Personal BitTorrent Tracker

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Description of the program:

This program is divided into 2 parts: *a client* and *a tracker*. A tracker keeps track the peers that are currently connected to it. It will respond to a client if and only if the client requests the IP address of peer that is currently sharing the file.
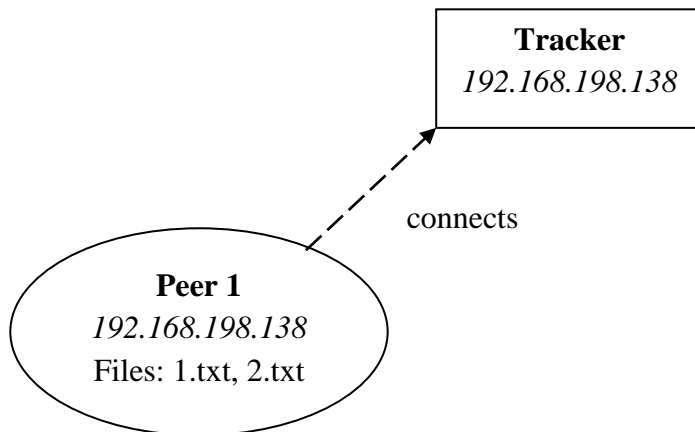
For client, its current posses file lists the files that located at same directory as the client exe file. When it requests for a file, a checking is done to ensure no existing file with same name as requested file exists in the directory. After that, a request will be sent to its neighbours. If the neighbours has the file, the file will be sent to the client. Otherwise, a request is made to the tracker to get the IP address of a peer that is sharing the file. If the server fails to find an IP address, a message will be shown to user to indicate the request is failed to be fulfilled.

Clients (peers) can leave anytime. The tracker can know the current status of the peers by asking them to send an update regularly. If the tracker does not receive the update in certain interval, it knows that the client has left. The same concept applies to peer. The neighbours of a peer have to send an update regularly. If the peer does not receive an update from a neighbour in certain interval, it knows that the peer has left. It will remove the peer from its neighbour list.

Screen Shots:

Initially, Peer 1 that is having same IP address as Tracker connects to the tracker.
Note: We must type the IP address of the server instead of "localhost" in order to run the program correctly.

Figure 1a: The view of tracker when the first peer connects to it.

Figure 1b: The view on client side of peer 1 when it connects to the tracker.

Note: The peer IP and their file list is sorted in alphabetically. The list of files is also sorted in alphabetically.
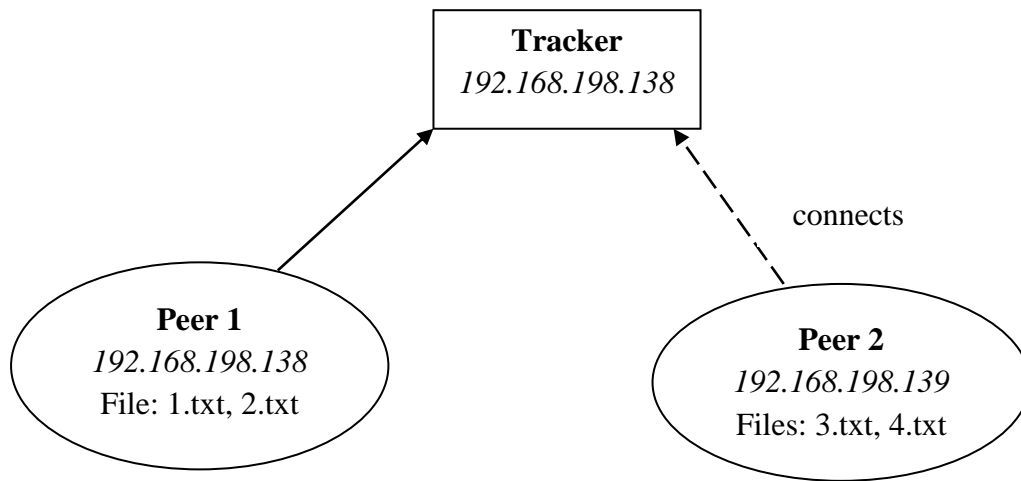
```
Peer with IP: 192.168.198.139 connected.
Waiting for a connection...

                        List of Peers
+-----------------+------------------------+------------------+
| Peer IP         | File List              | Neighbours       |
+-----------------+------------------------+------------------+
| 192.168.198.138 | 1.txt                  |                  |
|                 | 2.txt                  |                  |
|                 | client                 |                  |
+-----------------+------------------------+------------------+
| 192.168.198.139 |                        |                  |
+-----------------+------------------------+------------------+

                    List of Files
+-----------------+------------------------+
| File Name       | IP Address             |
+-----------------+------------------------+
|  ▶.txt          | 192.168.198.138        |
+-----------------+------------------------+
| 2.txt           | 192.168.198.138        |
+-----------------+------------------------+
| client          | 192.168.198.138        |
+-----------------+------------------------+
```

