

All About Time-Sharing and Remote Computing Services

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. 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.

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"

This comprehensive overview of the current status of the timesharing and remote computing services includes a historical perspective of the development of RCS services, a discussion of user benefits and disadvantages, the results of Datapro's latest user survey on timesharing/remote computing services, an index of application programs and user programming aids offered by various RCS vendors, a guide for selection and evaluation of remote computing services, and comparison charts for 117 commercially available remote computing services offered by 106 different vendors.

processing (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 wide- ➤



Pictured at the left is one of Xerox Computer Services' four data centers, all of which are located in the greater Los Angeles area. The centers provide a total of 23 mainframes, including Xerox Sigma 7's and 9's and IBM 3033N's, to accommodate XCS users from the United States, Canada, and Europe.

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➤ spread use for a variety of applications, including local clustered timesharing and data entry, as well as classical remote batch.

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 timesharing 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 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 comput-

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Following a trend towards providing customers with the capability to perform off-line processing locally as well as centralized processing at the data center, Computer Sciences Corporation has recently introduced its Distributed Network Service. A part of CSC's INFONET offerings, the new service includes installation of specially-configured DEC PDP 11/23's and -11/44's at the customer's site. Data base management software, FORTRAN, COBOL, and BASIC programming languages, and a utilities package are provided as off-line processing tools. All charges for DNS hardware/software are bundled into the overall INFONET service price.

➤ ing 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.

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 \$3.5 billion in 1979, and the industry's revenues are currently growing at the rate of about 22 percent per year.

Until 1973, the leading suppliers 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. Three GE "super-centers" located in Cleveland, Ohio, Rockville, Maryland, and Amsterdam, The Netherlands 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 \$500 million from data services in 1979.

Recent Development

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.

In the spring of 1978, ADP Network Services went one step further by announcing the ONSITE service, which provides a DECSYSTEM 2020 for dedicated processing power. The system may be installed either at the customer's site or at ADP's data center, and about one-third of ADP's ONSITE customers prefer the latter choice. ADP grossed \$371 million from its remote computing services in 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's Service Bureau Company, which released an IBM Series/1 system late in 1979; Tymshare, which is offering a DECSYSTEM 2020; and Computer Sciences Corporation's Infonet service, which announced support for DEC PDP-11 systems in June 1980.

Many of the large service vendors have continued their rapid growth and have consistently been in the news ➤

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▷ with announcements of increased computing hardware, enlarged areas of access, additional services and applications, etc. In this highly competitive environment, the current top contenders include Control Data, ADP, General Electric, Tymshare, McDonnell Douglas, and Computer Sciences.

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 in-house 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 time-sharing an accepted mode of operation for numerous engineers and accountants who previously resisted all efforts to get them directly involved with computers.
- *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 “head-scratching” 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 wide-spread 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 ▷

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➤ 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 one respondent to Datapro's latest survey of remote computing users rated the reliability of the services he was 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 a few 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, most timesharing services now support 30-cps interactive terminals, and many 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 previously, 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, 3 percent judged the response time to be poor and 13 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 adminis-

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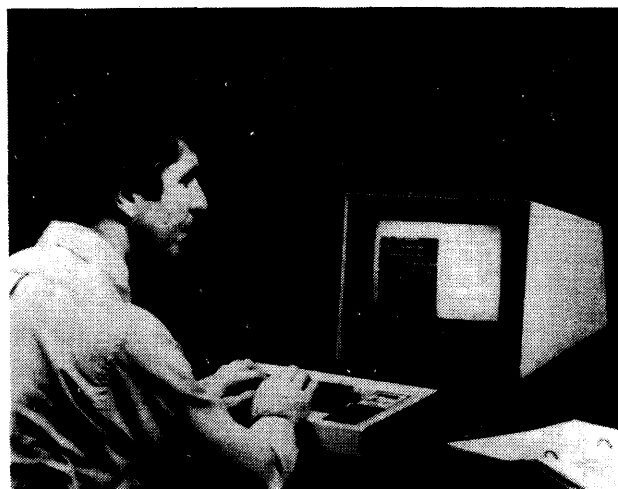
▷ tering a centralized computer facility. It can help a lot if the remote computing network requires each user to identify himself with a password and a department or project charge number.

- *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



Illustrative of the wide variety of applications packages available through remote computing services, Tymshare's new AUGMENT office automation service provides fully integrated word, text, and file processing capabilities. The AUGMENT service can be accessed by most ASCII terminals, as well as by Tymshare's own terminals, via Tymshare's Tymnet packet-switched network or via the federal government's ARPANET network.

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 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.

Although 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. In fact, 1979 figures showed that for the first time, revenues for general business and administrative remote computing services have exceeded those from scientific and engineering applications. However, the rate of acceptance has been well below the early predictions. The prognosticators apparently overlooked—or underestimated 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 ready-made 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 ▷

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▷ 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).
- 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 mini-computers 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▷

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▷ 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 May 1980 supplement to DATAPRO REPORTS ON DATA COMMUNICATIONS and the June 1980 supplement to DATAPRO 70, a questionnaire was included which solicited user experience and ratings with remote computing and timesharing services. By the cut-off date of June 23, 72 useable responses had been received, with 112 ratings of remote computing services. Forty of the users were using more than one service, and provided separate ratings for each.

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 \$5 million	7	11
Between \$5 million and \$50 million	14	22
Between \$50 million and \$100 million	5	8
Between \$100 million and \$500 million	18	28
Over \$500 million	20	31
Total number of users responding to this question	64	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	14	20
Some in-house facilities	16	22
Extensive in-house facilities	42	58
Total number of users responding	72	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	19	34
Planned an increase	24	43
Planned a decrease	13	23
Total number of users responding	56	100
In-house plans:		
Planned to move some applications in-house	18	32
Planned to move all applications in-house	10	18
Total number of users responding	28	50

In the above tables, the first question was completely definitive; therefore, the actual number of users 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	Cost	3.264
•	Accessibility	3.424
•	Application packages	3.656
•	Response time	3.820
•	Technical support	4.161
•	Data security	5.119
•	Control procedures	5.477
Least important	Proprietary data files	5.735

*Calculated on a scale of 1 to 8 by assigning a numerical value of 1.0 to most important, 2.0 to next most important, and so on. Totals were then divided by the number of responses per criteria.

It is interesting to note that most users considered cost and accessibility 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 ▷

USERS' RATINGS OF REMOTE COMPUTING SERVICES

Company	Number of User Responses	Weighted Averages and Response Counts*																																		
		Overall Satisfaction					Response Time					Up Time					Operating Instructions 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	5	3.4	3	1	1	0	3.2	2	2	1	0	3.6	3	2	0	0	2.8	1	3	0	1	3.0	1	2	1	0	3.0	1	3	1	0	2.8	1	2	2	0
Avco Computer Services	3	3.7	2	1	0	0	3.7	2	1	0	0	3.7	2	1	0	0	**	0	1	1	0	3.3	1	2	0	0	2.7	1	1	0	1	3.0	1	1	1	0
Boeing Computer Services Co.	5	3.6	3	2	0	0	3.8	4	1	0	0	3.8	4	1	0	0	3.6	3	2	0	0	3.6	3	2	0	0	3.6	3	2	0	0	3.6	3	2	0	0
Computer Sciences Corp.	3	3.0	0	3	0	0	3.0	0	3	0	0	3.3	1	2	0	0	2.7	0	2	1	0	**	0	2	0	0	**	0	1	0	0	3.3	1	2	0	0
Comshare, Inc.	6	3.5	3	3	0	0	3.5	3	3	0	0	3.3	2	4	0	0	2.8	0	5	1	0	2.7	0	4	2	0	3.4	2	3	0	0	3.0	2	2	2	0
Control Data Corp. (Cybernet)	3	3.0	1	1	1	0	2.7	1	1	0	1	3.3	1	2	0	0	3.0	1	1	1	0	**	1	0	1	0	3.3	1	2	0	0	2.7	1	1	0	1
General Electric Co.	12	3.1	3	7	2	0	3.2	4	7	0	1	3.6	7	5	0	0	2.8	2	6	4	0	3.2	3	7	1	0	3.0	2	6	2	0	2.8	1	7	4	0
Interactive Data Corp.	3	3.0	1	1	1	0	2.7	0	2	1	0	3.3	2	0	1	0	2.7	0	2	1	0	**	0	1	1	0	3.0	1	1	1	0	2.7	0	2	1	0
McDonnell Douglas Automation Co.	3	2.7	0	2	1	0	3.0	1	1	1	0	3.0	1	1	1	0	3.0	1	1	1	0	**	0	1	1	0	3.3	1	2	0	0	3.0	2	0	0	1
National CSS, Inc.	7	3.3	3	3	1	0	3.3	3	3	1	0	3.6	4	3	0	0	2.8	2	4	0	0	2.8	2	4	0	0	3.4	3	4	0	0	3.3	3	3	1	0
Optimum Systems, Inc.	3	3.0	1	1	1	0	3.7	2	1	0	0	3.3	2	0	1	0	2.3	0	1	2	0	3.3	1	2	0	0	**	0	2	0	0	2.7	1	0	2	0
STSC, Inc.	3	3.7	2	1	0	0	3.7	2	1	0	0	4.0	3	0	0	0	3.0	1	1	1	0	3.3	1	2	0	0	3.0	1	1	1	0	3.0	1	1	1	0
The Service Bureau Company	15	3.2	5	9	0	1	3.1	2	12	1	0	3.5	7	8	0	0	3.1	2	12	1	0	2.9	1	10	2	0	2.9	1	10	3	0	2.6	1	8	3	2
Tymshare, Inc.	3	3.3	1	2	0	0	3.0	1	1	1	0	3.3	1	2	0	0	2.7	0	2	1	0	3.3	1	2	0	0	3.3	2	0	1	0	2.7	1	0	2	0
United Computing Systems, Inc.	9	3.0	0	9	0	0	3.1	1	8	0	0	3.0	1	7	1	0	2.9	1	6	2	0	3.0	2	4	2	0	3.2	3	5	1	0	2.9	1	7	0	1
All Others	29	2.9	4	19	6	0	2.9	7	12	8	1	3.0	7	15	6	1	2.7	4	13	10	2	3.3	8	13	2	0	3.1	9	12	5	1	3.0	11	7	10	1
GRAND TOTALS	112	3.1	32	65	14	1	3.1	35	59	14	3	3.3	48	53	10	1	2.9	18	62	28	3	3.1	25	58	13	0	3.1	31	55	15	2	2.9	31	45	29	6

*Response counts summarize the number of users responding Excellent (E), Good (G), Fair (F), and Poor (P) for each category. The Weighted Averages (WA) are calculated by assigning a value of 4 to each Excellent, 3 to Good, 2 to Fair, and 1 to Poor.

**The Weighted Average is considered invalid if based on fewer than three responses.

➤ 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. A summary of the responses to the specific questions follows.

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	6	6
Between 6 months and 2 years	27	26
Between 2 years and 5 years	38	36
Over 5 years	34	32
Total number of user responses	105	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	42	38
Distribution	8	7
Engineering	39	35
Manufacturing	16	14
Personnel	6	5
Research and Development	31	28
Sales/Marketing	34	30
Financial Planning/Budgeting	7	6
Actuarial/Insurance	5	4
Other	16	14

The total number of user responses (112) 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 ➤

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▷ computing services, we elected to ask about terminal characteristics. The results are summarized below:

	User Responses	
	Number	Percent
Terminal characteristics:		
Interactive	86	77
Character printer	80	71
CRT	37	33
Batch	34	30
Line printer	32	29
Programmable	15	13

Again, the total number of user responses (112) 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. Nearly everybody uses interactive terminals, about one-third 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:

	User Responses	
	Number	Percent
Users with 1 terminal	28	27
Users with 2 terminals	17	16
Users with 3 terminals	15	15
Subtotal	60	58
Users with 4 or 5 terminals	15	15
Users with from 6 to 9 terminals	7	7
Users with from 10 to 15 terminals	12	12
Users with from 16 to 50 terminals	4	4
Users with 50 or more terminals	4	4
Total number of user responses	102	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 had over 15. With this in mind, we can readily see that the average number of terminals per user, 9.2, 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	
	Number	Percent
Access method:		
Dial-up (DDD)	102	91
Leased voice-grade line	14	13
DDS (AT&T digital service)	7	6
Packet switched service	2	2

The percentages are based on a total number of 112 user 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	
	Number	Percent
Total remote computing vendor bill:		
Under \$500/mo.	21	19
Between \$500 and \$2,000/mo.	33	30
Between \$2,000 and \$5,000/mo.	24	22
Between \$5,000 and \$10,000/mo.	14	13
Over \$10,000/mo.	18	16
Total number of user responses	110	100
Terminal cost:		
Under \$500/mo.	59	57
Between \$500 and \$2,000/mo.	32	31
Between \$2,000 and \$5,000/mo.	10	9
Over \$5,000/mo.	2	2
None	1	1
Total number of user responses	104	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:

	User Responses	
	Number	Percent
Vendor-maintained data bases:		
No	69	63
Yes	41	37
Total number of user responses	110	100

The 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 ▷

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▷ 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 special time requirements that must be met. Finally, determine the present overall cost of 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 list is to find out which remote computing companies are actively marketing their services in your area. Collect the basic information about their capabilities, specialties, and pricing. The company 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 of any acquaintances who are using remote computing. The salesmen for the various 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

4. *Choose the most likely candidates.* Now it's time to reduce the list of contenders to three to six that seem best able to meet your requirements. This can usually be accomplished by a selection "weeding out" process. You simply eliminate 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 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 applications 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 able to meet your requirements for operational reliability and data security?
- Are you satisfied that the company is soundly financed and in the business long?

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, specialties, and pricing. By now you'll have a good idea of what questions to

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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

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▷ 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 117 services from over 106 vendors are presented in the following section. All information in the following charts was furnished by the suppliers between May and June 1980. Their responsiveness and cooperation with the Datapro staff is greatly appreciated.

Datapro sent repeated 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 different 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 ▷

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▷ 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. Examples include the GE TerminiNet 300 and 1200, Texas Instruments Silent 700 Series, and Digital Equipment DEC-writers, plus CRT display terminals such as the Hazeltine 1400 and 1500 series, the ADDS Consul and Regent 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 Transceiver, and several other companies.

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 of 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 \$1,000 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, Northern Telecom, Harris, and Mohawk, can emulate the functions of the IBM 2780/3780 and other popular batch terminals.

Many of the remote computing companies also support the use of small computers, such as the Digital Equipment PDP-11, Data General Nova and Eclipse, 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.

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. ▷

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➤ 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, PASCAL, and PL/I, 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 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 C51-010-107 and -108 show which of 25 groups of applications are available from each of the remote computing companies. In addition, the charts indicate what level of support for user program development is available from the vendor.

