Book Reviews

PC System Architecture Series

Addison-Wesley Publishing Company, Reading, Massachusetts, 1995

Tom Shanley, Don Anderson

PCI System Architecture

pp. xxxi, 559, ISBN 0–201–40993–3

Don Anderson

PCMCIA System Architecture: 16-Bit PC Cards

pp. xxii, 440, ISBN 0–201–40991–7

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PowerPC System Architecture

pp. xii, 609, ISBN 0–201–40990–9

The *PC System Architecture Series* of books from MindShare, one of the leading technical training companies in the hardware industry, includes the following titles: *ISA System Architecture, EISA System Architecture, 486 System Architecture, Pentium Processor System Architecture, Plug&Play System Architecture, PowerPC System Architecture, PCI System Architecture, PCMCIA System Architecture.* Each of them is a powerful reference book for one particular type of chip or hardware, with the characteristic that there is no duplication of common information in each book.

PCI System Architecture provides a comprehensive treatment of the PCI bus specification (revision 2.1) and its relationship to the rest of the system. The book consists of twenty-three chapters structured into eight parts.

The first of them, consisting of two chapters, is an introduction to the local bus concept. Chapter 1 highlights the performance problems inherent in PC architecture experienced when devices performing block data transfers are placed on the expansion bus. Chapter 2 provides an overview of the two major local bus standards, the VESA VL bus and the PCI bus.

The second part in its twelve chapters provides a detailed explanation of the mainstream aspects of the PCI bus operation. Chapter 3 gives an introduction to the PCI transfer mechanism. As the PCI bus does not incorporate termination resistors, but uses reflections to its advantage, Chapter 4 provides an introduction to reflected-wave switching. The functions of each PCI bus signal, as well as PCI bus arbitration and transaction types a bus master may initiate, are defined in the following three chapters. A detailed description and timing diagrams of the basic PCI data transfer are given in Chapter 8. Premature transaction termination, error detection, reporting and handling mechanisms are described in Chapters 9 and 10. The focus of Chapter 11 is on interrupt routing, generation and servicing. Chapter 12 deals with the locking problem, a situation when a master must perform multiple access to a target, and ensuring that no other master will access the same device between its accesses. Chapter 13 describes the 64–bit extension that permits masters and targets to perform eight byte transfers during each data phase. The concluding chapter of the second part covers the PCI expansion card and connector types, shared slots and pinout definition.

Part III, through Chapters 15 to 18, provides an introduction to the PCI configuration address space, a detailed description of the mechanisms used to generate configuration bus transactions, the configuration registers defined by the spec-

ification and the implementation of expansion ROMs associated with PCI devices.

Chapter 19 makes Part IV where the details of PCI-to-PCI bridge specification are worked out. Part V (Chapter 20) introduces the PCI BIOS specification while Parts VI and VII in Chapters 21 and 22 provide a detailed description of the PCI cache support and the implementation of a 66MHz bus and components. The closing Chapter 23 furnishes an overview of the VL82C59x SuperCore PCI chip set from VLSI Technology.

PCMCIA System Architecture: 16 Bit PC Cards describes PC card hardware and software interfaces and their relationships to overall system design. It is organized into six parts consisting of twenty-five chapters.

The first part consists of three chapters and discusses the emergence of PCMCIA, traces its evolution and introduces terminology and key concepts behind PCMCIA. Key features of the 16–bit PCMCIA standard (also called the PC Card Standard) and various hardware and software elements employed in such environment are also discussed.

Part two, through its Chapters 4 to 10, describes various physical packages defined by PCMCIA for PC Cards and the related environmental specifications. This part also details several interfaces, like the Memory-Only Socket Interface, the Memory or I/O Interface, the DMA Interface, the ATA Interface, and the AIMS Interface.

Part three, which also consists of seven chapters, deals with a data structure called the Card Information Structure (CIS) and configuration register implementations for both single and multiple function cards. Several sample card implementations are presented, such as SRAM, Flash, Fax/Modem, ATA PC and Multiple Function PC Card example.

