The COOK Report on Internet → NREN

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An NREN Agenda in the National Interest --
A Challenge for Clinton, Gore, and the Congress

An Editorial--

The new administration and the new congress coming to power in January have a major opportunity to set right a critical technology initiative that has been left rudderless by what one must suspect has been OSTP and White House jockeying to achieve a favorable position with Republican constituencies. It has also been cast adrift by an apparent reluctance of its original proponent, vice-president elect Gore, to become involved in the messy day-to-day policy issues that the HPCC legislation has left to fester.

NREN will play a major role in defining the ability of the Clinton Administration to use the powers of the Federal Government in an effective way to enhance our technology competitiveness and strengthen our economy. Given the current lack of specificity behind the legislation and the lack of executive or Congressional direction, agencies are essentially proceeding with their own mission plans tied to their own agendas.

Few people realize, but as things are now unfolding, the Director of the NSFnet has explicitly stated that there will be no single national network -- that the NREN should be understood as the use of Federal monies by the NSF and mission agencies to improve the capabilities of their own networks. Consequently, we are likely to see only a continuation of agency missions possibly subject to alliances with some of the same vendors that prevailed in the pre NREN second half of the 1980s.

President Elect Clinton and Congess have a major opportunity that they must not waste. Here are ten general policy areas that the new administration and Congress must first comprehend and then address.

First: NREN has continually been promoted in terms of technology competitiveness -- the use of Federal funds to help first technology development and second the transfer of that technology into the commercial arena. The source of this technology development is to be found in the Gigabit testbeds not in the NSFnet backbone. High speed TCP/IP inter-networking is no longer pre-competitive technology. Therefore government funding of the general purpose NSFnet backbone is probably no longer appropriate. However Federal support of pre competitive technology is appropriate. Indeed it is critical. Since the gigabit testbeds have been the most fertile and best managed sources of new technology development, the new administration should develop a plan to ensure their continuation and linking together into a small pre competitive technology development network.

It should be understood that such a network would link a very limited number of laboratories and universities. Academic researchers would have to undergo rigorously refereed scrutiny to be awarded access to the gigabit testbed network. Such access would be only from hosts at universities already connected to the testbed network. Moreover the administration should make clear that the only universities that will be attached to the gigabit testbed network will be those that are either currently participating in the five testbeds or are selected by the Corporation for National Research Initiatives in the next round of testbed funding.

Second: Develop creative ways to transition pre competitive technology to commercial use. Realize that while commercial backbone service providers must strive to run stabile production networks, they should also be interested in being the first points of transition for new, leading edge technology into the market place. Through open and intensive discussion with these providers, the new administration should ascertain what are expected to be the new kinds of high performance communications technologies that should be ready to begin the transition to commercial use every year. It

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may wish to establish a program designed to assist commercial service providers who are willing to make these technologies available to their research and education users on a beta-test basis.

Third: The administration should move promptly and decisively to clear up confusion about network bandwidth. It must understand that for the rest of the decade if not longer, clear channel gigabit applications will remain within the testbeds. The operational networks making up an NREN may reach aggregate gigabit speeds on their backbones as the result of many small bandwidth applications multiplexed together. This aggregate network bandwidth will be the result of some combination of increased use due to increasingly ubiquitous access to the network or increased use due to the spread of bandwidth intensive applications like high definition video. With only limited federal investment possible, the administration should be very cognizant of the cost trade -offs between the two courses of action. The administration will probably find that it must develop a clear rationale for subsidizing greater access to current competitive network technology.

Fourth: The administration must understand that development of high performance communications can no longer be thought of as data communications isolated from the voice network and from national telecommunications policy. The current NASA DOE contract with Sprint will have an impact on the deployment of SONET and ATM networks by the LECs and IXCs. If the NSF were to support the deployment of IBM's SONET and PTM switch, it would be supporting a field trial for an openly advertised alliance between IBM and the cable TV industry against the telephone industry in the battle to bring information into the home. This could have significant implications for the PSTN and national telecommunications policy in general.

Ten Commandments for an Effective NREN

1. Understand that the Gigagbit testbeds is the source of technology competitiveness -- not the NSFnet backbone.

2. Develop better ways to transition precompetitive technology to commercial use.

3. Clear up cost and technology implications of aggregate versus clear channel gigabit bandwidth.

4. Understand that high performance communications can not be developed in isolation from the PSTN and telecommunications policy issues.

5. Understand that choices may have to be made between high end applications and a ubiquitous easy to use network.

6. In making the network available to k-12 resiste the urge for national top down implementation.

7. Beware of the problems that would be created by a move to individual usage charges for the network.

8. Understand the criticality of some of the issues such as address space that rapid internet growqth is raising. Realize that the internet is international in scope and must not be treated as an American Fiefdom.

9. Act to protect and preserve the independence of IAB, IETF and IESG. Understand the value of the internet standards process.

10.Understand the difference between Fortune 1000 interest in internet technology and the commercialization of network services for its present research and education marketplace.

Fifth: The administration should take a serious look at how users are using the current network and weigh carefully the benefits of federal policy designed to extend the availability of the network to new groups of users versus investment in high bandwidth applications that will benefit only a small class of current network users. The creation of a stable environment of ever growing network access and a more user friendly environment is likely to most significantly increase the network's ability improve the quality of education and research.

Sixth: With the Gore II legislation in the wings, it becomes very important to understand that a top down implementation of the network in the k-12 arena is likely to be extraordinarily expensive and ineffective. To get the most mileage out of federal investment, a bottom up approach involving carefully constructed alliances with current network users and coordination with current state efforts in creating networks for the k-12 population is the only fiscally responsible way to proceed.

Seventh: The administration must understand the functionality for the current research and education community of pricing by size of connection rather than by measured traffic. (While metered use of the network for very small scale users in a free market is an acceptable alternative to flat bandwidth pricing, it will be vitally important that institutional users remain free to determine the bandwidth of their connection and that their network use be charged by that bandwidth.)

The character of the network as an experimental tool in the hands of faculty and students would be crippled, if it were necessary to develop a bureaucracy at each university or college that would measure each faculty and student's usage and cut it off every month if it exceeded a pre defined limit. Also before entertaining the possible imposition of metered pricing, policy makers had better be very certain what such pricing would cost in terms of network accounting and billing resources that are now unnecessary.

Eighth: The administration must understand that the exponential growth of the Internet is beginning to cause problems with the allocation of ad-

dress space -- problems that have nothing to do with speed, but problems that will need the maintenance of a politically neutral ground to fix in a way that fairly benefits all segments of the network community. They must realize that emphasis on the development of an NREN is helping to fuel this growth and thereby exacerbating a fundamental problem that must be fixed in an environment that is unregulated and subject to the equivalent of a commercial land rush as competitors stake out their claims to the market. They must also realize that the Internet may also raise sensitive issues between governments.

Ninth: The administration must understand the self governing nature of the Internet as expressed in the IETF, IESG and IAB. It must make certain that, in a technical area otherwise free of regulation, commercial pressures do not destroy the Internet's ability to have open, self governing bodies that design open standards, publicly debated and arrived at.

Tenth: The administration must understand that while the network administrators of the Fortune 1000 list TCP/IP based wide area networks as a means of interconnecting corporate LANs as among their most critical technical priority, corporate concerns about control and security of their data will be likely, for the foreseeable future, to prevent any massive migration of corporate use from private networks to the NSFnet.

Because the public officials involved have understandably lacked the technical expertise to ferret out these issues, the development of high performance communications has yet to acquire the focus and leadership necessary for it to fulfill the purposes of strengthening American competitiveness - a worthwhile goal for which Senator Gore and his counterparts in the House have labored long and hard. Gore, the Congress and President elect Clinton must understand that much work remains to be done in order to reap the benefits of an NREN.

Analysis of a Possible IBM Strategy for the PARIS/Planet Switch

-- An Exchange with IBM and Dave Farber

Ever since March of 1991 the editor has been following with much interest the development of IBM's gigabit switch - originally named PARIS and now called Planet. With the September *Wall Street Journal* story on IBM's interest in using the switch in a network alliance with the cable tv industry, he decided that it was time to take his first close look at PARIS/Planet since early in 1992. Having been told of "telco" concerns about the switch and IBM's apparent strategy, he wrote the following summary which he sent to Alan Baratz and Inder Ghopal at IBM -- asking for their comment.

IBM's Sonet Strategy?

We are beginning to see a new generation of switches designed to route traffic over SONET fiber optic networks. SONET is a standard for fiber transmission in the range of speeds from 155 mega bits per second to well over 2.4 gigabits per second. (The standard envisions speeds of up to 13 gigabits per second.) It will allow transmission equipment built by different manufactures to inter operate on the same networks. The CCITT has adopted ATM (Asynchronous Transfer Mode) over as a cell switched standard to be used with SONET at level 2 of the seven layer protocol stack. This means that ATM is treated by the international telephony community as world wide standard for digital data transmission and switching. (ATM puts data into small frames known as cells that are similar in some respects to packets.)

