

THE MULTI-TASK COMPUTER THAT MAKES ITSELF EFFICIENT.

A lot of people have suddenly become very interested in multi-task computers.

And suddenly they've become worried about efficiency. In computers and in the people who use them.

Few have noticed how closely the two are related. How inefficient most multi-task computers are.

And even fewer have understood why.

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MULTI-TASKS CAN MAKE A COMPUTER INEFFICIENT

Most computers started out with batch processing, then grafted on multi-tasks and multi-terminals.

It was, however, more easily said than done. While working in batch, lots of different people had developed lots of different software, with lots of different wrinkles. To get everything working together on a multi-task system, they had to add all sorts of connecting links to the software. And that's where the whole problem started.

Just running the computer — keeping all the users straight, giving everyone what they needed, processing all their jobs — began to take up more CPU time than the work itself. The computer inevitably became inefficient.

Our DECsystem-10 stands out as an exception to the rule. In a typical installation, it spends 90% of its time on useful work.

One of the reasons for that is our approach. We didn't start off with a huge backlog of batch software.

DECsystem-10 started out as an on-line, interactive, multi-task computer that lots of different people could all use at the same time. For timesharing, real time, batch or remote batch. By simply going to any I/O device and doing it. Without ever having to worry about what everybody else was doing at the same time.

But the biggest reason why DECsystem-10 is so much more efficient is the way it was designed. Starting simply and evolving steadily over eight years.

THE WAY TO MAKE A MULTI-TASK COMPUTER EFFICIENT IS TO KEEP ALL OF ITS RESOURCES WORKING ON USER'S JOBS AS MUCH OF THE TIME AS POSSIBLE.

Most computers were (and still are) designed on the theory that the best way to share computer resources is to preallocate fixed chunks of the resources to each user. To define specific partitions for each user and each resource throughout the computer.

The theory may look good, but in practice it leaves a lot to be de-

sired. People don't always act the way they are supposed to. They use less computer than they've been given. Or they need more. As a result, much of the time the CPU just sits there waiting.

DYNAMIC RESOURCE ALLOCATION DOES IT.

Rather than try to preallocate the DECsystem-10 resources, we assigned the job to the internal operating system. So there would be no fixed partitions.

We made the operating system sense the demands being put on the computer then automatically allocate resources to handle those demands in the most efficient way. And we made it a dynamic process. So if a user needs more computer, he has it. And as soon as he doesn't need it anymore, the operating system assigns it to someone else. And this dynamic process happens for every single resource in the computer. The CPUs, main memory, virtual memory, file system, I/O devices, software. Everything.

AN EFFICIENT COMPUTER LETS PEOPLE USE IT EFFICIENTLY

Because of dynamic resource allocation, DECsystem-10 can keep as few as 1/5 of the active jobs in main memory. The rest go into virtual memory storage. But nobody ever knows. Virtual memory makes up to 127 jobs run just as though they were in main memory.

But a computer is only as efficient as the software. So we made DECsystem-10 software shareable.

SHARED SOFTWARE SAVES MAIN MEMORY

That means that several users can all share the same language compiler—like COBOL, BASIC, FORTRAN, and ALGOL at the same time. Since they don't need their own individual compiler copies in main memory, more space is available for the work you really want done.

It's a lot easier to get a program up and running on a DECsystem-10.

You can go on-line to prepare, edit, and debug COBOL, FORTRAN, and ALGOL jobs. No tedious batch runs. No memory dumps.

And you don't have to worry about file geometry, size or location. You just give a file name. The computer does the rest.

You don't have to worry about file security either.

Your files are automatically protected.

At the same time, you also have a complete set of options that let you share whatever files you want with anyone you want.

We also gave DECsystem-10 a multi-level monitor that lets real time users get their jobs done as efficiently as possible. Anytime they need response in microseconds, they can lock their job in core. So anytime an interrupt occurs, it is processed immediately.

Indeed, the multi-job turnaround time on a DECsystem-10

often turns out to be faster than the turnaround time on many equivalent single job systems.

THE RIGHT SOFTWARE SAVES USER TIME

Since so many different kinds of users need so many different kinds of software, DECsystem-10 has all the languages users need to do their programming as efficiently as possible. COBOL, FORTRAN, BASIC, ALGOL, APL, SNOBOL, LISP, AID, BLISS, DATA MANAGEMENT, SPSS, CSSL, JOVIAL, MIMIC.

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What's more, they can work in whatever mode they prefer—batch, remote batch or timesharing—without having to learn many different command languages. DECsystem-10 uses a single, common set of job commands for all modes, all languages.

IT SHOULD WORK THE WAY YOU WORK

And since so many different people want to use the computer so differently, we made DECsystem-10 transparent.

Anyone can walk up to any terminal and do whatever he wants to do, without worrying about what everybody else is doing. On the other hand, the computer scientist who wants hands-on interaction every inch of the way can do that, too. The DECsystem-10 hardware and software is easy to get to, easy to understand, and easy to modify.

