

# Sissejuhatus infotehnoloogiasse

seitsmekümnendad ja  
kaheksakümnendad

# Loengu ülevaade: seitsmekümnendad

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**1970-1979: mikroprotsessoritest personaalarvutiteni**

- Esimene mikroprotsessor: Intel 4004
- Arpanet: interneti eelkäija
- Esimesed arvutimängud
- Email, ethernet ja muu võrguvärk
- Esimesed ise-kokkupandavad mikroarvutid
- Miniarvutite tarkvara: Unix, C, ..., Smalltalk, Prolog
- Mikroarvutite tarkvara: CP/M, PL/1 ja BASIC kloonid
- Personaalarvutite teke: Commodore PET, Apple II, Radio Shack
- Microsoft ja BASIC
- Visicalc
- Xerox ALTO

# Loengu ülevaade: kaheksakümnead

## 1980-1989:

- USENET
- Spetsiaalprotsessorid
- Sinclair ja Acorn archimedes
- IBM PC
- Kontoritarkvara
- Workstationid: Sun ja Apollo
- SQL ja Oracle
- Macintosh
- Portaablid arvutid
- GNU, gcc, X-windows
- arpanet => nsfnet

# 1970

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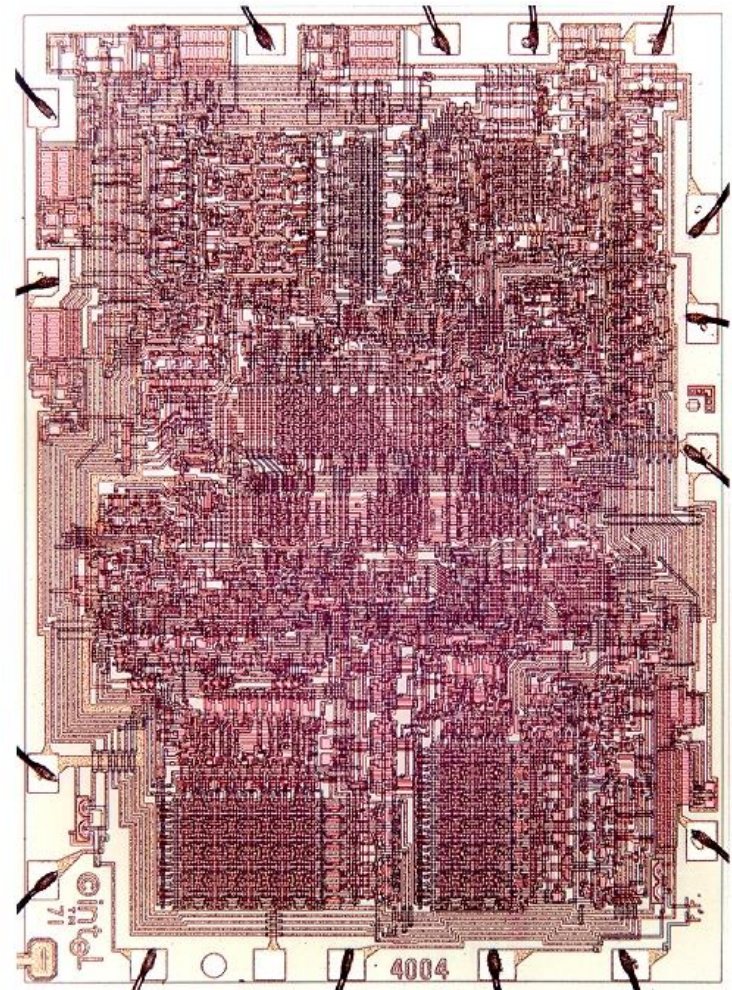
- **Xerox** opens the Palo Alto Research Center (**PARC**).
- Intel creates the 1103 chip, **the first generally available DRAM memory chip.**
- **Wayne Pickette** takes his **computer-on-a-chip design to Intel**, and is hired, began working for Dr. Ted Hoff.
- At Intel, Wayne Pickette proposes to Ted Hoff the idea of building a computer-on-a-chip for the Busicom project.
- **Gilbert Hyatt** files a patent application entitled "Single Chip Integrated Circuit Computer Architecture", **the first basic patent on the microprocessor.**
- Work begins at Intel on the layout of the circuit for what would be the 4004 microprocessor. Federico Faggin directs the work.
- **Intel creates the first 4004 microprocessor.**

# 1971: First microprocessor: Intel 4004

## 1971

The first commercial 4-bit microprocessor 4004:

- 2,300 transistors
- 10  $\mu\text{m}$  features
- 10  $\text{mm}^2$  die
- 108 kHz



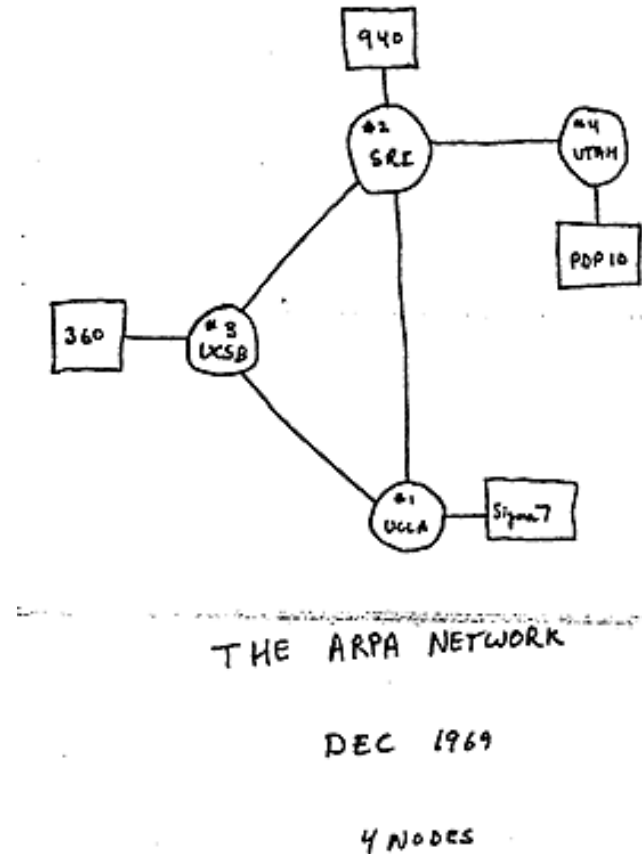
## ...1970

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- **Relational database software: theory and first research groups**
- In 1970 an **IBM researcher named Ted Codd** published the first article on relational databases.
- Codd envisaged a system where the user would be able to access information with English like commands, and where information would be stored in tables.
- Due to the technical nature of the article, and the reliance on mathematics to support its case, the significance of it was not realized immediately. However, it did lead to IBM starting a **research group known as 'System R'**.
- Eventually **System R evolved into SQL/DS** which later became DB2. The language created by the System R group, SQL (Structured Query Language) has become the industry standard for relational databases and is now an ISO standard.
- **First commercial SQL database** created by Honeywell Information Systems Inc., which released a commercial product in June of **1976**.

# 1971...

- Computer-to-computer Communication expanded when the Department of Defense established four nodes on the **ARPANET**: the University of California-Santa Barbara and UCLA, SRI International, and the University of Utah.



