Lesson 06: Programmed IO
Objective

- Understand the programmed IO mode of data transfer
- Learn that the program waits for the ready status by repeatedly testing the status bit(s) and data transfer is only when other end ready
Three modes of transfer of device data, commands and status

(i) Programmed IO
(ii) Interrupt driven IO
(iii) Direct memory access (DMA)
Programmed IO mode input data transfer
Read Input in Programmed IO mode

(i) Each input is read after first testing whether the device is ready with the input (a state reflected by a bit in a status register) or whether the device input buffer is not empty
Input read by the processor in programmed I/O mode

1. Program
2. Read status bit and test whether the device is ready with the data
3. Yes
4. Input Not Ready
5. Wait for a period
6. Next step of the program
7. Read byte(s)
8. Yes
9. Test more bytes to be read
10. No
Input read in Programmed IO mode

- The program waits for the ready status by repeatedly testing the status bit(s) and till all targeted bytes are read from the input device.
- The program is in busy (non-waiting) state only after the device gets ready else in wait state.
Programmed IO mode output data transfer
Output write in Programmed IO mode

(ii) Each output written after first testing whether the device is ready to accept the byte(s) at its output register or output buffer is empty
Output write in Programmed IO mode

1. Program
   - Read status bit and test whether the device is ready
     - Output buffer Not Full
       - Wait for a period
     - Yes
2. Write byte(s)
3. Next step of the program
   - Yes
   - No
4. Test more bytes to be written
Output write in Programmed IO mode

- The program waits for the ready status by repeatedly testing the status bit(s) and till all the targeted bytes are written to the device.
- The program in busy (non-waiting) state only after the device gets ready else wait state.
Advantage and Disadvantage Programmed
IO mode data transfer
Advantage of programmed I/O mode

- A program and processor dedicated to wait and repeatedly tests the status and for IO data transfer till the IO operation completes
Disadvantage of programmed I/O mode

- A program has to wait and repeatedly tests the status; Waiting period for an asynchronous event can be too large.
- Many I/O devices generate *asynchronous* events—events that occur at times that the processor cannot predict or control, but which the processor must respond to reasonably quickly to provide acceptable performance.
Example of Unpredictable wait events

- Keyboard on a workstation or PC
- The processor cannot predict when the user will press a key but must react to the key-press in well under a second or the response time will be noticeable to the user
- The programmed I/O mode therefore not appropriate due to prolonged wait states
Summary
We Learnt

- Programmed IO method of IO operations
- The program waits for the ready status by repeatedly testing the status bit(s) and data transfer is only when other end ready
End of Lesson 06 on
Programmed IO