

FOOL US ONCE SHAME ON YOU—FOOL US TWICE SHAME ON US: WHAT WE CAN LEARN FROM THE PRIVATIZATIONS OF THE INTERNET BACKBONE NETWORK AND THE DOMAIN NAME SYSTEM

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I. INTRODUCTION

The Internet has transformed our everyday life. Already in the United States, more than 100 million people use the Internet for communication with

friends and family, as an information source, and for electronic commerce.¹ The Internet has also become a tremendous economic force, as illustrated by the \$919 billion in electronic commerce transactions this year and the \$6 trillion expected by 2004.²

The Internet's origins date back to the 1960s with government-funded research into computer networks. Over the last ten years, the U.S. government has begun to shift control of the Internet to the private sector, a process called "privatization".³ The first major privatization occurred in the early 1990s when the government shifted from the practice of contracting out a government-subsidized backbone to that of allowing the market to provide backbone services.⁴ Recently, the government has begun to privatize another portion of the Internet, the Domain Name System (DNS).⁵

Histories of the Internet abound, yet a comprehensive account of the privatization of the Internet's backbone network does not exist.⁶ When it comes to describing the transition of control of the Internet from the government to the private sector, the descriptions suddenly shift to the passive tense.⁷ It becomes unclear who the actors were and what actions they took to

1. See Computer Industry Almanac, Inc., *U.S. Tops 100 Million Internet Users According to Computer Industry Almanac*, available at <http://www.c-i-a.com/199911iu.htm> (last modified Nov. 4, 1999).

2. See Bob Tedeschi, *Revised Forecasts Area Reminder how Quickly Business Assumptions Can Crumble*, N.Y. TIMES, Mar. 26, 2001, at C4; *Economic Downturn Slows B2B Commerce* (Mar. 21, 2001), at http://cyberatlas.internet.com/markets/b2b/article/0,,10091_719571,00.html.

3. For a background on the privatization process generally, see *infra* Part IV.A.

4. This process of privatization is known as "load shedding." See *infra* Part IV.A. A backbone consists of the main high-speed telecommunications networks that make up the Internet. Backbone services have historically been contracted out by the government. See DONALD F. KETTL, *SHARING POWER: PUBLIC GOVERNANCE AND PRIVATE MARKETS* 68-69 (1993); Brian Kahin & Bruce McConnell, *Towards a Public Metanetwork: Interconnection, Leveraging, and Privatization of Government-Funded Networks in the United States*, in *PRIVATE NETWORKS PUBLIC OBJECTIVES* 307 (Eli Noam and Aine Nishúilleabháin eds., 1996).

5. In the privatization of the DNS, the government went from contracting out the DNS to granting the incumbent contractor a franchise. A franchise is when a private firm provides a service with price regulation by the government. See *infra* notes 539-40 and accompanying text.

6. For histories that only briefly discuss the privatization of the Internet, see Robert E. Kahn & Vinton G. Cerf, *What is the Internet (And What Makes It Work)*, at http://www.internetpolicy.org/briefing/12_99.html (last modified Dec. 1999); CHRISTOS J.P. MOSCHOVITIS ET AL., *HISTORY OF THE INTERNET: A CHRONOLOGY, 1843 TO THE PRESENT* (1999); JOHN NAUGHTON, *A BRIEF HISTORY OF THE FUTURE: FROM RADIO DAYS TO INTERNET YEARS IN A LIFETIME* (2000); ROBERT H. REID, *ARCHITECTS OF THE WEB: 1,000 DAYS THAT BUILT THE FUTURE OF BUSINESS* (1997); PETER H. SALUS, *CASTING THE NET: FROM ARPANET TO INTERNET AND BEYOND* (1995); DAN SCHILLER, *DIGITAL CAPITALISM: NETWORKING THE GLOBAL MARKET SYSTEM* (1999); STEPHEN SEGALLER, *NERDS 2.0.I: A BRIEF HISTORY OF THE INTERNET* (1998).

7. It was this observation by Robert McChesney that inspired this Article. He documented how the commercial basis for U.S. broadcasting was met with serious public opposition. See ROBERT W. MCCHESENEY, *TELECOMMUNICATIONS, MASS MEDIA, AND DEMOCRACY: THE BATTLE FOR THE CONTROL OF U.S. BROADCASTING* (1993).

privatize the backbone network. One goal of this study is to describe and document the privatization processes for the backbone network and the DNS.

We initially assumed the privatization of the Internet consisted of a simple shift from a subsidized network to a competitive market for backbone services. However, we found the privatization process to be quite complex and problematic. Unfortunately, many of these same problems are reoccurring in the current privatization of the DNS. Our study found three categories of problems that occurred during the privatizations of the Internet's backbone network and the DNS: procedural problems, problems with the management of competition, and problems with the management of the technological infrastructure of the Internet.

As a direct result of these problems, there is a lack of competition in the backbone and DNS industries. In the backbone industry, a few large backbone providers have been able to limit the entry of potential new competitors. The lack of competition in the DNS has resulted in consumers paying higher prices for domain name registrations. Furthermore, lack of competition has also constrained consumers' choice of domain names and led to overcrowding in the popular dot com ("com") domain.

Thus, a second goal of this study is normative. We propose specific measures to prevent these problems from reoccurring in future privatizations. In addition, we present proposals to promote competition for backbone services and the DNS. These proposals address the proper role of government in future privatizations. We also address the government's role in ensuring that new technologies are not employed in a manner contrary to our existing social values.

A. The Importance of the Internet's Privatizations

The privatization of the backbone network is not merely an historical anecdote. The Internet community, the government, and the private sector currently confront the consequences of the privatization of the backbone network.⁸ Moreover, this is not the only occurrence of a privatization involving the Internet. The government is now transitioning the DNS, a key component of the Internet, to the private sector. Not surprisingly, the government faces the same sorts of issues in the privatization of the DNS as it did in the privatization of the backbone network.⁹ Perhaps most importantly, these issues will continue to be significant for future privatizations involving the Internet.

The following three reasons illustrate the importance of the study of both

8. See *infra* Part V.

9. See *infra* Part VI.

privatization processes. First, the study shows how the government's lack of transparency in its privatization decisions has adversely affected the process as a whole. No matter what the outcome of the privatization, the government is expected to act evenhandedly, in a procedurally fair manner. In order to accomplish this goal in the context of privatizations, the government must make its decisions transparently, receive public input, and act fairly towards all firms in the marketplace. Transparency in decision making allows the public to understand the reasoning behind governmental decisions and requires the government to announce publicly its important decisions. Public input allows the government to hear the concerns of the public before making important decisions. Finally, the government should act without favoritism towards any firm during a privatization.

Second, the consequences of the Internet's privatizations have proved disappointing and, at times, alarming. A handful of large backbone providers have continually controlled the market for backbone services since the privatization. They have successfully limited competition despite the increase in potential competitors who have contributed to the steadily increasing telecommunications bandwidth over the last decade.¹⁰ As a result, a few large backbone providers can charge considerably more than their competitors for backbone services. Similarly, the government contractor for the DNS grew to a market capitalization of \$21 billion by charging excessive fees after being purchased for \$3.9 million in 1995. It could charge these fees because the government granted it a monopoly over the DNS. Without an analysis of the problems that occurred during the initial privatization, there is little hope that future privatization efforts will not repeat these types of mistakes.

Third, the study of the initial privatization provides insights about influential theories concerning how the Internet regulates behavior and how to regulate the Internet. One theory examines how "Code" regulates behavior on the Internet. The term "Code" refers collectively to the hardware and software of information technologies. Commentators such as Lawrence Lessig, Joel Reidenberg, and Ethan Katsh have recently recognized that Code in the form of the Internet's technological infrastructure is a force analogous to law.¹¹ The concept of Code helps explain how the Internet regulates itself. For example, the government redesigned the Internet's backbone network—Code—to

10. Douglas A. Galbi, *Growth in the "New Economy": U.S. Bandwidth Use and Pricing Across the 1990s* (July 9, 2000), at <http://users.erols.com/dgalbi/telpol/bw-tr1-4.pdf>.

11. See LAWRENCE LESSIG, *CODE AND OTHER LAWS OF CYBERSPACE* (1999); M. Ethan Katsh, *Software Worlds and the First Amendment: Virtual Doorkeepers in Cyberspace*, 1996 U. CHI. LEGAL F. 335; Joel R. Reidenberg, *Lex Informatica: The Formulation of Information Policy Rules Through Technology*, 76 TEX. L. REV. 553 (1998).

support multiple, competing backbone networks. The government intended this redesign as a method to support competition. This attempt to introduce competition through Code is analogous to regulation promoting competition.

A second theory concerns the proper role of government in regulating the Internet. Johnson and Post have argued that the government should generally refrain from regulating the Internet and instead allow for a decentralized rulemaking approach.¹² By analyzing how the Internet developed from both the government regulating the Internet and from decentralized rulemaking this study explicates the limitations of both approaches.

Finally, this is not the last privatization. As long as the government funds and controls research that may be of commercial use, the issues of privatizations carry lasting importance. For example, the U.S. government is currently spending hundreds of millions of dollars on the Next Generation Internet (NGI) initiative.¹³ NGI will connect universities and national laboratories with high-speed networks that are 100 to 1000 times faster than today's Internet. The NGI also serves as a testbed for experimentation with new technologies. In time, the U.S. government will need to decide who will finally control the NGI.

B. Summary of Our Thesis

This Article analyzes the privatization processes for the Internet's backbone network and the DNS.¹⁴ The analysis includes a discussion of the problems encountered in the privatizations, consequences of these problems, and remedial efforts that may be undertaken to rectify these consequences. This Article does not attempt to provide a comprehensive account of the facts and the policy rationales surrounding Internet privatizations. Instead, we focus on the facts and policy rationales germane to the privatization process. Furthermore, we assume that privatization was the correct course for the government to follow and that a privatization with meaningful competition is

12. See David R. Johnson and David Post, *Law and Borders—The Rise of Law in Cyberspace*, 48 STAN. L. REV. 1367 (1996).

13. See *infra* note 223 and accompanying text.

14. For other discussions of the Internet's privatization, see JANET ABBATE, *INVENTING THE INTERNET* (1999); MICHAEL HAUBEN & RONDA HAUBEN, *NETIZENS: ON THE HISTORY AND IMPACT OF THE USENET AND THE INTERNET* (1997); Kahin & McConnell, *supra* note 4. See also GORDON COOK, NSFNET "PRIVATIZATION" AND THE PUBLIC INTEREST: CAN MISGUIDED POLICY BE CORRECTED? (1992), at <http://www.cookreport.com/p.index.shtml> (last visited May 5, 2001) [hereinafter COOK, NSFNET "PRIVATIZATION"]; Gordon Cook, *The National Research and Education Network: Whom Shall It Serve?* (Feb. 28, 1992), at http://www.cookreport.com/nren_opus_ascii.shtml [hereinafter Cook, *National Research*].

beneficial to society.¹⁵

Our analysis of the problems that occurred during the privatizations found three root causes that have hindered competition. Discovery of these root causes leads us to conclude that the problems occurring in the DNS are general problems that will continue to reoccur in future privatizations. Our approach differs from previous studies of the DNS, which have analyzed the DNS's problems as *sui generis*.¹⁶ This Article develops a number of proposals based upon these three root causes in order to prevent these problems from reoccurring in future privatizations as well as to remedy the current lack of competition in the Internet's backbone industry and the DNS.

The lack of procedural fairness in the processes employed by the government caused the first category of problems in the initial privatizations. Government decision making repeatedly lacked transparency and public participation in several important decisions. In the privatization of the backbone, the government favored incumbent contractors, did not publicly announce important decisions, and simply acted without public input.¹⁷ Consequently, the public's confidence in the privatization methodologies employed by the government diminished significantly.

The government's management of competition during the privatizations caused the second set of problems. First, instead of introducing competition for government services, the government repeatedly granted its incumbent contractors, such as Advanced Network Services (ANS) and Network Solutions, Inc. (NSI), control of lucrative services. For example, NSI grew into a \$21 billion company as a result of its monopoly control of the DNS.¹⁸ Second, the government ignored the fundamental goal of privatization—the creation and maintenance of competition. Rather, the government treated

15. For a good evaluation of the privatization of the Internet, see Brett M. Frischmann, *Privatization and Commercialization of the Internet: Rethinking Market Intervention into Government and Government Intervention into the Market*, COLUM. SCI. & TECH. L. REV. (Forthcoming 2001).

16. The influential works on the problems with the privatization of the DNS have not discerned the parallels to the privatization of the Internet's backbone network. See ELLEN RONY & PETER RONY, *THE DOMAIN NAME HANDBOOK* (1998); A. Michael Froomkin, *Of Governments and Governance*, 14 BERKELEY TECH. L.J. 617 (1999); A. Michael Froomkin, *Wrong Turn in Cyberspace: Using ICANN to Route Around the APA and the Constitution*, 50 DUKE L.J. 17 (2000); Marshall Leaffer, *Domain Names, Globalization, and Internet Governance*, 6 IND. J. GLOBAL LEGAL STUD. 139 (1998); Milton Mueller, *ICANN and Internet Governance: Sorting Through the Debris of 'Self-Regulation'*, 1 J. POL'Y, REG. & STRATEGY FOR TELECOMMS. INFO. & MEDIA 497 (1999); Jonathan Weinberg, *ICANN and the Problem of Legitimacy*, 50 DUKE L.J. 187 (2000); Jonathan Zittrain, *ICANN: Between the Public and Private—Comments Before Congress*, 14 BERKELEY TECH. L.J. 1071 (1999); David R. Johnson & Susan P. Crawford, *What's Wrong with ICANN—and How to Fix It*, at http://www.icannwatch.org/archives/whats_wrong_with_icann.htm (last visited May 5, 2001).

17. See *infra* Part VII.A.1.

18. See *infra* Part VII.A.2.

privatization as an end in itself and not as a means to achieve the desirable public purpose of the facilitation of competition in the marketplace. As a result, consumers are forced to pay higher prices for services such as domain name registrations.¹⁹

The management of the “Code” or the technological infrastructure of the Internet caused the final set of problems discovered in the initial privatizations. First, as part of the privatization, the government redesigned the technological infrastructure of the Internet to create competition for backbone services.²⁰ This technical redesign was subject to network effects and favored a few large backbone providers over smaller networks. The government’s failure to require an interconnection policy to offset this technical favoritism has significantly reduced the level of competition for backbone services. Second, as part of the privatization of the Internet, the government has transferred control of the Code to the private sector. Today, control of the Internet’s Code lies within the hands of a few large backbone providers who remain free from any regulation or oversight.²¹ Consequently, this small number of providers will significantly influence future technological development of the Internet. Third, the government failed to consider societal concerns, such as security and privacy, while redesigning the Internet for privatization. The government could have ensured that the infrastructure of the Internet was designed for security conscious, electronic commerce applications.²² Thus, the problems with the government’s management of the Code can be stated as follows—what the government should have done, what it didn’t do, and what it can’t do today.

These problems have resulted in a lack of competition both in the backbone industry and the DNS. For example, the lack of a nondiscriminatory interconnection policy has allowed the established large backbone providers to thwart potential new competitors, such as Level 3 Communications, by merely refusing interconnection.²³ There is still no competition for the DNS, although the privatization of the DNS was suggested in 1995, and by 1996 there were a number of operational alternative DNS models.²⁴ The government and the private sector’s management of the DNS have allowed procedural problems and favoritism to the incumbent contractor to interfere with the introduction of competition.²⁵ As a result, consumers have had to pay higher prices for

19. *Id.*

20. *See infra* Part VII.A.3.

21. *See infra* Part III.C.3.

22. *Id.*

23. *See infra* Part VII.B.1.

24. *See infra* Part VII.B.2.

25. *See id.*

backbone services and domain name registrations. In the case of domain names, the lack of competition has also limited consumers' choice of domain names and led to overcrowding in the popular ".com" domain.

We have developed a number of proposals in three areas to address the lack of competition in the backbone and DNS industries, and to prevent these problems from reoccurring in future privatizations. First, we emphasize the need for the government to abide by fair and open procedures during privatizations. Therefore, to promote competition in the DNS, we highlight the need for ICANN to become accountable to the Internet community while conducting its affairs in an open and transparent manner.²⁶ Second, the government must properly manage competition. This requires the government first to understand that a crucial objective for a privatization is competition, and second to ensure that its incumbent contractors do not impede competition. In the case of the backbone industry, the government should promote competition through a requirement of a nondiscriminatory interconnection policy. Finally, the government must understand the Code's significant impact not only upon competition in the marketplace, but also upon our existing societal values. Therefore, we call for a technological interconnection policy that follows the guiding principle that new technologies should not amplify network effects and limit competition.

The Article is organized as follows. Part II provides the background of the privatization process. This Part includes a brief description of the early computer networks and documents how the National Science Foundation (NSF) Network (NSFNET) became the Internet. Part III describes the NSF's problems with the contractor who managed the NSFNET. Part IV explains the NSFNET's privatization process and includes a short primer on privatization processes. Part V discusses the consequences of the NSF's redesign. This Part concludes with a discussion of what could have been done differently during the redesign process. Part VI describes how many of the same problems and issues from the privatization of the backbone are reoccurring in the privatization of the DNS, bringing to mind Yogi Berra's famous line, "déjà vu all over again." Part VII first highlights the commonality of the problems with both privatization processes and how these problems have led to a lack of competition for backbone services and the DNS. Next, we present our proposals to promote competition in both industries. Finally, we note the limitations of decentralized lawmaking based upon the history of these privatizations.

26. The Internet Corporation for Assigned Names and Numbers (ICANN) is a private sector organization that is assuming responsibility of the management of the DNS from the government.

II. THE HISTORY OF THE NATIONAL SCIENCE FOUNDATION NETWORK (NSFNET)

The government has historically played a crucial role in the development of computers and computer networks.²⁷ The Department of Defense and federal agencies such as the National Science Foundation (NSF) funded early computer networking research. Their successes led the government to create the National Science Foundation Network (NSFNET), to serve as a national backbone network interconnecting with other networks.²⁸ This “network of networks” is the Internet. It is important to distinguish the NSFNET from the Internet. The NSFNET was a government-sponsored backbone network, which interconnected hundreds of other networks. In 1995, the government allowed the private sector to replace the NSFNET with several commercially owned backbone networks. The Internet is now the sum of these networks.²⁹

This Part provides a background into the privatization process for the Internet’s backbone network. The first section contains a history of the early computer networks. The second section discusses the origins and the direction of the NSFNET as well as the commercial backbone providers who began to emerge as the NSFNET matured. The third section explains how the NSF privatized the NSFNET by replacing it with several commercially owned backbone networks. A timetable for the privatization of the Internet’s backbone is presented in Table 1. Finally, the last section shows how privatization was the dominant policy approach towards the Internet in both the government and the private sector.

27. See PAUL N. EDWARDS, *THE CLOSED WORLD: COMPUTERS AND THE POLITICS OF DISCOURSE IN COLD WAR AMERICA* (1996).

28. The NSFNET program spent over \$200 million. In addition, other public sources, such as state governments, state-supported universities, and the federal government, probably invested more than \$2 billion on networking with the NSFNET. See David Lytel, *Nonprofit Parents, Corporate Kids*, *UPSIDE TODAY*, Feb. 2, 1998; Jeffrey K. MacKie-Mason & Hal Varian, *The Economics of the Internet*, *DR. DOBB’S J.*, Dec. 15, 1994, at 6. It is important to note that the government funding of the Internet not only connected many organizations, but also created much of the software and hardware to use the Internet. See BARRY M. LEINER ET AL., *A BRIEF HISTORY OF THE INTERNET*, at <http://www.isoc.org/internet/history/brief.html> (last modified Aug. 4, 2000). For example, government funding developed Gopher, Kermit, Archie, and Mosaic. See KATIE HAFNER & MATTHEW LYON, *WHERE WIZARDS STAY UP LATE: THE ORIGINS OF THE INTERNET* (1996); *Regulating the Internet*, *THE CQ RESEARCHER*, June 30, 1995, at 576.

29. Because the NSFNET no longer exists, definitions of the Internet are not based on the NSFNET. See Kahn & Cerf, *supra* note 6.

Table 1: Timetable for the Privatization of the Internet's Backbone

Year	NSFNET	ANS	Privatization Process
1985	Dennis Jennings hired to lead NSFNET project		
1986	NSFNET online with 56 Kb/sec backbone		
6/24/1986			Al Gore introduced Supercomputer Network Study Act
6/15/1987	NSF Solicitation for management and operation of the backbone		
11/1987	The NSF awarded the team of MERIT, IBM, and MCI management of the NSFNET.		
11/20/1987			1987 OSTP Strategic Plan
1988	MCI Mail permitted experimental use of commercial email services		
7/1988	NSFNET backbone upgraded to T-1		
8/1989			PSI spun off NSYERNET
10/8/1989			1989 OSTP Implementation Report
3/1990			First meeting at Harvard on privatizing the NSFNET
6/28/1990		NSF was notified of ANS	
9/10/1990		NSF gave permission for ANS	
9/17/1990		Creation of ANS	
11/29/1990			Second meeting at Harvard
2/14/1991		PSI, CERFnet, and UUNET agree to interconnect at CIX	
5/1991		Creation of ANS CO+RE	
8/1991			FARNET meeting in Montana

11/26/1991			NSF announces in the Project Develop Plan that it is rebidding the backbone
3/12/1992	Hearings on NSFNET Management		
6/1992		ANS CO+RE connects to CIX	
6/1992			NSF draft solicitation for the redesign
10/23/1992	Modification of AUP by adding a section of the NSF Act		
12/2/1992	NSFNET upgraded to T-3		
3/23/1993	Report by the Office of Inspector General released		
5/6/1993			Final solicitation of the redesigned network by the NSF
2/1994	NAPs are awarded		
2/1994		ANS CO+RE formally joins CIX	
5/30/1995	NSFNET was retired		

A. Early Computer Networks

The Advanced Research Projects Agency (ARPA) of the Department of Defense funded the Advanced Research Projects Agency Network (ARPANET) project in the late 1960s.³⁰ ARPANET was the first network to connect heterogeneous computers together.³¹ The purpose of ARPANET was to facilitate communication between the various contractors of the ARPA, who often operated different types of computers.³² ARPANET also demonstrated the utility of networking heterogeneous computers.³³ In 1990, however, the

30. ABBATE, *supra* note 14, at 44; HAFNER & LYON, *supra* note 28, at 257-58. For other histories of the ARPANET, see Peggy M. Karp, *Origin, Development and Current Status of the ARPA Network*, in SEVENTH ANNUAL IEEE COMPUTER SOCIETY INTERNATIONAL CONFERENCE, DIGEST PAPERS 49-52 (1973); Brad Schultz, *The Evolution of ARPANET*, DATAMATION, Aug. 1, 1988, at 71; Judy E. O'Neill, *The Evolution of Interactive Computing Through Time-Sharing and Networking* (1992) (unpublished Ph.D. dissertation, University of Minnesota) (on file with UMI Dissertation Services).

31. ABBATE, *supra* note 14, at 64.

32. *Id.*

33. *Id.*

ARPANET was decommissioned, because it was obsolete compared to the NSFNET.³⁴

Access to the ARPANET was limited to universities and research laboratories of the government and private industry. The ARPANET was “to be used solely for the conduct of or in support of official U.S. Government business.”³⁵ This restricted commercial use of the ARPANET and led to the creation of Telenet in 1975 as a network for commercial customers.³⁶

The NSF also has a long history of funding research in computer networking. Between 1968 and 1973, the NSF funded thirty regional computing centers to ensure widespread use of computing resources. With the NSF’s help, new entities such as the New England Regional Computing Program and the Michigan Education Research Information Triad (MERIT) emerged. These entities typically connected various institutions to share computing resources.³⁷ For example, MERIT interconnected computers on the campuses of Michigan State University, Wayne State University, and the University of Michigan.³⁸

In the 1970s, the limited availability of ARPANET connections led the NSF to create the Computer Science Research Network (CSNET). In 1979, there were 120 university computer science departments, but only 15 of the 61 ARPANET sites were at these universities.³⁹ CSNET remedied this imbalance by linking computer science researchers in academia, government, and industry. CSNET also connected to the ARPANET, thus allowing CSNET users access to resources on ARPANET.⁴⁰ CSNET successfully connected universities together,⁴¹ and became the first government funded network to demonstrate financial self-sufficiency. This met one of the NSF’s grant conditions for CSNET.⁴² CSNET’s financial self-sufficiency depended upon

34. See Jeffrey A. Hart et al., *The Building of the Internet*, 16 TELECOMM. POL’Y 666, 673-75 (1992).

35. *U.S. Government Communications Network Activities*, COMPUTER COMM. REV., Oct. 1975, at 32-33. ARPANET was connected to ARPA contractors, some of which were commercial companies such as Xerox. It is unclear how they gained approval for ARPA connections or how the restrictive use policy was enforced. There is little written on the interaction of the private sector with the government sponsored ARPANET.

36. See HAFNER & LYON, *supra* note 28, at 232-33.

37. ABBATE, *supra* note 14, at 192.

38. See University of Michigan, *Networking History--Merit and UMNet*, INFO. TECH. DIG., May 13, 1996; Merit Network, *About Merit Network: Michigan’s Leading Internet Provider*, at <http://www.merit.edu/merit/> (last visited May 5, 2001).

39. HAFNER & LYON, *supra* note 28, at 241.

40. CSNET was able to interconnect with paying any fees. See LEINER ET AL., *supra* note 28.

41. OFFICE OF TECHNOLOGY ASSESSMENT, U.S. CONGRESS, SUPERCOMPUTERS: GOVERNMENT PLANS & POLICIES 17 (1986).

42. *Id.*

charging industrial research laboratories significantly higher dues than universities.⁴³ CSNET was finally shut down in 1991, when the success of NSFNET made it obsolete.⁴⁴

The government and the private sector constructed other networks in 1970s and 1980s. In the 1980s, the Because It's Time Network (BITNET) was a cooperative network among IBM systems with no restrictions on membership.⁴⁵ Bell Labs built a network, UUCP, which carried the USENET.⁴⁶ Governmental agencies created their own computer networks. For example, the Department of Energy created the High Energy Physics Net and NASA created the Space Physics Analysis Net.⁴⁷ Many of these networks were specialized and built upon proprietary protocols, which often limited their ability to interconnect with other networks.⁴⁸ Consequently, it was not until the NSFNET and the NSF's chosen network standards that these networks were interconnected.

B. Early History of the NSFNET

Early computer networks proved the feasibility and the utility of networking computers together. Two other significant factors in the growth of computer networking consisted of the development of local area networks⁴⁹ and the Unix operating system.⁵⁰ The next major step towards the Internet began with the call for a national network to link federally funded supercomputing centers together. This network, NSFNET, was designed and managed by the NSF. Eventually, the NSFNET linked together thousands of

43. See Larry Press, *Seeding Networks: The Federal Role*, COMM. ACM, Oct. 1996, at 11-18. CSNET's member institutions paid either \$30,000 (industrial), \$10,000 (government or nonprofit), \$5,000 or less (university) per year.

44. See Larry H. Landweber, *CSNET: A Brief History* (Sept. 22, 1991), at <http://www.mit.edu:8008/MENELAUS.MIT.EDU/com-priv/1395>.

45. See HAFNER & LYON, *supra* note 28, at 243-44.

46. See *id.* See generally HAUBEN & HAUBEN, *supra* note 14, for a history of the Usenet.

47. See Robert E. Kahn, *The Role of Government in the Evolution of the Internet*, in REVOLUTION IN THE U.S. INFORMATION INFRASTRUCTURE (National Academy of Engineering ed., 1995), available at <http://www.nap.edu/readingroom/books/newpath/chap2.html>.

48. *Id.*

49. Between 1981 to 1991, there was an explosion of local area networks. Local area networks connect computers together that are geographically located closely together, such as on a university campus. The predominant protocol for local area networks is Ethernet. COOK, NSFNET "PRIVATIZATION", *supra* note 14. See also HAFNER & LYON, *supra* note 28, at 251.

50. UNIX was important for several reasons. The first was its low cost for universities. The second was AT&T's liberal licensing policy for UNIX. This allowed new protocols such as the TCP/IP protocol to be built into the UNIX operating system. The accessibility of this protocol lead to its adoption in 1983 for ARPANET. The wide spread use of the TCP/IP protocol eventually forced manufacturers such as IBM and Digital Equipment Corporation to support the TCP/IP protocol. See HAFNER & LYON, *supra* note 28, at 250; Hart et al., *supra* note 34, at 671.

computers spread across the world to create the Internet. This section provides the history of the NSFNET, beginning with the idea of creating a national network to link supercomputers. Over time, this network grew to connect not only supercomputing centers, but also universities, federal agencies, and the private sector.

1. *The Vision and Origins of the NSFNET*

The origins of the NSFNET began with an interest in supercomputing in the 1980s.⁵¹ In 1982, the NSF brought together a panel on supercomputing. Their report found that the U.S. research community was in need of access to high-performance computing.⁵² The panel recommended the development of the supercomputer program. The following year, another NSF sponsored report recommended that the NSF support supercomputing by constructing a network between universities, laboratories, and supercomputer centers.⁵³ By 1984, the NSF was managing the construction and operation of the new supercomputing centers.⁵⁴ To ensure the research community access to the supercomputing centers, the NSF planned to set up a national research network.⁵⁵ The proposed network had two stages. The first stage would involve interconnecting the NSF funded supercomputer centers. The second stage would involve constructing a high-speed backbone to link together various regional and campus networks.⁵⁶

In 1985, the NSF hired Dennis Jennings to lead the NSFNET program.⁵⁷ He made three important design decisions for the architecture of the NSFNET. First, he decided the NSFNET would serve as a general-purpose network, as opposed to a specialized supercomputer network.⁵⁸ Second, he decided the architecture of the network would be a three level hierarchy as shown in Figure 1.⁵⁹

51. For a history of the origins of the NSFNET and how the NSFNET was shaped by many such forces within the government, academia, and commercial institutions, see Juan D. Rogers, *Internetworking and the Politics of Science: NSFNET in Internet History*, 14 INFO. SOC'Y 213 (1998).

52. OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 41, at 6.

53. *Id.*

54. *Id.* at 11.

55. *Id.* at 13.

56. *See* Press, *supra* note 43.

57. *See* Rogers, *supra* note 51, at 219.

58. *Id.*

59. *Id.*

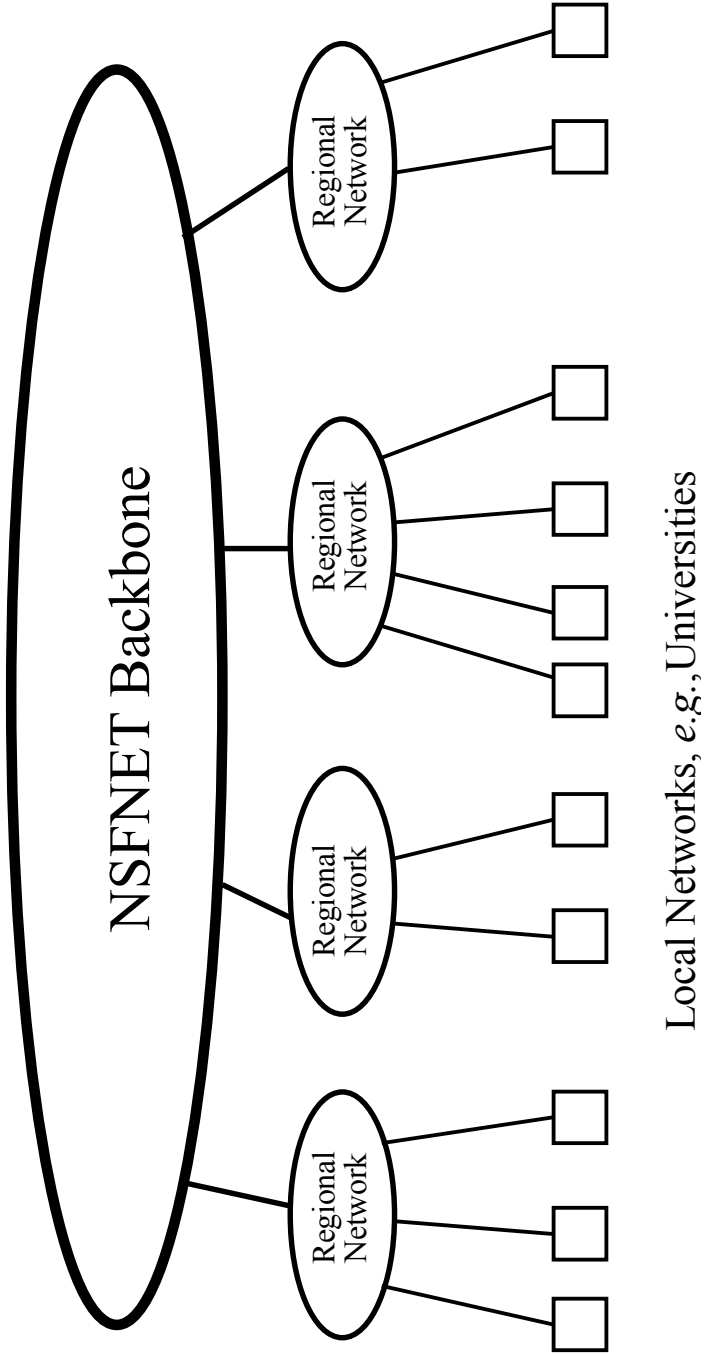


Figure 1: Architecture of the NSFNET

The first level would be a backbone entirely supported by the NSF. The backbone network, NSFNET, would be connected to regional networks, which in turn would connect to local networks, such as university campuses. Third, Jennings decided the NSFNET would use the TCP/IP protocol.⁶⁰ Undoubtedly, if the NSF had made different design choices the NSFNET and the Internet would have developed in a dramatically different fashion.⁶¹

The NSF envisioned the regional networks arising from established entities such as the regional computing centers. MERIT provides an example of such a regional entity, which, as mentioned above, linked together a number of universities in Michigan. To promote networking, the NSF created a policy of offering universities access to the NSFNET if the universities created a community network. This increased the research and educational communities' access to the NSFNET.⁶²

2. Governmental Advocacy for the NSFNET

The NSF did not act alone in the creation of a national research network. The NSF had considerable support from Congress and the White House. The government provided much of the vision for the NSFNET.

Senator Al Gore introduced a bill in 1986,⁶³ requiring the White House's Office of Science and Technology Policy (OSTP) to produce a report for Congress on the role of the government in promoting supercomputing and high-speed networking.⁶⁴ OSTP released the final report, *A Research and Development Strategy for High Performance Computing*, in 1987.⁶⁵ Networking was one of four topics discussed in the OSTP report. The report found current network technology inadequate for scientific needs. Moreover,

60. See *id.* The origins of TCP/IP traced back to 1974 when Vinton Cerf, who was heavily involved in ARPANET, published a paper on a new interconnection protocol TCP/IP. See Vinton G. Cerf & Robert E. Kahn, *A Protocol for Packet Network Intercommunication*, 22 IEEE TRANSACTIONS ON COMM. 637 (1974).

61. For example, when Jennings chose TCP/IP as the protocol for the NSFNET, it was the only nonproprietary protocol available. The NSFNET would have been quite different if a proprietary protocol such as DECNET was chosen. See Richard Mandelbaum & Paulette A. Mandelbaum, *The Strategic Future of the Mid-Level Networks*, in BUILDING INFORMATION INFRASTRUCTURE 59, 62 n.6 (Brian Kahin ed., 1993).

62. See HAFNER & LYON, *supra* note 28, at 245-46.

63. National Science Foundation Authorization Act for Fiscal Year 1987, Pub. L. No. 99-383, 100 Stat. 813 (1986).

64. See Hart et al., *supra* note 34, at 678. Al Gore was instrumental in federal support for the Internet despite political barbs to the contrary. See Richard Wiggins, *Al Gore and the Creation of the Internet*, 5 FIRST MONDAY, Oct. 1, 2000, at http://firstmonday.org/issues/issue5_10/wiggins/index.html.

65. See OFFICE OF SCIENCE AND TECHNOLOGY POLICY, *A RESEARCH AND DEVELOPMENT STRATEGY FOR HIGH PERFORMANCE COMPUTING* (1987).

Europe and Japan were moving ahead of the U.S. in networking because of a close collaboration between government and industry. The report recommended that “U.S. Government, industry, and universities . . . coordinate research and development for a research network to provide a distributed computing capability that links the government, industry, and higher education communities.”⁶⁶

The OSTP report also provided an outline of the implementation plan for the NSFNET.⁶⁷ The first step involved upgrading the newly created NSFNET network to 1.5 Mb/sec. The next stage called for an upgrade of the main backbone to 45 Mb/sec over the next three to five years. The final step was the delivery of 1 to 3 Gbit/sec to selected sites and 45 Mb/sec to over 1000 research sites. This final step was not expected to occur for another ten years.

3. *Construction of the NSFNET*

Operational in 1986, the NSFNET had a 56 Kb/sec backbone connecting together the five supercomputing centers.⁶⁸ The NSFNET, while operational, performed poorly because the 56 Kb/sec backbone was inadequate.⁶⁹ To address this, the NSF issued a “Project Solicitation for Management and Operation of the NSFNET Backbone Network (NSF 87-37)” in 1987 to upgrade the NSFNET backbone.⁷⁰

In response, the NSF received six proposals for the management and operation of the NSFNET backbone. NSF found three of the proposals technically unresponsive and, therefore, did not consider them. The remaining three proposals offered bids of \$40 million, \$25 million, and \$14 million. Naturally, the NSF chose the lowest bid, despite the fact that the proposal did not rate the highest on the technical criteria. The \$14 million bid from MERIT, IBM, and MCI was justified by the NSF because of the cost sharing plan proposed. For example, MCI agreed to a lower than market rate for access to its lines, which would save \$5 million. The State of Michigan offered to contribute \$5 million for facilities and personnel, and IBM agreed to contribute

66. *Id.* at 2.

67. *See id.* at 27.

68. The supercomputer centers were located at the University of California at San Diego, Cornell University, University of Illinois at Urbana-Champaign, Carnegie Mellon University, and the National Center for Atmospheric Research. *See* Hart et al., *supra* note 34, at 672.

69. *See* Pat Burns et al., *Back on Track to the NII*, available at <http://www.educause.edu/netatedu/contents/events/aug96/cheyenne/archive/back-on-track.html> (last visited Apr. 1, 1999).

70. Karen D. Frazer, NSFNET: A Partnership for High-Speed Networking (report on NSFNET backbone service from 1987-1995), at <http://www.merit.edu/merit/archive/nsfnet/final.report/> (last visited May 5, 2001).

\$10 million in equipment and services.⁷¹

In 1988, the NSF awarded a cooperative agreement to the team of MERIT, MCI, and IBM.⁷² Each team member had a different responsibility. MERIT was responsible for the management and administration of the NSFNET. MCI was responsible for the telecommunications network for the NSFNET, while IBM provided the software and routers for the network.⁷³

The team of MERIT, IBM, and MCI upgraded the NSFNET backbone in July 1988 and again in 1991. The first upgrade was to a T-1 (1.5 Mb/sec) backbone.⁷⁴ This new backbone, as shown in Figure 2,⁷⁵ linked thirteen sites including the supercomputer centers, National Center for Atmospheric Research, MERIT, and several mid-level networks.⁷⁶ The NSFNET backbone connected over 170 networks, including the regional networks.⁷⁷ After the second upgrade in 1991, the NSFNET became a T-3 backbone (45 Mb/sec). Three new backbone nodes were added during this second upgrade: NEARNET, Chicago's Argonne National Laboratory, and another SURAnet node. This was the last major upgrade of the NSFNET backbone.⁷⁸

71. See OFFICE OF INSPECTOR GENERAL, NATIONAL SCIENCE FOUNDATION, REVIEW OF NSFNET 9-12 (1993), available at <http://www.nsf.gov/pubs/stis1993/oig9301/oig9301.txt>.

