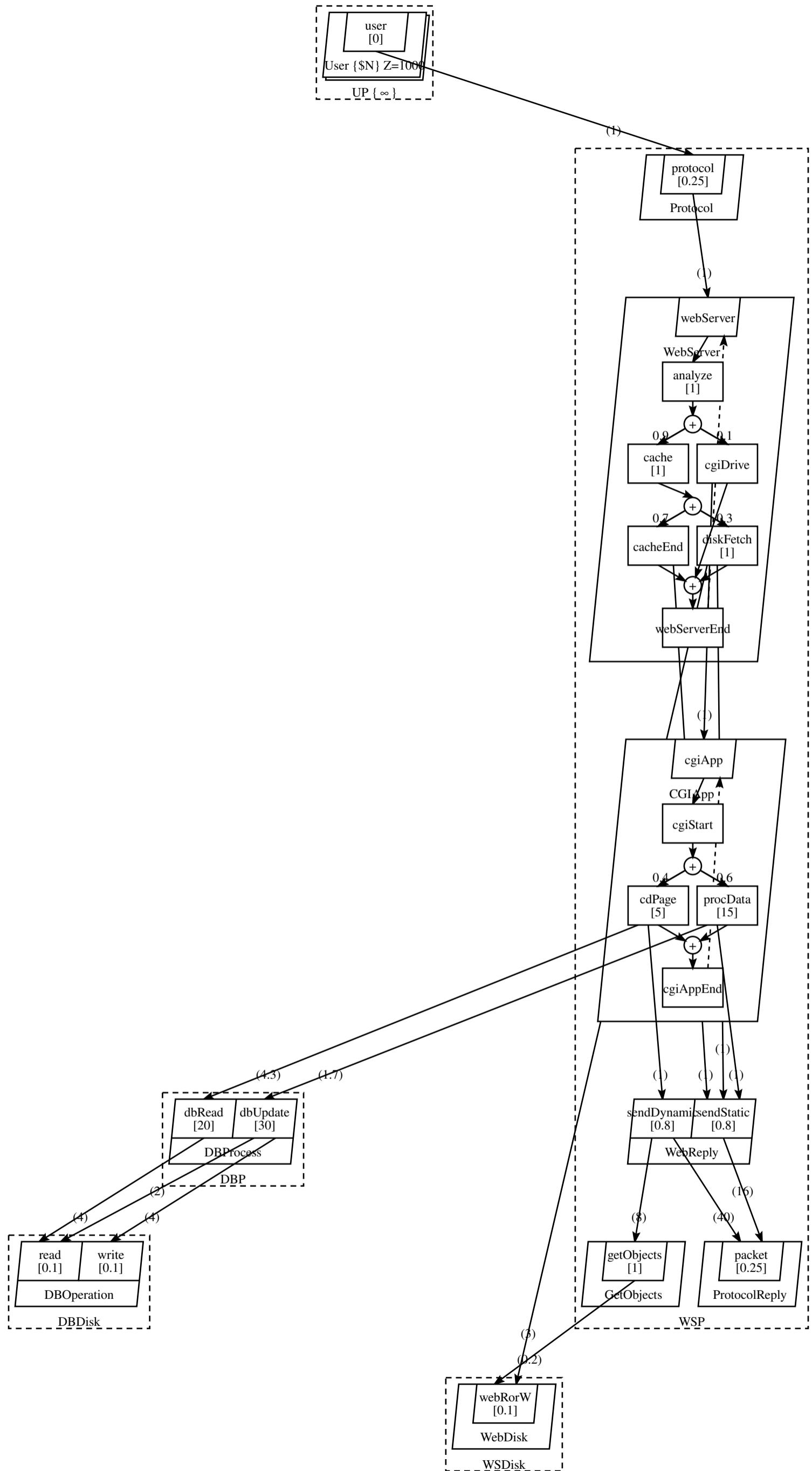


SYSC 5101
PROJECT
TEMPLATE 1
OSONDU
RONALD
101327044



1.1 From our LQN model Diagram, I have the User as an infinite /delay server. WSP , WSDisk , DBP and DBdisk are our processors. In this project I have also added activities, entries and tasks that are needed to carry analysis for the performance of the system.

1.2 INCREASING THE NO OF USERS UNTIL SATURATION

I carried out this analysis on my Excel Sheet.

i) THROUGHPUT ANALYSIS

\$0	\$thruProtocol	\$thruWebServer	\$thruWDisk	\$thruCGIAPP	\$thruWebReply	\$thruGetObjects	\$thruProtocolReply	\$thruDBProcess	\$thruDBOpt
1	0.0390665	0.0390665	0.0341441	0.00390665	0.0390665	0.0125013	0.662567	0.0107042	0.0507864
2	0.0448788	0.0448788	0.0392241	0.00448788	0.0448788	0.0143612	0.761144	0.0122968	0.0583424
3	0.0458057	0.0458057	0.0400342	0.00458057	0.0458057	0.0146578	0.776864	0.0125508	0.0595473
4	0.0476785	0.0476785	0.041671	0.00476785	0.0476785	0.0152571	0.808626	0.0130639	0.061982
5	0.0493406	0.0493406	0.0431236	0.00493406	0.0493406	0.015789	0.836816	0.0135193	0.0641427
6	0.0507295	0.0507295	0.0443376	0.00507295	0.0507295	0.0162334	0.860372	0.0138999	0.0659483
7	0.0515636	0.0500851	0.0448181	0.00500656	0.0513529	0.0160732	0.870183	0.0137573	0.0654441
8	0.0521745	0.0525771	0.044641	0.00526173	0.0509363	0.0167713	0.863226	0.014397	0.0682562
9	0.0529558	0.0533825	0.0452798	0.00534262	0.05166	0.0170242	0.875346	0.0146174	0.0692995
10	0.0536266	0.0540743	0.0458261	0.00541208	0.0522786	0.0172406	0.885683	0.0148065	0.0701941
11	0.0542085	0.0546752	0.0462991	0.00547242	0.0528139	0.0174283	0.894619	0.0149706	0.0709709
12	0.0547178	0.0552017	0.0467123	0.00552531	0.0532816	0.0175926	0.902417	0.0151145	0.0716514
13	0.0551674	0.0556669	0.0470765	0.00557203	0.0536935	0.0177376	0.90928	0.0152416	0.0722525

14	0.055567	0.0560808	0.0473998	0.00561361	0.0540591	0.0178665	0.915366	0.0153546	0.0727873
15	0.0559246	0.0564514	0.0476887	0.00565085	0.0543858	0.0179818	0.920799	0.0154559	0.073266
16	0.0562466	0.0567853	0.0479484	0.0056844	0.0546794	0.0180856	0.925679	0.015547	0.0736973
17	0.0565377	0.0570874	0.0481831	0.00571477	0.0549447	0.0181794	0.930085	0.0156296	0.0740875
18	0.0568024	0.0573623	0.0483963	0.00574239	0.0551855	0.0182647	0.934083	0.0157046	0.0744424
19	0.057044	0.0576134	0.0485907	0.00576763	0.0554052	0.0183426	0.937727	0.0157732	0.0747666
20	0.0572655	0.0578436	0.0487687	0.00579078	0.0556063	0.018414	0.941062	0.0158361	0.0750639
21	0.0574693	0.0580556	0.0489324	0.00581209	0.0557912	0.0184797	0.944126	0.0158939	0.0753375
22	0.0576574	0.0582513	0.0490834	0.00583176	0.0559617	0.0185403	0.946951	0.0159474	0.0755902
23	0.0578316	0.0584326	0.0492231	0.00584999	0.0561195	0.0185964	0.949562	0.0159968	0.0758241
24	0.0579933	0.058601	0.0493527	0.00586693	0.0562658	0.0186484	0.951985	0.0160428	0.0760415
25	0.0581439	0.0587579	0.0494733	0.0058827	0.056402	0.0186969	0.954238	0.0160856	0.0762439
26	0.0582844	0.0589043	0.0495859	0.00589743	0.056529	0.0187422	0.956338	0.0161256	0.0764329
27	0.0584158	0.0590413	0.0496911	0.00591121	0.0566477	0.0187845	0.958301	0.016163	0.0766097
28	0.0585391	0.0591698	0.0497896	0.00592413	0.056759	0.0188242	0.96014	0.0161981	0.0767755
29	0.0586549	0.0592906	0.0498822	0.00593628	0.0568635	0.0188615	0.961866	0.016231	0.0769313
30	0.0587638	0.0594043	0.0499693	0.00594771	0.0569617	0.0188966	0.963489	0.0162621	0.0770779
31	0.0588665	0.0595115	0.0500513	0.0059585	0.0570543	0.0189297	0.965018	0.0162913	0.0772163
32	0.0589636	0.0596128	0.0501288	0.00596869	0.0571417	0.0189609	0.966461	0.016319	0.0773469
33	0.0590553	0.0597086	0.0502021	0.00597833	0.0572244	0.0189904	0.967825	0.0163451	0.0774705
34	0.0591423	0.0597994	0.0502715	0.00598746	0.0573027	0.0190184	0.969116	0.0163699	0.0775876
35	0.0592248	0.0598856	0.0503373	0.00599613	0.0573769	0.019045	0.97034	0.0163934	0.0776988
36	0.0593032	0.0599675	0.0503998	0.00600437	0.0574474	0.0190702	0.971503	0.0164158	0.0778044
37	0.0593777	0.0600454	0.0504592	0.00601221	0.0575144	0.0190942	0.972608	0.016437	0.0779049
38	0.0594487	0.0601196	0.0505158	0.00601967	0.0575782	0.019117	0.97366	0.0164573	0.0780006
39	0.0595164	0.0601903	0.0505697	0.00602679	0.0576391	0.0191388	0.974662	0.0164766	0.0780918
40	0.059581	0.0602579	0.0506212	0.00603359	0.0576971	0.0191596	0.975619	0.016495	0.0781789
41	0.0581408	0.0599304	0.0527607	0.00599057	0.0605131	0.0192199	1.03013	0.0163849	0.0775284
42	0.0581949	0.0599902	0.0528148	0.00599655	0.0605757	0.0192396	1.03122	0.0164013	0.0776052
43	0.0582467	0.0600474	0.0528665	0.00600227	0.0606356	0.0192583	1.03226	0.0164169	0.0776789
44	0.0582964	0.0601023	0.0529161	0.00600775	0.0606931	0.0192764	1.03326	0.0164319	0.0777494

45	0.058344	0.0601549	0.0529637	0.00601301	0.0607482	0.0192936	1.03422	0.0164463	0.0778171
46	0.0583897	0.0602054	0.0530094	0.00601806	0.0608011	0.0193102	1.03514	0.0164601	0.0778821
47	0.0584336	0.060254	0.0530533	0.0060229	0.0608519	0.0193262	1.03602	0.0164734	0.0779445
48	0.0584758	0.0603007	0.0530955	0.00602757	0.0609008	0.0193415	1.03687	0.0164861	0.0780045
49	0.0614797	0.0614797	0.0537332	0.00614797	0.0614797	0.0196735	1.0427	0.0168454	0.0799236
50	0.0615278	0.0615278	0.0537753	0.00615278	0.0615278	0.0196889	1.04351	0.0168586	0.0799862

At saturation we can see that the following computer resources are saturated : Web Server, Protocol, CGI Application, DB Processor , DB Optimizer.

ii) UTILIZATION

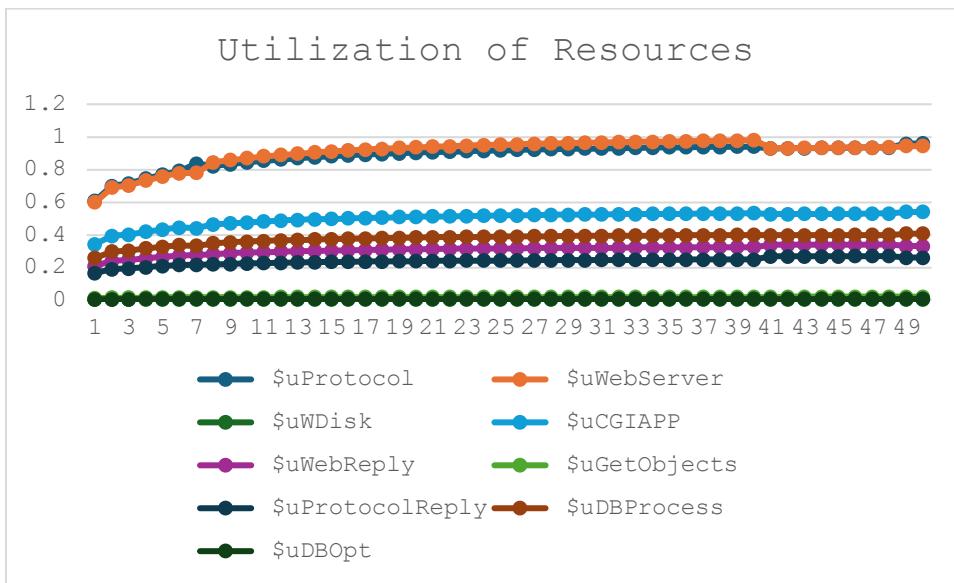
\$N	\$uProtocol	\$uWebServer	\$uWDisk	\$uCGIAPP	\$uWebReply	\$uGetObjects	\$uProtocolReply	\$uDBProcess	\$uDBOpt
1	0.609335	0.599569	0.003414	0.342863	0.209646	0.0127513	0.165642	0.259011	0.005079
2	0.699993	0.688773	0.003922	0.393874	0.240838	0.0146484	0.190286	0.297546	0.005834
3	0.71445	0.702999	0.004003	0.402009	0.245812	0.014951	0.194216	0.303692	0.005955
4	0.74366	0.73174	0.004167	0.418445	0.255862	0.0155622	0.202157	0.316108	0.006198
5	0.769584	0.757249	0.004312	0.433032	0.264781	0.0161048	0.209204	0.327128	0.006414
6	0.791248	0.778566	0.004434	0.445222	0.272235	0.0165581	0.215093	0.336336	0.006595
7	0.837011	0.778749	0.004482	0.440648	0.277876	0.0164	0.217783	0.332887	0.006544
8	0.820586	0.844358	0.004464	0.463082	0.282307	0.0171666	0.218313	0.348366	0.006826
9	0.833209	0.85821	0.004528	0.470266	0.286766	0.0174289	0.221525	0.353698	0.00693
10	0.844062	0.870152	0.004583	0.476439	0.290603	0.0176536	0.224269	0.358273	0.007019
11	0.853492	0.880553	0.00463	0.481804	0.293943	0.0178487	0.226649	0.362246	0.007097
12	0.861758	0.88969	0.004671	0.486509	0.296876	0.0180195	0.228732	0.365727	0.007165
13	0.869063	0.89778	0.004708	0.490667	0.299472	0.0181704	0.230569	0.368802	0.007225
14	0.875564	0.904993	0.00474	0.494369	0.301786	0.0183046	0.232201	0.371537	0.007279
15	0.881387	0.911464	0.004769	0.497686	0.303861	0.0184247	0.233661	0.373987	0.007327
16	0.886635	0.917304	0.004795	0.500675	0.305734	0.0185329	0.234975	0.376193	0.00737
17	0.891384	0.922597	0.004818	0.503381	0.30743	0.0186307	0.236164	0.37819	0.007409
18	0.895706	0.927418	0.00484	0.505844	0.308976	0.0187197	0.237244	0.380006	0.007444
19	0.899654	0.931828	0.004859	0.508094	0.310389	0.018801	0.23823	0.381665	0.007477
20	0.903276	0.935878	0.004877	0.510158	0.311686	0.0188756	0.239133	0.383186	0.007506

21	0.90661	0.939609	0.004893	0.512059	0.312881	0.0189441	0.239964	0.384587	0.007534
22	0.909689	0.943058	0.004908	0.513815	0.313986	0.0190075	0.240731	0.385879	0.007559
23	0.912542	0.946256	0.004922	0.515441	0.315011	0.0190661	0.241441	0.387077	0.007582
24	0.915192	0.94923	0.004935	0.516953	0.315963	0.0191206	0.2421	0.388189	0.007604
25	0.917661	0.952001	0.004947	0.518361	0.316851	0.0191713	0.242714	0.389225	0.007624
26	0.919966	0.954591	0.004959	0.519676	0.31768	0.0192186	0.243287	0.390193	0.007643
27	0.922124	0.957016	0.004969	0.520906	0.318457	0.0192629	0.243822	0.391098	0.007661
28	0.924147	0.959292	0.004979	0.52206	0.319185	0.0193045	0.244325	0.391946	0.007678
29	0.926049	0.961432	0.004988	0.523145	0.31987	0.0193435	0.244796	0.392744	0.007693
30	0.927839	0.963448	0.004997	0.524167	0.320516	0.0193802	0.24524	0.393495	0.007708
31	0.929527	0.965351	0.005005	0.52513	0.321125	0.0194149	0.245659	0.394203	0.007722
32	0.931123	0.967149	0.005013	0.526041	0.3217	0.0194476	0.246054	0.394872	0.007735
33	0.932632	0.968851	0.00502	0.526902	0.322245	0.0194785	0.246428	0.395504	0.007747
34	0.934063	0.970465	0.005027	0.527718	0.322762	0.0195079	0.246782	0.396104	0.007759
35	0.93542	0.971997	0.005034	0.528493	0.323252	0.0195357	0.247118	0.396673	0.00777
36	0.93671	0.973454	0.00504	0.529229	0.323718	0.0195621	0.247437	0.397214	0.00778
37	0.937938	0.97484	0.005046	0.52993	0.324162	0.0195873	0.24774	0.397728	0.00779
38	0.939107	0.976162	0.005052	0.530598	0.324585	0.0196112	0.248029	0.398218	0.0078
39	0.940222	0.977422	0.005057	0.531234	0.324988	0.0196341	0.248305	0.398685	0.007809
40	0.941287	0.978626	0.005062	0.531842	0.325373	0.0196559	0.248568	0.399131	0.007818
41	0.92929	0.930131	0.005276	0.5271	0.338959	0.01988	0.267682	0.396467	0.007753
42	0.930218	0.931095	0.005281	0.52763	0.339358	0.0199013	0.267998	0.396863	0.007761
43	0.931106	0.932018	0.005287	0.528138	0.33974	0.0199216	0.2683	0.397241	0.007768
44	0.931957	0.932903	0.005292	0.528625	0.340106	0.0199411	0.26859	0.397604	0.007775
45	0.932773	0.933752	0.005296	0.529092	0.340458	0.0199598	0.268868	0.397952	0.007782
46	0.933557	0.934567	0.005301	0.529541	0.340796	0.0199777	0.269135	0.398286	0.007788
47	0.93431	0.935351	0.005305	0.529971	0.341121	0.019995	0.269392	0.398607	0.007794
48	0.935035	0.936104	0.00531	0.530386	0.341434	0.0200116	0.269639	0.398916	0.0078
49	0.958923	0.943553	0.005373	0.53957	0.329924	0.020067	0.260674	0.40761	0.007992
50	0.959674	0.944292	0.005378	0.539993	0.330183	0.0200827	0.260878	0.40793	0.007999

iii) RESPONSE TIME AND WAITING TIME

\$N	\$wUser	\$wProtocol	\$wSendStatic	\$N	\$rt Protocol	\$rtWebServer	\$rtWdisk	\$rtCGIApp	\$rtWeb reply	\$rtGetObjects	\$rtProtocol Reply	\$rt DB process	\$rt DBOp
1	0	0	0	1	15.59737883	15.5973788	19.28764	245.9738	15.59737883	69.99168087	1.509281326	83.42127389	9.690
2	18.9671	0	0	2	34.56447142	34.5644714	40.98906	435.6447	34.56447142	129.2641283	2.627623682	152.6439399	24.28
3	39.8966	0	0	3	55.4940324	55.4940324	64.93593	644.9403	55.4940324	194.6691864	3.861679779	229.0285878	40.38
4	58.2979	0	0	4	73.89525677	73.8952568	85.99002	828.9526	73.89525677	252.1730211	4.94666261	296.1872794	54.53
5	75.7391	0	0	5	91.33642477	91.3364248	105.9458	1003.364	91.33642477	306.676167	5.975029158	359.8416338	67.95
6	92.677	0	0	6	108.2743768	108.274377	125.3253	1172.744	108.2743768	359.6083384	6.973727643	421.6577817	80.98
7	109.522	0.490965	0.00245291	7	125.7546797	129.762125	146.1869	1388.166	126.3116786	425.5075529	8.044284938	498.8207715	96.96
8	127.604	0	0.00353184	8	143.3316084	142.157498	169.2075	1510.412	147.0589148	467.0053603	9.26756145	545.6713204	107.2
9	144.219	0	0.00366679	9	159.9530552	158.594577	188.7641	1674.567	164.2160279	518.6592028	10.28164863	605.7045713	119.8
10	160.735	0	0.00379374	10	176.4746227	174.930734	208.2163	1837.718	181.2828576	570.0262172	11.2907214	665.3790565	132.4
11	177.176	0	0.003906	11	192.9202062	191.188107	227.5856	2000.08	198.2785024	621.1573705	12.29573707	724.7734894	144.9
12	193.558	0	0.00400592	12	209.3070628	207.38461	246.8917	2161.824	215.2184619	672.104976	13.29762183	783.9395944	157.4
13	209.893	0	0.00409538	13	225.6464144	223.531955	266.1463	2323.081	232.1149674	722.9063684	14.29702622	842.9288264	169.9
14	226.191	0	0.00417592	14	241.9480987	239.639805	285.3599	2483.939	248.9758246	773.5893992	15.29442868	901.7788806	182.3
15	242.458	0	0.00424879	15	258.2182796	255.715288	304.5399	2644.468	265.8072879	824.1767787	16.29020014	960.5031735	194.7
16	258.699	0	0.00431523	16	274.4616386	271.763062	323.6921	2804.721	282.614769	874.6817357	17.28460946	1019.137454	207.1
17	274.918	0	0.00437566	17	290.6843221	287.789004	342.8208	2964.748	299.4019987	925.1243715	18.27789933	1077.679787	219.4
18	291.119	0	0.00443092	18	306.8880188	303.794949	361.9293	3124.583	316.1726359	975.5075638	19.27023616	1136.160997	231.7
19	307.305	0	0.0044819	19	323.0762219	319.78439	381.0213	3284.247	332.9281006	1025.840066	20.26176062	1194.574848	244.1

20	323.477	0	0.00452894	20	339.2504213	335.759946	400.0991	3443.766	349.6714761	1076.130118	21.25258485	1252.937213	256.4
21	339.637	0	0.00457242	21	355.4124898	351.722211	419.1635	3603.158	366.4034471	1126.382084	22.24279386	1311.261616	268.7
22	355.787	0	0.00461285	22	371.5642051	367.673975	438.2167	3762.446	383.126013	1176.604316	23.2324587	1369.535222	281.
23	371.927	0	0.00465048	23	387.7064442	383.615892	457.2603	3921.631	399.839717	1226.79852	24.22169379	1427.787558	293.3
24	388.06	0	0.00468558	24	403.8409092	399.549325	476.2956	4080.725	416.5468544	1276.973681	25.21048126	1485.998205	305.6
25	404.185	0	0.00471841	25	419.967718	415.474702	495.3231	4239.749	433.2466934	1327.120057	26.19891474	1544.18511	317.8
26	420.305	0	0.00474918	26	436.0884902	431.393922	514.3426	4398.7	449.9409153	1377.24376	27.18704057	1602.343107	330.1
27	436.418	0	0.00477808	27	452.2037189	447.307004	533.3569	4557.593	466.6301191	1427.355266	28.17486364	1660.481965	342.4
28	452.526	0	0.00480527	28	468.3127858	463.214376	552.3664	4716.432	483.3138357	1477.44701	29.16241381	1718.597799	354.6
29	468.63	0	0.00483078	29	484.4173462	479.116319	571.3697	4875.214	499.9932294	1527.523527	30.1497298	1776.704454	366.9
30	484.729	0	0.00485499	30	500.5183804	495.013947	590.3686	5033.958	516.6696745	1577.587185	31.13683706	1834.780194	379.2
31	500.824	0	0.00487789	31	516.6153075	510.907724	609.3645	5192.652	533.3420443	1627.638209	32.12375313	1892.856126	391.4
32	516.916	0	0.00489957	32	532.7077044	526.797466	628.3556	5351.31	550.0113402	1677.683602	33.11049282	1950.904467	403.7
33	533.005	0	0.00492013	33	548.7982789	542.684203	647.343	5509.936	566.6770818	1727.720111	34.09707333	2008.953693	415.9
34	549.091	0	0.00493966	34	564.8846426	558.567578	666.3275	5668.535	583.3402789	1777.742397	35.08351941	2066.982755	428.2
35	565.174	0	0.00495823	35	580.9686483	574.44768	685.3094	5827.098	600.001586	1827.752691	36.06983119	2125.005551	440.4
36	581.255	0	0.00497591	36	597.0498725	590.325176	704.2885	5985.633	616.6602144	1877.762058	37.05598439	2183.009174	452.6
37	597.333	0	0.00499277	37	613.1295587	606.200408	723.2657	6144.143	633.3171519	1927.761205	38.04204777	2241.019042	464.
38	613.41	0	0.00500886	38	629.2065764	622.0734	742.2399	6302.638	649.9720033	1977.759586	39.02799745	2299.00573	477.1
39	629.484	0	0.00502423	39	645.2815694	637.944935	761.2128	6461.107	666.6240278	2027.745313	40.01387148	2356.99319	489.4
40	645.556	0	0.00503892	40	661.3549622	653.813376	780.1828	6619.552	683.2757452	2077.726257	40.99961153	2414.977266	501.
41	679.202	0.136923	0	41	695.1846552	674.126921	767.0936	6834.09	667.5392436	2123.205688	39.80080184	2492.303951	518.8
42	695.728	0.137244	0	42	711.7127274	690.114352	785.2316	6994.027	683.3473323	2172.997568	40.72845756	2550.772622	531.2
43	712.253	0.137552	0	43	728.2392479	706.100947	803.3695	7153.956	699.1543582	2222.803518	41.65617189	2609.252112	543.5
44	728.777	0.137847	0	44	744.7635875	722.085128	821.505	7313.873	714.9588503	2272.583885	42.58366723	2667.718341	555.9
45	745.3	0.138131	0	45	761.287536	738.068736	839.6385	7473.773	730.7626893	2322.379649	43.51105181	2726.177742	568.2
46	761.822	0.138405	0	46	777.8101789	754.051065	857.7706	7633.659	746.5652595	2372.160723	44.43843345	2784.636728	580.6
47	778.342	0.138667	0	47	794.3317543	770.031201	875.9015	7793.55	762.3670091	2421.931782	45.36591958	2843.084366	592.9
48	794.862	0.138921	0	48	810.8523868	786.01066	894.0314	7953.408	778.1669863	2471.710312	46.29317079	2901.543664	605.3
49	771.414	0	0	49	787.0110459	787.011046	901.9129	7960.11	787.0110459	2480.660025	46.99338256	2898.805965	603.0
50	787.043	0	0	50	802.64079	802.64079	919.7949	8116.408	802.64079	2529.501953	47.91520925	2955.845325	615.1

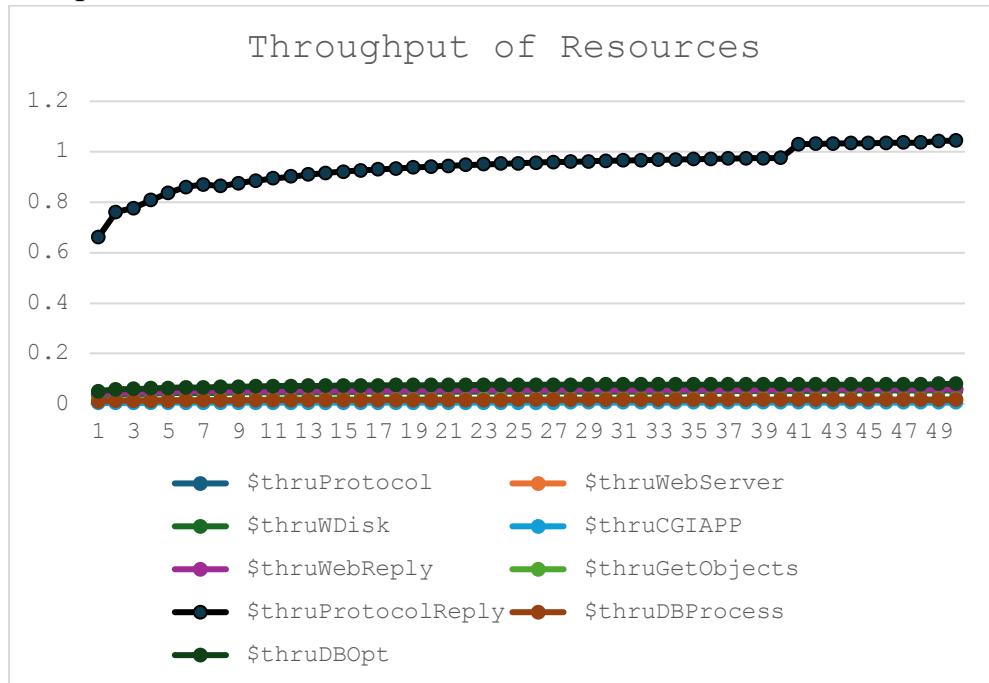


1c) Bottleneck Analysis:

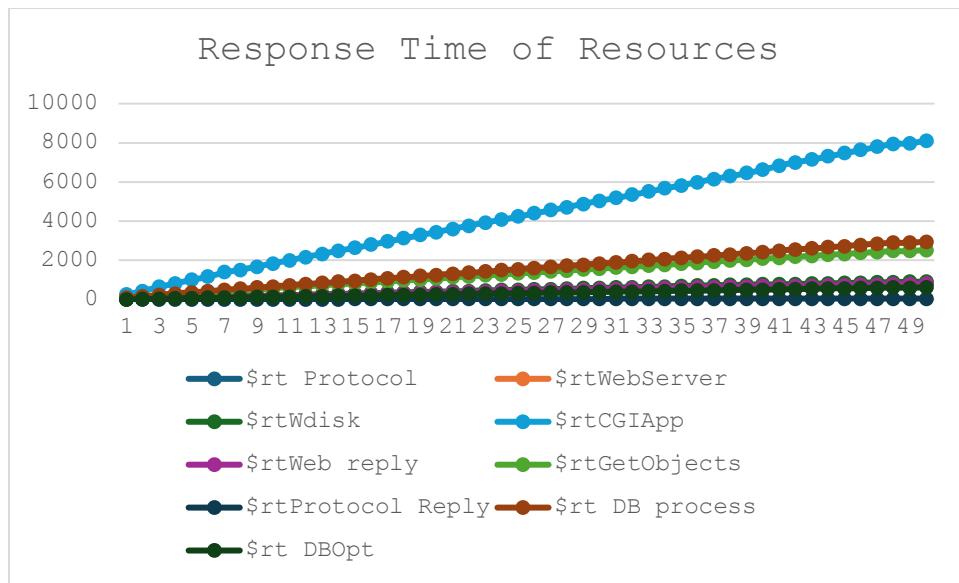
The utilization graph shows that the software task saturates when utilizations of other tasks and processors are very low. So, the Protocol and Web Server are the bottleneck of the system. We will need to carry out more experiments to validate what leads to the saturation of S1. The analysis of the utilization shows that Protocol and Web Server are the bottleneck of the system, and they need to be improved.

