CSCI 1101 Introduction to Computer Science

WHAT IS COMPUTER SCIENCE AND
A [BRIEF] HISTORY OF COMPUTERS AND COMPUTING

What is computer science?

Computer Science is the study of computer systems including hardware and software.

Unlike computer engineers who deal with hardware and software, computer scientists focus mainly on software (programs) and software systems (which includes their theory, design, development, and application). This requires them to solve from abstract problems (like determining if a problem can be solved with a computer and, if it is, discovering the algorithm that will solve it) to concrete problems like creating a web site, installing and maintaining a network, designing and implementing a device driver, etc.

As a CS student you will learn not only programming languages, but how to design computer systems, how people interact with computers, how to handle large amounts of information, how to build networks, create websites, computer animation, robotics, and much more.

Computer Science

As a discipline

Discipline:

- A field of study.
- A branch of knowledge, typically one studied in higher education.

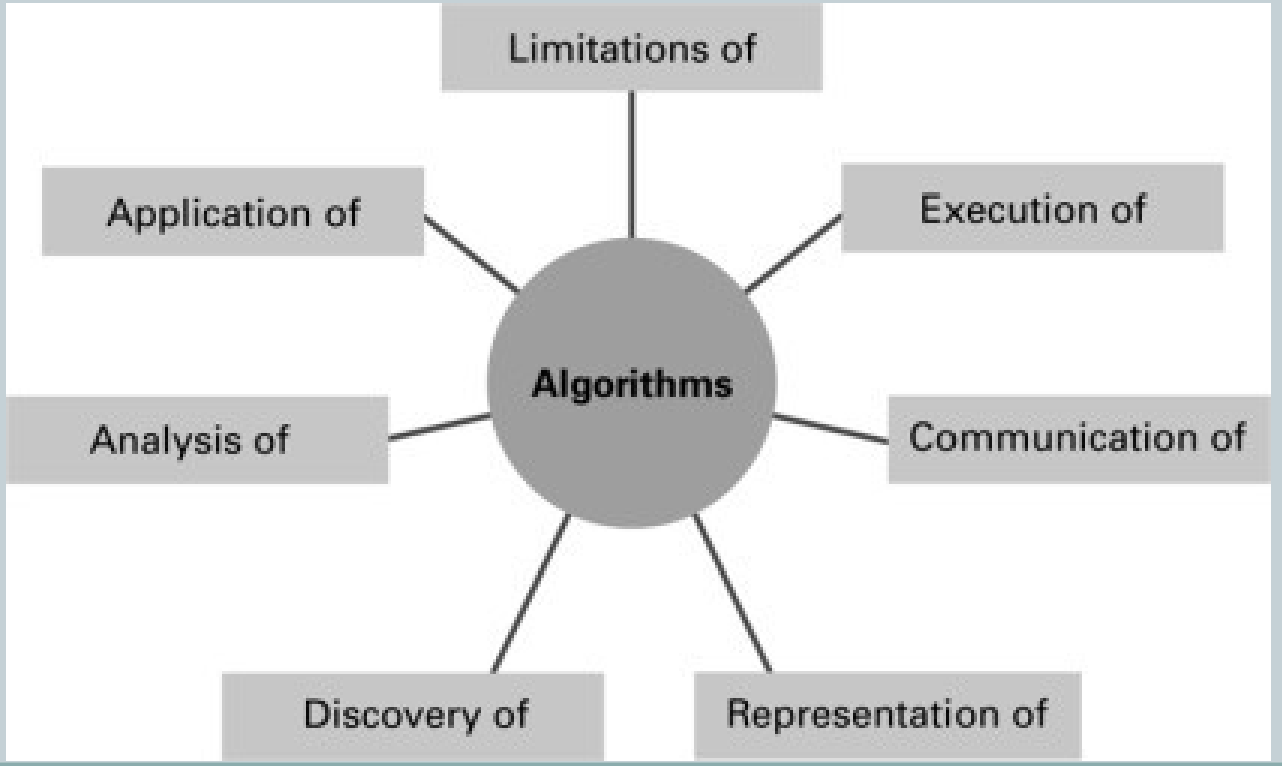
- What can be efficiently automated?
- Necessary skills
  - Design solutions
  - Algorithmic thinking
  - Data Representation
  - Programming

