Requirements:

Lib aenum:

- https://pypi.python.org/pypi/aenum
- http://stackoverflow.com/questions/36932/how-can-i-represent-an-enum-in-python

Peut s'installer avec la commande suivante:

```
pip install aenum
```

Utilisation

Le client se lance de la manière suivante:

```
python src/client.py -get/-put host port filename
```

Le serveur se lance de la manière suivante:

```
python src/server.py -p port -d repertoireAUtiliser
```

Sortie

Exemple de sortie en lançant le serveur d'abord, puis en effectuant deux requêtes client d'affilée.

Serveur:

```
$ sudo python src/server.py -p 69 -d serverFiles/
Nb packets lost: 1. Efficienty: 0.999935
Nb packets lost: 0. Efficienty: 1.000000
```

Client:

```
$ python src/client.py -put localhost 69 test7777k
Nb packets lost: 0. Efficienty: 1.000000
$ python src/client.py -get localhost 69 test7777k
Nb packets lost: 1. Efficienty: 0.999935
```

Test du client / serveur

Déroulement du test

Afin de tester les programmes, un sript **test.sh** est lancé avec la commande:

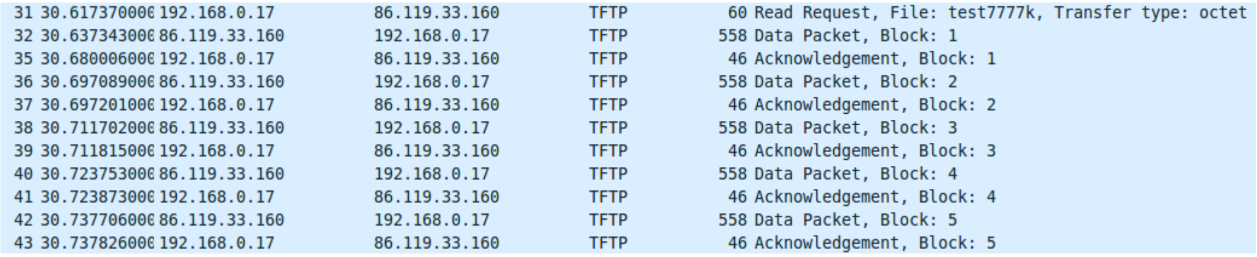
```
bash test.sh
```

Le port par défaut est 8888 afin de pouvoir lancer le script sans les droits admin. Les captures suivantes ont été effectuées avec le port 69, en droit admin.

Le script effectue la chose suivante:

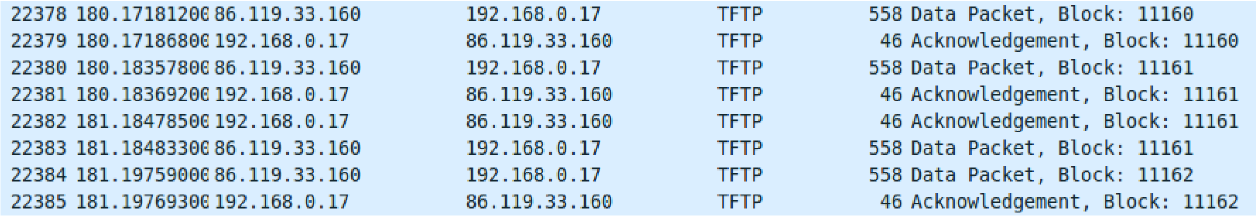
1. Téléchargement du fichier test7777k auprès de hepia.infolibre.ch avec client.py.

