Gossip Project Report

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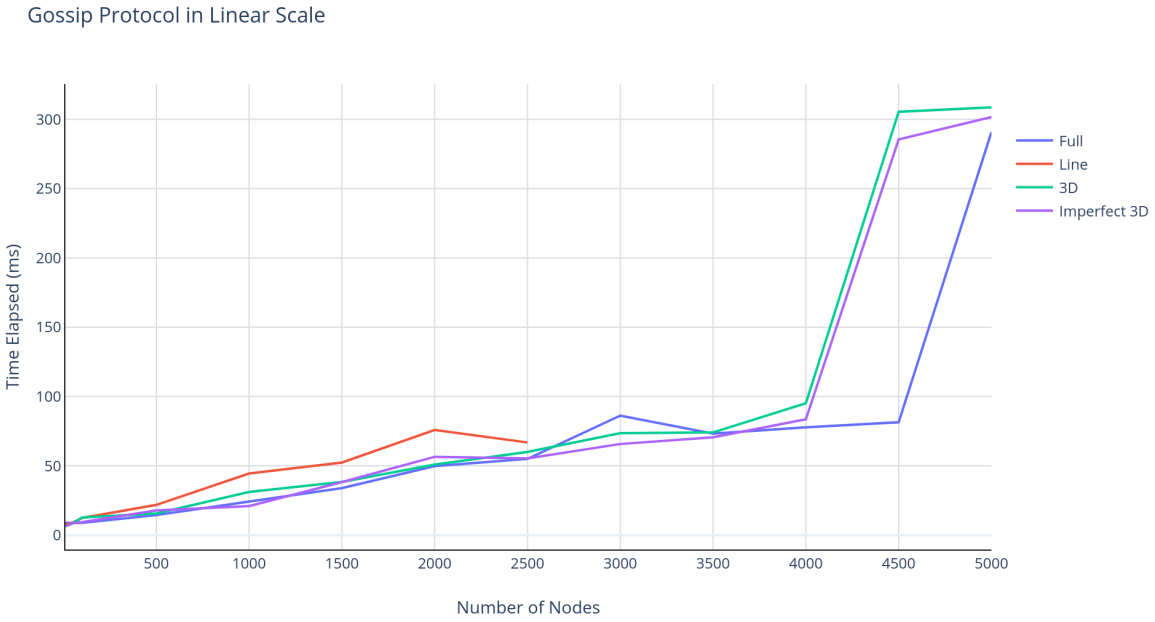
1 Curves and Findings

Line graphs showing the trends for an algorithm are attached below. Runtime vs Number of Nodes has been plotted for each type of algorithm. Each algorithm has two graphs, one in the 'linear' scale and the other in the 'log' scale. Each graph has 4 traces depicting each topology. This facilitates comparison of their runtime for each algorithm.