Other Analysis:

Hardware Utilization: All the selected hardware resource utilization is less than 0.6 when the system is saturated. Hardware performance is acceptable.



From the graph we can see that the throughput(Protocol reply) is considerably high compared to other resources which tells us that the frequency is high there compared to other resources. This problem will be addressed further in the project .We can also see that other resources are performing at a very low rate, which will also be addressed further in the project.



From our response time graph we can see that at low workload intensity, customers meet low competition , so its response time is roughly equal to service demand. As the workload increases, we see that CGI application responds quickly compared to other resources. The DB process and Get Objects also perform well but the CGI outperforms all resources . The remaining resources are abysmal because there is no change in the response time as the no of users increases. Further improvements need to be made to improve software performance.

1d) SENSITIVITY TO CACHE RATE

When PCM =0.1

THROUGHPUT

\$0	\$thruProtocol	\$thruWebServer	\$thruWDisk	\$thruCGIAPP	\$thruWebReply	\$thruGetObject	\$thruProtReply	\$thruDBProcess	\$thruDBOpt
1	0.0394269	0.0394269	0.0131686	0.00394269	0.0394269	0.0126166	0.66868	0.010803	0.051255
2	0.0451966	0.0451966	0.0150956	0.00451966	0.0451966	0.0144629	0.766533	0.0123839	0.0587555
3	0.0460931	0.0460931	0.0153951	0.00460931	0.0460931	0.0147498	0.781738	0.0126295	0.059921
4	0.0480073	0.0480073	0.0160344	0.00480073	0.0480073	0.0153623	0.814203	0.013154	0.0624094

5	0.0497134	0.0497134	0.0166043	0.00497134	0.0497134	0.0159083	0.843139	0.0136215	0.0646274
6	0.0511426	0.0511426	0.0170816	0.00511426	0.0511426	0.0163656	0.867379	0.0140131	0.0664854
7	0.0520084	0.0504842	0.0172286	0.0050464	0.0517833	0.0162014	0.877436	0.0138675	0.0659713
8	0.0516051	0.0528086	0.0177096	0.00527926	0.0531336	0.0169046	0.9028	0.0144415	0.0683773
9	0.053434	0.0538872	0.0175143	0.00539314	0.0521143	0.0171817	0.882962	0.0147545	0.069946
10	0.0541273	0.0546039	0.0177323	0.0054651	0.0527537	0.0174058	0.893645	0.0149504	0.0708725
11	0.0547293	0.0552269	0.0179213	0.00552768	0.0533077	0.0176004	0.902888	0.0151206	0.0716778
12	0.0552567	0.0557735	0.0180866	0.00558259	0.053792	0.0177709	0.910961	0.01527	0.0723841
13	0.0557225	0.0562567	0.0182324	0.00563114	0.054219	0.0179214	0.918071	0.015402	0.0730084
14	0.0561369	0.056687	0.0183619	0.00567437	0.0545982	0.0180553	0.924381	0.0155195	0.0735643
15	0.056508	0.0570726	0.0184777	0.00571312	0.0549372	0.0181752	0.930016	0.0156248	0.0740623
16	0.0568422	0.0574202	0.018582	0.00574806	0.0552421	0.0182832	0.935081	0.0157197	0.0745111
17	0.0571446	0.0577349	0.0186762	0.0057797	0.0555176	0.0183809	0.939655	0.0158057	0.0749175
18	0.0574196	0.0580214	0.0187618	0.0058085	0.0557679	0.0184697	0.943809	0.0158839	0.0752874
19	0.0576708	0.0582832	0.01884	0.00583482	0.0559963	0.0185509	0.947595	0.0159554	0.0756254
20	0.0565407	0.0581585	0.0195384	0.00581354	0.0586599	0.0186413	0.998059	0.015901	0.0752526
21	0.056737	0.0583735	0.0196122	0.00583501	0.0588835	0.0187115	1.00193	0.0159597	0.0755288
22	0.0569182	0.0585719	0.0196805	0.00585483	0.05909	0.0187763	1.00551	0.0160139	0.0757839
23	0.0570858	0.0587558	0.0197437	0.00587319	0.0592814	0.0188364	1.00883	0.016064	0.0760201
24	0.0572415	0.0589266	0.0198025	0.00589024	0.0594594	0.0188923	1.01191	0.0161107	0.0762395
25	0.0573863	0.0590856	0.0198572	0.00590613	0.0596251	0.0189443	1.01479	0.0161541	0.0764439
26	0.0575215	0.0592341	0.0199084	0.00592095	0.0597799	0.0189929	1.01748	0.0161946	0.0766347
27	0.0576478	0.059373	0.0199562	0.00593483	0.0599249	0.0190384	1.01999	0.0162326	0.0768132
28	0.0577663	0.0595033	0.0200011	0.00594784	0.0600608	0.0190811	1.02235	0.0162681	0.0769807
29	0.0578775	0.0596257	0.0200433	0.00596007	0.0601886	0.0191212	1.02457	0.0163016	0.077138
30	0.0579822	0.0597409	0.0200831	0.00597158	0.060309	0.0191589	1.02666	0.016333	0.077286
31	0.0580809	0.0598496	0.0201205	0.00598243	0.0604225	0.0191945	1.02863	0.0163627	0.0774256
32	0.0581741	0.0599522	0.0201559	0.00599268	0.0605298	0.0192282	1.0305	0.0163907	0.0775576
33	0.0582622	0.0600494	0.0201895	0.00600238	0.0606313	0.0192601	1.03226	0.0164173	0.0776824
34	0.0583456	0.0601414	0.0202212	0.00601157	0.0607275	0.0192903	1.03394	0.0164424	0.0778006
35	0.0584248	0.0602287	0.0202514	0.00602029	0.0608189	0.0193189	1.03553	0.0164662	0.0779129

36	0.0585	0.0603117	0.02028	0.00602858	0.0609057	0.0193462	1.03704	0.0164889	0.0780195
37	0.0585715	0.0603907	0.0203073	0.00603646	0.0609883	0.0193721	1.03847	0.0165105	0.0781209
38	0.0586396	0.0604658	0.0203333	0.00604397	0.061067	0.0193968	1.03984	0.016531	0.0782175
39	0.0587045	0.0605376	0.020358	0.00605114	0.0611421	0.0194204	1.04115	0.0165506	0.0783097
40	0.0587665	0.060606	0.0203817	0.00605797	0.0612137	0.0194429	1.0424	0.0165693	0.0783977
41	0.0588257	0.0606714	0.0204043	0.00606451	0.0612823	0.0194644	1.04359	0.0165872	0.0784817
42	0.0588823	0.060734	0.0204259	0.00607076	0.0613478	0.0194849	1.04473	0.0166042	0.0785622
43	0.0589365	0.060794	0.0204466	0.00607674	0.0614106	0.0195046	1.04583	0.0166206	0.0786392
44	0.0589884	0.0608514	0.0204665	0.00608248	0.0614708	0.0195235	1.04688	0.0166363	0.078713
45	0.0590382	0.0609065	0.0204856	0.00608798	0.0615286	0.0195416	1.04788	0.0166514	0.0787838
46	0.059086	0.0609594	0.0205039	0.00609327	0.0615841	0.019559	1.04885	0.0166658	0.0788518
47	0.059132	0.0610102	0.0205214	0.00609834	0.0616374	0.0195758	1.04978	0.0166797	0.0789171
48	0.0591761	0.0610591	0.0205383	0.00610323	0.0616886	0.0195919	1.05067	0.0166931	0.0789799
49	0.0623166	0.0623166	0.0208138	0.00623166	0.0623166	0.0199413	1.05689	0.0170748	0.0810116
50	0.0623672	0.0623672	0.0208307	0.00623672	0.0623672	0.0199575	1.05775	0.0170886	0.0810774

UTILIZATION

\$N	\$uProtocol	\$uWebServer	\$uWDisk	\$uCGIAPP	\$uWebReply	\$uGetObjects	\$uProtReply	\$uDBProcess	\$uDBOpt
1	0.605731	0.595874	0.001317	0.346026	0.21158	0.0128689	0.16717	0.2614	0.005126
2	0.694373	0.683074	0.00151	0.396663	0.242543	0.0147521	0.191633	0.299653	0.005876
3	0.708146	0.696623	0.00154	0.404531	0.247354	0.0150448	0.195435	0.305597	0.005992
4	0.737555	0.725553	0.001603	0.421331	0.257626	0.0156696	0.203551	0.318288	0.006241
5	0.763767	0.751338	0.00166	0.436305	0.266782	0.0162264	0.210785	0.3296	0.006463
6	0.785725	0.772939	0.001708	0.448848	0.274452	0.0166929	0.216845	0.339076	0.006649
7	0.832357	0.773337	0.001723	0.444186	0.280303	0.0165311	0.219608	0.335553	0.006597
8	0.807081	0.803796	0.001771	0.464085	0.293297	0.0174018	0.231612	0.349441	0.006838
9	0.828173	0.854129	0.001751	0.474745	0.289546	0.0175931	0.223574	0.357017	0.006995
10	0.839228	0.866346	0.001773	0.481142	0.293528	0.017826	0.226421	0.361756	0.007087
11	0.848843	0.876998	0.001792	0.486708	0.296999	0.0180283	0.228892	0.365875	0.007168
12	0.857279	0.886367	0.001809	0.491593	0.30005	0.0182058	0.231056	0.369488	0.007238

13	0.864739	0.89467	0.001823	0.495915	0.302753	0.0183626	0.232967	0.372683	0.007301
14	0.871384	0.90208	0.001836	0.499766	0.305165	0.0185022	0.234667	0.375527	0.007356
15	0.87734	0.908732	0.001848	0.503218	0.30733	0.0186273	0.236188	0.378075	0.007406
16	0.88271	0.91474	0.001858	0.506332	0.309284	0.01874	0.237559	0.380372	0.007451
17	0.887573	0.920189	0.001868	0.509152	0.311057	0.018842	0.238799	0.382452	0.007492
18	0.892	0.925155	0.001876	0.51172	0.312672	0.0189349	0.239927	0.384345	0.007529
19	0.896047	0.9297	0.001884	0.514068	0.31415	0.0190197	0.240956	0.386074	0.007563
20	0.888675	0.887624	0.001954	0.511394	0.32713	0.0192533	0.258333	0.384758	0.007525
21	0.891961	0.891015	0.001961	0.513298	0.32853	0.0193287	0.259439	0.386178	0.007553
22	0.894995	0.894148	0.001968	0.515056	0.329826	0.0193984	0.260463	0.387489	0.007578
23	0.897806	0.897052	0.001974	0.516686	0.331028	0.0194631	0.261413	0.388703	0.007602
24	0.900418	0.89975	0.00198	0.518199	0.332148	0.0195232	0.262298	0.389831	0.007624
25	0.90285	0.902265	0.001986	0.519609	0.333192	0.0195792	0.263123	0.390882	0.007644
26	0.905122	0.904613	0.001991	0.520925	0.334169	0.0196316	0.263895	0.391863	0.007663
27	0.907248	0.906811	0.001996	0.522157	0.335085	0.0196806	0.264619	0.392781	0.007681
28	0.909241	0.908874	0.002	0.523312	0.335945	0.0197266	0.265299	0.393641	0.007698
29	0.911115	0.910812	0.002004	0.524397	0.336754	0.0197699	0.265939	0.39445	0.007714
30	0.912879	0.912638	0.002008	0.525419	0.337517	0.0198107	0.266542	0.395212	0.007729
31	0.914543	0.91436	0.002012	0.526383	0.338238	0.0198491	0.267111	0.395929	0.007743
32	0.916115	0.915987	0.002016	0.527293	0.338919	0.0198855	0.26765	0.396608	0.007756
33	0.917602	0.917527	0.002019	0.528155	0.339565	0.0199199	0.26816	0.39725	0.007768
34	0.919012	0.918987	0.002022	0.528971	0.340177	0.0199526	0.268644	0.397858	0.00778
35	0.920349	0.920372	0.002025	0.529746	0.340759	0.0199835	0.269104	0.398435	0.007791
36	0.92162	0.921689	0.002028	0.530482	0.341313	0.020013	0.269542	0.398983	0.007802
37	0.92283	0.922942	0.002031	0.531183	0.34184	0.020041	0.269958	0.399505	0.007812
38	0.923982	0.924136	0.002033	0.53185	0.342342	0.0200678	0.270356	0.400002	0.007822
39	0.925081	0.925275	0.002036	0.532487	0.342822	0.0200932	0.270735	0.400476	0.007831
40	0.92613	0.926362	0.002038	0.533094	0.34328	0.0201176	0.271097	0.400928	0.00784
41	0.927133	0.927402	0.00204	0.533675	0.343719	0.0201409	0.271444	0.401361	0.007848
42	0.928092	0.928396	0.002043	0.53423	0.344138	0.0201632	0.271776	0.401774	0.007856
43	0.929011	0.929349	0.002045	0.534762	0.34454	0.0201845	0.272094	0.40217	0.007864

44	0.929891	0.930262	0.002047	0.535272	0.344926	0.020205	0.272399	0.40255	0.007871
45	0.930736	0.931138	0.002049	0.535761	0.345297	0.0202246	0.272692	0.402914	0.007878
46	0.931547	0.931979	0.00205	0.536231	0.345652	0.0202435	0.272973	0.403264	0.007885
47	0.932327	0.932788	0.002052	0.536682	0.345995	0.0202616	0.273244	0.4036	0.007892
48	0.933076	0.933566	0.002054	0.537116	0.346324	0.020279	0.273504	0.403923	0.007898
49	0.957396	0.941816	0.002081	0.546916	0.334416	0.0203402	0.264223	0.413159	0.008101
50	0.958173	0.942581	0.002083	0.54736	0.334688	0.0203567	0.264437	0.413495	0.008108

RESPONSE TIME

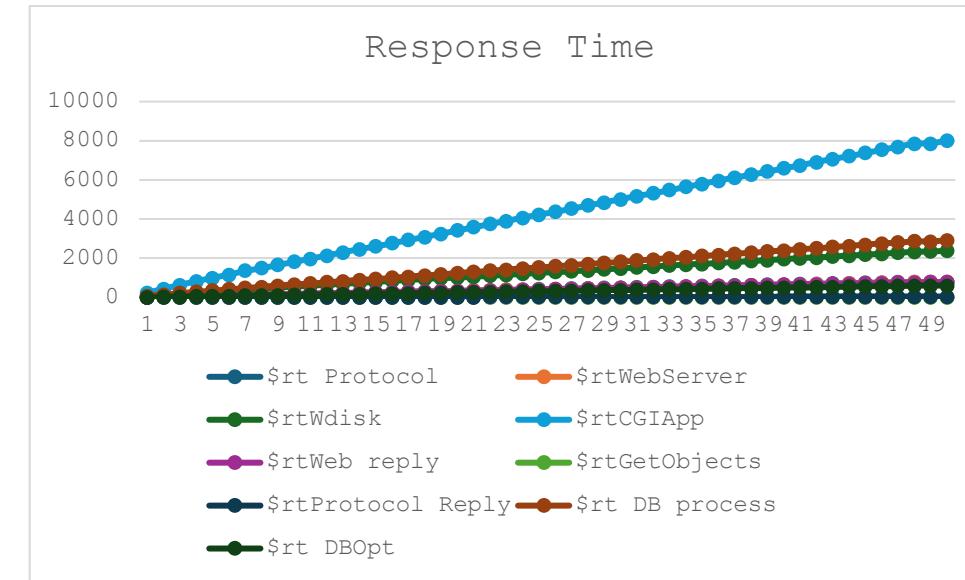
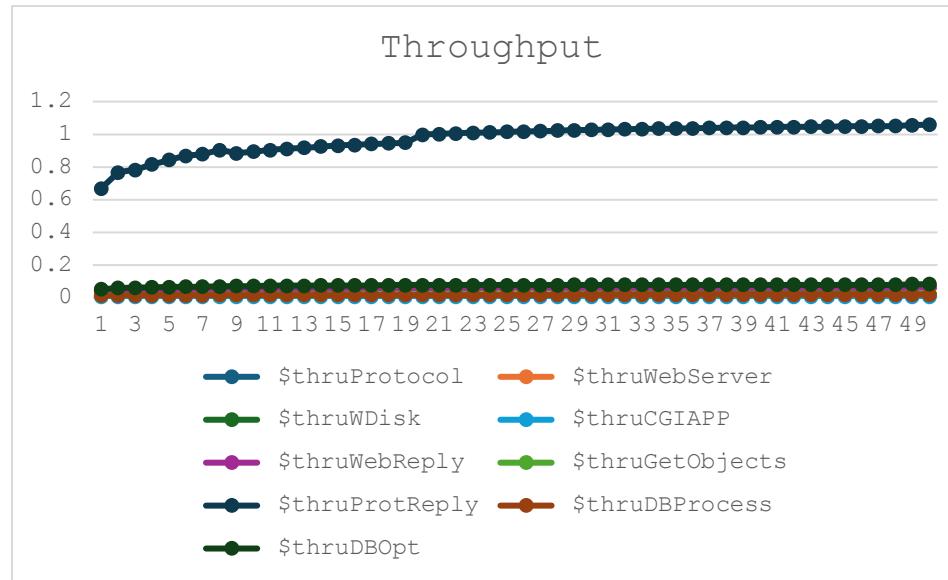
\$N	\$rt Protocol	\$rtWebServer	\$rtWdisk	\$rtCGIApp	\$rtWeb reply	\$rtGetObject	\$rtProtocol Reply	\$rt DB process	\$rt DBOpt
1	15.36339	15.36339403	65.93822	243.6339	15.363394	0.09873834	1.495484	82.56688	9.510292
2	34.25112	34.25111623	122.4889	432.5112	34.2511162	0.19855371	2.609151	151.5	24.03937
3	55.08566	55.08566358	184.8672	640.8566	55.0856636	0.29852502	3.837603	227.5391	40.06592
4	73.32066	73.32066165	239.4637	823.2066	73.3206616	0.39846377	4.91278	294.09	54.09291
5	90.5765	90.57650452	291.1268	995.765	90.5765045	0.49840917	5.93022	357.0668	67.36657
6	107.319	107.3190256	341.2552	1163.19	107.319026	0.59836344	6.917391	418.1708	80.24538
7	124.5936	128.6572433	396.3012	1377.127	125.178716	0.69837986	7.97779	494.7774	96.10675
8	145.0234	141.4904769	441.7324	1505.364	140.563862	0.79830954	8.86132	543.9591	106.9979
9	158.4321	157.0155436	503.8658	1658.787	162.697321	0.89828183	10.19296	599.9834	118.6707
10	174.7497	173.1371019	553.9426	1819.793	179.560164	0.99825942	11.19013	658.8784	131.0985
11	190.9892	189.178299	603.7948	1979.985	196.349177	1.09823996	12.18313	717.4844	143.4645
12	207.1682	205.1559432	653.4746	2139.54	213.081499	1.19822291	13.1729	775.8546	155.7823
13	223.2989	221.0835865	703.0164	2298.591	229.768347	1.29820786	14.16012	834.0462	168.0617
14	239.3903	236.9702048	752.4483	2457.234	246.41871	1.39819447	15.14527	892.0909	180.3097
15	255.4491	252.8231411	801.7893	2615.536	263.039034	1.49818248	16.12875	950.0123	192.5322
16	271.481	268.647584	851.0483	2773.548	279.634174	1.59817168	17.11082	1007.831	204.7331
17	287.4909	284.4492846	900.2494	2931.329	296.209202	1.69816191	18.09175	1065.561	216.9163
18	303.4818	300.2303633	949.3962	3088.907	312.766323	1.79815303	19.07166	1123.223	229.0838

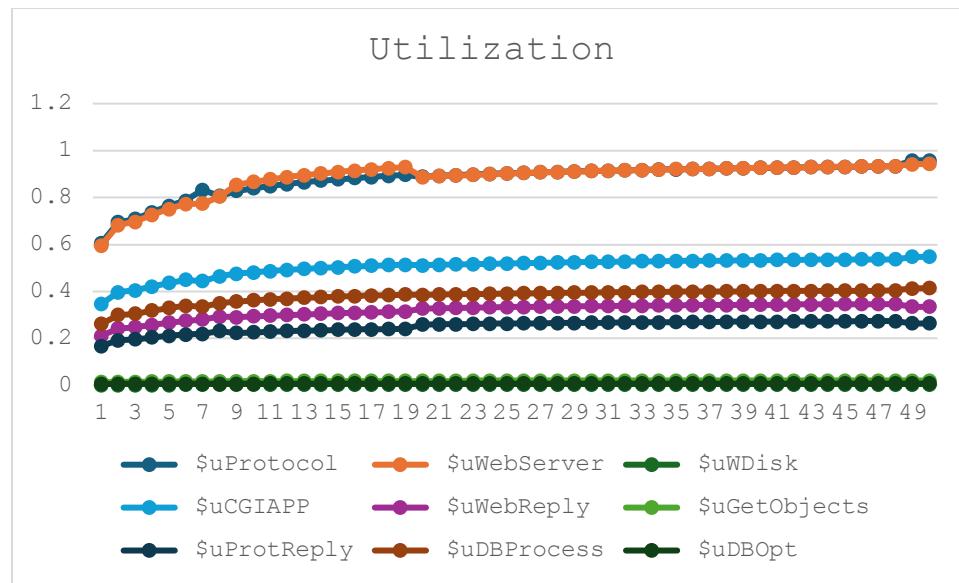
19	319.4562	315.9944547	998.4926	3246.313	329.308133	1.89814491	20.05076	1180.819	241.2383
20	343.7275	333.8878238	1013.625	3430.245	330.948416	1.99813587	20.0389	1247.783	255.7715
21	360.1288	349.7522849	1060.762	3588.966	346.636409	2.09812885	20.95955	1305.814	268.0396
22	376.5196	365.6067329	1107.858	3747.581	362.31342	2.19812237	21.87944	1363.807	280.2991
23	392.9023	381.4507164	1154.929	3906.1	377.980041	2.29811636	22.79869	1421.773	292.5516
24	409.2762	397.2863529	1201.968	4064.537	393.636767	2.39811077	23.71752	1479.693	304.7974
25	425.644	413.1149383	1248.989	4222.89	409.286509	2.49810557	24.63564	1537.595	317.0372
26	442.0049	428.9363559	1295.981	4381.187	424.928797	2.59810071	25.55333	1595.473	329.2719
27	458.3613	444.7521601	1342.963	4539.414	440.563956	2.69809616	26.47085	1653.319	341.5021
28	474.7117	460.5621369	1389.923	4697.591	456.194256	2.79809189	27.38788	1711.16	353.7275
29	491.0583	476.3674556	1436.868	4855.715	471.818816	2.89808788	28.30456	1768.966	365.9496
30	507.4002	492.1685311	1483.793	5013.796	487.438193	2.99808411	29.22097	1826.772	378.1686
31	523.7383	507.9650323	1530.717	5171.841	503.053912	3.09808055	30.13717	1884.553	390.3844
32	540.073	523.758561	1577.624	5329.848	518.665219	3.19807718	31.05289	1942.327	402.5966
33	556.405	539.5475392	1624.513	5487.819	534.273337	3.29807399	31.96869	2000.075	414.8066
34	572.7346	555.334362	1671.404	5645.76	549.878144	3.39807097	32.88392	2057.825	427.0146
35	589.0607	571.1183041	1718.276	5803.673	565.479004	3.49806811	33.79912	2115.566	439.2196
36	605.3846	586.8991091	1765.148	5961.555	581.077682	3.59806538	34.71419	2173.287	451.4231
37	621.7065	602.6771175	1812.005	6119.42	596.673739	3.69806279	35.62934	2230.998	463.6249
38	638.0262	618.4544321	1858.856	6277.258	612.267346	3.79806032	36.54408	2288.712	475.8248
39	654.3443	634.2277196	1905.709	6435.067	627.858366	3.89805796	37.45858	2346.41	488.0226
40	670.6599	650.00066	1952.545	6592.872	643.448493	3.99805571	38.37299	2404.103	500.219
41	686.9743	665.7714508	1999.38	6750.645	659.034942	4.09805356	39.28746	2461.785	512.4148
42	703.2874	681.5401587	2046.213	6908.409	674.621127	4.19805151	40.20177	2519.48	524.6082
43	719.5988	697.3066421	2093.039	7066.163	690.204851	4.29804954	41.11567	2577.151	536.8011
44	735.9094	713.0729285	2139.855	7223.891	705.787008	4.39804765	42.02965	2634.819	548.9928
45	752.2184	728.8373983	2186.665	7381.614	721.367202	4.49804584	42.94385	2692.475	561.1834
46	768.5262	744.600603	2233.476	7539.313	736.946046	4.5980441	43.85756	2750.144	573.3729
47	784.8319	760.3629885	2280.292	7697.015	752.524052	4.69804242	44.77129	2807.796	585.5617
48	801.1383	776.1236081	2327.097	7854.688	768.101627	4.79804081	45.68513	2865.44	597.7496
49	776.3073	776.3073403	2344.207	7853.073	776.30734	4.89800587	46.36244	2859.726	594.8517

L

50 | 791.7035 791.7034595 2390.303 8007.035 791.70346

4.99800425 47.27015 2915.927 606.6947





From our graphs we can see that when the PCM was reduced to 0.1 , there was little change to the system's performance. Therefore, we can say the system has low sensitivity (low impact) when PCM =0.1

1e) WHEN PCM= 0.5:

Throughput

\$0	\$thruProtocol	\$thruWebServer	\$thruWDisk	\$thruCGIAPP	\$thruWebReply	\$thruGetObjects	\$thruProtReply	\$thruDBProcess	\$thruDBOpt
1	0.0387126	0.0387126	0.0547396	0.00387126	0.0387126	0.012388	0.656565	0.0106072	0.0503263
2	0.0444993	0.0444993	0.062922	0.00444993	0.0444993	0.0142398	0.754707	0.0121928	0.057849
3	0.0454364	0.0454364	0.064247	0.00454364	0.0454364	0.0145396	0.7706	0.0124496	0.0590672
4	0.0472702	0.0472702	0.06684	0.00472702	0.0472702	0.0151265	0.801702	0.012952	0.0614512
5	0.0488921	0.0488921	0.0691335	0.00488921	0.0488921	0.0156455	0.82921	0.0133964	0.0635597
6	0.0502454	0.0502454	0.071047	0.00502454	0.0502454	0.0160785	0.852162	0.0137672	0.065319
7	0.0510537	0.0496251	0.0718546	0.00496061	0.0508571	0.015925	0.861822	0.0136302	0.0648352

8	0.0516592	0.0520362	0.0714808	0.00520751	0.0504458	0.0166013	0.854976	0.0142495	0.0675595
9	0.0524191	0.052818	0.0724846	0.00528602	0.0511498	0.0168469	0.866772	0.0144634	0.0685724
10	0.0530711	0.053489	0.0733423	0.00535338	0.0517511	0.0170569	0.876826	0.0146468	0.0694404
11	0.0536362	0.0540713	0.0740845	0.00541185	0.0522712	0.017239	0.885512	0.0148059	0.0701934
12	0.0541307	0.0545813	0.0747327	0.00546306	0.0527254	0.0173983	0.893089	0.0149453	0.0708527
13	0.0545669	0.0550315	0.0753035	0.00550828	0.0531252	0.0175387	0.899755	0.0150683	0.0714348
14	0.0549546	0.0554319	0.0758101	0.0055485	0.0534799	0.0176635	0.905663	0.0151777	0.0719522
15	0.0553014	0.0557904	0.0762627	0.00558451	0.0537967	0.0177751	0.910936	0.0152756	0.0724155
16	0.0556132	0.056113	0.0766692	0.00561692	0.0540813	0.0178755	0.915669	0.0153637	0.0728323
17	0.0558953	0.0564049	0.0770366	0.00564626	0.0543384	0.0179662	0.919942	0.0154435	0.0732095
18	0.0561517	0.0566704	0.07737	0.00567293	0.0545717	0.0180487	0.923819	0.015516	0.0735524
19	0.0563857	0.0569128	0.0776742	0.00569729	0.0547845	0.018124	0.927351	0.0155822	0.0738655
20	0.0566001	0.057135	0.0779526	0.00571963	0.0549792	0.0181929	0.930583	0.0156429	0.0741525
21	0.0567973	0.0573395	0.0782085	0.00574019	0.0551582	0.0182564	0.933552	0.0156987	0.0744166
22	0.0569793	0.0575283	0.0784445	0.00575917	0.0553233	0.0183149	0.936288	0.0157502	0.0746604
23	0.0571478	0.0577032	0.0786629	0.00577674	0.0554759	0.018369	0.938817	0.015798	0.0748862
24	0.0573043	0.0578656	0.0788654	0.00579307	0.0556175	0.0184193	0.941163	0.0158423	0.0750958
25	0.0574499	0.0580168	0.0790539	0.00580827	0.0557493	0.0184661	0.943345	0.0158836	0.075291
26	0.0575857	0.0581579	0.0792297	0.00582246	0.0558721	0.0185098	0.945378	0.0159221	0.0754732
27	0.0577128	0.0582899	0.079394	0.00583574	0.055987	0.0185506	0.947278	0.0159582	0.0756437
28	0.057832	0.0584138	0.0795479	0.00584819	0.0560946	0.0185889	0.949058	0.015992	0.0758035
29	0.0579439	0.0585301	0.0796924	0.00585988	0.0561955	0.0186249	0.950729	0.0160237	0.0759537
30	0.0580492	0.0586396	0.0798284	0.0058709	0.0562905	0.0186587	0.952299	0.0160536	0.076095
31	0.0581485	0.0587428	0.0799565	0.00588128	0.05638	0.0186906	0.953779	0.0160818	0.0762282
32	0.0582422	0.0588404	0.0800774	0.00589109	0.0564645	0.0187207	0.955175	0.0161084	0.0763541
33	0.0583309	0.0589326	0.0801918	0.00590037	0.0565444	0.0187492	0.956494	0.0161336	0.0764731
34	0.0584149	0.05902	0.0803001	0.00590916	0.0566201	0.0187762	0.957743	0.0161575	0.0765859
35	0.0584946	0.059103	0.0804027	0.0059175	0.0566918	0.0188018	0.958928	0.0161801	0.076693
36	0.0585702	0.0591818	0.0805003	0.00592543	0.0567599	0.0188261	0.960052	0.0162016	0.0767946
37	0.0586422	0.0592567	0.080593	0.00593297	0.0568246	0.0188492	0.961121	0.0162221	0.0768914
38	0.0587108	0.0593281	0.0806812	0.00594015	0.0568863	0.0188712	0.962138	0.0162415	0.0769835
39	0.0587762	0.0593962	0.0807654	0.005947	0.056945	0.0188922	0.963108	0.0162601	0.0770713
40	0.0588386	0.0594612	0.0808457	0.00595353	0.0570011	0.0189122	0.964033	0.0162779	0.0771552

