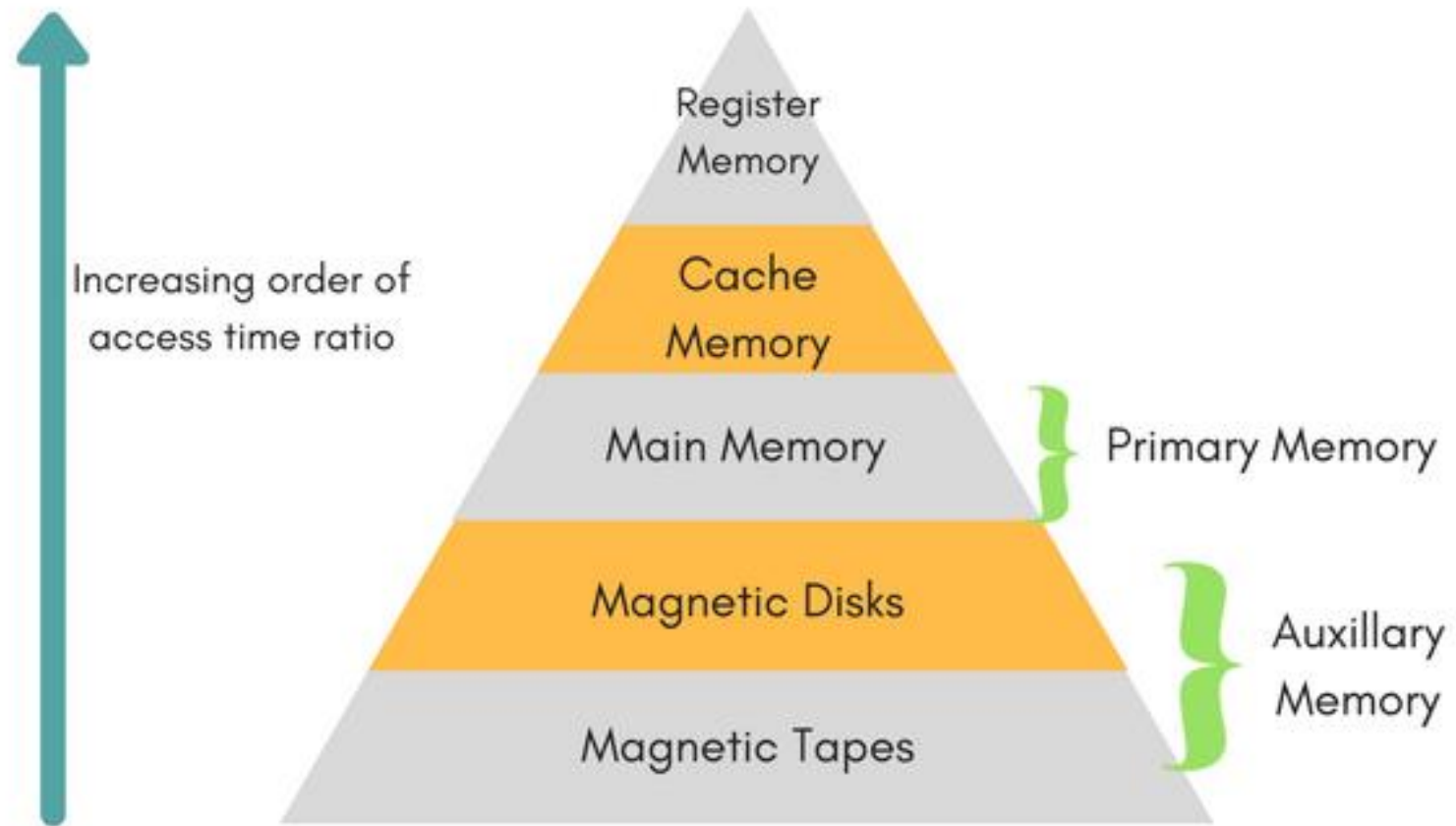


Registers

What is Register

- A register is a very small amount of fast memory, that is built in the CPU (or Processor) in order to speed up the operation.
- Register is very fast and efficient than the other memories like RAM, ROM, external memory etc,.
- That's why the registers occupied the top position in memory hierarchy model.

Memory hierarchy model



Register organization

- The 8086 microprocessor has a total of fourteen registers that are accessible to the programmer.
- All these registers are 16-bit in size. The registers of 8086 are categorized into 5 different groups.

