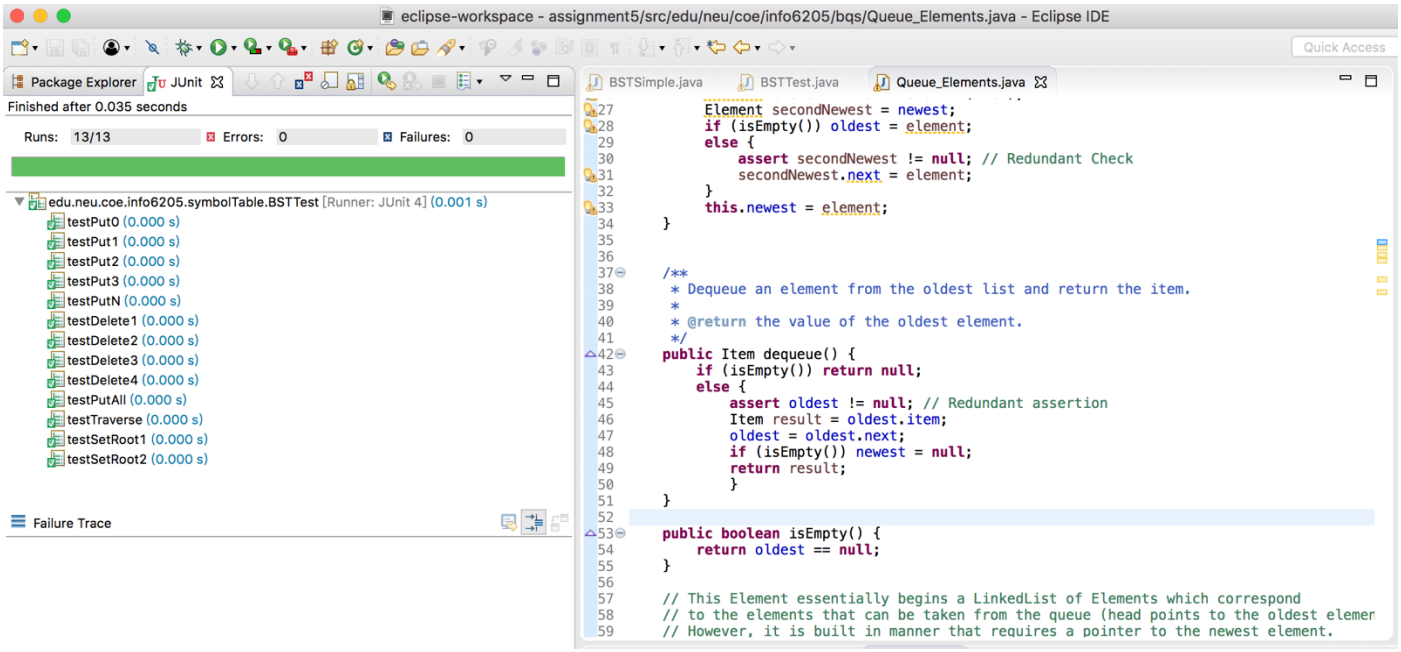
Test Cases: Eclips
Test



In this assignment, I ran the experiment for different number of nodes:
100, 1100, 2100, 3100, 4100, 5100, 6100, 7100, 8100, 9100, 11000
Adjust number of operation (number of inserts/deletions) and Key range for each experiments.

