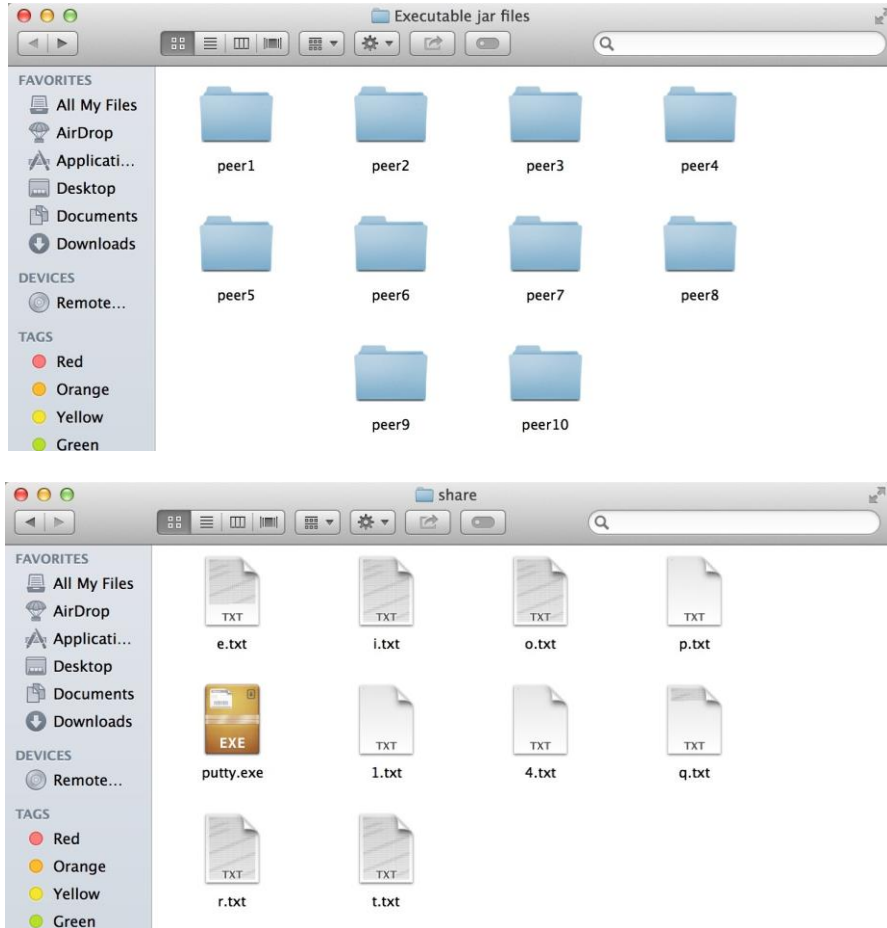


Performance Results

1. Test Environment and Nodes Deployment

In this performance test, we deploy 10 peers and test the performance of this program on the mac operating system.



1.1 Test Parameters and Design

In the first, register files on some peers for testing. In this experiment, automatic register was used to automatically register files on each peer. “t.txt” was registered on peer 4 and peer 10.

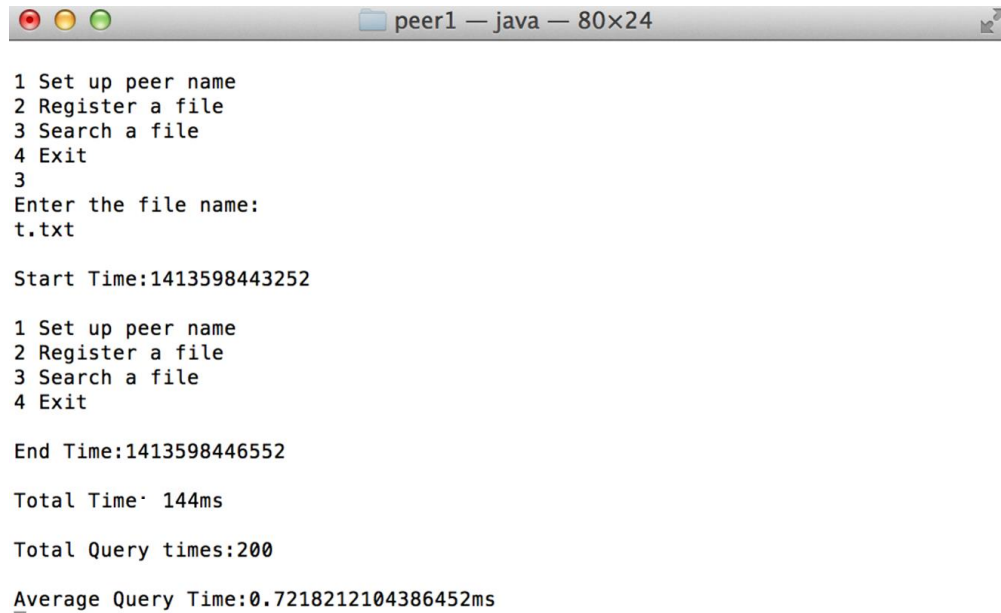
In the second, allow peer1 to search file “t.txt” for 200 times. Here, we did not use cutoff time to decide when the last query result should come back, due to the inaccuracy of using different cutoff time and it is very difficult to choose the proper cutoff time. Therefore, we calculate the total time of hitquery messages the peer received.

