4.x

The Internet Policy and Governance Ecosystem

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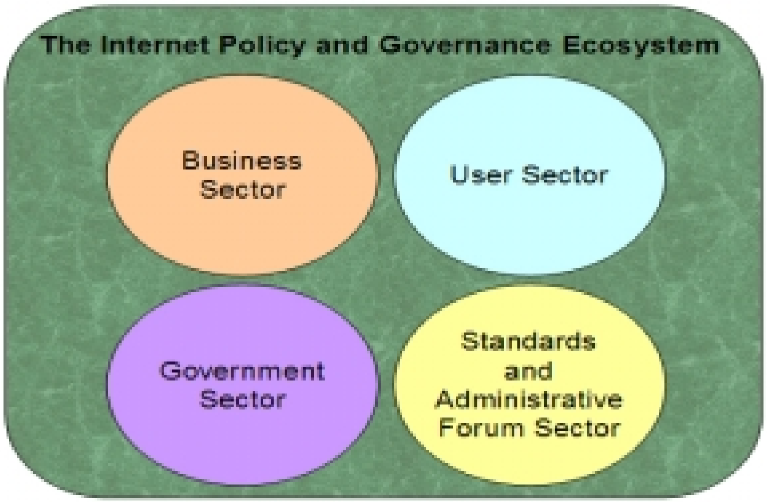
Other chapters in this book deal with many different facets of Internet computing. Policy and governance topics thread through nearly all of them. In this chapter, these topics are dealt with comprehensively as an ecosystem of controls on behavior that are assumed by or imposed upon myriad parties in four sectors that comprise or enable the Internet today: 1) a business sector consisting of vendors of Internet products, including large service providers; 2) a user sector consisting of major corporations or institutions, plus individuals or small offices; 3) a government sector; and 4) a standards and administrative forum sector. Wrapped around this ecosystem are important basics such as history, definitions, and emerging trends, as well as extensive references to additional information sources.


The Internet Policy and Governance Ecosystem
Business Sector
User Sector
Government Sector
Standards and Administrative Forum Sector

Such an ecosystem approach is necessary because of one simple fact – what is known as the Internet is not a network at all in the traditional sense. Rather the Internet is a means for achieving autonomous resource sharing based on information systems - accomplished by largely independent cooperative actions among the parties constituting the four ecosystem sectors. A better term is perhaps "Internetworking" rather than Internet, and the constituent agglomerations exist because parties make available computer and transmission resources. Where we are dealing with topics like policy and governance, a common understanding of these essential basic elements is critical.

In large measure, this chapter will only focus on the generic Internet ecosystem. It will not treat two other prominent Internet related domains that include a) the enormous number of application and syntax level arenas such as the World Wide Web or Internet Telephony; and 2) underlying transport media such as wireline, wireless, satellite, or cable.

First it is important to examine the historical context within which the Internet came into existence and evolved at a rapid pace over the last three decades of the 20th century that has produced what we have today.

4.1 Major Historical Policy and Governance Developments

Historically, three somewhat separate sets of developments substantially shaped the Internet policy and governance environment. The first development revolves around the constituents that formed the Internet ecosystem over four distinct periods of time. The second development involves the centers of administrative authority within those periods. The third development represents a larger global "war" between two contending factions over the development, deployment, and control of information networking technology that subsequently just went away.

Meta Internet Ecosystem Transitions

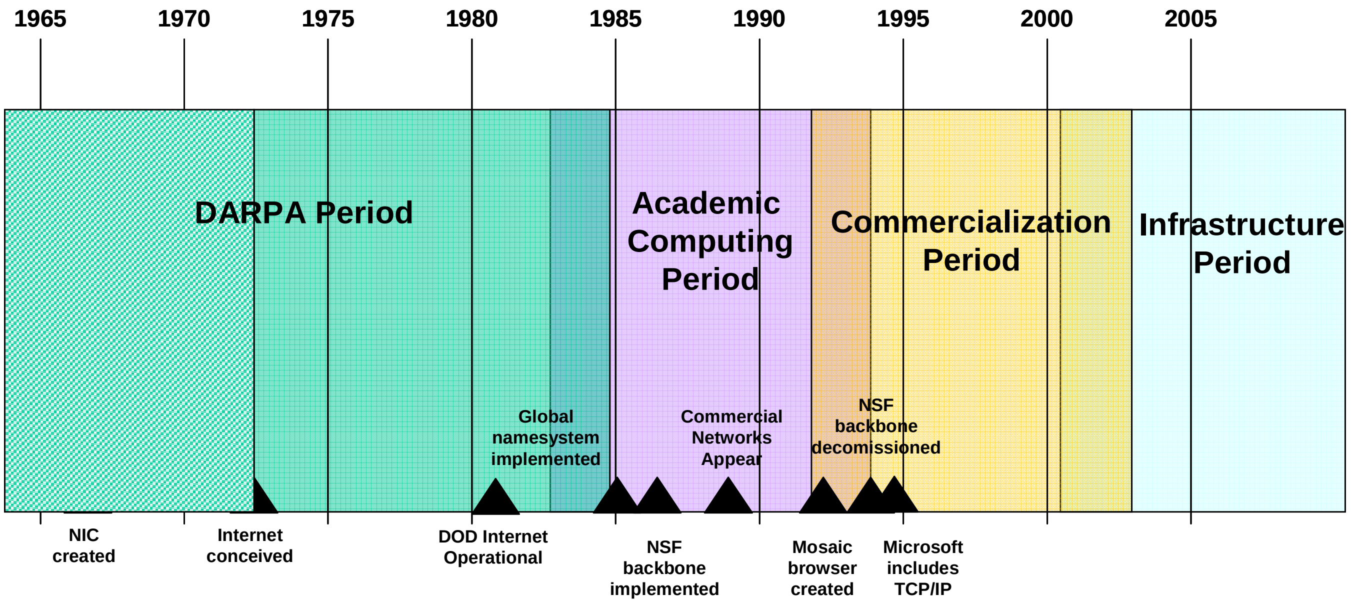


Figure __. MetaHistory of the Internet Ecosystem

From the point the Internet was first conceptualized as a host-to-host protocol network by Bob Kahn and his team of research developers in the early 1970s, four relatively distinct historical periods have ensued. The first is an initial DOD Advance Research Projects Agency (DARPA) period that presages the Internet, then nurtures, adopts, and scales it through the mid-80s. Although the DARPA program office played the dominant role in this period, as the Internet grew and evolved and become more important to DOD, other research centers and offices began to play important roles.

By 1982, as the DoD adopted TCP/IP as a protocol of choice in tactical, logistic, and messaging systems, including a mobile packet radio network and the ARPANET, the Defense Communications Agency (now the Defense Information Systems Agency) begins to play a significant role. The ARPANET was at that time a packet switched technology based network that had been developed in the 1960s also by DARPA and became an operational backbone for DOD operations and included multiple satellite facilities.

By the mid-80s, an increasingly large number of parties external to DOD begin to assume important ecosystem roles - in small commercial business user communities and a large academic computing and U.S. Federal networking and university Computer Science Network communities oriented around the National Science Foundation (NSF), Department of Energy, NASA, and equivalent institutions in other countries.

A particularly catalytic development was NSF's obtaining about 1.2 billion dollars from the U.S. Congress over the late 80s and early 90s to fund the construction of a national TCP/IP backbone, international connectivity, and an enormous amount of applications research among centers across the U.S. The expenditure of this amount of money as national policy decision at such a critical point in the development of networking technology was in retrospect quite an extraordinary move. Particularly sage was the allocation of funds to largely generic applications development – in contrast with decisions made in other countries to allocate similar sums of money explicitly tied to specified communications protocols or standards.

The Academic Period begins to diminish in the early 1990s, as the Internet infrastructure becomes increasingly privatized and a large commercial and consumer marketplace begins to dominate the Internet's management and evolution. This last transition, however, was subject to its own considerable controversy as many academic community actors fought the transfer of "their" technologies and applications to a larger commercial universe encompassing the general public. Ultimately, however, it was large commercial players – especially Microsoft – whose commitment to Internet technology resulted in the scaling of the Internet to encompass the hundreds of millions of users today.

