

## CN Assignment 1

21K-3153

Q1(i) Packet switching can dynamically allocate resources, which efficiently handles data traffic. Each packet is transported efficiently by dynamic routing algorithms. Packet switching ~~uses~~ uses shorter routes, making networks transfer efficient and faster.

### (ii) Layer 1 (Physical):

This layer deals with physical connection. Data is converted to ~~into~~ binary signals and transported through copper lines, fiber optics or wireless transmission.

## ② Layer 2 (Data Link Layer)

Ethernet is most common here. Used for node-to-node communication and error detection.

## Layer 3 (Network)

Routers use IP address to forward packets between different networks. This layer handles routing.

## Layer 4 (Transport):

TCP and UDP most common. This layer deals with end to end communication between hosts.

## Layer 5 (Application) :

Interacts with end users; provides network services to applications. E.g. HTTP, FTP, SMTP and DNS.

(ii)

- a. ~~Arrive~~ Packet arrive at buffer. If buffer already full, packet is dropped or lost.  
Packet loss is if arrival rate ( $b_{ps}$ ) > transmission rate ( $t_{ps}$ )

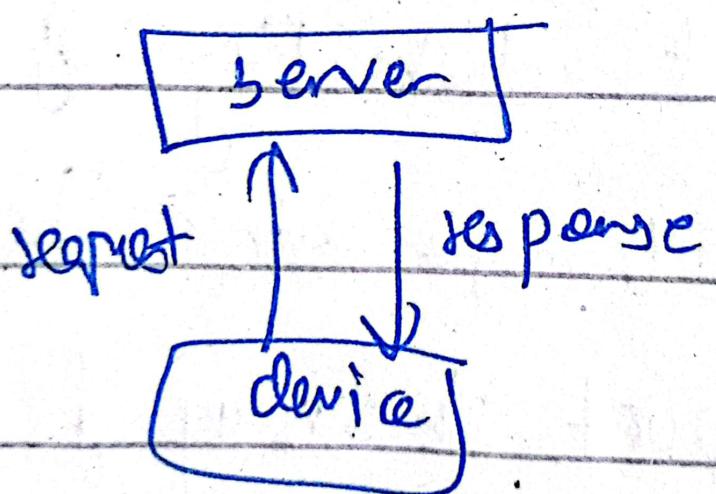
Looks like packet has been transmitted  
but never arrived at destination.

Packet loss increases as traffic intensity increases

Can be minimized by increasing buffer size  
or by circuit switching. In circuit switching,  
each call has ~~the~~ dedicated resources, so  
no overflow or blocking takes place.

Packet loss can affect reliability of applications such as email, file transfer etc. TCP can provide reliable transport b/w sending & receiving process

- (iv) HTTP uses client-server model of exchange data b/w Web client and server.
- 2 programs, client program & server program.
  - Both programs exchange HTTP ~~messages~~ <sup>messages</sup>.
  - When a user clicks on a link, browser sends HTTP requests for page objects to server. Server receives requests and sends the objects through HTTP message.



## HTTP

(vi) Web cache satisfies requests on behalf of Web server. Web cache keeps copies of recently accessed objects on its disk. This can:

- 1 Reduce traffic on an institution access link for lower bandwidth
- 2 Reduce Web traffic on the internet, improving performance.

(vii) Protocols are rules that dictate how data is transmitted and received. They ensure that devices communicate efficiently, like humans have rules (protocols) on how to interact at events, like a formal party etc. Be respectful, dress well and so on. Just as human protocols allow communication to function, network protocols allow devices to

~~Hardware~~

talk ~~safely~~ efficiently.

Or

f. Slow internet : Q

causes: insufficient bandwidth.

solutions: ~~upgrade~~ upgrade internet to higher bandwidth.

troubleshoot to identify bandwidth bottleneck

## 2 intermittent connectivity

Causes : incompatibility b/w old and new ~~network equipment~~

Sol : check equipment , ensure connectivity,  
upgrade if necessary  
troubleshoot by compatibility testing

## 3 Disruption in accessing shared resources

Causes : network interruption due to  
misconfiguration

Sol: implement backup system to  
route traffic during disruption .

troubleshoot by checking equipment for  
misconfiguration

To upgrade:

- 1 develop a detailed upgrade plan.
- 2 communicate changes to employees & stakeholders
- 3 implement changes gradually to minimize disruptions
- 4 update employees regularly.
- 5 thoroughly test upgraded network
- 6 train employees for ~~and~~ upgraded network
- 7 monitor performance and efficiency of ~~and~~ network

## (ii) + \$ ISP infrastructure problem:

causes: equipment failure, network congestion etc

sol: subscribe to multiple ISPs, or use backup internet connection

troubleshoot by ① checking ISP status on website

## 2 Routing problem

causes: routing issues between ISP and company networks

sol: employ load balancing routers solution to distributed traffic across multiple connection

troubleshoot by ensuring that routers work correctly. Contact ISP support.

Causes:

- (iii) ⚡ network issues, hardware/software problem  
⚡ sol: upgrade bandwidth, ⚡ upgrade hardware equipment, use latest software  
throubleshoot by ⚡ ⚡ ensuring stability  
⚡ ⚡ checking software/hardware

(iv) challenges: network congestion, scalability,  
security vulnerabilities

Expansion could be done by improving  
network performance, enhancing scalability,  
strengthening security.

(iv) Expand by upgrading internet connectivity  
network hardware -

(v) edge devices : routers at each branch  
wireless access points for WiFi  
switches connecting computers,  
servers & other devices

core devices : servers hosting banking data  
core routers and switches at headquarters

Protocol: TCP/IP for between devices  
HTTPS for web based banking services  
DHCP for assigning IP addresses  
to devices

Applications: online banking app.

bank website

Database (DBMS) for storing data.

b) edge network: VPN bw branches of headquarters  
for safe communication

Webcache: store frequently accessed content locally,  
reducing bandwidth

P2P: secure file sharing bw branches of headquarters

HTTP: delivery web content to all branches

(c) Different projects, ability to work with people on different projects, understanding different languages, their pros and cons.  
Building problem solving skills and working as a team

(d) Knowing latest technologies can help build top of the line systems & to advance the field.

④ adapting keeps skills sharp, making you ready for each new challenge.  
Networking with peers can help in a collaborative and interesting project.  
It also facilitates exchange of ideas.