NS-2 Simulation

Achintya Nath

20114003

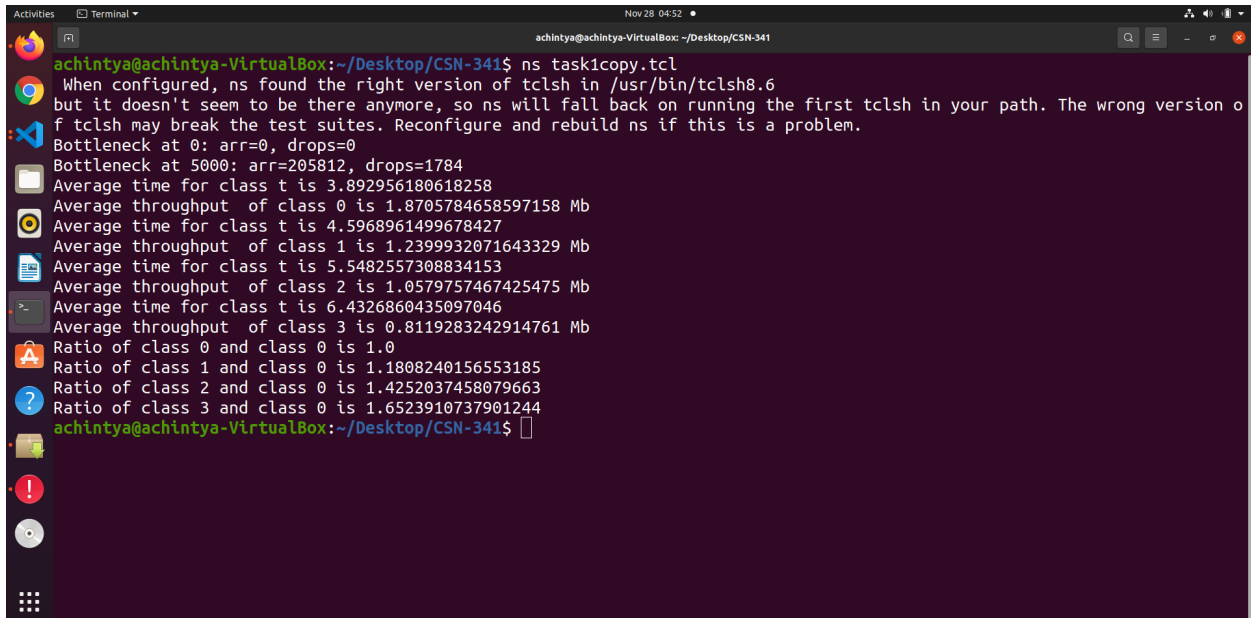The github link to the project is
https://github.com/achintyanath/CSN-341_Network_Simulator

