

All About Computer Time-Sharing Services

Time-sharing service companies owe their existence and rapid growth to the generally accepted principles that:

- 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 of a small one.
- Computers should be easy to use and should maximize the efficiency of the *people* who use them.
- Thousands of prospective users want and need a convenient, economical source of computer power.
- Present equipment, software, and communications technology makes it practical to divide the resources of a large computer system among many simultaneous users at remote terminals.

A time-sharing system can be defined as a computer system that allows multiple users to gain simultaneous access to its facilities. Ideally, such a 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.

Though the concept of computer time-sharing is quite simple, its effective implementation has turned out to be a difficult task for both equipment and software designers.

The first time-sharing systems were developed in the universities in the early 1960's, with M.I.T. and Dartmouth in the vanguard. 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 time-sharing company or nurture an existing one. Dozens of time-sharing service firms merged with other companies, abandoned their time-sharing efforts in favor of more promising activities, or closed their doors completely.

THE TIME-SHARING INDUSTRY TODAY

In the face of all these adverse conditions, more than 100 U.S. and Canadian time-sharing companies have managed to survive. What's more, a goodly number of them are now showing profits on their time-sharing operations.

Time-sharing service companies are now supplying a broad range of computer services to thousands of business firms of all sizes. Time-sharing offers many attractive benefits—but it's not for everyone. This report describes the current state of the art, surveys the offerings of 89 time-sharing service companies, reports users' ratings of 26 of the leading companies, and provides straightforward guidelines for selecting the one that best meets your needs.

Despite the problems that have been experienced by many of its suppliers, it's clear that time-sharing is here to stay. It represents an effective solution to some or all of the information processing requirements of many companies, and new developments in equipment and software are steadily increasing the scope of its practical applications. Datapro's survey of time-sharing users, which is summarized on page 70G-900-01f, indicated a high degree of user satisfaction with the overall effectiveness of the current commercial time-sharing networks.

Total revenues for on-line data processing services, including both interactive time-sharing and remote batch >



Time-sharing users enter data into one of Applied Logic Corporation's PDP-10 computer systems by means of a Hazeltine 2000, a popular teletype-compatible CRT display terminal.

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▷ processing, rose from just \$20 million in 1966 to an estimated \$400 million in 1971 and \$540 million in 1972. This figure is expected to grow to approximately \$1.4 billion by 1975.

The leading U.S. supplier of time-sharing services is General Electric Company, which entered the business in 1965 and has invested over \$150 million in developing an international network that serves the United States, Canada, and Western Europe. A "supercenter" in Cleveland contains nearly 100 interconnected central processors and communications controllers. GE's new "Mark III" service combines interactive time-sharing, remote batch processing, and network data management services that provide rapid access to centralized information files.

Major computer manufacturers with a significant involvement in time-sharing services include IBM (through its Service Bureau Corporation subsidiary), Control Data, and Honeywell. Among the leading independent suppliers of time-sharing services are Applied Logic Corporation, Computer Sciences Corporation, Com-Share, National CSS, Rapidata, Tymshare, United Computing Systems, and University Computing Company; each of these firms has made a multimillion-dollar investment in time-sharing and offers nationwide services. Not to be overlooked, however, are the dozens of smaller time-sharing companies, which offer a wide choice of equipment, software, and services together with the possibility of more personalized attention to your specific needs.

WHY USE TIME-SHARING?

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

- *Flexibility.* Time-sharing 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 time-sharing 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 time-sharing companies and take advantage of differences in their pricing structures, languages, and program libraries.
- *Ease of use.* In general, time-sharing 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 has made computational 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.* 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.* Time-sharing 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 time-sharing user can simply sit down at his terminal, enter the data, initiate execution of the appropriate program, and get the results he needs, either at his terminal or on a suitable output device at the computer site, all with a minimum of delay.
- *Choice of languages.* Most time-sharing 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 time-sharing 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 ▷

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This bank of three Xerox Sigma 7 computers in Los Angeles serves users of Xerox Computer Services' Interactive Accounting System.

▷ and operating your own. What's more, recent FCC decisions have opened the way for independent carriers to provide cheaper and more flexible data transmission facilities, which should spur further progress in this area. (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 time-sharing 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.

POTENTIAL DRAWBACKS

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

- *Questionable reliability.* This is the question that should be uppermost in the minds of prospective time-sharing users: Just how reliable is the service? Many of the early time-sharing networks earned a notorious reputation for being down (out of service)

more often than they were up. Fortunately, a great deal of progress has been made since those days. Only a few of the respondents to Datapro's October 1972 survey of time-sharing users listed excessive system downtime or other reliability problems as serious drawbacks of today's commercial time-sharing services. Most of the system "crashes" that occur nowadays are of short duration and are followed by effective recovery procedures that minimize their impact upon users' operations.

Unfortunately, the purveyors of time-sharing services are still being plagued by problems arising within the facilities of the telephone companies which provide the vital communications links between the time-sharing computers and their users. The telephone companies are being severely criticized for their failure to provide the quality of service required for reliable data communications. Overall, the reliability of the existing time-sharing services is more than adequate for most applications of the computational variety. But companies contemplating the use of time-sharing for business data processing, where important files must be stored and processed with minimal errors, should pay careful attention to the reliability aspect.

- *Slow input/output.* In many of the current time-sharing 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 companies now sup-▷

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➤ port 30-cps interactive terminals and/or much faster remote batch terminals.

- *Low computational efficiency.* The complex software required to coordinate and control the operations of multi-user 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.
- *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 time-sharing services have paid a good deal of attention to this security problem, combining special access protection with passwords and a variety of other techniques. Recent court decisions have established that access to computer files by unauthorized persons is a crime. Prospective users of any time-sharing 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 time-sharing system may be unavailable when you need it because the system is "saturated." Saturation occurs when a time-sharing system is being accessed by the maximum number of users it is capable of serving simultaneously. As the load on a system grows heavier, response times tend to increase, turnaround times get longer, and throughput drops. Finally, when saturation is reached, no more users can be served until someone completes his job and disconnects. Unfortunately, the heavy system loading conditions that are so frustrating for users often represent high-profit situations for the time-sharing suppliers.
- *High communications costs.* Unless you choose a time-sharing company that offers "free" or fixed-cost local access in your area, communications costs can easily represent the largest component of your time-sharing bill. One of the problems is that it is usually necessary to use standard voice-grade telephone lines, with a practical data-carrying capacity of 4800 bits per second or more, to transmit teletypewriter data at 110 bits per second. Needless to say, the user pays for this inefficiency. Prospective time-sharing 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 time-sharing

computer center may rule out some applications that otherwise seem made to order for time-sharing. Based on a typical monthly charge of \$1.00 per 1,000 characters stored, it would cost \$800 per month just to keep a file of 10,000 80-character records on-line. The cost of storing the programs to manipulate the file would further increase the user's monthly bill.

- *Loss of control.* When time-sharing terminals are installed in a company, their ease of use and undeniable appeal often leads 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 time-sharing 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 time-sharing terminals can be considerably more difficult and frustrating than administering a centralized computer facility. It can help a lot if the time-sharing 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.

TIME-SHARING FOR SCIENTISTS

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 time-sharing services. Users with problems of the computational type can take full advantage of most of the previously discussed advantages of time-sharing: 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 ➤

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▷ documented in dozens of articles in the trade press during the past few years.

From the viewpoint of the time-sharing 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 time-sharing has really only begun to tap the latter market.

TIME-SHARING FOR BUSINESSMEN

Just a few years ago, many observers of the EDP industry were predicting that the availability of time-shared computer 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 time-sharing and remote batch processing for business functions is growing steadily now, but the rate of acceptance has been far below the early predictions. The prognosticators apparently overlooked—or underestimated the impact of—four important factors.

First, a time-sharing 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 time-sharing supplier vying for business data processing accounts—yet the suppliers have been surprisingly slow to develop and offer such programs. There has, however, been significant recent progress in this area. As shown by the chart on the last two pages of this report, many of the time-sharing companies now offer programs to handle accounts payable, accounts receivable, general ledger, payroll, inventory control, and other common business functions. Moreover, nearly all 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 time-sharing suppliers seem to be 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 time-sharing for applications in which undetected errors and missed deadlines cannot be tolerated. Outright rejection of time-sharing on these grounds alone probably represents an unduly harsh judgement. In designing a time-sharing 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 time-sharing 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 time-sharing companies are now offering both faster typewriter-style terminals, with speeds in the 30-characters-per-second range, and high-speed batch-mode terminals capable of reading cards and printing reports at 150 to 600 characters per second.

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

- The establishment of dedicated time-sharing 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 250 cities in the U.S. and Canada and over 25 cities in Western Europe, and Tymshare's TYMNET, which uses more than 60 special communications processors and over 40,000 miles of leased Bell System lines.)
- The availability of a wide range of time-sharing application programs from sources other than the time-sharing companies themselves. A promising new concept called “piggy-backing” involves the development of application programs by independent software firms and the marketing of these programs for operation on specific time-sharing systems.

USER EXPERIENCE

To assess the current level of user satisfaction with specific time-sharing companies and with time-sharing ▷

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SUMMARY OF RESPONSES TO THE TIME-SHARING USER SURVEY

Company*	No. of User Responses	"Overall Effectiveness" Ratings				Significant Strengths and Weaknesses**
		Excel- lent	Good	Fair	Unsatis- factory	
ACTS Computing Corp.	6		3	2	1	Relatively low cost (3)
Allen-Babcock Computing, Inc.	2	1	1			
Applied Logic Corp.	2		2			
Boeing Computer Services, Inc.	3		3			Relatively expensive (3)
Computer Sciences Corp.	12	4	4	4		Good support (4); good software (3)
Com-Share, Inc.	10	1	5	2	2	Good software (4); weak support (4)
Control Data Corp.	4			3	1	Relatively low cost (3); powerful (2)
Cyphernetics Corp.	6	1	5			Good software (3); good support (2); relatively low cost (2)
Datalogics, Inc.	2		2			Relatively low cost (2)
General Electric Company	59	20	29	8	2	Relatively expensive (24); widespread availability (22); good software (20)
Honeywell Information Systems	3		2		1	
Interactive Data Corp.	4	1	2		1	
Interactive Sciences Corp.	2		2			
International Timesharing Corp.	5	1	2	2		BPL is effective language (3); relatively expensive (2)
ITT Data Services	3	1	1		1	Good remote batch service (2)
Leasco Response, Inc.	13	1	7	5		Relatively low cost (6); relatively slow (4)
McDonnell Douglas Automation Co.	3		2	1		
National CSS, Inc.	11	6	3	1		Good support (3); sophisticated, versatile system (3)
On-Line Systems, Inc.	7	2	5			Good software (3); relatively expensive (2)
Rapidata, Inc.	6	2	3	1		Good software (4); good support (3)
Remote Computing Corp.	3		2		1	
Scientific Time Sharing Corp.	2	1	1			
The Service Bureau Corp.	32	10	14	6	2	Relatively expensive (13); good software (9); good support (8)
Tymeshare, Inc.	11	2	4	4	1	Good software (6); slow response (6); good support (3)
United Computing Systems, Inc.	14	2	10	2		Powerful equipment (4)
University Computing Company	2		2			

*Only the time-sharing companies mentioned by two or more users are listed here.

