

## NETWORK SIMULATION NS-2 ASSIGNMENT

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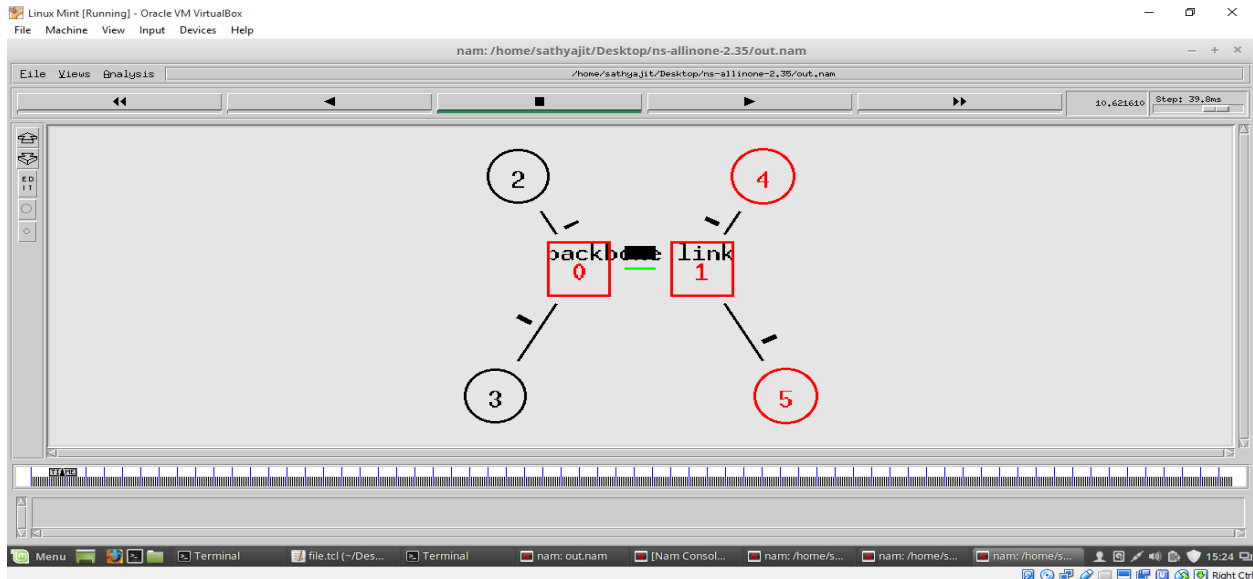
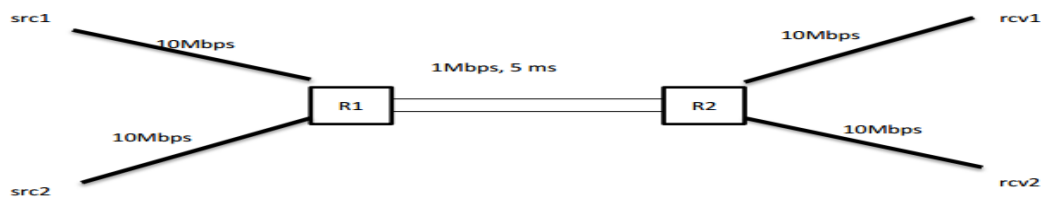
This is submitted as a part of ECEN 602 Network Simulation Assignment-1 (NS2 Familiarization).

Setup:

The following setup configuration was done on NAM.

Setup configuration:

- The routers, sources and receivers were set up using standard ns2 commands
- Duplex links were established with DropTail mechanism across the various nodes
- End to end delay between sources and routers was set up according to the test cases given in the problem statement
- RTTs were in a successive increasing ratio
- Simulation was run and animated using standard NAM tool for 400ms
- First 100ms was ignored and then throughput and relative throughput was tabulated



Router R1: 0, Router R2: 1, Source1: 2, Source2: 3, Receiver1: 4, Receiver2: 5

**Part (a) of Report: For each of the TCP flavors, make a table of the simulation cases and the relative throughput ratio.**

**TCP: SACK**

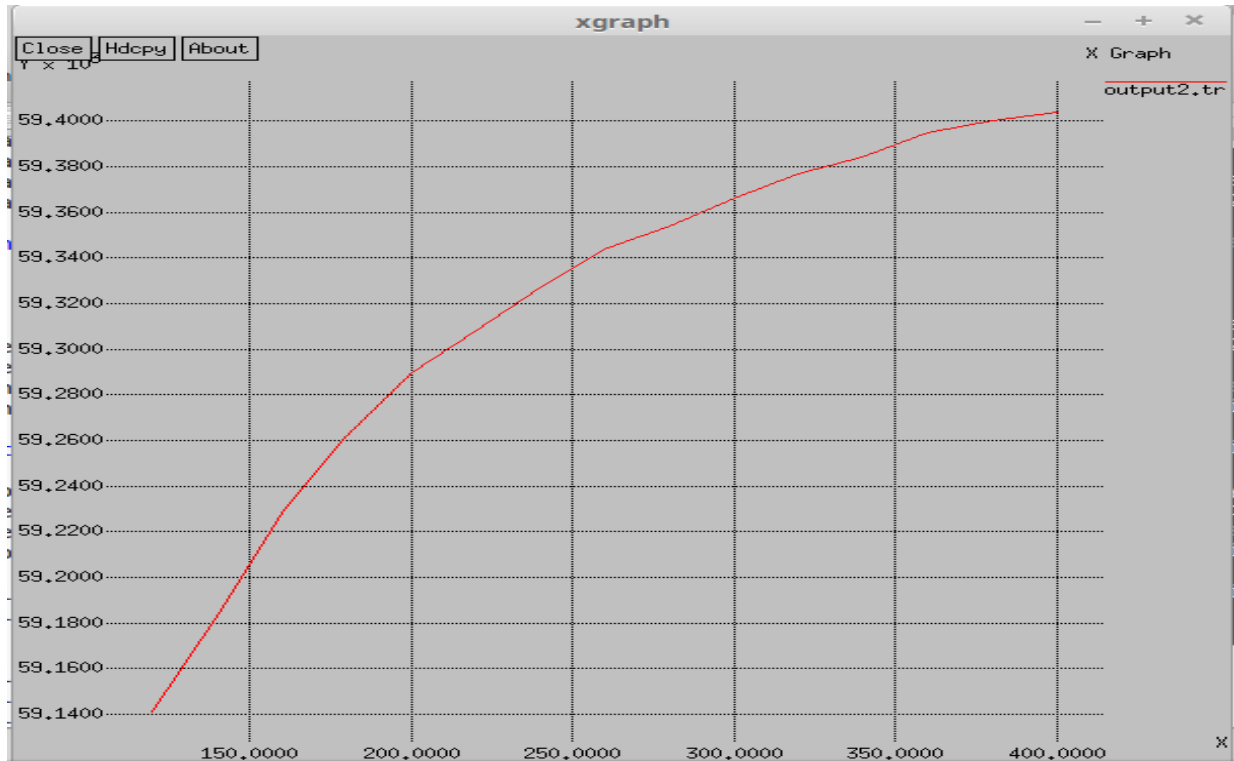
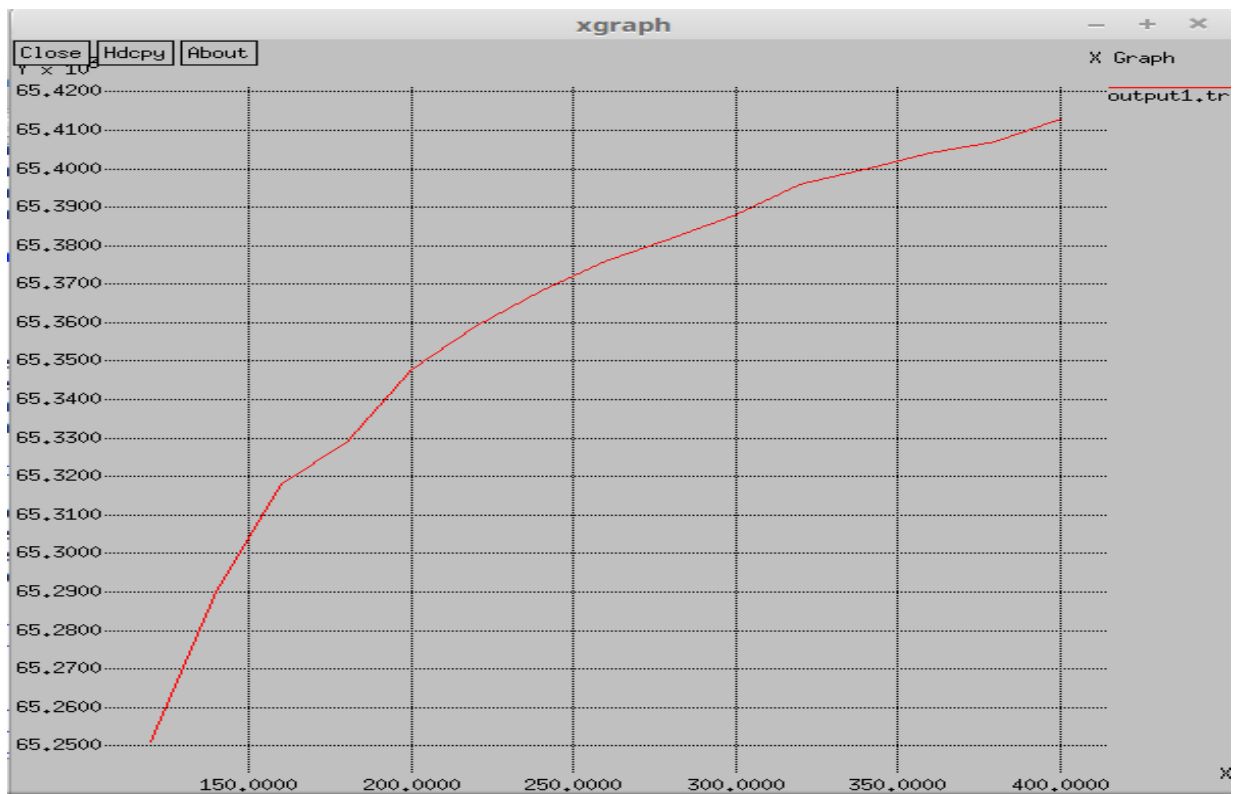
**Final Result:**

