Performance Report

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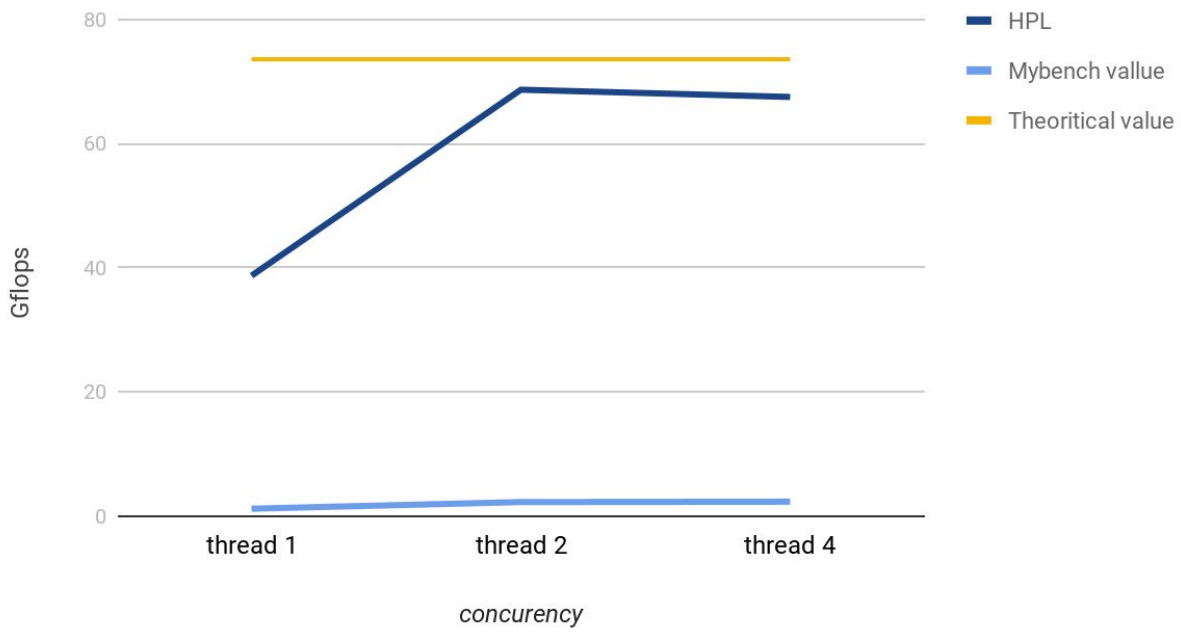
CPU-PERFORMANCE:

- CPU performance is measure in gigaflops. My Benchmark values are calculated using total workload ie 1 Trillion converted to giga and divided by total time taken to execute 1 trillion operation.
- HPL benchmark are only available for DP operations, detailed execution and screenshots are available in manual doc.
- Theoretical Values are calculated using formula :
  Cpu performance (gigaflops) = noofcores*flopspercycle*clockfreq
- MyBench Efficiency is calculated using formula:
  (Mybench/ Theoretical)*100
- HPL efficiency is calculated using the formula: (HPL/theoretical)*100

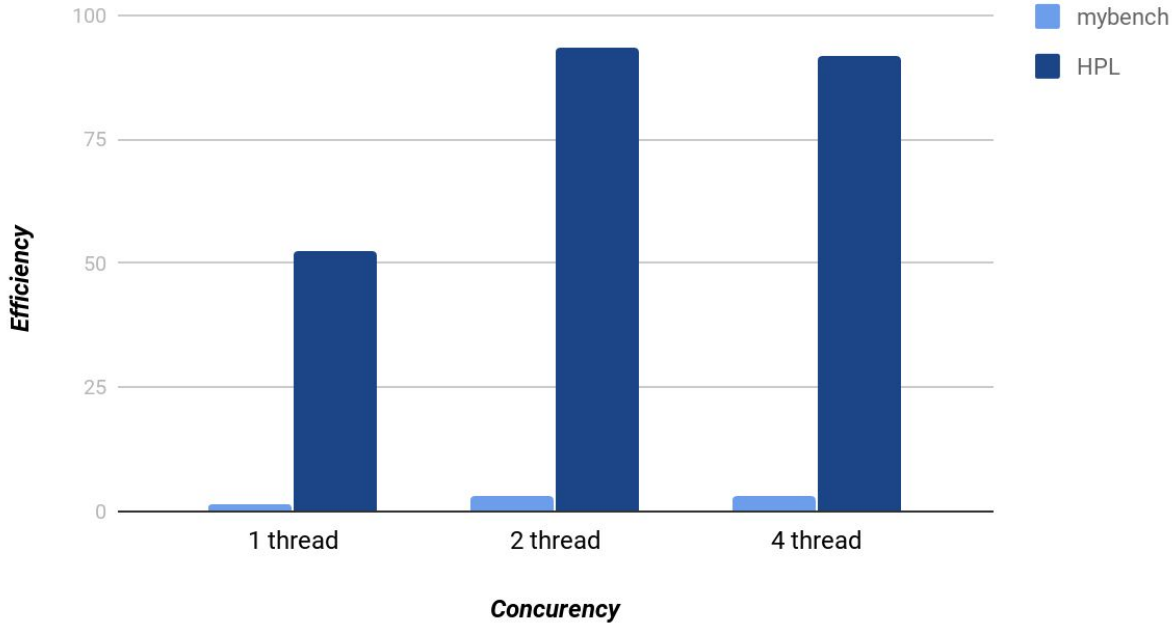
Workload	concurency	Mybenchvalue (Gigaflops)	HPL values	Theoritical values	Mybench efficiency	HPL efficiency
QP	1	8.5	N/A	588.8	1.44	N/A
QP	2	16.05	N/A	588.8	2.77	N/A
QP	4	16.78	N/A	588.8	2.84	N/A
HP	1	4.45	N/A	294.4	1.51	N/A
HP	2	8.45	N/A	294.4	2.87	N/A
HP	4	8.09	N/A	294.4	2.74	N/A
SP	1	2.19	N/A	147.2	1.48	N/A
SP	2	4.63	N/A	147.2	3.14	N/A
SP	4	4.68	N/A	147.2	3.17	N/A
DP	1	1.22	38.75	73.6	1.65	52.64
DP	2	2.29	68.7	73.6	3.11	93.3
DP	4	2.31	67.53	73.6	3.13	91.75

- A simple line chart is used to show the comparison between throughput values of Mybench , HPL and theoretical values.
- X axis represents concurency , and Y axis represents cpu performance in Gflops .
- Theoretical values are Peak values and are different for different operations. For comparison between HPL and Mybench we have considered only DP operations where peak value is 73.6 gflops .
- Each unit on Y axis is 20 Gflops and ON X axis there are no of threads .