**To be considered significant, a specific strength or weakness had to be mentioned by at least 2 users and by at least 25% of the total users responding. The numbers in parentheses indicate how many users mentioned each trait.

➤ techniques in general, Datapro Research Corporation conducted a large-scale survey of time-sharing users in October 1972. A time-sharing Reader Survey Form was included in the October supplement to DATAPRO 70 and mailed to all subscribers. By November 15, usable responses had been received from 139 users of commercial time-sharing services in the United States and Canada. Some users reported their experiences with as many as six different time-sharing companies, and the average number of companies mentioned was 2.13; it is apparent that many organizations are finding it advantageous to utilize the services of two or more suppliers concurrently.

The most significant question on Datapro's Reader Survey Form was: "How would you rate the overall effectiveness of the service?" Totaling the responses for all companies, the results were as follows:

Service Rating	No. of Responses	% of Total
Excellent	84	29
Good	141	49
Fair	47	16
Unsatisfactory	18	6

Thus, the survey indicates a fairly high level of satisfaction among the current users of commercial time-sharing companies. The breakdown of responses to the same question for each of the 26 companies mentioned by two or more users is shown in the accompanying table.

The users were also asked to list the "principal advantages or strengths" and the "principal disadvantages or weaknesses" of each service. Wherever there was enough agreement to be statistically significant, these comments are also summarized in the table. ➤

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▷ The terminals which were most commonly used by the respondents were as follows:

<u>Terminal</u>	<u>No. of Users</u>	<u>% of Total</u>
Teletype (all models)	101	73
UNIVAC DCT 500	24	17
IBM 2741	24	17
CTS Execuport	16	12
GE TermiNet 300	15	11
Novar	9	7
Hazeltine 2000	9	7
Memorex 1200 Series	8	6
Texas Instruments Silent 700	8	6
NCR 260	8	6
Datel	8	6
Syner-Data Beta	7	5
CTC Datapoint 3000/3300	6	4
Anderson-Jacobson	5	4
IBM 2780	3	2

The number of different types of terminals used by individual respondents ranged from 1 to 12 and averaged 2.12 per user. The 14 highest-rated devices are all primarily conversational terminals; the most frequently mentioned batch terminal was the IBM 2780, with only 3 user mentions.

The programming languages which were used most frequently by the respondents were as follows:

<u>Language</u>	<u>No. of Users</u>	<u>% of Total</u>
BASIC	104	75
FORTRAN	96	69
COBOL	19	14
PL/I	15	11
Assembly (all types)	12	9
None*	8	6
APL	7	5
ALGOL	3	2

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

The time-sharing applications reported by the survey respondents spanned virtually the entire spectrum of business and scientific functions. The reported applications can be broadly classified as follows:

<u>Application</u>	<u>No. of Users</u>	<u>% of Total</u>
Business (including accounting, administrative, market research, financial modeling, report generation, data base inquiry, etc.)	96	69
Scientific and Engineering (including simulation, statistical analysis, etc.)	71	51
Educational	6	4

Thus, it is clear that among DATAPRO 70 subscribers, at least, time-sharing services are now being used more heavily for business-related applications than for the scientific and engineering applications that spawned the industry.

THE FUTURE OF TIME-SHARING

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

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

- There will be several large, nationwide suppliers of time-sharing 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 time-sharing 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" will find it increasingly difficult to stay alive.
- Many current users of commercial time-sharing services will install their own in-house computer systems. Some companies will install small computers (such as the IBM System/3 Model 6 or the proliferating minicomputers) to replace individual time-sharing 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 time-sharing suppliers will have to keep on attracting new customers, primarily from the huge ranks of small business firms.

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- ● Time-sharing users will have an ever-growing variety of “packaged” application programs to choose from. These will be developed by both the time-sharing companies and independent software firms. “Piggy-backing” of specialized services on existing time-sharing networks will become much more common.
- Finally, both suppliers and users will begin to take advantage of the fact that the nationwide time-sharing networks can be used effectively for a broad range of communications functions, as well as for computation and information retrieval. The same time-sharing 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 time-sharing 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, time-sharing users have to settle for much 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.

SELECTING A TIME-SHARING SERVICE

In most metropolitan areas of the United States, prospective time-sharing users can choose from literally dozens of suppliers. Choosing 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 time-sharing requirements in a reliable, economical manner.

1. *Get all the help you can.* Time-sharing is a complex, fast-changing field. Though the ultimate goal is to make life easier for computer users, selection of the most suitable commercial time-sharing 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 time-sharing seminars, talking with various time-sharing sales representatives, and studying their technical documentation. The services of an independent consulting firm with broad time-sharing experience can also be well worth their cost.
2. *Define your requirements.* Before shopping for time-sharing computer services, it’s essential to know what

you want them to do for you. Try to list all the reasonable applications for time-sharing 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 time-sharing can really save you money.

3. *Survey the available time-sharing services.* The first step in narrowing down the field is to find out which time-sharing 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 time-sharing companies, and the experience of any acquaintances who are using time-sharing. The salesmen for the various time-sharing 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 on 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? ➤

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

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

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

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

- To find out exactly what's involved in using each supplier's services.
- To determine the service availability, response time, and anticipated throughput that each supplier can deliver at both peak hours (usually around 10 to 11 a.m. and 3 to 4 p.m.) and off-peak times.
- To determine the cost factors for each service on the types of problems you'll be running regularly.

If you'll be writing your own programs, go ahead and prepare one or more of them, in the language of your choice. Then ask each of the prospective suppliers to loan you an appropriate terminal plus the computer time required to compile, test, and execute your programs. If you'll be using a ready-made application program supplied by the time-sharing 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



Time-sharing is alive and well in Canada, as exemplified by this view of Dataline Systems' dual DECSYSTEM-1050 installation in Toronto.

(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 time-sharing 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 time-sharing 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, ➤

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▷ 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 time-sharing company will ask you to sign its standard contract form. But that's not necessarily your best move. Time-sharing is such a buyer's market these days that 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' time-sharing 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 time-sharing service for your needs, it's unwise to assume that it will *continue* to represent your best choice. As a time-sharing network becomes more heavily loaded, its performance tends to degrade. As the network's saturation point is approached, the response times to each user's requests are likely to become unbearably long. In addition to user frustration, this condition leads to longer connect times and higher costs. Therefore, it's wise to rerun your benchmark problems every month or two under the original test conditions. This will enable you to spot any deterioration in the service and present your supplier with documentary evidence of the fact. If the supplier cannot satisfy you that the original quality of service will soon be restored, remember that numerous other suppliers are anxious for your business. And, if you've written your own programs and used one of the common programming languages, it should be relatively easy to make the switch.

THE COMPARISON CHARTS

The principal characteristics of 89 commercially available time-sharing services are presented in the accom-

panying comparison charts. Except where otherwise indicated, all information in the charts was furnished by the suppliers in October 1972; their close cooperation with the Datapro Research staff in the preparation of these charts is greatly appreciated.

DATAPRO 70 sent repeated requests for information to more than 200 companies known or believed to be in the time-sharing business. The 89 usable responses summarized in our charts represent a good cross-section of the commercial time-sharing services that are currently available in the United States and Canada. *The absence of any specific company from our charts means that the company either failed to respond to our repeated information requests or was unknown to us.*

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

General Information

Headquarters. This entry tells where each company's corporate headquarters are located. The company's computer facilities are in the same city unless otherwise indicated in the entries that follow. The firm's telephone number is also listed to aid you in obtaining further information.

Name of service. The name under which a company's commercial time-sharing services are marketed may or may not be the same as the corporate name. Where they differ, this entry indicates the name of the time-sharing 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.

Date operational. This entry tells when each company's time-sharing services first became available for regular commercial use. Most time-sharing 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 time-sharing 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 time-sharing 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. ▷

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▷ 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 time-sharing network. The cities in which the computers are located are also indicated whenever they differ from the locations of the company’s headquarters. 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 time-sharing 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 time-sharing 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 time-sharing 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 time-sharing system. The response time to each user’s requests will naturally tend to increase as the number of simultaneous users gets larger, and in many cases an attempt to serve the indicated number of simultaneous users will lead to response times which are far too long for effective conversational-mode use.

Conversational terminals supported. The specific remote terminals that each time-sharing 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 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 \$500 to \$950, depending on whether or not an integrated paper tape reader and punch and various options are included. The Model 35 terminals are functionally similar but are beefed up for heavy-duty usage, offer a broader range of options, and cost about three times as much as their Model 33 counterparts.

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

To capitalize upon the widespread acceptance of the Teletype Model 33 and 35 terminals, numerous peripheral equipment makers have introduced “Teletype-compatible” printers, display units, and other terminals which have the same interface characteristics and can utilize the same software support as the Teletype units. Many of these Teletype-compatible terminals are described in the Peripherals section of DATAPRO 70. Examples include the GE TerminiNet 300, Memorex 1200 Series, and UNIVAC DCT 500 terminals, plus these CRT display units: Computer Terminal Corporation’s Datapoint 3300, Courier’s Executerm I, and Hazeltine’s Model 2000. In general, any Teletype-compatible terminal can be connected to any time-sharing network that supports the Teletype Model 33 or 35 Teletypewriters—but it will generally not be possible to take advantage of the terminal’s higher speed and/or improved functional capabilities unless the time-sharing 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.

Other widely supported conversational terminals include the Datel Model 30 and 31 Terminals, the Singer 7102 (a Flexowriter with integral communications interface) and the Novar Communication Terminals; all are described in the Peripherals section of DATAPRO 70. In addition to these and other typewriter-style terminals, many time-sharing companies also support the use of CRT display units, digital plotters, and/or portable terminals.

Although many of the time-sharing 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. (Companies such as the RCA Service Company ▷

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▷ and the Western Union Data Services Company, for example, now supply and service the popular Teletype terminals).

Batch terminals supported. In addition to the low-speed, conversational-mode terminals which are usually associated with time-sharing, about half the companies surveyed in our charts 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 time-sharing computer systems by permitting the entry of previously recorded data and the printing of results at comparatively high speeds.

The most widely supported batch terminal is the IBM 2780 Data Transmission Terminal. Four models of the 2780 provide different combinations of card reading, card punching, and/or line printing capabilities, at transmission speeds ranging from 1200 to 4800 bits (150 to 600 characters) per second. Data is transmitted under IBM's Binary Synchronous Communications (BSC) line discipline technique in one of three codes: ASCII, EBCDIC, or Six-Bit Transcode. Rental prices for the 2780 range from about \$680 to \$1,255 per month, so its installation must be carefully justified by virtue of a real need for the faster input/output speeds it provides.

As in the case of the Teletype terminals, the widespread acceptance of the IBM 2780 has led to the introduction of competitive terminals which offer functional compatibility with the 2780, usually at lower prices. Examples include the Data 100 Model 70 and the Remcom 2780. Numerous "intelligent" (programmable) terminals, such as the Badger DTS-100, Data 100 Model 78, and Westinghouse 2550, can emulate the functions of the IBM 2780 and other popular batch terminals. And IBM itself recently introduced a pair of new terminals, the 2922 and 3780, which perform the same functions as the 2780 at substantially higher speeds.

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

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

Software

Conversational programming languages. This entry lists the programming languages offered by each company for

interactive use by customers at remote terminals. The term "conversational" implies a high degree of interaction between the programmer and the computer system throughout the program entry and debugging process.

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

FORTRAN and BASIC are by far the most popular conversational programming languages for time-sharing 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 time-sharing services. Like FORTRAN, BASIC was designed for scientific and mathematical programming but has also been successfully used for business data processing. Many of the time-sharing 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. ▷

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➤ APL is a comparatively new and noteworthy arrival on the time-sharing language scene. Conceived in the early 1960's by Dr. Kenneth E. Iverson of IBM, APL was designed to permit clear, concise expression of computational algorithms. APL's proponents claim (with some justification) that it is "more powerful than FORTRAN and easier to learn than BASIC." APL uses a much larger set of symbols and operators and a considerably different syntax than either FORTRAN or BASIC. Its facilities for handling vectors and arrays are especially powerful, yet simple to use. Some of the commercial implementations of APL include file-handling and formatting facilities that make them quite effective for business as well as scientific applications. The conciseness of the language, however, is a mixed blessing in that it often makes APL programs hard to read and comprehend. Moreover, nearly all of the current implementation 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 time-sharing companies offer a conversational-mode COBOL compiler.

Other general-purpose languages offered in conversational implementation include ALGOL, CAL, JOVIAL, and PL/1, together with a variety of symbolic assembly languages. In addition, many of the time-sharing 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 time-sharing 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 time-sharing companies.

Principal applications. For most time-sharing 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 time-sharing companies now offer a broad spectrum of programs to choose from.

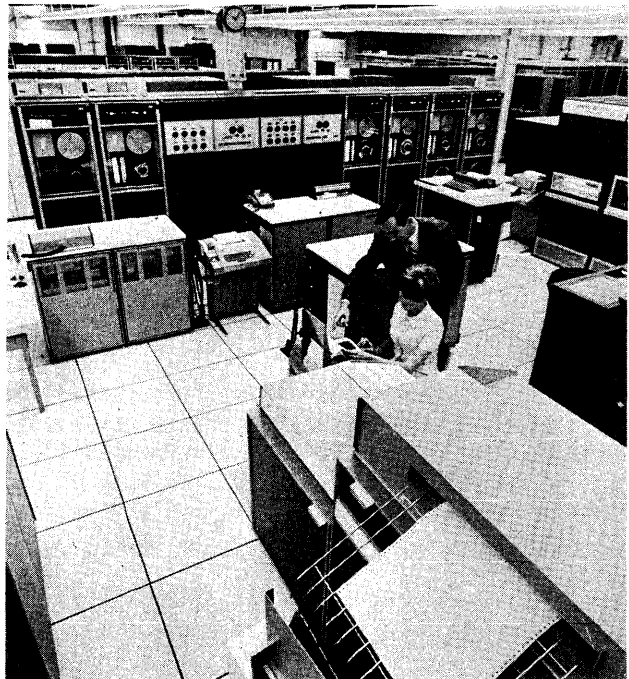
Because of space limitations, the main comparison charts show only the principal application areas supported by each company—and the entry "business & scientific" is used for the many suppliers that offer hardware and

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 time-sharing companies.

Charges

One of the most complex and confusing aspects of the current time-sharing 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 time-sharing companies impose no minimum monthly charge, while a few charge *only* a single, all-inclusive monthly service fee. 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. ➤



Multiple Honeywell computers in a "supercenter" in Cleveland provide the computing power for users of the General Electric Company's international Information Services Network.

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The economical Teletype Model 33 terminals (shown here with Teletype's new, cartridge-loaded Magnetic Tape Data Terminal) are by far the most widely used terminals for time-sharing applications.

- ▷ The principal pricing elements for each time-sharing company are summarized in the chart entries under the "Charges" heading. In all cases, the indicated rates are for conversational-mode service with low-speed terminals (usually 10 to 15 characters per second) during prime time. Many suppliers offer lower rates during non-prime hours, and discounts for volume usage are common. Remember that in addition to the charges listed in the charts, time-sharing users must bear the cost of their terminals, modems, and communication facilities.

Minimum monthly charge. This is the minimum charge, if any, that is imposed for each month of time-sharing 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 a low-speed terminal is "on-line" (i.e., connected to the central computer). Where terminals with speeds above 15 characters per second are supported, the associated connect-time charges are usually higher.

Central processor time. Most time-sharing 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.

Amount of "free" mass storage. This entry shows the amount of storage space, if any, on a random-access disc or drum unit at the central computer site that is available to each customer at no extra charge. Mass storage is useful, and in many cases vitally necessary, for on-line storage of programs and/or data files.

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

Comments

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

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COMPANY	ACTS Computing Corporation	Allen-Babcock Computing, Inc.	APL Services, Inc.	Applied Data Research, Inc.	Applied Logic Corporation
GENERAL					
Headquarters	Southfield, Mich. 48076	Los Angeles, Calif. 90067	Trenton, N.J. 08628	Princeton, N.J. 08540	Princeton, N.J. 08540
Name of service	(313) 557-6800 ACTS	(213) 277-1600 RUSH/RJE, RAIR	(609) 883-0050 APL/Services	(609) 921-8550 ADR Teleplex	(609) 924-7800 AL/COM
Date operational	Oct. 1968	Aug. 1966	July 1970	Nov. 1969	Late 1965
Areas currently served	Michigan, Ohio, Indiana, Illinois; multiplexers in L.A., Pittsburgh Chicago, Toledo, Schenectady, Okla. City, Grand Rapids	L.A., San Francisco, Phoenix, Portland, Seattle, Chicago, Philadelphia, New York, New Jersey, Connecticut	Middle Atlantic and New England states, Florida, and the Southwest	Contiguous 48 states; local service in Boston, New York, Philadelphia, Washington, D.C., and Chicago	Toll-free access in 19 states in the East, Mid-West, and Far West; service centers in 8 cities
EQUIPMENT					
Computers	Honeywell 265, 430, & 440 in Detroit; IBM 370/155 (HASP/RJE) in Grand Rapids	IBM 360/65 in Palo Alto (3000K bytes of core)	IBM 370/155 in Richmond, Va.	DEC PDP-10 (2)	DEC PDP-10 (9)
No. of simultaneous users	110 total	196 max. (100 at peak use)	96	64	200
Conversational terminals supported	TTY 33/35, IBM 2741, GE TerminiNet 300, Friden 7701, Dura, Datel, etc.	TTY 33/35/37, IBM 2741, Datel, Novar, AJ 630, etc.; various displays & plotters	IBM 2741 & compatible units, Memorex 1240, Tektronix 30 cps	Any full-duplex ASCII terminal at 10 or 30 cps	Virtually all ASCII terminals at 10 or 30 cps
Batch terminals supported	IBM 2780, IBM 360/20, Data 100, etc.	IBM 2780, Mohawk 2400, Westinghouse 2550, Data 100, etc.	—	Centronics 101 printer	IBM 2780 & compatible units
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, ALGOL	RUSH-PL/I, TSO FORTRAN, TSO BASIC, TSO COBOL	APL	FORTRAN, BASIC, COBOL, Macro-10, AID	FORTRAN, BASIC, COBOL, SNOBOL, LISP, Macro-10, AID
Batch-mode programming languages	FORTRAN, COBOL, PL/I, RPG, Assembler	FORTRAN, COBOL, PL/I, and all other OS/360 languages	FORTRAN, COBOL, PL/I, RPG, Assembler	FORTRAN, BASIC, COBOL, Macro-10	—
Principal applications	Business & scientific	Business & scientific	Business & scientific	Business & scientific	Business & scientific
CHARGES					
Minimum monthly charge	\$100	None	\$100	None	\$100 (after first 2 months)
Terminal connect time	\$5.00-15.00/hr.	See Comments	\$8.00/hr.	\$10.00/hr.	\$10.00/hr.
Central processor time	\$2.40-3.00/min.	See Comments	\$0.24-0.40/sec, depending on vol.	\$6.00/min. (8K)	\$0.10/"Core Unit"
Amount of "free" mass storage	None	100,000 bytes, for programs only	None	None	None
Charge for additional mass storage	\$1.00/1000 chars./month	\$0.033-0.06/7294 bytes/day	\$1.00/7200 chars./month	\$1.10/3200 chars./month	\$3.75/5120 chars./month
COMMENTS	Subsidiary of Lear Siegler, Inc. Also offers RJE and conventional batch processing.	Rates vary with core usage and monthly volume. Also offers TSO, RJE, and reduced "background" rate.	Offers large file capabilities and shared files for data base manipulation. Affiliated with The Computer Company.	Additional charge for peripheral I/O transfers.	Offers deferred unattended execution at reduced rates. Volume discounts of 40 to 70% on mass storage. Offers full ANS COBOL.

