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All About Remote Computing Services

A remote computing service company can be defined, for our purposes, as a commercial organization that provides computer-based services to users at remote locations. In the United States and Canada today, more than 100 of these companies offer a broad range of services that collectively span the full spectrum of business and scientific computer applications. You can make use of their services by installing a teletypewriter or other data terminal in your office and communicating, via telephone lines, with one or more powerful computers that may be located in your own city or hundreds of miles away.

The remote computing service companies owe their existence and rapid growth to these four generally accepted tenets:

- Because of the inherent economics of computer production and operation, it's unusually cheaper to use a small piece of a large computer system than a large piece (or all) of a small one.
- Computers should be easy to use and should maximize the efficiency of the *people* who use them.
- Thousands of prospective users want and need a convenient, economical source of computer power.
- Present equipment, software, and communications technology makes it practical to divide the resources of a large computer system among many simultaneous users at remote terminals.

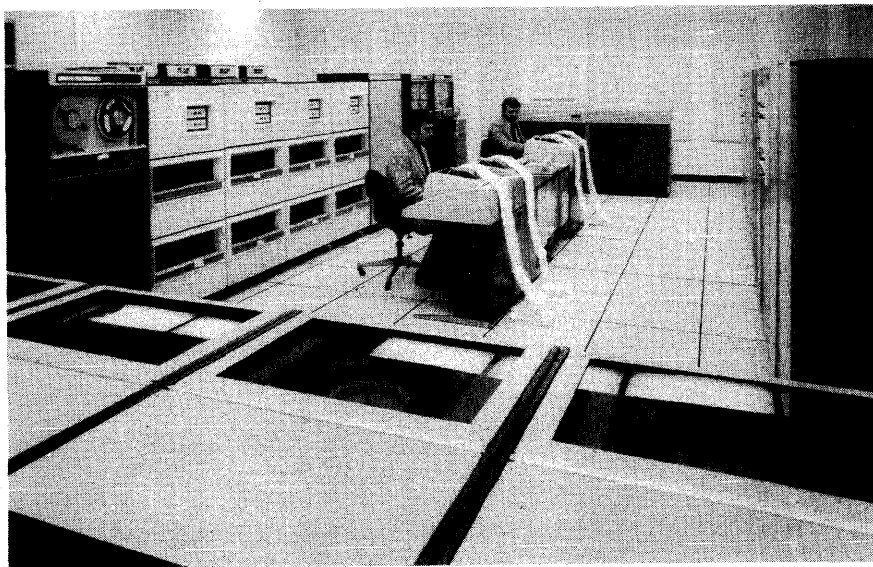
The currently available remote computing services can be broadly classified as either interactive time-sharing or remote batch processing services. Many companies now offer both types of services, and the distinctions between them are frequently blurred.

This comprehensive report explains both interactive time-sharing and remote batch processing, discusses their advantages and drawbacks, summarizes the services offered by 98 remote computing companies, tells how users rate the leading companies, and provides guidelines for selecting a suitable supplier and getting started.

An *interactive time-sharing 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.

The Evolution of Remote Computing

A glimpse at the history of remote computing shows why the earlier "time-sharing" designation is giving way to the newer name. The earliest remote computing systems were developed in the universities in the early 1960's, with Dartmouth and M.I.T. in the vanguard. These were interactive time-sharing services designed for scientists and engineers who wanted to use the computer's vast computational power to solve problems. Problems confronting scientists and engineers typically have this in common: they tend to require comparatively little input >



Here's one of the 14 Xerox computer systems, all located in Ann Arbor, Michigan, that provide the processing power for users of Com-Share's nationwide remote computing network.

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▷ 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 time-sharing 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.

That's interactive time-sharing 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 time-sharing 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 time-sharing, 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 the 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 time-sharing 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, time-sharing 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 time-sharing firms, led to a severe shakeout. New customers were hard to find, and it became virtually impossible to raise capital to start a new remote computing company or nurture an existing one. Dozens of remote computing service firms merged with other companies, abandoned their remote computing efforts in favor of more promising activities, or closed their doors completely.

But remote computing survived its period of adversity and must now be regarded as a healthy, fast-growing industry. More than 100 companies offer remote computing services in the U.S. and Canada today, and many of them are well-established and solidly profitable.

It's clear that 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 survey of remote computing users, which is summarized on page 70G-900-01h, indicated a 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 time-sharing and remote batch processing, rose from just \$20 million in 1966 to an estimated \$930 million in 1974, and the industry's revenues are currently growing at the rate of about 25 percent per year.

Until 1973, the leading supplier of remote computing services had long been General Electric Company, which entered the business in 1965 and has invested over \$150 million in developing an international network that serves the United States, Canada, and Western Europe. A "super-center" in Cleveland contains more than 100 ▷

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➤ interconnected central processors and communications controllers. GE's new "Mark III" service combines interactive time-sharing, 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. It should be noted, however, that a significant portion of SBC's revenues are derived from conventional service bureau operations that do not involve communications links.

Other leading suppliers of remote computing services include Computer Sciences Corporation, Com-Share, Honeywell Information Systems, International Timesharing Corporation, Keydata Corporation, Leasco Response, McDonnell Douglas Automation Company, National CSS, On-Line Systems, Rapidata, Remote Computing Corporation, Tymshare, United Computing Systems, and University Computing Company. Each of these firms has made a multimillion-dollar investment in remote computing and offers a wide range of services over a broad geographical area. Not to be overlooked, however, are the dozens of smaller remote computing companies, which offer a wide choice of equipment, software, and services together with the possibility of more personalized attention to your specific needs.

The Advantages of Remote Computing

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

- *Flexibility.* Remote computing enables you to buy only as much computing power as you need and (except for fixed terminal costs and minimum service charges) to pay only for what you use. Thus, you can effectively "stretch" or "shrink" the size of your computer installation from day to day as your workload expands or decreases. You can use a remote computing service to handle the peak-period overloads on your in-house computer system. You can explore the possibilities of centralized data bases and management information systems at comparatively low costs and without any long-term commitments. What's more, you can deal simultaneously with two or more remote computing companies and take advantage of differences in their pricing structures, languages, and program libraries.
- *Ease of use.* In general, remote computing terminals are straightforward in operation and easy to learn and use. Programming languages such as BASIC, together with conversational-mode compilers and debugging aids, have made programming quite simple and fun to learn. The comparative simplicity of the terminals and their use of operation has 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 time-sharing 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, time-sharing 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 widespread on-line communications network with centralized files at a fraction of the cost of setting up and operating your own. (It should be noted, however, ➤

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- ▷ 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.

Some Potential Disadvantages

Despite its many benefits, remote computing can be a distinctly mixed blessing. Here are some of the potential drawbacks to watch out for:

- *Questionable reliability.* This is the question that should be uppermost in the minds of prospective remote computing users: Just how reliable is the service? Many of the early time-sharing networks earned a notorious reputation for being down (out of service) more often than they were up. Fortunately, a great deal of progress has been made since those days. Only 5 percent of the respondents to Datapro's latest survey of remote computing users rated the reliability of the services they were using as poor. Most of the system "crashes" that occur nowadays are of short duration and are followed by effective recovery procedures that minimize their impact upon users' operations.

Unfortunately, the purveyors of time-sharing services are still being plagued by problems arising within the facilities of the telephone companies which provide the vital communications links between the computers and their users. The telephone companies are being severely criticized for their failure to provide the quality of service required for reliable data communications. 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 many of the current remote computing networks, input and output speeds are still limited to the 10 to 15 characters-per-second rates of conventional typewriter-style terminals. These low speeds are more than adequate for many applications, but in other cases they impose a severe restriction on

throughput. To overcome this limitation, many remote computing companies now support 30-cps interactive terminals and/or much faster remote batch terminals.

- *Low computational efficiency.* The complex software required to coordinate and control the operations of multi-user interactive time-sharing systems usually requires large amounts of central processor time and memory space. As a result, the computational efficiency of many of the current systems is very low. From the user's point of view, this poor efficiency may or may not be a matter of concern, depending upon the manner in which the central processor costs are allocated. Low computational efficiency is less likely to be a problem in remote batch processing systems because their control software requirements are less complex.
- *Questionable data security.* When multiple users share a computer system, challenging problems are encountered in safeguarding the confidentiality and integrity of each user's programs and data files. Most of the commercial remote computing services have paid a good deal of attention to this security problem, combining special access protection with passwords and a variety of other techniques. Prospective users of any remote computing system should make sure that the available security provisions will adequately protect their interests.
- *System loading problems.* In addition to down-time resulting from the reliability problems discussed above, a remote computing system may be unavailable when you need it because the system is "saturated." Saturation occurs when a remote computing system is being accessed by the maximum number of users it is capable of serving simultaneously. As the load on a system grows heavier, response times tend to increase, turnaround 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 remote computing users who responded to Datapro's recent survey, 5 percent judged the response time to be poor and 14 percent rated it only fair.
- *High communications costs.* Unless you choose a remote computing company that offers "free" or fixed-cost local access in your area, communications costs can easily represent the largest component of your remote computing bill. One of the problems is that it is usually necessary to use standard voice-grade telephone lines, with a practical data-carrying capacity of 4800 bits per second or more, to transmit teletypewriter data at 110 bits per second. Needless to say, the user pays for this inefficiency. Prospective remote computing users should carefully investigate the communications costs they will encounter and make every reasonable effort to minimize them. ▷

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The Teletype Model 33 KSR (keyboard send/receive) terminal, because of its low cost and widespread software support, has long been the most popular choice among users of interactive time-sharing systems. It can be equipped with a paper tape reader and punch (which makes it an ASR unit) or a magnetic tape buffer. Alternatively, users can choose from a host of faster keyboard/printer terminals and CRT display units which are fully compatible with the Teletype terminals.

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

remote computing network requires each user to identify himself with a password and a department or project charge number.

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

Scientific Applications

Scientific, engineering, educational, and other predominantly computational applications are the ones for which time-sharing 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.

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

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 really only begun to tap 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.

These predictions may yet come true, but it is now apparent that it's going to be a long, gradual process rather than a rapid revolution. The use of both interactive time-sharing and remote batch processing for business ▷

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▷ functions is growing steadily now, but 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 readymade application programs are a virtual necessity for any remote computing supplier vying for business data processing accounts — yet the suppliers were surprisingly slow to develop and offer such programs. There has, however, been significant recent progress in this area. As shown by the chart on the last two pages of this report, many of the remote computing companies now offer programs to handle accounts payable, accounts receivable, general ledger, payroll, inventory control, and other common business functions. Moreover, most of the suppliers offer programming services to tailor their “packaged” programs to the specific needs of each user.

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

Third, the previously discussed reliability problems have caused many companies to reject the use of remote computing for applications in which undetected errors and missed deadlines cannot be tolerated. Outright rejection of remote computing on these grounds alone probably represents an unduly harsh judgement. In designing a remote computing application — as in any business data processing function — the systems analysts and programmers should attempt to anticipate every possible source of error and then 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 time-sharing 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 cards 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 400 cities in the U.S. and Canada and over 25 cities in Western Europe, 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 application 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.

Trends in Remote Computing

The advantages of remote access to large computer systems are so obvious and attractive that the number of users and applications are bound to increase dramatically in the years to come.

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 System/3 or the proliferating mini-▷

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➤ computers) to replace individual time-sharing or remote batch terminals, while others will install full-barreled in-house time-sharing systems of their own. To make up for these lost customers and maintain their growth, the remote computing suppliers will have to keep on attracting new customers, primarily from the huge ranks of small business firms.

- Remote computing users will have an ever-growing variety of "packaged" application programs to choose from. These will be developed by both the remote computing companies and independent software firms. "Piggy-backing" of specialized services on existing remote computing networks will continue to increase.
- Finally, both suppliers and users will begin to take advantage of the fact that the nationwide remote computing networks can be used effectively for a broad range of communications functions, as well as for computation and information retrieval. The same remote computing system that satisfies a company's computational needs and holds its data files will also be able to handle its message transmission, data collection, report distribution, and other communications requirements.

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

How Users Rate Remote Computing

To access the current level of user satisfaction with specific remote computing companies and with remote computing techniques in general, Datapro Research Corporation conducted an extensive user survey. A Reader Survey Form on Remote Computing Services was included in the September 1974 supplement to DATAPRO 70 and mailed to all subscribers. Usable responses were received from 101 users of commercial remote computing services in the United States and Canada. Many of the users reported their experiences with two or more remote computing companies, and the average number of companies mentioned was 1.74. Thus, it is apparent that many organizations are finding it advantageous to use the services of multiple suppliers concurrently.

It should be noted that the 101 DATAPRO 70 subscribers who responded to our survey do not necessarily constitute a representative sample of "typical" remote computing users. Furthermore, the small sample sizes for many of the services make it unwise to draw firm conclusions from the indicated ratings. If the reader will keep these caveats in mind, we believe the survey results that follow can be of

considerable value to users and prospective users of the commercial remote computing services.

The responding users were asked to rate each remote computing service they were using by assigning a rating of Excellent, Good, Fair, or Poor to its overall effectiveness, reliability, response time, languages and compilers, application programs, technical support, and economy. The individual user ratings earned by 27 remote computing companies are summarized in the accompanying table.

A "Weighted Average of All Ratings" was calculated for each company by assigning a value of 4 to each user rating of Excellent, 3 to Good, 2 to Fair, and 1 to Poor. Among the 9 companies rated by 5 or more users, the highest average ratings were earned by On-Line Systems, Inc. (rated 3.27 by 5 users), General Electric Company (rated 3.15 by 33 users), University Computing Company (rated 3.14 by 5 users), and Computer Sciences Corporation (rated 3.04 by 8 users). Highly regarded companies mentioned by fewer than 5 users included Scientific Time Sharing Corporation (rated 3.40 by 3 users), Compu-Serv (rated 3.38 by 2 users), PRC Computer Center (rated 3.36 by 2 users), and National CSS, Inc. (rated 3.29 by 3 users).

The ratings assigned by all of the responding users can be combined to form the following overall picture of user satisfaction with the current remote computing services:

	<u>Excellent</u>	<u>Good</u>	<u>Fair</u>	<u>Poor</u>
Overall effectiveness	29%	56%	12%	3%
Reliability	30%	50%	15%	5%
Response time	34%	47%	14%	5%
Languages and compilers	34%	52%	13%	1%
Application programs	25%	44%	23%	8%
Technical support	25%	41%	21%	13%
Economy	15%	45%	28%	12%

These figures make it clear that users are generally quite pleased with the overall effectiveness of the current remote computing services, and also with their reliability, their response times, and the languages and compilers they offer. On the other hand, there is still ample room for improvement in the areas of technical support, application programs, and economy.

