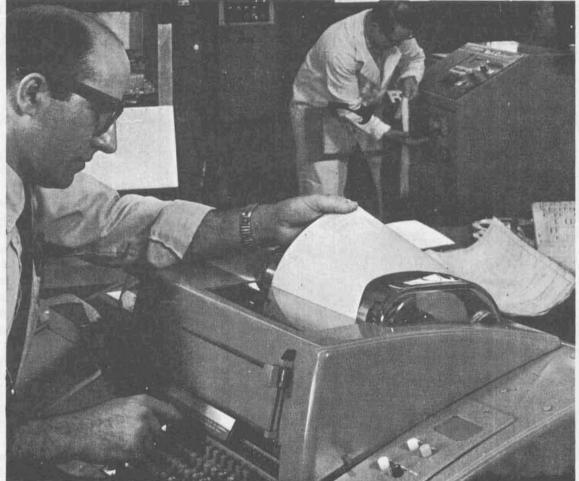
## **GE TIME-SHARING SERVICE MAKES NEWS**

The Field of Metalworking



Service

CHILTON PUBLICATION . AUGUST 22, 1968



Numerical Cutting, Inc. prepares N/C tapes in half the time through use of GE time-sharing service.

## **Conversation with a Computer**

Reprinted by General Electric from Iron Age Magazine, August 22. 1968, Copywrighted 1968, Chilton Company



# Time Sharing: The Swing to Service

Everyone who talks about computers today, talks about time sharing. The time-sharing computer industry, brand new two years ago, now boasts some 40 companies. The capabilities and potential of this service will have a significant impact on metalworking.

By A. M. Greene

■ This fall there will be at least three new N/C programming packages on the market specifically designed for time-sharing computers. By the beginning of next year, at least two major computer companies will announce greatly expanded timesharing services.

Experts predict that within six to eight years, 50% of all data processing will be done on a time-sharing basis,

Applications are everywhere. A small machine shop cuts the cost and the time required to prepare N/C tapes in half. An engineer prepares cost studies for products using various grades of manganese ores.

A management consultant won't take an assignment unless he is provided with a time-sharing terminal. And this year, a leading business school will spend \$250,000 on time-sharing service, compared to nothing two years ago.

Computers Undergo Change. The time-sharing concept — that of many people using the same computer at the same time from remote locations — has changed the computer industry. And, it's starting to change other industries as well.

Metalworking is no exception. In fact, metalworking can serve as a model through which to



IBM's latest entry in the time-sharing picture, CALL/360:BASIC, combines the BASIC language with telephone access to a System 360 Model 50.

study the growth of time sharing, since it offers as broad a range of computer applications as that serviced by the entire data processing industry.

Metalworking offers small, oneshot calculations and huge critical path studies; it offers technical jobs and business-oriented jobs; computations and control



Reels of magnetic tape on file at Univac hold customers' programs and file information. The firm's remote batch operation tackles lengthy problems.

functions and everything in between.

Faster, Cheaper, Easier. And the computer industry is in a rush to keep up with the needs of metalworking. Time sharing is certainly a big part of this rush—for good reason. It's faster, it's cheaper and it's easy to use.

But, there are a lot of different kinds of time sharing.

As the concept of sharing the operation of a computer became practical through advances in technology, different computer manufacturers saw different approaches to marketing this phenomena. And, at this point in time, there is great variety in the time-sharing capabilities available.

In-House or Out. The first division separates the time-sharing computers sold for in-house application from the time-sharing service centers. The time-sharing service center appears to be ahead right now, but as users install more and more terminals to keep up with new-found applications, the decision to go "in-house" gets closer.

In fact, using a time sharing service center can help a user make the right decision in buying an in-house time-sharing system by telling him exactly what his computer time and cost requirements are, according to S. H. Michael, president, Columbus Metal Products Co., Inc., Burlington, N. J.