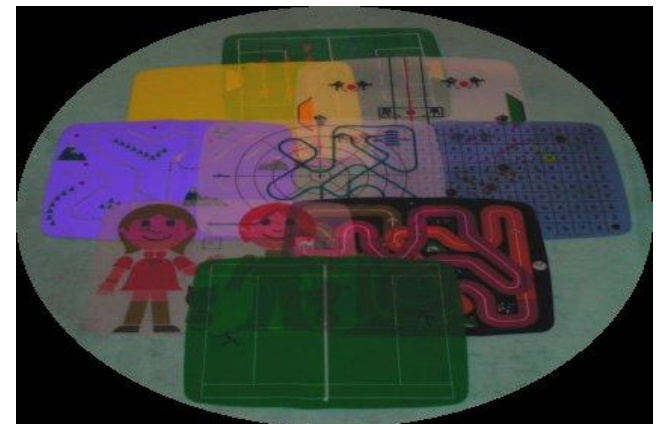
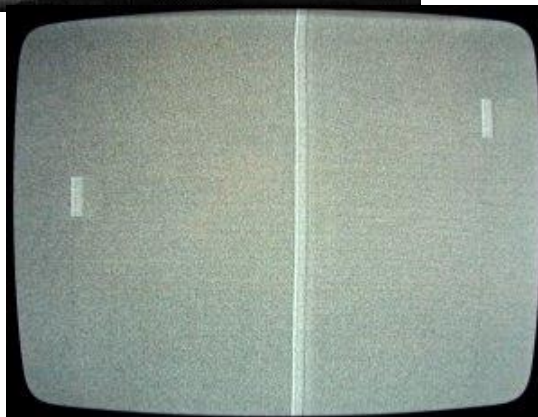
- **Some gaming stuff:**
  - **Space war** was a first graphical computer game, created on PDP-1 in 1961.
  - In 1970, an engineer called Ralph Baer created the system which later became Magnavox Odyssey
  - Nolan Bushnell tried to make an arcade version of *Space War* and created *Computer Space*. Nutting Associates bought the game, hired Nolan and manufactured 1,500 *Space War* machines. The game was not a success because people found it difficult to play.
- **As Nolan felt he didn't receive enough pay, he created his own company: Atari in 1972.**
- **Atari ships Pong**, one of the first really successful commercial video games.
- **In 1977 Atari enters the home computer market among others**



- **Magnavox Odyssey: first home video game along with Atari**



- **No processor: combined analog/digital**
- Chief developer: Ralph Baer
- Plastic overlays on TV screen to get a background picture
- over 80,000 Odyssey and over 20,000 rifle packs sold in 1972
- Altogether, ca 350,000 made



## 1972: Colossal Cave: a text-based adventure game

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- **Written by Will Crowther:** Will worked on developing the assembly language program for the original routers used in creating the ARPAnet. In their spare time the Crowthers, both avid cavers, explored and mapped portions of the Mammoth and Flint Ridge cave systems in Kentucky for the Cave Research Foundation.
- **Crowther wrote a computer simulation based on the maps, for a Digital Equipment Corporation PDP-10 computer, in FORTRAN.** His first version included caver jargon, and many of the names of rooms in this version came from actual features in the caves Will had been exploring.
- Unfortunately, it was during this period that Crowther's marriage ended. Feeling estranged from his two daughters and wanting to be closer to them, he decided to write a program that they might enjoy.
- Crowther's daughters enjoyed the game, and **it was passed from friend to friend during the early days of the Internet**, appearing on countless computers on and off the fledgling network.

# What happened later with Colossal Cave

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- **In 1976, Don Woods** was working at Stanford University's Stanford Artificial Intelligence Lab, otherwise known by the acronym SAIL. Woods found a copy of Crowther's rudimentary program left on one of the SAIL computers by some unknown Johnny Appleseed, so to speak.
- **He contacted Crowther by the simple expedient of sending email to "crowther@sitename,"** where *sitename* was every computer then on the Internet, only a mere handful of sites at the time. After corresponding with Crowther and getting his blessings, Woods greatly expanded the program.

- **Gary Kildall** implements **PL/I** on the Intel 4004 processor.
- **Bill Gates and Paul Allen** form the **Traf-O-Data** company.
- Traf-O-Data develops a primitive microcomputer based on Intel's 8008 microprocessor for recording automobile traffic flow on a highway.
- **5 1/4 inch diskettes** first appear.
- Xerox decides to build a personal computer to be used for research.  
**Project "Alto" begins.**
  
- In 1971 Ray Tomlinson of BBN invents email program to send messages across a distributed network.
- In 1972 Ray Tomlinson modifies **email program for ARPANET** where it becomes a quick hit. The @ sign was chosen from the punctuation keys on Tomlinson's Model 33 Teletype for its "at" meaning

- **Two important programming concepts introduced:**
  - **The first object-oriented language Smalltalk** developed at XEROX PARC, based on ideas by Alan Kay.
  - **The first logic programming language Prolog** developed by Alan Colmerauer at University of Marseilles

- **Hewlett-Packard introduces a programmable calculator** with a magnetic stripe memory for storing programs
- Users could write programs up to 100 lines in length and record them on blank cards, or they could buy pre-programmed cards.
- In 1975 it is used on Soyuz-Apollo mission for calculating critical course-correction maneuvers



# 1973...

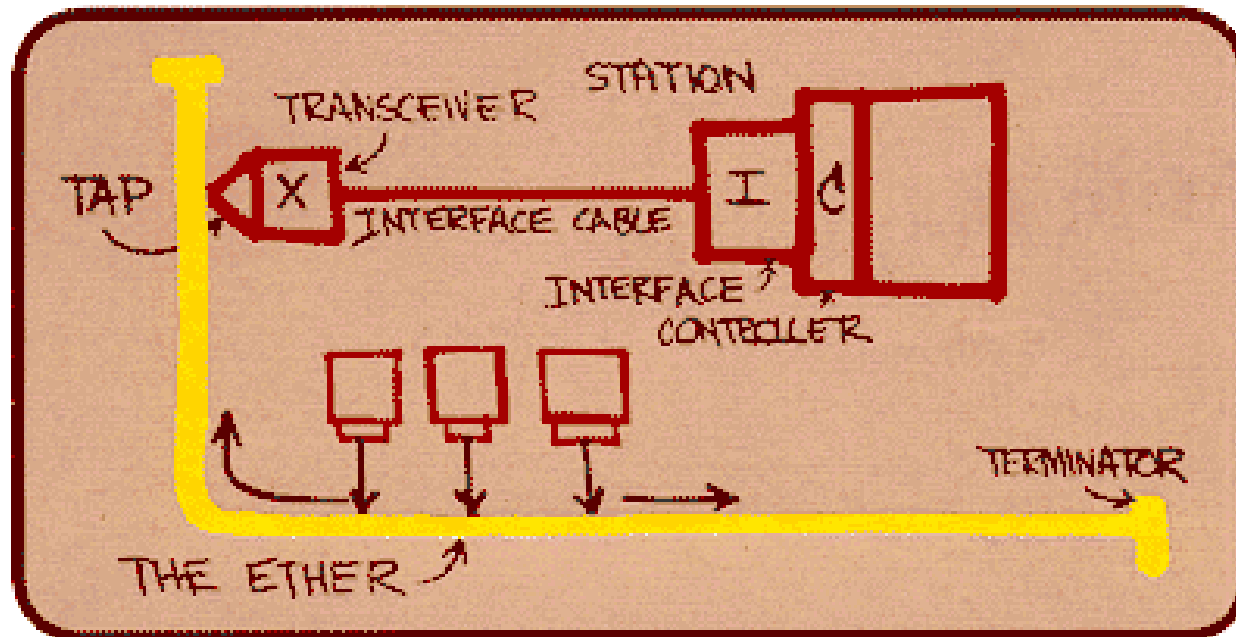
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- The first **prototype Alto workstation** computer is turned on at Xerox' Palo Alto Research Center. Its first screen display is a bitmapped image of the Sesame Street character Cookie Monster.
- **Traf-O-Data shuts down.** It made about US\$20,000.
- Design work is completed on the **Micral**, the first non-kit computer based on a microprocessor (the Intel 8008). Built in France, the Micral is advertised in the U.S., but is not successful there.
- The term "microcomputer" first appears in print, in reference to the Micral.

- Gary Kildall writes a simple operating system in his PL/M language. He calls it **CP/M** (Control Program/Monitor).
- Gary Kildall creates PL/M for the Intel 8008, based on PL/I.
- IBM develops a cheap disk and drive:  
IBM introduces the IBM 3340 hard disk unit, known as the **Winchester**, IBM's internal development code name. The recording head rides on a layer of air 18 millionths of an inch thick. It uses four 8-inch diameter platters, giving it a capacity of 70 MB.



- Scelbi Computer Consulting Company offers **the first computer kit in the U.S. using a microprocessor**, the Intel 8008-based Scelbi-8H, for US\$565, with 1KB programmable memory. An additional 15KB is available for US\$2760.
- **Bob Metcalfe** invents the **Ethernet** connectivity system.



# 1974...

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- Intel releases its **2-MHz 8080 chip, an 8-bit microprocessor**. It can access 64KB of memory. It uses 6000 transistors, based on 6-micron technology. Speed is 0.64 MIPS.
- In a desperate act to save his failing calculator company, **MITS** company owner Ed Roberts begins building a small computer based on Intel's new 8080 chip, with plans to sell it for the unheard-of price of US\$500.
- **MITS** completes the first prototype **Altair 8800 microcomputer**.
- Bravo is developed for the Xerox Alto computer. It is **the first WYSIWYG program for a personal computer**.

