Outline

Information Storage

Codex

- book made up of sheets of paper or parchment, bound on one edge for easy reading
- better than scrolls of papyrus, which were delicate and difficult to read

Gutenberg's printing press (1440)

- streamlined publication and enabled fast, spread distribution of printed work
- paved the way for distribution of subsequent innovative thought and social and political change (e.g. Scientific Revolution; Protestant Reformation)
- improved literacy, provided entertainment (printed music), empowered middle class

Computation

Mechanical Calculator
- ○ Arose out of a need to handle more complex calculations, in a growing money based economy

Pascal's Pascaline (1640)
- ○ Enabled addition of whole numbers up to six digits without human logic

Leibniz's Step Reckoner (1673)
- ○ Enabled addition, subtraction, multiplication and division of numbers up to 16 digits

Networking

Electricity

- ○ Alessandro Volta generated it chemically (using two metals in acid) in 1799 and created the first battery

- ○ Foundation for future scientists to utilize and create tools such as the electromagnet and telegraph

Telegraph

- ○ Demonstrated in 1830 by Joseph Henry by creating a ringing bell using electricity and an electromagnet

- ○ Idea was worked on and patented in 1838 by Samuel Morse, first commercial uses were for purposes such as fire alarm pull stations and transmitting transcontinental messages
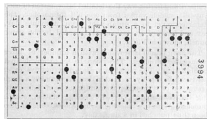
Outline

Computing

- Production of the Arithmometer in 1851
- Scheutz difference engine purchased in 1856
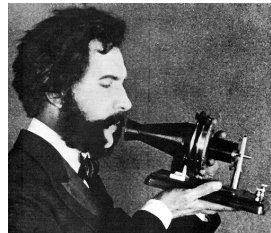- Punched Card Tabulation by Herman Hollerith in 1890 U.S. Census

Burroughs Adding Machine
(Class 1 Style 4)
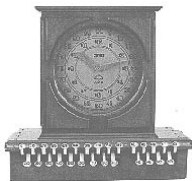Patented 1888-98

Punched Card from 1890

Networking

- Typewriter by Carlos Glidden and Samuel Soule in 1867
- Telephone by Alexander Graham Bell and Thomas A. Watson in 1876
- Radio by Guglielmo Marconi in 1895

Information Storage and Retrieval

- Cash register created by James Ritty in 1878

James Ritty's cash register

The clocklike dial registered the dollars and cents.

Outline

1. -1850

2. 1851-1900

3. 1901-1947

4. 1948-1967

5. 1968-1978

6. 1979-1989

7. 1990-2000

8. 2001-

Computing

ENIAC, 1946

- Precursor to the modern commercial computer.
- Had many features of a modern computer: electronic components, was reprogrammable.
- Military funded for WW2 and used for computation of artillery tables.
- Succeeded by the EDVAC which showed the potential value and feasibility of electronic computation.
- Reprogrammability was done electronically and allowed for other computations.

Networking

Infrastructure

- Connected telephone lines in the United States jumped from 600,000 in 1900 to 5.8 million by 1910.
- First commercial radio station: 1920. First television station: 1936.

Radio System

- Suggested by Sarnoff in 1916 as entertainment.
- Orson Welles' dramatization of *War of the Worlds* caused public panic in 1938.
- Continues to be important part of society today.

Teletype, 1908

- Device used to print messages transmitted over a telegraph line.
- Allowed news organizations to transmit stories between distant offices.
- Wall Street firms began sending records of stock transitions over teletype.

Television, 1939

- Transmitted sound and video over-the-air and via telephone wire connecting Europe and North America.
- Allowed messages to be transmitted around the world.

Remote Computing, 1940

- A teletype machine remotely controlled the Complex Number Calculator with the answer calculated, transmitted back, and printed.
- First form of terminal/server computing.

Information Storage and Retrieval

- The EDVAC (developed in 1944) could store programs in primary memory, but it wasn't completed until 1949.
- Punched cards were the primary medium for data entry, data storage, and processing in institutional computing.

Outline

COMPUTING

- Ferranti Mark I (1951)
- UNIVAC (1951)
  - presidential election
- Programming Languages
  - FORTRAN (1967)
    - precursor to modern languages
    - first compiled high level language
  - BASIC (1964)
    - accessible to wider audience

NETWORKING

- Packet-switched network (1961-67)
  - more stable and efficient system
  - first WAN (1965)
- Pre-cursor to ARPANET
  - began in 1967

INFORMATON STORAGE & RETRIEVAL

- Williams Tube (1948)
    - CRT as a storage device
- Hypertext (1965 – 67)
    - Connections with Memex
    - Creation of Xanadu
- Engelbart (1955 – 68)
    - Began work with human-computer interfacing and using CRT as an output device

Outline

Computing Milestones

- Microprocessor
  - invented in 1971 by Intel
  - Does computation on a semiconductor chip
  - Lead to production of personal computers

- Personal Computers
  - Personal computers start to emerge from late 1960's to late 1970's

- Basic
  - Developed by professors at Dartmouth College (mid to late 1960's)
  - Relatively simple programming language compared to assembly

- Unix
  - A multitasking, multi-user computer developed by a group of employees at AT&T and Bell labs
  - Unix operating system is a command line based OS

Networking

- Email
  - Tomlinson at BBN wrote first software to enable email in 1972
  - A much faster way of communication compared to traditional mail
  - Today one of the most important methods of communication

