Program Structures & Algorithms

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Assignment No. 3

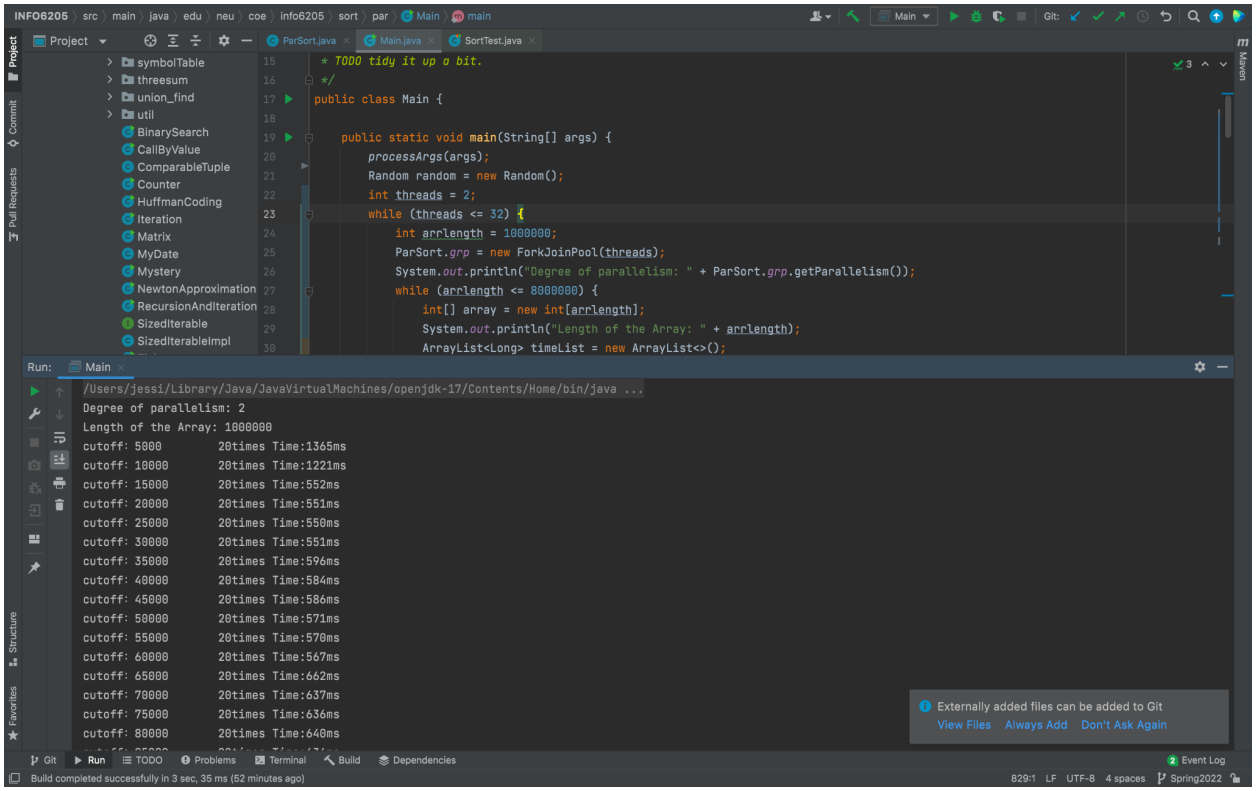
Name: Jashwanth Reddy Kamsani

(NUID): 002988299

Task:

1. Determine an ideal cutoff to sort an array with a large number of elements to sort.
2. Determine an ideal number of threads which restricts the depth of the recursion for sorting a huge array.
3. An appropriate combination of these which can be used for sorting a huge array.

