6

Interfaces

BlueTooth

- Bluetooth is a wireless LAN technology designed to connect devices of different functions such as telephones, notebooks, computers (desktop and laptop), cameras, printers, coffeemakers.
- A Bluetooth LAN is an adhoc network, which means that the Network is formed spontaneously; the devices, sometimes called gadgets, find each other and make a network called a piconet.
- Bluetooth was originally started as a project by the Ericsson Company.
- It is named for Harald Blaatand, the King of Denmark (940-981) who united Denmark and Norway.
- Blaatand translates to Bluetooth in English.
- Today, Bluetooth technology is the implementation of a protocol defined by the IEEE 802.15 standard.

BlueTooth Applications

- Peripheral devices such as a wireless mouse or keyboard can communicate with the computer through this technology.
- Monitoring devices can communicate with sensor devices in a small health care center.
- Home security devices can use this technology to connect different sensors to the main security controller.
- Conference attendees can synchronize their laptop computers at a conference.
- Operable in an area the size of a room or a hall

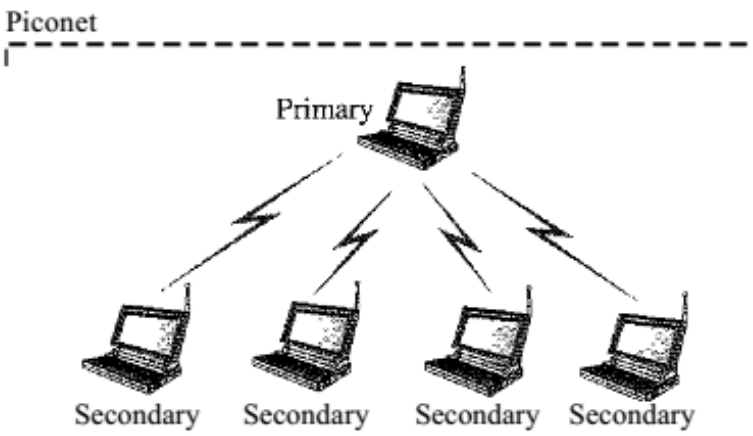
Bluetooth Architecture

- **Bluetooth defines two types of networks:**
- **Piconet and**
- **Scatternet**

Piconet

- A Bluetooth network is called a piconet , or a small net.
- A piconet can have upto eight stations, one of which is called the primary; the rest are called secondaries.
- All the secondary stations synchronize themselves with the primary.
- Note that a piconet can have only one primary station.
- The communication between the Primary and the secondary can be one-to-one or one-to-many.

Piconet

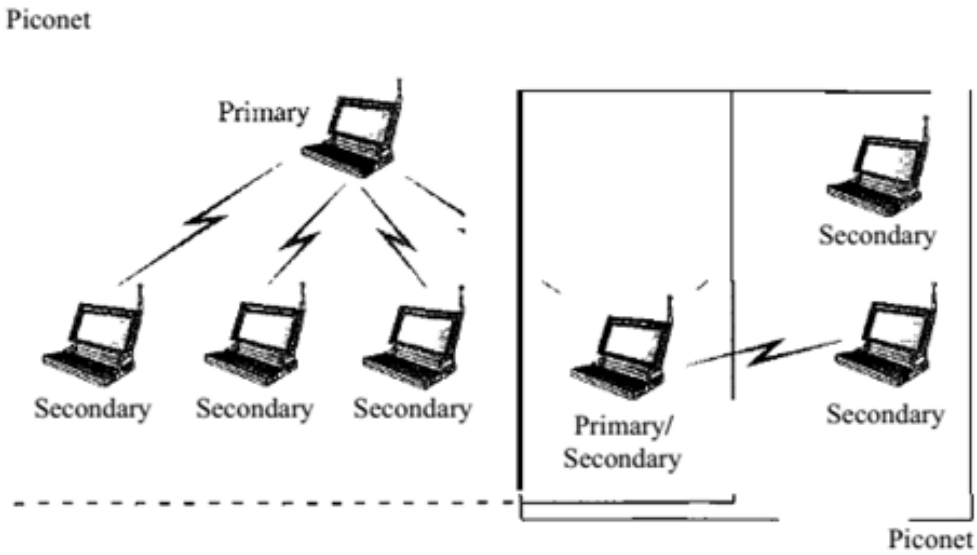


Scatternet

- Piconets can be combined to form what is called a scatternet.
- A secondary station in one piconet can be the primary in another piconet.
- This station can receive messages from the primary in the first piconet (as a secondary) and, acting as a primary, deliver them to secondaries in the second piconet.

