

RATIONALE

The future of computer technology is in computer networks. Global connectivity can be achieved through computer networks. A diploma holder in electronics and communication engineering should therefore understand the function of networks. Knowledge about hardware and software requirements of networks is essential.

LEARNING OUTCOMES

After completion of the course, the learner should be able to

- recognize physical topology and cabling (coaxial, OFC, UTP, STP) of a network.
- recognize various types of connectors RJ-45, RJ-11, BNC and SCST.
- demonstrate various types of networking models and protocol suites.
- install and configure a network interface card in a workstation.
- identify the IP address of a workstation and the class of the address and configure the IP Address on a workstation.
- configure routers.
- demonstrate sub netting of IP address.
- identify connectivity troubleshooting using PING, IPCONFIG, IFCONFIG.
- explain concept of wireless networking.
- configure different Network devices.
- understand network security management and configuration.

DETAILED CONTENTS

1. Networks Basics (08 Periods)
 - 1.1 What is network
 - 1.2 Peer-to-peer Network
 - 1.3 Server Client Network
 - 1.4 LAN, MAN and WAN
 - 1.5 Network Services
 - 1.6 Network Topologies
 - 1.7 Switching Techniques

2. OSI Model (08 Periods)
 - 2.1 Standards
 - 2.2 OSI Reference Model

- 2.3 OSI Physical layer concepts and application
 - 2.4 OSI Data-link layer concepts and application
 - 2.5 OSI Networks layer concepts and application
 - 2.6 OSI Transport layer concepts and application
 - 2.7 OSI Session layer concepts and application
 - 2.8 OSI presentation layer concepts and application
 - 2.9 OSI Application layer concepts and application
3. Introduction to TCP/IP (08 Periods)
- 3.1 Concept of physical and logical addressing
 - 3.2 Different classes of IP addressing, special IP address
 - 3.3 Sub netting and super netting
 - 3.4 Loop back concept
 - 3.5 IPV4 and IPV6 packet Format
 - 3.6 Configuring IPV4 and IPV6
4. Cables and Connectors (08 Periods)
- 4.1 Types of Cables(Coaxial, Twisted Pair), Shielded and Unshielded Pair of Cables, fiber optic cable.
(Straight through Cable, Cross Over Cables) with colour coding.
 - 4.2 Ethernet Specification and Standardization:
10 Mbps (Traditional Ethernet), 100 Mbps (Fast Ethernet) and 1000 Mbps (Gigabit Ethernet),Leased lines.
 - 4.3 Use of RJ45, RJ11, BNC,SCST.
5. Network Connectivity (09 Periods)
- 5.1 Network connectivity Devices
 - 5.2 NICs
 - 5.3 Hubs
 - 5.4 Bridges
 - 5.5 Repeaters
 - 5.6 Switches
 - 5.7 Routers and Routing Protocols, Routing Algorithm
 - 5.8 Configuring of Routers.
 - 5.9 VOIP and Internet Telephony
6. Network Administration / Security (09 Periods)
- 6.1 Client/Server Technology
 - 6.2 Server Management

- 6.3 RAID management and mirroring
- 6.4 Cryptography
- 6.5 Ethical Hacking

7. Wireless Networking

(06 Periods)

Basics of Wireless: Wireless MAN, Networking, Wireless LAN, Wi-Fi, WiMax (Broad-band Wireless) and Li-Fi.

LIST OF PRACTICALS

1. Configure local area network using topologies.
2. Configure different network devices used in LAN- hub/switch/routers/bridges.
3. Create different types of cables for straight through and cross over cable
4. Configure Ethernet network
5. Install NIC and locate MAC address
6. Configure TCP/IP addressing
7. Install Network printer and sharing content

INSTRUCTIONAL STRATEGY

This subject deals with both theory and practicals. The students should be made to practically establish LAN with various hardware and software and their integration.

MEANS OF ASSESSMENT

- Assignments and quiz/class tests
- Mid-term and end-term written tests
- Model/prototype making
- Actual laboratory and practical work, model/prototype making, assembly and disassembly exercises and viva-voce

RECOMMENDED BOOKS

5. Computer Networks by Tanenbaum, Prentice Hall of India, New Delhi
6. Data Communications and Networking by Forouzan, (Edition 2nd and 4th), Tata McGraw Hill Education Pvt Ltd , New Delhi
7. Data and Computer Communication by William Stallings, Pearson Education, New Delhi
8. e-books/e-tools/relevant software to be used as recommended by AICTE/NITTTR.

Websites for Reference:

<http://swayam.gov.in>

C.N.
Lect. 01.
2/2/22.

COMPUTER NETWORKS.



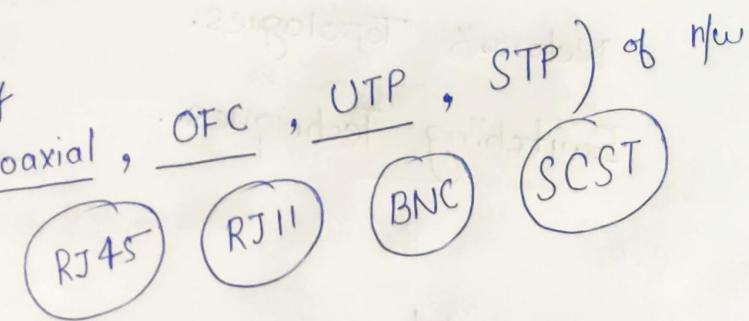
Global Connectivity.

fⁿ of n/w

Knowledge of Hardware & Software requirements of n/w.

Physical topology

Cabling



Connectors like

Various n/wing models

Protocol Suites

Installation | Configuration of n/w interface.

[IP address configuration]

Routers

Configure

IPCONFIG

[sub netting of IP address]

IFCONFIG

PING

IPCONFIG

wireless networking

✓ N/w devices

n/w Security Management. | Configuration.

ch(1) Network Basic.

1. What is network .

Peer to Peer network .

Server Client network

LAN MAN WAN

Network Services

Network Topologies.

Switching Techniques .

ch(2)

OSI Model

Standards

OSI Reference Model

- Physical layer
- Data link layer
- Network layer
- Transport layer
- Session layer
- Presentation layer .
- Application layer .

ch(3)

TCP / IP

◦ physical & logical addressing

◦ Class of IP addressing

◦ Sub netting Super netting

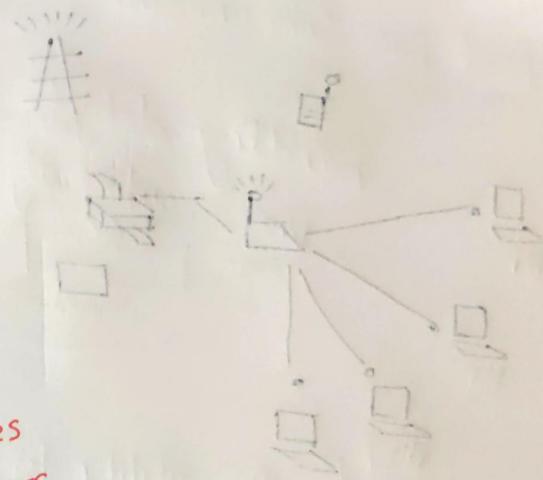
◦ IPv4 | IPv6 | Configuration

Ch(4) Cables & Connectors

- Types of Cables
 - { Coaxial
Twisted pair
Shielded TP
Unshielded TP }
 - { FOC
Fibre optic Cable }
- Ethernet Specifications
 - { 10 Mbps
100 Mbps
1000 Mbps }

• Leased Lines.

- Use of → RJ 45
- RJ 11
- BNC
- SCST



Ch(5) Network Connectivity

NICs
Hubs
Bridges
Repeaters
Switches

Routers & Routing Protocols
Routing Algorithm.
Configuring Routers.

VoIP

Ch(6) → Network Administration / Security

- Client / Server Technology
- Server Management
- RAID
- Cryptography

• Ethical Hacking.

Ch(7) Wireless Networking

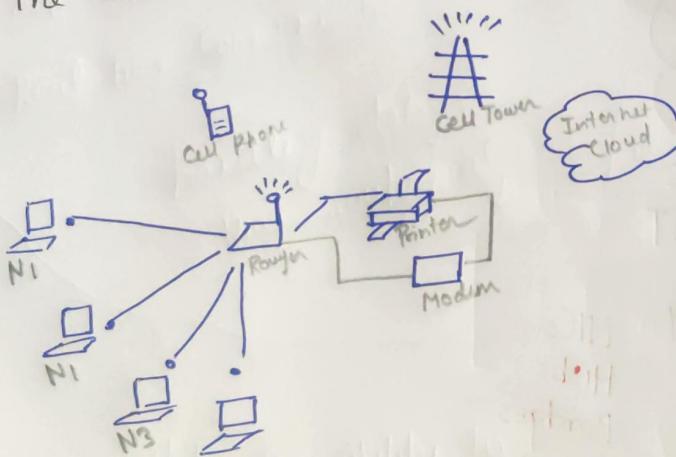
Computer Network :

" A CN is a set of nodes connected by communication links"

Node : " A node can be computer or any device capable of sending / receiving data generated by other nodes in the network "

Communication Link :— link can be a wired link or wireless link
The link carries the information

Computer
Server
Printer
Security Camera
Switcher / Bridges / Routers.



- o End devices / Nodes
- o Intermediary / Nodes.

Basic Characteristics of Computer N/w

(4)

1. Fault Tolerance

2. Scalability

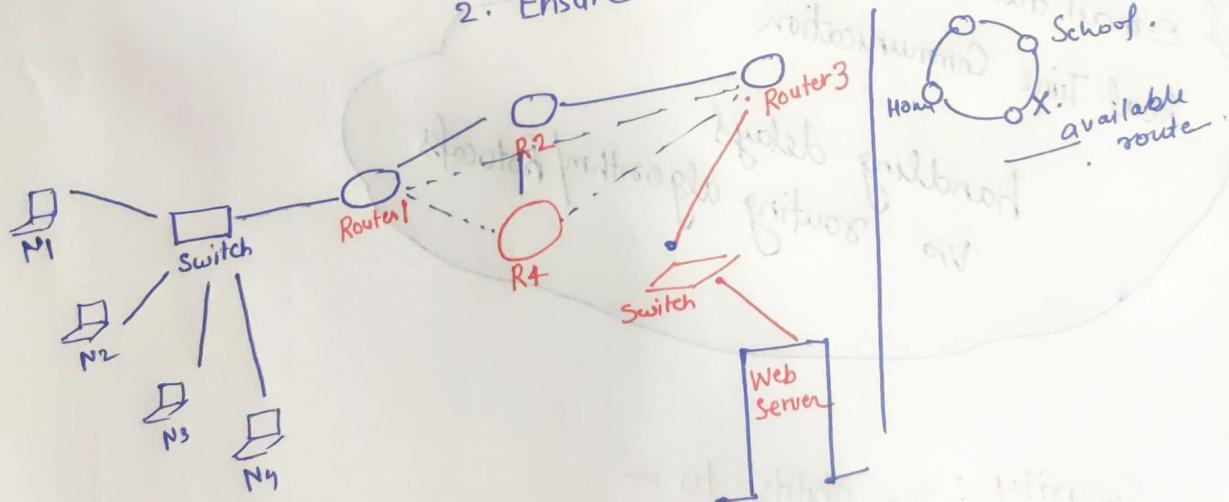
3. Quality of Service

4. Security

1. Fault Tolerance

The ability to :

1. Continue working despite failures
2. Ensure no loss of service



2. Scalability

Internet

The ability to

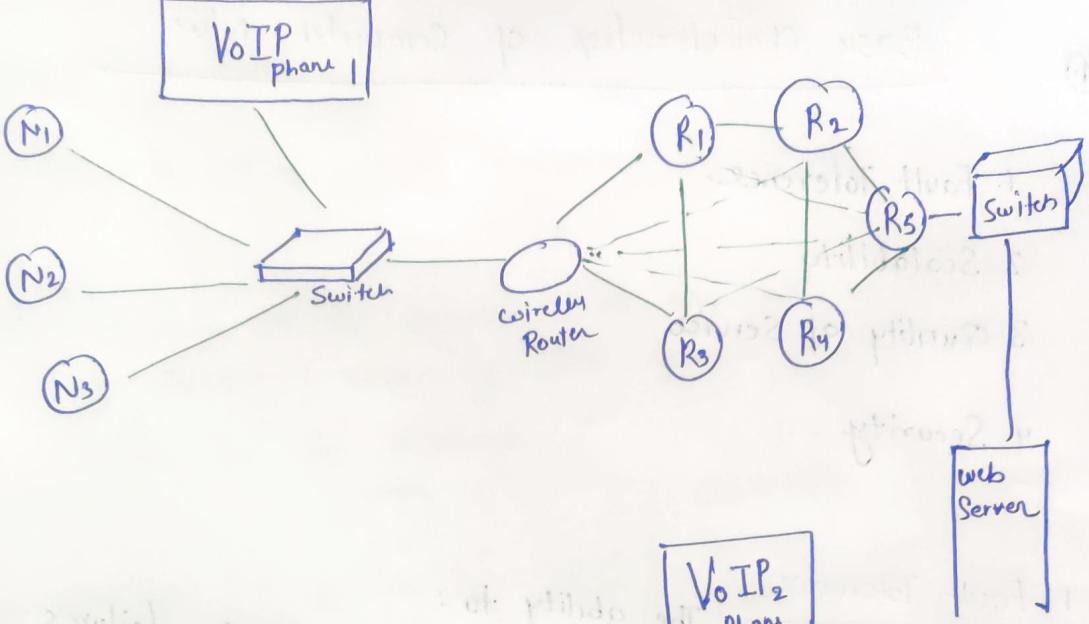
1. Grow based on needs
2. Have good performance after growth.

3. Quality of SERVICE

The ability to

1. Set Priorities

2. Manage data traffic to reduce data loss, delay, etc.



e-mail data
Real Time Communication
handling delays
via routing algorithm/Protocols

