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CSC 573- Internet Protocols

Project 2 Report

Go-Back-N-ARQ protocol

Task 1:

File Size: 1,078,895 bytes (1.02 MB)

RTT between Client and Server:

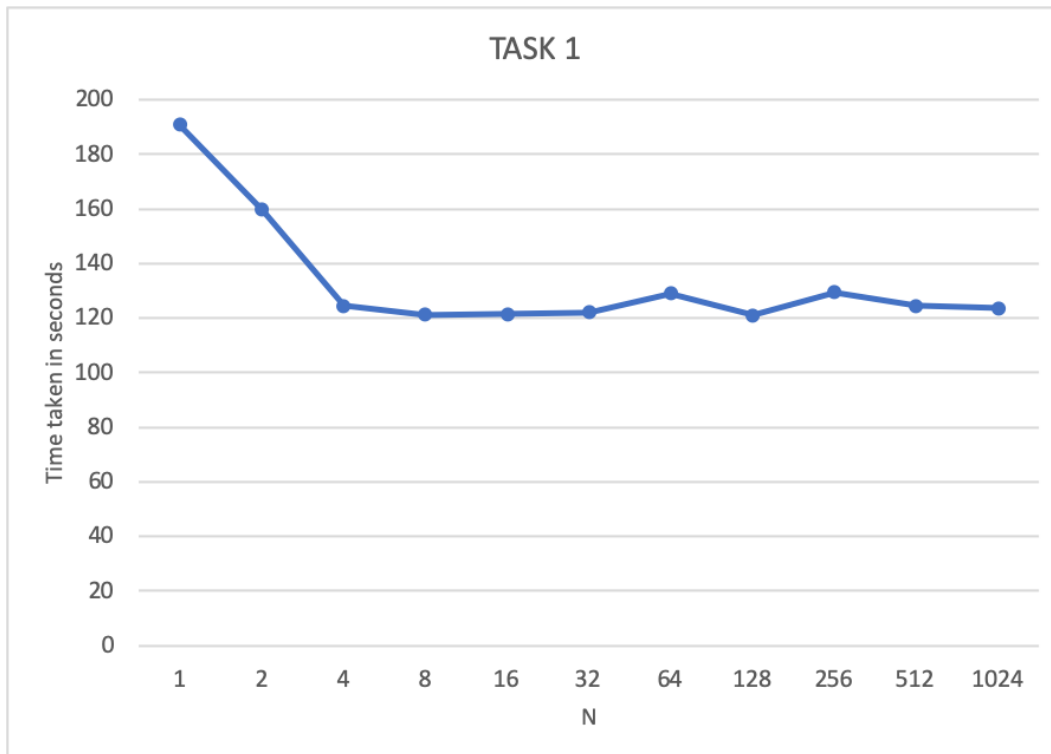
```
Prashanth-MacBook-Pro:Go-Back-N-ARQ prashanthm$ host 152.7.99.67
67.99.7.152.in-addr.arpa domain name pointer vclv99-67.hpc.ncsu.edu.
Prashanth-MacBook-Pro:Go-Back-N-ARQ prashanthm$ traceroute vclv99-67.hpc.ncsu.edu
traceroute to vclv99-67.hpc.ncsu.edu (152.7.99.67), 64 hops max, 52 byte packets
 1  192.168.0.1 (192.168.0.1)  12.651 ms  7.229 ms  2.701 ms
 2  * * *
 3  cpe-174-111-105-237.triad.res.rr.com (174.111.105.237)  443.048 ms  28.335 ms  31.633 ms
 4  cpe-024-025-063-144.ec.res.rr.com (24.25.63.144)  18.940 ms  14.444 ms  16.327 ms
 5  be31.chrcnctr01r.southeast.rr.com (24.93.64.186)  32.616 ms
   be10.drhmncev02r.southeast.rr.com (24.93.64.82)  16.771 ms
   be31.chrcnctr01r.southeast.rr.com (24.93.64.186)  24.855 ms
 6  ge-0-3-0.rlgncpop-rtr1.southeast.rr.com (24.93.64.172)  17.781 ms
   xe-7-0-0.rlgncpop-rtr1.southeast.rr.com (24.93.64.40)  27.127 ms
   xe-7-0-0.chrlncpop-rtr1.southeast.rr.com (24.93.64.42)  24.987 ms
 7  gig10-0-0.chrlncsa-rtr1.carolina.rr.com (24.93.64.27)  19.502 ms  19.978 ms  19.518 ms
 8  cpe-024-074-247-065.carolina.res.rr.com (24.74.247.65)  30.217 ms
   cpe-024-074-247-097.carolina.res.rr.com (24.74.247.97)  22.817 ms
   cpe-024-074-247-065.carolina.res.rr.com (24.74.247.65)  34.724 ms
 9  rrcs-24-172-68-237.midsouth.biz.rr.com (24.172.68.237)  24.042 ms  23.856 ms
   rrcs-24-172-68-245.midsouth.biz.rr.com (24.172.68.245)  21.287 ms
10  rrcs-98-101-20-133.midsouth.biz.rr.com (98.101.20.133)  24.005 ms
   rrcs-98-101-20-135.midsouth.biz.rr.com (98.101.20.135)  24.437 ms
   rrcs-98-101-20-133.midsouth.biz.rr.com (98.101.20.133)  29.036 ms
11  rrcs-24-172-64-46.midsouth.biz.rr.com (24.172.64.46)  19.656 ms  19.496 ms  25.078 ms
12  rtp-gw-to-hntvl-ip-asr-gw.ncren.net (128.109.9.5)  19.371 ms  33.670 ms  29.426 ms
13  ncsu-gw-1-to-rtp-gw.ncren.net (128.109.18.110)  30.117 ms  34.474 ms  25.224 ms
14  152.1.6.69 (152.1.6.69)  32.239 ms  22.546 ms  27.208 ms
15  * * *
16  * 
```

