COMPUTER SYSTEMS ORGANIZATION

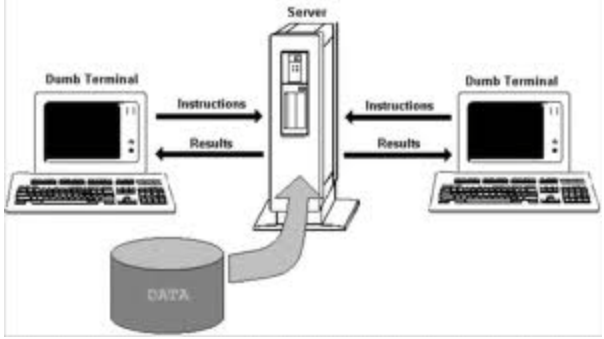
High Level Organization of a Computer System

Spring 2011 -- IIIT-H -- Suresh Purini

Basic Course Goal

- Course Goal: To study the anatomy of a typical Computer System.
- Well, what is a typical computer system?
  - Desktops, Laptops, Netbooks, …
- How about Server Machines?
  - In what way they are different from Desktops/Laptops?
- How about Embedded Computers lying inside Cell Phones, Automobiles, Airplanes, Set Top Boxes, Televisions etc. ?

Time Line

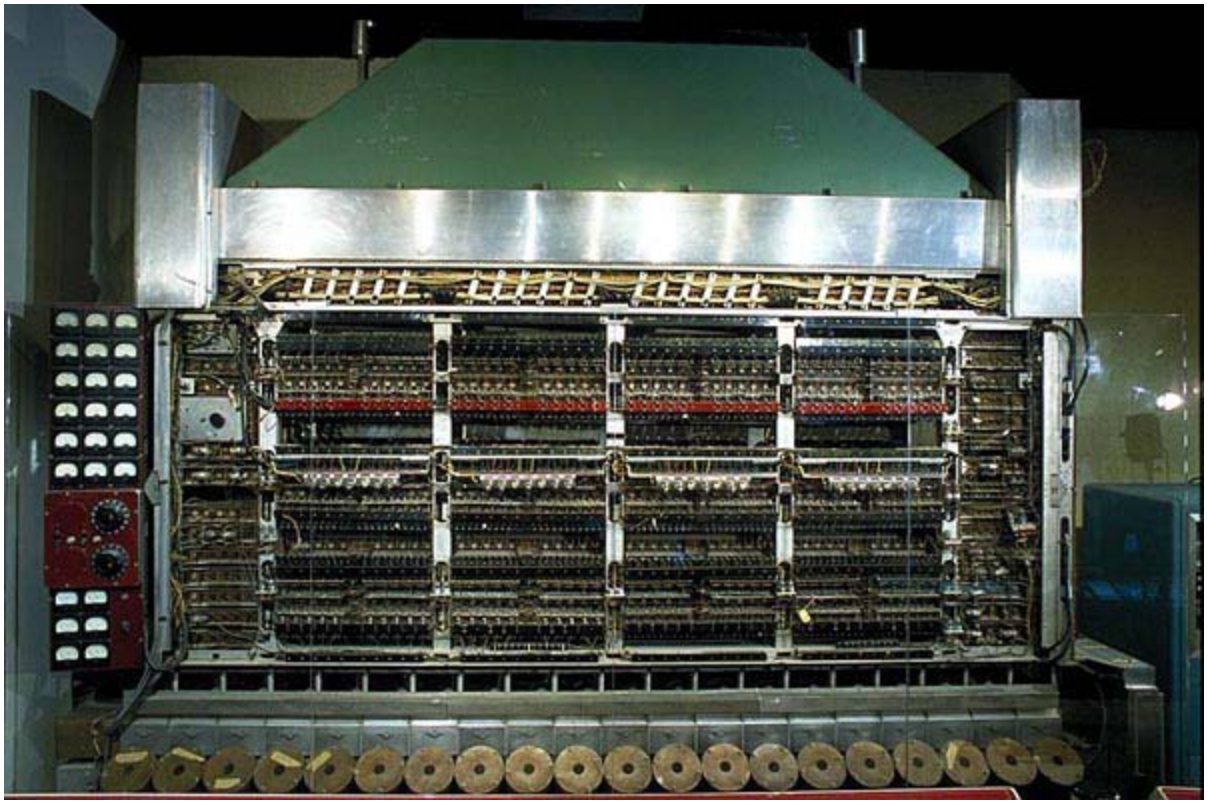

Server
Dumb Terminal
Instructions
Results
Instructions
Results
Dumb Terminal
DATA


