COP5615: Distributed Operating Systems (Fall 2018)

Project 2 - Gossip Simulator

Project Bonus Report

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Implementation details -

a. Gossip algorithm -

For the bonus section of the project, we decided to pass an additional parameter i.e. a number of nodes/actors that we would like to kill. After the processes were triggered, the number of nodes passed as argument were randomly chosen from the active actors and were terminated. We assumed a percentage of nodes to be killed for each run. On passing this we observed how much time it took for the remaining nodes to converge.

Removal of nodes caused the algorithms to converge quicker. It resulted in the network getting split and the subsequent nodes reached faster convergence. Certain networks behaved better when compared to others.

b. Push-Sum algorithm -

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Running the program:

To start the program in Unix environment, use:

```
time mix run proj2.exs [num_of_Nodes] [topology] [algorithm]
[Initiator_nodes] [nodes_to_kill]
```

Algorithm parameter types:

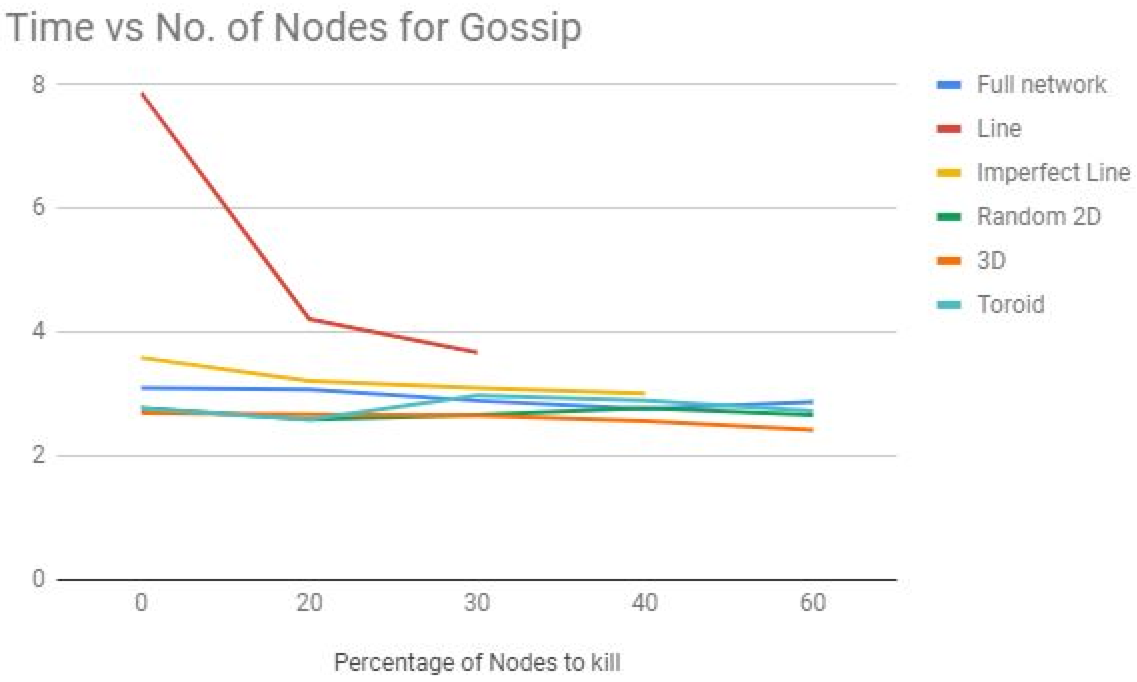
- Gossip: gossip
- Push Sum: push_sum

Topology parameter types:

- Full Network: full_network
- Line: line
- Random 2D Grid: random_2d
- 3D Grid: 3d
- Imperfect Line: imperfect_line
- Toroid/Sphere: toroid