41	0.0588982	0.0595233	0.0809224	0.00595978	0.0570547	0.0189314	0.964916	0.0162948	0.0772353
42	0.0574952	0.0592334	0.0843282	0.00592108	0.0597916	0.018991	1.01754	0.016195	0.0766336
43	0.0575452	0.0592886	0.0844087	0.0059266	0.0598493	0.0190091	1.01854	0.0162101	0.0767046
44	0.0575932	0.0593415	0.0844859	0.00593189	0.0599046	0.0190265	1.0195	0.0162246	0.0767727
45	0.0576392	0.0593923	0.0845599	0.00593696	0.0599577	0.0190431	1.02042	0.0162385	0.076838
46	0.0576833	0.059441	0.084631	0.00594183	0.0600086	0.0190591	1.02131	0.0162518	0.0769006
47	0.0577257	0.0594878	0.0846993	0.00594651	0.0600576	0.0190744	1.02216	0.0162646	0.0769609
48	0.0577665	0.0595328	0.084765	0.00595101	0.0601047	0.0190892	1.02297	0.0162769	0.0770188
49	0.0606426	0.0606426	0.0857487	0.00606426	0.0606426	0.0194056	1.0285	0.0166161	0.0788354
50	0.0606889	0.0606889	0.0858141	0.00606889	0.0606889	0.0194204	1.02928	0.0166287	0.0788955

Response Time

\$N	\$rt Protocol	\$rtWebServer	\$rtWdisk	\$rtCGIApp	\$rtWeb reply	\$rtGetObjects	\$rtProtocol Reply	\$rt DB process	\$rt DBOpt
1	15.83138306	15.8313831	8.26831	248.3138	15.83138	70.72328	1.523078	84.27559	9.870326
2	34.94452722	34.9445272	21.78539	439.4453	34.94453	130.4514	2.650035	154.0312	24.57277
3	56.02635772	56.0263577	36.69479	650.2636	56.02636	196.333	3.89307	230.9716	40.78961
4	74.61990853	74.6199085	49.8444	836.1991	74.61991	254.4366	4.989385	298.8326	55.0923
5	92.26601026	92.2660103	62.32384	1012.66	92.26601	309.5807	6.029836	363.2346	68.6662
6	109.4139165	109.413916	74.45114	1184.139	109.4139	363.1691	7.040915	425.8185	81.85689
7	131.0576503	131.05765	87.41895	1401.117	127.6406	429.5604	8.122327	503.5655	97.96604
8	143.7391278	143.739128	101.9182	1526.243	148.586	471.89	9.356988	551.4232	108.4141
9	160.3964558	160.396456	114.1643	1692.604	165.9538	524.2229	10.38335	612.2603	121.2481
10	176.9543271	176.954327	126.347	1857.979	183.2326	576.273	11.40477	672.743	134.0084
11	193.435094	193.435094	138.4791	2022.577	200.4409	628.0881	12.42219	732.9471	146.7099
12	209.8555183	209.855518	150.5723	2186.571	217.5943	679.7226	13.43651	792.928	159.3655
13	226.2283419	226.228342	162.6347	2350.083	234.705	731.218	14.44838	852.7383	171.9841
14	242.5621528	242.562153	174.672	2513.204	251.7806	782.5949	15.45829	912.4059	184.5736
15	258.8634604	258.86346	186.6886	2676.001	268.8275	833.8771	16.46658	971.9582	197.138

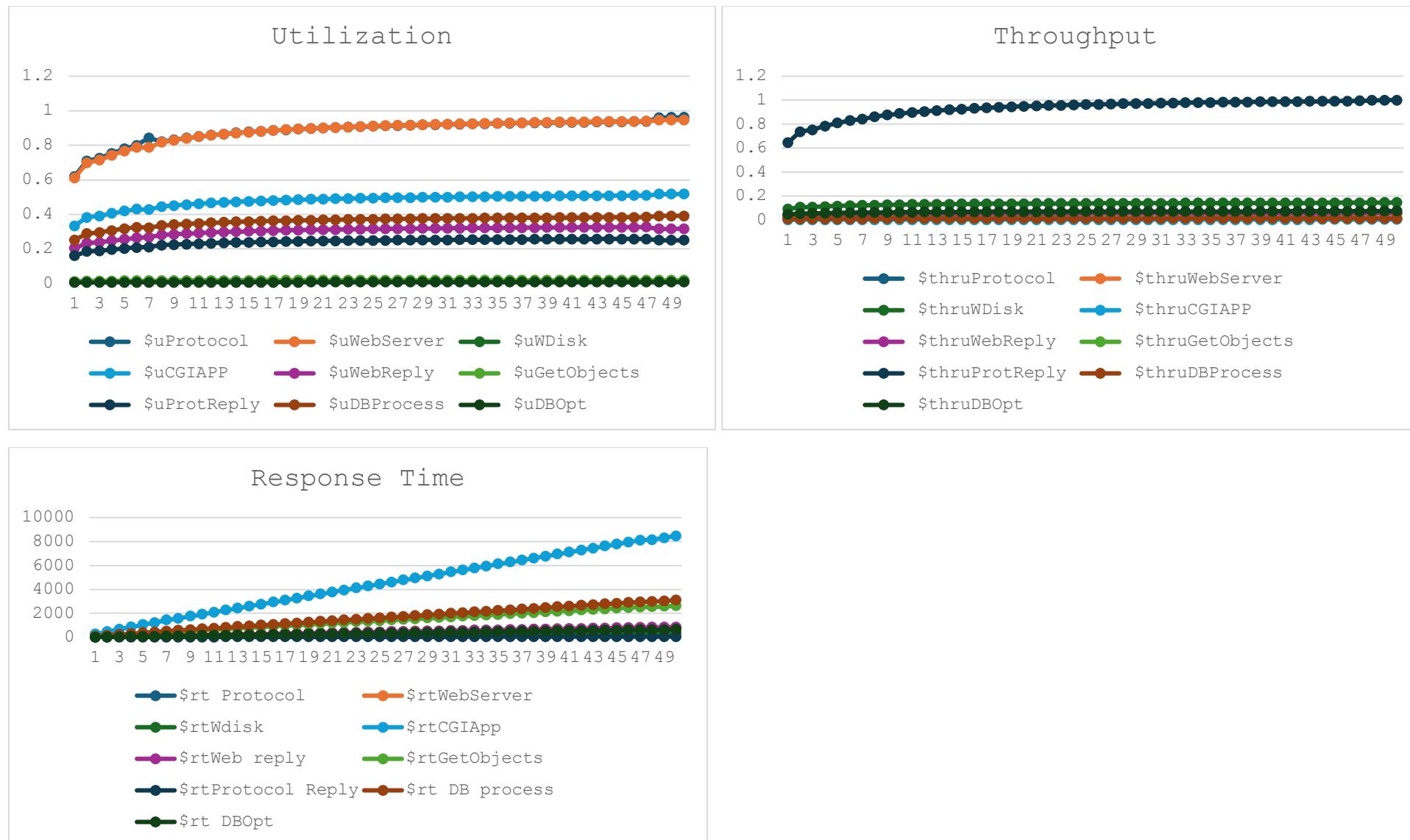
16	275.1389161	275.138916	198.6888	2838.536	285.8509	885.0799	17.47356	1031.416	209.6828
17	291.3922549	291.392255	210.6743	3000.843	302.8543	936.2212	18.47943	1090.787	222.2103
18	307.6261329	307.626133	222.6483	3162.964	319.8413	987.3017	19.48434	1150.093	234.7235
19	323.8440562	323.844056	234.6115	3324.919	336.8134	1038.334	20.48847	1209.34	247.2243
20	340.0481316	340.048132	246.5662	3486.73	353.7739	1089.33	21.4919	1268.535	259.7144
21	356.2396777	356.239678	258.513	3648.415	370.7231	1140.282	22.49473	1327.69	272.1951
22	372.4204783	372.420478	270.4531	3809.995	387.6625	1191.208	23.49704	1386.808	284.6676
23	388.5914126	388.591413	282.3869	3971.484	404.5944	1242.11	24.49892	1445.88	297.1327
24	404.754189	404.754189	294.316	4132.881	421.5189	1292.981	25.50036	1504.932	309.5918
25	420.9096675	420.909668	306.2399	4294.208	438.4361	1343.832	26.50144	1563.95	322.045
26	437.0587831	437.058783	318.1598	4455.466	455.3485	1394.661	27.50223	1622.95	334.4931
27	453.2020299	453.20203	330.0761	4616.663	472.2548	1445.479	28.50272	1681.92	346.9365
28	469.3387864	469.338786	341.9892	4777.806	489.1568	1496.275	29.50294	1740.875	359.3761
29	485.4715608	485.471561	353.8992	4938.907	506.0556	1547.055	30.50291	1799.819	371.8116
30	501.5996698	501.59967	365.8061	5099.949	522.9496	1597.829	31.50271	1858.74	384.244
31	517.7242488	517.724249	377.7108	5260.961	539.8404	1648.588	32.50229	1917.645	396.6736
32	533.8440255	533.844026	389.6134	5421.932	556.7278	1699.338	33.50171	1976.541	409.1
33	549.961719	549.961719	401.5134	5582.87	573.6122	1750.075	34.501	2035.421	421.5243
34	566.0759065	566.075906	413.4117	5743.779	590.4935	1800.803	35.50013	2094.286	433.9459
35	582.1865218	582.186522	425.3088	5904.66	607.3732	1851.524	36.49909	2153.151	446.365
36	598.2951178	598.295118	437.2033	6065.508	624.2506	1902.239	37.49797	2212.003	458.783
37	614.4019664	614.401966	449.0969	6226.337	641.1264	1952.948	38.49671	2270.839	471.1982
38	630.5059323	630.505932	460.9895	6387.145	657.9991	2003.65	39.49537	2329.685	483.6123
39	646.6076618	646.607662	472.88	6547.928	674.8714	2054.344	40.4939	2388.509	496.0249
40	662.7075807	662.707581	484.7697	6708.703	691.7408	2105.037	41.49236	2447.319	508.4356
41	678.8058962	678.805896	496.6582	6869.449	708.6086	2155.714	42.49075	2506.14	520.8454
42	699.0594158	699.059416	488.054	7083.301	692.4398	2201.574	41.27602	2583.393	538.0625
43	715.2659027	715.265903	499.4262	7245.425	708.4712	2252.074	42.21729	2642.667	550.5922
44	731.4709773	731.470977	510.797	7407.535	724.5012	2302.564	43.15841	2701.931	563.1204
45	747.6739746	747.673975	522.1671	7569.637	740.5291	2353.061	44.09949	2761.192	575.6477
46	763.8766171	763.876617	533.5361	7731.723	756.5568	2403.545	45.04019	2820.456	588.1748
47	780.0779656	780.077966	544.9042	7893.796	772.5821	2454.036	45.98106	2879.711	600.6997

48	796.2782197	796.27822	556.2715	8055.858	788.6064	2504.511	46.9222	2938.964	613.2245
49	798.0128491	798.012849	561.4372	8070.128	798.0128	2515.044	47.6422	2938.947	611.5482
50	813.873888	813.873888	572.6548	8228.739	813.8739	2564.612	48.57765	2996.85	623.7497

UTILIZATION

\$N	\$uProtocol	\$uWebServer	\$uWDisk	\$uCGIAPP	\$uWebReply	\$uGetObjects	\$uProtReply	\$uDBProcess	\$uDBOpt
1	0.612874	0.603196	0.005474	0.339757	0.207747	0.0126358	0.164141	0.256664	0.005033
2	0.704486	0.693361	0.006292	0.390543	0.238801	0.0145246	0.188677	0.29503	0.005785
3	0.719322	0.707963	0.006425	0.398768	0.24383	0.0148304	0.19265	0.301243	0.005907
4	0.748353	0.736536	0.006684	0.414862	0.253671	0.015429	0.200426	0.313401	0.006145
5	0.774031	0.761808	0.006913	0.429097	0.262375	0.0159584	0.207303	0.324155	0.006356
6	0.795455	0.782894	0.007105	0.440974	0.269637	0.0164001	0.213041	0.333127	0.006532
7	0.840326	0.78299	0.007185	0.436569	0.275084	0.0162486	0.215679	0.329811	0.006484
8	0.824595	0.84741	0.007148	0.458278	0.279334	0.0169898	0.216107	0.344796	0.006756
9	0.837049	0.861021	0.007248	0.465249	0.283654	0.0172443	0.219223	0.349972	0.006857
10	0.84775	0.872743	0.007334	0.471234	0.287367	0.0174622	0.221883	0.35441	0.006944
11	0.857041	0.882943	0.007408	0.476431	0.290597	0.0176511	0.224188	0.358261	0.007019
12	0.86518	0.891898	0.007473	0.480986	0.293431	0.0178166	0.226203	0.361632	0.007085
13	0.872369	0.89982	0.00753	0.485009	0.295938	0.0179625	0.22798	0.364609	0.007143
14	0.878763	0.906879	0.007581	0.488588	0.29817	0.0180923	0.229557	0.367256	0.007195
15	0.884491	0.913211	0.007626	0.491794	0.300172	0.0182084	0.230968	0.369625	0.007242
16	0.889645	0.918917	0.007667	0.49468	0.301976	0.0183129	0.232237	0.371757	0.007283
17	0.894312	0.924089	0.007704	0.497294	0.30361	0.0184074	0.233384	0.373687	0.007321
18	0.898556	0.928798	0.007737	0.49967	0.305098	0.0184934	0.234426	0.375441	0.007355
19	0.902432	0.933104	0.007767	0.501842	0.306458	0.0185718	0.235376	0.377043	0.007387
20	0.905987	0.937056	0.007795	0.503833	0.307707	0.0186437	0.236247	0.378511	0.007415
21	0.909258	0.940696	0.007821	0.505666	0.308856	0.0187099	0.237048	0.379863	0.007442
22	0.912279	0.94406	0.007844	0.507358	0.309919	0.0187709	0.237787	0.38111	0.007466
23	0.915077	0.947179	0.007866	0.508926	0.310903	0.0188274	0.238471	0.382265	0.007489

24	0.917676	0.950077	0.007887	0.510382	0.311818	0.0188799	0.239105	0.383338	0.00751
25	0.920097	0.952778	0.007905	0.511738	0.312671	0.0189288	0.239696	0.384337	0.007529
26	0.922356	0.955302	0.007923	0.513005	0.313467	0.0189744	0.240247	0.385269	0.007547
27	0.92447	0.957664	0.007939	0.51419	0.314213	0.0190171	0.240763	0.386141	0.007564
28	0.926453	0.95988	0.007955	0.515301	0.314912	0.0190571	0.241246	0.386959	0.00758
29	0.928316	0.961964	0.007969	0.516345	0.31557	0.0190946	0.2417	0.387727	0.007595
30	0.93007	0.963927	0.007983	0.517328	0.316189	0.01913	0.242126	0.388451	0.00761
31	0.931724	0.965778	0.007996	0.518256	0.316773	0.0191633	0.242529	0.389133	0.007623
32	0.933286	0.967528	0.008008	0.519131	0.317325	0.0191948	0.242909	0.389777	0.007635
33	0.934764	0.969185	0.008019	0.51996	0.317848	0.0192246	0.243268	0.390386	0.007647
34	0.936165	0.970755	0.00803	0.520745	0.318343	0.0192528	0.243608	0.390963	0.007659
35	0.937494	0.972245	0.00804	0.521491	0.318813	0.0192796	0.243931	0.391511	0.007669
36	0.938757	0.973662	0.00805	0.522199	0.31926	0.019305	0.244238	0.392031	0.007679
37	0.939958	0.97501	0.008059	0.522872	0.319685	0.0193292	0.244529	0.392526	0.007689
38	0.941103	0.976294	0.008068	0.523514	0.32009	0.0193523	0.244807	0.392998	0.007698
39	0.942194	0.97752	0.008077	0.524126	0.320477	0.0193742	0.245072	0.393447	0.007707
40	0.943236	0.97869	0.008085	0.52471	0.320846	0.0193952	0.245325	0.393877	0.007716
41	0.944232	0.979809	0.008092	0.525269	0.321199	0.0194152	0.245566	0.394287	0.007724
42	0.931838	0.933217	0.008433	0.520924	0.334521	0.0196363	0.264178	0.391872	0.007663
43	0.932705	0.93412	0.008441	0.521413	0.334888	0.0196558	0.264468	0.392238	0.00767
44	0.933536	0.934986	0.008449	0.521883	0.335239	0.0196745	0.264745	0.392588	0.007677
45	0.934333	0.935816	0.008456	0.522333	0.335576	0.0196925	0.265012	0.392923	0.007684
46	0.935098	0.936614	0.008463	0.522765	0.3359	0.0197098	0.265268	0.393245	0.00769
47	0.935833	0.93738	0.00847	0.523181	0.336212	0.0197263	0.265514	0.393555	0.007696
48	0.93654	0.938117	0.008477	0.52358	0.336511	0.0197423	0.265751	0.393853	0.007702
49	0.960057	0.944897	0.008575	0.532224	0.325433	0.0197937	0.257125	0.402061	0.007884
50	0.96079	0.945617	0.008581	0.53263	0.325681	0.0198088	0.257321	0.402367	0.00789



From our graphs we can see that when the PCM was increased to 0.5 , there was little change to the system's performance. Therefore, we can say the system has low sensitivity (low impact) when PCM =0.5

WHEN PCM is 0.9

THROUGHPUT

\$0	\$thruProtocol	\$thruWebServer	\$thruWDisk	\$thruCGIAPP	\$thruWebReply	\$thruGetObjects	\$thruProtReply	\$thruDBProcess	\$thruDBOpt
1	0.0380237	0.0380237	0.0948311	0.00380237	0.0380237	0.0121676	0.644882	0.0104185	0.0494308
2	0.0435699	0.0435699	0.108663	0.00435699	0.0435699	0.0139423	0.738944	0.0119381	0.0566408
3	0.0444738	0.0444738	0.110918	0.00444737	0.0444737	0.0142316	0.754274	0.0121858	0.0578158
4	0.0462362	0.0462362	0.115313	0.00462362	0.0462362	0.0147956	0.784166	0.0126687	0.0601071
5	0.047792	0.047792	0.119193	0.0047792	0.047792	0.0152934	0.810552	0.013095	0.0621295
6	0.049088	0.049088	0.122425	0.0049088	0.049088	0.0157082	0.832532	0.0134501	0.0638144
7	0.0498619	0.0485427	0.123897	0.00485236	0.0496923	0.0155754	0.842152	0.0133306	0.0633998
8	0.0495338	0.0506135	0.126708	0.00506027	0.0508942	0.0161963	0.864326	0.0138438	0.0655578
9	0.0502277	0.0513563	0.128588	0.00513443	0.0516548	0.0164352	0.87734	0.0140462	0.0665117
10	0.0508165	0.0519887	0.13019	0.00519762	0.0523038	0.0166392	0.888462	0.0142188	0.0673253
11	0.0513259	0.0525369	0.13158	0.00525239	0.0528671	0.0168162	0.898119	0.0143684	0.0680305
12	0.0517708	0.0530164	0.132797	0.00530031	0.0533604	0.0169711	0.906581	0.0144992	0.0686474
13	0.0521626	0.0534394	0.133871	0.00534257	0.0537959	0.0171078	0.914055	0.0146147	0.0691914
14	0.0525103	0.0538152	0.134826	0.00538012	0.0541832	0.0172294	0.920705	0.0147172	0.0696747
15	0.0528208	0.0541513	0.13568	0.0054137	0.0545298	0.0173381	0.92666	0.014809	0.0701069
16	0.0530998	0.0544537	0.136448	0.00544391	0.0548419	0.0174361	0.932024	0.0148915	0.0704958
17	0.053352	0.0547273	0.137144	0.00547124	0.0551244	0.0175247	0.936881	0.0149662	0.0708475
18	0.0535808	0.0549758	0.137776	0.00549607	0.0553812	0.0176052	0.941298	0.015034	0.071167
19	0.0537895	0.0552026	0.138353	0.00551873	0.0556157	0.0176787	0.945333	0.0150959	0.0714586
20	0.0539806	0.0554104	0.138882	0.0055395	0.0558307	0.0177461	0.949033	0.0151527	0.0717259
21	0.0541562	0.0556015	0.139369	0.0055586	0.0560286	0.0178081	0.952439	0.0152048	0.0719716
22	0.0543182	0.0557779	0.139818	0.00557622	0.0562112	0.0178654	0.955585	0.015253	0.0721984
23	0.054468	0.0559412	0.140234	0.00559254	0.0563804	0.0179184	0.958498	0.0152976	0.0724083
24	0.054607	0.0560928	0.14062	0.00560768	0.0565375	0.0179676	0.961205	0.015339	0.0726032
25	0.0547363	0.0562339	0.14098	0.00562178	0.0566838	0.0180134	0.963725	0.0153775	0.0727845
26	0.0548569	0.0563656	0.141316	0.00563494	0.0568203	0.0180562	0.966079	0.0154134	0.0729538
27	0.0549696	0.0564887	0.14163	0.00564724	0.0569481	0.0180962	0.968281	0.0154471	0.0731122

28	0.0550753	0.0566042	0.141924	0.00565878	0.0570679	0.0181338	0.970347	0.0154786	0.0732606
29	0.0551744	0.0567126	0.1422	0.00566961	0.0571805	0.018169	0.972289	0.0155082	0.0733999
30	0.0552677	0.0568146	0.142461	0.00567981	0.0572864	0.0182022	0.974116	0.015536	0.0735311
31	0.0553556	0.0569108	0.142706	0.00568942	0.0573864	0.0182335	0.97584	0.0155623	0.0736548
32	0.0554386	0.0570017	0.142938	0.00569849	0.0574807	0.0182631	0.977468	0.0155871	0.0737715
33	0.0555171	0.0570876	0.143157	0.00570708	0.05757	0.018291	0.979009	0.0156106	0.073882
34	0.0555914	0.057169	0.143365	0.00571521	0.0576546	0.0183175	0.980469	0.0156328	0.0739866
35	0.0556618	0.0572462	0.143562	0.00572292	0.0577349	0.0183426	0.981854	0.0156539	0.0740858
36	0.0557287	0.0573195	0.143749	0.00573025	0.0578111	0.0183665	0.983171	0.0156739	0.0741801
37	0.0557924	0.0573893	0.143927	0.00573722	0.0578837	0.0183892	0.984424	0.015693	0.0742698
38	0.0558529	0.0574557	0.144097	0.00574386	0.0579528	0.0184109	0.985617	0.0157111	0.0743552
39	0.0559107	0.057519	0.144258	0.00575019	0.0580187	0.0184315	0.986755	0.0157284	0.0744366
40	0.0559657	0.0575795	0.144413	0.00575623	0.0580816	0.0184512	0.987841	0.0157449	0.0745143
41	0.0560184	0.0576372	0.14456	0.005762	0.0581417	0.01847	0.98888	0.0157607	0.0745885
42	0.0560687	0.0576925	0.144701	0.00576752	0.0581992	0.018488	0.989873	0.0157758	0.0746595
43	0.0561169	0.0577454	0.144836	0.0057728	0.0582543	0.0185052	0.990824	0.0157902	0.0747275
44	0.056163	0.0577961	0.144966	0.00577787	0.0583071	0.0185217	0.991736	0.0158041	0.0747927
45	0.0562073	0.0578447	0.14509	0.00578272	0.0583577	0.0185376	0.992611	0.0158173	0.0748551
46	0.0562497	0.0578913	0.145209	0.00578739	0.0584063	0.0185528	0.993451	0.0158301	0.0749151
47	0.0562905	0.0579362	0.145324	0.00579187	0.058453	0.0185674	0.994258	0.0158423	0.0749728
48	0.0589298	0.0589298	0.146971	0.00589298	0.0589298	0.0188575	0.999449	0.0161468	0.0766087
49	0.0589751	0.0589751	0.147084	0.00589751	0.0589751	0.018872	1.00022	0.0161592	0.0766676
50	0.0590187	0.0590187	0.147193	0.00590187	0.0590187	0.018886	1.00096	0.0161711	0.0767244

UTILIZATION

\$N	\$uProtocol	\$uWebServer	\$uWDisk	\$uCGIAPP	\$uWebReply	\$uGetObjects	\$uProtReply	\$uDBProcess	\$uDBOpt
1	0.619763	0.610257	0.009483	0.333711	0.20405	0.0124109	0.16122	0.252097	0.004943
2	0.710163	0.69927	0.010866	0.382386	0.233813	0.0142212	0.184736	0.288868	0.005664
3	0.724896	0.713777	0.011092	0.390319	0.238664	0.0145162	0.188569	0.294861	0.005782
4	0.753623	0.742064	0.011531	0.405788	0.248122	0.0150915	0.196042	0.306546	0.006011

5	0.77898	0.767032	0.011919	0.419441	0.256471	0.0155993	0.202638	0.316861	0.006213
6	0.800105	0.787833	0.012243	0.430816	0.263426	0.0160223	0.208133	0.325453	0.006381
7	0.843179	0.788129	0.01239	0.426965	0.268538	0.0158914	0.210733	0.322562	0.00634
8	0.819913	0.817998	0.012671	0.444727	0.280196	0.0166593	0.221285	0.334979	0.006556
9	0.831855	0.830277	0.012859	0.451277	0.284722	0.0169116	0.224856	0.339876	0.006651
10	0.842016	0.840749	0.013019	0.456859	0.288608	0.0171275	0.227924	0.344052	0.006733
11	0.850823	0.849837	0.013158	0.461699	0.291994	0.0173151	0.230598	0.347672	0.006803
12	0.858529	0.857796	0.01328	0.465935	0.294971	0.0174795	0.232948	0.350839	0.006865
13	0.865326	0.864824	0.013387	0.469671	0.297607	0.0176247	0.23503	0.353632	0.006919
14	0.871366	0.871073	0.013483	0.472991	0.299958	0.017754	0.236886	0.356114	0.006967
15	0.876768	0.876667	0.013568	0.475962	0.302068	0.0178698	0.238553	0.358334	0.007011
16	0.881628	0.881704	0.013645	0.478634	0.303973	0.0179741	0.240057	0.360331	0.00705
17	0.886025	0.886263	0.013714	0.481052	0.3057	0.0180686	0.241421	0.362138	0.007085
18	0.890019	0.890407	0.013778	0.483249	0.307274	0.0181545	0.242664	0.363779	0.007117
19	0.893665	0.894192	0.013835	0.485255	0.308714	0.018233	0.243801	0.365277	0.007146
20	0.897006	0.897663	0.013888	0.487092	0.310037	0.0183051	0.244846	0.36665	0.007173
21	0.90008	0.900856	0.013937	0.488783	0.311255	0.0183714	0.245808	0.367913	0.007197
22	0.902916	0.903804	0.013982	0.490343	0.312383	0.0184326	0.246699	0.369078	0.00722
23	0.905541	0.906535	0.014023	0.491788	0.313428	0.0184893	0.247524	0.370157	0.007241
24	0.907979	0.909071	0.014062	0.493129	0.3144	0.018542	0.248292	0.371158	0.00726
25	0.910248	0.911432	0.014098	0.494377	0.315305	0.0185911	0.249007	0.37209	0.007278
26	0.912366	0.913636	0.014132	0.495542	0.316152	0.0186369	0.249676	0.37296	0.007295
27	0.914346	0.915699	0.014163	0.496632	0.316946	0.0186799	0.250303	0.373774	0.007311
28	0.916203	0.917632	0.014192	0.497654	0.31769	0.0187201	0.250891	0.374536	0.007326
29	0.917947	0.919449	0.01422	0.498614	0.318391	0.0187579	0.251444	0.375253	0.00734
30	0.919588	0.92116	0.014246	0.499517	0.31905	0.0187935	0.251965	0.375927	0.007353
31	0.921135	0.922773	0.014271	0.500368	0.319673	0.0188271	0.252457	0.376562	0.007365
32	0.922596	0.924296	0.014294	0.501172	0.320262	0.0188589	0.252922	0.377163	0.007377
33	0.923978	0.925737	0.014316	0.501933	0.320819	0.0188889	0.253362	0.37773	0.007388
34	0.925287	0.927103	0.014337	0.502654	0.321347	0.0189173	0.253779	0.378268	0.007399
35	0.926529	0.928399	0.014356	0.503337	0.321849	0.0189443	0.254176	0.378778	0.007409
36	0.927709	0.92963	0.014375	0.503986	0.322326	0.01897	0.254553	0.379263	0.007418

