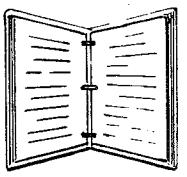
Library

ENGINEERING TECHNICAL INFORMATION SYSTEM

FIELD NOTES ● TECHNICAL REPORTS ● TEXTS
DATA RETRIEVAL ● CURRENT AWARENESS

Field  Notes

Volume 2 Number 2 February 1970

Trial Use of New Products and Materials
Adrian Pelzner

Computer Time Sharing
C. J. Montgomery

FOREST SERVICE ● U.S. DEPARTMENT OF AGRICULTURE

ENGINEERING FIELD NOTES

This publication is a monthly newsletter published to exchange Engineering information and ideas among Forest Service personnel.

The publication is not intended to be exclusive for engineers. However, because of the type of material in the publication, all engineers and engineering technicians should read each monthly issue.

The publication is distributed from the Washington Office directly to all Forest, Regional, Center, Station, Area, Laboratory, and Research Offices. Adequate copies are printed to provide all who wish a personal copy. If you are not now receiving a personal copy and would like one, ask your Office Manager or the Regional Information Coordinator to increase the number of copies sent to your office. Use form 7100-60 for this purpose. Copies of back issues are also available from the Washington Office and can be ordered on form 7100-60.

It is intended that the material in the Field Notes be primarily written and used by Forest Service Field Engineers; however, material from other publications may be used.

Field Note material should always be informative and cannot contain mandatory instructions or policy. The length of an article may vary from several sentences to several typewritten pages. Material need not be typed (neatly written or printed is acceptable), or edited before being submitted to the Washington Office. This will be done in the Washington Office to accommodate our format and allowable space.

Each Region has an Information Coordinator to whom field personnel should submit both questions and material for publication. The Coordinators are:

R-1	Kenneth Yeager	R-6	Don Loff
R-2	Marshall Fox	R-8	Rollie Bailey
R-3	Dan Roper	R-9	David Jones
R-4	Fleet Stanton	R-10	Gerald Schauwecker
R-5	Chuck Paletti	WO	Norman Sears

DISCLAIMER

Information contained in this report has been developed for the guidance of employees of the U. S. Department of Agriculture - Forest Service, its contractors and its cooperating Federal and State agencies. The Department of Agriculture assumes no responsibility for the interpretation or use of this information by other than its own employees.

The use of trade, firm, or corporation names is for the information and convenience of the reader. Such use does not constitute an official evaluation, conclusion, recommendation, endorsement, or approval of any product or service to the exclusion of others which may be suitable.

TRIAL USE OF NEW PRODUCTS AND MATERIALS

by Adrian Pelzner, WO

A program was recently initiated to evaluate new products and materials for use in selected Forest Service construction or maintenance projects. A complete description of the program, its objectives and procedures can be found in FSM 7115, TRIAL USE OF NEW PRODUCTS AND MATERIALS (December 1969). We hope the program will prove useful to the Forests, Regions and the Washington Office in evaluating the many new products and materials currently on the market and those to be offered in the future.

The basic idea of the program is to incorporate selected products and materials into construction and maintenance projects and evaluate them under actual service conditions. The products and materials should have a resonable chance for success and should have been subjected to some preliminary evaluation such as laboratory testing, experience of other users, and careful analysis of the promotional literature and claims of the manufacturer or producer.

There probably are many products and materials currently under evaluation. Generally the knowledge gained from these evaluations is not being reported within the Region or to other Regions. With the issuance of FSM 7115 these evaluations can be coordinated and the results made know Service-wide. The objectives of this program are to:

1. Determine the merits of new materials and products by incorporating them in selected Forest Service construction or maintenance projects and observing their behavior under actual service conditions.

2. Avoid uncoordinated trial-use installations of the same or similar new materials and products at more than one location and thus avoid duplication of effort within the Forest Service.

3. Provide for coordinated trial-use installations at several different locations, where deemed necessary or desirable, so that the new material or product will be evaluated under different environmental conditions and use.

4. Document and disseminate the findings of trial-use installations whether or not the findings indicate satisfactory or unsatisfactory performance of the product or material.

Prior to the issuance of FSM 7115, the program was reviewed by all Regions. Several Regions offered comments and suggestions which have improved and strengthened the program and all indicated the need and desirability of the program and their willingness to support it. This new program is still unused and untried. Hopefully, it can be of help in efficiently accomplishing the engineering mission of the Forest Service.

