

Chapter 2

Computer Evolution and Performance – Part 05

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| Agenda

» Pipelining

» Buses

- Address bus
- Data bus
- Control bus

| Intel

- 1971 - 4004
 - First microprocessor
 - All CPU components on a single chip
 - 4 bit
- Followed in 1972 by 8008
 - 8 bit
 - Both designed for specific applications

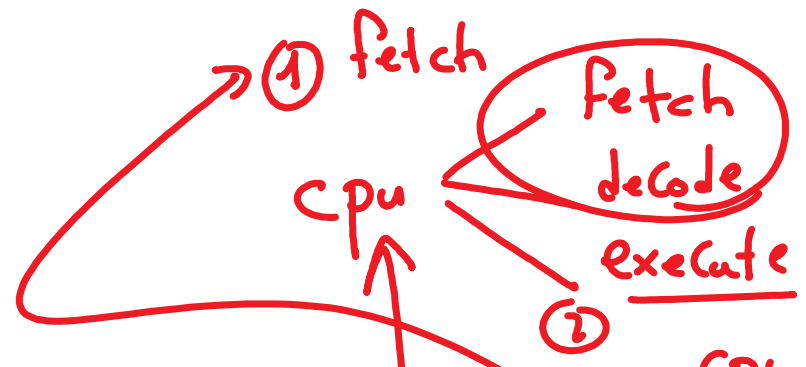
- 8 bit
- Both designed for specific applications
- 1974 - 8080
 - Intel's first general purpose microprocessor

| Microprocessor

- Single, **VLSI chip** that contains programmable electronics components that perform arithmetic, logic communication and control function
- A common way of categorizing MP is by the number of bits that their

- A common way of categorizing MP is by the number of bits that their ALU can work at a time
- In other words, a MP with a 4-bit ALU will be referred to as a 4-bit microprocessor, regardless of the number of address lines, or the number of data bus lines that it has

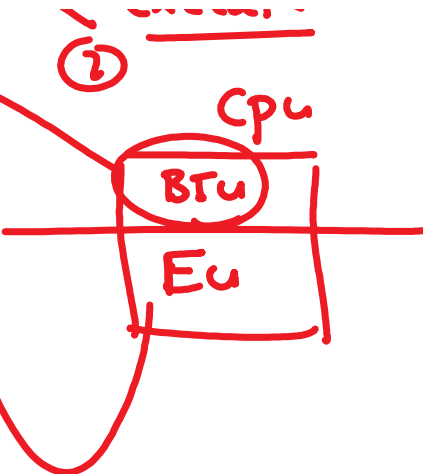
| Speeding it up



Pipelining

nonpipelined (e.g. 8085)