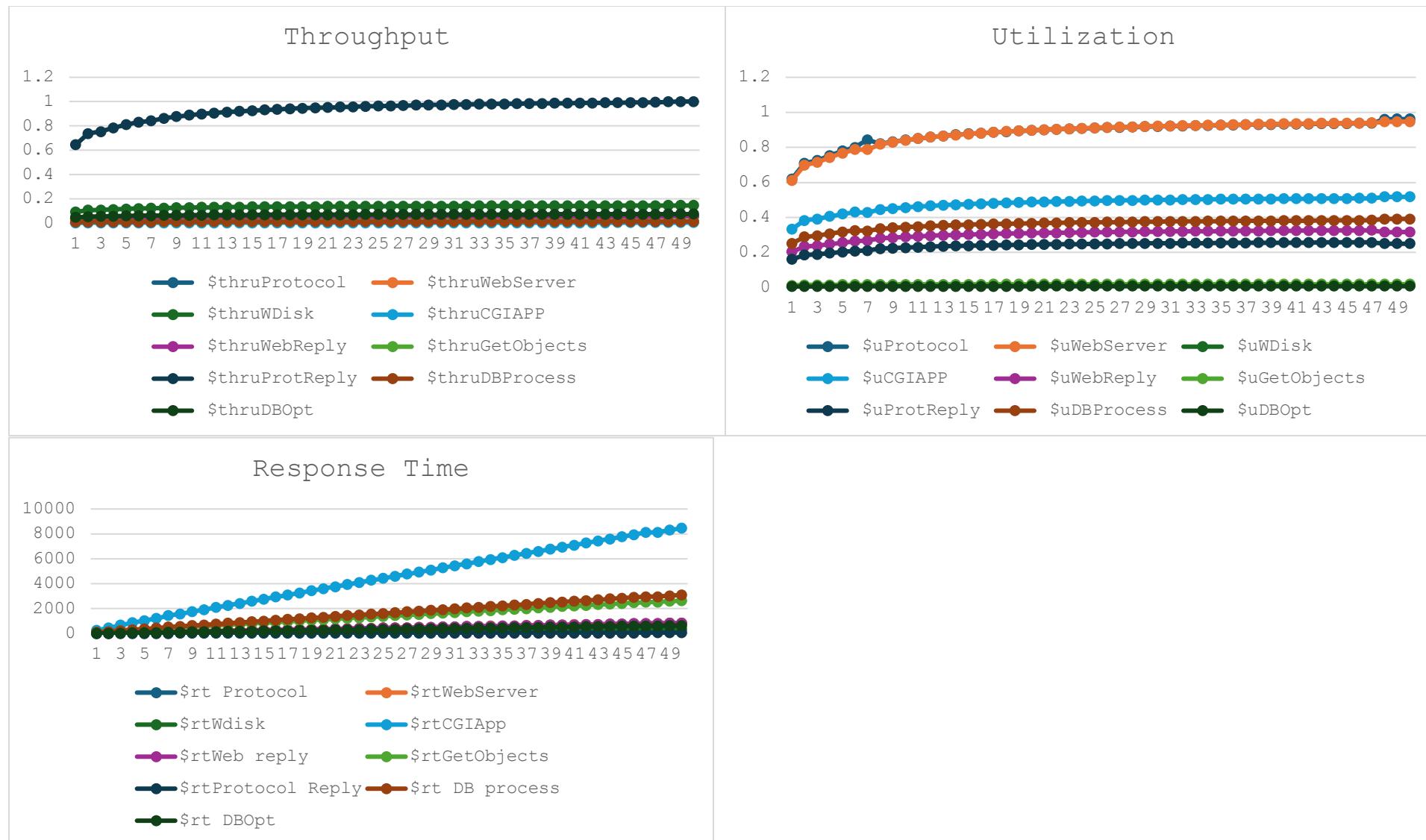
37	0.928831	0.930801	0.014393	0.504604	0.32278	0.0189944	0.254911	0.379724	0.007427
38	0.9299	0.931917	0.01441	0.505192	0.323213	0.0190177	0.255253	0.380163	0.007436
39	0.930919	0.93298	0.014426	0.505753	0.323626	0.0190399	0.255579	0.380581	0.007444
40	0.931892	0.933996	0.014441	0.506288	0.32402	0.0190611	0.255891	0.380981	0.007451
41	0.932821	0.934967	0.014456	0.5068	0.324397	0.0190813	0.256189	0.381362	0.007459
42	0.93371	0.935895	0.01447	0.507289	0.324758	0.0191007	0.256474	0.381727	0.007466
43	0.934561	0.936784	0.014484	0.507758	0.325104	0.0191192	0.256747	0.382077	0.007473
44	0.935376	0.937636	0.014497	0.508207	0.325436	0.019137	0.257009	0.382412	0.007479
45	0.936159	0.938453	0.014509	0.508637	0.325754	0.0191541	0.25726	0.382733	0.007486
46	0.93691	0.939238	0.014521	0.50905	0.326059	0.0191704	0.257502	0.383042	0.007492
47	0.937631	0.939992	0.014532	0.509448	0.326353	0.0191862	0.257734	0.383338	0.007497
48	0.96052	0.945787	0.014697	0.517191	0.316241	0.0192347	0.249862	0.390704	0.007661
49	0.961259	0.946515	0.014708	0.517589	0.316484	0.0192495	0.250054	0.391005	0.007667
50	0.96197	0.947216	0.014719	0.517972	0.316718	0.0192637	0.250239	0.391294	0.007672

RESPONSE TIME

\$N	\$rt Protocol	\$rtWebServer	\$rtWdisk	\$rtCGIApp	\$rtWeb reply	\$rtGetObjects	\$rtProtocol Reply	\$rt DB process	\$rt DBOpt
1	16.29938696	16.299387	0.545064	252.9939	16.29939	72.18548	1.550671	85.98311	10.2303
2	35.90324972	35.9032497	8.405529	449.0325	35.90325	133.4484	2.706565	157.5308	25.31024
3	57.45544568	57.4554457	17.04701	664.556	57.4556	200.7985	3.977334	236.1882	41.88893
4	76.51229989	76.5122999	24.6882	855.123	76.5123	260.3506	5.100961	305.7388	56.54788
5	94.62002009	94.6200201	31.94877	1036.2	94.62002	316.9384	6.168636	371.8251	70.47707
6	112.2294654	112.229465	39.0096	1212.295	112.2295	371.9661	7.20693	436.0933	84.02267
7	134.2029389	134.202939	46.49854	1432.597	130.8669	439.4267	8.312039	515.1076	100.4104
8	148.0605965	148.060596	53.13729	1570.943	147.1888	483.94	9.255767	567.876	112.0297
9	165.2462697	165.24627	59.99098	1742.872	164.2336	537.6051	10.25828	630.7427	125.3145
10	182.3494913	182.349491	66.81081	1913.958	181.1907	590.9904	11.25541	693.2942	138.5326
11	199.3766477	199.376648	73.59933	2084.285	198.0689	644.1311	12.24782	755.5689	151.6922
12	216.3450555	216.345055	80.36349	2254.019	214.8859	697.0844	13.23654	817.6319	164.8063
13	233.2662043	233.266204	87.10841	2423.286	231.6541	749.8873	14.22234	879.5154	177.8846

14	250.1495488	250.149549	93.83754	2592.172	248.3827	802.5646	15.20574	941.2679	190.9338
15	267.0016602	267.00166	100.5542	2760.748	265.0789	855.1467	16.18717	1002.898	203.959
16	283.8276003	283.8276	107.2608	2929.064	281.7477	907.6364	17.16694	1064.438	216.9639
17	300.6310744	300.631074	113.9573	3097.157	298.3934	960.0594	18.14531	1125.893	229.952
18	317.4167907	317.416791	120.6468	3265.067	315.02	1012.425	19.12253	1187.286	242.9262
19	334.1866869	334.186687	127.3299	3432.821	331.6302	1064.74	20.09874	1248.62	255.8882
20	350.9430721	350.943072	134.0071	3600.434	348.2259	1117.008	21.07408	1309.897	268.8393
21	367.6876523	367.687652	140.6791	3767.93	364.8086	1169.239	22.04866	1371.143	281.7818
22	384.4214465	384.421446	147.3474	3935.325	381.3811	1221.431	23.02255	1432.339	294.7159
23	401.145989	401.145989	154.0116	4102.621	397.9432	1273.597	23.99588	1493.504	307.6431
24	417.8623995	417.862399	160.6727	4269.845	414.497	1325.738	24.96866	1554.639	320.5639
25	434.5716907	434.571691	167.3301	4436.99	431.0431	1377.856	25.94101	1615.752	333.4797
26	451.2742524	451.274252	173.9848	4604.069	447.5829	1429.949	26.91291	1676.844	346.3899
27	467.9717005	467.971701	180.6376	4771.097	464.1159	1482.026	27.88447	1737.901	359.2954
28	484.6629402	484.66294	187.2887	4938.063	480.6436	1534.078	28.85566	1798.949	372.1973
29	501.3502114	501.350211	193.9381	5104.99	497.1659	1586.125	29.82652	1859.978	385.0959
30	518.0332872	518.033287	200.5839	5271.867	513.6845	1638.152	30.79715	1920.999	397.9906
31	534.7120757	534.712076	207.2298	5438.71	530.1977	1690.167	31.7675	1981.993	410.8823
32	551.3867657	551.386766	213.8733	5605.523	546.7086	1742.167	32.73764	2042.98	423.7718
33	568.058983	568.058983	220.5161	5772.291	563.2152	1794.166	33.70756	2103.948	436.6582
34	584.727912	584.727912	227.1569	5939.038	579.7188	1846.148	34.67728	2164.914	449.5427
35	601.3942934	601.394293	233.7971	6105.759	596.2191	1898.126	35.64685	2225.865	462.4252
36	618.0585141	618.058514	240.4365	6272.448	612.7178	1950.09	36.61621	2286.812	475.3054
37	634.719486	634.719486	247.0748	6439.116	629.2128	2002.051	37.58543	2347.739	488.1836
38	651.3791147	651.379115	253.7113	6605.76	645.706	2053.995	38.55453	2408.672	501.0604
39	668.0368226	668.036823	260.349	6772.385	662.1971	2105.943	39.52349	2469.591	513.9358
40	684.6916871	684.691687	266.9834	6938.993	678.6863	2157.881	40.49235	2530.505	526.8097
41	701.3461445	701.346145	273.6193	7105.585	695.1737	2209.816	41.46105	2591.407	539.6826
42	717.9975733	717.997573	280.2537	7272.159	711.6594	2261.744	42.42969	2652.306	552.554
43	734.6480585	734.648059	286.8875	7438.725	728.1429	2313.671	43.39822	2713.208	565.424
44	751.2970425	751.297043	293.5194	7605.263	744.6251	2365.592	44.36665	2774.088	578.2927
45	767.945084	767.945084	300.1523	7771.805	761.1065	2417.499	45.33498	2834.986	591.1614

46	784.5926245	784.592624	306.7848	7938.315	777.5863	2469.41	46.30324	2895.857	604.0284
47	801.2371885	801.237188	313.4153	8104.823	794.0648	2521.318	47.27143	2956.741	616.894
48	804.5284729	804.528473	316.595	8135.285	804.5285	2535.406	48.02646	2962.725	616.5607
49	820.8591253	820.859125	323.143	8298.591	820.8591	2586.439	48.98922	3022.328	629.1227
50	837.1891112	837.189111	329.6901	8461.891	837.1891	2637.464	49.95205	3081.936	641.6832



From our graphs we can see that when the PCM was increased to 0.9 , there was little change to the system's performance. Therefore, we can say the system has low sensitivity (low impact) when PCM =0.9. We can thus conclude that the PCM value does little or no impact to our system.

2) VARIOUS CHANGES TO LQN MODEL TO ALLEVIATE BOTTLENECK.

1) ADD 10 THREADS TO PROTOCOL

\$0	\$thruProtocol	\$thruWebServer	\$thruWDisk	\$thruCGIAPP	\$thruWebReply	\$thruGetObjects	\$thruProtReply	\$thruDBProcess	\$thruDBOpt
1	0.0641132	0.0641132	0.056035	0.00641132	0.0641132	0.0205162	1.08736	0.017567	0.0833472
2	0.0398625	0.0413081	0.0344496	0.00413553	0.0392844	0.013285	0.673256	0.0112881	0.0533891
3	0.0395342	0.0379092	0.0349714	0.00378696	0.0401853	0.012068	0.673754	0.010421	0.049618
4	0.0392211	0.0374226	0.0346637	0.00373877	0.0398435	0.0119159	0.667653	0.0102932	0.0490281
5	0.0391491	0.037216	0.0345702	0.00371852	0.0397436	0.0118531	0.665754	0.0102411	0.0487929
6	0.0391435	0.0371049	0.0345386	0.00370775	0.0397126	0.0118205	0.665086	0.0102141	0.0486748
7	0.0391592	0.0370367	0.0345297	0.00370121	0.0397064	0.0118011	0.664876	0.0101983	0.048607
8	0.0395111	0.0394078	0.0344105	0.00393843	0.0393673	0.0126072	0.667843	0.0107924	0.0512155
9	0.0395425	0.0394331	0.0344296	0.00394085	0.0393888	0.0126147	0.668202	0.010799	0.0512474
10	0.039415	0.0394109	0.0320157	0.00394125	0.0364012	0.0127069	0.624891	0.0107996	0.0512385
11	0.0393043	0.0368185	0.0343964	0.00367948	0.0395589	0.0117334	0.66228	0.0101406	0.0483401
12	0.0392515	0.0392532	0.0319125	0.00392545	0.0362863	0.0126549	0.622837	0.0107563	0.0510332
13	0.0392823	0.0392831	0.0319321	0.00392844	0.0363081	0.0126648	0.623226	0.0107645	0.0510722
14	0.0393052	0.0393052	0.0319466	0.00393067	0.0363242	0.0126721	0.623516	0.0107706	0.051101
15	0.0393227	0.0393222	0.0319577	0.00393237	0.0363366	0.0126777	0.623737	0.0107752	0.0511231
16	0.0393364	0.0393354	0.0319664	0.00393369	0.0363462	0.012682	0.623909	0.0107789	0.0511403
17	0.0393472	0.0393459	0.0319732	0.00393474	0.0363539	0.0126855	0.624045	0.0107817	0.0511539
18	0.039356	0.0393543	0.0319788	0.00393559	0.03636	0.0126883	0.624155	0.0107841	0.0511649
19	0.0393631	0.0393613	0.0319833	0.00393628	0.0363651	0.0126905	0.624245	0.010786	0.0511739
20	0.0393691	0.0393669	0.031987	0.00393684	0.0363692	0.0126924	0.624319	0.0107875	0.0511812
21	0.039374	0.0393716	0.0319901	0.00393732	0.0363727	0.012694	0.624381	0.0107888	0.0511874
22	0.0393782	0.0393757	0.0319927	0.00393773	0.0363756	0.0126953	0.624434	0.0107899	0.0511927
23	0.0393818	0.0393791	0.031995	0.00393807	0.0363781	0.0126964	0.624478	0.0107909	0.0511972
24	0.0393849	0.0393821	0.0319969	0.00393837	0.0363803	0.0126974	0.624517	0.0107917	0.0512011
25	0.0393876	0.0393847	0.0319986	0.00393863	0.0363821	0.0126983	0.62455	0.0107924	0.0512044

26	0.0393899	0.0393869	0.0320001	0.00393885	0.0363838	0.012699	0.62458	0.010793	0.0512073
27	0.039392	0.0393889	0.0320014	0.00393905	0.0363852	0.0126997	0.624605	0.0107936	0.0512099
28	0.0393938	0.0393906	0.0320025	0.00393922	0.0363865	0.0127002	0.624628	0.010794	0.0512121
29	0.0393954	0.0393922	0.0320035	0.00393938	0.0363876	0.0127007	0.624648	0.0107945	0.0512141
30	0.0393968	0.0393935	0.0320044	0.00393951	0.0363886	0.0127012	0.624666	0.0107948	0.0512159
31	0.0393981	0.0393947	0.0320052	0.00393964	0.0363895	0.0127016	0.624682	0.0107952	0.0512175
32	0.0393993	0.0393958	0.0320059	0.00393975	0.0363903	0.0127019	0.624696	0.0107955	0.0512189
33	0.0394003	0.0393968	0.0320066	0.00393984	0.036391	0.0127023	0.624709	0.0107957	0.0512202
34	0.0394012	0.0393977	0.0320071	0.00393993	0.0363916	0.0127026	0.62472	0.010796	0.0512214
35	0.0394021	0.0393985	0.0320077	0.00394002	0.0363922	0.0127028	0.624731	0.0107962	0.0512224
36	0.0394029	0.0393993	0.0320082	0.00394009	0.0363928	0.0127031	0.624741	0.0107964	0.0512234
37	0.0394036	0.0394	0.0320086	0.00394016	0.0363933	0.0127033	0.624749	0.0107966	0.0512243
38	0.0394042	0.0394006	0.032009	0.00394022	0.0363937	0.0127035	0.624757	0.0107968	0.0512251
39	0.0394048	0.0394011	0.0320094	0.00394028	0.0363941	0.0127037	0.624765	0.0107969	0.0512258
40	0.0394054	0.0394017	0.0320097	0.00394033	0.0363945	0.0127039	0.624772	0.0107971	0.0512265
41	0.0394059	0.0394021	0.03201	0.00394038	0.0363948	0.012704	0.624778	0.0107972	0.0512271
42	0.0394063	0.0394026	0.0320103	0.00394042	0.0363952	0.0127042	0.624784	0.0107973	0.0512277
43	0.0394068	0.039403	0.0320106	0.00394046	0.0363955	0.0127043	0.624789	0.0107974	0.0512282
44	0.0394072	0.0394034	0.0320108	0.0039405	0.0363957	0.0127044	0.624794	0.0107975	0.0512287
45	0.0394075	0.0394037	0.0320111	0.00394054	0.036396	0.0127045	0.624799	0.0107976	0.0512292
46	0.0394079	0.0394041	0.0320113	0.00394057	0.0363962	0.0127047	0.624803	0.0107977	0.0512296
47	0.0394082	0.0394044	0.0320115	0.0039406	0.0363965	0.0127048	0.624807	0.0107978	0.05123
48	0.0394085	0.0394047	0.0320117	0.00394063	0.0363967	0.0127049	0.624811	0.0107979	0.0512304
49	0.0394088	0.0394049	0.0320118	0.00394066	0.0363969	0.0127049	0.624814	0.010798	0.0512308
50	0.039409	0.0394052	0.032012	0.00394068	0.0363971	0.012705	0.624817	0.010798	0.0512311

\$N	\$uProtocol	\$uWebServer	\$uWDisk	\$uCGIAPP	\$uWebReply	\$uGetObjects	\$uProtReplly	\$uDBProcess	\$uDBOpt
1	1	0.983972	0.005604	0.562684	0.344057	0.0209266	0.27184	0.425071	0.008335
2	1.93726	0.928894	0.003445	0.401179	0.420626	0.0161672	0.258998	0.27314	0.005339
3	3.11559	0.855697	0.003497	0.375804	0.475081	0.0153895	0.276587	0.252157	0.004962
4	4.17291	0.867702	0.003466	0.374765	0.492236	0.0155878	0.282214	0.249067	0.004903
5	5.23365	0.876407	0.003457	0.37494	0.503392	0.0157497	0.285975	0.247804	0.004879

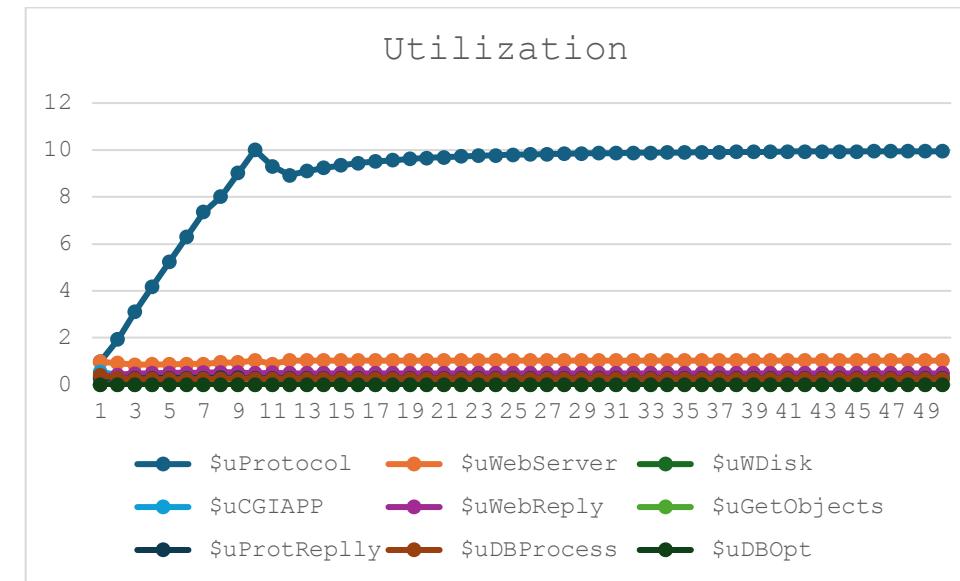
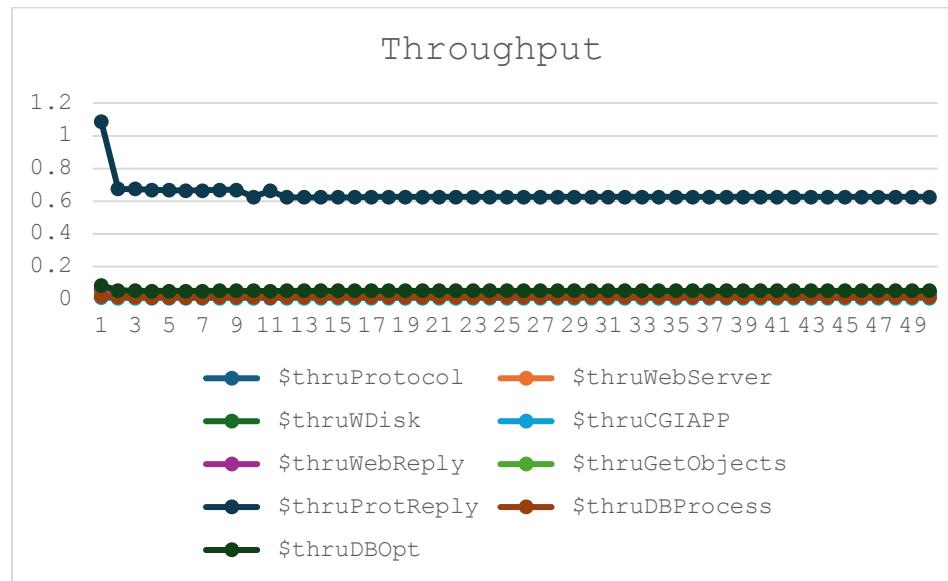
6	6.2966	0.882807	0.003454	0.375331	0.511264	0.015873	0.288676	0.247153	0.004867
7	7.36097	0.887672	0.003453	0.375732	0.517128	0.0159682	0.290713	0.246768	0.004861
8	8.01883	0.949956	0.003441	0.401949	0.526425	0.0172981	0.297263	0.261146	0.005122
9	9.02242	0.954957	0.003443	0.402935	0.530589	0.0173934	0.298801	0.261305	0.005125
10	10.0001	1.04093	0.003202	0.403271	0.493321	0.0174221	0.279706	0.261319	0.005124
11	9.30465	0.893132	0.00344	0.375284	0.525059	0.0160794	0.293105	0.245373	0.004834
12	8.93078	1.03504	0.003191	0.401472	0.490887	0.0173319	0.278481	0.260271	0.005103
13	9.10647	1.03615	0.003193	0.401813	0.491348	0.017349	0.278713	0.260469	0.005107
14	9.24411	1.03698	0.003195	0.402066	0.49169	0.0173617	0.278885	0.260617	0.00511
15	9.35346	1.03762	0.003196	0.40226	0.491952	0.0173714	0.279017	0.260729	0.005112
16	9.44151	1.03811	0.003197	0.40241	0.492156	0.0173789	0.279119	0.260817	0.005114
17	9.51326	1.0385	0.003197	0.40253	0.492318	0.0173849	0.279201	0.260887	0.005115
18	9.57239	1.03882	0.003198	0.402626	0.492448	0.0173897	0.279267	0.260943	0.005116
19	9.6216	1.03908	0.003198	0.402705	0.492555	0.0173937	0.27932	0.260989	0.005117
20	9.66298	1.03929	0.003199	0.402769	0.492642	0.0173969	0.279364	0.261026	0.005118
21	9.69805	1.03946	0.003199	0.402824	0.492715	0.0173997	0.279401	0.261058	0.005119
22	9.728	1.03962	0.003199	0.40287	0.492778	0.017402	0.279433	0.261085	0.005119
23	9.75377	1.03974	0.0032	0.402909	0.492831	0.0174039	0.279459	0.261108	0.00512
24	9.7761	1.03986	0.0032	0.402943	0.492877	0.0174056	0.279482	0.261128	0.00512
25	9.79556	1.03995	0.0032	0.402972	0.492917	0.0174071	0.279502	0.261145	0.00512
26	9.81261	1.04004	0.0032	0.402998	0.492951	0.0174084	0.27952	0.261159	0.005121
27	9.82764	1.04011	0.0032	0.40302	0.492981	0.0174095	0.279535	0.261173	0.005121
28	9.84095	1.04017	0.0032	0.40304	0.493008	0.0174105	0.279548	0.261184	0.005121
29	9.85278	1.04023	0.0032	0.403058	0.493032	0.0174114	0.27956	0.261194	0.005121
30	9.86336	1.04028	0.0032	0.403073	0.493053	0.0174122	0.279571	0.261203	0.005122
31	9.87284	1.04033	0.003201	0.403087	0.493072	0.0174129	0.27958	0.261212	0.005122
32	9.88138	1.04037	0.003201	0.4031	0.493089	0.0174135	0.279589	0.261219	0.005122
33	9.88909	1.04041	0.003201	0.403111	0.493104	0.0174141	0.279597	0.261225	0.005122
34	9.89607	1.04044	0.003201	0.403121	0.493118	0.0174146	0.279604	0.261231	0.005122
35	9.90242	1.04047	0.003201	0.403131	0.493131	0.017415	0.27961	0.261237	0.005122
36	9.90821	1.0405	0.003201	0.403139	0.493142	0.0174155	0.279616	0.261242	0.005122
37	9.9135	1.04052	0.003201	0.403147	0.493152	0.0174158	0.279621	0.261246	0.005122

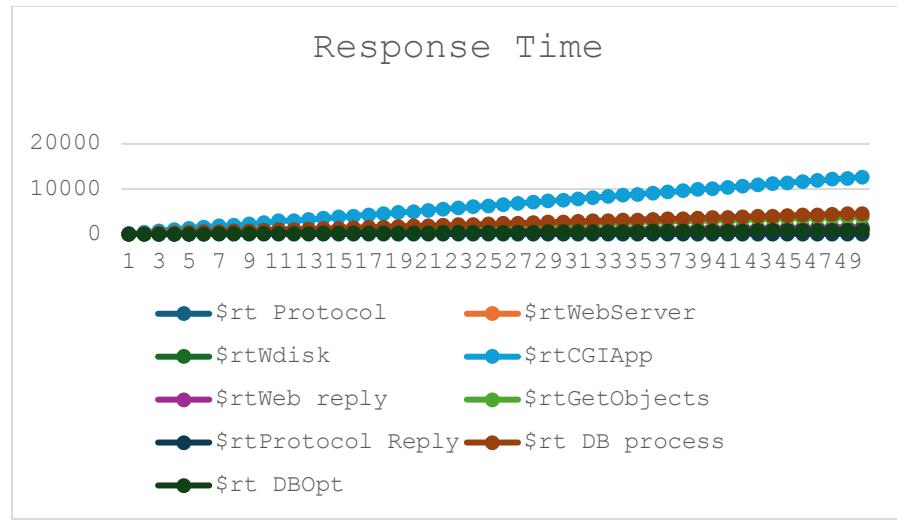
38	9.91835	1.04055	0.003201	0.403154	0.493162	0.0174162	0.279626	0.26125	0.005123
39	9.92281	1.04057	0.003201	0.40316	0.493171	0.0174165	0.27963	0.261254	0.005123
40	9.92691	1.04059	0.003201	0.403166	0.493179	0.0174168	0.279634	0.261257	0.005123
41	9.93069	1.04061	0.003201	0.403172	0.493186	0.0174171	0.279638	0.261261	0.005123
42	9.93419	1.04062	0.003201	0.403177	0.493193	0.0174174	0.279641	0.261264	0.005123
43	9.93743	1.04064	0.003201	0.403182	0.493199	0.0174176	0.279645	0.261266	0.005123
44	9.94044	1.04065	0.003201	0.403186	0.493205	0.0174178	0.279648	0.261269	0.005123
45	9.94324	1.04067	0.003201	0.40319	0.493211	0.017418	0.27965	0.261271	0.005123
46	9.94584	1.04068	0.003201	0.403194	0.493216	0.0174182	0.279653	0.261273	0.005123
47	9.94827	1.04069	0.003201	0.403197	0.493221	0.0174184	0.279655	0.261275	0.005123
48	9.95055	1.0407	0.003201	0.4032	0.493225	0.0174185	0.279657	0.261277	0.005123
49	9.95267	1.04071	0.003201	0.403203	0.493229	0.0174187	0.27966	0.261279	0.005123
50	9.95466	1.04072	0.003201	0.403206	0.493233	0.0174188	0.279661	0.261281	0.005123