The time-sharing computer service center itself has many different faces. Some are big and some are small, and both make their size an advantage. IBM the largest computer manufacturer, entered the market with their QUIKTRAN, a simplified version of FORTRAN.

General Electric, another giant and one of the first to offer remote time sharing from a remote center, provides general purpose computing capability with sperial purpose programming packages to meet specific industry problems, including numerical control.

Then, there are the smaller companies solely dedicated to time sharing—Com-Share Inc., Tymshare and many others. They offer a range of computing capability and software support.

Emphasis on Service. Westinghouse, in the first of a series of time-sharing service centers to be announced this fall, will take a more specialized approach — to the numerical control industry. As Frank Carr, director, Information Systems Laboratory, Westinghouse Electric Corp., puts it, "We don't look at our busi-

## The Problems Facing Metalworking's Computers

#### Aerospace

- 1. Matrix Algebra
- 2. Data Reduction
- 3. Curve Fitting
- 4. Performance Analysis
- 5. Solution of Differential Equations
- 6. Simulation
- 7. PERT
- 8. CPM
- 9. Plotting
- 10. Fourier Analysis
- 11. Statistical Analysis
- 12. Trajectory Analysis
- 13. Fluid Dynamics
- 14. Circuit Analysis
- 15. Reliability Analysis
- 16. Structural Design
- 17. Aerodynamics
- 18. Vibration Analysis
- 19. STRESS Analysis
- 20. Kinematics Problems
- 21. Thermo Dynamics and Heat Transfer Analysis
- 22. Electric Load Flow

#### Construction

1. Critical Path Scheduling

- 2. Job Cost
- 3. Estimating
- 4. Payroll and Labor Distribution
- 5. Structural Design
- Coordinate Geometry— Cut & Fill
- 7. Project Control

#### Engineering-Civil & Consultants

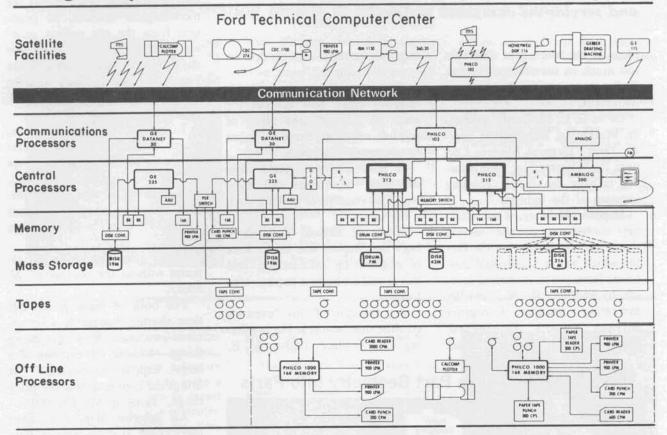
- Traverse Analysis, Closure,
   Sub-division
- 2. Plotting
- 3. Job Cost
- 4. Network Analysis— Hardy Cross
- 5. Highway Bridge Design
- 6. STRESS Analysis

#### Machinery and Electrical

- 1. Gear Design
- 2. Numerical Control
- 3. Drafting (plotting)
- 4. Electrical Network Analysis
- 5. Vibration Analysis
- 6. Moment of Inertia
- 7. Transformer Design

Source: Univac

## A Large Computer Center Extends Its Commitment to Time Sharing



■ The engineering staff of the Ford Motor Co. operates one of the largest technical computer complexes in the world. The computer facility serves Ford operations throughout the United States and overseas via a trans-Atlantic line. A number of suppliers and universities also have access to the center in cases where

their efforts are of mutual interest to the company. An advanced time-sharing system is presently being implemented using the two Philco 212 scientific processors and a Philco 102 communications processor. This system will allow users to run larger programs, access private and common data files, save programs and initiate background jobs from foreground.

ness as a time-sharing service, we look at it as filling a machine tool user's need, using time sharing as one part of the total service. As we see other areas of customer need, we will offer similar sets of services."

