

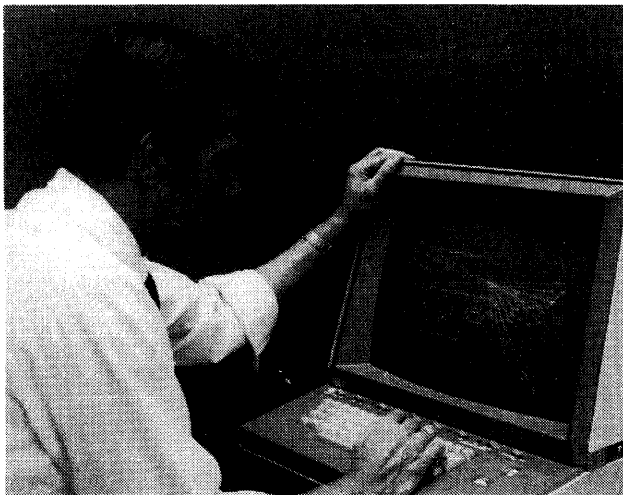
# All About Time-Sharing and Remote Computing Services

Commercially available remote computing services are expanding rapidly both in scope and size as a viable alternative to in-house computer systems. The types of services currently offered include interactive time-sharing for scientific and business computation, dedicated facilities for specific industry applications, and general-purpose remote batch processing facilities. In most cases you can make use of these services by simply 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 locally or hundreds of miles away.

The firms offering remote computing services have been generally experiencing a long-term revenue boom in spite of—or perhaps as a result of—the recent poor economy. Some of the more than 100 companies currently in operation are experiencing annual growths in revenues as high as 50 percent, with no foreseeable signs of diminishing. Moreover, the industry as a whole now appears to be well established in terms of stability and profitability.

The remote computing service companies owe their existence and rapid growth to a number of generally accepted tenets:

- Because of the inherent economics of computer production and operation, it's usually 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.



*Interactive services are not limited to crunching numbers, as this example of vehicle route scheduling via McDonnell Douglas Corporation's McAuto service indicates. McAuto has become one of the leading suppliers of remote computing services.*

**This comprehensive report explains both interactive time-sharing and remote batch processing, discusses their advantages and disadvantages, summarizes the current services offered by nearly 100 remote computing companies, suggests guidelines for selecting a suitable supplier, and reports on an extensive user survey that includes over 650 ratings of specific vendors.**

- 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.
- Individual requirements for computing resources tend to fluctuate considerably over a period of time.

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

In general, 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.

## How Remote Computing Evolved

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



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➤ 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. A special case of this capability treats one or a few program statements as a program with immediate data entry, statement execution, and result return.

That's interactive 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.

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

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

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

Until 1973, the leading supplier of remote computing services had long been General Electric Company, which entered the business in 1965 and has invested over \$150 ➤

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➤ million in developing an international network that serves the United States, Canada, and Western Europe. Two GE "super-centers" located in Cleveland and Maryland contain a total of more than 100 interconnected central processors and communications controllers. GE's "Mark III" service combines interactive 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 ADP Network Services, Inc. (Cyphernetics), Boeing Computer Services, Compu-Serv Network, Computer Sciences Corporation, Com-Share, McDonnell Douglas Automation Company, National CSS, On-Line Systems, Rapidata, 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.

### IBM Again?

Part of the agreement which sent The Service Bureau Corporation to Control Data included IBM's abstinence from data processing service operations until 1979 — and that's not far away. In addition, Satellite Business Systems (SBS), in which IBM is a partner, is scheduled to begin commercial operations in the 1979-1980 time frame; the company will provide common-carrier communications services. Many have speculated about the coincidence of the dates mentioned. Others have speculated about how IBM will participate in the multi-billion dollar per year market segments of remote computing services and communications facilities. Still others have pointed out that, increasingly, communications are becoming an integral part of data processing, a fact that IBM is well aware of.

The latter part of 1978 and the early part of 1979 should prove interesting as the existing remote computing companies, with substantial economic and technical resources in their own right, gear up to beat IBM to the punch — if IBM decides to get into the ring.

### User Benefits

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

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

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- ▷ execution of the appropriate program, and get the results he needs, either at his terminal or on a suitable output device at the computer site, all with a minimum of delay.
- *Choice of languages.* Most remote computing suppliers offer a choice of several programming languages, making it quite feasible for each user within your organization to work with the language that best suits his problem and his background.
  - *Application programs.* Most of the commercial remote computing companies are placing an ever-increasing emphasis upon the development of ready-made programs for specific applications. The availability of suitable application programs can save you thousands of dollars in programming costs and get you "on the air" much sooner.
  - *Networks and data bases.* A number of companies now offer nationwide communications networks that permit users scattered around the country to access a centralized data base. These services can permit your company to enjoy most of the advantages of a wide-spread on-line communications network with centralized files at a fraction of the cost of setting up and operating your own. (It should be noted, however, that considerations of communications reliability, access control, file security, and flexibility of the available data manipulation and retrieval languages become particularly important in this type of application.)
  - *Dedicated services.* Dozens of companies are now offering remote computing systems dedicated to providing a specific type of service. These systems can be divided into two basic classes: those that provide specialized computational or data processing services, and those that provide access to a single central data base. Examples of the first class include dedicated systems for hospital accounting, automobile dealer accounting, text editing, and civil engineering computations. Probably the best-known services of the data base type are the stock quotation services, automated credit bureaus, and reservation systems.

### Possible Drawbacks

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

- *Questionable reliability.* This question should be uppermost in the minds of prospective remote computing users: Just how reliable is the service? Many early time-sharing networks earned notorious reputations for being down (out of service) more than they were up. Fortunately, a great deal of progress has been made since those days. Only four percent of the respondents to Datapro's latest survey of remote computing users rated the reliability of the services they were using as poor. Most system "crashes" that occur

nowadays are of short duration and are quickly followed by effective recovery procedures that minimize their impact upon users' operations.

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

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

- *Slow input/output.* In some of the current remote computing networks, input and output speeds are still limited to 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 time-sharing services now support 30-cps interactive terminals, and some offer 120-cps interactive units and/or much faster remote batch terminals.
- *Low computational efficiency.* The complex software required to coordinate and control the operations of multi-user interactive 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 ▷

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*Here's what goes on behind the scenes. This photo shows about half the magnetic tape units connected to the Univac 1108 computers in University Computing Company's Dallas operations center. UCC is a long-established supplier of remote batch processing services.*

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

- **High communications costs.** Unless you choose a remote computing company that offers "free" or fixed-cost local access in your area, communications costs can easily represent the largest component of your remote computing bill. One of the problems is that it is usually necessary to use standard voice-grade telephone lines, with a practical data-carrying capacity of 4800 bits per second or more, to transmit teletype-writer data at 110 bits per second. Needless to say, the user pays for this inefficiency. Prospective remote computing users should carefully investigate the communications costs they will encounter and make every reasonable effort to minimize them.
- **High data storage costs.** The costs associated with on-line storage of large data files at the remote computer center may rule out some applications that otherwise seem made to order for remote computing. Based on a typical monthly charge of \$0.50 per 1,000 characters stored, it would cost \$400 per month just to keep a file of 10,000 80-character records on-line. The

cost of storing the programs to manipulate the file would further increase the user's monthly bill. (It should be noted, however, that many remote computing companies now offer on-line mass storage at prices well below the rate used in our example.)

- **Loss of control.** When interactive 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.

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### ➤ 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 decade.

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

### Business Applications

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

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 functions is growing steadily now, but the rate of acceptance has been well below the early predictions. The prognosticators apparently overlooked — or under-estimated the impact of — four important factors.

First, a remote computer, like every other computer, must be *programmed* before it can solve anybody's problems. Few small business firms have employees capable of analyzing and programming their data processing requirements, and few have been willing to pay an outside firm thousands of dollars to write the programs they need. This means that suitable readymade application programs are a virtual necessity for any remote computing supplier vying for business data processing accounts — yet the suppliers were surprisingly slow to develop and offer such programs. There has, however, been significant progress in this area. As shown by the chart 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 500 cities in the U.S. and Canada ➤)

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

### What's Ahead in Remote Computing

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

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

- There will be several large, nationwide suppliers of remote computing services. These will be true "information utilities," offering a broad range of computational, information retrieval, and communications services to users throughout the country (and perhaps the world).
- The smaller remote computing companies that survive will generally do so by offering highly specialized services to specific types of business firms. Companies attempting to market plain "computing power" are finding it increasingly difficult to stay alive.
- Many current users of commercial remote computing services will install their own in-house computer systems. Some companies will install small computers (such as the IBM System/32 or the proliferating mini-computers from dozens of vendors) 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.

### User Experience

To assess the current level of user satisfaction with the vendors of remote computing services and to determine usage patterns, Datapro mailed a questionnaire to its complete subscriber list in September 1977. By December 1, a total of 458 users had responded with information about their current and planned usage of remote computing services and with a total of 697 sets of ratings of specific vendors' services. The following paragraphs present a summary of the users' replies.

While the data base was certainly large enough to support a market study, we are *not* presenting a study on market penetration, market size, or market growth. We made no effort to solicit responses from non-users of remote computing, nor did we ask the users to quantify their future remote computing service needs. Neither did we normalize our subscriber base to match the general data processing public. The material presented in this section is simply a capsule summary of the experience of a sizeable number of users. Furthermore, the small sample sizes for some of the listed companies makes it unwise to draw firm conclusions about relative company performance.

The responses fell naturally into two groups: the "Big 8" and "Others." As you can see from the accompanying table, a total of 32 companies received three or more mentions by responding users. Of those 32, 8 companies received 28 or more mentions. (The next largest group of responses was 11.) In several places in the following summary, we will use this division into the Big 8 and Others to investigate and illustrate several points.

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



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➤ The 485 users who responded can be grouped according to company size as follows:

	Users Responding	
	Number	Percent
Annual revenue:		
Less than \$1 million	36	9
Between \$1 million and \$10 million	92	23
Between \$10 million and \$100 million	110	28
Over \$100 million	161	40
Total number of user responding to this question	399	100

When we tabulated company size by service response, a slightly different picture emerged:

	Percent of Responses for:	
	Big 8	Others
Annual revenue:		
Under \$1 million	8%	8%
Between \$1 million and \$10 million	16	22
Between \$10 million and \$100 million	25	30
Over \$100 million	51	36
Total number of users responding to	350	297

Of the several interpretations that are possible, the most probable is that large companies tend to use more than one service, at least one of which is one of the well-known remote computing services.

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

	Users Responding	
	Number	Percent
No in-house facilities	84	18
Some in-house facilities	140	31
Extensive in-house facilities	234	51
Total number of users responding	458	100

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

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

	Users Responding	
	Number	Percent
Remote computing service plans:		
Planned no change	84	22
Planned an increase	222	57
Planned a decrease	81	21
Total number of users responding	387	100
In-house plans:		
Planned to move some applications in-house	120	31
Planned to move all applications in-house	38	10
Total number of users responding	158	41

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

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

	Importance assigned by users of:		
	Big 8	Others	Overall
Most important	Technical support	Accessibility	Cost
•	Cost	Cost	Accessibility
•	Accessibility	Response time	Response time
•	Application packages	Application packages	Technical support
•	Response time	Data security	Application packages
•	Data security	Control procedures	Data security
•	Control procedures	Proprietary data files	Control procedures
Least important	Proprietary data files	Technical support	Proprietary data files
Total number of users responding	352	305	657

The "total number of users responding" to this question is larger than the number of users responding to the survey (458) because the counts were made on the basis of one count per service rated. This gives a slight extra weight to the users who rated more than one service. However, it permitted pointing out a significant difference between users of the Big 8 services (as defined earlier in the report) and the other users. The three columns in the table above look quite different at first glance, but there is only one major difference. Big 8 users rated technical support as most important, while users of other services rated it least important. Otherwise, there was not a great deal of difference between the order of importance assigned by the two groups of users. (Naturally, there is some crossover between the two groups, but it does not affect the order to any significant degree.) In fact, there was not a lot of difference among the levels of importance associated with the whole list. The differences were sufficient to establish the order given, but there was much variation in the order given by individual users.

The remainder of the questionnaire was devoted to specific questions and ratings for specific services. A summary of the ratings given to specific vendors' services is presented ➤