\$N	\$wUser	\$wProtocol	\$wSendStatic	\$rt Protocol	\$rtWebServer	\$rtWdisk	\$rtCGIApp	\$rtWeb reply	\$rtGetObjects	\$rtProtocol Reply	\$rt DB process	\$rt DBOpt
1	0	0	0	15.59741208	15.59741208	17.84599	155.9741	15.59741	48.74196976	0.919659	56.92491604	11.998
2	1.57394	25.3437	0	50.17246786	48.41665436	58.05583	483.614	50.91079	150.5457283	2.970638	177.1777358	37.46083
3	0	55.8663	0.00388059	75.88366528	79.13646292	85.78438	792.1922	74.65416	248.5913159	4.452664	287.8802418	60.46193
4	0	82.9455	0.00409196	101.9859208	106.887282	115.3945	1069.871	100.3928	335.6859322	5.991136	388.60607	81.58587
5	0	110.01	0.00420281	127.7168568	134.3508169	144.6332	1344.621	125.8064	421.830576	7.510282	488.2288035	102.4739
6	0	137.095	0.00426545	153.2821541	161.7037103	173.7187	1618.232	151.0855	507.5927414	9.02139	587.4232678	123.2671
7	0	164.2	0.00430481	178.7574823	189.0017199	202.724	1891.273	176.294	593.1650439	10.52828	686.388908	144.0122
8	0	178.032	0.00033869	202.4747476	203.0054964	232.4872	2031.266	203.2143	634.5580303	11.97886	741.2623698	156.2027
9	0	203.137	0.000362475	227.6032117	228.2346557	261.403	2283.771	228.4913	713.453352	13.46898	833.410501	175.6187
10	0	226.436	0.0011104	253.7105163	253.7369103	312.3468	2537.266	274.7162	786.9740062	16.00279	925.9602207	195.1657
11	43.134	213.31	0.00422181	279.8675972	298.7628502	319.8009	2989.553	278.0664	937.4946733	16.60929	1084.748437	227.5543
12	78.1936	200.294	0.00108951	305.7208005	305.7075601	376.0282	3056.974	330.7033	948.2492947	19.26668	1115.625261	235.141
13	99.1165	204.58	0.00109376	330.9378524	330.9311129	407.1138	3309.202	358.0468	1026.467058	20.85921	1207.673371	254.5416
14	120.999	207.941	0.00109722	356.1869676	356.1869676	438.2313	3561.734	385.418	1104.789261	22.45331	1299.834735	273.9672
15	143.595	210.612	0.00109923	381.4590555	381.4639059	469.3704	3814.494	412.8069	1183.179914	24.0486	1392.08553	293.4094
16	166.728	212.764	0.00110083	406.7479485	406.758289	500.5256	4067.428	440.2111	1261.630658	25.64477	1484.381523	312.8648

17	190.274	214.518	0.00110211	432.0510735	432.0653486	531.6953	4320.489	467.6252	1340.112727	27.24163	1576.745782	332.3305
18	214.138	215.965	0.00110314	457.3635532	457.3833101	562.8729	4573.647	495.0495	1418.629761	28.83899	1669.123988	351.8037
19	238.253	217.169	0.00110381	482.6855608	482.7076341	594.06	4826.892	522.479	1497.182932	30.43677	1761.542741	371.283
20	262.567	218.182	0.0011047	508.0126292	508.0410192	625.254	5080.217	549.9159	1575.746116	32.03491	1853.997683	390.7685
21	287.041	219.04	0.0011053	533.3468787	533.3793902	656.4531	5333.577	577.3561	1654.324878	33.63331	1946.462999	410.2572
22	311.644	219.773	0.00110582	558.6847545	558.7202259	687.6569	5586.975	604.801	1732.924783	35.23191	2038.943827	429.7488
23	336.354	220.404	0.00110626	584.0261237	584.0661671	718.8623	5840.424	632.2485	1811.537129	36.83076	2131.425553	449.2433
24	361.151	220.951	0.00110663	609.3705963	609.4139216	750.0727	6093.892	659.6977	1890.15074	38.4297	2223.931355	468.7399
25	386.021	221.427	0.00110696	634.7175253	634.7642612	781.2842	6347.385	687.1511	1968.767473	40.02882	2316.444906	488.2393
26	410.952	221.845	0.00110725	660.0676823	660.117958	812.4975	6600.911	714.6038	2047.405308	41.62797	2408.968776	507.7401
27	435.935	222.213	0.0011075	685.4183591	685.4723031	843.7131	6854.445	742.06	2126.034473	43.22732	2501.48236	527.2418
28	460.962	222.539	0.00110773	710.7717458	710.8294872	874.9316	7108.006	769.5162	2204.68969	44.82668	2594.033722	546.7458
29	486.027	222.829	0.00110793	736.1265528	736.1863516	906.1509	7361.565	796.9748	2283.338714	46.42615	2686.553337	566.2503
30	511.123	223.088	0.0011081	761.4831661	761.5469557	937.3711	7615.16	824.434	2361.981545	48.02566	2779.115871	585.7556
31	536.248	223.32	0.00110826	786.8399745	786.9078835	968.5926	7868.739	851.8941	2440.6374	49.62525	2871.646658	605.2619
32	561.397	223.529	0.0011084	812.197171	812.2693282	999.8157	8122.343	879.3552	2519.308135	51.22492	2964.198045	624.7694
33	586.567	223.718	0.00110853	837.5570744	837.6314828	1031.037	8375.975	906.8176	2597.954701	52.8246	3056.772604	644.2771
34	611.756	223.889	0.00110865	862.9178807	862.9945403	1062.264	8629.595	934.2815	2676.617385	54.42438	3149.314561	663.7851
35	636.961	224.044	0.00110876	888.2775284	888.3586939	1093.487	8883.204	961.7445	2755.298045	56.02411	3241.881403	683.2948
36	662.18	224.186	0.00110889	913.6383363	913.7218174	1124.712	9136.847	989.2067	2833.953917	57.62388	3334.444815	702.8038
37	687.412	224.316	0.00110898	939.0004974	939.0862944	1155.939	9390.482	1016.671	2912.629002	59.22378	3427.004798	722.3134
38	712.656	224.434	0.00110906	964.3642048	964.452318	1187.166	9644.132	1044.137	2991.30161	60.82365	3519.561352	741.8238
39	737.91	224.543	0.00110913	989.7271398	989.8200812	1218.392	9897.774	1071.602	3069.971741	62.42347	3612.147931	761.3351
40	763.172	224.644	0.0011092	1015.089302	1015.184624	1249.621	10151.43	1099.067	3148.639394	64.02336	3704.698484	780.8459
41	788.444	224.737	0.00110926	1040.453333	1040.553676	1280.85	10405.09	1126.535	3227.329975	65.62331	3797.280776	800.3576
42	813.722	224.822	0.00110932	1065.819425	1065.919508	1312.078	10658.76	1153.998	3305.993294	67.22323	3889.861354	819.8689
43	839.007	224.902	0.00110937	1091.182233	1091.287465	1343.305	10912.43	1181.465	3384.680777	68.82323	3982.440217	839.3814
44	864.299	224.975	0.00110942	1116.54723	1116.654908	1374.536	11166.1	1208.934	3463.367022	70.42321	4075.017365	858.8935
45	889.595	225.044	0.00110946	1141.91461	1142.024734	1405.762	11419.75	1236.4	3542.052029	72.02316	4167.592798	878.4053
46	914.897	225.108	0.00110951	1167.278642	1167.391211	1436.993	11673.44	1263.868	3620.707297	73.62321	4260.166517	897.9184
47	940.203	225.167	0.00110955	1192.645186	1192.760199	1468.222	11927.12	1291.333	3699.389207	75.22323	4352.738521	917.4312
48	965.514	225.223	0.00110958	1218.011343	1218.128802	1499.452	12180.79	1318.801	3778.069879	76.82323	4445.30881	936.9437

49	990.828	225.275	0.00110962	1243.377114	1243.500174	1530.686	12434.47	1346.269	3856.779668	78.42334	4537.877385	956.4559
50	1016.15	225.324	0.00110965	1268.745718	1268.868068	1561.914	12688.17	1373.736	3935.458481	80.02343	4630.487127	975.9697





From the graphs when we added 10 threads to the protocol there were some significant changes. There is a slight improvement in response time as we can see although rtCGI APP has the highest response time other devices improved their response times. The bottleneck is now only the Protocol as the Web Server and other devices are not being utilized to their full potential. We will make more changes. Also the throughput for the ProtocolReply is still the highest. More changes will be made to improve the system.

2.2 ADD 50 THREADS TO THE PROTOCOL AND WEB SERVER

```
#===== Variables =====
$N=[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50]
$ProtThread=50
$WSThread=50
```

\$0	\$thruProtocol	\$thruWebServer	\$thruWDisk	\$thruCGIAPP	\$thruWebReply	\$thruGetObjects	\$thruProtReply	\$thruDBProcess	\$thruDBOpt
1	0.0641132	0.0641132	0.056035	0.00641132	0.0641132	0.0205162	1.08736	0.017567	0.0833472
2	0.0593158	0.0593161	0.0518421	0.00593161	0.0593158	0.018981	1.00599	0.0162526	0.0771108
3	0.0632651	0.0632663	0.0552959	0.00632664	0.0632677	0.0202456	1.07303	0.0173351	0.0822468
4	0.0639808	0.0639809	0.0557889	0.00639809	0.063981	0.0198218	1.05055	0.0175308	0.0831752
5	0.0635045	0.0635047	0.0552712	0.00635047	0.0635048	0.0191612	1.01555	0.0174003	0.0825562
6	0.0628903	0.0628902	0.0547085	0.00628905	0.0628894	0.0188403	0.99853	0.0172318	0.0817567
7	0.0623065	0.0623066	0.0542028	0.00623065	0.0623067	0.018672	0.989618	0.017072	0.0809986
8	0.0617835	0.0617834	0.0537606	0.00617837	0.0617828	0.0185823	0.984858	0.0169285	0.080318
9	0.0613986	0.0613984	0.0534283	0.00613986	0.061369	0.018479	0.983354	0.0167432	0.0794387
10	0.0611465	0.0611464	0.0531972	0.00611462	0.0610587	0.0183418	0.984171	0.016513	0.0783464
11	0.0608574	0.0608574	0.0529513	0.00608574	0.0607444	0.0182835	0.984612	0.0163649	0.0776438
12	0.0605808	0.0605808	0.0527233	0.00605808	0.0604602	0.0182641	0.984693	0.0162686	0.077187
13	0.060327	0.0603269	0.0525177	0.00603269	0.0602076	0.0182648	0.984605	0.0162029	0.0768749
14	0.0601056	0.0601056	0.0523398	0.00601055	0.0599905	0.0182719	0.984443	0.016154	0.0766429
15	0.0599128	0.0599128	0.0521857	0.00599127	0.0598034	0.0182822	0.984231	0.0161168	0.0764667
16	0.0597455	0.0597454	0.0520523	0.00597454	0.0596422	0.0182931	0.983992	0.0160877	0.0763284
17	0.0596002	0.0596001	0.0519367	0.00596	0.0595028	0.0183036	0.983737	0.0160642	0.0762172
18	0.0594681	0.0594681	0.0518325	0.00594682	0.0593781	0.0183165	0.983451	0.0160475	0.0761378
19	0.0593588	0.0593586	0.0517452	0.00593584	0.0592733	0.0183244	0.983189	0.016031	0.0760594
20	0.0592622	0.0592622	0.0516685	0.0059262	0.0591814	0.0183314	0.982929	0.0160171	0.0759937
21	0.0591769	0.0591769	0.0516007	0.00591768	0.0591005	0.0183376	0.982672	0.0160054	0.0759379
22	0.0591014	0.0591014	0.0515405	0.00591012	0.0590287	0.0183429	0.982417	0.0159952	0.0758899
23	0.0590338	0.0590338	0.051487	0.00590339	0.058965	0.0183476	0.98217	0.0159866	0.0758488
24	0.0589736	0.0589736	0.0514389	0.00589735	0.058908	0.0183516	0.981926	0.015979	0.0758128
25	0.0589198	0.0589197	0.0513956	0.00589193	0.0588567	0.018355	0.981687	0.0159723	0.0757811
26	0.0588704	0.0588705	0.0513569	0.00588707	0.0588109	0.0183581	0.981461	0.0159666	0.0757541
27	0.0588261	0.0588262	0.0513216	0.00588265	0.0587692	0.0183606	0.981238	0.0159615	0.0757298
28	0.0587862	0.0587863	0.0512895	0.00587863	0.0587314	0.0183628	0.981021	0.0159569	0.075708
29	0.0587497	0.0587497	0.0512602	0.00587497	0.058697	0.0183646	0.980812	0.0159529	0.0756888
30	0.0587156	0.0587159	0.0512337	0.00587165	0.0586658	0.0183663	0.980613	0.0159494	0.0756722
31	0.0586857	0.0586857	0.0512088	0.00586856	0.0586367	0.0183675	0.980414	0.015946	0.0756561
32	0.0586573	0.0586574	0.0511862	0.00586574	0.0586103	0.0183686	0.980227	0.0159431	0.0756424
33	0.0586314	0.0586314	0.0511653	0.00586313	0.0585859	0.0183696	0.980046	0.0159404	0.0756298
34	0.0586071	0.0586072	0.051146	0.00586073	0.0585634	0.0183704	0.979873	0.0159381	0.0756185

35	0.0585848	0.0585848	0.051128	0.00585849	0.0585424	0.0183711	0.979705	0.0159359	0.0756081
36	0.0585637	0.0585639	0.0511114	0.00585643	0.0585231	0.0183717	0.979546	0.0159339	0.0755989
37	0.0585477	0.0585462	0.0510947	0.00585434	0.0585037	0.0183716	0.979376	0.0159315	0.0755876
38	0.0585265	0.0585265	0.0510809	0.00585265	0.0584878	0.0183725	0.97924	0.0159303	0.0755817
39	0.0585097	0.0585096	0.0510671	0.00585093	0.0584718	0.0183728	0.979097	0.0159287	0.0755741
40	0.0584935	0.0584935	0.0510543	0.00584934	0.058457	0.0183731	0.978961	0.0159273	0.0755673
41	0.0584783	0.0584783	0.0510422	0.00584784	0.058443	0.0183733	0.97883	0.0159259	0.0755609
42	0.0584641	0.0584641	0.0510307	0.00584642	0.0584297	0.0183735	0.978704	0.0159246	0.0755548
43	0.0584507	0.0584507	0.0510197	0.00584506	0.058417	0.0183736	0.978583	0.0159234	0.075549
44	0.058438	0.0584379	0.0510094	0.00584378	0.0584051	0.0183738	0.978468	0.0159223	0.0755435
45	0.0584258	0.0584257	0.0509995	0.00584256	0.0583937	0.0183739	0.978357	0.0159212	0.0755384
46	0.058414	0.0584141	0.0509903	0.00584142	0.058383	0.018374	0.978252	0.0159202	0.0755336
47	0.0584029	0.058403	0.0509813	0.00584031	0.0583727	0.0183741	0.978151	0.0159192	0.075529
48	0.0583926	0.0583925	0.0509727	0.00583924	0.0583627	0.0183741	0.978053	0.0159182	0.0755242
49	0.0583824	0.0583824	0.0509645	0.00583823	0.0583533	0.0183742	0.977961	0.0159173	0.07552
50	0.0583724	0.0583725	0.0509567	0.00583727	0.0583443	0.0183743	0.977874	0.0159164	0.075516

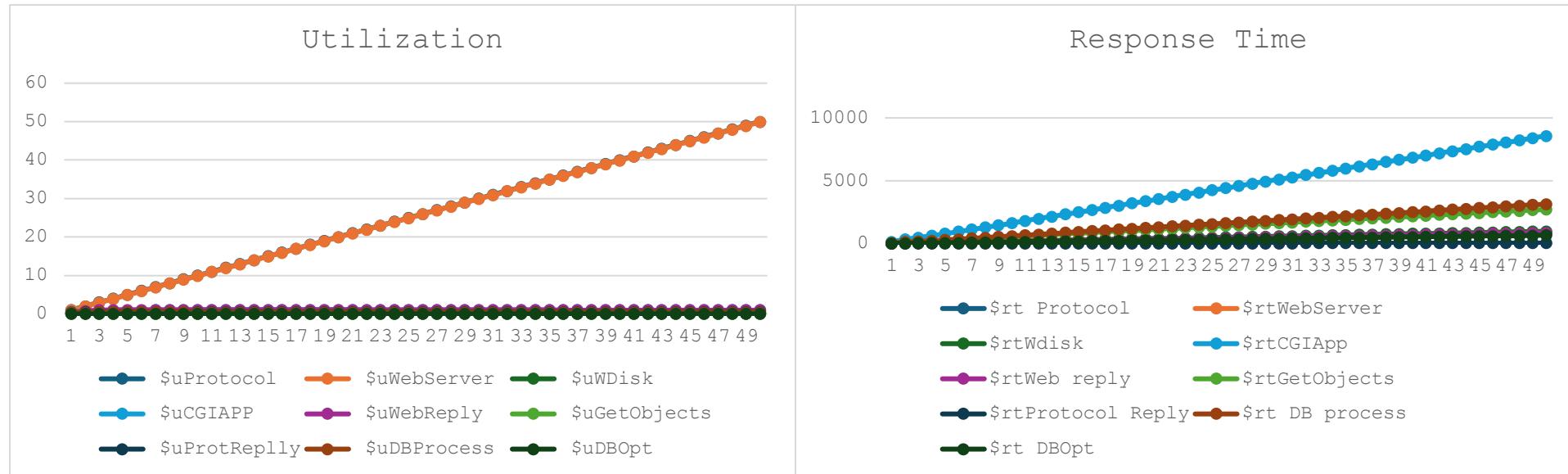
\$N	\$uProtocol	\$uWebServer	\$uWDisk	\$uCGIAPP	\$uWebReply	\$uGetObjects	\$uProtReply	\$uDBProcess	\$uDBOpt
1	1	0.983972	0.005604	0.562684	0.344057	0.0209266	0.27184	0.425071	0.008335
2	1.99999	1.95421	0.005184	0.635528	0.749264	0.0250632	0.432251	0.393265	0.007711
3	2.99995	2.93324	0.00553	0.744752	0.948878	0.0299654	0.515379	0.41946	0.008225
4	4	3.92367	0.005579	0.822311	1.0329	0.0308907	0.532401	0.424194	0.008318
5	4.99999	4.91994	0.005527	0.877724	1.06056	0.0305931	0.528611	0.421037	0.008256
6	6.00001	5.91814	0.005471	0.92323	1.06817	0.0305216	0.526654	0.416959	0.008176
7	6.99999	6.91707	0.00542	0.95979	1.06781	0.0305388	0.525528	0.413093	0.0081

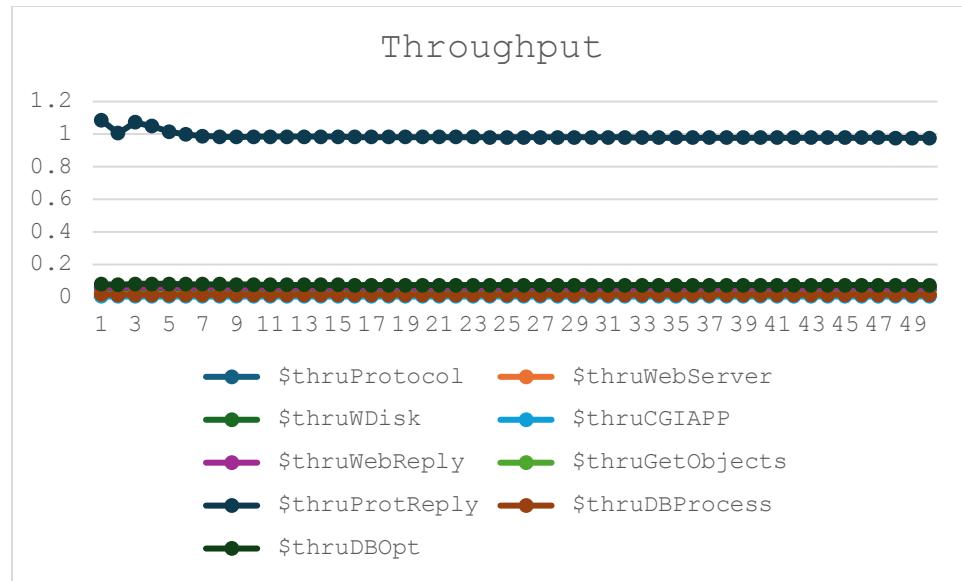
8	8.00001	7.9166	0.005376	0.98689	1.06394	0.0305934	0.524814	0.409621	0.008032
9	9.00003	8.91628	0.005343	1.00478	1.05818	0.030556	0.524422	0.405137	0.007944
10	10	9.91603	0.00532	1.0146	1.05144	0.030411	0.52426	0.399567	0.007835
11	11	10.916	0.005295	1.01894	1.04533	0.0303864	0.524081	0.395983	0.007764
12	12	11.916	0.005272	1.02032	1.04029	0.0304194	0.523897	0.393654	0.007719
13	13	12.916	0.005252	1.02016	1.03604	0.0304789	0.523721	0.392062	0.007687
14	14	13.916	0.005234	1.0195	1.03251	0.0305427	0.523559	0.390879	0.007664
15	15	14.916	0.005219	1.01857	1.02956	0.0306063	0.523411	0.38998	0.007647
16	16	15.9159	0.005205	1.01756	1.02708	0.0306663	0.523275	0.389275	0.007633
17	17	16.9159	0.005194	1.01657	1.025	0.0307215	0.523152	0.388708	0.007622
18	18	17.9158	0.005183	1.01538	1.02321	0.0307779	0.523036	0.388303	0.007614
19	19	18.9159	0.005175	1.01455	1.02171	0.0308221	0.522932	0.387903	0.007606
20	20	19.9158	0.005167	1.01378	1.02044	0.0308624	0.522838	0.387568	0.007599
21	21	20.9158	0.00516	1.01306	1.01935	0.030899	0.522751	0.387283	0.007594
22	22	21.9158	0.005154	1.01241	1.01841	0.0309321	0.52267	0.387038	0.007589
23	23	22.9156	0.005149	1.0118	1.0176	0.0309625	0.522596	0.386829	0.007585
24	24	23.9156	0.005144	1.01125	1.01689	0.0309899	0.522526	0.386645	0.007581
25	25.0001	24.9157	0.00514	1.01074	1.01628	0.0310149	0.52246	0.386484	0.007578
26	26	25.9154	0.005136	1.01027	1.01575	0.0310382	0.522402	0.386346	0.007575
27	27	26.9154	0.005132	1.00983	1.01528	0.0310594	0.522346	0.386222	0.007573
28	28	27.9154	0.005129	1.00943	1.01487	0.0310787	0.522292	0.386111	0.007571
29	29	28.9154	0.005126	1.00906	1.01451	0.0310967	0.522242	0.386013	0.007569
30	29.9999	29.915	0.005123	1.00871	1.0142	0.0311136	0.522198	0.385929	0.007567
31	31	30.9154	0.005121	1.00839	1.01391	0.0311287	0.52215	0.385846	0.007566
32	32	31.9153	0.005119	1.00809	1.01367	0.0311431	0.522109	0.385776	0.007564
33	33	32.9153	0.005117	1.00781	1.01345	0.0311565	0.522069	0.385712	0.007563
34	34	33.9152	0.005115	1.00755	1.01325	0.031169	0.522033	0.385654	0.007562
35	35	34.9151	0.005113	1.0073	1.01307	0.0311807	0.521997	0.385601	0.007561
36	35.9999	35.9149	0.005111	1.00707	1.01292	0.0311918	0.521965	0.385554	0.00756
37	37.0008	36.9168	0.005109	1.00686	1.01275	0.031201	0.52192	0.385496	0.007559
38	38	37.9152	0.005108	1.00665	1.01264	0.0312117	0.521901	0.385467	0.007558
39	39.0001	38.9152	0.005107	1.00646	1.01252	0.0312208	0.521871	0.385428	0.007557

40	40	39.9151	0.005105	1.00628	1.01241	0.0312296	0.521845	0.385393	0.007557
41	41	40.915	0.005104	1.0061	1.01232	0.0312378	0.521819	0.385361	0.007556
42	42	41.915	0.005103	1.00594	1.01223	0.0312456	0.521794	0.385329	0.007555
43	43	42.9151	0.005102	1.00578	1.01214	0.031253	0.521769	0.3853	0.007555
44	44	43.915	0.005101	1.00563	1.01206	0.0312601	0.521746	0.385272	0.007554
45	45	44.915	0.0051	1.00549	1.01198	0.0312668	0.521725	0.385246	0.007554
46	46	45.9149	0.005099	1.00536	1.01191	0.0312733	0.521704	0.385222	0.007553
47	46.9999	46.9148	0.005098	1.00523	1.01185	0.0312794	0.521685	0.385198	0.007553
48	48.0001	47.915	0.005097	1.00511	1.01178	0.0312852	0.521664	0.385174	0.007552
49	49	48.9149	0.005096	1.00499	1.01172	0.0312909	0.521646	0.385152	0.007552
50	49.9999	49.9147	0.005096	1.00488	1.01166	0.0312964	0.521629	0.385131	0.007552

\$N	\$rt Protocol					\$rtWeb				\$rtProtocol		\$rt DB	\$rt DBOpt
	\$wUser	\$wProtocol	\$wSendStatic			\$rt WebServer	\$rtWdisk	\$rtCGIApp	reply	\$rtGetObjects	Reply	process	
1	0	0	0	15.59741208	15.59741208	17.84599	155.9741	15.59741	48.74196976	0.919659	56.92491604	11.998	
2	0	0	0	33.71782898	33.71765844	38.57868	337.1766	33.71783	105.3685264	1.988091	123.0572339	25.9367	
3	0	0	0	47.41950933	47.41860991	54.25357	474.1853	47.41756	148.1803454	2.795821	173.0592843	36.47558	
4	0	0	0	62.51875563	62.51865791	71.69885	625.1866	62.51856	201.7980204	3.807529	228.1698496	48.09126	
5	0	0	0	78.73457786	78.7343299	90.46303	787.3433	78.73421	260.943991	4.923441	287.3513675	60.5648	
6	0	0	0	95.40421973	95.40437143	109.6722	954.0392	95.40559	318.4662665	6.008833	348.1934563	73.38848	
7	0	0	0	112.3478289	112.3476486	129.1446	1123.478	112.3475	374.8928877	7.073436	410.0281162	86.42125	
8	0	0	0	129.4844093	129.4846188	148.8079	1294.84	129.4859	430.5172126	8.122998	472.5758337	99.60407	
9	0	0	0	146.5831468	146.5836243	168.4501	1465.831	146.6538	487.039342	9.15235	537.5316546	113.2949	
10	0	0	0	163.5416581	163.5419256	187.9798	1635.425	163.7768	545.2027609	10.16084	605.5834797	127.6383	
11	0	0	0	180.75041	180.75041	207.7381	1807.504	181.0867	601.6353543	11.17191	672.1703157	141.6726	
12	0	0	0	198.0825608	198.0825608	227.6034	1980.826	198.4777	657.026626	12.18654	737.6172504	155.4666	
13	0	0	0	215.492234	215.4925912	247.5356	2154.926	215.9196	711.7515659	13.20326	802.3255096	169.1059	
14	0	0	0	232.9233882	232.9233882	267.4829	2329.238	233.3703	766.2038431	14.22124	866.6584128	182.6653	
15	0	0	0	250.3638621	250.3638621	287.4351	2503.643	250.8219	820.4701841	15.24032	930.7058473	196.1638	
16	0	0	0	267.802596	267.8030443	307.3832	2678.03	268.2664	874.6467247	16.26029	994.5486303	209.6205	
17	0	0	0	285.2339422	285.2344207	327.3215	2852.349	285.7008	928.779038	17.28104	1058.253757	223.0468	
18	0	0	0	302.6832873	302.6832873	347.2725	3026.828	303.1421	982.7204979	18.30289	1121.670042	236.4135	

19	0	0	0	320.0873333	320.0884118	367.1838	3200.895	320.549	1036.868874	19.32487	1185.203668	249.8048
20	0	0	0	337.4832524	337.4832524	387.083	3374.844	337.944	1091.024144	20.34735	1248.665489	263.1797
21	0	0	0	354.8682003	354.8682003	406.9712	3548.688	355.3269	1145.188029	21.3703	1312.057181	276.5418
22	0	0	0	372.2416051	372.2416051	426.8488	3722.429	372.7001	1199.374145	22.39375	1375.412624	289.8936
23	0	0	0	389.6073097	389.6073097	446.7147	3896.066	390.0619	1253.569949	23.41753	1438.704915	303.2349
24	0	0	0	406.9617592	406.9617592	466.573	4069.624	407.415	1307.787877	24.44176	1501.971337	316.5692
25	0	0	0	424.3055815	424.3063016	486.423	4243.092	424.7605	1362.026696	25.46637	1565.209769	329.8976
26	0	0	0	441.6480948	441.6473446	506.2611	4416.458	442.0949	1416.268568	26.49112	1628.399284	343.2157
27	0	0	0	458.9799426	458.9791623	526.0943	4589.768	459.4243	1470.540178	27.51626	1691.570341	356.5307
28	0	0	0	476.3022614	476.3014512	545.9207	4763.015	476.7467	1524.821923	28.54169	1754.726795	369.842
29	0	0	0	493.6195419	493.6195419	565.7411	4936.195	494.0627	1579.125056	29.56734	1817.8513	383.1478
30	0	0	0	510.9374681	510.9348575	585.5521	5109.296	511.3712	1633.426439	30.59311	1880.9485	396.4468
31	0	0	0	528.2377138	528.2377138	605.3647	5282.386	528.6791	1687.763713	31.6193	1944.061207	409.7489
32	0	0	0	545.5416461	545.5407161	625.1685	5455.407	545.9791	1742.103372	32.6455	2007.137884	423.0432
33	0	0	0	562.8383426	562.8383426	644.9684	5628.393	563.2755	1796.446303	33.67189	2070.211538	436.3359
34	0	0	0	580.1344888	580.133499	664.7636	5801.325	580.5674	1850.803466	34.69837	2133.253023	449.6254
35	0	0	0	597.4245879	597.4245879	684.5564	5974.236	597.8573	1905.166267	35.72504	2196.298923	462.9134
36	0	0	0	614.7152588	614.7131595	704.3438	6147.09	615.1417	1959.53559	36.75172	2259.333873	476.1974
37	0	0	0	631.9633393	631.9795307	724.1456	6320.098	632.4386	2013.978097	37.77916	2322.442959	489.4983
38	0	0	0	649.2785319	649.2785319	743.918	6492.785	649.7081	2068.308613	38.8056	2385.391361	502.7672
39	0	0	0	666.5561437	666.5572829	763.7011	6665.607	666.9882	2122.703126	39.83262	2448.41073	516.0498
40	0	0	0	683.8366656	683.8366656	783.4796	6838.378	684.2636	2177.095863	40.85965	2511.411225	529.3295
41	0	0	0	701.1147725	701.1147725	803.2569	7011.136	701.5383	2231.498969	41.88674	2574.422796	542.6087
42	0	0	0	718.3895758	718.3895758	823.034	7183.883	718.8125	2285.90089	42.91389	2637.428884	555.8879
43	0	0	0	735.6627038	735.6627038	842.8117	7356.64	736.0871	2340.314364	43.94109	2700.4283	569.167
44	0	0	0	752.9347342	752.9360227	862.5861	7529.373	753.3589	2394.714213	44.96826	2763.419858	582.4459
45	0	0	0	770.2076822	770.2090005	882.3616	7702.103	770.6311	2449.126206	45.99548	2826.420119	595.7235
46	0	0	0	787.4824528	787.4811047	902.1324	7874.798	787.9006	2503.537607	47.02265	2889.410937	609.0005
47	0	0	0	804.7545584	804.7531805	921.9067	8047.518	805.1709	2557.948417	48.04984	2952.409669	622.2775
48	0	0	0	822.0219685	822.0233763	941.6805	8220.248	822.4431	2612.372851	49.0771	3015.416316	635.5579
49	0	0	0	839.2940338	839.2940338	961.4536	8392.955	839.7126	2666.782771	50.10425	3078.41154	648.8347
50	0	0	0	856.5692005	856.5677331	981.2252	8565.648	856.9817	2721.1921	51.13133	3141.413888	662.1113





From our graphs, when we add 50 threads to the protocol and 50 threads to the web server, we can see that the response time reduces for all resources, we can say the response time reduces with increase in threads. Also, the throughput still remains stagnant, and the utilization is now highest at the Protocol and Web Server. We can see that any changes made to the Protocol affects the Web Server , they depend on each other. We will carry out more modifications to relieve the bottleneck.

