Project 2: Bonus Project Report

Group Members

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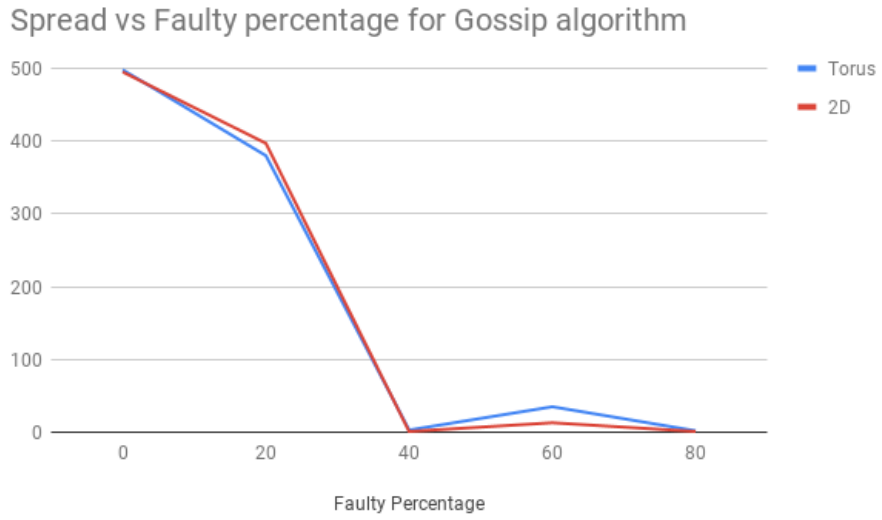
Experiment

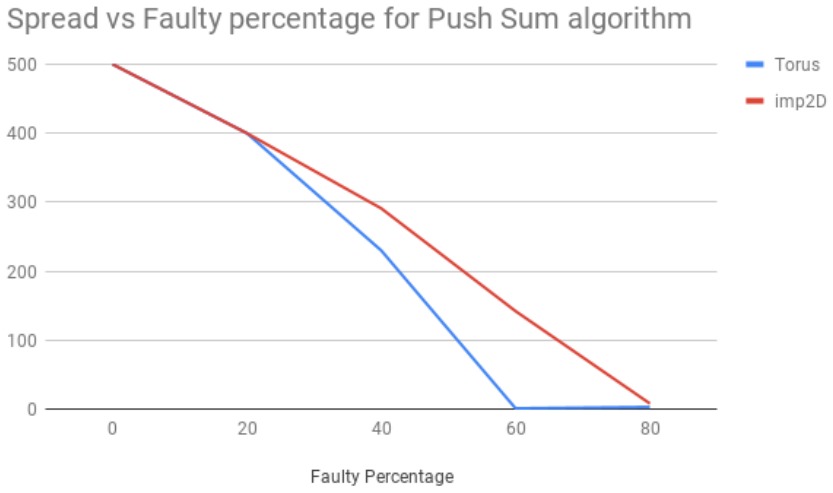
- In the main program of the Project we implement two propagation protocol with no failure occurrence
- Normal failure occurrence of actors dying or call taking too much times is handled by supervisor using one-for-one and one-for-all strategy or GenServers timeout respectively
- But what happens if a failure is generated such as some nodes in a topology fails like for example stop transmitting error? Then how will it affect our protocols? This is what we try to answer from our solution.
- We perform an experiment in which we introduce a failure model that takes an argument as percentage of failure to be introduced in our topology
- We take failure argument as percentage of failure that is if the parameter is 20% that means 0.2*numNodes have failed at random in our topology
- We used ETS table of erlang to store the state of failed nodes in our failure model

Results, Graph and Observation

- An interesting observation here is that all the topologies we have used here contains a single connected component (except for small values (<400) of rand2D topology) that is all the nodes can be reached from any random node. But when failure model is introduced in our topology then it is highly possible that there can be many connected components now and message propagation won't happen between different connected components.
- To measure this, we introduced a new scale that is the spread count of the run. Which means how many nodes were able to receive the message.

- Below graphs shows the spread change with fault percentage for gossip and push sum protocol for a fixed number of nodes = 500





- Spread of a run highly depends upon the following factors
    - Random selection of failure nodes: more number of connected components
    - Selection of first node of message propagation: If we get the first node in connected component of maximum number of nodes then spread will be more
    - Topology: Topology plays a major role for example if a node fails in line topology it creates two different connected components whereas this is not the case with

2D or torus topology since it may each other neighbors through different paths. Same is the case with imperfect line, the selection of random neighbor ensures that two connect component of a line are still connected after the failure and the spread is more

- To support above observation, we performed this experiment by running 10 runs on 4 different topologies for gossip and calculated the average spread.