The Recent History of Computers & Technologies

You will learn about the developments in computing and other related technologies that were made from the 1970s onward.

James Tam

Computers Before The Microprocessor

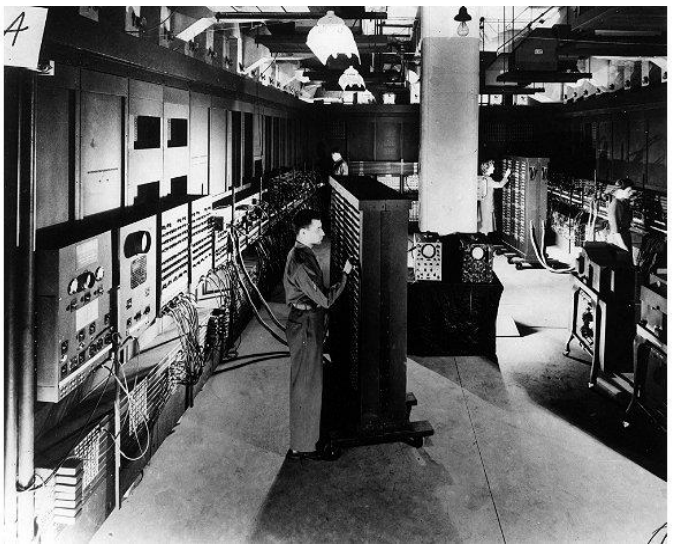

Image © University of Pennsylvania

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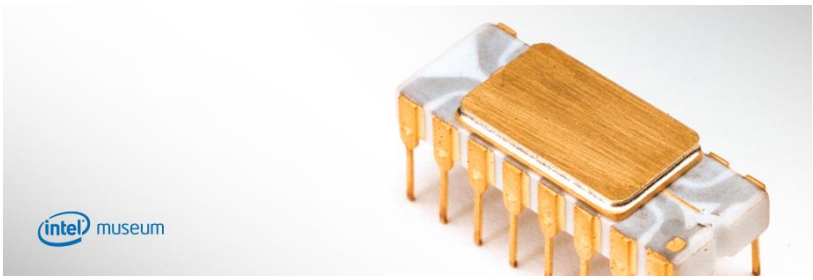
The First Microprocessor: 4004

- Produced by Intel in the early 1970s
- It's development revolutionized computers by allowing computers to be more widely used.
- Clock speed: 108 kHz[1]



From the "Intel museum" www.intel.com

1 http://www.intel.com/pressroom/kits/quickreffam.htm

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What Is Microcomputer?

- A computer that uses a microprocessor as it's main processor.
- Sometimes it's referred to as a 'PC' (Personal Computer).
  - Designed for use by only one person at a time.
  - Unfortunately this term has taken on multiple meanings.
    - PC = IBM PC (a model produced by IBM)
    - PC = A computer running a Microsoft operating system.
- Consequently the less ambiguous term 'microcomputer' will be used.

Image courtesy of James Tam

The First Popular Computer For Home Users: The Altair

Images © Mark Richards from www.computerhistory.org

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Note: Most Computer Users At The Time Were Extremely Technically-Oriented

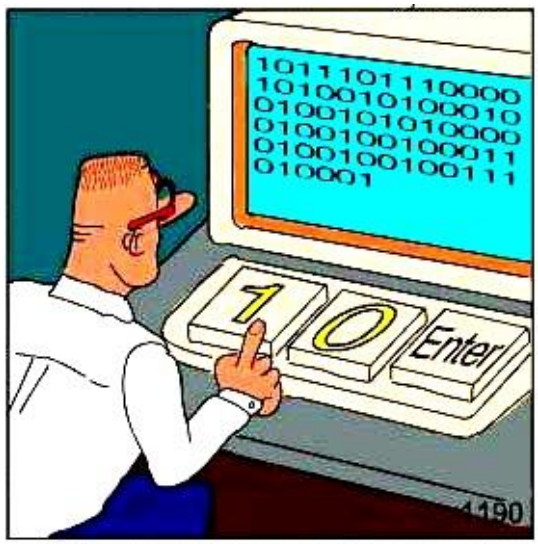
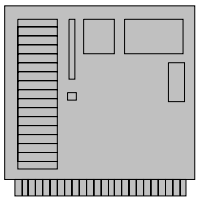


