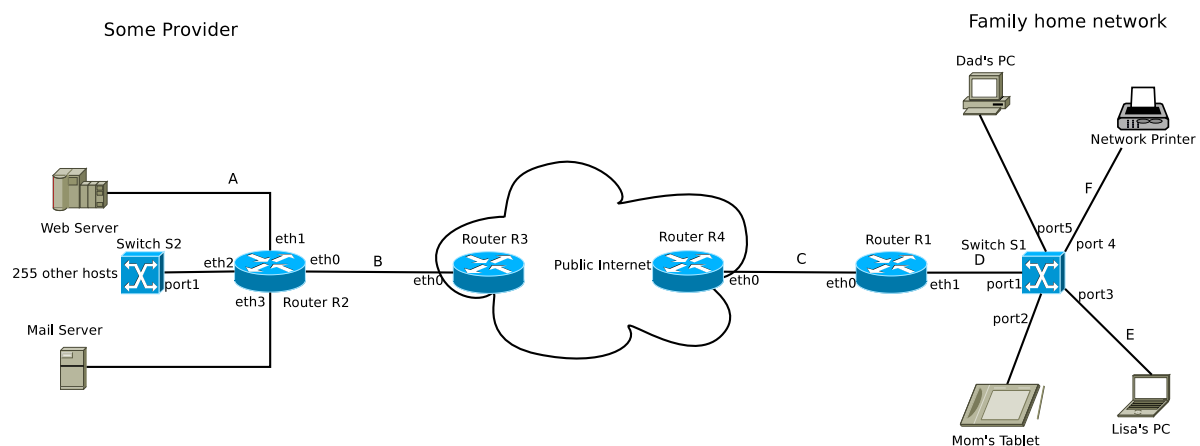


10th Assignment: Network Protocols and Architectures, WS 14/15

Question 1: (10 + 10 + 10 + 15 + 15 = 60 points) MAC Addressing and ARP

The figure below depicts the topology of two networks (“Some Provider” and “Family home network”) connected via the public Internet. The networks consist of four routers (R1, R2, R3 and R4), two switches S1 and S2, and several hosts. Interfaces of the routers are labelled eth_i and ports of the switch are labelled $port_i$. Assume that *none* of the routers is a NAT gateway! You can ignore any communication inside the public internet, i. e., between router R3 and R4.



- Consider the topology¹ above and assign MAC addresses. For simplicity, it is sufficient to provide the last 8 bits of the MAC address, i. e., two characters in HEX notation (e. g., AB) as long as they are unique. You do not have to assign MAC addresses to the “255 other hosts”.
- Also, in the topology, mark any broadcast and collision domain. Do these domains change when switch S2 is replaced by a hub? If yes, how?
- Which parts of the Ethernet, IP and TCP header will be modified when a packet is forwarded by i) router R1 / ii) switch S1?
- What are the IP and MAC address fields of a response sent by the web server to Lisa’s computer? Consider the response traversing all drawn LAN segments (A, B, C, D, E) and enter your result in a table as in Tab. 1.
- Lisa wants to establish an IP connection to the network printer. Assume that all ARP caches in the network are empty. What are the IP and MAC address fields of the ARP messages? Enter your results in a table as in Tab. 1 for LAN segments E and F.

Note: In order to answer the questions you can reuse the IP configuration from the 3rd assignment, question 1. Alternatively, assign IP addresses to the relevant interfaces.

Please turn!

¹The figure of the topology provided can be downloaded via ISIS from <https://www.isis.tu-berlin.de/2.0/mod/resource/view.php?id=32302> in various formats and used for annotation.

LAN Segment	Source IP	Source MAC	Destination IP	Destination MAC
A

Table 1: Addressing

Question 2: (20 + 5 + 10 + 5 = 40 points) *Neighbor Discovery in IPv6*

We will now consider the Neighbor Discovery in IPv6. Please download the trace from <https://www.isis.tu-berlin.de/2.0/mod/resource/view.php?id=134031> and answer the following questions.

- Explain the purpose of each packet in the trace (except the packets that belong to TCP connections) with one or two short sentences. Give a short summary about the purpose of the TCP connections.
- How many Neighbor Discoveries are in the trace and where do they occur?
- Why are packets in the trace sufficient to populate the IPv6 neighbor cache of the hosts involved? Assume that the IPv6 neighbor cache was empty at the beginning of the trace.
- Compare Neighbor Discovery in IPv6 with ARP in IPv4. At which layer of the network stack do they operate?

Due Date: Wednesday, January, 14th 2015 only until 14:00 h s. t.

- **As PDF files (no MS Office or OpenOffice files):** Uploaded via ISIS (<https://www.isis.tu-berlin.de/2.0/course/view.php?id=2560>)
- Put your name, StudentID number (Matrikelnummer) **and** the name of your tutor on your solution.