Google


SAMSUNG
16:16

Computers Now

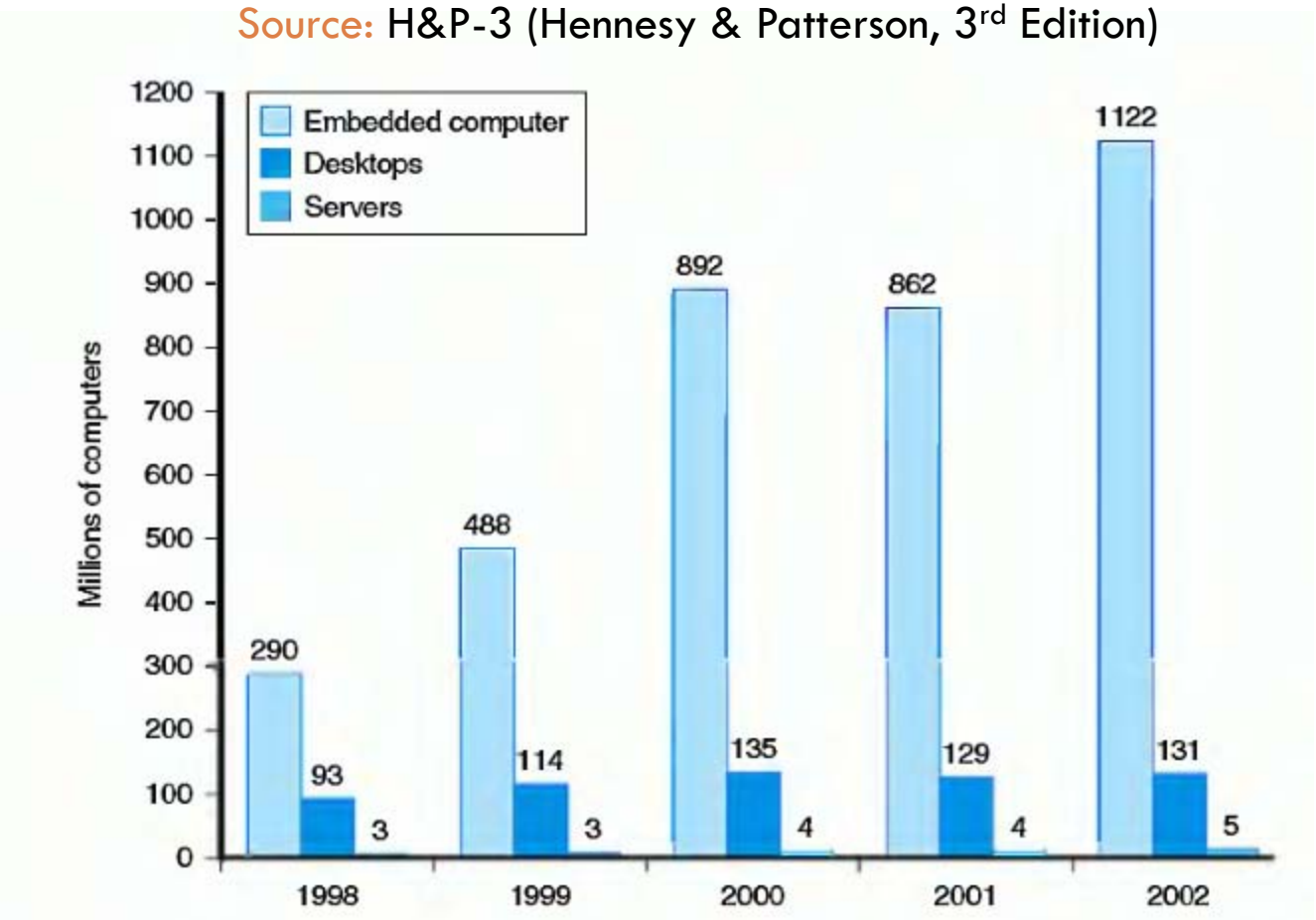
- Sensor Networks
- Cameras
- Smartphones
- Mobile Audio Players
- Laptops
- Autonomous Cars
- Servers
- Game Players
- Routers
- Flying UAVs
- GPS
- eBooks
- Tablets
- Set-top Boxes



IAS Machine. Design directed by John Von Nuemann.
First booted in Princeton NJ in 1952
Smithsonian Institution Archives (Smithsonian Image 95-06151)

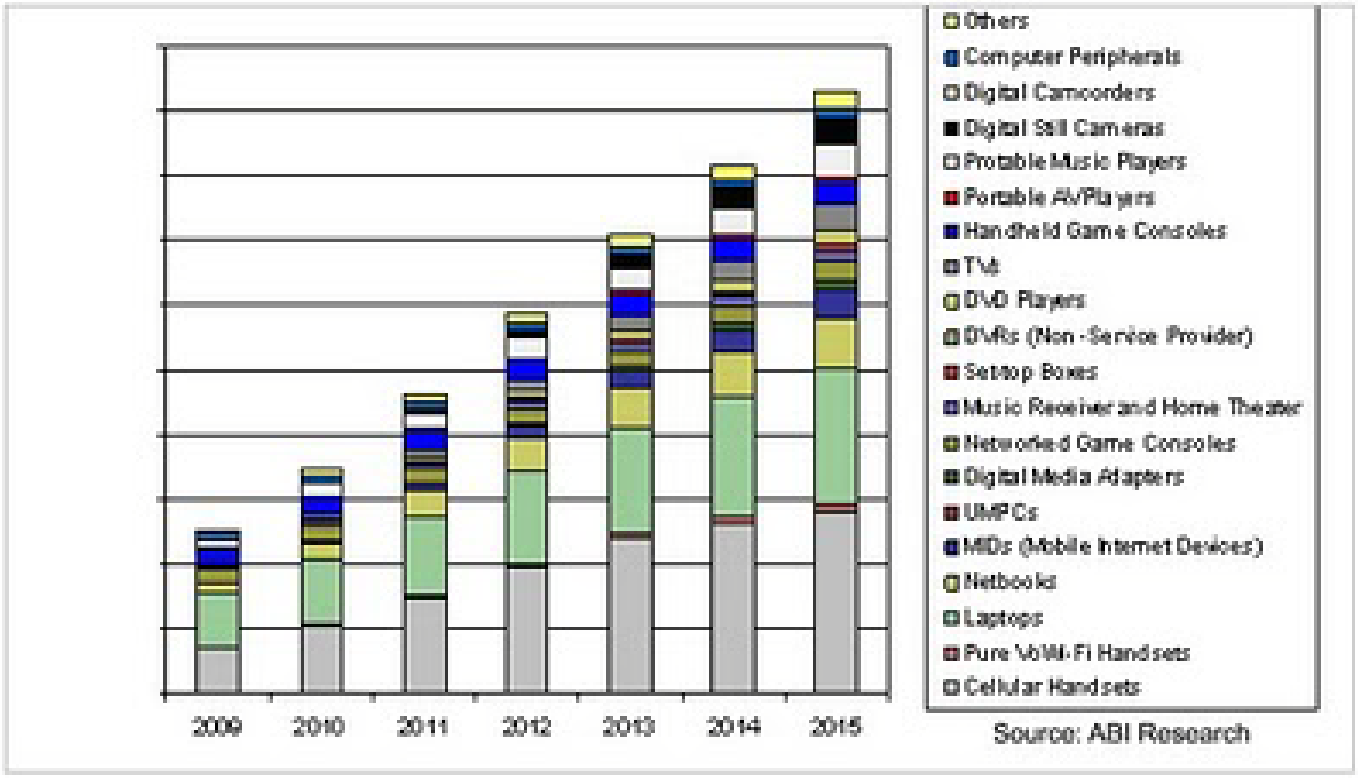
Sales Distribution

Source: H&P-3 (Hennesy & Patterson, 3rd Edition)



