

COP5615 – Fall 2019

Report Project 2 – Gossip Simulator

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The aim of the project is to implement Gossip and Push-Sum algorithm for different network topologies like Full, Line, Random2D, 3DTorus, Honeycomb and Honeycomb with a random neighbor and analyze their convergence time.

Gossip Algorithm:

- Starting: A participant (actor) is told/sent a rumor(fact) by the main process
- Step: Each actor selects a random neighbor and tells it the rumor
- Termination: Each actor keeps track of rumors and how many times it has heard the rumor. It stops transmitting once it has heard the rumor 10 times

Push-Sum algorithm for sum computation:

- State: Each actor A_i maintains two quantities: s and w .
- Starting: Ask one of the actors to start from the main process.
- Receive: Messages sent and received are pairs of the form (s, w) . Upon receive; an actor should add received pair to its own corresponding values. Upon receive, each actor selects a random neighbor and sends it a message.
- Send: When sending a message to another actor, half of s and w is kept by the sending actor and half is placed in the message.
- Sum estimate: At any given moment of time, the sum estimate is s/w where s and w are the current values of an actor.

Topologies:

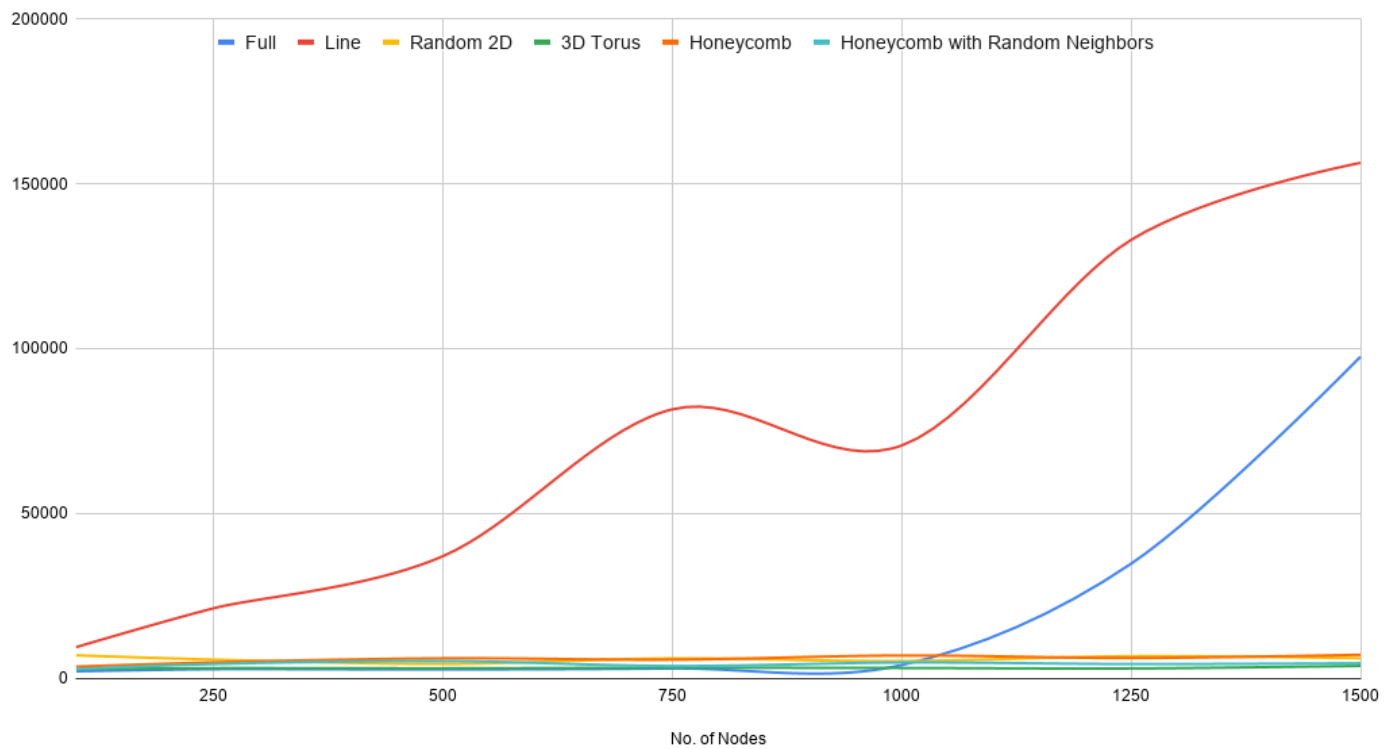
The actual network topology plays a critical role in the dissemination speed of Gossip protocols. As part of this project you have to experiment with various topologies. The topology determines who is considered a neighbor in the above algorithms.