72. See *id.*

73. See Hart et al., *supra* note 34, at 672-73.

74. See *id.* at 673.

75. See National Laboratory for Applied Network Research, *The National Science Foundation Network*, available at <http://moat.nlanr.net/INFRA/NSFNET.html> (last modified Nov. 23, 1995).

76. The mid-level networks were BARRNet, MIDNET, Westnet, NorthWestNet, SESQUINet, and SURAnet. NYSErNet and JVNcnet were already connected because they were co-located at a supercomputer center. Frazer, *supra* note 70.

77. *Id.*

78. See Susan R. Harris & Elise Gerich, *Retiring the NSFNET Backbone Service: Chronicling the End of an Era*, CONNEXIONS, April 1996, at 2.

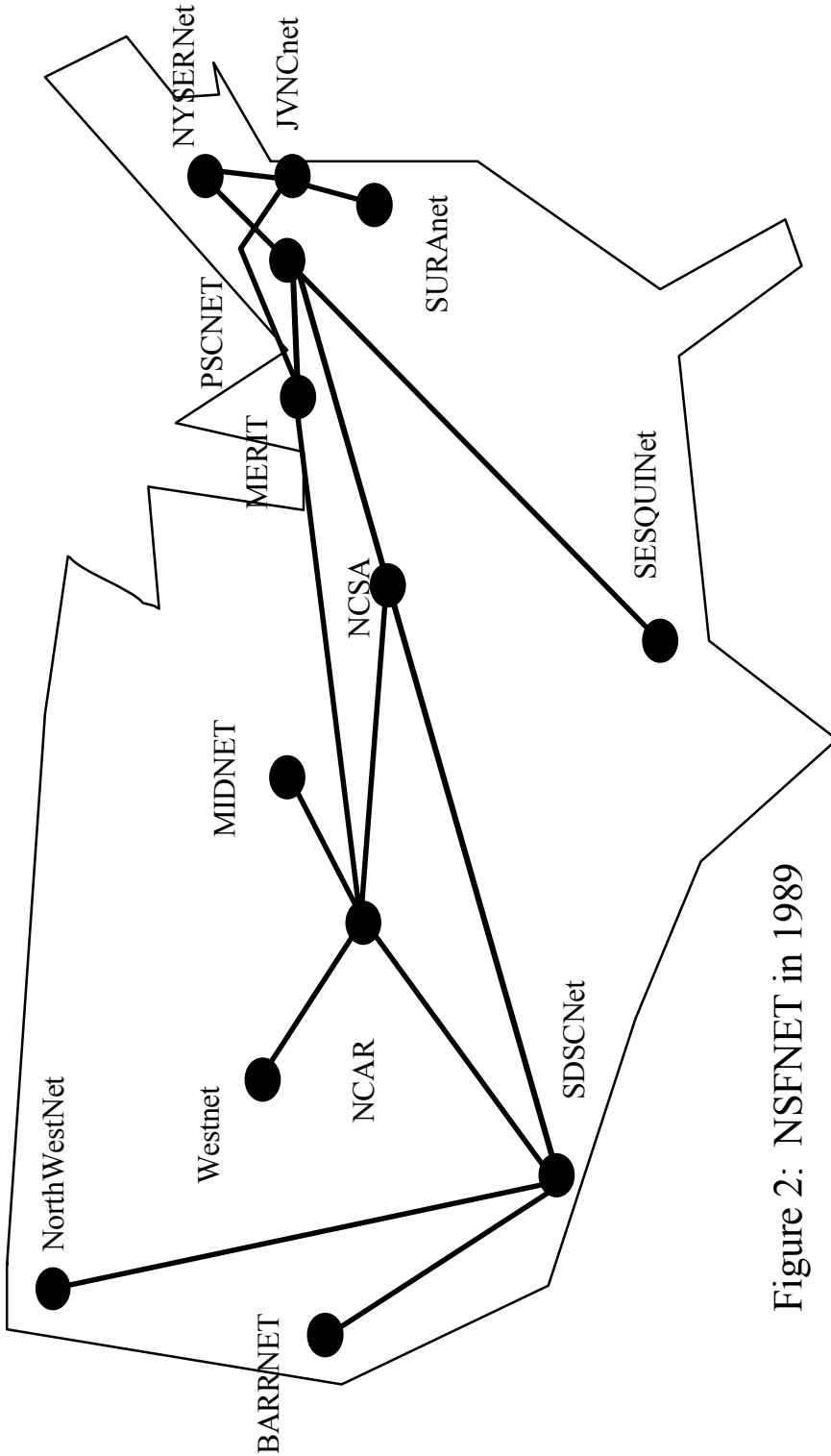


Figure 2: NSFNET in 1989

By the late 1980s, the NSFNET backbone connected more than 200 colleges and universities together via the regional networks. Funds from the NSF, state, university, federal, and private sector supported this combination of networks.⁷⁹ Besides offering grants to encourage academic institutions to connect to the NSFNET via the regional networks,⁸⁰ the NSF also encouraged the regional networks to find commercial customers. The NSF reasoned that the revenue of new customers would allow regional networks to expand and use the economies of scale to lower costs for everyone.⁸¹

As regional networks sought new customers, their institutional forms transformed from nonprofits who provided connectivity to “for-profits” that sold networking services. This change depended on the relative stability of the technical side of the network, which would allow the regional networks to focus on business-related issues.⁸² For example, in late 1989, two of the founders of the nonprofit New York regional network, NSYERNet, established a for-profit company, Performance Systems International (PSI). The rationale for PSI was that NYSErNet, as a nonprofit corporation, was unable to raise the venture capital necessary to invest in new services. Furthermore, the for-profit PSI was not constrained by charter, tax, or unfair competition issues that may have affected NSYERNet.⁸³ Similarly, virtually all of the later commercial backbone providers emerged from the nonprofit regional networks.⁸⁴

The NSFNET backbone connected not only the regional networks,⁸⁵ but also various federal networks.⁸⁶ For example, the NSFNET interconnected with the Department of Energy’s Energy Sciences Network and NASA’s

79. *Computer Networks and High Performance Computing: Hearing Before the Subcomm. on Science, Tech., and Space of the Senate Comm. on Commerce, Science, and Transp.*, 100th Cong. 66-67 (1988) (statement of Kenneth M. King, President, EDUCOM). See *supra* note 28 (regarding total government subsidies for the NSFNET and Internet).

80. The NSF spent a considerable amount of funds on grants to regional networks through its “connections program,” for example, over \$7 million in fiscal year 1991. Cook, *supra* note 14. These grants would expire after two years; thereafter, the campus would have to pay between \$20,000 to \$50,000 for a high-speed connection. See HAFNER & LYON, *supra* note 28, at 245-46.

81. LEINER ET AL., *supra* note 28.

82. See Mandelbaum & Mandelbaum, *supra* note 61, at 79.

83. See *id.* at 73-74. The unfair competition issues are because of the competition by nonprofits with for-profit businesses. This is essentially government-subsidized competition with the private sector.

84. See Vinton G. Cerf, *Computer Networking: Global Infrastructure for the 21st Century*, available at <http://www.cs.washington.edu/homes/lazowska/cra/networks.html> (last visited Feb. 15, 2000).

85. U.S. CONGRESS, OFFICE OF TECHNOLOGY ASSESSMENT, *ADVANCED NETWORK TECHNOLOGY—BACKGROUND PAPER 18* (1993).

86. See *id.* at 15-17.

NASA Science Internet.⁸⁷ Unlike the NSFNET, all the traffic along these federal networks was supposed to be strictly for official government work in support of these federal agencies.⁸⁸

While there was considerable use of the NSFNET by government agencies and universities, the private sector was not very active in the early days of the Internet.⁸⁹ The few private sector users consisted of either research and development arms of large companies or small high-technology companies. Although many companies had business and research networks, their networks did not connect to the Internet and had low transmission capacity.⁹⁰ Nevertheless, traffic on the Internet and NSFNET was increasing rapidly and would continue to grow.⁹¹

C. Privatizing the NSFNET

The NSFNET connected universities, federal agencies, public and private research laboratories, and community networks. While the NSFNET encouraged such diversity, it also had an Acceptable Use Policy (AUP). The AUP prohibited the use of the NSFNET for purposes not in support of research and education,⁹² a policy consistent with the NSF's mission. Nevertheless, a growing number of users wished to use NSFNET for purposes beyond research and education, a push for what the NSF termed "commercial use."⁹³ The potential for commercial use of the Internet propelled regional networks to create for-profit spin-offs. These for-profit commercial networks would eventually form the basis for the privatized Internet backbone.

This section divides the remaining history of the NSFNET into three

87. See *id.* at 15. The interconnections took place at the two Federal Internet eXchange (FIX) East and West interconnection points. See *id.* at 16. The various interconnecting federal agencies shared in the cost of these managed interconnection points. LEINER ET AL., *supra* note 28.

88. *Id.*

89. See Hart et al., *supra* note 34, at 673.

90. See U.S. CONGRESS, OFFICE OF TECHNOLOGY ASSESSMENT, HIGH PERFORMANCE COMPUTING AND NETWORKING FOR SCIENCE 27 (1989).

91. See Kimberly C. Claffy et al., *Tracking Long-Term Growth of the NSFNET*, COMM. ACM, Aug. 1994, at 34-45; Memorandum from Mark K. Lottor, SRI International, Network Information Systems Center, Request for Comments 1296: Internet Growth (Jan. 1992), at <http://www.ietf.org/rfc/rfc1296.txt>.

92. See Brian Kahin, *The NREN as Information Market: Dynamics of Public, Private, and Academic Publishing*, in BUILDING INFORMATION INFRASTRUCTURE 323, 324 (Brian Kahin ed., 1993).

93. The term "commercial use" is defined in the background statement by Stephen Wolff, Director of the NSF Division for Networking and Communications Research and Infrastructure. See Memorandum from Brian Kahin Director, Information Infrastructure Project, Science, Technology & Public Program, John F. Kennedy School of Government, Harvard University, Request for Comments 1192: Commercialization of the Internet Summary Report (Nov. 1990), at <http://www.ietf.org/rfc/rfc1192.txt>.

subsections. The first subsection explains the trend toward commercial use of the NSFNET. The second concerns the behavior of NSFNET's contractors. The third section discusses how the NSF privatized the NSFNET.

1. Commercial Use of the NSFNET

The first official commercial use of the NSFNET began in 1988 with ARPANET pioneer Vinton Cerf. He persuaded the government to allow MCI Mail to link with federal networks—the Internet—for “experimental use.” Soon after, other companies such as CompuServe and Sprint gained permission for “experimental use” for commercial email. The stated rationale was that these commercial providers would enhance research and educational uses by allowing researchers to communicate with more people.⁹⁴

In 1990, the AUP changed slightly. The original AUP described the NSFNET as supporting “scientific research and other scholarly activities.”⁹⁵ The AUP then became “to support research and education in and among academic institutions in the U.S. by providing access to unique resources and the opportunity for collaborative work.”⁹⁶ Brian Kahin noted that even without this slight change, commercial use was permissible as long as it generally supported the purpose of NSFNET.⁹⁷ Thus, commercial information providers, such as Lexis, Dow Jones, Dialog, and CARL were permitted access to the NSFNET backbone for the support of research and education.⁹⁸ For example, Lexis could provide services for law students because that would support research and education. However, Lexis could not provide services for Apple computer's legal department over the NSFNET because that would be commercial use.⁹⁹

The NSF recognized that by disallowing commercial traffic, it would encourage the growth of commercial backbone companies to create AUP free networks.¹⁰⁰ Commercial backbone companies began to provide Internet connectivity to companies who were fearful of violating the NSF's AUP. Eventually, several of these commercial backbone companies decided to interconnect their networks, creating the Commercial Internet Exchange

94. See John Adam, *How Cybergeniuses Bob Kahn and Vint Cerf Turned a Pentagon Project into the Internet and Connected the World*, WASH. MAG, Nov. 1996, at 66.

95. Kahin, *supra* note 92, at 324.

96. *Id.* at 324-25.

97. *See id.* at 325.

98. See NAT'L RESEARCH COUNCIL, *REALIZING THE INFORMATION FUTURE* 242 (1994).

99. See Stephen Wolff, *Forwarded from PACS-L Digest* (Aug. 9, 1991), at <http://www.mit.edu:8008/MENELAUS.MIT.EDU/com-priv/1130>.

100. LEINER ET AL., *supra* note 28.

(CIX).¹⁰¹ By creating the CIX, the commercial backbones could access users on their competitors' backbones. Moreover, the commercial backbones could gain these additional users without violating the NSF's AUP. In effect, the commercial backbone providers created a commercial alternative to the NSFNET.

2. *Creation of Advance Network Services (ANS) to Manage the NSFNET*

The new opportunities for commercial backbone companies led the NSFNET's contractors to enter this new industry. In September 1990, the operators of NSFNET (MERIT, IBM, and MCI) created a not-for-profit corporation, Advanced Network Services (ANS), as a subcontractor to operate the NSFNET backbone.¹⁰² ANS would also offer networking services on the new ANSNet. Because the new ANSNet shared the same infrastructure as the NSFNET, ANS was able to provide commercial connectivity to the NSFNET.¹⁰³

The relationship between ANS and the NSF drew criticism and charges of unfair competition by other commercial backbone providers.¹⁰⁴ These problems are reviewed in detail in Part III of this Article.¹⁰⁵ In response to the criticism, congressional hearings were held on the management of the NSFNET.¹⁰⁶ As a result of the hearings, the Office of the Inspector General (OIG) performed a review of the NSFNET's management,¹⁰⁷ and discovered a number of problems.¹⁰⁸

After the hearings, Congressman Boucher introduced a bill to remove the NSF's AUP. This bill was amended later to allow commercial use of the network as long as it would increase the networks' utility for research and education.¹⁰⁹ In late 1992, the NSF's new AUP allowed the private sector to

101. See Bilal Chinoy & Timothy J. Salo, *Internet Exchanges: Policy-Drive Evolution*, in COORDINATING THE INTERNET 325 (Brian Kahin & James H. Keller eds., 1997).

102. See *MCI and IBM Form Nonprofit Supercomputing Company*, COMM. DAILY, Sept. 18, 1990, at 3 [hereinafter *MCI and IBM*].

103. See *A Giant Step Towards Internet Commercialization? The Evolution of Internet into the National Research and Education Network*, TELECOMMUNICATIONS, June 1991, at 7 [hereinafter *A Giant Step*]. For a further discussion of ANS, see *infra* Part III.A.

104. John Markoff, *Data Network Raises Monopoly Fear*, N.Y. TIMES, Dec. 19, 1991, at D7.

105. See *infra* Part III.

106. *Management of NSFNET: Hearing Before the Subcomm. on Science of the House Comm. on Science, Space, and Tech.*, 102th Cong. (1992). See *infra* Part III.D.

107. See OFFICE OF INSPECTOR GENERAL, *supra* note 71, at 3.

108. See *infra* Part III.D.

109. See Scientific and Advanced-Technology Act of 1992, Pub. L. No. 102-476, § 4, 106 Stat. 2297, 2300 (codified at 42 U.S.C. § 1862(g) (1994)).

use the network as long as it indirectly benefited research and education. This new, liberal AUP led to even more growth for the NSFNET.¹¹⁰

3. *National Science Foundation's (NSF) Planning for the NSFNET Privatization*

In late 1989, OSTP released an implementation plan for the High Performance Computing Program.¹¹¹ The 1989 OSTP report provided a detailed program plan for implementing the networking strategy of the earlier 1987 OSTP report.¹¹² William Wulf of the NSF testified before Congress in 1989 that the NSF would follow the implementation plan of the 1989 OSTP report on the future of the NSFNET.¹¹³ He also admitted that because the report was not clear on how to privatize the NSFNET, the NSF would proceed to fund studies to examine the issue.¹¹⁴ The NSF then began funding a number of workshops through 1990 and 1991 on how to privatize the Internet.¹¹⁵

By late 1991, after these workshops and meetings, the NSF formulated a new design for the NSFNET with multiple backbones. The NSF announced this design in its "Project Development Plan," which provided an overview for the future of NSFNET. The goal of this plan was to award competitive backbone services by April 1993.¹¹⁶ In June of 1992, the NSF released a solicitation for public comment on the new network design.¹¹⁷ In response, the NSF received more than 240 pages of comments from industry groups. The comments largely expressed concern that only a few firms would be awarded the entire contract and, suggested instead, the desire for a more competitive

110. See Johna Till Johnson, *The Internet Opens Us to Commercial Use*, DATA COMM., Mar. 1993, at 58.

111. See OFFICE OF SCIENCE AND TECHNOLOGY POLICY, THE FEDERAL HIGH PERFORMANCE COMPUTING PROGRAM 10 (1989). For a thorough discussion of the redesign and privatization of the NSFNET, see Part IV.

112. For further discussion concerning the implementation plan, see *infra* Part IV.B.

113. *National High-Performance Computer Technology Act of 1989: Hearings on S. 1067 Before the Subcomm. on Science, Tech., and Space of the Senate Comm. on Commerce, Science, and Trans.*, 101st Cong. 66 (1989) (statement of Dr. William Wulf, Assistant Director, Computer and Information Science and Engineering, National Science Foundation).

114. *Id.*

115. See *infra* Part IV.C.

116. See Posting of Stephen Wolff, steve@cise.nsf.gov, to comp-priv@psi.com, members@famnet.org (Nov. 26, 1991) (regarding NSFNET Backbone Services After November, 1992), at <ftp://nic.merit.edu/cise/pdp.txt>. For a discussion of the Project Development Plan, see Part IV.D.

117. National Science Foundation, Public Draft: Network Access Point Manager/Routing Authority and Very High Speed Backbone Network Services Provider for NSFNET and the NREN Program (request for public comment), available at ftp://nic.merit.edu/nsfnet/recompete/solicit_comment.ascii (last visited May 5, 2001).

network design.¹¹⁸ To provide additional time for the NSF to develop the new design of the NSFNET, the NSF in 1992 extended its agreement with MERIT to manage the NSFNET.¹¹⁹

In the spring of 1993, the NSF incorporated the industry groups' comments and released a revised solicitation with three parts.¹²⁰ The first part consisted of a Routing Arbiter which operates as a "traffic cop" to ensure consistent routing policies.¹²¹ The second part proposed the creation of a Very High Speed Backbone Service (vBNS) to replace the NSFNET as a new high-speed backbone for research and educational use. The vBNS would be initially restricted to a select group of researchers requiring high-speed networking for specialized applications.¹²² The third part of the solicitation concerned the use of Network Access Points (NAPs) to connect together the vBNS, federal networks, and commercial backbone networks.¹²³ The concept of multiple backbones interconnecting through NAPs is shown in Figure 3. Instead of a central backbone connecting the regional networks, the regional networks had to choose a commercial backbone network. To ensure connectivity between commercial backbone networks, they would interconnect at the NAPs.

In February 1994, the NSF announced the award of the NAPs to Sprint for New York, MFS for Washington, D.C., Ameritech for Chicago, and Pacific Bell for California. NSF awarded MCI the contract to operate and maintain the vBNS.¹²⁴ To allow MERIT to oversee this transition, it was necessary again to extend the cooperative agreement.¹²⁵ The regional networks were supposed to disconnect from the NSFNET backbone by October of 1994 and connect to commercial providers, which would be interconnected via the NAPs. None of the regional networks were able to meet the October deadline, but over the following six months they migrated to commercial providers.¹²⁶ Finally, on April 30, 1995, the NSFNET was retired.¹²⁷

118. See Christopher Anderson, *The Rocky Road to a Data Highway*, 260 *SCIENCE* 1064 (1993).

119. Johnson, *supra* note 110, at 58.

120. See National Science Foundation, Network Access Point Manager, Routing Arbiter, Regional Network Providers, and Very High Speed Backbone Network Services Provider for NSFNET and the NREN (SM) Program (May 6, 1993) (solicitation inviting proposals), available at <ftp://nic.merit.edu/nsfnet/recompete/nsf9352>. For a discussion of the revised solicitation, see Part IV.E.

121. Andrew Lawler, *NSF Hands Over the Internet . . .*, 267 *SCIENCE* 1584 (1995).

122. *See id.*

123. *See id.*

124. Frazer, *supra* note 70.

125. *Id.*

126. For discussion and analysis of the problems concerning the transition, see Burns, *supra* note 69; Dennis Fazio, *Hang onto your Packets: The Information Superhighway Heads to Valleyfair* (Mar. 14, 1995), available at <http://ei.cs.vt.edu/~history/internet.hist.html>.

127. See Harris & Gerich, *supra* note 78, at 2.

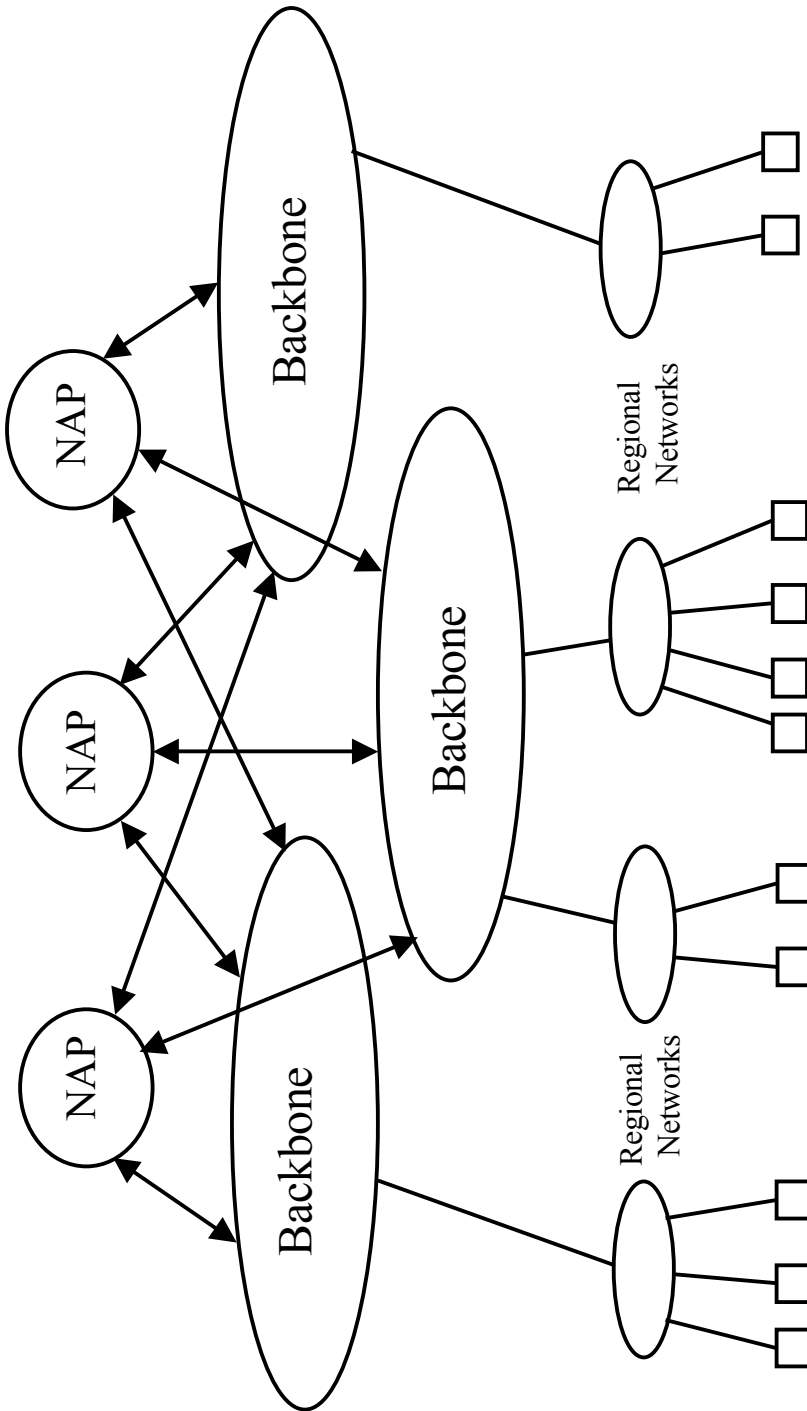


Figure 3: The New Design for the NSFNET

In August 1996, the NSF announced it would end its sponsorship of the four public NAPs. The NAPs would be operated entirely by the private sector.¹²⁸ By this point, the government had transitioned from contracting out services to allowing the market to provide Internet backbone service—thus fully privatizing the Internet. After this decision, the only remaining NSF-subsidized backbone service was the vBNS.¹²⁹ The vBNS served as the initial foundation of the Internet2 networking effort.¹³⁰

D. Privatization as the Dominant Policy Approach

There was little public debate or opposition to the privatization of the NSFNET. By the early 1990s, telecommunications policy for both political parties was based upon notions of deregulation and competition.¹³¹ At numerous junctures before the privatization of the NSFNET, politicians and telecommunication executives made it clear that the private sector would own and operate the Internet.¹³² This section illustrates the dominance of privatization as the preferred policy for the NSFNET among the leaders in the private sector and in government.

The prominent computer scientist, Leonard Kleinrock, representing the National Research Council on networking, told Congress in 1988 that any government-run network would eventually be transitioned to the telecommunications industry.¹³³ Similarly, a bill introduced in Congress in 1989 acknowledged eventual control and ownership of the NSFNET by commercial providers. The language of this bill by Senator Al Gore highlighted the importance of the private sector. In regards to a national

128. See Maria Farnon & Scott Huddle, *Settlement Systems for the Internet*, in COORDINATING THE INTERNET 377 (Brian Kahin & James H. Keller eds., 1997).

129. For further background, see the vBNS web site, available at <http://www.vbns.net> (last visited May 10, 2001).

130. For further background, see the Internet2 web site, available at <http://www.internet2.edu> (last visited May 10, 2001).

131. See DICK W. OLUFS III, THE MAKING OF TELECOMMUNICATIONS POLICY 67 (1999).

132. The closest opposition was a proposal by Senator Daniel Inouye (D-Haw) which would reserve fixed percentage of the telecommunication network capacity as noncommercial space. This proposal was roundly attacked and summarily dismissed by everybody; not only for technical reasons, but also that this bill would essentially hand over 20% of the NII to the government for noncommercial entities. See Leslie Harris, *Build Infosystem Fairly and Ensure Diversity*, INSIGHT MAG., Oct. 17, 1994, available at 1994 WL 11273710.

133. *Computer Networks and High Performance Computing: Hearings Before the Subcomm. on Science, Tech., and Space of the Senate Comm. on Commerce, Science, and Trans.*, 100th Cong. 24 (1988) (statement of Dr. Leonard Kleinrock, Professor of Computer Science, University of California at Los Angeles, National Research Network Review Committee, Computer Science and Technology Board, National Research Council).

network, the bill stated that the network shall:

(1) link government, industry, and the higher education community; (2) be developed in close cooperation with the computer and telecommunications industry; (3) be designed and developed with the advice of potential users in government, industry, and the higher education community; [and] . . . (5) be phased out when commercial networks can meet the networking needs of American researchers.¹³⁴

In the testimony before the committee on this bill, there was no dissent from this view of private ownership of NREN (the NSFNET was the implementation of the NREN concept). For example, Gene Gabbard, Chairman/CEO of Telecom*USA, recommended establishing a nonprofit corporation to direct NREN. He suggested the nonprofit corporation consist of government and industry, and after five years it would terminate and transfer control of the network to commercial carriers.¹³⁵

In committee hearings on the High Performance Computing Act of 1991, Senator Gore asked Tracey Gray, Vice President of Marketing, U.S. Government Systems Division, U.S. Sprint Communications, if it was acceptable for NREN to “be phased into commercial operation as commercial networks can meet the networking needs of American researchers and educators.”¹³⁶ Naturally, Gray was happy with the phrase but requested that the objectives be more clearly defined and a general roadmap be included. Gore stated the reason he asked Gray about privatization was to reiterate the clear intention of the bill to support eventual privatization.¹³⁷

In 1993, Lewis Branscomb, Director of the Science, Technology, & Public Policy Program at Harvard University’s John F. Kennedy School of Government wrote “[a]ll those associated with planning for NREN take it as a given that commercially provided facilities will be used for the network.”¹³⁸ Mitch Kapor and Jerry Berman of the public interest group Electronic Frontier Foundation (EFF) reiterated this assumption, when they concluded that the goal of NREN was to create a level, competitive playing field for private

134. *National High-Performance Computer Technology Act of 1989: Hearings on S. 1067 Before the Subcomm. on Science, Tech., and Space of the Senate Comm. on Commerce, Science, and Trans.*, 101st Cong. 13 (1989).

135. See Paul Nicholson, *National Research Network Advocated in Congressional Testimony*, TELECOMMUNICATIONS, Jan. 1990, at 49.

136. *High-Performance Computing and Communications Act of 1991: Hearing Before the Subcomm. on Science, Tech., and Space of the Senate Comm. on Commerce, Science, and Trans.*, 102d Cong. 90 (1991).

137. *Id.* at 90-91.

138. Lewis M. Branscomb, *Information Infrastructure for the 1990s: A Public Policy Perspective*, in BUILDING INFORMATION INFRASTRUCTURE, *supra* note 92, at 15, 26.

network carriers.¹³⁹

The only significant issue among politicians was the role of government in the initial stages of the network. Senator Al Gore called for government funding of a new national network for the first five years.¹⁴⁰ Meanwhile the Bush administration called for the network to be designed by the government but paid for by the private sector.¹⁴¹ However, Gore changed his position and later stated that the Internet would be built and paid for by the private sector. This event occurred in late 1992 at a summit on the information superhighway. At the summit both Al Gore and AT&T CEO Robert Allen agreed that a national network should be built. However, there was difference of opinion about the government's role in building the network. Allen accused Gore of proposing that the government should build the information superhighway, while Gore denied he ever suggested such a proposal.¹⁴² However on December 21, 1992, just before Al Gore was sworn in as Vice President, he stated, "information highways will be built, paid for and funded principally by the private sector."¹⁴³ On the same day, the Democratic Party received substantial political donations. According to records from the Federal Elections Commission, the Democratic National Committee received a \$15,000 contribution from Sprint, a \$10,000 contribution from U.S. West, a \$50,000 contribution from MCI, and a \$15,000 contribution from NYNEX.¹⁴⁴ The next day the Democratic National Committee received another \$20,000 contribution from MCI and \$10,000 more from NYNEX.¹⁴⁵

By 1993, the NSF was actively working on the privatization of the Internet. As shown above, the government and private sector fully supported the privatization of the Internet. In fact, the privatization of the Internet became seen as virtually inevitable. In sum, both political parties and the private sector supported the NSF's actions in privatizing the Internet because they agreed that the private sector should build, own, and operate the Internet.

139. Mitchell Kapor & Jerry Berman, *Building the Open Road: The NREN as Testbed for the National Public Network*, in BUILDING INFORMATION INFRASTRUCTURE, *supra* note 92, at 199, 205.

140. See Ellen Messmer, *Bush Administration, Gore Spar Over U.S. Gigabit Net; Both Debate Federal Role in Net's Infrastructure*, NETWORK WORLD, Mar. 11, 1991, at 6.

141. See *id.*

142. See Lee McKnight & W. Russell Neuman, *Technology Policy and the National Information Infrastructure*, in THE NEW INFORMATION INFRASTRUCTURE: STRATEGIES FOR U.S. POLICY 137, 139 (William J. Drake ed., 1995).

143. *Frontline: So You Want to Buy a President?* (PBS television broadcast, Jan. 30, 1996), available at <http://www.pbs.org/wgbh/pages/frontline/president/presidentscript.html>.

144. NYNEX became Bell-Atlantic and which has since become Verizon. See Verizon homepage, at <http://www.verizon.com> (last visited May 5, 2001). U.S. West was purchased by Qwest in 2000. See Qwest, Company Information, at <http://www.qwest.com/about/company/profile> (last visited May 5, 2001).

145. See *supra* note 143.

III. THE PROBLEMS WITH ADVANCED NETWORK SERVICES (ANS)

While the success of the NSFNET is obvious, the problems the NSF had with the entities that managed the NSFNET are not. This Part details three significant incidents involving MERIT, IBM, MCI, and their offspring—ANS and ANS CO+RE—that illustrate the problems that developed during the government's management of the NSFNET. The first incident concerns a backroom deal that allowed ANS to sell commercial access to the NSFNET. The second incident concerns how ANS took advantage of its position as operator of the NSFNET. In the third incident, ANS impeded competition for commercial backbone services. Finally, these incidents led to a congressional hearing, where the actions were publicly aired.

The purpose of this section is not to open old wounds. Rather, this section serves to teach us what worked well in the initial privatizations and what could have worked better. One technique we use to show how the privatization process could have been handled differently is by noting the contemporary concerns of those involved in the privatizations. This analysis is important because what we learn is applicable to other Internet privatizations, such as the Domain Name System and the Next Generation Internet initiative.

A. A Backroom Deal Gives Control of the NSFNET to ANS

ANS emerged in June 1990, when MERIT, IBM, and MCI notified Steve Wolff of the NSF that they were creating a not-for-profit corporation. They eventually named this corporation Advanced Network Services (ANS).¹⁴⁶ ANS then entered into a subcontracting agreement with MERIT, IBM, and MCI and became responsible for the management of the NSFNET backbone. In July 1990, John Markoff of the *New York Times* wrote that many competing networking companies were afraid that ANS would have a competitive advantage because of its relationship with IBM and MCI.¹⁴⁷

On September 10, 1990, Stephen Wolff responded to MERIT's actions on the NSF's behalf. Agreeing with MERIT's decision to subcontract the management of the NSFNET to the new corporation, he further stated that the

146. See Letter from Douglas E. Van Houweling, Merit Computer Network, to Steve Wolff, Division Director of NCRI, National Science Foundation (June 28, 1990) (regarding formation of not-for-profit corporation by Merit Network, IBM, and MCI), at <http://www.merit.edu/merit/archive/nsfnet/nsf.agreements/restructuring.of.partnership>. The creation of ANS occurred a few months after the first meeting discussing the future of the NSFNET and privatization. It could be inferred that this meeting may have led to the decision to create ANS with a belief that the NSF would approve of such a situation. However, there is no evidence to prove such a statement.

147. See John Markoff, *Discussions are Held on Fast Data Network*, N.Y. TIMES, July 16, 1990, at D2.

“NSF agrees that the new corporation may solicit and attach to the NSFNET Backbone new users, including commercial users.”¹⁴⁸ On September 17, 1990, MERIT, IBM, and MCI publicly announced the formation of ANS; however, neither the NSF nor MERIT, IBM, and MCI publicly announced NSF’s decision to allow the new corporation to solicit commercial users.¹⁴⁹

ANS then divided the network it managed into two pieces, NSFNET and ANSnet, although both used the exact same physical facilities. Although they used the same backbone—for example, if there was congestion on ANSnet, it would affect traffic on the NSFNET¹⁵⁰—the virtual separation allowed ANS to provide services that would otherwise violate the NSF’s Acceptable Use Policy (AUP).¹⁵¹

According to NSF officials, ANS and NSFNET “share[d] [the same] physical plant, but have logically distinct nets. That’s how [they were] able to have different Acceptable Use policies.”¹⁵² The “distinct nets” also allowed ANS’s customers to access the NSFNET backbone without going through NSF’s lengthy application process. In return, the customers paid usage fees to ANS.¹⁵³ However, because ANS was a nonprofit entity, it could not yet provide commercial access to the NSFNET.¹⁵⁴

A year later, in May of 1991, ANS set up ANS CO+RE Systems—a for-profit subsidiary—to sell commercial access to the NSFNET.¹⁵⁵ In September of 1991, ANS CO+RE had their first commercial customer. This caused quite a controversy because no other commercial network provider was permitted to sell access to the NSFNET. A commercial competitor to ANS CO+RE asked the NSF for copies of the agreements between ANS and the NSF,¹⁵⁶ seeking to discover why ANS CO+RE was allowed to sell commercial access to ANSNet. As a result of this request, the NSF publicly released the agreement it

148. See Letter from Stephen Wolff, Division Director of NCRI, National Science Foundation, to Douglas E. Van Houweling, Merit Computer Network (Sept. 10, 1990) (regarding the subcontracting of services for the NSFNET backbone), at <http://www.merit.edu/merit/archive/nsfnet/nsf.agreements/subcontracting.services>.

149. See *MCI and IBM*, *supra* note 102, at 3.

150. COOK, NSFNET “PRIVATIZATION”, *supra* note 14; Fazio, *supra* note 126; *A Giant Step*, *supra* note 103, at 7.

151. For more on the AUP, see *supra* Part II.C.1.

152. Jeff Hayward, *ANS Acceptable Use Policy* (Apr. 9, 1991), at <http://www.mit.edu:8008/MENELAUS.MIT.EDU/com-priv/574> (quoting Stephen Wolff of the NSF).

153. See *MCI and IBM*, *supra* note 102, at 3.

154. See Kahin & McConnell, *supra* note 4, at 318-21. For the text of the charter, see OFFICE OF INSPECTOR GENERAL, *supra* note 71, at 21.

155. A for-profit structure also provided a means for substantial capital investment by IBM and MCI that would be unavailable to a nonprofit corporation such as ANS. See *A Giant Step*, *supra* note 103, at 7; Elisabeth Horwitz, *Access to NSFnet Broadened*, COMPUTERWORD, June 17, 1991, at 51.

156. See OFFICE OF INSPECTOR GENERAL, *supra* note 71, at 36.

entered into with ANS in late 1990. NSF had agreed to allow ANS to solicit commercial users for almost a year before alerting the public.

Because of the significance of this decision—permitting an entity to sell access to a government-subsidized network—the NSF’s delay to announce the agreement publicly was a mistake. According to a later report by the Office of the Inspector General (OIG), who investigated the management of the NSFNET, the “NSF should have affirmatively announced **this** development to the networking community.”¹⁵⁷ The NSF’s failure to announce this decision led to the conclusion that a backroom deal had been reached between the NSF and its contractors.¹⁵⁸

The OIG report also noted two other omissions by the NSF in allowing ANS to sell commercial access to the NSFNET. First, the OIG’s investigation revealed a lack of documentation of the NSF’s decision to allow commercial access to the NSFNET.¹⁵⁹ The lack of documentation forced the OIG to reconstruct the reasoning behind these decisions through interviews, two years after the relevant events had occurred.¹⁶⁰ Second, the OIG found that the NSF’s decision was never reviewed.¹⁶¹ The OIG noted that decisions of this magnitude require public comment or peer review. However, there was no indication that the NSF’s decision regarding commercial access to the NSFNET was ever reviewed or commented on by anyone. The report then stated that “the dearth of documentation of NSF’s underlying reasoning—as well as the lack of evidence of peer, supervisory, or National Science Board review of this decision—reduces our confidence in [the NSF’s decision].”¹⁶²

B. How ANS Took Advantage of the Public

ANS took advantage of the public in several ways. First, it relied heavily on support from the government. Second, ANS did not find new customers, instead it attempted mainly to convert customers from the government-subsidized regional networks. Finally, ANS’s decision to create a for-profit

157. *Id.* at 36-37.

158. For example, Internet luminaries Mitch Kapor and David Farber publicly questioned the NSF’s decision to allow ANS commercial access without open and public debate. *See NSF Embroiled in Commercialization Debate*, COMM. DAILY, Feb. 5, 1992, at 4.

159. *See* OFFICE OF INSPECTOR GENERAL, *supra* note 71, at 9-12.

160. *See id.* at 32. According to Cook there was considerable pressure on the NSF to allow commercial access for ANS. ANS had pledged to sell connectivity to the Fortune 1000 companies and use those proceeds to subsidize educational institutions. Cook also notes that the formation of ANS never reduced government expenditures, because the federal government was still spending \$9 million on the backbone plus subsidizing regional networks for another \$7 million. *See* COOK, NSFNET “PRIVATIZATION”, *supra* note 14.

