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http://expert.cc.purdue.edu/~mundy/comp_links.html

Blaise Pascal

In 1642, Blaise Pascal (1623-1662), the 18-year-old son of a French tax collector, invented what he called a numerical wheel calculator to help his father with his duties. This brass rectangular box, also called a Pascaline, used eight movable dials to add sums up to eight figures long. Pascal's device used a base of ten to accomplish this. For example, as one dial moved ten notches, or one complete revolution, it moved the next dial - which represented the ten's column - one place. When the ten's dial moved one revolution, the dial representing the hundred's place moved one notch and so on. The drawback to the Pascaline, of course, was its limitation to addition.

Gottfried Wilhem von Leibniz

In 1694, a German mathematician and philosopher, Gottfried Wilhem von Leibniz (1646-1716), improved the Pascaline by creating a machine that could also multiply. Like its predecessor, Leibniz's mechanical multiplier worked by a system of gears and dials. Partly by studying Pascal's original notes and drawings, Leibniz was able to refine his machine. The centerpiece of the machine was its stepped-drum gear design, which offered an elongated version of the simple flat gear. It wasn't until 1820, however, that mechanical calculators gained widespread use. Charles Xavier Thomas de Colmar, a Frenchman, invented a machine that could perform the four basic arithmetic functions. Colmar's mechanical calculator, the arithometer, presented a more practical approach to computing because it could add, subtract, multiply and divide. With its enhanced versatility, the arithometer was widely used up until the First World War. Although later inventors refined Colmar's calculator, together with fellow inventors Pascal and Leibniz, he helped define the age of mechanical computation.

Herman Hollerith

In 1889, an American inventor, Herman Hollerith (1860-1929), also applied the Jacquard loom concept to computing. His first task was to find a faster way to compute the U.S. census. The previous census in 1880 had taken nearly seven years to count and with an expanding population, the bureau feared it would take 10 years to count the latest census. Unlike Babbage's idea of using perforated cards to instruct the machine, Hollerith's method used cards to store data information which he fed into a machine that compiled the results mechanically. Each punch on a card represented one number, and combinations of two punches represented one letter. As many as 80 variables could be stored on a single card. Instead of ten years, census takers compiled their results in just six weeks with Hollerith's machine. In addition to their speed, the punch cards served as a storage method for data and they helped reduce computational errors. Hollerith brought his punch card reader into the business world, founding Tabulating Machine Company in 1896, later to become International Business Machines (IBM) in 1924 after a series of mergers. Other companies such as Remington Rand and Burroughs also manufactured punch readers for business use. Both business and government used punch cards for data processing until the 1960's.

Further Early Developments

Vannevar Bush(1890-1974) developed a calculator for solving differential equations in 1931. The machine could solve complex differential equations that had long left scientists and mathematicians baffled. The machine was cumbersome because hundreds of gears and shafts were required to represent numbers and their various relationships to each other. To eliminate this bulkiness, John V. Atanasoff (b. 1903), a professor at Iowa State College (now called Iowa State University) and his graduate student, Clifford Berry, envisioned an all-electronic computer that applied Boolean algebra to computer circuitry. This approach was based on the mid-19th century work of George Boole (1815-1864) who clarified the binary system of algebra, which stated that any mathematical equations could be stated simply as either true or false. By extending this concept to electronic circuits in the form of on or off, Atanasoff and Berry had developed the first all-electronic computer by 1940. Their project, however, lost its funding and their work was overshadowed by similar developments by other scientists.

Bill Gates Mini-Biography

Gates, William Henry, III (1955-), American business executive, chairman and chief executive officer of the Microsoft Corporation, born in Seattle, Washington. Gates cofounded Microsoft in 1975 with Paul Allen, his high school friend and partner in computer language development from 1967. Fascinated by computers by the age of 12, Gates had been involved with various programming projects throughout high school. While attending Harvard in 1975, Gates teamed with Allen to develop a version of the BASIC computer programming language for the MITS Altair, the first personal computer. This work on BASIC for the Altair led Gates to drop out of Harvard in 1977 to pursue full-time his vision of Òa computer on every desk and in every home,Ó the idea behind the Microsoft Corporation. In the early 1980's, Gates led Microsoft's evolution from a developer of computer programming languages to a diversified computer software company producing computer operating systems and applications software a s well as programming tools. This transition began with the introduction of MS-DOS, the operating system for the new IBM Personal Computer in 1981. Gates took a personal role in convincing other computer companies to standardize on MS-DOS, fueling computer industry growth in the 1980's through software compatibility. Gates also pushed Microsoft toward the introduction of application software such as the Microsoft Word word processing software for the IBM-PC. A key strategic move by Gates was to agree to develop application software for the Apple Macintosh prior to the release of the first Mac in 1984. This led to a strong position for Microsoft in applications that take advantage of the graphical user interface (GUI).

Much of Gates' success rests on his ability to translate technical visions into market strategy, and to blend creativity with technical acumen. He is one of the few founding CEO's from the technical side of the PC industry to have survived and thrived on the business side as well. Although Gates has accumulated great wealth from his holdings of Microsoft stock, he has been known as a tough competitor who seems to value winning in a competitive environment over money. Gates continues to stay personally involved in product development at Microsoft. His willingness to bet on new technologies such as Microsoft Windows, Windows NT, and workgroup applications has paid off in keeping Microsoft at the forefront of computer hardware and software evolution.

Computer Types

Analog vs. Digital computers

Computers are divided into two main types, analog computers and digital computers. Analog computers measure change in continuous physical or electrical states, such as pressure, temperature, voltage, length, volume or shaft rotations. A speedometer is an example of an analog device. The computer measures the rotations of the driveshaft and then uses a pointer to indicate the speed of the car.

Unlike analog computers, digital computers count. In a digital computer, data is represented by discrete "on" and "off" states of the computer's electronic circuitry.

Numbers, letters and symbols are represented by a code based on the binary number system, a number system consisting of two digits, 1 and 0. This number system is well suited to represent the on/off states of the electric current. The digital computer must convert all data to binary form.

Happy Birthday, micro!

For 25 years we have lived with and been irrevocably affected by a tiny device called the microprocessor. The programmable piece of silicon led directly to the desktop computing revolution which has radically changed our lives.

It was in November 1971 that US chip maker Intel unveiled the world's first microprocessor called the 4004. The device, at the time the ultimate in state-of-the-art electronics, consisted of 2,300 transistors located on a sliver of silicon that was one eight of an inch wide by one sixth of an inch long, drawn using lines 10 microns (a hundredth of a millimetre) wide.

The man behind the device, the father of the microprocessor, was Marcian 'Ted' Hoff, an Intel engineer who has gone down in history as the man responsible for the PC industry. The 4004 was, in 1971, a fantastic device, but by today's standards it was nothing more than a glorified adding device. Indeed, one if its primary uses was in calculators.

In fact, the 4004 came about because Intel had been approached in 1969 by a Japanese company, Busicom, to design a set of high-performance, programmable calculators.

Hoff, Federico Fagin and Stan Mazor started the project to design the chip, and were joined later by Busicom engineer Masatoshi Shima, who was to join Intel and become head if its design centre and had the task of designing the logic for the 4004 chip.

The 4004 was designed to be an arithmetic unit that could process some 60,000 operations a second. At that time this was a fantastic speed, but by today's standards it is primitive.

Revolution

Although the 4004 is regarded as the start of the microprocessor revolution as we know it, the chip that really started the ball rolling was the 8008 which was developed in parallel with the 4004 and made it to market in April 1972.

The chip was the first to be taken and sold on the open market. It was built around 3,500 transistors and moved from the world of 4-bit to 8-bit processing with the ability to address a massive 16 Kbytes of memory. This was followed by the 8080 chip which went from 3,500 transistors to 6,000 and could address 64 Kbytes of memory.

However, the real change in the industry was to come with the design of the 8086 and 8088 microprocessor chips. In the early 1980s IBM was working on a project to develop what it called a personal computer at its facility at Boca Raton, Florida.