In 1988, when ATM was in the early stages of the standardization process, IBM came out with its own design for packet switching over SONET - PTM (Packet Transfer Mode). PTM was based on the concept of frame relay and contemplated a large variable length frame or packet. IBM signaled that it knew it was diverging from the public switched telephone network by calling its initial design specification for the Paris switch a design for a "private network." PTM envisioned packets of 1000 bytes or more. ATM offered 48 byte packets (or speaking very precisely 48 octet cells) with 5 octet headers. ATM Switches (in the telephone industry at least) route cells (packets) in hardware in parallel from a large number of input ports to a large number of output ports. The hardware design is referred to as the switching fabric. Switches generally work at level two. While routers use software to perform their routing function at levels 3 and 4. (However if ATM switches were ubiquitous throughout a network they could provide level 3 functionality as well.)

In comparing ATM with PTM, one feature immediately stands out. On a 1.2 gigabit network channel the ATM switch would have to make 3 million decisions per second while the PTM switch would need to make about one twentieth of that number or 150,000 decisions per second. It is intuitively obvious that the PTM switch could be much more simple in construction and design. Indeed IBM's 1988 article stated the intent of building Paris with off-the-shelf components. Design simplicity would also, one suspects, lead to a product that would be far less expensive than the very costly ATM switches that the telephone industry is about to employ.

1993 will see the first significant deployment of SONET transport and the deployment of a few ATM switches by the LECs and IXCs. Virtually all plans for high speed networks assume that these companies will either be providing higher level protocol services themselves direct to customers or will be selling SONET and ATM services to network service providers who will use them in providing higher level services to end users. In looking at the telephone network as the infrastructure for a national data network, it is unclear why a company would be bringing to market a switch that at this very fundamental base layer of the network would diverge from the industry standard.

All this would make little sense unless IBM's market for the PARIS/PLANET switch has become the cable TV industry and IBM's game plan is to form an alliance with the cable TV industry in the anticipated epochal battle that will decide which technology is able to deliver information to the home. (See Michael Miller's Sept 16, 1992 Wall St. Journal article.) With cable TV franchises usually based on cities, IBM's less powerful and less expensive switching technology would function somewhat like a Metropolitan area network. The data streams in these instances would presumably less intense than the trans continental firehose that telephone backbone network connections would have to cope with. What's more having a switch that coped at level two would be an advantage that would free the cable TV operator from having to deal with the phone companies at all. They would have an engine that could power data over their networks in complete by pass of the telephone company. They could in effect become their own telephone comanies. (While IBM states that Paris/Planet has been modified to be ATM compatible, other sources state that it does this by encapsulating the the ATM cells and should not therefore be considered a true multiprotocol switch.)

Now the *COOK Report* has no objection to competition in the marketplace. However, it believes that if a Federal agency should appear to be contemplating providing public money to IBM for a national testbed for its PARIS/Planet technology, that Congressional policy makers should be made well aware of the technology implications of what public money was funding. Universal telephone service was decided upon as a national priority in 1934. In 1994 congress could find itself faced with unpredictable outcomes from a struggle between the cable tv and telephone industries. Universal access to information available from an NREN is likely to become an issue facing policy makers. One might however question the wisdom of anything that would imply universal access to cable tv in order to obtain universal access to NREN.

IBM and Dave Farber Respond

The editor asked Inder Ghopal the principal design engineer for the PARIS/Planet switch to review the above text. He sent the following response on November 25.

Gordon:

Thanks for giving us an opportunity to review your article prior to publication.

There are a couple of technical inaccuracies that I would like to point out:

1) In para 2 you state "PTM envisioned packets of 1000 bytes or more". In fact, PTM supports packets which range from 20 bytes to 2000 bytes. As you can see, this includes the ATM cell size as a special case.

2) In para 5 you refer to "IBM's less powerful...switching technology" In fact, as reference 1 indicates, the currently deployed Paris/plaNET system supports 8 1.2Gb/s ports and the system under development will support 32 1.2Gb/s ports. This is comparable to any ATM system with port speeds of higher than 1Gb/s.

3) You also state in para 5 that IBM's support of ATM is not "true"ATM switching but some form of encapsulation. In fact, the Paris/plaNET system operates a fully compatible "true" ATMswitch. ATM cells are transported without any additional overhead. Reference 1 points this out and reference 2 provides extensive detail. Reference 3 gives some of our network "philosophy".

Again, thanks for letting us review the article. I hope the technical corrections are of value to you. In addition, I noticed you talked a great deal about IBM's interactions with the CATV industry. You may be interested to know that we're also actively talking to the telco industry to define the role of our technology in their environment.

Ref 1: The plaNET/ORBIT high speed network, IBM Research Report, RC 18270, August 1992.

Ref 2: ATM support in a Transparent Network, IEEE Networks Magazine, Vol. 6, No. 6, Nov. 1992.

Ref 3: Network Transparency: The plaNET approach, IEEE INFOCOM, Florence. 1992.

The editor also shared Ghopal's response with Dave Farber who is a principal investigator in the Aurora Gigabit testbed in which the IBM switch is playing a significant role. Dave responded that Ghopal's critique is accurate. Farber added that the IBM design was for a bus-based switch that was not intended to scale to the large number of ports necessary to support a national PSTN telco based architecture but that would do just fine to support intra company communication needs. He added that while IBM had believed that PTM would be demonstrably superior to ATM in various aspects of network operation verification tests were now underway and the outcome is still open.

The COOK Report hopes to present some telephone industry response to these issues in the near future.

Letter to Editor: Beware of Service Provider Funding in North Carolina

From a network professional in North Carolina came the following lament by private mail: "The basic problem with both NSF/NREN and N.C's 'CoNCert' network is that the funding should go to the 'users' (universities, schools, etc.) to buy connectivity and bandwidth from the most appropriate source. It's the direct subsidization of the service providers (ANS, CoNCert) without sufficient accountability to *customers* that is causing all of the problems. The situation would *not* be better with a regulated monopoly service-provider (telco. or state datanetwork.) since they're also generally not really accountable to their customers.

Currently in North Carolina,there are a variety of committees, commissions, and so on looking at the diversity of networks in state government and education in N.C. A number of observers believe that these committees and commissions will recommend consolidatation of the networking efforts and that a state-run high performance (fiber-based) network will somehow emerge. It seems likely that the telephone companies will become the primary service providers. That would probably mean that CoNCert would concentrate on 'research' efforts rather than continuing to provide 'service' to a growing number of campuses. The bad news is that this emerging network is probably going to cost the users a great deal more and include traffic-based charging (that will probably kill off most of what has been accomplished so far).

MFS Announces High Speed NREN- Like National Backbone

On October 5 Metropolitan Fiber Systems announced that it was creating a national wide area network to interconnect its 14 Metropolitan Area Netwotrks. According to the press release reproduced below, the result will in many ways look like a commercial NREN. The new national network may be expected to give large corporate customers the kind of data interconnectivity that ANS has so far only talked about.

The *COOK Report* believes that it is extremely significant that the new MFS network is the major vehicle behind the first protype Network Access Point (NAP) initiated in the Washington DC area in November 92. (See article page xx this issue.) The new network may be preparing to deliver all or nearly all the very high speed backbone services demanded by the NSF in its draft solicitation. Readers should expect to see it play a significant role when the final solicitation is issued. The press release follows:

MFS DATANET ANNOUNCES FIRST NATIONAL SERVICE FOR HIGH-SPEED INTERCONNECTION OF LANS AND CUSTOM NETWORKS

OAKBROOK TERRACE, IL, October 5, 1992 -- MFS Datanet, Inc., an operating subsidiary of MFS Communications Company, Inc. (MFSCC) has announced the first commercially available nationwide network designed specifically to allow companies to interconnect geographically dispersed Local Area Networks (LANs) at native LAN speeds.

MFS Datanet said that its new national High-speed LAN Interconnect (HLI) service supports Ethernet, Token Ring, FDDI, and custom networks via a nationwide fiber optic based network. To be available in the 14 metropolitan areas now serviced by MFSCC's local access services, the first national service offering will interconnect Washington, D.C., New York City, and Chicago, and is scheduled to be operational in December 1992. Other national LAN interconnection networks are anticipated to follow over the next five months.

"An important but complex part of internetworking has overnight become a relatively routine matter with the interduction of the first national data superhighway," said Royce Holland, president of MFSCC. "This development means companies, government agencies and institutions will for the first time be able to connect their LAN networks and communicate at high speeds up to 100 megabits per second (Mbs) with other LANs. This can occur not only within metropolitan areas, but across the nation with ease and with complete confidence in the system's overall reliability and security."

Holland further noted that this national service offering is a dramtic addition to MFSCC's metropolitan LAN interconnection services introduced in August 1991.

"Until now, communications and MIS professionals had to tailor their locan and long-distance LAN interconnect requirements to transmission rates designed primarily for voice services," said Al Fenn, president of MFS Datanet. "This usually meant choosing between either too much or too little transport capacity."

"Also, building and operating networks required negotiations with multiple carriers and equipment vendors," said Fenn. "Users were offered little or no flexibility in achieving rapid upgrades to accommodate high-bandwidth applicatoins such as distributed computing, exchanging image files, or large file transfers."

Fenn said MFS Datanet's nationwide HLI services "relieve users of daily concern with complex, trouble-prone interfaces and systems integration so they can concetrate on supporting their companies' strategic objectives."

Fenn noted a variety of potential uses for national LAN networks, such as:

❑ **CONCURRENT ENGINEERING** - Engineers in multiple locations can work together, sharing data and programs despite being geographically separated.

❑ **TELEMEDICINE** -- Customers in the medical field can make diagnostic evaluations in real time from data supplied by X-rays or CAT scans generated by imaging equipment located across town or the nation.