# Altair

- Altair was one of the first **successfully sold personal computer kits** for do-it-yourself computing fans. No monitor, no keyboard



- Keyboard and cassette drive can be added
- Oscilloscope can be attached to be used as a display



- **Popular Electronics publishes an article by MITS announcing the Altair 8800 computer for US\$439 in kit form.** It uses the Intel 8080 processor. The Altair pictured on the cover of the magazine is actually a mock-up, as an actual computer was not available.
- Paul Allen sees the Popular Electronics issue with the Altair, and tells Bill Gates that the microcomputer revolution is just beginning.

- Gary Kildall, of Microcomputer Applications Associates, develops the **CP/M operating system for Intel 8080-based systems**.
- **Motorola** introduces its **6800 chip**, an early 8-bit microprocessor used in microcomputers and industrial and automotive control devices. The 6800 was designed by Chuck Peddle and Charlie Melear.
- Engineer David Ahl suggests Digital Equipment produce an inexpensive version of its PDP-8 minicomputer, for US\$5000. Top management call the idea foolish.

## ...1974: Alto

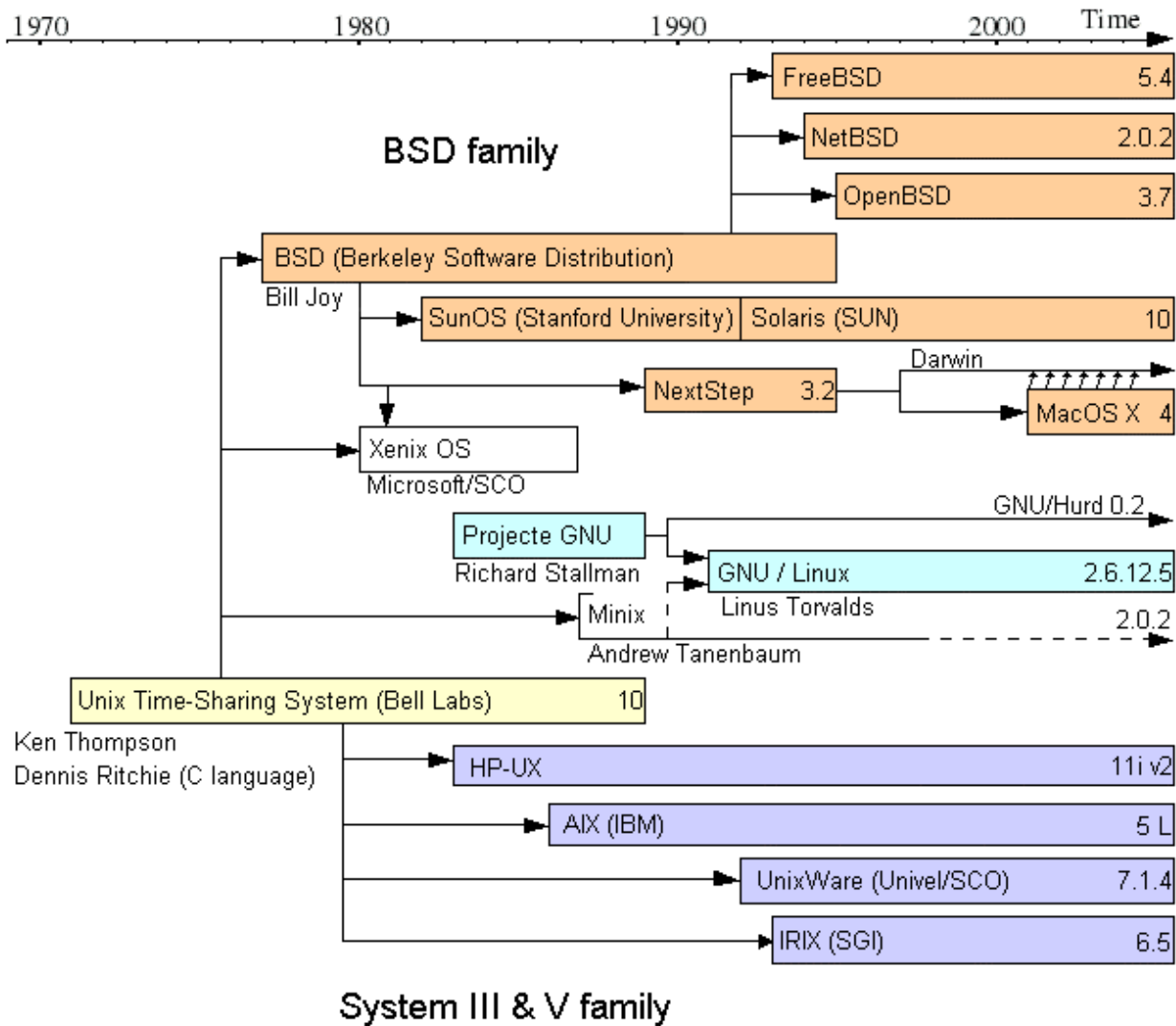
- Xerox releases the Alto computer.



- A personal computer to be used for research
- Cost: \$32,000
- Never produced for profit
- **First serious machine to feature a modern user interface:** windows, mouse, etc invented by Engelbart in 1964
- Great influence on Macintosh
- Great influence on Microsoft

# ...recall: birth of UNIX 69-71

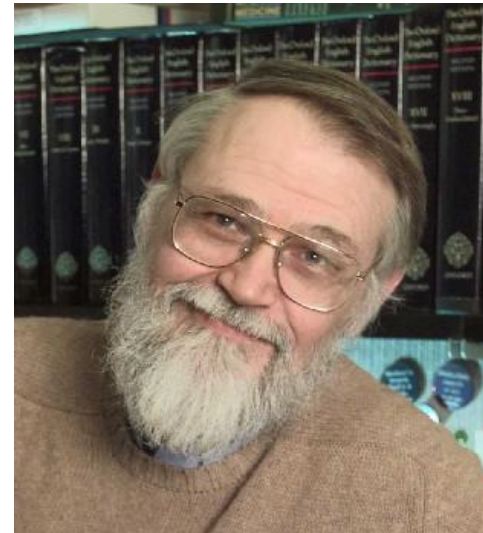
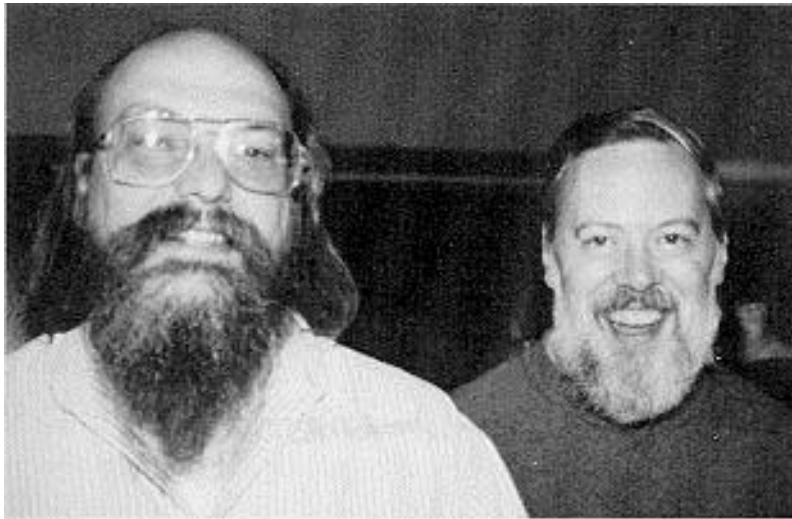
- 69-71
- PDP 7 and 11
- Ken Thompson,
- Dennis Ritchie



- Gory details: see <http://www.levenez.com/unix/>

# C language: first half of 70s

- **Influences/derivation history: from ALGOL to C**
  - **ALGOL 58/60:** Hoare, Perlis, Dijkstra, Kurtz, ..., Kotli,...
  - BCPL derivative of ALGOL (Strachey)
  - B simplified derivative of BCPL (Ken Thompson)
  - **C derivative of B (Dennis & Ritchie)**
- **C development 1969-1973**
- **Famous C book 1978 “The C Programming Language”**
- **Thompson, Ritchie, Kernighan:**





# 1975

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- Paul Allen meets with Ed Roberts to demonstrate the newly written BASIC interpreter for the Altair. Despite never having touched an Altair before, the BASIC works flawlessly.
- **Bill Gates and Paul Allen license their newly written BASIC to MITS**, their first customer. This is the first computer language program written for a personal computer.
- Fred Moore and Gordon French hold the first meeting of a **new microcomputer hobbyist's club** in French's garage, in Menlo Park, California. 32 people meet, including Bob Albrect, Steve Dompier, Lee Felsenstein, Bob Marsh, Tom Pittman, Marty Spergel, Alan Baum, and **Steven Wozniak**. Bob Albrect shows off an Altair, and Steve Dompier reports on MITS, and how they had 4000 orders for the Altair.
- The second meeting of Fred Moore/Gordon French's computer hobbyists group is held at the Stanford AI lab. 40 attend. The name for the group is chosen: Bay Area Amateur Computer Users Group - **Homebrew Computer Club**.