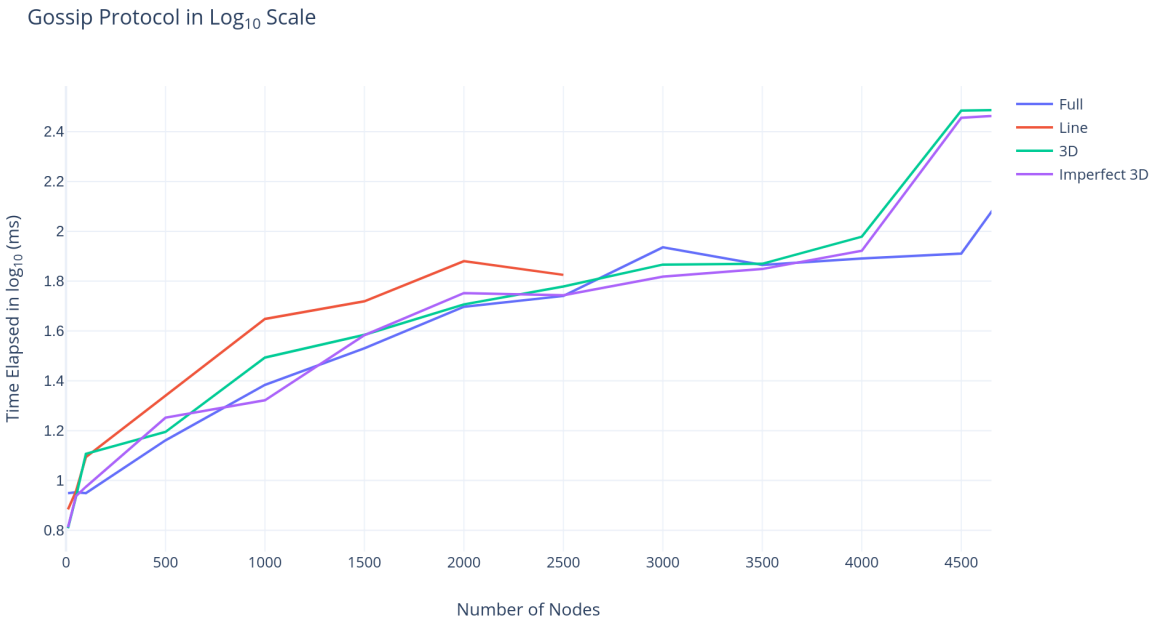
- Full topology gives the least running time when compared to others. This is because each node is connected to all other nodes which allows lot of messages to be passed. This helps in faster convergence of all the nodes in the system.
- Line topology takes the most time to converge when compared to others. Each node in the Line topology is connected to at most 2 neighbors which reduces the probability of messages being received by a node, thus delaying it's convergence. It is logical that it will have the worst runtime which is also depicted in the graph.
- 3D topology has 6 neighbors and so its time of convergence is more than the Full topology.
- Imperfect 3D with 7 neighbors have comparable time of convergence to 3D topology. However, due to one extra neighbor it sometimes takes less time to converge than the 3D topology.

1.1 Gossip Algorithm in Linear Scale



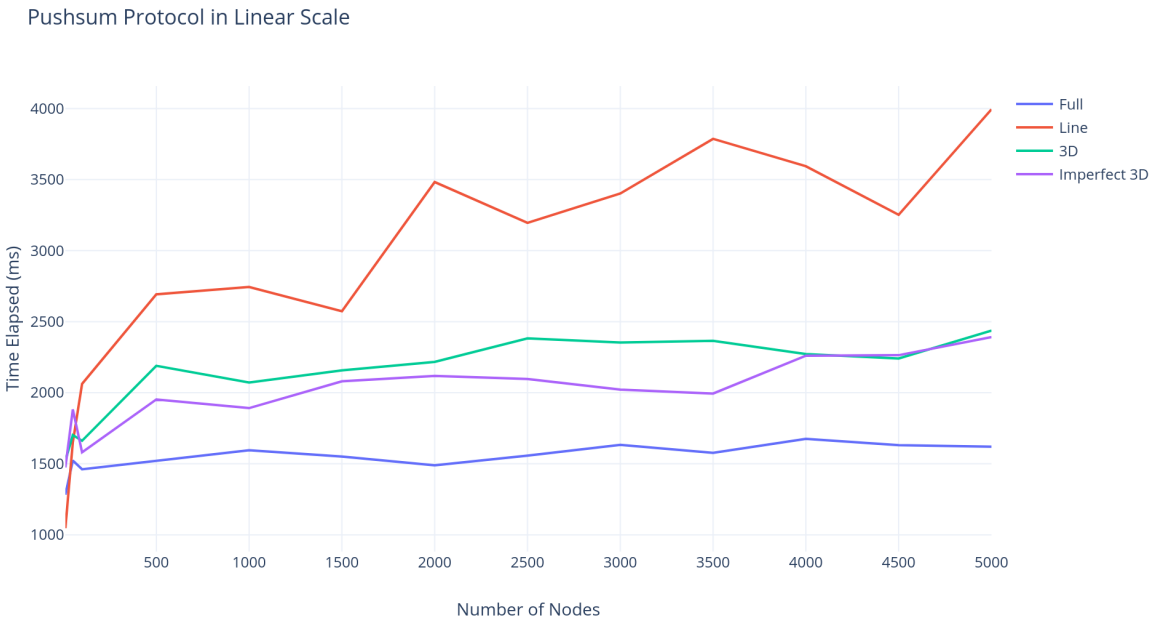
- Line did not converge for nodes greater than 2500.
- Convergence time were comparable till number of nodes = 4000. After 4000 nodes differences in time required for convergence started showing.

