Design Document

CPU benchmark

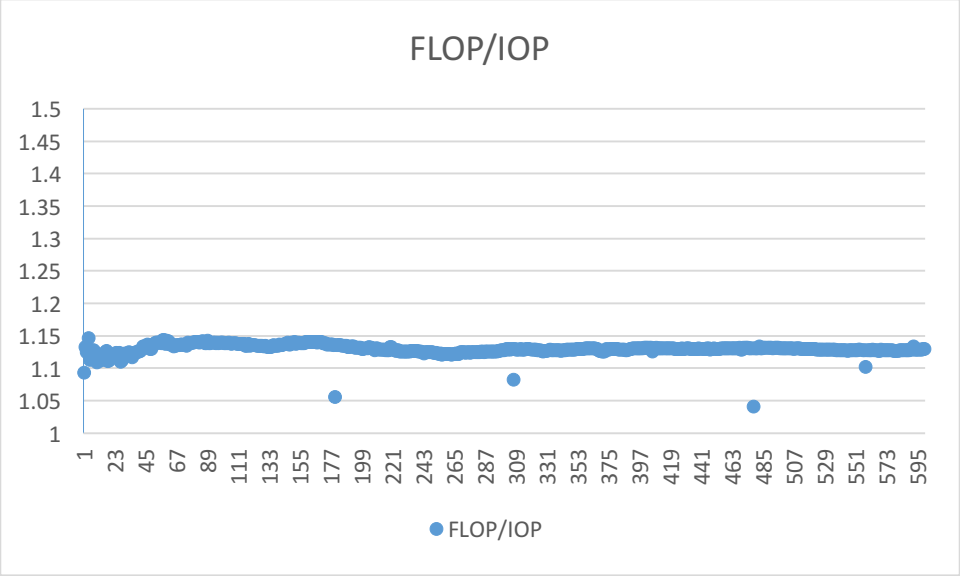
The benchmark calculates the duration of calculator (sum, subtraction, multiplication and deviation) in 1, 2, 4 thread which implement the thread concurrency to measure the process speed in terms of floating point operations per second and integer operations per second.

threads	type	number
1	IOP	1.489361702
2	IOP	1.473684210
4	IOP	1.465968586
1	FLOP	2.800000000
2	FLOP	2.745098039
4	FLOP	2.718446601

From the table above, we could see that FLOP is more than IOP which we conclude that float operations are more than the integer operations per second. In addition, we could find that the operations is around 10^9.

10-mins benchmark

The benchmark was run for 10 minutes to calculate how many float and integer operations the processor would execute in 4 threads. I use a second chronograph to count how many sum would execute every second and run the second chronograph for 600 seconds which equals to 10 minutes. This benchmark also measures the process speed in terms of floating point operations per second and integer operations per second.