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### USERS' RATINGS OF REMOTE COMPUTING SERVICES

Company	Number of User Responses	Users' Ratings*																																		
		Overall Satisfaction					Response Time					Up Time					Installation and Training					Languages and Compilers					Application Programs					Technical Support				
		WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P	WA	E	G	F	P
Boeing Computer Services, Incorporated	9	2.9	1	6	0	1	3.0	0	8	0	0	2.9	0	7	1	0	3.3	3	4	1	0	3.4	3	5	0	0	3.0	1	5	1	0	3.0	3	3	1	1
Bowne Time Sharing Incorporated	4	3.3	1	3	0	0	3.3	1	3	0	0	3.5	2	2	0	0	2.5	0	3	0	1	3.0	0	3	0	0	3.0	2	1	0	1	2.5	0	3	0	1
Chi Corporation	3	3.7	2	1	0	0	3.0	1	1	1	0	4.0	3	0	0	0	3.0	0	3	0	0	3.0	0	3	0	0	3.0	1	1	1	0	3.0	0	3	0	0
Compu-Serv Network, Incorporated	13	3.2	3	9	1	0	3.1	3	8	2	0	3.2	4	8	1	0	2.5	1	6	4	1	3.2	4	8	1	0	3.0	3	6	3	0	3.0	3	7	3	0
Computer Sciences Corporation	29	3.0	3	23	0	2	3.0	5	18	5	0	3.4	11	17	0	0	3.0	8	14	2	3	3.2	6	18	2	0	2.8	1	18	7	0	2.7	3	14	9	1
Comshare, Inc.	31	3.3	12	14	2	0	3.4	13	14	2	0	3.4	13	17	0	0	3.1	6	21	2	0	3.2	9	18	2	0	3.3	10	15	2	0	3.1	11	11	6	1
Control Data Corp.	28	3.5	15	12	1	0	3.4	14	12	2	0	3.5	17	9	2	0	3.1	10	12	5	1	3.4	12	15	1	0	3.6	17	10	1	0	3.2	10	14	3	1
Cyphernetics (ADP Network Services, Incorporated)	9	3.3	4	4	1	0	3.1	4	1	3	0	3.4	6	1	2	0	3.0	1	7	1	0	3.3	4	4	1	0	3.1	2	6	1	0	3.0	1	6	1	0
Data Resources, Inc.	5	3.2	1	4	0	0	2.8	0	3	1	0	2.5	0	2	2	0	2.8	0	3	1	0	3.3	1	3	0	0	3.5	2	2	0	0	3.3	1	3	0	0
First Data Corp.	6	3.0	0	6	0	0	3.2	1	5	0	0	3.0	1	4	1	0	3.0	0	6	0	0	3.2	1	5	0	0	2.8	0	5	1	0	2.8	0	5	1	0
General Electric Co.	104	3.2	21	77	3	1	3.2	31	55	12	2	3.5	52	44	5	0	2.9	17	55	24	2	3.0	20	58	15	2	2.8	11	59	24	1	2.7	12	50	24	9
Grumman (CallData Systems, Inc.)	5	2.6	0	3	2	0	3.2	1	4	0	0	3.2	2	2	1	0	2.6	1	1	3	0	3.0	0	5	0	0	2.3	0	1	3	0	2.8	1	1	2	0
Honeywell Information Systems, Inc.	5	2.6	0	4	0	1	2.4	0	2	3	0	3.0	2	1	2	0	3.0	1	3	1	0	3.0	1	3	1	0	2.4	0	3	1	1	2.8	0	4	1	0
Informatics, Inc.	5	3.2	2	2	1	0	3.4	2	3	0	0	3.6	3	2	0	0	3.4	3	1	1	0	3.8	3	1	0	0	3.5	2	2	0	0	3.6	3	2	0	0
Interactive Data Corp.	4	2.3	1	0	2	1	2.3	0	1	3	0	2.8	0	3	1	0	2.3	0	2	1	1	2.3	0	2	1	1	2.5	0	2	2	0	2.0	0	1	2	1
Interactive Science Corporation	4	3.3	1	3	0	0	3.3	1	3	0	0	3.5	2	2	0	0	3.3	0	1	3	0	2.3	1	3	0	0	2.5	1	1	1	1	2.8	0	3	1	0
Lockheed	3	3.7	2	1	0	0	3.7	2	1	0	0	3.3	1	2	0	0	3.3	1	2	0	0	3.7	2	1	0	0	3.5	1	1	0	0	3.7	2	1	0	0
McDonnell Douglas Automation Co.	8	3.0	1	6	1	0	3.3	2	6	0	0	3.6	5	3	0	0	2.9	2	4	1	1	3.5	4	4	0	0	3.3	2	5	0	0	3.0	1	6	1	0
National CSS, Inc.	30	3.3	11	16	3	0	3.2	9	16	2	1	3.3	13	10	4	1	2.9	5	14	9	0	3.1	8	15	4	0	3.0	9	12	4	2	2.8	9	9	7	4
On-Line Systems, Inc.	10	3.3	3	7	0	0	3.4	4	6	0	0	3.4	5	4	1	0	3.0	3	4	3	0	3.4	4	6	0	0	3.2	3	6	1	0	3.3	5	3	2	0
Optimum Systems, Inc.	4	3.5	2	2	0	0	3.3	1	3	0	0	3.0	2	1	1	0	3.5	2	2	0	0	3.5	2	2	0	0	3.3	1	2	0	0	3.5	2	2	0	0
Rapidata, Inc.	12	2.9	4	4	3	1	2.8	3	5	3	1	3.3	5	5	2	0	2.8	3	5	3	1	3.0	4	4	2	1	3.0	3	5	3	0	2.9	3	6	2	1
Remote Computing Corporation	3	3.7	2	1	0	0	3.3	1	2	0	0	3.3	1	2	0	0	3.3	1	2	0	0	3.0	1	2	0	0	3.0	0	3	0	0	3.3	1	2	0	0
Scientific Timesharing Corporation	4	3.5	2	2	0	0	3.3	1	3	0	0	3.8	3	1	0	0	3.0	1	2	1	0	3.3	2	1	1	0	3.0	1	1	1	0	3.3	2	1	1	0
Service Bureau Co.	73	3.1	20	39	8	1	3.1	20	36	12	1	3.5	34	34	1	0	3.0	17	38	14	0	3.1	17	39	8	0	3.0	13	41	11	0	2.8	15	28	21	4
System Development Corporation	3	3.0	1	1	1	0	3.3	2	0	1	0	3.7	2	1	0	0	3.0	1	1	1	0	3.0	1	1	1	0	3.3	1	2	0	0	3.3	1	2	0	0
Systems Dimensions Ltd.	5	3.2	1	4	0	0	3.4	2	3	0	0	2.8	1	2	2	0	3.3	2	0	1	0	3.6	3	2	0	0	3.2	1	4	0	0	3.6	4	0	1	0
Timesharing Resources, Incorporated	3	3.3	1	2	0	0	3.7	2	1	0	0	3.0	0	3	0	0	3.3	1	2	0	0	3.7	2	1	0	0	2.5	0	1	1	0	3.0	1	1	1	0
Tymshare, Inc.	45	3.0	5	33	3	2	3.0	7	30	4	1	3.4	19	21	2	0	2.8	5	25	10	1	2.9	6	28	7	1	2.8	5	24	12	0	2.6	3	24	10	4
United Computing Systems, Inc.	29	3.4	13	15	0	1	3.4	14	12	3	0	3.6	18	10	0	1	3.0	8	15	5	1	3.2	6	22	1	0	3.0	6	16	6	0	3.0	9	13	6	1
University Computing Company	10	3.3	3	7	0	0	3.3	3	7	0	0	3.6	6	4	0	0	3.0	2	6	2	0	3.0	1	7	1	0	2.9	1	7	2	0	3.0	3	4	3	0
Warner Computer Service	4	3.0	1	1	1	0	3.3	1	2	0	0	3.3	1	2	0	0	2.7	0	2	1	0	3.0	1	1	1	0	3.3	1	2	0	0	2.7	0	2	1	0
All Others	187	3.0	46	87	38	8	2.9	41	83	41	12	3.0	50	92	31	6	2.6	29	71	45	29	3.0	41	86	31	9	2.7	32	73	46	14	2.7	39	67	56	16
GRAND TOTALS	697	3.1	205	399	71	19	3.1	191	357	100	17	3.3	284	318	62	8	2.9	134	337	145	42	3.1	170	376	82	14	2.9	134	342	135	20	2.8	148	301	166	45

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

in the accompanying "Users' Ratings" table and is self-explanatory.

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

	User Responses	
	Number	Percent
Length of time service used:		
Less than 6 months	60	9
Between 6 months and 2 years	172	26
Between 2 years and 5 years	248	38
Over 5 years	178	27
Total number of users responding	658	100

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

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

	User Responses	
	Number	Percent
Accounting	327	47
Distribution	68	10
Engineering	216	31
Manufacturing	75	11
Personnel	102	15
Research and Development	200	29
Sales/Marketing	187	27
Others	177	25

## All About Time-Sharing and Remote Computing Services

▷ The total number of user responses (697) was used as the basis for calculating the above percentages. Obviously, many users reported multiple applications. The results make it clear that remote computing services are now being used extensively for mainstream data processing applications in addition to the traditional engineering/scientific calculations.

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

	User Responses	
	Number	Percent
Terminal characteristics:		
Interactive	567	81
Character printer	429	62
CRT	263	38
Batch	259	37
Line printer	204	29
Programmable	116	17

Again, the total number of user responses (697) was used as the base for calculating percentages. While the overall numbers may be a little low because a few users did not answer this question, the pattern is quite clear. "Everbody" uses interactive terminals, many of which are CRT units. Printers are clearly required by the vast majority of users, and many users employ high-performance batch terminals and line printers. Programmable terminals have not yet made as much impact as they undoubtedly will in the future.

While on the subject of terminals, we naturally asked the traditional question about how many were being used. The results showed two distinct groups of users: those with a lot of terminals and those with just one or only a few terminals. Using the arbitrary dividing line of 25 between the two groups (based on a perusal of the answers given), the results are summarized below:

Number of terminals used by:	
High-volume terminal users:	
Total number of responses:	58
Total number of terminals reported:	6534
Average number of terminals per response:	113
Low-volume terminal users:	
Total number of responses:	546
Total number of terminals reported:	2244
Average number of terminals per response:	4.1

The above numbers do not include one user who reported a total of 7100 terminals; this response was excluded because it would have greatly distorted the averages.

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

### User Responses

	Number	Percent
Access method:		
Dial-up (DDD)	604	87
Leased voice-grade line	102	15
DDS (AT&T digital service)	20	3
Packet switched service	16	2
Other	26	4

The percentages are based on the total number of responses (697).

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

	User Responses	
	Number	Percent
Total remote computing vendor bill:		
Under \$500/mo.	160	24
Between \$500 and \$2,000/mo.	233	34
Between \$2,000 and \$5,000/mo.	95	14
Over \$5,000/mo.	188	28
Total number of user responses	676	100
Communications cost:		
Under \$500/mo.	299	48
Between \$500 and \$2,000/mo.	94	15
Between \$2,000 and \$5,000/mo.	27	4
Over \$5,000/mo.	36	6
None	165	27
Total number of user responses	621	100
Terminal cost:		
Under \$500/mo.	347	55
Between \$500 and \$2,000/mo.	152	24
Between \$2,000 and \$5,000/mo.	52	8
Over \$5,000/mo.	55	9
None	30	5
Total number of user responses	636	100

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

The final two questions addressed the use of data bases within the remote computing environment. The first asked, "Are you using data from a vendor-maintained data base?" The second asked about user-maintained data bases in these words: "Are you maintaining data by means of a data base system? A summary of the users' responses is given below. ▷

## All About Time-Sharing and Remote Computing Services



	User Responses	
	Number	Percent
Vendor-maintained data bases:		
Yes	516	76
No	166	24
Total number of user responses	682	100
User-maintained data bases:		
No	338	50
Partially	286	43
Exclusively	44	7
Total number of user responses	668	100

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

### Selecting a Vendor

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

1. *Get all the help you can.* Remote computing is a complex, 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:
  - 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?



## All About Time-Sharing and Remote Computing Services

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

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

- To find out exactly what's involved in using each supplier's services.
- To determine the service availability, response time, and anticipated throughput that each supplier can deliver at both peak hours (usually around 10 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 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 ▷

## All About Time-Sharing and Remote Computing Services

➤ 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 102 commercially available services offered by 93 remote computing companies are presented in the accompanying comparison charts. All information in the charts was furnished or verified by the suppliers between October and December 1977; their responsiveness and cooperation with the Datapro Research staff is greatly appreciated.

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

The comparison chart entries and their significance to potential remote computing users are explained in the following paragraphs, together with additional useful guidelines for selecting the remote computing service that will most effectively meet your needs.

#### General Information

*Name of service.* The name under which a company's commercial remote computing services are marketed may or may not be the same as the corporate name. Where they differ, this entry indicates the name of the remote computing service. Some suppliers offer several different levels of service with different names and capabilities, and in these cases the chart entries differentiate between the various levels to the extent that space permits.

*Data operational.* This entry tells when each company's remote computing services first become available for regular commercial use. Most remote computing networks require lengthy shakedown periods before settling down to normal operations, so the length of time a service has been operational may serve as a reasonable indication of its reliability — as well as its financial stability. But it is also important to note that few remote computing

networks remain really stable for long periods of time; disruptions can occur at any time through addition or consolidation of computer centers, changes in systems software, communications breakdowns, etc.

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

Where a company professes to serve a large region (such as "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 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. ➤

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▷ *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.

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, Univac DCT 500 terminals, and Digital Equipment DECwriters, plus CRT display terminals such as the Hazeltine Model 1000 and 2000, the ADDS Consul series, the Beehive display line, and the Lear Siegler ADM series. In general, any Teletype-compatible terminal can be connected to any remote computing network that supports the Teletype Model 33 or 35 Teletypewriters—but it will generally not be possible to take advantage of the replacement terminal's higher speed and/or improved functional capabilities unless the remote computing company makes suitable modifications in its equipment and supporting software.

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

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

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

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

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

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

### Software

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

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

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

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

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

APL is a comparatively recent and noteworthy arrival on the remote computing language scene. Conceived in the early 1960's by Dr. Kenneth E. Iverson of IBM, APL was designed to permit clear, concise expression of computational algorithms. APL's proponents claim (with some

justification) that it is "more powerful than FORTRAN and easier to learn than BASIC." APL uses a much larger set of symbols and operators and a considerably different syntax than either FORTRAN or BASIC. Its facilities for handling vectors and arrays are especially powerful, yet simple to use. Some of the commercial implementations of APL include file-handling and formatting facilities that make them quite effective for business as well as scientific applications. The conciseness of the language, however, is a mixed blessing in that it often makes APL programs hard to read and comprehend. Moreover, most of the current implementations of APL are interpreters, which means that the efficiency of object-program execution is likely to be comparatively low.

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

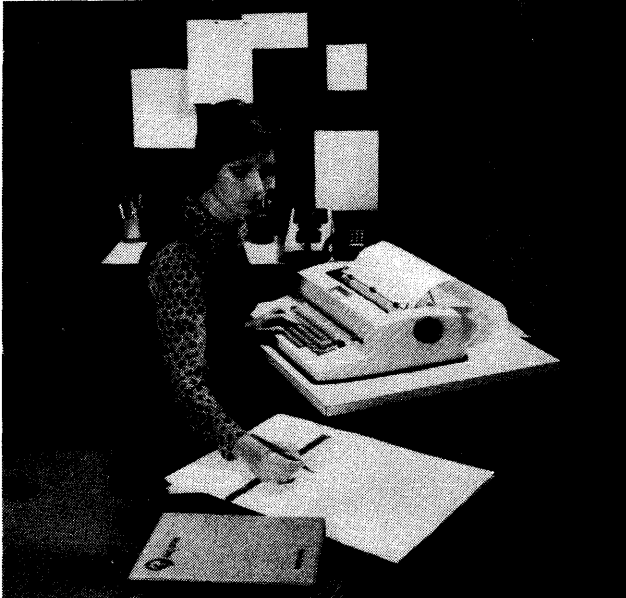
Other general-purpose languages offered in conversational implementations include ALGOL, CAL, JOVIAL, and PL/1, together with a variety of symbolic assembly languages. In addition, many of the remote computing companies offer special-purpose languages designed for specialized functions such as list processing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

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

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Word processing, the non-computational manipulation of information, is not reserved for small minicomputer-based systems. The IBM 2741 terminal shown in the photo is connected to Bowne's Word One computer in New York and is being used to modify the text of documents stored at the computer site.

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

### Comments

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

### Remote Computing Suppliers

Listed below, for your convenience in obtaining additional information, are the headquarters addresses and telephone numbers of the 93 remote computing companies whose services are described in the comparison charts.