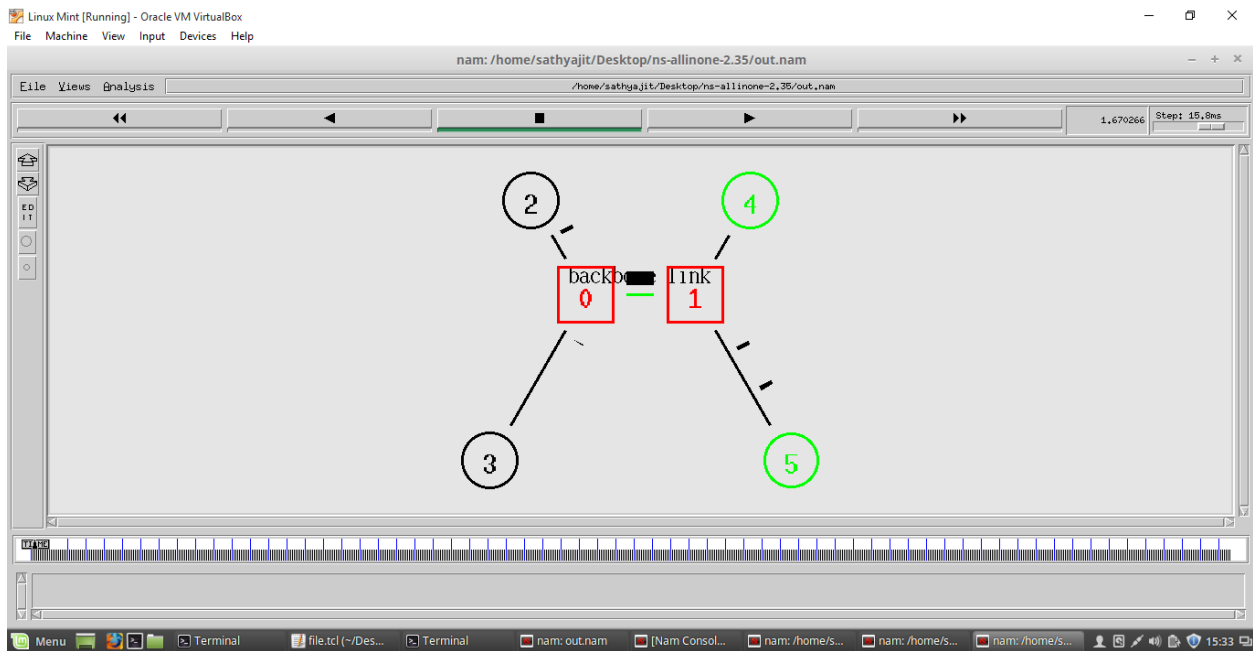
Cases	Throughput Ratio
Case1	1.1019
Case2	1.204205
Case3	1.305996

**Case1 Results:**

Throughput1*100000	Throughput2*100000	Ratio
65251	59141	1.103312
65290	59183	1.103188
65318	59228	1.102823
65329	59262	1.102376
65348	59290	1.102176
65359	59308	1.102027
65368	59327	1.101825
65376	59344	1.101645
65382	59354	1.10156
65388	59366	1.101439
65396	59377	1.101369
65400	59384	1.101307
65404	59395	1.10117
65407	59400	1.101128
65413	59404	1.101155
		1.1019

