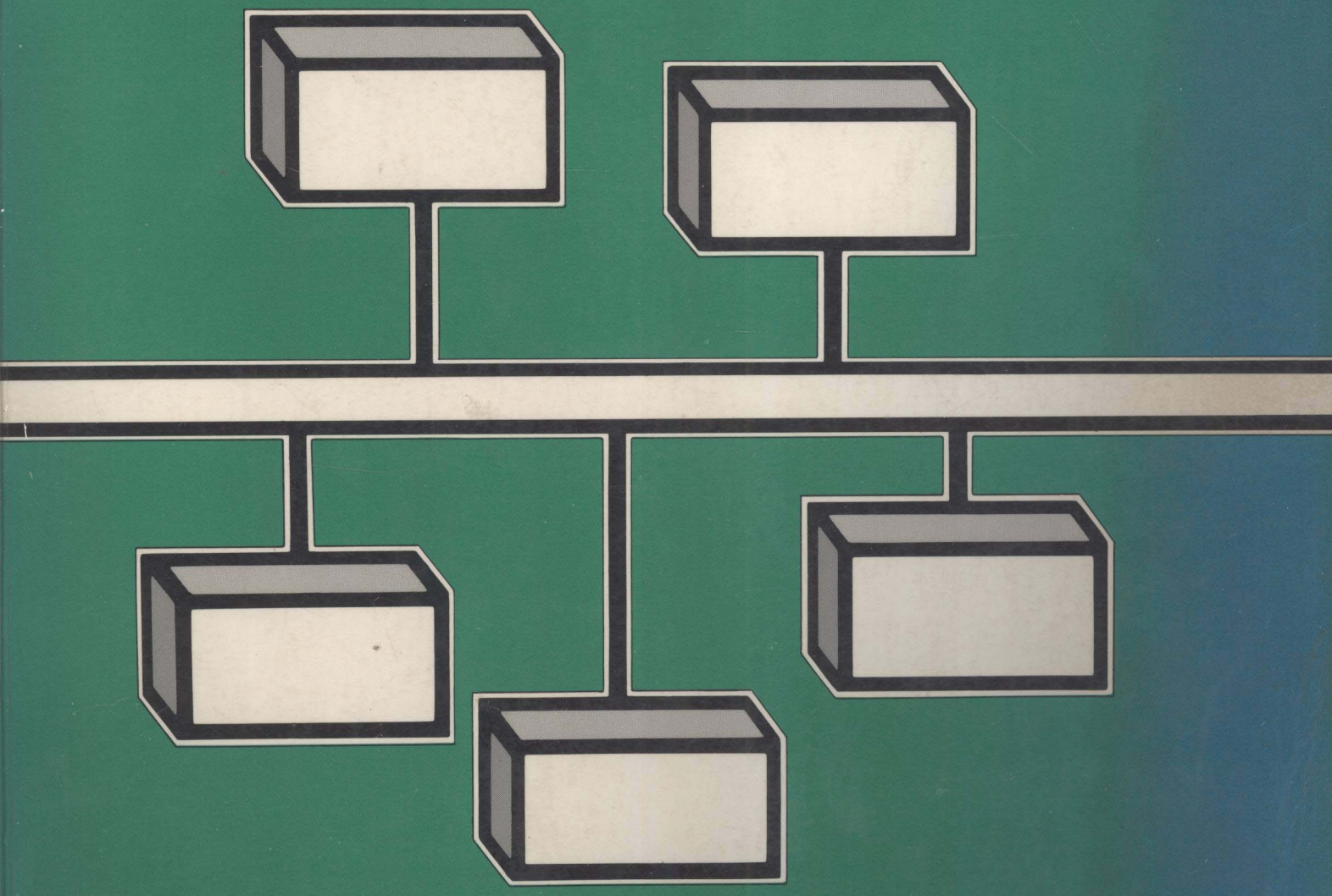
LOCAL NET 84



ıe Proceedings of the conference held in San Diego USA October 1984

LOCAL NET 84

The Proceedings of the conference held in San Diego USA October 1984

British Library Cataloguing in Publication Data

Localnet '84.
1. Computer networks
I. Online Conferences
001.64'404 TK5105.5

ISBN 0-86353-016-8

Online Publications
Pinner Green House, Ash Hill Drive, Pinner, Middlesex HA5 2AE, UK.
Suite 1190, 2 Penn Plaza, New York, NY 10121, USA.