The fourth part, from Chapter 18 to 23, covers the PCMCIA Software environment. It discusses the role of socket services, card services, client drivers, and it defines the mechanisms allowing the code to be executed directly from the card.

Part five (Chapter 24) introduces the ExCA (QuickSwap) specification that defines a required set of hardware and software support, intended to improve PC Card interoperability across the platforms based on Intel x86 architecture.

The last part provides an overview of a sample PCMCIA host bus adapter (The Cirrus Logic CL-PD6722) used in Intel x86 implementations for either an original PC or ISA compatible host bus.

PowerPC System Architecture describes the hardware architecture of PowerPC systems, providing clear and concise explanation of the PowerPC specification, the template upon which all PowerPC processors are designed. The book is organized into two volumes preceded by an introductory section entitled *Part One — Background and Introduction*, which consists of four chapters. It introduces the concept of the prefetcher, the L1 and L2 cache and the demand-mode paging. A basic description of the PowerPC processor microarchitecture is also presented here.

Volume One —The PowerPC Processor Specification, comprises Parts two and three, and defines the PowerPC processor specification. A complete description of both the 32 and 64–bit PowerPC processor specifications is provided here. Part two, through Chapters 5 to 14, supplies the description of instructions, registers and other facilities available to the applications programmer, to be run at the user privilege level, like memory semaphores, the WIM bits, posted memory accesses and the timebase facility. Part three provides the description of facilities available to the operating system programmer, to be executed at the supervisor privilege level. Nine chapters that constitute Part three deal with the operating system registers and instructions, interrupts, MMU's address translation mechanisms, memory-mapped I/O and the timebase and decrementer facilities.

Volume Two —The PPC 601, consisting of Part four, focuses on the PPC 601 processor. It gives a complete description of the PPC 601 processor's external bus structure and operation. It is important to note that the external bus used for communication with the rest of the machine is outside the scope of the PowerPC processor specification. This part describes the way the PPC 601 processor adheres to or deviates from the specification given in the first volume of the book. Chapters 24 to 39 (Part four) elaborate on the PPC 601 microarchitecture, the user and OS

register and instruction sets, interrupts, MMU operation, I/O transactions, bus structure and multiprocessing support mechanisms.

The books under review are written clearly and comprehensibly, the text matter being well-structured and supplemented with an extensive glossary and with an index. Although these books offer a great deal of technical information, the authors have succeeded in keeping them readable. What I have appreciated most are the accompanying examples of several card implementations.

Primarily intended for use by hardware and software design and support personnel, the books can also be considered valuable for individuals outside the design field. I hope to see new editions by these authors soon, which I am sure will continue to contribute to the computing technology field.

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OS/2 Warp Survival Guide

John Wiley & Sons Inc., New York, 1995, pp. xxxii, 573, ISBN 0–471–06083–6

OS/2 Warp is the third generation of an operating system that was originally designed for large corporations and later refocused toward the PC market. Although the developers of OS/2 have done a great deal of work to make the operating system as easy and intuitive as possible, due to its enormous complexity and comprehensiveness some of OS/2 features aren't always obvious. This is especially true of OS/2 installation, system configuration and maintenance. This book is intended to help the user get the most out of OS/2 Warp and her/his computer by guiding the user thoroughly trough various features of the system.

The book *OS/2 Warp Survival Guide* consists of 12 chapters and one appendix. It is equipped with the obligatory index that is sufficiently detailed and can help the reader find the information needed. The chapters can be divided into three groups. System requirements and installation procedure is covered in Chapters 1 and 2. For people with little or no experience Chapters 3 to 6 cover the basics of working with the computer, using GUI and navigating through OS/2 basic features. The remaining chapters are dedicated to advanced features, such as configuring DOS and Windows sessions, installing and using multimedia options, setting up printers, automating common tasks and troubleshooting.

After the Foreword and the Introduction providing brief OS/2 history and its main features, Chapter 1 initiates the reader to the OS/2 basics. It clearly points out the necessary preparations for OS/2 installation, such as acquiring the right version and the basic requirements of the computer. Memory requirements are discussed in detail. Chapter 2 continues with the actual installation procedure. The entire procedure is covered very thoroughly, explaining the meaning of various screens and questions that the installation program displays. The problems of localizing the operating system for various countries is also addressed. The chapter closes with the first boot of the system and usage of OS/2 tutorial.