In the third, test the program performance under the situation of 1 peer, or multiple peers make search requests at the same time, evaluating the concurrent requests. And test two different topologies, star topology and 2D-mesh topology.

2. Star topology

2.1 Average Response Time of One Peer

When we use one peer to search a file deployed on peer4 and peer10, its search time can be calculated as following picture.



```

1 Set up peer name
2 Register a file
3 Search a file
4 Exit
3
Enter the file name:
t.txt

Start Time:1413598443252

1 Set up peer name
2 Register a file
3 Search a file
4 Exit

End Time:1413598446552

Total Time: 144ms

Total Query times:200

Average Query Time:0.7218212104386452ms

```

Table 1. 1 Peer Response Test

	Average Response Time (ms)	Total Time (ms)
Peer1	0.7218	144

2.2 Average Response Time of Two Peers

With the same configuration and files deployed on same peers. We start two peer to search the same file at the same time.

Table 2. 2 Peers Response Test

	Average Response Time (ms)	Total Time (ms)
Peer1	1.1149	223
Peer2	1.3264	265

End Time:1413602617447

Total Time:223ms

Total Query times:200

Average Query Time:1.1149361465852303ms

2.3 Average Response Time of Three Peers

End Time:1413602617447

Total Time:549ms

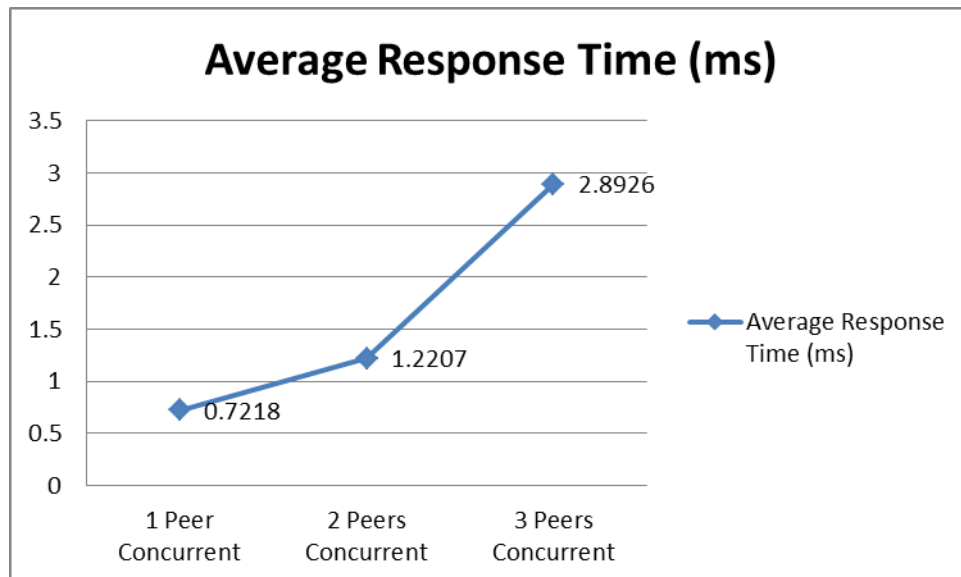
Total Query times:200

Average Query Time:2.7481481481481481ms

Table 3. 3 Peers Response Test

	Average Response Time (ms)	Total Time (ms)
Peer1	2.7481	549
Peer2	3.036	607
Peer3	2.8937	579