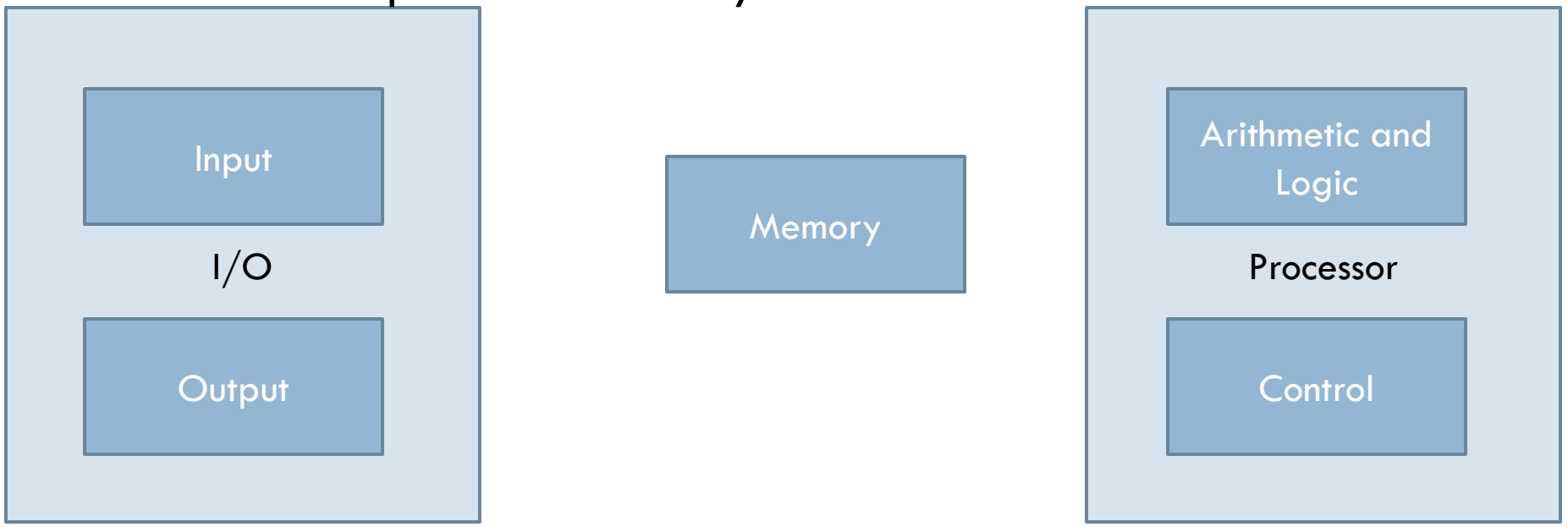
Number of distinct processors sold between 1998 and 2002.

Sales Distribution Projections



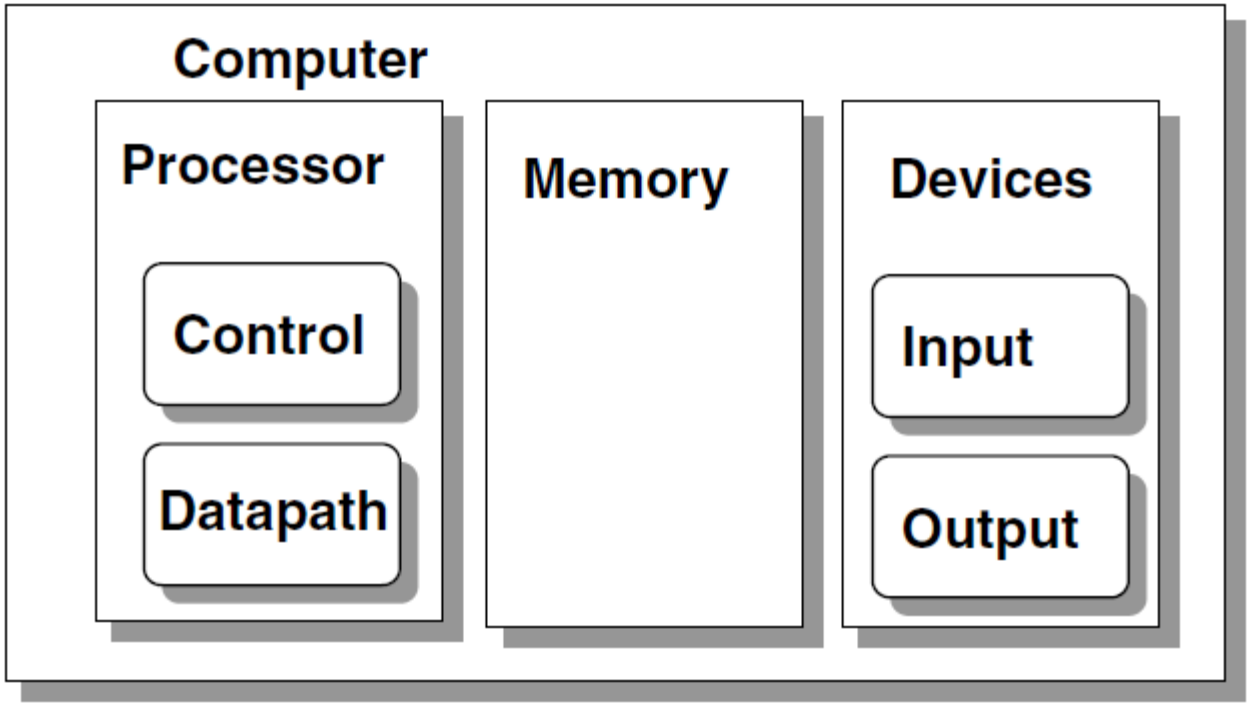
Major Functional Units of a Computer

Embedded Computers, Desktops and Servers are composed of three main parts functionally.