Security : The ability to -

prevent

- Unauthorised access

◦ Misuse

◦ Forgery

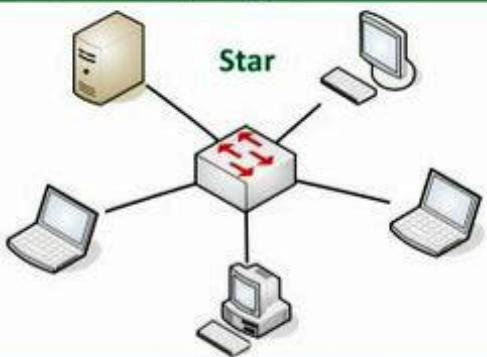
The ability to provide

- Confidentiality

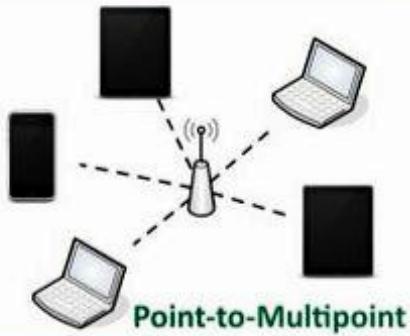
◦ Integrity

◦ Availability

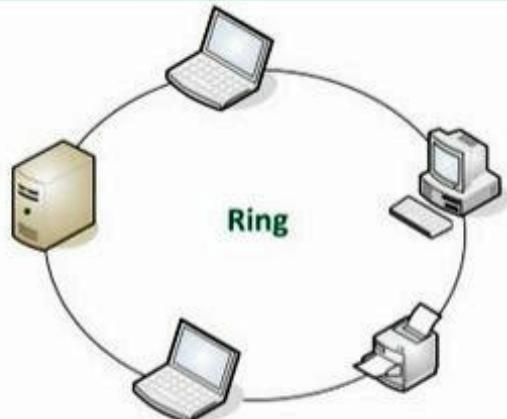
Network Topologies



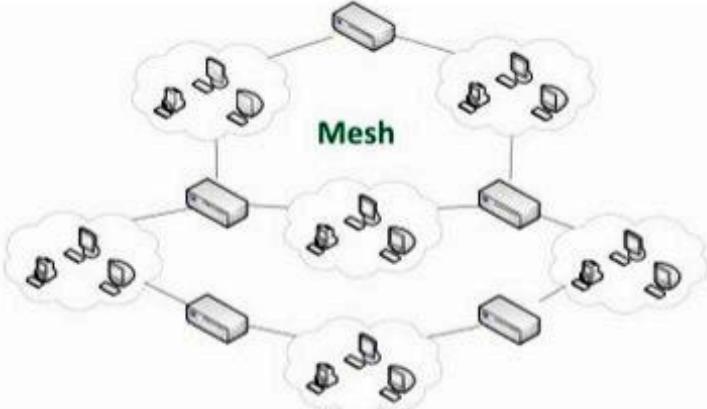
Point-to-Point



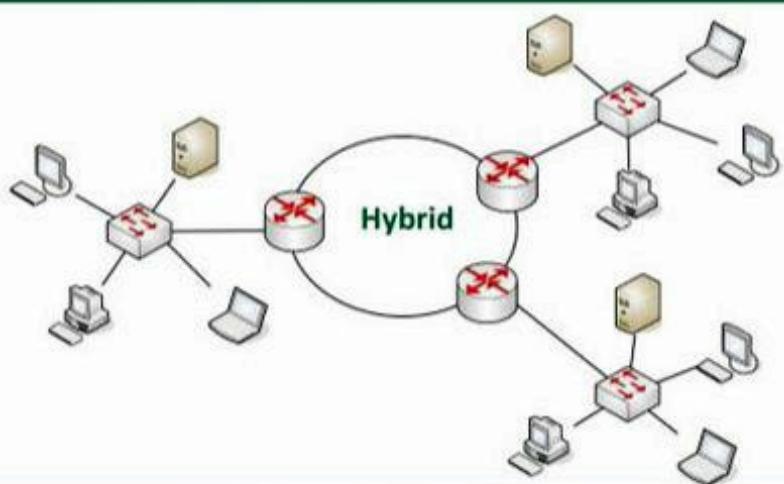
Point-to-Multipoint



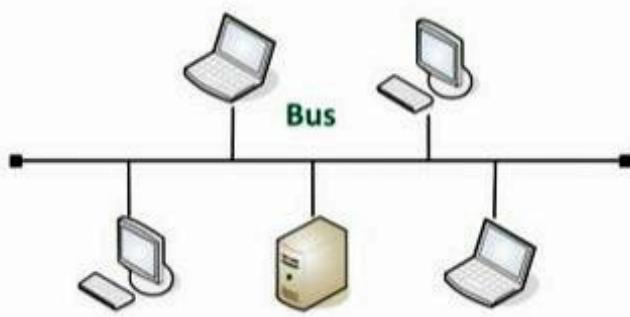
Mesh



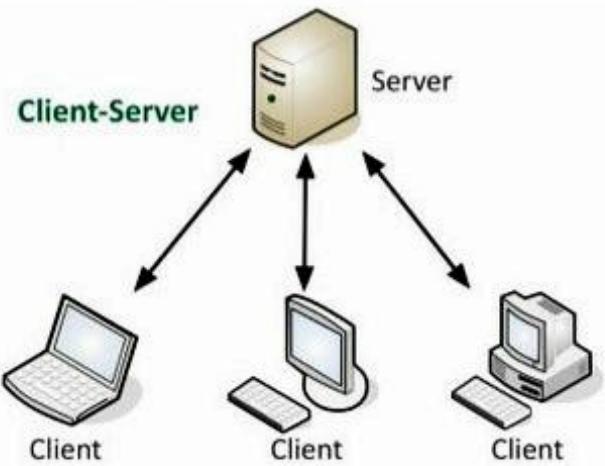
Hybrid



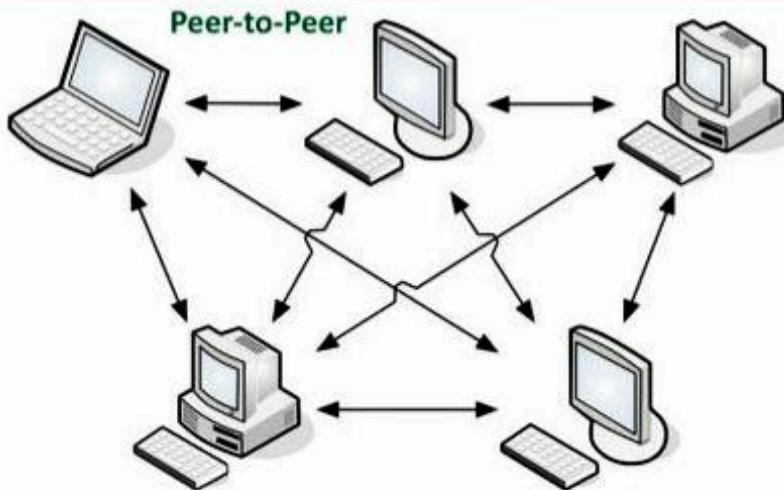
Bus

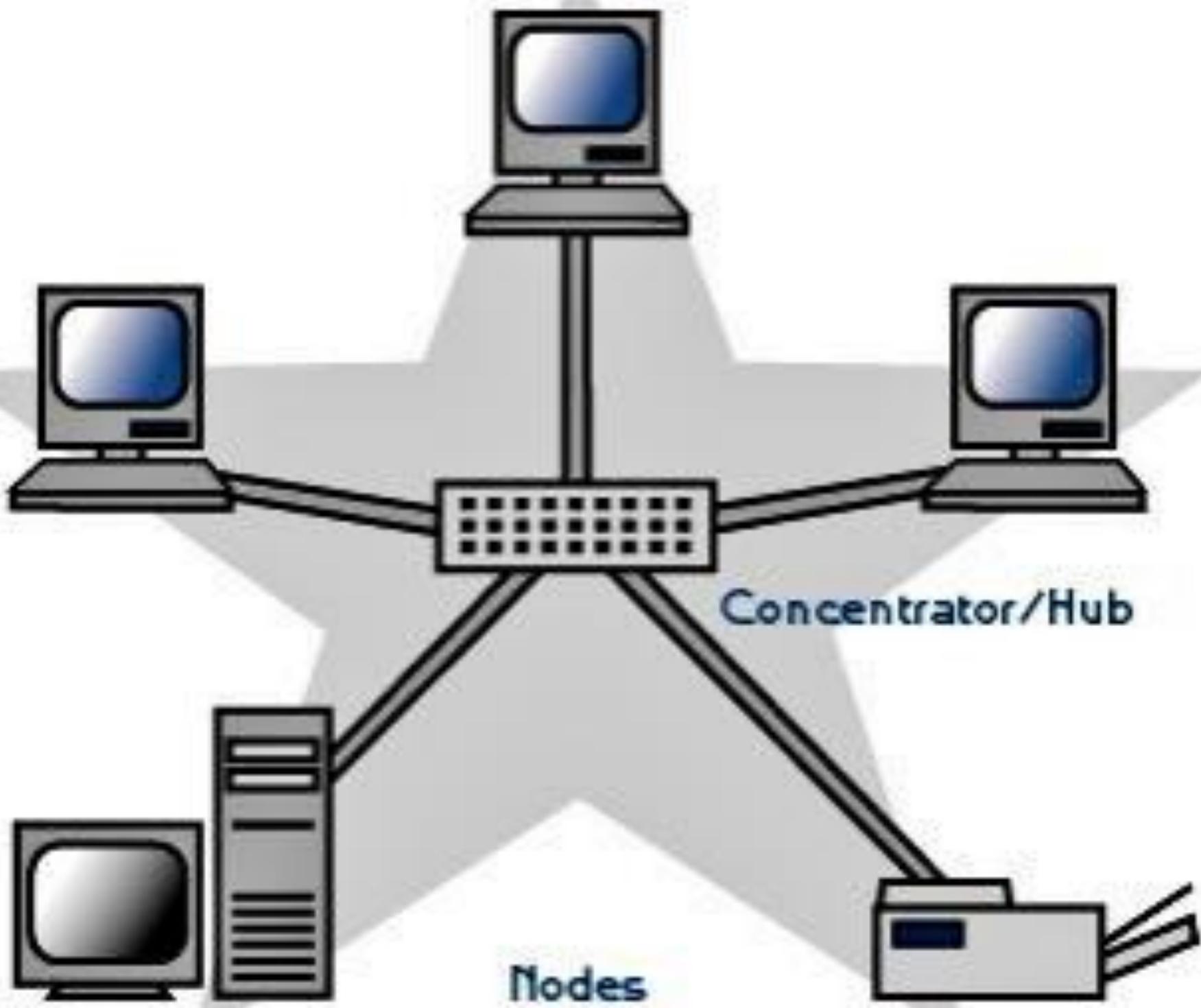


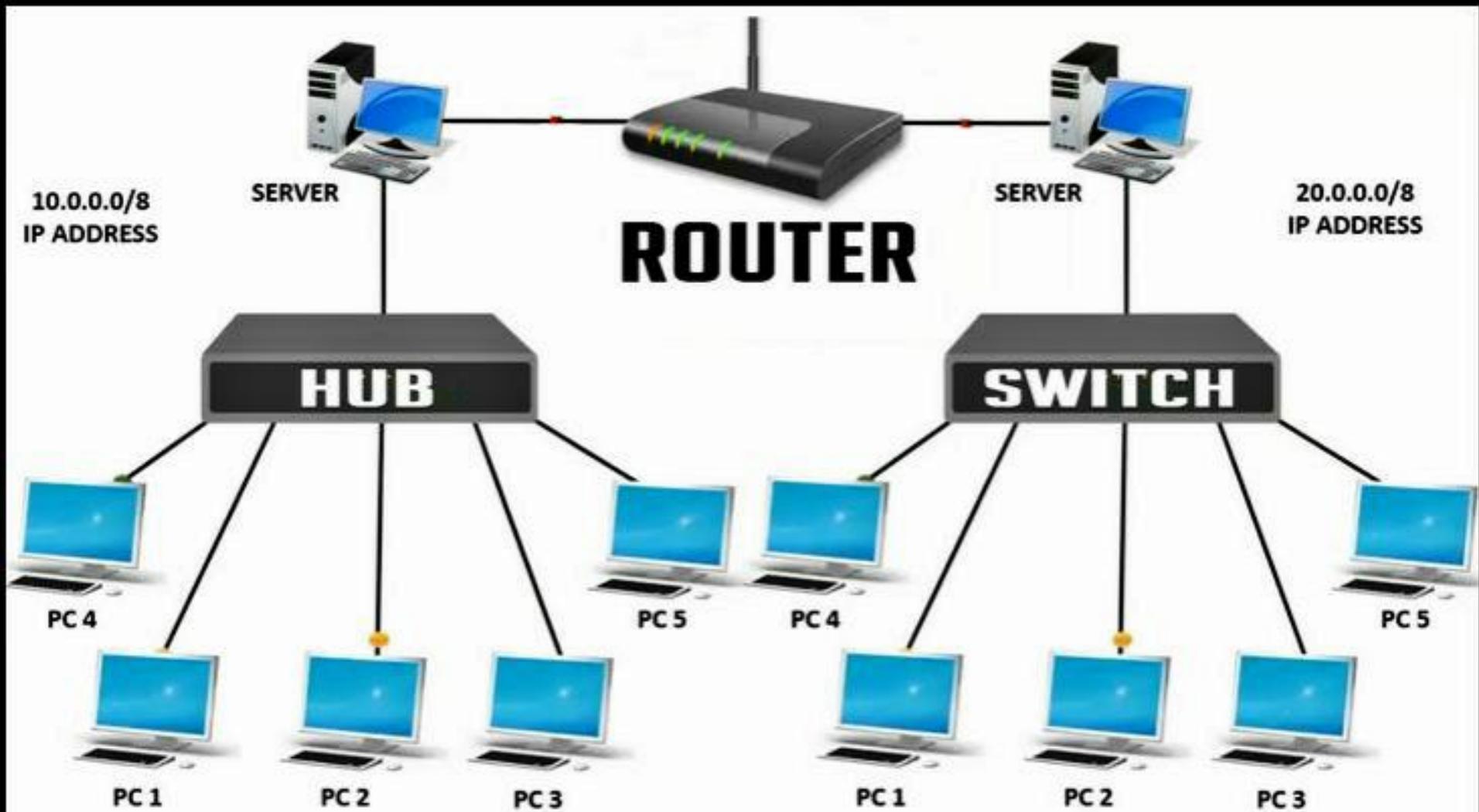
Client-Server



Peer-to-Peer









TYPES OF COMPUTER NETWORK

Computer networks allow computers to connect and communicate with different networks over various geographical locations.

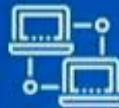
1



PERSONAL AREA NETWORK (PAN)

A personal area network is a computer network for interconnecting devices centered on an individual person's workspace.

2



LOCAL AREA NETWORK (LAN)

So we know two things about a LAN just from the name "Local Area Network"—the devices on them are networked and they're local.

3



WIRELESS LOCAL AREA NETWORK (WLAN)

Stands for "Wireless Local Area Network." A WLAN, or wireless LAN, is a network that allows devices to connect and communicate wirelessly.

4



CAMPUS AREA NETWORK (CAN)

A campus area network known as is used to inter-connect networks in limited geographical locality like university campus, military bases, or organizational campuses etc.

5



SYSTEM-AREA NETWORK (ALSO KNOWN AS SAN)

A System area network is a relatively local network designed for high-speed interconnection in cluster environments server to server, multiprocessing systems (processor to processor), and storage area networks.

6



WIDE AREA NETWORK (WAN)

A wide area network is a geographically distributed private telecommunications network that interconnects multiple local area networks .

7



STORAGE-AREA NETWORK (SAN)

A storage area network is a dedicated high-speed network or sub network that interconnects and presents shared pools of storage devices to multiple servers.

8



METROPOLITAN AREA NETWORK (MAN)

A metropolitan area network is a network that interconnects users with computer resources in a geographic area or region larger than that covered by even a large local area network but smaller than the area covered by a wide area network .



SSD



HDD



(10 000 - 15 000 rpm)

0.1 ms

Access times

SSDs exhibit virtually no access time

5.5 ~ 8.0 ms

SSDs deliver at least

6000 io/s

Random I/O Performance

SSDs are at least 15 times faster than HDDs

HDDs reach up to

400 io/s

SSDs have a failure rate of less than

0.5 %

Reliability

This makes SSDs 4 - 10 times more reliable

HDD's failure rate fluctuates between

2 ~ 5 %

SSDs consume between

2 & 5 watts

Energy savings

This means that on a large server like ours, approximately 100 watts are saved

HDDs consume between

6 & 15 watts

SSDs have an average I/O wait of

1 %

CPU Power

You will have an extra 6% of CPU power for other operations

HDDs' average I/O wait is about

7 %

the average service time for an I/O request while running a backup remains below

20 ms

Input/Output request times

SSDs allow for much faster data access

the I/O request time with HDDs during backup rises up to

400~500 ms

SSD backups take about

6 hours

Backup Rates

SSDs allows for 3 - 5 times faster backups for your data

HDD backups take up to

20~24 hours

Reverse Polarity
TNC Male



N connector



TNC connector



HD15 connector



Mini BNC connector



BNC connector



Reverse Polarity
TNC Female



SMA connector



SMB connector



SMB HD connector



F connector



RCA connector



Fiber Connector Types



D4



FC



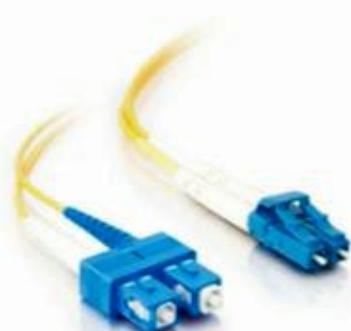
FCA



FCU



LC Clipped



LCU Clipped



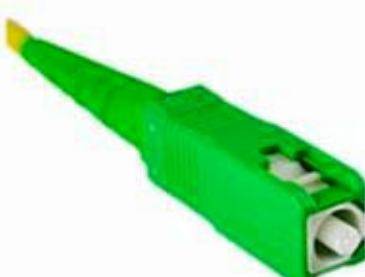
MU



SC Clipped



SC



SCA



ST



STU

Types of port plug



Ethernet



Mini USB



HDMI



USB Type A



Micro USB



USB Type B



USB Type C



USB 3.0



USB A plug



USB A socket



USB3 A plug



USB3 A socket



USB B plug



USB B socket



USB3 B plug



USB3 B socket



USB Mini-A plug



USB Mini-A socket



USB Micro-A plug



USB Micro-A socket



USB Mini-B plug



USB Mini-B socket



USB Micro-B plug



USB Micro-B socket



USB Mini-B to Mini-A plug



USB Mini-AB socket



USB3 Micro-B plug



USB3 Micro-B socket





RG214

A photograph of a RG214 coaxial cable, showing its blue center conductor and black outer jacket.

RG141

A photograph of a RG141 coaxial cable, showing its blue center conductor and black outer jacket.

RG178

A photograph of a RG178 coaxial cable, showing its orange center conductor and white outer jacket.

LMR195

A photograph of a LMR195 coaxial cable, showing its orange center conductor and black outer jacket.

086

A photograph of a 086 coaxial cable, showing its blue center conductor and black outer jacket.

RG59

A photograph of a RG59 coaxial cable, showing its blue center conductor and black outer jacket.

RGB

A photograph of a RGB coaxial cable, showing its grey center conductor and black outer jacket.

RG174

A photograph of a RG174 coaxial cable, showing its yellow center conductor and grey outer jacket.

RG213

A photograph of a RG213 coaxial cable, showing its grey center conductor and grey outer jacket.

RG6

A photograph of a RG6 coaxial cable, showing its grey center conductor and grey outer jacket.

RG316

A photograph of a RG316 coaxial cable, showing its grey center conductor and grey outer jacket.

RG405

A photograph of a RG405 coaxial cable, showing its grey center conductor and grey outer jacket.



Gripping pliers



Cutting pliers



Combination pliers



Shearing pliers



EvoLine



Electronic pliers



Circlip pliers



Waterpump pliers and
Pipe wrenches



Bolt cutters and related
products



Wire stripper and cable
tools



Grip pliers



Special pliers



Service Cases



Complementary Products



Selling aids



VDE-tools



SINGLE-CONDUCTOR WIRES

Solid-core wire



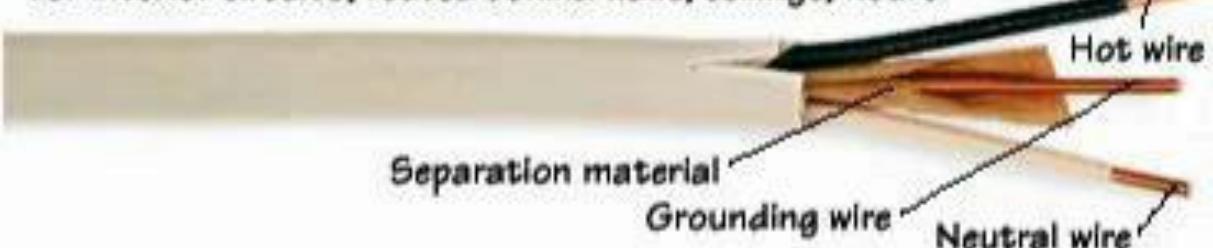
Stranded wire



MULTICONDUCTOR CABLES

Type NM (nonmetallic sheathed) cable "12-2"

For interior circuits; routed behind walls, ceilings, floors



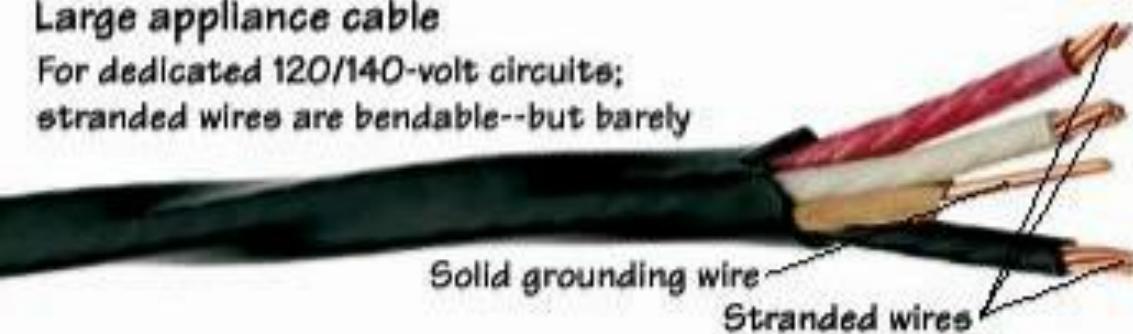
Type NM (nonmetallic sheathed) cable "14-3"

For interior circuits; contains two hot wires



Large appliance cable

For dedicated 120/140-volt circuits;
stranded wires are bendable--but barely



Type MC armored cable

For interior circuits only



Ultimate Chart of Computer Connectors and Ports

Updated for 2018

USB, Keyboard and Mouse



Storage / Disk



Network / Communications



Audio



Video



Power



Brought to you by:



PRR Computers, LLC
(239) 244-1579
www.prrcomputers.com



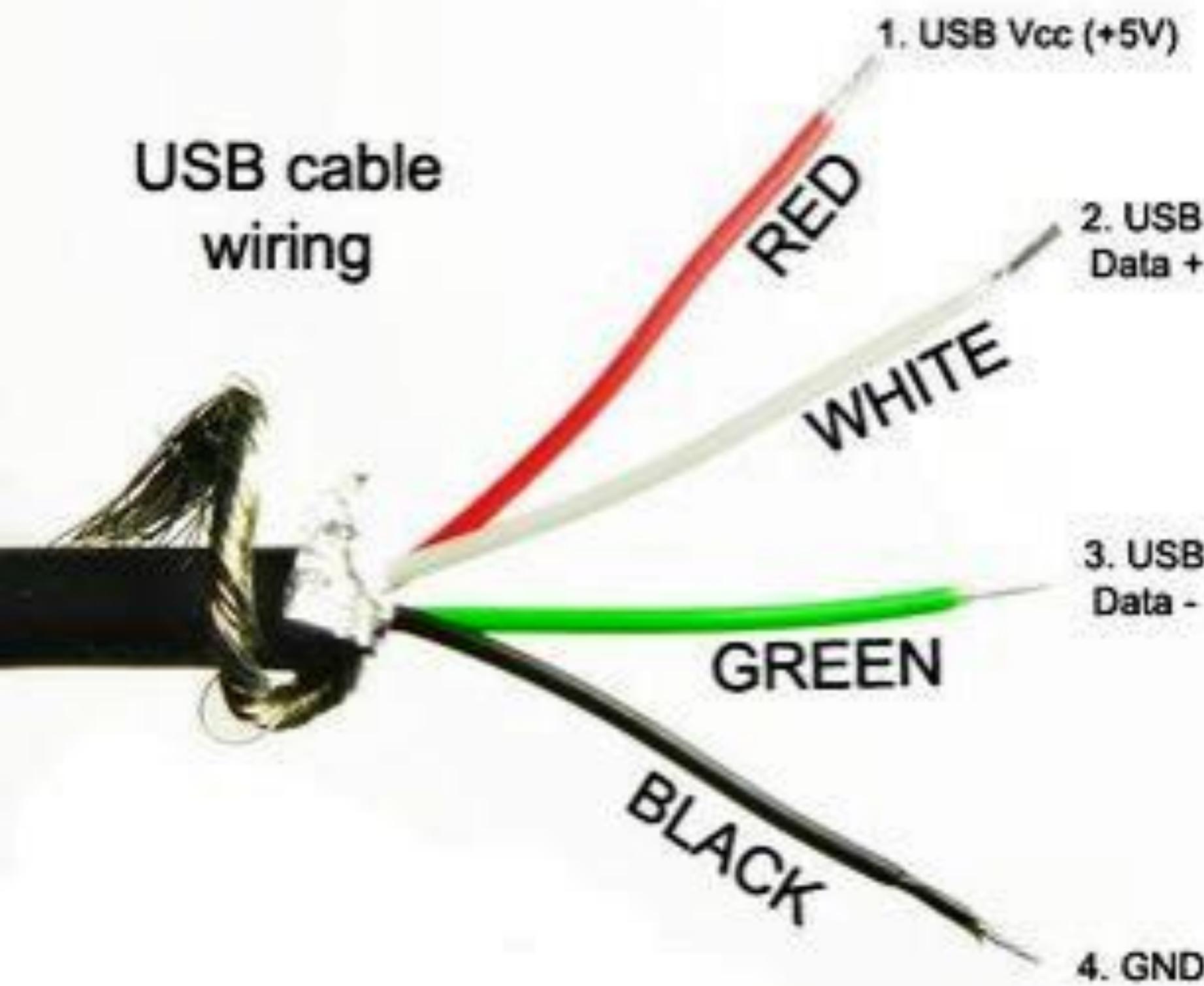
LegitUpdates.com

The safe source for real software updates.



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USB cable wiring





vs



Pros



- It is impossible to track the visited resources from your IP address.
- The network is distributed, therefore, it is difficult to close it.
- It is free to use.

Pros



- Easy to use.
- The connection is more reliable and the speed is higher.
- A stronger encryption.
- You can run any network software – torrents, Skype, email clients, and all traffic will be encrypted.
- The work of VPN connection is controlled not by anonymous individuals but by legal, officially-registered companies. Due to this, a VPN has a much higher level of confidentiality compared to Tor, and you can always get technical help from the Support Team.

Cons



- Low connection speed due to the fact that traffic passes through multiple network nodes.
- Many providers block Tor's nodes on their network.
- Traffic on the last node is not encrypted, so personal data is accessible to third parties.
- Browser plugins like Flash and the use of torrents are not allowed, as they can bypass the Tor and connect directly.

Cons



- Some VPN providers, usually totally free ones, save logs and resell the data to third-party organizations. Make sure your provider has a no-logs policy.
- Reliable and fast VPNs are not free.

POINT-TO-POINT PROTOCOL

packetlife.net

PPP Components

Link Control Protocol (LCP)

Provides for the establishment, configuration, and maintenance of a PPP link. Protocol-independent options are negotiated by LCP.

Network Control Protocol (NCP)

A separate NCP is used to negotiate the configuration of each network layer protocol (such as IP) carried by PPP.

PPP Header

Address	Control	Protocol	32
---------	---------	----------	----

LCP Header

Code	Identifier	Length	32
------	------------	--------	----

Authentication Protocols

Plaintext Authentication Protocol (PAP)

Original, obsolete authentication protocol which relies on the exchange of a plaintext key to authenticate peers (RFC 1334).

Challenge Handshake Authentication Protocol (CHAP)

Authenticates peers using the MD5 checksum of a pre-shared secret key (RFC 1994).

Extensible Authentication Protocol (EAP)

Provides MD5-based authentication similar to CHAP (RFC 3748). Could be expanded to support other EAP mechanisms as well.

General PPP Configuration

```
! Configure a peer account if authentication will be used
username peer-hostname password password
```

```
! Configure a local IP address pool if needed
ip pool name first-IP last-IP
```

```
interface Serial0/0
    ! Enable PPP encapsulation
    encapsulation ppp
    ! Enable CHAP and/or PAP for authentication
    ppp authentication { chap | pap } [ chap | pap ]
    ! Enable compression
    compress { predictor | stac }
    ! Enable peer IP address assignment (server side)
    peer default ip address { pool name | IP-address }
    ! Enable IP address negotiation (client side)
    ip address negotiated
```

Multilink PPP Configuration

```
! Create the multilink interface
interface Multilink1
    ip address IP-address subnet-mask
    ppp multilink group group
```

```
! Assign physical interfaces to the multilink group
interface Serial0/0
    encapsulation ppp
    ppp multilink group group
```

PPP Summary

Standard RFC 1661

Interfaces Asynchronous serial, synchronous serial, ISDN, HSSI

PPP Features

Protocol Multiplexing · Multiple NCPs

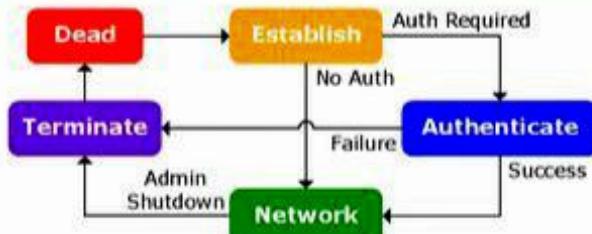
Optional Authentication · PAP/CHAP

Optional Compression · Stacker/predictor

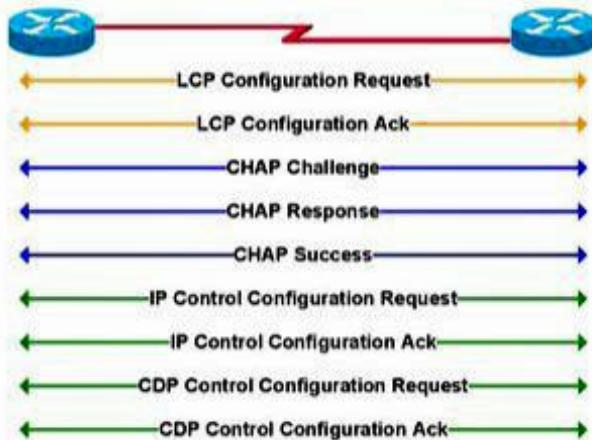
Loopback Detection · Provided by LCP

Load Balancing · Multilink PPP

Connection Phase Flowchart



PPP Connection Example



PPP Compression Algorithms

Stacker

Replaces repetitive data with symbols from a dynamic dictionary (more processor-intensive)

Predictor

Attempts to predict sequential data (more memory-intensive)

Troubleshooting

```
show ppp multilink
```

```
debug ppp authentication
```

```
debug ppp { negotiation | packet }
```

Computer Networking

What is networking?

