A History of the Electronic Digital Computer (part 3)

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Abstract

This paper is a slightly edited version of the article originally published in the March 1997 issue of *Phasor* (pp. 2–4), a computer journal (in PDF) for the computer user group MACRO, which was defunct in mid-1997, IIRC. I was the editor of the journal during its very short run.

Part 3: 1947–1969

Initial Jockeying for Supremacy

After Mauchly and Eckert left the Moore School, they eventually started their own company to build computers. By 1947, they were contracted to build two computers at the same time, but having differing requirements. The first was the UNIVAC (Universal Automatic Compater) computer for National Bureau of Standards, or NBS. The second was the BINAC (Binary Automatic Computer) for Northrup.

The BINAC was a truly innovative machine. It was modeled after the EDVAC. (Yes, what ever happened to the EDVAC. Well, either it was never built, or if it was, it never got much notoriety.) That is, it was only a logical design for the state-of-the-art computer. EDVAC is a sort of spiritual father to the modern computer as we know it. BINAC was the first memory-stored programmed computer built in the US, and the first to use tape to store data. But soon, the projects were behind schedule and the money running out, so M & E looked for some investors to keep them afloat.

After BINAC was completed, the team went back to work on UNIVAC. Prudential Insurance Company put in an order for the machine and put money up front to keep the development going. But Prudential, not wanting to offend IBM, asked to keep their IBM data punch cards. Much to the displeasure of M & E, they then had to invent a machine to translate from data cards to tape, and the other way around. Perhaps this is the first example of serious computer interoperability. Nevertheless, it was probably a wise thing to do, because it made an easier migration path from the old data storage method to the new.

M & E were by then in deep financial trouble. They needed to be bought out to keep from going bankrupt. To their rescue came James Rand of Remington Rand. On 1 February 1950, he bought out M & E and then hired them on his payroll. By 1952, the UNIVAC 1 was ready for sale, the best computer available at that time. (IBM had still not taken the computer as a serious business machine.) We can thank an RR public-relations person for coming up with this next scheme: The RR programmers would attempt to program UNIVAC 1 to predict the winner of the 1952 presidential election on elections day, as the returns were coming in. The race was between Eisenhower and Stevenson. This was an extremely important test for the computer itself. Few companies to this point had seen any need for a computer. But if a computer could predict the future, that would be of enormous monetary value, and businesses would realize it immediately. So, if it succeeded they could find a ready market for UNIVAC 1, but it would surely launch competitors as well. This was a chance Rand was willing to take.

The pundits had predicted that Stevenson would win easily, but by 9 pm election night, UNIVAC was predicting that Eisenhower would win by a landslide. However, the RR people lost their nerve, and its director of advanced research ordered the programmers to change the programming to produce results consistent with the pundits—bad decision. The programmers did, UNIVAC did, but the results didn't. Eisenhower won, and UNIVAC had originally predicted the final count to within one percent of its final value!

The question you may be asking is, Where is IBM in all this computer development? IBM had worked on some lower-level computer development over the previous years, both before the war and during it. But its president, Thomas Watson, Sr, was skeptical about its future as a business machine. Three things conspired to change his mind on this. The first was the sales of a UNIVAC to the Census Bureau. The second was the pressure from IBM customers to get more efficient means of storing customer data. (Large companies, such as insurance companies, were using entire floors of their buildings to store customers's data on punch cards.) And the third was that Watson's son, Thomas Watson, Jr., was quite eager to go into the computer development game.

So IBM hired von Neumann to lead the effort in 1951. IBM's first computers for sale were the IBM 701 for scientific use, and the IBM 702 for commercial use. They were soon followed by the 704 and 705 models. But none of them was as good as the UNIVAC. All the same, Remington was not doing well against IBM. IBM salesmen knew their customers's businesses well enough to properly advise customers on computer usage for their companies. And its after-sales support was superior, too.

By 1955, Remington needed to be bailed out, too, so it merged with Sperry to become Sperry Rand. But its management was not much better than Remington's was. By 1957, one of S-R's best computer men, William C. Norris, left in disgust, taking with him an entourage of experts to form their own computer company called Control Data. This new company would specialize in high-end scientific computers, and so would not directly challenge IBM. John Mauchly started his own company in 1959.

