

Introduction to Computer Systems

Computer networks

The Malabe campus team

Mr. Kavinga Yapa Abeywardena (MSc - UK): kavinga.y@sliit.lk

Ms. Hansika Mahaadikara (MSc – SLIIT): pipuni.w@sliit.lk

Ms. Pipuni Wijesiri (BSc – SLIIT): <u>pipuni.w@sliit.lk</u>

Ms. Dinithi Pandithage (BSc – KDU): dinithi.p@sliit.lk

Computer Networks - Course Outline

Week 9: Living in a Network Centric World

Week 10: Communicating over the Network

Week 11: ISO – OSI Reference Model

Week 12: Addressing in a Network

Week 13: Design a Network

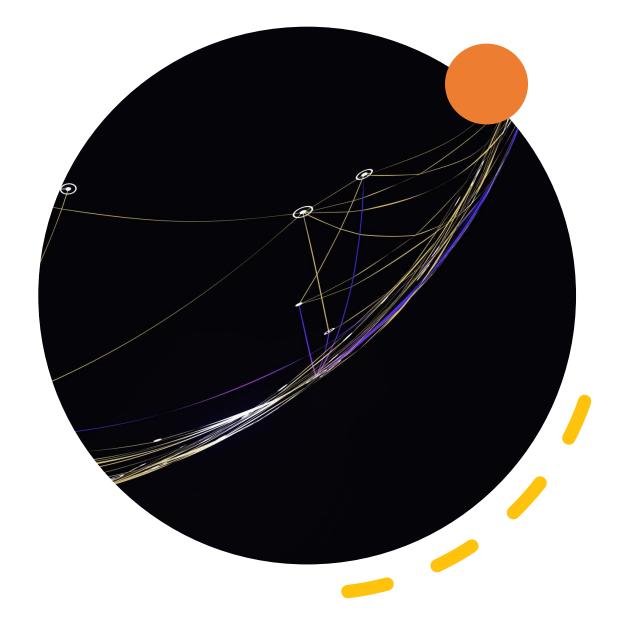
Lecture 07

Living in a Network Centric World



Lecture Outline

- Networking
- Computer Networks
- Classification of Computer Networks
 - Technologies
 - Topologies
 - Devices
- Internet
- Private vs Public Networks
- Intranets vs Extranets











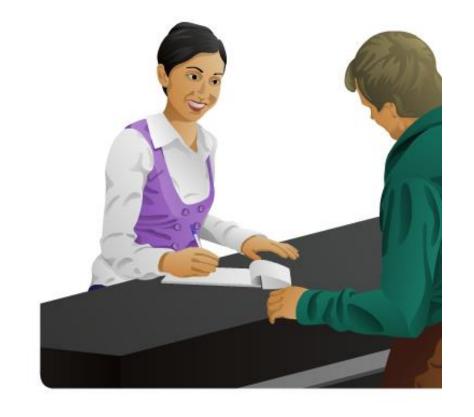
Networking Today

- Network has no boundary and supports the way we:
 - ✓ Communicate
 - ✓ Work
 - ✓ Share
 - ✓ Learn
 - ✓ Play

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General Communication

- ✓ Rules/agreements are established
- ✓ Information may need to be repeated
- ✓ Communication modes may impact the effectiveness of getting the message across





Data Communication Networks Need

- Devices
 - To communicate with one another
- Medium
 - Connects devices together
- Messages
 - Information over media
- Rules
 - Govern how messages flow across networks

A Computer Network

✓ A collection of computers and other associated devices

(PCs, laptops, smart phones, printers, fax machines, or any devices capable of sending/receiving data)

- ✓ Interconnected by intermediate networking devices (hubs, routers and switches)
- ✓ Using a transmission media (copper, fiber, free space)



Modern Networks

Most of today's networks are known as converged networks

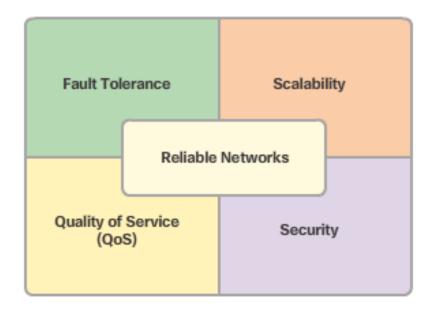
Converged networks carry:

- Data
- Voice
- Video
- Images over the same network



Reliable Networks

- Four Basic Characteristics of Network Architecture
 - ✓ Fault Tolerance
 - ✓ Scalability
 - ✓ Quality of Service (QoS)
 - ✓ Security

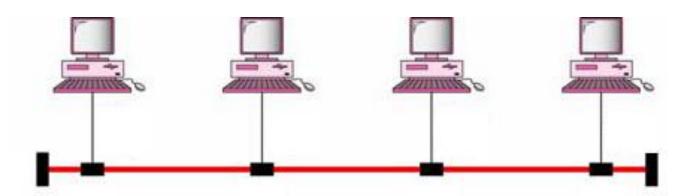


Connecting Devices in a Network

 Point-to-Point: Provides a dedicated link between the two devices.



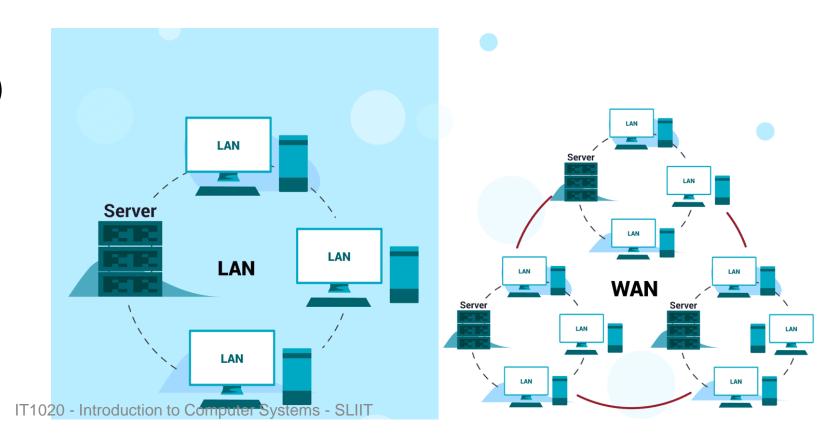
• Multipoint: More than two devices (i.e. several) share a single link.



Classification of Computer Networks

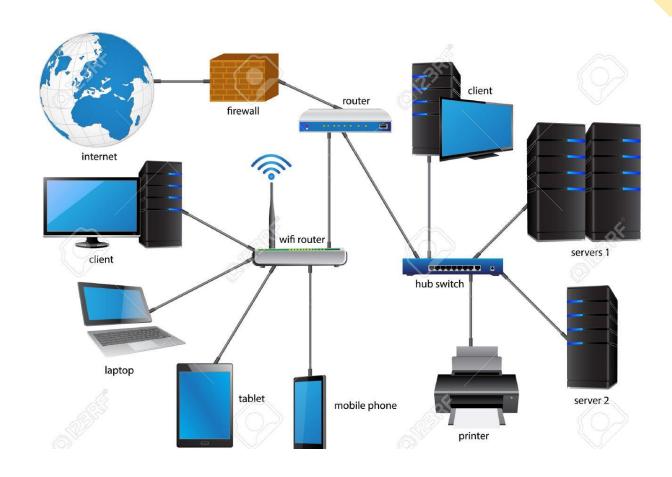
Based on the covered geographical area, computer networks can be divided into categories:

- LAN (Local Area Network)
- WAN (Wide Area Network)



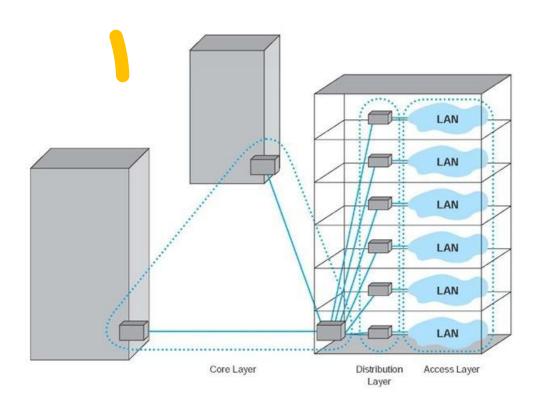
Local Area Network (LAN)

- A LAN connects network devices over a relatively small geographical area.
- A networked office building, school, campus or home usually contains a single LAN.



