

Project 2 – Gossip Simulator Bonus Report

1. Group members

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2. Design and Analysis

We add a failure model in which we randomly selected some nodes to delete, and the number of deleted nodes is a parameter controlled by us to show the percent of the number of nodes.

2.1 Implementation

- a. Firstly, we input a parameter which represent the percent of the number of nodes to delete.
- b. Randomly delete the selected number of nodes and store these dead nodes in an array. The corresponding worker actors will be stopped.
- c. Then the nodes would be separated. If we have selected a dead node to be the random node to send message, then we would change it to a new random node until it is a valid node.
- d. Calculate the execution time and percent of convergence.

2.2 Algorithms

2.2.1 Gossip Algorithm for information propagation

Using gossip algorithm, If the program can converge, the program will stop and print final time and percent of convergence.

If not, the program will be stopped in 60 seconds. And it will print the percent of convergence and time to reach that percent.

2.2.2 Push-Sum algorithm for sum computation

Using push-sum algorithm, if the program can converge, the program will stop and print final time.

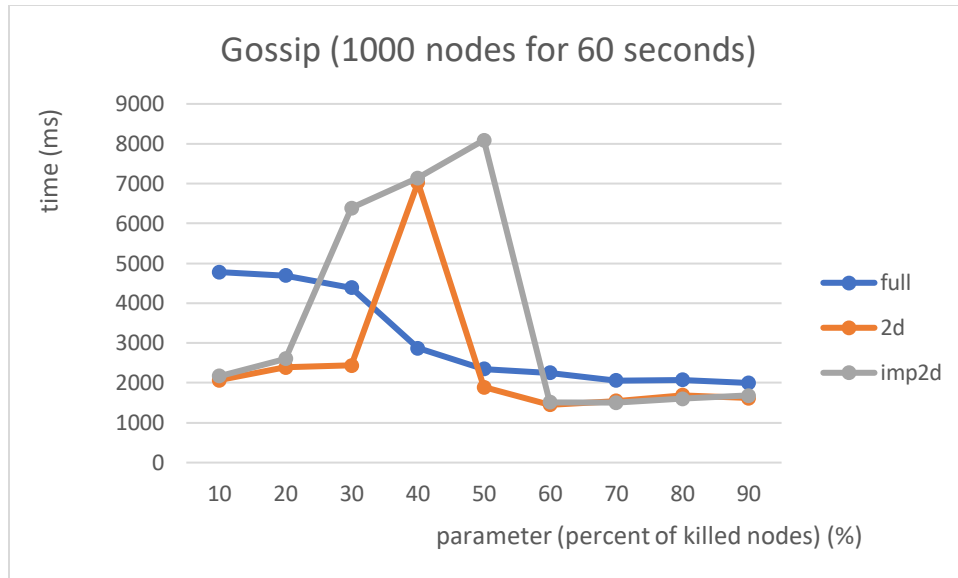
If not, the program will be stopped in 60 seconds. And we define it as a failure state because it will not converge in this time.

3. Results and Findings

3.1 Results

We have initialized 1000 worker actors (nodes) and changed the parameter to observe the 4 curves, one for each topology and produce 2 graphs for the two algorithms.

Here is the gossip algorithm of 3 curves, one for each topology as shown in the following figure.

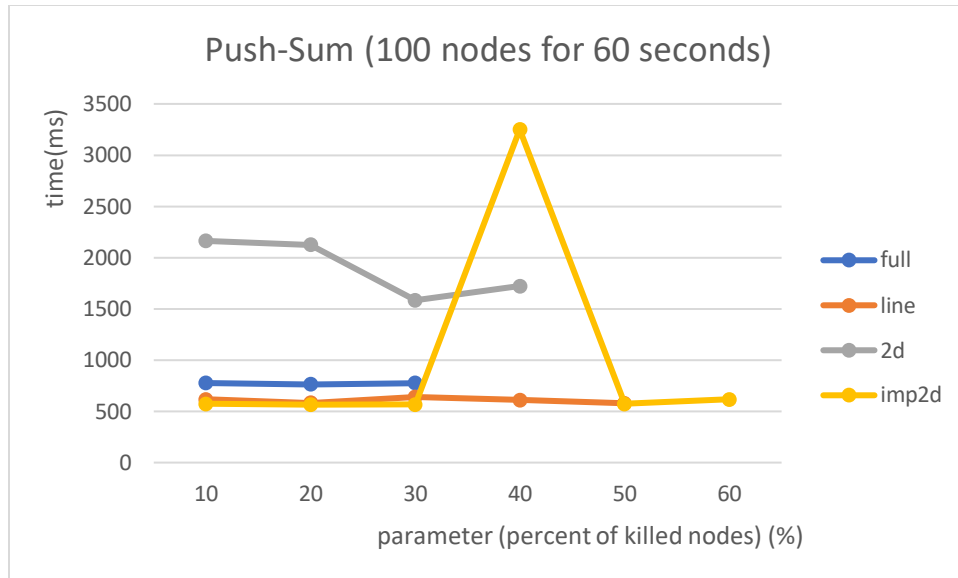


parameter		10	20	30	40	50	60	70	80	90
full	time(ms)	4780	4693	4386	2868	2347	2248	2060	2072	1998
	convergence(%)	100	100	100	100	100	100	100	100	100
line	time(ms)	954	1078	1162	1268	1363	1447	1521	1606	1646
	convergence(%)	6.11	0.75	0.71	1.33	0.2	0.5	1.33	0.5	4
2d	time(ms)	2065	2386	2438	7024	1888	1449	1542	1686	1618
	convergence(%)	100	100	100	88.9	36	2.77	1.53	17.39	8.19
imp2d	time(ms)	2175	2608	6384	7138	8092	1513	1505	1601	1682
	convergence(%)	100	100	100	100	97.8	19.11	4.6	22.98	39.34

Since the line topology cannot converge (the percent of killed nodes is low), we do not show line topology in the figure.

In addition, the 2D and imperfect2D topology cannot converge from nearly 40 percent to 90 percent. Because most of the neighbor nodes are deleted in these topologies, which makes them difficult to converge.

Here is the push-sum algorithm of 3 curves, one for each topology as shown in the following figure.



parameter	10	20	30	40	50	60	70	80	90
full	776	762	775	not converging	not converging	not converging	not converging	not converging	not converging
line	618	582	640	611	579	not converging	587	not converging	not converging
2d	2163	2124	1584	1722	not converging	not converging	not converging	not converging	not converging
imp2d	573	565	566	3250	573	618	not converging	not converging	not converging

As shown in the figures, most of the topologies cannot converge from percent of 30. And the possibility of convergence is not stable.

3.2 Interesting Findings

We have found that in the line topology in gossip algorithm, the percent of convergence is lower than the other topologies. And its possibility of reach convergence is lowest. Because if the nodes are separated, it is harder to find a valid neighbor for line topology which only have at most two neighbors at the outset.

The more neighbors one topology has, the high possibility it can converge.