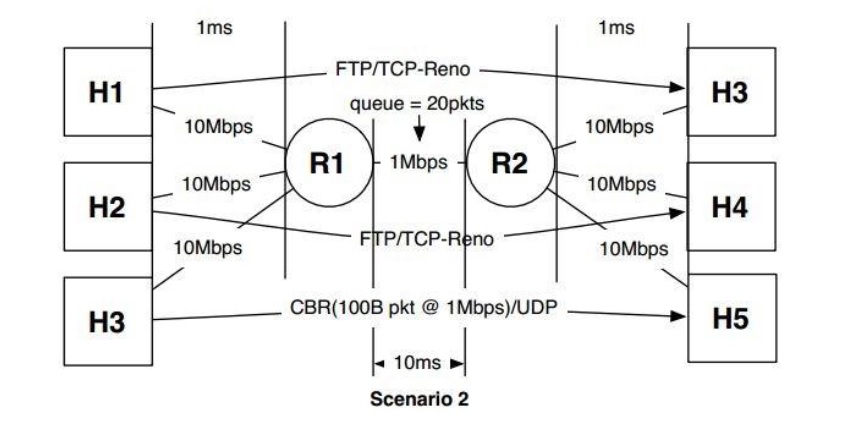
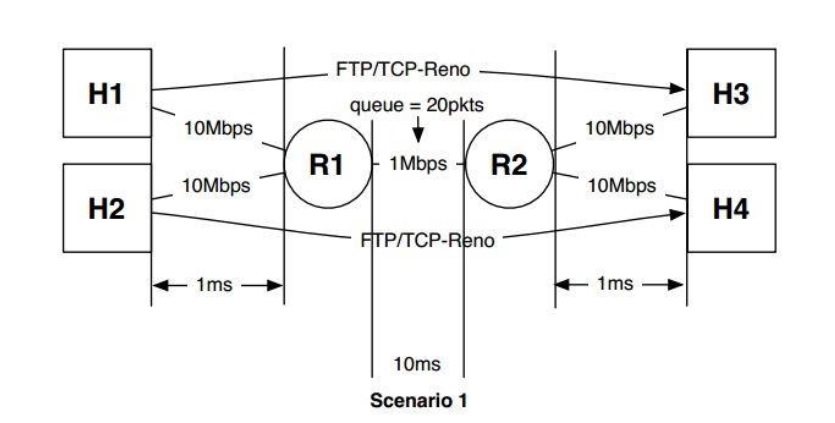
**Network Simulation Assignment 2 Report**

**Simulation Setup & Procedure:**

Scenarios -

****

The simulation scenario models setup above are to be simulated and validated with two different buffer management strategies –

1. DROPTAIL management

1. RED (Random Early Detection), using RED parameters (10, 15, 50) for (thresh\_, maxthresh\_, linterm\_)

Simulations are performed using NS-2 Software. Simulations will be run for 180 seconds. The first 30 seconds of the simulation output is ignored in each scenario.

A total of four simulations were performed – each of the two scenarios simulated using each of the two buffer management strategies – DROPTAIL & RED.

The output values for scenario 1 are in the following format –

- timestamp

- instantaneous throughput of TCP link 1 (H1 to H3)

- instantaneous throughput of TCP link 2 (H2 to H4)

- average throughput of TCP link 1

- average throughput of TCP link 2

As Scenario 2 has an additional UDP connection, the output values for Scenario 2 will consist of –

- timestamp

- instantaneous throughput of TCP link 1 (H1 to H3)

- instantaneous throughput of TCP link 2 (H2 to H4)

- instantaneous throughput of UDP link

- average throughput of TCP link 1

- average throughput of TCP link 2

- average throughput of UDP link

Then, the instantaneous throughput and average throughput values are plotted against time (interval ~1s) for each of the four simulations.

**Theory:**

The Buffer Management Strategies –

DROPTAIL Management –

Also known as Tail Drop, it is a very simple technique, working in complement with TCP, to decide when to drop packets. It basically looks for a free buffer space in the queue. If available, it queues the packet. If there is no free buffer space available and the queue is full, then it drops the arriving packets.  The loss of packets causes the TCP protocol to enter slow-start at the sending host, which reduces throughput in that TCP session until the sender begins to receive acknowledgements again and increases its congestion window. A more severe scenario occurs if packets from multiple senders are dropped causing all of them to enter slow-start. This may take TCP a longer time to get back up to speed.

Thus, congestion control is entirely the responsibility of TCP and the routers provide no helping hand.

RED (Random Early Detection) –

RED was originally designed with the objectives –

(1) minimize packet loss and queuing delay,

(2) avoid global synchronization of sources,

(3) maintain high link utilization, and

(4) remove biases against bursty sources.

RED maintains an exponentially-weighted moving average (EWMA) of the queue length which it uses to detect congestion. When the average queue length exceeds a minimum threshold, packets are randomly dropped or marked with an explicit congestion notification (ECN) bit. When the average queue length exceeds a maximum threshold, all packets are dropped or marked.

RED represents a class of queue management mechanisms that does not keep the state of each flow. That is, they put the data from the all the flows into one queue, and focus on their overall performance. It is that which originate the problems caused by non-responsive flows.