Interconnection of two or more computers in such a way so that they can easily share information

CCNA & CCNP CERTIFICATION

Types of network based on geographical area

LAN

Local Area Network

WAN

Wireless
Local Area Network

W LAN

Wide Area Network

MAN

Metropolitan
Area Network

SAN

Storage
Area Network

CAN

Campus
Area Network

PAN

Personal
Area Network

DAN

Desk Area Network

CISCO SECURITY TRAINING

Benefits Of Computer Networking



Data Sharing



Video conferencing



Internet services



Eases out management of data

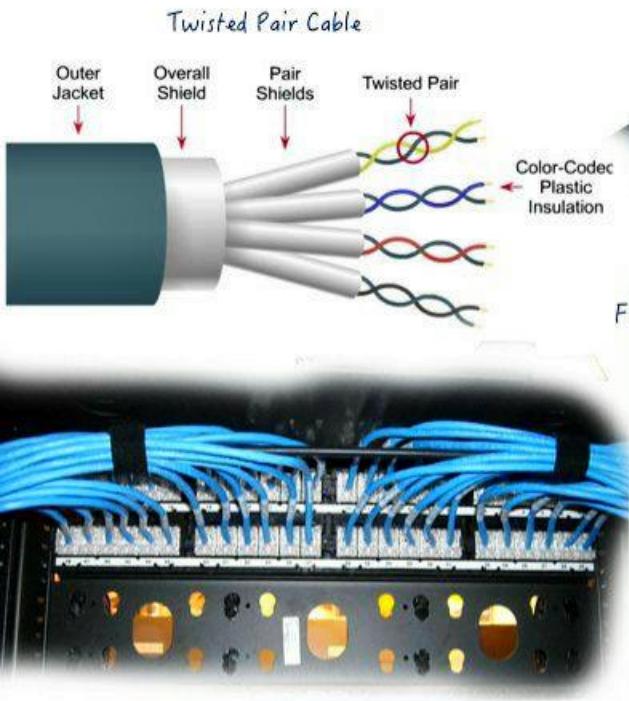


enhance connectivity

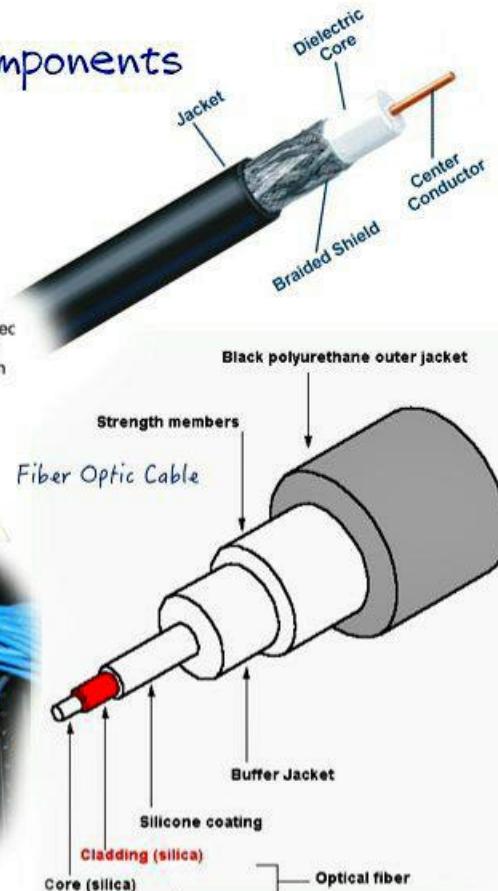


Saves Money

Network Components



Patch Panel



Switch



Network Components

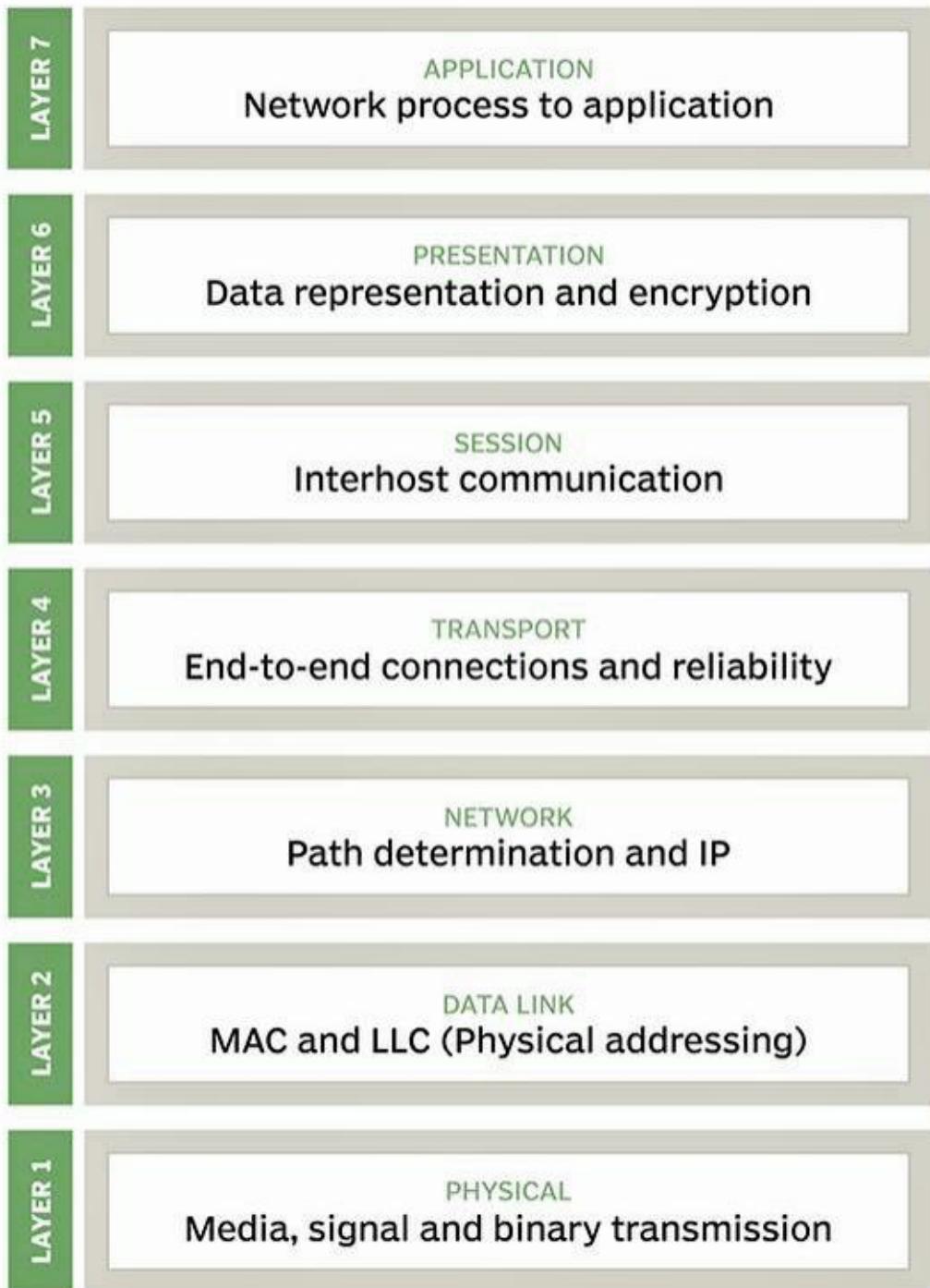
Passive Network Components

Active Network Components

Cable
Junction box
Connector
Patch Panel
Network Cabinet / Patch cabinet

Network card
Repeater
Hub
Switch
Router
Gateway
Server
Proxy
Print Server
NAS (Storage)
Firewall
Load Balancer

The OSI model



LAN VS MAN VS WAN

LAN

A computer network that interconnects computers within a limited area such as residence, office building, school or a laboratory

Stands for Local Area Network

Covers an area within 1km to 10km

Easier to design and maintain

High data transferring speed

Has a limited number of users - less congestion

A network in a home, school or an office

MAN

A computer network that interconnects user with computer resources in a geographical area larger than LAN but smaller than WAN

Stands for Metropolitan Area Network

Covers an area within 100km

Difficult and complicated to design and maintain

Moderate data transferring speed

Moderate congestion

A network in a city or a small town

WAN

A computer network that extends over a large geographical area

Stands for Wide Area Network

Covers a large area that goes beyond 100km

Difficult and complicated to design and maintain

Low data transferring speed

Low congestion

A network network covering a state or a country

7 Layers of the OSI Model



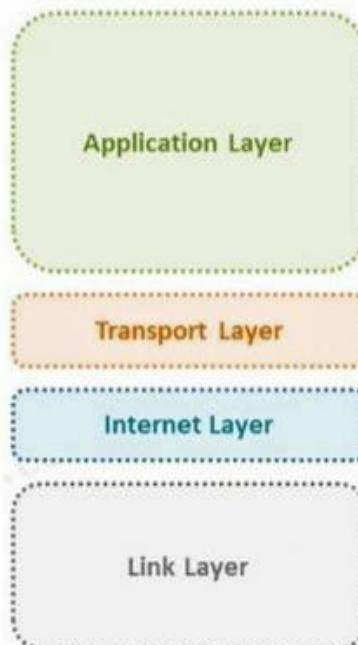
- End User layer
- HTTP, FTP, IRC, SSH, DNS
- Syntax layer
- SSL, SSH, IMAP, FTP, MPEG, JPEG
- Synch & send to port
- API's, Sockets, WinSock
- End-to-end connections
- TCP, UDP
- Packets
- IP, ICMP, IPSec, IGMP
- Frames
- Ethernet, PPP, Switch, Bridge
- Physical structure
- Coax, Fiber, Wireless, Hubs, Repeaters

What is the Layers of TCP/IP ?

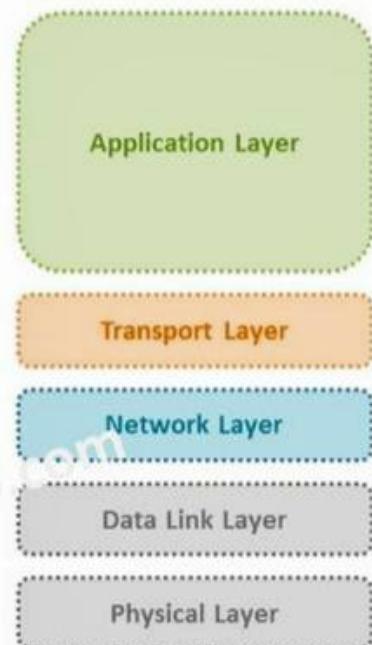
OSI Reference Model

Application Layer
Presentation Layer
Session Layer
Transport Layer
Network Layer
Data Link Layer
Physical Layer

TCP / IP Model (Four Layered)



TCP / IP Model (Five Layered)



COMPUTER NETWORKING KNOWLEDGE

ETHERNET CONNECTIVITY

Set your Duplex

Half duplex (HDX) requires one device to wait if the other is transmitting. Full duplex (FDX) allows traffic to flow both ways simultaneously.

Duplex Configuration	Auto-negotiating	Fixed Half Duplex	Fixed Full Duplex
Auto-negotiating	Safe. Selects the best configuration common to both partners	Works because auto defaults to half duplex if the link partner is also not auto-negotiating	Fails because auto defaults to half duplex if the link partner is also not auto-negotiating
Fixed Half Duplex	Works because auto defaults to half duplex if the link partner is also not auto-negotiating	Works and is safe because auto-negotiation defaults to half duplex	HDX device will be blocked by FDX device traffic
Fixed Full Duplex	Fails because auto defaults to half duplex if the link partner is also not auto-negotiating	HDX device will be blocked by FDX device traffic	Not recommended. Usually OK for servers and uplinks that are never disturbed

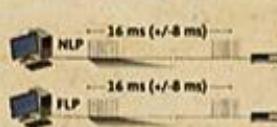
Get up to Speed

Speed (Mbit/s)	Distance (m)	Name	Standard/Year	Required Cable
10	100	10BASE-T	802.3 (14)/ 1990	Cat 3 (2 pair)
100	100	100BASE-TX	802.3 (24)/ 1995	Cat 5 (2 pair)
1000	100	1000BASE-T	802.3 (40)/ 1999	Cat 5e (4 pair)
10,000	100	10GBase-T	802.3an/ 2004	Cat 6a (4 pair)

Ethernet can run on twisted pair cabling at rates from 10Mbps to 10Gbps.

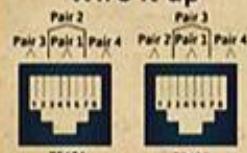
Negotiation occurs in this order

highest
1000BASE-T - Full duplex
1000BASE-T - Half duplex
1000BASE-T2 - Full duplex
1000BASE-T2 - Half duplex
1000BASE-T4
1000BASE-TX - Half duplex
10BASE-T - Full duplex
lowest
10BASE-T - Half duplex



Getting connected on Ethernet is more than turning on a link light - a complex process is required to provide complete connectivity.

Wire it up



10BASE-T and 100BASE-TX use the 3-6 pairs.
1000BASE-T uses all four pairs.



Good cable

A crossover cable can be used to connect two switches together. Most modern devices automatically provide the crossover function.

A split pair occurs when the cables are paired improperly. For example, pins 3 and 4 are paired together instead of 3 and 6. This can cause errors or a complete failure.

Grab an Address

Dynamic Host Configuration Protocol (DHCP) Server provides key IP connectivity information: IP address, Subnet mask, Gateway address, Domain Name Service (DNS) server address

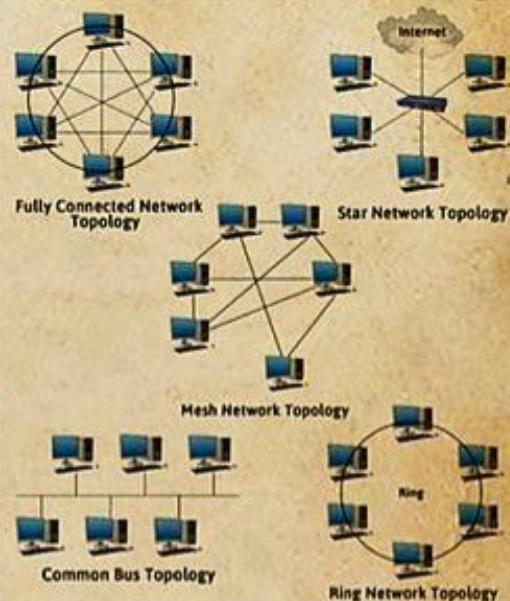
Let me check – 192.168.1.12

IP Address, please!

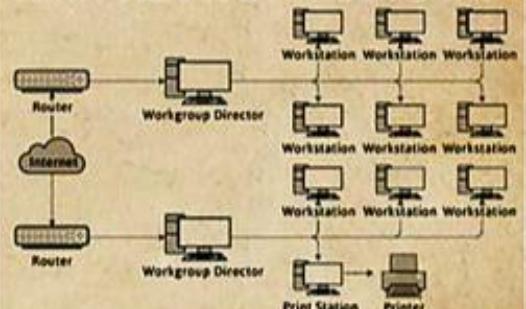
Handshake with a Server

A TCP syn/ack sequence (aka "three-way handshake" or "port open") tests connectivity by providing a "real" user request and is therefore unlikely to be discarded or blocked by routers or firewalls.

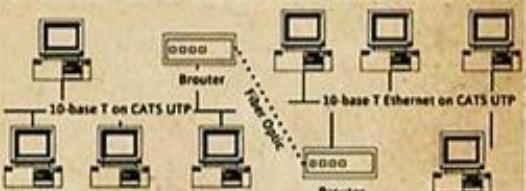
NETWORK TOPOLOGIES



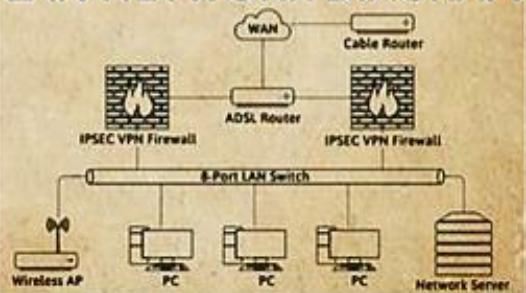
WAN NETWORK DIAGRAM



USE OF BROUTER IN NETWORKING



LAN NETWORK DIAGRAM



Features Of Computer Network

→ **Communication speed**

→ **File sharing**

→ **Back up and Roll back**

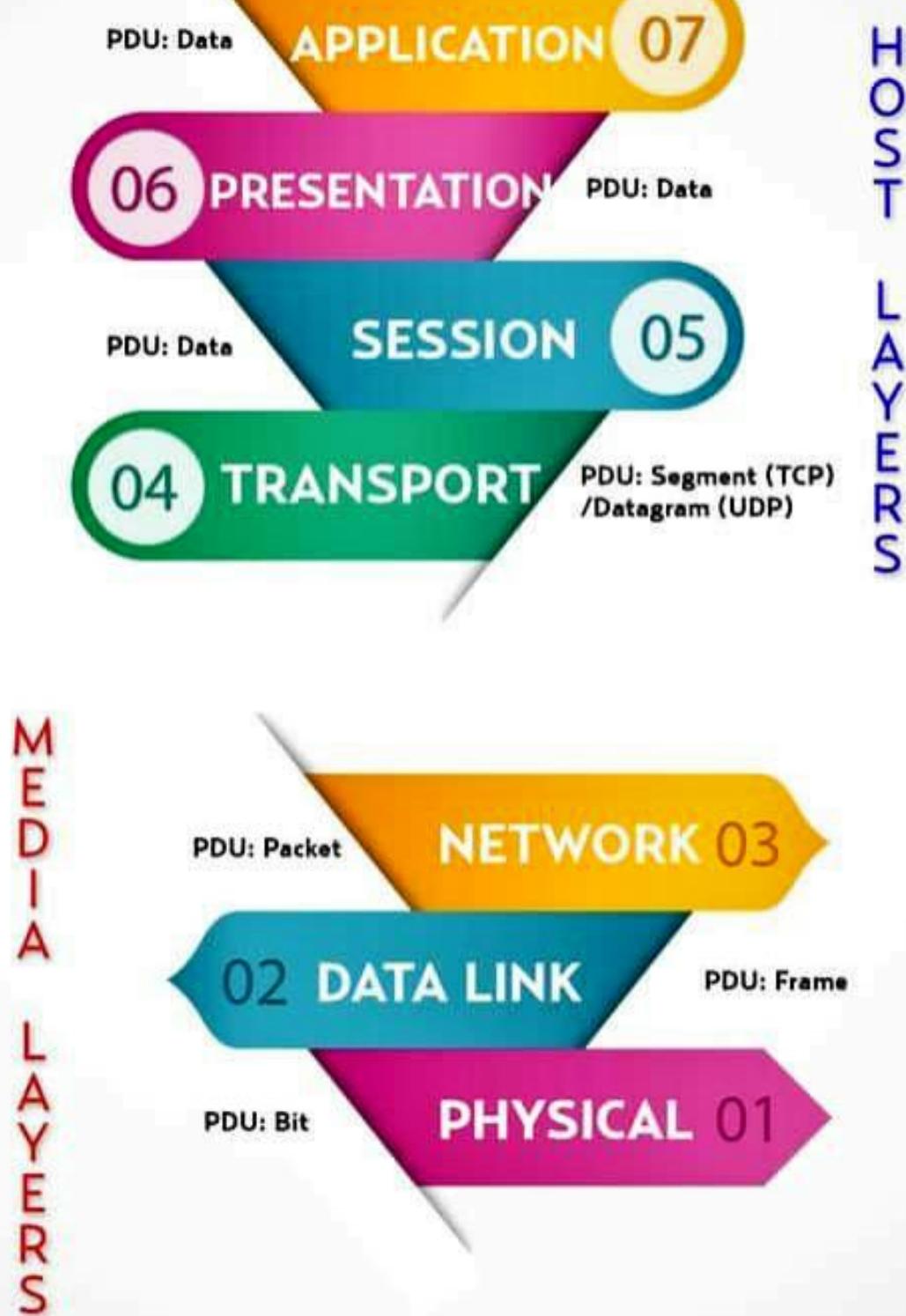
→ **Hardware &
Software sharing**

→ **Security**

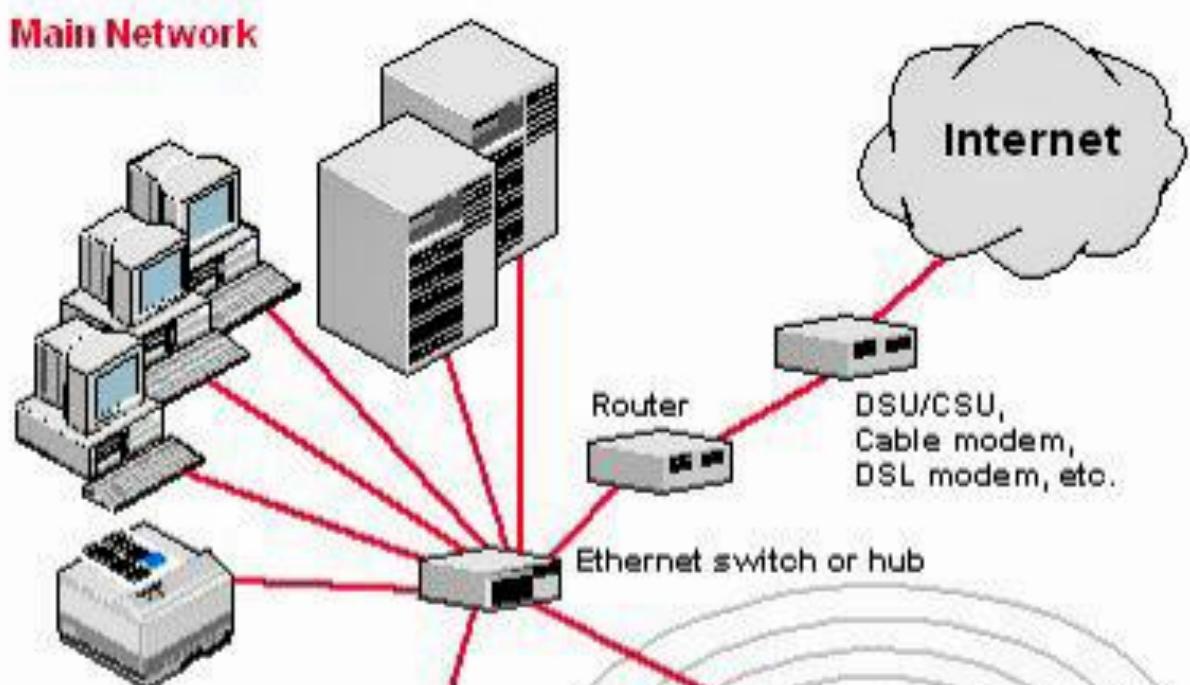
→ **Scalability**

→ **Reliability**

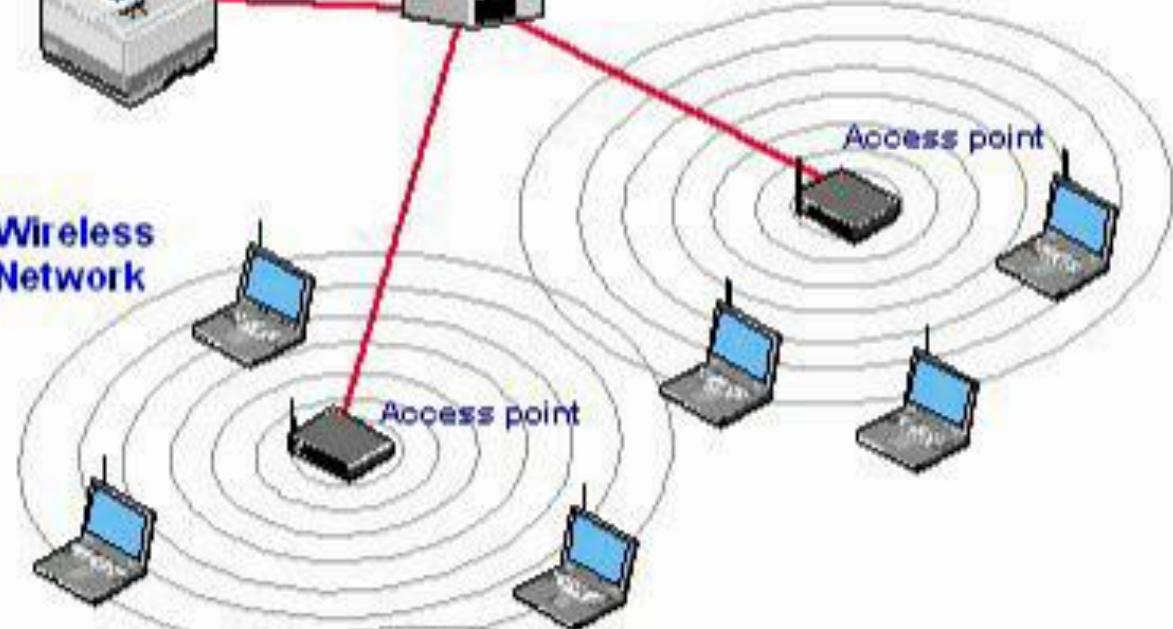
OSI MODEL



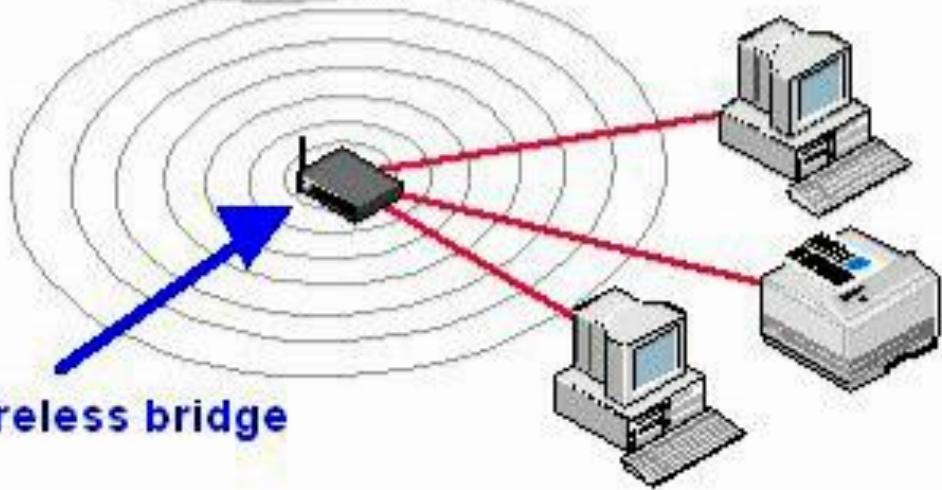
Main Network



Wireless Network



Wireless bridge



Internet protocol suite

Application layer

BGP · DHCP · DNS · FTP · HTTP · IMAP ·
LDAP · MGCP · NNTP · NTP · POP ·
ONC/RPC · RTP · RTSP · RIP · SIP · SMTP ·
SNMP · SSH · Telnet · TLS/SSL · XMPP ·
more...