   Début du téléchargement



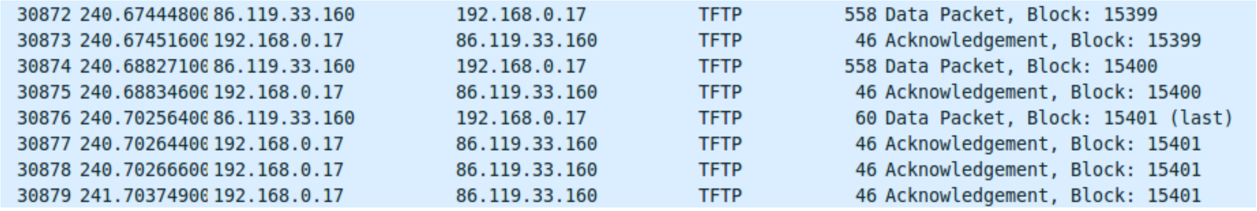
```
31 30.617370000 192.168.0.17     86.119.33.160    TFTP    60 Read Request, File: test7777k, Transfer type: octet
32 30.637343000 86.119.33.160    192.168.0.17     TFTP   558 Data Packet, Block: 1
35 30.680006000 192.168.0.17     86.119.33.160    TFTP    46 Acknowledgement, Block: 1
36 30.697089000 86.119.33.160    192.168.0.17     TFTP   558 Data Packet, Block: 2
37 30.697201000 192.168.0.17     86.119.33.160    TFTP    46 Acknowledgement, Block: 2
38 30.711702000 86.119.33.160    192.168.0.17     TFTP   558 Data Packet, Block: 3
39 30.711815000 192.168.0.17     86.119.33.160    TFTP    46 Acknowledgement, Block: 3
40 30.723753000 86.119.33.160    192.168.0.17     TFTP   558 Data Packet, Block: 4
41 30.723873000 192.168.0.17     86.119.33.160    TFTP    46 Acknowledgement, Block: 4
42 30.737706000 86.119.33.160    192.168.0.17     TFTP   558 Data Packet, Block: 5
43 30.737826000 192.168.0.17     86.119.33.160    TFTP    46 Acknowledgement, Block: 5
```

   Le téléchargement d'un grand fichier permet de vérifier la gestion des éventuelles pertes de packets.



```
22378 180.17181200 86.119.33.160    192.168.0.17     TFTP   558 Data Packet, Block: 11160
22379 180.17186800 192.168.0.17     86.119.33.160    TFTP    46 Acknowledgement, Block: 11160
22380 180.18357800 86.119.33.160    192.168.0.17     TFTP   558 Data Packet, Block: 11161
22381 180.18369200 192.168.0.17     86.119.33.160    TFTP    46 Acknowledgement, Block: 11161
22382 181.18478500 192.168.0.17     86.119.33.160    TFTP    46 Acknowledgement, Block: 11161
22383 181.18483300 86.119.33.160    192.168.0.17     TFTP   558 Data Packet, Block: 11161
22384 181.19759000 86.119.33.160    192.168.0.17     TFTP   558 Data Packet, Block: 11162
22385 181.19769300 192.168.0.17     86.119.33.160    TFTP    46 Acknowledgement, Block: 11162
```

   Fin du téléchargement

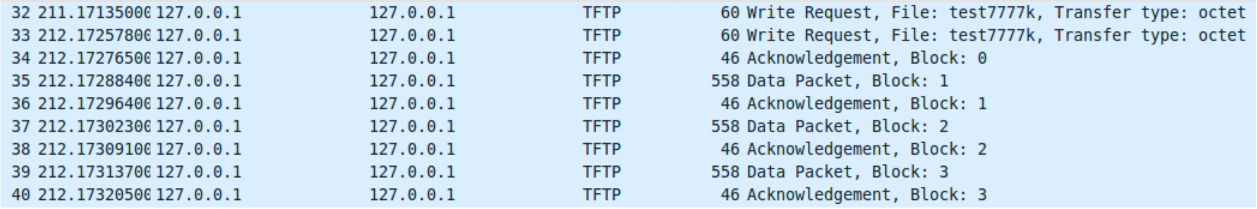


```
30872 240.67444800 86.119.33.160    192.168.0.17     TFTP   558 Data Packet, Block: 15399
30873 240.67451600 192.168.0.17     86.119.33.160    TFTP    46 Acknowledgement, Block: 15399
30874 240.68827100 86.119.33.160    192.168.0.17     TFTP   558 Data Packet, Block: 15400
30875 240.68834600 192.168.0.17     86.119.33.160    TFTP    46 Acknowledgement, Block: 15400
30876 240.70256400 86.119.33.160    192.168.0.17     TFTP    60 Data Packet, Block: 15401 (last)
30877 240.70264400 192.168.0.17     86.119.33.160    TFTP    46 Acknowledgement, Block: 15401
30878 240.70266600 192.168.0.17     86.119.33.160    TFTP    46 Acknowledgement, Block: 15401
30879 241.70374900 192.168.0.17     86.119.33.160    TFTP    46 Acknowledgement, Block: 15401
```