Terminology

- **Algorithm:** A set of steps that defines how a task is performed
- **Program:** A representation of an algorithm
- **Programming:** The process of developing a program
- **Hardware:** Equipment; the physical elements of the system
- **Software:** Programs and algorithms
- **Abstraction:** a mental model that removes complex details

The Role of Algorithms in CS

- Algorithms play a central role in the discipline of computer science



Systems Areas and Application Areas

Systems: Helps manage computer system

- Algorithms and Data Structures
- Programming Languages
- Architecture
- Operating Systems
- Software Engineering
- Human-Computer Communication

Applications: Get stuff done

- Numerical and Symbolic Computation
- Databases and Information Retrieval
- Intelligent Systems
- Graphics and Visual Computing
- Net-Centric Computing
- Computational Science

History of the Computer

- http://www.history.com/shows/modern-marvels/videos/who-invented-the-computer

- http://www.computerhistory.org/timeline/?category=cmptr

Early (not electronic) Computing Machines

- Abacus: positions of beads represent numbers
- Gear-based machines: positions of gears represent numbers
  - Blaise Pascal: Pascaline, mechanical calculator
  - Joseph Jacquard: Jacquard's Loom, inventor of punch card
  - Charles Babbage: Difference Engine, Analytic Engine
  - Ada Lovelace: first programmer, inventor of the loop

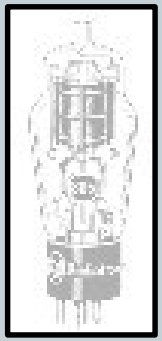
The “Generations” of Computing

- Hardware and software innovations went hand in hand
- Each “generation” is characterized by particular technology

First Generation (1951-1959)

Hardware

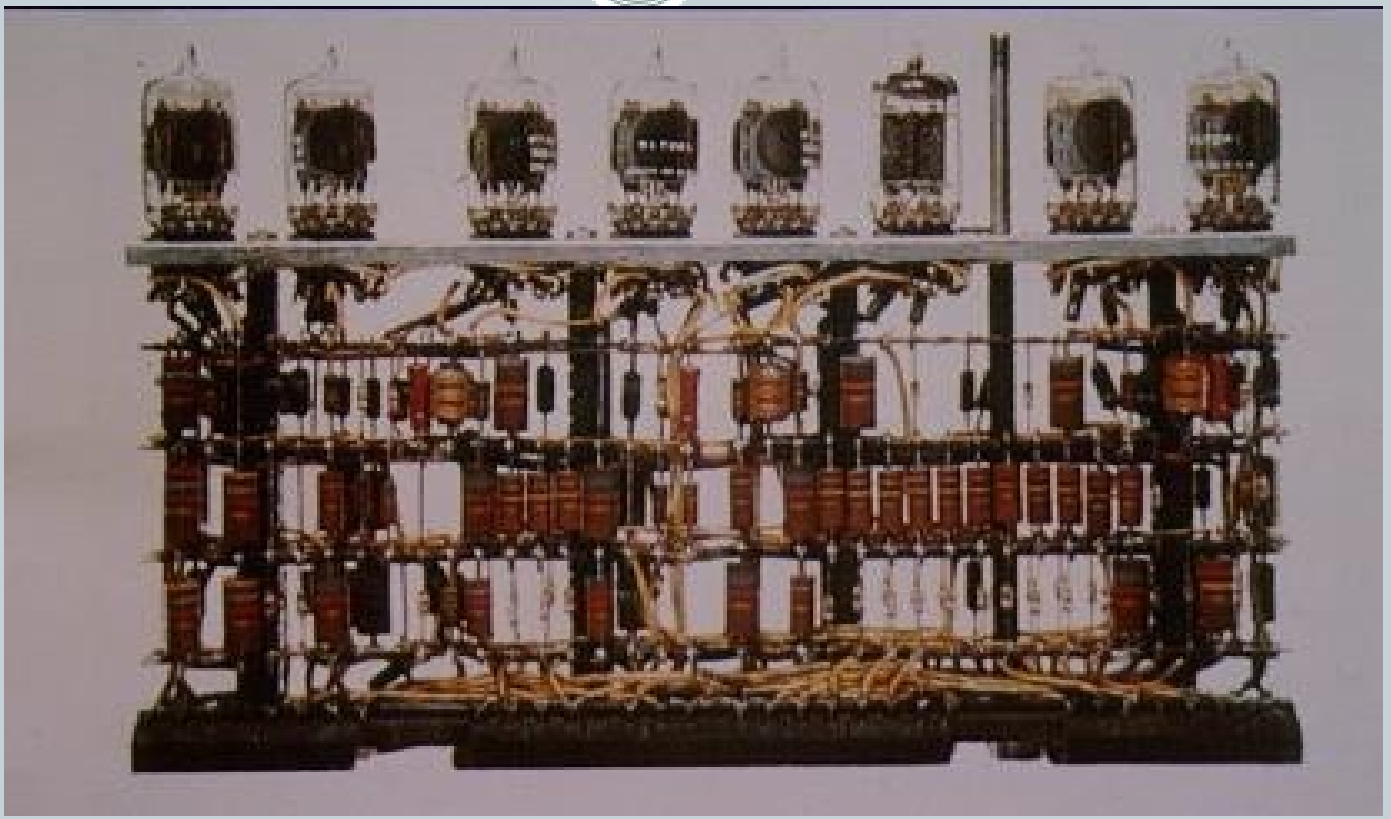
- Mechanical relays (Harvard Mark I)
- Vacuum tube (Colossus, ENIAC)
- Magnetic drum
- Magnetic tape drive