- Full Network
- Line
- Random 2D Grid
- 3D Torus Grid
- Honeycomb
- Honeycomb with a random neighbor

Gossip Protocol:

		Time taken to converge (in Milliseconds)				
No. of Nodes	Full	Line	Random 2D	3D Torus	Honeycomb	Honeycomb with Random Neighbor
100	2093	9438	6953	2750	3515	2782
250	2750	21250	5656	3063	4828	4321
500	2672	37062	4359	3016	6046	5218
750	2969	81609	6015	3187	5640	3719
1000	4000	70641	5203	3118	6907	4766
1250	34757	133031	6703	2969	6147	4312
1500	97578	156406	6078	3750	7125	4562

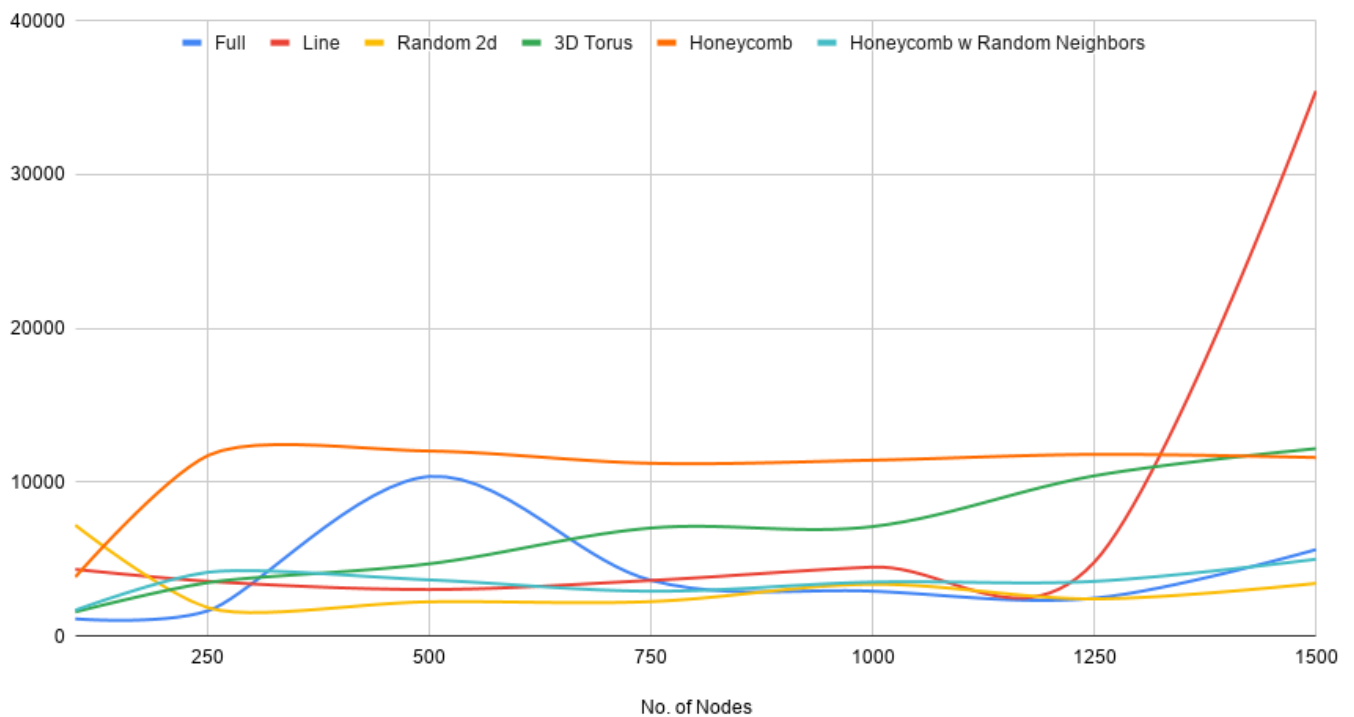
Gossip



Push Sum:

	Time taken to converge (in Milliseconds)					
No. of Nodes	Full	Line	Random 2D	3D Torus	Honeycomb	Honeycomb with Random Neighbor
100	1125	4344	7219	1578	3844	1688
250	1657	3563	1844	3485	11750	4156
500	10375	3032	2235	4708	12031	3657
750	3625	3625	2250	7031	11234	2922
1000	2922	4489	3375	7125	11437	3515
1250	2469	4812	2422	10422	11813	3563
1500	5625	35435	3432	12188	11609	5000

Push Sum



Interesting Findings:

- Line has the lowest probability of converging. This might be due to the fact that it has a higher chance of the neighbors of that particular node have reached their count.
- The Honeycomb topology attains convergence for any number of nodes in a same time.