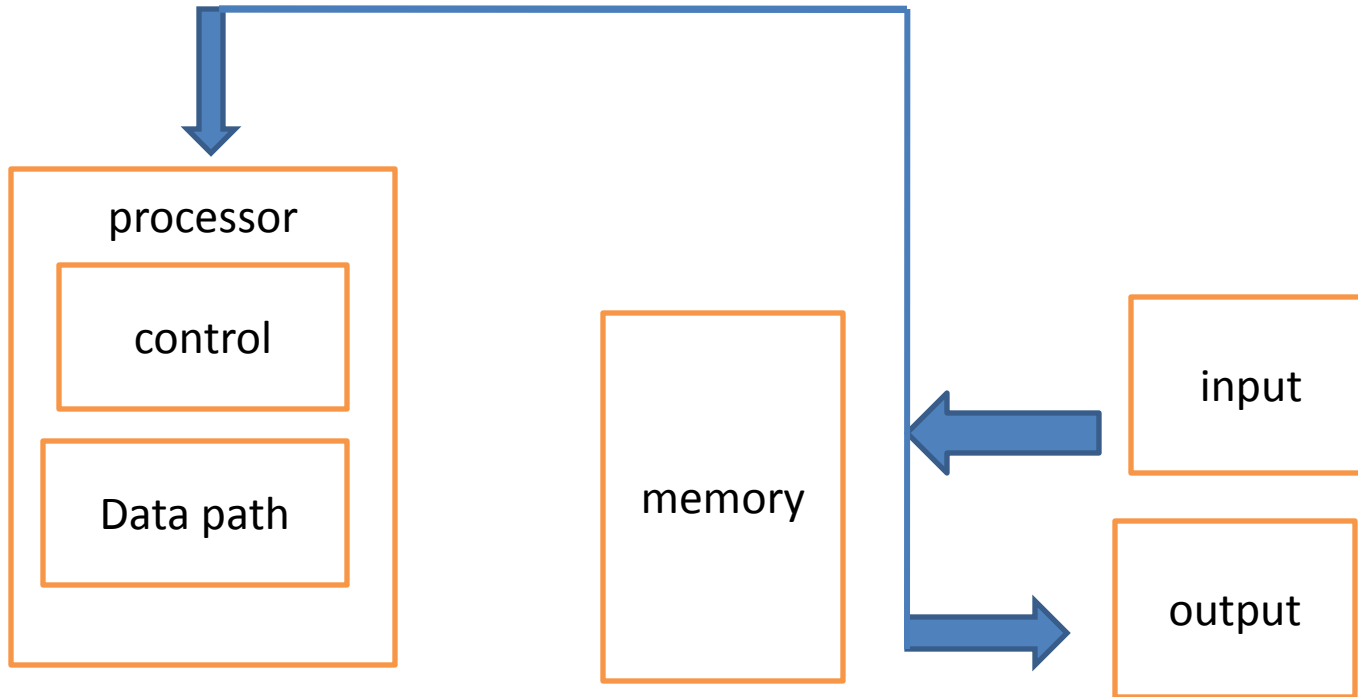
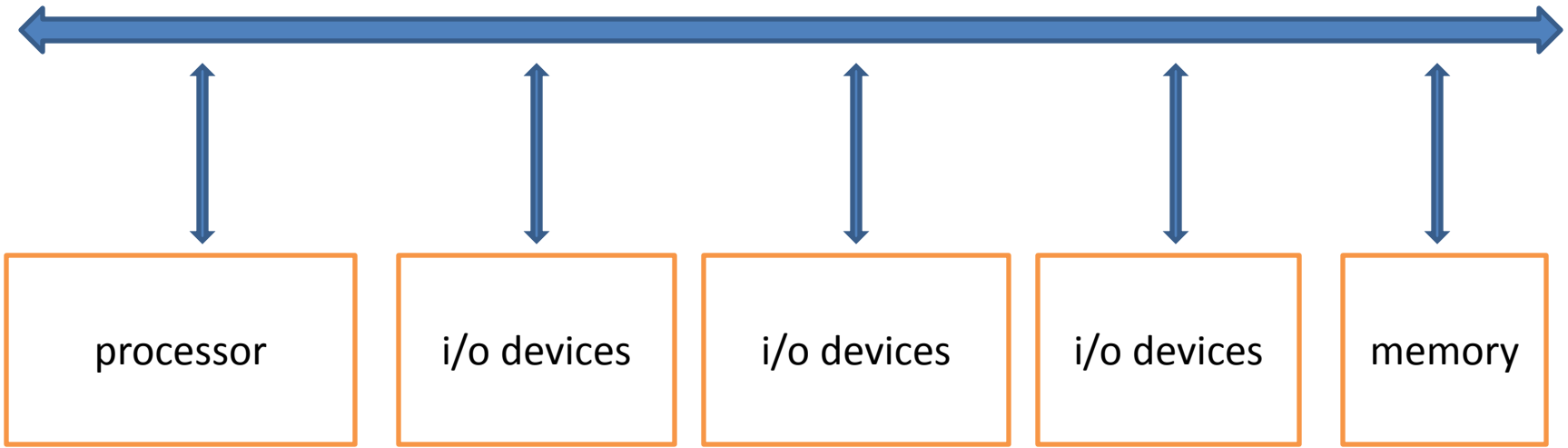


