

Project 2 Gossip Simulator

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Graph for Gossip algorithm:

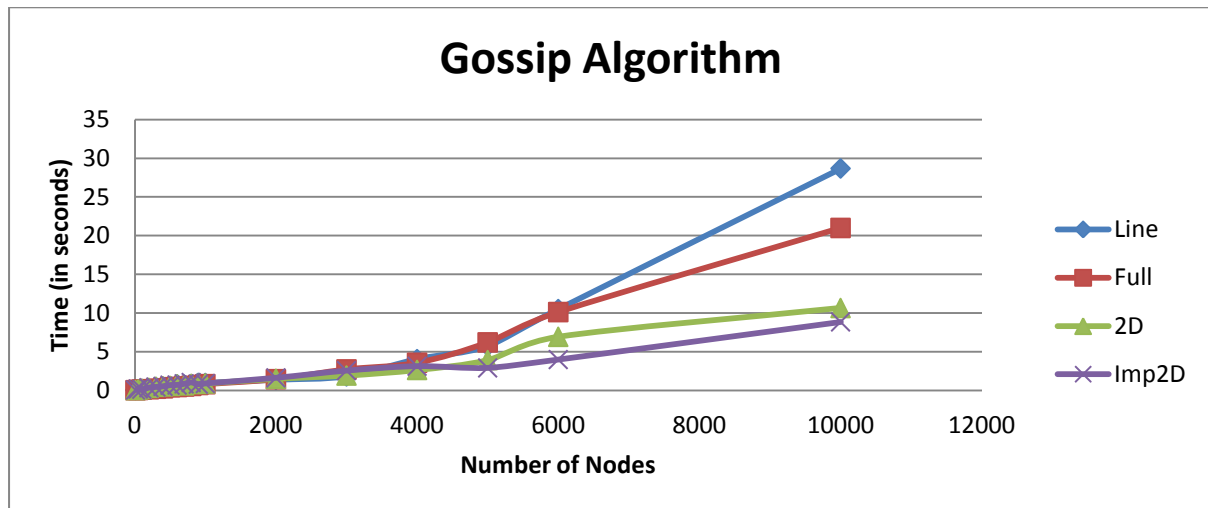


Table of data:

Nodes	Line	Full	2D	imp2D
10	0.059	0.024	0.048	0.061
50	0.153	0.061	0.125	0.188
100	0.201	0.107	0.196	0.148
200	0.258	0.158	0.331	0.35
300	0.419	0.218	0.476	0.441
400	0.398	0.273	0.532	0.526
500	0.549	0.413	0.584	0.678
600	0.787	0.443	0.781	0.699
700	0.745	0.509	0.656	0.848
800	0.82	0.585	0.845	1.022
900	0.973	0.706	0.843	0.801
1000	0.956	0.805	0.896	0.896
2000	1.36	1.446	1.506	1.623
3000	1.814	2.711	1.925	2.555
4000	4.039	3.57	2.645	3.129
5000	5.735	6.203	3.917	2.909
6000	10.507	10.123	6.928	3.986
10000	28.676	20.991	10.644	8.849

Convergence criteria:

In Gossip Algorithm, each actor sends a message to other actors so that each of the actors receives the message at least once. Once the actor receives the message, it sends to other actors based on the topology. If an actor receives a message 10 times then it stops transmitting. The network converges when all the actors have received the message at least once.

Findings:

Gossip Algorithm:

Full Network:

The time taken for convergence in Full is less as compared to Line topology in Gossip algorithm.

2D Grid:

In this topology the time taken for convergence is less as compared to Full and Line topologies.

Line:

The convergence time is greater than other topologies.

Imperfect 2D Grid:

This topology has the best convergence time as compared to other topologies.

Conclusion:

From the above graph and data we can see that in Gossip algorithm, Imperfect 2D is the best topology amongst the given four topologies for communication between the nodes.