161. *Id.*

162. OFFICE OF INSPECTOR GENERAL, *supra* note 71, at 34.

subsidiary raised questions as to ANS's responsibility to the NSFNET and to the public interest.

At the time of ANS's creation, it depended on its only customer, the government, for its operating revenue of \$9.3 million.¹⁶³ ANS often claims it contributed twice as much as the NSF towards the support of the backbone. Gordon Cook, an independent reporter covering the Internet, investigated this claim by examining ANS's tax-exempt documents.¹⁶⁴ Cook found the most liberal interpretation showed ANS contributing 4% more than the federal government. A more conservative interpretation showed ANS making a profit on the NSFNET.¹⁶⁵ In effect, it could be suggested that the federal government funded a competitor to other commercial backbone providers.¹⁶⁶ Some of ANS's national competitors included Sprint and PSI.

By the spring of 1991, ANS had only a few commercial customers. Moreover, ANS publicly admitted that it expected most of its customers to switch from existing regional networks.¹⁶⁷ For example, ANS's first customer was the North Carolina state network—previously a customer of the regional network SURAnet.¹⁶⁸

As discussed above, in May 1991, ANS created a for-profit subsidiary, ANS CO+RE, to provide commercial services. As a for-profit corporation, ANS CO+RE could provide commercial services and allow for capital investment by IBM and MCI, unlike the nonprofit ANS.¹⁶⁹ When ANS CO+RE was created, Brian Kahin, the director of Harvard University's Information Infrastructure Project, said that the use of ANS CO+RE backbone would be attractive to companies who were afraid of violating the NSF's AUP. He then added, "if ANS proceeds with this approach, it will raise a host of critical and unresolved regulatory questions concerning the company's responsibilities to the public interest as a quasi-monopoly provider—questions that seem to have no clear cut answers under the current FCC and MFJ regulatory framework."¹⁷⁰ Competitors to ANS CO+RE publicly raised Kahin's concerns a year later before Congress. They argued that ANS had an unfair advantage because it managed the NSFNET. The NSF eventually responded to this criticism by redesigning the Internet to allow for multiple

163. See COOK, NSFNET "PRIVATIZATION", *supra* note 14.

164. *Id.*

165. See *id.*

166. See *id.* See also Ellen Messmer, *NSF, ANS Charged with Internet Abuse*, NETWORK WORLD, Dec. 23, 1991, at 6.

167. See COOK, NSFNET "PRIVATIZATION", *supra* note 14.

168. See Cook, *National Research*, *supra* note 14.

169. See *supra* notes 154-55 and accompanying text.

170. *A Giant Step*, *supra* note 103, at 7.

commercial providers.¹⁷¹ Meanwhile, however, ANS had taken advantage of its position as the sole supplier of commercial access to the NSFNET.

C. *How ANS Stifled Competition*

The NSF's AUP prohibited the use of the NSFNET for purposes not "in support [of] research and education."¹⁷² Consequently, this policy encouraged the growth of commercial backbone companies to transmit data that did not meet the AUP's requirements.¹⁷³ In 1991, several commercial backbone providers established their own "commercial" interconnection point, the Commercial Internet Exchange (CIX).¹⁷⁴ CIX allowed users of any of the commercial backbones to connect to users on any of the other participating commercial backbones.¹⁷⁵ Thus, CIX allowed commercial backbone providers to increase dramatically the number of connected commercial users. However, CIX's members did not have commercial access to the NSFNET, because the NSFNET was not connected to CIX.

ANS mediated access to the NSFNET. ANS's network shared the same physical connections as NSFNET, so ANS could easily connect to anyone on the NSFNET.¹⁷⁶ In late 1991, CIX asked ANS to interconnect with it.¹⁷⁷ ANS refused to agree to the standard interconnection terms at CIX.¹⁷⁸

ANS's initial decision to not interconnect with CIX was understandable. If it interconnected with CIX, it would lose its monopoly control on providing commercial access to the NSFNET. Once it connected to CIX, ANS would become vulnerable to competition from other providers such as CERFnet and PSI. Such competition would also affect the price of commercial connectivity.

Mitchell Kapor of the Electronic Frontier Foundation (EFF), the first chairman of CIX, drew attention to ANS's privatization of the NSFNET and the need for competition. In the summer of 1991, Kapor called for a policy to create a "level and competitive playing field for private network carriers, both for-profit and not-for-profit to compete."¹⁷⁹ After an outcry from the Internet community and congressional hearings, ANS capitulated and connected to

171. See *infra* Part IV.

172. National Science Foundation, Acceptable Use Policy (July 3, 1990), at http://www.eff.org/pub/Net_culture/Net_info/Technical/Policy/nsfnet_policy.old.

173. LEINER ET AL., *supra* note 28.

174. See Chinoy & Salo, *supra* note 101.

175. See *supra* notes 100-01 and accompanying text.

176. COOK, NSFNET "PRIVITIZATION", *supra* note 14.

177. See Messmer, *supra* note 166, at 6; Kahin & McConnell, *supra* note 4, at 318-21.

178. Mitchell Kapor, *My Views on ANS* (Jun. 8, 1991), at <http://www.mit.edu:8008/MENELAUS.MIT.EDU/com-priv/817>.

179. *Id.*

CIX in June 1992 for a “provisional period.”¹⁸⁰ By connecting to CIX, ANS CO+RE agreed to carry all traffic between CIX and ANS CO+RE sites. In February of 1994, ANS CO+RE announced that it would formally join CIX, which finally allowed ANS’s competitors to gain commercial access to the NSFNET.¹⁸¹ Thus for almost four years ANS and ANS CO+RE greatly impeded competition for the Internet.

D. Congressional Hearings Regarding the Management of the NSFNET

The complaints by commercial backbone companies concerning the conduct of ANS and the NSF drew the attention of Congress. Hearings held on March 12, 1992, examined the NSF’s management of the NSFNET, and allowed competitors of ANS to describe the unfair playing field.¹⁸²

William Schrader, the CEO of PSI and a competitor of ANS, provided a broad critique of the NSF’s actions, ranging from allowing ANS effectively to privatize and gain control of the NSFNET to disregarding potential conflicts of interest between the NSF, ANS, ANS CO+RE, and the Federal Networking Council.¹⁸³ Schrader’s sharpest criticism concerned the agreements between the NSF and ANS to allow ANS to carry commercial traffic on the backbone network. He stated that the NSF’s actions put ANS in a “monopoly position” and was akin to “giving a federal park to K-mart.”¹⁸⁴

Mitchell Kapor, of the EFF and the CIX, spoke about the “marketplace distortions” created by ANS. He remarked, “[m]uch of the recent negative publicity surrounding the NSFNET has come because important decisions about the network were made without opportunity for public comment or input from commercial Internet providers.”¹⁸⁵ Kapor called for broader representation on the NSF’s advisory boards by including additional commercial backbone providers.¹⁸⁶

Many of the people at the hearing complained about the NSF’s AUP. For example, Kapor said that companies hesitated to use the NSFNET because of

180. *News*, COMM. DAILY, Jun. 10, 1992, at 4.

181. See Robert O’Brien & Dolores Kazanjian, *ANS Joins CIX Alliance*, TELECOMMUNICATIONS, Feb. 1994, at 10.

182. *Management of NSFNET: Hearing Before the Subcomm. on Science of the House Comm. on Science, Space, and Tech.*, 102d Cong. (1992) [hereinafter *Management of NSFNET*].

183. *Id.* at 87-88 (statement by William L. Schrader, President and CEO of Performance Systems International, Inc.).

184. *NSF Embroiled in Commercialization Debate*, *supra* note 158, at 4.

185. *Management of NSFNET*, *supra* note 182, at 85 (statement by Mitchell Kapor, President, Electronic Frontier Foundation, and Chairman of the Commercial Internet Exchange Association).

186. See *infra* Part IV.D. (noting that the NSF ensures that commercial backbone providers are allowed to provide their full input).

the AUP.¹⁸⁷ Eric Hood, president of the Federation of American Research Networks, stated that the AUP impeded activities between academia, government, and industry.¹⁸⁸ Hood also said that the AUP discouraged the use of the NSFNET. Others at the hearing commented on the numerous and continual AUP violations, such as users sending personal email.¹⁸⁹ It was noted that NSF did not actively police the AUP, instead it policed itself based on an honor system.

As a result of the hearings, Congress requested that the Office of the Inspector General (OIG) perform a review of the NSFNET's management.¹⁹⁰ The OIG report largely concentrated on the relationship, decisions, and actions between the NSF and ANS. The OIG report found a number of problems with the NSF similar to those discussed above.¹⁹¹ However, the report also found that the general behavior of the NSF was consistent with the NSF's overall mandate.¹⁹² The NSF agreed with the conclusions and recommendations of the OIG report.¹⁹³ This review led to changes in the NSF's behavior and consequently there was much less controversy over future NSF decisions in privatizing the backbone network.¹⁹⁴

Four consequences for the NSF and the NSFNET resulted due to the congressional hearings: (1) the report by the OIG reviewing the NSFNET's management;¹⁹⁵ (2) the introduction of a law to change the NSF's AUP;¹⁹⁶ (3) ANS's agreement in June of 1992 to interconnect with CIX;¹⁹⁷ (4) the consideration by the NSF of input from commercial backbone providers on decisions concerning the NSFNET.¹⁹⁸

187. See *Management of NSFNET*, *supra* note 182.

188. See *id.* (statement by Eric Hood).

189. See Ellen Messmer, *Users Question New NSFNET Usage Policy*, NETWORK WORLD, Mar. 30, 1992, at 19. For the unenforceability of the network, see Jeff Ubois, *What is Acceptable Internet Use? Academic-Corporate Balance Changing*, MACWEEK, Sept. 28, 1992, at 30.

190. See OFFICE OF INSPECTOR GENERAL, *supra* note 71.

191. See *supra* notes 157-62.

192. *Id.* The OIG report found no evidence that the NSFNET should not have been commercialized. Instead, commercialization was seen as consistent with the NSF's policy of enlarging connectivity for the benefit of the research and educational users.

193. *Id.* at 81.

194. See *infra* Part IV.

195. See OFFICE OF INSPECTOR GENERAL, *supra* note 71, at 3. See also *NSF Criticized by Inspector General on High-Speed Computer Network*, COMM. DAILY, Apr. 27, 1993, at 1; *IG Recommends Improvements for NSFNet Operations*, TELECOMMS. REP., May 3, 1993, at 9.

196. See Scientific and Advanced-Technology Act of 1992, Pub. L. No. 102-476, § 4, 106 Stat. 2297, 2300 (codified at 42 U.S.C. § 1862(g) (1994)).

197. See *supra* note 180 and accompanying text.

198. See *supra* notes 185-86 and accompanying text.

E. Lessons Learned from the ANS Debacle

The problems with ANS adversely affected the Internet community's confidence in the NSF. For example, Milo Medin, Deputy Project Manager of the NASA Science Internet Office, wrote:

The Foundation's track record in terms of technical management of the existing awardee is less than stellar. This is not because the Foundation's personnel are incompetent or unwilling to perform supervision; it is because the existing staff is hopelessly overburdened with other work, and simply does not have the time or resources to perform adequate supervision.¹⁹⁹

There are a number of lessons to be learned from the NSF's management of the NSFNET. The first lesson concerns the need for government to follow procedural requirements of transparency and openness. The second lesson concerns the problems that result when the government allows contractors to impede competition. The final lesson is the need for government to capitalize on competition when it exists in the market. We conclude by noting that a key source of NSF's problems was the inadequacy of the cooperative agreement put in place.

By not documenting the reasons why ANS was allowed to provide commercial access to the NSFNET,²⁰⁰ the NSF acted in a manner contrary to our expectations that the decision-making processes of government be transparent. The U.S. Supreme Court has stated that "the orderly functioning of the process of review requires that the grounds upon which the administrative agency acted be clearly disclosed and adequately sustained."²⁰¹ The public's expectations regarding transparency are also reinforced by the Freedom of Information Act (FOIA) and the Sunshine Act. The FOIA provides for a general right to examine government documents,²⁰² while the Sunshine Act strives to provide the public with information on the decision-making processes of federal agencies.²⁰³ However, officials render both of these statutes meaningless if they do not document the grounds for their decisions. The NSF should have documented its important policy decisions to satisfy the requirements of transparency in governmental decision making.

Further, the NSF behaved contrary to the notion that important

199. NASA Science Internet Office, Comments of NASA (Aug. 3, 1992), at <ftp://nic.merit.edu/nsfnnet/recompete/solicitation-responses/nasa.ps.Z> (file is zipped and in postscript format).

200. See *supra* Part III.A.

201. Securities and Exch. Comm'n v. Chenery Corp., 318 U.S. 80, 94 (1943).

202. See 5 U.S.C. § 552 (1994).

203. 5 U.S.C. § 552b (1994).

governmental decisions should invite public comment. The Administrative Procedure Act (APA) requires federal agencies to allow for public comment in either formal or informal rulemaking,²⁰⁴ except for interpretive rules and statements of general policy.²⁰⁵ The NSF's decision to allow commercial companies to sell access to the NSFNET was not merely interpreting an existing rule or a policy statement. The NSF should have allowed public comment before it acted. Mitchell Kapor's comments concerning the lack of opportunity for public comment or input from the commercial backbone providers support this conclusion. He noted that the NSF could have avoided the uproar and negative publicity if it had allowed ANS's competitors to provide public comment.²⁰⁶

ANS's position allowed it to impede competition for commercial backbone services. ANS leveraged its control of the NSFNET to avoid interconnecting with CIX. ANS's actions to impede competition are completely rational. If ANS interconnected at CIX, it would have allowed competitors to provide commercial access to the NSFNET.²⁰⁷ Why should it promote competition? Moreover, what ANS did was not unprecedented. It is well established that incumbent private contractors may use tangible assets, such as telecommunication networks, and intangible assets, such as insider information and expertise, to impede other competitors.²⁰⁸ However, the government has the obligation to ensure that a sole provider of services such as ANS does not impede competition. While ANS has come and gone, this is no reason to believe that such conduct will not happen again under similar circumstances. In fact, as we discuss in Part VI.C-D, the behavior of Network Solutions, Inc. (NSI), the entity awarded a cooperative agreement by the government to manage the Domain Name System (DNS), is alarmingly similar to the behavior of ANS.²⁰⁹ The lesson for the government is to abide by its obligation not to allow its own contractor to impede competition.

The NSF should not have allowed ANS to sell commercial access to the government-subsidized NSFNET. Commercial access to the NSFNET was not

204. *Id.* §§ 551-59. An intriguing issue considers the question of "Code". Is setting technical standards analogous to formal rulemaking?

205. *Id.* § 553(b)(A). See Peter J. Henning, Note, *An Analysis of the General Statement of Policy Exception to Notice and Comment Procedures*, 73 GEO. L.J. 1007 (1985). Interpretive rules are rules that clarify the meaning of an existing rule. See Michael Asimow, *Nonlegislative Rulemaking and Regulatory Reform*, 1985 DUKE L.J. 381, 383. A policy statement provides guidance on how an agency will exercise its discretionary power. See *id.*

206. See *supra* note 185 and accompanying text.

207. See *supra* Part III.C.

208. See JOHN D. DONAHUE, *THE PRIVATIZATION DECISION: PUBLIC ENDS, PRIVATE MEANS* 78 (1989).

209. See *infra* Part VI.C.3.

considered in the cooperative agreement between the NSF, MERIT, IBM, and MCI.²¹⁰ The NSF's behavior not only provided the appearance that ANS was privileged, but actually placed ANS in a privileged position by allowing ANS to profit from its situation.²¹¹

The NSF should have competitively bid the rights to commercial access to the NSFNET. When the NSF granted ANS the right to sell commercial access to the NSFNET, other, competing commercial backbone networks were already in place.²¹² If the NSF wished to subsidize commercial use of the NSFNET, it should have handled that process separately from the existing cooperative agreement with MERIT, IBM, and MCI. The NSF's actions violated established governmental procedures that require the government to have the appearance of fairness towards firms in a competitive market.²¹³ This notion of fairness has led to the governmental policy of competitive bidding.²¹⁴

In this case, other commercial backbone companies could have provided subsidized access to the NSFNET.²¹⁵ In the 1987 solicitation for the management of the NSFNET, the NSF received a total of three proposals that it found technically capable.²¹⁶ In 1992, several entities, such as Sprint, PSI, and UUNET Technologies, offered commercial backbone services.²¹⁷ When the NSF solicited comments in 1992 for the redesign of the NSFNET, it received comments from over thirty different firms interested in the solicitation.²¹⁸ This interest in the solicitation indicates that some of these firms would have been interested in the rights to commercial access to the NSFNET. Thus, the NSF should have competitively bid the rights to commercial access instead of just granting the right to ANS. The lesson here is that the government should capitalize on the existence of other competitors in the marketplace.

Many of the problems between the NSF and ANS originated from the lack of specificity in the original cooperative agreement. The cooperative agreement did not envision commercial use of the NSFNET.²¹⁹ So when ANS

210. OFFICE OF INSPECTOR GENERAL, *supra* note 71, at 25.

211. *See supra* Part III.B.

212. *See id.*

213. *See generally* Gene Ming Lee, Note, *A Case for Fairness in Public Works Contracting*, 65 *FORDHAM L. REV.* 1075 (1996).

214. *See* 41 U.S.C.S. § 251 (1994).

215. *See supra* Part III.B.

216. *See supra* note 71 and accompanying text.

217. *See Management of NSFNET*, *supra* note 182, at 73 (statement by Mitchell Kapor, President, Electronic Frontier Foundation, and Chairman of the Commercial Internet Exchange).

218. *See* comments online, at <ftp://nic.merit.edu/nsfnet/recompete/solicitation-responses/> (last visited May 5, 2001).

219. *See* OFFICE OF INSPECTOR GENERAL, *supra* note 71, at 25.

asked for and later sold commercial access to the NSFNET, no clear guidelines existed for the NSF to follow. This resulted in a conflict for ANS, acting as a sole governmental contractor while also selling identical services. The lesson here is that the government should define the research contract rights of the government and its contractor during and after the contract with regard to commercial use of the underlying property or services.

In sum, there are three major lessons to be learned from the ANS debacle. First, the government must act with procedural fairness. Second, the government should not allow a contractor to impede competition. Finally, the government should not favor an incumbent contractor when a competitive market for the relevant services exists. Fortunately, the NSF did learn from this debacle. Its later decision-making processes became more public. For example, in the next Part we discuss how ANS's competitors were allowed to provide public comments during the redesign of the Internet.

IV. REDESIGNING THE INTERNET FOR PRIVATIZATION

The original plans for the NSFNET contemplated a transition to the private sector.²²⁰ It was NSF's responsibility to decide how to transition the NSFNET. The NSF thought that it could privatize the Internet in "18 months or sooner."²²¹ "The assumption was that you could just spin this off."²²² However, this assumption would prove overly optimistic. It took the NSF several years to fully privatize the NSFNET.

To create competition for Internet backbone services, it was necessary to redesign the structure of the NSFNET. Over several years the NSF managed a transition to a system of commercially owned backbones to replace the NSFNET. This section describes the privatization process for the NSFNET. After a discussion on privatization processes generally, this Part discusses some of the limitations of the NSF's redesign. These issues are not only relevant to the NSFNET privatization, but also to future privatizations and the role of government in regulating the Internet.

The government currently funds and controls a great deal of research that it will eventually transfer to the private sector. For example, the U.S. government currently spends hundreds of millions of dollars on the Next Generation Internet (NGI). However, critical questions about the current use and the future of the network remain unanswered. The NGI Implementation Plan does not

220. These plans include the 1987 OSTP report, the 1989 OSTP Report, and the FRICC Program Plan. *See supra* text accompanying notes 65, 111, 246.

221. Lawler, *supra* note 121, at 1584 (quoting Jane Caviness as temporary director of NSF's Networking and Communications Research Division).

222. *Id.* (quoting Fred Weingarten of the Computing Research Association).

consider two fundamental issues that caused problems with the privatizations of the backbone and the DNS.²²³ First, can commercial partners use the new network for commercial purposes? Second, who controls and will control the network? For example, will NGI be privatized? When? And who will manage the privatization?

A. General Background on a Privatization Process

There is enormous literature on privatization.²²⁴ Private contractors in the United States perform many governmental functions such as billing and collection, cafeteria services, data entry, and office-machine maintenance.²²⁵ Privatizing other governmental functions such as hospitals,²²⁶ prisons,²²⁷ education,²²⁸ and aviation,²²⁹ becomes more controversial.

The prerequisite for a privatization is competition in the private sector.²³⁰ Competition ensures that the goals of privatizations, such as lower costs, lower prices, greater innovation, increased investment, and better service will be reached.²³¹ To ensure competition, the government may utilize regulations, like requiring access to interconnection for industries such as telecommunications.²³²

223. See LARGE SCALE NETWORKING NEXT GENERATION INTERNET IMPLEMENTATION TEAM, NEXT GENERATION INTERNET INITIATIVE IMPLEMENTATION PLAN (Feb. 1998), at <http://www.ccic.gov/ngi/implementation/>. For background on the Next Generation Internet Initiative, see Large Scale Networking Group of the Computing, Information, and Communications R&D Subcommittee, NGI Initiative Concept Paper (July 23, 1997), at <http://www.ccic.gov/ngi/concept-Jul97/>. There will undoubtedly be more privatizations as long as the government subsidizes and manages research on Internet-related technologies. Another recent privatization was that of the Routing Arbiter which was fully funded by the NSF between July 1994 to March 1998. Today, MERIT sells routing services to exchange point operators to aid them in supporting of customer peering. See Routing Arbiter Project, at <http://www.ra.net> (last visited May 5, 2001).

224. For a background on privatization, see E.S. SAVAS, *PRIVATIZATION AND PUBLIC-PRIVATE PARTNERSHIPS* (2000); DONAHUE, *supra* note 208. For a discussion on the intellectual origins of the privatization movement, see REPORT OF THE PRESIDENT'S COMMISSION ON PRIVATIZATION, *PRIVATIZATION: TOWARD A MORE EFFECTIVE GOVERNMENT* 230-55 (1988).

225. For a vastly more comprehensive list, see SAVAS, *supra* note 224, at 72-73.

226. See Phyllis E. Bernard, *Privatization of Rural Public Hospitals: Implications for Access and Indigent Care*, 47 MERCER L. REV. 991 (1996).

227. See E.S. Savas, *Privatization and Prisons*, 40 VAND. L. REV. 889 (1987).

228. See Julie Huston Vallarelli, Note, *State Constitutional Restraints on the Privatization of Education*, 72 B.U. L. REV. 381 (1992); Note, *The Hazards of Making Public Schooling a Private Business*, 112 HARV. L. REV. 695 (1999).

229. See Christopher R. Rowley, Comment, *Financing Airport Capital Development: The Aviation Industry's Greatest Challenge*, 63 J. AIR L. & COM. 605 (1998); Janie Lynn Treanor, Comment, *Privatization v. Corporatization of the Federal Aviation Administration: Revamping Air Traffic Control*, 63 J. AIR L. & COM. 633 (1998).

230. See DONAHUE, *supra* note 208, at 222; SAVAS, *supra* note 224, at 122-24.

231. SAVAS, *supra* note 224, at 248.

232. SAVAS, *supra* note 224, at 250.

The privatization under consideration here is the transition in backbone service by the NSF. The NSF originally contracted out its backbone services to MERIT, IBM, and MCI. With the rise of other commercial backbone providers, the NSF decided to allow the market to provide backbone services. After this transition, individual consumers were responsible for purchasing backbone services. This process is known as “load shedding.”²³³ Unlike contracting, with load shedding, the government no longer maintained direct oversight for backbone services. Instead, the government left the management and control of the Internet backbone services in the hands of the private sector.

Privatization scholars agree that the management of a privatization process is complex. The number one consideration is that “privatization is more a *political* than an *economic* act.”²³⁴ It is not a simple matter of turning over assets to the private sector. Instead, according to the widely held neoclassical view, the government must ensure there is sufficient competition and not market failure to achieve an effective privatization.²³⁵ This approach is distinguishable from the property rights view that private sector ownership in itself will result in an efficient marketplace.²³⁶ Most privatization advocates maintain the neoclassical view. They believe that a privatization will not be successful unless the government ensures sufficient competition.²³⁷

During the privatization of the backbone network, the government did not simply turn over the backbone network to the private sector. Instead, the government redesigned the network architecture to support competition. As discussed below, the networking industry widely supported the government’s actions in redesigning the network. However, as we shall see, the government’s new design favored a few large backbone providers over their competitors.

233. *Id.* at 133. For a background on load shedding, see Harvey Goldman & Sandra Mokuvos, *Dividing the Pie Between Public and Private*, in *PRIVATIZATION: THE PROVISION OF PUBLIC SERVICES BY THE PRIVATE SECTOR* 25 (Roger L. Kemp ed., 1991); E.S. SAVAS, *PRIVATIZATION: THE KEY TO BETTER GOVERNMENT* 234-41 (1987).

234. SAVAS, *supra* note 224, at 144. There are several significant procedures necessary for an effective privatization: assigning unambiguous responsibility for the process; establishing clear objectives for the privatization process; enacting necessary legal reforms; developing clear and transparent procedures for the process; and gaining public support by educating the public about privatization. *Id.* at 145-46. See also U.S. GENERAL ACCOUNTING OFFICE (USGAO), *PRIVATIZATION: LESSONS LEARNED BY STATE AND LOCAL GOVERNMENTS* (1997).

235. See also Paul Starr, *The Meaning of Privatization*, 6 *YALE L. & POL’Y REV.* 6 (1988) (discussing the differences between the property rights view and the neoclassical view).

236. *Id.*

237. See Lawrence W. Reed, *The Privatization Revolution*, Remarks at the Shavano Institute for National Leadership, Indianapolis, Ind. (May 21, 1997) (adaptation), at <http://www.privatization.org>.

B. The Lack of Guidance for the NSF

The goal of the NSF was to privatize the NSFNET. However, the government never provided the NSF with explicit guidance on how to privatize the NSFNET. The NSF relied upon the 1989 Office of Science & Technology Policy (OSTP) report as an implementation plan for the NSFNET.²³⁸ However, the report simply stated that the last stage of the National Research and Education Network (NREN) would include a process by which the network would be transitioned from governmental control to a commercial service.²³⁹

Originally, the NSFNET implemented the NREN concept. A section in the 1989 OSTP report, the “Action Plan,” detailed the implementation strategy for NREN.²⁴⁰ The Action Plan was based upon the three-stage development from an earlier 1987 report. The timetable for the implementation plan is shown in Figure 4. The first stage, which the report noted was already underway, was to upgrade networks to T1 (1.5 Mbs/sec) speed. In the second stage, the backbone was to be upgraded to T3 (45 Mbs/sec) speed. The report also stated that stage two, “will provide a base from which commercial providers can offer compatible networking services nationally.”²⁴¹ The third stage would involve a national backbone of 1 gigabit per second for a few sites. All other sites would connect at T3 speed. The report noted that the stage three deployment was not expected until the middle or late 1990s. The report went on to state that “the deployment of the Stage 3 NREN will include a specific, structured process resulting in transition of the network from a government operation to a commercial service.”²⁴²

The OSTP report also assigned certain responsibilities to various federal agencies. The NSF was the lead agency in deploying and operating the network.²⁴³ Other federal agencies had specific responsibilities—for example, NASA was responsible for providing networking support for the aerospace community and for research on telescience.²⁴⁴ However, the report did not charge any federal agency with the responsibility of transitioning the government network to the private sector.²⁴⁵

238. See *supra* note 113 and accompanying text.

239. See OFFICE OF SCIENCE AND TECHNOLOGY POLICY, *supra* note 111.

240. See *id.* at 33-36.

241. *Id.* at 34.

242. *Id.* at 35.

243. See *id.*

244. See *id.*

245. See *id.* at 35-36.

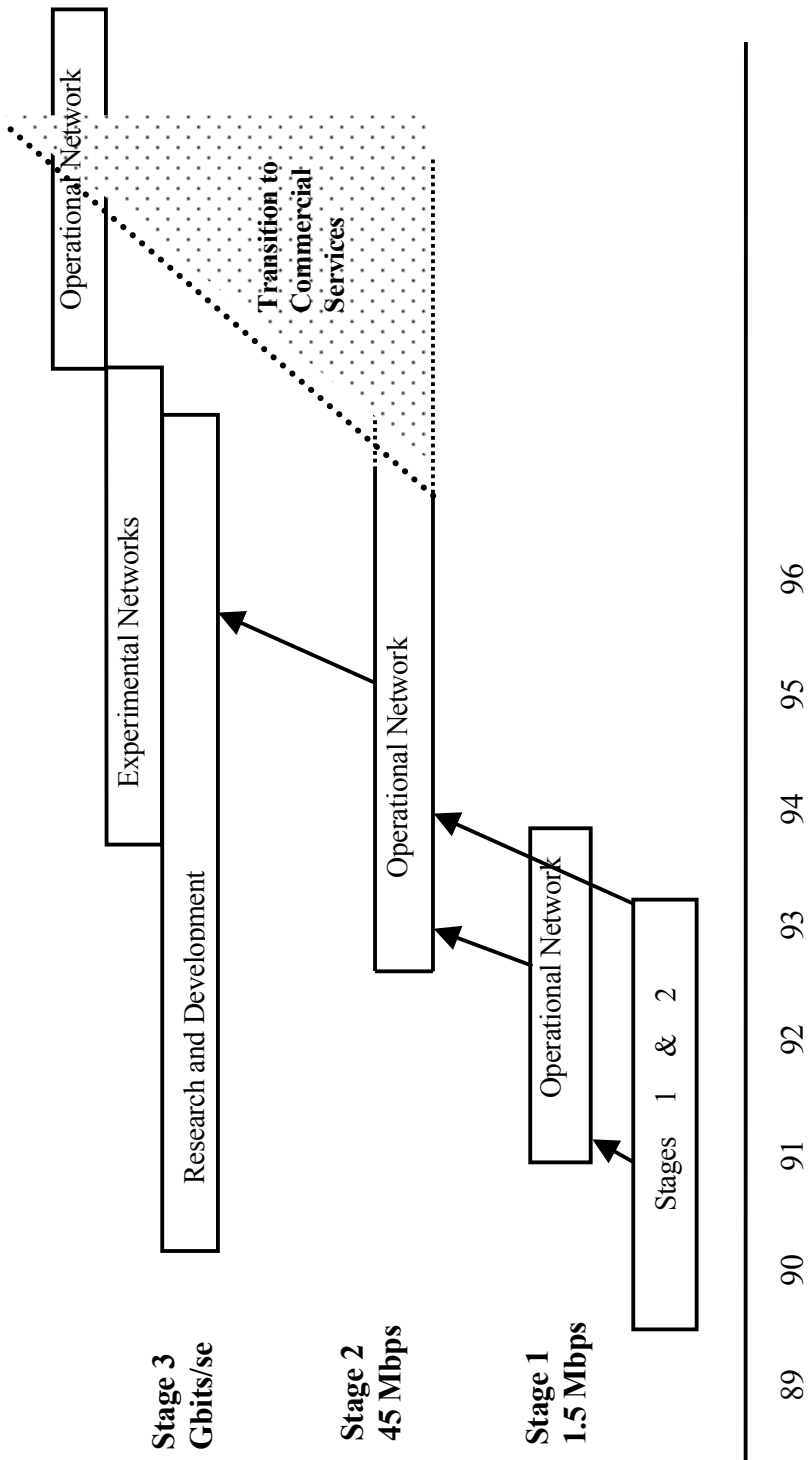


Figure 4: Timetable for the Privatization from the 1989 OSTP Report

The lack of details on this transition was not limited to the OSTP. The Federal Research Internet Coordinating Committee's (FRICC) program plan of May 1989 explicitly called for industry to supplant the government in supplying computer network services.²⁴⁶ However, the FRICC's management was unsure how the transition to commercial providers should be implemented.²⁴⁷ Similarly, Congress did not provide any guidance on how to privatize the NSFNET. Congress instead left this issue to the users, the "commercial interests and the federal agencies that now have responsibility for the Internet backbones."²⁴⁸

C. The NSF Decides the Details

To determine the details for the NSFNET's future, the NSF held a number of workshops.²⁴⁹ The first workshop sponsored by the NSF consisted of an invitation-only meeting in March 1990 at Harvard University.²⁵⁰ About thirty people attended, including "university networkers, economists, specialists in public policy (especially telecommunications policy), telecommunication carriers, and others."²⁵¹ The meeting focused on how to privatize the Internet.

246. Kahin, *supra* note 93.

247. See U.S. CONGRESS, OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 90, at 35.

248. J. A. Savage & Gary H. Anthes, *Internet Privatization Adrift*, COMPUTERWORLD, Nov. 26, 1990, at 1.

249. *National High-Performance Computer Technology Act of 1989: Hearings on S. 1067 Before the Subcomm. on Science, Tech., and Space of the Senate Comm. on Commerce, Science, and Trans.*, 100th Cong. 65-66 (1989) (statement of Dr. William Wulf, Assistant Director, Computer and Information Science and Engineering, National Science Foundation).

250. See Kahin, *supra* note 93. A few months after this workshop ANS was formed. In response, an electronic mailing list, com-priv (Commercialization-Privatization), was developed for the discussion on the issues of commercialization and privatization of the Internet. Many of the key participants from commercial network providers, to old-timers, reporters, and even NSF officials actively participated in com-priv. A notable exception to participation in com-priv would be Advanced Network Services (ANS). Although an ANS employee attempted to address complaints and comments about his employer, ANS never officially participated on com-priv. For the archives of the com-priv discussion group, see Commercialization & Privatization of the Internet, at <http://www.mit.edu:8008/MENELAUS.MIT.EDU/com-priv/> (last visited May 5, 2001). For mentions of the com-priv discussion group, see Cook, *National Research*, *supra* note 14; Jack Rickard, *Yet Another Unique Moment in Time Peering Redux—Back to the Future and the Essentials of a Competitive Internet*, BOARDWATCH, May 1998, at 6.

251. *Management of NSFNET*, *supra* note 182, at 136. The following are the listed institutional affiliations of the participants: AT&T, Bellcore, Brookings Institution, CICNet, Corporation for National Research Initiatives, Defense Advanced Research Projects Agency, Department of Commerce, Digital Equipment Corporation, EDUCOM, Harvard University, IBM, MCI, Merit, National Science Foundation, National Telecommunications and Information Administration, New York State Public Service Commission, Office of Management and Budget, Performance Systems International, RAND Corporation, Research Libraries Group, U.S. Congress Office of Technology Assessment, University of California, Berkeley, University of Colorado, University of Pennsylvania, University of Southern California, UUNET.

At the workshop, Stephen Wolff, Director of the NSF Division of Networking and Communications Research and Infrastructure, discussed the issue. Wolff believed privatization could occur if government subsidies shifted from network providers to the end users.²⁵² This would create a market for network communications and result in a network owned and operated by the private sector. Such a commercial network would not be subject to the NSF's AUP and, therefore, would be available for commercial use to all consumers.²⁵³

The second workshop, also at Harvard University, occurred in November 1990.²⁵⁴ This workshop was open to the public; however, the fee for attendance was about \$750 to \$1500. Some participants acknowledged the high fees essentially eliminated a sector of the public from the conference.²⁵⁵ Brian Kahin later published the papers submitted to the workshop in an edited book, *Building Information Infrastructure*.²⁵⁶ In August 1991, the NSF sponsored another meeting in Montana with the Federation of American Research Networks (FARNET), a trade association for the regional networks. The participants included providers of backbone services as well as telephone company representatives.²⁵⁷

Virtually all the groups represented at these workshops had a stake in the future of the NSFNET. Some, like the telecommunications industry, were new to the Internet. Back in 1989, the telecommunications industry viewed the academic market as too risky and unprofitable for computer networking.²⁵⁸ But the mood of the telecommunication companies had changed. As Kenneth King of EDUCOM, a group representing university computing interests, remarked, "[T]he reason industry is interested in joining us is that there is a huge investment at these universities in the equipment to connect to this network and so it represents an extraordinary market for them."²⁵⁹ Similarly, the atmosphere at the regional networks was changing and they began to either turn into or spin off commercial networking companies.²⁶⁰

By the fall of 1991, there was a consensus in the networking and education community that the NSFNET should be owned and operated by multiple

252. See Kahin, *supra* note 92.

253. *Management of NSFNET*, *supra* note 182.

254. *Id.* at 136 (statement of Dr. A. Nico Habermann and Dr. Stephen S. Wolff).

255. See Steve Cisler, *The National Research and Education Network: Two Meetings* (Dec. 17, 1990), at <http://www.cpsr.org/cpsr/nii/nren/harvard.ota>.

256. BUILDING INFORMATION INFRASTRUCTURE (Brian Kahin ed., 1993).

257. *Management of NSFNET*, *supra* note 182, at 136.

258. See U.S. CONGRESS OFFICE OF TECHNOLOGY ASSESSMENT, *supra* note 90, at 26.

259. *Computer Networks and High Performance Computing: Hearing Before the Subcomm. on Science, Tech., and Space of the Senate Comm. on Commerce, Science, and Transp.*, 100th Cong. 62 (1988) (statement of Kenneth M. King, President, EDUCOM).

260. Mandelbaum & Mandelbaum, *supra* note 61, at 73-74.

commercial providers.²⁶¹ The only doubts about the privatization related to the ongoing favoritism the NSF was showing toward ANS and ANS CO+RE.²⁶² This favoritism further contributed to the call for a network that would be owned and operated by multiple commercial providers.

D. The Draft Solicitation for Public Comment

In late 1991, the NSF presented its idea for a new network architecture in the "Project Development Plan." The plan envisioned multiple competing backbones, instead of just the NSFNET.²⁶³ This addressed the concerns of FARNET, a trade association for network providers. The Project Development Plan noted that "[t]here [was] substantial agreement in the networking community that, while providing for continued Backbone services, the NSF should assure both that the incumbent is not favored and that there is an equitable opportunity for other firms to participate in the long-haul TCP/IP networking business."²⁶⁴ To provide time to develop and implement the new network design which would support competition, the NSF extended its cooperative agreement with MERIT for eighteen months in late 1991.²⁶⁵

The Project Development Plan envisioned the use of Network Access Points (NAPs) as a place where federal networks, research networks, and commercial networks would connect with each other.²⁶⁶ Stephen Wolff stated that such points would allow the networks to share information and users, but still allow users to select their choice of network provider. He stated that the NAPs would function as public interconnection points open to all government networks and commercial networks.²⁶⁷ The NSF never intended the NAPs to serve as the only interconnection points. He further noted that "a NAP-based system does not preclude networks peering at a non-NAP site and exchanging peer-wise specific routing and traffic."²⁶⁸

261. After the public outcry over ANS, NSF knew it could not hand over NSFNET to ANS. The NSF was left with two choices. One, the NSF could not allow commercial activity over the NSFNET, which would be widely criticized by Congressman Boucher and many NSFNET users. Secondly, NSF could privatize the NSFNET. See Burns et al., *supra* note 69.

262. See *infra* Part III.

263. Wolff, *supra* note 116. Many of the ideas in this project plan were derived from a paper submitted to the NSF. See Robert Aiken et al., *NSF Implementation Plan for Interagency Interim NREN*, 2 J. HIGH SPEED NETWORKS 1 (1993).

264. Wolff, *supra* note 116.

265. *Id.*

266. Aiken et al., *supra* note 263, at 15.

267. See Electronic Frontier Foundation, Comments of the Electronic Frontier Foundation (Aug. 3, 1992), at <ftp://nic.merit.edu/nsfnet/recompete/solicitation-responses/eff.ps.Z> (file is zipped and in postscript format).

