PERMANENT NODE FAILURE AND ITS EFFECTS ON FULL TOPOLOGY

This experiment is to support my intuition that as we go on killing more and more nodes in full topology the more time it takes for the remaining nodes to achieve convergence.

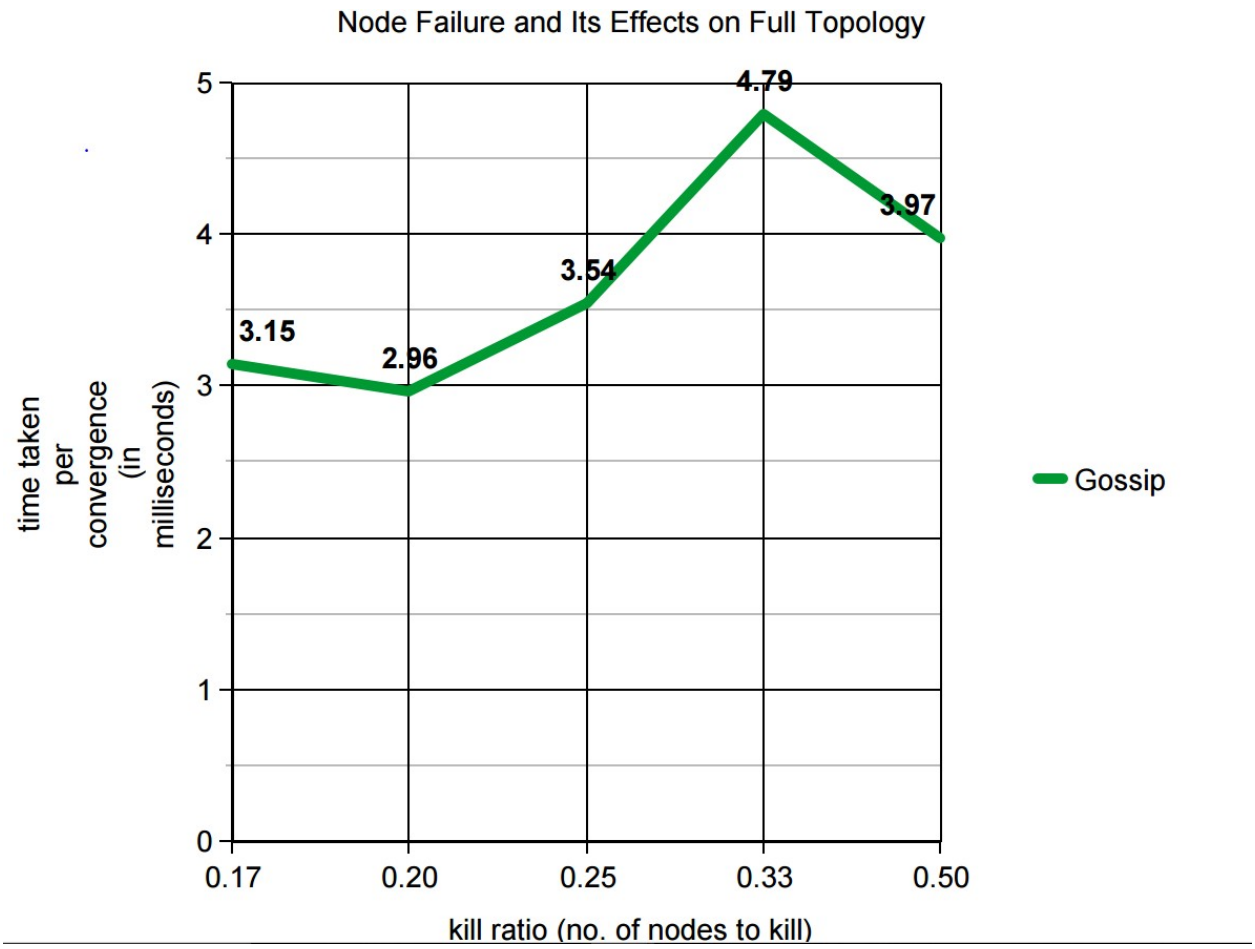
I defined kill ratio as the ratio of number of nodes I would be randomly killing in the topology to the total number of nodes available in the topology. For example 0.5*1000 will give us 500 nodes to fail randomly. Since the randomkill function is message based the number of kills depend on how many actors are not already dead as it would cause null pointer exception.

