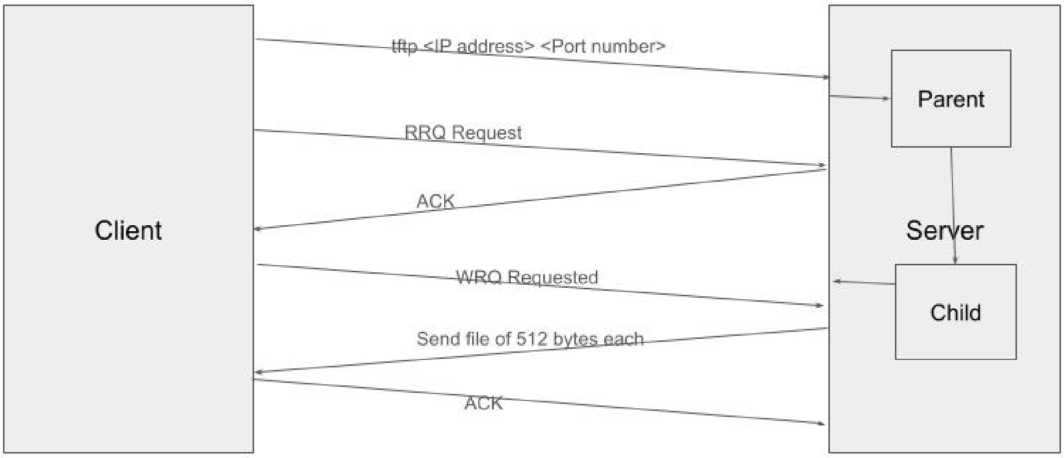
# ECEN-602-MP-3-File-Transfer

# Group#8 (Shubham Santosh & Ibrahim Shahbaz )

This project implements the Trivial File Transfer Protocol (TFTP) server. TFTP is tested on transfrerring different files between two a server and a client using the User Datagram Protocol (UDP). We have implemented the server side only, while for the client side we installed the tftp package (sudo apt-get install tftp-hpa) and used it to create client instances to perfom both Read Request (RRQ) and Write Request (WRQ) functions.

# Architecture

**The Architecure we followed for MP3 is shown below**



# Steps to run the file:

1. To generate .out file, enter make all

2. To execute TFTP server code: make tftp e.g. make tftp 127.0.0.1 1200

On the client side, switch to a different directory and enter the following for **RRQ**:

1. tftp 127.0.0.1 1200 (in case of the example used above)
2. tftp> get <file_name> Available file names: bin_2047.bin, bin_2048.bin, binary_file_34MB.bin, two_cr.txt, lf.txt(long text file),etc.

On the client side, switch to a different directory and enter the following for **WRQ**:

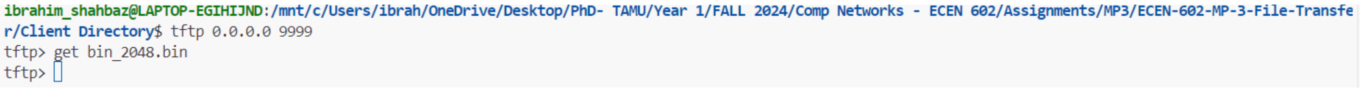
1. tftp 127.0.0.1 1200 (in case of the example used above)
2. tftp> mode {binary|netascii}
3. tftp> put <file_name_on_client_directory> <file_name_on_client_directory> Available file names: bin_2047.bin, bin_2048.bin, binary_file_34MB.bin, two_cr.txt, lf.txt(long text file),etc.

# Test Case Execution

1. **Transfer a binary file of size=2048 Bytes and check that it matches the source file.**

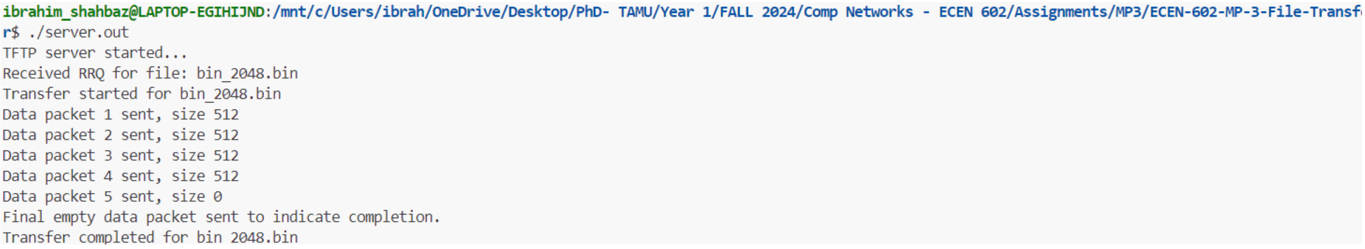
In this test case, a file of size 2048 Bytes is transfred from server to client directory and we check that it matches the source file.

### Client Side Terminal



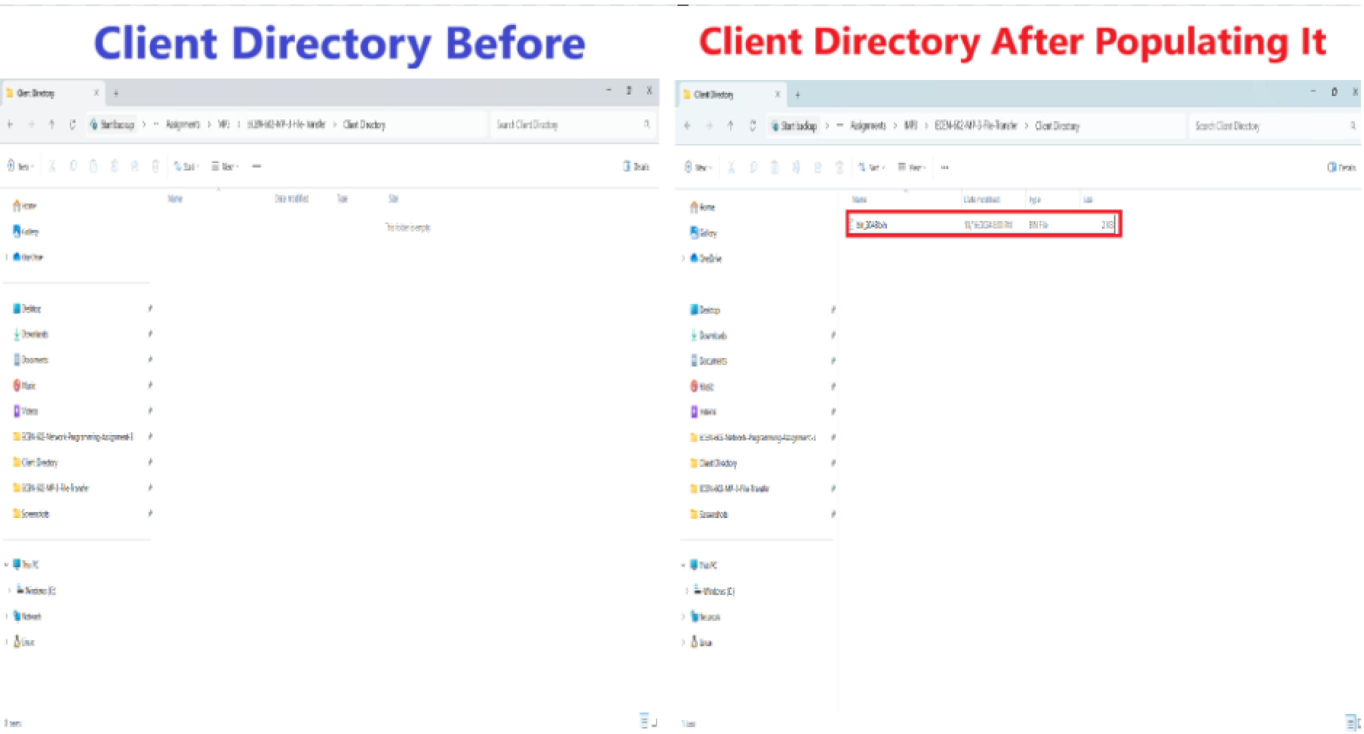
```
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignments/MP3/ECEN-602-MP-3-File-Transfe
r/Client Directory$ tftp 0.0.0.0 9999
tftp> get bin_2048.bin
tftp> 
```