Introduction

The 12 months since Localnet '83 has seen an explosive growth in local networking. With demand for efficient internal office communications systems increasing dramatically, local networks are proving to be the solution to many real-world problems.

Still many issues remain unresolved, and along with increasing opportunities for local network systems come a similarly increasing number of competitive alternatives. As the industry reaches a critical stage in its development, it is time to concentrate on real technological and strategic issues.

The proceedings of Localnet '84 contained in these pages examine the key developments in the local network and office communications environment. From standards issues to system selection, from PBX technology to network management these proceedings will prove to be an invaluable reference source of practical insights from many of the leading experts in local networks.

online

Localnet '84 is organized and controlled by Online Conferences Inc. The conference and exhibition continue the highly successful series of events begun in 1981 in London and held in New York in 1984.

Online is one of the world's leading specialists in the design, coordination and management of conferences and exhibitions concerned with business applications of leading-edge technology. The company, formed in 1971, has its head office in London and subsidiaries in New York and Singapore.

Online Conferences Ltd
Pinner Green House, Ash Hill Drive, Pinner, Middlesex HA5 2AE, UK
Phone: 01 868 4466 Telex: 923498 ONLINE G Fax: 01 868 9933 (G2/3)

Online Conferences Inc
2 Penn Plaza, Suite 1190, New York, NY 10121, USA
Phone: (212) 279-8890 Fax: 2122798898

Author

Beckmann W H	Bell Communications Research Inc	303
Berry D L	Chrysler Corp	165
Biba K J	Sytek Inc	243
Brohpy F J	AT&T Information System Laboratories	415
Cooper E	Sytek Inc	43
Colony G F	Forrester Research Inc	99
Coronaro M	Face-Research Center, Italy	329
Cunningham D J	Siecor FiberLAN	31
Dias L A	NYNEX	387
Dolphin J L	SAI Comsystems	381
Dvorak D L	AT&T Bell Laboratories	201
Feltman C	Ungermann-Bass Inc	257
Flatman A V	International Computers, UK	269
Gee B J	Software Connections	63
Gopen C	Intel Corp	281
Hopkins G T	Ungermann-Bass Inc	343
Hughes J M	Texas Instruments Inc	105
Hurst M B	Novell Inc	369
Karhuse R A	AT&T Bell Laboratories	201
Killorin E H	Hyatt Research Corp	149
Langford G J	AT&T Information Systems	405
Machlin R N	Codex Corp	191

Masters P	Northern Telecom	71
McDowell J	Radionics	351
Meyers J C	Naval Surface Weapons Center	133
Mitchell K E	AT&T Information Systems	395
Myhre K	International Data Corp	23
Nonken H R	Kenrex Enterprises Ltd	179
Potter D	Interlan Inc	51
Rossi B C	Face-Research Center, Italy	329
Russell W H	American Management Systems	133
Skene J	Gandalf Data Ltd, Canada	81
Stahlman M D	Sanford C Bernstein & Co, Inc	91
Stieglitz M	Western Digital Corp	233
Stuck B W	Viatel Corp	1
Sturgis K M	General Motors Corp	13
vonTaube E	Codex Corp	213
Thorton P	AMNET Inc	295
Thurber K J	Architecture Technology Corp	123
Vasant N S	AT&T Informations Systems	115

LOCAL NET84

Contents

Protocol standardization—de facto or ad hoc?

The impact of traffic handling characteristics on local area network standards: was there any?	Bart Stuck Viatel Corp	1
General Motors' manufacturing automation protocol	Kathleen Sturgis General Motors Corp	13

Broadband vs baseband—what's at issue?

Mixed media alternatives for local area networks	Greg Hopkins Ungermann-Bass Inc	343
Local area network market development: is the medium the market?	Kim Myhre International Data Corp	23
Broadband or baseband; CSMA/CD or token - what's the difference?	Jerry McDowell Radionics	351

Media choices—new developments

Fiber optic applications in local networks	Jay Cunningham Siecor FiberLAN	31
Broadband technology: the year in review	Ed Cooper Sytek Inc	43
Trends in baseband networks	Dave Potter Interlan Inc	51

Software and operating systems—an inside view

A solution to PC distributed processing	Mark Hurst Novell Inc	369
Multi-user PC applications using a PC/LAN DBMS	Buck Gee Software Connections	63

PBX and local networks—compatibility or competition?

