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AICPA

Microcomputer Communications

Management Consulting Services Division

AMERICAN

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ACCOUNTANTS

NOTICE TO READERS

This special report is designed as educational and reference material for Institute members and others who provide *consulting services* as defined in the Statement on Standards for Consulting Services (SSCS) issued by the AICPA. It does not establish standards or preferred practices.

Various members of the 1992-1993 Computer Applications Subcommittee provided information for this special report and advised the authors and staff. The subcommittee members are listed below.

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51/100   **MICROCOMPUTER COMMUNICATIONS**

51/105 INTRODUCTION

.01   Advances in computer technology have propelled us into the Information Age. Enormous amounts of information stored in thousands of large computer databases around the world are available to anyone with a microcomputer, a modem, and a telephone line. Consequently, the microcomputer, which most businesses use for operating spreadsheets, database managers, word processors, and accounting programs, is a valuable business tool for electronically communicating with clients, vendors, and colleagues and for gaining access to large databases. These functions can be accomplished with even the most basic microcomputer.

.02   The opportunities for using microcomputers as communications devices have grown tremendously in both small businesses and large corporations. Although minicomputers and mainframes also can be used for communications, the focus of this special report is on microcomputer communications.

.03   This report provides an overview of communications between microcomputers via modems and standard telephone lines. It discusses various applications for microcomputer communications, from the perspective of both the practitioner and the client. Most of these applications involve communicating remotely or dialing into electronic information services and bulletin boards. The report also addresses the costs and security risks of microcomputer communications. Although this report focuses on microcomputer communications via modems and standard telephone lines, the importance and popularity of local area networks (LANs) in computer communications cannot be ignored. LANs are usually used for internal communications. LANs allow two or more microcomputers to communicate by sharing hardware and software.

.04   An understanding of when and how to establish communications between microcomputers may help the practitioner identify situations in which such communications are warranted. The solution may involve establishing a link among the client's microcomputers, between the client's microcomputer and the practitioner's microcomputer, or exclusively among the practitioner's microcomputers.

.05   Before equipping a microcomputer for communications, the practitioner should determine the purpose of the communications. The information in this special report will help to determine the hardware and software most appropriate for the organization's microcomputer communications.

51/110 WHY MICROCOMPUTER COMMUNICATIONS?

.01   Microcomputer communications can be more efficient than other methods of communications. Consider the evolution in communications illustrated in the following situation. A practitioner has been engaged to develop accounting procedures for a client located 300 miles away. After exchanging drafts of the procedures many times and spending many dollars on overnight delivery services, the practitioner and client decide to fax the changes back and forth.

.02   Although faxing small documents is usually less expensive and more timely than overnight delivery, it proves to be cumbersome in this situation. For a document that is longer than fifty pages, the mechanics of outgoing and incoming faxing are both time- and labor-consuming, and the long-distance telephone charges are costly.

.03   Finally, the practitioner and client decide to use remote control software to review the document together, on-line. The practitioner dials into the client's computer and, using the remote control software's file transfer features, sends the document to the client's computer. As the client looks on, the practitioner transmits the changes to the client's computer where the client can view them and also make additional changes. As soon as editing is completed, the changes to the document can be copied to the client's disk, printed on the client's printer, and transferred to the practitioner's computer.

.04   In this instance, remote control communications is the best form of communications because it satisfies the need at hand by allowing the client and the practitioner to view and discuss the document simultaneously. In many other situations as well, microcomputer communications has several advantages over other forms of communications. These advantages include the following.

a.   The electronic transfer of large files can be more practical and faster than mail.

b.   Electronic file transfer may eliminate the need to rekey data into the receiving computer's software. Fax transmission, even by microcomputer-based fax boards, cannot accomplish this without using other software to translate the fax image file.

c.   Computer files can be saved for future reference on both the sending computer and the receiving computer.

d.   Microcomputer communications is the fastest way to send computer programs from one computer location to another. Nevertheless, sending disks by courier or by mail may be more appropriate to meet certain needs, such as the distribution of a large volume of files or distribution to many locations.

51/115 APPLICATIONS

.01   Microcomputer communications increases the return of an organization's investment in hardware. By adding an inexpensive modem and communications software, the organization can

use microcomputer communications for research, external data transfer, internal corporate communications, and computer consulting and support.

Research

.02   Public databases offer the latest stock prices and number of shares traded, financial data, and profiles of publicly held corporations, including SEC 10K reports, corporate credit ratings and reports, and other financial news. These databases also provide historical cost and dividend information, thereby facilitating the reconstruction of the cost basis for stocks, bonds, and other investments. In addition, they present official pronouncements, court decisions, and industry regulations.

.03   Electronic information databases on tax regulations and accounting information are available through the AICPA's on-line system, TOTAL, as well as LEXIS and NEXIS. Tax professionals use these on-line databases to research tax issues more quickly; the computer can search the entire tax code and related court cases for key words in just a few seconds. The user may also download the research material to an electronic file for later reference off-line and for incorporation into a document. In addition to saving research time, this transfer eliminates the need for copying and typing material from reference books.

.04   Through on-line databases, auditors can obtain such information as industry averages for current ratios and days' supply in inventory. These ratios are useful in conducting an audit of a client's financial statements. Via microcomputer and modem, a researcher can also access electronic databases that contain encyclopedias as well as the indexes, abstracts, and full text of articles in many scholarly journals. Other information, such as current articles related to the client's industry, may add insight that helps formulate managerial advice and may provide information on accounting treatment for certain transactions.

External Data Transfer

.05   Another application of microcomputer communications is data transfer. For practitioners, the possibilities are almost endless. With this technology, the CPA practitioner can collect data from clients for audit, review, compilation, tax, or consulting services. The client can send monthly reports via modem, which can be printed on the practitioner's printer without manual intervention. In addition, financial data can be transferred to the practitioner's computer for subsequent processing by the practitioner's tax or write-up software, eliminating the need to rekey data.

.06   CPA firms that do not process returns in-house may save money by entering client tax data into a microcomputer and transmitting the data to a tax preparation service. This process, known as remote job entry, may help some CPA firms to reduce tax preparation costs. Tax preparers can also use the microcomputer to transmit tax returns directly to the Internal Revenue Service, resulting in quicker refunds for their clients. Practitioners who work closely with other professionals, such as attorneys and consultants, can exchange documents and forms very quickly by modem.

.07   Various industries have specific applications of the data transfer capability of microcomputer communications. Health care providers, for example, can file insurance medical claims electronically and thereby improve their cash flow. Businesses that are trading partners in Electronic Data Interchange (EDI) may transact business electronically with each other. EDI eliminates excess paper shuffling, thereby promoting more efficient and accurate transaction processing and record keeping. For example, with EDI, an electronic invoice for goods or services can be matched with the vendor's electronic purchase order and receiving documents to create an authorized payment in the accounts payable system. This eliminates the need to complete a paper-based form. In addition, customers can connect to a vendor's computer and place an order for supplies or inventory.

.08   Many businesses minimize their inventory levels by using EDI to place orders directly with their suppliers. This speeds up the ordering process and may allow a business to maintain a smaller inventory. Similarly, by accelerating the processing of sales invoices, EDI will also provide benefits to managing the receivables system.

.09   Financial institutions can service clients by electronically transferring funds and providing balance and account information. Investors can dial into their broker's computer to initiate trade requests, check the status of their portfolio, or leave instructions.

.10   A number of administrative tasks can be efficiently completed by communicating with external organizations via microcomputer. For example, corporate cash managers can access their banks' computers to determine account balances, transaction clearings, and other data. Furthermore, they can download this information to spreadsheets and other programs for cash planning, account analysis, and similar uses. Employers can also file payroll tax returns electronically, thus eliminating the work involved in producing and mailing hard copy forms.

.11   Electronic bulletin board systems (BBSs) may be used to exchange information among similar organizations. For example, CPA firms can use a BBS to share their expertise with other CPA firms. A BBS allows a user to log into an electronic mailbox that can be shared by affiliated firms. The user may issue a special request for a person with expertise in a specialized area such as litigation support. When the other firms receive the message, they may notify the user electronically that they have the necessary expertise to assist in the engagement.

Internal Corporate Communications

.12   Microcomputer communications can be used to disseminate data and information throughout an organization. Within a CPA practice, for example, an auditor working in the field may transfer a time report to the firm's time and billing system, thereby minimizing the time spent traveling for administrative purposes.

.13   A practitioner may also use remote communications software to dial into a home-office computer while in the field or at home. For example, with remote communications software, a practitioner may operate a tax preparation program and print a tax return on the home-office computer.

.14   Many businesses and CPA firms use electronic mail (E-mail) to send information between offices. Overnight delivery services or couriers can be expensive and time-consuming; deliveries can require from four to twenty-four hours. Electronic communications usually are faster and less expensive.

.15   Many businesses use microcomputer communications to automatically poll remote locations each night to produce consolidated sales, cost of sales, and up-to-date inventory reports. For example, a restaurant chain with five locations could obtain a daily report detailing the total sales activity and inventory levels for each location as well as for the entire organization. Such information can be invaluable for carefully monitoring and managing several locations.

.16   Similarly, a corporate office with several branches could collect daily reports on sales, orders, and other activities from the branches. In addition, accounting data from the branches could be consolidated at the corporate office in a more timely manner through electronic transmission.

.17   Retail stores can use a point-of-sale (POS) system to capture sales transactions and transmit the sales data to a central computer for consolidation and reporting. The central computer may poll the POS terminals at one or more predetermined times during the day and automatically download each POS terminal's data.

.18   With modem-equipped laptop or notebook computers, employees working outside the office, such as field salesmen, estimators, and engineers, can communicate with the office efficiently. Using remote control communications software, managers can access current information, such as technical bulletins and on-line instruction manuals, and messages while away from their offices. They can work directly on office computers without having the programs loaded onto their field computers. In the insurance industry, field agents may accelerate the processing of personal property insurance claims by filing them electronically.

.19   Conversely, communications from the corporate office to the branches may be disseminated via E-mail or internal electronic bulletin board. Sales bulletins, inventory availability, price lists, policy changes, and other communications can be transmitted to branches or made available for immediate review. A company may implement an electronic BBS, on which employees may read bulletins, policies, and other corporate news. They may also use the BBS as a message center if an E-mail system is unavailable.

Computer Consulting and Support

.20   Microcomputer communications enables practitioners to provide computer support to clients. Practitioners are able to dial into the client's computer and operate programs from remote locations to correct software problems, provide informal training, develop applications, and give other kinds of support. If the client calls with questions or problems, the practitioner can solve the problem very quickly, efficiently, and cost effectively without making on-site visits. Project schedules can be accelerated when practitioners have access to the client's system.

.21   Software vendors can distribute program changes such as enhancements and bug fixes directly to users via microcomputer communications. The practitioner may communicate electronically with software vendors to download software updates for their clients or to obtain answers to support questions.

51/120   MICROCOMPUTER COMMUNICATIONS TECHNOLOGY

Hardware

.01   To establish microcomputer communications, two hardware components are required in addition to the microcomputer. These components are a modem and a communications channel, such as a standard telephone line.

.02   **Modems.** *Modem* is an abbreviation for *modulator-demodulator*, a device that converts the digital signals that computers understand into analog signals that can be sent over standard telephone lines. Digital signals are binary, which means that they involve a choice of two alternatives, on or off. Analog signals, however, vary continuously. The modem translates the digital signal into an analog packet and sends it through the telephone line to the receiving modem, which converts the analog packet back into digital signals for the receiving computer. Modems vary in location (internal or external), speed, and error-correction and file-compression capabilities.

