

BUS : THE DATA HIGHWAY

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The word bus came from latin omnibus meaning (in the public transport sense) for every body but here in computer hardware it means for every device.

Bus is typically a row of standardized parallel conducting paths (wires) or strips on a PCB, which links modular components, processors, peripherals, registers and provides data transport.

In strict sense, the definition applies only to the interconnection of microprocessor and memory. A bus includes power and signal conductors to energize all functional parts of the computer and allow them to communicate with each other. Buses are operated under a strict set of data communication rules.

Why bus ?

Bus offers many advantages over haphazard connection, this include, protection of components from overload conditions, modular, high fan-out and standardization.

Bus Width

The number of bits that can be transmitted simultaneously along the bus (in parallel fashion) is called the bus width or bus size. It depends on the size of the

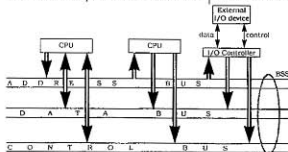


Fig : Simplified Block diagram of a typical Bus System.

unit that the bus is connecting. A bus connecting two n -bit registers must be at least n -bit wide.

In reality the bus width is frequently much larger than just the size of the registers to which it is connected. This is because in addition to transmitting binary data, the bus will also simultaneously transfer control and timing information or signals.

Bus Length

Since with the increase in length the technical problem such as impedance, signal propagation delay, reflection arises hence Bus length is usually half a meter or so. Now a days modular components are packed closer together for making shorter bus length.

Bit rate

The bit rate of a bus is usually measured by the number of bits per second (bps) that can be transmitted along the bus. Typical bit rate for serial bus are of the range of 100 to 50000 bps.

A serial bus is less speedy, as it transmits one bit at a time. Considering time factor parallel buses are used in computer system.

Classification

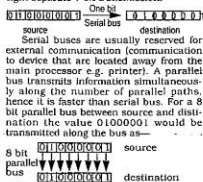
Considering function, buses are divided into three main categories.

- Control bus :** It passes timing and initiating signals from one subsystem to another. It conveys timing signals, memory commands, I/O requests, interrupt request. It acknowledges idle signals.
- Data bus :** Data bus carry specified number of data bits usually 8, 16 or 32. It is used to carry data from source register to destination register (i.e. μ processor and memory). Input and output lines on the memory unit are connected to it. Sometimes it is also called Bus Bar.
- Address bus :** This is a unidirectional bus which selects a memory location to which the microprocessor wishes to use transfer operation. It is also used to select I/O controller.

According to construction, buses are of two kinds-Ribbon cable and Backplane. Ribbon cable is a kind of portable and flexible parallel wires, e.g. a 25 wire parallel cable. Backplane is an integral part of the frame of the computer, much like a plugboard into which other fundamental components are inserted.

On the basis of the direction of the data transfer, buses are Unidirectional and Bidirectional. In an unidirectional bus, transfer proceeds only in one direction, e.g. address bus. Whereas in bidirectional bus, transfer can proceed in both direction but not at the same time. (e.g. data or control bus).

Depending on the nature of data transmission there are two types of buses, Serial and Parallel. In serial bus only one bit can be transmitted at a time. Transmission of the 8bit ASCII character 010000001 (the letter A) would involve eight separate 1 bit transmission.



Conclusion

All the current bus structure have been designed with two goals in view—
a. Standardization of the mechanical characteristics of major components of

the computer system, with the concomitant reduction in manufacturing cost, and

- Flexibility in system configuration.
- A bus standard specifies the upper and lower limits of the electrical signals carried by each bus group.

Bus terminologies

Multibus : This is the trade mark of IEEE 796 bus developed by INTEL.

External bus : This provides a standard set of lines and a standard pin configuration to exchange data with external devices hooked to it i.e. IEEE-488 bus.

Mass bus : It supports specifically transfer between memory and mass storage system.

Bus master : In shared or common bus structure a number of devices can be connected to the bus. During the transfer one of the device must take control of the transfer operation. This device is called bus master and the other devices are called slave units.

Memory bus : It handles all transfer between memory and the internal component of the computer much like a common bus.

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