

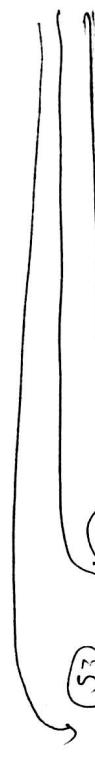
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## UNIT - III

Page - 03

### Ethernet Basics:

#### Networking Basics



① The elements of a n/w

- Components ✓
- Modular design
- The n/w Protocol stack
- Clusters & Bridges
- Requirement of internet connections.

② Inside Ethernet. → Advantages & Limitations

- using PC for n/w communication
- IEEE 802.3 Standard.

- Framed.
- Media Access Control when to transmit
- Using Physical Address
- Using Protocol Analyzer to view Ethernet

③ Building a n/w : hardware options

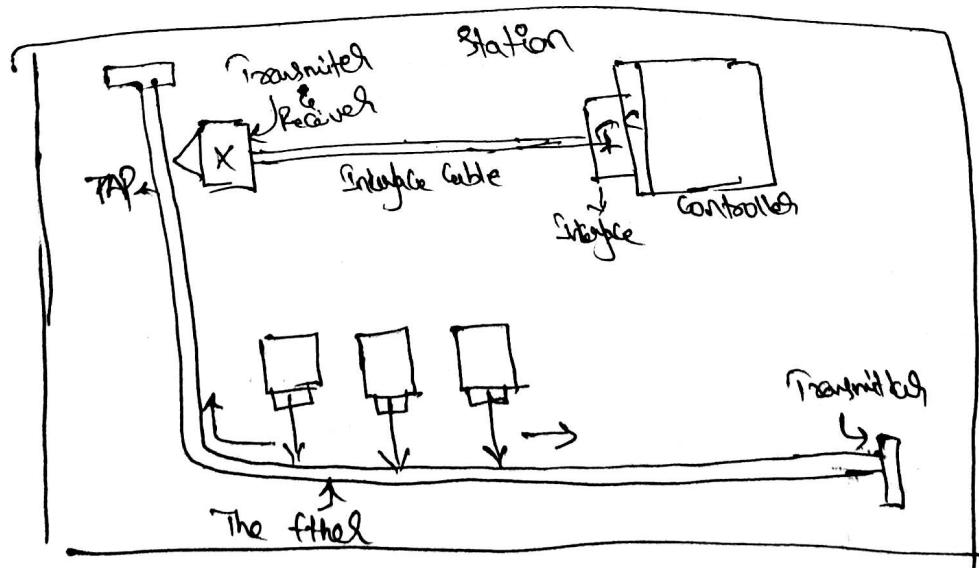
Connection to

PC

Cable, Connection & n/w speed

④ Design choices :- selecting Components.

⑤ using the Internet Protocol in Local & Internet Communication



## Lecture :-

III (2)

Ethernet :- is a standard for family of few technologies that share same basic Bus topology ; frame type ; N/w Access method.

→ first method Ethernet implementation :-

- i) Developed by Xerox in 1973
- ii) Based on bus topology
- iii) Transfer data at 3Mbps max

→ then came :- DIX Standard (ca 1979)  
DIX = Digital Equipment (DEC) + Intel + Xerox.

→ standardization

- DIX transferred control to IEEE
- IEEE created the 802.3 (Ethernet) sub committee

→ 10 Base T :- earliest version of Ethernet use UTP Cabling → unshielded Twisted Pair  
Used data frame CSM A / CD.  
↓  
Control Queue

→ Topology :-

Hybrid star bus. with hub @ center.

→ organization the data :- Ethernet frames :-

- All n/wing technologies use frames
- using frames address two networking issues
  - 1) Prevents any single machine from monopolizing the shared bus cable
  - 2) makes the process of retransmitting lost data more efficient

→ Ethernet frames Contains Seven pieces of data :-

Preamble

Destination MAC Address

Source MAC "

length .

Data

Pad (minimum size = 64 bytes)

frame check sequence (like CRC)

→ Collision Domain :- is a group of nodes that hear each other's traffic

in ③

Working :- (i) Nodes listen on connection

(ii) If no activity, send frame

(iii) Listen again.

(iv) If collision indicated wait a random amount of time and try again.

(v) On a "good" link should only have 10% collision rate [2 bits out of 20 bytes]

→ 10 Base T :- Created in 1990

→ over 99% of all links use this (ii) It's newer version.

→ 2 more computers connected to central hub.

→ NIC Connect with wires per 802.3 standards

New interface  
cards.

→ Hubs for 10 Base T

↳ vary in size & no. of ports

↳ need electrical power.

→ 10 Base T → (Type of cable :- Twisted pair)

↓  
(10 meters)

↳ Signal type is  
Base band.

A single signal on  
cable

(i) UTP :- Unshielded Twisted Pair

uses CAT 3 (i) twisted with RJ-45 connectors

two pairs of wires required (4-pair cable commonly used)

one pair of wires sends data to hub

other pair receive data from hub.

(ii) RJ-45 Connector :- Each pin connects a single wire in other devices put voltage on individual wires  
pins no. :- from 1 - 8.

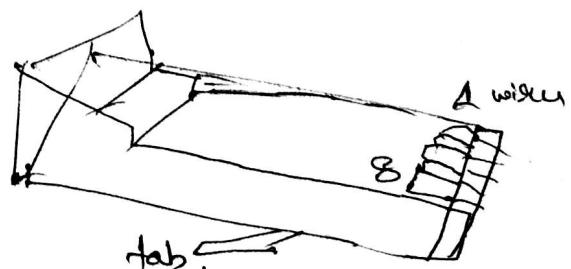
② Pin assignments :- 1 and 2 send data  
3 and 6 receive data

(An cable with four twisted pairs,  
ie 8-pair.)

RJ-45 Connector Called as Crimp :-

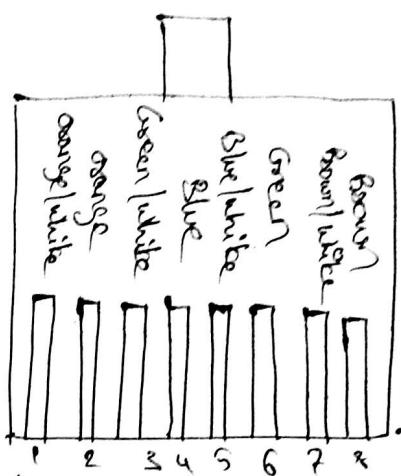
Crimping is an act of initializing on RJ-45 connector

Crimper is a tool use.





TIA/EIA 568 A



TIA/EIA -568 B.

### → 10 Base T : Summary :-

- Speed :- 10 mbps
- Signal type :- Base band
- Distance :- 100 meters b/w the hub and the node
- Node limit :- no more than 1024 nodes per hub
- Topology :- star bus topology ; physical star ; logical bus
- Cable type :- uses CAT5 (or) better UTP Cabling with RJ-45 Connectors.

