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Special Issue on Internetworking
Guest Editor's Introduction

The Internet continues to grow. As of the writing of this introduction (January 1994), the Internet consists of over 23000 networks, with one new network being added to the system approximately every ten minutes. Other measures of growth provide similar statistics. Best estimates of the number of computers on the Internet are approximately ???. Over ??? people can be reached by electronic mail and have access to resources via the Internet.

NOTE: replace ??? with current figures at time of final submission

Initially a technology designed primarily to respond to the needs of the US military, the Internet experiment grew to first serve the academic and research communities. More recently, there has been tremendous expansion of the network both internationally and into the commercial user domain. Projections indicate that by the time you read this, the number of non-US networks will exceed those of the US. The commercial domain now makes up more than ??? percent of the connected networks, and represents the largest rate of growth. As the Internet based on the TCP/IP technology continues to grow, so does the larger global Internet (i.e. the set of networks using multiple network technologies that can intercommunicate.) The TCP/IP Internet has provided a glue for this larger infrastructure.

Equally impressive are the changes in public perception. It wasn't very long ago that the Internet, if perceived at all, was viewed as a specialized network serving the academic and research community. In the early 1990's (up to last year), the public began to take notice of the Internet, with many articles discussing this new networking capability and its potential ramifications. In the past year, there has been an interesting shift. Rather than articles discussing the Internet, we now see the Internet referred to in passing as the standard computer communications infrastructure. For example, we see casual references that say "you may send messages to joe@computer.com", putting Internet communications roughly on a par with telephone, fax, and postal mail as a normal communication mechanism. We see such statements in notices from such wide-ranging organizations as the *San Jose Mercury News* and *Time* magazine to National Public Radio to national television to the US White House (e.g. President@whitehouse.gov). For example, during NBC's special series on violence during January, viewers were told to provide input by several means, including messages to "violence@nbc.ge.com". This apparently resulted in messages at a rate of 3-4 per minute. Regular mention is made in the media of the use of the Internet for humanitarian purposes (e.g., obtaining information about loved ones during the recent Los Angeles earthquake.) Information of broad interest (e.g. Securities and Exchange Commission filings) is accessible via the Internet. The active discussion in the US regarding the national information infrastructure is centered around how to use the Internet technology to achieve such goals.

To capture the spirit of this evolution, this issue consists of papers based on the International Networking Conference (INET '93) held in San Francisco in August. Attended by approximately 860 people from 91 countries, it covered a wide variety of topics ranging from underlying network technology through to how users in various communities and regions were exploiting the technology to serve their constituencies. Papers were presented by authors from 30 countries, organized into six tracks as shown in the table. In addition, a training workshop was held the week prior to the actual conference, attended by about 130 participants from 67 countries and 3 international

Track	*Organizers*
Network Technology	Christian Huitema Phill Gross
Network Engineering	Elise Gerich Francois Fluckiger
Application Technology	Eric Hood John Hine
User Applications	Laura Breeden Rolf Nordhagen
Policy Issues	Haruhisa Ishida Steven Goldstein
Regional Issues	Richard Mandelbaum Tomaz Kalin

organizations. The training consisted of intensive, hands-on practice building and interconnecting laboratory networks and using services on the net. While this activity did not directly contribute to the published results of the conference, it underlines community efforts to ensure that the Internet will soon become genuinely a world-wide network with international connectivity.

The papers in this issue were derived from the presentations at INET '93, revised and updated to better match the CACM readership. Papers were selected to capture both the technical quality of the presentations as well as the technical breadth of topics discussed.

The first two papers discuss some of the issues associated with the Internet's rapid growth. Braun, Polyzos, and Claffy discuss the difficulties in making measurements of network statistics for the purpose of projecting growth, both in size and traffic quantity. Growth in the Internet is straining both the address space and the capabilities of the routers. Eidnes discusses some of the practical aspects of using a proposed near-term solution to these problems.

The next three papers discuss some of the extensions being explored in the Internet to provide new functionality. The paper by Eriksson discusses the multicast infrastructure being used to support audio and video conferencing and broadcast. Moy discusses the enhancements to routing protocols required to support multicast. Uehara *et al* discusses a proposed method for handling mobile computers transparently to the user.

One exciting development over the last few years has been the rapid emergence of powerful information tools, ones that permit access and retrieval to a wide variety of information distibuted over the Internet as well as supporting user collaboration. Berners-Lee discusses one of these developments - the World Wide Web. Ishii explores future applications of real-time collaboration technology appropriate to the era of broadband networks. Schwartz discusses some of the research problems involved in finding resources widely distributed on the Internet.

Last, but certainly not least, many of the exciting developments are taking place within specific user communities. One of those critical to the operation of the network itself is the community that coordinates responses to threats to the network. Fithen and Fraser present how that community uses the network to respond to this requirement.

The papers in this issue are a small portion of the excellent papers presented at the conference. Essentially all (83 of 89) of the papers presented are available in the Proceedings, which can be obtained either in hard copy or online from the Internet Society (online by *ftp* to cnri.reston.va.us or *gopher* to Internet Society). The online papers are in PostScript form and are identical to those printed in the hard copy Proceedings, thereby maintaining the quality of the presentation.

In conclusion, I would like to thank the track leaders mentioned above as well William Yundt (my program co-chair), the organizing committee of INET '93 and its chairman, Eric Benhamou. The high quality of the papers and conference was due to their effort and dedication.

SIDEBAR:

With the tremendous growth in the Internet has come an explosion of acronyms. To assist the reader, we provide a few that are common throughout the Internet.

Some Common Internet Acronyms	
CLNP	Connectionless-mode Network Protocol - ISO/OSI developed protocol
FTP	File Transfer Protocol, an IPS application protocol
IAB	Internet Architecture Board, responsible for focussing architectural directions and discussions
IESG	Internet Engineering Steering Group, the steering group of the IETF
IETF	Internet Engineering Task Force, an international organization responsible for develop and evolution of the Internet standards
IP	Internet Protocol - linch pin of the IPS. provides connectionless routing and addressing
IPS	Internet Protocol Suite, a common way of referring to the layered protocol suite that uses the Internet Protocol but includes many other protocols as well, such as application protocols
ISO	International Organization for Standardization
ISOC	Internet Society, a professional society aimed at the success and evolution of the Internet
MBONE	Multicast Backbone, a virtual network over the Internet providing multicast support.
NSFNet	A major backbone network in the US, funded by the National Science Foundation
OSI	Open Systems Interconnection - a framework and set of protocols for networking developed by ISO
RFC	Request for Comment, online publications of standards and information documents related to the Internet
TCP	Transmission Control Protocol - transport level reliable protocol
TCP/IP Protocol Suite	Another way of referring to the Internet Protocol Suite