MSS: 500 bytes

p = 0.05

N	Data Transfer Time(seconds)	Average(seconds)
1	186.145	190.707
	195.756	
	192.321	
	188.876	
	190.435	
2	160.323	159.704
	163.094	
	154.163	
	159.436	
	161.508	
4	127.392	124.45
	121.711	
	126.472	
	123.712	
	123.009	
8	119.707	121.251
	123.880	
	121.060	
	121.598	
	120.010	
16	141.511	121.324
	127.537	
	115.194	
	113.414	
	108.967	
32	124.855	122.080
	120.609	
	135.345	
	109.699	
	119.896	
64	151.247	128.910
	128.466	
	124.748	
	118.624	
	121.499	

N	Data Transfer Time(seconds)	Average(seconds)
128	116.008	121.049
	117.781	
	110.442	
	126.918	
	134.099	
256	124.199	129.366
	130.389	
	146.746	
	118.603	
	126.894	
512	119.962	124.395
	116.583	
	118.859	
	146.002	
	120.570	
1024	132.210	123.530
	127.992	
	113.746	
	123.134	
	120.570	



As the value of N increases the time taken to transfer the file decreases. Initially it decreases drastically because more the size of the window, we can transfer more number of packets at a time without waiting for acknowledgment. But at certain point (N = 16, 32), the time taken to transfer remains almost constant. This is observed because as the window size increases, and if there are packet losses, we have to send the whole

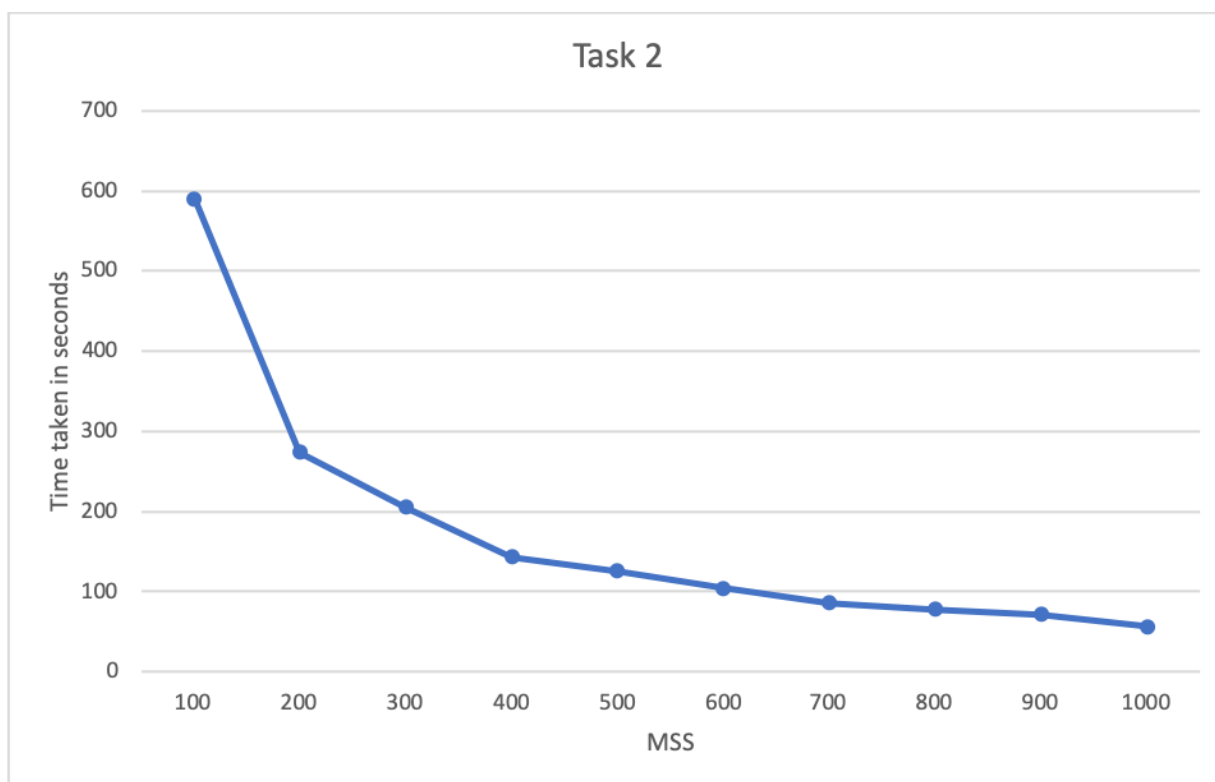
window of packets once again (even if there's one Packet loss) due to Go-Back-N ARQ protocol. This increases the time taken to transfer the file. At $N = 256$ we actually see this increase in time compared to previous N values. So keeping MSS and p constant, varying N exponentially causes a decrease first and an increase (slightly) later.