Features of a LAN

- Smaller scope (Building or Small Campus)
- Usually owned by same organization
- Data rates are much higher
- Usually, a single broadcast systems
- Easy to manage



Any LAN environment you are familiar with?

Network Devices Used to build a LAN

- Switches
- Wi-Fi Routers
- Repeaters
- Hubs
- Bridges









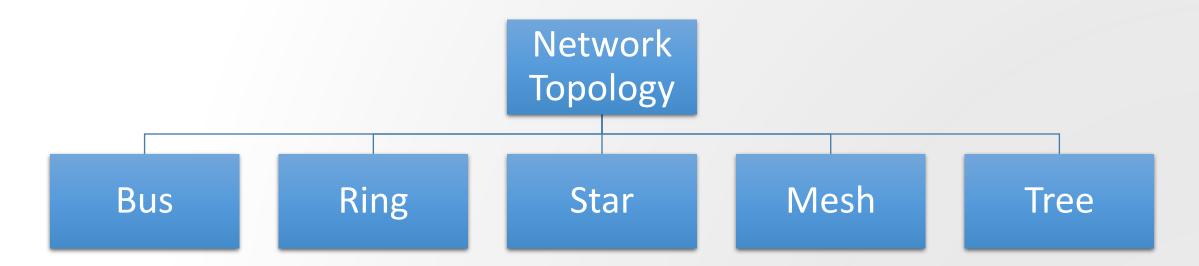


LAN Connectivity Methods

- There are several standards (or specifications) to setup a LAN,
 - **✓** Ethernet
 - **✓** Fast Ethernet
 - **✓** Gigabit Ethernet
 - ✓ Wireless LAN
 - ✓ Token Ring
 - ✓ Token Bus
- Each standard specifies a certain topology and a media access technique for the network

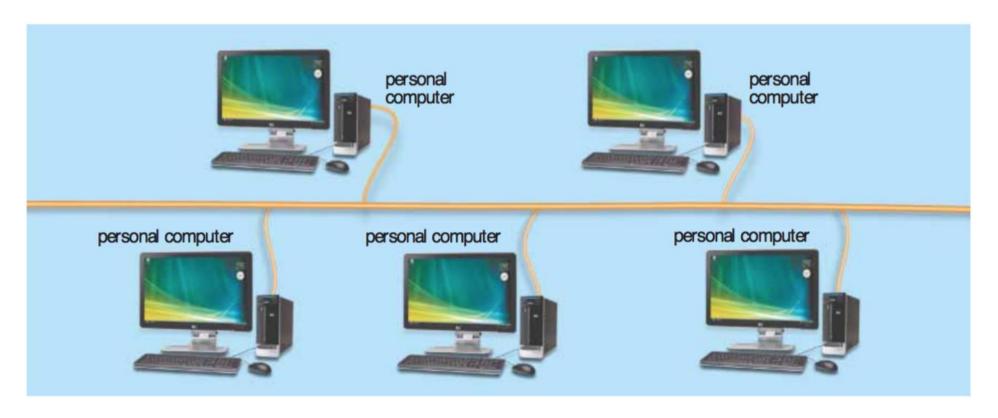
Topologies

 Topology (or network topology) refers to the physical arrangement of the computers in the network