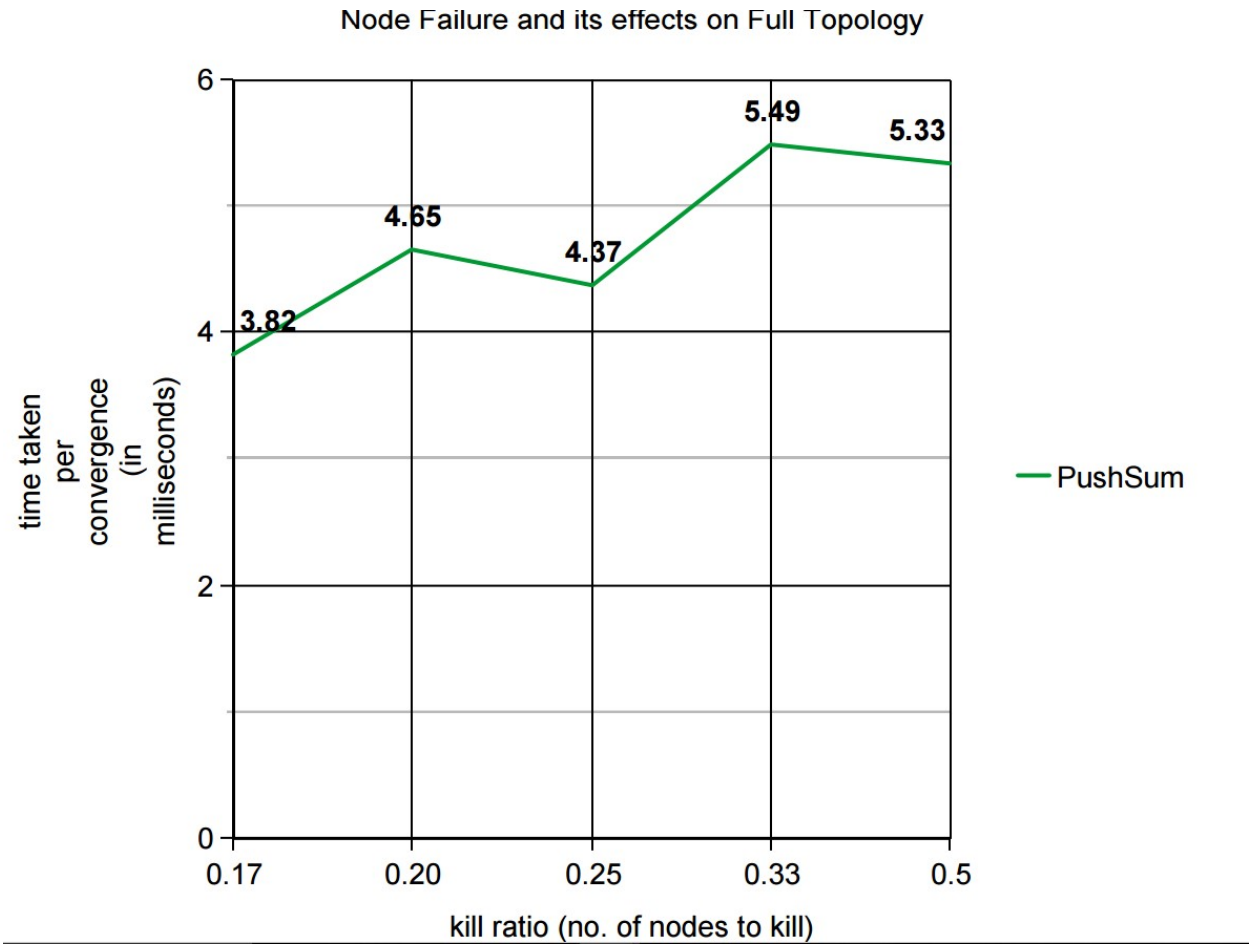
My program GossipSimulatorFailureModel.scala takes kill ratio as a parameter and 1000 nodes in Full topology. It prints after each node converges the time taken, so that when the program starts midway without achieving convergence I still have the time and number of active nodes yet to converge.

time taken per convergence = time elapsed at the end of code execution/(1000-active nodes) , which gives me the total number of nodes converged until that point of time.

Kill ratio	Pushsum total time taken	No. of active nodes	Total nodes converged	Time taken per convergence	Gossip total Time taken	No. of active nodes	Total nodes converged	Time taken per convergence
0.17	3230	156	844	3.82	2663	156	844	3.15
0.20	3800	183	817	4.65	2928	181	819	2.96
0.25	3392	225	775	4.37	2743	227	773	3.54
0.33	3934	284	716	5.49	3393	293	707	4.79
0.50	3209	398	602	5.33	2912	268	732	3.97

The two graphs shown below support my intuition that as we go on killing more and more nodes we are left with more and more disconnected nodes and hence this effects the convergence time inversely. If we kill large number of nodes in full topology its possible that we might end up with Line topology in worst case and hence the time to converge increases.




Node Failure and its effects on Full Topology
6
4
2
0
time taken per convergence (in milliseconds)
3.82
4.65
4.37
5.49
5.33
0.17
0.20
0.25
0.33
0.5
kill ratio (no. of nodes to kill)
PushSum