Members:

Srinadh Kakkera (UFID: 0514-0863)

Neharika Khera (UFID-89500-993)

Graphs and Analysis

For analysis different times of running of different number of Nodes for all the topologies are considered. However in a Rand2D only certain portion of nodes are converging for smaller number of nodes rather than the whole network due to its randomness. So we will discuss both gossip and pushSum for rand2D separately

To simplify the graphing procedure, logarithmic values of times are considered.

These Times are calculated as follows:

While running the program, the system time is calculated just before the message passing(i.e; Gossiping) is started and again after whole network is converged.

The difference in time gives the time of convergence of network.

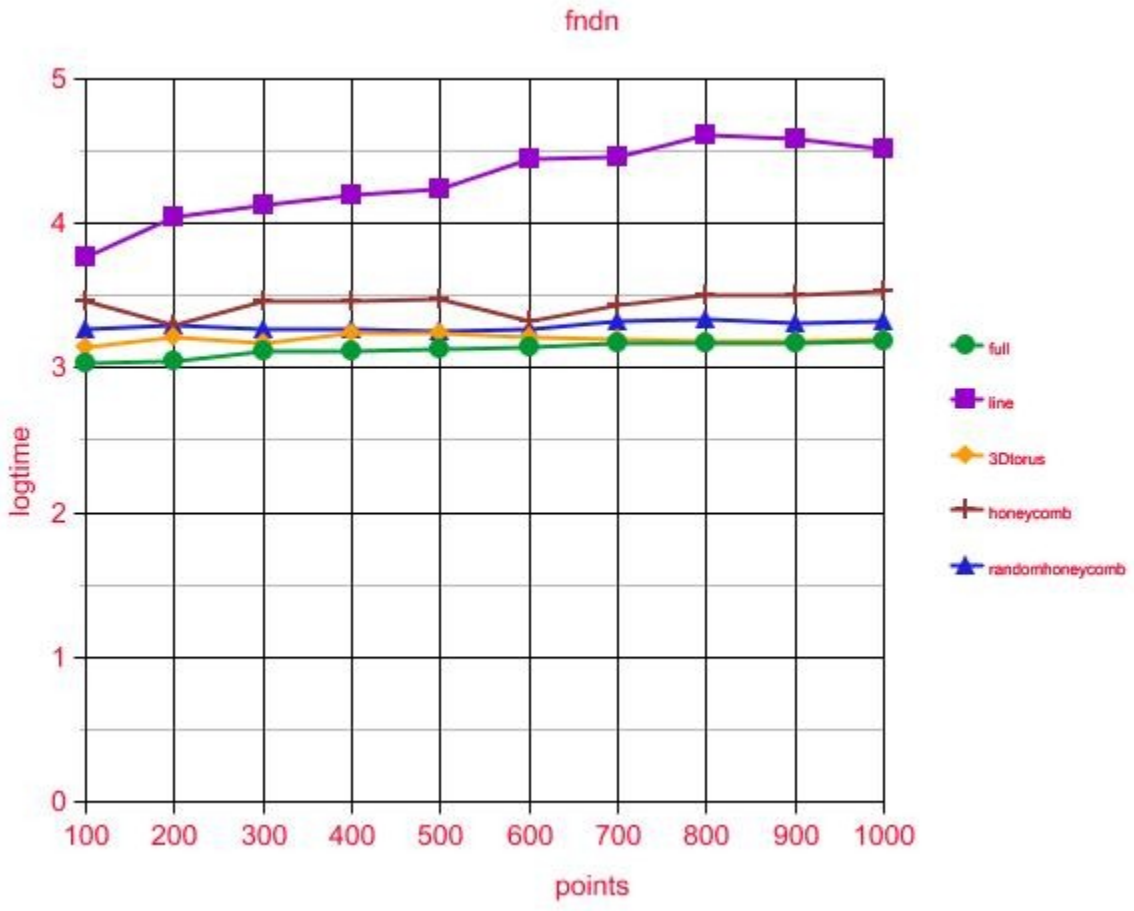
NoOfNodes/Topology	Full	Line	3Dtorus	Honeycomb	RandHoneycomb
100	1069	5827	1403	2859	1849
200	1127	11156	1627	1963	1962
300	1293	13562	1462	2916	1850
400	1292	15525	1745	2860	1850
500	1347	17354	1743	2976	1796
600	1414	27523	1627	2083	1850
700	1469	28464	1574	2755	2096
800	1464	40576	1522	3204	2194
900	1472	38403	1548	3148	2023
1000	1528	32354	1575	3376	2129

Logarithm of Times:

NoOfNodes/To	Full	Line	3Dtorus	Honeycomb	RandHoneyco

pology					mb
100	3.02897770521	3.76544501809	3.14705767103	3.45621415536	3.26693691116
200	3.05192391605	4.04750850559	3.21138755294	3.2929202996	3.29269900304
300	3.11159852488	4.13232374004	3.16494737262	3.46478751965	3.2671717284
400	3.11126251366	4.19103160885	3.2417954313	3.45636603313	3.2671717284
500	3.12936759572	4.23939959312	3.24129738711	3.47363292687	3.25430633233
600	3.15044940946	4.43969577013	3.21138755294	3.31868926995	3.2671717284
700	3.16702179579	4.45429593074	3.19700472802	3.44012160319	3.32139127831
800	3.16554107672	4.60826923187	3.18241465243	3.50569250741	3.34123662324
900	3.16790781	4.5843651523	3.18977095635	3.49803472369	3.30599588277
1000	3.18412335424	4.50992798116	3.19728055813	3.52840243795	3.32817566144

Graph for Gossip Algorithm:



From the graph it is clear that the Line topology takes most time to converge. Of all, a fully connnected network takes the least time.

