MCU fundamentals

Embedded system :. special purpose computer system one or few dedicated functions.

constrains
Time / size \ power

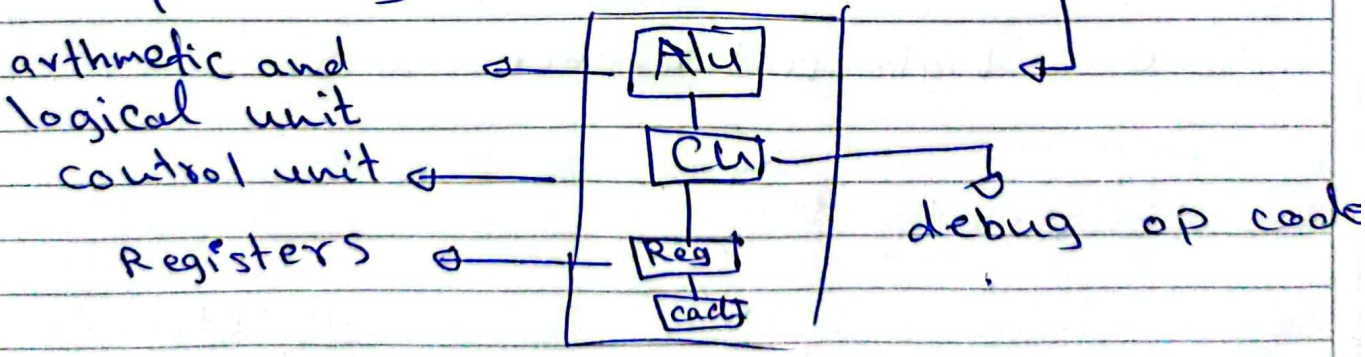
IC : integerated chip has electronics circuits acts resistor capacitor coil

VISIC :. very larg scale IC

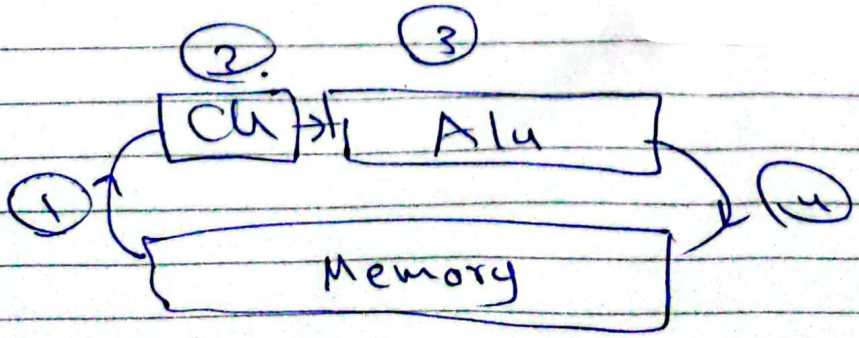
and gate ⇝ 4 transistors moore's law

Rams are Rom are IC's

Microprocessor → IC CPU



Fetch decode execute store



cycle

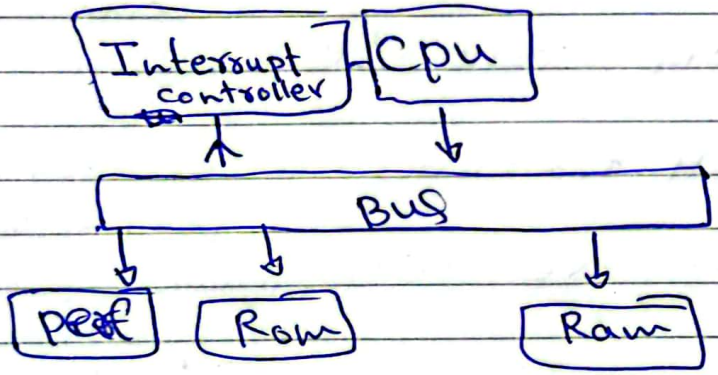
- general register ⟶ 8
  16
  32 } حسب المعمارية

add r_3, r_1, r_2

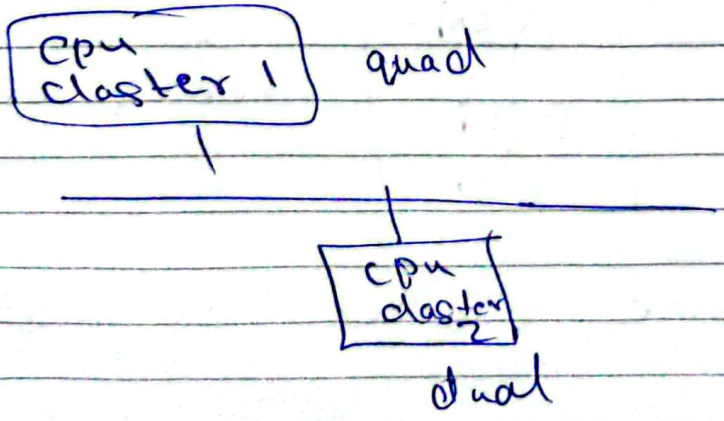
↳ CU decode the op code to execute $r_1 + r_2 \longrightarrow r_3$