Figure 2a: The view of tracker when a new node (192.168.198.139) connects to it.

Note: The tracker will only show the new node's file list when the new node update with it later.

Now, peer 2 wants to request 1.txt. Since it has no neighbours, its request will be sent to the tracker, and the tracker will send back the ip address of peer who is having this file.

Note (Extra): This program support a sending of small text file.


```
lee@ubuntu: ~/Desktop
File  Edit  View  Search  Terminal  Help
Please type the file name (with extension).
3.txt
Connecting to 192.168.198.139 on port 4444
What you wish to do?
1. Request a file.
2. Leave.

                    List of Peers
+-------------------+-------------------+-------------------+
| Peer IP           | File List         | Neighbours        |
+-------------------+-------------------+-------------------+
| 192.168.198.139 |                   |                   |
+-------------------+-------------------+-------------------+

                    List of Peers
+-------------------+-------------------+-------------------+
| Peer IP           | File List         | Neighbours        |
+-------------------+-------------------+-------------------+
| 192.168.198.139 | 3.txt             |                   |
|                   | 4.txt             |                   |
|                   | client            |                   |
+-------------------+-------------------+-------------------+
```

Figure 2b: Neighbour list will be shown for peer 2 when it is connected to it.

```
lee@ubuntu: ~/Desktop
File  Edit  View  Search  Terminal  Help
1. Request a file.
2. Leave.
Waiting for a connection...
Peer with IP: 192.168.198.138 connected.
Waiting for a connection...

                    List of Peers
+-------------------+-------------------+-------------------+
| Peer IP           | File List         | Neighbours        |
+-------------------+-------------------+-------------------+
| 192.168.198.138 |                   |                   |
+-------------------+-------------------+-------------------+

                    List of Peers
+-------------------+-------------------+-------------------+
| Peer IP           | File List         | Neighbours        |
+-------------------+-------------------+-------------------+
| 192.168.198.138 | 1.txt             |                   |
|                   | 2.txt             |                   |
|                   | 3.txt             |                   |
|                   | client            |                   |
+-------------------+-------------------+-------------------+
```

Figure 2c: Neighbour list is shown to peer 1.

```
                    List of Peers
+-------------------+-------------------+-------------------+
| Peer IP           | File List         | Neighbours        |
+-------------------+-------------------+-------------------+
| 192.168.198.138 | 1.txt             | 192.168.198.139 |
|                   | 2.txt             |                   |
|                   | 3.txt             |                   |
|                   | client            |                   |
+-------------------+-------------------+-------------------+
| 192.168.198.139 | 3.txt             | 192.168.198.138 |
|                   | 4.txt             |                   |
|                   | client            |                   |
+-------------------+-------------------+-------------------+

                    List of Files
+-------------------+-------------------------------+
| File Name         | IP Address                    |
+-------------------+-------------------------------+
| 1.txt             | 192.168.198.138               |
+-------------------+-------------------------------+
| 2.txt             | 192.168.198.138               |
+-------------------+-------------------------------+
| 3.txt             | 192.168.198.138               |
|                   | 192.168.198.139               |
+-------------------+-------------------------------+
| 4.txt             | 192.168.198.139               |
+-------------------+-------------------------------+
| client            | 192.168.198.138               |
|                   | 192.168.198.139               |
+-------------------+-------------------------------+
```

Figure 2c: View of the tracker after the operation.

