Library Loans
- Patron enpowerment services

Virtual Libraries
- Special collections
- Virginia Historic collections
- Unique collections

3. Processes and functions

3.1 Government functions
- Auto Registration
- License renewals
  - Driver's license
  - Marriage license
- Filing taxes and levies
- Procurement
  - Bidding
  - Bonding
  - Purchases
- Public notices
- Applications
  - Jobs
  - Universities
  - Schools

3.2 Business functions
- Banking
- Travel
- Delivery

3.3 Commerce and trading

4. Statistics

4.1 Usage Statistics
- By network node (geography)
- By type of user
- By type of service
- By cost categories
- By time of day
- By age/income/etc. (where appropriate)

4.2 Accounting

5. Management

5.1 Evaluation
- Resource usage
- Outcomes
- Effectiveness
- Predefined goals

5.2 Maintenance

5.3 Security

6. Expansion

ESTIMATES OF RESIDENT POPULATION OF STATES AND COUNTIES
APRIL 1, 1990 TO JULY 1, 1992
VIRGINIA

Sum Lev	FIPS		April 1, 1990 census	7/90	7/91	7/92
040	51000	Virginia	6187358	6211909	6288044	6394481
050	51001	Accomack County	31703	31687	31865	31985
050	51003	Albemarle County	68040	68339	68438	68385
050	51005	Alleghany County	13176	13143	13077	13057
050	51007	Amelia County	8787	8802	8940	9192
050	51009	Amherst County	28578	28672	28807	29031
050	51011	Appomattox County	12298	12296	12514	12542
050	51013	Arlington County	170936	170800	170549	171582
050	51015	Augusta County	54677	54910	55583	56287
050	51017	Bath County	4799	4781	4749	4754
050	51019	Bedford County	45656	45928	47006	48325
050	51021	Bland County	6514	6528	6491	6620
050	51023	Botetourt County	24992	25072	25531	25806
050	51025	Brunswick County	15987	15991	16074	16230
050	51027	Buchanan County	31333	31247	31646	31646
050	51029	Buckingham County	12873	12899	12993	12993
050	51031	Campbell County	47572	47679	48183	48703
050	51033	Caroline County	19217	19331	19804	20076
050	51035	Carroll County	26594	26658	26785	27084
050	51036	Charles City County	6282	6298	6282	6363
050	51037	Charlotte County	11688	11705	11805	11853
050	51041	Chesterfield County	209274	211362	218217	225225
050	51043	Clarke County	12101	12081	11986	11985
050	51045	Craig County	4372	4381	4517	4496
050	51047	Culpeper County	27791	28098	28666	29135
050	51049	Cumberland County	7825	7829	7833	7878
050	51051	Dickenson County	17620	17569	17749	17762
050	51053	Dinwiddie County	20960	21013	20512	20358
050	51057	Essex County	8689	8707	8779	8896
050	51059	Fairfax County	818584	821923	838217	857020
050	51061	Fauquier County	48741	48976	49651	50686
050	51063	Floyd County	12005	12013	12136	12366
050	51065	Fluvanna County	12429	12577	13289	13980
050	51067	Franklin County	39549	39732	40526	40923
050	51069	Frederick County	45723	46149	47136	47975
050	51071	Giles County	16366	16346	16340	16370
050	51073	Gloucester County	30131	30252	30699	31295
050	51075	Goochland County	14163	14217	14564	14992
050	51077	Grayson County	16278	16290	16098	16134
050	51079	Greene County	10297	10400	10923	11523
050	51081	Greensville County	8853	8846	10237	11217
050	51083	Halifax County	29033	29056	29126	29316
050	51085	Hanover County	63306	63797	65693	67725
050	51087	Henrico County	217881	218376	220371	223165
050	51089	Henry County	56942	56826	56792	56908
050	51091	Highland County	2635	2637	2586	2594
050	51093	Isle of Wight County	25053	25185	25678	26169

050	51095	James City County	34859	35101	36050	36973
050	51097	King and Queen County	6289	6280	6287	6296
050	51099	King George County	13527	13621	13982	14337
050	51101	King William County	10913	11000	11203	11557
050	51103	Lancaster County	10896	10925	10900	10905
050	51105	Lee County	24496	24448	24350	24390
050	51107	Loudoun County	86129	87097	90064	94266
050	51109	Louisa County	20325	20479	20909	21451
050	51111	Lunenburg County	11419	11400	11502	11473
050	51113	Madison County	11949	12014	12122	12025
050	51115	Mathews County	8348	8349	8368	8388
050	51117	Mecklenburg County	29241	29245	29408	29681
050	51119	Middlesex County	8653	8714	8849	8921
050	51121	Montgomery County	73913	74153	74012	74515
050	51125	Nelson County	12778	12819	13041	13087
050	51127	New Kent County	10445	10549	10820	11006
050	51131	Northampton County	13061	13073	13015	12914
050	51133	Northumberland County	10524	10538	10692	10872
050	51135	Nottoway County	14993	15028	15066	15062
050	51137	Orange County	21421	21546	22099	22468
050	51139	Page County	21690	21747	21988	22265
050	51141	Patrick County	17473	17430	17484	17516
050	51143	Pittsylvania County	55655	55717	55765	55751
050	51145	Powhatan County	15328	15457	16076	16775
050	51147	Prince Edward County	17320	17388	17351	17644
050	51149	Prince George County	27394	27563	26606	28057
050	51153	Prince William County	215686	217302	222691	229565
050	51155	Pulaski County	34496	34529	34398	34534
050	51157	Rappahannock County	6622	6664	6692	6768
050	51159	Richmond County	7273	7277	7234	7314
050	51161	Roanoke County	79332	79434	79984	79882
050	51163	Rockbridge County	18350	18401	18518	18674
050	51165	Rockingham County	57482	57733	58273	58958
050	51167	Russell County	28667	28660	28789	28874
050	51169	Scott County	23204	23194	23046	23192
050	51171	Shenandoah County	31636	31826	32126	32282
050	51173	Smyth County	32370	32427	32537	32838
050	51175	Southampton County	17550	17569	17133	17063
050	51177	Spotsylvania County	57403	58247	59883	61435
050	51179	Stafford County	61236	62297	66425	70900
050	51181	Surry County	6145	6165	6207	6358
050	51183	Sussex County	10248	10239	10223	10191
050	51185	Tazewell County	45960	46038	46625	46869
050	51187	Warren County	26142	26319	27031	27724
050	51191	Washington County	45887	45972	46511	46952
050	51193	Westmoreland County	15480	15575	15886	16162
050	51195	Wise County	39573	39565	39868	40089
050	51197	Wythe County	25466	25496	25651	25738
050	51199	York County	42422	42720	44732	46960
050	51510	Alexandria city	111183	111266	112516	113134
050	51515	Bedford city	6073	6084	6231	6237

050	51520	Bristol city	18426	18432	18265	18096
050	51530	Buena Vista city	6406	6440	6487	6465
050	51540	Charlottesville city	40341	40412	40664	40558
050	51550	Chesapeake city	151976	153457	159079	166005
050	51560	Clifton Forge city	4679	4645	4648	4483
050	51570	Colonial Heights city	16064	16076	16167	16433
050	51580	Covington city	6991	6976	6945	6867
050	51590	Danville city	53056	53222	53474	53571
050	51595	Emporia city	5306	5314	5469	5636
050	51600	Fairfax city	19622	19621	19947	20511
050	51610	Falls Church city	9578	9497	9466	9324
050	51620	Franklin city	7864	7909	8163	8523
050	51630	Fredericksburg city	19027	19350	20072	20853
050	51640	Galax city	6670	6651	6668	6523
050	51650	Hampton city	133793	134045	135646	137048
050	51660	Harrisonburg city	30707	30901	31243	32156
050	51670	Hopewell city	23101	23124	23278	23595
050	51678	Lexington city	6959	6974	6987	7052
050	51680	Lynchburg city	66049	66125	66178	66097
050	51683	Manassas city	27957	28289	29065	30301
050	51685	Manassas Park city	6734	6762	6895	7046
050	51690	Martinsville city	16162	16259	16165	15961
050	51700	Newport News city	170045	170818	171922	177286
050	51710	Norfolk city	261229	261129	252756	253768
050	51720	Norton city	4247	4247	4142	4101
050	51730	Petersburg city	38386	38421	39404	40111
050	51735	Poquoson city	11005	11032	11217	11231
050	51740	Portsmouth city	103907	103799	103615	104361
050	51750	Radford city	15940	15952	15743	16120
050	51760	Richmond city	203056	203370	202824	202263
050	51770	Roanoke city	96397	96646	97156	96754
050	51775	Salem city	23756	23742	23835	23840
050	51780	South Boston city	6997	7016	6891	7023
050	51790	Staunton city	24461	24544	24572	24624
050	51800	Suffolk city	52141	52283	52752	53276
050	51810	Virginia Beach city	393069	395951	404469	417061
050	51820	Waynesboro city	18549	18563	18709	18715
050	51830	Williamsburg city	11530	11639	11848	12088
050	51840	Winchester city	21947	22192	22556	22860

Sum Lev = Summary Level code that identified the geographic level for which data are provided.