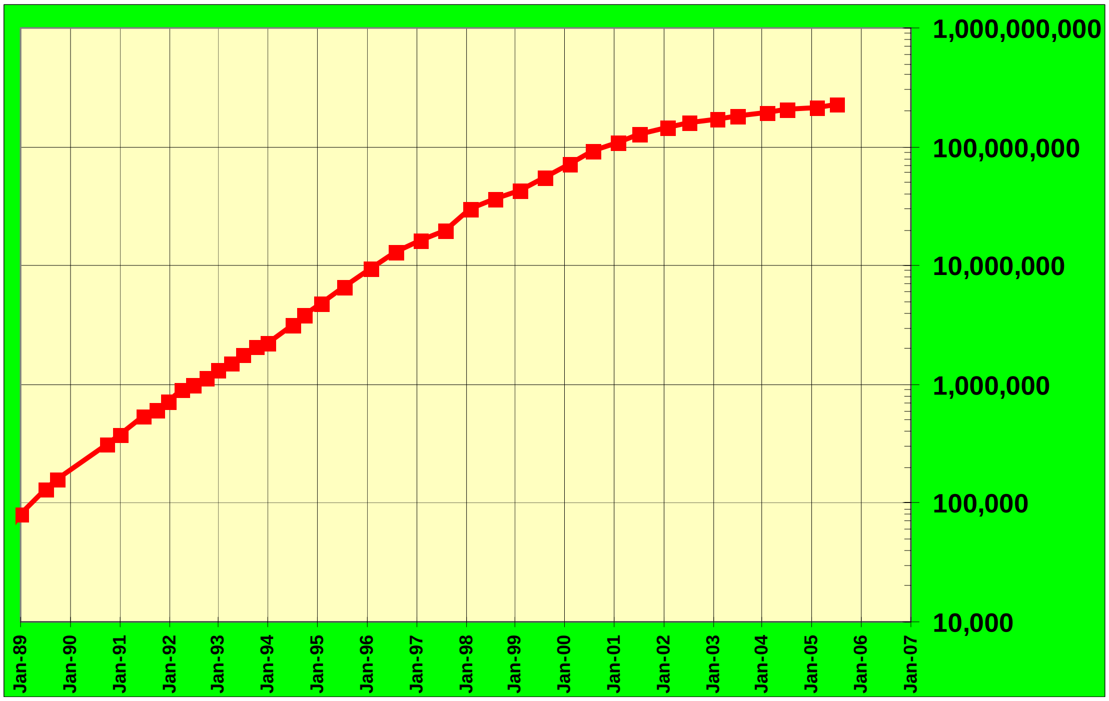


Fig. __ Publicly reachable Internet hosts (Mark Lottor data)

The Commercial Period itself evolved in new directions as it grew. After scaling as a social, economic and even political phenomenon during the 1990s, followed by a several year "bursting bubble" descendent phase, the Internet at the time of this publication seems to finding a niche among synergistic technologies and products – even as it has been thoroughly assimilated by commercial business and an increasingly large portion of modern society.

Indeed, it is this very assimilation that is now giving rise to an Infrastructure Phase. This new phase is marked by an increased focus on security – in terms of technologies, operation, and public policy and law. Not only beneficial developments have been manifested through the Internet. Increasingly, the Internet has been a home to large scale fraud, identity theft, destructive software agents, and myriad other criminal activity. A hallmark characteristic of this new and long-term, steady-state phase of the Internet is security. Behavior will continue to be autonomous, but it will not be anonymous.

None of these transition points are very distinct. For example, commercialization of the Internet as a technology and corporate infrastructure began in the mid-1980s with the creation of such early pioneer companies like Sun Microsystems and Cisco Systems who marketed their products to corporate IT managers at Interop trade shows. Similarly, the emergence of a consumer mass market could be mapped by the appearance of Internet-related articles in the major newspapers – that ultimately lead to the commitment of Microsoft Corporation bundling TCP/IP in the next major release of its operating system. At any point in time, hundreds of events were in play - collectively pushed the envelope of change from day to day.

Like human genetic code, today’s Internet policy and governance ecosystem reflects these major historical periods – which continue to shape an ongoing evolution. Not only the norms, but in many cases the roles if not the powers of institutional parties are traceable to earlier historical periods.

Centers of Authority

One of the frequently overlooked historical innovations of the Internet's development and evolution is the use of competency centers as sources of authority – many of which persist today. Ecosystems based on autonomously shared resources require an unusual degree of acceptance by the participants – in contrast to dictated power centers of highly regulated traditional infrastructures. In the Internet ecosystem, centers of authority solved this "buy-in" requirement rather nicely by relying on multiple self-initiative among principal actors in the community.

Centers of Authority – the NIC

In the Internet's earliest years when the infrastructure and activities were largely under the control of government research program offices or academic institutions, various competence centers of authority began to emerge. One of the first was the Network Information Center (NIC). The initial DARPA period is traceable back to the assumption by the agency a packet network research role in the early 1960s. The creation of a Network Information Center (NIC) is generally credited to computer networking pioneer Doug Engelbart at Menlo Park, California, and was run by the Stanford Research Institute (SRI). If the DARPA Program Office was the ultimate source of power during this early period, the NIC on a day-to-day basis played a key role in the Internet's development and coordination over the first two periods of its development.

During the late 1980s, the NIC began to be broken up into many pieces worldwide based on geographical or governmental jurisdiction, as well as increasingly privatized. Yet, even as these developments occurred at regional and national levels, the idea of the NIC competency center was replicated hundred of times.

The NSF and Commercial Periods also witnessed significant NIC internationalization, beginning with coordination roles under the UK Internet pioneer Peter Kirstein at University College London. This was rapidly followed by NICs appearing in multiple countries, and the emergence of world regional NICs - the *Reseaux Internet Protocol Europeen* Network Coordination Center (RIPE-NCC) in Amsterdam in the late 1980s, and the Asia-Pacific NIC (AP-NIC) in the early 1990s.

The original primary NIC at Menlo Park was transferred to the Defense Information Systems Agency and became known as the DISA-NIC. In the early 1990s, most of these functions were then transferred to the NSF and renamed InterNIC. The NIC contractors also shifted from SRI to Government Systems, Inc (GSI) to Network Solutions, Inc. (NSI) (now a part of VeriSign, Inc.).

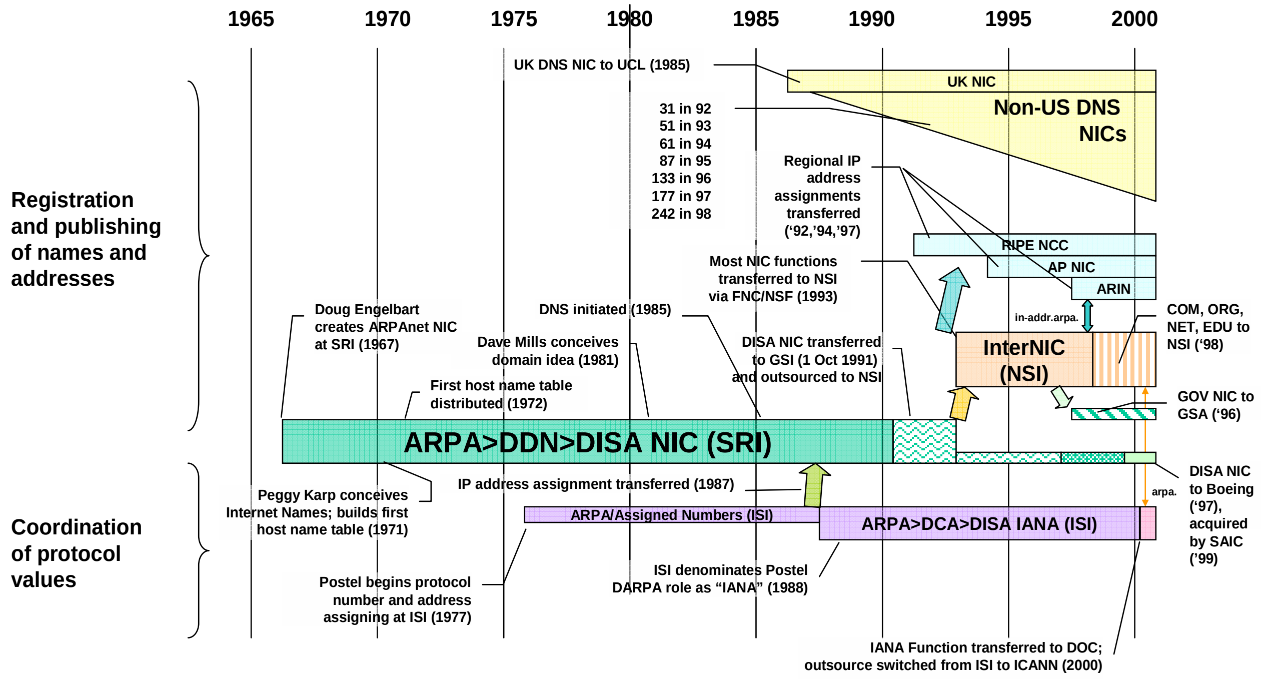

1965
1970
1975
1980
1985
1990
1995
2000
Registration and publishing of names and addresses
Coordination of protocol values
UK DNS NIC to UCL (1985)
UK NIC
Non-US DNS NICs
31 in 92
51 in 93
61 in 94
87 in 95
133 in 96
177 in 97
242 in 98
Regional IP address assignments transferred ('92,'94,'97)
RIPE NCC
AP NIC
ARIN
Most NIC functions transferred to NSI via FNC/NSF (1993)
in-addr.arpa.
COM, ORG, NET, EDU to NSI ('98)
InterNIC (NSI)
Doug Engelbart creates ARPAnet NIC at SRI (1967)
DNS initiated (1985)
Dave Mills conceives domain idea (1981)
DISA NIC transferred to GSI (1 Oct 1991) and outsourced to NSI
First host name table distributed (1972)
GOV NIC to GSA ('96)
ARPA>DDN>DISA NIC (SRI)
Peggy Karp conceives Internet Names; builds first host name table (1971)
IP address assignment transferred (1987)
arpa.
DISA NIC to Boeing ('97), acquired by SAIC ('99)
ARPA/Assigned Numbers (ISI)
ARPA>DCA>DISA IANA (ISI)
Postel begins protocol number and address assigning at ISI (1977)
ISI denominates Postel DARPA role as "IANA" (1988)
IANA Function transferred to DOC; outsource switched from ISI to ICANN (2000)

Fig __ Evolution of Internet NICs

Today, the NIC as a center of authority is completely distributed among hundreds of cooperating institutions worldwide. See Sec. 4.x.6.

Centers of Authority – the NOC

A second early DARPA management innovation that ensued at about the same time as the ARAPA NIC, was the creation of a Network Operations Center (NOC) operated by Bolt, Beranek, and Newman, Inc. (BBN) near Cambridge, Massachusetts. This responsibility during the NSF Period was largely transferred to Merit Network, Inc for the domestic US Internet infrastructure and Sprint Corp for the international infrastructure. The underlying infrastructure itself was provided through a MCI-IBM joint venture known as Advanced Network & Services (ANS) which focussed on domestic US networks, through multiple regional US networks. Internationally, Sprint Corp provided equivalent capabilities.

The NOC functions eventually transitioned in the mid-1990s to individual Internet Service Provider (ISPs), coordinated through a combination of bilateral arrangements and multilateral forums that included the Commercial Internet Exchange (CIX) (now known as the U.S. Internet Service Provider Association), and three global regional groups (North American Operators Group or NANOG, the *Reseax IP European* or RIPE group, and the AP Networking Group or APNG). Internationally, this includes the Coordinating Committee for Inter-Continental Research Networking (CCIRN).

Centers of Authority – the Research and Development Framework

The third management innovation involved standards making and applications development processes. During the early 70's, Keith Uncapher started a DOD information systems thinktank in Marina del Rey, California - the Information Sciences Institute (ISI) under the University of Southern California. As initial Internet focussed Internet standards activity began to emerge during the 1970s, ISI – chiefly through the efforts of one of its graduate students, Jon Postel who operated an Internet Assigned Numbers Authority (IANA) function for DOD - began to play an important standards coordination role that was shared with the IETF Secretariat in the mid-1980s as the Internet Engineering Task Force began to emerge as an initial standards development body. The IETF Secretariat was run by the Corporation for National Research Initiatives (CNRI) after it was started in the mid-1980s by Bob Kahn. The secretariat remains at CNRI today.

During the DARPA and NSF periods, these standards and applications processes blossomed with significant funding to nearly every major university research center. Much of the funding was coordinated through a combination of a Federal advisory committee - the Federal Networking Council - and a university computer science coordinating organization - and Outside the U.S. significant funding also occurred at research centers such as UCL in the UK, SURF in the Netherlands, KTH in Sweden, UNI-C in Denmark, INRIA in France, CERN in Europe, and Keio University and University of Tokyo in Japan - all of which emerged as significant centers for standards and applications development activities.

These non-traditional activities stood in stark contrast with traditional standards and development activities occurring at the time through traditional formal forums under international organizations like the International Telecommunication Union (ITU) and the Organization for International Standardization (ISO). These forums including participating agencies, companies and academic institutions had developed their own suite of standards and products known as Open Systems Interconnection (OSI). For most of the 1980s, OSI standards and product were officially sanctioned, and in many cases mandated by law for use.

The fact that the first two phases of the Internet's development occurred under the aegis of defense and scientific research agencies is especially significant with respect to legal and regulatory aspects of the policy and governance ecosystem. The arrangement allowed development to escape the traditional regulatory treatment and requirements imposed by telecommunication law upon networks and services made available to the public. Additionally, the sponsoring agencies assumed the civil liability and policing responsibilities. These roles began to diminish significantly as the Internet commercial phase began in the mid-1990s. Vestiges of that transition are still underway.

International Politics of Control

The development of the Internet occurred over the years against a backdrop of several major developments that for lack of a better term are cast as international politics – although in many cases these developments had national counterparts. These principally include attempted control over the Internet's 1) ability to exist, 2) standards, and 3) administration of identifiers. Internationally, these controls were principally manifested by the International Telecommunication Union (ITU) – which is a United Nations specialized agency of government telecommunication ministries that also serves as an umbrella for legacy telecommunication providers.

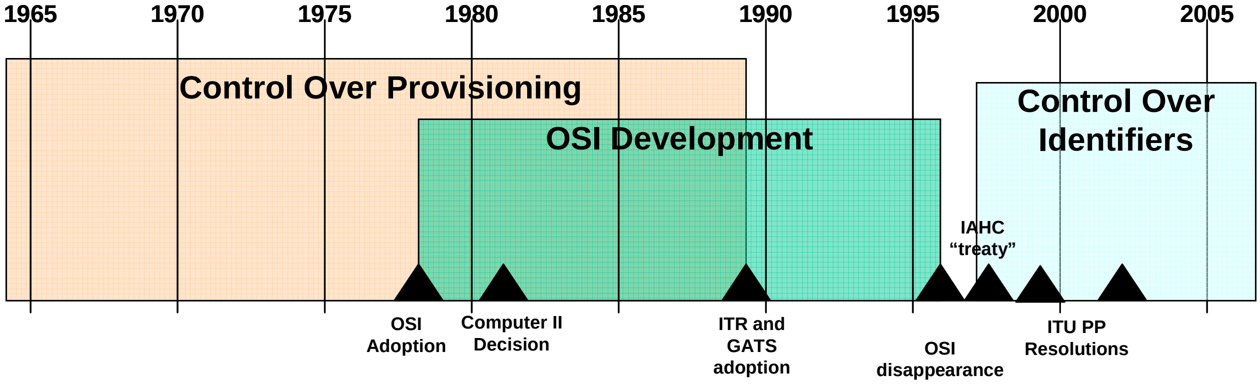


Figure __. Historical Periods of International Control Attempts

Under the international telecommunication regime of treaties effected by the ITU, all telecommunication and information network services and facilities were supposed to exist only under strict rules and standards established by ITU bodies and enforced by national governments worldwide. Although provision was made for large agencies and companies acquiring dedicated private circuit capacity for the purposes of building their own networks, neither the capacity nor the resulting services were not to be made externally available. It was simply an international cartel for the purposes of controlling the marketplace for all public telecommunication services.

