

Results and Analysis

Results for Number of nodes = 20 and S = 0.9:

A peer to peer network of 20 nodes is setup, resources allocated per node are 8 and Queries are generated according to Zipf's Distribution with $S = 0.9$.

1. Average number of Minimum hops in the network for each node = 1.3
Standard Deviation of Minimum hops in the network for each node = 1.25 (approximately 1).

2. Average number of Maximum hops in the network for each node = 3.2
Standard Deviation of Minimum hops in the network for each node = 1.52 (approximately 2).

3. Average number of hops in the network = 2.4. (approximately 2).
Standard Deviation of hops in the network = 1.3 (approximately 1).

4. Average Latency is 26.45 Millis seconds. (approximately 26).
Standard Deviation for Latency is 7.4 Millis seconds.

5. Average number of Messages received per node = 500
Standard Deviation of the number of Messages received = 0

→ Minimum **Node degree** in a network of twenty nodes = 3 (As Bootstrap server gives a minimum of three IP Address for a node to join the network)

→ Maximum **Node degree** in a network of twenty nodes = 8

→ Average Node Degree of a node in a network of 20 nodes is in between 5 and 6.

Query cost depends on the number of hops. So, the average cost of a query in the network is 2.

Per Node cost depends on the number of messages a node has received, average per node cost in a network of twenty nodes is 500.

(Values are rounded to integers as double values of hops and node degree isn't possible).

Results for Number of nodes = 20 and S = 0.8:

A peer to peer network of 20 nodes is setup, resources allocated per node is 8 and Queries are generated according to Zipf's Distribution with $S = 0.8$.

1. Average number of Minimum hops in the network for each node = 1.3
Standard Deviation of Minimum hops in the network for each node = 1.28 (approximately 1).

2. Average number of Maximum hops in the network for each node = 3.24
Standard Deviation of Minimum hops in the network for each node = 1.58 (approximately 2).

3. Average number of hops in the network = 2.6. (approximately 2).
Standard Deviation of hops in the network = 1.35 (approximately 1).

4. Average Latency is 28.45 Millis seconds. (approximately 26).
Standard Deviation for Latency is 7.46 Millis seconds.

5. Average number of Messages received per node = 500
Standard Deviation of the number of Messages received = 0

→ Minimum **Node degree** in a network of twenty nodes = 3 (As Bootstrap server gives a minimum of three IP Address for a node to join the network)

→ Maximum **Node degree** in a network of twenty nodes = 8

→ Average Node Degree of a node in a network of 20 nodes is in between 5 and 6.

Query cost depends on the number of hops. So, the average cost of a query in the network is 2.

Per Node cost depends on the number of messages a node has received, average per node cost in a network of twenty nodes is 500.

Results for Number of nodes = 20 and S = 0.7:

A peer to peer network of 20 nodes is setup, resources allocated per node is 8 and Queries are generated according to Zipf's Distribution with S = 0.7.

1. Average number of Minimum hops in the network for each node = 1.5
Standard Deviation of Minimum hops in the network for each node = 1.32 (approximately 1).

2. Average number of Maximum hops in the network for each node = 3.29
Standard Deviation of Minimum hops in the network for each node = 1.42 (approximately 2).

3. Average number of hops in the network = 2.49. (approximately 2).
Standard Deviation of hops in the network = 1.28 (approximately 1).

4. Average Latency is 29.35 Millis seconds. (approximately 26).
Standard Deviation for Latency is 7.4 Millis seconds.

5. Average number of Messages received per node = 500
Standard Deviation of the number of Messages received = 0

- Minimum **Node degree** in a network of twenty nodes = 3 (As Bootstrap server gives a minimum of three IP Address for a node to join the network)
- Maximum **Node degree** in a network of twenty nodes = 8
- Average Node Degree of a node in a network of 20 nodes is in between 5 and 6.

Query cost depends on the number of hops. So, the average cost of a query in the network is 2.

Per Node cost depends on the number of messages a node has received, average per node cost in a network of twenty nodes is 500.

Results for Number of nodes = 40 and S = 0.9:

A peer to peer network of 40 nodes is setup, resources allocated per node are 4 and Queries are generated according to Zipf's Distribution with S = 0.9.

1. Average number of Minimum hops in the network for each node = 3.42
Standard Deviation of Minimum hops in the network for each node = 2.64

2. Average number of Maximum hops in the network for each node = 4.63
Standard Deviation of Minimum hops in the network for each node = 3.37

3. Average number of hops in the network = 3.7
Standard Deviation of hops in the network = 2.38.

4. Average Latency is 31.85 Millis seconds.
Standard Deviation for Latency is 8.6 Millis seconds.

5. Average number of Messages received per node = 500
Standard Deviation of the number of Messages received = 0

- Minimum **Node degree** in a network of forty nodes = 3 (As Bootstrap server gives a minimum of three IP Address for a node to join the network)
- Maximum **Node degree** in a network of forty nodes = 10.
- Average Node Degree of a node in a network of 20 nodes is 6.

Query cost depends on the number of hops. So, the average cost of a query in the network is 3.

Per Node cost depends on the number of messages a node has received, average per node cost in a network of twenty nodes is 500.

Results for Number of nodes = 40 and S = 0.8:

A peer to peer network of 40 nodes is setup, resources allocated per node is 4 and Queries are generated according to Zipf's Distribution with S = 0.8.

