All About Timesharing and Remote Computing Services

Remote computing is an alternative to expensive, in-house computing facilities. In most cases you can make use of these services by simply installing a teletypewriter or other data terminal in your office or plant and communicating, over telephone lines, with one or more powerful computers that may be located nearby, or hundreds of miles away.

The broad range of remote computing services now available includes general-purpose remote batch processing facilities, interactive timesharing for scientific and business applications, and many dedicated facilities for specific industry applications such as insurance, banking, or medical administration.

Remote computing is not a recent development, nor is it a passing fad. While some service vendors have fallen by the wayside over the years, the majority are now stable and profitable enterprises. Some vendors have even started leasing and selling hardware components (such as intelligent terminals and minicomputer systems), which are placed on the customer premises and work in conjunction with the remote computing service.

The growth and continued success of remote computing services can be attributed to several factors. First and foremost is the fact that it is still generally cheaper to use a small piece of a large computer system than most or all of a small system. This is inherently true for the costs of computer production, even though recent years have seen a somewhat sharp decrease in hardware prices. Conversely, maintenance and support costs have increased at a proportionate rate.

It may appear surprising that corporations with extensive in-house computing facilities comprise a large portion of the remote computing customer base. Several conditions have caused this. For example, a company's in-house facilities might be devoted to "high-priority" processing

This comprehensive report on the timesharing/remote computing industry includes background on the evolution of the industry, an analysis of recent developments, and a user's guide for selecting/evaluating a service. Features include comparison charts summarizing 125 services offered by 105 vendors, a 2-page chart of vendors' applications offerings, and an anlaysis of 193 user ratings obtained via a subscriber survey.

(perhaps production management or billing), with little time left for secondary processing functions such as personnel or statistical reporting. A remote computing company could effectively supply the additional resources needed to perform these and other functions.

Another incentive for and characteristic of remote computing is ease of use. The user will typically need only train a terminal operator, and need not be concerned about training of computer operators, software programmers, maintenance personnel, etc. Remote computing vendors have found that it is more cost-effective for a central computing facility to absorb these costs, and then distribute the computing resources among many users.

Currently available remote computing services can be broadly classified as either interactive timesharing or remote batch processing services. Many companies now provide both types of services, and the frequently blurred distinctions between them are likely to virtually disappear as multifunction remote batch terminals come into widespread use for a variety of applications, including local clustered timesharing and data entry, as well as classical remote batch. ▷

Here is an inside view of the University Computing Company's Dallas operations center. The photo shows multiple Univac 1108 computers which run UCC's EXEC/FASBAC and 1100/OS services. Other UCC services run with IBM and CDC systems.

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▷ In general, an *interactive timesharing system* can be defined as a computer system that enables multiple users to gain simultaneous access to its facilities and to interact with the system in a conversational mode. A *remote batch processing system* can be defined as a system that enables users at remote locations to enter data, initiate the batch-mode execution of programs, and receive the resulting output data. Ideally, either type of system should give each user the impression that all the computational, storage, input/output, and software resources he needs are continuously at his disposal, while keeping him unaware of the fact that he is actually competing with many other customers for the use of these resources.

Remote Computing Background

The earliest remote computing systems were developed in the universities in the early 1960's, with Dartmouth and M.I.T. in the vanguard. These were interactive time-sharing services designed for scientists and engineers who wanted to use the computer's vast computational power to solve problems. Problems confronting scientists and engineers typically have this in common: they tend to require comparatively little input and output, often involve no files of data, and generally demand large, complex calculations.

For these users, the least expensive and slowest computer terminals, such as teletypewriters, suited their purposes quite well.

Also, many of the scientists and engineers wanted to program the computers themselves. To meet this need, the timesharing services provided easy-to-use conversational language capabilities. That is, the user entered his program commands a statement at a time, in one of the programming languages available to him on the system. The language was usually BASIC (Beginner's All-purpose Symbolic Instruction Code) or FORTRAN (FORmula TRANslation). As the program commands were keyed in, the computer checked them for proper syntax (rules of the language) and stored them. When the user indicated that the last statement had been entered, the computer rechecked the overall syntax and compiled the program by translating the commands into its own machine language. Once the program was compiled, the user could enter his data. Then the data would be processed as the program steps dictated, and the answer presented at the terminal. A special case of this capability treats one or a few program statements as a program with immediate data entry, statement execution, and result return.

That's interactive timesharing in a nutshell. The user just uses a little of the computer's time to compute a solution for himself. Of course, there are many refinements. One of the foremost among these is is the option for the user to store useful programs for reuse in a library. This type of interactive timesharing is still in widespread use among scientists, engineers, statisticians, and business planners.

But just as the computer itself has evolved from its initial role as a gigantic calculator into an everyday business tool, so has timesharing, becoming today's remote computing industry. Whereas the scientific user typically requires a great deal of computing power and very little input and output data involving almost no files, the business user tends to require the capability for a comparatively large volume of input, maintenance of organized files, formatted output, and just enough computational power to perform a relatively simple process upon the data.

And just as the programming language is important to the scientific user, the program library is important to the business user. While the former may have wanted to keep a few useful computational routines in the library, the business user absolutely requires a library of processing programs that will ensure that the system is always prepared to operate on and process his current data in an appropriate and uniform fashion. Importantly, if the program library is adequate, the user need not know or care about the programming language; he only has to know how to prepare the data and specify initiation of the desired process. Indeed, many remote computing vendors will create the programs for their users or install into the library "packaged" programs that the users require.

The business user's requirements for a terminal can also be quite different from those of scientific users. Business users tend to input batches of data which must be processed against files in order to produce results (such as a payroll), to generate reports, or to maintain files through additions, deletions, or changes. Most business users of remote computing services today therefore employ remote batch processing terminals and methods, which usually lead to lower overall costs for processing a given volume of data than the interactive approach.

The Remote Computing Industry

The first commercial timesharing services were established in 1965. Both the suppliers and the users of these early services had to overcome many problems, and progress was quite slow at first. But by 1968, timesharing had become the hottest topic in the computer industry and the darling of Wall Street, and it seemed as if everybody was trying to get into the act.

Unfortunately, the economic crunch that began in 1969, coupled with the sadly misdirected technical and sales efforts of many of the young timesharing firms, led to a severe shakeout. New customers were hard to find, and it became virtually impossible to raise capital to start a new remote computing company or nurture an existing one. Dozens of remote computing service firms merged with other companies, abandoned their remote computing efforts in favor of more promising activities, or closed their doors completely.

Even today, there are still companies leaving the business. Meanwhile, a significant number of users have converted from remote computing services to in-house systems. The economics and performance of the newly emerging minicomputer systems have enabled many users to justify purchase of their own systems. ▷

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▷ However, despite the inevitable business fluctuations, the industry has survived its infancy and must be regarded today as a healthy, fast-growing segment of the computer business. Remote computing is here to stay. It represents an effective solution to some or all of the information processing requirements of many companies, and new developments in equipment and software are steadily increasing the scope of its practical applications. Datapro's recent survey of remote computing users, which is summarized in the Users' Ratings tables, indicates a continued high degree of user satisfaction with the overall effectiveness of the current commercial remote computing networks.

Total revenues for commercial remote computing services, including both interactive timesharing and remote batch processing, rose from just $20 million in 1966 to an estimated $2 billion in 1977, and the industry's revenues are currently growing at the rate of about 30 percent per year.

Until 1973, the leading supplier of remote computing services had long been General Electric Company, which entered the business in 1965 and has invested over $150 million in developing an international network that serves the United States, Canada, and Western Europe. Two GE "super-centers" located in Cleveland and Maryland contain a total of more than 100 interconnected central processors and communications controllers. GE's "Mark III" service combines interactive timesharing, remote batch processing, and network data management services that provide rapid access to centralized information files.

Control Data Corporation became the largest supplier of computing services in January 1973, when it acquired IBM's Service Bureau Corporation as part of the out-of-court settlement of its antitrust suit against IBM. With SBC's revenues added to those of its own Cybernet service, Control Data grossed more than $100 million from computing services in 1974 and edged out GE for the industry leadership. This has since increased to an estimated $350 million from data services in 1978.

Recent Developments

Recent developments in remote computing have been highlighted by service vendors' offerings of hardware systems which reside on the customer's premises, perform various but limited in-house processing functions, and tie in to the remote computing service.

Xerox Computer Services started this trend by announcing in 1977 the availability of an intelligent terminal system which its customers would use to supplement the remote computing service. The system features diskette storage, and applications permit in-house processing of payroll, accounting, and report generation functions. The terminal system adds about $750 to the user's monthly computing costs.

In the spring of 1978, ADP Network Services went one step further by announcing the ONSITE service, which places a DECsystem 2020 at the customer site to provide considerably more in-house processing capability. ADP, which grossed an estimated $300 million from its services in 1978, reported 24 ONSITE systems in place by May 1979.

Soon afterward, General Electric followed suit with its announcement of the Marklink system, a minicomputer system built by Texas Instruments that connects to the GE Mark III service and resides at the customer site.

Several other remote computing vendors have stated their intentions to market minicomputer systems to supplement their services. These include Control Data, which will be releasing an IBM Series/1 system late in 1979; Tymshare, which will also be offering a DECsystem 2020; and Informatics, said to be working on a Honeywell Level 6 mini system.

Many of the large service vendors have continued their rapid growth and have consistently been in the news with announcements of increased computing hardware, enlarged areas of access, additional services and applications, etc. The most notable have been General Electric, Control Data, Tymshare, Computer Sciences, and McDonnell Douglas.

User Benefits

Commercial remote computing services offer numerous attractive benefits to their users. Some of these benefits, indeed, are so compelling that many companies with large inhouse computer systems of their own are also heavy users of commercial remote computing networks. Here are some of the principal reasons for using remote computing services:

● *Flexibility*. Remote computing enables you to buy only as much computing power as you need and (except for fixed terminal costs and minimum service charges) to pay only for what you use. Thus, you can effectively "stretch" or "shrink" the size of your computer installation from day to day as your workload expands or decreases. You can use a remote computing service to handle the peak-period overloads on your in-house computer system. You can explore the possibilities of centralized data bases and management information systems at comparatively low costs and without any long-term commitments. What's more, you can deal simultaneously with two or more remote computing companies and take advantage of differences in their pricing structures, languages, and program libraries.

● *Ease of use*. In general, remote computing terminals are straightforward in operation and easy to learn and use. Programming languages such as BASIC, together with conversational-mode compilers and debugging aids, have made programming quite simple and fun to learn. The comparative simplicity of the terminals and their ease of operation have made interactive timesharing an accepted mode of operation for numerous engineers and accountants who previously resisted all efforts to get them directly involved with computers. ▷

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▷ ● *Man/machine interaction.* Interactive timesharing permits direct, instantaneous communication between humans and computers at affordable prices. Users can test and debug their programs as they write them, with the computer checking, guiding, and reassuring them at each step in the process. A similar dialog process between man and computer can greatly facilitate the solution of many engineering and scientific problems, and can provide managers with exactly the information they need for informed decision-making. What's more, timesharing users can spend hours of "headscratching" time at their terminals without holding up an expensive processor—although it should be noted that the terminal connect time usually costs from $5 to $15 an hour.

● *Fast turn-around.* Remote computing can greatly reduce the elapsed time between the submission of data to be processed and the delivery of the computed results. In the case of typical in-house batch computer systems, turn-around times usually range from several hours to several days. The remote computing user can simply sit down at his terminal, enter the data, initiate execution of the appropriate program, and get the results he needs, either at his terminal or on a suitable output device at the computer site, all with a minimum of delay.

● *Choice of languages.* Most remote computing suppliers offer a choice of several programming languages, making it quite feasible for each user within your organization to work with the language that best suits his problem and his background.

● *Application programs.* Most of the commercial remote computing companies are placing an ever-increasing emphasis upon the development of ready-made programs for specific applications. The availability of suitable application programs can save you thousands of dollars in programming costs and get you "on the air" much sooner.

● *Networks and data bases.* A number of companies now offer nationwide communications networks that permit users scattered around the country to access a centralized data base. These services can permit your company to enjoy most of the advantages of a widespread on-line communications network with centralized files at a fraction of the cost of setting up and operating your own. (It should be noted, however, that considerations of communications reliability, access control, file security, and flexibility of the available data manipulation and retrieval languages become particularly important in this type of application.)

● *Dedicated services.* Dozens of companies are now offering remote computing systems dedicated to providing a specific type of service. These systems can be divided into two basic classes: those that provide specialized computational or data processing services, and those that provide access to a single central data base. Examples of the first class include dedicated

systems for hospital accounting, automobile dealer accounting, text editing, and civil engineering computations. Probably the best-known services of the data base type are the stock quotation services, automated credit bureaus, and reservation systems.

Possible Drawbacks

Despite the many advantages, remote computing can be a distinctly mixed blessing. Here are some potential disadvantages to be aware of:

● *Questionable reliability.* This question should be uppermost in the minds of prospective remote computing users: Just how reliable is the service? Many early timesharing networks earned notorious reputations for being down (out of service) more than they were up. Fortunately, a great deal of progress has been made since those days. Only four percent of the respondents to Datapro's latest survey of remote computing users rated the reliability of the services they were using as poor. Most system "crashes" that occur nowadays are of short duration and are quickly followed by effective recovery procedures that minimize their impact upon users' operations.

Users of the commercial remote computing services are being plagued by fewer problems arising within the facilities of the telephone companies that provide the vital communications links between the computers and their users. The telephone companies, after being severely criticized for their failure to provide the quality of service required for reliable data communications, have made many improvements.

Overall, the reliability of the existing remote computing services is more than adequate for most applications of the computational variety. But companies contemplating the use of remote computing for business data processing, where important files must be stored and processed with minimal errors, should pay careful attention to the reliability aspect.

● *Slow input/output.* In some of the current remote computing networks, input and output speeds are still limited to 10 to 15 characters-per-second rates of conventional typewriter-style terminals. These low speeds are more than adequate for many applications, but in other cases they impose a severe restriction on throughput. To overcome this limitation, many timesharing services now support 30-cps interactive terminals, and some offer 120-cps interactive units and/or much faster remote batch terminals.

● *Low computational efficiency.* The complex software required to coordinate and control the operations of multi-user interactive timesharing systems usually requires large amounts of central processor time and memory space. As a result, the computational efficiency of many of the current systems is very low. From the user's point of view, this poor efficiency may or may not be a matter of concern, depending upon the manner in which the central processor costs are ▷

▷ allocated. Low computational efficiency is less likely to be a problem in remote batch processing systems because their control software requirements are less complex.

• *Questionable data security.* When multiple users share a computer system, challenging problems are encountered in safeguarding the confidentiality and integrity of each user's programs and data files. Most of the commercial remote computing services have paid a good deal of attention to this security problem, combining special access protection with passwords and a variety of other techniques. Prospective users of any remote computing system should make sure that the available security provisions will adequately protect their interests.

• *System loading problems.* In addition to down-time resulting from the reliability problems discussed above, a remote computing system may be unavailable when you need it because the system is "saturated." Saturation occurs when a remote computing system is being accessed by the maximum number of users it is capable of serving simultaneously. As the load on a system grows heavier, response times tend to increase, turn-around times get longer, and throughput drops. Finally, when saturation is reached, no more users can be served until someone completes his job and disconnects. Unfortunately, the heavy system loading conditions that are so frustrating for users often represent high-profit situations for the suppliers. Among the timesharing users who responded to Datapro's recent survey, 2 percent judged the response time to be poor and 14 percent rated it only fair.

• *High communications costs.* Unless you choose a remote computing company that offers "free" or fixed-cost local access in your area, communications costs can easily represent the largest component of your remote computing bill. One of the problems is that it is usually necessary to use standard voice-grade telephone lines, with a practical data-carrying capacity of 4800 bits per second or more, to transmit teletypewriter data at 110 bits per second. Needless to say, the user pays for this inefficiency. Prospective remote computing users should carefully investigate the communications costs they will encounter and make every reasonable effort to minimize them.

• *High data storage costs.* The costs associated with on-line storage of large data files at the remote computer center may rule out some applications that otherwise seem made to order for remote computing. Based on a typical monthly charge of $0.50 per 1,000 characters stored, it would cost $400 per month just to keep a file of 10,000 80-character records on-line. The cost of storing the programs to manipulate the file would further increase the user's monthly bill. (It should be noted, however, that many remote computing companies now offer on-line mass storage at prices well below the rate used in our example.)

• *Loss of control.* When interactive timesharing terminals are installed in a company, their ease of use and undeniable appeal often lead to their utilization for many problems that could more economically be handled by a desk calculator, a slide rule, an in-house computer, or a conventional service bureau. As a result, the bill for remote computing services is likely to escalate beyond management's wildest dreams. Therefore, it's important to establish and enforce proper control procedures. But controlling the access to and utilization of multiple terminals can be considerably more difficult and frustrating than administering a centralized computer facility. It can help a lot if the remote computing network requires each user to identify himself with a password and a department or project charge number.

• *Man/machine communication barriers.* A mundane but nonetheless important factor that militates against the dream of giving every manager and/or every engineer direct access to a central computer utility is the fact that most of these prospective users lack the typing skill that is now required for efficient man/machine communication. It is safe to predict that this problem will eventually be solved through the use of simplified keyboard layouts and through gradual development of the necessary keying skills. In addition, more direct input techniques, such as light pens and touch-sensitive display tubes, will receive increased development emphasis and wider usage.

Scientific Applications

Scientific, engineering, educational, and other predominantly computational applications are the ones for which timesharing computer systems were originally conceived and developed, and they still comprise the bulk of the workload for many of the commercial remote computing services. Users with problems of the computational type can take full advantage of most of the previously discussed advantages of remote computing, flexibility, ease of use, direct man/machine interaction, fast turn-around times, program libraries, etc.

Timesharing computer systems, when properly utilized, can open up new dimensions in productivity, creativity, and job satisfaction for scientists, engineers, financial analysts, applied mathematicians, and many other professionals, Examples of specific applications have been documented in dozens of articles in the trade press during the past decade.

From the viewpoint of the remote computing suppliers, the only disappointing aspect of these computational-type applications has been the gradual realization that the total potential market for them is far smaller than the market for business data processing services. And remote computing has been far slower in exploiting the latter market.

Business Applications

Just a few years ago, many observers of the EDP industry ▷

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▷ were predicting that the availability of remote computing services would quickly revolutionize the business world. One or more terminals in every business establishment, tied into a powerful central computer, would handle the company's bookkeeping, billing, payroll, inventory control, and many other vital functions—and do all this at an irresistibly low cost.

These predictions may yet come true, but it is now apparent that it's going to be a long, gradual process rather than a rapid revolution. The use of both interactive timesharing and remote batch processing for business functions is growing steadily now, but the rate of acceptance has been well below the early predictions. The prognosticators apparently overlooked—or under-estimated the impact of—four important factors.

First, a remote computer, like every other computer, must be *programmed* before it can solve anybody's problems. Few small business firms have employees capable of analyzing and programming their data processing requirements, and few have been willing to pay an outside firm thousands of dollars to write the programs they need. This means that suitable readymade application programs are a virtual necessity for any remote computing supplier vying for business data processing accounts—yet the suppliers were surprisingly slow to develop and offer such programs. There has, however, been significant progress in this area. As shown by the chart in the next two pages of this report, many of the remote computing companies now offer programs to handle accounts payable, accounts receivable, general ledger, payroll, inventory control, and other common business functions. Moreover, most of the suppliers offer programming services to tailor their "packaged" programs to the specific needs of each user.

Second, small businessmen tend to be quite conservative and set in their ways. Very few of them are anxious to plunge into the use of a new and unperfected technology. They tend to be understandably apprehensive about storing their vital, confidential files in a computer system that is located miles away and shared by many other simultaneous users. The remote computing suppliers are gradually learning how to answer the questions and dispel the doubts of these prospective customers, but their penetration of the huge business data processing market continues to be relatively slow.

Third, the previously discussed reliability problems have caused many companies to reject the use of remote computing for applications in which undetected errors and missed deadlines cannot be tolerated. Outright rejection of remote computing on these grounds alone probably represents an unduly harsh judgement. In designing a remote computing application—as in any business data processing function—the systems analysts and programmers should attempt to anticipate every possible source of error and then to incorporate appropriate controls and checks to detect and overcome these errors. When this is done, present commercial remote computing systems should be able to satisfy all reasonable requirements for reliability and security in data processing applications.

Fourth, the 10-character-per-second Teletypewriter input/output speeds of the early commercial timesharing services made them unsuitable for any data processing function that involved large volumes of input and/or output data. In order to qualify for a broader range of business applications, many of the remote computing companies are now offering both faster typewriter-style terminals, with speeds in the 30-character-per-second range, and high-speed batch-mode terminals capable of reading card and printing reports at 120 to 600 characters per second.

Thus, definite progress is being made toward overcoming the main obstacles against widespread use of commercial remote computing systems for business applications. Three other recent trends seem destined to help accelerate the swing toward remote computing for business data processing:

● The establishment of dedicated systems designed to satisfy the data processing requirements of specific types of businesses.

● The development of nationwide networks that enable users in many different locations to access a central data base. (The most impressive current examples are GE's international network, which is available by local telephone in over 600 cities in 22 countries, and Tymshare's TYMNET, which uses more than 60 special communications processors and over 50,000 miles of leased Bell System lines.)

● The availability of a wide range of applications programs from sources other than the remote computing companies themselves. A promising concept called "piggy-backing" involves the development of application programs by independent software firms and the marketing of these programs for operation on specific remote computing systems.

What's Ahead in Remote Computing

The obvious advantages of remote access to large systems without the burdens of ownership or leasing will continue to attract new users, and current users will increase their spending as new applications are added. These factors will combine to produce the dramatic increase in usage expected over the next several years.