In Chapter 3, the authors deal with the part of OS/2 that the user interacts with most of the time - the Workplace Shell. The chapter begins with an overview of new features to the shell for new OS/2 users and continues with the basics of computer usage. Computer basics, such as files and folders, using mouse etc. are also explained. The chapter ends with the description of the on-line documentation. Chapter 4 explains how to install the BonusPak - a supplementary set of programs and utilities - and how to use each of its programs. First, since we live in the age of communication, The Internet Access Kit is covered, and subsequently the IBM Works and the Personal Information Manager. Chapter 5 discusses how to set up your system to suit your needs. The Settings Notebook is presented thoroughly, explaining each individual setting. The chapter also describes how to uninstall parts of the operating system that aren't needed any more. Chapter 6 deals with the biggest novelty of OS/2 Workplace Shell - the object-oriented paradigm: crucial differences between program objects and program

file objects have been pointed out. Other types of objects are also explained, such as shadows, reference objects, folder objects and device objects.

Chapter 7 explains the fundamentals of features enabling compatibility with DOS and Windows programs. OS/2 has a number of settings that can improve the execution of DOS and Windows programs, if set properly. These settings have been presented in a table-like manner, listing all possible options for each setting and including their short, but clear description. Chapter 8 is dedicated to multimedia, a feature obligatory for any operating system that tends to be widely used nowadays. The chapter explains the installation of multimedia support, its configuration and the usage of multimedia programs. The reader will get all she/he needs to know on playing video clips, audio CDs, MIDI files and digital audio files. Parallel to its GUI, OS/2 offers the user a command line interface that many DOS gurus are familiar with. Chapter 9 deals with the command line and contains the information on how to customize the command line. A large part of the chapter is devoted to listing many commands found in OS/2 with their parameters and explanation in alphabetical order. Chapter 10 discusses the more advanced aspects of using OS/2. It covers advanced configuration options by editing the `CONFIG.SYS` file. Further, OS/2 extended attributes are discussed. Finally, the chapter describes the print spooler, a system that enables an application to print a document and to continue its work, while printing is done in the background. Chapter 11 deals with automation features of OS/2. The basics of writing command files - the analogue of batch files, well-known to DOS users - are covered. OS/2 offers a more powerful tool - the REXX programming language. Because of its complexity, the authors didn't focus on explaining every single REXX keyword and feature, but have provided the reader with the information needed to understand the fundamentals of REXX. Chapter 12 deals with troubleshooting. It explains how to recover the system in case of failure, what to do if the user installs an inappropriate device driver, how to save configuration settings, repair damage done to hard disks, resolve device conflicts and much more. In addition, the causes and remedies for OS/2 system errors, traps and Internal Processing Errors (IPEs) are explained.

Appendix A lists all system files of OS/2 by their directories, in a table-like manner. This can be very useful for the users who want to protect their hard disk from being drowned in files installed by various programs.

To conclude with, OS/2 Warp Survival Guide is a good book introducing to the reader the basics of computer usage, but it can also serve as a handbook to everyone wishing to configure her/his computer appropriately. It is aimed primarily to new and intermediate users. Although some of the information might be useful to advanced users and power-users, they are not the primary audience for the book. But for all others, this book can serve as a valuable guide in steps, from the preparation to buy OS/2, through upgrading the computer, installation and configuration of the system, therefore I recommend it.

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Woody Leonhard

The Underground Guide to Word for Windows

Addison–Wesley Publishing Company, 1994, pp. xiii, 314, ISBN 0–201–40650–0

Watch out, you softies at Redmond: Woody rides again! That would be a short announcement for this book. Before I got familiar with Woody Leonhard's titles, I thought that there were only two groups of books dealing with Microsoft's Word for Windows: manuals and a bundle of books where manuals are more or less closely retold. Most of these books are written for beginners, their main drawback being the lack of any criticism. This is not the case with Leonhard's books: they constitute a separate group of really helpful books for advanced users who have successfully surpassed WinWord basics. Just to remind you: Woody Leonhard is a contributing editor and columnist at *PC/Computing magazine* and the author or co-author of several books, including two titles dealing with Word for Windows. In one of the

previous issues of this journal I have already reviewed Woody's *Hacker's Guide to Word for Windows* (co-authored with Vincent Chen and Scott Krueger) which I find to be a reference book for any professional WinWord user.

The Underground Guide to Word for Windows is another useful book that should not be overlooked by anyone who intends to become a "Word guru". It is not an introduction for beginners, but a guide for those who are already familiar with Word's basic features. As the "warning" on the back of the cover claims: "This is not your ordinary WinWord book. . . . If you've swallowed the Microsoft Party Line — that WinWord is straightforward, stable, easy-to-use product with just a few minor glitches — *The Underground Guide* will shock you". The book has 314 pages, divided into ten chapters and six appendices.

It starts with the chapter entitled *Power Toolbars*, which shows the ways of customising toolbars. Some readers may think that this is only a "cosmetic" problem, but as the author states: "The bone-stock WinWord configuration is made to sell WinWord, not to make your life easier". That's the main reason why most of the users use toolbar rarely or not at all. A clear, step-by-step description throughout the chapter enables even a beginner to make these buttons on toolbars really useful.

Chapter 2 (*Custom Settings*) is a collection of helpful suggestions how to customise Word settings. This chapter includes sections on view settings, tools settings (which are often overlooked by regular users), autocorrect facility, em-dash and apostrophes. It concludes with a section on styles and classes and an overview of how to restore default settings.

Chapter 3 gives a brief overview of formatting concepts, distinguishing font and paragraph formatting. There follows a chapter on styles and templates, very efficient tools that, as a rule, are not understood and therefore ignored by most users. Chapter 4 ends with sections on fields and bookmarks. The chapter entitled *Your Burning Questions Answered* offers answers to the questions most frequently asked by WinWord newcomers, while chapter *Bugfest 6.0-What Docs Dare Not Tell* reveals some of the bugs recognised by the author, along with some annoying features that could be attributed to "an unpolished job".

Chapter 7 is dedicated to macros: it gives a simple introduction to WordBasic programming. This will help even those not familiar with any programming language to understand WinWord programming. There follows *The Underground Template* that summarises and exploits the knowledge gained in previous chapters: it describes the complete process of a template creation from scratch.

The *Power User Bag o' Tricks* chapter is a collection of some tips such as how to obtain macro assignment shortcut, page numbering on folded sheets or crop marks. The book ends with a chapter on helpful add-ins and appendices with cast of characters, built-in styles, standard key assignments, WinWord files.

The well-known Leonhard-like casual style of writing with amusing and very picturesque quotations will keep the attention of every reader. Although a little bit out-dated (the book is written on WinWord 6.0 basis), this book is still very useful, even for the 7.0 version. If you have learnt the WinWord basics and are seeking for a book to guide you further, this is the book I would suggest. Moreover, even if you are an experienced user, you should have a look — there are a lot of useful tips for everyone.

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Martin de Prycker

Asynchronous Transfer Mode — Solution for Broadband ISDN,

Third Edition

Prentice Hall International (UK) Limited, 1995, pp. 380, ISBN 0–13–342171–6

In this book, Martin de Prycker presents the principles of ATM (Asynchronous Transfer Mode). This book benefited largely from the expertise which has grown since 1984, when the Research Division of Alcatel Bell in Antwerp started working on ATM. The purpose of this

book is to cover all aspects related to ATM. Its intention is to help telecommunication experts who will be working on broadband ISDN (BISDN) to acquire the necessary experience on ATM and related issues. Seeing the growing importance of telecommunications in graduate programs at universities, the book can also be used by graduate courses to build the basic ATM know-how and allow the students to start working on more detailed topics such as ATM traffic studies, congestion control etc.