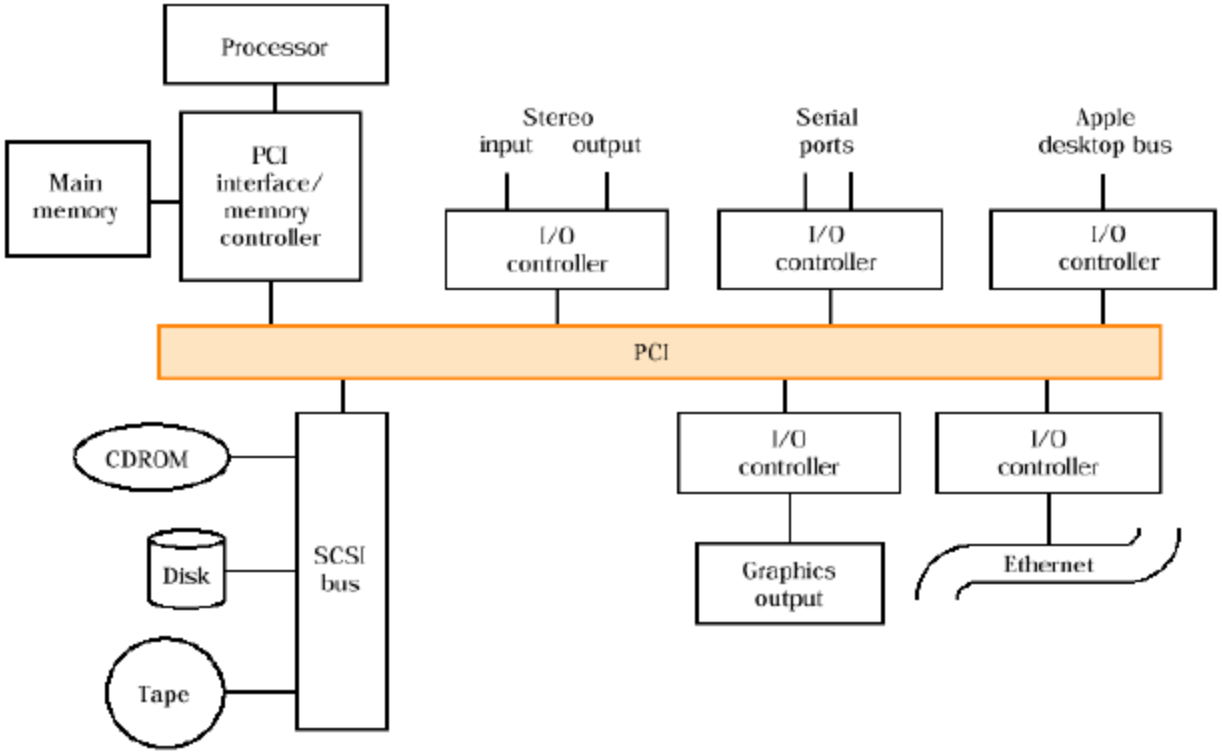
These Three Components can be interconnected in many ways.

Major Function Units



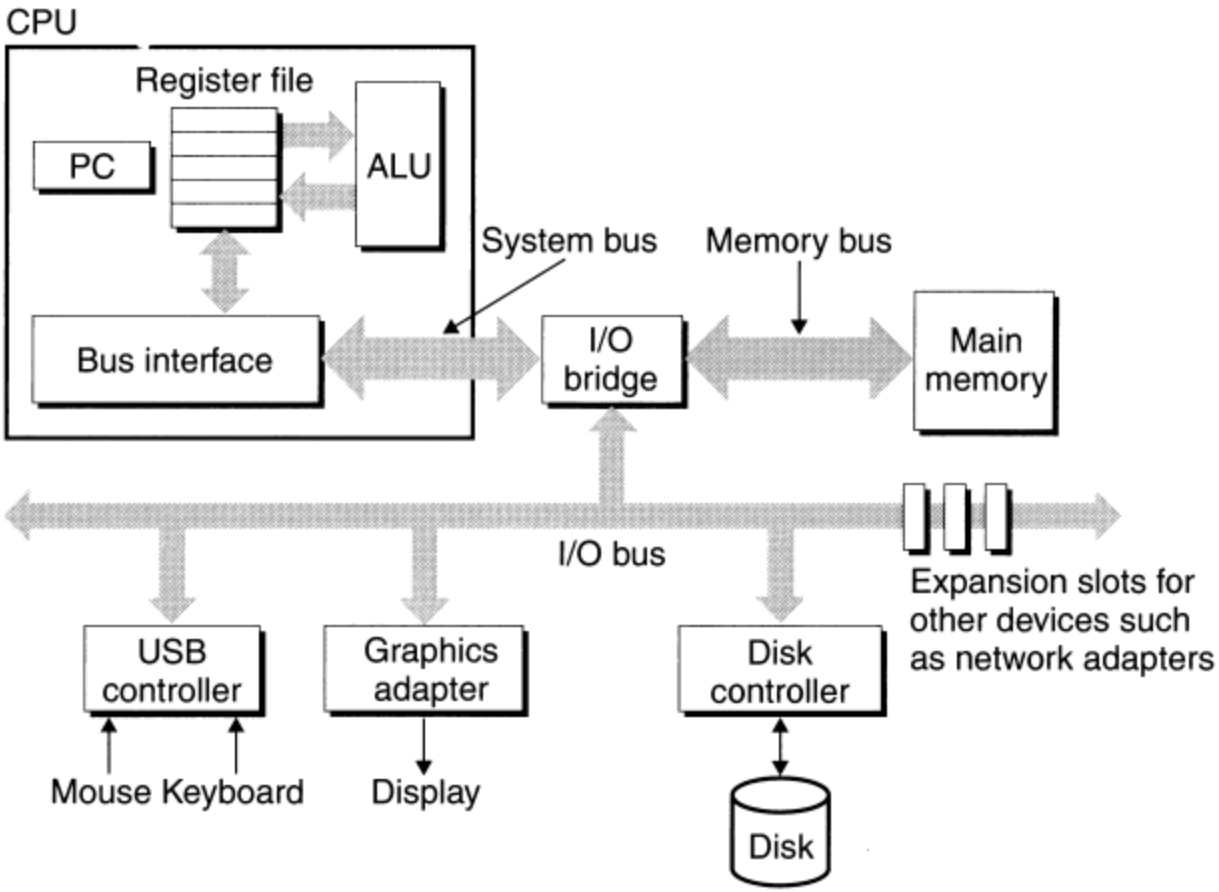
Source: Prof. Cheung's Course Notes (Imperial College, London)

