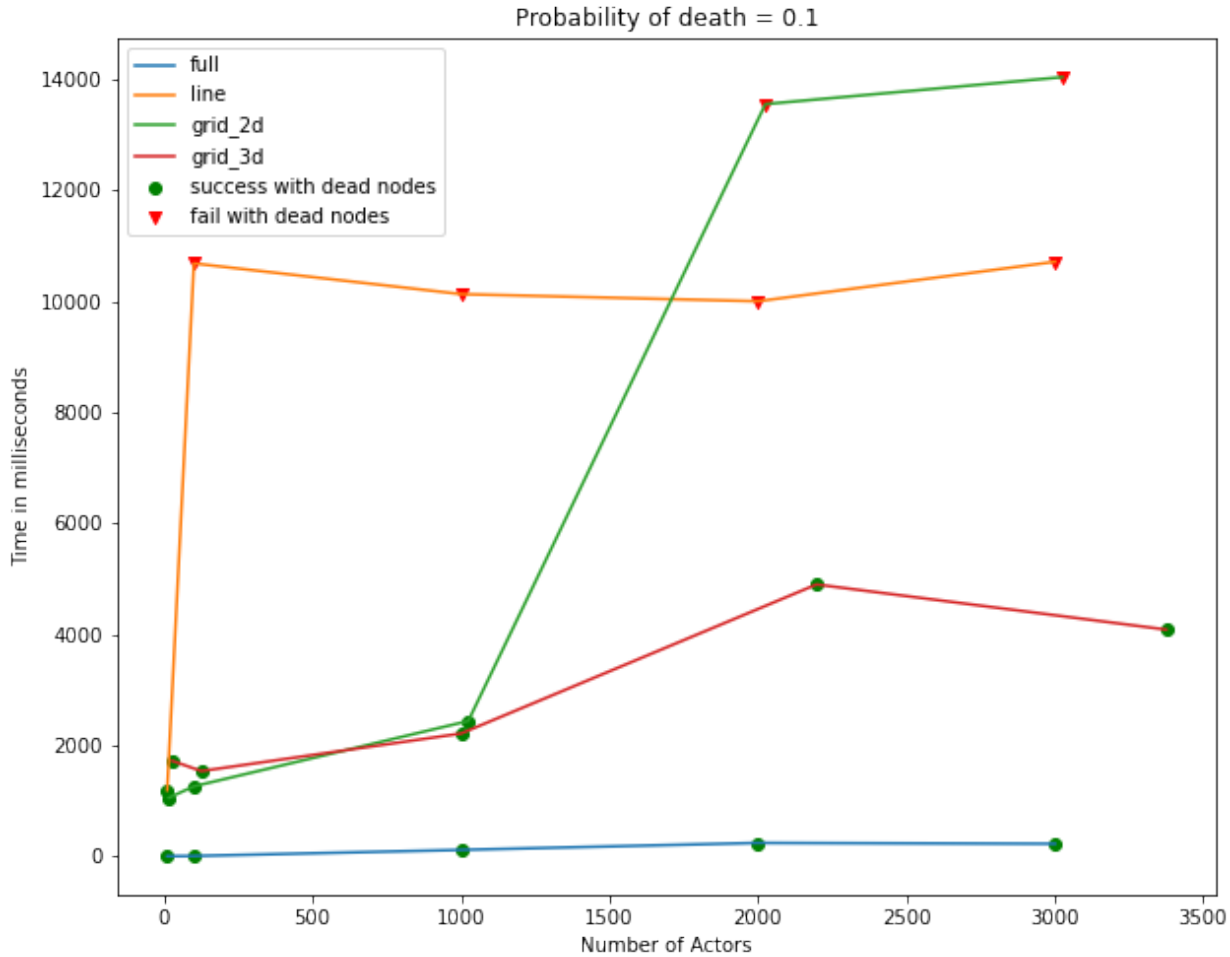
Group Members:
Adish Someshwar Rao
Sanjana Rao Guttalu Prasan

To test the bonus question we set a death probability to each node. We did this by setting a global death probability and generated a random number between 0 and 1. If the number generated is less than the death probability the node dies. The main node who is responsible for spawning the remaining actors forms a link with each actor and is informed when an actor dies. Thus, using this information we vary the death probability to track how long the remaining surviving nodes take to converge. Further, if at least one node fails to converge after a set amount of time (10 seconds in our case, given all nodes usually converge in a few milli seconds) we assume that too many nodes have died and thus terminate.