Software

- Earliest machine programs were hard wired
- Machine language
- Assembly language
- Programmers already splitting into systems and applications

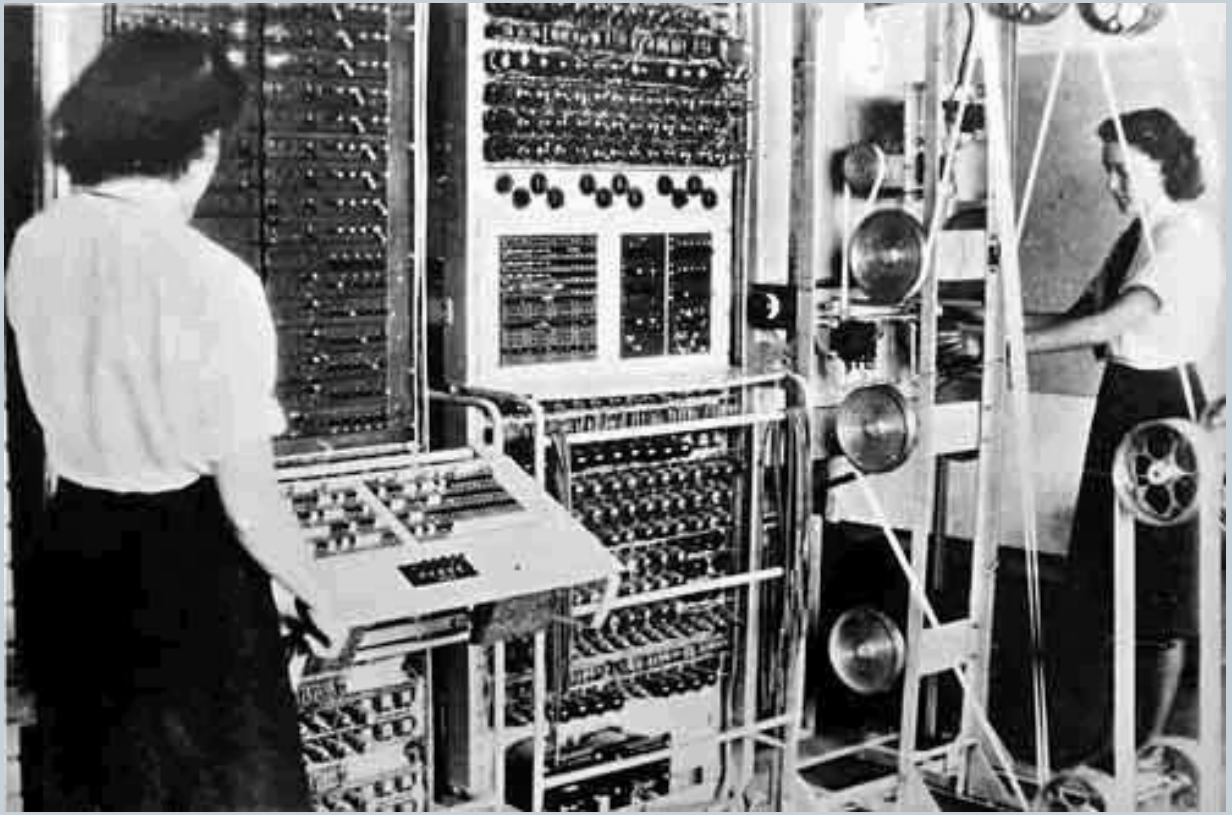
First Generation



http://minf.vub.ac.be/~marc/info-hecol/html/cu-02.html

