Preface

This issue is the second of a two-part set commemorating the twenty-fifth anniversary of the *IBM Systems Journal.* The papers in this issue continue the theme of *architecture* and reflect work from a variety of hardware, software, and communications disciplines.

The systems architect may currently design a system by selecting from a rich variety of functionally attractive—and sometimes competing—building blocks. Large systems continue to provide the most advanced function while retaining economies of operation and management. Desktop personal computers can provide highly responsive and attractive user interfaces, and meet an increasing number of user application requirements by themselves. Intermediate systems can nicely service the collective needs of work groups by providing processing based on a combination of dedicated function, organizational affinities, and geographical clustering. Virtually all of these configurations will require a large contribution from communications to connect shared processors and peripherals into a coherent local and organizational solution. The papers by Scherr, Sundstrom, and Green discuss aspects of systems design and communications that assist in formulating these solutions.

Scherr provides a fresh look at the fundamental design considerations for structuring a network of systems. He examines system trends and trade-offs among the key parameters of performance, cost, control, integrity, and availability. Guidelines are provided to assist in determining the optimal placement of data and processing in future networks of systems.

Network architectures provide the conduit for the flow of information between workstations, processing, data storage, and printing systems. New user requirements and new technologies have altered the rules for creating these architectures. It has become increasingly important to ensure that network architectures provide strong network management and ready support for the interconnection of products from different system families and vendors. The paper by Sundstrom et al. is a revealing look at current requirements and directions for *Systems Network Architecture.* The authors outline the history of SNA and describe the evolution of the architecture so as to address the needs of a diversity of networks and provide advanced services and high availability. These needs include developments related to very large networks and networks of small systems, peer-to-peer connections, in-office capabilities, local-area networks, and network interconnection.

Looking at future network technologies, the paper by Green and Godard reviews research in the implementation of integrated voice and data transmission for *wide-area integrated private networks.* The authors examine work at the transport and switching level, including two promising approaches: fast packet switching and hybrid switching. These technologies offer possibilities for reducing total network costs, providing higher levels of service, and facilitating the introduction of new services.

There is little doubt that economical performance of numerous assembly and other repetitive-motion tasks will come to depend on the effective introduction of *robotics.* Although most of these applications will be found in manufacturing, others will be found in areas not far removed from the domain of traditional data processing. An example of the latter is that of picking and packing customer orders in a warehouse. The paper by Korein and Ish-Shalom serves as a tutorial on robotics. At the same time it discusses many advanced technological considerations and methodologies. Potential applications for robotics abound, and the authors offer an insight into some of the many exciting and innovative uses of these technologies. Many references are listed as a guide to further reading.

Software systems for database management have been subject to contending forces. Traditional approaches have evolved and have been highly refined in successive generations of data management tools. On the other hand, the technologies of workstations and networks, as well as the dual requirements for twenty-four-hour operation and very high availability, have made it necessary for different and innovative approaches to be taken. Selinger presents in her paper a very readable discussion of the history, current issues, and future directions of *database technology*. She covers anticipated changes stemming from developments in hardware, user requirements, and distributed access, including a discussion on usability, fault tolerance, and portability.

Meeting specialized requirements with an architecture provides benefits that must be weighed against the cost of the complexity of the solution. Computer designers at IBM Research believe that performance improvements can be gained by adopting a simpler instruction set than is incorporated in most modern computers and can be implemented in hardware without the need for microcode. The result has become known as the *Reduced Instruction Set Computer* (RISC) and has been incorporated in the IBM RT Personal Computer product. In his paper Hopkins chronicles the background and evolution of this research project and provides a thorough discussion of the technical observations and resulting designs that have made RISC architecture successful.

The paper by Goldstein and Jaffe examines protocol design and communication systems design, including suitability for particular machine and transmission environments. The authors discuss the value and role of protocol standards and the need to design for multiple implementations; in particular, they discuss network control protocols and flow control protocols.

In recent years there has been significant growth within the IBM technical community in the use of large network-linked shared data bases containing narrative information and executable programs. These files can be freely browsed; notes may be appended; and new files may be created. Powerful capabilities exist to accomplish tasks ranging from listing available files, through being informed automatically when particular files are updated, to semi-automatically transferring executable programs to other systems and workstations. The paper by Chess and Cowlishaw describes this *large-scale computer conferencing system* from conceptual and working software points of view.

Applications for computer-mediated communications and for the facilities described by Chess and Cowlishaw seem almost unlimited. For example, the authors were able to receive constructive feedback on a draft of the paper itself by making it available for reading on the network. The *Systems Journal* staff is now using the TOOLS facility described in the paper to interact with IBM authors, to discuss topics of interest, and accept employee subscription requests.

The editors and staff of the *IBM Systems Journal* hope that you find our two-part anniversary issue to be interesting and informative.

We have received many fine suggestions from our readers on topics that are of particular interest to them for future issues of the *Journal*. We welcome manuscript submissions from outside authors as well as IBM employees. Should you wish to submit a paper, please contact the *Journal* staff for a copy of our *Information for Authors*. Submissions are refereed prior to publication.

Gary Gershon
Editor