.03   *Location.* Internal and external modems have different advantages and disadvantages. Internal modems, which are inserted into an expansion slot inside the computer, take up no desktop space. The internal modem also has a serial port, unlike the external modem for which a serial port must be provided. However, internal modems take up a computer's resources by occupying what could be a valuable expansion slot inside.

.04   Internal modems typically are less expensive than external ones. However, they are dedicated to a single computer and therefore are not as easily transportable to other computers as are external modems. Furthermore, internal modems draw their power from the computer, whereas external modems usually require a separate power source. Modem vendors are more likely to bundle communications software with internal modems than with external ones. However, if the external modem also has fax capabilities, fax software normally is included.

.05   Generally, external modems display their operating status in a series of LEDs (light-emitting diodes), while the internal modems cannot be seen. An internal modem may be installed with software utilities that simulate an external modem's lights on the monitor.

.06   One type of external modem is the pocket-size modem, a very small, lightweight modem designed to plug into a notebook or the serial port of a laptop. The pocket-size modem has features of both the external and internal modem. For example, like an internal modem, it may not have LEDs to display its operating status or require an external power source. However, it is external and plugs into the laptop's serial port. The pocket-size modem may also be connected

to a desktop computer. Wireless modems have also become available. These modems use radio waves, rather than standard telephone lines, to communicate.

.07 *Speed.* A modem's speed is more important than its location. The measure used for modem speed is bits per second (bps). For example, the speed of a modem that transmits 120 characters (or bytes) per second is 1,200 bps. The most popular modem today is 2,400 bps, but the 9,600-bps modem is growing in popularity. A 9,600-bps modem will speed up transmission noticeably, repainting screens and transmitting files four times as fast as a 2,400-bps modem. When combined with the faster modem's built-in compression, its effect may even be greater. However, since a modem is required on both ends of the communications link, the transmission speed is dictated by the slower of the two modems. A single standard has not yet emerged for the various brands of high-speed modems. Therefore, compatibility among them is a problem. Appendix A provides a description of the software settings that must be compatible for communications to take place.

.08 *Error-correction capability.* Modems performing at 2,400 bps or faster may contain built-in error-correction and file-compression capabilities, allowing them to achieve a greater speed.

.09 Compared with slower modems (2,400 bps and below), high-speed modem signals are more vulnerable to line interference (noise). Therefore, error-correction capability is necessary in the faster modems. Although the slower modems use error-correction software (via such protocols as Xmodem or Ymodem), the error-correction features of high-speed modems are hardware-based. These features are active during the entire communications session, not only during file transfers.

.10 *Costs.* Although a 1,200-bps modem is less expensive than a 2,400-bps modem, using the former to download files from a commercial information service may eventually cost more since connect time is approximately twice as long. Nevertheless, some services charge users of high-speed modems higher rates than users of lower-speed modems, although the higher cost is not directly proportional to speed. The 9,600-bps modem is recommended by many authorities if a great deal of file transfers will take place.

.11   Telephone Lines. Standard analog telephone lines may be used for microcomputer communications. However, if data communications are heavy, a dedicated line is worthwhile.

.12 Some telephone systems make microcomputer communications difficult. These include PBXs and systems requiring the pressing of a button for a dial tone. However, if a dial tone can be obtained by pressing one of the phone's digits, for example, 9, the digit can be entered into the communications software's dialing directory. Some PBXs may require additional hardware for modem usage. In general, a single telephone line that can access a dial tone directly is preferable because it enables the modem to respond to incoming calls, or allows it to dial out directly.

.13 Modems that share telephone lines with other communications equipment such as fax machines, telephones, and telephone switching equipment *may* experience interference or noise.

Although this is not necessarily fatal to a communications session, a dedicated line for the modem would reduce interference substantially.

.14   If a modem is to share a data line with other communications devices, an automatic line switch may be installed. A line switch can detect the nature of the incoming call (modem or fax) by the call's tone and direct it to the appropriate device. In addition, phone companies can assign different numbers to a single phone line. This gives the modem line and fax line different rings even though they share the same physical line.

Software

.15   In general, the software used in microcomputer communications is one of four types: (a) remote control software, (b) general communications (terminal emulation) software, (c) bulletin board software, and (d) E-mail or some LAN packages.

.16   Remote Control Software. Remote control software allows the user of one computer to dial into and control the functions of another microcomputer. File transfer between the host and the remote microcomputers is also possible with this kind of software. Standard remote control programs include Carbon Copy, PC Anywhere, Co-Session, PC Remote, and PC Tools Deluxe's Commute (version 7).

.17   Terminal Emulation Software. Terminal emulation software allows a computer to appear as a terminal to the host system. The software also enables files to be transferred between the terminal and the host computer. (Terminal emulation may also apply to communications between a microcomputer and a mainframe computer.) Any microcomputer can be a host or a remote terminal, and files can be transferred in any direction.

.18   If the main objective of microcomputer communications is to allow files to be transferred between two microcomputers, almost any general communications software program (terminal emulation software) can be used. Communications programs are available in a stand-alone format (for example, Crosstalk, Smartcom, Procomm, and PC-Talk); as part of integrated software programs (for example, Symphony and Microsoft Works); or as part of a utility (for example, Sidekick and PC Tools, which also offers fax communications and remote control communications modules). In addition, Microsoft Windows contains Terminal, a communications module. Several communications programs that allow background communications are also available for Windows.

