

## Internet Governance

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### Introduction

The term “Internet Governance” begs two questions: “What is the Internet?” and “What does it mean to govern the Internet?” The recent December 2003 World Summit on the Information Society (WSIS) led to the creation of a special Working Group on Internet Governance (WGIG) charged with answering these questions for UN Secretary-General Kofi Annan in preparation for a second summit on WSIS to be held in November 2005 in Tunisia.

The Internet began as a research project of the US Defense Advanced Research Projects Agency in the early 1970s, spurred by the success of an earlier project to demonstrate the efficacy of a new communication method, packet switching. That project, called the ARPANET, showed the utility of breaking up digitized information to be exchanged between computers into “packets” of information that could be relayed from one computer to another, as if they were digital postcards in a high speed, online postal system. The Internet experiment explored methods for interconnecting an arbitrary collection of packet-switched networks into an “Internet” in such a way that computers connected to any of the networks could communicate with one another in a transparent, end-to-end fashion.

On October 24, 1995, the body responsible for Internet policy in the United States, the Federal Networking Council (FNC) adopted a definition of the Internet that read as follows:

"The Federal Networking Council (FNC) agrees that the following language reflects our definition of the term "Internet".

"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."

At the time this definition was composed, there was a distinction made between the term "Internet" and the term "internet." The capitalized version referred to the publicly available system and the lowercase version referred to private copies. In recent literature, these terms sometimes have been replaced by the phrases "public internet" and "private internet" or "intranet." In this paper, we will use the term "Internet" to refer to the public system.

Interest in "governing" the Internet has grown as access to the Internet itself has become more widely available and as applications of this system have become more relevant to its now nearly one billion users. Governments, businesses, educational and research institutions and individuals have all found the Internet to offer extraordinarily rich and varied content and to serve as a highly flexible platform for the support of a seemingly endless array of communication services.

Contributing to this interest is the fact that the Internet, largely through the mechanisms of the World Wide Web, is showing an ability to transport all traditional communication modalities that were previously considered distinct and separate (e.g. television, radio, telephony), in addition to electronic mail, web services and interactive computer games. Most national governments have historically had a significant role in the regulation of telecommunications but the Internet has grown in an unregulated way. While its creation arose out of research sponsored by the US and other Governments, and its early use was largely confined to the academic sector, the provision of its services to the general public has been largely through private sector initiatives. In regulatory terms, the Internet began as a "private network," using dedicated circuits leased from telecom service providers, but it has become an enormous, sprawling and rapidly evolving, public utility that has had and will have an increasingly revolutionary effect on the traditional telecommunications sector. It is not surprising that many national administrations are focusing attention on this phenomenon that entered public consciousness only about a decade ago.

The Working Group on Internet Governance was charged with developing a definition of Internet Governance, identifying the associated public policy issues, and developing a common understanding of the roles and responsibilities of governments, inter-governmental organizations and other forums, the private sector and civil society as they relate to the operation of the Internet.

How does the Internet Work?

The basic technology of the Internet is called "packet switching." This concept evolved from earlier ideas often referred to as "message switching." Unlike the telephone network in which devices (e.g. telephones, fax machines) are

connected by end to end switched circuits that remain in place until the communication has ended, message switching and packet switching systems send units of information (packets, messages) that behave in many respects like electronic postcards. A computer originates a "postcard," addressing it to a destination computer somewhere in the network. The postcard is forwarded from one computer to another until it reaches its destination. The communication links that interconnect the computers are dedicated to particular pairs of computers and the electronic postcards are forwarded over these channels. Packets and messages thus occupy the transmission channels only during transit and are available immediately to carry another packet or message as soon as the first one has transited the inter-computer link. The computers that forward packets through the Internet are called "routers" today.

The basic formats and procedures for moving packets around in the Internet are codified in a set of protocols that are referred to as the TCP/IP protocol suite. IP stands for Internet Protocol and this is the basic mechanism by which Internet Packets are sent around in the Internet. The Transmission Control Protocol transmits streams of data between the computers on the Internet by breaking the streams into Internet packets and sending them via the Internet Protocol in a store-and-forward fashion through the network to the destination.