2.4 Testing Results for Star Topology



3. 2D-mesh topology

3.1 Average Response Time of One Peer

End Time:1413607289686

Total Time:914ms

Total Query times:200

Average Query Time:4.574074074074074ms

Table 4. 1 Peer Response Test

	Average Response Time (ms)	Total Time (ms)
Peer1	4.5741	914

3.2 Average Response Time of Two Peers

End Time:1413607478330

Total Time:1047ms

Total Query times:200

Average Query Time:5.235583223029639ms

Table 5. 2 Peers Response Test

	Average Response Time (ms)	Total Time (ms)
Peer1	5.2356	1047
Peer2	5.3682	1074

3.3 Average Response Time of Three Peers

End Time:1413610168327

Total Time:1142ms

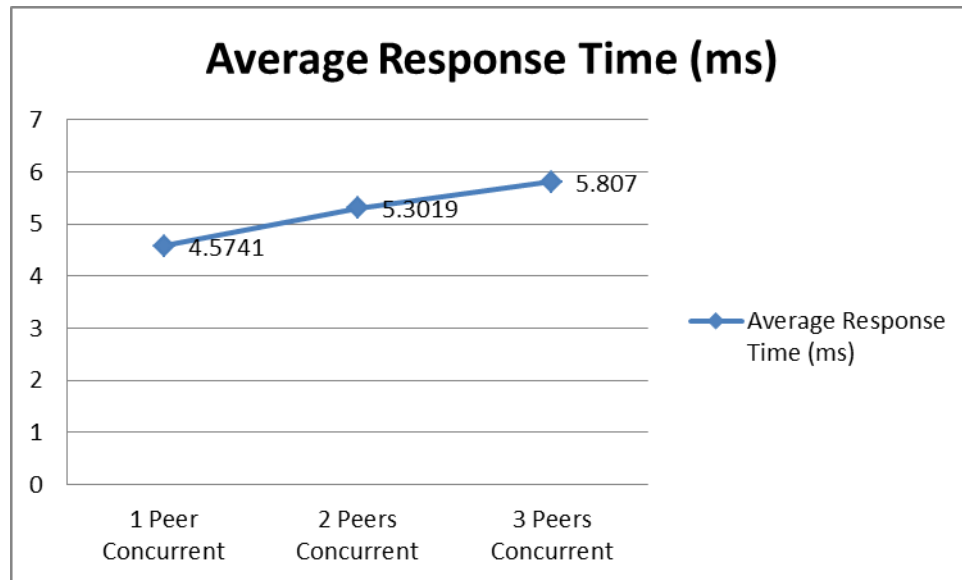
Total Query times:200

Average Query Time:5.711111111111111ms

Table 6. 3 Peers Response Test

	Average Response Time (ms)	Total Time (ms)
Peer1	5.7111	1142
Peer2	5.9862	1197
Peer3	5.7237	1145

3.4 Testing Results for 2D-mesh Topology



4. Performance Comparison and Analysis

4.1 Result of Program 1

In the previous programming 1, the testing results are showed as follows.

1. One peer

```

1 Register a file
2 Search a file
3 Exit
2
Start 2000 times search request test!
Start time: 1413666675231
End time: 1413666675961
Total time of 2000 times search request is: 730ms
Average sponse time: 0.365ms

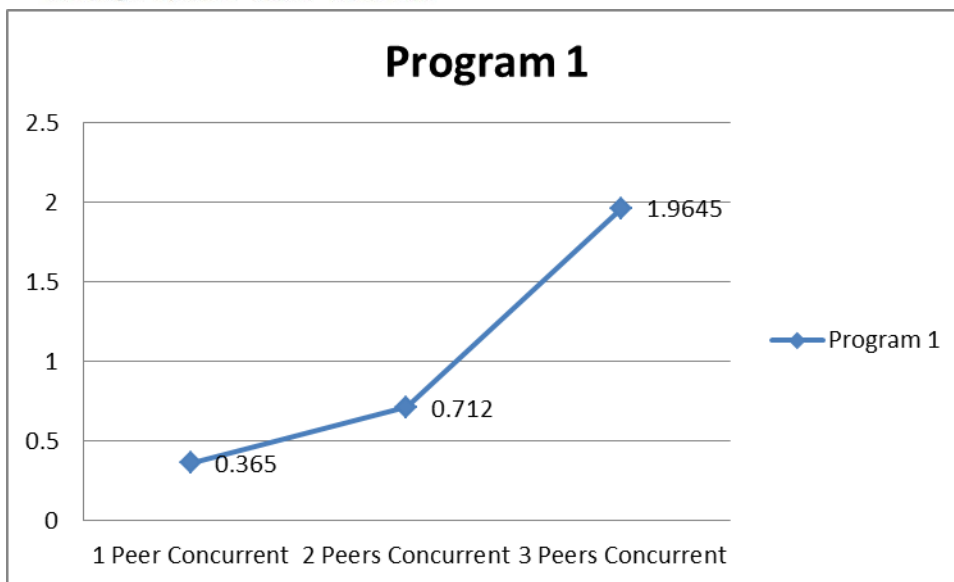
```

2. Two peer

```
1 Register a file
2 Search a file
3 Exit
2
Start 2000 times search request test!
Start time: 1413666744265
End time: 1413666745689
Total time of 2000 times search request is: 1424ms
Average sponse time: 0.712ms
```