Charges

One of the most complex and confusing aspects of the current remote computing scene is the pricing of the ser- ➤

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▷ vices. 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.

Remote Computing Suppliers

Listed below, for your convenience in obtaining additional information, are the headquarters addresses and telephone numbers of the 106 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, Inc., 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. P.O. Box 1260, Old Forest Road, Lynchburg, Virginia 24505. Telephone (804) 384-5111.

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

Bowne Information Systems. 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.

Citibank N.A., 153 East 53rd Street, CCC/6/2, New York, New York 10043. Telephone (212) 559-3636.

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

Compudial, Inc., 2 Keystone Avenue, Cherry Hill, New Jersey 08003. Telephone (609) 424-4700.

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

Computel Systems Limited. Place de Ville, 14th Floor, Tower B, 112 Kent Street, Ottawa, Ontario K1P 5P2. Telephone (613) 238-6061. ▷

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- ▷ **The Computer Company, Inc.**, 1905 Westmoreland Street, Richmond, Virginia 23230. Telephone (804) 358-2171.
- Computer Innovations**, 55 East Jackson Boulevard, Suite 1616, Chicago, Illinois 60604. Telephone (312) 663-5930.
- Computer Network Corporation**, 5185 MacArthur Boulevard N.W., Washington, D.C. 20016. Telephone (202) 537-2500.
- Computer Research Company**, 200 North Michigan Avenue, Chicago, Illinois 60601. Telephone (312) 977-7500.
- Computer Resource Services, Inc.**, 6501 North Black Canyon, Phoenix, Arizona 85015. Telephone (602) 242-9121.
- Computer Sciences Canada, Ltd.**, Suite 367, Place du Canada, Montreal, Quebec H3B 2N8. Telephone (514) 878-9811.
- Computer Sciences Corporation**, 650 North Sepulveda Boulevard, El Segundo, California 90245. Telephone (213) 322-6204.
- Computer Sciences Corporation, Business Services Division (formerly a division of ITEL Corporation)**, 6701 South Sepulveda Boulevard, Los Angeles, California 90045. Telephone (213) 649-2660.
- Computer Sharing Services, Inc.**, 2498 West Second Avenue, Denver, Colorado 80223. Telephone (303) 934-2381.
- Computer Usage Company**, 141 Battery Street, San Francisco, California 94111. Telephone (514) 543-3940.
- Computone Systems, Inc.**, One Dunwoody Park, Atlanta, Georgia 30338. Telephone (404) 393-3010.
- Comshare, Incorporated**, P.O. Box 1588, 3001 South 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 Systems**, 7700 Edgewater Drive, Oakland, California 94621. Telephone (415) 635-5750.
- Control Data Corporation**, Cybernet Services, P.O. Box O, Minneapolis, Minnesota 55440. Telephone (612) 853-8100.
- CSG—Keydata Division (formerly Keydata Canada)**, 885 Don Mills Road, Don Mills, Ontario M3C 3H1. Telephone (416) 443-6800.
- CSG—Multiple Access Division (formerly Multiple Access, Limited)**, 885 Don Mills Road, Don Mills, Ontario M3C 3H1. Telephone (416) 443-3900.
- CSG—Processing Services**, 2599 Speakman Drive, Mississauga, Ontario M4Y 1K7. Telephone (416) 822-5000.
- 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, Room 400, Philadelphia, Pennsylvania 19107. Telephone (215) 564-4133.
- Datacrown, Inc.**, 650 McNicoll Avenue, Willowdale, Ontario M2H 2E1. Telephone (416) 499-1012.
- Dataline Systems Limited**, 175 Bedford 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 Corporation (formerly Chi)**, 21111 Chagrin Boulevard, Beachwood, Ohio 44122. Telephone (216) 991-9000.
- Financial Data Systems, Inc.**, 763 New Ballas Road South, St. Louis, Missouri 63141. Telephone (314) 567-1940.
- 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, P.O. 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.**, DATANETWORK MN12-1124, Honeywell Plaza, Minneapolis, Minnesota 55408. Telephone (612) 870-6000.
- Informatics, Inc., Data Services Operations**, 6 Kingsbridge Road, Fairfield, New Jersey 07006. Telephone (201) 575-2800.
- Information Consultants, Inc. (ICI)**, 1012 Twentieth Street N.W., Washington, D.C. 20036. Telephone (202) 785-0115.
- Information Science, Incorporated**, 95 Chestnut Ridge Road, Montvale, New Jersey 07645. Telephone (201) 391-1600.
- Information Systems Design, Inc.**, 2500 Mission College Boulevard, Santa Clara, California 95054. Telephone (408) 727-8100.
- Intelligent Systems Corporation of Massachusetts**, #6 DeAngelo Drive, Bedford, Massachusetts 01730. Telephone (617) 275-6642.
- Interactive Data Corporation**, 486 Totten Pond Road, Waltham, Massachusetts 02154. Telephone (617) 890-1234.
- Interactive Market Systems, Incorporated**, 19 West 44th Street, New York, New York 10109. Telephone (212) 869-8810.
- Interactive Sciences Corporation**, 60 Brooks Drive, Braintree, Massachusetts 02184. Telephone (617) 848-2660.
- ITEL Corporation**: See Computer Sciences Corporation, Business Services Division.
- Keydata Canada**: See CSG—Keydata Division.
- Keydata Corporation**, 20 William Street, Wellesley, Massachusetts 02181. Telephone (617) 237-6930.
- Litton Computer Services, Litton Systems, Inc.**, 1831 Michael Faraday Drive, Reston, Virginia 22090. Telephone (703) 471-9200.
- Litton Mellonics Information Center**, 6701 Variel Avenue, Canoga Park, California 91303. Telephone (213) 887-5100.
- Lockheed Information Systems**, 3460 Hillview Avenue, Palo Alto, California 94304. Telephone (415) 858-2700.
- Management Concepts, Inc.**, #8 Executive Park West, Atlanta, Georgia 30329. Telephone (404) 321-0140 ▷

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What might appear to some readers as a modern-decor resting place for weary computer operators is actually the cylindrical central processing unit of the CRAY-1 SuperComputer that operates in the United Computing Center's Kansas City, Missouri, data center. It serves to remind you of the selection of data processing equipment available through the computing services marketplace itself. The marketplace is as broad as the DP services offered, that within the wide variety of services available, there is at least one that fits your requirements. By the way, the machine conceals part of the system's cooling system, and, yes, you can sit on it.

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

Martin Marietta Systems, 300 East Joppa Road, Baltimore, Maryland 21204. Telephone (301) 321-5744.

McDonnell Douglas Automation Company (McAuto), P.O. Box 516, St. Louis, Missouri 63166. Telephone (314) 232-8021.

Mellonics Information Center, Litton Systems, Inc.: See Litton Information Center.

Metridata Computer Inc.: See Sun Information Services of Kentucky.

Multiple Access Division: See CSG—Multiple Access Division.

Multiple Access Division of CSG, 1010 Westwood Boulevard, Los Angeles, California. Telephone (213) 474-6565.

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

National CSS, Inc., 87 Danbury Road, Wilton, Connecticut 06897. Telephone (203) 762-2511.

Newfoundland and Labrador Computer Service, P.O. Box 9308, 40 Higgins Line, St. John's, Newfoundland A1A 2Y3. Telephone (709) 737-6100.

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

Ohio Valley Data Control, Inc., 2505 Washington Boulevard, 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, Incorporated, 2801 Northwestern Parkway, Santa Clara, California 95051. Telephone (408) 987-4444.

Pacific Applied Systems Division, System Development Corp.: See System Development Corporation.

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., 2460 West 26th Avenue, Suite 136C, 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 48034. 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.

Ross Systems, Inc., 1900 Embarcadero Road, Palo Alto, California 94303. Telephone (415) 856-1100.

Rotelcom Data, Inc., 67 Chestnut Street, Suite 450, Rochester, New York 14604. Telephone (716) 546-5060.

Scientific Computers, Inc., 10101 Bren Road East, Minnetonka, Minnesota 55343. Telephone (612) 933-4200.

Scientific Process & Research, Inc., 400 Cleveland Avenue, P.O. Box 1268, Highland Park, New Jersey 08904. Telephone (201) 846-3477.

Scientific Time Sharing Corporation: See STSC, Inc.

The Service Bureau Company, a subsidiary of Control Data, 500 West Putnam Avenue, Greenwich, Connecticut 06830. Telephone (203) 622-2044.

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

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

A.O. Smith Corporation—Data Systems, 8901 North Kildeer Court, Brown Deer, Wisconsin 53209. Telephone (414) 449-2900.

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

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▷ **STSC, Inc. (formerly Scientific Time Sharing Corporation)**, 7316 Wisconsin Avenue, Bethesda, Maryland 20014. Telephone (301) 657-8220.

Sun Information Services Company, 656 Swedesford Road, Building 6, Wayne, Pennsylvania 19087. Telephone (215) 293-8000.

Sun Information Services of Kentucky (formerly Metridata Computing, Inc.), P.O. Box 21099, Louisville, Kentucky 40221. Telephone (502) 361-7161.

System Development Corporation, 2500 Colorado Avenue, Santa Monica, California 90406. Telephone (213) 820-4111.

Systems Dimensions Limited: See Datacrown, Inc.

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.

Teledata, Inc., P.O. Box 364, Hanover, New Hampshire 03755. Telephone (603) 448-5005.

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

Timesharing Consultants, Inc., 6420 East Broadway, Suite C300, Tucson, Arizona 85710. Telephone (602) 745-2060.

Time Sharing Resources, Inc., 777 Northern Boulevard, Great Neck, New York 11021. Telephone (516) 487-0101.

Tymshare, Inc., 20705 Valley Green Drive, Cupertino, California 95014. Telephone (408) 446-6000.

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, Room 3383, Pittsburgh, Pennsylvania 15230. Telephone (412) 433-7456.

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 10158. Telephone (212) 697-0110.

Western New York Computing Systems, Inc., 2129 Five Mile Line Road, P.O. Box 56, Penfield, New York 14526. Telephone (716) 381-4120.

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.	Avco Computer Services	Babcock and Wilcox Company
GENERAL					
Name of service	Remote Computing Services	ADP Onsite Service	Computer Services	Avco Timesharing, Avco Interact, Avco Batch	B & W Computer Services
Date operational	July 1969	1978	December 1969	May 1973 (Timesh., Batch); May 1980 (Inrct)	1971
Areas currently served	Worldwide	United States, England, Western Europe, Canada	Wash. DC area, other US and int'l. via Telenet	Continental US, Alaska, Canada, and international cities served by Telenet	US, Canada, Japan, Germany
EQUIPMENT					
Computers	DECsystem-10s in Ann Arbor, MI, Waltham, MA, and London, England	DEC 2020s	HP 3000 II	IBM 370/158 and IBM 3033 in Wilmington, MA	CDC CYBER 73 and 76 in Lynchburg, VA; CYBER 750 to be operational in August, 1980
No. of simultaneous users	3000	32 per system	64	350 (Timesh., Interact); 110 (Batch)	128
Conversational terminals supported	All async 110, 300 and 1200 bps terminals and other graphic terminals	All async 110, 300 and 1200 bps terminals and other graphic terminals	All ASCII terminals at 300 or 1200 bps	TTY 33/35, IBM 2741 and compatible	All ASCII terminals At 300 or 1200 bps
Batch terminals supported	IBM 2780/3780 and compatible bisync. terminals	IBM 2780/3780 and compatible bisync. terminals	All ASCII terminals at 300 or 1200 bps	IBM 2780/3780, 1130, 360/20 HASP workstations and compatible	IBM HASP, 2780, 3780; CDC 200 UT
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, MACRO 10	FORTRAN, BASIC, APL, COBOL, MACRO 10, PASCAL	FORTRAN, COBOL, SPL, PASCAL	FORTRAN, BASIC, COBOL	FORTRAN, BASIC, COBOL, PASCAL, COMPASS
Batch-mode programming languages	FORTRAN, COBOL, BASIC	FORTRAN, BASIC, APL, COBOL, MACRO 10, PASCAL	FORTRAN, COBOL, SPL	FORTRAN, COBOL, PL/1, Assembler, RPG	FORTRAN, BASIC, COBOL, PASCAL, COMPASS
Principal applications	Business, finan. mgt., statistical analysis, banking, international network applications, etc.	Business, finan. mgt., statistical analysis, banking, international network applications, etc.	Business, engineering, scientific, legal, architectural, educational	Business, scientific, engineering, & financial modelling	Engineering, scientific, mathematical
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	\$5.00-35.00/hr.	\$6.00/Connect Time hr.	\$5.50-10.00/hr.
Remote batch	None	None	\$5.00-35.00/hr.	\$10.00-28.00/hr.	\$15.00/hr.
Central processor time:					
Interactive	\$0.022/CRU	None	\$0.06-0.08/CPU sec.	(location dependent)	\$0.15/conversation sec.
Remote batch	\$0.011-0.02/CRU*	None	\$0.04-0.08/CPU sec.	\$380-1600/ACU hr.	\$0.09-0.12/system sec.*
Mass storage:					
Interactive	\$0.06-0.75/1000 chars./month	None	\$16.00/256K bytes/mo.	\$0.03/track/day	\$0.003/640 chars./day
Remote batch	\$0.06-0.75/1000 chars./month	None	\$16.00/256K bytes/mo.	\$0.03/track/day	\$0.003/640 chars./day
COMMENTS					
	ADPNS provides software pkgs. & sophisticated tools for easy implementation and maintenance of client applications. Services include client training, documentation, and technical support from field offices in North America & Western Europe. ADPNS is a division of Automatic Data Processing, Inc. *CRU (Computer Resource Unit) is a function of CPU time and memory resources used.	ADP/Onsite Service places a full-scale time-shared computing system on the client's premises. Services include systems & applications software and technical support. ADP/Onsite consolidates the client's timesharing into one system, often at a dramatic savings in cost.	Provides general computing services plus specialty services for interactive creation of line, bar, pie, or word charts (Presentation Graphics), DBMS & word processing packages for legal and related professions (LAWDATA), and piping and hydraulic design and analysis; WP 3000 Word Processing software interfaces with HP's DBMS, IMAGE/QUERY	Provides interactive TSO and batch on hosts operating MUS/JES 2	Specialty is nuclear and structural engineering and mathematics; conversational and batch mode services provided via CYBER 73 under NOS/BE op. sys.; batch mode services provided via CYBER 76 under SCOPE2 op. sys.; conversational and batch mode services via CYBER 750 under NOS op. sys. to be operational in August 1980. *For CYBER 73 services \$0.60-1.00/SRU for CYBER 76 services.