**pipelined
(e.g. 8086)**

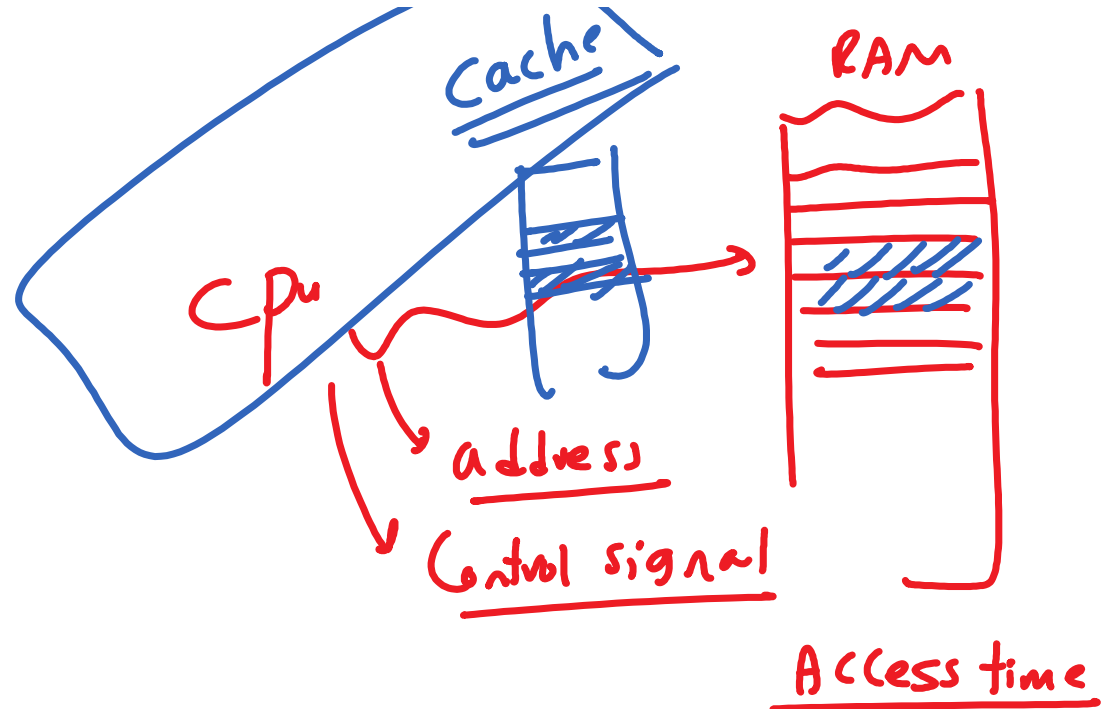


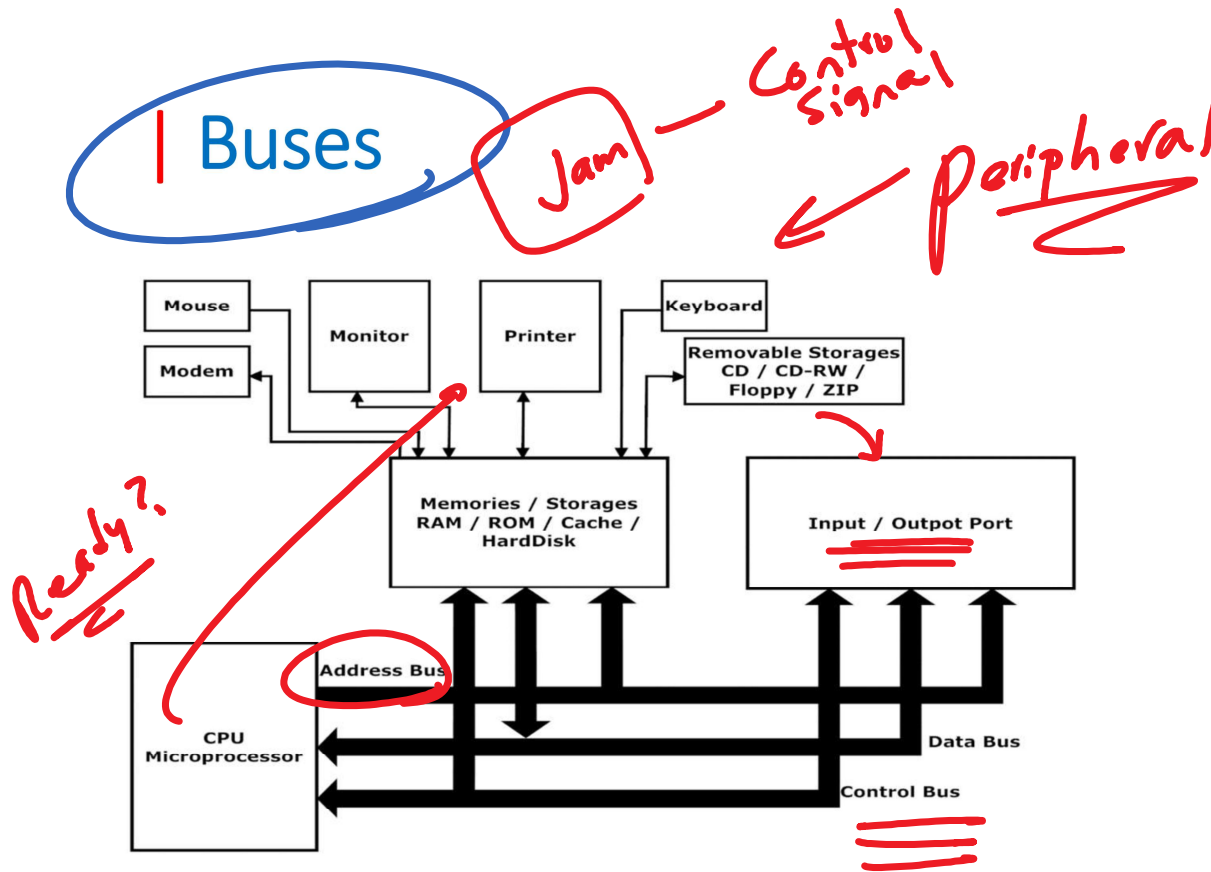
Cache

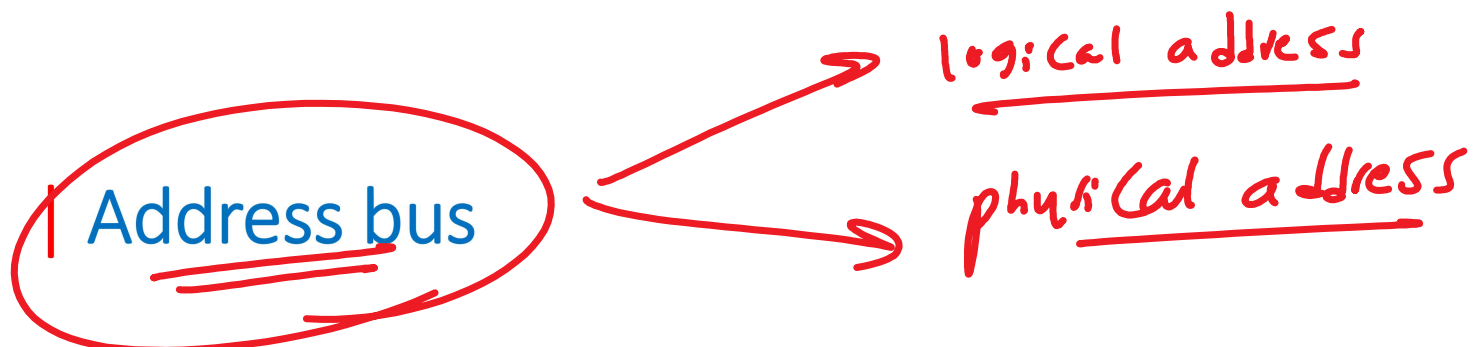
RAM

| Speeding it up

- Pipelining