### Server Side Terminal

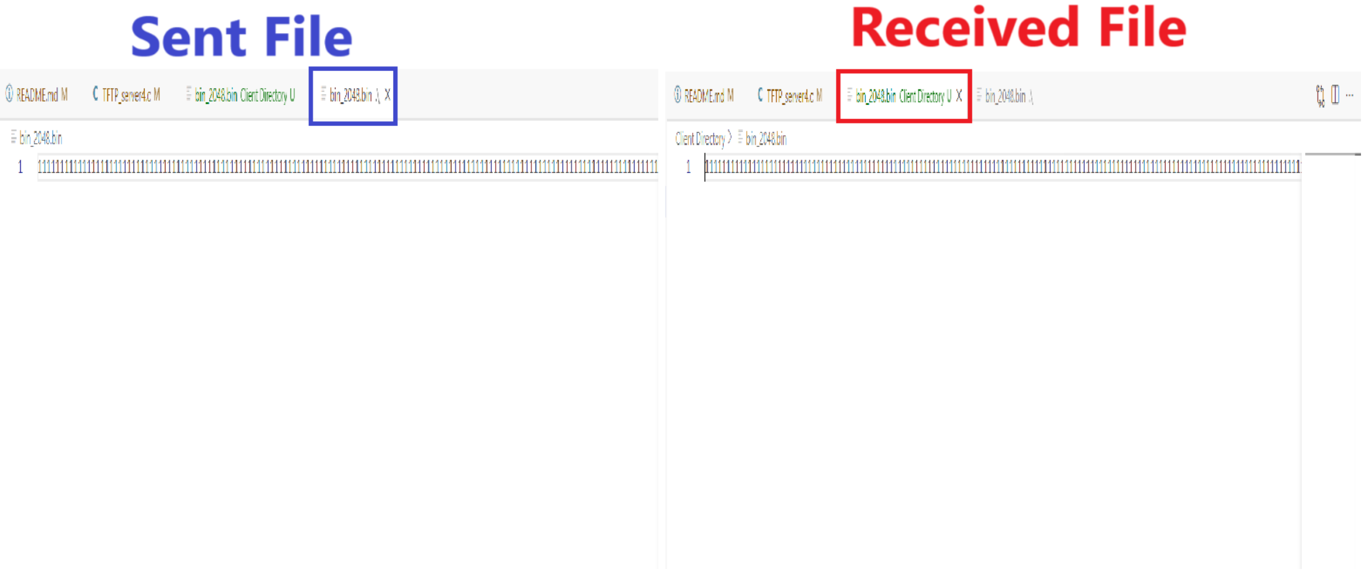


```
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignments/MP3/ECEN-602-MP-3-File-Transf
r$ ./server.out
TFTP server started...
Received RRQ for file: bin_2048.bin
Transfer started for bin_2048.bin
Data packet 1 sent, size 512
Data packet 2 sent, size 512
Data packet 3 sent, size 512
Data packet 4 sent, size 512
Data packet 5 sent, size 0
Final empty data packet sent to indicate completion.
Transfer completed for bin 2048.bin
```

### Client Side Directory Before & After



### Files Comparison



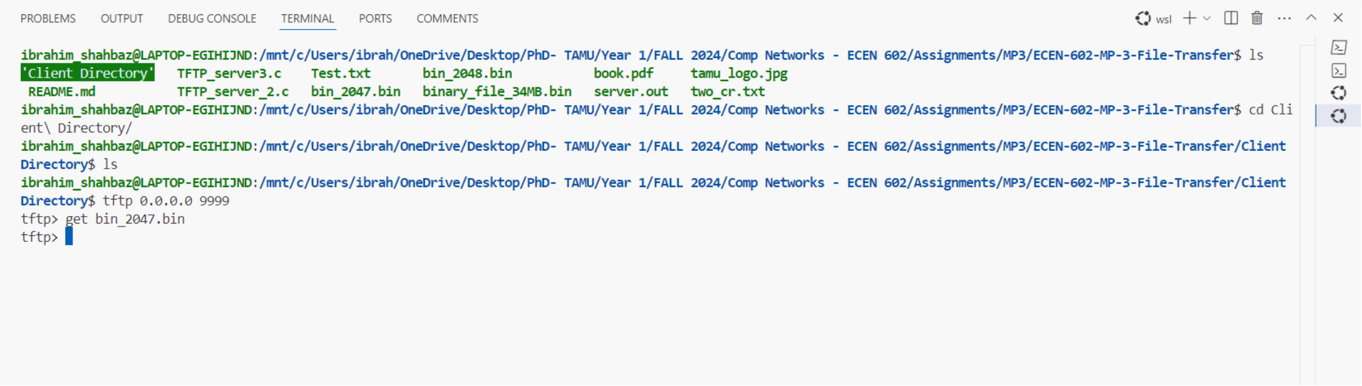
Sent File

Received File

2. **Transfer a binary file of size=2047 Bytes**

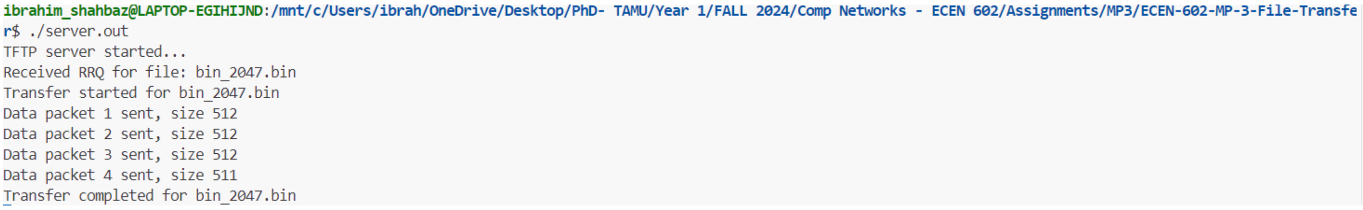
In this test case, a file of size 2047 Bytes is transfred from server to client directory and we check that it matches the source file.

### Client Side Terminal



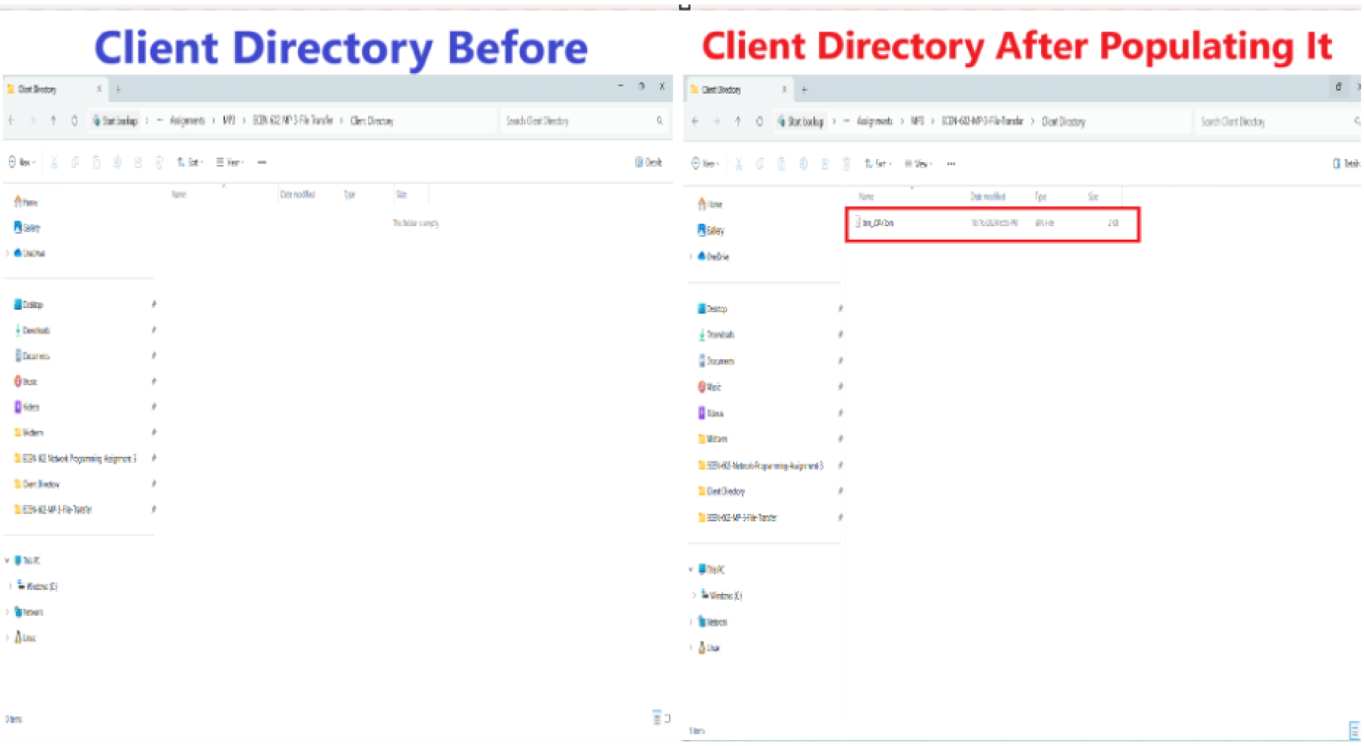
```
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignments/MP3/ECEN-602-MP-3-File-Transfer$ ls
'Client Directory'   TFTP_server3.c    Test.txt      bin_2048.bin           book.pdf     tamu_logo.jpg
 README.md           TFTP_server_2.c   bin_2047.bin  binary_file_34MB.bin   server.out   two_cr.txt
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignments/MP3/ECEN-602-MP-3-File-Transfer$ cd Cli
ent\ Directory/
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignments/MP3/ECEN-602-MP-3-File-Transfer/Client
Directory$ ls
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignments/MP3/ECEN-602-MP-3-File-Transfer/Client
Directory$ tftp 0.0.0.0 9999
tftp> get bin_2047.bin
tftp> 
```