COMPUTER TIME SHARING

by C. J. Montgomery, Manager, Systems & Data Processing Dept.
Getty Oil Company, Box 1404, Houston, Texas 77001

INTRODUCTION

A new and growing method of computer resource sharing is making itself felt in the technical world. This computer time sharing makes it possible for a person with no computer training to take advantage of the power and speed of a large scale computer.

Several of our Regional and Forest Offices are using a computer time sharing program and others have plans for its future use. The following article by Mr. Montgomery is very enlightening on the use of computer time sharing.

COMPUTER TIME SHARING

Almost everyone knows that computers have been programmed to take the square root of ten-digit numbers in microseconds, that they can perform the stress analysis of the most complicated bridge structure, and that they can compute your utility bill correctly most of the time. But the engineer who needs the answer

to some problem may wait hours or even days for the results of these calculations which were performed at the speed of light. He has, on the whole, been pleased with the results but not happy at having to wait.

Almost anyone can tell that something is up in the world of computing. There is an air of the excitement of new ideas. The new ideas are dealing with Computer Time Sharing in several ramifications.

Time sharing is a new kind of resource sharing. In this concept a central computer has the apparent ability to serve the requests of a number of users at the same time. It is called a number of names by different people; "conversational," "interactive," "responsive mode." They all mean approximately the same thing and that is when a person who needs answers from a computer can sit at a terminal and think in interaction with the computer. He by-passes the programmer and algorithms altogether, in the problem-saving stage, supplies his data using intuition, guesses or even hunches as freely as he wishes and receives his computations directly from the computer in "real time." Of course to be able to do this someone must have previously written a program for this user to do his computations or to handle the data he wishes to use.

The growth of computer use has been phenomenal. Only 16 years ago, for instance, a particularly well informed person estimated that only a half dozen or so computers would suffice to satisfy the computational needs of the entire world.

The magazine, Computers and Automation, reports that there are 50,950 computer installations in use today. There are over 26,000 additional systems on order making it easy to predict that by 1975 there could easily be nearly 100,000 computer systems in use.

The growth of time sharing has been equally rapid. In 1965, no more than 500 terminals were on-line to time sharing computers. Today, General Electric alone serves more than 50,000 time sharing customers. There are countless other companies offering time sharing services and no way to even guess at how many customers they are now serving. Commercial time sharing is reported to have a $70 million dollar market in 1968 and is expected to double each year. At this rate the industry will be at one billion dollars in 1972.

Reprinted by permission of the publisher from Proceedings of the Semi-annual Meeting of A. C. S. M. and A. S. P. in Portland, Oregon, 1969.

Time sharing probably had its beginning back in 1940 when George Steiblitz of Bell Labs demonstrated that it was possible to use the telephone lines to transmit data. However, it was not until 1952 that the first system became operational. This was an on-line inquiry system at American Airlines for reservation service. The second system was at the Toronto Stock Exchange for stock quotations.

In 1956 I. B. M. developed their RAMAC system which made a computer with a large memory available. In 1958 A. T. & T. began to install their dataphones which are now widely used for transmitting data over the telephone lines.

At M. I. T. in 1961 the first true time sharing system was initiated serving 8 users. It was called the Compatible Time-Sharing System (CTSS). This was later expanded into Project MAC - which makes a large scale computer accessible to more than 100 separate terminals. Each user has a secret password that permits only him to access the data stored in his file. It is quite a sport for some of the students to try to break the code of some favorite professor's file and put some inane remark in his data.

The Rand Corporation, famous West Coast "think tank", took a major step in developing a prototype of the conversational type languages now used in time sharing. They developed a system to make an in-house computer available to members of their technical staff. The computer was an ancient vacuum tube machine built in 1950-1953 called the Johnniac. The language developed, called JOSS (Johnniac Open - Shop System), was put in full use in 1964. JOSS is a simple algebraic type language which permits non-computer people with an hour or so of training to solve problems and is available only to RAND people.

In 1965 the first commercial time sharing services came on line. By the end of 1967 a major magazine reported 19 services were offering time sharing and at the end of 1968 41 major firms were reported offering time sharing on 121 processors. There are numerous other small services which were not included in this figure.

In such a new and esoteric field as computers a certain "computer mystique" has developed. Computer programmers and systems specialists have tended to attempt to convince us that the computers are some all-powerful diety that only they, the high-priests, can approach.