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COMPANY	Com-Share Limited	Control Data Corporation	Cybernetics Corporation	Data Resources Inc.	Dataline Systems Limited
GENERAL					
Headquarters	Rexdale, Ontario, Canada (416) 678-1363	Minneapolis, Minn. 55420 (612) 853-8100	Ann Arbor, Mich. 48103 (313) 769-6800	Lexington, Mass. 02173 (617) 861-0165	Toronto, Ontario, Canada (416) 964-9515
Name of service	Com-Share	Cybernet/KRONOS Time-Sharing	Cybernet	-	-
Date operational	Oct. 1969	Nov. 1971	Sept. 1969	Sept. 1969	Sept. 1969
Areas currently served	Ontario and Quebec	Continental U.S.	Michigan, Illinois, Wisconsin, Ohio, New York, N.J., Pennsylvania, & San Francisco	Continental U.S. through a multiplexer network	Toronto, Ottawa, Montreal, Sarnia, Calgary, Edmonton
EQUIPMENT					
Computers	Xerox Sigma 7	CDC 6400 (4); 1 in Los Angeles, 1 in Houston, & 2 in Washington, D.C.	DEC PDP-10 (5)	Burroughs B 5500 (2), B 5700 (2), & B 6700	DECsystem-1050 (2)
No. of simultaneous users	64	128/system	60/system	INA	INA
Conversational terminals supported	TTY 33/35/37, GE TerminiNet 300, Memorex 30/60 cps, Olivetti	TTY and all compatible units at 10 or 30 cps	TTY 33/35/37 & other ASCII terminals at 10, 15, or 30 cps; also IBM 2741, etc.	TTY and all compatible units to 300 bps	TTY 33/35, IBM 2741, and compatible units at 110 to 300 bps; all ASCII CRT's
Batch terminals supported	-	CDC 200 User, Terminal and compatible units	Cybernet Batch Terminal (own design)	Burroughs DC 1100	Honeywell G-115, UCC COPE 1210
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, SNOBOL, QED	FORTRAN, BASIC, COBOL	FORTRAN, BASIC, COBOL, Macro-10	FORTRAN, BASIC, COBOL, ALGOL, APL	FORTRAN, BASIC, COBOL, SNOBOL, AID, Macro-10, etc.
Batch-mode programming languages	FORTRAN, BASIC, COBOL, SNOBOL, QED	FORTRAN, BASIC, COBOL, Simscript 1.5, ALGOL, etc.	FORTRAN, BASIC, COBOL, Macro-10	FORTRAN, BASIC, COBOL, ALGOL, APL	FORTRAN, BASIC, COBOL, SNOBOL, LISP, Macro-10, etc.
Principal applications	Business & scientific	Business & scientific	Business & scientific	Business & scientific	Business & scientific
CHARGES					
Minimum monthly charge	\$100	None	None	None	None
Terminal connect time	\$8.00/hr. (avg.)	\$8.00/hr.	\$10.00/hr.	\$10.00/hr.	\$10.00/hr.
Central processor time	\$4.80/min. (avg.)	\$12.00/min.	See Comments	\$9.00/min.	\$6.67/min.
Amount of "free" mass storage	None	None	None	100,000 chars.	None
Charge for additional mass storage	\$0.30/1000 bytes/month	\$0.01/1280 char./day	\$0.12-1.00/1000 chars./month	\$1.00/1000 chars./month	\$0.20/640 chars./month
COMMENTS	Subsidiary in London, England has Xerox 940 and Xerox Sigma 9 computers.	CDC also offers remote batch processing through its nationwide Cybernet network of CDC 6600 and 3300 computers.	CP time charges based on \$0.02 per 4096 words per second. Rates are much lower during non-prime hours.	Charges subscription fee of \$1,500 to \$16,000/year. B 6700 CP time costs \$36.00/minute.	CP charge is higher when more than 16K words are used. Rates are much lower during non-prime hours.

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COMPANY	Datalogics, Inc.	Dialcom, Inc.	Distronics Corporation	First Data Corporation	General Electric Company
GENERAL					
Headquarters	Cleveland, Ohio 44120	Silver Spring, Md. 20910	Cherry Hill, N.J. 08002	Waltham, Mass. 02154	Bethesda, Md. 20014
Name of service	(216) 721-9035 DL/70	(301) 588-1572	(609) 667-6233	(617) 890-6701	(301) 654-9360 Mark III
Date operational	March 1969	July 1969	July 1968	1970	Oct. 1965
Areas currently served	Northern Ohio	Washington, D.C., Baltimore, & Philadelphia	Northeastern quarter of U.S.	New England New York, New Jersey, Washington, D.C., Maryland, & Virginia	Continental U.S., Alaska, Puerto Rico, Canada, and Western Europe; local-call access in over 250 cities
EQUIPMENT					
Computers	Xerox Sigma 7	Honeywell 1648 (2)	IBM 360/40	DEC PDP-10 (3)	Nearly 100 central & communications processors in one "supercenter" near Cleveland, Ohio
No. of simultaneous users	40	64/system	40	96	INA
Conversational terminals supported	TTY 33/35, GE TermiNet 300, Datapoint 3300, Hazeltine 2000, Memorex 1240, etc.	TTY and other ASCII terminals at 10 or 30 cps; IBM 2741-type units at 134.5 bps	IBM 2740	All TTY models, IBM 2741, Datel, Execuport, Datapoint 3300, Hazeltine 2000, etc.	ASCII terminals at 10, 15, or 30 cps; Correspondence or EBCDIC terminals at 14.8 cps
Batch terminals supported	Xerox 7670	—	—	UNIVAC DCT 2000, DC75	IBM 2780, Data 100, IBM 360 & 370 computers
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, Proforma-70	FORTRAN, BASIC, COBOL, DAP, EDIT, TEACH, SOLVE	Formatted English	FORTRAN, BASIC, COBOL, ALGOL, AID, LISP, SNOBOL, Macro-10, etc.	FORTRAN, BASIC, editors, data management facilities
Batch-mode programming languages	FORTRAN, COBOL, Metasymbol, Manage, etc.	—	—	FORTRAN, BASIC, COBOL, ALGOL, SNOBOL, Macro-10, etc.	FORTRAN, COBOL
Principal applications	Business & scientific	Business & scientific	Distribution (see Comments)	Business & scientific	Business & scientific
CHARGES					
Minimum monthly charge	None	\$25	Varies	None	\$100
Terminal connect time	\$9.00/hr.	\$6.00/hr.	Not applicable	\$7.50/hr. max.	\$7.00/hr. base
Central processor time	\$4.80/min.	No charge	Not applicable	\$3.00-15.00/hr.	\$0.33/"CRU"
Amount of "free" mass storage	None	None	Not applicable	See Comments	None
Charge for additional mass storage	\$0.50/2048 chars./month	\$0.50/512 chars./month	Not applicable	\$0.50/1000 chars./month	\$0.20/320 36-bit words/mo.
COMMENTS	Offers local and remote batch processing.	Offers special rates for large data bases and dedicated ports.	Offers on-line accounting and inventory control services for distributors. Subsidiary of Western Union.	No charge for 1,000,000-char. scratch files used during daytime. Volume discounts on mass storage.	Also offers Mark I, a less powerful service, and Mark Delta, for data handling involving large files. Over 400 programs available.

All About Computer Time-Sharing Services

COMPANY	Genesee Computer Center, Inc.	Grumman Data Systems Corporation	Honeywell Information Systems, Inc.	Information Systems Design, Inc.	Interactive Data Corporation
GENERAL					
Headquarters	Rochester, N.Y. 14605 (716) 232-7050	Bethpage, N.Y. 11714 (516) 575-3282	Minneapolis, Minn. 55408 (612) 332-5200	Oakland, Calif. 94621 (415) 562-4204	Waltham, Mass. 02154 (617) 890-1234
Name of service	GCC	CALLDATA	DATANETWORK	ISD	—
Date operational	Aug. 1968	Feb. 1970	Aug. 1968	June 1968	Dec. 1968
Areas currently served	Upstate New York plus "all major cities in U.S."	New York metropolitan area and New England	Entire U.S.; service in most large cities plus INWATS	West Coast—San Diego to Vancouver	Northeast, Mid Atlantic, Northern Midwest, Los Angeles, and San Francisco
EQUIPMENT					
Computers	CDC 6400's in Houston, L.A., & Washington, D.C.; CDC 3500 in Toronto; Xerox 940 in Philadelphia	IBM 360/67	Honeywell 6000 (1) and 1648A (4)	UNIVAC 1108 (2)	IBM 360/67 (3); 2 in Waltham, 1 in San Francisco
No. of simultaneous users	Differs for each system	60	250 on 6000, 256 on 1648A's	45	INA
Conversational terminals supported	TTY 33/35 and all compatible units	IBM 2741, TTY 33/35, and equivalent units	TTY and all compatible units at 10, 15, or 30 cps; Honeywell VIP displays; IBM 2741	TTY and other ASCII units at 10, 15, 30, 60, or 120 cps	TTY 33/35, IBM 2741, Datapoint 3300, Memorex 1240, Execuport, etc.
Batch terminals supported	IBM System/3 & 1130, CDC 200, UNIVAC 9200	—	Honeywell Series 100, 200, 400, 58, 316 & 516 computers; Mohawk 2400	UNIVAC 1004, 9200, & 9300; IBM 1130, UCC COPE, M&M, etc.	IBM 2780, Data 100, Remcom, etc.
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, ALGOL, CAL	FORTRAN, COBOL, BASIC, PL/I	FORTRAN, BASIC, TEACH, SOLVE, data-BASIC, Text Editor, etc.	—	FORTRAN, BASIC, COBOL, PL/I, etc.
Batch-mode programming languages	FORTRAN, BASIC, COBOL, ALGOL	FORTRAN, COBOL, BASIC, PL/I, Assembler	FORTRAN, COBOL, ALGOL, JOVIAL, GMAP, COBOL/IDS	FORTRAN, COBOL, SNOBOL, etc.	FORTRAN, BASIC, COBOL, PL/I, Assembly
Principal applications	Business & scientific	Business & scientific	Business & scientific	Business & scientific	Business & scientific
CHARGES					
Minimum monthly charge	\$200 (no minimum for batch service)	\$50 if any service is rendered	\$90	\$30	None
Terminal connect time	\$8.00-15.00/hr.	\$7.50/hr.	\$5.00-13.00/hr.	\$4.00/hr.	\$10.00/hr.
Central processor time	\$2.75-12.00/min.	\$21.00/min.	\$2.40-3.00/min. (1648A computers)	\$13.00/min.	\$16.80/min.
Amount of "free" mass storage	0-20,000 chars.	None	None	None	None
Charge for additional mass storage	\$0.30-1.00/1000 chars./month	\$12.50/120K bytes/month	\$0.08-1.00/1000 chars./month	\$9.00/86,056 chars./month	\$10.00-20.00/120K bytes/month
COMMENTS	Sells time on CDC, Megasystems, and Multiple Access systems, plus applications services. Rates depend upon system used.	Features automatic interaction with an IBM 360/75 for efficient execution of TS-developed programs.	Offers a broad range of services, including common-file data base management. Service available 24 hours/day, 7 days/week.	Substantial financial discounts. Lower rates for non-prime time.	Offers on-line financial data bases with proprietary software for accessing and processing the data.