On the basis of current trends and projections, it seems likely that the remote computing industry of the future will shape up this way:

● There will be several large, nationwide suppliers of remote computing services. These will be true "information utilities," offering a broad range of computational, information retrieval, and communications services to users throughout the country (and perhaps the world).   ▷

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AVAILABILITY OF APPLICATION PROGRAMS

COMPANY \ APPLICATION	Accounts payable	Accounts receivable	Banking	Billing	Data base management	Educational	Engineering	General ledger	Hospital administration	Information retrieval	Insurance	Inventory control	Numerical control	Operations research	Payroll	Personnel	Project control	Sales analysis	Scheduling	School administration	Scientific	Simulation	Statistical	Text editing	Typesetting
ADP Network Services, Inc.—Timesharing		●		●						●	●	●		●			●	●	●			●	●		
ADP Network Services, Inc.—Onsite		●		●							●	●		●			●	●	●						
Arens Applied Elec. Inc.—Comp. Services	●	●	●	●	●		●	●		●	●			●			●	●	●		●		●	●	
Arens Applied Elec. Inc.—View/Graphs	●	●		●	●			●		●	●			●									●	●	
Arens Applied Elec. Inc.—LAWDATA	●	●		●	●			●		●	●			●									●	●	
Arens Applied Elec. Inc.—Piping/Hyd.	●	●		●	●	●	●				●			●			●				●	●	●	●	●
Avco Computer Services					●	●	●								●			●			●	●	●	●	
Babcock and Wilcox Company						●															●	●	●	●	
Boeing Computer Services, Inc.—CTS	●	●			●	●	●	●		●					●	●	●	●	●		●	●	●	●	
Boeing Computer Services, Inc.—TSO	●	●			●	●	●	●		●					●	●	●	●	●		●	●	●	●	
Boeing Computer Services, Inc.—EKS	●	●			●	●	●			●					●	●	●	●	●		●	●	●	●	●
Bowne Inc.—COMSPEC										●														●	●
Bowne Inc.—CMS										●														●	●
Bowne Inc.—Word/One										●														●	●
Burroughs Corporation					●					●	●		●								●	●	●		
CallData Systems—TS*RJE/Batch					●		●	●		●						●					●	●	●	●	
CallData Systems—Easy*Use	●	●	●		●	●	●	●	●	●										●	●	●	●	●	
CallData Systems—TS*RJE/Timeshare					●		●	●	●	●	●			●			●		●		●	●	●	●	●
CallData Systems—TeleScope					●		●	●		●											●	●	●	●	
CallData Systems—CompUtility					●		●	●								●			●		●		●	●	
Citibank, N.A.																									
Community Computer Corp.		●	●	●	●	●	●				●			●		●			●		●	●	●		
Compudial, Inc.	●	●		●	●					●	●	●		●	●						●	●	●		
CompuServe, Inc.	●	●	●	●	●		●	●		●	●	●		●	●	●		●	●		●	●	●	●	
Computel Systems Ltd.		●		●	●			●		●	●	●	●	●	●	●	●	●	●		●	●	●	●	
The Computer Company, Inc.		●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●		●	●	●	●	
Computer Innovations	●	●	●	●	●	●	●	●		●	●	●		●	●	●	●	●	●		●	●	●	●	
Computer Network Corp.			●	●	●		●	●		●	●	●		●	●		●	●	●		●	●	●	●	
Computer Research Company			●		●	●																			
Computer Resource Services, Inc.	●	●	●		●	●	●	●		●				●			●	●			●		●		
Computer Sciences Canada, Ltd.	●	●	●		●	●	●	●	●	●		●		●	●		●	●	●		●	●	●	●	
Computer Sciences Corp.					●	●	●	●		●		●		●	●		●	●	●		●	●	●	●	
Computer Sharing Services, Inc.	●	●	●	●	●	●	●	●	●	●		●	●		●	●		●	●	●	●	●	●	●	
Computer Usage Company					●																●	●	●		
Computone Systems, Inc.											●														
Comshare, Incorporated	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
Comshare, Limited	●	●		●	●		●	●	●	●	●	●		●	●	●	●	●	●		●	●	●	●	
CONCAP Computing Systems	●	●		●			●							●		●	●	●			●	●	●		●
Control Data Corp.				●			●							●			●	●			●	●	●	●	
Cybershare Limited	●	●		●			●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	
Data Resources Inc.			●		●	●					●	●		●	●			●	●		●	●	●	●	
Data-Tek Corporation	●	●		●	●		●	●		●	●			●	●		●	●			●	●	●	●	
Datacrown Inc.	●	●			●		●	●	●	●	●			●	●		●	●			●	●	●	●	
Dataline Systems, Ltd.	●	●	●	●	●		●	●		●		●	●		●	●	●	●	●		●	●	●	●	
Datalogics, Inc.	●	●	●	●	●		●	●		●	●			●	●		●	●	●		●	●	●	●	
DIALCOM, Inc.	●	●			●		●	●		●	●	●	●	●	●		●	●	●	●	●	●		●	●
Ecotran-Chi Corp.	●	●			●		●	●		●							●	●	●	●	●	●		●	
Financial Data Systems, Inc.			●					●																	
First Data Division, ADP, Inc.			●		●		●		●	●	●	●		●		●	●	●	●		●	●	●	●	
General Electric Company			●		●		●		●	●		●	●			●	●	●	●		●	●	●	●	
Genesee Computer Center, Inc.	●	●		●	●	●	●			●		●		●			●		●		●	●	●	●	
GTE Data Services Inc.					●	●	●			●							●				●	●	●	●	
Harris Corp., PRD Elec. Div.	●	●			●	●	●			●						●	●		●		●	●	●	●	
HDR Systems, Inc.	●	●			●	●	●	●	●	●		●	●		●	●		●	●	●	●	●	●	●	
Honeywell Information Systems, Inc.	●	●			●	●	●	●	●	●	●	●	●	●		●			●	●	●	●	●	●	
Informatics, Inc.	●	●	●		●				●						●	●	●	●	●		●		●	●	●
Information Consultants, Inc.	●	●		●	●										●	●	●	●	●		●		●	●	●
Information Science Inc.										●						●					●		●	●	●
Information Systems Design					●		●			●				●	●		●	●	●		●	●	●	●	●
Interactive Data Corp.		●		●				●		●		●			●		●		●		●	●	●	●	

All About Timesharing and Remote Computing Services

AVAILABILITY OF APPLICATION PROGRAMS (Continued)

COMPANY \ APPLICATION	Accounts payable	Accounts receivable	Banking	Billing	Data base management	Educational	Engineering	General ledger	Hospital administration	Information retrieval	Insurance	Inventory control	Numerical control	Operations research	Payroll	Personnel	Project control	Sales analysis	Scheduling	School administration	Scientific	Simulation	Statistical	Text editing	Typesetting
Interactive Sciences Corp.			•		•		•			•			•				•	•	•		•	•	•	•	
Itel Corporation	•	•	•	•				•				•			•			•	•						
Keydata Canada	•	•		•				•			•	•						•							
Keydata Corporation	•	•		•				•			•	•						•							
Le Groupe BST, Inc. (formerly Aquila)	•	•	•	•	•					•					•									•	•
Litton Computer Services					•					•											•	•	•	•	
Lockheed Information Systems																									
Management Concepts, Inc.	•	•		•				•	•			•			•			•							
Management Systems Corp.	•	•					•	•	•	•					•		•	•	•		•	•	•	•	
Mark/Ops	•	•			•		•	•	•			•		•	•		•	•	•		•	•	•	•	
Martin Marietta Data Systems				•	•	•	•	•				•		•	•		•	•	•		•	•	•	•	
McDonnell Douglas—CYBER Service				•	•	•	•	•	•	•		•	•	•	•		•	•	•		•	•	•	•	
McDonnell Douglas—370 Service	•	•		•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	
McDonnell Douglas—IMS/Data Base					•	•				•	•	•					•				•				
Mellonics Information Center					•		•	•					•	•			•	•			•	•	•	•	
Metridata Computing, Inc.	•	•	•		•	•	•	•									•	•		•	•	•	•	•	
Multiple Access Limited	•	•	•	•	•	•	•	•		•	•	•	•	•		•	•	•	•		•	•	•	•	
Nat. Computer Network of Chicago	•	•	•		•	•	•	•						•		•	•	•	•		•	•	•	•	
National CSS, Inc.	•	•	•		•	•	•	•						•		•	•	•	•		•	•	•		•
Newfoundland and Labrador Comp. Svc.	•	•		•		•	•	•	•	•		•	•	•	•		•	•	•		•	•	•	•	
NLT Computer Service	•	•		•				•	•			•			•			•							
Ohio Valley Data Control, Inc.	•	•	•					•	•			•			•										
On-Line Business Systems, Inc.	•	•			•							•												•	
On-Line Systems, Inc.—Info. Proc. Syst.			•	•	•		•			•		•	•		•	•		•	•	•		•	•	•	•
On-Line Systems, Inc.—OSCAR					•											•		•		•					
On-Line Systems, Inc.—Dynabank			•	•																					
Optimum Systems, Inc.	•	•	•		•		•	•				•		•	•			•		•	•	•	•	•	
Pacific Applied Systems Div., SDC					•		•	•				•								•	•	•			
Polycom Systems Limited	•	•		•	•	•	•	•	•			•		•	•		•	•	•		•	•	•	•	
PRC Computer Center, Inc.					•				•	•							•							•	•
Profitool, Inc.	•	•			•			•		•				•			•		•			•		•	•
Programs & Analysis, Inc.	•	•		•	•		•	•		•		•	•	•	•		•	•	•	•	•	•		•	•
Proprietary Comp. Sys., Inc.—COMPUTERNET			•	•	•						•	•	•	•	•		•	•			•	•		•	•
Proprietary Comp. Sys., Inc.—PCS/TEXT					•																			•	•
Pryor Corporation	•	•		•	•		•	•				•			•		•	•	•			•			
Quanex Management Sciences	•	•		•	•			•				•			•	•		•	•		•	•	•		
Rapidata, Inc.	•	•	•		•	•	•	•		•	•	•		•	•		•	•		•	•	•	•	•	
Remote Computing Corp.					•		•			•															
Scientific Process & Research, Inc.							•			•													•	•	
Scientific Time Sharing Corp.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•
The Service Bureau Company	•		•		•		•	•		•	•	•	•		•		•	•	•	•	•	•	•		
Shared Medical Systems, Inc.	•	•	•	•	•		•	•	•	•		•		•	•		•	•	•		•	•	•		
I.P. Sharp Associates Limited	•	•	•	•		•	•	•			•	•		•			•	•	•		•	•	•		
A.O. Smith Corporation	•	•	•	•	•		•	•	•			•		•			•	•	•		•	•	•		
Statistical Tabulating Corporation	•	•		•		•	•	•		•	•	•			•			•	•		•	•	•	•	
Structural Dynamics Research Corp.							•						•								•		•		
Sun Information Services—INTERCOM							•														•		•		
Sun Information Services—TSO, WYLBUR							•			•				•			•		•		•		•	•	
Systems Dimensions Limited	•	•			•		•	•	•	•				•	•			•	•		•	•	•	•	
Technical Advisors, Inc.							•																		
Tel-A-Data, Inc.		•		•	•						•		•	•		•			•	•				•	
Telstat Systems, Inc.			•										•	•									•	•	
Timesharing Consultants, Inc.	•	•		•	•		•	•			•	•	•	•	•						•	•	•	•	
Time-Sharing Resources, Inc.	•	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	
Tymshare, Inc.	•	•	•		•		•	•	•	•		•		•	•		•	•	•		•	•	•	•	
United Computing Systems, Inc.	•	•	•	•	•		•	•		•		•	•	•	•		•	•	•		•	•	•	•	
University Computing Co.—EXEC/FASBAC					•		•						•	•							•	•	•	•	•
University Computing Co.—VS-370	•	•					•							•			•				•	•	•	•	
University Computing Co.—1100/OS					•		•			•					•			•			•	•	•		
University Computing Co.—NOS/BE							•														•		•		
USS Engineers and Consultants, Inc.							•			•				•			•	•			•	•	•		
Wang Data Center					•									•			•	•	•	•	•		•	•	
Warner Computer Systems, Inc.		•	•		•					•	•			•	•		•	•	•	•	•		•	•	
Xerox Computer Services	•	•		•	•		•	•				•			•		•	•					•	•	

▷ ● The smaller remote computing companies that survive will generally do so by offering highly specialized services to specific types of business firms. Companies attempting to market plain "computing power" are finding it increasingly difficult to stay alive.

● Many current users of commercial remote computing services will install their own in-house computer systems. Some companies will install small computers (such as the IBM Series/1 or the proliferating minicomputers from dozens of vendors) to replace individual timesharing or remote batch terminals, while others will install full-barreled in-house timesharing systems of their own. To make up for these lost customers and maintain their growth, the remote computing suppliers will have to keep on attracting new customers, primarily from the huge ranks of small business firms.

● Remote computing users will have an ever-growing variety of "packaged" application programs to choose from. These will be developed by both the remote computing companies and independent software firms. "Piggy-backing" of specialized services on existing remote computing networks will continue to increase.

● Finally, both suppliers and users will begin to take advantage of the fact that the nationwide remote computing networks can be used effectively for a broad range of communications functions, as well as for computation and information retrieval. The same remote computing system that satisfies a company's computational needs and holds its data files will also be able to handle its message transmission, data collection, report distribution, and other communications requirements.

When the remote computing companies offer this broad spectrum of services, and when a large number of business firms accept and use them on a daily basis, the age of the "information utility" will have arrived at long last. At the present time, however, remote computing users have to settle for less. The guidelines and comparison charts that follow will help prospective users to assess what's available today and how it can aid in solving their information processing problems.

User Experience

In the April 1979 supplements to DATAPRO 70 and DATAPRO REPORTS ON DATA COMMUNICATIONS, a questionnaire was included which solicited user experience and ratings with remote computing and timesharing services. By the cut-off date of June 1, 127 useable responses had been received, with 193 ratings of remote computing services. Over 60 of the users were using more than one service, and provided separate ratings for each.

The last Datapro user survey of remote computing services was conducted in the fall of 1977, and consisted of separate questionnaires mailed to our entire subscriber base. As might have been expected, the number of responses received this year through inclusion of the questionnaires in the supplements was significantly less than that resulting from the direct mailing. However, the responses received this year were certainly sufficient in number to provide an adequate basis for the information and conclusions presented in this report.

The first series of questions pertained to the user's company size, the amount of in-house processing performed, the near-term future plans for using remote computing services, and the relative importance of a series of considerations. These questions form a picture of the users responding to the questionnaire.

The users who responded can be grouped according to company size as follows:

	Users Responding	
	Number	Percent
Annual revenue:		
Less than $1 million	9	7
Between $1 million and $10 million	20	17
Between $10 million and $100 million	31	26
Over $100 million	60	50
Total number of users responding to this question	120	100

The next question asked about the extent of in-house computing facilities, with the following result:

	Users Responding	
	Number	Percent
No in-house facilities	21	17
Some in-house facilities	30	24
Extensive in-house facilities	72	59
Total number of users responding	123	100

Clearly, remote computing services were being used to supplement rather than replace in-house computation by most of the Datapro subscribers who responded.

The next question was intended to elicit a qualitative measure of the users' plans regarding remote computing service growth by asking directly if the user planned to increase or decrease usage, planned no change, planned to move some applications in-house, or planned to move all applications in-house. The responses are summarized below.

	Users Responding	
	Number	Percent
Remote computing service plans:		
Planned no change	16	15
Planned an increase	55	57
Planned a decrease	36	34
Total number of users responding	107	100
In-house plans:		
Planned to move some applications in-house	36	34
Planned to move all applications in-house	12	11
Total number of users responding	48	45

In the above tables, the first question was completely definitive; therefore, the actual number of users ▷

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▷ responding was used as the base for calculating the percentages. In effect, we assumed that the users who did not answer the question matched the pattern of those who did. The second question is not definitive; no answer was elicited from those users not planning to bring any applications in-house. Therefore, an approximation was made by using the same number of responses as in the previous question as the base for percentages.

The next question attempted to identify important considerations in selecting a remote computing service. A list of eight considerations was presented with the request for the user to arrange the list in numerical order of importance. The following table summarizes the results.

	Criteria	Weighted* Importance
Most important	Accessibility	5.871
●	Cost	5.732
●	Response time	5.613
●	Application packages	5.608
●	Technical support	5.212
●	Data security	3.700
●	Control procedures	3.638
Least important	Proprietary data files	2.974

*Calculated by assigning a numerical value of 8.0 to most important, 7.0 to next most important, and so on. Totals were then divided by the number of respondents (124).

It is interesting to note that most users considered accessibility and cost almost equally important in their evaluation of a remote computing service. Of almost equal, but secondary importance were the applications available from the service vendor, and the response time with which their information needs are met. The high priority given to applications availability might very well be interpreted as meaning that most of these respondents rely on the programming expertise of the remote computing service, rather than assume the expense of developing their own tailored applications.

The last three criteria, data security, control procedures and proprietary data files, ranked sixth, seventh and eighth, respectively, in priority of consideration. The fact that security and control of proprietary information was ranked as relatively unimportant might be explained in several ways. First of all, many users might be performing processing functions involving 'sensitive' data in-house, as most of the users indicated they also had extensive in-house facilities. Alternately, many of the users might be quite satisfied with the security and control measures offered by the remote service. It may, in fact, offer more security than if such files were kept in-house.

The remainder of the questionnaire was devoted to specific questions and ratings for specific services. A summary of the ratings given to specific vendors' services is presented in the accompanying "Users' Ratings" table and is self-explanatory.

One question dealt with the length of time the user had been utilizing the service. A summary for all services is presented below:

	User Responses	
	Number	Percent
Length of time service used:		
Less than 6 months	14	8
Between 6 months and 2 years	43	23
Between 2 years and 5 years	76	41
Over 5 years	52	28
Total number of users responding	185	100

Clearly, the survey included mostly seasoned users of remote computing services who should be well qualified to judge them.

Another question asked about the applications for remote computing services, with the following results:

	User Responses	
	Number	Percent
Accounting	78	41
Distribution	11	6
Engineering	56	29
Manufacturing	17	9
Personnel	25	13
Research and Development	54	28
Sales/Marketing	53	28
Financial Planning/Budgeting	13	7
Other	33	17

The total number of user responses (192) was used as the basis for calculating the above percentages. Obviously, many users reported multiple applications. The results make it clear that remote computing services are now being used extensively for mainstream data processing applications in addition to the traditional engineering/scientific calculations.

Instead of trying to determine the specific brand names of the terminals being used in connection with the remote computing services, we elected to ask about terminal characteristics. The results are summarized below.

	User Responses	
	Number	Percent
Terminal characteristics:		
Interactive	147	77
Character printer	114	59
CRT	57	50
Batch	62	32
Line printer	48	25
Programmable	33	17

Again, the total number of user responses (192) was used as the base for calculating percentages. While the overall numbers may be a little low because a few users did not answer this question, the pattern is quite clear. "Everybody" uses interactive terminals, many of which are CRT units. Printers are clearly required by the vast majority of users, and many users employ high-performance batch terminals and line printers. Programmable terminals have not yet made as much impact as they undoubtedly will in the future.

While on the subject of terminals, we naturally asked the traditional question about how many were being used. The results showed two distinct groups of users: those with a lot of terminals and those with just one or a few terminals. The results are summarized below: ▷

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USERS' RATINGS OF REMOTE COMPUTING SERVICES

Company	Number of User Responses	Overall Satisfaction					Response Time					Up Time					Installation and Training					Languages and Compilers					Application Programs					Technical Support				
		WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
ADP Network Services, Inc.	5	3.4	2	3	0	0	3.4	2	3	0	0	3.6	3	2	0	0	3.2	2	2	1	0	3.6	3	2	0	0	3.3	1	3	0	0	3.0	1	2	1	0
Boeing Computer Services, Inc.	6	3.3	3	2	1	0	3.3	3	2	1	0	3.3	4	0	2	0	2.5	2	0	3	1	3.2	2	3	1	0	2.8	2	2	1	1	2.8	2	2	1	1
CompuServe, Incorporated	4	2.8	1	2	0	1	3.5	2	2	0	0	3.0	1	2	1	0	2.5	0	3	0	1	3.3	1	3	0	0	2.8	0	3	1	0	2.8	1	2	0	1
Computer Sciences Corporation	3	3.3	1	2	0	0	3.3	1	2	0	0	3.7	2	1	0	0	3.5	1	1	0	0	3.0	0	2	0	0	3.0	1	0	1	0	3.5	1	1	0	0
Comshare, Inc.	9	3.4	4	5	0	0	3.2	3	5	1	0	3.3	3	6	0	0	3.1	2	6	1	0	2.9	0	8	1	0	3.0	2	5	2	0	3.2	4	3	2	0
Control Data Corp	8	3.3	3	4	1	0	3.1	2	4	1	0	3.3	2	4	0	0	2.4	0	3	4	0	3.0	2	5	0	1	3.1	2	4	1	0	3.1	3	3	2	0
Datacrown, Incorporated	4	3.3	1	3	0	0	3.3	1	3	0	0	3.3	1	3	0	0	3.0	0	4	0	0	3.3	1	3	0	0	2.3	0	1	2	0	3.3	1	3	0	0
Data Resources, Inc.	3	2.7	0	2	1	0	2.3	0	2	0	1	3.3	2	0	1	0	2.7	0	2	1	0	2.3	0	1	2	0	3.0	0	3	0	0	3.0	1	1	1	0
General Electric Co.	36	3.1	9	21	6	0	2.9	5	24	3	3	3.3	15	18	3	0	2.7	5	18	11	2	3.1	8	24	3	0	3.1	9	18	5	1	2.8	9	13	0	4
Interactive Data Corp.	3	2.3	0	2	0	1	3.0	1	1	1	0	3.0	0	3	0	0	2.3	0	2	0	1	3.0	0	3	0	0	3.0	0	3	0	0	2.3	0	2	0	1
McDonnell Douglas Automation Co	8	3.3	3	4	1	0	3.3	3	4	1	0	3.5	4	4	0	0	3.0	2	4	2	0	3.8	6	2	0	0	3.0	2	5	0	1	3.4	3	5	0	0
National CSS, Inc.	7	3.3	3	3	1	0	3.4	3	4	0	0	3.4	3	4	0	0	3.3	3	2	1	0	3.3	3	3	1	0	3.2	3	1	2	0	3.4	3	4	0	0
Proprietary Computer Systems	3	3.0	1	1	1	0	3.0	0	3	0	0	3.0	0	3	0	0	3.0	0	3	0	0	3.0	0	3	0	0	3.3	1	2	0	0	3.0	0	3	0	0
Rapidata, Inc.	3	2.0	0	1	1	1	2.0	0	0	3	0	2.5	0	1	1	0	2.0	0	0	3	0	2.0	0	0	2	0	2.7	0	2	1	0	1.5	0	0	1	1
Service Bureau Co	19	3.3	5	13	0	0	3.0	3	12	3	0	3.6	11	6	1	0	3.1	3	13	2	0	3.1	3	12	2	0	3.1	3	12	2	0	3.0	5	9	3	1
Systems Dimensions Ltd.	3	3.7	2	1	0	0	3.3	1	2	0	0	3.3	1	2	0	0	3.0	0	3	0	0	3.0	0	3	0	0	3.0	0	3	0	0	3.3	1	2	0	0
Tymshare, Inc	9	2.9	3	3	2	1	3.0	2	5	2	0	3.0	3	3	3	0	3.1	3	4	2	0	3.1	3	4	2	0	3.0	3	2	3	0	3.1	4	2	1	1
United Computing Systems, Inc	9	3.3	4	4	1	0	3.2	5	2	1	1	3.0	2	6	0	1	2.9	2	4	3	0	3.3	2	6	0	0	3.1	3	5	0	1	3.2	4	4	0	1
Others	51	3.1	13	32	3	2	3.0	16	22	9	4	3.2	19	23	7	1	2.8	7	29	11	3	3.2	14	28	2	1	2.9	8	26	6	4	2.9	12	25	12	2
GRAND TOTALS	193	3.1	57	108	20	6	3.0	53	102	26	9	3.3	76	91	19	2	2.8	32	103	45	8	3.2	48	115	16	2	3.0	40	101	27	8	3.0	55	86	34	13

*Users' ratings are given in terms of the number of users responding Excellent (E), Good (G), Fair (F), or Poor (P).
Weighted Averages (WA) were calculated by assigning a value of 4 to each Excellent rating, 3 to Good, 2 to Fair, and 1 to Poor.