- On board cache
- On board L1 & L2 cache
- Branch prediction
- Data flow analysis
- Speculative execution

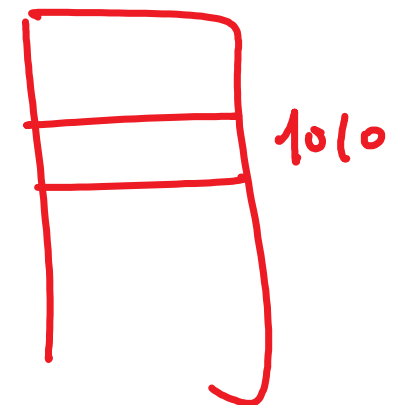
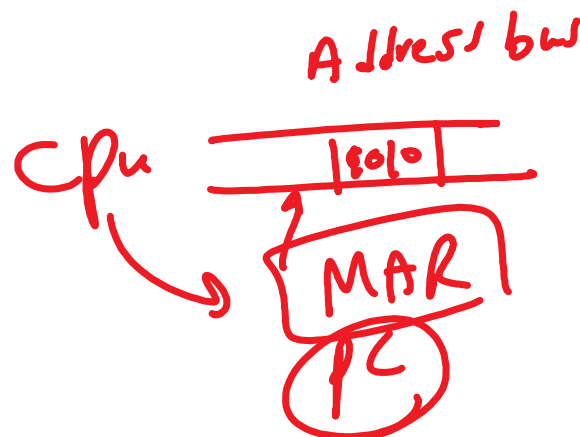






