

A Brief History Of Computing

1B

Electronic Computing
(1940s to the present)



ENIAC

Electronic Numerical Integrator and Computer

- Collaboration between Moore School of Electrical Engineering at the University of Pennsylvania and the Ballistic Research Laboratory in Aberdeen, MD
- Designed by John W. Mauchley and J. Presper Eckert
- In 1943, the Ordnance Dept. signs a contract for UPenn to develop an electronic computer to solve differential equations for ballistic trajectories
- Constructed completed in the fall of 1945 after WWII ends, and dedicated in February 1946.



from www.computer.org

ENIAC

Electronic Numerical Integrator and Computer



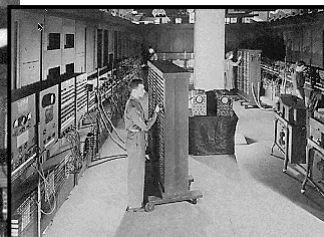
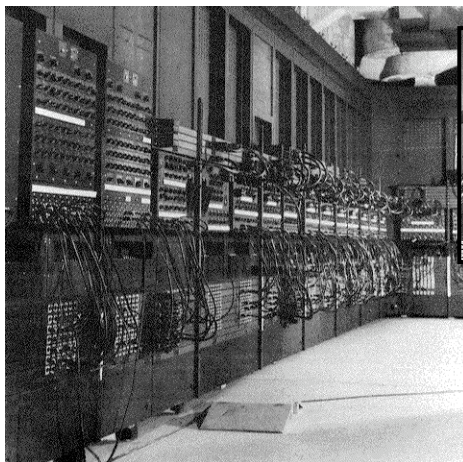
- Filled an entire room
 - 42 panels, each 9' X 2' X 1', three on wheels
 - organized in a U shaped around the perimeter of a room with forced air cooling
- Weighed 30 tons
- Reportedly consumed 150-200 kW of power
- Contained a huge amount of parts:
 - approx. 19,000 vacuum tubes and 1,500 relays
 - over 100,000 resistors, capacitors and inductors
- Input and output via an IBM card reader and card punch

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ENIAC

Electronic Numerical Integrator and Computer



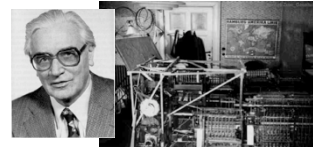
(Virginia Tech –
History of Computing)

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The first electronic computer?

- Patent filed for ENIAC in 1947 as first electronic computer
- In 1973, patent is ruled invalid
 - The inventor of the first electronic computer is John Atanasoff for the Atanasoff-Berry Computer
 - Outside of the U.S., Konrad Zuse of Germany is considered the inventor of the modern-day computer
 - Also designed the first programming language, Plankalkül (Plan Calculus) in 1945



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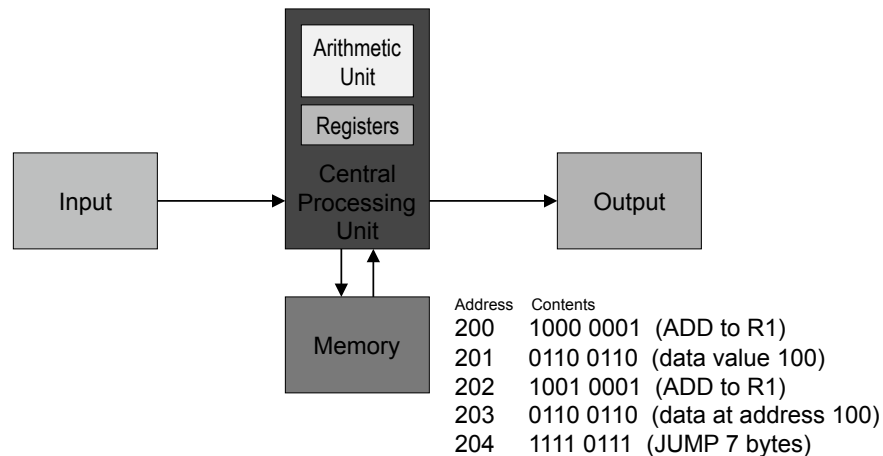
Stored Program Concept

- Stored-program concept is the fundamental principle of the ENIAC's successor, the EDVAC (Electronic Discrete Variable Automatic Computer)
- Instructions were stored in memory sequentially with their data
- Instructions were executed sequentially except where a conditional instruction would cause a jump to an instruction someplace other than the next instruction.