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

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

*Aquila BST (1974) Ltd./Ltee.*, C.P. 10, Tour de la Bourse, Montreal, Quebec H4Z 1A4. Telephone (514) 866-5841. ►



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- *Boeing Computer Services, Inc.*, 177 Madison Avenue, Morristown, New Jersey 07960. Telephone (201) 540-7700.
- Bowne Time Sharing, Inc.*, 160 Water Street, New York, New York 10038. Telephone (212) 952-4400.
- CallData Systems, Inc.*, 20 Crossways Park North, Woodbury, New York 11797. Telephone (516) 575-3282.
- Chi Corporation*, 11000 Cedar Avenue, Cleveland, Ohio 44106. Telephone (216) 229-6400.
- Citibank, N.A.*, 399 Park Avenue, New York, New York 10022. Telephone (212) 559-0787.
- Community Computer Corporation*, 185 West Schoolhouse Lane, Philadelphia, Pennsylvania 19144. Telephone (215) 849-1200.
- Compudial, Inc.*, 21 Olney Avenue, Cherry Hill, New Jersey 08005. Telephone (609) 424-4700.
- Compu-Serv Network, Inc.*, (Ilex Corporate Group), 5000 Arlington Centre Boulevard, Columbus, Ohio 43220. Telephone (614) 457-8600.
- Computel Systems Limited*, 1200 St. Lawrence Boulevard, Ottawa, Ontario K1K 3B8. Telephone (613) 746-4353.
- The Computer Company, Inc.*, 1905 Westmoreland Street, Richmond, Virginia 23230. Telephone (804) 358-2171.
- Computer Innovations*, 55 E. Jackson Boulevard, Chicago, Illinois 60604. Telephone (312) 663-5930.
- Computer Network Corporation (Comnet)*, 5185 MacArthur Boulevard, Washington, D.C. 20016. Telephone (202) 244-1900.
- Computer Research Company*, 200 North Michigan Avenue, Chicago, Illinois 60601. Telephone (312) 977-7500.
- Computer Resource Services, Inc.*, 6501 N. Black, Canyon, Arizona 85015. Telephone (602) 242-9121.
- Computer Sciences Canada, Ltd. (Infonet)*, Suite 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 Usage Company*, 141 Battery Street, San Francisco, California 94086. Telephone (415) 543-6070.
- Computone Systems, Inc.*, 1 Dunwoody Park, Atlanta, Georgia 30338. Telephone (404) 393-3010.
- Comshare, Incorporated*, P.O. Box 1588, 3001 S. State Street, Ann Arbor, Michigan 48106. Telephone (313) 994-4800.
- Comshare Limited*, 230 Galaxy Boulevard, Rexdale, Ontario M9W 598. Telephone (416) 675-6363.
- Control Data Corporation*, Cybernet Services, P.O. Box 0, Minneapolis, Minnesota 55440. Telephone (612) 853-8100.
- Cybershare Ltd.*, 550 Berry Street, Winnipeg, Manitoba R3H 0R9. Telephone (204) 786-5831.
- Data Resources Inc.*, 29 Hartwell Avenue, Lexington, Massachusetts 02173. Telephone (617) 861-0165.
- Data-Tek Corporation*, 1211 Chestnut Street, Philadelphia, Pennsylvania 19107. Telephone (215) 564-4133.
- Datacrown Limited*, 650 McNicoll Avenue, Willowdale, Ontario. Telephone (416) 499-1012.
- Dataline Systems Limited*, 175 Bedford Road, Toronto, Ontario. Telephone (416) 964-9515.
- Datalogics, Inc.*, 11001 Cedar Avenue, Cleveland, Ohio 44106. Telephone (216) 229-1300.
- Dialcom, Inc.*, 1104 Spring Street, Silver Spring, Maryland 20910. Telephone (301) 588-1572.
- Financial Data Systems, Inc.*, 763 New Ballas Road South, St. Louis, Missouri 63141. Telephone (314) 567-1940.
- First Data Division/ADP, Inc.*, 40 Second Avenue, Waltham, Massachusetts 02154. Telephone (617) 890-6701.
- Fulton Data Systems*, 55 Marietta Street, 2nd Floor, Atlanta, Georgia 30302. Telephone (404) 577-3500.
- General Electric Company*, Information Services Business Division, 401 North Washington Street, Rockville, Maryland 20014. Telephone (301) 340-4000.
- Genesee Computer Center, Inc.*, 20 University Avenue, Rochester, New York 14605. Telephone (716) 232-7050.
- GTE Data Services Incorporated*, First Florida Tower, P.O. Box 1548, Tampa, Florida 33601. Telephone (813) 224-3131.
- HDR Systems, Inc.*, 8404 Indian Hills Drive, Omaha, Nebraska 68114. Telephone (402) 399-1400.
- Honeywell Information Systems, Inc.*, Honeywell Plaza, 2701 Fourth Avenue South, Minneapolis, Minnesota 55408. Telephone (612) 870-5200.
- Information Systems Design, Inc.*, 3205 Coronado Drive, Santa Clara, California 95051. Telephone (408) 249-8100.
- Interactive Data Corporation*, 486 Totten Pond Road, Waltham, Massachusetts 02154. Telephone (617) 890-1234.
- Interactive Sciences Corporation*, 60 Brooks Drive, Braintree, Massachusetts 02184. Telephone (617) 848-2660.
- Itel Corporation*, Three Corporate Park Drive, White Plains New York 10604. Telephone (914) 694-8800.
- Keydata Canada*, 885 Don Mills Road, Don Mills, Ontario N3C 3H1. Telephone (416) 443-6800.
- Keydata Corporation*, 20 William Street, Wellesley, Massachusetts 02181. Telephone (617) 237-6930.
- Litton Computer Services*, 1831 Michael Faraday Drive, Reston, Virginia 22090. Telephone (703) 471-9200.
- Management Systems Corporation*, 125 North State Street, Salt Lake City, Utah 84103. Telephone (801) 531-1122.
- Manufacturing Data Systems, Inc.*, 4251 Plymouth Road, Ann Arbor, Michigan 48104. Telephone (313) 995-6000.
- Mark/OPS*, Division of Northeastern Systems Associates, Inc., 475 Commonwealth Avenue, Boston, Massachusetts 02215. Telephone (617) 266-1930.
- Martin Marietta Data Systems*, 800 East Joppa Road, Baltimore, Maryland 21204. Telephone (301) 321-5700.
- McDonnell Douglas Automation Company*, P.O. Box 516, St. Louis, Missouri 63166. Telephone (314) 232-4640. ➤

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- *Mellonics Information Center*, Litton Systems, Inc., 6701 Variel Avenue, Canoga Park, California 91303. Telephone (213) 887-5100.
- 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.*, 500 Summer Street, Stamford, Connecticut 06901. Telephone (203) 853-7200.
- National Computer Network of Chicago, Inc.*, 1929 N. Harlem Avenue, Chicago, Illinois 60635. Telephone (312) 622-6666.
- Newfoundland and Labrador Computer Service*, P.O. Box 9308, 40 Higgins Line, St. John's, Newfoundland, A1A 2Y3. Telephone (709) 737-6700.
- NLT Computer Services Corporation*, Distributor Services Division, 1777 Walton Road, Blue Bell, Pennsylvania 19422. Telephone (215) 542-8300.
- Ohio Valley Data Control, Inc.*, P.O. Box 219, Belpre, Ohio 45714. Telephone (614) 423-9501.
- On-Line Business Systems, Inc.*, 115 Sansome Street, San Francisco, California 94104. Telephone (415) 391-9555.
- On-Line Systems, Inc.*, 115 Evergreen Heights Drive, Pittsburgh, Pennsylvania 15229. Telephone (415) 931-7600.
- Optimum Systems Incorporated*, 2801 Northwestern Parkway, Santa Clara, California 95051. Telephone (408) 987-4444.
- Pacific Applied Systems Division*, System Development Corporation, 2500 Colorado Avenue, Santa Monica, California 90406. Telephone (213) 829-9413.
- Polycorn 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.
- Profutool, Inc.*, Box 10188, Denver, Colorado 80211. Telephone (303) 433-6568.
- Programs & Analysis, Inc.*, 21 Ray Avenue, Burlington, Massachusetts 01803. Telephone (617) 272-7723.
- Proprietary Computer Systems, Inc.*, 16625 Saticoy Street, Van Nuys, California 91406. Telephone (213) 781-8221.
- Pryor Corporation*, 400 North Michigan Avenue, Chicago, Illinois 60611. Telephone (312) 644-5650.
- Quanex Management Sciences*, 2777 Franklin Road, Suite 1000, Southfield, Michigan 48076. Telephone (313) 353-7200.
- Rapidata, Inc.*, 20 New Dutch Lane, Fairfield, New Jersey 07006. Telephone (201) 227-0035.
- Remote Computing Corporation*, 1076 East Meadow Circle, Palo Alto, California 94303. Telephone (415) 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.
- The Service Bureau Company*, 500 West Putnam Avenue, Greenwich, Connecticut 06830. Telephone (203) 622-2000.
- Shared Medical Systems, Inc.*, 650 Park Avenue, King of Prussia, Pennsylvania 19406. Telephone (215) 265-7600.
- I.P. Sharp Associates Limited*, Suite 1400, 145 King Street West, Toronto, Ontario. Telephone (416) 364-5361.
- A.O. Smith Corporation*, 8793 N. Port Washington, Milwaukee, Wisconsin 53217. Telephone (414) 447-4472.
- Statistical Tabulating Corporation*, 2 North Riverside Plaza, Chicago, Illinois 60606. Telephone (312) 454-8000.
- Structural Dynamics Research Corporation*, 5729 Dragon Way, Cincinnati, Ohio 45227. Telephone (513) 272-1100.
- Sun Information Services*, 656 Swedesford Road, Building 5, Wayne, Pennsylvania 19087. Telephone (215) 293-9600.
- 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.
- 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.*, 20705 Valley Green Drive, Cupertino, California 95014. Telephone (408) 446-6581.
- United Computing Systems, Inc.*, 2525 Washington, Kansas City, Missouri 64108. Telephone (816) 221-9700.
- University Computing Company*, 8303 Elmbrook Drive, Dallas, Texas 75247. Telephone (214) 688-7100.
- 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.
- Xerox Computer Services*, 5310 Beethoven Street, Los Angeles, California 90066. Telephone (213) 390-3461. □

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COMPANY	ADP Network Service, Inc.	Applied Computer Timesharing	Aquila BST (1974) Ltd./Ltée.	Boeing Computer Services, Inc.	Boeing Computer Services, Inc.
<b>GENERAL</b>					
Name of service	Cyphernet System	Contractors Management Info. Service	Customized and Tailored	MAINSTREAM—CTS	MAINSTREAM—TSO
Date operational	July 1969	Dec. 1967	Sept. 1970	May 1970	Feb. 1973
Areas currently served	United States, England, Europe	Nationwide access through United Com- puting Systems and Profitool, Inc. networks	Canada	Continental U.S. (includ- ing Alaska) and Canada via nationwide data communications net- work; also Great Britain	Continental U.S., (includ- ing Alaska) and Canada via nationwide data communications net- work; also Great Britain
<b>EQUIPMENT</b>					
Computers	DECsystem-10 in Ann Arbor, MI (13); Waltham, MA (7); and London (4)	See United Computing Systems and Profitool, Inc. entries	Honeywell 2000; IBM 370/155; HP 2100, 21MX E; RCA 45 & 46	IBM 370/168 in McLean, VA	IBM 370/168 in McLean, VA
No. of simultaneous users	1200	100+	12	150	80
Conversational ter- minals supported	All 10, 14.8, 30, and 120 cps terminals; Tektronix and other graphic terminals	All TTY-compatible terminals at 10, 30 or 120 cps	IBM 1130, 2780, HASP Multileaving terminals	TTY 33/35 and com- patible units at 10, 30 or 20 cps; IBM 2741 and compatible units at 14.8 cps	TTY 33/35 and com- patible units at 10 or 30 cps; IBM 2741 and com- patible units at 14.8 cps
Batch terminals supported	IBM 2780, Data 100, and compatible terminals	CDC 200 UT, IBM 2780	IBM 1130, 2780, 3780, HASP Multileaving terminals	IBM 2780, 3780, 360/ 20, 1130, or any other HASP RJE terminal	IBM 2780, 3780, 360/ 20, 1130, or any other HASP RJE terminal
<b>SOFTWARE</b>					
Conversational pro- gramming languages	FORTRAN, BASIC, COBOL, Macro 10	FORTRAN, COBOL, BASIC	FORTRAN, COBOL, PL/1, and others	FORTRAN, ALGOL, COBOL, PL/1, VSAPL, Assembler, BASIC	FORTRAN, COBOL, PL/1, APL, Assembler
Batch-mode program- ming languages	FORTRAN, COBOL, Macro 10	FORTRAN, COBOL,	Extracto, Tabulo, Infoval, plus conventional languages	FORTRAN, VSAPL, COBOL, PL/1, BASIC	FORTRAN, COBOL, PL/1, APL, Assembler
Principal applications	Business & scientific	Accounting & job cost analysis for contract construction industry	Business & data base management	Business, scientific, & data base management	Business & scientific
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	None	None	—	None	None
Remote batch	None	None	As contracted	None	None
Terminal connect time:					
Interactive	\$10.00-\$15.00/hr.	\$10.00/hr.	—	\$6.00-12.00/hr.	\$8.00-14.00/hr.
Remote batch	None	\$10.00/hr.	None	\$15.00-24.00/hr.	\$16.00-40.00/hr.
Central processor time:					
Interactive	\$0.02/CRU	\$0.04/CPU second	—	\$0.32-0.71/sec.	\$2.00/CCU
Remote batch	\$0.01-0.02/CRU	\$0.04/CPU second	\$4.00/min.	\$0.32/sec.	\$2.00/CCU
Mass storage:					
Interactive	\$0.06-1.00/1000 chars./month	\$0.10/1000 chars./ month	—	\$0.0033-0.0061/ 1000 chars./day	\$0.015-0.050/track/ day
Remote batch	\$0.06-1.00/1000 chars./month	\$0.10/1000 chars./ month	As contracted	Same	Same
<b>COMMENTS</b>					
	Specializes in banking, brokerage, and govern- ment applications in addition to general ser- vices; DBMS capabilities and data bases; inter- national data communi- cations network	Specializes in construc- tion industry manage- ment information	Canadian subsidiary of System Development Corp.; uses TEXT II communications soft- ware	Interactive time-sharing service; deferred batch service at 50% savings over prime interactive	Offers remote job entry over a range of service times (10 minutes to overnight)

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	Boeing Computer Services, Inc.	Bowne Time Sharing, Inc.	Bowne Time Sharing, Inc.	Bowne Time Sharing, Inc.	CallData Systems, Inc.
of service	MAINSTREAM—EKS	COMSPEC	MAILPAC	Word/One	TS*RJE, Easy*Use, CompUtility, Telescope
date operational	Jan. 1975	Dec. 1970	Sept. 1974	Nov. 1969	Feb. 1970
areas currently served	Continental U.S., (including Alaska) and Canada via nationwide data communications network; also Great Britain	Atlanta, Boston, Conn., Chicago, Houston, L.A., New York, New Jersey, Phila., San Francisco, & Washington, DC areas	Atlanta, Boston, Conn., Chicago, Houston, L.A., New York, New Jersey, Phila., San Francisco, & Washington, DC areas	Atlanta, Boston, Conn., Chicago, Houston, L.A., New York, New Jersey, Phila., San Francisco, & Washington, DC areas	Continental U.S., Hawaii, Puerto Rico, Europe, Japan, Mexico; U.K. and Iran via satellite
EQUIPMENT Computers	Cyber 175 (2) Cyber 74(2), CDC 6600 (1)	IBM 370/155 (2) in New York City	IBM 370/155 (2) in New York City	IBM 370/155 (2) in New York City	Amdahl 470V/5 (2), Honeywell 635 (2), CDC Cyber 73/172, DECsystem-10 (3)
No. of simultaneous users	384	200	200	200	Over 1000
Conversational terminals supported	TTY-compatible units at 10, 30, or 120 cps; IBM 2741-compatible units at 14.8 cps	IBM 2741, TTY, and compatible units at 10, 14.8, 15, or 30 cps	IBM 2741, TTY, and compatible units at 10, 14.8, 15, or 30 cps	IBM 2741, TTY, and compatible units at 10, 14.8, 15, or 30 cps	All industry-standard terminals
Batch terminals supported	COPE, HASP, and CDC 200 UT	—	—	—	IBM 2770/2780/3770/3780, 360/370 Series, 1130, System/3, and compatible units
SOFTWARE					
Conversational programming languages	FORTRAN, COBOL, BASIC, APL, Compass, Simscript, SPSS, System 2000	COMSPEC; specification preparation	MAILPAC I & II letters, lists, & labels system	Word/One (text editing)	FORTRAN, BASIC, COBOL, APL, SNOBOL, BRUIN, EDIT, RPG, PL/1
Batch-mode programming languages	FORTRAN, COBOL, APL, Compass, Simscript, SPSS	—	—	—	FORTRAN, COBOL, PL/1, RPG, WYLBUR
Principal applications	Engineering, scientific, & data base management	Construction specification preparation	List maintenance, letters, & labels	Text editing & typesetting	Business & scientific
CHARGES					
Min. monthly charge:					
Interactive	None	\$150	\$150	\$150 (after 3 mo.)	None
Remote batch	None	—	—	—	None
Terminal connect time					
Interactive	\$10.75-15.00/hr.	\$2.95-5.30/hr.	\$2.95-5.30/hr.	\$2.95-5.30/hr.	\$8.00-14.00/hr.
Remote batch	\$11.75-19.50/hr.	—	—	—	None
Central processor time					
Interactive	\$2.00/CCU	\$0.01/Proc. Unit	\$0.01/Proc. Unit	\$0.01/Proc. Unit	Varies with service
Remote batch	\$0.60-1.25/CCU	—	—	—	\$6.50-13.00/SRU (IBM)
Mass storage:					
Interactive	\$0.0016-0.00595/640 char./day	\$0.28/1550 chars./month	\$0.28/1550 chars./month	\$0.28/1550 chars./month	Varies with service
Remote batch	\$0.0016-0.00595/640 char./day	—	—	—	Varies with service
COMMENTS	Offers both interactive time-sharing and remote job entry to multiple mainframes, with access to the same files in either mode	Several master and automated specification text data bases are available	System can be used to send Western Union Mailgrams	Specializes in text editing, typesetting, information retrieval, and address file maintenance; volume discounts available	User has choice of 4 different computers and services; COM service available; formerly under Computility Division and Grumman Data Systems