First Generation

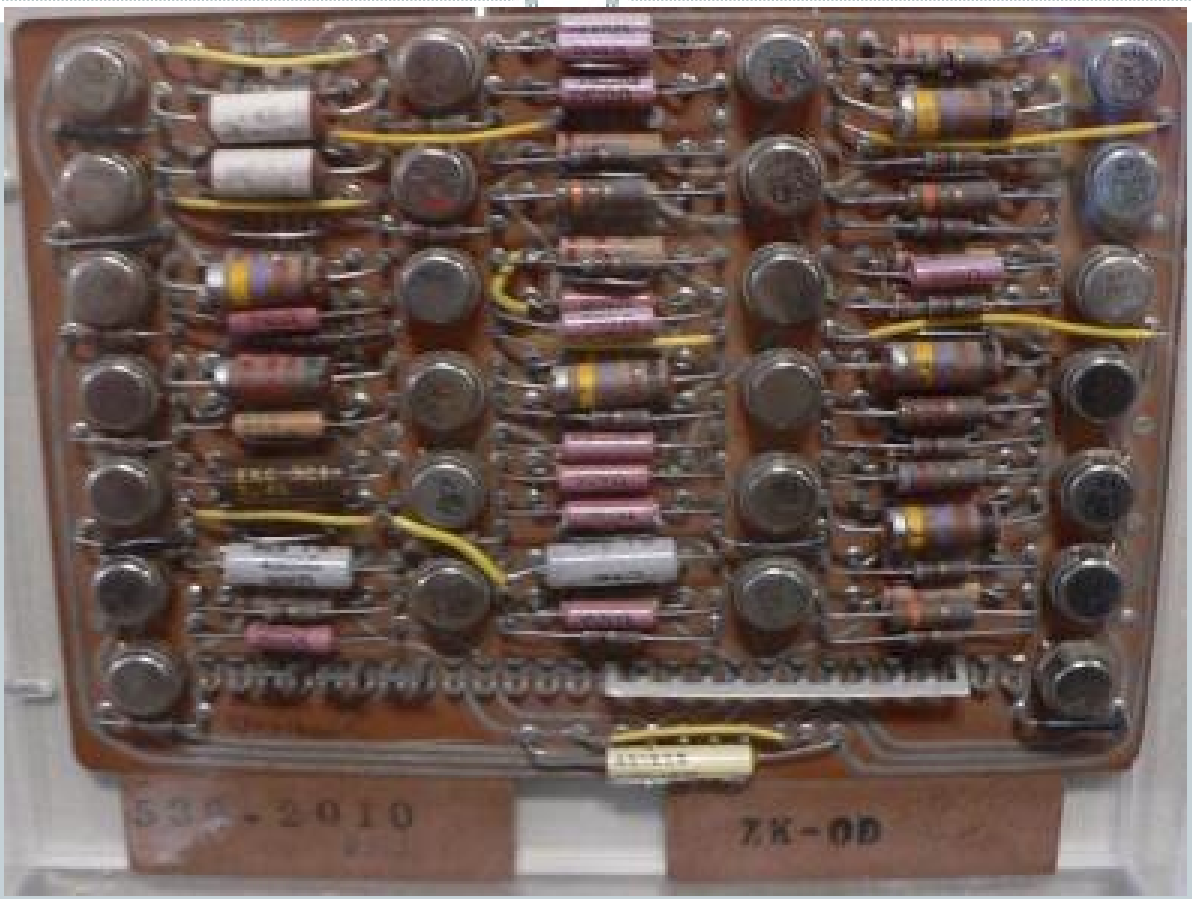
- Colossus, United Kingdom, 1944



Second Generation (1960-1965)

Hardware	Software
• Transistors • Magnetic core memory • Magnetic discs	• Introduction of high-level programming languages

