"The End-End Principle and the Definition of Internet"
Preparatory Process: Working Group on Internet Governance (WGIG)
Contribution of Corporation for National Research Initiatives
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Key to an understanding of "Internet governance" is a grasp of the nature and scope of the Internet itself. There have been many exchanges of views over the last year on the metes and bounds of Internet governance, most recently, in the course of the Consultations on the Establishment of a Working Group on Internet Governance (WGIG) held at Geneva from 20-21 September 2004, but little attention has been paid to what it means to be the "Internet." On that occasion, the concept of "end-to-end" was mentioned briefly; however, since the Consultations were focused for the most part on the composition and structure of the Working Group, CNRI preferred to submit its comments on this matter after the consultative meeting in Geneva.

Most of the preparatory work to date leading up to the WSIS 2nd phase, assumes that there is a common understanding of what is meant by the Internet; however, from the general tenor of the approaches suggested at Geneva and other occasions, there does not appear to be a clear consensus on this matter. This has serious implications for the outcome of the WGIG, as well as the success of the World Summit on the Information Society when it meets a second and final time in Tunis in November 2005.

Why is a definition of "Internet" important? There are many activities that may be governed by such a concept. Since the principal focus of the WSIS is a wide and ambitious development agenda, it seems clear that an understanding of "Internet" should not be tethered only to a physical infrastructure. This limitation would serve to harness the Internet in ways that may not allow users or service providers to take advantage of this dynamic and rapidly growing information system to provide, for example, educational, medical and other social and economic services.   Provision of telecommunications capabilities, such as cable and satellite connectivity, frequency allocations, and acquisition of computer and related facilities, are clearly anticipated by the effort to date, described generally in the Declaration of Principles and Plan of Action adopted by the WSIS 1st phase; but it is also important to recognize that the Internet is a global information system that, while operating in a physical environment, may also be

viewed as a logical construct that is separate and distinct from the physical elements of the infrastructure.

An understanding of what is meant by the "Internet" is reflected in an important definition that was adopted on October 24, 1995, by the U.S. Federal Networking Council (FNC) in consultation with leaders drawn from the Internet and intellectual property rights communities (http://www.hpcc.gov/fnc/Internet_res.html).[1] Since that time, the technology has advanced to the point where a slight modification of this definition would appear advisable to allow for flexibility by carriers, as well as other service providers, in making choices about the future operation of the Internet. Specifically, in the third paragraph of the definition, after the phrase "high level services layered on," it is advisable to add the following words: "or integrated with." This point is directly relevant to the ongoing discussions about the so-called "end-to-end" principle that is often viewed as essential to an understanding of the Internet. This situation was dictated by the environment from which the Internet originally evolved, but has not been as critical for a number of years going back to at least to the early work on mobile programs, distributed searching, and certain aspects of collaborative computing.

To argue today that the only stateful elements that may be active in the Internet environment should be located at the edges of the Internet is to ignore the evolution of software and other technologies to provide a host of services throughout the Internet. The layering approach has many advantages and should be retained along with more integrated system architectures; the approach was a practical way of overlaying the Internet architecture over existing networks when its was difficult to coordinate the modification of those networks, if indeed such modifications could have been agreed

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[1] **FNC Resolution (10/24/95)**
"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."

upon and implemented. For some newer applications, maintaining state information within the network may now be desirable for efficiency if not overall performance effectiveness. In addition, current research efforts may need to draw upon innovative methods to increase security of communications, develop new forms of structuring data, create and deploy dynamic metadata repositories, or real-time authentication of the information itself.

The technology needed to enable these services may be of a more dynamic nature than the early practice of viewing the communications pathways as simply transport and distribution mechanisms. For example, a mobile program operating environment, such as the one based on Knowbot technology being developed by the Corporation for National Research Initiatives (CNRI),[2] may be viewed either as an internal network capability or as an edge technology. For some applications, one choice or the other may be better suited to the task at hand. In most cases, this choice is best made by the applications developer, who would have to secure the cooperation of the underlying network provider(s). Although some network providers may elect to play no role in such applications, for reasons that may include performance risks, legal issues (including any potential liabilities), and possible undesired internal effects on their network, others may have a different point of view. For example, if the carrier were a party to the design and implementation of the application, and their internal exposure was known to them beforehand, they may find this an opportunity space worth considering.

 Mobile programs do not operate in a static environment, but are capable of moving in the Internet environment to fulfill queries received from users, including from other programs, and to integrate information received with other communications in order to provide a reply.

Again, it may be asked, why this nuance is important. Instead of trying to "fix" the Internet at a moment in time with a definition that does not anticipate the integration of certain advanced and/or rapidly evolving technologies, a better approach would seem

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[2] Information about the CNRI Knowbot program initiative may be found at:
http://www.cnri.reston.va.us/home/koe/index.html

to be to broaden the definition as proposed herein so as to recognize the need for flexibility in implementation for the future.