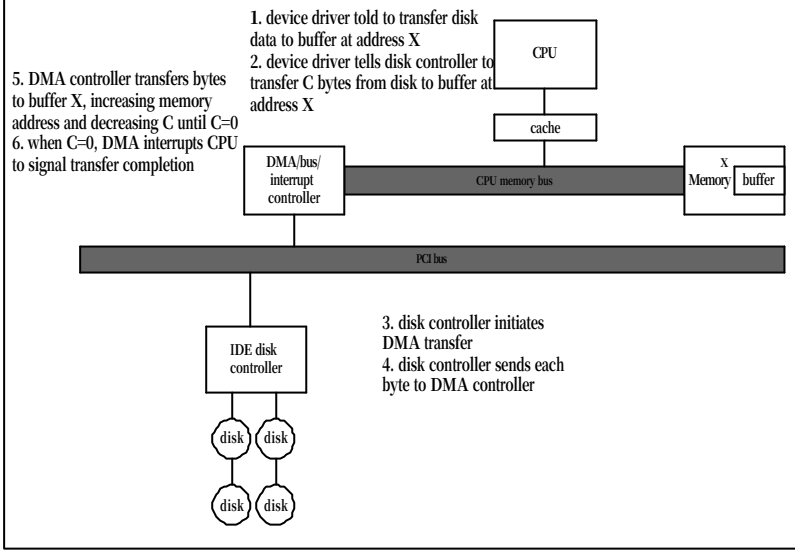
Introduction of Direct Memory Access (DMA)

Why is DMA?

- It is wasteful to feed data into a controller register 1 bytes at a time. (PIO)
- The DMA unit is word.
- In the high loading environment, a system with DMA has better improvement.

DMA transfer



DMA Progress

- To initiate a DMA transfer, the host writes a DMA command into memory:
  - A pointer to the source of a transfer
  - A count of the number of bytes to be transferred
  - ……..
- The CPU writes the address of the DMA command block to the DMA controller.

DMA Progress (cont.)

- The DMA controller proceeds to operate the memory bus directly without CPU help.
- Handshaking exists between DMA controller and device controller.
- When the entire transfer is finished, the DMA controller will interrupts the CPU.

Handshaking

- DMA-request and DMA_acknowledge
  - When a word of data is available, the device controller places a signal on the *DMA-request* wire.
  - The signal causes the DMA controller to seize the memory bus,
    - To place the desired address on the memory-address wire
    - To place a signal on the DMA-acknowledge wire

Handshaking (cont.)

- When the device controller receives the DMA-acknowledge signal,
  - it transfer the word of data to memory
  - and remove the DMA_request signal.