Task 1

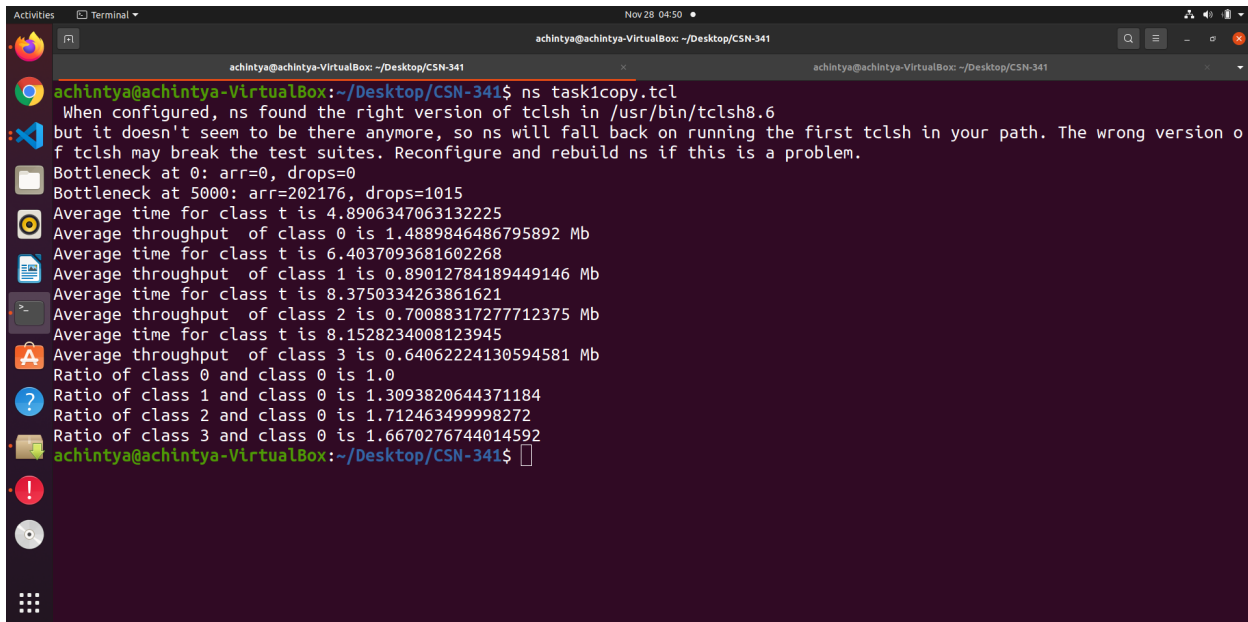We stimulate our result for five different values of p
1. p=0.1%


```
Average time for class 0 is 3.892956180618258
Average throughput  of class 0 is 1.8705784658597158 Mb
Average time for class 1 is 4.5968961499678427
Average throughput  of class 1 is 1.2399932071643329 Mb
Average time for class 2 is 5.5482557308834153
Average throughput  of class 2 is 1.0579757467425475 Mb
Average time for class 3 is 6.4326860435097046
Average throughput  of class 3 is 0.8119283242914761 Mb
Ratio of class 0 and class 0 is 1.0
Ratio of class 1 and class 0 is 1.1808240156553185
Ratio of class 2 and class 0 is 1.4252037458079663
Ratio of class 3 and class 0 is 1.6523910737901244
```
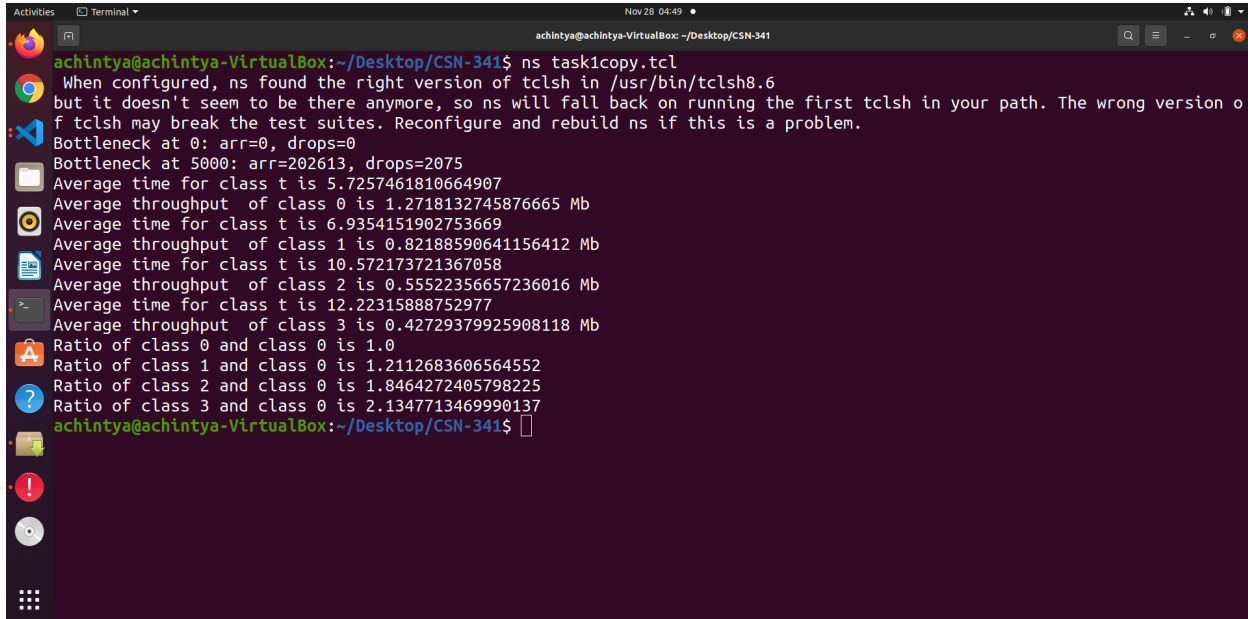
2. p=0.5%


```
Average time for class t is 4.8906347063132225
Average throughput  of class 0 is 1.4889846486795892 Mb
Average time for class t is 6.4037093681602268
Average throughput  of class 1 is 0.89012784189449146 Mb
Average time for class t is 8.3750334263861621
Average throughput  of class 2 is 0.70088317277712375 Mb
Average time for class t is 8.1528234008123945
Average throughput  of class 3 is 0.64062224130594581 Mb

Ratio of class 0 and class 0 is 1.0
Ratio of class 1 and class 0 is 1.3093820644371184
Ratio of class 2 and class 0 is 1.712463499998272
Ratio of class 3 and class 0 is 1.6670276744014592
```
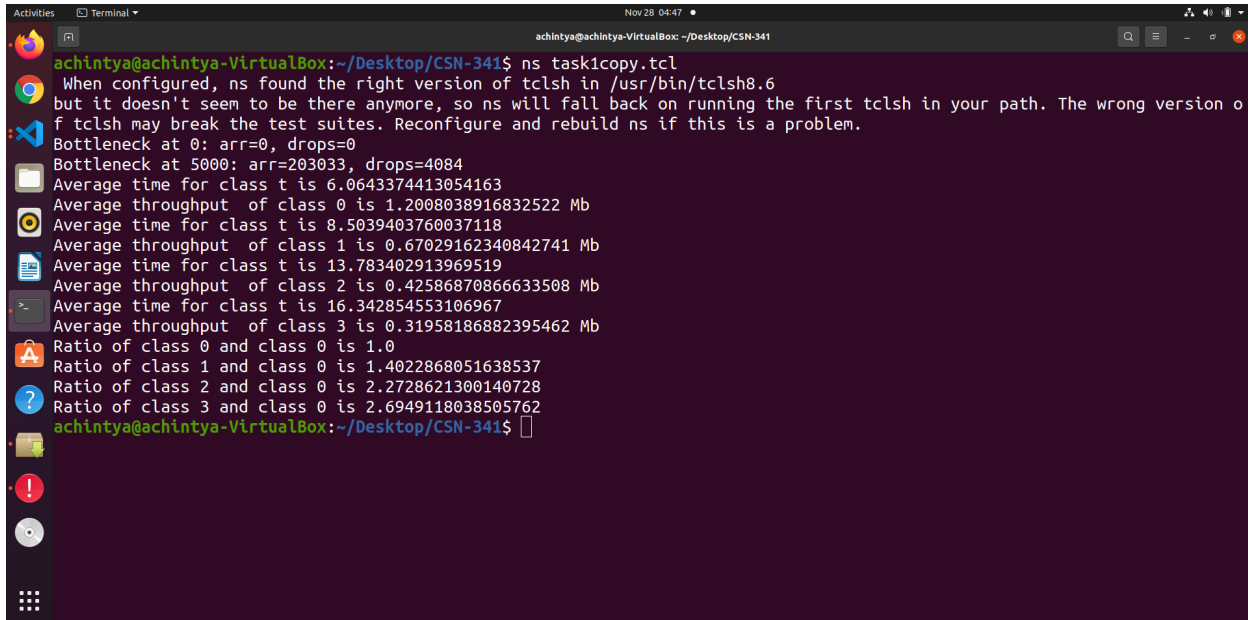
3. p=1%


```
Average time for class 0 is 5.7257461810664907
Average throughput  of class 0 is 1.2718132745876665 Mb
Average time for class 1 is 6.9354151902753669
Average throughput  of class 1 is 0.82188590641156412 Mb
Average time for class 2 is 10.572173721367058
Average throughput  of class 2 is 0.55522356657236016 Mb
Average time for class 3 is 12.22315888752977
Average throughput  of class 3 is 0.42729379925908118 Mb

Ratio of class 0 and class 0 is 1.0
Ratio of class 1 and class 0 is 1.2112683606564552
Ratio of class 2 and class 0 is 1.8464272405798225
Ratio of class 3 and class 0 is 2.1347713469990137
```
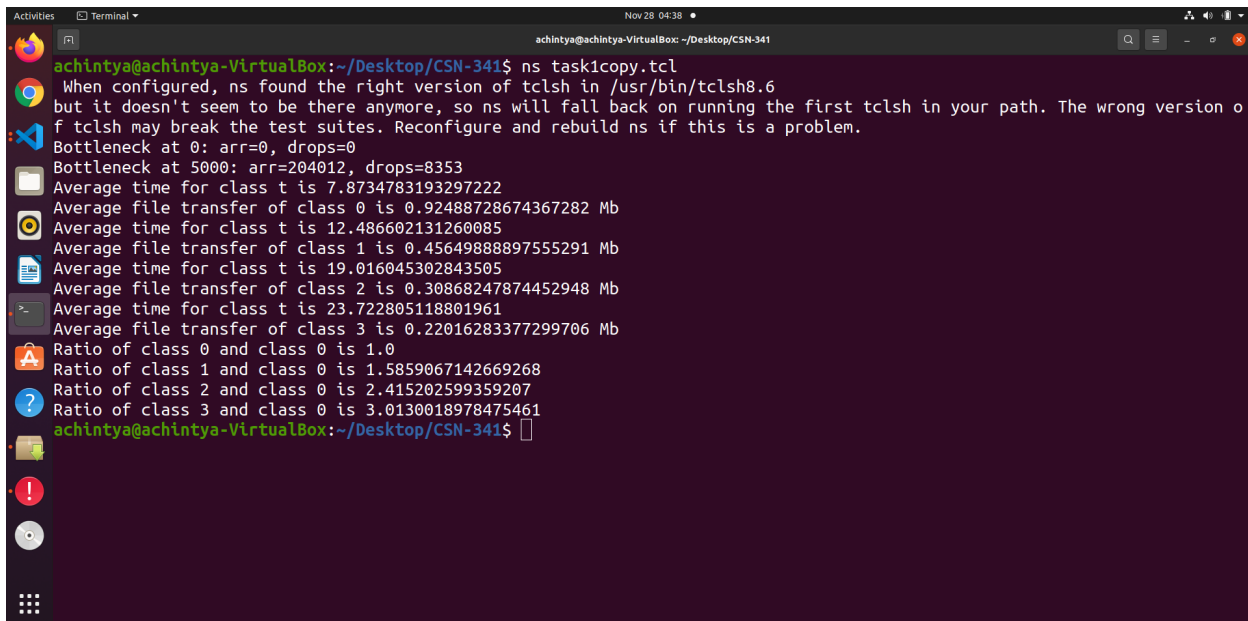
4. p=2%