Mybench vs HPL vs Theoretical



Efficiency Comparision



- Apparently HPL has higher efficiency , Y axis represents efficiency where as X axis represents the no of threads.

MEMORY PERFORMANCE:

- ❏ Memory performance is measured in terms of throughput and latency
- ❏ My Bench latency is measured using the formula:
  (Total data in GB)/total time.
- ❏ Theoretical value of RAM throughput is calculated using formula:
  (Dram clock freq*Number of data transfer per clock * Memory Bus width* Number of interfaces).
  Myrambench efficiency = (MYRambench/Theoretical)*100
  Pmbw efficiency = (Pmbw/theoretical)*100
- ❏ Values are measured with coresponding threads and blocksize with specifirs access patterns.

Memory Throughput Table:

work-load	concurrency	Blocksize	MyRambench values(GB/sec)	Pmbw(GB/sec)	Teoretical (GB/sec)	Myrambench Efficiency	Pmbw efficiency
RWS	1	1KB	12.94	16.3	68.26	18.95	23.86
RWS	1	1MB	6.33	19.2	68.26	9.27	28.17
RWS	1	10MB	8.23	17.8	68.26	12.0	26.07
RWS	2	1KB	5.12	23.6	68.26	7.5	34.57
RWS	2	1MB	6.45	19.6	68.26	9.44	28.71
RWS	2	10MB	8.15	38.2	68.26	11.9	41.29
RWS	4	1KB	8.12	27.1	68.26	11.89	39.6
RWS	4	1MB	8.27	40.8	68.26	12.1	59.7
RWS	4	10MB	13.43	34.8	68.26	19.6	50.98
RWR	1	1KB	4.80	4.25	68.26	7.0	6.2

RWR	1	1MB	6.33	0.5	68.26	9.27	0.73
RWR	1	10MB	8.48	0.25	68.26	12.4	0.366
RWR	2	1KB	1.98	9.5	68.26	2.9	13.19
RWR	2	1MB	10.28	1.19	68.26	15.0	1.7
RWR	2	10MB	6.95	0.85	68.26	10.18	1.24
RWR	4	1KB	1.50	21.3	68.26	2.19	31.20
RWR	4	1MB	10.94	2.68	68.26	15.0	3.9
RWR	4	10MB	14.10	0.828	68.26	20.65	1.21

Memmory Latency Table:

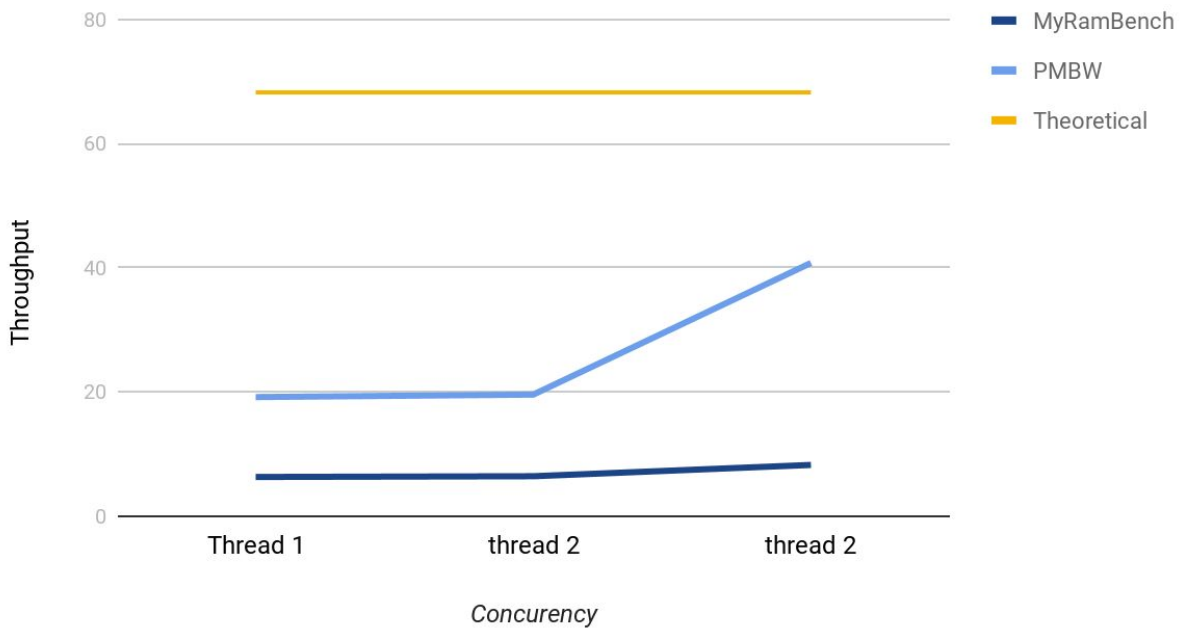
- Latency is measured using formula: (time in microsecs/data transfer) note : latency is measured for 100 million operations
- Theoretical latency is taken fron specification sheets.
- MyRam bench Efficiency is measured using formula :
  (change in efficiency / Theoretical value)*100
  Pmbw efficiency is measured using formula: ((Pmbw-theoretical)theoretical)*100

Work-load	concurrency	Block size	MyRam Bench latency	Pmbw latency	Theoretical Latency	MyRAm Bench Efficiency	Pmbw-Efficiency
RWS	1	1B	0.061	.006	0.014	3.35	57.14285714
RWS	2	1B	0.055	.0046	0.014	2.92	67.14285714
RWS	4	1B	0.040	.0041	0.014	1.85	70.71428571
RWR	1	1B	0.091	.19	0.014	554.24	1257.142857