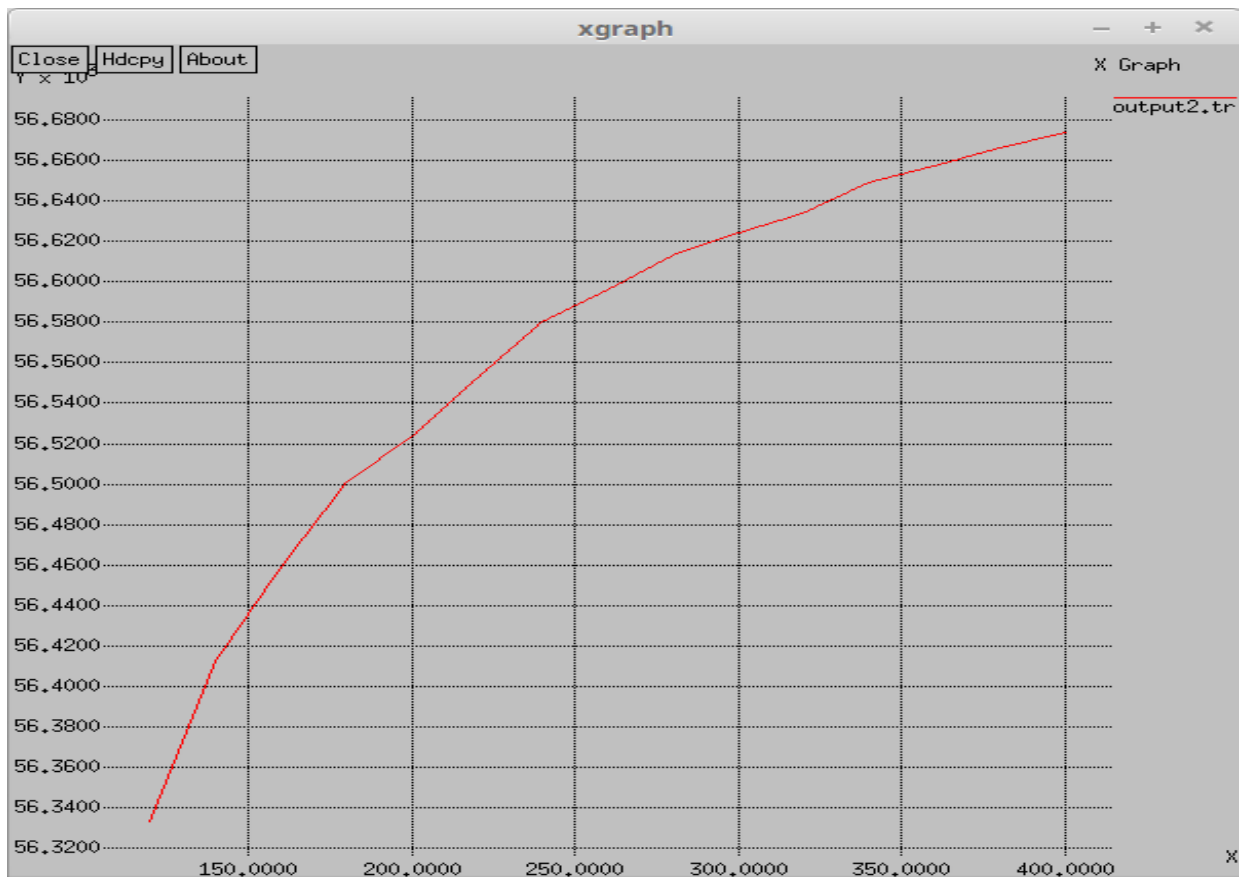
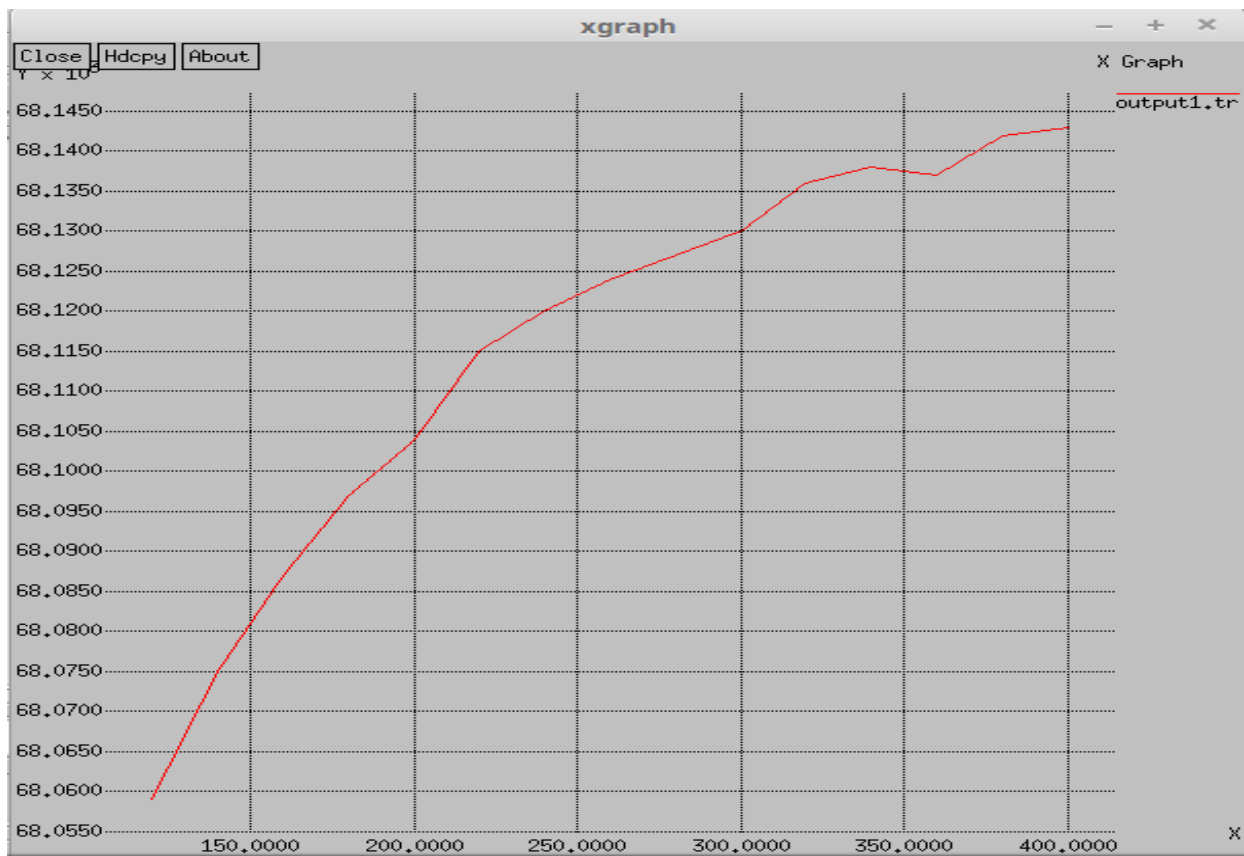
The following are the XGRAPH results for case1 SACK.

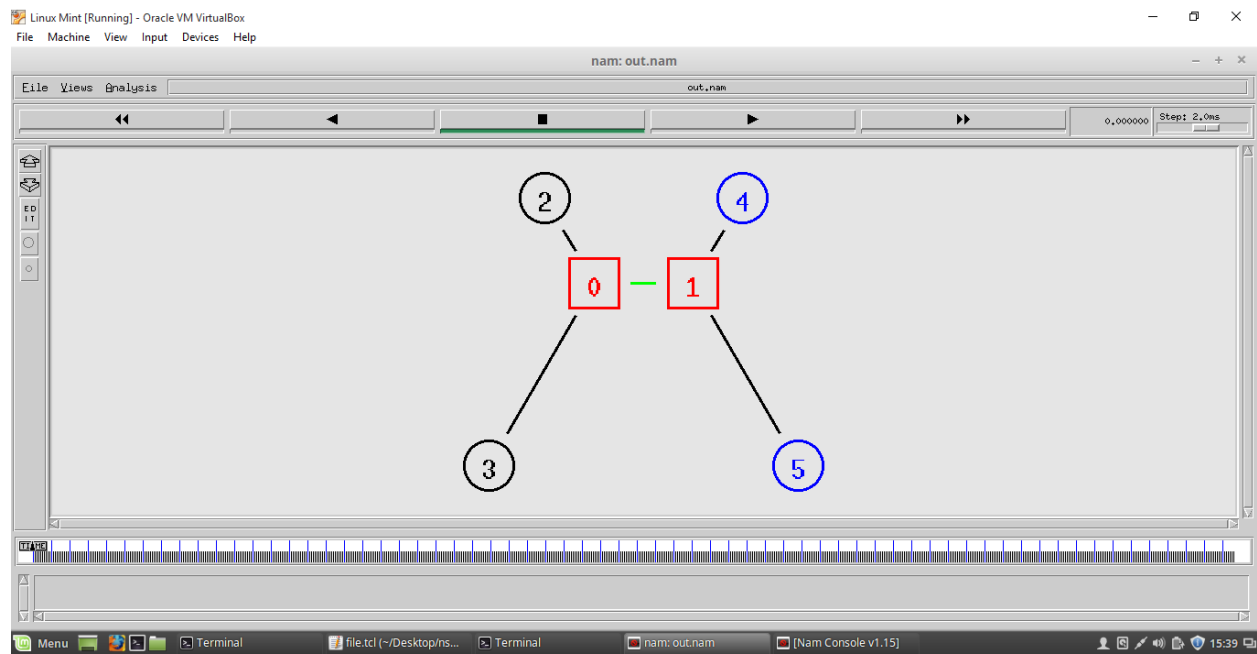




## Case2 Results:

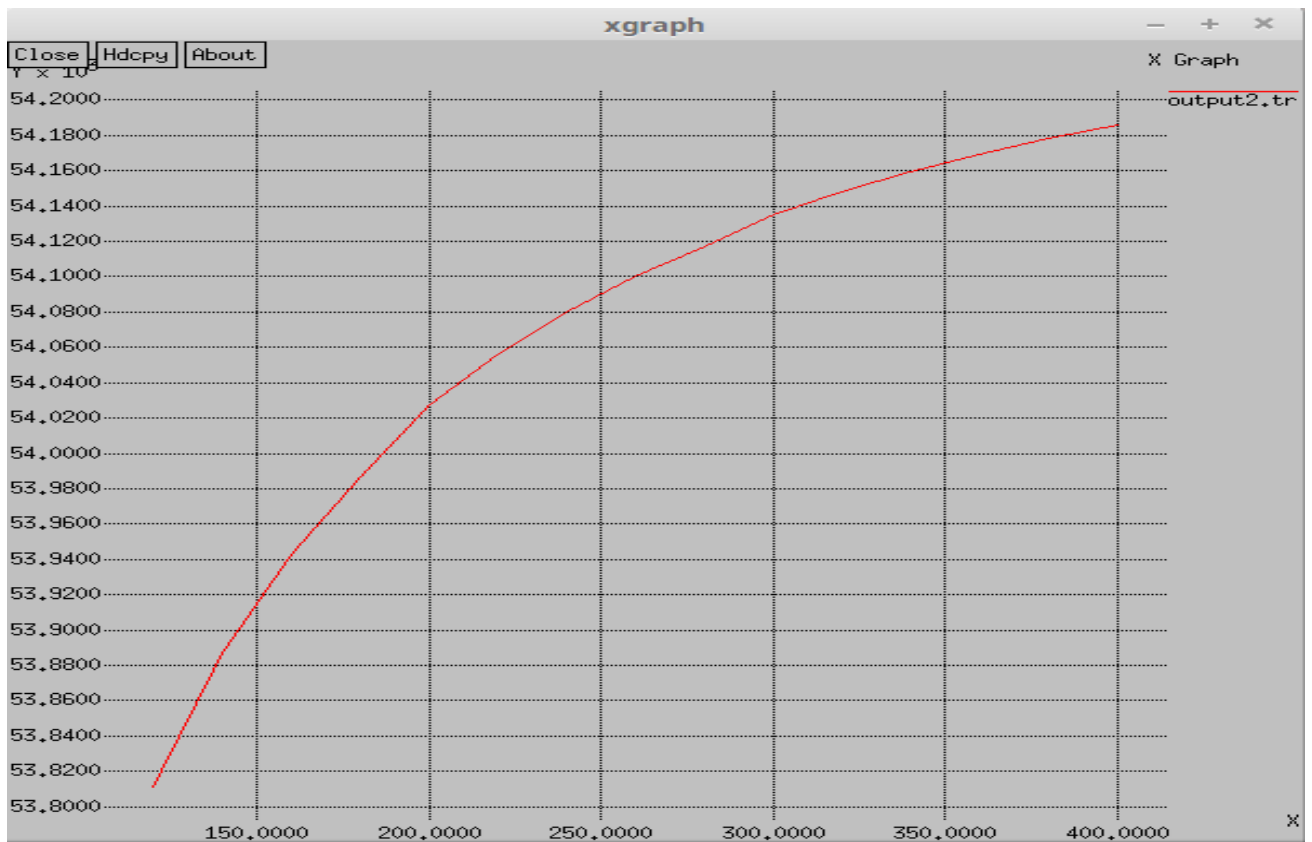
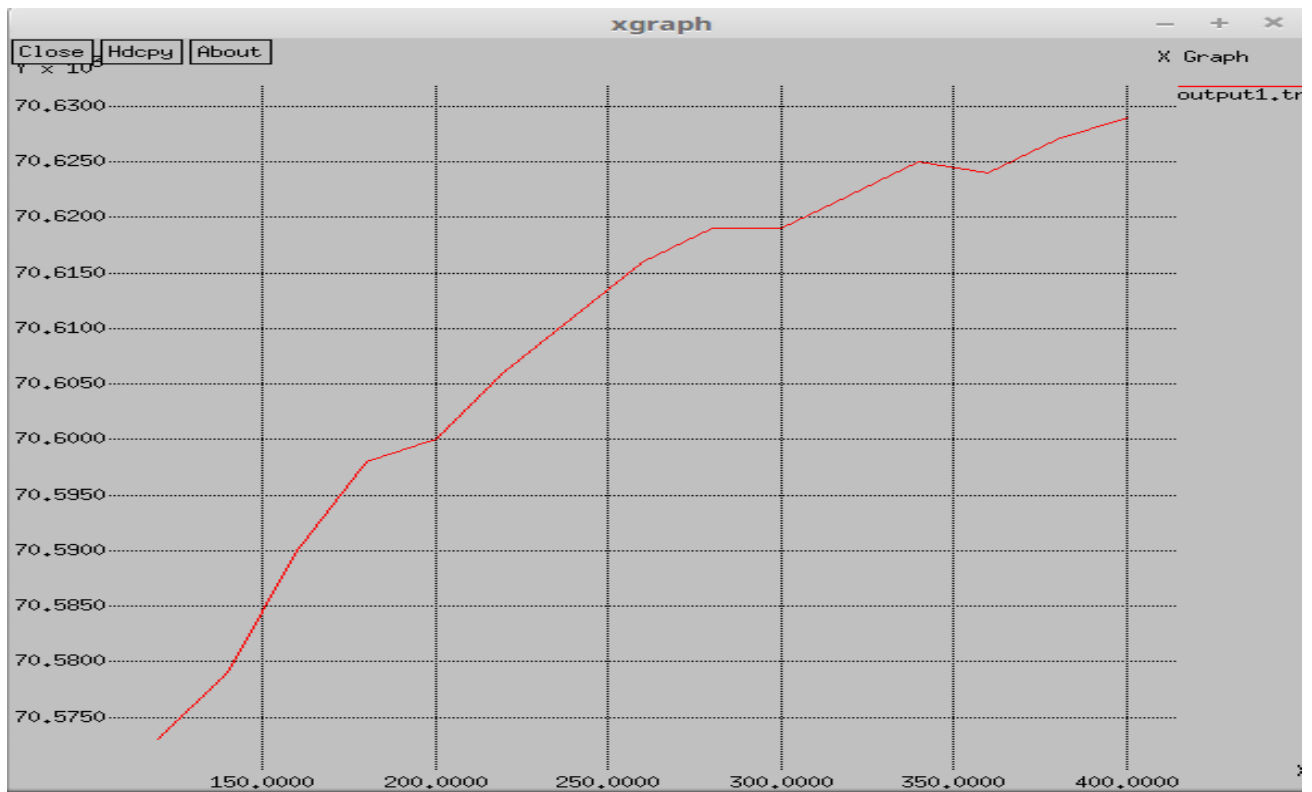
Throughput1*100000	Throughput2*100000	Ratio
68059	56333	1.208155
68075	56412	1.206747
68087	56459	1.205955
68097	56501	1.205235
68104	56524	1.204869
68115	56552	1.204467
68120	56580	1.203959
68124	56596	1.203689
68127	56613	1.203381
68130	56624	1.2032
68136	56634	1.203094
68138	56649	1.20281
68137	56657	1.202623
68142	56666	1.20252
68143	56674	1.202368
		1.204205