Telecommunication networks of today are evolving rapidly, and telecommunications are considered as one of the drivers for our new global international society. The answer to these initiatives is a broadband network with attractive services. This broadband network can transport services like digital TV, digital HDTV, high quality videophony, high speed data transfer, video on demand etc. The first standards for the broadband network were defined by ITU-T, based on the SDH (Synchronous Digital Hierarchy) concept. In 1990, ITU-T already prepared 13 recommendations defining the basic ATM and determining most of its parameters. So, the experts agreed that ATM would be the transfer mode for the future BISDN. This book presents the ATM in an interesting and readable way, acceptable not only for the experts.

The book consists of nine chapters. The first chapter briefly describes the evolution towards an integrated broadband communication network. In the second chapter, transfer modes, used in telecommunication networks today, are described and compared. From that chapter it becomes obvious why ATM is the transfer mode of the future. The description of ATM standards is given in the third chapter. It can help you find out what AAL, UNI, OAM, ATM layers and other terms closely related to the ATM terminology are. Chapter 4 brings us a detailed description of broadband ATM switching. The engineers may find it very interesting to read this part of the book to see how ATM switches really work. What follows is a brief description of the impact of ATM on terminals and services. For many network managers and people involved in internetworking, Chapter 6 could be of enormous importance. It gives the necessary information about ATM LANs, high-speed local and metropolitan networks and their comparison regarding efficiency and quality of service. Chapter 7 brings us a more scientific approach to traffic and congestion control in ATM networks. Introduction strategies for ATM and ATM for private business networks are explained in Chapter 8. And, finally, the last chapter is dedicated to video-on-demand (VOD), a service that unable to function without ATM.

In comparison with the previous edition, this third one is noticeably changed and there are three important factors contributing to the changes. The first factor are new services like VOD, home shopping and some other ones, thus evolving networks to FSNs (Full Service Networks). The second is the initiative taken in all countries to build a National Information Highway, whereby ATM is often cited as the proper technology. And the third factor are the standards which are evolving faster than ever.

This book is an excellent treatment of ATM as the transfer mode in broadband networks. Anyone looking for some fundamental information on ATM and the world of high-speed networks, can find it in the book. It is not written for the experts only, but also for those whose skills in telecommunications are not highly professional. I would recommend it to all communication engineers and people involved in the development of telecommunications as a perfect primer for this new area in broadband telecommunications of the future.

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Raif O. Onvural

Asynchronous Transfer Mode Networks: Performance Issues,

Second Edition

Artech House, Inc., Norwood, MA, 1995, pp. xviii, 535, ISBN 0–89006–804–6

A number of books have already been published on ATM (Asynchronous Transfer Mode) networks in the past few years. The book by Dr. Onvural, to be reviewed in the following, concentrates on performance issues encountered in

practically realizing feasible ATM networks. A bestseller in its first edition, this revised edition addresses evolving standards and implementation issues in detail. This book is divided into eleven chapters (seven chapters in the first edition, two years ago).

Chapter 1 introduces the basic concepts of B-ISDN (Broadband Integrated Services Digital Network). The various services that will be supported by these networks are discussed here, including a comparison of different types of network switching (message switching, packet switching and circuit switching) along with an overview of the B-ISDN protocol reference model and reference configurations. Chapter 2 describes the whole ATM network architecture focusing in depth on the physical, ATM and ATM adaptation (AAL) layers.

Chapter 3 deals with one of the important issues in designing ATM networks — source characterization. This chapter discusses details of different traffic models such as CBR sources, VBR voice and video sources, data sources and multimedia applications. A section on QoS (Quality of Service) metrics in ATM networks is provided, too. Call control parameters, associated with connection-oriented networks and packet networks, are studied and the QoS specifications of different types of B-ISDN applications are provided. Chapter 4 deals with traffic management in ATM networks. This chapter contains a breadth of information on call admission control, traffic control policies and congestion control. Call admission algorithms, that are examined, include Gaussian approximation, fast buffer reservation, equivalent capacity method, heavy traffic approximation, and the nonparametric approach. Traffic policing based on leaky bucket and window-based techniques are also studied. Selective discarding and reactive congestion control mechanisms, including adaptive rate control, incall parameter negotiation techniques and dynamic source coding are explained.