FIPS - Federal Information Processing System State and county code

Note: These estimates are consistent with the population as enumerated in the 1990 census, and have not been adjusted for census coverage errors.

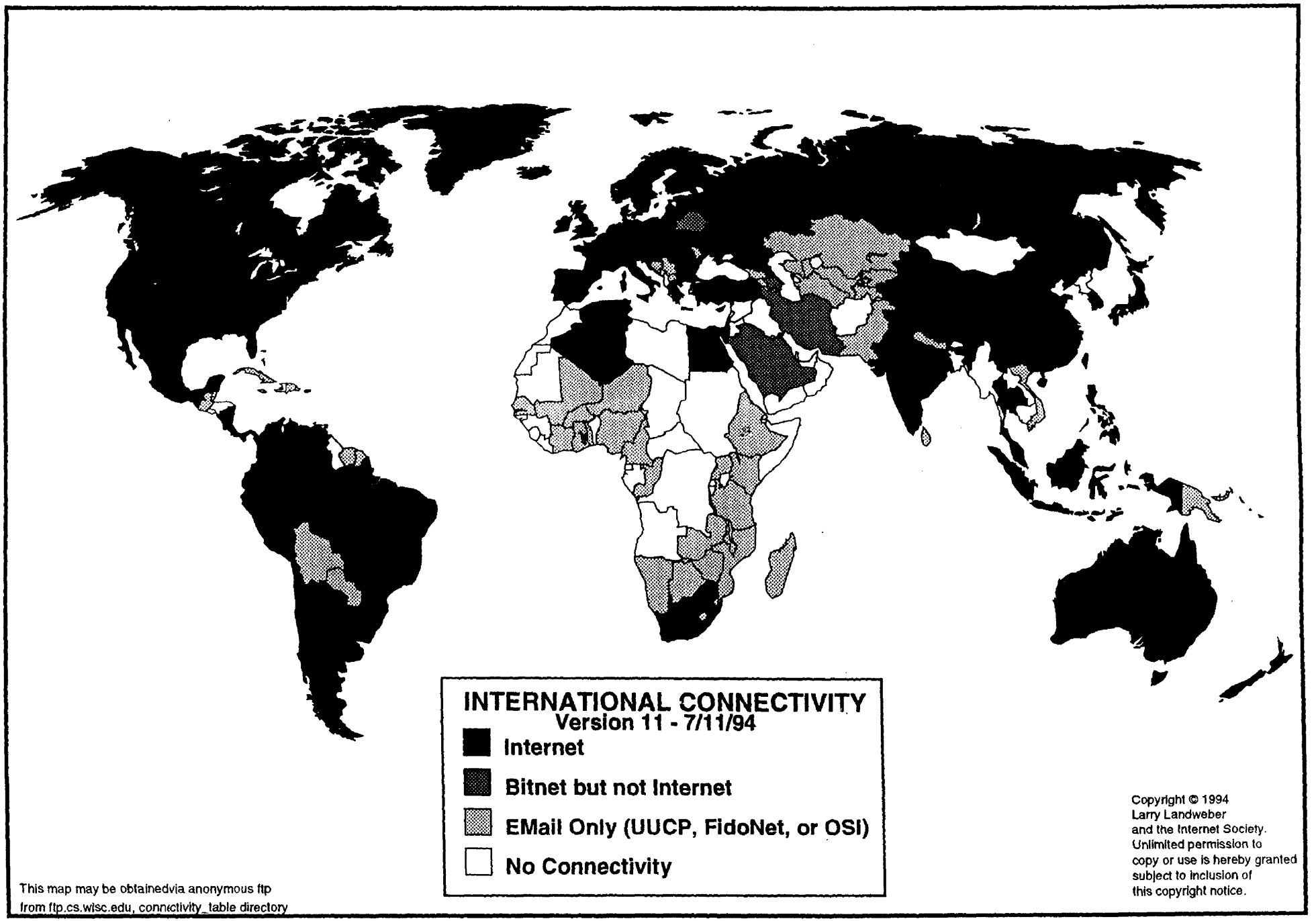
These estimates are also consistent with the data shown in Press Release CB94-15.

ESTIMATES OF RESIDENT POPULATION OF STATES AND COUNTIES
APRIL 1, 1990 TO JULY 1, 1992
VIRGINIA Population > 40,000

Sum Lev	FIPS		April 1, 1990 census	7/90	7/91	7/92
040	51000	Virginia	6187358	6211909	6288044	6394481
050	51013	Arlington County	170936	170800	170549	171582
050	51015	Augusta County	54677	54910	55583	56287
050	51019	Bedford County	45656	45928	47006	48325
050	51031	Campbell County	47572	47679	48183	48703
050	51041	Chesterfield County	209274	211362	218217	225225
050	51059	Fairfax County	818584	821923	838217	857020
050	51061	Fauquier County	48741	48976	49651	50686
050	51067	Franklin County	39549	39732	40526	40923
050	51069	Frederick County	45723	46149	47136	47975
050	51085	Hanover County	63306	63797	65693	67725
050	51087	Henrico County	217881	218376	220371	223165
050	51089	Henry County	56942	56826	56792	56908
050	51107	Loudoun County	86129	87097	90064	94266
050	51121	Montgomery County	73913	74153	74012	74515
050	51143	Pittsylvania County	55655	55717	55765	55751
050	51153	Prince William County	215686	217302	222691	229565
050	51161	Roanoke County	79332	79434	79984	79882
050	51165	Rockingham County	57482	57733	58273	58958
050	51177	Spotsylvania County	57403	58247	59883	61435
050	51179	Stafford County	61236	62297	66425	70900
050	51185	Tazewell County	45960	46038	46625	46869
050	51195	Wise County	39573	39565	39868	40089
050	51199	York County	42422	42720	44732	46960
050	51510	Alexandria city	111183	111266	112516	113134
050	51540	Charlottesville city	40341	40412	40664	40558
050	51550	Chesapeake city	151976	153457	159079	166005
050	51590	Danville city	53056	53222	53474	53571
050	51650	Hampton city	133793	134045	135646	137048
050	51680	Lynchburg city	66049	66125	66178	66097
050	51700	Newport News city	170045	170818	171922	177286
050	51710	Norfolk city	261229	261129	252756	253768
050	51730	Petersburg city	38386	38421	39404	40111
050	51740	Portsmouth city	103907	103799	103615	104361
050	51760	Richmond city	203056	203370	202824	202263
050	51770	Roanoke city	96397	96646	97156	96754
050	51800	Suffolk city	52141	52283	52752	53276
050	51810	Virginia Beach city	393069	395951	404469	417061

