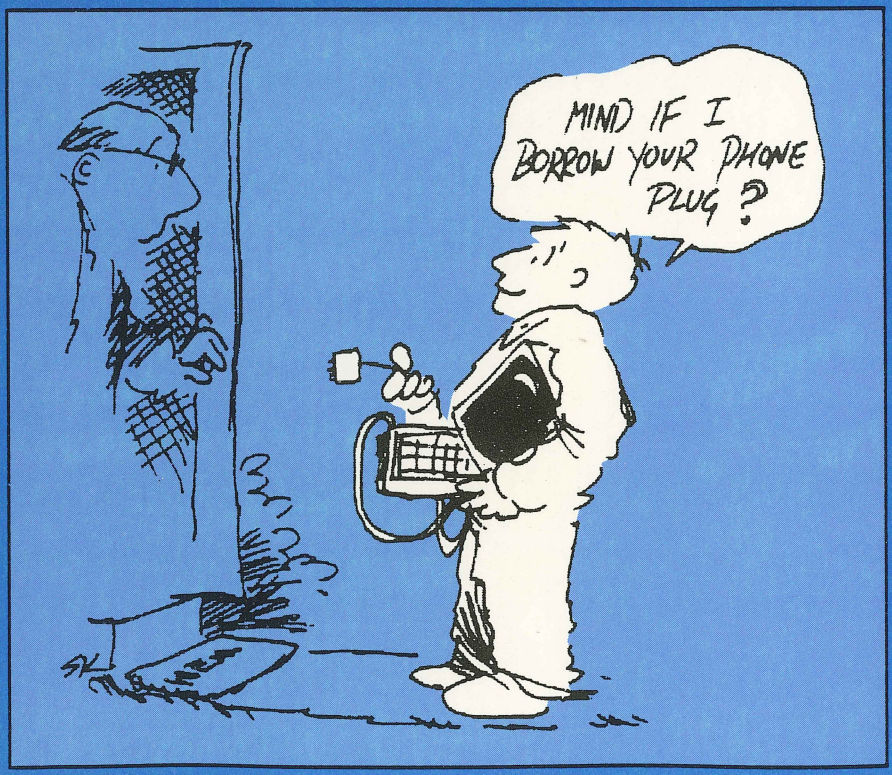
The Hitch-Hiker's Guide to Digital

Roger Caffin

Published by DECUS Australia
to help DECUS members, or Digital
(we're not sure which).



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To John -
with thanks

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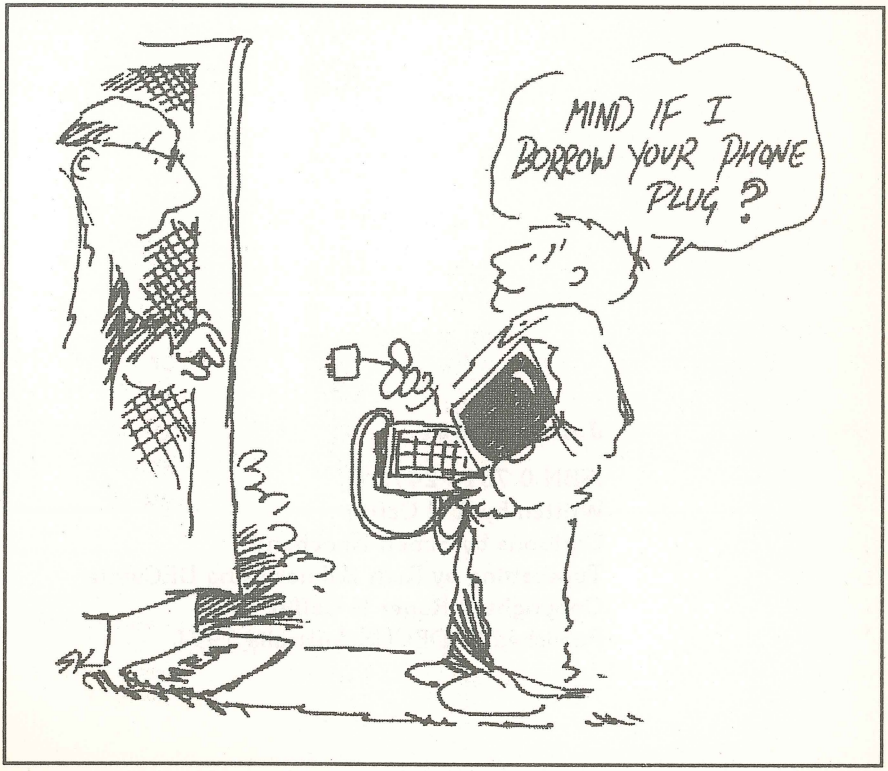

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The Goodies Within

Preface

Dealing with Digital Equipment Corporation is a bit different from dealing with many other companies. Digital has its own style of organisation, and its own way of doing things. Sometimes, for someone who has just started doing business with Digital, this can be very confusing, and can result in all sorts of misunderstandings. This guide was written by a veteran (and independent) member of DECUS to help you understand Digital and Digital staff: how they operate, what motivates them, and how to get the most out of them. The first rule is:

In the pages that follow, we will look at how the company got started, how it is structured, and what philosophies motivate it. We will also look at the family trees of products and at how Digital conducts its research and development (something which may not be all that obvious). With this background we will then try to explain how you can get the maximum response out of Digital, how you can resolve any problems most efficiently (no organisation is perfect), how to do business with Digital (not obvious!), and in general how to "work the system", to use Digital's own words.

To round out the accumulated wisdom and most excellent advice contained herein, a chapter on DECUS itself has been included. After all, DECUS too has its own ways and its own traditions. We do not claim to cover all of these by any means, but hopefully we can help you use DECUS more effectively.

This guide was written without any assistance or guidance from Digital, and does NOT contain any company propaganda. If parts of it sometimes seem to be complimentary to Digital, remember that Digital has a long history of being easy to get on with: customers generally stay customers. And if some parts seem mildly critical, it just goes to show we are independent and speak our mind!

As you read this you will notice that in some places it changes tone near the end of a section. There is an interesting reason for this. The author started writing in 1989, and continued through 1990 to the start of 1991. This just happened to mark a period of enormous change in Digital, and sometimes it was hard to keep up. So rather than sanitize the whole thing, it was decided to keep the historical perspective and note the changes. This will actually help you understand some strange references to Digital behaviour you will meet in your travels.

The acronym DEC stands for Digital Equipment Corporation and is usually used by customers and the press, while the word Digital is normally used by Digital staff as a short

form of their company name. The two may be interchanged in practice. The term "*Digit*" is often used within Digital (and DECUS) to refer to a member of the Digital staff (without being crude). Now that Digital has moved to Rhodes, some use the term *Rodent* instead.

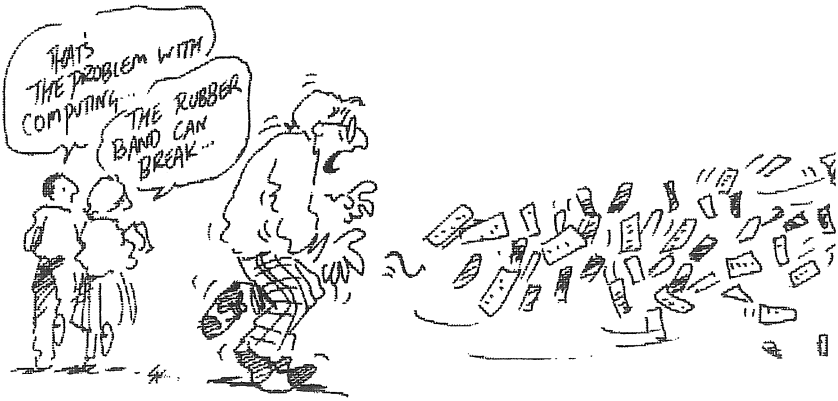
DECUS stands for Digital Equipment COMPUTER Users Society. It does NOT stand for Digital Equipment CORPORATION Users Society, a body which simply does not exist.

Any other acronyms used will (in theory) have been spelt out in full beforehand. Finally, most special names are probably registered or trademarks or something or other and usually belong to Digital or someone else.

Chapter 1

The Founding of Digital

Way back in the 1950's computers were very large and very rare. They were also very expensive. Given all this, the natural tendency was to try to keep them running jobs all the time, and so the users had to fit in with the machine. These were "mainframes", and the mode of operation was called "batch processing".You had to "submit" your job (on punch-cards) to the operator, who would add special Job Control Language (JCL) instructions/cards to get it to run.



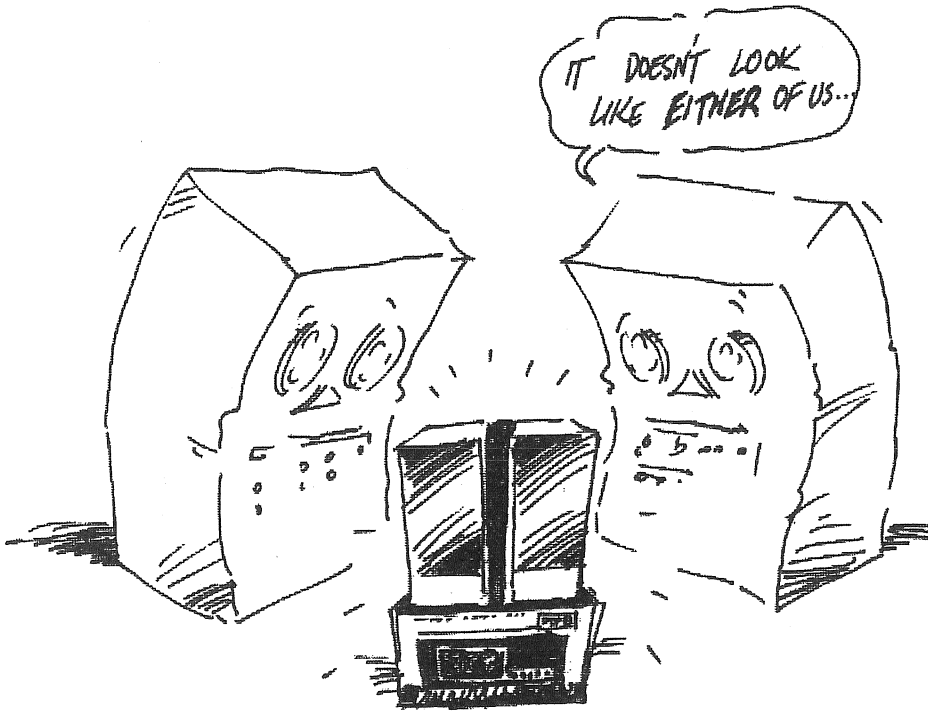
Mind you, the complexities of JCL were such that the ordinary mortal didn't want to get any closer to the machine. He was usually quite happy to inherit little bits of JCL from

someone else who had found something which worked. (The author remembers "inheriting" a suitable stack of cards while at Uni from another student: very precious.)

At the Massachusetts Institute of Technology (MIT) some of the staff had a different idea: to make computers small and cheap enough that a single department or even a single research group could have one. They put ideas into action and built several, with names like "Whirlwind". Physically, such machines were still very large compared with modern machines, even where they used the very latest invention: transistors. Actually, Whirlwind was meant to be an analogue computer and part of a flight simulator for training military flight crews, but in an incredible violation of the usual bureacratic morass some brilliant engineers at MIT were "let loose" to be creative[1]. Anyhow, one of the graduate students who helped build the MIT machines decided that this was a Good Thing, and that he wanted to start a company making small machines. It was a revolutionary idea, but Ken Olsen and two others managed it in 1957, and called it Digital Equipment Corporation. Following advice from one of the investors they carefully avoided the use of the word "computer" because it was common knowledge in those days that you couldn't make money out of computers. Some of Digital's competitors would still agree with that sentiment.

At first they made "logic modules" for the laboratory, and then they used these to build their first computer: the "Programmed Data Processor 1", or PDP-1, in 1960. At $120,000 each, they managed to sell several of this model at a time when mainframes cost over $1,000,000.

[1] For more historical information on early computers, read "Project Whirlwind" by K C Redmond & T M Smith.



They went on to build other models of differing sizes and designs, introducing the terms *interactive computing, minicomputers* and *time-sharing*, and made enough of a profit to stay in business. Digital is now a Fortune-100 company (actually about position 27), and the second or third largest computer vendor in the world, depending on mergers between other companies.

Several points should be noted from this (*very* condensed) history. The first is that it conceals an encyclopedia of quite incredible stories about some rather incredible people which have been better told elsewhere and are worth reading. The second is that Digital created the concept of the *minicomputer*, and is the world's largest vendor of minis

today. Thirdly, while the mainframe world went in for somewhat user-hostile job-submission and batch-processing, Digital was dedicated to interactive or *personal computing* right from the beginning.

The early Digital Equipment Corporation sold mainly to laboratory and technical customers: people who spoke the same language as the designers, and this influenced the development of the company. One of the consequences was that Digital developed and kept a reputation for excellence in design and engineering. Another consequence was the formation of DECUS, the Digital Equipment Computer Users Society, in 1962, about which more later. Today, with the growth of the company and the size of its computers has come an expansion into the commercial world. Put very bluntly, this change (expansion) in its customer base has not been without some trauma, as Digital has struggled to adapt to its new environment without losing its old virtues. As you will find out, DECUS sees itself as having some responsibility for keeping Digital on the straight and narrow (as in "not shooting itself in the second foot").

Given that Digital has grown to be a such a large company, it is remarkable that the founder Ken Olsen is still the President and Chief Executive Officer. Actually, it appears to be a unique achievement in the whole business world. It is not surprising then that Ken has had a very significant influence on how the company operates: its structure, its philosophies and its culture. It would be safe to say in fact that most of the rather curious philosophies which make Digital unique come from Ken.[1] Before you worry about this, note three facts: the company has the highest credit rating possible, it continues to expand where others flounder, and it has many extremely loyal customers.

[1] For more information about Ken Olsen and Digital, read "The Ultimate Entrepreneur", by G Rifkin & G Harrar. Note however that it is NOT an "authorised biography".

Chapter 2

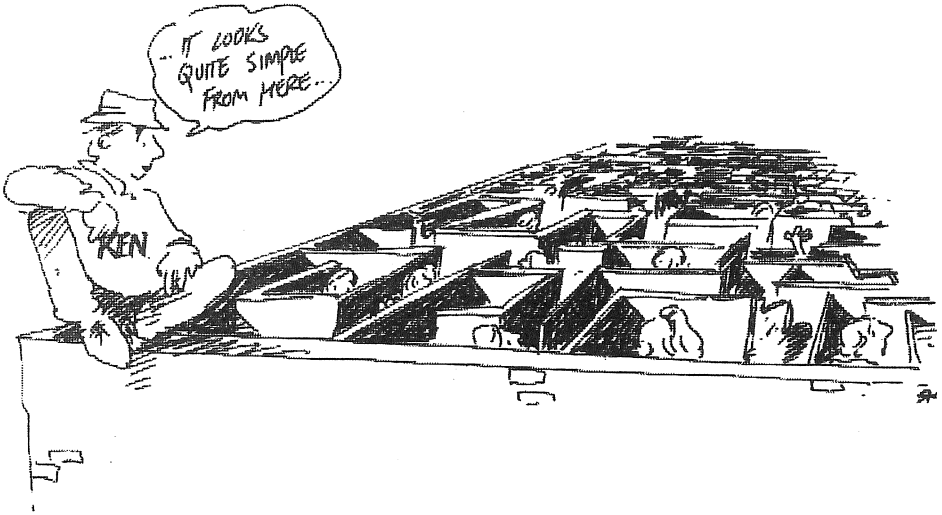
Company Structure

Digital has been named as one of America's five best managed companies. This never ceases to amaze some (most?) customers, as Digital often appears to be totally disorganised. Sometimes Digital really is totally disorganised, but we try not to mention that. The secret of all this lies in the "Matrix Management" style used by Digital. This is NOT the same as the usual "bureaucratic style" of management. The concept has been described by detractors as having everyone answer to everyone, with no-one responsible for anything. That's not quite true, as we shall see. On the other hand, very few other companies use this management style, so ....

THE DIGITAL MATRIX

At the top there is Ken Olsen. At this level the structure remains simple. Answering to him are Vice Presidents and Senior Vice Presidents covering key corporate sections: Corporate Operations, Finance, Sales, Service, Personnel, Administration, and Manufacturing/Engineering, (at least at the time of writing). There are also hordes of other Vice Presidents, but not to worry. These sections permeate throughout the entire international organisation. There are three geographic areas: US, Europe and General International Area (GIA). Australia, New Zealand, PNG and Fiji comprise the South Pacific Region which is part of GIA. In each region there is a Sales & Marketing organisation and a Digital Serv-

ices organisation. Under other sections there are the usual breakdowns of function as well.



