

DOS PROJECT 2

TEAM MEMBERS:

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Project Execution:

Compilation: mix escript.build

Running the project (on Windows): escript project2 numNodes topology algorithm

Eg.:

escript project2 100 line gossip

escript project2 100 line push-sum

Implementation:

Algorithm: Gossip

Gossip Implementation: Once a node receives the gossip 10 times, it stops the transmission to other nodes. The program makes use of :timer.send_interval() method from the erlang :timer library which sends message to itself to find new neighbors after every 20 ms. As a result, the gossip propagates among all the neighbors.

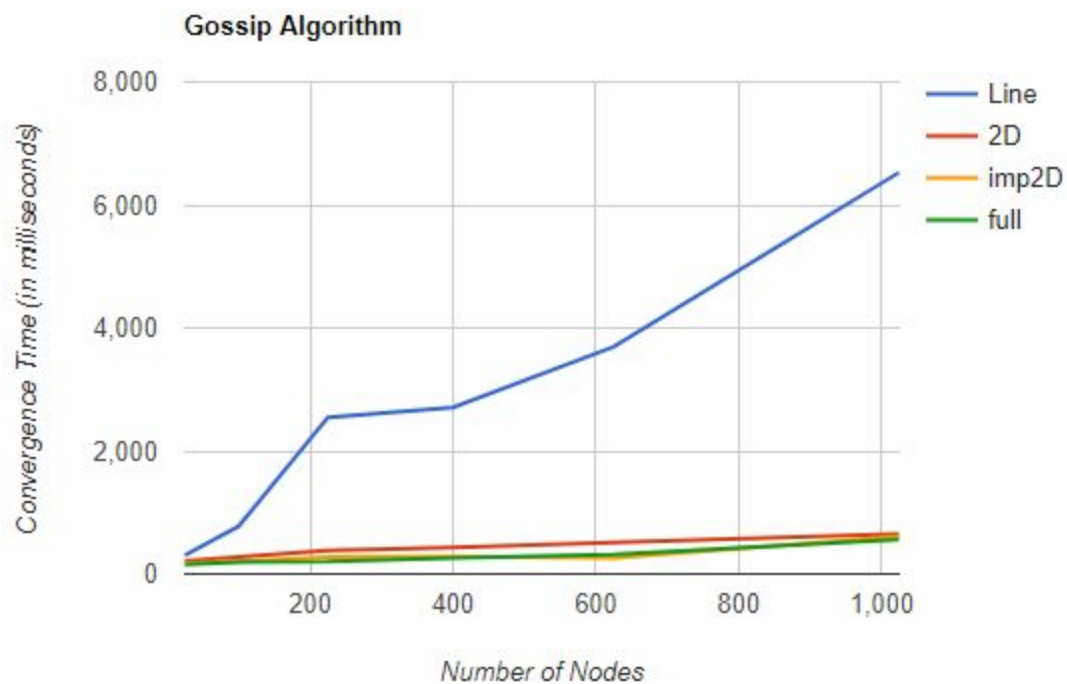
Maximum Number of Nodes Tested and their Convergence Time for each of the topology for Gossip Implementation:

	Full	Imp2D	2D	Line
Maximum no. of Nodes	1600	1600	10000	2500
Convergence Time (in ms)	2959	5077	53824	18270

Number of nodes and Convergence Time:

(All time is in milliseconds)

Nodes\Topology	Full	Imp2D	2D	Line
25	305	175	213	305
100	774	207	278	774
225	2547	274	382	2547
400	2707	282	431	2707
625	3697	262	514	3697
1024	6529	607	650	6529



Observations:

- The above graph is based on the convergence time for a particular number of nodes for a topology for Gossip algorithm.

- $\text{Time}(\text{Line}) > \text{Time}(\text{2D}) > \text{Time}(\text{imp2D}) > \text{Time}(\text{Full})$ where $\text{Time}(x)$ is the convergence time for a topology.
- Full topology converges fastest.
- Line topology converges slowest.
- The convergences for Gossip algorithm was 100%.