The Big Box and the Small. Hewlett-Packard, for one example, claims its low-cost HP 2000A system will reduce user terminal costs considerably below other services "by restricting itself to one programming language—Conversational BASIC—and by using a relatively small computer."

And, on the other hand, Philco-Ford is converting its large 102-212 system to time sharing. The announcement, expected to be made around January 1969, will put a heavyweight scientific computer, the 212, at the end of a telephone line from users. In this setup, the 102 will handle the input-output functions.

This system will allow customers to use the computer in either the time sharing or the remote batch mode of operation from the same terminal.

The Other Side. Univac's Information Services Div. has stayed out of conversational time sharing so far, because they feel that the present state of computer technology is used most efficiently and effectively on a remote batch basis. However, they

are offering special purpose systems which serve selective industry groups on what is very close to a time-sharing basis.

Univac's approach serves as a caution sign to users in a rush to time share. Make sure you don't sacrifice efficiency, power and cost for the convenience of immediate response. Many computing jobs need a very large computer and are best suited to a batch mode.

The Service Trend. If there is one trend that stands out, despite all the variety in the computer industry today, it is the emphasis on service.

As one industry in-sider said, "Years ago, when you sold a

# "The 30-day contract imposes honesty and service on computer people."

piece of hardware, you didn't do too much in the way of service. Today, you can't sell hardware without it."

Or as E. L. McCleary, manager, Marketing, Information Service Dept., General Electric Co., puts it, "Commercial time sharing is now the fastest growing segment of the industry."

Imposes Honesty. Time sharing contributes to the service quota because it is often the factor which sways a potential customer from one time sharing service to another. R. N. Verville, marketing manager, Computer Services Network, Philco-Ford, explains, "The 30-day contract

imposes honesty and service on computer people."

The interesting aspect of this industry right now is that for each of the different types of services available, there are more than enough customers.

A look at some typical users and their experience will show why this concept is making such a big hit.

Areas of Action. Time sharing's first impact was in the area of engineering calculations, and this is still its biggest market area today.

An example of this "expanded slide rule" usage is Hecla Mining Co., Wallace, Idaho. W. E. Crandall, chief engineer, reports that calculations to determine the metallurgical balance of products from the ore milling process used to take one man two days. Now, it can be done in the length of time it takes to pose the problem to the computer—11 minutes.

In another application area, newer and growing fast, Peter Witzman, president, Quality Gage & Manufacturing Inc., Cleveland, can cut an N/C tape for a complex radius generation problem using 243 seconds of computer time.

"It's a job I wouldn't even attempt without the computer," he adds.

For both of these users, GE time sharing represents a better, more accurate way of doing things—without the expense of a large capital investment. "It brings the computer into our price range," sums up Mr. Crandall.

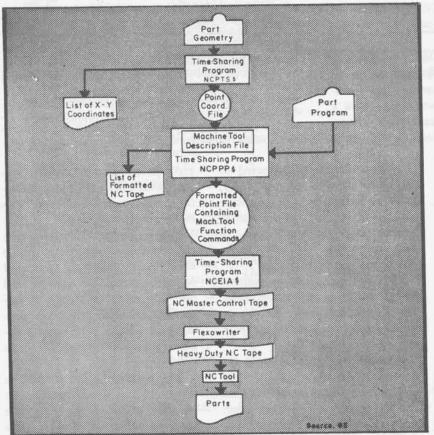
An Interim Step. For other users, time sharing from a time sharing service center is an interim step until in-house time sharing becomes feasible.

Alcoa, for example, rents time sharing capacity at locations throughout the country. Applications include engineering calculations, cost analysis of forgings and furnace temperature balancing. But the company anticipates regional in-house time sharing centers owned or leased by Alcoa. This idea will group three or four Alcoa plants together in a time sharing complex.

