Distributed Operating Systems Principles

(COP 5615)

Project 2 Failure Model

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The purpose of this project is to use the F# actor model to implement Gossip and Push-Sum algorithms for “full”, “line”, “3D”, “imp3D” topologies with a certain number of failure nodes and to analyze their convergence times.

Execution steps

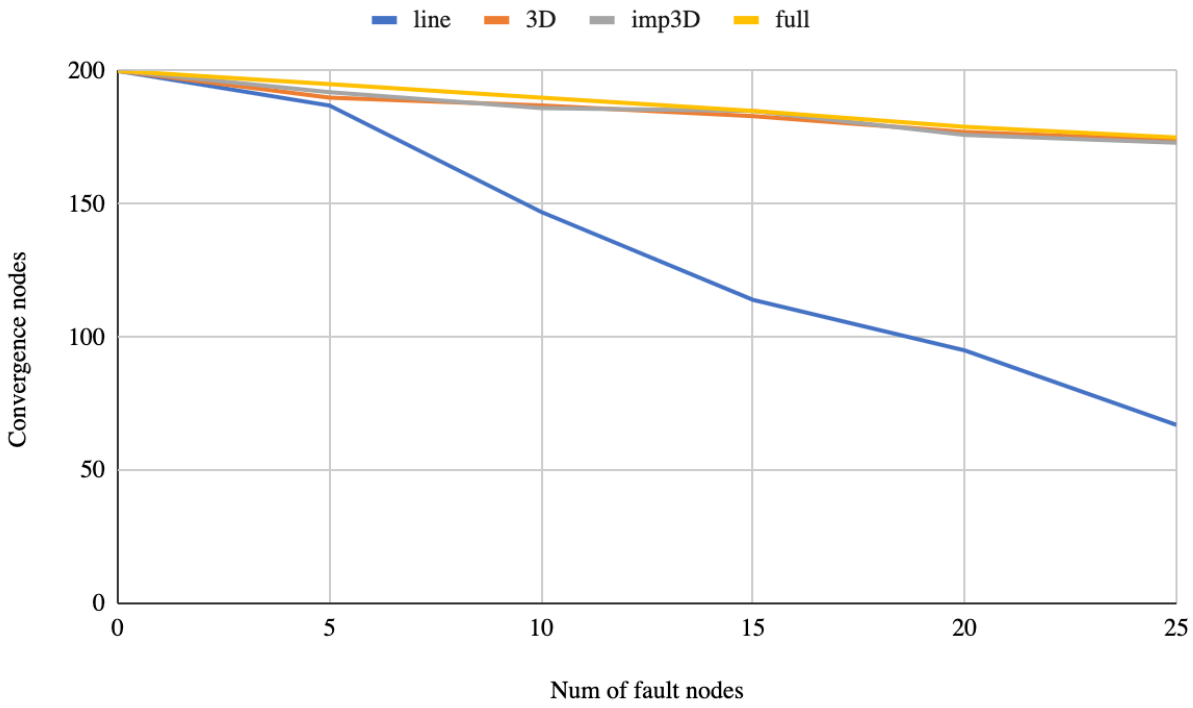
To execute the program which acts as server, navigate into the project folder and run the program using the below command.

dotnet fsi GossipSimulatorBonus.fsx num_of_nodes num_of_fail_nodes topology algorithm

Performed Experiment

1) The supervisor chooses a specified number of nodes at random from all the nodes in the cluster (based on the input) for purposeful failure.
2) We can determine the overall number of nodes that were converged by keeping the cluster size constant and increasing the failure node input on each run, and with that data, we can study how node failures affect topology convergence in both techniques.
3) The convergence of nodes should decrease as the number of failure nodes increases.

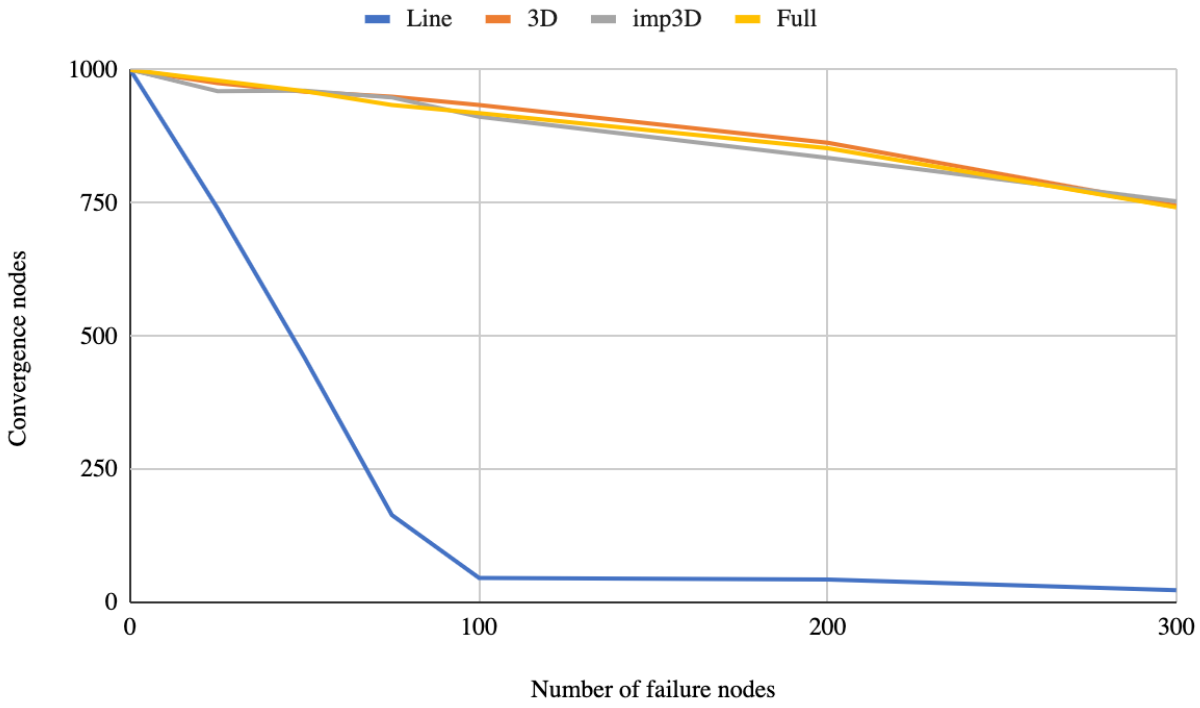
Push-sum



Num of fault nodes	line	3D	imp3D	full
0	200	200	200	200
5	187	190	192	195
10	147	187	186	190
15	114	183	185	185
20	95	177	176	179
25	67	174	173	175

For a fixed network size for all topologies, it was seen that when the number of failure nodes increases, the convergence of nodes in the line topology decreases. It is because line topology is more prone to forming blind spots when nodes fail, because each node in line topology has just two neighbors. The convergence of other topologies is not affected at the same time.

Gossip



Number of failure nodes	Line	3D	imp3D	Full
0	1000	1000	1000	1000
25	740	975	960	980
50	459	959	961	960
75	164	950	948	934
100	46	934	912	919
200	43	863	835	853
300	23	745	753	742

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