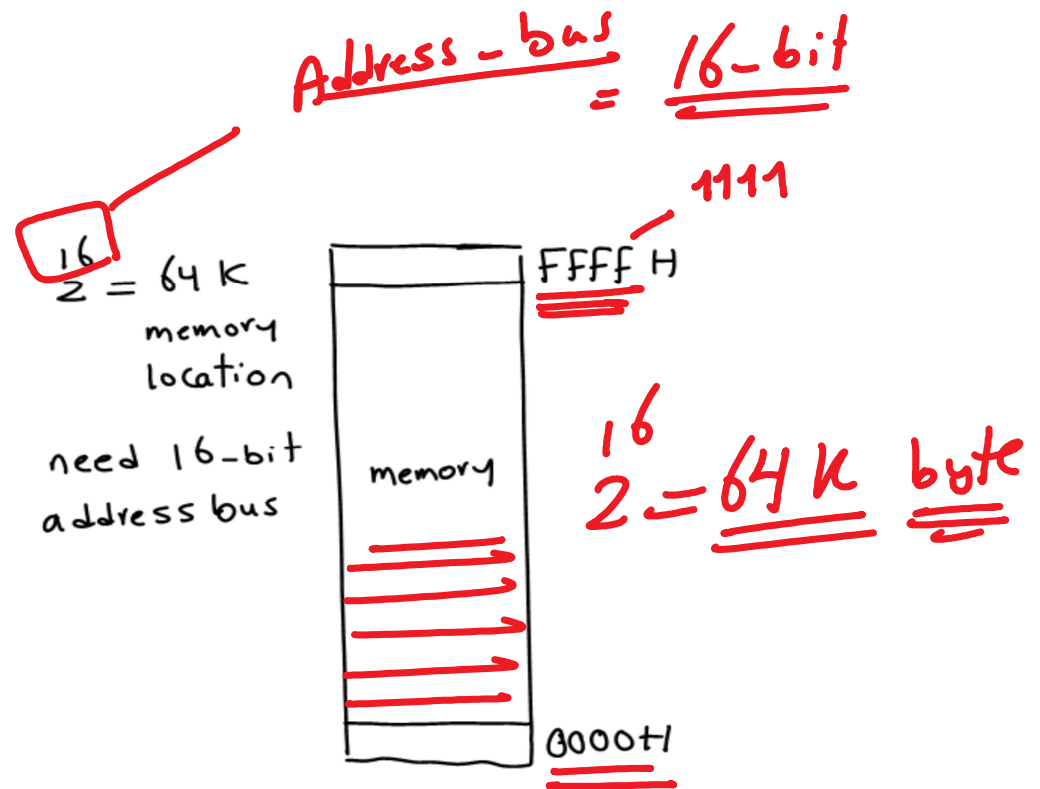
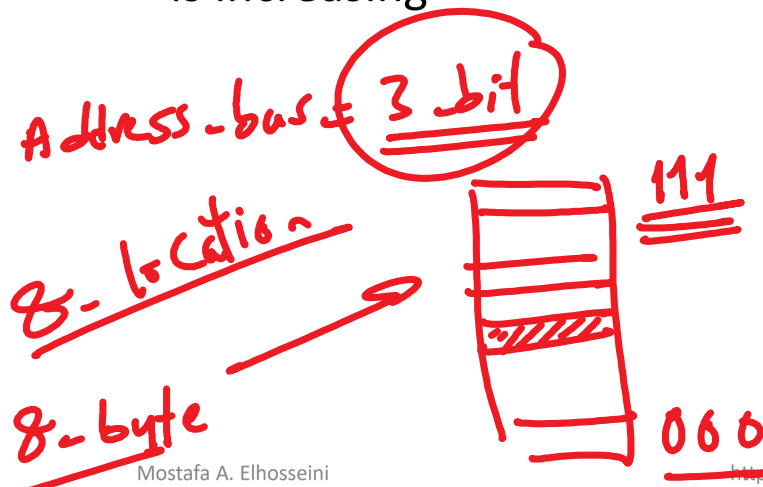
- It requests a memory location from the memory or an I/O location from the I/O devices
- It carries the **information for the address** of a specific memory location to access stored data