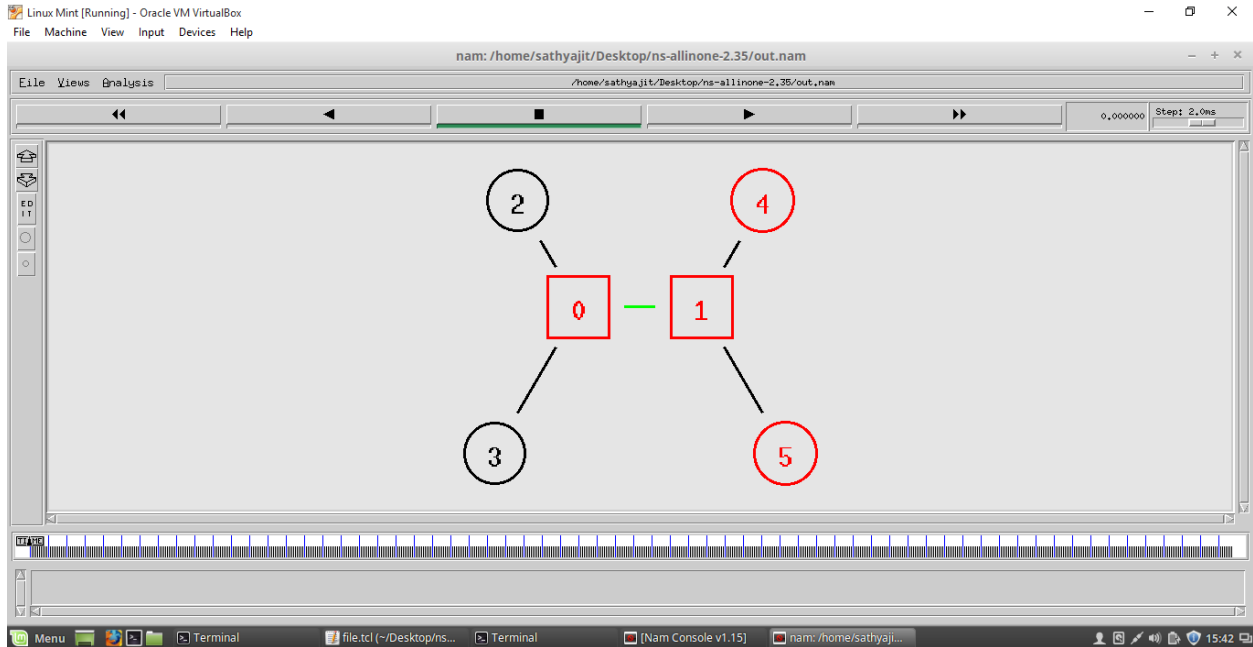
### Case 3 Results:

Throughput1*100000	Throughput2*100000	Ratio
70573	53811	1.311498
70579	53887	1.309759
70590	53943	1.308604
70598	53987	1.307685
70600	54028	1.30673
70606	54056	1.306164
70611	54080	1.305677
70616	54100	1.305287
70619	54117	1.304932
70619	54135	1.304498
70622	54148	1.30424
70625	54159	1.304031
70624	54169	1.303772
70627	54178	1.30361
70629	54186	1.303455
		1.305996



## TCP: VEGAS

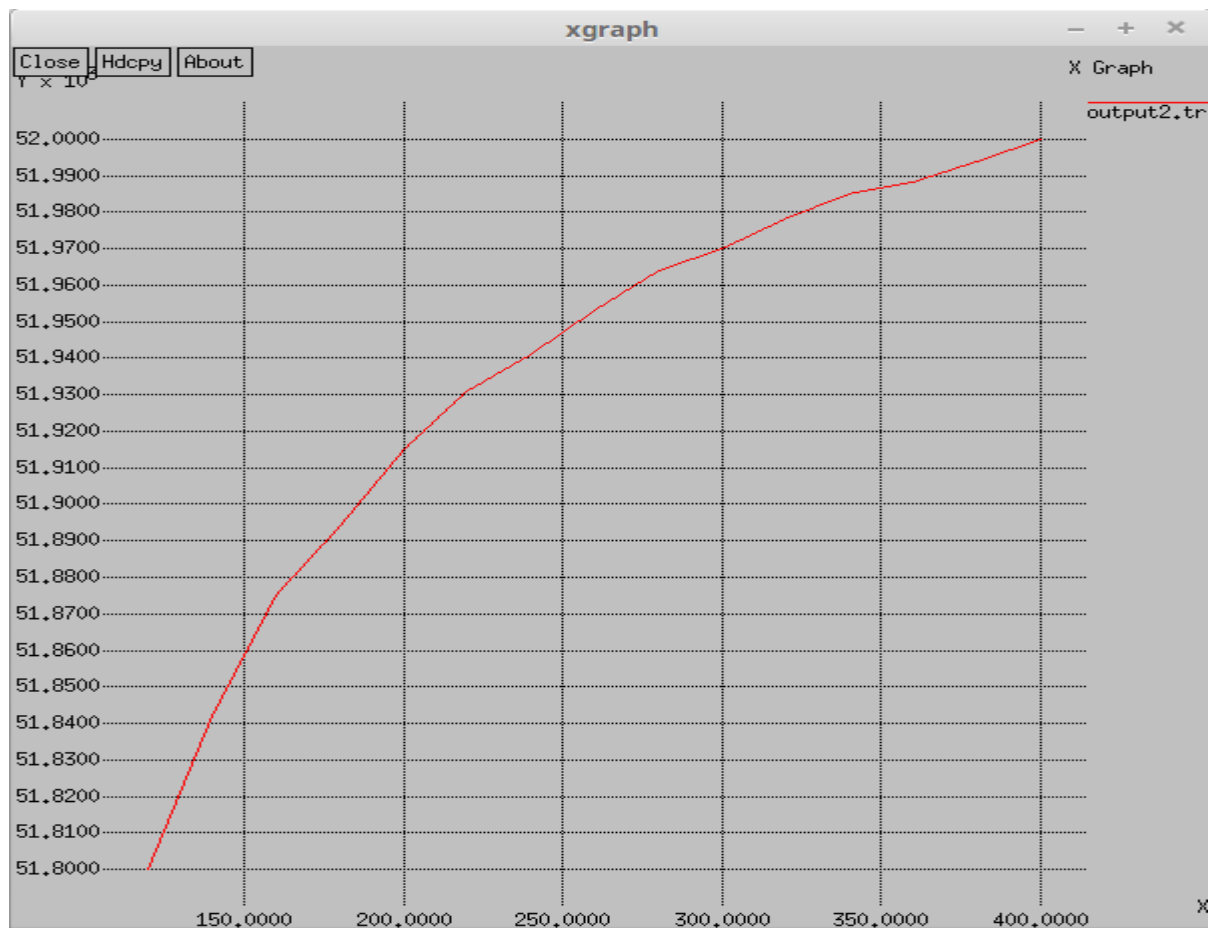
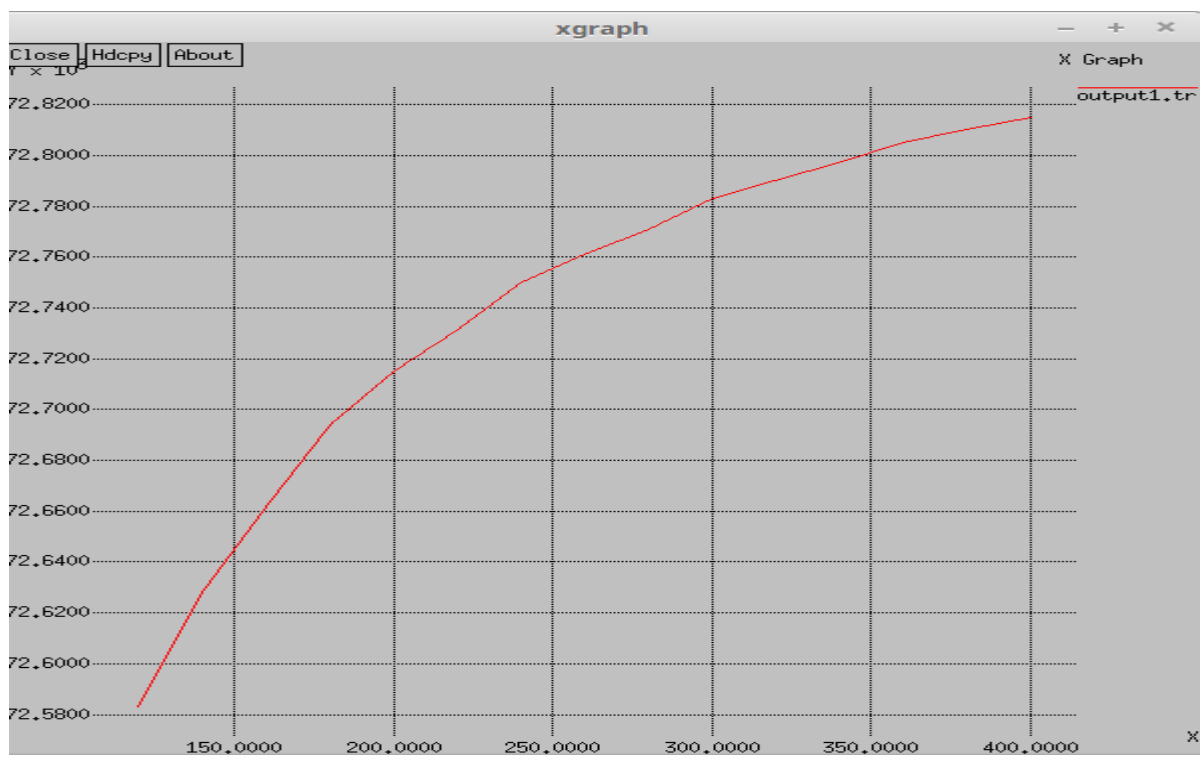
Cases	Throughput Ratio
Case1	1.400582
Case2	2.203191
Case3	3.004107

