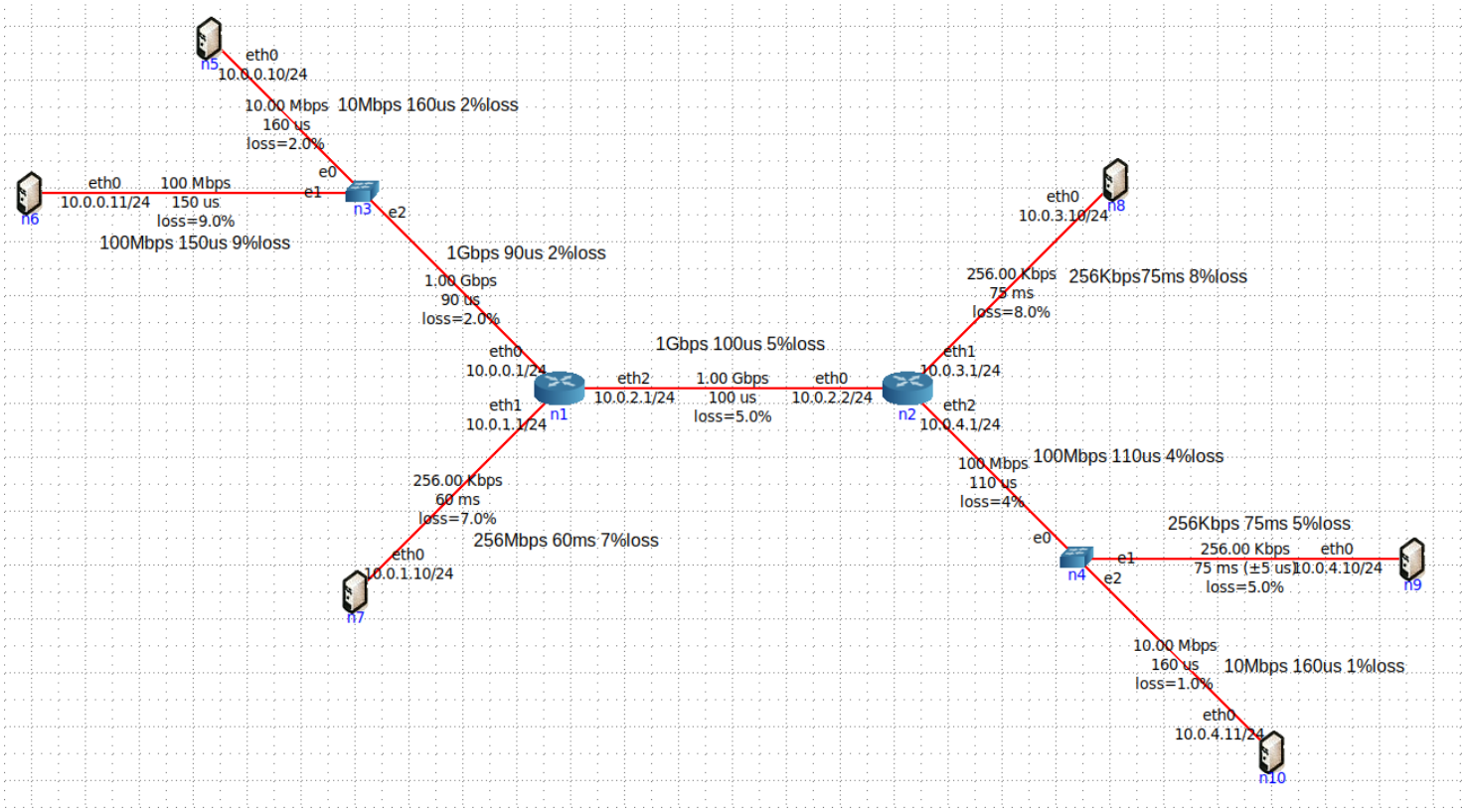
Topologia:



Testes Realizados:

	Par	Prtcl.	Tam. Pacotes	NumPac(tot)	Tam.Buffer
T1	n10<-n9	udp	(8 à 32 por 4)	5(30)	8000
T2	n10<-n9	tcp	(8 à 32 por 4)	5(30)	12000
T3	n10<-n9	udp	(16 à 64 por 8)	5(30)	14000
T4	n10<-n9	tcp	(16 à 64 por 8)	5(30)	16000
T5	n5<-n7	udp	(32 à 256 por 16)	3(42)	8000
T6	n5<-n7	tcp	(32 à 256 por 16)	3(42)	12000
T7	n5<-n7	udp	(16 à 256 por 16)	3(45)	14000
T8	n5<-n7	tcp	(16 à 256 por 16)	3(45)	16000
T9	n10<-n6	udp	(128 à 512 por 32)	4(48)	8000
T10	n10<-n6	tcp	(128 à 512 por 32)	4(48)	12000
T11	n10<-n6	udp	(256 à 512 por 64)	8(32)	14000
T12	n10<-n6	tcp	(256 à 512 por 64)	8(32)	16000

*servidor<-cliente

Teste 1:

Par de máquinas: n10 (servidor) e n9 (cliente)

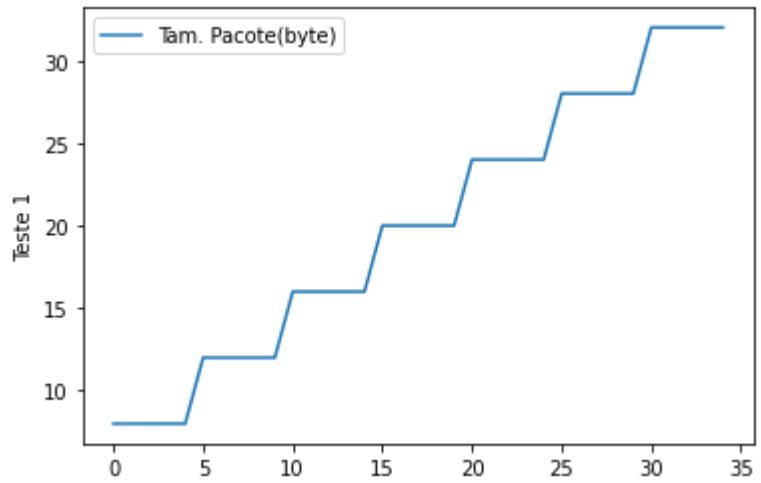
Parâmetros do Servidor: -s -u -p 52000 -b 8000

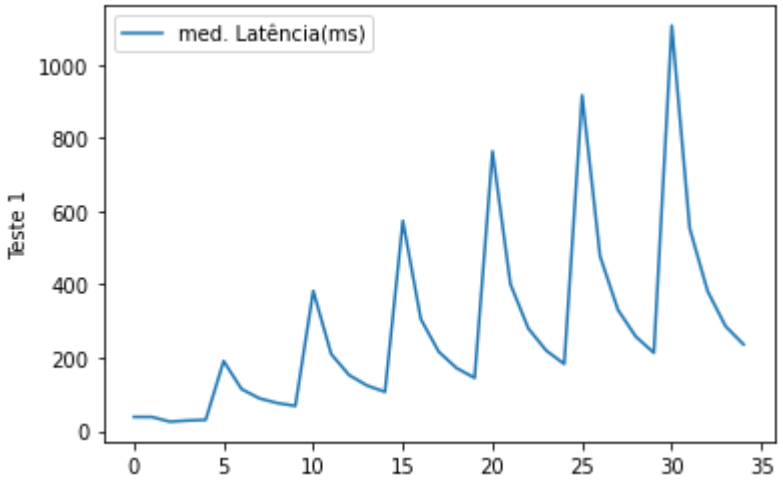
Parâmetros do Cliente: -c -u -p 52000 -a 10.0.4.11 -w 8,32,4 -n 5 -b 8000

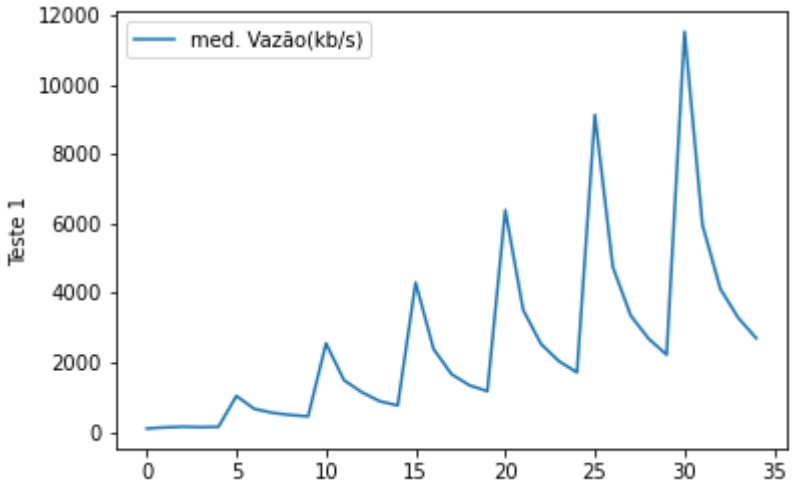
Resultados Experimentais:

```
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
5 20 145.11 0.24 1169.87 132.95 5.00 0.24
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 24 764.03 0.24 6390.55 140.50 4.76 0.24
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 24 401.12 0.24 3509.85 153.61 4.55 0.24
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 24 280.15 0.23 2525.28 158.01 4.35 0.23
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
4 24 219.66 0.23 2032.24 161.14 4.17 0.23
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
5 24 183.37 0.22 1707.96 158.41 4.00 0.22
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 28 916.86 0.22 9135.96 163.04 7.69 0.22
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 28 477.37 0.23 4752.06 159.90 7.41 0.23
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 28 330.88 0.23 3348.44 160.94 7.14 0.23
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
4 28 257.65 0.23 2681.04 168.84 6.90 0.23
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
5 28 213.80 0.23 2220.11 165.91 6.67 0.23
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 32 1107.15 0.22 11533.53 163.51 6.45 0.22
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 32 553.58 0.22 5965.31 160.92 9.38 0.22
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 32 381.78 0.22 4116.25 158.58 9.09 0.22
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
4 32 286.34 0.22 3281.14 170.67 11.76 0.22
-------------------------|----------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
5 32 236.71 0.22 2696.12 168.22 11.43 0.22
Fechando conexão com Servidor
```

Gráficos obtidos:







Análise:

A taxa de pacotes perdidos encerrou em torno de 11% invés dos 6% esperados.