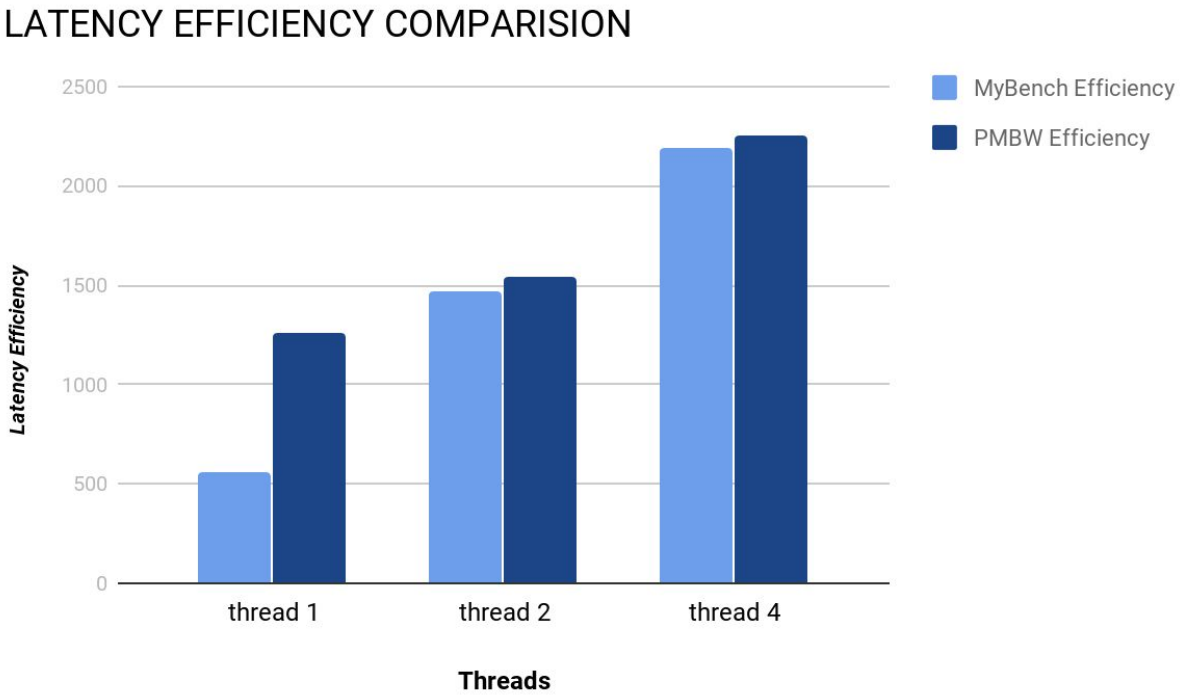
RWR	2	1B	0.22	.23	0.014	1470.34	1542.857143
RWR	4	1B	0.32	.33	0.014	2185.56	2257.142857

- A simple graph is used to compare the throughput values of MyBench , Pmbw and the theoretical value . The Y axis represents the throughput in GB/sec, X axis represents comcurency i.e no of threads.
- Each unit on Y axis is 20 GB/secs and X axis each unit is no of thread used for measurement of throughput.

RAM THROUGHPUT COMPARISON



- ❏ Latency is compared using a Bar graph which plots the efficiency calculated for both Mybench values and Pmbw .
- ❏ On Y axis we have efficiency with each unit equal to 500. And on X axis we have threads these threads are the correcponding threads used for calculation of latency.
- ❏ Latency efficiency increases with increase in thread i.e. change in latency is increasing thus measured latency is decreasing with increase in no of thread.



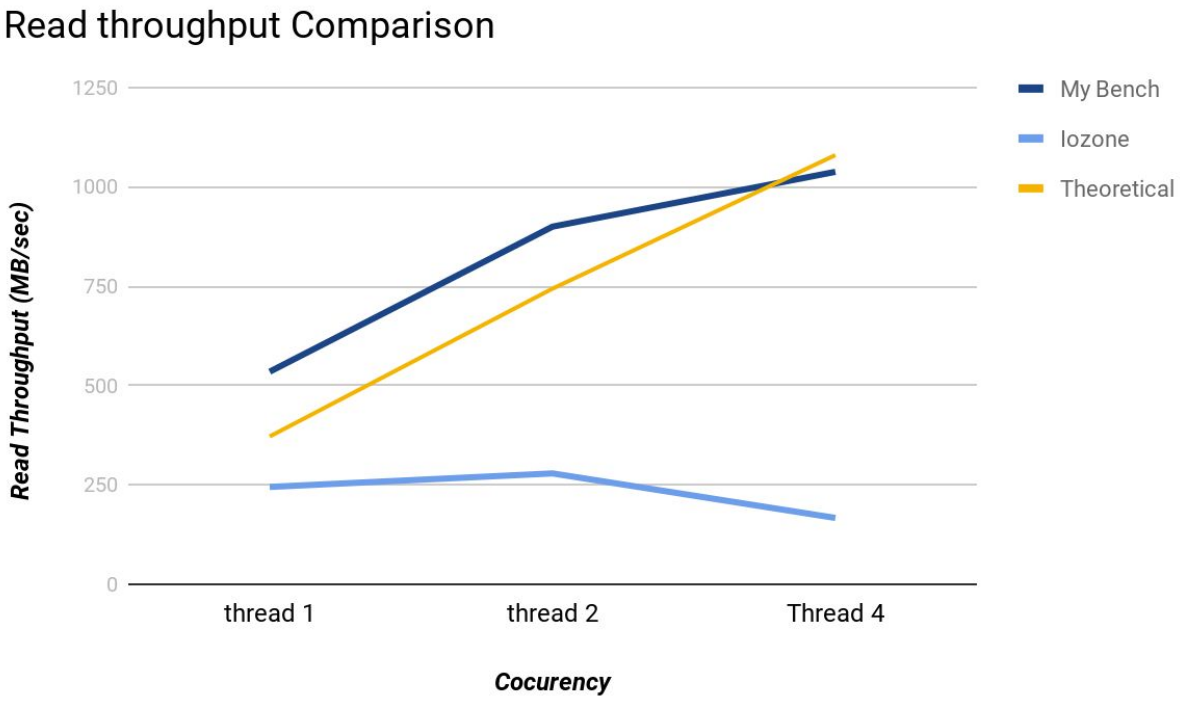
Disk Performance:

- Disk performance is measured in terms of throughput and latency. My Bench value is calculated using the formula : (Totala data in MB / Total time taken).
- Iozone is used to measure throughput and values are in MB/sec , Theoretical value od disk throughput is taken from data specification sheet For Random Read value is 410 MB/sec and for Random write throughput is 540 MB/sec.
- My bench efficiency is calculated using formula(MyDiskBench/Theoretical)*100
- Iozone efficiency is calculated using : (IOZONE/ Theoretical)*100

