



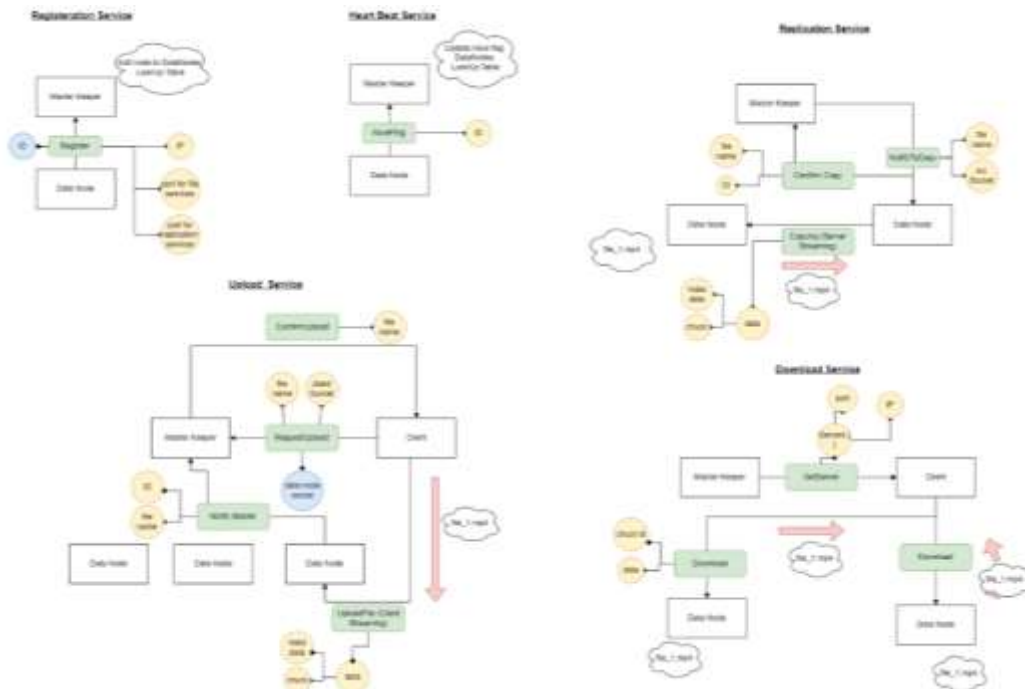
CMP4050 Wireless

Distributed File System Assignment

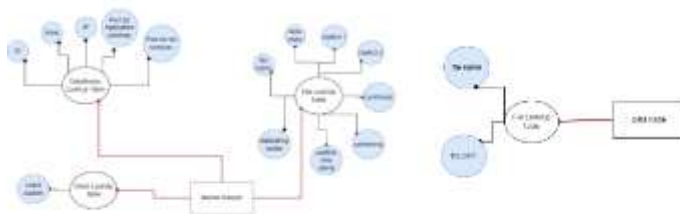
Team 9

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System Services Design:



System Data Structures:



Testing Scenarios:

Scenario (1): Testing Node Registration Service

- ✓ go run .\master_tracker\main.go
- ✓ go run .\data_keeper\main.go 127.0.0.1

```
[0/0]0xf49f60
New Data Node added Successfully
[DataNode] ID: 1, IP: 127.0.0.1, File Port: 1024, Replica Port: 1025, Alive: true, Ping Timestamp: 2024-04-06T19:28:31+02:00,
Load: 0.00
```

Scenario (2): Testing Ping Service Between Nodes and Master:

- ✓ go run .\master_tracker\main.go
- ✓ go run .\data_keeper\main.go 127.0.0.1
- ✓ kill data_keeper terminal

```
[0/0]0xf49f60
Check Ideal Nodes....
DataNode 1 is Idl at time stamp 2024-04-06T19:28:44+02:00
Checking UnReplicated Files...
Checking UnConfirmed Files...
```

Scenario (3): Upload file

The least loaded node is chosen by the master to be the node of uploading.

```
PS D:\Distributed-File-System\mp4-dfs> go run ./client/main.go 127.0.0.1
Welcome Client 😊
Listening to Socket: 127.0.0.1:1026
Enter 1 for upload and 2 for download:1
Enter file path: tmp/file_1.mp4
Connected To Master localhost:8090
Sending Upload Request To Master ....
Sending File to 127.0.0.1:1024 ...
End of File
Sending End Of File To DataNode
Finished Sending File 🚀
Waiting for confirmation from server...
Master Confirmed File file_1.mp4 being uploaded successfully
Video Uploaded Successfully 🎉
Enter 1 for upload and 2 for download:
```