Transport layer

TCP · UDP · DCCP · SCTP · RSVP · *more...*

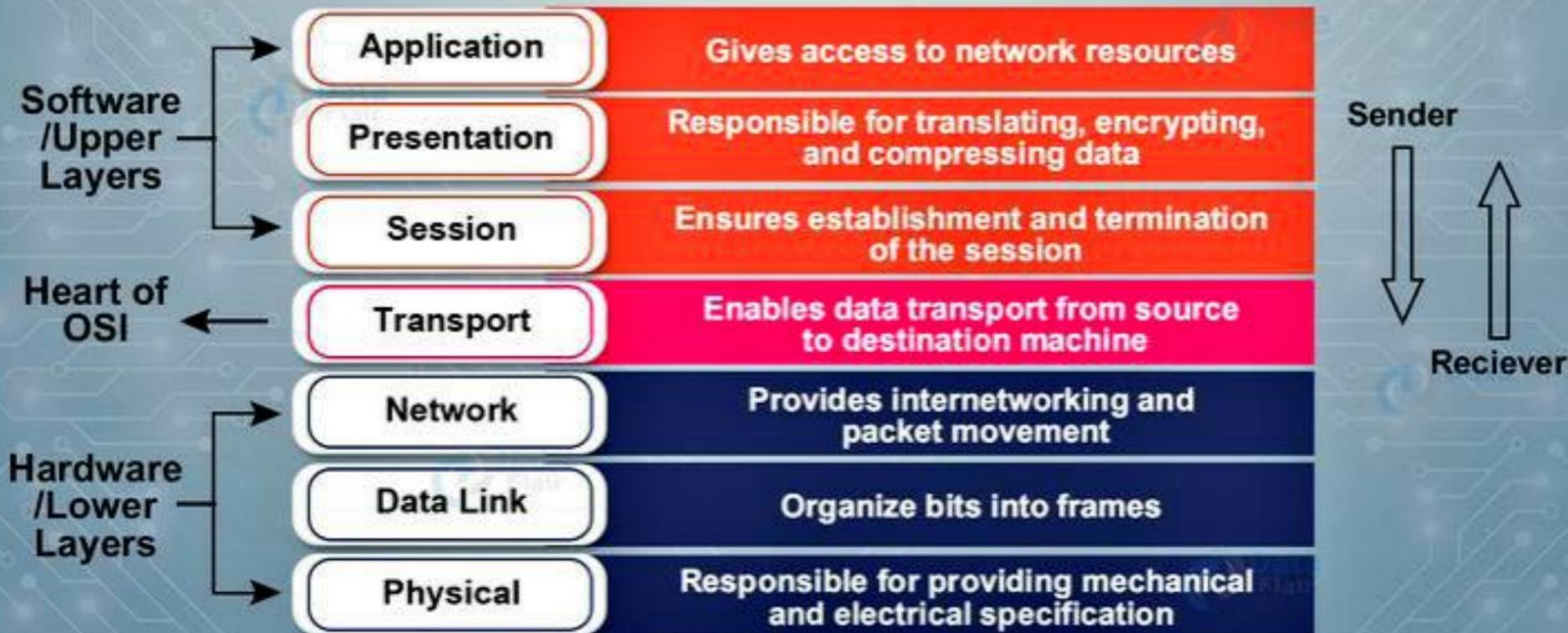
Internet layer

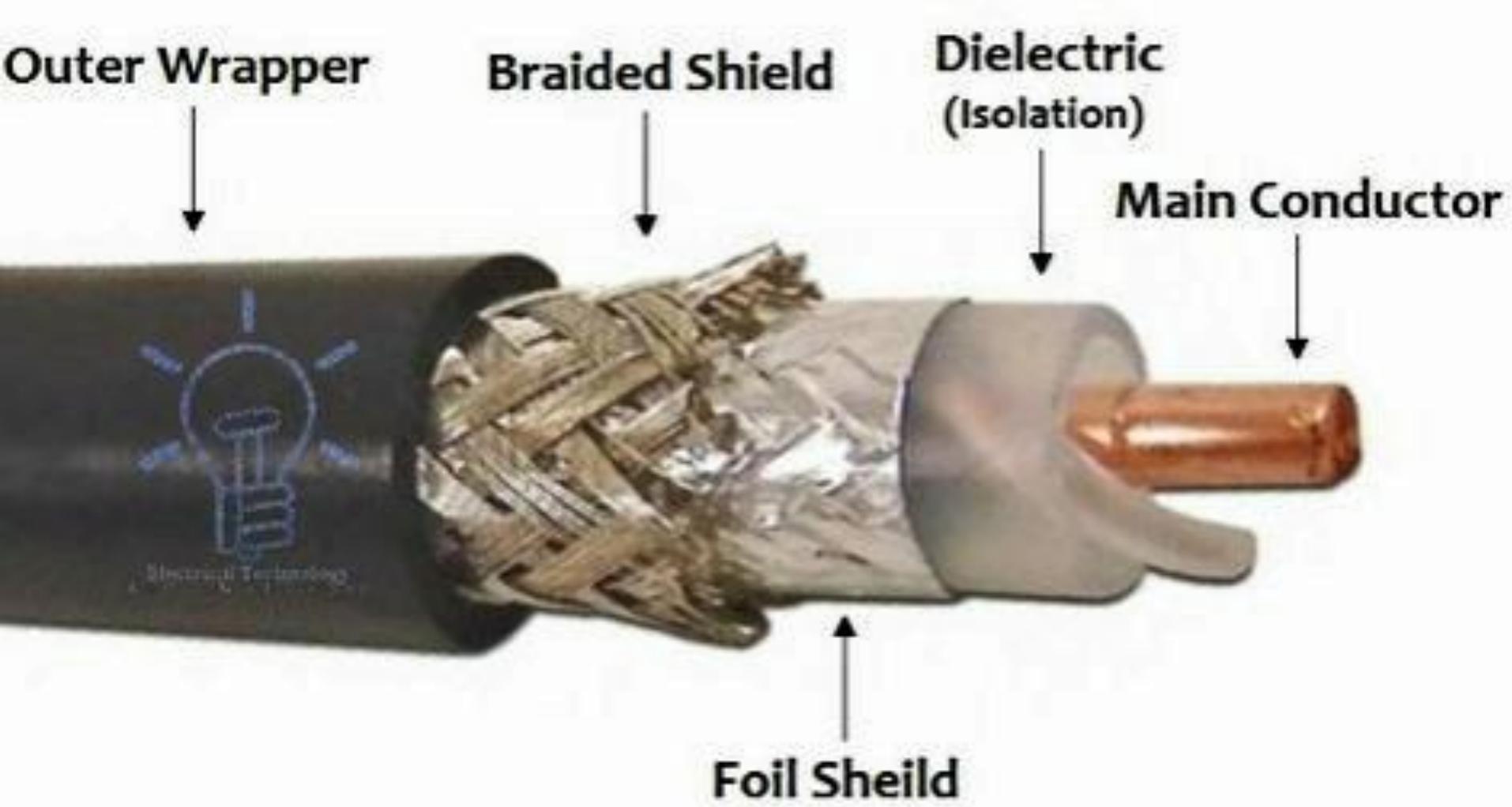
IP (IPv4 · IPv6) · ICMP · ICMPv6 · ECN · IGMP ·
IPsec · *more...*

Link layer

ARP · NDP · OSPF · Tunnels (L2TP) · PPP ·
MAC (Ethernet · DSL · ISDN · FDDI) · *more...*

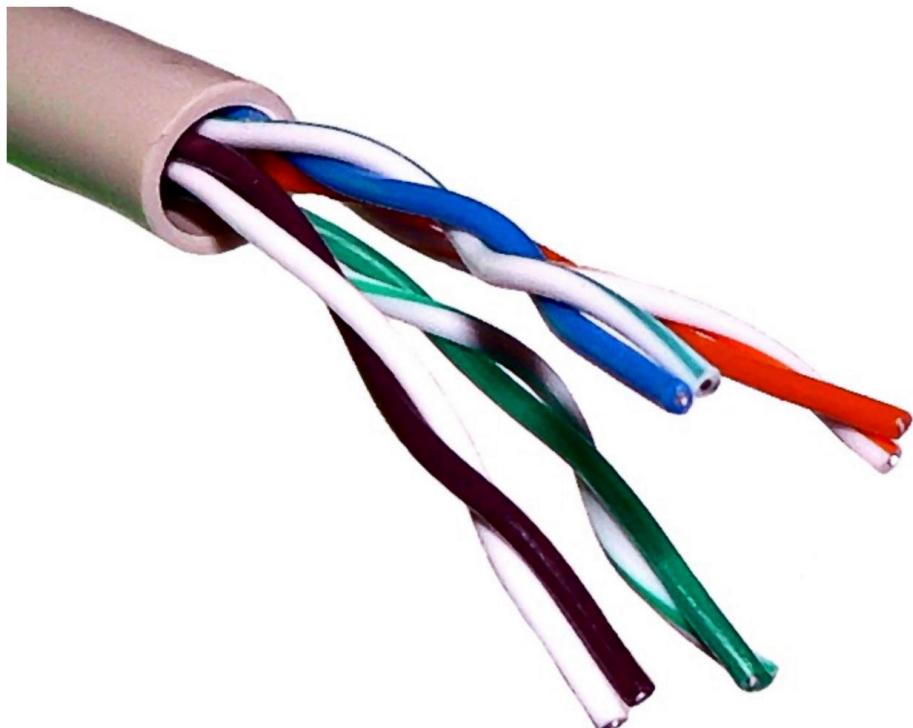
OSI Model Layers





Coaxial Cable

An image of UTP cable –



Unshielded twisted pair is the most common kind of copper telephone wiring. Twisted pair is the ordinary copper wire that connects home and many business computers to the telephone company. To reduce crosstalk or electromagnetic induction between pairs of wires, two insulated copper wires are twisted around each other. Each signal on twisted pair requires both wires. Since some telephone sets or desktop locations require multiple

RJ45

Short for Registered Jack-45, an eight-wire connector used commonly to connect computers onto a local-area networks (LAN), especially Ethernets. RJ-45 connectors look similar to the ubiquitous RJ-11 connectors used for connecting telephone equipment, but they are somewhat wider.

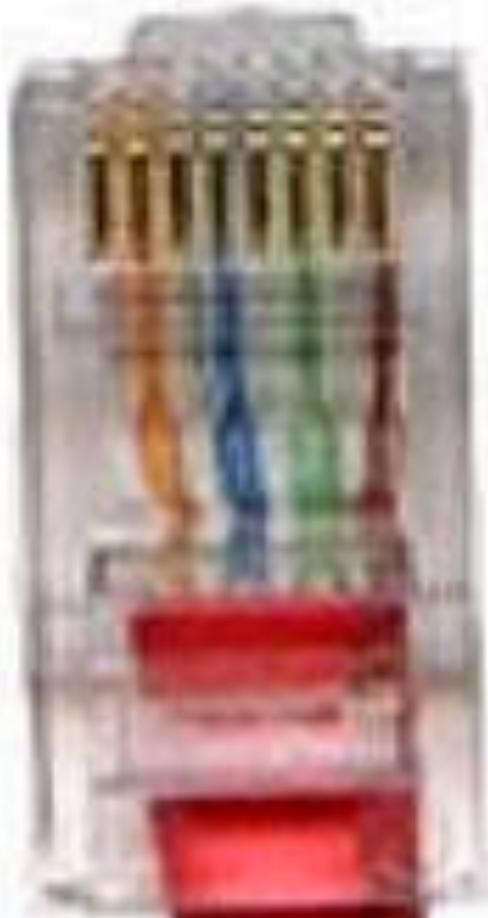
RJ45 is a standard type of connector for network cables. RJ45 connectors are most commonly seen with Ethernet cables and networks.

RJ45 connectors feature eight pins to which the wire strands of a cable interface electrically. Standard RJ-45 pinouts define the arrangement of the individual wires needed when attaching connectors to a cable.

WARNING



8 wires



**Cat 5
RJ45**

2 wires

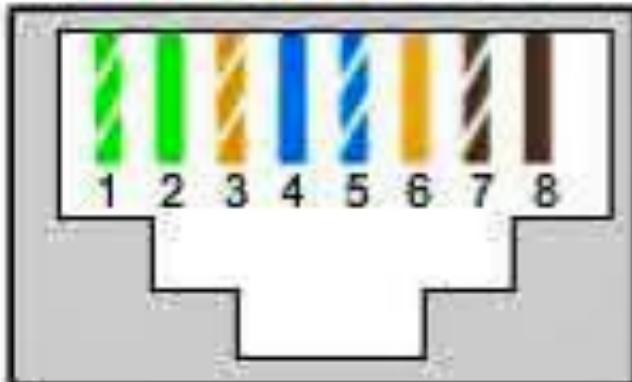


**(Phone)
RJ11**

RJ-45 T568A & T568B Termination

Pair 2

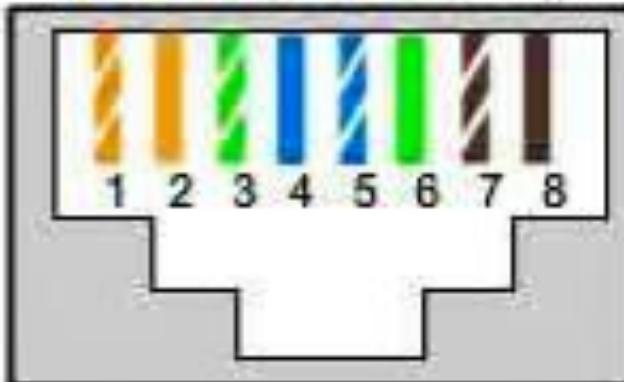
Pair 3 Pair 1 Pair 4



T568A

Pair 3

Pair 2 Pair 1 Pair 4



T568B



T568A
(Top View)



T568B
(Top View)

ETHERNET CONNECTOR MULTI-PACKS

Each multi-pack includes a variety of connectors, which are great for applying shielded RJ45 connector to Mediabridge Ethernet cables. Here are the multi-options we offer:

CAT5e

Cat5e Cable

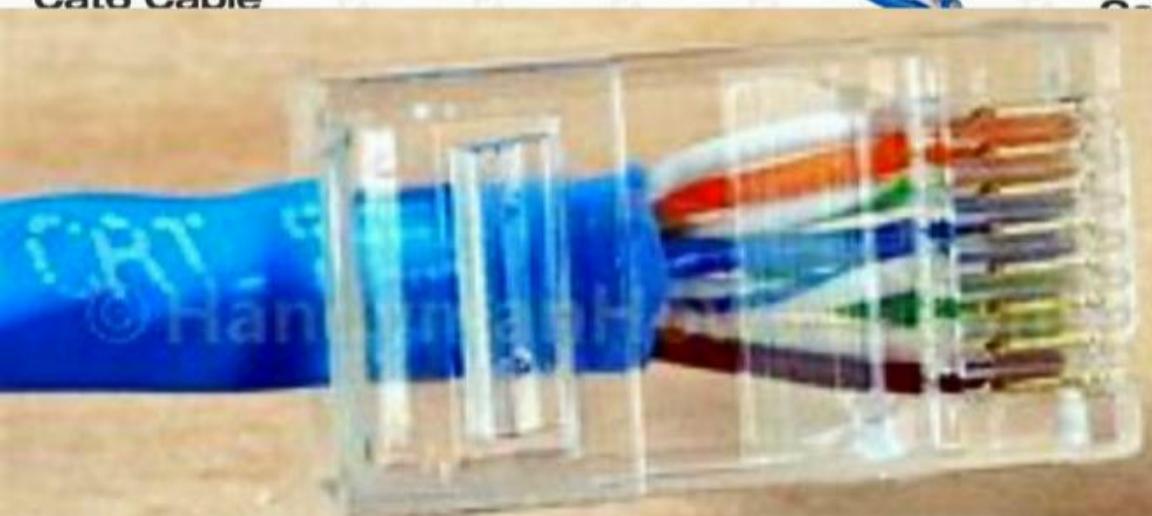
CAT6

Cat6 Cable

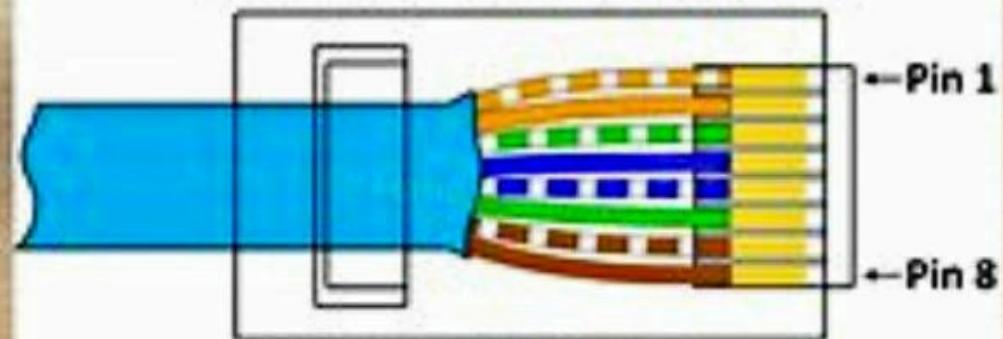
Cat5e Con

x5

Cat6 Con



EIA/TIA T568B Ethernet Plug Wiring





WAHING



Gift

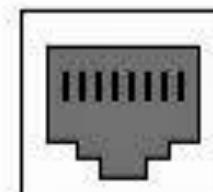
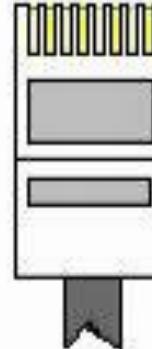
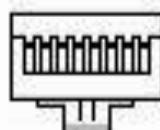
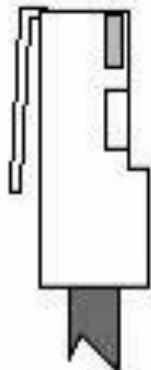
RJ-45 Male

Plug

8 7 6 5 4 3 2 1

1 2 3 4 5 6 7 8

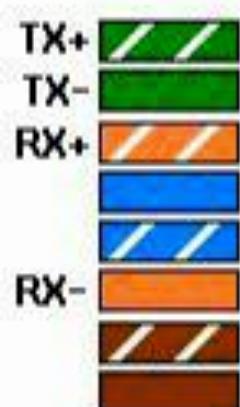
1 2 3 4 5 6 7 8



RJ-45
Female

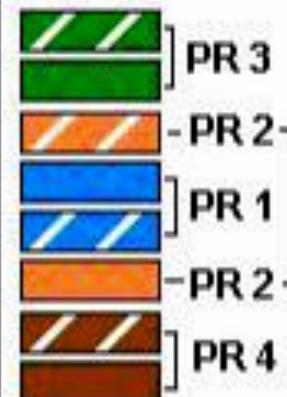
Color Standard
EIA/TIA T568A

Ethernet Patch Cable



	RJ45	Pin#
TX+	Green/White Tracer	1
TX-	Green	2
RX+	Orange/White Tracer	3
	Blue	4
RX-	Blue/White Tracer	5
	Orange	6
	Brown/White Tracer	7
	Brown	8

Pin#	RJ45
1	Green/White Tracer
2	Green
3	Orange/White Tracer
4	Blue
5	Blue/White Tracer
6	Orange
7	Brown/White Tracer
8	Brown



Color Standard
EIA/TIA T568A

Ethernet Crossover Cable



	RJ45	Pin#
TX+	Green/White Tracer	1
TX-	Green	2
RX+	Orange/White Tracer	3
	Blue	4
RX-	Blue/White Tracer	5
	Orange	6
	Brown/White Tracer	7
	Brown	8

Pin#	RJ45
1	Orange/White Tracer
2	Orange
3	Green/White Tracer
4	Brown/White Tracer
5	Brown
6	Green
7	Blue
8	Blue/White Tracer



NETWORK Connectors

Network
Connectors

Infiniband
Connector



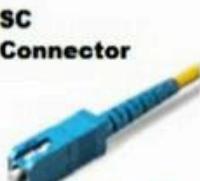
10G-CX4
Connector



ST
Connector



SC
Connector



LC
Connector



RJ45 Male



IpCisco.com

RJ45 Female



MTRJ
Connector



MTP
Connector



IpCisco.com

Cat8 ETHERNET CABLE

Extremely Fastest

Support up to 25G and
40GBASE-T Switch-to-server links

CAT6

2400Mbps



CAT7

10Gbps

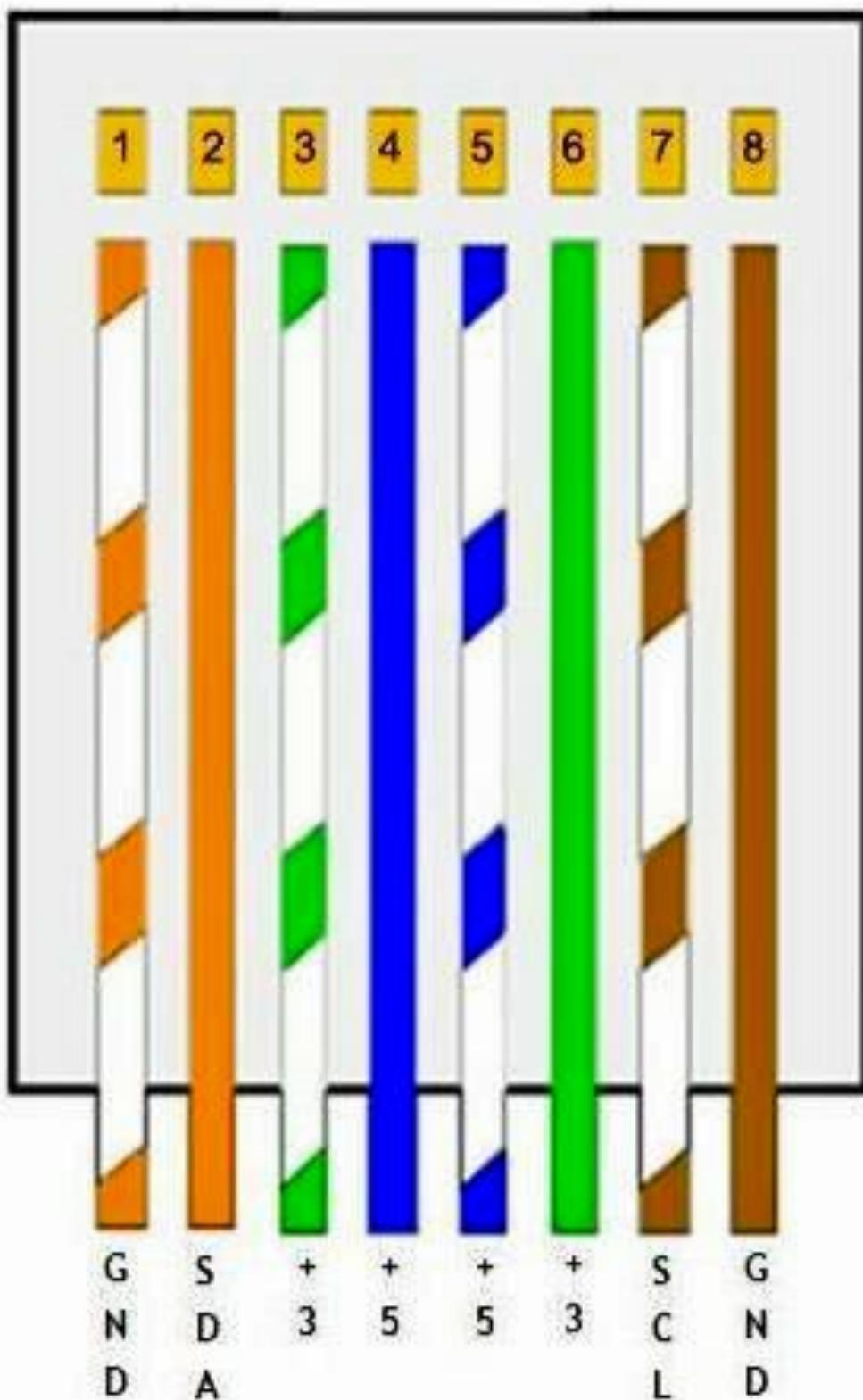


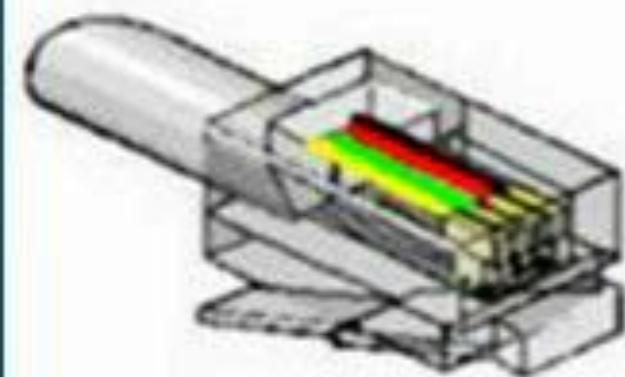
CAT8

40Gbps



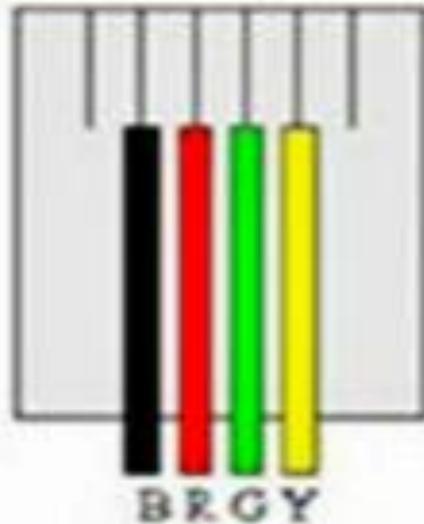
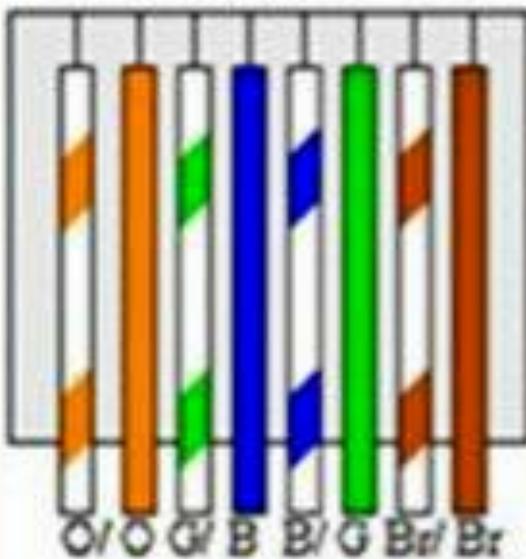
Rpi I2C bus connector pinout (RJ45)





T-568B

1 2 3 4 5 6 7 8

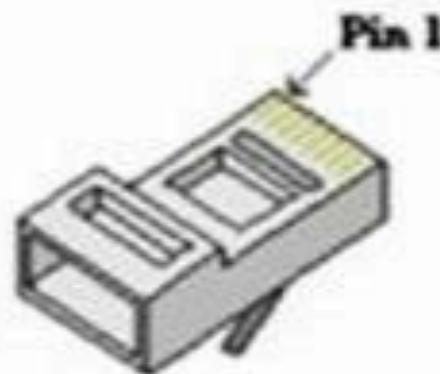
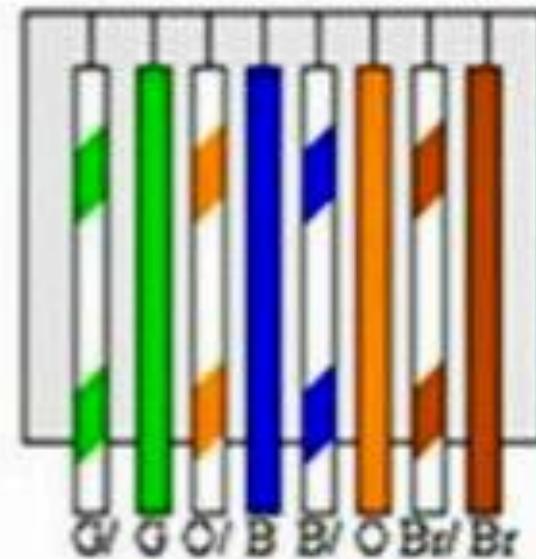


RJ11



T-568A

1 2 3 4 5 6 7 8



RJ45



what's the difference between rj11 and rj45



RJ-11

6 pin



RJ-45

8 pin



Router-switch.com



Visit

RJ45 vs RJ11: What is the difference between RJ45 and RJ11?