There are nearly 200 protocols associated with various applications of the Internet. These are layered on top of one another in various ways, the lower layers supporting the requirements of the higher ones. The layered structure for any particular application is usually not more than 4-7 layers deep.

The Internet is designed to allow an arbitrarily large number of networks to be interconnected and to be operated independently. They all adhere to the same set of communication protocol standards and it is this standardization that allows the Internet to function as an apparently uniform grand collaboration of hundreds of thousands of private and public networks.

In addition to the routing and forwarding functions at the IP layer which are accomplished through software in devices called "routers," the Internet also includes a Domain Name System (DNS) that associates so-called "domain names" (e.g. [www.icann.org](http://www.icann.org)) with Internet addresses (IP addresses). Internet addresses define exactly where a host computer is in the topology of the global Internet. Domain Names are used in the Internet Protocol suite as substitutes for Internet addresses. For most of the Internet protocols, host and client computers in the Internet are referenced by Domain Name. Only the lowest layer protocols such as IP and TCP or the User Datagram Protocol (UDP) make use of actual Internet addresses. The Domain Name System comprises tens of thousands if not hundreds of thousands of computers that act as Domain Name servers. When a query (called a Domain Name lookup) is presented to one of these servers, it responds with the corresponding IP address, if it has been registered in the system, or it replies that the reference Domain Name does not exist. In

fact, the situation is somewhat more complex because there are other responses that a Domain Name server might make, as will be apparent below.

A Domain Name is hierarchical in nature. The right-most term (“org” in the example of `www.icann.org`) is called a Top Level Domain (TLD). There are fifteen such generic TLDs (.COM, .NET, .ORG, .EDU, .GOV, .MIL, .INT, .ARPA, .COOP, .AERO, .PRO, .INFO, .NAME, .MUSEUM, and .BIZ) and about 240 so-called Country Code TLDs (e.g. .DE for Germany, .UK for United Kingdom, .ZA for South Africa, and .CN for China).

The administrator of a TLD can register domain names at the “second level” such as ICANN.ORG, IBM.COM, WANADOO.FR, and CO.UK. This registration confers on the registrant the right to assign IP addresses to Domain Names and define lower level Domain Names such as WWW.ICANN.ORG, WATSON.IBM.COM or CS.UCL.AC.UK and assign IP addresses to these. The hierarchy can be many levels deep although for the most part the depth tends not to be much larger than four or perhaps even five levels. When a lower level Domain Name is assigned, responsibility for its management may be “delegated” to another party. Typically, registries operating the Top Level Domains delegate responsibility for lower level domain names to other parties who may delegate yet lower level names to yet other parties. ICANN delegates the responsibility for registering second level Domain Names to parties it deems qualified to manage top level domains. ICANN itself is responsible for managing the content of the so-called “root” of the Domain Name System.

When a program running in a host on the Internet needs to know how to get to another host on the Internet whose Domain Name is known, it looks up the name in the DNS by sending a query to a local Domain Name Resolver. If the Resolver already knows the answer, it responds immediately. If it does not, it may query a so-called “root server” that knows about all the top level domain name servers. The process of interrogation may work its way through a hierarchy of servers until one is found that knows the IP address associated with the desired Domain Name, and this information is returned to the program making the query. Thus one of the responses a Domain Name Server might make to a query is the address of a lower level Domain Name Server, serving a subset of names associated, for example, with IBM.COM or UCL.AC.UK.

In addition to this Domain Name System, there are a set of protocols known collectively as “routing protocols” that are used by the routers of the Internet to convey information about the topology of the system to all routers who need to know this information. Routers are grouped into subsets called “autonomous systems.” Each Autonomous System (AS) has a unique identifier associated with it. Typically, a set of routers will run one kind of routing protocol (historically called an “interior gateway protocol”) to determine how a particular Autonomous System of routers is interconnected. Each Autonomous System then exchanges routing information with other Autonomous Systems using an “exterior gateway

protocol” that establishes how all the Autonomous Systems are interconnected. The latter represents the topology of the global Internet.

All of the rest of the Internet protocol suite runs on top of the IP, TCP or UDP layers of protocol and implement all of the complex applications with which the users of the Internet have become accustomed.

Who runs the Internet?