Typical Hardware Organization of a System



Source: Prof. Cheung's Course Notes (Imperial College, London)

Typical Hardware Organization of a System



Source: RB&DO -1 (Randal E. Bryant & David O'Hallaron, 1st Ed)

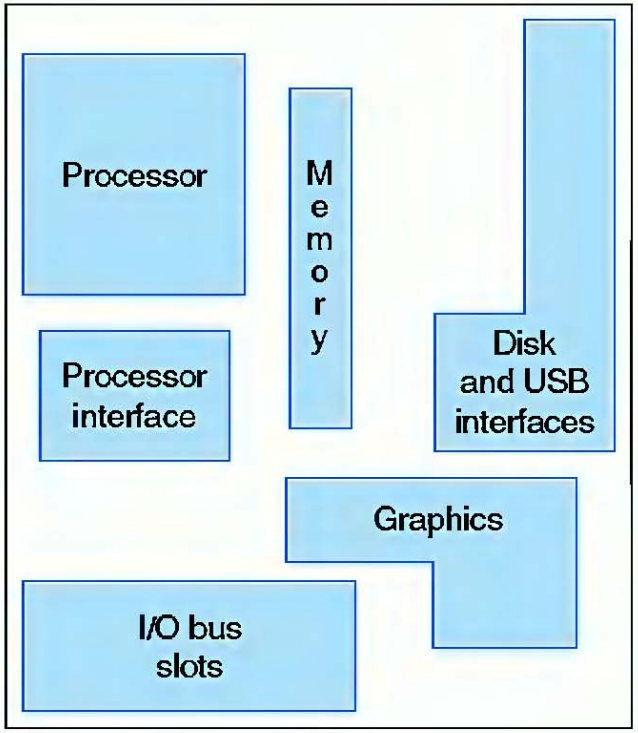
Inside a Laptop

Source: howstuffworks.com

Inside a PC

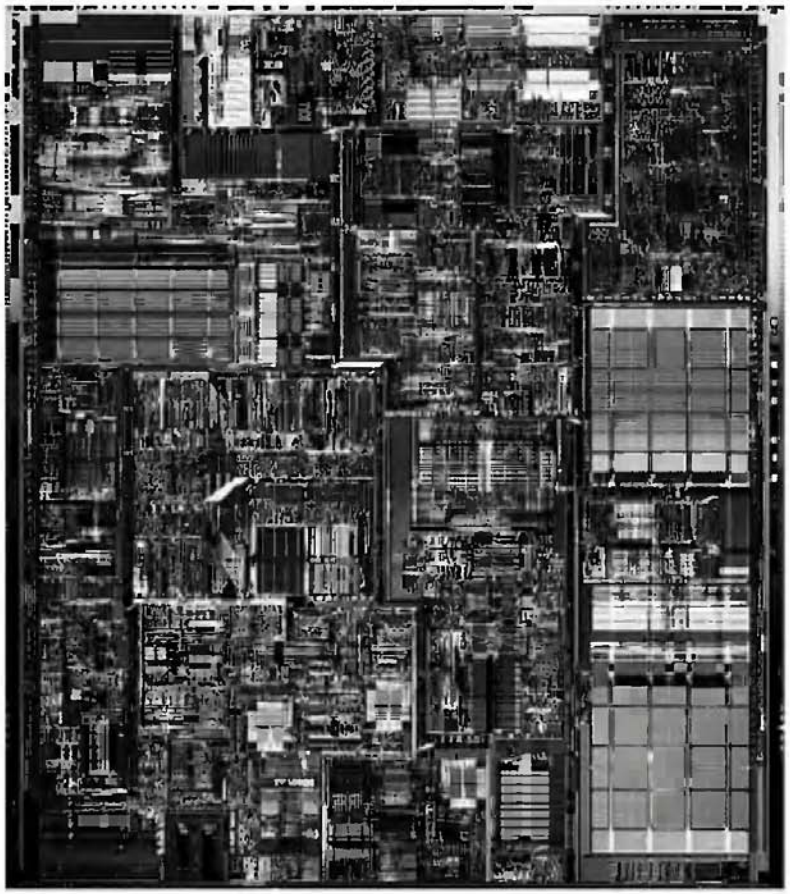
Source: H&P-3 (Hennesy & Patterson, 3rd Edition)

