Implementation of a simple peer-to-peer (P2P) system with a distributed index(DI)

Submitted by:
Rajshree Jain - rjain27
Prashanthi Kanniappan Murthy - pkannia

The exact format of the messages exchanged between the peers and the RS and between peers:

&* is the separator used
REGISTER - command sent
P2P-DI/1.0 - version of the protocol used
Rajshrees-MacBook-Pro.local - host of the machine running
Darwin - Host OS
65452 - PORT at which the client is running

For peer-to-RS communication:

1) REGISTER:

1) A client sends the following message to the register to register for the first time :

```
REGISTER&*P2P-DI/1.0&*Rajshrees-MacBook-Pro.local&*Darwin&*65453
```

2) Registration server replies back with the message :

```
P2P-DI/1.0&*200&*OK&*Rajshrees-MacBook-Pro.local&*Darwin&*1

version - status code - status phrase - host - os - cookie
```

3) *When the client registers for the second time, it sends the cookie in the request it sends:*

```
REGISTER&*P2P-DI/1.0&*Rajshrees-MacBook-Pro.local&*Darwin&*65453*
1
version - host - os - port - cookie
```

2) KEEPALIVE:

```
KEEPALIVE&*P2P-DI/1.0&*1&*Rajshrees-MacBook-Pro.local&*Darwin
```

```
command - version - cookie - host - os
```

3) LEAVENETWORK :

```
LEAVE&*P2P-DI/1.0&*1&*Rajshrees-MacBook-Pro.local&*Darwin
command - version - cookie - host - os
```

4) PQUERY :

1) Request :

```
PQUERY&*P2P-DI/1.0&*2&*Rajshrees-MacBook-Pro.local&*Darwin

command - version - cookie - host - os
```

2) Reply :

The server sends you the entire list of peer index which is active

For peer-to-peer communication:

1. RFCQuery :

1) Request :

```
GET&*RFC-Index&*P2P-DI/1.0&*Rajshrees-MacBook-Pro.local&*Darwin
```

2) Respond :

Server sends you the RFC-Index that it has

2. GetRFC:

1) Request :

```
GET&*RFC&*768&*P2P-DI/1.0&*Rajshrees-MacBook-Pro.local&*Darwin
```

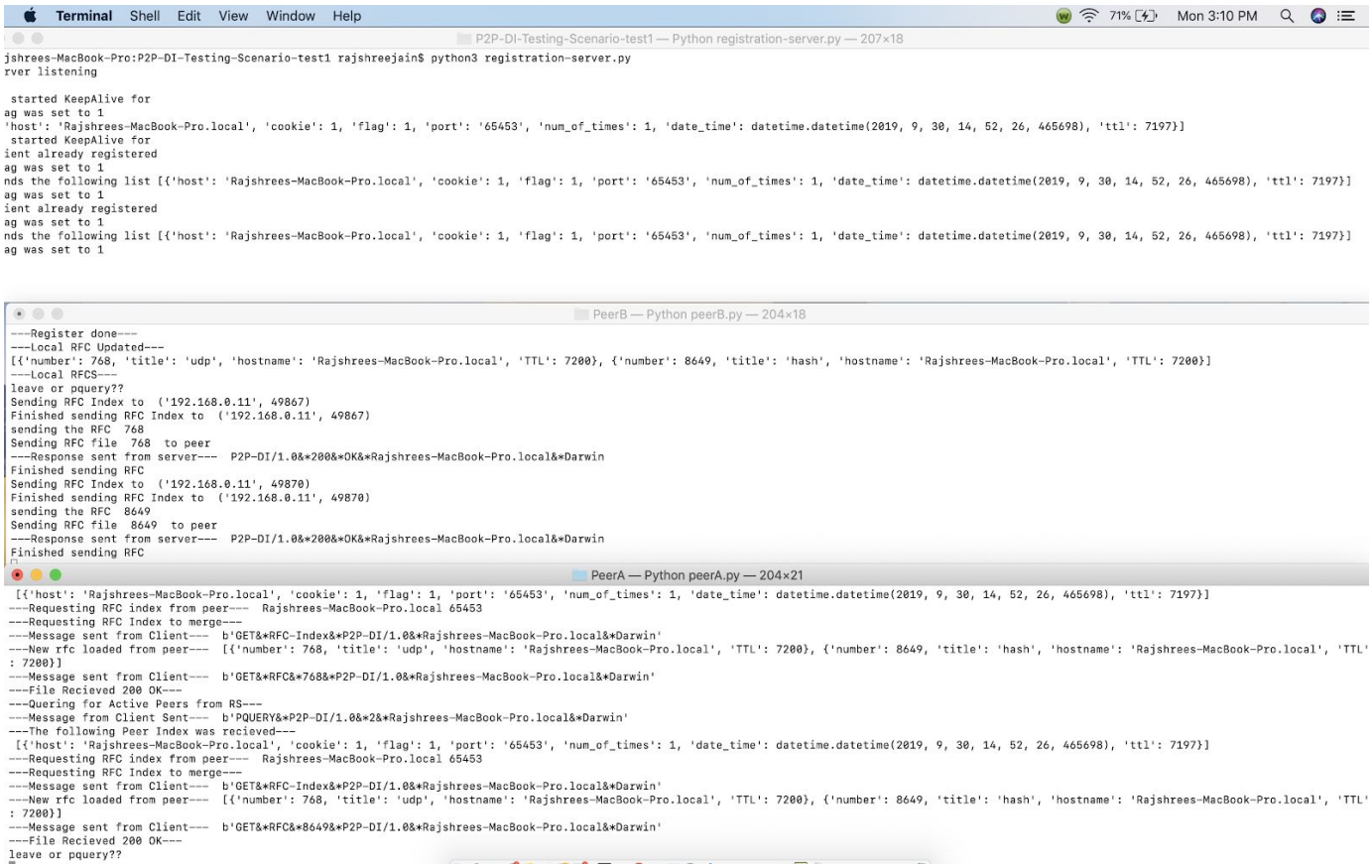
```
method - RFC - Number - version - host - os
```

