MICROPROCESSORS

8086 features

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OBJECTIVE

1. Understand the basic concepts of a microprocessor.
2. Understand the Intel 8086 CPU Architecture.

01 ORGANIZATION OF A MICROPROSESSOR BASED SYSTEM

02 HOW DOES A MICROPROCESSOR WORK

03 FEATURES OF 8086 MICROPROCESSOR

04 ARCHITECTURE OF 8086 MICROPROCESSOR

Organization of a microprocessor based system

→ MP → programmable integrated device → { computation / decision making capabilities

↓

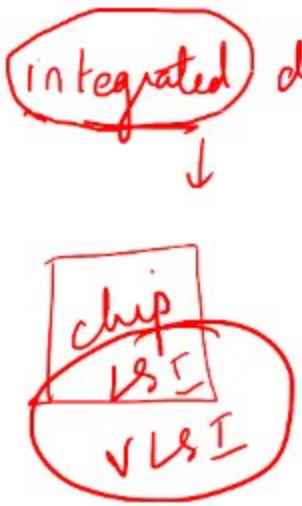
similar to CPU of a computer

Microcomputer

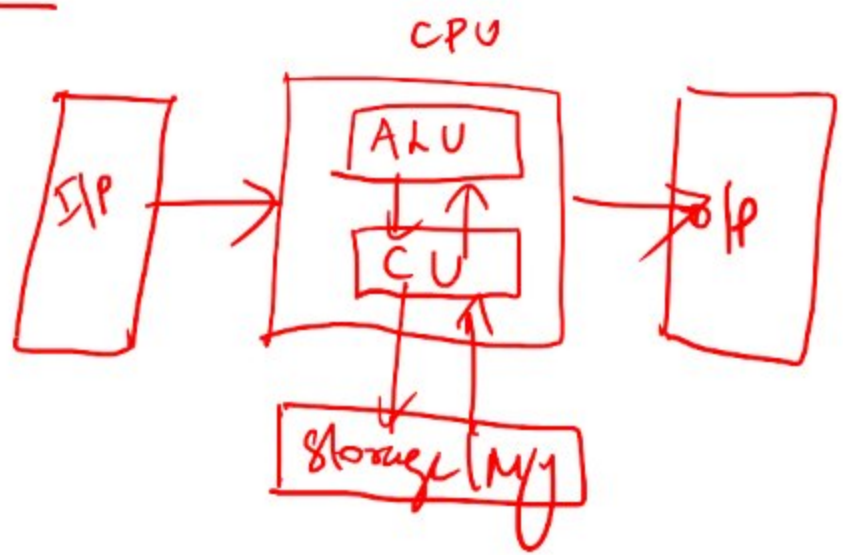
↓

MP

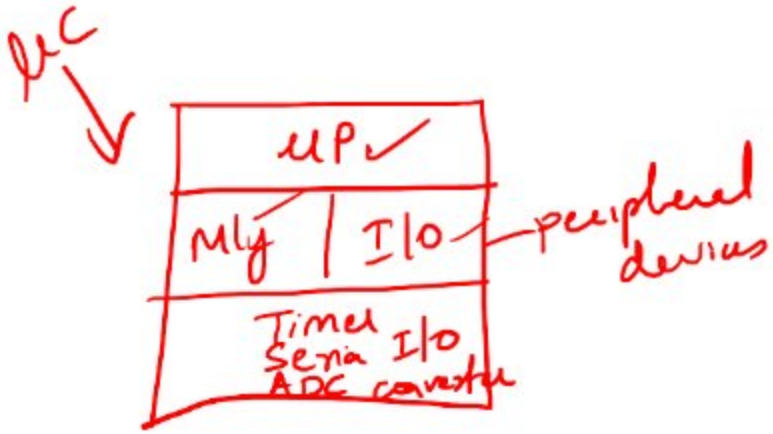
MC

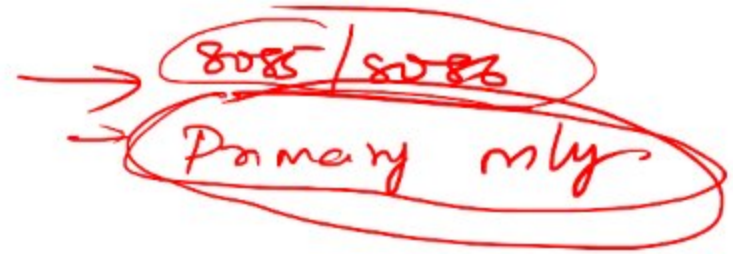


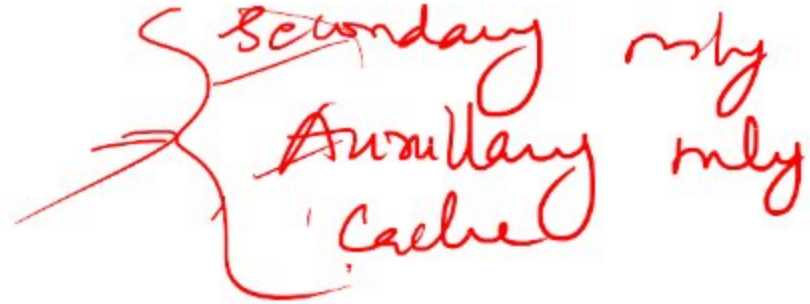
Microcomputer

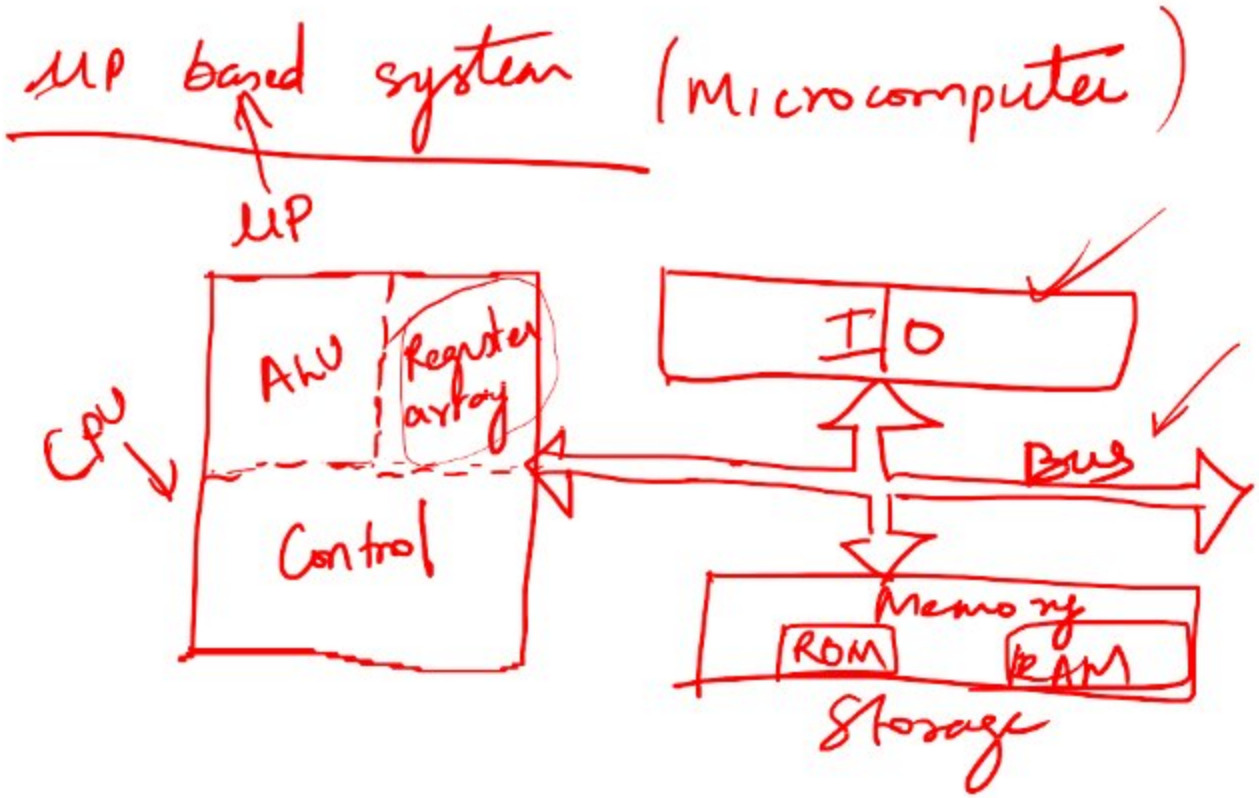


MP → CPU


μC
μP
Mly
I/O
peripheral devices
Timer
Serial I/O
ADC converter


8085 / 8086
Primary mly


Secondary mly
Auxillary mly
Cache


μP based system (Microcomputer)
μP
ALU
Register array
CPU
Control
I/O
Bus
Memory
ROM
RAM
Storage