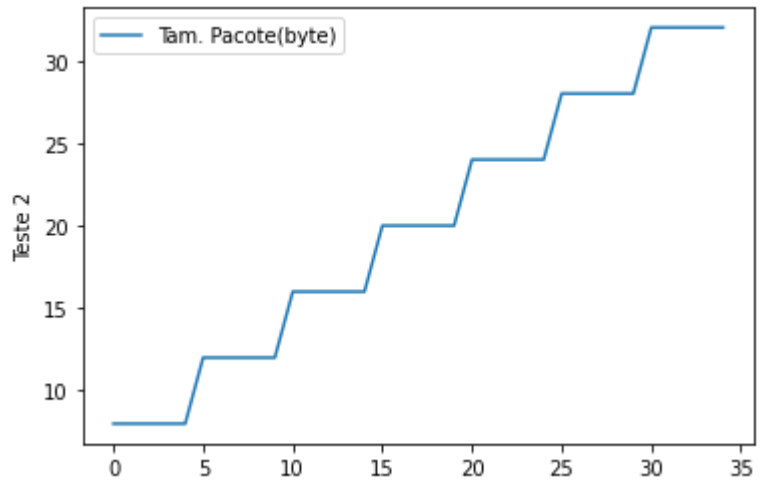
Pode-se observar um atraso médio em torno de 200ms, pelo menos 75ms são atraso do meio de comunicação entre as duas máquinas, observa-se também um salto na latência quando ocorre troca do tamanho do pacote, provavelmente devido à execução do programa demorar na iteração do laço responsável.

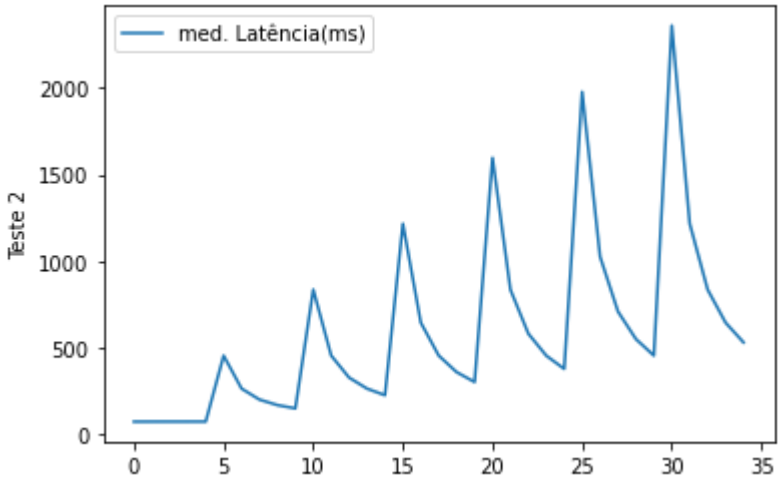
Teste 2:

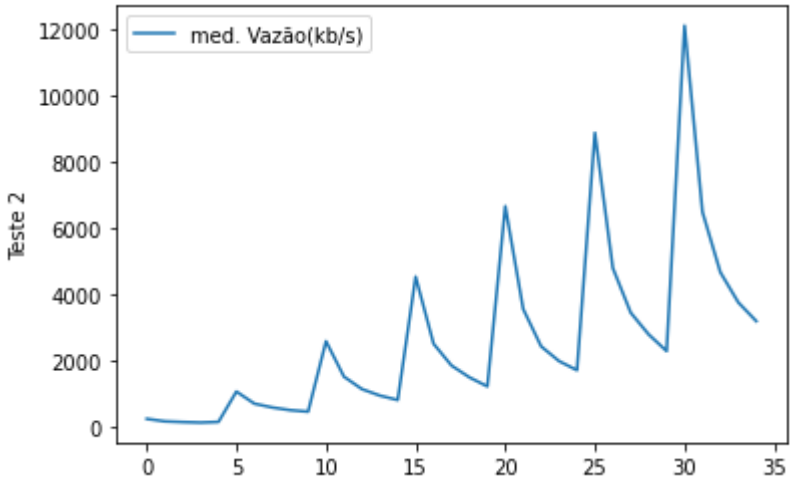
Par de máquinas: n10 (servidor) e n9 (cliente)
Parâmetros do Servidor: -s -t -p 52000 -b 12000
Parâmetros do Cliente: -c -t -p 52000 -a 10.0.4.11 -w 8,32,4 -n 5 -b 12000
Resultados Experimentais:

```
4 20 360.89 0.14 1493.42 132.39
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
5 20 303.94 0.13 1219.78 135.63
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 24 1595.56 0.13 6667.61 144.18
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 24 835.56 0.14 3559.51 143.58
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 24 582.27 0.14 2430.46 143.78
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
4 24 455.67 0.13 1985.21 156.13
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
5 24 379.71 0.13 1709.45 162.47
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 28 1975.30 0.15 8886.66 159.19
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 28 1026.20 0.18 4799.21 171.57
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 28 709.76 0.20 3447.24 183.62
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
4 28 551.32 0.19 2790.74 198.89
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
5 28 456.29 0.19 2287.86 196.43
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 32 2357.23 0.19 12127.60 200.85
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 32 1216.53 0.19 6493.99 214.28
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 32 836.30 0.18 4668.26 236.20
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
4 32 646.20 0.18 3759.30 254.90
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
5 32 532.23 0.18 3193.86 264.42
```

Gráficos obtidos:







Análise:

Em comparação com a execução do programa em UDP, comunicação TCP demonstrou o dobro da latência pelo protocolo TCP ter que se ajustar e reenviar pacotes perdidos, mas uma vazão um pouco maior, visto que todas as mensagens eram enviadas inteiras.

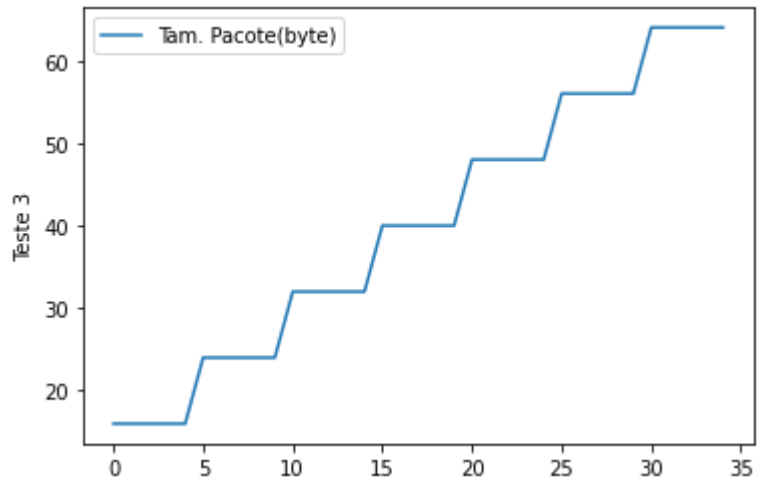
O desvio padrão da latência permaneceu similar embora um pouco mais baixo, enquanto o da vazão ficou um pouco maior.

