

Distributed Database

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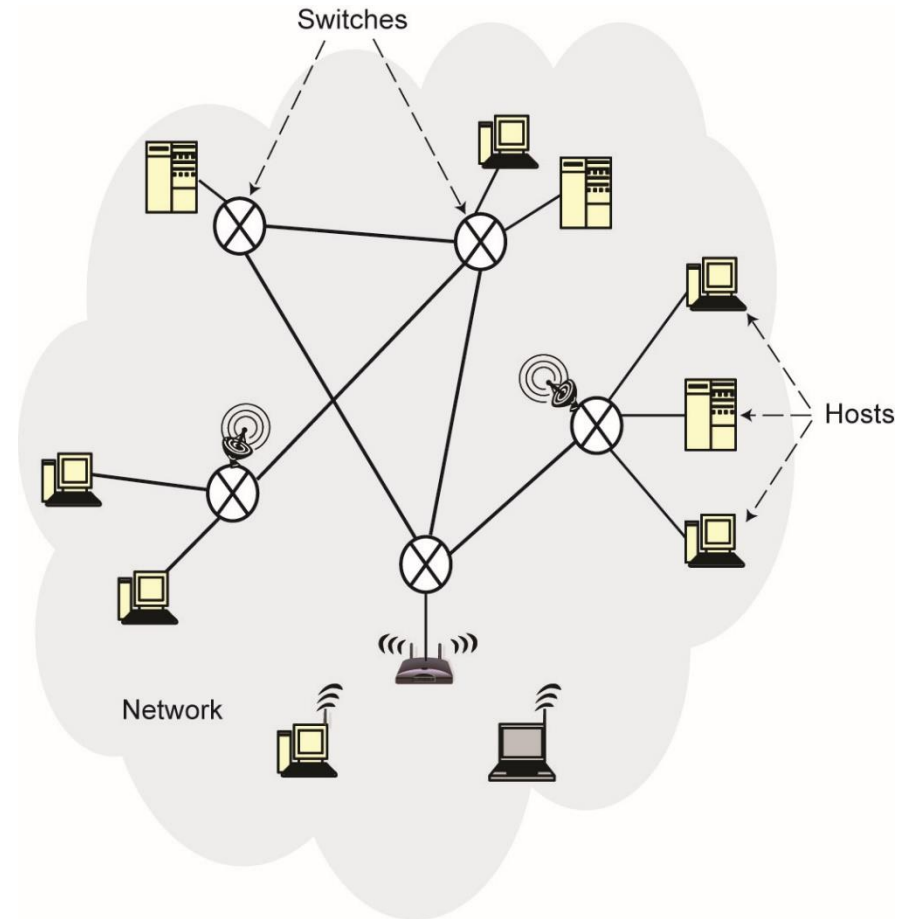


