

Inside the



2nd Edition

J. Scott Haugdahl



ARCHITECTURE
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SPECIALISTS IN COMPUTER ARCHITECTURE

Inside the Token-Ring

2nd Edition

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FOREWORD

Since 1981, Architecture Technology Corporation has gathered and disseminated information on computer communications architecture. ATC provides consulting and seminar services, and publishes newsletters, handbooks, and reports. *Inside the Token-Ring 2nd Edition*, by J. Scott Haugdahl, is a completely revised version of the first title in our book series.

Inside the Token-Ring 2nd Edition covers all aspects of IBM's Token-Ring local area network, from history to IEEE Standards to operation and actual products. Because the Token-Ring is the IBM strategic LAN, this book is essential reading for any interested in data communications, particularly in SNA and distributed processing environments.

Architecture Technology Corporation

PREFACE

When IBM announced its Token-Ring in October of 1985, there was much skepticism and criticism surrounding this new IBM LAN -- after all, it could only connect PCs and the software was no match for established PC LAN vendors. Now, just over two short years later, the Token-Ring provides connectivity for every major computing device that IBM offers. In addition, it is the strategic local area network included in IBM's Systems Application Architecture (SAA). We are beginning to see the emergence of third-party hardware to complement or compete with IBM's offering. Software written to PC-DOS, Operating System/2, NETBIOS or APPC protocols will operate over the Token-Ring.

The Token-Ring has achieved status in the local area network marketplace that took Ethernet ten years to achieve (Ethernet is now in its fifteen year). The blitz of products that IBM has announced over the past 2 years are shipping or about to ship, with more announcements to come. Token-Ring purchases of 10,000+ nodes at a time are not unheard of. Needless to say, the critics are somewhat embarrassed by the success of the IBM Token-Ring. While Ethernet continues to currently dominate, we can not ignore this "new" technology. I hope that this book will enable you to better understand token-ring technology and products.

Thanks to all those that helped me produce this book, and at the mercy of maintaining my truly unbiased perspective on LAN technology and vendors (and life in general), I do have to thank IBM for providing me and the rest of the consulting community with "direction" and product information that even the trade press has to wait for.

J. Scott Haugdahl
Minneapolis, Minnesota
December 1987

To Nancy

Appendix A: Acronyms

ACF	Advanced Communication Facility
API	application programming interface
APPC	Advanced Program-to-Program Communication
APPC/PC	APPC for the Personal Computer
ARCNET	Attached Resource Computer Network
ARP	Advanced Research Project
ASCII	American Standard Code for Information Interchange
ASIC	application specific integrated circuit
ASYNCR	asynchronous
AWG	American Wire Gauge
BIOS	basic input output system
BISYNCR	bisynchronous
CBX	computerized branch exchange
CCB	command control block
CCITT	International Telegraph and Telephone Consultative Committee
CPU	central processing unit
CRC	cyclic redundancy check
CSMA/CD	carrier sense multiple access/collision detection
DB/2	Database/2
DDN	defense data network
DFT	distributed function terminal
DIA	data interchange architecture

DLC	data link control
DMA	direct memory access
DOS	disk operating system
DSAP	destination service access point
EBCDIC	extended binary-coded decimal interchange
ECF	Enhanced Connectivity Facility
EPROM	erasable programmable read-only memory
FAT	file allocation table
FCC	Federal Communications Commission
FCS	frame check sequence
FEP	Front End Processor
HDLC	high level data link control
ID	IDentification
IEEE	Institute of Electrical and Electronics Engineers
IFIP	International Federation for Information Processing
ISO	International Organization for Standardization
Kbps	thousand bits per second
LAB	Line Attachment Base
LAN	Local Area Network
LCC	logical link control

LED	light emitting diode
LEN	Low Entry Networking
LLC	logical link control
LPDU	logical link protocol data unit
LSAP	link service access point
LU	Logical Unit
MAC	media access control
MAP	Manufacturing Automation Protocol
MAU	multistation access unit
Mbps	million bits per second
MCB	message control block
MIC	media interface connector
MMIO	memory mapped i/o
MS-DOS	microsoft disk operating system
MVID	major vector ID
MVS	Multiple Virtual System
NAUN	nearest active upstream neighbor
NCB	network control block
NCP	network control processor
OS/2	Operating System/2
OSI	Open Systems Interconnection
PBX	Private Branch Exchange
PC	Personal Computer

PC-DOS	Personal Computer Disk Operating System
PDU	Protocol Data Unit
PHY	PHYsical
PS/2	Personal System/2
PU	Physical Unit
RAM	random access memory
RAS	reliability, availability, serviceability
ROM	read-only memory
RPL	remote program load
RT PC	risc technology personal computer
SAA	systems application architecture
SABME	set asynchronous balanced mode extended
SAP	service access point
SDLC	synchronous data link control
SMB	server message block
SNA	systems network architecture
SNADS	SNA distribution system
SQL	sequential query language
SRPI	server-requester protocol interface
SSAP	Source Service Access Point
TCP/IP	Transport Control Protocol/Internet Protocols
TIC	token interface coupler
TSO	time share option

VLSI	very large scale integration
VM	virtual machine
VTAM	virtual telecommunications access method
XID	eXchange IDentification
XNS	Xerox Network Systems

Appendix B: References

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IEEE publications can be ordered from The Institute of Electrical and Electronics Engineers, Inc., 345 East 47th Street, New York, NY 10017.

Texas Instruments publications may be obtained from by calling (800) 232-3200.

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Glossary

ACF/NCP	Resides in the IBM 3720 or IBM 3725 Communication Controller and provides the physical management of the communication network. Its main function is to control attached lines and workstations, perform error recovery, and route data through the SNA network.
ACF/VTAM	The base for the IBM SNA network, which may be thought of as an "operating system" for the network. Its functions are analogous to the functions of an IBM host operating system in terms of resource sharing and logical handling of user requests.
Advanced Program-to-Program Communication (APPC)	An architecture for peer-to-peer, application-to-application program. Also called LU6.2, which is the technical name for the marketing name APPC.
alert	The main network management message for forwarding problem determination information to a network operator.
Application Programming Interface (API)	A protocol boundary which can be used by arbitrary user-written programs.
Advanced Peer-to-Peer Networking (APPN)	An extension of LU6.2 and PU2.1, which allows peripheral nodes to perform intermediate and dynamic routing functions.
architecture	A formal set of definitions describing how components of an overall system must interact to work for a common objective. Architecture is of a general nature, not tied into a specific product implementation.