Like most other companies, Digital undergoes periodic redrawing of its organisational chart, and this structure may no longer be true by the time you read this. Such changes don't really alter the internal operation of the animal however: whoever thought real life bore any relation to wall charts? In fact, while this was being written Digital amalgamated Field Services and Software Services to make the above Customer Services. Then they amalgamated Customer Services and Enterprise Integrated Services to make Digital Services. Generally the customers don't bother understanding the current situation: they just hang on to a couple of useful names and let Digital internals sort out the rest. This seems to work most of the time.

Now consider the Australian Field Service Manager. To whom does he answer? Obviously he has to answer to the Australian (general) Manager. He also answers to the GIA

Field Service Manager. By and large, most staff have this split responsibility, with one side looking after the "what to do", while the other side looks after the "how to do it". The "why to do it" and the "when to do it" are a little bit more obscure at present (and we won't even start on the "who to do it" here).

In Australia we have a South Pacific Region (SPR) Manager. Below him there are a collection of managers who answer both to him and to other managers in GIA. As a customer you are not going to be very interested in the internals, but it is worth your while knowing a bit about the Field Service, Telephone Support and Sales sections. We were going to include the relevant matrix structure for you to fill in with peoples' names, but it varies with great regularity (or seems to). Instead we have just listed some fairly stable function names in the hope they are still relevant. It would be well worth your while filling in the names for your

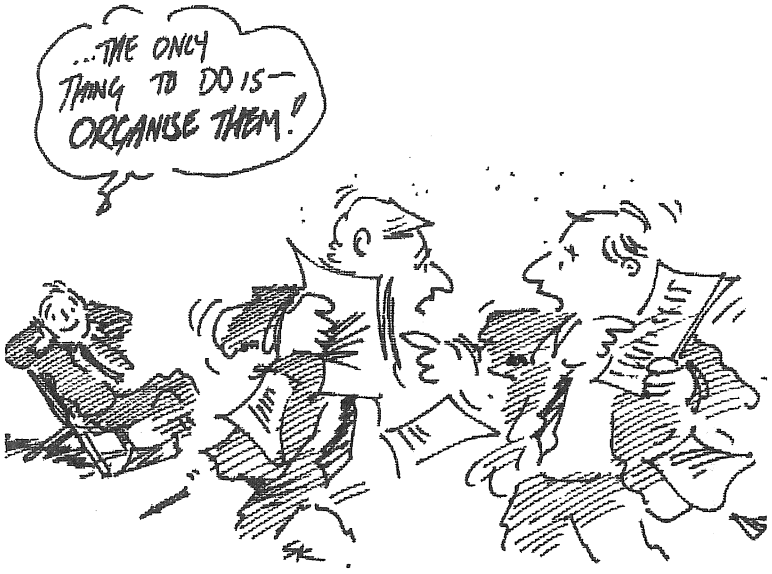
area: this can be done with assistance from your local Sales and Service contacts (they will be happy to oblige). Do it on a separate bit of paper: it WILL change!

State Unit Manager . . . . . .
Account Representative . . . . . .

Field Service Unit Manager . . . . . .
Field Service Engineer. . . . . .
Telephone Support Number for Australia 008 252277

HOW DOES IT WORK?

Anyone with any experience in management is immediately going to ask how on earth can this matrix structure be made to work. One thing is clear: the normal "do this, do that" type of "bureaucratic" management is not going to work.



For the new employee it can be very confusing: there are usually no clear boundaries to the job and responsibilities can be diffuse. Making it work in general requires a lot of talking and negotiating inside the company. The aim in any particular situation is to balance needs and resources, getting commitments from others who are involved, and reaching a consensus. A manager cannot "order" an employee to do something as he does not fully "own" that employee. He has to achieve cooperation. Equally, an employee may not be able to satisfy two managers at once: instead of panicking or giving up he gets them together to find out what is most important.

Inside Digital this business of wheeling and dealing to get what one wants is called "working the system". It is the normal way of operating. It has been called "honorable conflict" by an outside reporter who tried to get a simple managerial decision made. It may explain why, whenever you try to telephone someone, he is usually "in a meeting". Contrary to what you may hear, it is not true that half the meetings are held to decide who should answer the phone the next time it rings.

Without real commitment from the very top of the organisation, Matrix Management will not work. Without willing cooperation from the staff, Matrix Management will not work. At Digital it does seem to work (party line!). The internal consequences are sometimes "interesting", but do include great flexibility and freedom, which can lead to high job satisfaction. Compared with the whole industry, Digital has few resignations and very few sackings. The external consequences are sometimes a little confusing because the system seems different. We will come back to this later, and try to suggest ways you can use to get what you want out of the system.

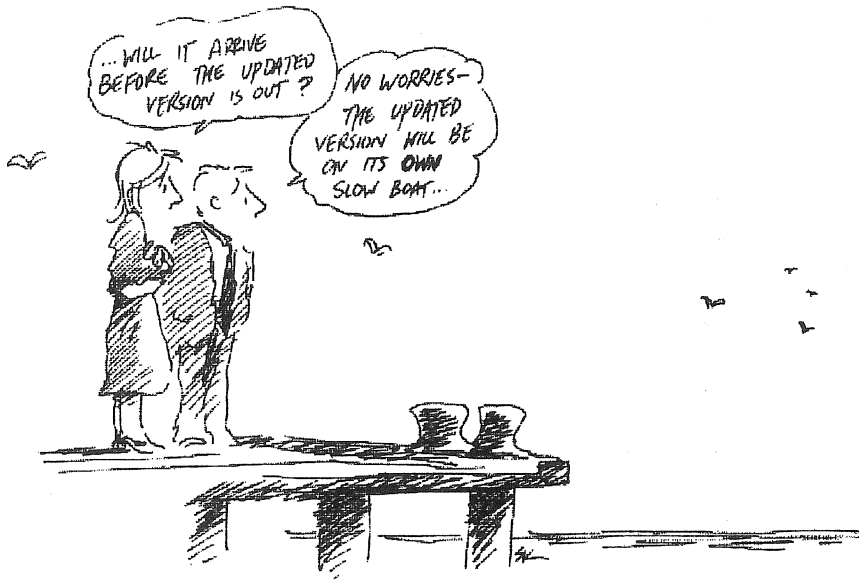
Chapter 3

Digital Corporate Philosophy

When Ken Olsen started Digital he had his own ideas about how a company should function. Having borrowed money (all of $70,000) he felt it should be paid back. He wanted a company with a future, rather than something which could be sold off at a profit in a few years. And above all, he wanted to retain the free and trusting atmosphere of the MIT research labs. Some people have labeled these ideas "eccentric" — but then they haven't held one job for so long or been so successful either. Mind you, some of Digital's internal security on future products makes the military look very amateurish. The classic response is "I don't recognise that name/product number/description". On the other hand, there are always "non-disclosure agreements" (now called Proprietary Information Disclosures (PID)) when there's a million dollar sale to be had.

Financially, Digital is extremely strong. Ken does not believe in borrowing money. As a result, while other companies have problems paying the interest on their loans, Digital is collecting interest on its bank accounts (it was hovering around $2 billion for a while by some accounts, but see later). Rumour has it that this income from bank interest exceeded the total revenue of some well-known smaller computer companies. On the other hand, while the company shares attract a high price, Digital has yet to pay a dividend on those shares: the money is put back into the company.

Ken and Digital get criticised for this very strange form of financial management every so often. It doesn't seem to worry them. Of course, from the customer point of view it would be nice if they used the money to build more production facilities, so deliveries weren't quite so slow....



Actually, while that is the perspective of many long term customers, by 1991 it would appear to be no longer quite fair. That $2B has shrunk to about $1.7B, with the rest spent on state of the art production facilities. Response to DECUS pressure, or just good business sense?

Digital does very little advertising — relative to the rest of the somewhat frenetic computer world. Again, Ken's idea is that a product should be launched on the waters with little fanfare. If it is any good it will sell, and if it isn't it will (and should) sink.

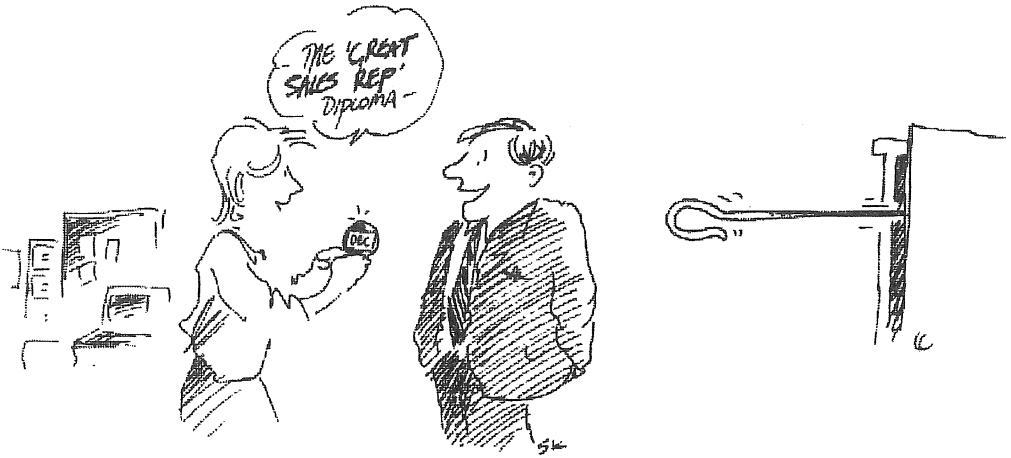
This philosophy really relies on genuine performance, as measured by users rather than by specious benchmarks,

and "word-of-mouth" advertising, which is undeniably the best form there is. Despite belonging to rival companies, you will find that technical customers do exchange such assessments quite freely. You may also have noticed that Digital doesn't feature in the almost constant stream of mind-blowing press releases in the media. (A pity: some of the PC games advertising artwork is fantastic!) To technical customers, this restraint is a sign of maturity and respect for the customer's intelligence. On the other hand, the PC world sometimes reminds one of the phrase "Never mind the quality, feel the advertising". With the expansion into the commercial world the rules have changed a bit, such that Digital now does some limited advertising. So far it has remained quite low-key and even staid, with very little razzamatazz.

Digital is the only computer company which pays most of its sales staff a flat salary, without commission or bonus. That's right: most of Digital sales staff do not get any commission on their sales. A small fraction at the top do get a commission, but that change happened only recently, and applies in practice only in the commercial environment with very large contracts. The reason for this is found in one of Digital's formal ethics: if what you are selling can't solve the customer's problems, then don't make the sale. Compare that with the average PC distributor, where the message seems to be to sell as much as possible before the company goes into receivership! The only special reward Digital does offer to staff is a stock option. However, this is a rare event, requires significant contributions to the functioning of the company over a period of time before it is made, and is more a token than a fortune. Interestingly, the fact that it has been made is not advertised to other staff: that is considered very bad form.

On the other hand, ordinary rewards are quite achievable: this is usually some form of promotion. Digital has quite a large and fascinating set of salary steps and ranks, which is

quite reasonable when you compare its size with any large government body. There is a difference though: at Digital you get paid for measured performance. There is only one problem with this system for the customer: if you manage to get a really good sales rep or field service engineer, there is every possibility that he will get promoted. This usually happens when you have just finished training him to a really useful state.



Add to that the enormous growth rate Digital has suffered — over 30% per year at one stage, and the potential for a few problems does become apparent. Fortunately Digital recognises this and has mechanisms in place to avoid (or at least ameliorate) disasters, especially in the area of Field Service.

As an aside on this theme, you may find as the years roll by that the once junior salesman or engineer you helped train has become a senior manager. Stay in touch with such people: they can be very helpful later on when you need to "work the system". We will explain what that means in another chapter.

In management terms, Digital relies on the individual. Ideas are mooted, support is traded, commitments are made, and projects get driven. Naturally, performance against commitments gets regularly reviewed. Success is rewarded. Failure is not the end: everyone has failures. The secret lies in learning as much as possible from the mistakes, and trying again. This is not just a nice story: within Digital there is a very strong culture covering the above, and in 1974 it was formally set down and acknowledged in an internal handbook for staff training. It even discusses what to do after a failure, or how "to climb out of the valley".

Digital places heavy reliance on certain philosophies: honesty inside and outside the company, quality of the product, caring for both the employee and the customer, encouraging employees to develop themselves and their ideas, and being willing to accept responsibilities.

The Matrix style almost encourages "conflict". Properly managed this is seen as an integral part of the system: it means that ideas and proposals get thoroughly reviewed, and it does elicit cooperation from the players. As a result no-one is afraid to discuss problems, criticise or ask for help. Well, in most cases anyhow: they are all human. Above all, the Corporate Philosophy is to "do the right thing". Breaking this rule is not good for an employee's future prospects.

Most long-term customers of Digital have some sort of understanding of the above, even if they have never put it into such concrete terms. In fact, many customers are happy to make verbal agreements with Digital staff they would never make with another firm. We don't recommend those sorts of business practices of course, and Digital corporate policy is that all agreements MUST be in writing, but you will find that many Digits are quite happy with that sort of situation and they will keep their side of a verbal agreement. The company IS ethical.

Chapter 4

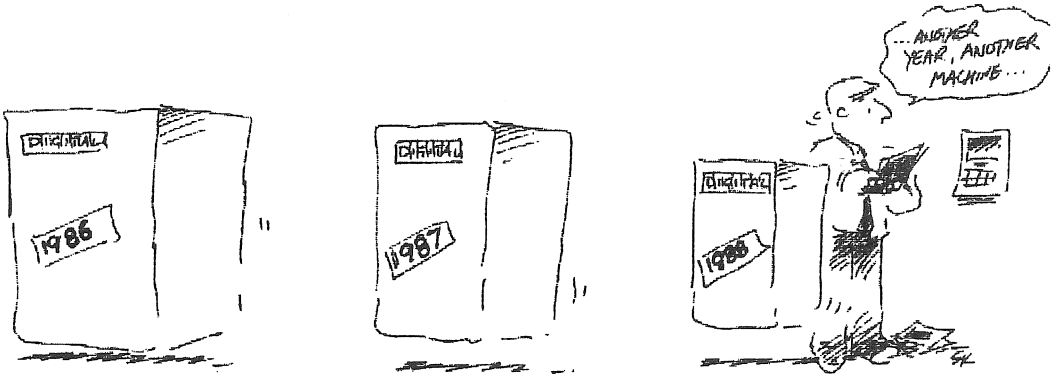
The Family Tree(s)

Digital has been in the computer game for a long time, and they (the designers) pioneered many things now taken for granted. They created the concept of the mini-computer with the PDP-1 in 1960, and made it a commercial reality with the PDP-5 in 1963. They created the first time-sharing operating system, on the PDP-1, and sold the first full-blown time-share system (a PDP-6) in the world — to the University of Western Australia. To this day no-one understands why they chose to beta-test on the exact opposite side of the globe: out of sight of management perhaps? And they created the now universal concept of a "bus" to which are attached the different parts of the computer such as processor, memory and so on.

In this chapter we will explore the hardware, both past and present, and some of the more important developments you should know about. Some years back it would also have been appropriate to discuss Operating Systems: the software that makes the machines tick. We haven't done so: researching that "is left as an exercise for the reader". That means going to DECUS Local User Group (LUG) meetings and Symposia, and talking to other DECUS members: it could fill days. (A caution is in order here: it could equally take weeks, involve bloodshed and black eyes, and leave you feeling you have been through a Middle Eastern "holy war"!)

THE COMPUTERS

Most of the Digital computers fit into "families", and they used to have the prefix "PDP", standing for "Programmed Data Processor".



Then for a long while it was all VAX-this and VAX-that. Lately, with Digital's move to Open Systems, new terms like DECsystem and DECstation have begun to creep in. This may not seem important, but you should remember that in those days the whole concept of compatibility and families was unknown; there weren't enough machines in the world for it to be a problem. In fact, not long before Digital was founded, the idea of duplicating a machine was still novel. The Digital idea of inexpensive personal machines made it relevant. We list below the family tree in one form: other forms exist, including large posters from Digital with dates and all, but they can be hard to find.

