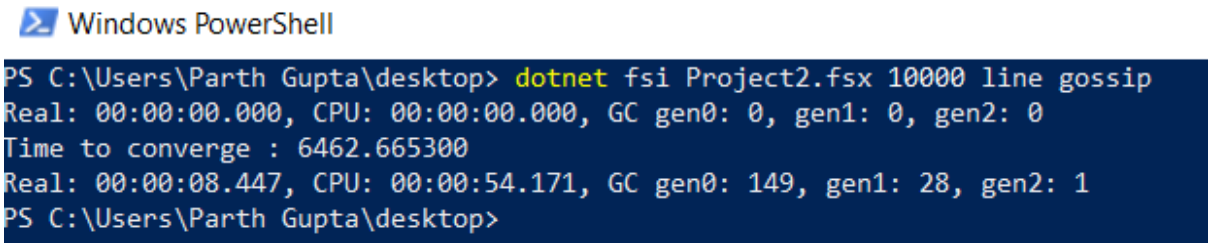
COP5615 - Distributed Operating System Principles

Project 2 – Gossip Simulator

Submitted By: Parth Gupta, UFID: 91997064

Sample Output

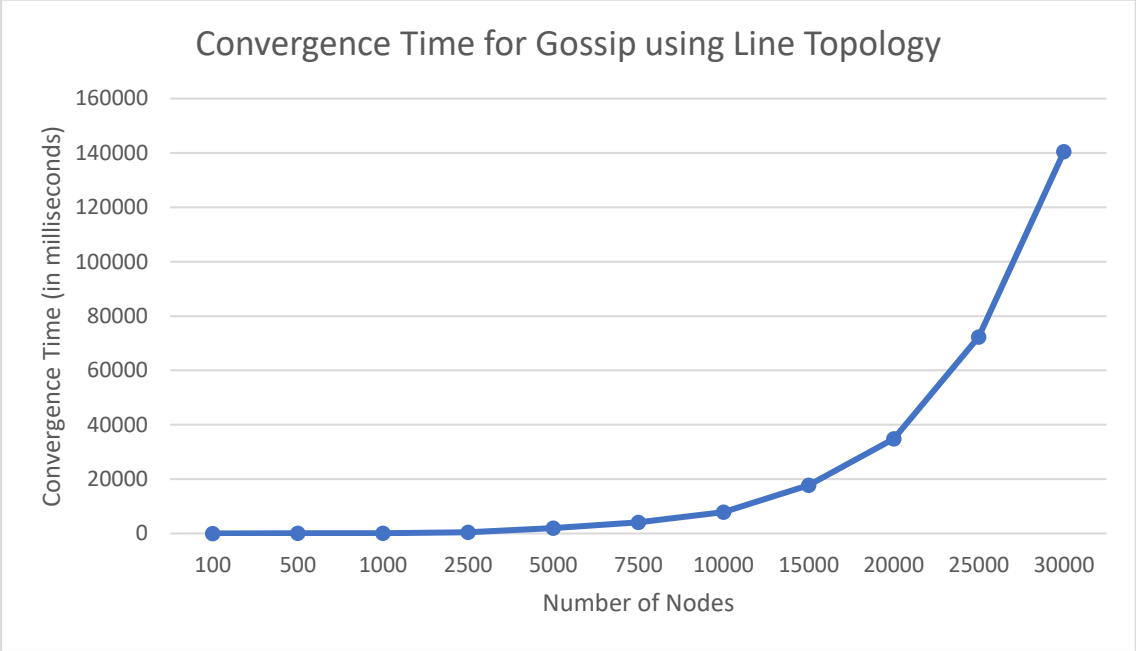


The dependency of convergence time as a function of the size of the network.

