Project no: 2
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Project Report

- Push Sum Algorithm:

Data in a tabular form:

Time\Topology	Line	Full	2D	2Dimp
10	407	34	77	47
100	2113	353	1421	759
200	1623	560	2510	1117
300	6577	739	10852	1592
400	11828	985	26216	1605
500	13750	1224	48742	1551
700	20839	1588	80837	2323
1000	22334	2287	132298	2996

This table represents the time required to converge the program for different topologies when the number of actors are changed from the range 0 to 100.

When we plot the graph as shown in figure 1.1, I observed following outcomes.

- **Line Topology** takes most time to converge under any set of varying input.
- **Full Topology** converges rapidly under the varying input. I can see that it increases linearly as the number of actor's increases. So we can say that in the push sum algorithm time taken to converge by full topology is directly proportional to no of actors involved in the gossip.
- When the number of actors in the system increases we can see a drastic increase in the convergence time taken by **2D** topology.
- Even though number of actors increases the time taken to converge by **2D Impatient** increases slowly.

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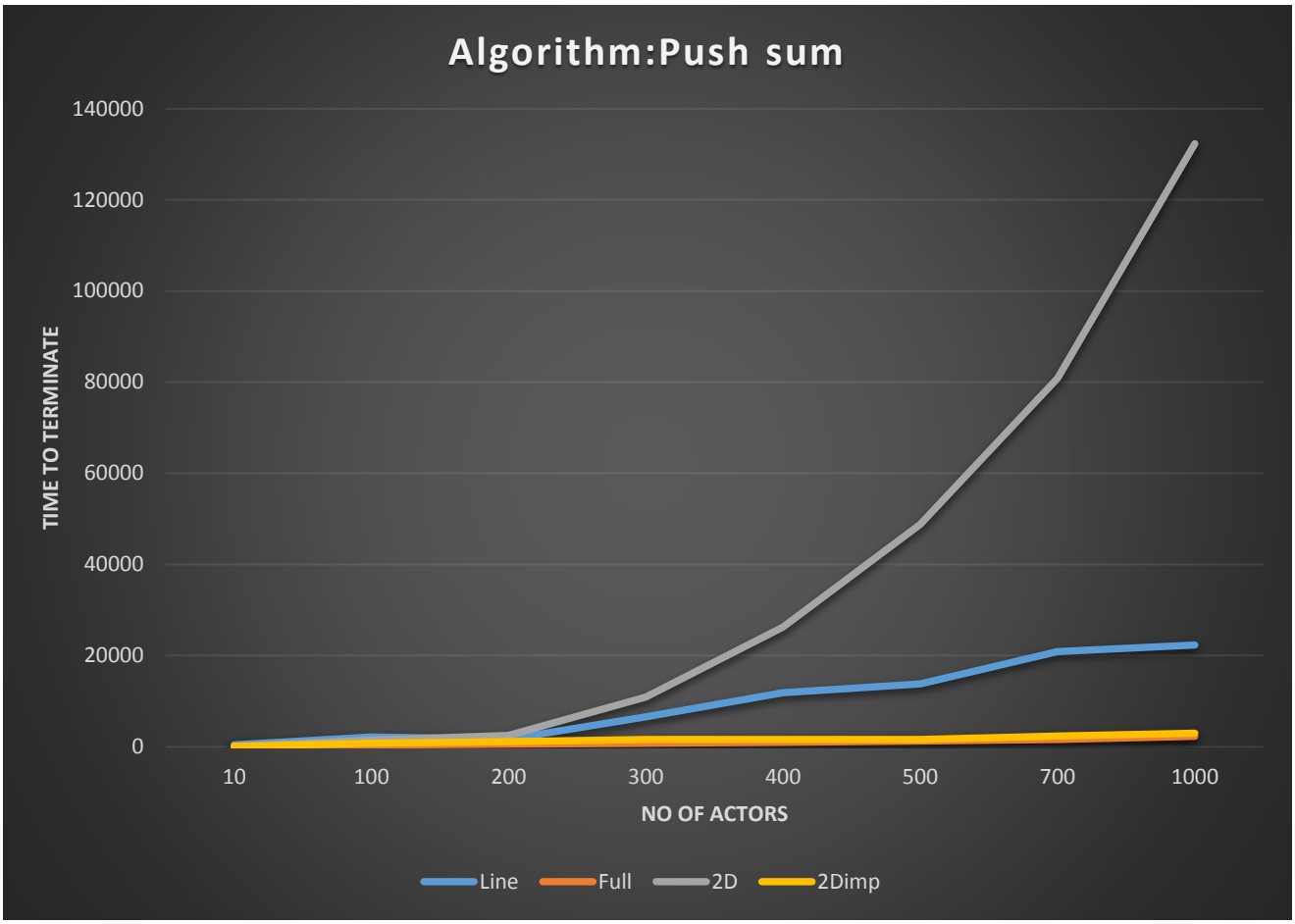

Figure 1.1

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- Asynchronous Gossip

Data in a tabular form

Time\Topology	Line	Full	2D	2DImp
10	4	3	34	5
100	20	17	22	32
500	101	76	99	127
1000	166	92	141	122
2000	210	157	231	279
3000	256	143	286	248
5000	623	188	582	486
10000	712	487	2050	1590
20000	-	522	7292	3712

This table represents the time required to converge the program for different topologies when the number of actors are changed from the range 0 to 20000.Here each actor stops transmitting once it has heard the rumor 10 times.