IBM took the decision to buy Intel's design for a microprocessor, opting to base its machines on the 8086 and then 8088 microprocessors. The move came at just the right time for Intel, which had found itself under pressure from competition in the form of the Z8000 microprocessor from Zilog and Motorola's 68000 chips. Apple, a California computer company founded in a garage and with grand plans to dominate the personal computer industry, had chosen the 68000 chip from Motorola, and Intel needed a big adopter of its microprocessor technology.

IBM's decision to support the 8086 microprocessor, running an operating system called MS-Dos, resulted in Intel and a software company called Microsoft, under Bill Gates and Paul Allen, becoming the two most powerful firms in a marketplace that is now worth billions of dollars annually.

What's in store

Since Intel's launch of the 4004 faster, smaller and more complex microprocessor devices have been developed. Intel, Texas Instruments, Advanced Micro Devices (AMD), Digital Equipment, Cyrix and many others have deluged the industry with tiny black microprocessor chips that have altered the course of our lives.

But Intel had dominated the markets for microprocessor chips and looks likely to continue this for quite some time, unless companies such as AMD can break its monopolistic grip.

Following the 4004 Intel came out with the 8008, 8088, 80286, 80386, i486, Pentium; and now we have the Pentium Pro, with Intel's multimedia extensions (MMX) technology already in the shops. Closely following this will be a device called Klamath, which will mark a new generation of high-performance 'rich-media' chips from Intel. Klamath will bring together the world of MMX with the multi-processing capability of the Pentium Pro chip. The impact this will have on the software industry will be interesting.

The Motorola 68000 microprocessor family has been the single most significant threat to the dominance of Intel in the chip business. Apple's all-out adoption of the 68000 for use in its Macintosh computers forged a market with 12 million-plus loyal customers.

But Intel saw off this competition, and has beaten off the challenge from firms such as AMD and Cyrix, which introduced Intel-compatible processors in an attempt to hijack Intel's market. During the early 1990s, thanks to a huge investment programme in chip manufacturing plants, Intel was able to maintain its position as the only firm able to satisfy the burgeoning demand for PC chips.

Even Digital, which came up with the massively powerful Alpha chip, which made it into the Guinness Book ok Records as the fastest ever microprocessor, has hardly dented Intel's market share. Instead, Compaq, AST, Apricot, IBM, Dell, Gateway 2000, Acer and a multitude of other PC manufacturers continue to buy Intel chips.

Promises, promises

Intel promises more and more power for the computer industry and its customers. And the software industry it will always take this power and waste it.

If you want to watch a fast microprocessor collapse under pressure then install an operating system with a graphical user interface (GUI) on it. The Microsoft Windows operating system has been a classic example of soaking up power, ever since its inception in 1984.

But its the user interface of computers that will benefit most from the power that Intel promises fro the future. GUIs are a bit old hat now.

Speech recognition/creation, artificial intelligence and handwriting recognition are the future of the PC interface. And much of this technology will be achieved by throwing raw horse power at the problem of how to make computers easier to use.

Back in 1994 Hoff was asked how he felt about having such a profound impact on the world. "The computer went from being under the control of a very privileged group to being available to everyone. Before micro processing, you turned in you program cards at the computer centre, and they were processed overnight. Today, highschool kids have more processing power than some of the most elite had three decades ago. We took the computer and made it everyone's tool."

The 4004 kick-started a revolution that we are only half way through. We've had 25 years: the next 25 years will be even more exciting.

Mainframes

During the 1960s, the term mainframe was synonymous with CPU. Today the word refers simply to a category of computers between the supercomputers and the minicomputer.

Mainframes operate at very high speeds and support main input and output devices that also operate at very high speeds. They can be subdivided into small, medium and large systems. Most mainframes are manufactured as "families" of computers. A family consists of several mainframe models varying in size and power. An organisation can purchase or lease a small system, and if processing needs expand, upgrade to a medium or large system. Purchase prices range from a few hundred thousand pounds to several million pounds for a large mainframe with peripherals. Mainframes are used chiefly by large businesses, hospitals, universities and banks with large data processing needs.