AN EFFICIENT COMPUTER LETS NETWORKS WORK EFFICIENTLY

Because it's so easy to work with, DECsystem-10 often ends up in networks. It's equally at home as a number-crunching host to minicomputers or as a communications and timesharing front-end to other computers like the 6600, 7600, 360/91, ILLIAC-IV. Networks have supported Digital and we've supported them. With off-the-shelf simulators and interfaces that'll let you hook Digital PDP-8s, PDP-11s or other computers into a DECsystem-10.

Indeed, DECsystem-10 is a superb computer for developing software for the PDP-8 and PDP-11. We're using it ourselves on most of our minicomputer system software.

DECsystem-10 MAKES DIGITAL EFFICIENT

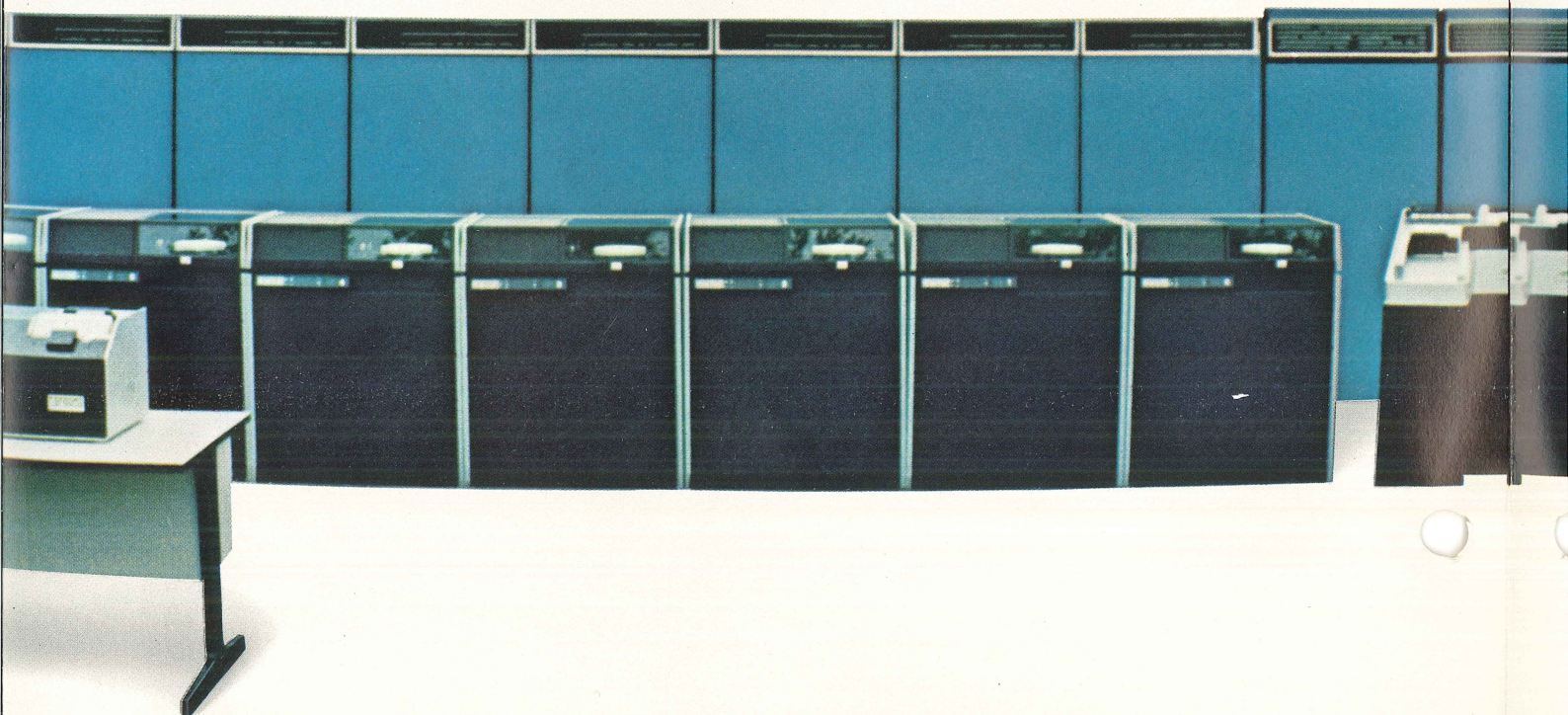
For that matter, we're using DECsystem-10 throughout our organization. For payroll. Manufacturing scheduling and control. Accounting. Finance. Inventory. Order processing. And of course, engineering design and development.

DECsystem-10 MAKES EFFICIENT USE OF YOUR MONEY

Digital has always made more computer cost less. DECsystem-10 happens to be the biggest example of all.

Because DECsystem-10 is so efficient, you can get more work out of less computer. So you can buy less computer. Which is why you can probably get a DECsystem-10 to do your job for half the cost of other computers.