2) Response :

```
P2P-DI/1.0&*200&*OK&*Rajshrees-MacBook-Pro.local&*Darwin&*<file>

version - status code - status phrase - host - os - file data
```

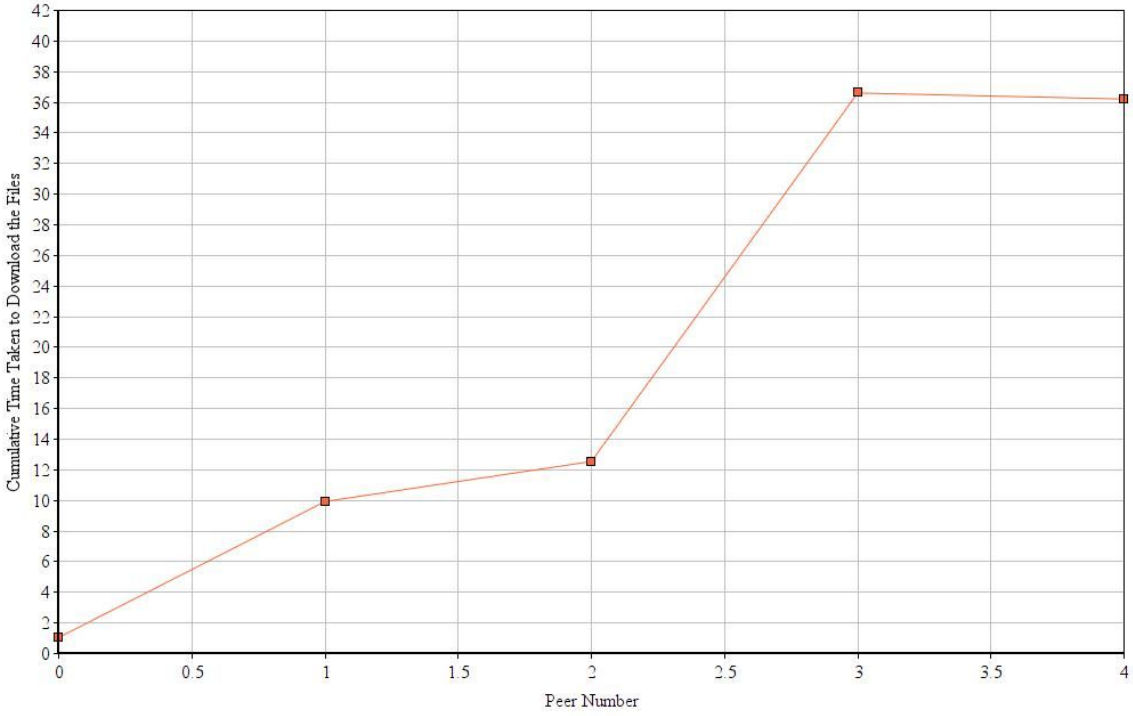
The entire conversation of the transaction can be seen as shown in the screenshot :