A mainframe requires special installation and maintenance procedures. It creates a fair amount of heat, so it requires a cooling system. A mainframe cannot be plugged into a standard electrical outlet; it needs special electrical wiring. It may rest on special platforms so that wires and cables can be housed beneath it. Furthermore, a mainframe runs day and night and provides access to a large amount of data. Because this accesss needs to be controlled, users must implement some type of security system. All these factors add to the cost of using a mainframe.

Mainframe computers are sold or leased and can include support from the vendor. The vendor can invest considerable time and money helping a customer select and install a mainframe. Once the system is installed, the vendor spends additional effort training the customer's employees from top executives to clerical workers to use the system, servicing and repairing the mainframe, and solving questions and problems that arise periodically.

Major mainframe manufacturers include IBM, Unisys, Honeywell and National Cash Register (NCR).

Minicomputers

Minicomputers were developed in the 1960s for doing specialised tasks. They were smaller, less powerful, and less expensive than the large computers available at the time. As they became increasingly sophisticated, their capabilities, memory size and overall performance have overlapped those of mainframes. The more powerful minicomputers are called superminis.

Minicomputers are easier to install and operate than mainframe computers. They take up less floor space than mainframes; they may fit on a desk or they may be as large as a file cabinet. They require few special environmental conditions. Minicomputers can be plugged into standard electrical outlets and often do not require facilities such as air conditioning and special platforms. Prices for minicomputers range from a few thousand pounds to several hundred thousand pounds.

Minicomputers are used for multiuser applications, numerical control of machine tools, industrial automation and wordprocessing. They are also used in conjunction with communication facilities for sharing data and peripherals or serving a geographically dispersed organisation. Like microcomputers, they also can use packaged software.

A minicomputer system can be easily enlarged to meet the needs of a growing organisation since it can be implemented in a modular fashion. For example, a hospital may install one minicomputer in its outpatient department for record keeping and another in the pharmacy or laboratory. As additional minicomputers are installed, they can be connected to existing ones to share common data.

In the late 1970s and early 1980s, the minicomputer industry grew at a rate of 35 to 40% annually. Today, the market for minicomputers is weakening. The increased capabilities and improved software of microcomputers has led to the increased use of micros in traditional minicomputer markets. Many companies now link microcomputers with mainframes or existing minicomputers to hold down equipment investment costs and still meet processing needs. This practice, however, creates new security problems for many corporations.

Manufacturers of minicomputers include Digital Equipment Corporation (DEC), Hewlett-Packard, Unisys, Wang Laboratories and IBM.

Modern Computing - Second Generation
(1956-1964)

In 1946, the thermionic valve was the only technology capable of switching fast enough to do calculations at a reasonable speed. However, the valve had numerous drawbacks. A valve was expensive to produce and the numbers required for a computer put the cost of a computer beyond the reach of all but the richest organisations. Valves also consumed vast amounts of power in operation, as well as cost, the technical difficulties of controlling the waste heat generated were considerable. Reliability of valve based computers was low because of the vast numbers of valves used. Great cost, time and effort was expended in maintaining these computers.

In 1947, three Bell scientists, William Shockley, Walter Brattain and John Bardeen demonstrated an invention called the transistor This device was ideal to replace the valve. Minute compared to a valve, it cosumed very little power, and because of lower power characteristics, was more reliable. When mass production of transistors commenced, the costs plummeted. At a stroke computers became smaller, cheaper and more reliable.

Modern Computing - Second Generation (1956-1964)

Around the same time as the development of the transistor, the US Navy found itself with a requirement for a fast, reliable flight trainer. Current technology being inadequate, the US Navy instigated the Whirlwind I project. This project was one of the most innovative and influential projects in the history of the computer.

One of the developments arising from Whirlwind I was the development of the magnetic core. This replaced magnetic drum technology in the storing of instructions and data. Using magnetic cores allowed the storage and retrieval of instructions and data in much reduced times (typically a few millionths of a second).

With real time processing available, other options opened for computers in such areas as air traffic control and manufacturing process control.