PDP-1	1960, 18 bits, $120k, 50 sold, some ran till late 70s
PDP-2	Paper design for 24 bit machine
PDP-3	Paper design for 36 bit machine
PDP-4	1962, 18 bits, $65k, 45 sold, slow
PDP-5	1963, 12 bits, $27k, sold from 1963 to 1965
PDP-6	1964, 36 bits, $300k, 23 sold, precursor to DEC 10
PDP-7	1964, 18 bits, $45k, 120 sold, followed PDP-4
PDP-8	1965, 12 bits, $30k, 40,000 sold, followed PDP-5
PDP-9	1966, 18 bits, $200k, 445 sold, followed PDP-7
DEC-10	1966, 36 bits, $1M, 1000 sold, big time-share system
PDP-11	1970, 16 bits, new design, family concept
PDP-12	1969, 12 bits, $100k, 1000 sold, PDP-8 LINC-8
PDP-13	never started!
PDP-14	1970, Industrial controller using 8008 Moules (MPS)
PDP-15	1970, 18 bits, $200k, 790 sold, successor to PDP-9
PDP-16	1975, Ind. controller, "Register Transfer Moules"
PDP-17,18,19	never allocated
DEC-20	1976, 36 bits, 1500 sold, DEC-10 with new O/S
Rainbow	1982, IBM PC partial emulation
Professional	1982, PDP-11 based PC
VAX-11/7xx	1978, 32 bits, with PDP-11 emulation
MicroVAX I	1983, small VAX with Q-bus
MicroVAX II	1985
VAX 8xxx	1986, 32 bits, pure VAX
VAXmate	1986, PC clone with DECnet interface
VAXstation 2000	1987, Personal VAX, cost competitive with large PCs
DECstation 3100	1989, RISC (MIPS) processor, UNIX hot-box
VAX 3000	1987, Wide range of Q-bus VAXs
DECsystem 5000	1989, RISC (ULTRIX) timeshare system
VAX 6000	1988, symmetric multi-processor, mid-range
VAX 9000	1989, mainframe competition, 4x30 VUP[1]
VAX 4000	1990, hot channel architecture in small box

But the tree does not tell you everything. Which are the great machines? As you might expect, you will never get complete agreement on this score, and the question is a great way of starting an all-night fight at a Symposium, but the following seem popular.

[1] VUP, VAX Units of Performance, are explained later

PDP-8

The world's first cheap large-volume (40,000) minicomputer, it appeared in many forms until supposedly "displaced" by the PDP-11. In fact, Digital sold more PDP-8 computers once they were displaced than ever before, only the latter ones (150,000) were built with a single (microprocessor) chip and disguised as DECmate word-processors. As such, they were among the cream of the dedicated word-processing systems, unmatched by any of the PC-based packages of the time. Unknown to many is the fact that the old PDP-8 operating system (OS-8) and layered products (compilers and other utilities) are still available through DECUS, and can be run on DECmates. That unused word processor on your secretary's desk can be persuaded to function just like a Departmental system of yesteryear. (Shades of valve amplifiers!) They knew how to write software in those days: the resident part of the operating system occupied just 256 words of memory: VMS occupies well over 1000 times that!

Those who used the PDP-8 may tell you that it only had eight instructions. While not absolutely true, it is close enough that the PDP-8 easily qualifies as the world's first RISC machine. The current academic popularity of the RISC architecture is slightly puzzling to those of us who moved from the 8 to the 11 to the VAX. Perhaps the simplicity with which the RISC architectures can be understood, created and modeled is sufficient explanation (although they do claim awesome speeds).

One of the major features of the later PDP-8 models was the backplane or bus into which all the modules plugged: the "Omnibus". The specifications were published, third party vendors sold add-ons, and every hardware guru built his own dedicated interface board. You could even control the processor operation from your custom interface board via special lines on the backplane. Modifications to Omnibus interface boards were standard DECUS Symposium

fare for a long time (a prerequisite for "guru" status), and helped account for some of the "technical" reputation of DECUS.

The PDP-8 had only 12 bits per word, unlike the later 16-bit machines. This decision had an unstructured origin typical of the era: the machine was partly based on the PDP-5, a 12-bit machine which had roots in the DC-12, a controller which Digital designed but never released. Actually, the PDP-5 started design life with 10 bits, but grew to 12 bits so as to accommodate more memory, two 6-bit characters per word, and a 12-bit analog to digital converter. This allowed it to replace a custom analog front-end to an 18-bit PDP-4 for Atomic Energy of Canada. Note that at this stage the current environment had 6-bit peripherals. The PDP-8 designers could not have contemplated going to 16 bits: the cost implications were just too much. Design costs were very important in those days: the front panel "bat-

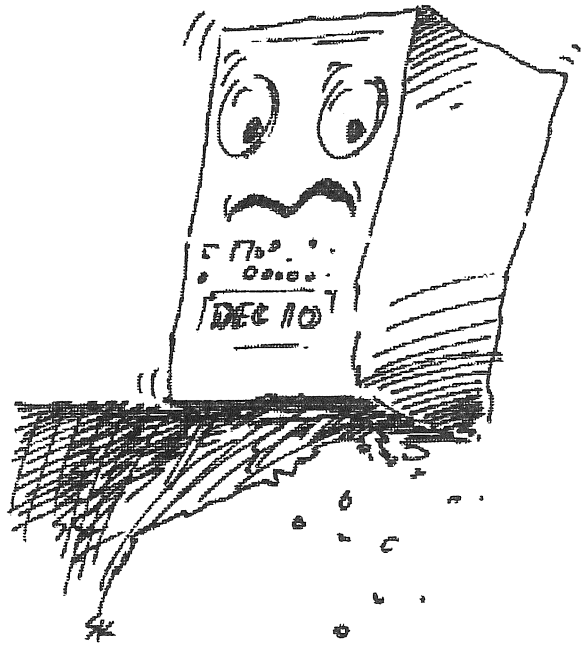
wing" switches on the PDP-8 which spread to many other Digital machines were derived from a 1964 Hotpoint clothes drier which Ken Olsen saw in a local shop. Contrast this method of system design with the enormous costs encountered today. Are the designs any better?

DEC-10/20

These were the Digital "mainframes" for many, many years. They probably served in more than half the world's Universities as the central time-share computer systems, and gained a near-fanatical following. Some of the software features developed for the 10s and 20s still have not been matched on any other system (or so their followers claim). Non-users should note that the 10 and 20 hardware was actually the same: just the operating systems differed. Some of the architectural features of the CPUs were put there for reasons which would seem very strange today, but they did support LISP very well...

Unfortunately, further development of the 10/20 architecture proved difficult to achieve (it was becoming quite old), and development projects were behind schedule when Digital was gearing up with more powerful VAXs. To the shock of the faithful, the decision was taken to terminate development of the line and transfer customers to the VAX series.

It must have been a difficult time for Digital, with so many large-system customers appearing so upset and many Wall Street "advisers" severely critical,



but it would appear that the migration has taken place, and the new high-end VAXs are proving to be much more powerful.

In the period following the cancellation of the 10/20 line, a firm in America was supposed to be still working on producing newer and more powerful members of the family. However, this seems to have died a natural death.

PDP-11 & LSI-11

The story of the design of the 11 is a fascinating one. There is indeed some truth in the legend that it was designed in a weekend, at a Carnegie-Mellon University workshop, in 1969. This conceals the collective experience of the men who designed it of course, and also conceals the man-years of fine tuning that followed that weekend. Two important features of the design are the word size and the

underlying philosophy. After the PDP-8, with its 12 bit addressing and memory extension tricks, it was obvious that users were demanding more memory. It was felt at the time that it was obvious that 16 bits (64 Kbytes) would be enough for quite a while.

As the designers admitted very soon after, this was a mistake! It is now apparent that memory demands increase by 1 bit (ie they double) about every two years. Address extension for the 11 was required within two years. The ultimate address size for the 11 family reached 22 bits or 4 Mbytes.

However, the choice then of a clean binary number (16) for the number of bits in a word made it easy to adopt the concept of 8-bit bytes, a new IBM convention of the day, believe it or not — or was it triggered by the 8-bit byte? Either way, it confirmed the definition of the 16-bit word, and heavily promoted the use of the ASCII standard alphabet. This probably set the standard for the rest of the industry: with the exception of old-timers such as Control Data and IBM, who had already created their own (totally weird and archaic) internal standards and saw no reason to change, no designer has used any other standard since. And those two companies are now embracing the ASCII standard too, albeit rather coyly and without admitting any problems.

Even more important in some ways was the formal decision to design a "perfect" architecture, without any compromises. It was recognised that such a decision might lead to difficulties of implementation at first, but it was bravely expected that time and technology would resolve these. Already some visionaries were noting the steady trends in device technology and starting to extrapolate to the next few years. The result was an architecture which has been accepted as both the grandfather for the design of many other computers and the benchmark against which they are compared. The proof of this can be found in the sales figures and in the acknowledgments in the literature and in

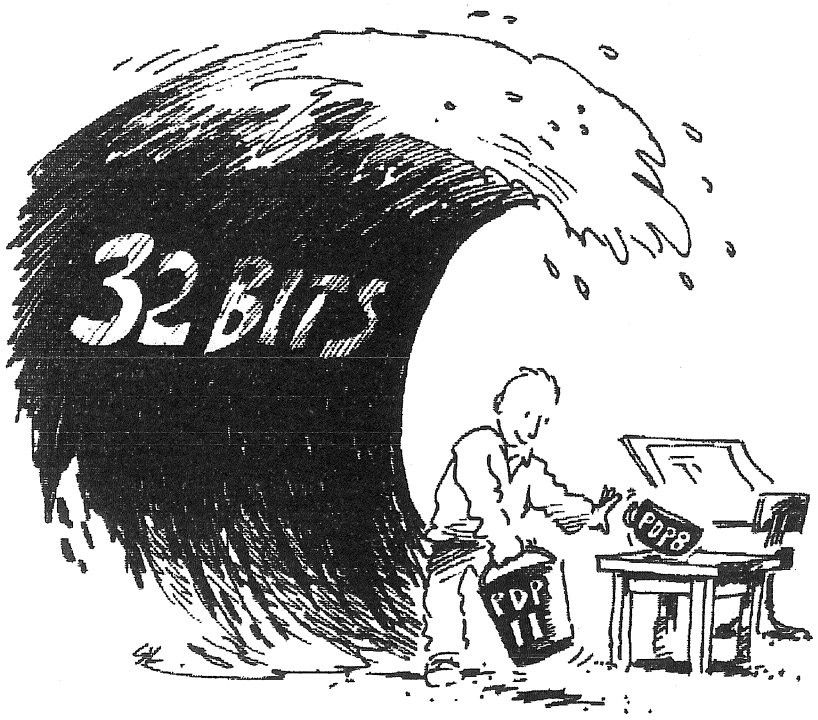
other companies' advertising (well, up until the VAX took over anyhow).

The bus used as the backbone of the PDP-11 for many years — the "Unibus", proved to be a bit expensive for the low end of the market. A second and simpler bus — the

"Q-bus", was designed and released in 1975. Originally slower than the Unibus, it ended up being as fast or faster. The exact number of Third-Party manufacturers making add-ons for the two buses is not certain, but is commonly believed to be over 70. This was and still is a popular architecture.

The PDP-11 featured a range of software Operating Systems, each with their own adherents. There was RT-11, for very fast, essentially single-user systems; RSX-11M+ for interactive multi-user systems such as University Departments; and RSTS for large time-share systems in commercial environments. There were several others, including DOS-11 and CAPS-11 and PTS-11 (see if your sales rep recognises them!), RSX-11M and RSX-11D, TSX+ (multi-user RT-11, by a Third-Party vendor) and UNIX (which came to glory on the PDP-11).

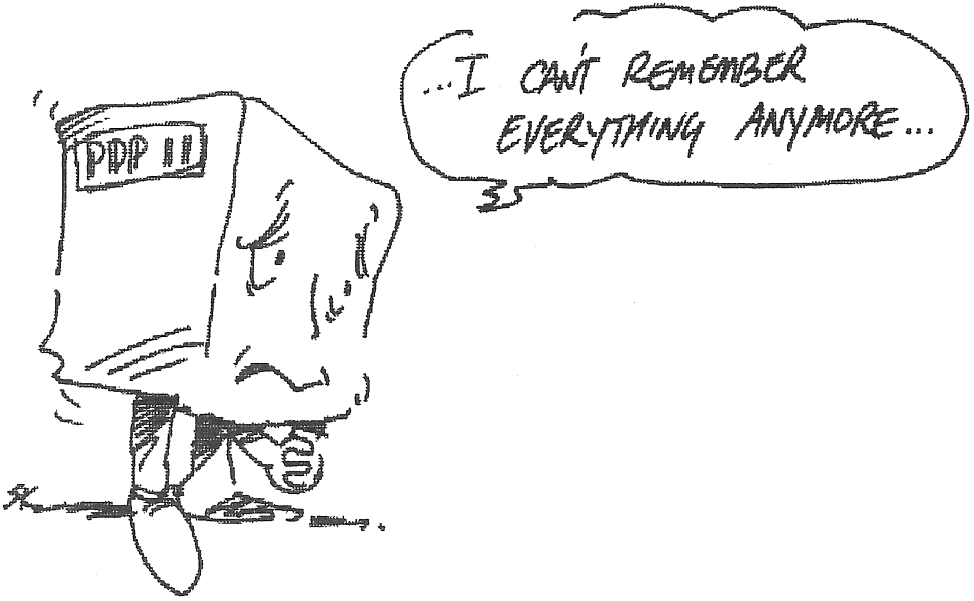
The top-end PDP-11, the 11/70, became physically a very large machine occupying many large cabinets before Very Large Scale Integration (for chips) and Winchester technology (for disks) finally struck. Nowadays you can get the same power as once supported a major University Department or large company in a small suitcase volume, and for a price justifiable for one or two people. The small suitcase or "floor stand box" is often referred to affectionately as a room heater because of its physical appearance. On the other hand, it uses only a fraction of the electrical power a full 11/70 used.



The PDP-11 really promoted the concept of a "family" with a wide range of power. Code running on the first PDP-11 will still run on the latest 11/94, and vice-versa (excepting a few special instructions added later). The ability to upgrade by swapping a processor (more or less) was both fantastic and very well received (ie profitable). You will still find near-fanatical adherence to the 11 by some members at DECUS Symposia.

From a futurologist's point of view, it is unlikely that the PDP-11 will completely die for a long time. The PDP-8 found a niche as a text-screen word-processor which lasted way beyond anyone's expectations. The 11 has a far simpler structure than its successor the VAX, which makes it

eminently suitable for real-time data collection and control in laboratories and industry. Digital will even sell PDP-11 subsystems on single boards to plug into a VAX system as a special I/O processor. They still make good sense for small companies in dedicated commercial applications: the hardware is good and cheap, and the software is mature and reliable. But the memory space is limited, and the future looms...



The VAX

Despite all the memory expansion tricks, the PDP-11 eventually ran out of memory addressing space. There was no way around the fact. So Digital decided to do things properly and double the word size, to 32 bits. In fact VAX stands for Virtual Address eXtension, which indicates the importance that the designers attached to a large address space.

Some companies chose to try to retain full compatibility with earlier architectures (and deficiencies) when designing new families. IBM chose to do this when going from the 1401 (designed in the early 1960s) to the 7040, through the 360 series and the 370 series and into the current 30xx series, in order to keep customer code running. Long-time mini-computer competitor Data General chose to make their MV series as an extension of the original Nova design. Interestingly, the microprocessor vendor Intel lumbered the IBM PC world with 64KB segmented memory as a legacy of the 8080, 8086 and 80286 family. You would think they would have learnt from the mistakes of the mainframe and mini makers. One can only speculate what the computer world would be like if IBM had chosen the Motorola 68000 instead.

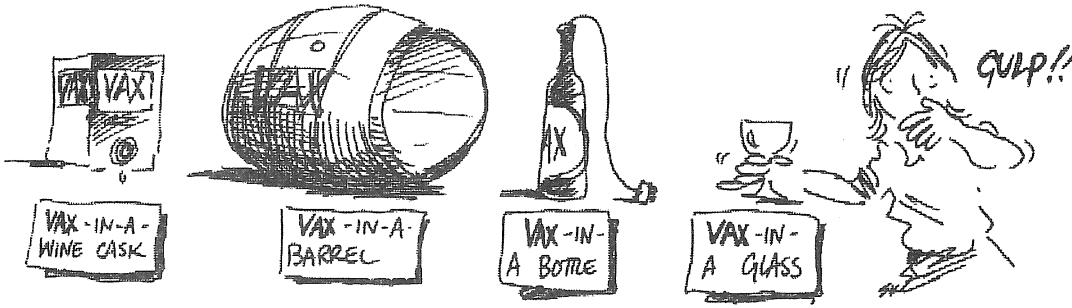
Digital made the extremely difficult decision to stick with the conceptual PDP-11 design philosophy, but to break with the detailed architecture. Thus old code would no longer run on the new machines in native VAX mode. For quite a while this allowed the so-called experts of Wall Street to claim that Digital had "blown it". However, this decision created a new architecture which could fully exploit the increased word size, and the opportunity to totally rethink software design (albeit at considerable cost).