.19   Bulletin Board Software. Bulletin board software is a special kind of communications software that is installed on a computer (the host) and which offers other computers (terminals) access to the host. BBS software includes various security controls for different callers, message handling, file-transfer protocols, and doors to other application programs, among other features. Depending on the kind of computer used and the number of telephone lines installed, BBS software can control multiple simultaneous communications sessions with the host.

.20   Special hardware or software may be required by an information service. For example, subscribers to Prodigy receive proprietary communications software; none of the popular

communications programs will connect to Prodigy. An information service may require a certain terminal emulation, such as ANSI or VT-100; it may *not* support all 9,600-bps modems, or it may impose other technical idiosyncrasies.

.21   E-Mail and LAN-based Software. Modem-based microcomputer communications is but one method of electronic communications, along with LANs, wide area networks (WANs), facsimile, direct microcomputer-to-microcomputer cable connection, and other connectivity technology. These different kinds of technology are complementary rather than competitive, as each offers unique advantages in different situations.

Local Area Networks (LANs)

.22   Local area networks (LANs) may be used for internal communications. LANs allow two or more microcomputers to communicate by sharing hardware and software.

.23   LANs and asynchronous communications may be used together. For example, a workstation on a LAN may be equipped with a modem for asynchronous communications. If more than one user needs to access a modem, the users on the network can share it much as they would share any peripheral device. The network may contain a communications server, which directs network communications among workstations, modems, and fax boards.

.24   In general, however, LANs and asynchronous communications have different connectivity functions. The sharing of files and peripheral equipment within an office is probably best accomplished with a LAN; transferring files occasionally over long distances is best accomplished with modems and communications software. If the computers are widely dispersed geographically but need more continuous communications than is practical asynchronously, a WAN may provide the best connectivity.

.25   If continuous communication is required, a direct, leased telephone line connecting the host and remote computers may be appropriate. However, because of the expense, leased lines should be used only when continuous or high-volume communications are required.

File Compression Utilities

.26   File compression utilities are another kind of special software. The amount of time required to transmit files via modem relates directly to their number and size. For example, the time required to transmit a 100K (102,400 bytes) file at 2,400 bits per second is approximately ten minutes. (The time will also vary primarily according to the file-transfer protocol.) Similarly, ten 10K files take more transmission time than one 100K file because of the start-and-stop time needed for multiple files.

.27   Fortunately, software utilities are available to compress files for transfer. With a compression utility, a 100K file may be reduced to a 50K or 60K file, requiring only 50 percent or 60 percent of the original transmission time. The degree of compression depends primarily on the nature of the file. For example, a pure text (ASCII) file may be compressed 70 to 90

percent while a program may be compressed only 20 percent. A compression utility can also compress several files into a single file to further reduce transmission time. For example, ten individual files totaling 75K may be compressed into a single 25K file. Again, the degree of compression depends upon the kinds of files being compressed.

.28   A compressed file may often be referred to as *arced, zipped,* or *stuffed* because of the popularity of the compressing programs.

.29   The ability to compress multiple files into a single file makes uploading and downloading files more efficient. A user who uploads a set of files to a remote computer (for example, to a BBS or to a client's computer), could determine, off-line, which files should be transferred and then, on-line, compress them into a single file ready for transmitting.

.30   Most BBSs and electronic information services contain files that callers may download. Many of these files are compressed into a single file. For example, a user may notice that a BBS's file area contains a utility named UTIL.ZIP, which may contain one or more utilities, "help" text files, "README.1ST" files, and other related files. The compressed file saves the user (and the BBS) much time and inconvenience in downloading all the related individual files.

.31   A file is unusable in a compressed format. To use it, the user must first decompress the file with a utility that reverses the compression process, such as PKUNZIP or PKXARC. Anyone who is performing file transfer with a modem should own both compression and decompression utilities. It is important that both the sender and receiver of the file have the same compression utility.

Facsimile Communications

.32   Faxes can also be used in microcomputer communications. Like a standard data modem, a fax modem may be internal or external. A fax board can boost productivity by eliminating the need to first print a text file to paper and then feed it into a fax machine. However, if the user wishes to fax a paper document such as a magazine article or picture, it must first be digitized by a scanner into a file that can be transmitted by the fax board.

.33   Fax boards may be either send-only or send-and-receive. However, send-only boards are quickly becoming obsolete as the price of send-and-receive fax boards declines. Send-only boards are not equipped to receive faxes; however, they contain a modem on the same board. It is typical to use fax boards to convert a document prepared on the word processor into a bit-mapped image. The fax board then sends the image as if it were from a stand-alone fax machine.

.34   Some fax software can read standard word processor file formats directly, in which case document conversion before transmission is unnecessary. Send-and-receive fax boards can be configured not only to send faxes but also to receive them in the background, while the microcomputer's user is working on another program. Of course, the communications line must remain open. In addition, a microcomputer fax board can be accessed by other workstations via a LAN. Any user on the LAN may access the fax board to send faxes, and incoming faxes may be routed to the user's electronic mailbox for later reading or printing. It should be noted that

the capabilities of fax software vary greatly. As with the purchase of any software, users should determine their needs before selecting the fax board and software.

Mainframe and Minicomputer Terminal Emulation

.35   Microcomputer users can access their organization's minicomputers or mainframes with an emulation board. An emulation board provides proprietary communications. It is installed in the microcomputer and attached to a cable (coaxial, twisted pair, or fiber optic) that leads to the communications controller of the minicomputer or the mainframe. Terminal emulation software allows the microcomputer to resemble a terminal to a minicomputer or mainframe. For example, a microcomputer equipped with a 3270 emulation board and software may log onto an IBM mainframe and execute a mainframe job.

.36   The benefit of terminal emulation is that the user can download mainframe data to the microcomputer and then use microcomputer-based programs, such as spreadsheets, database management programs, and graphics programs, to further process the information.