The new concept of computer languages called "Problem-oriented programs" permits the engineer, surveyor or other user, without training in computer programming, to communicate with the computer in the technical language he understands. In many cases everyday English technical words are used--not machine language--and these are terms which have a precise meaning to the user. The impact of these languages is that the technically trained person is freed from tedious computational chores, and is thus permitted more time to devote to creative work. Many of these programs developed for time sharing also provide helpful hints to unskilled users.

In time sharing the user is encouraged to think of the computer as a black box somewhere across town and to not concern himself with how computers work. Inside knowledge is of no value to him. He is urged not to be concerned about compilers, word length, access time, etc. A user is not now buying computing power alone but is buying a service which includes application type programs as well as computer time. Furthermore there is no layer of people or processes, such as key punching, to slow him down.

By shopping around a prospective user can find a firm with library programs which can do almost any kind of computation he desires. If he wants to get sophisticated and learn more there are several quite universal conversational type computer languages such as BASIC, FORTRAN, CAL, QUICKTRAN or ALGOL, all easily learned, which will permit him to write his own programs.

Now let's again consider "Time Sharing." What is it? Basically, in the sense we will use it, Time Sharing means using two-way "conversational" man-machine queries and answers between the man with the problem and the computing power he needs to solve it. This provides a continuous dialogue between man and machine. Generally there is a central, large capacity computer to which is attached many remote terminals. The speed of the computer is such that it appears to each user that he has exclusive use of the computer when, in reality, it may be operating on as many as thirty to ninety problems at the same time, devoting a tiny slice of a second of its attention to each problem in sequence.

The remote terminal can be a teletype, a special electric typewriter or some sort of paper tape reader. The remote terminal is usually connected to an ordinary voice grade telephone line through a device called a "dataphone."

In operation, the user picks up his telephone and dials the number of his remote computing facility which may be half-way across the nation. When he has his connection, he places the receiver in the special cradle of the "dataphone" and types his code number on the teletype. The computer responds on the teletype asking what program the user wishes to use. The user then types the program name and, when ready, the computer types something like "READY" or "COMMAND." In COGO the user might answer "CLEAR 1 999," telling the computer to clear storage areas for 999 survey points. The computer then replies again "READY" or "COMMAND." Each command is processed and the solution to the problem is typed out before the next command is requested. This interaction continues, in a question and answer mode, until the entire problem is solved. It is important to know that desired data can be saved in the computer's mass storage for later use, available only by use of the originator's special password.

An example of this type of user--computer response is reflected in Figure 1 which is a solution with COGO, since many of you are familiar with that language. The user's response in each case is underlined by us for emphasis.

Some specialized computer service organizations have time sharing programs that deal only with special problems. The larger nation-wide companies generally have other computing capabilities such as BASIC, FORTRAN, COBOL, ALGOL, payroll computation, earthword programs and many others available.

Now all of this sounds great, I know, but how much does it cost?

For any such service a first cost is usually the installation of a teletype of electric typewriter terminal for those systems requiring a fixed installation. This averages about $125 and is a one-time cost. Then one must pay rent on the teletype, which amounts to about $75 to $100 per month, and rent on the dataphone, about $35 per month. So our first cost for a fixed installation is about $125 and we will be out $110 to $135 per month for equipment rental whether we do any computing or not. Other costs will be determined by our contract with the computer service organization for use of the computer.

The I. B. M. Corporation and Com-Share Inc. provide their own remote terminals and do not require a fixed installation. I. B. M. has an installation charge of $40 and rentals ranging upward from

$87/month. Com-Share charges no installation fee and rentals are a minimum of $63/month. This latter equipment may be purchased. Both of these systems contemplate your using your own office telephone rather than a special installation.

Briefly summarizing, it would be possible for you to have the use of a high-speed electronic computer in your office for as little as $63 per month for a minimum installation. For a little more, say $100 to $140 per month, including an hour's computer time, you may have a more sophisticated installation.

You may feel that this concept of "Time Sharing" will force you to sit at the keyboard of a teletype playing "cross questions and crooked answers" with the computer. Not so. Your secretary can easily learn to type the instructions from a data sheet prepared by the professional. The teletype machines can be provided with a paper tape reader and punch. The secretary can punch a tape for the problem "off line", or while not connected to the computer, and consequently at no cost. This tape can be played back on the teletype for editing, then, when error free, can be transmitted to the computer at a time when the long distance rates are low and at a speed of about 250 to 700 characters per minute rather than the 50 or so words per minute an operator can manually send on a teletype.