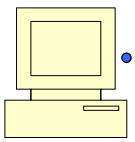
Image by Chris Kania
http://www.kaniamania.com/

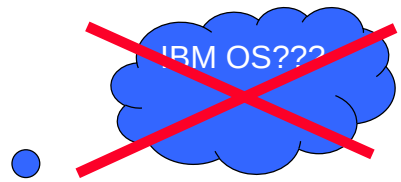
REAL Programmers code in BINARY.

ames Tam

Microsoft's Influence On Microcomputers[1]







1 https://www.forbes.com/sites/timbajarin/2021/08/25/attack-of-the-clones-how-ibm-lost-control-of-the-pc-market/?sh=1e6da2dd5b81

Clipart: Microsoft

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Microsoft's Influence On Microcomputers (2)

- IBM approached two companies as possible vendors of an operating system to run it's computers:
  - Digital Research
  - Microsoft (never wrote operating system software just a BASIC interpreter).
  - Microsoft: 7 million in annual sales
  - IBM: 30 billion in yearly revenues.
- IBM and Microsoft worked out an arrangement to have a version of Microsoft's DOS (*D*isk *O*perating *S*ystem) run IBM computers: PC-DOS.
- MS-DOS was based on 86-DOS an OS written by Tim Paterson of Seattle Computer products (later Q-DOS).
- With the arrangement with IBM Microsoft could (and eventually did) license its operating system to other computer manufacturers.

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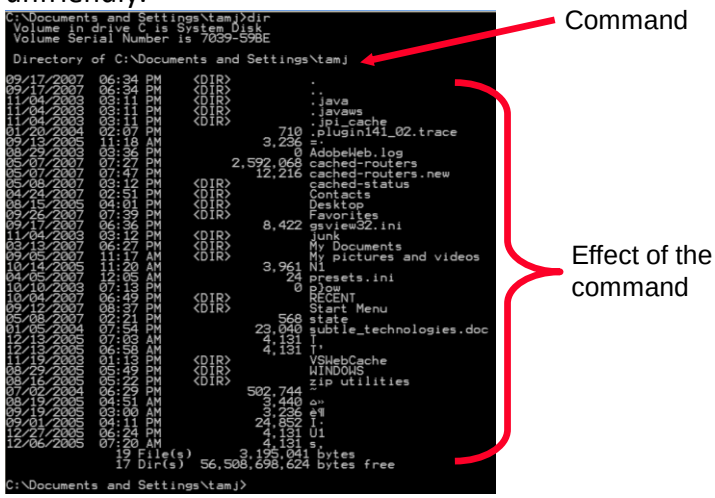
Microsoft's Influence On Microcomputers (3)

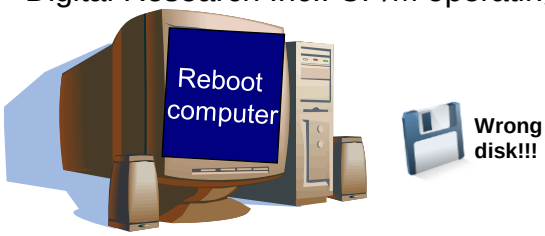
- The interface of PC/MS-DOS has been criticized as being user-unfriendly.



Microsoft's Influence On Microcomputers (4)

- However the interface of PC/MS-DOS was a significant improvement over other operating systems of the day.

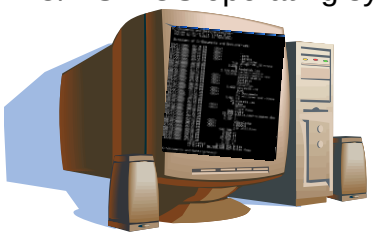
Digital Research Inc.: CP/M operating system



Microsoft's Influence On Microcomputers (4)

- However the interface of PC/MS-DOS was a significant improvement over other operating systems.