Other Connectivity Devices

.37   A microcomputer without a terminal emulation board can still communicate with a mainframe. If the microcomputer is connected to a LAN that has access to terminal emulations, it may communicate with the mainframe via a LAN gateway (or a communications board in the file server). A communications server is a computer on a LAN dedicated to controlling communications activities among workstations, the network, and the mainframe or minicomputer.

51/125 APPROACHES TO PROVIDING ELECTRONIC INFORMATION

Information Services

.01   Electronic information services were once used primarily by hobbyists, universities, and corporations. However, they are becoming more popular as the cost of the necessary hardware declines. A number of these information services serve various markets. Some, such as LEXIS, WestLAW, or TOTAL, are directed at specific professions or industries. Others, such as CompuServe and the General Electric Network for Information Exchange (GEnie), are intended for general use, although these services offer Special Interest Group (SIG) subsections. CompuServe Information Services (CIS) has among its offerings financial services, news, travel and research databases. It has an E-mail service that allows messages to be sent to other CIS members and to certain other national electronic mail systems, such as MCI Mail, to be converted and sent via fax or to be printed and mailed. GEnie is a service of the GE Information Services (GEIS), one of the commercial communications networks and provides services similar to those of CIS. Prodigy, a joint venture between IBM and Sears, Roebuck & Co., targets the home-computer market by providing information that users can access easily through a graphical interface that requires its own software. Appendix 51/D lists examples of the more popular

electronic information services that are available. (The listing is not exhaustive and is for illustrative purposes only. The reader should not infer that a listed service is recommended.)

.02   New information services are emerging to meet the needs of users who spend a great deal of time and money dialing up various services and searching for information. Client-server technology has made it easier and less expensive to provide organizations with information that can be distributed internally. For example, one vendor transmits news and research services to client servers installed at customer sites. The news and research services are selected from more than one hundred available licensed sources including news wires, regional newspapers, and industry reports. The vendor's proprietary software searches through the sources for anything matching the profile or requirements of the individuals on the network fed by the server.

Bulletin Boards

.03   Usually, an electronic BBS is a microcomputer equipped with one or more modems and software that provides several functions and services, such as the following:

●   Message areas where callers can read and leave electronic mail (store and forward messages)

●   File areas where callers can send or download programs (shareware or freeware)

●   Special-interest conferences or forums for callers sharing a specific hobby, profession, or interest

.04   A BBS may be operated by anyone with a computer, modem, and BBS software. BBSs may appeal to general or specific interests and may range from a BBS operated by a hardware or software vendor for its customers to one operated by an individual, club, university, or business, which may or may not have access restrictions. A general BBS may contain several files for downloading, such as utilities, educational and entertainment software, word processors, business programs, and graphics. A general-interest BBS may have several conferences and message bases that cover a wide variety of topics, ranging from computers to politics. Users can upload comments, responses, and files, among other uses. Some BBSs offer a conference for technical support in a variety of hardware and software products. Users with problems may post a message requesting assistance. Subsequent users can post their suggestions and solutions.

.05   An example of a specific-interest BBS is one supported by a hardware or software vendor. Registered owners of the products may dial into the BBS for technical assistance, tips on product usage, program fixes, device drivers, or simply to communicate directly with the vendor.

.06   A company may establish a private BBS as a general-purpose electronic forum for its employees. Employees dialing into the BBS may read on-line, or download, information and items of interest such as company policies and procedures, and special bulletins and announcements. The BBS's message area may contain messages directed to specific employees, departments, or branches or to every employee. Employees at remote sites may exchange files with corporate staff or use the BBS as the company's electronic mail system.

51/130 COSTS

.01   Information services charge for their data through various fees: sign-up fees, annual subscription fees, on-line connect charges based on time usage, and special service charges. Fees and charges vary according to the information service.

Sign-Up Fees

.02   Not all information services charge sign-up fees, which are one-time fees. Usually, these fees are minimal and may be combined with a usage requirement or service plan.

Annual Subscription Fees

.03   An information service may also charge an annual subscription fee regardless of the amount of usage. This fee offsets the cost of customer service and support.

.04   A variation of the annual subscription fee is the minimum fixed fee. For example, an information service may charge each subscriber ten dollars per month. If a subscriber uses more than a certain amount of service, the minimum fee is waived. A subscriber who uses less than the designated amount is charged a nonusage penalty, which represents the difference between the ten dollar fee and the amount of charges actually incurred.

Connect Charges

.05   The greatest cost for subscribing to an information service is normally the charges incurred while on-line or connected to the host system. Connect charges usually are calculated on a per-minute basis and may vary according to the time of day when the call is made and the kind of modem used. For example, the cost per minute of on-line time may be more for a 2,400-bps modem than for a 1,200-bps modem, but frequently the faster modem reduces the time required to stay on-line and thereby lowers the total cost.

Special Service Fees

.06   Subscribers to an information service may need specialized data for which a premium is charged by the information service. For example, Dow Jones News Service charges a premium for corporate profiles and financial information databases.

Controlling Costs

.07   Users can take cost control measures to avoid running up excessive charges on public databases and information services. The connect charges, which are usually the greatest costs

for most users, are the most controllable because they vary directly with usage: the longer the time on-line, the greater the connect charges.

.08   Connect charges can be controlled in several ways. On-line work can, for example, be specialized. Experienced users can access information more quickly and methodically than casual users. Thus, concentrating the training and experience needed to become a skilled user in one person—preferably two people if the second person is a backup—makes on-line sessions more efficient and minimizes costs.

.09   A corollary to this strategy is to restrict access to the information service. Anyone with a computer and a modem can dial into an information service. However, only after the caller enters the correct password do on-line charges begin to accrue. Therefore, it is advisable not to create sign-on script files or batch files that include the password to automate the process for logging on to the information service. Most terminal programs can be set up to ask for the password, thereby allowing a script to be used. By limiting access to only those individuals who are trained to use the information service, the subscriber can control connect charges better.