268. *Id.*

In June 1992, already a few months behind schedule, the NSF released a draft solicitation for the NSFNET architecture for public comment²⁶⁹ that essentially fleshed out the Project Development Plan. The NSF received over 200 pages of comments in response to the solicitation.²⁷⁰

The comments on the solicitation covered a number of issues. Some comments were concerned about the technical performance issues related to the NAPs and the ability of the NAPs to handle adequately future traffic. For example, comments by Science Application International Corporation (SAIC) included three different models for the architecture of the NAP depending on the cost, performance, and growth capabilities required.²⁷¹ Others such as Milo Medin, Deputy Project Manager, NASA Science Internet Office, emphasized the need for explicit performance requirements for the NAPs:

NASA strongly [recommends] that the section that deals with the RA and NAP architecture be rewritten to explicitly deal with the critical operational issues and performance requirements associated with management of the NAPs and route servers. It would be sheer negligence to not call out this critical issue in the specification.²⁷²

Some comments attempted to force the NSF to understand the significance of its actions. For example, the Electronic Frontier Foundation (EFF) comments noted that “despite the NSF’s stated intentions, the NSFNet has set de facto national public policy for an important part of the U.S. communications infrastructure and will likely continue to do so.”²⁷³ Others such as Brian Kahin, the Director of the Information Infrastructure Project at

269. National Science Foundation, *supra* note 117.

270. Many of the comments are online, at <ftp://nic.merit.edu/nsfnet/recompete/solicitation-responses/> (last visited May 5, 2001).

271. Science Applications International Corporation, Request for Public Comment (Aug. 3, 1992), at <ftp://nic.merit.edu/nsfnet/recompete/solicitation-responses/saic.ps.Z> (file is zipped and in postscript format).

272. NASA Science Internet Office, *supra* note 199.

273. These comments represented the findings of a Communications Policy Forum, which consisted of a roundtable of consumer and public interest groups, telecommunication companies, and computer industry groups. Electronic Frontier Foundation, *supra* note 267. The EFF was the “public interest group” for many early Internet-related issues. Their conception of public interest was based upon a competitive market for network services. It would be several years before other public interest groups would comment on the privatization, and by then it would be too late. A report by the Computer Professionals for Social Responsibility was released in 1994, years after these meetings where the decisions were made. See Computer Professionals for Social Responsibility, *Serving the Community: A Public-Interest Vision of the National Information Infrastructure* (executive summary), at http://www.cpsr.org/cpsr/nii/cpsr_nii_policy.txt (last visited Jan. 18, 2000). For a background on the EFF and their early work defending computer crackers, see Sandra Stewart, *Whatever Happened to the EFF?*, THE INDUSTRY STANDARD, Mar. 13, 2000, available at <http://www.thestandard.com/article/display/0%2C1151%2C12707%2C00.html>.

Harvard University, commented, "I have observed over the past year a growing reluctance on NSF's part to acknowledge the critical role it is playing in shaping a broader infrastructure."²⁷⁴ In contrast, Ron Perry of USWest was concerned that the NSF was carrying out industrial policy by influencing the development of a commercial network.²⁷⁵

EFF stressed the point that all network providers needed a level playing field. "Critical governance issues seem as yet unspecified, including interconnection policies that would ensure a level playing field for all network service providers. In the absence of such policy, it remains unclear how the NSF will proceed to ensure an equitable and fair environment for all service providers and users."²⁷⁶ The EFF made this point in early 1991, when Kapor stressed the need to ensure a competitive market for backbone services. He noted three possible options at that time. First, he suggested that the NSF could impose a contractual obligation.²⁷⁷ He next proposed a government agency, such as the Federal Communications Commission (FCC), could require interconnection.²⁷⁸ But to avoid government involvement, Kapor suggested the use of binding agreements between the commercial backbone networks to interconnect.²⁷⁹

The impetus for the redesign of the network was to introduce competition. The original design of the NSFNET consisted of one major backbone. The NSF and other network providers understood that without redesigning the NSFNET, the incumbent network provider, ANS, would retain its considerable advantages.²⁸⁰ These advantages can be explained by the concept of network effects.²⁸¹ Simply put, ANS's network was far more valuable than any competitor's, because it was already connected to sites and people on the NSFNET. ANS's larger network provided an incentive for people and sites to switch to ANS's network. Similarly, there would be a disincentive for sites and people to switch away from ANS's network. The NSF and the networking community understood that ANS's advantage could only be minimized by requiring backbone networks to interconnect. Therefore, the NSF designed the

274. Brian Kahin, Comments on Solicitation Concept (Aug. 3, 1992), at <ftp://nic.merit.edu/nsfnet/recompete/solicitation-responses/kahin.ps.Z> (file is zipped and in postscript format).

275. See Messmer, *supra* note 140, at 6.

276. See Electronic Frontier Foundation, *supra* note 267.

277. See Mitchell Kapor, The Privatized NREN (Feb. 14, 1991) (unpublished paper), at http://www.eff.org/pub/Publications/Mitch_Kapor/privatize_nren_kapor_eff_021491.paper. See also Kapor, *supra* note 178.

278. *Id.*

279. *Id.*

280. See *supra* note 264 and accompanying text.

281. For a discussion of network effects, see *infra* Part V.A.3.

NAPs to allow backbone networks to interconnect. This design allowed people to communicate with other sites and people regardless of their backbone network provider.

E. The Revised Solicitation

The revised solicitation,²⁸² released on May 6, 1993, allowed more telecommunication companies to participate in the structure of the Internet.²⁸³ The new architecture permitted more companies to own and control parts of the Internet, such as the NAPs. Additionally, the new architecture was decentralized with no management authority. The revised solicitation required that the regional networks purchase Internet service from commercial backbone companies. It is certainly interesting to see how the new structure for backbone services mirrors the structure in the telephone industry.

In a footnote in her book on the Internet's history, Janet Abbate writes about an interview with Robert Morris.²⁸⁴ Morris commented that the NSF's managers probably looked to the telephone industry as a model. The telephone system consists of two types of carriers: local and long distance. The long distance companies have "backbone networks." Morris thought this would have been an obvious model for the Internet, because MCI, Sprint, and other phone companies were involved with providing Internet service.²⁸⁵

To further understand the relationship between telecommunications companies and the Internet, consider the following excerpt from an interview with Steve Wolff of the NSF:

Might telcos become dominant? Of course there is such a danger. Be careful when you begin to dance with the elephants. But remember if they employ illegal means of increasing market share, we have laws against anti-competitive behavior. I doubt that they would do something questionable and walk away unchallenged. On the other hand if we draw them in now we have a chance of influencing them. Until they understand the desire for communication between users that motivated the CB radio fad and the Internet style and provide it, they cannot do anything that will put the Internet out of business. But if the telcos do understand it, they can use their muscle to get it to more people more

282. National Science Foundation, *supra* note 117.

283. Eillen Mesmer, *NSF Changes Course on its Internet Plan; Targets 155M Net Primarily for Supercomputers, Leaves Door Open for Expanded Commercial Use*, NETWORK WORLD, Dec. 21, 1992, at 1. See Frazer, *supra* note 70.

284. ABBATE, *supra* note 14, at 239 n.16.

285. *Id.*

cheaply. While they are doing this they will also develop a common ground to discuss what these services should be.²⁸⁶

Gordon Cook, who conducted the interview, later commented:

These views make us uneasy. For it seems to us that he allows the big industry, high tech, high bandwidth, high cost view of the Internet to dominate his policy making process. To some the congressionally mandated High Performance Computing and Communications (PL 102-194) view of the Internet seems to dictate an approach that only our largest corporations with their economic muscle can handle. We distrust this point of view for two reasons. One - it ignores low cost lower tech ways that are extremely cost effective in their ability to act on a broad scale as enabling technologies both for the provision of Internet service and the uses that ordinary citizens can make of it. Two - by potentially putting the Internet and NII into the hands of a few giant corporations, it may well smother the diversity that makes the net so useful to such a broad range of people.²⁸⁷

The history of the NSFNET and its redesign reveal the role of the NSF in guiding the development of the NSFNET. For example, during the initial design of the NSFNET, the NSF required the use of the TCP/IP protocol.²⁸⁸ Later, during the redesign of the network, the NSF changed the NSFNET's architecture with the addition of the NAPs. The decisions made by the NSF affected issues such as security, privacy, innovation, and competition.²⁸⁹ Through these decisions, the NSF essentially regulated the Internet. It is important to note that although the NSF consulted with the affected parties and limited their intervention to broad technical issues, the intervention was not insignificant and did constitute regulation of the Internet.

F. Limitations of the Redesign

The NSF's transition of the NSFNET to the private sector was procedurally sound.²⁹⁰ The NSF allowed for considerable public comment at several points during the process. The NSF also ensured that the process remained

286. Gordon Cook, *Cook Report—Frenzy on the Internet*, BOARDWATCH, Dec. 1994.

287. *See id.*

288. *See supra* note 60 and accompanying text.

289. The choice of the TCP/IP protocol has added consequences for security, privacy, and innovation. *See infra* notes 406, 408 and accompanying text.

290. The NSF procedural behavior was as if they were performing rulemaking activity. For procedural requirements under the Administrative Procedure Act, see *supra* note 204.

transparent by accepting public comment. While there was little public comment from “public interest” groups,²⁹¹ this was not the NSF’s fault. The lack of interest probably stemmed from the lack of awareness of the significance of the privatization process.

During the privatization, Kahin commented that the NSF’s redesign fundamentally reshaped the infrastructure of the Internet.²⁹² Instead of one major backbone—the NSFNET—the new network depended on multiple backbone providers. The NSF created the NAPs to interconnect these networks and to prevent a balkanized Internet.²⁹³ While this design was inspired by the CIX and the FIX interconnection points, it went substantially beyond them. This new network was designed to create competition for backbone services. However, in designing the NAPs, the NSF neglected to put into place minimum performance requirements.²⁹⁴ Consequently, the public NAPs have been neglected and have become areas for congestion on the Internet.²⁹⁵

The new network was designed with a substantial role for nationwide backbone providers as only nationwide backbone providers could connect to all the major NAPs. Unlike smaller networks, they were the only ones who could carry traffic throughout the Internet. Thus, a hierarchical system—the dependence of smaller networks on larger networks—was implicit in the design of the new network.

Smaller networks continue to be dependent upon larger backbone providers for interconnection. Without interconnection, a smaller network cannot survive. With interconnection, smaller networks can compete against larger backbone providers. For example, in the case of telephony, the FCC regulates interconnection policies.²⁹⁶ During the redesign, industry leaders such as Mitch Kapor drew attention to the need for an interconnection policy. Such a policy could have been designed and implemented by the government or by an industry-operated arbitration board.²⁹⁷ In fact, requiring an interconnection policy is typical for a privatization.²⁹⁸ However, the NSF failed to ensure an

291. The Electronic Frontier Foundation was the only “public interest” group that participated in the transition process.

292. See *supra* note 274 and accompanying text.

293. See *supra* notes 266-67 and accompanying text. For more on NAPs, see *infra* Part V.A.

294. See *supra* notes 271-72 and accompanying text.

295. See *infra* Part V.A.1.

296. Recently, the FCC has required local phone companies to share their lines with Digital Subscriber Lines (DSL), however they have not done the same for cable systems. See Paul Krill & Jennifer Jones, *FCC Shows Mixed Approach to Internet Access*, INFO WORLD, Nov. 15, 1999, at 22. For an opinion on opening access to cable systems, see Lawrence Lessig, *Cable Blackmail*, THE INDUSTRY STANDARD, Nov. 14, 1999, available at <http://www.thestandard.com/article/display/0,1151,5198,00.html>.

297. See *supra* notes 276-77 and accompanying text.

298. See *supra* Part IV.A.

interconnection policy. Part V will show how many of the problems that exist today can be traced back to the NSF's inaction.

V. THE CONSEQUENCES OF THE NSF'S REDESIGN FOR PRIVATIZATION: THE CHANGING RELATIONSHIP BETWEEN THE GOVERNMENT, THE PRIVATE SECTOR, AND "CODE"

When Kevin Ryan, President of DoubleClick was asked who is the most powerful public person in the Internet industry today, he answered: "Bernie Ebbers, CEO of WorldCom, because he will ultimately control the Internet's backbone."²⁹⁹

Bernie Ebbers derived his power not from the network architecture³⁰⁰ developed by the NSF, but from the lack of an interconnection policy, which ensures the large backbone networks a competitive advantage. The first section of this Part describes the lack of competition in the backbone industry as a consequence of the lack of an interconnection policy. The second section describes a potential problem with the transfer of the Internet's management to the private sector. The third section explains how the government lost an opportunity to address general societal concerns during the NSF's redesign of the NSFNET. The final section summarizes the consequences of the NSF's redesign of the Internet.

A. *Lack of Competition in the Backbone Industry*

The prevailing wisdom in 1995, represented by Scott Bradner, a consultant with Harvard University's Office of Information Technology, was that management of the Internet would occur by self-interested cooperation between commercial companies.³⁰¹ He also believed that the Internet would consolidate to a few providers: "[u]ltimately, the Internet will boil down to a few big providers with bilateral agreements on how to interoperate, service and support one another's networks."³⁰² This section shows how Bradner's vision has come true.

In this Article we repeatedly compare the large backbone providers to the

299. Lauren Barack, *The Industry Standard's Internet Architecture Spotlight* (Feb. 23, 2000), available upon request at <http://www.thestandard.com>.

300. For a technical perspective on these changes, see CISCO SYSTEMS, INC., *EVOLUTION OF THE INTERNET*, available at <http://www.cisco.com/cpress/cc/td/cpress/design/isp/1ispint.htm> (last visited May 5, 2001).

301. Michael Cooney et al., *Internet Surge Strains Already Shaky Structure; Who Will Manage the Net's Commercialization?*, NETWORK WORLD, Apr. 3, 1995, at 1.

302. *Id.*

smaller networks because only five companies currently control 80% of the Internet's backbone.³⁰³ Although thousands of companies provide Internet connectivity, they are all dependent upon MCI WorldCom, Genuity (formerly GTE), AT&T, Sprint, and Cable & Wireless.³⁰⁴ It is virtually impossible to transmit information across the Internet that does not travel upon one of these five large backbone networks.

Because the NSF did not set performance requirements for the public Network Access Points (NAPs) they became congested. This congestion led to a dependence on interconnecting at private exchange points with the large backbone providers. In turn, this dependence has allowed a few large backbone providers to ensure their own dominance, while increasing the gap between themselves and smaller networks. The result is a lack of competition for backbone services.³⁰⁵

1. Problems with Interconnecting at the Public Network Access Points (NAPs)

The original NSFNET relied upon one national backbone. The NSF's redesign allowed for multiple competing backbones to replace the NSFNET. A fundamental concept of the new network architecture was the use of NAPs where backbones could interconnect.³⁰⁶ Backbones could meet at the NAPs and exchange traffic with other networks as they wished. It was in the public interest to provide facilities for these networks to interconnect and therefore prevent a balkanized Internet.³⁰⁷

The NSF initially funded a number of public NAPs.³⁰⁸ However, in August 1996, the NSF announced it would end its sponsorship of the four public NAPs.³⁰⁹ The NSF turned the public NAPs over to the private sector without

303. See Neil Weinberg, *Backbone Bullies*, FORBES, Jun. 12, 2000, at 236.

304. *Id.*

305. Some commentators argue that the "NSF got it right, but they also got quite lucky" in their privatization of the Internet. However, their analysis focused on an entirely different market—smaller commercial ISPs—and not on the few large backbone providers. See Shane Greenstein, *On the Net: The Recent Commercialization of Access Infrastructure*, IMP, Dec. 22, 1999, available at http://www.cisp.org/imp/december_99/12_99greenstein.htm.

306. See *supra* Parts IV.D-E.

307. Farnon & Huddle, *supra* note 128. For more on NAPs and interconnection, see Chinoy & Salo, *supra* note 101; Padmanabhan Srinagesh, *Internet Cost Structures and Interconnection Agreements*, 2 J. ELECTRONIC PUBLISHING (May 1996), available at <http://www.press.umich.edu/jep/works/SrinCost5t.html>.

308. Public NAPs operate in a nondiscriminatory manner. There are still requirements that backbone networks must meet such as minimum connection bandwidth. See Chinoy & Salo, *supra* note 101.

309. See Tracie Monk & K. Claffy, *Cooperation in Internet Data Acquisition and Analysis* (unpublished manuscript), available at <http://www.caida.org/outreach/papers/Cooperation/> (last modified Sept. 24, 1996).

establishing minimal performance requirements or an interconnection policy.

Today, the public NAPs suffer from congestion. According to InterNAP, a company that specializes in avoiding the public NAPs, approximately 70% of the data transmissions across the Internet pass through public NAPs during peak hours. Of the traffic that flows through the public NAPs, between 10% and 40% of all data packets are dropped and must be retransmitted, which creates poor performance.³¹⁰ For example, Dwight Gibbs the chief technician for the web site Motley Fool, has often traced slowdowns of his web site to congestion on the public NAPs.³¹¹ And when problems occur at public NAPs, the effects of congestion are spread across the entire Internet.³¹²

The congestion at public NAPs leads to degraded performance for interconnecting networks. There are two principal reasons for these problems at public NAPs. The first is that the shared media, such as gigaswitches (which perform the actual interconnection), are degrading in performance as they approach saturation.³¹³ The second is that the circuits of the major backbone providers that connect to the public NAPs run at or near full capacity.³¹⁴ Because of lack of competition, the major backbones have no incentive to increase the capacity of their networks connected to the public NAPs. Meanwhile, traffic at the NAPs has doubled over time.³¹⁵ For example, Sprint's backbone network operates at 2.5 billion bits per second, while the highest speed offered at the Sprint managed public NAP is 45 million bits per second. Neil Wienberg aptly characterizes this as "giving drivers on a six-lane highway access via a dirt road."³¹⁶

310. See Peter D. Henig, *InterNAP Wakes Up Transmission Quality*, REDHERRING.COM, Apr. 21, 1999, available at <http://www.redherring.com/insider/1999/0421/vc-internap.html>. Other studies have found that removing one percent of the nodes on the Internet would require information to travel twice as far and removing four percent of the nodes would fracture the Internet in a number of small networks. See Mark Ward, *Unweaving the World Wide Web*, BBC NEWS, July 26, 2000, at http://news.bbc.co.uk/hi/english/sci/tech/newsid_852000/852866.stm. Because of these problems, content rich sites often pay "overlay networks" such as Akamai to ensure that rich content is delivered quickly to consumers. The overlay networks attempt to bypass as much of the public Internet as possible. See Paul Spinrad, *Akamai Overcomes the Internet's Hot Spot Problem*, WIRED, Aug. 1999, at 152.

311. See Sandra Gittlen & Denise Pappalardo, *Even a \$10M Upgrade Won't Fix Congested Internet Exchange Points*, NETWORK WORLD FUSION, Nov. 7, 1997, available at <http://www.nwfusion.com/news/1997/1107mae.html>.

312. See John Borland, *WorldCom Outage Ripples Across Net*, CNET NEWS.COM, July 13, 2000, at <http://news.cnet.com/news/0-1004-200-2253847.html>.

313. See Jim Winkelman, *Getting Connected: Now that Public Peering Isn't Viable for Hooking to the 'Big Five' Internet Backbones, What are the Best Approaches?*, AMERICA'S NETWORK (Aug. 15, 1998), available at http://www.americasnetwork.com/issues/98issues/980815/980815_peer.html. See also Michael Dillon, *Inside Public Exchange Points*, INTERNET WORLD, Aug. 1, 2000 (discussing the limitation of NAPs), available at <http://www.internetworld.com/080199/8.0infraexpert.jsp>.

314. *Id.*

315. See Winkelman, *supra* note 313.

316. Weinberg, *supra* note 303, at 238.

The performance issues at the public NAPs have led many backbone providers to consider the public NAPs' connections as worthless.³¹⁷ Longitudinal performance measurements of the Internet show that by using private exchange points and avoiding the public NAPs, backbone providers can increase their performance.³¹⁸ Private exchanges points were contemplated as part of the NSF's redesign of the Internet.³¹⁹ However, their recent popularity is a result of the congestion at the public NAPs.³²⁰ By interconnecting at private exchange points, it is possible to avoid routing traffic through the public NAPs. For example, the five large backbone providers have each implemented at least four connections with the other large backbone providers at private exchanges.³²¹ This allows the large backbone providers to provide high performance Internet access for their customers. Meanwhile, smaller networks are often relegated to the congested public NAPs because there is no requirement for a private exchange to treat other networks in a fair and nondiscriminatory manner.³²²

The problems of performance at the public NAPs can be traced to the inaction by the NSF during the redesign of the Internet. According to Scott Hiles, Sprint's network operations manager, "the public peering points are by design bottlenecks."³²³ While the public NAPs were not designed as bottlenecks, it was clearly foreseeable that they would become bottlenecks. The NAPs were designed to interconnect traffic. It was well known at the time the NAPs were designed that traffic through the NAPs would continue to rise rapidly in the foreseeable future. In fact, the NSF received comments about the need for performance requirements for the NAPs.³²⁴ Despite these comments, the NSF never took a step towards preventing performance issues at the public NAPs. The result is congestion at the public NAPs and the abandonment of the

317. See Gordon Cook, *Optical IP Backbone Revolution Emerges Canarie Runs IP Over WDM Eliminating SONET and ATM—Expects Cost-Savings of Greater than 95%*, COOK REPORT, July 1998, available at <http://www.cookreport.com/07.04.shtml> (summary of actual issue). Chinoy and Salo argue that the private sector has not been successful in funding research to scaling Internet exchange points, and therefore it may be necessary for the federal government to support this critical research. Chinoy & Salo, *supra* note 101, at 345.

318. See Keynote, *Keynote/Boardwatch Internet Backbone Index*, available at <http://www.keynote.com/measures/backbones/backbones-secondindex.html> (last visited May 5, 2001).

319. See *supra* note 268 and accompanying text.

320. See Winkleman, *supra* note 313. Private exchange points also have a security advantage. At a public NAP not only is everyone sharing traffic, but everyone's equipment is located in one facility. It is possible for a competitor to physically access your equipment. See Robin Gareiss, *Is the Internet in Trouble*, DATA COMM., Sept. 21, 1997, at 36.

321. See Winkleman, *supra* note 313.

322. See *id.* See Denise Caruso, *Mergers Threaten Internet's Informal System of Data Exchange*, N.Y. TIMES, Feb. 14, 2000, at C4.

323. Weinberg, *supra* note 303, at 238.

324. See *supra* notes 271-72 and accompanying text.

public NAPs by the large backbone providers.

During the redesign of the Internet, groups such as the EFF called for interconnection policies.³²⁵ These policies would have ensured open and nondiscriminatory access to all competitors. The NSF never implemented any type of interconnection policy or guidelines for operators of the public NAPs, which has led the parties who control the public NAPs to operate in an opportunistic fashion and take advantage of the fact that they control and operate both a backbone network and the NAP.³²⁶ For example, an entity that controls a NAP and provides backbone services may offer customers an inexpensive connection to the NAP as an alternative to purchasing connectivity from a competitor.³²⁷ Second, control of the NAP allows the operator to use the NAP facility for other services, such as web site hosting and co-location of servers.³²⁸ Third, the NAP operators can use high monthly fees to discourage use of public NAPs. For example, MCI WorldCom has begun charging smaller networks up to tens of thousands of dollars for placing equipment inside a public NAP managed by MCI Worldcom.³²⁹ The high fees encourage smaller networks to leave the public NAP.

The NSF redesigned the Internet for multiple competing networks. The key to interconnecting these networks was the public NAPs. However, the NSF's failure to put into place performance requirements and interconnection policies for the public NAPs has led to three significant problems. The first is the performance issues at the public NAPs. The second is the abandonment of the public NAPs by the large backbone providers. The next section will show that it is advantageous to the large backbone providers to leave the public NAPs. The third problem is the opportunistic behavior of the operators of the public NAPs, which has a significant effect on the competitiveness of smaller networks. The next section also illustrates how the lack of an interconnection policy affects all Internet interconnections, not just those at the public NAPs.

2. How the Lack of an Interconnection Policy Affects Backbone Services

The lack of an interconnection policy favors a few large backbone providers to the detriment of consumers and smaller backbone providers. At its

325. See *supra* notes 276-77 and accompanying text.

326. For further discussion of this opportunistic behavior, see Farnon & Huddle, *supra* note 128. Worldcom owns two of the largest public NAPs, MAE-East and MAE-West. See WorldCom MAE Information Site, at <http://www.mae.net> (last visited May 5, 2001). Sprint operates the public New York NAP, located in Pennsauken, New Jersey. See Cisco Systems, *supra* note 300.

327. See Farnon & Huddle, *supra* note 128.

328. See *id.*

329. See Weinberg, *supra* note 303, at 238.

simplest, an interconnection policy would ensure all competitors fair and nondiscriminatory access to each other's networks. This section explains how the large backbone providers unfairly benefit from the lack of an interconnection policy. These advantages allow large backbone providers to provide better performance and charge higher prices. Most importantly, the large backbone providers use the lack of an interconnection policy to treat smaller networks unfairly and limit new competitors.

To connect to the Internet, a network must peer with other networks. The term "peer" means to interconnect networks and exchange information.³³⁰ The original meaning of peering implied a settlement-free basis, because peering was held to be advantageous to both parties.³³¹ In 1997, however, UUNET (now owned by MCI WorldCom) stated that it would no longer peer with networks that were not of similar size.³³² UUNET's rationale was that peering requests from smaller networks and web hosting server farms were taking advantage of UUNET's infrastructure to transport data.³³³ With similar size networks, UUNET is able to exchange traffic in a mutually beneficial manner. Thus, smaller networks pay larger networks to peer with them, while the large backbone providers still peer with each other on a settlement-free basis.³³⁴

The movement towards paid peering has allowed a few large backbone providers to set the terms of interconnection with smaller networks. Simply put, the large backbone providers decide with whom they wish to peer and the conditions of the peering.³³⁵ First, large backbone providers do not publicly disclose with what other networks they peer or their terms for the peering. This secrecy benefits the large backbone providers as they undoubtedly claim they are well-connected.³³⁶ Second, smaller networks often have to sign

330. For an overview of the business and technical aspects of peering, see Geoff Huston, *Interconnection, Peering and Settlements* (Jan. 1999), at <http://www.telstra.net/gih/papers/books/peerdocs/peer.html>.

331. Settlement free means no money exchanges. See Farnon & Huddle, *supra* note 128.

332. See UUNET, *UUNET Details Peering Strategy*, available at <http://www.us.uu.net/about/press/1997/peering.html> (last visited May 5, 2001). For further background on this incident, see Jack Rickard, *The Big, The Confused, and the Nasty: UUNET Resigns from the Internet*, BOARDWATCH, June 1997, available at <http://www.ispworld.com/archive/mag/97/jun/bwml.html>.

333. Web hosting server farms are a series of servers that provide content for the Internet.

334. See Winkleman, *supra* note 313. For a good overview of peering issues, see Jack Rickard, *Yet Another Unique Moment In Time Peering Redux—Back to the Future and the Essentials of a Competitive Internet*, BOARDWATCH, May 1998, at 6.

335. See Kenneth Neil Cukier, *Peering and Fearing: ISP Interconnection and Regulatory Issues*, at <http://ksgwww.harvard.edu/iip/iicompol/Papers/Cukier.html> (last visited Jan 18, 2000).

336. See Jonathan Angel, *Toll Lanes on the Information Superhighway*, NETWORK, Feb. 1, 2000, at 27; Robin Gareiss, *The Old Boys' Network*, DATA COMM., Oct. 7, 1999. In September 2000, Genuity announced they were publicly posting their peering guidelines. See Press Release, Genuity, Genuity Announces Public Posting of Interconnect Guidelines (Sept. 8, 2000), available at http://www.genuity.com/announcements/news/press_release_20000908-01.xml. In January 2001,

nondisclosure agreements, which limits sharing information with other smaller networks regarding their interconnection terms.³³⁷ This practice has also limited the creation of industry standards concerning who should get free peering and what are reasonable rates.³³⁸ Third, larger backbone providers can discontinue their interconnection arrangements with little notice.³³⁹ Such action disparately affects the smaller networks.

The lack of an interconnection policy ensures a competitive performance advantage to the larger backbone providers. The large backbone providers connect with each other at private exchange points with direct connections. These direct connections are much quicker than the slower shared connections at the public NAPs. This allows large backbone providers to provide superior performance in comparison to the slower “second-class” performance from smaller networks.³⁴⁰ This superior performance results in more business for larger networks, because a principal criterion in selecting a backbone provider is performance. Moreover, large backbone providers are also able to generate additional revenue by offering performance guarantees. For example, larger networks, such as MCI WorldCom, offer performance guarantees for traffic that stays on their backbone network.³⁴¹

The performance advantage enjoyed by larger backbone providers allows them to charge higher prices. For example, MCI WorldCom’s UUNET pricing of \$875 per megabit is double that of smaller backbones.³⁴² While a pricing differential may be justified, this pricing differential appears excessive. Access to MCI WorldCom’s UUNET network means better performance, because MCI WorldCom’s network avoids the public NAPs by interconnecting with the other large backbone providers. A cheaper, smaller network undoubtedly

UUNET publicly posted their peering policy. See UUNET, WorldCom Policy for Settlement-Free Interconnection with Internet Networks (Jan. 2001), at <http://www.uu.net/peering>. However, as Sean Donelan noted, these requirements are just the first stage of requirements and, therefore, meeting these requirements does not guarantee interconnection. See Posting from Sean Donelan to Cybertelecom, Re: Genuity Announces Public Posting of Interconnection Guidelines (Sept. 9, 2000) (on file with author).

337. Cukier, *supra* note 335.

338. See Weinberg, *supra* note 303, at 238.

339. Cukier, *supra* note 335.

340. Keynote, *supra* note 318. Not that anything is necessarily wrong with a second-class Internet. It is just necessary to acknowledge the direction the Internet is heading. Moreover, there have been a number of advocates of a tiered Internet system.

341. See WorldCom, *Internet Service Level Guarantee*, at http://www.worldcom.com/terms/service_level_guarantee/t_sla_terms.phtml (last visited May 5, 2001); Ian Scales, *UUNet to Break New Ground with Blanket Service-Level Agreements*, COMM. WK. INT’L, Oct. 19, 1998, at <http://totaltele.com/cwi/213/213news2.html>.

342. See Weinberg, *supra* note 303, at 238. Frieden discusses how this private peering may affect universal service by increasing costs for smaller rural ISPs. See Rob Frieden, *Without Public Peer: The Potential Regulatory and Universal Service Consequences of Internet Balkanization*, 3 VA. J.L. & TECH. 8 (1998).

connects to one of the public NAPs, thus causing a performance drop.

The lack of an interconnection policy has also allowed large backbone providers to impede new entrants to the backbone business, such as Level 3 Communications. An article in *Business Week* noted that Level 3 Communications is “frustrated that they haven’t been able to strike peering agreements with major backbone providers. They fear that the established backbone companies have an incentive to keep them out of the game, since the new players could overtake the old-timers with their well-capitalized, next-generation networks.”³⁴³ Thus, despite the rapid increase in the deployment and use of optical fiber, “[o]ne way the dominant backbone companies have maintained their oligopoly is by controlling peering agreements.”³⁴⁴

The strategy of the large backbone providers to prevent competition has been successful. In 1995, there were five major backbone providers: UUNET, ANS, SprintLink, BBN, and MCI.³⁴⁵ Despite the rapid growth in Internet services and new Internet start-ups such as Level 3 Communications and Qwest, the same companies still control the Internet. In 2000, there were five major backbone providers: MCI WorldCom (bought ANS and UUNET), Sprint, Genuity (formerly GTE who bought BBN), AT&T, and Cable & Wireless (which owns MCI’s old backbone).³⁴⁶ AT&T built its network with its own large fiber optic network and by acquiring IBM’s Global Network and one of the early Internet backbone providers, CERFnet.³⁴⁷ After all, the only way to become a large backbone provider is to buy one!

In August 1998, it was reported that the FCC issued a notice of inquiry and sought public comment on whether the FCC should have the authority to “preserve efficient peering arrangements among Internet companies, especially in the face of consolidations of large proprietary gateways.”³⁴⁸ The former chairman of the FCC, Reed Hundt, tried to get the large backbone providers to discuss peering issues, but could not “get any of the big ISPs to show up at the

343. *How the Internet Works: All You Need to Know*, BUS. WK., July 20, 1998, at 60.

344. Joan Engebretson, *Challenging the Oligopoly*, TELEPHONY, May 10, 1999, at 84.

345. See Winkelman, *supra* note 313. This oligopoly has always existed. When the NSFNET was decommissioned, almost all of the regional networks chose either MCI or Sprint for their backbone services. See Cisco Systems, *supra* note 300. In an article on the privatization of the Internet in *Byte*, there was a simple table that asked, “Who Controls the Infrastructure?” See Nicholas Baran, *The Greatest Show on Earth*, BYTE, July 1995, at 72. On the left, which represented “Yesterday”, the National Science Foundation was listed. *Id.* On the right, which represented “Today”, three companies were listed: MCI, Sprint, and ANS/AOL. *Id.*

346. See Weinberg, *supra* note 303.

347. ISPWorld, *AT&T History*, at <http://www.ispworld.com/isp/bb/Att.htm> (last visited Jun. 19, 2000).

348. See Kenneth Cukier, *ISPs Face Regulation as Peering Conflicts Rise*, COMM. WK. INT’L, Sept. 7, 1998, at <http://totaltele.com/cwi/210/210news5.html>.

negotiating table.”³⁴⁹ In the spring of 1999, a smaller backbone provider, Exodus Communications, attempted to bring the players to the table and also failed.³⁵⁰

In sum, the industry has failed to develop an interconnection policy, despite the adverse effects on smaller competitors and potential new entrants. The failure to develop an interconnection policy is due to the noncooperation of the large backbone companies. This is to be expected, because the large backbone providers have several competitive advantages under the current system. Most importantly, they have been able to limit new entrants into the market. Additionally, they are able to provide unmatched performance while charging higher prices. As the next section shows, these developments in the backbone industry can be explained by “network effects.”

3. *How Network Effects Reduce Competition for Backbone Services*

The enormous power of a few large backbone providers can be explained by “network effects.” A direct “network effect” or “demand-side economy of scale” emerges from communications networks.³⁵¹ For example, a fax machine increases in value as other people obtain fax machines. Consider this hypothetical example of a city with two telephone networks that are not interconnected. The first telephone company, Dominant Phone Company, has 90% of the telephone market. The second company, Alternative Phone Company, has only 10% of the market. If a person were to choose a new telephone company, they would undoubtedly choose Dominant Phone Company because they could reach more people. This is an example of network effects. As more people join Dominant Phone Company, its network

349. See Gareiss, *supra* note 336. Recently the FCC released a policy paper on the Internet backbone industry. Kende argues there is no need for an interconnection policy because there is competition in the backbone industry. They never provide any evidence that the backbone industry is competitive. Michael Kende, *OPP Working Paper No. 32: The Digital Handshake: Connecting Internet Backbones*, in OFFICE OF PLANS AND POLICY, FEDERAL COMMUNICATIONS COMMISSION (2000). The earlier policy papers on the Internet by the FCC only mention congestion and competition for backbone services in passing. Instead, they focus on “congestion and pricing issues that affect the public switched telephone network, because it is in that area that decisions by the FCC and other regulatory entities will have the greatest significance.” Kevin Werbach, *OPP Working Paper No. 29: Digital Tornado: The Internet and Telecommunications Policy*, in OFFICE OF PLANS AND POLICY, FEDERAL COMMUNICATIONS COMMISSION 54 (1997).

350. See Gareiss, *supra* note 336.

351. See CARL SHAPIRO & HAL R. VARIAN, INFORMATION RULES: A STRATEGIC GUIDE TO THE NETWORK ECONOMY 174 (1998); Mark A. Lemley & David McGowan, *Legal Implications of Network Economic Effects*, 86 CAL. L. REV. 479, 550 (1998). For information and resources on network effects, see Nicholas Economides, *The Economics of Networks*, 14 INT’L J. INDUS. ORG., 673 (1996), available at <http://raven.stern.nyu.edu/networks/top.html>. See generally Michael L. Katz & Carl Shapiro, *Systems Competition and Network Effects*, J. ECON. PERSP., Spring 1994, at 93.

becomes more valuable, while Alternative Phone Company's network becomes less valuable. Now suppose that both telephone networks were interconnected and interoperable. The dominance of Dominant Phone Company is reduced because both telephone companies could reach the entire market. This section shows how the competitive problems in the backbone industry arise from network effects. Later, we use the concept of network effects and interconnection to develop proposals to promote competition for backbone services.³⁵²

When the NSF designed the Internet, they created a series of NAPs and required the large backbone providers to connect to each of these points. The thinking was that if anyone connected to just one of these points, they would have access to the entire Internet through the large backbone networks. However, the large backbone providers quickly noted how network effects affect the Internet. Less than a year after the decommissioning of the NSFNET backbone, MCI began claiming that its Internet service was better because it was possible to access more of the Internet through its network. MCI was not claiming it had the fastest backbone, but that more Internet sites were connected to its backbone.³⁵³ This is a telling statement. Implicit in this statement is that it is more valuable to be connected to MCI's network than a competitor's because of the size of MCI's network. This implies there are delays and problems whenever networks exchange traffic. Otherwise why would it matter how many sites were connected to a MCI's backbone network? This is network effects. The larger MCI's network is, the more valuable it becomes.

Network effects suggest that the larger the networks are, the more valuable they are. Conversely, if a network is too small, no one will want to connect to it. This theory is in accordance with the consolidation in the backbone industry. The margin between large backbone providers and smaller providers has grown in the last few years as measured by the amount of infrastructure, number of customers, and backbone speed.³⁵⁴

Network effects also suggest that it is natural for the industry to move towards one provider. This move almost happened when the merger of MCI and WorldCom would have combined two of the largest four backbones in the world. According to Constance Robinson, Director of Operations and Merger Enforcement, Antitrust Division, U.S. Department of Justice, a variety of

352. See *infra* Part VII.C.2.

353. See Mark Dziatkiewicz, *A New Market for IXCs—Just in Time*, AMERICA'S NETWORK, Dec. 15, 1995, at 28. Recently, MCI WorldCom has begun advertising the security advantage of using only their network, and not allowing your data to go over "other" networks.

354. Cukier, *supra* note 335.

indicators showed that “MCI/Worldcom would be the dominant player in the market, and substantially larger than any other player.”³⁵⁵ The fear was that such expansive control would allow MCI WorldCom to substantially increase the fees for Internet access by threatening to withhold connectivity to any competitors. Even the Vice President of WorldCom and CEO of UUNET, John Sidgmore, admitted that “[h]aving a big network is a huge barrier to entry for competitors.”³⁵⁶ Thus, as a condition of approval by the Department of Justice and the European Union, MCI was forced to divest its Internet business prior to the merger. MCI sold to Cable & Wireless.³⁵⁷ Recently, similar concerns were raised between the attempted merger of MCI WorldCom and Sprint. Sprint and MCI WorldCom control two of the largest four backbone networks. European regulators opposed the merger because it would have left one entity in control of the majority of the Internet backbone.³⁵⁸

Hal Varian, Dean of the School of Information Management at the University of California at Berkeley, commented to the *New York Times* that “[t]he natural state in [the backbone] industry is for there to be only a few backbone providers, the challenge is to see that there is more than one.”³⁵⁹ Varian believes “antitrust and regulatory issues will stabilize the number around four [large backbone providers].”³⁶⁰ So far, regulators have prevented further consolidation in the backbone industry.