Average time for class 0 is 6.0643374413054163

Average throughput of class 0 is 1.2008038916832522 Mb

Average time for class 1 is 8.5039403760037118

Average throughput of class 1 is 0.67029162340842741 Mb

Average time for class 2 is 13.783402913969519

Average throughput of class 2 is 0.42586870866633508 Mb

Average time for class 3 is 16.342854553106967

Average throughput of class 3 is 0.31958186882395462 Mb

Ratio of class 0 and class 0 is 1.0

Ratio of class 1 and class 0 is 1.4022868051638537

Ratio of class 2 and class 0 is 2.2728621300140728

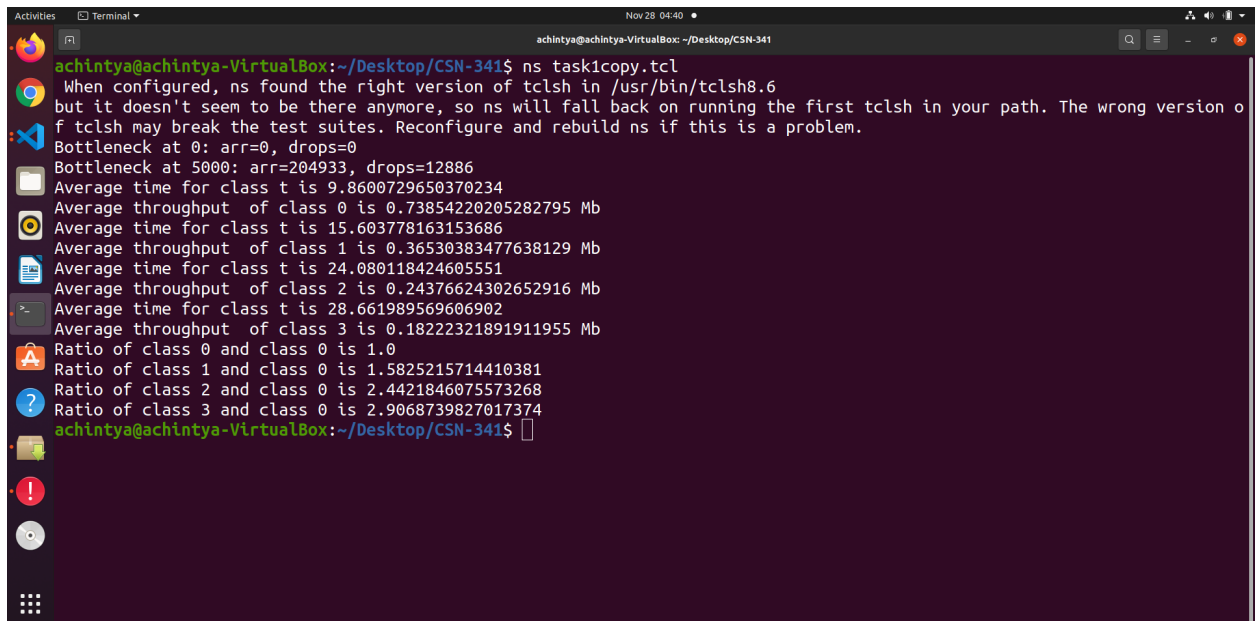Ratio of class 3 and class 0 is 2.6949118038505762

