COURSE: UCS1502 - MICROPROCESSORS AND INTERFACING

Microprocessor 8086 architecture: Instruction queue and Flag register

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This presentation covers

• Instruction queue and flags of 8086

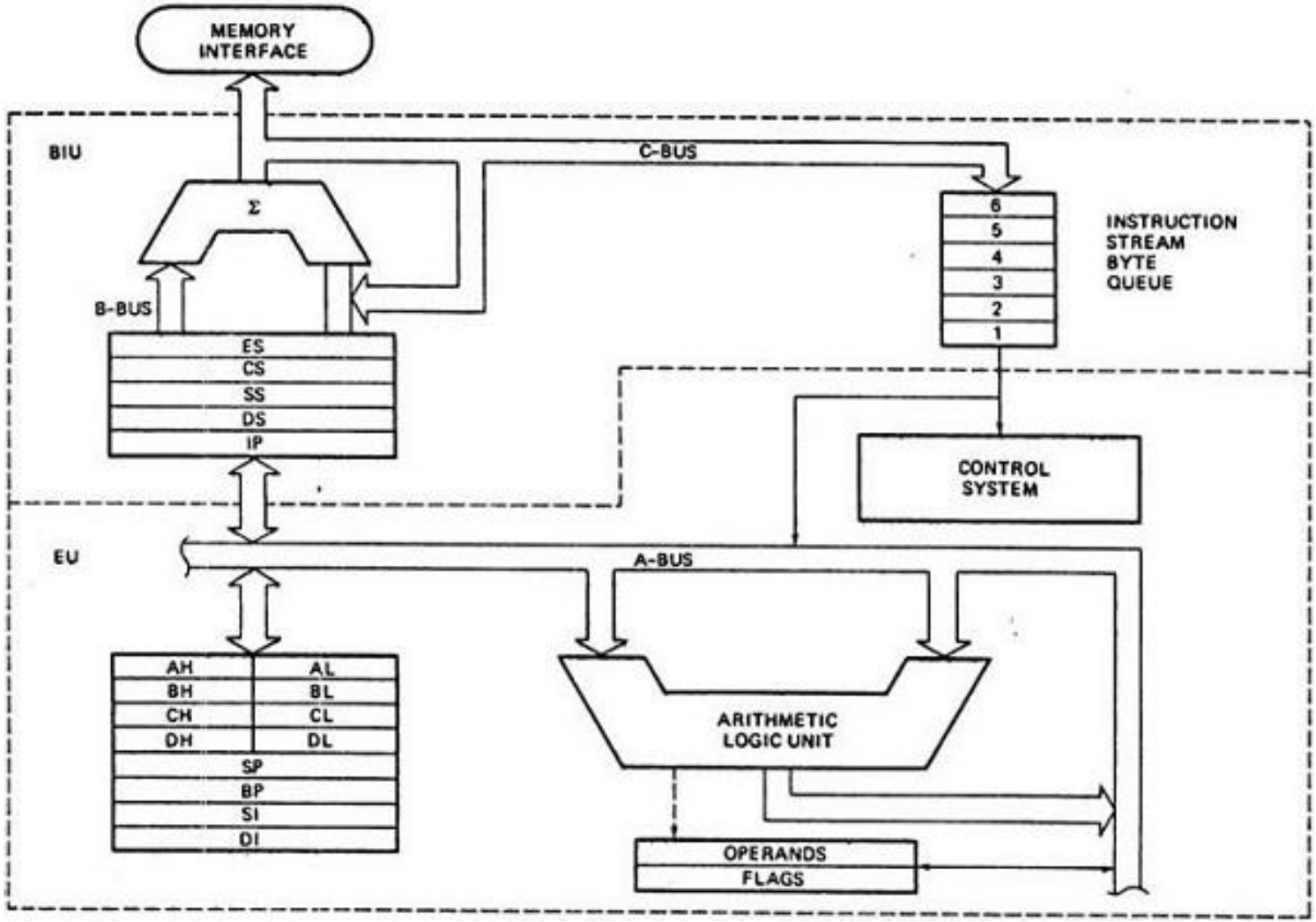
Learning Outcome of this Module

• To understand instruction queue and various flags of 8086

Do you know ??

- What is the use of instruction queue ?
- What are the different flags available in 8086

Internal architecture of 8086 – cont.