The communications terminals used by the survey respondents were as follows:

<u>Terminal</u>	<u>No. of Users</u>	<u>% of Total</u>
Interactive terminals:		
Teletype Model 33	21	21
GE TermiNet 300	16	16
Texas Instruments Silent 700 Series	13	13
UNIVAC DCT 500	11	11
IBM 2741	8	8
Anderson Jacobson (all models)	7	7
CTS Execuport	6	6



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USERS' RATINGS OF REMOTE COMPUTING SERVICES

Company*	No. of User Replies	Weighted Average of All Ratings**	Users' Ratings**																														
			Overall Effectiveness				Reliability				Response Time				Languages and Compilers				Application Programs				Technical Support				Economy						
			E	G	F	P	E	G	F	P	E	G	F	P	E	G	F	P	E	G	F	P	E	G	F	P	E	G	F	P			
Boeing Computer Services	3	2.50	1	2	0	0	0	2	1	0	0	0	1	1	1	1	1	0	1	0	0	1	0	0	1	0	2	0	0	1	1	1	1
Bowne Time Sharing	2	3.23	2	0	0	0	1	1	0	0	1	1	0	0	0	1	0	0	0	2	0	0	1	0	1	0	0	0	1	1	0	0	
Chi Corporation	2	3.14	1	1	0	0	1	1	0	0	1	1	0	0	1	1	0	0	1	0	0	1	0	1	1	0	1	0	1	0	1	0	
Compu-Serv	2	3.38	0	2	0	0	1	1	0	0	1	1	0	0	1	0	0	0	2	0	0	0	1	0	1	0	0	0	1	0	0	0	
Computer Sciences Corp.	8	3.04	3	4	1	0	1	6	1	0	3	4	1	0	4	4	0	0	3	3	1	0	1	4	2	1	1	2	4	1	1	1	
Com-Share, Inc.	3	3.15	0	3	0	0	1	2	0	0	0	3	0	0	0	1	1	0	1	2	0	0	2	1	0	0	0	3	0	0	0	0	
Control Data Corp.	10	2.30	0	6	3	1	2	3	4	1	1	3	2	4	1	3	6	0	1	5	2	2	0	3	2	4	0	3	6	1	1	1	
Data Resources Inc.	2	2.79	1	0	1	0	0	1	0	1	0	1	0	1	1	0	1	0	2	0	0	0	1	0	1	0	1	0	0	1	0	0	
General Electric Co.	33	3.15	11	21	0	0	14	17	2	0	13	19	1	0	9	19	3	0	12	17	3	0	6	17	6	3	1	19	9	3	1	1	
Honeywell Information Systems Inc.	3	3.00	1	2	0	0	0	2	1	0	1	2	0	0	0	3	0	0	1	0	2	0	1	3	0	0	0	2	1	0	0	0	
International Timesharing Corp.	2	2.79	0	2	0	0	0	2	0	0	0	1	1	0	2	0	0	0	0	1	1	0	0	1	1	0	0	1	0	1	0	1	
Leasco Response Inc.	5	2.64	0	3	2	0	1	2	2	0	1	4	0	0	0	3	2	0	0	2	2	0	0	0	4	1	1	2	1	0	0	0	
McDonnell Douglas Automation Co.	3	2.80	0	2	1	0	1	1	1	0	1	1	1	0	1	1	0	0	1	2	0	0	0	2	0	1	0	1	1	1	1	1	
National CSS, Inc.	3	3.29	2	1	0	0	2	1	0	0	2	1	0	0	2	1	0	0	0	2	0	1	1	2	0	0	1	1	0	1	0	1	
On-Line Systems Inc.	5	3.27	2	3	0	0	2	3	0	0	1	4	0	0	3	2	0	0	2	1	1	0	2	2	1	0	1	1	2	0	0	0	
PRC Computer Center	2	3.36	2	0	0	0	1	1	0	0	1	1	0	0	1	1	0	0	0	1	1	0	0	2	0	0	1	1	0	0	0	0	
Rapidata, Inc.	6	2.49	0	2	3	1	2	2	1	1	1	3	2	0	1	3	2	0	0	3	1	1	0	2	3	1	0	3	1	2	1	2	
Remote Computing Corp.	2	2.93	1	1	0	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1	1	0	0	1	0	1	1	1	0	0	0	0	
Scientific Time Sharing Corp.	3	3.40	1	2	0	0	1	2	0	0	3	0	0	0	2	0	1	0	2	0	0	1	1	2	0	0	1	0	2	0	0	0	
The Service Bureau Co.	14	2.93	3	6	3	1	6	5	1	2	7	5	1	0	3	10	1	0	3	6	4	1	5	3	3	3	1	7	4	2	1	2	
The Singer Company	2	3.29	1	1	0	0	0	2	0	0	1	1	0	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	0	0	0	0	
Systems Dimensions Ltd.	2	3.00	1	1	0	0	1	0	1	0	1	1	0	0	1	1	0	0	0	1	1	0	1	0	0	1	1	0	0	1	0	1	
Time Sharing Resources, Inc.	2	3.08	1	1	0	0	1	1	0	0	0	2	0	0	0	2	0	0	0	2	0	0	0	1	0	0	0	0	1	0	0	0	
Tymshare, Inc.	7	2.67	2	3	0	1	2	3	2	0	1	2	2	2	3	4	0	0	1	3	1	2	1	3	1	2	1	1	3	2	1	2	
United Computing Systems, Inc.	4	2.71	0	2	2	0	0	3	1	0	0	3	1	0	1	2	1	0	0	3	1	0	0	2	2	0	0	3	1	0	0	0	
University Computing Company	5	3.14	2	3	0	0	2	3	0	0	3	2	0	0	2	3	0	0	1	2	2	0	1	2	2	0	0	3	2	0	0	0	
Westinghouse Tele-Computer Systems	3	2.95	0	2	1	0	0	3	0	0	1	0	2	0	1	2	0	0	1	2	0	0	1	1	1	0	0	2	1	0	0	0	
All others*	38	3.04	13	21	3	1	10	18	7	3	13	16	8	1	13	18	3	0	9	9	11	4	15	16	3	4	11	17	7	3	1	3	
Totals	176	2.96	51	27	20	5	54	88	26	8	59	83	24	9	56	87	22	1	41	71	37	13	43	71	37	22	25	78	49	20	20		

*Only the remote computing companies mentioned by two or more users are listed individually. The 38 companies rated by only one user each are combined in the "All others" entry.

**Users' ratings are expressed in terms of number of user responses; the legend is E for Excellent, G for Good, F for Fair, and P for Poor. The "Weighted Average of All Ratings" was calculated by assigning a value of 4 to each Excellent rating, 3 to Good, 2 to Fair, and 1 to Poor.

➤ Terminal No. of Users % of Total

Interactive terminals (continued):

Hazeltine 2000	6	6
Teletype (model not specified)	6	6
Other interactive terminals	36	36

Batch terminals:

Data 100 (all models)	10	10
Other batch terminals	26	26

The figures clearly indicate that interactive terminals are

far more widely used than remote batch terminals for remote computing applications. Although the Teletype Model 33 is still the most widely used interactive terminal, its lead over more modern terminals such as those manufactured by GE, Texas Instruments, and UNIVAC is considerably smaller than in previous years. An average of 1.64 different types of terminals was being used by each of the survey respondents.

The programming languages used by the survey respondents were as follows:



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Language	No. of Users	% of Total
FORTRAN	66	65
BASIC	49	49
COBOL	26	26
PL/1	7	7
ALGOL	4	4
APL	4	4
None*	2	2
All other languages	27	27

*Apparently these users relied completely on "packaged" application programs.

Thus, FORTRAN is the clear leader in popularity, while BASIC and COBOL are the only other languages finding widespread acceptance among remote computing users. The average number of programming languages being used by each of the survey respondents was 1.81.

The remote computing applications reported by the survey respondents spanned virtually the entire spectrum of business and scientific applications. The reported applications can be broadly classified as follows:

Application	No. of Users	% of Total
Business (including accounting, financial, insurance, order entry, manufacturing, inventory control, etc.)	46	46
Planning and forecasting (including financial modeling, econometrics, market research, etc.)	33	33
Scientific and engineering (including simulation, graphics, etc.)	32	32
Mathematics and statistics	26	26
Data base management and information retrieval	11	11
Program development	10	10
Text editing	3	3
Educational	2	2
Backup	1	1
No application specified	2	2

Choosing Your Supplier

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

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

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

4. *Choose the most likely candidates.* Now it's time to reduce the list of contenders to the three to six that seem best able to meet your requirements. This can usually be accomplished by a selective "weeding out" process. You simply eliminate from consideration those suppliers that fail to measure up to one or more critical questions such as these:

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- Are the company's services available in your area at a competitive cost (including all communication and terminal costs)?
 - Does the company offer the programming and technical support services you need?
 - Does the company offer the specific programming languages and/or application programs you need?
 - Does the company support the type of terminal equipment you need (or already own)?
 - Can the company satisfy the requirements, if any, for compatibility with your existing programs and/or data files?
 - Does the company appear to be able to meet your requirements for operational reliability and data security?
 - Are you satisfied that the company is soundly financed and in the business to stay?

5. *Learn all you can about each remaining candidate.*

Now it's time to call in the sales representatives of each of the remaining contenders for in-depth discussions about their capabilities, services, and pricing. By now you'll have a good idea what questions to ask them — and what answers you're looking for. Be sure to find out exactly what each company offers in the way of equipment configuration, program library, programming services, training, documentation, security measures, contract terms, etc. Get the details of each company's pricing structure, including possible "extra" charges for programming, training, manuals, application programs, and other products and services you'll need. Be sure to ask for reference lists of current users. Contact these users, and learn all you can about what their experiences have been; it's likely to be a remarkably informative exercise. Also, check the results of the Datapro user survey on page 70G-900-01h.

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 threefold:

- 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 to 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

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▷ contract terms if that's what it takes to land your account. So read the contract carefully. Make sure it clearly defines the company's pricing structure, charges for all additional products and services, hours of service availability, length of commitment, termination provisions, etc. If the supplier writes any programs for you, make sure it's clear whose property they will be. If you're not completely satisfied with the standard contract terms, ask the supplier to amend them.

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

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

The Comparison Charts

The principal characteristics of 98 commercially available remote computing services are presented in the accompanying comparison charts. Except where otherwise indicated, all information in the charts was furnished by the suppliers in October and November 1974; their close cooperation with the Datapro Research staff in the preparation of these charts is greatly appreciated.

DATAPRO 70 sent repeated requests for information to approximately 150 companies known or believed to be in the remote computing business. The 98 usable responses summarized in our charts represent a good cross-section of

the commercial remote computing services that are currently available in the United States 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 the chart entries differentiate between the various levels to the extent that space permits.

Date operational. This entry tells when each company's remote computing services first became 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 "Eastern Seaboard and Mid-West"), 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. 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

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▷ computers are located are also indicated in most cases. The smaller supporting computers which are frequently used as communications processors or remote multiplexers are not listed here because of space limitations.

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

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

Conversational terminals supported. The specific remote terminals that each remote computing system can accommodate for interactive, conversational-mode operations are listed in this entry. The abbreviation "TTY 33/35" stands for the Teletype Model 33 and Model 35 Teletypewriters, which are still by far the most widely used time-sharing 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.

Teletype's newer Model 38 terminals are transmission-compatible with the model 33 and offer a 132-character print line and upper-and-lower-case printing at prices just above those of the Model 33. The Teletype Model 37 terminals, which feature a higher speed (15 characters per second) as well as expanded printing control facilities, are supported by comparatively few remote computing companies to date.

To capitalize upon the widespread acceptance of the Teletype Model 33 and 35 terminals, numerous peripheral equipment makers have introduced "Teletype-compatible" printers, display units, and other terminals which have the same interface characteristics and can utilize the same software support as the Teletype units. These Teletype-compatible terminals are described in the Peripherals section of DATAPRO 70. Examples include the GE TermiNet 300 and 1200, Memorex 1200 Series, NCR 260, Texas Instruments Silent 700 Series, and UNIVAC DCT 500 terminals, plus CRT display terminals such as the Hazeltine Model 1000 and 2000 and the ITT 3501 Asciscope. In general, any Teletype-compatible terminal can be connected to any remote computing network that supports the Teletype Model 33 or 35 Teletypewriters — but it will generally not be possible to take advantage of the replacement terminal's higher speed and/or improved functional capabilities unless the remote computing company makes suitable modifications in its equipment and supporting software.

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

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

Although many of the remote computing companies offer to supply and maintain the terminals which their systems support, you'll retain more flexibility if you obtain your terminals from the manufacturer or some other independent source. The Teletype terminals, for example, can be leased from the various telephone companies or from sources such as the RCA Service Company and Western Union Data Services.

Batch terminals supported. In addition to the low-speed, conversational-mode terminals which are usually associated with time-sharing, 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 Data Transmission Terminal. Four models of the 2780 provide different combinations of card ▷

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▷ reading, card punching, and/or line printing capabilities, at transmission speeds ranging from 1200 to 4800 bits (150 to 600 characters) per second. Data is transmitted under IBM's Binary Synchronous Communications (BSC) line discipline technique in one of three codes: ASCII, EBCDIC, or Six-Bit Transcode. Rental prices for the 2780 range from about \$700 to \$1,300 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 has led to the introduction of competitive terminals which offer functional compatibility with the 2780, usually at lower prices. Numerous "intelligent" (programmable) terminals, such as those produced by Control Data, Data 100, Harris, Sanders, Sycor, and Westinghouse, can emulate the functions of the IBM 2780 and other popular batch terminals. And IBM itself has largely superseded the 2780 in favor of a pair of newer terminals, the 2922 and 3780, which perform the same functions as the 2780 at substantially higher speeds.

Many of the remote computing companies also support the use of small digital computers, such as the Honeywell (nee GE) 105, IBM 1130, IBM System/360 Model 20, and UNIVAC 9200, as remote batch terminals. These independently programmed computers can serve as "intelligent terminals," processing some data locally and providing great flexibility in their communications functions. Their costs, as might be expected, are comparatively high.

All the terminals mentioned above are described in detail in the Peripherals or Computers section of DATAPRO 70; please refer to the Index, beginning on page 70A-100-01a.

Software

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

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

FORTRAN and BASIC are by far the most popular conversational programming languages for remote com-

puting 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 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, nearly all of the current implementations of APL are interpreters, which means that the efficiency of object-program execution is likely to be comparatively low. ▷

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▷ Though COBOL is by far the most widely used programming language for business applications, comparatively few companies offer a conversational-mode COBOL compiler.

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

Batch-mode programming languages. The languages offered by each remote computing company for batch-mode (i.e., non-interactive) compilation are listed in this 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. The special chart on the last two pages of this report shows which of 25 important classes of application programs are available from each of the remote computing companies.

Charges

One of the most complex and confusing aspects of the current remote computing scene is the pricing of the services. There has been no general agreement to date as to the best technique for accounting and charging for the system resources used by each customer. As a result, prospective users are confronted by a bewildering array of rate schedules. The diverse pricing policies make cost comparisons very difficult and accentuate the desirability of benchmark testing.

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 are for prime-time use. 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 must bear the cost of their terminals, modems, and communications facilities.

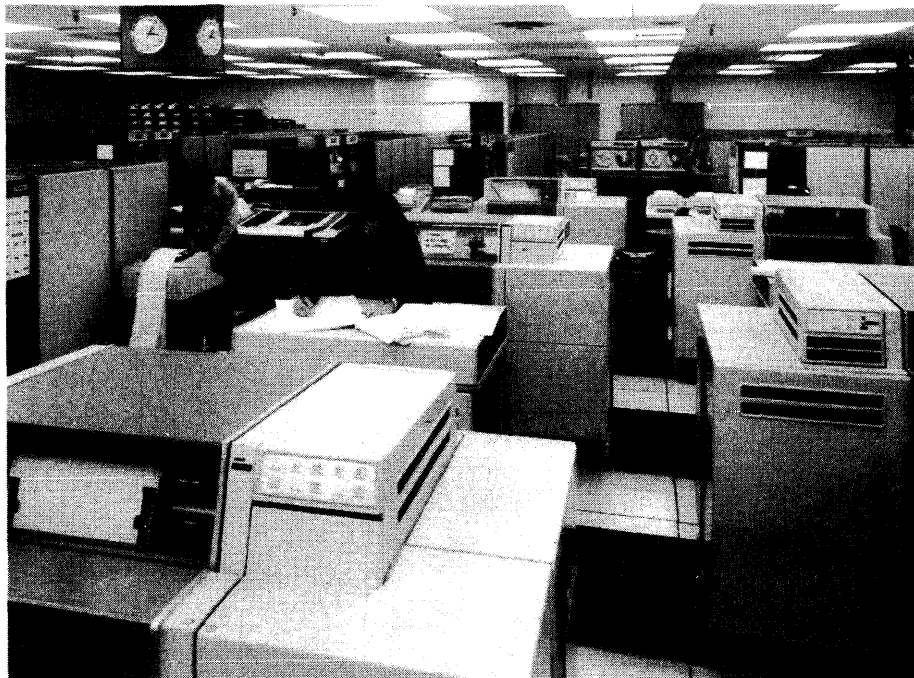
Minimum monthly charge. This is the minimum charge, if any, that is imposed for each month of remote computing service. (The companies that impose no minimum charge will naturally be of particular interest to users who plan to deal simultaneously with several different suppliers.)