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COMPANY	Boeing Computer Services Co.	Boeing Computer Services Co.	Boeing Computer Services, Co.	Bowne Information Systems	Burroughs Corporation
GENERAL					
Name of service	MAINSTREAM—CTS	MAINSTREAM—TSO	MAINSTREAM—EKS	Bowne Information Systems	NYC Data Center
Date operational	May 1970	Feb. 1973	Jan. 1975	Nov. 1969	1971
Areas currently served	Continental US, (including Alaska) and Canada via nationwide data communications network; also Great Britain	Continental US, (including Alaska) and Canada via nationwide data communications network; also Great Britain	Continental US, (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	Continental US; worldwide via communications network
EQUIPMENT					
Computers	IBM 3033 in Vienna, VA	IBM 3033 in Vienna, VA	Cyber 175 (6), IBM 3031 in Seattle	IBM 370/155 (2), IBM 4300 in New York City	Burroughs B 6700, B 6800 in New York City
No. of simultaneous users	250	120	384	300	150
Conversational terminals supported	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	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; Xerox, Lanier, CPT, Lexitron, etc.	All TTY-compatible at up to 1200 bps
Batch terminals supported	IBM 2780, 3780, 360/20, 1130, or any other HASP RJE terminal	IBM 2780, 3780, 360/20 1130, or any other HASP RJE terminal	COPE, HASP, IBM 2780/3780, CDC 200 UT	—	Burroughs B 80, B 800, B 1800, IBM 2780
SOFTWARE					
Conversational programming languages	FORTRAN, ALGOL, COBOL, PL/1, VSAPL, Assembler, BASIC	FORTRAN, COBOL, PL/1, Assembler	FORTRAN, COBOL, BASIC, APL, Compass, Simscript, SPSS, System 2000	Proprietary languages designed for application specialties	BASIC, APL, COBOL, FORTRAN
Batch-mode programming languages	FORTRAN, VSAPL, COBOL, PL/1, BASIC	FORTRAN, COBOL, PL/1, Assembler	FORTRAN, COBOL, APL, Compass, Simscript, SPSS	—	FORTRAN, COBOL, ALGOL, PL1
Principal applications	Business, finance & data base management	Business & data base management	Engineering, scientific, & data base management	Records mgt., text proc., photocomposition, and correspondence services for engineering, legal and other applications	Business and scientific, word processing
CHARGES					
Min. monthly charge:					
Interactive	None	None	None	\$150-300	None
Remote batch	None	None	None	—	None
Terminal connect time:					
Interactive	\$8.00-12.00/hr.	\$8.00-12.00/hr.	\$8.50-13.00/hr.	\$3.45-5.80/hr.	\$11.50/hr.
Remote batch	\$15.00-17.00/hr.	\$15.00-17.00/hr.	\$14.00-16.00/hr.	—	\$11.50/hr.
Central processor time:					
Interactive	\$0.08-0.16/sec.	\$0.20/CCU	\$0.20/CCU	\$0.01/Proc. Unit	\$0.38/sec.
Remote batch	\$0.16/sec.	\$0.20/CCU	\$0.024-0.125/CCU	—	\$0.38/sec.
Mass storage:					
Interactive	\$0.0061/1K chars./day	\$0.05-0.06/track/day	\$0.0015-0.0070/640 char./day	\$0.28/1550 chars./month	\$0.02/1K char./day
Remote batch	Same	Same	Same	—	\$0.02/1K char./day
COMMENTS					
	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)	Offers both interactive time-sharing and remote job entry to multiple mainframes, with access to the same files in either mode	Service specialties include Word/One (text editing, photocomposition), PhotoComp (typesetting), MailPac (name/address and letter service), COMSPEC (engineering specification production), and KeySearch (records mgt. service with special applications for litigation support)	Page printer service now available on Burroughs B9270 laser printer

All About Time-Sharing and Remote Computing Services

COMPANY	Citibank, N.A.	Community Computer Corporation	Compudial, Inc.	CompuServe Inc.	Computel Systems Limited
GENERAL Name of service	Citishare	—	Compudial	—	Time Shared Processing
Date operational	Jan. 1977	Jan. 1969	1967	May 1970	1968
Areas currently served	Continental U.S. and Canada; limited access overseas	Delaware Valley	Mid-Atlantic States	Nationwide	Canada from offices in Victoria, Vancouver, Edmonton, Calgary, Winnipeg, Ottawa, Tor- onto, Montreal, Quebec, & Halifax; also Miami and Saudi Arabia
EQUIPMENT Computers	DECSYSTEM-10(2) and DECSYSTEM-20(2)	HP 2116B(3) in Philadelphia	NCR 201 (2)	DECSYSTEM-10&-20(17) Columbus, OH	IBM 370/168(2), IBM 3033, IBM 370/158, Univac 1100 & HP 3000 (5) in Ottawa; B 4700(2) in Miami; IBM 360/30 (3) in Toronto 135 at 300 bps
No. of simultaneous users	200	48	250	2000	
Conversational ter- minals 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: IBM 2741- and Teletype-compatibles; Univac: Teletype- compatibles
Batch terminals supported	IBM 2780/3780 and compatible	—	—	IBM 2780	IBM: IBM 360/20, 3780, 2780, 2770, 3741, 3770; Univac: IBM 360/20, 2780, 3780, Univac 1004, DCT 2000, NTR 9000
SOFTWARE Conversational pro- gramming languages	FORTRAN, COBOL, BASIC, APL, Assembler	BASIC	NEAT 3, COBOL	FORTRAN, BASIC, COBOL, APL, MACRO- 10	FORTRAN, COBOL, APL, BASIC; Univac Demand & CITS; IBM TSO, TSO/ SPF, Roscoe; HP MPE/III
Batch-mode program- ming languages	FORTRAN, COBOL, BASIC, APL, Assembler	—	—	FORTRAN, BASIC, COBOL, Macro-10	FORTRAN, COBOL, PL/1, ALGOL, RPG, Assembler, Mark IV
Principal applications	Business & financial	Business & scientific	Business	Business & scientific	Accounting/financial, econometrics, engi- neering, mathematics/ statistics, etc.
CHARGES Min. monthly charge: Interactive	\$250/mo.	None	None	\$100/mo.	\$100
Remote batch	\$250/mo.	—	—	—	\$100
Terminal connect time: Interactive	\$7.50-12.00/hr. (prime)	\$10.00/hr	None	\$10.00-30.00/hr.	\$3.00 min. (IBM)
Remote batch	\$3.00/hr. (prime)	—	—	\$40.00-50.00/hr.	\$3.00 min. (IBM)
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	\$20.00/volume/day
Remote batch	\$0.02/day/disk page	—	—	\$0.052/3200 char./day	\$20.00/volume/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 Mon- day through Friday; one disk page equals 2560 characters, or any part thereof, on a per-file basis; extensive financial data bases available	Storage beyond 80,000 characters is priced at \$0.05/160 chars./month	Costs are on a per- transaction/file storage basis; volume and commitment discounts are available	High-speed plotting available; volume and commitment discounts available; CompuStat and TELSTAT data bases offered	Prices vary with com- puter and software sys- tem used; volume and commitment discounts are available; MVS/ JES3, ADABAS, S2000, EASYTRIEVE, CARMIS (project management) software available

All About Time-Sharing and Remote Computing Services

COMPANY	The Computer Company	Computer Innovations	Computer Network Corp. (COMNET)	Computer Research Company	Computer Resource Services, Inc.
GENERAL					
Name of service	Action/APLSV	PCS/TEXT and Computernet	ALPHA	Remote Computing Services	CRS
Date operational	Oct. 1969	June 1969	Dec. 1967	1968	1969
Areas currently served	U.S., Canada, Mexico, France, Belgium & Switzerland	U.S.; Europe	Continental U.S. via national network access; local dial-up access in the Washington area	Nationwide; primarily Mid-West	Phoenix, Tucson, San Antonio areas
EQUIPMENT					
Computers	Several IBM 370/158s	IBM 370/158, IBM 3031	Itel AS/6, IBM 370/158(3), Itel AS/5 (2), IBM 370/168(1), IBM 3032	Amdahl 470/V8 (2) in Chicago, IL	HP 2000 (5) in Phoenix, AZ
No. of simultaneous users	80-100	Not specified	150	160	32
Conversational terminals supported	IBM 2741, CMC 2260, 2265, Memorex 3270, Tektronix, TI 700 & 800, ASCII at 10, 15, 30 and 120 cps	Most hardcopy and video terminals at 15, 30, and 120 cps	IBM 2741, TTY 33/35, and compatible units at 10 to 120 cps	IBM 3270, TTY, Tektronics up to 9600 bps	Any ASCII or Correspondence Code terminal at 10 to 30 cps
Batch terminals supported	IBM 2780/3780, HASP and compatible units	IBM 2780/3780, HASP, 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, ADS, XPERT	APL, PCS/TEXT	All OS/MVT, MVS, TSO, WYLBUR languages	FORTRAN, COBOL, COBOL/VS, PL/1, Assembler, BASIC	BASIC
Batch-mode programming languages	FORTRAN, COBOL, APL	FORTRAN, COBOL, PL/1, Assembler, PCS/TEXT	All OS/MVT, MVS languages	FORTRAN, COBOL, PL/1, RPG	—
Principal applications	Business & scientific, many specialized	Statistics, engineering, DBMS, financial modeling, publication production	Business, scientific, & engineering	Business, scientific, engineering, banking	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	None	\$300/mo.	None	None	50
Remote batch	None	\$300/mo.	None	None	—
Terminal connect time:					
Interactive	\$13.44-23.52/hr.	\$4.05-22.50/hr.	\$12/hr. (10-120 cps)	\$7.50/hr.	\$10-15/hr.
Remote batch	—	\$11.00/hr.	\$0.50/1000 cards or lines	—	—
Central processor time:					
Interactive	\$0.65/CRU*	\$0.005-0.0107/CRU*	\$0.20/CUU*	\$0.15/CPU sec.	None
Remote batch	\$0.65/CRU*	\$11.00*/proc. unit	\$0.20/CUU*	\$0.10/CPU sec.	—
Mass storage:					
Interactive	\$12.32/million bytes/day	\$0.0107/1000 chars./day	\$2.00/13,030 chars./month	See comments	\$0.060/1024 chars./month
Remote batch	—	\$0.01/track/day	\$2.00/13,030 chars./month	See comments	—
COMMENTS					
	Offers shared files and data base applications, specialized data bases, RJE, consulting, systems design, & contract programming *CRU (Computer Resource Unit) is based on an algorithm of resource usage	Affiliated with Proprietary Computer Systems, Inc.; Computernet can mix batch and interactive, APL and TEXT	Offers nationwide OS/MVT, MVS-compatible time-sharing services and remote job entry over a wide range of service times, terminal speeds, and charges *CUU—Computer Utilization Unit	Emulates DOS; also offers Mark IV, TSO, ATS, CICS, IMS, Panvalet, and HASP/RJE; banking and engineering services; mass storage charges are \$1.35/week/cylinder or \$0.020/day/cylinder for casual users; users can also rent dedicated disk drives for \$550/mo. (Model 3330) or \$1,100/mo. (Model 3350)	\$100 initiation fee; licenses available in other cities

All About Time-Sharing and Remote Computing Services

COMPANY	Computer Sciences Canada, Ltd.	Computer Sciences Corporation	Computer Sciences Corporation, Business Services Division	Computer Sharing Services, Inc.	Computer Usage Company
GENERAL					
Name of service	CSTS	CSTS/CSTS8	Commercial Services	DTSS	MVS/WYLBUR/APL/CICS/TSO (SPF)/VM/CMS
Date operational	Jan. 1970	Jan. 1970	1968	Nov. 1967	Oct. 1975
Areas currently served	Local access in over 150 metropolitan areas throughout U.S., Canada, Mexico, & Europe	Local access in over 150 metropolitan areas throughout U.S., Canada, Mexico, & Europe	Nationwide	Local access in 250 cities throughout the U.S. and abroad	Continental U.S., inbound WATS and TYMNET
EQUIPMENT					
Computers	Univac 1108 (15) in Los Angeles, Chicago, Washington, DC, Toronto, & Calgary	Univac 1108 (15) in Los Angeles, Chicago, Washington, DC, Toronto, & Calgary; IBM 370/168 in Dallas	IBM 370/155 (3), 360/50 (7), 360/40 (2), ITEL AS/5; in White Plains, NY; Pittsburgh, PA; Cleveland, OH; Chicago, IL; Oakland, CA; etc. Approx. 680 per data center	Honeywell dual 66/17 and two Honeywell 66/DPS in Denver	Amdahl 470 V/6, 3031-equivalent
No. of simultaneous users	180 total	1300 total		200	300
Conversational terminals supported	Most ASCII terminals at up to 1200 bps, Zeta, Calcomp, Tektronix, Telex, TWX, foreign exchange (FX)	Most ASCII terminals at up to 1200 bps, Zeta, Calcomp, Tektronix, Telex, TWX, foreign exchange (FX)	DECwriter LA36 at 15 or 30 cps; MSI terminals at 15 or 30 cps	ASCII, EBCDIC, or correspondence terminals at 10 to 120 cps; Houston Instruments, Calcomp, Tektronix, and Zeta plotters	ASCII 10-120 cps or Correspondence terminal
Batch terminals supported	2000 to 4800 bps; up to 9600 bps via private line; Data 100, DEC PDP-11, IBM 2780/3780 and compatible units	2000 to 4800 bps; up to 9600 bps via private line; Data 100, DEC PDP IBM 2780/3780 and compatible units, IBM HASP	—	IBM 2780 and compatible units	All IBM compatibles
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, APL, COBOL, Assembler, SNOBOL	FORTRAN, BASIC, APL, COBOL, Assembler, SNOBOL	CSC proprietary language	FORTRAN, BASIC, COBOL, ALGOL, APL, LISP, SNOBOL, QED, GMAP, PL/1, others	APL, WYLBUR, CICS, CMS, TSO
Batch-mode programming languages	FORTRAN, BASIC, APL, COBOL, Assembler, SNOBOL	FORTRAN, BASIC, APL, COBOL, Assembler, SNOBOL, PL/1	COBOL, FORTRAN	All conversational languages can be used in background or batch mode	COBOL, FORTRAN, PL/1, Assembler, BASIC, PASCAL, ALGOL
Principal applications	Business, scientific, & data base management	Business, scientific, & data base management	Accounting, distribution, manufacturing, tax preparation	Business & scientific, corporate modelling, investment banking, lighting design, mining & telephone company applications	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	\$50	\$250	Contact vendor for pricing	\$100	\$100
Remote batch	\$50	\$250		\$100	\$100
Terminal connect time:					
Interactive	\$6.50-27.00/hr.	\$6.00-35.00/hr.	—	\$3.00-12.00/hr.	\$3.50-10.00/hr.
Remote batch	None	\$0.18/100 records	—	\$3.00-12.00/hr.	\$7.50/hr.
Central processor time:					
Interactive	\$0.272-0.60/SRU	\$0.25-0.48/SRU*	—	\$0.04-0.23/CRU*	\$1.07-2.00/CPU sec.
Remote batch	\$0.05-0.45/SRU	\$0.07-0.58/SRU*	—	\$0.03-0.12/CRU*	\$1.07/CPU sec.
Mass storage:					
Interactive	\$0.038/2048 chars./day	\$0.029/2048 chars./day	—	\$0.90-1.20/4096 std. chars./month	\$1.38/track/month
Remote batch	\$0.038/2048 chars./day	\$0.029/2048 chars./day	—	\$0.90-1.20/16,384 binary chars./month	\$1.38/track/month
COMMENTS	Matrix pricing enables user to optimize costs; volume discounts for committed volumes; affiliated with Computer Sciences Corporation	Charges for remote batch use vary with priority; lower rates for non-prime time use; subscription storage and high-volume discounts; pricing options available *SRU (System Resource Unit) includes CPU time and other factors	Formerly a division of ITEL Corporation	Complete customer support services, with industry specialists in investment banking, lighting design, mining, and other areas; design and programming services available to develop custom applications *CRU (Computer Resource Unit) is a function of CPU time, core size used, and quantity of I/O	Offers IDMS, SPSS, SAS, MARK IV, EASY-TRIEVE and other software packages; branch offices in LA, NYC, SF, Chicago, Boston, Atlanta