### Server Side Terminal

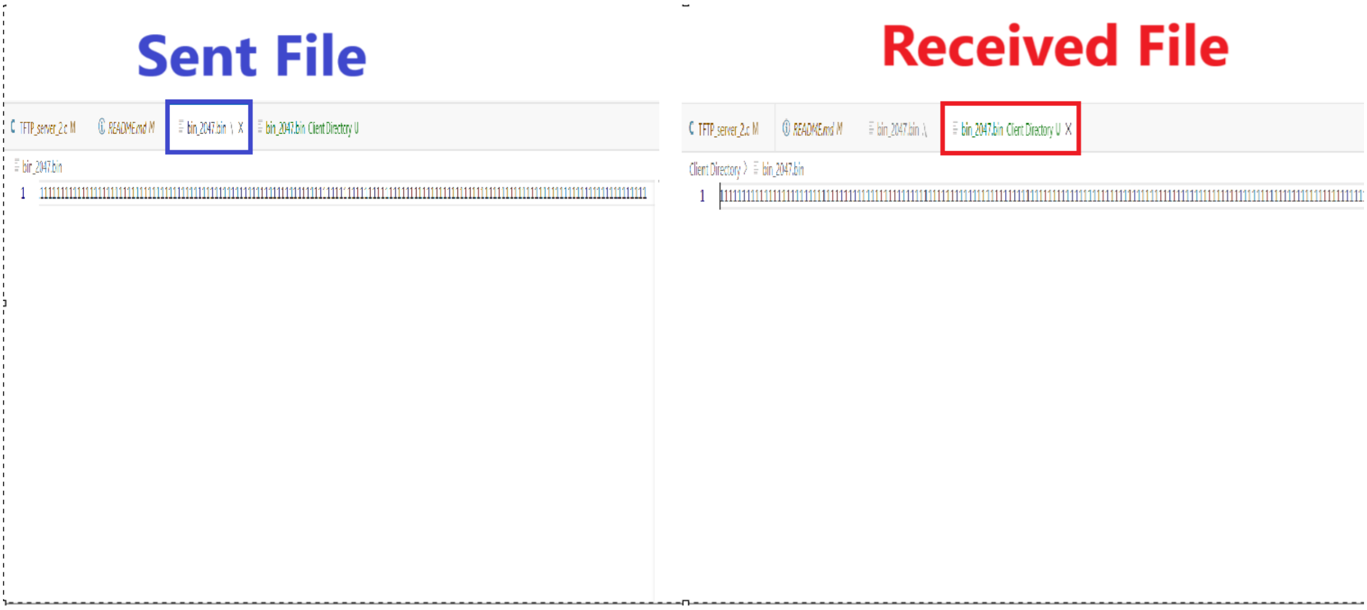


```
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignments/MP3/ECEN-602-MP-3-File-Transfe
r$ ./server.out
TFTP server started...
Received RRQ for file: bin_2047.bin
Transfer started for bin_2047.bin
Data packet 1 sent, size 512
Data packet 2 sent, size 512
Data packet 3 sent, size 512
Data packet 4 sent, size 511
Transfer completed for bin_2047.bin
```

### Client Side Directory Before & After



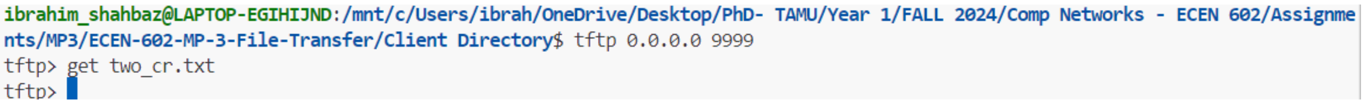
### Files Comparison


Sent File
Received File
TFTP_server_2.c M
README.md M
bin_2047.bin
bin_2047.bin Client Directory U
Client Directory > bin_2047.bin

3. **Transfer a netascii file that includes two CR's**

In this test case, a netascii file that includes two CR's is transfered from server to client, and we check that the resulting file matches the input file.

### Client Side Terminal

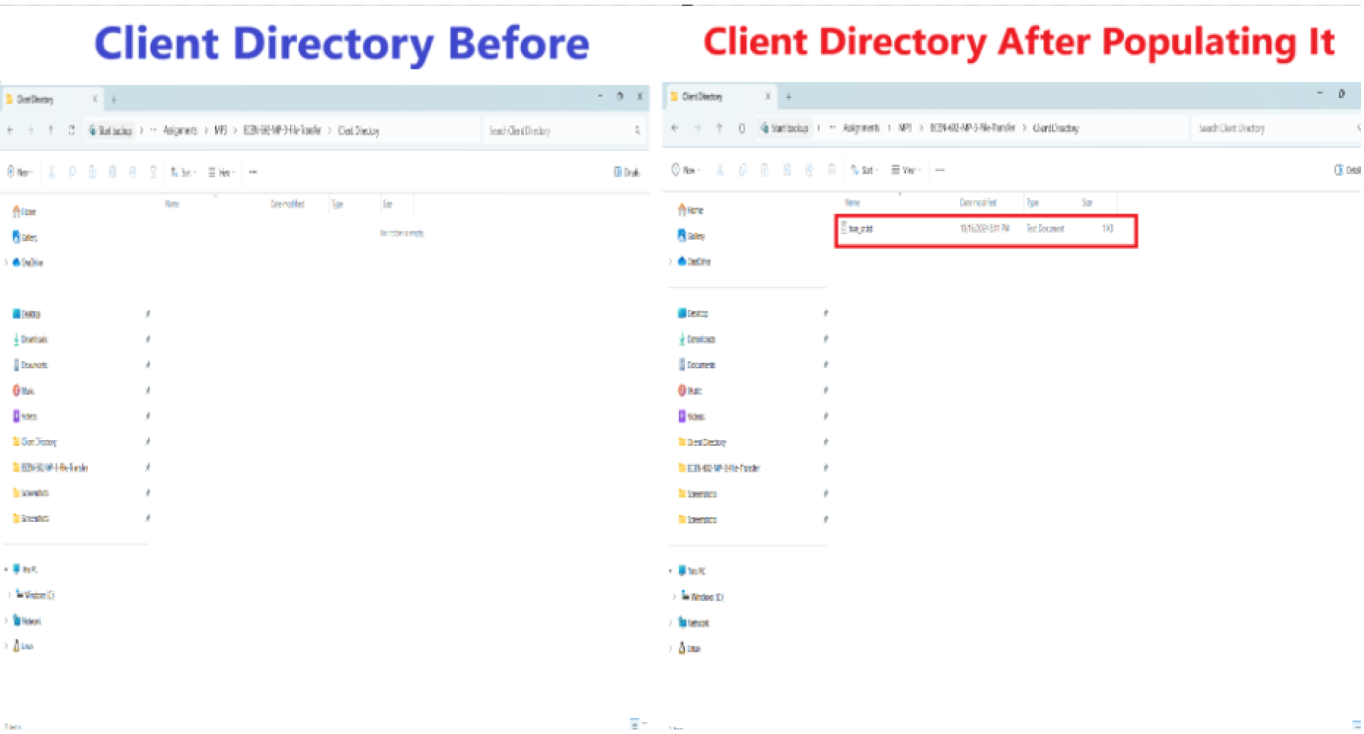


```
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignme
nts/MP3/ECEN-602-MP-3-File-Transfer/Client Directory$ tftp 0.0.0.0 9999
tftp> get two_cr.txt
tftp>
```

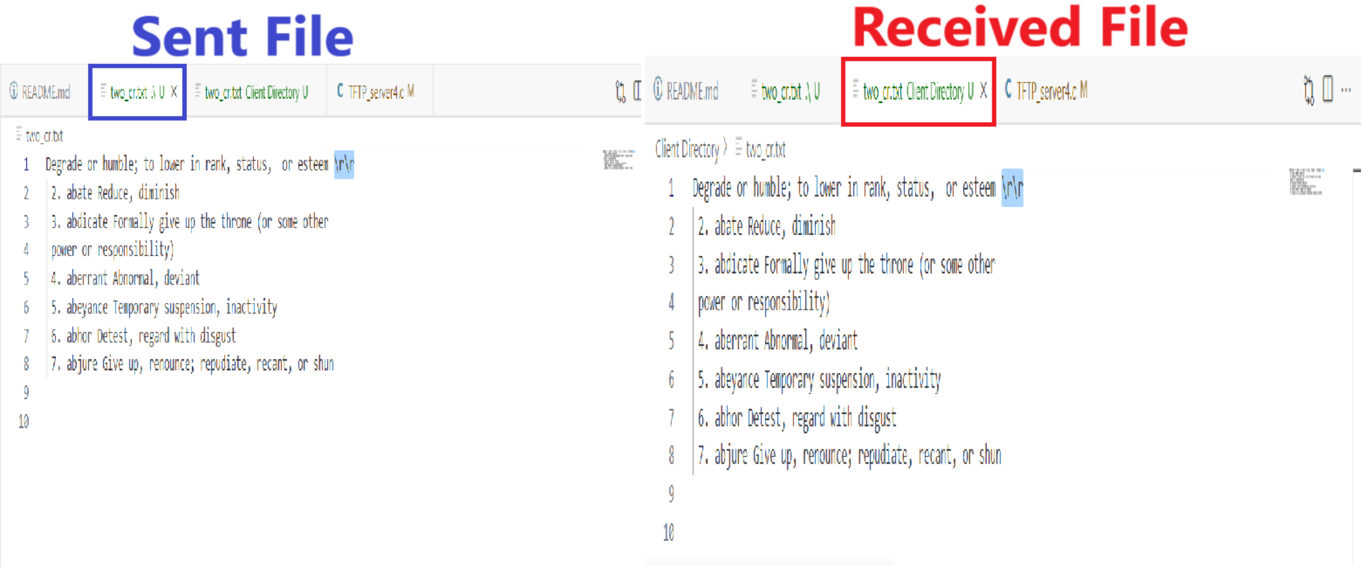
### Server Side Terminal

```
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignments/MP3/ECEN-602-MP-3-File-Transfer$ ./server.out
TFTP server started...
Received RRQ for file: two_cr.txt
Transfer started for two_cr.txt
Data packet 1 sent, size 352
Transfer completed for two_cr.txt
```