### → 10 Base FL Summary :-

- Speed : 10 mbps
- Signal type :- Base band
- Distance :- 2000 meters b/w hub and node
- Node limit : - no more than 1024 nodes per hub
- Topology : star bus ; physical star ; logical bus
- Cable type:- uses multimode fiber-optic Cabling with ST(S) connectors

### Common Name

### Formal name Ref Standard

### Informal Hardware name

### Speed

### Cable Type max length

Ethernet

802.3

10 Base T

10 mbps

Copper ; 100 m

Fast Ethernet

802.3u

100 Base-T

100 mbps

" ; 11 meter

Giga

802.3z

1000 Base-T LX

1000 mbps

Fiber ; 500m

" "

802.3ab

1000 Base T

1000 mbps

Copper ; 100m

10 Giga Ethernet

802.3an

10 GBase-T

10Gbps

" "

## → Networking Basics :-

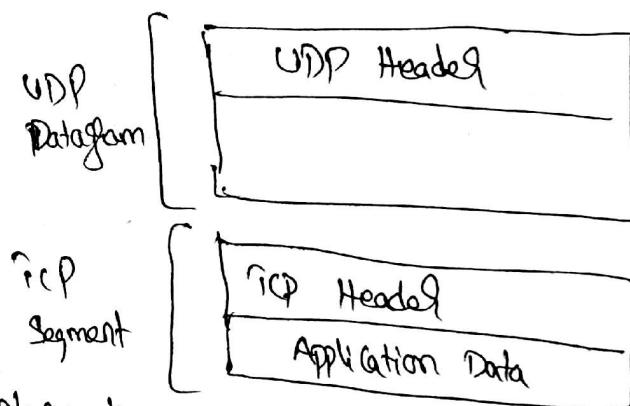
- (i) Modular design :- Consists of hardware ; Software (or) a Combination.  
 → A Software module may be as small as procedure (or) Subroutine within large applications.

- (ii) The Application : Providing and Using new Data :-  
 → An Application often has a user interface that enables users to request data from a computer on the (or) Provide data to send on new.  
 → The data sent by an application follows a protocol ; (or) set of rules, that enables the application at receiving computer to understand what to do with received data.  
 → An application may use a standard protocol such as hypertext transferred Protocol (HTTP) for requesting and sending web pages, the file transferred Protocol (FTP) for transferring files. (or) Simple mail transferred Protocol (SMTP)  
 (or) POP3 (Post office Protocol). for e-mail messages.  
 → In embedded systems, the application might be module that periodically reads and store sensor reading (or) the state of other external signals (or) an application might use received data to control motors, relays (or) other circuits.  
 → An E.S can function as web servers that receive and respond to request for web pages, which may enable users to provide ip (or) view real time data.  
 → E.S can send and receive information via e-mail and infel via FTP.  
 (iii) Ethernet :- A system for connecting a number of computer system to form a local area net with protocols to control the passing of information and to avoid simultaneously tx by 2 (or) more system.

### (iii) TCP and UDP : Error checking ; flow control ; and ports:-

No often includes additional info. to help data get to destination efficiently and without errors.

- A module that support TCP (Transmission Control Protocol) can add information for use in error checking ; flow control ; and identifying application level. Ports at source → destination.
- Error checking value help the receiver detect when received data doesn't match what was sent.
- flow control information helps the sender determine when the receiver is ready for more data and value that identifies as application level port (or) port(s) in application layer. Can help in routing received data to be collected properly in application layer.
- windows and other operating systems have support for TCP built in.
- Development kits for network capable Embedded Systems often build libraries (or) packages with TCP support.
- In sending data using TCP, the application layer passes the data to send and source and destination to a TCP layer. Value that identify the data consists of header followed by application.
- ✓ → TCP layer creates TCP segment
  - Header is defined structure with fields containing information used in error checking, flow control ; and routing the message to collect port at destination.
  - The TCP layer doesn't change the message to be sent . It just places the message in data portion, of TCP segment
  - TCP segment provides a container for the data received from application layer.
  - TCP layer then passes segment to IP layer for transmitting on top.
  - In other direction TCP receives segment from IP layer strips the TCP header, and passes the segment to Port specified in TCP header.
  - ✓ → Alternative to TCP is UDP (User Datagram Protocol).



- UDP has header followed by a data portion that contains application data.
- " includes specifying ports and optional error checking but no support for flow control.
- Windows has development kits for C/S include support for UDP.

(iv) IP : Internet Addressing & Routing :-

IP (Internet Protocol) layer can help data get to destination even if source & destination computers are on different local nw.

Source & destinations computers communicate.

→ Enables on Internet communicate.

→ IP is closely tied to TCP and UDP local nw that use TCP and UDP

also use IP.

→ In Ethernet nw a unique hardware address identifies each interface on nw.

on nw.

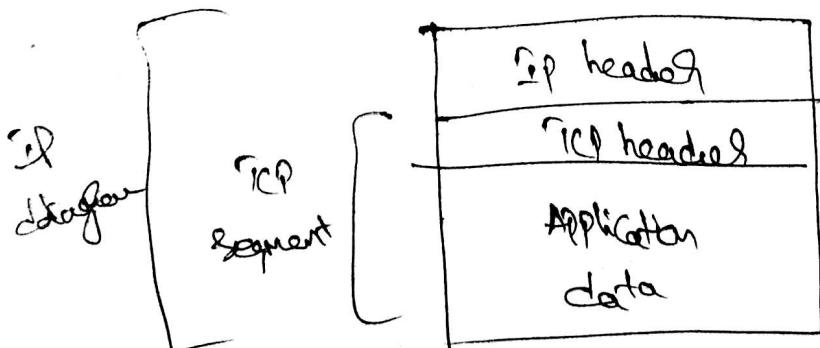
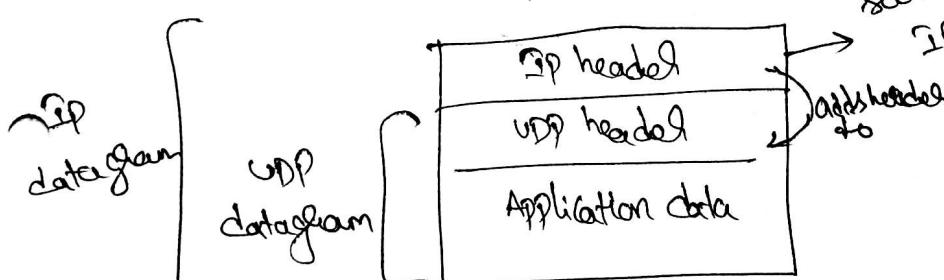
→ IP are more flexible b/c they don't specify to nw type.

→ IP are more flexible b/c they don't specify to nw type.

→ A message that uses IP can travel through different types of nw

including Ethernet, token ring, wireless nw & etc.