Network effects can be amplified by new technologies such as “Quality of Service.”³⁶¹ Simply put, Quality of Service allows networks to treat different traffic differently. For example, networks may make a high-speed lane for video conferencing and a slow lane for email traffic. Effective Quality of Service requires end-to-end control to ensure network traffic maintains its priority, whether in the fast or slow lane. The requirement of end-to-end control means that larger networks become more valuable. Smaller networks that interconnect with other networks cannot guarantee that network traffic maintains its priority level. Thus, by employing technologies such as Quality

355. Constance K. Robinson, *MCI WorldCom Merger: Protecting the Future of the Internet*, Address Before the Practising Law Institute (Aug. 23, 1999), available at <http://www.usdoj.gov/atr/public/speeches/3889.htm>.

356. *Id.*

357. *Id.*

358. See Peter S. Goodman, *EU Set to Block Sprint's Merger with WorldCom*, WASH. POST, Jun. 21, 2000, at A1; FCC Memo: *MCI-Sprint Merger is "Intolerable"* (Dec. 10, 1999), at http://www.clecplanet.com/news/9912/991213mci_sprint.htm.

359. Caruso, *supra* note 322.

360. John Gallant, *Internet Economics*, NETWORK WORLD FUSION (July 7, 1998), available at <http://www.nwfusion.com.news/0709varian.html>.

361. For a thorough discussion of Quality of Service, see PAUL FERGUSON & GEOFF HUSTON, *QUALITY OF SERVICE: DELIVERING QOS ON THE INTERNET AND IN CORPORATE NETWORKS* (1998), available at <http://www.wiley.com/compbooks/ferguson>.

of Service, the large backbone providers have amplified network effects to make their own networks more valuable.³⁶²

The large backbone providers further magnify network effects by working together to the detriment of potential competitors. The large backbone providers all peer with each other for free. Each of the five major backbones peers with the other major backbones using at least four private exchanges.³⁶³ The rudimentary nature of settlement mechanisms makes its understandable that they trade traffic for free. However, their concerted action makes it difficult for any third party to become a large backbone provider. The large backbone providers only want to peer freely with other providers of similar size. Thus, no new entrant can enter the industry because they can not grow to the size of the existing large backbone networks. Any new backbone network will have difficulty acquiring customers if it is not connected to the other large backbone networks. Theoretically, a new entrant could pay for peering with the other large backbone providers. If they spent enough money, they could perhaps become as large as the other carriers. However, no entrant has employed such a costly strategy that also requires cooperation from at least another large backbone provider. This is an example of how network effects can work against new entrants into the backbone industry.

The concept of network effects has great explanatory value for changes in backbone industry. Simply put, network effects increase the value of large existing backbone networks while negatively impacting smaller networks and new entrants. The concept of network effects explains why and how the present uncompetitive backbone industry emerged. It also highlights how the cooperation between large backbone providers and new technologies can reduce competition for backbone services.

4. Lack of Competition in the Backbone Industry: Past, Present, and Future

The combination of network effects and the lack of any governmental policies for interconnection have allowed a few large backbone providers to dominate the backbone industry. This section summarizes the factors that point towards the lack of competition in the backbone industry. This section first discusses factors that indicate a lack of competition for backbone services.

362. SHAPIRO & VARIAN, *supra* note 351, at 187; Michael Kende & Jason Oxman, The Information Interchange: Interconnection on the Internet (Aug. 30, 1999), at <http://www.tprc.org/ABSTRACTS99/KENDEPAP.PDF>. Smaller network providers could provide Quality of Service if there was an interconnection policy and a settlement system. *See infra* Part VII.B.

363. *See* Winkleman, *supra* note 313.

Next, this section explains how the domination of backbone services by a few companies hurts competition. Finally, we highlight the potential for increased consolidation in backbone services if nothing is done.

There are four factors that indicate a lack of competition for backbone services. First, there are but a few firms who control 80% of the backbone market.³⁶⁴ Second, there have been no new entrants to the backbone market in the last five years.³⁶⁵ Third, a few large backbone firms are able to charge more for connectivity than their smaller rivals.³⁶⁶ Fourth, the large backbone providers work together to provide each other with free peering to the detriment of potential competitors.³⁶⁷

As discussed above, the lack of an interconnection policy makes it difficult for smaller networks to compete against the larger networks. The large backbone providers can decide with whom they want to peer and what the conditions should be. For example, smaller networks often have to sign nondisclosure agreements and may have their service discontinued with little notice.³⁶⁸ Finally, the lack of access to private exchange points means that smaller networks cannot provide performance similar to large backbone providers.³⁶⁹

The large backbone providers could further reduce competition by amplifying network effects through new technologies, so that their networks will become even more valuable in the future. For example, Quality of Service may allow a few large backbone providers to provide unmatched performance for Internet services over smaller backbone networks.³⁷⁰

Another area of concern is the movement towards vertical integration by the large backbone providers. Already, six of the largest Internet Service Providers³⁷¹ (ISPs) account for 73% of the online audience. These six are America Online (AOL), Netzero, Earthlink, CompuServe, MSN Internet Access, and AT&T Worldnet. Of these, AOL, CompuServe (owned by AOL), and MSN Internet Access utilize MCI WorldCom's backbone network.³⁷² Naturally, AT&T uses its parent network. The potential problem for

364. See *supra* note 303 and accompanying text.

365. See *supra* notes 343-47 and accompanying text.

366. See *supra* note 342 and accompanying text.

367. See *supra* note 363 and accompanying text.

368. See *supra* notes 335-39 and accompanying text.

369. See *supra* notes 340-41 and accompanying text.

370. See *supra* notes 361-62 and accompanying text.

371. ISPs refer to the entity that provides consumers with access to the Internet. ISPs vary from nation-wide ISPs such as America Online (AOL) to small firms that may serve only one specific geographic locality.

372. See *Report Show Internet Approaching Oligopoly*, ISP PLANET, May 3, 2000, available at http://www.isp-planet.com/research/census_q12k.html.

competition lies in the fact that a large backbone provider could provide substantial discounts to its ISPs and reduce competition at the ISP level. Already, AOL receives a substantial discount from MCI WorldCom because of the huge volume it provides.³⁷³

Thus, there are a number of factors pointing to the dominance of a few large backbone providers for backbone services. This domination can increase as large backbone providers adopt new technologies that further amplify existing network effects. It did not have to be this way. This market domination was clearly predictable and a consequence of the government's reliance upon changing the underlying technological infrastructure while not addressing the lack of an interconnection policy.³⁷⁴ A number of proposals to alleviate these problems and increase competition are discussed in Part VII.

B. A Potential Problem with Private Sector Management of the Internet

In today's privatized Internet, the private sector manages the Internet. The FCC has maintained a hands-off approach with the Internet backbone providers.³⁷⁵ This lenient regulatory approach began in the early 1980s when the FCC ruled that enhanced services were not subject to common carrier regulation.³⁷⁶ This removed Internet services from the many regulations that govern voice telephony. In contrast, ISPs benefit from FCC regulated interconnection policies with local phone companies.³⁷⁷ The only scrutiny of the backbone industry came with the merger of MCI and WorldCom in 1998. Regulators, led by the Justice Department, ensured that MCI sold off its

373. See Nancy Weil, *Who Owns the Internet?*, INT'L DATA GROUP, Mar. 2, 2000, available at <http://www.thestandard.com/article/display/1,1151,12545,00.html>.

374. See *supra* notes 297-98 and accompanying text.

375. See Jason Oxman, *OPP Working Paper No. 31: The FCC and the Unregulation of the Internet*, in OFFICE OF PLANS AND POLICY, FEDERAL COMMUNICATIONS COMMISSION (1999); Werbach, *supra* note 349. But see Steve Bickerstaff, *Shackles on the Giant: How the Federal Government Created Microsoft, Personal Computers, and the Internet*, 78 TEX. L. REV. 1 (1999) (discussing the role of regulation in creating the telecommunication policies that fostered the growth of the Internet). One of the provisions of the Telecommunications Act of 1996 was that Regional Bell Operating Companies, such as Verizon, could not offer long-distance data service. This has kept a group of major telecommunication companies out of the Internet backbone industry. Patrick Ross, *Legislators Ponder Telecom Act Overhaul*, CNET NEWS.COM, May 2, 2001, at <http://news.cnet.com/news/0-1004-200-5801210.html>. See Ken McGee, *Commentary: The Telecom Act Spurs Little Competition*, CNET NEWS.COM, Feb. 1, 2001, at <http://news.cnet.com/news/0-1004-201-4686982-0.html>.

376. *In the Matter of Amendment of Section 64.702 of the Commission's Rules and Regulations (Second Computer Inquiry)*, 77 F.C.C.2d 384, 418-19 (1980) (Computer II Final Decision).

377. See Federal Communications Commission, *The FCC, Internet Service Providers, and Access Charges*, available at http://www.fcc.gov/Bureaus/Common_Carrier/Factsheets/ispfact.html (last modified Jan. 7, 1998); DAN SCHILLER, *BAD DEAL OF THE CENTURY: THE WORRISOME IMPLICATIONS OF THE WORLDCOM-MCI MERGER* (1998), available at <http://www.epinet.org/studies/baddealfull.html>.

Internet assets before the merger to prevent MCI WorldCom from owning 70% of the Internet.³⁷⁸

The Internet is governed by Scott Bradner's belief that "enlightened self-interest among the many different groups that make up the Internet will drive cooperation in the future."³⁷⁹ There were other opinions. For instance, Don Gilbert, Director for Information Services at the American Petroleum Institute, asked, "Why would you move over to a network no one is responsible for maintaining?"³⁸⁰ Nevertheless, the prevailing wisdom as represented by David Farber, former Chief Technologist at the FCC, is that these companies have a self-interest in the success of the Internet.³⁸¹

The use of self-interest as the primary motivating factor for management of the Internet has worked well in maintaining system performance and reliability. Nevertheless, there are occasional complaints that it is difficult to fix some problems on the Internet because of finger-pointing and the lack of a central authority.³⁸² In addition, the self-interest notion appears to have some problems. Potential conflicts of interest exist between large backbone providers and their competitors, customers, or some public interest. This issue is especially important when it comes to network standards and new networking technologies.

Consider the issue of providing Quality of Service. As mentioned above, Quality of Service allows networks to treat different types of traffic differently. For effective Quality of Service, it is necessary to maintain control of the network traffic over the entire length of the network.³⁸³ Under the current system, smaller networks depend upon a few large backbone providers for some of their Internet transport. This limits their use of Quality of Service. Naturally, the few companies who can provide Quality of Service are the large backbone providers. Thus, customers who require technologies such as Quality of Service must rely on a large backbone provider. This example shows how the private sector's introduction of a technology may be used in an anticompetitive manner. For example, a few large backbone providers may use

378. See Dan Goodin, *WorldCom-MCI Scrutiny Heats Up*, CNET NEWS.COM, Mar. 16, 1998, available at <http://news.cnet.com/news/0-1003-200-327443.html>; Robinson, *supra* note 355. Regulators in the United States did not express much concern over potential concentration in the backbone industry during the attempted merger of MCI WorldCom and Sprint. The United States was instead concerned about concentration in the long distance telephone market. See Simon Romero, *WorldCom and Sprint End Their \$115 Billion Merger*, N.Y. TIMES, July 14, 2000, at C5.

379. Cooney et al., *supra* note 301.

380. *Id.*

381. Caruso, *supra* note 322.

382. An example of such a problem is routing problems on the Internet. Telephone Interview with Pat Burns, Director of Westnet (Jan. 28, 2000).

383. See FERGUSON & HUSTON, *supra* note 361.

Quality of Service technology as a means of creating a significant distinction between their backbone services and those of smaller competing networks. The net effect reduces competition.

Another example of conflicting interests between small and large backbone providers is the issue of IP address portability. In 1995, David Crocker warned the Internet community that in the future, smaller networks would have to lease blocks of IP numbers from larger backbone providers.³⁸⁴ IP numbers are the “addresses” of the Internet. The motivation for this new scheme was that the rapid growth of the Internet mandated the need for a hierarchical structure to address concerns of routing complexity. Today, smaller networks depend upon a larger backbone provider for their IP addresses.³⁸⁵ If the smaller network wishes to change backbone providers, it must also go through the expensive and time-consuming task of reconfiguring its networks to different IP addresses. Thus the lack of IP address portability reinforces the Internet’s hierarchical structure and the power of the large backbone providers. The problems of IP address portability are not the result of a conspiracy by the backbone providers. However, this development disproportionately affects smaller networks and new entrants to the backbone industry. As a result, this issue raises concerns about the ability of backbone providers to use technical means to limit competition.

The goal of this section is to highlight a potential problem with the private sector management of the Internet. First, large backbone providers could use technologies that adversely affect the public interest, for example privacy or competition. Second, the large backbone providers have enormous power in introducing new technologies. Decisions to introduce new technologies such as IPv6 are in their hands.³⁸⁶ If they do not implement it, nobody will. And if they require everyone else to implement it, everyone else will have to. It is also important to note that the large backbone providers operate without any significant checks on their behavior.³⁸⁷ For example, they already meet

384. See Posting of David Crocker, dcrocker@BRANDENBURG.COM, to IAP@VMA.CC.ND.EDU (Aug. 31, 1995) (regarding casting your multi-homing/provider-changing vote), at <http://www.sobco.com/ipng/archive/big-i/1995-09-sep>. The issue of IP address portability was raised by Nathaniel Borenstein in an unrelated interview.

385. See Steven Baker, *Renumbering IP*, UNIX REV., Mar. 1998, at 13; William Dutcher, *The IP Swamp*, PC WK., May 19, 1997, at 85; Havard Eidnes, *Practical Considerations for Network Addressing Using CIDR*, COMM. ACM, Aug. 1994, at 46.

386. IPv6 is the next generation Internet protocol (<http://www.ipv6.org>). The development of Internet standards is the responsibility of the Internet Engineering Task Force (IETF). The protocol decisions for the Internet are now the responsibility of the Internet Corporation for Assigned Names and Numbers (ICANN). However, they have no ability to prevent or enforce protocol standards. They rely on cooperation from Internet vendors and service providers.

387. It is likely than any major engineering changes would be done in accordance with the Internet Engineering Task Force (IETF). However, the IETF does not have any enforcement power and could not

regularly in private to discuss engineering issues.³⁸⁸ Thus, a few large backbone providers have the ability to use new technologies in a manner that could be detrimental to the public interest and competition.³⁸⁹ In our later proposals to increase competition, we suggest that the government maintain vigilance to ensure that the large backbone providers do not manipulate technologies merely for their own benefit.³⁹⁰

C. The Redesign: A Lost Opportunity to Address Societal Concerns

Lawrence Lessig has impressively argued that “Code”, or the technological infrastructure of the Internet, is a force analogous to the law in cyberspace.³⁹¹ Issues such as privacy and security are often governed by the architecture of the Code, and differing forms of Code can affect social issues differently.³⁹² For example, cookies are a form of Code that significantly affects our privacy online.³⁹³ Thus, any discussion of social issues such as security, privacy, and the protection of intellectual property must acknowledge the role of Code. This section discusses the NSF’s lost opportunity to address societal concerns when redesigning the Internet’s technological infrastructure. By societal concerns, we mean the concerns of all in society, including consumers, citizens, government, churches, and businesses.

The issue of network security is not new. The 1987 Office of Science and Technology Policy (OSTP) report highlighted the importance of security for the National Education and Research Network (NREN): “A significant effort in implementing the NREN will be development and implementation of mechanisms to enhance the security of the connected computing systems, and

require the backbone providers to perform any action. Also, many members of the IETF are employees of the large backbone providers. At one time the government funded the IETF, but, as part of the privatization, the government withdrew its financial support. See Noah Green, *Weaning the Net: The Feds Hand Cyberspace to the Private Sector*, VILLAGE VOICE, July 11, 1995, available at <http://www.cs.columbia.edu/~ngreen/writing/voice/nsfnet.html>.

388. Cukier, *supra* note 335.

389. The Internet is a layered network. The influence of the backbone providers is concentrated on the lower layers of the TCP/IP protocol, which govern the transport of data. Most software programs, for example, Netscape, are indifferent to these lower layers. Moreover, some issues such as security can be handled at the higher application level.

390. See *infra* Part VII.C.2.

391. See *supra* note 11.

392. For an excellent discussion of how Code is biased, see BATYA FRIEDMAN, HUMAN VALUES AND THE DESIGN OF COMPUTER TECHNOLOGY (1997). For an example of bias in search engine, see Lucas Introna & Helen Nissenbaum, *Defining the Web: The Politics of Search Engines*, IEEE COMPUTER, Jan. 2000, at 54.

393. See SIMON ST. LAURENT, COOKIES (1998). Cookies allow web sites to remember information about their visitors. This information can allow for the customization of online experiences, for example, weather tailored to your zip code, but also has privacy implications.

mechanisms to protect the networks themselves.³⁹⁴ The 1989 OSTP report emphasized that “an important issue is that of computer and network security to ensure privacy and trustworthiness in a heterogeneous network environment.”³⁹⁵ Later, in 1991, Charles Brownstein, assistant director in the NSF’s Computer and Information Science and Engineering Directorate, acknowledged that security “is a big concern and growing bigger every day.”³⁹⁶

Over the NSFNET’s lifetime, the government never seriously addressed concerns of security.³⁹⁷ The most significant development for Internet security was the creation of the Computer Emergency Response Team (CERT).³⁹⁸ CERT is a reporting center for Internet security problems that disseminates security information to the Internet community. While CERT helps people who are affected by security issues, it does not perform fundamental research and development to address security issues.

The distributed denial of service (DDOS) attacks in February 2000 focused attention on security issues.³⁹⁹ Many within the Internet community viewed the DDOS attacks as a reflection of the inherent vulnerabilities in the Internet and suggested major alterations in the design of the Internet to address these security problems.⁴⁰⁰ Bruce Schneier analogizes the Internet’s security problems to the phone companies’ problems in the 1960s with phone

394. OFFICE OF SCIENCE AND TECHNOLOGY POLICY, *supra* note 65, at 33-34.

395. OFFICE OF SCIENCE AND TECHNOLOGY POLICY, *supra* note 111, at 19.

396. Bill Rogers, *Network’s Goal to Push the Edge of Technology: NSF Helps Keep Rapidly Growing Internet on the Cutting Edge of Research*, GOV’T COMPUTER NEWS, Sept. 30, 1991, at 49. Others called for the network community to focus on privacy and security issues to prevent problems and costly retrofits. See Lance J. Hoffman & Paul C. Clark, *Imminent Policy Considerations in the Design and Management of National and International Computer Networks*, IEEE COMM. MAG., Feb. 1991, at 68.

397. The agency responsible for the security of government information systems is the National Institute of Standards and Technology (NIST). Under the Brooks Act (P.L. No. 89-306), NIST is tasked with developing Federal Information Processing Standards (FIPS) for unclassified federal computer systems. This was reiterated by Congress in 1987 when it passed the Computer Security Act of 1987 (P.L. No. 100-235) and in P.L. No. 102-194, the High-performance Computing Act of 1991. See *Hearing Before the Subcomm. on Science of the House Comm. on Science, Space, and Technology*, 103d Cong. (1994) (statement of F. Lynn McNulty, Associate Director for Computer Security, National Institute of Standards and Technology, U.S. Dep’t of Commerce).

398. See CERT Coordination Center, *About the CERT Coordination Center*, available at <http://www.cert.org/nav/aboutcert.html> (last modified Nov. 27, 2000).

399. Distributed denial of service (DDOS) attacks use of a number of hacked or slave servers to inundate a web site and effectively stop the web site’s ability to respond to web page requests. By distributing the attack among many servers, it is difficult to pinpoint the origin of the attack. See Greg Sandoval & Troy Wolverton, *Leading Web Sites Under Attack*, CNET NEWS.COM, (Feb. 9, 2000), at <http://news.cnet.com/news/0-1007-200-1545348.html>.

400. See People for Internet Responsibility, *PFIR Statement on Recent Internet Denial of Service Attacks* (Feb. 9, 2000), at <http://www.pfir.org/statements/2000-02-09>; Bruce Schneier, *Distributed Denial of Service Attacks: Flood in the Frontyard*, COMPUTERS TODAY, Mar. 15, 2000, at 110.

phreaking and blue boxes.⁴⁰¹ The phone companies redesigned their network in the 1980s with Signaling System 7, which eliminated many of these security issues.⁴⁰² Steve Cross, the Director of the Software Engineering Institute and the home of the CERT Coordination Center criticized the vendors of hardware and software for not adequately addressing security issues. He commented on the poor state of security on the Internet:

There is little evidence of improvement in the security features of most products; developers are not devoting sufficient effort to apply lessons learned about the sources of vulnerabilities. The CERT Coordination Center routinely receives reports of new vulnerabilities. We continue to see the same types of vulnerabilities in newer versions of products that we saw in earlier versions.⁴⁰³

Federal agencies could have conducted, or at least funded, research to address many social concerns, including privacy and security among others. For example, the NSFNET's security could have been redesigned along the lines of secure military networks. The government could have funded the development of a secure, authenticated method for electronic mail.⁴⁰⁴ Or the NSFNET could have been designed to allow network monitoring/tracking by only a few designated organizations.⁴⁰⁵ The NSF could have used domain names or IP address allocation to create a subnetwork for "adult" content. These are just a few of the possibilities for how the NSFNET and Internet could have been redesigned to accommodate the concerns of society as a whole.

The significant point is that government could have done something, not necessarily that the government should have. However, there was little public debate concerning what the government could have done. The lack of government action is especially appalling when you consider the potential

401. *See id.*

402. *See id.*

403. Steve Cross, Cyber Security, Testimony to the Senate Armed Services Committee Subcommittee on Emerging Threats and Capabilities (Mar. 1, 2000), at http://www.cert.org/congressional_testimony/Cross_testimony_Mar2000.html.

404. The lack of a secure authenticated email system has been a significant factor in the promulgation of unsolicited bulk email and spam, and has slowed the development of electronic commerce technologies such as Electronic Data Interchange which depend upon Internet email. *See* Paul Hoffman, *Security and Authentication in Internet Mail*, available at <http://www.isoc.org/inet99/posters/005/> (last visited Sept. 1, 2000); Paul Hoffman & David Crocker, *Unsolicited Bulk Email: Mechanisms for Control* (May 4, 1998), available at <http://www.imc.org/ube-sol.html>.

405. Ironically, the feature that provides the most privacy for individuals today on the Internet developed from the lack of enough IP addresses. The lack of address space led network providers to use a dynamic allocation system. This system provides a different "number" to each user every time they use the Internet and therefore makes it much more difficult to track a specific user.

influence it may have had. The government lost a valuable opportunity during the redesign of the Internet to ensure that social concerns were addressed in the redesigned Internet. For example, the Internet could have been designed in a more secure fashion by requiring security mechanisms be put in place within the lower layers of the network.⁴⁰⁶ In fact, there is still a movement to add more security to the Internet by using more secure network protocols.⁴⁰⁷ For example, the next generation Internet Protocol, IPv6, will increase security.⁴⁰⁸ In sum, the government failed to consider societal concerns and, as a result, lost its onetime opportunity during the redesign of the Internet.

The only societal concern that was publicly considered was the protection of intellectual property. The High Performance Act of 1991⁴⁰⁹ mandated that the NREN be designed to ensure protection of copyrighted materials and include accounting mechanisms to charge users for their use of copyrighted materials.⁴¹⁰ However, there was little progress on designing the network to protect intellectual property. For example, the May 1992 implementation plan for the NREN states that “[t]he NREN will take advantage of accounting technologies which become available and will not attempt to develop NREN specific technologies. It is expected that related technologies will also directly impact traffic monitoring, analysis, modeling, and policy routing.”⁴¹¹ Thus, the government did not actively develop technologies in response to the requirements of the High Performance Act of 1991.

In April 1993, a workshop was held at Harvard University on the protection

406. For a discussion on the Internet and its layers, see Roger Clarke, *A Primer on Internet Technology*, available at <http://www.anu.edu.au/people/Roger.Clarke/II/IPrimer.html> (last modified Feb. 15, 1998). Placing functionality such as security at a lower level allows for much more control over the network. However, as with all engineering decisions there are tradeoffs such as less innovation in the future and performance considerations. See David Reed, *The End of the End-to-End Argument* (Apr. 2000), at <http://www.reed.com/papers/endofendoend.html>.

407. See Cisco, *IPSec Simplifies End-to-End Network Security for Public IP Networks*, available at <http://www.cisco.com/warp/public/784/packet/april98/7.html> (last visited June 19, 2000).

408. See TIMOTHY PARKER ET AL., TCP/IP UNLEASHED 152 (1996); Steve King et al., *The Case for IPv6* (June 25, 2000), at <http://www.ietf.org/internet-drafts/draft-iab-case-for-ipv6-07.txt> (providing author's contact information for a copy of the draft).

409. High Performance Computing and Communications Act, Pub. L. No. 102-194, 105 Stat. 1594 (1992) (codified at 15 U.S.C. § 5501 (1994)).

410. *Id.* § 5512(c). The section states:

NETWORK CHARACTERISTICS.—The Network shall— . . .

(5) be designed and operated so as to ensure the continued application of laws that provide network and information resources security measures, including those that protect copyright and other intellectual property rights, and those that control access to databases and protect national security;

(6) have accounting mechanisms which allow users or groups of users to be charged for their usage of copyrighted materials available over the Network and, where appropriate and technically feasible, for their usage of the Network.

411. Aiken, *supra* note 263, at 18.

of intellectual property on the NSFNET.⁴¹² Even at this time, participants noted federal agencies had not yet addressed this issue.⁴¹³ Furthermore, Jerry Linn, of the National Institute of Standards and Technology, argued at the workshop that the High Performance Act of 1991 is unrealistic and unenforceable.⁴¹⁴ Linn did not believe the network could be designed to protect intellectual property.⁴¹⁵ Instead, his solution was to amend the law to place the protection of intellectual property only on information providers (i.e., content providers) and not the operators of the network (i.e., backbone providers).⁴¹⁶ Thus, the government's lead agency on security backed off the earlier legislation requiring backbone providers to incorporate protection for intellectual property directly into the network.

The emphasis on intellectual property as opposed to security and privacy can be well explained by public choice theory.⁴¹⁷ The protection of intellectual

412. See COALITION FOR NETWORKED INFORMATION ET AL., PROCEEDINGS TECHNOLOGICAL STRATEGIES FOR PROTECTING INTELLECTUAL PROPERTY IN THE NETWORKED MULTIMEDIA ENVIRONMENT, at <http://www.cni.org/docs/ima.ip-workshop> (last modified Dec. 2, 1997) (providing links to papers delivered at conference).

413. Brian Kahin, *The Strategic Environment for Protecting Multimedia*, available at <http://www.cni.org/docs/ima.ip-workshop/Kahin.html> (last modified Nov. 20, 1997).

414. See Jerry Linn, *Copyright and Information Services in the Context of the National Research and Education Network*, available at <http://www.cni.org/docs/ima.ip-workshop/Linn.html> (last visited Feb. 1, 2000). The recently passed Digital Millennium Copyright Act limits the liability of copyright infringement for online service providers. Digital Millennium Copyright Act, Pub. L. No. 105-304, 112 Stat. 2860 (codified at 17 U.S.C. § 512 (Supp. 1998)).

415. Protection for intellectual property can be placed at the level of hard drives, operating systems, and digital audio. See Robert Lemos, *Do Antipiracy Measures Rob Consumers?*, CNET NEWS.COM, Jan. 17, 2001, at <http://news.cnet.com/news/0-1003-201-4500456-0.html>. The FCC is even considering requiring measures to protect intellectual property in the next generation of televisions and VCRs. See Jube Shiver, Jr., *FCC to Require Anti-Piracy Features in Digital TVs, VCRs Broadcasting*, L.A. TIMES, Sept. 15, 2000, at C1, available at 2000 WL 25896817.

416. See Linn, *supra* note 414.

417. Public choice theory applies economics to political science. DENNIS C. MUELLER, PUBLIC CHOICE I (1979). See also DANIEL A. FARBER & PHILIP P. FRICKEY, LAW AND PUBLIC CHOICE: A CRITICAL INTRODUCTION (1991); Daniel A. Farber & Philip P. Frickey, *The Jurisprudence of Public Choice*, 65 TEX. L. REV. 873 (1987). The fundamental unit of analysis is individuals, who are assumed to be rational utility maximizers. See James M. Buchanan, *Politics Without Romance: A Sketch of Positive Public Choice Theory and Its Normative Implications*, in THE THEORY OF PUBLIC CHOICE-II 11 (James M. Buchanan & Robert D. Tollison eds., 1984). In the case of legislation, legislators are considered monopoly suppliers of good, favorable laws. Individuals then attempt to "buy" legislation from legislators. Individuals pursuing legislation are subject to the "free rider problem." Legislation is a public good. It benefits all members of an affected group, even those who did not contribute to the effort to win favorable legislation. Because members can "free ride"—receive benefits without contributing—there is little incentive for people to pursue favorable legislation. MUELLER, *supra*, at 116-19. Special interest groups form as a result of the "free rider problem." These smaller and more focused groups seek to gain benefits for themselves at the public's expense. The special interest groups can also monitor other members in the group and exclude them if they are not adequately contributing. Thus, special interests groups are more effective in reducing the free rider problem. See William N. Eskridge, Jr., *Politics Without Romance: Implications of Public Choice Theory for Statutory Interpretation*, 74 VA. L. REV. 275, 286 (1988). Special interest groups expend considerable resources on lawyers and lobbyists to gain

property is important to a class of businesses who profit from the sale or use of intellectual property. These businesses include publishers, broadcasters, and software companies. This class of businesses had a direct interest in ensuring that any computer network designed by the government provided protection for their intellectual property.

Privacy and security are general public concerns. During the redesign of the network in the early 1990s, however, there were no special interest groups for these issues. Therefore, concerns of privacy and security were not addressed, because no one was present to voice them to legislators. These concerns, if articulated, perhaps would have been addressed. On the other hand, the protection of intellectual property is the focus of several special interest groups. These groups stand to profit personally from legislation protecting intellectual property. Therefore, it is not surprising that legislation was passed protecting intellectual property, while concerns of security and privacy were never addressed.⁴¹⁸

The privatization of the backbone network and the liberalization of the Acceptable Use Policy (AUP) were responses to a growing demand for access to the Internet. The NSF transferred a network designed for research and education to the private sector for commercial use. Despite the differences between these two uses, the NSF did not attempt to address potential social concerns for the commercialized Internet. Clearly, the open design of the NSFNET reflected its constituency, a small number of academic researchers. This network design does not represent the concerns of the general public. The NSF never considered changing the design of the network to reflect its new constituency, despite the contemporary concerns during the redesign, such as security and privacy. These concerns were even explicitly stated in the guidance the NSF purported to follow when privatizing the backbone

favorable legislation. The organized nature of special interest groups allows them to attain the attention of legislators. Other disorganized groups cannot similarly grab the attention of the legislators. See Herbert Hovenkamp, *Legislation, Well-Being, and Public Choice*, 57 U. CHI. L. REV. 63, 86 (1990). Special interest groups also provide legislators with campaign contributions, votes, and promises of future favors. See William M. Landes & Richard A. Posner, *The Independent Judiciary in an Interest-Group Perspective*, 18 J.L. & ECON. 875, 877 (1975). Empirical research has shown that legislators are more likely to be influenced by special interests when legislators feel their constituency doesn't care and the provision doesn't conflict with their own ideology. See generally Arthur T. Denzau & Michael C. Munger, *Legislators and Interest Groups: How Unorganized Interests Get Represented*, 80 AM. POL. SC. REV. 89 (1986). Thus, by overcoming the free rider problem and by providing suitable incentives for legislators, special interest groups are able to gain favorable legislation.

418. The Digital Millennium Copyright Act of 1998 provided a limited liability for copyright infringement if the entities (such as backbone providers) were merely conduits for the information. See Jonathan A. Friedman & Francis M. Buono, *Using the Digital Millennium Copyright Act to Limit Potential Copyright Liability Online*, 6 RICHMOND J.L. TECH. 18 (1999), available at <http://www.richmond.edu/jolt/v6i4/article1.txt>.

network.⁴¹⁹ Today, we are left with a network that suffers from a number of issues which could have been addressed during the redesign of the network.

D. Lessons Learned from the Privatization of the Internet's Backbone

This Part has discussed the interaction between the government, the private sector, and “Code”. The first section described how the lack of a government policy regarding interconnection distorted competition for backbone services. The second section highlighted a potential problem with private sector control of Code. The final section discussed the government’s failure to modify the Code to reflect societal concerns when redesigning the Internet.

The redesigned Internet relied solely on Code to create competition. The absence of an interconnection policy allowed large backbone providers to create distortions in the market for backbone services in three ways. First, there is a lack of competition for backbone services.⁴²⁰ Second, the domination of backbone services by a few providers is continuing to impede competition.⁴²¹ Third, the domination by a few backbone providers can increase in the future because of new technologies—Code—that amplify network effects, and through vertical integration.⁴²²

These results were foreseen and could have been prevented. Mitchell Kapur repeatedly asked the government to ensure a level playing field for all competitors.⁴²³ There were a number of comments to the NSF on both the significance of its decisions⁴²⁴ and the potential performance requirements for the NAPS.⁴²⁵ However, the NSF never addressed these concerns and it never began a discussion on an interconnection policy. Indeed, the NSF could have had another agency, such as the FCC, address the issue of an interconnection policy.

Today, the management of the Internet has shifted to the private sector. If there is no government oversight of the backbone industry, we implicitly equate the public’s interest with the large backbone providers. However, the large backbone providers could use Code to reduce competition. Instead of relying on favorable regulation, the large backbone providers could manipulate Code to their advantage as illustrated in the Quality of Service and IP address portability examples above. Moreover, there are no safeguards that prevent the

419. *See supra* Part V.C.

420. *See supra* notes 364-67 and accompanying text.

421. *See supra* notes 368-69 and accompanying text.

422. *See supra* notes 370-73 and accompanying text.

423. *See supra* notes 276-77 and accompanying text.

424. *See supra* notes 273-74 and accompanying text.

425. *See supra* notes 271-72 and accompanying text.

backbone provider from arbitrarily manipulating Code.

It is possible that the Internet could be designed to support societal concerns. However, public choice theory predicts that public concerns such as security and privacy will not emerge from the political process. Instead, concerns that favor a special interest, such as protection of the intellectual property, are more likely to be favored by government. Thus, the inclusion of general societal concerns into the Internet seems doubtful. Despite the calls for the government to address concerns such as security, the government has never considered or attempted to address social concerns in the design of the Internet. Moreover, the government forever lost an opportunity to redesign the Internet for society. If the government had acted, it could have been possible to ensure that the network was prepared for commercialization and commerce.

It is the private sector that has been left to fulfill societal concerns. The private sector can be expected to address societal concerns that are profitable. For example, consider the private sector's response to the protection of intellectual property with Code that allows digital watermarking or the Secure Digital Music Initiative.⁴²⁶ However, what about other societal concerns? For example, online privacy is a real concern, which is commonly an anathema to the private sector. While paying lip service to consumers' concerns about privacy, the private sector is busy profiling consumers and using data-mining techniques to enhance revenues.⁴²⁷ Thus, it seems likely that the design of the Internet will only reflect societal concerns to the extent that they can be profitable.

The consequences of the privatization have highlighted a few important lessons. First, changes in the Code are not sufficient to create competition. There is a need for policies, from the public or private sector, to ensure competition. The second is the need for oversight. This oversight should not be limited to establishing and enforcing policies such as interconnection, but also to monitoring changes in the architecture of the Internet. Changes in the architecture of the Internet have just as much ability to change the nature of the marketplace as policies by regulators. Finally, we have learned that the government lost an opportunity to redesign the Internet to incorporate general societal values. With private sector control of the Internet, it is unlikely that societal concerns, which are unprofitable, will be addressed. This lesson is evident in the differing treatment of the protection of intellectual property as

426. See Peter Cassidy, *Burning the Jolly Roger: Technical Solutions for Armoring Data Puts Creatives Back in Control*, available at <http://www.triarche.com/ipprot1.html> (last visited Mar. 20, 2000).

427. See Katie Hafner, *Do You Know Who's Watching You? Do You Care?*, N.Y. TIMES, Nov. 11, 1999, at G1, available at LEXIS, News Library, The New York Times File.

compared to privacy and security.

The problems from the privatization of the backbone are not isolated. The same lessons that have been derived from the privatization of the backbone are applicable in the privatization of the Domain Name System. A brief overview of the privatization of the Domain Name System will reinforce many of these lessons.

VI. PRIVATIZATION OF THE DOMAIN NAME SYSTEM (DNS)

A vital component of the Internet is the Domain Name System (DNS).⁴²⁸ The DNS transforms textual representations of domain names (yahoo.com) into numerical representations (204.71.200.68). Without such a transformation, people would be forced to remember the unwieldy numerical representation for functions such as email and the web. Our reliance on the textual representation is so great that if a computer is not listed in the DNS it basically doesn't exist. The DNS as designed is dependent upon on the "root server" computer. The entity that controls this computer, controls the DNS and, therefore, exerts a significant influence on the operation of the Internet. Furthermore, control of this key component could allow an entity to control changes in the Internet's architecture. Thus, the control of the DNS is about governance of the Internet.⁴²⁹

Between 1993 and 1999, the management of the DNS was contracted to Network Solutions, Inc. (NSI) by the U.S. government. Recently, the U.S. government has begun to transfer control of the DNS to a nonprofit corporation, the Internet Corporation for Assigned Names and Numbers (ICANN) in order to privatize the DNS. However, this privatization is still underway and whether all the components of the DNS will be privatized remains to be seen.

The privatization of the DNS has suffered from the same type of problems that occurred during the privatization of the backbone network. For example,

428. See RONY & RONY, *supra* note 16, at 104. For a technical description of the Domain Name System, see Jon Postel, *RFC 1591: Domain Name System Structure and Delegation* (Mar. 1994), at <ftp://ftp.isi.edu/in-notes/rfc1591.txt>.

429. See A. Michael Froomkin, *Wrong Turn in Cyberspace: Using ICANN to Route Around the APA and the Constitution*, 50 DUKE L.J. 17, 166 (2000); David Post, *Governing Cyberspace: "Where is James Madison When We Need Him?"* (June 6, 1999), at http://www.icannwatch.org/archive/governing_cyberspace.htm. The history of the DNS has been fodder for other case studies. One case study traced the norms of Internet governance through the privatization of the DNS. See *Developments in the Law—The Law of Cyberspace*, 112 HARV. L. REV. 1577, 1657-80 (1999). Another case study used the history of the DNS to illustrate that the management of DNS is not a technical issue but a public issue. See Joseph P. Liu, *Legitimacy and Authority in Internet Coordination: A Domain Name Case Study*, 74 IND. L.J. 587 (1999).

the privatization has suffered from a lack of transparency in decision making, the absence of public input into crucial decisions, and government-subsidized firms hampering competition. As a result, only a very limited form of competition for the DNS has been introduced. After a discussion of how the DNS operates, this section will present a short history of the DNS. This is followed by a discussion of the problems that occurred with the management of the DNS.

A. Background on the DNS

When the ARPANET was first created, every computer had a unique number identifier.⁴³⁰ For the ease of users, every computer's address was represented in textual format. For example, Sally@BartUSC would represent Sally's email account on a computer named Bart at USC. This textual address would then be converted automatically into a numerical address. With the advent of the DNS in the 1980s, addresses would now represent an organization which could have many computers, so Sally@BartUSC became Sally@Bart.USC.EDU.⁴³¹ The DNS relies on a hierarchical structure. In this example, EDU is at the top of the hierarchy and the Bart computer at USC is one of many at the bottom of the hierarchy. Therefore, EDU is called a Top Level Domain (TLD).