Lockheed-California Co, will go from 9 to 25 terminals when they switch from buying time to an in-house system this fall. Terminals are divided among the engineering, marketing, quality control and finance areas of the company.

The biggest advantage of time sharing at Lockheed, a company with 22 in-house computers, is

### Three Programs Turn Part Geometry Into Parts



Three N/C programs in the General Electric Time-Sharing Service Library can quickly and easily translate workpiece geometry and machining operations into an EIA-coded control tape at the user's remote terminal.

## What Remote Time-Sharing Means to the Small Machine Shop



Peter Witzman, president, Quality Gage & Manufacturing Inc., claims: "I've never had the kind of feedback I have now. Now, I know what it costs to generate a \$100 worth of business."

This manufacturer of special machines and prototypes uses the GE time sharing service for, in addition to N/C tape preparation, detailed business analyses. Mr. Witzman gets feedback from the computer on each of 11 types of work his firm handles. From this he can know exactly what is the

return per hour on each type of work. "Then we can concentrate on the profitable areas.

"In sales, too, we know what our costs are." This information allows the company to decide between a direct sales effort or the use of a manufacturer's representative — with exact figures to go by.

In yet another area, Mr. Witzman can get the hourly return on the jobs of each of his customers, plus information on the volume of business each represents. "I know whether a job is costing me \$3 an hour or \$5."

Samuel H. Michael, president, Columbus Metal Products Co., Inc., says: "I consider myself a layman in computers, but I had to make a decision whether or not to invest \$50,000 or \$100,000 in a computer. Time sharing simplified the decision—there's no capital investment, and we're only committed for 30 days at a time."

Columbus Metal Products manufactures custom-built cabinets and enclosures for a variety of industries. The firm uses the time-sharing service for preparing N/C tapes as well as cost estimating. Pro-

gramming for job cost analysis is in the works.

The company has cut lead time in preparing tapes drastically with greater accuracy. More significantly, "it has changed our whole approach," says Mr. Michael. "We are now more flexible starting at the design stage."

One pharmaceutical drying cabinet posed a particularly difficult problem. Manually, the tooling cost would have been \$1300. With N/C, there was no tooling cost whatever. And the time involved was reduced from 16 working hours to 16 minutes.





Edward Brown, president, Numerical Cutting, Inc., notes: "The time we save is reflected in the company's profit. It stems from using the machines we have more efficiently. We are able to do cuts and combine machining operations that were impossible before."

This custom subcontract parts manufacturer with 50 employees had relied on outside services and laborious manual calculations to prepare N/C tapes before time sharing.

"We didn't require much selling;

we were waiting for them," he adds.

How do the two methods compare? In terms of cost, it's twice as expensive to get tapes prepared outside. In terms of time, the very fastest outside service would be three days. Now, "it's just a matter of dialing a telephone."

Another advantage noted by Mr. Brown is that he can now make manufacturing improvements quickly. The old way, the machine would be down while a new tape was made. "We can't afford to let the machine sit idle that long."



Arthur Klever, vp, Akron Equipment Co., manufacturer of tire molds, uses CALCOMP plotter to verify N/C tapes prepared through time-sharing.

accessibility. "The user can do a lot of small jobs he wouldn't bother to bring to the computer center," says William Payne, manager, EDP Depelopment Planning. Applications range from analyzing fatigue of airframe structures to management science problems.

A Dime a Dozen. Case histories such as these are a dime a dozen with time sharing. And endorsements are even more abundant.

Cliff Whiting, technical manager, Union Carbide's Mining & Metals Div. headquarters "Time sharing is beginning to snowball; the future's tremendous."

Cecil Abarr, manager, General Financial Analysis, Massey-Ferguson Inc: "It's been a great help in developing new products. With it, we are able to develop many more alternatives for study than before."

What's Next? Bright new areas for this service are numerical control and management-oriented problems.