Chapter 5 presents different ATM switch architectures (switch fabrics) including shared medium, shared memory and space division ones. Performance analysis, a key aspect in efficient design and implementation of ATM networks, is studied for these three switch architectures.

The B-ISDN architecture model consists of separate signaling (control plane) and user-to-user connections (user plane). For signaling purposes, the two B-ISDN interfaces defined are user-to-network interfaces (UNI) and network-to-network interface (NNI). Depending on whether the network is private or public, the interface is respectively referred to as a private UNI or a public UNI. The NNI is used for different types of interfaces in different contexts. An NNI can be a switch-to-switch interface or an NNI. In ITU-T terminology, it refers to a network node interface (NNI) in public networks. A P-NNI is the corresponding interface between two private networks. Chapter 6 presents an overview of current ATM interfaces, including the UNI, the NNI, B-ICI (a carrier-to-carrier interface, i.e. the ATM Forum version of public NNI), and data exchange interfaces (ATM DXI), the latter being developed to allow current routers to internetwork with ATM networks without requiring special hardware. Chapter 7 discusses signaling in ATM networks, both at the UNI and the NNI (P-NNI and B-ISDN user part signaling). An end-to-end connection setup is used as an example to illustrate how an end-to-end connection may be established and how various network services can be provided in a standards-compliant manner.

Chapter 8 describes routing in ATM networks. The chapter begins with an overview of routing in existing networks, followed by a discussion of ATM routing functions and virtual path selection schemes. The routing schemes presented include shortest-path, fixed-path, saturation routing, stochastic learning automata and routing in telephony network. The different types of connections — point-to-point, point-to-multipoint and multipoint-to-multipoint, are also presented. The final section of the chapter deals with private NNI.

Chapter 9 describes various approaches proposed in standards organizations and the ATM Forum to provide connectionless service in ATM, with a view to enable different applications already developed in current packet-switched networks. ATM Forum LAN Emulation (LANE) and classical IP and ARP over ATM (IETF RFC 1577) are provided, too.

Chapter 10 contains an analysis of transport layer protocols and their functionalities.

Conventional protocols TCP and TP4 and lightweight protocols such as Delta-T, Datakit, NETBLT, VMTP, APPN, RTP, XTP are elaborated and followed by the respective comparison and benchmarking and a discussion on reliability in multicast services and multimedia networking.

Chapter 11 provides an overview of the network management framework along with a discussion on interface management and the global management of ATM networks.

A large portion of the book is suitable for self-study. The mathematical matter is located in appendices and a large number of references are provided at the end of each chapter. The glossary of frequently used terms and an index are included, too.

To conclude, the book provides a good overview of critical performance issues that need to be resolved before realizing ATM networks. It is written in such a way, that both, beginners and more sophisticated readers will greatly benefit from reading it. *Asynchronous Transfer Mode Networks: Performance Issues* by Raif O. Onvural will serve as a valuable reference to systems engineers, network planners and researchers, interested in understanding the key issues involved in the design and implementation of ATM networks. Since ATM is changing so rapidly, you will probably see the third edition of this book in the near future.

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Casting the Net. From ARPANET to Internet and Beyond

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"... *Casting the Net* offers an important and valuable historical look at the evolution of packet switching and its application in the ARPANET, its successor, the Internet, and the combination of these networks over a period of about 25 years." This are the words of Vinton Cerf, the Foreword author, also known as one of *Internet's* founding fathers. It is hard not to concur with him. Through a well-chosen selection of interviews and relevant RFCs (Request for Comments), as well as anecdotal material, Peter Salus really succeeded in building a vivid chronological account of the history of computer networking. Just to do justice to Salus' style I will mention the anecdote on Sen. Edward Kennedy's congratulating telegram to the Massachusetts based BBN for winning the contract for the IMP (Interface Message Processor), wrongly interpreted as the "Interfaith Message Processor" thus promoting the spirit of "ecumenism".

The book is structured into five parts, each one of them describing a particular period in the chronicles of packet switching computer networking. They are appropriately introduced by a "Time Line" listing important events which characterize them.