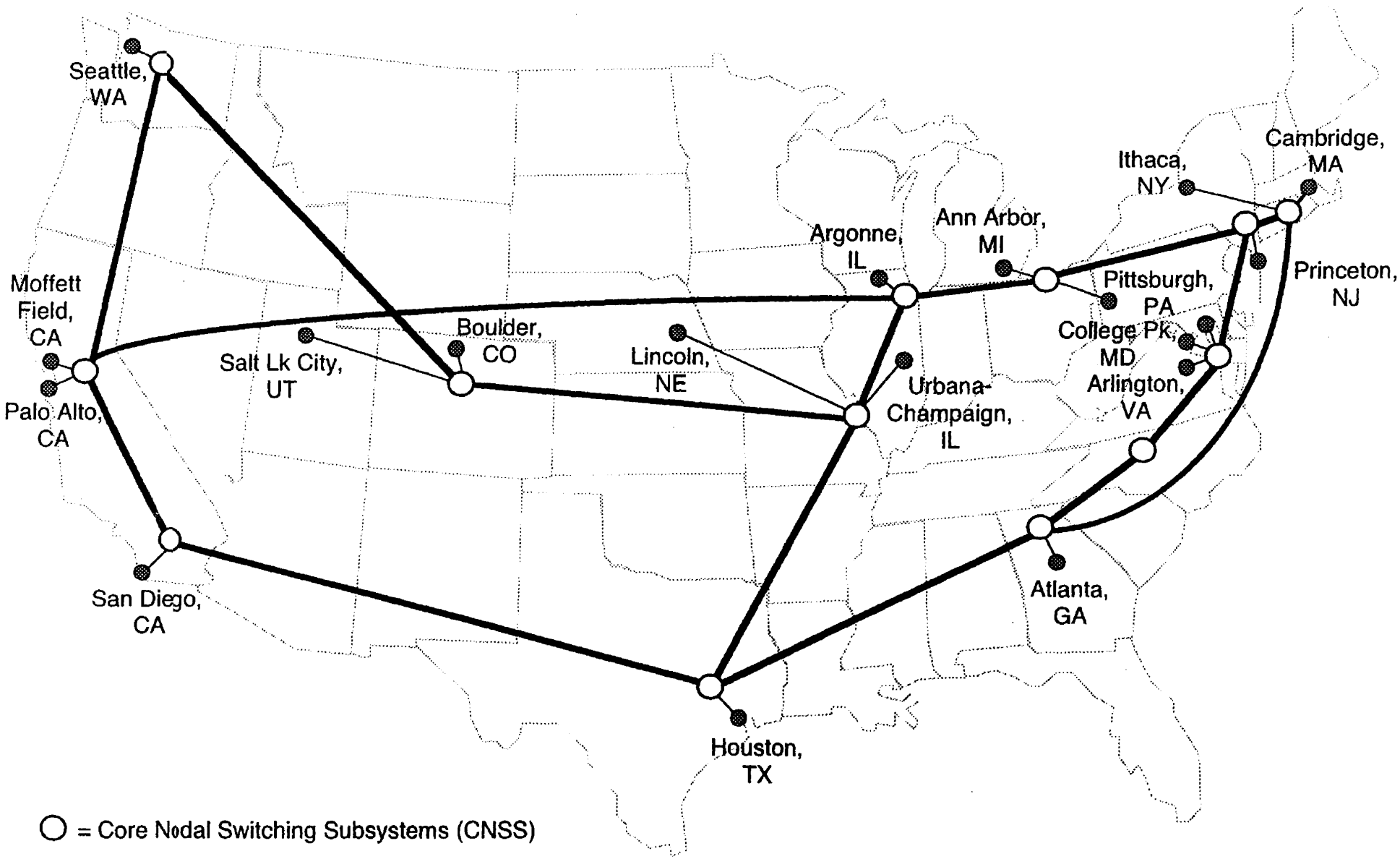
ESTIMATES OF RESIDENT POPULATION OF STATES AND COUNTIES
APRIL 1, 1990 TO JULY 1, 1992
VIRGINIA Population County > 70,000 and City > 40,000

Sum Lev	FIPS		April 1, 1990 census	7/90	7/91	7/92
040	51000	Virginia	6187358	6211909	6288044	6394481
050	51013	Arlington County	170936	170800	170549	171582
050	51041	Chesterfield County	209274	211362	218217	225225
050	51059	Fairfax County	818584	821923	838217	857020
050	51087	Henrico County	217881	218376	220371	223165
050	51107	Loudoun County	86129	87097	90064	94266
050	51121	Montgomery County	73913	74153	74012	74515
050	51153	Prince William County	215686	217302	222691	229565
050	51161	Roanoke County	79332	79434	79984	79882
050	51179	Stafford County	61236	62297	66425	70900
050	51510	Alexandria city	111183	111266	112516	113134
050	51540	Charlottesville city	40341	40412	40664	40558
050	51550	Chesapeake city	151976	153457	159079	166005
050	51590	Danville city	53056	53222	53474	53571
050	51650	Hampton city	133793	134045	135646	137048
050	51680	Lynchburg city	66049	66125	66178	66097
050	51700	Newport News city	170045	170818	171922	177286
050	51710	Norfolk city	261229	261129	252756	253768
050	51730	Petersburg city	38386	38421	39404	40111
050	51740	Portsmouth city	103907	103799	103615	104361
050	51760	Richmond city	203056	203370	202824	202263
050	51770	Roanoke city	96397	96646	97156	96754
050	51800	Suffolk city	52141	52283	52752	53276
050	51810	Virginia Beach city	393069	395951	404469	417061

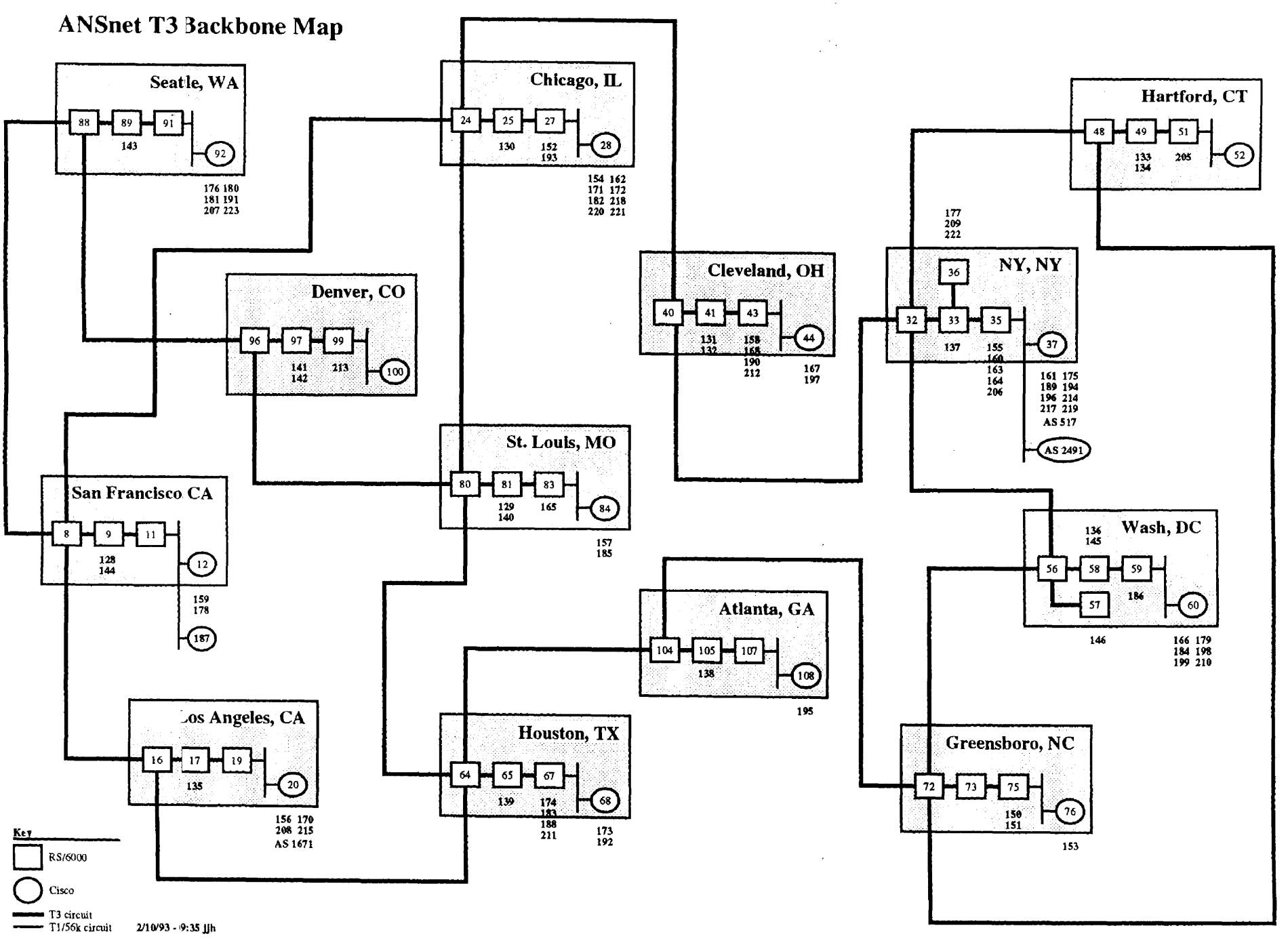


This map may be obtainedvia anonymous ftp
from ftp.cs.wisc.edu, connectivity_table directory