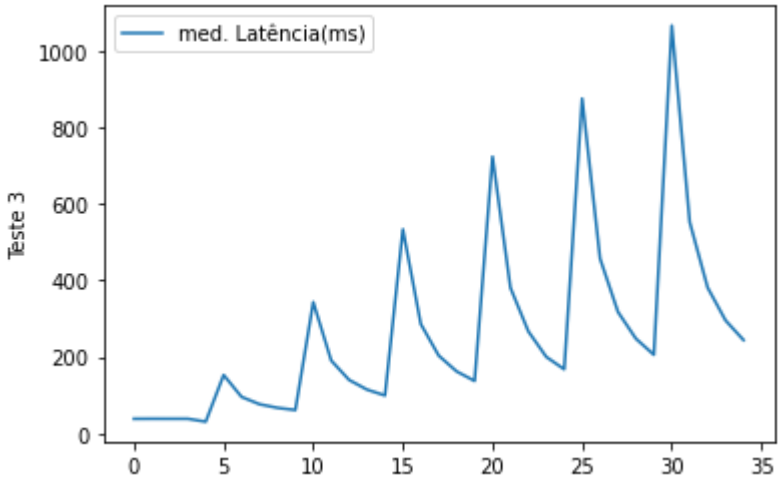
Teste 3:

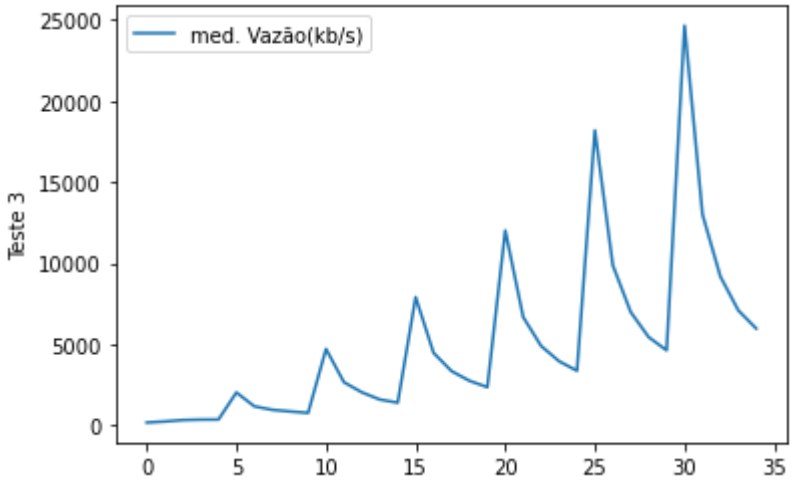
Par de máquinas: n10 (servidor) e n9 (cliente)
Parâmetros do Servidor: -s -u -p 52000 -b 14000
Parâmetros do Cliente: -c -u -p 52000 -a 10.0.4.11 -w 16,64,8 -n 5 -b 14000
Resultados Experimentais:

```
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
5 40 137.13 0.19 2355.34 283.47 10.00 0.19
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 48 723.74 0.18 12012.44 286.83 9.52 0.18
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 48 380.85 0.18 6672.86 323.57 9.09 0.18
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 48 266.64 0.18 4893.01 350.56 8.70 0.18
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
4 48 199.98 0.18 3952.52 357.31 12.50 0.18
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
5 48 167.58 0.18 3364.35 356.84 12.00 0.18
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 56 875.78 0.18 18187.34 375.10 11.54 0.18
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 56 457.10 0.19 9866.31 402.22 11.11 0.19
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 56 317.48 0.19 6979.04 404.72 10.71 0.19
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
4 56 247.58 0.19 5439.60 397.66 10.34 0.19
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
5 56 205.64 0.19 4623.22 406.18 10.00 0.19
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 64 1066.82 0.21 24641.29 421.73 9.68 0.21
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 64 552.71 0.23 13008.94 427.42 9.38 0.23
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 64 381.27 0.23 9172.51 437.34 9.09 0.23
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
4 64 295.45 0.23 7087.79 430.66 8.82 0.23
------------------------|------------------|-------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
5 64 244.08 0.24 5968.50 438.60 8.57 0.24
Fechando conexão com Servidor
```

Gráficos obtidos:







Análise:

A taxa de pacotes perdidos encerrou em torno de 8% invés dos 6% esperados, porém foi melhor que no Teste 1

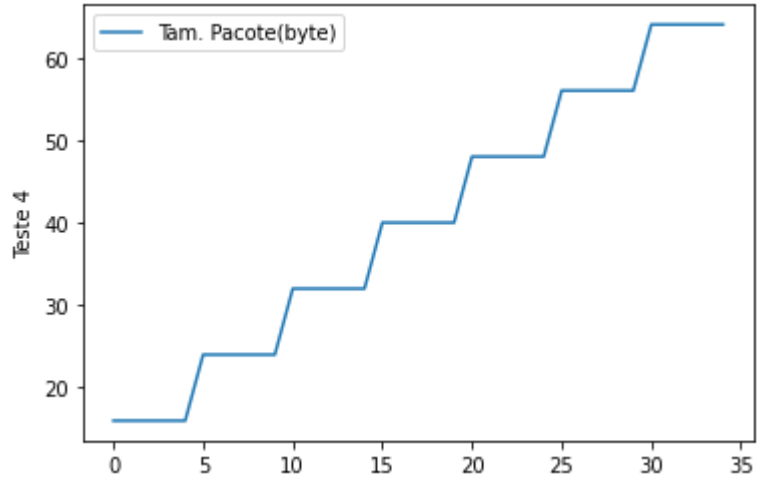
Pode-se observar um atraso médio em torno de 250ms invés dos 200 anteriores, provavelmente devido aos pacotes terem o dobro do tamanho que no Teste 1

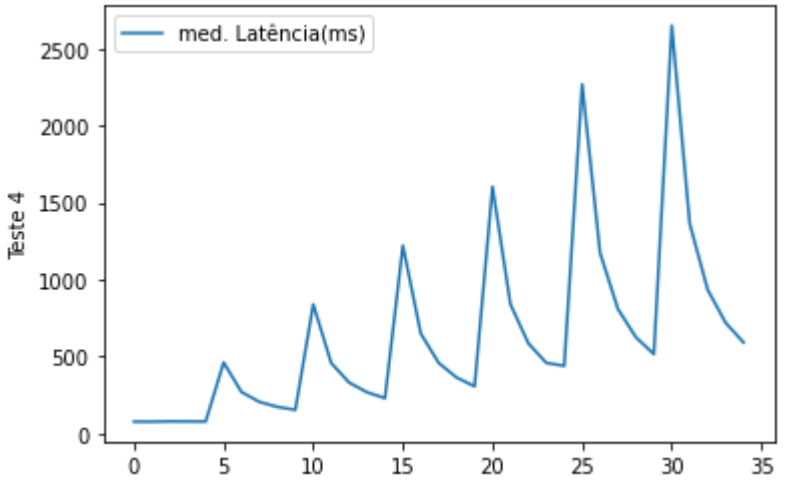
Teste 4:

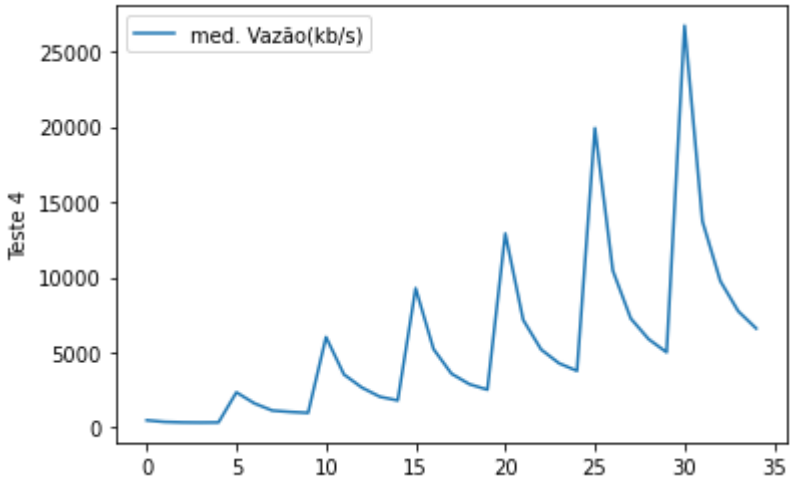
Par de máquinas: n10 (servidor) e n9 (cliente)
Parâmetros do Servidor: -s -t -p 52000 -b 16000
Parâmetros do Cliente: -c -t -p 52000 -a 10.0.4.11 -w 16,64,8 -n 5 -b 16000
Resultados Experimentais:

```
4 40 362.27 0.70 2879.18 334.51
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
5 40 305.14 0.68 2514.38 340.72
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 48 1602.26 0.66 12898.17 338.58
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 48 839.07 0.65 7153.03 371.23
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 48 584.84 0.63 5185.51 383.68
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
4 48 457.81 0.62 4270.43 413.31
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
5 48 438.35 28.14 3766.48 454.85
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 56 2267.55 27.60 19914.80 450.31
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 56 1172.10 27.10 10438.71 443.18
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 56 806.97 26.62 7251.28 435.33
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
4 56 624.39 26.16 5873.43 463.38
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
5 56 514.65 25.73 4999.87 472.70
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 64 2649.69 25.32 26731.19 491.97
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 64 1362.77 24.93 13714.21 484.85
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 64 933.76 24.56 9735.38 503.40
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
4 64 719.25 24.20 7726.28 515.00
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
5 64 590.57 23.86 6587.74 541.81
```

Gráficos obtidos:







Análise:

Similar aos Testes 1 e 2, verifica-se que a latência desse teste em comparação ao Teste 3 continua sendo o dobro do mesmo teste na versão UDP e a vazão é superior. Idem os desvios padrão de ambas as medidas, latência similar ou um pouco menor e vazão significativamente maior embora ainda similar.