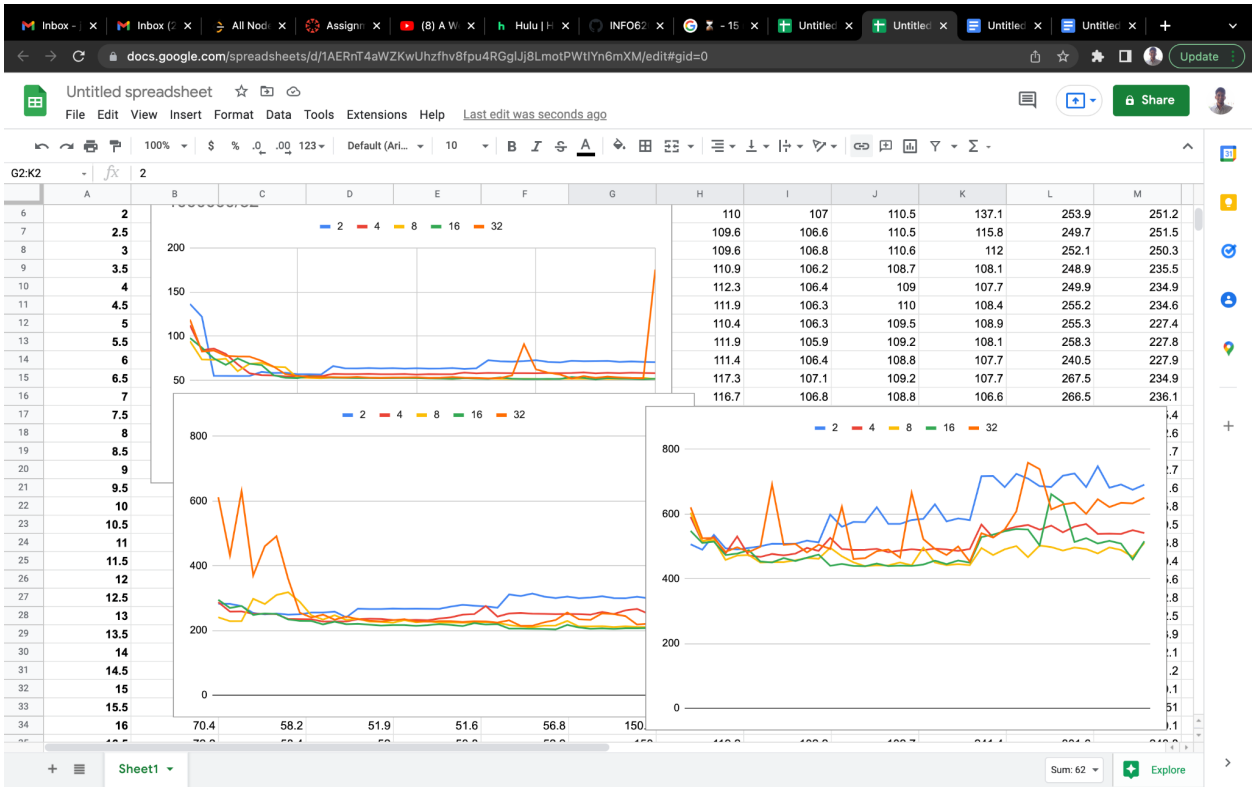
Output screenshot:



Conclusion:

For the arrays of relatively smaller size the thread count and cut off limit are not affecting the time. The times are relative to the size of the array. As the array size increases, time is getting proportional to the number of threads. The cutoff values are not affecting the times as long as they are above 0.5% of the array size.

Evidence / Graph:



Arr Length	1000000					2000000					4000000					8000000				
Cut-off/Threads	2	4	8	16	32	2	4	8	16	32	2	4	8	16	32	2	4	8	16	32
0.5	136.5	112.4	94.4	98	118.9	115.2	117.9	114.6	119.7	126.2	282.5	287.3	240.8	294.6	611.6	506.6	591.1	604.2	547.9	620.9
1	122.1	84.3	73.6	87	82.7	113	113.9	109.7	113	117.6	282.1	258.2	228.6	269.7	431.3	489.9	514.6	517.3	510.7	525.6
1.5	55.2	86.1	73.3	74.9	83.8	112.7	111.8	109.4	113.2	169.5	275.3	258.8	229	275.8	630.9	535.9	528.8	519.3	514.9	526.3
2	55.1	80	74.6	67.6	77.8	112.7	110	107	110.5	137.1	253.9	251.2	297.8	248.1	370	494.2	478.5	458.4	473.5	483.2
2.5	55	68.2	60.4	74.9	77.1	112.4	109.6	106.6	110.5	115.8	249.7	251.5	281.7	252.7	460.5	490.5	530.6	471.9	477.8	497.5
3	55.1	58	68.8	68.8	76.9	112.2	109.6	106.8	110.6	112	252.1	250.3	430 9.5	251	491.1	495.3	471.7	473.5	488.4	482.7