MP4-DFS	master_t
1	11
file_1.mp4	12
client	13
	14

Scenario (4) No Data Nodes:

- ✓ go run .\master_tracker\main.go
- ✓ go run .\client\main.go 127.0.0.1

```

PS D:\Distributed-File-System\mp4-dfs> go run .\master_tracker\main.go
0
Hello From Master Node 🤗
Handle Client
Checking Stuck Files ....

Checking UnConfirmed Files...
check Ideal Nodes....
UnconfirmedFiles: Checking UnReplicated Files...
[]
Unreplicated Files: []
Listening to Data Keeper at Socket: localhost:8080 [Data]
Listening to Client at Socket: localhost:8090
Listening to Data Keeper at Socket: localhost:8085 [Ping]
Check Ideal Nodes....
checking UnConfirmed Files...
UnconfirmedFiles: []
Check Ideal Nodes....
checking UnConfirmed Files...
UnconfirmedFiles: []
Unreplicated Files: []
no Data NodesCheck Ideal Nodes....
[]

PS D:\Distributed-File-System\mp4-dfs> go run .\client\main.go 127.0.0.1
Welcome Client 🤗
Listening to Socket: 127.0.0.1:1024
Enter 1 for upload and 2 for download:1
Enter file path: tmp/file_1.mp4
Connected To Master localhost:8090
Sending Upload Request To Master ....
Failed to request port from Master

rpc error: code = Unknown desc = no data nodes
Enter 1 for upload and 2 for download:

```

Scenario (5): Replication of file

- ✓ go run .\master_tracker\main.go
- ✓ go run .\data_keeper\main.go 127.0.0.1
- ✓ go run .\data_keeper\main.go 127.0.0.1
- ✓ go run .\client\main.go 127.0.0.1

```

Timestamp: 2024-06-06T22:01:51+02:00, load:
0.00
Checking Unreplicated Files...
Unreplicated Files: []
Checking Stuck Files ....

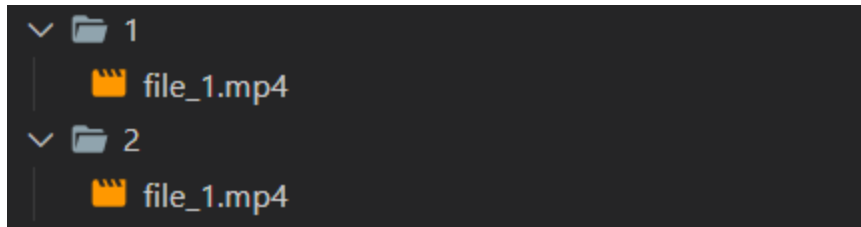
Checking Unconfirmed Files...
UnconfirmedFiles: []
Check Ideal Nodes....
Checking UnConfirmed Files...
UnconfirmedFiles: []
Check Ideal Nodes....

New Client: added Successfully
[Client] at 127.0.0.1:1026, waiting for file
1.mp4
key: File_1.mp4, Value: M[File_1.mp4] 1 false [130431682182000724 2954042
2024-06-06T22:01:51+02:00]
New file added successfully
[file] name: file_1.mp4, confirmed: false, at
node [1] at node [1] at node [1]
Checking Unreplicated Files...
Unreplicated Files: [File_1.mp4]
Connected to Src 127.0.0.1:1027
Added Node 2 to Replicating list of File fil
e_1.mp4
Sending copy request to data node

File Service port: 1026
Replication Service port: 1025
Connected To Master at localhost:8090 [Data]Registered To Mas
ter with ID 1
Folder 1 applied successfully
Handle Replicate
Handle Ping
Handle Client
Listening to Socket 127.0.0.1:1025
Listening to Socket 127.0.0.1:1024
Connected To Master at localhost:8085 [Ping]uploading file 1.
mp4 .....
Received IOE
Send file at 1/File_1.mp4
[file system] key: File_1.mp4, Value: 1/File_1.mp4
New file added Successfully
[file system] name: file_1.mp4, at 1/File_1.mp4
Connection With Client is closed id
Connected to Master at localhost:8090
Sending file file_1.mp4 upload confirm to Master .....
Sent file file_1.mp4 upload Confirm to Master
Closed connection to Master at localhost:8090
Sent file Successfully
[]

Hello from Data Node
IP address: 127.0.0.1
File Service port: 1026
Replication Service port: 1027
Connected to Master at localhost:8090 [Data]
Registered To Master with ID 2
Folder 2 applied successfully
Handle Replicate
Handle Ping
Handle Client
Listening to Socket 127.0.0.1:1027
Listening to Socket 127.0.0.1:1026
Connected to Master at localhost:8085 [Ping]
I got Notified to Copy File File_1.mp4 from Node 127.0.0.1:1
025
Connected to Src Data Node 127.0.0.1:1025
File Copying Successfully
[file system] key: File_1.mp4, Value: 2/File_1.mp4
New file added Successfully
[file system] name: file_1.mp4, at 2/File_1.mp4
Connected to Src localhost:8090
Sending Ack Master
Replication Ack Sent to Master
[]

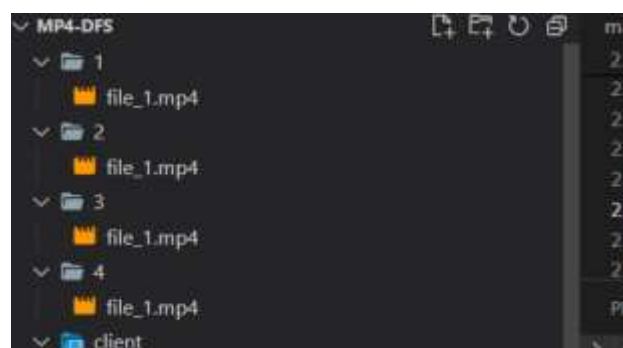
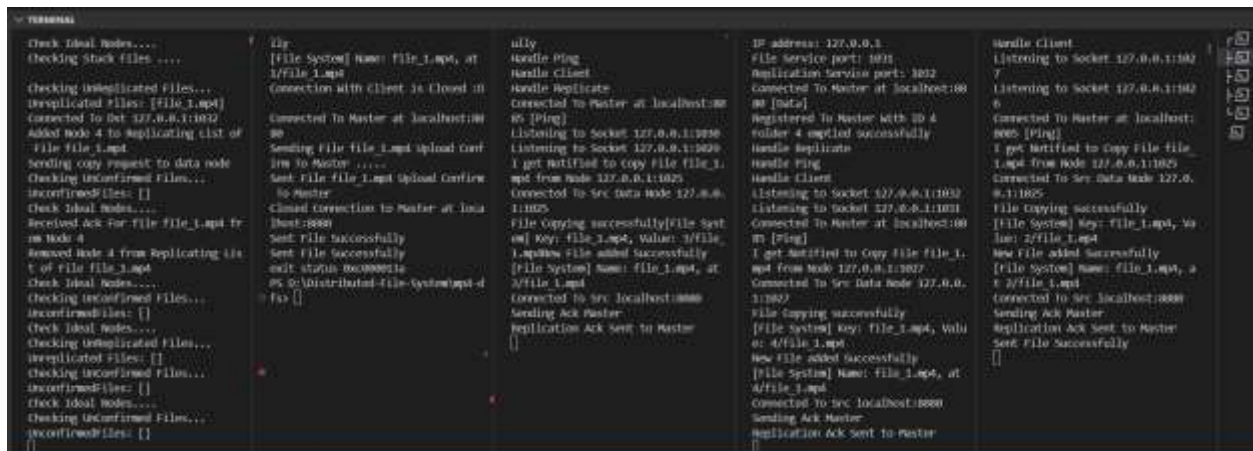
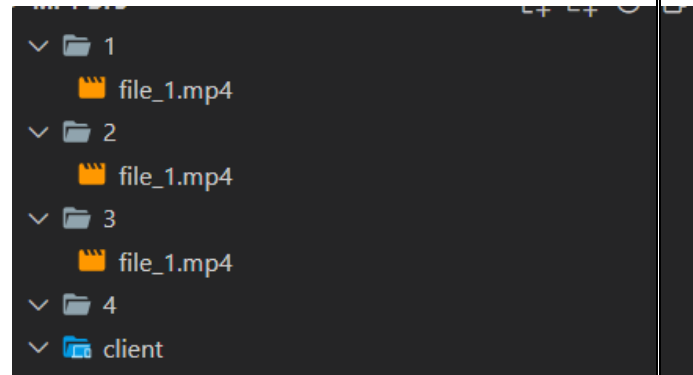
```