5. p=4%


```
Average time for class 0 is 7.8734783193297222
Average file transfer of class 0 is 0.92488728674367282 Mb
Average time for class 1 is 12.486602131260085
Average file transfer of class 1 is 0.45649888897555291 Mb
Average time for class 2 is 19.016045302843505
Average file transfer of class 2 is 0.30868247874452948 Mb
Average time for class 3 is 23.722805118801961
Average file transfer of class 3 is 0.22016283377299706 Mb

Ratio of class 0 and class 0 is 1.0
Ratio of class 1 and class 0 is 1.5859067142669268
Ratio of class 2 and class 0 is 2.415202599359207
Ratio of class 3 and class 0 is 3.0130018978475461
```
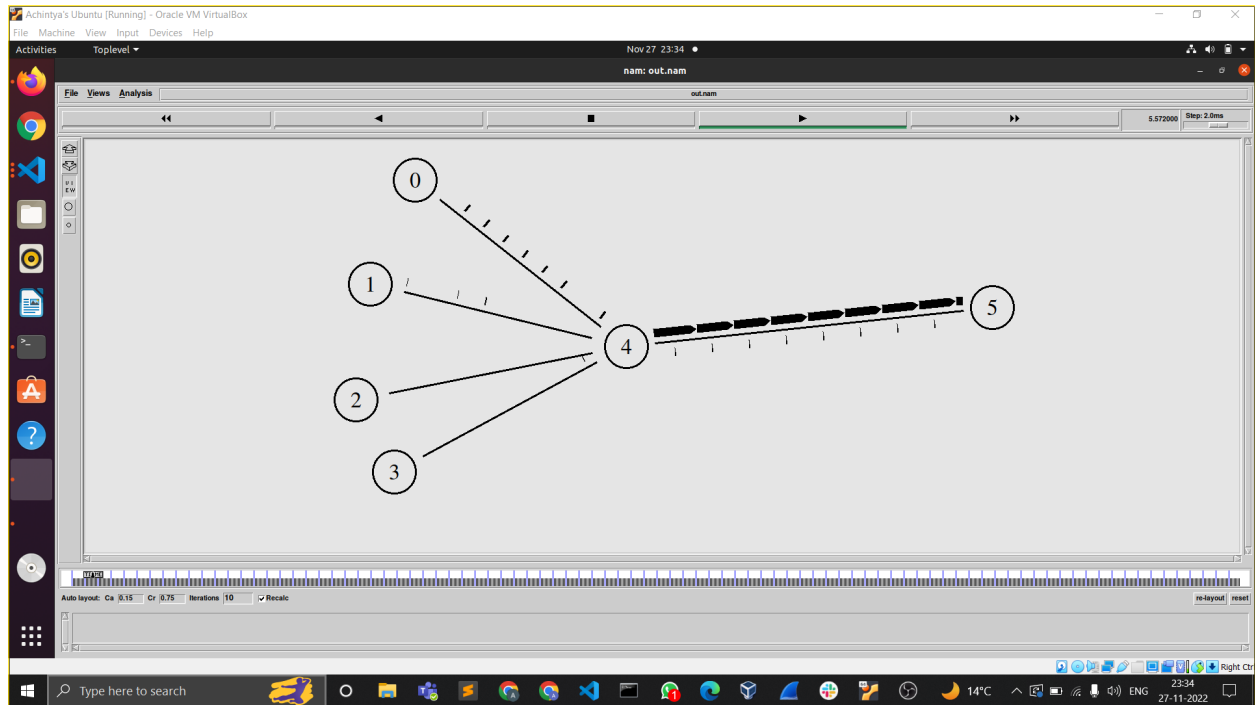
6. p=5%


```
Average time for class 0 is 9.8600729650370234
Average throughput  of class 0 is 0.73854220205282795 Mb
Average time for class 1 is 15.603778163153686
Average throughput  of class 1 is 0.36530383477638129 Mb
Average time for class 2 is 24.080118424605551
Average throughput  of class 2 is 0.24376624302652916 Mb
Average time for class 3 is 28.661989569606902
Average throughput  of class 3 is 0.18222321891911955 Mb

Ratio of class 0 and class 0 is 1.0
Ratio of class 1 and class 0 is 1.5825215714410381
Ratio of class 2 and class 0 is 2.4421846075573268
Ratio of class 3 and class 0 is 2.9068739827017374
```
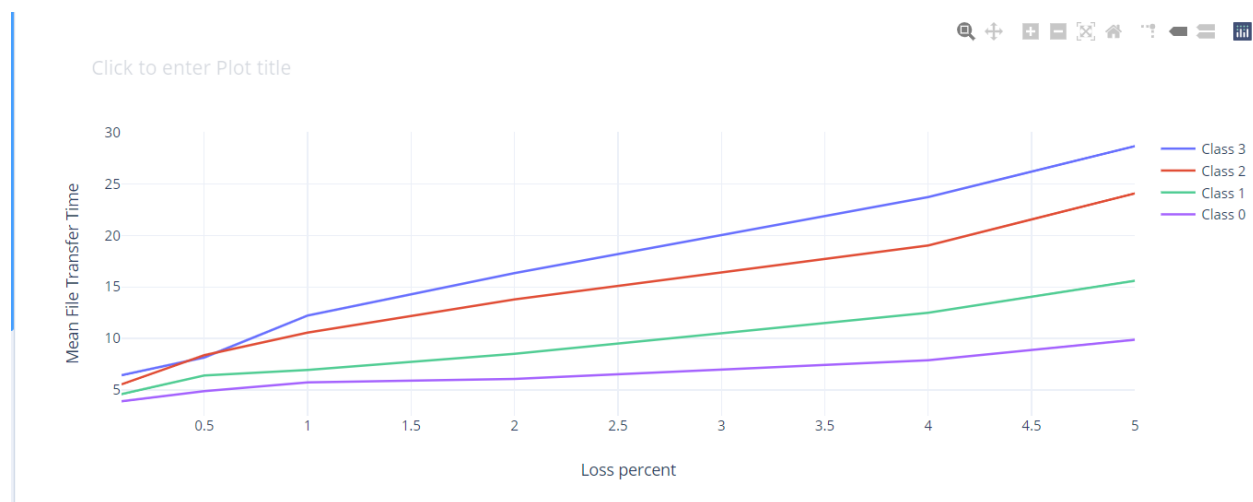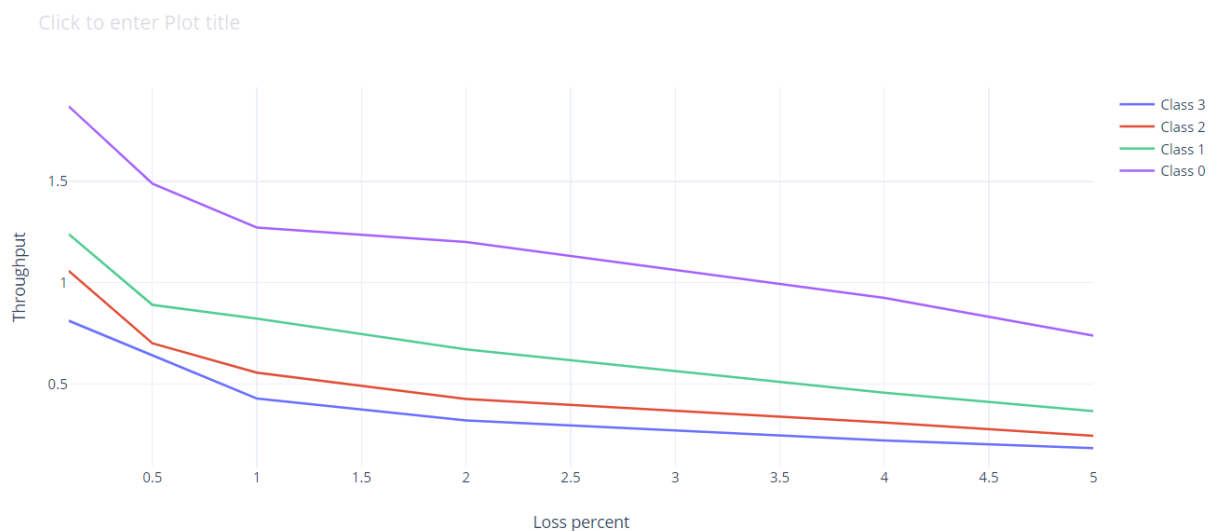
Screenshot of simulation:

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Graph:
Mean-Time vs Loss Rate

As we can see from the graph that the mean file transfer size keeps on increasing with increase in loss rate. At a certain loss rate, the mean file transfer size is minimum for Class 0 and Highest for Class 1

As we can see from the graph that the throughput keeps on decreasing with increase in loss rate. At a certain loss rate, the throughput is minimum for Class 3 and Highest for Class 0.
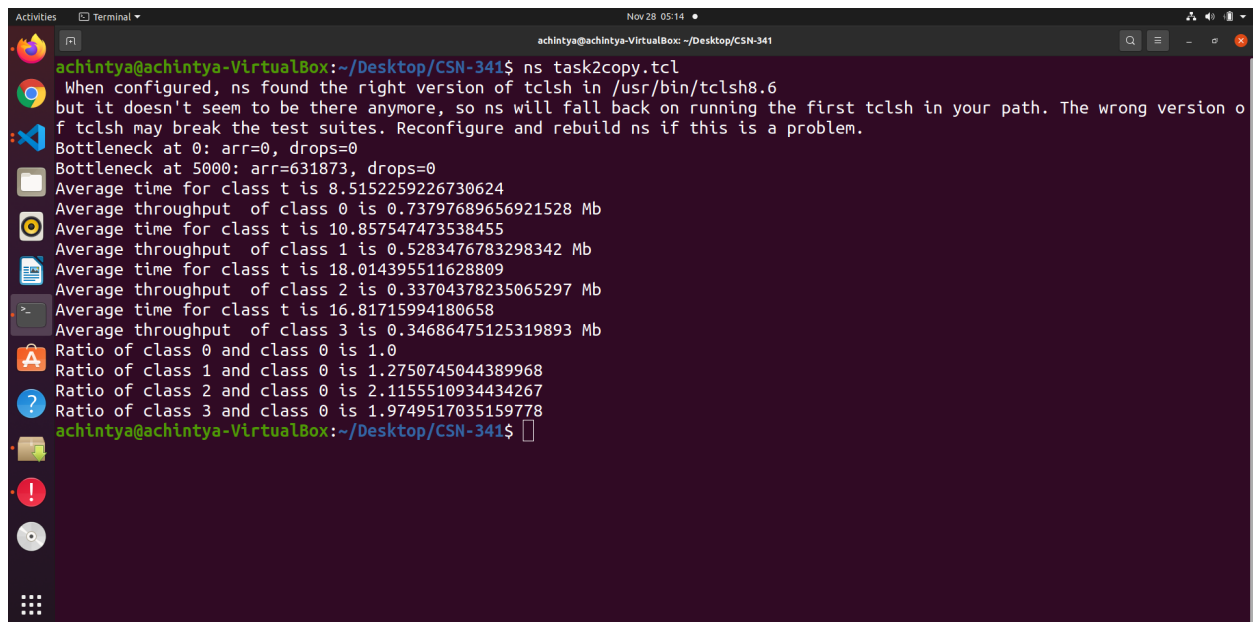
Video Stimulation can be found in the Github Repository

Task 2

The video demonstration can be found at the repo
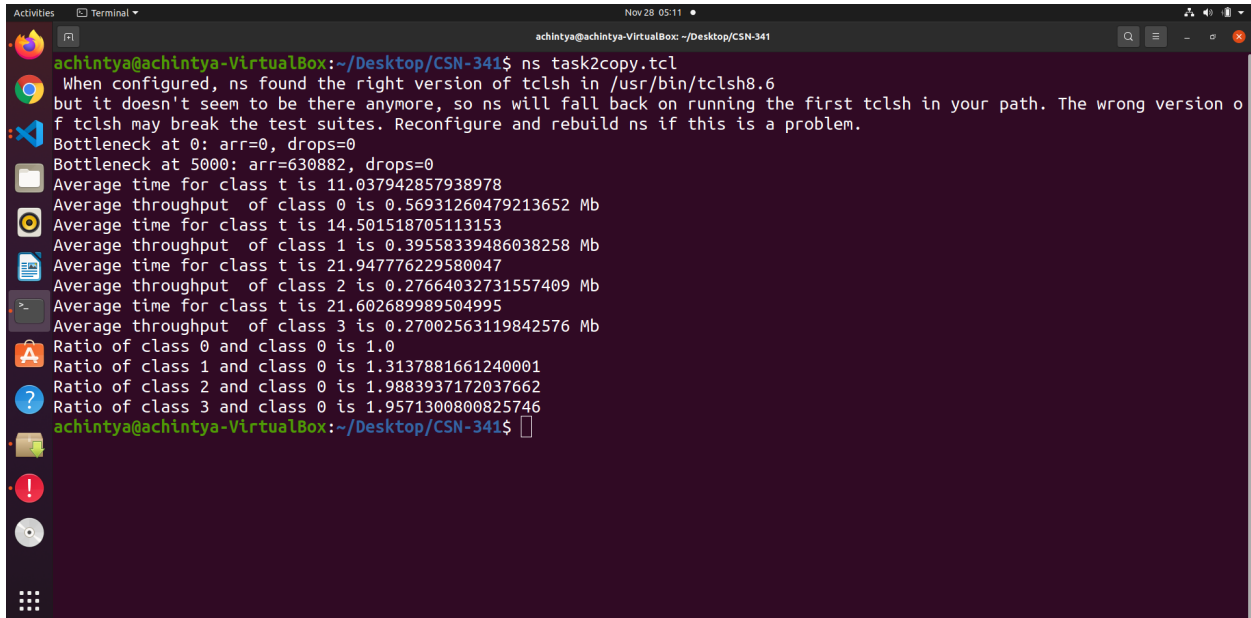
We have to calculate for load value:

l=0.7


```
Average time for class 0 is 8.5152259226730624s
Average throughput  of class 0 is 0.73797689656921528 Mb
Average time for class 1 is 10.857547473538455
Average throughput  of class 1 is 0.5283476783298342 Mb
Average time for class 2 is 18.014395511628809
Average throughput  of class 2 is 0.33704378235065297 Mb
Average time for class 3 is 16.81715994180658
Average throughput  of class 3 is 0.34686475125319893 Mb

Ratio of class 0 and class 0 is 1.0
Ratio of class 1 and class 0 is 1.2750745044389968
Ratio of class 2 and class 0 is 2.1155510934434267
Ratio of class 3 and class 0 is 1.9749517035159778
```

l=0.75

Average time for class t is 11.037942857938978

Average throughput of class 0 is 0.56931260479213652 Mb

Average time for class t is 14.501518705113153

Average throughput of class 1 is 0.39558339486038258 Mb

Average time for class t is 21.947776229580047

Average throughput of class 2 is 0.27664032731557409 Mb

Average time for class t is 21.602689989504995

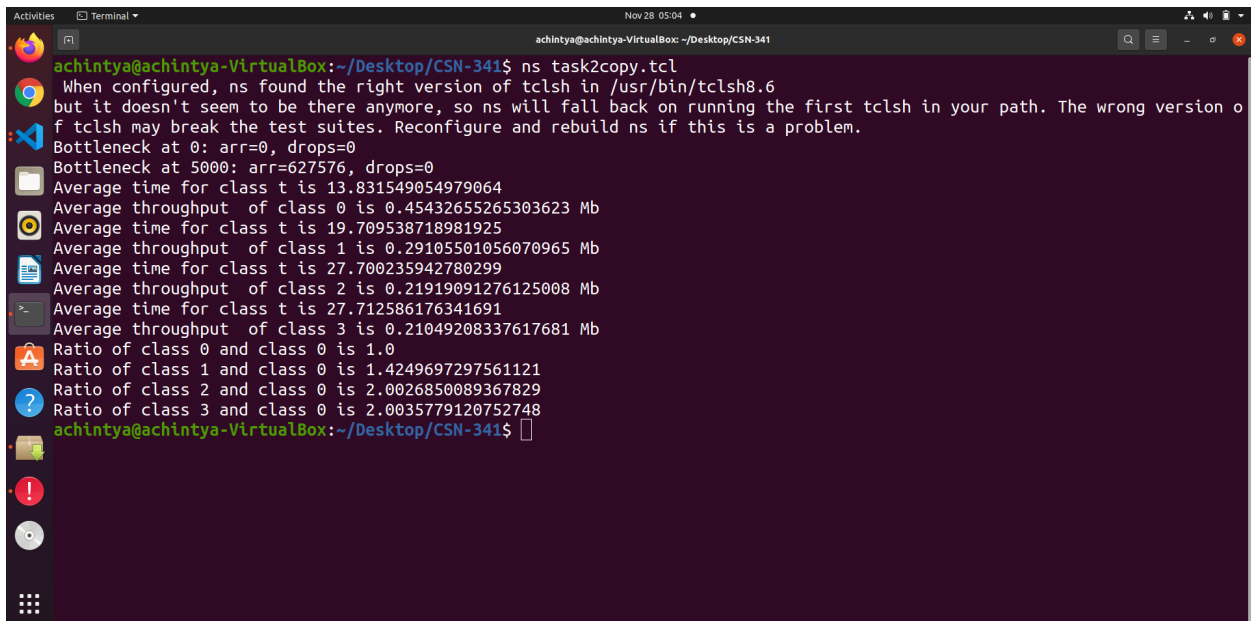Average throughput of class 3 is 0.27002563119842576 Mb

