The Computer Architect’s View

- Architect is concerned with design & performance
- Designs the ISA for optimum programming utility and optimum performance of implementation
- Designs the hardware for best implementation of the instructions
- Uses performance measurement tools, such as benchmark programs, to see that goals are met
- Balances performance of building blocks such as CPU, memory, I/O devices, and interconnections
- Meets performance goals at lowest cost
Buses as Multiplexers

- Interconnections are very important to computer
- Most connections are shared
- A bus is a time-shared connection or multiplexer
- A bus provides a data path and control
- Buses may be serial, parallel, or a combination
  - Serial buses transmit one bit at a time
  - Parallel buses transmit many bits simultaneously on many wires
Fig 1.4 Simple One- and Two-Bus Architectures

(a) One bus

(b) Two buses
Fig 1.5 The Apple Quadra 950 Bus System (Simplified)

- CPU
  - System bus
    - LocalTalk interface
      - LocalTalk bus
        - Printers, other computers
    - ADB transceiver
      - ADB bus
        - Keyboard, mouse, bit pads
    - SCSI interface
      - SCSI bus
        - Disk drives, CD ROM drives
    - NuBus interface
      - NuBus
        - Video and special purpose cards
    - Ethernet transceiver
      - Ethernet
        - Other computers
    - Memory
Fig 1.6 The Memory Hierarchy

- Modern computers have a hierarchy of memories
  - Allows tradeoffs of speed/cost/volatility/size, etc.
- CPU sees common view of levels of the hierarchy.
Tools of the Architect’s Trade

- Software models, simulators and emulators
- Performance benchmark programs
- Specialized measurement programs
- Data flow and bottleneck analysis
- Subsystem balance analysis
- Parts, manufacturing, and testing cost analysis