

# Communication Networks

## File Sharing Protocol

Download, Upload, Indexed searching.

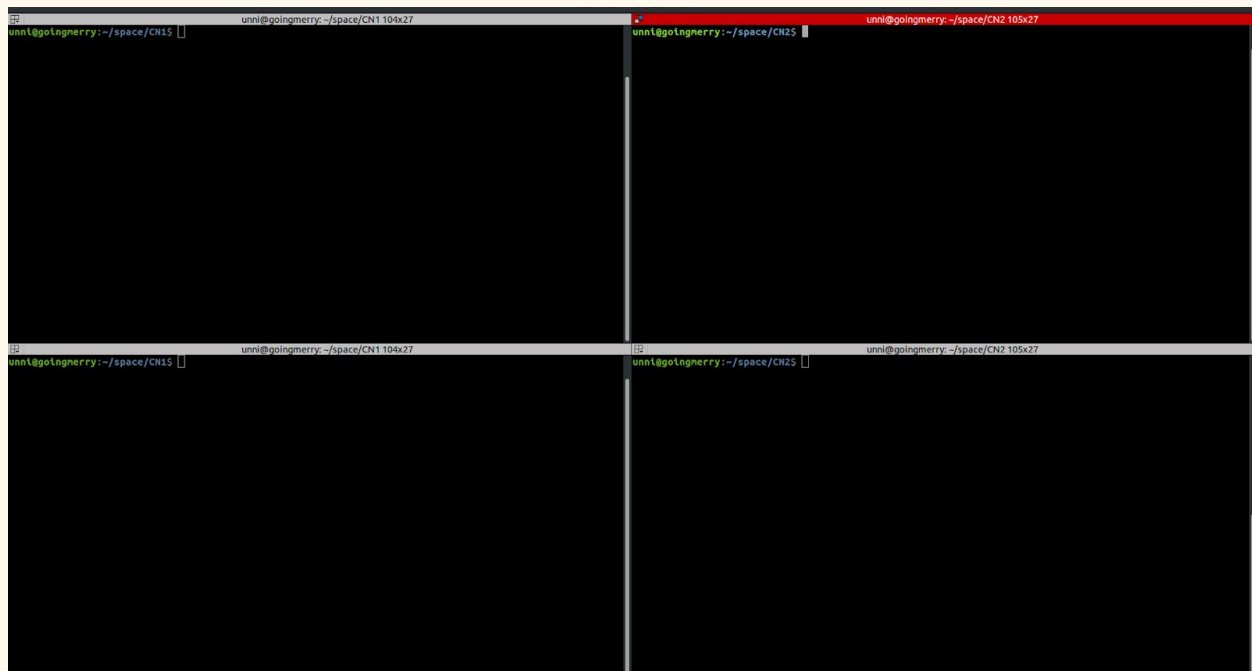
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By Unni Krishnan R Nair (20171405) and Abhilash Varma (20161155)

**Aim :**

- To create a file sharing protocol similar to Dropbox with support for download and upload for files and indexed searching.
- The system should have 2 clients (acting as servers simultaneously) listening to the communication channel for requests and waiting to share files
- Each client has the ability to do the following :
  - Know the files present on each others machines in the designated shared folders.
  - Download files from this shared folder

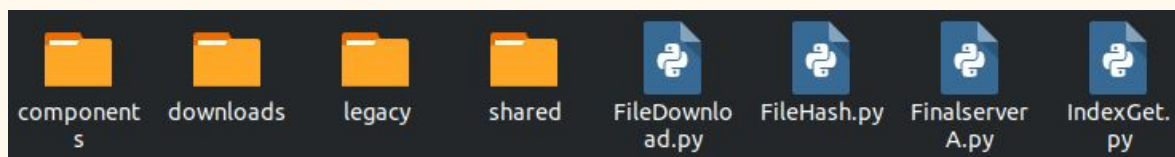
## Setup for emulating 2 pcs on lan



The left 2 panels are from pc1 and the right 2 panels are from pc2.

The idea is to have the always on servers for both pcs to be on the top most panels and execute commands on the bottom ones.