**Table for DROPTAIL simulation with Scenario 1-**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Timestamp | TCP Link 1  Instantaneous  Throughput | TCP Link 2  Instantaneous  Throughput | TCP Link 1  Average  Throughput | TCP Link 2  Average  Throughput |
| 31 | 540.8 | 457.6 | 540.8 | 457.6 |
| 32 | 440.96 | 532.48 | 490.88 | 495.04 |
| 33 | 540.8 | 482.56 | 507.52 | 490.88 |
| 34 | 499.2 | 507.52 | 505.44 | 495.04 |
| 35 | 474.24 | 524.16 | 499.2 | 500.864 |
| 36 | 457.6 | 474.24 | 492.267 | 496.427 |
| 37 | 532.48 | 532.48 | 498.011 | 501.577 |
| 38 | 490.88 | 507.52 | 497.12 | 502.32 |
| 39 | 432.64 | 457.6 | 489.956 | 497.351 |
| 40 | 607.36 | 482.56 | 501.696 | 495.872 |
| 41 | 490.88 | 532.48 | 500.713 | 499.2 |
| 42 | 524.16 | 474.24 | 502.667 | 497.12 |
| 43 | 474.24 | 432.64 | 500.48 | 492.16 |
| 44 | 482.56 | 615.68 | 499.2 | 500.983 |
| 45 | 465.92 | 532.48 | 496.981 | 503.083 |
| 46 | 549.12 | 449.28 | 500.24 | 499.72 |
| 47 | 440.96 | 474.24 | 496.753 | 498.221 |
| 48 | 557.44 | 524.16 | 500.124 | 499.662 |
| 49 | 499.2 | 507.52 | 500.076 | 500.076 |
| 50 | 524.16 | 474.24 | 501.28 | 498.784 |
| 51 | 374.4 | 457.6 | 495.238 | 496.823 |
| 52 | 607.36 | 557.44 | 500.335 | 499.578 |
| 53 | 474.24 | 524.16 | 499.2 | 500.647 |
| 54 | 499.2 | 507.52 | 499.2 | 500.933 |
| 55 | 499.2 | 482.56 | 499.2 | 500.198 |
| 56 | 540.8 | 474.24 | 500.8 | 499.2 |
| 57 | 499.2 | 499.2 | 500.741 | 499.2 |
| 58 | 515.84 | 482.56 | 501.28 | 498.606 |
| 59 | 399.36 | 499.2 | 497.766 | 498.626 |
| 60 | 582.4 | 524.16 | 500.587 | 499.477 |
| 61 | 449.28 | 549.12 | 498.932 | 501.079 |
| 62 | 532.48 | 465.92 | 499.98 | 499.98 |
| 63 | 507.52 | 416 | 500.208 | 497.435 |
| 64 | 524.16 | 549.12 | 500.913 | 498.955 |
| 65 | 457.6 | 549.12 | 499.675 | 500.389 |
| 66 | 532.48 | 465.92 | 500.587 | 499.431 |
| 67 | 449.28 | 515.84 | 499.2 | 499.875 |
| 68 | 515.84 | 515.84 | 499.638 | 500.295 |
| 69 | 482.56 | 515.84 | 499.2 | 500.693 |
| 70 | 524.16 | 482.56 | 499.824 | 500.24 |
| 71 | 482.56 | 440.96 | 499.403 | 498.794 |
| 72 | 524.16 | 549.12 | 499.992 | 499.992 |
| 73 | 524.16 | 474.24 | 500.554 | 499.393 |
| 74 | 515.84 | 482.56 | 500.902 | 499.011 |
| 75 | 465.92 | 532.48 | 500.124 | 499.755 |
| 76 | 515.84 | 490.88 | 500.466 | 499.562 |
| 77 | 449.28 | 549.12 | 499.377 | 500.616 |
| 78 | 399.36 | 482.56 | 497.293 | 500.24 |
| 79 | 632.32 | 474.24 | 500.049 | 499.709 |
| 80 | 532.48 | 482.56 | 500.698 | 499.366 |
| 81 | 457.6 | 540.8 | 499.853 | 500.179 |
| 82 | 440.96 | 457.6 | 498.72 | 499.36 |
| 83 | 599.04 | 499.2 | 500.613 | 499.357 |
| 84 | 465.92 | 532.48 | 499.97 | 499.97 |
| 85 | 465.92 | 532.48 | 499.351 | 500.561 |
| 86 | 440.96 | 366.08 | 498.309 | 498.16 |
| 87 | 590.72 | 607.36 | 499.93 | 500.076 |
| 88 | 524.16 | 474.24 | 500.348 | 499.63 |
| 89 | 499.2 | 499.2 | 500.328 | 499.623 |
| 90 | 449.28 | 391.04 | 499.477 | 497.813 |
| 91 | 532.48 | 632.32 | 500.018 | 500.018 |
| 92 | 507.52 | 490.88 | 500.139 | 499.871 |
| 93 | 457.6 | 540.8 | 499.464 | 500.521 |
| 94 | 474.24 | 399.36 | 499.07 | 498.94 |
| 95 | 532.48 | 590.72 | 499.584 | 500.352 |
| 96 | 549.12 | 457.6 | 500.335 | 499.704 |
| 97 | 465.92 | 532.48 | 499.821 | 500.193 |
| 98 | 515.84 | 391.04 | 500.056 | 498.588 |
| 99 | 524.16 | 565.76 | 500.406 | 499.562 |
| 100 | 482.56 | 515.84 | 500.151 | 499.794 |
| 101 | 457.6 | 549.12 | 499.552 | 500.489 |
| 102 | 507.52 | 432.64 | 499.662 | 499.547 |
| 103 | 532.48 | 524.16 | 500.112 | 499.884 |
