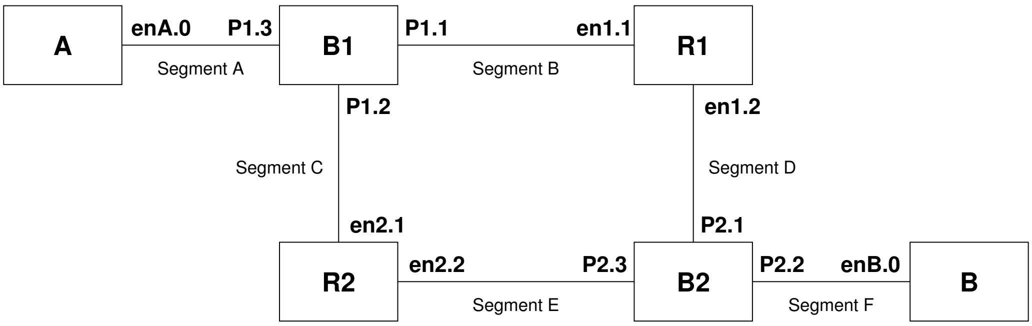
Computer Networks
Jacobs University Bremen
Dr. Jürgen Schönwälder

Course: 320301
Date: 2015-10-15
Due: 2015-10-22

Problem Sheet #3

Problem 3.1: *ip layer and lan layer forwarding* (2+3+1 = 6 points)

Consider the network topology shown below. The hosts A and B are connected to the bridges $B1$ and $B2$. The bridges are connected via the two routers $R1$ and $R2$. All devices use default parameter settings.



Host A uses the IPv4 address 198.51.100.3 in the 198.51.100.0/24 network and Host B uses the IPv4 address 203.0.113.4 in the 203.0.113.0/24 network.

a) Assign suitable IP addresses to the IP layer interfaces and define the forwarding table of the two routers so that they can both reach A and B.

b) Assume that A has a default route to $R1$ and B has a default route to $R2$. The devices just got initialized and A is now establishing a TCP connection to B. Which frames are transmitted over the segments? Produce a table like this:

no	segments	eth-src	eth-dst	ip-src	ip-dst	description

Please denote the MAC address of an interface or port i with $mac(i)$ and the IP address of interface i with $ip(i)$. Use $mac()$ and $ip()$ for layer two and layer three broadcast addresses.

c) Discuss the benefits and potential problems of the network configuration used in the previous step.

Problem 3.2: *longest-prefix match forwarding* (2+2 = 4 points)

IP packets are forwarded by performing a longest-prefix match on the network prefixes. Forwarding tables can be represented as binary or multibit tries. Furthermore, network prefixes can sometimes be aggregated.

In this problem, prefixes are represented using a binary notation (e.g., the binary notation "10101000*" matches all addresses starting with the binary prefix "10101000" which is equivalent to the prefix 168.0.0.0/8 in dotted quad notation). Consider the following three forwarding tables F_1, F_2, and F_3.

F_1	prefix	next hop
	*	R_1
	00*	R_2
	10*	R_2
	11*	R_3

F_2	prefix	next hop
	*	R_2
	01*	R_1
	11*	R_3

F_3	prefix	next hop
	*	R_1
	1*	R_3
	10*	R_2
	110*	R_2

Assume that the minimum legal network prefix is 8 bit long.

a) Are the forwarding tables F_1 and F_2 equivalent? Why or why not?

b) Is there an equivalent forwarding table for F_3 with less than four entries? Why or why not?