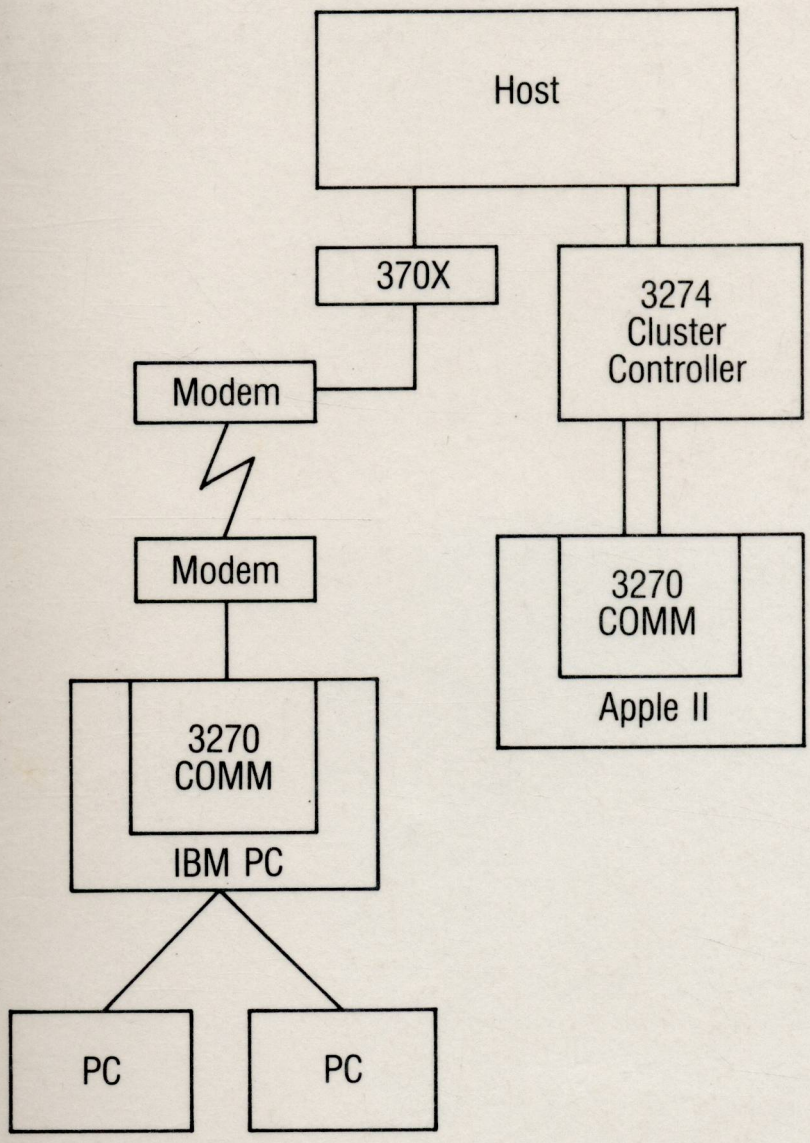
The Micro to Mainframe Communications Directory

2nd Edition



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PREFACE

When the first edition of the Micro-to-Mainframe Communications Directory was released in October of 1984, the micro-to-mainframe field was just beginning to burgeon. As more vendors entered the field and product lines began to expand, certain trends became obvious. This second edition of the Micro-to-Mainframe Communications Directory is designed to reflect those trends.

As in the first edition, the product descriptions are listed alphabetically by product name for easy reference. The product descriptions themselves have been expanded considerably. The expanded descriptions of over 500 products should help PC users in mainframe environments identify what products are available to enable PCs to communicate effectively with mainframes.

One of the features of the directory that has remained unchanged is the extensive indexing at the back which enables readers to flip directly to the products appropriate to them. Products are indexed according to product name, company name, PC types supported, operating systems supported, and specific hardware/software categories.

In the first edition, the hardware category was further broken down into modems, plug-in boards and cards, and protocol converters. The software category was broken down into communications, terminal emulation, integrated micro/mainframe, and controller emulation. These categories have been revised as follows for the second edition:

- Modems are no longer a separate category, although they appear elsewhere if they are bundled with communications software.
- The boards/cards category has been refined to include only those hardware products featuring communications protocols.
- Communications has been replaced by the more specific category of file transfer.
- The terminal emulation category has been subdivided according to the type of emulation, including IBM 3101, 3270, RJE, 5251, and DEC VTxxx.
- Gateways have been added as a new category to reflect the growing popularity of LAN-to-host communications.