Numerical control is the most

easily defined area of application. As D. R. Orr, General Electric's national sales manager, Information Service Dept., says, "It's the only area you can put your arms around." And a lot of computer and controls companies are trying to do just that.

General Electric kicked off by announcing their N/C programming package for point-to-point work. In the first, three months after announcement, customers for the service have multiplied 150%.

Com-Share entered the picture with a 3-axis point-to-point program. Westinghouse opened its bid for the point-to-point market at this year's Machine Tool Electrification Forum with the announcement of the first of its Camp (Computer Aided Machine Programming) Services with Campoint, a 2-axis, point-to-point language with a unique minimum tool cutting time feature.

A Look at Lathes. What's next of course is contouring.

This fall, Westinghouse will ex-

pand its N/C capabilities with a programming package for lathe work. And, General Electric will introduce an APT compatible conversational language called REMAPT for contouring applications. Westinghouse's Campturn and GE's REMAPT seem to be almost parallel in capability. Compudyne is also working on a contouring package called ZAP which should be announced shortly.

So, while N/C is only a small area of the present time sharing market, it's expected to grow and grow and grow.

Don't Settle for Less. Univac experts claim that no one should settle for less than full APT for N/C programming. And APT at present is not structured for time shared computing. Philco-Ford's 102-212 system will be the exception when it gets on the air.

Dr. Gastone Chingari, staff scientist, Univac, states, "APT is the most powerful processor in the world for N/C; to use less of its power in a time-sharing environment would be inefficient." And W. E. Mangold, N/C manager, Univac International, adds, "Using a smaller N/C processor is setting limitations on the N/C programming scope and flexibility of control of the N/C machines."

Not everyone agrees with this. J. M. Cauley, Manager, Design Information Systems, Westinghouse, says emphatically, "One language will not suit all machine tools, just as one language will not suit all computers."

Univac's approach, according to F. A. Rowe, general manager, Univac Information Services Div., is to apply the brute force computing power of the 1108 and the sophistication of APT to numerical control work through "facility sharing" in a remote batch mode.

"The Westinghouse approach in its Camp Service," according to

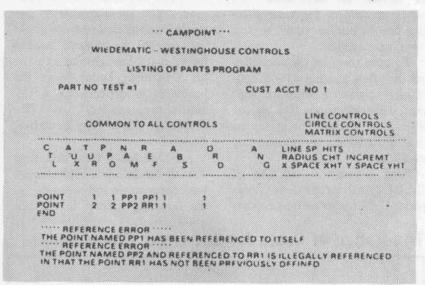
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To use Westinghouse's Campoint system, the parts programmer begins with an engineering drawing of the part. He identifies the patterns he will be specifying and indicates a reference point on his drawing. From this, he fills out the Campoint input form (left) with information on the machining operations to be performed. The parts programmer then inputs his parts manuscript to the computer through the remote terminal. If he makes a mistake in the input phase, the Campoint system will indicate this by a diagnostic message (below). When the program has been successfully executed, a printout of the points will be displayed. After optimization, the program punches a machine tool tape.

Mr. Carr, "is to tailor the language to the machine tool and the computer to the language." In addition to Campoint and Campturn, on the RCA 70/46 timesharing computer, Westinghouse offers APT for complex machining and Campfive, a powerful 5-axis point-to-point language in a remote batch mode.

The computer system Westinghouse is using for remote batch is the IBM 360-50/75 ASP (Attached Support Processor) and the terminals range from the low speed keyboard type up to the high speed IBM 360/30 depending upon the customers' volume of work. "In this way, the part programmer uses the language which makes it easiest for him to solve his problem and we use the computer and communication system which will do the data processing job at the lowest cost."

Discipline by Price. Turnaround time in the remote batch mode of operation can be from immediate to one day to more, depending on what level of priority the customer pays for. "When you have 30 or more people using the machine, you have to discipline the operation somewhere. Conversational time sharing is disciplined by the machine itself, which is costly in computing overhead and capacity, lim-



iting the solution power of the system. In the Univac system, the discipline is externalized by priority, or in effect, by price," comments Mr. Rowe.