	Number	Percent
Users with 1 terminal	53	31
Users with 2 terminals	36	21
Users with 3 terminals	20	11
Subtotal	109	63
Users with 4 or 5 terminals	16	9
Users with from 6 to 9 terminals	16	9
Users with from 10 to 15 terminals	16	9
Users with from 16 to 50 terminals	8	5
Users with from 51 to 100 terminals	6	5
Total number of user responses	171	100

Almost one-third of the respondents had only a single terminal accessing the remote service, and almost two-thirds has three or less. Less than one user in ten has over 15. With this in mind, we can readily see that the average number of terminals per user, 7.3, can be misleading.

One question asked the users to identify the method of accessing the remote computing service. The summary below confirms the expected dominance of the public telephone network, but other methods are also being used.

User Responses

Access method:	Number	Percent
Dial-up (DDD)	178	94
Leased voice-grade line	20	11
DDS (AT&T digital service)	8	3
Packet switched service	4	2

The percentages are based on a total number of 189 responses.

The next two questions explored the subject of monthly expenditures. Users were asked to check appropriate boxes which indicated monthly cost ranges for total vendor bill and terminal cost. These figures should be used only qualitatively. The results are presented below.

User Responses

Total remote computing vendor bill:	Number	Percent
Under $500/mo.	45	23
Between $500 and $2,000/mo.	52	27
Between $2,000 and $5,000/mo.	31	16
Over $5,000/mo.	64	34
Total number of user responses	192	100

▷ Terminal cost:

Under $500/mo.	100	55
Between $500 and $2,000/mo.	47	25
Between $2,000 and $5,000/mo.	16	9
Over $5,000/mo.	16	9
None	8	5
Total number of user responses	181	100

The "None" category under terminal costs accommodates those cases where line costs and/or terminal costs are included as part of a service arrangement. These areas of cost were intended to be independent; i.e., terminal connect time would be included under the vendor bill. From the pattern of responses, it appears that our subscribers generally interpreted the questions as intended. Nonetheless, we urge you not to draw hard-and-fast conclusions from the above information. Used as a source of qualitative indicators, with other material in this section, it can provide indications but not definitive answers.

Clearly, there is no "average" cost of using a remote computing service, at least based on these responses. The monthly costs reported were greatly dispersed, ranging from several hundred dollars to well over $5,000. It is noteworthy, however, that the majority of respondents were spending less than $500 per month for terminal costs. This appears consistent with the fact that most users have only one or two terminals in use with the remote service.

A final question asked users whether their remote computing service was being used to maintain a data base. The results are as follows:

Vendor-maintained data bases:

No	135	70
Yes	57	30
Total number of user responses	192	100

The vast majority of users are not now using remote computing to maintain a data base. Inasmuch as the majority of the respondents indicated extensive in-house computing facilities, it might be assumed that many are maintaining their own data base files. It is also possible that many of the users move portions of their data bases to the remote service in batch mode only as needed for a specific job. Many scientific/engineering applications may also not require maintenance of a data base.

In closing this section, Datapro thanks the subscribers who cooperated with us in this survey. The completeness and clarity of the input was unusually good, even for Datapro subscribers, who have a long history of important contributions to our user experience survey efforts. The picture of remote computing drawn by the summary of the users' input clearly indicates that remote computing services are being used as an effective alternative or supplement to in-house data processing activities. Our users obviously feel that neither special applications nor an unusually low or high volume of activity are necessary for remote computing service to be desirable.

Selecting a Vendor

In most metropolitan areas of the United States and Canada, prospective remote computing users can choose from literally dozens of suppliers. Selecting the company that will provide you with the most effective service at the lowest overall cost isn't easy, but it can be done. What's needed is a straightforward, logical selection process that will guide you around the numerous pitfalls which await the unwary. The following procedure, if judiciously applied, will virtually assure the satisfaction of your remote computing requirements in a reliable, economical manner.

1. *Get all the help you can.* Remote computing is a complex and changing field. Though the ultimate goal is to make life easier for computer users, selection of the most suitable commercial remote computing service requires consideration of complex and interrelated hardware, software, communications, and economic factors. Therefore, it's wise to learn as much as you can before making your choice. This report and other related material in DATAPRO 70 will help a lot. So will reading other articles and books, attending remote computing seminars, talking with various sales representatives, and studying their technical documentation. The services of an independent consulting firm with broad remote computing experience can also be well worth their cost.

2. *Define your requirements.* Before shopping for remote computing services, it's essential to know what you want them to do for you. Try to list all the reasonable applications for remote computing in your organization. Then rank these applications according to their relative importance and urgency. For each of the key applications, define the required computer functions— usually in terms of the inputs to be supplied, the calculations to be performed, the outputs to be produced, and their associated volumes. Specify the exact manner in which all computer inputs and outputs must interface with your existing procedures, forms, and/or data files, as well as any turn-around time requirements that must be met. Finally, determine the present overall cost of processing each application, so that you'll be in a position to know whether or not remote computing can really save you money.

3. *Survey the available remote computing services.* The first step in narrowing down the field is to find out which remote computing companies are actively marketing their services in your locality and collect the basic information about their capabilities, specialties, and pricing. The comparison charts in this report can help a lot. So can the Yellow Pages of your local telephone directory, the advertisements of the remote computing companies, and the experience of any acquaintances who are using remote computing. The salesmen for the various remote computing companies will usually be more than pleased to give you brief presentations describing their firms' capabilities and to present you with brochures, price schedules, and sample contract forms.

4. *Choose the most likely candidates.* Now it's time to reduce the list of contenders to the three to six that ▷

▷ seem best able to meet your requirements. This can usually be accomplished by a selective "weeding out" process. You simply eliminate from consideration those suppliers that fail to measure up to one or more critical questions such as these:

- Are the company's services available in your area at a competitive cost (including all communication and terminal costs)?

- Does the company offer the programming and technical support services you need?

- Does the company offer the specific programming languages and/or application programs you need?

- Does the company support the type of terminal equipment you need (or already own)?

- Can the company satisfy the requirements, if any, for compatibility with your existing programs and/ or data files?

- Does the company appear to be able to meet your requirements for operational reliability and data security?

- Are you satisfied that the company is soundly financed and in the business to stay?

5. *Learn all you can about each remaining candidate.* Now it's time to call in the sales representatives of each of the remaining contenders for in-depth discussions about their capabilities, services, and pricing. By now you'll have a good idea what questions to ask them—and what answers you're looking for. Be sure to find out exactly what each company offers in the way of equipment configuration, program library, programming services, training, documentation, security measures, contract terms, etc. Get the details of each company's pricing structure, including possible "extra" charges for programming, training, manuals, application programs, and other products and services you'll need. Be sure to ask for reference lists of current users. Contact these users, and learn all you can about what their experiences have been; it's likely to be a remarkably informative exercise. Also, check the results of the Datapro user survey on the preceding pages.

6. *Conduct benchmark tests.* This is probably the most important—and yet the most frequently ignored or misguided—phase of any remote computing selection project. The essence of benchmark testing is the actual preparation and execution of one or more problems which are representative of the user's planned computer workload. The purpose is three-fold:

- To find out exactly what's involved in using each supplier's services.

- To determine the service availability, response time,

and anticipated throughput that each supplier can deliver at both peak hours (usually around 10 or 11 a.m. and 3 to 4 p.m.) and off-peak times.

- To determine the cost factors for each service on the types of problems you'll be running regularly.

If you'll be writing your own programs, go ahead and prepare one or more of them, in the language of your choice. Then ask each of the prospective suppliers to loan you an appropriate terminal plus the computer time required to compile, test, and execute your programs. If you'll be using a ready-made application program supplied by the vendor, prepare some representative test data, borrow the necessary terminal, and give the program a real tryout. In either case, be sure to: (1) control all test conditions as carefully as you can; (2) make the benchmark programs and data as representative of your actual workload as time permits; (3) run each test at both peak and off-peak hours (and at the same times of day for all prospective suppliers); and (4) keep detailed records of all pertinent timing and cost data, as well as your impressions about the comparative ease or difficulty of using each service.

7. *Make your selection.* By now, you've amassed a great deal of pertinent information. Now it's time to "put it all together." From the results of your benchmark tests, calculate the estimated overall costs of satisfying all your remote computing needs with each supplier's services. Compare these costs with your present costs, and (if appropriate) with the estimated costs of alternative approaches such as a computer of your own or a conventional service bureau. In many cases, one of the remote computing suppliers will now stand out as a clear-cut choice. In others, it may be practical to contract with two or more suppliers and use the one whose offerings turn out to be the most economical for each of your applications.

If neither of the above solutions is appropriate, you may want to turn to some type of weighted point scoring system, in which each supplier is awarded an appropriate number of points for every desirable characteristic (such as availability, response time, languages, terminals, application programs, costs, etc.). But frankly, if it still looks like a really close race, we'd recommend giving preference to the company that made the best showing on your benchmark tests; there's no more convincing evidence than impressive performance on your own problems.

8. *Negotiate a suitable contract.* At this point, virtually every remote computing company will ask you to sign its standard contract form. But that's not necessarily your best move. There's a good chance the supplier will offer considerably more favorable contract terms if that's what it takes to land your account. So read the contract carefully. Make sure it clearly defines the company's pricing structure, charges for all additional products and services, hours of ▷

▷ service availability, length of commitment, termination provisions, etc. If the supplier writes any programs for you, make sure it's clear whose property they will be. If you're not completely satisfied with the standard contract terms, ask the supplier to amend them.

You'll notice that most of the standard contracts disclaim any liability for damages arising either from the use of the suppliers' services or their failure to provide the agreed-upon services. If you feel you need more protection, such as guaranteed file security, it certainly can't hurt to ask for it. Discussions with other customers of the service may be especially helpful in this area. And the advice of your company's lawyer is likely to be well worth having to help ensure that you'll get the services and the protection you need.

9. *Make periodic re-evaluations.* Once you've selected the most suitable remote computing service for your needs, it's unwise to assume that it will *continue* to represent your best choice. As a remote computing network becomes more heavily loaded, its performance tends to degrade. As the network's saturation point is approached, the response times to each user's requests are likely to become unbearably long. In addition to user frustration, this condition leads to longer connect times and higher costs. Therefore, it's wise to rerun your benchmark problems every month or two under the original test conditions. This will enable you to spot any deterioration in the service and present your supplier with documentary evidence of the fact. If the supplier cannot satisfy you that the original quality of service will soon be restored, remember that numerous other suppliers are anxious for your business. And, if you've written your own programs and used one of the common programming languages, it should be relatively easy to make the switch.

The Comparison Charts

Comparative characteristics of 125 services from over 100 vendors are presented in the following section. All information in the following charts was furnished, or verified where possible, by the suppliers between April and July 1979. Their responsiveness and cooperation with the Datapro staff is greatly appreciated.

Datapro sent repreated requests for information to companies known or believed to be in the remote computing business. The usable responses summarized in our charts represent a comprehensive cross-section of the currently available commercial remote computing services in the U.S. and Canada. *The absence of any specific company from our charts means that the company either failed to respond to our repeated information requests or was unknown to us.*

The comparison chart entries and their significance to potential remote computing users are explained in the following paragraphs, together with additional useful

guidelines for selecting the remote computing service that will most effectively meet your needs.

General Information

Name of service. The name under which a company's commercial remote computing services are marketed may or may not be the same as the corporate name. Where they differ, this entry indicates the name of the remote computing service. Some suppliers offer several differnt levels of service with different names and capabilities, and in these cases there are separate chart entries for each of the separately-defined services.

Date operational. This entry tells when each company's remote computing services first become available for regular commercial use. Most remote computing networks require lengthy shakedown periods before settling down to normal operations, so the length of time a service has been operational may serve as a reasonable indication of its reliability—as well as its financial stability. But it is also important to note that few remote computing networks remain really stable for long periods of time; disruptions can occur at any time through addition or consolidation of computer centers, changes in systems software, communications breakdowns, etc.

Areas currently served. Each remote computing company was asked to state the geographical areas it can service effectively, and their answers are reported in the charts. Where specific cities are named, the companies generally offer toll-free service in those cities through local computer centers, communications multiplexers, or foreign exchange facilities.

Where a company professes to serve a large region (such as "Entire U.S.," the implication is that the company either offers INWATS (Inward Wide Area Telephone Service) or maintains computer centers, multiplexers, or other toll-free entry points in strategic cities throughout the area. More recently, an increasing number of services are offering access via one of the packet-switched common carriers, such as Telenet or Tymnet. This cost is, in some cases, included in the service charge. Unfortunately, this is not true in all cases. It's wise to contact all the companies whose services appear to meet your needs, and find out exactly what communications and computational facilities they offer in your area.

Equipment

Computers. This entry describes the number and type of central processors that each company currently employs in its remote computing network. The cities in which the computers are located are also indicated in most cases. The smaller supporting computers which are frequently used as communications processors or remote multiplexers are not listed here because of space limitations.

Space limitations have also precluded the reporting of configuration details such as main storage capacity, type and capacity of mass storage units, number and speed of ▷

▷ central-site peripheral devices, etc. These configuration details may or may not be significant, depending upon your applications. Conventional scientific applications are typically coded in FORTRAN or BASIC, require little or no permanent file storage, and can be run without difficulty on most of the commercial remote computing systems. Conversely, many business data processing applications impose special requirements for mass storage units, central-site peripheral equipment, and compatibility with existing programs and data files. In these cases, it will be necessary to contact the remote computing vendors for details about their equipment configurations and capabilities.

Number of simultaneous users. This entry indicates the maximum number of users at remote terminals that each remote computing company claims to be able to serve simultaneously. This figure can serve as a useful—though far from precise—indication of the power of a remote computing system. The response time to each user's requests will naturally tend to increase as the number of simultaneous users gets larger, and in many cases an attempt to serve the indicated number of simultaneous users will lead to response times which are far too long for effective conversational-mode use.

Conversational terminals supported. The specific remote terminals that each remote computing system can accommodate for interactive, conversational-mode operations are listed in this entry. The abbreviation "TTY 33/35" stands for the Teletype Model 33 and Model 35 Teletypewriters, which are still by far the most widely used timesharing terminals. These units have conventional typewriter-style keyboards and transmit an 11-unit ASCII code, usually at 110 bits per second. The Model 33 terminals are designed for "standard-duty" usage (up to about four hours a day) and are priced at about $450 to $1,300, depending on whether or not an integrated paper tape reader and punch and various options are included. The Model 35 terminals are functionally similar but are beefed up for heavy-duty usage, offer a broader range of options, and cost about three times as much as their Model 33 counterparts.

To capitalize on the widespread acceptance of the Teletype Model 33 and 35 terminals, numerous peripheral equipment makers have introduced "Teletype-compatible" printers, display units, and other terminals which have the same interface characteristics and can utilize the same software support as the Teletype units. These Teletype-compatible terminals are described in the Peripherals section of DATAPRO 70. Examples include the GE TermiNet 300 and 1200, Memorex 1200 Series, NCR 260, Texas Instruments Silent 700 Series, Univac DCT 500 terminals, and Digital Equipment DECwriters, plus CRT display terminals such as the Hazeltine Model 1000 and 2000, the ADDS Consul series, the Beehive display line, and the Lear Siegler ADM series. In general, any Teletype-compatible terminal can be connected to any remote computing network that supports the Teletype Model 33 or 35 Teletypewriters—but it will generally not be possible to take advantage of the replacement terminal's

higher speed and/or improved functional capabilities unless the remote computing company makes suitable modifications in its equipment and supporting software.

The IBM 2741 is another widely supported conversational-mode terminal. Built around an IBM Selectric Typewriter, it provides keyboard input and typed output in both upper and lower case. Its rated transmission speed is 134.5 bits (14.8 characters) per second. The 2741, however, cannot be equipped with paper tape I/O or any other medium for local storage of programs or data.

Typewriter-style terminals that are compatible with the IBM 2741 are marketed by Anderson Jacobson, Computer Devices, Harris, Memorex, Texas Instruments, and several other companies. All are described in the Peripherals section of DATAPRO 70. In addition to these and other typewriter terminals, many remote computing companies also support the use of CRT display units, digital plotters, and/or portable terminals.

An increasing number of timesharing vendors are also providing support for the IBM 3270 family of interactive terminals. These terminals include numerous models of stand-alone or clustered configurations, and communicate with the remote service via synchronous communications. The 3270 can therefore provide higher-speed communications and quicker response time than with the asynchronous conversational terminals previously described.

Batch terminals supported. In addition to the low-speed, conversational-mode terminals which are usually associated with timesharing, many of the remote computing networks now support faster terminals designed for batch-mode transmission and reception of comparatively large volumes if data. Batch terminals greatly extend the spectrum of practical applications for remote computing systems by permitting the entry of previously recorded data and the printing of results at comparatively high speeds.

The most widely supported batch terminal has long been the IBM 2780/3780. Models provide different combinations of card reading, card punching, and/or line printing capabilities, at transmission speeds ranging from 1200 to 7200 bits (150 to 900 characters) per second. Data is transmitted under IBM's Binary Synchronous Communications (BSC) line discipline technique in ASCII or EBCDIC data code. Rental prices for the 2780/3780 range up to $1,500 per month, so its installation must be carefully justified by virtue of a real need for the faster input/output speeds it provides.

As in the case of the Teletype terminals, the widespread acceptance of the IBM 2780/3780 has led to the introduction of competitive terminals which offer functional compatibility, usually at lower prices. Numerous "intelligent" (programmable) terminals, such as those produced by Control Data, Data 100, Harris, and Mohawk, can emulate the functions of the IBM 2780/3780 and other popular batch terminals. Multifunction remote batch terminals (RBT's), from companies such as Digital Equip- ▷

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ment and Data General, offer 2780/3780 emulation plus the capability to perform a multitude of other applications and functions, some simutaneously.

Many of the remote computing companies also support the use of small computers, such as the IBM System/3, Honeywell Level 62, and Univac 90/25, as remote batch terminals or workstations. These independently programmed computers can serve as "intelligent terminals," processing some data locally and providing great flexibility in their communications functions. Their costs, as might be expected, are comparatively high.

All the terminals mentioned above are described in the Peripherals or Computers section of DATAPRO 70; please refer to the Index, beginning on page 70A-100-01a. Minicomputers are covered in the DATAPRO 70 feature report *All About Minicomputers*, 70C-010-020.

Software

Conversational programming languages. This entry lists the programming languages offered by each company for interactive use by customers at remote terminals. The term "conversational" implies a high degree of interaction between the programmer and the computer system throughout the program entry and debugging process.

In most cases, each statement of the source-language program is checked for proper syntax as the user enters it, and any necessary corrections can be made immediately. After the whole program has been entered and checked, one of two basic techniques is usually followed to get it into operation: the program may either be compiled into a machine-language object program and then executed in conventional fashion, or it may be executed immediately in an interpretive mode. Interpretive execution saves compilation time and facilitates program changes, but it also requires that each source-language statement be translated into the appropriate machine instructions every time it is executed—an inherently inefficient process.

FORTRAN and BASIC are by far the most popular conversational programming languages for remote computing use. Between the two, experienced computer users tend to favor FORTRAN because of its greater power and flexibility, while first-time users often choose BASIC because it is generally considered easier to learn and use.

FORTRAN has been the most widely used scientific programming language for more than a decade. It uses symbols and expressions similar to those of algebra to express the procedures for performing computational and logical processes. Though it was designed strictly for scientific applications, FORTRAN has been successfully used for a wide range of business data processing functions as well. There are many different versions of the FORTRAN language, but conversions of FORTRAN programs from one version to another can usually be made with comparatively little difficulty. Thus, programs which are prepared and debugged in conversational mode can

later be converted into efficient production programs through recompilation by a batch-mode compiler.

BASIC (Beginners' All-purpose Symbolic Instruction Code) was developed at Dartmouth College to provide nonprogrammers with the capability to write programs in an easy-to-use language that resembles standard mathematical notation. BASIC is well suited for use in conversational-mode programming and debugging, and has rapidly gained wide acceptance among suppliers and users of remote computing services. Like FORTRAN, BASIC was designed for scientific and mathematical programming but has also been successfully used for business data processing. Many of the remote computing companies offer extended "supersets" of the BASIC language which considerably increase its capabilities. (Note, however, that the use of these extended language facilities in your programs may effectively cause you to become "locked in" to the particular company that offers them.) Most of the existing BASIC compilers emphasize rapid compilation and ease of use rather than efficiency of object-program execution; efficient batch-mode compilers for the BASIC language are rare.

APL is a comparatively recent and noteworthy arrival on the remote computing language scene. Conceived in the early 1960's by Dr. Kenneth E. Iverson of IBM, APL was designed to permit clear, concise expression of computational algorithms. APL's proponents claim (with some justification) that it is "more powerful than FORTRAN and easier to learn than BASIC." APL uses a much larger set of symbols and operators and a considerably different syntax than either FORTRAN or BASIC. Its facilities for handling vectors and arrays are especially powerful, yet simple to use. Some of the commercial implementations of APL include file-handling and formatting facilities that make them quite effective for business as well as scientific applications. The conciseness of the language, however, is a mixed blessing in that it often makes APL programs hard to read and comprehend. Moreover, most of the current implementations of APL are interpreters, which means that the efficiency of object-program execution is likely to be comparatively low.

Though COBOL is by far the most widely used programming language for business applications, comparatively few companies offer a true conversational-mode COBOL compiler. Nonetheless, COBOL's dominance in batch-mode business data processing has made it a popular language among remote computing users.