NSFNET Backbone Service 1993



NSFNET Backbone Services provided by
Advanced Network & Services (ANS)


ANSnet T3 Backbone Map
Seatle, WA
88
89
91
92
143
176 180
181 191
207 223
Chicago, IL
24
25
27
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130
152
193
154 162
171 172
182 218
220 221
Hartford, CT
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49
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133
134
205
Cleveland, OH
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131
132
158
165
190
212
167
197
Denver, CO
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100
141
142
213
177
209
222
NY, NY
36
32
33
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137
155
160
163
164
206
161 175
189 194
196 214
217 219
AS 517
AS 2491
St. Louis, MO
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81
83
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129
140
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157
185
San Francisco CA
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128
144
159
178
187
Wash, DC
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166 179
184 198
199 210
Atlanta, GA
104
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107
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138
195
Los Angeles, CA
16
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135
156 170
208 215
AS 1671
Houston, TX
64
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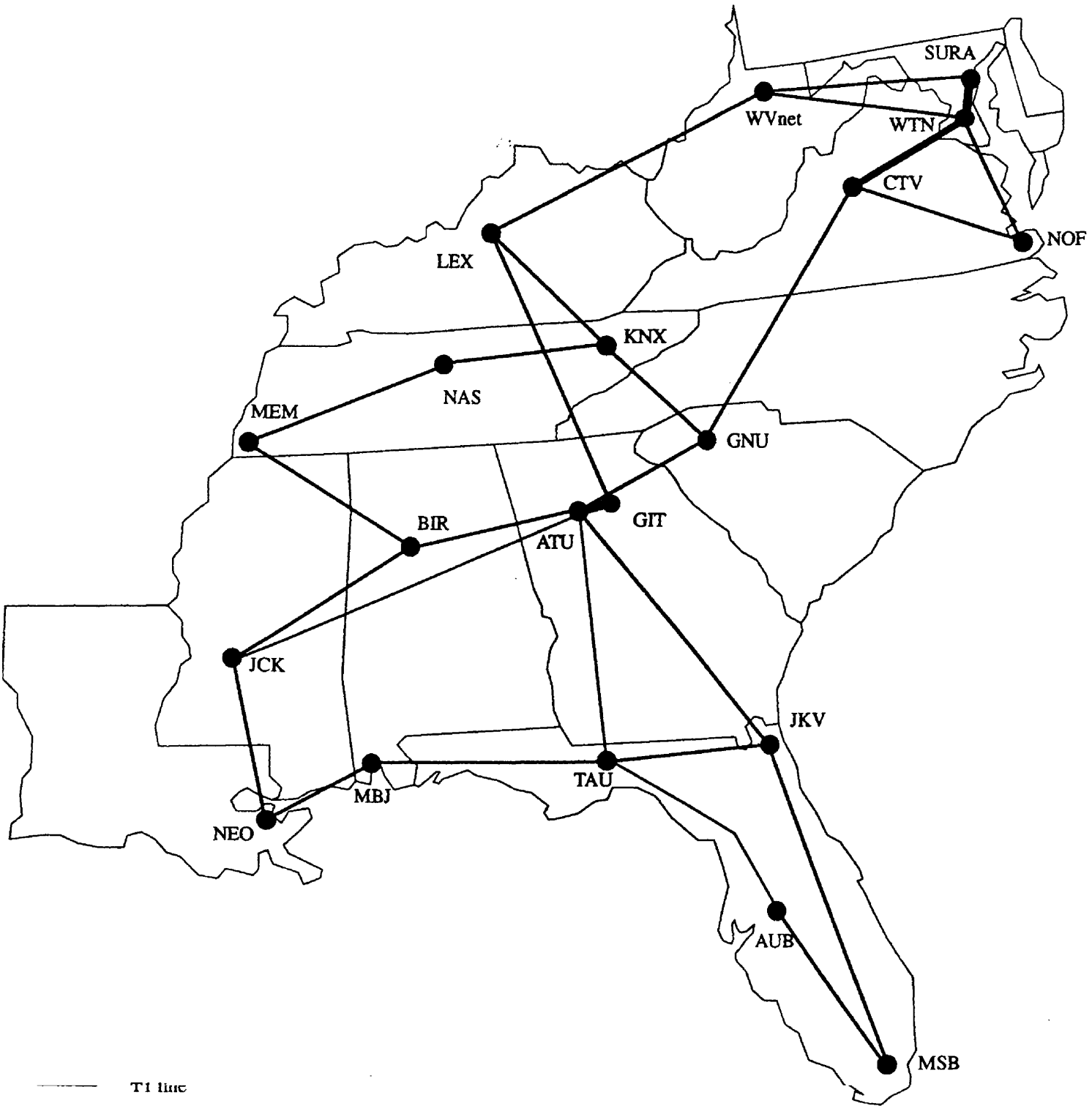
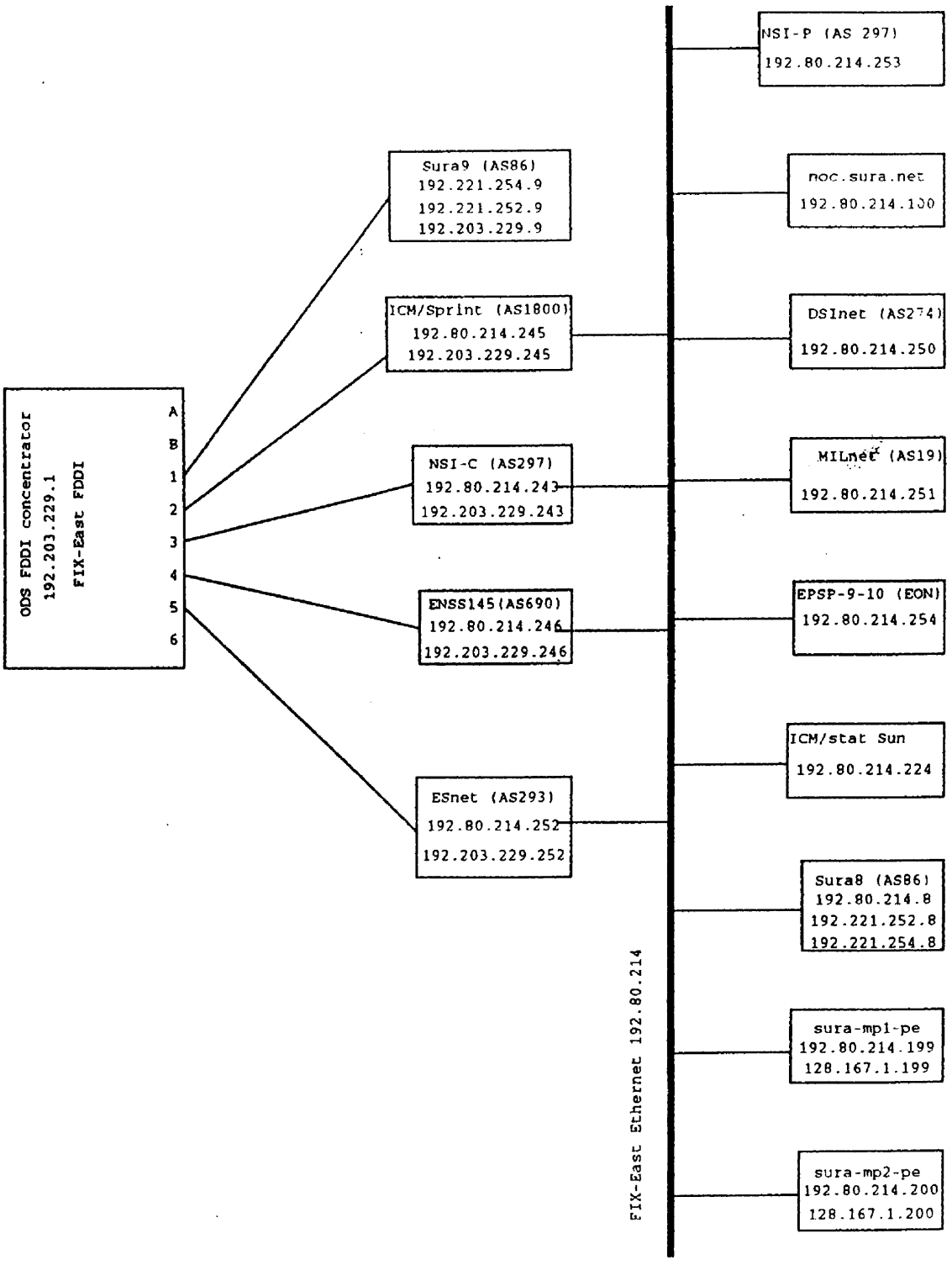
139
174
183
188
211
173
192
Greensboro, NC
72
73
75
76
150
151
153
Key
RS/6000
Cisco
T3 circuit
T1/56k circuit
2/10/93 - 9:35 JJh