2.3 HERE WE ADDED MORE THREADS TO OTHER RESOURCES INCLUDING THE WEB SERVER

I decided to step it up a bit and add more threads to the Database Operation, Database Processor, CGIAPP, WSP and other resources. We add more threads to relieve the bottleneck.

```
#===== Variables =====
$N=[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50]
$ProtThread=50
$WSThread=50
$WReplyThread=50
$CGIAppThread=50
$WSPThread=15
$PRThread=50
$DBProcessThread=50
$DBPThread=10
```

\$0	\$thruProtocol	\$thruWebServer	\$thruWDisk	\$thruCGIAPP	\$thruWebReply	\$thruGetObjects	\$thruProtReply	\$thruDBProcess	\$thruDBOpt
1	0.064113	0.064113	0.056035	0.006411	0.064113	0.020516	1.08736	0.017567	0.083347
2	0.109112	0.109112	0.095364	0.010911	0.109112	0.034916	1.85054	0.029897	0.141846
3	0.134979	0.134979	0.117971	0.013498	0.134979	0.043193	2.28924	0.036984	0.175472
4	0.146208	0.146208	0.127786	0.014621	0.146208	0.046787	2.47968	0.040061	0.19007
5	0.149969	0.149969	0.131073	0.014997	0.149969	0.04799	2.54347	0.041091	0.194959
6	0.151126	0.151126	0.132084	0.015113	0.151126	0.04836	2.5631	0.041409	0.196078
7	0.151481	0.151481	0.132395	0.015148	0.151481	0.048474	2.56912	0.041506	0.196078
8	0.151562	0.151562	0.132465	0.015156	0.151562	0.0485	2.5705	0.041528	0.196078
9	0.151572	0.151572	0.132473	0.015157	0.151572	0.048503	2.57065	0.041531	0.196078
10	0.151547	0.151547	0.132452	0.015155	0.151547	0.048495	2.57023	0.041524	0.196078
11	0.15151	0.15151	0.13242	0.015151	0.15151	0.048483	2.56961	0.041514	0.196078
12	0.151471	0.151471	0.132386	0.015147	0.151471	0.048471	2.56895	0.041503	0.196078
13	0.151433	0.151433	0.132353	0.015143	0.151433	0.048459	2.56831	0.041493	0.196078
14	0.151398	0.151398	0.132322	0.01514	0.151398	0.048447	2.56771	0.041483	0.196078
15	0.151366	0.151366	0.132293	0.015137	0.151366	0.048437	2.56716	0.041474	0.196078
16	0.151336	0.151336	0.132268	0.015134	0.151336	0.048428	2.56666	0.041466	0.196078

17	0.151309	0.151309	0.132244	0.015131	0.151309	0.048419	2.5662	0.041459	0.196078
18	0.151285	0.151285	0.132223	0.015129	0.151285	0.048411	2.56579	0.041452	0.196078
19	0.151262	0.151262	0.132203	0.015126	0.151262	0.048404	2.56541	0.041446	0.196078
20	0.151242	0.151242	0.132185	0.015124	0.151242	0.048397	2.56506	0.04144	0.196078
21	0.151223	0.151223	0.132169	0.015122	0.151223	0.048392	2.56475	0.041435	0.196078
22	0.151206	0.151206	0.132154	0.015121	0.151206	0.048386	2.56446	0.041431	0.196078
23	0.151191	0.151191	0.132141	0.015119	0.151191	0.048381	2.56419	0.041426	0.196078
24	0.151176	0.151176	0.132128	0.015118	0.151176	0.048376	2.56395	0.041422	0.196078
25	0.151163	0.151163	0.132116	0.015116	0.151163	0.048372	2.56372	0.041419	0.196078
26	0.15115	0.15115	0.132105	0.015115	0.15115	0.048368	2.56351	0.041415	0.196078
27	0.151139	0.151139	0.132095	0.015114	0.151139	0.048364	2.56331	0.041412	0.196078
28	0.151128	0.151128	0.132086	0.015113	0.151128	0.048361	2.56313	0.041409	0.196078
29	0.151118	0.151118	0.132077	0.015112	0.151118	0.048358	2.56296	0.041406	0.196078
30	0.151108	0.151108	0.132069	0.015111	0.151108	0.048355	2.5628	0.041404	0.196078
31	0.1511	0.1511	0.132061	0.01511	0.1511	0.048352	2.56265	0.041401	0.196078
32	0.151091	0.151091	0.132054	0.015109	0.151091	0.048349	2.56251	0.041399	0.196078
33	0.151084	0.151084	0.132047	0.015108	0.151084	0.048347	2.56238	0.041397	0.196078
34	0.151076	0.151076	0.132041	0.015108	0.151076	0.048344	2.56225	0.041395	0.196078
35	0.151069	0.151069	0.132035	0.015107	0.151069	0.048342	2.56214	0.041393	0.196078
36	0.151063	0.151063	0.132029	0.015106	0.151063	0.04834	2.56202	0.041391	0.196078
37	0.151057	0.151057	0.132023	0.015106	0.151057	0.048338	2.56192	0.04139	0.196078
38	0.151051	0.151051	0.132018	0.015105	0.151051	0.048336	2.56182	0.041388	0.196078
39	0.151045	0.151045	0.132013	0.015105	0.151045	0.048334	2.56172	0.041386	0.196078
40	0.15104	0.15104	0.132009	0.015104	0.15104	0.048333	2.56163	0.041385	0.196078
41	0.151035	0.151035	0.132004	0.015104	0.151035	0.048331	2.56155	0.041384	0.196078
42	0.15103	0.15103	0.13200	0.015103	0.15103	0.04833	2.56147	0.041382	0.196078
43	0.151025	0.151025	0.131996	0.015103	0.151025	0.048328	2.56139	0.041381	0.196078
44	0.151021	0.151021	0.131992	0.015102	0.151021	0.048327	2.56131	0.04138	0.196078
45	0.151017	0.151017	0.131989	0.015102	0.151017	0.048325	2.56124	0.041379	0.196078
46	0.151013	0.151013	0.131985	0.015101	0.151013	0.048324	2.56117	0.041378	0.196078
47	0.151009	0.151009	0.131982	0.015101	0.151009	0.048323	2.56111	0.041376	0.196078
48	0.151005	0.151005	0.131978	0.015101	0.151005	0.048322	2.56105	0.041375	0.196078

49	0.151001	0.151001	0.131975	0.0151	0.151001	0.048321	2.56099	0.041374	0.196078
50	0.150998	0.150998	0.131972	0.0151	0.150998	0.048319	2.56093	0.041374	0.196078

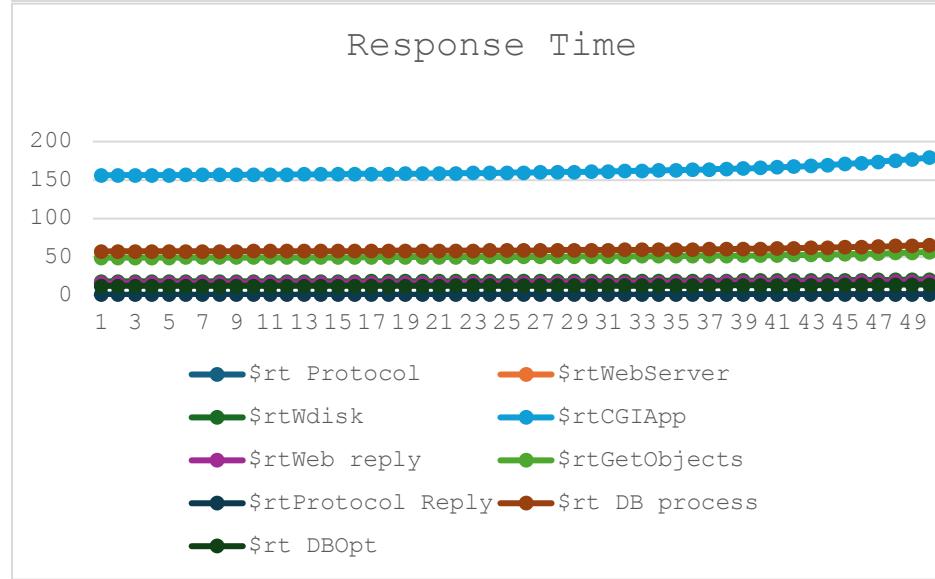
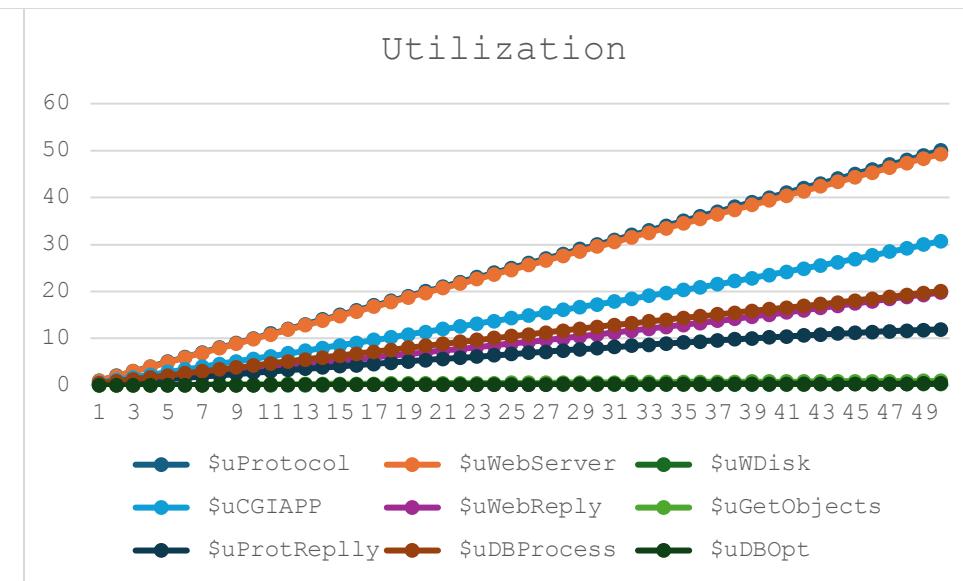
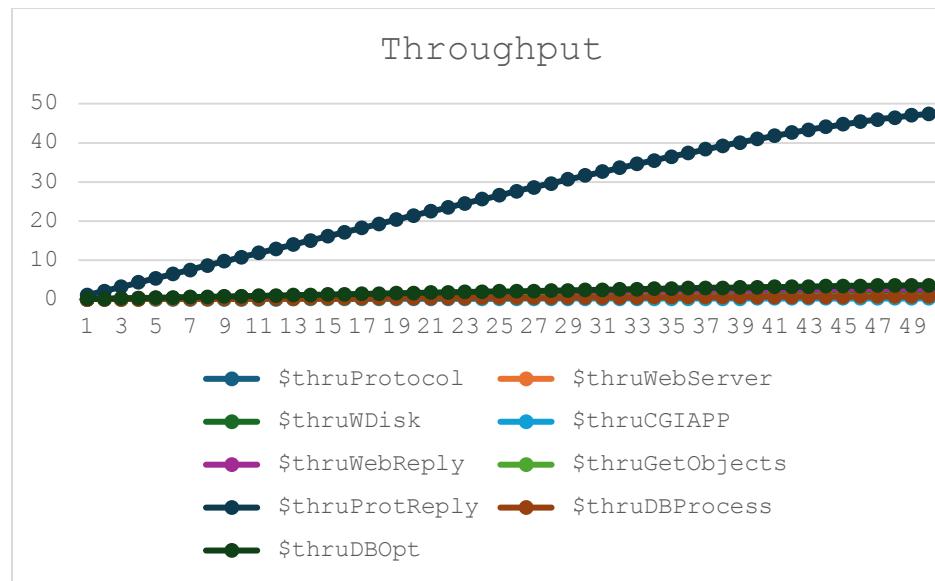
\$N	\$uProtocol	\$uWebServer	\$uWDisk	\$uCGIAPP	\$uWebReply	\$uGetObjects	\$uProtReplly	\$uDBProcess	\$uDBOpt
1	1	0.983972	0.005604	0.562684	0.344057	0.020927	0.27184	0.425071	0.008335
2	2	1.96796	0.011201	1.1258	0.688634	0.041835	0.543395	0.849834	0.016661
3	3	2.95197	0.016792	1.68935	1.03376	0.062725	0.814641	1.27426	0.024977
4	4	3.93599	0.022377	2.25336	1.37946	0.083594	1.08556	1.69832	0.033284
5	5	4.92004	0.027954	2.81786	1.72577	0.10444	1.35614	2.12199	0.04158
6	6	5.90411	0.033524	3.38289	2.07275	0.125264	1.62636	2.54524	0.049865
7	7	6.8882	0.039087	3.94847	2.42044	0.146062	1.89619	2.96806	0.058138
8	8	7.87231	0.04464	4.51463	2.76888	0.166834	2.16562	3.3904	0.066399
9	9	8.85645	0.050185	5.08142	3.11813	0.187578	2.43463	3.81223	0.074647
10	10	9.84061	0.055721	5.64888	3.46825	0.208291	2.70317	4.23351	0.08288
11	11	10.8249	0.061207	6.22019	3.81675	0.228822	2.96929	4.65842	0.09104
12	12	11.8093	0.066675	6.79276	4.16583	0.249292	3.23458	5.0834	0.099173
13	13	12.7938	0.07209	7.36927	4.51338	0.269572	3.49735	5.51199	0.107228
14	14	13.7785	0.077426	7.95169	4.85793	0.289559	3.75636	5.94676	0.115165
15	15	14.7635	0.082643	8.54257	5.19751	0.309112	4.00989	6.39123	0.122925
16	16	15.7488	0.08769	9.14477	5.52994	0.328046	4.25592	6.84948	0.130431
17	17	16.7346	0.092501	9.76105	5.85328	0.346134	4.49224	7.32575	0.137588
18	18	17.7206	0.09701	10.3928	6.16691	0.36315	4.71717	7.82275	0.144294
19	19	18.7068	0.101149	11.0397	6.47177	0.37888	4.92975	8.3414	0.15045
20	20	19.6927	0.104876	11.698	6.77172	0.393193	5.13085	8.87833	0.155993
21	21	20.6782	0.108192	12.3682	7.06591	0.406103	5.31991	9.43412	0.160926
22	22	21.6621	0.111029	13.0309	7.37432	0.417425	5.5019	9.98769	0.165145
23	23	22.6452	0.113526	13.6977	7.68328	0.427562	5.67587	10.5506	0.16886
24	24	23.6272	0.115693	14.3652	7.99567	0.436473	5.84216	11.1194	0.172083
25	25	24.6082	0.117574	15.0303	8.31371	0.44437	6.00356	11.6899	0.174881
26	26	25.5884	0.11922	15.6957	8.63405	0.451358	6.15948	12.2643	0.17733
27	27	26.5678	0.120666	16.3617	8.95522	0.457543	6.30848	12.8429	0.179481

28	28	27.5467	0.121936	17.0268	9.27949	0.463055	6.45521	13.4233	0.181369
29	29	28.5255	0.123045	17.6978	9.59923	0.467899	6.59632	14.0136	0.183019
30	30	29.5038	0.124044	18.3684	9.92141	0.472283	6.73556	14.6052	0.184505
31	31	30.4821	0.124935	19.0415	10.2412	0.476209	6.87141	15.2021	0.18583
32	32	31.4605	0.125733	19.7191	10.5573	0.479736	7.00399	15.806	0.187016
33	33	32.4391	0.12645	20.402	10.8688	0.482905	7.13332	16.4176	0.188082
34	34	33.4181	0.127097	21.0916	11.1742	0.485755	7.25935	17.0385	0.189045
35	35.0001	34.3974	0.127683	21.7878	11.4733	0.488328	7.382	17.6687	0.189914
36	36.0001	35.3772	0.128213	22.4916	11.7654	0.490656	7.50146	18.3087	0.190702
37	37.0001	36.3576	0.128694	23.2034	12.05	0.492761	7.61762	18.9592	0.191417
38	38.0002	37.3385	0.129132	23.9242	12.3258	0.494664	7.73016	19.6213	0.192068
39	39.0003	38.3212	0.129513	24.6659	12.5814	0.496297	7.83482	20.3091	0.192628
40	40.0004	39.3035	0.129879	25.4041	12.8404	0.497863	7.94074	20.9933	0.19317
41	41.0006	40.2864	0.130215	26.1514	13.0906	0.499282	8.04325	21.6889	0.193664
42	42.0008	41.2702	0.130523	26.9073	13.3325	0.500569	8.1426	22.3952	0.194115
43	43.001	42.2545	0.130805	27.6724	13.5652	0.501751	8.23896	23.113	0.194528
44	44.0012	43.2396	0.131065	28.4468	13.7889	0.502808	8.33152	23.8419	0.194906
45	45.0015	44.2253	0.131301	29.221	14.0145	0.503755	8.43104	24.5714	0.195248
46	46.0017	45.2117	0.131521	30.0132	14.2208	0.504622	8.51726	25.3225	0.195567
47	47.0058	46.1982	0.131711	30.8207	14.4076	0.505392	8.59657	26.0931	0.195863
48	48.0028	47.1879	0.131895	31.6345	14.5938	0.506023	8.6748	26.8707	0.196089
49	49.0042	48.176	0.132086	32.4347	14.7914	0.50671	8.75783	27.633	0.196331
50	50.0044	49.1648	0.132252	33.2545	14.9705	0.507308	8.83395	28.4181	0.19656

\$N				\$rt Protocol	\$rtWebServer	\$rtWdisk	\$rtCGIApp	\$rtWeb reply		\$rtGetObjects	\$rtProtocol Reply	\$rt DB process	\$rt DBOpt
1	\$wUser	\$wProtocol	\$wSendStatic	15.59741208	15.59741208	17.84599	155.9741	15.59741	48.74196976	0.919659	56.92491604	11.998	
2	0	0	0	15.6056149	15.6056149	17.85539	156.0561	15.60561	48.76752278	0.920141	56.95474376	12.0043	
3	0	0	0	15.61426519	15.61426519	17.86522	156.1427	15.61427	48.79453111	0.920652	56.98633468	12.01095	
4	0	0	0	15.62323018	15.62323018	17.87558	156.2323	15.62323	48.82264199	0.921181	57.01912564	12.01789	
5	0	0	0	15.6326209	15.6326209	17.88627	156.3262	15.63262	48.85197851	0.921734	57.05326721	12.02507	

6	0	0	0	15.64231246	15.64231246	17.89741	156.4231	15.64231	48.88222642	0.922306	57.08903034	12.03256
7	0	0	0	15.65242669	15.65242669	17.90895	156.5243	15.65243	48.91376503	0.922902	57.12560288	12.04032
8	0	0	0	15.66293367	15.66293367	17.92099	156.6293	15.66293	48.94672761	0.923522	57.16408952	12.04841
9	0	0	0	15.673872	15.673872	17.9335	156.7387	15.67387	48.98092465	0.924167	57.20387461	12.05683
10	0	0	0	15.68526573	15.68526573	17.94652	156.8527	15.68527	49.01648424	0.924838	57.24557206	12.06559
11	0	0	0	15.70746419	15.70746419	17.97192	157.0746	15.70746	49.08588692	0.926144	57.32660006	12.08267
12	0	0	0	15.73009258	15.73009258	17.99783	157.3009	15.73009	49.15655544	0.927479	57.40912614	12.10007
13	0	0	0	15.76076612	15.76076612	18.03291	157.6077	15.76077	49.25231202	0.929288	57.52110582	12.1237
14	0	0	0	15.80342347	15.80342347	18.08171	158.0342	15.80342	49.38567745	0.931805	57.67677933	12.15647
15	0	0	0	15.863336356	15.863336356	18.15031	158.6336	15.86336	49.57301113	0.935343	57.89561035	12.20256
16	0	0	0	15.94705577	15.94705577	18.24614	159.4706	15.94706	49.8347666	0.94028	58.20128916	12.26702
17	0	0	0	16.06243563	16.06243563	18.37812	160.6244	16.06244	50.19531884	0.94708	58.62230682	12.35573
18	0	0	0	16.21694671	16.21694671	18.55483	162.1695	16.21695	50.67781579	0.956185	59.18580067	12.47453
19	0	0	0	16.41738169	16.41738169	18.78417	164.1738	16.41738	51.30434548	0.96801	59.91762903	12.62878
20	0	0	0	16.66736114	16.66736114	19.07014	166.6736	16.66736	52.08563921	0.982748	60.82984069	12.82109
21	0	0	0	16.96435063	16.96435063	19.40994	169.6435	16.96435	53.01356895	1.000252	61.91366287	13.04948
22	0	0	0	17.31806195	17.31806195	19.81464	173.1806	17.31806	54.1189436	1.021114	63.2045875	13.32163
23	0	0	0	17.70701814	17.70701814	20.25968	177.0702	17.70702	55.33448493	1.044045	64.62416832	13.62075
24	0	0	0	18.13072251	18.13072251	20.74456	181.3072	18.13072	56.6586951	1.069028	66.17075363	13.94676
25	0	0	0	18.58404448	18.58404448	21.2632	185.8404	18.58404	58.07511203	1.095756	67.8249357	14.29544
26	0	0	0	19.06046566	19.06046566	21.80842	190.6047	19.06047	59.56417352	1.123853	69.56410064	14.66193
27	0	0	0	19.55643117	19.55643117	22.37581	195.5643	19.55643	61.1137644	1.153092	71.37381374	15.04338
28	0	0	0	20.06952657	20.06952657	22.96287	200.6967	20.06953	62.71755151	1.183347	73.24684973	15.43814
29	0	0	0	20.5989317	20.5989317	23.56861	205.9893	20.59893	64.37177586	1.214558	75.17861402	15.84535
30	0	0	0	21.13762709	21.13762709	24.18497	211.3763	21.13763	66.05499739	1.246318	77.14462045	16.25972
31	0	0	0	21.68651099	21.68651099	24.8129	216.8651	21.68651	67.77037648	1.278683	79.14785841	16.68191
32	0	0	0	22.24400281	22.24400281	25.45076	222.44	22.244	69.51262958	1.311556	81.18262793	17.11084
33	0	0	0	22.8089577	22.8089577	26.09727	228.0912	22.80912	71.27845468	1.344875	83.24483314	17.54554
34	0	0	0	23.3803921	23.38055288	26.75122	233.8055	23.38055	73.06438477	1.378567	85.33087045	17.98514
35	0	0	0	23.95767022	23.95783421	27.41164	239.58	23.95783	74.86887252	1.412606	87.43813752	18.42939
36	0	0	0	24.54037915	24.54037915	28.07828	245.4055	24.54055	76.68973039	1.446963	89.56471548	18.87762
37	0	0	0	25.12750511	25.12767576	28.75037	251.2785	25.12768	78.5252533	1.481588	91.70855517	19.32953

38	0	0	0	25.71912014	25.71929421	29.42725	257.1964	25.71947	80.37412038	1.51647	93.86795249	19.78466
39	0	0	0	26.31809808	26.31827568	30.11281	263.1899	26.31863	82.24794169	1.5518	96.05674737	20.24628
40	0	0	0	26.91663246	26.91699472	30.7979	269.1772	26.91736	84.11967706	1.587094	98.24292528	20.70715
41	0	0	0	27.51825601	27.51862541	31.48639	275.1973	27.51918	86.00165711	1.62258	100.4412064	21.17069
42	0	0	0	28.1224263	28.12299121	32.17824	281.2469	28.12374	87.89258689	1.658224	102.6503339	21.63666
43	0	0	0	28.72968043	28.73044826	32.87336	287.3256	28.73141	89.79266248	1.694041	104.8698638	22.10479
44	0	0	0	29.33920117	29.34017938	33.57113	293.4272	29.34135	91.70067233	1.729995	107.0986963	22.57498
45	0	0	0	29.95167796	29.95287414	34.2724	299.5606	29.95447	93.61854396	1.766133	109.3392749	23.04761
46	0	0	3.35603e-05	30.56559643	30.56701819	34.9754	305.7067	30.56885	95.54073982	1.802345	111.5849428	23.52135
47	0	0	4.03312e-05	31.18323801	31.18758336	35.68419	311.9069	31.188	97.4705359	1.838825	113.8408698	23.99636
48	0	0	0	31.80240108	31.80492976	36.39259	318.1083	31.80746	99.42004971	1.875352	116.1187314	24.47868
49	0	0	6.6762e-05	32.41598306	32.4194146	37.09704	324.2821	32.42349	101.355055	1.911628	118.3820794	24.95785
50	0	0	9.99831e-05	33.03513617	33.03884708	37.80661	330.4911	33.04365	103.2983152	1.948178	120.6528768	25.43753



From the graphs we can see there is improvement in the utilization. Although the Web Server and Protocol are still the bottleneck, we can see there is improvement in CGI APP and DB process and other resources are now being utilized more. The throughput is highest at the Protocol Reply. The other devices throughput seems to low be showing no customers are entering them. Although we can see all those devices saturated at 50, we will want to make improvements. The response time seems to be improving for most devices as it generally reduces with an increase in threads.