Unidirectional
البيانات



| Address bus

- Increasing the address bus size indicates that the memory capacity is increasing



8-byte

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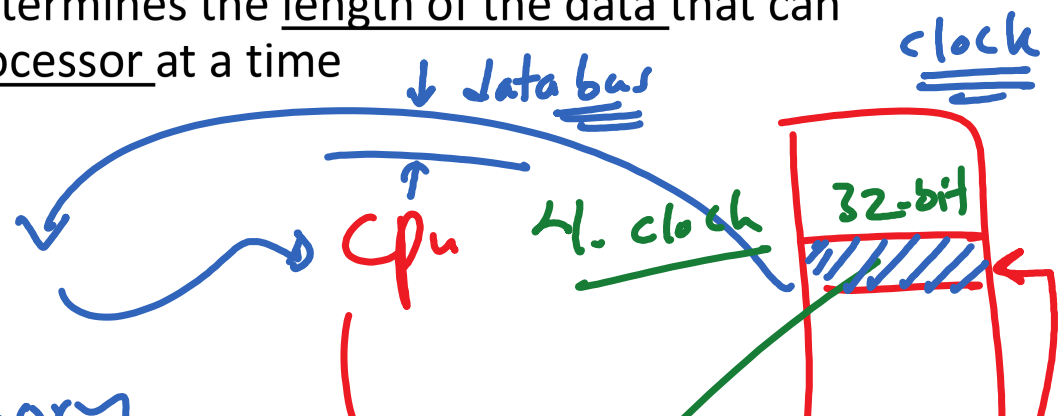
<https://youtube.com/drmelhosseini>

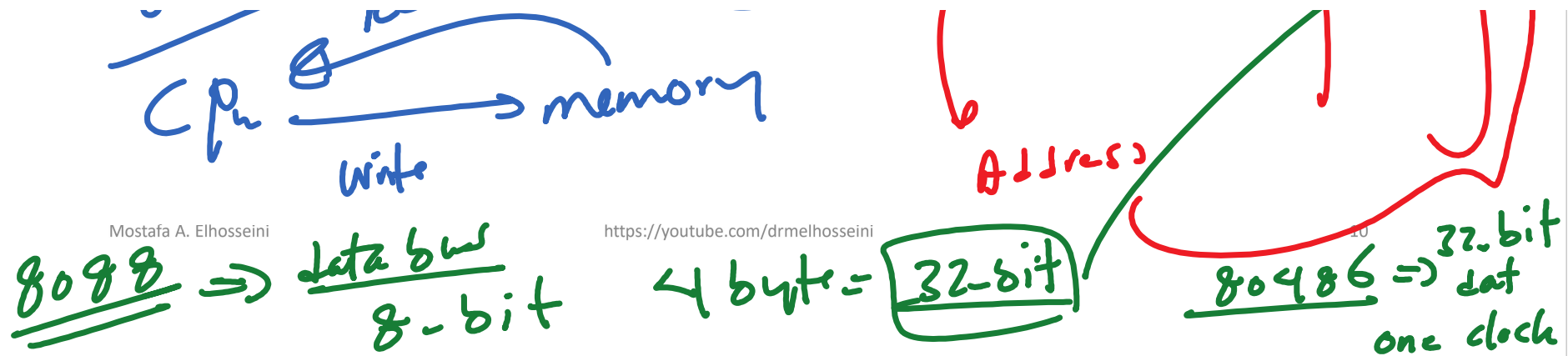
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Data bus

