REVIEWS

H A R D W A R E

ACORN'S SUPERCOMPUTER

Peter Yoke witnesses the 32016 Second Processor in action

The BBC microcomputer is almost unique in its design as a stand-alone personal or education computer that can also act as a 'front-end' for a different and possibly much more powerful second processor. The concept proved fruitful for Acorn when it brought out the Master series: by putting the 'back-end' processors inside the case, the hybrid BBC micros can serve a variety of markets, with Turbo, Master 512 and SC versions catering for the home enthusiast, small business user and higher education markets respectively.

The Master SC is not out yet, but its precursors, the 32016 Second Processor and the Acorn Cambridge Workstation, have been around for some time. Little is heard of the 32016 processor partly because of the very specialised market it is aimed at; it is designed primarily for use in colleges and universities, and Acorn have only sold a few hundred machines so far. As I hope to explain, the 32016 is a very different proposition from the more familiar 6502 and Z80 second processors.

For one thing, it costs more: 32016s are available with one megabyte (mb) of RAM, costing typically £1400. (The Master SC was originally said to have half a megabyte, though most of the software available needs 1mb.) The Cambridge Workstation is basically a complete 1mb system with separate keyboard and screen included, costing £3480 plus VAT; there is a 4mb version of the Workstation, too. It is immediately apparent that the 32016-based systems are not ordinary 'home' machines. To find out more, there is no better place to go than Queen Mary College in the East End of London, which has no less than 80 of the 300 machines Acorn have sold.

The 32016s at Queen Mary College (QMC) are being used in two quite distinct ways. Sixty-four of the 80 machines are linked up in Econet networks; each network consists of up to 12 processors (each plugged into its own BBC, of course) together with its Winchester hard disc fileserver. The other machines, however, are being used as personal supercomputers by individual members of staff who have number-crunching research projects under way.

The individual academics who have 32016s are all fairly pleased with them. Most are using the 32016 Fortran-77 compiler, which can

Little Is heard

of the 32016 processor partly because of the very specialised market it Is aimed at; it is designed primarily for colleges and universities

handle Fortran programs ported straight on to the 32016 from the London University network. I spoke to Dr Andrew Tworkowsi, who was running programs originally developed for the university's Cray-1, one of the fastest supercomputers in the world. Andrew was using the 32016 to pursue his research on chaotic dynamical systems, and getting the same answer using double precision Fortran on the 32016 as he had got from the 64-bit Cray machine. For his programs, running time on the 32016 was about 140 times longer than on the Cray, so programs that had taken half an hour on the supercomputer took three days on the 32016. But since the Cray had to be shared with many other users, a job like that would frequently take up to a week to be run on the supercomputer. Andrew now gets his results faster, using a machine that is more than a thousand times cheaper.

Individual supercomputers like Andrew Tworkowski's 32016 are an immensely attractive proposition, and anyone who wants a desk-top Fortran engine and doesn't need more than 1mb total memory should consider one. You may not always get one-140th of the speed of a Cray-1, but my tests suggest you will never get worse than a 700th, which is still

impressive. Andrew's 32016 co-processor and BBC micro have never broken down, and are run from double 80-track floppy drives. Other academics are using them for statistical analysis in biology, or doing long Fourier transforms on data taken directly from instruments.

Of course Fortran is not the only possibility: 32016 Assembler, Pascal, Lisp, Basic and BCPL are all available, plus several packages run within or using these languages, such as the Gino-F (for Fortran graphics), GCAL (a text processor written in BCPL) and the algebraic manipulation package Reduce (in Cambridge Lisp). The languages are all standard (Fortran has the WHILE statement as an optional extension), and generally appear topnotch. If you are keen on Lisp, make sure it is the dialect you want. If BCPL is what you are after, try it first; it is probably the weakest of the languages on the 32016. Prolog is promised, along with more applications packages.

The main complaints are that too many important features had been 'promised' by Acorn for far too long. Sounds familiar enough. Crucially, the 32016 still does nor have a good straightforward wordprocessor – you have to use GCAL, or make do with View on the BBC micro. The popular scientific wordprocessor Vuwriter is promised, but the current version is unusably slow according to Acorn. Vuman, the authors of Vuwriter, are trying to speed it up.
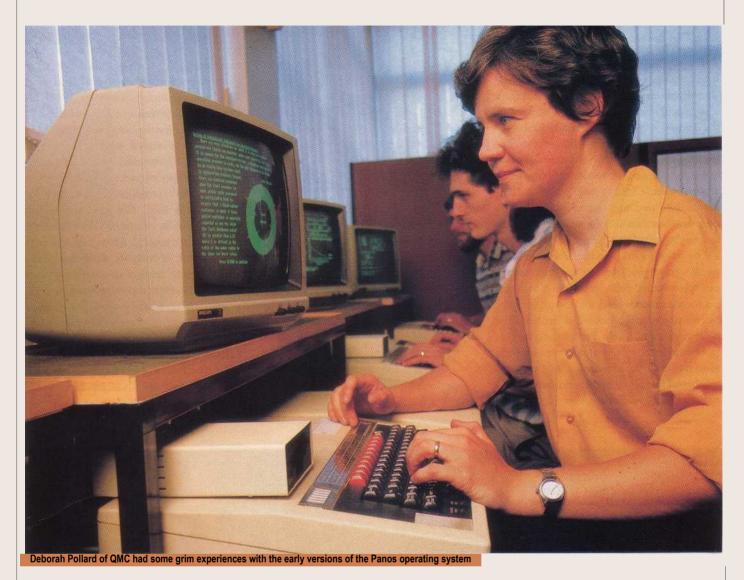
A rather less rosy story comes from those who are using the networked 32016 processors. David Pick, who as head of Small Systems in the computer unit at QMC has his own 32016 in his office but is also in charge of the software for the networked machines, sums up his mixed experiences by saying: 'When they are good they are very, very good, but when they are bad . .