### Client Side Directory Before & After



### Files Comparison

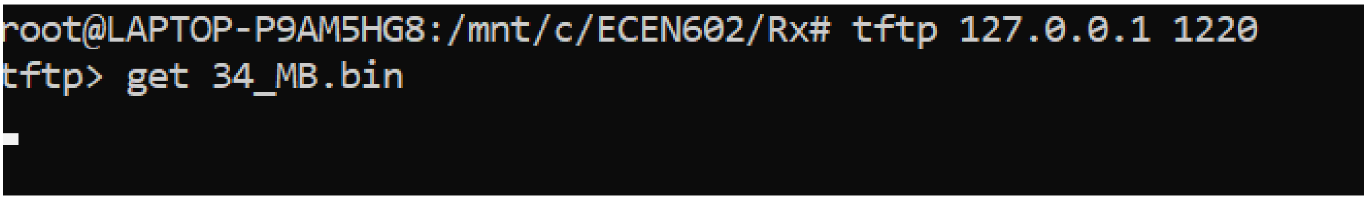


```
Degrade or humble; to lower in rank, status, or esteem \r\r
2. abate Reduce, diminish
3. abdicate Formally give up the throne (or some other
power or responsibility)
4. aberrant Abnormal, deviant
5. abeyance Temporary suspension, inactivity
6. abhor Detest, regard with disgust
7. abjure Give up, renounce; repudiate, recant, or shun
```

Degrade or humble; to lower in rank, status, or esteem \r\r
2. abate Reduce, diminish
3. abdicate Formally give up the throne (or some other
power or responsibility)
4. aberrant Abnormal, deviant
5. abeyance Temporary suspension, inactivity
6. abhor Detest, regard with disgust
7. abjure Give up, renounce; repudiate, recant, or shun

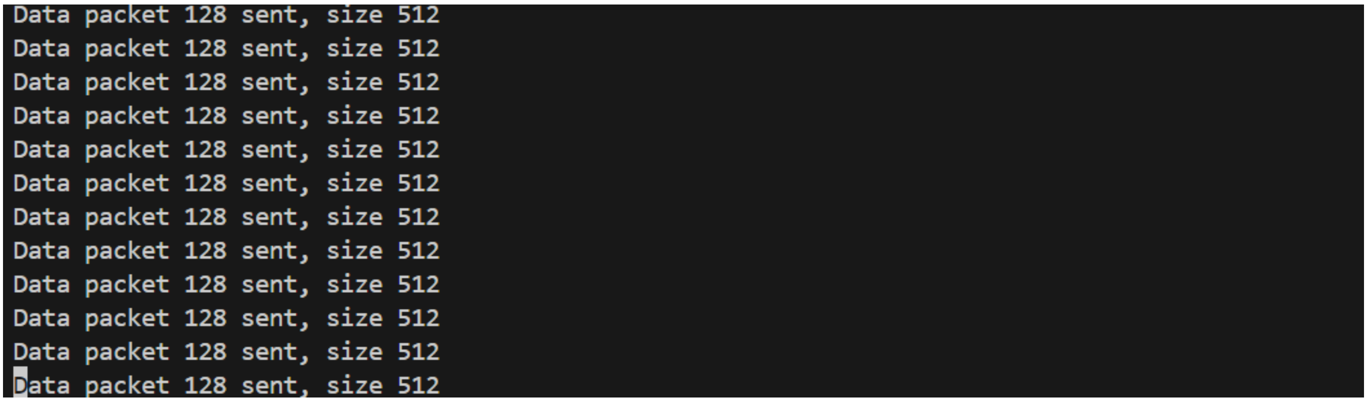
4. **Transfer a binary file of size 34MB** In this test case, we transfer a binary file of 34MB and see if block number wrap-around works.

### Client Side Terminal



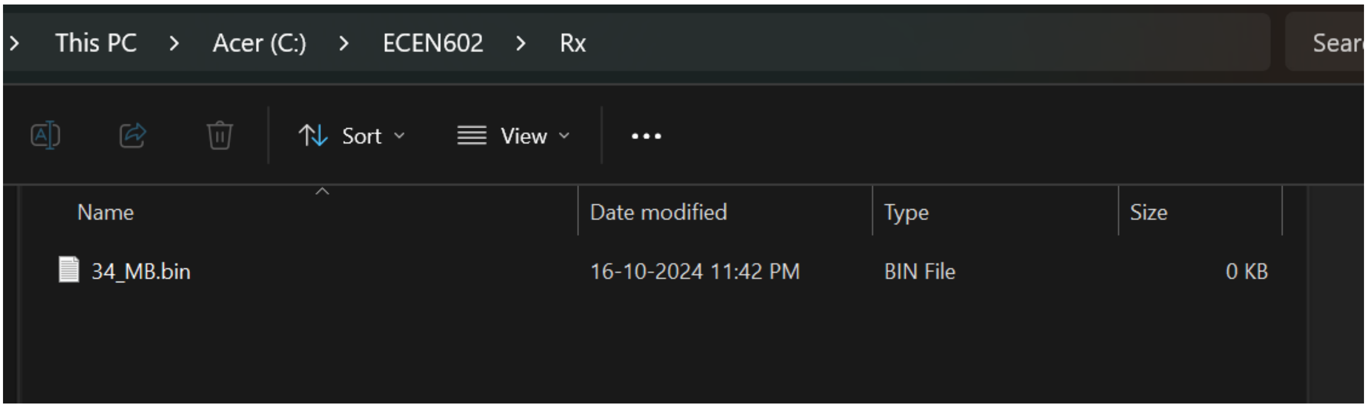
```
root@LAPTOP-P9AM5HG8:/mnt/c/ECEN602/Rx# tftp 127.0.0.1 1220
tftp> get 34_MB.bin
```

### Server Side Terminal



```
Data packet 128 sent, size 512
Data packet 128 sent, size 512
Data packet 128 sent, size 512
Data packet 128 sent, size 512
Data packet 128 sent, size 512
Data packet 128 sent, size 512
Data packet 128 sent, size 512
Data packet 128 sent, size 512
Data packet 128 sent, size 512
Data packet 128 sent, size 512
Data packet 128 sent, size 512
Data packet 128 sent, size 512
```

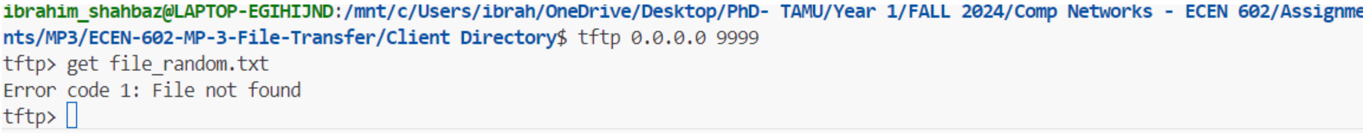
### Client Side Directory After Transfer



| Name | Date modified | Type | Size |
|---|---|---|---|
| 34_MB.bin | 16-10-2024 11:42 PM | BIN File | 0 KB |

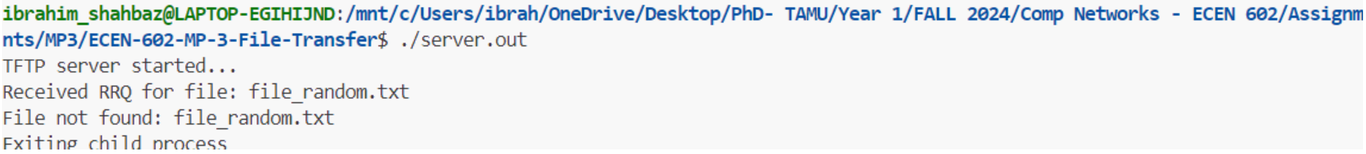
5. **Try to transfer an invalid file** In this test case, we check that we receive an error message if we try to transfer a file that does not exist and that our server cleans up and the child process exits.

### Client Side Terminal



```
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignme
nts/MP3/ECEN-602-MP-3-File-Transfer/Client Directory$ tftp 0.0.0.0 9999
tftp> get file_random.txt
Error code 1: File not found
tftp> 
```

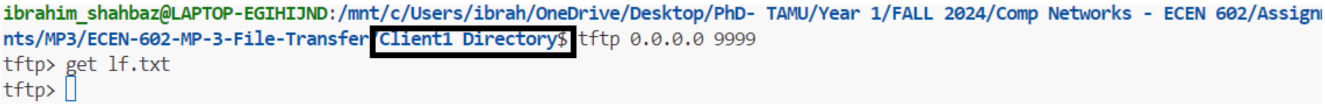
### Server Side Terminal



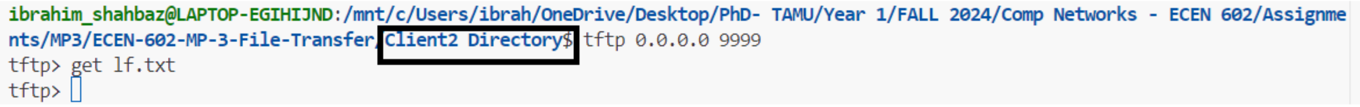
```
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignm
nts/MP3/ECEN-602-MP-3-File-Transfer$ ./server.out
TFTP server started...
Received RRQ for file: file_random.txt
File not found: file_random.txt
Exiting child process
```

6. **Transfer a file to three client simultaneously** In this test case, we check that we receive the same file on three different client directories simultaneously.