pc ++

MCU
micro controller unit



SOC high performance mcu



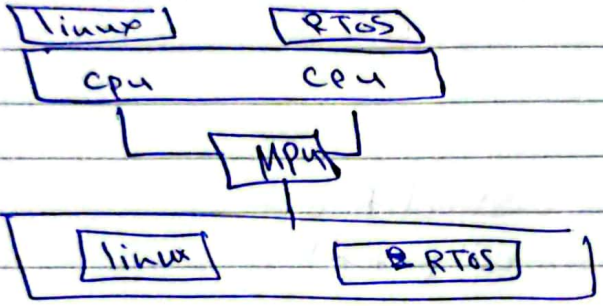
ECU electrical control unit

MPU → memory protection unit

مسؤول عن تقسيم الميموري لاجزاء

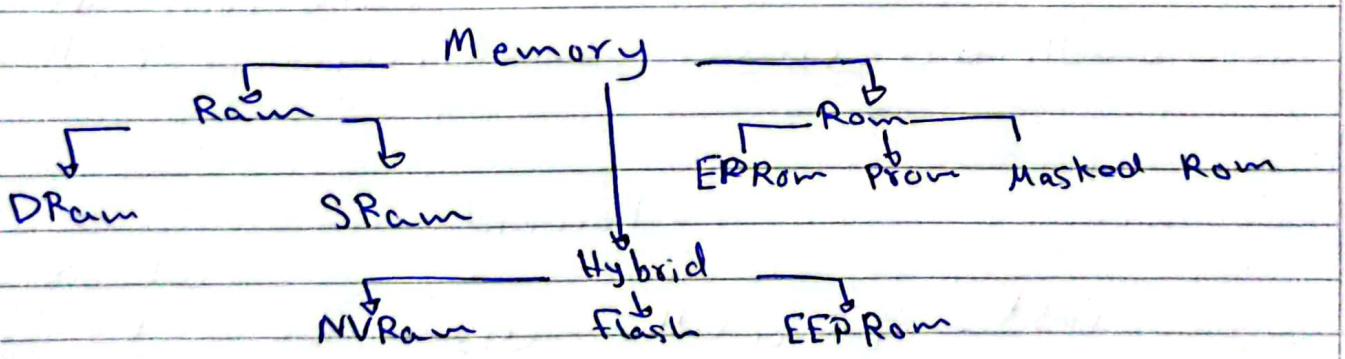
Secure

non secure



MMU ~~translator~~ memory mangment unit

virsual → physical



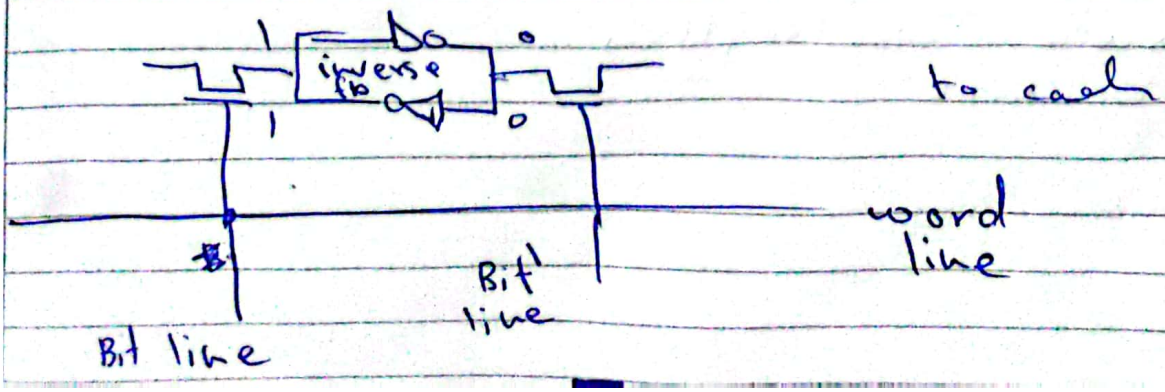
Ram → Read write memory

volatile memory

fast

Based on mosfet

SRam → 6 transistor



. DRam
. based on capacitor
. more storage
. cant be accessed while refresh time

~~Re~~ ≤ 64 ms
Refresh rate

PRom vs masked Rom
أنت اللي تحرق — المصنع اللي بيحرق

Von neumann

. كله باص واحد
. الـ CPU مينفعش يأكسس ميموري في نفس الوقت

Harvard

. 2 باص
. واحد مع الميموري والتاني مع inst

modified harvard

. الميموري و inst على بلوك واحد وله 2 باص

why Von neumann is used in com and Harvard in mcu

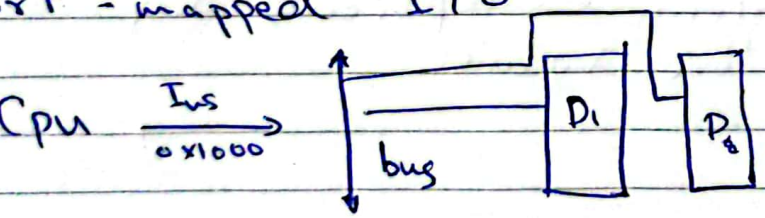
- Signal ~~tags~~ length.