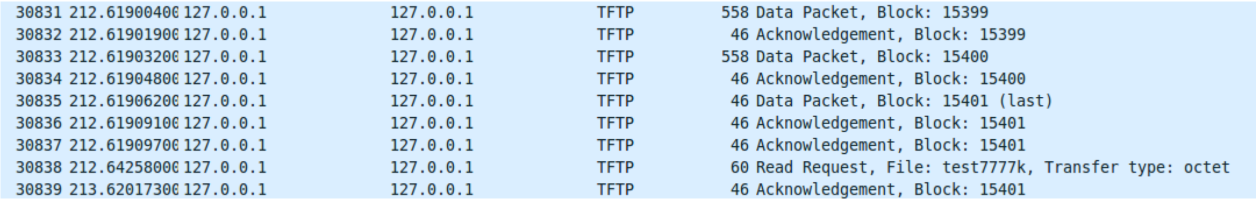
2. Vérification checksum du fichier downloadé. Il doit correspondre à a60814a887e267e2412c268c549be5c0

3. Lancement du serveur local

4. Upload du fichier 7777k vers le serveur local.



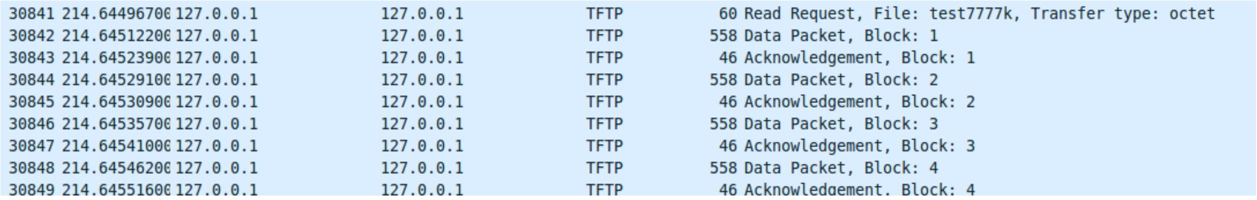
```
32 211.17135000 127.0.0.1        127.0.0.1        TFTP    60 Write Request, File: test7777k, Transfer type: octet
33 212.17257800 127.0.0.1        127.0.0.1        TFTP    60 Write Request, File: test7777k, Transfer type: octet
34 212.17276500 127.0.0.1        127.0.0.1        TFTP    46 Acknowledgement, Block: 0
35 212.17288400 127.0.0.1        127.0.0.1        TFTP   558 Data Packet, Block: 1
36 212.17296400 127.0.0.1        127.0.0.1        TFTP    46 Acknowledgement, Block: 1
37 212.17302300 127.0.0.1        127.0.0.1        TFTP   558 Data Packet, Block: 2
38 212.17309100 127.0.0.1        127.0.0.1        TFTP    46 Acknowledgement, Block: 2
39 212.17313700 127.0.0.1        127.0.0.1        TFTP   558 Data Packet, Block: 3
40 212.17320500 127.0.0.1        127.0.0.1        TFTP    46 Acknowledgement, Block: 3
```



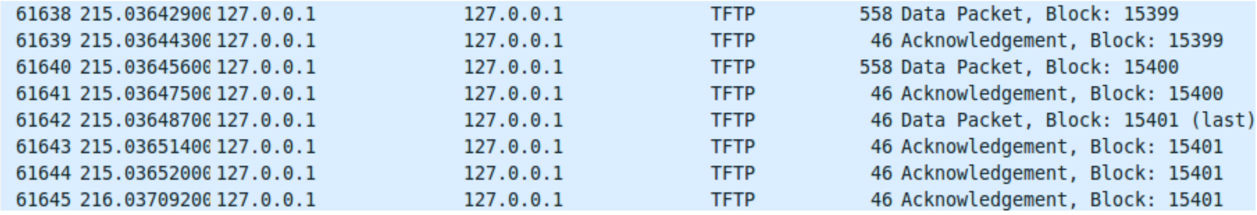
```
30831 212.61900400 127.0.0.1        127.0.0.1        TFTP   558 Data Packet, Block: 15399
30832 212.61901900 127.0.0.1        127.0.0.1        TFTP    46 Acknowledgement, Block: 15399
30833 212.61903200 127.0.0.1        127.0.0.1        TFTP   558 Data Packet, Block: 15400
30834 212.61904800 127.0.0.1        127.0.0.1        TFTP    46 Acknowledgement, Block: 15400
30835 212.61906200 127.0.0.1        127.0.0.1        TFTP    46 Data Packet, Block: 15401 (last)
30836 212.61909100 127.0.0.1        127.0.0.1        TFTP    46 Acknowledgement, Block: 15401
30837 212.61909700 127.0.0.1        127.0.0.1        TFTP    46 Acknowledgement, Block: 15401
30838 212.64258000 127.0.0.1        127.0.0.1        TFTP    60 Read Request, File: test7777k, Transfer type: octet
30839 213.62017300 127.0.0.1        127.0.0.1        TFTP    46 Acknowledgement, Block: 15401
```

