

Exercise 1

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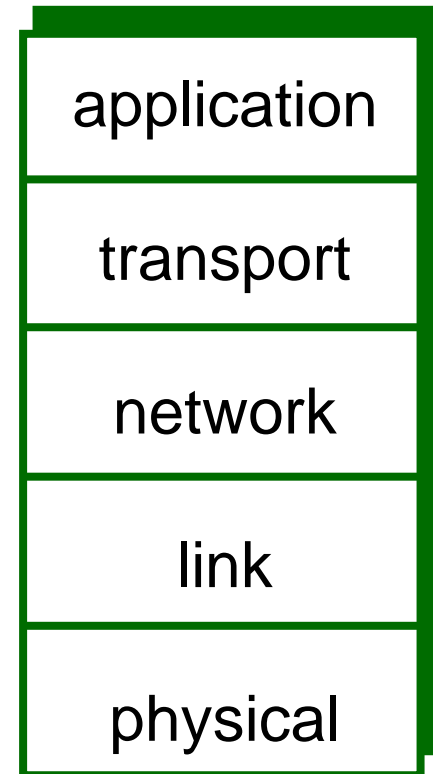
Notes

Q1

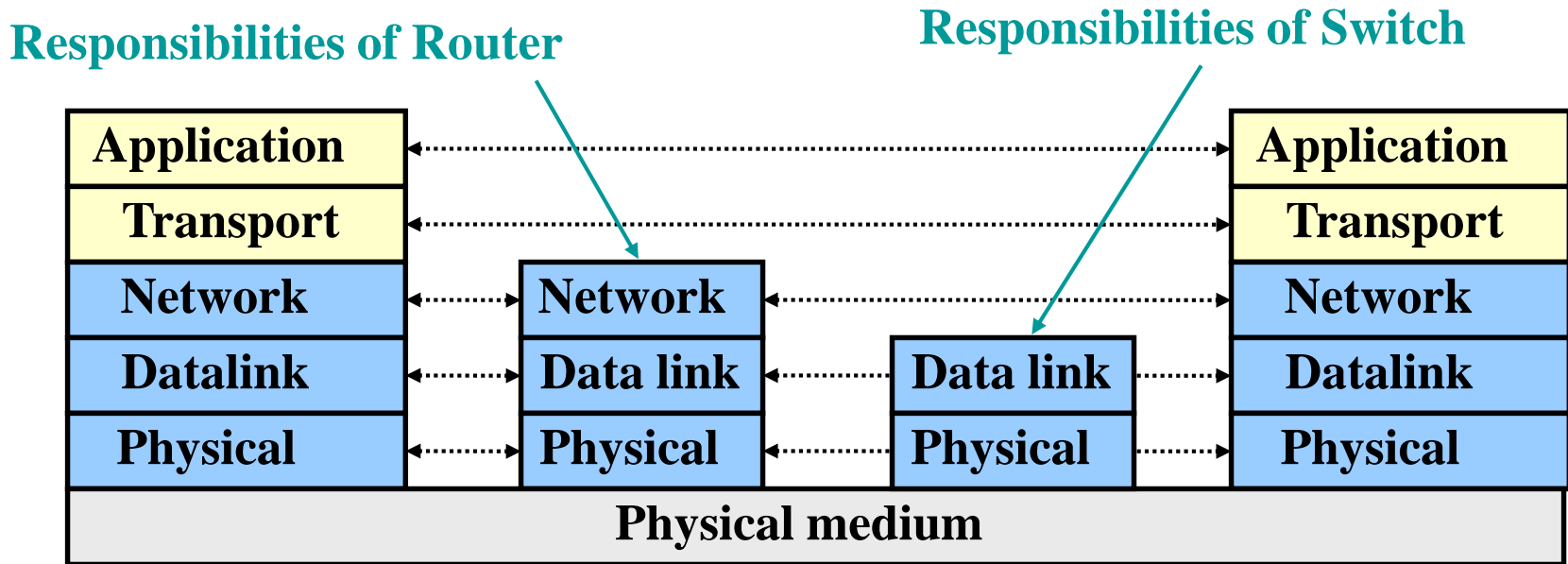
- In the Internet, what are the five layers, from top to bottom, in the Internet protocol stack? Till which layer does a switch process? Please make sure you understand the concept of layering and also think about advantages and disadvantages of layering.

1. The five layers

- A switch processes up to layer 2. It uses the physical and the link layer.
- Advantages: Isolation, transparent to changes in other layers
- Disadvantages: Isolation ;), cannot optimize across layers



1. The five layers



Q2

- The ISO/OSI reference model adds two layers. What is the purpose of the session layer? Does the current Internet implements a session layer?

2. ISO/OSI

- Adds **Session layer** that is responsible for synchronization and recovery of data exchange.
 - Today's Internet does typically not implement Session layer and nodes are identified by IP addresses. If connection breaks or IP changes, session typically fails.
- **Presentation layer** takes care of data interpretation, e.g. compression, en- and decryption etc.

Q3

- What is the difference between the client/server model and the peer-to-peer model?

3. Client/Server and P2P

- Client/Server: Client requests, server delivers (typically always-on!).
 - Examples: Web browser and server, email client and server
- Peer-to-Peer model: Everybody serves as client and server. Typical setup of file sharing systems, but also used in Skype. No always-on etc.
 - (Often P2P operates between end hosts and is not or only lightly infrastructure supported.)

Q4

- Circuit switching versus packet switching:
Assume all traffic sources to be bursty: what switching technology is preferable? What are the advantages of the other technique?

4. Circuit vs. Packet switching

- If sources are bursty they do use the bandwidth only for short timeslots. The burst-process is random.
 - Randomness: Hard to deal with in circuit switching but easy to do with packet switching.
 - Circuit switching has lots of wasted bandwidth with bursty sources, packet switching scales better.
- Even if the sources are bursty, QoS reason can make it indispensable to use circuit switching

Q5

- In what switching technology is Frequency or Time Division Multiplexing used?

5. FDMA and TDMA

- Only in shared media, Multiple Access protocols to guarantee resource allocation via channel partitioning
- Divides a shared channel in fixed timeslots or frequency slots.

FDMA and TDMA are used in circuit switching.

Q6

- What is “statistical multiplexing”?

6. Statistical multiplexing

- Occurs in packet switching
- Statistical multiplexing: Sequence of sending packets does not have a fixed pattern
 - No definite prediction possible
 - This has implications for router queues etc.

Q7

- What are the four sources of packet delay?
How does loss occur?

7. 4 Sources of packet delay

- Nodal processing: Error checks and link determination
- Queuing: Congestion at router? Time wait at output link (e.g. when shared channel is busy)
- Transmission delay: Writing data to the link
- Propagation delay: Typically the speed of light and level 1 processing.

7. Loss

- If router queues are full, new packets are just dropped
- Physical influences: Interruption in communication, especially in wireless communications

- Do you want more exercises ?
- Student resources portal
- http://wps.pearsoned.com/ecs_kurose_comp_netw_6/216/55463/14198700.cw/index.html