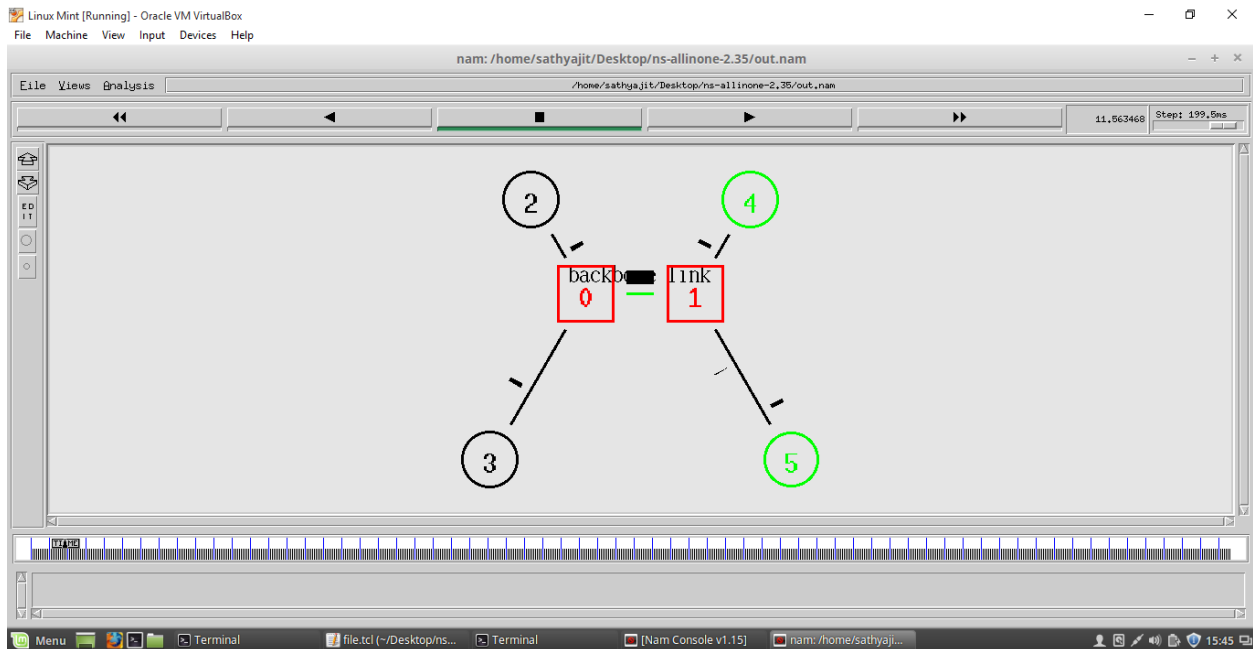


## Case1 Results:

Throughput1*100000	Throughput2*100000	Ratio
72583	51800	1.401216
72628	51842	1.400949
72662	51875	1.400713
72694	51894	1.400817
72715	51915	1.400655
72731	51931	1.400531
72750	51941	1.400628
72761	51953	1.400516
72771	51964	1.400412
72783	51970	1.400481
72790	51978	1.4004
72797	51985	1.400346
72805	51988	1.400419
72810	51994	1.400354
72815	52000	1.400288
		1.400582