| 104 | 524.16 | 474.24 | 500.437 | 499.537 |
| 105 | 474.24 | 524.16 | 500.087 | 499.866 |
| 106 | 532.48 | 449.28 | 500.514 | 499.2 |
| 107 | 490.88 | 532.48 | 500.389 | 499.632 |
| 108 | 465.92 | 532.48 | 499.947 | 500.053 |
| 109 | 457.6 | 540.8 | 499.411 | 500.569 |
| 110 | 532.48 | 457.6 | 499.824 | 500.032 |
| 111 | 490.88 | 515.84 | 499.714 | 500.227 |
| 112 | 540.8 | 465.92 | 500.215 | 499.809 |
| 113 | 482.56 | 515.84 | 500.002 | 500.002 |
| 114 | 507.52 | 474.24 | 500.091 | 499.695 |
| 115 | 499.2 | 515.84 | 500.081 | 499.885 |
| 116 | 507.52 | 490.88 | 500.167 | 499.78 |
| 117 | 457.6 | 449.28 | 499.678 | 499.2 |
| 118 | 482.56 | 607.36 | 499.484 | 500.429 |
| 119 | 532.48 | 474.24 | 499.854 | 500.135 |
| 120 | 549.12 | 449.28 | 500.402 | 499.57 |
| 121 | 449.28 | 440.96 | 499.84 | 498.926 |
| 122 | 524.16 | 590.72 | 500.104 | 499.923 |
| 123 | 532.48 | 465.92 | 500.452 | 499.558 |
| 124 | 449.28 | 549.12 | 499.908 | 500.085 |
| 125 | 474.24 | 457.6 | 499.638 | 499.638 |
| 126 | 524.16 | 540.8 | 499.893 | 500.067 |
| 127 | 507.52 | 499.2 | 499.972 | 500.058 |
| 128 | 524.16 | 474.24 | 500.219 | 499.794 |
| 129 | 499.2 | 457.6 | 500.208 | 499.368 |
| 130 | 507.52 | 532.48 | 500.282 | 499.699 |
| 131 | 482.56 | 515.84 | 500.106 | 499.859 |
| 132 | 507.52 | 499.2 | 500.179 | 499.853 |
| 133 | 482.56 | 515.84 | 500.008 | 500.008 |
| 134 | 474.24 | 524.16 | 499.76 | 500.24 |
| 135 | 499.2 | 499.2 | 499.755 | 500.23 |
| 136 | 557.44 | 440.96 | 500.299 | 499.671 |
| 137 | 407.68 | 507.52 | 499.433 | 499.744 |
| 138 | 557.44 | 532.48 | 499.97 | 500.047 |
| 139 | 532.48 | 465.92 | 500.269 | 499.734 |
| 140 | 465.92 | 532.48 | 499.956 | 500.032 |
| 141 | 416 | 507.52 | 499.2 | 500.099 |
| 142 | 549.12 | 524.16 | 499.646 | 500.314 |
| 143 | 549.12 | 457.6 | 500.084 | 499.936 |
| 144 | 524.16 | 474.24 | 500.295 | 499.711 |
| 145 | 440.96 | 532.48 | 499.779 | 499.996 |
| 146 | 540.8 | 482.56 | 500.132 | 499.846 |
| 147 | 507.52 | 490.88 | 500.196 | 499.769 |
| 148 | 482.56 | 524.16 | 500.046 | 499.976 |
| 149 | 440.96 | 482.56 | 499.55 | 499.829 |
| 150 | 549.12 | 524.16 | 499.963 | 500.032 |
| 151 | 474.24 | 524.16 | 499.75 | 500.231 |
| 152 | 432.64 | 449.28 | 499.2 | 499.814 |
| 153 | 607.36 | 490.88 | 500.079 | 499.741 |
| 154 | 507.52 | 515.84 | 500.139 | 499.871 |
| 155 | 507.52 | 490.88 | 500.198 | 499.799 |
| 156 | 482.56 | 416 | 500.058 | 499.134 |
| 157 | 474.24 | 615.68 | 499.855 | 500.052 |
| 158 | 482.56 | 532.48 | 499.72 | 500.305 |
| 159 | 540.8 | 457.6 | 500.038 | 499.974 |
| 160 | 432.64 | 465.92 | 499.52 | 499.712 |
| 161 | 574.08 | 524.16 | 500.089 | 499.899 |
| 162 | 482.56 | 515.84 | 499.956 | 500.019 |
| 163 | 532.48 | 465.92 | 500.201 | 499.763 |
| 164 | 366.08 | 457.6 | 499.2 | 499.448 |
| 165 | 607.36 | 574.08 | 500.001 | 500.001 |
| 166 | 474.24 | 524.16 | 499.812 | 500.179 |
| 167 | 499.2 | 499.2 | 499.807 | 500.172 |
| 168 | 499.2 | 474.24 | 499.803 | 499.984 |
| 169 | 540.8 | 490.88 | 500.098 | 499.918 |
| 170 | 515.84 | 482.56 | 500.21 | 499.794 |
| 171 | 499.2 | 499.2 | 500.203 | 499.79 |
| 172 | 399.36 | 490.88 | 499.493 | 499.727 |
| 173 | 590.72 | 515.84 | 500.131 | 499.84 |
| 174 | 457.6 | 549.12 | 499.836 | 500.182 |
| 175 | 532.48 | 465.92 | 500.061 | 499.946 |
| 176 | 499.2 | 416 | 500.055 | 499.371 |
| 177 | 532.48 | 549.12 | 500.275 | 499.709 |
| 178 | 449.28 | 549.12 | 499.931 | 500.043 |
| 179 | 540.8 | 465.92 | 500.205 | 499.814 |
| 180 | 432.64 | 515.84 | 499.755 | 499.921 |