- A station can be a member of two piconets.
- **The literature sometimes uses the terms master and slave instead of primary and secondary.**

20 *Scatternet*



USB (Universal Serial Bus) Features

1. **Host:** The computer acts as a Host
2. **Multiple devices**: We can connect up to 127 devices to the host directly or by USB hubs.
3. **USB Cable length**: Individual USB cables can be as long as 5 meters; with hubs, devices can be upto 30 meters, away from the host.
4. **Faster Data Transfer Rate**:
    1. • Full Speed: 12 Mbps (USB1.1 max speed)
    2. • Hi-Speed: 480 Mbps (USB2.0 max speed)
    3. • Super Speed : 4.8 Gbits/s (600 MB/s) (USB 3.0 max rate)
5. **Hub Architecture :** The devices are not daisy chained but they are connected to a USB Hub.
6. **Hot-swappable**: USB devices are hot swappable, meaning you can plug them into the bus and unplug them any time.
7. **Power Saving**: Many USB devices can be put to sleep by the host computer when the computer enters a power saving mode.
8. **Power allocation**: USB controller in PC detects the presence or absence of the USB devices and does allocation of electrical power

FireWire Features

1. Firewire, also known as IEEE 1394 and i.Link, is a high speed serial bus developed by Texas Instruments and Apple computers in the mid 1990s.
2. Hot pluggability
3. Multiple devices up to 63.
4. Uses daisy chain topology
5. Data Transfer Rate 400/ 800 Mbps
6. Firewire also facilitates peer-to-peer device communications without using PC memory.
7. Max distance between devices: 4.5m
8. Well suited for different devices such as **Digital Camera, DV Camcorders, HDTV, High-Speed Drives, DVD players and digital audio equipment**

Comparison between Firewire and USB

Feature	**Firewire**	**USB**
Data Transfer Rate	400 /800 Mbps	12 Mbps /480 Mbps /4.8 Gbps
Number of devices	63	127
Plug and Play	Yes	Yes
Hot pluggable	Yes	Yes
Bus type	Serial	Serial
Networkable	Yes	Yes
Network Topology	Daisy Chain	Hub
Cable Length	4.5 m	5 m

SCSI Small Computer System Interface (pronounced as scuzzy)

- SCSI(Small Computer System interface) is a set of standards for physically connecting and transferring data between computers and peripheral devices.
- SCSI is not device level interface it is system level interface
- It is used in special servers and RISC systems

There are 3 different SCSI standards SCSI-1, SCSI-2, SCSI-3

SCSI-1:

1. The original specification developed in 1986, SCSI-1 is now obsolete.
2. It featured a **bus width** of 8 bits and **clock speed** of 5 MHz.
3. 8 bit parallel bus
4. 50 pin cable

SCSI-2:

1. Adopted in 1994, this specification included the **Common Command Set (CCS)** -- 18 commands considered an absolute necessity for support of any SCSI device.
2. It also had the option to double the clock speed to 10 MHz (**Fast**), double the bus width from to 16 bits and increase the number of devices to 15 (**Wide**), or do both (**Fast/Wide**).
3. SCSI-2 also added **command queuing**, allowing devices to store and prioritize commands from the host computer.
4. High density 50 pin cable connectors.

SCSI-3:

1. This specification debuted in 1995 and included a series of smaller standards
2. A set of standards involving the **SCSI Parallel Interface** (SPI), which is the way that SCSI devices communicate with each other
3. Most SCSI-3 specifications begin with the term **Ultra**, such as Ultra for SPI variations,

   Ultra2 for SPI-2 variations

   Ultra3 for SPI-3 variations.
4. SCSI-3 is the standard currently in use.
5. Double the clock speed to 20/40/80 MHz
6. Double the bus width from to 16 bits
7. Increase the number of devices to 16.

SCSI Drive Configuration

The following items need to be set up for configuring a SCSI Drive.
They are,

1. Set SCSI Device ID
2. Activate the termination jumper to the device which is present at the end of the chain.
3. Disable auto start
4. Delay auto start
5. Stagger spin: it is an enhanced version of Delay Auto Start. It should be configured if many hard disk are attached to the system
6. Narrow/Wide mode
7. Force SE : Allow newer Ultra 2,Wide Ultra 2,Ultra 160, Ultra 160+) SCSI drives to be forced to use single-ended (SE) operation.
8. Disable parity.