PC/MS-DOS operating system



Wrong disk!!!

Correct disk

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The IBM PC (Personal Computer: 1981)

www.computerhistory.org

- IBM was a large company but a late comer into the microcomputer market.
- As mentioned the IBM PC used an operating system produced by Microsoft.

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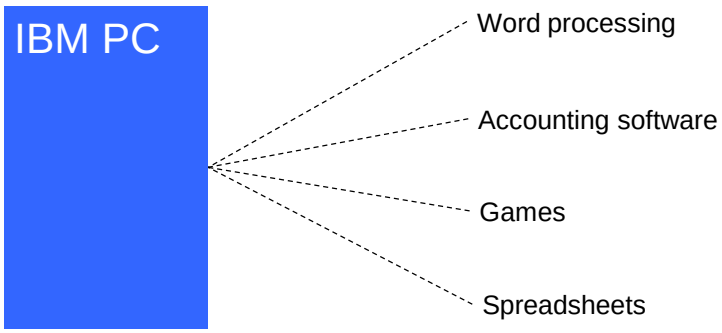
The IBM PC (Personal Computer: 1981): 2

- With the entry of IBM in the microcomputer market, many developers produced a plethora of software.



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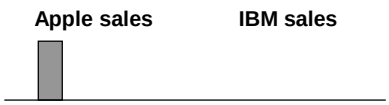
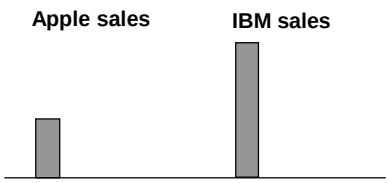
The IBM PC (Personal Computer: 1981): 3

- Apple entered the microcomputer market sooner and already had an established market when IBM began to first market the PC.



- Because of the prevalence of so much software the IBM-PC soon overtook the Apple in sales.



There were many other important microcomputer manufacturers (omitted for brevity)

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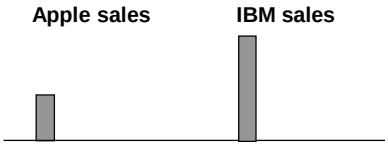
The Attack Of The Clones

- Although it was a late entry into the microcomputer market IBM eventually dominated.



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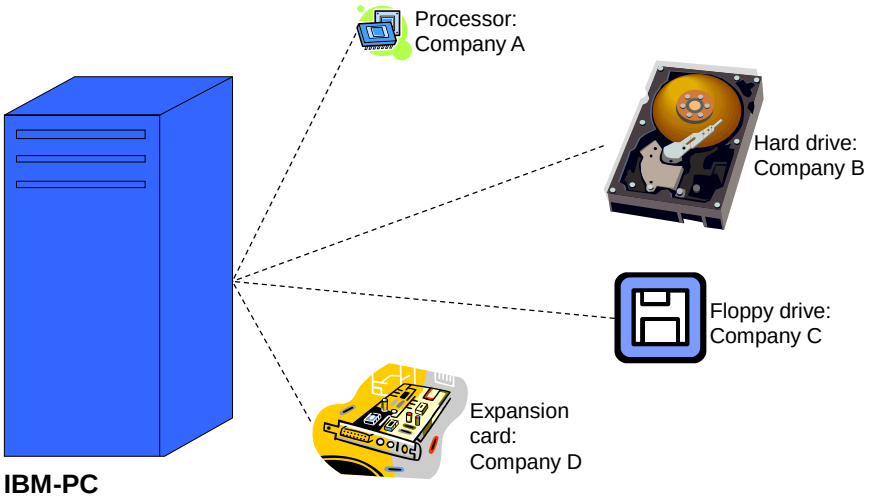
The Attack Of The Clones (2)

- Although the IBM-PC was marketed and sold under the IBM brand most of the parts were not manufactured in-house.