Teste 5:

Par de máquinas: n5 (servidor) e n7 (cliente)

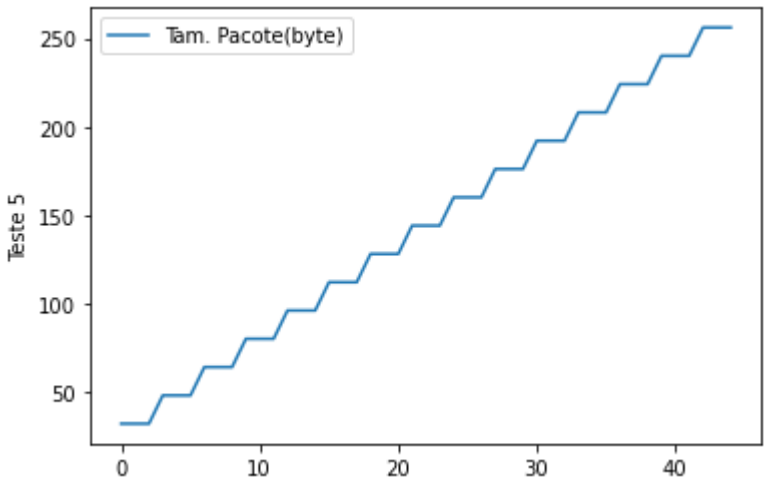
Parâmetros do Servidor: -s -u -p 52000 -b 8000

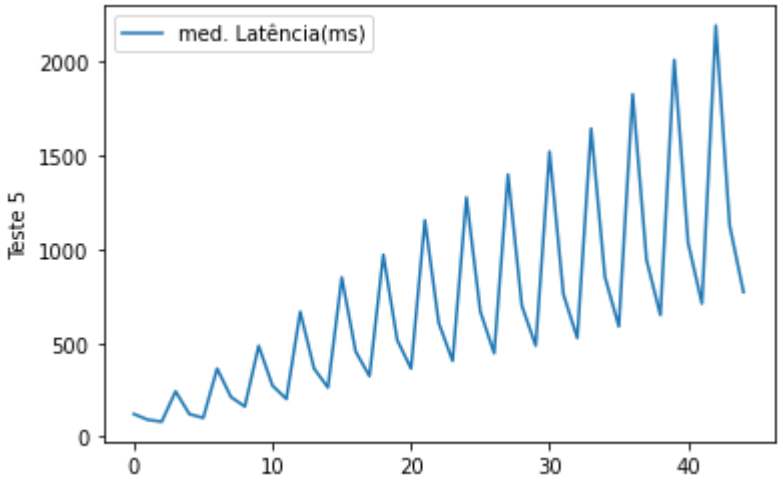
Parâmetros do Cliente: -c -u -p 52000 -a 10.0.0.10 -w 32,256,16 -n 3 -b 8000

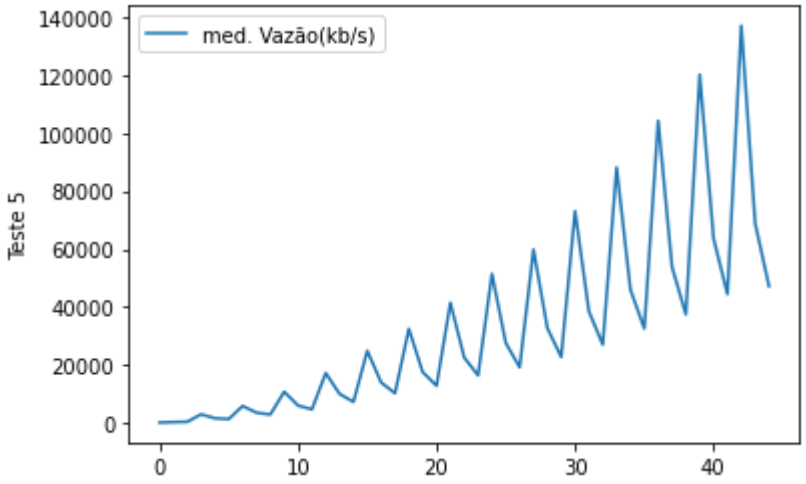
Resultados Experimentais:

```
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 176 486.47 12.65 22897.07 1244.77 23.33 12.65
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 192 1521.15 12.37 73091.78 1281.22 22.58 12.37
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 192 760.57 12.37 38579.49 1296.11 25.00 12.37
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 192 527.27 12.12 27155.15 1317.66 24.24 12.12
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 208 1643.79 11.88 88125.09 1483.32 23.53 11.88
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 208 852.55 11.66 45992.67 1476.98 22.86 11.66
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 208 588.59 11.45 32695.33 1566.57 22.22 11.45
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 224 1827.23 11.25 104226.83 1643.58 21.62 11.25
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 224 944.07 11.06 53872.82 1625.21 21.05 11.06
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 224 649.52 10.88 37546.33 1637.19 20.51 10.88
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 240 2010.37 10.71 120095.54 1770.15 20.00 10.71
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 240 1035.63 10.54 63642.89 1866.24 19.51 10.54
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 240 710.62 10.39 44538.93 1909.39 19.05 10.39
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 256 2193.24 10.24 136972.24 1886.70 18.60 10.24
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 256 1127.53 10.09 68920.13 1897.08 18.18 10.09
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 256 772.08 9.95 47253.01 1879.06 17.78 9.95
Fechando conexão com Servidor
```

Gráficos obtidos:







Análise:

A taxa de pacotes perdidos encerrou em torno de 17% invés dos 11% esperados introduzidos pelos 3 meios entre os hosts.

Pode-se observar um atraso médio em torno de 700ms, bem mais que os 60 introduzidos pelo meio. Houveram mais passos de tamanho de pacote, entretanto, cada um atrasando a execução, possivelmente trazendo a média mais para cima.

Teste 6:

Par de máquinas: n5 (servidor) e n7 (cliente)

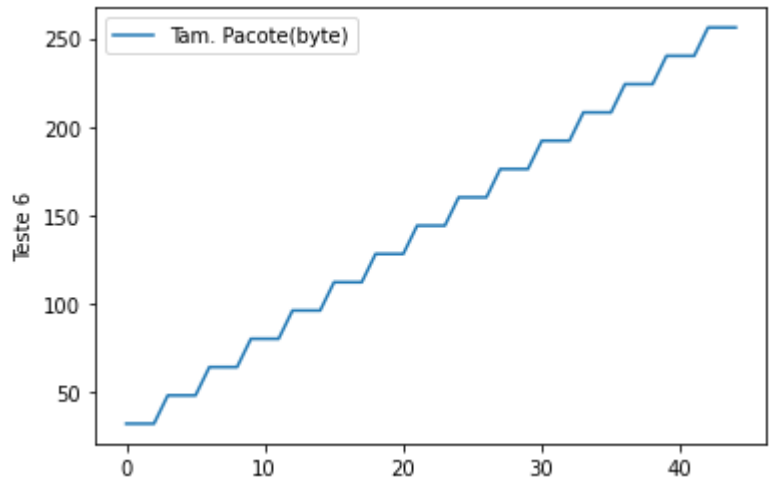
Parâmetros do Servidor: -s -t -p 52000 -b 12000

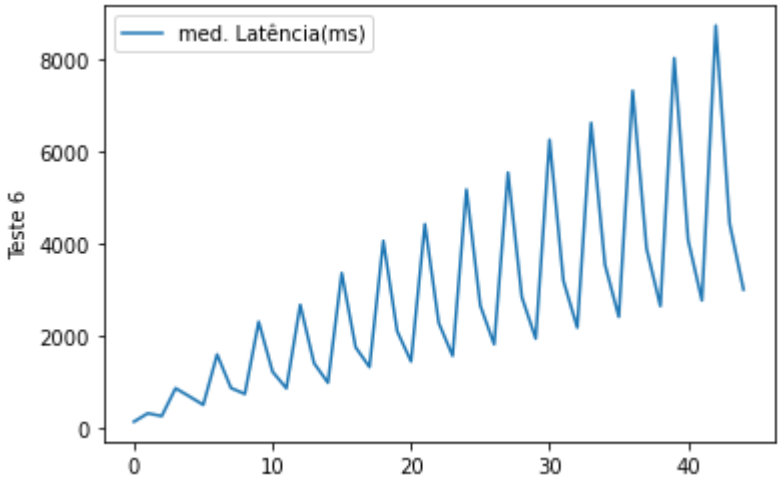
Parâmetros do Cliente: -c -t -p 52000 -a 10.0.0.10 -w 32,256,16 -n 3 -b 12000