## Directory Structure per PC



- components
- downloads
- legacy
- shared
- command executables

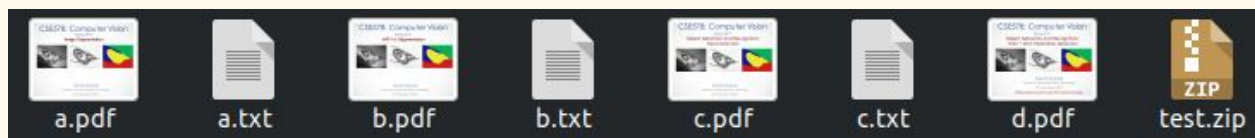
Downloads store the downloaded files.

Legacy contains some old basic code used to build the final system. Exists for reference.

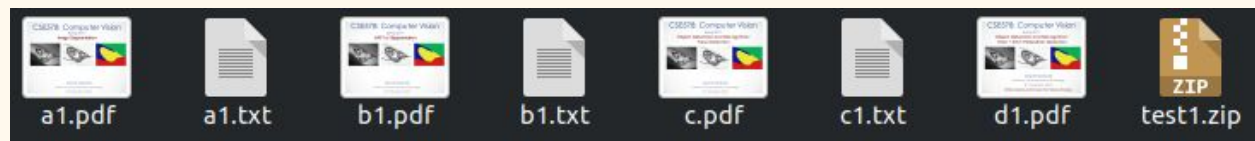
## Shared

Shared store the shared files. The files on pc1 are a.pdf b.pdf a.txt .... The files on pc2 are a1.pdf b1.pdf a1.txt .....

PC1

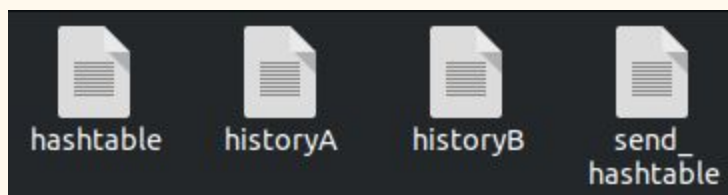


PC2



## Components

Components store hashtables and the history for both the machines.



Hashtable = own shared folders files hashtable

send\_Hashtable = other shared folders files hashtable

historyA = list of requests made by indexing by A

historyB = list of requests made by indexing by B

## Executables

These are used as the commands for downloading indexing and starting of the server.

### IndexGet flag <args>

Can request the display of the shared files on the connected system. The history of requests made by either clients is maintained at each of the clients respectively. The flag variable can be shortlist , longlist .

” Shortlist” Flag would mean the the client only wants to know the names of files between a specific set of timestamps. The sample query:

- \$> IndexGet shortlist <starttimestamp><endtimestamp>
- Output includes ‘name’ , ‘size’ , ‘timestamp’ and ‘type’ of the files between the start and end timestamps.
- Return only \*.txt , \*.pdf files between specified time stamps with this type of

query \$> IndexGet shortlist <starttimestamp><endtimestamp> \*.txt or \*.pdf

Note: Timestamp should be in epoch a helper script is given to convert time in date time to epochs.

“ Longlist” flag would mean that client wants to know the entire listing of the shared folder/directory including ‘name’, ‘size’ , ‘timestamp’ and ‘type’ of the files .

- \$>IndexGet longlist
- Output : similar to above , but with complete listing.
- Return longlist for only \*.txt file contained a word “Programmer” in it.

### FileHash flag <args> :

This command indicates that the client wants to check if any of the files on the other end have been changed. The flag variable can take two values, verify and checkall.

- Verify : flag should check for the specific file name provided as command line argument and return its ‘checksum’ and ‘last modified’ timestamp.
  - \$>FileHash verify <filename>
  - Output : checksum and lastmodified timestamp of the input file.

Checkall : flag should check perform what 'verify' does for all the files in the shared folder.  
(Hint: this command can be used for the periodic check of changes in the files of shared folders)

- \$> FileHash checkall
- Output : filename , checksum and last modified timestamp of all the files in the shared directory.

### **FileDownload flag <args> :**

This would be used to download files from the shared folder of connected user to our shared folder.

- The flag variable can take the value TCP or UDP depending on the users request.
- If a socket is not available , it should be created and both clients must use this socket for the file transfer.
  - \$>FileDownload <filename>
  - Output : contains the filename , filesize , lastmodified timestamp and the MD5hash of the requested file.

### **The protocol:**

The protocol designed depends on the natural integrity of small file transfers and message transfers via tcp. All hashtables are maintained at each pc for the shared folders and we simply send these hashtables along with the files to check for file integrity. Also the same hashtables can be used for the hashcheck function and the indexing functions required to be coded.

