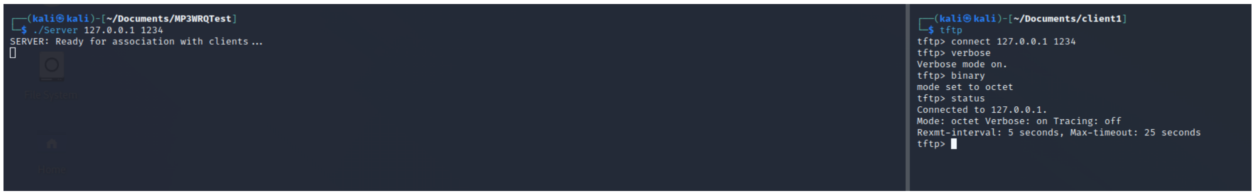
Test cases: This document involves screenshots of all test cases including bonus question

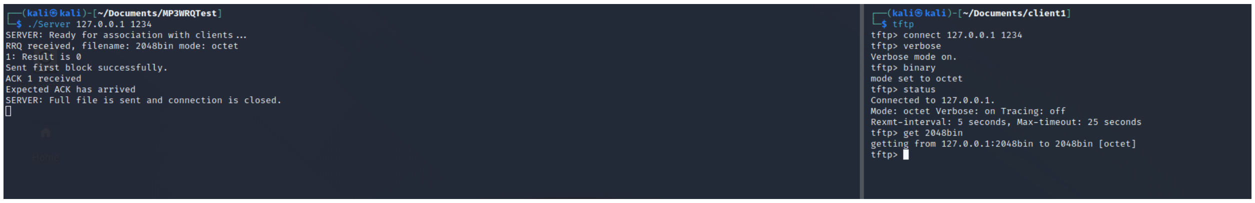
Initial setup :



```
┌──(kali㉿kali)-[~/Documents/MP3WRQTest]
└─$ ./Server 127.0.0.1 1234
SERVER: Ready for association with clients ...
```

```
┌──(kali㉿kali)-[~/Documents/client1]
└─$ tftp
tftp> connect 127.0.0.1 1234
tftp> verbose
Verbose mode on.
tftp> binary
mode set to octet
tftp> status
Connected to 127.0.0.1.
Mode: octet Verbose: on Tracing: off
Rexmt-interval: 5 seconds, Max-timeout: 25 seconds
tftp>
```

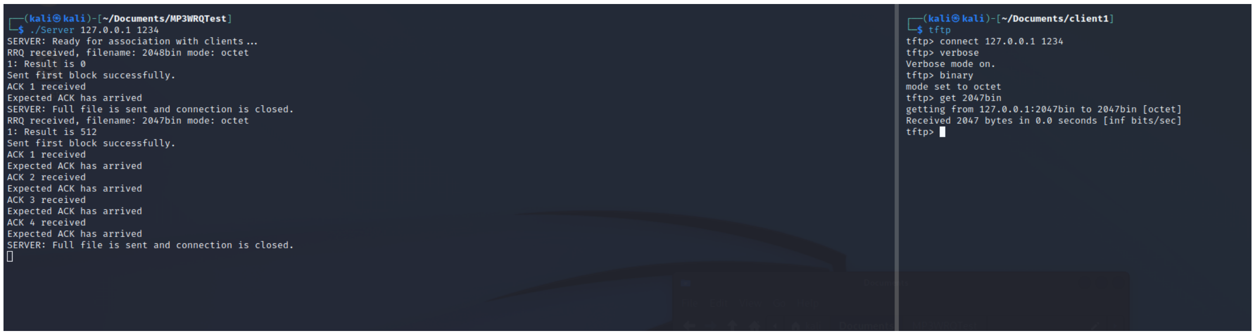
Test case 1: Transfer a binary file of 2048 bytes and check that it matches the source file



```
┌──(kali㉿kali)-[~/Documents/MP3WRQTest]
└─$ ./Server 127.0.0.1 1234
SERVER: Ready for association with clients ...
RRQ received, filename: 2048bin mode: octet
1: Result is 0
Sent first block successfully.
ACK 1 received
Expected ACK has arrived
SERVER: Full file is sent and connection is closed.
```

```
┌──(kali㉿kali)-[~/Documents/client1]
└─$ tftp
tftp> connect 127.0.0.1 1234
tftp> verbose
Verbose mode on.
tftp> binary
mode set to octet
tftp> status
Connected to 127.0.0.1.