Ratio of class 0 and class 0 is 1.0

Ratio of class 1 and class 0 is 1.3137881661240001

Ratio of class 2 and class 0 is 1.9883937172037662

Ratio of class 3 and class 0 is 1.9571300800825746

For l=0.8


```
Average throughput  of class 0 is 0.45432655265303623 Mb
Average time for class 1 is 19.709538718981925
Average throughput  of class 1 is 0.29105501056070965 Mb
Average time for class 2 is 27.700235942780299
Average throughput  of class 2 is 0.21919091276125008 Mb
Average time for class 3 is 27.712586176341691
Average throughput  of class 3 is 0.21049208337617681 Mb

Ratio of class 0 and class 0 is 1.0
Ratio of class 1 and class 0 is 1.4249697297561121
Ratio of class 2 and class 0 is 2.0026850089367829
Ratio of class 3 and class 0 is 2.0035779120752748
```
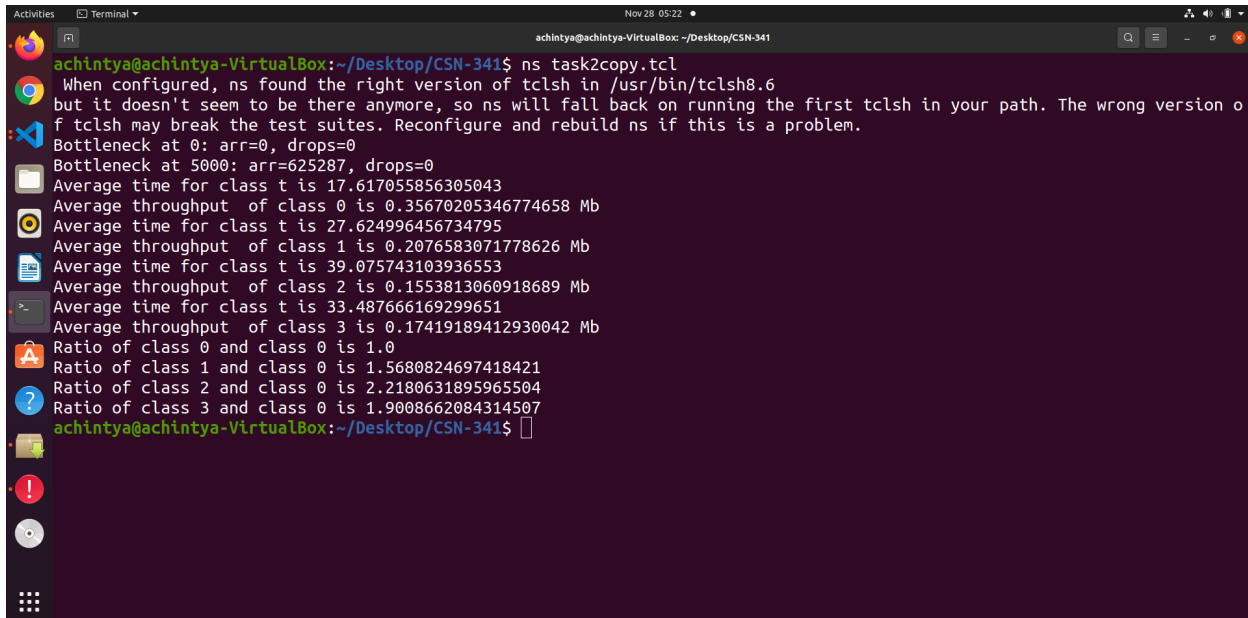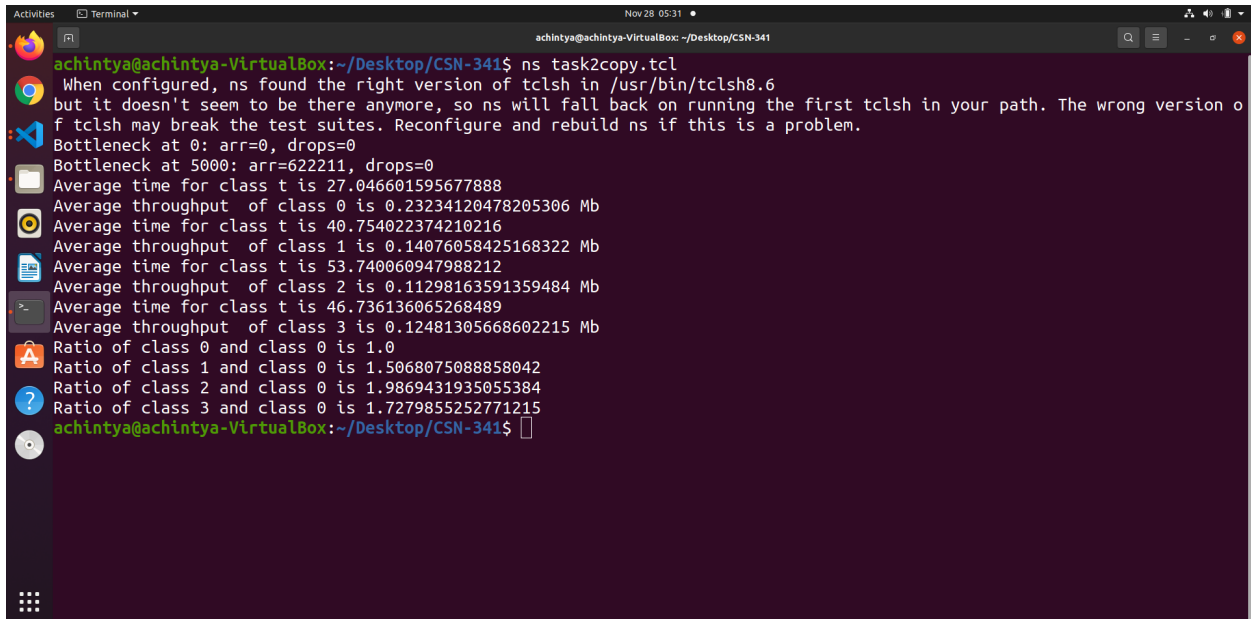
l=0.85

Average time for class 0 is 17.617055856305043

Average throughput of class 0 is 0.35670205346774658 Mb

Average time for class 1 is 27.624996456734795

Average throughput of class 1 is 0.2076583071778626 Mb

Average time for class 2 is 39.075743103936553

Average throughput of class 2 is 0.1553813060918689 Mb

Average time for class 3 is 33.487666169299651

Average throughput of class 3 is 0.17419189412930042 Mb

Ratio of class 0 and class 0 is 1.0

Ratio of class 1 and class 0 is 1.5680824697418421

Ratio of class 2 and class 0 is 2.2180631895965504

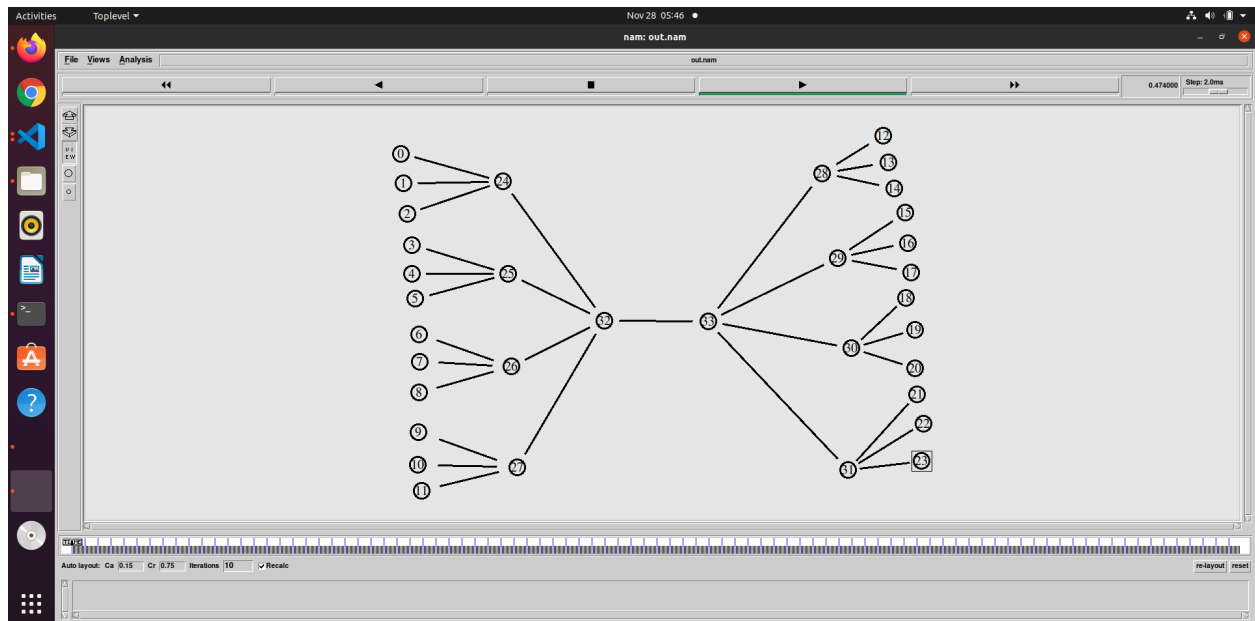Ratio of class 3 and class 0 is 1.9008662084314507

