

12th Assignment: Network Protocols and Architectures, WS 12/13

Question 1: (10 + 10 + 10 + 10 = 40 points) *Interaction of Layers*

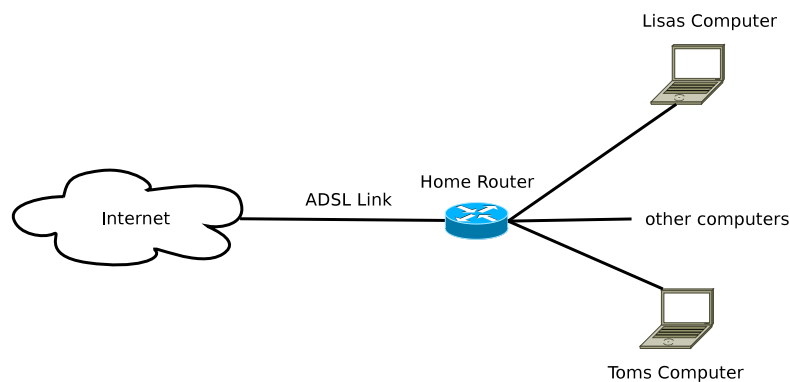


Figure 1: Topology

Assume a student flat where a single DSL line is shared by multiple computers. The bottleneck is the full-duplex, symmetric DSL line having a bandwidth of 1 Mbit/s. Lisa is downloading a large file from the Internet via HTTP. All of a sudden, the DSL uplink is fully utilized by 10 other users uploading large files to the Internet. Assuming that all computers are very powerful, and all of the downloads and uploads are not putting any strain on any computer (CPU, disk I/O, and so on).

- Will the simultaneous uploads slow down Lisas downloads? Why or why not? Justify your answer!
- How does your answer change when you have 1 Mbit/s upstream and 4 Mbit/s downstream as part of an ADSL connection. Discuss your thoughts.
- How could QoS help in this situation? How would you design a simple QoS scheme that would help in this situation? (Hint: you don't need to consider complex approaches such as IntServ or DiffServ.)
- Recently, an on-going debate on correct buffer sizes has focussed on the existence of large buffers in home routers / DSL and cable modems (Bufferbloat). How would a large buffer at the home router, introducing queueing delays in the order of one second when filled, affect the dynamics of TCP flows?

Question 2: (10 + 10 + 10 = 30 points) *QoS in the Internet*

Assume a Voice-over-IP telephone call over the Internet.

- Assume the call's data transfer stays within a single AS. Describe briefly how Quality of Service (QoS) can be enabled for this call.
- Assume that the data transfer of the VoIP call spans over multiple ASes now. How can QoS be implemented?
- A QoS-enabled Internet does not yet exist. Briefly discuss difficulties in establishing an Internet-wide QoS.

Question 3: (10 + 20 = 30 points) *Net neutrality*

Net neutrality is subject to debate in the media nowadays. Familiarize yourself with the concept.

- (a) Definitions of net neutrality in public debates and media discussions diverge and range from "each bit should be treated equally", making QoS deployment impossible, to "no service should be blocked / censored". Briefly discuss a few different definitions of net neutrality.
- (b) Debates on net neutrality are typically focused on the end-user perspective and negative impacts of censorship or service limitations. Discuss net neutrality from the perspective of a) an end-user and b) an Internet Service Provider (ISP). Provide a) two reasons for violating net neutrality and b) two reasons for adhering net neutrality (one for the end-user perspective and one for the ISP perspective). Justify your answers!

To bootstrap your discussion, please find some thoughts below. It does not suffice to simply repeat them in your answer! Also note that the list is incomplete and there are more aspects that can be discussed.

- There are different kinds of traffic traversing the Internet: elastic traffic (e.g., downloads), real-time traffic (e.g., Voice over IP / Live TV), or control traffic (e.g., routing updates). Is it legitimate to treat them differently? For examples, after a TCP connection is lost between two BGP routers, the full routing table is typically exchanged, which typically takes several minutes. During this time, the routing is affected. Should ISPs be allowed to prioritize control traffic between BGP routers in order to guarantee availability of their networks?
- Should Quality of Service be deployed in the Internet? Should an ISP be allowed to prioritize services like IPTV or Voice over IP? Do users benefit from QoS?
- Deutsche Telekom provides a separate data plan for unlimited access to the music service Spotify¹. Is it bad if certain services receive better/other service than others?
- Mobile operators e.g. blocked access to Voice over IP services (e.g., Siptgate, Skype) in the past. Is it legitimate? Would it affect internet economics?
- The French ISP Orange recently announced that Google is paying Orange for making its YouTube service available to Orange customers².

Due Date: Thursday, January, 31th 2013 only until 13:55 h s. t.

- **As PDF files (no MS Office or OpenOffice files):** Uploaded via ISIS (<https://www.isis.tu-berlin.de/course/view.php?id=7028>)
- **On paper:** Postbox in the Telefunkenhochhaus (basement, behind the doorman right)
- Put your name, StudentID number (Matrikelnummer) **and** the name of your tutor on your solution.

¹<http://www.spiegel.de/netzwelt/netzpolitik/netzneutralitaet-was-der-telekom-spotify-deal-bedeutet-a-853246.html>

²<http://www.heise.de/newsticker/meldung/Google-zahlt-Durchleitungsentgelte-an-Orange-1788434.html>
<http://www.dw.de/french-isp-revives-debate-on-free-internet/a-16508222>