DOS PROJECT 2

TEAM MEMBERS:

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IMPLEMENTATION DETAILS:

We have implemented the following topologies using Gossip algorithm:

1. Line
2. Full
3. Imperfect line
4. Random 2D
5. 3D
6. Torus

We have implemented the following topologies using Push-sum algorithm:

1. Line
2. Full
3. Imperfect Line
4. Random2D
5. 3D
6. Torus

HOW TO RUN:

```
mix escript.build
./proj2 numNodes topology algorithm
```

```
Eg, ./proj2 100 line|rand2D|torus|3D|full|imp2D gossip|push-sum
```

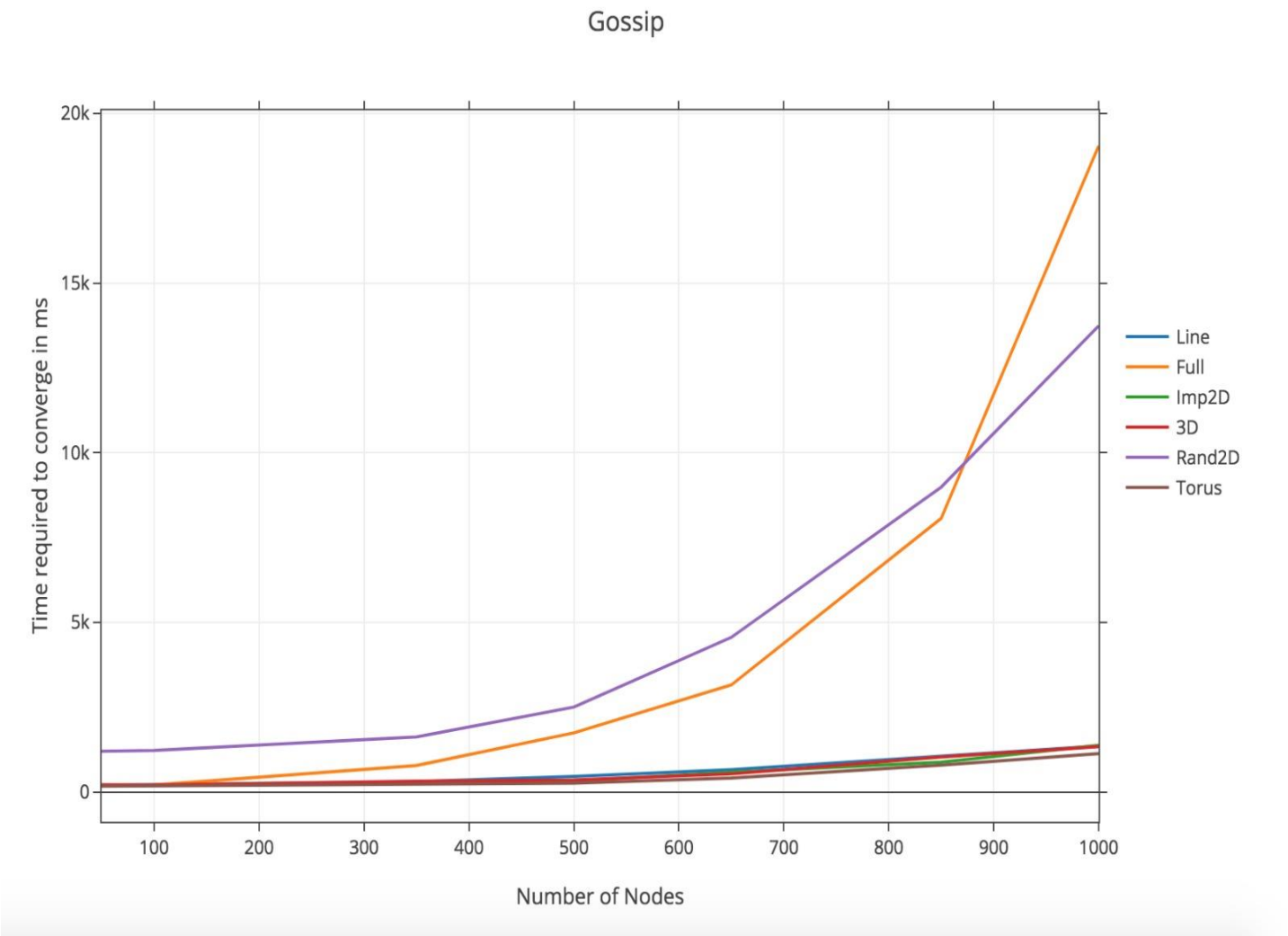
LARGEST NETWORK DONE:

Gossip Algorithm: Line: 7500 nodes Time: 447622 ms

Others topologies: 2000 (both push-sum and gossip)