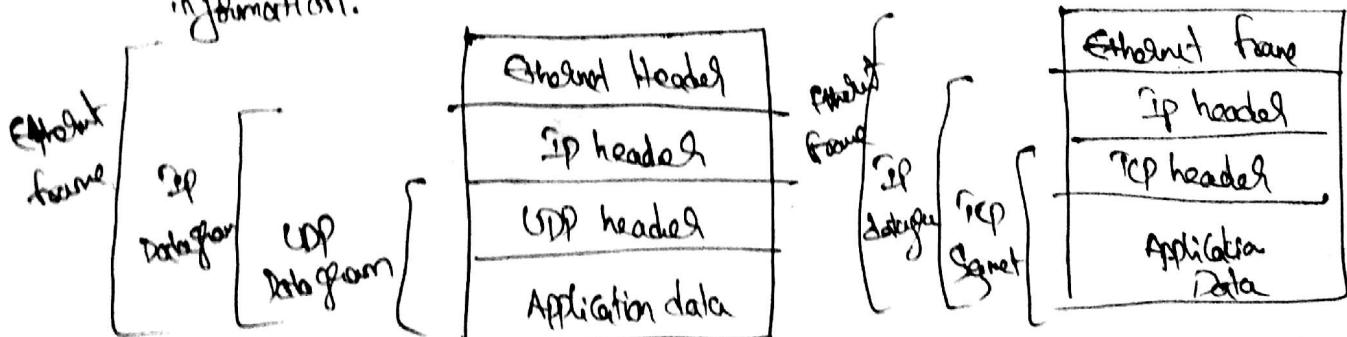
Source & destination  
IP Address identified



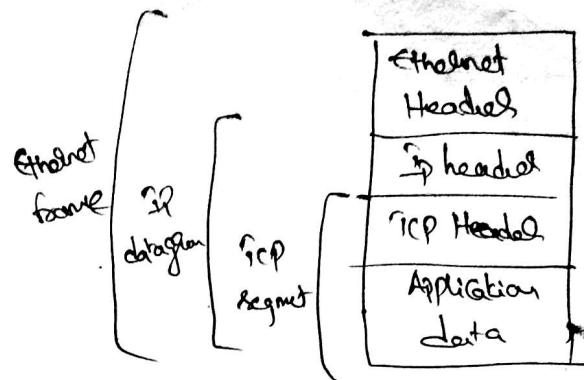
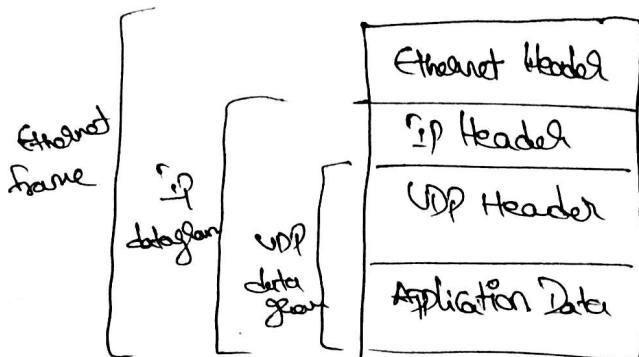
→ A Computer that communicates over Internet must have an address  
 that is different from the address of every other Computer on Internet.  
 Internet Corporation for Assigned Names and Numbers (ICANN)  
 assigns blocks of address to Internet service Providers.

- Assigning & learning IP Address 3-Protocol often used with IP.
  - (a) DHCP → Dynamic Host Configuration Protocol.
  - (b) DNS → Domain Name System.
  - (c) ARP → Address Resolution Protocol (ARP).
- A Computer functioning as DHCP server can use DHCP to assign IP Address to local nw.
- A Computer that wants to learn the IP Address of domain such as xyz.com use DNS Protocol to request information from DNS server.
- A Computer wants to learn the Ethernet hardware Address that responds to IP Address in local nw can broadcast using ARP request for information.

- (v) The Ethernet Driver and Controller :- The Hardware Interface
- In Ethernet nw : - the interface to nw is an Ethernet controller chip and its driver.
- Ethernet driver contains program code used to manage communication b/w Control chip and high level in nw protocol stack.
- To send an IP datagram over Ethernet nw IP layer puts datagram to Ethernet controller driver.
- Driver inserts Ethernet controller to transmit Ethernet frame containing datagram preceded by a header containing addressing and error checking information.



## (vi) Clients & Servers:-



- Eg:- If a Computer performs monitoring function might send a alarm notification to a master computer as soon as condition meets the alarm occur.
- The Computer doesn't need to wait for master Computer to request info.
  - For request resource b/w Client & Server may be web page, a file, (8) any other information the Server makes available.
  - The Client & Server must agree Protocol for requesting & sending requests.
  - Protocols such as FTP; HTTP; SMTP; POP3 are Standard.
  - When you use a browser to view webpages, the browser is functioning as a client, requesting Pages from Server Computer must be running software.
  - Server Software for PC includes Apache Software foundations Apache HTTP Server and Microsoft Personal Web Server.
  - Embedded system can function as servers software with the addition of program code that decodes and responds to received requests.
  - Client & servers are referred as established a TCP connection for exchange of info.

## (vii) In depth: Inside Ethernet:-

### Advantages:-

- (a) It's reliable ; (b) Easy to use (c) A wide selection of products available.
- (d) Hardware Control over Access (e) It's fast (f) It can span long distance.
- (g) Interfaces are electrically isolated (h) Cost is reasonable.
- Disadvantages:- (a) Cost (b) Real time limits (c) Efficiency (d) Power Consumption

## IEEE 802.3 Standard:-

IEEE is responsible for specification popularly known as Ethernet.

Ethernet:- Distributed packet switching for local computer nw.

### The 802.X series:-

The document describes IEEE 802.3 with widely title of Part 3:  
Carrier sense multiple Access (CSMA) / Collision detection (CD) access method  
and physical layer specifications.

CSMA/CD is a method Ethernet uses for sharing the nw.  
→ Ethernet main use is local nw, though recent standards and usage have expanded scope to length nw such as (MAN (metropolitan Area nw) & wide Area nw. (WAN)).

→ All of Standards 802 series standard that define alternate approaches for the physical layer and method of media access control.

→ All standard 802 series share numbering convention of 802.X.

→ Significance 802 standard includes local (or) metropolitan Area nw and X-represents one (or) more digits that identify the specific standard.

→ The support of supplement for Gigabit Ethernet, 802.3z is now part of 802.3 standard.

The 802.3ae amendment approved in 2002, adds support for 10 Giga bits Ethernet.

→ Options for Ethernet cables in 802.3 standard include Co-axial, twisted pair, and fiber optic cables.

→ 802.11 Standard, is a separate document that covers methods of wireless nw.

→ 802.3 standard allow 4 nw speeds.

→ The original standard supported only 10 mb/sec. and standard also supports 100 mb/sec often called fast Ethernet ; 1 Gb/sec and 10 Gb/sec (10-Gb Ethernet, also called 10 GbE).

Frames:- All data in Ethernet also travels in structures called frames.

→ An Ethernet frame consists of fields for data and other information to help the data get to its destination and to help the destination computer determine whether the data arrived intact.

\* Preamble and Start frame Delimiter:- (Joining together) Provide a predictable bit pattern that enables interfaces on 10-Mbit/s networks to synchronize to (a) match the timing of a new frame being transmitted.

→ In data link, the receiving interface needs to know what to read the bits of transmitted data.

Interfacing that include a clock line such as I<sup>2</sup>C, with I<sup>2</sup>C the transmitting devices work bits when the clock is low, and a receiving device reads the bits when clock is high.

field	length in bytes	Purpose
Preamble	7	Synchronization pattern.
Start frame Delimiter	1	End of synchronization pattern.
Destination Address	6	Ethernet hardware Address the frame is directed to
Source Address	6	Ethernet hardware Address of sender
Length (8) / type	2	If 1500 (05DCh) less the length of data field in byte. If 1536 (0600h) or greater, the protocol used by the contents of data field.
Data	46 - 1500	The information the source want to send to the destination
frame check sequence	4	Error checking value

## \* Ethernet Devices Choices:-

For design of E-Network System need some considerations on device hardware and programming code that control hardware interfacing.

→ Interfacing Ethernet controller chip to a CPU and writing code to support Ethernet communications and Internet Protocols to devices.