The notion of an Internet was inimical to this long-standing regime. What ensued was a succession of tactics that first sought to ban the existence of Internets, followed by a coordinated effort to erect economic impediments through costly leased line tariffs, followed by official dismissiveness of the existence of a massively growing Internet infrastructure and marketplace, followed by attempted control over key administrative functions like identifier administration.

The international telecommunications cartel began to crumble in the early 1980s with a series of actions taken by the Federal Communications Commission in the U.S. beginning with the Computer II decision that established a policy of complete regulatory forbearance toward Internet-like networks. This action in turn induced similar actions like the Open Network Policy (ONP) of the Commission of the European Union, followed by initiatives within the General Agreement on Tariffs and Trade (GATT, now the World Trade Organization) and ultimately in the ITU itself at a 1988 conference that adopted a treaty provision explicitly allowing for an Internet to exist under international law.

Slowly over the 1990s as the Internet public marketplace and infrastructure began to scale to the point where it could no longer be ignored, most legacy telecommunication providers began to find ways to cooperative with the emerging array of Internet Service Providers. First the provisioning barriers fell, then the economic impediments of line and access costs began to moderate. Even today, however, in many locales worldwide, the artificial high metered costs of a local access line connection represent a continuing impediment.

A significant component of the global attempt to impede Internet developments began in the late 1970's in the form of a rigorous standards regime that existed on paper in parallel with the Internet's development. This Open Systems Interconnection (OSI) regime took the form of treaty provisions, national law and regulation, services and provisioning controls, and funding strictures. It dominated the formal telecommunications and information networking environment and institutions over nearly a 20 year period, consuming billions of dollars, millions of meeting hours, and whole forests of paper devoted to standards development and regulations. As the Internet and its TCP/IP protocol suite continued to grow in the early 1990s, the frictions and rhetoric grew to the point where the situation was referred to as the "TCP/IP vs. OSI wars." Ultimately OSI completely disappeared circa 1996 as if it had never existed. It did represent, however, an example of the limits of government and tradition industry to dictate market product specifications in the face of evolutions in technology coupled with the innovations and large-scale public demand.

The next chapter in this history of the international politics of control took the form in 1996 of abortive attempts by the ITU and its constituents to assume power over the Internet's identifier administration provided by the NICs. This initial foray was an abortive one where the ITU General Secretariat attempted in 1996-97 to craft an international agreement that ceded NIC authority to the ITU through a rump International Ad-Hoc Committee (IAHC).

After intervention by the U.S. Dept of State which squelched the initiative, the matter was raised formally in an ITU treaty making conference in 1998 with a major of the ITU's constituents crafting an ITU Resolution that called for continuing discussion of the matter. A subsequent conference in 2002 re-adopted the resolution with minor modifications, and the dialogue continues. During these forays, the U.S. government conducted a policy making proceeding in 1997-98 timeframe that led to a switch of IANA coordinating functions from the Institute for Information Sciences to another non-profit organization known as the Internet Corporation for Internet Names and Numbers (ICANN). The NICs were essentially unaffected worldwide except for a few of the largest domain name registration activity which was voluntarily segmented by the provider, Network Solutions, to allow sales opportunities for other providers.

Given the reality that Internet users and providers are unlikely to accept an ITU dictated regime – coupled with the impracticability of enforcement and the continuing opposition of the U.S. on fundamental policy grounds - the ITU-based international politics of control seems likely to continue indefinitely.

A majority of its national administration members through the ITU do have the power to mandate a treaty-based result that asserts control over Internet names and numbers. At the time of publication of this book, the ITU World Summit on the Information Society (WSIS) is emerging as a venue for advancing such a result. If such a forced result actually occurs, the Internet governance environment could resemble the "de jure" versus "de facto" dual networking environment that existed ten years ago. As long everyone cooperated in such a duality to avoid interference (i.e., name and address collisions) – as is done with radio regimes – some manner of pragmatic harmonization could emerge.

4.2 Definitions

In any policy and governance ecosystem or regime, definitions play a key threshold role. This is particularly critical with respect to the Internet because the construct is purely virtual. There is no physical facilities basis for the Internet. It is constituted solely by protocols for sharing virtual information resources.

The threshold challenge is to define the Internet for policy and governance purposes. The challenge is magnified by the reality of the Internet as an abstraction for a chaotic ensemble of millions of networks encompassing hundreds of millions of host computers supporting billions of processes and service capabilities - all of which are autonomously shared in ways that are constantly changing.

Protocols

Generally, the Internet is defined solely be the use of the Internet Protocol, i.e., RFC 791, to exchange datagrams within a core architecture. RFC 791 specifies the Standard Internet Protocol, which "is designed for use in interconnected systems of packet-switched computer communication networks...and provides for transmitting blocks of data called datagrams from sources to destinations, where sources and destinations are hosts identified by fixed length addresses." Although other Internet protocols exist, the almost universal practice over the past two decades is to confine the term "Internet" to the concatenation of networks using the RFC 791 specification.

Network Boundaries and Variables

At network boundaries or within networks under common management, however, the definition becomes more difficult to apply. The use of proxy servers and firewall gateways allow well-defined constraints on the use of the Internet Protocol to reach connected host computers. The use of further packet encapsulation is cable of creating myriad virtual Internets within the Internet. Terms like "intranet" or "extranet" have been invented to market these creations.

Entirely different network protocols can be used on one side of a gateway; or where the gateways are dedicated to specific applications, encompass entirely distinct, independent networks. One of the most extensive involves voice telephony and the existing Public Switched Telephone Network (PSTN). The Internet has long encompassed a larger "matrix" of multiple commercial, academic, and personal user networks such as America On-Line, Bitnet, CSnet, UUCP networks, and Fidonets, as well as gateways to the OSI world's X.400 messaging system, and assorted proprietary messaging networks such as Microsoft Mail, MCI Mail, Sprint Mail. The key requirement is the existence of a connecting gateway to the core Internet concatenation.

Legal Constructs

One of the first definitions developed and widely adopted within legal constructs was that of the Federal Networking Council (FNC) written in 1995 for use within the U.S. government.

> "Internet" refers to the global information system that --
> (i) is logically linked together by a globally unique address space based on the Internet Protocol (IP) or its subsequent extensions/follow-ons;
> (ii) is able to support communications using the Transmission Control Protocol/Internet Protocol (TCP/IP) suite or its subsequent extensions/follow-ons, and/or other IP-compatible protocols; and
> (iii) provides, uses or makes accessible, either publicly or privately, high level services layered on the communications and related infrastructure described herein.

As of 2002, the Federal Communications Commission in key proceedings dealing with the exercise of regulatory authority over the provisioning of Internet access services, this FNC definition was recited as authoritative as an Internet definition.

Relatively recently, a relatively simple definition was prepared by the T1 Committee of the telephony-oriented Alliance for Telecommunication and Information Standards (ATIS) as American National Standard T1.523-2001

> Internet [the]: 1. A worldwide interconnection of individual networks a) with an agreement on how to talk to each other, and b) operated by government, industry, academia, and private parties.

The most widely used definition in U.S. domestic legislation and regulations follow the lead of Title 47, Sec 230 of the U.S. Code:

> 2. The international computer network of both federal and nonfederal

interoperable packet switched data networks.

The quandary for regulatory authorities is that the Internet inherently consists of resource sharing among large numbers of *private* resources to create a single common aggregation. "Private resources" in this context refers to those resources manifested by privately owned computers or networks, and are not subject to national or international obligations to provide to the public as telecommunication facilities or services at network or application layers.

The private vs. public distinction has over the past 150 years formed a fundamental distinction in governing electronic networks. The Internet has come into existence and evolved over the past 30 years as a "private user network" either by virtue of government agency sponsorship or subsequent corporate implementations. This single common aggregation constituting the Internet occurred not by design or regulatory mandate, but rather through the choice of the many participating parties to share those resources for perceived common benefit.

The architectures of this resource sharing are also highly variable through the countless application and network level gateways that implement locally administered rules for traversing the gateways. This does not imply anything, however, about definitive laws applying to Internet usage and behavior. The Internet - whatever its definitional construct - stands distinct and transparent with respect to individual or institutional behaviors and actions manifested using Internet resources. A rather significant constellation of policy and law applies – as covered in Sec. 4.x.5 below.