SURAnet Backbone Map



2 EPS 8/29/94 ftp.sura.net:pub/maps/SURAnet/SURA.backbone.2.ps

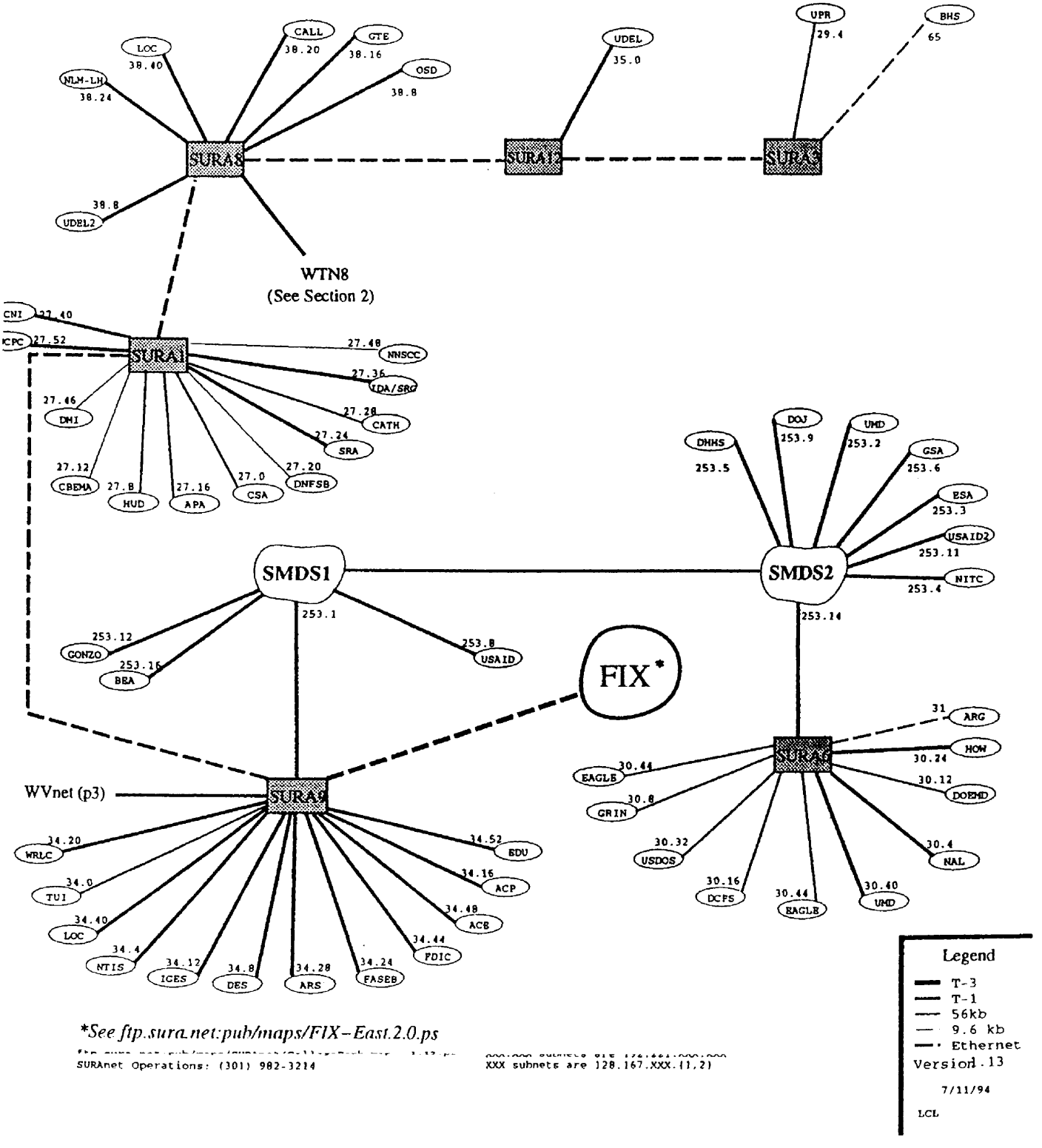
FIX-East topology



ftp.sura.net:/pub/maps/FIX-East.2.0

1/12/94 BFS

SURAnet Map Section 1
College Park, MD

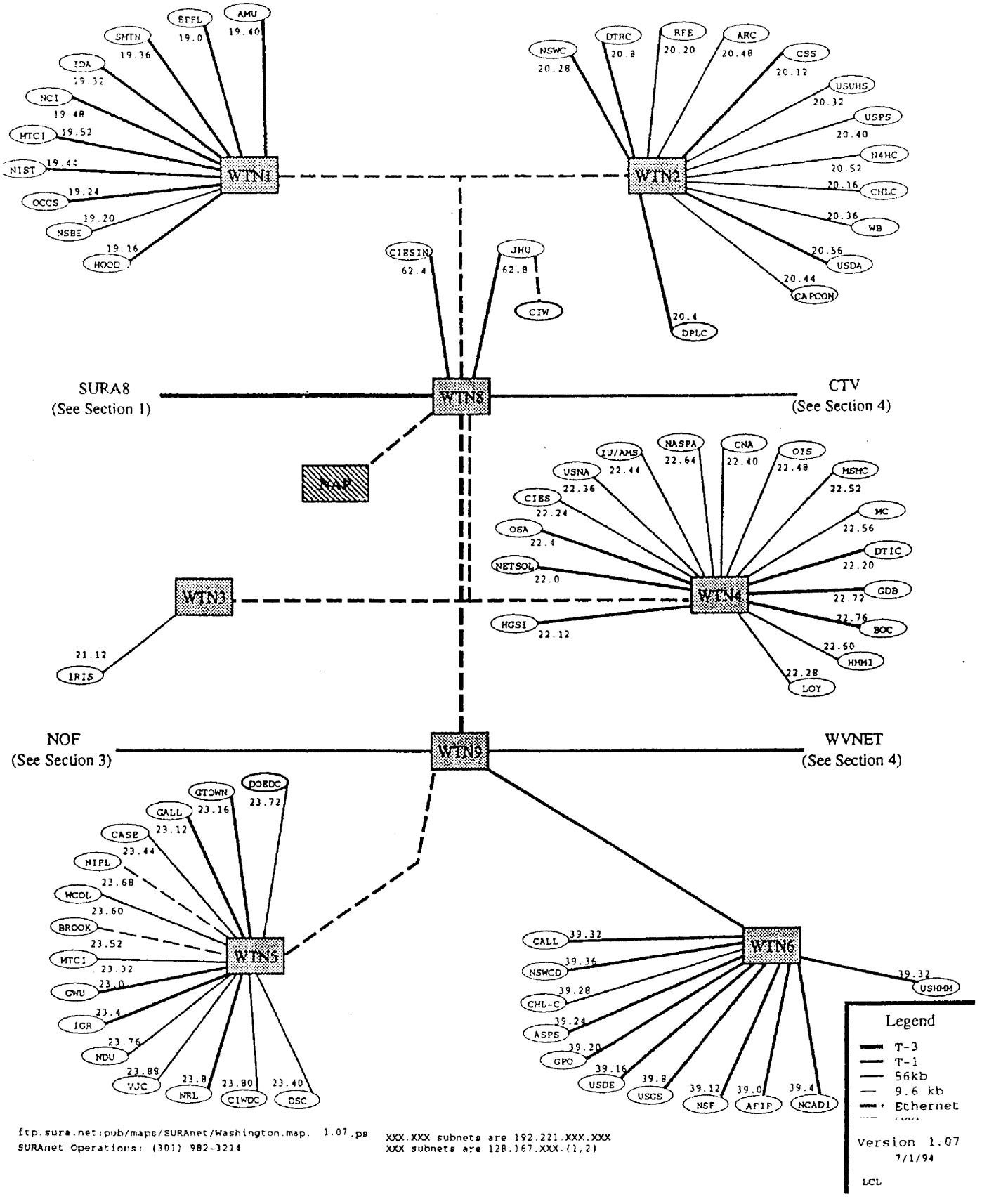


See ftp.sura.net:pub/maps/FIX-East.2.0.ps

SURAnet Operations: (301) 982-3214

XXX subnets are 128.167.XXX.(1,2)