## Selecting Components:-

on software side both 'c' and Java are popular languages for

programming of Embedded system.

- The hardware typically includes circuit board with CPU, Ethernet Controller and related components.
- The program code includes support for Ethernet TCP/IP and other IP's.

## \* Rabbit Semiconductors RCM 3200:-

→ A fast Z80-derivative CPU with plenty of I/O, low GMII and a

complete development system including C-Compiler.

Ethernet Support:- 10 Base-T & 100 Base-TX

Source:- Rabbit Semiconductors.

Hardware:- RCM 3200 Rabbit Core & Programmable module with Ethernet circuit board that contains Rabbit Semiconductors Rabbit 3000 MP's which is much improved and enhanced derivative of Zilog Inc's venerable

Z80 MP's.  
→ The circuit board is smaller than business cards supports variety of I/O integrated.

- Rabbit 3000 microprocessor has seven (8-bit Ports)
- ① → many ports have special functions ; including six serial ports for Async & Sync communication. & Infrared Data Association (IrDA) Protocol.
- ② → A bidirectional parallel port ; ③ 2-PP Capture channels
- ④ → 4-Pulse width modulation (PWM) of ⑤ 2 Quadrature decoder with 16 bit optical incremental encoder modules.

- (11-12) 2  
16)
- (f) In addition to I<sub>O</sub> there is an external memory Bus with 8 data bits and 20 Address bits.
  - (g) Power supply zener (3.6V)  $\rightarrow$  (1.8V).
  - (h) A Counter that functions as real time clock has a separate Power pin to make it easy to provide backup.
  - (i) chip is available in 128-Bit QFP (Low Profile Quad flat Pack) (8)
  - (j) chip is available in 128-ball TFBGA (Thin Profile fine pitch ball grid array package).

### features:-

- Lowering the supply voltage can reduce power consumption 75%.
- Slowing clock reduces power consumption as well.
- CPU can switch between fast clock (up to 54 MHz) & second clock that runs at 32 KHz.

- In RCM 3200 contains a Rabbit 3000 clocked at 44.2 MHz along with memory and components to support Ethernet communication.
- There are 512 Kbytes of flash memory for storing programs; 512 Kbytes of RAM for storing data, fast RAM for loading code for execution and 256 Kbytes of RAM for storing data.
- one of serial port uses a special programming cable to load firmware from a PC into RAM flash memory.
- The mobile Ethernet Controller is an ASIX AS88796 (3-in-1) local bus fast Ethernet controller which interfaces to the external data bus.
- The module has (RJ45) connectors for 10Base-TX, 10Base-T, and 10Base-TX. The module has two headers on bottom of board provide access to I<sub>O</sub> pins and other signals.
- The RCM3200 development kit includes an RCM3200 module and prototyping board with power supply connectors; a voltage regulator; prototyping area; switches and LED's for experimenting header plug into sockets on board.

→ RCM3200:- is a module offered by Rabbit Semiconductors if we don't need to spread of 100 Base T then there are other modules like

→ RCM2100 → supports 10 Base T ethernet. Contains Rabbit 2000 MP. which is slower but reliable. with same instruction set as Rabbit 3000 MP.

→ The module's Ethernet Controlled 3000 & 2000 MP's are available for use on circuit boards of your own design.

→ The Ethernet Controlled module is a Realtek RTL8019AS full duplex Ethernet Controller.

Software:- Rabbit Semiconductor Dynamic 'C' is a complete environment for working and editing code, compiling, linking, loading compiled code into RCM 3200's RAM (or) flash memory & debugging.

for networking:- Dynamic 'C' includes drivers for Ethernet Controller and libraries that support TCP/IP communication and other new protocols.

→ The libraries provide support for HTTP server; FTP client and select and sending and receiving email with SMTP & POP3.

→ Additional library modules are available including open source; real time Point to Point Protocol (PPP) and Simple Network Management Protocol (SNMP).

→ Q-Codes modules perform basic functions for all Dynamic C-Program Compiled code; automatically includes virtual file module, which performs initialization & final functions.

The Rabbit BIOS is compiled separately and handles startup, shutdown, debugging communication & other basic tasks.

→ Dynamic C-loads BIOS onto RCM 3200's memory automatically using Rabbit 3000's bootstrap mode and programming cable.

The virtual driver to Rabbit BIOS fully documented with source code available.

→ Dynamic C supports multitasking for tasks that each require CPU time on interrupt basis.

- Page 15
- ② Dallas Semiconductor DS11IN1m400 (TINI)
  - ③ Systemic JSTIK
  - ④ Netbeam MOD5282 Router module
  - ⑤ microchip technology PICDEM.net Demonstration board.
  - ⑥ Special purpose modules

↳ Lantronix Device Server  
 ↳ uBcom IP2022 wireless New Router  
 ↳ net media site player Ethernet web server  
 ↳ EDIP Electronics packet sniffer  
 ↳ serial to ethernet bridge //.

### Project Controls:

- ② Dallas Semiconductor DS11IN1m400 (TINI)  
 It is just microcontroller enclosed 8051 architecture plenty of I/O's  
 an operating system, and a Java virtual machine (JVM).  
 → Ethernet support:- 10 Base T ; 100 Base TX
- Source :- Dallas Semiconductor
- Sample :- Dallas Semiconductor
- Hardware :- TINI → (Tiny Internet Interface) is a platform  
 consists of CPU related components supportive for networking and  
 Java runtime environment.
- DS11IN1m400 networked microcontroller Evaluation kit Contains  
 Dallas Semiconductor DS80C400 New microcontroller which is  
 much enhanced & of high speed derivative Intel Corporation.  
 long popular 8051 M.C.
- Max Clock speed is 25MHz.
- BOCH400 Contains over 91bytes of RAM & can Address 16Mbytes  
 of external memory.

- ② The chip has 8-bit I/O Ports, many of Port bits function as Address/data for external memory but 8 data bits and 22 Address Bits
- There are 3-Aynchronous serial ports and Programmable clock for an (I<sub>2</sub>C) interface.
  - A 1-wire-net master can control slaves on 1-wire net (or) micro LAN which connects components using a single data line plus ground line.
  - A Control Area Network (CAN) 2.0B enables communication over a CAN bus which is serial interface.
  - Z80C400 chip includes a programmed 64Kbytes ROM that contains 3-firmware components.
  - A new stack supports TCP/IP and related protocols, including IP version 6.
  - DS80C400 chip requires +1.8V Core supply voltage and a +3.3V I/O supply voltage.

## Ethernet Controller:-

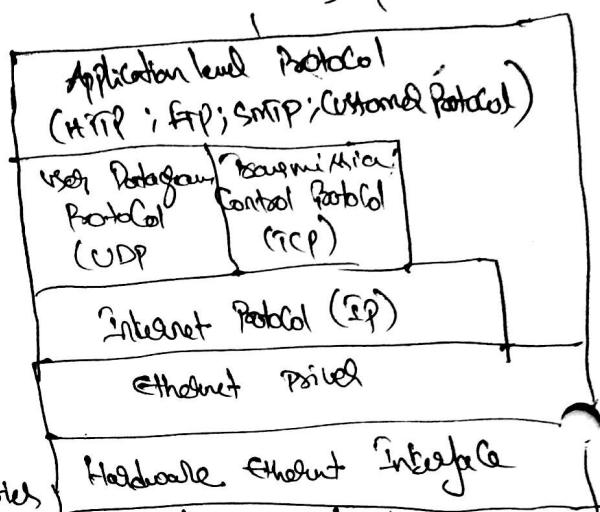
- Ethernet Controller chips are designed for use in desktop computers and include support for standard PC bus and Plug & Play functions.
- Controller chip handles many of details of sending & receiving Ethernet frames.

