

Guest Editorial

Computer Communications—An Emerging Discipline



Guest Editor: Raymond L. Pickholtz

PROGRESS AT THE FRONT

IT IS now almost five years since this *TRANSACTIONS* (vol. COM-20, no. 3, June 1972) dedicated an entire issue to computer communications. Since that time there have been innumerable conferences, symposia, published papers, and books on the subject. In addition, many new private commercial and experimental computer communication networks have been built and have become operational. Furthermore, we have witnessed the emergence of operational specialized common-carrier networks using packet switching and which have incorporated "value-added" features specifically for computer communications. Noteworthy among these particular common carrier networks is Telenet in the U.S., Datapac in Canada, the European Informatics Network, and a similar network underway in Japan. The traditional common carriers and other specialized carriers have meanwhile made significant strides in establishing highly reliable digital communication facilities for both voice and data.

The new technologies have matured significantly and promise materially to affect not only computer communications, but all telecommunications in a profound way. These new technologies include digital satellites, optical fiber waveguide, microprocessors, digital switching, and the uses of the upper end of the microwave band.

FOCUS ON THE ISSUES: NETWORK AND SUBNETWORK

The major problems in computer communications have been expressed often. They include topological network optimization for cost, delay, and throughput, routing techniques, flow control, queueing problems, the design of efficient protocols and to establish that they are effective, interfacing the network with a variety of terminals, computers, and other networks. Frequently these problems transcend the pure communications problem, i.e., that of insuring the reliable flow of information from source to destination. Indeed, people working in computer networking frequently distinguish between the computer-communications network and the communications subnet. The former includes the latter plus the

terminals, devices, and computer intercommunication via the subnet. This logically includes the resident processes that control or interface with the subnet. The higher level protocol functions, for example, are included.

The problems identified with the communications subnet, as difficult as they are, are at least relatively well defined and lend themselves to modeling and analysis. And while we are far from any complete understanding of the issues here, we are beginning to see some considerable progress in quantifying many of the individual problems in subnet design and optimization. In short, this part of the subject is emerging as an identifiable discipline, and it is mainly the subnet problems that have found expression in the papers following. (The one possible exception is the paper on system network architecture (SNA) by J. P. Gray). The absence of a meaningful balance of papers dealing with the overall network is certainly not a product of any policy of the Editorial Committee. On the contrary, the call for papers specifically encouraged such papers. Of the 40-odd papers submitted, the majority were excellent as measured by the independent review process, but many of those we would classify as overall network papers did not pass muster for the archival character we have come to expect of *TRANSACTIONS* papers. This may say something about our in-grown biases, in the Communications Society, in favor of "analytical" results. I also believe that it says something about the immaturity of development of certain aspects of computer communications as a scientific discipline. This is not to say that important work is not done for those parts of the subject which have not yielded to quantification. To paraphrase my predecessor in the June 1972 Special Issue, it must be conceded that analytically undescribed systems can be made to work. In fact, most of them do work quite well.

THIS ISSUE OF THE TRANSACTIONS

The table of contents reveals that this issue has an emphasis on analytical methods for network modeling and design. There are two invited papers: one a rather comprehensive treatment of queueing models, and the other on large-scale network optimization. The first four regular papers deal with diverse aspects of network design. The next four papers deal with various aspects of protocols, routing, and the overall network. The last seven papers deal rather extensively with the use of satellite and radio media as an integral part of the data communications subnet. Finally, we have a Book Reviews section dealing with the representative published works on the subject.

It is my pleasure to thank the authors, the Associate Editors, the reviewers, and the Technical Committee on Computer Communication (which constituted the Editorial Board for this special issue) for their work in making this special issue a reality.

Raymond L. Pickholtz
Guest Editor