READ THROUGHPUT MEASUREMENT:

work-load	concurrency	Blocksize	MyDiskbench values	IOZONE	Theoretical	MyDiskbench Efficiency	Iozone efficiency
RS	1	1 MB	1077.7	245	372	289.7043011	65.86021505
RS	1	10MB	535.01	245	372	143.8198925	65.86021505
RS	1	100MB	1327.06	295	372	356.7365591	79.30107527
RS	2	1 MB	1006.6	269	744	135.2956989	36.15591398
RS	2	10MB	900.02	279	744	120.9704301	37.5
RS	2	100MB	1242.29	300	744	166.9744624	40.32258065
RS	4	1 MB	1942.05	276	1488	130.5141129	18.5483871
RS	4	10MB	3267.93	291	1488	219.6189516	19.55645161
RS	4	100MB	1202.34	304	1488	80.80241935	20.43010753
RR	1	1 MB	1395	136	540	258.3333333	25.18518519
RR	1	10MB	3689.5	145	540	683.2407407	26.85185185
RR	1	100MB	1922.04	143	540	355.9333333	26.48148148
RR	2	1 MB	1443.93	154	1080	133.6972222	14.25925926
RR	2	10MB	1037.9	167	1080	96.10185185	15.46296296
RR	2	100MB	1328.3	172	1080	122.9907407	15.92592593

RR	4	1 MB	3842.7	155	2160	177.9027778	7.175925926
RR	4	10MB	2698	158	2160	124.9074074	7.314814815
RR	4	100MB	1500	167	2160	69.44444444	7.731481481



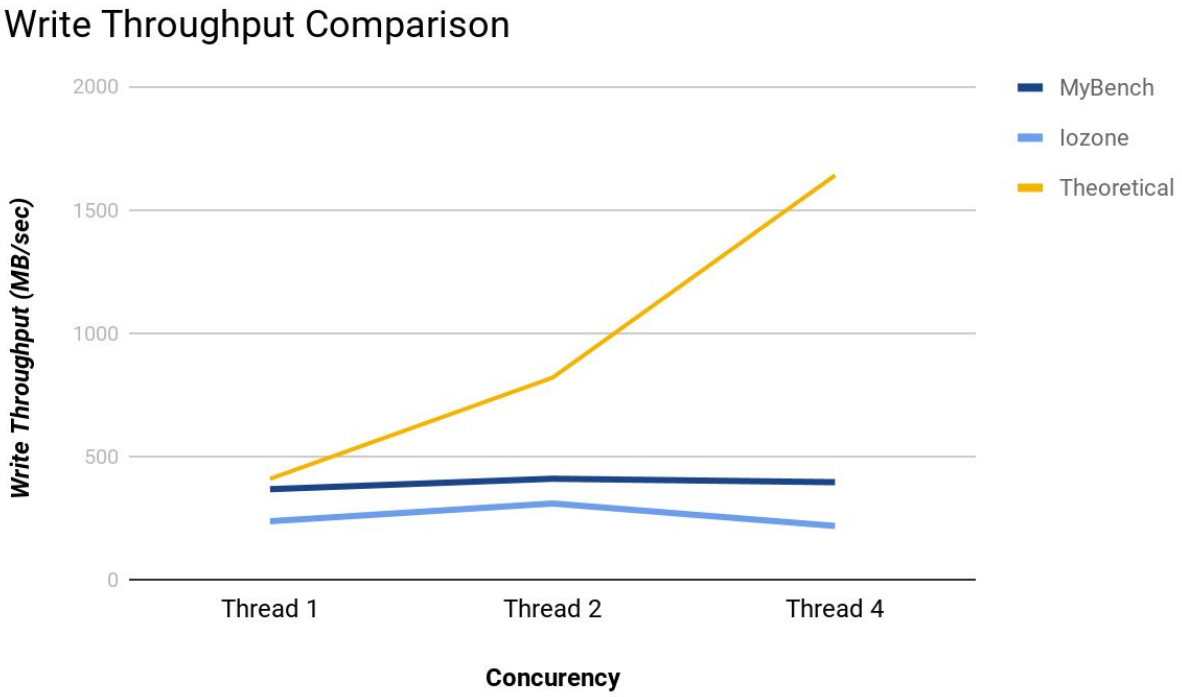
- Read throughput comparison is graph plotted against Throughput and Concurrency ie number of threads . On Y axis throughput in MB/sec with each unit equal to 250 MB/sec and on X axis each unit is the no of threads used for measurement of the value.
- Considering the reads are from Disk cache read through put comes out to be moire than theoretical values.
- Note: As discussed with TAs we were not suppose to clear disk cache as it creates problems while execution of benchmarks on the cluster.

WRITE THROUGHPUT MEASUREMENT:

- ❏ Write throughput measurement is done with random and sequential access patern.
- ❏ Theoretical value are taken from the data specification sheet.
- ❏ My DiskBench efficiency is calculate using the formula (Mydiskbench/Theoretical)*100
- ❏ IOzone efficiency is measured using the formula (Iozone/theoretical formula).

work-load	concurrency	Blocksize	MyDiskbench values	IOZONE	Theoretical	MyDiskbench Efficiency	Iozone efficiency
WS	1	1 MB	233.56	256	410	56.96585366	62.43902439
WS	1	10MB	401.52	245	410	97.93170732	59.75609756
WS	1	100MB	343.71	233	410	83.83170732	56.82926829
WS	2	1 MB	158.34	302	820	19.3097561	36.82926829
WS	2	10MB	400.45	320	820	48.83536585	39.024390:24
WS	2	100MB	300.77	354	820	36.67926829	43.17073171
WS	4	1 MB	334.90	348	1640	20.42073171	21.2195122
WS	4	10MB	467.75	369	1640	28.52134146	22.5
WS	4	100MB	201.46	364	1640	12.28414634	22.19512195
WR	1	1 MB	367.93	238	410	89.73902439	58.04878049
WR	1	10MB	374.10	245	410	91.24390244	59.75609756
WR	1	100MB	266.72	250	410	65.05365854	60.97560976
WR	2	1 MB	172.30	279	820	21.012195	34.024390

						12	24
WR	2	10MB	429.35	281	820	52.3597561	34.2682926 8
WR	2	100MB	410.36	310	820	50.0439024 4	37.8048780 5
WR	4	1 MB	416.91	206	1640	25.4213414 6	12.5609756 1
WR	4	10MB	396.30	219	1640	24.1646341 5	13.3536585 4
WR	4	100MB	341.14	220	1640	20.8012195 1	13.4146341 5