### Steps:-

- ① Rx message to send and destination address from high level software
  - ② Calculates Ethernet frame check sequence
  - ③ Attempts to tx frame when idle
  - ④ Detects Collision
  - ⑤ Cancels any tx frame with Collision and retries according to protocol specified in IEEE 802.3 (half duplex) or according to protocol specified in IEEE 802.3 (full duplex)
  - ⑥ Provides an indication of success (or) failure of transmission.
- Step 2:- In receiving a frame controller typically does all following.
- ① Detects and synchronizes to new received frame
  - ② Ignores any frames that are less than minimum size.
  - ③ Ignores frames that don't contain the interface address (or) a valid multicast address field.
  - ④ Ignores burst address in Destination Address field.
  - ⑤ Ignores frame check sequence value. Compare received with expected value.
  - ⑥ Ignores errors if they don't match.
  - ⑦ Ignores frame data and other information available and indicates errors if they don't match.
  - ⑧ Ignores the received frame data and other information available and does what ever need to be done.

## (ii) Ethernet Controller Bus:-

- CPU manages communication with Ethernet Controller. Minimum requirement for the CPU is micro controlled with external 8-bit data bus.
- F.S that uses an ISA compatible controller can ignore any unneeded interrupt; address, status & control reg.



### Related Components:-

Typically NIC requires few additional components for 10 Base T & 100 BASE-TX, the IEEE 802.3 standard requires isolation transformation also function as low pass filter b/w Controller & RJ-45 Connectors.

→ filters that comply with Standard available.

e.g.: FA163079 from YCL Electronics & PM1006 from Bernard magnetics

→ Appropriate filters tally with Controller chip MAU (8) PHY circuits that connect to filter.

→ Other Components include Timing Crystal to clock Controller chip and decoupling capacitors for Power pins.

→ Some Controllers also support an interface to serial EEPROM which can provide non-volatile, read/write storage.

### (iii) NE2000 Compatibility:-

→ Program code of new Controller is NE2000 - Compatible.

→ i.e. Program code of new Controller is NE2000 - Interface Card from Novell.

→ NE2000 was an early and popular PC network interface card from Novell.

→ The Card contains National Semiconductor DP8390 Controller.

→ Software that use 8390 (8) a compatible chip has come to known as NE2000 - Compatible.

→ A major feature of 8390 is set of internal registers.

→ By reading & writing to registers a CPU can control the Controller, initiate transmitting data on bus and read received in bus data.

→ Registers in 8390 are arranged in two 16-bit pages.

→ Register 0 in 8390 are at offset 00H on both pages. waiting to bits.

→ The CR register is at offset 00H on both pages. Selects current page.

→ 6 and 7 in CR register store additional register values.

→ Offset 01H through 0FH on each page store additional register values.

→ An NE2000 compatible chip should support all of 8390's registers.

→ NE2000 compatible chips also likely supports accessing buffer memory at address 4000H through FFFFH.

3794.95  
B-420.11  
V1.1  
V1.1

Documentation:-

original DP8390 can be useful supplement to the sometimes thin documentation provided for newer NE2000-compatible chips.

National Semiconductors has a couple of application notes

AN-675

(Waiting Details for DP8390 NIC

DP8390 new interface Controller

(Described for process of sending and receiving data).

family of Ethernet Controller).

Focus Programming with e.g. Assembly code

(v) The ASIX AX88796 :-

→ Ethernet net Controller designed for E.S is AX88796 (3 in 1) local bus.

→ Ethernet net Controller designed for E.S is AX88796 (3 in 1) local bus.

→ Just Ethernet Controller from ASIX electronic Corporation.

→ Just Ethernet Controller from ASIX electronic Corporation.

→ The Raltek Semiconductors use controller RCM3200 module.

→ The 88796 is NE2000 compatible.

→ major difference b/w 88796 and DP8390 is

→ (has on-chip 16kbyte  
static RAM buffer for  
network data)

→ (has Address & data lines  
interface to serial EEPROM)

→ (has

Ethernet:- for twisted pair now the chip can connect through a fitted to

an RJ-45 Jack.

RCM3200 uses a Pulse Jack module.

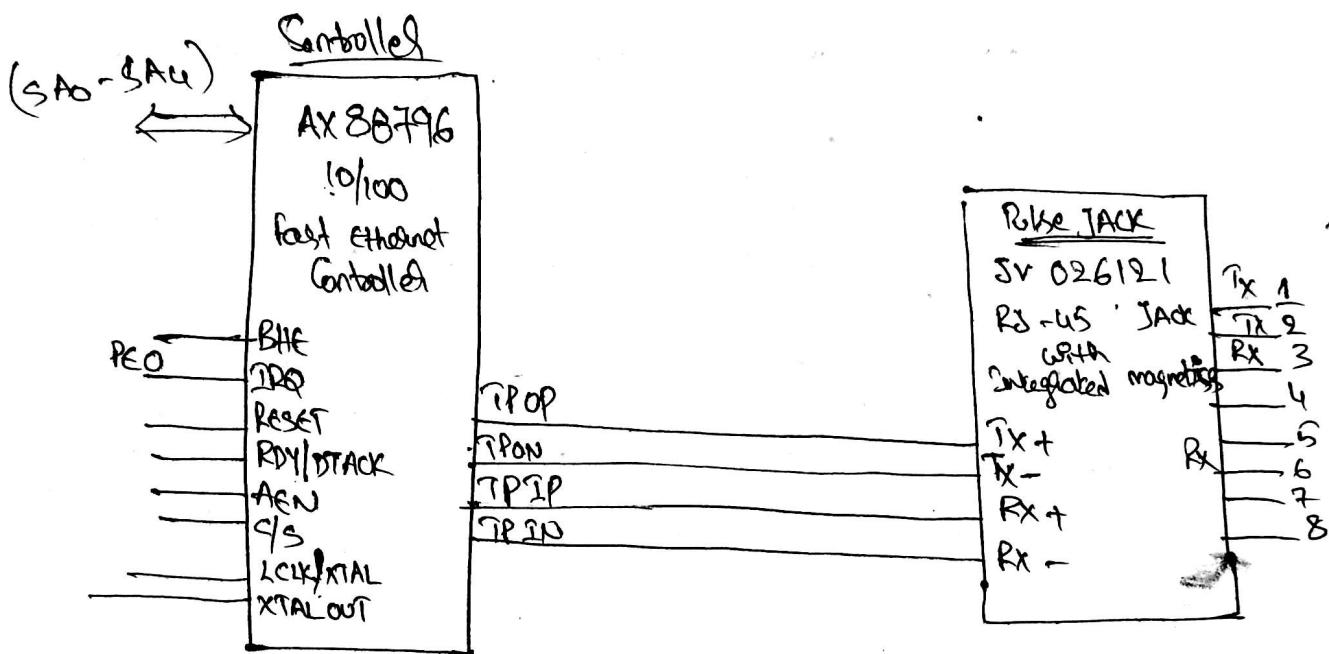
→ A module integrates the RJ-45 Connector and filtering circuitry in single package.