The Internet is actually a grand collaboration of hundreds of thousands of network operators. Private companies and various branches of the governments of the world, including various local jurisdictions, may operate Internet Protocol-based networks. To the extent that these are interconnected to the so-called public Internet, they are all part of it and each operator typically owns his or her own piece of the Internet. When individual users operate local area networks in their homes or when companies run corporate networks connected to the public Internet, they all participate in the operation of the global system. If by “Internet” one intends to refer to all the computers, laptops, personal digital assistants and Internet-enabled mobile phones that are connected to it, then all the owners of these devices participate in “operating” the Internet.

The backbone of the global Internet consists of thousands of wide area or regional networks and it might be said that all of the operators of these systems are responsible for the operation of the Internet’s backbone. The operation of the Domain Name servers is equally distributed and in some degree hierarchical. There are, of course, millions of World Wide Web servers on the Internet and the operators of these systems also participate in the running of the Internet.

There are on the order of a dozen operators of the so-called Root Servers of the Domain Name System. These operators cooperate to run the Root Server system in a distributed fashion. ICANN is responsible for populating the top level “Root Zone File” that references all the top level Domain Name servers.

Top level Domain Names operators are referred to as “registries” and for some of them a collection of separate entities known as “registrars” are authorized to register domain name holders on behalf of the registries.

Before one can use the Internet, it is necessary to have an Internet Address. While the analogy is actually somewhat flawed, this is not unlike a postal address or a telephone number. There are four Regional Internet Registries (RIRs) that are responsible for allocating and assigned Internet addresses to network operators. Network operators may make further assignments to users as needed. ICANN is responsible for allocating global address space to each RIR. The four RIRs include the North American Registry for Internet Numbers (ARIN), the Latin and Central American Network Information Center (LACNIC), the Asia/Pacific Network Information Center (APNIC) and the Reseau Internet Protocol European

Network Information Center (RIPE-NIC). The African Network Information Center (AFRINIC) is expected to join this group as the fifth RIR sometime in 2005. Because the process of allocating and assigning Internet addresses is also hierarchical, there can be so-called Local Internet Registries that further assign Internet address space to users. Typically, an Internet Service Provider (ISP) assigns address space to its users who may, in turn, assign address space from their allocation to their customers.

The Internet would not work at all without the Internet Protocol standards and the organization most associated with the development of these standards is the Internet Engineering Task Force (IETF). This group now operates under the auspices of the Internet Society (ISOC), but it was formed around 1984 before the creation of ISOC in 1992. The IETF has an architectural arm, the Internet Architecture Board (IAB) that oversees the general architecture of the Internet and the procedures for standardization. The Internet Research Task Force also operates under the auspices of the Internet Society to conduct research in new functions for the Internet that are not yet ready for standardization. The documents that define the Internet Standards are published as part of a series of documents called Requests for Comment (RFCs) and the editing of this series is supported by the Internet Society. The RFC series was actually started in 1969 before the invention of the Internet, to document the technical standards of the first wide area packet network, the so-called ARPANET.

There are several key, hierarchical mechanisms that are critical to the operation of the Internet, namely the Domain Name System, the allocation and assignment of Internet Protocol Addresses, and the maintenance of other unique parameters associated with the Internet protocols. The task of managing the key system of unique identifiers of the Internet had been the responsibility of one of the Internet's pioneers, Jonathan Postel. He had undertaken this stewardship in the context of the Internet's predecessor, ARPANET, in 1969, and continued to serve the community as the Internet Assigned Numbers Authority until his death in 1998. In the mid-1990s it became increasingly apparent to Postel and others serving the Internet community that institutionalization of these stewardship functions was an important objective and after a considerable degree of debate and time, the Internet Corporation for Assigned Names and Numbers was established, in October 1998, to carry out the oversight and information management functions needed to assure unique allocation of domain names, IP addresses and other protocol identifiers.

What is the role of ICANN?