### **The server**

There is a server on each pc listening on the following ports

#### **server b**

- 60001 tcp
- 60002 udp

#### **server a**

- 60003 tcp
- 60004 udp

Default transfer method for all files and messages is TCP.

The server understands the following messages:

**Send\_hashtable, filename UDP, filename TCP, historyX**

(where X is the history of the indexing command)

```
if command == 'send_hashtable':
    generatehash()
    sendfile('./components','hashtable',conn)
elif command.split(' ')[0].strip() == 'UDP':
    sendfile_udp('./shared',command.split(' ')[1].strip())
elif command.split(' ')[0].strip() == 'TCP':
    sendfile('./shared',command.split(' ')[1].strip(),conn)
elif command == 'historyB':
    sendfile('./components','historyB',conn)
else:
    sendfile('./shared',command,conn)
conn.close()
```

- send\_hashtable sends a hashtable to the client of all files in the shared folder.
- filename UDP sends file via UDP.
- filename TCP sends file via TCP.
- historyB sends all the commands used by the indexing command on server B.
- We use md5 hashing for all the hashes in this assignment.

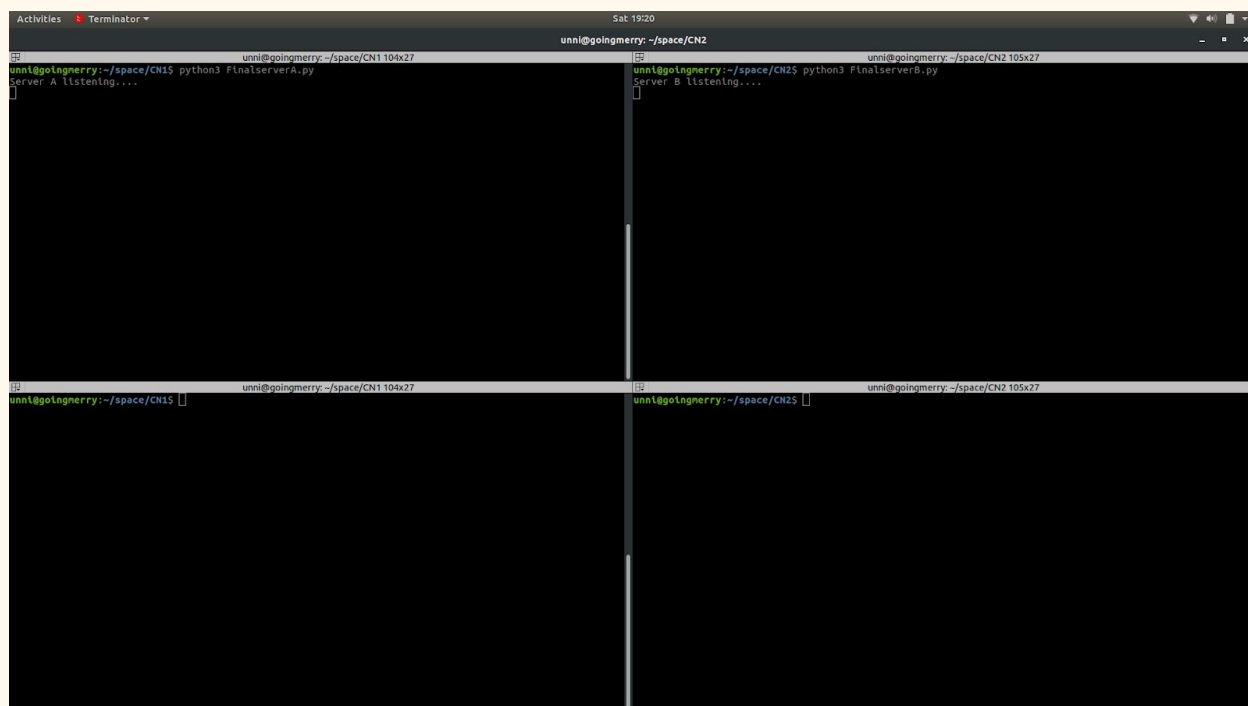
## The client:

Can get the hash tables from the server by sending the required messages (command) and then simply parse the hashtable for indexing and the file integrity checks.

The file transfer methods available are TCP and UDP they use the defined ports above for file transfers.