(b) Bus Compatibility:- The ~~CPU0~~ CPU0 & CPU1 pin Configure the chip for use with one of four types popular in E.S : Intel 80186; Intel MCS-51 (8051); Motorola (68000).

The selected bus determines function of pins Control reading & writing to external data bus and polarity of interrupt o/p.

RAM:- The Controller 16 kbytes SRAM buffer holds packets waiting to transmit on new & packets received from above. With 8-bit data bus, only 8-kilobytes of SRAM.

Addressing:- The chip has 10-Address pins  
 5-bits (SA0 through SA4) address the Controller's internal registers  
 2-Registers (10h, 11h) are Data Port

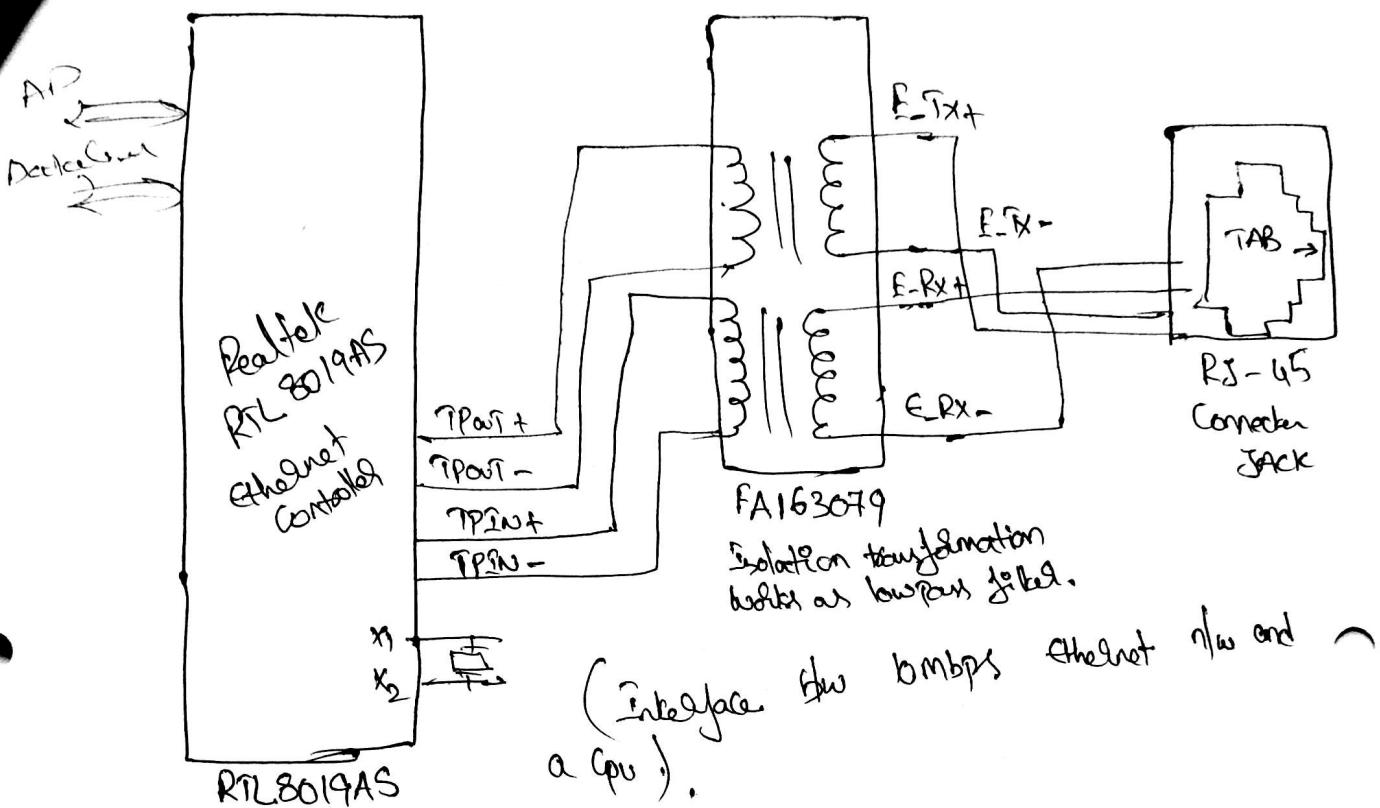


Shows a portion of Communication in RCM 3200 module.

Realtek RTL8019AS :- Most popular Controller has been the RTL8019AS full Duplex ethernet Controller with Plug & Play. from Realtek Semiconductor

→ The 8019AS is another NE2000 Compatible derivative of DP8390.

→ The " " is designed for use with ISA bus but the chip can also interface 8-bit & 16-bit buses.



- \* SMSI LAN 91C96 :- Standard micro systems Corporation (smsc) LAN 91C96
- It is full duplex Ethernet Controller with Magic Packet.
  - Dallas Semiconductor DS2101-1 module use the micro controller.
  - 91C96 supports 10 BASE T Ethernet
  - The chip is 100 pin QFP (Thin quad flat pack) - TQFP with Power supply +5V (or) +3.3 V
  - Don't have ISA (or) PCI interface, (a) Plug & Play support ?
  - It has local bus interface supports PC-Card (PCMCIA) & Motorola 68000 buses.
  - The chip can be 8 (or) 16 data lines up to 20-Address lines with external EEPROM
  - A 64kbtye of SRAM buffer received new data and data waiting to transmit
  - The chip supports Magic Packet, which is Power conserving technology that enables the Controller to wake from a Sleep mode on receiving a special magic packet from new.

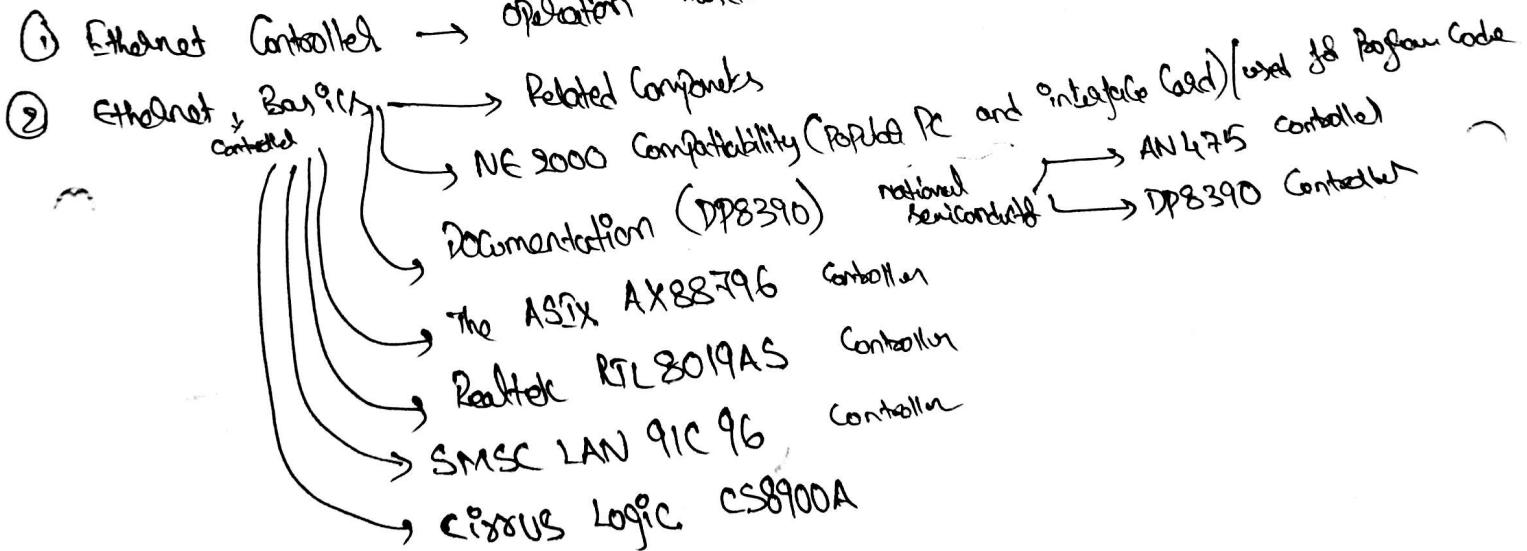
## Cirrus Logic CS8900A :-

" - (2)