- Bill Gates and Paul Allen found **Micro-Soft** (the hyphen is later dropped).
- Bill Gates and Paul Allen ship 4K and 8K version of BASIC v2.0.
- MITS delivers the first generally-available **Altair 8800**, sold for **US\$375** with 1KB memory.
- MOS Technology announces the MC6501 at US\$20 and the **MC6502** at **US\$25**. At this point, the Intel 8080 costs about US\$150.

- The first issue of **Byte** magazine is published.
- MITS releases a version of **MicroSoft BASIC 2.0** for its Altair 8800, in 4K and 8K editions.
- Paul Terrell opens the Byte Shop, in Mountain View, California, one of the first computer stores in the US.
- Bill Gates writes **an open letter** to microcomputer hobbyists, complaining about software piracy, to be published in an Altair newsletter.
- Lee Felsenstein and Bob Marsh **begin work on a complete computer**, 8080-based with a keyboard and color video display capabilities built-in.
- To date, MITS has sold 2,000 Altair 8800 systems.
- **Zilog** is founded.
- MITS begins work on a Motorola 6800-based Altair.
- MITS sales of Altair computers hits **US\$1 million**.

# 1976

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- Steve Wozniak and Steve Jobs finish work on a computer circuit board, that they call the **Apple I** computer
- By the end of its first year in business, Micom Data Systems ships 180 Micom 2000 computers, worth \$2 million.
- Intel introduces the 5-MHz **8085 microprocessor**. Speed is 0.37 MIPS. It uses 6500 transistors, based on 3-micron technology. It supports an 8-bit bus. Operates on a single 5-volt power supply. (1978)
- Bill Gates writes a **second open letter** to computer hobbyists, condemning software piracy. Again it is published in the Altair newsletter.
- Microsoft hires its **first employee**, Marc McDonald.

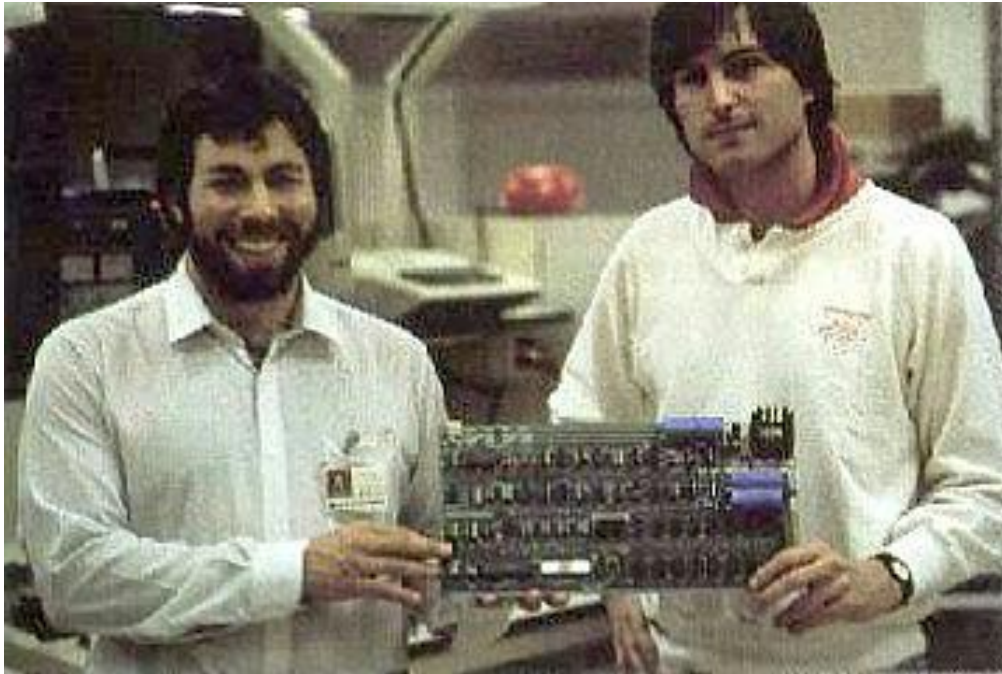
# 1976

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- **National Semiconductor** releases the SC/MP 8-bit microprocessor, providing early advanced multiprocessing.
- **Digital Research copyrights CP/M**, its industry-standard microcomputer operating system, created by company founder Gary Kildall.
- Texas Instruments introduces the TMS9900, **the first 16-bit microprocessor**. The microprocessor implemented Texas Instrument's 16-bit architecture on the TI 990 minicomputer.
- **Wang Laboratories** announces a word-processing system using advanced computer technology, rather than traditional electromechanical devices. The price is **US\$30,000**, more than twice that of the most expensive competitor's word-processor.

# 1976

- **Steve Jobs and Steve Wozniak** form the **Apple Computer Company**, on April Fool's Day.
- The **Apple I computer board** is sold in **kit form**, and delivered to stores by Steve Jobs and Steve Wozniak. Price: US\$666.66.
- Paul Terrell orders **50 Apple computers** from Steve Jobs, for his Byte Shop.



# 1976

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- Zilog releases the **2.5-MHz Z80**, an 8-bit microprocessor whose instruction set is a superset of the Intel 8080.
- iCOM advertises their "Frugal Floppy" in BYTE magazine, an **8-inch floppy drive, selling for US\$1200**.
- Steve Wozniak **begins work on the Apple II**.
- Commodore International buys MOS Technology.
- **Advanced Micro Devices and Intel** sign a patent cross-license agreement, giving Advanced Micro Devices the right to copy Intel's processor microcode and instruction codes.
- **Mike Markkula**, ex-marketing wizard at Intel, visits Steve Jobs' garage, to see the Apple computers.
- **Steve Wozniak** decides to remain at Hewlett-Packard, but is soon convinced that he should leave and join Apple Computer permanently.
- **Paul Allen** resigns from MITS and joins Microsoft full time
- **Bill Gates** drops out of Harvard, to devote his full attention to Microsoft.

# 1976

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- Xerox management rejects two proposals to market the Alto computer.
- **Gary Kildall founds Intergalactic Digital Research.**
- Gary Kildall grants a license to CP/M to GNAT Computers for US\$90, to IMSAI for US\$25,000.



# 1976

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- **U.S. Robotics** is founded, in Skokie, Illinois
- MOS Technology ships the **6502 microprocessor**. The 6502 was developed by Chuck Peddle.
- MOS Technology Inc. announces the KIM-1 Microcomputer System, with 1-MHz 6502 CPU, 1KB RAM, 2KB ROM monitor, 23-key keypad, LED readout, cassette and serial interfaces, for US\$245.
- Chuck Peddle designs the **Commodore PET**.
- MITS unveils the **Altair 680**, based on the Motorola 6800 microprocessor.
- Steve Wozniak proposes that Hewlett-Packard create a personal computer. Steve Jobs proposes the same to Atari. **Both are rejected.**

- **Warner Communications buys Atari from Nolan Bushnell for US\$26 million.**
- The first issue of Dr. Dobbs is published
- IMSAI begins shipping the IMSAI 8080.
- Polymorphic Systems introduces the Poly morphic 8800. It is the first microcomputer with an interface for a video monitor, a connection for a cassette tape recorder, and its basic operating system in ROM
- **Cray Research introduces the Cray-1 vector-processing computer.**
  
- **Bill Joy writes “vi”: a simple visual text editor for UNIX.**
- Vi is a follow-up to the line editors ed and em
- **Joy later became:**
  - Main author of the Berkeley UNIX (BSD) version
  - One of the founders of Sun Microsystems
  - One the main authors of Java

- The **Commodore PET** (Personal Electronic Transactor) -- the first of several personal computers released in 1977 -- came fully assembled and was straightforward to operate.