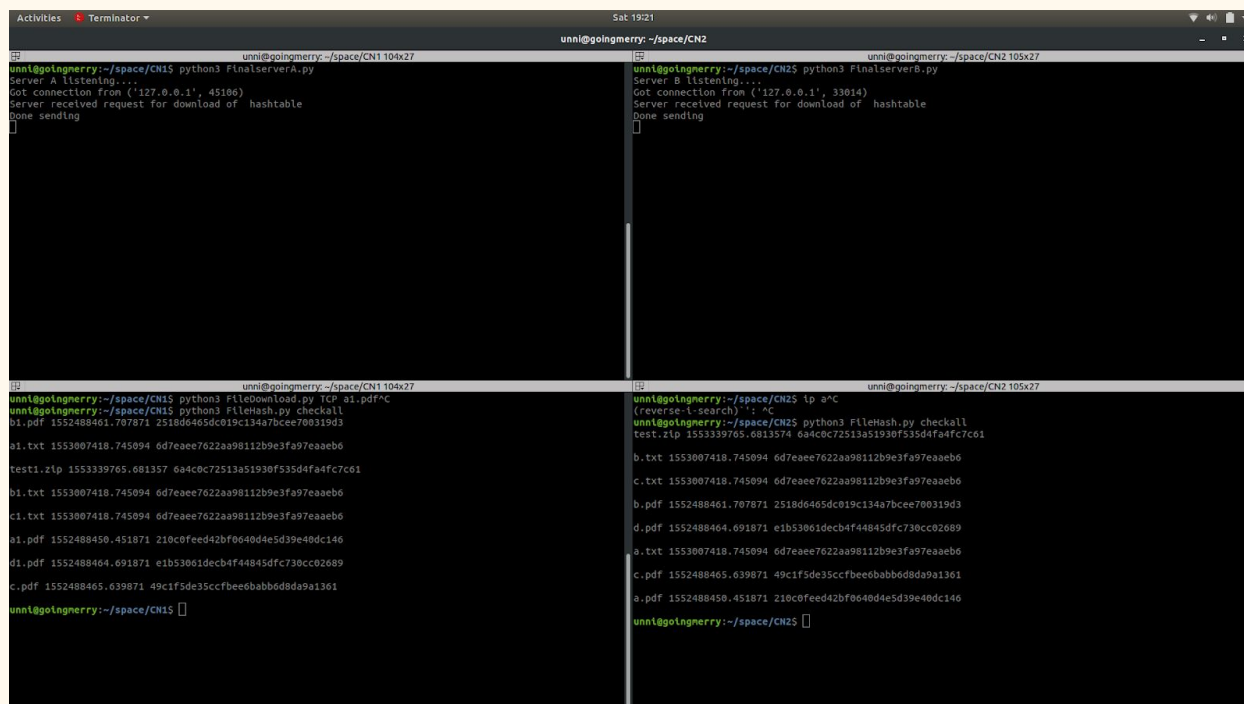
## The Results

### Starting the servers



```
Activities Terminator Sat 19:20
unnit@goingmerry: ~/space/CN2
unnit@goingmerry: ~/space/CN1 104x27
unnit@goingmerry: ~/space/CN1$ python3 FinalServerA.py
Server A listening....
unnit@goingmerry: ~/space/CN2 105x27
unnit@goingmerry: ~/space/CN2$ python3 FinalServerB.py
Server B listening....
unnit@goingmerry: ~/space/CN1 104x27
unnit@goingmerry: ~/space/CN1$ 
unnit@goingmerry: ~/space/CN2 105x27
unnit@goingmerry: ~/space/CN2$ 
```