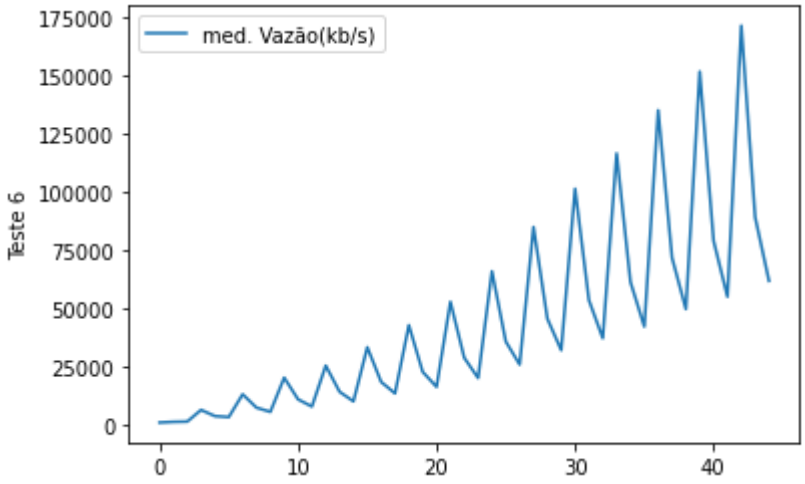
Resultados Experimentais:

```
2 176 2829.48 72.31 45584.52 1697.92
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 176 1927.37 71.37 32030.12 1699.66
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 192 6251.94 74.41 101423.51 1714.32
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 192 3186.49 73.56 53547.34 1738.97
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 192 2165.52 72.71 37181.29 1722.31
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 208 6619.05 71.89 116616.07 1720.66
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 208 3538.11 74.19 61337.25 1752.43
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 208 2399.12 73.44 42189.74 1728.43
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 224 7318.42 72.72 135188.70 1899.60
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 224 3890.47 74.84 71788.66 2025.07
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 224 2634.67 74.15 49701.31 2017.76
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 240 8027.33 73.47 151802.67 1999.65
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 240 4075.01 72.81 79047.06 2012.62
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 240 2757.44 72.17 55028.21 2045.91
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 256 8735.23 74.11 171552.96 2058.12
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 256 4428.92 73.50 89196.04 2078.92
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 256 2993.65 72.90 61834.32 2105.06
```

Gráficos obtidos:







Análise:

Neste teste a comunicação TCP demonstrou uma latência tremendamente maior, mais do triplo da versão UDP enquanto a vazão exibiu um aumento de 50%. Comportamento dos desvios padrão permanece o mesmo.

Teste 7:

Par de máquinas: n5 (servidor) e n7 (cliente)

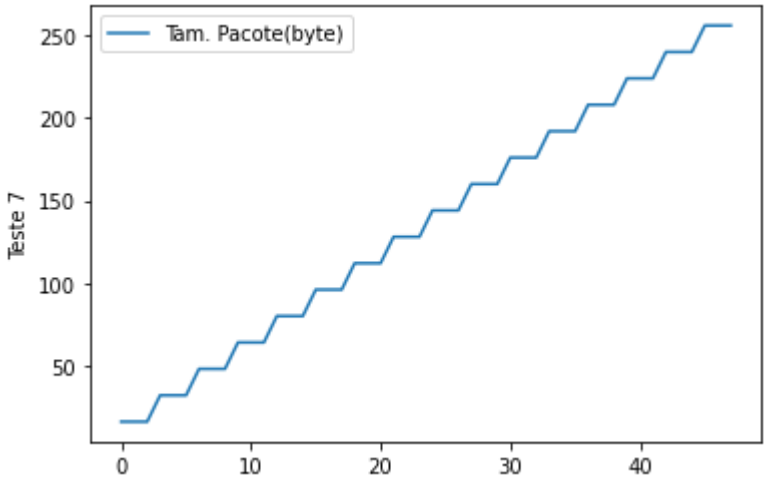
Parâmetros do Servidor: -s -u -p 52000 -b 14000

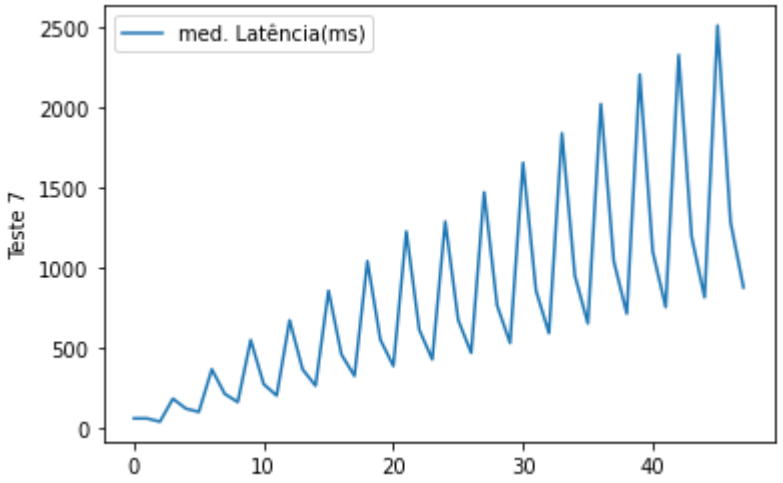
Parâmetros do Cliente: -c -u -p 52000 -a 10.0.0.10 -w 16,256,16 -n 3 -b 14000

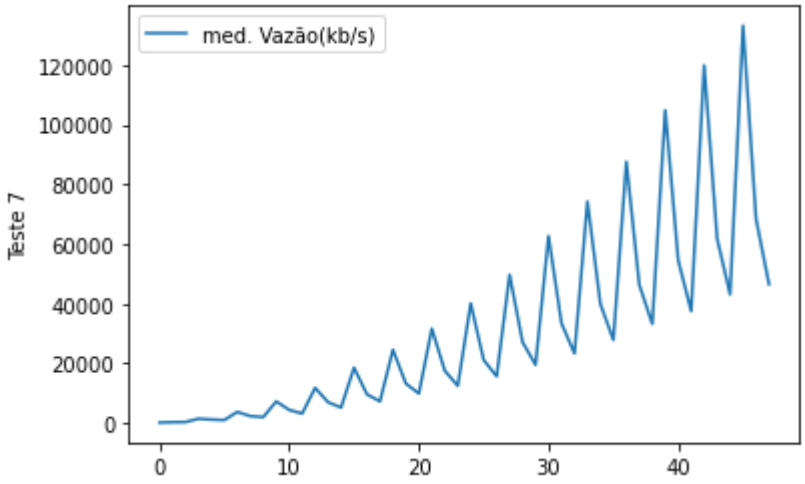
Resultados Experimentais:

```
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 176 591.41 0.46 23331.60 1339.08 12.12 0.46
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 192 1835.58 0.45 74255.67 1368.75 11.76 0.45
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 192 948.14 0.45 39904.75 1463.84 11.43 0.45
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 192 652.52 0.45 27863.43 1464.29 11.11 0.45
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 208 2018.32 0.45 87592.19 1469.99 10.81 0.45
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 208 1039.42 0.45 46347.02 1516.32 10.53 0.45
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 208 713.06 0.47 33224.45 1663.50 10.26 0.47
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 224 2201.12 0.48 104864.10 1694.06 10.00 0.48
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 224 1100.56 0.48 54586.92 1693.40 12.20 0.48
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 224 753.95 0.48 37530.10 1676.66 11.90 0.48
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 240 2323.65 0.48 119884.73 1799.81 11.63 0.48
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 240 1192.11 0.49 61856.12 1785.64 11.36 0.49
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 240 814.85 0.50 43143.91 1817.68 11.11 0.50
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 256 2506.03 0.49 133225.88 1802.46 10.87 0.49
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 256 1283.32 0.49 68483.57 1787.01 10.64 0.49
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 256 876.14 0.50 46535.11 1768.35 10.42 0.50
Fechando conexão com Servidor
```

Gráficos obtidos:







Análise:

A taxa de pacotes perdidos encerrou em torno de 10%, muito próxima dos 11% esperados.

Pode-se observar um atraso médio em torno de 700ms, o teste foi bem similar ao Teste 5 apesar do buffer aumentar.

Teste 8:

Par de máquinas: n5 (servidor) e n7 (cliente)

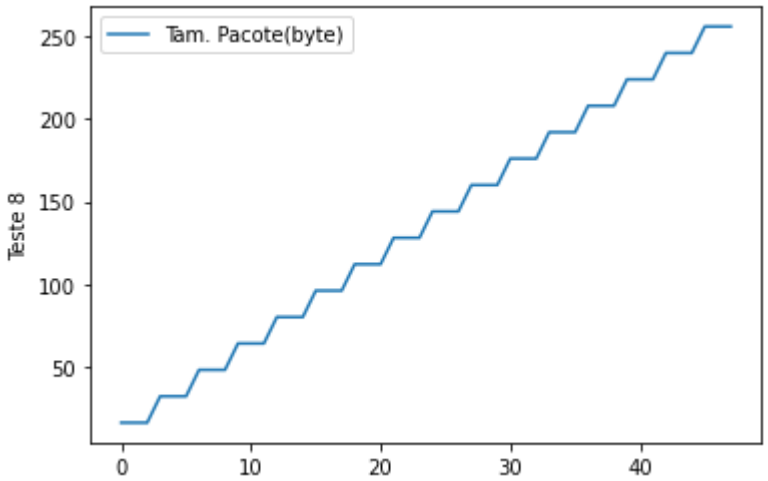
Parâmetros do Servidor: -s -t -p 52000 -b 16000