❑ **REMOTE SERVICES** -- Customers can use the network for economical high-speed tape transmissions of data. In the past, due to high costs and low speed, tapes had to be physically delivered from site to site.

❑ **DISTRIBUTED COMPUTING/ COLLABORATIVE PROCESSING** -Customers in the scientific and mathematical fields can access remote computers for real-time problem solving.

"MFS Datanet's HLI services function independently of, but in concert with, the still-evolving services and standards of SONET, SMDS, Frame Relay and ATM," Fenn said. "This protects the customer against network obsolescence caused either by changing requirements or advancing technology. Users can enjoy nationwide LAN and high-speed connectivity solutions without the technical and financial risks of multi-vendor supplied in-house systems based on technologies that could have a short life span."

Accessing MFS Datanet's HLI services can be a simple as plugging into a LAN wall jack connected to MFSCC's fully secured point of presence in the customer's building. Transport is over a fiber-based network that is monitored around the clock.

In addition to native LAN rates of 4, 10, 16, and 100 Mbs, MFS Datanet also offers fractional data rates for customers requiring less bandwidth. "Fractional-rate customers get the same benefits of MFS Datanet's end-to-end network management and maintenance services, plus the ability to upgrade to higher capacities with the ease of a telephone call," Fenn said. "Since the MFS Datanet network protocol is independent of the customer's network protocol, the customer is free to migrate from Ethernet to Token Ring to FDDI as requirements dictate."

"A nationwide LAN offering is a natural evolution in MFSCC's position as the leading supplier of total solutions for business communications," said Holland. "*Coupled with the September 17, 1992 decision by the FCC mandating interconnection between local exchange carrier and competitive access provider networks* [editors's italics], it means that customers on or off our

(concluded on p.15)

Sprint, PSI, and Uunet Join in Building Washington DC NAP

At the end of the summer several network service providers including ANS met in Ann Arbor Michigan to discuss the possibility of creating a proto-type of the Network Access Point (NAP) contained in the NSFnet backbone pre-solicitation. ANS apparently wanted to study the idea further before moving forward. PSI, Uunet and Sprint decided to move toward immediate implementation. On October 20, Uunet sent the following message to interested parties.

From: asp@uunet.uu.net
Subject: Washington, DC prototype NAP
To: regional-techs@merit.edu, ops@sura.net
Date: Tue, 20 Oct 92 15:46:42 EDT
Cc: wdc-nap@uunet.UU.NET, sgoldste@cise.cise.nsf.gov, steve@cise.cise.nsf.gov, peter@goshawk.lanl.gov

"PSI, AlterNet, and SprintLink have set up a prototype NAP in the Washington, DC area. This is based on MFS's 10 Megabit Ethernet product.

This is a prototype implementation of the NAP proposal. We are going to get it up and running and see how well it works. Other network providers are welcome to join with us in making this NAP a success.

The working 'rules' for this NAP are:

- ❏ only network providers (no end users).
- ❏ any network provider can join.
- ❏ AUP-free on the NAP.
- ❏ any provider can peer (or not peer) with any other provider (mutual consent).
- ❏ providers pay for 'their' connect point.
- ❏ should any costs be assessed for the FIX-East connectivity, they will be shared on a pro-rata basis (there are no costs being charged at this time.)
- ❏ no internal traffic on the NAP.

We have ordered a 3 drop MFS 10 Megabit Ethernet to form the NAP. Drops are in College Park (to connect to FIX-East), the WilTel WDC POP, and the Sprint WDC POP.

Sprint & AlterNet are connecting at the Sprint WDC POP. PSI is connecting at the WilTel WDC POP. All three are using the NAP to connect to FIX-East (the NSFNET and SURAnet) at College Park.

MFS is moving very fast on this installation. They say that they should be able to get the NAP up & running this week - current install is for Wednesday."

Andrew Partan

A Lapse in Collaboration?

Peter Ford from Los Alamos wrote in answer to a comment by PSI's Marty Schofstal:

"Since you weren't there let me fill you in on the details. It was called a proto-NAP, as in prototype, to evaluate the suitability of the NAP idea. During the meeting there was not consensus on how to implement. Several alternative engineering choices were evaluated which often delved into issues of cost, bandwidth and reliability. The meeting went well and all members of the group agreed to future open dialog to get resolution on an implementation plan.

A subset of that group immediately pursued an independent effort and subsequently announced that they were building a proto-NAP. The rest of the group was not brought into subsequent discussions on building this prototype prior to the announcement of the proto-NAP implementation. This seems to have been an unfortunate lapse in collaboration. By the way, when did this proto-NAP become operational?

Your note implies that people have chosen not to interconnect with the recently announced project. I don't believe anyone from the Ann Arbor meeting has said their networks will not connect to this proto-NAP in the DC area. This proto-NAP is using technology which has not been used in production by any of the network providers and several people in the Ann Arbor meeting expressed their concern and wanted to see it operate before attaching their networks to it.

Given the interest generated in the NAP idea, and the conversations I have had with all sorts of network operators, I suspect we will see several proto-NAP projects. I recently read a note on a mailing list which indicated interest in a peering interconnect in Europe. It is important to remember that there is no concept of a singular NAP".

Marty Schofstal replied to Peter Ford's comment about untested technology:

"This maybe the view from Michigan. But there are lots of companies using ethernet, Cisco, fiber, and in fact the MFS LAN service. But on our own nickel we will let the interested parties know how it goes and then pop the stack of objections and see what the new one is."

On November 6th Andrew Partan added

"My viewpoint of the basic idea behind this NAP is to see if high speed Metro area connectivity will work for interconnecting multiple network providers on a NAP.

Three providers who did not already have high speed connectivity to College Park, MD (where the NSFNET and SURAnet already are) got together to get some physical infrastructure in place. And thus the Washington, DC prototype NAP was formed.

Current status is that the Sprint POP link is in and AlterNet is connected to it; the College Park link is in, but with nothing connected to it; and the WilTel POP link should be in on Monday Nov 9th. With some luck, the WDC NAP should be operational some time next week. As I said 2 1/2 weeks ago, other network providers are welcome to join with us in making this NAP a success.

wdc-nap@uunet.uu.net is a mailing list for this effort; send email to

wdc-nap-request@uunet.uu.net to be added to the list."

ANS as a Servant of the Public Interest: What the Form 990 Reveals

ANS Gains 501(c)(3) Recognition and Releases Its Form 990

Advanced Network and Services had been pursuing 501(c)(3) status for close to a year when, on September 14, 1992, it was finally granted. As early as June, requests had been made for copies of the ANS Form 990. At the time ANS avoided talking directly about this form. On November 9, 1992 the *COOK Report*, with the help of a reference librarian at a major university, obtained a citation from the *Bureau of National Affairs, Inc. Daily Report For Executives* September 22, 1992. This citation stated that on September 14, 1992 the IRS national office ruled on ANS' request to become a 501(c)(3). According to the *Daily Report* "the IRS classified the organization as a charity under Section 501 (c)(3), which is not a private foundation due to classification under Section 509(a)(2). The exemption letter provides a description of the tax liabilities and return filing obligations of the organization."

On November 9th the *COOK Report* released the news of the IRS action to the Internet Com-Priv mail list. Confronted with public knowledge of the IRS action, ANS replied that it had filed Form 990s with the IRS in April of 1992 and promised to mail copies to those who asked. While waiting for ANS to respond to its request, as a backup, the *COOK Report* submitted a request to the Brooklyn New York Public Affairs Office of the IRS for the Form 990, the Form 1023 and all supporting documentation, and the IRS letter to ANS recognizing the 501(c)(3) status. When as Editor of the COOK Report I received the form 990 from ANS, I asked Susan Eldred, ANS Public Relations Director, to send the Form 1023 and the IRS letter so that this article could benefit from all pertinent documentation. Susan refused to send the material, inviting me to come to their Elmsford NY headquarters to review it instead. Since Susan also made it clear that no one from ANS would answer any questions that I might have about the material, an all day round trip to look at material that I should get next month from the IRS did not seem to be a worth while investment.

The Form 990

Before going into detail on the information found in the Form 990, let me point out that I do not allege that there is any information in the Form indicative of any kind of illegality on the part of ANS. I do allege that there is a gap between the goals that ANS talks about and its actual "accomplishments." I also state that the chain running from the United States Treasury to the National Science Foundation, to the non profit MERIT, to the non profit ANS, to the profit making ANS CO+RE allows too many government and state officials to say that the public should go to the next entity in the grant chain to find out what is happening. These officials seem to studiously avoid any discussion of who is minding the public interest.

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I do also say that ANS has never demarcated its activities from those of CO+RE in such a way that an interested observer can be certain whether an action benefits ANS or CO+RE. And that it is also unclear whether CO+RE may be paying salaries to officers of ANS. While IRS recognized non profit status generally implies a public belief that an entity is operating on behalf of the "public good," in reality it can sometimes be used to clothe with benign intentions what for the most part is a nothing more than a standard business operation. It appears that ANS is a case in point.

The Form 990 covers October 1 1990 through September 30, 1991. Under contributions ANS lists income of $6,060,680 -- $3,000,000 from MCI and $3,060,680 from IBM. IBM and MCI had pledged a total of $5 million each to ANS. It is not clear whether they had already given the remainder of these funds -- the period from ANS's incorporation on September 13 1990 to Sept 30 1990 is not covered by the Form 990 -- or whether ANS has yet to receive this money.