All About Computer Time-Sharing Services

COMPANY	Interactive Sciences Corporation	International Timesharing Corporation	ISC Corporation	ITT Data Services	Kaman Aerospace Corporation
GENERAL Headquarters	Braintree, Mass. 02184 (617) 848-2660 ISC/10	Chaska, Minn. 55318 (612) 448-3061 —	Denver, Colo. 80210 (303) 985-1738 —	Paramus, N.J. 07652 (201) 262-8700 Reactive Terminal Service (RTS)	Bloomfield, Conn. 06002 (203) 242-4461 Kaman TS Systems
Name of service					
Date operational	May 1969	May 1968	May 1972	March 1968	Aug. 1971
Areas currently served	Boston, New York, Washington, D.C., & Pittsburgh regions plus national INWATS service	Minneapolis, St. Paul, San Francisco, L.A., Chicago, New York, Boston, Philadelphia, Milwaukee, etc.	Continental U.S.	Continental U.S.	Central Connecticut
EQUIPMENT Computers	DEC PDP-10 (2)	CDC 3300 (2)	Xerox Sigma 5	IBM 360/65, IBM 370/155, IBM 360/40, IBM 360/30	HP 2116
No. of simultaneous users	128	130	48	INA	32
Conversational terminals supported	Any ASCII, BCD, EBCDIC, or Correspondence device at 10, 15, or 30 cps	TTY 33/35, IBM 2741, and compatible units at 10, 15, or 30 cps	Any ASCII terminal at 10, 30, or 120 cps	TTY 33/35/37/38, IBM 2740 & 2741, IBM 1050, GE TermiNet 300, Execuport, etc.	Any ASCII terminal at 10 or 30 cps
Batch terminals supported	—	—	Any ASCII terminal at 10, 30, or 120 cps	—	—
SOFTWARE Conversational programming languages	FORTRAN, BASIC, COBOL, LISP, AID, Macro-10	FORTRAN, BASIC, Assembly, EDIT, DEBUG	FORTRAN	FORTRAN, BASIC, COBOL, Assembler	BASIC
Batch-mode programming languages	FORTRAN, BASIC, COBOL, LISP, Macro-10	—	FORTRAN	—	—
Principal applications	Business & scientific	Business & scientific	Contractors (see Comments)	Business & scientific	Business & scientific
CHARGES Minimum monthly charge	None	None	\$100	None	None
Terminal connect time	\$6.00-9.00/hr.	\$10.00/hr.	See Comments	\$10.00/hr.	\$5.50/hr.
Central processor time	\$0.60/min./1024 words core (approx.)	\$0.12/"CRU"	See Comments	\$0.03/"Computer Work Unit"	No charge
Amount of "free" mass storage	None	None	1,000,000 chars.	60,000 bytes	None
Charge for additional mass storage	\$0.30/640 chars./month	\$0.15-0.60/640 chars./month	\$0.10/1000 chars./month	\$0.01/"Storage Unit"/day	\$0.10/512 bytes/month
COMMENTS	Offers deferred processing, bulk usage plans, and library of financial planning packages.	Offers contract programming services.	Designed specifically for construction contractors. Charges are based upon activity as measured by various I/O volumes.	A division of International Telephone and Telegraph Corp.	Will install HP System 3000 in May 1973.

All About Computer Time-Sharing Services

COMPANY	Keith Lawrence Associates, Inc.	Keydata Corporation	Leasco Response, Inc.	Management Systems Corporation	Mark/Ops
GENERAL Headquarters	Bowie, Md. 20715 (301) 261-3729	Watertown, Mass. 02172 (617) 924-1200	Bethesda, Md. 20016 (301) 657-1840	Salt Lake City, Utah 84103 (801) 363-1511	Boston, Mass. 02215 (617) 266-1930
Name of service	GOSSIP, QUIL, Civil Engineering	Keydata	Response/360, Response I	—	Mark/Ops
Date operational	Dec. 1971	1965	1969	Jan. 1970	March 1967
Areas currently served	Middle Atlantic States plus N.Y. & Connecticut	Continental U.S. & Eastern Canada; message concentrators in 14 cities	Eastern and Midwestern U.S. plus Los Angeles; facilities in over 20 cities	Salt Lake City & Intermountain Area	Eastern Mass., Rhode Island, New York City area, & Eastern New Jersey
EQUIPMENT Computers	Sells specific applications only, on Honeywell 635 & Burroughs B 5500	UNIVAC 494 (2)	IBM 360/65 in Bethesda; HP 2116 in each branch office	IBM 360/65	DEC PDP-10
No. of simultaneous users	INA	600	INA	100	64
Conversational terminals supported	ASCII terminals	TTY 28, GE TermiNet 300, Datapoint 3300, Tymshare 100	All 10 cps ASCII and 30 cps terminals, IBM 2741	IBM 2741, Trendata 1000	TTY, IBM 2741, & compatible units
Batch terminals supported	—	—	—	—	—
SOFTWARE Conversational programming languages	Offers standard applications only	Offers standard commercial applications only	BASIC, FORTRAN, PL/I	APL	FORTRAN, BASIC, COBOL, LISP, AID, Macro-10, Proforma
Batch-mode programming languages	—	—	—	—	FORTRAN, COBOL, Macro-10
Principal applications	See Comments	Business	Business & scientific	Business & scientific	Business & scientific
CHARGES Minimum monthly charge	None	None	\$100	None	None
Terminal connect time	\$10.00-12.00/hr.	See Comments	\$9.00/hr.	\$3.75/hr.	\$7.50/hr.
Central processor time	\$12.00/min.	See Comments	\$18.00/min.	\$8.40/min.	\$0.0125/1024 36-bit words/sec
Amount of "free" mass storage	None	See Comments	None	72K bytes	None
Charge for additional mass storage	\$1.00/1280 chars./month	See Comments	\$0.35/half track/month	\$5.00/36K bytes/month	\$0.50/1000 bytes/month
COMMENTS	Offers programs for file/record management and IR, general accounting, and civil engineering.	Dedicated system for business data processing applications. Charges are based upon usage.	Rates shown are for Response/360 service. Response I service on HP 2116 costs \$6-8/hr. of connect time. (Information supplied in Nov. 1971).	Offers Text Processing System (TPS) to facilitate preparation of publications, proposals, etc.	Division of Northeastern Systems Associates, Inc. Lower rates for non-prime time.

All About Computer Time-Sharing Services

COMPANY	McDonnell Douglas Automation Co.	Megasystems, Inc.	Merlin Systems Corporation	Metridata Computing, Inc.	Multiple Access Limited
GENERAL					
Headquarters	St. Louis, Mo. 63166	Bala Cynwyd, Pa. 19004	Roslyn, N.Y. 11576	Louisville, Ky. 40221	Don Mills, Ontario, Canada
Name of service	(314) 232-7268 Direct Access Computing	(215) 667-1700	(516) 484-4545	(502) 361-7161 Metrinet-400	(416) 443-3900
Date operational	Jan. 1968	Jan. 1968	Jan. 1970	Jan. 1969	Oct. 1969
Areas currently served	New York, Chicago, Washington, D.C., Detroit, Houston, Denver, St. Louis, Los Angeles, & San Francisco	Middle Atlantic States, especially New York City, Philadelphia, and Harrisburg	Continental U.S.; toll-free access from all zones	Kentucky, Ohio, & Indiana	All of Canada & Northeastern U.S.
EQUIPMENT					
Computers	Xerox Sigma 7 (2)	XDS 940	Burroughs B 5500 (2)	Honeywell 430	CDC 3500, CDC 6600
No. of simultaneous users	128	52	50	40	48 on CDC 3500, 32 on CDC 6600
Conversational terminals supported	TTY, IBM 2741, compatible units, & graphic CRT's at 10, 15, or 30 cps	TTY 33/35/37, IBM 2741, Data-point 3300, UNIVAC DCT 500 & 1000, etc.	Any ASCII terminal at 10 or 30 cps, including Hazeltine & ARDS graphic terminals	Any ASCII terminal at 10 or 30 cps	TTY and all compatible units at 10 or 30 cps
Batch terminals supported	—	—	—	—	IBM 360/20 & 1130, UNIVAC 9200, Mohawk 2400, CDC 200, etc.
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, Assembly	FORTRAN, BASIC, CAL, TAP	FORTRAN, BASIC, COBOL, ALGOL	FORTRAN, BASIC	FORTRAN, BASIC, COBOL, Assembler
Batch-mode programming languages	FORTRAN, BASIC, COBOL, Assembly	FORTRAN, TAP	FORTRAN, BASIC, COBOL, ALGOL	—	FORTRAN, BASIC, COBOL, Assembler, Simscript
Principal applications	Business & scientific	Business & scientific	Financial & statistical	Business & scientific	Business & scientific
CHARGES					
Minimum monthly charge	None	\$200	None	None	\$10
Terminal connect time	\$8.00/hr.	\$11.00/hr.	\$10.00/hr.	INA	\$3.50-12.00/hr.
Central processor time	\$12.00/min.	\$2.75/min.	\$10.00/min.	INA	\$0.167-0.43/sec.
Amount of "free" mass storage	None	20,000 chars.	None	INA	10 million chars. (scratch files only)
Charge for additional mass storage	\$0.40/1024 bytes/month	\$1.00/1000 chars./month	\$0.15-0.50/1000 chars./month	INA	\$0.20/1000 chars./month
COMMENTS					
	Batch-mode CP time costs \$6.00/minute. Time-sharing users can submit batch jobs; files and languages are compatible.	Accounting packages priced on transaction basis.	Offers on-line financial data bases of securities and commodities prices. Subsidiary in Los Angeles area.	Rapidata Inc. announced an agreement in principle to acquire Metridata in November 1972.	High-speed link between CDC 3500 and 6600 gives all users on-line access to both systems; 6600 has remote job entry capabilities.