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The Attack Of The Clones (3)

- The parts manufacturers were free to sell their components to other companies.
- Shortly after the IBM-PC was released, three ex-employees of Texas Instruments founded their own company: Compaq.
  - They conceived of the idea of producing their own copy of the IBM-PC under their own brand name.
  - It would run under MS-DOS and be 100% compatible with application software written for the PC.
  - The first IBM-PC clone was delivered by Compaq in 1983.

IBM-PC

Compaq clone

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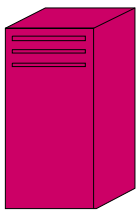
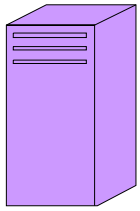
The Attack Of The Clones (4)

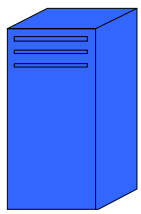
- This opened the flood gates for other computer manufacturers to produce their own clone computers.



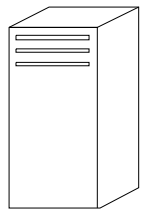
Compaq clone



Dell clone



IBM-PC



Mom and pop shop clone

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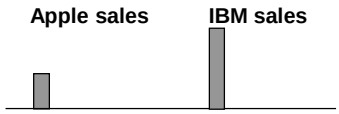
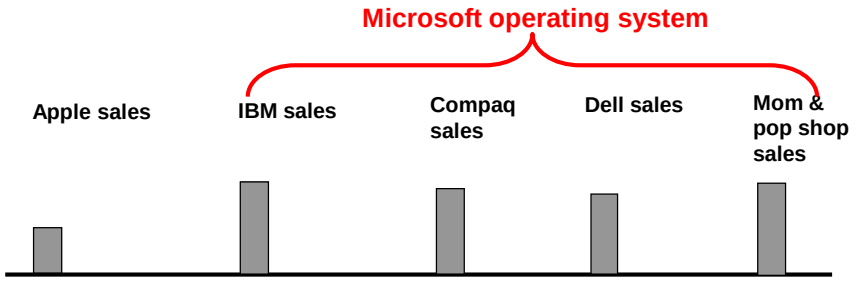
The Attack Of The Clones: Result

- The result was that IBM eventually lost control over the computer architecture that it was the first one to market.





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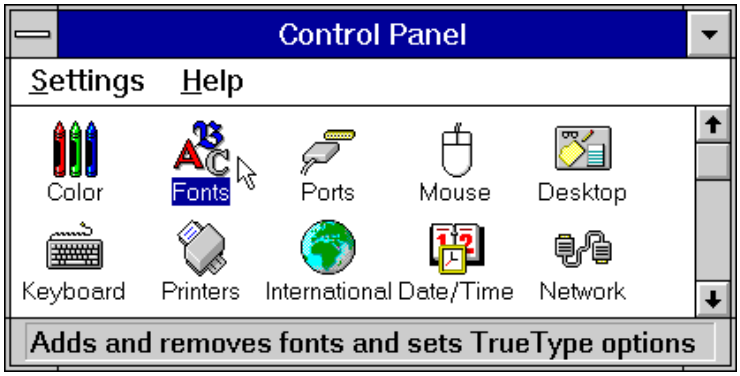
IBM's Attempt To Take Back Their Market

- IBM later developed their own operating system (OS2 for the PS2 computer).
- Even with it's benefits their attempt to standardize the market around OS2 failed.

The Attack Of The Clones: The Rise Of Microsoft

- The loser of the clone war was IBM.
- The real winner of the clone war was Microsoft.
- By the 1990s Microsoft developed an interface for MS-DOS that incorporated some of the features of the MAC GUI.



Windows 3 image from www.microsoft.com

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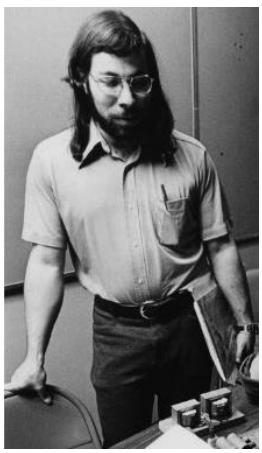
The History Of Apple Computers: Steve And Steve

- Apple was founded by Steven Jobs and Steve Wozniac in Silicon Valley garage.