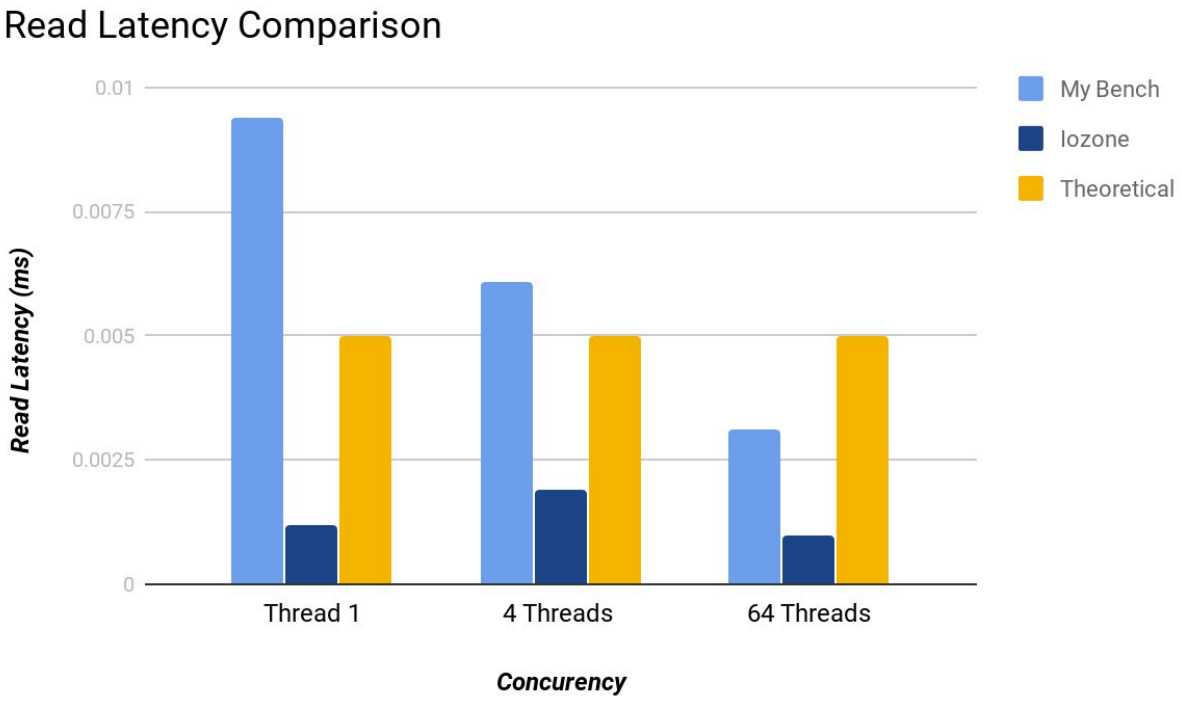


- Throughput comparison is done between My bech values, IOzone and theoretical values. ON Y axis each unit is 500 MB/sec and on X axis each unit are the no of threads on used for execution .

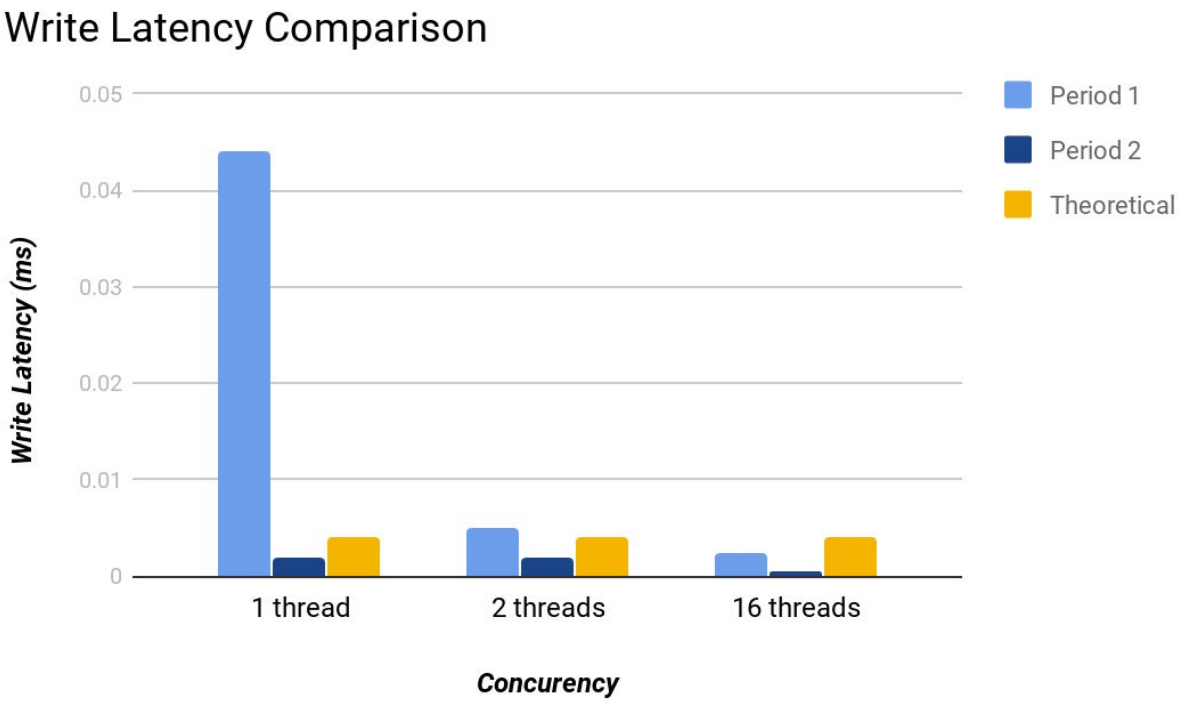
LATENCY MEASUREMENT:

- ❏ Latency measurement is done for Random read and Random write
- ❏ My disk bench latency is calculated using the formula :(Time in ms/ no of operations).
- ❏ Theoretical latency is taken from data specification sheet .
- ❏ My diskbench efficiency = (Mydisk bench - theoretical)*100
- ❏ IOzone efficiency = (iozone- theoretical)*100

