

## Governance of the Internet: the tasks ahead

Vint Cerf  
Chairman, ICANN

October 30, 2006  
Internet Governance Forum  
Athens, Greece

Prime Minister Karamanlis, Minister Liapis, Chairman Desai, Secretary-General Utsumi, Minister Kamel, Commissioner Reding, Secretary-General Sebban, Executive Director Primo, my good friend and colleague, Robert Kahn, distinguished attendees and guests, ladies and gentlemen, it is an honor to have this opportunity to address you and to participate in this first convening of the Internet Governance Forum.

In the 33 years since the concept of the Internet first took shape, it has become a global infrastructure of increasing value in many dimensions. Its ability to absorb new technologies and to support an increasing variety of applications are indicators of the power of its simple, clear and well-defined technical specifications and openly accessible capabilities at all layers of its architecture. We have reached this stage as a consequence of the voluntary cooperation and coordination of literally hundreds of millions of participants: users, service providers, standards developers, application software programmers, operating system vendors, and a host of others. The influx of information on the Internet with the advent of the World Wide Web has fired our imagination and given substance to the possibility that all of the world's knowledge may someday be accessible to every person on this planet, and perhaps others, with the touch of a fingertip or the utterance of a few well-chosen words.

During the World Summit on the Information Society we learned from one another that there was still a great deal of work to be done to realize such a dream. There are only an estimated one billion users on the Internet today. That number might actually be larger if one considers that some of the 2.5 billion mobiles in use are also Internet-enabled and may be the sole means of accessing the Internet for some of the user population. We still have to provide several billion more users with access, preferably at the highest speeds technically feasible and affordable.

Moreover, as the general public has become the dominant base of users on the Internet, we are finding that there are some who abuse this medium, as other media have been abused. One can find fraud, harassment, illegal copying, material unsuited to children, content that is rejected in civilized societies, and a range of other troubling behaviors intermingled with the massive amount of

useful content and services on the net. Nor are these matters simply confined to national boundaries. The Internet is a global system designed to allow everyone to interact with everyone else, and many of the problem behaviors are international in scope. These concerns will need to be addressed at local, national and international levels and will call for cooperative technical, political and legal efforts for their solution. The Internet Governance Forum is the latest in the potential forums in which many of these issues can be addressed and directional concepts shared.

On the more positive side, the Internet is already the largest, distributed collection of historical and current information ever in existence. It is becoming a major facilitator of global commerce, an innovative source of education and entertainment, and a powerful conduit for collaborative and coordinated personal, enterprise and governmental activities. Putting into place legal and technical frameworks that enhance the effectiveness of these capabilities in a global setting will further increase the value of the Internet investments made thus far and to be made in the future.

Already a variety of organizations already at work helping to standardize or coordinate some of the efforts needed, often at the technical level, such as the Internet Architecture Board (IAB) and Internet Engineering Task Force (IETF), the World Wide Web Consortium (W3C), the Internet Corporation for Assigned Names and Numbers (ICANN) and the International Telecommunications Union (ITU). Other organizations are contributing towards deeper understanding of the cultural and practical implications of this global and growing network such as the Internet Society (ISOC), the World Intellectual Property Organization (WIPO), the United Nations Educational, Scientific and Cultural Organization (UNESCO), among many others. The Internet Governance Forum can serve as a platform for identification of important Internet-related issues and which potential organizations already equipped to deal with them.

As increasing amounts of information find their ways into the Internet's archives, it is vital that we preserve their accessibility, renderability and interpretability. Digital documents often need to be interpreted by specific software packages to be rendered in understandable form. We will need to assure that the bits we preserve on digital media can also be read and understood not only by people but by computers programmed to help us manage this ocean of information. Steps are needed to assure that the information we accumulate today will be usable not merely decades but centuries and even millennia into the future. We need to preserve access to application software, operating systems and perhaps even hardware or simulators so as to retain the ability to make effective use of our digital archives.

It is equally important that we preserve the global interoperability of the Internet even as we strive to make it more inclusive of all the world's languages. Already, UNICODE is helping us to record and present information in many of the world's

languages on web pages and in massive databases. There is a strong interest in the existing and nascent Internet community to have the ability to register domain names written in the characters used in their preferred languages and therein lies a huge technical challenge. Such domain names are sometimes called "International Domain Names" or IDNs for short.

One of the most important aspects of the Internet is the ability for every user to make unambiguous references to every registered domain name. Historically, this global feature has been achieved in part by restricting host domain names to be expressed in a small subset of the Latin characters A-Z, the digits 0-9 and the hyphen "-". It is well understood that this will not suffice for users whose native languages use characters other than these. At the same time, it is vital to preserve the global ability to refer to and use every domain name. This global interoperability needs to be preserved especially as new languages are supported by the UNICODE system through the addition of new characters needed to express them.

It is utterly critical to appreciate that domain names are NOT general natural language expressions. They are simply identifiers that help users uniquely reference information in the Internet using strings of characters grouped into a sequence of labels that make up domain names. They must be unique, and names registered today must continue to work into the distant future, no matter what new characters are added to UNICODE to support the expression of additional written languages. To assure this stability and global interoperability, it is necessary to permit only a carefully chosen subset of all possible characters in UNICODE to be used in domain names. Work in this area will be discussed in other sessions during this Internet Governance Forum so I will simply underscore here that the work is technically challenging and will require extraordinary expertise.

It is understandable that proponents of IDNs are eager to make progress. ICANN is already conducting tests to determine the readiness of the root zone file and its associated root servers and resolvers to house or work with internationalized top level domains. Adding IDNs at all levels in the domain names system potentially affects every application that makes use of domain names. The mechanisms of the domain name system make demands on the normalization and matching of domain name strings that far exceed the simpler requirement that natural language strings be renderable using UNICODE. A misstep in the specifications of the IDN rules could easily and permanently break the Internet into non-interoperable components. New work in the Internet Engineering Task Force and in the ICANN committee on IDNs, among others, is pointing the way towards specific solutions.

Much work is still to be done to assure the stability and security of the Internet's addressing and routing system, to expand the address space from the present maximum of 4.3 billion addresses (IPv4) to 340 trillion trillion addresses

(IPv6). The potential scale of such a network brings with it huge challenges associated with the management and efficiency of the Internet's low level routing tables. Accurate and verifiable records of IP address assignments are increasingly important in assuring stability of this vital part of the Internet's technical design. We have much work to do to improve resistance of the network and its attached computers to a wide range of denial of service or other attacks. The incorporation of signed domain name zone files is but one of the many efforts underway to increase the ability of the Internet and its components to resist attacks by would-be disruptors.

In addition to these technical challenges, we need to join together to identify the non-technical but equally important operational frameworks in which the Internet's resources can best be deployed and applied. The openness of the Internet, the ability of its users to invent and test new applications, the freedom of virtually any computer on the network to interact with any other, within the limits of safety and resistance to abuse, have all contributed to its vitality and innovative character.

Despite its operational existence since 1983, the Internet's application space has barely been explored. There seem to be an endless array of potential ideas left to be considered, limited only by the imagination and our ability to produce the necessary software to make these ideas real. Together with my colleagues at ICANN and elsewhere, I am personally dedicated to helping to realize the potential of this remarkable system. I hope that all who gather in this forum will share this same desire and will work together to achieve for ourselves and those who come after us a stable, secure, global, evolving and richly functional Internet.