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GEC Computers Ltd.

Origins.
In 1968 the real-time computing interests of AEI, Elliott-Automation, English Electric, Marconi and GEC, were consolidated into a single company [ref. 1]. It traded initially as Marconi Elliott Computer Systems Ltd (MECS) and then, after 1971, as GEC Computers Ltd. English Electric obtained the non-computing products and the mainframe data processing products were transferred to ICT/ICL.

MECS, and GEC Computers, were for many years based at Borehamwood, though the specialist aerospace computing activities were soon transferred to Marconi-Elliott Avionics Systems Ltd. at Rochester. Initially, the range of MECS computers was inherited from Marconi and Elliott-Automation and comprised the MYRIAD series, M2100 series (a small-scale 16-bit multiprocessor for real-time control]), and the 900 series (see below). About 50% of the applications for these computers were described as 'military'. The other 50% was made up roughly equally of the following applications areas: Industrial, Laboratory, Marine, Education, Traffic control, Communications, Medical.

The GEC 900 series of computers [refs. 2- 4], though first introduced in 1961, had a life extending into the 1980s with machines such as the 920ATC. By then developments had for several years been based firmly at Rochester, under various titles such as GEC-Marconi Avionics Ltd. and eventually BAE Systems. The 900 series is described elsewhere, in the *Mainframes* section of the *Our Computer Heritage* website. [ref. 2].

The GEC 2000 and 4000 families.
By 1970 GEC Computers Ltd. was working at the Computer Research Laboratory (CRL), Borehamwood, on three new computer ranges. These were known internally as Alpha, Beta, and Gamma. Alpha became the GEC 2050 8-bit minicomputer, and beta became the GEC 4080 16-bit minicomputer with its unique Nucleus feature. Gamma was planned to have 32-bit hardware but was shelved, so a few of its enhanced features were consequently pulled back into the GEC 4080. Later, Gamma was developed in the form of the 32-bit GEC 4090.

The 2050, an 8-bit machine [ref. 5], was used widely in the real-time and communications market after its introduction in 1972. It was used in the public sector, including the Post Office, especially for remote job entry to a mainframe.

The arrival of the more powerful 16-bit 4000 series [ref. 6, 7] gave GEC Computers a basis for a much wider attack on the market. When public sector bodies, such as the Post Office and universities, were directed to buy British it was able to build on the 4000 series and it also had an internal market within the GEC group, whose members were not compelled but encouraged to buy from GEC Computers through financial discounts.

GEC Computers traditionally had strong links with the university market, providing front-end computers for the ICL 1900 as well as stand-alone machines. It provided a range of software-compatible 16-bit minicomputers, the early 4000 series. The low end of the family consisted of the three machines, the 4060, 4062 and 4065, all of which could be mounted in a desk-style unit. They varied only in the type and capacity of storage available. Higher up the range were the 4070 and 4080. The three people originally associated with the Alpha, Beta and Gamma projects at CRL were J W J (Bill) Williams, N D (Neil) Gammage and Michael Melliar-Smith. The principal designer of the GEC 4080 was Melliar-Smith and the principal designer of the GEC 4060 was Peter Mackley.

When the new semiconductor-based machines arrived, GEC Computers implemented the architecture of its larger and more expensive 4070/4080 minis with more LSI circuitry and lower internal speeds to produce a reasonable entry-level price. The 4060 needed two printed circuit boards for the CPU and not 15; it used 64KB semiconductor memory cards, rather than the older core boards which stored half that amount. The design included a separate I/O processor (another PCB), with a good deal of built-in self-testing, and the more compact approach required less cabling, generated less heat, and gave more reliability.

In terms of 32-bit minicomputers, the 4090 was the first and Peter Mackley was the principal designer for this too. This was followed by the 4190 which had more memory and its more compact version, the 4195. The 4193 was based on the 4195 but instead of the usual I/O processor it incorporated the industry standard SCSI interface.

The 4090 used the same 64KB memory cards as the 4060 but included a cache. The ALU, known as the ‘Mill Board’ (in tribute to Charles Babage’s machines), contained 18 four-bit bit-slice microprocessors enabling it to efficiently perform double precision floating point arithmetic. It was designed to have an optional fast multiplier board but most systems that were sold included this anyway.

The 16-bit 4000 series systems were developed and manufactured in the UK at GEC Computers’ Borehamwood factory in Elstree Way. Development and manufacture was transferred to GEC Computers’ new Dunstable factories in Woodside Estate, Dunstable in the late 1970s. Support for the 4000 series continued for many years (see later).

Many manuals for the 4000 series can be found on the computing history website [ref. 7] including the instruction set, installation, system configuration and systems manuals.

The GEC Series 63: the beginning of the end.

By 1978 sales of the GEC 4000 series were still buoyant but the management decided that GECCL should embark on the design of a new computer, in due course named *Project R* (the R standing for *Roadrunner*), that was “powerful, state of the art, capable of being produced in a number of variants, have as its basic operating system an industry standard (UNIX) and most importantly that it should be able to run 4000 series software so that the investment made by our customer base was protected”. GECL formed a joint project with AB Dick, an American reprographics

company based in Chicago. Collaboration proved to be very difficult. *Project R* was formally re-named the GEC Series 63 [refs. 8, 9] and was publicly announced in May 1983. Originally there were to be six models in the Series 63 range. For all models, the normal GEC Series 4100 peripherals could be attached and the UX63 (UNIX-compatible) Operating System was installed. Actually, only two models (the 63/30 and the 63/40) were produced.