All About Time-Sharing and Remote Computing Services

COMPANY	Computone Systems, Inc.	Comshare, Incorporated	Comshare Limited	CONCAP Computing Systems	Control Data Corporation
GENERAL					
Name of service	KEYPACT	Commander I & Commander II	Commander I, Commander II, CPV	CONCAP Civil Engineering	Cybernet Services
Date operational	Dec. 1965	1967	1969	1965	1963
Areas currently served	US and Canada	U.S., Canada, United Kingdom, The Netherlands, Belgium, West Germany, France, Japan, access through Telenet	Local dial-up throughout major Canadian trading areas with int'l communications to US and Europe	United States, Canada, and areas serviced by TELENET Communications	Entire U.S., Canada, Mexico, S. Africa, Europe; Brazil, Israel, Australia, Venezuela, and Japan
EQUIPMENT					
Computers	IBM 360/65, IBM 370/145	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, PDP-11/34, LSI-11/23	32 large-scale Control Data computers in 25 worldwide centers
No. of simultaneous users	10-45	42 per 940, 64 per Sigma 9	Over 200	10	Approximately 1500
Conversational terminals supported	All ASCII at 30 or 120 cps	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; in-house installations up to 9600 bps	Any ASCII terminal at 10 or 30 cps; Correspondence terminals at 14 cps; most ASCII at 120 cps
Batch terminals supported	—	IBM 2780 & 3780, and compatible units	IBM 2780, IBM HASP, Data 100	—	Various RJE terminals at 2000 to 9600 bps; supports CDC Mode 4A (200UT), IBM 2780/3780, and HASP multi-leaving protocols
SOFTWARE					
Conversational programming languages	COBOL, FORTRAN, RPG	FORTRAN, COBOL, BASIC, PASTEL	FORTRAN, BASIC, COBOL, APL, Assembler, PASCAL	FORTRAN	FORTRAN, BASIC, COBOL, APL, SIMULA, SIMSCRIPT
Batch-mode programming languages	—	FORTRAN, COBOL,	FORTRAN, COBOL, BASIC, APL, Assembler, PASCAL	—	FORTRAN, BASIC, COBOL, ALGOL, COMPASS, SIMULA, SIMSCRIPT
Principal applications	Financial, insurance	Business & scientific	Business & scientific	Engineering	Engineering & scientific
CHARGES					
Min. monthly charge:					
Interactive	\$25-\$30	\$25.00	None	\$2.50-200.00	\$100
Remote batch	—	—	None	—	None
Terminal connect time:					
Interactive	\$0.90-\$1.00/minute	\$8.40-33.00/hr.	\$9.60-23.40/hr.	\$8.00-18.00/hr.	\$9.00-40.00/hr.
Remote batch	—	\$8.40-24.00/hr.	\$12.00-26.40/hr.	—	\$12.00-48.00/hr.
Central processor time:					
Interactive	—	\$0.0675-0.0900/CCU*	\$0.08-0.13/CCU*	\$0.012-0.22/CCU	\$0.38/sec.
Remote batch	—	\$0.0450-0.0900/CCU*	\$0.04-0.16/CCU*	—	\$0.11-1.51/sec.
Mass storage:					
Interactive	Contact vendor	\$0.18-0.30/2K bytes/mo.	\$0.005-\$0.020/2048 chars./day	\$0.03/512 chars./day	\$0.016/1280 chars./day
Remote batch	—	\$0.18-0.30/2K bytes/mo.	\$0.005-\$0.020/2048 chars./day	—	\$0.0125-0.016/1280 chars./day
COMMENTS	Dedicated system for life insurance sales, feed and meat formulation, and turnkey market information	Offers international data communications via TELEGRID network; services include accounting, data base management, human resource management, telephone systems management, mechanical and structural design, financial analysis, trust management, and graphics *CCU-Comshare Computer Unit	Offers service in all major Canadian cities via TELEGRID network; an affiliate of Comshare, Inc. with international data communications to U.S. and Europe *CCU (Comshare Computer Unit) is a load-independent measure of all significant system resources actually utilized	Specialties are civil and structural engineering, and land surveying, including automated plotting services for subdivision design. Company also installs minicomputer systems, complete with engineering and graphics software	Also see The Service Bureau Company, a division of Control Data Corporation

All About Time-Sharing and Remote Computing Services

COMPANY	CSG Keydata Division	CSG Multiple Access Division	CSG Processing Services	Cybershare Limited	Data Resources Inc.
GENERAL					
Name of service	Keydata	CDC Service	IBM Service	NOS	—
Date operational	1969	1969	1972	July 1972	1969
Areas currently served	Canada	All of Canada and U.S.	All Canada, Eastern & Western U.S.	Canada and US	US, Canada, Western Europe, plus other international locations via Tymnet
EQUIPMENT					
Computers	DECsystem 10 (1), Univac 494 (3) in Foxboro, MA	Cyber 720, Cyber 174, CDC 6600 in Don Mills, Ontario	IBM 370/168 (2) with A/P & EF, IBM 3033, HP 2000, HP21 MXE in Mississauga; IBM 360/40 & 360/50 in Montreal; IBM 3031 in Calgary	CDC Cyber (171's (2), Honeywell 66/40	Several Burroughs B7800 multiprocessor systems
No. of simultaneous users	1000	144 (Interactive); 64 (Batch)	Over 1000	512 time-sharing, 200+ remote batch	Over 500
Conversational terminals supported	TTY Model 28, GE TerminiNet, Vucom, ADDs, DECwriter, Tally, Datapoint	All compatible ASCII & TTY terminals at 10, 30, and 120 cps	All compatible ASCII, EBCDIC, & TTY terminals; IBM 2741	TTY 33/35 and compatible units; any ASCII at 110 to 1200 bps	All ASCII terminals at speeds to 120 cps; IBM 2741
Batch terminals supported	—	All CDC 200 UT & IBM 2780/3780 (BSC protocol) compatible terminals	IBM 2780/3780, HASP protocols, HASP multileaving	CDC 200, IBM 2780/3780, IBM HASP	IBM 2780/3780, Burroughs DC 1100, or equivalent units
SOFTWARE					
Conversational programming languages	Keydata On-line Processing Language (KOP 111)	COBOL, BASIC, APL, FORTRAN	COBOL, FORTRAN, TSO, WYLBUR	FORTRAN, BASIC, APL, Text Editor, COBOL	FORTRAN, BASIC, APL, ALGOL, plus proprietary langs. (EPS, FILETRAN, DRISCAN)
Batch-mode programming languages	—	COBOL, FORTRAN, BASIC, COMPASS	COBOL, FORTRAN, PL/1, RPG, Assembler	FORTRAN, COBOL, COMPASS, PL/1	FORTRAN, ALGOL, COBOL, plus proprietary langs. (EPS, FILETRAN, DRISCAN)
Principal applications	Business	Engineering, scientific, financial modelling, business	Business, financial, & government	Business & scientific Business, engineering, & scientific	Business, scientific, & financial
CHARGES					
Min. monthly charge:					
Interactive	\$900	—	—	None	\$250
Remote batch	—	—	—	None	\$250
Terminal connect time:					
Interactive	—	\$4.50-14.00/hr.	\$11.00-13.00/hr.	\$8/hr.	\$20.00/hr.
Remote batch	—	\$16.50-22.00/hr.	\$8.50-22.00/hr.	\$10.00-15.00/hr.	\$30.00/hr.
Central processor time:					
Interactive	—	\$0.70/resource unit	\$38.00/minute	\$0.20/SRU	\$0.06-0.17/CRU*
Remote batch	—	\$0.25-0.60/res. unit	\$19.33/minute	\$0.10-0.20/SRU	\$0.06-0.14/CRU*
Mass storage:					
Interactive	—	\$0.19/block/month	\$1.20/million bytes allocated/day	\$0.005-0.01/1280 chars./day	\$0.00023-0.004/1000 chars./day
Remote batch	—	\$9.30/block/month	\$3.80/million bytes/connect hour	\$0.005-0.01/1280 chars./day	\$0.00023-0.004/1000 chars./day
COMMENTS	All charges are based on number of transactions processed; dedicated system for interactive business data processing applications; Keydata service is also offered through turnkey installation of UNITY minicomputers in user's office	Terminal and customer facilities in all branch locations; extensive engineering and scientific software library; high speed links between processors give all users on-line access to the computer systems network	Service levels allow user to specify service required; volume and commitment discounts, as well as for overnight and weekend processing and low speed national networks; terminal and customer facilities in all branch locations; full range of shared software		Specializes in economic and financial planning and analysis; offers Economic Information Systems at charges of \$4,000 to \$100,000 per year; other specialties are a vast assortment of economic and financial data bases, including commodities and stock price information
					*CRU (Computer Resource Unit) is a measure of overall system throughput

All About Time-Sharing and Remote Computing Services

COMPANY	Data-Tek Corporation	Datacrown Inc.	Dataline Systems Limited	Datalogics, Inc.	Dialcom Inc.
GENERAL					
Name of service	Data-Tek Corp.	Shared Processing	Dataline Time-Sharing Network	DL/OS	Timesharing
Date operational	1971	June 1972	1969	1969	July 1970
Areas currently served	Northeastern U.S.	All of Canada and U.S.	All of Canada and U.S.	Ohio, Illinois, New York, & Pennsylvania	Nationwide and 27 foreign locations
EQUIPMENT					
Computers	HP 3000 Series III	Equivalent of 12 IBM 370/168s in Ontario	DECSYSTEM-1070 (1); DECSYSTEM-1090 (4)	Honeywell Sigma 7's in Cleveland	Prime 750 (7), Honeywell 1648A (9)
No. of simultaneous users	48 users at 1200 bps	Over 500	325	Approx. 100	1024 total
Conversational terminals supported	All ASCII terminals	IBM 2741, 3270; TTY and compatible units	All ASCII terminals at 10 or 120 cps	TTY and other ASCII terminals at 10, 30, or 120 cps; IBM 2741	All ASCII, EBCDIC and correspondence terminals at 10 or 30 cps; IBM 2741
Batch terminals supported	IBM HASP	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, COBOL, SPL	APL, PL/1, WYLBUR, FORTRAN, COBOL, Assembler, SCSS	FORTRAN, BASIC, COBOL, APL, MACRO, SIMULA	FORTRAN, BASIC, COBOL, APL, Text, Proforma	FORTRAN, BASIC, COBOL, RPG, Text Editor
Batch-mode programming languages	FORTRAN, RPG, SPL, COBOL	FORTRAN, COBOL, PL/1, RPG, Assembler, Mark IV	FORTRAN, COBOL, RPG, BASIC, MACRO, SIMULA	FORTRAN, APL, BASIC, COBOL, RPG, Meta-symbol	—
Principal applications	Statistics, HMO, payroll, health care, accounting	Business, scientific, & government	Business, statistical, engineering, financial	Business; financial & statistical	Business, scientific, electronic mail, correspondence management
CHARGES					
Min. monthly charge:					
Interactive	\$25	None	\$15	None	\$25.00
Remote batch	\$25	None	None	None	—
Terminal connect time:					
Interactive	\$10.00/hr.	\$3.00-6.00/hr.	\$6.00/hr.	\$10.00-18.00/hr.	\$7.00-10.00/hr.
Remote batch	\$10.00/hr.	\$6.00-12.00/hr.	None	Variable	—
Central processor time:					
Interactive	\$0.08/sec.	\$35.00/min.	See Comments	\$0.08/CRU	\$0.02/CPU
Remote batch	\$0.08/sec.	\$35.00/min.	See Comments	\$0.04-0.16/CRU	—
Mass storage:					
Interactive	\$0.10/256 chars./month	\$0.012/track/day	\$0.002-0.01/640 char./month	\$0.80/2048 chars./month	\$0.50-1.00/1K chars./month
Remote batch	\$0.10/256 chars./month	\$0.012/track/day	\$0.002-0.01/640 char./month	\$0.80/2048 chars./month	—
COMMENTS	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 payroll 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; reduced rates for non-prime time usage; discounts for volume usage; major software systems include Business Accounting, Modelling, and Data Management	"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	Special rates available for large data bases and dedicated ports