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Stored Program Concept



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Stored Program Concept

- Mauchly and Eckert are generally credited with the idea of the stored-program
- BUT: John von Neumann publishes a draft report that describes the concept and earns the recognition as the inventor of the concept
 - “von Neumann architecture”
 - *A First Draft of a Report of the EDVAC* published in 1945
 - <http://www.wps.com/projects/EDVAC/>



von Neumann,
Member of the Navy
Bureau of Ordnance
1941-1955

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The Integrated Circuit



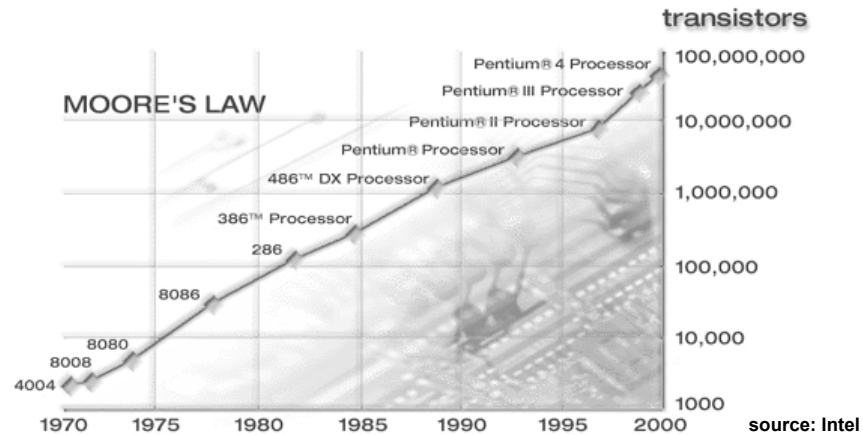
- Robert Noyce and Jack Kilby are credited with the invention of the integrated circuit (IC) or microchip.
 - Kilby wins Nobel Prize in Physics in 2000.
 - Robert Noyce co-founded Intel in 1968.
- By the mid 1970s, ICs contained tens of thousands of transistors per chip.
 - In 1970, Intel created the 1103--the first generally available DRAM chip.
 - Today, you would need more than 65,000 of them to put 8 MB of memory into a PC.

Moore's Law



- Gordon Moore co-founded Intel Corporation in 1968.
- Famous for his prediction on the growth of the semiconductor industry: Moore's Law
 - `ftp://download.intel.com/research/silicon/moorespaper.pdf`
 - An empirical observation stating in effect that the complexity of integrated circuits doubles every 18 months. ("complexity" generally means number of transistors on a chip)

Moore's Law



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UNIVAC and the First Compiled Programming Language



- UNIVAC I
 - Built by Remington Rand to compute 1950 U.S. census but completed in 1951
 - Used to predict the winner of the 1952 U.S. Presidential Election based on ~3.4M votes
- A-0 is a programming language for the UNIVAC I or II, using three-address code instructions for solving mathematical problems.
 - Example: ADD R1, R2, R3
(Add the contents of R2 and R3 and put result in R1.)
- A-0 was the first language for which a compiler was developed, produced by a team led by Admiral Grace Hopper.

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UNIVAC



UNIVAC I, from
IEEE Computer Society



J. Presper Eckert and Walter Cronkite
next to the UNIVAC in 1952
(Center for the Study of Technology and Society)



Adm. Grace Hopper
(from San Diego Supercomputing Center
WOMEN IN SCIENCE)

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The GUI

Graphical User Interface



- Concept born at SRI in the early 1960s
- Major development at Xerox PARC in late 70s
- Apple Macintosh, founded by Steve Jobs and his friend Steve Wozniak, introduced in 1984 with full GUI operating system
- Microsoft is founded by Bill Gates and Paul G. Allen with sales of Microsoft BASIC
 - develops its own window-based operating system soon afterwards based on Apple's design... many lawsuits follow
- Even IBM jumps into the fray with OS/2



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Microsoft Windows 1.0

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- The mouse was invented by Douglas Engelbart of Stanford Research Institute in 1963 after extensive usability testing.
- He received a patent in Nov. 1970 for the "X-Y Position Indicator For A Display System".
- He was the recipient of the 1997 ACM Turing Award. (<http://www.acm.org/awards/taward.html>)
- Ethernet was originally developed as one of the many pioneering projects at Xerox PARC.
- Invented between 1973-1976 by Robert Metcalfe and David Boggs