An other ISA based model suitable for E.g is Cirrus logic CS8900A  
Crystal LAN ISA Ethernet Controller.

- 8900A is not NE2000-Compatible.
- for 10 BaseT now the chip can connect through a filter to an RJ-45 Jack.
- Power supply :- 5V (DC) +3.3V
- The package is 100 pin TQFP with serial EEPROM interface enabled
- Flash memory is 4-kilobyte.
- first 350 bytes holds Contents of registers for Configuring bus interface, Providing status and control information; initiating transmit; and address filtering.
- Chip has 20-Address lines & both 8 or 16-data lines.
- No support of DMA & No auto incrementing of packet page pointer.

— X —  
(Tx & Rx)



## \* Using Internet Protocol in Local & Internet Communications:-

- Protocols in IEEE 802.3 standard enables the computer in local due to exchange messages with other.
- ~~802~~ Internet protocols such as TCP; UDP and IP defined well supported methods for accomplishing common tasks such as flexible addressing and Routing messages.

### (i) Connecting to Internet:-

Computer requires 3-thing for communication.

- IP address that identifies the computer on the Internet
- Ability to send and receive IP datagrams
- A connection to a router that can access the Internet.

→ An ISP (internet service provider) provides 1 or more IP addresses and connection to router.

### (ii) Considerations in obtaining Internet Service:-

In Internet communication one computer functions as a client, and others as server.

- A Client request resources from Server.
- A ~~server~~ resource may be web page, file (or) other data.
- Microsoft Internet Explorer & other web browsers are clients. The text that in browser text box (as <http://www.123.com> (or) <http://192.168.1.1>) identified resources.

To request webpages, download (or) upload requires 3-things:-

- Computer that functions as server.
- Internet account that permits hosting a server
- network security settings that enable server to receive and respond to requests from other Computer.

### (iii) Technologies for Connecting:-

- via Dial-up Connections on phone lines
- for high speed, are Digital Subscribers Line (DSL); Integrated Services Digital Network (ISDN) line;
- Cable modem;
- like RS232; USB; UART;

### Access Type

Access Type	Downstream speed (kbps) typically maximum	Upstream speed (kbps, typically max)	Transmission medium
Dialup	56	56	Phone line
ADSL	1500	384	"
SDSL	2000	2000	"
BRI ISDN	128	128	"
PRI ISDN	1500 (23 channels)	1500 (23 channels)	"
Cable modem	1500, shared	384, shared	TV cable
Satellite	500	50	Wireless

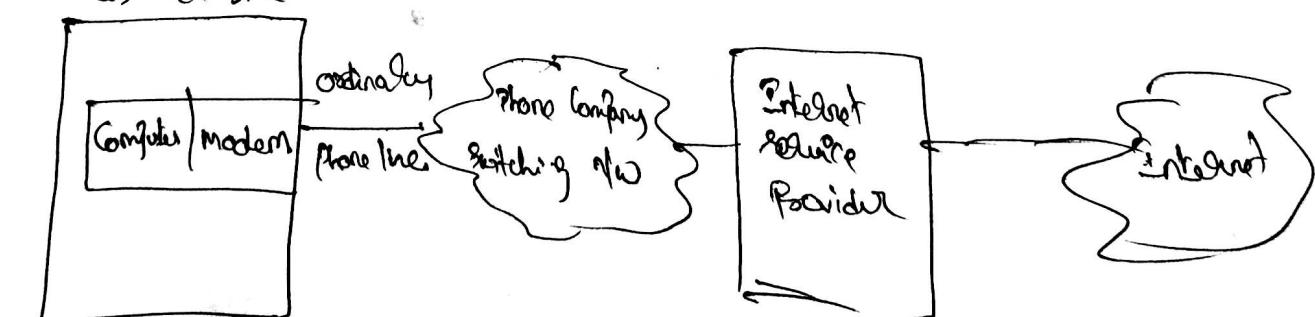
(iv) Connecting multiple computers to internet :-

- Computer connected to Internet must have a IP address that different from address of others.
- The ways to enable multiple computer to share public IP address are with a routers that supports Network Address Translation (NAT) Protocol and with a Windows PC Configured as internet Connection Sharing host.
- The router uses NAT Protocol to translate the public and local address as needed.

(v) Dial up :- is available anywhere there is phone service.

- A modern provides interface for Computer that wants to access Internet.
- The dialup number connects to an modem at ISP.
- ISP modem interconnects to a router with Internet connection.

Customer Site



→ Computer uses PPP Point to Point Protocol to manage modem connection and to send and receive IP datagram over serial link.

→ Dialup connections are max speed 56 kbps/sec

(c)

DSL :- (Digital Subscribed Line)

→ use a conventional phone line with equipment at each end to enable the line to carry voice and internet Comm at same time.

→ In upstream direction splitted combined phone & internet traffic on a single pair wire

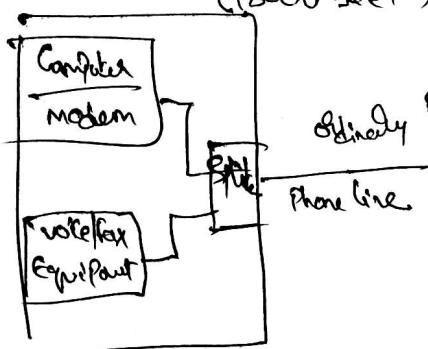
→ In downstream direction ~~use~~ splitter routes the phone and internet traffic onto appropriate wires inside the customer's premise.