Other general-purpose languages offered in conversational implementations include ALGOL, CAL, JOVIAL, and PL/1, together with a variety of symbolic assembly languages. In addition, many of the remote computing companies offer special-purpose languages designed for specialized functions such as list processing (e.g., LISP and SNOBOL), text editing, and program debugging.

Batch-mode programming languages. The languages offered by each remote computing company for batch-mode (i.e., non-interactive) compilation are listed in this ▷

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▶ entry. In general, the batch-mode language processors place a considerably greater emphasis upon the generation of efficient object programs than do their conversational-mode counterparts. Therefore, their use can lead to substantial savings in computer time for "production" programs which are run on a regular basis. Batch-mode compilers for virtually every programming language currently in use are offered by one or more of the remote computing companies. By far the most popular languages for batch-mode use are FORTRAN for scientific applications and COBOL for business data processing.

Principal applications. For most remote computing users, the range and capabilities of the available application programs rank among the most important factors in choosing a particular supplier. Thousands of dollars worth of programming efforts can often be saved through the use of suitable ready-made programs, and many of the remote computing companies now offer a broad spectrum of programs to choose from.

Because of space limitations, the main comparison charts show only the principal application areas supported by each company—and the entry "business & scientific" is used for the many suppliers that offer hardware and software designed to support both commercial and scientific applications. This information provides a general guideline only for quick comparisons. The charts on pages 70G-100-01g and -01h show which of 25 groups of applications are available from each of the remote computing companies.

Charges

One of the most complex and confusing aspects of the current remote computing scene is the pricing of the services. There has been no general agreement to date as to the best technique for accounting and charging for the system resources used by each customer. As a result, prospective users are confronted by a bewildering array of rate schedules. The diverse pricing policies make cost comparisons very difficult and accentuate the desirability of benchmark testing. Many vendors offer different pricing options, and users should carefully scrutinize alternate plans to select the one that best suits their needs.

Some remote computing companies impose no minimum monthly charge, while a few charge *only* a single, all-inclusive monthly service fee, and a number of companies offering specialized services bill their customers on a per-transaction or per-item basis. Most companies bill the user for each second of central processor time, while others include the processor time as part of the terminal connect charge. Some companies provide each user with a certain amount of "free" mass storage space, while others do not. Some companies impose a one-time charge for initiation of service, and some have special pricing schedules for certain application programs. In addition, there are usually separate charges for the use of central-site peripheral devices (such as card readers and printers),

for punched cards and printer forms, and for extra programming manuals and training courses.

The principal pricing elements for each remote computing company, in both the interactive and remote batch modes, are summarized in the comparison chart entries under the "Charges" heading. The indicated rates usually provide a range, depending on whether use is prime-time or non-prime-time. Many suppliers offer lower rates during non-prime hours, and discounts for volume usage are common. Remember that in addition to the charges listed in the charts, users usually must bear the cost of their terminals, modems, and communications facilities.

Minimum monthly charge. This is the minimum charge, if any, that is imposed for each month of remote computing service. The companies that impose no minimum charge will naturally be of particular interest to users who plan to deal simultaneously with several different suppliers or to very small-volume users.

Terminal connect time. This entry shows the charge for each hour of time during which an interactive or remote batch terminal is "on-line" (i.e., connected to the central computer).

Central processor time. Most remote computing companies impose a specific charge for each minute (or second) of time during which the central processor is working on the user's program. In some cases, this charge varies with the amount of main memory occupied by the program. Other companies allocate their central processor charges on the basis of more complex units with names like "Core Unit" or "Computer Resource Unit." Typically, such units are functions of the amount of processor time, main memory space, and input/output activity required by each program. Definitions vary significantly from service to service, and users should contact the vendors for specific delineations of their resource units.

Mass storage. Virtually every remote computing company has large-capacity disk storage units at its computer site. Users can rent as much of this mass storage space as they need for on-line storage of programs and files, at the rates indicated in this entry. The storage space is usually rented in units of one track or sector, whose capacity depends upon the physical format of the available mass storage device. Storage charges may be computed on the basis of either the average or maximum amount of storage used during each month; it's important to find out which basis your prospective suppliers use. Discounts are frequently granted for large-volume storage requirements.

Comments

This final entry on the comparison charts is used to explain or amplify the preceding entries and/or to provide other pertinent information about each company's services. ▷

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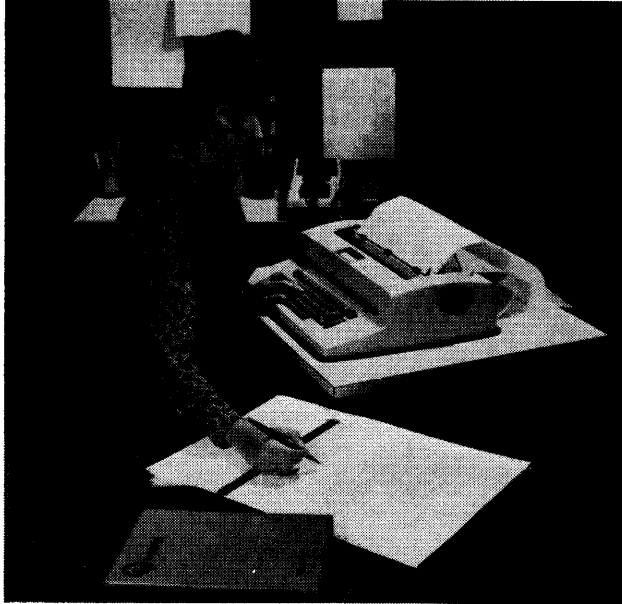
Recent developments in the field of remote computing have included the emergence of electronic mail applications, extensions of what had been text editing and word processing. The IBM 2741 terminal in the photo is tied into Bowne's Word One computer, specializing in non-computational manipulation of information.

▷ Remote Computing Suppliers

Listed below, for your convenience in obtaining additional information, are the headquarters addresses and telephone numbers of the 105 remote computing companies whose services are described in the comparison charts.

ADP Network Services, 175 Jackson Plaza, Ann Arbor, Michigan 48106. Telephone (313) 769-6800.

Arens Applied Electromagnetics, 15801 White Rock Road, Gaithersburg, Maryland 20760. Telephone (301) 948-6249.

Avco Computer Services, 201 Lowell Street, Wilmington, Massachusetts 01887. Telephone (617) 729-7700.

Babcock & Wilcox Company, PO Box 1260, Old Forest Road, Lynchburg, Virginia 24505. Telephone (804) 384-5111.

Boeing Computer Services, Inc., 177 Madison Avenue, Morristown, New Jersey 07960. Telephone (201) 540-7700.

Bowne Incorporated, 160 Water Street, New York, New York 10038. Telephone (212) 952-4400.

Burroughs Corporation, NYC Data Center, 80 Pine Street, New York, New York 10005. Telephone (212) 752-7333.

CallData Systems, Inc., 20 Crossways Park North, Woodbury, New York 11797. Telephone (516) 575-3282.

Citibank N.A., 153 East 53rd Street, CCC/6/2, New York, New York 10043. Telephone (212) 559-0787.

Community Computer Corporation, 185 West Schoolhouse Lane, Philadelphia, Pennsylvania 19144. Telephone (215) 849-1200.

Compudial, Inc., 21 Olney Avenue, Cherry Hill, New Jersey 08005. Telephone (609) 424-4700.

CompuServe Inc., 5000 Arlington Centre Boulevard, Columbus, Ohio 43220. Telephone (614) 457-8600.

Computel Systems Limited, 1200 Saint Lawrence Boulevard, Ottawa, Ontario K1K 3B8. Telephone (613) 746-4353.

The Computer Company, Inc., 1905 Westmoreland Street, Richmond, Virginia 23230. Telephone (804) 358-2171.

Computer Innovations, 55 E. Jackson Boulevard, Chicago, Illinois 60604. Telephone (312) 663-5930.

Computer Network Corporation, 5185 MacArthur Boulevard, Washington D.C. 20016. Telephone (800) 621-2240.

Computer Research Company, 200 North Michigan Avenue, Chicago, Illinois 60601. Telephone (800) 621-2240.

Computer Resource Services, Inc., 6501 N. Black, Canyon, Arizona 85015. Telephone. (602) 242-9121.

Computer Sciences Canada, Ltd, Suite 367, Place du Canada, Montreal, Quebec. Telephone (514) 878-9811.

Computer Sciences Corporation, 650 North Sepulveda Boulevard, El Segundo, California 90245. Telephone (213) 678-0311.

Computer Sharing Services, Inc., 2498 West Second Avenue, Denver, Colorado 80223. Telephone (303) 934-2391.

Computer Usage Company, 141 Battery Street, San Francisco, California 94086. Telephone (415) 543-6070.

Computone Systems, Inc., One Dunwoody Park, Atlanta, Georgia 30338. Telephone (404) 393-3010.

Comshare, Incorporated, P.O. Box 1588, 3001 S. State Street, Ann Arbor, Michigan 48106. Telephone (313) 994-4800.

Comshare Limited, 230 Galaxy Boulevard, Rexdale, Ontario M9W 5R8. Telephone (416) 675-6363.

CONCAP Computing Services, 7700 Edgewater Drive, Oakland, California 94621. Telephone (415) 635-5750.

Control Data Corporation, PO Box 0, Minneapolis, Minnesota 55440. Telephone (612) 853-8100.

Cybershare Limited, 550 Berry Street, Winnipeg, Manitoba R3H 0R9. Telephone (204) 786-5831.

Data Resources Inc., 29 Hartwell Avenue, Lexington, Massachusetts 02173. Telephone (617) 861-0165.

Data-Tek Corporation, 1211 Chestnut Street, Philadelphia, Pennsylvania 19107. Telephone (215) 564-4133.

Datacrown, Inc., 650 McNicoll Avenue, Willowdale, Ontario M2H 2E1. Telephone (416) 499-1012.

Dataline Systems Limited, 175 Belford Road, Toronto, Ontario M5R 2L2. Telephone (416) 964-9515.

Datalogics, Inc., 11001 Cedar Avenue, Cleveland, Ohio 44106. Telephone (216) 229-1300.

Dialcom, Inc., 1104 Spring Street, Silver Spring, Maryland 20910. Telephone (301) 588-1572.

Ecotran-Chi Corporation (formerly Chi), 21111 Chagrin Boulevard, Beachwood, Ohio 44122. Telephone (216) 991-9000. ▷

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Financial Data Systems, Inc., 763 New Ballas Road South, St. Louis, Missouri 63141. Telephone (314) 567-1940.

First Data Division, ADP, Inc., 40 Second Avenue, Waltham, Massachusetts 02154. Telephone (617) 890-6701.

General Electric Company, Information Services Business Division, 401 North Washington Street, Rockville, Maryland 20850. Telephone (301) 340-4000.

Genesee Computer Center, Inc., 20 University Avenue, Rochester, New York 14605. Telephone (716) 232-7050.

GTE Data Services Inc., First Florida Tower, PO Box 1548, Tampa, Florida 33601. Telephone (813) 224-3131.

Harris Corporation, PRD Electronics Div., 6801 Jericho Turnpike, Syosset, New York 11791. Telephone (516) 364-0400.

HDR Systems, Inc., 8404 Indian Hills Drive, Omaha, Nebraska 68114. Telephone (402) 399-1400.

Honeywell Information Systems, Inc., Honeywell Plaza, 2701 Fourth Avenue South, Minneapolis, Minnesota 55408. Telephone (612) 870-5200.

Informatics, Inc., 6 Kingsbridge Road, Fairfield, New Jersey 07006. Telephone (201) 575-2800.

Information Consultants, Inc., 1012 Twentieth Street NW, Washington, DC 20036. Telephone (202) 785-0115.

Information Science Incorporated, 95 Chestnut Ridge Road, Montvale, New Jersey 07645. Telephone (201) 391-1600.

Information Systems Design, Inc., 3205 Coronado Drive, Santa Clara, California 95051. Telephone (408) 249-8100.

Interactive Data Corporation, 486 Totten Pond Road, Waltham, Massachusetts 02154. Telephone (617) 890-1234.

Interactive Sciences Corporation, 60 Brooks Drive, Braintree, Massachusetts 02184. Telephone (617) 848-2660.

Itel Corporation, Three Corporate Park Drive, White Plains, New York 10604. Telephone (914) 694-8800.

Keydata Canada, 885 Don Mills Road, Don Mills, Ontario M3C 3H1. Telephone (416) 443-6800.

Keydata Corporation, 2000 Market Street, Philadelphia, Pennsylvania 19103. Telephone (215) 567-5800.

Le Groupe BST, Inc. (formerly Aquila BST), C.P.10, Tour de la Bourse, Montreal, Quebec H4Z 1A4. Telephone (514) 866-5841.

Litton Computer Services, 1831 Michael Faraday Drive, Reston, Virginia 22090. Telephone (703) 471-9200.

Lockheed Information Systems, 3251 Hanover Street, Palo Alto, California 94304. Telephone (415) 493-4411.

Management Concepts, Inc., #8 Executive Park West NE, Atlanta, Georgia 30329. Telephone (404) 321-0140.

Management Systems Corporation, 125 North State Street, Salt Lake City, Utah 84103. Telephone (801) 531-1122.

Mark/Ops, Division of Northeastern Systems Assoc., 475 Commonwealth Avenue, Boston, Massachusetts 02215. Telephone (617) 266-1930.

Martin Marietta Data Systems, 300 East Joppa Road, Baltimore, Maryland 21204. Telephone (301) 321-5700.

McDonnell Douglas Automation Company, PO Box 516, St. Louis, Missouri 63166. Telephone (314) 232-4640.

Mellonics Information Center, Litton Systems, Inc., 6701 Variel Avenue, Canoga Park, California 91303. Telephone (213) 887-5100.

Metridata Computing, Inc., PO Box 21099, Louisville, Kentucky 40221. Telephone (502) 361-7161.

Multiple Access Limited, 885 Don Mills Road, Don Mills, Ontario, N3C 3H1. Telephone (416) 443-3900.

National CSS, Inc., 187 Danbury Road, Wilton, Connecticut 06897. Telephone (203) 762-2511.

National Computer Network of Chicago, Inc., 1929 N. Harlem Avenue, Chicago, Illinois 60635. Telephone (312) 622-6666.

Newfoundland and Labrador Computer Service, PO Box 9308, 40 Higgins Line, St. John's, Newfoundland A1A 2Y3. Telephone (709) 737-6700.

NLT Computer Services Corporation, 1777 Walton Road, Blue Bell, Pennsylvania 19422. Telephone (215) 542-8300.

Ohio Valley Data Control, Inc., PO Box 219, Belpre, Ohio 45714. Telephone (614) 423-9501.

On-Line Business Systems, Inc., 115 Sansome Street, San Francisco, California 94104. Telephone (415) 391-9555.

On-Line Systems, Inc., 115 Evergreen Heights Drive, Pittsburgh, Pennsylvania 15229. Telephone (412) 931-7600.

Optimum Systems, Inc., 2801 Northwestern Parkway, Santa Clara, California 95051. Telephone (408) 987-4444.

Pacific Applied Systems Division, System Development Corp., 2500 Colorado Avenue, Santa Monica, California 90406. Telephone (213) 829-9413.

Polycom Systems Limited, 133 Wynford Drive, Don Mills, Ontario M3C 1K1. Telephone (416) 449-3400.

PRC Computer Center, Inc., 7670 Old Springhouse Road, McLean, Virginia 22102. Telephone (703) 893-4880.

Profitool, Inc., Box 10188, Denver, Colorado 80211. Telephone (303) 433-6568.

Programs & Analysis, Inc., 21 Ray Avenue, Burlington, Massachusetts 01803. Telephone (617) 272-7723.

Proprietary Computer Systems, Inc., 16625 Saticoy Street, Van Nuys, California 91406. Telephone (213) 781-8221.

Pryor Corporation, 400 North Michigan Avenue, Chicago, Illinois 60611. Telephone (312) 644-5650.

Quanex Management Sciences, 27777 Franklin Road, Suite 1000, Southfield, Michigan 48076. Telephone (313) 353-7200.

Rapidata, Inc., 20 New Dutch Lane, Fairfield, New Jersey 07006. Telephone (201) 227-0035.

Remote Computing Corporation, 1076 East Meadow Circle, Palo Alto, California 94303. Telephone (415) 494-6111.

Scientific Process & Research, Inc., 24 North Third Avenue, Highland Park, New Jersey 08904. Telephone (201) 846-3477.

Scientific Time Sharing Corporation, 7316 Wisconsin Avenue, Bethesda, Maryland 20014. Telephone (301) 657-8220.

All About Timesharing and Remote Computing Services

▷ **The Service Bureau Company,** 500 West Putnam Avenue, Greenwich, Connecticut 06830. Telephone (203) 622-2000.

Shared Medical Systems, Inc., 650 Park Avenue, King of Prussia, Pennsylvania 19406. Telephone (215) 265-7600.

I.P. Sharp Associates Limited, Suite 1400, 145 King Street West, Toronto, Ontario M5H 1J8. Telephone (416) 364-5361.

A.O. Smith Corporation, 8797 N. Port Washington Road, Milwaukee, Wisconsin 53217. Telephone (414) 447-2272.

Statistical Tabulating Corporation, 2 North Riverside Plaza, Chicago, Illinois 60606. Telephone (312) 454-8000.

Structural Dynamics Research Corporation, 2000 Eastman Drive, Milford, Ohio 45150. Telephone (513) 576-2400.

Sun Information Services, 656 Swedesford Road, Building 5, Wayne, Pennsylvania 19087. Telephone (215) 293-9600.

Systems Dimensions Limited (merged with Datacrown), 770 Brookfield Road, Ottawa, Ontario K1V 6J5. Telephone (613) 731-6910.

Technical Advisors, Inc., 4455 Fletcher Street, Wayne, Michigan 48184. Telephone (313) 722-5010.

Tel-A-Data, Inc., 1500 Northwest 167th Street, Miami, Florida 33169. Telephone (305) 625-8266.

Telstat Systems, Inc., 150 E. 58th Street, New York, New York 10022. Telephone (212) 826-0640.

Timesharing Consultants, Inc., 4400 East Broadway, Suite 606, Tucson, Arizona 85711. Telephone (602) 881-8888.

Time Sharing Resources, Inc., 777 Northern Boulevard, Great Neck, New York 11022. Telephone (516) 487-0101.

Tymshare, Inc., 20705 Valley Green Drive, Cupertino, California 95014. Telephone (408) 446-6581.

United Computing Systems, Inc., 2525 Washington, Kansas City, Missouri 64108. Telephone (816) 221-9700.

University Computing Company, 8303 Elmbrook Drive, Dallas, Texas 75247. Telephone (214) 353-7100.

USS Engineers and Consultants, Inc., 600 Grant Street, Pittsburgh, Pennsylvania 15230. Telephone (412) 433-6515.

Wang Data Center, Division of Wang Laboratories, Inc., 20 South Avenue, Burlington, Massachusetts 01803. Telephone (617) 272-8550.

Warner Computer Systems, Inc., 605 Third Avenue, New York, New York 10016. Telephone (212) 697-0110.

Xerox Computer Services, 5310 Beethoven Street, Los Angeles, California 90066. Telephone (213) 390-3461.□

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COMPANY	ADP Network Services, Inc.	ADP Network Services, Inc.	Arens Applied Electromagnetics, Inc.	Arens Applied Electromagnetics, Inc.	Arens Applied Electromagnetics, Inc.
GENERAL					
Name of service	Timesharing Services	Onsite Service	Computer Services	ViewGraphs, CartoGraph	LAWDATA
Date operational	July 1969	1978	December 1969	April 1979	April 1979
Areas currently served	United States, England, Europe	United States, England, Western Europe	Wash. DC area, other US and int'l. via Telenet	Wash. DC area	Wash. DC area
EQUIPMENT					
Computers	DEC PDP-10 (37)	DEC 2020 (30)	HP 3000 II	HP 3000 II	HP 3000 II
No. of simultaneous users	2,400	32 per system	64	64	64
Conversational terminals supported	All async 110, 300 and 1200 bps terminals, and other graphic terminals	All async 110, 300 and 1200 bps terminals; and 29 graphic terminal models	All ASCII terminals at 300 or 1200 bps	All ASCII terminals at 300 or 1200 bps	All ASCII terminals at 300 or 1200 bps
Batch terminals supported	IBM 2780/3780 and compatible terminals	IBM 2780/3780 and compatible terminals	All ASCII terminals at 300 or 1200 bps	All ASCII terminals, IBM 2780/3780 and compatible	All ASCII terminals, IBM 2780/3780
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, Macro 10	FORTRAN, BASIC, COBOL, Macro 10	FORTRAN, BASIC, COBOL, SPL, PASCAL	FORTRAN, BASIC, COBOL, SPL, PASCAL	FORTRAN, BASIC, COBOL, SPL
Batch-mode programming languages	FORTRAN, COBOL, Macro 10	FORTRAN, BASIC, COBOL, Macro 10	FORTRAN, BASIC, COBOL, SPL	FORTRAN, BASIC, COBOL, SPL	FORTRAN, BASIC, COBOL, SPL
Principal applications	Business & scientific, economics, insurance	Business, finan. mgmnt., economics, insurance	Business, engineering, scientific, graphics	Business, scientific, graphics	Legal and related professional services
CHARGES					
Min. monthly charge:					
Interactive	None	$10,000	None	None	None
Remote batch	None	$10,000	None	None	None
Terminal connect time:					
Interactive	$10.00-$15.00/hr.	None	$5.00-9.00/hr.	$5.00-9.00/hr.	$5.00-9.00/hr.
Remote batch	None	None	$5.00-9.00/hr.	$5.00-9.00/hr.	$5.00-9.00/hr.
Central processor time:					
Interactive	$0.02/CRU	None	$0.06-0.08/CPU sec.	$0.06-0.08/CPU sec.	$0.06-0.08/CPU sec.
Remote batch	$0.01-0.02/CRU	None	$0/04-0.08/CPU sec.	$0.04-0.08/CPU sec.	$0.04-0.08/CPU sec.
Mass storage:					
Interactive	$0.06-0.75/1000 chars./month	None	$16.00/256K bytes/mo.	$16.00/256K bytes/mo.	$16.00/250K bytes/mo.
Remote batch	$0.06-0.75/1000 chars./month	None	$16.00/256K bytes/mo.	$16.00/256K bytes/mo.	$16.00/256K bytes/mo.
COMMENTS	Specializes in banking, brokerage, and government applications in addition to general services; DBMS capabilities and data bases; international data communications network	Service features a computer placed on customer premises, connected to ADP network	WP3000 Word Processing software interfaces with DBMS	Specialty is charts, graphs and map projections	DBMS, word processing and accounting packages for legal and related professions

