University of Oslo
IN5020 - Distributed Systems
Assignment 3 - PeerSim

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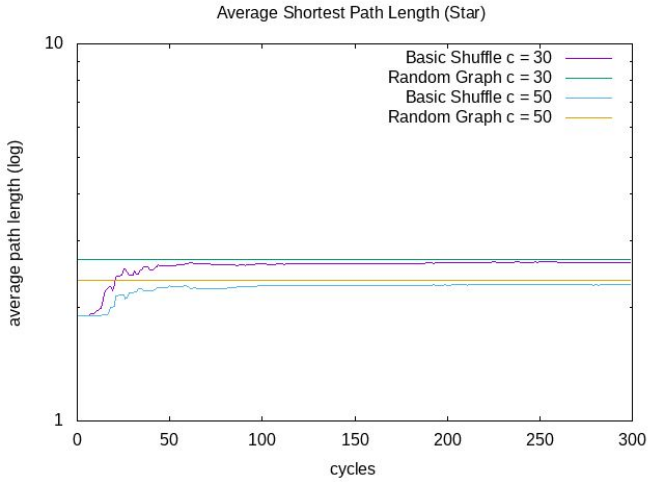
Topology analysis

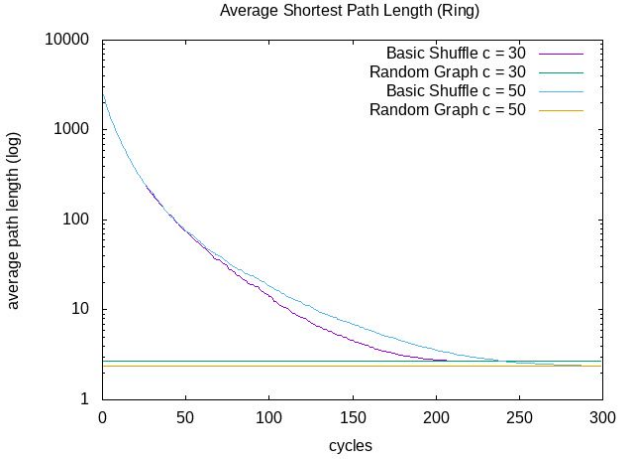
With regards to the topologies simulated, the **star** seems to be the most adequate one to bootstrap a P2P system. By analyzing the graphs we can see that this topology is the most stable during the course of the simulation and the quickest to converge to the values exhibited by a random graph overlay when using the basic shuffle algorithm.

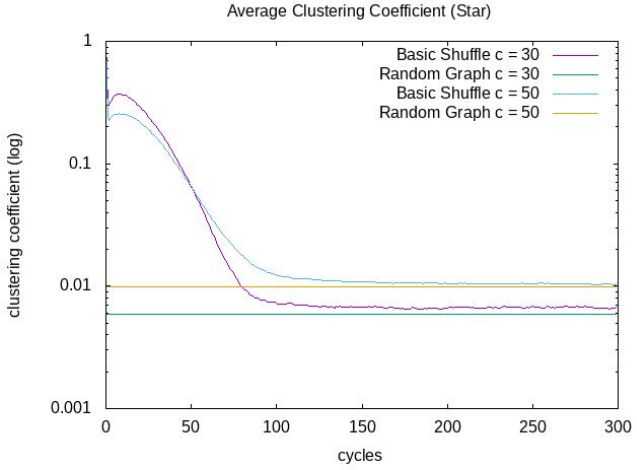
However, in some P2P systems, a star topology is not attainable because it requires to have a central node which is aware of all the other nodes in the topology, which transforms the system into a centralized P2P system.