**Table for RED simulation for scenario 1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Timestamp | TCP Link 1 Instantaneous Throughput | TCP Link 2 Instantaneous Throughput | TCP Link 1 Average Throughput | TCP Link 2 Average Throughput |
| 31 | 407.68 | 307.840 | 698.88 | 307.84 |
| 32 | 382.72 | 574.080 | 561.6 | 440.96 |
| 33 | 449.28 | 574.08 | 510.293 | 485.333 |
| 34 | 715.52 | 624 | 478.4 | 520 |
| 35 | 490.88 | 549.12 | 472.576 | 525.824 |
| 36 | 474.24 | 266.24 | 513.067 | 482.56 |
| 37 | 332.8 | 499.2 | 509.897 | 484.937 |
| 38 | 432.64 | 549.12 | 505.44 | 492.96 |
| 39 | 624 | 665.6 | 486.258 | 512.142 |
| 40 | 565.76 | 549.12 | 480.896 | 515.84 |
| 41 | 557.44 | 399.36 | 493.905 | 505.251 |
| 42 | 424.32 | 382.72 | 499.893 | 495.04 |
| 43 | 632.32 | 490.88 | 504.32 | 494.72 |
| 44 | 549.12 | 507.52 | 498.606 | 495.634 |
| 45 | 341.12 | 440.96 | 507.52 | 491.989 |
| 46 | 648.96 | 449.28 | 510.12 | 489.32 |
| 47 | 574.08 | 599.04 | 500.179 | 495.774 |
| 48 | 457.6 | 391.04 | 508.444 | 489.956 |
| 49 | 740.48 | 349.44 | 511.899 | 482.56 |
| 50 | 465.92 | 632.32 | 509.184 | 490.048 |
| 51 | 440.96 | 266.24 | 520.198 | 479.39 |
| 52 | 457.6 | 515.84 | 517.731 | 481.047 |
| 53 | 590.72 | 499.2 | 514.393 | 481.837 |
| 54 | 490.88 | 615.68 | 512.027 | 487.413 |
| 55 | 624 | 407.68 | 515.174 | 484.224 |
| 56 | 640.64 | 490.88 | 514.24 | 484.48 |
| 57 | 299.52 | 349.44 | 518.305 | 479.479 |
| 58 | 407.68 | 407.68 | 522.674 | 476.914 |
| 59 | 707.2 | 682.24 | 514.979 | 483.994 |
| 60 | 707.2 | 565.76 | 511.403 | 486.72 |
| 61 | 732.16 | 332.8 | 517.719 | 481.755 |
| 62 | 299.52 | 249.6 | 523.64 | 474.5 |
| 63 | 607.36 | 316.16 | 529.959 | 469.702 |
| 64 | 690.56 | 624 | 523.181 | 474.24 |
| 65 | 457.6 | 465.92 | 525.586 | 474.002 |
| 66 | 465.92 | 291.2 | 530.169 | 468.924 |
| 67 | 432.64 | 557.44 | 528.208 | 471.317 |
| 68 | 557.44 | 482.56 | 526.568 | 471.613 |
| 69 | 507.52 | 540.8 | 524.16 | 473.387 |
| 70 | 524.16 | 515.84 | 524.992 | 474.448 |
| 71 | 873.6 | 499.2 | 524.566 | 475.052 |
| 72 | 565.76 | 449.28 | 524.556 | 474.438 |
| 73 | 648.96 | 149.76 | 532.673 | 466.887 |
| 74 | 416 | 407.68 | 533.425 | 465.542 |
| 75 | 266.24 | 366.08 | 535.993 | 463.332 |
| 76 | 482.56 | 582.4 | 533.384 | 465.92 |
| 77 | 665.6 | 732.16 | 527.7 | 471.585 |
| 78 | 490.88 | 499.2 | 526.76 | 472.16 |
| 79 | 740.48 | 324.48 | 529.593 | 469.146 |
| 80 | 673.92 | 424.32 | 528.819 | 468.25 |
| 81 | 515.84 | 349.44 | 532.969 | 465.92 |
| 82 | 648.96 | 332.8 | 535.68 | 463.36 |
| 83 | 391.04 | 440.96 | 535.306 | 462.937 |
| 84 | 349.44 | 391.04 | 537.41 | 461.606 |
| 85 | 590.72 | 549.12 | 534.749 | 463.197 |
| 86 | 599.04 | 707.2 | 531.44 | 467.554 |
| 87 | 565.76 | 391.04 | 532.48 | 466.212 |
| 88 | 665.6 | 341.12 | 533.628 | 464.055 |
| 89 | 815.36 | 515.84 | 534.172 | 464.933 |
| 90 | 532.48 | 332.8 | 536.363 | 462.731 |
| 91 | 490.88 | 183.04 | 540.936 | 458.146 |
| 92 | 449.28 | 465.92 | 540.8 | 458.271 |
| 93 | 341.12 | 507.52 | 540.008 | 459.053 |
| 94 | 632.32 | 532.48 | 538.59 | 460.2 |
| 95 | 707.2 | 590.72 | 535.552 | 462.208 |
| 96 | 532.48 | 391.04 | 537.018 | 461.13 |
| 97 | 324.48 | 257.92 | 539.558 | 458.097 |
| 98 | 307.84 | 549.12 | 539.454 | 459.435 |
| 99 | 416 | 640.64 | 536.339 | 462.061 |
| 100 | 465.92 | 723.84 | 533.074 | 465.801 |
| 101 | 332.8 | 590.72 | 531.425 | 467.561 |
| 102 | 540.8 | 507.52 | 530.516 | 468.116 |
| 103 | 382.72 | 624 | 527.807 | 470.251 |