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Related images



Video Connectors for A+ 901 Sub-Obj....
certblaster.com



rj-45 & rj-11 port | Computer Hardware...
pinterest.com



RJ 45 to RJ11 & RJ45-to-IO Box &
RJ11 Convertor RJ45 through IO BOX

Role of Sockets & Connectors | Compu...

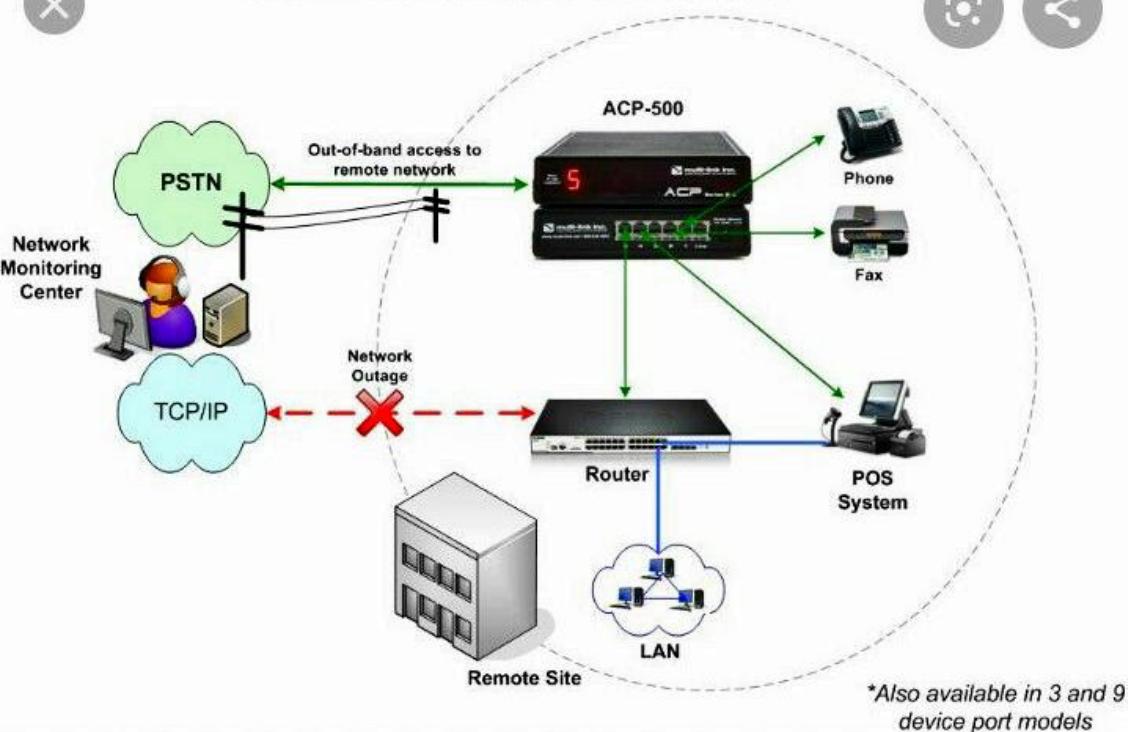


1





Out-of-Band Network Access



multi-link.net

ACP-900 | Out-of-Band Network Switch

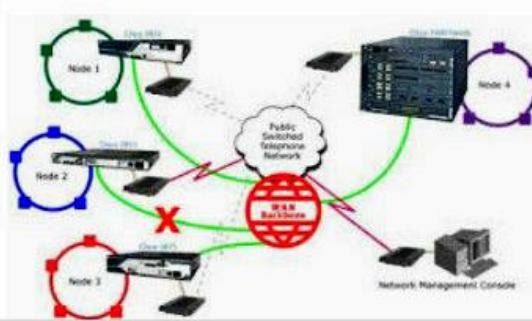
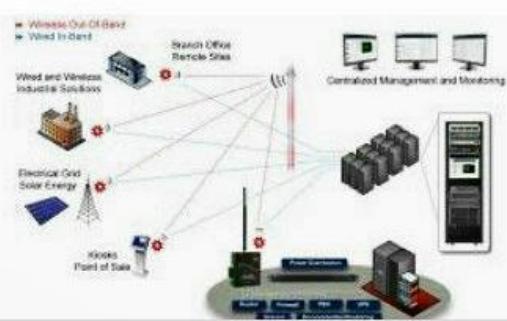
\$645.00* · In stock · Brand: Multi-Link Inc

ACP-900 Out-of-Band Network Switch & Call Router - 9 telephony devices share 1 phone line, The ACP-900 is an industrial grade Out-of-Band Network ...

* Check website for latest pricing and availability. Images may be subject to copyright. [Learn More](#)



Related images



SMA

BNC



Male

Female

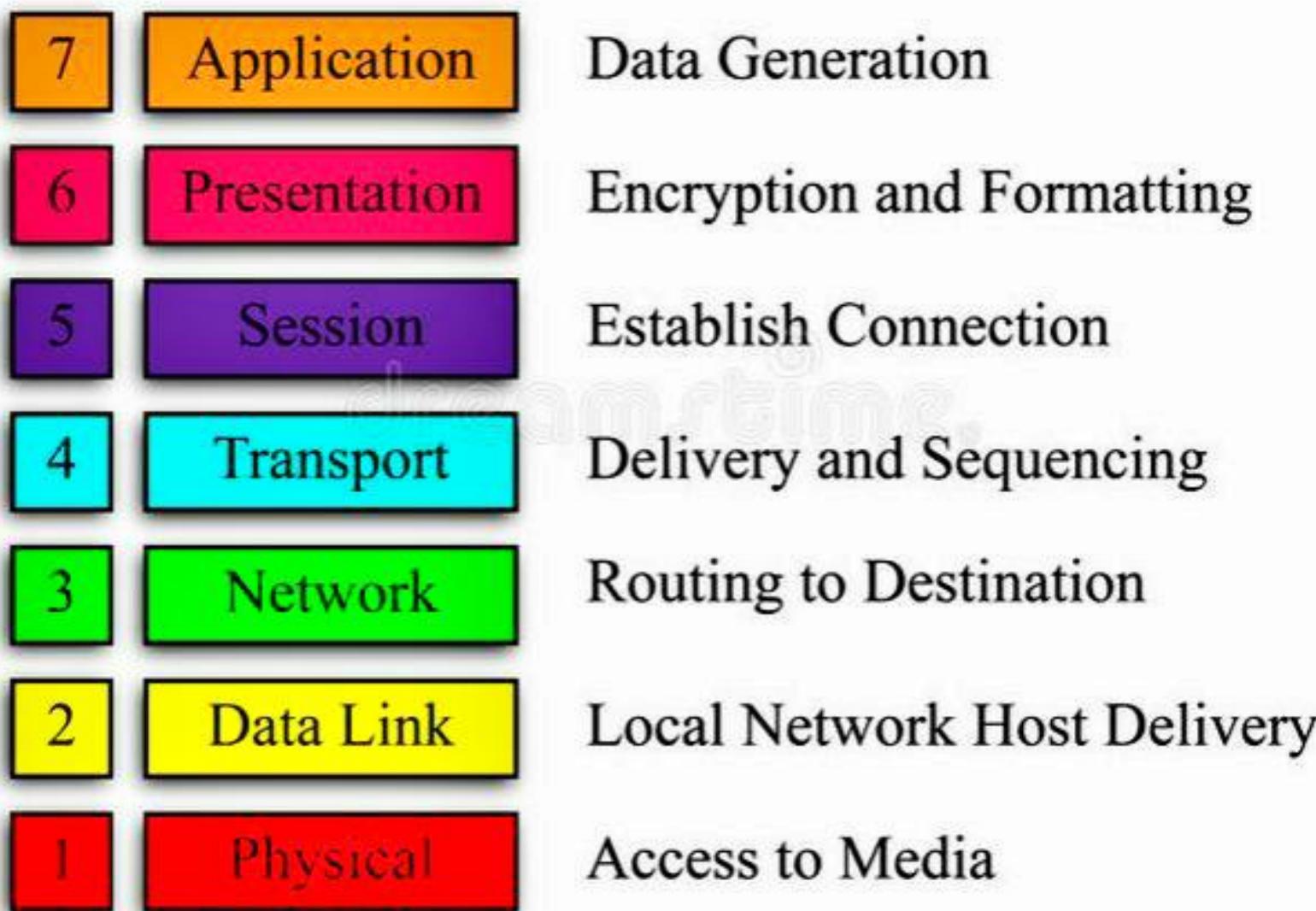
BetterSateRadio.com



7 Layers of the OSI Model



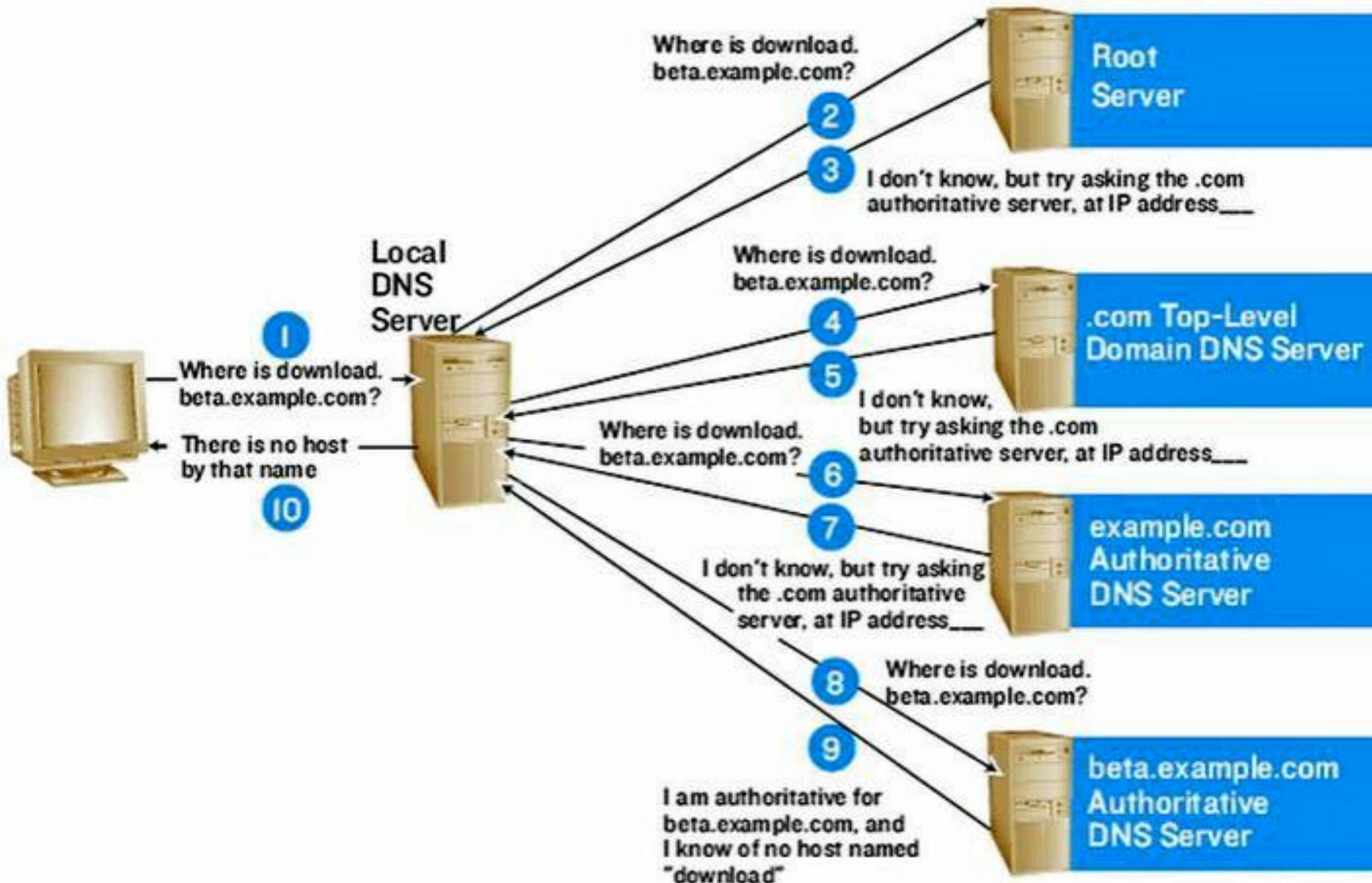
OSI Model



Layer Names	Protocols
Application	HTTP,FTP,POP3, SMTP,SNMP
Transport	TCP,UDP
Networking	IP,ICMP
Datalink	Ethernet, ARP

TCP/IP Networking Model

HOW DNS WORKS



Internet protocol suite

Application layer

BGP · DHCP · DNS · FTP · HTTP · IMAP ·
LDAP · MGCP · NNTP · NTP · POP ·
ONC/RPC · RTP · RTSP · RIP · SIP · SMTP ·
SNMP · SSH · Telnet · TLS/SSL · XMPP ·
more...

Transport layer

TCP · UDP · DCCP · SCTP · RSVP · *more...*

Internet layer

IP (IPv4 · IPv6) · ICMP · ICMPv6 · ECN · IGMP ·
IPsec · *more...*

Link layer

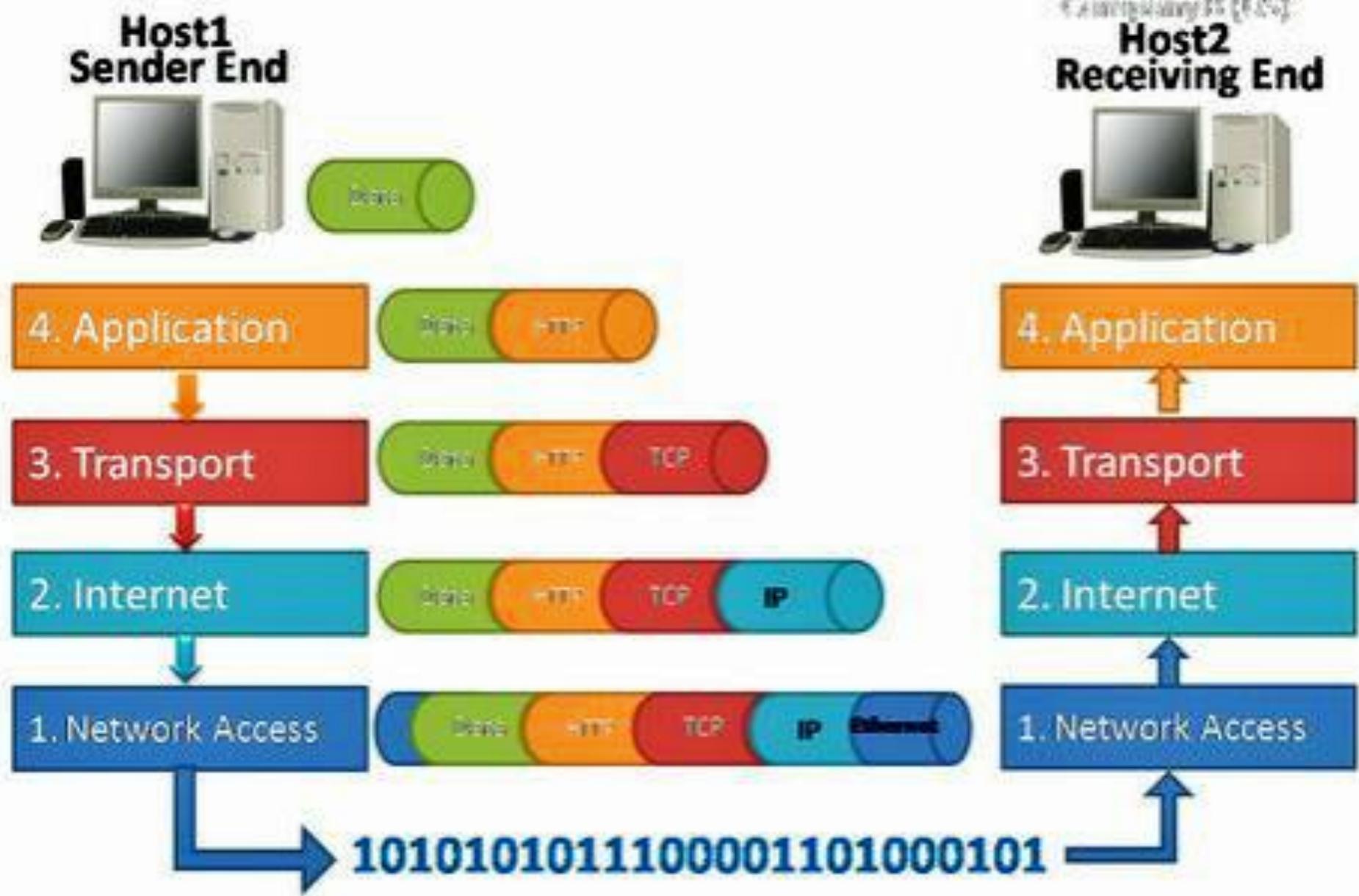
ARP · NDP · OSPF · Tunnels (L2TP) · PPP ·
MAC (Ethernet · DSL · ISDN · FDDI) · *more...*

What is OSI Model

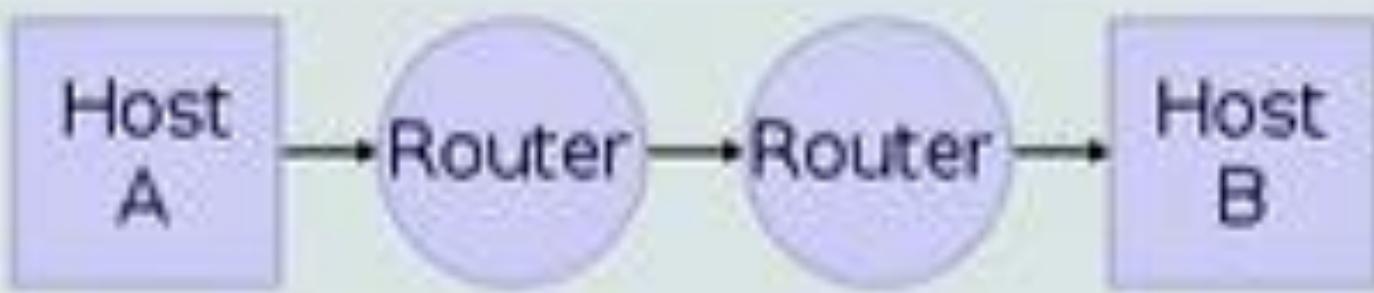
Data	Application	FTP , HTTP , SMTP Data Generation	
Data	Presentation	Jpeg , Mpeg , Gif Encryption & Formatting	
Data	Session	Apple talk Establish Connection	
Segments	Transport	TCP , UDP Delivery & Sequence	
Packets	Network	IP , IPX , ICMP Routing to Destination	Router
Frame	Data Link	PPP , Ethernet Local Network	Switch, Bridge
Bits	Physical	Ethernet , USB Access Media	Hub, Repeater

Arpanet Reference Model (RFC 871)	RFC 1122, Internet STD 3 (1989)	Cisco Academy	Various Authors	OSI model
Three layers	Four layers	Four layers	Five Layers	Seven layers
Application/Process	Application	Application	Application	Application
				Presentation
				Session
Host to Host	Transport	Transport	Transport/ Host to Host	Transport
	Internet	Internetwork	Network/ Internet	Network
Network Interface	Link	Network interface	Network access/ Data Link/Network interface	Data Link
			Physical/ Hardware	Physical

