fault tolerance report

In this program, the command is like “java -jar gossip2.jar 1000 10 3 full gossip 0.001” .
In this example above, each actor has the probability of 0.001 to be shutdown accidentally when sending a message.
And the result shown below is based on 10 tests for each given fail probability and a network size. We tested and recorded the convergence time in different circumstances.

In the discussions below, we use p to represents failure probability of each node and n to represents the network size

1. full network

convegence time	p = 0	0.1	0.01	0.001
n = 100	30	40 or forever	40	35
1000	120	130 or forever	100	80
2000	130	130	130	130
4000	220	200	210	200

We found that full network has an excellent fault tolerance ability. The smaller p is and the greater n is, the less the network is influenced by p.

However, p can cause fatal error, especially when p is great and n is small. When p = 0.1 and n = 100, the whole system can get stuck and will never terminate.

In most circumstances, full network is very stable.

A interesting finding is that when a system got stuck, it often got stuck when most of the actors have terminated normally. For example, when n = 1000, p = 0.1, the system often got stuck when more than 990 actors have shutdown normally. This phenomena also demonstrates that the full network is very robust. Even the failure probability is as great as 0.1, most actors still work normally, which is really amazing!

2. 2d & imperfect2d network

2d and imperfect2d network also has a great fault tolerance ability. Their behaviors are very similar to full network.

3. line network

We found that line network has a poor fault tolerance ability.
Different from the three networks above, the greater n is, the more likely the line network will get

	0	0.1	0.01	0.001	0.0001
100	600	forever	800 or forever	800 or forever	800
1000	8400	forever	forever	forever	8500 or forever
2000	12000	forever	forever	forever	12000 or forever

stuck.
And line network doesn't have the property mentioned above that **the system often got stuck when most of the actors have terminated normally.**

4. General conclusion

Another interesting finding is that if system does not get stuck, the convergence time is barely influenced by p. In other words, p will give us either a fatal error or merely no impact.