Scenario (6): One Replica is Down of file

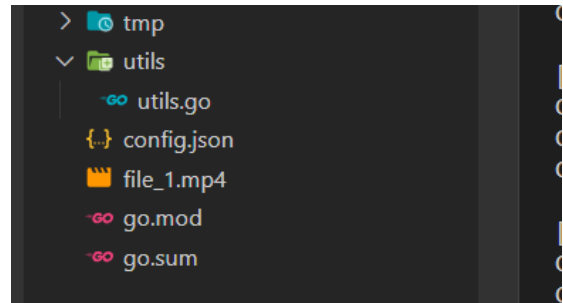
- ✓ go run .\master_tracker\main.go
- ✓ go run .\data_keeper\main.go 127.0.0.1
- ✓ go run .\data_keeper\main.go 127.0.0.1
- ✓ go run .\data_keeper\main.go 127.0.0.1
- ✓ go run .\data_keeper\main.go 127.0.0.1
- ✓ go run .\client\main.go 127.0.0.1

- ✓ Kill terminal for node (1)



Scenario (7): Parallel Downloading

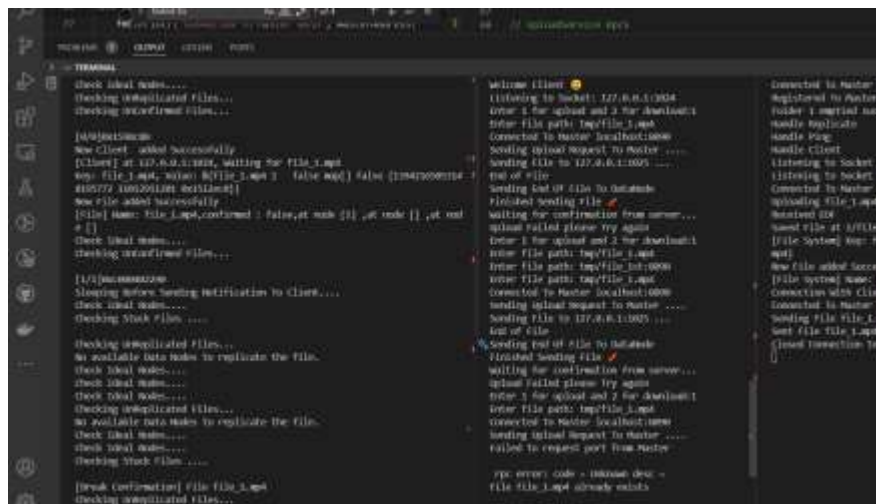
- ✓ go run .\master_tracker\main.go
- ✓ go run .\data_keeper\main.go 127.0.0.1
- ✓ go run .\client\main.go 127.0.0.1
- ✓ go run .\data_keeper\main.go 127.0.0.1



```
Enter 1 for upload and 2 for download:2
Enter file name: file_1.mp4
Downloading ....
Connected To Master localhost:8090
servers list [port:"1024" ip:"127.0.0.1" port:"1027" ip:"1
27.0.0.1" port:"1029" ip:"127.0.0.1"]
Multiple servers available
File downloaded successfully
Enter 1 for upload and 2 for download:
```

Scenario (8) Delayed Confirmation for file from mater to the client [MUST modify Master to sleep]