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COMPANY	Arens Applied Electromagnetics, Inc.	Avco Computer Services	Babcock and Wilcox Company	Boeing Computer Services, Inc.	Boeing Computer Services, Inc.
GENERAL					
Name of service	Piping/Hydraulic Design and Analysis	Timesharing	B & W Computer Services	MAINSTREAM—CTS	MAINSTREAM—TSO
Date operational	June 1972	May 1973	1971	May 1970	Feb. 1973
Areas currently served	Principal US and int'l. cities via Telenet	Continental US and Canada	US, Canada, Japan, Germany	Continental U.S. (including Alaska) and Canada via nationwide data communications network; also Great Britain	Continental U.S., (including Alaska) and Canada via nationwide data communications network; also Great Britain
EQUIPMENT					
Computers	HP 3000 II	IBM 370/158 (A)	CDC 76, CYBER 73 and 171	IBM 370/168 in Vienna, VA	IBM 370/168 in Vienna, VA
No. of simultaneous users	64	100	Not Specified	250	120
Conversational terminals supported	All ASCII terminals at 300 or 1200 bps	TTY 33/35, IBM 2741 and compatible	All ASCII terminals at 300 or 1200 bps	TTY 33/35 and compatible units at 10, 30 or 120 cps; IBM 2741 and compatible units at 14.8 cps	TTY 33/35 and compatible units at 10, 30, 120 cps; IBM 2741 and compatible units at 14.8 cps
Batch terminals supported	All ASCII terminals plus IBM 2780/3780	IBM 2780/3780, 1130, 360/20 and compat.	200 UT and compatible at 2000 to 9600 bps.	IBM 2780, 3780, 360/20, 1130, or any other HASP RJE terminal	IBM 2780, 3780, 360/20 1130, or any other HASP RJE terminal
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, SPL, PASCAL	FORTRAN, BASIC, PL/1, COBOL, Assembler	FORTRAN, BASIC, COBOL	FORTRAN, ALGOL, COBOL, PL/1, VSAPL, Assembler, BASIC	FORTRAN, COBOL, PL/1, Assembler
Batch-mode programming languages	FORTRAN, BASIC, COBOL, SPL	FORTRAN, COBOL, PL/1, Assembler	FORTRAN, BASIC, COBOL	FORTRAN, VSAPL, COBOL, PL/1, BASIC	FORTRAN, COBOL, PL/1, Assembler
Principal applications	Architectural, engineering, educational	Business, scientific, engineering	Engineering, scientific, mathematical	Business, finance & data base management	Business & data base management
CHARGES					
Min. monthly charge:					
Interactive	None	None	None	None	None
Remote batch	None	None	None	None	None
Terminal connect time:					
Interactive	$5.00-9.00/hr.	$6.00/hr.	$5.50-$10.00	$8.00-12.00/hr.	$8.00-12.00/hr.
Remote batch	$5.00-9.00/hr.	$28.00/hr.	$15.00	$15.00-17.00/hr.	$15.00-17.00/hr.
Central processor time:					
Interactive	$0.06-0.08/CPU sec.	$380-$1600/ACU hr.	$0.15/sec.	$0.08-0.16/sec.	$0.20/CCU
Remote batch	$0.04-0.08/CPU sec.	$380-$1600/ACU hr.	$0.09-$1.00	$0.16/sec.	$0.20/CCU
Mass storage:					
Interactive	$16.00/256K bytes/mo.	$0.03/track/day	$0.003/640 chars./day	$0.0061/1K chars./day	$0.05-0.06/track/day
Remote batch	$16.00/256K bytes/mo.	$0.03/track/uay	$0.003/640 chars./day	Same	Same
COMMENTS	Computes selection of pump and pipe sizes for specified flow of piping networks	Provides interactive TSO and batch on hosts operating MUS/JES 2	Specialty is nuclear and structural engineering and mathematics	Interactive time-sharing services; deferred batch service at 50% savings over prime interactive	Offers remote job entry over a range of service times (1 minute to overnight)

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COMPANY	Boeing Computer Services, Inc.	Bowne Incorporated	Bowne Incorporated	Bowne Incorporated	Burroughs Corporation
GENERAL					
Name of service	MAINSTREAM—EKS	COMSPEC	Correspondence Mgmnt Systems (CMS)	Word/One	NYC Data Center
Date operational	Jan. 1975	Dec. 1970	Sept. 1974	Nov. 1969	1971
Areas currently served	Continental U.S., (including Alaska) and Canada via nationwide data communications network; also Great Britain	Atlanta, Boston, Conn., Chicago, Houston, L.A., New York, New Jersey, Phila., San Francisco, & Washington, DC areas	Atlanta, Boston, Conn., Chicago, Houston, L.A., New York, New Jersey, Phila., San Francisco, & Washington, DC areas	Atlanta, Boston, Conn., Chicago, Houston, L.A., New York, New Jersey, Phila., San Francisco, & Washington, DC areas	Continental US, Canada, Europe, Orient via communications network
EQUIPMENT					
Computers	Cyber 175 (6), IBM 3031 in Seattle	IBM 370/155 (2) in New York City	IBM 370/155 (2) in New York City	IBM 370/155 (2) in New York City	Burroughs B 6700, B 6800
No. of simultaneous users	384	300	300	300	48
Conversational terminals supported	TTY-compatible units at 10, 30, or 120 cps; IBM 2741-compatible units at 14.8 cps	IBM 2741, TTY, and compatible units at 10, 14.8, 15, 30, or 120 cps; BSC at 2400 bps	IBM 2741, TTY, and compatible units at 10, 14.8, 15, 30, or 120 cps; BSC at 2400 bps	IBM 2741, TTY, and compatible units at 10, 14.8, 15, or 30 cps; Xerox 850, Lanier, CPT Lexitron, NBI	All TTY-compatible at up to 1200 bps
Batch terminals supported	COPE, HASP, IBM 2780/3780, CDC 200 UT	—	—	—	IBM 2780, Burroughs B 80, B 800, Data 100
SOFTWARE					
Conversational programming languages	FORTRAN, COBOL, BASIC, APL, Compass, Simscript, SPSS, System 2000	COMSPEC; specification and engineering documentation	CMS; name/address file maint., letter creation, data base compilation	Word/One; a text processing language	BASIC, APL
Batch-mode programming languages	FORTRAN, COBOL, APL, Compass, Simscript, SPSS	—	—	—	FORTRAN, COBOL, ALGOL
Principal applications	Engineering, scientific, & data base management	Engineer word information systems	Consumer address and name file maint., correspondence	Text processing, photo-composition, records mgmnt, electronic mail	Business and scientific
CHARGES					
Min. monthly charge:					
Interactive	None	$150	$150	$300 (after 3 mo.)	None
Remote batch	None	—	—	—	None
Terminal connect time:					
Interactive	$8.50-13.00/hr.	$2.95-5.30/hr.	$2.95-5.30/hr.	$2.95-5.30/hr.	$11.50/hr.
Remote batch	$14.00-16.00/hr.	—	—	—	$11.50/hr.
Central processor time:					
Interactive	$0.20/CCU	$0.01/Proc. Unit	$0.01/Proc. Unit	$0.01/Proc. Unit	$0.38/sec.
Remote batch	$0.024-0.125/CCU	—	—	—	$0.38/sec.
Mass storage:					
Interactive	$0.0015-0.0070/640 char./day	$0.28/1550 chars./month	$0.28/1550 chars./month	$0.28/1550 chars./month	$0.02/1K char./day
Remote batch	Same	—	—	—	$0.02/1K char./day
COMMENTS	Offers both interactive time-sharing and remote job entry to multiple mainframes, with access to the same files in either mode	Several master and automated specification text data bases are available	System may be used in electronic mail applications; intra-office administrative correspondence	Specializes in text editing, typesetting, information retrieval, and electronic mail applications; volume discounts available	

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COMPANY	Call Data Systems, Inc.	Call Data Systems, Inc.	Call Data Systems, Inc.	Call Data Systems, Inc.	Call Data Systems, Inc.
GENERAL					
Name of service	TS*RJE/Batch	Easy*Use	TS*RJE/ timesharing	TeleScope	CompUtility
Date operational	1972	1973	1972	1970	1971
Areas currently served	Continental US	Continental US	Continental US	Continental US	Continental US
EQUIPMENT					
Computers	Amdahl 470 V/5	Honeywell 66/07	Amdahl 470 V/5	CDC CYBER 172 (2)	DEC KI-10 (3)
No. of simultaneous users	99-256	200	10-140	Not Specified	80 per system
Conversational terminals supported	TTY, IBM 2741, 3270 and compatible terminals	TTY, IBM 2741 and compatible at 10 to 1200 cps.	TTY, IBM 2741, 3270 and compatible terminals	TTY, IBM 2741 and compatible	TTY, IBM 2741 and compatible
Batch terminals supported	IBM 2780/3780, HASP	IBM 2780	IBM 2780/3780, 360/20, etc.	CDC 200, IBM HASP	IBM HASP
SOFTWARE					
Conversational programming languages	MENTEXT Conversational System	FORTRAN, COBOL, BASIC, APL, PL/1, ALGOL, LISP	FORTRAN, COBOL, BASIC, APL, PL/1, RPG	FORTRAN, COBOL, BASIC	FORTRAN, COBOL, BASIC, PASCAL
Batch-mode programming languages	FORTRAN, COBOL, RPG, PL/1, Assembler	FORTRAN, COBOL, BASIC, PL/1, LISP, ALGOL	FORTRAN, COBOL, BASIC, RPG, PL/1	FORTRAN, COBOL, BASIC	FORTRAN, COBOL, BASIC
Principal applications	Engineering, data base mgmnt, statistical	Business, scientific	Scientific, graphics, business, legal, word proc, data base	Scientific and engineering	Scientific, financial, engineering
CHARGES					
Min. monthly charge:					
Interactive	None	None	None	—	None
Remote batch	None	None	None	—	None
Terminal connect time:					
Interactive	$6.00/hr.	$6.00-11.00/hr.	$6.00-11.00/hr.	—	$6.00-11.00/hr.
Remote batch	$12.00-20.00/hr.	—	$12.00-20.00/hr.	—	$12.00-20.00/hr.
Central processor time:					
Interactive	$14.00-17.00/CSRU	$0.075-0.1/SRU	$12.00-20.00/ISRU	—	$0.06-0.10/ISRU
Remote batch	$9.00-14.00/SRU	$0.075-0.1/SRU	—	—	$0.06-0.10/ISRU
Mass storage:					
Interactive	$2.50/450M bytes/day	$1.50/4K bytes	$2.40/450M bytes/day	—	$0.25/block
Remote batch	$2.50/450M bytes/day	$1.50/4K bytes	—	—	$0.25/block
COMMENTS	Links to other CallData services	Accesses over 500 applications from Dartmouth System, links to other CallData services	Links to batch and timesharing services	Supplements TS*RJE/Batch service; includes utilities for front-ending engineering applications such as ADLPIPE, STRUDL, etc	

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COMPANY	Citibank, N.A.	Community Computer Corporation	Compudial, Inc.	CompuServe Inc.	Computel Systems Limited
GENERAL					
Name of service	Interactive Computer Center	—	Compudial	—	Time Shared Processing
Date operational	Jan. 1977	Jan. 1969	1967	May 1970	Jan. 1968
Areas currently served	Continental U.S. and Canada; limited access overseas	Delaware Valley	Mid-Atlantic States	Local access in over 30 U.S. cities, plus access via TYMNET packet network	Canada from offices in Victoria, Vancouver, Edmonton, Calgary, Winnipeg, Ottawa, Toronto, Montreal, Quebec, & Halifax; also Miami
EQUIPMENT					
Computers	DECsystem-10(2) and DECsystem-20(2)	HP 2116B(3) in Philadelphia	NCR 201	DEC PDP-10 and -20 (13) Columbus, OH	IBM 370/168(2), IBM 3033, Univac 1100 & HP 3000(2) in Ottawa; B 4700(2) in Miami
No. of simultaneous users	200	48	250	750	200; excluding B 4700's
Conversational terminals supported	All ASCII-supported terminals at 10, 30, and 120 cps	TTY and other ASCII-coded terminals at 10 or 30 cps	GE TermiNet 300 (split platen) at 10, 30, and 120 cps; Centronics 301; DECwriter & CRT	All ASCII at 10, 15, 30, and 120 cps, IBM 2741 Corresp., CALL-360 & BCD	IBM 2741 and equivalents and ASCII terminals
Batch terminals supported	IBM 2780/3780 and compatible	—	—	IBM 2780	All IBM batch terminals and equivalents; Univac 1004 and equivalents
SOFTWARE					
Conversational programming languages	FORTRAN, COBOL, BASIC, APL, Assembler	BASIC	NEAT 3, COBOL	FORTRAN, BASIC, COBOL, APL, MACRO-10, others	TSO, ROSCOE, APL, Univac Demand & CTS
Batch-mode programming languages	FORTRAN, COBOL, BASIC, APL, Assembler	FORTRAN, ALGOL	—	FORTRAN, BASIC, COBOL, Macro-10, others	FORTRAN, COBOL, PL/1, ALGOL, RPG, Assembler, Mark IV
Principal applications	Business & financial	Business & scientific	Business	Business & scientific	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	$250/mo.	None	$300/month	$100/mo.	$100
Remote batch	$250/mo.	—	—	—	$100
Terminal connect time:					
Interactive	$6.50-9.50/hr. (prime)	$10.00/hr	None	$10.00-30.00/hr.	$5.00-10.00/hr.
Remote batch	$2.50/hr. (non-prime)	—	—	$40.00-50.00/hr.	No charge
Central processor time:					
Interactive	$0.01/0.003/CRU	None	See Comments	$0.012-0.023/SRU	See Comments
Remote batch	$0.01/0.003/CRU	—	—	—	See Comments
Mass storage:					
Interactive	$0.02/day/disk page	$0.20/160 chars./month	See Comments	$0.052/3200 char./day	$0.03/track/day
Remote batch	$0.02/day/disk page	—	—	$0.052/3200	$0.03/track/day
COMMENTS	Pricing for terminal connect and CPU time varies according to non-prime and prime time usage; prime time is 8 AM to 6 PM EST Monday through Friday; one disk page equals 2560 characters, or any part thereof, on a per-file basis	Storage beyond 80,000 characters is priced at $0.05/160 chars./month	Costs are on a per-transaction basis	High-speed plotting available; volume and commitment discounts available; CompuStat and TELSTAT data bases offered	Prices vary with computer and software system used; volume and commitment discounts are available; MVS/JES3, ADABAS, S2000, EASYTRIEVE, DARTS (inventory control), CARMIS (project management) software available

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COMPANY	The Computer Company	Computer Innovations	Computer Network Corp. (Comnet)	Computer Research Company	Computer Resource Services, Inc.
GENERAL					
Name of service	Action/APL.SV	PCS/TEXT and Computernet	Alpha	Remote Computing Services	Response
Date operational	Oct. 1969	June 1969	Dec. 1967	1968	1969
Areas currently served	U.S., Canada, France, Belgium & Switzerland	Continental US	Continental U.S. via national network access; local dial-up access in the New York, Washington, & Pittsburgh areas	Nationwide; primarily mid-West	Phoenix, Tucson, Las Vegas areas
EQUIPMENT					
Computers	IBM 370/155, IBM 370/158	IBM 370/158, IBM 3031	Itel AS 6, IBM 370/158(1), Itel AS 5 (2), IBM 370/168(1), IBM 3032	IBM 370/155, IBM 370/168, & IBM 3033	HP 2000 (5) in Phoenix, AZ
No. of simultaneous users	80-100	160	150	50 average	32
Conversational terminals supported	IBM 2741, CMC 2260, 2265, Memorex 3270 ASCII at 10, 15, 30 and 120 cps	ASCII-type terminals at up to 120 cps, Selectric at 15 cps	IBM 2741, TTY 33/35, and compatible units at	IBM 3270, TTY, Textronics 10 to 120 cps	Any ASCII or Correspondence Code terminal at 10 to 30 cps
Batch terminals supported	IBM 2780/3780, HASP and compatible units	IBM 2780/3780 and compatible units	IBM 2780, 1130, 360/20, and compatible units at 2000 to 9600 bps	IBM 2780/3780, 360/20, Honeywell, Burroughs	—
SOFTWARE					
Conversational programming languages	APL	APLSV, PCS/TEXT	All OS/360 languages	FORTRAN, COBOL, CICS, UCON, PL/1	BASIC
Batch-mode programming languages	FORTRAN, COBOL, APL, RPG	FORTRAN, COBOL, PL/1, and others	All OS/360 languages	FORTRAN, COBOL, PL/1, RPG	—
Principal applications	Business & scientific, many specialized	Business, scientific, & word processing	Business, scientific, & engineering	Business, scientific, & engineering	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	None	None	None	None	50
Remote batch	None	None	None	None	—
Terminal connect time:					
Interactive	$13.44-23.52/hr.	$3.25-21.50/hr.	$12/hr. (10-120 cps)	$7.00/hr.	$10-15/hr.
Remote batch	$13.44-23.52/hr.	$11.00/hr.	$0.50/1000 cards $0.50/1000 lines	—	—
Central processor time:					
Interactive	$0.65/CRU	$0.1/CRU	$0.20/CUU	$0.15/CPU sec.	None
Remote batch	$0.65/CRU	$10.00/min.	$0.20/CUU	$0.10/CPU sec.	—
Mass storage:					
Interactive	$12.32/million bytes/day	$12.50/million bytes/day	$2.00/13,030 chars./month	$1.00-1.50/cylinder/ week	$0.060/1024 chars./month
Remote batch	—	—	$2.00/13,030 chars./month	$1.00-1.50/cylinder/ week	—
COMMENTS	Offers shared files and data base applications, specialized data bases, & RJE	Affiliated with Proprietary Computer Systems, Inc.; Computernet can mix batch and interactive, APL and TEXT	Offers nationwide "OS-compatible time-sharing services" and remote job entry over a wide range of service times, terminal speeds, and charges	Emulates DOS; also offers Mark IV, TSO, ATS, CICS, Panvalet, and HASP/RJE	$100 initiation fee

All About Timesharing and Remote Computing Services

COMPANY	Computer Sciences Canada, Ltd.	Computer Sciences Corporation	Computer Sharing Services, Inc.	Computer Usage Company	Computone Systems, Inc.
GENERAL					
Name of service	Infonet	CSTS/CSTS 8	DTSS	WYLBUR/APL/HASP RJE	KEYPACT
Date operational	July 1967	Jan. 1970	Nov. 1967	Oct. 1975	Dec. 1965
Areas currently served	Calgary, Edmonton, Montreal, Ottawa, Quebec, Regina, Toronto, Vancouver & Winnipeg; London	Local access in over 30 metropolitan areas throughout continental U.S.; also Europe	Local access in 250 cities throughout continental U.S. and abroad	West Coast plus inbound WATS and TYMNET	US and Canada
EQUIPMENT					
Computers	Univac 1108 (2); 1 in Toronto and 1 in Calgary	Univac 1108 (15) in El Segundo, CA, Oak Brook, IL, and Beltsville, MD; IBM 370/168 in Dallas, TX	Honeywell 66 (2) in Denver	Amdahl 470 V/6	IBM 360/65, IBM 370/145
No. of simultaneous users	180 total	1320 total	200	150	10-45
Conversational terminals supported	Most 300-1200 bps terminals including Tektronix, Zeta, Calcomp, and Telex	TTY 33/35 and compatible units at 10, 15, 30, or 120 cps; 2741 or equivalent; Telex	TTY 33/35, IBM 2741, and compatible units at 10, 14.8, 15, 30, or 120 cps	ASCII 10-30 cps or Correspondence terminal	All ASCII at 30 or 120 cps
Batch terminals supported	Any IBM 2780/3780; Univac 9200, 1004, DCT 2000; Honeywell 2000	IBM 2780, 3780, & 1130; Data 100; DEC PDP-11; Sycor; Qantel; etc.	IBM 2780 and compatible units	Any HASP workstations	—
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, Assembler, SNOBOL	FORTRAN, BASIC, COBOL, Assembler	FORTRAN, BASIC, COBOL, ALGOL, APL, LISP, SNOBOL, QED, GMAP	APL, WYLBUR, CICS	COBOL, FORTRAN, RPG
Batch-mode programming languages	FORTRAN, BASIC, COBOL, Assembler, SNOBOL	FORTRAN, BASIC, COBOL, Assembler	All conversational languages can be used in background or batch mode	COBOL, FORTRAN, PL/1, Assembler	—
Principal applications	Data base management & financial management	Business & scientific	Business & scientific	Business & scientific	Financial, insurance
CHARGES					
Min. monthly charge:					
Interactive	$50	$150	$100	$100	See Comments
Remote batch	$50	$150	$100	$100	—
Terminal connect time:					
Interactive	$6.50-25.00/hr.	$5.50-15.00/hr.	$3.00-20.00/hr.	$3.50-10.00/hr.	—
Remote batch	None	$0.17/100 records	$3.00-20.00/hr.	$7.50/hr.	—
Central processor time:					
Interactive	$0.15-0.21/SRU	$0.20-0.33/SRU	$0.255/Unit	$1.07-2.00/CPU sec.	—
Remote batch	$0.05-0.17/SRU	$0.06-0.351/SRU	$0.03/Unit	$1.07/CPU sec.	—
Mass storage:					
Interactive	$0.035/page/day	$0.028/2048 chars./day	$1.50-1.75/4096 chars./month	$1.38/track/month	—
Remote batch	$5.40/month	$0.028/2048 chars./day	$1.50-1.75/16,384 chars./month	$1.38/track/month	—
COMMENTS	Matrix pricing enables user to reduce costs by volume discounts for high usage; affiliated with Computer Sciences Corporation	CPU charges for remote batch use vary with priority; lower rates for non-prime time use; subscription storage and high-volume discounts; pricing options available	Offers numerous pricing options; first commercial installation of Dartmouth Time-Sharing System; also offers voice response (Votrax) time-sharing; offers Landsat Exploration Plotting	Offers IDMS, SPSS, MARK IV, EASYTRIEVE and other software packages; branch offices in LA and NYC	Dedicated system for life insurance sales, feed and meat formulation, and turnkey market information; prices on request