Discussions about how the Internet works and about rules for its use and operation inevitably include some discussion of the Internet Corporation for Assigned Names and Numbers (ICANN). ICANN was formed in 1998 to carry on the development of policy for the operation of the Domain Name System, and for the allocation and assignment of Internet address space. In its role as the

operator of the Internet Assigned Numbers Authority (IANA), ICANN is responsible for accurate recording of tables of unique parameters needed for the successful operation of the wide range of protocols that make up the TCP/IP suite. There are hundreds of such protocols and many of them have defined parameters whose values must be known to implementers of the protocols if their implementations are to interwork successfully. The IANA responsibility also includes the responsibility for allocation of global IP address space to the Regional Internet Registries and the delegation of operational responsibility for the operation of Top Level Domains (both generic and Country-Code types).

ICANN is a non-profit entity with a charter to operate for public benefit and is incorporated in the State of California. ICANN undertakes its responsibilities under the auspices of the US Department of Commerce (DOC) by way of a Memorandum of Understanding between ICANN and the DOC. The IANA responsibilities are further outlined in an additional contractual document assigning these responsibilities to ICANN. ICANN has opened an office in Brussels, in addition to its principal office in Marina del Rey, California, and anticipates that additional offices may be opened as needed.

The Board of Directors of ICANN is drawn from around the world. Of the eighteen directors and liaisons, three directors and two board liaisons are from the US, and the remaining thirteen are from Brazil, Mexico, the UK, Portugal, Switzerland, Germany, Bulgaria, Senegal, Kenya, Australia, China, Chile and Malaysia. An even wider range of participation is found in ICANN's Governmental Advisory Committee (GAC) which has on the order of 100 countries represented. Within ICANN, there are support and consultative organizations drawn from the technical community, the Domain Name operators, the root server, registry and registrar operators, the internet service providers, the intellectual property protection professionals, and from the at-large general public.

ICANN's principal role is the coordination of policy development for the management of the unique system of identifiers (domain names, IP addresses, Autonomous System numbers and protocol parameters). To carry out this mission, it has the assistance of the Root Server System Advisory Committee, the Security and Stability Advisory Committee, the Governmental Advisory Committee, the Country-Code Name Support Organization, the Generic Name Support Organization, the At-Large Advisory Committee, the Technical Liaison Group and the Address Support Organization. The Regional Internet Registries have formed a Number Resource Organization and this group undertakes the responsibilities of the ICANN Address Support Organization.

Does the Internet need to be governed?

In its earlier years, the Internet was simply a tool for the research and education community to explore new ways of sharing computing power, software, and information by way of electronic mail (which became a popular application

around 1971 on one of the Internet's predecessors, the ARPANET). The approximately one billion users of the Internet today have the same range of interests as the general population in most countries. The side-effect of this wide spread use is that abuses have arisen that are not unlike the kinds of abuses one finds in other societal settings. Fraud, misinformation, harassment, illegal transactions, theft of resources, breaking and entering (hacking into computers), copyright infringement, and many other exact or approximate electronic analogs of improper behavior can be found on the Internet. Such problems plainly raise public policy concerns among governments and stimulated much interest during the many talks associated with the World Summit on the Information Society (WSIS).

The term "Internet Governance" has become an area of particular attention in part as a consequence of widespread recognition that the Internet represents an important area of national interest for all countries seeking to participate in the benefits of global electronic commerce, distance learning, access to the encyclopedic wealth of information on the Internet, and in the social dimension that the Internet is creating. From the perspective of governments, the Internet is simultaneously a technology that promises high economic value for parties making use of it and a challenge in that it is unlike all other telecommunications media previously invented.

While traditional telephony, broadcast radio and television and cable television, as well as satellite communication have tended to evolve in a regulated setting, the Internet has been a "grass-roots" phenomenon, operating essentially above the traditional regulated environment. Internet runs on top of the telephone network, or its underlying dedicated circuitry. It works on broadcast and point-to-point radio, point-to-point satellite, optical transmission links and virtually any other communications medium. It was designed to work that way. As a consequence, it has had the advantage of rapid innovation by users at the "edge" of the network, largely without much or any regulatory interference. Indeed, because much of the flexibility of the Internet is a consequence of its dependence on software running in devices at the edge of the network, rather than in systems embedded in the net, virtually anyone is free to invent new applications and to put them up for use. The World Wide Web, which entered the Internet picture around 1992, though it was invented a few years earlier, provided a gigantic opportunity for virtually anyone to share information with everyone else on the Internet.