1. Experiment Result:

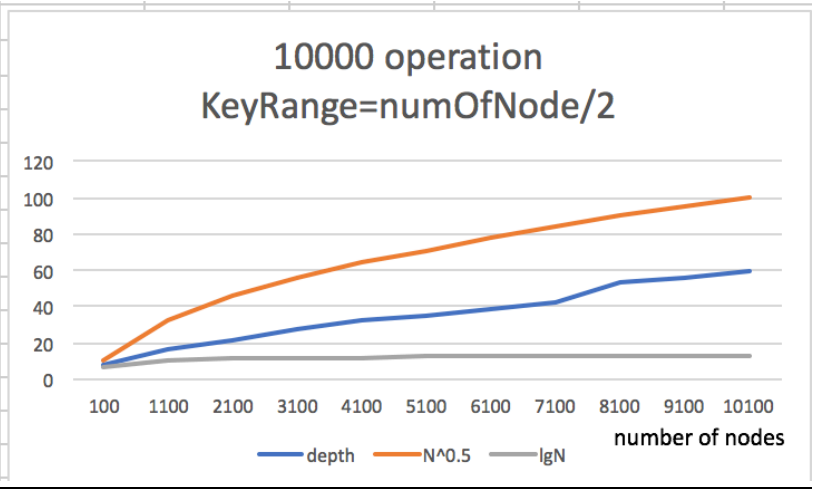
Some useful abbreviations:

- N – Number of nodes.
- depth – The largest depth of tree.

<u>Experiment 1: 10000 operations</u>

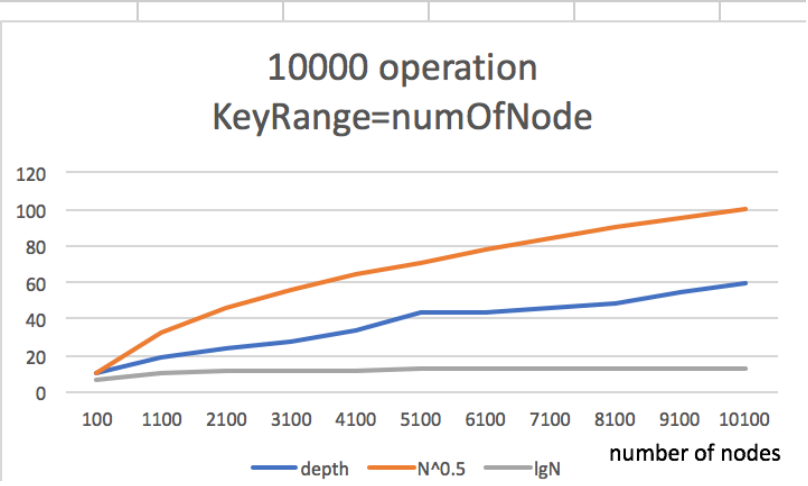
Key range= (number of node)/2

numberOfKey=num/2			
op10000	depth	N^0.5	lgN
100	8	10	6.64385619
1100	16	33	10.1032878
2100	22	46	11.0361736
3100	27	56	11.5980525
4100	32	64	12.0014082
5100	35	71	12.3162815
6100	39	78	12.5745935
7100	42	84	12.7936033
8100	53	90	12.9837062
9100	56	95	13.1516508
10100	60	100	13.3020677



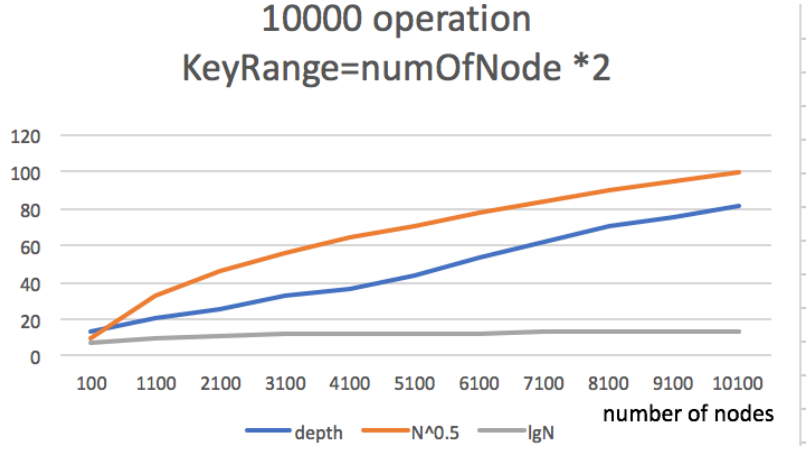
Key range= number of node

numberOfKey=num			
op10000	depth	N^0.5	lgN
100	10	10	6.64385619
1100	19	33	10.1032878
2100	24	46	11.0361736
3100	27	56	11.5980525
4100	34	64	12.0014082
5100	44	71	12.3162815
6100	43	78	12.5745935
7100	46	84	12.7936033
8100	49	90	12.9837062
9100	55	95	13.1516508
10100	60	100	13.3020677