4.3 Business Sector

Providers of Internet hardware and software products, as well as Internet services, have long played the most significant role in the governance ecosystem since the mid-80s when TCP/IP began to emerge as the internetworking protocol of choice. It includes companies and other kinds of organizations such as government agencies who procure Intranet/Extranet infrastructure for their own use.

This rather significant role of Internet business frequently gets subordinated by other ecosystem sectors which depend on public self-promotion. In the final analysis, however, it is the individual and collective business decisions of vendors that substantially govern the Internet and implement the provisions of the other sectors.

The largest vendors also have significant resources that can be deployed to create their own independent development and standards communities that are extraordinarily valuable bringing about rapid innovation and widespread deployment of new technology. This kind of entrepreneurial “just do it” behavior stands in striking contrast to traditional legacy practices in the telecommunications industry that rely on formal, hierarchical international, regional, and national standards bodies and development activity – with decade long cycles. The formality and rigidity can be exacerbated, and cycles stretched out over even longer timeframes through overlays of formal government sponsored R&D activity frequently endemic in Europe and Asia.

Hardware and Software Vendors

Although there are many vendor specific Internet development forums in existence today, the most prominent include large hardware and software vendors who have chosen to create their own communities, including devoting large grants to independent developer institutions: Microsoft, Cisco, Sun Microsystems and IBM. In some cases, like Sun Microsystems with Java, the development activity was largely spun off as an independent group. This is not to say that other industry vendors are not significant and highly influential in the governance realm; only that the largest ones - who have also chosen to create an extensive community penumbra – emerge as the most prominent.

Because the Internet is fundamentally a software-based construct, it is not surprising that the vendors who control most of the operating systems extant on the hundreds of millions of Internet host computers emerge at the top of the governance ecosystem. "Code as Law" has even given rise to book length treatises. However, these vendors are not alone. Constant changes in technology, agile competitors producing compelling new applications, marketplace conditions, constraints imposed by other suppliers in the Internet food change such as telecom operators, and government agencies – all constrain the power of even the largest actors.

Prominent collective industry groups that have emerged to represent this sub-sector in the U.S. include the Information Technology Association of America (ITAA), and the Software Publishers Association.

Large Commercial Users

From the earliest years of the Internet – and indeed the X.25 data network universe preceding it - the interests and role of large commercial users have been paramount in policy and governance. In this context, "commercial user" includes corporations, government agencies, and institutions – especially educational ones. One has only to look at the allocations of Class A blocks of Internet addresses to get a listing of commercial users who early-on expressed their interests in the form of resource allocations.

The first large conferences devoted to the Internet were, not surprisingly, the Interop trade shows and seminars begun in 1986 to provide a means for the commercial user sector to meet, discuss current policy and governance developments, view new products, and express their common interests and needs to vendors. The phenomenon has continued over the years and dispersed worldwide. The number of commercial trade shows and seminars focused on the Internet today has blossomed to such an extent that it is difficult to discover all of them.

Large commercial users have also played significant roles within advisory bodies, as well as formal regulatory, legislative, and judicial forums, and has resulted in shaping some of the most fundamental Internet policies and governance regimes at domestic national and international levels. This has occurred both through individual corporate and institutional initiative, as well as collectively through common user organizations. Especially notable over many years have been ADEPSO, CBEMA, INTUG, the Int'l Chamber of Commerce, and EDUCOM (now EDUCAUSE).

Major Service Providers

The Internet was largely ignored by service providers until it began to scale significantly as a business opportunity in the late 1980s. The first entrants as stand-alone Internet providers were UUNET and Performance Systems International. At about the same time, MCI obtained part of a NSF award to construct a national backbone (NSFnet), followed a few years later by Sprint garnering a similar award for international connectivity (International Connections Manager).

The late 1980s saw the emergence of mixes of educational and specialized Internet related provider organizations appropriate to the times. These included creatures like FARNET and USENET, as well as comparable regional organizations like RARE (Réseaux Associés pour la Recherche Européenne), EARN (European Academic and Research Network) [subsequently joined with RARE to form TERENA in 1994), RIPE (which also emerged as an administrative organization), and a plethora of national level bodies.

In the early 90s, the Commercial Internet Exchange (CIX) organization was formed among the then existing providers to play a major policy and governance role, including supporting a traffic exchange mechanism. The CIX subsequently evolved into the U.S. Internet Service Provider Association (US ISPA). Boardwatch magazine also emerged as an Internet service provider advocacy organization through its semi-annual conferences of ISPs and policy making initiatives that were institutionalized in the U.S. Internet Industry Association.

As the Internet Service Provider business grew and merged to a significant extent with mainline telecommunications provisioning, the boundaries between telecom, on-line (especially America On-Line), and Internet provisioning are substantially blurred. This has been reflected in turn in the associated ISP bodies in most countries, regions, and states. Hybrid organizations such as the Cellular Telecommunications and Internet Association (CTIA) in the U.S. are exemplary of the evolution within legacy industry organizations.

Like other business sector users, providers – individually and collectively through their industry bodies – constitute critical components of the policy and governance ecosystem because t he scaling, deployment, development, and economics of the Internet through advocacy and decisions taken within their organizations and in the marketplace.

Some significant business sector organizations dealing with governance and policy span broad interests. One of the less visible but nonetheless influential is the Internet Law and Policy Forum (ILPF). The ILPF consists principally of representatives from the general counsel or government relations offices of many significant providers of Internet products and services, and has been influential in harmonizing transnational law that affects the Internet.

4.4 User Sector

The Internet by definition is an edge network consisting of host applications and processes reachable by a combination of unique host addresses and TCP/UDP ports. Individual users and local system administrators have the ultimate ability to govern the Internet with respect to the user domain.

During the 70s and 80s and up through the mid-90s, the collective power of users was especially strong because of the ability of most users until that time to set up their own Internet services and applications. As the Internet became a mass market phenomenon – first with Microsoft bundling TCP/IP into the Windows operating system, then with AOL connecting its infrastructure to the Internet via a gateway – the effective policy and governance power of end users began to decline. A prominent exception is developers.

Developers

The developer community – that is, individuals and groups that actually write “running code” – has always been one of the principal strengths and forces within the Internet environment. Even those operating on the “dark side” as hackers of various sorts, significantly shape the Internet’s ecosystem.

For many years, the developer community existed largely with the university computer science community and the National Labs; and then over time migrated into existing companies or crafted new startups. The university Internet developer community was significantly was especially well funded between 1985 and 1995 through the National Science Foundation which expended more than 500 million dollars to create a renaissance for application development, that was enhanced through additional funding through DARPA.

Scores of new mass market applications – some successful, many unsuccessful – reshaped the Internet environment and led to new policy and governance mechanisms and developments. These included almost everything identified with the Internet today: Email, World Wide Web, network caching, search engines, file sharing, Internet domain names, Voice over IP, dialup access. All emerged from developer communities and institutions. Some subsequently evolved into continuing research institutions such as the Cooperative Association for Internet Data Analysis (CAIDA) spearheaded by Kim (KC) Claffy.

Perhaps the most significant developer forum is also a standards body – the Internet Engineering Task Force. In the Web development environment, the World Wide Web Consortium (W3C) is a forum led by Web developer Tim Berners-Lee, and enhanced through a companion staff developer team as well as an International World Wide Web Conference.

The U.S. was not alone in these endeavors. Almost every large country and region have maintained well funded Internet development initiatives as a manifestation of national policy. The Commission of the European Union's Information Society programme is among the largest.

As noted above in the context of business sector, major hardware and software vendors began to create their own large, active Internet user communities as the market opportunities grew. All of these communities co-exist and in complex ways through scores of forums, large and small – many in the form of Internet-based virtual organizations.

End User and SOHOs

End-users and Small Offices/Home Offices exercise broad power to make macro decisions affecting Internet governance and policy through their marketplace choices and through political pressure placed on officials in government or administrative positions. Their procurement choices also represent an enormous embedded economic base of capital investment, The Internet itself is an effective tool in rapidly organizing end-users and reaching decision makers.