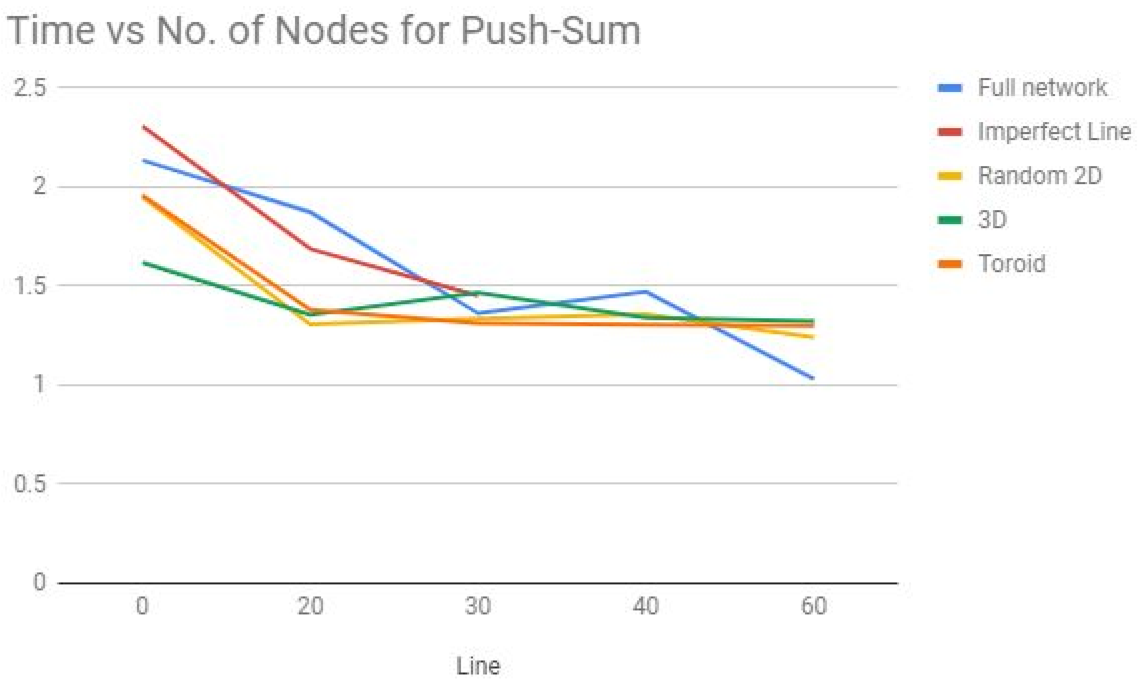
Convergence Times

Percentage of Nodes to kill	Full network	Line	Imperfect Line	Random 2D	3D	Toroid
0	3.097	7.866	3.590	2.779	2.701	2.768
20	3.080	4.214	3.218	2.591	2.672	2.591
30	2.895	3.675	3.098	2.661	2.654	2.982
40	2.759	Not converging	3.013	2.780	2.564	2.898
60	2.876	Not converging	Not converging	2.663	2.423	2.732



For Push-Sum algo:-

Percentage of Nodes to kill	Full network	Line	Imperfect Line	Random 2D	3D	Toroid
0	2.134	2.167	2.306	1.950	1.618	1.958
20	1.873	Not converging	1.687	1.307	1.355	1.380
30	1.363	Not converging	1.452	1.334	1.467	1.312
40	1.471	Not converging	Not converging	1.357	1.339	1.306
60	1.032	Not converging	Not converging	1.242	1.323	1.299



Interesting Observations:

- When the number of nodes decreased, the convergence time for any given topology and its subsequent algorithm decreased. This can be attributed to the fact that removal of nodes caused the network to shrink thus making fewer nodes available for spread of information in the future, speeding the convergence process.
- For Gossip algorithm - the 3d topology almost always showed the best convergence times and could be considered to be more fault tolerant and resilient for disseminating information as per this algorithm.
- For Push-Sum algorithm - the toroid topology almost always showed the best convergence times and could be considered to be more fault tolerant and resilient for disseminating information as per this algorithm.
- Line fails to converge as chances of getting isolated nodes increase even further.