Mode: octet Verbose: on Tracing: off
Rexmt-interval: 5 seconds, Max-timeout: 25 seconds
tftp> get 2048bin
getting from 127.0.0.1:2048bin to 2048bin [octet]
tftp>
```

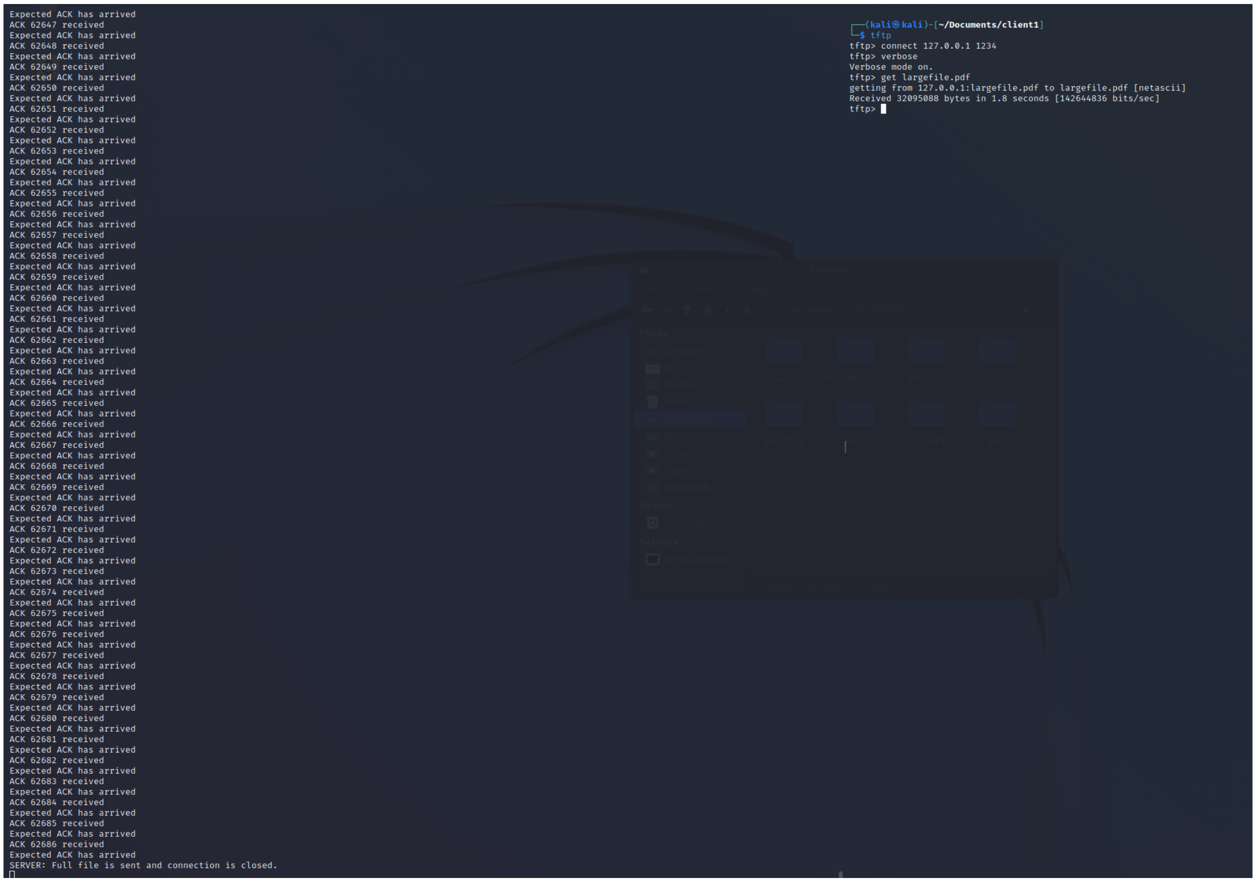
Test case 2 : Transfer a binary file of 2047 bytes and check that it matches the source file,



```
┌──(kali㉿kali)-[~/Documents/MP3WRQTest]
└─$ ./Server 127.0.0.1 1234
SERVER: Ready for association with clients ...
RRQ received, filename: 2048bin mode: octet
1: Result is 0
Sent first block successfully.
ACK 1 received
Expected ACK has arrived
SERVER: Full file is sent and connection is closed.
RRQ received, filename: 2047bin mode: octet
1: Result is 512
Sent first block successfully.
ACK 1 received
Expected ACK has arrived
ACK 2 received
Expected ACK has arrived
ACK 3 received
Expected ACK has arrived
ACK 4 received
Expected ACK has arrived
SERVER: Full file is sent and connection is closed.