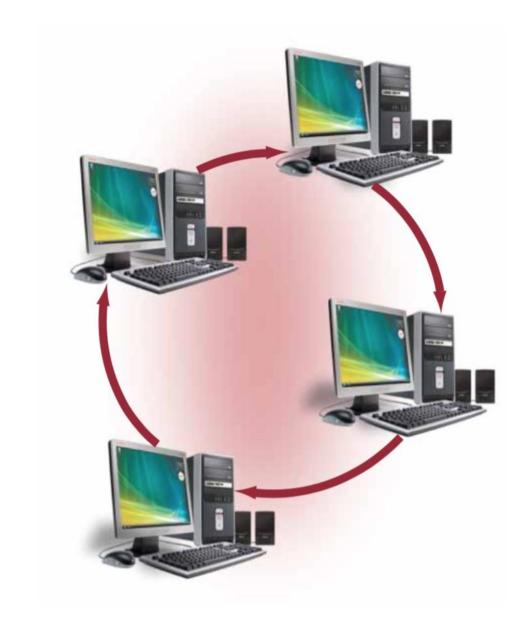
Bus Topology

A common media connecting all the computers



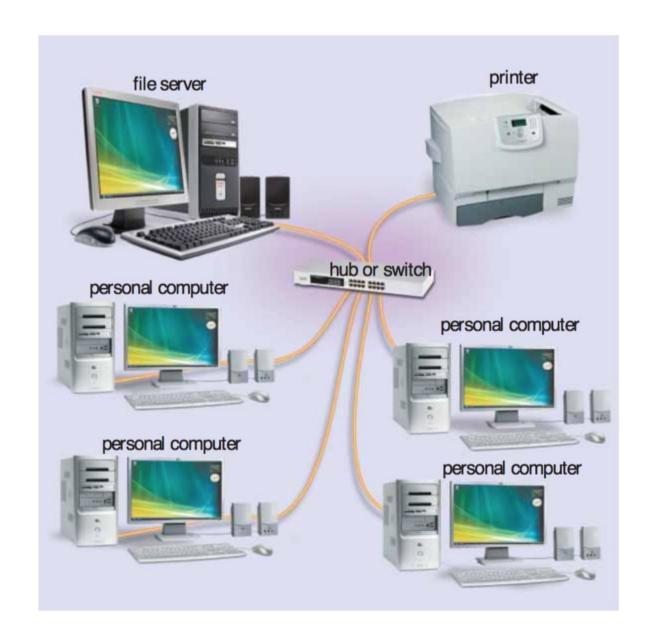
RING Topology

Also shares a common media, but computers are arranged in a ring



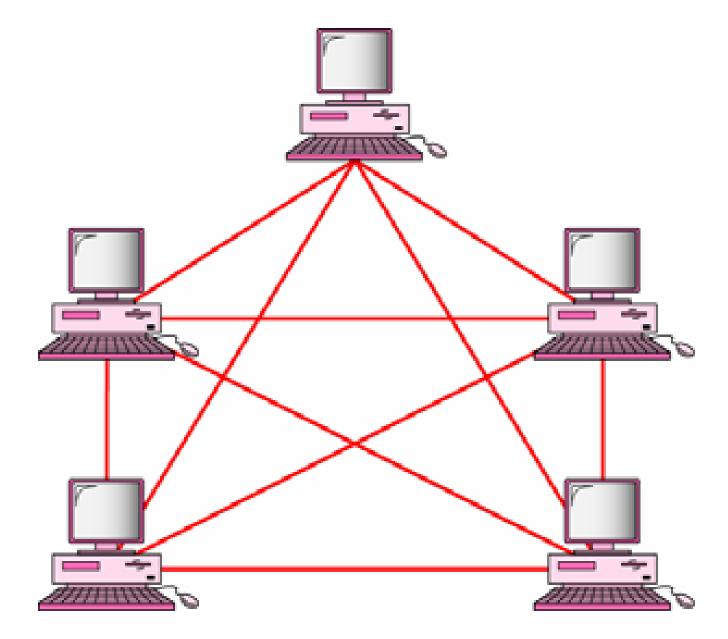
Star Topology

Computers are connected to a central device (typically a hub) and forms a star like arrangement.