Review of Computer Networks



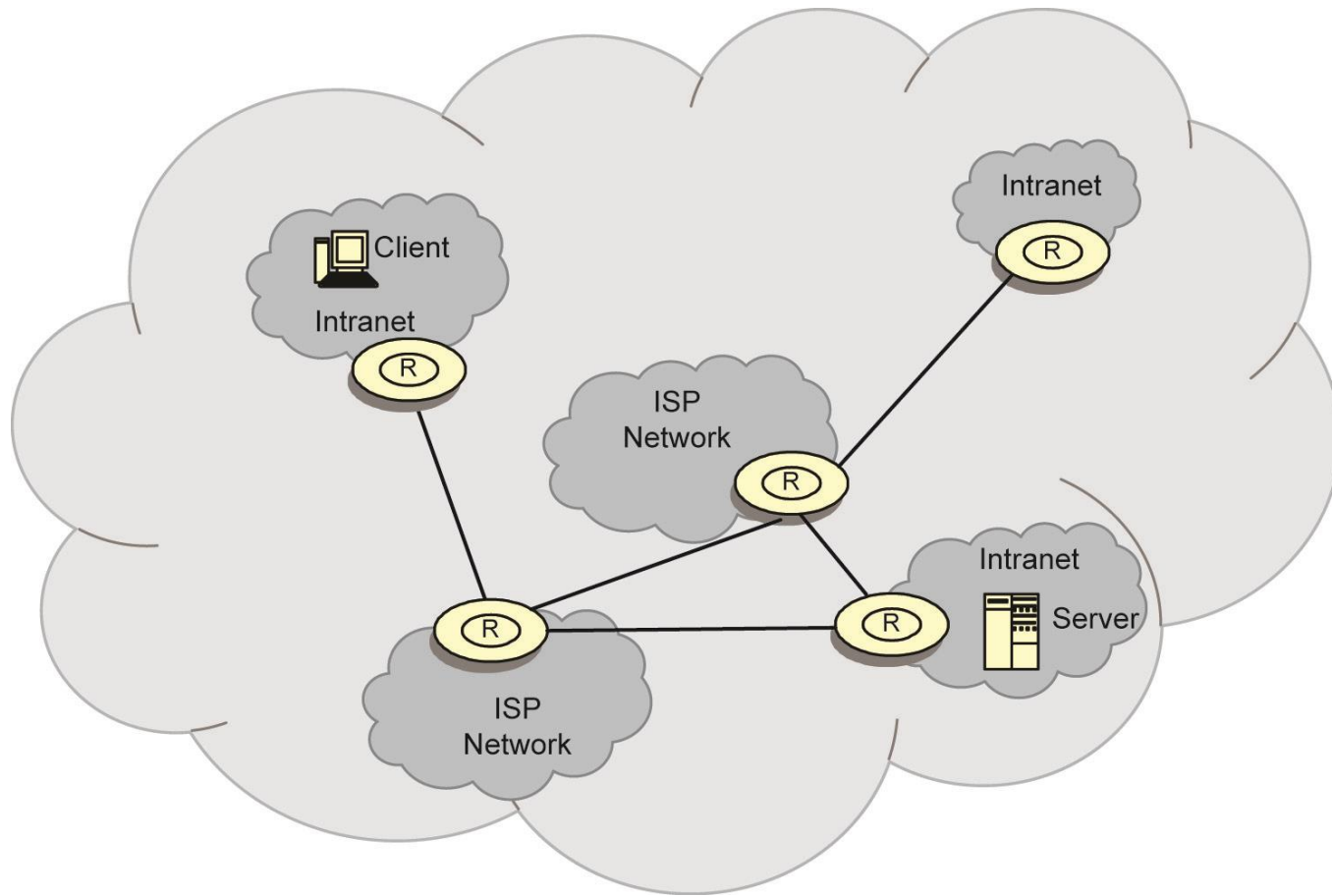
Computer Network

- ❖ An interconnected collection of autonomous computers that are capable of exchanging information among themselves.
- ❖ Components
 - Hosts (nodes, end systems)
 - Switches
 - Communication link





Internet (Network of networks)





Types of Networks

- ❖ According to scale (geographic distribution)
 - Wide area network (WAN)
 - Distance between any two nodes $> 20\text{km}$ and can go as high as thousands of kms
 - Long delays due to distance traveled
 - Heterogeneity of transmission media
 - Speeds of 150Mbps to 10Gbps (OC192 on the backbone)
 - Local area network (LAN)
 - Limited in geographic scope (usually $< 2\text{km}$)
 - Speeds 10-1000 Mbps
 - Short delays and low noise
 - Metropolitan area network (MAN)
 - In between LAN and WAN



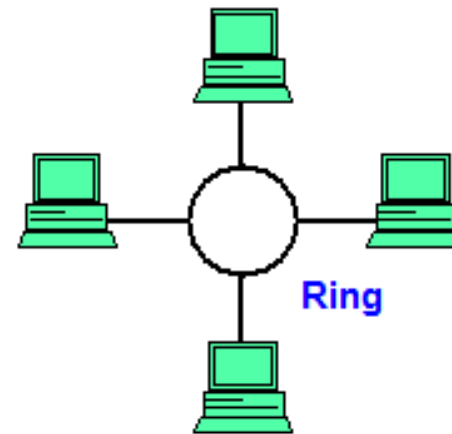
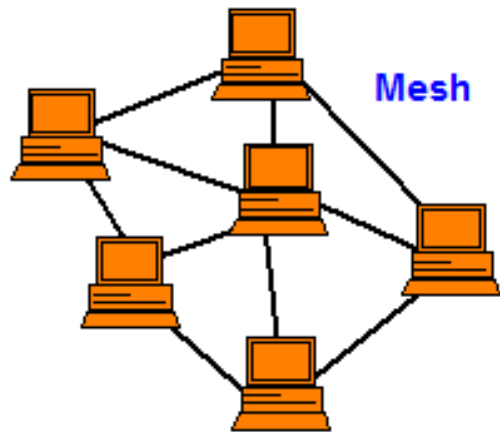
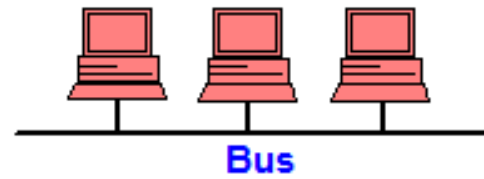
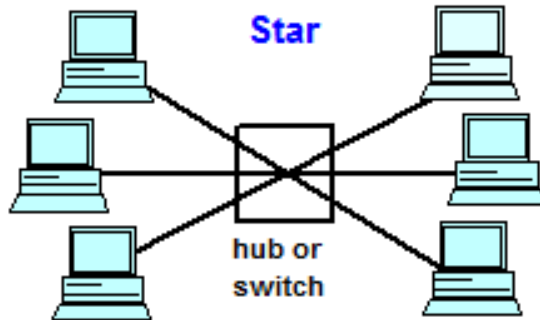
Types of Networks (continued)