Interesting Fact

• The interesting fact observed here is that line has at most two neighbors so it takes too long time to get converged as compared to other topologies that is the more the node is connected the better its performance will be.

• By looking at the slope of plots, we can conclude that performance of topologies has less dependency in number of nodes. This is because the gossip is asynchronous .

Times for PushSum:

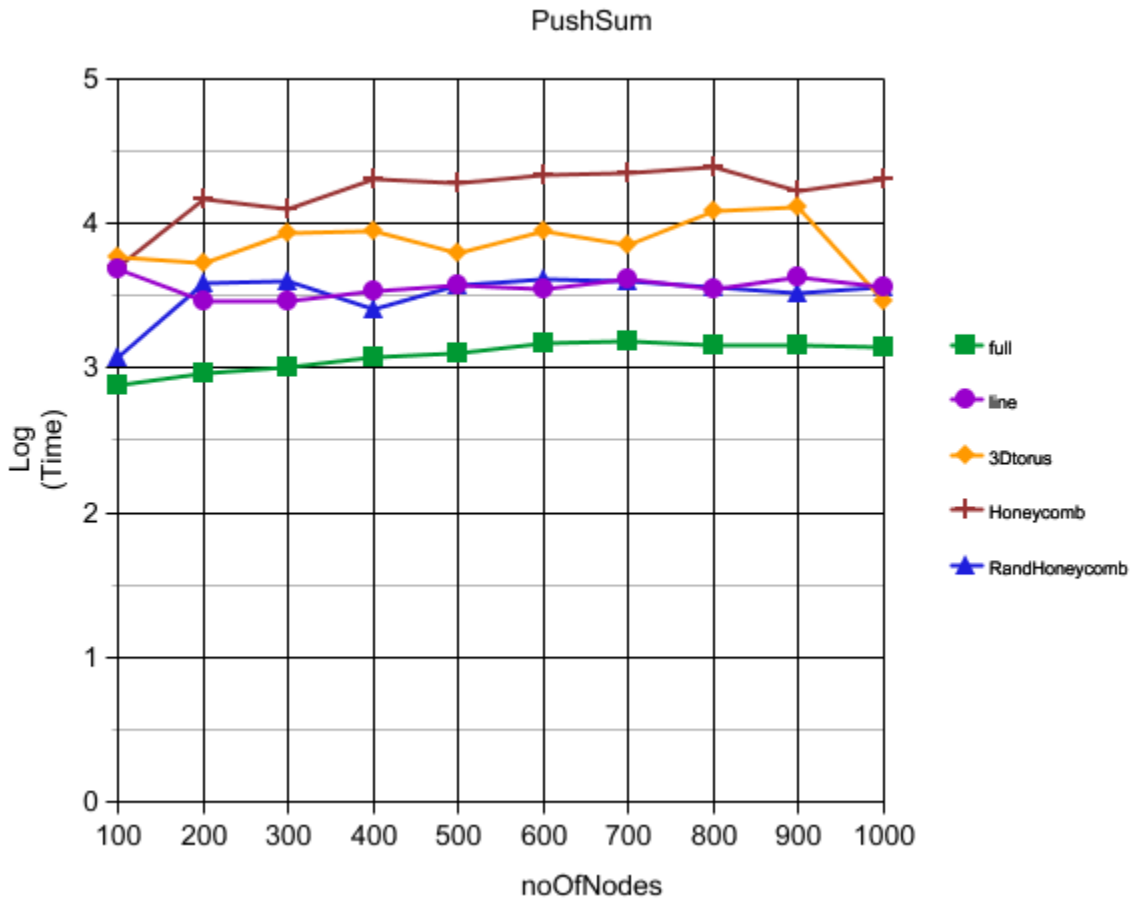
	Full	Line	3Dtorus	Honeycomb	RandHoneycomb
100	751	4800	5778	5018	1181
200	915	2934	5298	14528	3883
300	1001	2889	8457	12776	4012
400	1187	3360	8985	20271	2514
500	1248	3787	6151	18965	3734
600	1471	3461	8723	21550	4161
700	1532	4105	7131	22340	4020
800	1444	3519	12120	24770	3640
900	1424	4224	13189	16930	3276
1000	1405	3587	2871	20630	3621

Logarthmic values of times for pushsum:

	Full	Line	3Dtorus	Honeycomb	RandHoneycomb
100	2.8756	3.6812	3.7617	3.7005	3.0722
200	2.9614	3.4674	3.7241	4.1622	3.5891
300	3.0004	3.4607	3.9272	4.1063	3.6033
400	3.0744	3.5263	3.9535	4.3068	3.4003

500	3.0962	3.5782	3.7889	4.2779	3.5721
600	3.1676	3.5392	3.9406	4.3334	3.6191
700	3.1852	3.6133	3.8531	4.3490	3.6042
800	3.1595	3.5464	4.0835	4.3939	3.5611
900	3.1535	3.6257	4.1202	4.2286	3.5153
1000	3.1476	3.5547	3.4580	4.3144	3.5588

Graph for PushSum:



Interesting Fact

• Higher the connectivity of the nodes, better is the performance. This can be easily observed from the graph.

Random2D:

For random2D because of it's randomness the network converges only for higher number of nodes. So we consider noNodes above 1000 in intervals of 1000.

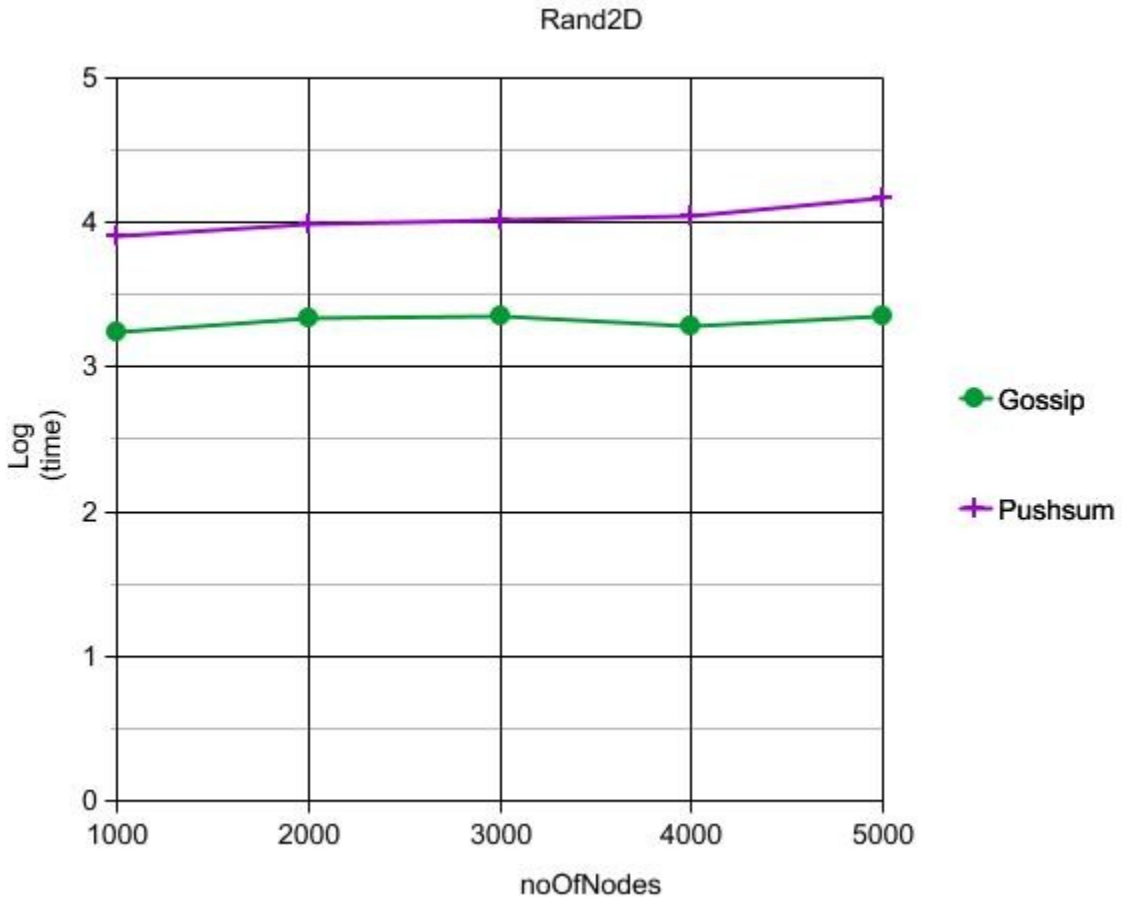
	Gossip	PushSum

1000	1754	8054
2000	2194	9740
3000	2266	10273
4000	1925	11065
5000	2281	14638

Logarithmic value of time:

	Gossip	PushSum
1000	3.2440	3.9060
2000	3.3412	3.9885
3000	3.3552	4.0116
4000	3.2844	4.0439
5000	3.3581	4.1654

Graph for Rand2D:



InterestingFact:

- Gossip Algorithm converges faster than PushSum for a rand2D network
- Rand2D converges only for a larger number of Nodes. For lesser number of Nodes only partial number of Nodes converges.