All About Computer Time-Sharing Services

COMPANY	National CSS, Inc.	Ohio Valley Data Control, Inc.	On-Line Business Systems, Inc.	On-Line Systems, Inc.	Pacific International Computing Corp.
GENERAL					
Headquarters	Norwalk, Conn. 06851	Belpre, Ohio 45714	San Francisco, Calif. 9411	Pittsburgh, Pa. 15229	San Francisco, Calif. 94119
Name of service	(203) 853-7200 VP/CSS	(614) 423-9501 See Comments	(415) 391-9555 —	(412) 931-7600 —	(415) 764-9126 COMSPEC, ATS/360, Honeywell TSS
Date operational	Dec. 1968	June 1972	Jan. 1972	1968	1969
Areas currently served	North Atlantic & Middle Atlantic States, Mid-West, West Coast, Arizona, England, & Canada	Ohio, West Virginia, & Western Pennsylvania	Northern California (available in all 50 states)	Eastern, Mid-Western, and Southern U.S.; toll-free access from 18 cities	San Francisco, L.A., Boston, New York, Washington, D.C., Phila., Chicago, Dayton, & Ann Arbor
EQUIPMENT					
Computers	IBM 360/67 (5); 2 duplex systems in Stamford, Conn.; simplex system in Sunnyvale, Calif.	Burroughs B 3500 (2)	IBM 370/145	DEC PDP-10 (4)	Honeywell 635 in San Francisco, IBM 360/50 in New York
No. of simultaneous users	320 in Conn. & 65 in Calif.	80	125	240	40 in San Francisco, 176 in N.Y.
Conversational terminals supported	TTY 33/35, IBM 2741-type, Execuport, Hazeltine 2000, Datapoint 3300, Memorex 1240/1280	Various Burroughs terminals and cash dispensing devices	IBM 2260, 3270, & 2740	TTY 33/35/37, IBM 2741, Datel, Datapoint 3300, Hazeltine 2000, Execuport, etc.	TTY 33/35, IBM 2741, Datel, Novar, AJ 841, Datapoint 3300, Trendata
Batch terminals supported	IBM 1130 & 2780, Data 100, Remcom, UNIVAC DCT 2000	Burroughs B345	IBM 2780	Data 100	Honeywell G-105 & G-115
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, COBOL, PL/I, Assembler	FORTRAN, COBOL	—	FORTRAN, BASIC, COBOL, APL, AID, Macro-10, etc.	FORTRAN, BASIC
Batch-mode programming languages	FORTRAN, BASIC, COBOL, PL/I, Assembler	FORTRAN, COBOL	—	FORTRAN, BASIC, COBOL	FORTRAN, COBOL, GMAP
Principal applications	Business & scientific	Business & cash dispensing	Custom-developed business systems	Business & scientific	Construction & text editing
CHARGES					
Minimum monthly charge	None	\$320 to \$720	None	\$5/user no.	\$100
Terminal connect time	\$10.00/hr.	\$10.00-12.00/hr.	See Comments	\$10.00/hr.	\$2.50-10.00/hr.
Central processor time	\$22.80/min.	Approx. \$2.00/min.	\$3.60/min.	\$0.05/"CP Unit"	\$0.20-0.25/sec.
Amount of "free" mass storage	None	500,000 bytes	None	None	None
Charge for additional mass storage	\$20.00/120K bytes/month	\$10.00/100K bytes/month	\$0.10/1000 bytes/month	\$0.05/3200 chars./day	\$0.24/1550 chars./month
COMMENTS	CP charges are for time spent in pure problem state. Offers remote OS batch with on-line, JCL syntax checking.	Offers time-sharing plus "Mister Cash" on-line cash dispensing service for banks. Cash terminal connect charge is \$1.00/hour.	Develops on-line systems for specific business applications. Users are charged on a transaction basis.	Service available 24 hours/day, 7 days/week. Offers on-line data management system.	Specializes in COMSPEC service for construction industry and ATS/360 text editing system.

All About Computer Time-Sharing Services

COMPANY	PHI Computer Services, Inc.	Philco-Ford Corporation	Profile Technology, Inc.	Programs & Analysis, Inc.	Proprietary Computer Systems, Inc.
GENERAL					
Headquarters	Arlington, Mass. 02174 (617) 648-8550	Ft. Washington, Pa. 19333 (215) 248-2334	Collegedale, Tenn. 37315 (615) 396-3131	Burlington, Mass. 01803 (617) 272-7723	Van Nuys, Calif. 91406 (213) 781-8221
Name of service	WYLBUR, Remote Job Entry	Computer Services Network (CSN)	The Computer Spectrum	—	PCS/APL
Date operational	April 1972	Jan. 1969	1972	1968	Oct. 1968
Areas currently served	New England, New York, and Washington, D.C.	Delaware Valley, New York City, Northern N.J. Washington, D.C. Chicago, Detroit, and Baltimore	Southeastern U.S.	New England, Cincinnati, Dayton, & New York metro- politan area	West Coast, Moun- tain States, Mid- West, and Eastern Seaboard
EQUIPMENT					
Computers	IBM 360/65	Burroughs B 5700 (2) and B 6700, Honeywell 635	HP 2000F	Honeywell 430, Honeywell 6000	IBM 360/65
No. of simultaneous users	300	100 total	32	30 on 430, 50 on 6000	160
Conversational ter- minals supported	TTY, IBM 2741, and compatible units, including CRT's	TTY and all com- patible units at 110 or 300 bps	TTY and other ASCII terminals	TTY and all com- patible units	IBM 2741, A-J, Novar, Datel, Trendata, etc.
Batch terminals supported	IBM 360/370, IBM 2780, and compatible units	Burroughs DC 1000, Honeywell G-115	NCR printers & card readers, etc.	Honeywell G-105 & G-115, Data 100, IBM 360/20, Mo- hawk 2400, etc.	IBM 2780, 3780, or equivalent
SOFTWARE					
Conversational pro- gramming languages	WYLBUR (similar to PL/I)	FORTRAN, BASIC, COBOL, ALGOL	FORTRAN, BASIC	FORTRAN, BASIC	APL, ATS, BASIC
Batch-mode program- ming languages	FORTRAN, COBOL, PL/I, BASIC, ALGOL, Assembly, etc.	FORTRAN, BASIC, COBOL, ALGOL	FORTRAN, Assembly	FORTRAN, COBOL, GMAP	FORTRAN, COBOL, PL/I, etc.
Principal applications	Business & scientific	Business & scientific	Business & scientific	Business	Business & scientific
CHARGES					
Minimum monthly charge	None	None	\$70	See Comments	None
Terminal connect time	\$8.00/hr.	\$9.00/hr.	\$7.00/hr.	See Comments	\$10.00-11.00/hr.
Central processor time	\$6.00/min.	\$7.20/min.	No charge	See Comments	\$18.00/min.
Amount of "free" mass storage	None	75,000 chars.	None	See Comments	48,000 chars.
Charge for additional mass storage	\$12.00/145K bytes/month	\$0.50/1000 chars./month	\$1.00/3000 chars./month	See Comments	\$1.75/7294 chars./month
COMMENTS	Offers RJE/HASP service for remote batch processing. WYLBUR language permits data file editing, debugging, and job submission.	Lower rates for non-prime time. Volume discounts on processing and storage. Dedicated lines available at fixed monthly fee.		Handles business applications in on- line or remote batch mode. Ser- vices are priced on a per-transaction basis.	Rates shown are for APL & BASIC; 1 CP minute is free with each 4 con- nect hours. Lower rates for ATS text editing system.

All About Computer Time-Sharing Services

COMPANY	Rapidata, Inc.	Registration, Inc.	Remote Computing Corporation	Scientific Process & Research, Inc.
GENERAL				
Headquarters	Fairfield, N. J. 07006 (201) 227-0035	New Ipswich, N.H. 03071 (603) 878-1000 REG-IDENT	Palo Alto, Calif. 94301 (213) 629-2532 RCC Network	Highland Park, N.J. 08904 (201) 846-3477 SPR
Name of service	—	—	—	—
Date operational	Sept. 1967	April 1972	Oct. 1968	1969
Areas currently served	Continental U.S.; technical support in New York, New Jersey, Boston, Phila., Atlanta, & California	New England	Local coverage throughout Calif.; nationwide tollfree INWATS service	Mid-Atlantic & Mid- Western States
EQUIPMENT				
Computers	Honeywell 437 (10)	DEC PDP-11/20	Burroughs B 5700 (4); 2 in Palo Alto, 2 in Los Angeles	DEC PDP-10 (2) in Princeton, N. J.
No. of simultaneous users	48/system	45	32/system	60
Conversational terminals supported	All ASCII terminals at 10 & 30 cps; BCD terminals at 13.5 & 15 cps	TTY and other ASCII terminals at 110 bps	TTY 33/35/37, IBM 2741, and compatible units at 110 to 1200 bps	TTY 33/35 and other ASCII terminals at 10 or 30 cps
Batch terminals supported	IBM 2780 and compatible units; Tempo terminals	OCR & paper tape units	Support will be available in 1st quarter of 1973	—
SOFTWARE				
Conversational programming languages	FORTRAN BASIC, COBOL, Assembly, Rapidata RPG	BASIC Assembly	FORTRAN, BASIC, COBOL, ALGOL	FORTRAN BASIC, COBOL, Macro-10, etc.
Batch-mode programming languages	FORTRAN	—	FORTRAN, BASIC, COBOL, ALGOL	—
Principal applications	Business & scientific	Mailing lists & trade shows	Business & scientific	Engineering & simulation
CHARGES				
Minimum monthly charge	\$10	See Comments	None	None
Terminal connect time	\$11.00/hr.	See Comments	\$7.00/hr.	\$10.00/hr.
Central processor time	\$0.06/"CPU"	See Comments	\$7.20/min.	\$2.25-22.50/min.
Amount of "free" mass storage	None	See Comments	None	None
Charge for additional mass storage	\$ 0.60/1000 chars./month	See Comments	\$0.01-0.04/2400 chars./day	\$1.10/3200 chars./month
COMMENTS	Offers discounts on non-prime time, educational & volume usage. Supports Memorex terminals at 60 & 120 cps.	Specializes in mailing lists & subscription fulfillment and in trade show registration. Charges vary for each job.	Connect charge ranges from \$7/hr. at 110 bps to \$25/ hr. at 1200 bps. Rates are 40% lower after 5 p.m.	Offers simulators for plastics processing.

All About Computer Time-Sharing Services

COMPANY	Scientific Time Sharing Corporation	Sci-Tek, Inc.	The Service Bureau Corporation	Statistical Computing Center, Inc.	Statistical Tabulating Corporation
GENERAL					
Headquarters	Bethesda, Md. 20014 (301) 657-8220 APL Plus	Wilmington, Del. 19806 (302) 658-2431 —	Harrison, N.Y. 10528 (914) 696-3697 Call/370	Oklahoma City, Okla. 73105 (405) 528-7741 —	Chicago, Ill. 60606 (312) 346-7300 STAT:COM
Name of service					
Date operational	Aug. 1969	Jan. 1967	June 1968	Jan. 1969	Oct. 1969
Areas currently served	Continental U.S.; local service in New York, Boston, Atlanta, Dallas, L.A., San Francisco, & 15 other cities	Eastern Seaboard	Continental U.S.; 51 local dial points in 25 states; sales offices in 22 cities	Mid-Western States	Continental U.S.
EQUIPMENT					
Computers	IBM 370/145	UNIVAC 1108 (2); one in Wilmington and one in Mineola, N.Y.	IBM 370/155 (5) in Cleveland	Honeywell 3200	IBM 360/65
No. of simultaneous users	128	128 total	Over 600	Approx. 100	64
Conversational terminals supported	IBM 2741, A.J, Datel, Novar, Memorex 1240, Hazeltine 2000, Tektronix 4013	TTY 33/35, IBM 2741, UNIVAC DCT 500, etc.	IBM 2741 and equivalent units, TTY 33/35, and 300-bps ASCII terminals	Bunker Ramo 370, Memorex 1240	TTY 33, IBM 2741, Novar, Hazeltine 2000, Memorex 1240
Batch terminals supported	IBM 2780, Data 100	UNIVAC 1004, 9000, DCT 2000; IBM 2780, 1130 etc.	IBM 2780 and equivalent units	—	IBM 2770, 2780 360/20, & System/3; NCR Century 50, Data 100, etc.
SOFTWARE					
Conversational programming languages	APL	BASIC, RALPH	FORTRAN, BASIC, PL/I	COBOL, Easycoder	HyFaster II
Batch-mode programming languages	APL	FORTRAN, COBOL, SLEUTH	FORTRAN, BASIC, PL/I	COBOL, Easycoder	FORTRAN, COBOL, PL/I, ADPAC, RPG, Assembly
Principal applications	Business & scientific	Business & scientific	Business & scientific	Business & financial	Business & scientific
CHARGES					
Minimum monthly charge	None	None	\$100	\$500	None
Terminal connect time	\$12.00/hr.	\$10.00/hr.	\$11.00-12.50/hr.	See Comments	\$10.00/hr.
Central processor time	\$10.80/min.	\$12.00/min.	\$0.62/second	See Comments	\$11.00/min.
Amount of "free" mass storage	None	None	None	See Comments	None
Charge for additional mass storage	\$165.00/million bytes/month	\$0.04/1792 words/day	\$1.50/3400 bytes/month	See Comments	\$0.25/7294 bytes/week
COMMENTS	APL Plus File Sub-system facilitates processing of large shared files and data bases.	Offers APT, NAS-TRAN, graphics systems, file management system, and Securities Validation System.	Subsidiary of IBM. Offers conversational time-sharing, remote batch, and local batch service. Wide range of pricing plans.	Offers insurance, billing, and credit union/savings & loan services. Charges are based on number of transactions.	Offers System/360 remote job entry services. Central processor and I/O charges vary with core usage.

All About Computer Time-Sharing Services

COMPANY	Structural Dynamics Research Corp.	Systems Dimensions Limited	Technical Advisors, Inc.	Technology for Information Management, Inc.	Tel-A-Data, Inc.
GENERAL					
Headquarters	Cincinnati, Ohio 45227	Ottawa, Ontario, Canada	Wayne, Mich. 48184	Albany, N.Y. 12205	Miami, Fla. 33169
Name of service	(513) 272-1100 SDRC Computer Operations	(613) 731-6910 SDL Computer Services	(313) 722-5010 TECH-MAC	(518) 869-0928 TIM-Sharing	(305) 625-8266 Tel-A-Data
Date operational	Jan. 1969	July 1969	June 1967	Sept. 1968	Dec. 1966
Areas currently served	Nationwide access	Canada and North-eastern U.S.	Continental U.S. except Alaska (toll-free except in Michigan)	New York State	South Atlantic States
EQUIPMENT					
Computers	CDC 6500 in Pittsburgh; CDC 6600 in Minneapolis; Xerox 940 in Ann Arbor; etc.	IBM 360/85	Varian 620i (2); 1 in Wayne, 1 in Phoenix, Ariz.	Honeywell 440 in Detroit	Burroughs B 500
No. of simultaneous users	Varies with system	45 to 50	16 in Wayne, 6 in Phoenix	50	64
Conversational terminals supported	TTY 33/35 and other ASCII terminals at 10 or 30 cps	IBM 2741, 2740, and 1050	TTY 33/35 or equivalent	TTY 33/35 and other ASCII terminals at 10 or 30 cps	TTY 33/35, GE TermiNet 300, Burroughs TC 500
Batch terminals supported	CDC 200 & 1700, IBM 1130, Data 100, Mohawk 2400, UNIVAC 9200, etc.	IBM 360/20 & up, IBM 1130, 2770, 2780, 2933, 3780; UNIVAC 9200, etc.	—	—	—
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC	CRBE	—	FORTRAN, BASIC	Assembler
Batch-mode programming languages	FORTRAN, BASIC, COBOL, ALGOL, Assembly	FORTRAN, COBOL, PL/I, ALGOL, Assembly, etc.	—	—	—
Principal applications	Engineering & business	Business & scientific	Civil engineering & surveying	Business & scientific	Business
CHARGES					
Minimum monthly charge	None	\$60	None	\$25	\$1,000
Terminal connect time	\$9.50-13.00/hr.	Varies with type	\$11.00-30.00/hr.	\$10.00/hr.	No extra charge
Central processor time	\$1.80-24.00/min.	\$1200.00/task hour	No charge	\$3.00/min.	No extra charge
Amount of "free" mass storage	None	None	None	None	Varies with contract
Charge for additional mass storage	\$0.10-1.75/1000 chars./month	\$2.00/million bytes/day	\$12.50/1000 words/month	\$0.75/1000 chars./month	\$0.25/300 chars./month
COMMENTS	Sells time on U.S. Steel, CDC, ACTS, Com-Share, and Metridata systems. Features mechanical design & structural analysis programs.	Offers System/360 remote job entry services under OS/MVT.	Offers specialized services for civil engineers and surveyors only. \$25 initiation fee. Plotter available at \$30/hour.	Offers services on ACTS system. \$50 initiation fee. Reduced rates for non-prime hours and volume usage.	Main emphasis is on statistical reports and inventory control. Monthly charge includes CP and connect time.