5. Suppression du fichier 7777k récupéré auprès de hepia.infolibre *(pour être sûr de faire ensuite le checksum du bon fichier)*

6. Téléchargement du fichier 7777k depuis le serveur local



```
30841 214.64496700 127.0.0.1         127.0.0.1         TFTP       60 Read Request, File: test7777k, Transfer type: octet
30842 214.64512200 127.0.0.1         127.0.0.1         TFTP      558 Data Packet, Block: 1
30843 214.64523900 127.0.0.1         127.0.0.1         TFTP       46 Acknowledgement, Block: 1
30844 214.64529100 127.0.0.1         127.0.0.1         TFTP      558 Data Packet, Block: 2
30845 214.64530900 127.0.0.1         127.0.0.1         TFTP       46 Acknowledgement, Block: 2
30846 214.64535700 127.0.0.1         127.0.0.1         TFTP      558 Data Packet, Block: 3
30847 214.64541000 127.0.0.1         127.0.0.1         TFTP       46 Acknowledgement, Block: 3
30848 214.64546200 127.0.0.1         127.0.0.1         TFTP      558 Data Packet, Block: 4
30849 214.64551600 127.0.0.1         127.0.0.1         TFTP       46 Acknowledgement, Block: 4
```



```
61638 215.03642900 127.0.0.1         127.0.0.1         TFTP      558 Data Packet, Block: 15399
61639 215.03644300 127.0.0.1         127.0.0.1         TFTP       46 Acknowledgement, Block: 15399
61640 215.03645600 127.0.0.1         127.0.0.1         TFTP      558 Data Packet, Block: 15400
61641 215.03647500 127.0.0.1         127.0.0.1         TFTP       46 Acknowledgement, Block: 15400
61642 215.03648700 127.0.0.1         127.0.0.1         TFTP       46 Data Packet, Block: 15401 (last)
61643 215.03651400 127.0.0.1         127.0.0.1         TFTP       46 Acknowledgement, Block: 15401
61644 215.03652000 127.0.0.1         127.0.0.1         TFTP       46 Acknowledgement, Block: 15401
61645 216.03709200 127.0.0.1         127.0.0.1         TFTP       46 Acknowledgement, Block: 15401
```

7. Vérification du checksum du fichier downloadé depuis le serveur local. Il doit à nouveau correspondre à a60814a887e267e2412c268c549be5c0

Sortie:

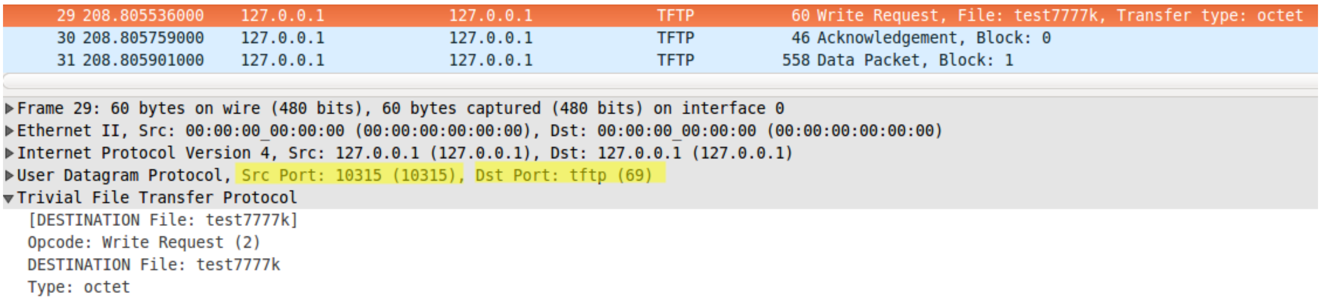
```
$ sudo ./test.sh
md5 sums should be:
a60814a887e267e2412c268c549be5c0
downloading test7777k from hepia.infolibre.ch... This will take 5 minutes
unexpected block num 11161
unexpected block num 11577
Nb packets lost: 3. Efficienty: 0.999805
downloading finished.
md5 sum after downloading from hepia.infolibre.ch:
a60814a887e267e2412c268c549be5c0  test7777k
starting server
server started. PID : 4143
uploading file to local server...
Nb packets lost: 0. Efficienty: 1.000000
removing first downloaded file
downloading file from local server
Nb packets lost: 1. Efficienty: 0.999935
Nb packets lost: 0. Efficienty: 1.000000
Nb packets lost: 1. Efficienty: 0.999935
md5 sum after downloading from hepia.infolibre.ch:
a60814a887e267e2412c268c549be5c0  test7777k
stoping server
removing files
```