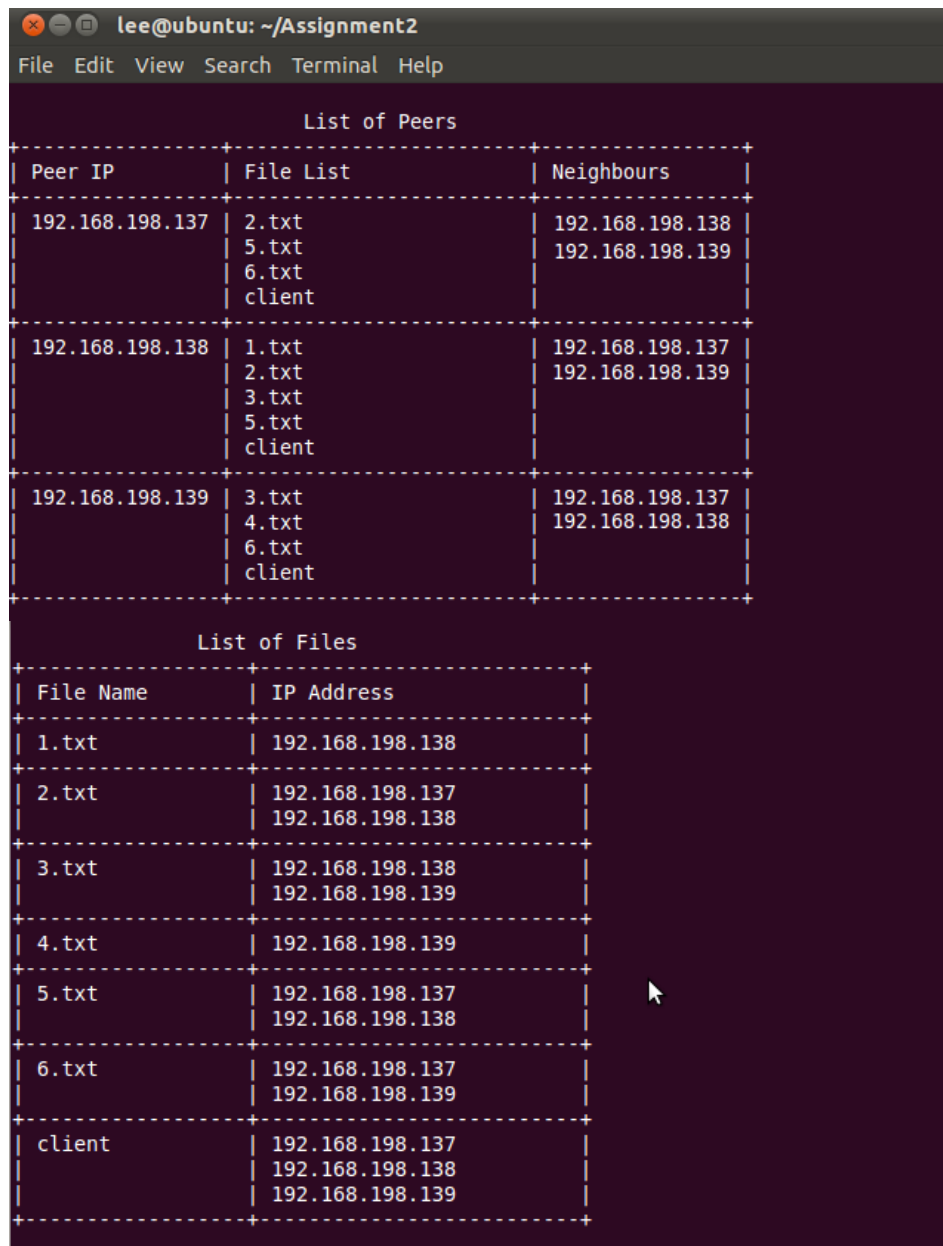The below diagram show the state after the following operation:
1. Peer 3 with IP 192.168.198.137 with files 5.txt and 6.txt joined.
2. Peer 3 request file 2.txt from tracker (since it has no neighbour).
3. Tracker send the IP address of peer 1 (192.168.198.138).
4. Peer 3 connects to peer 1 and gets the file.
5. Peer 1 request file 5.txt, and it is found in 1 of its neighbour (peer 3), so the file is sent to it without sending the request to tracker.
6. Peer 2 request file 6.txt, and it is not found in its neighbour, so request is sent to tracker and it connects to peer 3 after the get respond (ip address) from tracker.