B, D, C, HL

Read
write

Functionality

Address bus
Data bus
Control bus

3500
Read signal

Write

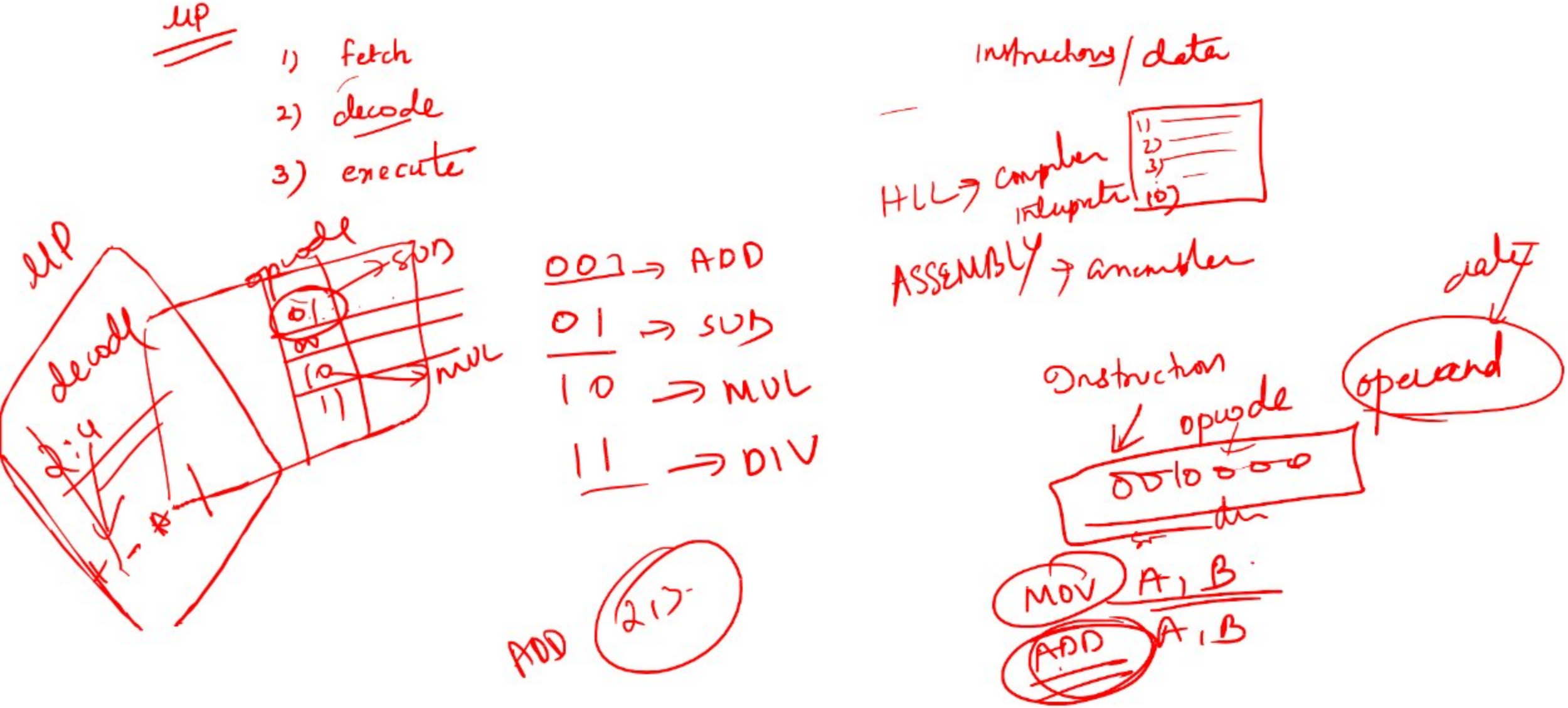
Address
Data
Control — write

BUS

The interconnections (known as Interfacing) between the 5 units of computer system is carried by 3 basic buses i) Address Bus ii) Data Bus iii) Control Bus. A bus(from the Latin *omnibus*, meaning "for all") is essentially a set of wires which is used in computer system to carry information of the same logical functionality. The function of the 3 buses is

- ✓ The **address bus** selects memory location or an I/O device for the CPU.
- ✓ The **data bus** transfers information between the microprocessor and its memory or I/O device. Data transfer can vary in size, from 8-bits wide to 64 bits wide in various members of microprocessors.
- ✓ The **Control bus** generates command signals to synchronize the CPU operation with IO and Memory devices

How does a microprocessor work?