```

```
┌──(kali㉿kali)-[~/Documents/client1]
└─$ tftp
tftp> connect 127.0.0.1 1234
tftp> verbose
Verbose mode on.
tftp> binary
mode set to octet
tftp> get 2047bin
getting from 127.0.0.1:2047bin to 2047bin [octet]
Received 2047 bytes in 0.0 seconds [inf bits/sec]
tftp>
```

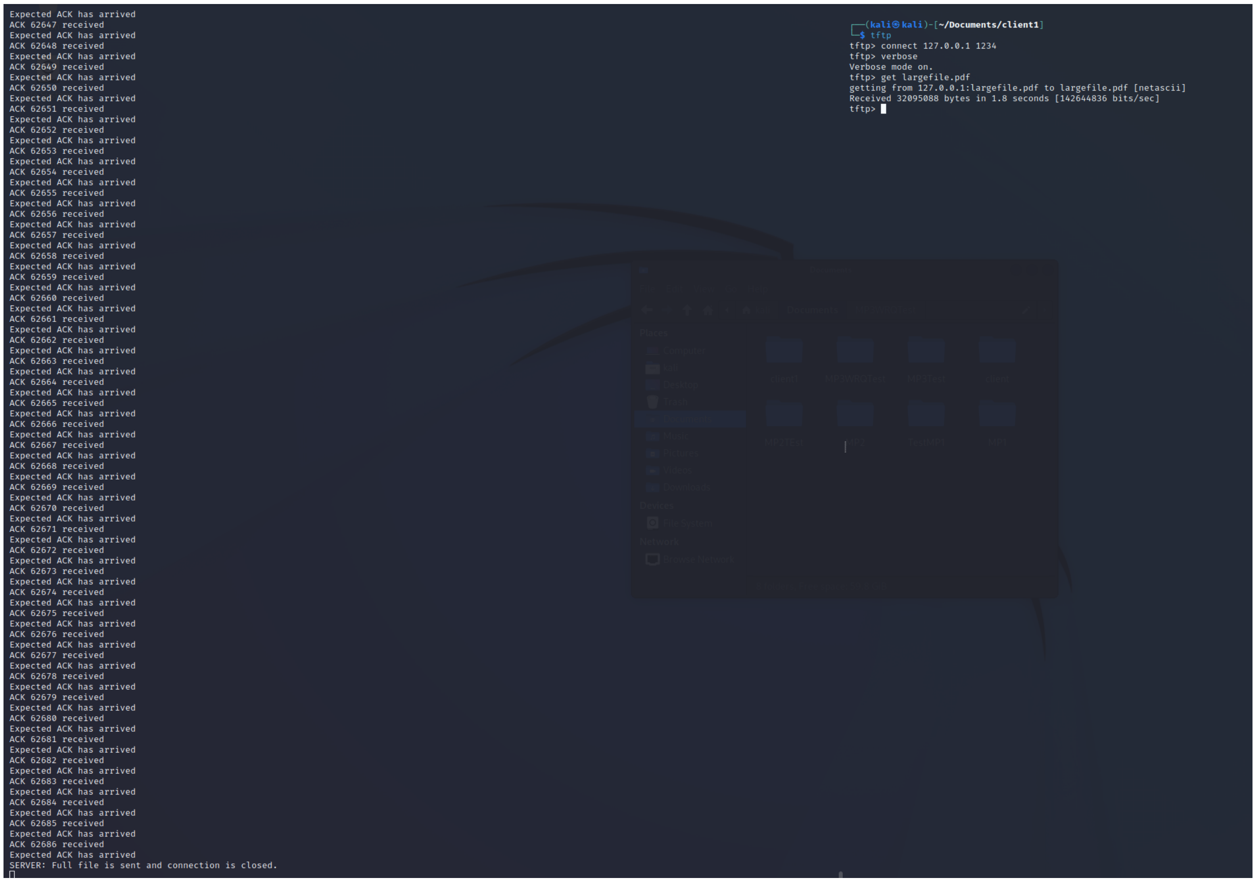
Test case 3: Transfer a netascii file that includes two CR's and check that the resulting file matches the input file



```
Expected ACK has arrived
ACK 62647 received
Expected ACK has arrived
ACK 62648 received
Expected ACK has arrived
ACK 62649 received
Expected ACK has arrived
ACK 62650 received
Expected ACK has arrived
ACK 62651 received
Expected ACK has arrived
ACK 62652 received
Expected ACK has arrived
ACK 62653 received
Expected ACK has arrived
ACK 62654 received
Expected ACK has arrived
ACK 62655 received
Expected ACK has arrived
ACK 62656 received
Expected ACK has arrived
ACK 62657 received
Expected ACK has arrived
ACK 62658 received
Expected ACK has arrived
ACK 62659 received
Expected ACK has arrived
ACK 62660 received
Expected ACK has arrived
ACK 62661 received
Expected ACK has arrived
ACK 62662 received
Expected ACK has arrived
ACK 62663 received
Expected ACK has arrived
ACK 62664 received
Expected ACK has arrived
ACK 62665 received
Expected ACK has arrived
ACK 62666 received
Expected ACK has arrived
ACK 62667 received
Expected ACK has arrived
ACK 62668 received
Expected ACK has arrived
ACK 62669 received
Expected ACK has arrived
ACK 62670 received
Expected ACK has arrived
ACK 62671 received
Expected ACK has arrived
ACK 62672 received
Expected ACK has arrived
ACK 62673 received
Expected ACK has arrived
ACK 62674 received
Expected ACK has arrived
ACK 62675 received
Expected ACK has arrived
ACK 62676 received
Expected ACK has arrived
ACK 62677 received
Expected ACK has arrived
ACK 62678 received
Expected ACK has arrived
ACK 62679 received
Expected ACK has arrived
ACK 62680 received
Expected ACK has arrived
ACK 62681 received
Expected ACK has arrived
ACK 62682 received
Expected ACK has arrived
ACK 62683 received
Expected ACK has arrived
ACK 62684 received
Expected ACK has arrived
ACK 62685 received
Expected ACK has arrived
ACK 62686 received
Expected ACK has arrived
SERVER: Full file is sent and connection is closed.