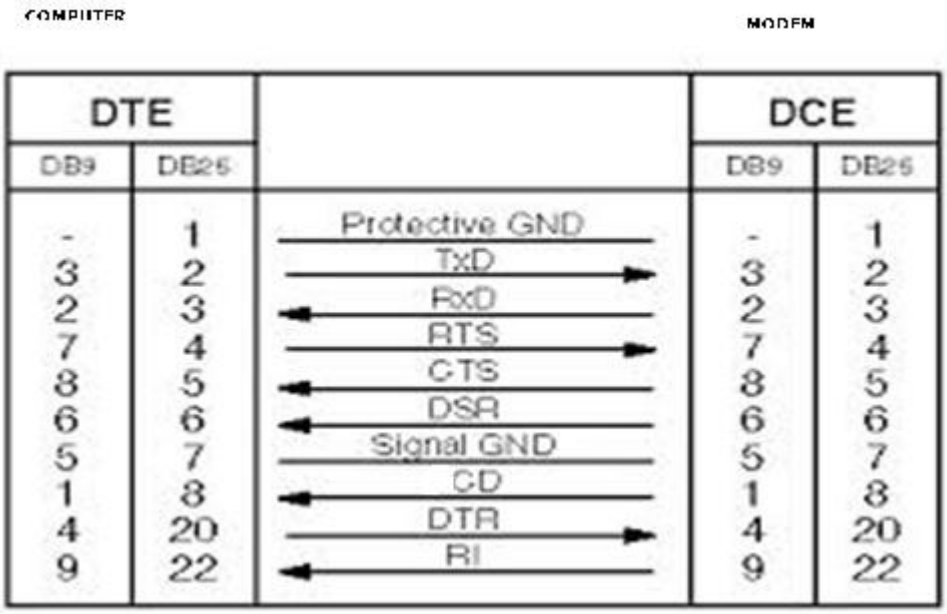
RS232 (RS- Recommended Standard)

- Is a standard interface developed by Electronics Industries Association(EIA)
- Uses asynchronous serial Communication
- It is a standard for serial binary data signals connecting between a DTE (Data Terminal Equipment eg: Computer) and a DCE (Data Communication Equipment eg: modem).
- It is commonly used in computer serial ports.

RS 232 Voltage Level:

- Follows Negative Logic
- Logic 1 represents a negative voltage (-3V to -15V)
- Logic 0 represents a positive voltage (+3 V to +15V)