In October 1984, there was a proposal to create an initial set of TLDs, such as .com, .gov, .edu, .net, and .org.⁴³² Originally, there was one international domain, .int. However, the rapid growth of Internet connections around the world led to the introduction of over two hundred country code TLDs, like .uk for the United Kingdom and .dk for Germany.⁴³³

The DNS depends on an authoritative "A" root server. The "A" root server contains all the TLDs and their respective numerical IP addresses.⁴³⁴ To aid in the propagation of this information, there are a number of other root servers (named "B" through "M") spread across the world. This distribution eases the load on the "A" root server. The DNS utilizes special software to ensure that changes are properly propagated to the other name servers. Usually, the name servers are updated on a daily basis. This is why it takes time for a newly registered domain name to become active. Similarly, if NSI's root server has a problem, this problem can propagate and affect the rest of the network.⁴³⁵

430. See RONY & RONY, *supra* note 16, at 99.

431. See *id.* at 104-07.

432. See *id.* at 113.

433. See *id.* at 139.

434. See *id.* at 60-62.

435. See *id.* at 58-59.

There are three governance issues with the DNS. The first concerns the assignment of numerical addresses to Internet users. Every computer on the Internet must have a unique Internet Protocol (IP) number.⁴³⁶ Blocks of these numbers are provided to regional IP registries in North America, Europe, and Asia. These IP registries, in turn, provide blocks of numbers to large backbone providers. Until the formation of ICANN, this function was maintained by the Internet Assigned Numbers Authority (IANA).⁴³⁷ The second governance issue concerns the registration of domain names. Currently, there are a number of companies capable of registering domain names which are not country specific (.com, .net, .org).⁴³⁸ The third issue concerns the operation and maintenance of the root servers.⁴³⁹ The root servers contain the registry database for the TLDs.

B. A Short History of the DNS

The DNS's history traces back to the mid 1980s. In the early 1990s, the NSF entered into a cooperative agreement with NSI for the management of the DNS. In 1995, the NSF allowed NSI to begin charging fees for domain name registration. Soon after, there were calls to create competition for NSI. Over the last few years, several entities have attempted to create competition for the DNS. The latest is the Internet Corporation for Assigned Names and Numbers (ICANN). This section provides a short history of the DNS. A summary of the notable events appears in Table 2.

436. *See id.* at 51.

437. *See* Management of Internet Names and Addresses, 63 Fed. Reg. 31,741 (June 10, 1998).

438. *Id.* at 31,742.

439. *See id.*

Table 2: Timetable for the Privatization of the Domain Name System

Year	Privatization of the DNS
1/1993	NSI awarded contract to manage the DNS
3/1995	SAIC acquires NSI
9/1995	NSI begins charging fees for domain name registrations
1/1996	Alternative DNS operational
5/1996	Dr. Jon Postel proposes creation of 50 new registries
9/1996	Creation of the IAHC
2/1997	Final report by IAHC (gTLD-MoU)
7/1/199	Executive Order by the President
6/1998	White Paper by the Department of Commerce
9/1998	IFWP attempts to hold a meeting with IANA and NSI
10/1998	Creation of ICANN
7/1999	Congressional hearings into the privatization of the DNS
9/1999	Agreements between Department of Commerce, ICANN, and NSI
3/2000	VeriSign agrees to purchase NSI for \$21 billion
11/2000	Selection of seven new gTLDs by ICANN
2/2001	Congressional hearings into ICANN's management
4/2001	ICANN announced new agreement with VeriSign

1. *Early History of the DNS*

In the early 1970s, Dr. Jon Postel, then a graduate student at the University of California at Los Angeles, volunteered to maintain a list of host names and addresses for the ARPANET.⁴⁴⁰ This list kept track of the numerical and textual representations for every host computer on the ARPANET. The official responsibility for the lists fell to SRI International (SRI). Eventually, SRI provided administrative assistance for maintenance of the list, while Dr. Jon Postel maintained technical oversight.⁴⁴¹ By the end of 1988, the Internet community referred to the work by Postel as that of the Internet Assigned Numbers Authority (IANA).⁴⁴²

The 1991 High Performance Computing Act directed the NSF to oversee

440. *Id.*

441. *Id.* For histories of the Domain Name System, see RONY & RONY, *supra* note 16; Fromkin, *supra* note 429; Mueller, *supra* note 16.

442. See RONY & RONY, *supra* note 16, at 120-23.

computer networking for the government, so the NSF assumed responsibility for the DNS.⁴⁴³ As part of this transition, the domain name registration services were transferred from SRI to Government Systems, Inc. (GSI).⁴⁴⁴ In 1992, the NSF chose Network Solutions, Inc. (NSI) to provide domain name and IP number registration. The origins of NSI are unclear. NSI's public documents state that NSI was founded in 1979.⁴⁴⁵ However, according to Dr. Jon Postel, NSI was a spin-off of GSI in 1992.⁴⁴⁶

In January 1993, the NSF entered into a cooperative agreement with NSI to manage the DNS.⁴⁴⁷ NSI was responsible for registering domain names in the TLDs and maintaining the authoritative "A" root name server.⁴⁴⁸ NSI would manage the DNS over the next five years. After 1998, NSI would continue to manage the DNS, but the governmental authority had shifted from the NSF to the Department of Commerce.⁴⁴⁹

2. *Proposals for New Top Level Domains (TLDs)*

In 1995, Science Applications International Corporation (SAIC), a \$4 billion technology conglomerate based in San Diego, acquired NSI.⁴⁵⁰ Shortly thereafter, NSI asked the government to amend the cooperative agreement in order to charge an annual fee of \$50 for each domain name. The government approved that request.⁴⁵¹

NSI's new fees for domain names led Dr. Jon Postel in September 1995, to call for "a small number of alternate TLDs managed by other registration centers. I'd like to see some competition between registration services to encourage good service at low prices."⁴⁵² In fact, as early as January 1996, the Internet contained several operating, alternative, experimental registry systems, for example, AlterNIC, name.space, and eDNS.⁴⁵³ In May 1996, Dr. Jon Postel

443. *See id.* at 126-27.

444. *See id.*

445. Network Solutions, *VeriSign Acquires Network Solutions to Form World's Largest Provider of Internet Trust Services* (Mar. 7, 2000), at http://corporate.verisign.com/news/2000/pr_20000307.html.

446. *See RONY & RONY, supra* note 16, at 127-28.

447. *See id.* at 128.

448. *See* Management of Internet Names and Addresses, 63 Fed. Reg. at 31,742.

449. *See* Mueller, *supra* note 16, at 503.

450. *See* David Diamond, *Whose Internet Is It, Anyway?*, WIRED, Apr. 1998, at 172, available at <http://www.wired.com/wired/archive/6.04/kashpureff.html>.

451. NSF agreed to the proposal and implemented as amendment 4 to the original NSF/NSI Cooperative Agreement No. NCR-9218742. *See RONY & RONY, supra* note 16, at 149.

452. Mueller, *supra* note 16, at 501. *See also* National Science Foundation, *Internet Names, Numbers, and Beyond: Issues in the Coordination, Privatization, and Internationalization of the Internet* (Nov. 20, 1995), at <http://ksgwww.harvard.edu/iip/GIIconf/nsfmin1.html>.

453. *See* Management of Internet Names and Addresses, 63 Fed. Reg. at 31,743.

proposed the creation of fifty new registries, each having the right to register names in three new TLDs, thus creating 150 new TLDs.⁴⁵⁴ However, as Milton Mueller notes, the IANA and Internet Society (ISOC), who were backing the proposal, did not have the necessary legitimacy or legal authority to advance this proposal.⁴⁵⁵

To gain more legitimacy, the International Ad Hoc Committee (IAHC) was formed in September 1996.⁴⁵⁶ The committee consisted of members of the Internet Society (ISOC), the International Telecommunications Union (ITU), and the trademark owners.⁴⁵⁷ In December 1996, IAHC issued a draft report,⁴⁵⁸ and a final report in February 1997.⁴⁵⁹ The report, the memorandum of understanding regarding generic TLDs (gTLD-MoU), called for the establishment of new gTLDs with competition between firms for registering new domain names.⁴⁶⁰ According to Mueller, who has written about the history of the DNS:

NSI, which correctly saw its control of the lucrative .com domain as the target of the gTLD-MoU's shared registry model, mounted a lobbying campaign against the proposal. The internet entrepreneurs positioning themselves as alternative registries loathed the gTLD-MoU. Instead of opening the market it had limited TLD expansion to a monopoly registry, and it imposed heavy fees and regulations upon participating registrars. Many policy analysts and user groups criticized the gTLD-MoU as a sellout to the trademark interests. Many trademark interests, however, were still unhappy with the creation of any new TLDs and criticized INTA for its participation. Congressional hearings were held. The European Commission weighed in against the plan, charging that it was 'too US-centric' and demanding more EC representation and 'further public debate'.⁴⁶¹

These political pressures led the U.S. President to execute an Executive Order on July 1, 1997, that authorized the Secretary of Commerce to "privatize the domain name system (DNS) in a manner that increases competition and

454. *See id.*

455. *See* Mueller, *supra* note 16, at 501.

456. *See* Management of Internet Names and Addresses, 63 Fed. Reg. at 31,743.

457. *See* Mueller, *supra* note 16, at 501.

458. Management of Internet Names and Addresses, 63 Fed. Reg. at 31,743.

459. *See* Mueller, *supra* note 16, at 501 n.15.

460. *See* Will A. Foster et al., *Who Governs the Internet?*, COMM. ACM, Aug. 1997, at 15; THE INTERNET COMMUNITY, ESTABLISHMENT OF A MEMORANDUM OF UNDERSTANDING ON THE GENERIC TOP LEVEL DOMAIN NAME SPACE OF THE INTERNET DOMAIN NAME SYSTEM (gTLD-MoU) (Feb. 28, 1997), at <http://www.iahc.org/gTLD-MoU.html>.

461. Mueller, *supra* note 16, at 502.

facilitates international participation in its management.”⁴⁶² As part of the Order, responsibility for the management of the DNS shifted from the NSF to the Department of Commerce and the National Telecommunications and Information Administration (NTIA).⁴⁶³ However, it is important to note that Congress has never legislated on the DNS and it has not designated an agency to be responsible for the DNS. Instead, control over the DNS has been exercised by the Executive Branch.⁴⁶⁴

Over the next year, the Department of Commerce prepared a final Statement of Policy, the “White Paper.”⁴⁶⁵ The White Paper called for the U.S. government to transition control of the DNS to a private corporation who had the consensus of the Internet community.⁴⁶⁶ This led to the International Forum on the White Paper (IFWP). The IFWP held a number of meetings during the summer of 1998 to bring together interested participants to form the new private corporation. These meetings were considered an “Internet constitutional convention.”⁴⁶⁷ At the same time, IANA and ISOC hired Joe Sims of Jones, Day, Reavis & Pogue, to provide advice on the creation of the new corporation.⁴⁶⁸

In September 1998, the IFWP sought a final meeting between IANA, NSI, and other stakeholders to develop a consensual constitution for the new corporation.⁴⁶⁹ The IANA refused to meet. The IANA stated that it would use its newly created articles and bylaws as a starting point. IANA supporters who were on the IFWP steering committee, such as Mike Roberts, then proceeded “to disband the IFWP instead of holding a wrap-up meeting.”⁴⁷⁰ The IANA entered into private negotiations with NSI and developed a joint draft for the new corporation. Milton Mueller summarized these actions: “The internet’s ‘constitutional convention’ had been reduced to two government contractors negotiating in secret. These negotiations, incidentally, came up with the new corporation’s optimistic acronym: ICANN.”⁴⁷¹

462. Management of Internet Names and Addresses, 63 Fed. Reg. at 31,743.

463. See Request for Comments on the Registration and Administration of Internet Domain Names, 62 Fed. Reg. 35,896 (July 2, 1997).

464. U.S. GENERAL ACCOUNTING OFFICE, OFFICE OF THE GENERAL COUNSEL, DEPARTMENT OF COMMERCE: RELATIONSHIP WITH THE INTERNET CORPORATION FOR ASSIGNED NAMES AND NUMBERS, at 8-9 (2000) [hereinafter U.S. GENERAL ACCOUNTING OFFICE].

465. Management of Internet Names and Addresses, 63 Fed. Reg. 31,741 (June 10, 1998). The first draft was known as the “Green Paper.” See Improvement of Technical Management of Internet Names and Addresses, 63 Fed. Reg. 8826 (Feb. 20, 1998).

466. Management of Internet Names and Addresses, 63 Fed. Reg. at 31,741.

467. Mueller, *supra* note 16, at 506.

468. See *id.*

469. *Id.*

470. *Id.* at 507.

471. *Id.*

3. *Creation of the Internet Corporation for Assigned Names and Numbers (ICANN)*

The Internet Corporation for Assigned Names and Numbers (ICANN) was set up as a nonprofit corporation for the management of the DNS. IANA selected the nine initial board members in October 1998.⁴⁷² On November 25, 1998, the Commerce Department recognized ICANN as the entity for the management of the DNS. According to Jonathan Zittrain:

The idea of ICANN was also one of closure: an end to paralyzing fights over domain policy between Network Solutions and engineers like Jon Postel. A mere trade association model does not capture the breadth of ICANN's responsibilities and intended structure, both because of the diversity of Internet stakeholders and because of the powerful, quasi-regulatory decisions that ICANN will make. ICANN is supposed to act in the public interest, not beholden to any one stakeholder. It is as if a private "International Communications Commission," comprised of all interested parties with a vested stake, were to attempt to allocate radio spectrum that had never been explicitly designated a public resource.⁴⁷³

In late 1998, the Department of Commerce extended NSI's cooperative agreement. The new amendment allowed NSI to continue to operate the authoritative "A" root server, but required NSI to provide a mechanism to allow for multiple registrars to accept registrations for the TLDs, for which NSI acts as a registrar.⁴⁷⁴ The following year, in September 1999, the Department of Commerce, NSI, and ICANN entered into a series of agreements. The agreements allowed NSI to continue to register the TLDs (.com, .net, and .org), but NSI had to agree not to deploy an alternative DNS while continuing to operate the authoritative root server system under the direction of the Department of Commerce.⁴⁷⁵ The agreements also strove to create competition in the registration of domain names.

To ensure competition, the agreements allowed NSI to maintain control of the .com, .net, and .org registry until 2007 so long as NSI fully divested either their registry or registrar function. Otherwise, NSI would lose control of the three registries in 2003.⁴⁷⁶ NSI agreed to divide its business into two divisions,

472. *See id.* at 508.

473. Zittrain, *supra* note 16, at 1083.

474. *See* Department of Commerce & Network Solutions, Inc., *Amendment No. 11 to NCR-9218742*, available at <http://www.ntia.doc.gov/ntiahome/domainname/proposals/docnsi100698.htm> (last visited Mar. 1, 2000).

475. *See* Mueller, *supra* note 16, at 514.

476. *See id.* at 414. *See also* ICANN, AMENDMENT 19 TO COOPERATIVE AGREEMENT BETWEEN NSI

one a registration division, the second a registry division. NSI agreed to compete against other ICANN accredited registrars for registering domain names. The new Shared Registration System (SRS), which is operational, allows multiple competing companies to register names in the .com, .net, and .org TLDs.⁴⁷⁷ In July 2000, a congressional hearing was held titled, "The Domain System Privatization: Is ICANN Out of Control?" The hearing sought to review the actions of ICANN.⁴⁷⁸

At ICANN's July 2000 board meeting in Yokohama, Japan, ICANN passed a resolution for the creation of more TLDs.⁴⁷⁹ This would create new TLDs, such as .biz, .firm, and .union, to allow entities more choice in registering their domain names.⁴⁸⁰ More TLDs are necessary because the .com TLD is so crowded that there are virtually no dictionary words that are available.⁴⁸¹ ICANN hoped to have the new TLDs operational by the Spring of 2001.⁴⁸² In November 2000, ICANN announced the seven new gTLDs that they had chosen. These gTLDs included names such as .name, .biz, and .museum.⁴⁸³ However, complaints over the selection process led to congressional hearings on ICANN in February 2001.⁴⁸⁴

In April 2001, ICANN announced a new agreement with VeriSign, which purchased NSI in March 2000.⁴⁸⁵ The new agreement, subject to approval from the Department of Commerce, would require VeriSign to give up control of the .org and .net registry after 2002 and in early 2006, respectively. In return, VeriSign would keep control of the .com registry until 2007 and have a presumptive right to the .com registry, thus potentially allowing VeriSign

AND U.S. GOVERNMENT, at <http://www.icann.org/nsi/coopagmt-amend19-04nov99.htm> (last visited May 11, 2001). See also Jeri Clausing, *Internet Group Approves Domain Registration Rules*, N.Y. TIMES, Nov. 5, 1999, at C2, available at LEXIS, News Library, The New York Times File.

477. *Id.*

478. See Jeri Clausing, *Internet Address Company Grilled in Congress*, N.Y. TIMES, July 23, 1999, at <http://www.nytimes.com/library/tech/99/07/cyber/articles/23domain.html>.

479. See *News Dots on the Net Scene*, WIRED NEWS, July 16, 2000, at www.wired.com/news/business/0,1367,37594,00.html. See also ICANN, *ICANN Yokohama Meeting Topic: Introduction of New Top Level Domains*, at <http://www.icann.org/yokohama/new-tld-topic.htm> (June 13, 2000).

480. See *supra* note 479.

481. See Declan McCullagh, *Domain Name List is Dwindling*, WIRED NEWS, Apr. 14, 1999, at <http://www.wired.com/news/technology/0,1282,19117,00.html>.

482. See Oscar S. Cisneros, *Is .biz the .com of the Future?*, WIRED NEWS, Aug. 2, 2000, at <http://www.wired.com/news/print/0,1294,37927,00.html>.

483. Chris Gaither, *7 Domains to Compete With .Com*, N.Y. TIMES, Nov. 17, 2000, at C4, available at LEXIS, News Library, The New York Times file.

484. Ariana Eunjung Cha, *Web Naming Group Hit from Within*, WASH. POST, Feb. 15, 2001, at E03.

485. The Department of Commerce is expected to approve the agreement between ICANN and VeriSign with only minor changes. See Anick Jesdanun, *Internet Names Deal Nearly Done*, WASH. POST, May 14, 2001, at <http://www.washingtonpost.com/wp-dyn/articles/A26696-2001May14.html>.

control of the .com registry forever. The agreement would also not require VeriSign to divest ownership of either the registry or the registrar business, as required by the 1999 agreement.⁴⁸⁶

C. Problems with the Management of the DNS

The privatization of the DNS suffered from a number of problems, many of which were quite similar to the problems encountered in the privatization of the Internet's backbone. These problems included the lack of transparency in decision making, the absence of accountability and public input, and the egregious behavior of the incumbent contractor.

1. Transparency in Decision Making

The privatization of the DNS suffered from a lack of transparency in the decision making by ICANN,⁴⁸⁷ starting with the initial selection for the board of directors and continuing throughout closed-door board meetings and the creation of bylaws for the ICANN corporation. The problems with ICANN's transparency have led to the formation of a number of watchdog groups. In the summer of 1999, three professors, David Post, David J. Farber, and Michael Froomkin, started a web site, ICANN Watch, devoted to providing information about ICANN.⁴⁸⁸ And in the summer of 2000, the American Civil Liberties Union, the Computer Professionals for Social Responsibility, and the Electronic Privacy Information Center joined together to launch the Internet Democracy Project.⁴⁸⁹ One of the goals of the Internet Democracy Project is to serve as a watchdog over ICANN.

At a congressional hearing into the management of ICANN, the Commerce Department demanded that ICANN open its board meetings.⁴⁹⁰ Andrew Pincus, General Counsel, Department of Commerce stated that "ICANN should immediately open its board meetings to the public. Transparency is

486. Anthony Shadid, *The Name Game*, BOSTON GLOBE, Apr. 9, 2001, at C1, available at LEXIS, News Library, The Boston Globe File.

487. For a discussion of the some of the procedural problems in the privatization of the DNS, see generally Froomkin, *supra* note 16. For further criticism, see Open Root Server Confederation, *ORSC Proposal* (Oct. 8, 1998), at http://www.ntia.doc.gov/ntiahome/domainname/proposals/orsc/ORSC_PRO.htm.

488. See ICANN web site, at <http://www.icannwatch.org> (last visited May 9, 2001); Jeri Clausing, *Internet Governing Group Already has a Watchdog*, N.Y. TIMES ON THE WEB, July 6, 1999, at <http://www.nytimes.com/library/tech/99/07/cyber/capital/06capital.html>.

489. See Internet Democracy Project web site, at <http://www.internetdemocracyproject.org> (last visited May 9, 2001).

490. See Jeri Clausing, *U.S. Moves to Tighten Reins on New Internet Regulator*, N.Y. TIMES, July 10, 1999, at C2.

critical to establishing trust in decision making. And trust is essential for ICANN's ultimate success."⁴⁹¹ Thus, it was only after pressure from the U.S. government that ICANN opened its board meetings to the public.⁴⁹²

ICANN's selection process for the new gTLDs has been criticized for its lack of transparency. Representative Edward Markey noted that the "[d]ecisions made in the Vatican to select the [P]ope are more clear to the public than how new domain names are issued."⁴⁹³ He continued, "only a small high priesthood of the Internet fully understands how these decisions are made." Others offered a harsher assessment. Michael Froomkin stated, "Instead of considering the applications solely on technical merit, or indeed on any other set of neutral or objective criteria, ICANN selected seven winners on the basis of a series of often subjective and indeed arbitrary criteria, in some cases applied so arbitrarily as to be almost random."⁴⁹⁴ It follows that a selection process that appears to be random clearly cannot be transparent decision making.

Governmental organizations are typically subject to a variety of "openness" laws, such as the Sunshine Act, to ensure transparency in decision making.⁴⁹⁵ As a nonprofit corporation, ICANN is not subject to these requirements. For example, ICANN is not required to produce documents under the Freedom of Information Act.⁴⁹⁶ While ICANN may have opened its board meetings, ICANN's decision-making process is not transparent when compared to traditional governing bodies. This has led to criticism of ICANN by organizations such as the Small Business Administration (SBA). The SBA requested that ICANN adopt further procedural rules to allow for transparency and openness in decision making.⁴⁹⁷ Even Ralph Nader has come forth with proposals for additional procedural rules.⁴⁹⁸

491. Andrew J. Pincus, *Response to Honorable Tom Bliley* (July 8, 1999), at <http://www.ntia.doc.gov/ntiahome/domainname/blileyrsp.htm>.

492. See Jeri Clausing, *Internet Board to Open Meetings and Drop Fee*, N.Y. TIMES ON THE WEB, July 20, 1999, at <http://www.nytimes.com/library/tech/99/07/cyber/capital/20capital.html>; Esther Dyson, *Prepared Testimony for U.S. House of Representatives, Subcommittee on Oversight and Investigation* (July 22, 1999), at <http://www.icann.org/dyson-testimony-22july99.htm>.

493. Shadid, *supra* note 486.

494. Declan McCullagh & Ryan Sager, *Getting to Domain Argument*, WIRED NEWS, Feb. 8, 2001, at <http://wired.lycos.com/news/print/0,1294,41683,00.html>.

495. Zittrain, *supra* note 473, at 1084.

496. See *id.*

497. See Clausing, *supra* note 488; Small Business Administration, *Request for a Procedural Policy* (Oct. 27, 1999), at http://www.sba.gov/advo/laws/comments/icann99_1027.html.

498. For the Nader proposal, see Ralph Nader, *A Framework for ICANN and DNS Management* (Sept. 25, 1999), at <http://www.cptech.org/ecom/cpsr-icann.html>. See also Erich Luening, *Ralph Nader Renews Criticism of ICANN*, CNET NEWS.COM, Sept. 27, 1999, at <http://news.cnet.com/news/0-1005-200-205423.html>.

2. *Accountability and Public Input*

The U.S. government has consistently asked for public comment on the privatization process for the DNS.⁴⁹⁹ In contrast, ICANN has been criticized for the lack of public input into its processes. For example, Alan Davidson, policy analyst for the Center for Democracy and Technology stated, “ICANN is clearly addressing issues that will have tremendous long-term impact on the shape of the Internet, but very few consumer or public interest groups have been involved.”⁵⁰⁰ The SBA criticized ICANN for its handling of public comments on proposed policies, characterizing it as follows: “de facto barriers are being erected to the participation of small businesses and individuals in the ICANN decision-making process.”⁵⁰¹ The SBA asked ICANN to adopt policies for better public notification of proposed policies and requested a longer comment period on proposed policies.⁵⁰²

There is a feeling among some in the Internet community that ICANN’s corporate structure was designed to be unaccountable to the public.⁵⁰³ For example, the initial ten member board of ICANN was unrepresentative and unaccountable.⁵⁰⁴ There was never any public input into the selection of the board. Instead, it was done in secret and presented as a *fait accompli*.⁵⁰⁵ According to Diane Cabell, a Boston lawyer and a member of the Boston Working Group (BWG), “The board was not accountable to anyone because there were no members or shareholders.”⁵⁰⁶ She also added that there is no organization, public or private, that oversees the ICANN board.⁵⁰⁷ Members of the BWG have suggested that ICANN change its membership structure by having the board members directly elected in annual meetings.⁵⁰⁸

ICANN has attempted to address its lack of accountability by allowing the

499. Both the White Paper and the Green Paper provided for public comment.

500. Jeri Clausing, *Internet Body Feels Democracy’s Tug*, N.Y. TIMES, Aug. 30, 1999, at C1.

501. *Id.*

502. Jeri Clausing, *Government Has More Questions for Internet Board*, N.Y. TIMES ON THE WEB, Nov. 2, 1999, at <http://www.nytimes.com/library/tech/99/11/cyber/capital/02capital.html>.

503. See Keith Dawson, *UDRP? JDRP* (Nov. 16, 1999), at http://tbt.com/roving_reporter/jdrp.html; Patrick Greenwell, *Despite Our Best Efforts, ICANN Fails in Many Respects* (Dec. 7, 1999), at <http://www.icannwatch.org/archives/944584730.shtml>. For the regulations concerning ICANN as a California nonprofit corporation, especially with respect to shareholders, see Leon Koay & Michael Richardson, *Openness & Transparency, ICANN & the Public Interest: Pressing Issues* (Oct. 31, 1999), at <http://cyber.law.harvard.edu/icann/workshops/la/papers/openness.html>.

504. Greenwell, *supra* note 503.

505. See Mueller, *supra* note 16, at 507.

506. Carl S. Kaplan, *A Kind of Constitutional Convention for the Internet*, N.Y. TIMES (Cyber Law Journal), Oct. 23, 1998, at <http://www.nytimes.com/library/tech/98/10/cyber/cyberlaw/23law.html>.

507. *Id.*

508. *Id.*

Internet community to select its board members. In October 1999, ICANN's three supporting organizations each nominated three members to fulfill ICANN's original plan of a nineteen member board of directors.⁵⁰⁹ According to the *New York Times*, the supporting organizations "represent specific groups like Internet service providers, domain name registration companies, and the intellectual property interests."⁵¹⁰ To allow for the rest of the Internet community to participate, ICANN proposed the creation of an "election council" that would select nine replacements for the interim board, the so-called "at-large" seats.⁵¹¹ This would allow the supporting organizations and the Internet community to share in the management of ICANN. The election council was to be selected by direct voting in September 2000. This two-tiered system was intended to provide half the board members from the Internet community with the other half nominated by the supporting organizations.

In March 2000, the Center for Democracy and Technology (CDT) and Common Cause issued a report critical of ICANN's plan.⁵¹² The report was concerned about the lack of safeguards in preventing the election council from being captured by special interests. Additionally, the report believed there was a lack of understanding about ICANN's mission among the Internet community. The report's concerns were supported by the hundreds of members of the Internet community at an ICANN board meeting later that month. ICANN's board listened to criticisms of the election plan from people who were worried that ICANN was beholden to big corporate interests. These people requested that ICANN slow down to ensure that the process of transition was legitimate.

There were also calls for direct election of the board members by a consensus of public interest groups.⁵¹³ In response, Esther Dyson, ICANN's chairwoman said, "I am concerned about capture by people who don't know what they are doing. . . . People who are stupid, individually."⁵¹⁴ Charles Costello, director of the Carter Center, who had experience in aiding democratic elections in developing countries, was present at the ICANN board meeting. He noted that ICANN's plan of an electoral college, the "election

509. Jeri Clausing, *U.S. Shut Out in First Round of Internet Board Elections*, N.Y. TIMES ON THE WEB, Oct. 19, 1999, at <http://www.nytimes.com/library/tech/99/10/cyber/capital/19capital.html>.

510. Jeri Clausing, *Internet Board Faces Heavy Opposition on Voting Plan*, N.Y. TIMES ON THE WEB, Mar. 10, 2000, at <http://www.nytimes.com/library/tech/00/03/cyber/articles/10domain.html>.

511. Clausing, *supra* note 502.

512. Jeri Clausing, *Report Sees Major Hurdles for Internet Election*, N.Y. TIMES ON THE WEB, Mar. 3, 2000, at <http://www.nytimes.com/library/tech/00/03/cyber/articles/03domain.html>.

513. See Jeri Clausing, *What's in a Name?*, N.Y. TIMES, Mar. 13, 2000, at C9.

514. Clausing, *supra* note 510.

council,” dilutes the voting rights of individuals.⁵¹⁵ Finally, ICANN reconsidered its initial plan and agreed to hold direct elections for five new at-large members by November 1, 2000, while postponing the elections of the four remaining board members to allow for further study.⁵¹⁶ This means that the Internet community had representation on ICANN for the first time on November 1, 2000, for only five of the nineteen seats. Moreover, it will not be until 2002 that the four remaining board members will be selected, thus ensuring ICANN very little accountability to the Internet community.⁵¹⁷

At the ICANN board meeting in July 2000, ICANN considered further reducing its accountability to the Internet community when it decided to review whether it should eliminate or reduce the number of at-large board members.⁵¹⁸ Such a move would ensure that the business interests represented by the supporting organizations would entirely control ICANN. In response to ICANN’s proposal, two high government officials warned ICANN board members that such an unbalanced board could lead to government oversight of ICANN.⁵¹⁹ Governments would be forced to regulate the DNS to protect consumer interests. While ICANN backed down from eliminating at-large members at the Yokohama meeting, the issue will likely be revisited. Especially considering that only one of the nineteen board members actually spoke out against the proposal to reduce the number of at-large board members.⁵²⁰

The issues of public input and accountability are intimately related to the structure of ICANN. Joe Sims of Jones, Day, Reavis & Pogue, and Dr. Jon Postel developed the articles of incorporation and bylaws for ICANN.⁵²¹ Not surprisingly, a number of proposals have been suggested to modify the structure of ICANN.⁵²² However, ICANN has not yet addressed its own procedural shortcomings and instead is attempting to reduce its accountability to the public. As a result, confidence in ICANN as a governing institution is waning.

515. *Id.*

516. Clausing, *supra* note 513.

517. See Cyber-Federalist, Reflections on the ICANN Meeting in Yokohama (July 17, 2000), at http://www.cpsr.org/internetdemocracy/cyber-fed/Number_2.html. See also David McGuire, *ICANN Hunts for New Board Members*, NEWSBYTES, Jan. 5, 2001, at www.newsbytes.com/news/01/160137.html.

518. Aaron Pressman, *Group Overseeing Internet Changes Sets Its Election Rules*, CNN.COM, July 19, 2000, at <http://www.cnn.com/2000/TECH/computing/07/19/icann.election.idg/index.html>.

519. Cyber-Federalist, *supra* note 517.

520. *Id.*

521. See Mueller, *supra* note 16, at 507.

522. Harish Bhatt, *Governing the Commons: The Future of Global Internet Administration* (Sept. 25, 1999), at <http://www.cpsr.org/conferences/dns99/spkr-Froomkin.htm> (summary of presentation by Michael Froomkin). See also Nader, *supra* note 498; *supra* notes 497-98 and accompanying text.

3. *Problems with Network Solutions, Inc. (NSI)*

In March 2000, VeriSign, Inc. agreed to purchase NSI for \$21 billion.⁵²³ It is interesting to note that NSI, whose existence depended on one government contract from 1993 to 1999, has grown from a net worth of virtually nothing to \$21 billion. NSI grew to this size by profiting off its monopoly status, while fending off competition. Esther Dyson, the chairwoman of ICANN, has accused NSI of “funding and otherwise encouraging a variety of individuals and entities to throw sand in the gears whenever possible, from as many directions as possible.”⁵²⁴ She goes on to state that “it would have been much simpler, and a lot more pleasant, to have seen [NSI] work with the rest of the community to make this obviously necessary transition to open competition and policy-based management of the Internet’s vital technical infrastructure. Still, we will persevere, and we will succeed.”⁵²⁵

This section focuses on two specific acts by NSI. The first concerns NSI’s ability to amend its contract with the government to charge fees for domain name registration. The second concerns NSI’s behavior regarding the domain name database.

a. NSI’s “Jackpot Amendment”

In 1993, NSI entered into a five-year cooperative agreement with the U.S. government in which NSI was to receive \$4 million to maintain the databases and domain servers.⁵²⁶ The original cooperative agreement provided for cost reimbursement plus a fixed fee cost for NSI.⁵²⁷ In 1995, Science Applications International Corporation (SAIC) acquired NSI.⁵²⁸ Later that year, NSI asked the NSF to amend the cooperative agreement to allow it to charge fees for domain name registrations.⁵²⁹ The NSF approved that request, allowing NSI to charge \$100 for the first two years and then an annual fee of \$50 for domain name registrations.⁵³⁰

523. See Lawrence M. Fisher, *VeriSign to Acquire Network Solutions in Stock Swap*, N.Y. TIMES, Mar. 8, 2000, at C2.

524. Jeri Clausing, *Head of Internet Body Attacks Network Solutions*, N.Y. TIMES ON THE WEB, June 16, 1999, at <http://www.nytimes.com/library/tech/99/06/cyber/articles/16icann.html>.

525. *Id.*

526. See RONY & RONY, *supra* note 16, at 165.

527. See *id.*

528. See Diamond, *supra* note 450.

529. NSF agreed to the proposal and implemented as amendment 4 to the original NSF/NSI Cooperative Agreement No. NCR-9218742. See RONY & RONY, *supra* note 16, at 149. For the original cooperative agreements, see *Analysis of NSF’s Response: Overview of the Analysis*, at <http://www.cavebear.com/nsf-dns/analysismain.htm> (last modified Jan. 31, 1998).

530. The NSF required thirty percent of the registration fees from NSI to be placed in a fund for the

In their book on the DNS, Ellen and Peter Rony refer to this as the “jackpot amendment.”⁵³¹ The registration fee also caused a good deal of controversy online. NSI explained the increase as follows: “The increased activity, with the corresponding growth of operating costs, have resulted in funding requirements exceeding the National Science Foundation’s budget. In addition, it is appropriate that Internet users, instead of the U.S. Federal Government, pay the costs of domain name registration services.”⁵³² Thus, the NSI was asking the government to allow NSI to charge a fixed fee for each domain name.

Even in 1995, it was well-understood that domain name registrations were increasing rapidly and would continue to do so. In 1995, NSI registered over a million names subject to the annual renewal fee.⁵³³ For example, through June of 1996, NSI registered over 1.3 million domain names.⁵³⁴ In 1996, NSI registered more than 70,000 names every month.⁵³⁵ Moreover, NSI transacted over 90% of its business with new customers without any human intervention,⁵³⁶ so that its operating costs remained quite low. In congressional hearings in 1999, ICANN stated NSI’s “mandatory fees exceed the actual costs of providing those services.”⁵³⁷ Without competition, NSI benefited greatly at the expense of millions of people and firms who registered domain names with NSI. This issue is still relevant today with over 30,000 domain names being registered daily and over 24 million domain names registered with VeriSign.⁵³⁸

The NSF originally subsidized the entire DNS. The “jackpot amendment” led the NSF to stop subsidizing the DNS. In essence, the NSF shifted from contracting services with NSI to granting NSI a franchise. A franchise is defined as a private firm providing a service with price regulation by the government, as opposed to contracting, where the government pays for

enhancement of the Intellectual Infrastructure of the Internet. See RONY & RONY, *supra* note 16, at 149. This was later found to be an unconstitutional tax because it did not have approval of Congress. See Courtney Macavinta & Janet Kornblum, *Judge Rules Domain Fees Illegal*, CNET NEWS.COM, Apr. 9, 1998, at <http://news.cnet.com/news/0-1005-200-328222.html>.

531. RONY & RONY, *supra* note 16, at 149.

532. *Id.*

533. *See id.*

534. *See id.* at 140.

535. See Milton L. Mueller, *Internet Domain Names: Privatization, Competition, and Freedom of Expression* (Oct. 16, 1997), at <http://www.cato.org/pubs/briefs/bp-033.html>.

536. See Monte Paulsen, *Raiders of the Last Ark*, available at <http://www.newhavenadvocate.com/articles/raiders.html> (last visited Mar. 1, 2000).

537. Declan McCullagh, *ICANN Points Finger at NSI*, WIRED NEWS, July 9, 1999, at <http://www.wired.com/news/politics/0,1283,20654,00.html>.

538. See Stefan C. Friedman, *No 3-Letter .Com Names Left*, at <http://www.nypost.com/business/28458.htm> (last visited Sept. 1, 2000); VeriSign, Inc., *VeriSign, Inc. Fact Sheet*, at <http://corporate.verisign.com/about/fact.html> (last visited Feb. 19, 2001).

services from a private firm.⁵³⁹ As another form of privatization, franchising only provides public benefits when it is conducted through an open, transparent, competitive process.⁵⁴⁰ Clearly, in this case, there was not an open, transparent, competitive process when the government granted NSI a franchise on domain name registrations.

b. Competition on NSI's Terms

The DNS's operation depends upon the "zone files," which contain the domain names and the IP addresses. The Whois database provides comprehensive information such as who owns or operates a domain name and their contact information. The Whois database was provided publicly as a network "white pages" for free. The Whois database was frequently consulted to see if a domain name was already registered.⁵⁴¹

In March 1999, NSI redirected people looking for the Whois database to its own web site.⁵⁴² NSI calculated the timing of this transition to occur just prior to when ICANN was to select five competing companies to act as alternative registrars. NSI claimed that the Whois database was a customer list owned by NSI. It is clear that NSI redirected visitors to its own web site to place itself in a favorable position with respect to its potential competitors.

NSI also claimed ownership of the Whois database in March 1999.⁵⁴³ NSI maintained its position at a later congressional hearing in July 1999 on the privatization of the DNS.⁵⁴⁴ However, under the cooperative agreement, NSI was obligated to provide a copy of the database to the Department of Commerce when the agreement expired or was terminated.⁵⁴⁵

The cooperative agreement did not state whether NSI could continue to register names at the conclusion of the cooperative agreement. However, it was well-understood that if there was no agreement reached, NSI could and would continue to register TLDs. NSI publicly stated that it planned to operate the DNS without supervision of the government when the cooperative agreement

539. SAVAS, *supra* note 224, at 79.

540. *Id.* at 128.

541. See RONY & RONY, *supra* note 16, at 193.

542. See Associated Press, *U.S. Wants Domain Company to Explain Shift*, N.Y. TIMES ON THE WEB, Mar. 24, 1999, at <http://www.nytimes.com/library/tech/99/03/biztech/articles/24domain.html>; Dan Goodin, *Rivals Criticize Merged NSI, InterNIC Site*, CNET NEWS.COM, Mar. 22, 1999, at <http://news.cnet.com/news/0-1005-200-340231.html>; Michael J. Martinez, *Network Solutions Registers Dissent*, ABC NEWS.COM, Mar. 27, 1999, at <http://abcnews.go.com/sections/tech/DailyNews/netsol990326.html>.

543. Associated Press, *supra* note 542.

544. Clausing, *supra* note 478.

545. See Mueller, *supra* note 16, at 513.

ended.⁵⁴⁶ This posturing by NSI allowed it to gain favorable terms in agreements with the Department of Commerce and ICANN.

