BASICS OF COMPUTER NETWORK	
What is the Computer network?	Network of nodes connected by communication links • Node: end device (ex: computer), intermediate node (router, hub, switch) • Communication link: fiber, copper, radio, satellite (§ transmission rate: bandwidth)
What is the Internet?	Billions of connected computing devices managed by an organization (ISP: Internet service provider)
What is ISP?	an organization that provides a myriad of services for accessing, using, or participating in the Internet.
What is protocol?	Protocol is a standardized set of rules for formatting and processing data, which enables computers (or nodes) to communicate with one another. (controls sending and receiving of message)
What protocol define?	The protocol defines the rules, syntax and semantics and synchronization of the communication and possibly, find any error recovery methods.
What is Internet standard?	Internet Standard is a normative specification of a technology or methodology applicable to the Internet.
List out some Internet standard?	RFC: Request for Comments IETF: Internet Engineering Task Force
The Internet structure contains?	Network edge Access network, Physical media Network core
What is network edge?	The area where a device or local network interfaces with the Internet. (include end nodes s.a computer,…)
What is Access network/ Physical media?	wired, wireless communication links • Physical media: include guided and unguided media
List out some links in Physical media?	Coaxical cable, fiber optic cable, wireless radio
What is Network core?	The central element of network (interconnected routers) that provide service to user
List out 2 fundamental approaches of network core	Packet switching Circuit switching • FDM (Frequency Division Multiplexing) • TDM (Time Division Multiplexing)
packet transmission delay formula?	L (bits) / R (bits/sec) L: packet length R: transmission rate
Why layering?	Easier for us to deal with complex system (identify the relationships between network's pieces) The modular format of layers ease the maintenance + updating.
2 models of computer network	OSI model (Open Systems Interconnection Model) TCP/IP model (Transmission control protocol/ Internet protocol model)
Layers of OSI model	Application

	Presentation Session Transport Network Data link Physical
Layer of TCP/IP model	Application Transport Network Data link Physical
What is Wireshark?	an open-source network protocol analysis software program. It captures network traffic on the local network and stores that data for offline analysis. Wireshark captures network traffic from Ethernet, Bluetooth, Wireless (IEEE.802.11) …
Kinds of data flow?	Simplex Half-duplex Full-duplex
Kinds of network?	Client-Server network (CS) Peer-to-peer network (P2P)
What is Client-Server network?	computer network in which many clients (remote processors) request and receive service from a centralized server (host computer).
What is peer-to-peer network?	Network in which two or more computer systems connect in order to share resources. computers are linked together with equal permissions and responsibilities for processing data
Classification of computer network	Personal area network (PAN) Local area network (LAN) Metropolitan area network (MAN) Wide area network (WAN) The Internet
Ascending order of coverage?	PAN-LAN-MAN-WAN-Internet
What is PAN?	network for interconnecting electronic devices centered on an individual person's workspace. • Ex: infrared, ZigBee, Bluetooth and ultrawideband, or UWB
What is LAN?	network that interconnect computers within a limited area such as residence, school, laboratory, university, office building. • Ex: wired LAN (ethernet, hub,switch), wireless LAN (Wi-fi)
What is MAN?	network that interconnect users from with computer resources with geographic region of the size of a metropilitan area. • Ex: switch, hub, router,bridge ...
What is WAN?	network that extends over large geographical area for primary purpose of computer networking. • Ex: ex: all end and intermediate nodes

What is Network Topology?	Arrangement of nodes of a computer network Bus-Ring- Star- Mesh - Hybrid
OSI MODEL	
What is OSI model?	The OSI Model (Open Systems Interconnection Model) is a conceptual framework used to describe the functions of a networking system.
Function of Application	Human-computer interaction layer, high-level API, where application can access the network services.
Protocol of Application	HTTP (Hypertext Transfer Protocol) FTP (File Transfer Protocol) POP (Post Office Protocol) SMTP (Simple Mail Transfer Protocol) Domain Name System (DNS)
Service of Application	File Transfer and Access management (FTAM) Mail services Directory service: store, retrieve, manage info about objects
Function of Presentation	Ensure the data is in usable format and encrypt data It is concerned with the syntax (structure) and sematic (meanings of each section in the file) of the information exchanged by the 2 systems
Service of Presentation	-Translation: Converting the info sent by the sender by common format accepted by both -Encryption (Decryption): Confidential info, we do not want protect data from disclosure or any unauthorized access (convert plain text to unreadable text) -Compression: reduce the number of bits in transferred files
Function of Session	Establish, maintain, synchronize the connection (or reconnection) among the communicating devices, control ports and sessions
Service of Session	-Dialog control: allow the 2 systems to enter the dialogue -Synchronization: insert checkpoint (synchronization point) to the big file transmitted.
Function of Transport	It is responsible for process to process delivery of the entire message including message segmentation, acknowledgement and reliability.
Protocol of Transport	TCP (Transmission Control Protocol- Connection oriented protocol) UDP (User Datagram Protocol- Connectionless Protocol)
Service of Transport	Port addressing Segmentation and reassembly Connection control End-to-end flow control: speed-matching mechanism Error control
Protocol of network	IP (IPv4& IPv6) (Internet Protocol) Routing protocols
Function of Network	Decides which path the data will take, multi-node routing and addressing.