- The **Apple II** became an instant success when released in 1977 with its printed circuit motherboard, switching power supply, keyboard, case assembly, manual, game paddles, A/C powercord, and cassette tape with the computer game "Breakout."



# 1977

- In the first month after its release, **Tandy Radio Shack's** first desktop computer -- the **TRS-80** -- sold 10,000 units, well more than the company's projected sales of 3,000 units for one year.



# 1977

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- Commodore Business Machines Inc. shows its **PET 2001** computer at the West Coast Computer Faire. The PET includes a 6502 CPU, 4KB RAM, 14KB ROM, keyboard, display, and tape drive, for US\$600.
- Apple Computer introduces the **Apple II** at the West Coast Computer Faire. The computer features a 6502 CPU, 4KB RAM, 16KB ROM, keyboard, 8-slot motherboard, game paddles, graphics/text interface to color display, and built-in BASIC, for US\$1300. It is the first personal computer with color graphics
- 10 months after its introduction, 175 Apple I kits have sold.
- **Pertec buys MITS and the Altair line for US\$6 million in stock.**
- Microsoft ships "Microsoft FORTRAN" for CP/M-based computers
- Radio Shack (a division of Tandy Corp.) announces the TRS-80 microcomputer, with Z80 CPU, 4KB RAM, 4KB ROM, keyboard, black-and-white video display, and tape cassette for US\$600.

- One month after launching the TRS-80, 10,000 are sold, despite sales projections of only 3,000 in the first year.
- Apple Computer releases Applesoft, a version of BASIC with floating-point capabilities. It is licensed from Microsoft
- Heath Schlumber Company introduces its first microcomputer kit, the H-8 personal computer kit, based on the Intel 8080.

- **Intel introduces the 4.77-MHz 8086 microprocessor.** It uses 16-bit registers, a 16-bit data bus, and 29,000 transistors, using 3-micron technology. Price is US\$360. It can access 1 MB of memory. Speed is 0.33 MIPS. Later speeds included 8-MHz (0.66 MIPS) and 10-MHz.
- Microsoft ships Microsoft COBOL.
- Apple Computer introduces the Disk II, a 5.25 inch floppy disk drive linked to the Apple II by cable. Price: US\$495, including controller card.
- **Pertec ceases production of the Altair.**



- Epson announces the MX-80 dot matrix printer, which established a new standard in high performance with low price for printers.
- Atari announces the Atari 400 and 800 personal computers, using the 6502 microprocessor.
- **Microsoft's sales for the year reach US\$1 million.**
- Apple Computer begins work on a supercomputer with a bit-sliced architecture, code-named **Lisa**.

- Harvard MBA candidate Daniel Bricklin and programmer Robert Frankston developed VisiCalc, the program that made a business machine of the personal computer, for the Apple II.



# 1979

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- Apple Computer introduces the **Apple II Plus**, with 48KB memory, for US\$1195.
- Apple Computer introduces its first printer, the Apple Silentype, for US\$600. It is a Trendcom Model 200, released under the Apple name.
- Intel introduces the **4.77-MHz 8088 microprocessor**. It was created as a stepping stone to the 8086, as it operates on 16 bits internally, but supports an 8-bit data bus, to use existing 8-bit device-controlling chips. It contains 29,000 transistors, using 3-micron technology, and can address 1MB of memory. Speed is 0.33 MIPS. A later version operates at 8-MHz, for a speed of 0.75 MIPS.
- Bob Metcalfe founds **3Com** Corporation.
- Texas Instruments introduces the TI-99/4 personal computer, for an initial price of US\$1500. It uses the TI 9940 16-bit microprocessor.
- MicroPro releases the **WordStar** word processor, written by Rob Barnaby. It is made available for Intel 8080A Zilog Z-80 based CP/M-80 systems. written by Seymour Rubenstein
- Microsoft announces Microsoft BASIC 8086 at the National Computer Conference.]

- Wayne Ratliff develops the Vulcan database program (Ashton- Tate later markets it as **dBase II**).
- **Motorola's 68000 16-bit microprocessor appears.** It uses 68,000 transistors, giving it its name.
- 2.5 years after the introduction of the Apple II, 50,000 units have been sold.
- Personal Software releases VisiCalc for the Apple II, for US\$100.
- A group of Apple Computer engineers and executives is given a **demo of Xerox Palo Alto Research Center's Alto computer system**, in exchange for Xerox buying 100,000 Apple Computer shares for US\$1 million.
- Ross Perot asks Bill Gates about buying Microsoft. Gates recalls asking US\$6-15 million. Perot recalls Gates asking US\$40-60 million.
- Xerox shows its Alto personal computer in TV commercials.
- After airing a TV commercial for the Alto several times, Xerox decides **not to market the Alto.**

## 79-80: USENET : varane “web” : tekstiudised

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- USENET on hiiglaslik kogus uudisgrupe. Tekstid liiguvad masinast masinasse.
- **USENET**: Unix Users Network founded **late 1979**.
- Info liikus algselt: **UUCP** protolli abil (Unix to Unix communications protocol, enamasti moodemi abil sissehelistamisega).
- **V7 Unix with UUCP**. Two Duke University grad students in North Carolina, Tom Truscott and Jim Ellis, thought of hooking computers together to exchange information with the Unix community. Steve Bellovin, a grad student at the University of North Carolina, put together the first version of the news software using shell scripts and installed it on the first two sites: "unc" and "duke." At the beginning of 1980 the network consisted of those two sites and "phs" (another machine at Duke), and was described at the January Usenix conference.
- **1986 murrang**: Network News Transfer Protocol (**NNTP**) . Uudised liiguvad TCP/IP (interneti) kaudu.

# Spetsiaalkeelte protsessorid: sünd 1980 ja surm ca 1990

**Symbolics founded 1980.** Created special hardware for running LISP programs (mostly AI) efficiently. The whole system written in LISP.

- 21 founders: mostly from **MIT AI lab**.
- Revenue 35 millions by 1986, then decreases rapidly.
- Cost of a Symbolics machine in 1988 was between 36.000\$ and 125.000\$.
- Sun-X computer at that time started at 14.000\$
- Another Lisp machine company created at the same time: **LMI LISP machine** died even faster than Symbolics



## 1980: planning for IBM PC

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- IBM's Corporate Management Committee gives William Lowe approval to begin Project Chess, by recruiting 12 engineers, and building a **prototype microcomputer**.
- IBM representatives meet with Microsoft's Bill Gates and Steve Ballmer to talk about Microsoft products, and home computers. IBM asks Bill Gates to write the operating system for their coming PC.
- IBM's Project Chess task force contacts Digital Research about using CP/M-86 for IBM's upcoming microcomputer. Gary Kildall is not interested, for a variety of reasons.
- IBM meets with Microsoft again, and shows plans for Project Chess, a personal computer. The code name for the computer is "Acorn". Bill Gates argues that IBM should use the 16-bit 8086, rather than the 8-bit 8080 processor.
- QDOS 0.10 (Quick and Dirty Operating System) is shipped by Seattle Computer Products. Even though it had been created in only two man-months, the DOS worked surprisingly well. A week later, the EDLIN line editor was created. EDLIN was supposed to last only six months, before being replaced.

# 1980

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- Apple Computer sells over 78,000 Apple II computers during the fiscal year.
- Microsoft announces the Microsoft XENIX OS, a portable and commercial version of the UNIX operating system for the Intel 8086, Zilog Z8000, Motorola M68000, and Digital Equipment PDP-11.
- Microsoft decides to propose to IBM that they provide the operating system for IBM's microcomputer.
- William Lowe assembles the members of "Project Chess", known as the "Dirty Dozen", the 12 engineers assembled to design and build the IBM PC, in Boca Raton, Florida.
- IBM meets with Microsoft again, to formalize plans to work together in creating a new microcomputer.



Microsoft's Paul Allen contacts Seattle Computer Products' Tim Patterson, asking for the rights to sell SCP's DOS to an unnamed client (IBM). Microsoft pays less than US\$100,000 for the right.