Vérification du changement de port

A travers wireshark surveillant l'interface locale, nous avons également vérifié que notre serveur notre client changent bien de port une fois la connexion initialisée:

Connexion avec PUT Request

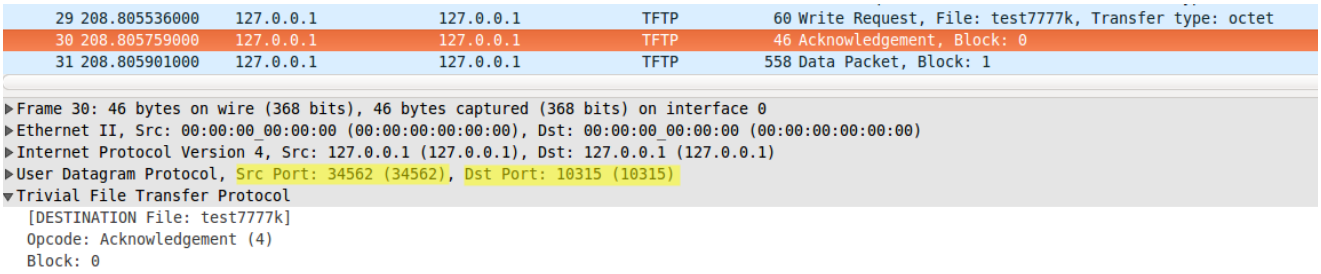
Le client envoie sur le port 69.



```
   29 208.805536000    127.0.0.1            127.0.0.1            TFTP          60 Write Request, File: test7777k, Transfer type: octet
   30 208.805759000    127.0.0.1            127.0.0.1            TFTP          46 Acknowledgement, Block: 0
   31 208.805901000    127.0.0.1            127.0.0.1            TFTP         558 Data Packet, Block: 1

▶Frame 29: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0
▶Ethernet II, Src: 00:00:00_00:00:00 (00:00:00:00:00:00), Dst: 00:00:00_00:00:00 (00:00:00:00:00:00)
▶Internet Protocol Version 4, Src: 127.0.0.1 (127.0.0.1), Dst: 127.0.0.1 (127.0.0.1)
▶User Datagram Protocol, Src Port: 10315 (10315), Dst Port: tftp (69)
▼Trivial File Transfer Protocol
   [DESTINATION File: test7777k]
   Opcode: Write Request (2)
   DESTINATION File: test7777k
   Type: octet
```