**All About Time-Sharing
and Remote Computing Services**

COMPANY	Ecotran Corporation	Financial Data Systems Inc.	General Electric Information Services Company	Genesee Computer Center, Inc.	GTE Data Services Incorporated
GENERAL					
Name of service	Timesharing, Remote Batch, Typesetting	FDS online Thrift System	MARK III Service	Genesee Services	RCS
Date operational	May 1968	1970	1965	Aug. 1968	Nov. 1971
Areas currently served	Nationwide (principally Midwest); European access via Telenet	Continental U.S.	Local-call service to more than 600 cities in North America, and Far East, Western Europe, Australia, Venezuela, Saudi Arabia	Entire U.S., Canada, Europe, Mexico, Brazil, Israel, Australia	Continental U.S. plus Hawaii
EQUIPMENT					
Computers	Univac 1100/11, Univac 1108, Univac 1100/60, & DEC 2060 in Cleveland	IBM 370/155 (2), ASA 5000, CDC	Honeywell L66 and IBM 370/3033 computers in 3 supercenters in Ohio, Maryland, & Europe	CDC 6600, 7600, and Cyber 175 belonging to Control Data (Cybernet); GENESEE/NDS Distributed Processing System	CDC 6500, 6600, and Cyber 73-28 (2); dual Honeywell 66/60
No. of simultaneous users	48 on 2060; 96 on 1108; 16 on 1100/11; 128 on 1100/60	1200 terminals on largest network	Approx. 200 per computer	Not specified	120
Conversational terminals supported	Most ASCII- & EBCDIC-compatible terminals up to 120 cps	IBM 1050/1060/2740/2980/3270/3600/3780; Burr. TC 700/TU 700/TU 1700; BR 2001; TRW; NCR 270; Olivetti TC 800; DataSaab; etc.	ASCII, EBCDIC, or Correspondence Code terminals at 10, 14.8, 15, 30, and 120 cps; Touch-Tone	GENESEE/NDS; all ASCII-compatible terminals at 10, 30, or 120 cps	TTY & compatible terminals at 10, 15, 30 & 120 cps
Batch terminals supported	Most batch terminals at up to 9600 bps	—	IBM 2780/3780, Data 100, MDS 2400, RCP 702, Honeywell G-115, etc., at 2000-4800 bps	GENESEE/NDS, CDC 200, DEC PDP-11 & PDT-11, IBM 1130, Univac 9200/9300, Data 100, etc.	CDC 200 & compatible units at 2000 to 9600 bps
SOFTWARE					
Conversational programming languages	BASIC, FORTRAN, COBOL, EDIT, SAM, APL	COBOL, Dial 260	FORTRAN, BASIC, ALGOL	FORTRAN, COBOL, Compass, BASIC, APL	FORTRAN, BASIC, APL, Text Editor
Batch-mode programming languages	FORTRAN, BASIC, ALGOL, COBOL, RPG, etc.	—	FORTRAN, COBOL PL/1	FORTRAN, COBOL, Compass, BASIC, ALGOL, SIMSCRIPT, SIMULA	FORTRAN, BASIC, COBOL, Simscrip, Compass
Principal applications	Engineering, scientific, phototypesetting, management sciences, educational	On-line thrift account processing and interactive distributed processing	Business & scientific	Engineering & scientific (optics and mechanical engineering)	Business, scientific, engineering, financial modeling
CHARGES					
Min. monthly charge:					
Interactive	\$25	See Comments	See Comments	None	\$100
Remote batch	\$25	—	—	None	\$100
Terminal connect time:					
Interactive	\$10.00/hr.	—	—	\$9.00-28.00/hr.	\$10.50-22.00/hr.
Remote batch	\$7.00-10.00/hr.	—	—	\$12.00-18.00/hr.	\$10.50-30.00/hr.
Central processor time:					
Interactive	See Comments	—	—	\$0.38/SBU	\$1.50-30.00/min.
Remote batch	See Comments	—	—	\$0.11-0.49/SBU	\$9.60-33.60/min.
Mass storage:					
Interactive	\$1.50/2560 chars./month	—	—	\$0.0125/1000 chars./day	\$0.40-0.50/1280 chars./month
Remote batch	\$0.10/1000 chars./month	—	—	\$0.01/1000 chars./day	\$0.40-0.50/1280 chars./month
COMMENTS	Charges vary based on volume, time of day, commitment period, and computer utilized; Ecotran Corporation encompasses all services previously provided by Chi Corporation; Ecotran's divisions include ADECS, CHI, DIGITYPE, ECOCENTERS, ECOSYSTEMS, and MANDEC	Serves savings and loan associations and mutual savings banks; charges based on number of accounts on file	CPU costs depend on priority, time of day, and resources used; network access costs depend on speed and access plan selected, and are based on characters transmitted and/or terminal connect time; custom usage subscription discounts, COM service, and data management facilities are also available	GENESEE/NDS Distributed Processing System includes the Genesee Data Entry Module, which is a special language to assist unsophisticated users in preparing input for any applications program	Offers general time-sharing services plus large library of applications for telephone companies

All About Time-Sharing and Remote Computing Services

COMPANY	Harris Corp., PRD Elec. Division	HDR Systems, Inc.	Honeywell Information Systems, Inc.	Informatics Inc.	Information Consultants, Inc.
GENERAL Name of service	Computer Service Center	HDR Systems	Datanetwork	Remote Computing Service	ICI
Date operational	1971	Oct. 1972	July 1972	1972	June 1974
Areas currently served	Local access in 7 states; rest of U.S. via INWATS	U.S. Canada, and any country serviced by Tymnet; WATS Line Processing has been added to augment Tymnet service	Entire U.S.; local service in most large cities plus INWATS service	Continental U.S.	Continental U.S.
EQUIPMENT Computers	Univac 1108, Harris SLASH6 (3), & Varian 76 (2)	CYBER 173 in Omaha, Nebraska	Multiple Honeywell 66/6000 systems; each system at least dual processor configuration or better	Intel AS/6 (2), IBM 370/158	DECSYSTEM 2050 (2)
No. of simultaneous users	Not specified	256	256 per system	250	256
Conversational terminals supported	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	All major 10, 15, 30 or 120-cps terminals; Tektronix graphics terminals	ASCII, EBCDIC or correspondence terminals at 10, 15, 30 or 120 cps
Batch terminals supported	U1004, U9300, cope, Data 100, Harris 1200	CDC 200, IBM HASP	IBM 2780/3780, and GRTS-compatible	IBM 2780/3780 & HASP workstations and equivalents	IBM 2780/3780 and compatible at 1200 to 9600 bps
SOFTWARE Conversational programming languages	FORTRAN, COBOL, BASIC, APL, Editor	FORTRAN, APL, BASIC, COBOL, Assembler	FORTRAN, DATABASIC, BASIC, APL, ALGOL, PASCAL, SOVIAL	FORTRAN, COBOL, BASIC, APL, PL/1, Assembler	FORTRAN, COBOL, BASIC, APL, PL/1, ALGOL
Batch-mode programming languages	FORTRAN, COBOL, RPG, Assembler	FORTRAN, COBOL, PL/1, APL	FORTRAN, COBOL, ALGOL, PASCAL, JOVIAL, GMAP	FORTRAN, COBOL, PL/1, Assembler	FORTRAN, COBOL
Principal applications	Engineering, scientific	Business & scientific	Business, scientific, engineering, data base management	General business planning and control	Financial, data management, planning, text processing, interactive graphics, on-line SPSS
CHARGES Min. monthly charge:					
Interactive	\$100	\$100	\$200	None	None
Remote batch	\$100	\$100	\$200	None	None
Terminal connect time:					
Interactive	\$5.00/hr.	\$5.35/hr.	\$13.50/hr.	\$6.00-18.00/hr.	\$6.00-12.00/hr.
Remote batch	—	\$10.70/hr.	None	\$15.00/hr.	\$15.00-35.00/hr.
Central processor time:					
Interactive	\$450-600/hr.	\$1.07/SRU*	\$0.11/TSU*	\$0.10/IRU*	\$0.01/CRU*
Remote batch	\$450-600/hr.	\$1.07/SRU*	\$0.11/RBU*	\$0.10/IRU*	\$0.01/CRU*
Mass storage:					
Interactive	\$0.02/10,752 chars./day	\$0.011/1K chars./day	\$0.065-0.45/320 words/month	\$18-35/212K bytes/mo.	\$0.01/640 chars./day
Remote batch	\$0.02/10,752 chars./day	\$0.011/1K chars./day	\$0.065-0.45/320 words/month	\$18-35/212K bytes/mo.	\$0.01/640 chars./day
COMMENTS	Uninterruptible power supply; 18 hour/day operation	International service via Tymnet; Cyber 173 with 131K-byte central memory; 1.2 billion characters of storage available; next upgrade due December 1980 *SRU (System Resource Unit) is a function of I/O, central memory, and central processor usage	DATANETWORK services are accessible 24 hours per day, seven days per week, except for scheduled preventive maintenance; Non-prime time and volume discounts are available *TSU includes processor time charges; RBU includes processor time charges and certain types of data transfer charges	Many general tools for financial analysis and planning; information management and graphics *IRU includes CPU usage, I/O usage, connect time, and disk storage	Special rates for volume users; turnkey applications provided with consultants and system staff; FISCAL and ADMIT services Washington, DC facility *CRU (Computer Resource Unit) is based on central processor and I/O usage

All About Time-Sharing and Remote Computing Services

COMPANY	Information Science Inc.	Information Systems Design, Inc.	Intelligent Systems Corp.	Interactive Data Corporation	Interactive Market Systems, Inc.
GENERAL					
Name of service	InSci/80	ISD	ISC	CS/ES	Interactive Market Systems
Date operational	Feb. 1978	May 1968	June 1974	1968	Dec. 1969
Areas currently served	Entire U.S. and Canada	Entire U.S. via INWATS (batch) and Tymnet (interactive)	Greater Boston area	Continental U.S., Canada, Europe	Worldwide
EQUIPMENT					
Computers	Microdata 6000 & 8000	Univac 1100/82 (1) and Univac 1108 (3) in Santa Clara, CA	DEC PDP-11 in Bedford, MA	Amdahl 470/V8, IBM 370/168 in Waltham, MA	DEC 2050 in New York
No. of simultaneous users	32 per CPU	200+	8 at 300 or 1200 bps	500	Not specified
Conversational terminals supported	TTY-compatible CRTs at up to 120 cps	TTY and compatible ASCII terminals at 10, 30 or 120 cps; IBM 2741; Tektronix graphics terminals	Any TTY-compatible ASCII terminal	TTY and compatible ASCII terminals at 10, 30 or 120 cps; IBM 2741	All major 300 and 1200 bps terminals
Batch terminals supported	—	IBM 2780, 1130; Data 100, Harris, MDS, Univac 1004 Unitech, HASP	IBM 2780	IBM 2780/3780, 3741 and compatible EBCDIC units at 2K, 2.4K and 4.8K bps	—
SOFTWARE					
Conversational programming languages	BASIC	FORTRAN, BASIC, COBOL, APL, Editor, Assembler	BASICPLUS, BASIC-PLUS II, FORTRAN, MACRO 11	FORTRAN, BASIC, COBOL, PL/1, XSIM, Assembler, XDMS	A proprietary English-type language
Batch-mode programming languages	—	FORTRAN, BASIC, COBOL, APL, Editor, Assembler	BASICPLUS, BASIC-PLUS II	FORTRAN, BASIC, COBOL, PL/1, Assembler, XSIM, XSCAN, XDMS	A proprietary English-type language
Principal applications	Personnel	Engineering, scientific, graphics, data base mgmnt., electronics, structural analysis	General accounting, materials handling, materials requirements planning	Business, financial, data base management, scientific, financial modelling, cash management, data collection	Advertising and media industry
CHARGES					
Min. monthly charge:					
Interactive	\$500	\$50	None	\$150-total batch and interactive	None
Remote batch	—	\$50	None		None
Terminal connect time:					
Interactive	—	\$10-15/hr.	\$3.50/hr.	\$16.00/hr.	See comments
Remote batch	—	\$10-\$15/hr.(2K/4.8K bps)	\$3.50/hr.	—	See comments
Central processor time:					
Interactive	—	\$0.09-0.36/sec.	\$1.00/kilo-core minute	\$0.16/charge unit	See comments
Remote batch	—	\$0.09-0.36/sec.	\$1.00/kilo-core minute	\$0.08/charge unit	See comments
Mass storage:					
Interactive	—	\$0.05/10,752 chars./day	\$0.08/512 bytes average per month	\$0.085-0.47/1K chars./month	See comments
Remote batch	—	\$0.05/10,752 chars./day	\$0.08/512 bytes average per month	\$0.085-0.47/1K chars./month	See comments
COMMENTS	Charges based on file volumes and number of locations supported; minimum charge includes CRT, printer, modem, and 2 hrs. connect time per day; will be accessible through Tymnet in late 1980; special reporting and database customization services are available at an additional cost.	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	Business applications and special project orientation, with special package offerings and assistance for those obtaining their own computers	Packages include banking, insurance, finance, brokerage, math, graphics, modeling, econometric data, management science, data base management, text processing, merger/acquisition analysis, securities analysis, cash management, data collection	IMS offers advertising and marketing systems for the retrieval, analysis, and display of data from syndicated and proprietary data bases; a wide variety of display, tabulation, and statistical analysis reports for market research, analysis, and media planning can be produced; charges are based on system resources used and range from \$55.00 up to \$132.00 per resource hour, depending on the program utilized

All About Time-Sharing and Remote Computing Services

COMPANY	Interactive Sciences Corporation	Keydata Corporation	Litton Computer Services	Litton Mellonics Information Center	Lockheed Information Systems
GENERAL					
Name of service	Computing service	Keydata	Timesharing and Remote Job Entry	MIC	DIALOG Information Retrieval Service
Date operational	May 1968	1965	Aug. 1971	1968	1972
Areas currently served	Entire U.S., Europe, Far East, Hawaii, Australia	Continental U.S. & Canada; more than 40 concentrators	Continental U.S. & Canada	Principally southern California, with nationwide access via Telenet network	Worldwide
EQUIPMENT					
Computers	DECsystem-10 (6) in Braintree, MA	DECsystem-10 (1), Univac 494 (3) in Foxboro, MA	IBM 370 Model 3033 in Reston, VA	IBM 3033 (2) in Canoga Park, CA; operating system is MVS/JES2	IBM 3032 & 3033
No. of simultaneous users	62 per system	1000	512	200 users (both time-sharing and batch) at 110 to 9600 bps	Not specified
Conversational terminals supported	All ASCII to 1200 bps; IBM, other BCD, Selectric, correspondence units via telenet	TTY Model 28, GE TermiNet, ADDS, DEC-writer, Tally, Datapoint at 30 or 120 cps	TTY-compatible units; IBM 3270	IBM 3277, 3278, 2741; TTY 33, 35, 43; Miscellaneous ASCII terminals	All ASCII, EIA terminals
Batch terminals supported	IBM 2780/3780 and compatible units	—	IBM HASP, 2780, 3780, & emulators	IBM HASP/JES workstations; IBM 2780 & 3780 (bisync); IBM 3776 & 3777 (SDLC)	—
SOFTWARE					
Conversational programming languages	FORTRAN, COBOL, BASIC, MACRO, PASCAL, AID, LISP, SNOBOL	Keydata On-Line Processing Language (KOP III)	FORTRAN, BASIC, COBOL, APL, PL/1, MARK IV	FORTRAN, COBOL, BASIC, APL	—
Batch-mode programming languages	FORTRAN, COBOL, BASIC, RPG, MACRO, PASCAL, LISP, AID SNOBOL	—	FORTRAN, COBOL, PL/1, RPG, MARK IV, Easytrieve	FORTRAN, COBOL, PL/1, RPG	—
Principal applications	Business, scientific, financial, engineering, data base mgmnt.	Business	Business & scientific	Business & scientific	Literature searching via interactive on-line database access
CHARGES					
Min. monthly charge:					
Interactive	\$50	\$800	None	None	None
Remote batch	\$50	—	None	None	—
Terminal connect time:					
Interactive	\$7.00-18.00/hr.	See Comments	\$8.00-15.00/hr.	\$4.00-9.00/hr.	\$25.00-90.00/hr.
Remote batch	\$20.00-40.00/hr.	—	\$15.00/hr.	—	—
Central processor time:					
Interactive	\$0.01/CRU (Prime)	See Comments	\$0.0573/Computer Sec*	\$2.57/CRU	—
Remote batch	\$0.007-0.0025/CRU	—	\$0.0573/Computer Sec*	\$1.71/CRU	—
Mass storage:					
Interactive	\$0.013/1000 chars./day	See Comments	Contact vendor	\$0.17/track/day	—
Remote batch	—	—	Contact vendor	\$0.17/track/day	—
COMMENTS	Financial modeling programs, accounting systems, statistical analysis, data base management; discounts for non-prime users	All charges are based on number of transactions processed; dedicated system for interactive business data processing applications	Rates vary with amount and period of time resources used *Computer Second usage is computed using a formula that takes into account memory usage, I/O access, and other factors	Offers idle capacity disaster recovery facility	DIALOG service contains over 40 million abstracts and references to newspaper, journal, and magazine articles, technical reports, papers, and patents in virtually all subject areas