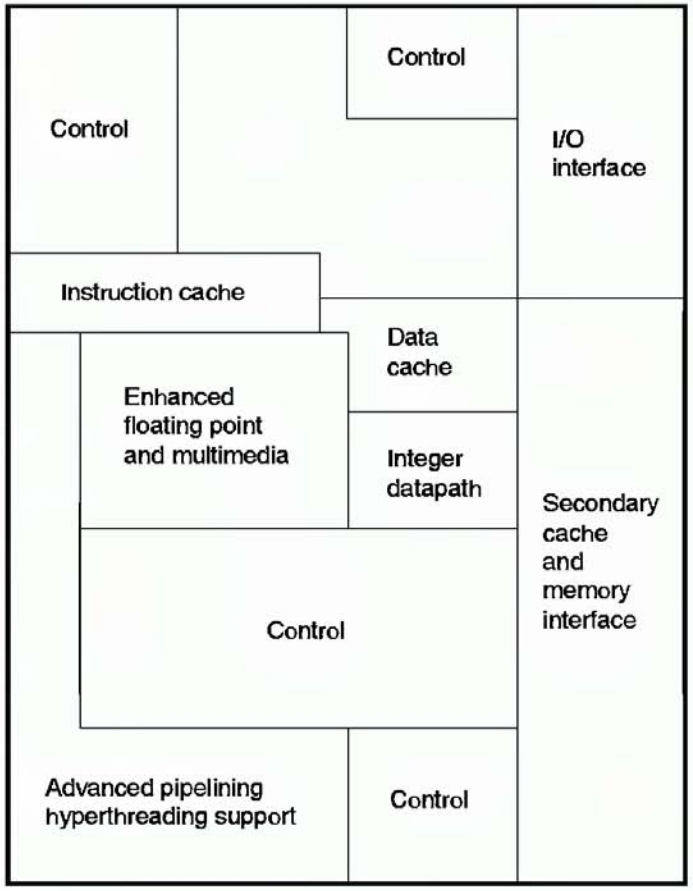
Close-up of Motherboard



Source: H&P-3 (Hennesy & Patterson, 3rd Edition)