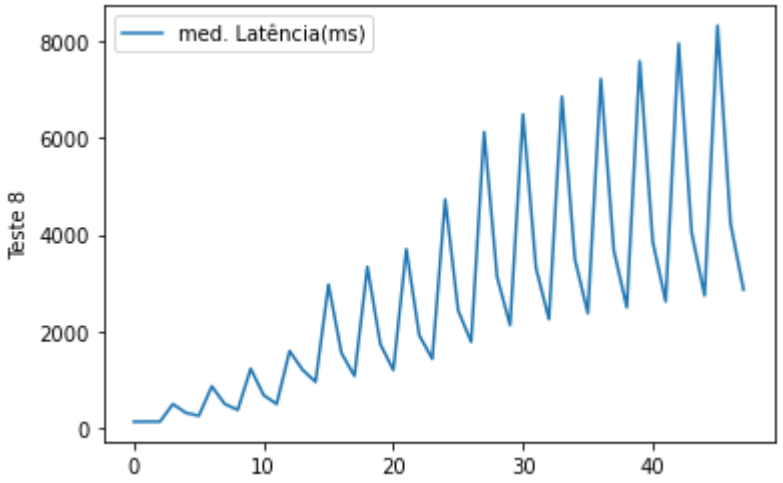
Parâmetros do Cliente: -c -t -p 52000 -a 10.0.0.10 -w 16,256,16 -n 3 -b 16000

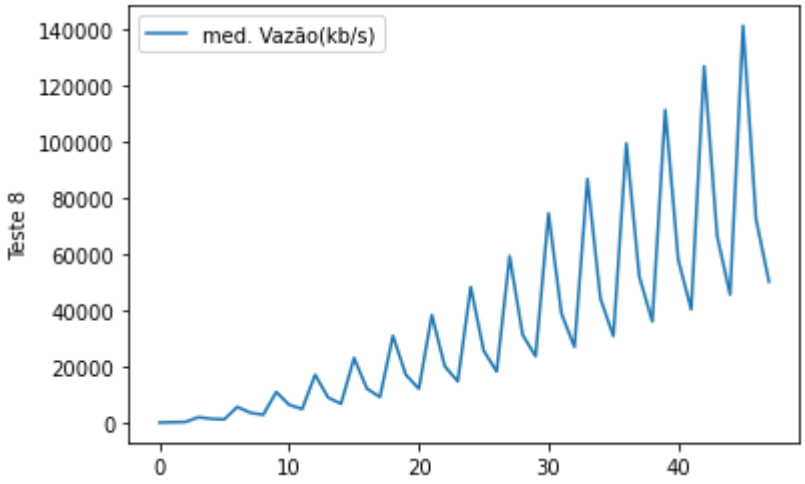
Resultados Experimentais:

```
2 176 3306.51 95.56 38892.32 1569.63
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 176 2245.22 94.36 27111.22 1557.13
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 192 6858.83 93.20 86702.37 1612.21
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 192 3490.04 92.09 44291.96 1592.34
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 192 2367.84 91.00 30955.82 1596.38
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 208 7227.20 89.94 99378.04 1701.54
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 208 3674.35 88.93 52085.76 1712.86
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 208 2490.71 87.95 36142.40 1707.48
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 224 7593.83 87.00 111257.10 1685.47
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 224 3858.59 86.08 58050.00 1695.12
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 224 2613.42 85.18 40430.25 1713.43
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 240 7963.52 84.31 126791.48 1739.17
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 240 4043.30 83.46 66581.29 1794.60
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 240 2736.68 82.64 45653.73 1777.82
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 256 8332.66 81.85 141188.52 1766.59
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 256 4229.82 81.06 72471.43 1750.14
----------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 256 2860.54 80.31 50248.96 1775.38
```

Gráficos obtidos:







Análise:

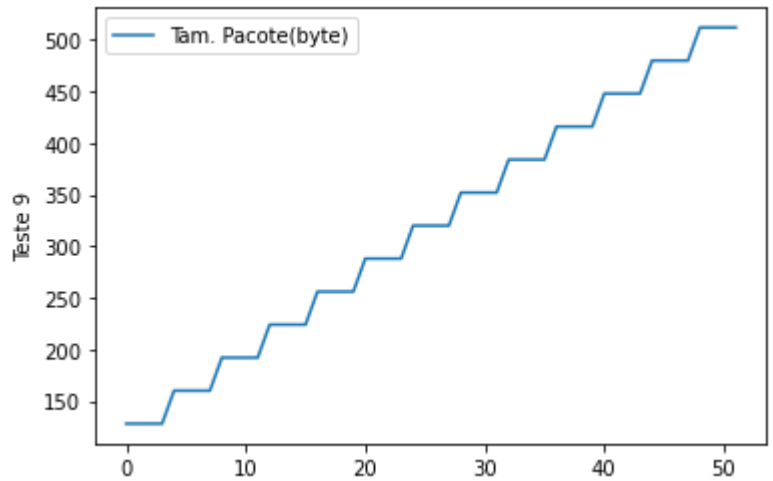
Similar aos Testes 5 e 6, observa-se uma latência três vezes maior na execução TCP comparada a UDP e uma vazão um pouco maior. Entretanto, observa-se um desvio padrão de latência 160x maior, o da vazão permaneceu em valor similar.

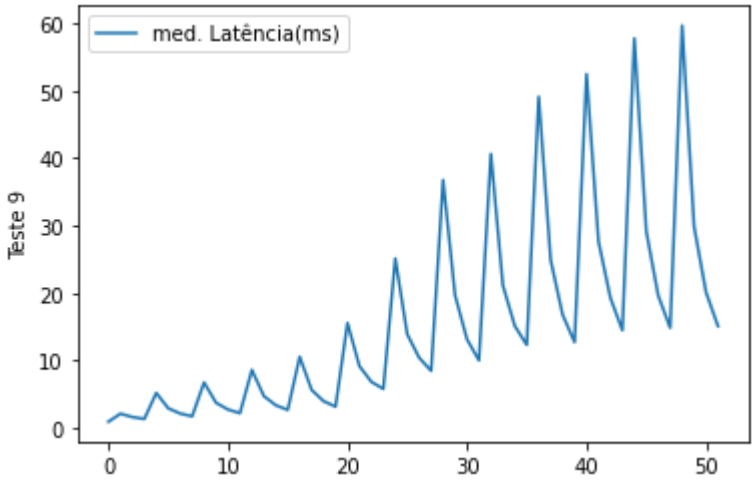
Teste 9:

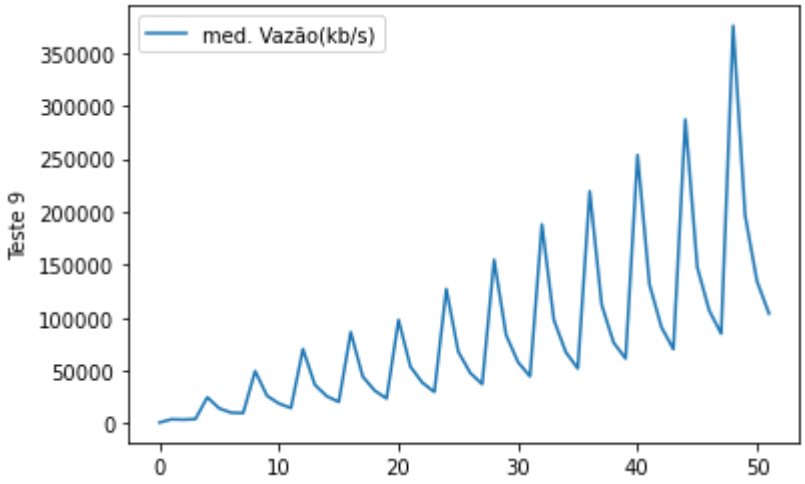
Par de máquinas: n10 (servidor) e n6 (cliente)
Parâmetros do Servidor: -s -u -p 52000 -b 8000
Parâmetros do Cliente: -c -u -p 52000 -a 10.0.4.11 -w 128,512,32 -n 4 -b 8000
Resultados Experimentais:

```
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 416 49.15 1.14 219352.75 3100.58 16.22 1.14
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 416 24.90 1.14 112176.13 3062.10 15.79 1.14
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 416 16.77 1.13 76377.54 3026.90 15.38 1.13
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
4 416 12.70 1.13 61398.32 3424.69 15.00 1.13
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 448 52.52 1.12 253623.41 3394.47 14.63 1.12
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 448 27.70 1.12 131372.50 3383.28 14.29 1.12
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 448 19.27 1.12 91061.39 3403.09 13.95 1.12
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
4 448 14.46 1.12 70197.91 3368.60 15.91 1.12
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 480 57.82 1.12 287286.04 3330.14 17.78 1.12
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 480 29.18 1.11 147637.60 3301.42 17.39 1.11
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 480 19.61 1.11 106710.11 4230.15 17.02 1.11
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
4 480 14.82 1.11 84872.16 4559.96 16.67 1.11
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 512 59.72 1.11 375886.68 6157.15 16.33 1.11
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 512 29.86 1.11 196744.50 6253.75 18.00 1.11
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 512 20.10 1.10 134248.47 6193.94 17.65 1.10
-------------------------------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
4 512 15.07 1.10 103882.01 6170.23 19.23 1.10
Fechando conexão com Servidor
```

Gráficos obtidos:







Análise:

A taxa de pacotes perdidos encerrou em torno de 20%, muito próxima dos 21% esperados.

