# Bonus Report

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We randomly kill nodes after the program starts. To control the program, we modified the program to accept the dead-nodes percentage as input. Then we test the program to see what will happen with different nodes numbers and dead node percentage.

The following is the result we got. (Empty means, in that conditions, the program will not converge.)

1. With 10% percent nodes killed:

Convergence times of topologies in ms				(Dead 10%)
Nodes	Line	3D	Imp3D	Full
1000	3706	250	194	214
2000	7357	203	194	152
3000		376	363	199
4000		245	134	199
5000		305	160	276
10000		464	340	299
30000		692	625	336
50000		1466	1540	373
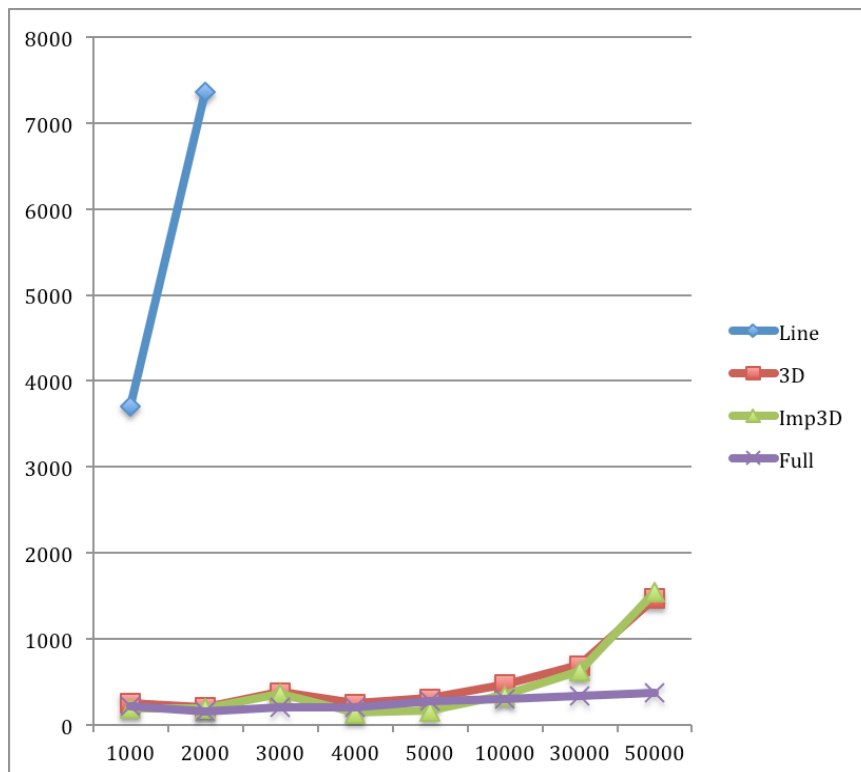
2. With 20% percent nodes killed:

Convergence times of topologies in ms				(Dead 20%)
Nodes	Line	3D	Imp3D	Full
1000	1765	251	218	261
2000		183	212	81
3000		260	366	132
4000		242	218	166
5000		399	169	202
10000		335	458	244
30000		881	924	284
50000		1338	1391	323
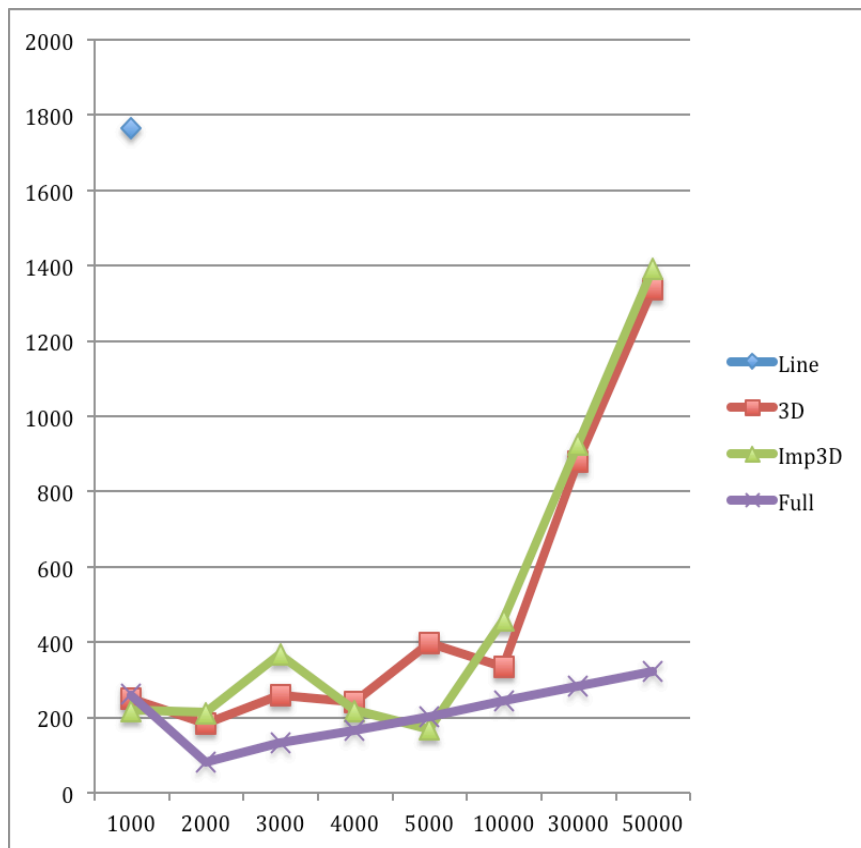
3. With 30% percent nodes killed:

Convergence times of topologies in ms				(Dead 30%)
Nodes	Line	3D	Imp3D	Full
1000	3647	286	278	128
2000		179	219	77

3000		223	325	132
4000		293	200	124
5000		392	169	169
10000		318	279	192.5
30000		964	879	219.3
50000		1160	1645	246.1
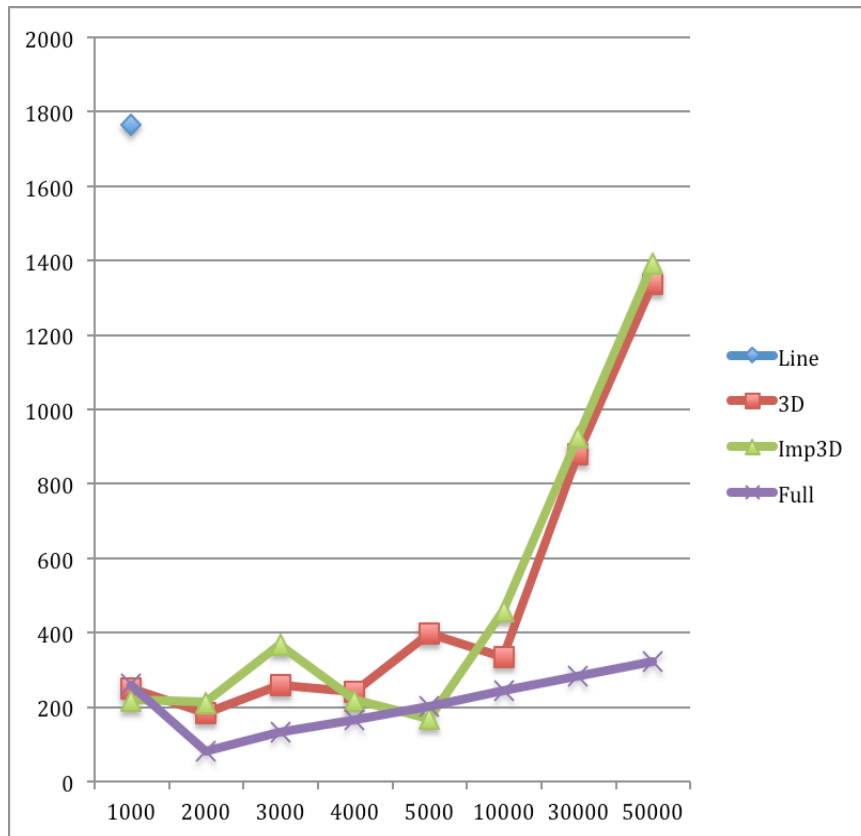
4. With 60% percent nodes killed:

Convergence times of topologies in ms				(Dead 60%)
Nodes	Line	3D	Imp3D	Full
1000		135	145	196
2000		153	210	105
3000		170	245	208
4000		332	270	246
5000		241	491	219
10000			712	250.9
30000				269.6
50000				288.3
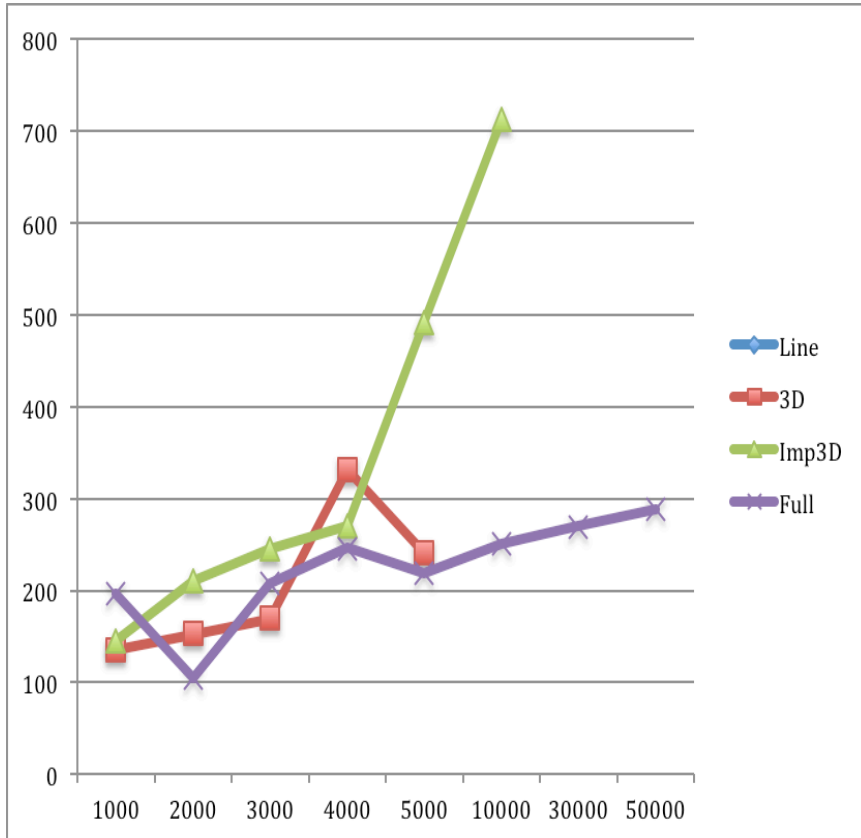
Conclusion:
As the results already showed above, the topoloy and nodes numbers affact the robustness of the network. While the line structure is mostly easy to crash and the full structure will be most robust but it also waste sapces in pratice.