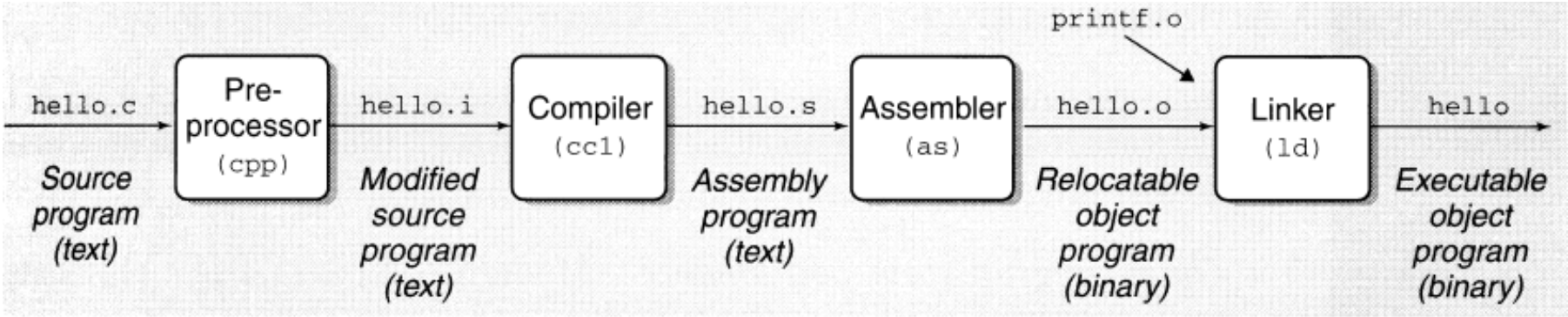
Inside a Pentium 4 Processor



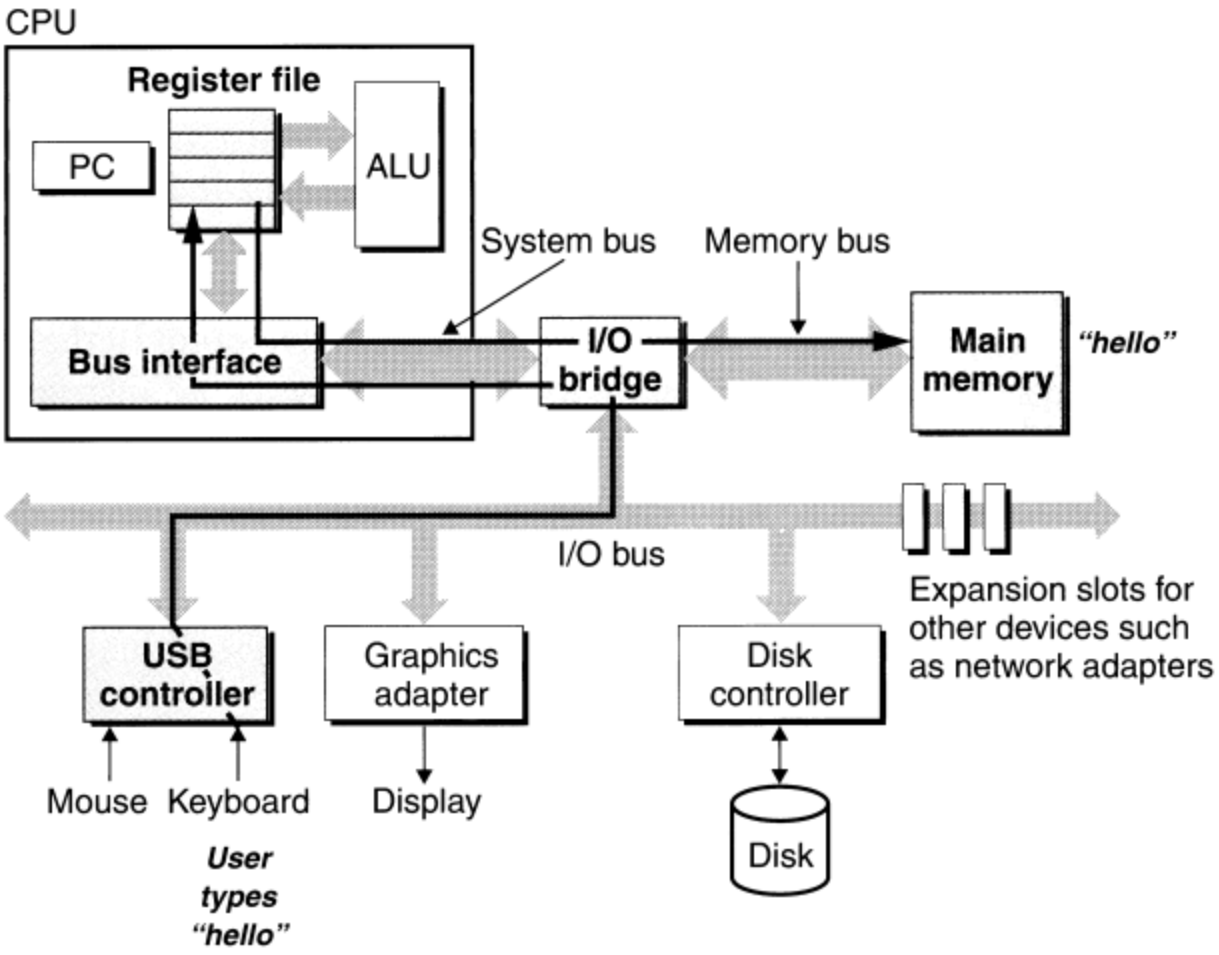


Source: H&P-3 (Hennesy & Patterson, 3rd Edition)