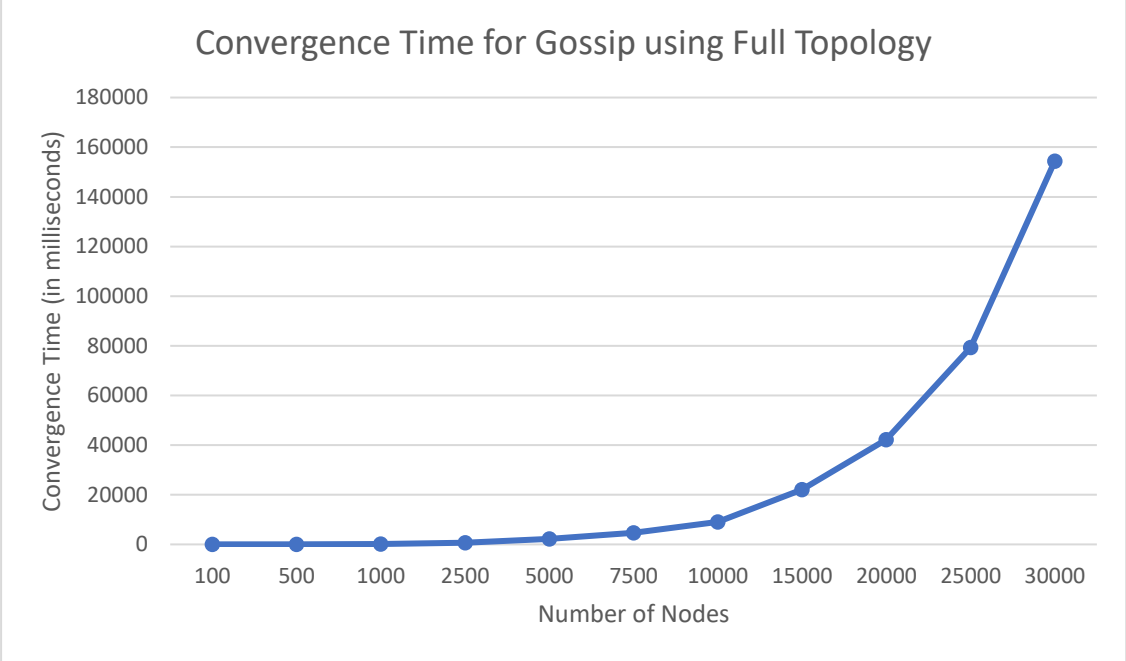
- **Gossip Algorithms**

Number of Nodes	Line	Full	3D	Imp 3D
100	11.4682	11.9193	9.5979	9.124
500	39.9342	35.0335	34.9524	33.3159
1000	74.1518	113.7208	68.1499	74.1591
2500	468.0404	697.3609	494.4086	561.9959
5000	1972.4765	2171.22	2321.2368	2483.9599
7500	4086.4125	4706.5801	4281.9718	4420.8218
10000	7818.2977	9060.2626	7675.3966	7866.1434
15000	17742.3912	22083.7586	16732.5396	17077.5304
20000	34822.322	42184.4302	36155.1023	36566.4919
25000	72276.6803	79363.8767	63410.9363	62600.527
30000	140443.7874	154370.8609	117377.9906	111530.5079
40000	-	-	261191.9953	246596.9607
50000	-	-	438514.3026	400532.4017
60000	-	-	713041.9178	768455.8883