Pode-se observar um atraso médio em torno de 15ms. O atraso introduzido pelo meio é em torno de 500us, desprezível para o teste então estes 15ms são apenas da execução do programa.

Teste 10:

Par de máquinas: n10 (servidor) e n6 (cliente)

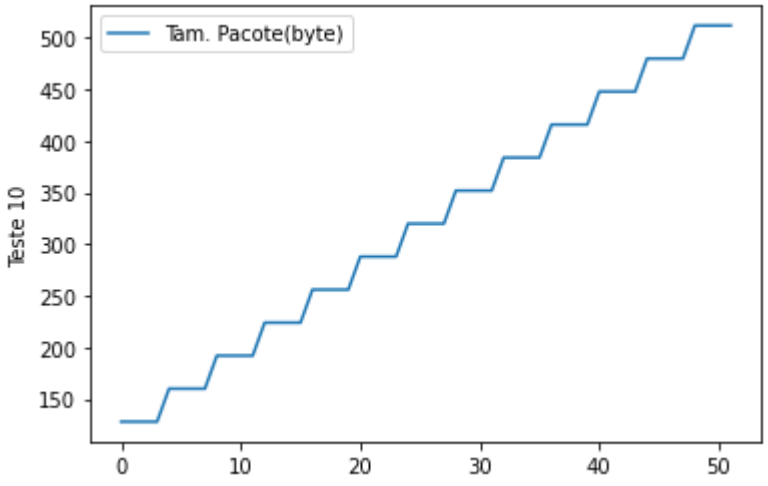
Parâmetros do Servidor: -s -t -p 52000 -b 12000

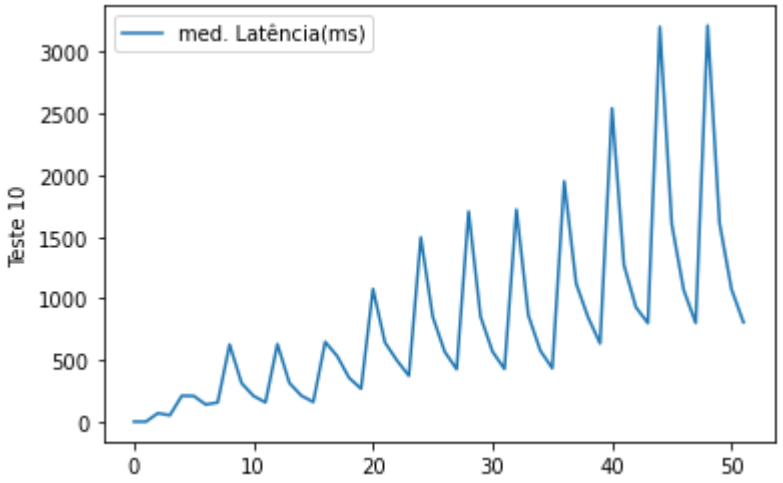
Parâmetros do Cliente:-c -t -p 52000 -a 10.0.4.11 -w 128,512,32 -n 4 -b 12000

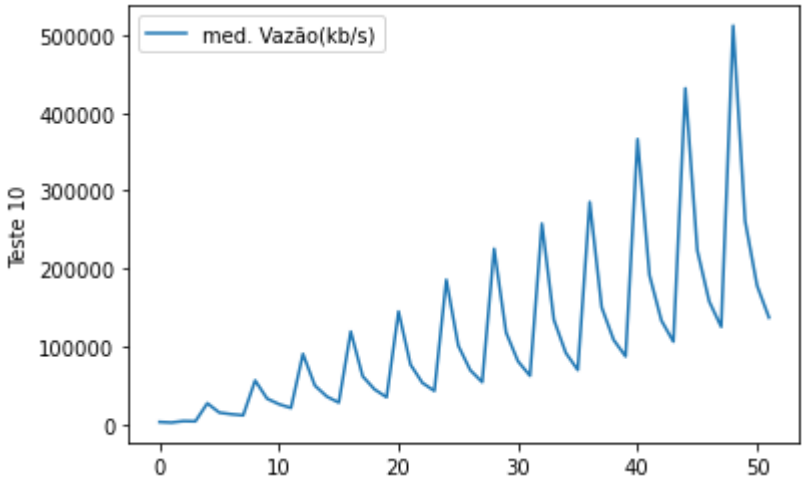
Resultados Experimentais:

```
4 384 434.24 49.64 69698.33 3300.25
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 416 1950.04 50.77 285504.22 3258.52
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 416 1120.66 53.65 150208.65 3419.64
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 416 846.70 56.28 108330.79 4302.44
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
4 416 635.25 55.80 87142.79 4883.35
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 448 2541.91 55.32 366298.04 5023.16
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 448 1271.41 54.85 191463.39 5101.61
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 448 928.87 55.95 133185.18 5169.03
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
4 448 800.31 61.20 106152.38 5634.17
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 480 3202.37 60.74 431624.37 5583.61
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 480 1601.72 60.29 223438.19 5583.94
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 480 1068.10 59.85 157674.23 6020.57
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
4 480 801.31 59.41 125150.42 6470.46
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 512 3212.99 58.94 512147.29 6404.69
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 512 1608.95 58.50 261260.80 6339.01
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 512 1073.84 58.07 178172.91 6279.04
-------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
4 512 806.33 57.65 137006.23 6231.32
```

Gráficos obtidos:







Análise:

Apesar da latência 50 vezes maior que no UDP, a vazão viu um aumento de 30%, o desvio da latência aumentou proporcionalmente e o da vazão se manteve.

Teste 11:

Par de máquinas: n10 (servidor) e n6 (cliente)

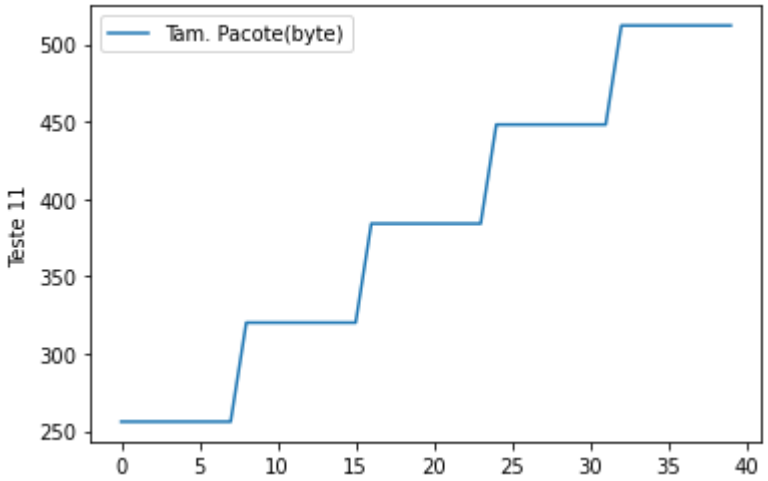
Parâmetros do Servidor: -s -u -p 52000 -b 14000

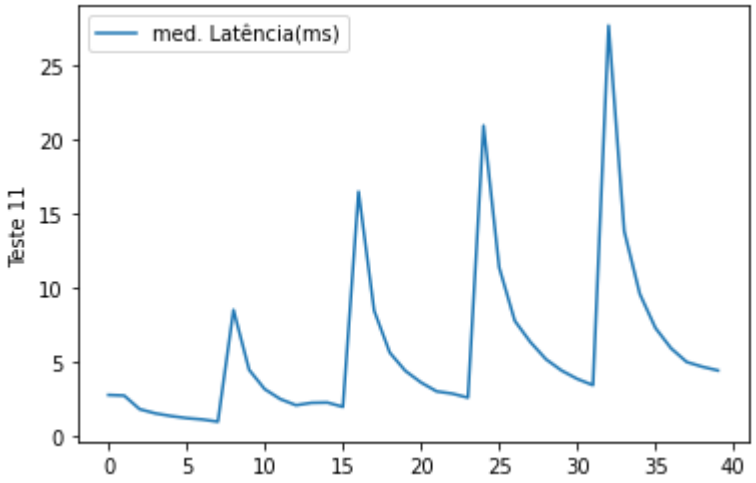
Parâmetros do Cliente: -c -u -p 52000 -a 10.0.4.11 -w 256,512,64 -n 8 -b 14000