In the early 1990s, several small end-user advocacy organizations emerged. The Internet Society was formed primarily as an organization to promote common interests of the educational user community. The Society expanded its scope, created numerous national chapters, and subsequently asserted Intellectual Property ownership of the Internet Engineering Task Force (IETF) standards and represented the IETF's interests in other standards bodies.

Advocacy and Academic Groups

A significant number of small advocacy organizations across the political spectrum have also emerged to play policy and governance shaping roles. Some of the more prominent Internet libertarian groups include the U.S. oriented Electronic Frontier Foundation (EFF) and Center for Democracy and Technology (CDT), Computer Professionals for Social Responsibility (CPSR), the Foundation for Information Policy Research in the U.K., and internationally, the Soros Foundation Open Society Institute, the Global Internet Liberty Campaign (GILC), the Global Internet Policy Initiative (GIPI). Others concerned with Internet content include ProtectKids.com.

A large number of prominent academic groups are involved in Internet policy and governance. Some of the more prominent in the U.S. include Harvard's Berkman Center, Chicago Law School's, the Stanford Center for Internet and Society, Chicago-Kent College of Law, and the Georgia Tech Information Security Center (GTISC).

4.5 Government Sector

Public bodies have the ability to substantially shape the behavior of other governance ecosystem sectors - frequently with substantial interaction through public consultative proceedings or funding decisions. Government policy is manifested both through funding decisions such as discussed above under other sectors, or governance actions that are both direct (i.e., specific legal and regulatory provisions that apply to Internet use) as well as indirect (i.e., generic provisions that apply to all networking or other kinds of uses).

In almost all government systems, the governance and policy making activities are effected through legislative, executive, judicial, or independent agency bodies that can exist at national as well as local levels. Additionally, national governments may establish bilateral agreements between themselves, or multilateral agreements among any number of nations through global and regional intergovernmental organizations – typically in the form of treaty instruments.

A large and rapidly growing body of law and policy applies both generally and explicitly to Internet operation and user conduct that may be regulatory in nature, or which establish civil and criminal causes of action. Where multiple law and policy apply of different jurisdictions concurrently applies to Internet architecture, service, or user behavior, instances of Conflict of Law occur – for which there are some generally accepted guides for weighing competing claims and interests in crafting an equitable and just result.

Regulatory Constructs and Requirements for Internet Service Provisioning

The most enduring and significant regulatory construct applicable to the provisioning of network based communication services is that between “public” and “private.” Public services in some countries as the U.S., are often referred to as Common Carrier services. Since 1850, public network services have generally been subject to domestic and international government oversight, while private networks and service have not. The Internet is for regulatory purposes an amalgamation of private networks.

Until the early 90s, the Internet operated under a difficult regulatory bifurcation where it was unregulated in the U.S., impeded in most other countries, and banned internationally. The ban – instituted by an ITU provision that prohibited international leased line capacity to be made available to third parties – was circumvented through government ownership of the network infrastructure.

The international ban stood in marked contrast to the actions of the Federal Communications Commission which in the U.S. decided in 1982 Computer II Decision to “forbear” indefinitely from exercising regulatory authority over “enhanced services” such as those provided via the Internet. The Decision led significantly to the Internet’s rapid growth and innovation, as anyone with the incentive and a modest investment could become an Internet provider. This FCC stance, however, left a vacuum that was partially filled in 1997 by a much more regulatory oriented Executive Branch agency – the Department of Commerce – in it’s imposing a classic legacy common carrier regulatory regime on the provisioning of Internet domain name services. In related actions related to national security, the Department also assumed control over the administration of many Internet addresses and the operation of root

DNS servers – functions formerly controlled by the U.S. DOD and the NSF.

By 2002, as the Internet emerged as necessary infrastructure, as it began to support legacy telephone services, and an assortment of criminal and terrorist behaviors emerged, the FCC began to propose regulatory requirements for Internet service providers. The outcome of those proceedings is unknown at the time of this book’s publication, it appears likely that the FCC will minimally impose public safety and law enforcement support requirements on service providers.

In most countries outside the U.S., the public provisioning of Internet services was not allowed until the early 90s. This was followed by a several year period where economic disincentives were instituted to impede Internet use – typically to promote higher priced and officially favored public telecommunication service alternatives. The mechanisms included costly leased line tariffs, high metered charges for dialup line use, restrictions on modem use, and prohibitions on specific services like Voice over IP. In most countries, these impediments have largely disappeared except for the last – which is still prevalent in most of the world. Essentially every country also imposes Lawful Access and Interception regulatory requirements upon Internet Service Providers in the same fashion as any telecommunication service.

At intergovernmental levels, there are many forums that are attempting to play increasing Internet regulatory roles – the more prominent of which are International Telecommunication Union (ITU), the Organization for Economic Cooperation and Development (OECD), and the Commission of the European Community (CEC). The ITU in particular – which until the early 90s was the principal intergovernmental forum to impede the Internet’s development – has since the mid-90s attempted to assert jurisdiction over the administration of Internet IP addresses and domain names, as well as interconnection arrangements, despite the fact that the ITU's jurisdiction does not normally extend to private networks and services of the Internet, and the standards involved belong to another organization – the IETF.

Law

The diverse systems of law have always applied transparently to the conduct of Internet service providers and users. The laws pertaining to crime, fraud, contract, libel, contracts, intellectual property, and the like, do not distinguish among kinds of media used, and judicial decisions over the years sought to adapt existing provisions to cases in controversy occurring via the Internet. Communication networks, however, have always posed occasional difficult questions of jurisdiction over the conduct or actors; and the characteristics of the Internet exacerbate jurisdictional issues.

During the 1990, specific Internet-related law began to emerge to deal with specific issues or difficulties posed. These included enabling law such as the recognition of digital signatures for the purposes providing assent, the acceptance of forms of digital documents as being sufficient in legal actions, and Email as being sufficient in providing notice. The law also began to deal with Internet cybercrime and other unique new developments in the form of malicious harm to computer systems, stalking, protection of minors, fraudulent communications, gambling, consumer protection, data protection, privacy protection, content regulation, intellectual property protection (e.g., copyright and trademark) fraud, identity theft, terrorism, unsolicited Email (SPAM), and taxation of on-line sales.

There is now a large and rapidly growing body of Internet law emerging in almost every legal jurisdiction throughout the world. Some international harmonization of this law was effected in 2002 in the form of the Convention on Cybercrime – a broad treaty instrument among 30 signatory countries that will likely come into force in 2004 and expand to include other nations. The Convention establishes a model for other areas of international harmonization and cooperation with respect to Internet law.

4.6 Standards and Administrative Sector

A variety of standards bodies and forums have developed technical and operational specifications among providers and users - occasionally with public body involvement. In some instances, there is some type of administrative body associated with the forum that implements the registration and notification requirements associated with some standards.

Legacy Standards and Administrative Forums

During the 70's and 80's, Internet standards were the province of the DARPA sponsored committees that produced the specifications in the form of Requests for Comment (RFC). This activity and the standards were formalized by the U.S. Department of Defense in 1982 and published by DARPA and Defense Communications Agency (now DISA). The standards development activity became institutionalized in the form the Internet Engineering Task Force (IETF) that was maintained through an IETF Secretariat under the aegis of the Corporation for National Research Initiatives (CNRI). The IETF itself has become associated with the Internet Society. This configuration remains today, and the authoritative standards are published by the IETF Secretariat on its web site. The IETF work is managed through an Internet Engineering Steering Group (IESG) and an Internet Architecture Board (IAB) – also supported by the IETF

Secretariat.

During the 1970's, the USC Information Sciences Institute (ISI) in Marina del Rey, California, in cooperation with the Menlo Park, California, NIC, began to provide some of the administrative functions necessary to implement the Internet standards. The ISI activity subsequently became institutionalized in the late 1980s as the Internet Assigned Numbers Authority (IANA). The evolution of the IP address and DNS components of this function are depicted in Fig. __, above. There were many scores of other functions, however, that remain with the IANA – which is maintained as an outsourced contractor activity by the U.S. Department of Commerce's National Institute of Standards and Technology (NIST).

The Universe of Internet Standards and Administrative Forums

As the Internet grew, so did the standards and administrative forums of various kinds. There are now more than 100 different bodies and forums of various kinds that are far too numerous to describe here. Table XX – Internet Standards Forums lists most of them.