1.2 Gossip Algorithm in Log Scale



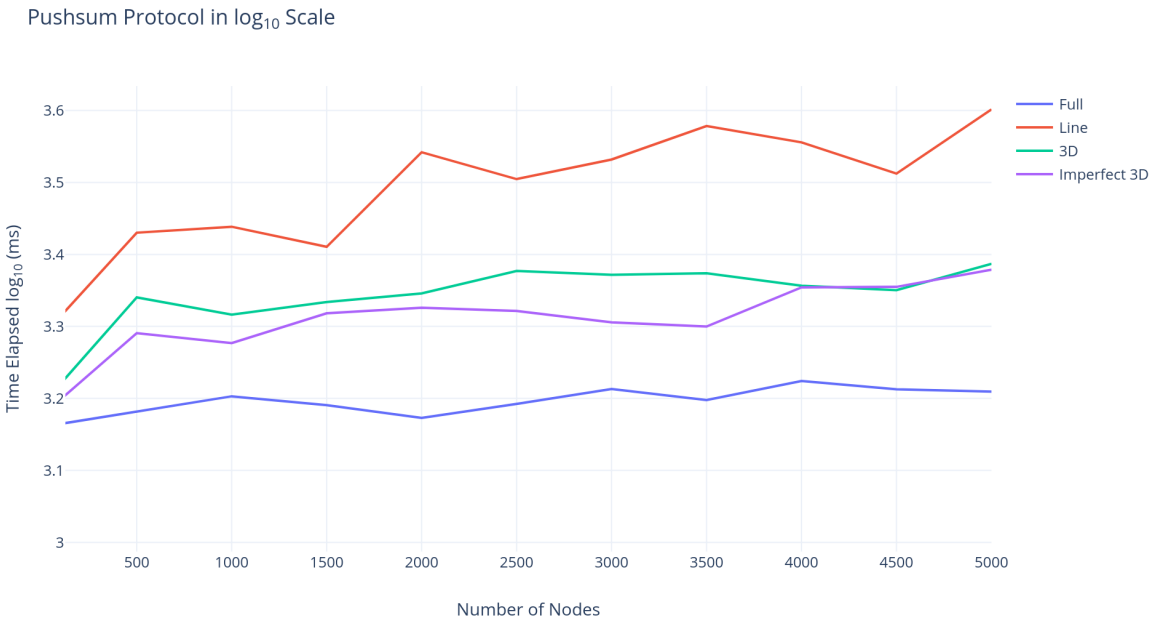
- This is the above graph in logarithmic scale.

1.3 Push-Sum Algorithm in Linear Scale



- The differences in runtime of push-sum algorithm for various topology is quite prominent and follows the previous observations.

1.4 Push-Sum Algorithm in Log Scale



- The above graph for push-sum in logarithmic scale is shown.

2 Interesting Findings based on Experiments

- Based on the above graphs we can conclude that Line is the worst performing topology no matter the algorithm.
- Full is the best performing topology.
- Convergence in push-sum is achieved with minor deviations from the average of the sum. If we increase the number of consecutive rounds for which sum/weight change is less that 10^{-10} from 3 to 15, the sum/weight value for every node converges at the average value of the sums of all nodes with high accuracy.
- Building the Full topology is memory extensive. As each node has all other nodes as its neighbor. Running Full on 10k nodes is slow because of the topology buildup.