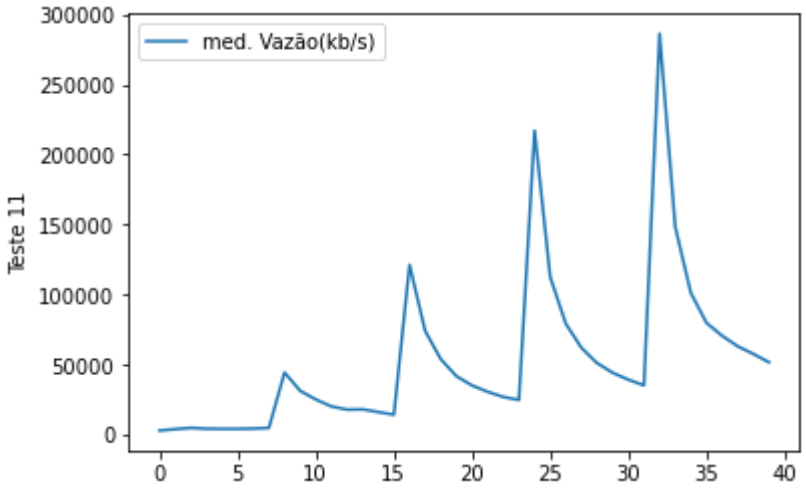
Resultados Experimentais:

```
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 448 20.95 0.94 217046.64 6261.81 24.00 0.94
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 448 11.39 0.93 112555.61 6136.49 23.08 0.93
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 448 7.79 0.92 79130.86 6057.59 22.22 0.92
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
4 448 6.36 0.92 61957.93 5952.49 21.43 0.92
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
5 448 5.20 0.90 51034.35 5851.96 20.69 0.90
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
6 448 4.44 0.89 44126.46 5751.98 20.00 0.89
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
7 448 3.88 0.88 39213.54 5657.67 19.35 0.88
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
8 448 3.46 0.87 35169.07 5576.85 18.75 0.87
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
1 512 27.69 0.87 286266.74 5530.38 21.21 0.87
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
2 512 13.84 0.87 148396.81 5455.20 23.53 0.87
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
3 512 9.60 0.85 101120.28 5386.78 22.86 0.85
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
4 512 7.31 0.84 79787.79 5440.37 22.22 0.84
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
5 512 5.94 0.84 70541.12 6726.81 21.62 0.84
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
6 512 5.02 0.83 63045.15 7126.81 21.05 0.83
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
7 512 4.70 0.88 57564.94 7417.38 20.51 0.88
numTrans., tamPct(bytes)  med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s), PctPerd.(%), Jitter
8 512 4.45 0.91 51606.36 7321.99 20.00 0.91
Fechando conexão com Servidor
```

Gráficos obtidos:







Análise:

A taxa de pacotes perdidos encerrou em 20%, muito próxima dos 21% esperados.

Pode-se observar um atraso médio em torno de 5ms, menos que no Teste 9. A rapidez provavelmente pelo teste ter menos passos de aumento de pacote.

Teste 12:

Par de máquinas: n10 (servidor) e n6 (cliente)

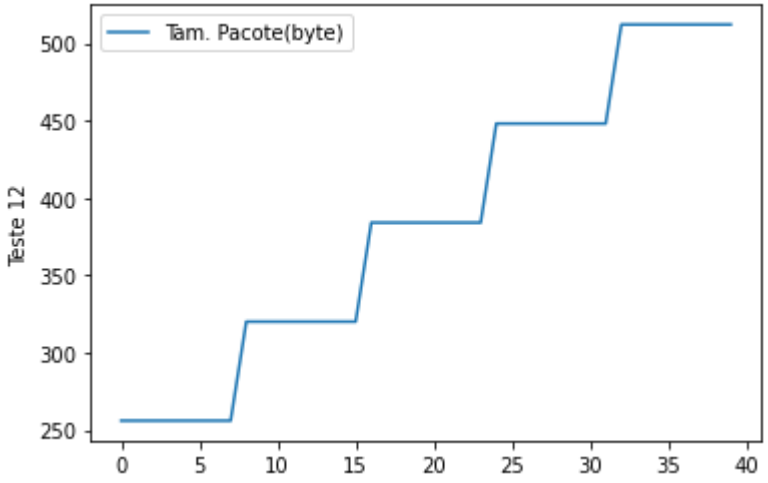
Parâmetros do Servidor: -s -t -p 52000 -b 16000

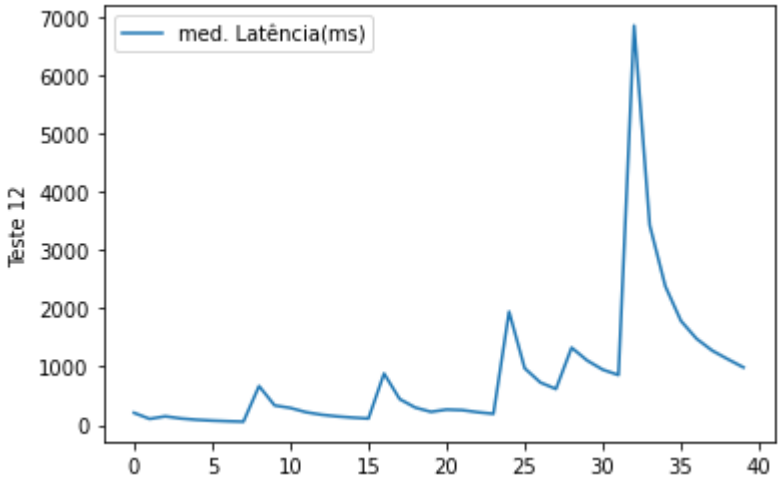
Parâmetros do Cliente: -c -t -p 52000 -a 10.0.4.11 -w 256,512,64 -n 8 -b 16000

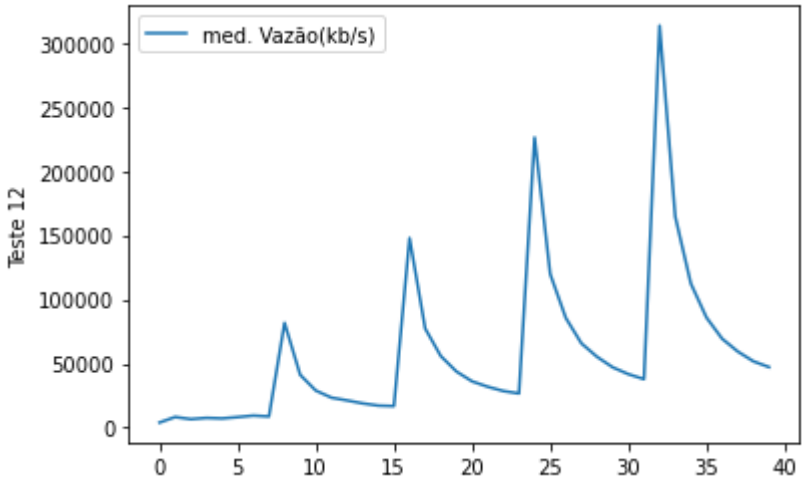
Resultados Experimentais:

```
8 384 190.82 57.43 26674.23 4227.57
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 448 1941.57 66.13 226264.00 4214.36
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 448 971.27 65.24 119795.29 4213.51
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 448 727.87 65.94 85506.32 4390.26
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
4 448 616.57 67.43 65690.41 4351.97
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
5 448 1324.93 380.40 55217.64 4335.79
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
6 448 1104.37 374.46 47048.28 4303.26
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
7 448 946.74 368.79 41732.52 4231.63
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
8 448 855.61 362.89 37842.97 4168.15
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
1 512 6845.91 357.73 313481.15 4108.52
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
2 512 3423.41 352.79 164635.74 4187.17
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
3 512 2376.31 347.71 112360.17 4137.30
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
4 512 1782.54 343.19 85844.53 4115.44
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
5 512 1477.21 338.48 69384.36 4175.83
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
6 512 1274.10 333.97 59403.99 4119.06
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
7 512 1126.88 329.63 51744.62 4104.98
--------------------------------------------------------------------------------
numTrans., tamPct(bytes), med.Lat(ms), stdDevLat(ms), medVaz(kb/s), stdDevVaz(kb/s)
8 512 986.14 325.81 47221.72 4171.68
```

Gráficos obtidos:







Análise:

Houve um pico no final da execução com a latência, jogando a média para cima mas similar a testes anteriores, comparado com o UDP, ela é bem maior. A vazão neste caso diminuiu, provavelmente devido à algum engasgue durante a execução.

O desvio padrão da Latência comparado com a média é muito alto comparado com outros casos de teste, demonstrando conexão instável, enquanto o desvio da vazão diminuiu com a média.

Código usado para gerar os gráficos

Foi utilizado um caderno Jupyter no browser para tal com o código abaixo conforme cada teste

```
import matplotlib.pyplot as plt

a = [[i]*<num_pacotes> for i in range(<valor_ini>, <valor_fin>+1, <valor_step>)]
tamPac = []
for i in range(0,len(a)):
    tamPac += a[i]

medLat = []
medVaz = []
numPac = [i for i in range(0,len(tamPac))]

plt.plot(numPac, tamPac)
plt.legend(["Tam. Pacote(byte)"])
plt.ylabel("Teste 1")
plt.show()

plt.plot(numPac, medLat)
plt.legend(["med. Latência(ms)"])
plt.ylabel("Teste 1")
plt.show()

plt.plot(numPac, medVaz)
plt.legend(["med. Vazão(kb/s)"])
plt.ylabel("Teste 1")
plt.show()
```