RS 232 Signals



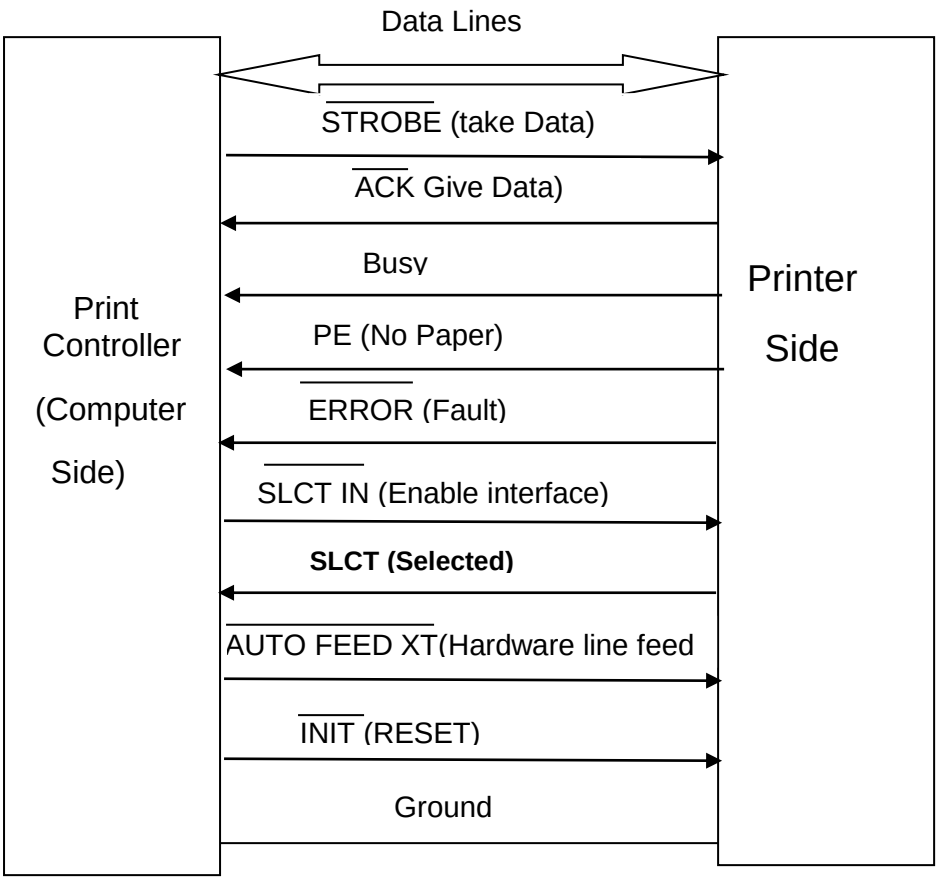
Sr No	Pin No	Signal	Signal Name	Source	Destination
1	1	-----	Frame Ground	---	----
2	2	TXD	Transmit Data	DTE	DCE
3	3	RXD	Receive Data	DCE	DTE
4	4	RTS	Request to Send	DTE	DCE
5	5	CTS	Clear to Send	DCE	DTE
6	6	DSR	Data Set Ready	DCE	DTE
7	7	SG	Signal Ground	---	----
8	8	CD	Carrier Detect	DCE	DTE
9	20	DTR	Data Terminal Ready	DTE	DCE
10	22	RI	Ring Indicator	DCE	DTE

1. **DTR(Data Terminal Ready):** It is sent from **computer to the modem** to inform that computer is ready for communication
2. **DSR(Data Set Ready) :** It is sent from the modem to the computer to inform that modem is ready for communication
3. **RI (Ring Indicator)**: This signal is used by a modem connected to the serial port to inform to the computer that someone is calling the modem.
4. **CD (Carrier Detect or Data Carrier Detect) :** It is used by computer to know that the modem connected to the serial port has made proper connection with modem on the other side.
5. **CTS(Clear To send):** CTS signal is used by the modem to inform the computer that it can start the data transmission.
6. **RTS(Request To Send):** Once clear to send signal is received the computer send Request To Send(RTS) signal to the modem to inform that computer is also ready to start the data transmission
7. **RxD(Receive Data)** : It is used by the modem to send data to the computer
8. **TxD(Transmit Data):** It is used by the computer to send data to modem.
9. **GND(Signal Ground)** This is one of the most important signal. This wire provides the necessary return path for both the data signals and the hand shaking signals.

Centronics interface

- The cable plugs into a 25-pin parallel port on the computer.
- Data flows in one direction only, from the computer to the printer or other device.

- The Centronics parallel interface is an older and still widely-used standard I/O interface for connecting printers.
- Centronics Corporation designed the original Centronics parallel interface for dot matrix printers.



Signals in Centronics interface

Signals from PC to Printer

There are 12 signals from the PC to the printer. Out of these 8 signals are data bits and 4 signals are control signals. These are