2.4 INCREASE THREADS IN WSP AND Database Processor

The only modification here was increasing the no of threads to the WSP and DBP

```
#===== Variables =====
$N=[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50]
$ProtThread=50
$WSThread=50
$WReplyThread=50
$CGIAppThread=50
$WSPTThread=30
$PRThread=50
$DBProcessThread=50
$DBPTThread=20
```

\$0	\$thruProtocol	\$thruWebServer	\$thruWDisk	\$thruCGIAPP	\$thruWebReply	\$thruGetObjects	\$thruProtReply	\$thruDBProcess	\$thruDBOpt
1	0.0641141	0.0641137	0.0560353	0.00641137	0.0641137	0.0205164	1.08737	0.0175671	0.0833478
2	0.12816	0.12816	0.112012	0.012816	0.12816	0.0410112	2.17359	0.0351158	0.166608
3	0.192133	0.192133	0.167925	0.0192133	0.192133	0.0614827	3.25858	0.0526446	0.249773
4	0.25603	0.25603	0.22377	0.025603	0.25603	0.0819297	4.34227	0.0701523	0.332839
5	0.319846	0.319846	0.279546	0.0319846	0.319846	0.102351	5.4246	0.0876379	0.4158
6	0.383577	0.383577	0.335247	0.0383577	0.383577	0.122745	6.50547	0.1051	0.49865
7	0.447218	0.447218	0.390868	0.0447218	0.447218	0.14311	7.58482	0.122538	0.581383
8	0.510763	0.510763	0.446407	0.0510763	0.510763	0.163444	8.66255	0.139949	0.663992
9	0.574208	0.574208	0.501857	0.0574208	0.574208	0.183746	9.73856	0.157333	0.74647
10	0.637545	0.637545	0.557214	0.0637545	0.637545	0.204014	10.8128	0.174687	0.828808
11	0.700768	0.700769	0.612472	0.0700769	0.700769	0.224246	11.885	0.192011	0.910999

12	0.763871	0.763871	0.667624	0.0763871	0.763871	0.244439	12.9553	0.209301	0.993033
13	0.826845	0.826845	0.722663	0.0826845	0.826845	0.264591	14.0233	0.226556	1.0749
14	0.889683	0.889683	0.777583	0.0889683	0.889683	0.284698	15.089	0.243773	1.15659
15	0.952374	0.952374	0.832375	0.0952374	0.952374	0.30476	16.1523	0.26095	1.23809
16	1.01491	1.01491	0.88703	0.101491	1.01491	0.324771	17.2128	0.278085	1.31938
17	1.07728	1.07728	0.94154	0.107728	1.07728	0.344728	18.2706	0.295174	1.40046
18	1.13947	1.13947	0.995893	0.113947	1.13947	0.364629	19.3253	0.312214	1.48131
19	1.20146	1.20146	1.05008	0.120146	1.20146	0.384468	20.3768	0.329201	1.5619
20	1.26325	1.26325	1.10408	0.126325	1.26325	0.404241	21.4248	0.346132	1.64223
21	1.32482	1.32482	1.1579	0.132482	1.32482	0.423944	22.469	0.363002	1.72227
22	1.38615	1.38615	1.2115	0.138615	1.38615	0.44357	23.5092	0.379806	1.802
23	1.44723	1.44723	1.26488	0.144723	1.44723	0.463113	24.545	0.396541	1.8814
24	1.50802	1.50803	1.31801	0.150803	1.50803	0.482568	25.5761	0.413199	1.96043
25	1.56852	1.56852	1.37089	0.156852	1.56852	0.501927	26.6021	0.429775	2.03908
26	1.62869	1.62869	1.42348	0.16287	1.6287	0.521183	27.6227	0.446263	2.1173
27	1.68851	1.68852	1.47576	0.168852	1.68852	0.540325	28.6372	0.462654	2.19507
28	1.74796	1.74796	1.52771	0.174796	1.74796	0.559346	29.6454	0.47894	2.27235
29	1.80698	1.80698	1.5793	0.180698	1.80698	0.578235	30.6465	0.495114	2.34908
30	1.86555	1.86556	1.6305	0.186556	1.86556	0.59698	31.6399	0.511164	2.42523
31	1.92365	1.92365	1.68127	0.192365	1.92365	0.615567	32.6251	0.527079	2.50074
32	1.98118	1.98119	1.73156	0.198119	1.98119	0.633983	33.6011	0.542848	2.57555
33	2.03817	2.03817	1.78136	0.203817	2.03817	0.652215	34.5674	0.558459	2.64962
34	2.09448	2.09448	1.83058	0.209449	2.09449	0.670236	35.5225	0.573889	2.72283
35	2.15008	2.15008	1.87917	0.215008	2.15008	0.688026	36.4654	0.589123	2.79511
36	2.20487	2.20487	1.92706	0.220488	2.20488	0.70556	37.3947	0.604136	2.86634
37	2.25876	2.25876	1.97416	0.225876	2.25876	0.722805	38.3086	0.618902	2.93639
38	2.31162	2.31162	2.02036	0.231162	2.31162	0.739719	39.2051	0.633384	3.00511
39	2.36329	2.36329	2.06552	0.236329	2.36329	0.756255	40.0815	0.647543	3.07228
40	2.41359	2.41359	2.10948	0.241359	2.41359	0.77235	40.9345	0.661324	3.13767
41	2.46229	2.46229	2.15204	0.246229	2.46229	0.787934	41.7605	0.674668	3.20098
42	2.50914	2.50914	2.19299	0.250914	2.50914	0.802925	42.555	0.687504	3.26188
43	2.55388	2.55388	2.23209	0.255388	2.55388	0.817242	43.3138	0.699763	3.32004
44	2.59621	2.59621	2.26909	0.259622	2.59622	0.83079	44.0318	0.711363	3.37508
45	2.63687	2.63686	2.30462	0.263686	2.63686	0.843795	44.7211	0.7225	3.42792
46	2.6728	2.67281	2.33604	0.267282	2.67282	0.855307	45.3311	0.732354	3.47467
47	2.7075	2.70711	2.36656	0.270794	2.70763	0.865969	45.9324	0.741273	3.51801

48	2.738	2.73984	2.39384	0.273903	2.73915	0.875753	46.4054	0.750692	3.56131
49	2.76838	2.76776	2.41963	0.276853	2.76838	0.885963	46.9685	0.758322	3.59802
50	2.79464	2.79358	2.4423	0.279461	2.79429	0.893642	47.4026	0.764958	3.63093

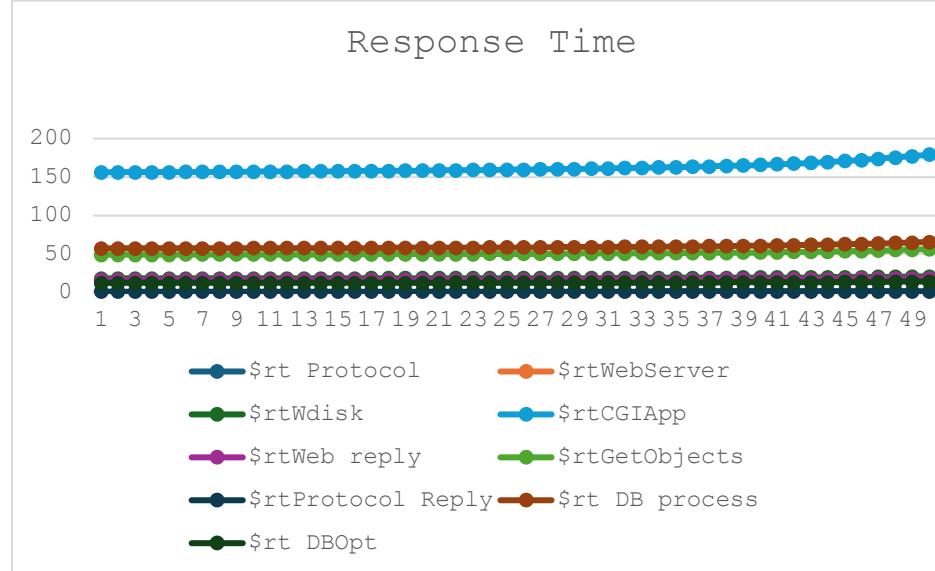
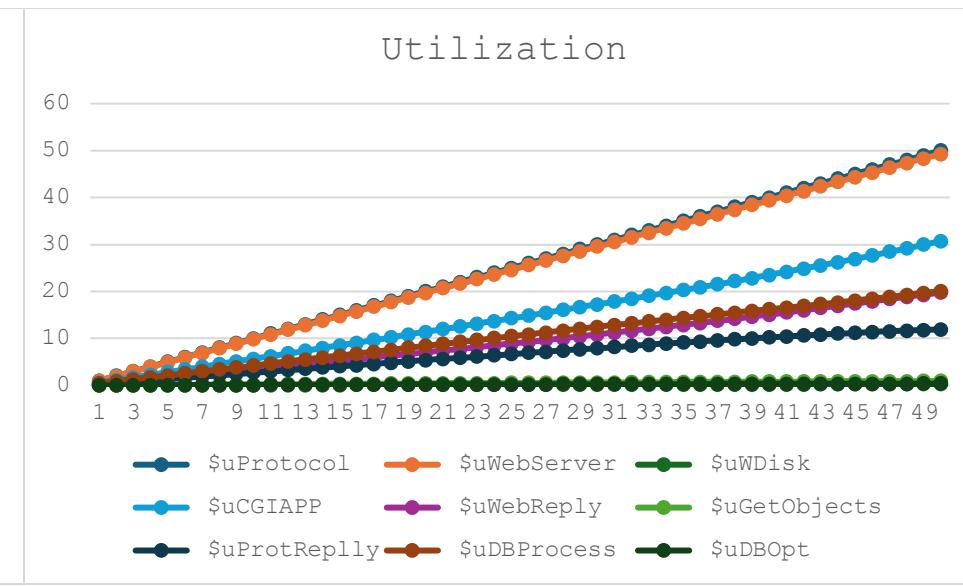
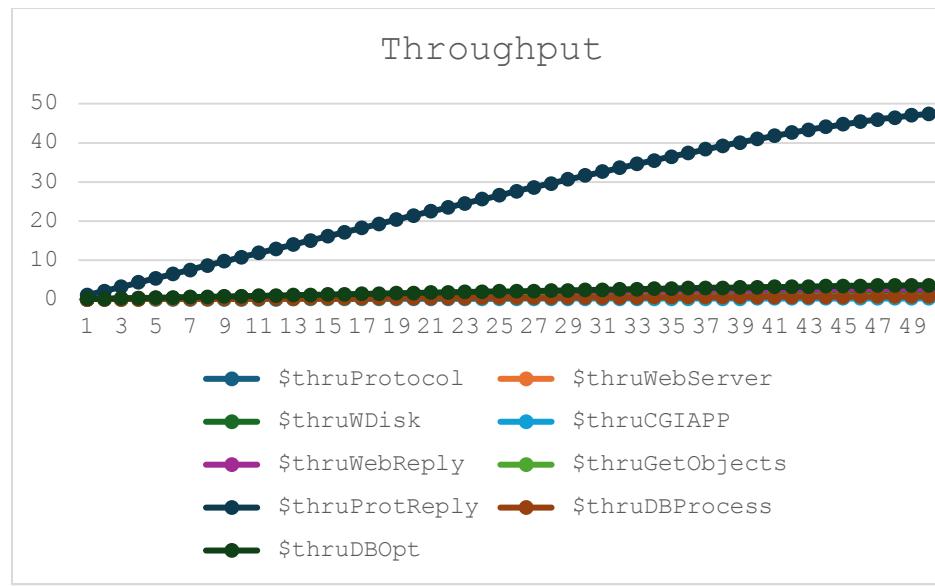
\$N	\$uProtocol	\$uWebServer	\$uWDisk	\$uCGIAPP	\$uWebReply	\$uGetObjects	\$uProtReply	\$uDBProcess	\$uDBOpt
1	1.00001	0.983972	0.005604	0.562681	0.34406	0.0209267	0.271842	0.425067	0.008335
2	2	1.96796	0.011201	1.12579	0.688639	0.0418357	0.543398	0.849826	0.016661
3	3	2.95197	0.016793	1.68934	1.03376	0.0627252	0.814646	1.27424	0.024977
4	4	3.93599	0.022377	2.25335	1.37946	0.0835941	1.08557	1.6983	0.033284
5	5	4.92004	0.027955	2.81785	1.72579	0.104441	1.35615	2.12197	0.04158
6	6	5.90411	0.033525	3.38287	2.07277	0.125265	1.62637	2.54522	0.049865
7	7	6.8882	0.039087	3.94845	2.42046	0.146063	1.8962	2.96803	0.058138
8	8	7.87231	0.044641	4.51461	2.7689	0.166835	2.16564	3.39037	0.066399
9	9	8.85645	0.050186	5.0814	3.11815	0.187579	2.43464	3.8122	0.074647
10	10	9.84061	0.055721	5.64886	3.46827	0.208293	2.70319	4.23348	0.082881
11	11	10.8248	0.061247	6.21702	3.81933	0.228974	2.97126	4.65417	0.0911
12	12	11.809	0.066762	6.78595	4.17138	0.24962	3.23881	5.07424	0.099303
13	13	12.7933	0.072266	7.35569	4.5245	0.270229	3.50582	5.49363	0.10749
14	14	13.7776	0.077758	7.92629	4.87879	0.290799	3.77225	5.91228	0.115659
15	15	14.7619	0.083238	8.49783	5.23432	0.311325	4.03806	6.33015	0.123809
16	16	15.7463	0.088703	9.07036	5.59119	0.331806	4.30321	6.74717	0.131938
17	17	16.7307	0.094154	9.64396	5.94952	0.352236	4.56765	7.16327	0.140046

18	18	17.7151	0.099589	10.2187	6.30942	0.372614	4.83133	7.57838	0.148131
19	19	18.6996	0.105008	10.7947	6.67102	0.392934	5.0942	7.99241	0.15619
20	20	19.6842	0.110408	11.372	7.03446	0.413191	5.3562	8.40527	0.164223
21	21	20.6688	0.11579	11.9508	7.39989	0.433382	5.61725	8.81686	0.172227
22	22	21.6535	0.12115	12.5311	7.76749	0.453499	5.8773	9.22707	0.1802
23	23	22.6382	0.126488	13.1132	8.13744	0.473538	6.13625	9.63579	0.18814
24	24	23.623	0.131801	13.697	8.50996	0.493491	6.39403	10.0429	0.196043
25	25	24.6079	0.137089	14.2828	8.88526	0.513352	6.65054	10.4482	0.203908
26	26	25.5928	0.142348	14.8707	9.26359	0.533111	6.90567	10.8515	0.21173
27	27	26.5779	0.147576	15.461	9.64524	0.552761	7.15931	11.2528	0.219507
28	28	27.563	0.152771	16.0538	10.0305	0.572291	7.41134	11.6518	0.227235
29	29	28.5483	0.15793	16.6494	10.4197	0.591691	7.66161	12.0482	0.234908
30	29.9999	29.5336	0.16305	17.248	10.8132	0.610948	7.90998	12.4419	0.242523
31	31	30.5191	0.168127	17.8498	11.2113	0.63005	8.15626	12.8327	0.250074
32	31.9999	31.5046	0.173156	18.4553	11.6145	0.648981	8.40027	13.2202	0.257555
33	33	32.4904	0.178136	19.0646	12.0233	0.667729	8.64185	13.6041	0.264962
34	34	33.4764	0.183058	19.6783	12.438	0.686265	8.88063	13.9846	0.272283
35	35	34.4625	0.187917	20.2969	12.859	0.70457	9.11636	14.3612	0.279511
36	36	35.4488	0.192706	20.9209	13.2868	0.722617	9.34871	14.7339	0.286634
37	37	36.4353	0.197416	21.551	13.7216	0.740371	9.57723	15.1028	0.293639
38	38	37.422	0.202036	22.1879	14.1635	0.757791	9.80143	15.4681	0.300511
39	39	38.4091	0.206552	22.8328	14.6126	0.774826	10.0207	15.8306	0.307228
40	40	39.3965	0.210948	23.4866	15.0684	0.791416	10.2343	16.1912	0.313767
41	41	40.3842	0.215204	24.1507	15.5303	0.807485	10.4413	16.5514	0.320098
42	42	41.3723	0.219299	24.8264	15.9971	0.822952	10.641	16.9131	0.326188
43	43	42.3608	0.223209	25.5148	16.4678	0.837736	10.8324	17.2784	0.332004
44	44	43.3498	0.226909	26.2171	16.9401	0.85174	11.0147	17.6503	0.337508
45	45	44.339	0.230462	26.9272	17.4235	0.865203	11.1914	18.0165	0.342792
46	45.9998	45.3289	0.233604	27.6652	17.8848	0.877145	11.35	18.4212	0.347467
47	47.0061	46.3059	0.236656	28.4427	18.3644	0.88824	11.5092	18.8054	0.351801
48	47.9709	47.322	0.239384	29.1494	18.8568	0.89845	11.6387	19.2449	0.356131
49	49.01	48.2875	0.241963	29.9361	19.2765	0.909133	11.7954	19.6537	0.359802

50	50.0174	49.2729	0.24423	30.74	19.7852	0.91721	11.9233	20.0424	0.363093
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\$N	\$wuser	\$protocol	\$sendstatic	\$rt Protocol	\$rtWebServer	\$rtWdisk	\$rtCGIApp	\$rtWeb reply	\$rtGetObjects	\$rtProtocol Reply	\$rt DB process	\$rt DBOpt
1	0	0	0	15.59719313	15.59729044	17.84589	155.9729	15.59729	48.74149461	0.91965	56.92459199	11.99792
2	0	0	0	15.60549313	15.60549313	17.85523	156.0549	15.60549	48.76716604	0.920137	56.95441938	12.00423
3	0	0	0	15.61418392	15.61418392	17.86512	156.1418	15.61418	48.79421366	0.920646	56.98590169	12.01091
4	0	0	0	15.62316916	15.62316916	17.8755	156.2317	15.62317	48.82234403	0.921177	57.01880052	12.01782
5	0	0	0	15.63252315	15.63252315	17.88614	156.3252	15.63252	48.85150121	0.921727	57.05294171	12.02501
6	0	0	0	15.64223089	15.64223089	17.89725	156.4223	15.64223	48.88182818	0.922301	57.08848716	12.03249
7	0	0	0	15.65232169	15.65232169	17.90886	156.5232	15.65232	48.91342324	0.922896	57.12513669	12.04026
8	0	0	0	15.66284167	15.66284167	17.92087	156.6284	15.66284	48.94642813	0.923516	57.16368106	12.04834
9	0	0	0	15.67376282	15.67376282	17.9334	156.7376	15.67376	48.98065808	0.924161	57.20351102	12.05675
10	0	0	0	15.68516732	15.68516732	17.94643	156.8517	15.68517	49.01624398	0.92483	57.24524435	12.06552
11	0	0	0	15.69706379	15.69704139	17.96	156.9704	15.69704	49.05327185	0.925536	57.28838452	12.07466
12	0	0	0	15.7094588	15.7094588	17.97419	157.0946	15.70946	49.0920025	0.926262	57.33369645	12.08419
13	0	0	0	15.72241472	15.72241472	17.98902	157.2241	15.72241	49.13243459	0.927029	57.38095658	12.09415
14	0	0	0	15.7359419	15.7359419	18.00451	157.3594	15.73594	49.17491517	0.927828	57.43047835	12.10455
15	0	0	0	15.75011498	15.75011498	18.02072	157.5011	15.75011	49.21905762	0.92866	57.4822763	12.11544
16	0	0	0	15.76494467	15.76494467	18.03772	157.6494	15.76494	49.26548245	0.929541	57.53636478	12.12691
17	0	0	0	15.78048418	15.78048418	18.05553	157.8048	15.78048	49.31424195	0.930457	57.59314845	12.13887
18	0	0	0	15.79681782	15.79681782	18.07423	157.9682	15.79682	49.36524522	0.931422	57.65276381	12.15141
19	0	0	0	15.81409285	15.81409285	18.09386	158.1409	15.81409	49.41893734	0.932433	57.71549904	12.16467
20	0	0	0	15.8321789	15.8321789	18.11463	158.3218	15.83218	49.47543668	0.933498	57.78142443	12.17856
21	0	0	0	15.85120998	15.85120998	18.13628	158.5121	15.85121	49.53484422	0.934621	57.85092093	12.19321
22	0	0	0	15.8712982	15.8712982	18.15931	158.713	15.8713	49.59758325	0.935804	57.92430873	12.20866
23	0	0	0	15.89242899	15.89242899	18.18354	158.9243	15.89243	49.66390492	0.937054	58.00156856	12.22494
24	0	0	0	15.91490829	15.91480276	18.20927	159.148	15.9148	49.73392351	0.938376	58.08339323	12.24221
25	0	0	0	15.93859179	15.93859179	18.23633	159.3859	15.93859	49.80803981	0.939775	58.16997266	12.26043
26	0	0	0	15.96375001	15.96375001	18.2651	159.6365	15.96365	49.88650819	0.941255	58.26160807	12.27979

27	0	0	0	15.99042943	15.99033473	18.29566	159.9033	15.99033	49.96992551	0.94283	58.35894643	12.30029
28	0	0	0	16.0186732	16.0186732	18.32809	160.1867	16.01867	50.05846113	0.944497	58.46243788	12.32205
29	0	0	0	16.04887713	16.04887713	18.36257	160.4888	16.04888	50.15261961	0.946274	58.57236919	12.34526
30	0	0	0	16.08104848	16.08096228	18.39926	160.8096	16.08096	50.2529398	0.94817	58.68957908	12.36996
31	0	0	0	16.11519767	16.11519767	18.43844	161.152	16.1152	50.36007453	0.950189	58.81471278	12.39633
32	0	0	0	16.15199023	16.1519087	18.48045	161.5191	16.15191	50.47453954	0.95235	58.94836124	12.42453
33	0	0	0	16.19099486	16.19099486	18.52517	161.9099	16.19099	50.5968124	0.954657	59.09117769	12.45462
34	0	0	0	16.23314617	16.23314617	18.57335	162.3307	16.23307	50.72840015	0.95714	59.24490624	12.48701
35	0	0	0	16.27846406	16.27846406	18.62524	162.7846	16.27846	50.8701706	0.959814	59.41034385	12.52187
36	0	0	0	16.32749323	16.32749323	18.68131	163.2742	16.32742	51.02330064	0.962703	59.58923156	12.55957
37	0	0	0	16.38066904	16.38066904	18.74215	163.8067	16.38067	51.18946327	0.965841	59.78329364	12.60051
38	0	0	0	16.43868802	16.43868802	18.80853	164.3869	16.43869	51.37085839	0.969262	59.99520038	12.64513
39	0	0	0	16.50241824	16.50241824	18.88144	165.0242	16.50242	51.56990698	0.973017	60.22766056	12.69416
40	0	0	0	16.57282306	16.57282306	18.96202	165.7282	16.57282	51.78999158	0.977171	60.48472458	12.74831
41	0	0	0	16.65116619	16.65116619	19.05169	166.5117	16.65117	52.0348151	0.981789	60.77063089	12.80858
42	0	0	0	16.73880294	16.73880294	19.15193	167.388	16.7388	52.30874615	0.986958	61.09055365	12.87601
43	0	0	0	16.83712625	16.83712625	19.26446	168.3713	16.83713	52.61599379	0.992755	61.44937643	12.95165
44	0	0	0	16.94778157	16.94778157	19.39103	169.4772	16.94772	52.96163892	0.999278	61.85309048	13.03673
45	0	0	0	17.06568773	17.06575245	19.526	170.6575	17.06575	53.33048904	1.006236	62.28373702	13.12749
46	0	0	0	17.21041604	17.21035165	19.69144	172.1029	17.21029	53.78185844	1.014756	62.81115417	13.23867
47	0	0.00489028	0	17.35918744	17.36168829	19.86005	173.5637	17.35835	54.27446017	1.023243	63.40444074	13.35983
48	0.010612	0	0	17.53104456	17.5192712	20.05147	175.2445	17.52368	54.80997496	1.034362	63.94100377	13.47819
49	0	0.00442382	0	17.69988224	17.70384715	20.25103	176.9892	17.69988	55.30705007	1.043252	64.61635031	13.6186
50	0	0.00622115	0	17.89139209	17.89818083	20.47251	178.9158	17.89363	55.95081699	1.054794	65.36306568	13.77058



From our graphs we can see the response time has shown great improvement and the results and the results are satisfactory. Utilization and Throughput are also getting better as there is a slight improvement from the earlier graphs.

2.5 INCREASE PCM to 0.9 AND THEN ADD THREAD

We want to test how sensitive the PCM is now to our results when we add threads. In the previous results we saw our PCM showed little or no sensitivity. Now we decided to debunk that theory and add more threads and then increase the PCM value to 0.9 to see how the results are affected.

\$0	\$thruProtocol	\$thruWebServer	\$thruWDisk	\$thruCGIAPP	\$thruWebReply	\$thruGetObjects	\$thruProtReply	\$thruDBProcess	\$thruDBOpt
1	0.061352	0.0613568	0.153016	0.00613533	0.0613535	0.0196328	1.04056	0.0168106	0.079758
2	0.122632	0.122632	0.305845	0.0122632	0.122632	0.0392424	2.07985	0.0336013	0.159422
3	0.183823	0.183823	0.458455	0.0183823	0.183823	0.0588235	3.11764	0.0503676	0.23897
4	0.24492	0.24492	0.610832	0.024492	0.24492	0.0783746	4.15385	0.0671082	0.318397
5	0.305919	0.305919	0.762963	0.0305919	0.305919	0.0978942	5.18839	0.0838219	0.397695
6	0.366815	0.366815	0.914836	0.0366815	0.366815	0.117381	6.22118	0.100507	0.476859
7	0.427601	0.427601	1.06644	0.0427601	0.427601	0.136832	7.25212	0.117163	0.555882
8	0.488274	0.488274	1.21775	0.0488274	0.488274	0.156248	8.28112	0.133787	0.634756
9	0.548825	0.548825	1.36877	0.0548825	0.548825	0.175624	9.30808	0.150378	0.713473
10	0.60925	0.60925	1.51947	0.060925	0.60925	0.19496	10.3329	0.166934	0.792025
11	0.669544	0.669544	1.66984	0.0669544	0.669544	0.214254	11.3555	0.183455	0.870407
12	0.729692	0.729692	1.81985	0.0729692	0.729692	0.233501	12.3756	0.199936	0.9486
13	0.78969	0.78969	1.96949	0.078969	0.78969	0.252701	13.3931	0.216375	1.0266
14	0.84953	0.84953	2.11873	0.084953	0.84953	0.27185	14.408	0.232771	1.10439
15	0.909201	0.909201	2.26755	0.0909201	0.909201	0.290944	15.42	0.249121	1.18196
16	0.968693	0.968693	2.41592	0.0968693	0.968693	0.309982	16.429	0.265422	1.2593
17	1.028	1.028	2.56382	0.1028	1.028	0.328959	17.4348	0.281671	1.33639
18	1.0871	1.0871	2.71122	0.10871	1.0871	0.347871	18.4372	0.297865	1.41323
19	1.14598	1.14598	2.85808	0.114598	1.14598	0.366715	19.4359	0.314	1.48978
20	1.20464	1.20464	3.00438	0.120464	1.20464	0.385486	20.4307	0.330072	1.56604
21	1.26306	1.26306	3.15006	0.126306	1.26306	0.404178	21.4215	0.346078	1.64197

22	1.32121	1.32121	3.2951	0.132121	1.32121	0.422788	22.4078	0.362012	1.71758
23	1.37909	1.37909	3.43945	0.137909	1.37909	0.441309	23.3894	0.377871	1.79282
24	1.43667	1.43667	3.58305	0.143667	1.43667	0.459734	24.3659	0.393648	1.86767
25	1.49393	1.49393	3.72587	0.149393	1.49393	0.478059	25.3371	0.409338	1.94211
26	1.55086	1.55086	3.86783	0.155086	1.55086	0.496274	26.3025	0.424934	2.01611
27	1.60741	1.60741	4.00889	0.160741	1.60741	0.514372	27.2617	0.440431	2.08964
28	1.66358	1.66358	4.14897	0.166358	1.66358	0.532345	28.2143	0.455821	2.16265
29	1.71932	1.71932	4.28799	0.171932	1.71932	0.550184	29.1597	0.471095	2.23512
30	1.77462	1.77462	4.42589	0.177462	1.77462	0.567877	30.0975	0.486245	2.307
31	1.82942	1.82942	4.56258	0.182942	1.82942	0.585415	31.027	0.501262	2.37825
32	1.88371	1.88371	4.69797	0.188371	1.88371	0.602787	31.9477	0.516137	2.44882
33	1.93743	1.93743	4.83194	0.193743	1.93743	0.619977	32.8588	0.530855	2.51866
34	1.99053	1.99053	4.96439	0.199053	1.99053	0.63697	33.7594	0.545406	2.58769
35	2.04297	2.04297	5.09517	0.204297	2.04297	0.653751	34.6488	0.559775	2.65587
36	2.09469	2.09469	5.22417	0.209469	2.09469	0.670302	35.526	0.573946	2.7231
37	2.14563	2.14563	5.3512	0.214563	2.14563	0.686601	36.3899	0.587902	2.78932
38	2.1957	2.1957	5.47608	0.21957	2.1957	0.702624	37.2391	0.601622	2.85441
39	2.24482	2.24482	5.59858	0.224482	2.24482	0.718343	38.0722	0.615081	2.91827
40	2.29287	2.29287	5.71843	0.229288	2.29288	0.733721	38.8872	0.628249	2.98074
41	2.33974	2.33974	5.83533	0.233975	2.33975	0.74872	39.6821	0.641091	3.04167
42	2.38521	2.38521	5.94873	0.238522	2.38522	0.76327	40.4533	0.65355	3.10078
43	2.42921	2.42921	6.05845	0.242921	2.42921	0.777347	41.1994	0.665603	3.15797
44	2.47146	2.47146	6.16382	0.247146	2.47146	0.790868	41.916	0.67718	3.2129
45	2.51186	2.51185	6.26458	0.251186	2.51186	0.803796	42.6014	0.688247	3.26541
46	2.54986	2.54987	6.35934	0.254985	2.54986	0.815953	43.2453	0.698665	3.31483
47	2.58561	2.58561	6.4485	0.25856	2.58561	0.827393	43.8517	0.708458	3.36129
48	2.61882	2.61878	6.53134	0.261882	2.61882	0.838024	44.416	0.717543	3.40442
49	2.64941	2.64944	6.60762	0.26494	2.64941	0.847807	44.933	0.72595	3.44428
50	2.67702	2.6764	6.67689	0.267726	2.67707	0.856493	45.4109	0.73323	3.47927