These aspects of the Internet have stimulated considerable attention, especially in the government sector in recent years. Moreover, as the Internet becomes increasingly accessible around the world, its applications and uses begin to reflect the interests of the general population. Where computers and computer-based systems go, networking is not far behind. This is especially so as wireless technologies make it less and less expensive to provide connectivity for voice



communications (mobiles) and for data communication ("hot spots" using wireless local area networks).

In a sense, ICANN has become the only globally visible body charged with any kind of oversight for the Internet. The scope of this oversight responsibility was deliberately and intentionally limited in the process of the creation of ICANN. But as the Internet continues to grow, as domain names become increasingly visible in the context of the World Wide Web, and as the so-called "dot.com" bubble expanded between 1998 and early 2000 and then burst, many people with concerns or complaints about problems associated with the Internet or use uses (and abuses) have turned to ICANN expecting it to address many of these issues.

Not surprisingly, ICANN's intentionally limited mandate and limited resources, did not outfit it with the ability to deal with such complaints as spam (unsolicited commercial electronic mail), fraud, theft, pornography, and the long list of other abuses that creative human beings have invented for the Internet. Though intense discussions about Internet policy (or "governance") frequently reference ICANN, it has become apparent that the topic of governance is far more expansive than the limited role ICANN plays in the operation of the Internet.

These responsibilities of ICANN are often carried out through the cooperative efforts of other groups such as the system of voluntary root servers and the work of the Regional Internet address Registries (RIRs), and domain name registries and registrars around the world. While these functions appear on the surface to be quite straightforward, they have policy ramifications that make them more complex. Who should be assigned the responsibility for operating a top level domain name service? Which addresses should be placed in the root zone file? Who should be allowed to register any particular domain name in a top level domain? Are there any restrictions on registrations? How can character sets other than simple Latin characters be introduced into domain names? Where should the root servers be located? What should be the policy for allocation and assignment of Internet address space? How should that policy be developed? It is because these questions are not simple that ICANN has formed a rich system of supporting organizations and forums in which to air such policy issues and seek to develop consensus around them.

In the course of the WSIS discussions, the full breadth of the term "Internet Governance" was sometimes confused with the narrower scope of ICANN responsibility. During the next phase of WSIS, culminating in late 2005 in Tunisia, it is vital that the discussion takes into account that the range of Internet governance questions requires a much broader system of practices, agreements and policies than are encompassed in ICANN's mandate. Nor does it seem appropriate to seek to expand that mandate to accommodate areas that should be the province of domestic and international governmental concern. The participants in the WSIS and associated WGIG discussions have a significant

task ahead of them. Dealing with the many public policy interests arising from the rapid growth of Internet requires that many of the issues lying outside ICANN's responsibility find venues in which they can be addressed. Intellectual property protection concerns might be addressed in the World Intellectual Property Organization and perhaps the World Trade Organization. Concerns for criminal use of the Internet may be taken up in organizations such as Interpol among others. Many of the concerns may be addressed domestically but because of its global nature and relative insensitivity to national boundaries, resolving these issues may require cooperation among governments or non-governmental but international organizations for their solution.

There is a vast range of policy issues concerning which ICANN has no charter. To facilitate the use of the Internet for global electronic commerce, it would be beneficial to develop international procedures for the use of digital signatures, mechanisms to resolve disputes associated with international electronic transactions, treatment of various transaction taxes in an international setting and the protection of intellectual property held in digital formats and distributed globally through the Internet medium. These are not new problems; rather, they are old problems emerging in a new medium.

It has been suggested by some participants in the WSIS discussions that the role of ICANN might be undertaken by the traditional International Telecommunications Union (ITU). While the ITU has served the world as the international forum for the handling of many international issues associated with traditional tele-communications, the Internet has disrupted the neat categorization of various telecommunications media. It is the potential bearer of every form of communication. ICANN has evolved international processes and structures over the last six years to cope with a limited set of issues associated with this rich, complex and rapidly evolving infrastructure. The world needs an effective and well-supported ICANN but the participants in the World Summit on the Information Society and the Working Group on Internet Governance now need to turn their attention to the full panoply of public policy issues that, as discussed above, lie outside the mandate of ICANN. These need a thorough and open airing in this next phase of the World Summit on the Information Society.