| 104 | 307.84 | 507.52 | 527.983 | 470.755 |
| 105 | 515.84 | 615.68 | 526.046 | 472.687 |
| 106 | 449.28 | 624 | 523.175 | 474.678 |
| 107 | 740.48 | 515.84 | 523.079 | 475.212 |
| 108 | 357.76 | 490.88 | 522.133 | 475.413 |
| 109 | 316.16 | 341.12 | 524.897 | 473.713 |
| 110 | 282.88 | 640.64 | 522.808 | 475.8 |
| 111 | 432.64 | 682.24 | 520.257 | 478.349 |
| 112 | 607.36 | 723.84 | 517.362 | 481.342 |
| 113 | 499.2 | 532.48 | 516.341 | 481.959 |
| 114 | 565.76 | 374.4 | 517.425 | 480.678 |
| 115 | 349.44 | 524.16 | 517.21 | 481.19 |
| 116 | 490.88 | 432.64 | 517.775 | 480.625 |
| 117 | 632.32 | 648.96 | 515.84 | 482.56 |
| 118 | 440.96 | 507.52 | 515.556 | 482.844 |
| 119 | 515.84 | 366.08 | 516.868 | 481.532 |
| 120 | 565.76 | 515.84 | 516.025 | 481.913 |
| 121 | 490.88 | 532.48 | 516.023 | 482.469 |
| 122 | 557.44 | 349.44 | 516.563 | 481.023 |
| 123 | 499.2 | 574.08 | 516.287 | 482.023 |
| 124 | 582.4 | 457.6 | 516.725 | 481.763 |
| 125 | 515.84 | 507.52 | 516.541 | 482.035 |
| 126 | 540.8 | 416 | 517.227 | 481.347 |
| 127 | 549.12 | 482.56 | 517.212 | 481.359 |
| 128 | 299.52 | 457.6 | 517.453 | 481.117 |
| 129 | 349.44 | 449.28 | 517.773 | 480.795 |
| 130 | 116.48 | 657.28 | 515.59 | 482.56 |
| 131 | 549.12 | 698.88 | 513.945 | 484.702 |
| 132 | 416 | 856.96 | 510.049 | 488.351 |
| 133 | 474.24 | 449.28 | 510.428 | 487.972 |
| 134 | 274.56 | 582.4 | 509.52 | 488.88 |
| 135 | 374.4 | 524.16 | 509.184 | 489.216 |
| 136 | 474.24 | 732.16 | 506.971 | 491.508 |
| 137 | 690.56 | 624 | 505.732 | 492.746 |
| 138 | 590.72 | 457.6 | 505.44 | 492.421 |
| 139 | 574.08 | 332.8 | 507.138 | 490.956 |
| 140 | 657.28 | 382.72 | 507.898 | 489.972 |
| 141 | 399.36 | 499.2 | 508.494 | 490.055 |
| 142 | 440.96 | 341.12 | 509.823 | 488.726 |
| 143 | 465.92 | 590.72 | 508.845 | 489.628 |
| 144 | 324.48 | 499.2 | 508.25 | 489.712 |
| 145 | 499.2 | 540.8 | 507.882 | 490.157 |
| 146 | 382.72 | 723.84 | 506.301 | 492.171 |
| 147 | 515.84 | 515.84 | 506.24 | 492.373 |
| 148 | 648.96 | 549.12 | 505.193 | 492.854 |
| 149 | 524.16 | 490.88 | 505.283 | 492.838 |
| 150 | 332.8 | 407.68 | 506.48 | 492.128 |
| 151 | 341.12 | 482.56 | 506.626 | 492.049 |
| 152 | 407.68 | 665.6 | 505.201 | 493.471 |
| 153 | 291.2 | 657.28 | 503.867 | 494.803 |
| 154 | 291.2 | 540.8 | 503.092 | 495.174 |
| 155 | 424.32 | 757.12 | 501.396 | 497.27 |
| 156 | 590.72 | 682.24 | 499.728 | 498.738 |
| 157 | 607.36 | 599.04 | 499.134 | 499.528 |
| 158 | 723.84 | 416 | 499.85 | 498.875 |
| 159 | 574.08 | 357.76 | 500.683 | 497.781 |
| 160 | 399.36 | 266.24 | 502.4 | 496 |
| 161 | 357.76 | 424.32 | 502.947 | 495.453 |
| 162 | 790.4 | 607.36 | 502.162 | 496.301 |
| 163 | 399.36 | 682.24 | 501.077 | 497.699 |
| 164 | 291.2 | 199.68 | 503.236 | 495.475 |
| 165 | 357.76 | 549.12 | 502.466 | 495.872 |
| 166 | 324.48 | 765.44 | 500.913 | 497.854 |
| 167 | 374.4 | 615.68 | 499.868 | 498.714 |
| 168 | 690.56 | 707.2 | 498.597 | 500.225 |
| 169 | 707.2 | 624 | 497.704 | 501.115 |
| 170 | 881.92 | 307.84 | 499.081 | 499.735 |
| 171 | 624 | 291.2 | 500.557 | 498.256 |
| 172 | 773.76 | 91.52 | 503.243 | 495.392 |
| 173 | 490.88 | 391.04 | 504.087 | 494.662 |
| 174 | 507.52 | 224.64 | 505.96 | 492.787 |
| 175 | 665.6 | 507.52 | 505.856 | 492.888 |
| 176 | 690.56 | 432.64 | 505.867 | 492.476 |
| 177 | 582.4 | 399.36 | 506.954 | 491.842 |
| 178 | 557.44 | 257.92 | 508.195 | 490.262 |
| 179 | 582.400 | 465.92 | 508.693 | 490.098 |
| 180 | 557.440 | 440.96 | 509.018 | 489.771 |