1. Average number of Minimum hops in the network for each node = 3.25
Standard Deviation of Minimum hops in the network for each node = 2.62

2. Average number of Maximum hops in the network for each node = 4.81
Standard Deviation of Minimum hops in the network for each node = 1.98

3. Average number of hops in the network = 3.5
Standard Deviation of hops in the network = 1.85

4. Average Latency is 28.25 Millis seconds. (approximately 26).
Standard Deviation for Latency is 7.76 Millis seconds.

5. Average number of Messages received per node = 500
Standard Deviation of the number of Messages received = 0

- Minimum **Node degree** in a network of twenty nodes = 3 (As Bootstrap server gives a minimum of three IP Address for a node to join the network)
- Maximum **Node degree** in a network of twenty nodes = 10
- Average Node Degree of a node in a network of 20 nodes is in between 5 and 6.

Query cost depends on the number of hops. So, the average cost of a query in the network is 2.

Per Node cost depends on the number of messages a node has received, average per node cost in a network of twenty nodes is 500.

Results for Number of nodes = 40 and S = 0.7:

A peer to peer network of 40 nodes is setup, resources allocated per node is 4 and Queries are generated according to Zipf's Distribution with S = 0.7.

1. Average number of Minimum hops in the network for each node = 3.45
Standard Deviation of Minimum hops in the network for each node = 2.72

2. Average number of Maximum hops in the network for each node = 4.88
Standard Deviation of Minimum hops in the network for each node = 2.02

3. Average number of hops in the network = 3.59
Standard Deviation of hops in the network = 1.93

4. Average Latency is 28.85 Millis seconds. (approximately 26).
Standard Deviation for Latency is 7.74 Millis seconds.

5. Average number of Messages received per node = 500
Standard Deviation of the number of Messages received = 0

- Minimum **Node degree** in a network of twenty nodes = 3 (As Bootstrap server gives a minimum of three IP Address for a node to join the network)
- Maximum **Node degree** in a network of twenty nodes = 10
- Average Node Degree of a node in a network of 20 nodes is in between 5 and 6.

Query cost depends on the number of hops. So, the average cost of a query in the network is 2.

Per Node cost depends on the number of messages a node has received, average per node cost in a network of twenty nodes is 500.

Results for Number of nodes = 80 and S = 0.9:

A peer to peer network of 80 nodes is setup, resources allocated per node is 2 and Queries are generated according to Zipf's Distribution with S = 0.9.

1. Average number of Minimum hops in the network for each node = 6.45
Standard Deviation of Minimum hops in the network for each node = 3.42

2. Average number of Maximum hops in the network for each node = 8.3
Standard Deviation of Minimum hops in the network for each node = 4.72

3. Average number of hops in the network = 5.87
Standard Deviation of hops in the network = 2.93

4. Average Latency is 54.85 Millis seconds. (approximately 26).
Standard Deviation for Latency is 27.74 Millis seconds.

5. Average number of Messages received per node = 500
Standard Deviation of the number of Messages received = 0

- Minimum **Node degree** in a network of twenty nodes = 3 (As Bootstrap server gives a minimum of three IP Address for a node to join the network)
- Maximum **Node degree** in a network of twenty nodes = 16
- Average Node Degree of a node in a network of 20 nodes is in between 8 and 9.

Query cost depends on the number of hops. So, the average cost of a query in the network is 2.

Per Node cost depends on the number of messages a node has received, average per node cost in a network of twenty nodes is 500.

Results for Number of nodes = 80 and S = 0.8:

A peer to peer network of 80 nodes is setup, resources allocated per node is 2 and Queries are generated according to Zipf's Distribution with $S = 0.8$.

1. Average number of Minimum hops in the network for each node = 6.65
Standard Deviation of Minimum hops in the network for each node = 3.41

2. Average number of Maximum hops in the network for each node = 8.37
Standard Deviation of Minimum hops in the network for each node = 4.82

3. Average number of hops in the network = 5.8
Standard Deviation of hops in the network = 2.37

4. Average Latency is 58.85 Millis seconds. (approximately 26).
Standard Deviation for Latency is 23.74 Millis seconds.

5. Average number of Messages received per node = 500
Standard Deviation of the number of Messages received = 0

→ Minimum **Node degree** in a network of twenty nodes = 3 (As Bootstrap server gives a minimum of three IP Address for a node to join the network)

→ Maximum **Node degree** in a network of twenty nodes = 16

→ Average Node Degree of a node in a network of 20 nodes is in between 8 and 9.

Query cost depends on the number of hops. So, the average cost of a query in the network is 2.

Per Node cost depends on the number of messages a node has received, average per node cost in a network of twenty nodes is 500.

Results for Number of nodes = 80 and $S = 0.7$:

A peer to peer network of 80 nodes is setup, resources allocated per node is 2 and Queries are generated according to Zipf's Distribution with $S = 0.7$.

1. Average number of Minimum hops in the network for each node = 6.87
Standard Deviation of Minimum hops in the network for each node = 3.81

2. Average number of Maximum hops in the network for each node = 8.67
Standard Deviation of Minimum hops in the network for each node = 4.826

3. Average number of hops in the network = 5.88
Standard Deviation of hops in the network = 2.57

4. Average Latency is 58.97 Millis seconds. (approximately 26).

Standard Deviation for Latency is 23.64 Millis seconds.

5. Average number of Messages received per node = 500

Standard Deviation of the number of Messages received = 0

→ Minimum **Node degree** in a network of twenty nodes = 3 (As Bootstrap server gives a minimum of three IP Address for a node to join the network)

→ Maximum **Node degree** in a network of twenty nodes = 16

→ Average Node Degree of a node in a network of 20 nodes is in between 8 and 9.

Query cost depends on the number of hops. So, the average cost of a query in the network is 2.

Per Node cost depends on the number of messages a node has received, average per node cost in a network of twenty nodes is 500.

Graphs:



