Course Outline:

- Overview of Data Communication and Networking
- Physical Layer
- Data Link Layer
 - Logical Link Control (LLC)
 - Medium Access Control (MAC)
- Network Layer
- Transport Layer
- Application Layer

References:

- Data Communication and Network
 - B. Forouzan (McGraw-Hill Publications)
- Computer Networks
 - Andrew S. Tanenbaum (Pearson Education Asia)
- Data and Computer Communications
 - William Stallings (Pearson Education Asia)

Distribution of Marks:

Component	Marks	Number of Questions	Duration	Scheduled Date	Scheduled Time
Quiz – I	10	≈ 30 MCQ	20 Mins	23 February 2024	From 1:15 PM
Mid Semester	32	Descriptive	120 Mins	To be announced	To be announced
Quiz – II	10	≈ 30 MCQ	20 Mins	24 April 2024	From 1:15 PM
End Semester	48	Descriptive	180 Mins	To be announced	To be announced

Total Marks 100

Computer Networks Lab (csc307)

Course Outline:

Socket Programming 4 Weeks

- NS-3 Programming 4 Weeks

- CISCO Packet Tracer2 Weeks

- Network Protocols & Tools 3 Weeks

Computer Networks Lab (csc307)

Distribution of Marks:

Component	Marks	Number of Questions	Duration	Scheduled Date	Scheduled Time
Continuous Assessment	39	13 to 20	26 Hours	Regular Lab Date	Regular Lab Time
Quiz	11	≈ 30 MCQ	20 Mins	16 th April 2024	12:15 PM to 12:35 PM
End Semester	50	1 to 2	120 Mins	23 rd April 2024	10 AM to 12 Noon

Total Marks 100

Computer Networks Lab (csc307)

Group Division:

Group No	From	То	
1	20JE1092	21JE0172	
2	21JE0195	21JE0293	
3	21JE0298	21JE0363	NI HC I AD 1
4	21JE0367	21JE0474	NLHC LAB 1
5	21JE0475	21JE0577	
6	21JE0582	21JE0726	
7	21JE0727	21JE0922	
8	21JE0930	21JE1037	NLHC LAB 3
9	21JE1038	19JE0056	INLITE LAD 3
10	19JE0063	19JE0951	

Course Outline:

VOverview of Data Communication and Networking

- Physical Layer
- Data Link Layer
 - Logical Link Control (LLC)
 - Medium Access Control (MAC)
- Network Layer
- Transport Layer
- Application Layer

Data Communication is the <u>exchange of data</u> (in the forms of 0s and 1s) between to devices via some form of transmission medium.

Effectiveness of a Data Communication system depends on:

- Delivery
- Accuracy
- Timeliness

Data Communication system is made up of **five components**:

- Message
- Sender
- Receiver
- Medium
- Protocol

Networks:

- A network is a set of devices (often referred to as nodes) connected by media links.
- Networking is the sharing of information and services.

Network Criteria:

To be considered effective and efficient, a network must meet a number of criteria.

- Performance
- Reliability
- Security

Network Criteria:

Performance -

Can be measured in many ways, including <u>transit time</u> and <u>response</u> <u>time</u>.

Other factors are:

- Number of users
- Type of transmission medium
- Hardware
- Software

Reliability -

In addition to accuracy of delivery, network reliability is measured by:

- Frequency of failure
- Recovery time of a network after a failure
- Catastrophe

Security -

Protecting data from:

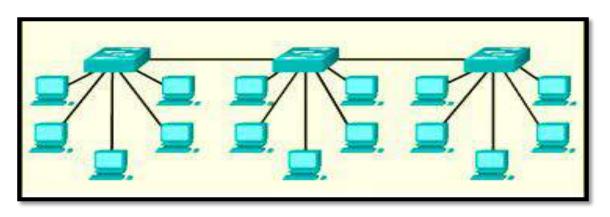
- Unauthorized access
- Viruses

Network Design Goals:

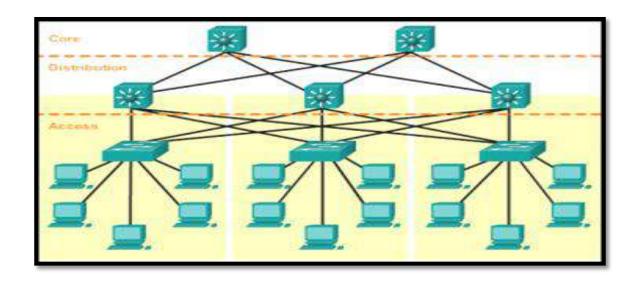
- Scalability
- Availability
- Performance
- Security

- Manageability
- Adaptability
- Affordability

FLAT NETWORK



HIERARCHICAL NETWORK



A good network design is hierarchical, with a clear separation of functions. It may comprise of three layers:

- CORE LAYER
- DISTRIBUTION LAYER
- ACCESS LAYER

NETWORK DESIGN & DEPLOYMENT PHASES

Phase-1	Requirement Assessme	nt, Proper Planning an	d Site Survey
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Phase-2 Cable Plant and Wiring Closets

Phase-3 IP and VLAN Design

Phase-4 Installation of Active Components

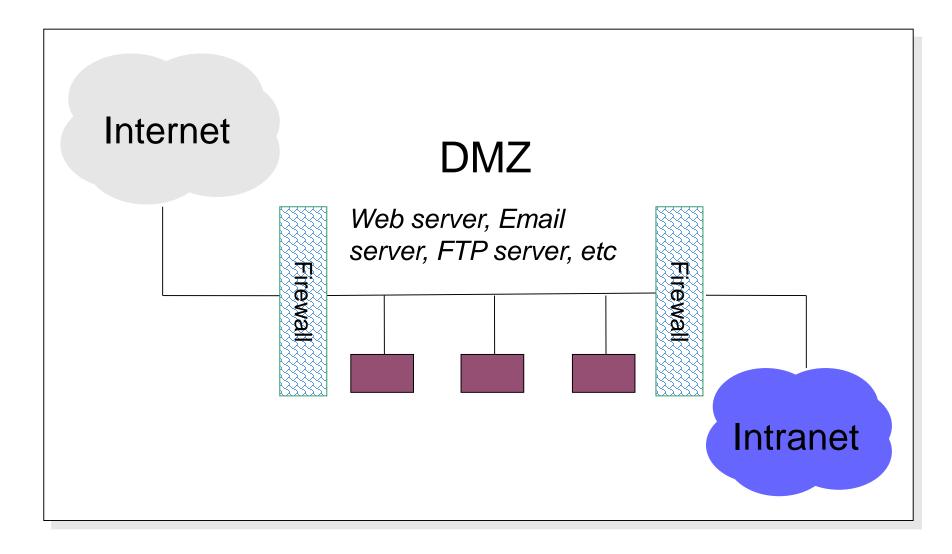