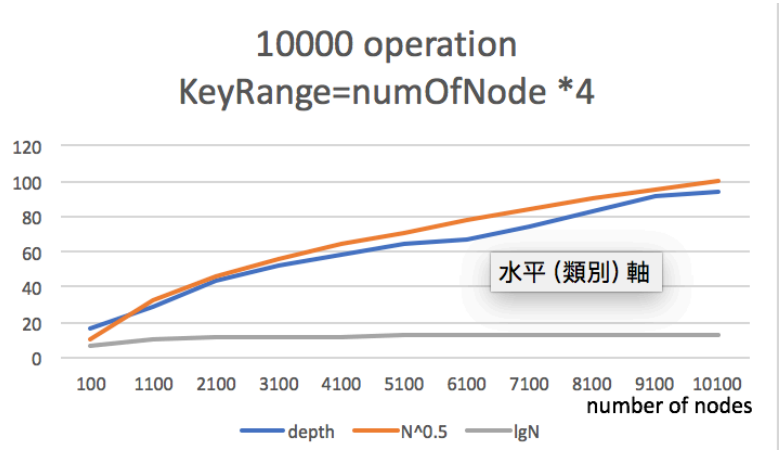
Key range= (number of node)*2

numberOfKey=num*2			
op10000	depth	N^0.5	lgN
100	13	10	6.64385619
1100	21	33	10.1032878
2100	26	46	11.0361736
3100	33	56	11.5980525
4100	36	64	12.0014082
5100	44	71	12.3162815
6100	53	78	12.5745935
7100	62	84	12.7936033
8100	71	90	12.9837062
9100	76	95	13.1516508
10100	82	100	13.3020677



Key range= (number of node)*4

numberOfKey=num*4			
op10000	depth	N^0.5	lgN
100	16	10	6.64385619
1100	29	33	10.1032878
2100	43	46	11.0361736
3100	52	56	11.5980525
4100	59	64	12.0014082
5100	65	71	12.3162815
6100	67	78	12.5745935
7100	74	84	12.7936033
8100	83	90	12.9837062
9100	92	95	13.1516508
10100	94	100	13.3020677



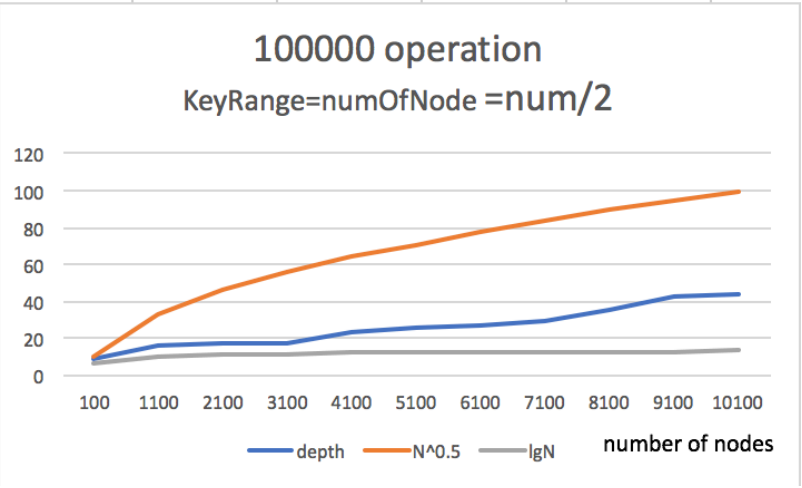
In this experiment, we can conclude that when key range is small, the largest depth of tree will close to lgN.