All About Time-Sharing and  
Remote Computing Services

COMPANY	Chi Corporation	Citibank, N.A.	Community Computer Corporation	Compudial, Inc.	Compu-Serv Network, Inc.
<b>GENERAL</b>					
Name of service	Chi Time-Sharing, Chi Remote Batch	Interactive Computer Center	—	Compudial	—
Date operational	May 1968	Jan. 1977	Jan. 1969	1967	May 1970
Areas currently served	Ohio, Pennsylvania, Michigan, New York	Continental U.S. and Canada; limited access overseas	Delaware Valley	Mid-Atlantic States	Local access in over 30 U.S. cities, plus access via TYMNET packet network
<b>EQUIPMENT</b>					
Computers	Univac 1100/11, Univac 1108, & Honeywell 430 (2) in Cleveland	DECsystem-10(2) and DECsystem-20(1)	HP 2116B(3) in Philadelphia	NCR 201	DEC PDP-10(12) in Columbus, OH
No. of simultaneous users	60 on 430's; 32 on 1108; 16 on 1100/11	180	48	250	650
Conversational terminals supported	TTY 33/35/38, Data-point 3300, GE TermiNet 300, AJ 630, DCT 500, etc., at 10, 30, or 120 cps	All ASCII-supported terminals at 10, 30, and 120 cps	TTY and other ASCII-coded terminals at 10 or 30 cps	GE TermiNet 300 (split platen) at 10, 30, and 120 cps; Centronics 301; DECwriter & CRT	All ASCII at 10, 15, and 30 cps. GE TermiNet at 120 cps, IBM 2741 Corresp., CALL-360 & BCD
Batch terminals supported	Univac 1004, 9200; 9200; IBM 2780, 1130, 360/20; Data 100, etc.	—	—	—	—
<b>SOFTWARE</b>					
Conversational programming languages	BASIC, FORTRAN, COBOL, EDIT, SAM	FORTRAN, COBOL, BASIC, APL, Assembler	BASIC	NEAT 3, COBOL	FORTRAN, BASIC, COBOL, APL, MACRO-10, others
Batch-mode programming languages	FORTRAN, BASIC, ALGOL, COBOL, RPG, etc.	FORTRAN, COBOL, BASIC, APL, Assembler	FORTRAN, ALGOL	—	FORTRAN, BASIC, COBOL, Macro-10, others
Principal applications	Business, scientific, & phototypesetting	Business & financial	Business & scientific	Business	Business & scientific
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	None	—	None	\$300/month	\$100/period
Remote batch	None	—	—	—	—
Terminal connect time:					
Interactive	\$7.00/hr.	\$6.50-9.50/4.00/hr.	\$10.00	None	\$10.00-30.00/hr.
Remote batch	\$7.00-10.00/hr.	\$2.50/NC/hr.	—	None	No charge
Central processor time:					
Interactive	\$4.20/min.	\$0.01/0.003/CRU	None	See Comments	\$0.02/SRU
Remote batch	\$18.00/min.	\$0.01/0.003/CRU	—	See Comments	\$0.02-0.012/SRU
Mass storage:					
Interactive	\$0.35/1000 chars./month	\$0.02/day/disk page	\$0.20/160 chars./month	See Comments	\$0.055/3200 char./day
Remote batch	\$0.20/2772 chars./month	\$0.02/day/disk page	—	—	\$0.055/3200 char./day
<b>COMMENTS</b>					
	Volume discounts; lower rates for non-prime time	Pricing for terminal connect and CPU time varies according to non-prime and prime time usage; prime time is 8 AM to 6 PM EST Monday through Friday; one disk page equals 2560 characters, or any part thereof, on a per-file basis	Storage beyond 80,000 characters is priced at \$0.05/160 chars./month	Costs are on a per-transaction basis	High-speed plotting available; volume and commitment discounts available; CompuStat and TELSTAT data bases offered

## All About Time-Sharing and Remote Computing Services

COMPANY	Computel Systems Limited	The Computer Company	Computer Innovations	Computer Network Corp. (Comnet)	Computer Research Company
<b>GENERAL</b>					
Name of service	Time Shared Processing	Action/APL	Advanced APL, Enhanced ATS	Alpha	Open Job Shop
Date operational	Jan. 1968	Oct. 1969	June 1969	Dec. 1967	1967
Areas currently served	Canada from offices in Victoria, Vancouver, Edmonton, Calgary, Winnipeg, Ottawa, Toronto, Montreal, Quebec, & Halifax; also Miami	U.S., Canada, France, Belgium & Switzerland	Illinois, Indiana, Michigan, Minnesota, Wisconsin; 8 cities in the East; 9 cities in the West	Continental U.S. via national network access; local dial-up access in the New York, Washington, & Pittsburgh areas	Nationwide
<b>EQUIPMENT</b>					
Computers	IBM 370/168(2), IBM 360/65, Univac 1108 & HP 3000(2) in Ottawa; B 4700(2) in Miami	IBM 370/155	IBM 360/65(2) in Van Nuys, CA	IBM 360/65(3), IBM 370/158(1), Intel AS 5 (1), IBM 370/168(1), & PDP 11/70(2)	IBM 370/155, IBM 370/158, & IBM 370/165(2)
No. of simultaneous users	200, excluding B 4700's	140	120	150	50 average
Conversational terminals supported	IBM 2741 and equivalents and ASCII terminals	All 10, 15, and 30 cps; ASCII, BCD, and Correspondence units	Selectric/ASCII-type terminals at 10, 15, or 30 cps	IBM 2741, TTY 33/35, and compatible units at 10 to 120 cps	IBM 3275, 2741
Batch terminals supported	All IBM batch terminals and equivalents; Univac 1004 and equivalents	IBM 2780 and compatible units	IBM 2780, etc.	IBM 2780, 1130, 360/20, and compatible units at 2000 to 9600 bps	IBM 2770, 2780, 3780, 360/20, 360/30, 360/40, System/3
<b>SOFTWARE</b>					
Conversational programming languages	TSO, ROSCOE, APL, Univac Demand & CTS	APL	APL	All OS/360 languages	FORTRAN, COBOL, BASIC, APL, Assembler (F, G)
Batch-mode programming languages	FORTRAN, COBOL, PL/1, ALGOL, RPG, Assembler, Mark IV	SPSS service through APL—interactive/RJE	All OS/360 languages	All OS/360 languages	FORTRAN, COBOL, PL/1, RPG, Assembler (F, G)
Principal applications	Business & scientific	Business & scientific	Business, scientific, & text editing	Business, scientific, & engineering	Business, scientific, & data base (IMS batch)
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	\$100	\$100	None	None	None
Remote batch	\$100	—	—	None	None
Terminal connect time:					
Interactive	\$5.00-10.00/hr.	\$13.44-17.00	\$12.50-15.50/hr.	\$12/hr. (10-120 cps)	\$7.50/hr.
Remote batch	No charge	—	—	\$0.50/1000 cards	\$7.50/hr.
Central processor time:					
Interactive	See Comments	—	\$0.833/CRU	\$0.50/1000 lines	\$0.15/CPU sec.
Remote batch	See Comments	\$257 min. to \$1192 max./hr.	—	\$0.20/CUU	\$0.10/CPU sec.
Mass storage:					
Interactive	\$0.03/track/day	\$10.00/million bytes/day	\$12.50/million bytes/day	\$2.00/13,030 chars./month	\$1.00-1.50/cylinder/week
Remote batch	\$0.03/track/day	—	—	\$2.00/13,030 chars./month	\$1.00-1.50/cylinder/week
<b>COMMENTS</b>	Prices vary with computer and software system used; volume and commitment discounts are available; MVS/JES3, ADABAS, S2000, EASYTRIEVE, DARTS (inventory control), CAR-MIS (project management) software available	Offers shared files and data base applications, specialized data bases, & RJE	Affiliated with Proprietary Computer Systems, Inc.; offers high-speed RJE and RJE via APL & ATS	Offers nationwide "OS-compatible time-sharing services" and remote job entry over a wide range of service times, terminal speeds, and charges	Emulates DOS; also offers Mark IV, TSO, ATS, CICS, Parvalet, and HASP/RJE

## All About Time-Sharing and Remote Computing Services

COMPANY	Computer Resource Services, Inc.	Computer Sciences Canada, Ltd.	Computer Sciences Corporation	Computer Sharing Services, Inc.	Computer Usage Company
<b>GENERAL</b>					
Name of service	Response	Infonet	Infonet/CSTS	DTSS	WYLBUR/APL/HASP RJE
Date operational	1969	July 1967	Jan. 1970	Nov. 1967	Oct. 1975
Areas currently served	Phoenix, Tucson, Las Vegas areas	Calgary, Edmonton, Montreal, Ottawa, Quebec, Regina, Toronto, Vancouver & Winnipeg; London	Local access in 25 metropolitan areas throughout continental U.S.; also Europe	Local access in 130 cities throughout continental U.S.	West Coast plus inbound WATS and TYMNET
<b>EQUIPMENT</b>					
Computers	HP 2000 (5) in Phoenix, AZ	Univac 1108 (2); 1 in Toronto and 1 in Calgary	Univac 1108 (11) in El Segundo, CA, Oak Brook, IL, and Beltsville, MD; IBM 370/168 in Dallas, TX	Honeywell 6617 in Denver	Amdahl 470 V/6
No. of simultaneous users	32	180 total	1320 total	200	150
Conversational terminals supported	Any ASCII or Correspondence Code terminal at 10 to 30 cps	Most 300-1200 bps terminals including Tektronix, Zeta, Calcomp, and Telex	TTY 33/35 and compatible units at 10, 15, 30, or 120 cps; 2741 or equivalent; Telex	TTY 33/35, IBM 2741, and compatible units at 10, 14.8, 15, 30, or 120 cps	ASCII 10-30 cps or Correspondence terminal
Batch terminals supported	—	Any IBM 2780/3780; Univac 9200, 1004, DCT 2000; Honeywell 2000	IBM 2780, 3780, & 1130; Data 100; DEC PDP-11; Sycor; Qantel; etc.	IBM 2780 and compatible units	Any HASP workstations
<b>SOFTWARE</b>					
Conversational programming languages	BASIC	FORTRAN, BASIC, COBOL, Assembler, SNOBOL	FORTRAN, BASIC, COBOL, Assembler	FORTRAN, BASIC, COBOL, ALGOL, APL, LISP, SNOBOL, QED, GMAP	APL, WYLBUR
Batch-mode programming languages	—	FORTRAN, BASIC, COBOL, Assembler, SNOBOL	FORTRAN, BASIC, COBOL, Assembler	All conversational languages can be used in background or batch mode	COBOL, FORTRAN, PL/1
Principal applications	Business & scientific	Data base management & financial management	Business & scientific	Business & scientific	Business & scientific
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	\$50	\$50	\$150	\$100	\$100
Remote batch	—	\$50	\$150	\$100	\$100
Terminal connect time:					
Interactive	\$10-15/hr.	\$6.50-25.00/hr.	\$5.50-16.00/hr.	\$3.00-20.00/hr.	\$3.50-10.00/hr.
Remote batch	—	None	\$0.17/100 records	\$3.00-20.00/hr.	\$7.50/hr.
Central processor time:					
Interactive	None	\$0.15-0.21/SRU	\$0.19-0.31/SRU	\$22.5/Unit	\$1.07-2.00/CPU sec.
Remote batch	—	\$0.05-0.17/SRU	\$0.06-0.319/SRU	\$3.218/Unit	\$1.07/CPU sec.
Mass storage:					
Interactive	\$0.060/1024 chars./month	\$0.035/page/day	\$0.03/2048 chars./day (on-line)	\$1.50-1.75/4096 chars./month	\$1.05/track/month
Remote batch	—	\$5.40/month	\$0.03/2048 chars./day (on-line)	\$1.50-1.75/16,384 chars./month	\$1.05/track/month
<b>COMMENTS</b>	\$100 initiation fee	Matrix pricing enables user to reduce costs by volume discounts for high usage; affiliated with Computer Sciences Corporation	CPU charges for remote batch use vary with priority; lower rates for non-prime time use; subscription storage and high-volume discounts; pricing options available	Offers numerous pricing options; first commercial installation of Dartmouth Time-Sharing System; also offers voice response (Votrax) time-sharing; offers Landsat Exploration Plotting	Offers IDMS, SPSS, and MARK IV packages

## All About Time-Sharing and Remote Computing Services

COMPANY	Computone Systems, Inc.	Comshare, Incorporated	Comshare, Limited	Control Data Corporation	Cybershare Limited
<b>GENERAL</b>					
Name of service	—	Commander I & Commander II	Commander I, Commander II, CPV	Cybernet Services	NOS
Date operational	1966	1967	1969	1966	July 1972
Areas currently served	Entire U.S. via national INWATS service, plus network of Great Britain, Canada, & New Zealand	Continental U.S.; 6 cities in Canada; 6 in the U.K., The Hague; Brussels, Osaka, & Tokyo	Dataroute dial service to Montreal, Ottawa, Hamilton,, London, & Vancouver; local dial-up service in Toronto; access via Comshare, Inc. & Comshare UK networks	Entire U.S., Canada, Mexico, S. Africa, Europe; Brazil, & Australia	Alberta, Manitoba, Ontario, Saskatchewan, & British Columbia
<b>EQUIPMENT</b>					
Computers	IBM 360/65 in Atlanta	Xerox 940 (10) in Ann Arbor, MI and Sigma 9 (5) in London, Tokyo, Toronto	Xerox Sigma 9 (2) Toronto (dual configurations)	32 large-scale Control Data computers in 17 worldwide centers	CDC Cyber 171 and CDC 2550 in Winnipeg
No. of simultaneous users	48	42 per 940, 64 per Sigma 9	Over 200	Approximately 1500 total	512 time-sharing, 46 remote batch
Conversational terminals supported	TTY, TI, Memorex 120 cps; Keypact portable insurance terminal (Computone); DECwriter; Execuport	TTY 33/35 and any compatible unit at 10, 30, or 120 cps	Any ASCII terminal up to 120 cps; also graphic terminals	Any ASCII terminal at 10 or 30 cps; Correspondence terminals at 14 cps	TTY 33/35 and compatible units
Batch terminals supported	—	IBM 2780 & 3780, Remcom 2780 & 4780, Data 100, Mohawk 2400, etc.	IBM 2780, IBM HASP, Data 100	Various RJE terminals at 2000 to 40,800 bps; supports multileaving, CDC 200, and COPE protocols	CDC 200, 731 & 734; IBM 360/20, Comterm, Mohawk, Remcom, Data 100
<b>SOFTWARE</b>					
Conversational programming languages	—	FORTRAN, COBOL, BASIC, PASTEL	FORTRAN, BASIC, COBOL, APL, Meta-symbol	FORTRAN, BASIC, COBOL, APL, COMPASS, SIMULA, SIMSCRIPT	FORTRAN, BASIC, APL, Text Editor
Batch-mode programming languages	—	FORTRAN, COBOL, PASTEL	FORTRAN, COBOL, Metasymbol	FORTRAN, BASIC, COBOL, ALGOL, COMPASS, SIMULA, SIMSCRIPT	FORTRAN, COBOL, COMPASS, Spectre
Principal applications	See Comments	Business & scientific	Business & scientific	Business, engineering, & scientific	Business, engineering, & scientific
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	See Comments	None	None	\$100	None
Remote batch	—	None	None	None	None
Terminal connect time:					
Interactive	—	\$7.20-19.80/hr.	\$8.00-12.00/hr.	\$9.00-28.00/hr.	\$8/hr.
Remote batch	—	\$8.40-24.00/hr.	\$8.00-12.00/hr.	\$10.00-18.00/hr.	\$12.00-15.00/hr.
Central processor time:					
Interactive	—	\$0.03-0.07/CCU	\$0.08-0.12/CCU	\$0.35/sec.	\$0.22/SRU
Remote batch	—	\$0.03-0.07/CCU	\$0.08-0.12/CCU	\$0.18-0.45/sec.	\$0.10-0.22/SRU
Mass storage:					
Interactive	—	\$0.30/2048 bytes/month	\$0.20-0.60/2048 bytes/month	\$0.016/1280 chars./day	\$0.30/1280 chars./month
Remote batch	—	\$0.30/2048 bytes/month	\$0.20-0.60/2048 bytes/month	\$0.00375-0.016/1280 chars./day	\$0.30/1280 chars./month
<b>COMMENTS</b>	Dedicated system for life insurance sales, feed and meat formulation, and turnkey market information; prices on request	Offers both interactive and remote batch services through TELEGRID communications network; specializes in accounting, data base management, human resource mgmt., telephone systems mgmt., mechanical and structural design	Offers service in all major Canadian cities via Dateline 2 and Dataroute; an affiliate of Comshare, Inc. with international data communications to U.S. and U.K.	Also see The Service Bureau Company, a division of Control Data Corporation	Formerly called Phoenix Data Limited