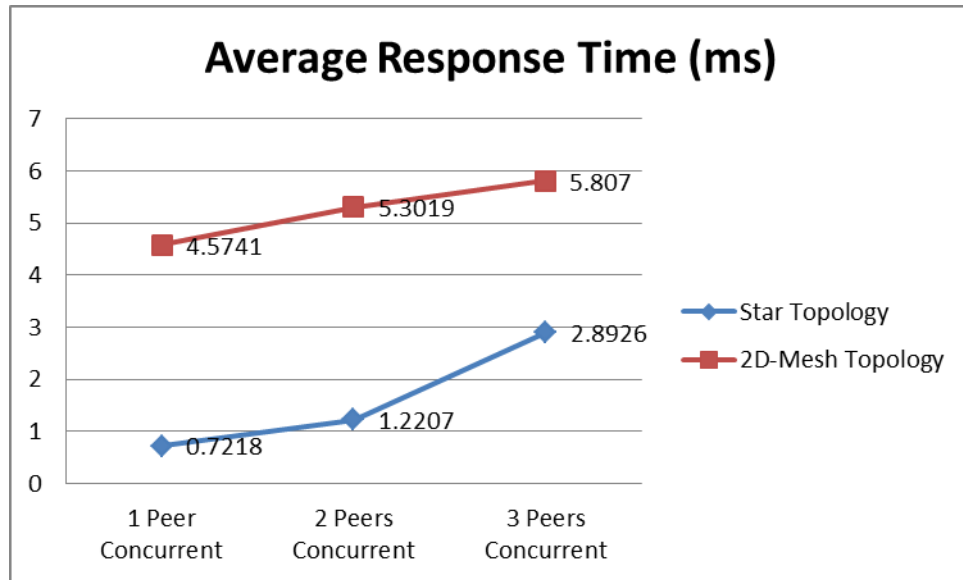
3. Three peer

```
1 Register a file
2 Search a file
3 Exit
2
Start 2000 times search request test!
Start time: 1413666924106
End time: 1413666926035
Total time of 2000 times search request is: 1929ms
Average sponse time: 0.9645ms
```

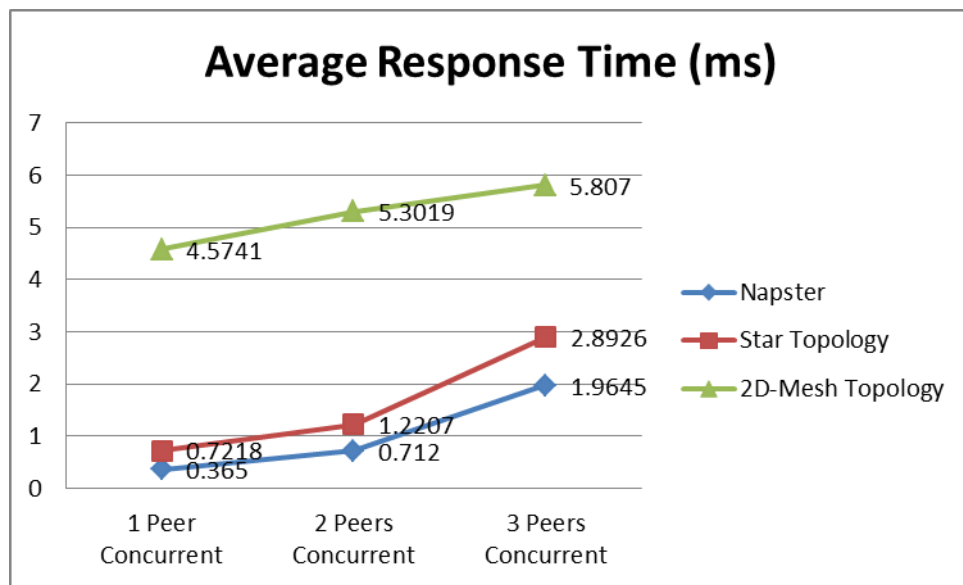


4.2 Result of Program 2

The following figure shows the average response times of 1 peer, 2 peers, and 3 peers concurrent situations.



4.3 Comparison of these 2 programs



4.3.1 Performance

1. The Performance of Program1 is better than Program 2

In the first, in program 1, when one peer sends query message, it only need to send it to the index server. However, in program 2, the peer needs to send it to all its neighbors, making more connection than program 1.

In the second, in program 1, the topology structure is simpler than that in program 2. It is only one hop between peer and index server. However, in program 2, except to start topology,

it is more than 1 hop, so that the query message and hitquery message will be sent between several peers.

2. The Performance of Star Topology is better than 2D-Mesh Topology

2D-Mesh topology is more complicate than star topology. Query message and hitquery message will be transmitted between multiple peers, which will consume more time. The more depth it has, the more time will be consumed.

4.3.2 Scalability

The scalability of Napster style P2P system is poorer than Gnutella style P2P system. The reason is that the ability of index server to handle the connection between it and peers is limited. it cannot supports a large number of peers to search the file at the same time. However, for Gnutella system, we can use multiple hops to find peers, so that it can support a large number of peers through complicate topology.