Task 2:

$N = 64$
 $p = 0.05$

MSS	Data Transfer Time(seconds)	Average(seconds)
100	580.873	590.174
	608.855	
	600.483	
	578.560	
	582.099	
200	290.222	273.884
	291.519	
	282.852	
	244.039	
	260.792	
300	213.702	205.390
	219.053	
	202.948	
	211.960	
	179.291	
400	147.292	142.901
	127.053	
	156.369	
	145.442	
	138.350	
500	123.132	125.44
	119.300	
	126.466	
	136.512	
	121.812	
600	92.209	104.125
	99.122	
	107.310	
	102.647	
	119.338	
700	83.822	85.752
	89.038	
	91.269	
	79.651	
	84.980	

MSS	Data Transfer Time(seconds)	Average(seconds)
800	72.731	78.217
	92.083	
	76.946	
	79.990	
	69.338	
900	70.137	71.810
	75.062	
	77.603	
	61.246	
	75.018	
1000	71.034	56.721
	56.634	
	52.310	
	49.493	
	54.137	



The above graph is obtained keeping N and p as constant. Varying M linearly (an increase of 100 bytes each time), we see a decreasing trend in the time taken to transfer the file. This is observed because as the maximum segment increases, a bigger packet is sent each time. So sending a larger sized packets directly influences the time taken to send the file. The packet drop factor ' p ' here doesn't increase the time taken to transfer (as seen in first case) is because it either server either drops the whole packet or receives whole, so

making the packet larger, effectively eliminates the multiple retransmissions. So we transmission time decreases as MSS increases.

Task 3:

MSS = 500

N = 64

p	Data Transfer Time(seconds)	Average(seconds)
0.01	12.978	21.773
	20.862	
	27.933	
	25.298	
	21.798	
0.02	40.324	44.156
	43.799	
	42.875	
	31.390	
	62.394	
0.03	53.939	65.497
	65.983	
	65.888	
	63.245	
	78.431	
0.04	96.648	97.656
	98.465	
	99.139	
	97.592	
	96.438	
0.05	136.323	105.166
	111.071	
	140.881	
	137.557	
	109.453	
0.06	140.318	144.107
	150.772	
	150.278	
	145.451	
	133.718	
0.07	149.174	165.590
	197.063	
	154.092	
	181.250	
	146.373	

p	Data Transfer Time(Seconds)	Average(second s)
0.08	179.913	196.590
	163.664	
	226.985	
	202.248	
	210.167	
0.09	219.958	221.809
	219.980	
	252.823	
	215.333	
	200.951	
0.10	257.512	254.703
	261.979	
	229.511	
	279.541	
	244.973	



The above graph is obtained keeping N and MSS constant. As the probability of the packet drop increases, more number of packets are dropped. Which means, that Go-Back-N ARQ protocol retransmits the entire window of packets from the lost packet again. This leads to increased time to send packets.