- ✓ go run .\master_tracker\main.go
- ✓ go run .\data_keeper\main.go 127.0.0.1
- ✓ go run .\client\main.go 127.0.0.1



```
terminal
Check Ideal Nodes....
Checking unreplicated Files...
Checking unconfirmed Files...
[14/06/2020:00:00:00]
New Client added successfully
[Client] at 127.0.0.1:1024, waiting for file_1.mp4
New file_1.mp4, status: [File_1.mp4] false [127.0.0.1:1024]
New file added successfully
[File] name: file_1.mp4, confirmed: false, at node [0], at node [0], at node [0]
Check Ideal Nodes....
Checking unreplicated Files...
Checking unconfirmed Files...
[14/06/2020:00:00:00]
Sending notice, sending notification to client....
Check Ideal Nodes....
Checking stuck Files ....
Checking unreplicated Files...
No available Data Nodes to replicate the file.
Check Ideal Nodes....
Check Ideal Nodes....
Checking unreplicated Files...
No available Data Nodes to replicate the file.
Check Ideal Nodes....
Checking stuck Files ....
[Break Confirmation] File file_1.mp4
Checking unreplicated Files...

Welcome client
[Listening to Socket: 127.0.0.1:1024]
Order 1 for upload and 2 for download
Order file path: file_1.mp4
Connected to Master localhost:1024
Sending upload request to Master ....
Sending file to 127.0.0.1:1024 ....
file of file
Sending end of file to database
Finished sending file
Waiting for confirmation from server...
upload failed please try again
Order 1 for upload and 2 for download
Order file path: file_1.mp4
Order file path: file_1.mp4
Connected to Master localhost:1024
Sending upload request to Master ....
Sending file to 127.0.0.1:1024 ....
end of file
Sending end of file to database
Finished sending file
Waiting for confirmation from server...
upload failed please try again
Order 1 for upload and 2 for download
Order file path: file_1.mp4
Connected to Master localhost:1024
Sending upload request to Master ....
failed to request port from Master
rpc error: code = unknown desc = file file_1.mp4 already exists

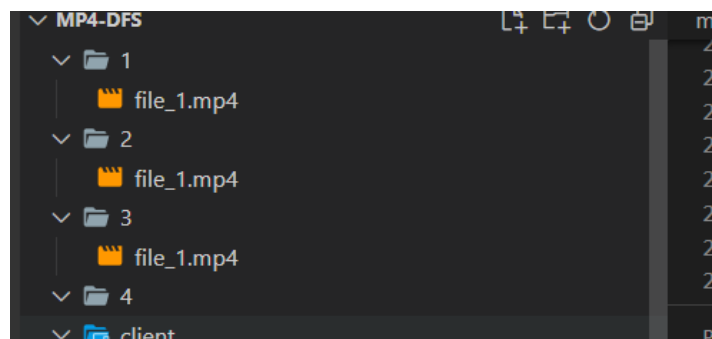
Connected to Master at
Registered to Master at
Folder 1 upload success
Handle replicate
Handle file
Handle client
Listening to Socket at
Listening to Socket at
Connected to Master at
uploading file_1.mp4
Finished OK
Send file at 14/06/2020
[File System] Rep: file_1.mp4
New file added success
[File System] name: file_1.mp4
Connected with client
Connected to Master at
Sending file file_1.mp4
Send file file_1.mp4
Closed connection to client
```

```
No available Data Nodes to replicate the file.
Check Ideal Nodes....
GoodMorning
Connected to Client 127.0.0.1:1024
Sending Notification To Client ....
File file_1.mp4 Confirmation is TimedOut So We Only Remove Client From Table But The File is Kept
Closed Connection To Client 127.0.0.1:1024
Check Ideal Nodes....
Checking Stuck Files ....
```

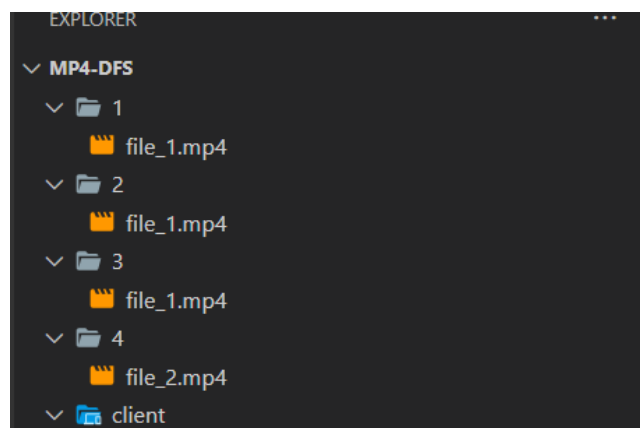
Scenario (9) Full system:

- ✓ go run .\master_tracker\main.go
- ✓ go run .\data_keeper\main.go 127.0.0.1
- ✓ go run .\data_keeper\main.go 127.0.0.1
- ✓ go run .\data_keeper\main.go 127.0.0.1
- ✓ go run .\data_keeper\main.go 127.0.0.1
- ✓ go run .\client\main.go 127.0.0.1
- ✓ go run .\client\main.go 127.0.0.1

1. Client 1 Upload file_1.mp4

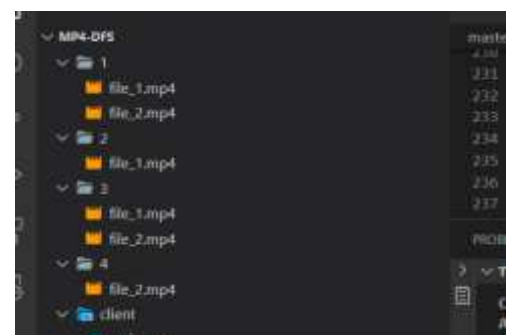


2. Client 2 Upload file_2.mp4

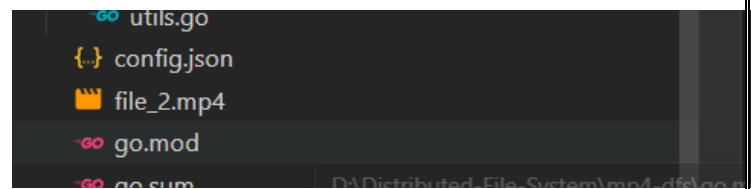


Notice Load Balancing Node 4 is chosen to Upload file_2.