Some of these forums operate essentially independently of each other. Many serve specialized technologies, applications, or constituencies.

4.7 Emerging Trends

Like all ecosystems, that for Internet policy and governance continues to evolve to accommodate the needs of its constituents. The inherently autonomously, self-organizing characteristics of the Internet will no doubt continue indefinitely to stress governmental attempts to encourage beneficial actor conduct and punish undesirable behavior – which is what policy and governance mechanisms are meant to accomplish.

Security

The most obvious emerging trends revolve around two kinds of protective and security-related needs. One is proactive - involving actions to reduce the vulnerability of Internet resources, including users subject to adverse behavior. The other is reactive – involving a need to identify bad Internet actors and to acquire evidence for subsequent legal proceedings. Almost all new, successful infrastructure technologies have these same steady-state needs.

These needs have grown dramatically post 2001 as governments worldwide have witnessed dramatic increases in malevolent Internet use. The needs seem unlikely to abate. An almost certain result will be to impose user authentication requirements and the maintenance of usage records. Accountability cannot otherwise exist. At the same time, encryption as a means of both protecting sensitive information and verifying content will expand. Access to

Diversity

The Internet because of its growing ubiquity, seems destined to support an increasing diversity of uses – both in terms of an expanding number of transport options, as well as increasing numbers of users and services. This "hourglass effect" of the Internet protocol becomes ever more attractive as a universal glue between transport options and applications – especially with expanded address options supported by IP version 6. On the other hand, single infrastructures create their own vulnerabilities, and because of increasing concerns regarding security and survivability, the all-encompassing expansion of the Internet is likely self-limiting.

Assimilation

Like all of the precedent technologies before it, the Internet has moved into a mass market assimilation phase where it's identity has substantially merged into a common infrastructure together with a vast array of "always on" access devices, networks, and services. The price of success, however, is the adaptation and adoption of the infrastructure and the emergence of vulnerabilities as it becomes a vehicle for unintentional or intentional harm with profound adverse consequences for people, commerce, and society. The vulnerabilities exist for any significant infrastructure whether communications, power, or transport.

Going forward, the challenges faced with this larger infrastructure will be not be those of innovation and growth alone – but include every more prominently, the imposition of policies and requirements that lessen infrastructure vulnerabilities.

4.8 References

Where possible, readers are urged to access source documents rather than secondary material.

1. Bootstrap Institute, Interview 4, 1987 Interviews *with Douglas Engelbart*, < http://www-sul.stanford.edu/depts/hasrg/histsci/ssvoral/engelbart/engfmst4-ntb.html>
2. *Request for Comments Repository*, <http://www.ietf.org/rfc.html>
3. J. McQuillan, V. Cerf, *A Practical View of Computer Communications Protocols*, IEEE Computer Society, 1978.
4. FCC, *Computer II Final Order*, 77 FCC2d 384 (1980)
5. *DoD Policy on Standardization of Host-to-Host Protocols for Data Communications Networks*, The Under Secretary of Defense, Washington, DC, 23 March 1982.
6. *Internet Protocol Implementation Guide*, Network Information Center, SRI International, Menlo Park, August 1982.
7. R. E. Kahn, A. Vezza, & A. Roth, Electronic Mail and Message Systems, Technical and Policy Perspectives, AFIPS, Arlington VA (1981).

8. *Internet Protocol Transition Workbook*, Network Information Center, SRI International, Menlo Park, March 1982.

9. Mark Lottor, *Internet Domain Survey*, Network Wizards, <http://www.nw.com/>. Lottor has since 1982 engaged in Internet metrics research, data collection, and analysis.

10. *DDN Protocol Handbook*, DDN Network Information Center, SRI International, Menlo Park, 1985.

11. Towards a Dynamic Economy – Green Paper on the Development of the Common Market for Telecommunications Services and Equipment, COM (87) 290 final (June 30, 1987).

12. OECD, Committee for Information, computer and Communications Policy, Value-Added Services: Implications for Telecommunications Policy, Paris 1987.

13. National Science Foundation, Network Information Services Manager(s) for NSFnet and the NREN, NSF 92-24 (1992).

14. Internet Engineering Task Force Secretariat, www.ietf.org

15. RIPE NCC, www.ripe.net

16. Cooperative Association for Internet Data Analysis, www.caida.org

17. Internet International Ad Hoc Committee, www.iahc.org

18. Commission of the European Union, Information Society, http://europa.eu.int/information_society. See also, EU Law + Policy Overview, the Internet, The Information Society and Electronic Commerce, http://www.eurunion.org/legislat/interweb.htm

19. U.S. Dept. of Commerce, National Telecommunications and Information Administration,

Management of Internet Names and Addresses,

www.ntia.doc.gov/ntiahome/domainname/

20. FCC, Notice of Proposed Rulemaking , Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, CC Docket No. 02-33, FCC 02-42, 15 Feb 2002.

Table __

Contemporary Internet Standards Fora

Name	Acronym	URL	Type	Focus
3RD Generation Partnership Project	3GPP	www.3gpp.org	standards	telecom
3RD Generation Partnership Project2	3GPP2	www.3gpp2.org	standards	telecom
Accredited Standards Committee (ASC) X12		www.x12.org	standards	data exchange
Aim, Inc.		www.aimglobal.org	standards	identifiers
Alliance for Telecommunications Industry Solutions	ATIS	www.atis.org	standards	telecom
American Library Association		www.ala.org	standards	library
American National Standards Institute	ANSI	www.ansi.org	standards	diverse
American Society for Information Science and Technology	ASIS	www.asis.org	standards	general
ANSI X9		www.x9.org	standards	financial
Asia Pacific Networking Group	APNG	www.apng.org	operations	internet
Asia-Pacific Telecommunity Standardization Program	ASTAP	www.aptsec.org/astap/	standards	telecom
Association for Information and Image Management International	AIIM	www.aiim.org	standards	imaging
Bluetooth Consortium		www.bluetooth.com	standards	wireless
Cable Labs		www.cablelabs.org	standards	telecom
Computer Emergency Response Team	CERT		operations	security
Critical Infrastructure Assurance Office	CIAO	www.ciao.gov	government	security
Cross Industry Working Team	XIWT	www.xiwt.org	standards	internet
Data Interchange Standards Association	DISA	www.disa.org	standards	application
Department of Justice	DOJ	www.doj.gov	government	security
Digital Library Federation	DLF	www.diglib.org	standards	library
Digital Video Broadcasting Consortium	DVB	www.dvb.org	standards	broadcasting
Directory Services Markup Language Initiative Group	DSML	www.dsml.org	standards	directory
Distributed Management Task Force	DMTF	www.dmtf.org	standards	management
DOI Foundation		www.doi.org	standards	application
ebXML		www.ebxml.org	standards	application
EC Diffuse Project		http://www.diffuse.org/fora.html	standards	reference
Electronic Payments Forum	EPF	www.epf.org	standards	financial
Electronics Industry Data Exchange Association	EIDX	www.eidx.org	standards	data exchange