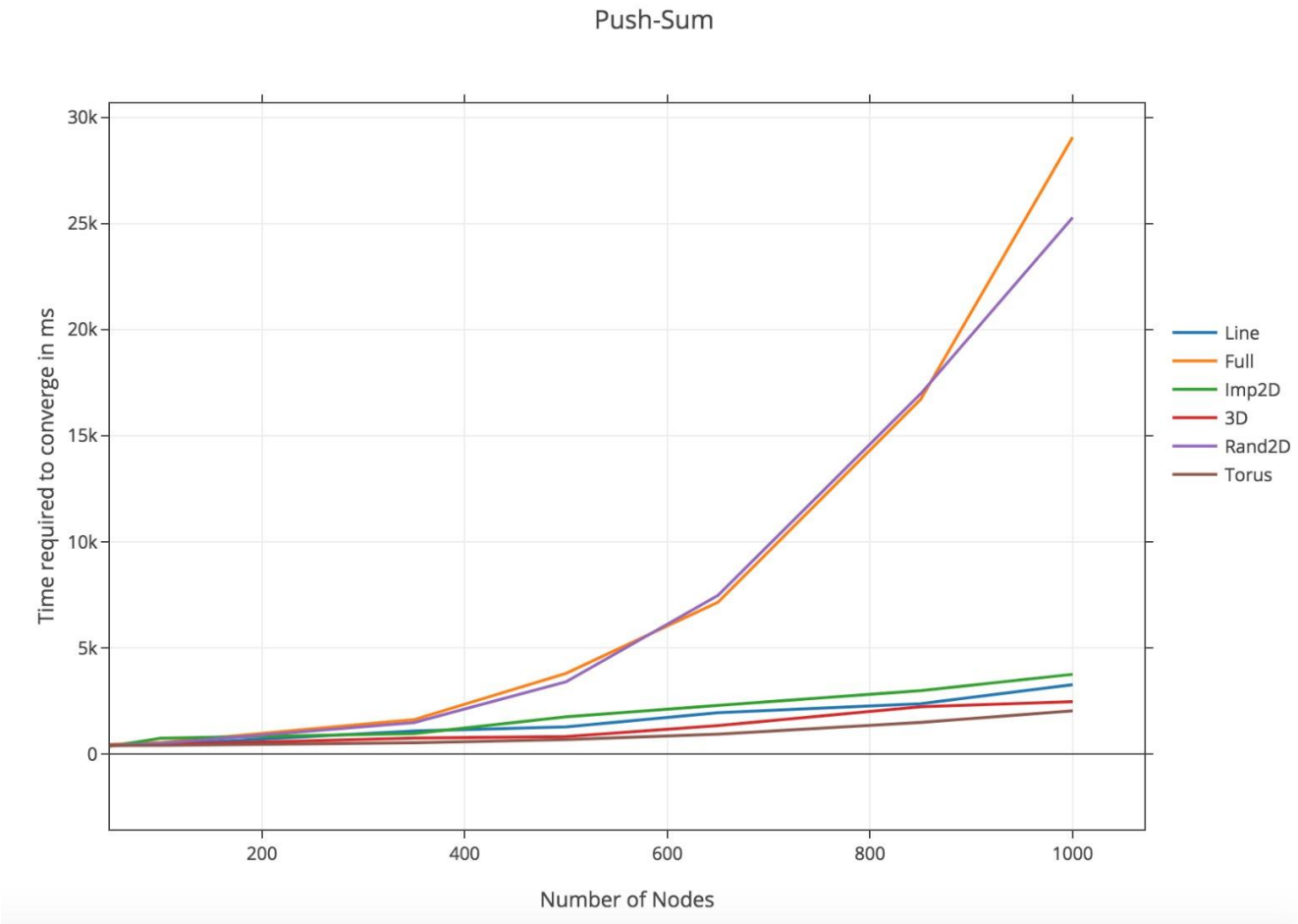
Graphs for Convergence time vs number of nodes in the network for different topologies

GOSSIP ALGORITHM:



Graphs for Convergence time vs number of nodes in the network for different topologies

Push-sum:



ANALYSIS:

	Convergence Time (in milliseconds) for Gossip Algorithm					
NODES	**LINE**	**FULL**	**IMP2D**	**3D**	**TORUS**	**RAND2D**
50	199	183	184	210	178	1204
100	217	211	199	212	189	1232
350	310	786	302	324	237	1630
500	466	1748	330	356	262	2507
650	662	3159	587	540	419	4562
850	1060	8071	886	1038	795	8990
1000	1359	19045	1385	1340	1138	13740
2000	4952	345770	10009	15403	8219	141912

For network size of 1000 nodes, from the above results obtained, we observe that the convergence time follows:

Torus<3D<Line<Imperfect Line<Random 2D<Full

The largest that we could run was 5000 nodes on Gossip algorithm using Line topology.

	Convergence Time (in milliseconds) for Push-sum Algorithm					
NODES	**LINE**	**FULL**	**IMP2D**	**3D**	**TORUS**	**RAND2D**
50	414	458	572	432	409	404
100	460	548	749	446	413	515
350	1089	1627	969	756	534	1486
500	1282	3808	1764	831	687	3406
650	1950	7158	2244	1345	944	7484
850	2373	16721	2989	2234	1495	16984
1000	3274	29071	3762	2472	2041	25289

For network size of 1000 nodes, from the above results obtained, we observe that the convergence time follows

Torus<3D<Line<imperfect Line<random 2D<Full

DESCRIPTION

GOSSIP ALGORITHM:

- The protocol initiates the process from a single node and sends the gossip to other actors. It terminates/converges when the node/actor has heard the gossip 10 times.
- Without this, the convergence was not being achieved since if neighbours are dead(like in line topology), message would not get forwarded.
- The process runs till all the nodes in the network are killed.
- Convergence was achieved faster when we terminated the program when all our nodes heard the send gossip or nodes kept sending dead gossip for the entered number of nodes.
- Hence, we obtain different results when we change the criteria for achieving convergence.

PUSH-SUM:

- In Push-sum, messages are sent and received as pairs in the form of (s,w). We converge the algorithm when the ratio of s/2 reaches 10^-10.
- The forwarding continues till all nodes are killed and convergence is achieved.
- Convergence was achieved faster when we terminated the program when all our nodes heard the send gossip or nodes kept sending dead gossip for the entered number of nodes.
- Comparing both push-sum and gossip, we conclude that push-sum is more reliable than gossip for cause convergence of the network.