Chapter FOUR

INT 21H Programming

The x86 PC

assembly language,
design, and interfacing

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- Use INT 21H function calls to:
  - Input characters from the keyboard.
  - Output characters to the screen.
  - Input strings.
  - Output strings.

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- ## The INT instruction is somewhat like a FAR call.
    - Saves CS:IP and the flags on the stack and goes to the subroutine associated with that interrupt.

    ```
    INT    xx;the interrupt number xx can be 00 - FFH
    ```

    - In x86 processors, 256 interrupts, numbered 00 to FF.
        - **INT 10H** and **INT 21H** are the most widely used with various functions selected by the value in the AH register.

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4.2: DOS INTERRUPT 21H

- In previous chapters, a fixed set of data was defined in the data segment & results viewed in a memory.
  - This section uses information inputted from the keyboard, and displayed on the screen.
    - A much more dynamic way of processing information.
- When the OS is loaded, INT 21H can be invoked to perform some extremely useful functions.
  - Commonly referred to as DOS INT 21H function calls.

- INT 21H can send a set of ASCII data to the monitor.
  - Set AH = 09 and DX = offset address of the ASCII data.
    - Displays ASCII data string pointed at by DX until it encounters the dollar sign "$".

- The data segment and code segment, to display the message *"The earth is but one country"*:

```
DATA_ASC      DB      'The earth is but one country','$'

MOV   AH,09                ;option 09 to display string of data
MOV   DX,OFFSET DATA_ASC   ;DX= offset address of data
INT   21H                  ;invoke the interrupt
```

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- To output only a single character, **02** is put in **AH**, and **DL** is loaded with the character to be displayed.

- The following displays the letter *"J"*:

```
MOV     AH,02       ;option 02 displays one character
MOV     DL,'J'      ;DL holds the character to be displayed
INT     21H         ;invoke the interrupt
```

  – This option can also be used to display '$' on the monitor as the string display option (option 09) will not display '$'.

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- This functions waits until a character is input from the keyboard, then echoes it to the monitor.
  - After the interrupt, the input character will be in AL.

```
MOV     AH,01   ;option 01 inputs one character
INT     21H     ;after the interrupt, AL = input character (ASCII)
```

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- A means by which one can get keyboard data from & store it in a predefined data segment memory area.
  - Register AH = 0AH.
  - DX = offset address at which the string of data is stored.
    - Commonly referred to as a buffer area.
- DOS requires a buffer area be defined in the data segment.
  - The first byte specifies the size of the buffer.
  - The number of characters from the keyboard is in the second byte.
  - Keyed-in data placed in the buffer starts at the third byte.

- Use this directive to define a buffer area for the string keyboard input:

```
DATA_BUF      LABEL BYTE
MAX_SIZE      DB      10
BUF_COUNT     DB      ?
BUF_AREA      DB      10 DUP(20H)
```

- In the code segment the data can be accessed by name as follows:

```
MOV     AH,0AH          ;load string into buffer
MOV     DX,OFFSET DATA_BUF
INT     21H
MOV     CL,BUF_COUNT;load the actual length of string
MOV     SI,OFFSET BUF_AREA;SI=address of first byte of string
```

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