SNS COLLEGE OF ENGINEERING

Kurumbapalayam (PO), Coimbatore – 641 107
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DEPARTMENT OF ECE

COURSE NAME: 19IT301 COMPUTER ORGANIZATION AND ARCHITECTURE

II YEAR/ III SEM

Unit 1 : BASIC STRUCTURE OF COMPUTERS Topic 2:

Basic operational concepts – Bus Structures

Recap

- Activity in a computer is governed by instructions.
- To perform a task, an appropriate program consisting of a list of instructions is stored in the memory.
- Individual instructions are brought from the memory into the processor, which executes the specified operations.
- Data to be used as operands are also stored in the memory.

Basic Operational Concepts

Instruction:

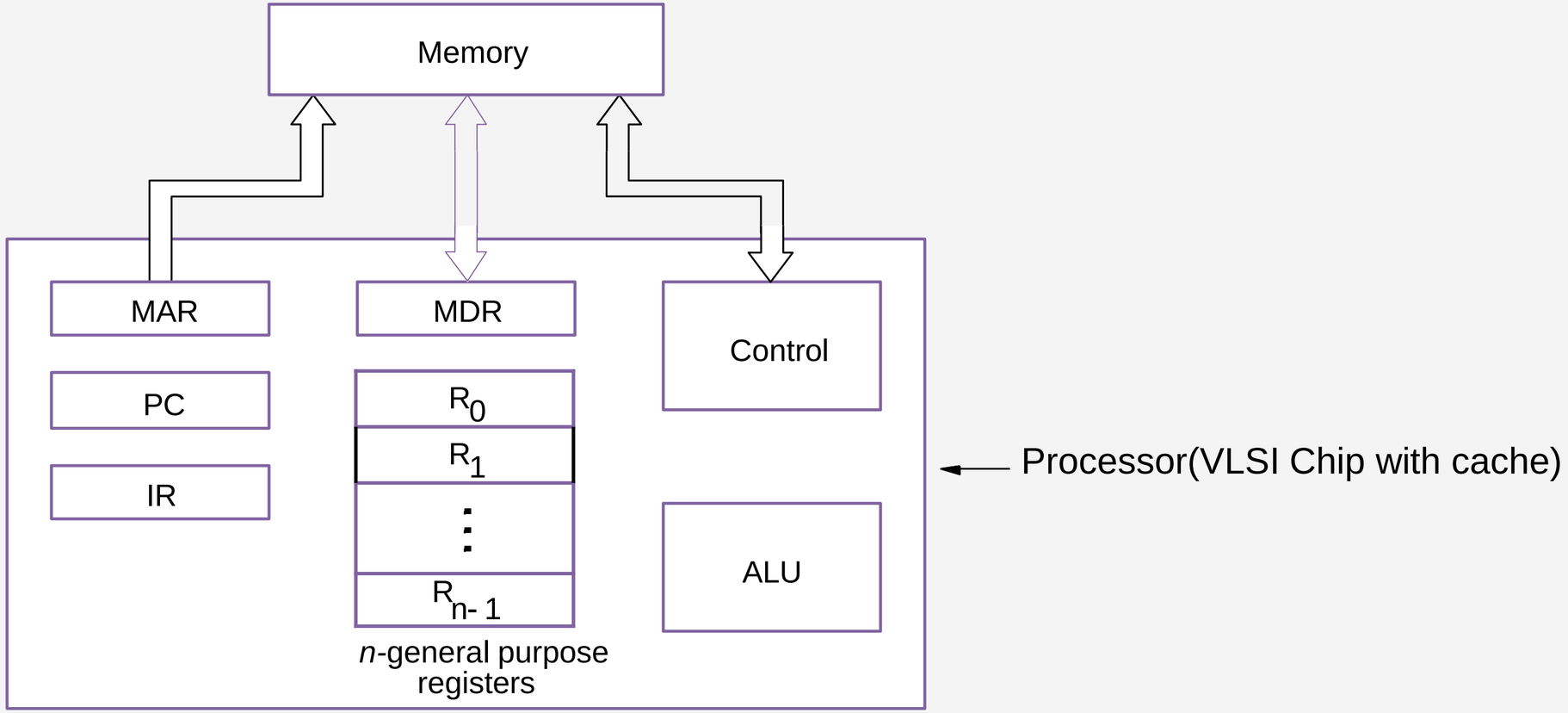
Add LOCA, R0

- Add the operand at memory location LOCA to the operand in a register R0 in the processor.
- Place the sum into register R0.
- The original contents of LOCA are preserved.
- The original contents of R0 is overwritten.
- Steps involved:
  - ✓ Instruction is fetched from the memory into the processor
  - ✓ the operand at LOCA is fetched and added to the contents of R0
  - ✓ the resulting sum is stored in register R0.