**Table for DROPTAIL simulation for Scenario 2-**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Timestamp | TCP Link 1 Instantaneous Throughput | TCP Link 2 Instantaneous Throughput | UDP Instantaneous Throughput | TCP Link 1 Average Throughput | TCP Link 2 Average Throughput | UDP Average Throughput |
| 31 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 32 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 33 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 34 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 35 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 36 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 37 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 38 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 39 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 40 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 41 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 42 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 43 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 44 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 45 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 46 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 47 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 48 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 49 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 50 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 51 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 52 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 53 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 54 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 55 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 56 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 57 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 58 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 59 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 60 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 61 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 62 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 63 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 64 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 65 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 66 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 67 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 68 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 69 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 70 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 71 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 72 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 73 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 74 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 75 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 76 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 77 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 78 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 79 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 80 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 81 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 82 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 83 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 84 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 85 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 86 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 87 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 88 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 89 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 90 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 91 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 92 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 93 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 94 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 95 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 96 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 97 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 98 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 99 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 100 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 101 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 102 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 103 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 104 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 105 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 106 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 107 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 108 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 109 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 110 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 111 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 112 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 113 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 114 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 115 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 116 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 117 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 118 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 119 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 120 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 121 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 122 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 123 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 124 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 125 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 126 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 127 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 128 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 129 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 130 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 131 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 132 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 133 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 134 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 135 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 136 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 137 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 138 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 139 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 140 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 141 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 142 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 143 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 144 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 145 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 146 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 147 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 148 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 149 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 150 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 151 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 152 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 153 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 154 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 155 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 156 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 157 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 158 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 159 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 160 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 161 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 162 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 163 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 164 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 165 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 166 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 167 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 168 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 169 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 170 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 171 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 172 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 173 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 174 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 175 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 176 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 177 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 178 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 179 | 0 | 0 | 1000 | 0 | 0 | 1000 |
| 180 | 0 | 0 | 1000 | 0 | 0 | 1000 |