## Updating hashtables via the Filehash checkall command.



```

unni@golngmerry: ~/space/CN1 104x27
unni@golngmerry: ~/space/CN2
unni@golngmerry: ~/space/CN2 105x27

unni@golngmerry:~/space/CN1$ python3 FlnalserverA.py
Server A listening....
Got connection from ('127.0.0.1', 45186)
Server received request for download of hashtable
Done sending

unni@golngmerry:~/space/CN2$ python3 FlnalserverB.py
Server B listening....
Got connection from ('127.0.0.1', 33014)
Server received request for download of hashtable
Done sending

unni@golngmerry:~/space/CN1 104x27
unni@golngmerry:~/space/CN2 105x27

unni@golngmerry:~/space/CN1$ python3 FileDownload.py TCP a1.pdf^C
unni@golngmerry:~/space/CN1$ python3 FileHash.py checkall
b1.pdf 1552488461.787871 2518d6465dc019c134a7bcee700319d3
a1.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
test1.zip 1553339765.681357 6a4c0c72513a51930f535d4fa4fc7c61
b1.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
c1.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
a1.pdf 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
d1.pdf 1552488464.691871 e1b53061decba4f44845dfc730cc02689
c.pdf 1552488465.639871 49c1f5de35ccfbee0abb6d8da9a1361
unni@golngmerry:~/space/CN1$

unni@golngmerry:~/space/CN2$ lp a^C
(reverse-i-search) ': ^C
unni@golngmerry:~/space/CN2$ python3 FileHash.py checkall
test1.zip 1553339765.681357 6a4c0c72513a51930f535d4fa4fc7c61
b.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
c.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
b.pdf 1552488461.787871 2518d6465dc019c134a7bcee700319d3
d.pdf 1552488464.691871 e1b53061decba4f44845dfc730cc02689
a.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
c.pdf 1552488465.639871 49c1f5de35ccfbee0abb6d8da9a1361
a.pdf 1552488458.451871 210c0feed42bf0640d4e5d39e40dc146
unni@golngmerry:~/space/CN2$

```



## Downloading the file a1.pdf from serverB and a.pdf from serverA

```

unni@golngnerry: ~/space/CN1 104x27
unni@golngnerry:~/space/CN15 python3 FlnalserverA.py
Server A listening...
Got connection from ('127.0.0.1', 45130)
Server received request for download of hashtable
Done sending
Got connection from ('127.0.0.1', 45132)
Server received request for download of a.pdf
Done sending
]

unni@golngnerry:~/space/CN2 105x27
unni@golngnerry:~/space/CN25 python3 FlnalserverB.py
Server B listening...
Got connection from ('127.0.0.1', 33014)
Server received request for download of hashtable
Done sending
Got connection from ('127.0.0.1', 33022)
Server received request for download of a1.pdf
Done sending
]

unni@golngnerry:~/space/CN1 104x27
unni@golngnerry:~/space/CN15 python3 FllDownload.py TCP a1.pdf-c
unni@golngnerry:~/space/CN15 python3 FllHash.py checkall
b1.pdf 1552488461.707871 2518d6465dc019c134a7bcee700319d3
a1.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
test1.zip 1553339765.681357 6a4c0c72513a51930f535d4fa4fc7c61
b1.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
c1.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
a1.pdf 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
b1.pdf 1552488464.691871 e1b53061decba4f4845dfc730cc02689
c.pdf 1552488465.639871 49c1f5de35ccfbeeababb6d8da9a1361
unni@golngnerry:~/space/CN15 python3 FllDownload.py TCP a1.pdf
a1.pdf 6224690 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unni@golngnerry:~/space/CN15 ]

unni@golngnerry:~/space/CN2 105x27
unni@golngnerry:~/space/CN25 python3 FllHash.py checkall
test.zip 1553339765.681357 6a4c0c72513a51930f535d4fa4fc7c61
b.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
c.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
b.pdf 1552488461.707871 2518d6465dc019c134a7bcee700319d3
d.pdf 1552488464.691871 e1b53061decba4f4845dfc730cc02689
a.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
c.pdf 1552488465.639871 49c1f5de35ccfbeeababb6d8da9a1361
a.pdf 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unni@golngnerry:~/space/CN25 python3 FllDownload.py TCP a.pdf
a.pdf 6224690 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unni@golngnerry:~/space/CN25 ]