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.

Mass storage. Virtually every remote computing company has large-capacity disk or drum 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. ▷

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This complex of Xerox Sigma 7 and 9 computers in Los Angeles serves users of Xerox Computer Services' Interactive Accounting System.

▷ 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 98 remote computing companies whose services are described in the comparison charts.

ACTS Computing Corporation, 29200 Southfield Road, Southfield, Michigan 48076. Telephone (313) 557-6800.

APL Services, Inc., 684 Whitehead Road, Trenton, New Jersey 08638. Telephone (609) 883-0050.

Applied Computer Timesharing, Box 10188, Denver, Colorado 80210. Telephone (303) 771-0476.

Applied Data Processing, Inc., 33 Bernhard Road, North Haven, Connecticut 06473. Telephone (203) 787-4107.

Applied Data Research, Inc., Timesharing Division, Route 206 Center, Princeton, New Jersey 08540. Telephone (609) 921-8550.

Applied Logic Corporation, 900 State Road, Princeton, New Jersey 08540. Telephone (609) 924-7800.

Aquila BST (1974) Ltee/Ltd., C.P. 10 Tour de la Bourse, Montreal, Quebec H4Z 1A4.

Axicom Systems, Inc., 615 Winters Avenue, Paramus, New Jersey 07652. Telephone (201) 262-8200.

Beloit Computer Center, Inc., 423 State Street, Beloit, Wisconsin 53511. Telephone (608) 365-2206.

Boeing Computer Services, Inc., Eastern District, 7598 Colshire Drive, McLean, Virginia 22101. Telephone (703) 356-6900.

Bowne Time Sharing, Inc., 345 Hudson Street, New York, New York 10014. Telephone (212) 741-4700.

Chi Corporation, 11000 Cedar Avenue, Cleveland, Ohio 44106. Telephone (216) 229-6400.

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

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

The Computer Company, Inc., Seventh and Franklin Building, Richmond, Virginia 23219. Telephone (804) 644-1841.

Computer Innovations, 70 West Hubbard Street, Chicago, Illinois 60610. Telephone (312) 329-1561.

Computer Network Corporation (Comnet), 5185 MacArthur Boulevard, Washington, D.C. 20016. Telephone (202) 244-1900.

Computer Research Company, 200 North Michigan Avenue, Chicago, Illinois 60601. Telephone (312) 346-1331.

Computer Resource Services, Inc., 1600 West Camelback Road, Suite 1F, Phoenix, Arizona 85015. Telephone (602) 266-8444.

Computer Sciences Canada, Ltd., Room 367, Place du Canada, Montreal 101, Quebec. Telephone (514) 878-9811.

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

Computer Sharing Services, Inc., 2498 West Second Avenue, Denver, Colorado 80223. Telephone (303) 934-2381.

Computer Spectrum, Box 8666, Chattanooga, Tennessee 37411. Telephone (615) 396-3131.

Computility Division, Grumman Data Systems Corporation, 31 Tremont Street, Boston, Massachusetts 02111. Telephone (617) 423-6780. ▷

All About Remote Computing Services

Computone Systems, Inc., 361 East Paces Ferry Road N.E., Atlanta, Georgia 30305. Telephone (404) 261-0070.

Com-Share, Incorporated, P.O. Box 1588, Ann Arbor, Michigan 48106. Telephone (313) 994-4800.

Com-Share Limited, 41 Voyager Court North, Rexdale, Ontario. Telephone (416) 678-1363.

Control Data Corporation, Cybernet Services, P.O. Box 0, Minneapolis, Minnesota 55440. Telephone (612) 853-8100.

Cyphernetics Corporation, 175 Jackson Plaza, Ann Arbor, Michigan 48106. Telephone (313) 769-6800.

Data Resources Inc., 29 Hartwell Avenue, Lexington, Massachusetts 02173. Telephone (617) 369-7853.

Data-Tek Corporation, University City Science Center, 3401 Market Street, Philadelphia, Pennsylvania 19104. Telephone (215) 349-9900.

Datacrown Limited, 650 McNicoll Avenue, Willowdale, Ontario. Telephone (416) 499-1012.

Dataline Systems Limited, 40 St. Clair Avenue West, Toronto, Ontario. Telephone (416) 964-9515.

Datalogics, Inc., 11001 Cedar Avenue, Cleveland, Ohio 44106. Telephone (216) 721-9035.

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

Fedder Data Centers, Inc., 412 West Redwood Street, Baltimore, Maryland 21201. Telephone (301) 685-6773.

First Data Corporation, 400 Totten Pond Road, Waltham, Massachusetts 02154. Telephone (617) 890-6701.

Fulton National Bank, 55 Marietta Street, Atlanta, Georgia 30302. Telephone (404) 577-3500.

General Electric Company, Information Services Business Division, 7735 Old Georgetown Road, Bethesda, Maryland 20014. Telephone (301) 654-9360.

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

Grumman Data Systems Corporation, 20 Crossways Park North, Woodbury, New York 11797. Telephone (516) 575-3284.

GTE Data Services Incorporated, First Financial Tower, P.O. Box 1548, Tampa, Florida 33601. Telephone (813) 224-3131.

HDR Systems, Inc., 8404 Indian Hills Drive, Omaha, Nebraska 68114. Telephone (401) 393-5775.

Honeywell Information Systems, Inc., 2701 Fourth Avenue South, Minneapolis, Minnesota 55408. Telephone (612) 332-5200.

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

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

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

International Timesharing Corporation, I T S Building, Jonathon Industrex, Chaska, Minnesota 55318. Telephone (612) 448-3061.

Kaman Aerospace Corporation, Old Windsor Road, Bloomfield, Connecticut 06002. Telephone (203) 242-4461.

Keydata Canada, 74 Victoria Street, Toronto, Ontario. Telephone (416) 362-7681.

Keydata Corporation, 108 Water Street, Watertown, Massachusetts 02172. Telephone (617) 924-1200.

Leasco Response Incorporated, 20030 Century Boulevard, Germantown, Maryland 20767. Telephone (301) 428-0500.

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

Manufacturing Data Systems, Inc., 320 North Main Street, Ann Arbor, Michigan 48104. Telephone (313) 761-7750.

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

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

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

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

National CSS, Inc., 300 Westport Avenue, Norwalk, Connecticut 06581. Telephone (203) 853-7200.

Newfoundland and Labrador Computer Service, P.O. Box 9308, St. John's, Newfoundland.

Ohio Valley Data Control, Inc., 2505 Washington Boulevard, Belpre, Ohio 45714. Telephone (614) 423-9501.

On-Line Business Systems, Inc., One Embarcadero Center, San Francisco, California 94111. Telephone (415) 576-4222.

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

Pacific Applied Systems, Inc., 4835 Van Nuys Boulevard, Suite 108, Sherman Oaks, California 91403. Telephone (213) 986-7515.

Pacific International Computing Corporation, 50 Beale Street, San Francisco, California 94105. Telephone (415) 764-9990.

Paden Data Systems, Inc., 5838 Live Oak, Dallas, Texas 75214. Telephone (214) 823-3773.


Philco-Ford Corporation, Computer Services Network, 515 Pennsylvania Avenue, Fort Washington, Pennsylvania 19034. Telephone (215) CH 8-2334.

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

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

PRC Computer Center, Inc., 7670 Old Springhouse Road, McLean, Virginia 22101. Telephone (703) 893-4880.

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. 

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- *Pryor Corporation*, 400 North Michigan Avenue, Chicago, Illinois 60611. Telephone (312) 644-5650.
- 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) 328-5230.
- Scientific Process & Research, Inc.*, 24 North Third Avenue, Highland Park, New Jersey 08904. Telephone (201) 846-3477.
- Scientific Time Sharing Corporation*, 7316 Wisconsin Avenue, Bethesda, Maryland 20014. Telephone (301) 657-8220.
- Sci-Tek Incorporated*, 1707 Gilpin Avenue, Wilmington, Delaware 19800. Telephone (302) 658-2431.
- The Service Bureau Company*, 500 West Putnam Avenue, Greenwich, Connecticut 06830. Telephone (203) 661-0001.
- I.P. Sharp Associates Limited*, Suite 1400, 145 King Street West, Toronto, Ontario. Telephone (416) 364-5361.
- The Singer Company*, Information Systems Network, 150 Totowa Road, Wayne, New Jersey 07470. Telephone (201) 256-5004.
- Standard Information Systems, Inc.*, 36 Washington Street, Wellesley Hills, Massachusetts 02181. Telephone (617) 237-2910.
- Statistical Tabulating Corporation*, 2 North Riverside Plaza, Chicago, Illinois 60606. Telephone (312) 346-7300. 454-8046
- Structural Dynamics Research Corporation*, 5729 Dragon Way, Cincinnati, Ohio 45227. Telephone (513) 272-1100.
- Systems Dimensions Limited*, 770 Brookfield Road, Ottawa, Ontario K1V 6J5. Telephone (613) 731-6910.
- Technical Advisors, Inc.*, 4455 Fletcher Street, Wayne, Michigan 48184. Telephone (313) 722-5010.
- Technology for Information Management, Inc.*, 1654 Central Avenue, Albany, New York 12205. Telephone (518) 869-0928.
- Tel-A-Data, Inc.*, 1500 Northwest 167th Street, Miami, Florida 33169. Telephone (305) 625-8266.
- Telstat Systems, Inc.*, 150 East 58th Street, New York, New York 10022. Telephone (212) 826-0640.
- Time Sharing Resources, Inc.*, 777 Northern Boulevard, Great Neck, New York 11022. Telephone (516) 487-0101.
- Tymshare, Inc.*, 10340 Bubb Road, Cupertino, California 95014. Telephone (408) 257-6550.
- Uni-Coll*, 3401 Science Center, Philadelphia, Pennsylvania 19104. Telephone (215) EV 7-3890.
- United Computing Systems, Inc.*, 2525 Washington, Kansas City, Missouri 64108. Telephone (816) 221-9700.
- University Computing Company*, 7720 Stemmons Freeway, P.O. Box 47911, Dallas, Texas 75247. Telephone (214) 637-5010.
- USS Engineers and Consultants, Inc.*, 600 Grant Street, Pittsburgh, Pennsylvania 15230. Telephone (412) 433-6515.
- Wang Computer Services*, Division of Wang Laboratories, Inc., 836 North Street, Tewksbury, Massachusetts 01876. Telephone (617) 837-4111.
- Westinghouse Tele-Computer Systems Corporation*, 2040 Ardmore Boulevard, Pittsburgh, Pennsylvania 15221. Telephone (412) 256-7799.
- Xerox Computer Services*, 5310 Beethoven Street, Los Angeles, California 90066. Telephone (213) 390-3461. □

All About Remote Computing Services

COMPANY	ACTS Computing Corporation	APL Services, Inc.	Applied Computer Timesharing	Applied Data Processing, Inc.	Applied Data Research, Inc.
GENERAL					
Name of service	ACTS RJE and Timesharing	Action/APL	—	Telephase	Teleplex
Date operational	Feb. 1969	July 1970	Dec. 1967	Aug. 1974	Nov. 1969
Areas currently served	Michigan, Ohio, Illinois & Midwest; New York, L.A., Oklahoma, Florida, Georgia & Southeast	Local dial service in New York City, Boston, Phila., Atlanta, Houston, Miami, Tallahassee, Hartford, Princeton, and 12 other cities	Nationwide access through United Computing Systems network	Connecticut, New York, Massachusetts, Rhode Island	Toll-free dial-up service throughout continental U.S.; multiplexers in Boston, Chicago, New York, Phila., Princeton, & D.C.
EQUIPMENT					
Computers	Honeywell 440 (2) in Detroit; Honeywell 430 (2) and 440 in Daytona; IBM 370/155 (2) in Grand Rapids	IBM 370/155 in Richmond, Va.	See United Computing Systems entry	IBM 360/50 in North Haven, Conn.	DEC PDP-10 (2) in Princeton, N.J.
No. of simultaneous users	240 total on Honeywell systems	120	Not specified	3 processing & 12 spooling	110
Conversational terminals supported	Any 10, 15, 30, or 120 cps terminal using ASCII, BDC, EBCDIC, or Correspondence Code	IBM 2741 and compatible units at 15 or 30 cps; AJ 630, AJ 840, CDI 1030, etc.	TTY & compatible terminals at 10, 30, or 120 cps	—	Any ASCII terminal at 10, 15, 30, 120, or 180 cps
Batch terminals supported	IBM 2770, 2780, 2922, 3780, 360/20, System/3; Data 100 Models 70, 74, 78	—	—	Four-Phase IV-40 Intelligent Remote Batch Terminal	Data 100, IBM 2780, UNIVAC DCT 2000, and compatible units (up to 9600 bps)
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, PDP-8 Assembler	APL	—	—	FORTRAN, BASIC, COBOL, Macro-10, AID, SNOBOL
Batch-mode programming languages	FORTRAN, COBOL, PL/1, RPG	—	—	COBOL	FORTRAN, COBOL, BASIC, Macro-10, SNOBOL
Principal applications	Business & scientific	Business & scientific	Contract construction industry	Business	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	\$100	\$100	None	—	None
Remote batch	\$250	—	—	\$500	None
Terminal connect time:					
Interactive	\$10-15/hr.	\$10-15/hr.	See Comments	—	\$10/hr.
Remote batch	None	—	—	\$8.64/hr.	\$25/hr.
Central processor time:					
Interactive	\$0.06/CPU Unit	\$24/min.	See Comments	—	\$0.01/RAM
Remote batch	\$250/hr.	—	—	\$4.41/min.	\$0.01/RAM
Mass storage:					
Interactive	\$1.00/1000 chars./month	\$10/million bytes/day	\$0.40/1000 chars./month	—	\$0.45/1000 chars./month
Remote batch	\$0.50/cylinder/month	—	—	\$0.06/1000 chars./month	\$0.45/1000 chars./month
COMMENTS	Subsidiary of Lear Siegler, Inc.; reduced rates for non-prime time; remote Job Entry service uses HASP Multileaving	Offers large file capabilities and shared files for data base manipulation; affiliated with The Computer Company	Offers application programs for the contract construction industry only; charges are based upon transactions	Offers "intelligent" remote batch processing of business applications	Reduced rates for non-prime time and volume usage