```

```
┌──(kali㉿kali)-[~/Documents/client1]
└─$ tftp
tftp> connect 127.0.0.1 1234
tftp> verbose
Verbose mode on.
tftp> get largefile.pdf
getting from 127.0.0.1:largefile.pdf to largefile.pdf [netascii]
Received 32095088 bytes in 1.8 seconds [142644836 bits/sec]
tftp> 
```

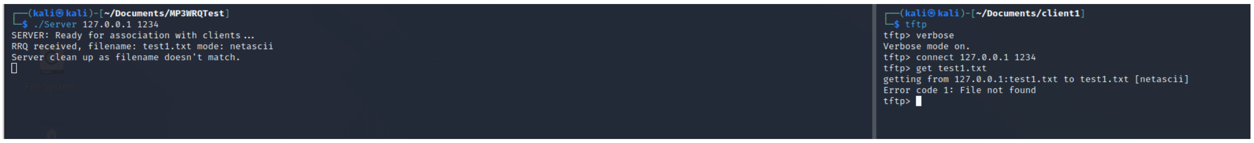
Test case 4: Transfer a binary file of 34 MB and see if block number wrap-around works



```
Expected ACK has arrived
ACK 62647 received
Expected ACK has arrived
ACK 62648 received
Expected ACK has arrived
ACK 62649 received
Expected ACK has arrived
ACK 62650 received
Expected ACK has arrived
ACK 62651 received
Expected ACK has arrived
ACK 62652 received
Expected ACK has arrived
ACK 62653 received
Expected ACK has arrived
ACK 62654 received
Expected ACK has arrived
ACK 62655 received
Expected ACK has arrived
ACK 62656 received
Expected ACK has arrived
ACK 62657 received
Expected ACK has arrived
ACK 62658 received
Expected ACK has arrived
ACK 62659 received
Expected ACK has arrived
ACK 62660 received
Expected ACK has arrived
ACK 62661 received
Expected ACK has arrived
ACK 62662 received
Expected ACK has arrived
ACK 62663 received
Expected ACK has arrived
ACK 62664 received
Expected ACK has arrived
ACK 62665 received
Expected ACK has arrived
ACK 62666 received
Expected ACK has arrived
ACK 62667 received
Expected ACK has arrived
ACK 62668 received
Expected ACK has arrived
ACK 62669 received
Expected ACK has arrived
ACK 62670 received
Expected ACK has arrived
ACK 62671 received
Expected ACK has arrived
ACK 62672 received
Expected ACK has arrived
ACK 62673 received
Expected ACK has arrived
ACK 62674 received
Expected ACK has arrived
ACK 62675 received
Expected ACK has arrived
ACK 62676 received
Expected ACK has arrived
ACK 62677 received
Expected ACK has arrived
ACK 62678 received
Expected ACK has arrived
ACK 62679 received
Expected ACK has arrived
ACK 62680 received
Expected ACK has arrived
ACK 62681 received
Expected ACK has arrived
ACK 62682 received
Expected ACK has arrived
ACK 62683 received
Expected ACK has arrived
ACK 62684 received
Expected ACK has arrived
ACK 62685 received
Expected ACK has arrived
ACK 62686 received
Expected ACK has arrived
SERVER: Full file is sent and connection is closed.