On line 1c government grants, an amount of $9,343,046 is listed. This presumably represents funds from the National Science Foundation for running the NSFnet backbone. The NSF has stated that the money is paid to MERIT as the holder of the NSF award. Apparently MERIT simply passes the income through to ANS -- a convenient relationship that allows the NSF to support ANS indirectly and to explain that it is really MERIT that is accountable for ANS's actions.

Part III of the 990 is ANS's Statement of Program Service Accomplishments. Here it is instructed to describe what was achieved in carrying out its exempt purposes -- including a full description of services provided and the number of persons benefited. ANS's answer is quite brief: "development and operation of high speed network services of the benefit of the research and education communities throughout the United States." ANS lists the expense of

doing this as $7,279,504. ANS might have been more clear if it had said simply: run the ANSnet backbone on which we provide service to the research and education communities of the United States and on which we also sell access to commercial organizations.

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In the public mind there is a generally accepted belief that a tax exempt organization is providing a service that would not normally be provided otherwise, or at the very least that some people, who would not otherwise be served, are benefiting from the service being provided. As to the first question: we have yet to see a statement from ANS, MCI, IBM, or MERIT that they would refuse to accept federal money for providing T-3 backbone services unless it were done under a 501(c)(3) corporation. For the answer to the question of whether someone is being served who might otherwise not be served, we must turn to the question of the infrastructure pool promised 18 months ago by ANS' profit making subsidiary ANS CO+RE. As is pointed out elsewhere in this issue, neither the National Science Foundation nor ANS will confirm that the pool even exists let alone has disbursed any money.

On line 93a of Form 990 Schedule A ANS lists income of $118,226 from Network Services. On the same page in Part VIII it states that this "income helped expand the amount of network services available to be provided and added additional sources of educational and research organizations included on the network." It would be interesting to ascertain the exact services that ANS is talking about here. Since ANS refuses to comment, it is possible to take an educated guess. Early on ANS made three attachments to its backbone: CONCERT, the North Carolina state network, Purdue University and Virginia Polytechnic Institute. If these are the connections that generated the $118,226 in income, their connection to ANS at T-1 speeds may have increased the amount of network services available. However the one network and two schools were already attached to the NSFnet via SURAnet in the case of VPI and CONCERT, and NCSAnet in the case of Perdue. It appears that ANS was carrying out its tax exempt services to the research and education community by taking customers away from mid-level networks which also owed their existence to grants from the National Science Foundation.

We note that interest income and income from the sale of investments added another $193,802 to ANS' total income. "Contributions," program service revenue, interest, and sales of assets gave ANS a total income of $15,715,754. Adding the backbone (program service) expense of 7,279,504 and the management (salaries, etc) and general expense figure of 2,773,002 yields expenses of 10, 052,506. Subtracting the $10 million expense from the total income left ANS with a balance sheet "excess" of $5,663,248.

How Much Does the Network Really Cost?

Those who have followed the history of the cooperative agreement have heard much about cost sharing. The original $15 million pledged by the NSF for the five years of the agreement was said by Steve Wolff to represent between a third and a half of what it really cost IBM and MCI to deliver what was promised. Mike Nelson, the principal staffer on the Senate side for HPCC, often asserted that the National Science Foundation's agreement with MERIT combined with the public service of ANS was saving the tax payers millions of dollars because the Federal government was only having to pay for a fraction of the actual cost of delivering the network. By the summer of 1992 figures in the neighborhood of $100 million in cost sharing by MERIT, MCI and IBM were being bandied about. While most of these figures came from the National Science Foundation, none apparently ever came directly from MCI or IBM. However, to the best of my knowledge neither MCI nor IBM has ever denied them.

When it bought IBM's proposal to upgrade to T-3, the NSF increased what it paid MERIT from 3 to 10 million a year. From the ANS Form 990 it is interesting to learn that the expense of running the network for the first year (which was also the first year of the T-3 upgrade) was $7,279,504. A breakdown follows:

Network Costs	$7,118,434
Gateways	62, 277
Single Institutions	4, 319
Network Operations	67,659
Network Development	2,500
Local Loop Lines	10,961
Consulting	7,481
License Amortization	5,872

Part III Question 2 of Schedule A for the Form 990 asks whether ANS has "engaged in any of the following acts with a . . . creator of your organization: (c) furnishing of goods services or facilities?" ANS answers yes and refers the reader to Statement 7. There we read:

"1. Goods and services furnished by MCI Communications Inc. in the amount of $2,929,395. (T-3)

2. Goods and services furnished by Merit Inc. (one of the organization's creators) in the amount of $2,770,899.

3. Goods and services furnished by MCI Communications in the amount of $1,324,476. (T-1)

4. Services furnished by Merit Inc. in the amount of $55,305."

Item 1 obviously represents the cost of the T-3 circuits and item 3 the cost of the T-1 safety net circuits. Item 2 would represent the cost of running MERIT's Network Operations Center (NOC) in Ann Arbor. Item 4 might represent MERIT assistance to ANS in running a backup NOC in Elmsford, NY. These items total

$7,080,075 -- an amount which is roughly $38,000 less than the $7,118,434 network cost figure provided in Statement 3. Although the amount does not precisely match, if one adds to the $18,315 accounts payable to MCI listed as Statement 7, Schedule A, Part III, Line 2 b, 4, the difference is only $20,000. Now the language is ambiguous: "have you engaged in the furnishing of goods and services with a creator?" Does it mean have you furnished to the creator or has the creator furnished by you? In the case of ANS' response the goods and services were clearly furnished to it. One must assume that these are goods and services for which ANS had to pay MERIT and MCI. If they were gifts for which no payment was anticipated, one would expect to see them appear on one of the income lines in Part 1 page 1 of the 990. They do not appear there. So it seems reasonable to conclude that they represent the vast majority of the network costs listed in ANS' program service expenditure.

Now there is one part of the network expense which appears to be absent from ANS' accounting: the famous RS/6000 routers provided by IBM. The only entry in the Form that seems likely to contain the answer is Question 2b of Part III Section A: Lending of Money or Other Extension of Credit. In ANS' Statement 7 we find response 3 to Question 2b: "Accounts payable to IBM $2,660,000." Do these represent the roughly 30 to 40 routers necessary to serve the 16 backbone nodes supported by the NSFnet cooperative agreement? Only ANS can say for sure, and ANS so far has refused to comment. (If they do not represent the routers, it is then unclear what item on the 990 does. Perhaps we are meant to assume that IBM already gave them to ANS and that 7, 279, 504 dollars represents the total cost of running the backbone? However, if this is correct, what does the accounts payable to IBM of $2,660,000 represent?)

The Form 990 reveals grants of $9,343,046 from the US government. The network -- minus IBM's contribution -- cost in the first year of the T-3, $7,279,504. One must ask where the cost sharing has gone? If we assume that the $2,660,000 aacounts payable to IBM is to money for the routers that *Communications Daily* called "crippled technology," then we have a total expenditure by the spin-off that inherited the awardees' cooperative agreement of about $350,000 more than the $9.34 million paid by the US government. This is a long way from doubling the government's contribution let alone the tripling that has sometimes been suggested. NASA's critique of the NSF draft solicitation shows that cost sharing in the new agreement should be unnecessary. The ANS Form 990 appears to show that cost sharing at the end of this agreement is a myth.

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Balance Sheets and ANS CO+RE

ANS lists the following major assets: cash (non interest bearing) $3,431,351; accounts receivable $1,042,203; land, buildings, and equipment $4,485,961; note and loans $46,491; prepaid expenses and deferred charges $37,029; investments $1,000; miscellaneous deposits $3,410; deferred costs $647,720. The total listed assets are $9,474,364.

Liabilities include accounts payable and accrued expenses $2,976,262; deferred income and miscellaneous other liabilities $300,912 and long term debt owed to IBM credit corporation of $533,942. The difference between the assets and liabilities is the $5,663,248 net asset figure listed on line 21 page one of the Form 990.

Looking very carefully through the Form 990 usually makes it possible to determine how the various pieces are put together. However the one figure in the balance sheets section that seems a bit opaque is the land, buildings and equipment figure of $4,485,961. This is more than one would expect to find in the way of office equipment at ANS' Elmsford NY headquarters. One wonders whether it includes the RS/6000 routers and/or any equipment at the MERIT Network Operations Center?

Finally Part IX of Form 990 Schedule A lists ANS CO+RE as 100% owned profit making subsidiary which exists to "provide network services to commercial users and consulting services." The entry for CO+RE covers the first four months of its existence. It is listed as having lost $28,609 and having $12,200 in end of year assets.

ANS Salaries

Here is the list of ANS Officers and their salaries:

Guy Almes	VP	$44,074
Jordan Becker	VP	$80,138
Susan Eldred	Public Afairs	$28,750
Phillip Gross	VP	$38,631
Robert Harris	FinVP	$142,175
Alton Hoover	VP	$45,708
Joel Maloff	VP	$98,700
James Parker	Counsel	$112,800
Allen Weis	President	$195,833

All the officers are listed as devoting 100% of their time to ANS. Weis, Harris, Hoover and Parker are also officers of CO+RE. It is not clear whether they serve in those positions without pay.