Peer 3
192.168.198.137
File: 5.txt, 6.txt, 2.txt

Tracker
192.168.198.138

Peer 1
192.168.198.138
File: 1.txt, 2.txt, 3.txt, 5.txt

Peer 2
192.168.198.139
Files: 3.txt, 4.txt, 6.txt
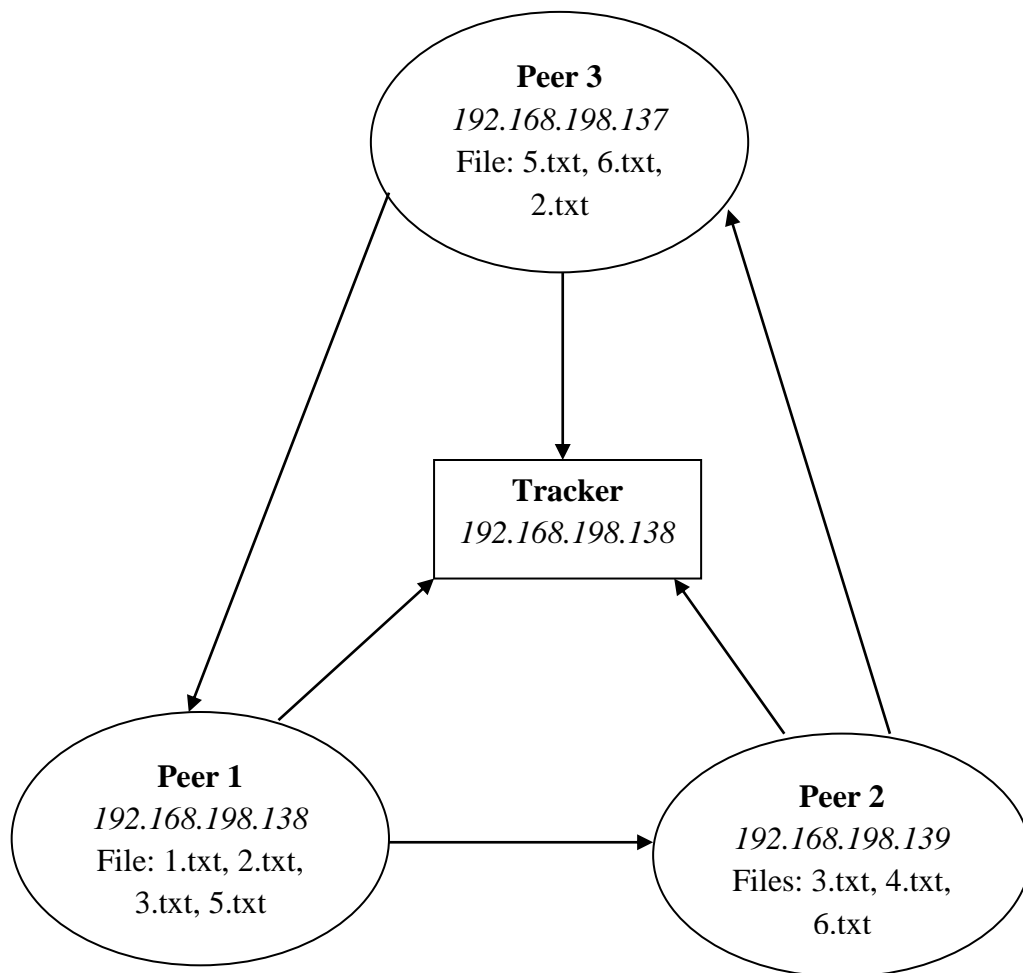
The screen shot below shows the display of the tracker after the operations above.

```
⊗⊖⊡  lee@ubuntu: ~/Assignment2
File  Edit  View  Search  Terminal  Help
                    List of Peers
+-----------------+------------------------+----------------------+
| Peer IP         | File List              | Neighbours           |
+-----------------+------------------------+----------------------+
| 192.168.198.137 | 2.txt                  | 192.168.198.138      |
|                 | 5.txt                  | 192.168.198.139      |
|                 | 6.txt                  |                      |
|                 | client                 |                      |
+-----------------+------------------------+----------------------+
| 192.168.198.138 | 1.txt                  | 192.168.198.137      |
|                 | 2.txt                  | 192.168.198.139      |
|                 | 3.txt                  |                      |
|                 | 5.txt                  |                      |
|                 | client                 |                      |
+-----------------+------------------------+----------------------+
| 192.168.198.139 | 3.txt                  | 192.168.198.137      |
|                 | 4.txt                  | 192.168.198.138      |
|                 | 6.txt                  |                      |
|                 | client                 |                      |
+-----------------+------------------------+----------------------+
                    List of Files
+-----------------+------------------------+
| File Name       | IP Address             |
+-----------------+------------------------+
| 1.txt           | 192.168.198.138        |
+-----------------+------------------------+
| 2.txt           | 192.168.198.137        |
|                 | 192.168.198.138        |
+-----------------+------------------------+
| 3.txt           | 192.168.198.138        |
|                 | 192.168.198.139        |
+-----------------+------------------------+
| 4.txt           | 192.168.198.139        |
+-----------------+------------------------+
| 5.txt           | 192.168.198.137        |
|                 | 192.168.198.138        |
+-----------------+------------------------+
| 6.txt           | 192.168.198.137        |
|                 | 192.168.198.139        |
+-----------------+------------------------+
| client          | 192.168.198.137        |
|                 | 192.168.198.138        |
|                 | 192.168.198.139        |
+-----------------+------------------------+
```