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COMPANY	Comshare, Incorporated	Comshare, Limited	CONCAP Computing Systems	Control Data Corporation	Cybershare Limited
GENERAL					
Name of service	Commander I & Commander II	Commander I, Commander II, CPV	CONCAP	Cybernet Services	NOS
Date operational	1967	1969	1965	1966	July 1972
Areas currently served	Continental U.S., Canada, U.K., The Hague; Brussels, Osaka, Tokyo and Germany	Local dial-up throughout major Canadian trading areas with int'l communications to US and Europe	United States	Entire U.S., Canada, Mexico, S. Africa, Europe; Brazil, Israel, Australia and Venezuela	Canada and US
EQUIPMENT					
Computers	Xerox 940 (10) in Ann Arbor, MI and Sigma 9 (20) in London, Tokyo, Toronto and Ann Arbor	Xerox Sigma 9 (2) Toronto (dual configurations)	PDP-11/45	32 large-scale Control Data computers in 17 worldwide centers	CDC Cyber (171's (2)
No. of simultaneous users	42 per 940, 64 per Sigma 9	Over 200	10	Approximately 1500 total	512 time-sharing, 200+ remote batch
Conversational terminals supported	TTY 33/35 and any compatible unit at 10, 30, or 120 cps	Any ASCII terminal up to 120 cps; also graphic terminals	ASCII terminals at 10 or 30 cps	Any ASCII terminal at 10 or 30 cps; Correspondence terminals at 14 cps; most ASCII at 120 cps	TTY 33/35 and compatible units; any ASCII at 110 to 1200 bps
Batch terminals supported	IBM 2780 & 3780, and compatible units	IBM 2780, IBM HASP, Data 100	—	Various RJE terminals at 2000 to 4800 bps; supports multileaving, CDC 200, and COPE protocols IBM 2780/3780	CDC 200, IBM 2780/3780, IBM HASP
SOFTWARE					
Conversational programming languages	FORTRAN, COBOL, BASIC, PASTEL	FORTRAN, BASIC, COBOL, APL, Metasymbol, PASTEL	FORTRAN	FORTRAN, BASIC, COBOL, APL, COMPASS, SIMULA, SIMSCRIPT	FORTRAN, BASIC, APL, Text Editor, COBOL
Batch-mode programming languages	FORTRAN, COBOL,	FORTRAN, COBOL, Metasymbol, PASTEL	—	FORTRAN, BASIC, COBOL, ALGOL, COMPASS, SIMULA SIMSCRIPT	FORTRAN, COBOL, COMPASS, PL/1
Principal applications	Business & scientific	Business & scientific	Engineering	Business, engineering, & scientific	Business & scientific Business, engineering, & scientific
CHARGES					
Min. monthly charge:					
Interactive	$25.00	None	$2.50-200.00	$100	None
Remote batch	$25.00	None	—	None	None
Terminal connect time:					
Interactive	$8.40-24.00/hr.	$7.80-21.00/hr.	$8.00-18.00/hr.	$9.00-28.00/hr.	$8/hr.
Remote batch	$8.40-26.00/hr.	$7.80-21.00/hr.	—	$12.00-18.00/hr.	$10.00-15.00/hr.
Central processor time:					
Interactive	$0.04-0.08/CCU	$0.08-0.13/CCU	$0.12-0.22/CCU	$0.35/sec.	$0.20/SRU
Remote batch	$0.04-0.08/CCU	$0.04-0.16/CCU	—	$0.14-0.28/sec.	$0.10-0.20/SRU
Mass storage:					
Interactive	$0.18-0.30/2K bytes/mo.	$0.15-0.60/2048 bytes/month	$0.03/512 chars./day	$0.016/1280 chars./day	$0.005-0.01/1280 chars./day
Remote batch	$0.18-0.30/2K bytes/mo.	$0.15-0.60/2048 bytes/month	—	$0.00375-0.016/1280 chars./day	$0.005-0.01/1280 chars./day
COMMENTS	Offers both interactive and remote batch services through TELEGRID communications network; specializes in accounting, data base management, human resource mgmt., telephone systems mgmt., mechanical and structural design	Offers service in all major Canadian cities via TELEGRID network; an affiliate of Comshare, Inc. with international data communications to U.S. and Europe	Specialty is civil engineering including plotting services; also provides in-house turnkey minicomputer systems, flat bed plotters, and engineering and graphics software	Also see The Service Bureau Company, a division of Control Data Corporation	

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COMPANY	Data Resources Inc.	Data-Tek Corporation	Datacrown Inc.	Dataline Systems Limited	Datalogics, Inc.
GENERAL					
Name of service	—	—	Shared Processing; Infoservices	Dataline Time Sharing Network	DL/OS
Date operational	1969	Dec. 1971	June 1972	1969	1969
Areas currently served	US, Canada, Mexico, Western Europe, Chile, Hong Kong	Mid-Atlantic States	All of Canada and U.S.	All of Canada (Vancouver to Halifax via Dataroute Dataline II services plus U.S.	Ohio, Illinois, New York, & Pennsylvania
EQUIPMENT					
Computers	Burroughs B 7805 and B 7780 (duplex systems) in Lexington, MA	HP 3000 Series II	IBM 370/168 (9) in Ontario	DECsystem-10/70 (4) in Toronto; DEC system-10/90 (1)	Xerox Sigma 7 in Cleveland
No. of simultaneous users	Over 350	32	Over 500	275	Approx. 100
Conversational terminals supported	All ASCII terminals at speeds to 120 cps; IBM 2741	ASCII 10, 15, 30, or 120 cps terminals	IBM 2741, 3270; TTY and compatible units	All ASCII terminals at 10 or 120 cps; Diablo; graphics (e.g., Tektronix)	TTY and other ASCII terminals at 10, 30, or 120 cps; IBM 2741
Batch terminals supported	IBM 2780/3780, Burroughs DC 1100, or equivalent units	IBM 2780/3780, DCT 2000, COPE 1200, CDC 200, etc.	IBM 2780/3780, HASP and compatible units	IBM 2780/3780, IBM 3741 and equivalent units	IBM 2780 and compatible units using HASP protocol
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, EPS, COBOL, APL, ALGOL	FORTRAN, BASIC, COBOL, SPL, RPG II	TSO lang., APL, PL/1, WYLBUR, FORTRAN, COBOL, Assembler, SCSS	FORTRAN, BASIC, COBOL, APL, AID, LISP, SNOBOL	FORTRAN, BASIC, COBOL, APL, Text, Proforma
Batch-mode programming languages	FORTRAN, ALGOL COBOL, EPS	FORTRAN, BASIC, COBOL, APL	FORTRAN, COBOL, PL/1, RPG, Assembler, Mark IV	FORTRAN, COBOL, LISP, SNOBOL	FORTRAN, APL, BASIC, COBOL, RPG, Meta-symbol
Principal applications	Business & scientific	Business, health, & scientific	Business, scientific, & government	Business, scientific & engineering	Business; financial & statistical
CHARGES					
Min. monthly charge:					
Interactive	$400	$10	None	$10	None
Remote batch	$400	$10	None	None	None
Terminal connect time:					
Interactive	$15.00/hr.	$9.00/hr.	$3.00-6.00/hr.	$13.00/hr.	$10.00-18.00/hr.
Remote batch	$25.00/hr.	$9.00/hr.	$9.00-12.00/hr.	None	Variable
Central processor time:					
Interactive	$0.05-0.15/CRU	$0.08/sec.	$20.00/min.	See Comments	$0.08/CRU
Remote batch	$0.05-0.15/CRU	$0.08/sec.	$20.00/min.	See Comments	$0.04-0.16/CRU
Mass storage:					
Interactive	$0.055-0.53/K bytes/month	$0.40/1000 chars./month	$0.012/track/day	$0.030/640 chars. (or less)/month	$0.80/2048 chars./month
Remote batch	$0.055-0.53/K bytes/month	$0.40/1000 chars./month	$0.012/track/day	$0.30/640 chars./month	$0.80/2048 chars./month
COMMENTS	Specializes in economic planning and analysis; offers Economic Information System at charges of $4,000 to $100,000 per year; other specialties are weather, commodities and stock price information	Offers municipal bonds program; port rates available; offers special programs related to health care: HMO organizations and Methadone treatment centers; turnkey systems; TSRO; company also OEM's Hewlett-Packard systems with specialized software	Offers discounts for volume usage and non-prime time; dedicated high-speed access ports available; DB/DC services and COM available; integrated batch and interactive; includes extensive shared software library Note. Datacrown has recently merged with Systems Dimensions Limited (SDL)	CPU charges vary with amount of main storage used; rates are much lower during non-prime hours; FPS and RAFTS available (financial planning system and remote access financial transaction system)	"Virtual port" and fixed price contracts available; offers discounts for volume usage and non-prime time; fund accounting; Municipality package offered, financial and statistical analysis software

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COMPANY	DIALCOM Inc.	Ecotran-Chi Corporation	Financial Data Systems, Inc.	First Data Division, ADP, Inc.	General Electric Company
GENERAL Name of service	Timesharing	Chi Time-Sharing, Chi Remote Batch	FDS online Thrift System	—	Mark III Service
Date operational	July 1970	May 1968	1970	1970	1965
Areas currently served	Nationwide and 7 foreign locations	Ohio, Pennsylvania, Michigan, New York; access via Telenet	Continental U.S.	North America and Europe via Telenet	Local-call service to more than 600 cities in North America, and Far East, Western Europe, Australia, Venezuela, Saudi Arabia
EQUIPMENT Computers	Prime 750 (4), Honeywell 1648A (9)	Univac 1100/11, Univac 1108, & DEC 2050 in Cleveland	IBM 370/155 (5)	DECsystem-10 (8)	Over 100 Honeywell 6088 and IBM 370/158 computers in 3 super-centers in Ohio, Maryland, & Europe
No. of simultaneous users	1024 total	96 on 2050; 32 on 1108; 16 on 1100/11	50	Over 250	200 per computer
Conversational terminals supported	All ASCII, EBCDIC and correspondence terminals at 10 or 30 cps; IBM 2741	TTY 33/35/38, Datapoint 3300, GE TermiNet 300, AJ 630, DCT 500, etc., at 10, 30, or 120 cps	IBM 1050, 1060, 2740, 2980; Burroughs TC 700, TU 700, BR 2001; TRW; NCR 270; Olivetti, and others	Most American-made interactive terminals	ASCII, EBCDIC, or Correspondence Code terminals at 10, 14.8, 15, 30, and 120 cps; Touch-Tone
Batch terminals supported	—	Univac 1004, 9200; 9200; IBM 2780, 1130, 360/20; Data 100, etc.	—	IBM 2780, Data 100 and others	IBM 2780/3780, Data 100, MDS 2400, RCP 702, Honeywell G-115, etc., at 2000-4800 bps
SOFTWARE Conversational programming languages	FORTRAN, BASIC, COBOL, RPG, Text Editor	BASIC, FORTRAN, COBOL, EDIT, SAM, APL	COBOL, Dial 260	FORTRAN, BASIC, COBOL, APL, LISP, SNOBOL, ALGOL	FORTRAN, BASIC, ALGOL
Batch-mode programming languages	—	FORTRAN, BASIC, ALGOL, COBOL, RPG, etc.	—	FORTRAN, BASIC, APL COBOL, SNOBOL, ALGOL, MAXBASIC	FORTRAN, COBOL PL/1
Principal applications	Business, scientific, electronic mail	Engineering, scientific, phototypesetting, management sciences	On-line savings and loan accounting	Business, scientific, engineering, data base management	Business & scientific

CHARGES
Min. monthly charge:
  Interactive
  Remote batch
	
	$25.00
	—
		
		None
		None
			
			See Comments
			—
				
				None
				None
					
					See Comments
					—

Terminal connect time:
  Interactive
  Remote batch
	
	$7.00-10.00/hr.
	—
		
		$10.00/hr.
		$7.00-10.00/hr
			
			—
			—
				
				$5.00-7.50/hr.
				—
					
					—
					—

Central processor time:
  Interactive
  Remote batch
	
	$0.02/CCU
	—
		
		$4.00/min.
		$18.00/min.
			
			—
			—
				
				$0.0033-0.011/CRU
				$0.0033-0.011/CRU
					
					—
					—

Mass storage:
  Interactive
  Remote batch
	
	$0.50-1.00/1K chars./month
	—
		
		$1.50/2.560 chars./month
		$0.20/2772 chars./month
			
			—
			—
				
				$0.10/1K chars./day
				$0.10/1K chars./day
					
					—
					—

COMMENTS	Special rates available for large data bases and dedicated ports	Volume discounts; lower rates for non-prime time	Serves savings and loan associations and mutual savings banks; charges based on number of accounts on file	See related services under ADP, Inc.	CPU costs depend on priority, time of day, and resources used; continuous access pricing, special data entry mode, custom usage plan discounts, COM service, and data management facilities are available

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COMPANY	Genesee Computer Center, Inc.	GTE Data Services Incorporated	Harris Corp., PRD Elec. Division	HDR Systems, Inc.	Honeywell Information Systems, Inc.
GENERAL					
Name of service	Genesee Services	RCS	Computer Service Center	HDR Systems NOS	Datanetwork
Date operational	Aug. 1968	Nov. 1971	1971	Oct. 1972	July 1972
Areas currently served	Entire U.S., Canada, Europe, Mexico, Brazil, Saudi Arabia, Australia	Continental U.S. plus Hawaii	Local access in 7 states; rest of U.S. via Telenet or INWATS	Any area served by Tymnet	Entire U.S.; local service in most large cities plus INWATS service
EQUIPMENT					
Computers	CDC 6600, 7600, and Cyber 175 belonging to Control Data (Cybernet)	CDC 6500, 6600, and Cyber 73-28 (2); dual Honeywell 66/60	Univac 1108	CYBER 172	Honeywell 66/6000 (3) in Minneapolis
No. of simultaneous users	Not specified	120	Not specified	256	256 per system
Conversational terminals supported	TTY and all compatible units at 10 or 30 cps & 120 cps	TTY & compatible terminals at 10, 15, 30 & 120 cps	TTY-compatible, Tektronix and USCOPE	All ASCII asynchronous terminals; IBM 2741	IBM 2741 at 15 cps; TTY; ASCII terminals at 10, 15, 30 or 120 cps
Batch terminals supported	CDC 200, DEC PDP-11, IBM 1130, Univac 9200/9300, Data 100, etc.	CDC 200 & compatible units at 2000 to 9600 bps	U1004, U9300, cope, Data 100	CDC 200	IBM 2780/3780, and GRTS-compatible
SOFTWARE					
Conversational programming languages	FORTRAN, COBOL, Compass, BASIC, APL	FORTRAN, BASIC, APL, Text Editor	FORTRAN, COBOL BASIC, APL, Editor	FORTRAN, APL, BASIC, COBOL, Assembler	FORTRAN, DATABASIC, BASIC, APL, ALGOL, PASCAL, SOVIAL
Batch-mode programming languages	FORTRAN, COBOL, Compass, BASIC, ALGOL, SIMSCRIPT, SIMULA	FORTRAN, BASIC, COBOL, Simscript, Compass	FORTRAN, COBOL, Assembler	FORTRAN, COBOL, BASIC, APL	FORTRAN, COBOL, ALGOL, PASCAL, JOVIAL, GMAP
Principal applications	Engineering & scientific (optics and mechanical engineering)	Business, scientific, engineering, financial modeling	Engineering, scientific	Business & scientific	Business, scientific, engineering, data base management
CHARGES					
Min. monthly charge:					
Interactive	None	$100	$100	$100	$200
Remote batch	None	$100	$100	$100	$200
Terminal connect time:					
Interactive	$9.00-28.00/hr.	$10.50-22.00/hr.	$5.00/hr.	$5.35/hr.	$12.00-33.00/hr.
Remote batch	$12.00-18.00/hr.	$10.50-30.00/hr.	—	$10.70/hr	—
Central processor time:					
Interactive	$0.35/SBU	$1.50-30.00/min.	$450-600/hr.	$1.07/SRU	$0.10/TSU
Remote batch	$0.14-0.45/SBU	$9.60-33.60/min.	$450-600/hr.	$0.97/SRU	$0.10/RBU
Mass storage:					
Interactive	$0.01/1000 chars./day	$0.40-0.50/1280 chars./month	$0.02/10,752 chars./day	$0.C 17/1K chars./day	$0.057-0.50/320 36-bit words/month
Remote batch	$0.01/1000 chars./day	$0.40-0.50/1280 chars./month	$0.02/10,752 chars./day	$0.017/1K chars./day	$0.057-0.50/320 words/month
COMMENTS	Provides specialized technical services, and Control Data computer services, at the supplier's rates	Offers general timesharing services plus large library of applications for telephone companies	Uninterruptible power supply; 24 hour/day operation	Nationwide service via Tymnet	DATANETWORK services are accessible 24 hours per day, seven days per week, except for scheduled preventive maintenance; Non-prime time and discounts are available

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COMPANY	Informatics Inc.	Information Consultants, Inc.	Information Science Inc.	Information Systems Design	Interactive Data Corporation
GENERAL					
Name of service	Remote Computing Service	ICI	InSci/80	ISD	CS/ES
Date operational	1972	June 1974	Feb. 1978	May 1968	1968
Areas currently served	Continental U.S.	Continental U.S.	Entire U.S.	Entire U.S. via INWATS (batch) and Tymnet (interactive)	Continental U.S., Canada, Europe
EQUIPMENT					
Computers	Itel AS/6 (2), IBM 370/158	DECsystem 2060	Microdata Royale	Univac 1100 (4) in Santa Clara, CA	Amdahl 470/V7, IBM 370/168 in Waltham, MA
No. of simultaneous users	250	128	32	158	300
Conversational terminals supported	All major 10, 15, 30 or 120-cps terminals	ASCII, EBCDIC or correspondence terminals at 10, 15, 30 or 120 cps	ADDS, Regent-40, Regent-100	TTY and compatible ASCII terminals at 10, 30 or 120 cps; IBM 2741; Tektronix graphics terminals	TTY and compatible ASCII terminals at 10, 30 or 120 cps; IBM 2741
Batch terminals supported	IBM 2780, HASP and equivalent	IBM 2780/3780 and compatible at 1200 to 9600 bps	—	IBM 2780, 1130; Data 100, Harris, MDS, Univac 1004 Unitech, HASP	IBM 2780/3780, 3741 and compatible EBCDIC units at 2K, 2.4K and 4.8K bps
SOFTWARE					
Conversational programming languages	FORTRAN, COBOL, BASIC, APL, PL/1, Assembler	FORTRAN, COBOL, BASIC, APL, PL/1, ALGOL	BASIC	FORTRAN, BASIC, COBOL, APL, Editor, Assembler	FORTRAN, BASIC, COBOL, PL/1, XSIM, Assembler, XDMS
Batch-mode programming languages	FORTRAN, COBOL, PL/1, Assembler	FORTRAN, COBOL	—	FORTRAN, BASIC, COBOL, APL, Editor, Assembler	FORTRAN, BASIC, COBOL, PL/1, Assembler, XSIM, XSCAN, XDMS
Principal applications	General business planning and control	Financial, data management, planning	Personnel	Engineering, scientific, graphics, data base mgmnt.	Business, financial, scientific, data base mgmnt.
CHARGES					
Min. monthly charge:					
Interactive	None	None	$700	$50	$100-total batch and
Remote batch	None	None	—	$50	interactive
Terminal connect time:					
Interactive	$6.00-18.00/hr.	$6.00-12.00/hr.	—	$5-9/hr.	$13.00-20.00/hr.
Remote batch	$15.00/hr.	$15.00-35.00/hr.	—	$10-15/hr. (2K/4.8K bps)	—
Central processor time:					
Interactive	$0.10/IRU	$0.01/CRU	—	$0.135-0.18/sec.	$0.13/charge unit
Remote batch	$0.10/IRU	$0.01/CRU	—	$0.135-0.18/sec.	$0.06/charge unit
Mass storage:					
Interactive	$18-35/212K bytes/mo.	$0.01/640 chars./day	—	$0.05/10,752 chars./day	$0.07-0.23/1K chars./month
Remote batch	$18-35/212K bytes/mo.	$0.01/640 chars./day	—	$0.05/10,752 chars./day	$0.07-0.23/1K chars./month
COMMENTS	Many general tools for financial analysis and planning; information management and graphics	Special rates for volume users; turnkey applications provided with consultants and system staff; FISCAL and ADMIT services Washington DC facility	Charges based on file volumes and number of locations supported; minimum charge includes CRT, printer, modem and 2 hours connect time/day	Discounts for volume and non-prime time use; applications include remote and interactive graphics, structural, electrical and nuclear engineering, simulation, operations research, project control, etc	Packages include banking, insurance, finance, brokerage, math, graphics, modeling, econometric data, management science, data base management, text processing, merger/ acquisition analysis, securities analysis

SEPTEMBER 1979

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COMPANY	Interactive Sciences Corporation	Itel Corporation	Keydata Canada	Keydata Corporation	Le Groupe BST, Inc.
GENERAL					
Name of service	Computing service	Commercial Services Division	Keydata	Keydata	Customized and Tailored
Date operational	May 1968	1968	1969	1965	September 1970
Areas currently served	Entire U.S., Europe, Far East, Hawaii, Australia	Nationwide	Major Canadian metropolitan areas; current subscribers in Toronto, Montreal, Winnipeg, and Vancouver	Continental U.S. & Canada; more than 40 concentrators	Canada, limited US
EQUIPMENT					
Computers	DECsystem-10 (5) in Braintree, MA	IBM 370/155 (2) in White Plains, NY	DECsystem-10 (1) Univac 494 (3) in Foxboro, MA	DECsystem-10 (1), Univac 494 (3) in Foxboro, MA	Honeywell 200, Itel AS 5, HP 21 MX (2)
No. of simultaneous users	62	Approx. 680	1000	1000	15
Conversational terminals supported	All ASCII to 1200 bps; IBM, other BCD, Selectric, correspondence units via telenet	DECwriter LA36 at 15 or 30 cps; Bunker Ramo 2200 Series	TTY Model 28, GE Termi-Net, Bell Canada Vucom, ADDS, DECwriter, Tally, Datapoint at 30 or 120 cps	TTY Model 28, GE Termi-Net, ADDS, DECwriter, Tally, Datapoint at 30 or 120 cps	IBM 1130, 2780 and HASP terminals
Batch terminals supported	IBM 2780/3780 and compatible units	—	—	—	—
SOFTWARE					
Conversational programming languages	FORTRAN, COBOL, BASIC, MACRO, PASCAL, AID, LISP, SNOBOL	Itel language	Keydata On-Line Processing Language (KOP III)	Keydata On-Line Processing Language (KOP III)	FORTRAN, COBOL, BASIC, PL/1, RPG
Batch-mode programming languages	FORTRAN, COBOL, BASIC, RPG, MACRO, PASCAL, LISP, AID, SNOBOL	—	—	—	—
Principal applications	Business, scientific, financial, engineering, data base mgmnt.	Business	Business	Business	Business, DBMS, gov't. applications
CHARGES					
Min. monthly charge:					
Interactive	None	See Comments	$900	$800	$5,000
Remote batch	None	—	—	—	—
Terminal connect time:					
Interactive	$6.00-18.00/hr.	—	See Comments	See Comments	—
Remote batch	$20.00-40.00/hr.	—	—	—	—
Central processor time:					
Interactive	$0.01/CRU (Prime)	—	See Comments	See Comments	$27.00/CPU min.
Remote batch	$0.0067-0.0025/CRU	—	—	—	—
Mass storage:					
Interactive	$0.01/640 chars./day	—	See Comments	See Comments	$2.00/1K print line
Remote batch	—	—	—	—	—
COMMENTS	Financial modeling programs, accounting systems, statistical analysis, manufacturing systems, data base management; discounts for non-prime users	Charges based on transaction volume; also offers legal fee billing	All charges are based on number of transactions processed; dedicated system for interactive business data processing applications	All charges are based on number of transactions processed; dedicated system for interactive business data processing applications	Communications, hardware and terminal facilities are available at additional costs

