

FUTURE INVESTMENT

Xerox, the world's biggest seller of reprographic equipment, were keen to enter the area of office automation. Their reputation was already firmly established — so much so that people refer to the activity of photocopying as 'xeroxing' — and the new impetus aimed to extend Xerox's pre-eminence to other office machines.

In the early 1970s, the Xerox corporation planned a full-scale research programme to realise a dream — to have information available on tap in the office, like electricity or running water. Xerox created a new research team with an open brief, and encouraged maximum freedom of operation by setting it up in Palo Alto, California, on the far side of the USA from Xerox's worldwide headquarters in Rochester, New Hampshire.

The move to Santa Clara county, California, was a fruitful one. Located close to the campus of Stanford University, which had a thriving computer science department specialising in artificial intelligence research, the Palo Alto Research Center (PARC) attracted some of the best brains in computing. In this close community, talented students were able to move smoothly from academic to commercial research. PARC became the centre of the computer culture, spawning a jargon understood only by initiates. Several Xerox products were given jokey names while under development. The 820 series of micros, for example, was code-named 'Worm' on the grounds that it was going to 'eat Apple'.

The main impetus of the new research team was directed at developing a local area network (LAN). This term is now commonplace, but when Xerox made its first experimental network, in

Hawaii in the late 1960s, it was a revolutionary concept. Connections between a mainframe machine and a terminal required expensive cabling for high-speed communications, and there were problems with cable runs longer than 20 metres (70 feet). The public switched telephone network could be used but this restricted exchange of data to 9,600 baud.

The aim at Palo Alto was for a network with reasonable speed that would link smaller computers together so that the user would have local computing power for his own machine, as well as access to larger computers, big disk stores, and other expensive peripherals such as plotters and printers. This was the basis of the Ethernet LAN concept.

In the Ethernet system, connections were made with ordinary co-axial cable, which is capable of carrying 10 million bits per second and is suitable for carrying digitised sound and graphics information as well as data. Moreover, the system could run up to 500 metres (1700 feet) without the need for repeater amplifiers. Any new device could be plugged in by simply tapping into the existing net, allowing maximum flexibility.

The physical net is passive: data of whatever kind is broadcast around the network and a *transceiver* acts as the front end of each device, determining whether the message is intended for that device. If it is, the transceiver decodes the message and presents it in a form that the device — whether microcomputer, printer, plotter or whatever — can use.

By the mid-1970s Ethernet was working. Xerox felt that if it could enlist the help of other manufacturers, the system would become a standard for communication among computers. It took its designs to IBM, who declined to participate. The Digital Equipment Corporation, however, were keen to become involved. In 1975, Xerox also secured the all-important co-operation of chip manufacturer Intel, which started to build the transceiver chip.

Ethernet was put on trial in an experimental office and factory complex in Sweden and after successful testing was adopted by other manufacturers. It has now become an official international standard and manufacturers such as Hewlett-Packard, ICL in the UK, Siemens in Germany and Olivetti in Italy have all decided to adopt it. Xerox fostered acceptance of the standard by selling the blueprints for a single fee of \$1,000. All Xerox products, from microcomputers and typewriters to laser printers — another PARC invention — can be connected to Ethernet.



CHRIS STEVENS

Early Lisa

One of the major triumphs of the PARC was the development of STAR, a programming system that uses the SMALLTALK language. STAR operates by combining programs and data in the same file for processing. Apples Lisa technology owes much to this approach — in fact, most of Lisa's development team were recruited from the PARC.