**Table of RED simulation for Scenario 2-**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Timestamp | TCP Link 1 Instantaneous Throughput | TCP Link 2 Instantaneous Throughput | UDP Instantaneous Throughput | TCP Link 1 Average Throughput | TCP Link 2 Average Throughput | UDP Average Throughput |
| 31 | 16.64 | 0 | 967.2 | 16.64 | 0 | 967.2 |
| 32 | 0 | 24.96 | 983.2 | 8.32 | 12.48 | 975.2 |
| 33 | 33.28 | 0 | 966.4 | 16.64 | 8.32 | 972.267 |
| 34 | 0 | 0 | 1000 | 12.48 | 6.24 | 979.2 |
| 35 | 0 | 0 | 1000 | 9.984 | 4.992 | 983.36 |
| 36 | 16.64 | 0 | 992 | 11.093 | 4.16 | 984.8 |
| 37 | 33.28 | 0 | 958.4 | 14.263 | 3.566 | 981.029 |
| 38 | 33.28 | 0 | 950.4 | 16.64 | 3.12 | 977.2 |
| 39 | 33.28 | 33.28 | 958.4 | 18.489 | 6.471 | 975.111 |
| 40 | 0 | 0 | 1000 | 16.64 | 5.824 | 977.6 |
| 41 | 24.96 | 0 | 974.4 | 17.396 | 5.295 | 977.309 |
| 42 | 24.96 | 0 | 975.2 | 18.027 | 4.853 | 977.133 |
| 43 | 24.96 | 0 | 958.4 | 18.56 | 4.48 | 975.692 |
| 44 | 41.6 | 0 | 975.2 | 20.206 | 4.16 | 975.657 |
| 45 | 33.28 | 0 | 958.4 | 21.077 | 3.883 | 974.507 |
| 46 | 49.92 | 0 | 958.4 | 22.88 | 3.64 | 973.5 |
| 47 | 33.28 | 0 | 966.4 | 23.492 | 3.426 | 973.082 |
| 48 | 16.64 | 0 | 967.2 | 23.111 | 3.236 | 972.756 |
| 49 | 49.92 | 0 | 958.4 | 24.522 | 3.065 | 972 |
| 50 | 58.24 | 0 | 924.8 | 26.208 | 2.912 | 969.64 |
| 51 | 24.96 | 0 | 992 | 26.149 | 2.773 | 970.705 |
| 52 | 0 | 33.28 | 933.6 | 24.96 | 4.16 | 969.018 |
| 53 | 58.24 | 0 | 958.4 | 26.407 | 3.979 | 968.557 |
| 54 | 16.64 | 0 | 983.2 | 26 | 3.813 | 969.167 |
| 55 | 24.96 | 0 | 983.2 | 25.958 | 3.661 | 969.728 |
| 56 | 0 | 0 | 975.2 | 24.96 | 3.52 | 969.938 |
| 57 | 0 | 0 | 1000 | 24.036 | 3.39 | 971.052 |
| 58 | 58.24 | 0 | 949.6 | 25.257 | 3.269 | 970.286 |
| 59 | 0 | 0 | 1000 | 24.386 | 3.156 | 971.31 |
| 60 | 41.6 | 0 | 958.4 | 24.96 | 3.051 | 970.88 |
| 61 | 33.28 | 0 | 975.2 | 25.228 | 2.952 | 971.019 |
| 62 | 33.28 | 0 | 972.8 | 25.48 | 2.86 | 971.075 |
| 63 | 24.96 | 0 | 968.8 | 25.464 | 2.773 | 971.006 |
| 64 | 33.28 | 0 | 975.2 | 25.694 | 2.692 | 971.129 |
| 65 | 16.64 | 0 | 967.2 | 25.435 | 2.615 | 971.017 |
| 66 | 41.6 | 0 | 966.4 | 25.884 | 2.542 | 970.889 |
| 67 | 0 | 0 | 1000 | 25.185 | 2.474 | 971.676 |
| 68 | 33.28 | 0 | 958.4 | 25.398 | 2.408 | 971.326 |
| 69 | 41.6 | 0 | 958.4 | 25.813 | 2.347 | 970.995 |
| 70 | 33.28 | 0 | 975.2 | 26 | 2.288 | 971.1 |
| 71 | 0 | 0 | 1000 | 25.366 | 2.232 | 971.805 |
| 72 | 33.28 | 0 | 958.4 | 25.554 | 2.179 | 971.486 |
| 73 | 8.32 | 0 | 983.2 | 25.153 | 2.128 | 971.758 |
| 74 | 33.28 | 0 | 966.4 | 25.338 | 2.08 | 971.636 |
| 75 | 33.28 | 0 | 958.4 | 25.515 | 2.034 | 971.342 |
| 76 | 24.96 | 0 | 967.2 | 25.503 | 1.99 | 971.252 |
| 77 | 41.6 | 0 | 983.2 | 25.845 | 1.947 | 971.506 |
| 78 | 33.28 | 58.24 | 921.6 | 26 | 3.12 | 970.467 |
| 79 | 24.96 | 41.6 | 945.6 | 25.979 | 3.905 | 969.959 |
| 80 | 8.32 | 8.32 | 941.6 | 25.626 | 3.994 | 969.392 |
| 81 | 0 | 0 | 1000 | 25.123 | 3.915 | 969.992 |
| 82 | 108.16 | 0 | 916.8 | 26.72 | 3.84 | 968.969 |
| 83 | 24.96 | 0 | 975.2 | 26.687 | 3.768 | 969.087 |
| 84 | 8.32 | 24.96 | 972 | 26.347 | 4.16 | 969.141 |
| 85 | 0 | 0 | 986.4 | 25.868 | 4.084 | 969.455 |
| 86 | 24.96 | 0 | 991.2 | 25.851 | 4.011 | 969.843 |
| 87 | 33.28 | 0 | 950.4 | 25.982 | 3.941 | 969.502 |
| 88 | 16.64 | 16.64 | 966.4 | 25.821 | 4.16 | 969.448 |
| 89 | 16.64 | 0 | 975.2 | 25.665 | 4.089 | 969.546 |
| 90 | 0 | 0 | 992 | 25.237 | 4.021 | 969.92 |
| 91 | 0 | 0 | 1000 | 24.824 | 3.955 | 970.413 |
| 92 | 66.56 | 0 | 958.4 | 25.497 | 3.892 | 970.219 |
| 93 | 33.28 | 0 | 966.4 | 25.62 | 3.83 | 970.159 |
| 94 | 33.28 | 0 | 966.4 | 25.74 | 3.77 | 970.1 |
| 95 | 0 | 0 | 992 | 25.344 | 3.712 | 970.437 |
| 96 | 41.6 | 0 | 950.4 | 25.59 | 3.656 | 970.133 |
| 97 | 33.28 | 0 | 974.4 | 25.705 | 3.601 | 970.197 |
| 98 | 58.24 | 0 | 933.6 | 26.184 | 3.548 | 969.659 |
| 99 | 33.28 | 0 | 975.2 | 26.286 | 3.497 | 969.739 |
| 100 | 41.6 | 0 | 941.6 | 26.505 | 3.447 | 969.337 |
| 101 | 0 | 0 | 1000 | 26.132 | 3.398 | 969.769 |
| 102 | 91.52 | 0 | 916.8 | 27.04 | 3.351 | 969.033 |
| 103 | 24.96 | 0 | 983.2 | 27.012 | 3.305 | 969.227 |
| 104 | 16.64 | 0 | 975.2 | 26.871 | 3.261 | 969.308 |
| 105 | 41.6 | 0 | 967.2 | 27.068 | 3.217 | 969.28 |