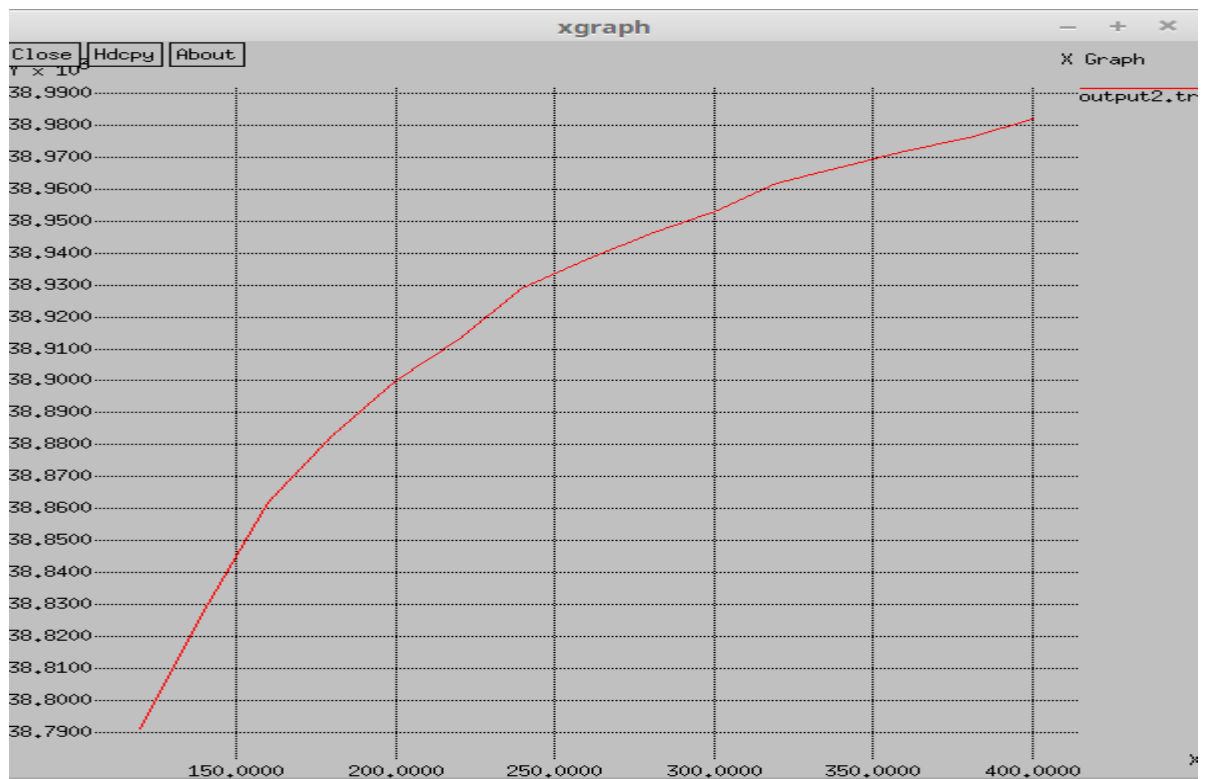
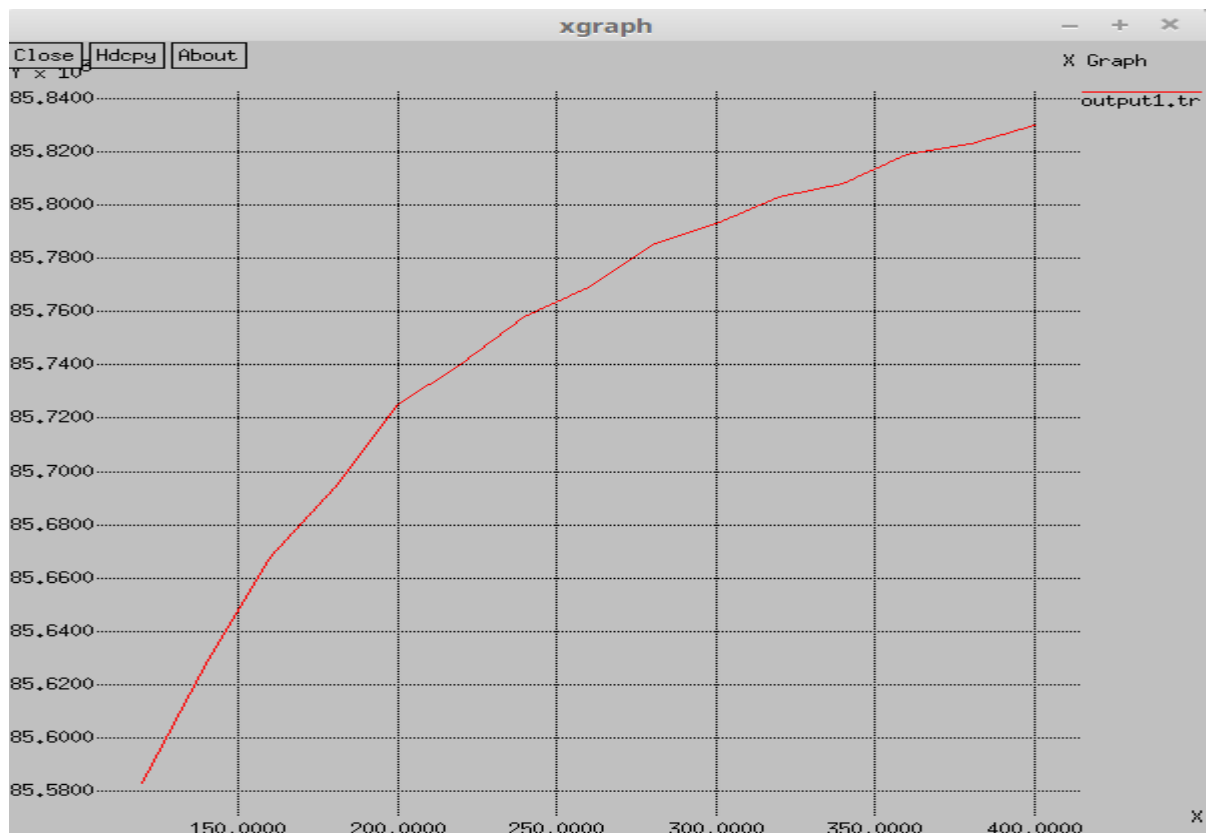