Steve Wozniac

Steve Jobs

Images © Apple Computer, Inc. from www.computerhistory.org

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The Apple I Computer (1976)

- It was far from the standard of a modern computer

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Apple I To The Apple II

- A local electronic shop owner immediately put in for an order of 50 computers.
- Cash was so tight for 'Apple' that payment for the parts had to made on credit.
- Even then personal sacrifices had to be made.

HP programmable VW van

- Wozniak`s friend: Ronald Wayne helped him assemble the computers in Wozniak`s living room.
- Even this preassembly process the machine still required some assembly by the end customers.

The Apple II Computer (1977)

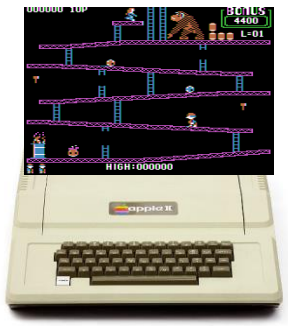
- It was a simpler and more powerful design than the Altair
- The color graphics were superior to larger and more expensive computers
- Strong selling points
  - Name
  - Appearance

Images
Apple II:
www.computerhistory.org

Donkey Kong:
www.donkeykong.gamebub.com

James Tam

The Apple II Computer (1977): 2



- The storage device was primitive by today's standards but actually sufficient to meet the needs of the time
- VisiCalc: "*It was the software tail that wagged the hardware dog*"[1]

Images
Apple II:
www.computerhistory.org

Donkey Kong:
www.donkeykong.gamebub.com

James Tam

1 "*Just for Fun*" (Chapters 2,3) by Torvalds and Diamond

First Graphical Interface

- Contrary to popular belief it was not invented by Apple.
- Xerox star: pioneered the GUI (graphical user interface) in 1981:

Image of Xerox Star screen from Xerox brochure

  - Other GUI-based computers: Apple {Lisa (1983), McIntosh (1984)}, the Commodore Amiga 1000 (1985).
  - Although it was a technical innovation the Star was regarded as a business failure.
  - It was Apple (and others such as Commodore) who successfully mass marketed a GUI-based computer.

Xerox star hardware picture: www.flickr.com/photos/mwichary

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The Apple Lisa (1983)

Image © Mark Richards from www.computerhistory.org

- Unlike other Apple computers which were text-based, this one would employ a GUI.
  - It was inspired by a tour of the Xerox PARC (Palo Alto Research Center) laboratories.
    - It cost $1 million in Apple stock for a 3 day tour of Xerox.
    - It was a failure but laid the ground work for the successful Macintosh.

      The Lisa (1983) incorporated many of the features of the Xerox Star.

      Like the Star it was expensive ($10K) and sales were weak

James Tam

The Apple Macintosh (1984)

Image © Mark Richards from www.computerhistory.org

- Apple's next computer was the Macintosh
- It incorporated the best features of the Lisa but was sold at a substantially lower price ~$2.4K
- Compared to the IBM-PC it was a price/performance vs. ease of use tradeoff

James Tam

Origins Of The Internet

- What was happening in the 1950s

The major powers of the cold War

Image Credit: Microsoft

James Tam

The Cold War And The Space Race

- At the same time that each side (USSR-USA) was trying to be dominant on the ground they also wanted to be dominant in space.
  - Both sides tried to be the first to send a satellite into space.
- In the 1950s it appeared that the USSR had a technological edge:
  - Americans in 1957: A sophisticated three stage rocket was planned as the first human-made vehicle to be spent into space.
  - The USSR in 1957: surprised the world by launching Sputnik I (first artificial satellite).

http://astroprofspage.com

- The launch of Sputnik helped motivate the creation of ARPA (Advanced Research Projects Agency) in the US.