```

```
┌──(kali㉿kali)-[~/Documents/client1]
└─$ tftp
tftp> connect 127.0.0.1 1234
tftp> verbose
Verbose mode on.
tftp> get largefile.pdf
getting from 127.0.0.1:largefile.pdf to largefile.pdf [netascii]
Received 32095088 bytes in 1.8 seconds [142644836 bits/sec]
tftp>
```

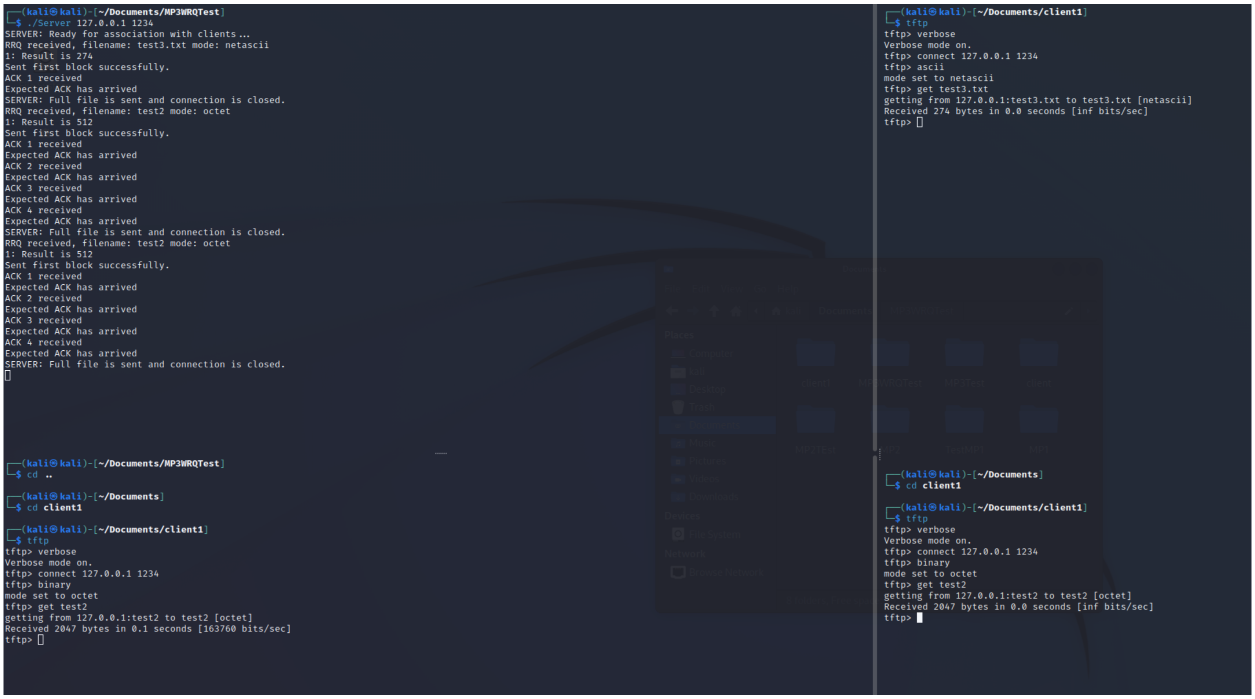
Test case 5: check that you receive an error message if you try to transfer a file that does not exist and that your server cleans up and the child process exits



```
┌──(kali㉿kali)-[~/Documents/MP3WRQTest]
└─$ ./Server 127.0.0.1 1234
SERVER: Ready for association with clients...
RRQ received, filename: test1.txt mode: netascii
Server clean up as filename doesn't match.