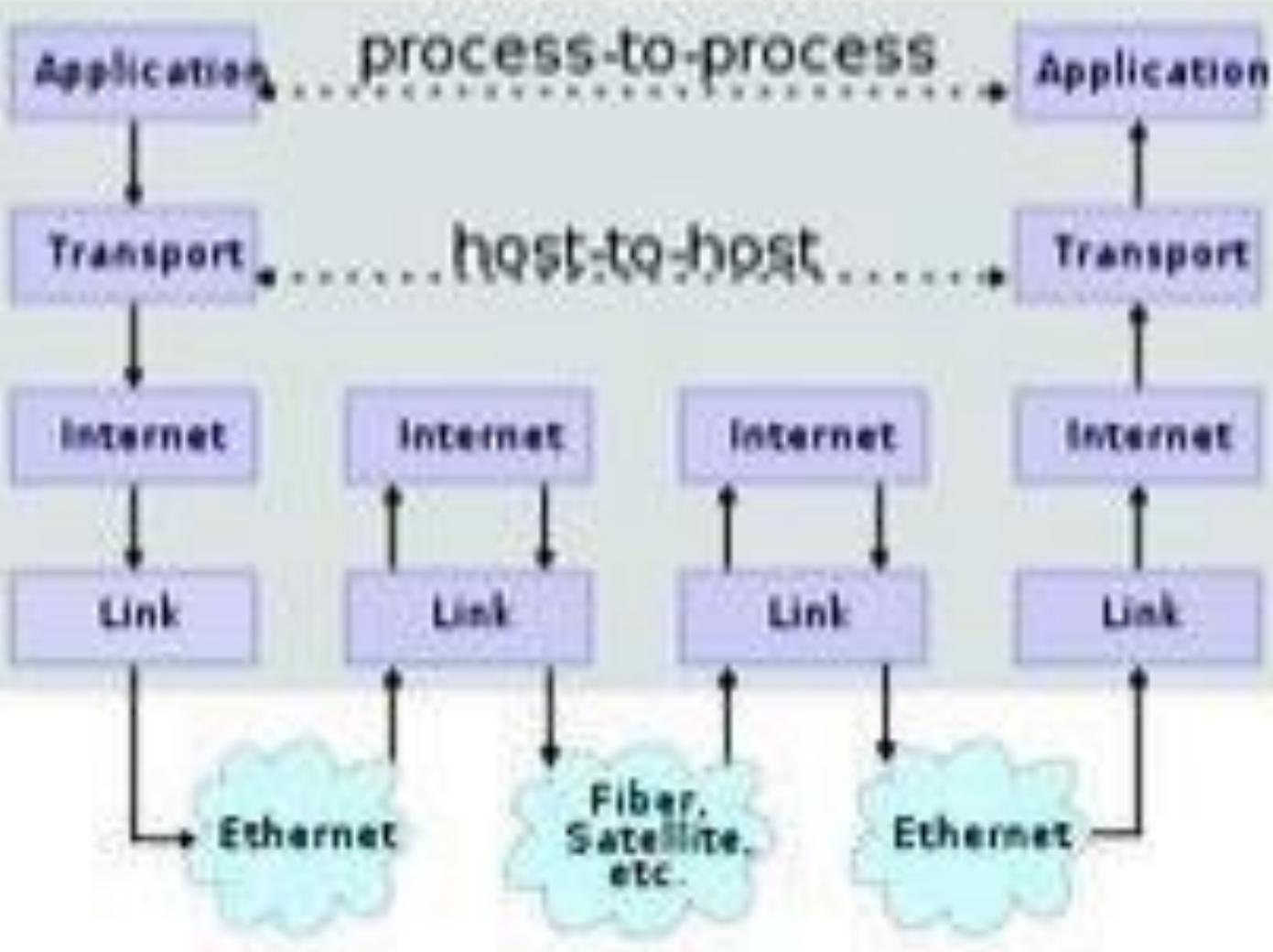
Data Sending Process



Network Topology



Data Flow



The TCP/IP Protocol Suite

Application

TFTP	Telnet	NFS	SMTP
DNS	rlogin	LPD	SNMP

Host-to-Host

TCP UDP

Internet

ICMP ARP RARP
IP

Network
Access

Ethernet	Fast Ethernet	PPP	FDDI
ATM	Token Ring	Frame Relay	HDLC

ifconfig

**Command To Configure, Monitor And
Debug
Network Interface**

Step By Step Configure Static IP Address In Microsoft Windows



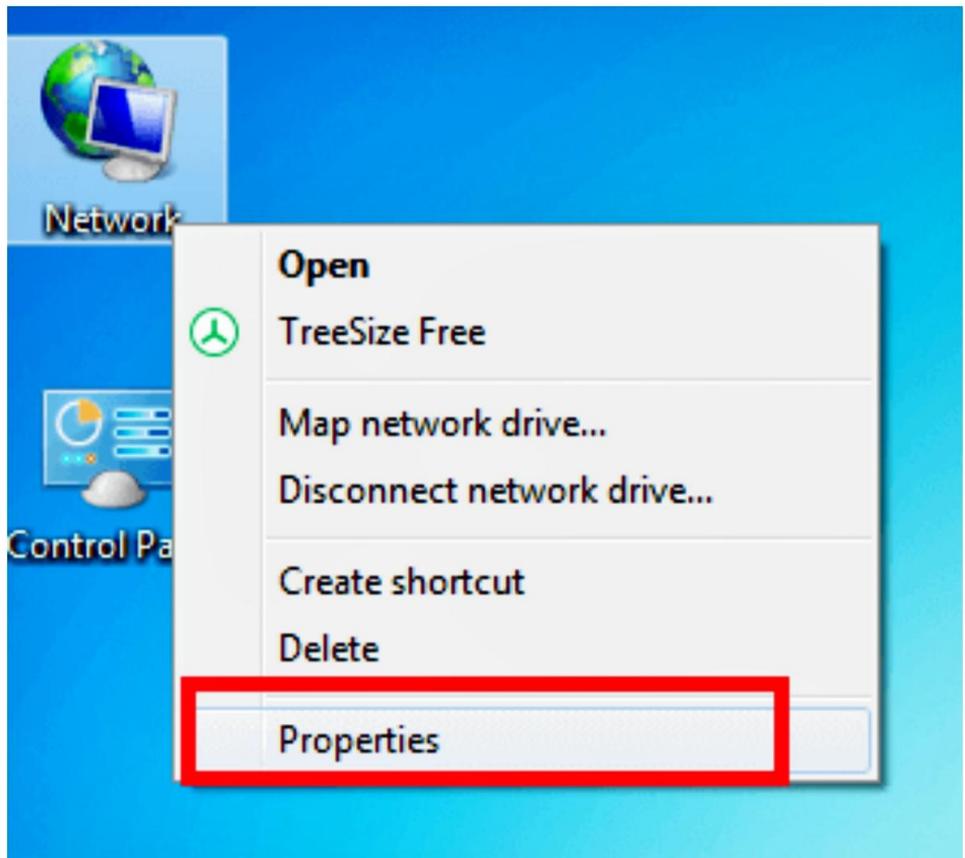
Mangesh Dhulap

2 years ago

In this article, we are going to learn how to configure static IP address in the Microsoft Windows operating system. In this chapter, I will explain to you both the Static and Dynamic IP address. First, what is a dynamic IP address? When a client system gets the IP address automatically from the DHCP server that is called a dynamic IP address. A static IP address is completely opposite of that. When we configure the IP address manually for any client system then that is called a Static IP address configuration. Here in this article, I will show you how to do that. So let's get started.

You have to follow simple 5 steps to configure the same.

Right-click on the **Network icon** (Available on desktop) and click on **Properties**.



Click On Properties

Now you will get the Network and Sharing Center window. Here on the left side top portion, you will get an option called **Change adapter settings**. Just click there.

Now you will get the Network and Sharing Center window. Here on the left side top portion, you will get an option called **Change adapter settings**. Just click there.

Control Panel Home

Manage wireless networks

Change adapter settings

Change advanced sharing settings

View your basic network information and set up connections

ITSMART-L001 (This computer)

Prachi Dhulap

Internet

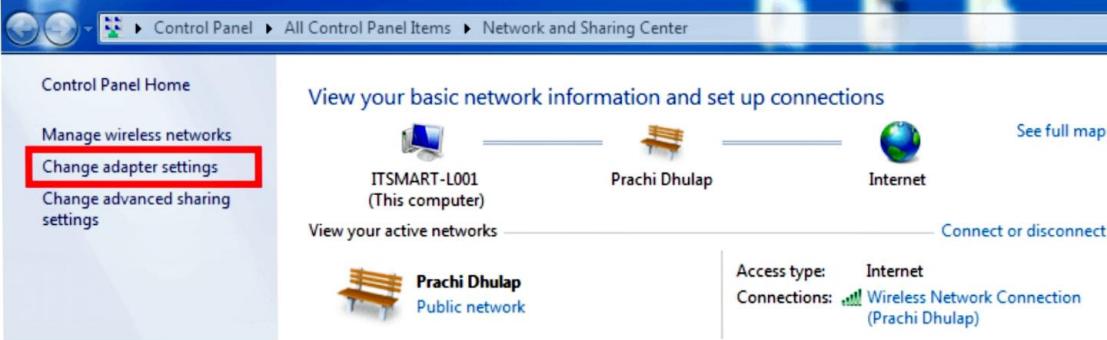
See full map

View your active networks

Prachi Dhulap Public network

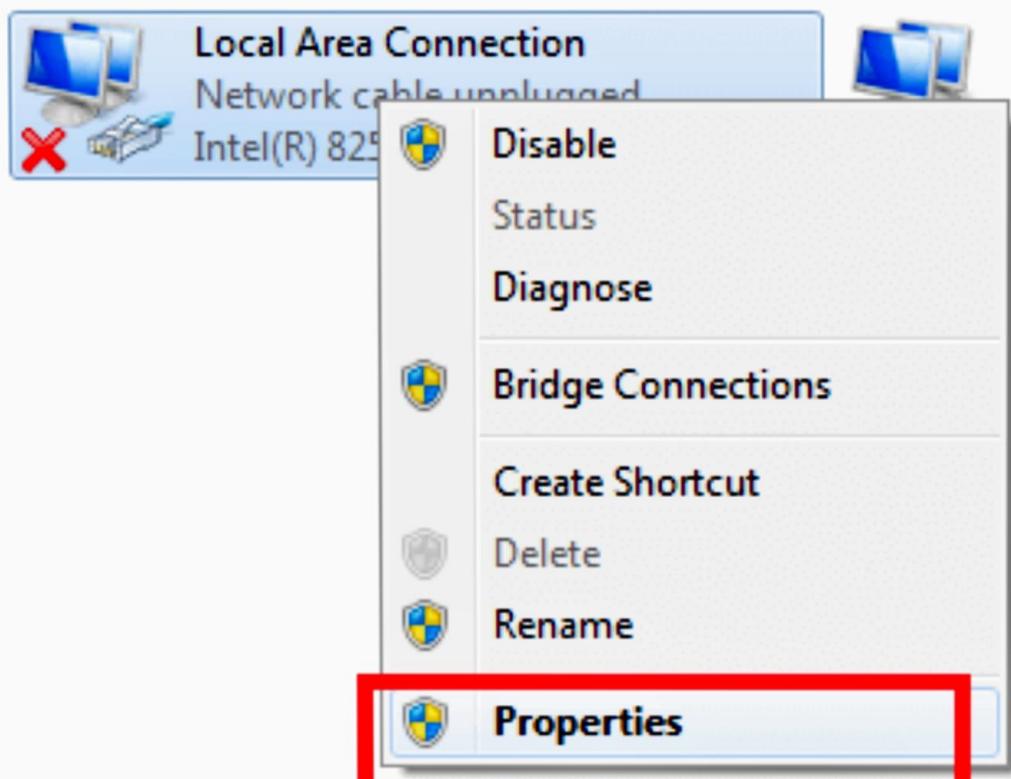
Access type: Internet
Connections: Wireless Network Connection (Prachi Dhulap)

Connect or disconnect

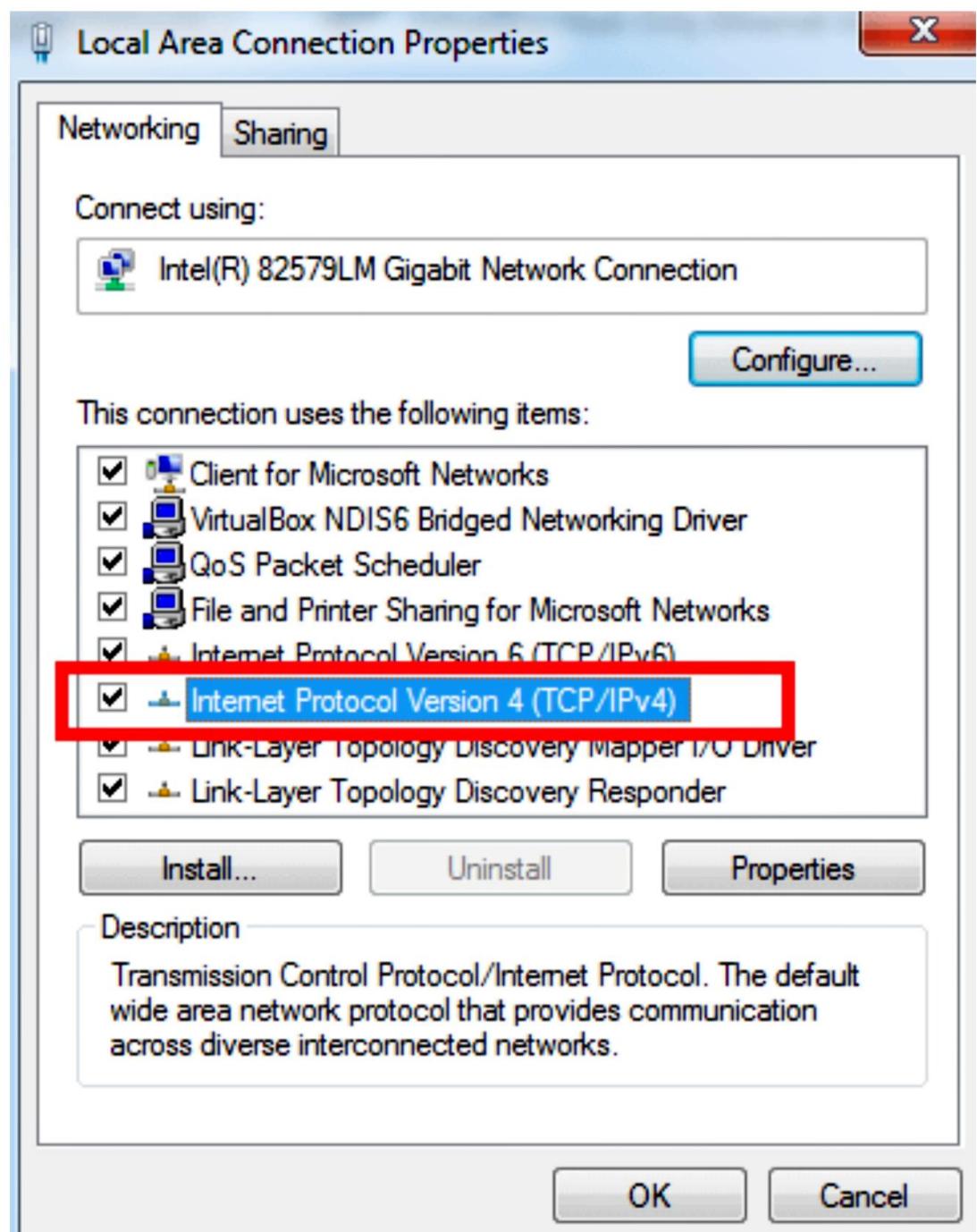


Change Adapter Settings

After the above step, you will get all the list of LAN connections that are connected to your system. Here just right click on the Local Area Connection where you want to configure static IP address and click on **Properties**.



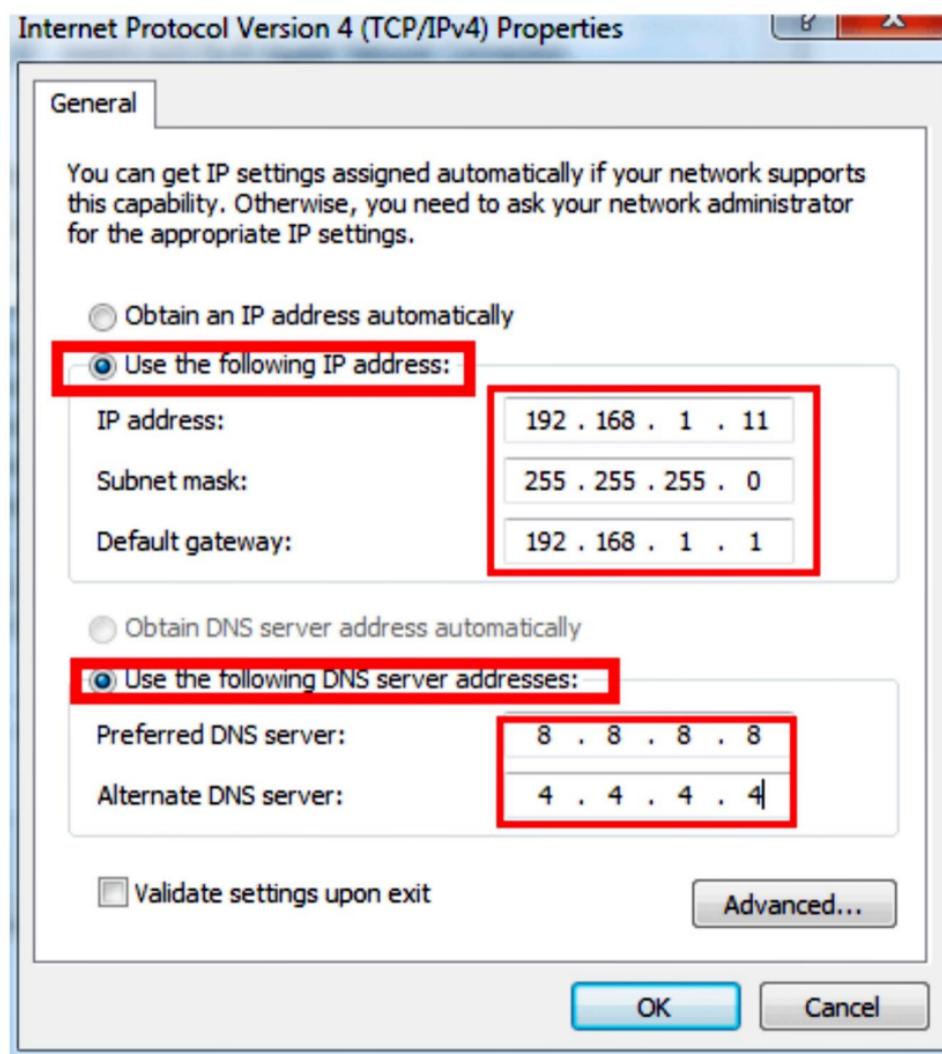
On the next window, you will get an option called **Internet Protocol version 4 (IPv4)**. Just select the option and click on the **Properties** button. Refer to the snapshot below.



After the above step, you will get a new window. Here enable the **Use the following IP address** option and enter **IP Address, Subnet Mask, Default Gateway** on the respective field.

Step By Step Configure Stat...
itsmarttricks.com

For DNS client configuration enable the **Use the following DNS server addresses** option and enter DNS Server IP addresses on **Preferred DNS Server** and **Alternate DNS Server** field. Refer to the snapshot below.

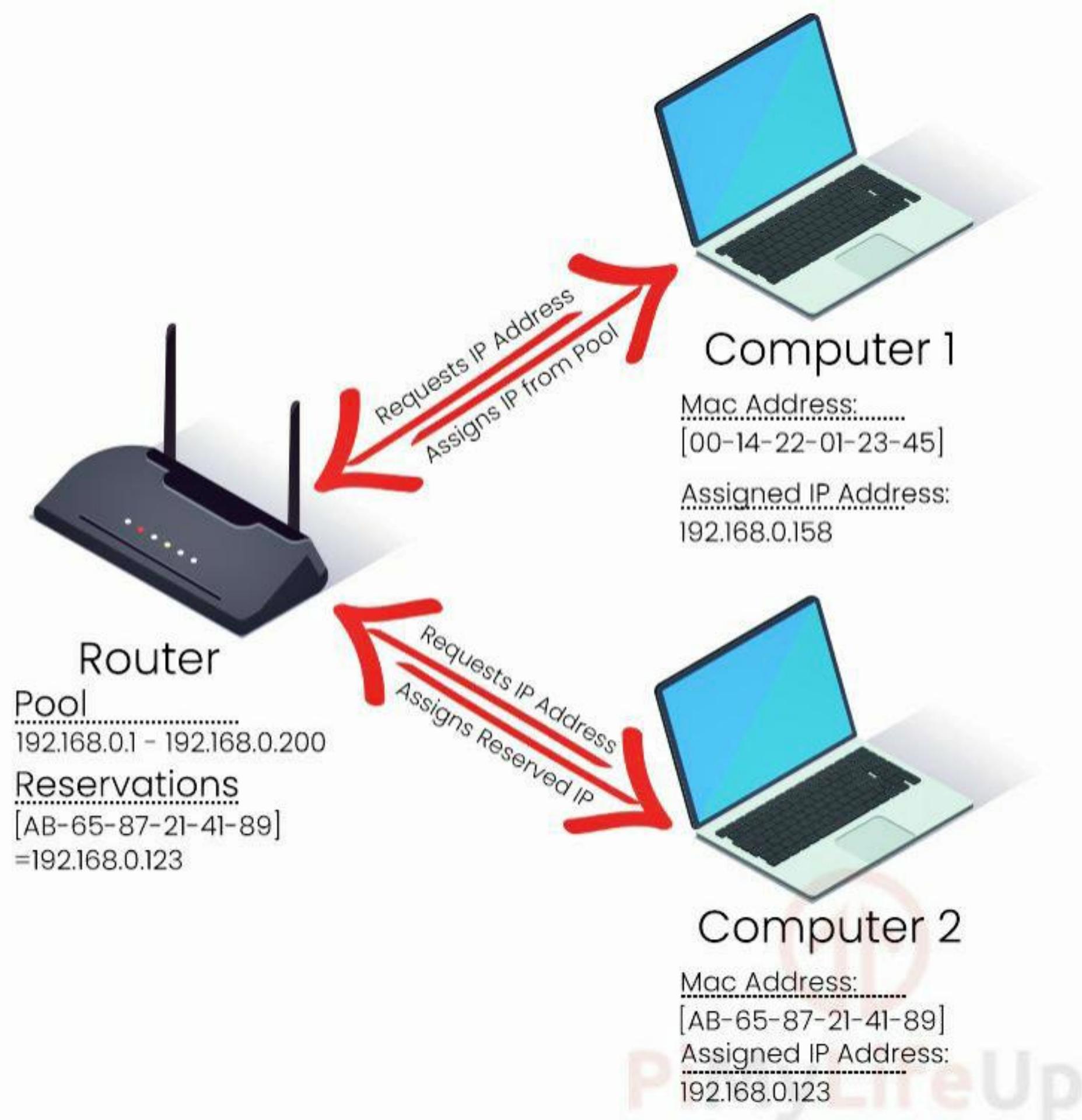


Enter Static IP Address



Send

SAVE



IP Subnetting Cheat-Sheet

IP/CIDR	Host bits borrowed in subnetted octet	Decimal Mask	Possible Host Values (-2 for Valid Hosts)	Add to subnet ID for Last IP (BCast)	Add to subnet ID for next subnet ID
a.b.c.d/32	8	255.255.255.255	1	+0.0.0.0	+0.0.0.1
a.b.c.d/31	7	255.255.255.254	2	+0.0.0.1	+0.0.0.2
a.b.c.d/30	6	255.255.255.252	4	+0.0.0.3	+0.0.0.4
a.b.c.d/29	5	255.255.255.248	8	+0.0.0.7	+0.0.0.8
a.b.c.d/28	4	255.255.255.240	16	+0.0.0.15	+0.0.0.16
a.b.c.d/27	3	255.255.255.224	32	+0.0.0.31	+0.0.0.32
a.b.c.d/26	2	255.255.255.192	64	+0.0.0.63	+0.0.0.64
a.b.c.d/25	1	255.255.255.128	128	+0.0.0.127	+0.0.0.128
a.b.c.0/24	0	255.255.255.0	256	+0.0.0.255	+0.0.1.0
a.b.c.0/23	7	255.255.254.0	512	+0.0.1.255	+0.0.2.0
a.b.c.0/22	6	255.255.252.0	1,024	+0.0.3.255	+0.0.4.0
a.b.c.0/21	5	255.255.248.0	2,048	+0.0.7.255	+0.0.8.0
a.b.c.0/20	4	255.255.240.0	4,096	+0.0.15.255	+0.0.16.0
a.b.c.0/19	3	255.255.224.0	8,192	+0.0.31.255	+0.0.32.0
a.b.c.0/18	2	255.255.192.0	16,384	+0.0.63.255	+0.0.64.0
a.b.c.0/17	1	255.255.128.0	32,768	+0.0.127.255	+0.0.128.0
a.b.0.0/16	0	255.255.0.0	65,536	+0.0.255.255	+0.1.0.0
a.b.0.0/15	7	255.254.0.0	131,072	+0.1.255.255	+0.2.0.0
a.b.0.0/14	6	255.252.0.0	262,144	+0.3.255.255	+0.4.0.0
a.b.0.0/13	5	255.248.0.0	524,288	+0.7.255.255	+0.8.0.0
a.b.0.0/12	4	255.240.0.0	1,048,576	+0.15.255.255	+0.16.0.0
a.b.0.0/11	3	255.224.0.0	2,097,152	+0.31.255.255	+0.32.0.0
a.b.0.0/10	2	255.192.0.0	4,194,304	+0.63.255.255	+0.64.0.0
a.b.0.0/9	1	255.128.0.0	8,388,608	+0.127.255.255	+0.128.0.0
a.0.0.0/8	0	255.0.0.0	16,777,217	+0.255.255.255	+1.0.0.0
a.0.0.0/7	7	254.0.0.0	33,554,432	+1.255.255.255	+2.0.0.0
a.0.0.0/6	6	252.0.0.0	67,108,864	+3.255.255.255	+4.0.0.0
a.0.0.0/5	5	248.0.0.0	134,217,728	+7.255.255.255	+8.0.0.0
a.0.0.0/4	4	240.0.0.0	268,435,456	+15.255.255.255	+16.0.0.0
a.0.0.0/3	3	224.0.0.0	563,870,912	+31.255.255.255	+32.0.0.0
a.0.0.0/2	2	192.0.0.0	1,073,741,824	+63.255.255.255	+64.0.0.0
a.0.0.0/1	1	128.0.0.0	2,147,483,648	+127.255.255.255	+128.0.0.0
a.0.0.0/0	0	0.0.0.0	4,294,967,296	N/A	N/A