One could argue forever the pros and cons of such a decision, but the success of the VAX, even greater than that of the PDP-11, is undeniable. The first VAX designed, the VAX 11/780, became the industry standard benchmark almost overnight.

The VAX 11/780 was the original 1 MIPS (Million Instructions Per Second) machine until it was discovered that the engineers had measured it incorrectly and it was only half a MIP. Digital now uses the term VUP (VAX Unit of Processing), which is the power of an 11/780. In a way, this is an indictment of the whole "Wall Street Expert" syndrome: they are solely concerned with the next quarter's profits, have little knowledge of technology, and absolutely no vi-

sion. Anyhow, an "expert" is simply someone who embodies the current state of ignorance on a subject.....

Actually, the so-called incompatibility was really a bit of a myth. The early VAXs had an "11/" prefix: this meant that they had a PDP-11 emulation capability, to allow the running of all the customer's PDP-11 code while the customer got around to creating new packages. It was probably also a bit of a psychological advertising ploy. The later machines dropped the prefix and the emulation, and stand on their own. While Digital has never officially admitted it, a strong rumour has it that RSX-11M and RT-11 were fired up on an early VAX — just to test the compatibility, of course, and they ran quite happily (and very fast!).



The VAX family, like the PDP-11 family, covers a wide range of power, from a now obsolete sub-1VUP VAX-in-a-wine-cask (μVAX 2000) to the 4-processor 9440 with vector extensions and over 100 MIPS. The portability of executable code has proven a best-seller, although there is little real reason to have to do this. It makes much more sense to move source code around and recompile it. This binary compatibility is a strange and archaic relic from mainframe days, when you never got the sources, and definitely not recommended practice if you have any viruses floating around. (Rumour has it that IBM has to retain portability

at executable code because they have lost the sources of a couple of very popular commercial programs. It may not really be true, but it is a wonderful story!)

To give you some idea of the popularity of the VAX, we list below some sales figures to the end of 1990 just for Australia. It is interesting to compare them with the sales figures for the 11 and the 10/20. (It was even more interesting to try to keep up with all the models released while writing the book. I failed.)

VAXS IN AUSTRALIA/NEW ZEALAND

Model	sites	VUPs	
9000	4	nx30	n-processor SMP + Vectors
88n0	52	nx6	n-processor 8800 class SMP
8650	16	6	Enhanced 8600
8600	49	4	First 8xxx machine
8550	39	6	Single 6 VUP machine
8530	77	4	Enhanced 8500
8500	18	3	Reduced 8700
8350	81	2.3	Dual 8250
8250	88	1.2	Lowest cost CI
65n0	22	nx12	n-processor SMP
64n0	103	nx6	n-processor SMP
63n0	147	nx4	n-processor SMP
62n0	140	nx3	n-processor SMP
4000	207	10	Hot channel architecture
3900	40	4	Fast Q-bus, big disk
3800	95	4	Fast Q-bus
3600	86	3	QBus and CVAX chip, server
3500	90	3	QBus and CVAX chip
33/3400	528	2.5	QBus and CVAX chip
3100	741	2.7	Lowest cost 3000
µVAX II	1237	0.9	Industry benchmark, magic
µVAX 2000	184	0.9	VAX in a wine cask
VS 3500	21	3	Hot VAXstation
VS 3200	30	3	VAXstation
VS 3100	745	3	Personal VAXstation
VS 2000	770	0.9	Lowest cost VAXstation
11/785	71	1.5	Enhanced 780
11/780	201	1	The original VAX: 1 VUP
11/750	516	0.6	Very popular "small" VAX
11/730	141	0.3	Low-powered VAX

And there are more models being released right now, especially in the multi-processor series. It is interesting and even instructive to find out that the concept of a low-end VAX simply didn't occur to some of the senior planners at Digital until it had just about happened. They only thought of high-end machines. Rumour has it that too many of them come from "other" mainframe companies and still don't understand modern computing. Many of them were unprepared for the way the µVAX II sold, but the sales figures above show the way computing is going. They recovered of course, and came back with the 2000 series, even cheaper than the µVAX II. Note in particular that on a network the VAXstation 2000 and its bigger brother the 3100 are very competitive with high-end PCs — and the quality of the software is a world above. The low-end section of Digital is gathering power with its continued successes: a return to the original concept of personal computers! The future is shaping up to be powerful workstations on everyone's desk. Part of this future is of course networking. We will come back to networking later.

A comment is in order here about the way Digital thinks — or sometimes fails to think. When the first microVAX was released, the µVAX I, Digital released a special version of VMS to go with it: µVMS. The logic was that it was such a small machine that it "couldn't possibly" support all of VMS. Leaving aside the possibility that VMS was already

too large and clumsy, this was in direct opposition to the corporate policy that "a VAX is a VAX, and VMS is VMS". It reflected a degree of blinkered thinking by non-technical management which has long bedeviled Digital: that a small box couldn't possibly have the power which used to be in a large one. A preoccupation with "big iron". The user response was spectacular. At the next US Symposium senior Digital staff were lined up against the wall in a special session and "hammered" by the combined attendance until they committed to making micro VMS and full VMS the same thing again. Unfortunately, it is the sort of mistake Digital is good at making. Fortunately, they have a somewhat vocal DECUS to sort them out.

Closely allied to the above is the VLSI problem facing Digital and many other mainframe and minicomputer companies. As the level of integration gets higher, the size of the box gets smaller. As the box gets smaller, so does the price. And as the price gets smaller, the number of sales may go up, but the overall revenue goes down. Often visible in Digital's behaviour are the panics and price rises when this trend is realised but not understood. A lot of DECUS energy is spent rescuing Digital from this sort of blinkered view of the world. Some other companies find out the hard way: count the bankruptcies.

Workstations

One of the most useful things to come out of the PC revolution (some might say the only one) is the concept of the workstation as the basic user interface. That is, instead of the now antique ASCII character terminal, the user should have a full colour graphics screen with a mouse and lots of local CPU power.

Of course, if transaction processing at a bank counter is all that the "user" is going to be doing, a workstation is inappropriate, but in any technical environment the improvement in productivity and user enthusiasm is significant. There are in fact several good reasons for moving to this approach.

The CPU power in a VAXstation is at least an order of magnitude cheaper per VUP than on a large time-share host. That is, a million dollars spent on VAXstations will give you an order of magnitude more computing power than if spent on one large host machine. Where you have many people either developing software or running CPU-intensive jobs, this is a factor which you simply cannot ignore. Often the software licensing costs on VAXstations are significantly lower too, although not all vendors make much allowance for clusters yet.

DECstations and ULTRIX

Way back in the earlier 80s (!) Digital made a very public announcement that henceforth they would be a company with "One architecture, one operating system". By this they were referring to the VAX and VMS of course, which left all the PDP-11 owners feeling a bit peeved for a while. What Digital really meant (isn't hindsight wonderful) was that they were not going to repeat the mistakes of some other companies with multiple incompatible operating systems and machine architectures: they were going to have one system across the whole range. The customer was meant to look back at the incompatibilities across the IBM range, which really are pretty gross, and think "how wonderful".

Well, it worked for a while, until a bunch of academics got tired of not being able to mathematically model (or simulate) the VAX architecture over the summer vacation on

their desk-top PCs and decided to invent something so simple that it would fit on a PC. They called it the Reduced Instruction Set Computer (RISC), and of course labelled the VAX a Complex Instruction Set Computer (CISC). Unfortunately, it turned out that this was not such a bad idea, as the simpler RISC architecture could be made to run like a scalded cat. Increases in performance were much easier to achieve with a RISC design than a CISC one. The net result was that the RISC architecture could significantly outperform the CISC architecture in certain applications.

Naturally, one has to have an operating system for one's new machine. Being academics the natural reaction was to turn to UNIX, and so it all came about. A whole lot of small companies sprang up overnight, with some of those academics turning entrepreneur quite successfully. They got stuck in, producing hot RISC/UNIX boxes which did terrible things to everyone else's cost-performance ratios.

Anyway, to cut a long story short, Digital relented on their "One architecture" platform: it was that or get blown out of the water after all. They decided to put their toe in the RISC waters with a chip from a company called MIPS. Thus were born the DECsystems and DECstations. There was no real choice over the operating system: it had to be a UNIX clone.[1] Surprise: the combination turned out to be very hot machines, fully competitive with the rest of the world. First there was the DECstation 2100, then the DECstation 3100 (both designed to complement the equivalent VAXstations), and at the time of writing the DECstation 5000, in several flavours.

Digital now recognises the validity of the RISC architecture and UNIX and spends half its software development effort in ULTRIX. There is no doubt that UNIX is now mainstream computing.

[1] Even though UNIX came to life on Digital computers, especially the PDP-11 and then the VAX, Digital was never happy marketing it too openly. Instead they had "upgraded" it and called it ULTRIX and offered it for the VAXs to those who insisted. It was a natural for the new systems.

The question you may well now ask is which avenue should I follow? For an answer to that you either consult a consultant or go to a DECUS conference. The consultant will tell you at great length (and cost) whatever his current biases may be; DECUS attendees will essentially do the same, but for free. A not too silly suggestion is to ask your Digital Sales Representative. As he (or she) sells both, you actually stand a fair chance of getting a useful answer. Of course, the range of brands may be a bit restricted....

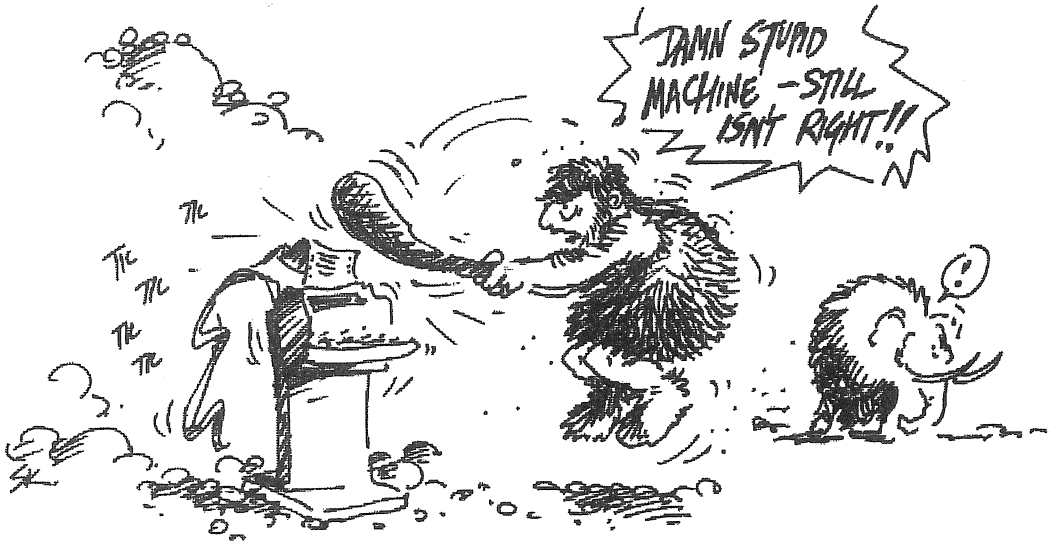
More seriously, if what you want is a commercial system or a complex development site, both with good security, VMS remains the best choice. If you want a very open system (ie with low security), or want to run compute-intensive things like CAD/CAM, go ULTRIX. Both are infinitely better than MS-DOS.

Finally, just to round the story out, a bit of history. UNIX was developed by two researchers at Bell Laboratories, on a discarded PDP-7[1]. It was quickly transported to a PDP-11, and that's where it first came to fame. Most of it was written in the C language (which was developed at the same time and place), with only the smallest kernel in the assembly language of the machine. For this reason it was soon transported to other machines, and became a "standard" at universities. Also the source code was very cheap to universities: a smart move. Thousands of computer enthusiasts added thousands of bits, pieces and utilities to it, to make it what it is today. Digital has always sold UNIX, but not with great enthusiasm in the past. It is ironic that it has taken so long for it to be fully accepted at Digital: something about the prophet being without honour in his own family?

[1] See "Bell System Technical Journal", July-August 1978, Vol 57, No 6, Part 2.

TERMINALS

In the beginning .... there were ASR-33 Teletypes[1] (also cavemen, stone clubs and dinosaurs, all of about the same vintage).



Eventually it occurred to someone that a better solution had to be possible. A brave soul in Digital decided that they should make terminals. This was not well received by all, since Digital was a computer company, not a terminal company, but he went ahead anyhow (he pulled rank). The terminal section did not go broke immediately, so they continued with a few more models. The family tree, roughly by date and skipping quite a few groups, is as follows.

[1] Not true really: prior to the Teletype there were Flexowriters and other barbaric hardcopy devices, but they never achieved the fame (or infamy) of the Teletype!

HARDCOPY, IMPACT

1960	ASR33	10cps	barrel	72 characters, noisy!
1971	LA30	30cps	7 wire	72 characters wide
1975	LA36	30cps	7 wire	132 char
1975	LA180	180cps	7 wire	132 char, parallel
1977	LA120	120cps	9 wire	132 char
1978	LS120	120cps	9 wire	132 char
1978	LA100	120cps	9 wire	draft/NLQ
1982	LA12	30cps	9 wire	portable, built-in modem
1982	LA50	100cps	9 wire	draft/letter
1987	LA75	240cps	9 wire	draft/NLQ
1988	LA210	240cps	12 wire	draft/NLQ
1990	LA324	300cps	24 wire	draft/NLQ

HARDCOPY, NON-IMPACT

1984	LN01	8 pages/min, Laser printer
1986	LN03	8 pages/min, Laser printer
1986	LPS40	40 pages/min, PostScript, network server
1987	LN03R	8 pages/min, PostScript
1988	LPS20	20 pages/min, PostScript, network server
1990	LN05	8 pages/min Laser printer
1990	LN06	8 pages/min Laser printer

In fact, rather than go broke, Digital became one of the world's largest manufacturers of hardcopy and then video terminals. The major video terminals are listed below; there are numerous variants for special markets including the factory floor and the military. The VT52 was copied or emulated by a fair few companies; the VT100 was emulated by every man and his dog, and the VT200 went the same way. We expect the inevitable VT300 clones, al-

though the aggressive pricing on these show that Digital is now aware of the clones and is fighting back.

VIDEO TERMINALS

1967	338	Graphics display, preceding the GT40
1971	VT05	20 lines x 72 characters, uppercase only
1972	GT40	Graphics terminal based on PDP-11/05
1975	VT50	12 lines x 80 characters
1976	VT52	24 lines x 80 characters, basic text terminal
1976	VT55	Graphics version of VT52
1980	VT100	Basic text terminal
1981	VT125	Graphics version of VT100
1983	VT220	Basic text terminal
1983	VT240/1	Graphics (colour) version of VT220
1987	VT320	Basic text terminal, low-cost
1987	VT330	B/W graphics
1987	VT340	Colour graphics
1990	VT420	Sophisticated text terminal
1990	VT1000	X-Window Terminal
1990	VT1200	X-Window Terminal
1990	VT1300	Colour X-Window Terminal

It is an unarguable compliment to Digital that every basic terminal the company produces becomes the reference point for all the terminal clone companies. Doubtless Digital wishes they weren't so quick off the mark, but would probably be even unhappier if the clone makers centred on another brand. It is also interesting that the terminal emulator programs for the PC market almost always offer VT100 mode as the first or only option. Digital claims the secret of success is quality: few would argue, although the very clean architecture of the later VTxxx terminals has helped.

As an aside, the next time you log onto a machine, see what your port is called. Chances are it will be something like `TTA3` on a VAX. This comes from the older `TT3` on an 11. And this comes from a concatenation of device type `TT` with a port number `3`. Where does the device type `TT` come from? It is an abbreviation of "TTY", which is/was short for "Teletype", a mechanical machine with a reputed 1000+ components. In the good old days, everyone used a Teletype as a terminal. If you haven't had the pleasure, see if you can get the use of a Teletype for a short while: it will be an experience you will remember. (The author took a PDP-8 and a teletype home once to do some compiling. It took less than five minutes to destroy marital harmony with the noise!)