Part 1, covering the period 1940–1964, provides insights into the origins of networking, to be traced back in 1940, when G. Stibitz first used a long-distance telegraph link to connect a Teletype terminal to the Bell Labs Complex Calculator, and up to the moment when military reasons paved the way to packet switching. This resulting concept to be pervasively used afterwards, is attributed to Paul Baran (to mention the verse of a poem reported in the book: "Paul Baran came out of the wood/With a message first misunderstood" [1]).

The period 1967–1972, which saw the first successful implementation of computer networks, is contained in the second part. As Kleinrock suavely wrote, "It was back in '67 that the clan agreed to meet. /The gangsters and the planners were a breed damned hard to beet./The goal we set was honest and the need was clear to all:/Connect those big old mainframes and the minis, lest they fall." [2] After "Ideas born in tanks that think" [3], on September 2, 1969, ARPANET was given birth. The organization for ARPANET, contacts with NPL's (National Physical Laboratory, Teddington, UK) group, and the lively narrative of starting up the first ARPANET configuration, including reports on

hardware and software conceptualization and installation, are also given a fitting account.

The next part, outlining the period 1974–1981, first addresses the internationalization of computer networks: European and Japan's efforts are mentioned, the most prominent of them being France's CYCLADES and European Community's EIN (European Informatics Network). Then the layered approach on ARPANET protocol definition is tackled, the protocols "[establishing] a virtual communications medium between the communicating entities", [reported from 4]. The ubiquitous question "to OSI or not to OSI" is present, of course, and the case for TCP/IP duly delivered, the dissemination of UNIX contributing to TCP/IP's great success. The "Great Switch" to TCP/IP as the official ARPANET protocol suite which took place at the turn from 1982 to 1983 and also meant switching the mail service by introducing of the now very familiar *sendmail*, message formats (RFC 822, later followed by MIME), and the addressing scheme (the well-known DNS). This also represented the circumstance when ARPANET became Internet. Other networking initiatives are mentioned as well, comprising BITNET, Fidonet and UUNET.

Part 4 describes the period 1982–1989. It first sketches some proprietary networks: IBM's VNET, XNS (Xerox Network Services) and Digital's EASYnet, and elaborates on other European and Japan's networking initiatives like the development of UKnet, Eunet, EARN (European Academic and Research Network) and RARE (Reseaux Associes pour la Recherche Europeenne), as well as Japan's JUNET. The following chapters report on the splitting of the original ARPANET into ARPANET (TCP/IP) and MILNET, CSNET as the access network for computer science and engineering researchers (later merged with BITNET to form CREN, Corporation for Research and Educational Networking), NSFNET — the network for connecting US supercomputer centers, along with the description of some US regional networks. This part ends with an account on the (re)organization of the ARPANET administration.

The final part encompasses the period 1988–1994. It gives a review of tools for searching in the Internet virtual space (archie, Gopher, Veronica and Jughead, WWW and Mosaic), and comments on commercializing the Internet, on the offer of services, as well as on associated security issues. New approaches are also discussed: NII (National Information Infrastructure) as an extension of NREN (National Research and Education Network), which will provide "a general information infrastructure serving society with a broad range of services", as quoted in the book. Also, the issue of address space is referred to, with the development of IPng representing the envisioned solution.

The Appendix offers an entertaining view on the past and the (possible) future of networking, References and Further Readings provide a chapter-based bibliography listing with short remarks, mostly addressing the information sources, while the Index gives a thorough list of pointers on characters and institutions having prominent roles in the networking history.

This book is a nice complement to, say, a textbook on computer networks which, because of space restrictions, usually lacks such a historical treatment. The text is richly interspersed with quotations; "Diversions" with the text of some of the verbal, non-technical (or at least non exclusively technical) and intentionally entertaining RFCs, as well as casual biographies of distinguished individuals who are leaders in this field, yield the book a particular flavour. All in all, Casting the Net is an entertaining account on one of the most important technical achievements of the second half of the twentieth century and therefore deserves to be recommended as a companion.

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