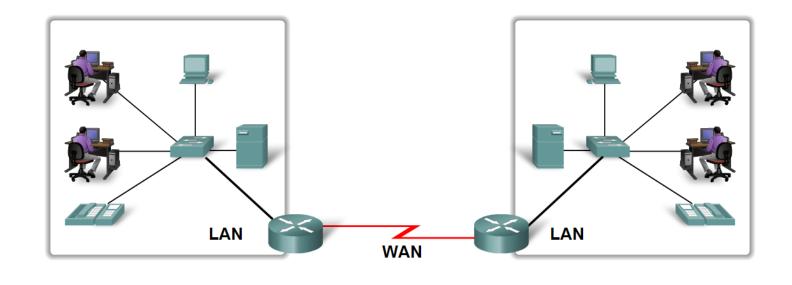


Mesh Topology

Each computer has a dedicated point-to-point connection to every other computer in the network



Wide Area Network (WAN)



- A WAN spans across a large geographical area.
- It is a geographically-dispersed collection of LANs.
- Internet is the largest WAN spanning the entire globe.

Network Devices Used to Build a WAN

Device Name	What they look like	Icon used in industry
Routers		
WAN switches (L3 switches)		MGX 8000 Multiservice switch
ADSL Routers		IP DSL Switch
Servers (e.g. Web Servers, Proxy Servers)		File server
Multiplexers IT102	20 - atrodaction to Compter Systems - SLI	

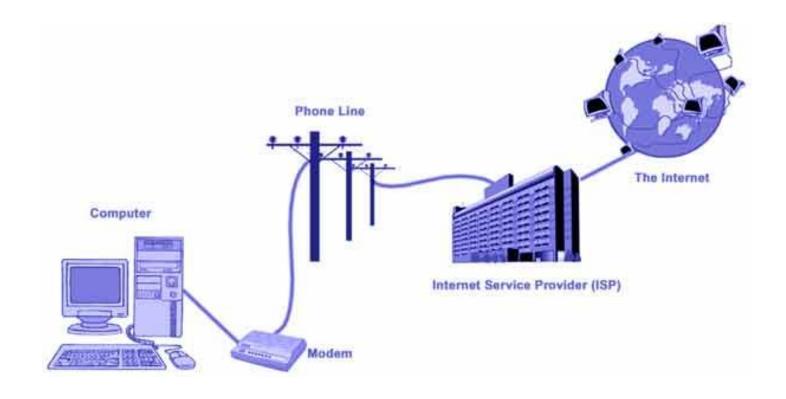


WAN Technologies

Over the years there have been many WAN technologies

- ✓ Dial up connections
- ✓ Leased Lines
- ✓ Frame relay
- ✓ ISDN
- ✓ ADSL
- ✓ VPN
- ✓ More lately: Software Defined WAN SD-WAN