Phase-5 Testing

Phase-6 Network & Security Audit

Campus Network Schematic

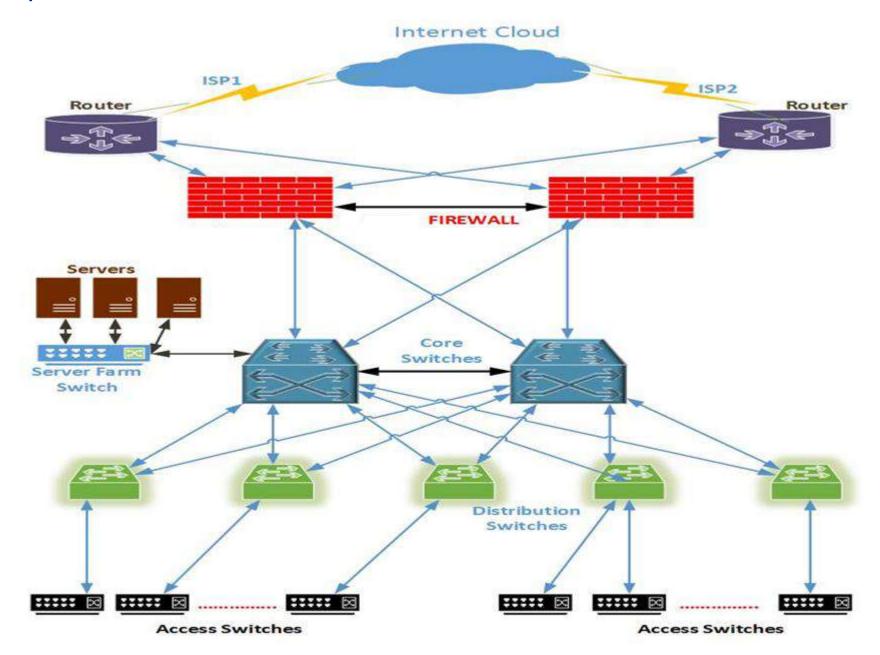
(without redundancy) Internet Cloud ISP NOC ROUTER **SERVER FARM DMZONE FIREWALL** ===== WLAN CONTROLLER **CORE SWITCH** DISTRIBUTION SWITCH **DISTRIBUTION SWITCH** 00000 **EDGE** switches **EDGE**↓SWITCHES **PRINTER** SCANNER **CLIENTS CLIENTS**

DEMILITIRASED ZONE (DMZ)



It separates an internal LAN from other untrusted networks, usually the Internet.

Resilient Campus Network



Internet Bandwidth, IIT(ISM), Dhanbad

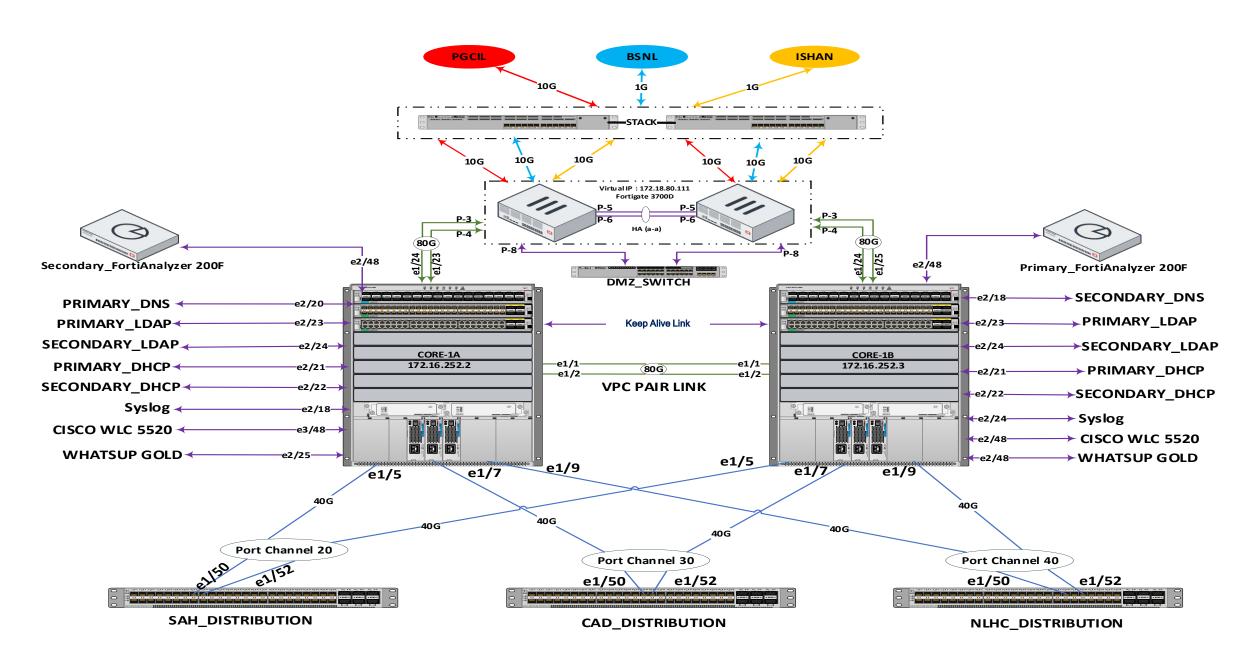
Total 7Gbps from following three ISP's:

• PGCIL 5Gbps

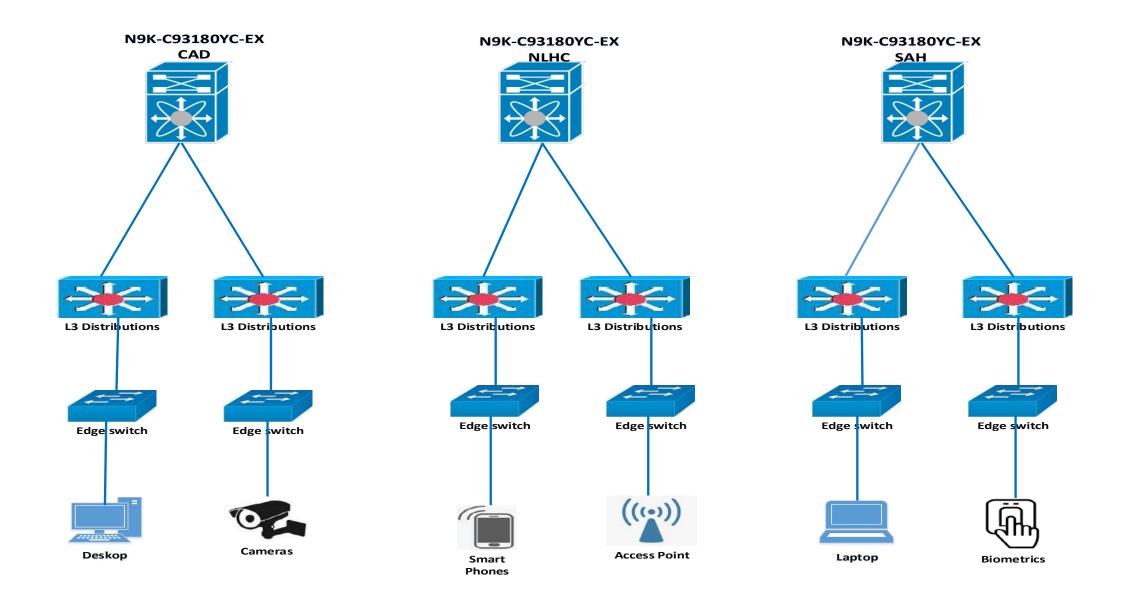
Ishan Netsol Pvt. Ltd. 1Gbps

BSNL
 1Gbps under NKN

Network Connectivity, IIT(ISM), Dhanbad

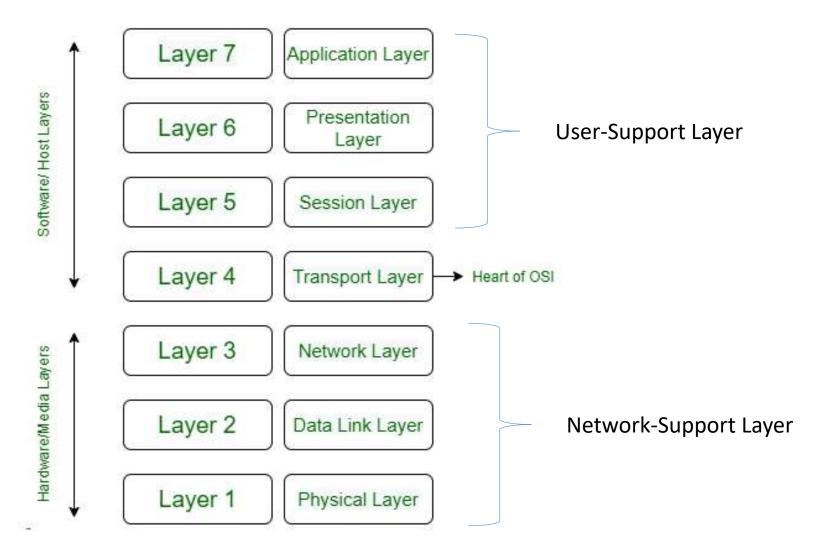


Network Connectivity, IIT(ISM), Dhanbad



- Established in 1947.
- Established by <u>International</u> <u>Standards Organization</u> <u>(ISO)</u>.
- ISO Standard that covers all aspects of network communications in the Open Systems Interconnection (OSI) model.
- OSI model is not a protocol;
 it is a model for understanding and designing a network architecture that is <u>flexible</u>, robust and interoperable.

OSI is a Layered Framework.



Please Do Not Touch Steve's Pet Alligator

Host Layers

Media Layers

APPLICATION

PRESENTATION

SESSION

TRANSPORT

NETWORK

DATA LINK

PHYSICAL

Network process to Application, User end APIs, resource sharing, remote file access, etc.

Translation of data like character encoding, encryption/decryption, data compression, etc.

Establish, maintain and gracefully shut down the session.

Reliable end to end communication, segmentation, flow-control, acknowledgement, and multiplexing

Path determination, logical addressing, routing, traffic control

Reliable node to node transmission of frames, MAC and LLC sublayers, Physical addressing

Transmission/Reception of binary bit streams over physical medium, encoding/decoding at bit level DATA