Separate Memory Access and ALU Operation

- Load LOCA, R1 ->Memory Access
- Add R1, R0 -> ALU Operation
- Whose contents will be overwritten? R1 and R0

Connection Between the Processor and the Memory



Connections between the processor and the memory.

Registers

- Instruction register (IR)
- Program counter (PC)
- General-purpose register (R0 – Rn-1)
- Memory address register (MAR)
- Memory data register (MDR)

Typical Operating Steps

- Programs reside in the memory through input devices
- PC is set to point to the first instruction
- The contents of PC are transferred to MAR
- A Read signal is sent to the memory
- The first instruction is read out and loaded into MDR
- The contents of MDR are transferred to IR
- Decode and execute the instruction
- Get operands for ALU
  - ✓ Either from general-purpose register or
  - ✓ Memory (address to MAR – Read – MDR to ALU)
- Perform operation in ALU
- Store the result back
  - ✓ To general-purpose register
  - ✓ To memory (address to MAR, result to MDR – Write)
- During the execution, PC is incremented to the next instruction

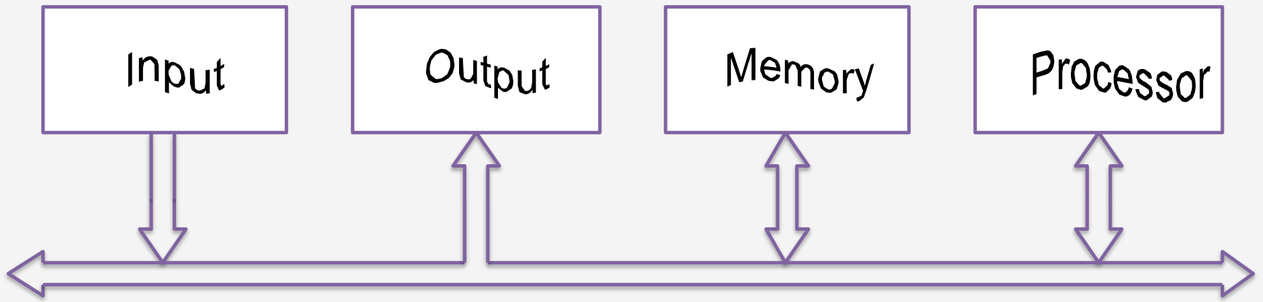
Interrupt

- Normal execution of programs may be preempted if some device requires urgent servicing.
- The normal execution of the current program must be interrupted – the device raises an interrupt signal.
- Interrupt-service routine
- Current system information backup and restore (PC, general-purpose registers, control information, specific information)

Bus Structures

- There are many ways to connect different parts inside a computer together.
- A group of lines(wires) that serves as a connecting path for several devices is called a *bus*.
- Address/data/control

Single-bus

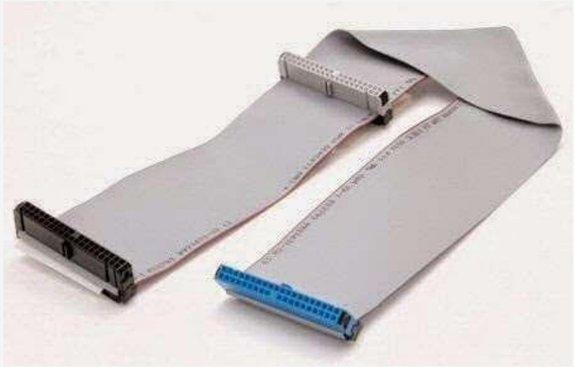


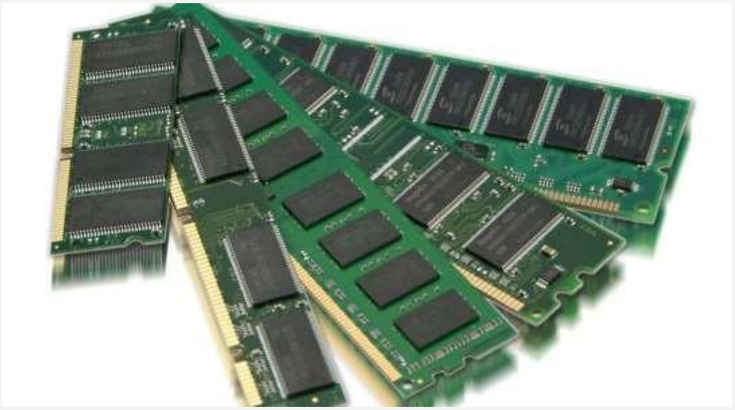
Speed Issue

- Different devices have different transfer/operate speed.
- If the speed of bus is bounded by the slowest device connected to it, the efficiency will be very low.
- How to solve this?
- A common approach – use buffer registers.
  e.g.- Printing the characters

Adv. of Buffers: Processor switches rapidly from one device to another.

Identify the Images





Thank You