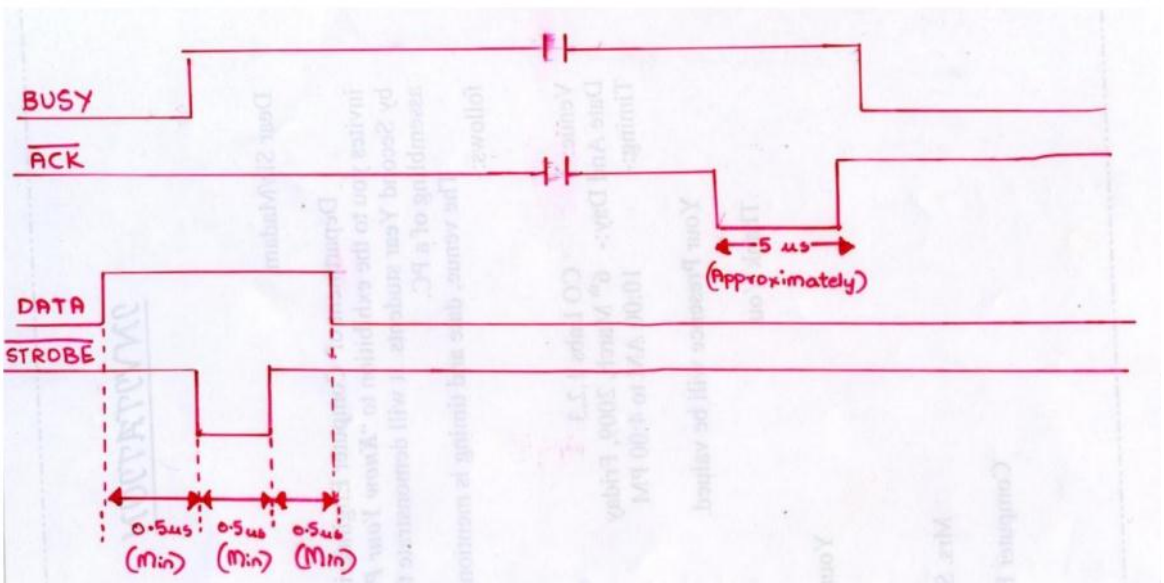
1)	$\overline{\text{STROBE}}$	The printer should take data when this signal is low.
2)	$\overline{\text{INIT}}$	When it is low the printer resets its electronics logic and clear the printer buffer
3)	$\overline{\text{SLCTIN}}$	It is an interface enable signal when this signal is low the printer responds to signals from the controller
4)	$\overline{\text{AUTO FEED XT}}$	After printing every line the printer will provide one line feed automatically if this signal is low. This type of line feed known as hardware line feed.

Signals from printer to PC

There are 5 status signals from the printer to the PC. These are

$\overline{ACK}$	This Signal is an acknowledgement for $\overline{STROBE}$ Signal from PC. When active, it indicates that printer has received data sent by the PC and the printer is ready to accept next data byte
BUSY	When BUSY Signal is high it indicates that the printer is busy and it cannot receive data. This signal becomes high under any of the four signals 1) On Receiving STROBE active 2) During printing operation 3) When the printer is in offline start 4) When the printer senses some error condition
PE	When PE Signal is high it indicates that there is no paper in the printer
SLCT	SLCT Signal indicates that the printer is selected and logically connected to PC
$\overline{ERROR}$	$\overline{ERROR}$ signal indicates that there is some error condition in the printer. This signal becomes active under any of the following three reasons: 1) Mechanical fault or electronic fault in the printer 2) The printer is in offline state 3) There is no paper in the printer

Centronics Interface Timing Diagram



- The printer controller sends data to the printer.
- After a minimum gap of 0.5 µs, it makes the strobe signal low and keeps it low for a minimum duration of 0.5 µs.
- As soon as strobe signal becomes active low the printer makes the busy line high.

- The controller should retain the data on the data lines for a minimum interval of 0.5 µs from the trailing edge of the strobe signal.
- Thus the data should be kept on the data lines for a minimum duration of 1.5 µs.
- When the printer is ready to receive the next character of data it makes the acknowledge line low.
- When the acknowledge line is made high the printer also removes the busy signal.

MSBTE Questions

1. Give four features of USB. (2M)(W-14)
2. List any four features of firewire(2M)(W-14)(S-14)
3. State any four Bluetooth features.(2M)(S-14)
4. Explain four features of USB (4M)(S-14)
5. Explain the following RS-232 signals (4M)(S-14)
    i. TXD
    ii. RXD
    iii. RTS
    iv. CTS
6. Write any four advantages of Bluetooth (4M)(W-14).
7. What is a Bluetooth? Give its function. (2 m W-15)
8. List any four features of firewire.(2M W-15).
9. Explain the SCSI drive configuration.(4M W-15).
10. List with meaning any eight features of USB(4M W-15)
11. Write any four important features of USB port(2M S-15)
12. Write two advantages and two disadvantages of Bluetooth.(2M S-15).
13. Draw and explain the RS232.(4M S-15)
14. Draw and explain centronics interface diagram.(4M S-15)
15. Write any four firewire features(4M S-15).
16. Write two features of each of the following:
    i. Jumper
    ii. Blue Ray Disc
    iii. SCSI
    iv. IDE (8M S-15)
17. Mention differences between following:
    i. IDE and SCSI
    ii. IDE and SATA (8M S-15)