Lesson 01:
Basic Processing Units
Basic Processing Units
Processor Block Diagram

Execution Unit
1. Execution Unit
Execution unit

- Includes Arithmetic Logic Unit (ALU)
- Contains the hardware that executes instructions
- Includes the hardware that fetches and decodes instructions
Execution unit

- Does actual computation using the arithmetic logic unit(s) [ALUs]
- Contain separate execution units for integer and floating-point computations in certain processors
- Hardware required to handle the two data types, integer and floating point
- Modern processors often use multiple execution units to execute instructions in parallel to improve performance
2. Register set
Current program register set used by the program

GPRs (General Purpose Registers)

• Program counter
• Status register (PSW Processor Status Word)
• Other processor registers used by a program instruction
Register set used by the execution unit

- Instruction Register (IR)
- Instruction Decoder (ID)
- MAR and MDR Registers
- Other processor registers used by a program instruction
Register Set

- Values stored in the register accessed more quickly than data stored in the memory
- Support to simultaneous access of registers by the processor
Processor Operations using Registers

- Allows an operation, such as an addition, to read all of its inputs from the register file at the same time, rather than having to read them one at a time.
3. Control Logic
Control Logic Unit

- Controls the rest of the processor, determining when instructions can be executed.
- Controls what sequences of operations are required to execute each instruction.
Early processors control logic

- Very small fraction of the processor hardware compared to the ALUs and the register file
New processors control logic

• Complex control unit one of the more difficult parts of a processor to design
Processor units

![Diagram of processor units]

- Fetch an Instruction
  Sections 5.4 steps j to j + 6
- Instruction Cache
- Data Cache
- Integer Registers
- Instruction cache
- Floating Point Registers
- Decoder register ID
- Execution-units hardware, for example, ALU
- Status/Flags
- Controller and Sequencer Unit
- External Inputs
- Bus Interface unit
- Memory System
Summary
We learnt

Processing units of a computer —

• Processor Control unit, IR, ID, PSW, ALU, MAR, MDR, Registers
• Address, data and control buses
• Memory
• Input-Output System — Hard Disk, CD-ROM, video card, ...
We learnt

• Execution unit Includes the hardware that fetches and decodes instructions
• Does actual computation using the arithmetic logic units (ALUs)
• General Purpose registers
• Program counter
• Status register
• other registers
We learnt

- Complex control unit in a processor with multiple addressing modes and large opcodes
End of Lesson 01
on
Basic Processing Unit