SURAnet Map Section 2
Washington, DC



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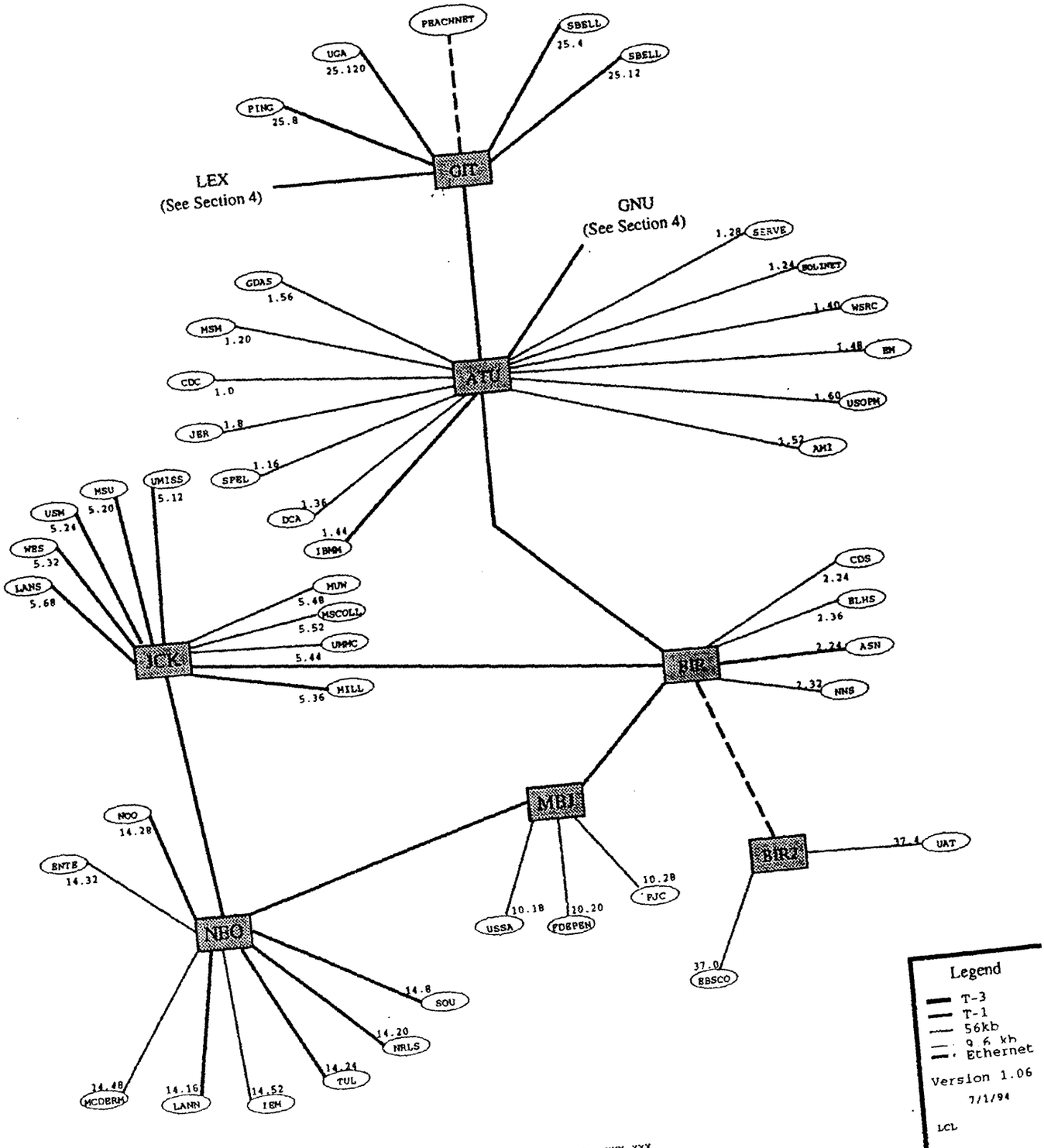
SURAnet Operations: (301) 982-3214

XXX.XXX subnets are 192.221.XXX.XXX
XXX subnets are 128.167.XXX.(1,2)

SURAnet Map Section 3
SURAnet Central



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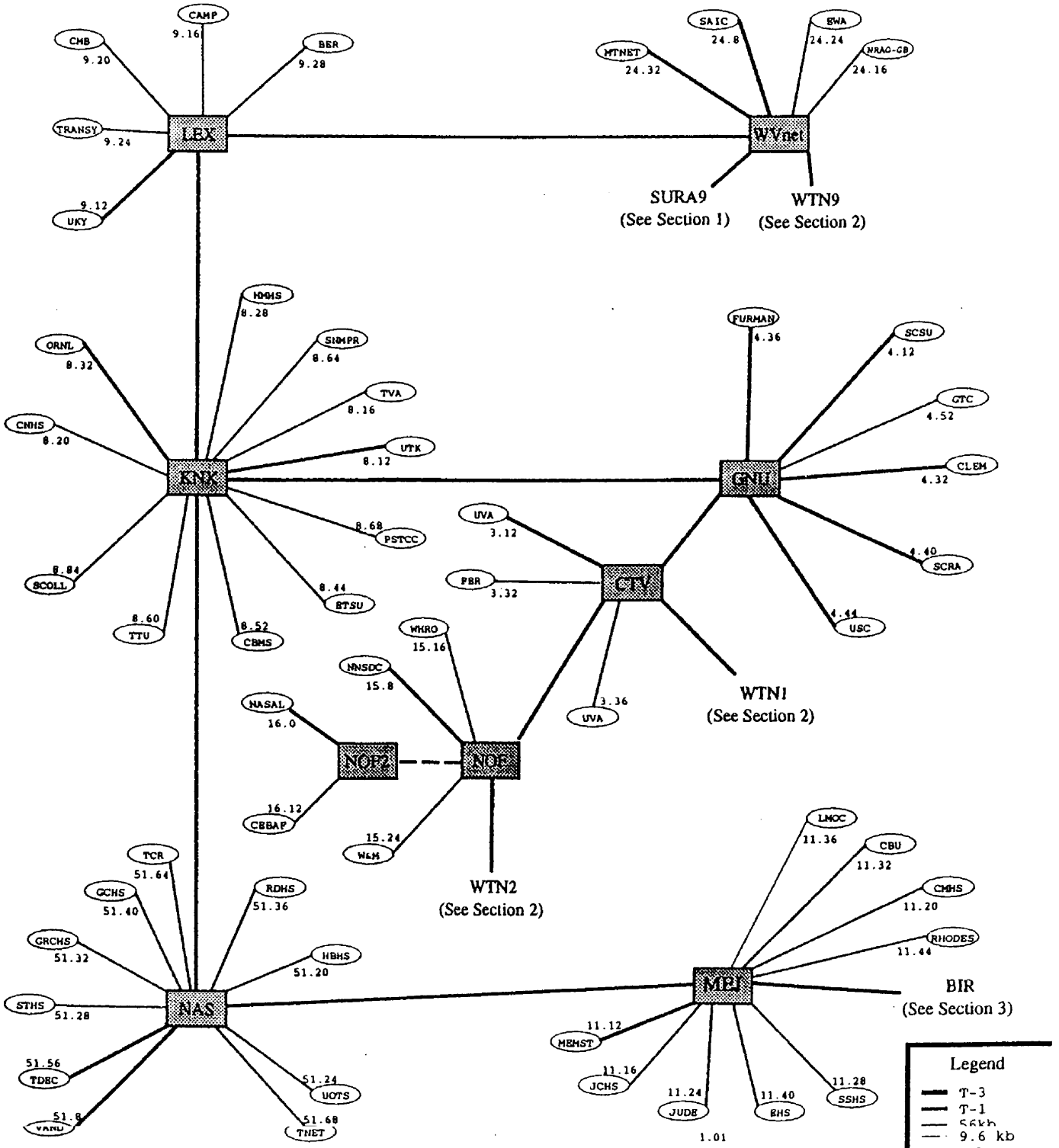
SURAnet Operations: (301) 982-3214

