Computer Networks
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Homework 1

Problem 1.1

Solution:

a) When using ping to measure the round-trip time to the following websites, I got these values:
* `amazon.com`: average time = 102 ms, on a range from 101 to 105 ms.
* `www.amazon.com`: average time = 78 ms, on a range from 8.64 to 176 ms.
* `www.jacobs-university.de`: average time = 16.5 ms, on a range from 13.4 to 25.1 ms.
* `moodle.jacobs-university.de`: average time = 2.65 ms, on a range from 1.72 to 7.04 ms.

The `ping` version was `ping from iputils s20190709` on Ubuntu 19.10. The time values are measured at 17:30 on 9. March. At this time, according to my observations, comparing the two first domains there is a huge difference in time ranges, in the sense that the first one, that does not start with 'www', has a time difference between the minimum and the maximum time that is much less compared to the time difference in the second domain that starts with 'www'. This may happen because the ping commands that are shown after running the commands, in the first case it shows the statistics of the exact domain we type, while in the second case it show the statistics of `d3ag4hukkh62yn.cloudfront.net`.
As for the two last domains, the time values and their differences were much closer to each other compared to the first case and the command shows the statistics of those exact domains.

b) When tracing the routes to the following destinations, I observed that:
* `amazon.com`: there were 2 AS??? destinations, 3 AS680 and 6 AS1299, making a total of 11 destinations, including 9 known and 2 unknown destinations.
* `www.amazon.com`: there were 2 AS??? destinations, 3 AS680, 6 AS1299, and 1 AS16509, making a total of 12 destinations, including 10 known and 2 unknown destinations.
* `www.jacobs-university.de`: there were 3 AS??? destinations, 3 AS680, and 3 AS24940, making a total of 9 destinations, including 6 known and 3 unknown destinations.
* `moodle.jacobs-university.de`: there was 1 AS??? destination, and 1 AS680, making a total of 2 destinations (1 known and 1 unknown).

The observations are done at around 19:30. Some of the most obvious things were the presence of AS680 and the unknown destinations in all the domains.

Problem 1.2

Solution:

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

b) The prefix is used by Jacobs University Bremen (also named International University Bremen), and has a registry of `RIPE`, which is not globally announced. The globally announced one is 2001:638::/32.

Problem 1.3

Solution:

a) The bandwidth was about 9.7 Mbits/sec, and since it did not exceed 10 Mbits/sec it did match what I was expecting.

b) I measured about 0.93ms of round trip time when using ping from host 1 to host 2 while not using 'iperf', and about 15.68ms or round trip time while using 'iperf'. These times suggest to me that 'iperf' consumed a major part of the bandwidth of the network giving the above numbers for the round trip time.

Problem 1.4

Solution:

a) I measured about 0.44ms for both cases, which suggests that the communication between h3 and h4 is not impacted in any way by that of h1 and h2.

b) For the bandwidth of both I measured about 9.7 Mbits/sec, which again suggests that the communication between h3 and h4 is not impacted in any way by that of h1 and h2.

Problem 1.5

Solution:

a) With a speed that also reached 10.1 Mbits/sec once, the information is transmitted faster between h2 to h3 and h1 to h4, than from h1 to h3 and h2 to h4.

b) I measured about 9.8 Mbits/sec for the data transmitted from h1 to h4 and about 8 Mbits/sec for the data transmitted from h3 to h6. The reason why the second measurement is a bit low is because of the 5 percent loss in packages between s2 and s3 which lowers the bandwidth.