A basic DECsystem-10 complete with CPU, 64K of 36 bit word main memory, 30 million character disk system, magtape system, card reader, line printer, real time clock and 16 data communication ports can be purchased outright for \$A320K.



DECsystem-10 IS MAKING A LOT OF PEOPLE MORE EFFICIENT

Yet even this small DECsystem-10 gives you all the features of the biggest system. When you need more performance, you add more hardware. Nothing gets thrown out. No software has to be changed. And you can expand the DECsystem-10 as much or as little as you need. There are no fixed boundaries at any level.

In fact, the smallest DECsystem-10 can grow into a dual processor, 4 million word main memory, 2 billion character disk, 16 magtape drive, 2 line printer, 2 card reader, 192 interactive terminal, 8 remote batch station, 64 real time device multi-million dollar system, that can run up to 127 jobs simultaneously.

At research laboratories like MIT, NASA, University of Illinois, Europe's C.E.R.N. in Geneva, and Germany's University of Bonn, DECsystem-10 is monitoring particle accelerators, controlling mass spectrometers, analyzing bubble and spark chamber data, cataloging environmental data, acting as host computer in huge networks, and analyzing data from satellites.

In college and university computer centers like Cal Tech, Wesleyan, University of Pittsburgh, Catholic University and Australia's James Cook University, DECsystem-10 is handling everything from budgeting and class scheduling to business data processing and student instruction.

In businesses like First National City Bank, Johnson and Johnson, Stock Exchange of Melbourne, and The Copley Press, DECsystem-10 is doing in-house time-sharing, on-line COBOL programming, accounting and typesetting.

For companies like TRW, Rolls Royce, Canada's Interprovincial Pipe Line, Pfizer and Plessey Telecommunications Ltd., DECsys-

tem-10 handles on-line data collection, data management and control, on-line quality control, simulation and scheduling.

And for data service organizations like On-Line Systems, TYMshare, Rapidata, Time-Sharing Ltd., Dataline Systems Ltd., and Cyphernetics, DECsystem-10 is involved in all kinds of industrial, scientific and commercial applications.

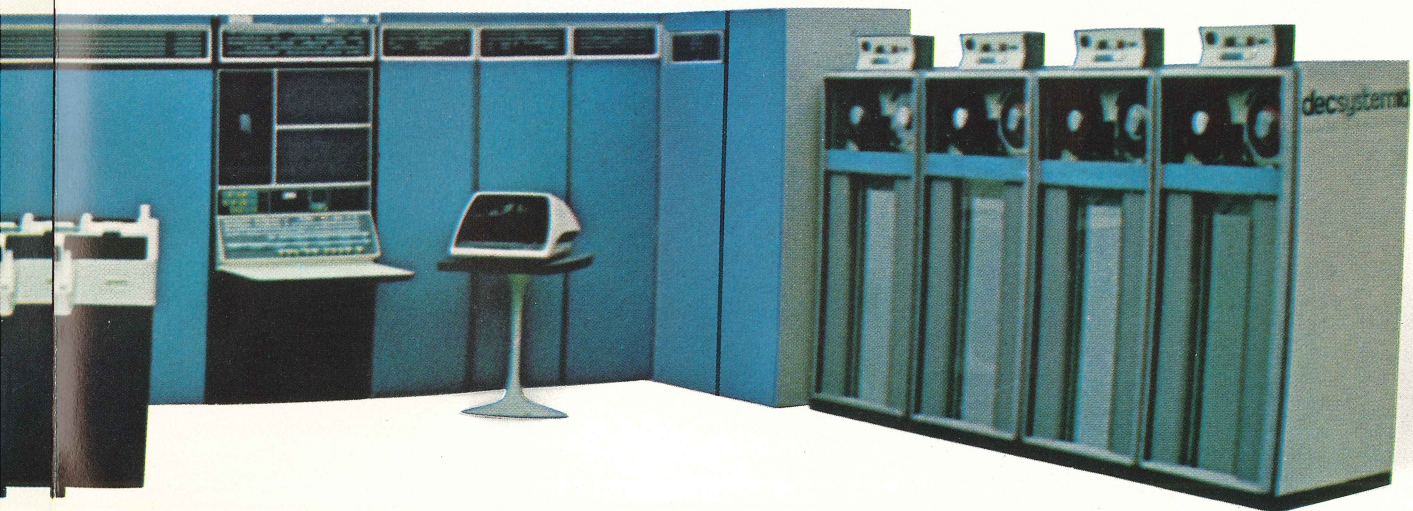
If you'd like to see one of our 240 installations at work, we'll set up a visit.

Or if you want to come to Maynard for a demonstration of everything mentioned here, that's fine, too.

Or if you want to get deeper into the technical side of DECsystem-10, write for the DECsystem-10 Technical Summary.

Or if you want to know more about who's doing what with the DECsystem-10, ask for the applications literature.

In any case, don't hesitate to call. We'll put you in touch with one of our people who can relate to whatever you're trying to do.



DECsystem-10: high performance on-line computing at low cost.

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