| 106 | 16.64 | 0 | 991.2 | 26.931 | 3.175 | 969.568 |
| 107 | 58.24 | 0 | 933.6 | 27.337 | 3.134 | 969.101 |
| 108 | 33.28 | 0 | 958.4 | 27.413 | 3.093 | 968.964 |
| 109 | 24.96 | 0 | 966.4 | 27.382 | 3.054 | 968.932 |
| 110 | 41.6 | 0 | 975.2 | 27.56 | 3.016 | 969.01 |
| 111 | 74.88 | 0 | 925.6 | 28.144 | 2.979 | 968.474 |
| 112 | 16.64 | 0 | 983.2 | 28.004 | 2.942 | 968.654 |
| 113 | 16.64 | 0 | 983.2 | 27.867 | 2.907 | 968.829 |
| 114 | 33.28 | 0 | 975.2 | 27.931 | 2.872 | 968.905 |
| 115 | 8.32 | 16.64 | 966.4 | 27.701 | 3.034 | 968.875 |
| 116 | 16.64 | 0 | 983.2 | 27.572 | 2.999 | 969.042 |
| 117 | 49.92 | 0 | 950.4 | 27.829 | 2.965 | 968.828 |
| 118 | 24.96 | 0 | 983.2 | 27.796 | 2.931 | 968.991 |
| 119 | 16.64 | 0 | 983.2 | 27.671 | 2.898 | 969.151 |
| 120 | 0 | 0 | 984 | 27.364 | 2.866 | 969.316 |
| 121 | 0 | 0 | 1000 | 27.063 | 2.834 | 969.653 |
| 122 | 58.24 | 0 | 932.8 | 27.402 | 2.803 | 969.252 |
| 123 | 0 | 0 | 1000 | 27.107 | 2.773 | 969.583 |
| 124 | 49.92 | 0 | 967.2 | 27.35 | 2.744 | 969.557 |
| 125 | 41.6 | 0 | 958.4 | 27.5 | 2.715 | 969.44 |
| 126 | 24.96 | 0 | 966.4 | 27.473 | 2.687 | 969.408 |
| 127 | 41.6 | 0 | 975.2 | 27.619 | 2.659 | 969.468 |
| 128 | 24.96 | 0 | 966.4 | 27.592 | 2.632 | 969.437 |
| 129 | 58.24 | 0 | 950.4 | 27.901 | 2.605 | 969.244 |
| 130 | 16.64 | 0 | 983.2 | 27.789 | 2.579 | 969.384 |
| 131 | 49.92 | 0 | 941.6 | 28.008 | 2.554 | 969.109 |
| 132 | 41.6 | 0 | 958.4 | 28.141 | 2.529 | 969.004 |
| 133 | 24.96 | 0 | 975.2 | 28.11 | 2.504 | 969.064 |
| 134 | 58.24 | 0 | 941.6 | 28.4 | 2.48 | 968.8 |
| 135 | 8.32 | 0 | 958.4 | 28.209 | 2.456 | 968.701 |
| 136 | 33.28 | 0 | 975.2 | 28.257 | 2.433 | 968.762 |
| 137 | 0 | 0 | 1000 | 27.993 | 2.41 | 969.054 |
| 138 | 58.24 | 0 | 941.6 | 28.273 | 2.388 | 968.8 |
| 139 | 49.92 | 0 | 950.4 | 28.471 | 2.366 | 968.631 |
| 140 | 0 | 0 | 983.2 | 28.212 | 2.345 | 968.764 |
| 141 | 66.56 | 0 | 933.6 | 28.558 | 2.324 | 968.447 |
| 142 | 49.92 | 0 | 966.4 | 28.749 | 2.303 | 968.429 |
| 143 | 16.64 | 0 | 984 | 28.641 | 2.282 | 968.566 |
| 144 | 99.84 | 0 | 883.2 | 29.266 | 2.262 | 967.818 |
| 145 | 66.56 | 0 | 924.8 | 29.59 | 2.243 | 967.443 |
| 146 | 33.28 | 0 | 975.2 | 29.622 | 2.223 | 967.51 |
| 147 | 16.64 | 0 | 983.2 | 29.511 | 2.204 | 967.644 |
| 148 | 33.28 | 0 | 973.6 | 29.543 | 2.186 | 967.695 |
| 149 | 33.28 | 0 | 952 | 29.574 | 2.167 | 967.563 |
| 150 | 0 | 0 | 1000 | 29.328 | 2.149 | 967.833 |
| 151 | 49.92 | 16.64 | 924.8 | 29.498 | 2.269 | 967.478 |
| 152 | 0 | 0 | 983.2 | 29.256 | 2.25 | 967.607 |
| 153 | 74.88 | 0 | 942.4 | 29.627 | 2.232 | 967.402 |
| 154 | 33.28 | 0 | 966.4 | 29.657 | 2.214 | 967.394 |
| 155 | 33.28 | 0 | 950.4 | 29.686 | 2.196 | 967.258 |
| 156 | 0 | 0 | 983.2 | 29.45 | 2.179 | 967.384 |
| 157 | 49.92 | 0 | 975.2 | 29.611 | 2.162 | 967.446 |
| 158 | 24.96 | 0 | 974.4 | 29.575 | 2.145 | 967.5 |
| 159 | 24.96 | 0 | 950.4 | 29.539 | 2.128 | 967.367 |
| 160 | 58.24 | 0 | 958.4 | 29.76 | 2.112 | 967.298 |
| 161 | 41.6 | 0 | 952 | 29.85 | 2.096 | 967.182 |
| 162 | 16.64 | 0 | 981.6 | 29.75 | 2.08 | 967.291 |
| 163 | 0 | 0 | 1000 | 29.527 | 2.064 | 967.537 |
| 164 | 41.6 | 0 | 958.4 | 29.617 | 2.049 | 967.469 |
| 165 | 33.28 | 0 | 975.2 | 29.644 | 2.034 | 967.526 |
| 166 | 8.32 | 0 | 983.2 | 29.487 | 2.019 | 967.641 |
| 167 | 33.28 | 0 | 975.2 | 29.515 | 2.004 | 967.696 |
| 168 | 24.96 | 0 | 958.4 | 29.482 | 1.99 | 967.629 |
| 169 | 24.96 | 0 | 974.4 | 29.449 | 1.975 | 967.678 |
| 170 | 41.6 | 0 | 958.4 | 29.536 | 1.961 | 967.611 |
| 171 | 33.28 | 0 | 975.2 | 29.563 | 1.947 | 967.665 |
| 172 | 49.92 | 0 | 957.6 | 29.706 | 1.934 | 967.594 |
| 173 | 49.92 | 0 | 942.4 | 29.847 | 1.92 | 967.418 |
| 174 | 33.28 | 0 | 975.2 | 29.871 | 1.907 | 967.472 |
| 175 | 0 | 0 | 1000 | 29.665 | 1.894 | 967.697 |
| 176 | 24.96 | 0 | 958.4 | 29.633 | 1.881 | 967.633 |
| 177 | 41.6 | 0 | 967.2 | 29.714 | 1.868 | 967.63 |
| 178 | 33.28 | 0 | 974.4 | 29.738 | 1.855 | 967.676 |
| 179 | 8.32 | 0 | 992 | 29.595 | 1.843 | 967.839 |
| 180 | 8.32 | 0 | 966.4 | 29.453 | 1.83 | 967.829 |

The below graphs have X-axis to be from 1 to 150 seconds as we considered simulations after 30 seconds.

**RED – Scenario 2**

**DROPTAIL Scenario 2-**

**DROPTAIL Scenario 1**

**RED Scenario -1**