When the key range is more than twice of number of node, the depth line will close to N^0.5.

Experiment 2: 100000 operations

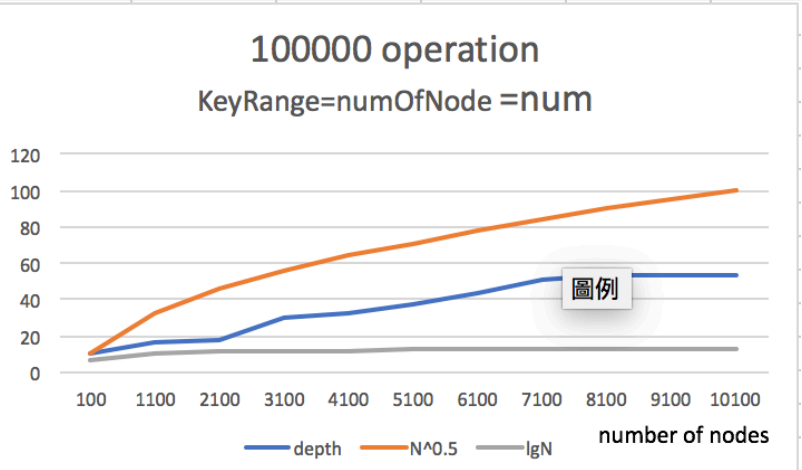
Key range= (number of node)/2

numberOfKey=num/2			
op100000	depth	N^0.5	lgN
100	9	10	6.64385619
1100	16	33	10.1032878
2100	17	46	11.0361736
3100	18	56	11.5980525
4100	23	64	12.0014082
5100	26	71	12.3162815
6100	27	78	12.5745935
7100	29	84	12.7936033
8100	35	90	12.9837062
9100	43	95	13.1516508
10100	44	100	13.3020677



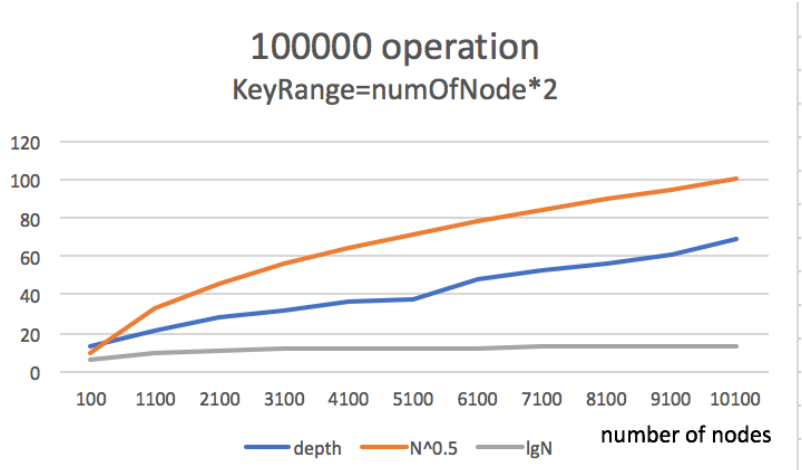
Key range= number of node

numberOfKey=num			
op100000	depth	N^0.5	lgN
100	10	10	6.64385619
1100	17	33	10.1032878
2100	18	46	11.0361736
3100	30	56	11.5980525
4100	32	64	12.0014082
5100	38	71	12.3162815
6100	43	78	12.5745935
7100	51	84	12.7936033
8100	54	90	12.9837062
9100	54	95	13.1516508
10100	54	100	13.3020677