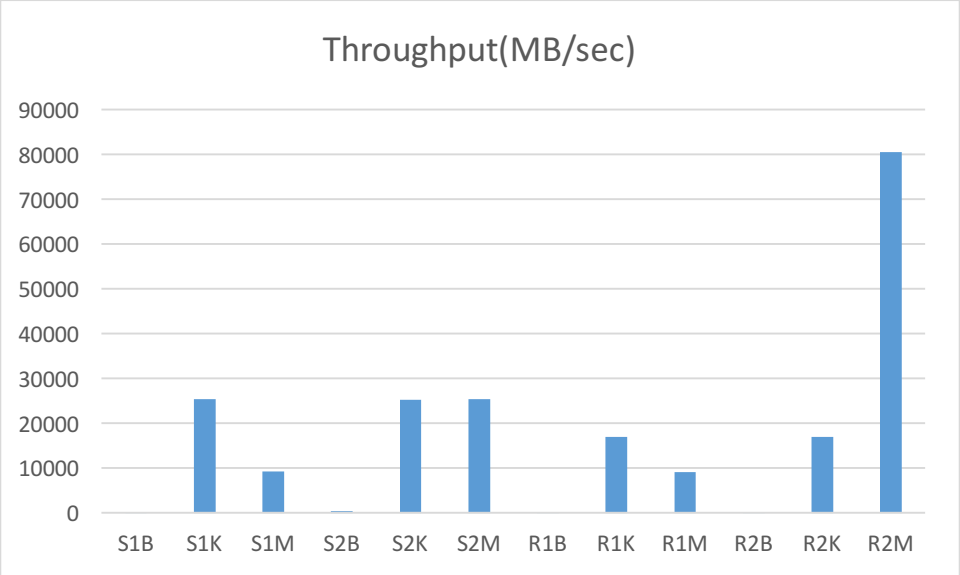


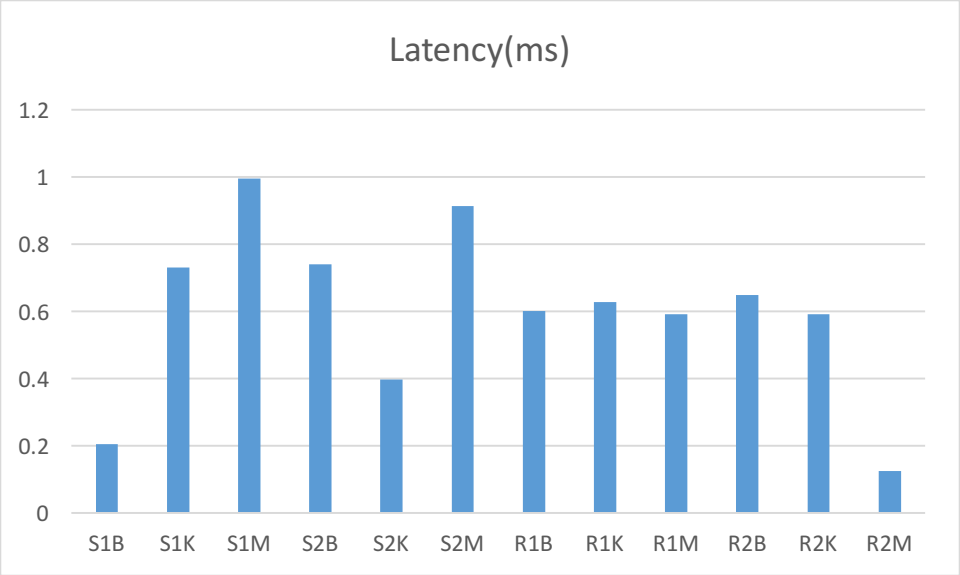
The chart shows that the float operations divided by integer operations every seconds. The FLOP/IOP is around 1.15.

Memory benchmark

The benchmark measures the memory speed in the metrics of MB/sec for the throughput and seconds for the latency. I use the benchmark to implement the memcpy every 1B, 1K and 1M block size of memory in 1 and 2 threads sequentially and randomly. I get the space of an array and copy the character from another array to the array sequentially and randomly.

Type	Thread	Block size	name	Throughput(MB/sec)	Latency(ms)
Sequence	1	B	S1B	122.54902	0.204
Sequence	1	K	S1K	25380.71066	0.73
Sequence	1	M	S1M	9261.231559	0.9953
Sequence	2	B	S2B	340.465753	0.74
Sequence	2	K	S2K	25188.91688	0.397
Sequence	2	M	S2M	25348.54246	0.912
Random	1	B	R1B	39.840637	0.6
Random	1	K	R1K	16949.15254	0.627
Random	1	M	R1M	9059.283954	0.59
Random	2	B	R2B	40.816327	0.64775
Random	2	K	R2K	16949.152	0.59
Random	2	M	R2M	80580.17728	0.1241