## All About Time-Sharing and Remote Computing Services

COMPANY	Data Resources Inc.	Data-Tek Corporation	Datacrown Limited	Dataline Systems Limited	Datalogics, Inc.
<b>GENERAL</b>					
Name of service	—	—	Shared Processing	Dataline Time Sharing Network	DL/OS
Date operational	1969	Dec. 1971	June 1972	1969	1969
Areas currently served	All major U.S. cities, Alaska, Montreal, Ottawa, Toronto, & Central Europe, all via local-call access	Mid-Atlantic States	All of Canada and U.S.	All of Canada (Vancouver to Halifax via Dataroute Dataline II services) plus parts of U.S.	Ohio, Illinois, New York, & Pennsylvania
<b>EQUIPMENT</b>					
Computers	Burroughs B 7800 and B 7820 (duplex systems) in Lexington, MA	HP 3000 Series II	IBM 370/168 (3) in Willowdale, Ont.	DECsystem-10/70 (4) in Toronto; DECsystem-10/90 (1)	Xerox Sigma 7 in Cleveland
No. of simultaneous users	Over 280 total	32	Over 250	275	Approx. 100
Conversational terminals supported	TTY-compatible units at speeds to 120 cps; IBM 2741, AJ 841, and Computer Devices at 14.8 cps	ASCII 10, 15, 30, or 120 cps terminals	IBM 2741, 3270; Vucom II; TTY and compatible units	All ASCII terminals at 10 or 30 cps; IBM 2741; Diablo; graphics (e.g., Tektronix)	TTY and other ASCII terminals at 10, 30, or 120 cps; IBM 2741
Batch terminals supported	IBM 2780, Burroughs DC 1100, or equivalent units	IBM 2780/3780, DCT 2000, COPE 1200, CDC 200, etc.	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
<b>SOFTWARE</b>					
Conversational programming languages	FORTRAN, BASIC, COBOL, APL, PL/1, EPS, AID	FORTRAN, BASIC, COBOL, SPL, RPG II	TSO Command Language, FORTRAN, COBOL, Assembler	FORTRAN, BASIC, COBOL, APL, AID, LISP, SNOBOL	FORTRAN, BASIC, COBOL, APL, Text, Proforma
Batch-mode programming languages	FORTRAN, BASIC, COBOL, PL/1, EPS, AID	FORTRAN, BASIC, COBOL, APL, SNOBOL, Metasymbol	FORTRAN, COBOL, PL/1, RPG, Assembler	FORTRAN, COBOL, LISP, SNOBOL	FORTRAN, APL, BASIC, COBOL, RPG, Metasymbol, Manage
Principal applications	Business & scientific	Business, health, & scientific	Business, scientific, & government	Business & scientific	Business & scientific
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	\$400	\$10	None	\$10	None
Remote batch	\$400	\$10	None	None	None
Terminal connect time:					
Interactive	\$15.00/hr.	\$9.00/hr.	\$3.00-6.00/hr.	\$13.00/hr.	\$10.00-18.00/hr.
Remote batch	\$25.00/hr.	\$9.00/hr.	\$9.00-12.00/hr.	None	Variable
Central processor time:					
Interactive	\$0.05-0.15/CRU	\$0.08/sec.	\$10.00/min.	See Comments	\$0.08/CRU
Remote batch	\$0.05-0.15/CRU	\$0.08/sec.	\$25.00/min.	See Comments	\$0.04-0.16/CRU
Mass storage:					
Interactive	\$0.055-0.83/K bytes/month	\$0.50/1000 chars./month	\$0.016/track/day (IBM 3330)	\$.030/640 chars. (or less)/month	\$0.80/2048 chars./month
Remote batch	\$0.055-0.83/K bytes/month	\$0.50/1000 chars./month	\$0.016/track/day (IBM 3330)	\$0.30/640 chars./month	\$0.80/2048 chars./month
<b>COMMENTS</b>					
	Specializes in economic planning and analysis; offers Economic Information System at charges of \$4,000 to \$80,000 per year	Offers municipal bonds program; port rates available; offers special programs related to health care: HMO organizations and Methadone treatment centers; turnkey systems	Offers discounts for volume usage and non-prime time; dedicated high-speed access ports available; DB/DC services and COM available	CPU charges vary with amount of main storage used; rates are much lower during non-prime hours; FPS and RAFTS available (financial planning system and remote access financial transaction system)	"Virtual port" and bulk usage contracts available; offers discounts for volume usage and non-prime time, "private funds" also available; Municipality Administration package offered

## All About Time-Sharing and Remote Computing Services

COMPANY	Diacom, Inc.	Financial Data Systems, Inc.	First Data Division/ADP, Inc.	Fulton Data Systems
<b>GENERAL</b>				
Name of service	Computer Timesharing	FOS Online Thrift System	—	—
Date operational	1970	1970	1970	1966
Areas currently served	Local dial-up service in over 20 cities across the U.S. via nationwide network	Continental U.S.	North America and Europe via multiplexers, WATS, & TYMNET	Major cities in Southeast via multiplexers; WATS service in most of Southeast; other major cities via Telenet
<b>EQUIPMENT</b>				
Computers	Honeywell 1648A (8) and Prime 400 (1) in Silver Spring, MD	IBM 360/50 (1) and 360/65 (3)	DECsystem-10 (8)	Honeywell 6080
No. of simultaneous users	562	1100	Over 250	125
Conversational terminals supported	TTY and other ASCII terminals at 10 or 30 cps; IBM 2741 and compatible units at 14.8 cps	IBM 1050, 1060, 2740, 2980; Burroughs TC 700, TU 700; BR 2001; TRW; NCR 270; Olivetti	Most American-made interactive terminals	TTY and IBM 2741-compatible units; TTY Model 40, Hazeltine 2000, and GE TermiNet 1200
Batch terminals supported	—	—	DN80, IBM 2780, Data 100, and others	Honeywell G-115 and IBM 2741-compatible units
<b>SOFTWARE</b>				
Conversational programming languages	FORTRAN, BASIC, COBOL, TEACH, SOLVE, DAP, Text Editor	—	FORTRAN, BASIC, COBOL, APL, MAXBASIC, LISP, SNOBOL, ALGOL	FORTRAN, BASIC
Batch-mode programming languages	—	—	FORTRAN, BASIC, COBOL, APL, MAXBASIC, SNOBOL, ALGOL	FORTRAN, COBOL, ALGOL, ASSEMBLY
Principal applications	Business, scientific, & correspondence control	Online savings & loan accounting for the thrift industry	Business, scientific, engineering, & data base management	Business & scientific
<b>CHARGES</b>				
Min. monthly charge:		See Comments		
Interactive	\$25	—	None	None
Remote batch	—	—	None	None
Terminal connect time:				
Interactive	\$6.00/hr.	—	\$5.00-7.50/hr.	\$9.50-23.75/hr.
Remote batch	—	—	\$20.00-35.00/hr.	\$20.00/hr.
Central processor time:				
Interactive	None	—	\$0.0033-0.011/CRU	\$0.04/unit
Remote batch	—	—	\$0.0033-0.011/CRU	\$8.33/min.
Mass storage:				
Interactive	\$0.52/512 chars./month	—	\$0.10/1000 chars./day	\$0.60/1280 chars./month
Remote batch	—	—	\$0.10/1000 chars./day	\$0.60/1280 chars./month
<b>COMMENTS</b>	Special rates available for large data bases and dedicated ports; offers business applications, correspondence, tracking & processing, and common business applications	Serves savings & loan associations and mutual savings banks; monthly charges are based on number of accounts on file		CPU charges vary with time of day, program size, and priority; deferred processing and COM services available

## All About Time-Sharing and Remote Computing Services

COMPANY	General Electric Company	Genesee Computer Center, Inc.	GTE Data Services Incorporated	HDR Systems, Inc.	Honeywell Information Systems, Inc.
<b>GENERAL</b>					
Name of service	Mark III Service	Genessee Services	GTEDS Time-Sharing Service	HDR Systems NOS	Datanetwork
Date operational	1965	Aug. 1968	Nov. 1971	Oct. 1972	July 1972
Areas currently served	Local-call service to more than 500 cities in North America, and (via satellite) Western Europe, Australia, and Japan	Continental U.S., France, Germany, Sweden, and Toronto via multiplexers and INWATS service	Continental U.S. plus Hawaii	Omaha and surrounding areas	Entire U.S.; local service in most large cities plus INWATS service
<b>EQUIPMENT</b>					
Computers	Over 100 Honeywell 6088 and IBM 370/158 computers in 3 super-centers in Ohio, Maryland, & Europe	CDC 6600, 7600, and Cyber 72 belonging to Control Data (Cybernet), Multiple Access Ltd., & UCC	CDC 6500, 6600, and Cyber 73-28 (2); dual Honeywell 66/60	CDC 6400 in Omaha, NE	Honeywell 6080 (3) in Minneapolis
No. of simultaneous users	200 per computer	Not specified	1000 total	150	256
Conversational terminals supported	ASCII, EBCDIC, or Correspondence Code terminals at 10, 14.8, 15, 30, and 120 cps; Touch-Tone	TTY and all compatible units at 10 or 30 cps & 120 cps	TTY & compatible terminals at 10, 15, 30 & 120 cps	TTY 33/35, CDC 713, Execuport, etc.; IBM 2741	IBM 2741 at 15 cps; any 10, 15, or 30 cps terminal using ASCII code with even parity
Batch terminals supported	IBM 2780, 3780, Data 100, MDS 2400, RCP 702, Honeywell G-115, etc., at 2000-4800 bps	CDC 200, DEC PDP-11, IBM 1130, Univac 9200/9300, Data 100, etc.	CDC 200 & compatible units at 2000 to 9600 bps	CDC 200 & 731, Data 100, M&M 500, Mohawk 2400, etc.	IBM 2780; Honeywell 115, 702, 300; and emulators
<b>SOFTWARE</b>					
Conversational programming languages	FORTRAN, BASIC, ALGOL, editors, data management, financial management	FORTRAN, COBOL, Compass, BASIC	FORTRAN, BASIC, APL, Text Editor	FORTRAN, APL, BASIC, COBOL, Text Editor	FORTRAN, COBOL, BASIC, APL
Batch-mode programming languages	FORTRAN, COBOL, PL/1, assembly, simulators	FORTRAN, COBOL, Compass	FORTRAN, BASIC, COBOL, Simscrip, Compass	FORTRAN, COBOL, Compass	FORTRAN, COBOL, PL/1
Principal applications	Business & scientific	Engineering & scientific	Business, scientific, engineering, financial modeling	Business & scientific	Business & scientific
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	\$100/catalog	None	\$100	\$100	\$200
Remote batch	\$100/catalog	None	\$100	\$100	\$200
Terminal connect time:					
Interactive	\$6-35 (120 cps)/hr.	\$9.00/hr.	\$10.50-22.00/hr.	\$5.00/hr. (10-30 cps)	\$12.00/hr.
Remote batch	\$12.50/hr.	\$12.00/hr.	\$10.50-30.00/hr.	\$10.00/hr. (2000 bps)	\$33.00/hr.
Central processor time:					
Interactive	\$0.048-0.12/CRU	\$0.21-0.35/sec.	\$1.50-30.00/min.	\$1.00/SRU	\$0.10/TSU
Remote batch	\$176-1,200/CRU	\$0.18-0.45/sec.	\$9.60-33.60/min.	\$1.00/SRU	\$0.10/RBU
Mass storage:					
Interactive	\$0.11-0.80/320 36-bit words/month	\$0.01/1000 chars./day	\$0.40-0.50/1280 chars./month	\$0.20/640 chars./month	\$0.088-0.50/320 36-bit words/month
Remote batch	\$0.10/320 36-bit words/month	\$0.01/1000 chars./day	\$0.40-0.50/1280 chars./month	\$0.20/640 chars./month	\$0.088-0.50/320 words/month
<b>COMMENTS</b>					
	CPU costs depend on priority, time of day, and resources used; continuous access pricing, special data entry mode, custom usage plan discounts, COM service, and data management facilities are available	Provides specialized technical services, and resells Control Data, Multiple Access, and University Computing Company computer services, at the supplier's rates	Offers general time-sharing services plus large library of applications 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

