<div align="center">

Communications and Computer Networks

Prof. Dr. Daniel Spiekermann
ccn@fh-dortmund.de

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Exercise 1

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1 Reference models

1. Which layer packs bits into bytes, bytes into frames, uses hardware addressing and implements error detection? Which device (network hardware) operates on this layer in principle?

   Solution: Layer 2: Data Link Layer; Switches work on this layer

2. At which layer does the assignment of addresses and the forwarding of data packets from one end of the network to another take place? Which network hardware operates on this layer?

   Solution: Layer 3: Network Layer; Router

3. Which layer is responsible for establishing, running and terminating a process communication between 2 systems?

   Solution: Layer 5: Session Layer

4. At which layer does data stream segmentation take place for communication between endpoints, is a mechanism for establishing/disestablishing virtual connections provided, and does detection and elimination of transport errors as well as flow control or congestion avoidance take place?

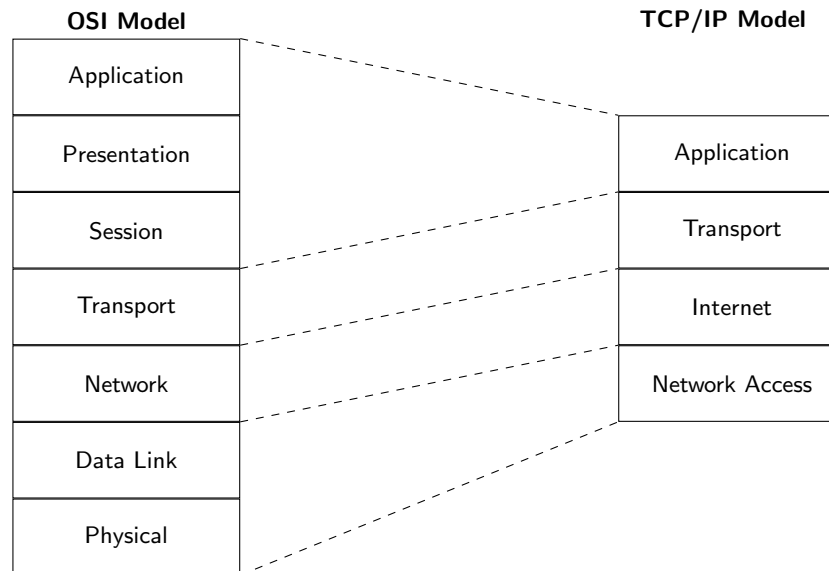**Solution: Layer 4: Transport Layer**

5. Which layer determines signal levels, transmission speeds, and connector pinouts, and transmits bits in a transmission channel? Which network hardware operates on this layer?

   Solution: Layer 1: Physical Layer

6. What boundary does the transport layer form between layers 5-7 and 1-3?

   Solution: The transport layer forms the boundary between the lower, transporting layers, which are primarily concerned with network tasks, and the application-oriented layers.

7. Contrast the OSI layer model with the widely used TCP/IP layer model. Which layers correspond to each other?

Solution:

OSI Model	TCP/IP Model
Application	
Presentation	Application
Session	Transport
Transport	Internet
Network	Network Access
Data Link	
Physical	

8. What are the addressing names of levels 2, 3, 4 and 7?

   Solution: L2 $\Rightarrow$ MAC-address
   L3 $\Rightarrow$ IP-address
   L4 $\Rightarrow$ Port number
   L7 $\Rightarrow$ Application-specific address such as a URL (z.B. https://fh-dortmund.de/login) or an email-address

9. Can collisions occur in point-to-point networks?

   Solution: No, the switch sends the data out only at the receiver port. With the original Ethernet 10 Mbit/s with CSMA/CD collisions can still happen between switch and connected host.

10. How are computer networks classified according to their extent?

    Solution:

Interprocessor distance	Processors located in same	Example
1 m	Square meter	Personal area network
10 m	Room	Local area network
100 m	Building	Local area network
1 km	Campus	Local area network
10 km	City	Metropolitan area network
100 km	Country	Wide area network
1000 km	Continent	Wide area network
10,000 km	Planet	The Internet