❖ Topology

- Irregular
 - No regularity in the interconnection – e.g., Internet
- Bus
 - Typical in LANs – Ethernet
 - Using Carrier Sense Medium Access with Collision Detection (CSMA/CD)
 - Listen before and while you transmit
- Star
- Ring
- Mesh



Topology Network





Communication Schemes

- ❖ Point-to-point (unicast)
 - One or more (direct or indirect) links between each pair of nodes
 - Communication always between two nodes
 - Receiver and sender are identified by their addresses included in the message header
 - Message may follow one of many links between the sender and receiver using **switching** or **routing**
- ❖ Broadcast (multi-point)
 - Messages are transmitted over a shared channel and received by all the nodes
 - Each node checks the address and if it not the intended recipient, ignores
 - Multi-cast: special case
 - Message is sent to a subset of the nodes



Communication Alternatives

- ❖ Twisted pair
- ❖ Coaxial
- ❖ Fiber optic cable
- ❖ Satellite
- ❖ Microwave
- ❖ Wireless



Data Communication

- ❖ Hosts are connected by **links**, each of which can carry one or more **channels**
- ❖ Link: physical entity; channel: logical entity
- ❖ Digital signal versus analog signal
- ❖ Capacity – bandwidth
 - The amount of information that can be transmitted over the channel in a given time unit
- ❖ Alternative messaging schemes
 - Packet switching
 - Messages are divided into fixed size packets, each of which is routed from the source to the destination
 - Circuit switching
 - A dedicated channel is established between the sender and receiver for the duration of the session



Communication Protocols

- ❖ Software that ensures error-free, reliable and efficient communication between hosts
- ❖ Layered architecture – hence protocol stack or protocol suite
- ❖ TCP/IP is the best-known one
 - Used in the Internet



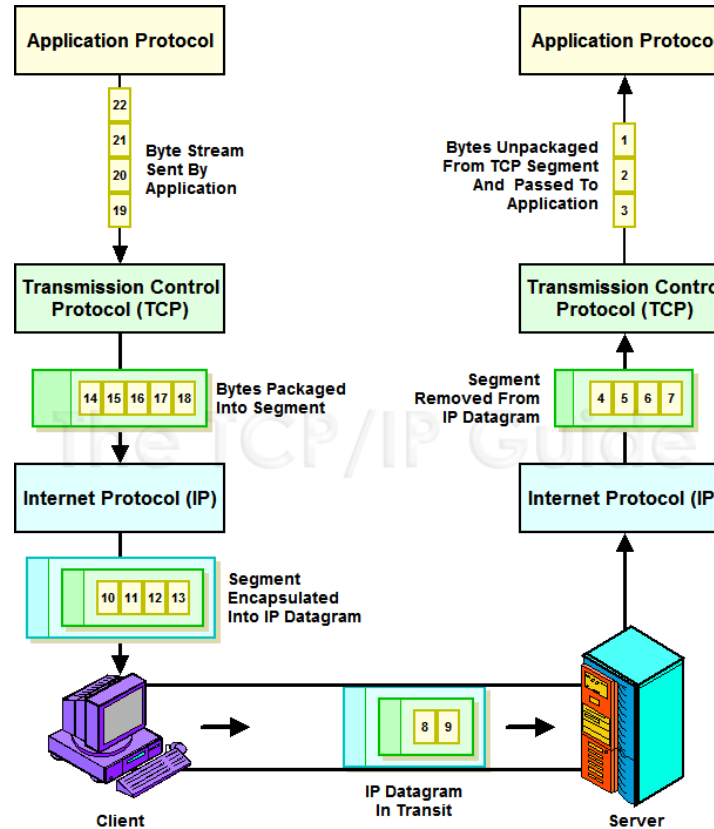
Protocols TCP/IP vs OSI (compare)

OSI Model	TCP/IP Hierarchy	Protocols				
7 th Application Layer	Application Layer	HTTP	SMTP	POP3	FTP	...
6 th Presentation Layer						
5 th Session Layer						
4 th Transport Layer	Transport Layer	TCP		UDP		
3 rd Network Layer	Network Layer	IP				ICMP
2 nd Link Layer	Link Layer	ARP	RARP	Ethernet	PPP	...
1 st Physical Layer						

- Link Layer : includes device driver and network interface card
- Network Layer : handles the movement of packets, i.e. Routing
- Transport Layer : provides a reliable flow of data between two hosts
- Application Layer : handles the details of the particular application



Message Transmission using TCP/IP





Classes IP

	Bits:	1	8 9	16 17	24 25	32
Class A:		0NNNNNNN	Host	Host	Host	
		Range (1-126)				
	Bits:	1	8 9	16 17	24 25	32
Class B:		10NNNNNN	Network	Host	Host	
		Range (128-191)				
	Bits:	1	8 9	16 17	24 25	32
Class C:		110NNNNN	Network	Network	Host	
		Range (192-223)				
	Bits:	1	8 9	16 17	24 25	32
Class D:		1110MMMM	Multicast Group	Multicast Group	Multicast Group	
		Range (224-239)				

Thank You !

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