In an agreement between NSI, ICANN, and the Department of Commerce in late September 1999, NSI finally agreed to grant certain public rights to “its” databases.⁵⁴⁷ In return, ICANN agreed to allow NSI to continue as the exclusive registry for the .com, .net, and .edu domain names for the next four years.⁵⁴⁸ NSI agreed to divide its business into two parts, including a retail side to register names and wholesale side known as NSI’s registry.⁵⁴⁹ The agreement ensured a long-term role for NSI in providing registry services.⁵⁵⁰

The agreement didn’t satisfy many of NSI’s hopeful competitors.⁵⁵¹ Before this agreement was executed, all of NSI’s competitors stated that they would rather see the agreement defeated.⁵⁵² The competitors of NSI were concerned that the agreement did not provide strong guarantees of service from NSI. They were also concerned about NSI’s close relationship and influence with ICANN.⁵⁵³ Thus, the agreement was not even slightly supported by competing firms.

Under the new Shared Registration System (SRS) which NSI agreed to, there are multiple competing companies that may register names in the .com, .net, and .org TLDs. However, NSI is responsible for maintaining the database and the root name server. In fact, the competing companies pay NSI \$6 per domain name registered, as mandated by the Department of Commerce, for the maintenance of the registration system.⁵⁵⁴ Leaving NSI in control of registry is controversial. As Mark Lemley noted, “if the point is to have competition and to make sure that the registry is open to everyone on nondiscriminatory terms, it probably doesn’t make any sense to have one of the competitors in charge of the registry.”⁵⁵⁵ This is why Mueller characterizes the DNS as a regulated

546. Pincus, *supra* note 491.

547. See Evan Hansen, *NSI Reaches Net Name Agreement With Groups*, CNET NEWS.COM, Sept. 28, 1999, at <http://news.cnet.com/news/0-1005-200-351900.html?tag=st.cn.1>.

548. Jeri Clausing, *Agreement to End Registrar’s Monopoly Meets Resistance*, N.Y. TIMES ON THE WEB, Nov. 4, 1999, at <http://www.nytimes.com/library/tech/99/11/cyber/articles/04icann.html>.

549. See Courtney Macavinta, *Net Name Registrars Vie for Fairer Competitive Landscape*, CNET NEWS.COM, Nov. 3, 1999, at <http://news.cnet.com/news/0-1005-200-1428939.html?tag=st.n.1002>.

550. See Chris Oakes, *NetSol, ICANN Reach Accord*, WIRED NEWS, Sept. 29, 1999, at <http://www.wired.com/news/print/0,1294,31557,00.html>.

551. See Macavinta, *supra* note 549.

552. Jeri Clausing, *supra* note 548.

553. *Id.*

554. See Dan Goodin, *Potential Domain Registrars Cry Foul*, CNET NEWS.COM, Apr. 27, 1999, at <http://news.cnet.com/news/0-1005-200-341769.html?tag=st.cn.1>. Beginning January 15, 2000, NSI as a registry changed its fee from \$9 to \$6 per registration-year for domain names. See ICANN, *Fact Sheet on Tentative Agreements among ICANN, the U.S. Department of Commerce, and Network Solutions, Inc.*, at <http://www.icann.org/nsi/factsheet.htm> (last modified Sept. 28, 1999).

555. Dan Goodin & Sandeep Junnarkar, *AOL Among New Domain Registrars*, CNET NEWS.COM,

monopoly.⁵⁵⁶ There is no true competition. Instead, the only competition that exists is for registering the domain names for which companies have to pay a fixed price. This is far removed from a privatization that achieves meaningful competition.

D. Déjà Vu All Over Again: Problems with the Privatization of the DNS

The famous Yogi Berra quote “Déjà Vu All Over Again” seems quite appropriate with regards to the privatization of the DNS.⁵⁵⁷ This privatization suffers from many of the same problems as the privatization of the backbone. Once we recognize this, we can develop proposals to address these problems for the DNS and for future Internet privatizations. The problems include not following procedures to ensure transparency and openness in decision making, favoritism towards incumbent contractors, and failing to introduce competition for the DNS. While the privatization process is still ongoing, ICANN has already made a number of crucial decisions, such as the domain name dispute policy,⁵⁵⁸ accreditation of domain name registrars, and the introduction of new TLDs.

Procedurally, there were problems with transparency in decision making and public input. For example, the Department of Commerce had to intervene to open ICANN’s board meetings.⁵⁵⁹ Additionally, ICANN is not required to provide documents to the public upon their request. ICANN has also been criticized for their policies limiting public input into their decisions. Many of these problems of transparency are related to ICANN’s articles and bylaws.⁵⁶⁰ These same articles and bylaws have limited ICANN’s accountability to the Internet community.⁵⁶¹ Moreover, ICANN’s proposed actions to limit at-large directors further reduces ICANN’s accountability to the Internet community. Even Karl Auerbach, a newly elected board member, has criticized ICANN for its secrecy. He has also commented about how ICANN does not justify its actions to anyone and is generally badly run.⁵⁶² Not surprisingly, there is considerable mistrust of ICANN as a result of these procedural problems.

Apr. 21, 1999, at <http://news.cnet.com/news/0-1005-200-341470.html?tag=st.cn.1>.

556. See Mueller, *supra* note 16, at 518.

557. Jon B. Kutler, *Déjà Vu All Over Again*, WASH. TECH., Feb. 5, 1998, at http://www.washingtontechnology.com/news/13_12/news/11637-1.html.

558. See ICANN, UNIFORM DOMAIN NAME DISPUTE RESOLUTION POLICY (approved Oct. 24, 1999), at <http://www.icann.org/udrp/udrp-policy-24oct99.htm> (last modified June 4, 2000).

559. See *supra* Part VI.C.1.

560. *Id.*

561. See *supra* Part VI.C.2.

562. Mark Ward, *Net Governing Body Slammed from Within*, BBC NEWS ONLINE:SCI/TECH, Feb. 15, 2001, at http://news.bbc.co.uk/low/English/sci/tech/newsid_1171000/1171793.stm.

These problems feed the perception that ICANN does not represent the Internet community and, instead, represents the special interests of a few large corporations. Moreover, in a recent influential article, Froomkin argues that ICANN has been used by the Department of Commerce as an end run around the safeguards of the Administrative Procedure Act (APA).⁵⁶³

The favoritism shown by the government with regard to NSI is unfortunately similar to the problems with ANS. The government should have bid out the contract for commercial domain name registrations instead of handing it over to NSI in 1995. It is quite reasonable to assume that there would have been a number of entities capable of registering domain names. As early as January 1996, there were alternative, experimental registry systems developed and operating on the Internet, including AlterNIC, name.space, and eDNS.⁵⁶⁴ These registry systems operated alternative root-name servers containing new TLDs such as .xxx, .med, and .lnx.⁵⁶⁵ Instead, the government allowed NSI to begin charging unreasonably high fees for domain name registration in 1995. Similarly, the government permitted NSI to continue to control the registry in 1999. As Richard Foreman, president and CEO of register.com stated, "Unfortunately, the current situation still promotes an uneven playing field. The Department of Commerce extended NSI's contract without even considering any competing registrars to run the registry."⁵⁶⁶ ICANN's latest agreement with VeriSign in 2001 has also been criticized for its overly favorable terms. Commenting on the agreement, Karl Auerbach, an ICANN board member, noted, "The public lost. The Internet community gains very little and will continue to pay high fees."⁵⁶⁷ Auerbach would have preferred that all three registries (.com, .net, and .org) be rebid without any favorable treatment to VeriSign. Thus, once again, the government may allow the incumbent contractor unduly favorable terms in the newly created commercial market. In this case, the government granted the incumbent contractor, NSI, a franchise on domain name services in 1995 and a more limited franchise on the registry service which could last forever.

The government allowed its NSI to hinder competition. NSI leveraged

563. See Froomkin, *supra* note 429. Froomkin's article led Senator Burns to write a letter to the General Accounting Office asking whether ICANN actions have been legal. See Tamara Loomis, *ICANN Has Hands Full Adding New Domains*, N.Y. L.J., Apr. 9, 2001, available at <http://www.law.com>.

564. Management of Internet Names and Addresses, 63 Fed. Reg. 31,741, 31,743 (June 10, 1998). Two of these registry systems that are still operational are: Alternic (<http://www.alternic.net>) and Name.Space (<http://name.space.xs2.net>). See also Kenneth Neil Cukier, *Addressing the Future*, RED HERRING, Jan. 2000, at 162.

565. See Diamond, *supra* note 450.

566. Oakes, *supra* note 550.

567. Elizabeth Hurt, *ICANN Approves VeriSign Agreement*, BUSINESS2.0, Apr. 2, 2001, at <http://www.business2.com/technology/2001/04/29406.htm>.

control over the .com and root information as a bargaining chip to gain a favorable position. Despite the fact that there were alternative registration and registry services operating for a number of years, NSI was able to hold off competition. The behavior of NSI was aimed at trying to reduce consensus, thus paralyzing the leitmotif of the Internet, “rough consensus and running code.”⁵⁶⁸ Although there was running code, NSI strove to limit the formation of a rough consensus on an alternative DNS.⁵⁶⁹ Today, NSI controls the registry service and leads in domain name registration.

Many of the problems with NSI resulted from the government failing to define adequately the rights of the government and its contractor with regard to commercial use of the underlying property or service in a research contract. This led to uncertainty when NSI requested to shift from a system of full governmental support to one where the consumers of domain names would pay a registration fee.⁵⁷⁰ These problems persist, most recently in NSI’s claim that it owned the zone files and the Whois database.⁵⁷¹

NSI’s position was reinforced by the “Code”, which, in this case, was the name server software. Manufacturers of name server software provide a default list of root name servers.⁵⁷² Manufacturers rely on the list of root name servers maintained by government-managed Internic.⁵⁷³ Internic is an integrated network information center for the Internet that was developed by several companies, including NSI, in cooperation with the U.S. government.⁵⁷⁴ Recently, control of Internic is being transferred from the U.S. government to ICANN.⁵⁷⁵ It is estimated that only 10% of systems running name server software have even changed their defaults, and almost all of these changes are updates to a newer list by Internic.⁵⁷⁶ It requires a conscious decision for network providers to change name servers.⁵⁷⁷ NSI derives its advantage,

568. This quote is attributed to Internet pioneer David Clark. See Fred Baker, *In the Works: Reaching Consensus*, NETWORK WORLD FUSION, Dec. 13, 1999, at <http://www.nwfusion.com/columnists/1213works.html>.

569. See *supra* note 524 and accompanying text.

570. See *supra* Part VI.C.3.a.

571. See *supra* Part VI.C.3.b.

572. See Gordon Irlam, *Controlling the Internet: Legal and Technical Aspects of the Domain Name System* (July 13, 1997), at <http://www.base.com/gordoni/thoughts/dns-control/dns-control.html>.

573. *Id.*

574. See Internic, *Frequently Asked Questions*, available at <http://rs.internic.net/faq.html> (last visited Apr. 30, 2001).

575. Department of Commerce, *New Version of InterNIC Website to be Launched December 1* (Nov. 30, 1999), at <http://www.ntia.doc.gov/ntiahome/press/internicpr113099.htm>.

576. See Irlam, *supra* note 572.

577. See Diamond, *supra* note 450. To overcome these advantages in Code, a new alternative DNS has sought a different strategy. New.net offers a browser plug-in that allows users to access their alternative DNS. New.net is entering into agreements with large ISPs such as Earthlink to switch to their alternative DNS. See Associated Press, *Internet Name Seller Strikes Deal*, CNET NEWS.COM, Apr. 8,

because it is the default root server blessed by the U.S. government and, therefore, on Internic's list.

The U.S. government and ICANN have been slow to add competition to the DNS. For example, Postel had suggested creating fifty new registries, which could have acted as competitors to NSI in 1995. The Commerce Department never attempted to add competition to the DNS. Instead, the Commerce Department depended on a number of agreements between itself, ICANN, and NSI. While these agreements have led to competition for the registration of domain names via the SRS, the DNS is aptly characterized as a regulated monopoly. The U.S. government and ICANN have not yet allowed competitors to operate alternative TLDs. For example, in 1995, IODesign had received a preliminary "go ahead" to modify the technological infrastructure of the DNS to allow for the new TLD ".web".⁵⁷⁸ However, permission was quickly denied and no new TLD was introduced. The U.S. government and ICANN, therefore, have used agreements to regulate the conduct of NSI, while resisting any modifications to the technological infrastructure that would support competition for the DNS.

NSI has continued to hold the government contract for management of the DNS. NSI maintained exclusive control of the .com, .net, and .org TLDs for seven years. By 1996, NSI was estimated to be worth \$1 billion dollars.⁵⁷⁹ In 1999, NSI entered the Fortune 500 after ten quarters of record earnings.⁵⁸⁰ In March 2000, VeriSign offered to purchase NSI for \$21 billion.⁵⁸¹ Even competition from other registrars is not expected to affect the profits of NSI for the foreseeable future.⁵⁸² Thus, the lack of competition in the DNS brought about by the government's poor management of the DNS's privatization has allowed NSI to profit handsomely.

VII. AN ANALYSIS OF THE PRIVATIZATIONS OF THE INTERNET BACKBONE AND THE DOMAIN NAME SYSTEM (DNS)

The privatization of the Internet's backbone and the Domain Name System (DNS) suffered from a number of problems. So far, we have confined our

2001 (on file with author).

578. Internet Assigned Numbers Authority, *IODesign Files Suit Against CORE* (Nov. 4, 1999), at <http://www.iana.org/comments/03oct1998-10jan2000/msg00303.html>.

579. See Kristin Spence, *Roadrunner, InterNIC's After You*, WIRE, Oct. 1996, at 90.

580. See Jeri Clausing, *Network Solutions Reports Record Earnings*, N.Y. TIMES, Apr. 22, 1999, at C2.

581. See Lawrence M. Fisher, *VeriSign to Acquire Network Solutions in Stock Swap*, N.Y. TIMES, Mar. 9, 1999, at C1.

582. See Courtney Macavinta, *Analysts: NSI Remains Dominant*, CNET NEWS.COM, Sept. 29, 1999, at <http://news.cnet.com/news/0-1005-200-266300.html>.

analysis to the specific problems that occurred during each privatization. This Part aims to highlight and summarize the commonality of the problems that continued to reoccur during the privatizations. The first step to correcting these problems is to recognize that they are not random isolated events, rather they are reoccurring because of the same root causes. This approach is novel and demonstrates how the problems that developed later in the DNS are not new and unique. The first section highlights three categories of problems that occurred at various steps during both privatizations. The second section discusses the effects of these problems on the backbone industry and the DNS. The third section suggests proposals, not only to prevent these problems from reoccurring in future privatizations, but also to fix those that have occurred.

A. Problems Occurring During the Privatization Processes

This section discusses the problems with the privatizations of the backbone network and the DNS. It distills the problems into three main areas: (1) the procedural problems in the privatization processes; (2) the government's inadequate management of competition during the privatizations; and (3) the government's management of the Internet's technological infrastructure or "Code".

1. The Procedural Problems in the Privatization Processes

The procedural problems with both privatizations fall into three categories. First, the processes for both privatizations were far from transparent. Transparency in government allows the public to understand the reasoning behind government decisions and requires the government to announce publicly its important decisions. Second, both privatizations suffered from a lack of public input into the process. Finally, there have been problems with accountability during the privatization of the DNS. As a consequence of these procedural problems, there is a diminution of public confidence in the privatization methodologies employed by the government.

Several times during the privatization processes it was not clear why many decisions were made. Moreover, many of these important decisions were not publicly announced. This lack of transparency in the decision-making process began with the NSF's "backroom deal" to allow ANS to sell access to the NSFNET. According to the Office of the Inspector General, this decision should have been announced publicly.⁵⁸³ Furthermore, the Office of the Inspector General could not find any documentation of the NSF's reasoning to

583. See *supra* Part III.A.

allow ANS to sell commercial access to the NSFNET.⁵⁸⁴ Similarly, in the privatization of the DNS, ICANN's corporate structure provided for little transparency in decision making.⁵⁸⁵ Although ICANN was forced to open its board meetings to the public by the Department of Commerce, ICANN still holds closed-door meetings for special committees on issues such as IP address convergence and new generic TLDs.⁵⁸⁶ ICANN has not yet enacted a written and enforceable procedural policy that entities such as the Small Business Administration have requested.⁵⁸⁷ Such a policy would ensure an open and transparent process, for example, by requiring ICANN to open all of its meetings to the public.

The second major procedural problem was the absence of public input or comment on important governmental decisions. The NSF should have asked for public comment before allowing ANS to sell commercial access to the NSFNET.⁵⁸⁸ After this debacle, the NSF began to ask for public comment during the redesign of the Internet.⁵⁸⁹ ICANN has also been criticized for the lack of public input into ICANN's corporate structure, initial board members, and policy decisions.⁵⁹⁰

The third major procedural problem is the lack of accountability in ICANN. ICANN is attempting to take over management of the DNS. However, the Internet community has not yet been able to directly elect any ICANN board members. ICANN is further distancing itself from accountability to the Internet community through the slow introduction of at-large board members and by considering the elimination of the at-large board members. Consequently, ICANN is only accountable to a narrow set of business interests.⁵⁹¹

These procedural problems have resulted in a lack of trust and confidence in both the government and ICANN. Numerous commentators have remarked on their lack of confidence in several entities involved with privatization activities. For example, Milo Medin from NASA's Science Internet Office commented on his lack of confidence in the NSF as a result of the problems with ANS.⁵⁹² ICANN has also engendered a considerable amount of distrust by following procedures such as closed board meetings and the lack of

584. *See supra* note 160 and accompanying text.

585. *See supra* Part VI.C.1.

586. Small Business Administration, *supra* note 497.

587. *See supra* note 497 and accompanying text.

588. *See supra* Part III.A.

589. *See supra* Part IV.D.

590. *See supra* Part VI.C.2.

591. *Id.*

592. *See supra* note 199 and accompanying text.

accountability of its board members.⁵⁹³ Also consider that there have been congressional hearings in 1999 and 2001 as well as continuing criticism from public interest groups.⁵⁹⁴ These incidents and others have led to a blatant distrust of ICANN manifested on watchdog web sites such as ICANNWatch and the Internet Democracy Project.⁵⁹⁵

2. *The Government's Inadequate Management of Competition*

The government's inadequate management of competition during the privatizations can be divided into three categories. The first concerns the government's conduct towards its incumbent contractors. The government not only directly favored incumbent contractors, but turned its back when these contractors impeded competition. The second category concerns the government's actions in ignoring a fundamental prerequisite—the existence of competition—when privatizing the Internet. Consequently, incumbent contractors such as NSI profited immensely to the detriment of the public. The third type of problem emerges from the government's lack of foresight in its use of cooperative agreements with its contractors.

The government on several occasions readily favored an incumbent contractor—even when a competitive market for the relevant services existed. For example, the NSF allowed ANS to sell commercial access to the NSFNET. The government should not have granted this right freely to ANS, especially since there were other commercial competitors.⁵⁹⁶ NSI was also a recipient of favorable treatment from the NSF. NSI was granted control of commercial domain name registrations and allowed to raise prices via the “jackpot amendment.”⁵⁹⁷ Recently, NSI was also allowed to continue to maintain sole control of the registry system for the lucrative .com domain names.⁵⁹⁸ This action occurred despite the existence of potential competitors.

The government not only directly favored its incumbent contractors, but also implicitly favored them by ignoring their actions that impeded competition. ANS's refusal to interconnect at CIX impeded competition for

593. See *supra* Part VI.C.

594. Recently, the American Civil Liberties Union (ACLU) wrote to the government about its concerns regarding ICANN's behavior. See Letter from Barry Steinhardt, Associate Director, American Civil Liberties Union, and Laura W. Murphy, Washington National Office Director, American Civil Liberties Union, to Secretary Norman Mineta, U.S. Dep't of Commerce (Jan. 16, 2001), at <http://www.aclu.org/congress/1011601a.html>.

595. See the homepages for ICANN Watch and the Internet Democracy Project, at <http://www.icannwatch.org> and <http://www.internetdemocracyproject.org> (last visited May 5, 2001).

596. See *supra* Part III.B.

597. See *supra* Part VI.C.3.a.

598. See *supra* Part VI.C.3.b. and text accompanying note 566.

commercial backbone services.⁵⁹⁹ NSI repeatedly impeded competition, for example, by claiming ownership of the zone files and the Whois database.⁶⁰⁰

The one notable twist to the government's problem with favoritism occurred during the redesign of the Internet's backbone network in the early 1990s.⁶⁰¹ In this case, the government did not treat the incumbent backbone contractor or any of its competitors with favoritism. Instead, the government's redesigned Internet favored these few large backbone providers over smaller competitors.⁶⁰² The lack of favoritism by the government between the large backbone providers can be readily explained. These were large established firms such as MCI and Sprint, who had been lobbying the government for a privatized Internet since the late 1980s.⁶⁰³ In contrast, during the privatization of the DNS, the government favored a single large incumbent contractor, NSI, by not introducing competition. The potential competitors to NSI consisted of a number of small Internet startups with little economic and political capital. Not surprisingly, these small competitors have not been successful in persuading the government to create competition for the DNS. Thus the government has had repeated problems with favoritism which has significantly reduced the level of competition for important services.

The government also failed fully to recognize that competition is essential for a privatization. Privatization is generally favored because of its benefits, such as lower costs for goods and services. A key requirement in determining whether to privatize a service is determining the existence of competition. Without competition, privatization does not benefit the government or society.⁶⁰⁴ This lesson—the need to analyze the relevant market to determine the level of competition—was ignored repeatedly. At several points, the government stayed with the incumbent contractor despite changed circumstances and the emergence of a competitive marketplace. For example, the government should have competitively bid commercial backbone access to the NSFNET instead of just granting it to ANS. At the time, there were several other competitors providing commercial backbone services such as Sprint, PSI, and UUNET, and many other firms who were considering providing backbone services.⁶⁰⁵ Similarly, the NSF should have turned down NSI's request for the “jackpot amendment” and competitively contracted or franchised out commercial domain name registration. Potential competitors

599. *See supra* Part III.C.

600. *See supra* Part VI.C.3.b and text accompanying note 524.

601. *See supra* Part II.C.

602. *See supra* Part V.A.

603. *See supra* Part II.D.

604. *See supra* Part IV.A.

605. *See supra* text accompanying notes 216-18.

operating alternative DNSes included AlterNIC, name.space, and eDNS.⁶⁰⁶ Most recently, the government has not introduced competition and is instead treating the DNS as a regulated monopoly.⁶⁰⁷ Consequently, NSI has profited immensely and grown to a market capitalization of \$21 billion.⁶⁰⁸ Thus, the government's failure to capitalize on the existence of other competitors has injured the public by allowing NSI to charge high fees for domain name services.⁶⁰⁹

The final problem with the government's management of competition appeared in its use of cooperative agreements. Cooperative agreements are a form of a government contract that differ from the more commonly used procurement contract.⁶¹⁰ Procurement contracts are appropriate when the government is acquiring property or services for the direct benefit of the federal government.⁶¹¹ In contrast, a cooperative agreement is used when the government is accomplishing a public purpose authorized by a federal statute, such as the development of a national computer network for the research community.⁶¹² Because cooperative agreements are not considered procurement contracts, they are not subject to the statutory and regulatory procedures for procurement contracts.⁶¹³ As a result, this provides the government flexibility in negotiating the terms and conditions of the agreement, such as allowing relaxed compliance requirements. Additionally, a recipient of a cooperative agreement can receive the rights to the intellectual property from a project under a cooperative agreement. Finally, unlike procurement contracts, neither the General Accounting Office nor the Contract Disputes Act of 1978 address disputes concerning cooperative agreements.⁶¹⁴

The NSF used cooperative agreements between itself and its contractors for the management of the NSFNET and the DNS. These agreements stated the terms and conditions of the relationship between the NSF and its contractor. However, the NSF's cooperative agreements with ANS and NSI did not consider potential commercial use of the underlying activity.⁶¹⁵ As a result, the

606. See *supra* text accompanying note 564.

607. See *supra* Part VI.C.3.b.

608. See *supra* text accompanying note 581.

609. See *supra* text accompanying note 537.

610. See 31 U.S.C. §§ 6303-08 (1994).

611. See *id.* § 6303.

612. See *id.* § 6305.

613. See Jeffrey C. Walker, Note, *Enforcing Grants and Cooperative Agreements as Contracts Under the Tucker Act*, 26 PUB. CONT. L.J. 683, 687 (1997).

614. *Id.*

615. These potential issues of conflicts between government and the private sector are well known. See Michael S. Gilliland, *Joint Venturing University Research: Negotiating Cooperative Agreements*, 40 BUS. LAW. 971 (1985). For more background on the use of cooperative agreements, see generally Kurt M. Rylander, Scanwell Plus: *Challenging the Propriety of a Federal Agency's Decision to Use a*

NSF was caught off guard when ANS began selling access to the NSFNET, when NSI sought to require fees for domain name registrations, and when NSI claimed ownership of the zone files and Whois database. These problems occurred because the NSF did not adequately define the rights of the government and the contractor, during and after the contract, with regard to commercial use of the underlying property or service in the cooperative agreements.⁶¹⁶

3. *The Government's Problems with "Code"*

Remember that the term "Code" refers to the technological infrastructure of the Internet.⁶¹⁷ Code has the ability to affect competition as well as issues such as privacy and security. For example, the redesign of the Internet's backbone architecture was based upon changing the Internet's Code from supporting one backbone network to supporting multiple, competing backbone networks.

The government has had problems with its use of Code. The government's failure to understand the relationship between Code and public policies has led to problems with competition for backbone services and the DNS. The government failed to realize that Code, by itself, can not produce competition; instead, it is necessary to employ a combination of Code and policies to create competition. Finally, the government has failed to acknowledge that Code may be designed to protect societal concerns.

The government has been unsuccessful in only using Code to create competition. For example, the NSF was able to redesign the Internet to support multiple backbones. However, this new design favored a few large backbone providers and has led to the unfair conditions for smaller networks and limited the entry of new competitors.⁶¹⁸ The NSF ignored this bias by never requiring an interconnection policy to level the competitive playing field, despite calls for an interconnection policy from groups such as the Electronic Frontier Foundation during the redesign of the network.⁶¹⁹ This is an example of how the government mistakenly relied solely on Code to create competition.

The government acted very differently during the privatization of the DNS. No attempt was made to add competition to the DNS by changing the Code of the DNS. Moreover, there has been little movement towards adding any competition to the DNS. Instead, the Department of Commerce, ICANN, and

Federal Grant and Cooperative Agreement, 28 PUB. CONT. L.J. 69 (1998).

616. See *supra* text accompanying notes 219, 570.

617. See *supra* Part V.C.

618. See *supra* Part V.A.2.

619. See *supra* text accompanying note 276.

NSI have developed a set of policies and procedures for NSI to follow, treating NSI as a regulated monopoly.⁶²⁰

The U.S. government, ICANN, and NSI have worked together to introduce competition for the registration of domain names through the Shared Registration System (SRS).⁶²¹ The development of the SRS involved a combination of Code and policies. First, the U.S. government and NSI amended their cooperative agreement to require NSI to accept domain name registrations from competing firms. Next, Code was developed to allow multiple companies to register domain names by accessing the data maintained by NSI.⁶²² Finally, ICANN developed a “Registrar Accreditation Agreement.”⁶²³ This agreement defines the rules and procedures that registrars must follow in order to provide the registration of domain names. Although the registration of domain names is only part of the entire DNS, this is a step forward towards a competitive DNS.

These examples show that Code, by itself, cannot create competition in network industries. There is a need for policies that: (a) ensure that incumbent contractors do not take advantage of their position to slow the introduction of competition (b) set ground rules for all competitors to follow and (c) require all competitors to employ equivalent Code. The problems with competition in the backbone industry can be traced back to the government’s refusal to set an interconnection policy. Similarly, the problems with competition for the DNS are the result of NSI impeding the development of rules and Code to create a competitive DNS. Our proposals to add competition for the backbone services and the DNS are based upon employing both Code and prudent policies together to create meaningful competition. Our final point is necessary because of the malleability of Code: If competitors are allowed to employ Code that is not fully interoperable and interconnected, the issue of network effects will once again hamper competition.

Finally, the government failed to consider societal concerns with Code, such as network and computer security and online privacy, when privatizing the Internet.⁶²⁴ This occurred despite the fact that the NSF was transitioning a network originally designed for computer scientists to the general public. The NSF even ignored contemporary concerns and problems that could be

620. See *supra* Part VI.C.3.b.

621. See *supra* text accompanying notes 554-56.

622. For documents relating to the development of the test beds, see ICANN, *Registrar Accreditation: Testbed Information*, at <http://www.icann.org/registrars/testbed-info.htm> (last modified Dec. 6, 1999).

623. See ICANN, REGISTRAR ACCREDITATION AGREEMENT (adopted Nov. 4, 1999), at <http://www.icann.org/nsi/icann-raa-04nov99.htm> (last modified Nov. 9, 1999).

624. See *supra* Part V.C.

addressed by Code, such as security, in redesigning the Internet. The government could have engineered the new network for electronic commerce by addressing concerns about security and privacy.⁶²⁵ Thus, the government lost a one-time opportunity during the Internet's redesign to accommodate societal concerns through Code.⁶²⁶

B. The Consequences of the Problems with the Privatizations

The problems that occurred during both privatizations have consequences. This section describes the consequences of these problems on the backbone and the DNS industries. The consequences are different because the privatization of the backbone industry is complete, while the privatization of the DNS is ongoing. For example, the privatization of the DNS still suffers from the three categories of problems discussed above. In contrast, the problem in the backbone industry is the direct result of the government's sole reliance on Code to create competition. The first part of this section discusses the problems of competitiveness in the backbone industry. The second part discusses the lack of competition for the DNS and the reasons why competition has not yet been introduced.

1. Lack of Competition for Backbone Services

When the government privatized the backbone network, it only changed the underlying technological infrastructure, or Code. The government introduced the concept of Network Access Points (NAPs) where different commercial providers could interconnect. However, the government never put into place any performance requirements or interconnection requirements for the NAPs. Consequently, the large backbone providers abandoned the NAPs and engaged in private negotiated interconnections with other networks. The lack of an interconnection policy allowed a few large backbone providers to arbitrarily decide with whom they interconnect. These large backbone providers have gained this power, according to network effects theory, because their networks are larger and therefore more valuable.⁶²⁷

The lack of an interconnection policy has allowed the large backbones to interconnect with whomever they wish on their terms. This freedom has allowed the large backbones to limit new entrants by limiting interconnection, and force smaller networks into unfavorable interconnection agreements and

625. See *supra* text accompanying note 404.

626. See *supra* Part V.C.

627. See *supra* Part V.A.

performance constraints.⁶²⁸ Their advantages over smaller competitors and potential new entrants are evident by examining the following exemplary facts. First, a few large backbone providers control 80% of the backbone market.⁶²⁹ Second, large backbone providers can charge more for connectivity than their smaller rivals.⁶³⁰ Third, the large backbone providers work together to provide each other with free peering to the detriment of potential competitors.⁶³¹

The large backbone providers can arbitrarily decide who they peer with and the terms of peering. The lack of any checks upon the large backbone providers has allowed them to discriminate against new entrants, such as Level 3 Communications.⁶³² Furthermore, the large backbone providers make smaller networks agree to unfair terms for interconnection.⁶³³ And since interconnections at high-speed, private exchange points are controlled by the large backbone providers, smaller networks can not provide performance similar to the large backbone providers.⁶³⁴ In Part VII.C., we introduce a number of policies the government could and should have followed to prevent these problems.

The problems of competition in the backbone services will become even greater in the future with the introduction of new technologies and vertical integration in the backbone industry. New technologies, such as Quality of Service over backbone networks, can only be offered by large backbone providers. This leaves smaller providers at a competitive disadvantage.⁶³⁵ The movement towards vertical integration by the large backbone providers will reduce competition at the ISP level. Naturally, ISPs that are owned by large backbone providers will be able to provide more attractive rates as compared to other networks.⁶³⁶

Another inefficiency in the backbone industry is the lack of a settlement system for the Internet.⁶³⁷ A settlement system ensures that networks are compensated for the traffic that is carried over their network. For example, the settlement system for telephone companies ensures that all carriers are compensated for calls over their networks through “access charges” and

628. *Id.*

629. *See supra* text accompanying note 303.

630. *See supra* text accompanying note 342.

631. *See supra* text accompanying note 363.

632. *See supra* text accompanying notes 343-44.

633. *See supra* text accompanying notes 335-39.

634. *See supra* text accompanying notes 340-41.

635. *See supra* text accompanying notes 361-62.

636. *See supra* text accompanying notes 371-73.

637. For a good discussion of the problems of settlement systems for the Internet, see Farnon & Huddle, *supra* note 128.

“reciprocal compensation.”⁶³⁸ Without a settlement system, networks are hesitant to interconnect, because they fear carrying traffic for which they will receive no compensation.

On the Internet, there are problems with effectively measuring traffic. Current methods and technologies cannot accurately measure usage across networks.⁶³⁹ This results in a system where it is difficult for backbone providers to compensate each other for the traffic that flows through the Internet. Thus, the lack of a settlement system contributes to the inefficiency of transactions to interconnect networks.

2. *Lack of Competition in the DNS*

ICANN and the U.S. government have introduced competition in the registration of domain names. Today, consumers can choose to register domain names through many different firms. However, the choices for domain names are limited. A few popular TLDs such as .com are overcrowded, and the alternatives to these are country code TLDs that are not very memorable. Additionally, there is no competition for the registry function for the existing TLDs. This is why every registrant for a domain name still pays NSI \$6 per domain name. Thus, the DNS is aptly characterized as a regulated monopoly.⁶⁴⁰

There is hope that competition will occur in the DNS. This is because the privatization of the DNS is still ongoing. However, it will be necessary for the government and ICANN to recognize and correct their past behavior if we are to achieve genuine competition in the DNS. There are two principal reasons why competition through the addition of new TLDs has not occurred for the DNS. First, there is uncertainty about the extent of the privatization of the DNS and who will manage it. Currently, ICANN is managing the DNS, but the U.S. government still maintains final control. Second, there are entrenched interests that are actively fighting the introduction of new TLDs.

The U.S. government has not yet stated whether it will fully privatize the DNS. Moreover, it is not clear whether the government must pass legislation to privatize the DNS. Currently, the U.S. government has entered into a series of

638. James B. Speta, A Common Carrier Approach to Internet Interconnection (Sept. 24, 2000) (unpublished paper presented at the Telecommunications Policy Research Conference (TPRC) 2000 in Alexandria, Va.) (on file with author).

639. See Bernadette Jew et al., *New Issues for Internet Interconnection*, TELECOMMS. ONLINE, Feb. 2000, at <http://www.telecoms-mag.com/issues/200002/tci/issues.html>; Burkhard Stiller et al., *Charging and Accounting for Integrated Internet Services*, available at http://www.isoc.org/inet98/proceedings/3e/3e_2.htm (last visited May 1, 2000).

640. See *supra* text accompanying notes 554-56.

agreements with ICANN regarding the privatization of the DNS. The Department of Commerce and ICANN have agreed that ICANN is responsible for maintaining the DNS on behalf of the U.S. government.⁶⁴¹ Relatedly, there is no explicit statute outlining the rules for the management of the DNS. While the U.S. government and ICANN have introduced competition for the registration of domain names through the SRS, the DNS is still far from privatized. There are still issues concerning the introduction of new TLDs, whether control of the authoritative “A” root server will be privatized, and the introduction of competing domain name registries.

A report by the U.S. General Accounting Office notes that it is not clear whether the Department of Commerce has the authority to transfer control of the DNS to ICANN, a necessary step to privatize fully the DNS.⁶⁴² The key issue is whether control of the authoritative “A” root server may be considered government property. The authoritative “A” root server promulgates information on the domain names throughout the entire Internet.⁶⁴³ According to the U.S. Constitution, disposal of government property requires statutory authority.⁶⁴⁴ Thus, without legislation from Congress, the DNS may not be transferred to ICANN’s control, and therefore, it cannot be privatized. This dependence upon Congress creates uncertainty about the future management of the DNS.

ICANN’s continued disregard for fair procedures during the privatization has significantly contributed to the uncertainty regarding the extent of the privatization of the DNS and whether ICANN will control the DNS. ICANN has repeatedly ignored the Internet community and instead appears beholden to certain business interests.⁶⁴⁵ Recently, it appears that ICANN is even moving away from its original vision of allowing the Internet community to select half its board members.⁶⁴⁶ This move raises the concern that ICANN may only represent business interests and not consumer interests. If this preferential representation is the case, it is likely that there will be government intervention on behalf of consumer interests. Thus far, the only entity that has been able to force ICANN to change its policies is the U.S. government. For example, the

641. See *supra* Part VI.B.3. Froomkin has recently argued that the relationship between ICANN and the Department of Commerce violates basic norms of due process and public policy, see Froomkin, *supra* note 429, at 153.

642. U.S. GENERAL ACCOUNTING OFFICE, *supra* note 464, at 25.

643. See *supra* Part VI.A.

644. U.S. GENERAL ACCOUNTING OFFICE, *supra* note 464, at 26 (citing the Property Clause of the Constitution, U.S. CONST., art. IV, § 3, cl. 2).

645. See *supra* Part VI.C.1.

646. See *supra* text accompanying notes 518-19.

Department of Commerce forced ICANN to open its board meetings.⁶⁴⁷ Besides these problems, competition has been slow to emerge for the DNS.⁶⁴⁸ At the earliest, competition for the DNS will not occur until Fall of 2001, which is six years after Postel's call for new TLDs (or twenty-four years in Internet time).⁶⁴⁹ In sum, ICANN's own policies are creating problems that are contributing to the lack of competition for the DNS.

Another barrier to introducing competition are the two parties who profit from NSI's monopoly on a few TLDs. The first party is NSI, which has actively resisted the introduction of competition for the DNS.⁶⁵⁰ The second less apparent interest is that of existing trademark holders who are genuinely concerned about having to fight for their trademarks in new TLDs.⁶⁵¹ For example, if a .biz TLD is introduced, Apple computer will seek the apple.biz domain name. Companies such as Apple are quite happy with the current system and are worried that the introduction of new TLDs will be costly in terms of not only new domain registrations, but also additional costs of fighting a seemingly endless string of trademark lawsuits.

C. How to Prevent These Problems from Reoccurring and Remediating Their Effects on Competition

The first section pointed out a number of common problems that occurred during the privatizations of the backbone network and the DNS. The next section discussed the effects of these problems on competition in the backbone industry and the DNS. The root causes of these problems were found in three principal areas: procedures, managing competition, and managing Code. This section develops a number of proposals to address problems in each of these areas. These proposals will be valuable to future privatizations, such as the federal government's Next Generation Internet (NGI) initiative, which seeks to develop the foundation for computer networks of the twenty-first century.⁶⁵²

647. See *supra* Part VI.C.1.

648. There are already several detailed proposals put forth within ICANN's working groups to increase competition. See Rebecca Nesson, *Comparison of Proposed gTLD Policies*, at <http://cyber.law.harvard.edu/icann/workshops/la/papers/gtld.html> (last visited May 8, 2001).

649. Recent delays by ICANN has pushed back, at least by several months, the introduction of new domain names from July 2001. See Reuters, *ICANN: New Domains are Behind Schedule* (Mar. 2, 2001), available at www.zdnet.com/filters/printerfriendly/0,6061,2692426-2,00.html; Tim Clark, *A Stitch in Internet Time*, CNET NEWS.COM, Sept. 18, 1996, available at http://www.news.com/Perspectives/tc/tc9_18_96.html. Due to the fast pace of technological change, an Internet year is equivalent to four years.

