

## Preface

Virtual Machine Facility/370 (VM/370), a time-sharing system that supports several virtual machines running concurrently on one real machine, was announced in 1972. Since then, functional and performance enhancements have altered and expanded the virtual machine environment. The intent of this issue of the Systems Journal is to present aspects of VM/370 as it is perceived and used today.

The first paper provides an overview of VM/370 usage and development. Subsequent papers discuss implementations of VM/370 designed to enhance its execution and extend its applicability, particularly in terms of intervirtual machine communication. The last two papers discuss the management and measurement of VM/370 environments.

The VM/370 overview, by Seawright and MacKinnon, discusses some of the computing environments in which virtual machine concepts are used, and it introduces new developments in VM/370 which are covered more fully in other papers. A detailed discussion of one of the major elements of VM/370, the control program (CP), is presented in an appendix, and a bibliography is provided for the reader wishing more background information.

Emphasis on improving capability and performance has resulted in new hardware and software implementations of VM/370. The second paper, by MacKinnon, discusses the operation of microcode assists and software interfaces to VM/370 and their effect on performance. Another paper, by Holley, Parmelee, Salisbury, and Saul, covers the design rationale and performance characteristics of the attached-processor support in VM/370.

Communications has played an increasingly important role in computing. The need for an effective means of communicating among virtual machines, isolated from each other by design, has resulted in the development of the Virtual Machine Communication Facility, an integral part of VM/370 Release 3. Jensen discusses the design and application of this facility in his paper. Another approach to communication is explored by Attanasio in the paper on his research project, Virtual Control Storage.

The development of virtual machine subsystems as a method of telecommunications support in a VM system is the subject of the paper by Hendricks and Hartmann. This paper includes networking aspects and discusses the development and operation of the IBM network.

Experience gained from the interactive user environment at the Thomas J. Watson Research Center forms the basis for the final two papers. In their paper, Kelisky and Doherty present management considerations and actions required for the effective operation of such an environment. The paper by Tetzlaff covers user performance measurement techniques. While both papers deal specifically with VM/370, the approaches used and conclusions drawn have wide applicability.

Both authors and the Journal staff used VM/370 in the preparation of this issue. Papers were created and edited in an interactive environment using text-processing programs available with VM/370. Also, with the IBM network available as an electronic mail system, papers were expeditiously transmitted back and forth among authors, reviewers, and editors.

An issue on VM/370 can only sample the activity in this area. Years of research and development by many people, both within and outside IBM, have laid the foundation for software systems like VM/370. As illustrated with this issue, much work continues today. It is impossible to recognize each individual contribution, but the bibliographies and references cited in this issue should enable the interested reader to gain a historical perspective of virtual machine development as well as a better understanding of current activity.

Special efforts are required to plan, organize and publish a topical issue, and I extend my thanks to all who contributed to this task. I especially wish to recognize Henry Gladney of the IBM San Jose Research Laboratory, who originally proposed the idea to me, and Richard MacKinnon of the IBM Cambridge Scientific Center, who has been continuously and actively involved in the development of this issue.

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Editor