Typical Compilation Sequence

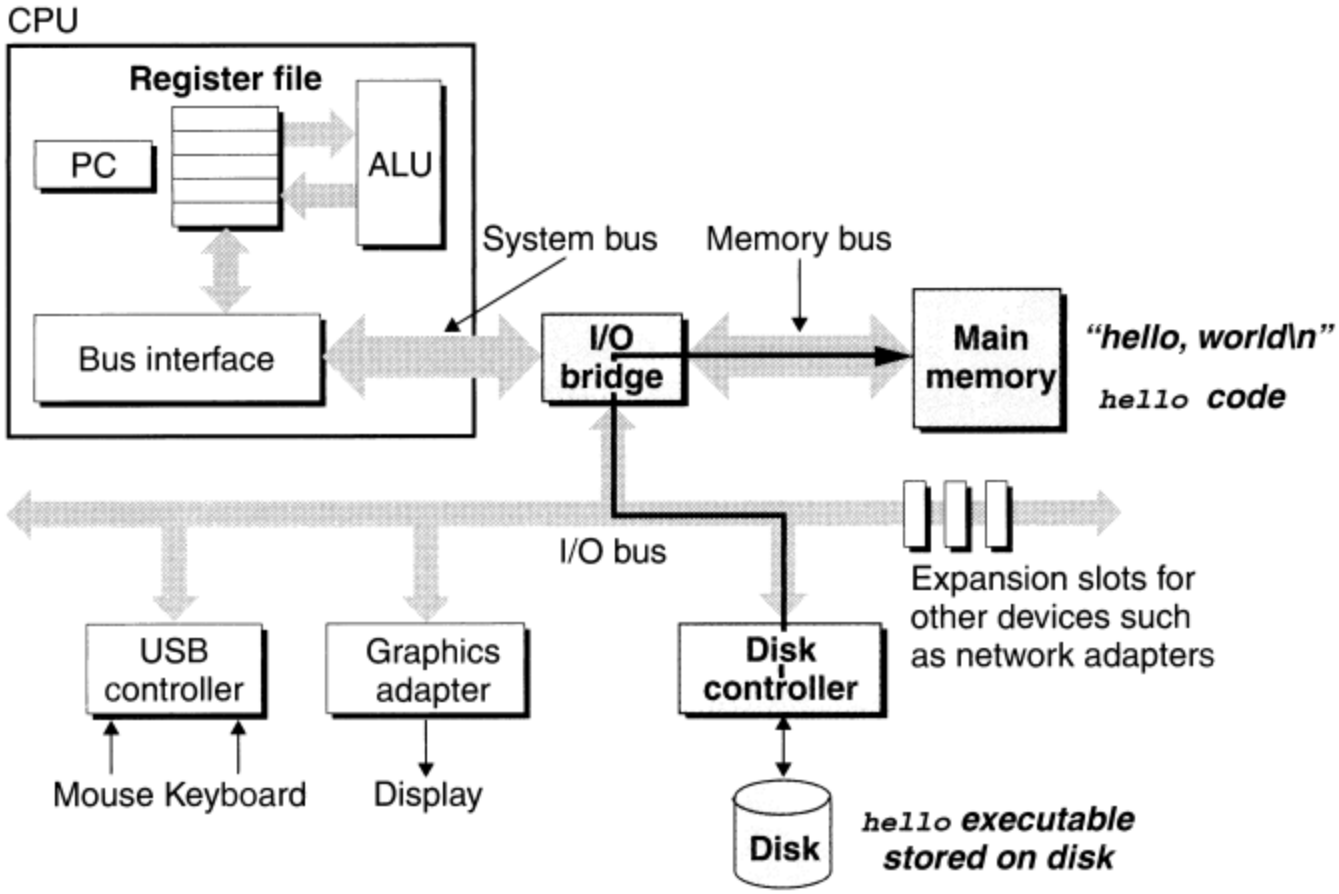


Running the "Hello World" Program



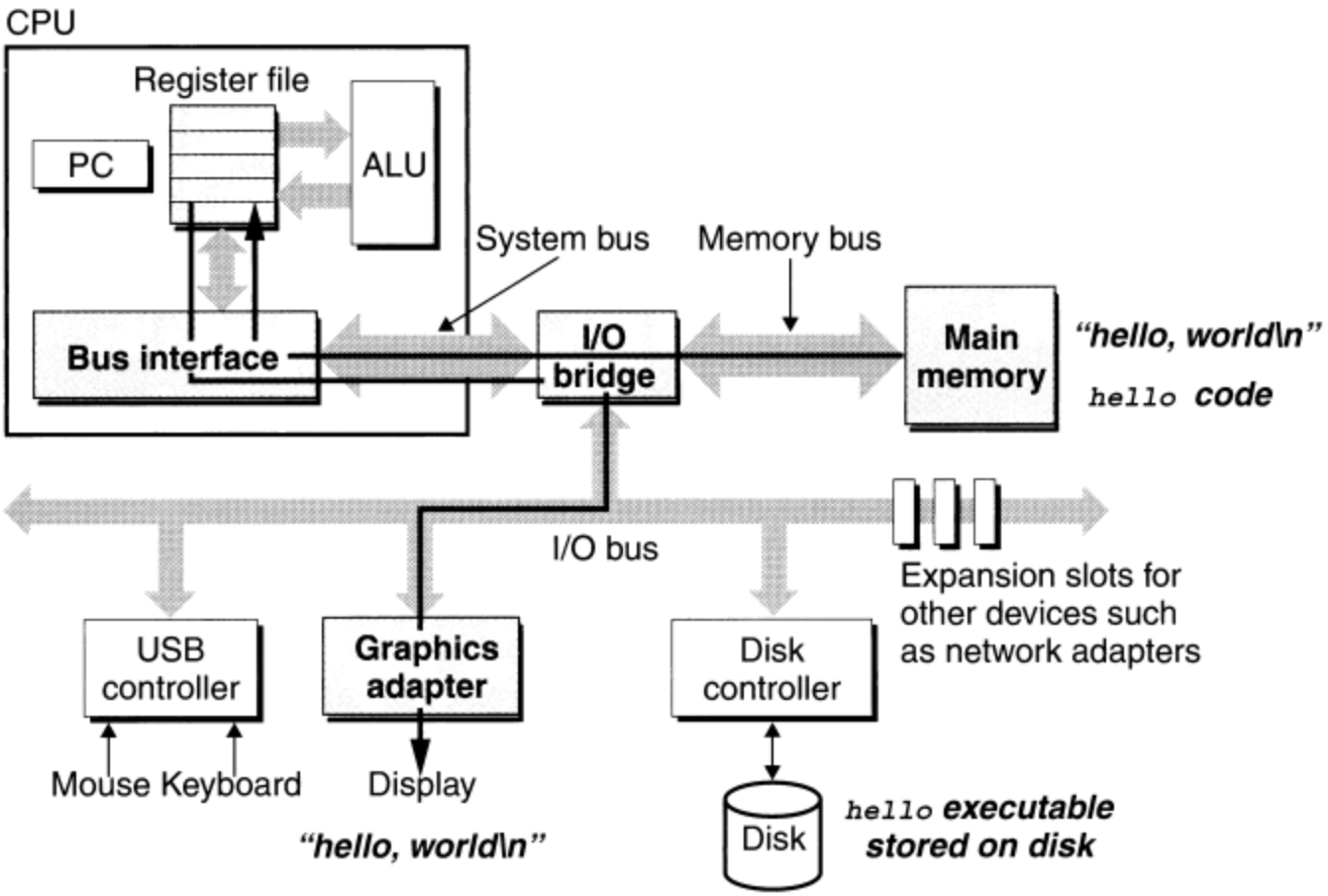
Source: RB&DO-1

Running the "Hello World" Program



Source: RB&DO-1

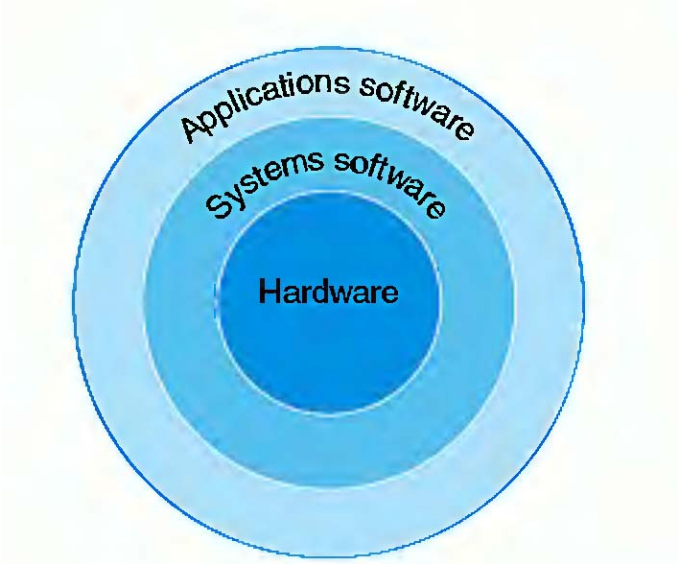
Running the "Hello World" Program



Source: RB&DO-1

Computer System = Hardware + System Software + Application Software

Source: H&P-3 (Hennesy & Patterson, 3rd Edition)



System Software: Operating System, Device Drivers, Loaders, Linkers, Compilers, Assemblers, Editors, ….

Application Software: Web browsers, user-specific applications, …..