All About Remote Computing Services

COMPANY	Applied Logic Corporation	Aquila BST (1974) Ltee/Ltd.	Axicom Systems	Beloit Computer Center, Inc.	Boeing Computer Services, Inc.
GENERAL					
Name of service	AL/COM	HASP RJE	Tymsharing, RJE.	AXSIM and BCC/RJE	Mainstream-TSO & Mainstream-CTS
Date operational	1967	Sept. 1972	Jan. 1969	Nov. 1969	May 1970
Areas currently served	Toll-free access in 19 states in the East, Midwest, and Far West; service centers in 5 cities	Canada	U.S. east of Mississippi River	Dial-up access in Beloit & Janesville, Wis.; Rockford & Chicago, Ill.; New York City; Washington, D.C.	Continental U.S. and Canada via nationwide data network and communication system
EQUIPMENT					
Computers	DEC PDP-10 (8) in Princeton, N.J.	Honeywell 2050, 1015, & 200 in Montreal; also RCA 45 & 46	UNIVAC 1108 (2) in Paramus, N.J.; UNIVAC 418 (2) in Greenville, S.C.	IBM 360/50 (2) in Beloit, Wisc.	IBM 370/168 (2) in McLean, Va.
No. of simultaneous users	200	6 (H 2050)	64	200	80 on TSO, 100 on CTS
Conversational terminals supported	Any ASCII terminal at 10 or 30 cps	—	Any ASCII terminal at 10, 30, or 120 cps	IBM 2741, AJ 841, Trendata 1000, Novar 5-41 & 5-50, Datel, Datapoint, etc.	TTY 33/35 and compatible units at 10 or 30 cps; IBM 2741 and compatible units at 14.8 cps
Batch terminals supported	IBM 2780 & compatible units	IBM 1130, 2780, 3780, & S/360 HASP Multileaving terminals	UNIVAC 1004 and "all intelligent terminals"	IBM 2780, 3780, 360/20, System/3; Data 100, NCR 399, Remcom, Sycor, etc.	IBM 2780, 3780, 360/20, 1130, or any other HASP RJE terminal
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, SNOBOL, LISP, Macro-10, AID, ALGOL	—	FORTRAN, BASIC, COBOL, APL, Assembler	AXSIM	FORTRAN, COBOL, ALGOL, BASIC, PL/1, APL, Assembler
Batch-mode programming languages	FORTRAN, BASIC, COBOL, SNOBOL, LISP, Macro-10, AID, ALGOL	Extracto, Tabulo, Infoval	FORTRAN, COBOL, ALGOL, RPG, Assembler	FORTRAN, COBOL, PL/1, Assembler, Foresight	FORTRAN, COBOL, PL/1, ALGOL, RPG, Assembler
Principal applications	Business & scientific	Business & data base management	Scientific & message switching	Business, scientific, & text processing	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	\$100 (after 2 mo.)	—	None	\$50	None
Remote batch	—	As contracted	None	None	None
Terminal connect time:					
Interactive	\$10/hr.	—	\$10/hr.	\$2.00-3.50/hr.	\$6-9/hr.
Remote batch	—	None	None	\$10-15/hr.	\$12-16/hr.
Central processor time:					
Interactive	\$0.10/Core Unit	—	\$0.58/sec.	Not specified	\$2.00/CCU
Remote batch	—	\$4.00/min.	\$0.33/sec.	\$5.00-7.80/min.	\$2.00/CCU
Mass storage:					
Interactive	\$3.75/5120 chars./month	—	\$0.04/11,000 chars./day	\$0.13/1000 chars./month	\$0.015-0.050/3336 chars./day
Remote batch	—	As contracted	\$0.04/11,000 chars./day	\$0.065/1000 chars./month	\$0.015-0.050/3336 chars./day
COMMENTS	Offers deferred unattended execution at reduced rates; volume discounts of 40 to 70% on mass storage. Offers full ANS COBOL with IMS simulator	Additional charges for printing, reading, punching, and tape mounting	Division of Transport Data Communications, Inc.; uses EXEC 8 operating system in a multi-programming environment	Features text editing, typesetting, & mailing list processing	Mainstream-CTS is an interactive time-sharing service; Mainstream-TSO offers remote job entry at a range of service times (10 minutes to overnight)

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COMPANY	Bowne Time Sharing, Inc.	Chi Corporation	Community Computer Corporation	Computel Systems Limited	The Computer Company
GENERAL					
Name of service	Word/One	Chi Time-Sharing, Chi Remote Batch	—	Time Shared Processing	Action/APL
Date operational	Nov. 1969	May 1968	Jan. 1969	Jan. 1968	Oct. 1969
Areas currently served	Atlanta, Boston, Chicago, L.A., New York, New Jersey, Phila., San Francisco, & Washington, D.C. areas	Ohio, Pennsylvania, Michigan, New York	Delaware Valley, New Brunswick, N.J.	Canada from offices in Victoria, Vancouver, Edmonton, Calgary, Winnipeg, Ottawa, Toronto, Montreal, Quebec, & Halifax	Boston, Chicago, Denver, Hartford, Los Angeles, Miami, Newark, New York, Phila., D.C., and 6 other cities
EQUIPMENT					
Computers	IBM 370/155 in New York City	UNIVAC 1108 & Honeywell 430 in Cleveland	HP 2116B (2) in Philadelphia	IBM 370/168, IBM 360/65, & UNIVAC 1108 in Ottawa	IBM 370/155 in Richmond, Va.
No. of simultaneous users	200	60 total	32	Not specified	156
Conversational terminals supported	IBM 2741, TTY, and compatible units at 10, 14.8, 15, or 30 cps	TTY 33/35/38, Datapoint 3300, GE TerminiNet 300, UNIVAC DCT 500, etc., at 10 or 30 cps	TTY and other ASCII-coded terminals at 10 or 30 cps	IBM 2741 and equivalents and ASCII terminals	IBM 2741, TTY 33, AJ, CDI, Datel, HP 7200, Memorex 1240, Novar, Tektronix
Batch terminals supported	—	UNIVAC 1004, 9200; IBM 2780, 1130, 360/20; Data 100, etc.	—	All IBM batch terminals and equivalents; UNIVAC 1004 and equivalents	—
SOFTWARE					
Conversational programming languages	Word/One (text editing)	BASIC, FORTRAN, EDIT, SAM	BASIC	Demand Processing, TSO, ROSCOE, APL	APL
Batch-mode programming languages	—	FORTRAN, BASIC, ALGOL, COBOL, RPG, etc.	FORTRAN, ALGOL	FORTRAN, COBOL, PL/1, ALGOL, RPG, Assembler, Mark IV	—
Principal applications	Text editing & typesetting	Business, scientific, & phototypesetting	Business & scientific	Business & scientific	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	\$150 (after 3 mo.)	None	None	\$100	None
Remote batch	—	None	—	\$100	—
Terminal connect time:					
Interactive	\$2.95-5.30/hr.	\$7.00/hr.	\$10.00	\$5.00-10.00/hr.	\$11.00-14.30/hr.
Remote batch	—	\$7.00-10.00/hr.	—	None	—
Central processor time:					
Interactive	\$0.01/Proc. Unit	\$4.20/min.	None	See Comments	\$26.40/min.
Remote batch	—	\$18.00/min.	—	See Comments	—
Mass storage:					
Interactive	\$0.28/1550 chars./month	\$0.35/1000 chars./month	\$0.20/160 chars./month	\$0.03/track/day	\$11.00/million bytes/day
Remote batch	—	\$0.20/2772 chars./month	—	\$0.03/track/day	—
COMMENTS	Specializes in text editing, typesetting, information retrieval, and address file maintenance; volume discounts available	Offers both time-sharing and remote batch services; substantial volume discounts; lower rates for non-prime time	Storage beyond 80,000 characters is priced at \$0.05/160 chars./month	Prices vary with computer and software system used; volume and commitment discounts are available	Offers remote job entry and file management system for shared files

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COMPANY	Computer Innovations	Computer Network Corp. (Comnet)	Computer Research Company	Computer Resource Services, Inc.	Computer Sciences Canada, Ltd.
GENERAL					
Name of service	Advanced APL, Enhanced ATS	Alpha	Open Job Shop	Response	Infonet
Date operational	June 1969	Dec. 1967	Sept. 1971	1969	July 1967
Areas currently served	Illinois, Indiana, Michigan, Minnesota, Wisconsin; 8 cities in the East; 9 cities in the West	Continental U.S. via INWATS; local dial-up access in the New York, Washington, & Pittsburgh areas	Midwestern U.S.	Phoenix and Las Vegas areas	Calgary, Edmonton, Montreal, Ottawa, Quebec, Toronto, Vancouver, Winnipeg
EQUIPMENT					
Computers	IBM 360/65 in Van Nuys, Calif.	IBM 360/65 (2) in Washington, D.C.	IBM 370/158 in Chicago	HP 2000 (2) in Phoenix, Ariz.	UNIVAC 1108 (2); 1 in Toronto and 1 in Calgary
No. of simultaneous users	120	75	30	32	180 total
Conversational terminals supported	Selectric/ASCII type terminals at 10, 15, or 30 cps	IBM 2741, TTY 33/35, and compatible units at 10 to 120 cps	TTY 33/35, IBM 2741, IBM 3270, and equivalents	Any ASCII or Correspondence Code terminal at 10 to 30 cps	TTY 33/35 and compatible units at 10, 15, or 30 cps; IBM 2741 or equivalent
Batch terminals supported	—	IBM 2780, 1130, 360/20, and compatible units at 2000 to 9600 bps	IBM 2770, 2780, 3780, 360/20, 1130, System/3, and equivalents	—	IBM 2780 & 1130, UNIVAC 9200, 1004, & DCT 2000, Honeywell Series 2000, etc.
SOFTWARE					
Conversational programming languages	APL	All OS/360 languages	FORTRAN, COBOL, PL/1, Assembler	BASIC	FORTRAN, BASIC, COBOL, Assembler
Batch-mode programming languages	All OS/360 languages	All OS/360 languages	FORTRAN, COBOL, PL/1, Assembler, RPG	—	FORTRAN, BASIC, COBOL, Assembler
Principal applications	Business, scientific, & text editing	Business & scientific	Business, scientific, & text editing	Business & scientific	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	None	None	None	\$25	\$50
Remote batch	—	None	None	—	\$50
Terminal connect time:					
Interactive	\$12.50/hr.	\$12/hr. (10-120 cps)	\$3.75-7.50/hr.	\$8/hr.	\$11.00-15.00/hr.
Remote batch	—	\$0.50/1000 cards, \$0.50/1000 lines	\$5.00-10.00/hr.	—	\$8.00/hr.
Central processor time:					
Interactive	\$18.00/min.	\$0.20/CUU	\$14.40/min.	None	\$0.25/SRU
Remote batch	—	\$0.20/CUU	\$9.60/min.	—	\$0.07-0.16/SRU
Mass storage:					
Interactive	\$12.50/million bytes/day	\$2.00/10,030 chars./month	\$0.024/1000 chars./month	\$0.75/1024 chars./month	\$0.031/2040 chars./day
Remote batch	—	\$2.00/10,030 chars./month	\$0.024/1000 chars./month	—	\$0.031/2040 chars./day
COMMENTS	Affiliated with Proprietary Computer Systems, Inc. and The Computer Company; offers high-speed RJE and RJE via APL	Offers "OS-compatible time-sharing services" and remote job entry at a wide range of service times, terminal speeds, and charges	Runs under OS/VS2 and includes TSO, HASP/RJE, and ATS; CPU charges shown are for 100K bytes of main memory	\$50 initiation fee	CPU charges for remote job entry vary with priority; discounts for high-volume usage; lower rates for non-prime time

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COMPANY	Computer Sciences Corporation	Computer Sharing Services, Inc.	Computer Spectrum	Computility Div., Grumman Data Systems Corp.	Computone Systems, Inc.
GENERAL					
Name of service	CSTS	DTSS	The Computer Spectrum	Comp/Utility	—
Date operational	Jan. 1970	Nov. 1967	Sept. 1972		1966
Areas currently served	Local access in 23 metropolitan areas throughout continental U.S.	Colorado and the Mountain States via leased lines and INWATS	Southeastern U.S.: AL, FL, GA, KY, LA, MS, NC, SC, and TN	Middle Atlantic and Northeastern States and Chicago; also national INWATS service	Entire U.S. via national INWATS service
EQUIPMENT					
Computers	UNIVAC 1108 (8); 5 in El Segundo, Calif., and 3 in Oak Brook, Ill.	Honeywell 6000 in Denver	HP 200F & Spectrum 3000 in Chattanooga, Tenn.	DECsystem-10 (3) in Boston	IBM 360/50 in Atlanta
No. of simultaneous users	400-640 total	100	48 total	200 total	48
Conversational terminals supported	TTY 33/35 and compatible units at 10, 15, or 30 cps; IBM 2741 or equivalent	TTY 33/35, IBM 2741, and compatible units at 10, 14.8, 15, 30, or 120 cps	TTY and any other ASCII terminal at 10, 15, 30, 60, 120, or 240 cps	Any ASCII terminal at up to 120 cps	TTY, TI, Memorex 120 cps; Keypact portable insurance terminal (made by Computone)
Batch terminals supported	IBM 2780 & 1130, Data 100, Remcom 2780, Qantel, M&M, etc.	IBM 2780 and compatible units (in 1st quarter 1975)	—	IBM 2780 and compatible units	—
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, Assembler	FORTRAN, BASIC, COBOL, ALGOL, APL, LISP, SNOBOL, QED, GMAP	FORTRAN, BASIC, Assembler	FORTRAN, BASIC, COBOL, ALGOL, AID LISP, Macro 10	—
Batch-mode programming languages	FORTRAN, BASIC, COBOL, Assembler	All conversational languages can be used in background or batch mode	FORTRAN, COBOL, Assembler	FORTRAN, BASIC, COBOL, ALGOL, SNOBOL, LISP, Macro 10	—
Principal applications	Business & scientific	Business & scientific	Business, scientific, & educational	Business & scientific	See Comments
CHARGES					
Min. monthly charge					
Interactive	\$25	\$100	\$70	None	See Comments
Remote batch	\$25	\$100	—	None	—
Terminal connect time:					
Interactive	\$11-15/hr.	\$2.50-29.00/hr.	\$7/hr.	\$8/hr.	—
Remote batch	\$10/hr. (2000 bps)	\$2.50-29.00/hr.	—	\$8/hr.	—
Central processor time:					
Interactive	\$0.25/SRU	\$0.05-0.40/Unit	None	\$0.01/KCS	—
Remote batch	\$0.05-0.25/SRU	\$0.05-0.40/Unit	—	\$0.01/KCS	—
Mass storage:					
Interactive	\$0.025/2048 chars./day	\$1.00-2.50/4096 chars./month	\$0.33/1000 chars./month	\$1.00/1280 chars./month	—
Remote batch	\$0.025/2048 chars./day	\$1.00-2.50/4096 chars./month	—	\$1.00/1280 chars./month	—
COMMENTS	CPU charges for remote batch use vary with priority; discounts for high-volume usage; lower rates for non-prime time	Offers numerous pricing options; first commercial installation of Dartmouth Time-Sharing System; also offers voice response (Votrax) time-sharing	Specializes in educational, information retrieval, inventory control, personnel, school administration, and text editing applications	Offers facilities management services	Dedicated system for life insurance sales, feed and meat formulation, and turkey market information; prices upon request