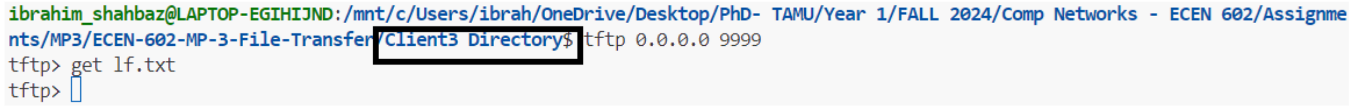
## Client Side Terminal



```
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assign
nts/MP3/ECEN-602-MP-3-File-Transfer/Client1 Directory$ tftp 0.0.0.0 9999
tftp> get lf.txt
tftp> 
```

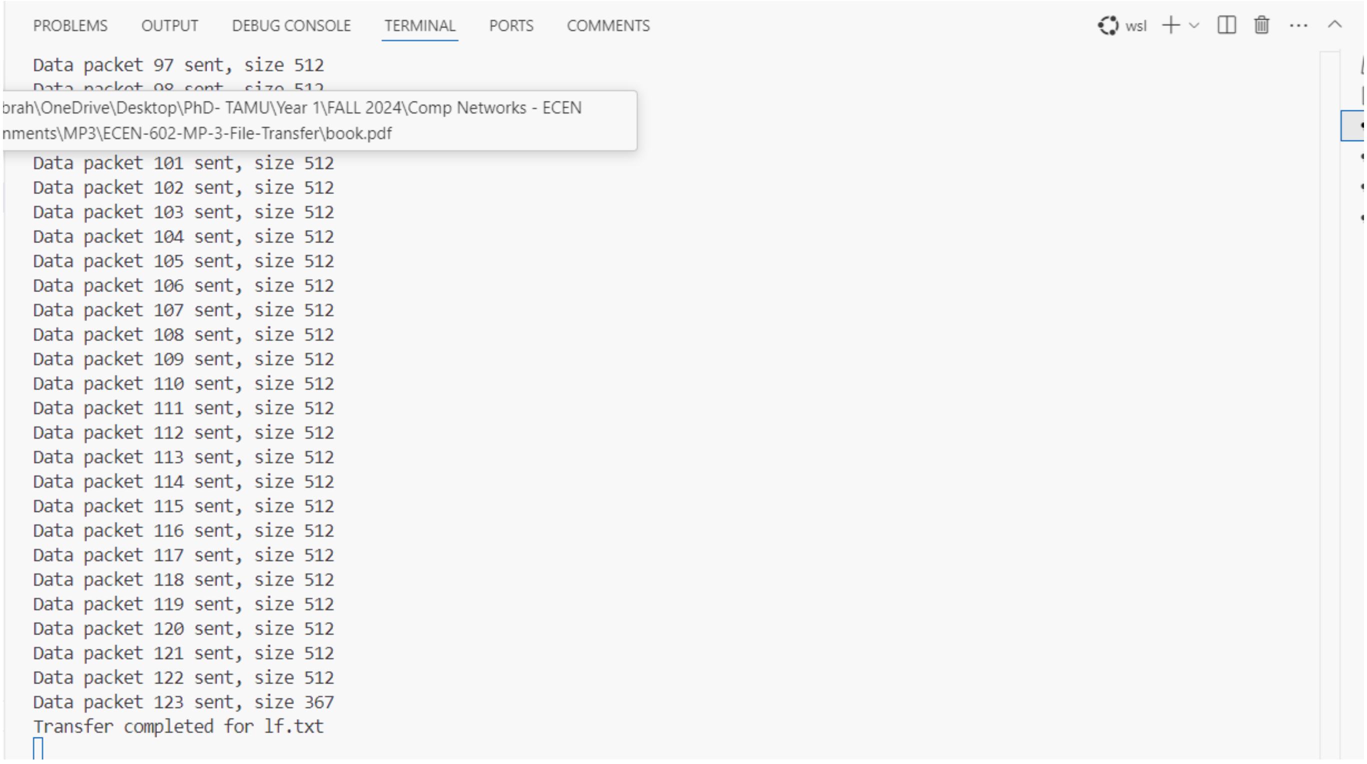


```
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignme
nts/MP3/ECEN-602-MP-3-File-Transfer/Client2 Directory$ tftp 0.0.0.0 9999
tftp> get lf.txt
tftp> 
```



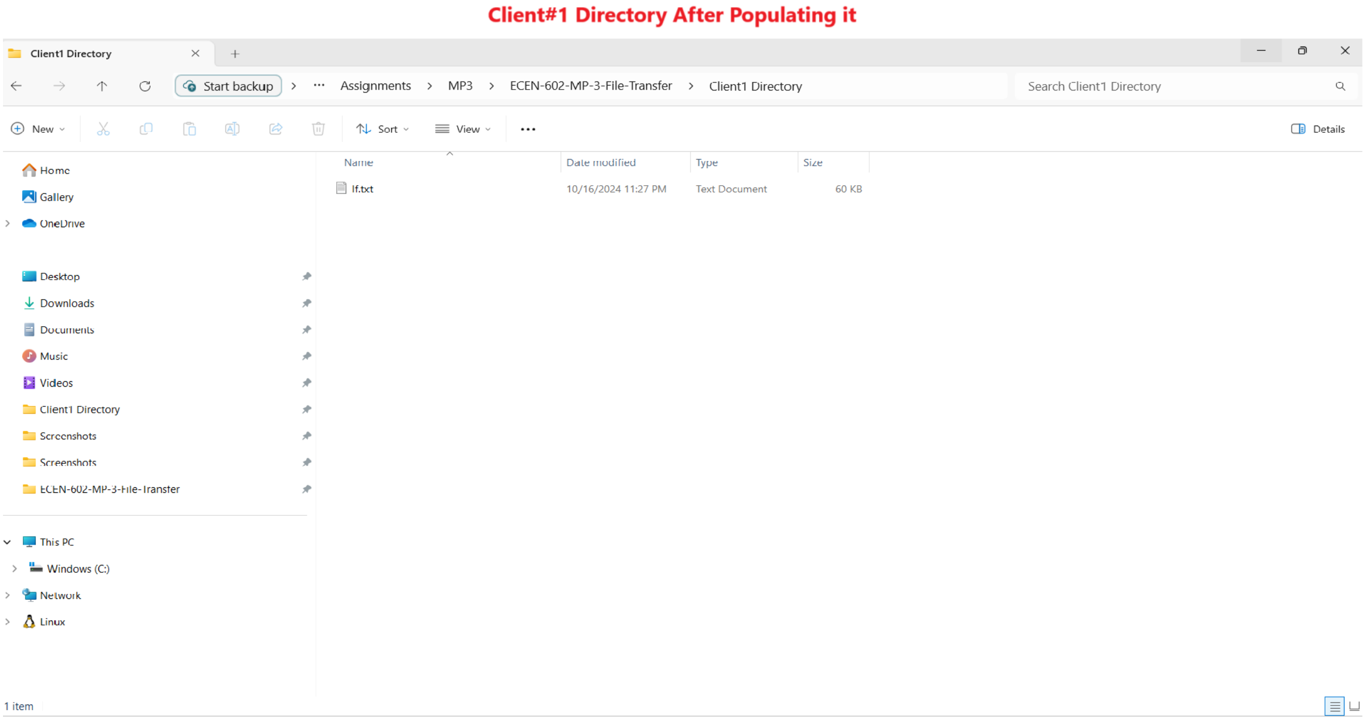
```
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignme
nts/MP3/ECEN-602-MP-3-File-Transfer/Client3 Directory$ tftp 0.0.0.0 9999
tftp> get lf.txt
tftp> 
```

## Server Side Terminal



```
Data packet 97 sent, size 512
Data packet 98 sent, size 512
brah\OneDrive\Desktop\PhD- TAMU\Year 1\FALL 2024\Comp Networks - ECEN
nments\MP3\ECEN-602-MP-3-File-Transfer\book.pdf
Data packet 101 sent, size 512
Data packet 102 sent, size 512
Data packet 103 sent, size 512
Data packet 104 sent, size 512
Data packet 105 sent, size 512
Data packet 106 sent, size 512
Data packet 107 sent, size 512
Data packet 108 sent, size 512
Data packet 109 sent, size 512
Data packet 110 sent, size 512
Data packet 111 sent, size 512
Data packet 112 sent, size 512
Data packet 113 sent, size 512
Data packet 114 sent, size 512
Data packet 115 sent, size 512
Data packet 116 sent, size 512
Data packet 117 sent, size 512
Data packet 118 sent, size 512
Data packet 119 sent, size 512
Data packet 120 sent, size 512
Data packet 121 sent, size 512
Data packet 122 sent, size 512
Data packet 123 sent, size 367
Transfer completed for lf.txt
```

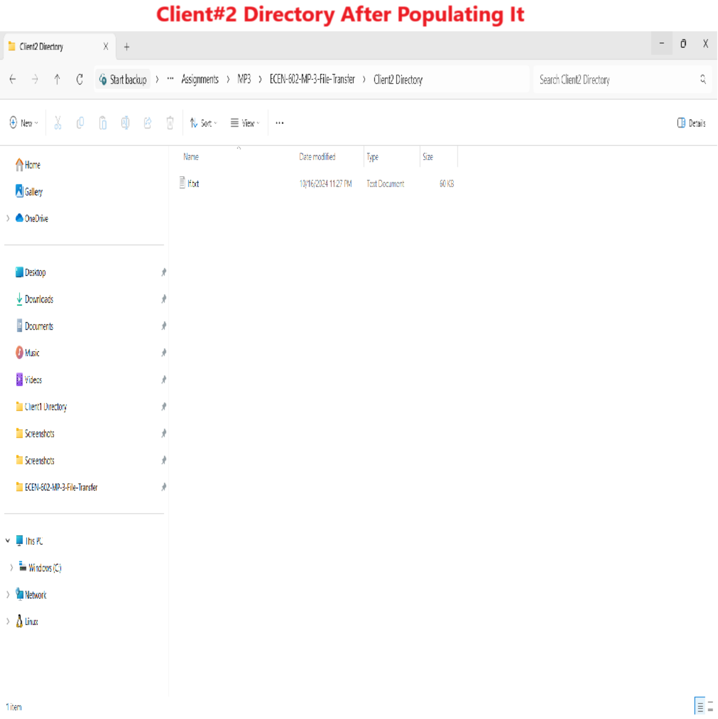
## Client#1 Side Directory After Transferring Files Siultanously