In Part 1 of Form 990 Schedule A the names and salaries of the five highest paid employees other than Officers, Directors, and Trustees are listed:

Geoff Alswanger, M'gerFinance &Admin $39,749.94
LindaBoykin, Sales/ Client Service $42,500.04
John Miller, Staff Engineer $40,757.41

Peter O'Neil, Sales/ Client Service
$54,375.00
Don Wehe, Sales/ Client Service
$42,291.71

ANS states that there are no other employees paid more than $30,000 per year.

Trying to Understand the Function of ANS CO+RE

This section gives a summary of the relationship of ANS CO+RE to ANS. It will summarize the editor's understanding of CO+RE's function in the commercialization of the American Internet. (For an explanation of the emergence of ANS CO+RE readers should see the following article on the National Science Foundation's role in the infrastructure pool also in this issue.)

Four Definitions of Commercial Use

Commercialization and commercial use of the Internet can have multiple definitions. First one may define it narrowly as delivery by private companies of the standard range of network services to the academic and research community that here-to-fore has been provided by government subsidy. Second, it may be defined as selling research and education oriented goods and services to the network's research and education user community. Third, it may be defined as selling purely commercial goods and services to the network's user community. Finally it may be defined as use of the network by businesses for proprietary enterprise networking having nothing to do with the network's research and education community.

Business conducted under the second definition has, upon request, generally been blessed by the National Science Foundation as non commercial since it supports the research and education goals of the network. Examples are Dialog after it found itself cut off from a majority of the network by signing up as an ANS commercial customer and the World Internet Service run by Barry Shein in Boston Mass which, after a public discussion on the Com-Priv List by various universities which could and could not access it, asked for and received an exemption.

An example of business under the third condition would probably be McGraw Hill's Primus text-book-on-demand publishing subsidiary. However, if Dialog could claim that the use of the network to deliver searches of the Chem Abstract database -- to pick an arbitrary example -- is compliant with acceptable use policy, it is difficult to see why Primus could not claim that the delivery of text books to a professor's students was not also in support of research and education. Another more obvious example would be the use of the network by any computer company to deliver advertisements for its products or to deliver invoices and service information. However it is considered appropriate for any computer company, as long as it uses an appropriate network mailing list or discussion group to deliver an "informational announcement" about a new product or services including price information.

Shortly before adjourning this fall the Congress passed legislation which loosens the network AUP policy further. The new language as stated in HR5344 says "the Foundation is authorized to foster and support the development and use of computer networks which may be used substantially for purposes in addition to research and education in the sciences and engineering, if the additional uses will tend to increase the overall capabilities of the networks to support such research and education capabilities." Under this definition one would assume that commercial use under definition 3 above would also be AUP compliant. However NSFnet Director Steve Wolff has not yet spoken on this point.

Business under the fourth condition would include corporations which used the NSFnet backbone to link local area networks and shipped invoices, spreadsheets, or various other kinds of proprietary data over the network. This kind of usage would clearly not be in support of research or education. There is some debate about whether corporations would use the network in this manner even if they were invited to. It is assumed that they would generally be hesitant to undertake such use because of security concerns. While the use of encryption might help, it is not considered to be a fool proof protection. The consensus of a recent discussion on this subject on the Com-Priv List was that while large corporations would be unlikely to use the net for this purpose, a goodly number of small companies would.

Uses of the second and third kinds fall into a gray and misunderstood area. It has been reported to me on many occasions that ANS tells potential clients that only they can give commercial access to the ANSnet/NSFnet backbone and that the safest course is join the network as a commercial client of ANS. However, when Dialog did this almost exactly a year ago, it found that much to its surprise, it was able to do business with only with institutions connected to mid-levels that had decided to go along with ANS' other stratagem for commercial use -- its Internet Connectivity Agreement -- a no obligations version of the ANS CO+RE Gateway Services Agreement and the Enterprise Attachment Agreement.

Dialog and network users rebelled. An angry debate ensued that finally found its way to the pages of the December 19, 1991 New York Times. Dialog applied for and was granted dispensation as a research and education client. ANS pulled the filters blocking access to Dialog from the mid-levels that had not signed the Internet Connectivity Agreement, and for a while everyone was happy.

At the time the figure of one fourth of the mid-levels was tossed around as number that had signed the connectivity agreement. Since then ANS states that the number has risen to one half. However when asked to identify which mid-levels have signed, ANS declines. The Editor is aware of the following signatories: CICnet, MICHnet, NYSERnet, BARRnet, NEARnet, OARnet, and CONCERT -- less than one fourth the number of mid-levels.

ANS has never to the Editor's knowledge stated whether it has sold a Gateway Services Agreement or an Enterprise Attachment Agreement. It certainly has its Plan for Commercial Services still in effect -- a considerably updated version from what existed a year ago is available via FTP from ANS. That plan makes it clear that commercial users will be charged extra fees -- a portion of which will go into the talked about but as-yet-unseen infrastructure pool. ANS also explains the necessity for the extra fees by saying that they will make it possible "to recover the costs associated with the commercial traffic." When asked to explain what these costs are, ANS refuses to comment.

ANS has apparently sold commercial attachments to other information ser-

vice providers such as McGraw Hill. (The CEO of McGraw Hill is a Director of ANS.) It is not clear whether these companies have access only to the mid-levels that have signed the ANS connectivity agreements.

BARRnet and NEARnet have signed a agreements with ANS where their customers who wish to have commercial use of the ANS backbone can have such use for a 15% surcharge on their yearly mid-level connect fees. These mid-levels apparently collect the fees and pass the money through to ANS.

In explaining why they have signed they also add that their customers will gain, as an added benefit, access to a dozen or so ANS commercial information service providers. This leads one to conclude that these companies are blocked from access to those mid-levels that have not signed the ANS agreements. Of course now that ANS has entered into a one year interconnect agreement with the CIX, such companies can presumably use the ANS CIX gateway to get to users of the Commercial Internet Exchange.

At the heart of this appears to be ANS' unremitting interest in com-bits -- a very complex plan to measure the traffic of commercial users of mid-levels that do sign the Gateway Agreements. . . . .. In arguments both public and private over the past two years ANS has placed itself squarely in favor of payment by measured use of the network and "settlements" between networks paid to those providers who receive more bits from a network than they send to the same network. The CIX has declared itself to be totally opposed to the ANS interest in settlements. . . . . In short ANS seems determined to impose operational and billing patterns on the network that are opposed by almost all other network providers.

At the heart of this appears to be ANS' unremitting interest in com-bits -- a very complex plan to measure the traffic of commercial users of mid-levels that do sign the Gateway Agreements. In such a case charges will be based at least in part on the amount of actual data passed through the network by the customer. In arguments both public and private over the past two years ANS has placed itself squarely in favor of payment by measured use of the network and "settlements" between networks paid to those providers who receive more bits from a network than they send to the same network. The CIX has declared itself to be totally opposed to the ANS interest in settlements. The result has been a split between the eight commercial Internet service providers that make up the CIX on the one hand and ANS in isolation on the other hand. In short ANS seems determined to impose operational and billing patterns on the network that are opposed by almost all other network providers.

For whose gain ANS is acting is not clear. ANS says it is acting to better the network by building up the infrastructure pool that will be used someday for purposes yet to be decided upon. The way ANS positions its talk about the pool leads one to believe that it should be ANS' principal program service activity -- an outcome that apparently is impossible since the pool is kept on the profit making rather than the non profit side of the house and therefore apparently does not have to be publicly discussed by ANS.

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Conclusion

The entire commercial use controversy needs careful re-examination. There are many kinds of commercial use. If commercial development of the network is going to actually benefit the research and education community, it must entail getting large corporate users onto the network for enterprise networking having little if anything to do with the R&E community. If ANS could demonstrate that it was attracting the Fortune 500 in droves to ANSnet, that should bring true economy of scale to the network and bring in profits to CO+RE that would indeed fill the infrastructure pool to overflowing. Apparently, given its refusal to discuss the infrastructure pool, it can demonstrate nothing of the sort.

Instead with its unwillingness to answer questions, it creates suspicion that with it emphasis on recovering unacknowledged additional costs of commercial usage, it is looking for any gimmick possible to help it squeeze additional income out of its market place niche. And what is not clear about ANS CO+RE is whether it functions only as an accounting mechanism for the receipt of funds from what so far appears to be a dearth of ANS commercial customers, or whether it has its own staff and payroll. Again it would seem as though these would be simple questions for ANS to answer. Silence doesn't seem to be an appropriate response. Unfortunately after two and one quarter years what ANS has brought into the network community is dissension and controversy -- along with a somewhat faster backbone.

A Note To Readers: ANS Offered Opportunity to Reply

The text of this article was sent by the Editor to ANS Public Affairs Director Susan Eldred on Wednesday evening November 25th. This Editor invited ANS to write its own comment on the article and promised to publish any comment up to 10,000 characters in length, unedited in this issue if he received the comment by 6pm Monday evening December 1, 1992. Realizing that such a deadline might not allow ANS enough time, he also offered to print any ANS response received by December 15th, unedited and complete in the January issue of the Cook Report. We will go to press Monday afternoon December 1. If ANS does respond, ann additional two pages will be added and mailing will be delayed by 24 hours. If readers do not find an ANS response in this issue, they should assume either that ANS has chosen not to respond or that its response will be printed in the January issue.