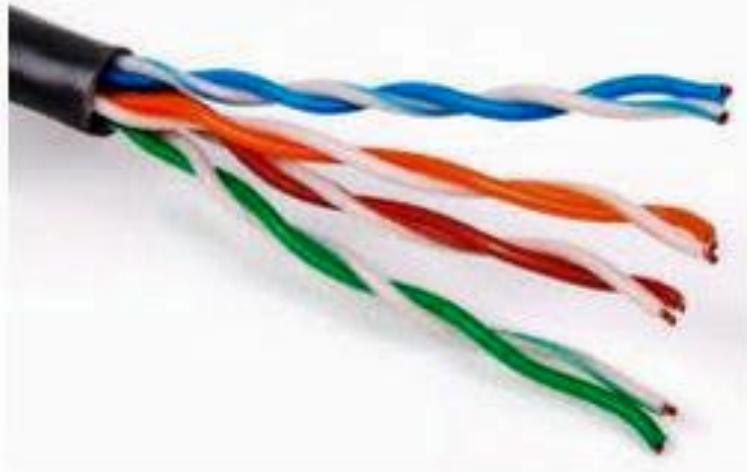
Subnetting Cheat Sheet

CIDR	SUBNET MASK	ADDRESSES	WILDCARD MASK
/32	255.255.255.255	1	0.0.0.0
/31	255.255.255.254	2	0.0.0.1
/30	255.255.255.252	4	0.0.0.3
/29	255.255.255.248	8	0.0.0.7
/28	255.255.255.240	16	0.0.0.15
/27	255.255.255.224	32	0.0.0.31
/26	255.255.255.192	64	0.0.0.63
/25	255.255.255.128	128	0.0.0.127
/24	255.255.255.0	256	0.0.0.255
/23	255.255.254.0	512	0.0.1.255
/22	255.255.252.0	1024	0.0.3.255
/21	255.255.248.0	2048	0.0.7.255
/20	255.255.240.0	4096	0.0.15.255
/19	255.255.224.0	8192	0.0.31.255
/18	255.255.192.0	16384	0.0.63.255
/17	255.255.128.0	32768	0.0.127.255
/16	255.255.0.0	65536	0.0.255.255
/15	255.254.0.0	131072	0.1.255.255
/14	255.252.0.0	262144	0.3.255.255
/13	255.248.0.0	524288	0.7.255.255
/12	255.240.0.0	1048576	0.15.255.255
/11	255.224.0.0	2097152	0.31.255.255
/10	255.192.0.0	4194304	0.63.255.255
/9	255.128.0.0	8388608	0.127.255.255
/8	255.0.0.0	16777216	0.255.255.255
/7	254.0.0.0	33554432	1.255.255.255
/6	252.0.0.0	67108864	3.255.255.255
/5	248.0.0.0	134217728	7.255.255.255
/4	240.0.0.0	268435456	15.255.255.255
/3	224.0.0.0	536870912	31.255.255.255
/2	192.0.0.0	1073741824	63.255.255.255
/1	128.0.0.0	2147483648	127.255.255.255
/0	0.0.0.0	4294967296	255.255.255.255

Classful IPv4 Addresses	
Class A	0.0.0.0 - 127.255.255.255
Class B	128.0.0.0 - 191.255.255.255
Class C	192.0.0.0 - 223.255.255.255
Class D	224.0.0.0 - 239.255.255.255
Class E	240.0.0.0 - 255.255.255.255
Private IPv4 Addresses	
	10.0.0.0 - 10.255.255.255
	172.16.0.0 - 172.31.255.255
	192.168.0.0 - 192.168.255.255
Special IPv4 Addresses	
Local Host	127.0.0.0 - 127.255.255.255
APIPA	169.254.0.0 - 169.254.255.255
Bogon IPv4 Addresses	
0.0.0.0/8	This network
10.0.0.0/8	Private IPv4 Address Block
100.64.0.0/10	Carrier-grade NAT
127.0.0.0/8	Loopback
127.0.53.53	Name collision occurrence
169.254.0.0/16	Link local
172.16.0.0/12	Private IPv4 Address Block
192.0.0.0/24	IETF protocol assignments
192.0.2.0/24	TEST-NET-1
192.168.0.0/16	Private IPv4 Address Block
198.18.0.0/15	Network benchmark testing
198.51.100.0/24	TEST-NET-2
203.0.113.0/24	TEST-NET-3
224.0.0.0/4	Multicast
240.0.0.0/4	Reserved
255.255.255.255/32	Limited broadcast

www.ipcisco.com





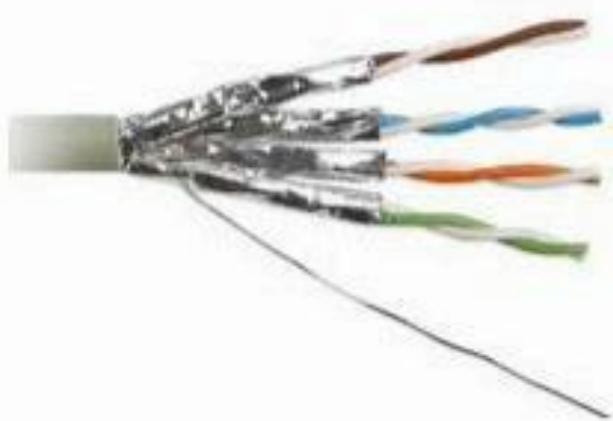
UTP

**Unshielded
Twisted Pair**



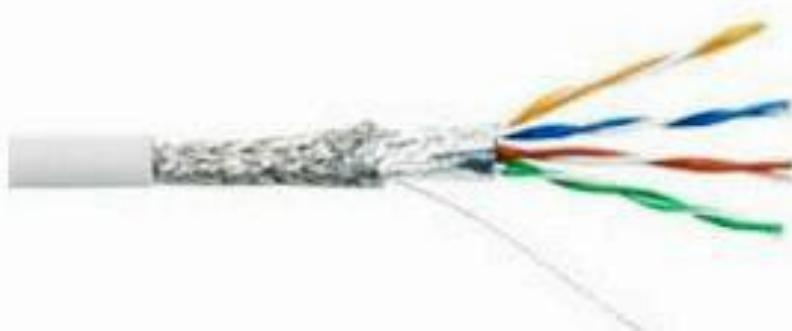
FTP

**Foiled
Twisted Pair**



STP

**Shielded
Twisted Pair**



S-FTP

**Shielded Foiled
Twisted Pair**

Networking Protocols

Networking Protocols include :

FTP - File Transfer Protocol : Port 21

SSH - Secure Shell : Port 22

Telnet - Port 23

SMTP - Simple Mail Transfer Protocol : Port 25

DNS - Domain Naming System (or Service) : Port 53

HTTP - Hypertext Transfer Protocol : Port 80

POP3 - Post Office Protocol : Port 110

IMAP - Internet Message Access Protocol : Port 143

HTTPS - HTTP Secure : Port 443

RDP - Remote Desktop Protocol : Port 3389

TCP - Transmission Control Protocol

UDP - User Datagram Protocol

ARP - Address Resolution Protocol

RARP - Reverse ARP

DHCP - Dynamic Host Configuration Protocol : Server Port 67, Client Port 68

MTP - Media Transfert Protocol

SFTP - Secure File Transfer Protocol

SSL - Secure Socket Layer

TLS - Transport Layer Security

E6 - Ethernet globalization protocols

NTP - Network time protocol

PPP - Point to Point Protocol

NNTP - Network News Transfer Protocol

QOTD - Quote Of The Day

Bitcoin Protocol - Protocol for Bitcoin transactions and transfers on the web

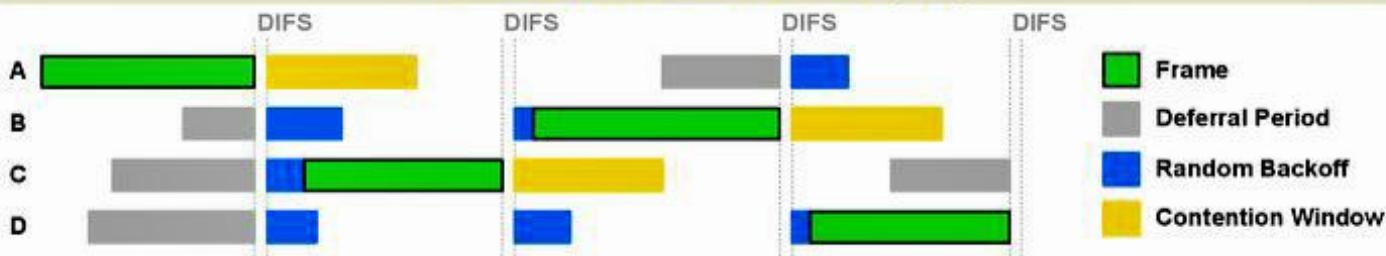
ICMP - Internet Control Message Protocol

IGMP - Internet Group Management Protocol

GGP - Gateway-to-Gateway Protocol

IP-in-IP - IP in IP (encapsulation)

Distributed Coordination Function (DCF)



Interframe Spacing

Short IFS (SIFS)

Used to provide minimal spacing delay between control frames or data fragments

DCF IFS (DIFS)

Normal spacing enforced under DCF for management and non-fragment data frames

Arbitrated IFS (AIFS)

Variable spacing calculated to accommodate differing qualities of service (QoS)

Extended IFS (EIFS)

Extended delay imposed after errors are detected in a received frame

Encryption Schemes

Wired Equivalent Privacy (WEP)

Flawed RC4 implementation using a 40- or 104-bit pre-shared encryption key (deprecated)

Wi-Fi Protected Access (WPA)

Implements the improved RC4-based encryption Temporal Key Integrity Protocol (TKIP) which can operate on WEP-capable hardware

IEEE 802.11i (WPA2)

IEEE standard developed to replace WPA; requires a new generation of hardware to implement significantly stronger AES-based CCMP encryption

Quality of Service Markings

WMM	802.11e	802.1p
Platinum	7/6	6/5
Gold	5/4	4/3
Silver	3/0	0
Bronze	2/1	2/1

Wi-Fi Multimedia (WMM)

A Wi-Fi Alliance certification for QoS; a subset of 802.11e QoS

IEEE 802.11e

Official IEEE WLAN QoS standard ratified in 2005; replaces WMM

IEEE 802.1p

QoS markings in the 802.1Q header on wired Ethernet

Client Authentication

Open

No authentication is used

Pre-shared Encryption Keys

Keys are manually distributed among clients and APs

Lightweight EAP (LEAP)

Cisco-proprietary EAP method introduced to provide dynamic keying for WEP (deprecated)

EAP-TLS

Employs Transport Layer Security (TLS); PKI certificates are required on the AP and clients

EAP-TTLS

Clients authenticate the AP via PKI, then form a secure tunnel inside which the client authentication takes place (clients do not need PKI certificates)

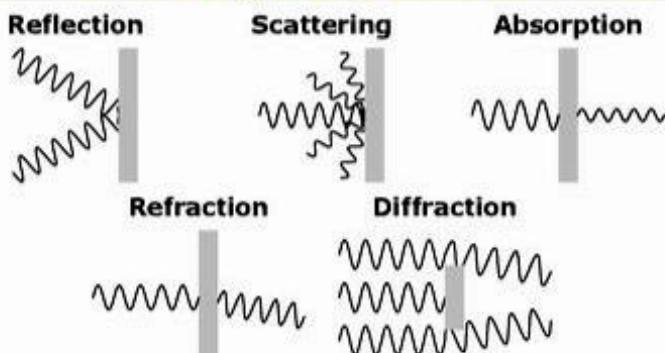
Protected EAP (PEAP)

A proposal by Cisco, Microsoft, and RSA which employs a secure tunnel for client authentication like EAP-TTLS

EAP-FAST

Developed by Cisco to replace LEAP; establishes a secure tunnel using a Protected Access Credential (PAC) in the absence of PKI certificates

RF Signal Interference



Antenna Types

Directional

Radiates power in one focused direction

Omnidirectional

Radiates power uniformly across a plane

Isotropic

A theoretical antenna referenced when measuring effective radiated power

CLASS A (1-126)

Default subnet mask = 255.0.0.0

Subnets/Hosts

Network

Host

Host

Host

255 . 0 . 0 . 0

CLASS B (128-191)

Default subnet mask = 255.255.0.0

Subnets/Hosts

Network

Network

Host

Host

255 . 255 . 0 . 0

CLASS C (192-223)

Default subnet mask = 255.255.255.0

**Subnets/
Hosts**

Network

Network

Network

Host

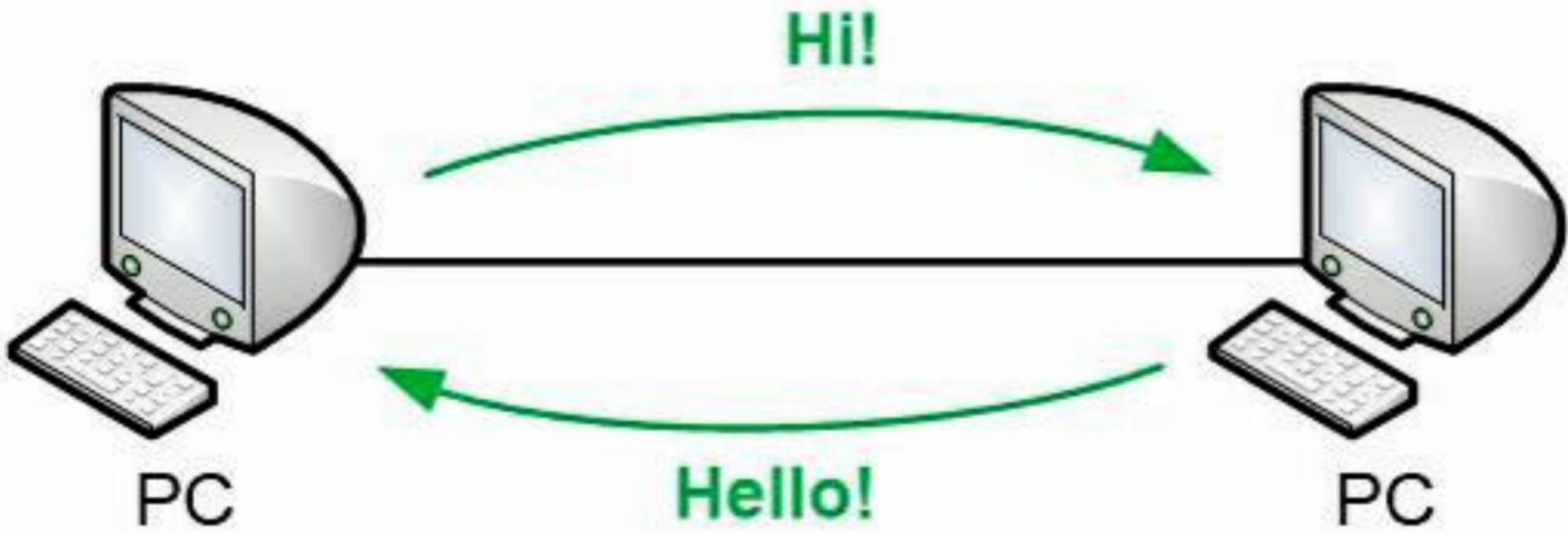
255 . 255 . 255 . 0

Private address range

Class	start address	finish address
A	10.0.0.0	10.255.255.255
B	172.16.0.0	172.31.255.255
C	192.168.0.0	192.168.255.255

Public address range

Class	start address	finish address
A	0.0.0.0	126.255.255.255
B	128.0.0.0	191.255.255.255
C	192.0.0.0	223.255.255.255
D	224.0.0.0	239.255.255.255
E	240.0.0.0	254.255.255.255



IP: 192.168.1.101

IP: 192.168.1.102



Ip Address

8bits 8bits 8bits 8bits

abc . def . ghi . jkl / 32 → All 32 bits are locked and is a single ip address.

abc . def . ghi . jkl / 24 → only 8 bits are locked and is 256 ip addresses..

0.0.0.0 / 0 → means any ip address because no bit locked

Subnetting

SUBNET	1	2	4	8	16	32	64	128	256
HOST	256	128	64	32	16	8	4	2	1
SUBNET MASK	/24	/25	/26	/27	/28	/29	/30	/31	/32

3 Subnet
create
from
Address
192.168.40/24

Network Id	Subnet Mask	Host Id	Usable Host
192.168.40	/26	192.168.4.1 - 192.168.4.62	62
192.168.4.64	/26	192.168.4.65 - 192.168.4.126	62
192.168.4.128	/26	192.168.4.129 - 192.168.4.190	62
192.168.4.192	/26	192.168.4.193 - 192.168.4.254	62



GATEWAY

Dissimilar

Network 1

Mobile Computer
Tablet



Router Is a gateway
connecting two
dissimilar NW



Router is
a Gateway

Network 2 or outside Network

Google

Facebook

Servers

Subnetting

Question:

Your manager gives you the network **192.168.2.0 /24** and tells you to split it in to **four** different networks.

Subnet Mask

11111111. 11111111. 11111111. 00000000
255 . 255 . 255 . 0

2^N = Numbers of networks created

N – Host bits (0) changed into network bits (1)



Solution:

$$2^N = 4 \Rightarrow 2^2 = 4 \Rightarrow N = 2$$

11111111. 11111111. 11111111. 11000000
255 . 255 . 255 . 192 **64 on the 4th**

Decimal	128	64	32	16	8	4	2	1
Binary	1	1	0	0	0	0	0	0

192.168.2.0 /26

00000000 = 0

192.168.2.64 /26

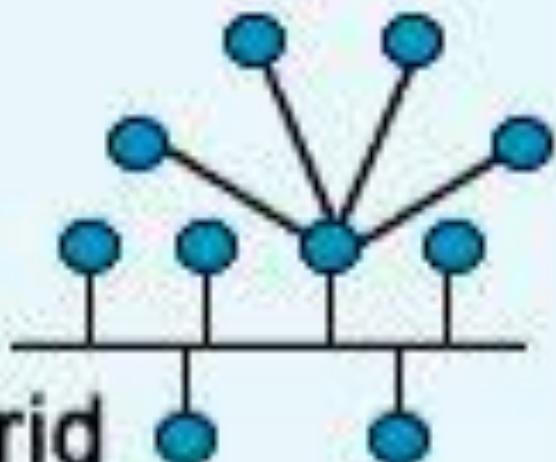
01000000 = 64

192.168.2.128 /26

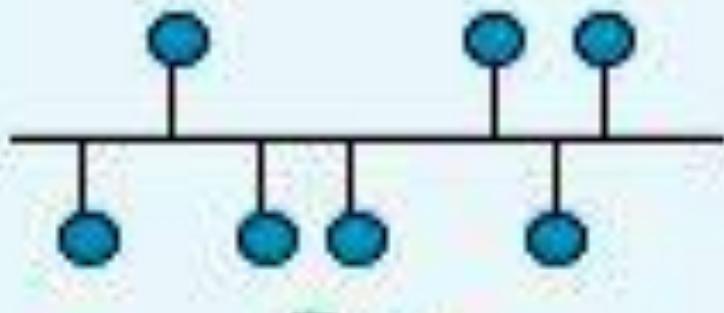
10000000 = 128

192.168.2.192 /26

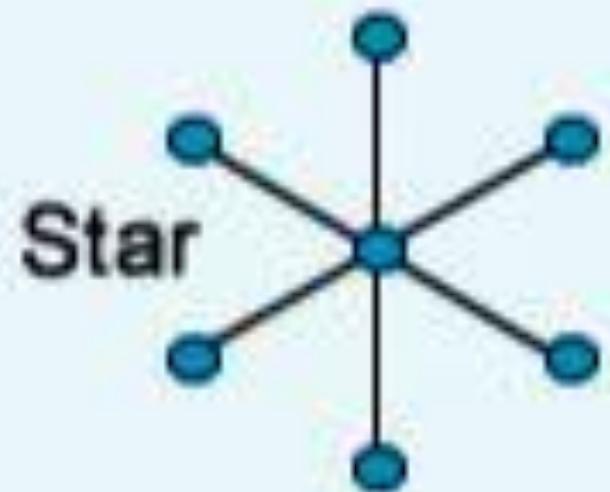
11000000 = 192



Hybrid



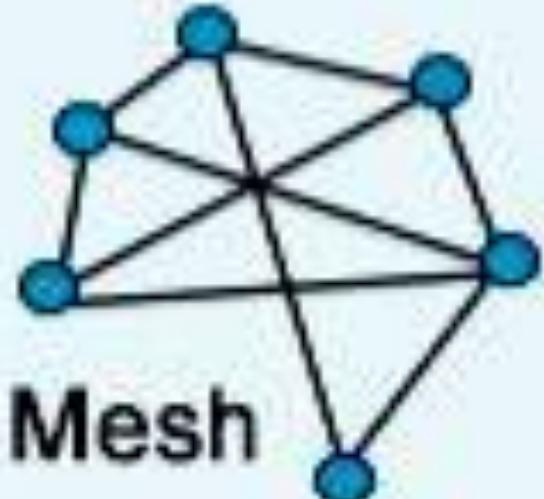
Bus



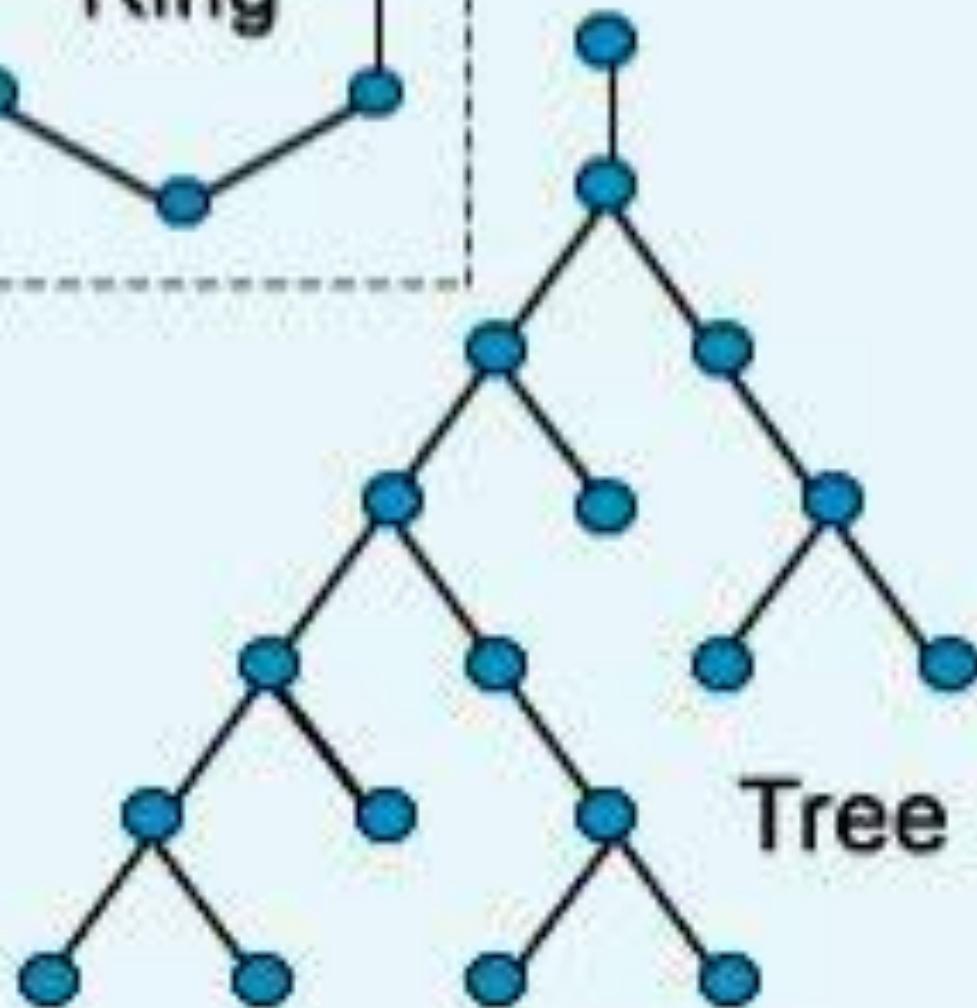
Star



Ring



Mesh



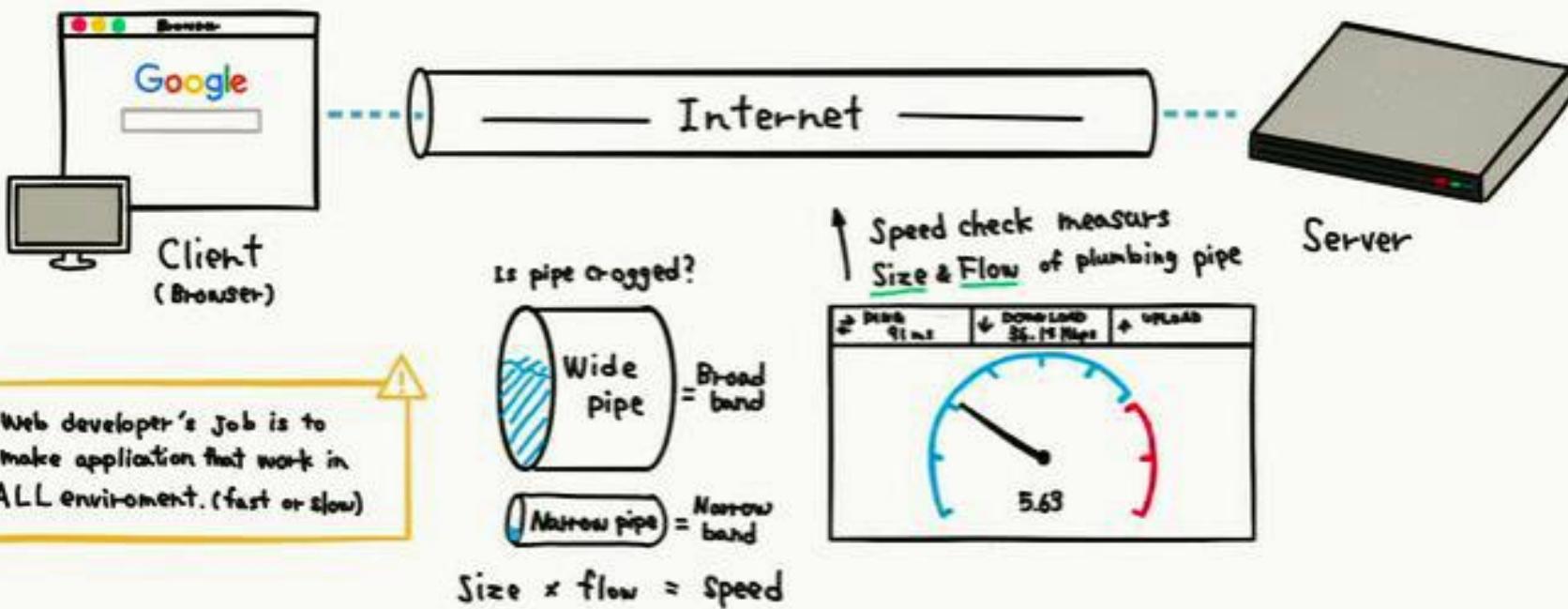
Tree

HTTP what ?

