COP5615 – Fall 2019 Distributed Operating System Principles

BONUS REPORT

Submitted by: Juhi Gelda: UFID -- 4996-9899
Suhrudh Reddy Sannapareddy: UFID -- 6485-1063

PROBLEM DEFINITION

The goal of this project is to determine the convergence of such algorithms through a simulator based on actors written in Elixir.

TYPES OF TOPOLOGIES

- Full network
- Line
- Random 2d grid
- 3d torus grid
- Honeycomb
- Random honeycomb

ALGORITHMS

- Gossip
- Push Sum

WORKING

Apart from the regular push sum and gossip, we have randomly chosen some nodes and killed it, So that the nodes will never pass information to them. We take percentage of the nodes from the user as input decide on the number of nodes deleted. We are also capable of checking the number of nodes alive after the algorithm terminates as we have a map which has the process id's of alive nodes in our code. Screenshot below shows the number of nodes that are alive.

```
Suhrudhs-MacBook-Pro:Pro2Bonus suhrudh_reddy$ ./Project2B 1000 randhoneycomb push-sum 50
nodes left: 424
time : 9422
```

PLOT DATA

Following shows the Percentage of nodes that were faulty and the ***time taken(in ms)*** by each topology to execute the algorithms. For analysis to be coherent we have chosen the number of nodes for each topology differently such that their convergence times are comparable.

- **GOSSIP**

Percentage of faulty nodes	Full Network	Line	Random 2D Grid	3D Torus Grid	Honeycomb	Random Honeycomb
0	150591	6	1450	6089	228	547
25	84175	6	96	2458	39	13
50	37887	7	0	552	0	3
75	9765		0	10	0	0

- **PUSH SUM**

Percentage of faulty nodes	Full Network	Line	Random 2D Grid	3D Torus Grid	Honeycomb	Random Honeycomb
0	85793	205272	163610	300140	200900	16133
25	48143	372	135893	281932	107467	24399
50	22178	248	523	178151	490	120
75	6107	125	274	39104	238	17

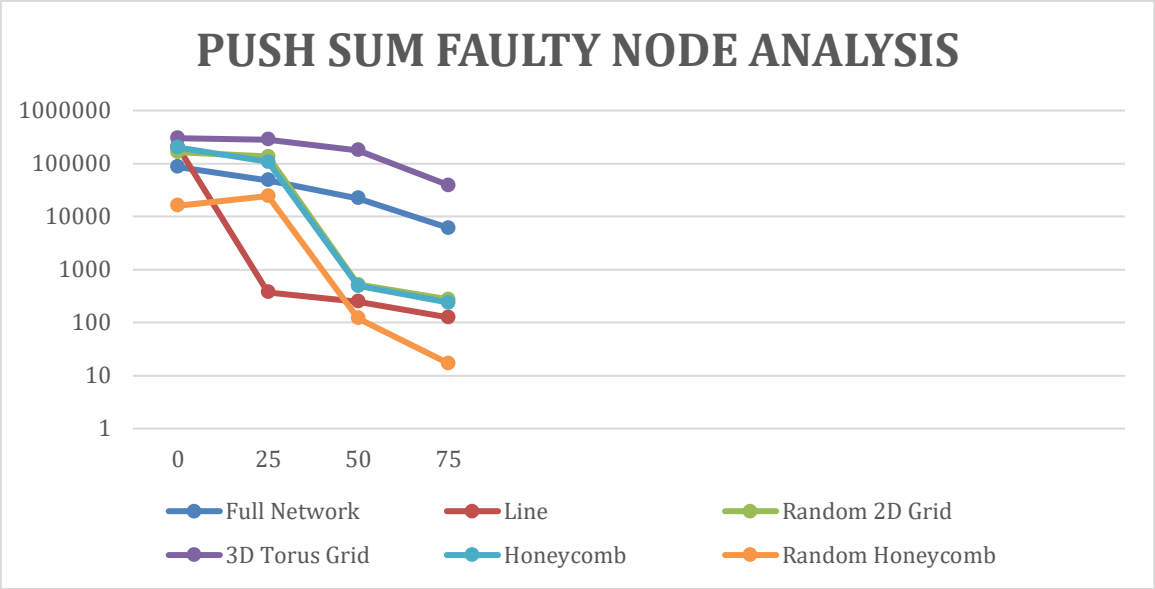
COMPARATIVE ANALYSIS

Our focus should be on the slope rather than the actual time as the observations were chosen to compare the change in performance with respect to percentage of faulty nodes. Please find the observations with focus on slope of the graphs.

- ***PUSH SUM ALGORITHM ANALYSIS***

  X axis denotes the percentage of faulty nodes

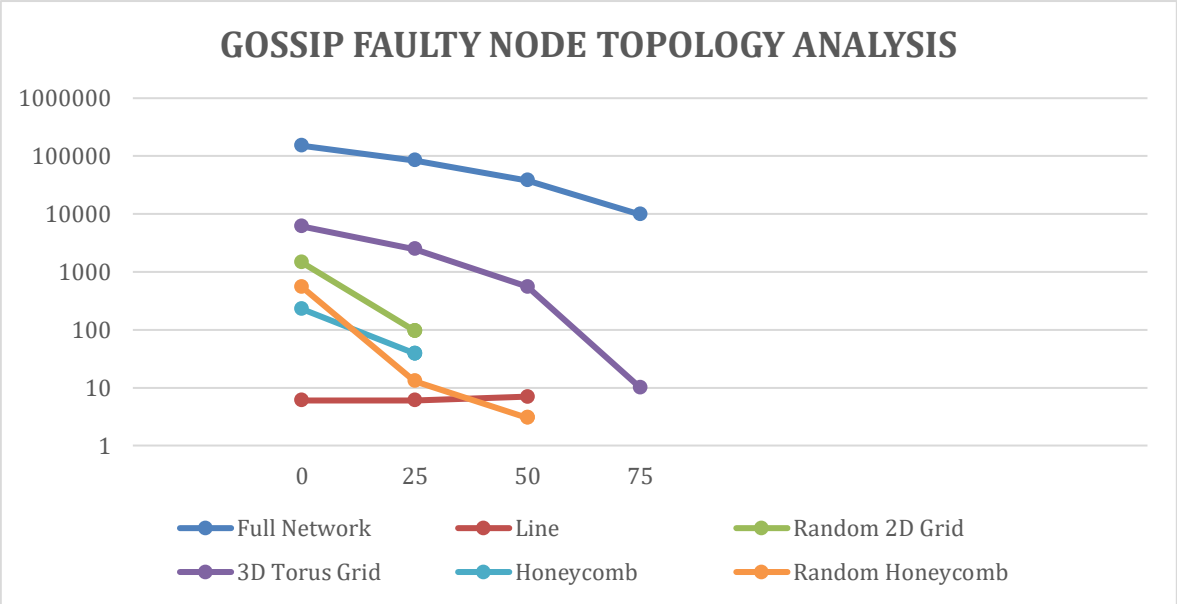
  Y axis denotes the convergence time



- ***GOSSIP ALGORITHM ANALYSIS***

X axis denotes the percentage of faulty nodes

Y axis denotes the convergence time



OBSERVATIONS AND FINDINGS

- Full network is more tolerant to faulty nodes in gossip as expected since it has connections to all other nodes.
- The slope of the graphs is interesting to observe, they indicate how the topologies react with increasing faulty nodes, line doesn't go well with faulty nodes.
    - Full network and torus 3D grid are very resistant to faulty nodes.
    - Though random honeycomb has 3 or 4 degree nodes it's performance is degrading faster with increase in faulty nodes
- Push sum and gossip has similar graphs