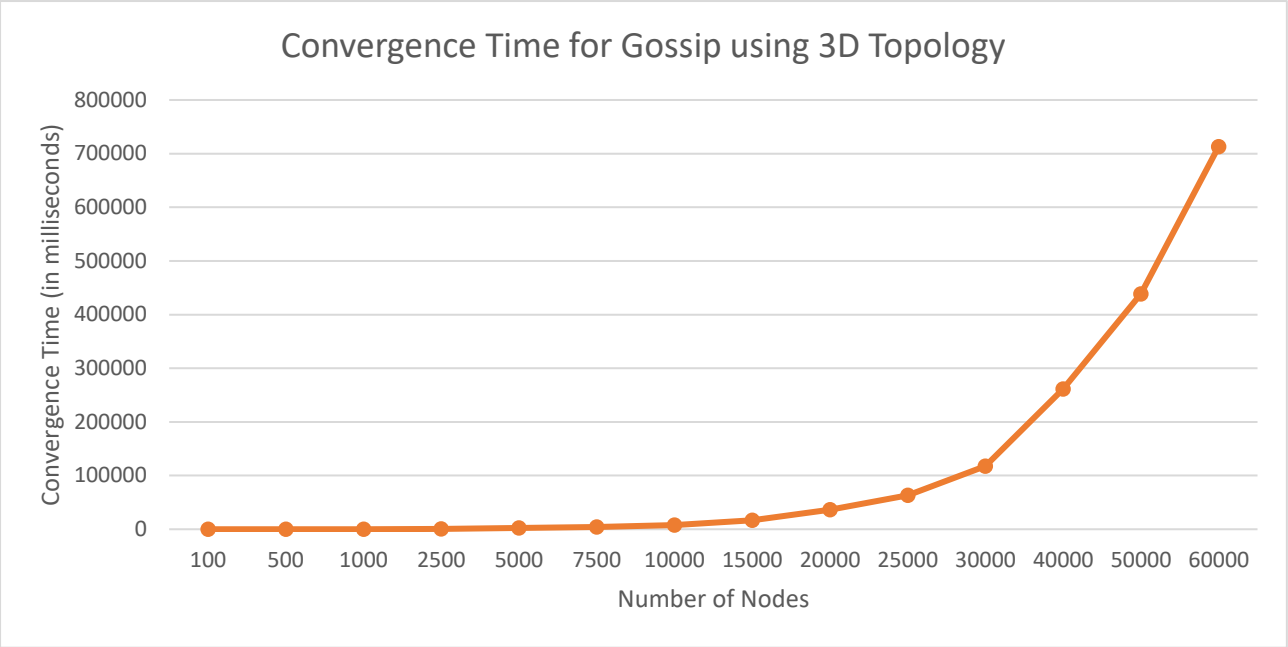
1) **Algorithm: Gossip**
Topology: Line



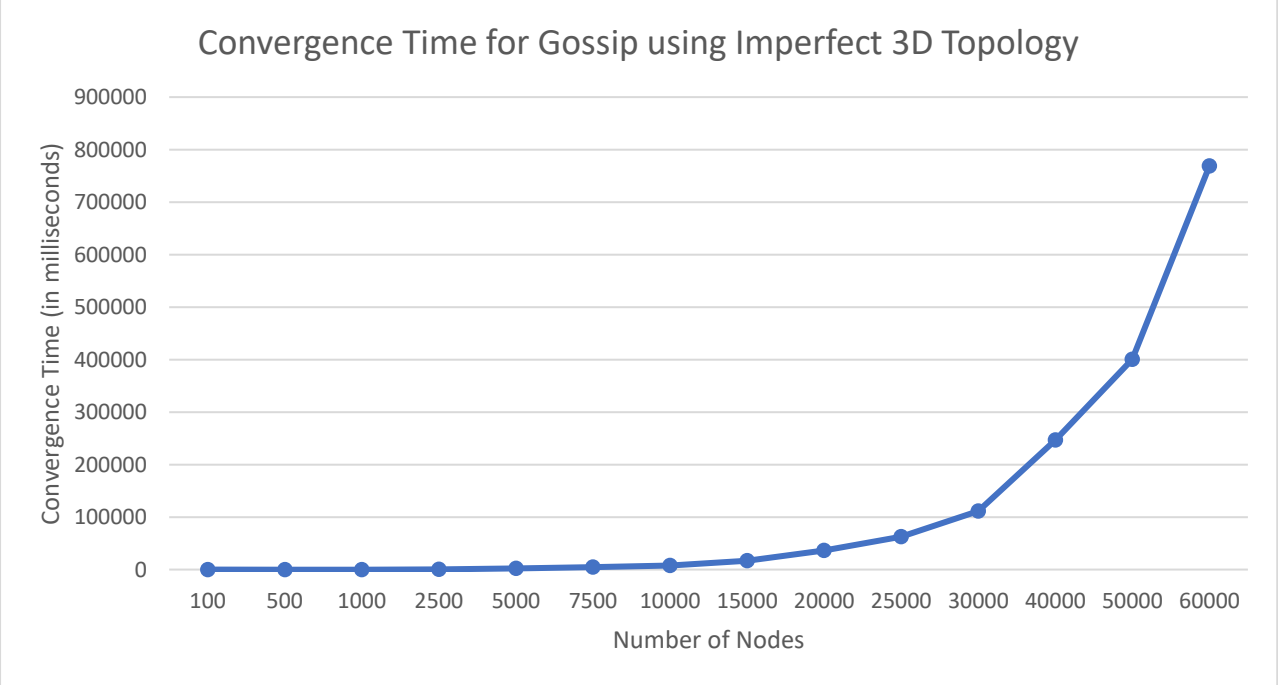
2) **Algorithm: Gossip**
Topology: Full

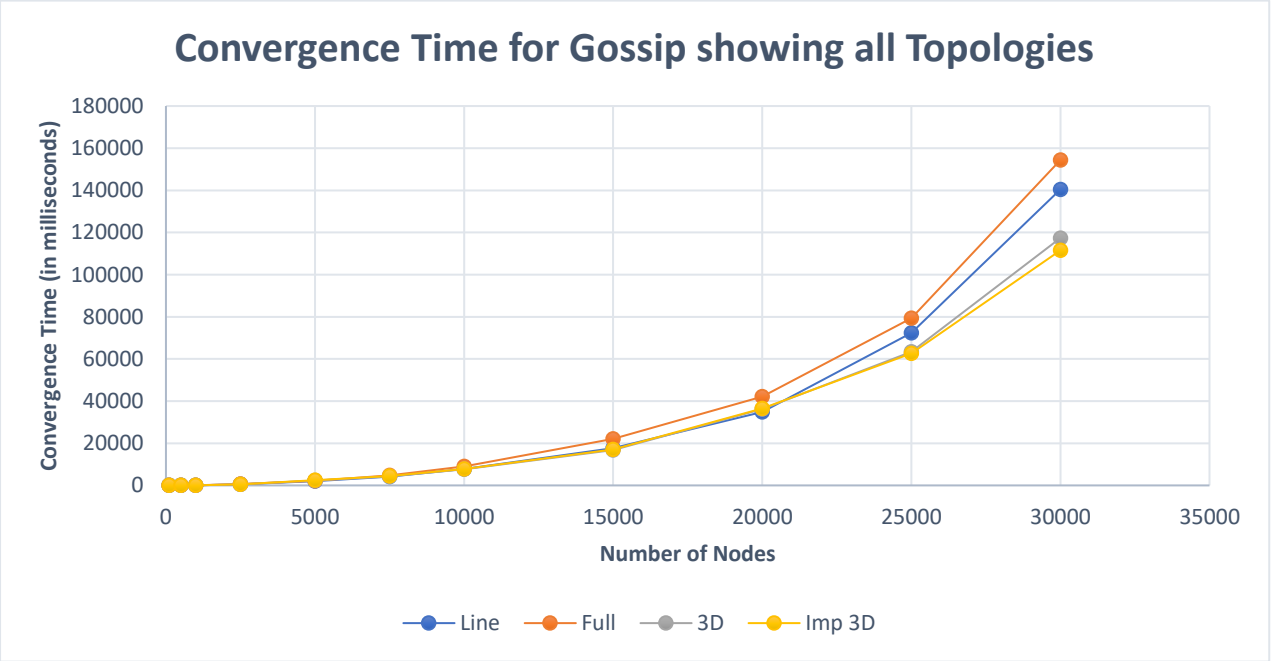


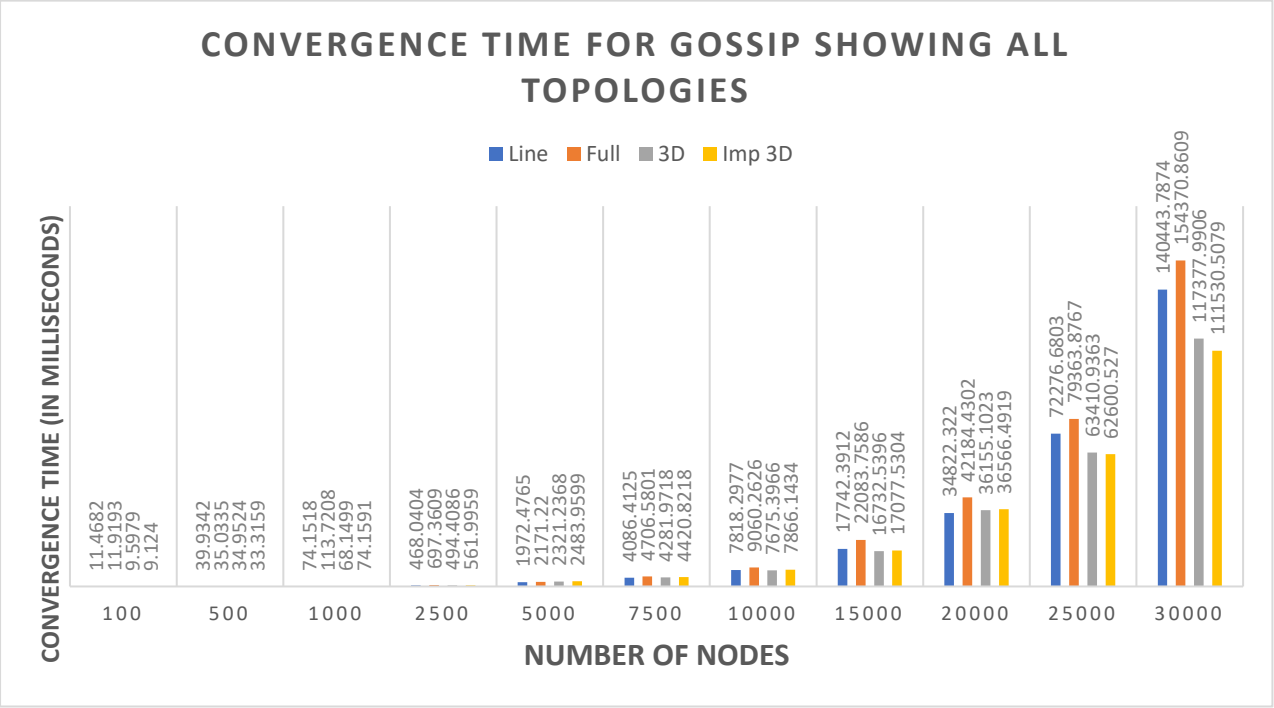
3) **Algorithm: Gossip**
Topology: 3D



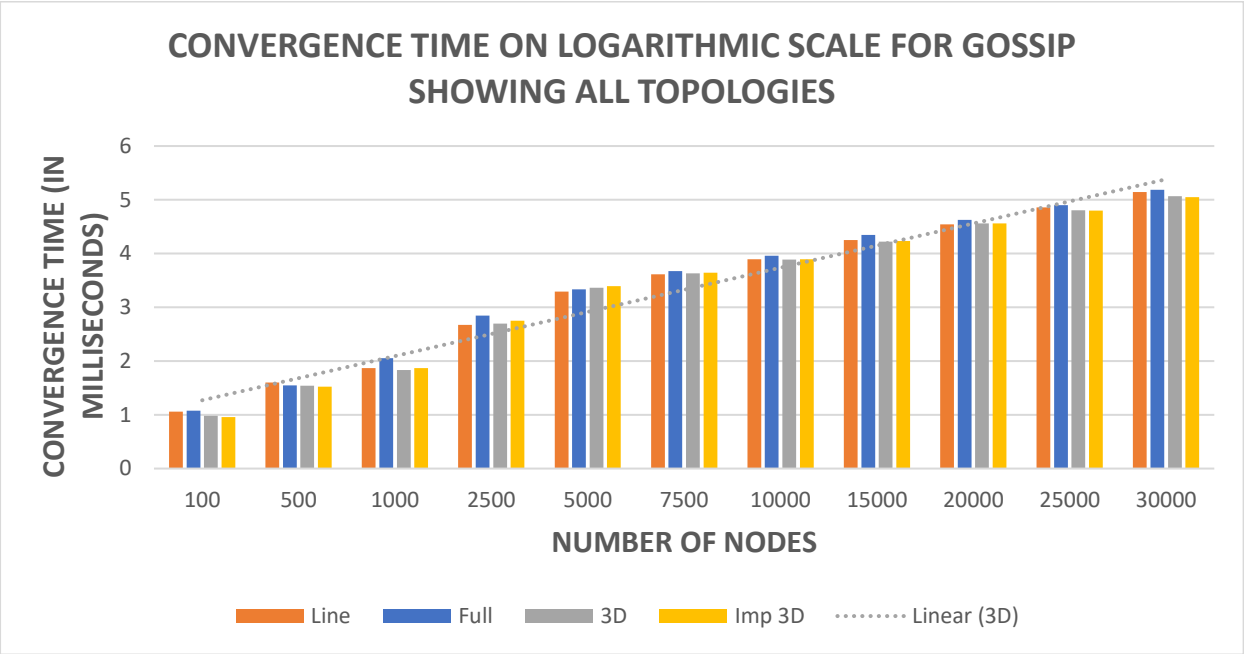
4) **Algorithm: Gossip**
Topology: Imperfect 3D




Convergence Time for Gossip showing all Topologies
Convergence Time (in milliseconds)
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
0
5000
10000
15000
20000
25000
30000
35000
Number of Nodes
Line
Full
3D
Imp 3D


CONVERGENCE TIME FOR GOSSIP SHOWING ALL TOPOLOGIES
Line
Full
3D
Imp 3D
CONVERGENCE TIME (IN MILLISECONDS)
11.4682
11.9193
9.5979
9.124
39.9342
35.0335
34.9524
33.3159
74.1518
113.7208
68.1499
74.1591
468.0404
697.3609
494.4086
561.9959
1972.4765
2171.22
2321.2368
2483.9599
4086.4125
4706.5801
4281.9718
4420.8218
7818.2977
9060.2626
7675.3966
7866.1434
17742.3912
22083.7586
16732.5396
17077.5304
34822.322
42184.4302
36155.1023
36566.4919
72276.6803
79363.8767
63410.9363
62600.527
140443.7874
154370.8609
117377.9906
111530.5079
100
500
1000
2500
5000
7500
10000
15000
20000
25000
30000
NUMBER OF NODES