What Does ANS CO+RE Give the Network? Questions about the Infrastructure Pool

In late October and early November some questions about ANS' plans for an infrastructure pool were raised on the Com-Priv Mail List. When neither ANS nor the NSF would answer them, the Editor posted the following analysis to the List:

Origins of the Infrastructure Pool

Point 1. ANS is announced in mid September 1990. From the very start it is explained that ANS will be a non profit entity with *one* goal - enriching and building a stronger network *infrastructure* so that our colleges and universities would have the best computer networking technology in the world. It was likely assumed that further contributions from IBM and MCI to ANS would be the source of the *money* used to build this better network for our researchers and educators.

Point 2. By May of 1991, it had become apparent that ANS was a network service provider out to make a buck like PSI and Uunet. A lot of people were becoming very nervous about ANS's privileged position as sole holder of the right to sell commercial transit of the backbone. (Note that it used to be called the NSFnet backbone, but that title was already dissappearing in favor of ANSnet backbone.) People wondered how much longer a would be non profit could hide solely behind non profit status as a seller of commercial access to the network. The way in which ANS would benefit the network in return for the non profit status that it desired was no longer so clear.

Point 3. The answer came in ANS's announcement of their for profit CO+RE at the end of May 1991. Profits from CO+RE would be plowed back into ANS which would use them to enrich the network infrastructure. In the press release posted to com-priv on June 10, 1991 ANS said:"revenues from the provision of CO+RE Service, after covering associated expenses, will be used to enrich national networking infrastructure."

The press release quotes Steve Wolff as NSFnet director as saying: "the new service will not only enrich the network resources accessible to the research and education communities [that] the National Science Foundation is charged to support, but will enable all network users to benefit from the infrastructure enhancements and accompanying economies of scale."

Point 4. At the same time (May 24th 1991) the NSF had initialed a second agreement with ANS and MERIT. There the NSF pledged that "ANS MERIT and the NSF would agree on the technical means of compliance with the points outlined above."

In Wolff's May 24 1991 email to Eric Aupperle in which he gave his blessing to the ANS plan (and which has become known as the second agreement), Wolff stated that NSF approval for the launching of CO+RE rested on four conditions:

"(1) ANS recovers at least the average cost of the commercial use that traverses the NSF sponsored gateways.

(2) Excess revenues recovered above costs for this use after tax will be placed in a pool to be distributed.

(3) An ANS resource allocation committee will be formed with representation from the participating NSF sponsored gateway management, other network organizations, the NSF and ANS to distribute those funds with the objective of further building national and regional infrastructure, and

(4) MERIT and ANS ensures that the attachment and service sponsored by the NSF under Merit's Cooperative Agreement with the NSF is not diminished."

Thus the NSF itself appears to have made the formation of the resource allocation committee and infrastructure pool a pre-condition for approving the formation of CO+RE and its shipment of commercial traffic over a resource that was at least paid for in part by the US government.

Point 5: If am not saying that Steve Wolff, as the representative of the NSF and therefore the public interest was not well intentioned when he made this agreement with MERIT and ANS. I *am* saying that after the passage of 17 months, as the designated steward of the well being of the network, it appears to me that he should have some obligation to *enforce* in clear public view the conditions that he insisted ANS agree to.

NSF Responsible to Protect the Public Interest?

After 17 months I'd like to see some response from Dr Wolff about the benefits gained by this no-longer-new twist in the development of the ANS saga. Steve's determined silence on this point leads me to wonder whether the NSF is excercising any further stewardship over the development of the network? Or is he silent because ANS has no real intention to carry out its obligations in a good faith manner?

Of course there may be nothing in the infrastructure pool because there are no profits from ANS with which to fill it. If this is the case, it is time to admit this and not carry forward any further the pretence that ANS is doing something in the public interest on behalf of network infrastructure.

And while Steve obviously has no specific duty to me or to any other member of the press to report on the NSF's stewardship, I'd like to ask the network community represented on this list whether it feels that he has no duty to the community to respond to it?

I think he has such a duty.

When was the Resource Allocation Committee formed?

Who sits on it?

What resources are there to allocate?

Steve's stricture says revenues above costs will go in the pool. Where are

these revenues? If they were not gained, then it seems to me that the concept isn't working and it is time to go back to ground zero.

If there is no pool because there are no profits (or "revenues above costs", then what is BARRnet doing in formulating a plan to have its members pay an extra 15% for commercial use of this government provided backbone? If the NSF disagrees with my question and really now intends for commercial use surcharges to subsidize regular ANS operations, then someone should say so.

It seems to me that the NSF has made a committment. It seems to me that if ANS won't answer the questions about the infrastruture pool that are being raised, that the NSF must be obligated to do so. If the NSF is not so obligated I'd like to know why.

If not from Dr Wolff, where and when will the public at large know what actions are being carried on behind closed doors between a public agency charged by congress with carrying out a public trust and a private company whose track record has become highly controversial?"

Greeted with no response from either the National Science Foundation or from ANS, I did receive many private messages of encouragement from network users. A few days later, I wrote the following comment:

"The April 1992 verson of ANS' Plan for Commercial Services lists entities who will have seats of the Resource Allocation Committee for the Infrastructure Pool-- (if such a committee is ever actually formed by ANS). Among those who will have seats are "several network service providers who are participants in the AIC Agreement."

AIC stands for ANS Internet Connectivity (page 4 of the latest version of ANS' commercial plan.) It seems to be the name chosen for signing the no-strings-attached connectivity agreement between a mid-level and ANS under the terms of which the mid-levels allow ANS commercial traffic to be received by their users. Such networks can apparently accept commercial traffic without rendering themselves liable for com-bit inspection and settlements.

Mid-levels opting for ANS CO+RE Gateway Attachments apparently become liable for settlements. On page 6 we find the sentence:"the fees from these attachments enables ANS to receover the costs associated with the commercial traffic and contribute *additional* funds to the infrastructure pool."

All this brings to mind the following questions:

A: What advantage would a mid-level gain by accepting a CO+RE Gateway contract? Have any mid-levels actually done this?

B: There will certainly be costs associated with the measurement of com-bits. Are these there any other "costs associated with the commercial traffic" besides the costs of measuring com-bits?

C: Why does it become a productive endeavor to spend ones time incurring the costs of measuring com-bits?

The reasoning here seems to be circular in form - unless the intent is to create a foundation for changing NSFnet usage rules to the measurement of and charging for data sent by individual users?

Is this the intent?" Again the NSF answered with silence.

A Critique of the "Official" Point of View

During this same time period, Marc Horowitz a NEARnet user asked about NEARnets plans to ship commercial data via ANSnet. John Rugo responded with the following reply:

"Marc,

As a general comment, the Internet is going through an administrative evolutionary step. As noted in a previous message to this list, the government did at one time pay for the Internet. Government agencies provided funding for specific purposes; DARPA for research in advanced technologies and NSF for the advancement of education. However, the potential uses of this technology have consistently exceeded the bounds of the purposes of those funding organizations. Networking provides a platform for communication among people, who have typically more than one dimension. Take as an example a university professor who is also trying to patent the results of some of his or her reseach. Are his or her efforts academic or commercial? Who can say?

It would have been nice in 1985, when NSFnet was "born", if there were a commercially provided data network, based on an open protocol suite like TCP/IP that the NSF could recommend to its constituents as the means for inteconnecting. However, it did not exist. The telcos at that time did not see the market for such a network. Even today they have doubts about the size of the market for such a service. Some have started to dabble in it, US West is talking about it, Sprint now offers SprintLink (SM) through its Government Services Division, MCI and AT&T have been behind the scenes as participants in regional or national networking efforts. Seven years later, after meteoric growth, the Internet is still not a proven market to them.

Given the situation in 1985, I believe that NSF needed to do something to get its constituents connected. Thus was born the idea of the NSFnet with its hierarchial structure; national backbone - regional service providers - organizational networks. Some of these networks received funding from NSF for their operations, others, like NEARnet, have not received direct funding for operations. NSF has allowed all Internet service providers; PSI, Alternet, NEARnet..., to interconnect with the backbone without charge, as long as that traffic was consistent with their goals for the network. Specifically, this means in support of Research and Education, which are defined in broad terms. This restriction is embodied in the much-debated Acceptable Use Policy (AUP).

Today, however, the situation has evolved. Organizations would now like to use the Internet for other, more commercial purposes. They would like to do so without violating the NSFnet AUP. This presents all Internet service providers with a dilemma as long as the NSFnet is the center of the network and is the fastest and most widely dispersed network. I believe that ANS is simply trying to allow organizations who want to use this existing infrastructure for purposes outside of the AUP to do so without violating the policy. As I understand it, from an accounting perspective the NSF is not the owner of the ANS equipment that is

used to provide the NSFnet, ANS is. Therefore, NSFnet is a "virtual" network running over the ANS-provided infrastructure. Surely the NSF is today ANS' largest customer.

This places the ANSnet in the center of the network, not the NSFnet. ANS is now able to provide access for commercial purposes to the fastest and most widely distributed backbone available today. Comparing that infrastructure to the CIX router is like comparing a new Porsche to a 1962 Volkswagon beetle - they are both cars, but they have very different performance characteristics. NEARnet has therefore decided to use the ANS infrastructure to reach the CIX router, which is on the other side of the continent from our geographic area. It allows us to offer the best of both worlds to our members, fast access to most of the Internet plus access to the CIX interconnected networks.