The Cold War And The Space Race (2)

- Later in 1957 the USSR launched another satellite carrying the dog Laika "bark/barker" on a one way trip into space :'(

http://news.bbc.co.uk

The Cold War And The Space Race (3)

- These events shook the US image as a technological super power (who had a technological lead in the Cold War).
  - It was believed that if the Soviets could launch artificial satellites into space they could launch nuclear armed missiles at North America.
  - It was believed that the math and science requirements would have to be revamped in high school (so the Americans could out think their Soviet counterparts).
  - "…for your own sake and for the sake of the nation do your homework." (apparently a quote from the Harvard president James Bryan Conant).[1]
- To close the perceived technological gap president Dwight Eisenhower brought together the best technological minds and ARPA (Advanced Research Projects Agency), an arm of the department of defense, was created.[2]

1 "The Ancient History of the Internet" (Edwin Diamond , Stephen Bates): American Heritage Pct 95: Vol. 46, Issue 6

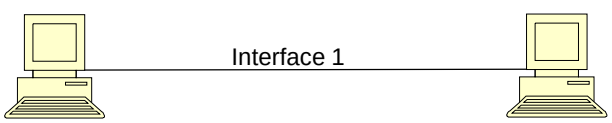
2 "On the Way to the Web" (Michael A. Banks)

ARPA

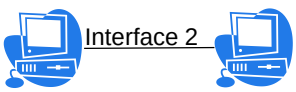
- As mentioned APRA was a branch of the ministry of defense.
- The focus was on:
  - Getting different types of computers communicating
- It funded research at several universities across the US.
- Size and mandate of ARPA:
  - Very small: no physical labs
  - It issued research and development contracts to other organizations.
- 1962: ARPA's (then) director, Jack Ruina (focus on ballistic missile defense, nuclear test detonation) recruited JCR Licklider to work on "command and control, and behavioral sciences"

ARPA (2)

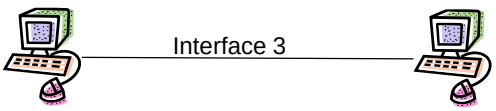
- In the early days of ARPA there 3 separate and incompatible networks to communicate with the 3 different research centers that worked with ARPA.



Project Genie (University of California, Berkley)



System Development group (Santa Monica)



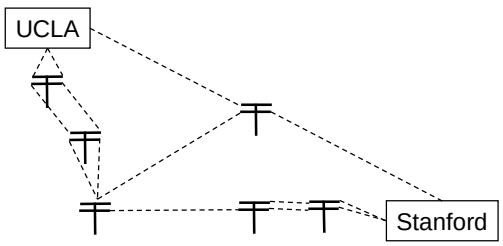
MULTICS project SHOPPING (Massachusetts Institute of Technology (MIT))

Image credits: Microsoft

1 "A History of the Internet and the Digital Future" (Johnny Ryan, Reaktion Books)

ARPANET

- The first computers were connected via ARPANET (Advanced Research Projects Agency Network).
- The initial ARPANET consisted of 2 host computers which were connected at the start of 1969 (birth of the early Internet!) from the following locations:
  - UCLA
  - Stanford
  - A standard protocol was used so the computers could communicate



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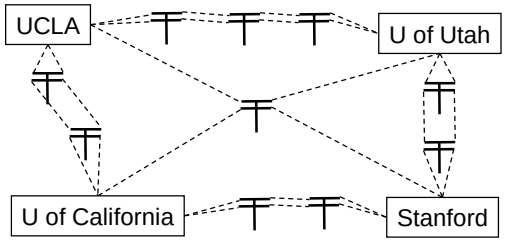
ARPANET (2)

- Later additional hosts were added to the network (end of 1969) from:
  - The University of California (Santa Barbara)
  - The University of Utah



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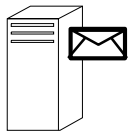
The First Data Sent On The Internet[1]

- Originally the message 'login' was to be transmitted.
- But the connection was lost and the transmission stopped after the first two characters were sent.
  - …and thus 'LO' the Internet was born!