A tweetzine by @kosamari
May 3rd 2017

• • •

Browser gets data over the Internet.
Internet is like a plumbing pipe of data.



IPv4 vs IPv6 Chart

	Internet Protocol version 4 (IPv4)	Internet Protocol version 6 (IPv6)
Deployed	1981	1999
Address Size	32-bit number	128-bit number
Address Format	Dotted Decimal Notation: 192.149.252.76	Hexadecimal Notation: 3FFE:F200:0234:AB00: 0123:4567:8901:ABCD
Prefix Notation	192.149.0.0./24	3FFE:F200:0234::/48
Number of Addresses	$2^{32} = \sim 4,294,967,296$	$2^{128} = \sim 340,282,366,\newline 920,938,463,463,374,\newline 607,431,768,211,456$

An IPv4 address (dotted-decimal notation)

172 . 16 . 254 . 1
 ↓ ↓ ↓ ↓
 10101100 . 00010000 . 11111110 . 00000001

One byte = Eight bits

Thirty-two bits (4x8), or 4 bytes

An IPv6 address (in hexadecimal)

2001:0DB8:AC10:FE01:0000:0000:0000:0000
 ↓ ↓ ↓ ↓
 2001:0DB8:ac10:FE01:: Zeros can be omitted
 ↗ ↗ ↗
 00100000000001:00001011011100:101010000010000:11111100000000:
 00000000000000:00000000000000:00000000000000:00000000000000

IPv4 Header

Version	IHL	Type of Service	Total Length				
Identification		Flags	Fragment Offset				
Time to Live	Protocol	Header Checksum					
Source Address							
Destination Address							
Options		Padding					

IPv6 Header

Version	Traffic Class	Flow Label		
Payload Length		Next Header	Hop Limit	
Source Address				
Destination Address				

TCP/IP Packet

32 bits

IPv4 Header	0	4	8	16	19	31
Version	Length	Type of Service		Total Length		
	Identification		Flags	Fragment Offset		
Time to Live		Protocol		Header Checksum		
		Source Address				
		Destination Address				
		Options				
		Data				
TCP						
Source Port			Destination Port			
		Sequence Number				
		Acknowledgment Number				
Offset	Reserved	TCP Flags C E U A P R S F		Window		
		Checksum		Urgent Pointer		
		TCP Options				

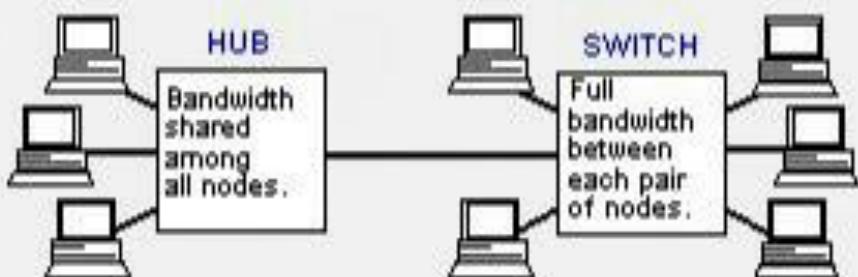
HUBS AND SWITCHES

Hub versus Switch



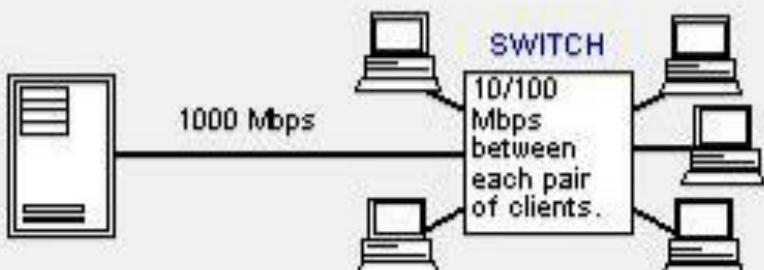
With a hub, bandwidth is shared among all stations. When the hub is replaced with a switch, each sender and receiver pair has the full wire speed. For example, a 16-port 100BaseT switch would have a backplane that supports eight pairs.

Hub and Switch Used Together

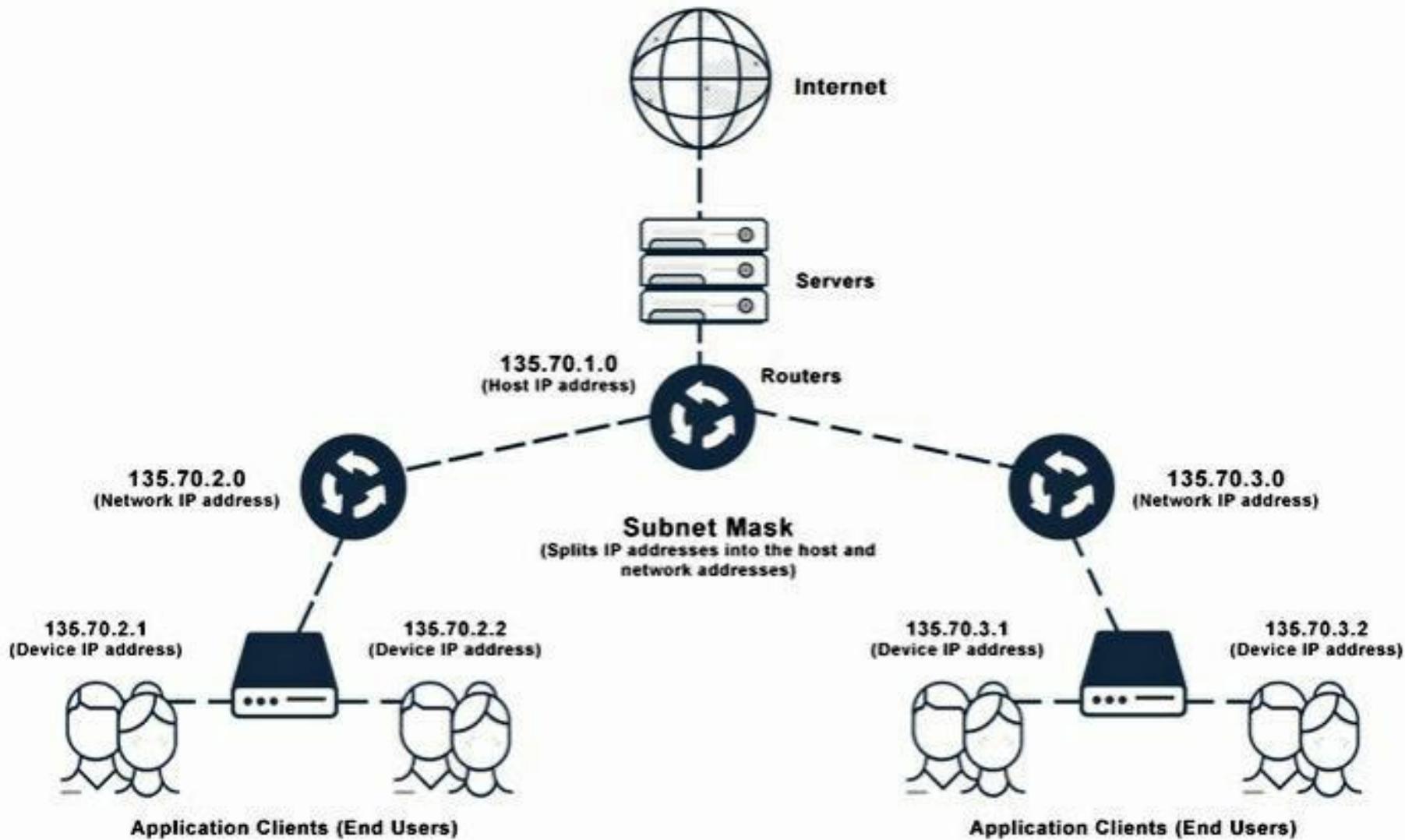


Hubs can be used in combination with switches. All users may not need the extra speed offered by individual switch ports.

Gigabit Ethernet Switch



Gigabit Ethernet switches provide support for 10, 100 and 1000 Mbps



C:\WINDOWS\system32>ping /?

Usage: ping [-t] [-a] [-n count] [-l size] [-f] [-i TTL] [-v TOS]
[-r count] [-s count] [[-j host-list] | [-k host-list]]
[-w timeout] [-R] [-S srcaddr] [-c compartment] [-p]
[-4] [-6] target_name

Options:

-t	Ping the specified host until stopped. To see statistics and continue - type Control-Break; To stop - type Control-C.
-a	Resolve addresses to hostnames.
-n count	Number of echo requests to send.
-l size	Send buffer size.
-f	Set Don't Fragment flag in packet (IPv4-only).
-i TTL	Time To Live.
-v TOS	Type Of Service (IPv4-only. This setting has been deprecate ed d and has no effect on the type of service field in the IP Header). Record route for count hops (IPv4-only). Timestamp for count hops (IPv4-only). Loose source route along host-list (IPv4-only). Strict source route along host-list (IPv4-only). Timeout in milliseconds to wait for each reply. Use routing header to test reverse route also (IPv6-only). Per RFC 5095 the use of this routing header has been deprecated. Some systems may drop echo requests if
-r count	
-s count	
-j host-list	
-k host-list	
-w timeout	
-R	

```
C:\Windows\system32\cmd.exe
C:\Users\raijin>ipconfig /all

Windows IP Configuration

Host Name . . . . . : raijin-PC
Primary Dns Suffix . . . . . :
Node Type . . . . . : Hybrid
IP Routing Enabled. . . . . : No
WINS Proxy Enabled. . . . . : No
DNS Suffix Search List. . . . . : baidwan

Mobile Broadband adapter Mobile Broadband Connection:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . . . . . :
Description . . . . . : Wireless Ethernet Adapter FFE9
Physical Address. . . . . : 00-A0-C6-00-00-12
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . . : Yes

Ethernet adapter Local Area Connection:

Connection-specific DNS Suffix . . . . . : baidwan
Description . . . . . : SiS191 Ethernet Controller
Physical Address. . . . . : 00-22-15-BE-CB-0A
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::79e6:385d:f4d1:16f5%11(PREFERRED)
IPv4 Address. . . . . : 192.168.1.100(PREFERRED)
Subnet Mask . . . . . : 255.255.255.0
Lease Obtained. . . . . : 16 February 2014 14:48:46
Lease Expires . . . . . : 16 February 2014 22:48:45
Default Gateway . . . . . : 192.168.1.254
DHCP Server . . . . . : 192.168.1.254
DHCPv6 IAID . . . . . : 234889749
DHCPv6 Client DUID. . . . . : 00-01-00-01-1A-8E-D2-87-00-22-15-BE-CB-0A
DNS Servers . . . . . : 8.8.8.8
NetBIOS over Tcpip. . . . . : Enabled

Tunnel adapter isatap.baidwan:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . . . . . : baidwan
Description . . . . . : Microsoft ISATAP Adapter
Physical Address. . . . . : 00-00-00-00-00-00-E0
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . . : Yes

Tunnel adapter Local Area Connection* 11:

Connection-specific DNS Suffix . . . . . :
Description . . . . . : Teredo Tunneling Pseudo-Interface
Physical Address. . . . . : 00-00-00-00-00-00-E0
DHCP Enabled. . . . . : No
Autoconfiguration Enabled . . . . . : Yes
IPv6 Address . . . . . : 2001:0:5ef5:79fb:10c8:b309:8a29:69ff(Pref
```

Windows IP Configuration

Host Name : DESKTOP-UV8IV07
Primary Dns Suffix :
Node Type : Hybrid
IP Routing Enabled. : No
WINS Proxy Enabled. : No
DNS Suffix Search List. : hitronhub.home

Wireless LAN adapter Local Area Connection* 2:

Media State : Media disconnected
Connection-specific DNS Suffix :
Description : Microsoft Wi-Fi Direct Virtual Adapter
Physical Address. : DA-FF-28-3C-84-13
DHCP Enabled. : Yes
Autoconfiguration Enabled : Yes

Wireless LAN adapter Local Area Connection* 3:

Media State : Media disconnected
Connection-specific DNS Suffix :
Description : Microsoft Wi-Fi Direct Virtual Adapter #4
Physical Address. : CA-FF-28-3C-84-13
DHCP Enabled. : Yes
Autoconfiguration Enabled : Yes

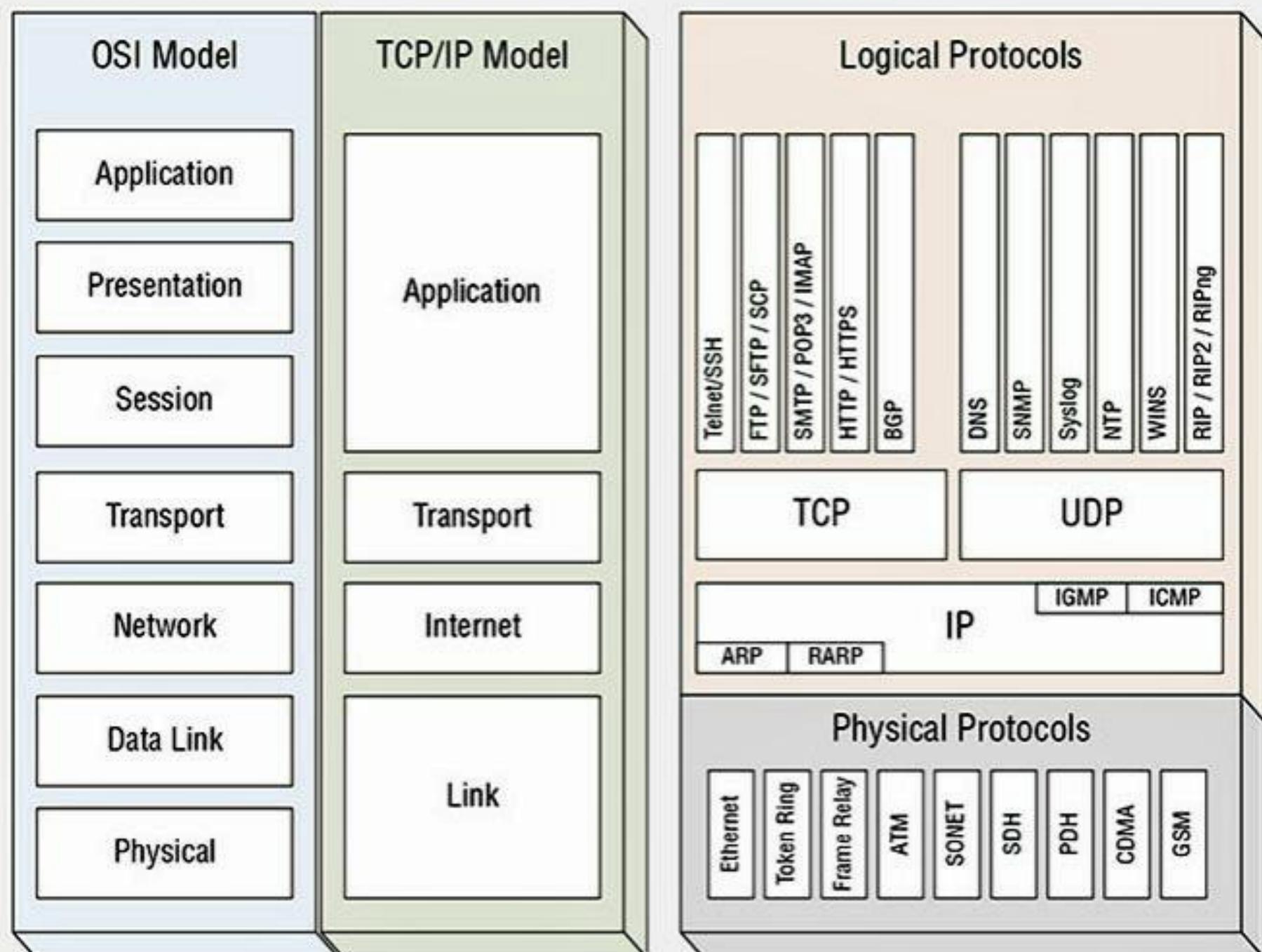
Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix : hitronhub.home
Description : Qualcomm Atheros QCA61x4A Wireless Network Adapter
Physical Address. : C8-FF-28-3C-84-13
DHCP Enabled. : Yes
Autoconfiguration Enabled : Yes
IPv6 Address. : 2607:fea8:3d20:949::2a(Preferred)
Lease Obtained. : Monday, August 19, 2019 4:50:48 PM
Lease Expires : Tuesday, August 27, 2019 10:00:06 PM
IPv6 Address. : 2607:fea8:3d20:949:fd03:b57e:3676:2037(Preferred)
IPv6 Address. : fd00:6477:7d99:6612:fd03:b57e:3676:2037(Preferred)
Temporary IPv6 Address. : 2607:fea8:3d20:949:ad4f:576c:5f2b:b1f0(Preferred)
Temporary IPv6 Address. : fd00:6477:7d99:6612:ad4f:576c:5f2b:b1f0(Preferred)
Link-local IPv6 Address : fe80::fd03:b57e:3676:2037%8(Preferred)
IPv4 Address. : 192.168.0.98(Preferred)
Subnet Mask : 255.255.255.0
Lease Obtained. : Tuesday, August 20, 2019 10:00:07 PM
Lease Expires : Tuesday, August 27, 2019 11:31:50 PM
Default Gateway : fe80::6677:7dff:fe99:6612%8
 192.168.0.1
DHCP Server : 192.168.0.1
DHCPv6 IAID : 80281384
DHCPv6 Client DUID. : 00-01-00-01-20-F7-C4-6E-C8-FF-28-3C-84-13
DNS Servers : 2607:fea8:3d20:949:6677:7dff:fe99:6612
 192.168.0.1
 2607:fea8:3d20:949:6677:7dff:fe99:6612
NetBIOS over Tcpip. : Enabled

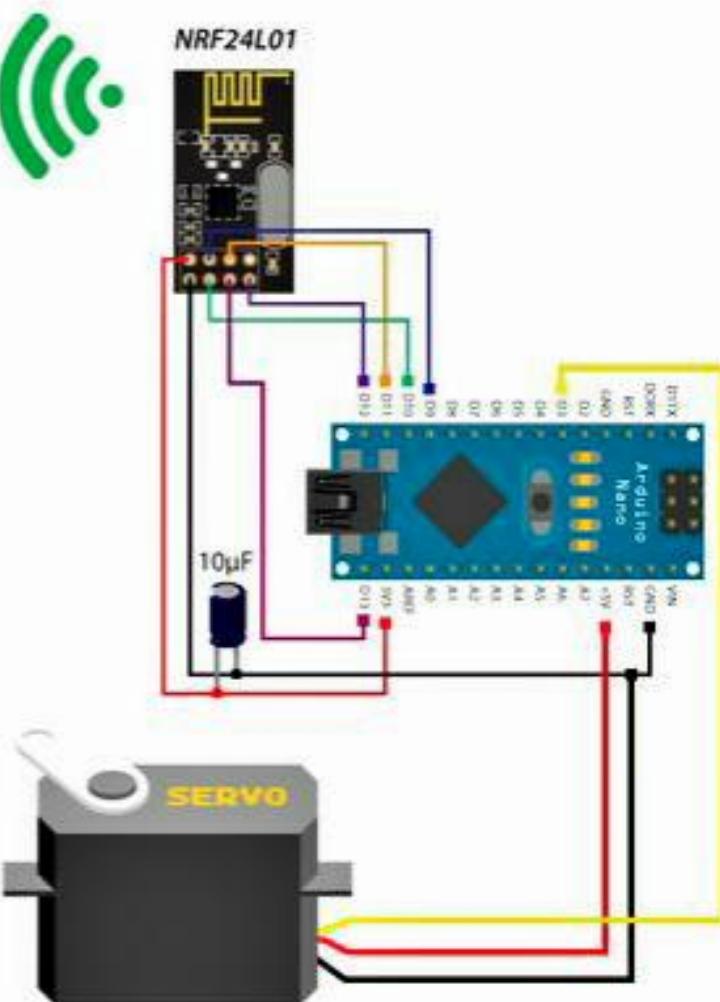
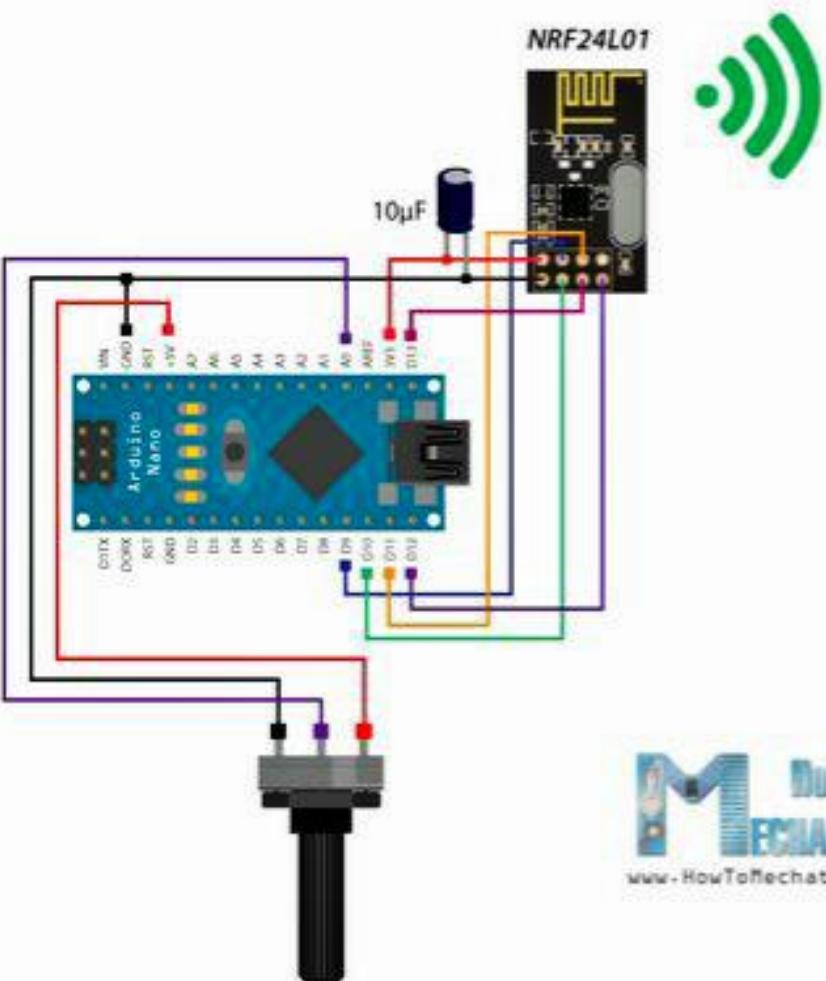
Ethernet adapter Bluetooth Network Connection:

Media State : Media disconnected
Connection-specific DNS Suffix :
Description : Bluetooth Device (Personal Area Network)
Physical Address. : C8-FF-28-3C-84-14
DHCP Enabled. : Yes
Autoconfiguration Enabled : Yes

NETWORK MODELS



Arduino Wireless Servo Motor Control



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