Intel 8086 Microprocessor

Key Features:

- ✓ Introduction date: March 1978
- ✓ It is 16-bit HMOS microprocessor implemented with 29,000 transistors
- ✓ It can be operated with clock Frequency of 5MHz
- ✓ Technology: HMOS
- ✓ Number of Pins 40
- ✓ It has 20-bit Address lines and hence it can address 2^{20} = 1 Mbytes memory location.
- ✓ It can generate 16-bit address for IO devices and can address 2^{16} = 64K IO ports.
- ✓ It can be operated in two Modes : Maximum and Minimum
- ✓ It has two stage pipeline architecture.
- ✓ Number of instructions: 135 instructions with eight 8-bit registers and eight 16-bit registers
- ✓ DC Power Supply +5v

00000
00001
:
:
:
FFFFFH

memory banks > 2 banks
memory segmentation → code, stack, data, segment
fetch
execute

256 interrupts

16 bit I/O address.

2^{16} → I/O ports → 65536

$2^1 = 2$

$2^2 = 4$

$2^8 = 256$

$2^9 = 512$

$2^{10} = 1024 =$ **1K**

$2^{11} = 2 \times 2^{10} = 2K$

$2^{15} = 2^5 \cdot 2^{10} = 32K$

$2^{20} = 2^{10} \cdot 2^{10} = 1K \times 1K$

$= 1MB$ mega

8086 can access 1MB of mely

$2^{24} = 16\,MB$

$2^{30} = 2^{10} \cdot 2^{20}$

$= 1K \times 1M$

$= 1$ Giga

$2^{40} = 2^{10} \cdot 2^{30}$

$= 1K \times 1G$

$= 1$ Tera

20

2^{20} addrm.