All About Time-Sharing and Remote Computing Services

COMPANY	Management Concepts, Inc.	Mark/Ops	Martin Marietta Data Systems	McDonnell Douglas Automation Co. (McAuto)	McDonnell Douglas Automation Co. (McAuto)
GENERAL					
Name of service	MCI	Mark/Ops	Remote Computing Services (RCS)	CYBER Service	370 Service
Date operational	1971	March 1967	1971	March 1976	1967
Areas currently served	Atlanta, GA	Northeastern U.S.	Continental U.S., Alaska, U.K.	Entire U.S. and foreign countries via Tymnet	Continental U.S. and Canada; customers also in U.K., Europe, and Japan
EQUIPMENT					
Computers	Prime 400, Prime 750, Honeywell 1648	DECSYSTEM-10 (2) & DEC PDP-11/45	IBM 370/168, IBM 3033 (3) in Orlando, FL; CDC 170/720, CDC 170/730, IBM 370/138 in Denver, CO	CDC Cyber 173 & 175 (3)	IBM 3033 (8) in St. Louis; IBM 3033 (7) in CA
No. of simultaneous users	64 at 1200 bps	64 & 24	600 (110-56K bps)	110 per system	100+ per system
Conversational terminals supported	Teletype 33	Any 110 or 300 bps ASCII unit	ASCII at 110, 300, 600, 1200 bps; IBM 3270 emulators	IBM 2741 and TTY 33 compatible units, graphics terminals	IBM 3741, 3270, graphics
Batch terminals supported	—	Any 1200 bps ASCII unit	IBM HASP, 2770, 2780, 3780, 3741, System/3, IBM workstation OS, SVS, MVS, DOS	CDC 200, IBM HASP, others through 370 service	IBM 2770, 2780/3780, HASP and compatible units
SOFTWARE					
Conversational programming languages	FORTRAN, COBOL, BASIC	FORTRAN, BASIC, COBOL, TECO, MAGIC II	FORTRAN, PL/1, BASIC, COBOL, APL, BAL	FORTRAN, BASIC, APL, MIMDAC, COBOL, SYSTEM 2000	FORTRAN, COBOL, BASIC, PL/1, IMS/PL-1, SYSTEM 2000
Batch-mode programming languages	FORTRAN, COBOL, RPG	FORTRAN, COBOL, BASIC+	FORTRAN, PL/1, BAL, COBOL, RPG, APT	FORTRAN, COBOL, MIMAC, SIMSCRIPT, BASIC, APL	FORTRAN, COBOL, PL/1, RPG, DL/1, BAL, MRCS
Principal applications	Commercial, accounting	Acctg., distribution, financial modeling, assembly control, engr.	Accounting, manufacturing, distribution, financial modelling, engineering, scientific	Engineering, scientific, graphics, data base management	Business, manufacturing, engineering, graphics, data base mgmnt., insurance
CHARGES					
Min. monthly charge:					
Interactive	\$329	None	—	None	None
Remote batch	\$200	None	—	None	None
Terminal connect time:					
Interactive	\$6.00-9.00/hr.	\$3.00-10.00/hr.	—	\$6.00-24.00/hr.	\$6.00-24.00/hr.
Remote batch	—	\$3.00-10.00/hr.	—	\$9.00-20.00/hr.	\$9.00-20.00/hr.
Central processor time:					
Interactive	\$0.58-0.85/sec.	None	—	\$0.10-0.20/MRU	\$4.50-9.00/VRU
Remote batch	—	None	—	\$0.15-0.50/MRU	\$3.50-7.50/VRU
Mass storage:					
Interactive	\$0.0825-0.15/1000 chars.	\$0.50/1K chars./mo.	—	\$0.045/64 wds/wk.; \$3.50/6848 wds/wk.	\$12.50/M bytes/wk.
Remote batch	—	\$0.50/1K chars./mo.	—	\$0.045/64 wds/wk.; \$3.50/6848 wds/wk.	\$12.50/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	Data Center Recovery Offering "REBOUND"; residential energy audits for utilities per national energy conservation legislation	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

**All About Time-Sharing
and Remote Computing Services**

COMPANY	Multiple Access Inc. (Division of CSG)	National Computer Network of Chicago, Inc.	National CSS, Inc.	Newfoundland and Labrador Computer Service	NLT Computer Services Corp.
GENERAL					
Name of service	IBM Service	—	VP/CSS	—	Datafile
Date operational	—	Dec. 1969	Dec. 1968	1969	1970
Areas currently served	Western U.S.	Continental U.S., Canada; worldwide via Tymnet	Continental U.S., Canada, U.K., France	Eastern Canada	Entire U.S.
EQUIPMENT					
Computers	IBM 360/65 (2), IteI AS5-3 in Los Angeles	DECSYSTEM 20, Honeywell 1648A (2)	IBM 3033-U8, Amdahl V-7, IBM 370/168 in Stamford, CT; Amdahl 470/V6-II, IBM 370/158 in California	IBM 370/158 in St. John's, Newfndnd	Burroughs B 4800, B 4700, DG NOVA 3 (4)
No. of simultaneous users	—	Not specified	1500 (mixed modes)	65	500
Conversational terminals supported	All compatible ASCII & TTY terminals; IBM 2741	All ASCII at 10, 30 or 120 cps; IBM 2741	TTY and all compatible terminals at 10, 15, 30, 60 or 120 cps; plus voice response, graphics, and 3270	IBM 3270-equivalent, TTY-equivalent	Up to 9600 bps, Hazeltine, others
Batch terminals supported	IBM 2780/3780	—	IBM HASP, 1130, 2780, 3780, 3740; dial-up 2000, 2400, 4800 bps; leased line to 9600 bps	DEC PDP-11/40, Comterm 1200, IBM 2780, 1130, System/3, & equivalents	Not specified
SOFTWARE					
Conversational programming languages	COBOL, FORTRAN, WYLBUR	FORTRAN, COBOL, BASIC, MAX BASIC, APL, PASCAL, MACRO, SNOBOL	FORTRAN, APL, BASIC, COBOL, PL/1, PASCAL, RPG II	FORTRAN, BASIC, COBOL, Assembler, PL/1, MARK IV	Dependent on specific application
Batch-mode programming languages	COBOL, FORTRAN	FORTRAN, COBOL	FORTRAN, APL, BASIC, COBOL, PL/1, RPG	FORTRAN, COBOL, PL/1, ALGOL, RPG, Assembler, MARK IV, etc.	COBOL: not available to user
Principal applications	Business, engineering, scientific, financial modelling	Business, financial, stocks/commodities data base options; portfolio analysis; statistics	Business, database, engineering, financial modelling, market research, information management	Business, scientific	Distribution, accounting
CHARGES					
Min. monthly charge:					
Interactive	—	None	\$100 per account	Not specified	\$1,000
Remote batch	—	None	None	Not specified	—
Terminal connect time:					
Interactive	—	\$5-10/hr.	\$12.00-20.00/hr.	Not specified	—
Remote batch	—	—	None	Not specified	—
Central processor time:					
Interactive	—	\$1.20-2.00/CPU min.	\$0.20/ARU*	Not specified	—
Remote batch	—	—	\$0.08-0.12/ARU*	Not specified	—
Mass storage:					
Interactive	—	\$0.75/1K chars./mo \$1.00/2560 chars./mo.	\$0.67/cylinder/day with volume discounts	Not specified	—
Remote batch	—	—	\$0.67/cylinder/day with volume discounts	Not specified	—
COMMENTS					
		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 systems; full range of graphics services; output to microfiche; TEXT MASTER text management system; forecasting, financial modelling, securities DB, reporting system; screen editor, format, operations research, market research; TWX, TELEX; customer educ.	Provides EDP services for provincial gov't, university, and crown corporations	Monthly charge up to \$20,000; dependent on transaction volume; matrix pricing and inventory management for wholesale distributors; also markets in-house minicomputer with same application software
			*ARU—Application Resource Unit		

All About Time-Sharing and Remote Computing Services

COMPANY	Ohio Valley Data Control, Inc.	On-Line Business Systems, Inc.	On-Line Systems, Inc.	On-Line Systems, Inc.	Optimum Systems Incorporated
GENERAL					
Name of service	Ohio/Kanawha Valley Data Control	Development & processing of on-line custom systems	OLS DEC Services	OLS/370 Services	OSI/AIRS
Date operational	1966	1969	1967	June 1976	1967
Areas currently served	Southeast Ohio and West Virginia	Nationwide network (California headquarters)	Continental U.S. and Canada	Continental U.S.; world-wide access through Telenet & Tymnet	Entire U.S.
EQUIPMENT					
Computers	Burroughs B4800, B4700, B3700, B1800 (2); DEC PDP 11/34 & DECSYSTEM-10	IBM 370/158 (2) with attached processors	DECSYSTEM-10 (17) in Pittsburgh, PA	Itel AS/6 (2) in Pittsburgh, PA	IBM 3033 and 370/165 in Santa Clara; 3033, 3031 & 370/168 (2) in Rockville, MD
No. of simultaneous users	100 (medium systems); 15-50 (small systems)	400	70 per system	150	Not specified
Conversational terminals supported	DEC-compatible terminals	All IBM-compatible terminals	ASCII, EBCDIC, Correspondence, TTY, 2741-types, Tektronix, etc.	ASCII, EBCDIC, & Correspondence compatibles	All popular terminals including TTY & IBM 2741
Batch terminals supported	Burroughs B 1700/1800, Honeywell 2020 Series	All IBM-compatible terminals	IBM 2780 & 3780 types	Virtually any type	IBM 2780/3780, Data 100 & compatible units; DEC, Interdata & Data-point distributed mini-computers
SOFTWARE					
Conversational programming languages	DIBOL	FORTRAN, BASIC, APL, WYLBUR	APL, BASIC, COBOL, FORTRAN, MACRO	APL, BASIC, COBOL, FORTRAN, Assembler, PL/1	SUPERWYLBUR
Batch-mode programming languages	COBOL	FORTRAN, COBOL, PL/1, RPG, ALC	COBOL, FORTRAN, APL, BASIC	COBOL, FORTRAN, PL/1, RPG, Assembler	All standard IBM compilers
Principal applications	Financial & small business systems	Custom on-line and batch services and distribution accounting	Financial, banking, operational planning & control, sales & marketing, project management	Accounting, financial modelling, econometrics, engineering	Mfg., health claims, accounting, engineering, scientific, banking, financial
CHARGES					
Min. monthly charge:					
Interactive	\$200	—	\$5.00/user number	\$100	\$250
Remote batch	—	—	\$5.00/user number	\$100	\$250
Terminal connect time:					
Interactive	\$10.00/hr.	—	\$12.50/hr.	\$12.50/hr.	
Remote batch	—	—	—	\$8.00/hr.	
Central processor time:					
Interactive	\$140.00/hr. (dedicated)	—	\$0.05/CPU*	\$0.20/SRU*	\$0.20/RU*
Remote batch	\$25.00/hr. (medium system)	—	\$0.05/CPU*	\$0.10/SRU*	\$4.75/MU*
Mass storage:					
Interactive	\$25.00/100K bytes/mo.	—	\$0.0469/1000 chars./day	\$1.00/214,000 chars./day	\$36.00/cylinder/month
Remote batch	—	—	\$0.0469/1000 chars./day	\$0.026/13,000 chars./day	\$0.04/track/day
COMMENTS	Strong experience and support in bank applications with remote job entry terminal computers and on-line applicational terminals; fast developing small business systems applicational terminal support system	Contact vendor for pricing	On-Line Systems, Inc. is a United Telecom Company *CPU—Central Processing Unit	A two-way link between the VM conversational and the MVS batch system; volume discounts available *SRU (System Resource Unit) includes CPU time, I/O access and royalties for proprietary software	Owns and markets SUPERWYLBUR for word processing, text editing, and RJE 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 *RU (Resource Unit) and MU (Machine Unit) are composed of core used, CPU time, and I/O activity

All About Time-Sharing and Remote Computing Services

COMPANY	Polycorn Systems Limited	PRC Computer Center, Inc.	Profitool, Inc.	Programs & Analysis, Inc.	Proprietary Computer Systems, Inc.
GENERAL					
Name of service	DTSS, VAX	Timesharing, Remote Computing Service	Contractors Mgmt Information Service	Thrift Line Service	PCS/Computernet
Date operational	1968	1968	Oct. 1967	1968	Oct. 1970
Areas currently served	Canada	U.S. and Europe	Continental U.S.	New England, New York, & Southeast	U.S.; Europe
EQUIPMENT					
Computers	Honeywell 6060, DEC VAX-11/780	Itel AS/5, Itel AS/6	Prime 400, Prime 550	Honeywell 6060 in Burlington, MA	IBM 3031 (370/158 backup)
No. of simultaneous users	200	Not specified	126	64	Not specified
Conversational terminals supported	Any ASCII-compatible terminal up to 4800 bps	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 for higher speeds	Most hardcopy and video terminals at 15, 30 and 120 cps
Batch terminals supported	Any terminal supporting IBM 2780, 3780, or SDLC protocol	IBM 2780/3780, HASP, and compatible units	—	Most terminals at up to 9600 bps	IBM 2780/3780, HASP & compatible units
SOFTWARE					
Conversational programming languages	FORTRAN, COBOL, BASIC, PL/1	FORTRAN, COBOL, BASIC	FORTRAN, COBOL, BASIC, RPG	FORTRAN, BASIC, ALGOL	APL
Batch-mode programming languages	FORTRAN, COBOL, BASIC, PL/1	FORTRAN, Easytrieve, COBOL, PL/1, RPG, Assembler	FORTRAN	FORTRAN, COBOL, Assembly, Jovial	FORTRAN, COBOL, PL/1, Assembler
Principal applications	Acct'g., order proc., job costing, financial planning, statistics, engineering	Business, scientific, engineering, statistical	Construction industry	General business, accounting, graphics, and other specialized applications	Statistics, engineering, data base mgmt., financial modeling
CHARGES					
Min. monthly charge:					
Interactive	\$100	None	None	See Comments	\$300/mo.
Remote batch	\$100	None	—	—	\$300/mo.
Terminal connect time:					
Interactive	\$6.00-12.00/hr.	\$8.00-12.00/hr.,	\$7.00/hr.	See Comments	\$12.85-22.50/hr.
Remote batch	None	None	—	—	\$11.00/hr.
Central processor time:					
Interactive	\$0.19-0.38/CRU	Varies	\$0.02/CPU second	See Comments	\$0.0107/CRU*
Remote batch	\$0.19-0.38/CRU	Varies	—	—	\$11.00+/proc. unit
Mass storage:					
Interactive	\$0.15/1000 chars./mo.	\$0.035/track/day	\$0.10/1000 chars./mo.	—	\$0.0107/1000 chars./day
Remote batch	\$0.15/1000 chars./mo.	\$0.25/spindle/minute	—	—	\$0.01/track/day
COMMENTS					
	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	Offers remote batch processing, TSO time-sharing, OBS-WYLBUR text editing, DBMS (ADABAS, Central Software), graphics	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; prices are contingent upon type of application and/or computer resource requirements	Higher-level "programmerless programming" procedures for financial modeling and data base management systems; users can call prewritten Fortran or Assembler language routines as subroutines of APL programs
					*CRU—A measure of CPU time including I/O access