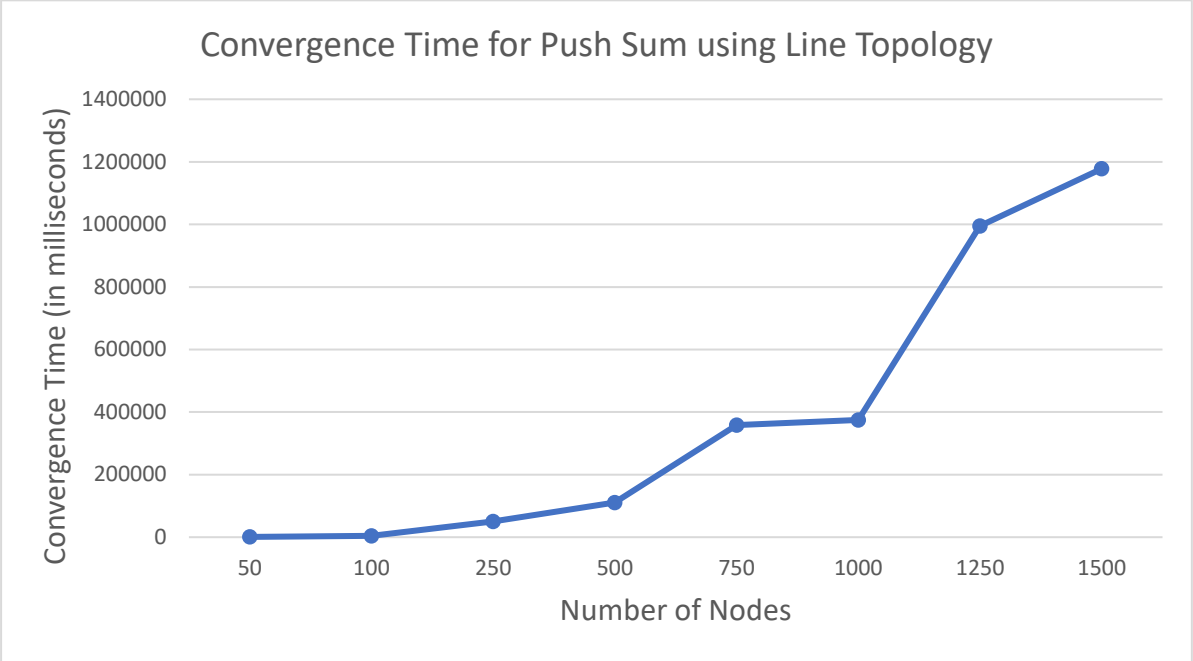
Gossip Logarithmic Scale



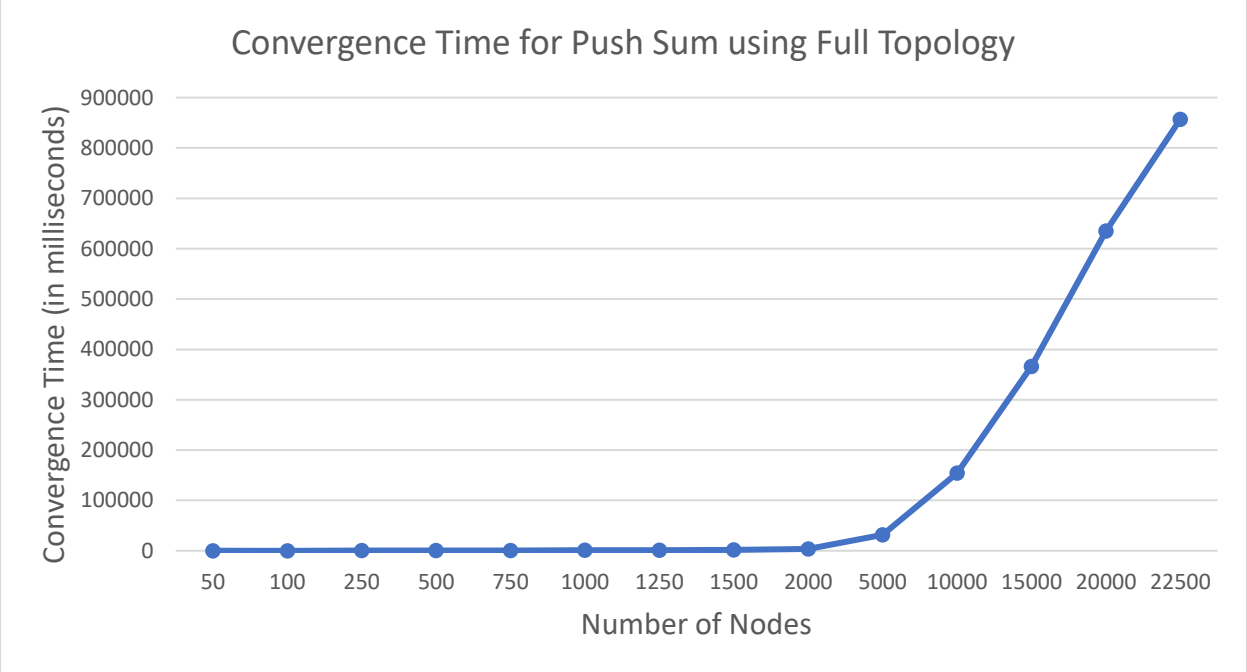
➢ Push Sum Algorithms

Number of Nodes	Line	Full	3D	Imp 3D
50	935.7908	22.6579	81.4929	48.1735
100	4793.5103	42.6876	250.9523	120.3985
250	50609.1861	132.8099	1257.9662	429.8097
500	111071.2481	262.2191	3510.1355	766.9905
750	358370.0479	513.3222	11157.034	2169.3974
1000	374815.7801	822.8763	12327.7259	2219.2776
1250	994582.1333	1243.7689	24744.7575	4833.3028
1500	1177774.758	1806.0699	55512.9292	6058.1887
2000	-	3778.8386	120472.9800	12542.4268
5000	-	31685.5507	-	168121.9889
10000	-	154312.196	-	534266.7895
15000	-	365767.7409	-	-
20000	-	635104.6993	-	-
22500	-	856802.0157	-	-