- Bill Gates, Paul Allen, and Steve Ballmer meet with IBM in Boca Raton, Florida, to deliver a report to IBM. They propose that Microsoft be put in charge of the entire software development process for IBM's new microcomputer, including converting Seattle Computer Products' SCP-DOS to run on the computer.
- **Microsoft and IBM sign a contract for Microsoft** to develop certain software products for IBM's microcomputer.
- IBM delivers the first PC prototype to Microsoft, so they can begin developing BASIC and the machine's operating system.
- Apple Computer becomes a publicly held company, selling 4.6 million shares at US\$22 per share. More than 40 Apple employees and investors become instant millionaires.

## 1981: big portable

- **Adam Osborne** completed the first portable computer, the Osborne I, which weighed 24 pounds and cost \$1,795. Used Z80 (NOT IBM-PC clone (yet)!)



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- **Adam Osborne** completed the first portable computer, the Osborne I, which weighed 24 pounds and cost \$1,795. Used Z80 (NOT IBM-PC clone (yet)!)



## 1981: Apollo Computer

- **Apollo Computer unveiled the first workstation, its DN100, offering more power than some minicomputers at a fraction of the price. Used a Motorola 68000 microprocessor.**



## 1981: Silicon Graphics

- College professor James Clark found **Silicon Graphics**, Incorporated. The 1000 and 1200 computers used a Motorola 68000 microprocessor with 8 Mhz and were sold as diskless systems intended for use as a terminal.



## 1981: IBM PC

- IBM announces the **IBM 5150 PC Personal Computer**, in New York. The PC features a 4.77-MHz Intel 8088 CPU, 64KB RAM, 40KB ROM, one 5.25-inch floppy drive (160KB capacity), and PC-DOS 1.0 (Microsoft's MS-DOS), for about US\$3000. Also included is Microsoft BASIC, VisiCalc, UCSD Pascal, CP/M-86, and Easywriter 1.0. A fully loaded version with color graphics costs US\$6000.
- IBM announces the **CGA** graphics card for the PC, giving 640x200 resolution with 16 colors.



## 1981: Microsoft as a main IBM PC software provider

- The **MS-DOS**, or Microsoft Disk Operating System, the basic software for the newly released IBM PC, established a long partnership between IBM and Microsoft, which Bill Gates and Paul Allen had founded only six years earlier
- Microsoft buys all rights to DOS from **Seattle Computer Products**, and the name MS-DOS is adopted.



- **Novell Data Systems ships the Novell Data Management Computer**, with the ability to share its hard drive space with other computers through software control and network cards.
- **Ashton-Tate ships dBase II**, the early industry-standard database program.
- **Intel ships the 8087 math coprocessor.** [446.504]
- **National Semiconductor announces the 32000 chip, the first commercial 32-bit microprocessor.** The 32000 family includes CPUs and peripheral chips.



## 1981: Apple marketing ideas, logos etc

- **Apple Computer** signs a secret agreement with Apple Corps Limited (the record company started by the **Beatles**), allowing Apple Computer to use the "Apple" name for its business. Apple Computer agrees not to market audio/video products with recording or playback capabilities.



# 1982: Sinclair & PSION & Symbian

- The ZX Spectrum is an 8-bit personal home computer released in the United Kingdom in 1982 by Sinclair Research Ltd.
- The Spectrum is based on a Zilog Z80A CPU running at 3.5 MHz.
- The original model Spectrum has 16 KB of ROM and either 16 KB or 48 KB of RAM
- Units sold altogether: 5 million
- Discontinued: 1992
- **Psion** was established in 1980 as a **software house** with a close relationship with Sinclair Research. The company developed games and other software for the ZX81 and ZX Spectrum home computers.
- Psion later developed an operating system **EPOC**, which resulted in the eventual formation of **Symbian Ltd.**
- Symbian was the main **operating system of mobile phones** prior iOS and Android.
- Clive Sinclair was influential in creating **Acorn Archimedes** ,which led to **ARM**



# 1982: SUN Microsystems

- **Sun Microsystems** is founded. "SUN" originally stood for Stanford University Network. Motto "**Network is the computer**".
- Four employees. Khosla, McNealy, Joy, Bechtolsheim.
- First workstation introduced. It includes TCP/IP, now known as the Internet protocol suite (**NOT invented by Sun**)



- The **SUN-2** features a Motorola 68010 processor and uses a Multibus. This one has 4MB of memory installed and a 400MB Fujitsu M2351 Eagle disk.
- The SUN-2 can be used diskless when booted from a server. In 1982 the **Network File System (NFS)** was a new invention by Sun.

- **Microsoft signs an agreement with Apple Computer**, for Microsoft to develop applications for the Macintosh.
- IBM splits its Personal Computer development team into three groups: one to work on the **PC XT**, one to develop the **PCjr**, and one to start work on the **PC AT**.
- **Compaq Computer Corporation** is founded by Rod Canion, Jim Harris, and Bill Murto, all former senior managers of Texas Instruments.
- Intel introduces the 6-MHz **80286** microprocessor. It uses a 16-bit data bus, 134,000 transistors (1.5 microns), and offers protected mode operation. Initial price is US\$360 each, in quantities of 100. It can access 16 MB of memory, or 1 GB of virtual memory. Speed is 0.9 MIPS. Later versions operate at 8-MHz, 10-MHz (1.5 MIPS), and 12-MHz (2.66 MIPS).

## 1983: Oracle corporation: SQL databases etc

- 1974-1979: **IBM System/R project gives SQL language** for database manipulation and queries. **SQL invented by IBM.** Ideas: **70-72 Codd.**
- **1977** Relational Software Inc. (RSI - currently Oracle Corporation) established: **Ellison and Miner.**
- 1978 Oracle V1 ran on **PDP-11** under RSX, 128 KB max memory. Written in assembly language. Implementation separated Oracle code and user code. Oracle V1 was never officially released.
- 1980 Oracle V2 released on DEC PDP-11 machine. Still written in PDP-11 assembly language, but now ran under Vax/VMS.
- 1982 Oracle V3 released, Oracle became the first DBMS to run on mainframes, minicomputers, and PC's. Code was written in C.
- **1983 Relational Software Inc. changed its name to Oracle Corporation.**



# 1983: other important software

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## Big machines:

- AT&T announces **UNIX System V**.
- AT&T Bell Labs designs **C++**.

## Small machines:

- Lotus Development ships **Lotus 1-2-3** Release 1.0 for MS-DOS. Functions: **spreadsheet+database+graphics**. US\$1 million was spent on promoting the release. It requires 256KB of RAM, more than any microcomputer program at the time. Jonathan Sachs was the programmer, with Mitch Kapor as the software designer.
- Borland International is founded by Philippe Kahn. Borland International releases **Turbo Pascal** for CP/M and 8086-based computers.

# 1983

- The one millionth Apple II is made.
- Microsoft, SpectraVideo, and 14 Japanese computer companies announce the MSX specifications for low-end, 8-bit home computers systems. The standard is Zilog Z80, TI TMS9918A video processor, General Instruments AY-8910 sound processor, NEC cassette interface chip, Atari joystick interface, 64 KB RAM, Microsoft's 32 KB ROM-based extended BASIC.
- AT&T Bell Labs designs C++.
- Steve Wozniak returns to Apple Computer.



# 1983

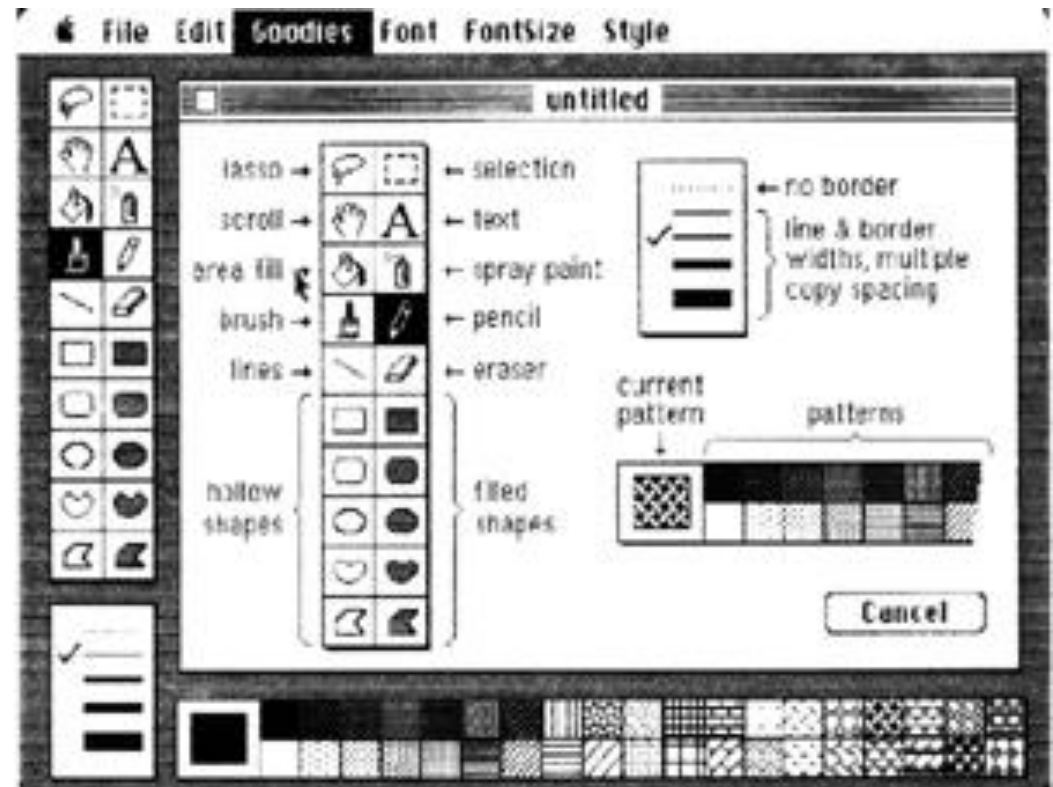
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# 1984: Apple Macintosh