Client#1 Directory After Populating it

| Name | Date modified | Type | Size |
|---|---|---|---|
| lf.txt | 10/16/2024 11:27 PM | Text Document | 60 KB |

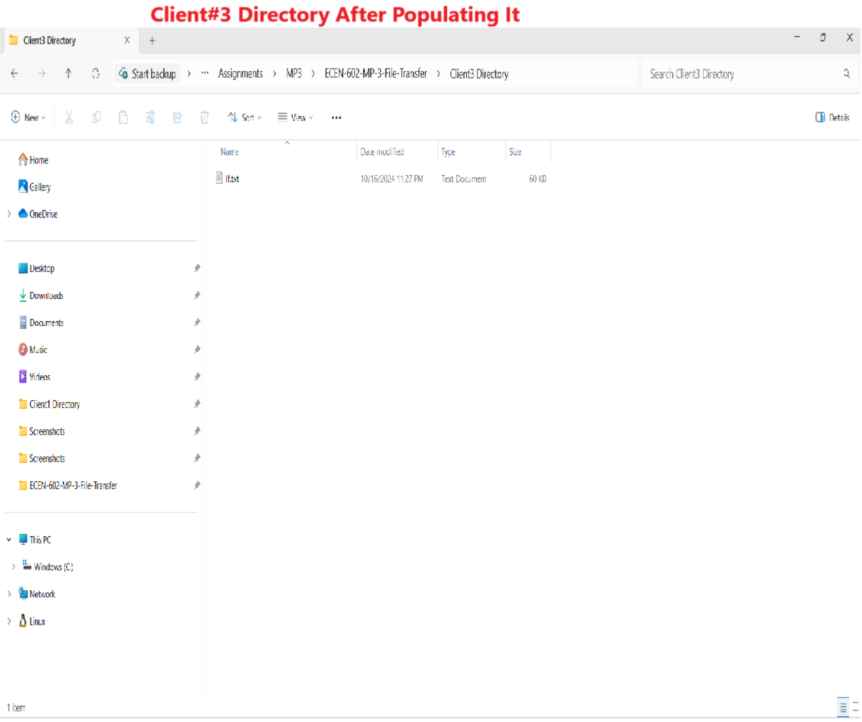
## Client#2 Side Directory After Transferring Files Siultanously



Client#2 Directory After Populating It

| Name | Date modified | Type | Size |
|---|---|---|---|
| lf.txt | 10/16/2024 11:27 PM | Text Document | 60 KB |

### Client#3 Side Directory After Transferring Files Siultanously

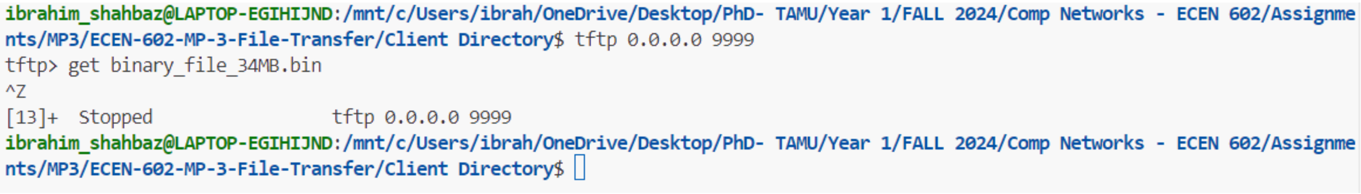


Client#3 Directory After Populating It

| Name | Date modified | Type | Size |
|---|---|---|---|
| lf.txt | 10/16/2024 11:27 PM | Text Document | 60 KB |

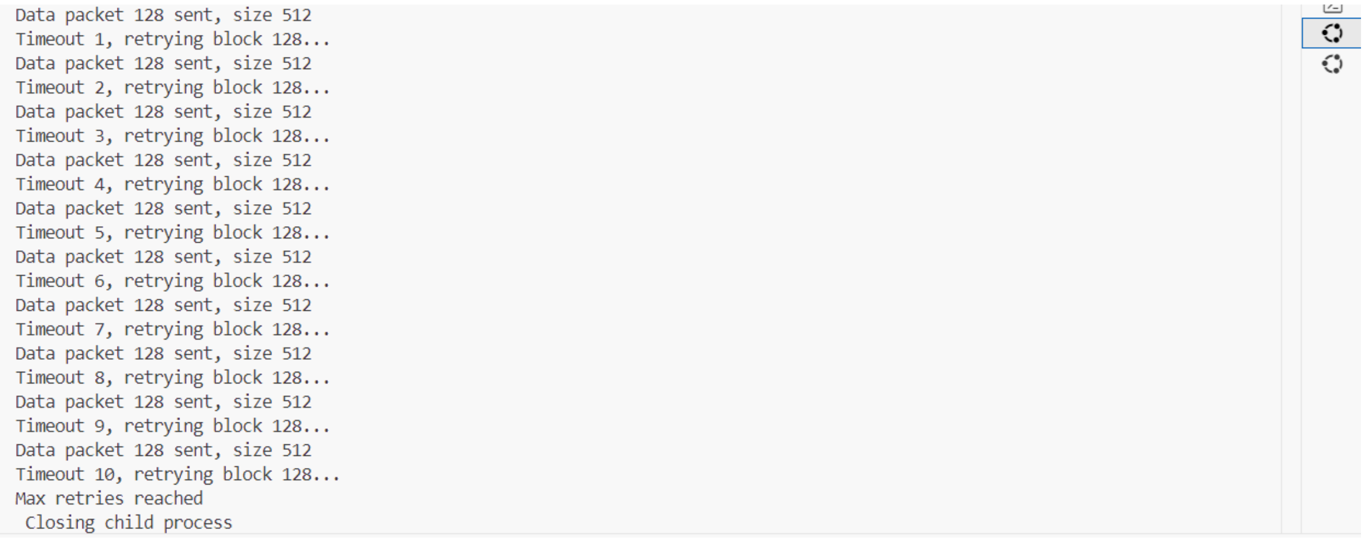
7. **Terminate a client while recieving a file** In this test case, we terminate the TFTP client in the middle of a transfer and see if our TFTP server realizes that the client got dissconnected after 10 timeouts.

### Client Side Terminal



```
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignments/MP3/ECEN-602-MP-3-File-Transfer/Client Directory$ tftp 0.0.0.0 9999
tftp> get binary_file_34MB.bin
^Z
[13]+  Stopped                 tftp 0.0.0.0 9999
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignments/MP3/ECEN-602-MP-3-File-Transfer/Client Directory$ 
```

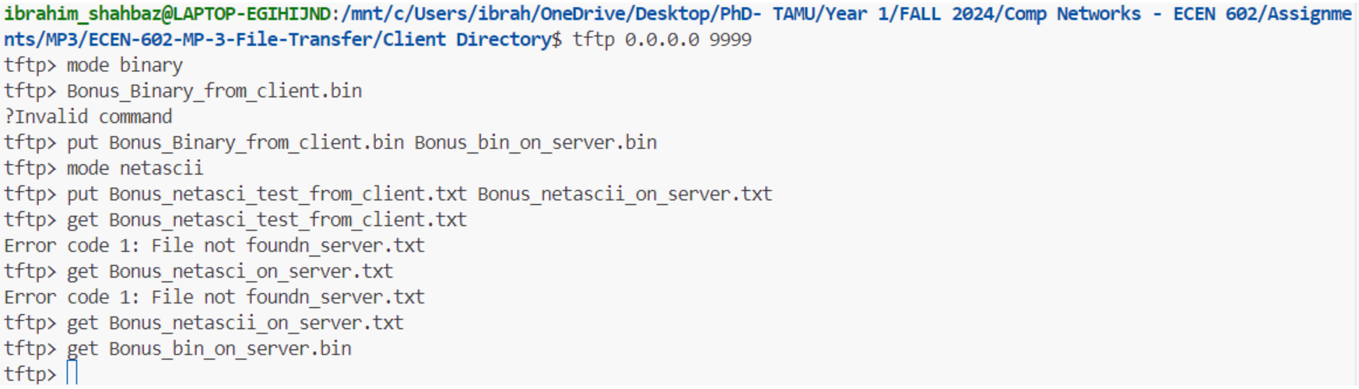
### Server Side Terminal



```
Data packet 128 sent, size 512
Timeout 1, retrying block 128...
Data packet 128 sent, size 512
Timeout 2, retrying block 128...
Data packet 128 sent, size 512
Timeout 3, retrying block 128...
Data packet 128 sent, size 512
Timeout 4, retrying block 128...
Data packet 128 sent, size 512
Timeout 5, retrying block 128...
Data packet 128 sent, size 512
Timeout 6, retrying block 128...
Data packet 128 sent, size 512
Timeout 7, retrying block 128...
Data packet 128 sent, size 512
Timeout 8, retrying block 128...
Data packet 128 sent, size 512
Timeout 9, retrying block 128...
Data packet 128 sent, size 512
Timeout 10, retrying block 128...
Max retries reached
 Closing child process
```