Few Moments Later 🕒🕒



3. Client 1 Download File 2



```
Video Uploaded Successfully 🚀
Enter 1 for upload and 2 for download:2
Enter file name: file_2.mp4
Downloading ....
Connected To Master localhost:8090
servers list [port:"1032" ip:"127.0.0.1" port:"1030" ip:"127.0.0.1"
port:"1028" ip:"127.0.0.1"]
Multiple servers available
File downloaded successfully
Enter 1 for upload and 2 for download:[]
```

```
listening to Socket 127.0
.0.1:1027
Connected To Master at localhost:80
85 [Ping]
Uploading file_1.mp4 .....
Received EOF
Saved File at 1/file_1.mp4
[File System] Key: file_1.mp4, Valu
e: 1/file_1.mp4New File added Succe
ssfully
[File System] Name: file_1.mp4, at
1/file_1.mp4
Connection With Client is Closed :D

Connected To Master at localhost:80
88
Sending File file_1.mp4 upload Conf
irm To Master .....
Sent File file_1.mp4 upload Confirm
To Master
Closed Connection to Master at loca
lhost:8080
Sent File Successfully
Sent File Successfully
[]

[File System] Name: file_
1.mp4, at 2/file_1.mp4
Connected To Src localhost:
1:8080
Sending Ack Master
Replication Ack Sent to Master
I get Notified to Copy file file_2.
mp4 from Node 127.0.0.1:1033
Connected To Src Data Node 127.0.0.
1:1033
File Copying successfully[File Syst
em] Key: file_1.mp4, Value: 2/file_
1.mp4[File System] Key: file_2.mp4,
Value: 2/file_2.mp4New File added
Successfully
[File System] Name: file_2.mp4, at
2/file_2.mp4
Connected To Src localhost:8080
Sending Ack Master
Replication Ack Sent to Master
Downloading file_2.mp4 .....
Done Downloading file_2.mp4
[]

Connected To Src localhos
t:8080
Sending Ack Master
Replication Ack Sent to Master
I get Notified to Copy file file_2.
mp4 from Node 127.0.0.1:1033
Connected To Src Data Node 127.0.0.
1:1033
File copying successfully[File Syst
em] Key: file_1.mp4, Value: 3/file_
1.mp4[File System] Key: file_2.mp4,
Value: 3/file_2.mp4New File added
Successfully
[File System] Name: file_2.mp4, at
3/file_2.mp4
Connected To Src localhost:8080
Sending Ack Master
Replication Ack Sent to Master
Downloading file_2.mp4 .....
Done Downloading file_2.mp4
[]

Received EOF
Saved File at 4/file_2.mp4
[File System] Key: file_2.mp4, Val
ue: 4/file_2.mp4
New File added Successfully
[File System] Name: file_2.mp4, at
4/file_2.mp4
Connection With Client is Closed :
0
Connected To Master at localhost:8
080
Sending File file_2.mp4 upload Conf
irm To Master .....
Sent File file_2.mp4 upload Confir
m To Master
Closed Connection to Master at loca
lhost:8080
Sent File Successfully
Sent File Successfully
Downloading file_2.mp4 .....
Done Downloading file_2.mp4
[]
```

4. Client 2 Download File 1

config.json

file_1.mp4

file_2.mp4

```
Master: config.json file_1.mp4 being uploaded successfully
Video Uploaded Successfully
Enter 1 for upload and 2 for download:2
Enter file name: file_1.mp4
Downloading ....
Connected To Master localhost:8090
servers list [port:"1026" ip:"127.0.0.1" port:"1028" ip:"127.0.0.1" port:"1030" ip:"127.0.0.1"]
Multiple servers available
File downloaded successfully
Enter 1 for upload and 2 for download:
```