- Apple Computer's Steve Jobs introduces the **Apple Macintosh** at the Flint Center of DeAnza College in Cupertino, California. The Macintosh uses the 8-MHz 32-bit Motorola 68000 CPU, built-in 9-inch B/W screen, 512x342 graphics, 400KB 3.5-inch floppy disk drive, mouse, 128KB RAM, and weighs 20 pounds. Price: US\$2500.



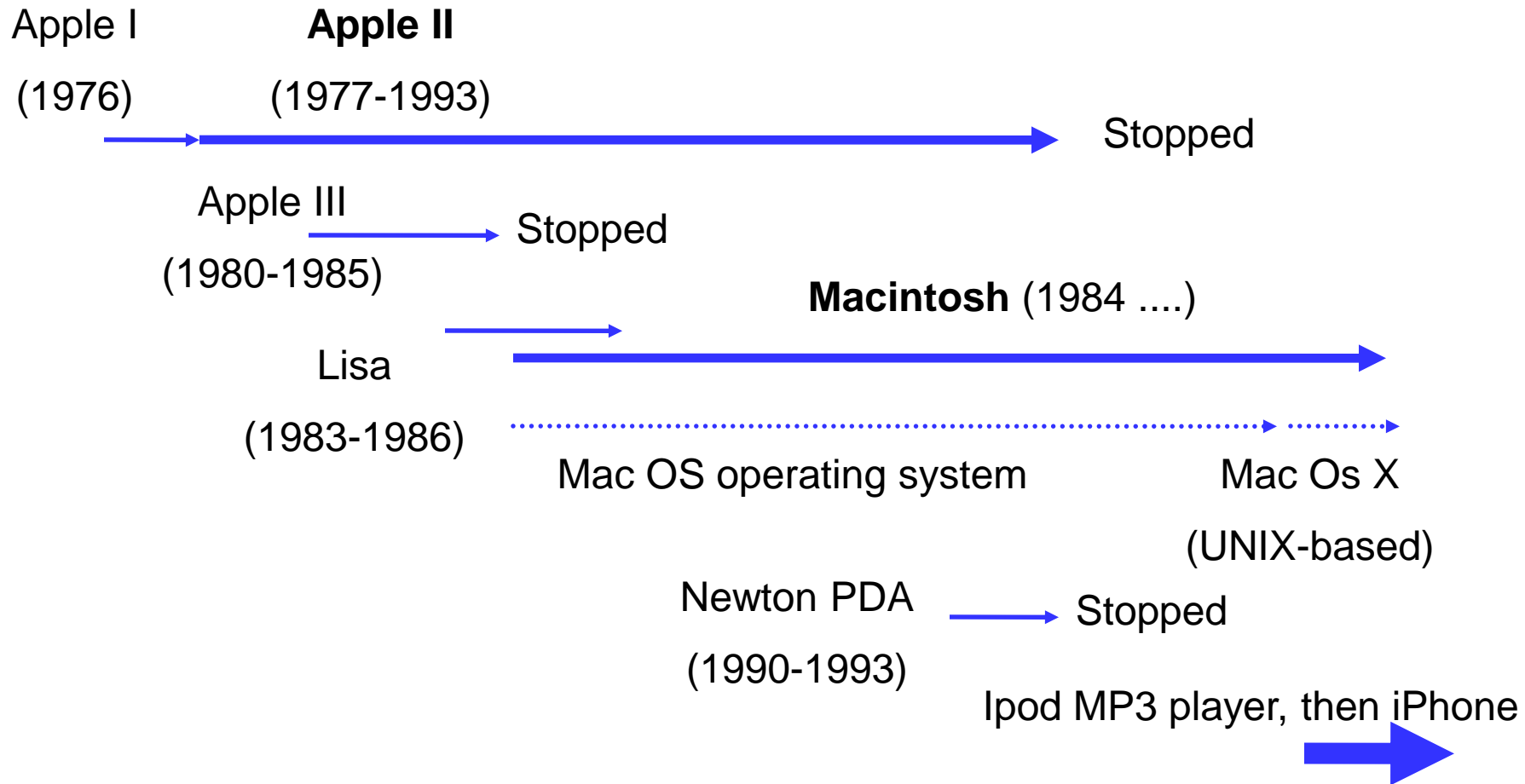
# 1984: Apple Macintosh

- Apple Computer launched the Macintosh, the first successful mouse-driven computer with a graphic user interface, with **a single \$1.5 million commercial during the 1984 Super Bowl.**
- ” ..... On January 24th, Apple Computer will introduce Macintosh. And you will see why 1984 won't be like "1984."



# Apple product lines: overview

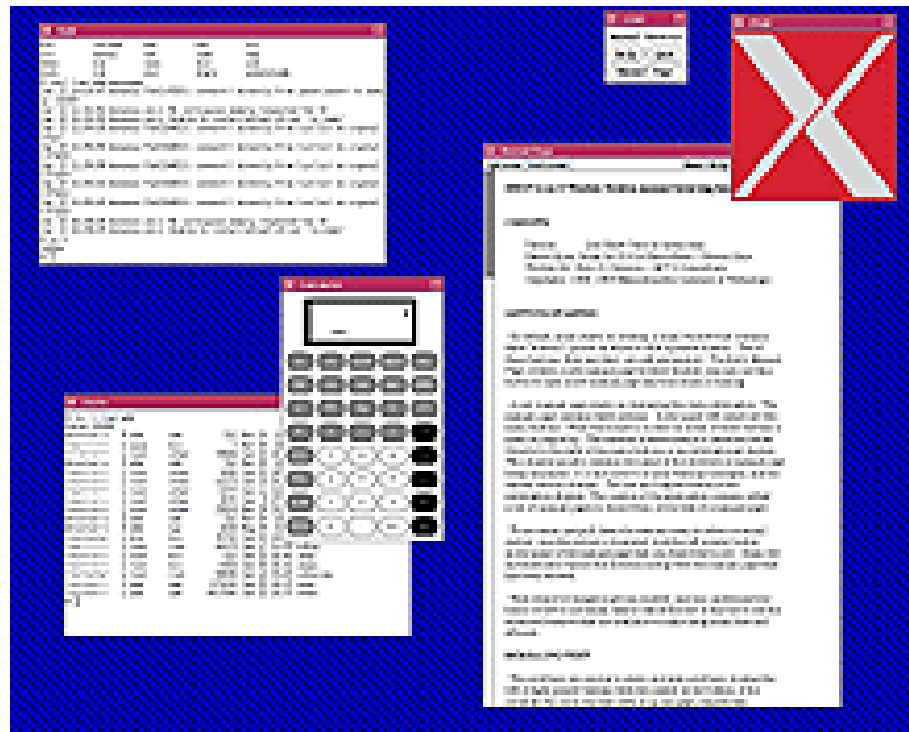
- Two main lines: **Apple II** and **Macintosh**
- Develop **BOTH hardware and software** (operating system and other important modules used by all external programmers)



- **Richard Stallman launches the GNU Project**, to develop the **free operating system GNU** (anacronym for ``GNU's Not Unix''), and thereby give computer users the freedom that most of them have lost. GNU is free software: everyone is free to copy it and redistribute it, as well as to make changes either large or small.