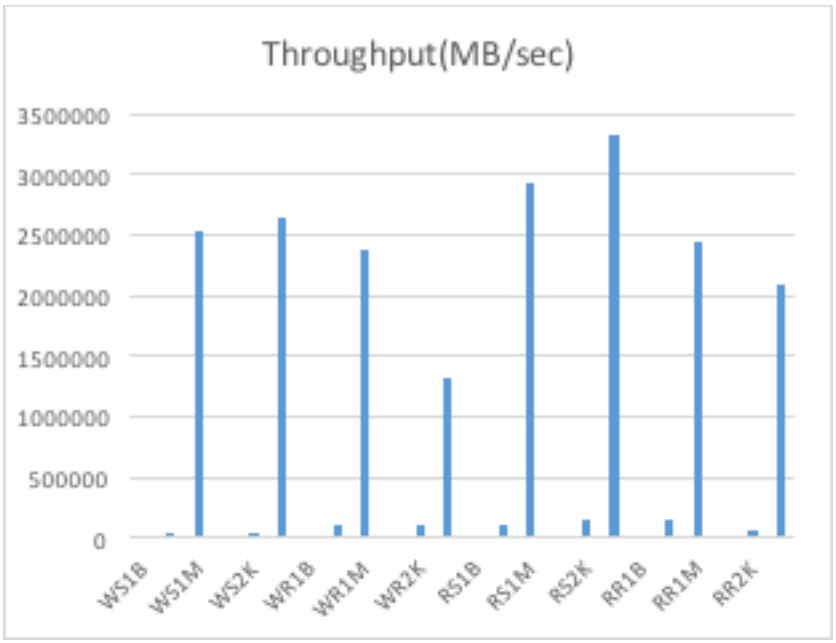


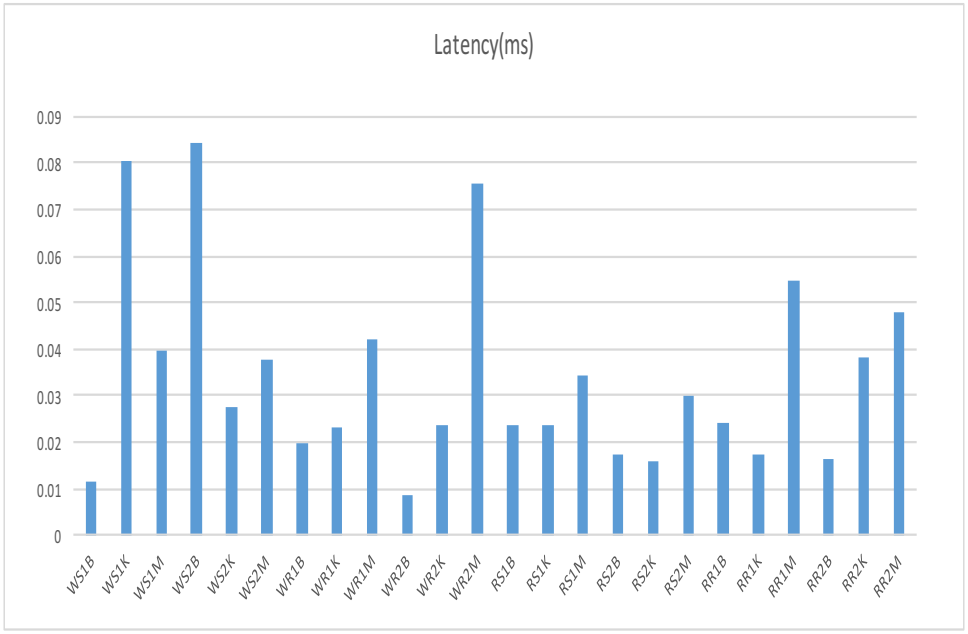
From the charts and table above, we can see that if we have 1M for the block size, the memory would have the biggest throughput, if we have 1B for the block size the memory would have the smallest throughput. In addition, compare the sequence and random, we found that random has a little bit bigger throughput. And the latency has a range between 1ms and 10^-1ms.

Disk benchmark

The benchmark measures the disk speed in the metrics of MB/sec for the throughput and seconds for the latency. I use the benchmark to implement the write and read every 1B, 1K and 1M block size of memory in 1 and 2 threads sequentially and randomly. I get the space of an array and copy the character from another array to the array sequentially and randomly.

W/R	Type	Threads	Block Size	NAME	Throughput(MB/sec)	Latency(ms)
Write	Sequence	1	B	WS1B	19.778481	0.01146
Write	Sequence	1	K	WS1K	28392.95855	0.0805
Write	Sequence	1	M	WS1M	2525252.525	0.0396
Write	Sequence	2	B	WS2B	29.59455	0.084475
Write	Sequence	2	K	WS2K	36363.636	0.0275
Write	Sequence	2	M	WS2M	2638522.714	0.0379
Write	Random	1	B	WR1B	125.944584	0.0198
Write	Random	1	K	WR1K	108732	0.02295
Write	Random	1	M	WR1M	2380952.542	0.042
Write	Random	2	B	WR2B	117.647059	0.0085
Write	Random	2	K	WR2K	105042.0588	0.0238
Write	Random	2	M	WR2M	1327140.013	0.07535
Read	Sequence	1	B	RS1B	80.809947	0.02385
Read	Sequence	1	K	RS1K	104821.8812	0.02385
Read	Sequence	1	M	RS1M	2923976.606	0.0342
Read	Sequence	2	B	RS2B	142.653352	0.017525
Read	Sequence	2	K	RS2K	158982.5119	0.015725
Read	Sequence	2	M	RS2M	3327787.022	0.03005
Read	Random	1	B	RR1B	103.950104	0.02405
Read	Random	1	K	RR1K	144092.219	0.01735
Read	Random	1	M	RR1M	2439024.39	0.0548
Read	Random	2	B	RR2B	15.10574	0.01655
Read	Random	2	K	RR2K	65703.02234	0.03805
Read	Random	2	M	RR2M	2096436.058	0.0477





From the charts and table above, we can see that if we have 1M for the block size, the disk would have the biggest throughput which is 10^7, if we have 1B for the block size the disk would have the smallest throughput which is 10^2 and the 1K for the throughput is about 10^5. And the Reading situation has a bigger throughput than Writing. In addition, the latency has a range between 10^-1ms and 10^-2ms.