Algorithm: Push-Sum

Push-Sum Implementation: The program converges when an actor's ratio s/w does not change by more than 10^{-10} in 3 consecutive rounds.

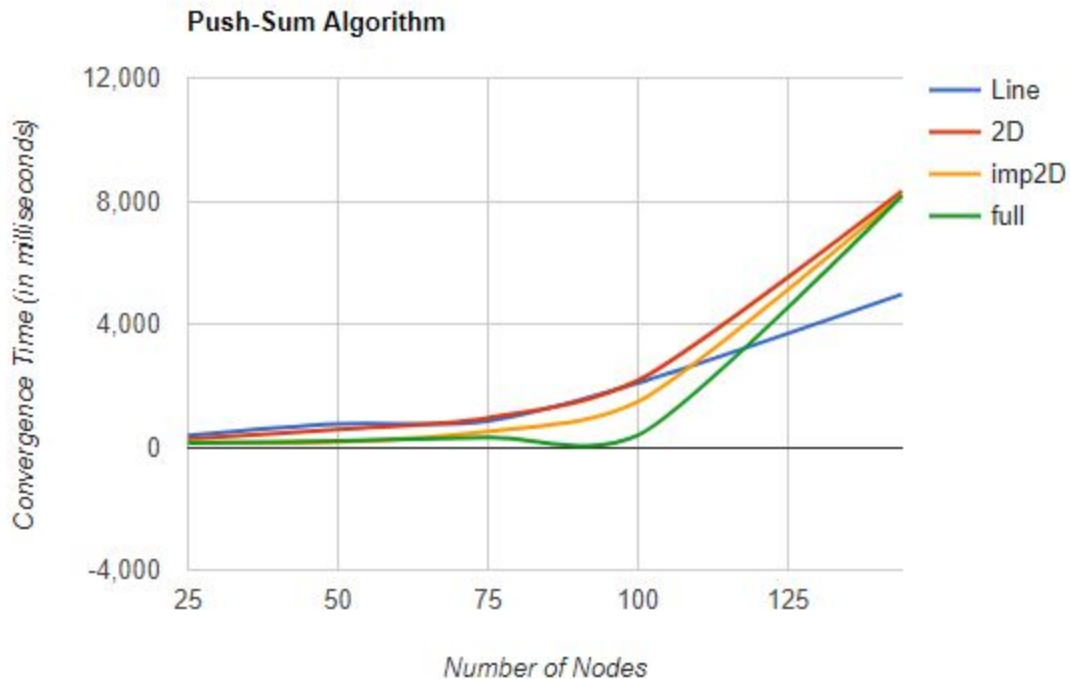
Maximum Number of Nodes Tested and their Convergence Time for each of the topology for Gossip Implementation:

	Full	Imp2D	2D	Line
Maximum no. of Nodes	200	144	144	200
Convergence Time (in ms)	63590	8200	8323	16555

Number of nodes and Convergence Time:

(All time is in milliseconds)

Nodes\Topology	Full	Imp2D	2D	Line
25	133	159	263	372
50	199	165	572	747
75	303	498	948	851
100	380	1470	2162	2080
144	8177	8200	8323	4968



Observations:

- The above graph is based on the convergence time for a particular number of nodes for a topology for Push-Sum algorithm.
- $\text{Time}(\text{Line}) > \text{Time}(\text{2D}) > \text{Time}(\text{imp2D}) > \text{Time}(\text{Full})$ where $\text{Time}(x)$ is the convergence time for a topology.
- Full topology converges fastest.
- Line topology converges slowest.
- The convergences for Push-Sum algorithm was 70%.

Notes:

1. We have made use of the Matrix library: <https://hexdocs.pm/matrix/api-reference.html>. The dependencies for the same has been added in the mix.exs file. The dependency can be fetched using `mix deps.get`, if not added automatically.
2. The values generated for the Line Topology largely depends on the random value generated in the code. It might sometime take more than 10 minutes to converge. The implementation can be checked by running it multiple times.

