**TCP/IP networking - Some Important points**

* LAN and WAN use packet switching

PSTN (Landline network ) uses circuit switching

* Hosts connected to ports of an ethernet switch (Layer 2 device) form a LAN

Connecting one port to router can provide WAN/internet connectivity

* Router has to have layers 1-3 (Real world router will have 4, 5 also)
* A host with wired ethernet interface and Wifi interface will have two IP addresses

Layer 3 – Layer 5 are common to both interfaces

* Type field in IEEE 802.3 frame identifies layer 3 protocol (IPv4, IPv6, …)
* IPv4 fragmentation normally done by router in WAN and reassembly by destination host

Each fragment will have IPv4 header

* IPv4 is connectionless and provides best effort delivery (Host to Host)
* PROTOCOL field in IPv4 header identifies layer 4 protocol (TCP, UDP, …)
* Protocol port number identifies a process / app (in a host) using TCP/IP stack
* TCP for **stream of bytes** and UDP for short fixed size messages
* TCP connection oriented and reliable
* TCP connection – a pair of end points – (host1, port1) (host2, port 2)
* UDP connectionless and unreliable
* UDP checksum computation optional
* TCP checksum computation mandatory
* Socket API **accept** returns a new socket id
* Network byte order is big endian
* Socket APIs connect, listen, and accept for TCP only
* Client and server can have same port number (port number has local significance)
* For standard application such as web browsing server side port is pre-defined (well known)

Client side random port number (from unreserved pool)

* HTTP an example for app layer protocol and uses TCP
* RTP/RTCP VoIP media protocol (uses UDP)

RTP for voice or video , RTCP for monitoring quality of underlying network

* VoIP signalling protocols – SIP, H.323. MGCP/MEGACO
* SIP endpoint has two addresses – AOR (Address of Record) and CA (Contact Address)
* VoIP codec (compression/decompression) example – G.729 (G.711 uncompressed)
* VoIP video call will have two RTP/RTCP streams
* VoIP in WAN/Internet – Internet telephony (Skype)
* VoIP in campus network – IP Telephony / IP PBX
* WAN is an interconnection between routers and router uses **routing protocols** to build and update forwarding table
* ISP (Internet Service Provider)
* ITSP (Internet Telephony Service Provider)
* IP Security protocols – IPSec (Layer 3), SSL/TLS (Layer 4)
* VPN uses IPSec
* DNS for getting IP address for an URL
* DHCP for getting an IP address for a host
* SNMP – Simple Network Management Protocol