.10   The subscriber can also control connect charges by downloading messages for later reading off-line and composing messages off-line to speed uploading them. This practice will reduce charges by the length of time needed to read posted messages and to type new messages while on-line.

.11   Another cost-saving practice is to download output to a disk file rather than print directly to the printer. The file could be printed off-line once the connection is terminated, saved for later reference, or imported into other applications, such as spreadsheets or word processors.

51/135   SECURITY ISSUES

.01   The security concerns associated with microcomputer communications involve the unauthorized use of dial-up services, the introduction of viruses, and the loss of data. Additional guidance on these security issues is provided in MAS Technical Consulting Practice Aids No. 13, *Microcomputer Security* (New York: AICPA, 1990) and No. 15, *Disaster Recovery Planning* (New York: AICPA, 1991).

Theft

.02   To gain access to an information service, the user usually enters a name or password that identifies the caller as a legitimate user of the system. For an information service that charges for connect time, the password is a key element of the billing system. Passwords are almost always chosen by subscribers, although the initial password may be assigned by the information service to identify a first-time user. Subscribers should protect their password as they would a credit card because they may be charged for unauthorized access to an information service.

.03   Certain passwords should be avoided: a family member's name, a nickname, a pet's name, or another known name are the first guesses an unauthorized caller is most likely to try. An unauthorized caller may be a coworker, associate, or friend familiar enough with the user to guess the password. The user should also change the password periodically. If a user subscribes to more than one information service, each service should be accessed with a different password.

Viruses

.04   The benefits and gains in productivity presented by microcomputer communications can be compromised by certain programs whose only mission is to destroy other computers' files or hard disks, either immediately or in the future.

.05   These programs have come to be known as computer viruses. Like its medical counterpart, a computer virus invades a host computer system and assumes control in some way. The virus may be relatively innocuous, displaying a benign message on the screen, or unconscionably destructive, reformatting a hard disk or scrambling or destroying its contents.

.06   Although the term virus is often used to refer to a variety of programs, there are, actually, several kinds of destructive software. The *bomb* is a program that is executed quickly. The bomb may erase the disk boot sector or reformat the hard disk. A *logic bomb* is programmed to unleash its destructiveness on a certain date, or after a program has been loaded a certain number of times. A virus is a program code that is imbedded inside legitimate application programs, and therefore can be the most insidious of all.

.07   Once a computer has been infected with a virus, the computer's hard disk may have to be reformatted, which results in the loss of all programs and data on the disk. However, virus purging software may be able to rid the system of the virus without the need to reformat.

.08   A virus works by becoming a part of the host program. Thus, when the host program is executed, the viral code is also executed. Often, this code will replicate itself onto another program in the system, or onto another computer entirely if the host program is on a network. If the host program is on a LAN, the potential for replication and destruction is exponential. Many LAN BBSs search each uploaded program for known viruses. Despite the real threat of infection from a BBS, most viruses are transmitted by a diskette or LAN.

.09   The risk of infection correlates with the electronic promiscuity with which a computer is used. For example, downloading software from public bulletin boards, a common source of virus infection, introduces a relatively high risk. Nevertheless, the risk of infection varies according the source of the downloaded file. Downloading a file from a hobbyist's local BBS is probably more risky than downloading from CompuServe, which does its own virus scanning.

.10   While communicating on-line, a user cannot transmit a virus from another computer unless software from the infected computer is downloaded or copied. Therefore, using a BBS merely for electronic messaging will not result in contracting a virus, although there is a risk of infection if messages are downloaded to be read off-line. Although software downloaded from

BBSs is a frequent source of viruses, it is not the only one. Infected software can be copied onto diskettes, which then serve as carriers of the virus.

.11   Antiviral software, also known as *vaccines*, can detect the presence of viruses, inoculate the computer against future viral attacks, and attempt to remedy the effects of existing viruses. Software may be written to detect specific strains of viruses or any virus in general. Antiviral software may also be installed to protect user data or existing programs from common viruses. Although vaccination is a good defense against viruses, it is not fail-safe. Users should always take precautions when loading software. For example, practitioners who take a portable computer to a client's office should use the following safety procedures:

●   When installing the firm's software (whether developed in-house or licensed) onto a client's computer, practitioners should always load the software from their copy, not the original disk. After installing and using the program, practitioners should clean the diskette copy with antiviral software before using it again on another computer.

●   When using a home-office computer, practitioners should avoid running software that has been used on any computer outside the office. Instead they should store the original program diskette and reload it to use the software.

.12   Whether or not vaccine software is used, proper procedures to prevent viral infection should always be practiced. Safe computing practices include proper security for access to telecommunications equipment and lines, enforced policies to prevent users from copying software of dubious origin onto a LAN's file server, and an appropriate backup strategy.

Recovery

.13   All files should be backed up regularly to prevent the loss of data, so that if a disaster occurs, the files can be reloaded quickly after the offending virus has been removed. Files should be backed up whenever the data are changed, and they should be stored in a secure off-site location.

APPENDIX 51/A

COMMUNICATIONS SOFTWARE SETTINGS

The ends of a communications link need not be equipped with the same software. Nevertheless, for effective microcomputer communications, all settings must be compatible in the following areas.

Data format. Data transmission must be either asynchronous or synchronous. In asynchronous communications, which accounts for almost all microcomputer communications, characters are transmitted individually. Start-and-stop bits frame every character, ensuring that each is both transmitted and recognized in the same format by the receiving modem. No time limit is required between characters.

In synchronous communications, a fixed block of data is transmitted as a continuous flow of bits. The two modems use a timing signal to establish the data transmission rate. Special synchronization characters are sent before data transmission begins so that the two modems will be synchronized. Buffers store characters until a prescribed number of characters has been collected for transmission.