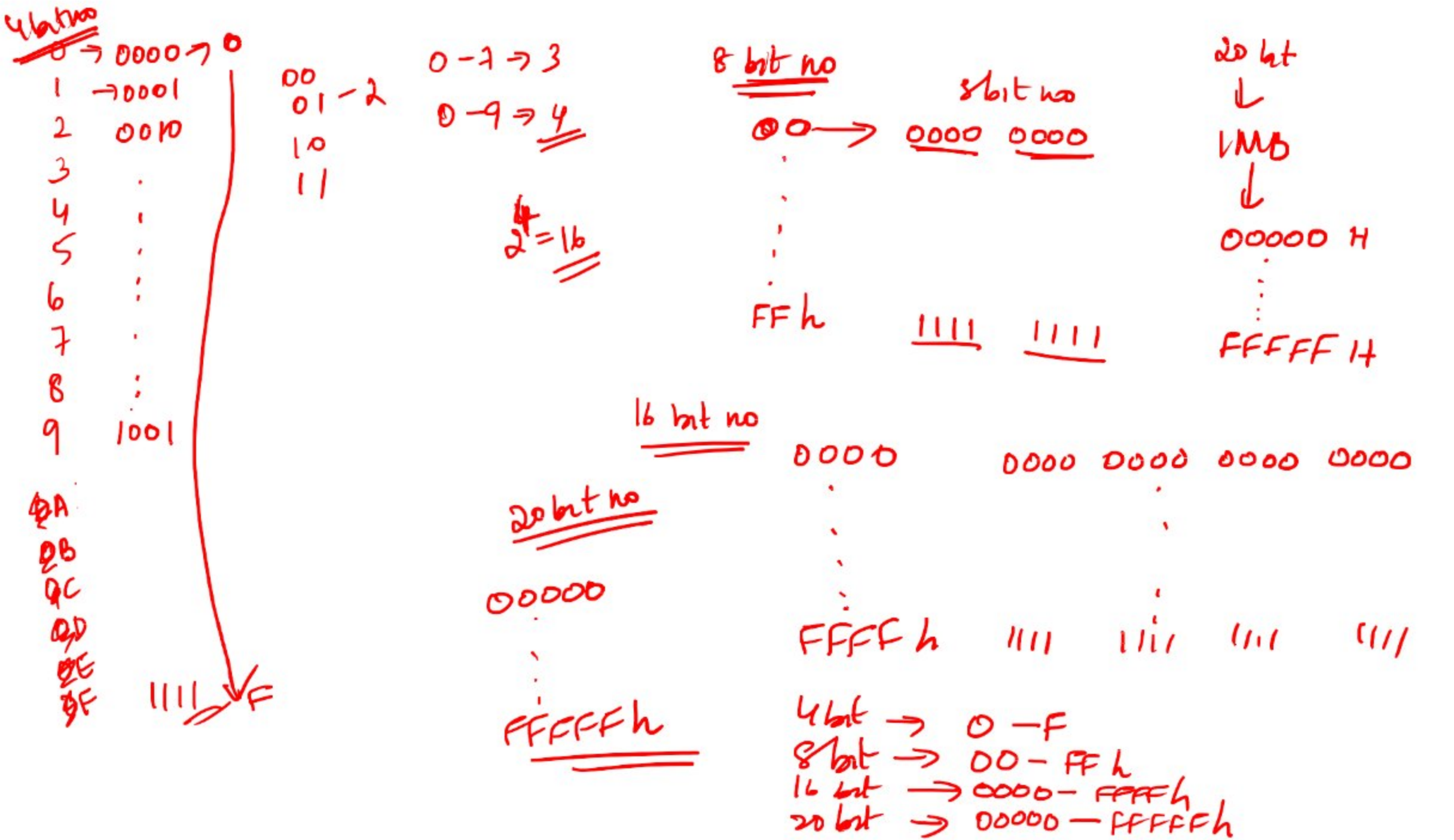
1

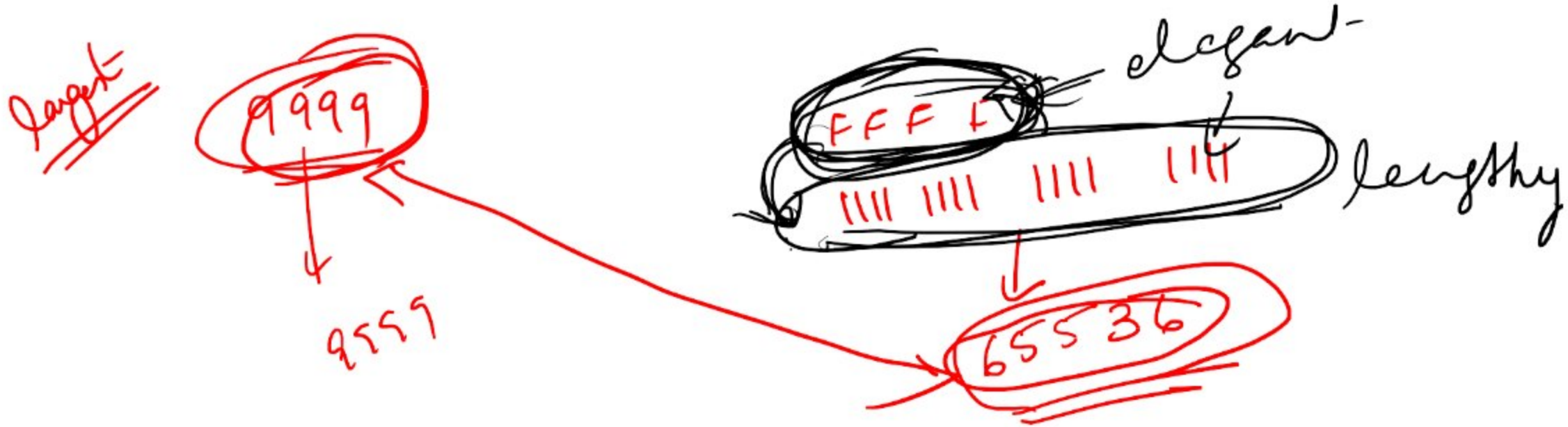
1 MB

00000

⋮

FFFFF h


4 bit no
0 → 0000 → 0
1 → 0001
2 0010
3
4
5
6
7
8
9 1001
$A
$B
$C
$D
$E
$F 1111 F
00
01 - 2
10
11
0 - 1 ⇒ 3
0 - 9 ⇒ 4
2^4 = 16
8 bit no
00 → 0000 0000
FFh
1111 1111
20 bit
1MB
00000 H
FFFFF H
16 bit no
0000 0000 0000 0000 0000
FFFFh 1111 1111 1111 1111
20 bit no
00000
FFFFFh
4 bit → 0 - F
8 bit → 00 - FFh
16 bit → 0000 - FFFFh
20 bit → 00000 - FFFFFh


target
9999
9999
FFFF
elegant-
lengthy
65536