Below is the experiment run on all topologies for the gossip algorithm varying the death probability from 0.1 to 0.25 (ie, 10% to 25% chance an actor dies). We indicate successful convergence with green circles and failure to converge with red triangles.

Death probability 10% (0.1):



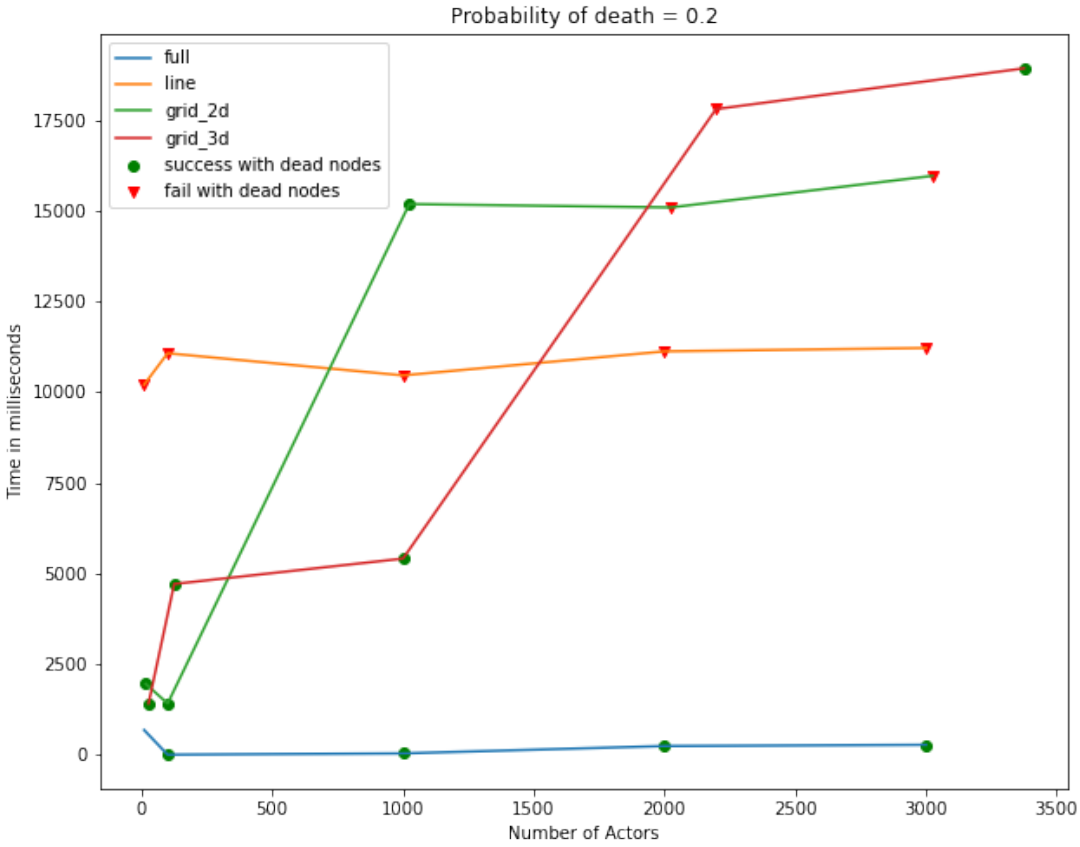
Here the fully connected network converges each time without any issue as all nodes can talk amongst themselves, thus the death of a multiple nodes does not effect the network. This same pattern can be observed below even for death probabilities of 20% and 25%.

The line topology clearly fails for almost all network sizes. For larger death probabilities, as seen below, the line topology always fails. This is due to the fact that if a node dies, the rest of the networks will never receive the information. This leads to a split network, or multiple split networks, with some networks having the information while the rest do not.

The grid_2d topology does fine for smaller networks but fails for larger networks. This could be either because too many actors have died and some nodes are isolated or because the convergence is taking too long (longer than 10seconds after which all nodes are killed).

However, grid_3d does not face this issue. This is potentially because of the random extra link preventing the formation of isolated networks and thus all actors are able to receive the message.

It should be noted though, all topologies take much longer amounts of time than usual.



For death probability of 20% the exact same pattern described above is followed.

For 25% death probability, almost all topologies fail to converge as too many nodes die out forming isolated networks except again in the case of the full topology which still converges.