An intriguing factor of this whole concept is the knowledge that from the beginning of Data Processing history, computers have been used as task doers far more often than as problem solvers. Couple this with the fact that we are moving toward the day when we shall have "personal computers". These will have an effect on us at least as profound as the effect of the personal passenger car. It will be as pointless to ask what Time Sharing Conversational Computers will be used for as it is to ask to what destination you can drive an automobile or what kinds of letters you can write on a typewriter.

But here are some things that are being tried.

Computer-Assisted Instruction (CAI)

Several learner-centered teaching systems have been devised which require learner-computer interaction. The student can call on the computer for help with something he doesn't understand. The use of the "Socratic System" is possible, in which

the student and computer carry on a dialogue in depth. This method is being used at Harvard Business School for case studies in business management. It is also being used at Harvard Medical School for case studies in medical diagnosis.

Students at M. I. T., Dartmouth, other Universities and many High Schools today are using computers from convenient terminals as nonchalantly as they would use a slide rule. The impact of Computer Time Sharing on American education may well serve to change its entire concept and the ways in which men learn.

Other possible uses are: 1) educational testing and evaluation; 2) solution of actual business management problems.

Time Shared Computing in Business

Systems have been devised which can accommodate entire business operations. They update files, keep inventory records, automatically type invoices, purchase orders, paychecks, etc. When given the proper information they can also produce the required tax forms, management reports, etc., required by a business.

Computer Graphics

With a time sharing terminal having a CRT visual display device all kinds of things are possible. An engineer can sketch a design on the CRT with a light pen. Pushing the proper key on a keyboard will true up a badly drawn circle or produce a perfectly straight line. The user can lengthen or shorten lines, change the scale of a drawing or repeat it scores of times all with his console. With some programs he can draw a bridge truss, load it and actually see the deformation caused by these loads.

Perhaps the best known of this type of program is called "Sketch Pad" developed at M. I. T.

Other Uses

A system known as MEDINET can find a bed for a new patient, inform a nurse on his medication, monitor his condition and type up his bill when he is released. Other Hospital Information Systems have been or are being developed by various firms to serve either a single hospital or all hospitals in a given region.

In a business environment, it is possible to model the entire business and experiment with variable factors. One could play "what if" the costs of such variables as labor, materials, transportation, etc. changed. How would it affect the business? This could be a powerful aid in making business decisions.

A central data file with many terminals could be very useful for real estate companies and their Multiple Listing Services.

The pentagon may well already be using Time Sharing Terminals to play war games.

A recent news article stated a famous Las Vegas casino has computerized their KENO game with ten remote terminals for on-line gambling. The computer will make it possible for twice as many games as before to be played in a given time. No doubt the profits will double also.

We are, without doubt, moving toward the non-monopoly computer utility concept. Just as each home owner cannot afford a personal electric generator, each user cannot afford a computer. However, responsive time sharing can give even the smallest user the effect of having a real computer of his own through a terminal device connected by a phone line to a data-processing system. The future terminal device may be as simple as a touch-tone telephone with voice-response output. It is surmised that such a touch-tone terminal unit may soon cost as little as $100 and could be carried by the user ready for use at any time on any telephone. This whole concept is fascinating and these few possible uses I have mentioned are only a few obvious ones.

As one writer says there is only one "application" of conversational computers, and that is whatever you do during the course of a normal day.

COGO FIGURE 1

```
W1558.3
COGO IS READY. TYPE READ/DISK IF FIRST COMMAND WILL
BE READY FROM DISK OR ELSE BEGIN TYPING IN COMMANDS
ON THE REMOTE CONSOLE
READY
clear 1  500
READY
store 1  5000.  5000.
READY
locate/azimuth 1 2 330.02 16 21 50.
 PT= 2   YCOORD= 5316.651  XCOORD=     5092.979
READY
      2 3 439.97 98 05 40.
 PT= 3   YCOORD= 5254.701  XCOORD=     5528.565
READY
      3 4 535.11 162 19 54.
 PT= 4   YCOORD= 5711.661  XCOORD=     5243.000
READY
      4 5 592.51 265 48 05.
 PT= 5   YCOORD= 5668.280  XCOORD=     4652.080
READY
      5 1 314.39 341 37 50.
 PT= 1   YCOORD= 5966.650  XCOORD=     4553.002
READY
      3 4 535.11 162 19 54
 PT= 4   YCOORD= 4744.833 XCOORD=     5690.975
READY
      4 5 592.51 265 48 05
 PT= 5   YCOORD= 4701.452  XCOORD=    5100.055
READY
      5 1 314 39 341 37 50
 PT= 1   YCOORD= 4999.822  XCOORD=    5000.977
READY
locate/angle 2 1 51 45.65 -67 05 30.
 PT= 51   YCOORD= 5028.613  XCOORD=   4965.551
READY
locate/line 1 2 21 161.32
 PT= 21   YCOORD= 5154.743 XCOORD=    5045.963
READY
locate/deflection 1 21 52 25.31 -90 00 00.
 PT= 52   YCOORD= 5161.801  XCOORD=   5021.657
READY
locate/line 2 3 22 -5.13
 PT= 22   YCOORD= 5317.374  XCOORD=  5087.900
READY
locate/line 2 3 23 -120.89
SOME DATA IS MISSING ON THE LAST CARD
PLEASE CORRECT THIS ERROR OR TYPE IN A NEW COMMAND
READY
```