Register organization

1. General Registers
2. Index Registers
3. Segment Registers
4. Pointer Registers
5. Flag Register

General Purpose Registers

AX	AH	AL	Accumulator
BX	BH	BL	Base
CX	CH	CL	Count
DX	DH	DL	Data

Pointer and Index Registers

SP		Stack Pointer
BP		Base Pointer
SI		Source Index
DI		Destination Index
IP		Instruction Pointer

Segment Registers

CS		Code Segment
DS		Data Segment
SS		Stack Segment
ES		Extra Segment

	Flags
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General Purpose Registers

- All general registers of the 8086 microprocessor can be used for arithmetic and logic operations. These all general registers can be used as either 8-bit or 16-bit registers.

AX (Accumulator)

- AX is used as 16-bit accumulator. The lower 8-bits of AX are designated to use as AL and higher 8-bits as AH. AL can be used as an 8-bit accumulator for 8-bit operation.
- This Accumulator used in arithmetic, logic and data transfer operations. For manipulation and division operations, one of the numbers must be placed in AX or AL

BX (Base Register)

- BX is a 16 bit register, but BL indicates the lower 8-bits of BX and BH indicates the higher 8-bits of BX. The register BX is used as address register to form physical address in case of certain addressing modes (ex: indexed and register indirect).
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CX (Count Register)

- The register CX is used default counter in case of string and loop instructions. Count register can also be used as a counter in string manipulation and shift/rotate instruction.



DX (Data Register)

- DX register is a general purpose register which may be used as an implicit operand or destination in case of a few instructions. Data register can also be used as a port number in I/O operations.



Segment Registers

- The 8086 architecture uses the concept of segmented memory. 8086 can able to access a memory capacity of up to 1 megabyte. This 1 megabyte of memory is divided into 16 logical segments. Each segment contains 64 Kbytes of memory.

Segment Registers

- There are four segment registers to access this 1 megabyte of memory. The segment registers of 8086 are:

1. Code Segment Register
2. Data Segment Register
3. Stack Segment Register
4. Extra Segment Register

General Purpose Registers

AX	AH	AL	Accumulator
BX	BH	BL	Base
CX	CH	CL	Count
DX	DH	DL	Data

Pointer and Index Registers

SP		Stack Pointer
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Segment Registers

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CS (Code Segment) Register

- Code segment (CS) is a 16-bit register that is used for addressing memory location in the code segment of the memory (64Kb), where the executable program is stored. CS register cannot be changed directly. The CS register is automatically updated during far jump, far call and far return instructions.

Stack segment (SS) Register

- Stack Segment (SS) is a 16-bit register that used for addressing stack segment of the memory (64kb) where stack data is stored. SS register can be changed directly using POP instruction.

Data segment (DS) Register

- Data Segment (DS) is a 16-bit register that points the data segment of the memory (64kb) where the program data is stored. DS register can be changed directly using POP and LDS instructions.

Extra segment (ES) Register

- Extra Segment (ES) is a 16-bit register that also points the data segment of the memory (64kb) where the program data is stored. ES register can be changed directly using POP and LES instructions.

Index Registers



- The index registers can be used for arithmetic operations but their use is usually concerned with the memory addressing modes of the 8086 microprocessor (indexed, base indexed and relative base indexed addressing modes).
- The index registers are particularly useful for string manipulation.

SI (Source Index)



- SI is a 16-bit register. This register is used to store the offset of source data in data segment. In other words the Source Index Register is used to point the memory locations in the data segment.

DI (Destination Index)

- DI is a 16-bit register. This is destination index register performs the same function as SI. There is a class of instructions called string operations that use DI to access the memory locations in Data or Extra Segment.



Pointer Registers

- Pointer Registers contains the offset of data(variables, labels) and instructions from their base segments (default segments). 8086 microprocessor contains three pointer registers.

SP (Stack Pointer)

- Stack Pointer register points the program stack that means SP stores the base address of the Stack Segment.

General Purpose Registers

AX	AH	AL	Accumulator
BX	BH	BL	Base
CX	CH	CL	Count
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Pointer and Index Registers

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SI		Source Index
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Segment Registers

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	Flags
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IP (Instruction Pointer)

- The Instruction Pointer is a register that holds the address of the next instruction to be fetched from memory. It contains the offset of the next word of instruction code instead of its actual address.

BP (Base Pointer)

- Base Pointer register also points the same stack segment. Unlike SP, we can use BP to access data in the other segments also.

Flag Name	Set	Clear
Overflow(yes/no)	OV	NV
Direction(increment/decrement)	DN	UP
Interrupt(enable/disable)	EI	DI
Sign(negative/positive)	NG	PL
Zero(yes/no)	ZR	NZ
Auxiliary carry(yes/no)	AC	NA
Parity(even/odd)	PE	PO
Carry(yes/no)	CY	NC

Flag Register of 8086 MP

