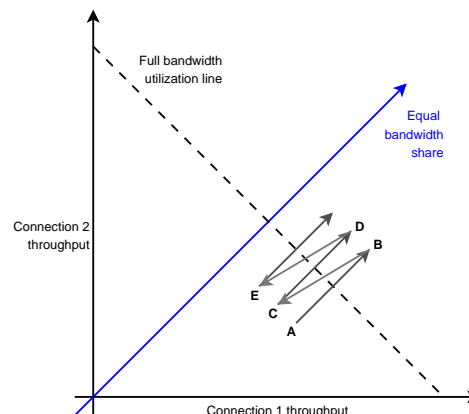


12th Assignment: Network Protocols and Architectures, WS 14/15

Question 1: (20 points) Fairness of TCP: AIMD vs. AIAD

Refer to the figure on the right which illustrates the convergence of TCP's additive-increase, multiplicative-decrease (AIMD) algorithm. The figure shows the throughput by the two TCP connections 1 and 2. Suppose that instead of a multiplicative-decrease TCP decreases the window size by a constant amount. Would the resulting additive-increase, additive-decrease converge to an equal share algorithm? Justify your answer using a diagram similar to the figure on the right.



Question 2: (10 points) Resource Allocation: Congestion Control

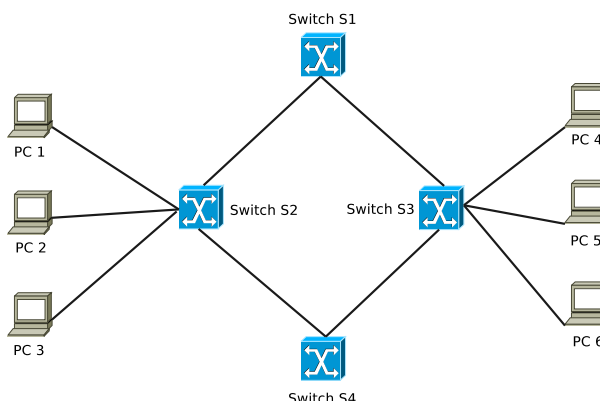
Discuss how the Internet would look like if every flow would be based on UDP and does not use congestion control.

Question 3: (10 points) Security of ARP

Explain the principle of ARP spoofing and discuss a way to defend against it.

Question 4: (10 points) Switching Loops

For redundancy reasons it might be a good idea to have a switch connected to several switches instead of only one. Have a look at the Figure below and explain why it can cause problems having switches S2 and S3 connected to both switches S1 and S4 and what can be done to prevent this.



Question 5: (15 + 15 + 20 = 50 points) *Soft state / hard state: Car rental*

Assume the following scenario: A car rental offers cars for rent via the Internet. The customer has to pay for the duration of using (driving) a car. The reservation time itself does not cost anything. Therefore, in order to increase revenues, the car rental allows reservations for a limited and fixed time period only (e.g., one hour). So if the car is not used during that time period, the reservation expires and the car gets free for other customers. However, when the car is in use, the reservation limit is suspended. Just when the car becomes unused again, the reservation limit is reset. Furthermore, a car can only be reserved if there is no current reservation.

Note: Make sure that your state diagram reflects the scenario described above.

- (a) Provide a state diagram that shows the reservation state of a car, that is whether this car is currently reserved or not. Use only soft state transitions.
- (b) Augment your state diagram with the information about the current usage of a car, by adding hard state transitions.
- (c) Argue, why soft *and* hard state transitions are used to achieve the services provided by the car rental. Please elaborate on the advantages / disadvantages for both state types with respect to the service offered by the car rental. Is it possible to achieve the same level of service by using either pure hard state or pure soft state transitions? If yes, describe how that could be achieved.

Due Date: Wednesday, January, 28th 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.