In graphics Digital has had mixed success. The GT40 graphics display played "Lunar Lander" better than any PC can. The later Digital graphics terminals, like the VT240 and VT340 using the proprietary ReGIS instruction set, have not been as popular, but then few people claim to be able

to understand ReGIS anyhow. Digital has moved away from ReGIS, first to Tektronix compatibility, and more recently to the open X Window standard. There was some question as to whether Digital would get their act together with graphics terminals before full workstations took over completely: we are pleased to report that the workstations won hands down.

This has left us with an interesting question: should the VT1n00 series of X Window units be listed as terminals or as workstations? Either way, the advent of these X Window terminals is yet another development in the man-machine interface. The X-Window unit is slightly cheaper, but places a significant compute-load on the host. As they get smarter the load falls, but it is still there. Eventually, upgrading the host becomes necessary, and this may be much dearer than starting with full workstations. The jury is still out on whether it is better to go with an X-Window terminal or a full workstation.

In the area of printers Digital also does well, although there is some competition. The LA30 and the LA36 were major factors in breaking the stranglehold the Teletype ASR-33 had on the market, even though they "lacked" a paper tape reader and punch. It may seem silly today, but when first released they faced resistance from many customers for that reason. The world had to be educated to "let go" of paper tape! However, they were three times faster, and silent by comparison, and the two features together were an irresistible lure. They were well built: many of them are still in use today, long after more modern Third-Party printers have collapsed. (The author still uses an LA180 line printer for bulk printouts on one system, and sees little reason to change. But then, he was doubtful about buying an LA36 instead of an ASR-33!)

Today Digital complies with the relevant ANSI standards (including the RS232 interface specifications) in all their terminals, which is good: they are all compatible. Unfortu-

nately (or predictably) IBM chose to go their own way when they released a printer to go with their PC, and of course many manufacturers chose to compete in that marketplace instead, at lower prices.

The major differences are in the areas of graphics (both classes use the basic ASCII character set) and the connectors. Since the translation of character codes into dots on the paper is done by software it is easy to handle different character sets, and recent printer releases have started to provide both formats. The choice IBM made for the connector (or connection) was somewhat more irresponsible: they chose to use a 15-pin connector instead of the standard RS232 25-pin connector. Various manufacturers then proceeded to *interpret* the RS232 standard in different ways, using different pins for different things. The trouble is that they all claim to implement the RS232 standard and be *compatible*, but anyone who has any experience in this area will tell you that they lie through their teeth.

With the advent of laser printers far more resolution and power became possible, outdistancing what can be done with the ASCII standard. Special typesetting languages have come in, with Digital supporting PostScript in the LPS40 and the LN03R. This is something to watch for: a powerful and really standard interface between your computer and the actual printer hardware. The cheaper laser printers lack this, and have all sorts of incompatibility problems (see any review of laser printers in a PC journal).

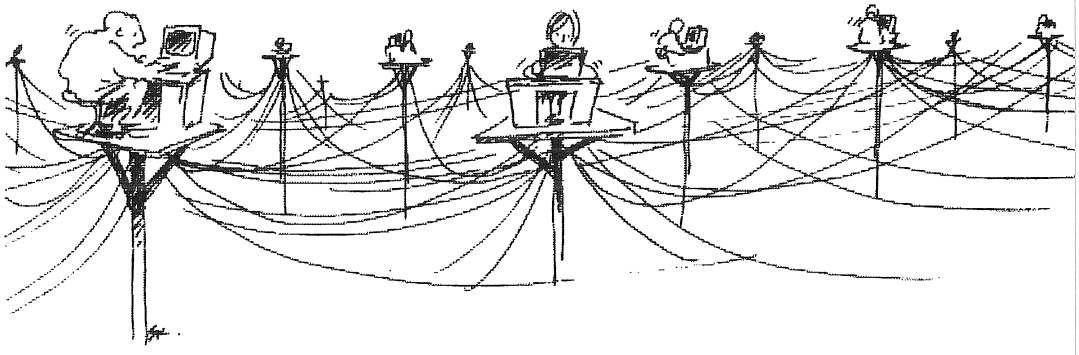
Chapter 5

Future Shock

If one thing is clear in the area of computing, it is that any vendor hoping for stability is going to die, quickly. The pace of development is enormous. Digital has gone beyond the concept of a single computer with terminals radiating outwards, and has introduced many philosophical changes. This chapter will outline those known at the time of writing. They include Networking, Clusters and Symmetric Multi-Processing. Of all the chapters in this book, this is the one which will be (most) out of date by the time of publication.

NETWORKING

Networking is the most mature of the above developments. You will find networking, both the proprietary DECnet and public ISO standards, central to much that is now Digital, and if you have not considered it for your own systems you would be well advised to do some quiet research. In fact, many users are now into their second round of network design. A typical scene is the replacement of thick-wire Ethernet with optical fibres.



It is a curious fact that the benefits of networking several machines together are often hard to quantify, and you could be forgiven for questioning the "faith" both Digital and users have in it. However, you will find fellow DECUS members generally very happy to discuss it with you. Your sales rep will also be quite happy, but take heart: networking is not that expensive. At least, the DECnet way isn't: some other systems seem to require a full-time network manager.

Basically, a network is a way of linking machines together to share data and resources. The extent to which this can be done, and the ease of doing it, vary enormously from brand to brand and company to company. It is Digital's claim that the company is the premier network vendor in the world and offers the highest and easiest levels of networking. There are convincing arguments and figures for both claims. If you want more technical information on Digital networking, you should contact either your Digital sales rep or a local DECUS guru.

As soon as you start to look at networking you will run into the "clash" between Ethernet (CSMA/CD), Token Rings and Systems Network Architecture (SNA).

The conflict exists at several levels, and while we can't go into all the ramifications here, it will probably be beneficial to cover the basics so that you don't feel totally lost. The biggest clash is between Digital, supporting Ethernet, and IBM, supporting SNA and Token Rings. The strength of SNA is that it is fully supported by IBM; the weakness is that it is aging, very complex, assumes a small number of large machines, and is proprietary. Originally it used a

"star" design, with a central controller (a large and expensive mainframe), but even IBM have started to see the light and are making SNA more "distributed" in operation. Ethernet is more or less the opposite. The clash between Token Rings and Ethernet is just about the same, with IBM again supporting Token Rings.

There is a secondary clash between the Ethernet concept and token rings in general. The Ethernet standard was developed by Digital, Intel and Xerox, and released as a fairly concrete standard with no room for any further experiment, while token rings remain a research area. It has been alleged that there is academic hostility towards the Ethernet for this reason. Whether or not this is true, the fact does remain that quite regularly articles and papers (still) appear showing why Ethernet is "quite unsatisfactory" in any important or time-critical situation compared with token rings. You are cautioned that these papers generally rely entirely on theoretical analyses, and that the underlying assumptions about the Ethernet protocol (which are not always clearly stated) are almost invariably false. In particular, suggestions that network messages might never get through can be safely ignored. The probability levels involved are similar in magnitude to encountering the end of the universe. Practical results from thousands of operational Ethernet/DECnet networks say that it works excellently. It would sometimes seem that a sustained and deliberate smear campaign is being conducted against the Ethernet, with motives and sources which you are left to guess at.

There are also a number of PC networks available, and quite heavily advertised too. From listening to all the hype you could be forgiven for believing that they are the real future. In comparison, they are primitive.

Remember that MS-DOS is a single user system of very limited capacity: it grew out of CP/M with a few UNIX-type additions, and CP/M was a simplistic subset of Digital's RT-11 V2 (about 1975). The basic MS-DOS/80n86 structure just can't support networking the way VMS does. (It can't even support multiple interrupts properly.) On the other hand, that doesn't mean that you can't hook a PC onto DECnet: you can, and Digital supports it. Part of a ploy to bring PC users into the Digital fold, of course! If you are a Macintosh enthusiast, there is DECnet software for you too. (Evolution: DECnet on PCs and Macs was called Pathworks, but may have changed again. Oh well.) It would be a mistake to think that the DECnet protocols are limited to Digital machines only. A growing number of other brands have DECnet-compatible support, and not just in the PC arena either.

Proponents of the PC networks often claim the justification for a network is to share peripherals or to transfer files.

That's a bit like saying that the purpose of marriage is to have children: true, but not quite the whole picture. You can share peripherals with DECnet, but you can also do so much more. You can transfer files, but you don't have to: you can access them where they are. DECnet is almost completely integrated into VMS: the node name becomes an integral part of any device or file specification. Well, most of the time: Digital are working on the exceptions.

As you will find out from users, DECnet on Ethernet does work, is both very flexible and extremely reliable, and can support very large networks. Digital uses it internally: it

has been alleged with some truth that the company had to develop it as the only way of tying the company's world-

wide operations together. Digital now runs a network (called EASYnet or the E-net) with over 45,000 nodes, over 100,000 users, 500 locations and 31 countries. It is the biggest private network in the world, and the internal users are a major driving force in creating enhancements. In the open market Digital has sold networking products for over 400,000 VAXs and 1.6M Ethernet terminal ports. (This figure is by now totally obsolete.)

If you are new to (real) networking, you may be a little confused by the terms DECnet, TCP/IP, Ethernet, Thickwire, Thinwire, Twisted pair, and even DDCMP. (There are plenty more acronyms and code names floating around, but that will do for a start.) Very briefly, DECnet is the name for the networking principle and high-level software which Digital promotes. It originally ran on direct links between individual computers, using a protocol (low level software) called DDCMP. This is now largely obsolete. At the same time Digital, Intel and Xerox produced the Ethernet "standard", covering the very low level signal definitions or protocol and the "Thickwire" coax cable it was to run on. Ethernet is almost a hardware definition: different network software protocols can be sent over it. DECnet is sent over it, and the UNIX TCP/IP networking protocol can equally be sent over it. Later on, it was realised that the Ethernet signals could be sent over other forms of wire: a cheaper coax cable called "Thinwire" was introduced, and in many places has displaced the Thickwire. In an attempt to reduce costs even further, Digital and others are sending the Ethernet signals over existing "twisted pair" cables normally used for telephones or in some old IBM installations. There is even an IEEE standard for this mode of operation. A biased opinion of the twisted pair versus coax debate likens it to comparing a rusty box trailer to a new Mercedes truck. It all depends on how you value your network.

Users with networks spanning some distance, between large buildings for instance, are now turning to fibre-optics

as the bulk carrier. This still runs at the same 10MHz speed, but is immune to lightning. Some sites have suffered badly from this in the past[1]. If you are starting from scratch, you should look very carefully at using a fibre-optic hub radiating out to each area, with thinwire at those areas spanning only short (!) distances.

DECnet users are generally very satisfied with their networks, and usually are quite willing to discuss their experiences with you. If still in doubt, ask around at a Local User Group meeting. The DECUS Symposium is also an excellent place to get further information.

[1] The author jests not. He has lost half a system at home through a direct lightning strike on the phone wire outside, and several Ethernet interface units and terminal servers at work through near misses. He has gone optical

NAS

An Ethernet/DECnet network is all very well, but for many customers it doesn't solve all the problems of communicating between machines. How can this be? Well, if what you have is a disparate and motley collection of brand X, Y & Z machines cluttering up your computer room, the odds are that they are not (all) going to talk DECnet! To pick an obvious case, if you are slowly replacing your IBM mainframes with VAXs (a praiseworthy exercise: ask any DEC sales rep), then you are going to want to transfer data between them, and even do network logins from one to the other. It is even remotely possible that you might want to manage your SNA network from your VAX. Actually, the sheer convenience of sitting at one workstation and administering the entire corporate network from there is just fantastic. It is also rather fun to be able to move bits and pieces of data (in the most general sense) between machines without having to play sneaker-net; a means of moving files from one machine to another which relys for speed on a floppy disk and a pair of sneakers i.e. you carry it. You can do it with a DECnet network of course, and you can now do it across different networks with Digital's Network Application Support. Basically, NAS has to know what sort of commands to send to other protocol networks and other operating systems, and how to interpret the results. Well, you can do it from several terminals so why not do it all from your friendly VAX? Once you can do this sort of thing, there is no reason why you shouldn't run programs and so on on other machines on other networks. Thus NAS. If you are into mixed situations, speak (once again) with your local Digit. Nothing is cheap, but think of the fun of having your microVAX II order a massive IBM mainframe around!

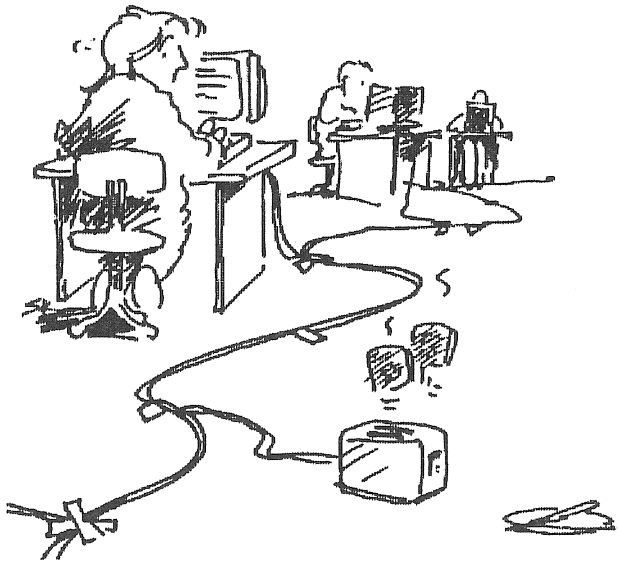
SI: Systems Integration

CLUSTERS

In a way the network has become like the old backplane: everything plugs into it. However, the analogy is not complete as all the processors are completely independent, and can come and go as they please. This flexibility presents certain limitations to combining their power. Full load sharing is not really possible, nor is full sharing of resources. While it is sometimes useful to have all machines on a network independent, in many cases more coordination is desirable. This can be done with a "cluster".

A cluster consists of a "host" machine which has disks, printers and other resources, and a number of satellites. The satellites can contain just processor and memory, plus a link to the host. The host provides disk space, operating system and other resources. One of the great advantages of a cluster is therefore the economies it can bring. Take one of your current machines with adequate disk space and

other peripherals and make it the cluster host. Buy a number of diskless VAXstations and run them as a cluster. Behold: you have a superb modern work environment of enormous power, yet you don't have to buy a large expensive disk (or laser printer!) for each user. They all use the ones on the host. If you have a couple of VAXs, each with some peripherals, you can cluster them and share the peripherals across the whole cluster. It does take a bit more setting up and management than a simple single machine, but the author does not know of any cases where a cluster has ever been broken up, back into separate machines.



Another advantage of a cluster is the management aspect. If all machines were separate, each "owner" would have to spend time looking after VMS and upgrades, and doing backups and so on. This can be very expensive in time and training. Even if one system manager were to look after all the machines, by going the rounds, this would still be expensive. With a cluster all system management is done from the host console, and the satellites are all "managed" in parallel. It is instructive, and slightly worrying, to work

out how much time all the PC owners in an organisation spend maintaining their PCs separately. It is even more worrying when you ask how well those PCs are actually maintained. (A biased viewpoint.)

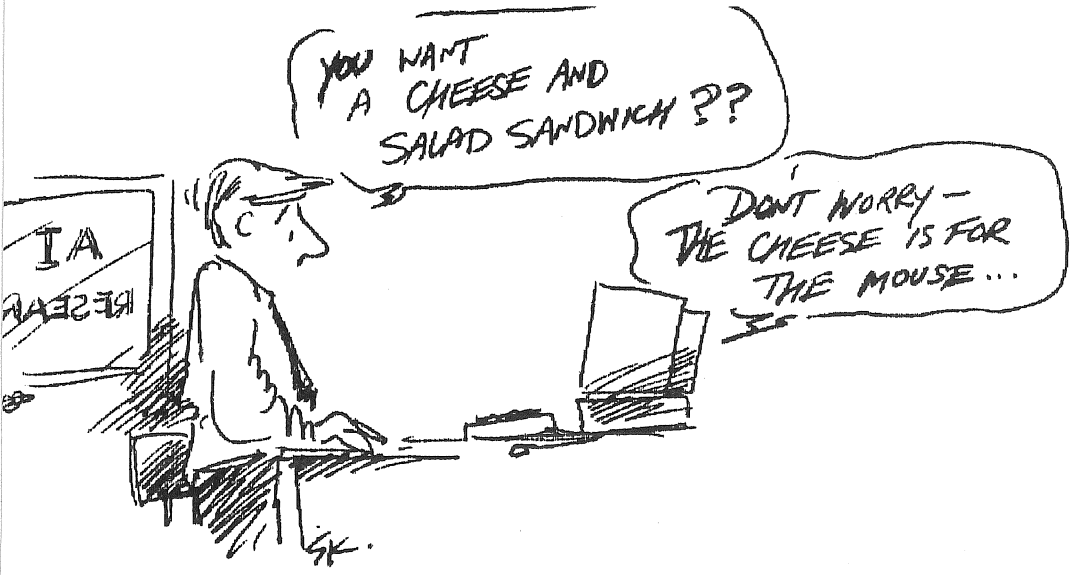
With the Licence Management Facility (LMF), software on the host is now available to all users at a significantly lower price. Perhaps you have only a licence for two users: any two users at a time can use that software. Perhaps you have a licence just for one machine: you can run the software on that machine from elsewhere in the cluster. You do not need to have a separate licence for every machine. This too can be an enormous saving.