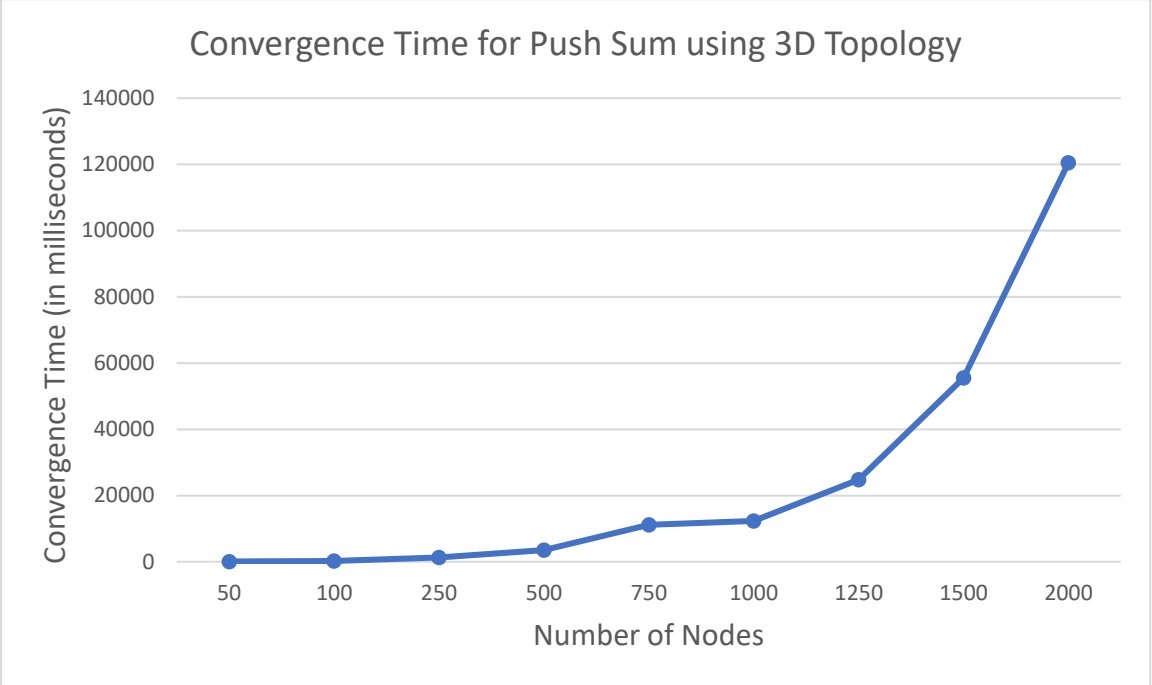
1) **Algorithm: Push Sum**
Topology: Line



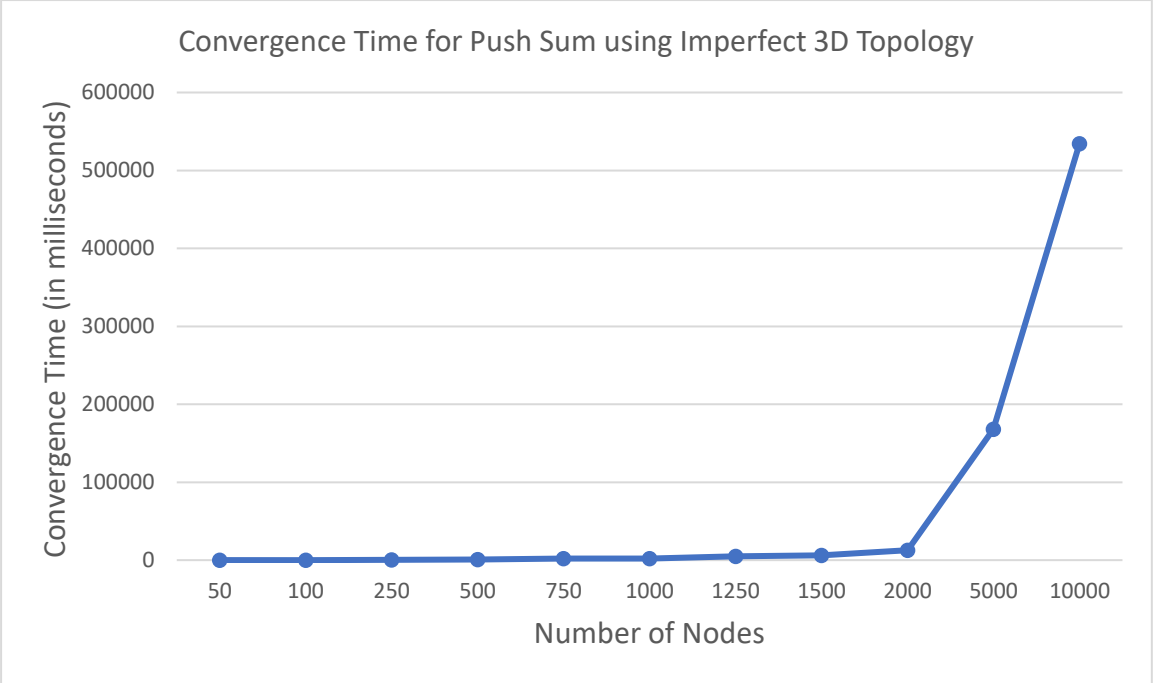
2) **Algorithm: Push Sum**
Topology: Full