All About Time-Sharing and Remote Computing Services

COMPANY	Proprietary Computer Systems, Inc.	Pryor Corporation	Quanex Management Sciences	Rapidata, Inc.	Remote Computing Corporation
GENERAL					
Name of service	PCS/TEXT	Remote Computing and Digital OEM	Remote Computing Services	Rapidnet	R-NET
Date operational	1970	June 1969	Aug. 1977	1967	Oct. 1968
Areas currently served	U.S.; Europe	Midwest	United States	U.S., U.K.	Continental U.S. via local dialing
EQUIPMENT					
Computers	IBM 370/158 (3031 backup)	DECSYSTEM-2050 in Chicago	IBM 3031-compatible (2) in Southfield, Michigan	Honeywell 437 (13), DECSYSTEM-1070 (3), DECSYSTEM-1080, and DECSYSTEM-2020	Burroughs B 7700 (2)
No. of simultaneous users	Not specified	35	256	500	200
Conversational terminals supported	Most hardcopy and video terminals at 15 and 120 cps	DEC 36, DEC III, Hazeltine 1550	IBM 3270	Most terminals to 120 cps unit	Most ASCII units at 10 to 120 cps, Correspondence/EBCD units at 14.8 to 120 cps
Batch terminals supported	IBM 2780/3780, HASP and compatible units	—	IBM HASP, IBM 2780/3780, 2770 and compatible units; Datapoint	Most terminals to 4800 bps	Data 100, IBM 2780 and emulators, Singer M&M, Burroughs DC 1000
SOFTWARE					
Conversational programming languages	PCS/TEXT	FORTRAN, BASIC, COBOL	O-W-L	FORTRAN, BASIC, COBOL, DBMS, and proprietary	FORTRAN, PL/1, BASIC, COBOL, ALGOL
Batch-mode programming languages	PCS/TEXT	—	FORTRAN, COBOL, PL/1, RPG, ASI-ST	FORTRAN, COBOL, BASIC, and proprietary	FORTRAN, PL/1, BASIC, COBOL, ALGOL, Work Flow (WFL)
Principal applications	Publication production in all business and government applications	Mfg., Dist.	Accounting and financial systems	Financial	Business; thrift, securities & commodities, data bases
CHARGES					
Min. monthly charge:					
Interactive	\$300.00/mo.	None	\$275	\$100	\$100
Remote batch	Negotiated	—	\$275	\$100	\$100
Terminal connect time:					
Interactive	\$4.05-10.75/hr.	\$6.00/hr.	\$5.00/hr.	\$7.00-32.00/hr.	\$13-20/hr.
Remote batch	—	—	\$20.00/hr.	—	\$12/hr.
Central processor time:					
Interactive	\$0.005/process unit	\$0.16/sec.	\$1,080.00/CPU hr.	\$0.033-0.11/CPU	\$0.30-0.367/RCU*
Remote batch	—	—	\$300.00/CPU hr.	\$0.033-0.11/CPU	\$0.15-0.30/RCU*
Mass storage:					
Interactive	\$0.25/psr	\$0.0033/1000 chars./day	\$0.06/13,030 chars./day	\$0.10-0.60/1000 chars./month	\$3.50/million chars./day
Remote batch	—	—	\$0.06/13,030 chars./day	—	\$3.50/million chars./day
COMMENTS	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 photo-composition	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 accounting and financial packages; volume discounts 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 *RCU (Remote Computing Unit) includes central processor time, I/O channel time, core storage, proprietary applications, and language used.

All About Time-Sharing and Remote Computing Services

COMPANY	Ross Systems, Inc.	Rotelcom Data, Inc.	Scientific Computers, Inc.	Scientific Process & Research, Inc.	The Service Bureau Company
GENERAL					
Name of service	—	—	—	SPR Timesharing Network	CALL/370 Management Time Sharing
Date operational	1974	Apr. 1980 (date commercially available)	1960	1969	1969 (CALL/360)
Areas currently served	Worldwide via TYMNET	Western New York State	Continental U.S.	Continental U.S., Canada, Mexico, & Puerto Rico via local dialing	Local access in 163 U.S. & 35 International locations, including Europe, Canada, Far East, Australia, and Puerto Rico
EQUIPMENT					
Computers	DEC PDP 11/70 (3), DEC VAX 11/780 in Palo Alto	DEC PDP 11/70 in Rochester, NY	Itel AS/5 (2)	Prime 400	IBM 370/158 (12), IBM 3031 (2), CDC Omega 480 (2)
No. of simultaneous users	200	24 dial-in lines	8	64	Over 160/system
Conversational terminals supported	Any ASCII terminal	DEC LA 34/36/120, VT 100; Lear Siegler ADM3; any ASCII terminal up to 1200 bps	IBM 3767, Harris, IBM 3270	TTY 33/35 and other ASCII terminals at 10 or 30 cps; IBM 2741	IBM 2741, TTY 33/35, and ASCII terminals at 10, 30, or 120 cps
Batch terminals supported	IBM 2780/3780	—	—	—	IBM 2780/3780 or equivalent; IBM S/360 & S/370 processors
SOFTWARE					
Conversational programming languages	COBOL, FORTRAN, BASICPLUS II; MAPS, INTACT (proprietary languages)	BASIC, FORTRAN, DIBOL	Assembler, COBOL	FORTRAN, BASIC, COBOL, PMA	FORTRAN, BASIC, PL/1, Data Management, APL
Batch-mode programming languages	—	—	Assembler, COBOL	—	FORTRAN, BASIC, COBOL, PL/1, Data Management
Principal applications	Financial planning and control systems	Inventory & budget control, record mgt., engineering, optics, telecommunications industry applications	Manufacturing, distribution, insurance, direct mail	Engineering, scientific and business	Business, manufacturing, financial modelling
CHARGES					
Min. monthly charge:					
Interactive	None	\$3.00	See Comments for pricing info.	None	\$100
Remote batch	None	—	—	—	—
Terminal connect time:					
Interactive	\$8.90/hr.	\$4.00-12.00/hr.	—	\$6.00-10.00/hr.	\$11.00-16.00/hr.
Remote batch	\$5.00/hr.	—	—	—	\$30.00/hr. (2400 bps)
Central processor time:					
Interactive	\$0.115/CPU second	\$0.15-0.30/kilo-core min	—	\$0.006-0.01/RAM	\$0.21/PU
Remote batch	\$0.07/CPU second	—	—	—	\$0.02-0.10/PU
Mass storage:					
Interactive	\$0.04-0.25/512 chars./month	\$0.05-0.15/512 chars./month	—	\$0.015/1000 chars./day less 10% connect charge	\$0.015-0.022/1000 bytes/day
Remote batch	\$0.04-0.25/512 chars./month	—	—	—	\$0.006/1000 bytes/day
COMMENTS					
		Rotelcom Data, Inc. is a subsidiary of Rochester Telephone Corp.; their timesharing service has been operational internally for 3 years; most of Rotelcom's applications are oriented towards the telecommunications industry; other Rotelcom services include sales of terminals, modems, & other data comm products, and turnkey small business systems for accounting applications based on DEC computers	Totally leased line on-line system; charges billed on a unit rate basis depending on application package utilized	Offers simulators for plastics processing and optimization package; extruding, blow molding, injection molding; also information retrieval	Subsidiary of Control Data Corp. since January 1973; also offers TSO, RJE, On Call/Plus, remote computer service under OS/VS2 (MVS)

All About Time-Sharing and Remote Computing Services

COMPANY	Shared Medical Systems, Inc.	I.P. Sharp Associates Limited	A.O. Smith Corporation	Statistical Tabulating Corporation	STSC, Inc.
GENERAL					
Name of service	Financial Management, ACTION, COMMAND	Sharp APL	Network Information Services	STAT-TAB	APL*PLUS Services
Date operational	1969	July 1969	1969	Spring 1972	Aug. 1969
Areas currently served	Nationwide network excluding Hawaii	Local access in over 300 cities with 48 branch offices in Canada, U.S., Europe and Australia	Continental U.S. & international via Telenet	Continental U.S.; dial-up access at 75 to 96.2K baud; leased lines available	U.S., Canada, U.K., France, Germany, Spain, Puerto Rico, Hong Kong
EQUIPMENT					
Computers	IBM 370/168 (2), IBM 3033 (2)	Amdahl 470/V6, Amdahl 470/V8	IBM 370/165-II, Amdahl 470/V6-II	IBM 370/158 (2) in Chicago	Amdahl 470/V6 (1), IBM 370/148 (1) in Bethesda, MD
No. of simultaneous users	Over 500	350	Not specified	200	Over 450
Conversational terminals supported	IBM 3770, Digital Equipment, Four-Phase	Asynchronous units up to 1200 bps, including ASCII (e.g., 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	All IBM-compatible hard-copy & CRT terminals; TTY 33/35 & compatible units	Any asynchronous ASCII unit up to 1200 bps; IBM 2741, 3767 at 14.9 cps
Batch terminals supported	—	—	IBM HASP, IBM 3780, and all BSC, JES II and compatible units; others on request	All IBM-compatible units	IBM 2780/3780, HASP, & System/3; Data 100, Harris, Sycor, Four-Phase, etc.
SOFTWARE					
Conversational programming languages	Remote job entry; time-sharing option	APL	FORTRAN, COBOL, PL/1	CMS- and TSO-supported languages	APL, COBOL, FORTRAN, BASIC, VS/APL (under VM only)
Batch-mode programming languages	Not applicable	APL	FORTRAN, COBOL, PL/1	FORTRAN, COBOL, PL1, RPG, ADPAC, Assembler	All System/370
Principal applications	Hospital accounting, administrative, patient care, & communications	Business, scientific, financial modelling, manufacturing, banking	Manufacturing, banking (EFT), engineering, financial modeling, graphics	Business & scientific	Business, scientific, manufacturing, & financial modeling
CHARGES					
Min. monthly charge:					
Interactive	—	None	\$100	Contact vendor for pricing	\$100
Remote batch	—	None	\$100	—	—
Terminal connect time:					
Interactive	—	\$1.00/hr.	\$16.00/hr.	—	\$12.00-24.00/hr.
Remote batch	—	—	\$20.00/hr.	—	—
Central processor time:					
Interactive	—	\$0.40/CPU unit	\$0.058/CRU*	—	\$0.85/CRU
Remote batch	—	\$0.20-0.30/CPU unit	\$0.033/CRU*	—	Greater of \$10 or \$0.85/CRU
Mass storage:					
Interactive	—	\$0.70/256K bytes/day	\$0.0067/1000 bytes/month	—	\$12.00/million bytes/day
Remote batch	—	\$0.70/256K bytes/day	\$0.0038/1000 bytes/month	—	—
COMMENTS	An integrated information system for hospitals in the areas of communications, patient care, financial processing, health care, and physician's billing	Provides in-house Sharp APL installations, consulting and education services, and mini-computer-based systems for real time and process control; over 28 on-line data bases	Offers on-line and batch services under MVS, TSO and JES II; EFT switching network available; DOS capabilities through UCC-II/DUO; volume and non-prime time discounts available *CRU (Computer Resource Unit) accounts for resources used, including CPU, memory, I/O operations, job setup, & proprietary software royalties	System runs under MVS and VM/370; emulation of any IBM software/hardware combination is supported	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

All About Time-Sharing and Remote Computing Services

COMPANY	Sun Information Services Company	Sun Information Services Company	Sun Information Services of Kentucky	System Development Corporation	Technical Advisors, Inc.
GENERAL					
Name of service	INTERCOM	TSO, WYLBUR	Timesharing & Remote Job Entry	SDC	TECH-mAC
Date operational	Sept. 1977	Sept. 1977	Jan. 1969	1971	June 1967
Areas currently served	U.S.	U.S.	Multiplexers in Indianapolis; access from most U.S. cities via Tymnet	North America (Claims Admin. Svc.); world-wide (Search Svc.)	Continental U.S. except Alaska (toll-free except in Michigan)
EQUIPMENT					
Computers	CDC Cyber 750	IBM 370/168 MP, 3033	Honeywell 430 (2) & 440 (2); IBM 360/65	Amdahl 470/V7 (1) in Santa Monica, CA	Varian 622i (2), 1 in Wayne, MI, and 1 in Phoenix, AZ; plus PDP-11/70 in Wayne, MI
No. of simultaneous users	20	150	80 total	No practical limit	20 in Wayne, 5 in Phoenix
Conversational terminals supported	GE TermiNet 300, Sycor 340 & TI 725/735/745	ASCII-compatible, IBM 2741/3270	Any ASCII terminal at 10 or 30 cps	IBM 3270-type (Claims Admin. Svc.); most asynchronous terminals (Search Svc.)	TTY 33/35 & other ASCII terminals at 10 or 30 cps
Batch terminals supported	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	Any HASP-compatible RJE terminal; IBM 2780, 3780, & 3620	—	—
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC	FORTRAN, COBOL	FORTRAN, BASIC, ROSCOE	COBOL, PL/1	FORTRAN
Batch-mode programming languages	FORTRAN	FORTRAN, COBOL, PL/1 BAL, SIMSCRIPT 2.5	COBOL, FORTRAN, PL/1, RPG	COBOL	—
Principal applications	—	Program development	Business, scientific, engineering, & banking	Employee health claims administration; bibliographic search & retrieval	Civil engineering & surveying
CHARGES					
Min. monthly charge:					
Interactive	None	None	None	Contact vendor for pricing	None
Remote batch	None	None	\$100		—
Terminal connect time:					
Interactive	\$12.00/hr.	\$14.00/hr.	\$10.00/hr.	—	\$10-28/hr. (10 cps)
Remote batch	\$10 (2000 bps)-15/hr.	\$10-15 (4800 bps)/hr.	\$10.00/hr.	—	\$15-36/hr. (30 cps)
Central processor time:					
Interactive	\$0.075/system sec.	\$5.58/CWU	\$0.04/CPU unit	—	None
Remote batch	\$0.050/sys.sec.(4800bps)	\$2.48/CWU (4-hr. resp.)	—	—	—
Mass storage:					
Interactive	\$0.30 storage unit/month	\$0.065/MSU/week	\$0.75-1.75/1000 chars./month	—	\$10.00/2000 chars./month
Remote batch	\$0.30 storage unit/month	\$0.065/MSU/week	—	—	—
COMMENTS					
			Metridata Computing, Inc. was purchased by Sun Information Services in February 1979	SDC Claims Administration Service automatically administers the complete process of employee health claims; SDC Search Service is an information retrieval service with access to 65+ bibliographic databases	Offers specialized service for civil engineers and surveyors only; plotter available for \$45/hour

