1. determine the number of probes per "ttl" used in each trace file.

3 probes per ttl

Number of ttl:s

[file\_name] [ttl]

group1-trace1.pcap 18

group1-trace2.pcap 17

group1-trace3.pcap 17

group1-trace4.pcap 17

group1-trace5.pcap 18

group2-trace1.pcap 9

group2-trace2.pcap 9

group2-trace3.pcap 9

group2-trace4.pcap 9

group2-trace5.pcap 9

2. determine whether or not the sequence of intermediate routers is the same in different trace files.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| group1trace1 | group1trace2 | group1trace3 | group1trace4 | group1trace5 |
| 142.104.68.167 | 142.104.68.167 | 142.104.68.167 | 142.104.68.167 | 142.104.68.167 |
| 142.104.68.1 | 142.104.68.1 | 142.104.68.1 | 142.104.68.1 | 142.104.68.1 |
| 192.168.9.5 | 192.168.9.5 | 192.168.9.5 | 192.168.9.5 | 192.168.9.5 |
| 192.168.10.1 | 192.168.10.1 | 192.168.10.1 | 192.168.10.1 | 192.168.10.1 |
| 192.168.8.6 | 192.168.8.6 | 192.168.8.6 | 192.168.8.6 | 192.168.8.6 |
| 142.104.252.37 | 142.104.252.37 | 142.104.252.37 | 142.104.252.37 | 142.104.252.37 |
| 142.104.252.246 | 142.104.252.246 | 142.104.252.246 | 142.104.252.246 | 142.104.252.246 |
| 207.23.244.242 | 207.23.244.242 | 207.23.244.242 | 207.23.244.242 | 207.23.244.242 |
| 206.12.3.17 | 206.12.3.17 | 206.12.3.17 | 206.12.3.17 | 206.12.3.17 |
| 199.212.24.64 | 199.212.24.64 | 199.212.24.64 | 199.212.24.64 | 199.212.24.64 |
| 206.81.80.17 | 206.81.80.17 | 206.81.80.17 | 206.81.80.17 | 206.81.80.17 |
| 74.125.37.91 | 72.14.237.123 | 74.125.37.91 | 74.125.37.91 | 72.14.237.123 |
| 72.14.237.123 | 74.125.37.91 | 72.14.237.123 | 72.14.237.123 | 209.85.249.153 |
| 209.85.249.155 | 209.85.249.109 | 209.85.247.63 | 209.85.246.219 | 209.85.250.59 |
| 209.85.250.121 | 209.85.250.57 | 209.85.245.65 | 209.85.250.123 | 209.85.247.61 |
| 209.85.249.153 | 209.85.246.219 | 209.85.249.155 | 209.85.245.65 |  |
|  |  |  |  |  |
| group2trace1 | group2trace2 | group2trace3 | group2trace4 | group2trace5 |
| 192.168.0.1 | 192.168.0.1 | 192.168.0.1 | 192.168.0.1 | 192.168.0.1 |
| 24.108.0.1 | 24.108.0.1 | 24.108.0.1 | 24.108.0.1 | 24.108.0.1 |
| 64.59.161.197 | 64.59.161.197 | 64.59.161.197 | 64.59.161.197 | 64.59.161.197 |
| 66.163.72.26 | 66.163.72.26 | 66.163.72.26 | 66.163.72.26 | 66.163.72.26 |
| 66.163.68.18 | 66.163.68.18 | 66.163.68.18 | 66.163.68.18 | 66.163.68.18 |
| 72.14.221.102 | 72.14.221.102 | 72.14.221.102 | 72.14.221.102 | 72.14.221.102 |
| 108.170.245.113 | 108.170.245.113 | 108.170.245.113 | 108.170.245.113 | 108.170.245.113 |
| 209.85.249.249 | 209.85.249.249 | 209.85.249.249 | 209.85.249.249 | 209.85.249.249 |

Intermediate routers in group1trace5 are missing 74.125.37.91 router from the rest of group1 trace files.