However, both approaches do allow for the Internet to transition its funding from primarily government to the private sector. We have agreed to charge our members an incremental fee for commercial access because it provides an alternate source of funding for the national infrastructure. If you think of NEARnet as an RBOC and ANS as an IXC carrier, we are simply paying for long-haul network access. It is my hope that someday there will be a self-funding, commercially available, ubiquitous data network with a range of access options. We are not, however, at that point today, though we are in transition toward that goal."

- John M. Rugo
NEARnet Project Manager
BBN Systems and Technologies

The Editor posted the following reply to John Rugo

John Rugo's reply to Marc Horowitz needs to be challenged. It reads like an account from the NSF and ANS of what was *intended* to be. Lets not confuse *intent* with *reality*. Here is what I understand to be the *reality* of the the situation. Taking John's points in the order he makes them:

1. the professor who wants a patent for the results of research -- it seems to me this is but one more example of the approach that I am told ANS uses to sow doubt in the minds of corporate types: commercial use is banned and no one can exactly define what commercial is, so you better be safe and stay out of trouble by signing with us, the *only* one who can give you commercial use of the backbone with the greatest speed and domestic connectivity.

This when the reality is that AUP is unenforcable, and has been watered down to such an extent that any use that tends to benefit the research and education purposes of the net is acceptable, -- and when incidental misuse is forgiven.

2. John says: "seven years later the internet is still not a proven market to them."

I'd invite some folks from the telco's to comment on whether they think the internet is a proven market. It has been asserted in the trade press that TCP/IP over WANs to link the LANS of Fortune 1000 comapnies around the world is a current $2 billion a year market.

3. John says: "I believe that ANS is simply trying to allow organizations who want to use this existing infrastructure for purposes outside of the AUP to do so without violating the policy."

A very charitable assumption: consider Dialog -- ANS's much vaunted "first" commercial customer. They apparently were sold a commercial contract by ANS because they would be selling data over the net and that would be commercial use of the net. Yet when this blew up in ANS' face last Dec and January, Dialog was given the AUP approval that they could have had from day one if they had only known to ask for it.

Now NEARnet has a majority of commercial customers who are on the net primarily for research and education purposes. ANS is asking and apparently NEARnet is agreeing to collect the 15% tariff for them to have the approval necessary to use the ANS backbone for commercial purposes.

What are the purposes? It would be instructive to be given some examples. Has WANG ellected to use the backbone to send out service orders and manual pages to its field service techs? Or DEC? Or IBM? That would probably *not* be AUP compliant. Is it being done? Will it be done?

These corps all have their own major networks. Why would they need ANS' backbone? It is very unlikely that theywould ever use it to ship proprietary corporate data.

4. John says: "this palces ANS in the center of the network, not the NSFnet."

Unfortunately this seems to be increasingly true. Nevertheless I object and I suspect others do also to the idea that a government agency using public funds has nothing but customer status and that such agency apparently is either unwilling or unable to get accountability from ANS even as it prepares to give ANS another 18 months control of the NSFnet backbone. Anyone here believe that ANS would last more than 6 months without the NSF as a customer?

Still I am privately told that the NSF has *no* authority over ANS because MERIT acts as a buffer between them. How convenient! It would be instructive to know whether the NSF has asked MERIT about the infrastructure pool and whether MERIT has gotten any answers for the NSF.

5. John says: "ANS is now able to provide access for commercial purposes to the fastest and most widely distributed backbone available today. Comparing that infrastructure to the CIX router is like comparing a new Porsche to a 1962 Volkswagon beetle - they are both cars, but they have very different performance characteristics."

Lets be serious. The NSF has for two years been paying for a 45 megabit per second backbone. They and ANS both know that what has been paid for has *not* been delivered! If the NSF did its business in the same responsible way that NASA and DOE are doing their networks, ANS as service provider would be in the position of having to refund a portion of what it was paid for "non performance."

Two questions: First clear channel speeds -- at the end of the summer Brian Lloyd complained to this list that he was unable to send packets from BARRnet onto the backbone at greater than 10 megabit speed. Has this changed? Are there FIDDI lans at the BARRnet and NEARnet ends of the ANS backbone that would make a greater than 10 megabit per second session possible between two end users?

Second agregate bandwidth. It is my impression that the agregate bandwidth on the T-3 net when its IBM routers don't flapp is in the 4 to 6

megabit per second range and that it has been doing this well for only the past 3 months or so. Would anyone be willing to confirm or deny?

Bursty traffic -- anyone have stats on the greatest aggregate throughput on ANSnet for a one hour period?

62 Beetle compared to a porsche???? How about a 62 beetle compared to a 64 Chevy V8 with holes in its manifolds!? As I have said before Cisco with the AGS+ does make a proven Porsche engine. Why say anything that contributes to the ANS speed mythlogy? Anyone here remember the *Chronicle of Higher Education* quoting Al Weis in late September 1990 along the lines that he hoped to be delivering a gigabit backbone within two years? And how many times during ANS' first year did he talk publicly about going to OC-12 by 1993?

6. John says: "We have agreed to charge our members an incremental fee for commercial access because it provides an alternate source of funding for the national infrastructure. "

John how does it provide such a source? Where is ANS' much vaunted infrastructure pool? What you say is in keeping with the ANS view of the world for sure. But before *I'd* believe it any longer, I'd like to have some proof that these funds are indeed being fed in some way back into the R&E community.

7. John says: "If you think of NEARnet as an RBOC and ANS as an IXC carrier, we are simply paying for long-haul network access. "

The analogy is not quite apt because ANS can also function as an RBOC in connecting institutions *as well as* networks to its backbone. If ANS were ONLY an IXC, some folk would breathe easier."

ANS Network Map Shows 29 Attachments from September 1990 to June 1992

According to a map titled "ANSNET/NSFNET T3 topology" and dated May 29, 1992 ANS during the first 20.5 months of its existence made 29 attachments to its national network in addition to the 16 NSFnet backbone sites and the FIX East and FIX West sites.

Here is a listing of the 29: NW Nexus, an IP dial-up service provider is connected to Seattle. Lockheed and Dialog are connected to San Francisco. Chevron and an entity called SuperNet to Los Angeles. Purdue, Chicago Research and Trade, Sears, Abbot Labs, and MCI Mail to the Chicago node. Lexmark and the University of Louisville to St Louis. IBM Austin and something called ITESM to Houston. MCI-Southfield, OARnet and Mead Data to Cleveland. Legislate, described by a librarian as a very expensive re-seller of the online data bases of the United States Congress, in Washington. Union Carbide, VPI, and CoNCert in Greensboro. JP Morgan investment bank, City University of New York, NYNEX, McGraw Hill, IBM Watson Labs, ANS headquarters, Xlink connecting the University of Karlsruhe in Germany, and the IBM Information Network in New York City.

Several of the entities connected have links directly traceable to ANS, IBM, MCI orbit. Sears in Chicago is presumably a customer because of the Sears IBM network outsourcing company called Advantis formed earlier this year. Lexmark makes dot matrix printers sold under the IBM nameplate. McGraw Hill's CEO is a Director of the ANS. Mead is also connected to JVNCnet. The two IBM and two MCI sites are there presumably in support of the IBM MCI offspring. Finally there is the IBM Information Network. In short eight of the twenty-two business connections can be traced to the corporate parents.

ANS has three full time salespeople and three vice presidents (Maloff, Almes, and Hoover) who are essentially full time sales people -- not to mention its president and two technically oriented vice presidents (Becker and Gross) who can presumably also sell. Yet if the network map I received is accurate, its sales in a national market are on the whole less than those made by most mid-levels during the same period of time.

MFS National WAN (cont from p 5.)

network, big or small, can take advantage of our services. More than ever before we can now provide telecommunications services that mesh with a customer's use patterns or that may not be available elsewhere."

AT&T Challenges DOE/NASA Award to Sprint

The *COOK Report* learned shortly before press time that AT&T has challenged the award of the ESnet and NSInet backbones to US Sprint. (See September *COOK Report.*) This award appears to have been a innovative effort that clearly will help the goals of the NREN program. The Editor is sorry to learn of the challenge and looks forward to the day when AT&T will offer commercial TCP/IP services on its own instead of protest such awards to its competitors.

Bulletin --
NSF Complies with *COOK Report* FOIA Request on Infrastructure Pool

At noon on November 30, 1992 the US Postal Service delivered an envelope from the National Science Foundation containing approximately 250 pages of information on commercial use of the T-3 net, the Infrastructure Pool, the Resource Allocation Committee, and so on. Included was a letter from Eric Aupperle of MERIT dated November 20, 1992 and received by the NSF on Nov. 24th explaining how MERIT would ensure technical compliance with the NSF's demands of May 24, 1991. From a hasty look at the material, it was very evident that the questions raised on Com-priv and reprinted in the article on page 12 of this issue had an impact.The January issue of the *COOK Report* will include an analysis of this material.

ANS Accepts Invitation to Respond to *COOK Report* Article on Form 990

Printed below, complete and unedited, is ANS' response to the article on its Form 990 that begins on page 7.

We at ANS have made many attempts at reasonable communication with Mr. Cook, but we have failed. From his actions and from discussions that we've had with him, we can only conclude that Mr. Cook has a deep-seated, personal bias against ANS, primarily because he erroneously believes that the company was responsible for difficulties he encountered with a past employer.