These changes make the second edition of the Micro-to-Mainframe Communications Directory an even more useful reference tool than the first. Once potentially useful products

have been identified, product vendors may be contacted for more specific information. A list of the 300+ vendors represented in the directory, as well as their company addresses and phone numbers, can be found at the back of the book.

We are pleased to offer you this newly revised second edition which reflects the latest product information in the rapidly evolving micro-to-mainframe communications industry.

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PC-TO-MAINFRAME COMMUNICATION: A LAYERED ARCHITECTURE

Introduction

One of the major concerns surrounding PC-to-host communication is compatibility. Selecting compatible hardware is one issue, achieving compatible file formats and protocols is another. In order to clear up some of the confusion, it is often useful to think in terms of the International Standards Organization (ISO) Reference Model.

The ISO Model was developed with open systems and interconnectivity in mind. While it has been the model upon which networking standards have been based, it can also be used to relate machine-to-machine communication.

The ISO Reference Model

Whenever work is to be performed involving more than one computer, additional hardware and software is required to support the communication of data between or among the systems. Communications hardware is reasonably standard and generally presents few problems. However, when communication is desired among heterogeneous machines (i.e., computers from different vendors, or even different models of a computer from the same vendor), few standards and little off-the-shelf software exists. Different vendors use different data formats and data exchange conventions. Even within one vendor's product line, for example, IBM's, different model computers may communicate in unique ways.

As computer communications and computer networking proliferates within an organization, the one-at-a-time, special-purpose approach to communications software development becomes too costly to be acceptable. The only alternative is for computer vendors to adopt and implement a common set of conventions, and for purchasing organizations to demand that products adhere to those conventions. For this to happen, a set of international, or at least national, standards must be promulgated by appropriate organizations.

This line of reasoning led the International Standards Organization Technical Committee 97 to establish a new subcommittee (SC 16) to develop such an architecture in 1977. The result was the Open Systems Interconnect (OSI) model, which is a framework for defining standards for linking heterogeneous computers. OSI provides the basis for connecting open systems for distributed applications processing. The term "open" denotes the ability of any two systems conforming to the reference model and associated standards to communicate.

ISO chose a widely accepted structuring technique -- layering. All communications functions are partitioned into a

hierarchical set of layers. Each layer performs a related subset of the functions required to communicate with another system at an analogous layer. It relies on the next lower layer to perform more primitive functions and to conceal the details of those functions; similarly, it provides services to the next higher layer. Ideally, the layer should be defined so that changes in one layer do not require changes in other layers. In this way, a single monolithic problem can be broken down into a number of more manageable subproblems.

The task of the OSI subcommittee was to define a set of layers and the services to be performed by each layer. By breaking the communications process into tasks, the OSI subcommittee hoped to group functions logically and provide enough layers so that each layer was a manageable size, yet all the layers together did not require an unrealistic amount of processing overhead. The resulting OSI reference model has seven layers, which are listed and briefly defined in Figure 1.

Each layer is also described in more detail below.

Physical Layer - The physical protocol layer, which is the lowest layer of the model, has to do with electrical and mechanical specifications, e.g., signal levels and connectors. The function performed by the physical layer is the transmission and reception of an unstructured stream of bits over the network communication medium.

Link Layer - The function performed by the link protocol layer (also called the data link layer) is the transmission and reception of a structured stream of bits over the network medium. Whereas the physical layer provides for the transmission of a raw bit stream, the data link layer provides the ability to subdivide this bit stream into structured blocks of information commonly called frames or packets. Frames are typically delimited by reserved bit patterns or reserved character sequences, or through the inclusion of an explicit bit or byte count within the frame.

Network Layer - The function of the network layer is to facilitate the transmission and reception of a packet from a source node to a destination node within the network. In traditional point-to-point, store-and-forward networks, packets are typically passed from source to destination through a series of intermediate nodes; hence, some strategy for routing a packet to its eventual destination must exist. This strategy is implemented within the network layer.