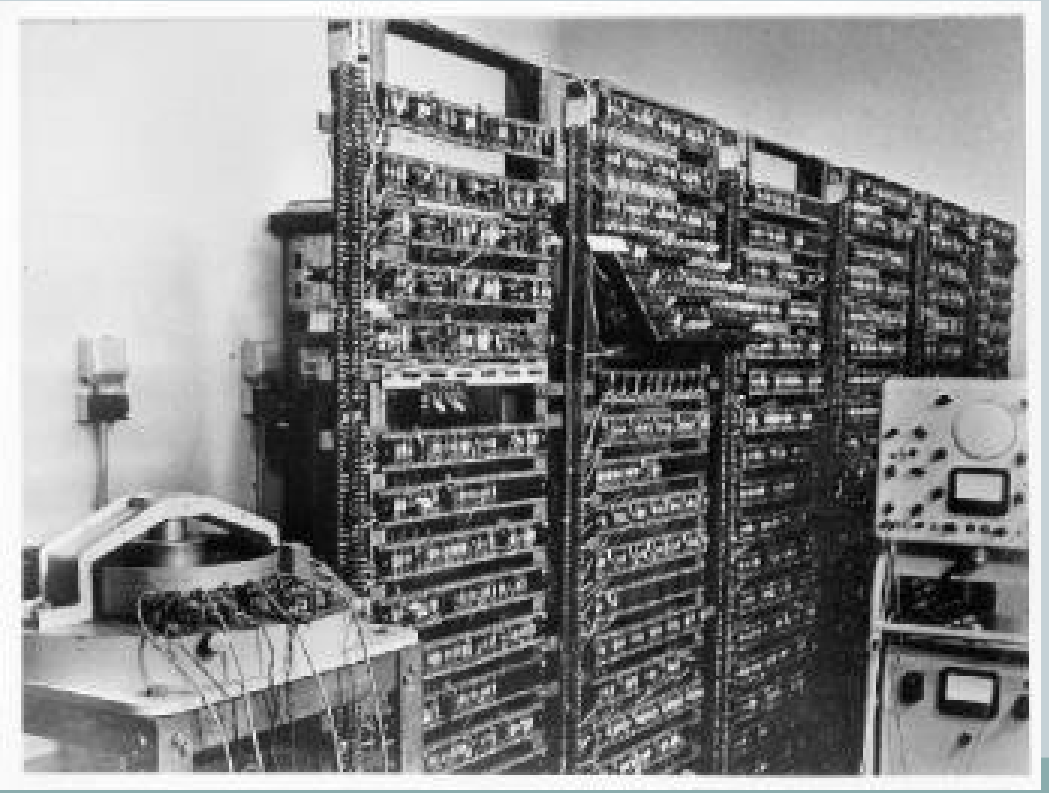
Second Generation



http://www.ganssle.com/tem/tem257.html

Second Generation