- Archititure

- pipe line can be used by harvard

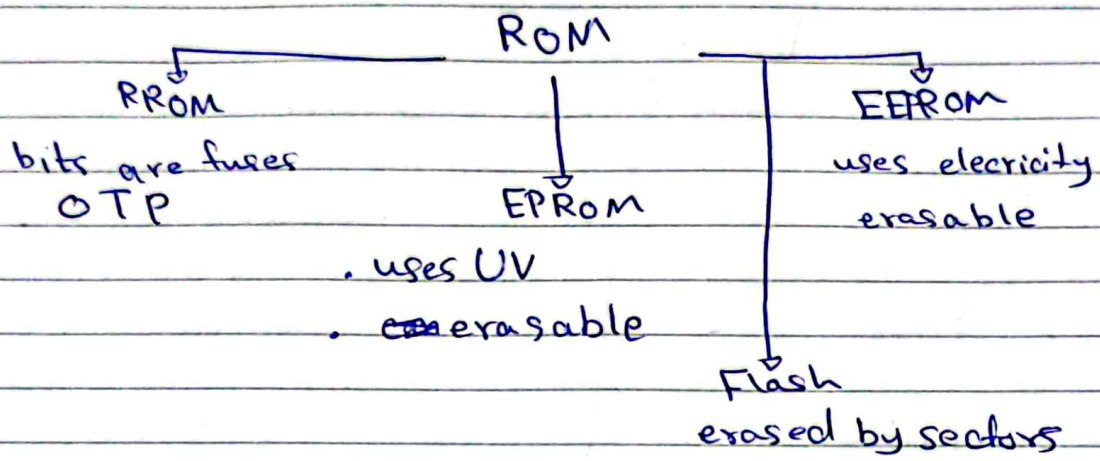
- CISC vs RISC

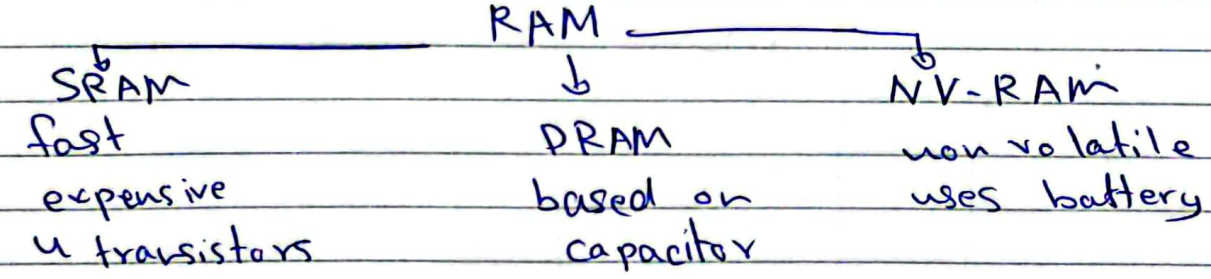
CISC	RISC
Complex instruction Set computer	Reduced instruction set computer
• Larg instruction	• Simple
• can't support pipeline	• support pipeline
• complex hardware	• based around arm
• more power	• Saver
• high clock	• low

Port - mapped I/O



الانستراكشن يحدد البورت (Address) الي رايح له





Q6
- because CPU can't write on it

Q7.

Type	volatile	W	Erase	Mx erases	cost	Speed
SRAM	✓	✓	byte	∞	high	high
						↓
DRAM	✓	✓	byte	∞	low	low
ROM masked	x	x	—	—	low	fast
EPROM	x	✓	byte	10000s	mod	fast
EEPROM	x	✓	byte	1000 s	high	fast
Flash	x	✓	sector	datasheet	mod	fast
NV-Ram	x	✓	byte	∞	high	fast

Date: ..... : الموافق ..... : التاريخ

- MPU vs MCU

• general	• specific task
• no prefirals	• has prefirals
• can extend Memory	• can't extend memory.