Instruction Queue

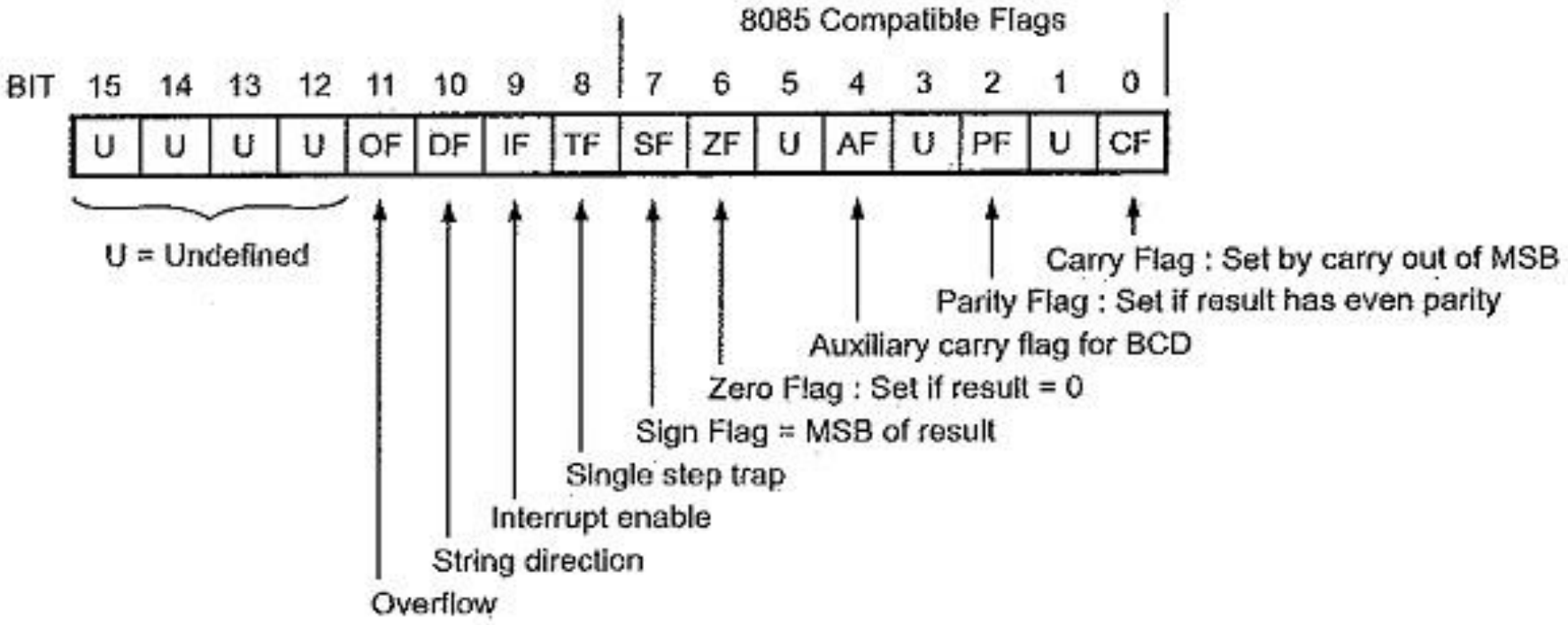
Instruction queue (6 bytes):

- 8086 instruction format varies from 1 to 6 bytes
- BIU gets up to 6 bytes of next instructions and stores them in the instruction queue.
- Fetching the next instruction while EU executes the current instruction
- When EU executes instructions and is ready for its next instruction, then it simply reads the instruction from this instruction queue resulting in increased execution speed.

Flags of 8086

A flag is a flip-flop which indicates some condition produced by the execution of an instruction.

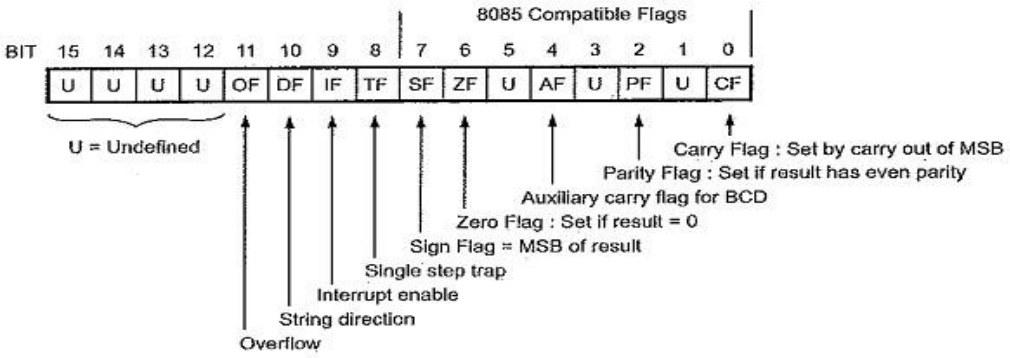
Flag Register



Flags of 8086

Flags classification

- Conditional flags or status flags
    - Lower byte of flag register + Overflow flag
    - Reflects the results of ALU
- Machine control flags
    - Direction flag (DF)
    - Interrupt flag (IF)
    - Trap flag (TF)



Conditional flags of 8086

- SF - Sign Flag : MSB of Result
- ZF – Zero Flag - Set if the ALU result is zero
- AF - Auxiliary Flag
  When an operation is performed at ALU, it results in a carry from lower nibble (D0 – D3) to upper nibble (D4 – D7), then this flag is set, i.e. carry given by D3 bit to D4 is AF flag. The processor uses this flag to perform binary to BCD conversion.
- PF – Parity Flag
  Set if the lower 8 bit of the result has even number of 1's (8086 follows odd parity)
- CF – Carry Flag - Set if a carry is generated after an 8 bit / 16 bit ALU operations
- OF – Overflow Flag - Set if a carry into MSB and no carry out of MSB

Machine control flags of 8086

- DF – Used by string manipulation instructions
  If 0 – process from lower to higher address (auto increment)
  If 1 – Process from higher to lower address (auto decrement)
  (Instructions: CLD - Clear direction flag, STD – Set direction flag)

- IF - It is an interrupt enable/disable flag, i.e. used to allow/prohibit the interruption of a program. It is set to 1 for interrupt enabled condition and set to 0 for interrupt disabled condition.
  (Instructions: STI – Set interrupt flag, CLI – Clear interrupt flag)

- TF - It is used for single step control and allows the user to execute one instruction at a time for debugging. If it is set, then the program can be run in a single step mode.

References

- Doughlas V. Hall, “Microprocessors and Interfacing, Programming and Hardware”, Second Edition, TMH, 2012.

Thank you