XXX.XXX subnets are 192.221. XXX.XXX
XXX subnets are 128.167.XXX.(1,2)

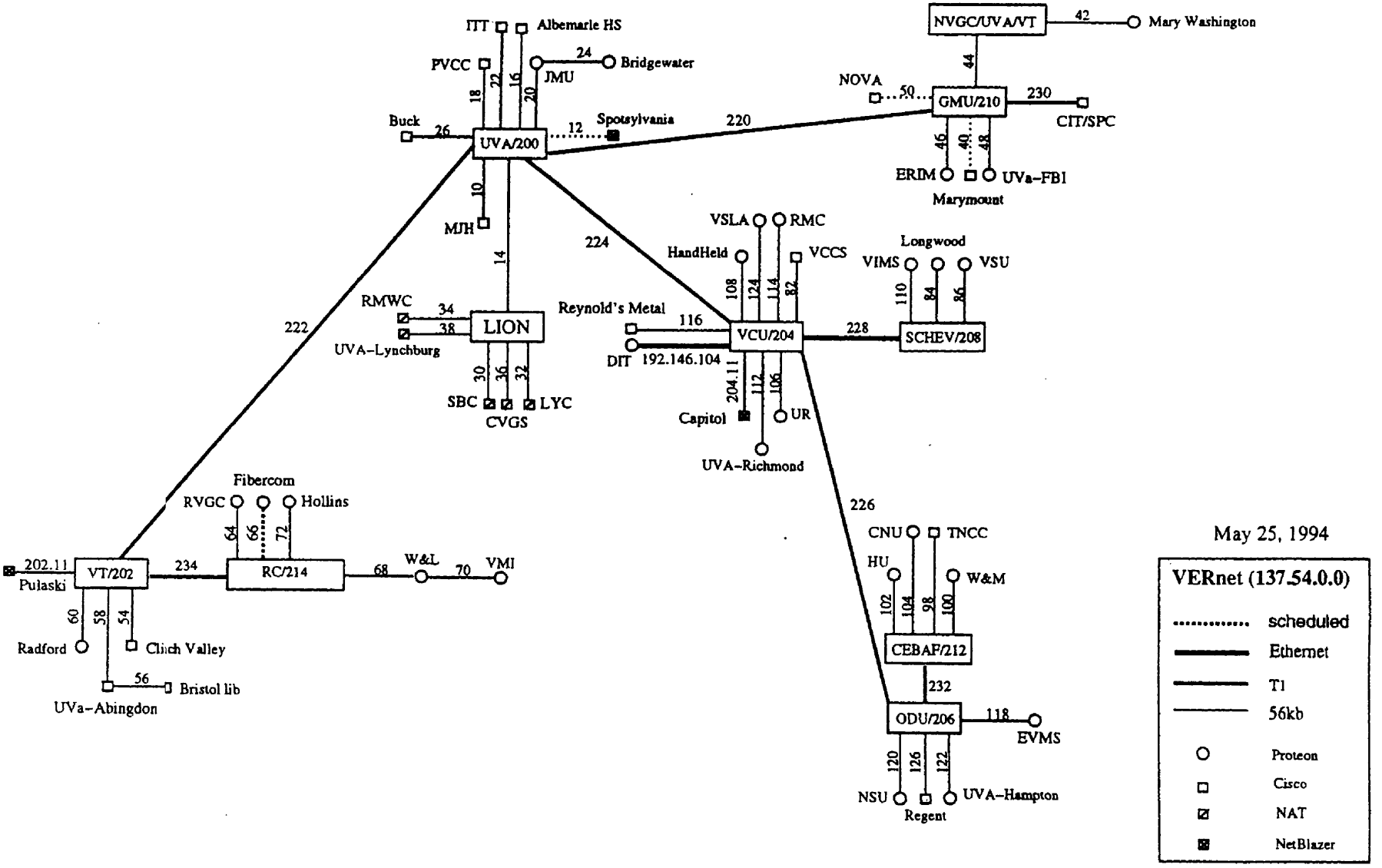
SURAnet Map Section 4
SURAnet West



ftp.sura.net:pub/maps/West.map. 1.08.ps
SURAnet Operations: (301) 982-3214

XXX.XXX subnets are 192.221. XXX.XXX
XXX subnets are 128.167.XXX.(1,2)