```

```
┌──(kali㉿kali)-[~/Documents/client1]
└─$ tftp
tftp> verbose
Verbose mode on.
tftp> connect 127.0.0.1 1234
tftp> get test1.txt
getting from 127.0.0.1:test1.txt to test1.txt [netascii]
Error code 1: File not found
tftp>
```

Test case 6: Connect to the TFTP server with three clients simultaneously and test that the transfers work correctly



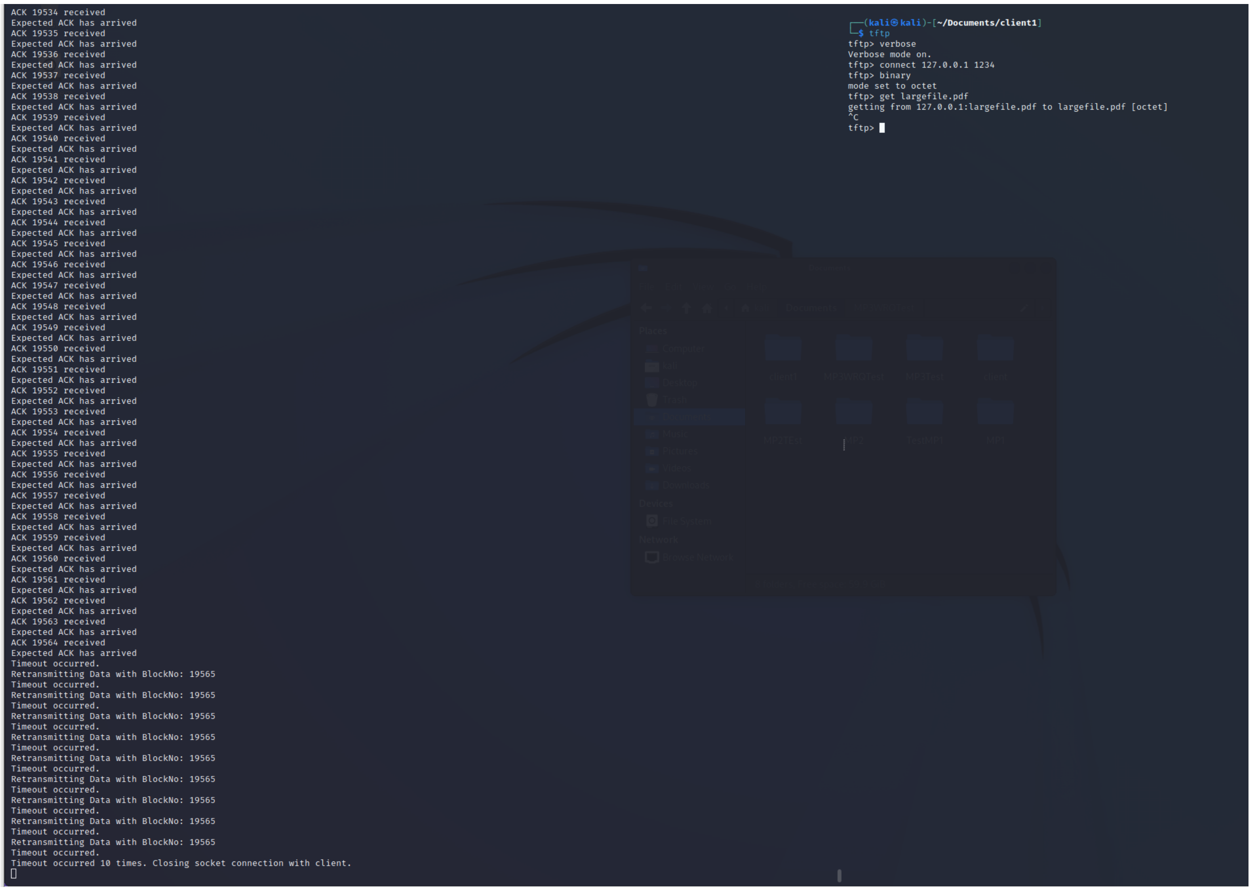
```
┌──(kali㉿kali)-[~/Documents/MP3WRQTest]
└─$ ./Server 127.0.0.1 1234
SERVER: Ready for association with clients ...
RRQ received, filename: test3.txt mode: netascii
1: Result is 274
Sent first block successfully.
ACK 1 received
Expected ACK has arrived
SERVER: Full file is sent and connection is closed.
RRQ received, filename: test2 mode: octet
1: Result is 512
Sent first block successfully.
ACK 1 received
Expected ACK has arrived
ACK 2 received
Expected ACK has arrived
ACK 3 received
Expected ACK has arrived
ACK 4 received
Expected ACK has arrived
SERVER: Full file is sent and connection is closed.
RRQ received, filename: test2 mode: octet
1: Result is 512
Sent first block successfully.