Enterprise Computer Telephony Forum	ECTF	www.ectf.org	standards	telecom
ENUM Forum		www.enum-forum.org	standards	telecom
European Commission	EC	europa.eu.int/comm/index_en.htm	government	telecom
European Committee for Electrotechnical Standardization	CENELEC	www.cenelec.org	standards	general
European Committee for Standardization	CEN	www.cenorm.be	standards	general
European Computer Manufacturers Association	ECMA	www.ecma.ch	standards	telecom
European Forum for Implementers of Library Automation	EFILA	www.efila.dk	standards	classification
European Telecommunications Standards Institute	ETSI	www.etsi.org	standards	telecom
European Umbrella Organisation for Geographic Information	EUROGI	www.eurogi.org	standards	location
Federal Communications Commission	FCC	www.fcc.gov	government	telecom
Federal Trade Commission	FTC	www.ftc.gov	government	diverse
FidoNet Technical Standards Committee	FSTC	www.ftsc.org	standards	network
Financial Information eXchange (FIX) protocol		www.fixprotocol.org	standards	financial
Financial products Markup Language Group		www.fpml.org	standards	financial
financial services industry		www.x9.org	standards	financial
Financial Services Technology Consortium	FSTC	www.fstc.org	standards	financial
Forum for metadata schema implementers		www.schemas-forum.org	standards	application
Forum of Incident Response and Security Teams	FIRST	www.first.org	operations	security
Global Billing Association		www.globalbilling.org	standards	
Global Standards Collaboration	GSC	www.gsc.etsi.org	standards	telecom
Group on Electronic Document Interchange	GEDI	lib.ua.ac.be/MAN/T02/t51.html	standards	classification
GSM Association		www.gsmworld.com	standards	telecom
ICTSB	ICTSB	www.ict.etsi.org/contactslinks/rtd.htm	standards	reference
IEEE Standards Association		standards.ieee.org	standards	diverse
IMAP Consortium		www.impa.org	standards	application
Information and Communications Technologies Board	ICTSB	www.ict.etsi.org	standards	authentication
Infraguard Alliance		www.infraguard.net	government	security
Interactive Financial eXchange (IFX) Forum		www.ifxforum.org	standards	financial
International Confederation of Societies of Authors and Composers	CISAC	www.cisac.org	standards	classification
International Digital Enterprise Alliance	IDEA	www.idealliance.org/	standards	metadata
International Federation for Information Processing	IFIP	www.ifip.or.at	standards	application
International Federation of Library Associations	IFLA	www.ifla.org	standards	classification
International Imaging Industry Association		www.i3a.org	standards	imaging
International Multimedia Telecommunications Forum	IMTC	www.imtc.org	standards	telecom
International Organization for Standardization	ISO	www.iso.ch	standards	diverse
International Telecommunication Union	ITU	www.itu.org	standards	telecom
International Telecommunication Union	ITU	www.itu.int	government	telecom
International Telecommunications Advisory Committee	ITAC	www.state.gov/www/issues/economic/cip/itac.html	standards	telecom
International Webcasting Association	IWA	www.iwa.org	standards	broadcasting
Internet Architecture Board	IAB	www.iab.org	standards	internet
Internet Corporation for Names and Numbers	ICANN	www.icann.org	operations	internet
Internet Engineering Task Force	IETF	www.ietf.org	standards	network
Internet Mail Consortium	IMC	www.imc.org	standards	application
Internet Security Alliance	ISA	www.isalliance.org	operations	security

IPDR (Internet Protocol Detail Record) Organization, Inc	IPDR	www.ipdr.org	standards	telecom
IPV6 Forum		www,ipv6.org	standards	internet
ISO/TC211		www.isotc211.org	standards	location
Java APIs for Integrated Networks	JAIN	jcp.org/jsr/detail/035.jsp	standards	telecom
Java Community		java.sun.com	standards	application
Library of Congress		www.loc.gov/standards/	standards	classification
Localisation Industry Standard Association	LISA	www.lisa.org	standards	application
Mobile Games Interoperability Forum	MGIF	www.mgif.org	standards	games
Mobile Payment Forum		www.mobilepaymentforum.org	standards	financial
Mobile Wireless Internet Forum	MWIF	www.mwif.org	standards	wireless
Multiservice Switch Forum	MSF	www.msforum.org	standards	telecom
National Association of Regulatory and Utility Commissioners	NARUC	www.naruc.org	government	telecom
National Committee for Information Technology Standards	NCITS	www.ncits.org	standards	security
National Communications System	NCS	www.ncs.gov/ncs/html/NCSProjects.html	standards	telecom
National Emergency Number Association	NENA	www.nena.org	standards	telecom
National Exchange Carriers Association	NECA	www.neca.org	government	telecom
National Genealogical Society		www.ngsgenealogy.org/comstandards.htm	standards	application
National Information Assurance Partnership	NIAP	niap.nist.gov	standards	security
National Information Standards Organization	NISO	www.niso.org	standards	security
National Infrastructure Protection Center	NIPC	www.nipc.gov	government	security
National Institute for Standards and Technology	NIST	www.nist.gov	government	security
National Security Agency	NSA	www.nsa.org	government	security
National Standards System Network	NSSN	www.nssn.org/developer.html	standards	reference
National Telecommunications and Information Administration	NTIA	www.ntia.doc.gov	government	telecom
Network Applications Consortium	NAC	www.netapps.org	standards	application
Network Reliability & Interoperability Council	NRIC		operations	telecom
NIMA Geospatial and Imagery Standards Management Committee	NIMA GSMC ISMC	http://164.214.2.51/	standards	location
NIST Computer Security Resource Center	CSRC	csrc.nist.gov	standards	security
North American Numbering Council	NANC	www.fcc.gov/ccb/Nanc/	operations	telecom
North American Operators Group	NANOG	www.nanog.org	operations	internet
Object Management Group	OMG	www.omg.org	standards	general
Online Computer Library Center	Dublin Core	www.oclc.org	standards	metadata
Ontology.org		www.ontology.org	standards	metadata
Open Applications Group	OAGI	www.openapplications.org	standards	application
Open Archives Forum	OAF	edoc.hu-berlin.de/oaf	standards	archive
Open Bioinformatics Foundation		www.open-bio.org	standards	application
Open Directory Project		www.dmoz.org	standards	directory
Open GIS Consortium	OGC	www.opengis.org	standards	location
Open H323 Forum		www.openh323.org	standards	multimedia
Open LS		www.openls.org	standards	location
Open Services Gateway Initiative	OSGi	www.osgi.org	standards	application
Organization for Economic Cooperation and Development	OECD	www.oecd.gov	government	political
Organization for the Advancement of Structured Information Standards	OASIS	www.oasis-open.org	standards	application
PKI Forum		www.pkiforum.com/main.html	standards	security

Presence and Availability Management Forum	PAM Forum	www.pamforum.org	standards	wireless
Project MESA		www.projectmesa.org	standards	wireless
Reseau IP EuropeenRéseaux IP Européens	RIPE	www.ripe.net	operations	internet
Security Industry Association	SIA	www.siaonline.org	standards	security
SIP Forum		www.sipforum.com/	standards	telecom
Smart Card Alliance	SCA	www.smartcardalliance.org/	standards	identifiers
Society of Motion Picture and Television Engineers	SMPTE	www.smpte.org	standards	imaging
Softswitch Consortium		www.softswitch.org/	standards	telecom
Speech Application Language Tags	SALT	www.saltforum.org	standards	application
SyncML Initiative, Ltd	SyncML	www.syncml.org	standards	wireless
Telecommunications Industry Association	TIA	www.tiaonline.org	standards	telecom
TeleManagment Forum		www.tmforum.org	standards	telecom
The Alliance for Technology Access	ATA	www.ataccess.org	standards	handicaped
The Electronic Payments Association	NACHA	www.nacha.org	standards	financial
The European Forum for Electronic Business	EEMA	www.eema.org	standards	financial
The Open Group		www.opengroup.org	standards	general
The PARLAY Group	PARLAY	www.parlay.org	standards	telecom
The Portable Application Standards Committee		www.pasc.org	standards	application
TruSecure		www.trusecure.com	standards	security
UMTS Forum	UMTS	www.umts-forum.org	standards	wireless
Unicode Consortium		www.unicode.org	standards	identifiers
Uniform Code Council	EAN-UCC	www.uc-council.org/	standards	identifiers
Universal Description, Discovery and Integration Community	UDDI	www.uddi.org	standards	application
Universal Plug and Play Forum	UPnP	www.upnp.org	standards	network
Universal Wireless Communications Consortium	UWC	www.uwcc.org	standards	wireless
Value Added Services Alliance	VASA	www.vasaforum.org	standards	telecom
Voice XML Initiative		www.voicexml.org	standards	wireless
WAP Forum	WAP	www.wapforum.org	standards	wireless
Web3d		www.web3d.org	standards	games
Wireless Ethernet Compatibility Alliance	WECA	www.wirelessethernet.org	standards	wireless
Wireless LAN Association	WLANA	www.wlana.org	standards	wireless
Wireless Location Industry Association	WLIA	www.sliaonline.com	standards	location
World Intellectual Property Organization	WIPO	www.wipo.int	government	trademark
World Wide Web Consortiuim	W3C	www.w3.org	standards	application
XML Forum		www.xml.org	standards	application
XML/EDI Group		www.xmledi-group.org	standards	data exchange