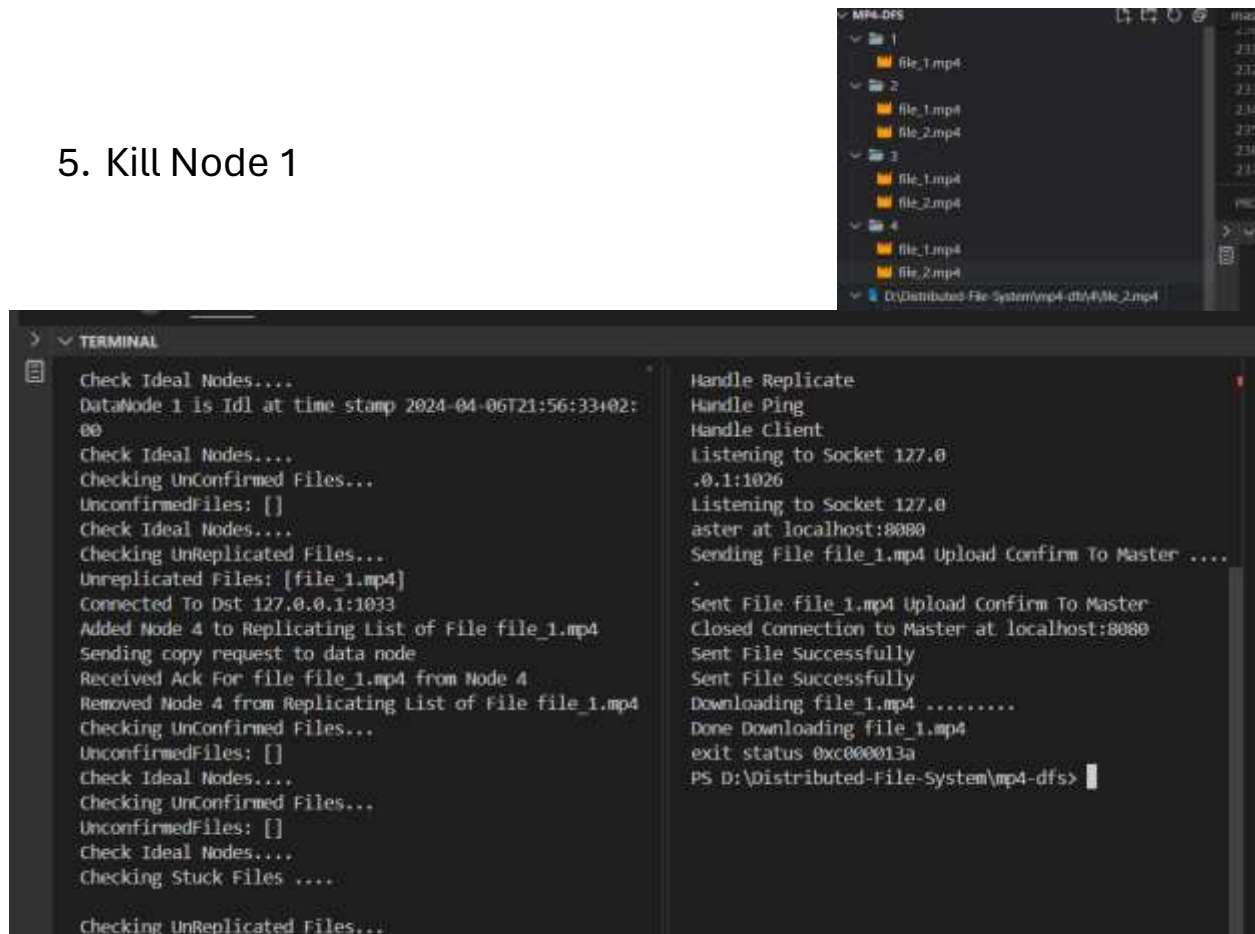
```
.....
Received EOF
Saved file at 1/file_1.mp4
[File System] Key: file_1.mp4, Value: 1/file_1.mp4
New file added Successfully
[File System] Name: file_1.mp4, at 1/file_1.mp4
Connection with client is closed: 0
Connected To Master at localhost:8090
Sending File file_1.mp4 upload Confirm To Master .....
Sent File file_1.mp4 upload confirm To Master
Closed connection to Master at localhost:8090
Sent File Successfully
Sent File Successfully
Downloading file_1.mp4 .....
Done downloading file_1.mp4
[]

[File System] Name: file_1.mp4, at 2/file_1.mp4
Connected To Src localhost:8090
I get Notified to Copy File file_1.mp4 from Node 127.0.0.1:1033
Connected To Src Data Node 127.0.0.1:1033
File Copying successfully[File System] Key: file_1.mp4, Value: 2/file_1.mp4
[File System] Key: file_2.mp4, Value: 2/file_2.mp4
New file added Successfully
[File System] Name: file_2.mp4, at 2/file_2.mp4
Connected To Src localhost:8090
Sending Ack Master
Replication Ack Sent to Master
Downloading file_2.mp4 .....
Done downloading file_2.mp4
Downloading file_1.mp4 .....
Done downloading file_1.mp4
[]

Connected To Src localhost:8090
I get Notified to Copy File file_2.mp4 from Node 127.0.0.1:1033
Connected To Src Data Node 127.0.0.1:1033
File Copying successfully[File System] Key: file_1.mp4, Value: 3/file_1.mp4
[File System] Key: file_2.mp4, Value: 3/file_2.mp4
New file added Successfully
[File System] Name: file_2.mp4, at 3/file_2.mp4
Connected To Src localhost:8090
Sending Ack Master
Replication Ack Sent to Master
Downloading file_2.mp4 .....
Done downloading file_2.mp4
Downloading file_1.mp4 .....
Done downloading file_1.mp4
[]

Received EOF
Saved file at 4/file_2.mp4
[File System] Key: file_2.mp4, Value: 4/file_2.mp4
New file added Successfully
[File System] Name: file_2.mp4, at 4/file_2.mp4
Connection with client is closed: 0
Connected To Master at localhost:8090
Sending File file_2.mp4 upload Confirm To Master .....
Sent File file_2.mp4 upload confirm To Master
Closed connection to Master at localhost:8090
Sent File Successfully
Sent File Successfully
Downloading file_2.mp4 .....
Done downloading file_2.mp4
[]
```