650. See *supra* Part VI.C.3.

651. See Brian Livingston, *Trademark Owners May Get Millions of New Names*, CNET NEWS.COM, May 19, 2000, at <http://news.cnet.com/news/0-1278-210-3287283-1.html>.

652. See *supra* note 223 and accompanying text.

Additionally, these proposals will address the ongoing problems of competition in the backbone industry and the DNS. Finally, these proposals discuss the role of government in developing and policing new technologies. The government's role is important not only for ensuring competitive markets, but also for ensuring that new technologies are not in conflict with existing societal values.

1. The Role of Procedures in Privatizations

The privatizations of the backbone network and the DNS suffered from procedural problems. To address these problems, there are two main issues that must be confronted. The first is the need for the government to be accountable and, thus, operate on the basis of openness and transparency. Secondly, the government must treat all contractors and potential competitors equally. Providing preferential treatment to a contractor or a class of competitors results in less competition and erosion of public confidence in the privatization process.

a. The Need for Transparency, Public Input, and Accountability

Government decisions concerning any privatizations should operate on the principles of public input and transparency. These principles are required by law. For example, the public may use the Freedom of Information Act or the Sunshine Act to examine government documents.⁶⁵³ The government must follow the requirements of the Administrative Procedure Act, which requires federal agencies to allow for public comment in either formal or informal rulemaking.⁶⁵⁴ All of these procedural rules act together to ensure openness and transparency of government decisions and actions. As the privatizations of the Internet illustrate, when the government acts without public input and transparency, public confidence in the government's decisions is not cultivated.

These procedural lessons are directly applicable to the ongoing privatization of the DNS. ICANN is attempting to take control of the DNS from the U.S. government. Thus far, ICANN has engendered considerable public distrust because of its lack of willingness to accept public input.⁶⁵⁵ ICANN needs to put into place policies that ensure transparency and public

653. See *supra* notes 202-03 and accompanying text.

654. See *supra* note 204 and accompanying text.

655. See *supra* notes 500-02 and accompanying text. For ICANN's problems with transparency, public input, and accountability, see *supra* Parts VI.C.1-C.2.

input.⁶⁵⁶ This requires procedural policies similar to that of the Sunshine Act, Freedom of Information Act, and Administrative Procedure Act, which ensure transparency in the U.S. government. Such a policy allows the public to examine the basis for important decisions by ICANN. Furthermore, such a policy requires ICANN to accept public comments before making important decisions. Such steps would increase the Internet community's confidence in the workings of ICANN.

The most important step ICANN can take to increase confidence in its governance is to be openly and fully accountable to the Internet community. The original vision of ICANN was of a body that represented a balance between the needs of the Internet community and those who profit from the Internet community.⁶⁵⁷ Currently, business interests control ICANN's board.⁶⁵⁸ Without at-large board members representing the Internet community, there will undoubtedly be government regulation of ICANN to protect the interests of consumers. ICANN should become accountable to the Internet community by requiring direct election of all board members. This would eliminate ICANN's structural bias towards business interests. Existing business interests could still have a substantial impact upon ICANN by recruiting voters and promoting candidates who promote their interests.

b. The Need to Treat All Competitors Fairly

The government should not provide preferential treatment to a contractor or a class of competitors. The government's preferential treatment of ANS led to considerable public backlash and precipitated congressional hearings into the NSF's management of the NSFNET.⁶⁵⁹ Similarly, during the privatization of the backbone network, the NSF favored the large backbone providers over smaller competitors and new entrants by never providing an interconnection policy.⁶⁶⁰

The requirement of fair treatment is relevant to the ongoing privatization of the DNS. It is important that ICANN ensure that all competitors—including NSI—are treated equally. Not only will an unfair playing field lessen

656. David Post has a similar suggestion. ICANN should adopt principles of openness, documentation, and allowance for time to build consensus. See David Post, *ICANN and the Consensus of the Internet Community* (Aug. 20, 1999), at http://www.icannwatch.org/archive/icann_and_the_consensus_of_the_community.htm.

657. Scribe's Notes on the Conference, *ICANN and the Public Interest: Pressing Issues* (Oct. 31, 1999) (statements of ICANN board member Greg Crew), at <http://cyber.law.harvard.edu/icann/la/archive/scribe-103199.html>.

658. See *supra* text accompanying note 517.

659. See *supra* Part III.D.

660. See *supra* Part V.A.2.

competition, it will also reduce the Internet community's confidence in the process. NSI's competitors for the DNS are small potatoes, not by any measure—market capitalization, revenue, or customers—even close to NSI.⁶⁶¹ This imbalance creates significant barriers to entry and adversely impedes the creation of new competition. Thus far, ICANN has failed to treat all competitors equally. For example, ICANN's requirement of a nonrefundable application fee of \$50,000 for proposals from groups seeking to introduce TLDs limits applications from noncommercial groups such as universities and poor international companies who could operate new TLDs such as a .school, .nonprofit, or .arts. Requiring \$50,000 for merely the right to submit an application effectively places a barrier to entry for these groups to operate new TLDs.⁶⁶²

2. *How to Manage Competition in a Privatization*

The privatizations of the Internet have highlighted problems with the government's management of competition during the privatizations. This section focuses on improving the government's management of competition. The first issue is determining under what conditions the government should privatize. The second improvement the government can make is to anticipate commercial use of a technology or service in its cooperative agreements. Finally, it is necessary for the government to understand the role of network effects and its counterbalance, effective interconnection, when privatizing a network.

a. *When the Government Should Privatize*

First, in any privatization, a crucial prerequisite is the existence of competition in the private sector. The benefits of competition generally include lower prices, better service, and greater innovation.⁶⁶³ The government should privatize services when there are multiple potential providers. For example, during both privatizations, there were numerous competitors who could have provided similar services, which were unfortunately contracted out to just one entity.⁶⁶⁴ In both privatizations, the government failed to take advantage of this preexisting competition. Consequently, the slow pace of privatization resulted

661. The lack of any powerful competitors to NSI is curious. Companies such as AOL, Apple, IBM, and MCI WorldCom all have the technical and financial resources to operate new TLDs. However, the largest competitor to date is Earthlink in their support of New.net.

662. Cisneros, *supra* note 482.

663. See *supra* Part IV.A.

664. See *supra* text accompanying notes 211-15, 564-65.

in higher costs and worse service for consumers.

This lesson regarding the benefits of competition must not be ignored during the privatization of the DNS. There is a need for new TLDs to provide competition for NSI. Despite pressure from the Internet community for new TLDs, such as .banc or .web, they have not yet been added. As a result, NSI effectively maintains a lucrative monopoly on a few TLDs. The government can and should ensure that there is competition in the DNS industry before fully privatizing the DNS. If there is no competition in this key area, consumers and the Internet community will undoubtedly suffer.

Without competition, privatizations are not advantageous to the government or society. The government should not lamely transfer control of government property or services to the private sector without studying whether there is adequate competition in the relevant market. A lack of competition could result in one entity having a monopoly injurious to consumers. Instead, the government should promote new competitors while ensuring the incumbent contractor does not take advantage of its privileged position.

b. The Use of Cooperative Agreements

Second, the government needs to evaluate its use of cooperative agreements. The NSF used cooperative agreements between itself and its contractors for the management of the NSFNET and the DNS. A number of problems emerged because of the lack of foresight in these cooperative agreements. The government must expect that commercial partners will attempt to make commercial use of any government-funded research. Therefore, the government should clearly delineate the rights of the government as well as the rights to future commercial use of the property or service in its cooperative agreements. Such steps can prevent similar problems from reoccurring in future privatizations.

c. Issue of Network Effects and Interconnection Policies

The government must also consider the role of network effects in an industry. As discussed above, network effects emerge in communication networks.⁶⁶⁵ As a result, larger networks are more valuable than smaller networks because they are connected to more people.

Network effects can explain the lack of competition for backbone services.⁶⁶⁶ Virtually all Internet traffic flows through a few large backbone

665. For a discussion of network effects, see *supra* text accompanying note 351.

666. See *supra* Part V.A.3.

providers. Their networks are significantly more valuable than smaller networks, because they can access more of the Internet. Smaller networks therefore, are at the mercy of the large backbone providers for obtaining access to the Internet. The large backbone providers have also exploited their size advantage to limit competition by not peering or interconnecting with potential upstarts.⁶⁶⁷

To ensure competition in industries with network effects, it is necessary to put into place interconnection policies that allow competitors access to each other's networks. However, this assumes that the technology or Code exists to allow these networks to interconnect. This critical issue of Code supporting interconnection and promoting competition is discussed in the following section. This section discusses the role of interconnection policies, by first discussing the historic role of interconnection in the telecommunications industry. The following two sections discuss how interconnection policies can be used to create competition in the backbone industry and the DNS.

i. Interconnection Policies in the Telecommunications Industry

The government has historically used interconnection policies to minimize network effects and to promote competition.⁶⁶⁸ For example, the Communications Act of 1934 required common carriers to establish physical connections with other carriers.⁶⁶⁹ James Speta noted that while Congress did not refer directly to the concept of network effects, this was the theory behind the interconnection obligations in the 1934 Act.⁶⁷⁰ Similarly, the Telecommunications Act of 1996 requires telecommunications carriers to interconnect.⁶⁷¹ Once again, this is because Congress implicitly understood that a telecommunication network's value increased as more people became connected to the network.⁶⁷² Therefore, it is in the public interest for networks to be able to effectively interconnect. While these laws apply to traditional voice telecommunication carriers, the FCC has held that Internet backbone providers are not telecommunications carriers as defined in the 1934 or 1996

667. See *supra* Part V.A.2.

668. For a good introduction to the FCC's policies towards interconnection, see INGO VOGELSANG & BRIDGER M. MITCHELL, TELECOMMUNICATIONS COMPETITION: THE LAST TEN MILES 111-78 (1997). For a more international perspective, see generally PAUL J.J. WELFENS ET AL., TOWARDS COMPETITION IN NETWORK INDUSTRIES: TELECOMMUNICATIONS, ENERGY AND TRANSPORTATION IN EUROPE AND RUSSIA (1999).

669. See James B. Speta, *Handicapping the Race for the Last Mile?: A Critique of Open Access Rules for Broadband Platforms*, 17 YALE J. ON REG. 39, 62 (2000).

670. See *id.*

671. See *id.*

672. See *id.*

act.⁶⁷³ Thus, there is no current interconnection policy required by law for backbone services. Nonetheless, the underlying need to employ effective interconnection policies to counter network effects in the Internet's backbone remains.

ii. Interconnection Policies for Backbone Services

Hal Varian has proposed an interconnection policy for backbone providers. Backbone providers should have to interconnect on a "fair, reasonable and nondiscriminatory" basis for backbone services.⁶⁷⁴ Varian chose the "fair, reasonable and nondiscriminatory" standard from the language used in licensing intellectual property.⁶⁷⁵ Varian envisions the interconnection policy as requiring a backbone provider to treat all competitors, regardless of size or age, equally. Such a standard would allow new competitors to enter the Internet backbone industry as well as ensuring smaller networks access to the handful of large backbone providers.

Varian's preferred method to enforce interconnection agreements is an industry-wide arbitration board. An industry-wide arbitration board is preferred over government regulation because it could adapt to changes in circumstances and technology. The arbitration board would address any complaints concerning interconnection policies. Varian believes that once an arbitration board is selected, firms would begin to interconnect on a fair basis, and the arbitration board would only hear a small number of complaints.⁶⁷⁶

Varian's proposal is a first step towards establishing an interconnection policy. The effect of such an interconnection policy would be to require that the large backbone providers treat all customers in the same manner. Such a policy would be effective in reducing the barriers to entry for both smaller competitors and new competitors. However, such a policy by itself is not enough. As described in Part VII.C.3.a, we propose a new Code-based "technological interconnection policy" to ensure that a few providers do not use new technologies to reduce competition.

673. See *id.* at 67. See also *supra* text accompanying note 376.

674. Hal R. Varian, *How to Strengthen the Internet's Backbone*, WALL ST. J., Jun. 8, 1998, at A22. Speta argues Internet backbone providers should be treated as common carriers and they should have to interconnect on a nondiscriminatory basis. See Speta, *supra* note 638.

675. See Gallant, *supra* note 360.

676. See *id.*

iii. Interconnection Policies for the DNS

The concept of network effects is applicable to the DNS as well.⁶⁷⁷ For example, the Department of Commerce recognized that NSI could potentially create an alternative DNS. This is because of network effects. NSI controls the vast majority of domain names. Based upon these names, it could create an alternative DNS, which would dwarf any of its competitors. Because of network effects, NSI's larger network would be more valuable and would, therefore, be adopted by the Internet community as a new DNS. This potential threat led the Department of Commerce to require NSI to agree to refrain from creating an alternative DNS.⁶⁷⁸

ICANN should use interconnection agreements to counterbalance "network effects." For example, without interconnection agreements, a few registries could secede from ICANN's control of the DNS. If the seceding registries were large enough, they could take control of the DNS. Such a secession would undermine the DNS's stability. Therefore, ICANN should contractually require all registries to agree to interconnect with all other ICANN approved registries.

3. Ensuring "Code" Supports Competition and Societal Interests

The government must understand the role of "Code". Code is malleable and can often be shaped by various parties for their own gain. For example, the government can use Code and policies to ensure competition during privatizations. After a privatization is accomplished, the government must remain vigilant to ensure that Code is not used in a manner contrary to our social values, such as new technologies that limit competition or invade our privacy. The government must be particularly vigilant regarding competition in the backbone because a few large backbone providers have a significant influence on the future technological development of the Internet.⁶⁷⁹

The privatizations highlighted two areas of concern with Code. First, Code can affect competition in network industries. For example, the introduction of new technologies can reduce competition. As a counter to this, the government should support a Code-based "technological interconnection policy." Such a policy is guided by the following principle—support technologies that reduce network effects and increase competition. Second, Code can affect a myriad of other social interests and values such as security, privacy, and free speech. The

677. See Lemley & McGowan, *supra* note 351, at 553.

678. See *supra* note 475 and accompanying text.

679. See *supra* Part V.B.

government must recognize the ability of Code to both support as well as weaken our existing societal values.

a. "Code" and Competition

The design of Code has the ability to favor particular groups in the marketplace. For example, when redesigning the Internet, the government chose Code, which favored a few large backbone providers over smaller backbone providers.⁶⁸⁰ Code also affected competition with the lack of IP address portability. When IP address portability was removed, smaller networks were forced to depend on one of the large backbone providers for their IP addresses. Consequently, this raised costs to smaller networks for switching backbone providers because they would have to renumber their network with new numbers from their new backbone provider.⁶⁸¹ This is an example of how Code can favor large backbone providers over smaller networks or potential new entrants. The first part of this section focuses on the role of government in ensuring that firms do not use Code to reduce competition. The second part argues that the government needs to support the development of Code that promotes competition.

First, as the example of the backbone industry has shown, Code all by itself can reduce competition. Thus, any discussion of Code and competition must keep in mind the place of traditional interconnection policies to ensure common ground rules for all competitors. However, interconnection policies have trouble addressing new technologies. For example, as discussed above, Quality of Service technology could create competitive differences between large and small networks.⁶⁸² Currently, smaller networks depend upon a few large backbone providers for some of their Internet transport. This limits their use of Quality of Service technology and places them at a significant competitive disadvantage.

As the example of Quality of Service illustrates, new Code can amplify network effects to further reduce competition for backbone services. Therefore, the government must maintain vigilance over the backbone industry to ensure that technologies are not used simply to limit competition. This is especially necessary when you consider that the large backbone companies principally control the Internet's Code and are not subject to any regulation or regulatory oversight.⁶⁸³

680. *See supra* Part IV.F.

681. *See supra* notes 384-85 and accompanying text.

682. *See supra* note 383 and accompanying text.

683. *See supra* Part V.B.

The government must limit the use of a technology that is anticompetitive with minimal consumer benefits. However, to ensure competition and innovation in the future, the large backbone providers should be able to introduce technologies that either do not significantly affect competition, or treat all interconnecting networks equally. Such a Code-based “technological interconnection policy” encourages the development of standardized technologies that work across multiple networks. The combination of this technological interconnection policy and traditional interconnection policies is necessary to ensure competition in network industries as new technologies emerge. This conception of a Code-based technological interconnection policy is premised on the use of Code that is interoperable and interconnected. The inherent malleability of Code often allows competitors to implement Code which is not fully compatible and thereby take advantage of network effects.⁶⁸⁴

An example of such a Code-based technological interconnection policy was the development of the Shared Registry System (SRS) for the registration of domain names.⁶⁸⁵ Initially, domain names could only be registered by NSI. The development of the SRS allowed multiple firms to register domain names. This is analogous to reducing network effects with interconnection. Interconnection through the software-based SRS enabled multiple firms to provide domain registration services. Thus, the software-based SRS allowed the U.S. government and ICANN to introduce competition and reduce network effects. The result was lower prices and improved service for the registration of domain names.

Another example of a Code-based technological interconnection policy was the use of Network Access Points (NAPs).⁶⁸⁶ The purpose of the NAPs was to serve as interconnection points between the large backbone providers. Additionally, smaller providers would ideally have access to the entire Internet, by merely connecting to a NAP. Thus, the NAPs, as a form of Code, appeared to reduce network effects and increase competition. However, as we have shown, this is not what happened. Instead, the lack of any rules or policies for interconnecting at the NAPs, or interconnections in general, allowed the large backbone providers to use network effects to their advantage.

The examples of the SRS and NAPs highlight that both Code and policies are necessary for competition. Without clear rules and policies, some parties

684. VARIAN & SHAPIRO, *supra* note 351. A central feature of the Microsoft antitrust case was the use of network effects through control of the Windows operating system to create barriers to entry of new and efficient competitors. See Steven C. Salop & R. Craig Romaine, *Preserving Monopoly: Economic Analysis, Legal Standards, and Microsoft*, 7 GEO. MASON L. REV. 617 (1999).

685. See *supra* text accompanying notes 621-23.

686. See *supra* text accompanying Part V.A.

will seek to employ network effects to reduce competition. In the example of the NAPs, the large backbone providers were able to reduce competition. However, in the SRS, the U.S. government and ICANN have ensured that NSI abides by some ground rules to allow other competitors to compete for domain name registrations. These two examples illustrate that to achieve salutary effects with Code requires the use of policies to ensure that no parties are favored. The policies do not necessarily call for government regulation. However, a policy is meaningless unless all relevant parties follow the policy, which requires some form of vigilance and enforcement.

There is still a significant issue of how the government should react if a backbone network uses technologies that provide consumer benefits while also limit competition. Suppose MCI WorldCom began offering Quality of Service for its customers. The service consisted of an expensive but fast “first-class” package and an extremely cheap but slower “second-class” package. Customers such as content providers could even select certain traffic such as advertising or movies to be delivered as first-class to all customers, including the second-class customers. However, these benefits would only be limited to those customers who were on MCI WorldCom’s networks. The combination of this new technology and MCI WorldCom’s large market share could lead many new customers to switch to MCI WorldCom’s network, because their existing network providers could not provide such a service. This example illustrates how technologies can provide both consumer benefits while at the same time reduce competition. Without addressing this aspect any further, we note that the dilemma between “competition” and “consumer welfare” is central to antitrust jurisprudence.⁶⁸⁷

ICANN should recognize the role of network effects in reducing competition. ICANN must ensure that network effects do not allow a few parties to seize control of the DNS. ICANN should set up procedures and technologies to ensure that it maintains control of the DNS. For example, ICANN could maintain control of the “zone files” by maintaining its own archive. This would allow ICANN to “cut off” or segregate a registry without orphaning all of its customers. To perform this, ICANN must possess the latest operational zone files.

Finally, the government needs to support the development of technologies that increase competition. For example, one of the problems in the backbone industry is the lack of settlement and accounting mechanisms. Current

687. See ROBERT H. BORK, *THE ANTITRUST PARADOX* (1978); RICHARD A. POSNER, *ECONOMIC ANALYSIS OF LAW* (1972). For the role of antitrust in network industries, see William J. Kolasky, *Network Effects: A Contrarian View*, 7 *GEO. MASON L. REV.* 577 (1999); A. Douglas Melamed, *Network Industries and Antitrust*, 23 *HARV. J.L. & PUB. POL’Y* 147 (1999).

methods of accounting do not accurately measure usage of the network.⁶⁸⁸ Consequently, this provides a disincentive for backbones to interconnect, because backbone providers cannot ensure that they are properly compensated for the traffic that flows across their network. Moreover, new accounting mechanisms must be developed for new technologies such as Quality of Service. Accounting for traffic that employs Quality of Service is more difficult, because network traffic is divided into a number different classes, such as a high-speed lane. The use of improved accounting mechanisms could allow backbone services to be further commodified and lead to more efficient transactions in the selling and reselling of backbone services. Thus, government support of technologies such as accounting mechanisms could lead to an efficient and competitive market for backbone services.⁶⁸⁹

b. "Code" and Societal Interests

The government must consider the relationship between Code and societal interests. As Lessig and others have noted, Code as the technological infrastructure has the ability to regulate our online conduct. Code affects issues such as privacy, security, and free speech in online environments. For example, Code played a crucial role in three recent high profile incidents concerning online privacy. The controversy over the Pentium III chip concerned an embedded serial number, which could theoretically be used by online marketers and governments to follow computer users around the Internet and construct massive profiles about their Internet habits.⁶⁹⁰ Similar concerns exist over cookies, which allow companies such as DoubleClick to build "online profiles" of Internet users.⁶⁹¹ And recently, it was revealed that Real Network's audio software was using Global Unique Identifiers to gather information on what music users played and recorded.⁶⁹²

During future Internet privatizations, the government should consider encouraging or mandating the development of Code for vindicating certain societal interests. Before and during a privatization, the government controls

688. See *supra* text accompanying note 639.

689. There are a few small projects devoted to developing and measuring Internet performance. For example, the Cooperative Association for Internet Data Analysis (CAIDA) consists of a handful of researchers at San Diego Supercomputer Center on the campus of the University of California, San Diego. See CAIDA web site, at <http://www.caida.org>.

690. See Polly Sprenger, *Intel on Privacy: 'Whoops!'*, WIRED NEWS, Jan. 25, 1999, at <http://www.wired.com/news/politics/0,1283,17513,00.html>.

691. See *EPIC Files Complaint with FTC Against DoubleClick*, TECH LAW JOURNAL ¶ 13 (Feb. 11, 2000), at <http://www.techlawjournal.com/privacy/20000210.htm>.

692. See Sara Robinson, *CD Software Said to Gather Data on Users*, N.Y. TIMES, Nov. 1, 1999, at C1.

the relevant technology. Therefore, the government can ensure societal interests are taken into consideration before a technology is transferred to exclusively private sector control. For example, the NSF could have required that the large backbone providers implement security mechanisms for electronic commerce, before privatizing the Internet's backbone.

Although an industry is privatized, there are still a number of methods by which the government can support the development of Code in keeping with societal interests.⁶⁹³ The government may regulate an industry to ensure that it utilizes Code compatible with societal interests. For example, the government has required telecommunication companies to design their networks to allow monitoring by law enforcement.⁶⁹⁴ Similarly, the FCC supports the development and implementation of technologies that enable disabled people to access the Internet.⁶⁹⁵ Finally, the government can sponsor research and development for Code to support societal interests. For example, the NSF sponsors research for "Managing and Ensuring the Security and Privacy of Information."⁶⁹⁶

Besides encouraging and mandating favorable Code, the government must maintain its vigilance for Code that adversely affects the public interest. For example, the Federal Trade Commission (FTC) has shut down sites that were conducting scams through Code. The sites offered visitors free images if they downloaded an image viewer program.⁶⁹⁷ The image viewer program then surreptitiously disconnected people from their present Internet connection and had their computer dial a phone number in Moldova. This resulted in a large long-distance telephone bill. The FTC had the authority to shut down the offending sites because this Code was conducting a scam upon consumers. An example of vigilance by a government official appeared after Lauren Weinstein of the Privacy Forum publicized privacy concerns with the business model employed by Predictive Networks.⁶⁹⁸ Predictive Networks was

693. See Reidenberg, *supra* note 11, at 588 (discussing how policymakers can influence the code's design).

694. The 1994 Communications Assistance for Law Enforcement Act (CALEA) requires the telecommunications industry to design its systems in compliance with FBI technical requirements that facilitate electronic surveillance. See 47 U.S.C. §1002 (1994 & Supp. II 1996).

695. See William E. Kennard, *The Americans with Disabilities Act: Lessons for the Virtual World*, Remarks at the 10th Anniversary of the Americans with Disabilities Act, Torch Relay (Jun. 19, 2000), available at <http://www.fcc.gov/Speeches/Kennard/2000/spwek015.html>.

696. National Science Foundation, *Fact Sheet: Information Technology Research* (Feb. 2000), at <http://www.nsf.gov/od/lpa/news/media/2000/fsitr2001.htm>.

697. See Jean Field, *All Nude! All Free! . . . Yeah, Right*, WIRED NEWS, Feb. 19, 1997, at <http://www.wired.com/news/politics/0,1283,2147,00.html>.

698. See Lauren Weinstein, *Massive Tracking of Web Users Planned—Via ISPs!*, 9 PRIVACY FORUM DIGEST 13 (2000), available at <http://www.vortex.com/privacy/priv.09.13>.

attempting to recruit ISPs, whether free or not, and pay them for the web usage data of their subscribers. This scheme could allow Predictive Networks to collect a vast amount of data on millions of web surfers. Understandably, Predictive Networks' strategy met with a great deal of suspicion from the Internet community.⁶⁹⁹ Even David Farber, the Chief Technologist at the FCC, commented that such action would result in "adult supervision" or government regulation of the Internet.⁷⁰⁰ As a result, Predictive Networks technology has spread very slowly and it is attempting to mollify privacy concerns. These examples highlight the need for government to maintain vigilance over Code that may be contrary to society's values.

D. The Limitations of Decentralized Rulemaking During the Privatizations

In an influential piece, David Johnson and David Post argue that traditional legal rules are unsatisfactory for the Internet.⁷⁰¹ Instead, they argue the Internet should be treated as its own jurisdiction to which distinct laws apply.⁷⁰² Moreover, Johnson and Post argue that we should allow the Internet to develop its own rules and legal institutions.⁷⁰³ Governments should allow these rules to regulate activity on the Internet as long as the rules do not violate the interest of others who would not visit the space.⁷⁰⁴

In a later article, Post develops two models for the regulation of the Internet. The first is a "top-down," Hamiltonian model with centralized control. The alternative is a "bottom-up," Jeffersonian model with decentralized lawmaking. This Jeffersonian model represents an "electronic federalism" where individual network access providers become the units of governance. Decisions and rules are not made by government, but by the system operators of these networks. This type of rulemaking is considered decentralized lawmaking.⁷⁰⁵ Johnson and Post argue that decentralized lawmaking is a better solution to the collective action problem than "top-down" regulation. They believe that the "bottom-up" approach will result in an Internet with contending and diverse rule sets, where citizens can choose the rules and regulations they wish to follow.⁷⁰⁶

699. See Jim Hu, *Start-up's Tracking Software Sets Off Privacy Alarm*, CNET NEWS.COM, May 1, 2000, at <http://news.cnet.com/news/0-1005-200-1795712.html>.

700. Posting of David Farber, farber@cis.upenn.edu, to www.interesting-people.org (Apr. 21, 2000), at <http://www.interesting-people.org/200004/0076.html>.

701. See Johnson and Post, *supra* note 12, at 1375.

702. See *id.* at 1379.

703. See *id.* at 1387.

704. See *id.* at 1393.

705. See David G. Post, *Governing Cyberspace*, 43 WAYNE L. REV. 155 (1996).

706. See David R. Johnson & David G. Post, *The New "Civic Virtue" of the Internet*, in THE

During the privatizations of the Internet, there have been failures in the bottom-up process of governance in two distinct cases. First, the backbone providers have not been able to develop an interconnection policy. The lack of an interconnection policy has favored the large backbone providers over smaller network providers and new entrants. The second major failure is the problems with governance of the DNS and the lack of competition for the DNS. The Internet community was not able to resolve the problem through a bottom-up process, and, as a result, the U.S. Government has begun to intervene.⁷⁰⁷ The failure of the bottom-up process during the privatizations is due to at least the following four factors.

First, at several points it was necessary for the government to engage in top-down rulemaking. For example, during the development of the NSFNET, the NSF set the technical criteria for the NSFNET by requiring certain Code such as TCP/IP.⁷⁰⁸ This was top-down rulemaking.⁷⁰⁹ However, in most cases the NSF allowed its contractors and users to develop their own rules as long as they followed the general technical guidelines and usage policies such as the AUP. For example, the NSF allowed multiple versions of software for email and the World Wide Web over the NSFNET.⁷¹⁰ Similarly, during the redesign of the network to add NAPs, it was the NSF that had the burden of introducing competition. While the NSF allowed and addressed public comments on the redesign, it imposed the redesign on the Internet community.⁷¹¹ Finally, the development of the Shared Registration System (SRS) for the registration of domain names is an example of top-down rulemaking. ICANN established ground rules for the SRS and then required firms to develop the necessary Code to create competition.⁷¹² All of these examples show that top-down rulemaking is sometimes necessary.

Second, top-down rulemaking is not limited to government action. As the privatizations demonstrate, top-down rulemaking can originate from the private sector. Top-down rulemaking is usually conceived as a territorial

EMERGING INTERNET 23 (Institute for Information Studies ed., 1998). *But see* LESSIG, *supra* note 11, at 201-02; Neil Weinstock Netanel, *Cyberspace Self-Governance: A Skeptical View from Liberal Democratic Theory*, 88 CAL. L. REV. 395 (2000).

707. *See* Froomkin, *supra* note 429, at 167.

708. *See supra* text accompanying note 60.

709. *See supra* text accompanying notes 288-89.

710. For a history of the some of the software developed for the World Wide Web and used on the NSFNET, see Tim Berners-Lee, *WEAVING THE WEB: THE ORIGINAL DESIGN AND ULTIMATE DESTINY OF THE WORLD WIDE WEB BY ITS INVENTOR* (1999). For a list of different commercial email server software, see *Commercial MIME Products*, at <http://www.irvine.com/~mime/payware.html> (last visited May 9, 2001).

711. *See supra* Part IV.E.

712. *See supra* text accompanying notes 621-23.

sovereign that imposes order on those below it. In contrast, bottom-up rulemaking allows people to decide upon the rule sets they wish to follow. On the Internet, the bottom-up approach allows people to select rules by “means of ‘voting with one’s modem’ rather than means of traditional balloting or the election of representatives.”⁷¹³ However, this assumes there are varied rule sets and that people can move between these different rule sets. The current design of the Internet allows backbone providers to impose restrictions on our behavior, usually through Code. For example, it is impossible to use the Internet without using TCP/IP. The use of TCP/IP has specific consequences in terms of privacy, security, and innovation.⁷¹⁴ Another example of top-down private sector rulemaking is in the DNS. ICANN is a private entity that is being handed control of the DNS.⁷¹⁵

Third, factors such as network effects and the structure of Code may impair the development of diverse bottom-up rulemaking. For example, consider the role of network effects in the development of rules for backbone providers. The existence of network effects leads to larger networks becoming more valuable. To counter this trend, interconnection policies are often used.⁷¹⁶ Interconnection policies promote competition because multiple network providers can connect people together. However, in the backbone industry, the large backbone providers who profit from the current uncompetitive environment have stymied a movement towards an interconnection policy.⁷¹⁷ Because the large backbone networks are more valuable due to network effects, they have a disproportionate influence on decentralized rulemaking on the Internet. Similarly, the DNS by its design is a centralized system that the Internet depends upon. While alternative DNSes exist, they must maintain compatibility with the dominant DNS. As a result, it is not possible to develop diverse rule sets for the DNS without fracturing the Internet. Thus, network effects may limit diverse rulemaking on the Internet.

Finally, the development of bottom-up, decentralized rules may be contrary to our established values. The bottom-up process may violate our expectations of fairness and competition in the marketplace. For example, the large backbone providers’ rulemaking has been aimed at trying to reduce competition. Similarly, ICANN has no imperative to act in a fair and open manner, unlike government agencies that are subject to the APA and the

713. See Johnson & Post, *supra* note 706, at 47.

714. See *supra* text accompanying notes 406, 408.

715. For an extensive discussion on the how ICANN is engaged in rulemaking, see Froomkin, *supra* note 429, at 93.

716. See *supra* Part VII.C.2.

717. See *supra* Part V.A.4.

Sunshine Act. Not surprisingly, as the privatizations have shown, the abandonment of principles of fairness and competition has injured the public.

The privatizations of the Internet have shown the importance of the government's role. In fact, a number of the key decisions were determined by the government, because they were unresolved by the bottom-up process. The analyses of the privatizations highlight some of the reasons why the bottom-up process has failed. While we agree generally with Johnson and Post's position concerning the advantages of decentralized law making, we also note its limitations.⁷¹⁸ At the same time, we should not forget the many problems created by the U.S. government's top-down actions during these privatizations. The history of the privatizations should suspend any belief that the best mode of regulation for the Internet is either "top-down" or "bottom-up". Perhaps the best we can do in a particular situation is to choose the lesser evil.

VIII. CONCLUSION

This work serves as a descriptive, analytical, and normative study of the privatizations of the Internet backbone network and the DNS. The first goal of this Article was to provide a descriptive account of the privatization process. Scholars have neglected the privatization of the Internet, despite the obvious significance of the U.S. government turning over control of a powerful new communication medium to the private sector. The second goal of the Article was to use the privatizations as a case study to understand better new theoretical perspectives concerning the regulation of the Internet. The third goal was to advocate a series of proposals to address existing problems and to prevent these problems from reoccurring in future privatizations. After discussing the implications of the privatization on the regulation of the Internet, this conclusion summarizes our proposals for increasing competition in the DNS and the backbone.

The results of this study provide insights into two important areas of theoretical discussion within the Internet regulation literature. First, the privatizations of the Internet provide evidence of how the government regulated the Internet. The privatizations also illustrated that while most rulemaking on the Internet is conducted in a decentralized "bottom-up" manner, this approach has its limitations. Some of these limitations include the private sector acting as "top-down" rulemakers, the limited mobility of most individuals to switch between different rule sets, the role of network effects, and how "bottom-up" rulemaking could be contrary to our society's values.

718. Johnson and Post's notion of bottom-up governance is generally shared among commentators. See Netanel, *supra* note 706, at 408.

Similarly, the history of the privatizations demonstrates the problems the government had with its use of “top-down” rulemaking. The overarching lesson is that both “top-down” and “bottom-up” modes of regulations have their limitations.

In analyzing the privatizations of the Internet, our analysis is steeped in the theoretical construct of “Code”. The concept of Code is new in legal literature and is just beginning to be explored. Throughout this work, we explained how Code could regulate behavior, for example, by affecting competition. The privatizations have shown that Code, all by itself, cannot create competition. The first step to creating competition is to ensure that Code is fully interoperable and interconnected. The next step to creating competition is the requirement of policies that all parties share common ground rules for all competitors. A failure to employ policies will result in problems with creating competition, resulting in harm to the public. The privatizations have also highlighted two important roles for the government with respect to Code. First, government must be vigilant in ensuring that Code contrary to our societal interests is not implemented. For example, consider the strategic use of technologies such as IP address portability and Quality of Service to limit competition in the backbone.⁷¹⁹ Second, the government should consider encouraging or mandating the development of Code for vindicating certain societal interests. The government could support the development and deployment of technologies that ensure competition, or technologies that address societal concerns in which the private sector has little interest.⁷²⁰

When studying the privatization processes for the Internet backbone and the DNS, to our surprise, we found consistently similar problems in both privatizations. These findings suggest that future analyses of the privatizations of the DNS and other Internet privatizations should take into account the three types of problem we discovered. The first set of problems related to the lack of procedural fairness in the processes adopted by the government. The second problem area implicated the government’s management of competition during the privatizations. Finally, there were problems related to the management of the technological infrastructure (Code) of the Internet. As a result of these problems, there now exists a lack of competition in both the backbone industry and the DNS. Based upon the three categories of problems we found in the privatizations, we have developed a number of proposals to prevent these problems from reoccurring in future privatizations. These proposals are applicable not only to future privatizations, but also to remedy the current

719. See *supra* text accompanying notes 383-85.

720. See *supra* Part V.C.

problems in the backbone industry and the DNS.

To increase competition in the backbone industry we have two main proposals. First, there must be an interconnection policy that ensures all networks nondiscriminatory access to the Internet. This recommendation is based in part upon the successful history of interconnection policy in telecommunications to offset network effects and enhance connectivity for the public's benefit. Second, the government should support the development and use of standardized technologies, which contribute to interconnection, through a new Code-based technological interconnection policy. Such a policy is informed by a guiding principle that new technologies should not amplify network effects but instead facilitate competition. Thus, we wish to place a discussion of network effects squarely within the discourse on Internet privatization.

To increase competition for the ongoing privatization of the DNS, we have three main proposals. First and most importantly, the U.S. government must ensure that ICANN is accountable to the Internet community as a whole rather than to business interests alone. Second, the U.S. government must ensure that there is more transparency and public input into ICANN's decision making. Finally, it must be remembered that a privatization is a means to achieve desirable public purposes, such as the creation of competition, and not an end all by itself. Privatization does not, in and of itself, guarantee competition in the relevant market. Without multiple competing firms, the proper use of interconnection agreements to counter network effects, and fair treatment by ICANN, there will continue to be problems with the privatization of the DNS.

The issue of future privatizations is tangible. The government currently funds and controls a great deal of research that it will eventually transfer to the private sector. For example, the U.S. government currently spends hundreds of millions of dollars on the Next Generation Internet (NGI). However, there are still critical questions about the current use and the future of the network that remain unanswered.⁷²¹ In this study we have attempted to go back to the core of the privatization process to understand why we are where we are. It is our fervent hope that the lessons learned from the analysis of the privatization of the Internet's backbone and the DNS will save us from being condemned to repeat the mistakes of the past.⁷²²

721. See *supra* text accompanying note 223.

722. Paraphrasing George Santayana's famous words, "[t]hose who cannot remember the past are condemned to repeat it." See GEORGE SANTAYANA, 1 REASON IN COMMON SENSE: THE LIFE OF REASON 284 (1905).

Glossary

ANS	Advanced Network Services
ARPA	Advanced Research Projects Agency
ARPANET	Advanced Research Projects Agency Network
AUP	Acceptable Use Policy
BITNET	Because It's Time Network
CERT	Computer Emergency Response Team
CIX	Commercial Internet Exchange
CSNET	Computer Science Research Network
DDOS	Distributed Denial of Service
DNS	Domain Name System
EFF	Electronic Frontier Foundation
FARNET	Federation of American Research Networks
FCC	Federal Communications Commission
FIX	Federal Internet Exchange
FOIA	Freedom of Information Act
FRICC	Federal Research Internet Coordinating Committee
GAO	General Accounting Office
GSI	Government Systems, Inc.
IAHC	International Ad Hoc Committee
IANA	Internet Assigned Numbers Authority
ICANN	Internet Corporation for Assigned Names and Numbers
IFWP	International Forum on the White Paper
IP	Internet Protocol
ISOC	Internet Society
ISP	Internet Service Provider
ITU	International Telecommunications Union
MERIT	Michigan Education Research Information Triad
NAP	Network Access Point
NGI	Next Generation Internet
NREN	National Research and Education Network
NSF	National Science Foundation
NSFNET	National Science Foundation Network
NSI	Network Solutions, Inc.
NTIA	National Telecommunications and Information Administration
OIG	Office of the Inspector General
OSTP	Office of Science and Technology
SAIC	Science Applications International Corporation
PSI	Performance Systems International

SRI	SRI International
SRS	Shared Registration System
TLD	Top Level Domain Name
vBNS	Very High Speed Backbone Service