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Seeds of the Internet

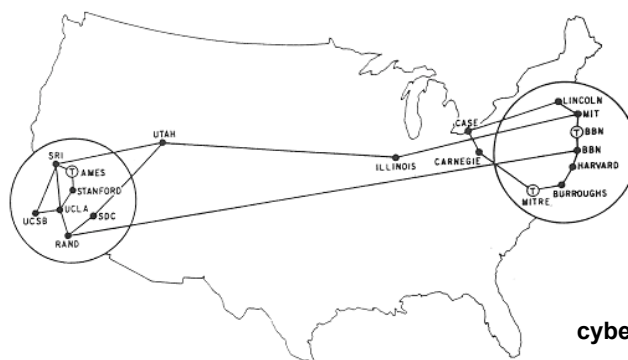


- In 1960, J.C.R. Licklider wrote his famous paper *Man-Computer Symbiosis*, which outlined the need for simpler interaction between computers and computer users.
 - <http://memex.org/licklider.pdf>
- The earliest ideas of a global computer network were formulated by Licklider at MIT in 1962 in a series of memos discussing the "Galactic Network" concept.
- The Advanced Research Projects Agency Network (ARPANET) of the U.S. DoD was the world's first operational packet switching network.
 - Much of the work in computer development in the 1960s was spurred by the Space Race and the Cold War.

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ARPANET



cybergeography.org

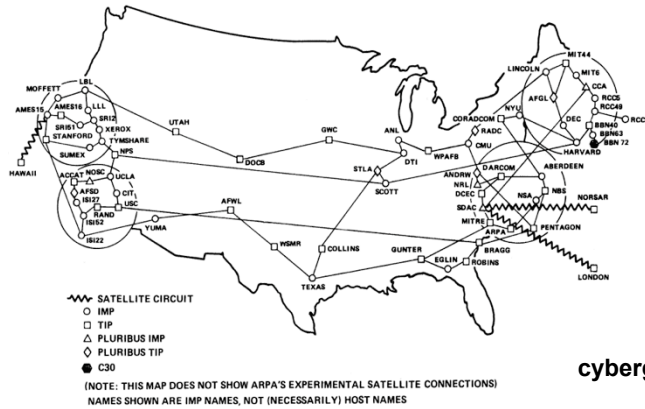
MAP 4 September 1971

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ARPANET

ARPANET GEOGRAPHIC MAP, OCTOBER 1980



By the late 1980s, the DOD transferred operation of the network to NSF, and what is known as the "Internet" emerges.

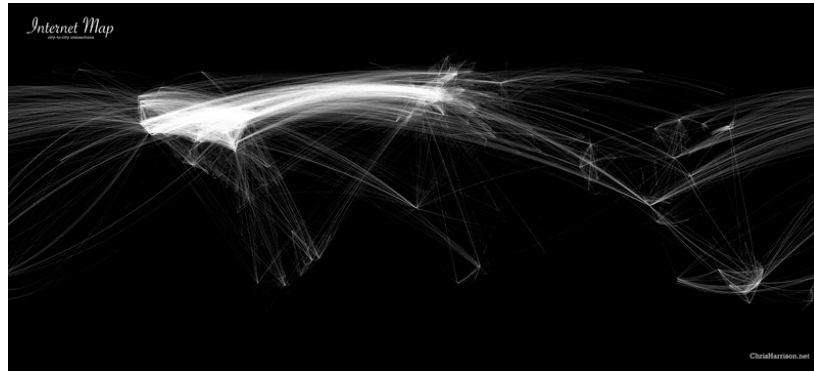
cybergeography.org

Global Internet



chrisharrison.net

Global Internet



chrisharrison.net

Global Internet



“While the United States carried 70 percent of the world’s Internet traffic a decade ago, he estimates that portion has fallen to about 25 percent.”

-New York Times, Aug 29, 2008

“Less than 4 percent of Africa’s population is connected to the Web; most subscribers are in North African countries and the republic of South Africa.”

-New York Times, Jul 22, 2007

Really?



- In 1981, Bill Gates is quoted as saying that how much computer memory “ought to be enough for anyone”?