- Internet
  - Packet switched networks such as ARPANET were developed in late 1960's to early 1970's

Information Storage and Retrieval

- Graphical User Interface
  - Doug Engelbart demonstrated oNLine System that included video display, use of a mouse, emails etc (1968)
  - Alan Kay saw the demo and became a founding member of Xerox Palo Alto Research Center (PARC)
  - Alto was a mini computer created by PARC team (Early1970's)
  - Alto incorporated Developed Bit-mapped display, keyboard, and mouse

- Ethernet
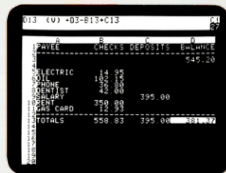 - Xerox PARC team created the Ethernet to link the Altos

Outline

COMPUTING

COMPUTER SPREADSHEETS
1979: VisiCalc for Apple II

PERSONAL COMPUTERS

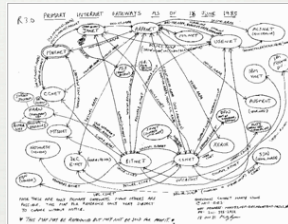| 1979:	1981:	1984:
APPLE LISA	IBM PC	APPLE MACINTOSH

NETWORKING

JAN 1, 1983: ARPANET SWITCHES TO TCP/IP PROTOCOL

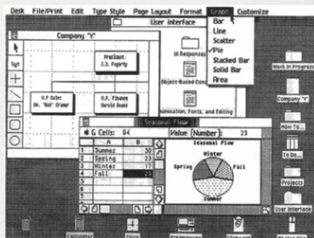NOV 1983: DOMAIN NAME SYSTEM (DNS) INTRODUCED

1985: NSFNET CREATED

INFORMATION STORAGE AND RETRIEVAL

GRAPHICAL USER INTERFACES

1979: APPLE LISA

1984: MacWrite & MacPaint FOR APPLE MACINTOSH

SINGLE COMPUTER HYPERTEXT SYSTEMS

1982: GUIDE

1987: HYPERCARD

Outline

World Wide Web
- Developed December 1990 at CERN by Tim Berners-Lee
- Networked Hypertext
- "links between information stored on different computers"
- URL, HTML, HTTP

Web Browser
- Mosaic: Simple, reliable, easy to install, Windows version
- Napster: Credited for being the first

Search Engines
- Google.com registered in 1997

Programming Languages
- A multitude of important programming languages were developed in the 1990's, a few examples include:
  - Python
  - Java
  - Ruby
- Also includes scripting languages: PHP and JavaScript
- Object oriented programming became widely available

Operating Systems
- Linux was introduced on August 1991
- Windows 95 and then 98 became the standard OS on PCs

Standardisation & Improvement
- Networks moved away from NetBIOS and IPX; standardised around TCP/IP
- HTML conceived by Tim Berners-Lee in 1990, rapidly evolved, became contentious and fragmented through the decade, HTML 4.01 standardised in 1999
- Dialup to broadband

Cell Phones

- The 1990s was the birth of 'second generation' (2G) cell phones
- 2G cell phones used digital transmission rather than analog transmission which was being used before by 1G cell phones
- The switch from 1G to 2G caused a rapid rise in cell phone usage
- Cell phones became more modern and compact vs the large 1G 'brick' phones and gained a larger battery life
- Texting was born in the 90s
- In 1999 the first cell phone with internet service became available in Japan which led to 3G phones in the millenium

Personal Computer

- In 1998, Apple released iMac, which is an all-in-one monitor with speakers, modem, Ethernet, CD-ROM, USB ports
- In 1998, eMachines created two personal computers for sale at low cost
- In 1999, Apple released PowerMac G4 with up to 500MHz processor, up to 256 MB memory, up to 128 GB hard drive, speakers, Ethernet and modem
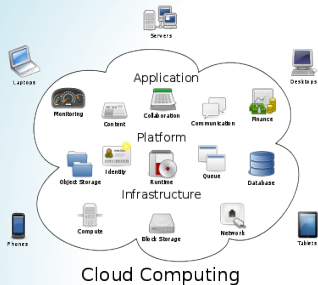
Outline

* 2001-present: From Big to Small

- Big to Small

- New GUI for smaller and smaller phones

- Simple yet powerful

- Touchscreens for user input

- Mobile Gaming Market

- Motion and Orientation Sensors
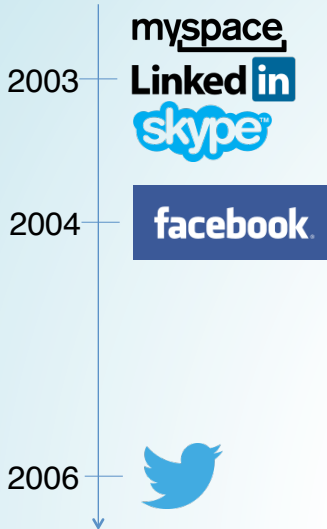
Cloud Storage

Cloud Computing

Cloud Computing

- Data storage over the Web
- Ease of user accessibility
- Diverse range of devices to synchronize

Dropbox

- Initial launch: September 2008
- An example of Cloud Storage
- Multi-OS compatibility

Networking

2003

2004

2006

Voice-Over-Internet Protocol Service

- i.e. Skype
- voice/video conference, and instant messaging are done over Internet instead of tradition telephone networks

Social Networking Service

- i.e. Myspace, LinkedIn, Facebook, Twitter
- real-time sharing of messages, pictures, and videos