Service of Network	Logical addressing: deal with IP address, help the router to make decision, the packets received by the routers will have source IP address and destination IP address. Routing: finding the best rout for the packets to be transmitted
Function of Data link	Responsible for flow and error control on physical link.
Protocol for Data link layer	Ethernet, 802.11 (WiFi), PPP
Service of Data link	Framing: group the bits of 0 and 1 and we call that grouping as a frame Physical addressing: IP, MAC, port addressing Flow control Error control Access control
Function of Physical	It is responsible for transmitting raw bits stream over physical medium. It also provides electrical and mechanical specification.
Service of Physical layer	Physical characteristics of the media Representation of bits Data rate Synchronization of bits Physical topology
IP + MAC ADDRESS, PORT NUMBER	
What is IP address?	- Internet Protocol Address. -Logical address of interface between host and computer network -The IP address is assigned to each device connected to a computer network using IP for communication. - IPv4 & IPv6 - Represented by decimal number - 4 octets, each octet ranging from 0-255 (0.0.0.0 -> 255.255.255.255) - IPv4 is 32 bits; IPv6 is 128 bits - Network ID- Host ID
What is MAC address?	- Media Access Control Address. -Physical address or hardware address -Represented by hexadecimal -Assigned by manufacturer - 6 octets -48 bits -Manufacturer ID- host ID
What is port number?	-Address of process or application -Fixed port number and dynamic port number (0-65535) - 16 bits
What is modem?	- Modulator-Demodulator - hardware component that allow a device to connect to the Internet. - Do 2 works: Modulation and Demodulation
What is Modulation?	-Analog-> Digital

	modulates an analog signal from a telephone or cable wire to digital data (1s and 0s) that a computer can recognize.
What is Demodulation?	- Digital -> Analog - converts digital data from a device into an analog signal that can be sent over standard telephone lines.
APPLICATION LAYER	
Address in Application layer? (Identifier)	IP address- port number
Types of protocols in application layer?	-Open protocol -Proprietary protocol
Application layer protocols defines?	-Type of message -Message Syntax -Message semantics
What is URL?	-Uniform Resource Locator - the address of a given unique resource on the Web. - Domain name (host name)/ Path name
What is HTTP?	- hypertext transfer protocol - Web's application layer protocol - client/server model (HTTP client- HTTP server)
Types of HTTP connection?	-Non-persistent HTTP -Persistent HTTP
Types of HTTP message?	-Request message -Response message
HTTP request message includes?	-POST method -GET method -HEAD method -PUT method
HTTP response status code?	1xx: Informational responses 2xx: Successful responses 3xx: Redirects 4xx: Client errors 5xx: Server errors
Examples of status code for HTTP response message	200 OK • request succeeded, requested object later in this message 301 Moved Permanently. • requested object moved, new location specified later in this message 400 Bad Request • request msg not understood by server 404 Not Found • requested document not found on this server 505 HTTP Version Not Supported
What is cookies?	HTTP cookie is a small piece of data stored on the user's computer by the web browser while browsing a website. -used to record the user's browsing activity.

What is Cache?	The Cache interface provides a persistent storage mechanism for Request / Response object pairs that are cached in long lived memory.
Components of Email?	-User-agent (mail-reader) -Mail-server -SMTP
Protocols used for Email?	-SMTP (Simple Mail Transfer Protocol) - delivery/storage of e-mail messages to receiver's server -IMAP Internet Message Access Protocol, POP3 (Post Office Protocol 3): retrieve e-mail messages - HTTP (gmail, Hotmail, Yahoo! Mail) provides web-based interface
What is user-agent (mail-reader)?	compose, edit, read mail messages
What is mail-server?	- Mailbox: contains incoming messages for user -Message Queue: contains outgoing mail messages - SMTP protocol: used to send email messages
What is DNS?	-Used for mapping between address/domain name to IP address s.t computer can understand. - DNS is distributed database implemented in hierarchy of many name servers
Hierarchy of DNS server?	- Root DNS server - Top Level Domain (TLD) DNS server - Authoritative DNS server
2 kinds of query for DNS?	-Iterated query - Recursive query
Types of DNS records?	-Type A, CNAME, NS, MX
Types of DNS message?	-DNS query message -DNS reply message
TRANSPORT LAYER	
Difference between transport and network layer?	Transport layer: logical communication between processes Network layer: logical communication between hosts
Difference between TCP and UDP?	TCP (Transmission Control Protocol) Reliable, in-order delivery, connection control, flow control, connection setup UDP (User Datagram Protocol) Unreliable, Unordered delivery
Difference between TCP and UDP phases?	TCP: Establish connection -> Transfer data -> Close connection. UDP: Nothing -> Transfer data -> Nothing
What is Multiplexing?	Gathering data from multiple application processes of sender, enveloping that data with header and sending them as a whole to the intended receiver
What is Demultiplexing?	use header info to deliver received segments to correct application processes.

Types of multiplexing & demultiplexing?	Connection-Oriented Multiplexing and Demultiplexing Connectionless Multiplexing and Demultiplexing
TCP socket is identified by?	TCP socket is identified by 4-tuples: Source IP address Destination IP address Source port number Destination port number
Multiplexing and Demultiplexing based on what as identifier?	IP datagram (IP packet): source+ dest IP address Segment header: source+ dest port number
Difference of TCP and UDP in using identifier?	UDP use destination port number only TCP use all 4 tuple : source + dest port number and IP address
What is 3-way handshake?	a three-step process that requires both the client and server to exchange synchronization and acknowledgment packets before the real data communication process starts.
TCP message types?	SYN, ACK, SYN-ACK, FIN
SYN used for?	Used to initiate and establish a connection.
ACK used for?	Helps to confirm to the other side that it has received the SYN.
SYN-ACK used for?	SYN message from local device and ACK of the earlier packet.
FIN used for?	Used to terminate a connection.