All About Remote Computing Services

COMPANY	Com-Share, Incorporated	Com-Share Limited	Control Data Corporation	The Cyphermatics Corporation	Data Resources Inc.
GENERAL					
Name of service	Commander I & Commander II	Com-Share	Cybernet Services	Cyphernet System	—
Date operational	1967	1969	1967	1969	1969
Areas currently served	Continental U.S.; multiplexers in 31 cities and foreign exchange lines in 27 others	Dataroute service to Montreal, Ottawa, Hamilton, London, and Vancouver; local dial-up service in Toronto	Entire U.S., Toronto, Montreal, & Western Europe; remote batch only in Calgary, Brazil, & Australia	Full service offices in 26 cities throughout the U.S., plus London, Brussels, The Hague, Cologne, & Frankfurt	All major U.S. cities plus Montreal, Ottawa, Toronto, & Central Europe, all via local-call access
EQUIPMENT					
Computers	Xerox 940 (10) and Sigma 9 (4) in Ann Arbor, Mich.	Xerox Sigma 9 in Toronto	23 large-scale Control Data computers in 7 U.S. and 8 foreign cities	DECsystem-10 (10) in Ann Arbor, Mich.	Burroughs B 6700 and B 7700 in Lexington, Mass. (both are duplex systems)
No. of simultaneous users	42 per 940, 64 per Sigma 9	96	Total: 732 batch & 545 interactive	450 total	Over 180 total
Conversational terminals supported	TTY 33/35 and any compatible unit at 10, 30, or 60 cps	TTY 33/35 and compatible units	Any ASCII terminal at 10 or 30 cps; Correspondence terminals at 14.7 cps	All 10, 14.8, and 30 cps terminals; Tektronix and other graphic terminals	TTY-compatible units at speeds to 30 cps; AT&T Dataspeed 40 or Hazeltine units at higher speeds
Batch terminals supported	IBM 2780 & 3780, Remcom 2780 & 4780, Data 100 Model 70, Mohawk 2400, etc.	IBM 2780 and compatible units	Various Control Data terminals at 2000 to 40,800 bps; COPE at selected U.S. sites	IBM 2780, Data 100, and compatible units	IBM 2780, Burroughs DC 1100, or equivalent units
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, CAL, SNOBOL, TAP, etc.	FORTRAN, BASIC, COBOL, APL, SNOBOL, QED, Metasympol	FORTRAN, BASIC, COBOL, APL, SIMULA, SIMSCRIPT	FORTRAN, BASIC, COBOL, Macro 10	FORTRAN, BASIC, COBOL, APL, PL/1, EPL, AID, MODSIM
Batch-mode programming languages	FORTRAN, COBOL, BASIC	FORTRAN, BASIC, COBOL, APL, SNOBOL, QED, Metasympol	FORTRAN, BASIC, COBOL, ALGOL, COMPASS, SIMSCRIPT, SIMULA	FORTRAN, BASIC, COBOL, Macro 10	FORTRAN, BASIC, COBOL
Principal applications	Business & scientific	Business & scientific	Business & scientific	Business & scientific	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	None	\$100	\$100	None	\$125
Remote batch	None	\$100	None	None	\$125
Terminal connect time:					
Interactive	\$7.20-20.00/hr.	\$8.00-12.00/hr.	\$9.00/hr.	\$10.00-15.00/hr.	\$10.00/hr.
Remote batch	\$8.40/hr. plus	\$8.00-12.00/hr.	\$10.00-15.00/hr.	\$15.00/hr.	\$20.00/hr.
Central processor time:					
Interactive	\$0.15/10,000 chars.	\$0.08-0.12/CCU	\$0.30/sec.	\$1.20-28.80/min.	\$0.17-1.25/sec.
Remote batch	\$0.03-0.07/CCU	\$0.08-0.12/CCU	\$0.21-0.65/sec.	\$0.60-14.40/min.	\$0.17-1.25/sec.
Mass storage:					
Interactive	\$0.30/2048 bytes/month	\$0.20-0.80/1000 bytes/month	\$0.016/1280 chars./day	\$0.06-1.00/1000 chars./month	\$0.20-0.80/1000 chars./month
Remote batch	\$0.30/2048 bytes/month	\$0.20-0.80/1000 bytes/month	\$0.013 1280 chars./day	\$0.06-1.00/1000 chars./month	\$0.20-0.80/1000 chars./month
COMMENTS					
	Commander II service provides time-sharing, remote batch, and data management facilities; Telegrid is Com-Share's nationwide comm. network	Offers service in most major Canadian cities via Dataline 2 and Dataroute; an affiliate of Com-Share, Inc.	Also see The Service Bureau Company, which is now a division of Control Data Corporation	International data communications network can link any client to any system; charges depend upon volume and type of contract; offers remote facilities management	Specializes in economic planning and analysis; offers Economic Information System at charges of \$1,500 to \$40,000 per year

All About Remote Computing Services

COMPANY	Data-Tek Corporation	Datacrown Limited	Dataline Systems Limited	Datalogics, Inc.	Dialcom, Inc.
GENERAL					
Name of service	—	Shared Processing	Dataline Time Sharing Network	DL/OS	—
Date operational	Dec. 1971	June 1972	1969	1969	1970
Areas currently served	New York, New Jersey, and Pennsylvania (Area Codes 201, 212, 215, 609, & 717)	All of Canada (via Dataroute, Bell Multicom, & CNCP) plus United States	All of Canada (Vancouver to Halifax via Dataroute Dataline II services)	Ohio	Middle Atlantic States; local service in Washington, D.C., Baltimore, New York, Philadelphia, Pittsburgh, and Minneapolis
EQUIPMENT					
Computers	Xerox Sigma 9 in Plainfield, N.J.	IBM 370/168 (2) in Willowdale, Ont.	DECsystem-10 (3) in Toronto	Xerox Sigma 7 in Cleveland	Honeywell 1648A (2) in Silver Spring, Md.
No. of simultaneous users	64	Not specified	190 total	Approx. 100	128 total
Conversational terminals supported	TTY-compatible units at 10, 15, or 30 cps	IBM 2741, 2260, 3270; Sycor 250; Vucom I; TI Silent 700; TWX; etc.	All ASCII terminals at 10 or 30 cps; IBM 2741; Diablo; graphics (e.g., Tektronix)	TTY and other ASCII terminals at 10, 15, 30, or 120 cps	TTY and other ASCII terminals at 10 or 30 cps; Correspondence units at 14.8 cps
Batch terminals supported	—	IBM, Data 100, Remcom, Sycor, Mohawk, Singer, Comterm, etc.	COPE .45, Honeywell G-115, IBM 2780 and equivalent units	IBM 2780 and compatible units using HASP protocol	—
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, APL, SNOBOL, Metasymbol	TSO Command Language	FORTRAN, BASIC, COBOL, APL, AID, LISP, SNOBOL	FORTRAN, BASIC, COBOL, APL, Text, Proforma	FORTRAN, BASIC, COBOL, TEACH, SOLVE, DAP, Text Editor
Batch-mode programming languages	FORTRAN, BASIC, COBOL, APL, SNOBOL, Metasymbol	FORTRAN, COBOL, PL/1, ALGOL, Assembler	FORTRAN, COBOL, LISP, SNOBOL	FORTRAN, BASIC, COBOL, RPG, Metasymbol, Manage	—
Principal applications	Business & scientific	Business & scientific	Business & scientific	Business & scientific	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	\$10	None	\$10	None	\$25
Remote batch	\$10	None	None	None	—
Terminal connect time:					
Interactive	\$10/hr.	\$6-12/hr.	\$10-12/hr.	\$10-18/hr.	\$6.00/hr.
Remote batch	\$10/hr.	\$6-15/hr.	None	Variable	—
Central processor time:					
Interactive	\$0.15-0.30/sec.	\$25/min.	See Comments	\$0.08/CRU	None
Remote batch	\$0.12-0.25/sec.	\$15/min.	See Comments	\$0.04-0.16/CRU	—
Mass storage:					
Interactive	\$0.50/1000 chars./month	\$0.015/track/day (IBM 3330)	\$0.30/640 chars./month	\$0.80/2048 chars./month	\$0.50/512 chars./month
Remote batch	\$0.50/1000 chars./month	\$0.015/track/day (IBM 3330)	\$0.30/640 chars./month	\$0.80/2048 chars./month	—
COMMENTS	Offers municipal bonds program; port rates available	Offers discounts for volume usage and non-prime time; dedicated high-speed access ports available	CPU charges vary with amount of main storage used; rates are much lower during non-prime hours	"Virtual port" and bulk usage contracts available; offers discounts for volume usage and non-prime time	Offers special rates for large data bases and dedicated ports; offers tax return preparation service and common business applications

All About Remote Computing Services

COMPANY	Fedder Data Centers, Inc.	First Data Corporation	Fulton National Bank	General Electric Company	Genesee Computer Center, Inc.
GENERAL					
Name of service	—	First Data Service; "Clockwork" in N.Y.	Fulton Data	Mark III	Genesee Services
Date operational	1959	1970	1966	1965	Aug. 1968
Areas currently served	U.S. and Canada	New England and Middle Atlantic States via multiplexers, WATS, FX, etc.	Southeastern U.S. via multiplexers in major cities and INWATS service	Local-call service to more than 400 cities in North America, and (via satellite) Western Europe, Australia, and Japan	Continental U.S. and Toronto via multiplexers and INWATS service
EQUIPMENT					
Computers	IBM 360/50 in Baltimore	DECsystem-10 (5) in Waltham, Mass.	Honeywell 6080 (2) and Honeywell 440 in Atlanta	More than 100 computers, including Honeywell 635 and 6000 systems, in one "supercenter" in Cleveland	CDC 6600, 6400, and 3500 systems belonging to Control Data (Cybernet) and Multiple Access Ltd.
No. of simultaneous users	Over 200	Over 250	125 total	Up to 100 per computer	Not specified
Conversational terminals supported	—	"All American-made interactive terminals"	TTY and all compatible units at 10 to 30 cps	ASCII, EBCDIC, or Correspondence terminals at 10, 14.8, 15, or 30 cps	TTY and all compatible units at 10 or 30 cps
Batch terminals supported	Fedder APT-1000, Fedder Fastback, or any IBM-compatible RJE terminal	FDC-73, all DEC batch terminals	"All"	IBM 2780, Data 100, Remcom 2780, MDS 2400, Honeywell G-115, RPS III, etc.	CDC 200, DEC PDP-11, IBM 1130, UNIVAC 9200/9300, Data 100, etc.
SOFTWARE					
Conversational programming languages	—	FORTRAN, BASIC, COBOL, APL, ALGOL, LISP, SNOBOL, AID, etc.	FORTRAN, BASIC	FORTRAN, BASIC, ALGOL, Editors, DATOOL	FORTRAN, COBOL, Compass
Batch-mode programming languages	None required by user	FORTRAN, BASIC, COBOL, APL, ALGOL, LISP, SNOBOL, etc.	COBOL, ALGOL, JOVIAL, Simscript, Databasic	FORTRAN, COBOL, Assembly, simulators	FORTRAN, COBOL, Compass
Principal applications	Business	Business & scientific	Business & scientific	Business & scientific	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	—	None	None	\$100/catalog	None
Remote batch	See Comments	None	None	\$100/catalog	None
Terminal connect time:					
Interactive	—	\$0.00-10.00/hr.	\$7/hr. (300 bps)	\$7-13.50/hr.	\$9-18/hr.
Remote batch	See Comments	\$7.50/hr.	\$15/hr. (2000 bps)	\$7-16/hr.	\$10-20/hr.
Central processor time:					
Interactive	—	\$0.00-18.00/min.	\$0.03/unit	\$0.33-0.40/CRU	\$0.20-0.30/sec.
Remote batch	See Comments	\$0.00-9.00/min.	\$8.33/min.	\$200-250/NBU	\$0.21-0.65/sec.
Mass storage:					
Interactive	—	\$0.10-0.50/1000 chars./month	\$1.00/1280 chars./month	\$0.20-1.10/320 36-bit words/mo.	\$0.01/1000 chars./day
Remote batch	See Comments	\$0.10-0.50/1000 chars./month	\$1.00/1280 chars./month	\$0.09/320 36-bit words/mo.	\$0.01/1000 chars./day
COMMENTS	Specializes in remote batch services for accountants; charges are based on number of transactions processed and frequency	CPU charges vary with amount of main storage used; offers stock market data base, financial modeling, and data management systems		Offers extensive data management facilities; CPU & NBU charges depend on resources required and other factors; discount for deferred processing	Provides specialized technical services, and resells Control Data or Multiple Access computer services, at the supplier's rates, in the process

All About Remote Computing Services

COMPANY	Grumman Data Systems Network Services	GTE Data Services Incorporated	HDR Systems, Inc.	Honeywell Information Systems, Inc.	Information Systems Design
GENERAL					
Name of service	Calldata	GTEDS Time-Sharing Service	HDR Systems KRONOS	Datanetwork	ISD
Date operational	Feb. 1970	Nov. 1971	Oct. 1972	July 1972	May 1968
Areas currently served	Middle Atlantic and New England, INWATS service to Conn., Del., Mass., N.H., N.J., Pa., R.I., & Vt.	Continental U.S. plus Hawaii	Omaha and surrounding area	Entire U.S.; local service in most large cities plus INWATS service	East Coast and West Coast
EQUIPMENT					
Computers	IBM 360/67, IBM 360/75, CDC Cyber 73, DECsystem-10, Honeywell 635	CDC 6500, CDC 6600, and CDC Cyber 73-28 (2)	CDC 6400 in Omaha, Neb.	Honeywell 6080 (2) in Minneapolis	UNIVAC 1108 (3) in Santa Clara, Cal.
No. of simultaneous users	Not specified	1000 total	150	130	109
Conversational terminals supported	ASCII, EBCDIC, or Correspondence terminals at 10, 14.8, 15, or 30 cps	TTY & compatible terminals at 10, 15, or 30 cps	TTY 33/35, CDC 713, Execuport, etc.; IBM 2741	TTY and compatible units at 10, 15, or 30 cps; Honeywell VIP displays; IBM 2741	TTY and most compatible ASCII units at 10, 30, or 120 cps; Tektronix graphics terminals
Batch terminals supported	IBM 2780, 1130, 360/20, and compatible units	CDC 200 User Terminal and all compatible units at 2000 to 9600 bps	CDC 200 & 731, Data 100, M&M 500, Mohawk 2400, etc.	Most Honeywell computers; Data 100, Mohawk 2400, etc.	Cope Series, Data 100, DEC PDP-8, IBM 1130 & 2780, M&M, MDS, UNIVAC 1004, etc.
SOFTWARE					
Conversational programming languages	BASIC, BRUIN, SNOBOL, SCRIPT, EDIT, FORTRAN, COBOL, PL/1, RPG	FORTRAN, BASIC, Text Editor	FORTRAN, BASIC, COBOL, APL, Text Editor	FORTRAN, BASIC, Text Editor	FORTRAN, BASIC, COBOL, ALGOL, APL, Editor
Batch-mode programming languages	FORTRAN, COBOL, PL/1, Assembler, RPG, Mark IV	FORTRAN, BASIC, COBOL, Simsript, Compass	FORTRAN, COBOL, Compass	FORTRAN, COBOL, ALGOL, JOVIAL, GMAP, COBOL/IDS	FORTRAN, BASIC, COBOL, ALGOL, APL, Assembler, Editor
Principal applications	Business & scientific	Business & scientific	Business & scientific	Business & scientific	Engineering & scientific
CHARGES					
Min. monthly charge:					
Interactive	None	None	None	\$90	\$50
Remote batch	None	None	None	\$90	\$50
Terminal connect time:					
Interactive	\$8.25-13.75/hr.	\$10.50-22.00/hr.	\$4/hr. (10-30 cps)	\$10.50/hr. (10-30 cps)	\$5.00/hr.
Remote batch	No charge	\$10.00-30.00/hr.	\$10/hr. (2000 bps)	\$31.50/hr. (2000 bps)	None if dedicated
Central processor time:					
Interactive	\$0.39/virtual sec.	\$1.50-30.00/min.	\$0.20/sec.	\$1.00/TSU	\$0.135-0.30/sec.
Remote batch	\$6.50-13.00/min.	\$9.60-33.60/min.	\$0.20/sec.	\$1.00/RBU	\$0.135-0.30/sec.
Mass storage:					
Interactive	\$4.25-14.00/cylinder/month	\$0.40-0.50/1280 chars./month	\$0.20/640 chars./month	\$0.15-0.65/320 36-bit words/mo.	\$0.05/10,752 chars./day
Remote batch	\$4.25-14.00/cylinder/month	\$0.40-0.50/1280 chars./month	\$0.20/640 chars./month	\$0.15-0.65/320 36-bit words/mo.	\$0.05/10,752 chars./day
COMMENTS	Also operates "Grumman-DTSS" service on dual H 635 system in Woodbury, N.Y., serving N.Y.C., Boston, Philadelphia, Washington, etc.	Offers general time-sharing services plus large library of applications programs for telephone companies	Offers powerful text editing system and professional consulting services	Offers 160 hours/week nationwide access to GCOS multidimensional computing, plus 24-hour customer service hotline	Applications include graphics, structural engineering, circuit analysis, nuclear engineering, simulation, etc.