The PBX: in lieu of a LAN or with a LAN	Paul Masters Northern Telecom	71
The advanced data PBX: a comparative analysis	Jerry Skene Gandalf Data Ltd Canada	81

Beyond local networks

Packet radio comes of age	Janet Dolphin SAI Comsystems	381
Metropolitan area networks and the growth of special services	Lakshmi Dias NYNEX Corp	387
Bypass opportunities and metropolitan area networks	Mark Stahlman Sanford C Bernstein & Co, Inc	91

Interpreting IBM strategy

IBM local area network directions: perspective and analysis	George Colony Forrester Research Inc	99
Interfaces to a token ring: local area network adapter	John Hughes Texas Instruments Inc	105

AT&T IS—local network strategy

Corporate networking concepts	Neil Vasant AT&T Information Systems	115
Network administration and management for ISN	Kenneth Mitchell AT&T Information Systems	395
Local area network product direction	Greg Langford AT&T Information Systems	405

Systems selection—multiple choice

Local network selection criteria	Ken Thurber Architecture Technology Corp	123
Selecting a local area network using higher-level protocols: a practical approach for management	Wayne Russell et al American Management Systems	133
A network directory of needs and solutions: solutions matrix	Eric Killorin Hyatt Research Corp	149

Implementation—getting the system to work

Installation of the intial office automation system at Chrysler Engineering	Dennis Berry Chrysler Corp	165
A federation of people and computers	Howard Nonken Kenrex Enterprises Ltd	179

Network management

Maintenance of a bus-oriented local network	Francis Brophy AT&T Information System Laboratories	415
Managing a local area network	Robert Machlin Codex Corp	191
A network management system for the Datakit virtual circuit switch	Daniel Dvorak et al AT&T Bell Laboratories	201

Interconnection: gateways and bridges

Internetworking: connecting LANs into a single network	Eugene vonTaube et al Codex Corp	213
Connecting dissimilar LANs with X.25	Mark Stieglitz Western Digital Corp	233

PC networking strategies

Localnet/PC: Integrated broadband Personal Communication Services	Ken Biba Sytek Inc	243
Personal computers and organizational productivity	Charles Feltmen Ungermann-Bass Inc	257
Cheapernet - a low cost open system LAN	Alan Flatman International Computers Ltd, UK	269
The impact on VLSI on PC networking	Charles Gopen Intel Corp	281

Local networks in the automated office

Desktop networking	Peter Thornton AMNET Inc	295

Voice/data integration in local networks

Voice and data integration: an applications perspective	William Beckmann Bell Communications Research Inc	303
Integrated office communication system	Bruno Rossi et al FACE-Research Center Italy	329

THE IMPACT OF TRAFFIC HANDLING CHARACTERISTICS ON LOCAL AREA NETWORK STANDARDS: WAS THERE ANY?

Bart W Stuck
President
Viatel Corp

In the spring of 1980 the IEEE Computer Society chartered Project 802: Local Area Network Standards. In the course of meetings throughout 1980, it became clear that no one standard would be appropriate for all applications. One of the factors that lend to this realization was the different traffic handling characteristics of the proposed access methods. The outcome: two different access methods, carrier sense multiple access collision detection on a bus, and token passing (on both a bus and a ring). This is a survey of how traffic handling characteristics might impact each proposed access method. Was there any impact? Yes!

B.W. Stuck is Chairman of the Traffic Handling Characteristics Technical Advisory Group of IEEE Computer Society Project 802 Local Area Network Standards. He was guest editor (with K. Kuemmerle and F. Tobagi) of a special issue of the IEEE Communications Society Journal on Selected Areas in Communications on local area networks that appeared in November 1983. He is coauthor (with E. Arthurs) of a book entitled A Computer and Communication Network Performance Analysis Primer published by Prentice Hall in the fall of 1984. He received the degrees S.B.E.E. and S.M.E.E. in 1969, Sc.D. in 1972, from the Massachussets Institute of Technology. From 1972 to 1984 he was with Bell Laboratories and worked on a variety of computer communication systems. In 1984 he founded Viatel to develope a software and hardware product line for interconnecting PBXs, LANs, long haul networks, terminals and computers from a variety of vendors.

