

Homework 1

Problem 1.1

Solution:

a) I measured the following results:

amazon.com → time ranged between 100ms to 109ms, on average about 104ms.
www.amazon.com → time ranged between 9.25ms to 18.2ms, on average about 14ms.
www.jacobs-university.de → time ranged between 27ms to 137ms, on average about 57ms.
moodle.jacobs-university.de → time ranged between 2.5ms to 60ms, on average about 15ms.

What I observed is that comparing the times of the first 2 hosts, the one that starts with 'www' takes significantly less time for a round trip. Other than that, an interesting observation would be that when studying the output of the ping command, it shows the statistics of domain **amazon.com** when running ping on **amazon.com**, but shows the statistics of domain **d3ag4hukkh62yn.cloudfront.net** when running ping on **www.amazon.com**. This only happened with this host and not the others.

The measurements were done at about 9pm on 8 March. The tool used was *ping* on Z shell in Ubuntu with version 'ping from iputils s20190709'.

b) I measured the following results:

amazon.com → 3 AS680 hops and 6 AS1299 hops making a total of 9 hops.
www.amazon.com → 3 AS680 hops and 1 AS16509 hops making a total of 4 hops..
www.jacobs-university.de → 3 AS680 hops and 3 AS24940 hops making a total of 6 hops.
moodle.jacobs-university.de → only 1 AS680 hop.

One interesting observation is that in all hosts, AS680 was visited at least once. Also there were many unknown hops (showing as AS???). Including them the total number of hops goes to 11, 7, 9 and 2 respectively.

The measurements were taken at about 9 25pm using **mtr** from Z shell in Ubuntu, using eduroam as a network.

Problem 1.2

Solution:

a) AS680 is owned by a German Research Network and has registry *RIPE*. AS1299 is owned by a company named Telia and has registry of *RIPE*. AS16509 is owned by Amazon and has registry of *ARIN*. AS24940 is owned by HETZNER and has registry of *RIPE*.

b) The prefix is used by International University Bremen (Jacobs), with a registry of *RIPE*. This prefix is not globally announced. The one that is globally announced is 2001:638::/32.

Problem 1.3

Solution:

a) Yes the results match my expectations as the bandwidth did not exceed 10 Megabits per second.

b) Running ping on h2 from h1 while no measurements were done resulted in a round trip time of about .1 ms (with small fluctuations), whereas when using *iperf* the round trip time went to about 14.6 ms. This huge difference was probably caused by the fact that the *iperf* terminal command consumed a lot of the bandwidth resulting in the significant increase in time.

Problem 1.4

Solution:

- a) The measurements give a round trip time of about .5 ms in average when not running iperf, and about .48 ms in average when running it. The fact that the time when not running the command is slightly less than when running it (almost equal), suggests that the communication between host 3 and 4 is not impacted by that of hosts 1 and 2 (as the schema suggests).
- b) The bandwidth for both communications are about 10 megabits per second, and judging by the measurements, the 2 do not impact on each other.

Problem 1.5

Solution:

- a) Judging from the measurements, the data was transmitted faster when the hosts were on different sides (h1 to h4 and h2 to h3). The speed was really close to exactly 10 megabits per second.
- b) The measurements were about 10 megabits per second from h1 to h4 which is as expected and about 7.5 megabits per second from h3 to h6, which makes sense as due to the 5% loss between s2 and s3, some of the packages tend to repeat and because of this the bandwidth is slowed to the value written above.