5. Kill Node 1



The image shows a file explorer window at the top right displaying a directory structure for 'MP4-DFS'. It contains four subdirectories, each with 'file_1.mp4' and 'file_2.mp4'. Below it is a terminal window with two panes. The left pane shows logs for 'DataNode 1' being idle and file replication status. The right pane shows logs for a client node, including file uploads and downloads.

```
MP4-DFS
├── 1
│   ├── file_1.mp4
│   └── file_2.mp4
├── 2
│   ├── file_1.mp4
│   └── file_2.mp4
├── 3
│   ├── file_1.mp4
│   └── file_2.mp4
└── 4
    ├── file_1.mp4
    └── file_2.mp4
D:\Distributed-File-System\mp4-dfs\file_2.mp4
```

```
TERMINAL
Check Ideal Nodes....
DataNode 1 is Idl at time stamp 2024-04-06T21:56:33+02:00
Check Ideal Nodes....
Checking UnConfirmed Files...
UnconfirmedFiles: []
Check Ideal Nodes....
Checking UnReplicated Files...
Unreplicated Files: [file_1.mp4]
Connected To Dst 127.0.0.1:1033
Added Node 4 to Replicating List of File file_1.mp4
Sending copy request to data node
Received Ack For file_1.mp4 from Node 4
Removed Node 4 from Replicating List of File file_1.mp4
Checking UnConfirmed Files...
UnconfirmedFiles: []
Check Ideal Nodes....
Checking UnConfirmed Files...
UnconfirmedFiles: []
check Ideal Nodes....
Checking Stuck Files ....
Checking UnReplicated Files...

Handle Replicate
Handle Ping
Handle Client
Listening to Socket 127.0.0.1:1026
Listening to Socket 127.0.0.1:1026
aster at localhost:8080
Sending File file_1.mp4 Upload Confirm To Master ....
.
Sent File file_1.mp4 Upload Confirm To Master
Closed Connection to Master at localhost:8080
Sent File Successfully
Sent File Successfully
Downloading file_1.mp4 .....
Done Downloading file_1.mp4
exit status 0xc000013a
PS D:\Distributed-File-System\mp4-dfs>
```

```
Done Downloading File_2.mp4
I get Notified to Copy File file_1.mp4 from Node 127.0.0.1:1029
Connected To Src Data Node 127.0.0.1:1029
File Copying successfully
[File System] Key: file_2.mp4, Value: 4/file_2.mp4
[File System] Key: file_1.mp4, Value: 4/file_1.mp4
New File added Successfully
[File System] Name: file_1.mp4, at 4/file_1.mp4
Connected To Src localhost:8080
Sending Ack Master
Replication Ack Sent to Master
█
```

Now You Have a Robust Distributed File System 😊😊