All About Remote Computing Services

COMPANY	Interactive Data Corporation	Interactive Sciences Corporation	International Timesharing Corporation	Kaman Aerospace Corporation	Keydata Canada
GENERAL					
Name of service	—	—	3300, 1640, and 360 Networks	Kaman TS Systems	Keydata
Date operational	1968	May 1969	May 1968 (3300)	Aug. 1971	1969
Areas currently served	All of continental U.S. except Alaska, Louisiana, Oklahoma, New Mexico, Texas & the Dakotas	Mid-Atlantic and New England States; multiplexers in Jacksonville, Detroit, and Schenectady	Atlanta, Boston, Chicago, Denver, Detroit, L.A., N.Y., Minneapolis, St. Paul, San Francisco, & 5 other cities	Central Connecticut	Major Canadian metropolitan areas; current subscribers in Toronto, Montreal, Winnipeg, and Vancouver
EQUIPMENT					
Computers	IBM 370/158 in Waltham, Mass.; IBM 370/158 in San Francisco	DECsystem-10 (2) in Braintree, Mass.	CDC 3300 (2) & Honeywell 1648A (4) in Chaska, Minn.; IBM 360/65 in Palo Alto, Cal.	HP 2000F in Bloomfield, Conn.	UNIVAC 494 (3) in Foxboro, Mass.
No. of simultaneous users	150 total	128 total	Not specified	32	3000 total
Conversational terminals supported	10 & 30 cps ASCII, 15 cps EBCDIC (IBM 2741 compatible); 120 cps full duplex	Nearly all ASCII units to 300 bps; also IBM & other BCD, Selectric, & Correspondence units	TTY, IBM 2741, & compatible units at 10, 15, or 30 cps	Any ASCII terminal at 10, 15, or 30 cps	TTY Model 28, GE TermiNet, Bell Canada Vucom
Batch terminals supported	IBM 2780 and compatible units at 2000, 2400, & 4800 bps	IBM 2780, 2968, & 2701/3704; MDS 2400 & 6403; UNIVAC 1004 & DCT 2000; etc.	IBM 2780, Cope 1200, Data 100, MDS 2400, Remcom 4780 (on 360 Network)	—	—
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, PL/1, Assembler; XSIM	FORTRAN, BASIC, COBOL, Macro, LISP, AID, IAM, etc.	FORTRAN, BASIC, COBOL, PL/1, Assembly, BPL, RUSH, etc.	BASIC	Keydata On-Line Processing Language (KOP)
Batch-mode programming languages	FORTRAN, BASIC, COBOL, PL/1, Assembler, XSIM	FORTRAN, COBOL, RPG	FORTRAN, BASIC, COBOL, PL/1, Assembly, BPL, RUSH, etc.	—	—
Principal applications	Business & scientific	Business & scientific	Business & scientific	Business & scientific	Business
CHARGES					
Min. monthly charge:					
Interactive	None	None	\$200	None	\$800
Remote batch	None	None	—	—	—
Terminal connect time:					
Interactive	\$10-20/hr. (10-120 cps)	\$6-9/hr.	\$10/hr.	\$5.50/hr.	See Comments
Remote batch	None	None	—	—	—
Central processor time:					
Interactive	\$0.16/charge unit	\$0.01/CRU	\$0.12/CRU	No charge	See Comments
Remote batch	\$0.08/charge unit	\$1.33/min.	—	—	—
Mass storage:					
Interactive	\$0.08-0.16/1000 chars./month	\$0.01/640 chars./day	\$0.15-0.60/640 chars./month	\$0.16-0.30/1000 bytes/month	See Comments
Remote batch	\$0.08-0.16/1000 chars./month	—	—	—	—
COMMENTS					
	Offers on-line economic and security market data bases with software for accessing and processing the data, as well as general-purpose time-sharing	Offers financial modeling programs; lower rates for non-prime CPU time	Charges shown are for 3300 Network; 360 Network was acquired from Allen-Babcock in 11/73; 1640 Network was acquired from Honeywell in 4/73	Offers dedicated port (i.e., unlimited access) for \$500 (local to Hartford) or \$825 (statewide access) per month; non-prime connect time costs only \$3.00/hr.	All charges are based on number of transactions processed; dedicated system for interactive business data processing applications

All About Remote Computing Services

COMPANY	Keydata Corporation	Leasco Response, Inc.	Management Systems Corporation	Manufacturing Data Systems, Inc.	Mark/Ops
GENERAL					
Name of service	Keydata	Response/360, Response I	Time Sharing & RJE Services	Compact II N/C Parts Programming	Mark/Ops
Date operational	1965	1969	April 1970	March 1969	March 1967
Areas currently served	Continental U.S. & Eastern Canada; more than 40 concentrators	Eastern and Mid-western U.S. plus Los Angeles	Salt Lake City, Provo, and Ogden, Utah	All of U.S. and Canada, United Kingdom, & France	Boston, New York, & Washington, D.C. areas
EQUIPMENT					
Computers	UNIVAC 494 (3) in Foxboro, Mass.	IBM 360/65 in Maryland; HP 2116 in each branch office	IBM 370/168 in Salt Lake City	Xerox 940 systems in Ann Arbor (Com-Share) and Palo Alto (Tymshare)	DEC PDP-10 (KI) in Boston
No. of simultaneous users	3000 total	Varies	55 time-sharing, 3 RJE	Not specified	64
Conversational terminals supported	TTY Model 28, GE TerminiNet, TI Silent 700, Computer Devices, etc.	TTY 33/35 & other ASCII terminals at 10 to 30 cps; IBM 2741	Trendata 1000, Trendata 1500, IBM 2741, GTE 5741; 15 & 30 cps	TTY ASR 33, Western Union DT300, GE TerminiNet	Any 10, 15, or 30 cps ASCII unit
Batch terminals supported	—	—	IBM 2780 & S/3, Mohawk	—	Any 1200 bps ASCII unit
SOFTWARE					
Conversational programming languages	—	BASIC, FORTRAN, PL/1	APL, ATS	Compact II	FORTRAN, BASIC, COBOL, Macro 10
Batch-mode programming languages	—	Full OS/360 capabilities	FORTRAN, COBOL, PL/1, RPG, Assembler, Easytrieve	—	FORTRAN, BASIC, COBOL, Macro 10
Principal applications	Business	Business, scientific, data base mgmt.	Business & scientific	Numerical control	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	See Comments	\$100	None	\$50	None
Remote batch	—	—	On request	—	None
Terminal connect time:					
Interactive	See Comments	\$9.40-13.75/hr.	\$3.00-3.75/hr.	\$10-14/hr.	\$8/hr.
Remote batch	—	—	None	—	\$12/hr.
Central processor time:					
Interactive	See Comments	\$18.60/min.	\$1.05/sec.	\$35/min.	\$0.10/sec. (4K)
Remote batch	—	—	On request	—	\$0.05/sec. (4K)
Mass storage:					
Interactive	See Comments	\$1.05/3440 chars./month	\$0.04/6440 chars./day	\$1.00/1000 chars./month	\$0.01/640 chars./day
Remote batch	—	—	On request	—	\$0.01/640 chars./day
COMMENTS	Dedicated system for interactive business data processing applications; all charges are based upon customer usage or fixed contracts	Charges shown are for Response/360 service on IBM 360/65; Response I service on HP costs \$6-8/hr. of connect time (no CPU charge)	Offers text processing system (ATS) to facilitate preparation of publications, proposals, etc.	Offers numerical control parts processing system, using Com-Share and Tymshare computers and communications networks	Division of Northeastern Systems Associates; specializes in large systems for specific customers; lower rates for non-prime time

All About Remote Computing Services

COMPANY	McDonnell Douglas Automation Co.	Metridata Computing, Inc.	Multiple Access Limited	National CSS, Inc.	Newfoundland and Labrador Computer Service
GENERAL					
Name of service	Direct Access Computing (DAC)	Metrinet	—	VP/CSS	—
Date operational	Jan. 1968	Jan. 1969	Oct. 1969	Dec. 1968	1970
Areas currently served	Continental U.S. plus Montreal, Toronto, Windsor, and Vancouver, Canada	Multiplexers in Chicago, Cincinnati, Dayton, Detroit, and Indianapolis; foreign exchange in Columbus, O.	All of Canada & Northeastern U.S.	East Coast, Midwest, West Coast, Arizona, Houston, Canada, London, Paris, Bonn	Eastern Canada
EQUIPMENT					
Computers	IBM 360/195 (2), IBM 370/168 (2), & Xerox Sigma 9 (2) in St. Louis; IBM 370/168 in Long Beach, etc.	Honeywell 430 (2) in Louisville	CDC 3500, 6600, & Cyber 72, IBM 370/168 & 360/30 in Toronto; UNIVAC 494 (3) in Boston	IBM 360/67 (3) & 370/168 in Stamford, Conn.; IBM 360/67 (2) in Sunnyvale, Calif.	IBM 370/155 in St. John's, Nfld.
No. of simultaneous users	128 time-sharing, over 100 batch	80 total	48 on CDC 3500, 32 on CDC 6600, 64 on Cyber 72	500 in Conn. & 160 in Calif.	30
Conversational terminals supported	All ASCII units at 10 or 30 cps; IBM 2741 and compatible units; Computek & Tektronix graphics	Any ASCII terminal at 10 or 30 cps	TTY and all compatible ASCII units at 10 or 30 cps	TTY and all compatible units at 10, 30, 60, or 120 cps	IBM 2740, 2741, 3270, TTY, or equivalent
Batch terminals supported	IBM 2770, 2780, 3780, 1130, 360/20, System/3, and compatible units	—	IBM 360/20 & 1130, UNIVAC 9200/9300, CDC 200, Data 100, Comterm 2100, DEC PDP-8 & -11, etc.	Dial-up units at 1200 to 4800 bps; leased-line units at 2400 to 9600 bps	IBM HASP and equivalent units
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, PL/1, APL, Assembler	FORTRAN, BASIC	FORTRAN, BASIC, COBOL, Compass	FORTRAN, BASIC, COBOL, PL/1, Assembler	FORTRAN, BASIC, COBOL, PL/1, Assembler
Batch-mode programming languages	FORTRAN, BASIC, COBOL, PL/1, RPG, Assembler, IMS/DL-1	COBOL	FORTRAN, BASIC, COBOL, ALGOL, RPG, PL/1, Assembler, Compass, etc.	FORTRAN, BASIC, COBOL, PL/1, Assembler	FORTRAN, COBOL, PL/1, ALGOL, RPG, Assembler, etc.
Principal applications	Business & scientific	Business & scientific	Business & scientific	Business & scientific	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	None or \$10/ID	None	None	None	Not specified
Remote batch	None	—	None	None	Not specified
Terminal connect time:					
Interactive	\$10/hr. (to 30 cps)	\$10/hr.	\$3.75-12.00/hr.	\$10-20/hr.	Not specified
Remote batch	None	—	\$20.00/hr.	None	Not specified
Central processor time:					
Interactive	\$6.00-12.00/min.	\$0.04/CPU unit	\$0.16/sec. (3500)	\$0.20/VPU	Not specified
Remote batch	\$12.50-47.50/min.	—	\$0.23-0.50/sec. (6600)	\$0.08-0.12/VPU	Not specified
Mass storage:					
Interactive	\$0.10/1024 chars./week	\$0.75-1.75/1000 chars./month	\$0.35/1280 chars./month	\$10-22/120,000 bytes/month	Not specified
Remote batch	\$0.50/track/month (3330)	—	\$7.00/32,000 chars./month	\$10-22/120,000 bytes/month	Not specified
COMMENTS	Primary time-sharing service is on Sigma 9's, with TSO available on 370/168's; Sigma 9's can access the other major processors		High-speed links between processors give all users on-line access to the computer systems network; also offers Keydata on-line commercial processing services		

All About Remote Computing Services

COMPANY	Ohio Valley Data Control, Inc.	On-Line Business Systems, Inc.	On-Line Systems, Inc.	Pacific Applied Systems, Inc.	Pacific International Computing Corp.
GENERAL					
Name of service	Mister Cash and Bank-A-Term	—	—	TASC system of test automation	COMSPEC, ATS/370
Date operational	1972	July 1971	Dec. 1967	1971	Nov. 1969
Areas currently served	Ohio, West Virginia, & Pennsylvania	California and the West Coast	Northeastern, Middle Atlantic, Midwestern, Western, and Southern U.S.; toll-free access from 18 cities	Continental U.S. and Europe	Atlanta, Boston, Chicago, Houston, L.A., New York, Phila., San Francisco, Washington, D.C. & 4 other cities
EQUIPMENT					
Computers	Burroughs B 3700 (dual processors) in Belpre, Ohio	IBM 370/145 in San Francisco	DEC PDP-10 (8) in Pittsburgh	TI 960 in Sherman Oaks, Calif.	IBM 370/155 in New York City; IBM 370/145 in San Francisco
No. of simultaneous users	Hundreds	100	512	6	212 in New York, 141 in S.F.
Conversational terminals supported	Burroughs B 342, 345, TD 700, TC 500, TU 500	All IBM-compatible terminals (e.g., 2260, 2740, 3270)	ASCII, EBCDIC, BCD, and Correspondence units at 10, 15, 30, or 120 cps	—	ASCII, EBCDIC, BCD, and Correspondence units at 10, 15, or 30 cps
Batch terminals supported	Burroughs B 342, 345, TC 500	All IBM-compatible terminals	Data 100, etc.	UNIVAC 1004, Harris COPE, etc. (tie into UNIVAC 1108 computer)	None
SOFTWARE					
Conversational programming languages	FORTRAN, COBOL	WYLBUR	FORTRAN, BASIC, COBOL, APL, Telcomp	TASC Test Oriented Language	COMSPEC, ATS/370
Batch-mode programming languages	FORTRAN, COBOL	FORTRAN, COBOL, PL/1, Assembler	FORTRAN, BASIC, COBOL, APL, Telcomp	TASC Test Oriented Language	FORTRAN, COBOL, PL/1, Assembler
Principal applications	Business, banking, cash dispensing	Specialized business systems	Business & scientific	ATE program development	Construction, text editing, data base
CHARGES					
Min. monthly charge:					
Interactive	\$500	None	\$5/user no.	—	\$100
Remote batch	\$1500	None	\$5/user no.	\$3,600 (2-year lease)	—
Terminal connect time:					
Interactive	\$12/hr.	See Comments	\$10/hr.	—	\$2.50/hr.
Remote batch	\$25/hr.	\$10/hr.	None	Not applicable	—
Central processor time:					
Interactive	—	Not applicable	\$0.05/CP unit	—	\$0.01/P.U.
Remote batch	—	\$7/min.	\$0.05/CP unit	Not applicable	—
Mass storage:					
Interactive	\$20/100,000 bytes/month	\$0.06/1000 bytes/month	\$0.05/3200 chars./day	—	\$0.24/1550 chars./month
Remote batch	\$20/100,000 bytes/month	\$0.03/1000 bytes/month	\$0.05/3200 chars./day	Not applicable	—
COMMENTS	Specializes in banking services; offers time-sharing, remote batch processing, and on-line cash dispensing service	Limited to applications such as reservations, order entry, POS, inventory, data base retrieval, etc.; billing is on a transaction basis	Service available 24 hours/day, 7 days/week; offers on-line data management, financial modeling, & resource management systems	Dedicated system tests simulation models for program development for automatic test equipment (ATE); uses UNIVAC 1108 at service bureau	Specializes in COMSPEC service for construction industry and ATS/370 text editing system; keyboarding service available in major cities