- Manchester University Experimental Transistor Computer, 1953

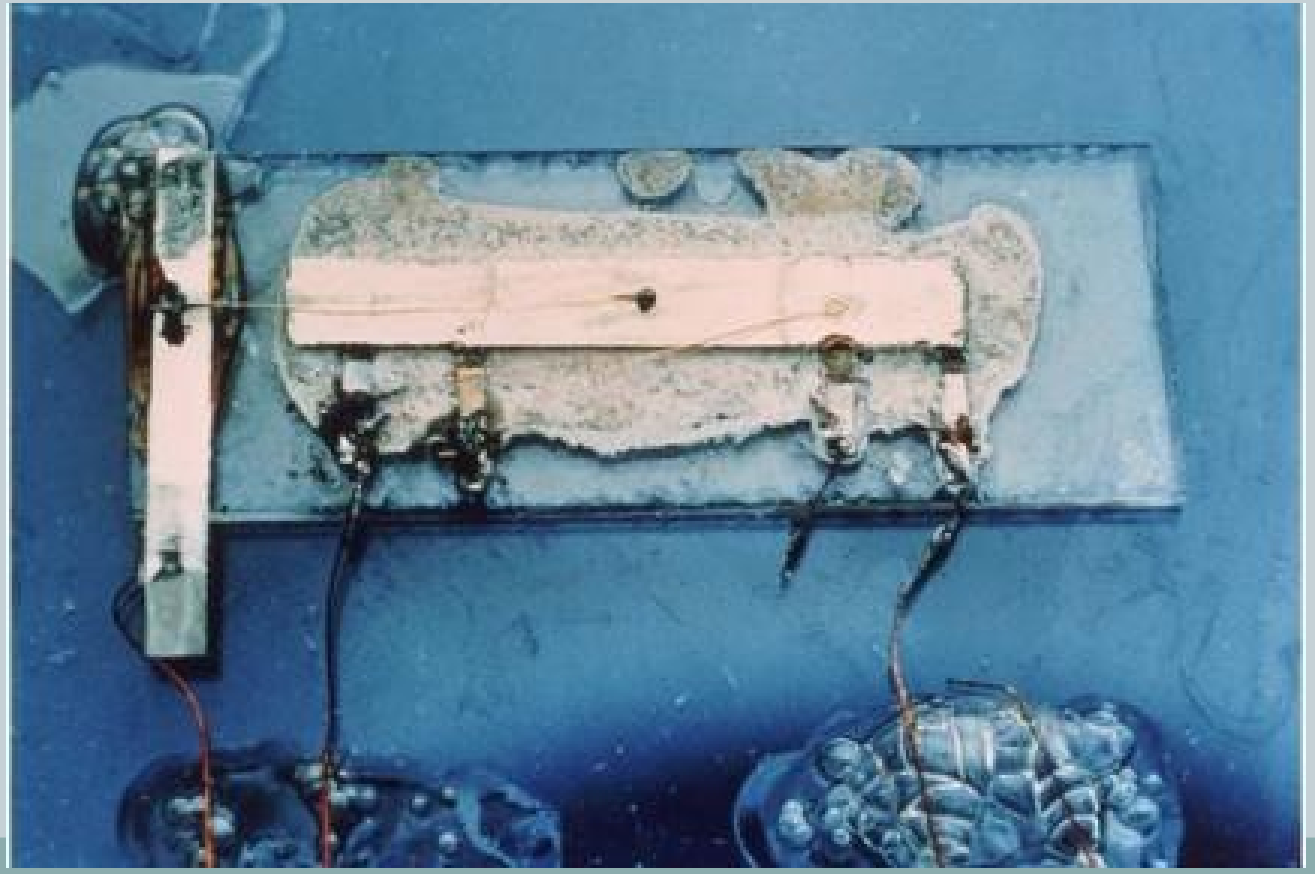


Third Generation (1965-1970)