By 1965, IBM had risen to the leader in computer sales. It had about 65% of computer sales, while Sperry Rand had about 12%. During the 1960s, the Series 360 was IBM's mainstay computer. IBM had been reluctant to get into the computer market because of its high cost and unsure future. But one day IBM learned that they had better create a new technology to replace their punch-card technology or else face losing customers who were being inundated by rooms full of punch card for their customers. The "new" technology was the use of tape to store data.

In 1968, Douglas Engelbart presented his vision of the computer of the future, which he had made already: A client computer (terminal) interfacing with a mainframe over radio, and using a keyboard and mouse to interface with the terminal.

So why didn't this vision catch on quickly then for general use? Well, a number of reasons. First is because computers were still expensive, yet for very little power. Second, because they were still difficult to operate. And third, because they still didn't have much in the way of applications to run. A deeper question is why this vision didn't catch on for big business, such as IBM.

Perhaps this had to be. The state of the art for both hardware and software was in such a state of flux that just keeping up was difficult. The first change came in 1948 when three Bell Labs physicists invented the transistor, which would replace the failure-prone and hot-running vacuum tube technology of ENIAC, for example.

The beginning of the space race between the U.S. and the Soviet Union was another funding source to drive computer technology along. The trip to the moon would require a powerful and compact on-board computer for the trip. Compaction came partially because of the integrated circuit developed in 1959. Then in 1969, arguably the most revolutionary device ever produced by humanity was invented—the Microprocessor.

DEC

IBM engineer, Jay Forrester, inventor of magnetic core memory, started his own computer company in 1957, named Digital Equipment Corporation (DEC). His computers would not be competing against IBM's. Instead, he went after the scientific and academic markets.

DEC is best known for its Programmed Data Processor (or PDP) series of computers. These were smaller than the IBMs, so Forrester called them "minicomputers." Of course, the descendant of the minicomputer is the microcomputer. The PDP-8 was the first computer to use integrated circuits.

The Generals

After von Neumann brought back word of electronic computers to the scientific community after his visit to Mauchly and Eckert's lab during the war, those scientists involved with the most complicated calculations were naturally impressed and eager to get one. Some of the most interested scientists were those

working on the atomic bomb. The general in charge of the bomb development was General Leslie R. Groves, who, having learned of the coming importance of the electronic computer, got himself an executive position with Remington Rand. When RR bought out Mauchly and Eckert's company, Groves was put in charge of the UNIVAC project.

When Sperry merged with Remington Rand to become Sperry Rand, Gen. Douglas MacArthur became its new chairman. He may have been the first Mac in the computer game. Last but not least was General Electric, which bought the first UNIVAC 1 and pioneered time-sharing.

Meteoric Electronics

The electronic computer evolution had begun with the novel use of vacuum tubes for calculations. These tubes were big, expensive, unreliable, fragile, ran hot, and consumed a lot of energy. They were still in use when President John F. Kennedy gave his inspiring speech about humans going to the moon and returning safely before the end of the decade. To pull this off, there would have to be a number of dramatic improvements in the electronics of computers.

Fortunately, a solution was in the works, and it was coming from a then little-known valley south of San Francisco; now called Silicon Valley. Soon after the invention of the transistor (in 1948 by AT&T) a co-inventor of the transistor, named William Shockley, setup his own company called Shockley Semiconductor Laboratories. By 1957, eight of Shockley's disgruntled employees left to found their own company, called Fairchild Semiconductor. By 1959, both Fairchild and Texas Instrument had developed and patented important Integrated Circuit (IC) technologies.

In 1968, a splinter group from Fairchild created their own company, called Intel, dedicated to developing the world's best IC's. Soon, one of its employees developed the microprocessor. Its first processor was the 4004, and then came the 8008.

Programming

Early programmers were expected to be mathematicians first, because of the very nature of the computer's low-level mathematical structure. But as higher-level languages were invented, the need to employ only mathematicians was reduced.

The first programmer on ENIAC was the female mathematician Adele Goldstine. Working for the Eckert-Mauchly Computer Corporation was Grace Hopper, who is credited with making the first compiler and also with contributing to the creation of COBOL.

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