## All About Time-Sharing and Remote Computing Services

COMPANY	Information Systems Design	Interactive Data Corporation	Interactive Sciences Corporation	Itel Corporation
<b>GENERAL</b>				
Name of service	ISD	CS/ES	Computing Service	Commercial Services Division
Date operational	May 1968	1968	May 1968	1968
Areas currently served	Entire U.S. via INWATS for batch, Tymnet for interactive service	All of continental U.S. except Alaska; London, England	New England States; multiplexers in Detroit, Schenectady, & Washington, D.C.; nationally via Telenet	Nationwide
<b>EQUIPMENT</b>				
Computers	Univac 1108 (5) in Santa Clara, CA	IBM 370/168 (2) in Waltham, MA	DECsystem-10 (5) in Braintree, MA	IBM 370/155 (2) in White Plains, NY
No. of simultaneous users	160	150	72 per system	Approx. 680
Conversational terminals supported	IBM 2741, TTY, compatible ASCII units at 10, 30, or 120 cps; Tektronix graphics terminals	10, 30 & 120 cps EBCD (IBM 2741 compatible)	Nearly all ASCII units to 300 bps; IBM & other BCD, Selectric, & Correspondence units via Telenet only	DECwriter LA36 at 15 and 30 cps; banking uses Bunker Ramo 2200 Series
Batch terminals supported	Cope Series, Data 100, IBM 1130 & 2780, M&M, MDS, Univac 1004, HASP multi-leaving, etc.	IBM 2780/3780/3741 and compatible units at 2000, 2400, & 4800 bps, EBCDIC	IBM 2780, 2968, & 2701/3704; MDS 2400 & 6403; Univac 1004 & DCT 2000; etc.	—
<b>SOFTWARE</b>				
Conversational programming languages	FORTRAN, BASIC, COBOL, ALGOL, APL, Editor	FORTRAN, BASIC, COBOL, PL/1, Assembler, XSIM, XDMS	FORTRAN, BASIC, COBOL, Macro, LISP, AID	Itel language
Batch-mode programming languages	FORTRAN, BASIC, COBOL, ALGOL, APL, Assembler, Editor	FORTRAN, BASIC, COBOL, PL/1, Assembler, XSIM	FORTRAN, BASIC, RPG	—
Principal applications	Engineering & scientific	Business, scientific, & data base management	Business & scientific	Business
<b>CHARGES</b>				
Min. monthly charge:				See Comments
Interactive	\$50	None	None	—
Remote batch	\$50	None	None	—
Terminal connect time:				—
Interactive	\$5/9/hr. (30/120 cps)	\$10-20/hr. (10-120 cps)	\$6.00-9.00/hr.	—
Remote batch	\$10/25/hr. (2/4.8K bps)	None	None	—
Central processor time:				—
Interactive	\$0.135-0.18/sec.	\$0.16/charge unit	\$0.01/CRU (prime time)	—
Remote batch	\$0.135-0.18/sec.	\$0.08/charge unit	\$1.33/min.	—
Mass storage:				—
Interactive	\$0.05/10,752 chars./day	\$0.08-0.16/1000 chars./month	\$0.01/640 chars./day	—
Remote batch	\$0.05/10,752 chars./day	\$0.08-0.16/1000 chars./month	—	—
<b>COMMENTS</b>	Applications include graphics, structural engineering, electronic engineering, nuclear engineering, simulation, data base management, etc.	Offers portfolio management, banking, insurance, finance, brokerage, math-statistics, plotter-graphics, modeling, econometric data, management science, data base management, text processing	Offers financial modeling programs, accounting systems, statistical analysis, manufacturing systems, and data base management; lower rates for non-prime CPU time	Charges are based on transaction volume; also offers legal fee billing

## All About Time-Sharing and Remote Computing Services

COMPANY	Keydata Canada	Keydata Corporation	Litton Computer Services	Management Systems Corporation	Manufacturing Data Systems, Inc.
<b>GENERAL</b>					
Name of service	Keydata	Keydata	Timesharing and Remote Job Entry	Time Sharing & RJE Services	Compact II N/C Parts Programming
Date operational	1969	1965	Aug. 1971	April 1970	March 1969
Areas currently served	Major Canadian metropolitan areas; current subscribers in Toronto, Montreal, Winnipeg, and Vancouver	Continental U.S. & Canada; more than 40 concentrators	Continental U.S. & Canada	Salt Lake City, Provo, and Ogden, Utah; Eastern Idaho	All of U.S. and Canada, United Kingdom, France, West Germany, Japan
<b>EQUIPMENT</b>					
Computers	DECsystem-10 (1) Univac 494 (3) in Foxboro, MA	DECsystem-10 (1), Univac 494 (3) in Foxboro, MA	IBM 370/168	IBM 370/168 in Salt Lake City	Xerox 940 systems in Ann Arbor (ComShare) and Palo Alto (Tymshare)
No. of simultaneous users	1000	1000	512	78 time-sharing, 18 RJE	Not specified
Conversational terminals supported	TTY Model 28, GE Terminal, Bell Canada Vucom, ADDS, DECwriter, Tally, Datapoint at 30 or 120 cps	TTY Model 28, GE Terminal, ADDS, DECwriter, Tally, Datapoint at 30 or 120 cps	TTY-compatible units; IBM 3270	Trendata 1000, Trendata 1500, IBM 2741, GTE 5741; 15 & 30 cps	TTY ASR 33, Western Union DT300, GE Terminal
Batch terminals supported	—	—	IBM HASP, 2780, 3780, & emulators	IBM 2780 & S/3, Mohawk Model 20	—
<b>SOFTWARE</b>					
Conversational programming languages	Keydata On-Line Processing Language (KOP III)	Keydata On-Line Processing Language (KOP III)	FORTRAN, BASIC, COBOL, APL, PL/1, MARK IV	APL, ATS, TSO, VSPC	Compact II
Batch-mode programming languages	—	—	FORTRAN, COBOL, PL/1, RPG, MARK IV, Easytrieve	FORTRAN, COBOL, PL/1, RPG, Assembler, Easytrieve	—
Principal applications	Business	Business	Business & scientific	Business & scientific	Numerical control
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	\$900	\$800	None	None	\$50
Remote batch	—	—	None	On request	—
Terminal connect time:					
Interactive	See Comments	See Comments	\$8.00-12.00/hr.	\$3.00-3.75/hr.	\$10.00-14.00/hr.
Remote batch	—	—	None	None	—
Central processor time:					
Interactive	See Comments	See Comments	See Comments	—	\$35/min.
Remote batch	—	—	—	—	—
Mass storage:					
Interactive	See Comments	See Comments	See Comments	\$0.04/6440 chars./day	\$1.00/1000 chars./month
Remote batch	—	—	—	On request	—
<b>COMMENTS</b>	All charges are based on number of transactions processed; dedicated system for interactive business data processing applications	All charges are based on number of transactions processed; dedicated system for interactive business data processing applications	Rates vary with amount and period of time resources used	Offers text processing system (ATS) to facilitate preparation of publications, proposals	Offers numerical control parts processing system, using Com-Share and Tymshare computers and communications networks

## All About Time-Sharing and Remote Computing Services

COMPANY	Mark/Ops	Martin Marietta Data Systems	McDonnell Douglas Automation Co. (McAuto)	McDonnell Douglas Automation Co. (McAuto)	McDonnell Douglas Automation Co. (McAuto)
<b>GENERAL</b>					
Name of service	Mark/Ops	Remote Computing Services	Cyber 173/175 Service	Cyber 74 Service	IBM TSO
Date operational	March 1967	1969	March 1976	Dec. 1972	1971
Areas currently served	Northeastern U.S.	U.S., Canada, Europe	Continental U.S.	Continental U.S.	Continental U.S. & Canada
<b>EQUIPMENT</b>					
Computers	DEC PDP-10 (2) & DEC PDP-11/45	IBM 370/168 (2), 370/158 (2), 370/148, 370/135, 360/50; CDC 6500, etc.	CDC Cyber 173 & 175	CDC Cyber 74	IBM 370/168 in St. Louis (8) and Long Beach, CA (4)
No. of simultaneous users	64 & 24	600	256	25	100+
Conversational terminals supported	Any 110 or 300 bps ASCII unit	IBM 2741, IBM 3270 TTY, or any compatible unit	IBM 2731 and TTY compatible units	—	TTY, IBM 2741, IBM 3270, high-speed graphics, low-speed graphics
Batch terminals supported	Any 1200 bps ASCII unit	IBM 2780/3780, HASP multileaving workstation (i.e., 360/20), or any compatible unit	CDC 200	IBM HASP, IBM 2780/3780, CDC 200, & COPE Native Mode	—
<b>SOFTWARE</b>					
Conversational programming languages	FORTRAN, BASIC, COBOL, TECO	FORTRAN, PL/1, BASIC, COBOL, TSO, IMS/DL-1, CICS	FORTRAN, BASIC, APL, MIMDAC	—	FORTRAN, COBOL, BASIC, PL/1
Batch-mode programming languages	FORTRAN, COBOL	FORTRAN, PL/1, BASIC, COBOL, RPG, Assembler, IMS/DL-1	FORTRAN, COBOL, MIMAC, SIMSCRIPT	FORTRAN, COBOL	—
Principal applications	Acctg., distribution, financial modeling, assembly control, engr.	Manufacturing, business, scientific, & data base management	Engineering, scientific, graphics, data base management	Engineering & scientific	System/program devel., graphics, mfrg., modeling, engr., distribution
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	None	—	None	—	\$10.00/ID
Remote batch	None	—	None	None	—
Terminal connect time:					
Interactive	\$8.00/hr. or \$7.50/hr.	—	\$10-20/hr. (30, 120 cps)	—	\$11.00/hr.
Remote batch	\$12.00/hr.	—	\$10/hr. (2000-4800 bps)	\$1.00/SRU	—
Central processor time:					
Interactive	\$0.10/sec. (4K)	—	\$0.18/MRU	—	\$8.00/TSO-MRU
Remote batch	\$0.05/sec. (4K)	—	\$0.15-0.40/MRU	\$3.15-5.85/MRU	—
Mass storage:					
Interactive	\$0.01/640 chars./day	—	\$0.04/64 wds./wk.; \$3.00/6848 wds./wk.	—	\$10.00/megabyte/wk.
Remote batch	\$0.01/640 chars./day	—	\$0.04/64 wds./wk.; \$3.00/6848 wds./wk.	\$0.04/64 wds./wk.; \$3.00/6848 wds./wk.	—
<b>COMMENTS</b>					
	Division of Northeastern Systems Associates; specializes in large systems for specific customers; lower rates for non-prime time and large data bases; different rates apply for PDP-11/45 system; bulk storage available at special rates	Price lists available on request; charges only for resources used related to response and volume; specializes in remote batch processing	Storage discounts are offered; disk files are shared between computers; full access to other McAuto processors is provided	Full access to other McAuto processors is provided	Full TSO service including interactive debug, RJE, low- and high-speed graphics; also offers Structured Program Facility; full access to other McAuto processors is offered

## All About Time-Sharing and Remote Computing Services

COMPANY	McDonnell Douglas Automation Co. (McAuto)	McDonnell Douglas Automation Co. (McAuto)	Mellonics Information Center	Metridata Computing, Inc.	Multiple Access Limited Computer Group
<b>GENERAL</b>					
Name of service	IMS/Data Base Services	IBM 370 RJE	MIC	Metrinet	—
Date operational	1970	1967	1968	Jan. 1969	Oct. 1969
Areas currently served	Continental U.S. & Canada	Continental U.S. & Canada	California and various user sites across the U.S.	Multiplexers in Chicago, Cincinnati, Dayton, De- troit, and Indianapolis; foreign exchange in Columbus, OH	All of Canada & U.S.
<b>EQUIPMENT</b>					
Computers	IBM 370/168 in St. Louis, MO (8) and Long Beach, CA (4)	IBM 370/168 in St. Louis, MO (8) and Long Beach, CA (4)	IBM 370/168-3 AP	Honeywell 430 (2) & 440 (2); IBM 360/65	CDC 6600 & Cyber 73, IBM 370/168 (3) in Toronto; Univac 494 (3) in Boston
No. of simultaneous users	2000+	150	90 TSO, 50 RJE	80 total	32 on CDC 6600, 128 on Cyber 73
Conversational ter- minals supported	TTY; IBM 2260, 2740, & 3270; and compatible units	—	All ASCII units at 10, 15, 30, or 120 cps	Any ASCII terminal at 10 or 30 cps	TTY and all compatible ASCII units at 10 or 30 cps
Batch terminals supported	IBM HASP, 2770, 2780, 3780, & compatible units (e.g., Data 100)	IBM 2770, 2780, 3780, & compatible units; IBM HASP, Data 100	Any HASP-compatible RJE terminal	IBM 2780, 3780, & 3620	IBM 360/20 & 1130, Univac 9200/9300, CDC 200, Data 100, Comterm 2100, DEC PDP-8 & -11, etc.
<b>SOFTWARE</b>					
Conversational pro- gramming languages	COBOL, DL/1, Assembler	—	FORTRAN, COBOL, BASIC, FORESIGHT, RAMIS, GIS/VS	FORTRAN, BASIC	FORTRAN, BASIC, COBOL, Compass
Batch-mode program- ming languages	COBOL, PL/1, DL/1, Assembler	FORTRAN, COBOL, PL/1, DL/1, Assembler	FORTRAN, COBOL, PL/1, RPG, TOTAL, pro- prietary applications	COBOL	FORTRAN, BASIC, COBOL, ALGOL, RPG, PL/1, Assembler, Compass, etc.
Principal applications	Manufacturing, distribu- tion, insurance, & com- munications	Acc'ting, mfrg., distr'n., eng'g., planning, project mgmt., data base	Business & scientific	Business, scientific, & banking	Business, scientific, banking & government
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	None	—	None	None	None
Remote batch	None	None	None	100	None
Terminal connect time:					
Interactive	None	—	\$7.50/hr.	\$7.50/hr.	Not specified
Remote batch	None	None	\$12.00/hr. or dedicated port	\$10.00/hr.	Not specified
Central processor time:					
Interactive	Special pricing	—	\$0.24/min.	\$0.04/CPU unit	Not specified
Remote batch	\$6.35/VRU	\$6.35/VRU	\$1.71/CRU	—	Not specified
Mass storage:					
Interactive	\$20.00/megabyte/wk.	—	\$0.10/19K bytes/week	\$0.75-1.75/1000 chars./month	Not specified
Remote batch	\$10.00/megabyte/wk.	\$10.00/megabyte wk.	\$0.10/19K bytes/week	—	Not specified
<b>COMMENTS</b>					
	Offers remote batch and on-line IMS production and testing. Full access to other McAuto proces- sors is provided	Full access to other McAuto processors is provided	IMS, STAIRS, LIS, and other proprietary applica- tions available for nomi- nal royalty charge; Tele- net access available	Gateway to Tymshare's TYMNET	High-speed links be- tween processors give all users on-line access to the computer systems network; also offers Key- data on-line commercial processing services; cus- tom design of industrial control systems

## All About Time-Sharing and Remote Computing Services

COMPANY	National CSS, Inc.	National Computer Network of Chicago, Inc.	Newfoundland and Labrador Computer Service	NLT Computer Service
<b>GENERAL</b>				
Name of service	VP/CSS	National Computer Network of Chicago	—	Datafile/500
Date operational	Dec. 1968	Dec. 1969	1969	1970
Areas currently served	All of U.S., London, Montreal, Paris, Toronto, & international Telex	Nationwide & Canada via Telenet network	Eastern Canada	Eastern U.S.
<b>EQUIPMENT</b>				
Computers	IBM 370/168 (1), Amdahl 470/V6 (1) in Stamford, CN; IBM 370/168 (1), 370/158 (1) in Sunnyvale, CA	Honeywell 1648A (2)	IBM 370/158 in St. John's, Nfld.	Burroughs B 4700 (2), Data General Nova 3 (several)
No. of simultaneous users	1200	64 per computer	30	250
Conversational terminals supported	TTY and all compatible units at 10, 15, 30, 60, or 120 cps; plus voice response	All 110 or 300 bps ASCII terminals, IBM 2741 Correspondence Code	IBM 2740, 2741, 3270, TTY, or equivalent	Burroughs TC 3500, Data General Nova/Hazeltine CRT
Batch terminals supported	Dial-up units at 1200 to 4800 bps; leased-line units at 2400 to 9600 bps	—	DEC PDP-11/40, Comterm 1200	—
<b>SOFTWARE</b>				
Conversational programming languages	FORTRAN, APL, BASIC, COBOL, PL/1, Assembler	FORTRAN, COBOL, XBASIC, TEACH, SOLVE	FORTRAN, BASIC, COBOL, PL/1, Assembler, MARK IV	—
Batch-mode programming languages	FORTRAN, APL, BASIC, COBOL, PL/1, Assembler	—	FORTRAN, COBOL, PL/1, ALGOL, RPG, Assembler, MARK IV, etc.	—
Principal applications	Business & scientific	Stock option data base, microprocessor assemblers	Business & scientific	Wholesale distribution applications
<b>CHARGES</b>				
Min. monthly charge:				See Comments
Interactive	None	None	Not specified	—
Remote batch	None	—	Not specified	—
Terminal connect time:				
Interactive	\$10.00-20.00/hr.	\$5.00-8.00/hr.	Not specified	—
Remote batch	None	—	Not specified	—
Central processor time:				
Interactive	\$0.20/VPU	None	Not specified	—
Remote batch	\$0.08-0.12/VPU	—	Not specified	—
Mass storage:				
Interactive	\$10-22/120,000 bytes/month	\$1.00/mo./1024 chars.	Not specified	—
Remote batch	\$10-22/120,000 bytes/month	—	Not specified	—
<b>COMMENTS</b>	Offers data bases and data base management systems	Pricing for terminal connect time varies for non-prime and prime time usage; volume discounts and unlimited usage numbers are available	Provides EDP services for provincial government, university, and crown corporations	Charges are based on transaction and storage volume; matrix pricing, system selling, and all wholesale distribution applications