→ Another name for splitter is Network Termination Device (NTD)

2 popular options of DSL are

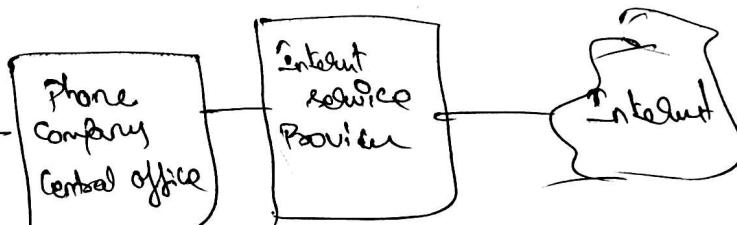
ADSL

Asymmetric Digital  
Subscribed line  
max distance b/w customer & central office  
(18,000 feet)



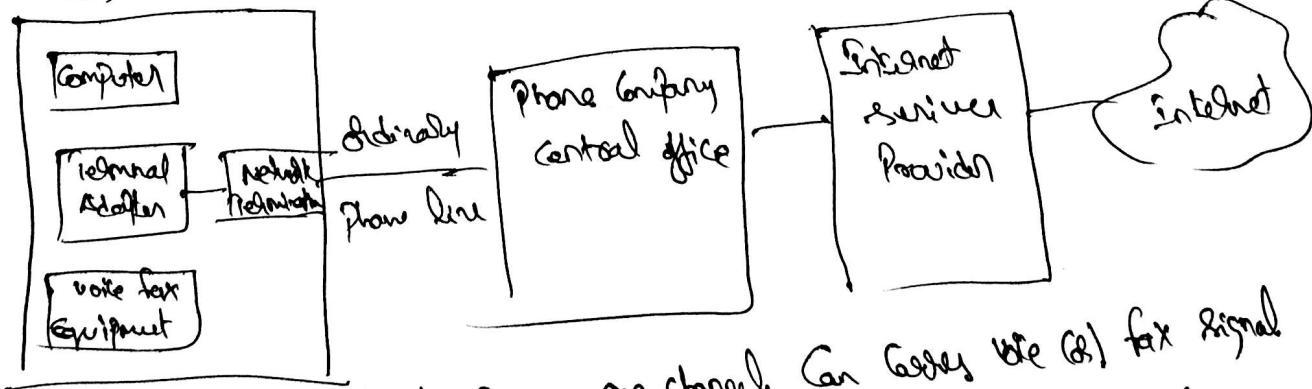
SDSL

Single line Digital Subscribed  
line  
(18,000 to 22,000 feet).



In DSL Connection, voice & fax lie can share the same phone line as data.

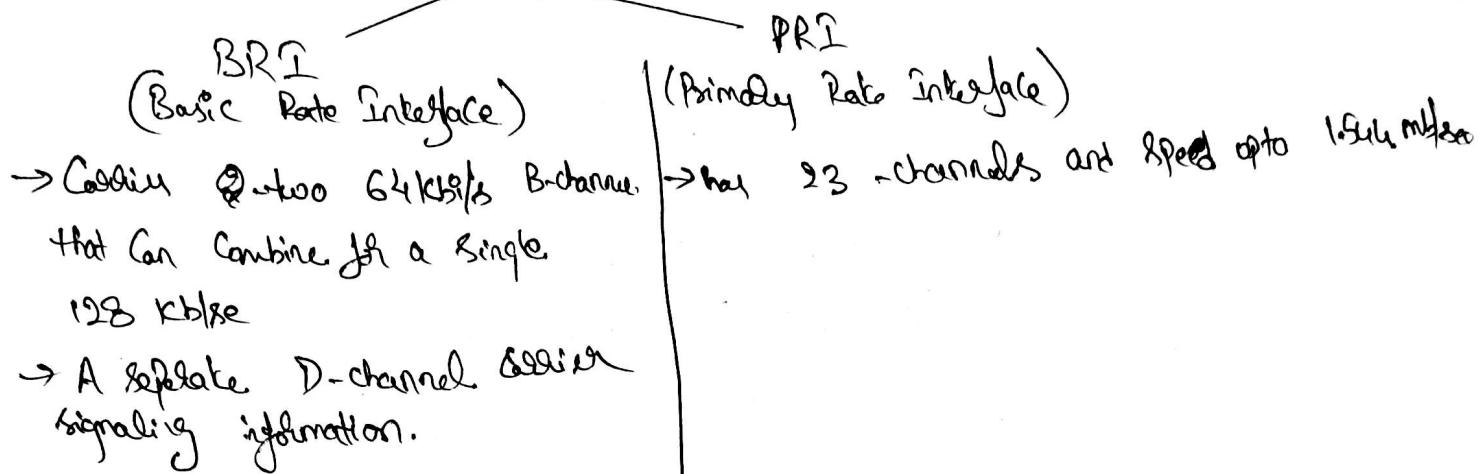
Customer side



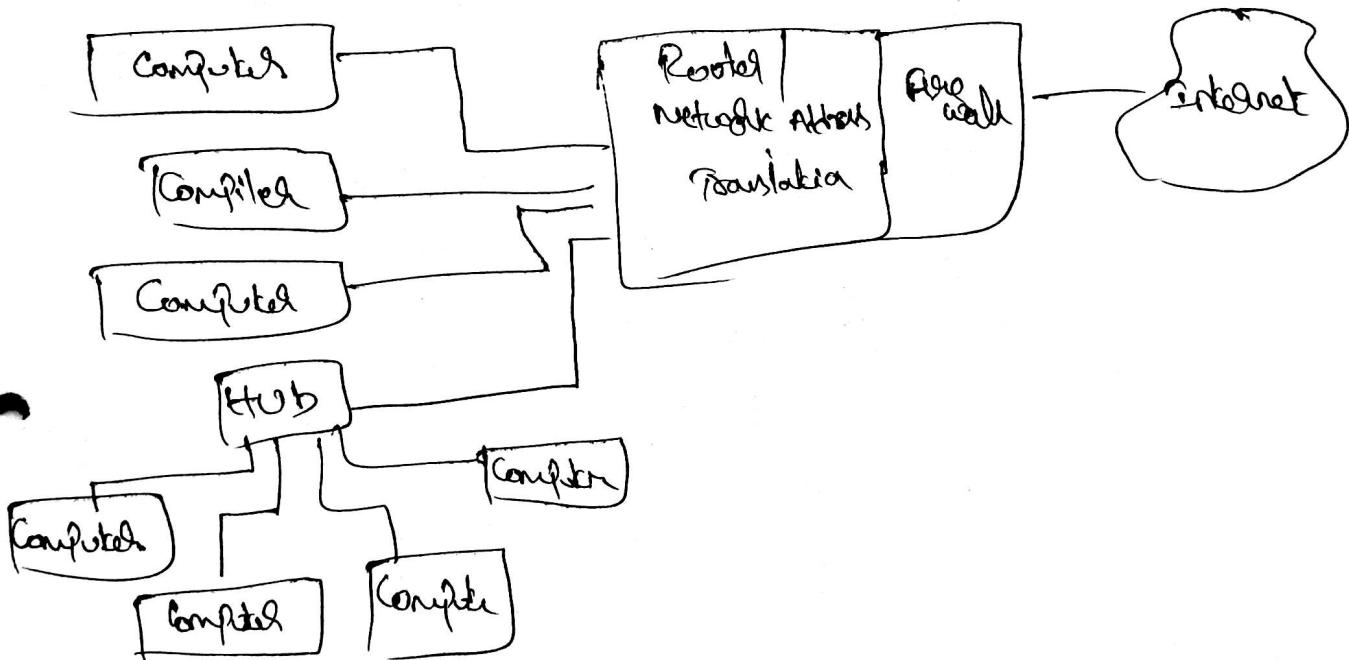
Basic Rate Interface (BRI) ISDN, one channel can carry voice (B) fax signal while other carries data (D) for a higher speed connection both channel can carry data.

(2) PSTN:- Integrated Services Digital Netw., ~~is~~ Re Converted Phone Line  
has 2 Variants

III 26



\* Communicating through a firewall:-



(X) How URL specifies a Resource  
↳ (Uniform Resource Locator)