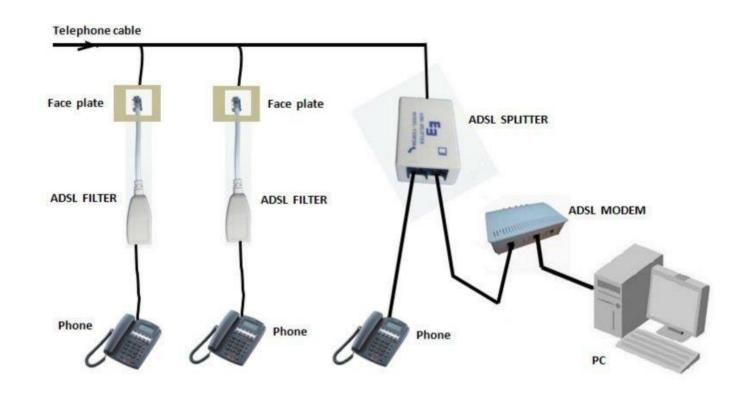
Dial Up Connections



• If the computers are a long distance away from the WAN,

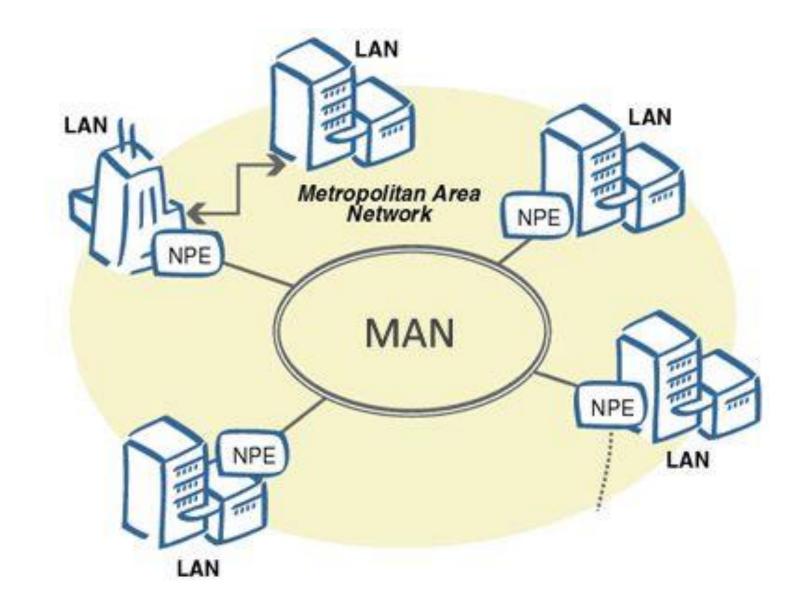
PSTN network can be used to connect them to the WAN.

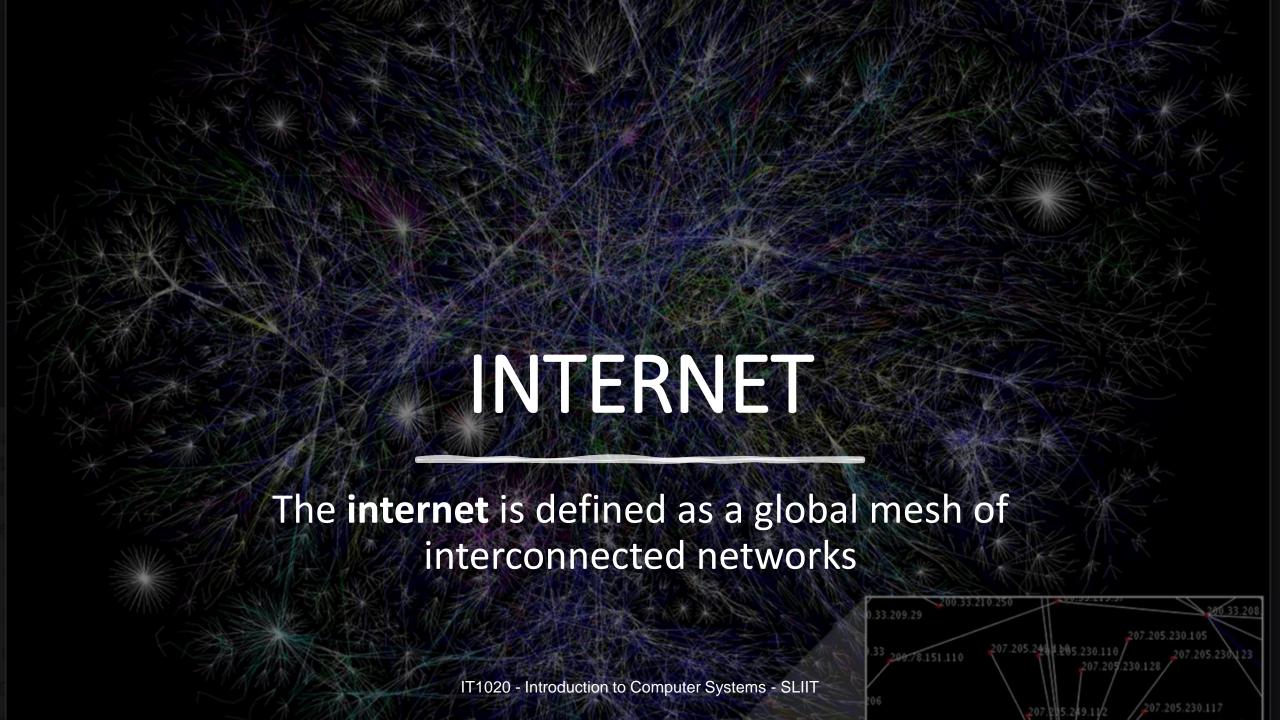
Asymmetric Digital Subscriber Line (ADSL)