## All About Time-Sharing and Remote Computing Services

COMPANY	Ohio Valley Data Control, Inc.	On-Line Business Systems, Inc.	On-Line Systems, Inc.	Optimum Systems Incorporated	Pacific Applied Systems Division, SDC
<b>GENERAL</b>					
Name of service	Ohio/Kanawha Valley Data Control	Remote Processing— System Development & Maintenance July 1971	—	OSI	TASC system for test automation
Date operational	1972		Dec. 1967	1967	1971
Areas currently served	Eastern Ohio, West Vir- ginia, Southwestern Pennsylvania	California and the West Coast	Entire U.S., Canada, and the U.K., toll-free access from 18 cities in U.S.	Continental U.S.; also offers access via TYMNET	Continental U.S., Europe, & Orient
<b>EQUIPMENT</b>					
Computers	Burroughs B 4700/3700 dual processors, B 1714 (2), B 2700 (1), & Honey- well 2020 (2)	IBM 370/158 in San Francisco	DEC PDP-10 (11) in Pitts- burgh; DEC PDP-11 in U.K. for remote concen- tration	IBM 370/158-3 and 370/165 in Santa Clara; 370/158 (2) & 370/168 (2) in Rockville, MD	TI 960; Amdahl 470/ V5; Univac 1108
No. of simultaneous users	20	100	64 per system	Not specified	300
Conversational ter- minals supported	Burroughs TD 700/800, TP 102, NCR 301/101, TI 700	All IBM-compatible terminals	ASCII, EBCD, BCD, and Correspondence units at 10, 15, 30, or 120 cps	All popular terminals including TTY & IBM 2741	ASCII terminals at 110 to 9600 bps
Batch terminals supported	Burroughs B 1700, B 345, Honeywell 2020 2020	All IBM-compatible terminals	Data 100, etc.	IBM 2780/3780, Data 100 & compatible units; DEC, Interdata & Data- point distributed mini- computers	Univac 1004, IBM 2780, COPE, etc.
<b>SOFTWARE</b>					
Conversational pro- gramming languages	COBOL	FORTRAN, BASIC, APL, SPITBOL, WATORV, PYLON, WYL- BUR	FORTRAN, BASIC, COBOL, APL	WYLBUR, SUPER- WYLBUR	TASC Test Oriented Language, FORTRAN
Batch-mode program- ming languages	COBOL	FORTRAN, COBOL, PL/1, RPG	FORTRAN, BASIC, COBOL, APL	COBOL, FORTRAN, PL/1, RPG	TASC Test Oriented Language, FORTRAN
Principal applications	Financial & commercial (general)	Specialized business systems	Business & scientific	Mfg., health, municipal & federal gov't., banking, const., engr., legal, tele- phone industry	ATE program develop- ment, circuit simulation
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	—	See Comments	\$5.00/user no.	\$200	—
Remote batch	\$1.50/month	—	\$5.00/user no.	\$200	—
Terminal connect time:					
Interactive	—	\$3.25/hr.	\$10.00/hr.	\$3.50/hr.	\$100-900/hr.
Remote batch	\$0.03/account/month	\$10.00/hr.	None	\$6.00/hr.	—
Central processor time:					
Interactive	—	\$30.00/CPU minute	\$0.05/CP unit	\$0.20/CPU sec.	Incl.
Remote batch	\$14.00/hr.	\$16.00-26.00/CPU hr.	\$0.05/CP unit	\$2.38-4.25/MU	—
Mass storage:					
Interactive	—	\$0.035 track/day (3330-11)	\$0.05/3200 chars./day	\$0.025/2314 tk./day; \$0.04/3330 tk./day	Incl. w./TI 960; \$0.50/8400 char./day
Remote batch	\$10.00/100K bytes/ month	\$0.01 track/day (3330-11)	\$0.05/3200 chars./day	\$0.025/2314 tk./day \$0.04/3330 tk./day	—
<b>COMMENTS</b>		Limited to applications such as reservations, order entry, POS, inven- tory, data base retrieval, etc.; billing is on a trans- action basis; minimum monthly charge is \$800 for total interactive and batch usage	Service available 24 hours/day, 7 days/ week; offers on-line data base management, finan- cial modeling, & project management systems	Owns and markets SUPERWYLBUR for word processing services; pro- vides CICS, IMS, TSO (East coast) services. Vol- ume discounts for mass storage; leased line ac- cess avail.; services and rates slightly different on East Coast	Dedicated system tests simulation models for program development for automatic test equip- ment (ATE) & generates configuration control package; division of Sys- tem Development Corporation

## All About Time-Sharing and Remote Computing Services

COMPANY	Polycom Systems Limited	PRC Computer Center, Inc.	Profitool, Inc.	Programs & Analysis, Inc.	Proprietary Computer Systems, Inc.
<b>GENERAL</b>					
Name of service	Remote Computing Service	Conserve	—	Thrift Line Service	PCS/Computernet; PCS/Text & RJE
Date operational	1968	1970	Oct. 1977	1968	Oct. 1970
Areas currently served	Canada (primarily Southern Ontario region)	Continental U.S.	Rocky Mountain States	New England, New York, & Southeast	Continental U.S. plus Hawaii, with offices in major cities, and Europe
<b>EQUIPMENT</b>					
Computers	Honeywell 6080	IBM 360/40, 360/30, & 370/158; IteI AS-5; and DEC PDP-11/40 in McLean, VA	Prime 400	Honeywell 6060 in Burlington, MA	IBM 360/65 (2) in Van Nuys, CA
No. of simultaneous users	104	120	63	64	160
Conversational terminals supported	Any ASCII-compatible terminal up to 120 cps	TTY, IBM 2741, and compatible ASCII and EBCD units at 10, 15, or 30 cps	All TTY-compatible terminals at 10, 30, and 120 cps	ASCII at 10 to 120 cps; IBM 2741 and compatible units	ASCII terminals at 10 to 30 cps; IBM 2741 and compatible units, including CRT displays
Batch terminals supported	Any terminal supporting IBM 2780 or SDLC protocol	IBM 2780 & 360/20, Data 100, Singer, COPE, etc.	—	"Almost any" unit up to 9600 bps	IBM 2780, 3780, and compatible units
<b>SOFTWARE</b>					
Conversational programming languages	FORTRAN, COBOL, BASIC, APL, SNOBOL, DYNAMO, ALGOL	FORTRAN, COBOL, WYLBUR	FORTRAN, COBOL, BASIC	FORTRAN, BASIC, ALGOL	APL, SV, PCS/Text
Batch-mode programming languages	FORTRAN, COBOL, BASIC	FORTRAN, BASIC, COBOL, ALGOL, PL/1, RPG, Assembler	FORTRAN, COBOL	FORTRAN, COBOL, Assembly, JOVIAL	FORTRAN, COBOL, PL/1, etc.
Principal applications	Acct'g., order proc., job costing, financial planning, statistics	Business & scientific	Accounting & cost control	Business, engineering, & scientific	Business, finance, scientific, word processing
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	\$100	None	None	See Comments	None
Remote batch	\$100	None	None	—	None
Terminal connect time:					
Interactive	\$6.00-12.00/hr.	\$8.00/hr.	\$10-20/hr. (30, 120 cps)	See Comments	\$2.85-15.00/hr.
Remote batch	None	None	—	—	\$11.00/hr.
Central processor time:					
Interactive	\$0.175-0.35/CRU	Not specified	\$0.04/CPU sec.	See Comments	\$0.01/CRU
Remote batch	\$0.175-0.35/CRU	Not specified	\$0.04/CPU sec.	—	\$10/min. (50K region)
Mass storage:					
Interactive	\$0.10/1000 chars./mo. minimum	Not specified	\$0.10/1000 chars./mo.	—	\$0.01/1000 chars./day
Remote batch	\$0.10/1000 chars./mo. minimum	Not specified	\$0.10/1000 chars./mo.	—	\$0.01/track/day
<b>COMMENTS</b>					
	Pricing for terminal connect and CPU time varies according to non-prime and prime time usage; 50% discount available during non-prime time; also offers an "off-the-shelf" financial management system utilizing an intelligent terminal system; dedicated ports available	Offers local and remote batch processing, TSO time-sharing, and WYLBUR text editing, plus various other computer and professional services	50% discount available on terminal connect and processor time during non-prime time	Offers dedicated business, engineering, and scientific data processing services; each application is charged on a unit transaction basis	Computernet can mix interactive and batch processing, & mix APL and Text; PCS/Text is an improved version of IBM's ATMS

## All About Time-Sharing and Remote Computing Services

COMPANY	Pryor Corporation	Quanex Management Sciences	Rapidata, Inc.	Remote Computing Corporation	Scientific Process & Research, Inc.
<b>GENERAL</b>					
Name of service	—	Remote Job Entry Computing Services	Rapidnet	R-NET	SPR Timesharing Network
Date operational	June 1969	Aug. 1977	Jan. 1969	Oct. 1968	1969
Areas currently served	Illinois, East and Midwest via network	United States	Continental U.S. via INWATS and foreign exchanges; multiplexers in Atlanta, Boston, Chicago, Detroit, L.A., Miami, N.Y., Phila., S.F., London, & other cities	Continental U.S. via local dialing	Continental U.S., Canada, Mexico, & Puerto Rico via local dialing
<b>EQUIPMENT</b>					
Computers	Honeywell 440 in Louisville, KY & DECsystem-20 in Chicago	Itel AS-5 & IBM 360/65	Honeywell 437 (13), DECsystem-1070 (2), & DECsystem-1080	Burroughs B 7700	Prime 400
No. of simultaneous users	50	100 total	500	200	64
Conversational terminals supported	ASCII terminals at 10 or 30 cps	IBM 2731, TTY 33	"Almost any" 10 to 120 cps unit	Most ASCII units at 10 to 120 cps, Correspondence/EBCD units at 14.8 to 120 cps	TTY 33/35 and other ASCII terminals at 10 or 30 cps; IBM 2741
Batch terminals supported	—	IBM HASP, IBM 3780, & CDC 200	"Almost any" unit up to 4800 bps	Data 100, IBM 2780 and emulators, Singer M&M, Burroughs DC 1000	—
<b>SOFTWARE</b>					
Conversational programming languages	FORTRAN, BASIC	COBOL, BASIC	FORTRAN, BASIC, COBOL, DBMS	FORTRAN, PL/1, BASIC, COBOL, ALGOL	FORTRAN, BASIC, COBOL, PMA
Batch-mode programming languages	—	FORTRAN, COBOL, PL/1, RPG	FORTRAN, COBOL, Assembler	FORTRAN, PL/1, BASIC, COBOL, ALGOL, Work Flow (WFL)	—
Principal applications	Business & scientific	Acct'g., mfg., distribution, engineering, & scientific	Financial, business, and integrated financial systems	Business; thrift, securities & commodities, data bases	Engineering, scientific and business
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	\$50	\$250	\$100	\$100	None
Remote batch	\$500	\$250	\$100	\$100	—
Terminal connect time:					
Interactive	\$10.00/hr.	None	\$5.00-30.00/hr.	\$11.00/hr.	\$6.00-10.00/hr.
Remote batch	—	None	\$30.00/hr.	\$10.00/hr.	—
Central processor time:					
Interactive	Not specified	—	\$0.024-0.07/CPU	\$0.30/RCU	\$0.006-0.01/RAM
Remote batch	—	—	\$0.024-0.07/CPU	\$0.15-0.30/RCU	—
Mass storage:					
Interactive	\$0.75/1000 chars./month	—	\$0.10-0.60/1000 chars./month	\$3.20/million chars./day	\$0.015/1000 chars./day less 10% connect charge
Remote batch	—	—	\$0.20-0.60/1000 chars./month	\$3.20/million chars./day	—
<b>COMMENTS</b>					
	Specializes in remote processing of billing, accounts receivable, sales analysis, payroll, inventory control, and accounts payable; also mfg. order processing, bill of material processing, and raw material requirements planning	Fully integrated financial packages and production planning and control packages available; previously known as ACTS Computing Division, Lear Siegler, Inc.	Several data bases available for market statistics, stock markets, finance, economics, banking, international trade data, etc.; also offers voice response and graphic plotting	Charges shown are for B 7700 system; discounts for non-prime time	Offers simulators for plastics processing and optimization package; extruding, blow molding, injection molding; also information retrieval