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COMPANY	Litton Computer Services	Lockheed Information Systems	Management Concepts, Inc.	Management Systems Corporation
GENERAL				
Name of service	Timesharing and Remote Job Entry	DIALOG Information Retrieval Service	MCI	Time Sharing & RJE Services
Date operational	Aug. 1971	1972	Oct. 1970	Aug. 1971
Areas currently served	Continental U.S. & Canada	Worldwide	Georgia	Continental U.S. and Canada
EQUIPMENT				
Computers	IBM 3033	IBM 370/165, IBM 3032	Honeywell 1646, 1648, 2040A; Prime 400	IBM 370/168, 158 in Salt Lake City
No. of simultaneous users	512	Not specified	72 total	78 time-sharing, 18 RJE, 30 TSO
Conversational terminals supported	TTY-compatible units; IBM 3270	All ASCII, EIA terminals	TTY, DEC II's and III's, Xerox 1710, 1760	Trendata 1000, 4000, 1500, IBM 2741, GTE 5741; 15 & 30 cps, most ASCII
Batch terminals supported	IBM HASP, 2780, 3780, & emulators	—	—	IBM 2780/3780, S/3, S/34, Mohawk Model 20, all IBM RJE terminals
SOFTWARE				
Conversational programming languages	FORTRAN, BASIC, COBOL, APL, PL/1, MARK IV	—	FORTRAN, COBOL, BASIC	APL, ATS, TSO, FORTRAN, VSPC, BASIC
Batch-mode programming languages	FORTRAN, COBOL, PL/1, RPG, MARK IV, Easytrieve	—	FORTRAN, COBOL	FORTRAN, COBOL, PL/1, RPG, Assembler, Easytrieve
Principal applications	Business & scientific	Interactive data base mgmnt.	General accounting	Business & scientific
CHARGES				
Min. monthly charge:				
Interactive	None	None	$460	$100/mo.
Remote batch	None	—	$250	$100/mo.
Terminal connect time:				
Interactive	$8.00-12.00/hr.	$25.00-90.00/hr.	$5.00-10.00/hr.	$3.00-3.75/hr.
Remote batch	None	—	—	None
Central processor time:				
Interactive	See Comments	—	$0.015-0.112/sec.	$0.65/CPU sec.
Remote batch	—	—	—	$0.80/CPU sec.
Mass storage:				
Interactive	See Comments	—	$0.05-0.25/880 chars.	$0.04/6440 chars./day
Remote batch	—	—		On request
COMMENTS	Rates vary with amount and period of time resources used	DIALOG service contains over 25 million abstracts and records of newspaper, journal and magazine articles, technical reports, papers and patents in virtually all subject areas		Offers text processing system (ATS) to facilitate preparation of publications, proposals

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COMPANY	Mark/Ops	Martin Marietta Data Systems	McDonnell Douglas Automation Co. (McAuto)	McDonnell Douglas Automation Co. (McAuto)	McDonnell Douglas Automation Co. (McAuto)
GENERAL					
Name of service	Mark/Ops	Remote Computing Services	CYBER Service	370.Service	IMS/Data Base Services
Date operational	March 1967	1971	March 1976	1967	1970
Areas currently served	Northeastern U.S.	U.S., Canada, Europe	Entire U.S. and foreign countries via Tymnet	Continental U.S. and Canada; customers also in U.K., France, Sweden, Japan and Germany	Continental U.S. and Canada
EQUIPMENT					
Computers	DEC PDP-10 (2) & DEC PDP-11/45	IBM 370/168 (2), 370/158 (2), 370/148, 370/135, 360/50; CDC 6500, HP, DEC, etc.	CDC Cyber 173 & 175 (3)	IBM 3033 (6), IBM 370/168 (3) and 3031 in St. Louis; IBM 3033 (7) in CA; 3031	IBM 3033 (6), 3701 168 (3), 3032 in St Louis; 3033 (7) in CA; 3031 in CO
No. of simultaneous users	64 & 24	600	110 per system	100+ per system	2000+ total
Conversational terminals supported	Any 110 or 300 bps ASCII unit	IBM 3741, IBM 3270 TTY, or any compatible unit	IBM 2741 and TTY 33 compatible units	TTY, IBM 3741, 3270, graphics	TTY; IBM 2260, 2740, 3270 and compatible
Batch terminals supported	Any 1200 bps ASCII unit	IBM 2780/3780, HASP multileaving workstation (i.e., 360/20), or any compatible unit; CDC 200	CDC 200, IBM HASP, others through 370 service	IBM 2770, 2780/3780, HASP and compatible units	IBM 2770, 2780/3780, HASP and compatible
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, TECO, MAGIC II	FORTRAN, PL/1, BASIC, COBOL, TSO, IMS/DL-1, CICS	FORTRAN, BASIC, APL, MIMDAC, COBOL	FORTRAN, COBOL, BASIC, PL/1	COBOL, DL/1, BAL
Batch-mode programming languages	FORTRAN, COBOL, BASIC+	FORTRAN, PL/1, BASIC, COBOL, RPG, Assembler, IMS/DL-1	FORTRAN, COBOL, MIMAC, SIMSCRIPT, BASIC, APL	FORTRAN, COBOL, PL/1, RPG, DL/1, BAL	COBOL, PL/1, DL/1, BAL
Principal applications	Acctg., distribution, financial modeling, assembly control, engr.	Manufacturing, business, scientific, & data base management	Engineering, scientific, graphics, data base management, communications	Business, scientific, engineering, graphics, data base mgmnt.	Manufacturing, distribution, insurance, communications
CHARGES					
Min. monthly charge:					
Interactive	None	—	None	None	None
Remote batch	None	—	None	None	None
Terminal connect time:					
Interactive	$7.50-8.00/hr.	—	$10-18/hr.	$10-18/hr.	Charge per port/terminal
Remote batch	$7.50-8.00/hr.	—	$15-20/hr.	$15-27.50/hr.	$15-27.50/hr.
Central processor time:					
Interactive	$0.10/sec. (4K)	—	$0.10-0.20/MRU	$4.25-8.50/VRU	Special
Remote batch	$0.05/sec. (4K)	—	$0.16-0.46/MRU	$3.35-6.70/VRU	pricing
Mass storage:					
Interactive	$0.50/1K chars./mo.	—	$0.04/64 wds/wk.; $3.50/6848 wds/wk.	$12.50/M bytes/wk.	$15.00/M bytes/wk.
Remote batch	$0.50/1K chars./mo.	—	$0.04/64 wds/wk.; $3.50/6848 wds./wk.	$12.50/M bytes/wk.	$15.00/M bytes/wk.
COMMENTS	Division of Northeastern Systems Associates; specializes in large systems for specific customers; lower rates for data bases; different rates apply for PDP-11/45 system; bulk storage available at special rates	Price lists available on request; charges only for resources used related to response and volume; specializes in remote batch processing	Storage discounts are offered; disk files are shared between computers; full access to 370 McAuto service is provided; fully integrated batch and interactive service	Full TSO service; interactive debug; structured Program Facility; RJE; graphics; full access to other McAuto services	Full IMS educational service available; various IMS utilities and on-line test facility available

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COMPANY	Mellonics Information Center	Metridata Computing, Inc.	Multiple Access Limited Computer Group	National Computer Network of Chicago, Inc.	National CSS, Inc.
GENERAL					
Name of service	TSO, Remote Batch	Metrinet	—	—	VP/CSS
Date operational	1968	Jan. 1969	Oct. 1969	Dec. 1969	Dec. 1968
Areas currently served	Continental U.S.	Multiplexers in Chicago, Cincinnati, Dayton, De-troit, and Indianapolis; foreign exchange in Columbus, OH	All of Canada & U.S.	Continental U.S., Canada; worldwide via Telenet and Tymnet	All of U.S., Canada, England, France
EQUIPMENT					
Computers	IBM 3033 (2)	Honeywell 430 (2) & 440 (2); IBM 360/65	CDC 6600 & Cyber 73, IBM 370/168 (3) in Toronto; Univac 494 (3) in Boston	DECsystem 20, Honeywell 1648A (2)	IBM 3033, 370/168 (2), 370/158, Amdahl 470/V6
No. of simultaneous users	130 TSO, 50 Remote Batch	80 total	32 on CDC 6600, 128 on Cyber 73	Not specified	1400
Conversational ter-minals supported	All ASCII units at 10, 15, 30, or 120 cps; IBM 2741, 3270, 3767	Any ASCII terminal at 10 or 30 cps	TTY and all compatible ASCII units at 10 or 30 cps	All ASCII at 10, 30 or 120 cps; IBM 2741	TTY and all compatible at 10, 15, 30, 60 or 120 cps plus voice response graphics and 3270
Batch terminals supported	Any HASP-compatible RJE terminal; IBM 2780/3780, 3776	IBM 2780, 3780, & 3620	IBM 360/20 & 1130, Univac 9200/9300, CDC 200, Data 100, Comterm 2100, DEC PDP-8 & -11, etc.	—	Dial-up units at 1200 to 4800 bps; leased lines to 9600 bps
SOFTWARE					
Conversational pro-gramming languages	FORTRAN, COBOL, BASIC, PL/1	FORTRAN, BASIC	FORTRAN, BASIC, COBOL, Compass	FORTRAN, COBOL, BASIC, APL, PASCAL, MACRO, SNOBOL	FORTRAN, APL, BASIC, COBOL, PL/1
Batch-mode program-ming languages	FORTRAN, COBOL, PL/1, RPG, TOTAL, pro-prietary applications	COBOL	FORTRAN, BASIC, COBOL, ALGOL, RPG, PL/1, Assembler, Compass, etc.	FORTRAN, COBOL	FORTRAN, APL, BASIC, COBOL, PL/1
Principal applications	Business & scientific	Business, scientific, & banking	Business, scientific, banking & government	Business, financial, stocks/commodities data base	Business, scientific, engineering, data base management
CHARGES					
Min. monthly charge:					
Interactive	None	None	None	None	$100
Remote batch	None	100	None	None	None
Terminal connect time:					
Interactive	$4.00-9.00/hr.	$7.50/hr.	Not specified	$5-10/hr.	$12.00-20.00/hr.
Remote batch	—	$10.00/hr.	Not specified	—	None
Central processor time:					
Interactive	$2.57/CRU	$0.04/CPU unit	Not specified	$0.60-1.00/CPU min.	$0.02/VPU
Remote batch	$1.71/CRU	—	Not specified	—	$0.08-0.12/VPU
Mass storage:					
Interactive	$0.17/track/day	$0.75-1.75/1000 chars./month	Not specified	$0.75/1K chars./mo. $1.00/2560 chars./mo.	$6-22/120K chars./mo.
Remote batch	$0.17/track/day	—	Not specified	—	$6-22/120K chars./mo.
COMMENTS	IMS, STAIRS, TOTAL, CICS & other proprietary applications available for nominal royalty charge; Telenet access available	Gateway to Tymshare's TYMNET	High-speed links be-tween processors give all users on-line access to the computer systems network; also offers Key-data on-line commercial processing services; cus-tom design of industrial control systems	Maximum cost for DEC 20 CPU time is $25.00/hr.; cost for terminal connect time varies between prime and non-prime connect times; volume discounts and unlimited usage rates available	Offers NOMAD data base management and reporting system; other proprietary data bases

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COMPANY	Newfoundland and Labrador Computer Service	NLT Computer Service	Ohio Valley Data Control, Inc.	On-Line Business Systems, Inc.	On-Line Systems, Inc.
GENERAL					
Name of service	—	Datafile	Ohio/Kanawha Valley Data Control	Remote Processing—System Development & Maintenance	Information Processing System
Date operational	1969	1970	1966	July 1971	Dec. 1967
Areas currently served	Eastern Canada	Eastern U.S.	Southeast Ohio and West Virginia	California and the West Coast	Entire U.S., Canada, U.K.; toll-free access from 36 U.S. cities, 14 European
EQUIPMENT					
Computers	IBM 370/158 in St John's, Newfdlnd	Burroughs B 4800, B 4700, DG NOVA 3 (4)	Burroughs B 4700/3700 dual processors, B 1700's (2), B 2700 (2)	IBM 370/158 in San Francisco	DEC PDP-10 (20), SIGMA-9 (2)
No. of simultaneous users	30	500	14	100	1000 total
Conversational terminals supported	IBM 2740, 2741, 3270, TTY and equivalent	Up to 1800 bps, Hazeltine, others	Burroughs TD 700, TT102, NCR 301/101, TI 700 Series	All IBM-compatible terminals	TELEX at 10, 15, 30 and 120 cps; other ASCII, EBCD, and BCD
Batch terminals supported	DEC PDP-11/40, Comterm 1200	Not specified	Burroughs B 1700, Honeywell 2020	All IBM-compatible terminals	Data 100, etc.
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, Assembler, PL/1, MARK IV	Dependent on specific application	COBOL, DIBOL (DEC)	FORTRAN, BASIC, APL, SPITBOL, WYLBUR, PYLON	FORTRAN, COBOL, BASIC, APL
Batch-mode programming languages	FORTRAN, COBOL, PL/1, ALGOL, RPG, Assembler, MARK IV, etc.	COBOL; not available to user	COBOL	FORTRAN, COBOL, PL/1, RPG	FORTRAN, COBOL, BASIC, APL
Principal applications	Business, scientific	Distribution, accounting	Financial & small business systems	Specialized business systems	Manufacturing, business, management
CHARGES					
Min. monthly charge:					
Interactive	Not specified	$1,000	Per Account	See Comments	$5.00/user number
Remote batch	Not specified	—	Per Account	—	$5.00/user number
Terminal connect time:					
Interactive	Not specified	—	$12.00/hr.	$3.25/hr.	$10.00/hr.
Remote batch	Not specified	—	—	$10.00/hr.	—
Central processor time:					
Interactive	Not specified	—	$140.00/hr. (dedicated)	$30.00/CPU minute	$0.05/CPU
Remote batch	Not specified	—	—	$16.00-26.00/CPU hr.	$0.05/CPU
Mass storage:					
Interactive	Not specified	—	$20.00/100K bytes/mo.	$0.035 track/day (3330-11)	$0.05/3200 chars./day
Remote batch	Not specified	—	—	$0.01 track/day (3330-11)	$0.05/3200 chars./day
COMMENTS	Provides EDP services for provincial gov't, university, and crown corporations	Monthly charge up to $10,000; dependent on transaction volume; matrix pricing and inventory management for wholesale distributors		Limited to applications such as reservations, order entry, POS, inventory, data base retrieval, etc.; billing is on a transaction basis; minimum monthly charge is $800 for total interactive and batch usage	Round-the-clock service with uninterruptible power supply; automatic processor backup; field service for tailoring management analysis and planning to customer information needs; quantity and guaranteed usage discounts

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COMPANY	On-Line Systems, Inc.	On-Line Systems, Inc.	Optimum Systems Incorporated	Pacific Applied Systems Division, SDC	Polycom Systems Limited
GENERAL					
Name of service	OSCAR	Dynabank	OSI	TASC system for test automation	DTSS
Date operational	Jan. 1974	—	1967	1971	1968
Areas currently served	Entire U.S.	Entire U.S.	Entire U.S.	Continental U.S., Europe, & Orient	Canada
EQUIPMENT					
Computers	DEC PDP-10	DEC PDP-10 (20)	IBM 3033 and 370/165 in Santa Clara; 3033, 3031 & 370/168 (2) in Rockville, MD	TI 960; Amdahl 470/V5; Univac 1108	Honeywell 6060
No. of simultaneous users	1000 Total	1,000 Total	Not specified	300	104
Conversational terminals supported	ASCII, EBCD, BCD and TELEX	ASCII, EBCD, BCD and TELEX	All popular terminals including TTY & IBM 2741	ASCII terminals at 110 to 9600 bps	Any ASCII-compatible terminal up to 120 cps
Batch terminals supported	Data 100, etc.	Data 100, etc.	IBM 2780/3780, Data 100 & compatible units; DEC, Interdata & Datapoint distributed minicomputers	Univac 1004, IBM 2780, COPE, etc.	Any terminal supporting IBM 2780 or SDLC protocol
SOFTWARE					
Conversational programming languages	—	FORTRAN, BASIC, COBOL	WYLBUR, SUPER-WYLBUR	TASC Test Oriented Language, FORTRAN	FORTRAN, COBOL, BASIC, APL, PL/1
Batch-mode programming languages	—	FORTRAN, BASIC, COBOL	COBOL, FORTRAN, PL/1, RPG II, all standard IBM compilers	TASC Test Oriented Language, FORTRAN	FORTRAN, COBOL, BASIC, PL/1
Principal applications	Project management	Financial & banking	Mfg., health claims, accounting, engineering, scientific, banking, financial	ATE program development, circuit simulation	Acct'g., order proc., job costing, financial planning, statistics, engineering
CHARGES					
Min. monthly charge:					
Interactive	$5.00/user number	$5.00/user number	$200	—	$100
Remote batch	$5.00/user number	$5.00/user number	$200	—	$100
Terminal connect time:					
Interactive	$10.00/hr.	$10.00/hr.	$6.00/hr.	$100-900/hr.	$6.00-12.00/hr.
Remote batch	—	—	$3.50/hr.	—	None
Central processor time:					
Interactive	$0.05/CPU	$0.05/CPU	$4.75/MU	Incl.	$0.175-0.35/CRU
Remote batch	$0.05/CPU	$0.05/CPU	$4.75/MU	—	$0.175-0.35/CRU
Mass storage:					
Interactive	$0.05/3200 chars./day	$0.05/3200 chars./day	$0.04/track/day	Incl. w./TI 960; $0.50/8400 char./day	$0.10/1000 chars./mo.
Remote batch	$0.05/3200 chars./day	$0.05/3200 chars./day	$0.04/track/day	—	$0.10/1000 chars./mo.
COMMENTS	OSCAR is a highly integrated system with both schedule and cost control for project management; easy input, meaningful and flexible reporting; a total project management service is available, including consulting and public/private seminars	Specializes in automated financial services; packages for bond accounting and valuation, trust accounting, credit analysis and cash management	Owns and markets SUPERWYLBUR for word processing services; provides CICS, IMS, TSO (East coast) services. Volume discounts for mass storage; leased line access avail.; services and rates slightly different on East Coast	Dedicated system tests simulation models for program development for automatic test equipment (ATE) & generates configuration control package; division of System Development Corporation	Pricing for terminal connect and CPU time varies according to non-prime and prime time usage; 50% discount available during non-prime time; also offers an "off-the-shelf" financial management system utilizing an intelligent terminal system; dedicated ports available

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COMPANY	PRC Computer Center, Inc.	Profitool, Inc.	Programs & Analysis, Inc.	Proprietary Computer Systems, Inc.	Proprietary Computer Systems, Inc.
GENERAL					
Name of service	Timesharing, Remote Computing Service	Contractors Mgmnt Information Service	Thrift Line Service	PCS/Computernet	PCS/TEXT
Date operational	1968	Oct. 1967	1968	Oct. 1970	1970
Areas currently served	Continental U.S.	Western U.S.	New England, New York, & Southeast	U.S.; Europe	U.S.; Europe
EQUIPMENT					
Computers	Itel AS-5 (2)	Prime 400, Prime 550	Honeywell 6060 in Burlington, MA	IBM 3031 (370/158 backup)	IBM 370/158 (3031 backup)
No. of simultaneous users	120	126	64	Not specified	Not specified
Conversational terminals supported	TTY, IBM 2741, and compatible ASCII and EBCD units at 10, 15, 30, and 120 cps	All ASCII at 300 and 1200 bps	ASCII at 10 to 120 cps; IBM 2741 and compatible units	Most hardcopy and video terminals at 15, 30 and 120 cps	Most hardcopy and video terminals at 15 and 120 cps
Batch terminals supported	IBM 2780/3780, 360/20 and compatible units	—	"Almost any" unit up to 9600 bps	IBM 2780/3780, HASP & compatible units	IBM 2780/3780, HASP and compatible units
SOFTWARE					
Conversational programming languages	FORTRAN, COBOL, BASIC	FORTRAN, COBOL, BASIC, RPG	FORTRAN, BASIC, ALGOL	APL	PCS/TEXT
Batch-mode programming languages	FORTRAN, Easytrieve, COBOL, ALGOL, PL/1, RPG, Assembler	FORTRAN	FORTRAN, COBOL, Assembly, JOVIAL	FORTRAN, COBOL, PL/1, Assembler	PCS/TEXT
Principal applications	Business, scientific, engineering	Construction industry	Business, engineering, & scientific	Statistics, engineering, data base mgmnt., financial modeling	Publication production in all business fields
CHARGES					
Min. monthly charge:					
Interactive	None	None	See Comments	$300/mo.	$300.00/mo.
Remote batch	None	—	—	$300/mo.	Negotiated
Terminal connect time:					
Interactive	$8.00-12.00/hr.	$7.00/hr.	See Comments	$15.00/hr.	$3.30-10.00/hr.
Remote batch	None	—	—	$11.00/hr.	—
Central processor time:					
Interactive	Varies	$0.02/CPU second	See Comments	$0.01/CPU	$0.05/process unit
Remote batch	Varies	—	—	$7.50+/proc. unit	—
Mass storage:					
Interactive	$0.035/track/day	$0.10/1000 chars./mo.	—	$0.01/1000 chars./day	$0.25/psr
Remote batch	$0.25/spindle/minute	—	—	$0.01/track/day	—
COMMENTS	Offers remote batch processing, TSO time-sharing, and WYLBUR text editing, plus various other computer and professional services	50% discount available on terminal connect and processor time during non-prime time; data processing services and software for construction industry exclusively	Offers dedicated business, engineering, and scientific data processing services; each application is charged on a unit transaction basis	Higher-level "programmerless programming" procedures for financial modeling and data base management systems; users can call pre-written Fortran or Assembler language routines as subroutines of APL programs	PCS/TEXT is an online word processing and information management system; features include automatic index and table of contents, document formatting, sorting, arithmetic operations, data creation and photocomposition