Also, we can infer that the convergence time for Line topology is greatest as compared to other topologies in Gossip algorithm.

Graph for Push-Sum algorithm

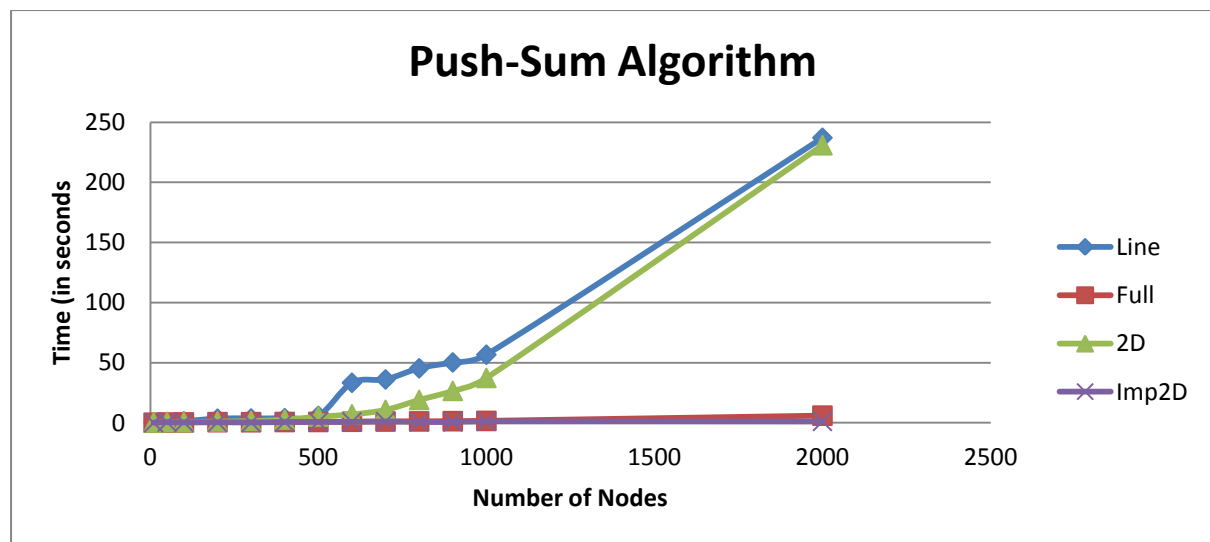


Table of data

No of Nodes	Line	Full	2D	Imp2D
10	0.259	0.044	0.179	0.014
50	0.716	0.214	0.552	0.5
100	1.179	0.287	0.584	0.308
200	3.433	0.527	1.093	0.396
300	3.55	0.469	1.546	0.222
400	3.824	0.657	2.688	0.633
500	5.733	0.704	5.161	0.74
600	33.274	0.865	7.062	0.742
700	36.053	1.05	10.775	1.1
800	45.344	1.133	19.035	0.71
900	50.223	1.34	26.54	0.597
1000	56.662	1.567	37.316	1.135
2000	237.14	5.936	230.916	1.061

Convergence criteria:

In **Push-Sum Algorithm**, each actor sends the s and w values to their neighbours according to the topology. The network converges when the value of the s/w ratio does not change more than 10^{-10} in 3 consecutive rounds for one actor after which that actor will have the average value.

Findings:

Push-Sum Algorithm:

Full Network and Line

The time taken for convergence in Full is less as compared to Line due to the presence of random walks in Full topology.

2D Grid and Imperfect 2D Grid:

The time taken for convergence in Imperfect 2D is less as compared to 2D topology as there is one extra random walk to the neighbour.

Conclusion:

From the above graph and data we can see that in Push-Sum algorithm, Imperfect 2D is the best topology amongst the given four topologies for communication between the nodes.

Also, we can infer that the convergence time for Line topology is greatest as compared to other topologies in Push-Sum algorithm.

We also see that the convergence time for Full and Imperfect 2D is close to each other.