## All About Time-Sharing and Remote Computing Services

COMPANY	Scientific Time Sharing Corporation	The Service Bureau Company	Shared Medical Systems, Inc.	I.P. Sharp Associates Limited	A.O. Smith Corporation
<b>GENERAL</b>					
Name of service	APL*Plus	CALL/370 Management Time Sharing	Financial Management, ACTION, Focus	Sharp APL	Time-Sharing and RJE Service
Date operational	Aug. 1969	1969 (CALL/360)	1969	July 1969	1969
Areas currently served	Local access in over 60 cities in the U.S., plus Canada, Mexico, Puerto Rico, Hong Kong, U.K., and several European countries	Local access in 125 U.S. & 21 international locations, including Belgium, Canada, France, Germany, Holland, Italy, Japan, Scandinavia, Switzerland, & U.K.	Nationwide network excluding Hawaii	U.S., Canada, Western Europe, Australia (on order), and access to Telenet and TYMNET	Continental U.S.
<b>EQUIPMENT</b>					
Computers	IBM 370/155 (2) in Bethesda, MD	IBM 370/158 (8) in Cleveland	IBM 370/168 (2)	IBM 370/75 & Amdahl 470/V6-II	IBM 370/165 in Milwaukee
No. of simultaneous users	250	Over 160/system	Over 400	200	Varies
Conversational terminals supported	IBM 2741 & 3767 AJ 630 & 832, CDT 1030, Datamedia, DECwriter, Teleray, Tektronix 4013, etc., up to 120 cps	IBM 2741, TTY 33/35, and ASCII terminals at 10, 30, or 120 cps	IBM 3770, Digital Equipment, Four-Phase	Asynchronous units up to 1200 bps, including ASCII (i.e., AJ 832), IBM 2741 compatible Tektronix, HP CRT's, etc.	TTY 33/35, Tektronix CRT's Sycor 250, IBM 3270 & 2741, and compatible units
Batch terminals supported	IBM 2780, 3780, HASP, & System/3; Data 100, Harris, Sycor, Four-Phase, etc.	IBM 2780/3780 or equivalent; IBM S/360 & S/370 processors	—	—	All IBM, Data 100, Harris COPE, Sycor, Mohawk, Datapoint, & compatible units
<b>SOFTWARE</b>					
Conversational programming languages	APL	FORTRAN, BASIC, PL/1, Data Management	Not applicable	APL	PL/1 & Speakeasy under TSO
Batch-mode programming languages	All System/370	FORTRAN, BASIC, PL/1, Data Management	Not applicable	APL	FORTRAN, COBOL, PL/1, Assembler, RPG, Speakeasy
Principal applications	Business, scientific, manufacturing, & financial modeling	Business & scientific	Hospital accounting, administrative, patient care, & communications	Business & scientific	Manufacturing, structural analysis, & financial modeling
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	\$100	\$100	—	None	None
Remote batch	—	—	—	None	None
Terminal connect time:					
Interactive	\$12.00/hr. (15 cps)	\$11.00-16.00+/hr.	—	\$8.00/hr.	\$8.00/hr.
Remote batch	\$75.00/hr.	\$30.00/hr. (2400 bps)	—	—	None
Central processor time:					
Interactive	\$0.65/CRU	\$0.18/PU	—	\$0.35/CPU unit	\$0.30/sec.
Remote batch	\$0.65/CRU	\$0.02-0.10/PU	—	\$0.20/CPU unit	\$0.30/sec.
Mass storage:					
Interactive	\$0.30/1000 chars./month	\$0.015-0.022/1000 bytes/day	—	\$0.55-0.80/100K bytes/day	\$0.017/1000 chars./month
Remote batch	—	\$0.006/1000 bytes/day	—	\$0.55-0.80/100K bytes/day	None
<b>COMMENTS</b>					
	APL*Plus File Subsystem and EMMA facilitate processing of large shared files and data bases; consulting and programming of customized applications; applications package also available for communications network analysis	Subsidiary of Control Data Corp. since January 1973; also offers TSO, RJE, On Call/Plus, remote computing service under OS/VS2 (MVS)	An integrated information system for hospitals in the areas of communications, patient care, and financial processing	Provides in-house Sharp APL software to large users, consulting and education services, and minicomputer-based systems for real-time and process control	Runs MVS and offers TSO and RJE

## All About Time-Sharing and Remote Computing Services

COMPANY	Statistical Tabulating Corporation	Structural Dynamics Research Corp.	Sun Information Services	Sun Information Services	Systems Dimensions Limited
<b>GENERAL</b> Name of service	STAT-TAB	SDRC Computer Operations	INTERCOM	TSO, WYLBUR	SDL Computer Ser- vices
Date operational	Spring 1972	Jan. 1969	Sept. 1977	Sept. 1977	June 1969
Areas currently served	Continental U.S.; dial-up access at 10, 14.8, 30, 120, & 200 cps; leased lines available	Continental U.S., Canada, Europe, Japan, & U.K.	U.S.	U.S.	All major Canadian cities plus Eastern U.S.; multiplexers in Boston & New York; RJE terminals in Boston, N.Y. & Washington
<b>EQUIPMENT</b> Computers	IBM 370/158 in Chicago	See Comments	CDC Cyber 173	IBM 370/168	IBM 370/168 AP & IBM 360/85 in Ottawa
No. of simultaneous users	99	See Comments	20	40	100
Conversational ter- minals supported	All IBM-compatible low-speed hard-copy & CRT terminals; TTY 33/35 & com- patible units	TTY 33/35 and other ASCII termi- nals at 10, 30, or 120 cps	GE TermiNet 300, Sycor 340 & TI 725/735/745	ASCII-compatible, IBM 2741/3270	IBM 2741 and com- patible units; TTY and compatible ASCII terminals
Batch terminals supported	All IBM-compatible medium-speed units	All IBM, CDC, Data 100, Harris COPE, Singer UNIVAC 9200, GA SPC-16, etc.	IBM 2780/3780 IBM HASP, Harris 1100/1600, Sycor 340, CDC 200	IBM 1130/2770/2780/ 3780/3776, 360/20/22, System/7, HASP; Data 100 70/76/78; Harris 1100/1600; PDP-11/45; Sycor 340	IBM BSC terminals and equivalents
<b>SOFTWARE</b> Conversational pro- gramming languages	CMS-supported languages, Hyper- faster	FORTRAN, BASIC	FORTRAN, BASIC	FORTRAN, COBOL	SDL/WYLBUR, SDL/APL, SDL/TSO; all batch languages in fast batch mode; SCSS
Batch-mode program- ming languages	FORTRAN, COBOL, PL/1, RPG, ADPAC, Assembler	FORTRAN, BASIC, COBOL, ALGOL, Assembly	FORTRAN	FORTRAN, COBOL, PL/1, BAL SIMSCRIPT 2.5	FORTRAN, SPSS, COBOL, PL/1, RPG, Mark IV, Assembler, WATFIV
Principal applications	Business & scientific	Mechanical design & structural analysis	—	Program development	BUS., data base, stat., eng'rg., proj. mgmt., & interactive services
<b>CHARGES</b> Min. monthly charge: Interactive	None	None	None	None	\$60
Remote batch	None	None	None	None	\$60
Terminal connect time: Interactive	\$3.50-10.00/hr.	—	\$12.00/hr.	\$14.00/hr.	\$12.00/hr.
Remote batch	\$10.00/hr.	Varies with system	\$10 (2000 bps)-15/hr.	\$10-15 (4800 bps)/hr.	—
Central processor time: Interactive	\$0.10-0.20/sec.	—	\$0.075/system sec.	\$5.58/CWU	33.00/min.
Remote batch	\$0.10-0.80/sec.	Varies with system	\$0.050/sys.sec.(4800bps)	\$2.48/CWU (4-hr. resp.)	22.00/min.
Mass storage: Interactive	\$0.25/7294 bytes/week	—	\$0.30 storage unit/ month	\$0.065/MSU/week	\$2.00/million bytes/day
Remote batch	\$0.25/7294 bytes/week	Varies with system	\$0.30 storage unit/ month	\$0.065/MSU/week	\$2.00/million bytes/day
<b>COMMENTS</b>	System runs under VM/370; emulation of any IBM software/ hardware combination is supported	Sells time on U.S. Steel CDC, GE, Comshare, CSC, and Quanex systems; features mechanical design and structural analysis programs			Offers on-line and batch services based upon MVS/370 & JES, plus an interactive file editor (SDL/WYLBUR) and data retrieval system (SDL/Info)

## All About Time-Sharing and Remote Computing Services

COMPANY	Technical Advisors, Inc.	Tel-A-Data, Inc.	Telstat Systems, Inc.	Time-Sharing Resources, Inc.	Tymshare, Inc.
<b>GENERAL</b> Name of service	TECH-MAC	Tel-A-Data	Telac 70	TOTAL/APL	TYMCOM IX, X, & 370
Date operational	June 1967	Dec. 1966	Jan. 1971	July 1970	1966
Areas currently served	Continental U.S. except Alaska (toll-free except in Michigan)	State of Florida	New York City metropolitan area; areas serviced through Telenet packet network	Local access in all major U.S. metropolitan areas, plus major Canadian cities	Local access in all major U.S. metropolitan areas, plus INWATS; local access in London, Paris, Brussels, & Stuttgart
<b>EQUIPMENT</b> Computers	Varian 622i (2), 1 in Wayne, MI, and 1 in Phoenix, AZ; plus PDP-11/70 in Wayne, MI	Burroughs B 500 & B 2800	Xerox Sigma 9	IBM 360/75 in Great Neck, NY	Xerox 940 (26), DEC PDP-10 (6), & IBM 370/158 (2); in Cupertino, CA & other locations
No. of simultaneous users	20 in Wayne, 5 in Phoenix	64	128	95	1500 total
Conversational terminals supported	TTY 33/35 & other ASCII terminals at 10 or 30 cps	TTY 33/35, GE TermiNet 300, Burroughs TC 500, Incoterm 10/20	TTY 33/35, IBM 2741, GE TermiNet TI Silent 700, Execuport, etc.	IBM 2741 & equivalent units; all ASCII terminals	Any ASCII, EBCDIC, or Correspondence unit at 10, 15, or 30 cps in full or half duplex mode
Batch terminals supported	—	—	IBM HASP, IBM 2780, Univac DCT 2000	IBM 2780, Data 100, & equivalent units	IBM 2780 and compatible units
<b>SOFTWARE</b> Conversational programming languages	FORTRAN	Assembler, COBOL	FORTRAN, COBOL, BASIC, APL, ASSIST	APL	FORTRAN, BASIC, COBOL, PL/1, Assembler, Editor
Batch-mode programming languages	—	—	FORTRAN, COBOL, BASIC, APL	FORTRAN, COBOL, BASIC, APL, PL/1, Assembler	—
Principal applications	Civil engineering & surveying	Business	Financial	Business & scientific	Business & scientific
<b>CHARGES</b> Min. monthly charge:					
Interactive	None	\$800	None	None	\$80
Remote batch	—	—	None	None	—
Terminal connect time:					
Interactive	\$10-28/hr. (10 cps)	No extra charge	\$12.00/hr.	\$13.00/hr.	\$16.00/hr.
Remote batch	\$15-36/hr. (30 cps)	—	—	\$12.00/hr.	—
Central processor time:					
Interactive	None	No extra charge	\$0.54/page-minute	\$0.08/CRU	\$0.05/sec.
Remote batch	—	—	\$0.54/page-minute	—	—
Mass storage:					
Interactive	\$10.00/2000 chars./month	\$0.30/330 digits/month	\$0.01/1000 chars./day	\$10.00/million bytes per day	\$0.50-1.00/1000 chars./month
Remote batch	—	—	\$0.01/1000 chars./day	—	—
<b>COMMENTS</b>	Offers specialized service for civil engineers and surveyors only; plotter available for \$45/hour	Main emphasis is on invoicing, accounts receivable, statistical reports, and inventory control; monthly charge includes CP and connect time	Provides access to Teleprice/70 databank for automatic retrieval of securities pricing and related information; Automated Portfolio Performance Measurement Services available	TOTAL/APL File Subsystem facilitates processing of large shared files and data bases; also offers financial system (Insight), Econometric Modeling Language (EML), stock data base system (IMPACT), and others	Charges shown are for Type A service on Xerox 940; other service plans are available; operates an extensive international network called TYMNET; over 1250 employees

## All About Time-Sharing and Remote Computing Services

COMPANY	Wang Computer Services	United Computing Systems, Inc.	University Computing Company	USS Engineers and Consultants, Inc.	Xerox Computer Services
<b>GENERAL</b>					
Name of service	HASP-RJE, WYLBUR	UCS	1108/FASBAC, 1100/OS, 6600, IBM 370/148 CDC May 1969	UEC	Interactive Accounting System
Date operational	Nov. 1968	Jan. 1968		May 1970	1970
Areas currently served	HASP-RJE: New England; WYLBUR & CICS: Northeast	More than 140 major cities nationwide; Canada & Europe via network of multiplexers; national INWATS for remote batch	Entire U.S. (thru WATS and multiplexers), plus Canada, England, Western Europe and Australia (1108); U.S. and Canada (6600)	Pittsburgh, Phila., New York, Houston, Chicago, Detroit, & 5 other cities in the Midwest	California, Texas, Illinois, Wisconsin, Mid-Atlantic, New York, New England
<b>EQUIPMENT</b>					
Computers	IBM 370/158 in Burlington, MA	CDC Cyber 174 & 175 (2), 6600 (3), 6500, 6400 (2), 3600 (4), 3300 (3); IBM 360/65 in Kansas City, MO	Univac 1108 in Dallas (5), U.K. (4); CDC 6600 (2) & IBM 370/148 (1) in Dallas	CDC 6500 (dual central processors), Honeywell 6800 in Pittsburgh	Xerox Sigma 7 & 9 (13 systems) in Los Angeles
No. of simultaneous user	Over 150 per system	Proprietary	150 conversational plus 150 RJE (1108); 40 (6600)	Not specified	Over 1600 (all systems)
Conversational terminals supported	TTY; CRT displays; IBM 2741, 3741; Wang 2200	Virtually all 10 to 120 cps terminals	ASCII, EBCDIC, & Correspondence units at 10, 15, or 30 cps (1108 only); 1100/OS at 30 cps only	TTY 33/35, GE Terminal 300, Datapoint 3300, Syner-Data, Incoterm	Xerox 1340, TTY, IBM 2741, Datel, Olivetti, and other ASCII-compatible units
Batch terminals supported	IBM 2780, 3780, S/360 & S/370 computers (to 9600 bps)	Data 100, DEC PDP-11, Mohawk 2400, Remcom	UCC Cope plus Univac 1004 and IBM 2780 and Hasp (1108) or CDC UT 200 (6600)	CDC 1700, CDC 200, IBM 1130, Incoterm	—
<b>SOFTWARE</b>					
Conversational programming languages	FORTRAN, BASIC, Assembler	FORTRAN, BASIC, APL, PASCAL, IFM, INFORM, Editor	FORTRAN, COBOL, BASIC, CASH, CALC, CASCMP, Fastext (1108 only)	FORTRAN, COBOL, BASIC, ALGOL	Proprietary "Plain English" language activates standard Xerox programs
Batch-mode programming languages	FORTRAN, BASIC, COBOL, PL/1, RPG, Assembler	FORTRAN, BASIC, COBOL, ALGOL, Compass, Simscript	FORTRAN, COBOL (1108 and 6600); ALGOL and Assembly (1108 only)	FORTRAN, COBOL, BASIC, ALGOL	—
Principal applications	Business & scientific	Business, scientific, engineering, & data base	Scientific and engineering (both) plus business (1108)	Business & scientific	Acct'g., mfg., distribution utility billing, municipal, general time-sharing
<b>CHARGES</b>					
Min. monthly charge:					
Interactive	None	\$100	None	None	\$1,000
Remote batch	None	\$100	None	None	—
Terminal connect time:					
Interactive	\$6.00/hr.	\$10.50-37.50/hr.	\$9.35-12.00/hr. (1108)	None	See Comments
Remote batch	None	\$10.00-30.00/hr.	\$300/mo. (dedicated) \$30/hr. (1108)	None	—
Central processor time:					
Interactive	\$4.00-34.50/min.	\$1.50-36.00/min.	\$1.20/1000 CRU's	\$24.00/min.	See Comments
Remote batch	\$4.00-34.50/min.	\$9.60-33.60/min.	\$0.36/sec.(1108); \$0.16-0.55 sys. sec. (6600)	Rates on request	—
Mass storage:					
Interactive	\$12/cylinder/month	\$0.50/1280 chars./month	\$1.10/2K char./mo. (1108); \$0.16/7K 36-bit wds./day (1108); \$0.012/1280 6-bit char./day (6600)	\$1.00/10,000 chars./month	See Comments
Remote batch	\$12/cylinder/month	\$50.00/204,800 chars./month		Rates on request	—
<b>COMMENTS</b>	CPU charges vary with storage region size (2K to 600K bytes) and priority; surcharges for certain software	Offers variety of pricing options and 4 levels of service: time-sharing, remote batch, RJE (batch job entry from TS environment), and local batch; has recently acquired International Timesharing Corporation and Standard Information Services	Principal emphasis is on remote batch; FASBAC is RJE with conversational set-up. 6600 CPU time includes I/O time; system seconds are based on portion of main memory used; mass storage discounts available	Subsidiary of U.S. Steel Corp., lower rates for batch mode and volume usage; surcharges for certain software	Offers integrated on-line accounting system; charges are based upon transactions entered, storage used, and lines printed; all programming is done by Xerox