ACK 1 received
Expected ACK has arrived
ACK 2 received
Expected ACK has arrived
ACK 3 received
Expected ACK has arrived
ACK 4 received
Expected ACK has arrived
SERVER: Full file is sent and connection is closed.
```

```
┌──(kali㉿kali)-[~/Documents/client1]
└─$ tftp
tftp> verbose
Verbose mode on.
tftp> connect 127.0.0.1 1234
tftp> ascii
mode set to netascii
tftp> get test3.txt
getting from 127.0.0.1:test3.txt to test3.txt [netascii]
Received 274 bytes in 0.0 seconds [inf bits/sec]
tftp>
```

```
┌──(kali㉿kali)-[~/Documents/MP3WRQTest]
└─$ cd ..

┌──(kali㉿kali)-[~/Documents]
└─$ cd client1

┌──(kali㉿kali)-[~/Documents/client1]
└─$ tftp
tftp> verbose
Verbose mode on.
tftp> connect 127.0.0.1 1234
tftp> binary
mode set to octet
tftp> get test2
getting from 127.0.0.1:test2 to test2 [octet]
Received 2047 bytes in 0.1 seconds [163760 bits/sec]
tftp>
```

```
┌──(kali㉿kali)-[~/Documents]
└─$ cd client1

┌──(kali㉿kali)-[~/Documents/client1]
└─$ tftp
tftp> verbose
Verbose mode on.
tftp> connect 127.0.0.1 1234
tftp> binary
mode set to octet
tftp> get test2
getting from 127.0.0.1:test2 to test2 [octet]
Received 2047 bytes in 0.0 seconds [inf bits/sec]
tftp>
```

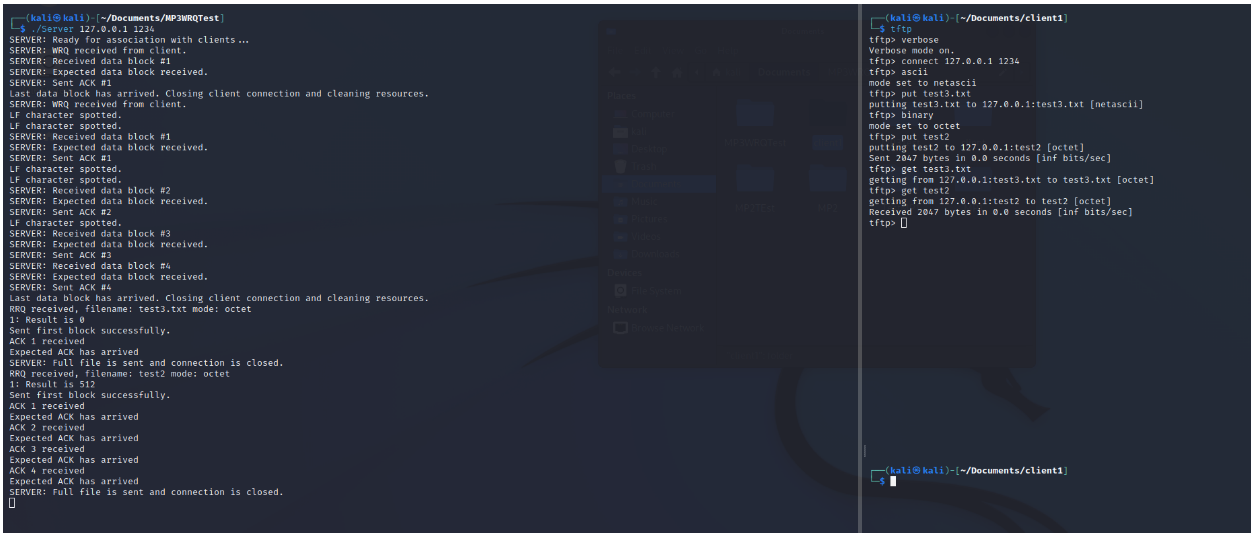
Test case 7: Terminate the TFTP client in the middle of a transfer and see if your TFTP server recognizes after 10 timeouts that the client is no longer there



```
ACK 19534 received
Expected ACK has arrived
ACK 19535 received
Expected ACK has arrived
ACK 19536 received
Expected ACK has arrived
ACK 19537 received
Expected ACK has arrived
ACK 19538 received
Expected ACK has arrived
ACK 19539 received
Expected ACK has arrived
ACK 19540 received
Expected ACK has arrived
ACK 19541 received
Expected ACK has arrived
ACK 19542 received
Expected ACK has arrived
ACK 19543 received
Expected ACK has arrived
ACK 19544 received
Expected ACK has arrived
ACK 19545 received
Expected ACK has arrived
ACK 19546 received
Expected ACK has arrived
ACK 19547 received
Expected ACK has arrived
ACK 19548 received
Expected ACK has arrived
ACK 19549 received
Expected ACK has arrived
ACK 19550 received
Expected ACK has arrived
ACK 19551 received
Expected ACK has arrived
ACK 19552 received
Expected ACK has arrived
ACK 19553 received
Expected ACK has arrived
ACK 19554 received
Expected ACK has arrived
ACK 19555 received
Expected ACK has arrived
ACK 19556 received
Expected ACK has arrived
ACK 19557 received
Expected ACK has arrived
ACK 19558 received
Expected ACK has arrived
ACK 19559 received
Expected ACK has arrived
ACK 19560 received
Expected ACK has arrived
ACK 19561 received
Expected ACK has arrived
ACK 19562 received
Expected ACK has arrived
ACK 19563 received
Expected ACK has arrived
ACK 19564 received
Expected ACK has arrived
Timeout occurred.