```

# Verification of the file hashes via the FileHash verify filename command

```

unni@golngnerry: ~/space/CN1 104x27
unni@golngnerry:~/space/CN1$ python3 FinalserverA.py
Server A listening....
Got connection from ('127.0.0.1', 45130)
Server received request for download of hashtable
Done sending
Got connection from ('127.0.0.1', 45132)
Server received request for download of a.pdf
Done sending
Got connection from ('127.0.0.1', 45152)
Server received request for download of hashtable
Done sending
]

unni@golngnerry:~/space/CN1 104x27
unni@golngnerry:~/space/CN1$ python3 FileDownload.py TCP a1.pdf c
unni@golngnerry:~/space/CN1$ python3 FileHash.py checkall
b1.pdf 1552488461.707871 2518d6465dc019c134a7bcee700319d3
a1.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
test1.zip 1553339765.681357 6a4c0c72513a51930f535d4fa4fc7c61
b1.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
c1.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
a1.pdf 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
d1.pdf 1552488464.691871 e1b53061decba4f44845dfc730cc02689
c.pdf 1552488465.639871 49c1f5de35ccfbeeababb6d8da9a1361
unni@golngnerry:~/space/CN1$ python3 FileDownload.py TCP a1.pdf
a1.pdf 6224690 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unni@golngnerry:~/space/CN1$ python3 FileHash.py verify a1.pdf
1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unni@golngnerry:~/space/CN1$ ]

unni@golngnerry:~/space/CN2 105x27
unni@golngnerry:~/space/CN2$ python3 FinalserverB.py
Server B listening....
Got connection from ('127.0.0.1', 33014)
Server received request for download of hashtable
Done sending
Got connection from ('127.0.0.1', 33022)
Server received request for download of a1.pdf
Done sending
Got connection from ('127.0.0.1', 33062)
Server received request for download of hashtable
Done sending
]

unni@golngnerry:~/space/CN2 105x27
unni@golngnerry:~/space/CN2$ python3 FileHash.py checkall
test.zip 1553339765.6813574 6a4c0c72513a51930f535d4fa4fc7c61
b.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
c.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
b.pdf 1552488461.707871 2518d6465dc019c134a7bcee700319d3
d.pdf 1552488464.691871 e1b53061decba4f44845dfc730cc02689
a.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
c.pdf 1552488465.639871 49c1f5de35ccfbeeababb6d8da9a1361
a.pdf 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unni@golngnerry:~/space/CN2$ python3 FileDownload.py TCP a.pdf
a.pdf 6224690 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unni@golngnerry:~/space/CN2$ python3 FileHash.py verify a.pdf
1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unni@golngnerry:~/space/CN2$ ]

```

# Indexing with shortlist, \*.pdf

```

Activities Terminator Sat 19:45
unnit@golngnerry: ~/space/CN1
unnit@golngnerry: ~/space/CN1
unnit@golngnerry: ~/space/CN1 python3 FlnalserverA.py
Server A listening...
Got connection from ('127.0.0.1', 45130)
Server received request for download of hashtable
Done sending
Got connection from ('127.0.0.1', 45132)
Server received request for download of a.pdf
Done sending
Got connection from ('127.0.0.1', 45152)
Server received request for download of hashtable
Done sending

unnit@golngnerry: ~/space/CN1 104x27
unnit@golngnerry: ~/space/CN2
unnit@golngnerry: ~/space/CN2 105x27
unnit@golngnerry: ~/space/CN2 python3 FileHash.py checkall
test.zip 1553339765.6813574 6a4c0c72513a51930f535d4fa4fc7c61
b.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
c.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
d.pdf 1552488465.639871 49c1f5de35ccfbee6abb6d8da9a1361
a.pdf 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
a.pdf 6224690 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unnit@golngnerry: ~/space/CN1 python3 FileDownload.py TCP a1.pdf
1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unnit@golngnerry: ~/space/CN1 python3 IndexGet.py shortlist 1552488445 1552488453 *.pdf
a1.pdf
unnit@golngnerry: ~/space/CN1 python3 IndexGet.py shortlist 1552488445 1552488470 *.pdf
a1.pdf
a1.pdf
a1.pdf
c.pdf
unnit@golngnerry: ~/space/CN1

unnit@golngnerry: ~/space/CN2 python3 FileHash.py checkall
test.zip 1553339765.6813574 6a4c0c72513a51930f535d4fa4fc7c61
b.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
c.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
d.pdf 1552488465.639871 49c1f5de35ccfbee6abb6d8da9a1361
a.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
c.pdf 1552488465.639871 49c1f5de35ccfbee6abb6d8da9a1361
a.pdf 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
a.pdf 6224690 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unnit@golngnerry: ~/space/CN2 python3 FileDownload.py TCP a.pdf
1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unnit@golngnerry: ~/space/CN2
unnit@golngnerry: ~/space/CN2
unnit@golngnerry: ~/space/CN2