In the same way that Digital (management) erred with microVMS, they sinned with clustering. Initially it was only available for the 8000 series, as the µVAX was "too small". However, after the right amount of DECUS pressure was applied, they came up with LAVc: Local Area VAX clustering. (It is not true that DECUS pressure is measured on the Richter scale, it just feels that way sometimes.) On a cluster of 8000 machines the (complex, fast and expensive) CI bus is used for the main data traffic, while the Ethernet is used for control; for LAVc the Ethernet is used for both even though it is slower, because Digital don't sell a CI interconnect for the Q-Bus yet. A third party has announced a Q-bus CI interface and Digital has been rumoured to have had their own internally for years. However, Digital has never released one. It is all a matter of marketing. There are now far more Ethernet-based clusters than CI-based ones, and they get hammered!

The X Window System

In many technical applications you simply cannot do the job with an ASCII terminal. You cannot display graphs on the screen, you cannot run CAD programs, you cannot work in several areas at once. Technical users benefit from these sorts of features, and so does their management

when the productivity goes up. However, you get nothing but confusion (also pain and agony and cost) if everyone goes it alone with the user interface. There has been an immense push in this area to bring standards in before every computer company (plus half the software houses) introduces their own totally incompatible "standard". Well, "they" were only half successful. We have the immensly successful X Window consortium and standard, plus several others like Open Look and Windows 3.0. Don't ever expect consensus: the world would be a dull place if we all said "Yes Sir". The author is biased towards the X Window standard. It was developed at MIT with funds from DEC and IBM, and represents a real effort at perfection. It has been widely adopted across the professional software and workstation marketplace. It's still evolving: the next generation will be known as OSF/Motif. Open Look is proprietary to SUN and AT&T, and Windows 3.0 is the most popular Graphical User Interface (GUI) on PCs, (me, biased?)



The VAXstation and the DECstation both run DECwindows: Digital's implementation of X. It is a superb work environment. At a DECUS Symposium there were rows of VAXstations and DECstations side by side, all running DECwindows on the same network. By the end of the symposium many users were not bothering to see what type of machine they were logging onto: the environment was the same and their files were all "there". Perhaps we should add at this point that attempts to achieve the same results with a group of PCs is an exercise in futility: the architecture simply isn't there, no matter what the PC enthusiasts say.

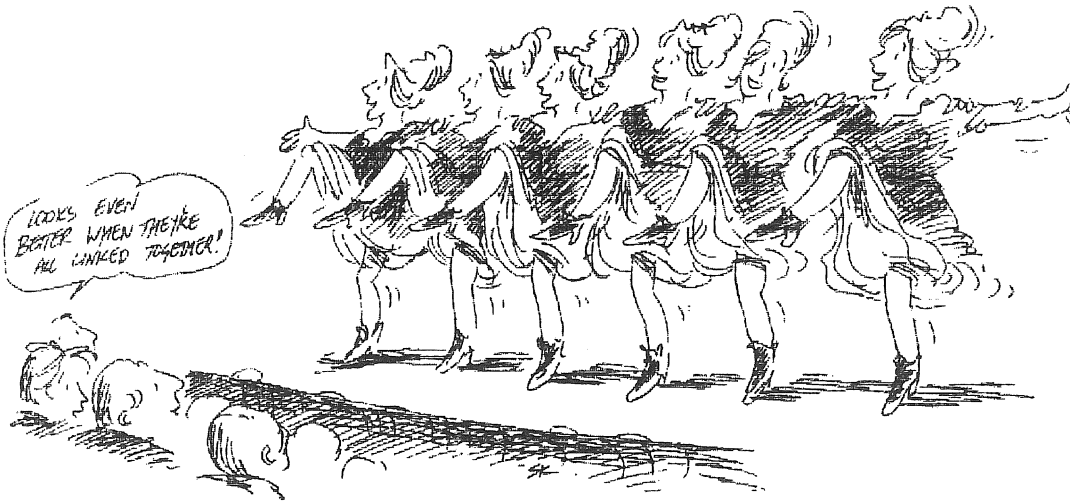
For most technical situations a cluster of VAXstations or a group of DECstations around a host with adequate disk storage and running DECwindows is about the most productive environment possible today.

SYMMETRIC MULTI-PROCESSING

Even clusters are not enough for some heavy applications. The next step is Symmetric Multiprocessing: multiple CPUs on a common backplane, sharing everything, even memory. Several of the older VAXs are pseudo-multiprocessors: the 785, the 8350, the 8800 and the 3602 for example. The newest ones, the 6nn0, 88n0 and 94n0 series, are true multiprocessors and doubtless more will come. The effect of clustering N processors of one power is to produce a single processor of about N times that power — if the software can support the use of parallel processors. Digital now provides that software.

One of the more fascinating sights at a DECUS Symposium was the Project Manager for the Parallel Fortran compiler describing how it would work. On a bare stage with nothing more than her hands, she "created" four CPUs in mid air and ran code generated by the new compiler on those machines. It was disappointing to find when she finished

that the machines were but figments of the imagination: we were quite sure we could see them at the time. That's the difference between a sales pitch and a real technical presentation by a guru. (Commercial break: you only get that quality of presentation at a DECUS Symposium!)

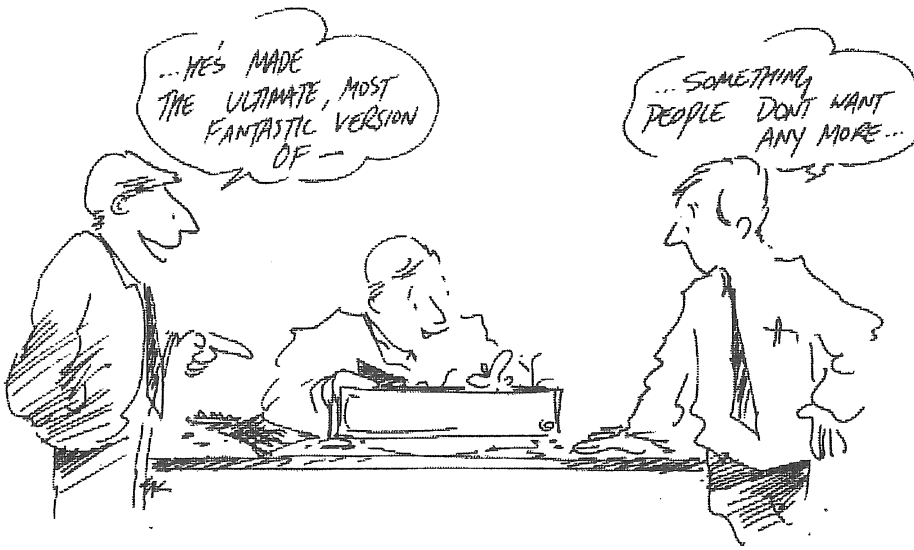


It is rumoured that all future high-end VAXs will be able to be paralleled. You no longer worry about which physical processor you are running on: the distinction becomes meaningless. With the 9000 series you also get vector operation for very heavy number-crunching: a feature formerly only available on the top-of-the-range IBM 3090 and on super computers like the CRAY, but at half the price or less. Doubtless it will take Digital some time to resolve all the problems, "aided" by DECUS, but "Digital has it now". It is worth noting that, SMP is still a research area for most of the world.

Chapter 6

Digital Product Development

Occasionally Digital releases a product which doesn't fit in. Ken Olsen believes in letting products sink or swim by their own merits, and some do sink.



The failures are well known: DECUS USA has had the "Robin Award" for the worst Digital lemon of the year: they awarded it at one of the annual Symposia. (The Robin itself

was an attempt to put a Z80 and CP/M into a VT100, and a separate floppy disk drive on top of the VT100. In marketing terms it was a spectacular flop.) You might well ask how Digital, an engineering company par excellence, can do it. This question makes the assumption that Digital is one large company with a well-structured management, and that product planning is fully developed. A naive and false assumption.

Once upon a time, when the world was young and bright, and Digital was small enough to fit in one building, there was a degree of central management (ie, Ken could walk around the building in one day). But Digital now has 120,000+ employees and development and manufacturing sites all around the world, not to mention that Matrix Management structure. Think instead of Digital as a whole mass (mess?) of small competing groups: competing for development funds, manufacturing resources, marketing commitments and so on. The corporation allows small groups to develop their own research projects, and encourages them to compete internally. The laws of evolution are allowed full play. The benefit is that, on the average, the products are better for it. Occasionally a loser does slip through — even dinosaurs aren't perfect. Of course, DECUS usually gives Digital hell over it: we expect perfection. Digital does not seem to mind: many in Digital see that feedback as the prime function for DECUS anyhow, and we don't mind that.

Another criticism levelled by users at Digital is that they are so slow in releasing new products. For a long while their disk drives were four to five years behind the marketplace, for instance. Well, in some areas at some times they have been slower than they should, and have reaped due criticism. But in many cases a bit of thought will reveal a problem. It is one thing for a disk manufacturer to advertise a fantastic new disk drive. It is another thing to get it into production: a feat which usually follows rather than pre-

cedes public release and promotion. It is easy enough for a small start-up computer company to release a new super-feature (and again usually before it is in production). Both cases often feature some product recall at the start. But what about Digital? The day they release a product they collect several thousand orders around the world, and more the day after. (That's not counting the ones enthusiastic Digital Sales Reps log before the product even has an order number.)

Digital simply can't afford to "release" a product before they have a production line in full operation: who wants a six month waiting list, (the VAX 9000 had a rumoured 9 month waiting list at one stage as a result of being released before the final bugs had been worked out — problems with the glue holding the chips in the chip-carriers. High Tech!) and who wants a product recall on ten thousand units?

For those who wonder what happens when the unthinkable occurs, rest easy. There was a problem with a large disk drive which necessitated the complete replacement of the

Head-Disk-Assembly. They were all replaced free of charge. There was a smaller disk with poor bearings, sold in even larger numbers: same result. There was a CPU chip with an obscure error condition, unlikely to occur very often in practice: again they were replaced on request, free of charge. The list goes on unfortunately, but the result is the same. The cost to Digital is sometimes a bit of a wrench, but they have their pride.

So next time they seem to be a bit slow with a new release, spare a thought for their problems, and then give them hell anyhow!

The same does NOT apply to delivery problems on standard products. An importer would really like to carry no stock: it ties up capital. He would prefer to import against your order. The customer would prefer to be able to buy off the shelf: who wants to wait for shipping from America? In some cases, such as popular documentation, the goods may be made locally and should always be on the shelf. There is a conflict, of course, but we are the customers and expect the very best of service from Digital. The laws of human nature being what they are, this can only be achieved by continuous "feedback". If delivery is not good enough, feel free to raise hell.

All of this may give you the idea that some members of DECUS feel that it is their duty to "look after" Digital, to provide a continuous form of "quality control". True, true. A fascinating reflection on the company (or on DECUS members?).

Chapter 7

Doing Business with Digital

Descending from the lofty heights of theory, just how should you do business with Digital? The question is simple enough, but the answer is "Quite Another Thing". For novices it sometimes seems, at least in the major cities, that the least efficient mechanism is to just ring up the local Digital Office. On the other hand, while the smaller offices in smaller centres sometimes appear to be a bit more efficient (because they are smaller and you can go and thump the sales rep more easily), they are not always able to handle your technical questions. If this is your experience, don't despair: you are not alone. We will show you how to get what you want in both large and small cities.

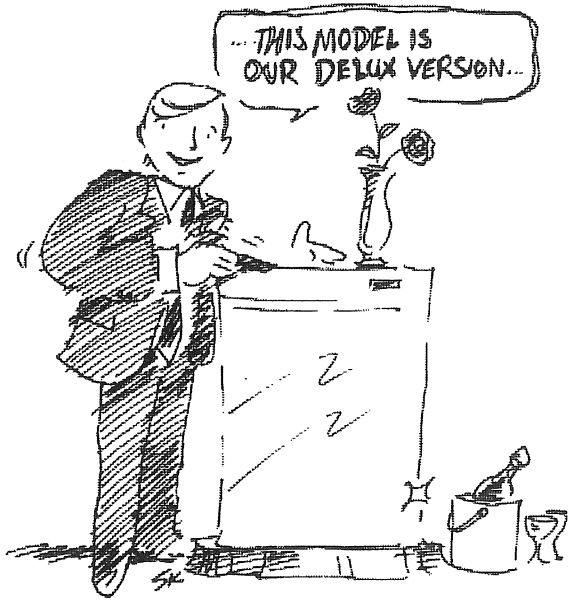
Let us first make the point that if what you want is a new VAX9440, or to install a complete Expert System, your best bet is to ring Digital directly. For large or complicated deals like these, they can turn on the whole panoply of support. Ask, and they will provide. Incidentally, if you are interested in negotiating a large technical deal like an expert system or a major network and there is a relevant Digital Educational Services audio-visual training course available (at a large fee), ask the rep to borrow it for you. If you don't know of any, ask anyhow: you will be surprised what sales reps can (will) do for a sale.

More often than not you will be after something small (and to Digital, this can be anything up to ten or twenty thousand dollars). To put it bluntly, in the major cities your official Digital rep won't have the time to be properly of assistance. He will be sorting out a tender for a 9440 for someone else (probably your rival). So what do you do? The most useful answer is to go to the right part of the system. The only problem is to find it.

OFFICIAL DIGITAL SALES CHANNELS

For many of the "add-on" types of components you can go to the official DEC direct marketing outlet: DECdirect. This is a new channel, set up by Digital in recognition of the problems customers have had in the past in getting a suitable response from one of their highly paid sales reps. In essence, it is a full-time sales desk backed up by some fairly

competent technical consultants. DECdirect is slightly different from the distributors, although no-one has ever been able to work out why. They also publish several catalogues: DECdirect, Add-ons and Upgrades, Documentation, Cabinets, etc. The DECdirect catalogue contains prices and delivery information. For added convenience, they have set up an Australia-wide direct dial (008) number to this service. Your sales rep will be quite happy to put you on the DECdirect mailing list. (Last the author saw, you could even buy a 9000 through DECdirect. That's carrying the "add-on" philosophy a bit far! Maybe they would send a sales rep out to collect the order?)



Alternately, if what you are after is something small like a terminal or a printer, you can go to one of the Authorised Digital Distributors, called Cooperative Selling Organisations (CSOs) at the time of writing.[1] That's where

[1] Their number varies as the market changes. Just wave money and see who comes running.

the Digital sales rep is quite likely to send you anyhow. They carry stock and are highly competitive. Get the names of the local ones and ask them to put you on their mailing lists. (Now try to get OFF the list!) When dealing with distributors remember that it is a very competitive market and haggle a bit: you might manage a (bigger) discount that way. Some distributors specialise in the terminals and PCs; others carry PDP-11 and microVAX stuff up to complete systems, so shop around.

If what you want is more in the nature of a software solution with the hardware to run it on, there are also a number of software houses acredited by Digital. In these cases the vendor is adding a substantial amount of value to the deal — in some cases the software and support is dearer than the hardware.

THE THIRD PARTY CHANNELS

A different possibility open to the discerning shopper is to contact one of the "other" distributors. The distinction here is that you are now entering the "Third-Party" market, where competition is if anything even fiercer. The Third-Party market, covering all those "Digital-compatible" devices and add-ons made by other companies, is a contentious one. It has seen good times and bad times, ethical and unethical manufacturers, and respectable and unscrupulous vendors.

The underlying theme of the Third-Party market is that an enormous company like Digital has to move more slowly and cautiously than a smaller and lighter company. Thus the Third Party Vendors claim to offer faster, bigger, cheaper, etc add-ons, and hope to persuade you that they are as reliable as genuine Digital items. It is not possible to offer a simple summary of the market: it is too variable. The unwary can get burnt, the canny can make good buys. The cautious buy from Digital, wear the extra cost, and let Digital Field Service (FS) look after any problems.