APPENDIX

WHERE TO BUY TIME

Company	Computer	Typical Applications	Number of Simultaneous Users	Hourly Terminal Use Charge
Computer Network Corp. Washington, D. C.	Burroughs	Statistical/Engineering Analysis Business		$ 7 -$10
Com-Share Houston, Texas	SDS (3)	Engineering Research Scientific		$15 - $30
Information Supplies Corp. Northbrook, Ill.	GE-420	Engineering design Finance, Statistics Mathematics	30	$ 8 - $85 per month
McDonnell Automation Co. St. Louis, Mo.	GE-420 GE-415 Datanet-30	Scientific Engineering		$10
Realtime Systems, Inc. New York, N. Y.	Burroughs B-5500	Financial Analysis Computational Programs		$15
Technology for Information Management, Inc. Chicago, Ill.	GE-420	Engineering design Mathematics Statistics, Finance	30	$ 8
Academy Computing Corporation Houston, Texas	GE-420	Surveying, Scientific Business, Finance Mathematical	40	$10+
ITT Data Services Houston, Texas	IBM-360/50 IBM-360/65	Scientific Mathematics Statistics		$7.00/min. plus $12.00/min. connect time
Control Data Corp. Minneapolis, Minn.	CDC 3600 6600	Scientific Engineering	64	3600/$500/hr. 6600/$1,200/hr.

Company	Computer	Typical Applications	Number of Simultaneous Users	Hourly Terminal Use Charge
Computrol Systems, Inc. Atlanta, Ga.	IBM 360/40	Linear Programming Scientific	31	
Concap Computing Systems Palo Alto, Calif.	IBM UNIVAC SDS GE	Civil/Structural Engineers Land Surveyors	40 - 200	$24
Bolt Beranek & Newman, Inc. Cambridge, Mass.	Dig. Equip. PDP-7 PDP-8 UNIVAC	Const. analysis Management analysis	32	$12 - $15
Dres Inc. Los Angeles, Calif.	CDC 3300	Traverse analysis Transportation systems Mapping		$20
Graphic Controls Corp. Buffalo, N. Y.	GE-235 PDP-10 PDP-8 Datanet-30	Engineering Scientific Business	40 PDP-10 64	
Computer Sharing, Inc. Bala Cynwyd, Pa.	SDS-940	Engineering Business Scientific	40	$ 7 - $10
Sci-Tek Computer Center, Inc. Wilmington, Delaware	UNIVAC	Scientific Engineering	6	

Company	Computer	Typical Applications	Number of Simultaneous Users	Hourly Terminal Use Charge
UNIVAC Information Services Div. Philadelphia, Pa.	UNIVAC	Scientific Business Engineering	16	$576
Call-A-Computer Raleigh, N. C.	GE-265	Engineering Scientific Financial analysis	40	$6.50 - $9
General Electric Bethesda, Md. Houston, Texas Chicago, Ill. Other Major Cities	GE-265 (20) GE-600	Scientific Engineering Business Education	39	$7.50
I. B. M. White Plains, N. Y.	IBM 7044 (5) IBM 360 System	General Purpose General Purpose	50 40	$13
Keydata & Adam Associates, Inc.	IBM 360/40-65K	Scientific Business Engineering		
Tech-Mac	VDM 620	Surveying	12	$10

(This Data from Survey of Time Sharing Services conducted by A. C. S. M. Committee on Computing during 1968)