DATA

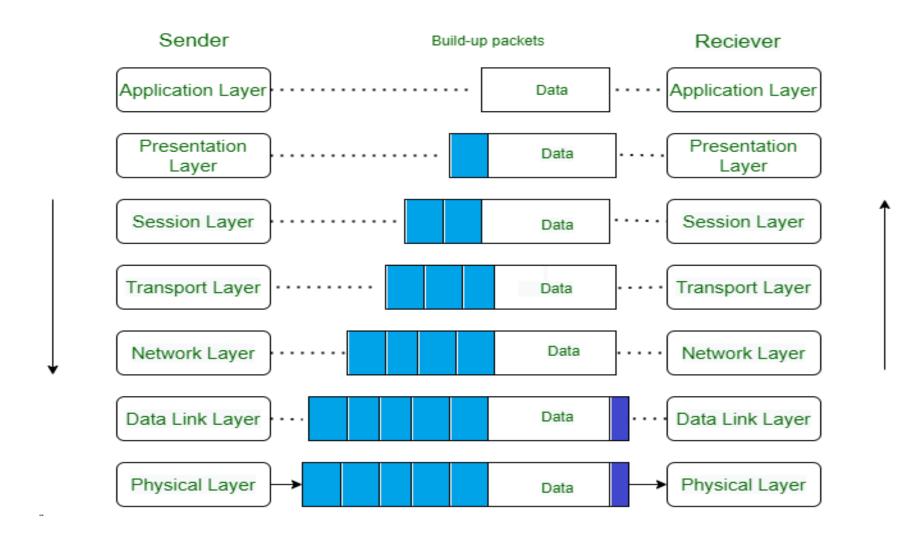
DATA

SEGMENT

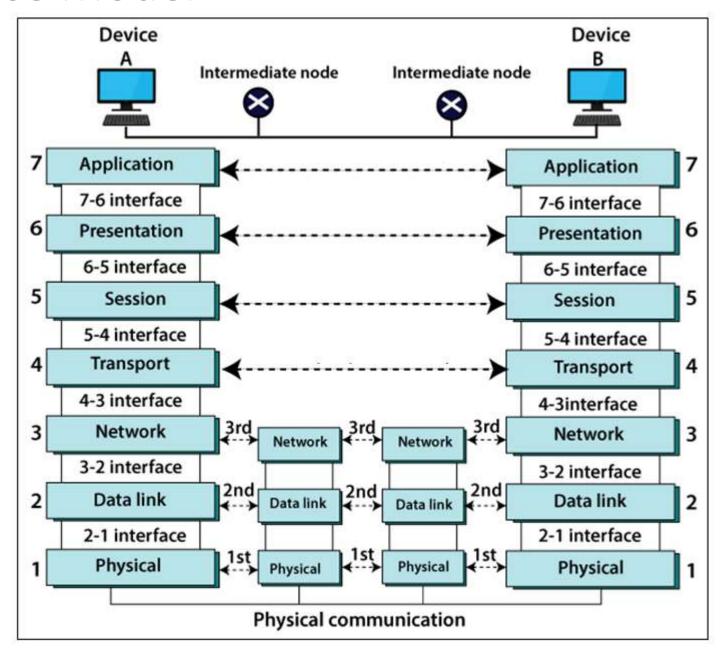
PACKET

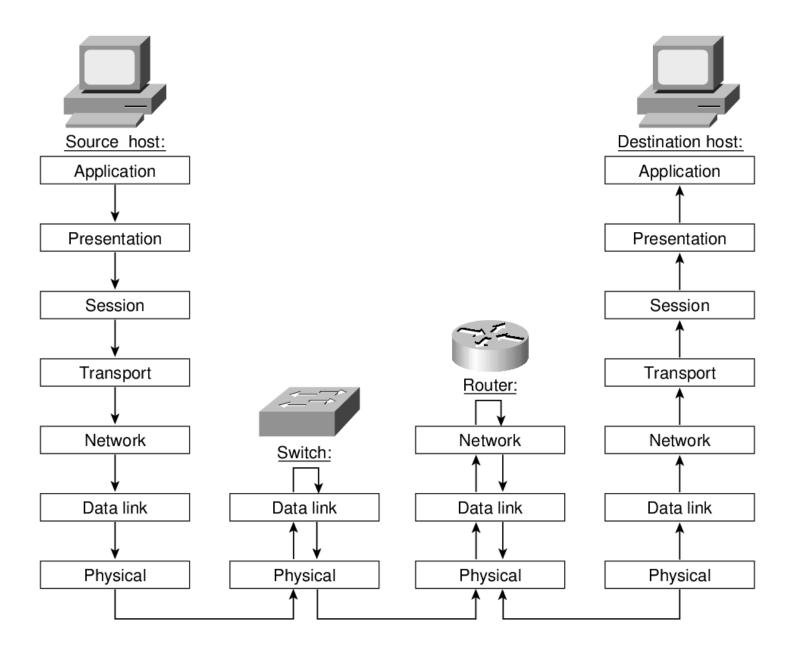
FRAMES

BITS



- Headers are added to the data at Layers 6, 5, 4, 3, and 2.
- Trailers are usually added at Layer 2.





TCP/IP Conceptual Model **OSI Reference Model Application** Application Presentation Session **Transport Transport** / Internet Layer / Network Network Internetwork Layer Data Link Network / Network Access Layer / Interface Physical Host-to-Network Layer

7 - Application

Interface to end user. Interaction directly with software application.

6 - Presentation

Formats data to be "presented" between application-layer entities.

5 - Session

Manages connections between local and remote application.

Segment

4 - Transport

Ensures integrity of data transmission.

3 - Network

Determines how data gets from one host to another.

2 - Data Link

Defines format of data on the network.

1 - Physical

Transmits raw bit stream over physical medium.

Message Formation

Session Management, Encryption, Data Compression.

DNS, SMTP, POP, FTP, WWW, HTTP

End-to-End Transport Services

Addressing, Reliable Delivery, Error Control, Flow Control.

Host –to-Host Delivery

Packet Switching, Routing Algorithms, Congestion Control Algorithms, Network and internet devices.

Node-to-Node Delivery

Framing, Error Control, Flow Control, Errors, Addressing, MAC Protocols.

TCP, UDP

IPv4, IPv6, ARP, RARP, BOOTP, ICMP, IGMP, DHCP

HDLC, Pure & Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA, IEEE 802 Project, TDMA, FDMA & CDMA

Cabling/Network Interface

Connection Types, Topology, Signalling, Synchronization, Multiplexing, Switching, Transmission Media.