The Digital Sales force don't like the Third Party market, of course: they think they lose sales to it. That is a moot point: the Third Party vendors also do a lot of advertising of the Digital core (the processor) and sell into areas Digital don't reach. Some would even argue that the impression of "second sources" actually increases Digital's sales. Anyhow, taking advantage of Digital's sentiments, some buyers have on special occasions been known to use the Third Party market as a lever to persuade Digital to improve an offer. That is up to the individual, of course. It should be noted that not all Third Party vendors are anathema to Digital: some specialised items well out of the standard Digital range (like array processors) have actually been marketed with some assistance from Digital in the past.

At the time of writing there is one particular area where there is real contention, and the buyer should at least be aware. Digital used to be relaxed and tolerant about third parties making add-ons to go onto their buses. If company X could make a better Y, then the Digital engineers had better pull their socks up. This still applies to the Unibus and the Q-Bus, but not to the more powerful and more recent buses such as the BI bus on the 8000 series. Digital is trying to enforce strict rules over the BI, limiting licences to those companies and indeed those items which are not competing with any Digital products. This attitude is understandable in a silly sort of way but is at odds with Digital's past history, and is probably doomed to failure in the long run. In the interim, there are a few legal battles going on.

The Digital Field Service force is somewhat more pragmatic about the Third Party market: they will maintain Third Party items if attached to a basically Digital system. Of course, quite a few "Digital" items are actually bought in from Third Party vendors anyhow, usually with modifica-

tions or tighter specifications to suit Digital. There have been "standard" Field Service fees for the more common items for some time, depending on the location and number of them around. The operating principle here is that if Digital FS won't support the foreign half of your system, you might get the Third Party vendor to support the lot, and that too is a loss to Digital.

At the time of writing, the new revamped Customer Support section, which combines Field Service and Telephone Support, has embarked on an ambitious campaign to provide total support for all of a customer's computer-related hardware and all Digital software, under one banner, one contract and one invoice. They are claiming that it can be cheaper, because the paperwork is much reduced: anyone who has seen Digital's paperwork would have little trouble believing that! Depending on circumstances, there could also be benefits in the area of licensing on clusters.

Actually, Digital is far more touchy about third party service support than third party add-ons. They claim poor maintenance is a potential threat to the reputation of their gear. On the other hand, FS is a very large and quite profitable section of the whole corporation, and sometimes third party maintenance vendors also sell third party add-ons, so it may not be all altruism. Anyhow, even if you do have Third Party gear in your system, you should most definitely invite your local FS manager to quote on the whole system.

If you really are thick-skinned and determined to buy third party gear, you could try asking either your Field Service manager or the FS engineer for an off-the-record opinion of whatever Third Party gear you are thinking of buying. You might not get an answer, but you might equally get an opinion as to what brands (apart from Digital, of course) gives them the least trouble.

In recent years the annual DECUS Symposium in Australia has had "Third-Party Hardware Workshops", where users have exchanged experiences about the Third Party market.

The first one of these was packed solid, with just a few brave but very nervous Digits hiding in the corners. They half expected to get beaten up: it was obvious that there were quite a few customers there with a lot of things to say. And say their piece they did: it was a very noisy session. In the event, and somewhat to their surprise, the Digits came out floating on air: some Third Party manufacturers and some of the local Third Party vendors got cremated instead. Feelings were very strong. Interestingly, some of those local Third Party vendors went bankrupt within a couple of years. Of recent times the Third Party market has improved, with only the more respectable participants surviving.

If you do want to try the Third Party market we will offer a couple of bits of general advice. The most obvious bit is to seek out other people who have tried out that gear. A less obvious bit is to check out the warranties offered. Digital now offer very good warranties on their products: usually 12 months or more. This is not always the case with Third Party products. Even more interesting is to look at the FS maintenance charges: for some Digital items (eg some memory boards) there is no charge if the rest of the system is under contract. If Digital FS can't support the item you are considering, check what the vendor can offer. Free repair upon "Return to Factory" may not be such a useful option, although some vendors carry swap modules in stock in order to compete effectively with Digital.

We can't offer any official (DECUS) advice on vendors or brands for several reasons. First of all, DECUS does not exist to make such comments. Secondly, the market is too variable to permit any other generalisations. Thirdly, the success of a Third Party item often depends not only on the manufacturer but also on the local vendor — and on occasions on the user and his environment too. About all we can say with confidence is that you should seek advice from other users with more experience, and attend the Third Party Workshops at the Symposia!

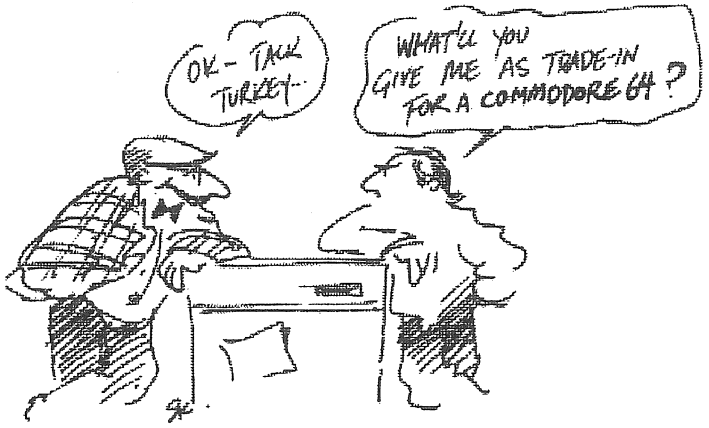
BROKERS

Brokers come in two flavours: legitimate second hand dealers and "grey" importers. While some brokers may actually fill both roles, we will treat them separately, for very good reasons.

Second Hand Brokers

Second hand brokers are a legitimate part of the market, and are recognised by Digital as such. In fact, Digital themselves will sometimes offer trade-ins, although they don't usually sell second-hand gear themselves. There are three major points to watch out for in this section of the market,

quite apart from the question of whether the equipment offered is really worth the price. That question is not addressed here.



The first question is whether the equipment has a covering letter from Digital Field Service, saying that they would be happy to take the equipment over under a normal FS contract. Without this you are very much alone in the world; with it you have reasonable assurance of staying alive. The more reputable brokers will only sell gear with this covering letter.

The second question concerns delivery and payment. It has been known for brokers to advertise equipment "on spec", when they do not in fact have it in stock. It has even been known for some brokers to request part or full payment in advance, even though they didn't have the gear in stock. Other more reputable brokers take a more respectable line: you don't pay anything until the equipment has been installed and commissioned by Digital Field Service on your

site. Second hand systems have been sold for millions of dollars this way, and have given perfectly satisfactory service. It can be a very economical approach if you know what you are doing. The major problem can be financing it with loans or leases. This is up to you.

The third question concerns software licensing. Digital do not automatically transfer software licences with a machine. At one stage they decided not to transfer any, but DECUS pressure soon changed that. From a narrow point of view, allowing licence transfer costs Digital the sale of a new system. Don't buy this argument for one moment: even a second-hand system will bring you into the Digital fold, from where you may never escape alive! Also, be aware that not all licences are transferable: you may still have to buy some outright. You will have to ask Digital for a transfer of licence, and should check on this before you proceed.

Grey Marketeers

Grey marketeers import machines directly from America and sell them locally. Often they will take the excess in a large volume contract (at a substantial discount) and seriously undercut the local "official" price. The standard argument is that the local office is just making too much profit. Be aware that there are a few (legal) problems with this approach. First, the warranty you get with the machine is probably "return to (USA) factory". After all, it probably came from a volume contract over there. This means that Digital (Australia) Field Service are not legally required to offer any support at all! Before you exclaim with glee over the lower grey-market price you have been offered, add on the cost of a full year of Field Service Support and see what you have got. If there is still a problem, you could try a delicate hint to your Digital sales rep that their price is a bit high, and see whether there is any room to negotiate.

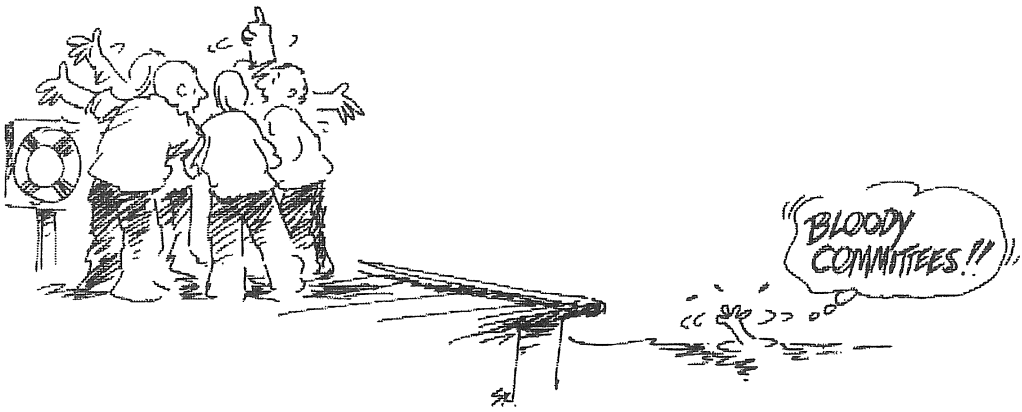
Secondly, most if not all VAXs require a US export licence, and often this is missing. Whether this should be of concern in Australia is another matter, but at least it should give you an uncomfortable feeling. Thirdly, the machine will not be licensed in Australia, and Digital can legitimately refuse to sell you a VMS licence for it. If it is a workstation which would normally include a single-user VMS licence, this too may not be included. Alternately, they may wish to charge you for the licence, so add this cost on as well (if you wish to get any form of support from Digital). What usually happens after these price corrections is that the whole deal ceases to be attractive.

DECUS takes no official position on grey marketing since this is a matter between Digital, a broker and a customer. Recent legislation and court judgments seem to be coming out more strongly against the practice, so perhaps the issue will be settled in the not too distant future. Clearly however most DECUS members will prefer to avoid the problem.

Chapter 8

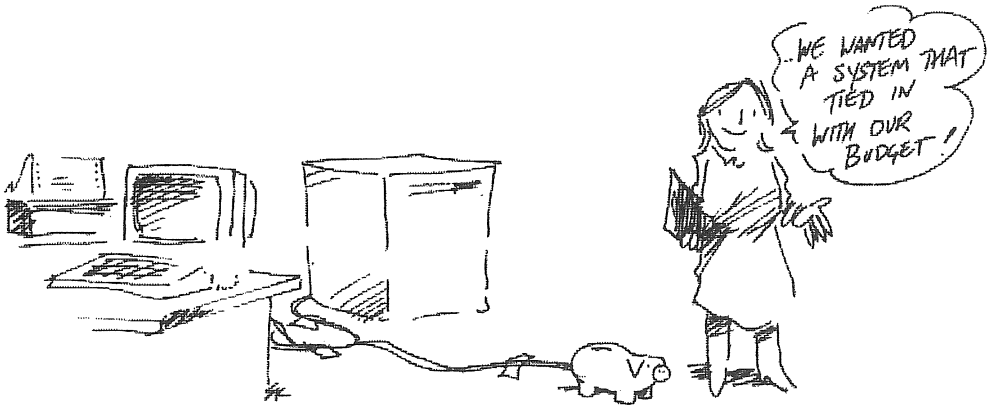
"Working the System"

Reference was made earlier to *working the system*. This is the Digital term for negotiating (alias horse trading). It is the normal practice within the company when someone wants to get something done. This even covers something like the sale and installation of a computer system. The Salesman may "sell" it, but Manufacturing has to make it, Installation has to install it, Field Service and Software support have to support it, and so on. This is all done by agreement internally. Before you goggle in amazement, just remember how successful the company is. Then goggle freely.



Sometimes you, the customer, may want something different or special. This is not impossible to achieve. Often, a simple

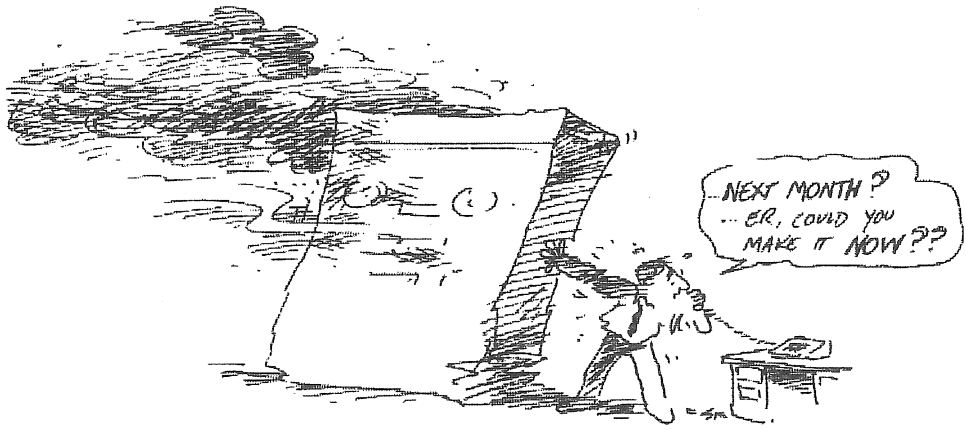
bit of explanation to the sales rep will be sufficient to get it under way. He will then work the system to get what you want. For example, suppose a customer suddenly needs a certain box very urgently. It may be that another section in Digital has one which they have purchased for their own use. If the customer's need is great enough, it may be that a bit of horse trading will borrow the box until one can be delivered from manufacturing. The pay-off might be allowing the sales rep to show your system, with the box operating, to a customer from the other section, to help them make a sale. To their credit, Digits are generally very chary about asking the customer for this sort of thing, preferring to rely on internal horse trading. The aim, after all, is to give the maximum service to all the customers.



Where the whole exercise gets interesting is when a customer wants to organise something rather more complex, and starts to work the system himself. This is rare but not unknown. Needless to say it should not be done unnecessarily or carelessly, as Digits are reluctant to ask customers for favours in return.

DELIVERY SCHEDULES

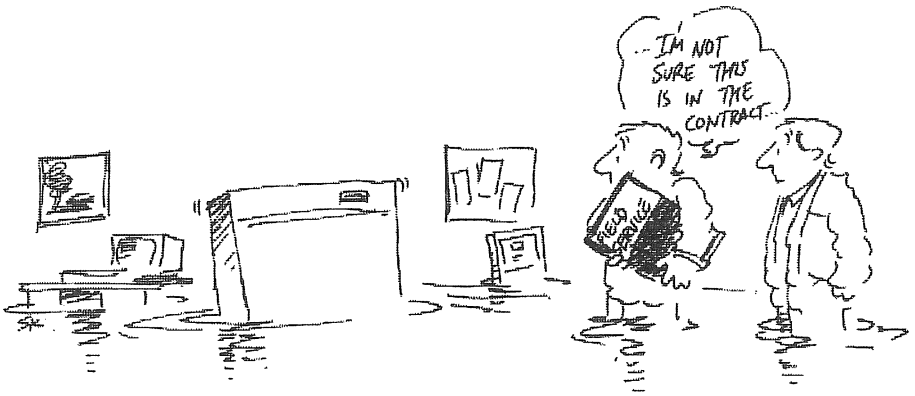
Reference was made in a preceding chapter to the time it takes for Digital to release a product, and the time Digital takes to deliver a product. Most of us have met situations where a customer is unhappy about a delivery schedule. It is reasonable to ask what should one expect from Digital. Generally the answer is based on common sense. You should not expect delivery off the shelf for a VAX 9440; you should expect delivery within a week for a common documentation kit. Most sections of Digital try hard to provide a first-rate service: it is genuine company policy, and staff promotions depend on it! Generally you should ask what to expect, and if not satisfied with the answer ask for an explanation. If it is really urgent and the response is inadequate, say so, with explanation. In other words, keep pushing, or negotiating. You will be surprised sometimes what can be done when there is a genuine emergency! Needless to say, you should not treat all your orders as emergencies — if they are, you need to revise YOUR method of doing business before you wear out your welcome.



MAKING CONTACTS

While you shouldn't need to work the system in any serious way, there are a number of simple things you can do which will return a very high yield. Let us assume that you have bought a computer system and software, and have taken out hardware and software maintenance contracts with Digital. If it is your first system, or if you are going to be commercially dependent on it, both forms of support/insurance are very strongly recommended, by the way.

There are now several people you are going to be dealing with. The Sales rep is an obvious one, the Field Service engineer is another, and the Software Support specialist is another. If you are a large customer you may have a specific Account Manager as well: the more you spend, the more attention you get, of course. Each one of these people answers to a Unit Manager: get to know the Unit Managers! By and large, they will all be very happy to sit down with you and to discuss what they can do for you. (Well, you're the customer with the money, after all.) This should be done before you run into any problems, while there is time.



