Direct Memory Access

MCIT 595

I/O with Direct Memory Access (DMA)

- Problem: CPU is kept busy while device driver is writing data to external device
- DMA controller:
  - Separate hardware co-processor dedicated for I/O
  - Co-processor helps the CPU copy data between memory and device
  - Frees up the CPU to do other work
  - DMA controller interrupts CPU only after the entire transfer
- DMA controller can be integrated with device controller, but usually one (on parentboard) for all devices

Reading Disk Block without DMA

- If DMA is not used:
  - Disk controller reads each disk block from the drive serially, byte by byte, until the entire block is in the controller's internal buffer
  - Disk controller computes checksum to verify no read errors occur
  - Controller causes an interrupt.
  - OS's interrupt handler read disk block from controller's buffer a byte or a word at time (in a loop), and storing it in main memory
- During this entire time, the CPU is kept busy copying from controller buffer to main memory

DMA Transfer Operations