Presented at LOCALNET '84 USA: Online Publications, Pinner, UK 1984

Introduction

Local area networks are currently coming into their own, driven by demands for greater economic productivity in offices and factories. So called information outlets in some buildings are becoming as common as electric power outlets. The analogy is deliberate: much as electric motors have multiplied productivity of office and factory workers in the past, the electric motors of tomorrow will be microprocessors. Local area networks provide part of the connectivity (along with PBXs and the nationwide telecommunications network) that eventually will allow any information processing device to exchange information with any other such device. Electric power grids allow a wide variety of devices to draw power: refrigerators, lights, motors, computers, terminals, printers, voice telephones, sensors, gateways and bridges all could be attached, requiring acceptable delay for a wide mix of services. In fact, this is the challenge of LANs: to allow the interconnection of such a wide variety of devices, while providing acceptable traffic handling characteristics with cost effective products. LANs need to interconnect devices with data rates spanning four to six orders of magnitude, via well defined engineering rules analogous to that of electrical power contractor codes, using cost effective modular building blocks.

In IEEE Project 802, traffic handling characteristics were one consideration in any media access method. A local area network is a shared serially reusable transmission medium: at any instant of time only one frame is being transmitted by one station, under intended operating conditions. This means a local area network can be a bottleneck, if more than one device simultaneous wants to transmit. In addition, a local area network uses its transmission medium for two distinct purposes, to control access to the network, and to transmit data. Hopefully the time spent controlling access to the network should be small compared to the time spent transmitting data. The participants in 802 articulated these ideas to one another throughout 1980-81, and came to the conclusion that no one access method would be appropriate for all intended services. The breakpoint between light and heavy loading, between having the attached devices be a bottleneck and the LAN being a bottleneck, between congestion delays that are small compared to a frame transmission time versus those that are large, all these ideas led to two distinct access methods. Traffic handling characteristics were only one component, but their impact on standards was in fact present. This report is a brief summary of some of those arguments.

INGREDIENTS

What are desirable traffic handling characteristics of a local area network? To answer this, two ingredients are required: how the LAN will be used, i.e., the workload generated by the attached devices, and how the LAN will arbitrate contention, i.e., the transmission medium access method. The ideal local area network allows more and more devices to be attached,i.e., increasing the workload, while the delay attributed to the local area network is acceptable for any number of devices.

Workload

Workload is specified by the message generation activity of each node attached to a LAN. This would require a detailed script for each node, showing when a frame was ready to be transmitted. The total offered load is the total number of bits per second that all stations are attempting to transmit.

Access Method

802 focused on two distinct access methods, each employing distributed control: carrier sense multiple access with collision detection, and token passing. No single device arbitrates access: the system state at any instant of time is given by the state of each device controller plus the state of transmission medium.

Transmission Medium Access Method

For token passing, control is passed either explicitly (via a unique bit pattern called a token) from one station to the next, or implicitly, via a trailing bit pattern on a successfully transmitted frame, or via a timeout. The station with the token is the only station allowed to transmit.

For carrier sense multiple access collision detection, all stations sense the transmission medium to see if carrier energy is present. If no carrier is sensed, a station can attempt to seize the transmission medium to transmit its frame. If carrier is sensed, a station defers its attempt until carrier is no longer sensed. If two or more stations attempt to seize the transmission medium within a time interval called a slot time (roughly the worst case round trip time interval for energy to propagate from one end of the bus to the other, plus allow circuitry transients to die out), a collision is said to occur: each station defers its next transmission attempt

until a later point in time. Retry time intervals are spread out in time further and further. If more and more collisions occur, to more efficiently utilize the bus at the expense of increasing the delay to successfully transmit a frame.

Station Access Method

Once a station gains access to the transmission medium by either access method, it might

1) Exhaustively transmit all frames, including those that arrived after transmission began, until no frames are waiting to be sent.

2) Transmit all frames present at the start of transmission but no more.

3) Transmit only a maximum number of frames per attempt.

PERFORMANCE MEASURES

Performance measures are related either to the system as a whole or to a particular service or application. These measures can be concerned with transient behavior or long term time averaged statistical behavior. Here we will focus on long term time averages, and only touch on transient behavior in passing.

Utilization

From an economic or financial point of view, the fraction of time equipment is idle is not a productive use of money. For a local area network, the fraction of time each device is busy, and the fraction of time the transmission medium is busy transmitting data, should both be as high as possible. Since the most expensive element in a local area network is the device and not the transmission medium, and since there are many more devices attached to a local area network than there are local area networks, a great deal of engineering attention is focused on cost reducing the devices. Unfortunately, virtually all the traffic engineering studies for local area networks have concentrated on the utilization of the least expensive component, the transmission medium. In any event, utilization of the transmission medium under load should be high; only a small portion of the available transmission time should be devoted to controlling access versus successfully transmitting data.