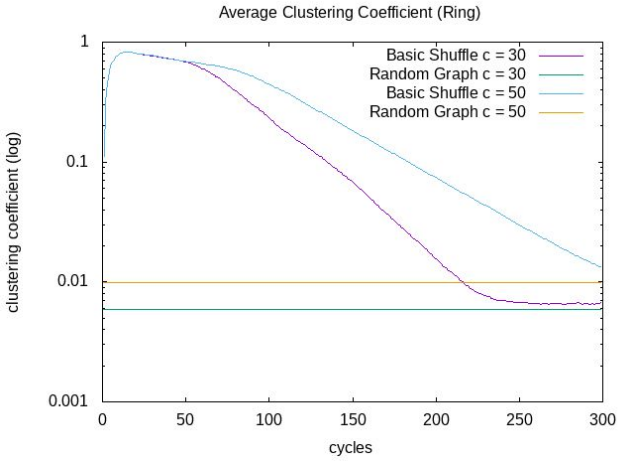
Cache size analysis

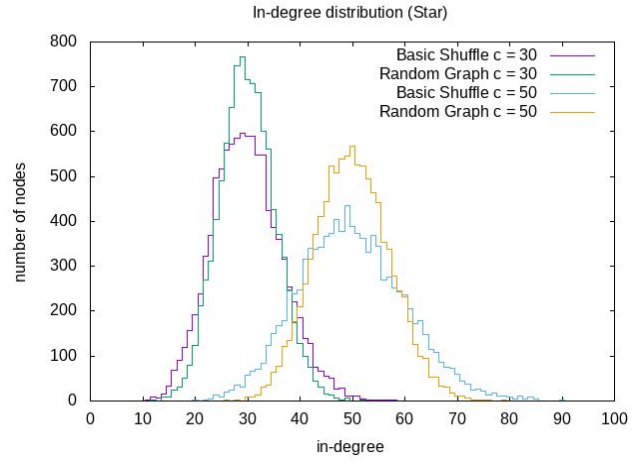
The larger cache (50 nodes) contributes to a smaller average path length, which makes the network faster. However, the clustering coefficient gets higher and takes more time to converge to a random graph value with a larger cache, due to the increased number of neighbors, causing the network to be more partition prone and inefficient. Finally, the in-degree distribution value also increases with a larger cache, which makes for a more robust and well-balanced network. Overall, it seems that finding a large enough cache size is definitely beneficial when implementing a P2P network.

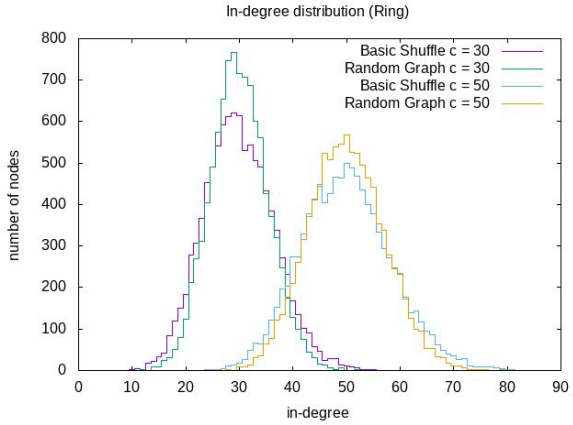

Average Shortest Path Length (Star)
average path length (log)
cycles
Basic Shuffle c = 30
Random Graph c = 30
Basic Shuffle c = 50
Random Graph c = 50
10
1
0
50
100
150
200
250
300


Average Shortest Path Length (Ring)
average path length (log)
cycles
Basic Shuffle c = 30
Random Graph c = 30
Basic Shuffle c = 50
Random Graph c = 50
10000
1000
100
10
1
0
50
100
150
200
250
300


Average Clustering Coefficient (Star)
clustering coefficient (log)
cycles
Basic Shuffle c = 30
Random Graph c = 30
Basic Shuffle c = 50
Random Graph c = 50
1
0.1
0.01
0.001
0
50
100
150
200
250
300


Average Clustering Coefficient (Ring)
clustering coefficient (log)
cycles
Basic Shuffle c = 30
Random Graph c = 30
Basic Shuffle c = 50
Random Graph c = 50
1
0.1
0.01
0.001
0
50
100
150
200
250
300


In-degree distribution (Star)
number of nodes
in-degree
Basic Shuffle c = 30
Random Graph c = 30
Basic Shuffle c = 50
Random Graph c = 50
800
700
600
500
400
300
200
100
0
0
10
20
30
40
50
60
70
80
90
100


In-degree distribution (Ring)
number of nodes
in-degree
Basic Shuffle c = 30
Random Graph c = 30
Basic Shuffle c = 50
Random Graph c = 50
800
700
600
500
400
300
200
100
0
0
10
20
30
40
50
60
70
80
90