Workload	Concurrency	Blocksize	MyDisk bench Latency (ms)	Iozone latency (ms)	Theoretical latency	MyDiskBench efficiency	Iozone efficiency
RR	1	1KB	.0094	.0012	.005	0.88	-0.76
RR	2	1KB	.0032	.0012	.005	-0.36	-0.76
RR	4	1KB	.0061	.0019	.005	0.22	-0.62
RR	8	1KB	.0033	.0012	.005	-0.34	-0.76
RR	16	1KB	.0039	.0005	.005	-0.22	-0.9
RR	32	1KB	.0042	.0011	.005	-0.16	-0.78
RR	64	1KB	.0031	.0010	.005	-0.38	-0.8
RR	128	1KB	.0030	.00055	.005	-0.40	-0.89
WR	1	1KB	.0440	.0020	.004	10	-0.5
WR	2	1KB	.0050	.0019	.004	0.25	-0.525
WR	4	1KB	.0021	.0032	.004	-0.475	-0.2
WR	8	1KB	.0070	.0008	.004	0.75	-0.8
WR	16	1KB	.0016	.0007	.004	-0.6	-0.825
WR	32	1KB	.0030	.0005	.004	-0.25	-0.875
WR	64	1KB	.0024	.00054	.004	-0.4	-0.865
WR	128	1KB	.0055	.00078	.004	0.375	-0.805



- Read and write latency for mybench , IOzone and theoretical are measured sing these charts on X axis we have concurrency and on Y axis we have latency in ms. Each unit on Y axis is .0025 ms and on x axis there are no of threads.



IOPS MEASUREMENT:

- ❏ Theoretical IOps measurement is done using the formula :

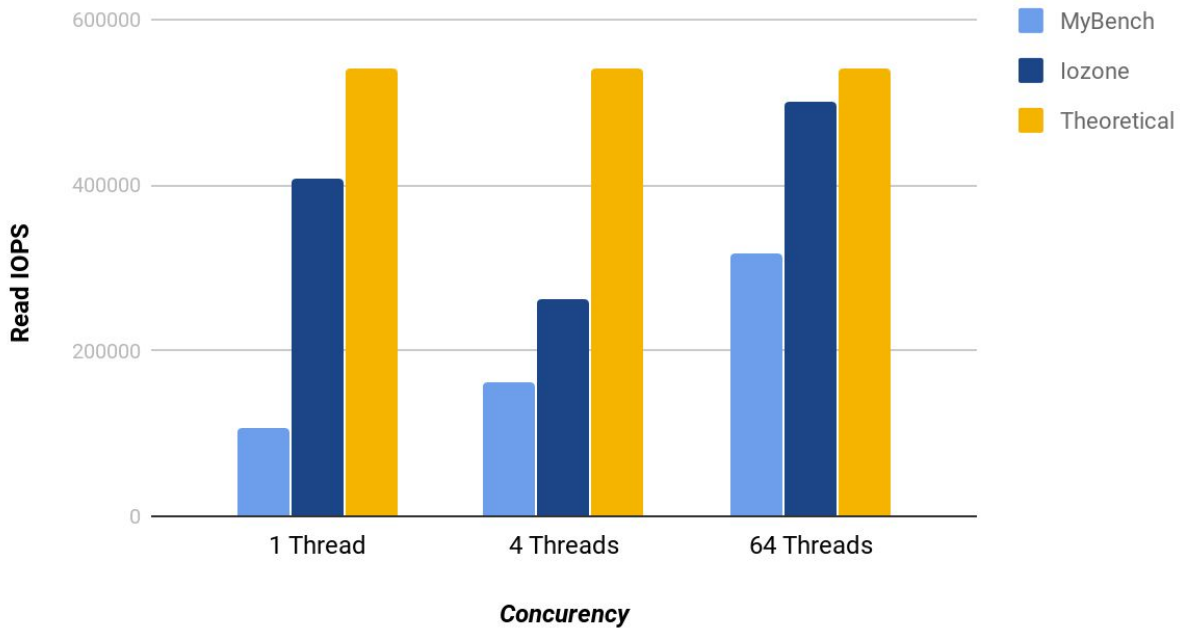
Throughput = Iosize * IOPS
Mybench IOPS = (no of operation / total time taken to perform operation)
MyDiskBench efficiency = (Mydiskbench/Theoretical)*100
IOzone efficiency= (Iozone/Theoretical)*100

Workload	Concurrency	Blocksize	MyDisk bench IOPS	Iozone IOPS	Theoretical IOPS	MyDiskBench efficiency	Iozone efficiency
RR	1	1KB	105428	407545	540000	19.5237037	75.4712963
RR	2	1KB	326918	386087	540000	60.54037037	71.49759259
RR	4	1KB	161392	261735	540000	29.88740741	48.46944444
RR	8	1KB	302499	420125	540000	56.01833333	77.80092593

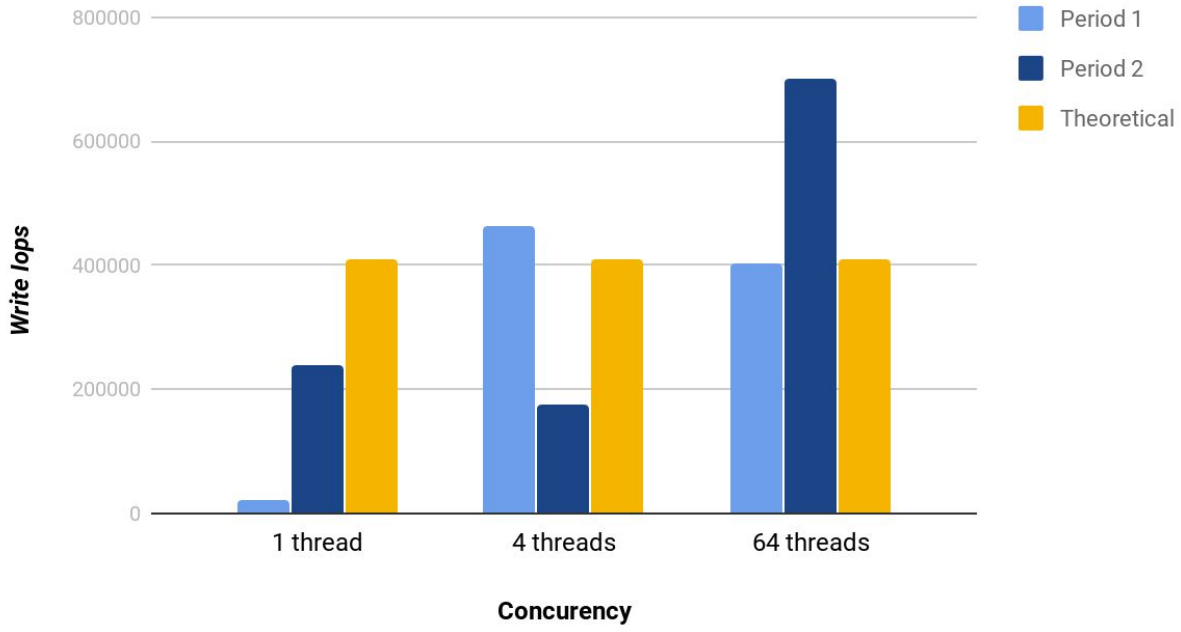
RR	16	1KB	252749	914856	540000	46.80537037	169.4177778
RR	32	1KB	324948	476689	540000	60.17555556	88.27574074
RR	64	1KB	318210	501206	540000	58.92777778	92.81592593
RR	128	1KB	327304	910565	540000	60.61185185	168.6231481
WR	1	1KB	22568	238699	410000	5.504390244	58.21926829
WR	2	1KB	199076	250324	410000	48.55512195	61.05463415
WR	4	1KB	463793	174234	410000	113.1202439	42.49609756
WR	8	1KB	142615	560738	410000	34.78414634	136.7653659
WR	16	1KB	611471	658904	410000	149.1392683	160.7082927
WR	32	1KB	237139	802617	410000	57.83878049	195.7602439
WR	64	1KB	401921	701480	410000	98.0295122	226.2146341
WR	128	1KB	180237	670791	410000	43.960243 9	163.607561