Approximately 22 Series 63 systems were sold. Early in 1984 the first ten went to academic sites, under the UK's Alvey collaborative research programme. Six of these sites also had DEC VAX 32-bit computers and academics were not slow to pronounce the VAX a more desirable machine. The eventual role for many of the Series 63 systems at Alvey-sponsored sites was as fileservers for SUN workstations.

By 1984 GEC Computers was in serious financial difficulties and development of the Series 63 was halted. Radical changes were made in the company, resulting in a return to profitability by 1988. – the year manufacturing was transferred to GEC Plessey Telecommunications (GPT). Thus, 1988 was the year in which Borehamwood finally lost its independence as a site of innovative computer development.

The end of GEC.

In 1988 GEC Computers was absorbed by GEC Telecommunications at Coventry. In the same year GEC Plessey Telecommunications, a company commonly known as GPT, was set up by GEC and Plessey. By 1991, the number of 4000 series systems built was falling off, and manufacture was transferred to GPT's Beeston, Nottinghamshire factory. The last systems were manufactured around 1995.

In 1999, after a major company reorganisation, GEC Telecommunications became part of Marconi plc and the initials 'GEC' were dropped. Marconi plc got into severe financial difficulties in 2002 and had disappeared by 2006. Marconi's remaining UK operations were renamed Telent Ltd., with headquarters in Coventry. Telent continued the support of GEC4000 series computers beyond 2010, in applications such as signalling systems for the London Underground. At the time of writing (2015), Telent remains active in many fields of vehicle and rail management.

Customers for the 4000 series.

Users of GEC 4000 series systems included many British university physics and engineering departments, the central computing service of University College London (Euclid) and Keele University, the JANET academic/research network X.25 switching backbone, Rutherford-Appleton Laboratory, Daresbury Laboratory, Harwell Laboratory, NERC, Met Office, CERN, ICI, British Telecom, SIP (Italian telco), Plessey, British Steel and BHP Steel real-time control of rolling steel mills, British Rail and London Underground for real-time train scheduling, London Fire Brigade and Durham Fire Brigade command and control systems, Suffolk Constabulary, and most of the National Videotex systems in the world including the Prestel viewdata service. Chelsea and Manchester United became the first football clubs to sell tickets from computerised systems and these used GEC computers. At the Rutherford-Appleton Laboratory a GEC 4000 system was used to control the synchrotron and injectors used for the ISIS neutron spallation source until 1998. A GEC 4080M was

also used as the central processor for the radar system of the ill-fated Nimrod AEW.3 airborne early warning aircraft.

Software
In the mid-1970s, GEC Computers was working on OS 4000 [ref. 6], a more advanced operating system for the GEC 4000 series. This opened up the GEC 4000 series computers to more customers, including many in the academic and research communities. A number of collaborative projects ran, some of which resulted in applications which GEC Computers developed further and sold, in addition to the sales of the computers themselves. One of the largest of these were X.25 packet switch systems, which resulted from a research collaboration with NERC. In the late 1970s, UK General Post Office developed Prestel on multi-CPU GEC 4000 systems. This resulted in sales of similar systems all over the world.

Services
The numbers of GEC computer systems around the UK by the 1980s meant that GEC Computers had built up a widespread field service organisation, and could guarantee on-site response within hours across pretty much the whole UK. This turned out to be a valuable asset. Many new technology companies trying to enter the market struggled when required to provide this type of service, and GEC Computers started taking on 3rd party field service support for many other companies, including some which competed with GEC Computers own products.

GEC Computers' extensive presence in UK academic and research organisations, and the UK field service organisation, led Sun Microsystems to choose GEC Computers to be its presence in the UK for the UK launch of its Sun-2 product range in the early 1980s, which GEC Computers sold under the name of GEC Series 42. GEC Computers developed some reduced cost workstations called the GEC Series 21 based on Atari 520ST and 1040ST systems with replaced PROM operating system code. GEC Computers was not particularly successful at selling the Sun systems, and Sun opened UK offices to sell direct, although GEC Computers field service continued providing field service for Sun Microsystems across the UK for many years, until Sun built up its own field service organisation.

At the company's peak in the early 1980s, there were about 1,600 employees, mainly based in the original Elliott building at Borehamwood UK, and at three new purpose built factory units in Woodside Estate in Dunstable UK. There were a number of small offices in many other countries too.

By the 1990s, the real-time process control market was moving to cheaper microprocessor based systems, and GEC 4000 series sales into that market dried up. X.25 networks were being replaced by Internet networks, and so X.25 packet switch sales dried up. This left just the Videotext sales to other countries, and so the company concentrated on this product. However, there was only a window of a few years before the World Wide Web displaced Videotex systems, and the last of the company's main products also dried up.

References and further reading.

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3. http://www.computermuseum.org.uk/fixed_pages/Elliott_903.html

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8. http://www.chilton-computing.org.uk/inf/alvey/p003.htm

9. See chapter 14 of [ref. 4].