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COMPANY	Tel-A-Data, Inc.	Teledata, Inc.	Telstat Systems, Inc.	Timesharing Consultants, Inc.	Time Sharing Resources, Inc.
GENERAL					
Name of service	Tel-A-Data, Inc.	Teledata Timesharing Services	Telac/1	—	TOTAL/APL
Date operational	Dec. 1966	1976	1971	Aug. 1976	July 1970
Areas currently served	State of Florida	Entire U.S. and abroad via local access numbers	U.S.	North America	Local access in all major U.S. metropolitan areas, plus major Canadian cities
EQUIPMENT					
Computers	Burroughs B2835	DTSS on Honeywell 66/07 in Lebanon, NH	Xerox Sigma 9, Sigma 6	DECSYSTEM-20s in Tucson, AZ	IBM 360/75 (2) plus several minicomputers in Great Neck, NY
No. of simultaneous users	80	100	52 (10 to 120 cps)	60	Not specified
Conversational terminals supported	Most asynch. & synch. terminals	All ASCII asynchronous terminals and IBM 2741 at 10, 15, 30, or 120 cps	Any ASCII terminal	All ASCII	IBM 2741 & equivalent units; all ASCII terminals
Batch terminals supported	—	IBM 2780 and compatible units	IBM HASP, IBM 2780/3780	—	IBM 2780, Data 100, & equivalent units
SOFTWARE					
Conversational programming languages	BASIC, COBOL, FORTRAN	APL, BASIC, COBOL, FORTRAN, PL/1	FORTRAN, ANS FORTRAN, EXTENDED FORTRAN IV, COBOL, BASIC, APL, RGP, METASYMBOL	FORTRAN, COBOL, BASIC, APL, SAIL, PASCAL, SNOBOL, LISP	APL, BASIC, COBOL, FORTRAN, PL/1, Assembler
Batch-mode programming languages	—	APL, BASIC, COBOL, FORTRAN, PL/1	FORTRAN, ANS FORTRAN, EXTENDED FORTRAN IV, COBOL, BASIC, APL, RPG, METASYMBOL	FORTRAN, COBOL, PASCAL, SNOBOL, LISP, SAIL	FORTRAN, COBOL, BASIC, APL, PL/1, Assembler
Principal applications	Business; wholesale distribution	Business, retailing, engineering, financial modelling	Financial, mathematical	Engineering, statistical, accounting, financial modelling, data base management	Financial & general business
CHARGES					
Min. monthly charge:					
Interactive	\$1,500	\$50	Contact vendor	None	None
Remote batch	—	\$50	Contact vendor	None	None
Terminal connect time:					
Interactive	Included	\$7.00-25.00	Contact vendor	\$4.50-25.00/hr.	\$14.00/hr.
Remote batch	—	\$7.00-25.00	Contact vendor	\$4.50-25.00/hr.	\$14.00/CPU hr.
Central processor time:					
Interactive	Included	\$0.08-0.11/CRU*	Contact vendor	\$0.09-0.20/sec.	\$0.11/CRU*
Remote batch	—	\$0.06-0.10/CRU*	Contact vendor	\$0.09-0.20/sec.	\$0.11/CRU*
Mass storage:					
Interactive	Included	\$1.40/4096 chars./month	Contact vendor	\$0.01-0.0125/2560 chars./day	\$11.00/million bytes per day
Remote batch	—	\$1.40/4096 chars./month	Contact vendor	\$0.01-0.0125/2560 chars./day	\$11.00/million bytes per day
COMMENTS	Main emphasis is on invoicing, accounts receivable, statistical reports, and inventory control; monthly charges include CP and connect time	Interactive and batch services available to all terminals; strong financial and retailing applications; data link to IBM hardware *CRU (Computer Resource Unit) is a composite of CPU, I/O, and core	Provides access to Teleprice/80 databank for automatic retrieval of securities pricing and related information; Automated Portfolio Performance Measurement Services available; GNMA full information service; dual computer configuration offers 100% hardware redundancy; system includes large in-house library of FORTRAN subroutines; contact vendor for pricing	Financial modelling using ADR's EMPIRE data base management with Software House's 1022; access through TYMNET, TELENET, and TCI communications networks; Hydrologic Engineering Center (HEC) programs available for civil engineers; OEM for DEC hardware	TOTAL/APL File Subsystem facilitates processing of large shared files and data bases; within TOTAL/APL packages include INSIGHT (financial analysis), QED (econometrics), SHELL (DBMS), GRAFIT (terminal graphics), & COMPASS (compustat analysis); additionally offered under VM/CMS are RAMIS II (DBMS) & IMPACT (financial analysis) *CRU (Computer Resource Unit)—a virtual algorithm; incl. CPU time & core reqs.

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COMPANY	Tymshare, Inc.	United Computing Systems, Inc.	University Computing Company	University Computing Company
GENERAL				
Name of service	TYMCOM IX, X, & 370	APEX/SL	EXEC/FASBAC	VS-370
Date operational	1966	Jan. 1968	1967	1977
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, Frankfurt, others	Access in 195 U.S. and 5 Canadian cities; also via Tymnet & Telenet; U.K. (London data center), and Europe via FIDES network (Zurich)	U.S., Canada, Europe	Nationwide
EQUIPMENT				
Computers	Xerox 940 (22), DECSYSTEM-10 (17), & IBM 370/158 (8), 3033 (2)	CDC 6600 (3), CDC CYBER 174 and 175 (2), Cyber 730 (2), CDC 176 (1), and CRAY-1	Univac 1108 (6)	IBM 370/168
No. of simultaneous users	1700 total	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, 30, and 120 cps and correspondence code	IBM 3270
Batch terminals supported	IBM 2780/3780 and compatible units	IBM 2780/3780, HASP, CDC 200 UT	IBM 2780, HASP, COPE, E1004	IBM 2780/3780, HASP
SOFTWARE				
Conversational programming languages	FORTRAN, BASIC, COBOL, PL/1, APL, SAIL, FOCUS, and others	FORTRAN, BASIC, APL, PASCAL, INFORM, IFM, Editor, etc.	EDIT	—
Batch-mode programming languages	FORTAN, BASIC, APL, COBOL, PL/1, SAIL, FOCUS, and others	FORTRAN, COBOL, BASIC, PASCAL, COMPASS, etc.	FORTRAN, COBOL, Assembler	FORTRAN, COBOL, PL/1, Assembler
Principal applications	Business & scientific	Engineering, business, scientific, data base	Scientific, engineering, manufacturing, commercial	Accounting, graphics, statistical, data mgt., engineering mgt.
CHARGES				
Min. monthly charge:				
Interactive	—	\$100	Contact vendor for pricing	Contact vendor for pricing
Remote batch	—	\$100		
Terminal connect time:				
Interactive	\$6.50-14.00/hr.	\$9.00-23.75/hr.	—	—
Remote batch	—	\$10.00-75.00/hr.	—	—
Central processor time:				
Interactive	\$0.09-0.16/TRU	\$0.20-0.28/SU*	—	—
Remote batch	—	\$0.19-0.56/SU*; \$0.75-1.35/CSU (CRAY)	—	—
Mass storage:				
Interactive	\$0.10-0.45/1000 chars./month	\$0.36/1K chars./mo. \$50/200K chars./mo.	—	—
Remote batch	—	\$0.36/1K chars./mo. \$50/200K chars./mo.	—	—
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; Dallas Datacenter has one CDC 176 *SU—System Unit	Service is UCC-designed with modified EXEC; unique language modifications, file handlers, and tape protection devices; photo-composition service; many exclusive applications	System charge is dependent on resource units utilized; O/S is MVS-JES II; RJE is via ROSCOE; interactive is via ROSCOE and TSO

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COMPANY	University Computing Company	University Computing Company	USS Engineers and Consultants, Inc.	Wang Data Center
GENERAL				
Name of service	1100/OS	NOS/BE	UEC	—
Date operational	1976	1975	May 1970	1965
Areas currently served	U.S., Canada	U.S., Canada	U.S., Canada	Northeastern U.S.
EQUIPMENT				
Computers	Univac 1108, 1100/81	CDC CYBER 170/750, CYBER 175	CYBER 175, Honeywell 6080 in Pittsburgh, PA	IBM 3033, WANG V5
No. of simultaneous users	Not specified	Not specified	Not specified	Not specified
Conversational terminals supported	ASCII at 300, 1200 bps	Asynchronous to 9600 bps	Most 30 to 120 cps terminals	All IBM compatible
Batch terminals supported	IBM 2780, HASP, COPE, E1004	IBM 2780/3780, HASP, COPE	CDC 1700, CDC 200, IBM 1130, IBM 2780/3780, IBM HASP, Incoterm	All IBM
SOFTWARE				
Conversational programming languages	FORTRAN, COBOL, BASIC, APL	FORTRAN, COBOL	FORTRAN, COBOL, BASIC, APL	COBOL, PL/1
Batch-mode programming languages	FORTRAN, COBOL, APL, Assembler	FORTRAN, COBOL	FORTRAN, COBOL	FORTRAN, COBOL, BASIC, RPG, PL/1
Principal applications	Financial modeling, structural analysis, data base, project mgmnt, others	Engineering, nuclear, scientific, graphics	Engineering, distribution	Business & scientific
CHARGES				
Min. monthly charge:				
Interactive	Contact vendor for pricing	Contact vendor for pricing	None	None
Remote batch			None	None
Terminal connect time:				
Interactive	—	—	None	\$4.00-8.00/hr.
Remote batch	—	—	None	\$4.00-8.00/hr.
Central processor time:				
Interactive	—	—	\$24.00/min.	Resource and priority based
Remote batch	—	—	Rates on request	
Mass storage:				
Interactive	—	—	\$1.00/10,000 chars./month	Priority based
Remote batch	—	—	Rates on request	Priority based
COMMENTS				
	Multiprogramming system; supports CTS conversational timesharing for text editing and interactive execution		Subsidiary of U.S. Steel Corp., lower rates for batch mode and volume usage; surcharges for certain software	Batch, interact, and TSO specialty

All About Time-Sharing and Remote Computing Services

COMPANY	Warner Computer Systems, Inc.	Western New York Computing Systems, Inc.	Xerox Computer Services	Xerox Computer Services
GENERAL				
Name of service	—	—	Interactive Accounting System (IAS)	General Timesharing Service
Date operational	1971	Oct. 1971	1970	1978
Areas currently served	U.S., Canada, Europe, Mexico	Western New York State	Continental U.S., Canada, & Europe	Entire U.S. plus Canada; in Europe, where Xerox Computer Services has branch offices
EQUIPMENT				
Computers	Xerox Sigma 6's, Sigma 9	Data General Nova 840, Nova 2/10, Nova 3/12 (2)	IBM 3033N's and Xerox Sigma 7's & 9's; a total of 23 mainframes located in 4 data centers in the greater Los Angeles area	Xerox Sigma 9 in Hawthorne, CA
No. of simultaneous users	128 per system	48 at 300 or 1200 bps	4000+	84 total (24 at 120 cps; 60 at 30 cps)
Conversational terminals supported	Most 10 to 120 cps terminals	Any ASCII terminal	Xerox 1340/1340A/1330/1350; any std. ASCII async. terminal	Any standard ASCII asynchronous terminal
Batch terminals supported	IBM 2780/3780, HASP and compatible units	—	—	Any IRBT (intelligent remote batch terminal) utilizing HASP protocol
SOFTWARE				
Conversational programming languages	FORTRAN, COBOL, BASIC, APL	BASIC, FORTRAN	Proprietary "Plain English" language activates standard Xerox programs	APL, BASIC, COBOL, FORTRAN
Batch-mode programming languages	FORTRAN, COBOL, BASIC, APL	BASIC	—	APL, BASIC, COBOL, FORTRAN
Principal applications	Financial, brokerage systems, insurance systems	Credit union service, medical billing systems, custom time-sharing, town court systems	Act'g., mfg., distribution utility billing, municipal, general time-sharing	Accounting, manufacturing, distribution, public services, financial
CHARGES				
Min. monthly charge:				
Interactive	None	None	\$1,000	\$250
Remote batch	None	—	—	\$250
Terminal connect time:				
Interactive	\$9.00-\$13.00/hr.	\$5.00-9.00/hr.	See Comments	\$9.50/hr.
Remote batch	—	—	—	\$9.50/hr.
Central processor time:				
Interactive	\$0.17/CPV*	\$0.01/second	See Comments	\$13.00/CPU
Remote batch	\$0.13-0.15/CPV*	—	—	\$13.00/CPU
Mass storage:				
Interactive	\$0.27-0.50/1K chars./month	\$0.10/1000 chars./mo.	See Comments	\$0.01/2048 bytes/day
Remote batch	\$0.27-0.50/1K chars./month	—	—	\$0.01/2048 bytes/day
COMMENTS				
	Full service company offering financially-oriented systems (financial modelling, cash mgt., etc.) to Fortune 1000 companies; maintains large data bases for the investment community; offers a fully automated assigned risk Automobile Insurance System *CPV unit equates to a CPU second; 60 CPV's equal one CPU minute	Concentrates on custom local support and dedicated long term relationships with clients; complete consulting services for all data processing needs	Offers integrated on-line accounting system; charges are based upon transactions entered, storage used, and lines printed	If the solution to your problem requires the development of a unique system, Xerox Computer Services technical consultants will define the problem, design the system, develop the programs, write the documentation, and train and support your staff for as long as the system is used, with guaranteed results; Custom Software pkgs. are available along with the Xerox CONTROL system, a self-contained software package