- It carries **data** associated with the **processing function of the CPU**
- The length of the data bus determines the length of the data that can be processed by the microprocessor at a time

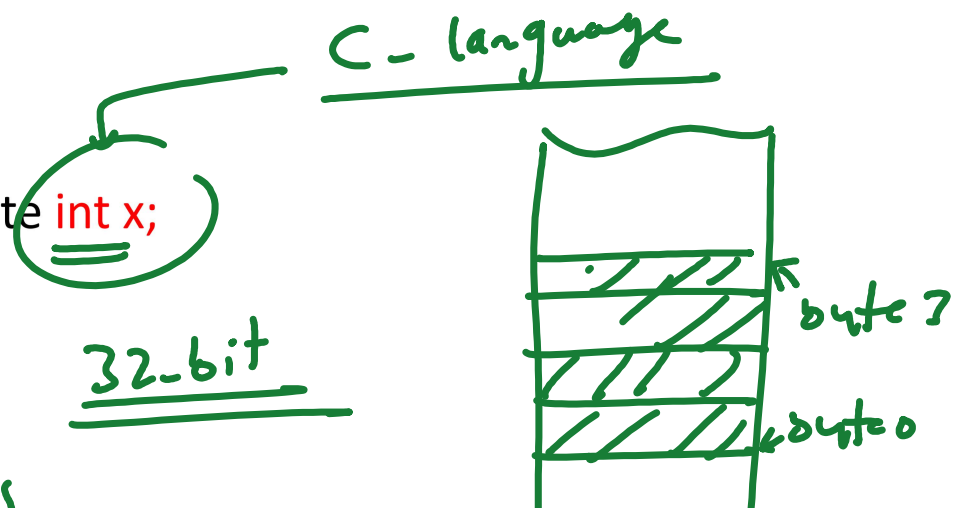
bidirectional
read





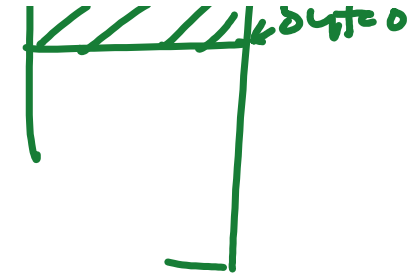
| Data bus

- In C program, you may write int x;

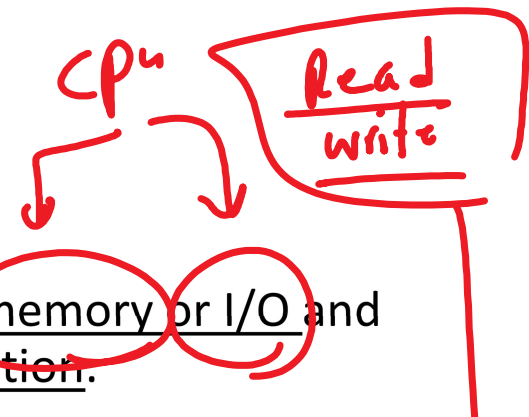


1 to bus

data bus



Control bus



- The control bus contains lines that select the memory or I/O and cause them to perform a read or a write operation.

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■ In most computer systems, there are four control bus connections:

- ✓ — $\overline{MRDC}$ (memory read control), *one-bit*
- ✓ — $\overline{MWTC}$ (memory write control),
- $\overline{IORC}$ (I/O read control), and
- $\overline{IOWC}$ (I/O write control).

Control

| Control bus

| Control bus

- Control bus lines are also used to insert special wait states for slower devices and prevent bus contention, a condition that can occur if two or more devices try to communicate at the same time.