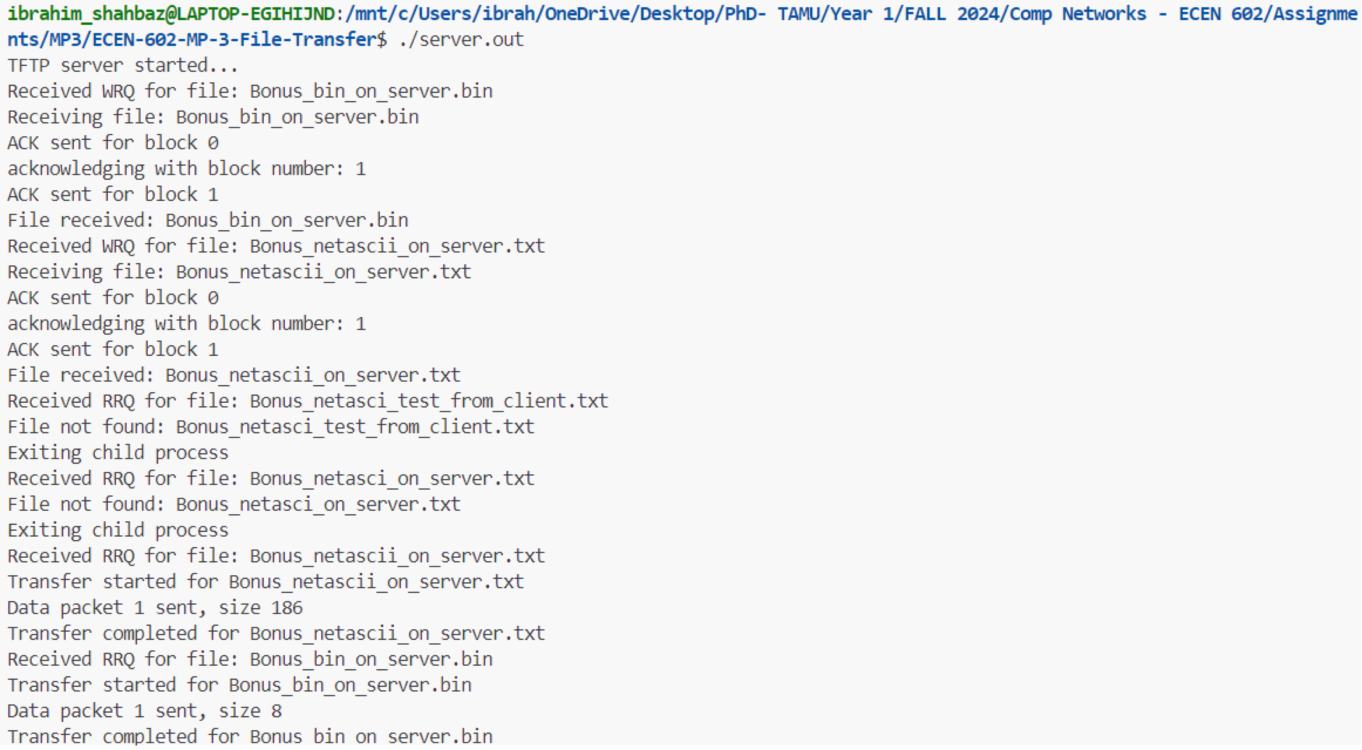
8. **Bonus Feature: WRQ for a Binary file** In this test case, we implement the WRQ bonus feature on both binary and netascii files.

## Client Side Terminal



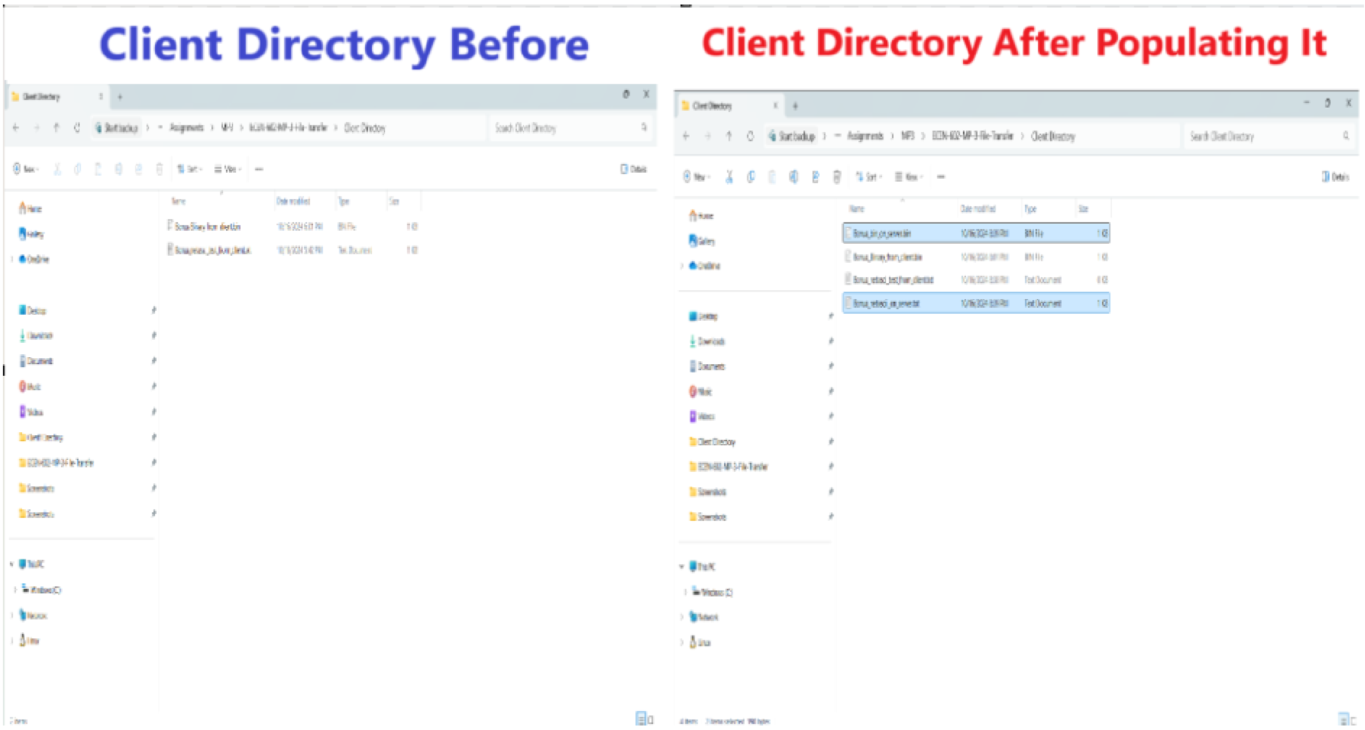
```
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignme
nts/MP3/ECEN-602-MP-3-File-Transfer/Client Directory$ tftp 0.0.0.0 9999
tftp> mode binary
tftp> Bonus_Binary_from_client.bin
?Invalid command
tftp> put Bonus_Binary_from_client.bin Bonus_bin_on_server.bin
tftp> mode netascii
tftp> put Bonus_netasci_test_from_client.txt Bonus_netascii_on_server.txt
tftp> get Bonus_netasci_test_from_client.txt
Error code 1: File not foundn_server.txt
tftp> get Bonus_netasci_on_server.txt
Error code 1: File not foundn_server.txt
tftp> get Bonus_netascii_on_server.txt
tftp> get Bonus_bin_on_server.bin
tftp> 
```