3.5	59.6	55.9	69.8	67.4	72.2	118	110.9	106.2	108.7	108.1	248.9	235.5	318.1	233.9	360.1	500.5	467.6	450.3	453.3	499
4	58.4	55.7	65.4	55.9	65.7	118.2	112.3	106.4	109	107.7	249.9	234.9	288.7	229.6	254.9	508.4	476.6	451.9	450.6	691.3
4.5	58.6	54.5	64.8	53	57.1	118.2	111.9	106.3	110	108.4	255.2	234.6	246.7	229.4	240	508	472.5	451.7	464	505
5	57.1	54.4	53.2	52.6	55.2	118.1	110.4	106.3	109.5	108.9	255.3	227.4	233.6	218.9	249	508.3	477.6	457.1	455.1	508
5.5	57	55.1	52.9	54.4	53.8	118.2	111.9	105.9	109.2	108.1	258.3	227.8	247.1	227.1	233.2	518.1	495.4	464.5	465	481.4
6	56.7	54.7	52.5	53.7	53.8	117.5	111.4	106.4	108.8	107.7	240.5	227.9	232.5	219.5	243.1	512.3	486.3	461.8	474.9	505.1
6.5	66.2	57.4	53.2	53	53.7	132.2	117.3	107.1	109.2	107.7	267.5	234.9	236.1	220.7	234.8	598.2	526.3	495.9	440.2	492.5
7	63.7	57.2	53.6	52.9	53.3	132.5	116.7	106.8	108.8	106.6	266.5	236.1	227.4	217.6	230.1	560.7	491.8	469.7	445.8	622.9
7.5	63.6	57.2	53.1	52.8	54	131.8	117.1	107.1	107.6	109.5	266.4	235.4	226.5	215.3	228	575.8	489.3	450.8	439.8	461.1
8	64	57.4	53.1	52.7	53.1	132.8	117.6	106.2	108	110.5	267.6	232.6	223.9	216.8	231.8	574.8	489.7	438.9	438.8	463.6
8.5	63.6	57	52.6	52.8	52.9	131.6	116.7	106.5	108.8	108.9	267.2	231.7	231.7	216.6	234.7	621.3	492.6	441.8	447.1	485
9	63.9	57	53	52.8	53.2	132	116.8	109.6	108.5	107	267.4	232.7	225.3	214.2	228.1	569.4	482.3	441.1	439	490.3
9.5	63.3	57.3	53.2	52.7	53.2	131	117.7	107.9	108.8	109.1	267	231.6	228.1	216.3	227.2	569.5	487.1	450.4	440.7	465.5
10	63.8	56.6	52.9	52.7	53.6	132.6	117.2	110.7	108.7	108.6	266.8	236.8	224.6	219.7	228.6	581.7	491.1	441.6	439.9	665.6
10.5	63.3	57.2	52.8	52.4	52.8	131.6	116.9	116	107.1	107.6	273.9	240.5	224.8	216.9	228.9	585.2	488.3	496.2	443.9	522.7
11	63.5	57	52.3	52.3	53	133.3	116.5	113.8	115.2	107.5	279.1	248.8	224.2	213.5	226	630.1	493.4	450.3	456.3	492.5
11.5	64	57	51.8	51.9	53.9	131.3	117.7	115.6	108.5	106.8	276.5	250.4	224.4	222.6	228.4	577.3	490.6	442.2	445.3	473.5
12	63	58.9	52.8	52.6	53	131.8	116.7	117.2	108.7	107.3	274.4	275.6	225.9	218.5	227.7	586.7	486.1	445.1	456.5	500.1
12.5	63.7	57.9	52.3	52.2	52.7	131.9	116.7	106.3	108	106.6	270.3	242.8	223.9	219.6	224.3	581.2	491.9	442.3	449.8	453.3
13	72.9	58.5	52.2	51.7	52.3	151.2	119.7	101.8	101.7	102.7	311.2	252.5	216.3	205.8	231.3	717	567.8	495.1	529	541
13.5	71.6	58.3	51.9	53.4	52.7	148.6	119.6	102.9	102.8	103.2	306.5	253.9	212.5	205.8	214.3	717.7	527.8	473.4	536.5	527.6
14	71.2	58.2	51.6	52	55.7	149.4	120	104.5	102.2	111.8	313.9	252.1	210	205.1	214.5	683.2	551.4	491.1	547	552.6
14.	71.	58.	51.	51.	91	149	119	102	102	113	304	251	214	204	224	724	560	501	554	608

5	8	1	9	5		.5	.6	.3	.3	.6	.8	.2	.9	.6	.9	.3	.9	.1	.1	.5
15	72.9	58	51.7	51.5	62.5	154	120.4	102.5	102.8	127.9	300.1	250.1	215.4	203.2	232.2	709.8	566.3	466.9	552.3	758.7
15.5	71	58.4	51.4	51.7	58.8	150.6	120.9	103	103.9	216.1	304.6	251	229.4	217.2	255.5	686.2	551.8	502.8	503.6	738.9
16	70.4	58.2	51.9	51.6	56.8	150.7	120	102.6	102.2	168.1	299.7	250.1	212.3	209.3	234.6	684	564.4	498.1	661.5	614.5
16.5	72.2	58.4	52	53.8	52.2	150	119.2	102.2	102.7	241.4	301.6	248.8	212.3	205.2	232.7	718.5	543.7	487.3	636	629.7
17	71.7	59.1	51.9	52.9	54.8	149.5	120.5	103.7	100.8	180.7	305.7	257.3	212.8	206.4	253.1	725.6	561.2	496.5	513.7	635.2
17.5	71.8	57.9	51.9	51	52.9	149.5	120.3	104.1	103.9	103.3	299.9	250.6	210.7	205	250.7	683.4	569.4	492	525.8	600.6
18	72	58.6	51.8	52.7	54.3	147.6	120	103.2	106.9	126.8	299.5	262.2	212.5	206.8	244.3	747.7	538.8	478.3	509	646
18.5	71	58.2	51.8	52.1	53.4	149.8	119.4	108	105.4	109.7	304.2	266.5	210.9	206.8	218.2	681.4	539.7	496.9	517.5	621.7
19	71.5	58.8	52.1	51.7	52.7	148.3	120.6	102.3	103.6	460 47	299	251.3	210.6	207.6	220.9	691.4	538.6	489	508.7	634.8
19.5	71	58.4	52.7	51.3	52.4	154.6	119.9	102.5	103	227.7	298.8	252.6	209.4	206.3	221.1	675	550.2	468.3	459.7	633.1
20	70.7	58.1	51.7	51.9	175.4	149.6	119.4	101.4	104.9	255.3	301.2	251	212.3	205.4	211.5	690.7	541.3	510.9	516	650.4