Kazi Shadman Sakib

Roll: 07

1. Client IP address: 192.168.1.102

   Client Port number: 1161

2. Server IP address: 128.119.245.12

   Server port number: 80

3. My IP address: 192.168.0.105

   My port number: 59441

4. Relative Sequence number: 0

   Raw sequence number: 232129012

   Flags: 0x002

↳ The segment is identified as a SYN segment by looking at the 11th bit of the flag which indicates the segment is a SYN segment. As 11th bit is in 0x002 is set, it is a SYN segment.

5. * Relative sequence number : 0
Raw sequence number : 883061785

* Relative acknowledgement number 1
Raw acknowledgement number : 232129013

* The server determined the acknowledgement number by adding 1 to the client request sequence number.
Server Acknowledgement number = client sequence number + 1

* flags : 0x012

* The 8th bit (Acknowledgement) and 11th bit (SYN) is set, in the flag.

6. Relative sequence number : 1
Raw sequence number : 232129013

7. Sequence number of first six segments:

1st sequence : 1

2nd sequence : 566

3nd sequence : 2026

4nth sequence : 3486

5th sequence : 4946

6th sequence : 6406

| Segment serial | serial time | Ack time | RTT = ACK time - serial time |
|---|---|---|---|
| 4 | 0.026477 | (6) 0.053937 | 0.02746 |
| 5 | 0.041737 | (9) 0.077294 | 0.035557 |
| 7 | 0.054026 | (11) 0.124085 | 0.070059 |
| 8 | 0.054690 | (14) 0.169118 | 0.11443 |
| 10 | 0.077405 | (15) 0.217299 | 0.13989 |
| 11 | 0.078157 | (16) 0.267802 | 0.18964 |

We know,

Estimated RTT = $(1-\alpha)$ Estimated RTT + $\alpha$ Sample RTT

[$\alpha = 0.125$]

1. Estimated RTT = RTT for Segment 1 = 0.02746 sec

2. Estimated RTT = 0.875 * 0.02746 + 0.125 * 0.03559

= 0.0285 sec.

3. Estimated RTT = 0.875 * 0.0285 + 0.125 * 0.070059

= 0.0332 sec.

4. Estimated RTT = 0.875 * 0.0332 + 0.125 * 0.11443

= 0.0438 sec.

5. Estimated RTT = 0.875 * 0.0438 + 0.125 * 0.13989

= 0.0558 sec.

6. Estimated RTT = 0.875 * 0.0558 + 0.125 * 0.18964

= 0.0725 sec.

8. Length of first TCP segment (containing HTTP POST): 565 bytes.

Length of each of other five TCP segment: 1460 bytes (mss)

9.

The minimum amount of buffer space advertised at gaia.cs.umass.edu for the entire trace is 5840 bytes, which shows in the first acknowledgement from the server.

The sender is never throttled due to lacking of receiver buffer space.

10.

No, there is no retransmitted segments in the trace file. I, checked for the sequence numbers of the TCP segments. (Time vs sequence Graph). All sequence

numbers from the source to destination are increasing with respect to time.

11.

Amount of typically ~~acknowledgement~~ acknowledged data is around 1460 bytes except for the 1st segment. There are cases where the receiver is acknowledging every other segment. The acknowledge numbers differ by around 2×1460 bytes or 2920 bytes. Thus, this means there has been acknowledgement for two segments.

12. Total data = Difference of sequence numbers

= 164091 − 1

= 164090 bytes.

Total time difference = 5.455830 − 0.026477

= 5.4294 sec

So, average throughput = 164090/5.4294 KB

= 30222 bytes/sec

13.

TCP's slow start phase begins at 0 sec. and ends at 0.125 second.

After 0.3 second congestion avoidance takes over.

In ideal case, the sequence number vs time graph should have looked like a perfect stair-case.