COAL LAB - Fall 2020

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Strings

Direction Flag (DF) is used for the movement in string. You can read from higher addresses to lower addresses or lower addresses to higher addresses. If the DF is set then the direction is from higher to lower addresses but if the DF is cleared then it's vice versa.

To clear the DF: **cld**
To set the DF: **std**

REP Prefix:
REP repeats the following string instruction CX times. After a cycle of loop is completed, CX decrements by one. This decrement doesn't affect any flags.

REPE and REPNE Prefixes:
REPE or REPZ repeat the following string instruction while the zero flag is set and REPNE or REPNZ repeat the following string instruction while the zero flag is not set. REPE or REPNE are used with SCAS or CMPS instructions.

STOS:
STOS transfers a byte or word from AL or AX register to the string element addressed by ES:DI and updates DI to point to the next location.

Usage: Used to clear a block of memory or fill it with a constant.

STOSB = used for byte
STOSW = used for word

- If DF is clear, DI will be incremented by one (for byte) or two (for word).
- If DF is set DI will be decremented by one (byte) or two (word).
- If REP is used before calling STOSB/W then the process will be repeated CX (it's used for loop) times. But REP will run independently of STOSB or STOSW i.e. CX will be decremented after every loop cycle by *one* only irrespective of STOSB, STOSW and status of DF.

Example 7.1 - Clearing the screen

LODS:
LODS transfers a byte or word from source location DS:SI to AL or AX register and updates SI to point to next location.

Usage: Used in a loop - not with REP

LODSB = used for byte
LODSW = used for word

Example 7.2 - String printing

SCAS:
SCAS compares a source byte or word in AL or AX register with the destination string element addressed by ES:DI and updates the flags. DI is updated to point to next location.

Usage: To locate equality or in-equality in a string through the use of an appropriate prefix.

SCASB = used for byte
SCASW = used for word

- Used like the CMP instruction as it does subtraction of its operands.
- REPE (repeat while equal) and REPNE (repeat while not equal) are used before SCASB/W.
- Used to locate a byte in AL in the block of memory.

Example 7.3 - String Length

LES and LDS:
LES and LDS instructions load a segment register and a general purpose register from two consecutive memory locations.
LES loads ES register while LDS loads DS register.
Both instructions have two parameters; one is the general purpose register to be loaded and the other is the memory location from which to load these registers.
The major application of these instructions is when a subroutine receives a segment offset pair as an argument and the pair is to be loaded in a segment and an offset register.

Example 7.4

MOVS:
MOVS transfers a byte or word from the source location DS:SI to the destination ES:DI and updates SI and DI to point to next locations.

Usage: To move a block of memory.

MOVSB = used for byte
MOVSW = used for word

It is possible that source and destination blocks overlap so DF resolves the issue here. For example when the source and destination blocks overlap and the source is below the destination copy must be done upwards while if the destination is below the source copy must be done downwards. We cannot perform both these copy operations properly if the direction flag
was not provided. If the source is below the destination and an upwards copy is used the source to be copied is destroyed. If however the copy is done downwards the portion of source destroyed is the one that has already been copied. So, DF is needed to handle this problem.

Example 7.5 - Screen Scrolling (Up)
Example 7.6 - Screen Scrolling (Down)

CMPS:
CMPS subtracts (byte by byte or word by word) the source location DS:SI from the destination location ES:DI without affecting the source and destination. SI and DI are updated accordingly.

Usage: To compare two blocks of memory for equality and inequality.

CMPSB = used for byte
CMPSW = used for word

Only REPE or REPNE are used before this instruction and repeat as long as the blocks are the same or as long as they are different.

Example 7.7 - String Comparison