The article concerning ANS' status as a nonprofit organization is yet one more example of Mr. Cook's habit of starting with factual information, which he then distorts to reflect his own biased opinions. As usual, the result in no way resembles the truth. To comment on or attempt to correct the errors in this article, point by point, would only prompt more absurd accusations from him and would not serve to clarify any relevant issues.

However, we do want to make several points. First of all, from the outset, ANS has said that it wanted to bring commercial funds to the national network infrastructure, so that a more robust backbone could better serve all the users, particularly those in the Research & Education community. We maintain that this is the right approach, and that we've made real progress toward this goal. Secondly, the formation of our two companies, one nonprofit, the other for profit, helps ensure that we pay our fair share of taxes.

Furthermore, we strongly disagree with the article's conclusion. It is Mr. Cook who has brought dissension and controversy into the network community. Keeping futile, circular discussions going serves his purposes. However, by reporting on the topic of commercialization of the Internet in such a biased and irresponsible fashion, he does a disservice to the members of the Internet community and the supporters of the NREN.

A Reply to ANS:

ANS in its comment omits a very fundamental point: it has been placed by the administrative action of the National Science Foundation in the "driver's seat" of one of the most critical Federally sponsored technology issues of the last 20 years. If access to information is access to power (economic or political), access the current Internet and future NREN could very likely be a critical determinant of the economic well being of many Americans. NREN was nurtured during the heyday of the privatization of public resources, including taxpayer-paid-for databases, several of which have become so expensive that they have been priced out of the reach of those whom they were intended to serve. In the rush to privatize the NREN, someone should mind the public interest, lest control of the NREN fall to an entity that sees it only as a source of commercial gain.

By privatizing the NSFnet backbone, ANS has placed itself in the position of being able to exert such control. At the Office of Technology Assessment I had an opportunity to try to define the issues of emerging NREN policy development in such a way that the Congress would get an officially-sanctioned report that would help it understand a critical technology initiative of extremely wide ranging ramifications and Byzantine complexity. My first task was to familiarize myself with the complete range of NREN technologies, stakeholders and changing alliance. The next duty was to articulate the policy issues involved and build a coherent understanding of the alliances at work as well as to articulate options for Congress in such a way that the Congress could understand their implications for various stakeholder communities. Finally the charge was to write a final draft of a report in the very precise policy analysis language of OTA within the time constraints imposed by a vanishing budget left over from a previous project director.

I did all of this under very unusual and difficult working conditions, having run a course of interminable obstacles, and left OTA with a draft of material that in my opinion could have become a report releasable to the Congress. The report however belongs to OTA and not the Project Director, so I have no way of knowing what happened to it in the midst of an intensely political process after I left.

The experience however left me with an determination that the rather unique body of knowledge that I have gained by constant immersion in NREN over two years not be wasted. (Congress, the public, and the public interest should get *some* benefit from the more than $200,000 spent on the OTA study that by all indications will never see the light of day.) Consequently I have begun to publish the *COOK Report on Internet -> NREN* in the hope of being able to speak as an independent entrepreneur for the public interest. Dependent for my income on none of the interest groups entangled in NREN, I can be an iconoclast and challenge sacred cows -- something I have done and will continue to do.

ANS has *not* made many attempts at reasonable communication with me. Since I left OTA they have never once afforded me an opportunity to sit down with them and get their answers to the questions I am asking. I very specifically tried to do this with their incorporation papers last May. The attempt failed. I tried it again with my article on their 990 in this issue. It failed again. I can only conclude that they have no wish to talk to me because I know the subject so well that I wind up asking questions they simply wish not to have to answer. Again ANS complains of errors in the Form 990 article. But given the chance to correct them it prefers not to.

And now I find out that ANS believes it is I who have brought dissension and controversy into the network community. They credit me with far more power than I wield, for unfortunately I had nothing to do with the emergence of the CIX. Or with the stinging public critique of them and the NSF by Mitch Kapor and Dave Farber almost exactly a year ago. Or with John Markoff's December 19th article on "monopoly fear" in the *New York Times*. Or with the decision of Congressman Boucher to haul MERIT and the NSF before his committee to testify in March of this year. Or Communication Daily's blistering attack from July of 92. Or with Vice President Elect Gore's original formulation of the NREN public interest as one of giving that little girl in Tennessee the chance to connect to the Library of Congress to do her homework on dinosaurs. Because I owe nothing to any of the power brokers or interest groups behind the deals that are being made, I will continue to report on events as they happen, with the hope that, if some light is shed into some dark corners, the NREN may serve public as well as certain narrow corporate interests. If it so wishes, let ANS talk of personal grudges. I have talked and will continue to do so of a commitment to defend the public interest which is why I offered them this chance to respond in the first place.

Routers Are Said To Face Unique Challenges Given Complexity of the NSFnet Backbone

Earlier issues of *The COOK Report* have commented on the controversy over the IBM RS/6000 routers on the ANSnet backbone. While RS/6000 has had more than its share of problems, it apparently has to cope with routing complexities on the ANS NSFnet backbone that according to some opinions expressed are unique. In mid November on the Com-Priv List the following part public part private exchange took place.

[**Editor's Note**: By the way for obvious reasons whenever I publish material that originally occurred on the network as a private message, and is not otherwise a part of the public record, I do so only with the author's consent and review.]

Brock Meeks wrote: "Now, while I'm at it, let's stop all the Cisco cheering at the expense of the IBM T3 router. We all are painfully aware that the IBM T3 routers are held together with what amounts to duct-tape and bailing wire. These pieces of hardware were simply never meant to handle this function. Someone should put those poor RS/6000s out to pasture. OK, enough of that.

Karl Denninger responded: "Yep. That is not a reasonable architecture for a high-performance router (the RS/6000). It is ill-suited for the task really (a workstation architecture is the wrong choice).

Meeks added: "*But* the Cisco AGS+ routers are smoke and mirrors, too, folks! No one has *ever* demonstrated that the Cisco routers can handle this complex routing task at a full clear channel T3. Cisco sits back, reads this list and smiles at the free publicity; but the marketing execs are sitting there with sweaty palms, knowing their necks are soon going on the line. They will have to put up orshut up very soon now. Why? Because they are on the hook to make the DoE network run at full T3 and do it by January. Not under thisinterminable "cooperative agreement" NSF situation, but underhard, specific performance defined contract."

Denninger responded: "That is correct. They are ALSO not the right choice. The AGS+ is a nice router. It works reasonably well. But it has limited route table space (read: unable to handle a large number of routes quickly) and its "fast packet switch" only works on a single board. There are several problems under 45mb/sec loads which I'm sure CISCO is aware of. Can they do it? Perhaps. Can they handle the full expansion of the IP space? Not on that architecture."

The COOK Report asked Scott Bradner the Chairman of the IETF Benchmarking Methodology Working Group and consultant at HARVARD University's Network Test Device Lab to comment. Scott responded by private email:

Gordon,

I publish the quantitative results that I get from testing devices and have not yet been able to test the NSF backbone router.

There are test results on hsdndev.harvard.edu in pub/ndtl on AGS+ routing ability and on IBM 6611 (i.e. not the NSF router). The AGS+ data includes the results of some T3 tests. But these tests do not represent the conditions that are present in the NSF backbone. I run with at most 36 routes, the NSFnet has more than 6,000. While the AGS+ can "fast switch" with 36 routes, I have no way of checking if this is true when there are 6,000 routes. The 6611 can deal with 100% of an Ethernet when routing larger frame sizes and seems to have a clean scaling with the number of interfaces but the 6611 does not support FDDI or T3.

The bottom line is that I do not have enough data to be able to make any predictions as to the performance characteristics of any routing device (including the Cisco AGS+ and the IBM NSFnet router) in the type of network environment that the NSFnet is.

As far as the technology, there is little difference. About the only thing is that the IBM uses general purpose RISC processors in its interfaces and the Cisco uses a bit-slice. It could be that the IBM would scale better than the Cisco for the NSFnet type of case because of the large amount of memory they can put on the RISC processor for each interface and because of the ability of the IBM to transfer data between interface cards without having to go through any single central point, all of the AGS+ traffic goes through the cBus controller. But that is theory, the same kind of theory that has bridges being faster than routers because of the router's complexity but in the "real world" there are routers that can deal with 100% of an Ethernet in all possible cases so the theoretical advantage of bridges is not relevant. (By the way - in the design area, the IBM router is almost identical to the Wellfleet Backbone node)

The difficult area for any device of this type is not the actual movement of data, it is the process of selecting where the data should go. Increasing the ability to just forward packets does not, by itself, translate into a device that has a higher effective data rate in the real world.

Scott

In reply to Scott's message *The COOK Report* asked: "Can you give an example of a large corporate type of network where Cisco would route? How many routes could you expect to find there at a maximum? Does the number of routes have something to do with the number of hosts on the *same* corporate net --perhaps several thousand -- versus the number of hosts on *different* nets as in *inter* nets?

Scott answered:

There are only a few corporate networks that exceed 500 nets, most routers can deal with that without much problem. The routing table is independant of the number of hosts, it is related to the number of nets. Some routers do have routing caches that deal with host to host links and there the number of hosts can make a difference.

By the way - there are very few non-sna networks that have anywhere near "thousands of hosts" the trend is to fewer hosts per net (i.e. more routers).

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