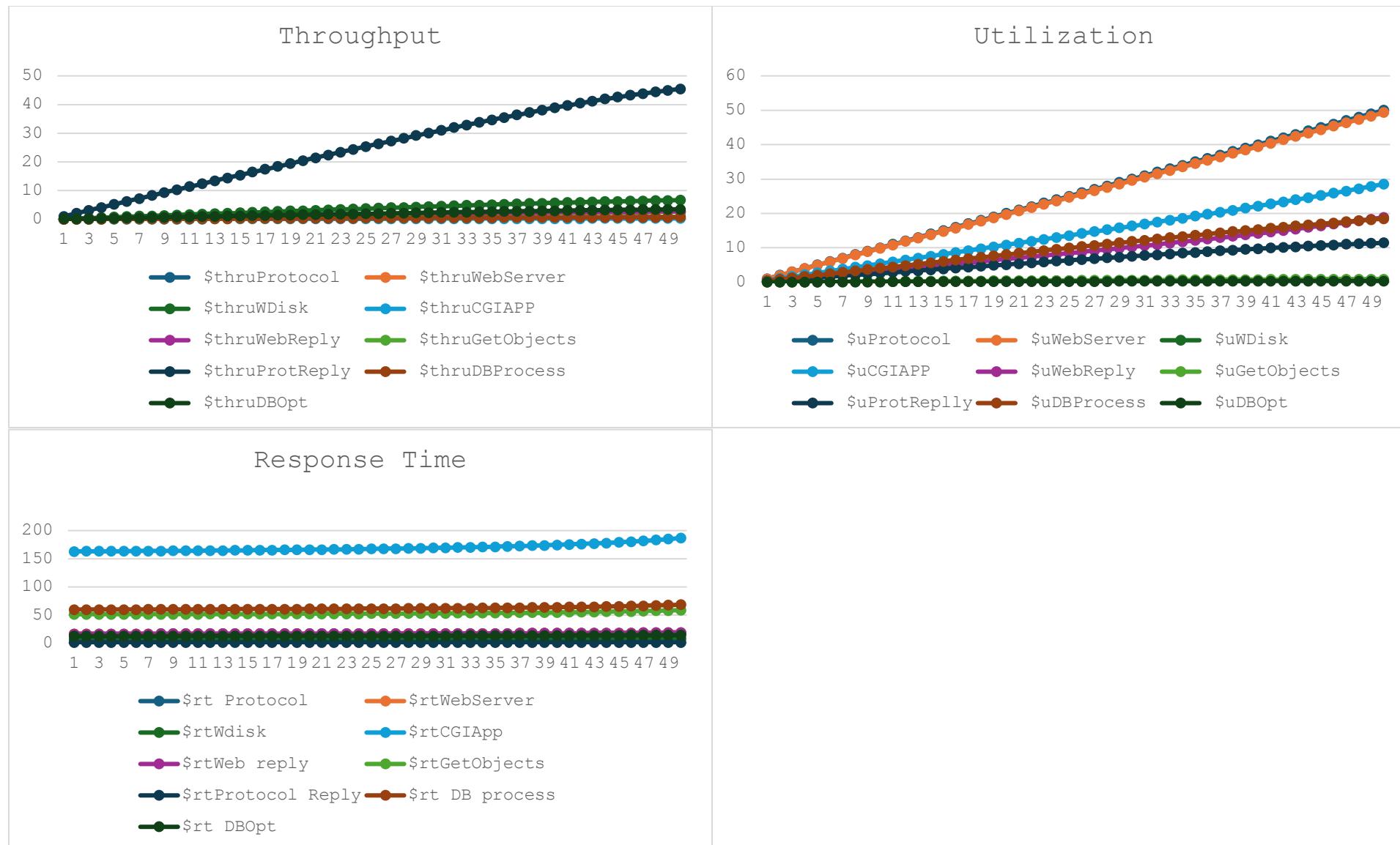
\$N	\$uProtocol	\$uWebServer	\$uWDisk	\$uCGIAPP	\$uWebReply	\$uGetObjects	\$uProtReply	\$uDBProcess	\$uDBOpt
1	0.999929	0.984712	0.015302	0.538453	0.329247	0.0200255	0.26014	0.40676	0.007976
2	2	1.96934	0.030585	1.0772	0.65891	0.040039	0.519962	0.813168	0.015942
3	3	2.95404	0.045846	1.61616	0.988962	0.0600357	0.779411	1.21911	0.023897
4	4	3.93877	0.061083	2.15535	1.31942	0.0800144	1.03846	1.62457	0.03184
5	5	4.92352	0.076296	2.69477	1.65032	0.0999742	1.2971	2.02951	0.03977
6	6	5.9083	0.091484	3.23445	1.98169	0.119914	1.55529	2.4339	0.047686
7	7	6.8931	0.106644	3.7744	2.31357	0.139833	1.81303	2.83771	0.055588
8	8	7.87793	0.121775	4.31465	2.64598	0.159729	2.07028	3.24091	0.063476
9	9	8.86279	0.136877	4.85521	2.97898	0.179601	2.32702	3.64345	0.071347
10	10	9.84769	0.151947	5.39611	3.3126	0.199448	2.58322	4.04529	0.079203
11	11	10.8326	0.166984	5.93734	3.64692	0.21927	2.83886	4.44635	0.087041
12	12	11.8176	0.181985	6.47899	3.98194	0.239061	3.09389	4.84666	0.09486
13	13	12.8026	0.196949	7.02107	4.31774	0.258822	3.34829	5.24614	0.10266
14	14	13.7876	0.211873	7.56362	4.65439	0.27855	3.60201	5.64471	0.110439
15	15	14.7727	0.226755	8.10666	4.99195	0.298243	3.85501	6.04233	0.118196
16	16	15.7578	0.241592	8.65024	5.3305	0.317899	4.10726	6.43894	0.12593
17	17	16.743	0.256382	9.19441	5.67012	0.337515	4.3587	6.83444	0.133639
18	18	17.7282	0.271122	9.73923	6.0109	0.357088	4.60929	7.22879	0.141323
19	19	18.7135	0.285808	10.2847	6.35293	0.376614	4.85897	7.62187	0.148978
20	20	19.6988	0.300438	10.831	6.69634	0.396091	5.10768	8.01362	0.156604
21	21	20.6842	0.315006	11.3781	7.04124	0.415514	5.35536	8.40393	0.164197
22	22	21.6697	0.32951	11.9262	7.38777	0.434879	5.60194	8.79269	0.171758
23	23	22.6552	0.343945	12.4752	7.73606	0.454182	5.84734	9.17979	0.179282
24	24	23.6408	0.358305	13.0253	8.08628	0.473417	6.09148	9.5651	0.186767
25	25	24.6265	0.372587	13.5766	8.43861	0.492579	6.33428	9.94848	0.194211
26	26	25.6123	0.386783	14.1293	8.79325	0.511661	6.57563	10.3298	0.201611
27	27	26.5981	0.400889	14.6834	9.15042	0.530658	6.81543	10.7089	0.208964
28	28	27.5841	0.414897	15.2391	9.51035	0.549561	7.05358	11.0855	0.216265
29	29	28.5702	0.428799	15.7967	9.87332	0.568362	7.28994	11.4596	0.223512
30	30	29.5563	0.442589	16.3561	10.2396	0.587052	7.52438	11.8308	0.2307
31	31	30.5426	0.456258	16.9178	10.6095	0.605621	7.75675	12.199	0.237825

32	32	31.5291	0.469797	17.4819	10.9835	0.624056	7.98693	12.564	0.244882
33	33	32.5156	0.483194	18.0487	11.3618	0.642348	8.21469	12.9255	0.251866
34	34	33.5024	0.496439	18.6185	11.7448	0.660481	8.43986	13.2832	0.258769
35	35	34.4892	0.509517	19.1916	12.1331	0.678438	8.66222	13.6369	0.265587
36	36	35.4763	0.522417	19.7684	12.5271	0.696202	8.88154	13.9864	0.27231
37	37	36.4636	0.53512	20.3494	12.9271	0.713751	9.09755	14.3314	0.278932
38	38	37.451	0.547608	20.9352	13.3338	0.731061	9.30995	14.6719	0.285441
39	39	38.4387	0.559858	21.5263	13.7476	0.7481	9.51841	15.0078	0.291827
40	40	39.4266	0.571843	22.1233	14.1688	0.764833	9.72254	15.339	0.298074
41	41	40.4148	0.583533	22.727	14.5979	0.781216	9.92196	15.666	0.304167
42	42	41.4032	0.594873	23.3378	15.0349	0.797201	10.116	15.9885	0.310078
43	43	42.3919	0.605845	23.9569	15.4806	0.81272	10.3047	16.3079	0.315797
44	44	43.3808	0.616382	24.5847	15.9349	0.827702	10.4874	16.6246	0.32129
45	45.0001	44.3696	0.626458	25.2222	16.3983	0.842068	10.6646	16.9399	0.326541
46	45.9998	45.3591	0.635934	25.8663	16.8704	0.855758	10.8344	17.2524	0.331483
47	46.9999	46.3481	0.644485	26.5196	17.3522	0.868699	10.9989	17.5642	0.336129
48	48.0006	47.3362	0.653134	27.1808	17.8429	0.880834	11.1579	17.8753	0.340442
49	48.9995	48.3258	0.660762	27.8443	18.3464	0.891999	11.3128	18.1868	0.344428
50	50.0105	49.2989	0.667689	28.5364	18.8667	0.902144	11.4621	18.4803	0.347927

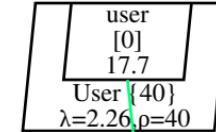
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1	0	0	0	16.29938714	16.29811203	6.535264	162.9904	16.29899	50.93516972	0.961021	59.48627652	12.53793	
2	0	0	0	16.30895688	16.30895688	6.53926	163.0896	16.30896	50.96528245	0.961608	59.52150661	12.54532	
3	0	0	0	16.320047	16.320047	6.543717	163.2005	16.32005	51.0000255	0.962266	59.56209944	12.55388	
4	0	0	0	16.33186347	16.33186347	6.548445	163.3186	16.33186	51.03694309	0.962962	59.60523453	12.56293	
5	0	0	0	16.34419569	16.34419569	6.553398	163.442	16.3442	51.07554891	0.96369	59.65028232	12.57245	
6	0	0	0	16.35701921	16.35701921	6.558553	163.5702	16.35702	51.11559792	0.964447	59.69733451	12.58234	
7	0	0	0	16.37040138	16.37040138	6.563895	163.704	16.3704	51.15762395	0.965235	59.74582419	12.5926	
8	0	0	0	16.38424327	16.38424327	6.569493	163.8424	16.38424	51.20065537	0.966053	59.79654226	12.60327	
9	0	0	0	16.39866989	16.39866989	6.575246	163.9867	16.39867	51.24584339	0.966902	59.84918007	12.61435	
10	0	0	0	16.41362331	16.41362331	6.581242	164.1362	16.41362	51.29257284	0.967783	59.90391412	12.62586	

11	0	0	0	16.42909204	16.42909204	6.587457	164.2909	16.42909	51.34093179	0.968694	59.96020823	12.63777
12	0	0	0	16.44529473	16.44529473	6.59395	164.4529	16.44529	51.39164286	0.96965	60.01920615	12.65022
13	0	0	0	16.46215604	16.46215604	6.600694	164.6216	16.46216	51.4441969	0.970649	60.08087811	12.66316
14	0	0	0	16.47970054	16.47970054	6.607732	164.797	16.4797	51.49898841	0.971682	60.14494933	12.67668
15	0	0	0	16.49800209	16.49800209	6.615069	164.98	16.498	51.55631324	0.972763	60.21170435	12.69078
16	0	0	0	16.51710088	16.51710088	6.622736	165.171	16.5171	51.61590028	0.973888	60.28136326	12.70547
17	0	0	0	16.53696498	16.53696498	6.630731	165.3696	16.53696	51.67817266	0.975061	60.35410106	12.72084
18	0	0	0	16.55781437	16.55781437	6.639078	165.5781	16.55781	51.74331864	0.976287	60.4300606	12.73678
19	0	0	0	16.57969598	16.57969598	6.64782	165.797	16.5797	51.81135214	0.977572	60.50955414	12.75356
20	0	0	0	16.60247045	16.60247045	6.656948	166.0247	16.60247	51.88255864	0.978919	60.59284035	12.77107
21	0	0	0	16.62628854	16.62628854	6.66654	166.2629	16.62629	51.95730594	0.980324	60.67996232	12.78952
22	0	0	0	16.65140288	16.65140288	6.67658	166.514	16.6514	52.03553554	0.981801	60.77146614	12.80872
23	0	0	0	16.67766426	16.67766426	6.687116	166.7766	16.67766	52.11767718	0.983351	60.86733303	12.82895
24	0	0	0	16.70529767	16.70529767	6.698204	167.053	16.7053	52.20410063	0.984983	60.96817461	12.85024
25	0	0	0	16.73438515	16.73438515	6.709842	167.3439	16.73439	52.29480043	0.986695	61.07422228	12.8726
26	0	0	0	16.76489174	16.76489174	6.722116	167.6489	16.76489	52.39041336	0.988499	61.18597241	12.89612
27	0	0	0	16.79720793	16.79720793	6.735031	167.9721	16.79721	52.49119314	0.9904	61.30358671	12.92089
28	0	0	0	16.83117133	16.83117133	6.748663	168.3117	16.83117	52.59746969	0.992405	61.42762181	12.94708
29	0	0	0	16.86713352	16.86713352	6.763075	168.6713	16.86713	52.70963896	0.994523	61.55870897	12.97469
30	0	0	0	16.90502756	16.90502756	6.778298	169.0503	16.90503	52.82834135	0.996761	61.69729252	13.0039
31	0	0	0	16.94526134	16.94526134	6.794401	169.4526	16.94526	52.95388741	0.99913	61.84390598	13.03479
32	0	0	0	16.98775289	16.98775289	6.811453	169.8775	16.98775	53.0867454	1.001637	61.99904289	13.06752
33	0	0	0	17.03287345	17.03287345	6.829555	170.3287	17.03287	53.22778103	1.004297	62.16386772	13.10221
34	0	0	0	17.08087796	17.08087796	6.848777	170.8088	17.08088	53.3777101	1.007127	62.33888149	13.13913
35	0	0	0	17.13192068	17.13192068	6.869251	171.3192	17.13192	53.537203	1.010136	62.5251217	13.17836
36	0	0	0	17.18631397	17.18631397	6.891047	171.8631	17.18631	53.70713499	1.013342	62.72367087	13.22023
37	0	0	0	17.24435247	17.24435247	6.914337	172.4435	17.24435	53.88864857	1.016766	62.93565934	13.26488
38	0	0	0	17.30655372	17.30655372	6.93927	173.0655	17.30655	54.08298037	1.020433	63.16258382	13.31273
39	0	0	0	17.3733306	17.3733306	6.966052	173.7333	17.37333	54.29161278	1.024369	63.40628307	13.36408
40	0	0	0	17.44538504	17.44538504	6.994927	174.4531	17.44531	54.51663507	1.028616	63.66902295	13.41949
41	0	0	0	17.52331456	17.52331456	7.026166	175.2324	17.52324	54.76012394	1.033211	63.9534793	13.47944
42	0	0	0	17.60851246	17.60851246	7.060331	176.0844	17.60844	55.02639957	1.038234	64.26440211	13.54498

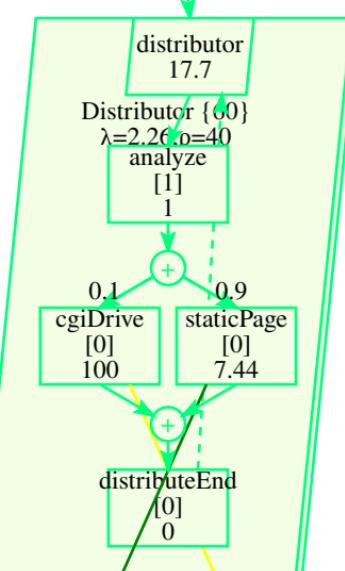
43	0	0	0	17.70122797	17.70122797	7.097525	177.0123	17.70123	55.31635164	1.043705	64.6030742	13.61634
44	0	0	0	17.80324181	17.80324181	7.13843	178.0324	17.80324	55.63507437	1.049718	64.97533891	13.69479
45	0	0	0	17.91501119	17.91508251	7.183243	179.1501	17.91501	55.98435424	1.056303	65.38350331	13.78081
46	0	0	0	18.04020613	18.04013538	7.233455	180.4028	18.04021	56.37579615	1.063699	65.83985172	13.87703
47	0	0	0	18.17752871	18.17752871	7.288517	181.776	18.17753	56.80492825	1.071794	66.34126511	13.98273
48	0	0	0	18.32886567	18.32914563	7.349181	183.2887	18.32887	57.27759587	1.080692	66.89494567	14.09932
49	0	0	0	18.49468372	18.4944743	7.415681	184.9475	18.49468	57.79617295	1.090513	67.49776155	14.22649
50	0	0.00556733	0	18.67748467	18.68181139	7.488516	186.7581	18.67714	58.37759328	1.101057	68.19142697	14.37083



We can to a degree say our performance is satisfactory because our response time decreases with threads and showed stability over the last results also our utilization has improved generally.



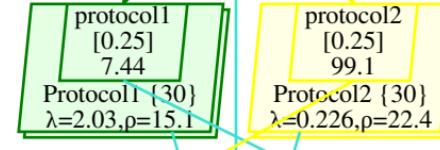
(1)
0



W[analyze]=0.00494

(1)
0

(1) 0.907



W[protocol1]=0.01
W[protocol2]=0.00999

ProtocolP1 {6} $\rho=2.82$

cgiApp 98.8
CGIApp {30} $\lambda=0.226, \rho=22.3$

cgiStart [0] 0

cdPage [5] 136 procData [15] 74.3

cgiAppEnd [0] 0

W[cdPage]=1.95
W[procData]=1.14

CGIP {4} $\rho=2.49$

read [0.1] 0.1 write [0.1] 0.1

DBOperation $\lambda=2.94, \rho=0.294$

dbRead [20] 20.6 dbUpdate [30] 30.8

DBProcess {25} $\lambda=0.619, \rho=15.1$

getObjects [1] 1.05

GetObject [1] 0.723, $\rho=0.759$

packet [0.25] 0.275

ProtocolReply {15} $\lambda=38.3, \rho=10.5$

DBDisk $\rho=0.294$

WSP {7} $\rho=5.17$

ProtocolP2 {12} $\rho=9.58$

webRorW [0.1] 0.1

WebDisk $\lambda=1.98, \rho=0.198$

WSDisk $\rho=0.198$

analyze [1] 1

cgIDrive [0] 100 staticPage [0] 7.44

distributeEnd [0] 0

Protocol1 [30] $\lambda=2.03, \rho=15.1$

Protocol2 [30] $\lambda=0.226, \rho=22.4$

ProtocolP1 {6} $\rho=2.82$

cgiApp 98.8
CGIApp {30} $\lambda=0.226, \rho=22.3$

cgiStart [0] 0

cdPage [5] 136 procData [15] 74.3

cgiAppEnd [0] 0

CGIP {4} $\rho=2.49$

read [0.1] 0.1 write [0.1] 0.1

DBOperation $\lambda=2.94, \rho=0.294$

dbRead [20] 20.6 dbUpdate [30] 30.8

DBProcess {25} $\lambda=0.619, \rho=15.1$

getObjects [1] 1.05

GetObject [1] 0.723, $\rho=0.759$

packet [0.25] 0.275

ProtocolReply {15} $\lambda=38.3, \rho=10.5$

ProtocolP2 {12} $\rho=9.58$

webRorW [0.1] 0.1

WebDisk $\lambda=1.98, \rho=0.198$

WSDisk $\rho=0.198$

ProtocolP1 {6} $\rho=2.82$

cgiApp 98.8
CGIApp {30} $\lambda=0.226, \rho=22.3$

cgiStart [0] 0

cdPage [5] 136 procData [15] 74.3

cgiAppEnd [0] 0

CGIP {4} $\rho=2.49$

read [0.1] 0.1 write [0.1] 0.1

DBOperation $\lambda=2.94, \rho=0.294$

dbRead [20] 20.6 dbUpdate [30] 30.8

DBProcess {25} $\lambda=0.619, \rho=15.1$

getObjects [1] 1.05

GetObject [1] 0.723, $\rho=0.759$

packet [0.25] 0.275

ProtocolReply {15} $\lambda=38.3, \rho=10.5$

ProtocolP2 {12} $\rho=9.58$

webRorW [0.1] 0.1

WebDisk $\lambda=1.98, \rho=0.198$

WSDisk $\rho=0.198$

analyze [1] 1

cgIDrive [0] 100 staticPage [0] 7.44

distributeEnd [0] 0

Protocol1 [30] $\lambda=2.03, \rho=15.1$

Protocol2 [30] $\lambda=0.226, \rho=22.4$

ProtocolP1 {6} $\rho=2.82$

cgiApp 98.8
CGIApp {30} $\lambda=0.226, \rho=22.3$

cgiStart [0] 0

cdPage [5] 136 procData [15] 74.3

cgiAppEnd [0] 0

CGIP {4} $\rho=2.49$

read [0.1] 0.1 write [0.1] 0.1

DBOperation $\lambda=2.94, \rho=0.294$

dbRead [20] 20.6 dbUpdate [30] 30.8

DBProcess {25} $\lambda=0.619, \rho=15.1$

getObjects [1] 1.05

GetObject [1] 0.723, $\rho=0.759$

packet [0.25] 0.275

ProtocolReply {15} $\lambda=38.3, \rho=10.5$

ProtocolP2 {12} $\rho=9.58$

webRorW [0.1] 0.1

WebDisk $\lambda=1.98, \rho=0.198$

WSDisk $\rho=0.198$

3. The final thing I will do is add a Distributor to my project.

The Distributor task includes operations such as analyze and distributeEnd. It leverages the analyze activity to send work to protocol 1 for static pages (staticPage) or protocol 2 for CGI requests (cgiDrive). This enables the distributor to properly manage and route incoming work according to the type of request. The distributor balances the workload by dividing jobs between protocols 1 and 2 based on the kind of request (static or CGI). This efficiently decreases the resource demands on each protocol while keeping to the Centering Principle which focuses on the software components with the greatest impact on performance by releasing dominating workload functions.

This output file prints out the results after adding the distributor.

Throughputs and utilizations per phase:

Task Name	Entry Name	Throughput	Phase 1	Total
User	user	2.45146	50	50
Distributor	distributor	2.45146	50.0001	50.0001
	Activity Name			
	analyze	2.45146	2.47327	
	cgiDrive	0.245146	27.8958	
	distributeEnd	2.45146	0	
	staticPage	2.20631	19.631	
Protocol1	protocol1	2.20631	19.6073	19.6073
Protocol2	protocol2	0.245145	26.0549	26.0549
WebServer	webServer	2.2063	19.0171	19.0171
	Activity Name			
	cache	2.2063	2.30783	
	cacheEnd	1.54441	10.9524	
	diskFetch	0.66189	5.75692	
	webServerEnd	2.2063	0	
WebDisk	webRorW	2.14248	0.214248	0.214248
CGIApp	cgiApp	0.245145	25.9894	25.9894
	Activity Name			
	cdPage	0.098058	14.7273	
	cgiAppEnd	0.245145	0	
	cgiStart	0.245145	0	
	procData	0.147087	11.2621	
WebReply	sendStatic	2.3533	16.6896	16.6896
	sendDynamic	0.0980574	5.21611	5.21611
Total:		2.45135	21.9057	21.9057
GetObjects	getObjects	0.784465	0.841024	0.841024
ProtocolReply	packet	41.5754	12.5973	12.5973
DBProcess	dbUpdate	0.250046	7.74001	7.74001
	dbRead	0.421647	8.70311	8.70311
Total:		0.671693	16.4431	16.4431
DBOperation	read	2.18668	0.218668	0.218668
	write	1.00019	0.100019	0.100019
Total:		3.18687	0.318687	0.318687

Entry execution demands:

Task Name	Entry Name	Phase 1
User	user	0
Distributor	Activity Name	
	analyze	1
	cgiDrive	0
	distributeEnd	0
	staticPage	0
Protocol1	protocol1	0.25
Protocol2	protocol2	0.25
WebServer	Activity Name	
	cache	1
	cacheEnd	0
	diskFetch	1
	webServerEnd	0
WebDisk	webRorW	0.1
CGIApp	Activity Name	
	cdPage	5
	cgiAppEnd	0
	cgiStart	0
	procData	15
WebReply	sendStatic	0.8
	sendDynamic	0.8
GetObjects	getObjects	1
ProtocolReply	packet	0.25
DBProcess	dbUpdate	30
	dbRead	20
DBOperation	read	0.1
	write	0.1

Service times:

Task Name	Entry Name	Phase 1
User	user	20.396
Distributor	distributor	20.3961
	Activity Name	
	analyze	1.0089
	cgiDrive	113.793
	distributeEnd	0
	staticPage	8.89765
Protocol1	protocol1	8.88695
Protocol2	protocol2	106.284
WebServer	webServer	8.61947
	Activity Name	
	cache	1.04602
	cacheEnd	7.09164
	diskFetch	8.69769
	webServerEnd	0
WebDisk	webRorW	0.1
CGIApp	cgiApp	106.016
	Activity Name	
	cdPage	150.189
	cgiAppEnd	0
	cgiStart	0
	procData	76.5676
WebReply	sendStatic	7.092
	sendDynamic	53.1944
GetObjects	getObjects	1.0721
ProtocolReply	packet	0.302999
DBProcess	dbUpdate	30.9543
	dbRead	20.6408
DBOperation	read	0.1
	write	0.1

SNIIPPETS OF THE CODE WILL BE DISPLAYED TO EXPLAIN HOW PERFORMANCE PATTERNS AND PRINCIPLES WILL BE APPLIED.

```
#===== Variables =====
$N=[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50]
$DistributorThread=60
$Prot1Thread=30
$Prot2Thread=30
$WSThread=30
$WReplyThread=40
$CGIApThread=30
$WSPTThread=7
$CGIPThread=4
$PRThread=15
$DBProcessThread=25
$DBPThread=20
$ProtP1Thread=6
$ProtP2Thread=12

|
$PS=0.9
$1_PS=0.1
$PCM=0.3
$1_PCM=0.7
$K=8
$PR=0.6
$1_PR=0.4

G "Layers: 1, Customers: 1, Clients: 1, Tasks: 1, (Delay: 0), Processors: 1"                                # Model comment
1e-05          # Convergence test value.
50             # Maximum number of iterations.
10             # Print intermediate results (see manual pages)
0.9            # Model under-relaxation ( 0.0 < x <= 1.0)
-1
```

```
p UP i
p WSP f m $WSPTThread
p CGIP f m $CGIPThread
p WSDisk f
p DBP f m $DBPThread
p DBDisk f
p ProtocolP1 f m $ProtP1Thread
p ProtocolP2 f m $ProtP2Thread
-1
```

```
#===== Tasks =====
T 0
# SYNTAX: t TaskName TaskType EntryList -1 ProcessorName [flags]
#   TaskName is any string, globally unique among tasks.
#   TaskType = r {reference or user task}
#           | n {other}
#   flags = m <int> {multithreaded}
#           | i {infinite or delay server}
#           | z <real> {think time}
#           | <int> {task priority}
t User r user -1 UP m $N
t Distributor n distributor -1 ProtocolP1 m $DistributorThread
t Protocol1 n protocol1 -1 ProtocolP1 m $Prot1Thread %f $thruProtocol %u $uProtocol
t Protocol2 n protocol2 -1 ProtocolP1 m $Prot2Thread
t WebServer n webServer -1 WSP m $WSThread %f $thruWebServer %u $uWebServer
t WebDisk n webRorW -1 WSDisk %f $thruWDisk %u $uWDisk
t CGIApp n cgiApp -1 CGIP m $CGIAPPThread %f $thruCGIAPP %u $uCGIAPP
t WebReply n sendStatic sendDynamic -1 WSP m $WReplyThread %f $thruWebReply %u $uWebReply
t GetObjects n getObjects -1 WSP %f $thruGetObjects %u $uGetObjects
t ProtocolReply n packet -1 ProtocolP2 m $PRThread %f $thruProtReply %u $uProtReply
t DBProcess n dbUpdate dbRead -1 DBP m $DBProcessThread %f $thruDBProcess %u $uDBProcess
t DBOperation n read write -1 DBDisk %f $thruDBOpt %u $uDBOpt
-1
```

```

===== Entries =====
E 0
# SYNTAX-FORM-A: Token EntryName Value1 [Value2] [Value3] -1
#   EntryName is a string, globally unique over all entries
#   Values are for phase 1, 2 and 3 {phase 1 is before the reply}
#   Token indicate the significance of the Value:
#       s - HostServiceDemand for EntryName
#       c - HostServiceCoefficientofVariation
#       f - PhaseTypeFlag
# SYNTAX-FORM-B: Token FromEntry ToEntry Value1 [Value2] [Value3] -1
#   Token indicate the Value Definitions:
#       y - SynchronousCalls {no. of rendezvous}
#       F - ProbForwarding {forward to ToEntry rather than replying}
#       z - AsynchronousCalls {no. of send-no-reply messages}
# ----- user -----
s user 0 -1
y user distributor 1 -1 %w1 $wUser
# ----- distributor -----
A distributor analyze
# ----- protocol1 -----
s protocol1 0.25 -1
y protocol1 webServer 1 -1 %w1 $wProtocol1
# ----- protocol2 -----
s protocol2 0.25 -1
y protocol2 cgiApp 1 -1 %w1 $wProtocol2
# ----- webserver -----
A webServer cache
# ----- webDisk -----
s webRorW 0.1 -1
# ----- sendPage -----
s sendStatic 0.8 -1
y sendStatic packet 16 -1 %w1 $wSendStatic
s sendDynamic 0.8 -1
y sendDynamic getObjects 8 -1
y sendDynamic packet 40 -1
s getObjects 1 -1
y getObjects webRorW 0.2 -1
# ----- protocol Reply -----
s packet 0.25 -1
# ----- CGI Application -----
A cgiApp cgiStart
# ----- CGI Application Database -----
s dbUpdate 30 -1
y dbUpdate read 2 -1
y dbUpdate write 4 -1
s dbRead 20 -1
y dbRead read 4 -1
s read 0.1 -1
s write 0.1 -1
-1

```

```

===== Activities =====
A Distributor
    s analyze 1
    s staticPage 0
    y staticPage protocol1 1
    s cgiDrive 0
    y cgiDrive protocol2 1
    s distributeEnd 0
:
    analyze -> (0.9)staticPage + (0.1)cgiDrive;
    staticPage + cgiDrive -> distributeEnd;
    distributeEnd[distributor]
-1

A WebServer
    s cache 1
    s diskFetch 1
    y diskFetch webRorW 3
    y diskFetch sendStatic 1
    s cacheEnd 0
    y cacheEnd sendStatic 1
    s webServerEnd 0
:
    cache -> (0.3)diskFetch + (0.7)cacheEnd;
    cacheEnd + diskFetch -> webServerEnd;
    webServerEnd[webServer]
-1

A CGIApp
    s cgiStart 0
    s procData 15
    y procData dbUpdate 1.7
    y procData sendStatic 1
    s cdPage 5
    y cdPage dbRead 4.3
    y cdPage sendDynamic 1
    s cgiAppEnd 0
    #s cgiEnd 0
    #y cgiEnd sendStatic 1
:
    cgiStart -> (0.6)procData + (0.4)cdPage;
    procData + cdPage -> cgiAppEnd;
    cgiAppEnd[cgiApp]
-1

```

PERFORMANCE PRINCIPLES

My new model incorporates these new principles and so I believe can be applied to the original model.

1. Centering Principle:

The Distributor task in LQN code distributes work to protocol tasks (Protocol1 and Protocol2) and the WebServer. This emphasis on the Distributor task as a dominating workload function exemplifies the centering concept, which involves improving system performance by focusing on the most important tasks.

2. Locality Principle: The LQN code prioritizes keeping actions and functions near to the resources they use. For example, the WebServer and CGIApp tasks contact other tasks (such as webRorW and dbUpdate) for data processing and retrieval, ensuring that the activities are local to the resources being used.

3. Parallel Processing Principle: The code uses many threads (e.g., m \$DistributorThread, m \$Prot1Thread, m \$Prot2Thread) to handle requests simultaneously. This can speed computer processing by dividing work into multiple concurrent processes.

4. Spread the Load Principle

The LQN code distributes workload among jobs and processors, such as between Protocol1 and Protocol2. This can help to balance the workload and prevent contention delays.

Performance patterns:

Batching:

The model includes tasks for batching requests, such as dbUpdate, which combines numerous reads and writes into batch operations. This is consistent with the "Processing Versus Frequency" theory and can increase efficiency.

Flex Time: The model distributes tasks across processors (p UP i, p WSP f m \$WSPThread, p DBP f m \$DBPThread) to manage load over time.

Locality: Tasks are aligned with their most frequent uses, such as webServer, webRorW, and sendStatic. This demonstrates a focus on locality and efficient processing.

Performance Antipatterns:

"God" Class: The Distributor and User jobs handle a substantial percentage of the work, which can lead to excessive traffic and decreased performance if they become highly centralized.

Circuitous Treasure Hunt:

The procData activity in CGIApp interacts with several activities, including dbUpdate, sendStatic, and dbRead, which may require many search operations to obtain data.

One-Lane Bridge: Some tasks run on single processors (e.g., p DBP f m \$DBPThread), which might cause bottlenecks if only one process can run at a time.

Traffic Jam:

Inadequate management of task interactions (e.g., User, Distributor, Protocol1, Protocol2, and WebServer) can result in backlogs and unpredictable response times.

CONCLUSION:

In conclusion, this layered queuing network model of a web server system helps us understand how various tasks entries and activities have a major impact in our system. To ensure we are designing a high performance software continuous monitoring and evaluation is needed to spot out any errors or bottlenecks can damage the software.