Quite simply, in the months since the 32016 networks were set up, single machines have crashed far too frequently. When use of a network has been high, it is possible for the whole network to crash so that it has to be rebooted from scratch. Of course this can happen on any Econet; but the large files that a network serving 32016s has to transfer seem to make the problem more frequent. Lecturers who are trying to teach Fortran, Pascal or Lisp to groups of first or second year students were

Deborah Pollard of QMC had some grim experiences with the early versions of the Panos operating system

keen on the 32016s at first; but their enthusiasm soon cooled as their students started to give up in disgust, put off by the regular unreliability of the networks.

In defence of the 32016 (and Acorn), it should be said that QMC is what the Americans would call a 'beta test site'; in other words a field trial site for many of the systems (hardware and software) that make up the 32016 package. In particular, QMC has been deliberately pushing the Econet networks as far as they will go – and probably a good bit further. It may well be that QMC has seen every problem that can crop up on the 32016, and that they are now nearly ironed out.

Deborah Pollard, who runs the Computer Aided Design and Education Centre at QMC, has had some of the worst experiences with her relatively small network in the Centre. Machines typically crashed three or four times a session with the older versions of the operating system, Panos. Deborah emphasises that things

have improved markedly since the field trial version 1.3 of Panos was installed recently, and is expecting that things will run a lot more smoothly next academic year. Loading files and linking compiled code for running are both much faster under Panos 1.3, though someone used to other well-known operating systems will still find such actions as loading or deleting files rather slow.

A number of good computer aided teaching programs had been brought across from the College's ICL mainframe (a straightforward process) and ran without too much alteration. Standard Fortran-77 will usually run first time on the 32016. Programmers used to a mainframe find the 32016 a bit short on facilities such as Fortran debugging diagnostics, the ability to link in libraries from one language to another, a Basic compiler or the means to dump a screen to disc or printer. The 32016 is still limited to some extent by the BBC micro, and is less than ideal for Computer Aided

Design; there is no mouse or trackerball software, and the screen resolution is too low. Deborah also commented on the lack of a decent wordprocessor or spreadsheet for the 32016 (*Matrix 3* is 'promised', like *Vuwriter*).

In spite of these complaints, what I saw in the Centre seemed impressive. Most of the work is done in Fortran, and the facilities for creating, compiling and running code seem attractive and easy to use. Regrettably there are still a few bugs in the screen editor (which is otherwise excellent) though most have been eliminated in Panos 1.3.

The Pascal and Lisp have been used by lecturers teaching in the Computer Science Department, but the networks have caused just as many problems in these contexts. A course on algebraic manipulation using the Lisp program *Reduce* could only take place at all because of the facilities provided by the 32016. Unfortunately, the large amount of code required students to interact frequently with the Win-

REVIEWS

H A R D W A R E

chester over the network – and the crashes have been correspondingly more severe. The 32016 is now reaching the point where it may well get – and deserve – more attention. The richer secondary schools or sixth-form colleges might consider a few in a network, if the demand is there for Fortran, Pascal, Lisp and/or C. If you are thinking along these lines, then bear in mind that the software does cost extra, and don't expect to save cash by cutting corners. Even a small network needs a Winchester hard disc, and should be installed on the basis of a one or two month acceptance test. Insist on the latest version of Panos, and if the network doesn't stand up under the most gruelling use your students or sixth-formers can subject it to, throw it back at Acorn and ask for your money back.

This hard-nosed approach is probably the only way to deal with a system that can vary from wonderful to worse than useless: from giving each of your students the power of a small VAX supermini to the sort of unreliability that puts people off programming for life. If

In defence of the

32016 (and Acorn) it should be said that QMC is a field trial site for many of the systems that make up the 32016 package

you are an individual researcher or freelance software developer, the 32016 is well worth considering. The totally standard Fortran and Pascal mean that programs developed on the 32016 will run on any mainframe. If you wish to get results, remember that a personal 32016 can give you hardcopy output about as fast as a supercomputer shared with a few hundred other users, for less than the cost of a motorbike. If applications packages are what you are after, the 32016 is still rather weak compared, say, with the IBM. With the small installed base, it is hardly surprising that software is a bit thin on the ground. Acorn need to turn the vicious circle of software famine and unreliability leading to low sales into a virtuous circle of new software coming on line to supply a growing community of a few thousand enthusiastic and contented 32016 users. Maybe the Master SC will be the magic wand to perform that trick.