- ❏ Read and write iops comparison is done for thread 1 , thread 4 and thread 64.
- ❏ On Y axis we have IOPS , each unit is 20000 iops, and on X axis we have concurrency.

Read IOPS



Write IOPS



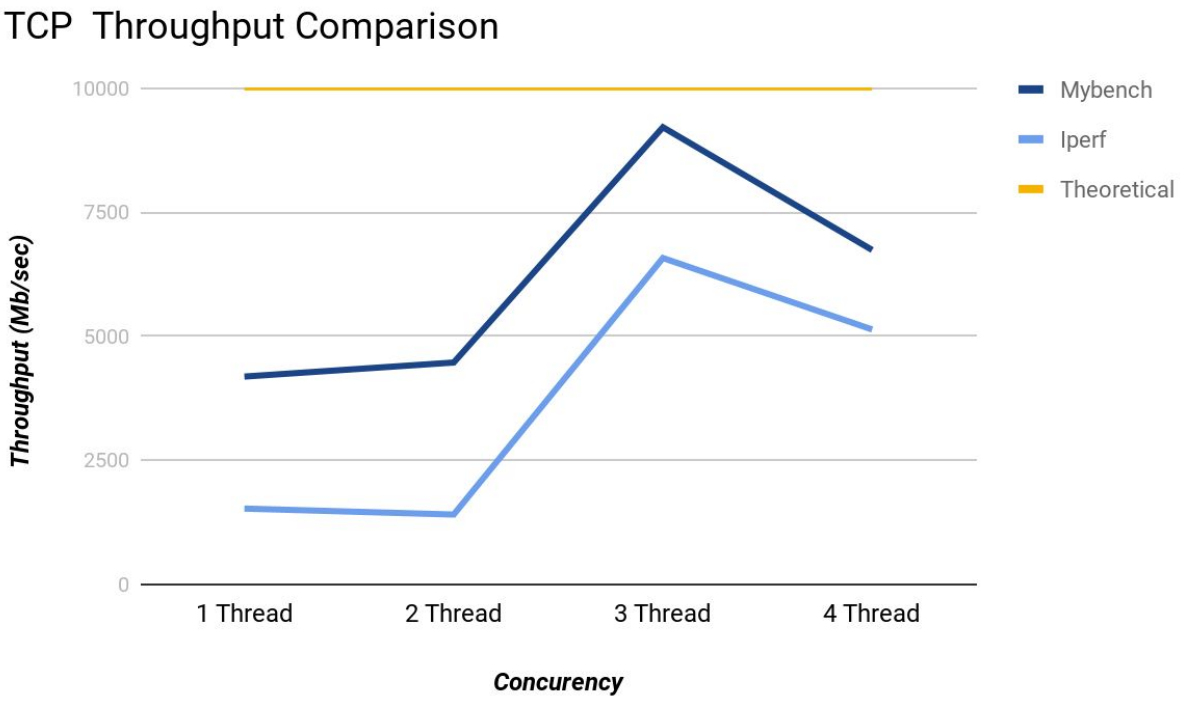
NETWORK PERFORMANCE MEASUREMENT:

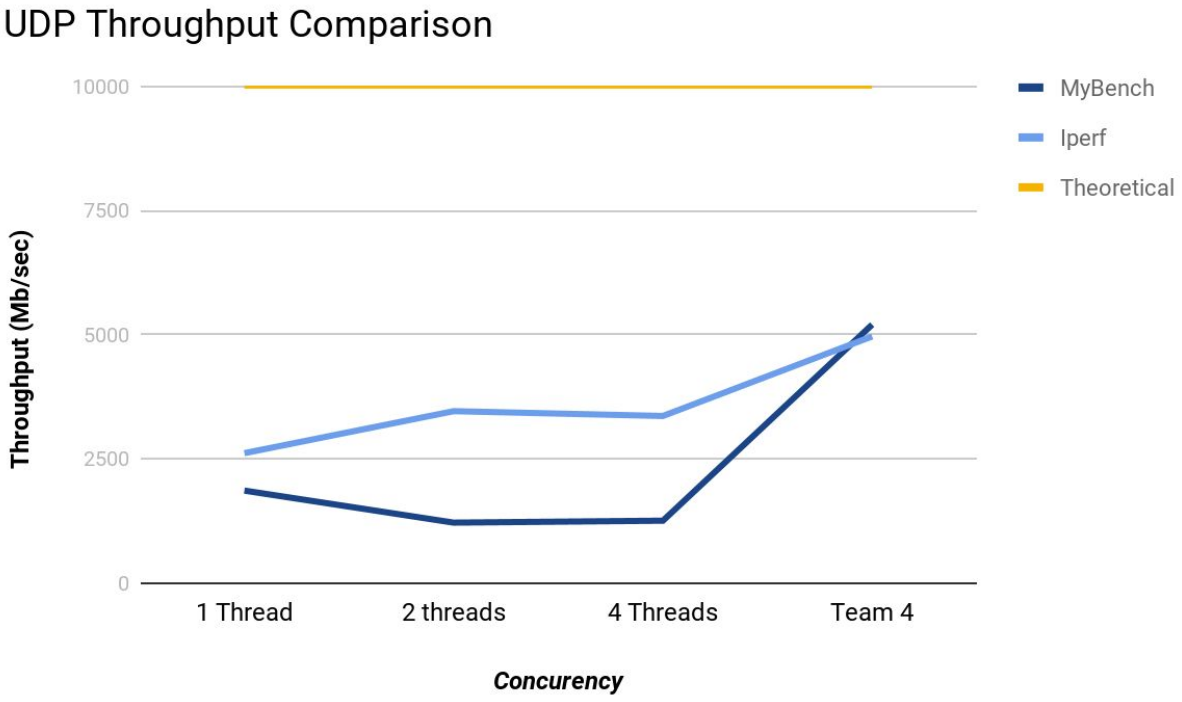
- Mybech throughput = (total data transferd / total time) in MB/sec
- Theoretical throughput is taken from the data specification sheet i.e 10 GB/sec
- My bench efficiency and Iozone efficiency is calculated by deviten the former with Theoretical values *100.