All About Remote Computing Services

COMPANY	Paden Data Systems, Inc.	Philco-Ford Computer Services Network	Phoenix Data Limited	Polycom Systems Limited	PRC Computer Center, Inc.
GENERAL					
Name of service	—	Computer Services Network (CSN)	KRONOS	—	Conserve
Date operational	1969	Dec. 1968	July 1972	1969	1970
Areas currently served	Dallas-Fort Worth metropolitan area	Middle Atlantic States, Chicago, Detroit	Alberta, Manitoba, Ontario, Saskatchewan, British Columbia	Toronto, Southern Ontario, Montreal, Ottawa	Continental U.S.
EQUIPMENT					
Computers	Burroughs B 3500 in Dallas	Burroughs B 5700 (2) and B 6700 in Fort Washington, Pa.	CDC 6500 and CDC 1700 in Winnipeg	Honeywell 440 & 6060 in Toronto	IBM 370/155 in McLean, Va.
No. of simultaneous users	15	168 total	512 timesharing, 46 remote batch	250	96
Conversational terminals supported	Burroughs TC 500 and TD 700	ASCII terminals at 10 or 30 cps	TTY 33/35 and compatible units	IBM 2741, TTY, GE TermiNet, Tektronix, etc.	TTY, IBM 2741, Hazeltine displays, & compatible units
Batch terminals supported	—	Burroughs DC 1000, IBM 2780, and compatible units	CDC 200, 731, & 734; IBM 360/20, Comterm, Mohawk, Remcom, Data 100	—	IBM 2780 & 360/20, Data 100, Harris Cope, etc.
SOFTWARE					
Conversational programming languages	COBOL	FORTRAN, BASIC, COBOL, ALGOL	FORTRAN, BASIC, APL, Text Editor	FORTRAN, BASIC, COBOL, ALGOL, APL	—
Batch-mode programming languages	COBOL, Assembler	FORTRAN, BASIC, COBOL, ALGOL	FORTRAN, COBOL, Compass, Spectre	FORTRAN, BASIC, COBOL, ALGOL, APL	FORTRAN, COBOL, ALGOL, PL/1, Assembler
Principal applications	Business	Business & scientific	Business & scientific	Business & scientific	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	\$850	None	None	\$100	None
Remote	—	None	None	—	None
Terminal connect time:					
Interactive	See Comments	\$9/hr. (to 30 cps)	\$5/hr.	\$10/hr.	\$8/hr.
Remote batch	—	\$25/hr. (over 30 cps)	\$7/hr.	\$10/hr.	None
Central processor time:					
Interactive	See Comments	\$7.20/min.	\$12.00/min.	\$15/min.	Not specified
Remote batch	—	\$14.40/min.	\$5.40-12.00/min.	\$15/min.	Not specified
Mass storage:					
Interactive	\$0.0375/200 bytes/month	\$1.00/1000 chars./month	\$0.28/1280 chars./month	\$0.05-0.15/500 chars./month	Not specified
Remote batch	—	\$0.50/1000 chars./month	\$0.28/1280 chars./month	\$50.00/million chars./month	Not specified
COMMENTS	Offers integrated business data processing service; charges \$0.125 per input transaction plus telephone line costs	Bulk storage and dedicated lines are available at large discounts; interactive rates shown are for B 5700, remote batch for B 6700		Reduced rates for non-prime time; dedicated ports available	Offers local and remote batch processing, TSO time-sharing, and ATS text editing, plus various other computer and professional services

All About Remote Computing Services

COMPANY	Programs & Analysis, Inc.	Proprietary Computer Systems, Inc.	Pryor Corporation	Rapidata, Inc.	Remote Computing Corporation
GENERAL					
Name of service	Thrift Line Service	PCS/APL, PCS/RJE, Advanced ATS	—	Rapidnet	RCC Network
Date operational	1969	Oct. 1968	June 1969	Jan. 1969	Oct. 1968
Areas currently served	New England and Middle Atlantic States plus Cincinnati	West and Midwest; offices and multiplexers in San Francisco, Palo Alto, San Diego, Santa Ana, Denver, Chicago, & Phoenix	Illinois and Ontario	Continental U.S. via INWATS and foreign exchanges; multiplexers in Atlanta, Boston, Chicago, L.A., N.Y., S.F. & other cities	Continental U.S. via INWATS; local dialing in Atlanta, Chicago, Cleveland, Houston, L.A., N.Y., Palo Alto, S.F., & Washington, D.C.
EQUIPMENT					
Computers	Honeywell 6050 and 435 in Burlington, Mass.	IBM 360/65 in Van Nuys, Calif.	Honeywell 440 in Toronto, Ont.	Honeywell 437 (12), DECSYSTEM-1070, and IBM 370/145 in Fairfield, N.J.	Burroughs B 5700 (3) and B 6700 in Palo Alto; B 5700 (2) in Roslyn, N.Y.
No. of simultaneous users	64 total	120	50	Over 500 total	32 per B 5700, 110 per B 6700
Conversational terminals supported	TTY and compatible units	ASCII terminals at 10 to 30 cps; IBM 2741 and compatible units; IBM & Hazeltine CRT displays	TTY 33/35, GE TerminiNet 300, Memorex 1240, UNIVAC DCT 500, Olivetti	"Almost any" 10 to 120 cps unit	Most ASCII units at 10 to 120 cps; Correspondence/EBDIC units at 14.8 or 120 cps
Batch terminals supported	Data 100, Harris COPE, Mohawk, Remcom	IBM 2780, 3780, and compatible units	—	"Almost any" unit up to 4800 bps	Data 100, Burroughs RJE terminals
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC	APL	FORTRAN, BASIC	FORTRAN, BASIC, COBOL, RIPS, DBMS	FORTRAN, BASIC, COBOL, ALGOL
Batch-mode programming languages	FORTRAN, COBOL	FORTRAN, COBOL, PL/1, LISP, GPSS	—	FORTRAN, COBOL, PL/1, Assembler	FORTRAN, BASIC, COBOL, ALGOL
Principal applications	Business	Business & scientific	Business & scientific	Business & scientific	Business & finance, communications industry
CHARGES					
Min. monthly charge:					
Interactive	See Comments	None	\$50	\$10	\$100
Remote batch	—	None	\$500	\$10	\$100
Terminal connect time:					
Interactive	See Comments	\$5.25-10.00/hr.	\$10/hr.	\$5-25/hr.	\$9/hr. (10-30 cps)
Remote batch	—	\$11.00/hr.	—	\$30/hr.	\$18/hr. (120 cps)
Central processor time:					
Interactive	See Comments	\$24.00/min.	Not specified	\$1.44-3.60/min.	\$0.15/sec.
Remote batch	—	\$3.83-12.46/min.	—	\$1.44-3.60/min.	\$0.15/sec.
Mass storage:					
Interactive	See Comments	\$10.00/million bytes/day	\$0.75/1000 chars./month	\$0.20-0.60/1000 char./month	\$0.002-0.004/240 chars./day
Remote batch	—	Depends on EXCP's	—	\$0.20-0.60/1000 chars./month	\$0.002-0.004/240 chars./day
COMMENTS	Offers dedicated business data processing services; each application is charged on a unit transaction basis	PCS services are available on the East Coast through affiliation with The Computer Company, of Richmond	Specializes in remote processing of billing, accounts receivable, sales analysis, payroll, inventory control, and accounts payable	Several data bases available for market statistics, stock markets, finance, economics, etc.	Charges shown are for B 5700 systems; discounts for non-prime time

All About Remote Computing Services

COMPANY	Scientific Process & Research, Inc.	Scientific Time Sharing Corporation	Sci-Tek Incorporated	The Service Bureau Company	I.P. Sharp Associates Limited
GENERAL					
Name of service	SPR	APL*Plus	Sci-Tek	CALL/370 Management Time Sharing	Sharp APL
Date operational	1969	Aug. 1969	Jan. 1967	1968 (CALL/360)	1969
Areas currently served	Continental U.S.	Local access in over 60 cities in the U.S. plus Toronto & London	Eastern Seaboard	Local access in 72 U.S. & 10 international locations, including Toronto, Montreal, U.K., Fr., Belgium, Holland, Germany, & Sweden	Continental U.S., Canada, United Kingdom, and The Netherlands
EQUIPMENT					
Computers	DEC PDP-10 (2) in Princeton, N.J.	IBM 370/158 (2) in Bethesda, Md.	UNIVAC 1108 (2) in Wilmington, Del.	IBM 370/158 (6) in Cleveland	IBM 370/145 (2) and Burroughs B 6700 in Toronto
No. of simultaneous users	60	Over 140/system	96 total	Over 150/system	240 total
Conversational terminals supported	TTY 33/35 and other ASCII terminals at 10 or 30 cps	IBM 2741 & 3767, AJ 630 & 840, CDI 1030, GTE 5741, Delta 5000, Tektronix 4013, etc.	TTY 33/35, Tektronix 4010, Princeton 801, Hughes Conograph	IBM 2741, TTY 33/35, and 30 cps ASCII terminals	Asynchronous units up to 30 cps, including IBM 2741, AJ 841, GTE, Harris, Tektronix, etc.
Batch terminals supported	—	IBM 2780, 3780, & System/3; Data 100, Harris Cope, Sycor, Four-Phase, etc.	UNIVAC 1004, 9200, & 9300; IBM 2780 & 1130; Harris 1200	IBM 2780 or equivalent; IBM S/360 & S/370 processors	IBM 2780 or equivalent
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, Macro-10, etc.	APL*Plus	FORTRAN, BASIC, RALPH	FORTRAN, BASIC, PL/1, Data Management	APL
Batch-mode programming languages	—	All System/370 languages	FORTRAN, COBOL, SLEUTH	FORTRAN, BASIC, PL/1, Data Management	System/370 & 6700 languages
Principal applications	Engineering & simulation	Business & scientific	Engineering, scientific, business	Business & scientific	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	None	None	None	\$100	None
Remote batch	—	—	None	—	—
Terminal connect time:					
Interactive	\$10/hr.	\$12/hr. (15 cps)	\$10/hr.	\$11-15/hr.	\$8/hr.
Remote batch	—	\$75/hr.	None	\$37.50/hr. (250 cps)	—
Central processor time:					
Interactive	\$2.25-22.50/min.	\$39/min.	\$0.30/CRU	\$0.16/PU	\$21/min.
Remote batch	—	\$39/min.	\$0.10-0.50/CRU based on priority	\$0.06-0.12/PU	—
Mass storage:					
Interactive	\$0.015/1000 chars./day	\$0.30/1000 chars./month	\$1.20/10,752 chars./month	\$0.012-0.02/1000 bytes/day	\$0.165-0.30/1000 bytes/month
Remote batch	—	—	\$1.20/10,752 chars./month	\$0.006-0.015/1000	—
COMMENTS					
	Offers simulators for plastics processing and optimization package	APL*Plus File Sub-system facilitates processing of large shared files and data bases	Offers APT, file management system, graphics systems, and Securities Validation System	Subsidiary of Control Data Corp. since January 1973; also offers TSO, RJE, stock data base, wide range of applications, and annual contracts	Company also provides systems consulting, makes CRT terminals, and produces special systems for real-time and process control applications

All About Remote Computing Services

COMPANY	The Singer Company	Standard Information Systems, Inc.	Statistical Tabulating Corporation	Structural Dynamics Research Corp.	Systems Dimensions Limited
GENERAL					
Name of service	Singer Information Systems Network	—	STAT-TAB	SDRC Computer Operations	SDL Computer Services
Date operational	1970	1967	Spring 1972	Jan. 1969	June 1969
Areas currently served	United States and Europe	Atlanta, Boston, Chicago, Minneapolis, L.A., New York, Phila., San Francisco, & Washington, D.C. areas	Continental U.S.; dial-up access at 10, 14.8, 30, 120, & 200 cps; leased lines available	Nationwide access	All major Canadian cities plus North-eastern U.S.; multi-plexers in Boston & New York; RJE terminals in Boston, N.Y., & Washington
EQUIPMENT					
Computers	IBM 370/165 & 370/168 in Wayne, N.J.; IBM 370/158 in Sunnyvale, Cal.; four IBM 370's in Europe	CDC 3600's in Waltham, Mass. (2) & Quincy, Mass.; Honeywell 265's in Mass., Minn., & N.C.	IBM 370/158 in Chicago	See Comments	IBM 370/168 in Ottawa
No. of simultaneous users	128 in N.J. & 64 in Cal.	230 total	99	See Comments	50; can increase
Conversational terminals supported	TTY, IBM 2741, and all compatible units	ASCII units at 10 or 30 cps; IBM 2741, Correspondence or EBCDIC	All IBM-compatible low-speed hard-copy & CRT terminals; TTY 33/35 & compatible units	TTY 33/35 and other ASCII terminals at 10 or 30 cps	IBM 2741 and compatible units; TTY and compatible ASCII terminals
Batch terminals supported	Singer System Ten, 1500, or M&M 500; IBM 2780, 360/20 or any HASP-compatible terminal	IBM 2780 and compatible units	All IBM-compatible medium-speed units	CDC 200 & 1700, IBM 1130, Data 100, Mohawk 2400, UNIVAC 9200, GA SPC-16, etc.	IBM BSC terminals and equivalents
SOFTWARE					
Conversational programming languages	WYLBUR, ATS	FORTRAN, BASIC, INFORM (DBMS/retrieval), CONFORM (financial planning/reporting)	CMS-supported languages, Hyperfaster	FORTRAN, BASIC	STS/WYLBUR; all batch languages in fast batch mode
Batch-mode programming languages	All OS/360 languages, Mark IV, WATFOR	FORTRAN, BASIC, INFORM, CONFORM	FORTRAN, COBOL, PL/1, RPG, ADPAC, Assembler	FORTRAN, BASIC, COBOL, ALGOL, Assembly	FORTRAN, COBOL, PL/1, RPG, Mark IV, Assembler
Principal applications	Business & scientific	Business & scientific	Business & scientific	Mechanical design, structural analysis	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	None	\$25	None	None	None
Remote batch	None	—	None	None	\$60
Terminal connect time:					
Interactive	\$3/hr.	\$10.00/hr.	\$3.50-10.00/hr.	\$9.50-13.00/hr.	\$12/hr.
Remote batch	\$10/hr.	\$22.50/hr.	\$10.00/hr.	Varies with system	—
Central processor time:					
Interactive	\$9/min.	\$0.03/CRU	\$0.10-0.20/sec.	\$1.80-24.00/min.	\$30/min.
Remote batch	By algorithm	\$375/hr.	\$0.10-0.80/sec.	Varies with system	\$20/min.
Mass storage:					
Interactive	\$4.05x10 ⁻⁷ /track/second (3330)	\$0.60/1000 chars./month	\$0.25/7294 bytes/week	\$0.10-1.75/1000 chars./month	\$2.00/million bytes/day
Remote batch	By algorithm	\$0.60/1000 chars./month	\$0.25/7294 bytes/week	Varies with system	\$2.00/million bytes/day
COMMENTS		Formerly Call-A-Computer, Inc.; offers greatly reduced rates for high-volume or non-prime usage; rates shown are for CDC 3600		Sells time on U.S. Steel, CDC, ACTS, GE, Com-Share, & Metridata systems; features mechanical design and structural analysis programs	Offers on-line and batch services based upon OS/360 and HASP, plus an interactive file editor (STS/WYLBUR) and data retrieval system (STS/INFO)

