DMA

Direct Memory Access

Contents

- What is DMA?

- DMA Controller

- DMA Operation

- Types of DMA Transfer

- Mode of DMA Transfer

- Conclusion

What is DMA?

- **Direct memory access** (**DMA**) is a feature of modern computer / embedded systems that allows certain hardware subsystems to read/write data to/from memory without processor intervention, allowing the processor to do other work.

DMA Controller

- A DMA controller is a device, usually peripheral to a CPU.

- DMA Controller is programmed to perform a sequence of data transfers on behalf of the CPU.

- A DMA controller can directly access memory and is used to transfer data from one memory location to another, or from an I/O device to memory and vice versa.
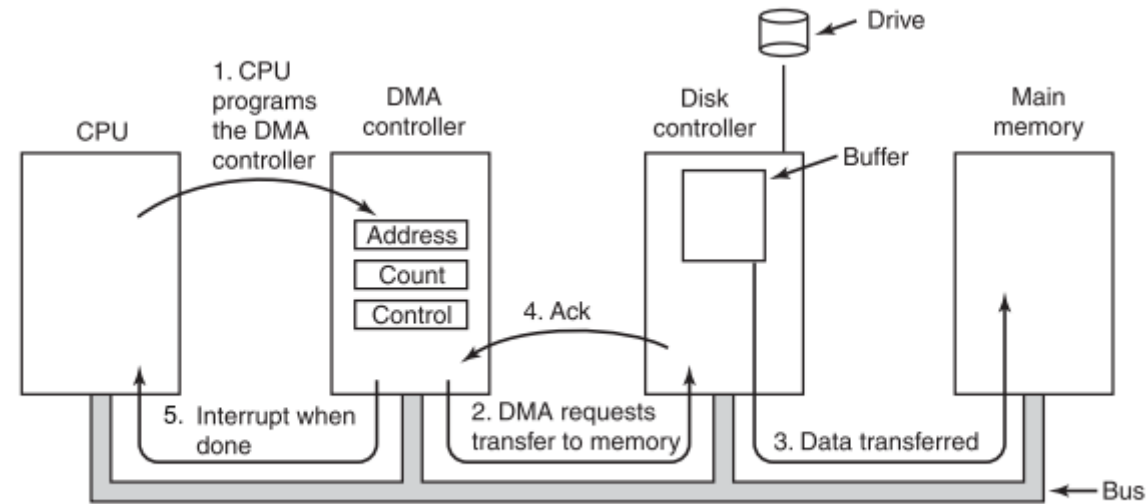
DMA Operation

Figure 5-4. Operation of a DMA transfer.

Types of DMA Transfers

- The two types of DMA transfers are flyby DMA transfers and fetch-and-deposit DMA transfers.

  1. Flyby DMA transfers

  2. Fetch-and-deposit DMA transfers.

- The fastest DMA transfer type is referred to as a single-cycle, single-address, or flyby transfer.

Flyby DMA transfers

- In a flyby DMA transfer, a single bus operation is used to accomplish the transfer, with data read from the source and written to the destination simultaneously.

- Flyby DMA transfers involve a single memory cycle per data transfer, these transfers are very efficient.

Fetch-and-deposit DMA transfer

- This DMA transfer is referred to as a dual-cycle, dual-address, flow-through, or fetch-and-deposit DMA transfer.

- This type of transfer involves two memory or I/O cycles.

- The data being transferred is first read from the I/O device or memory into a temporary data register internal to the DMA controller. The data is then written to the memory or I/O device in the next cycle.

Modes of DMA transfers

The most common transfer modes.

1. Single

2. Block

3. Demand

Single Transfer mode

- Single transfer mode transfers one data value for each DMA request assertion.

- This mode is the slowest method of transfer because it requires the DMA controller to arbitrate for the system bus with each transfer.

Block transfer mode

- Block and demand transfer modes increase system throughput by allowing the DMA controller to perform multiple DMA transfers when the DMA controller has gained the bus.

- For block mode transfers, the DMA controller performs the entire DMA sequence as specified by the transfer count register at the fastest possible rate in response to a single DMA request from the I/O device.

Demand transfer mode

- For demand mode transfers, the DMA controller performs DMA transfers at the fastest possible rate as long as the I/O device asserts its DMA request.

- When the I/O device unasserts this DMA request, transfers are held off.

Conclusion

- This lesson has given an overview of DMA controller.

- The controllers are normally used in high performance embedded systems where large bulks of data need to transferred from the input to the memory.

Any Queries?