All About Computer Time-Sharing Services

COMPANY	Telstat Systems, Inc.	Time Sharing Resources, Inc.	TransNet Corporation	Tymshare, Inc.	United Computing Systems, Inc.
GENERAL					
Headquarters	New York N.Y. 10022	Great Neck, N.Y. 11022	Union, N.J. 07083	Cupertino, Calif. 95014	Kansas City, Mo. 64111
Name of service	(212) 826-0640 TELAC/70	(516) 487-0101 TOTAL/APL	(201) 688-7800 —	(408) 257-6550 TYMCOM IX, TYMCOM X	(816) 753-4500 UCS-II & UCS-VI
Date operational	Jan. 1971	Jan. 1970	Oct. 1969	Nov. 1966	Dec. 1967
Areas currently served	New York City metropolitan area.	New York, New Jersey, Connecticut, Boston, Chicago, Los Angeles, & San Francisco	Greater New York and New Jersey	Continental U.S. and Europe; local phone lines & INWATS service cover U.S.	Continental U.S.; New York, Phila., Chicago, Dallas, Denver, Phoenix, L.A., San Francisco, & 42 other cities
EQUIPMENT					
Computers	Xerox Sigma 7	IBM 360/50	DEC TSS-8 in Union; Honeywell 440, Honeywell 1648, & Xerox Sigma 7 in New York City	Xerox 940 (18); DEC PDP-10 (3)	CDC 6500, 6600, & Cyber 73; Honeywell 265
No. of simultaneous users	64	60	184 total	44 per 940 and 48 per PDP-10	Not specified
Conversational terminals supported	TTY 33/35, IBM 2741, GE Terminal Net 300, Datapoint 3300, Execuport, etc.	TTY 33/35/38, IBM 2741, and compatible terminals	Any ASCII terminal at 110 or 300 bps	Tymshare 1030, TTY 33/35/37, IBM 2741, CRT's, plotters, and many other terminals at 10, 15, or 30 cps	All ASCII, EBCDIC, & Correspondence Code terminals
Batch terminals supported	XDS 7670, IBM 1130, UNIVAC DCT 2000	—	—	—	CDC 200 and equivalent units
SOFTWARE					
Conversational programming languages	FORTRAN, BASIC, Symbol, ASSIST	APL	FORTRAN, BASIC, COBOL, FOCAL, Assembly	FORTRAN, BASIC, COBOL, SNOBOL, etc.	FORTRAN, BASIC, ALGOL
Batch-mode programming languages	FORTRAN, COBOL, BASIC, Symbol, Metasymbol	FORTRAN, COBOL, BASIC, PL/I, Assembly	—	—	FORTRAN, COBOL, ALGOL, MIMIC, Compass, Simscript
Principal applications	Financial services	Business & scientific	Business & scientific	Business & scientific	Business & scientific
CHARGES					
Minimum monthly charge	None	None	None	\$80	\$100
Terminal Connect time	\$10.00/hr	\$11.00/hr.	\$5.00-10.00/hr.	\$16.00/hr.	\$5.50-16.50/hr.
Central processor time	\$9.00/min.	\$6.00/min.	\$0.00-6.00/min.	\$2.40/min.	\$0.00-36.00/min.
Amount of "free" mass storage	None	None	None	None	None
Charge for additional mass storage	\$0.01/1000 chars./day	\$1.50/7200 chars./month	Varies with system & volume	\$1.00/1000 chars./month	\$0.50/1280 chars./month
COMMENTS	Provides access to TELPRICE/70, an extensive financial data base, at a cost of \$350/month.	Offers ATS and facilities for processing large shared files and data bases.	Connect and CP time charges depend upon system used.	Charges shown are for Type A service on Xerox 940; other service plans are available. Operates TYMNET international communications network.	Rates depend on computer and pricing option used. Offers nationwide access to common data bases and remote job entry service.

All About Computer Time-Sharing Services

COMPANY	University Computing Company	USS Engineers and Consultants, Inc.	Wabash Computer Corporation	Westinghouse Tele-Computer Systems Corp.	Xerox Computer Services
GENERAL Headquarters	Dallas, Tex. 75222 (214) 741-5781 FASBAC	Pittsburgh, Pa. 15230 (412) 453-6515 UEC	Phoenix, Ariz. 85021 (602) 943-2311 —	Pittsburgh, Pa. 15221 (412) 256-7793 Remote Input Terminal System	Los Angeles, Calif. 90066 (213) 679-9513 Interactive Accounting System (IAS) July 1970
Name of service					
Date operational	May 1969	May 1970	Nov. 1968	Nov. 1968	
Areas currently served	Entire U.S. (thru WATS and multiplexers), plus England, Western Europe and Australia	Pittsburgh, Phila., New York, Houston, Los Angeles, Chicago, Detroit, & 5 other cities in the Mid-West	Arizona and Southern California	Middle Atlantic & New England States plus Illinois, Ohio, & Michigan	Los Angeles, San Francisco, & Chicago
EQUIPMENT Computers	UNIVAC 1108's in Dallas (2), Chicago, El Segundo (2), East Brunswick, London (2), and Sydney	CDC 6500 (2 central processors)	IBM 370/145	IBM 370/165, CDC 6600	Xerox Sigma 7 (3)
No. of simultaneous users	25 per FASBAC system	Not specified	80	32/system	500
Conversational terminals supported	ASCII devices at 10, 15, & 30 cps, IBM 2741, Datel, and plotters	TTY 33/35, GE TermiNet 300, Datapoint 3300, Syner-Data, Incoterm	TTY 33/35, IBM 2741, Datel 31, WU EDT-300, Typagraph DP30	Various terminals at 10, 15, or 30 cps	TTY, Olivetti, Datel, Novar, Execuport, Texas Instruments
Batch terminals supported	UCC COPE, IBM 2780 and System/360, UNIVAC 1004, etc.	CDC 1700, CDC 200, IBM 1130, Incoterm	—	IBM 360 & 370 computers, IBM 2770 & 2780, CDC 200 & 8231, etc.	—
SOFTWARE Conversational programming languages	BASIC, CASH, CALC, SHOBOL, Fastext	FORTRAN, COBOL, BASIC, ALGOL	Shared Access Reactive Processor (a proprietary language)	—	—
Batch-mode programming languages	FORTRAN V, COBOL, ALGOL, Assembly	FORTRAN, COBOL, BASIC, ALGOL	FORTRAN, COBOL, PL/I, RPG, Assembler	FORTRAN, COBOL, PL/I, APT	—
Principal applications	Business & scientific	Scientific & engineering	Business	Business & scientific	Business
CHARGES Minimum monthly charge	\$100	None	None	None	\$1,000
Terminal connect time	\$7.50/hr.	\$9.00/hr.	See Comments	See Comments	See Comments
Central processor time	\$20.00/min.	\$24.00/min.	See Comments	See Comments	See Comments
Amount of "free" mass storage	None	None	See Comments	None	See Comments
Charge for additional mass storage	\$0.50/2096 chars./month	\$1.00/10,000 chars./month	See Comments	\$0.02/5760 chars./day	See Comments
COMMENTS	Also offers remote batch service on CDC 6400 in Calif. and IBM 370/165's in Dallas (2), Chicago, and East Brunswick.	Subsidiary of U.S. Steel Corp. Lower rates for batch mode and volume usage. Surcharges for certain software.	Specializes in standard business applications. All services are priced on a functional or transaction basis.	Emphasizes remote batch processing. Prices depend upon system, type of port, and monthly volume.	Offers integrated on-line accounting system. Charges are based upon activity.

All About Computer Time-Sharing Services

AVAILABILITY OF TIME-SHARING APPLICATION PROGRAMS

<p>APPLICATION COMPANY</p>	<p>Accounts Payable Accounts Receivable Banking Billing Educational</p>	<p>Engineering General Ledger Hospital Administration Information Retrieval Insurance</p>	<p>Inventory Control Numerical Control Medical Research Operations Research Payroll</p>	<p>Personnel Project Control Sales Analysis Scheduling School Administration</p>	<p>Scientific Simulation Statistical Text editing Typesetting</p>
<p>ACTS Computing Corp. Allen-Babcock Computing, Inc. APL Services, Inc. Applied Data Research, Inc. Applied Logic Corp.</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Axicom Systems, Inc. Beloit Computer Center, Inc. Boeing Computer Services, Inc. Boise Cascade Computing Ops. Bowne Time Sharing, Inc.</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Call-A-Computer, Inc. Chi Corp. Community Computer Corp. The Computer Company Computer Innovations</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Computer Network Corp. Computer Research Company Computer Resource Services, Inc. Computer Sciences Corp. Computer Sharing Services, Inc.</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Computercraft Services, Inc. Computility, Inc. Compu-Time, Inc. Computone Systems, Inc. Com-Share, Inc.</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Com-Share Limited Control Data Corp. Cyphernetics Corp. Data Resources Inc. Dataline Systems Limited</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Datalogics, Inc. Dialcom, Inc. Distronics Corp. First Data Corp. General Electric Company</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Genesee Computer Center, Inc. Grumman Data Systems Corp. Honeywell Information Systems Information Systems Design, Inc. Interactive Data Corp.</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>
<p>Interactive Sciences Corp. International Timesharing Corp. ISC Corp. ITT Data Services Kaman Aerospace Corp.</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>	<p>• •</p>

All About Computer Time-Sharing Services

AVAILABILITY OF TIME-SHARING APPLICATION PROGRAMS (Continued)

COMPANY	APPLICATION																								
	Accounts Payable	Accounts Receivable	Banking	Billing	Educational	Engineering	General Ledger	Hospital Administration	Information Retrieval	Insurance	Inventory Control	Numerical Control	Medical Research	Operations Research	Payroll	Personnel	Project Control	Sales Analysis	Scheduling	School Administration	Scientific	Simulation	Statistical	Text Editing	Typesetting
Keith Lawrence Associates, Inc. Keydata Corp. Leasco Response, Inc. Management Systems Corp. Mark/Ops	•	•		•		•	•	•			•				•		•	•	•			•			
McDonnell Douglas Automation Co. Megsystems, Inc. Merlin Systems Corp. Metridata Computing, Inc. Multiple Access Limited	•	•				•	•				•					•		•				•	•	•	•
National CSS, Inc. Ohio Valley Data, Control, Inc. On-Line Business Systems, Inc. On-Line Systems, Inc. Pacific International Computing			•			•	•	•	•		•			•		•	•	•	•			•	•	•	•
PHI Computer Services, Inc. Philco-Ford Corp. Profile Technology, Inc. Programs & Analysis, Inc. Proprietary Computer Systems, Inc.	•	•		•		•	•		•		•				•	•	•	•				•	•	•	•
Rapidata, Inc. Registration, Inc. Remote Computing Corp. Scientific Process & Research Scientific Time-Sharing Corp.					•		•	•	•					•		•	•	•	•			•	•	•	•
Sci-Tek, Inc. The Service Bureau Corp. Statistical Computing Center Statistical Tabulating Corp. Structural Dynamics Research Corp.					•	•		•			•					•	•		•			•	•	•	•
Systems Dimensions Limited Technical Advisors, Inc. Technology for Information Mgmt. Tel-A-Data, Inc. Telstat Systems, Inc.	•	•		•	•	•		•	•		•	•	•	•		•	•	•				•	•	•	•
Time Sharing Resources, Inc. TransNet Corp. Tymshare, Inc. United Computing Systems, Inc. University Computing Company	•	•	•	•	•	•	•	•	•		•	•	•	•		•	•	•	•			•	•	•	•
USS Engineers and Consultants Wabash Computer Corp. Westinghouse Tele-Computer Corp. Xerox Computer Services	•	•		•		•	•		•		•					•		•				•	•	•	•