Throughput Measurement:

Protocol	Concurency	Block size	MyNet bench (Mb/sec)	iperf(Mb/sec)	Theoretical (Mb/sec)	MyNet Bench efficiency	Iperf Efficiency
TCP	1	1 KB	4191.03	1530	10000	41.9103	15.3
TCP	1	32 KB	6257.34	2480	10000	62.5734	24.8
TCP	2	1 KB	4473.92	1410	10000	44.7392	14.1
TCP	2	32 KB	5890.71	2370	10000	58.9071	23.7
TCP	4	1 KB	9217	6580	10000	92.17	65.8
TCP	4	32 KB	6680	4280	10000	66.8	42.8
TCP	8	1 KB	6742.32	5140	10000	67.4232	51.4
TCP	8	32 KB	6822.27	6270	10000	68.2227	62.7
UDP	1	1 KB	1866	2650	10000	18.66	12.5
UDP	1	32 KB	4756.80	3760	10000	47.568	27.6

UDP	2	1 KB	1221.065	3465	10000	12.21065	24.65
UDP	2	32 KB	5153.6	4145	10000	51.5368	31.45
UDP	4	1 KB	1260.23	3368	10000	12.6023	25.22
UDP	4	32 KB	4683.42	4840	10000	46.8342	18.4
UDP	8	1 KB	5208	4970	10000	52.08	23.67
UDP	8	32 KB	5070.063	4380	10000	50.70063	22.8





- Throughput comparison is done between Myench , iperf and theoretical. On Y axis we each unit is 2500 MB/sec and on x axis we have no of threads.

Latency Calculation:

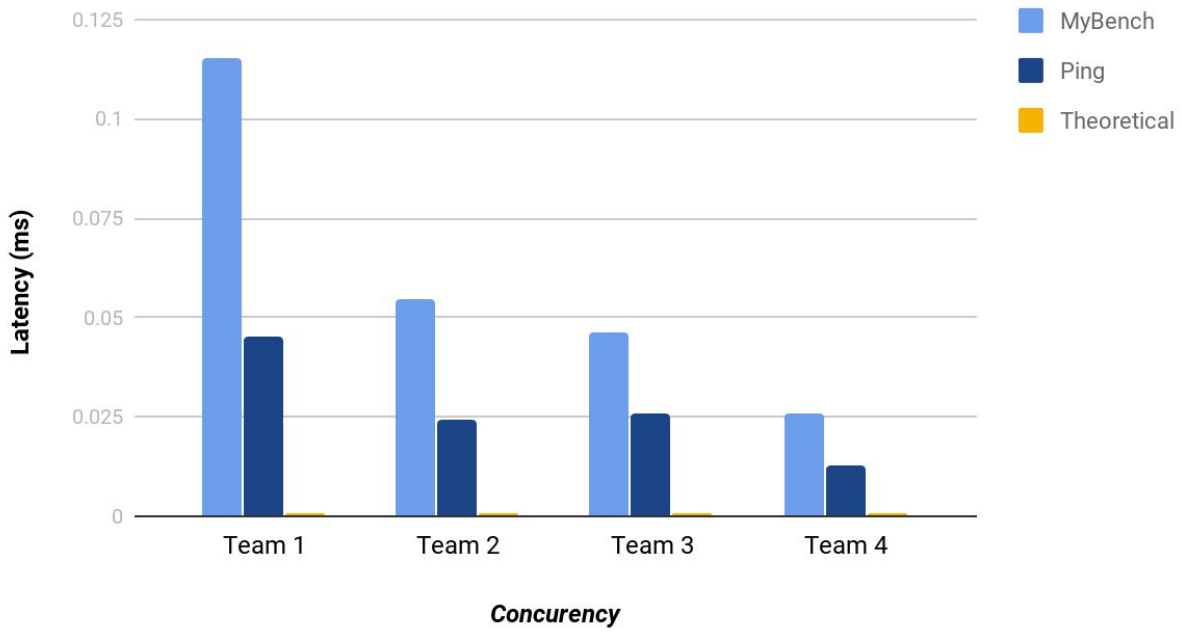
- My bench latency is calculated using the formula: (total time /1 million operations)
- Efficency is calculated by (change in efficency / Theoretical val)*100.
- Ping utility is used to calculate latency in ms.

Protocol	Concurency	Block size	MyNet bench Latency (ms)	Ping Latency (ms)	Theoretical Latency (ms)	MyNet Bench efficiency	Iperf Efficiency

TCP	1	1B	0.1151	0.045	0.0007	26342.85714	6328.571429
TCP	2	1B	0.0547	.0245	0.0007	7714.285714	3400
TCP	4	1B	0.0462	0.0256	0.0007	6500	3557.14
TCP	8	1B	0.0258	0.0128	0.0007	3585.714286	1728.571429
UDP	1	1B	0.1162	0.0842	0.0007	37428.57143	11928.57143
UDP	2	1B	0.0529	0.0448	0.0007	7457.142857	6300
UDP	4	1B	0.0507	0.0358	0.0007	7142.857143	5014.285714
UDP	8	1B	0.0469	0.0394	0.0007	6600	5528.571429

- Latency comparison is done by plotting threads on X axis and Latency on Y axis .
- Each unit on Y axis is .025 ms and on X axis we have no of threads.

TCP Latency Comparison



UDP Latency comparison