Virginia Network Serial Link Statistics								
Fri Apr 29 16:15:09 1994 through Wed Jun 1 00:05:14 1994								
Network Serial Link Endpoints	Complete Day Statistics				Workday Statistics			
	Peak Packs/Sec	Mean Packs/Sec	% Time 19.2 kBPS too slow	Mean Bytes/sec 19.2kB slow	Peak Packs/Sec	Mean Packs/Sec	% Time 19.2 kBPS too slow	Mean Bytes/sec 19.2kB slow
uva-cisco-ver-g <-> vcu-cisco-ver-g	1176.6	193.9 ± 81.9	100.0	33336.7	755.8	273.4 ± 59.5	100.0	47738.8
uva-cisco-ver-g <-> gmu-cisco-ver-g	373.8	115.7 ± 50.9	96.3	19392.1	373.8	155.8 ± 37.1	100.0	25343.9
odu-cisco-ver-g <-> vcu-cisco-ver-g	1065.5	92.2 ± 48.4	94.9,	15388.1	621.3	135.0 ± 39.7	99.9	21788.1
vcu-cisco-ver-g <-> schev-cisco-gw	363.0	91.8 ± 49.3	76.6	9902.2	363.0	131.6 ± 30.7	100.0	12111.8
uva-cisco-ver-g <-> vt-cisco-ver-gw	523.5	89.5 ± 28.2	99.9	15130.1	523.5	107.0 ± 27.4	100.0	18480.1
vt-cisco-ver-gw <-> rc-cisco-ver-gw	135.4	44.3 ± 14.4	91.2	7660.0	135.4	46.9 ± 15.9	89.5	8241.7
vt-ver-gw <-> rgc-ver-gw	83.1	37.3 ± 20.7	71.6	8115.9	83.1	45.1 ± 18.8	80.3	9186.6
wlu-ver-gw <-> rgc-ver-gw	107.9	37.6 ± 11.3	88.3	7421.9	70.2	41.4 ± 10.4	93.8	8045.0
vt-ver-gw <-> radford	78.4	32.2 ± 11.4	74.4	5305.9	73.3	36.3 ± 9.4	84.1	5662.7
odu-cisco-ver-g <-> cebaf-cisco-gw	324.2	24.0 ± 15.0	69.0	6715.5	324.2	34.3 ± 17.7	84.3	8191.6
uva-ver-gw <-> jmu-gw	175.5	26.2 ± 9.5	76.8	5594.7	175.5	31.0 ± 9.0	91.7	6113.1
telstar-gw <-> gmu-ver-gw	188.1	16.9 ± 9.8	64.6	4768.5	188.1	20.8 ± 13.2	67.1	4961.1
vcu-proteon-ver <-> urich-ver-gw	56.7	14.3 ± 7.3	36.4	3992.5	56.7	20.0 ± 6.8	56.6	4270.9
vcu-proteon-ver <-> vsla-ver-gw	61.7	10.6 ± 9.7	26.6	4310.1	61.7	18.8 ± 9.9	40.6	4630.2
telstar-gw <-> mwu-ver-gw	39.6	15.9 ± 7.5	61.1	4516.9	39.6	18.0 ± 7.9	63.0	4599.7
uva-cisco-ver-g <-> lion-gw	51.9	11.6 ± 7.6	15.8	4171.0	38.8	13.5 ± 7.0	22.8	4333.9
schev-gw <-> lwc-ver-gw	76.3	5.8 ± 9.2	0.7	4101.7	73.9	8.9 ± 8.5	1.8	4183.5
vcu-proteon-ver <-> handheld-ver-gw	25.3	7.8 ± 3.0	12.2	3575.1	24.6	8.4 ± 3.3	14.2	3757.1
VL <-> Blue-Ridge-Hosp	247.1	3.5 ± 9.7	9.5	7291.8	98.8	8.1 ± 10.7	32.4	6094.4
vcu-proteon-ver <-> rmc-gw	51.7	6.2 ± 5.4	15.8	3556.8	51.7	7.9 ± 5.7	21.6	3820.8
gmu-cisco-ver-g <-> cit-ver-gw	91.6	7.6 ± 8.1	27.2	4453.0	56.3	7.8 ± 7.9	26.6	4735.1
cebaf-gw <-> hu-ver-gw	112.7	5.7 ± 6.8	20.1	4202.1	112.7	6.5 ± 7.8	23.2	4400.7
cebaf-gw <-> cnc-ver-gw	181.7	4.6 ± 5.4	5.3	4954.4	181.7	6.4 ± 7.4	9.7	4757.7
vt-cisco-ver-gw <-> uva-abingdon	149.9	5.4 ± 6.7	0.3	5291.7	124.0	5.8 ± 8.3	0.5	5290.6
odu-ver-gw <-> nsu-ver-gw	64.8	5.8 ± 5.4	2.9	3798.0	64.8	5.6 ± 4.9	3.3	4013.1
acc1-gw <-> Northridge	20.9	2.7 ± 2.9	0.0	0.0	20.0	5.3 ± 3.9	0.0	0.0
w&m-ver-gw <-> cebaf-gw	76.6	2.8 ± 4.1	2.3	5430.5	76.6	5.1 ± 6.5	7.3	5618.8
jmu-gw <-> bridgewater-gw	107.4	2.5 ± 5.6	2.1	5229.8	107.4	5.0 ± 8.1	5.7	5259.2
schev-gw <-> vims-ver-gw	30.1	2.3 ± 3.1	1.8	4616.7	30.1	4.5 ± 4.2	4.0	4402.3
vt-cisco-ver-gw <-> Clinch-Valley	27.5	2.1 ± 3.0	0.2	4652.2	25.7	4.5 ± 3.8	0.6	4774.8
uva-abingdon <-> Bristol-Lib	137.9	5.1 ± 6.5	0.2	5239.4	122.1	4.5 ± 7.7	0.3	5210.1
Netops <-> KCRC	148.3	2.7 ± 4.6	1.7	6094.4	148.3	4.4 ± 7.9	5.8	5752.2
wlu-ver-gw <-> vmi-ver-gw	37.4	2.7 ± 2.9	1.8	3862.0	19.4	3.7 ± 2.8	2.6	3766.9
uva-old-sura-gw <-> Ivy-Office	28.5	1.7 ± 2.5	0.2	5340.1	28.5	3.6 ± 4.0	0.8	5741.2
uva-cisco-ver-g <-> pvcc-gw	47.0	2.1 ± 3.7	1.1	4974.9	34.8	3.3 ± 4.1	2.0	4490.0
uva-old-sura-gw <-> Health-Svcs	35.5	1.4 ± 2.0	0.1	59586.8	13.3	3.2 ± 2.7	0.0	0.0
rgc-ver-gw <-> roanoke-ver-gw	62.2	3.7 ± 4.5	1.0	3949.2	26.3	3.1 ± 3.7	1.8	3830.2
vcu-cisco-ver-g <-> vccs-gw	22.2	1.3 ± 1.9	1.5	4244.0	22.2	2.7 ± 2.9	4.2	4405.8
vcu-cisco-ver-g <-> reynolds-gw	24.3	1.9 ± 1.9	1.1	4770.0	24.3	2.6 ± 2.8	2.8	4744.4
uva-cisco-ver-g <-> mjh-gw	14.8	2.1 ± 0.5	0.0	0.0	14.8	2.3 ± 0.6	0.0	0.0
odu-ver-gw <-> evms-gw	32.5	1.3 ± 1.8	0.7	4147.1	23.8	2.1 ± 2.4	1.7	4393.2
rgc-ver-gw <-> hollins-ver-gw	21.0	1.5 ± 1.5	0.0	4119.2	21.0	1.6 ± 1.4	0.1	4119.2
gmu-ver-gw <-> erim-gw	23.0	0.8 ± 1.6	1.0	3848.6	23.0	1.6 ± 2.6	3.0	3737.2
uva-cisco-ver-g <-> albemarle-gw	38.3	0.8 ± 1.7	0.4	4356.4	38.3	1.4 ± 3.4	1.3	4444.9
uva-cisco-ver-g <-> buck-gw	24.9	0.6 ± 1.7	0.8	5423.4	24.9	1.3 ± 3.2	3.1	5488.4
uva-cisco-ver-g <-> itt-gw	36.6	0.6 ± 0.6	0.0	3851.2	36.6	0.7 ± 1.1	0.1	3851.2
odu-ver-gw <-> uva-hampton-gw	8.2	0.6 ± 0.2	0.0	0.0	8.2	0.6 ± 0.4	0.0	0.0
vcu-proteon-ver <-> uva-richmond-gw	21.1	0.5 ± 0.3	0.0	0.0	21.1	0.6 ± 0.6	0.0	0.0
cebaf-cisco-gw <-> tncc-gw	1.8	0.5 ± 0.1	0.0	0.0	1.8	0.5 ± 0.1	0.0	0.0
gmu-ver-gw <-> uva-fbi-gw	14.4	0.4 ± 0.6	0.0	0.0	12.2	0.4 ± 0.5	0.0	0.0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PVCC
24
Bridgewater
JMU
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16
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Buck
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UVA/200
12
Spotsylvania
220
NVGC/UVA/VT
42
Mary Washington
44
NOVA
50
GMU/210
230
CIT/SPC
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48
ERIM
UVa-FBI
Marymount
10
MJH
14
224
VSLA
RMC
HandHeld
VCCS
108
124
114
82
Longwood
VIMS
VSU
110
84
86
222
RMWC
34
38
LION
UVA-Lynchburg
Reynold's Metal
116
VCU/204
228
SCHEV/208
DIT
192.146.104
30
36
32
SBC
LYC
CVGS
204.11
112
106
Capitol
UR
UVA-Richmond
226
Fibercom
RVGC
Hollins
64
66
72
CNU
TNCC
HU
W&M
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104
98
100
202.11
Pulaski
VT/202
234
RC/214
68
W&L
70
VMI
CEBAF/212
232
60
58
54
Radford
Clinch Valley
ODU/206
118
EVMS
56
Bristol lib
UVa-Abingdon
120
126
122
NSU
Regent
UVA-Hampton
May 25, 1994
VERnet (137.54.0.0)
scheduled
Ethernet
T1
56kb
Proteon
Cisco
NAT
NetBlazer

High-Speed Network Technology Definitions

ATM:

Asynchronous Transfer Mode provides switching and line speeds up to 155Mbps

FDDI/CDDI:

100Mbps over fiber or copper in a ring topology

100baseT Fast Ethernet:

100Mbps version of Ethernet using CSMA/CD with either 100BaseX or 4T+signaling

100base VG-AnyLAN:

100Mbps using Demand Priority rather than CSMA/CD

Switched Ethernet:

Packet switching among multiple, dedicated 10Mbps segments that provides 20+Mbps aggregate throughput

Full-duplex Ethernet or Token Ring:

20Mbps or 32Mbps via concurrent, two-way communication on the same LAN segment

Fibre Channel:

Bi-directional point-to-point serial interconnect that provides transmission speeds up to 1Gbps