Retransmitting Data with BlockNo: 19565
Timeout occurred.
Retransmitting Data with BlockNo: 19565
Timeout occurred.
Retransmitting Data with BlockNo: 19565
Timeout occurred.
Retransmitting Data with BlockNo: 19565
Timeout occurred.
Retransmitting Data with BlockNo: 19565
Timeout occurred.
Retransmitting Data with BlockNo: 19565
Timeout occurred.
Retransmitting Data with BlockNo: 19565
Timeout occurred.
Retransmitting Data with BlockNo: 19565
Timeout occurred.
Retransmitting Data with BlockNo: 19565
Timeout occurred.
Timeout occurred 10 times. Closing socket connection with client.
```

```
┌──(kali㉿kali)-[~/Documents/client1]
└─$ tftp
tftp> verbose
Verbose mode on.
tftp> connect 127.0.0.1 1234
tftp> binary
mode set to octet
tftp> get largefile.pdf
getting from 127.0.0.1:largefile.pdf to largefile.pdf [octet]
^C
tftp>
```

Bonus: WRQ from server to client



```
┌──(kali㉿kali)-[~/Documents/MP3WRQTest]
└─$ ./Server 127.0.0.1 1234
SERVER: Ready for association with clients...
SERVER: WRQ received from client.
SERVER: Received data block #1
SERVER: Expected data block received.
SERVER: Sent ACK #1
Last data block has arrived. Closing client connection and cleaning resources.
SERVER: WRQ received from client.
LF character spotted.
LF character spotted.
SERVER: Received data block #1
SERVER: Expected data block received.
SERVER: Sent ACK #1
LF character spotted.
LF character spotted.
SERVER: Received data block #2
SERVER: Expected data block received.
SERVER: Sent ACK #2
LF character spotted.
SERVER: Received data block #3
SERVER: Expected data block received.
SERVER: Sent ACK #3
SERVER: Received data block #4
SERVER: Expected data block received.
SERVER: Sent ACK #4
Last data block has arrived. Closing client connection and cleaning resources.
RRQ received, filename: test3.txt mode: octet
1: Result is 0
Sent first block successfully.
ACK 1 received
Expected ACK has arrived
SERVER: Full file is sent and connection is closed.
RRQ received, filename: test2 mode: octet
1: Result is 512
Sent first block successfully.
ACK 1 received
Expected ACK has arrived
ACK 2 received
Expected ACK has arrived
ACK 3 received
Expected ACK has arrived
ACK 4 received
Expected ACK has arrived
SERVER: Full file is sent and connection is closed.
```

```
┌──(kali㉿kali)-[~/Documents/client1]
└─$ tftp
tftp> verbose
Verbose mode on.
tftp> connect 127.0.0.1 1234
tftp> ascii
mode set to netascii
tftp> put test3.txt
putting test3.txt to 127.0.0.1:test3.txt [netascii]
tftp> binary
mode set to octet
tftp> put test2
putting test2 to 127.0.0.1:test2 [octet]
Sent 2047 bytes in 0.0 seconds [inf bits/sec]
tftp> get test3.txt
getting from 127.0.0.1:test3.txt to test3.txt [octet]
tftp> get test2
getting from 127.0.0.1:test2 to test2 [octet]
Received 2047 bytes in 0.0 seconds [inf bits/sec]
tftp>
```

```
┌──(kali㉿kali)-[~/Documents/client1]
└─$
```