Transport Layer - The function of the transport layer is to provide for reliable end-to-end or host-to-host communication

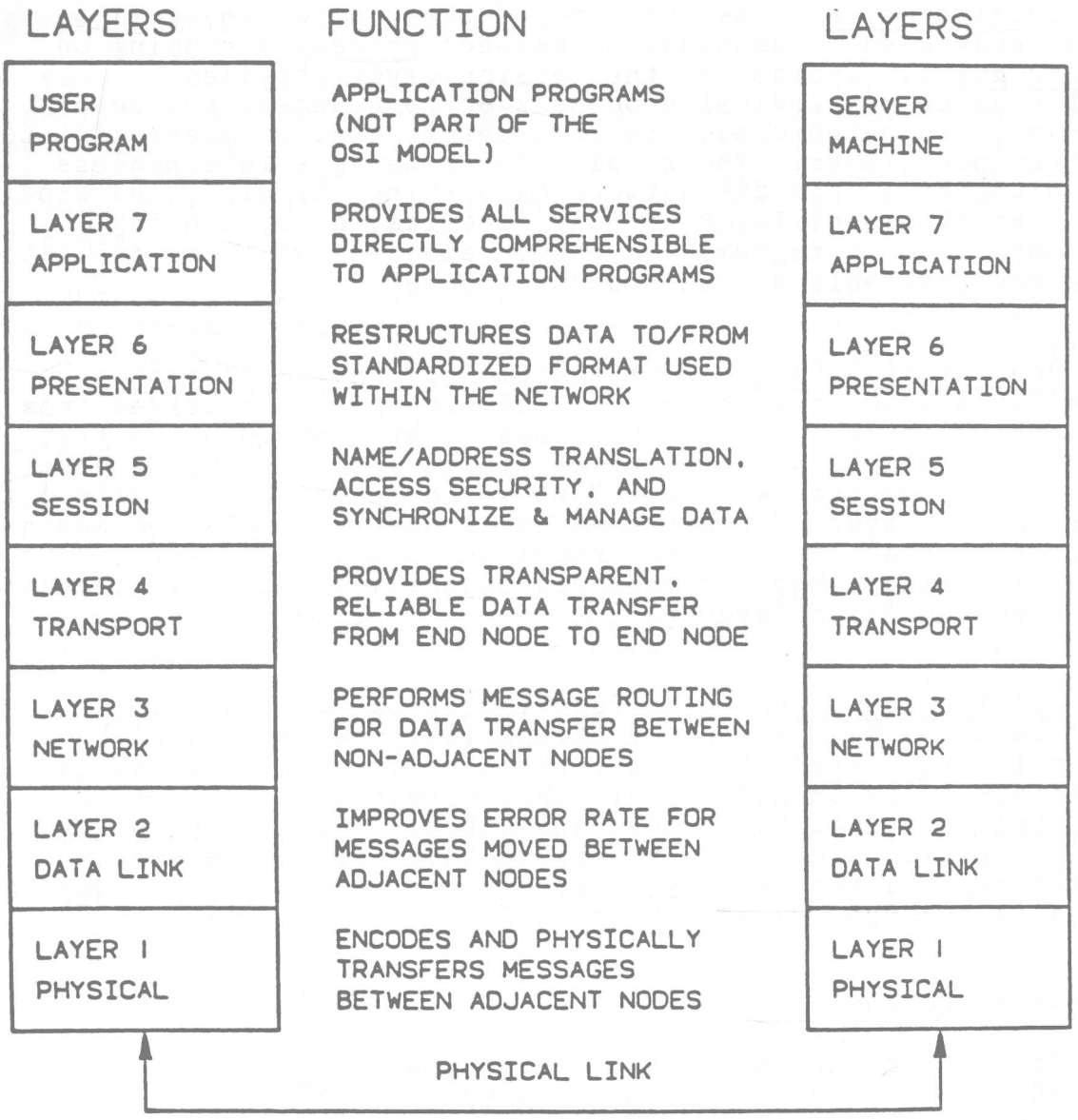

Figure 1: The Seven Layers of the OSI Reference Model

over the network. Two differing strategies have evolved to support this reliable communication -- datagrams and virtual circuits. Datagrams are self-contained messages which include explicit source and destination addressing information, and which are delivered reliably under the control of transport layer protocols. Virtual circuits allow logical (or physical) connections to be established between source and destination nodes; they also provide for a reliable data stream to be passed over the "circuit" from end to end.

