Foreword

LOCAL Area Networks (LAN's) have been one of the major technical advancements in the computing field in recent times. The ability to connect various computer systems and exchange information between them at high speed has given rise to new ways of resource sharing. However, to fully exploit the potential of LAN's, application and system software needs to be developed.

This special section addresses the issue of software development in a local area network. In the paper "Local Area Networks: Software and Related Issues" by Tripathi, Huang, and Jajodia, various components of LAN's are introduced and issues related to software are discussed. Operating systems and application software needs are outlined. This paper also presents a review of the topics relating to LAN's that are not covered in the rest of the papers.

Heterogeneity in hardware and software is natural in most local area network based systems. Many computers from different vendors running different software is a common phenomenon. Remote Procedure Calls (RPC) provide a mechanism to share resources in a distributed system. In the paper "A Remote Procedure Call Facility for Interconnecting Heterogeneous Computer Systems" by Bershad, Ching, Lazowska, Sanislo, and Schwartz, an RPC facility for heterogeneous computer systems is described. The paper develops techniques to emulate existing RPC facilities in the individual systems by providing appropriate black boxes: allowing systems to communicate without modifying them. An implementation and an evaluation of Heterogenous RPC (HRPC) is also described in the paper.

The service-request model provides a good framework for resource sharing in a LAN. Summers, in the paper "A Resource Sharing System for Personal Computers in a LAN: Concepts, Design, and Experience," considers such a model in which a virtual circuit between the client and the server is maintained for the duration of the request. The user either invokes the services directly or runs a program that invokes the service. The author presents the design and details of the prototype implementation of a system, RM, which consists of a network of PC's running DOS. RM resides in each of the PC's in the network and allows a PC on the LAN to offer and use services, which can be either user-written or off-the-shelf applications.

In the paper "Location Independent Remote Execution in NEST," Agrawal and Ezzat consider a homogeneous network of autonomous, cooperating, personal computer workstations and shared servers running the UNIX® operating system. The authors augment the operating system with location independent remote execution capability. The processes preserve their view of the file system, parent-child relationships, and process groups in a transparent way. An implementation of remote execution capability, along with performance and reliability results about the system, are described in the paper. A scheme, which allows processors to advertise themselves as being available to a group of nodes or to all of the nodes and withdraw as a compute server in a distributed manner, is presented. This scheme is also useful for load sharing.

Neher, Haban, Mattern, Wybraniez, and Rombach present an overview of the project INCAS at the University of Kaiserslautern in their paper "Key Concepts of the INCAS Multicomputer Project." The distributed system is based on ten MC68000-based four-processor nodes interconnected by a logical communication ring. The project puts its emphasis on structuring aspects and design methodologies. The authors argue that the application layer and the operating system layer of distributed systems have different requirements and are implemented in two different languages. The operating system is designed in LADY and the applications are developed in CSSA. The paper presents details of prototype implementation.

High speed local area networks offer the possibility of integrating various services such as data, video, voice, and facsimile. A class of demand-assigned multiple-access (DAMA) protocols have been proposed for this class of LAN's. An analysis of the time-dependent interaction among various traffic classes and their requirements is needed for a correct implementation of DAMA. In the paper "Modeling and Verification of Real-Time Protocols for Broadcast Networks," Jain and Lam present a formal model for broadcast LAN's, and a methodology based on the model for verifying DAMA protocols. The model provides facility to represent broadcast channels and specifications and analysis of real-time properties of protocols.

In distributed hard real-time systems, tasks performed are time constrained. This imposes explicit time constraints such as deadline on the message transmission in the network. The CSMA (Carrier-Sense Multiple-Access) protocol is not suitable for such applications and Virtual Time CSMA has been proposed for such systems. In the paper "Virtual Time CSMA Protocols for Hard Real-Time Communication," Zhao and Ramamritham propose two new Virtual Time CSMA protocols and compare their performance with the existing Virtual Time CSMA protocols. Implementation of the proposed protocols requires clock synchronization at various nodes; however, protocols will continue to function even if the clocks are not perfectly synchronized.

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Sushil Jajodia
Satish K. Tripathi
Guest Editors

Sushil Jajodia received the Ph.D. degree from the University of Oregon, Eugene.

He is head of the Database Management and Distributed Systems Section in the Computer Science and Systems Branch of the Information Technology Division at the Naval Research Laboratory, Washington, DC. Before that he was a tenured Associate Professor of Computer Science at the University of Missouri—Columbia. He has published over 35 research articles in refereed journals and conference proceedings and is a co-editor of the book Entity-Relationship Approach to Software Engineering (Amsterdam, The Netherlands: North-Holland, 1983). His current research interests include database management systems, distributed systems, and parallel computing.

Dr. Jajodia has served in different capacities for various journals and conferences. He is currently serving as the Chairperson of the IEEE Computer Society Technical Committee on Database Engineering and also as Program Co-Chairperson for the 4th IEEE International Conference on Data Engineering which will be held February 2–4, 1988 in Los Angeles. He is a member of the IEEE Computer Society and the Association for Computing Machinery.

Satish K. Tripathi (M’86–SM’86) was born in Faizabad, India, on January 20, 1951. He attended Banaras Hindu University, the Indian Statistical Institute, the University of Alberta, and the University of Toronto. He received the Ph.D. degree in computer science from the University of Toronto, Toronto, Ont., Canada, in 1979.

In 1978 he joined the computer science faculty of the University of Maryland, College Park, where he is currently an Associate Professor. He also holds a half-time appointment in the newly created Institute for Advanced Computer Studies. During the 1984–1985 academic year he was a Visiting Professor at the University of Paris-Sud and the University of Erlangen—Nuremberg. He has published a large number of articles on subjects of workload analysis, benchmarking, queueing network modeling, performance evaluations of specific systems, local area networks, performance modeling tools, and computer architecture. He has served on many program committees of international conferences. He is a co-editor of the book PERFORMANCE ’83, published by North-Holland.

Dr. Tripathi is a member of the Association for Computing Machinery.