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COMPANY	Pryor Corporation	Quanex Management Sciences	Rapidata, Inc.	Remote Computing Corporation	Scientific Process & Research, Inc.
GENERAL					
Name of service	—	Remote Computing Services	Rapidnet	R-NET	SPR Timesharing Network
Date operational	June 1969	Aug. 1973	1967	Oct. 1968	1969
Areas currently served	Illinois, East and Midwest via network	United States	U.S., U.K.	Continental U.S. via local dialing	Continental U.S., Canada, Mexico, & Puerto Rico via local dialing
EQUIPMENT					
Computers	DECsystem 2050 in Chicago	Itel AS-5	Honeywell 437 (13), DECsystem-1070 (3), DECsystem-1080, and DECsystem-2020	Burroughs B 7700 (2)	Prime 400
No. of simultaneous users	50	250 total	500	200	64
Conversational terminals supported	ASCII terminals at 10, 30, or 120 cps	IBM 2731, TTY 33	Most terminals to 120 cps unit	Most ASCII units at 10 to 120 cps, Correspondence/EBCD units at 14.8 to 120 cps	TTY 33/35 and other ASCII terminals at 10 or 30 cps; IBM 2741
Batch terminals supported	—	IBM HASP, IBM 2780/3780, 2770 and compatible units	Most terminals to 4800 bps	Data 100, IBM 2780 and emulators, Singer M&M, Burroughs DC 1000	—
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL	COBOL, BASIC	FORTRAN, BASIC, COBOL, DBMS, and proprietary	FORTRAN, PL/1, BASIC, COBOL, ALGOL	FORTRAN, BASIC, COBOL, PMA
Batch-mode programming languages	—	FORTRAN, COBOL, PI/1, RPG, Dial 260, Assembler	FORTRAN, COBOL, BASIC, and proprietary	FORTRAN, PL/1, BASIC, COBOL, ALGOL, Work Flow (WFL)	—
Principal applications	Business & scientific	Acct'g., mfg., distribution, data base	Financial	Business; thrift, securities & commodities, data bases	Engineering, scientific and business
CHARGES					
Min. monthly charge:					
Interactive	$50	—	$100	$100	None
Remote batch	$500	$250	$100	$100	—
Terminal connect time:					
Interactive	$6.00/hr.	—	$5.00-30.00/hr.	$13-20/hr.	$6.00-10.00/hr.
Remote batch	—	$18.00/hr.	—	$12/hr.	—
Central processor time:					
Interactive	$0.16/sec.	—	$0.024-0.07/CPU	$0.30-0.367/RCU	$0.006-0.01/RAM
Remote batch	—	$2.50/hr.	$0.024-0.07/CPU	$0.15-0.30/RCU	—
Mass storage:					
Interactive	$0.25/1000 chars./month	—	$0.10-0.60/1000 chars./month	$3.50/million chars./day	$0.015/1000 chars./day less 10% connect charge
Remote batch	—	$0.05/13,030 chars./day	—	$3.50/million chars./day	
COMMENTS	Specializes in remote processing of billing, accounts receivable, sales analysis, payroll, inventory control, and accounts payable; also mfg. order processing, bill of material processing, and raw material requirements planning	Fully integrated financial packages and production planning and control packages available	Several data bases available for market statistics, stock markets, finance, economics, banking, international trade data, etc.; also offers voice response and graphic plotting	Charges shown are for B 7700 system; discounts for non-prime time	Offers simulators for plastics processing and optimization package; extruding, blow molding, injection molding; also information retrieval

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COMPANY	Scientific Time Sharing Corporation	The Service Bureau Company	Shared Medical Systems, Inc.	I.P. Sharp Associates Limited	A.O. Smith Corporation
GENERAL					
Name of service	APL*Plus	CALL/370 Management Time Sharing	Financial Management, ACTION, COMMAND	Sharp APL	Network Information Services
Date operational	Aug. 1969	1969 (CALL/360)	1969	July 1969	1969
Areas currently served	Local access in over 60 cities in the U.S., plus Canada, Mexico, Puerto Rico, Hong Kong, U.K., and several European countries	Local access in 163 U.S. & 35 International locations, including Europe, Canada, Far East, and Puerto Rico	Nationwide network excluding Hawaii	Local access in over 275 cities with 45 branch offices in Canada, U.S., Europe and Australia	Continental U.S.; international via Telenet
EQUIPMENT					
Computers	IBM 370/155 (2) in Bethesda, MD	IBM 370/158 (12), IBM 3031 (2), CDC Omega 480 (2)	IBM 370/168 (2), IBM 3033	Amdahl V6-II (2)	IBM 370/165-II, Amdahl 470/V6
No. of simultaneous users	250	Over 160/system	Over 450	250	Not specified
Conversational terminals supported	IBM 2741 & 3767 AJ 630 & 832, CDT 1030, Datamedia, DECwriter, Teleray, Tektronix 4013, etc., up to 120 cps	IBM 2741, TTY 33/35, and ASCII terminals at 10, 30, or 120 cps	IBM 3770, Digital Equipment, Four-Phase	Asynchronous units up to 1200 bps, including ASCII (i.e., AJ 832), IBM 2741 compatible Tektronix, HP CRT's, etc.	TTY 33/35, Tektronix CRT's Sycor 250, IBM 3270 & 2741, and compatible units, others
Batch terminals supported	IBM 2780/3780, HASP, & System/3; Data 100, Harris, Sycor, Four-Phase, etc.	IBM 2780/3780 or equivalent; IBM S/360 & S/370 processors	—	—	All BSC, JES II and compatible units, others on request
SOFTWARE					
Conversational programming languages	APL	FORTRAN, BASIC, PL/1, Data Management	Not applicable	APL	PL/1 & Speakeasy under TSO, FORTRAN, COBOL
Batch-mode programming languages	All System/370	FORTRAN, BASIC, PL/1, Data Management	Not applicable	APL	FORTRAN, COBOL, PL/1
Principal applications	Business, scientific, manufacturing, & financial modeling	Business & scientific	Hospital accounting, administrative, patient care, & communications	Business, scientific, financial	Manufacturing, banking (EFT), engineering, financial modeling, graphics
CHARGES					
Min. monthly charge:					
Interactive	$100	$100	—	None	None
Remote batch	—	—	—	None	None
Terminal connect time:					
Interactive	$12.00/hr. (15 cps)	$11.00-16.00M/hr.	—	$1.00/hr.	$8.00/hr.
Remote batch	$75.00/hr.	$30.00/hr. (2400 bps)	—	—	None
Central processor time:					
Interactive	$0.65/CRU	$0.18/PU	—	$0.35/CPU unit	$0.95/sec.
Remote batch	$0.65/CRU	$0.02-0.10/PU	—	$0.20/CPU unit	$0.25-0.55/sec.
Mass storage:					
Interactive	$0.30/1000 chars./month	$0.015-0.022/1000 bytes/day	—	$0.55/256K bytes/day	$0.017/1000 chars./month
Remote batch	—	$0.006/1000 bytes/day	—	$0.55/256K bytes/day	None
COMMENTS	APL*Plus File Subsystem and EMMA facilitate processing of large shared files and data bases; consulting and programming of customized applications; applications package also available for communications network analysis	Subsidiary of Control Data Corp. since January 1973; also offers TSO, RJE, On Call/Plus, remote computer service under OS/VS2 (MVS)	An integrated information system for hospitals in the areas of communications, patient care, and financial processing	Provides in-house Sharp APL software to large users, consulting and education services, and minicomputer-based systems for real-time and process control; variety of application packages, access to over 25 public data bases; consulting and educational services	Offers on-line and batch services under MUS, TSO and JES II; EFT switching network available; DOS capabilities through UCC-II/DUO; volume and non-prime time discounts available

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COMPANY	Statistical Tabulating Corporation	Structural Dynamics Research Corp.	Sun Information Services	Sun Information Services	Systems Dimensions Limited
GENERAL					
Name of service	STAT-TAB	SDRC Computer Services	INTERCOM	TSO, WYLBUR	SDL Computer Services
Date operational	Spring 1972	Jan. 1969	Sept. 1977	Sept. 1977	June 1969
Areas currently served	Continental U.S.; dial-up access at 10, 14.8, 30, 120, & 200 cps; leased lines available	Continental U.S., Canada, Europe, Japan, & U.K.	U.S.	U.S.	All major Canadian cities plus Eastern U.S.; multiplexers in Boston & New York; RJE terminals in Boston, N.Y. & Washington
EQUIPMENT					
Computers	IBM 370/158 in Chicago	See Comments	CDC Cyber 172	IBM 370/168 MP, 3033	IBM 370/168 AP & IBM 360/85 in Ottawa
No. of simultaneous users	99	See Comments	20	150	100
Conversational terminals supported	All IBM-compatible low-speed hard-copy & CRT terminals; TTY 33/35 & compatible units	TTY 33/35 and other ASCII terminals at 10, 30, or 120 cps	GE TermiNet 300, Sycor 340 & TI 725/735/745	ASCII-compatible, IBM 2741/3270	IBM 2741 and compatible units; TTY and compatible ASCII terminals
Batch terminals supported	All IBM-compatible medium-speed units	All IBM, CDC, Data 100, Harris COPE, Singer UNIVAC 9200, GA SPC-16, etc.	IBM 2780/3780 IBM HASP, Harris 1100/1600, Sycor 340, CDC 200	IBM 1130/2770/2780/ 3780/3776, 360/20/22, System/7, HASP; Data 100 70/76/78; Harris 1100/1600; PDP-11/45; Sycor 340	IBM BSC terminals and equivalents
SOFTWARE					
Conversational programming languages	CMS-supported languages, Hyperfaster	FORTRAN, BASIC	FORTRAN, BASIC	FORTRAN, COBOL	SDL/WYLBUR, SDL/APL, SDL/TSO; all batch languages in fast batch mode; SCSS
Batch-mode programming languages	FORTRAN, COBOL, PL/1, RPG, ADPAC, Assembler	FORTRAN, BASIC, COBOL, ALGOL, Assembly	FORTRAN	FORTRAN, COBOL, PL/1 BAL SIMSCRIPT 2.5	FORTRAN, SPSS, COBOL, PL/1, RPG, Mark IV, Assembler, WATFIV
Principal applications	Business & scientific	Mechanical design, structural analysis, numerical control	—	Program development	BUS., data base, stat., eng'rg., proj. mgmt., & interactive services
CHARGES					
Min. monthly charge:					
Interactive	None	None	None	None	$60
Remote batch	None	None	None	None	$60
Terminal connect time:					
Interactive	$3.50-10.00/hr.	—	$12.00/hr.	$14.00/hr.	$12.00/hr.
Remote batch	$10.00/hr.	Varies with system	$10 (2000 bps)-15/hr.	$10-15 (4800 bps)/hr.	—
Central processor time:					
Interactive	$0.10-0.20/sec.	—	$0.075/system sec.	$5.58/CWU	33.00/min.
Remote batch	$0.10-0.80/sec.	Varies with system	$0.050/sys.sec.(4800bps)	$2.48/CWU (4-hr. resp.)	22.00/min.
Mass storage:					
Interactive	$0.25/7294 bytes/week	—	$0.30 storage unit/month	$0.065/MSU/week	$2.00/million bytes/day
Remote batch	$0.25/7294 bytes/week	Varies with system	$0.30 storage unit/month	$0.065/MSU/week	$2.00/million bytes/day
COMMENTS	System runs under VM/370; emulation of any IBM software/ hardware combination is supported	Sells time on CDC, GE, and Comshare; features mechanical design and structural analysis programs			Offers on-line and batch services based upon MVS/370 & JES, plus an interactive file editor (SDL/WYLBUR) and data retrieval system (SDL/Info) Note: SDL recently merged with Datacrown, Inc.

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COMPANY	Technical Advisors, Inc.	Tel-A-Data, Inc.	Telstat Systems, Inc.	Timesharing Consultants, Inc.	Time-Sharing Resources, Inc.
GENERAL					
Name of service	TECH-MAC	Tel-A-Data	Telac I	—	TOTAL/APL
Date operational	June 1967	Dec. 1966	Jan. 1971	Aug. 1976	July 1970
Areas currently served	Continental U.S. except Alaska (toll-free except in Michigan)	State of Florida	U.S.	North America	Local access in all major U.S. metropolitan areas, plus major Canadian cities
EQUIPMENT					
Computers	Varian 622i (2), 1 in Wayne, MI. and 1 in Phoenix, AZ; plus PDP-11/70 in Wayne, MI	Burroughs B 500 & B 2800	Xerox Sigma 9, Sigma 6	DECsystem 2040, 2050	IBM 360/75 in Great Neck, NY
No. of simultaneous users	20 in Wayne, 5 in Phoenix	80	60	55	Not specified
Conversational terminals supported	TTY 33/35 & other ASCII terminals at 10 or 30 cps	TTY 35, GE Terminet Burroughs TD 830, Burroughs TC 4000, Incoterm 10/20	TTY 33/35, IBM 2741 and compatible	All ASCII	IBM 2741 & equivalent units; all ASCII terminals
Batch terminals supported	—	—	IBM HASP, IBM 2780/3780	—	IBM 2780, Data 100, & equivalent units
SOFTWARE					
Conversational programming languages	FORTRAN	BASIC, COBOL	FORTRAN, COBOL BASIC, APL	FORTRAN, COBOL, BASIC, APL, SAIL, PASCAL, SNOBOL, LISP	APL
Batch-mode programming languages	—	—	FORTRAN, COBOL,	FORTRAN, COBOL, PASCAL, SNOBOL, LISP, SAIL	FORTRAN, COBOL, BASIC, APL, PL/1, Assembler
Principal applications	Civil engineering & surveying	Business; wholesale distribution	Financial, mathematical	Engineering, accounting	Business, scientific, financial
CHARGES					
Min. monthly charge:					
Interactive	None	$1,500	Contact vendor	None	None
Remote batch	—	—	Contact vendor	None	None
Terminal connect time:					
Interactive	$10-28/hr. (10 cps)	Included	Contact vendor	$6.50-20.00/hr.	$13.00/hr.
Remote batch	$15-36/hr. (30 cps)	—	Contact vendor	$6.50-20.00/hr.	$12.00/hr.
Central processor time:					
Interactive	None	Included	Contact vendor	$0.18/second	$0.10/CRU
Remote batch	—	—	Contact vendor	$0.18/second	—
Mass storage:					
Interactive	$10.00/2000 chars./month	Included	Contact vendor	$0.08-0.12/1K chars./month	$10.00/million bytes per day
Remote batch	—	—	Contact vendor	$0.08-0.12/1K chars./month	—
COMMENTS	Offers specialized service for civil engineers and surveyors only; plotter available for $45/hour	Main emphasis is on invoicing, accounts receivable, statistical reports, and inventory control; monthly charge includes CP and connect time	Provides access to Teleprice/70 databank for automatic retrieval of securities pricing and related information; Automated Portfolio Performance Measurement Services available; GNMA full information service; contact vendor for pricing		TOTAL/APL File Subsystem facilitates processing of large shared files and data bases; also offers financial system (Insight), Econometric Modeling Language (EML), stock data base system (IMPACT), and others

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COMPANY	Tymshare, Inc.	United Computing Systems, Inc.	University Computing Company	University Computing Company	University Computing Company
GENERAL					
Name of service	TYMCOM IX, X, & 370	APEX/SL	EXEC/FASBAC	VS-370	1100/OS
Date operational	1966	Jan. 1968	1967	—	1976
Areas currently served	Local access in all major U.S. metropolitan areas, plus INWATS; local access in London, Paris, Brussels, Zurich, Stuttgart, Osaka, Tokyo, Hague, Frankfort, others	Access in 195 U.S. and 5 Canadian cities; also via Tymnet; U.K. (London data center), and Europe via FIDES network (Zurich)	U.S., Canada, Europe	Nationwide	U.S., Canada
EQUIPMENT					
Computers	Xerox 940 (22), DEC PDP-10 (12), & IBM 370/158 (8), 3031	CDC 6600 (3), CDC CYBER 174 and 175 (2), CRAY-1	Univac 1108 (4)	IBM 370/158	Univac 1108
No. of simultaneous users	1700 total	Not specified	Not specified	Not specified	Not specified
Conversational terminals supported	Any ASCII, EBCDIC, or Correspondence unit at 10, 15, 30 or 120 cps in full or half duplex mode	TTY 33 at 10, 30, 120 cps; IBM 2741; Tektronix graphics terminals	ASCII terminals at 10, 15, or 30 cps, and correspondence code	TTY at 300 bps	ASCII at 300, 1200 bps
Batch terminals supported	IBM 2780/3780 and compatible units	IBM 2780/3780, HASP, CDC 200 UT	IBM 2780, HASP, COPE, 1004	IBM 2780/3780, 3270, HASP	IBM 2780, HASP, COPE, 1004
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, PL/1, APL SAIL, FOCUS, and others	FORTRAN, BASIC, APL, PASCAL, INFORM, IFM, Editor, etc.	EDIT	—	FORTRAN, COBOL, BASIC, APL
Batch-mode programming languages	FORTRAN, BASIC, APL, COBOL, PL/1, SAIL, FOCUS, and others	FORTRAN, COBOL, BASIC, PASCAL, COMPASS, etc.	FORTRAN, COBOL, Assembler	FORTRAN, COBOL, PL/1	FORTRAN, COBOL, APL, Assembler
Principal applications	Business & scientific	Engineering, business, scientific, data base	Scientific, engineering, manufacturing	Accounting, statistical	Financial modeling, structural, data base, project mgmnt, others
CHARGES					
Min. monthly charge:					
Interactive	—	$100	$50; both batch and interactive	See Comments	$50; both batch and interactive
Remote batch	—	$100		—	
Terminal connect time:					
Interactive	$6.00-13.00/hr.	$9.75-25.50/hr.	$10.50-13.50/hr.	—	$15-20/hr.
Remote batch	—	$10.00-50.00/hr.	$20.00/hr.	—	$20/hr.
Central processor time:					
Interactive	$0.08-0.14/TRU	$0.17-0.27/SU	$1.35/1000 SRU	—	$0.90/100 SRU
Remote batch	—	$0.17-0.56/SU	$0.34-0.55/sec.	—	$0.40-0.75/100 SRU
Mass storage:					
Interactive	$0.10-0.45/1000 chars./month	$0.50/1K chars./mo. $50/200K chars./mo.	$0.75-1.25/page/mo.	—	$0.06/10,752 chars./day
Remote batch	—	$0.50/1K chars./mo. $50/200K chars./mo.	$0.20/7168 chars./day	—	$0.06/10,752 chars./day
COMMENTS	Charges shown are for DEC-10 service; connect and CPU prices vary by equipment and time of use; Tymnet subsidiary offers packet-switched, common carrier network; over 3000 employees	Provides access to the only commercially-available CRAY-1; IBM 360/50, CDC 3300 (2), CDC 3600 (4), in Boston; London Datacenter has two CDC 6500's	Service is UCC-designed with modified EXEC; unique language modifications, file handlers, and tape protection devices; photocomposition service; many exclusive applications	System charge is dependent on resource units utilized; O/S is MVS-JES II; CRJE is via ROSCOE	Multiprogramming system

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COMPANY	University Computing Company	USS Engineers and Consultants, Inc.	Wang Data Center	Warner Computer Systems, Inc.	Xerox Computer Services
GENERAL					
Name of service	NOS/BE	UEC	—	—	Interactive Accounting System
Date operational	1975	May 1970	1965	1971	1970
Areas currently served	U.S., Canada	Pittsburgh, Phila., New York, Houston, Chicago, Detroit, & 5 other cities in the Midwest	Northeastern U.S.	U.S., Canada, Mexico	California, Texas, Illinois, Wisconsin, Mid-Atlantic, New York, New England, Ohio, Northwest, Arizona
EQUIPMENT					
Computers	CDC CYBER 170/175, 6600	CDC 6500 (dual central processors), Honeywell 6800 in Pittsburgh	IBM 3033	Xerox Sigma 6, Sigma 9	Xerox Sigma 7 & 9 (16 systems) in Los Angeles
No. of simultaneous users	Not specified	Not specified	Not specified	128 per system	Over 2300 (all systems)
Conversational terminals supported	Asynchronous to 9600 bps	TTY 33/35, GE Termi-Net 300, Datapoint 3300, Syner-Data, Incoterm	All IBM compatible	Most 10 to 120 cps terminals	Xerox 1340/50, TTY, IBM 2741, Datel, Olivetti, and other ASCII-compatible units
Batch terminals supported	IBM 2780/3780, HASP, COPE, CDC 200	CDC 1700, CDC 200, IBM 1130, Incoterm	All IBM	IBM 2780/3780, HASP and compatible units	—
SOFTWARE					
Conversational programming languages	FORTRAN, COBOL	FORTRAN, COBOL, BASIC, ALGOL	COBOL, PL/1	FORTRAN, COBOL, BASIC, APL	Proprietary "Plain English" language activates standard Xerox programs
Batch-mode programming languages	FORTRAN, COBOL	FORTRAN, COBOL, BASIC, ALGOL	FORTRAN, COBOL, BASIC, RPG, PL/1	FORTRAN, COBOL, BASIC, APL	—
Principal applications	Engineering, scientific	Business & scientific	Business & scientific	Financial	Acct'g., mfg., distribution utility billing, municipal, general time-sharing
CHARGES					
Min. monthly charge: Interactive	$50	None	None	None	$1,000
Remote batch	$50	None	None	None	—
Terminal connect time: Interactive	$20/hr.	None	$4.00-8.00/hr.	$9.00-13.00/hr.	See Comments
Remote batch	$20/hr.	None	$4.00-8.00/hr.	—	—
Central processor time: Interactive	$0.35/SRU	$24.00/min.	Resource and priority based	$0.15/CPV	See Comments
Remote batch	Varies	Rates on request		$0.12/CPV	—
Mass storage: Interactive	$0.013/data unit/day	$1.00/10,000 chars./month	Priority based	$0.27-0.50/1K chars./month	See Comments
Remote batch	$0.013/data unit/day	Rates on request	Priority based	$0.27-0.50/1K chars./month	—
COMMENTS		Subsidiary of U.S. Steel Corp., lower rates for batch mode and volume usage; surcharges for certain software	Batch, WYLBUR and TSO specialty	Financially-oriented services to Fortune 1000 clients, major banks, insurance companies, brokerage firms and investment community	Offers integrated on-line accounting system; charges are based upon transactions entered, storage used, and lines printed; all programming is done by Xerox