Session Layer - The function of the session layer is to manage end-to-end communication between processes running on network hosts. Typically, the session layer provides facilities to map logical processes or port names (character strings) into network address information that is meaningful to the transport layer. The session layer manages interprocess communication within the network by opening, closing, and sending data over transport layer virtual circuits, or by sending transport layer datagrams, or both, depending upon the facilities which are available at the transport layer.

Presentation Layer - The function of the presentation layer is to transform the data to be sent to, or received from, the session layer. For example, one might wish to use a text compression algorithm in order to minimize the amount of data to be sent through the network. Text would be compressed within the presentation layer of the transmitting host and expanded again in the presentation layer of the receiving host. Similarly, data encryption algorithms for enhanced security might be implemented at the presentation layer.

Application Layer - The function of the application layer is to provide a variety of application-specific protocols to application layer programs that might include services to facilitate funds transfer, information retrieval, electronic mail, text editing, and remote job entry. The variety of services provided at the application layer is theoretically limited only by the variety of possible application programs to be run in the network environment.

PC-To-Host Communication

The four major ways communication can be established between a PC and a mainframe are: (1) terminal emulation, (2) file transfer, (3) integrated packages running on both the mainframe and the PC, and (4) local area networks. Many hardware/software packages are a combination of the four. Terminal emulation packages, for example, may come with file transfer capability. The four communications methods are discussed in greater detail below.

Terminal Emulation - Terminal emulation is the easiest of the four communications methods to implement. The resources of a PC -- namely, the screen, keyboard, processor, and memory -- can emulate nearly any terminal imaginable. And since terminal emulation occupies only a small fraction of the CPU's processing time, the PC can perform other tasks, like transferring files to disk, simultaneously. With certain packages, PC users may toggle back forth between terminal emulation and the PC's operating system at will. The most commonly emulated terminals are the IBM

3278, the IBM 5251, and the DEC VT series.

Terminal emulation software fits in at the application level of the ISO Reference Model. It may work in conjunction with the presentation layer if, for example, character conversion from EBCDIC to ASCII is required. The data is typically picked up from data link level hardware such as an SDLC card that plugs into a PC.

Terminal emulation is usually done via direct connection to a host or modem connection over dial-up or leased lines. If the PC emulating a terminal is connected to a device such as an IBM 3274 cluster controller, then the cluster controller will provide the "missing" layers, including the session, transport, and network layers. Thus, simple terminal emulation packages typically provide Layer 7 and sometimes Layer 6 of the ISO Reference Model.

File Transfer - File transfer allows large amounts of data (files) to be transferred between the PC and a host. It is typically used in conjunction with terminal emulation, although some file transfer packages simply offer dumb terminal emulation. File transfer should be bidirectional -- that is, packages should allow the PC to send files to, and receive files from, the mainframe. Error detection and retransmission must be supported. More sophisticated file transfer packages may also perform file format conversion as the file is being sent or received.

File transfer software typically implements the transport layer and -- if conversion must be performed -- the presentation layer of the ISO Reference Model. The software will communicate with the data link layer of the hardware, such as a modem.

Integrated PC/Host Packages - Integrated PC/host packages call for the mainframe and the personal computer to be provided with cooperating programs that allow users to execute mainframe programs from their PCs and transfer data back and forth, typically from databases. These packages communicate in a task-to-task dialog to cooperate in giving users access to corporate information on the mainframe. Since the mainframe and PC programs are cooperating, the dialog is optimized for compact transmission; information is sent faster and requires less connect and transmission time. Because the communication is done transparently through the programs, the user need not learn anything about the mainframe, the package on the mainframe, or the database command language. The package running on the PC handles all the necessary conversions so that users can formulate their own queries off-line without requiring assistance from the data processing department.

Database query and selection is made possible by allowing the PC to contain some of the same database as the mainframe.

This capability, along with file transfer capability, is very useful because it allows users with very little training time to perform PC applications that issue queries against both local and mainframe databases. These types of databases are, for the most part, relational, since users can view the data in rows and columns similar to a spreadsheet, which can be easily understood.