Intermediate routers in group2 are the same

3. if the sequence of intermediate routers is different in the five trace files, list the difference and

explain why.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| DIFFERENCES listed below |  |  |  |  |
| group1trace1 | group1trace2 | group1trace3 | group1trace4 | group1trace5 |
| 74.125.37.91 | 72.14.237.123 | 74.125.37.91 | 74.125.37.91 | 72.14.237.123 |
| 72.14.237.123 | 74.125.37.91 | 72.14.237.123 | 72.14.237.123 | 209.85.249.153 |
| 209.85.249.155 | 209.85.249.109 | 209.85.247.63 | 209.85.246.219 | 209.85.250.59 |
| 209.85.250.121 | 209.85.250.57 | 209.85.245.65 | 209.85.250.123 | 209.85.247.61 |
| 209.85.249.153 | 209.85.246.219 | 209.85.249.155 | 209.85.245.65 |  |

Why: IP traffic does not necessarily follow the same path. So, in the case of traceroute, ICMP echo packets or UDP packets sent can also travel in different routes too.

4. if the sequence of intermediate routers is the same in the five trace files, draw a table as shown

below (warning: the values in the table do not correspond to any trace files) to compare

the RTTs of different traceroute attempts. From the result, which hop is likely to incur the

maximum delay? Explain your conclusion.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| TTL | Average RTT in group 1 trace 1 | Average RTT in group 1 trace 2 | Average RTT in group 1 trace 3 | Average RTT in group 1 trace 4 | Average RTT in group 1 trace 5 |
| 1 | 11.366606 | 11.385043 | 11.686007 | 11.214018 | 11.298418 |
| 2 | 16.85071 | 15.933037 | 15.732368 | 15.712738 | 16.691287 |
| 3 | 16.008615 | 15.450398 | 16.314427 | 15.420596 | 17.484347 |
| 4 | 17.561992 | 17.711639 | 17.157952 | 16.688665 | 18.24673 |
| 5 | 18.361012 | 16.877969 | 17.914693 | 17.442624 | 19.010385 |
| 6 | 11.861324 | 11.640946 | 12.113412 | 11.519353 | 11.917671 |
| 7 | 13.507366 | 13.429403 | 14.406045 | 13.587713 | 13.538917 |
| 8 | 14.095624 | 50.241947 | 15.182257 | 14.006376 | 18.522422 |
| 9 | 18.234253 | 16.794761 | 18.085559 | 16.93066 | 16.708374 |
| 10 | 16.911586 | 17.578046 | 18.86495 | 18.181006 | 17.964602 |
| 11 | 19.428968 | 19.223293 | 20.10258 | 19.433975 | 19.327402 |
| 12 | 13.721307 | 15.358448 | 13.836622 | 13.839324 | 13.892015 |
| 13 | 19.620419 | 18.018723 | 20.839691 | 19.775391 | 19.634644 |
| 14 | 18.988371 | 18.069347 | 18.976053 | 18.764734 | 19.336939 |
| 15 | 19.900958 | 19.585609 | 20.685911 | 20.239671 | 20.858924 |
| 16 | 21.450043 | 21.242619 | 21.635294 | 21.594048 | 22.158861 |
| 17 | 23.179054 | 13.635238 | 17.912626 | 17.996311 | 23.581346 |
| 18 | 9.184122 |  |  |  | 13.648987 |
|  |  |  |  |  |  |
| TTL | Average RTT in group 2 trace 1 | Average RTT in group 2 trace 2 | Average RTT in group 2 trace 3 | Average RTT in group 2 trace 4 | Average RTT in group 2 trace 5 |
| 1 | 3.329754 | 2.71066 | 7.853985 | 3.415346 | 1.745621 |
| 2 | 15.811682 | 17.118295 | 11.835416 | 13.245026 | 16.153574 |
| 3 | 18.869321 | 20.09662 | 22.579352 | 21.672249 | 21.601677 |
| 4 | 22.843043 | 19.420067 | 19.460201 | 19.754648 | 18.558343 |
| 5 | 26.502053 | 21.555344 | 20.321369 | 35.77129 | 20.717065 |
| 6 | 24.2637 | 19.982338 | 21.849712 | 22.67464 | 43.472052 |
| 7 | 18.407901 | 51.657995 | 22.763332 | 18.337329 | 26.921272 |
| 8 | 22.970756 | 108.737628 | 20.591974 | 24.57428 | 25.623401 |
| 9 | 18.099705 | 21.911065 | 23.139954 | 19.942602 | 13.462941 |

Group1 does not have the same intermediate routers.

Group2 does have the same intermediate routers. According to RTT table, second hop(TTL 2) is likely to incur the delay