This is the display for tracker after peer 1 and peer 2 leave.

```
                    List of Peers
+------------------+-----------------------+--------------------+
| Peer IP          | File List             | Neighbours         |
+------------------+-----------------------+--------------------+
| 192.168.198.137  | 2.txt                 |                    |
|                  | 5.txt                 |                    |
|                  | 6.txt                 |                    |
|                  | client                |                    |
+------------------+-----------------------+--------------------+

             List of Files
+------------------+-----------------------------+
| File Name        | IP Address                  |
+------------------+-----------------------------+
| 2.txt            | 192.168.198.137             |
+------------------+-----------------------------+
| 5.txt            | 192.168.198.137             |
+------------------+-----------------------------+
| 6.txt            | 192.168.198.137             |
+------------------+-----------------------------+
| client           | 192.168.198.137             |
+------------------+-----------------------------+
```

Extra features:

If there is a file with same name exists in the same directory, the program will ask the user to rename the file first before the file can be requested.

```
lee@ubuntu: ~/Desktop
File  Edit  View  Search  Terminal  Help
Please specify the tracker ip address.
192.168.198.138
Connecting to 192.168.198.138 on port 3333
Connection Established!
Waiting for a connection...
What you wish to do?
1. Request a file.
2. Leave.
1
Please type the file name (with extension).
1.txt
File with same name exists in the same directory!
Please rename it if you want to request this file.
What you wish to do?
1. Request a file.
2. Leave.
```

If currently there is no peer sharing the requested file, a message will be shown to user.

```
What you wish to do?
1. Request a file.
2. Leave.
1
Please type the file name (with extension).
aaaaa
No peer is sharing this file now. Try again later.
What you wish to do?
1. Request a file.
2. Leave.
```

Discussion:

I personally think that this modified version of Bittorrent tracker (peer can request neighbour for file) is better than traditional one since the problem of overloading in tracker can be reduced. The amount of requests to server can be greatly reduced since some requests can be done by requesting file from the peer's neighbours. Moreover, the requested files in a same region are normally the same. A peer can just request a file from their neighbours without the intervation of the tracker. Therefore, the chance of getting overloading in racker is greatly reduced. In addition, requests of files can be done more rapid since the request is sent to nearer place.

In a nutshell, this method is better from the traditional bittorrent tracker in term of speed, efficiency, and performance.

Limitation:

The tracker may need some time to get the update from each peers. This applies to peers also. Each peers may need some times to get the update from its neighbours. Therefore, there is may be a inconsistency when displaying the result. Just wait for the next display and everything will be fine.