Integrated applications take the information received from a terminal emulation input stream and act on it automatically to incorporate it into PC applications such as spreadsheets, graphics, and word processing programs. These integrated programs can interact with several databases or ordinary files. In such cases, a PC is usually required to emulate a terminal for up- and downloading of queries and data files, respectively; at all other times the PC can operate in its normal mode. For example, when the PC logs on to the mainframe, a template can be downloaded to the PC to enable it to determine all specifications for the query; the PC can then be reconnected to the mainframe for query completion. Thus, the PC switches from a terminal emulation mode to a local PC mode and receives all data in a format directly usable for specific personal computing applications.

Integrated packages incorporate all layers of the ISO reference model. Because of this high level of integration, the PCs and mainframes often communicate to each other in a peer-to-peer fashion, i.e., as one application "talking" with another application.

Local Area Networks - A major thrust in micro-to-mainframe communication is occurring in the area of local area networks (LANs). Several companies are attempting to connect mainframes and personal computers on a local network in which a user at any PC on the network can access mainframe applications transparently.

In order to successfully integrate such a local network of PCs into a mainframe environment, a number of hardware and software products must be available. The most important item is the gateway that provides the interface between the local network and the mainframe. This gateway may be a PC with special hardware and software, or a special purpose "black box." The gateway should also be capable of handling multiple users, much like an IBM 3274 cluster controller. On the PC level, users run terminal emulation software along with underlying communications software that communicates via the local network to the gateway, which in turn talks to the host.

The gateway will typically implement the physical layer through the presentation layer of the ISO model, while PCs attached to the LANs will implement all layers. The layers in the PCs will support the local area network and also communication with the gateway. The application layer within the PC will support terminal emulation. The gateway must support

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both sides of the conversation -- the PC and the mainframe -- and perhaps perform protocol conversion as well.

SNA

Systems Network Architecture (SNA), developed by IBM, is another set of layered protocols for distributed communication systems. While SNA is similar to the ISO Reference Model (see Figure 2), there are plenty of subtle differences such that a tremendous amount of protocol conversion must be performed during communications with an IBM PC.