- The Massachusetts Institute of Technology (MIT) begins developing the **X Window System**. X is the basic window system for almost all UNIX machines nowadays.



## 1985: Main highlights

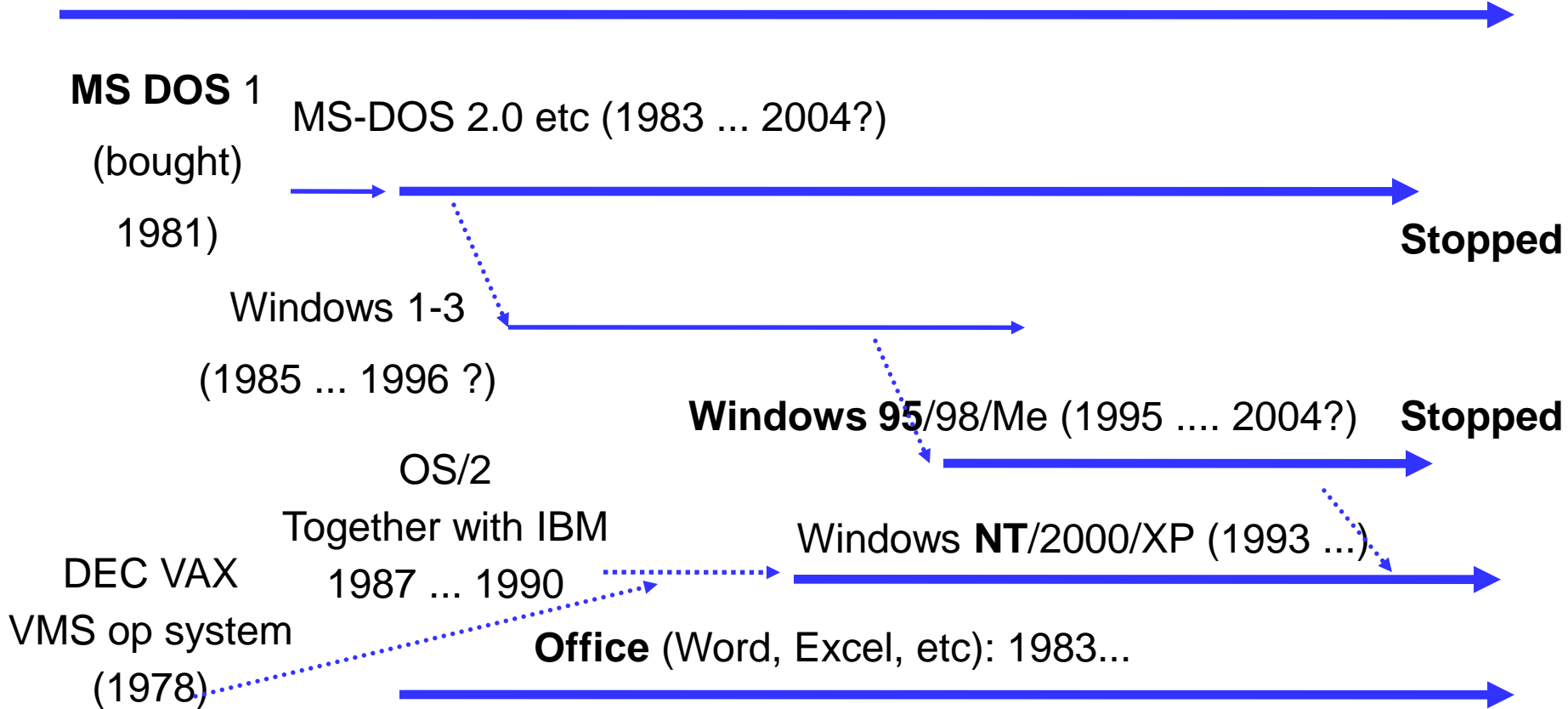
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- **The modern Internet gained support** when the National Science foundation formed the NSFNET, linking five supercomputer centers at Princeton University, Pittsburgh, University of California at San Diego, University of Illinois at Urbana-Champaign, and Cornell University.
- Able to hold 550 megabytes of prerecorded data, the new **CD-ROMs grew out of regular CDs** on which music is recorded.
- The **C++** programming language emerged as the dominant object-oriented language in the computer industry when Bjarne Stroustrup published "The C++ Programming Language."
- **Free GNU Emacs 15.34** released by Richard Stallman

# Microsoft main product lines: overview

- Main lines: **progr languages, MS-DOS, Windows, NT/2000/XP, Office**
- Develop **software** (hardware: mouse, Xbox, etc are much less important) for **IBM PC clones** and (Office, Basic) for **Apple**

**Basic**, (Fortran), (Cobol), **C**, C++, C# etc interpreters and compilers: 1975 ...



- Motorola unveiled the **68030 microprocessor**.
- Sun unveiled the **Sparc** microprocessor, based on RISC ideas.
- IBM introduced its **PS/2 machines**, which made the **3 1/2-inch floppy** disk drive and video graphics array (**VGA**) standard for IBM computers.
- Apple engineer William Atkinson designed **HyperCard**, a software tool that simplifies development of in-house applications. HyperCard was one of the inspirations for the web browser, which came in 1990.



# 1987 Acorn Archimedes

- The Acorn Archimedes designed and sold in Britain was Acorn Computers' first general purpose home computer to be based on their own ARM architecture
- Using a RISC design with a 32-bit CPU (26-bit addressing), at its launch in June 1987, the Archimedes was stated as running at 4 MIPS, with a claim of 18 MIPS during tests.
- The Archimedes was **one of the most powerful home computers** available during the late 1980s and early 1990s;
- Nowadays **ARM Holdings plc (ARM)** is a British multinational semiconductor and software design company with its head office in Cambridge, England. Its largest business is designing processors (CPU) bearing the ARM name.
- ARM is used by most mobile phones: it is the most produced architecture in the world by processor count.



## Side note: CISC vs RISC processor architectures

- **CISC**: complex instruction set computer (Intel, motorola 68000 series, ..)  
A large number of instructions, most are relatively slow
- **RISC**: reduced instruction set computer (ARM, PowerPC, Sparc, ....)  
A small number of instructions, all are very fast
- In practice, CISC and RISC ideas converge in newer processors

# 1987: GCC, the main C compiler on UNIX

- **GCC** version 1.0 released by [Free Software Foundation](#) founder [Richard Stallman](#).
- GCC once stood for **GNU C Compiler**, since it was used to compile programs written in the C programming language for Stallman's "[GNU's Not Unix](#)" (GNU) effort to create a clone of Unix. Now, though, because GCC accepts programs written in many other languages as well, GCC stands for **GNU Compiler Collection**.
- GCC is the main compiler used on all kinds of UNIX-es, and several ports of GCC (cygwin, djgpp) are highly popular on MS Windows as well
- Ported to a very large number of processors
- Compiles: C, C++, Objective C, Fortran, Java, Ada, (Pascal)

- Apple cofounder Steve Jobs, who left Apple to form his own company, unveiled the **NeXT** workstation.
- Compaq and other PC-clone makers developed enhanced industry standard architecture -- better than microchannel and retained compatibility with existing machine (**ISA**).
- **Pixar's "Tin Toy"** became the first computer-animated film to win an Academy Award, taking the Oscar for best animated short film. Pixar was founded by Jobs.
- **Robert Morris' worm flooded the ARPANET.** Then-23-year-old Morris, the son of a computer security expert for the National Security Agency, sent a nondestructive worm through the Internet, causing problems for about 6,000 of the 60,000 hosts linked to the network.

- Intel released the **80486** microprocessor and the **i860** RISC/coprocessor chip, each of which contained more than 1 million transistors.
- Motorola announced the **68040** microprocessor, with about 1.2 million transistors.
- Maxis released **SimCity**, a sophisticated video game that helped launch a new genre, the simulation.
- **AOL** (America Online) network service launched for Macintosh and Apple II (MS Windows version appears in 1993). The company - Quantum Computer Services – was created in 1985, by Steve Case, initially running internet services (games, email, chat, news) for the Commodore 64 machines using dial-up.  
AOL provided access to the Internet, and, in addition, offered access to its own online information and services tailored to average Americans.  
**NB!** In the initial years of AOL there was no WWW or HTML.