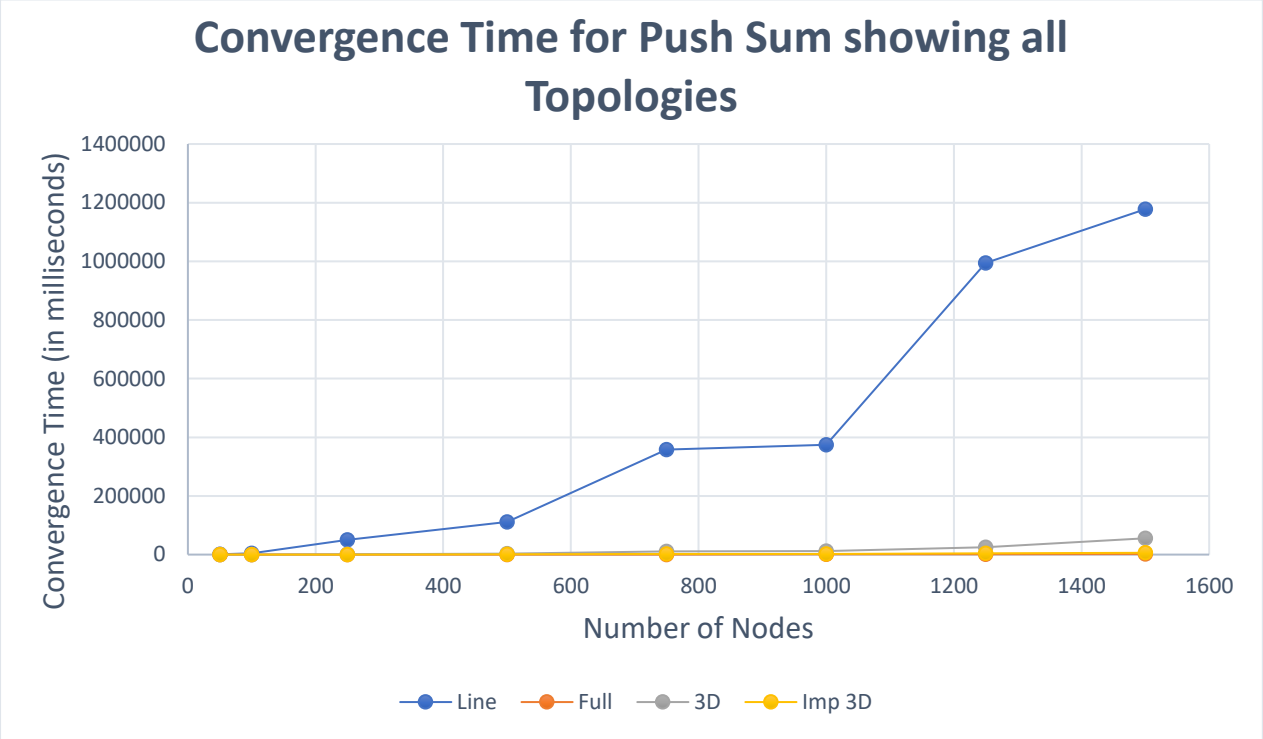


3) **Algorithm: Push Sum**
Topology: 3D

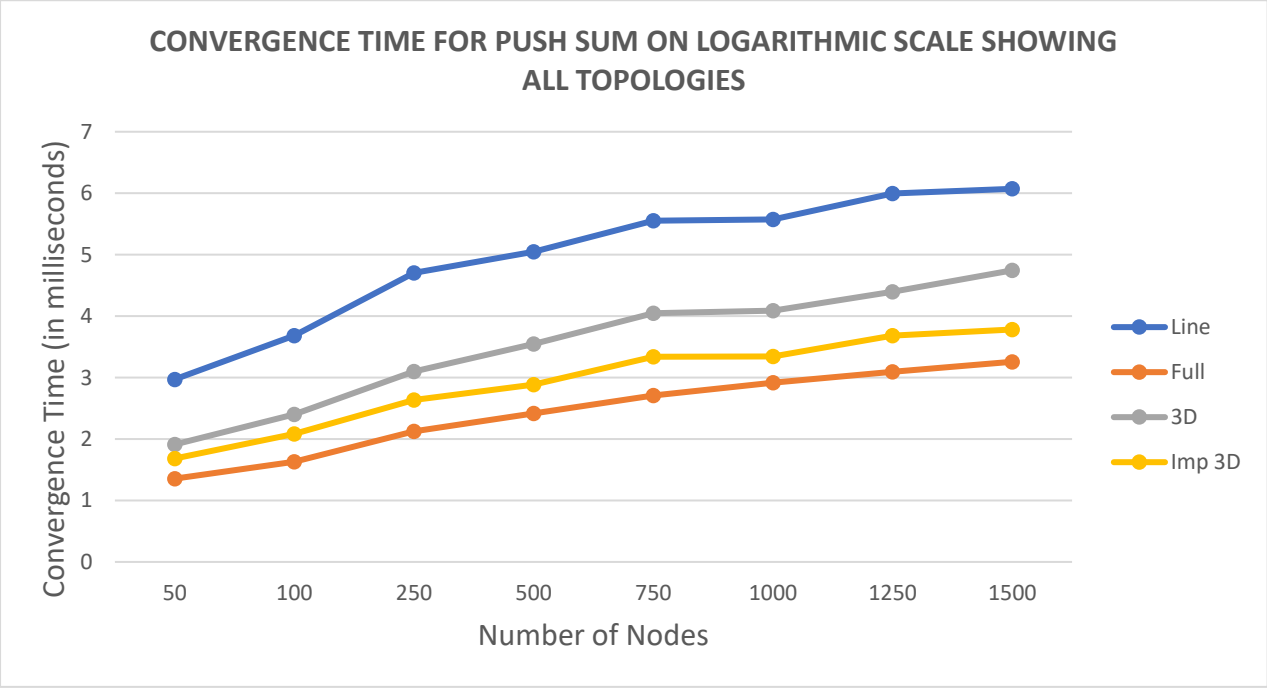


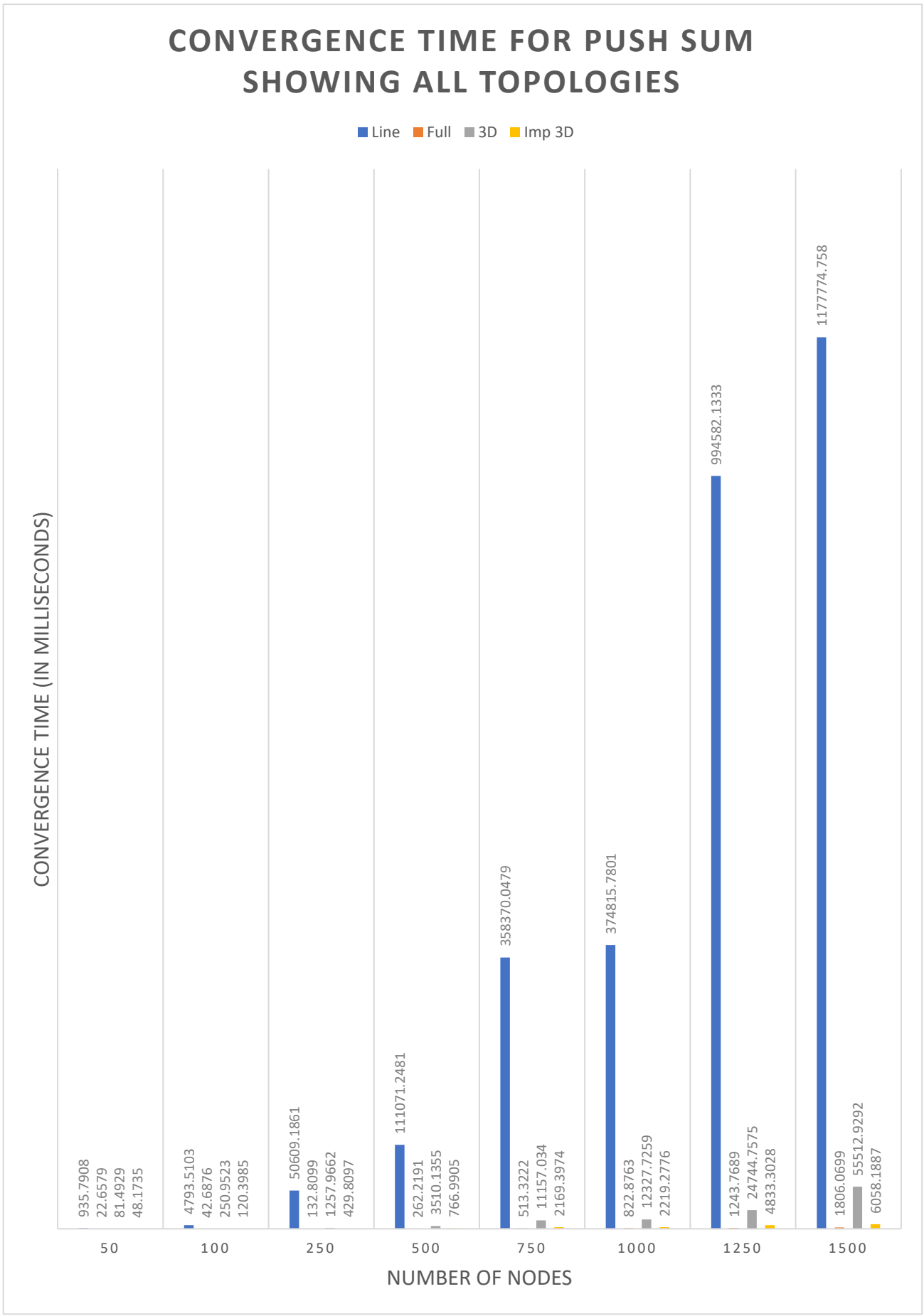
4) **Algorithm: Push Sum**
Topology: Imperfect 3D





Push Sum Logarithmic Scale




CONVERGENCE TIME FOR PUSH SUM SHOWING ALL TOPOLOGIES
Line
Full
3D
Imp 3D
CONVERGENCE TIME (IN MILLISECONDS)
935.7908
22.6579
81.4929
48.1735
4793.5103
42.6876
250.9523
120.3985
50609.1861
132.8099
1257.9662
429.8097
111071.2481
262.2191
3510.1355
766.9905
358370.0479
513.3222
11157.034
2169.3974
374815.7801
822.8763
12327.7259
2219.2776
994582.1333
1243.7689
24744.7575
4833.3028
1177774.758
1806.0699
55512.9292
6058.1887
50
100
250
500
750
1000
1250
1500
NUMBER OF NODES

Observations

➢ Gossip Algorithm:

- In Gossip type protocol, I found that the convergence time for all the topologies was very similar when the number of nodes in the network was less than 15000.
- When I increase the number of nodes beyond 15000 the time taken by Full topology increases by a big amount as compared to other topologies in the network.
- I also observe that the time to converge increased exponentially for Line and Full topologies after (10000 nodes) and for 3D and Imp 3D topologies after (15000 nodes).
- In my findings I observe that Imperfect 3D topology has taken the lowest time to converge.
- Time To Converge (Full > Line > 3D > Imp 3D) [After 25000 nodes].

➢ Push Sum Algorithm:

- In Push Sum type protocol, I found that the convergence time of the Line topology was much longer than all the other topologies in the network.
- I also found that the Full topology took the least time to converge.
- I also observed that after 2000 nodes in the Imperfect 3D network the time taken to converge increased rapidly.
- Even the largest network for Full Topology (22500) took less time that the largest network of Line topology (1500).
- Time to Converge (Line > 3D > Imp 3D > Full).