All About Remote Computing Services

COMPANY	Technical Advisors, Inc.	Technology for Information Management, Inc.	Tel-A-Data, Inc.	Telstat Systems, Inc.	Time Sharing Resources, Inc.
GENERAL					
Name of service	TECH-MAC	TIM-Sharing	Tel-A-Data	TELAC/70	Total-APL
Date operational	June 1967	Sept. 1968	Dec. 1966	Jan. 1971	July 1970
Areas currently served	Continental U.S. except Alaska (toll-free except in Michigan)	New York State	State of Florida	New York City metropolitan area	Middle Atlantic States plus Boston, Chicago, Los Angeles, San Francisco, and St. Louis
EQUIPMENT					
Computers	Varian 622i (2); 1 in Wayne, Mich., and 1 in Phoenix, Ariz.	Honeywell 440 in Detroit, operated by ACTS Computing Corp.	Burroughs B 500	Xerox Sigma 9	IBM 360/75 in Great Neck, N.Y.
No. of simultaneous users	20 in Wayne, 5 in Phoenix	50	64	64	95
Conversational terminals supported	TTY 33/35 & other ASCII terminals at 10 or 30 cps	TTY 33/35 & other ASCII terminals at 10 or 30 cps	TTY 33/35, GE TerminiNet 300, Burroughs TC 500, Incoterm 10/20	TTY 33/35, IBM 2741, GE TerminiNet 300, Datapoint 3300, Execuport, etc.	IBM 2741 & equivalent units; all ASCII terminals
Batch terminals supported	—	—	—	XDS 7670, IBM 1130, UNIVAC DCT 2000	IBM 2780, Data 100
SOFTWARE					
Conversational programming languages	—	FORTRAN, BASIC	Assembler, COBOL	FORTRAN, BASIC, Symbol, ASSIST	APL
Batch-mode programming languages	—	—	—	FORTRAN, COBOL, BASIC, Symbol, Metasybol	FORTRAN, COBOL, BASIC, APL, PL/1, Assembler
Principal applications	Civil engineering & surveying	Business & scientific	Business	Financial services	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	None	\$25	\$800	None	None
Remote batch	—	—	—	Not specified	None
Terminal connect time:					
Interactive	\$10-28/hr. (10 cps)	\$10/hr.	No extra charge	\$10/hr.	\$11-19/hr.
Remote batch	\$15-36/hr. (30 cps)	—	—	Not specified	\$120/hr.
Central processor time:					
Interactive	None	\$3/min.	No extra charge	\$9/min.	\$31.20/min.
Remote batch	—	—	—	Not specified	—
Mass storage:					
Interactive	\$10.00/2000 chars./month	\$0.75/1000 chars./month	\$0.30/330 digits/month	\$0.01/1000 chars./day	\$1.50/7200 chars./month
Remote batch	—	—	—	Not specified	—
COMMENTS					
	Offers specialized service for civil engineers and surveyors only; plotter available for \$45/hour	Offers services on ACTS system. \$50 initiation fee. Reduced rates for non-prime hours and volume usage	Main emphasis is on invoicing, accounts receivable, statistical reports, and inventory control; monthly charge includes CP and connect time	Provides access to TELPRICE/70, an extensive financial data base, at a cost of \$350/month	Total-APL File Subsystem facilitates processing of large shared files and data bases; also offers financial modeling system

All About Remote Computing Services

COMPANY	Tymshare, Inc.	Uni-Coll	United Computing Systems, Inc.	University Computing Company
GENERAL				
Name of service	TYMCOM IX, X, & 370	TSO and APL at Uni-Coll	UCS	1108/FASBAC services
Date operational	1966	July 1970	Jan. 1968	May 1969
Areas currently served	Local access in all major U.S. metropolitan areas, plus INWATS; local access in London, Paris, & Brussels	Delaware Valley	Major metropolitan areas nationwide thru network of multiplexers; national INWATS for remote batch; expanding to major Canadian cities	Entire U.S. (thru WATS and multiplexers), plus England, Western Europe and Australia
EQUIPMENT				
Computers	Xerox 940 (26), DEC PDP-10 (6), & IBM 370/158 (1); in Cupertino, CA & other locations	IBM 370/168 & DECsystem-10 (K1) in Philadelphia	CDC Cyber 70 (3), CDC 6600, & CDC 6500 in Kansas City, Mo.	UNIVAC 1108's in Dallas (4), East Brunswick, N.J. (2), London (2), and Sydney
No. of simultaneous users	1500 total	110 total	Proprietary	FASBAC: 25 per system
Conversational terminals supported	Any ASCII, EBCDIC, or Correspondence unit at 10, 15, or 30 cps, in full or half duplex mode	Any ASCII unit at 10, 30, or 120 cps; IBM 2741 & compatible units at 14.8 cps	Virtually all 10 to 30 cps terminals (120 cps in 1975)	ASCII, EBCDIC, & Correspondence units at 10, 15, or 30 cps
Batch terminals supported	IBM 2780 and compatible units	Any HASP-compatible RJE terminal	Data 100, DEC PDP-11, Mohawk 2400, Remcom, UNIVAC 1004, etc.	Any unit capable of operating in UNIVAC 1004 or COPE mode
SOFTWARE				
Conversational programming language	FORTRAN, BASIC, COBOL, PL/1, Assembler, Editor	APL & TSO on IBM 370/168; FORTRAN, BASIC, COBOL, ALGOL, APL on DECsystem-10	FORTRAN, BASIC, Editor	CASH, CALC, SHOBOL, Fastext
Batch-mode programming languages	—	FORTRAN, COBOL, PL/1, RPG, Assembler on IBM 370/168	FORTRAN, BASIC, COBOL, ALGOL, Compass, Simscript	FORTRAN, COBOL, ALGOL, Assembly
Principal applications	Business & scientific	Academic, scientific, administrative	Business & scientific	Business & scientific
CHARGES				
Min. monthly charge:				
Interactive	\$80	None	\$100	None
Remote batch	—	None	\$100	None
Terminal connect time:				
Interactive	\$16/hr.	\$3.60/hr. (168)	\$10.50-37.50/hr.	\$8.50-11.00/hr.
Remote batch	—	None	\$10.00-30.00/hr.	\$3.00/hr.
Central processor time:				
Interactive	\$0.05/sec.	\$45.00/min. (168)	\$1.50-36.00/min.	\$1.10/1000 CRU's
Remote batch	—	\$27.00-58.50/min.	\$9.60-33.60/min.	Not specified
Mass storage:				
Interactive	\$0.50-1.00/1000 chars./month	\$0.02/13,000 chars./day	\$0.50/1280 chars./month	\$1.00/2048 chars./month
Remote batch	—	\$0.02/13,000 chars./day	\$50.00/204,800 chars./month	\$0.14/7K 36-bit words/day
COMMENTS	Charges shown are for Type A service on Xerox 940; other service plans are available; operates an extensive international network called TYMNET; over 600 employees	Offers System/370 RJE, TSO, & APL services and DECsystem-10 time-sharing services to educational and commercial customers	Offers variety of pricing options and 4 levels of service: time-sharing, remote batch, RJE (batch job entry from TS environment), and local batch	Principal emphasis is on remote batch processing; FASBAC is an interactive batch system, offered at a maximum hourly rate of \$17/hr.

All About Remote Computing Services

COMPANY	USS Engineers and Consultants, Inc.	Wang Computer Services	Westinghouse Tele-Computer Systems Corp.	Xerox Computer Services
GENERAL				
Name of service	UEC	HASP-RJE, WYLBUR, SPARK	Remote Input Terminal System	Interactive Accounting System
Date operational	May 1970	Nov. 1968	Nov. 1968	1970
Areas currently served	Pittsburgh, Phila., New York, Houston, Chicago, Detroit, & 5 other cities in the Midwest	HASP-RJE: New England; WYLBUR & CICS: Northeast; SPARK: all of U.S. via remote multiplexers	Middle Atlantic & New England States plus Illinois, Ohio, & Michigan	Los Angeles, San Fran- cisco, San Diego, and New York metropolitan areas
EQUIPMENT				
Computers	CDC 6500 (dual central processors), Honeywell 6800 in Pittsburgh	IBM 370/158 & 360/65 in Arlington, Mass.	IBM 370/165, CDC 6600	Xerox Sigma 7 & 9 (7 systems) in Los Angeles
No. of simultaneous users	Not specified	Over 150 per system	32/system	Not specified
Conversational ter- minals supported	TTY 33/35, GE Terminet 300, Data- point 3300, Syner-Data, Incoterm	TTY; CRT displays; IBM 2741, 3741, S/360 & S/370 computers; Wang 2200	Various terminals at 10, 15, or 30 cps	TTY 35, IBM 2741, Datel, Execuport, Olivetti
Batch terminals supported	CDC 1700, CDC 200, IBM 1130, Incoterm	Data 100; IBM 2780, 3780, S/360 & S/370 computers (to 9600 bps)	IBM 360 & 370 com- puters, IBM 2770 & 2780, CDC 200, etc.	—
SOFTWARE				
Conversational pro- gramming languages	FORTRAN, COBOL, BASIC, ALGOL	FORTRAN, BASIC, Assembler	—	Proprietary "Plain English" language activates standard Xerox programs
Batch-mode program- ming languages	FORTRAN, COBOL, BASIC, ALGOL	FORTRAN, BASIC, COBOL, PL/1, RPG, Assembler	FORTRAN, COBOL, PL/1, APT	—
Principal applications	Business & scientific	Business & scientific	Business & scientific	Business
CHARGES				
Min. monthly charge:				
Interactive	None	None	—	\$1,000
Remote batch	None	None	None	—
Terminal connect time:				
Interactive	\$9/hr.	\$6/hr.	—	See Comments
Remote batch	Rates on request	None	See Comments	—
Central processor time:				
Interactive	\$24/min.	\$4.00-34.50/min.	—	See Comments
Remote batch	Rates on request	\$4.00-34.50/min.	See Comments	—
Mass storage:				
Interactive	\$1.00/10,000 chars./month	\$12/cylinder/month	—	\$1.40/1000 chars./month
Remote batch	Rates on request	\$12/cylinder/month	\$0.02/5760 chars./day	—
COMMENTS				
	Subsidiary of U.S. Steel Corp.; lower rates for batch mode and volume usage; surcharges for certain software	CPU charges vary with storage region size (2K to 600K bytes) and priority; surcharges for certain software	Emphasizes remote batch processing; prices depend upon system, type of port, and monthly volume	Offers integrated on-line accounting system; charges are based upon transactions entered, storage used, and lines printed; all programming is done by Xerox

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AVAILABILITY OF APPLICATION PROGRAMS

<p>APPLICATION COMPANY</p>	<p>Accounts payable Accounts receivable Banking Billing Data base management</p>	<p>Educational Engineering General ledger Hospital administration Information retrieval</p>	<p>Insurance Inventory control Numerical control Operations research Payroll</p>	<p>Personnel Project control Sales analysis Scheduling School administration</p>	<p>Scientific Simulation Statistical Text editing Typesetting</p>
<p>ACTS Computing Corporation ✓ APL Services, Inc. Applied Computer Timesharing Applied Data Processing, Inc. Applied Data Research, Inc.</p>	<p>• • • • • • • • • • • • • • • • • • • •</p>	<p>• • • • • • • • • • • • • • • • • • • •</p>	<p>• • • • • • • • • • • • • • • • • • • •</p>	<p>• • • • • • • • • • • • • • • • • • • •</p>	<p>• • • • • • • • • • • • • • • • • • • •</p>
<p>Applied Logic Corporation Aquila BST Axicom Systems, Inc. Beloit Computer Center, Inc. ✓ Boeing Computer Services, Inc.</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Bowne Time Sharing, Inc. Chi Corporation Community Computer Corporation Computel Systems Limited The Computer Company, Inc.</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Computer Innovations ✓ Computer Network Corporation Computer Research Company Computer Resource Services, Inc. Computer Sciences Canada, Ltd.</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Computer Sciences Corporation Computer Sharing Services, Inc. ✓ Computer Spectrum ✓ Computility Division, Grumman Computone Systems, Inc.</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Com-Share, Incorporated Com-Share Limited Control Data Corporation Cyphernetics Corporation Data Resources Inc.</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Data-Tek Corporation Datacrown Limited Dateline Systems Limited Datalogics, Inc. Dialcom, Inc.</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Fedder Data Centers, Inc. First Data Corporation Fulton National Bank General Electric Company ✓ Genesee Computer Center, Inc.</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Grumman Data Systems GTE Data Services Incorporated ✓ HDR Systems, Inc. Honeywell Information Systems, Inc. Information Systems Design</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Interactive Data Corporation Interactive Sciences Corporation International Timesharing Corporation Kaman Aerospace Corporation Keydata Canada</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>

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AVAILABILITY OF APPLICATION PROGRAMS (Continued)

APPLICATION COMPANY	Accounts payable	Accounts receivable	Banking	Billing	Data base management	Educational	Engineering	General ledger	Hospital administration	Information retrieval	Insurance	Inventory control	Numerical control	Operations research	Payroll	Personnel	Project control	Sales analysis	Scheduling	School administration	Scientific	Simulation	Statistical	Text editing	Typesetting
	Keydata Corporation Leasco Response Incorporated Management Systems Corporation ✓ Manufacturing Data Systems, Inc. Mark/Ops	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
McDonnell Douglas Automation Co. ✓ Metridata Computing, Inc. Multiple Access Limited National CSS, Inc. Newfoundland and Labrador Computer Service ✓	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Ohio Valley Data Control, Inc. ✓ On-Line Business Systems, Inc. On-Line Systems Inc. Pacific Applied Systems, Inc. Pacific International Computing Corp.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Paden Data Systems, Inc. Philco-Ford Comp. Serv. Network Phoenix Data Limited Polycom Systems Limited PRC Computer Center, Inc. ✓	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Programs & Analysis Inc. Proprietary Computer Systems, Inc. Pryor Corporation Rapidata, Inc. Remote Computing Corporation	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Scientific Process & Research, Inc. ✓ Scientific Time Sharing Corp. Sci-Tek Incorporated The Service Bureau Company I.P. Sharp Associates Limited	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
The Singer Company Standard Information Systems, Inc. Statistical Tabulating Corporation Structural Dynamics Research Corp. Systems Dimensions Limited	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Technical Advisors, Inc. Technology for Information Management Tel-A-Data, Inc. Telstat Systems, Inc. Time Sharing Resources, Inc.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Tymshare, Inc. Uni-Coll United Computing Systems, Inc. University Computing Company USS Engineers and Consultants, Inc.	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Wang Computer Services Westinghouse Tele-Computer Systems Xerox Computer Services	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•