You will find that it pays to be very explicit about such things as Field Service response times: the more they know about your requirements, the better they can serve you. Any special requirements should be brought up: Digital can be very flexible. They will be quite happy to help you work out your real needs as a function of your pocket. (OK, so they charge, but some other well known computer companies charge even more and get away with it!)

In our experience, most Digital employees work hard. Some of the Field Service engineers work very hard: cases of engineers staying on a job for hours past the contract time frame are common. One FS engineer spent most of the night on a job before it was fixed: he wasn't too popular with his boss the next morning, but the customer was very happy. One Software Support engineer spent a whole Sunday night — his own time — working on a customer's problem. It was a real lulu of a problem, with a very simple answer, fortunately. They seem to get a satisfaction from seeing a happy customer. Is there anything you can do in return?

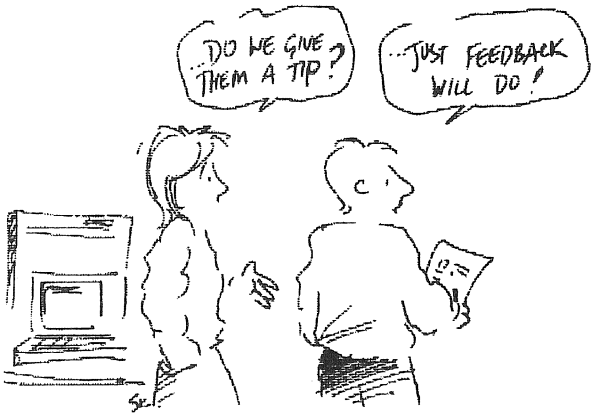
First of all, if the system is down and the hardware engineer or software specialist is working on it, don't hassle him (or her!). Fixing a computer is not always simple; maintaining polite conversation with an irate customer at the same time is only going to slow him down. If there is a problem, contact the Unit Manager and discuss it with him. That's his job. Hopefully, you will already know him because you followed the above advice, didn't you?

When the job is done and all is running, the natural tendency is to breathe a sigh of relief and get on with the job. That is reasonable, but take a moment to stop and think. If the problem really was serious, have you taken the necessary precautions to minimise or eliminate it? Do you even know what caused it? Talk it over with your Unit Manager, and get his advice.

A large site had problems with their disk packs going bad. It turned out that the night shift operators were using them and the tiled floor for games of draughts. It took Field Service quite a while to find the cause, but it took the site manager a lot less time to fix!

Suppose the problem was a large one, and the engineer or specialist put in a particularly notable effort in fixing it. (Stayed till midnight? Reloaded VMS five times? Stripped and rebuilt the entire system? They have all happened to the author.) How about letting the Unit Manager know of the effort and of your appreciation? A letter is best, but a telephone call will do. There are yearly promotions within Digital, and often the only way a Unit Manager has of knowing what sort of job his staff are doing is from the

very rare customer feedback. A compliment helps them, and doesn't do you any harm either when you next have a problem.



CUSTOMER SURVEYS

Once a year customers can expect to receive a survey form from each section of the company. Digital is asking you for feedback about their performance. Before you throw this form in the bin, see if it can help you. It is NOT just a public relations exercise: the combined results really do count inside Digital for promotions, performance prizes, and problem identification. In fact, the survey is conducted right around the world, with prizes up to the world level too.

Since Digital takes it all so seriously, so should you. In fact, you may notice a particularly assiduous attention to your needs in the months prior to the survey. This is a good time to get that doubtful disk drive realigned, that slightly noisy fan fixed, and so on. Experienced customers don't hesitate about it: why should you? In case you are wondering, be assured that the Field Service engineers know what is going on. It's their unit which is competing for the prizes, after all.

Chapter 9

When Things go Wrong

Digital is renowned for its ability to snatch a marketing defeat from an engineering success.

There are two main categories of things that go wrong. We'll put material things like hardware and software in the first category, although passionate advocates might object to such a lumping together, and we will put people communication problems in the other. These two classes are very different, so we will treat them separately.

MATERIAL PROBLEMS

So you have a problem: your computer doesn't work. You might be surprised to know that Digital also feels that it has a problem in such a situation: the customer is not happy. Not all companies react this way, but Digital does. There are many ways of fixing this problem, including bottom of the harbour schemes, assault rifles and even getting help from Digital. In theory you need to come to some commercial agreement with Digital about this (=$) before you call on them, but they are very forgiving and tolerant, as long as you sort the dollars out eventually.

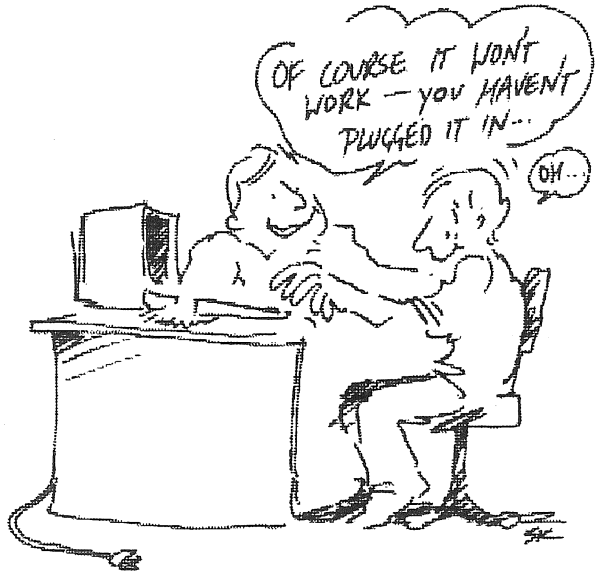
The important thing is that Digital's customer support services are excellent. Some say that they ought to be for the price they charge,

but that is partly a matter of perception. If your invoice system is down, and you have twenty staff sitting around doing nothing except wondering if all the company's data has just been lost, a hardware field service contract is not that dear. If your software simply won't work today, a software support contract will probably manage to point out what you have done wrong very quickly.

How you go about getting the help is important. Your sales rep is probably not the right person to actually solve the problem. He may be the right person to tell you who to contact, or he can get them to contact you, but the best results come from ringing the Telephone Support Centre. This changes names regularly, but underneath it stays roughly the same: Field Service and Software Support. For what it is worth, the author will not let either his hardware or software contracts lapse, for fear of a lynching from his staff!

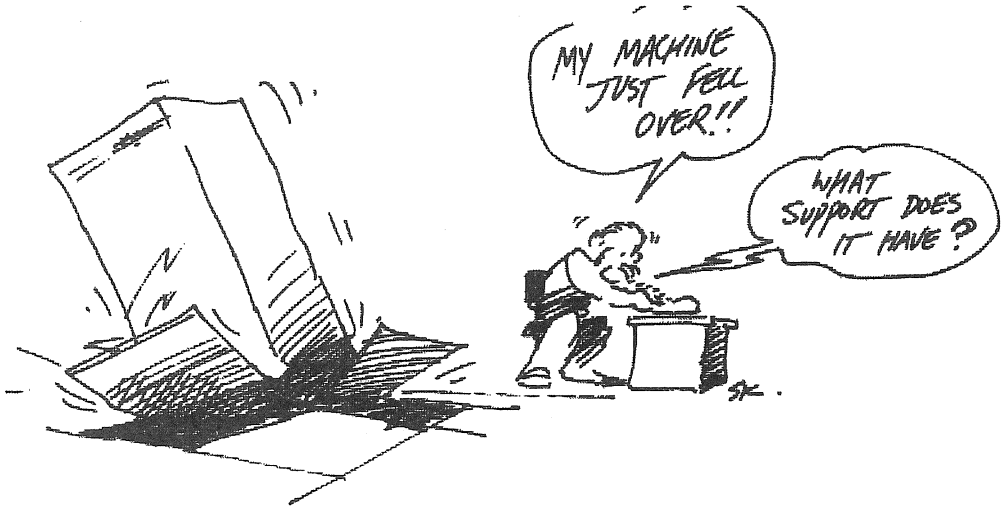
PEOPLE PROBLEMS

People problems usually mean sales contracts. Not all Digital sales contracts are simple. In fact, it sometimes seems that every contract has a few quirks. This is not a problem provided that both sides understand the rules of the game. Occasionally we have seen problems occur when one side, usually the customer, does not understand these rules. Typical cases are where the customer has asked for something non-standard and there has been inadequate discussion of what is to be supplied. Less common are cases where a system is down or not functioning for longer than the customer likes, or when Customer Support are not doing what the customer wants.



Very often it turns out that the real problem is lack of communication. Digital undertook to provide X, while what the customer really needed was Y: but the Y is much dearer than the X. X and Y might be tape drives of differing speeds, or might be different levels of Software Service response. Regrettably, many of these problems seem to arise when Digital tries to do something special for the customer and the details are not adequately spelt out. But they keep trying.

The above precepts apply equally to small things. You can confidently expect to get less than totally enthusiastic support from your FS engineer if you ask him to change all your line printer ribbons every time he turns up. It just isn't part of the contract, and he doesn't like doing it any more than you do. In this case the problem is one of false expectations, and can be avoided by (yet more) communication.



In our experience, most problems can be solved by the right people getting together and trying to sort out what the problem really is. It often turns out to be a bit different from what was initially presumed. Digital can be extremely flexible in their approach to problems, and are generally very concerned to protect their reputation. But remember: somewhere, somehow, someone has to pay the bill.

One thing should be remembered in handling such cases. Digital is less sensitive than most companies about rank. If you feel it is necessary, ask to speak to the staff member or manager at the next level up. He probably already knows about the problem from the person you are currently talking to: reporting such problems is one of the rules in Digital. He may well have a check list of possible solutions already prepared. Be reasonable, honest and willing to negotiate, and see what can be done.

DECUS INVOLVEMENT

In the past customers have sometimes come to DECUS with their problems, rather than going to the right person

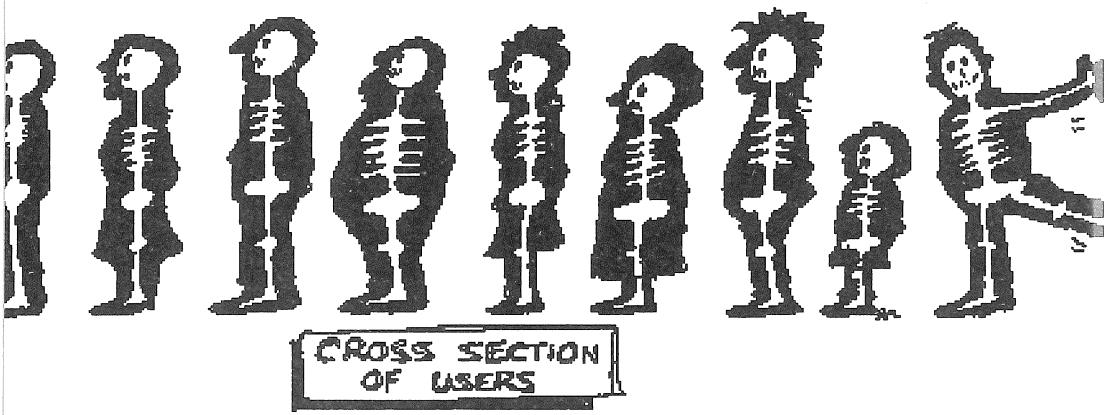
in Digital. While it is true that one of DECUS's functions is "beating up on Digital" when things go wrong, this is really meant for general cases rather than individual ones. Sad to say, it has been our experience in these cases that the customer is nearly always more in the wrong than Digital. It's embarrassing trying to explain to the customer that what he wants is quite unreasonable, and that DECUS has no power (or desire) to do anything about it anyhow.

On the other hand, if you do have a problem you can't make any headway on, don't think you are entirely in the wrong, and would like some advice at least, try contacting a local DECUS member with more experience. Try a member of the Local User Group committee, for instance, at a LUG meeting. He won't be able to solve it himself, but he might be able to point you at the right person in Digital to handle it. Or he might be thick-skinned enough to explain where you went wrong!

Chapter 10

A Side Look at DECUS

If Digital is a bit different from the average company, what about the User Society you have just joined? Well, it too has its little ways, but perhaps (hopefully?) not as much as Digital. For a start, DECUS is made up of USERS, from all walks of life, and that tends to even things out a bit. We list here a few points of note about DECUS and its members.



THE DIGITAL-DECUS RELATIONSHIP

The biggest anomaly you are likely to find is the very casual way many long term members treat the Digital-DECUS relationship. Some societies seem to exist to "confront" the vendor with which they are associated. DECUS does plenty of confrontation, but it does not get into an adversary position. Neither does it get into a dependent or subservient position, and this balancing act leaves many new members (not to mention their managers) unconvinced. But it works. We can offer no arguments which might be convincing: the only way to find out is to go to a couple of Symposia and attend your LUG meetings for a while. Even long term members are not sure why it works the way it does: perhaps tradition, experience and mutual respect between individuals are the magic ingredients.

HOW DECUS WORKS

The next most puzzling thing some members have commented on is the question of "how things get done" in DECUS. The answer is very simple: you get off your ergonomically-designed fully-adjustable programmer's chair and you do it yourself. It is a USER-RUN society, even though there are several full-time staff in the DECUS Office. The staff are in fact generally flat out with keeping the machinery of the system running: the Library, the Publications, the Membership system, the Symposium, the Finances, and so on. (Not like the Public Service, with acres of fat everywhere ...) But, if you have a good idea, contact the Office anyhow. They won't do it all for you, and they may refer you to someone in a leadership position, but you can make things happen. In fact, many members of the Board and other committees are there because they wanted to stir things up, and proceeded to do so.

1

We would warn the new enthusiast of just one thing: it can be addictive. You get in there to sort just one small problem out, then just another one, and so on, and it's a decade later before you know it. Mind you, it has been fun at times.

IS DECUS TOO TECHNICAL?

Lots of potential members don't join or don't join in because they feel that DECUS is too technical for them. To be sure, the origins of DECUS are with the technical user, but that is not a problem. If you are only a novice, start asking questions: there is nothing a GURU (Great Understanding but Relatively Useless) likes more than *explaining!*

[1] DECUS was a teenager when the cartoons were drawn - but no longer. DECUS Australia is now 21 years old.

If you are a commercial type, way out of your depth with technical terms: welcome again. There are lots of other commercial users in DECUS, and there is nothing a guru likes more . . . . And you may often get a lot clearer, cheaper and more accurate advice from a few guru members than from all the sales reps in the world. And when you get several gurus all arguing (noisily), you know you have asked a really good question!

There is a flip side to this point of course. If the present organisation of your Local User Group doesn't suit you, get in there and change it. You may be surprised to find that most committees spend an awful lot of their time trying to find out what the rest of the members want — a thought not limited to DECUS of course. If you would like to know more about a subject such as databases, artificial intelligence, PSI networking, etc, you should also contact the local Digital representative to the LUG to see what resources he can conjure from within the organisation. Don't hesitate: that is his function. Sometimes he can arrange a few nibbles or cans at a LUG meeting if the topic is of relevance to his sales. Some LUGs have done incredibly well this way: one LUG is reputed to live in the fridge at the back of the Field Service office!

OTHER COMPUTER MANUFACTURERS

The world of computer manufacturers may be divided into two classes relative to Digital: those bigger, and those smaller. Of recent times a third class has crept in: microprocessors. Each class seems to get a different treatment from DECUS members. DECUS is officially neutral on this subject, but the same cannot always be said for the members. Please note the difference, and don't mind the shouting.

Those manufacturers smaller than Digital generally just seem to get ignored. The reasons vary: that they aren't commercially significant is one, and the inferior design of their machines is another. Somehow, owning a PDP-11 or a VAX seems to be a step up in society. Well, that's our story anyhow!

Those manufacturers larger than Digital (and there really is only one) also get largely ignored. There is a very strong belief or culture within DECUS that the Digital architectures — both hardware and software, are so much better that only the hard sell keeps the other one afloat. If you doubt this, start an argument at a DECUS meeting on the subject (provided you have a few hours to spare). Part of the difference is the distinction between a batch-oriented philosophy and an interactive philosophy. You can guess which one experienced users and hackers prefer. And JCL has to be one of the most obscure languages known to man.

Finally there is the microprocessor world. This one can split a meeting, with some users seeing micros as a logical extension of the interactive philosophy, and others seeing them as toys. You won't ever get the two sides to completely agree, even though Digital does (well, used to) market the Robin and the Rainbow and the VAXmate, and at the time of writing is marketing PCs from Tandy and others. The interesting question, which has at long last become a reality, is how to classify the VAXstation and DECstation: microprocessor prices, but professional architectures. Anyhow, ask for advice, and you shall receive!

VACS ON VACATION