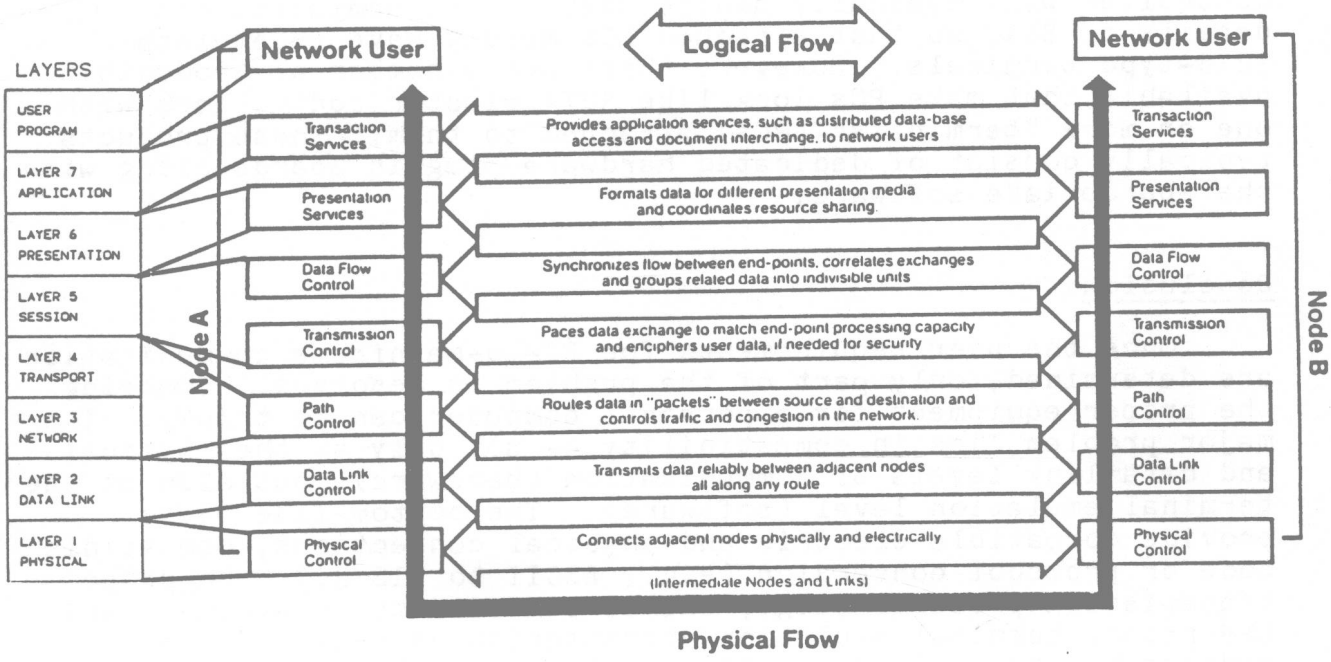

Figure 2: A Comparison of OSI and SNA Layers

In general, SNA is the description of the rules that enable IBM's customers to transmit and receive information through their computer networks. SNA may also be viewed as three distinct but related entities: a specification, a plan for structuring a network, and a set of products.

First, SNA is a specification governing the design of IBM products that are to communicate with one another in a network. It is called an architecture because it specifies the operating relationships of those products as part of a system.

Second, SNA provides a coherent structure that enables users

to establish and manage their networks and, in response to new requirements and technologies, to change or expand them.

Third, SNA may be viewed as a set of products: combinations of hardware and software designed in accordance with the specifications of SNA. In addition to a large number of computer terminals for both specific industries and general applications, IBM's SNA product line includes host processors, communication controllers and adapters, modems, and data encryption units.

The SNA product line also includes a variety of programs and programming subsystems. Telecommunication access methods, network management programs, distributed applications programming, and the network control program are examples.

During micro-to-mainframe communications, a cluster controller will typically handle most of the communication details of SNA, so that attached PCs merely have to emulate 3278-type terminals. However, there are a number of products available that make PCs look like 3274 cluster controllers with one or more "terminals" (PCs) attached to them. These products typically consist of dedicated hardware plug-in boards along with the appropriate software.

Conclusion

Once the user requirements for PC-to-mainframe communication are determined, only part of the problem is resolved. Choosing the proper equipment for a personal computer can be tricky. The major problem lies in compatibility -- not only at the physical and data link levels of communication (hardware), but also at the terminal emulation level (software). The bottom line is to provide compatible electric and physical connections, compatible code or protocol conversion (e.g., ASCII to BISYNC), the proper transmission protocol (e.g., one screen of data at a time), and the proper terminal emulation characteristics (e.g., cursor addressability, inverse fields, protected fields).

Designing an environment that will support personal computers along with mainframes requires careful planning and selection of the right hardware and software. The ISO Reference Model and SNA are layered architectures that provide helpful guidelines in this implementation.

Once communication is established, sophisticated PC software is needed to take full advantage of local processing power while maintaining the mainframe connection for required data and services. The successful implementation of PCs in such an environment will increase efficient use of computing resources and improve worker productivity.

3270 Coax Interface

Texas Instruments
P.O. Box 402430, H-701
Dallas, TX 75240
(800) 527-3500

Lets TI Professional emulate IBM 3278 and 3279 terminals. May be attached by coax to a remote or locally attached IBM 3274 or 3276 cluster controller.

PC Types Supported:
TI Professional

Price: $ 1195

3270 Personality Series

ABM Computer Systems
3 Whatney
Irvine, CA 92714
(714) 859-6531

Three levels of cluster control for the company's IBM 3270 BSC emulation subsystems. Product based on the Intelligent Communications Processor board and 3270 BSC software. Level 1 cluster, priced below, lets one PC communicate with an IBM mainframe. Level 2 allows four PCs and one printer to communicate as 3278 and 3287 devices ($1,990), while Level 3 connects up to 13 PCs and a printer ($2,685)

PC Types Supported:
IBM PC, XT, Clones

Price: $ 1295+

3270 Plus

NBI, Inc.
P.O. Box 9001
Boulder, CO 80301
(303) 938-2795

SNA and bisync communications for NBI's OASys 2000 and IBM PCs, as well as OASys 4000 word processors sharing an OASys 64 central controller.

PC Types Supported:
IBM PC, XT, Clones
Other

Operating Systems Supported:
PC/MS-DOS

Price: $ 4000

3270 SNA

Texas Instruments
P.O. Box 402430, H-695
Dallas, TX 75240
(800) 527-3500

Software that allows the TI Professional to act as a remote IBM 3276 Model 12 terminal with an attached 3287 printer. Data transmission rates are 4,800 bps over switched telephone line and 9,600 bps over leased lines. Program requires a sync/async communications card.

PC Types Supported:
TI Professional

Operating Systems Supported:
PC/MS-DOS

Price: $ 675

3270 Terminal Emulation SW/HW

Fortune Systems Corporation
101 Twin Dolphin Drive
Redwood City, CA 94065

A combination hardware/software package that allows Fortune Systems' 32:16 desk-top computer users to access IBM or non-IBM mainframes that support an IBM 3276 Model 2 cluster controller unit. The emulator permits 32:16 to appear as a 3276 controller or an IBM 3278 display terminal. Supports up to three concurrent users while additional users perform tasks on other software from the company.

PC Types Supported:
Other

Price: $ 995

3278 Emulation Board

Wang Laboratories, Inc.
1 Industrial Boulevard
Lowell, MA 01851
(710) 343-6769

A board and software that provides IBM 3278 terminal emulation to Wang Professionals that are attached to a 3270 terminal network. The board fits into an expansion slot of the micro. Package allows data to be downloaded from the mainframe for local manipulation.

PC Types Supported:
Wang Professional

Price: $ 1095

3703 Protocol Converter

Halcyon Communications, Inc.
2121 Zanker Road
San Jose, CA 95131
(408) 293-9970

Lets users of ASCII and BSC devices operate on an IBM SNA network. Up to 12 printers, plotters, or CRTs may be connected to the 3703.

3780 Bisync

Viking Associates
320 W. Fillmore
Colorado Springs, CO 80907
(303) 632-7004

An emulation package that allows Apples to appear to IBM mainframes as remote job entry stations. Batch file transfer in async and bisync environments.

PC Types Supported:
Apple II or IIe
Apple III

Operating Systems Supported:
Apple-DOS

Price: $ 1195

ABT VT-100 Terminal Emulator

Advanced Business Technology
1180 Colemen Avenue
San Jose, CA 95110
(408) 275-9880

Emulation of major DEC VT-100 features, including VT-52. Local work files can be obtained from or transferred to a network.

PC Types Supported:
Apple II or IIe

Access 1-2-3

Novation, Inc./Microstuf, Inc.
20409 Prairie Street
Chatsworth, CA 91311
(213) 996-5060

A communications package combining a PC1200B modem and Crosstalk 16 software. The modem features auto/dial/answer and audio monitoring; Crosstalk 16 software allows emulation of DEC VT-110, IBM 3101, ADDS Viewpoint, and TeleVideo 910/920.

PC Types Supported:
IBM PC, XT, Clones

Operating Systems Supported:
PC/MS-DOS

Access/SNA 3270

Communications Solutions, Inc.
992 S. Saratoga-Sunnyvale Road
San Jose, CA 95129
(408) 725-1568

Software written in C that allows multi-user micros under UNIX III, UNIX V, and Xenix to access an IBM SNA environment. Uses Termcap function to enable UNIX-based systems to emulate IBM 3274/76 cluster controllers. UNIX print spooler allows for simultaneous support of printers. Termkey function allows linked ASCII terminals to function as IBM 3278 terminals. Includes interactive configuration program and diagnostics. Cost of licensing begins at $75,000.

Operating Systems Supported:
UNIX or UNIX-like

Acculink

IE Systems, Inc.
112 Main Street
Newmarket, NH 03857
(603) 659-5891

Features emulation of IBM 3101, DEC VT100, VT102, VT52, and TVI950. Supports Xmodem protocol for ASCII and binary file transfers. Can also run on DECsystem 10/20, VAX, and PDP-11.

PC Types Supported:

HP 110
HP 150
IBM PC, XT, Clones

Operating Systems Supported:
CP/M-80
CP/M-86
PC/MS-DOS

Price: $ 245+

ACE

Insurance Technology
1437 W. Palmyra
Orange, CA 92668

ACE is a series of Asychronous Communications Emulators. The various products allow IBM PCs and compatibles to emulate Honeywell VIP7200, VIP7301, or VIP7303 terminals. They utilize the standard Honeywell terminal interface and function independently of the processor and operating system. PC must be equipped with a communications port. Optional FILE program ($295) allows ACE to up- and download files between PC and Honeywell GCOS 6 Mod 400.

PC Types Supported:
IBM PC, XT, Clones

Price: $ 495

ACOM-300

Allston Group
P.O. Box 547
Wylie, TX 75098
(214) 442-7205

Makes the IBM PC an intelligent terminal on GEISCO's Mark III network. Features to/from ASCII file transfer, data capture to disk or printer, and local mode file directory viewing, erasing. Requires acoustic modem, PC DOS 1.1 through 3.0.

PC Types Supported:
IBM PC AT
IBM PC, XT, Clones

Operating Systems Supported:
PC/MS-DOS

Price: $ 50

AdaptBSC 3270

Network Software Associates
19491 Sierra Soto
Irvine, CA 92715
(714) 768-4013

Software that enables IBM PCs to appear as 3276-51 control units and 3278-2 terminals. Supports interactive communications in a VTAM/TCAM environment. Features Application Programming Interface, which allows program-to-program communications on the 3270 data stream as well as multi-tasking, which allows PC-DOS programs to be run concurrently with emulator. Offers full link control and transparent text mode. Needs IBM bisync communications adapter.

PC Types Supported:
IBM PC AT
IBM PC, XT, Clones

Price: $ 275

AdaptSNA 3270

Network Software Associates
19491 Sierra Soto
Irvine, CA 92715
(714) 768-4013

Software that lets a PC emulate an IBM 3274 controller, 3278/9 terminal, and 3286/7 printer in an SNA environment. One optional feature is the AdaptSNA 3270 API (Applications Programming Interface), which allows customized PC applications and program-to-program communications ($285). Supports SDLC communications adapter cards from IBM, AST Research, and Emulex/Persyst.

PC Types Supported:
IBM PC AT
IBM PC, XT, Clones

Price: $ 585

AdaptSNA PCcom II

Network Software Associates
19491 Sierra Soto
Irvine, CA 92715
(714) 768-4013

Allows PCs in an SNA configuration to communicate with each other using SDLC and the modems and communications adapter cards already in place for micro to mainframe communications. Central PC can distribute software and diagnostic files to and from remote PCs. Bulk data transfers at up to 19.2 Kbps. Features include unattended operation, support of multi-drop configurations, autodial, password protection, and data compression.

PC Types Supported:
IBM PC AT
IBM PC, XT, Clones

Price: $ 475

AdaptSNA RJE

Network Software Associates
19491 Sierra Soto
Irvine, CA 92715
(714) 768-4013

Software that offers IBM 3770 or 8100 Remote Job Entry workstation emulation in an SNA environment. Allows PC to communicate with a JES or POWER host. User can switch between the communications session and a local DOS-based application. Optional unattended operator facility (UOF) available for $285. Supports SDLC communications adapter cards from IBM, AST Research, and Emulex/Persyst.

PC Types Supported:
IBM PC AT
IBM PC, XT, Clones

Price: $ 585+

Advanced Communications Board

Frontier Technologies Corp.
P.O. Box 11238
Milwaukee, WI 53211
(414) 964-8689

Lets PC communicate with mainframe or an X.25 network. Offers async, bisync, and SDLC protocols. With appropriate software, can emulate 3270 or 3780 terminal.

PC Types Supported:
IBM PC, XT, Clones

Price: $ 275

Advanced Communications Board

Micro Network Corporation
511 Eleventh Avenue, Suite 429
Minneapolis, MN 55415
(612) 333-4303

Consists of an 8088 co-processor, Smartmodem software, and an optional 300 FDX modem or 300-1200 bps FDC modem on board. Runs async, bisync, and SDLC protocols.

PC Types Supported:
IBM PC, XT, Clones

Operating Systems Supported:
CP/M-80
CP/M-86
PC/MS-DOS

Price: $ 895+

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