The area of management science applications brings up the same dispute over system size and capability. And yet, like the numerical control area, it is an area of increased activity in time sharing.

Carl Spetzler, assistant professor at Loyola University and consultant, management sciences, finds the time-sharing service almost indispensable for his work—the application of decision theory to project analysis.

One Program, Many Combi-

nations. "With the aid of the computer, I can look at all the things that might happen on a project, not just the most likely. And I only have to program the project analysis once, and then re-run it for all the different combinations."

Massey-Ferguson, Inc. uses time sharing for financial analysis, to develop new products, and to prepare monthly control reports. "It has essentially eliminated all manual calculations," says Cecil Abarr.

Massey-Ferguson divides its market planning operation in terms of product line: Tractors, harvesters, and so forth. Each month, with the help of the time

# "The time we save through time sharing is reflected in the company's profits."

sharing terminal, it is possible to look at the forecast for each product line together with new trend information, and thereby generate a new forecast for the line. The report becomes, in effect, a small model of the product line.

Draw From the Top. The computer companies are just as anxious to win over customers like these as they are to get the N/C market. General Electric claims that their introduction of Mark II service on large-scale 600 series computers for time sharing has begun to draw in top level management.

To keep them happy once they get into time sharing, GE is constantly upgrading software support for applications like capital investment analysis, plant expansion, distribution techniques and auditing.

IBM expects its offering of CALL/360:BASIC with expanded ability to format reports

will be attractive to the business area as well as the scientific and engineering personnel.

Philco-Ford's R. N. Verville sees his company's work with universities as a trend toward a new generation of managers—those trained in management sciences and trained to use the computer as a management tool.

Business Needs Science. The alternative to making the manager a scientist is to make the computer more like a businessman. "The inevitable is a language that the businessman could use so that he doesn't need a heavy math background to write his programs. Today, even the businessman depends on a scientific programmer," says Gus Mechalas, Sales Representative, Philco-Ford.

Mr. Mechalas feels that time sharing for business management has been neglected because of the booming market in the scientific community. That situation should change soon.

At the present time, according to E. L. McCleary, GE, "Less than 10% of the management people in the country really understand the power of time sharing and how it can be effectively used in their business as a key management tool." The task ahead of computer companies is one of education that closely parallels the situation which existed at the beginning of the computer industry itself.

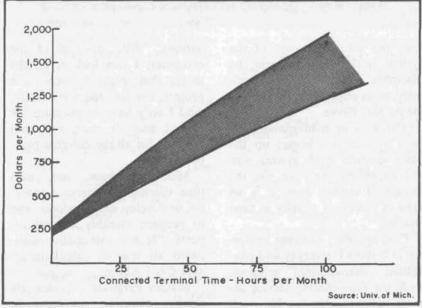
When Time Sharing? Of course, time sharing can't solve all management problems, just as it can't solve all N/C problems. The question facing potential time sharing customers is "when is this computing method the best?"

Problems with little input and output are ideal for time sharing, as are engineering calculations where instant turnaround is essential. If calculations are lengthy, a customer may be better off on a remote batch basis. If the problem requires the computing capability of a really large system, remote batch may be best.

What seems likely is that the future will bring a mixed mode of operation—some time shared, some remote batch, on a combination of small and large computers where the mode of operation at the terminal can switch from time sharing to remote batch with ease. The Philco-Ford proposal is the first step.

As far as what new application areas will open up for time sharing in the future, S. C. Mullé, manager, Manufacturing Information Services Dept., Westinghouse, sums it up, "Where it is not, it will be."

## The Range of Costs for Sharing a Computer



The essential factors that constitute the cost of using a time-shared computing facility include terminal costs, transmission line charges, connected terminal time, central processing time and data storage costs.

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