COP5615 – Fall 2019 Distributed Operating System Principles

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

PLOT DATA

Following shows the number of nodes and the ***time taken(ms)*** by each topology to execute the algorithms.

- **GOSSIP**

Number of Nodes	Full Network	Line	Random 2D Grid	3D Torus Grid	Honeycomb	Random Honeycomb
10	6	2	7	16	3	1
100	79	5	35	76	18	20
250	459	8	80	220	51	48
500	1654	6	98	317	95	80

750	3653	8	223	561	154	82
1000	6240	5	285	584	191	141
1500	13987	6	307	1061	206	181
2000	24213	6	473	1244	257	238
3000	54184	7	481	1994	314	369
5000	160334	12	491	3187	344	329
10000	811862	15	1450	6089	1014	1046

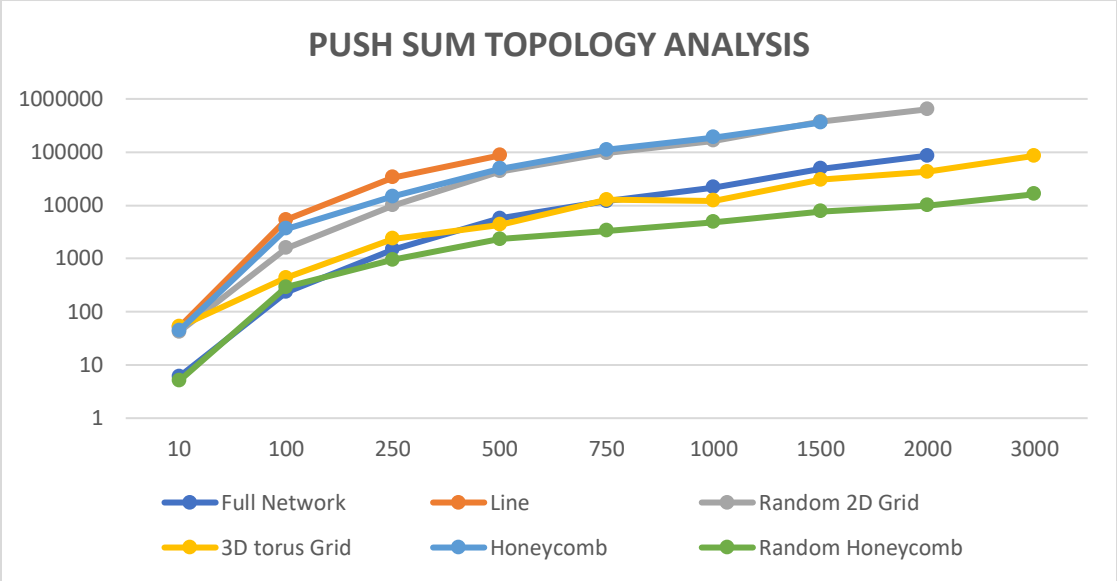
- **PUSH SUM**

Number of Nodes	Full Network	Line	Random 2D Grid	3D Torus Grid	Honeycomb	Random Honeycomb
10	6	51	42	52	44	5
100	235	5319	1572	431	3597	288
250	1477	33446	9930	2354	14654	939
500	5643	86619	43334	4312	48529	2298
750	11985		95285	12728	110681	3321
1000	21565		163610	12191	189263	4807
1500	48692		368725	30014	357923	7622
2000	85793		637831	42770		9896
3000				85257		16126

COMPARATIVE ANALYSIS

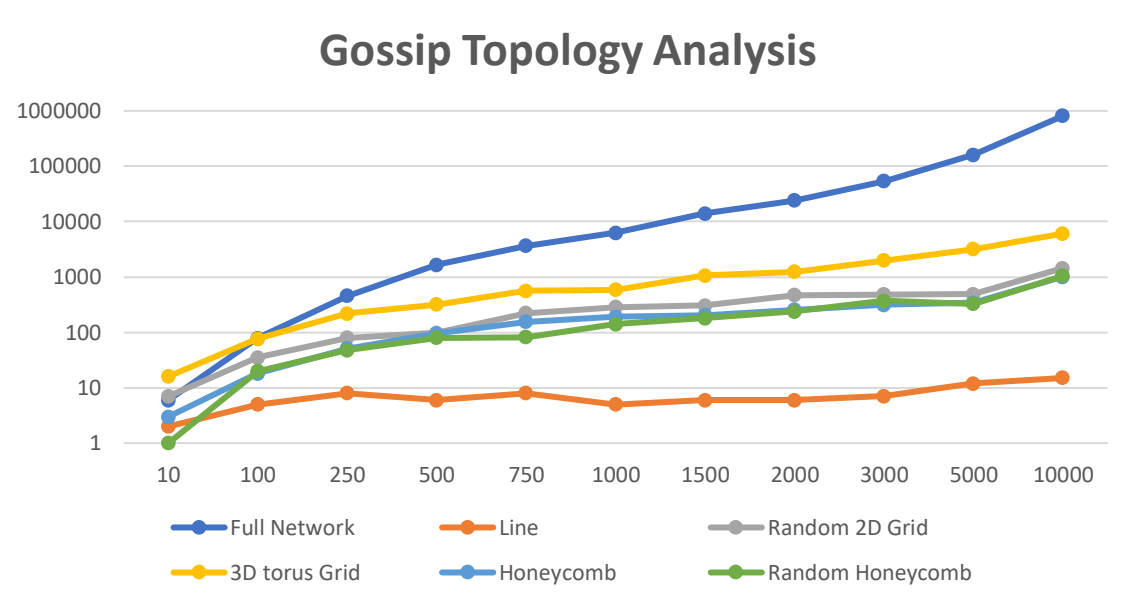
- ***PUSH SUM ALGORITHM ANALYSIS***

  X axis denotes the number of nodes
  Y axis denotes time taken in ms



- ***GOSSIP ALGORITHM ANALYSIS***

  X axis denotes the number of nodes
  Y axis denotes time taken in ms



OBSERVATIONS AND FINDINGS

- Push Sum :-
    - Random Honeycomb though has only 4 degree nodes is the fastest while line is the slowest.
    - T(line) > T(honey comb) are similar T(Random 2d grid) >T(full network)> T(3d torus) > T(random honeycomb)
      This observation is in the same order as with the degree of the nodes but the discrepancy of random honey comb can be due to the randomized nature of the 4th node(general case).
- Gossip:
    - Full network takes the highest time, random honey comb though is well connected is terminating early.
- In both push sum and gossip, the behaviour of both honeycomb and random 2D is quite similar.
- Although it is not guaranteed, but as we increase the number of nodes, in general, the convergence time increases