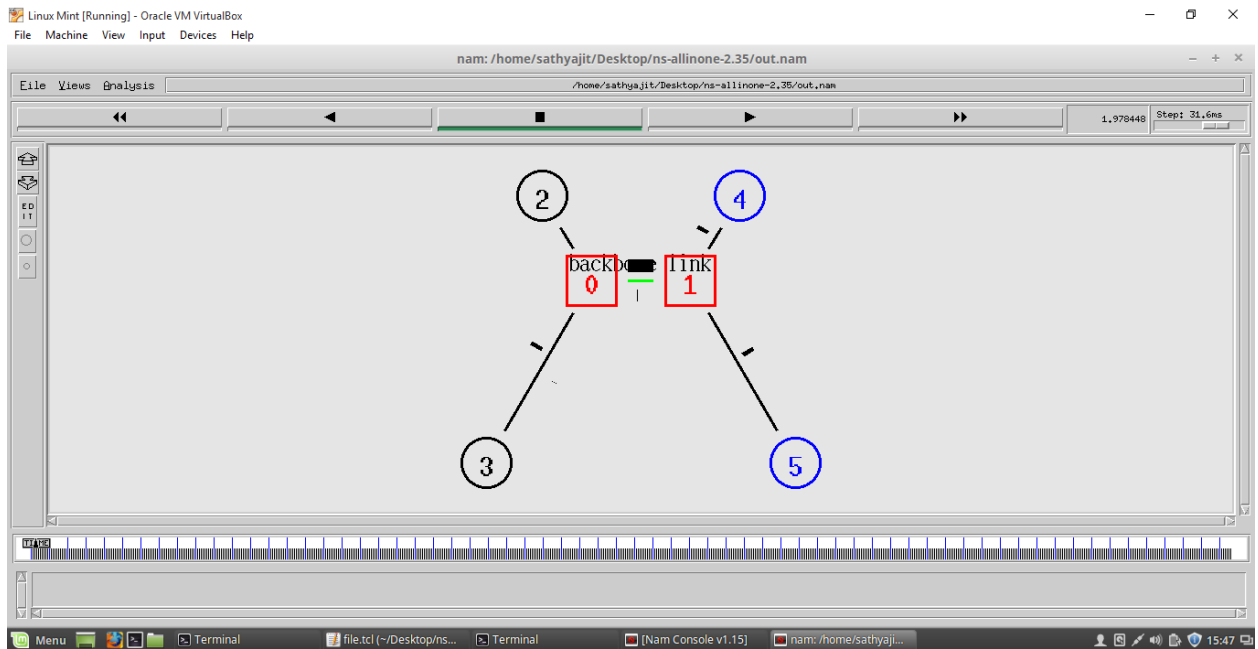




## Case2 Results:

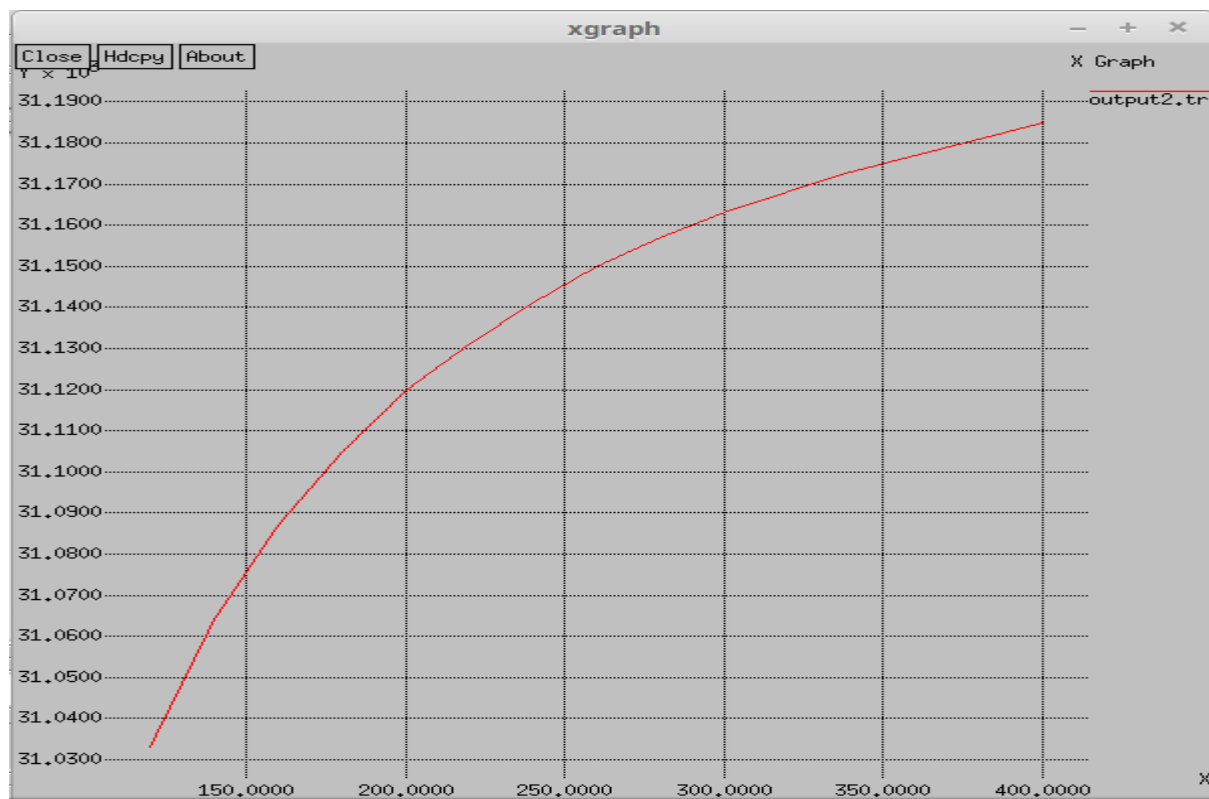
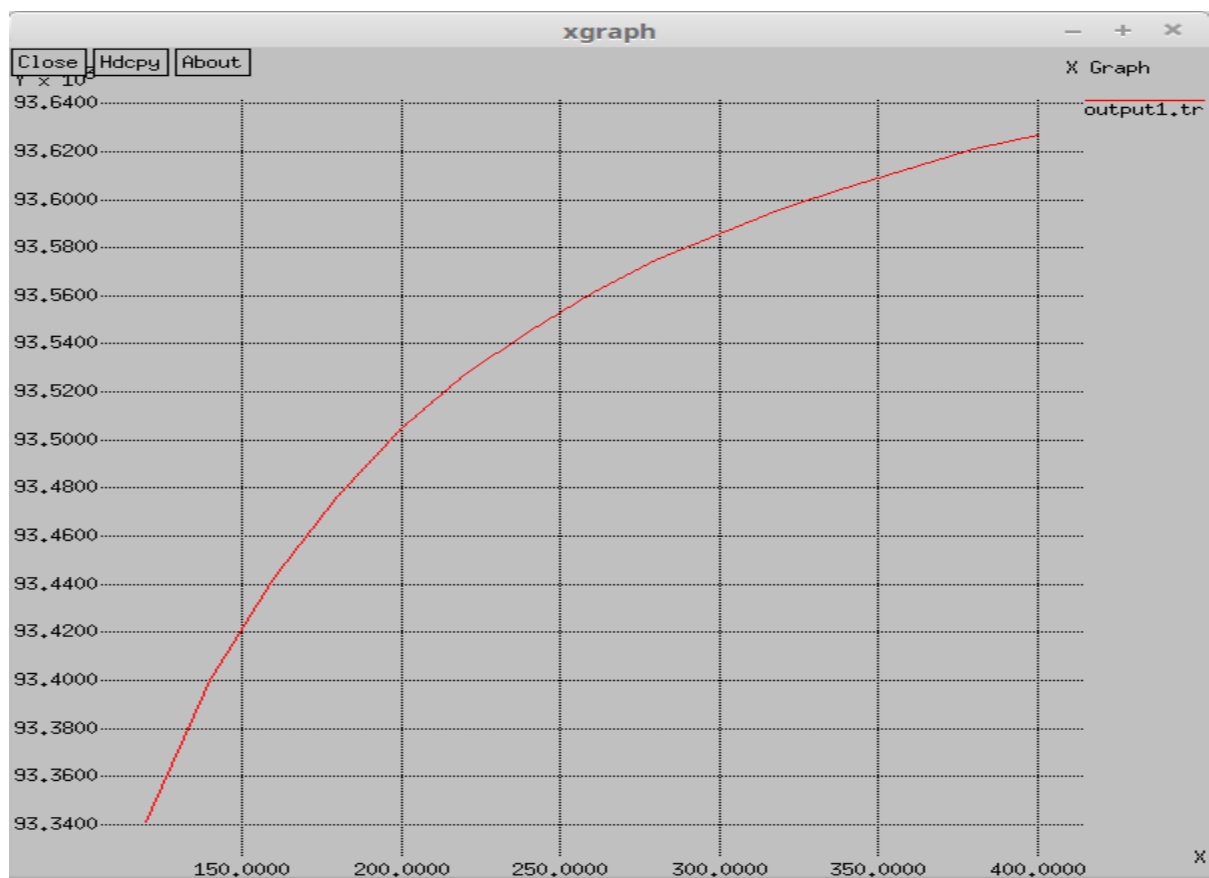
Throughput1*100000	Throughput2*100000	Ratio
85583	38791	2.206259
85628	38828	2.205316
85668	38862	2.204416
85694	38883	2.203894
85725	38900	2.203728
85740	38913	2.203377
85758	38929	2.202934
85769	38938	2.202707
85785	38946	2.202665
85793	38953	2.202475
85803	38962	2.202223
85808	38967	2.202068
85819	38972	2.202068
85823	38976	2.201945
85830	38982	2.201785
		2.203191





### Case3 Results:

Throughput1*100000	Throughput2*100000	Ratio
93341	31033	3.007798
93400	31064	3.006696
93443	31087	3.005855
93477	31105	3.005208
93505	31120	3.004659
93527	31131	3.004304
93545	31141	3.003918
93561	31150	3.003563
93575	31157	3.003338
93586	31163	3.003113
93596	31168	3.002952
93605	31173	3.002759
93613	31177	3.00263
93621	31181	3.002502
93627	31185	3.002309
		3.004107



**Part (b) of the Report Requirement:**

**Which is better and why?**

Answer: We can observe that as the ratio of RTT increases, the relative ratio of the throughput also increases for both TCP SACK and TCP VEGAS.

The increase in the ratio of throughput in TCP VEGAS is higher compared to TCP SACK for the same increase in RTT ratio.

Obviously, referring to the tables above, TCP VEGAS performs better.

Choosing case1 as the reference, the relative ratio of throughput for TCP SACK is 1.10 and for VEGAS it is 1.4.

Though the second FTP transfer has a higher throughput for TCP SACK (59%) than TCP VEGAS (54%), it is only 5% lesser. But the first FTP transfer has a much higher throughput for TCP VEGAS (72.8%) to TCP SACK (65.4%), which is 7.2% higher.

Choosing case3 as reference, we see that TCP VEGAS has a throughput of almost 100% for the first FTP transfer, which is a lot better compared to TCP SACK.