2   Tools

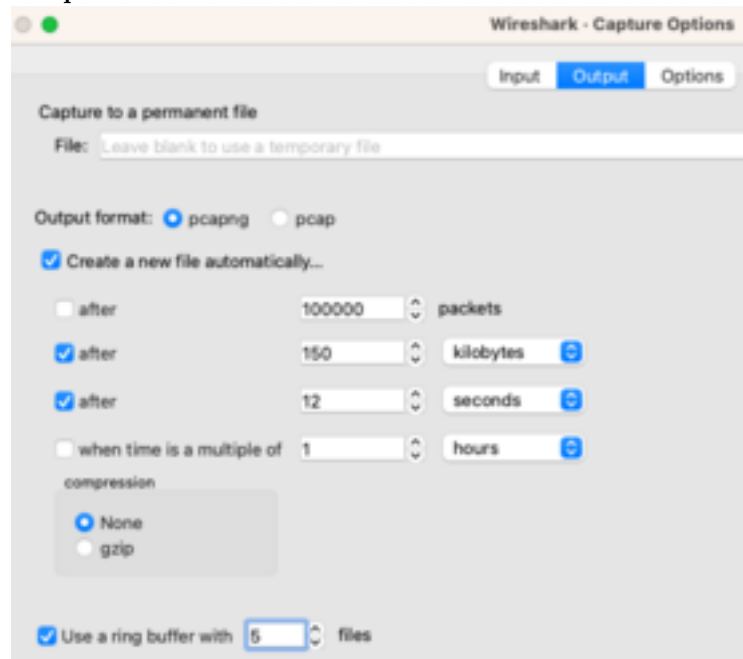11. Create the following network in GNS3
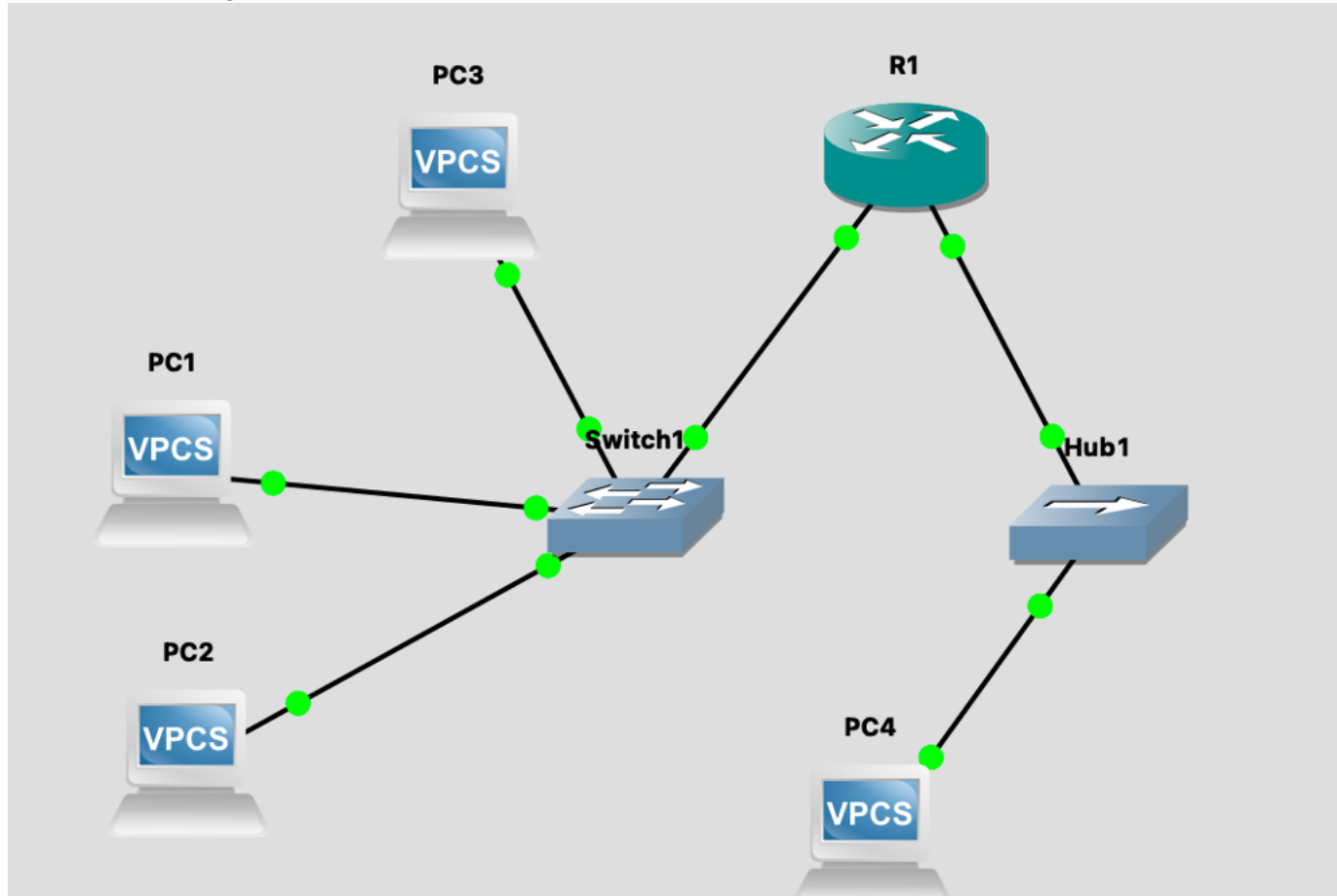
12. Create a packet capture in Wireshark with the following parameters:

- Stop after 68 seconds
- Create a ring buffer with 5 files
- Create a new pcapng file every 12 seconds or 150 kb.

Solution: 2 different sections to add the parameters

1. **Output**

2. **Options:**