L =0.9

Average time for class 0 is 27.046601595677888

Average throughput of class 0 is 0.23234120478205306 Mb

Average time for class 1 is 40.754022374210216

Average throughput of class 1 is 0.14076058425168322 Mb

Average time for class 2 is 53.740060947988212

Average throughput of class 2 is 0.11298163591359484 Mb

Average time for class 3 is 46.736136065268489

Average throughput of class 3 is 0.12481305668602215 Mb

Ratio of class 0 and class 0 is 1.0

Ratio of class 1 and class 0 is 1.5068075088858042

Ratio of class 2 and class 0 is 1.9869431935055384

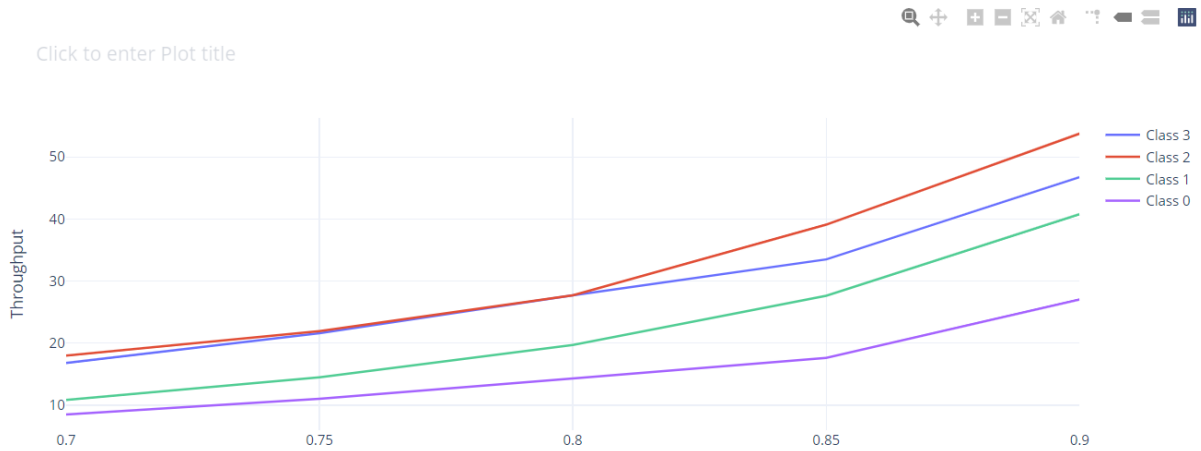Ratio of class 3 and class 0 is 1.7279855252771215
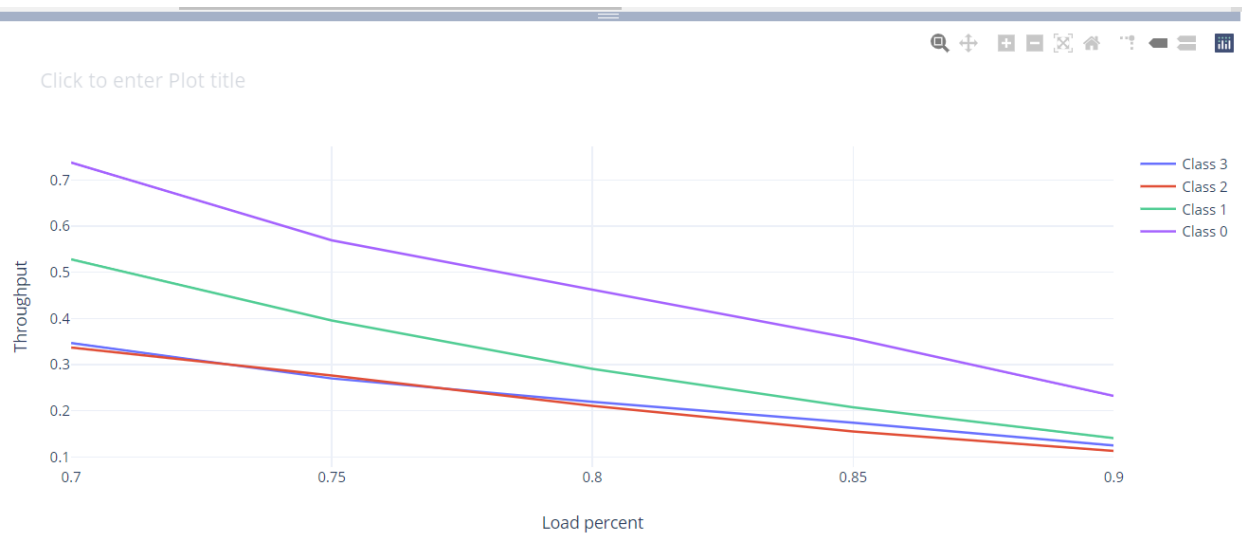
Screenshot of simulation:

Video Stimulation can be found in the Github Repository

Graphs:

Graph of mean file transfer time with the load factor:

With increase in the load the mean transfer file time also increases. As a particular load, Class 0 has minimum File Transfer Time and both Class 2 and Class 3 have almost the same (maximum) File Transfer Time.

With increase in the load the throughput decreases. As a particular load, Class 0 has maximum throughput and both Class 2 and Class 3 have almost the same(minimum) throughput..

Conclusion

The data received from the simulation are in-accordance with the theoretical values.