1 "On the Way to the Web" (Michael A. Banks, Wiley)

Important Milestones Of The Internet



- In 1972
  - The first "hot application" was introduced by Ray Tomlinson.
- 1989:
  - The ideas behind the World Wide Web were first described in a paper.
- 1990:
  - The ARPANET was shut down.
  - The first "Internet" search program Archie was developed at McGill university.
  - The first web browser was written.
- 1991:
  - The World Wide Web was released to the public.

James Tam

The History Of The World Wide Web

From www.computerhistory.org (2012)

- Designed in 1989 by Tim Berners-Lee and scientists in Geneva who were interested in making it easier to share research documents.
- Documents could be linked through a protocol called `http` (hyper text transfer protocol).
- Documents were made available for free browsing and downloading from the web (*substantially* easier than the alternative).
- 1990:
  - The first web browser "WorldWideWeb" (later renamed 'Nexus'[1] was written.
- 1993:
  - Mark Andreessen of NCSA (National Center for Super Computing Applications) launched Mosaic X the first popular web browser.

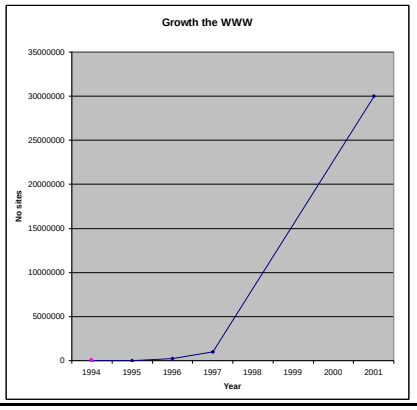
Source http://www.w3.org/People/Berners-Lee/WorldWideWeb.html

James Tam

The History Of The World Wide Web (2)

From www.computerhistory.org

- Prior to the advent of the WWW the Internet was largely used by a niche user group.
- The advent of the WWW drastically changed that.
  - Now some people even equate the World-Wide-Web with the Internet itself!



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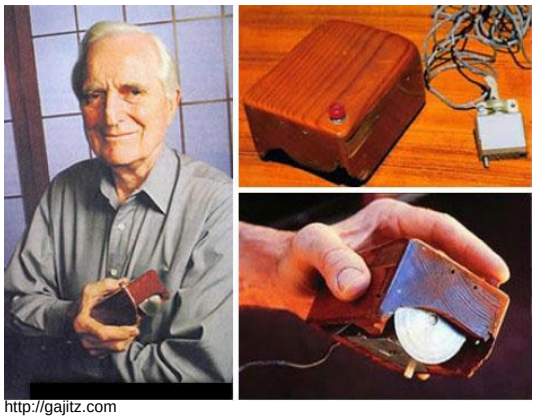
The Mouse

- 1962: ARPA (under JCR Licklider) provided a special fund to realize the vision of a "mechanically enhanced man".
  - It came out of a paper published by Licklider (before he joined ARPA) where he "…forecast a future that will involve a very close coupling between the human and electronic members of the [human-technology] partnership."[1]
- Douglas Engelbart applied for funding.

1 "A History of Modern Computing" (Paul Ceruzzi: MIT Press 2003)

The Mouse (2)

- Engelbart spent his time studying an experimenting with ways to improve communication between people and computers.
- 1967: he described (his most famous) invention, the mouse.



http://gajitz.com

You Should Now Know: History

- How the invention of the microprocessor revolutionized computing
- What was the first computer that was successfully targeted specifically for the home user
- What was the influence of Microsoft on microcomputers
- The history of the IBM-PC
- The foundation of Apple Computers
- The history of some of Apple's early computers: Apple I, Apple II, Lisa, Macintosh
- How IBM lost control over a computer architecture that it developed through the rise of clone computers
- How the rise of clone computers lead to the market dominance of Microsoft in the microcomputer market

James Tam

You Should Now Know: History

- What was the first GUI-driven computer: Xerox Star
- The early history of the Internet
  - When did it first become operational
  - How it works
  - What were some major milestones and when did they occur
  - When was the WWW invented and who was behind its creation
- Computer Mouse
  - Who invented the device
  - When was it invented
  - What was the motivation for its creation