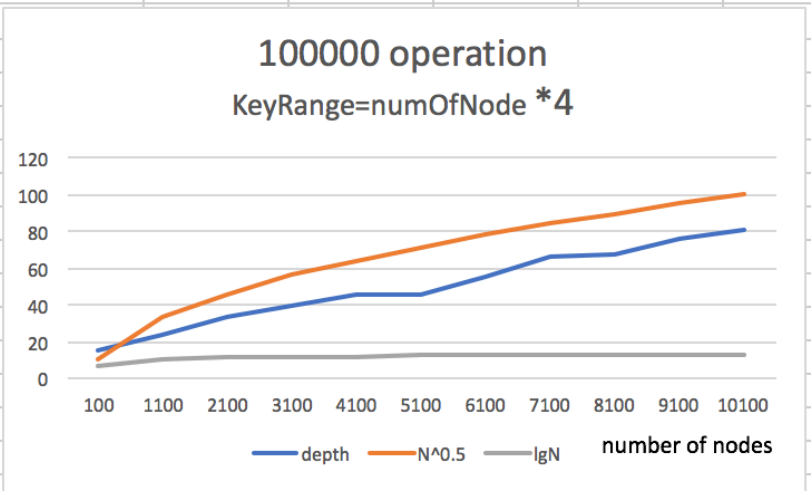
Key range= (number of node)*2

numberOfKey=num*2			
op100000	depth	N^0.5	lgN
100	13	10	6.64385619
1100	21	33	10.1032878
2100	28	46	11.0361736
3100	32	56	11.5980525
4100	37	64	12.0014082
5100	38	71	12.3162815
6100	48	78	12.5745935
7100	53	84	12.7936033
8100	56	90	12.9837062
9100	61	95	13.1516508
10100	69	100	13.3020677



Key range= (number of node)*4

numberOfKey=num*4			
op100000	depth	N^0.5	lgN
100	15	10	6.64385619
1100	24	33	10.1032878
2100	34	46	11.0361736
3100	39	56	11.5980525
4100	45	64	12.0014082
5100	46	71	12.3162815
6100	55	78	12.5745935
7100	66	84	12.7936033
8100	68	90	12.9837062
9100	76	95	13.1516508
10100	81	100	13.3020677



The same trend with experiment 1.

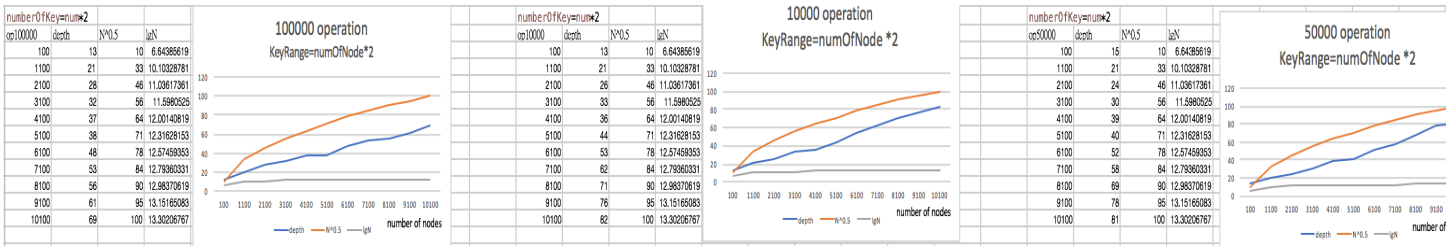
In this experiment, we can still also conclude that when key range is small, the largest depth of tree will close to lgN.

When the key range is more than twice of number of node, the depth line will close to N^0.5.

When we did more operation, the depth will smaller than the depth of less operation, that mean the depth line will more close to lgN. (compare with less operation)

Experiment 3: Compare different operations

We assume that Key range are all equal (number of node)*2.



In this experiment, we compare different operation, we can see that the more operations(100000) we did, the depth line will be more close to lgN.

When we did 1000 operation and 5000 operations, the depth line almost same, that means more close to N^0.5.

Conclusion:

When operations is 100000, the depth line will more close to lgN. (compare to 10000 opearations)

When the operations is less than 100000 and above 10000, the depth line will more close to N^0.5.

When the Key range is relatively small, the depth line will close to lgN, and when we increase the Key range, the depth line will stay away from lgN that mean close to N^0.5.