Chapter 11: Input/Output Organisation

Lesson 04:

Asynchronous data transfer

Objective

- Understand the data transfer on asynchronous bus
- Learn the asynchronous parallel and serial transfer
- Learn the timing of the various signals
- Understand that destinations must synchronize their internal clock and actions themselves with the source in the asynchronous transfer

Asynchronous data transfer

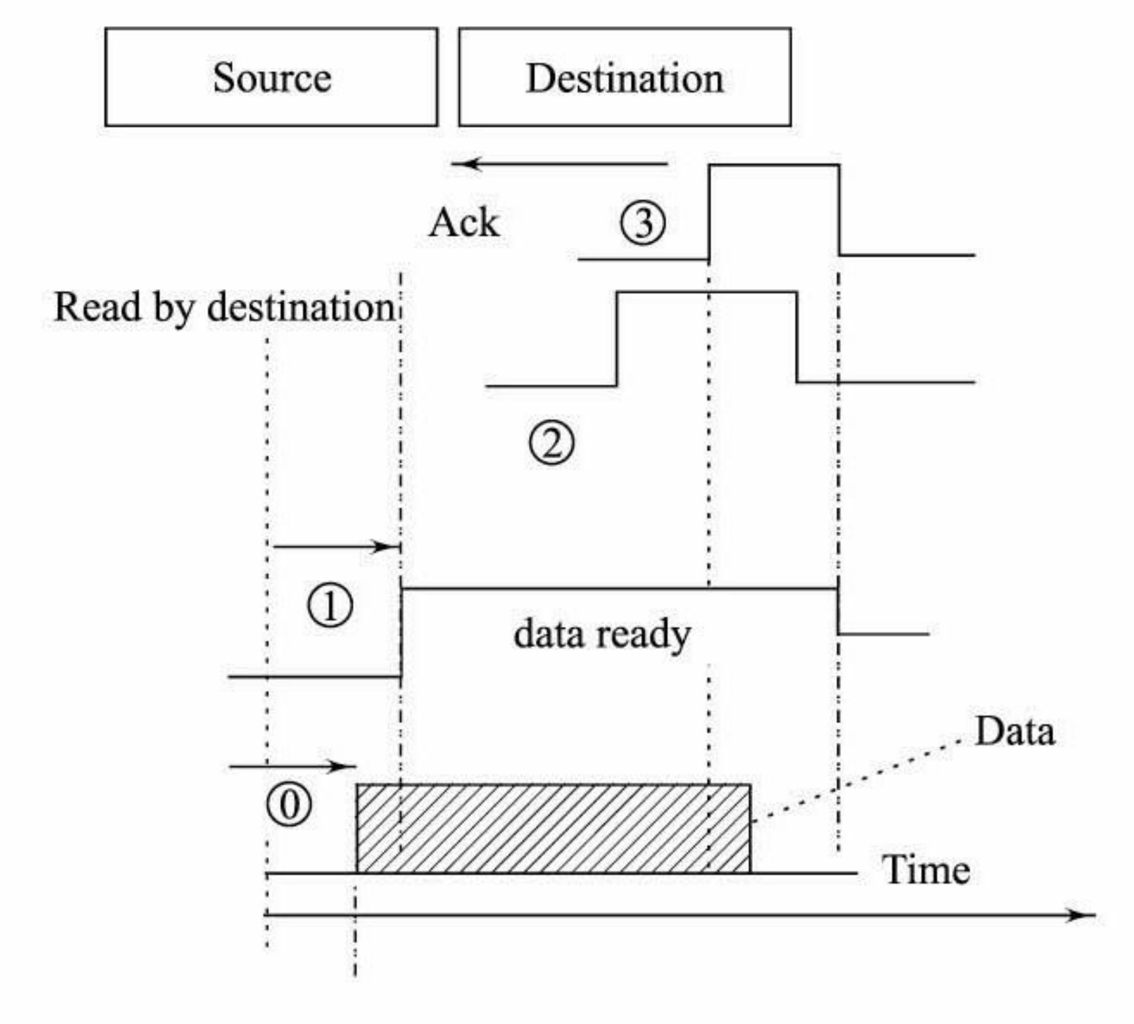
Data transfer

- Asynchronous data transfer using asynchronous bus
- Parallel and serial transfer

An asynchronous bus timing of the various signals

- Not guided by the master or source clock, but by the handshaking between the source and destination
- Generation of handshaking signals is an asynchronous event— an event that occurs at a time that the end source or destination cannot predict or control

Asynchronous data transfer



Asynchronous data transfer I/O Operation Initiated by Source I/O Device

Sequences for I/O Operation Initiated by Source I/O Device

1. Sequence 0: The source (initiator) sets and sends the data or command bits
2. Sequence 1: Source when ready with the data sets the data ready status (address or command)

Sequences for I/O Operation Initiated by Source I/O Device

3. Sequence 2: The destination reads the data bits
4. Sequence 3: The destination acknowledges to the source

Destination action on I/O Operation Initiated by Source I/O Device

- Destination action starts after an asynchronous event data shows ready status from the source
- The next action of the source will start after another asynchronous event data is acknowledged

Asynchronous data transfer I/O Operation Initiated on Destination Controller Request

Sequences for an I/O Operation Initiated on Destination Controller Request

1. *Sequence 0*: The destination (controller) sets and sends the data request command bits
2. *Sequence 1*: When ready with the data, the source sets the data

Sequences for an I/O Operation Initiated on Destination Controller Request

3. *Sequence 2*: The destination (controller) reads the data bits.

4. *Sequence 3*: The destination (controller) acknowledges to the source

Source action sequences for an I/O Operation Initiated on Destination Controller Request

- Source action starts after an asynchronous event data request command from the controller
- The next action of the source will start after another asynchronous event data acknowledge

Asynchronous data transfer Example

Serial port (COM port 9-pin connector) in a computer

1. Serial data-in RxD
2. Serial data-out TxD
3. RTS (Request to send) from port

- RTS also provides internal power to the mouse circuit, because its logic is 1 when inactivated and when activated, then 0
- Most of the time RTS is 1; therefore, RTS across an internal capacitor in the mouse will charge the capacitor sufficiently to enable capacitor voltage to the circuit

Serial port (COM port 9-pin connector) in a computer

4. CTS to the port, (for example, when mouse is communicating the position data or buttons status)
5. DTR (Data Terminal Ready) from port
6. DSR (Data Set Ready) from serial I/O device to port

Serial port (COM port 9-pin connector) in a computer

7. DCD (Data Carrier Detect) from serial I/O device to port
8. RI (Ring Indicator) from serial I/O device to port
9. Logic ground

Summary

We Learnt

- Synchronous and Asynchronous
- The timing of the various signals during asynchronous IO operation
- Destinations synchronizes their internal clock and actions themselves with the source in the asynchronous transfer
- Parallel and serial transfer

End of Lesson 04 on

Asynchronous data transfer