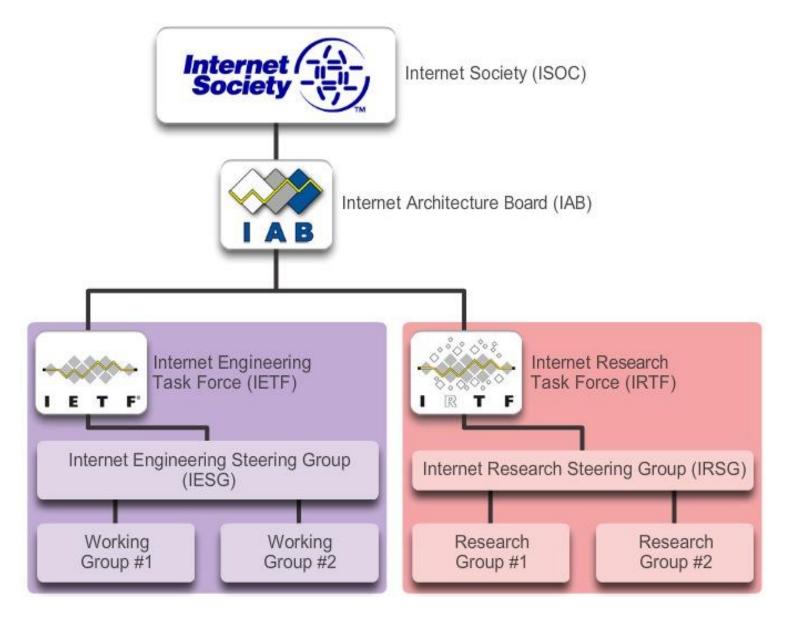
Metropolitan Area Network (MAN)

- A network spanning a geographical area larger than a LAN but smaller than a WAN, such as a city.
- A MAN is typically owned and operated by a single entity such as a government body or large corporation.





WHO MANAGES INTERNET?



Internet Services

Internet offers various services which include,

- ✓ Web Services
- ✓ Email Services
- ✓ News Services
- ✓ Online Gaming
- ✓ Social Networking
- ✓ Knowledge Services (e.g. Wikipedia)
- ✓ Audio/Video Streaming







Private Network vs. Public Network

With respect to internet, networks can be divided into two categories,

Private Network

- A network which is not directly connected to Internet.
- It is not mandatory to follow Internet standards.
- LAN (and can also have the internet access)

Public Network

- If a network is directly connected to Internet, it will become a part of Internet.
- It is mandatory to follow Internet standards.
- With the Internet

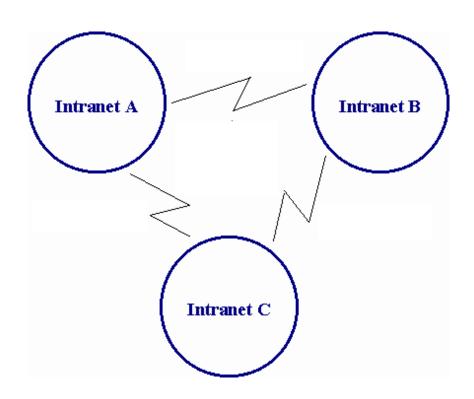
Intranet vs. Extranet

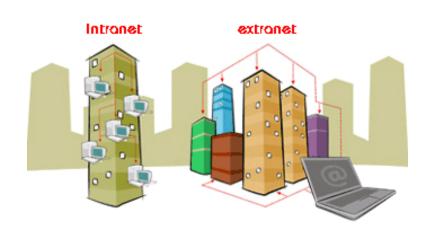
Intranet

- A private network maintained by a company or particular organization.
- It is used to exchange internal information and it is restricted to the general public.

Extranet

• A set of interconnected Intranets is known as an extranet.







NETWORKING & IT INDUSTRY

Computer Networking is a vast field in the IT Industry with many career pathways:

- Network support specialist
- Network technician
- Network administrator
- Computer systems administrator/Analyst
- Network engineer
- Wireless engineer
- Network architect
- Network Security Engineer & many more!

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THANK YOU!

ANY QUESTIONS?