Baud rates. Baud is the number of times the carrier signal is modulated per second. It is also called transmission speed. At lower rate—up to 300 bits per second (bps)—the signal is modulated once for each data bit. At higher speeds, multiple-data bits may be encoded on each transmitted bit. Speeds of modems currently in use range from 300 baud to 9,600 baud. However, the use of modems with speeds lower than 2,400 baud is unusual.

Parity. Parity checking is essential to ensure that each byte is properly transmitted. The first 128 characters of the normal ASCII set can be represented with just seven bits. The eighth bit in the byte can be ignored, or, for communications parity checking, can be used as a *parity bit*. If the character and actual byte do not match at the receiving modem, the receiving computer could detect a possible transmission error. Most modems use no-parity settings because DOS and the extended ASCII character set (256 characters) use all eight bits. Some older software may ignore the eighth bit. In this case, it may be necessary to change the settings to seven data bits or even parity.

Stop-and-start bits. A start bit is a signal that the transmitting modem sends to the receiving modem to indicate that what follows is a byte. At the end of the byte, another signal, a stop bit, is transmitted. The purpose of this is to avoid losing a single bit during a serial transmission over faulty telephone lines and corrupting the data that follow. However, modems with true error-checking capabilities ignore errors in parity or start-and-stop bits. An asynchronous data frame is always ten bits: one start bit, seven or eight data bits (an optional parity bit for seven), and one stop bit. A byte, which consists of eight bits, may contain either seven data bits plus one parity bit, or eight data bits. Communications software would abbreviate the former setting as E-7-1, for even parity, seven bits in a data byte, and one stop bit. If the byte contained eight data bits (and no parity bit), the software setting would be N-8-1: no parity, eight data bits, and one stop bit.

Terminal emulation parameters. For communications to take place, the modems should be able to interpret data coming into the port just as the actual terminal would and it must be able to send the codes that are available on the actual terminal. Generally, problems arise as a result of the codes executed through the special keys on the keyboard (for example, F1 to F12), rather than the standard typewriter-keyboard keys.

APPENDIX 51/B

ESTABLISHING A COMMUNICATIONS SESSION

Installing software in order to communicate with a remote computer may be a daunting experience at first. The following are general guidelines; specific instructions may be included in the manual for particular software.

1. Install the software.

2. Make sure the software is communicating to the proper port. For example, if there is an internal modem in a computer that already contains one built-in serial port, the communications software should be configured to address the COM2 port.

3. Determine the communications settings of the host computer.

4. Establish the same settings as the host computer. These settings will include baud rate, parity, data bits, and start-and-stop bits. For example, 2,400 N-8-1 indicates that the communications session will be at 2,400 baud, with no parity (N), eight data bits, and one stop bit. Adjustments to these settings may be selected through the communications software.

5. Obtain the host computer's modem line number. Many host computers will have separate telephone numbers for each modem speed.

6. If the host will be called regularly, include the modem line number and terminal settings in the communications software's dialing directory, if available.

7. If files will be transferred, ensure that the file transfer protocols of the host computer agree with those of the communications software.

8. If the files will be transmitted, it is a good idea to compress them into a .ZIP or .ARC file. Compression utilities, such as PKZIP/PKUNZIP and PKARC/PKXARC, are available as shareware from many bulletin boards. Refer to the section "File Compression Utilities," page 51/100-9, for more information about file compression.

APPENDIX 51/C

SAMPLE COMMUNICATIONS APPLICATIONS

Financial News and Research

Many public electronic information services, such as Dow Jones News Retrieval, CompuServe, and GEnie, offer a wide variety of financial news and information, including current and historical stock prices and other market prices; mutual fund asset values; and financial market volumes and activity. These data may be downloaded into a spreadsheet or other program for analysis, graphics, or storage in a database.

Tax Research

Tax regulations, revenue rulings, and other tax citations are available for on-line research. Citations may be downloaded for inclusion in a report, eliminating the need to retype the text.

Statistics, Demographics, and Other Research

Practitioners needing statistical data for consulting engagements may access U.S. Census Bureau and other demographic statistics on-line or consult electronic encyclopedias and government publications.

Computer Consulting

As may be expected, a wide variety of computer-related data is available on-line, from hardware and software vendor support to electronic computer clubs to special hardware or software interest groups. Practitioners may download spreadsheet templates, other shareware programs, or software updates and fixes, and exchange E-mail. Practitioners also may access databases containing abstracts and full-text articles of computer industry publications for research and review.

Travel

Practitioners may handle their own travel arrangements on-line. Airfare and schedule information, on-line ticketing, hotel and rental car reservations, and weather information are all available on-line.

Personal

Services such as on-line banking, mutual fund and stock trading, and portfolio management are available on-line.

APPENDIX 51/D

SAMPLE COMMERCIAL INFORMATION SERVICES

The following list of information services available, including features which may be found in each service, is for illustrative purposes only. It is not an exhaustive list of such information services or their features.