```



## Downloading the file a1.pdf from serverB via UDP and it failing integrity check

```

Activities Terminator Sat 2004
unnig@goingmerry: ~/space/CN1 104x27
unnig@goingmerry: ~/space/CN1
unnig@goingmerry: ~/space/CN2 105x27

unnig@goingmerry:~/space/CN1$ python3 FinalServerA.py
Server A listening...
Got connection from ('127.0.0.1', 45130)
Server received request for download of hashtable
Done sending
Got connection from ('127.0.0.1', 45132)
Server received request for download of a.pdf
Done sending
Got connection from ('127.0.0.1', 45152)
Server received request for download of hashtable
Done sending
[]

unnig@goingmerry:~/space/CN1 104x27
unnig@goingmerry:~/space/CN2 105x27

unnig@goingmerry:~/space/CN1$ python3 FileDownload.py UDP a1.pdf
210c0feed42bf0640d4e5d39e40dc146
f6fa7d8e71df2546f93e6ed76f2d5eb
redownload please
unnig@goingmerry:~/space/CN1$ []

unnig@goingmerry:~/space/CN2$ python3 FileHash.py checkall
test.zip 155339765.6813574 6a4c0c72513a51930f535d47a4fc7c61
b.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
c.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
b.pdf 1552488461.767871 2518d6465dc019c134a7bcee780319d3
d.pdf 1552488464.691871 e1b53861decb4f44845dfc738cc02689
a.txt 1553007418.745094 6d7eae7622aa98112b9e3fa97eaaeb6
c.pdf 1552488465.639871 49c1f5de35ccfbee0abb0d8da9a1361
a.pdf 1552488458.451871 210c0feed42bf0640d4e5d39e40dc146

unnig@goingmerry:~/space/CN2$ python3 FileDownload.py TCP a.pdf
a.pdf 0224698 1552488458.451871 210c0feed42bf0640d4e5d39e40dc146

unnig@goingmerry:~/space/CN2$ python3 FileHash.py verify a.pdf
1552488458.451871 210c0feed42bf0640d4e5d39e40dc146
unnig@goingmerry:~/space/CN2$
unnig@goingmerry:~/space/CN2$
unnig@goingmerry:~/space/CN2$ []

```

**Downloading the file a1.pdf from serverB via UDP and it being received successfully**

```
Activities Terminator Sat 04/04/2024 14:00:00

[1] unni@golngmerry: ~/space/CN1 104x27
unni@golngmerry:~/space/CN1$ python3 FlnalserverA.py
Server A listening...
Got connection from ('127.0.0.1', 45130)
Server received request for download of hashtable
Done sending
Got connection from ('127.0.0.1', 45132)
Server received request for download of a.pdf
Done sending
Got connection from ('127.0.0.1', 45152)
Server received request for download of hashtable
Done sending

[2] unni@golngmerry: ~/space/CN2 105x27
unni@golngmerry:~/space/CN2$ python3 FileDownload.py UDP a1.pdf
210c0feed42bf0640d4e5d39e40dc146
f0f07d08e1d12546f93eed07072d5eb
redownload please
unni@golngmerry:~/space/CN1$ python3 FileDownload.py UDP a1.pdf
210c0feed42bf0640d4e5d39e40dc146
a23f6d41dfdc78aad15cbbd4a5788e32
redownload please
unni@golngmerry:~/space/CN1$ python3 FileDownload.py UDP a1.pdf
a1.pdf 6224690 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unni@golngmerry:~/space/CN1$

[3] unni@golngmerry: ~/space/CN2 105x27
unni@golngmerry:~/space/CN2$ python3 FileHash.py checkall
test..zip 155339765.6813574 64c0c72513a51930f53d4fa4fc7c61
b.txt 1553007418.745094 6d7eae7622a098112b9e3fa97eaaeb6
c.txt 1553007418.745094 6d7eae7622a098112b9e3fa97eaaeb6
b.pdf 1552488461.707871 2518d6465dc019c13437bce0700319d3
d.pdf 1552488464.691871 e1b53061decba4f44845dfc730cc02689
a.txt 1553007418.745094 6d7eae7622a098112b9e3fa97eaaeb6
c.pdf 1552488465.639871 49c1f5de35ccfb0eb0abb6d8da9a1361
a.pdf 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unni@golngmerry:~/space/CN2$ python3 FileDownload.py TCP a.pdf
a.pdf 6224690 1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unni@golngmerry:~/space/CN2$ python3 FileHash.py verify a.pdf
1552488450.451871 210c0feed42bf0640d4e5d39e40dc146
unni@golngmerry:~/space/CN2$
unni@golngmerry:~/space/CN2$
unni@golngmerry:~/space/CN2$
```

**Note: Removed the shared and downloaded files due to size constraints in moodle.**