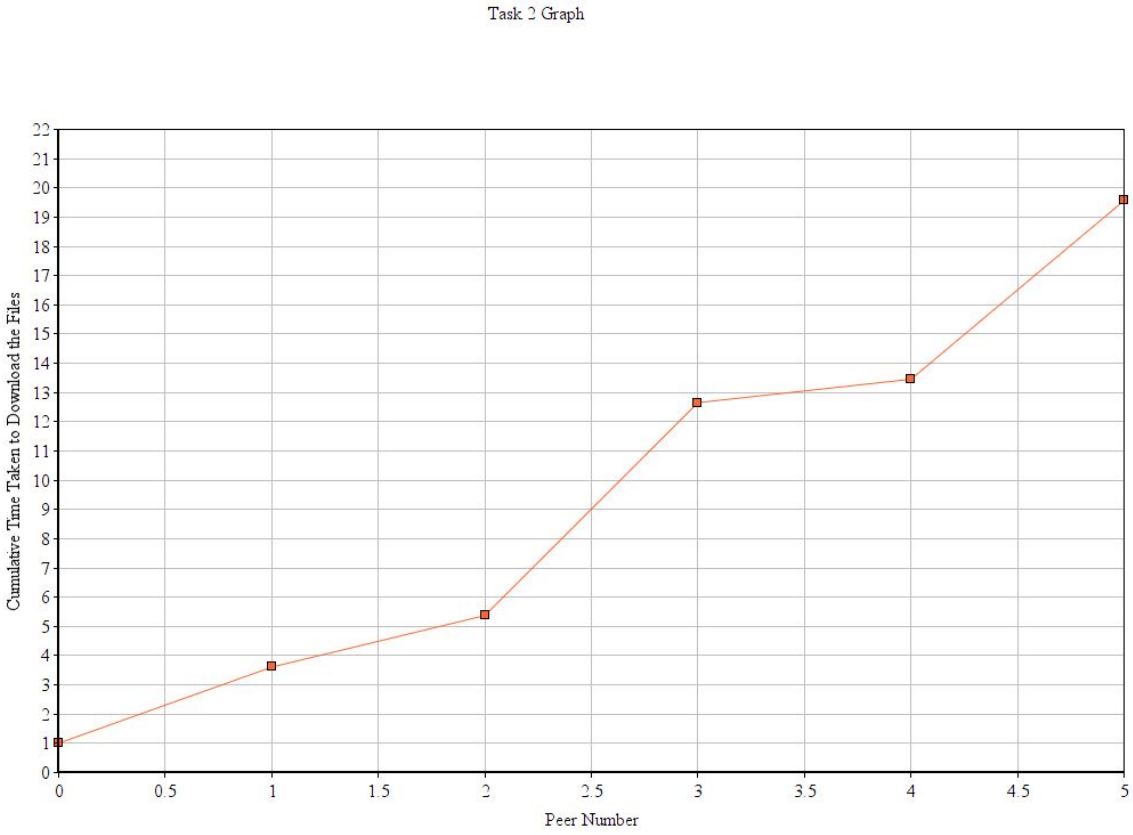
Link to a Screen Cast video which shows how the Testing Scenario works successfully:

The download time curves for Task 1:

Task 1 Graph


Cumulative Time Taken to Download the Files
Peer Number
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
0
0.5
1
1.5
2
2.5
3
3.5
4

the download time curves for Task 2:



D**iscussion of the differences you observed in the above download time curves and any conclusions you may draw regarding the scalability of P2P versus centralized systems for file downloading:**

1) Centralized systems can give way to a central point of failure. When we tried out our code first with centralized, we had a small syntax error in Peer0 and because of that, the entire network was stale and not receiving anything as the system (Peer0) that had every file went down.

Whereas, if it was P2P, at least the other active peers could have done partial downloading of files that are available with the other active peers.
Also, we could observe a drastic difference in the total times where the total times for distribution of files reduced a lot. This must-have happened because the files were distributed and there was no load on one peer for distributing files.

2) In a centralized system, we started the systems one by one. The first system downloaded relatively faster, as more requests were placed, the downloads were slower as compared to the P2P system.

3) Finding content in a P2P is difficult. For eg, when the test scenario was tested, we had to start PeerB first, so PeerA knows that there is an active peer with the RFC it wanted. For large scale systems, this may be difficult.