Service	*Features*
CompuServe 1-800-848-8199	E-mail, computer support, financial information, news services, special interest groups, entertainment, reference databases, travel services, and on-line shopping
Delphi 1-800-544-4005	Computer support, E-mail, news services, business and travel information, and on-line shopping
Dialog 1-800-334-2564	Articles, journals, patents, statistics, and other reference databases and newswire services
Dow Jones News/Retrieval Service 1-609-452-1511	Reference library, news, quotes and market averages, company and industry statistics and forecasts, and business services
GEnie 1-800-638-9636	Special interest groups, travel services, financial information, news services, reference, and entertainment
LEXIS (Mead Data Central) 1-800-227-4908	Legal research, federal and state regulations, codes, and case, and international legal materials
NEXIS (Mead Data Central) 1-800-227-4908	General and business news, financial information, and medical and business databases, including NAARS (National Automated Accounting Research System)

GLOSSARY

analog signal A signal of continuously variable voltage, such as a voice signal over a telephone line.

asynchronous communications A format of communications in which data are sent one character at a time, without any prior arrangement as to how many characters will be sent per unit of time. Each byte, or character, is preceded with a start bit and followed by a stop bit. It contrasts with *synchronous communications* in which characters are transmitted in groups.

background communications Microcomputers containing the appropriate processor and software are capable of maintaining multiple simultaneous computing windows, or *virtual machines*. Background communications occurs if data transfer takes place while the user is working in the *foreground*, or on an active application.

baud A measure of a signal's transmission speed during a specific period of time. The baud rate indicates how fast signals are sent, while bits per second (bps) shows the rate at which information (bits) is transferred.

BBS (bulletin board system) A computer equipped with a modem to handle asynchronous communications from several callers, either sequentially or simultaneously. BBSs allow callers to read and post messages and to download and upload files.

data bits A bit is the smallest piece of data. Each bit can have a value of either zero or one or be either on or off. Eight bits constitute a byte, or character, which is defined by the position and status (on or off) of each of the data bits. Bytes are transmitted asynchronously as a ten-bit packet (one stop, one start, and eight data bits).

EDI (Electronic Data Interchange) The electronic interchange of transactions (for example, orders and invoices) between business organizations. In some instances, an independent service organization provides EDI services that enable users to communicate regardless of the type of equipment.

E-mail (electronic mail) The core of the E-mail system is a communications network connecting remote terminals to a central system or a LAN that connects personal computers. E-mail allows a user to send an electronic message to a recipient's electronic mailbox. Commercial E-mail networks are offered by such providers as AT&T and MCI Mail.

fax board A board that fits into a microcomputer's expansion slot to allow it to send facsimiles. Fax software installed on the microcomputer controls the board's fax activity. Most fax boards are capable of receiving faxes (some can even send and receive in the background), and most also house a modem.

file transfer The transmission of data from one computer to another. File transfer requires both computers to use the same file transfer protocol, or rules such as Xmodem, Ymodem, Sealink, Ymodem-batch, and Kermit.

gateway A connection between two different data communications networks. Users of one network can communicate with users of the other network through the gateway.

information service An organization whose data are accessible to callers via computer communications. Commercial information services typically offer large volumes of data, for which users pay a fee based on either the amount of time they are logged into the host computer or the amount of data downloaded.

LAN (local area network) A form of computer communications in which two or more computers are connected by cable in order to share peripheral equipment, programs, and data files.

modem A device that converts a computer's digital signal into analog signals for transmission over telephone lines. Modems on the receiving end of the transmission translate the analog signal back to a digital format for the receiving computer.

parity checking A crude form of data verification in which the bits are compared for integrity. With a seven-bit byte, characters are represented with six bits. If the sum is even, the parity bit remains at zero, or off. If the six bits yield has an odd number, the parity bit is turned on, to become one to yield an even number. Each seven-bit byte should total an even number in all cases. Otherwise it will fail the parity check. If an eight-bit byte is used, there is no bit available for parity checking (no parity).

pocket modem A small, lightweight external modem designed to accompany laptop and notebook computers.

protocol The set of rules used to establish file transfer during a communications session. Examples of protocol are Xmodem, Ymodem, Zmodem, Sealink, ASCII, Kermit, CompuServe, and CompuServe B.

remote control communications A form of asynchronous communications in which the user of one computer can control remotely the operations of a second computer. Usually, to do this the remote control software on both computers must be of the same type.

RS-232 An acronym for Recommended Standard-232, the Electronic Industries Association (EIA) standard for serial communication. An RS-232 interface refers to the most common type of interface between a computer and its modem.

serial port A receptacle used to attach a serial device, such as a modem, mouse, or printer to a microcomputer. In modem software, serial ports are designated COM1 through COM4. A serial port implies that data are transmitted over the lines one bit at a time, in contrast with a *parallel port*, which transmits data one byte (eight bits) at a time over eight wires.

start bit The first bit in a data byte. The start bit signals the beginning of a character about to be communicated asynchronously.

stop bit The last bit in a data byte. The stop bit signals the end of the byte, or character. During a file transfer, the stop bit of one byte is always followed immediately by the start bit of the next byte.

store and forward A concept applied to E-mail, voice mail, and BBS messaging services. A message may be posted to a recipient's mailbox and stored there electronically until read by (transmitted to) the recipient.

synchronous communications A format of communications in which data are sent by one computer and received by another at precisely timed intervals. Synchronous communications does not employ start-and-stop bits because both transmitting and receiving computers know exactly how much data will be transmitted per unit of time. A sync character is transmitted periodically between the computers to ensure that both devices are in step with each other.

terminal emulation The capability of a computer through software to appear to have the same video and keyboard characteristics as the remote computer. Examples of terminal emulation software include ANTI, VT-100, VT-52, Wyse 100, IBM 3101, and TVI-920.

virus A type of malevolent program code that can cause varying degrees of damage to computer programs, data files, or hardware.

voice mail A type of data communications in which a voice signal is digitized and stored as a file on the receiving computer for later retrieval by the message's recipient.

WAN (wide area network) A type of network in which remote networks are connected via dedicated telephone lines, or microwave or satellite signals.

Xmodem A file transfer protocol in which files are transmitted in packet sizes of 128 or 1,024 bytes. Xmodem is not the fastest transmission protocol, but it is widely available and supported by most BBSs and electronic information services. It is capable of rudimentary error checking.

Ymodem A file transfer protocol in which files are transmitted in packet sizes of 1,024 bytes. Ymodem has batch file capabilities that Xmodem does not.

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