When we plot the graph as shown in figure 1.2, I observed following outcomes:

- **Line** topology fail to converge when actors increased beyond 10000.
- **Full** topology is the fastest topology when asynchronous gossip is considered.
- **2D and 2D impatient** shows similar kind of charactaristics in the above table.
  But when compared against each other 2D impatient takes less time as it is sending message to random actor.

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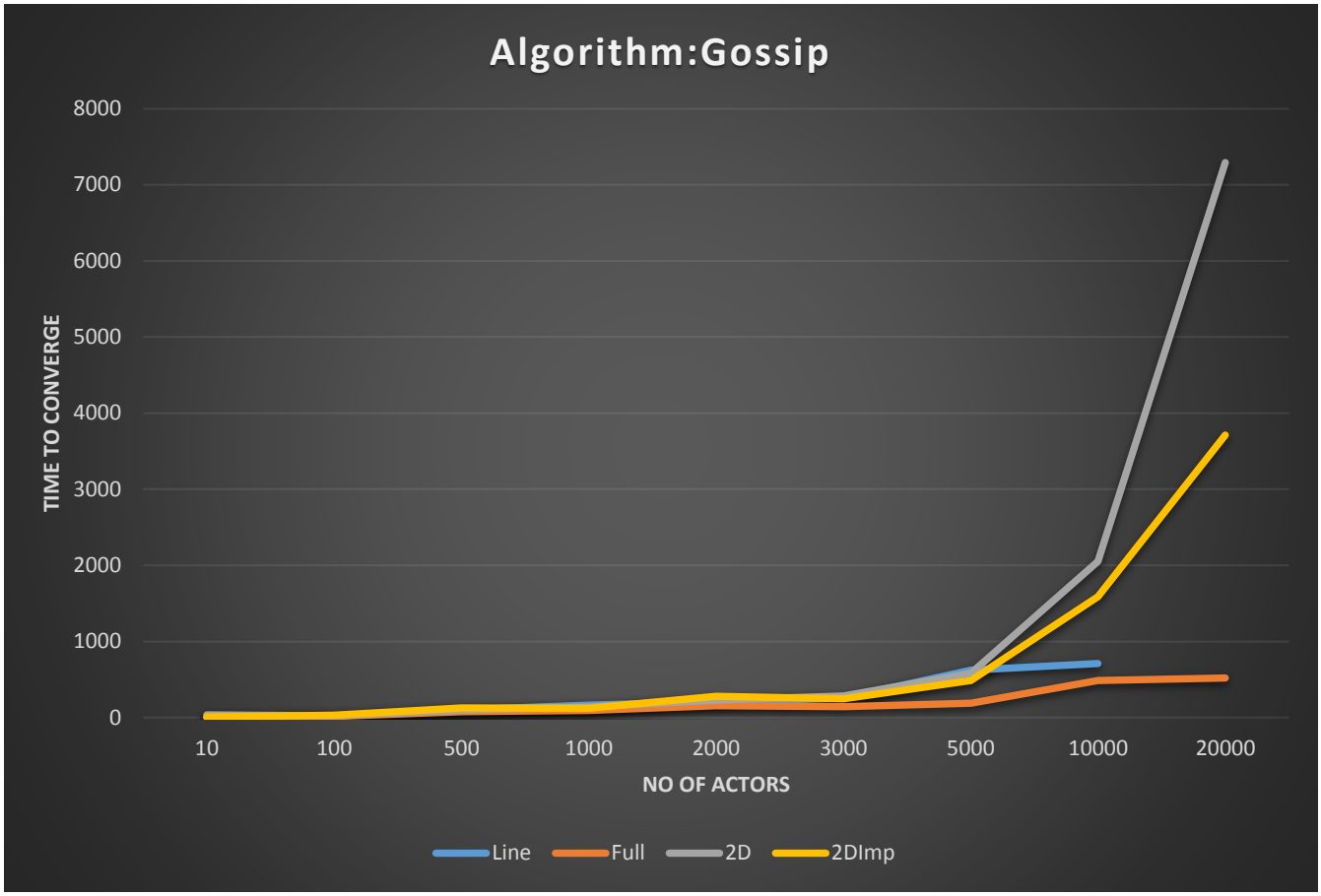

Conclusion: I have successfully simulated convergence of gossip and push sum algorithms using akka actors for the four different topologies.

For the big networks (actors >10000) with a gossip algorithm Full and 2D Imp topologies can be preferred over simple 2D and line.

Whereas in case of push sum, 2D imp topology is more efficient than other three topologies.

By looking at the outcome we can say that as the network increases the convergence of program becomes slow.