Chapter 4 Data Movement Instructions

Assoc. Prof. Dr. Gazi Erkan BOSTANCI

Slides are mainly based on The Intel Microprocessors by Barry B. Brey, 2008

- mov, push, pop sample

- LEA: Loads a 16 or 32 bit register with the offset address of the data specified by the operand.

```
LEA BX, [DI]; loads the offset address specified by
[DI], contents of DI into BX register.
MOV BX, [DI]; loads the data stored at the memory
location addressed by [DI] into register BX
❖MOV BX, OFFSET DATA1; the same as LEA BX, DATA1
```

- LDS: Loads any 16 or 32 bit register with an offset address and the DS segment register with a segment address.
  - LDS BX, [DI]; Transfers the 32 bit number addressed by DI in the data segment into BX and DS registers

- LODS: Loads AL or AX with data stored at the data segment offset address indexed by the SI register

```
LODSB    -> AL = DS:[SI]
              SI = SI ± 1
LODSW    -> AX = DS:[SI]
              SI = SI ± 2
```

❖Note that the increment or decrement operation on the SI is decided by the value of the D (direction) flag.
- STD for setting (D=1 -> decrement)
- CLD for clearing (D=0 -> increment)

- STOS: Stores AL or AX at the extra segment memory location addressed by the DI register.

```
STOSB     ->ES:[DI] = AL

             DI = DI ± 1
STOSW   -> ES:[DI] = AX
             DI = DI ± 2
```

❖Same applies to DI for this instruction.

- MOVS: Transfers a byte, word or doubleword from the data segment location addressed by SI to the extra segment location addressed by DI.

```
MOVSB    -> ES:[DI] = DS:[SI] ;(byte transfer)
              DI = DI ± 1
              SI = SI ± 1
MOVSW    -> ES:[DI] = DS:[SI] ;(word transfer)
              DI = DI ± 2
              SI = SI ± 2
MOVSD    -> ES:[DI] = DS:[SI] ;(double word transfer)
              DI = DI ± 4
              SI = SI ± 4
```

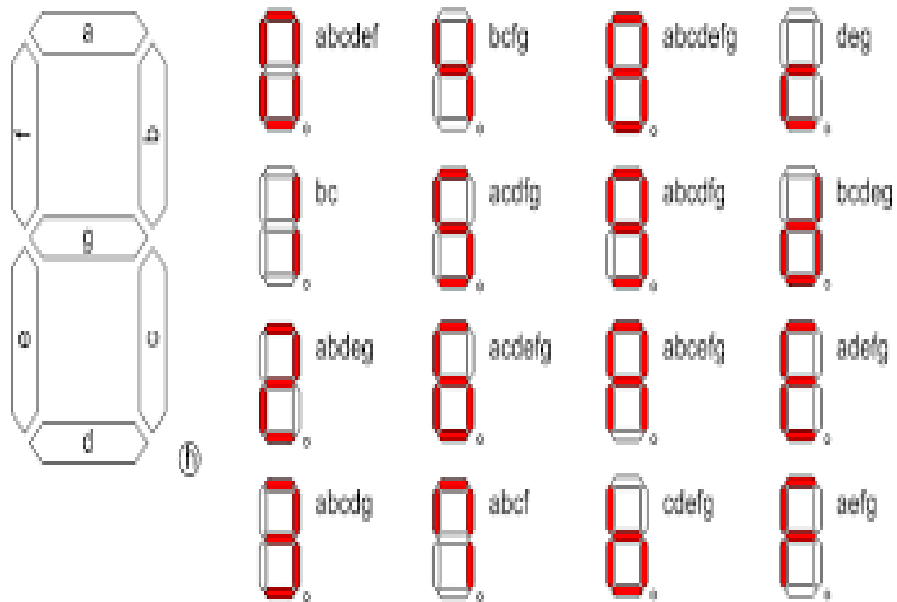- XCHG: Exchanges the contents of a register with the contents of any other register or memory location.

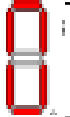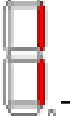 ❖It cannot Exchange segment registers or memory-to-memory data.
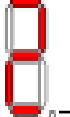
  XCHG AL, CL; Exchanges the contents of AL and CL

  XCHG AL, DATA2; Exchanges the contents of AL with the data segment memory location DATA2

- XLAT: Converts the contents of the AL register into a number stored in a memory table.
  - This is used to convert a BCD number into 7-segment code.

				-gfe	dcba		
0	->	3FH	->	0011	1111	->	
1	->	06H	->	0000	0110	->	
2	->	5BH	->	0101	1011	->	

- IN and OUT: Perform I/O operations.
  - In instruction transfers data from an external I/O device into AL or AX.
  - Out instruction transfers data from AL or AX to an external I/O device.

```
IN AL, p8; 8bits are input to AL from I/O port p8.
IN AX, p8; 16 bits are input to AX from I/O port p8.
OUT p8, AL, 8 bits are output to I/O port p8.
```
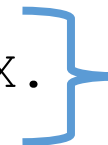
Fixed port addressing

```
OUT DX, AX; 16 bits are output to I/O port DX from AX.
```

Variable port addressing: The port number is stored in DX, and can be changed during the program execution.