Hardware	Software
• Integrated circuits • Transistors for memory • Terminal	• Operating system • Increasing separation between user and hardware

Third Generation

- Jack Kilby's original integrated circuit



Third Generation

Cromemco, "ZPU" (4mHz Zilog Z80 CPU board) 1976

http://www.kuhmann.com/Cromemco/CrosNest.htm

Fourth Generation (1970 – 1990)

Hardware	Software
• Advances in chip technology • Miniaturization and embedded circuits • Emergence of the personal computer • Introduction of networking	• Proliferation of application software • Rapid growth of computer use

Fourth Generation

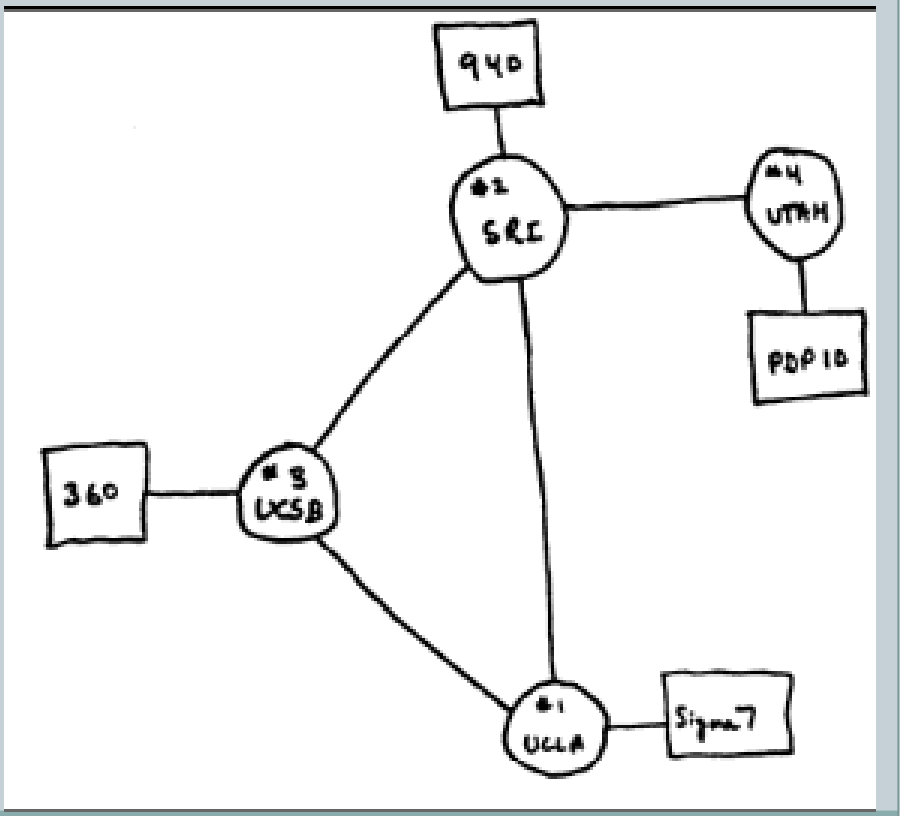
http://www.directindustry.com/prod/eurotech/cpu-boards-7026-846807.html

Fourth Generation

http://as400andmainframe.files.wordpress.com/2013/01/242995-gif.jpg

Fourth Generation

- ARPANET: The beginnings of the Internet
  - Original: 5 nodes
  - Now: 500+ million nodes



Fifth Generation (1990-present)

Hardware	Software

• Continued LSI and miniaturization
• Mobile computing
	• Networking
	  ○ Internet
	  ○ World Wide Web
	• Object oriented design
	• Explosion of number of users

Fifth Generation

http://www.itechnews.net/2009/11/05/garmin-aera-series-handheld-navigation-devices/

http://bgr.com/tag/tablets/

http://www.learnsmartsystems.com/details/mobile.asp x