Buses: Connecting I/O to Processor and Memory



- **A bus is a shared communication link**
- **It uses one set of wires to connect multiple subsystems**

Advantages of Buses



- **Versatility:**

- **New devices can be added easily**
- **Peripherals can be moved between computer systems that use the same bus standard**

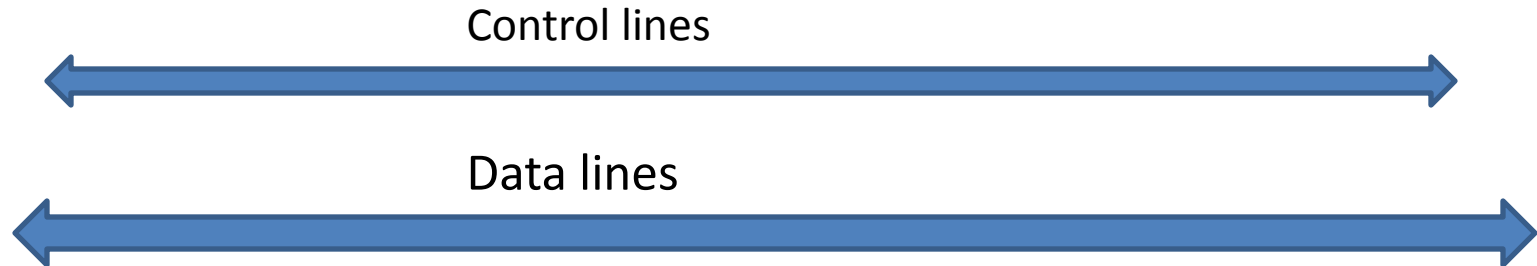
- **Low Cost:**

- **A single set of wires is shared in multiple ways**

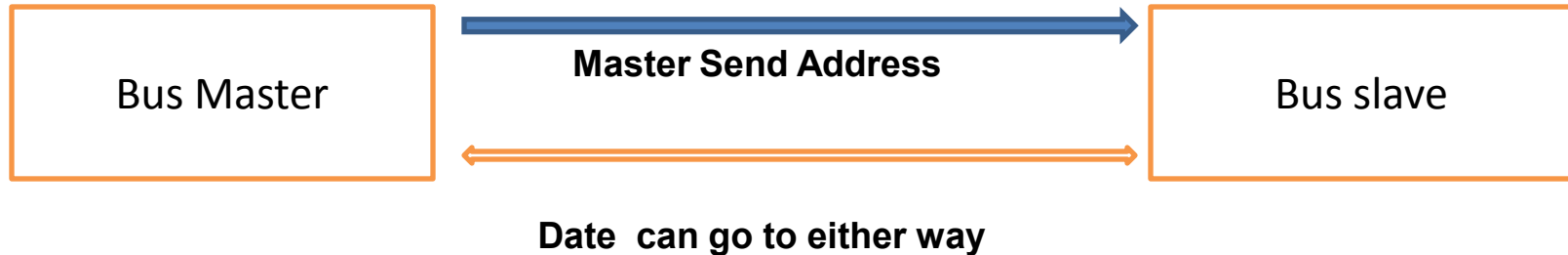
Disadvantages of Buses

- **It creates a communication bottleneck**
 - **The bandwidth of that bus can limit the maximum I/O throughput**
- **The maximum bus speed is largely limited by:**
 - **The length of the bus**
 - **The number of devices on the bus**
 - **The need to support a range of devices with:**
 - **Widely varying latencies**
 - **Widely varying data transfer rates**

The General Organization of a Bus



- **Control lines:**
 - **Signal requests and acknowledgments**
 - **Indicate what type of information is on the data lines**
- **Data lines carry information between the source and the destination:**
 - **Data and Addresses**
 - **Complex commands**
- **A bus transaction includes two parts:**
 - **Sending the address**
 - **Receiving or sending the data**



- **A bus transaction includes two parts:**
 - **Sending the address**
 - **Receiving or sending the data**
- **Master is the one who starts the bus transaction by:**
 - **Sending the address**
- **Slave is the one who responds to the address by:**
 - **Sending data to the master if the master ask for data**
 - **Receiving data from the master if the master wants to send data**