## Server Side Terminal

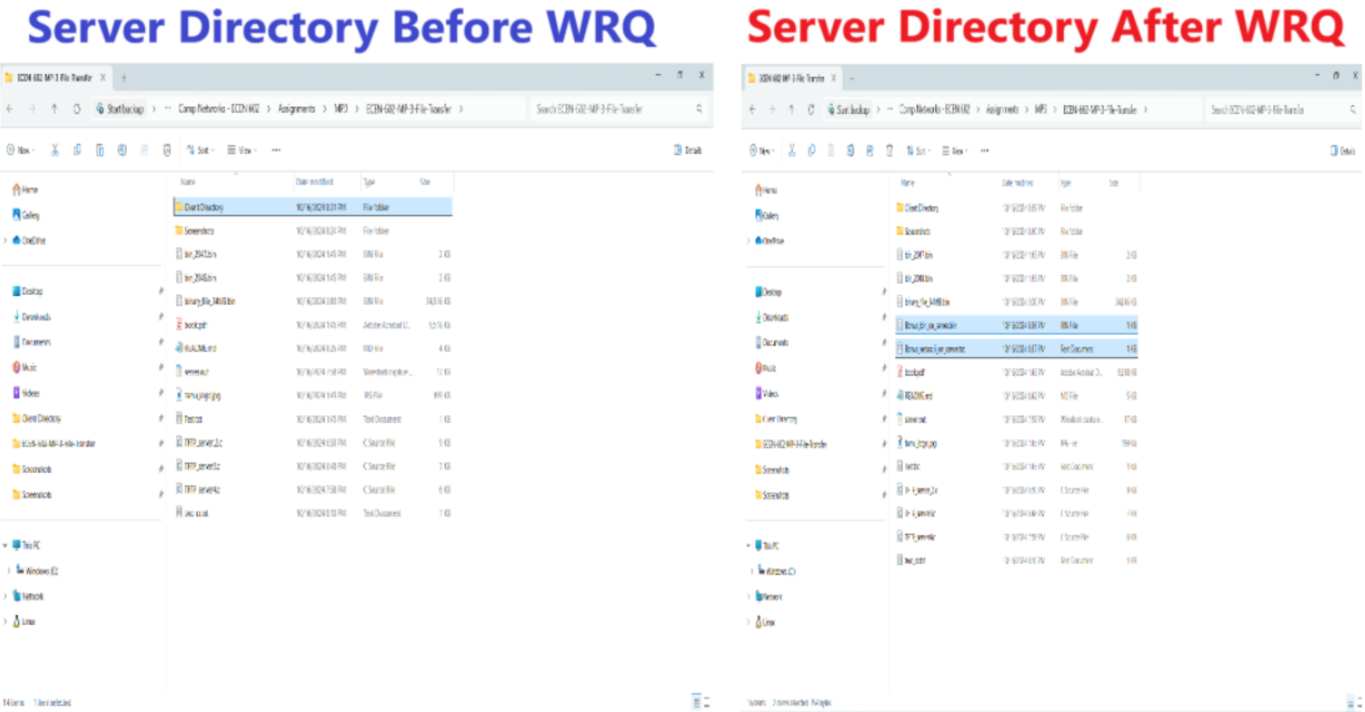


```
ibrahim_shahbaz@LAPTOP-EGIHIJND:/mnt/c/Users/ibrah/OneDrive/Desktop/PhD- TAMU/Year 1/FALL 2024/Comp Networks - ECEN 602/Assignme
nts/MP3/ECEN-602-MP-3-File-Transfer$ ./server.out
TFTP server started...
Received WRQ for file: Bonus_bin_on_server.bin
Receiving file: Bonus_bin_on_server.bin
ACK sent for block 0
acknowledging with block number: 1
ACK sent for block 1
File received: Bonus_bin_on_server.bin
Received WRQ for file: Bonus_netascii_on_server.txt
Receiving file: Bonus_netascii_on_server.txt
ACK sent for block 0
acknowledging with block number: 1
ACK sent for block 1
File received: Bonus_netascii_on_server.txt
Received RRQ for file: Bonus_netasci_test_from_client.txt
File not found: Bonus_netasci_test_from_client.txt
Exiting child process
Received RRQ for file: Bonus_netasci_on_server.txt
File not found: Bonus_netasci_on_server.txt
Exiting child process
Received RRQ for file: Bonus_netascii_on_server.txt
Transfer started for Bonus_netascii_on_server.txt
Data packet 1 sent, size 186
Transfer completed for Bonus_netascii_on_server.txt
Received RRQ for file: Bonus_bin_on_server.bin
Transfer started for Bonus_bin_on_server.bin
Data packet 1 sent, size 8
Transfer completed for Bonus_bin_on_server.bin
```

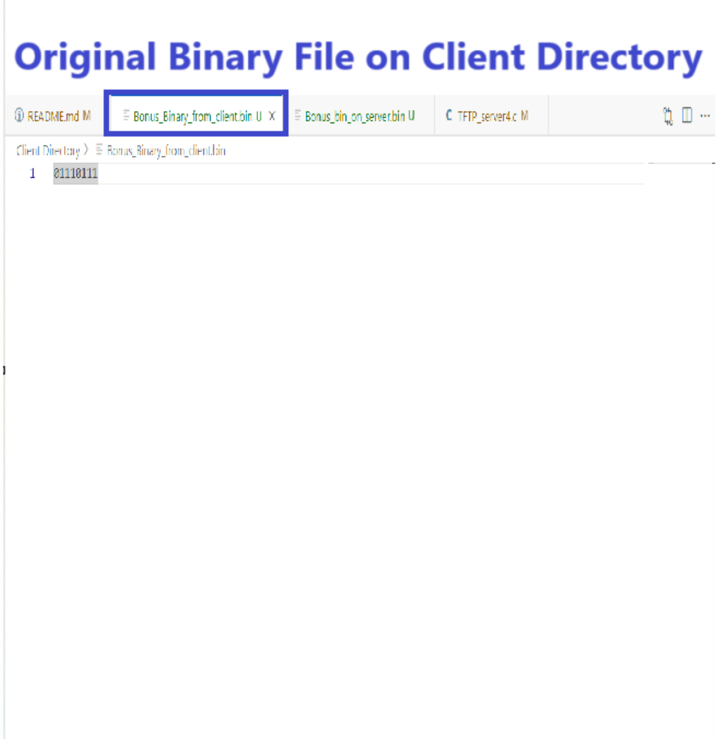
### Client Side Directory Before & After



### Server Side Directory Before & After



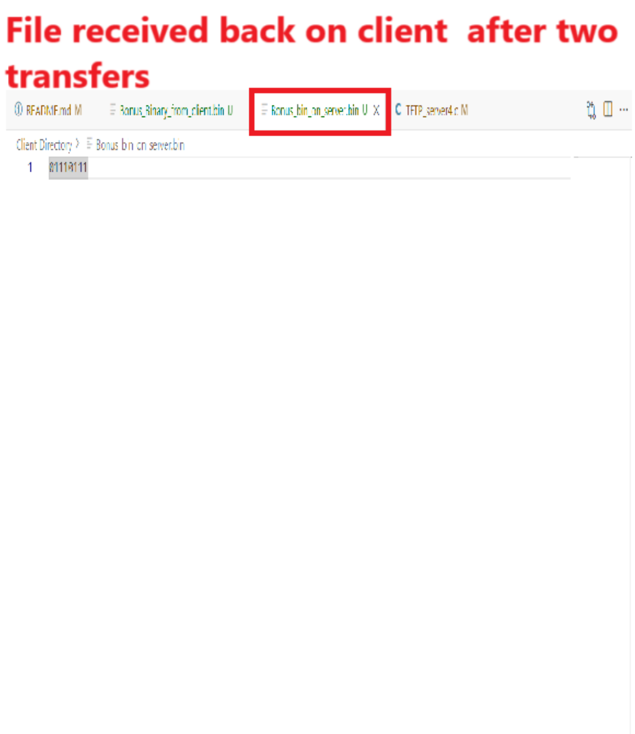
### Binary Files Comparison



Original Binary File on Client Directory

README.md M
Bonus_Binary_from_client.bin U X
Bonus_bin_on_server.bin U
TFTP_server4.c M
Client Directory > Bonus_Binary_from_client.bin

```
01110111
```

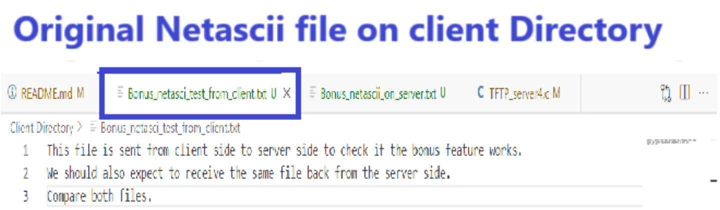


File received back on client  after two transfers

README.md M
Bonus_Binary_from_client.bin U
Bonus_bin_on_server.bin U X
TFTP_server4.c M
Client Directory > Bonus_bin_on_server.bin

```
01110111
```

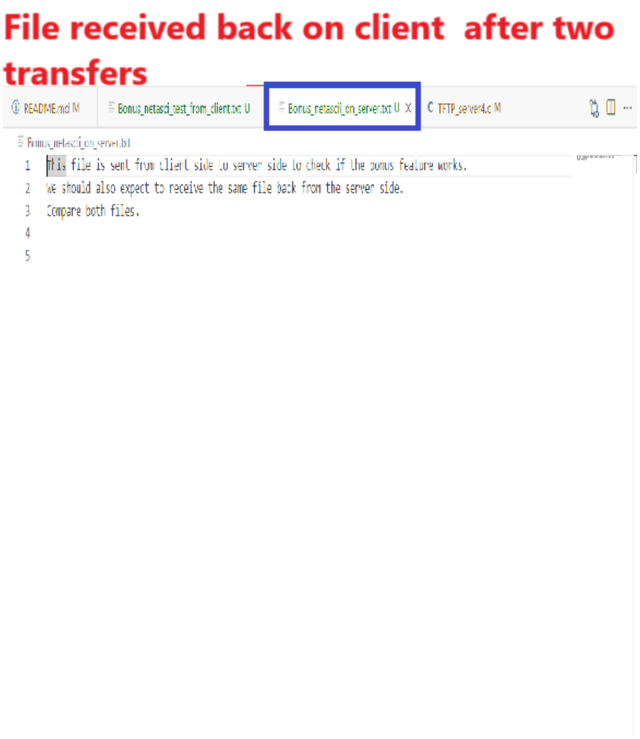
### Netascii Files Comparison



Original Netascii file on client Directory

README.md M
Bonus_netasci_test_from_client.txt U X
Bonus_netascii_on_server.txt U
TFTP_server4.c M
Client Directory > Bonus_netasci_test_from_client.txt

```
This file is sent from client side to server side to check it the bonus feature works.
We should also expect to receive the same file back from the server side.
Compare both files.
```



File received back on client  after two transfers

README.md M
Bonus_netasci_test_from_client.txt U
Bonus_netascii_on_server.txt U X
TFTP_server4.c M
Bonus_netascii_on_server.txt

```
This file is sent from client side to server side to check if the bonus feature works.
We should also expect to receive the same file back from the server side.
Compare both files.


```