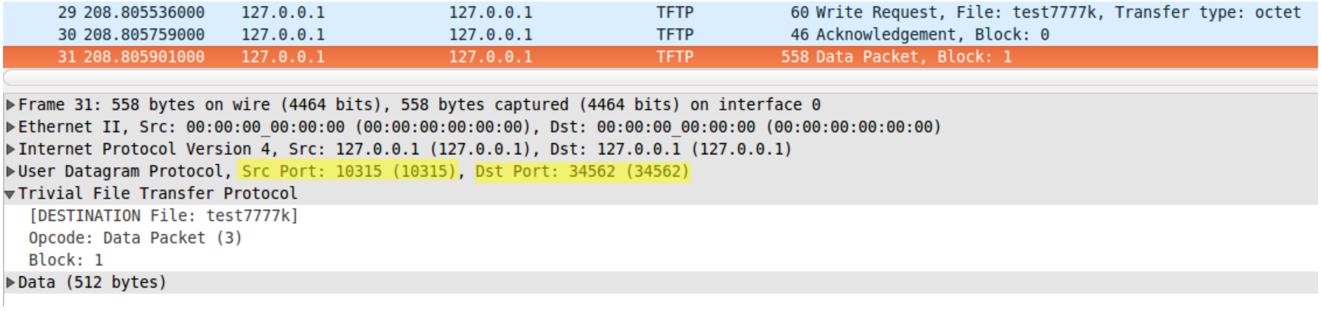
Le serveur répond en ayant changé de port



```
   29 208.805536000    127.0.0.1            127.0.0.1            TFTP          60 Write Request, File: test7777k, Transfer type: octet
   30 208.805759000    127.0.0.1            127.0.0.1            TFTP          46 Acknowledgement, Block: 0
   31 208.805901000    127.0.0.1            127.0.0.1            TFTP         558 Data Packet, Block: 1

▶Frame 30: 46 bytes on wire (368 bits), 46 bytes captured (368 bits) on interface 0
▶Ethernet II, Src: 00:00:00_00:00:00 (00:00:00:00:00:00), Dst: 00:00:00_00:00:00 (00:00:00:00:00:00)
▶Internet Protocol Version 4, Src: 127.0.0.1 (127.0.0.1), Dst: 127.0.0.1 (127.0.0.1)
▶User Datagram Protocol, Src Port: 34562 (34562), Dst Port: 10315 (10315)
▼Trivial File Transfer Protocol
   [DESTINATION File: test7777k]
   Opcode: Acknowledgement (4)
   Block: 0
```

Le client continue la connexion sur le nouveau port

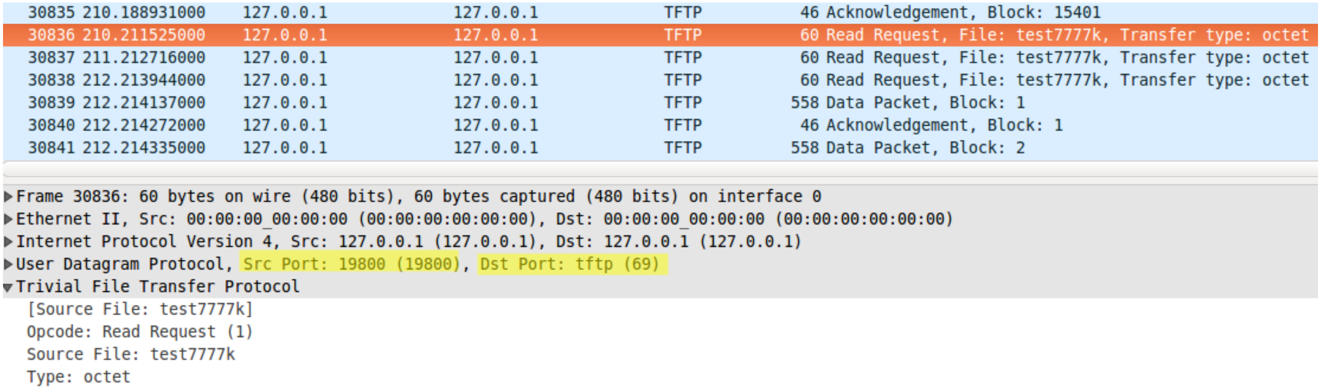


```
   29 208.805536000    127.0.0.1            127.0.0.1            TFTP          60 Write Request, File: test7777k, Transfer type: octet
   30 208.805759000    127.0.0.1            127.0.0.1            TFTP          46 Acknowledgement, Block: 0
   31 208.805901000    127.0.0.1            127.0.0.1            TFTP         558 Data Packet, Block: 1

▶Frame 31: 558 bytes on wire (4464 bits), 558 bytes captured (4464 bits) on interface 0
▶Ethernet II, Src: 00:00:00_00:00:00 (00:00:00:00:00:00), Dst: 00:00:00_00:00:00 (00:00:00:00:00:00)
▶Internet Protocol Version 4, Src: 127.0.0.1 (127.0.0.1), Dst: 127.0.0.1 (127.0.0.1)
▶User Datagram Protocol, Src Port: 10315 (10315), Dst Port: 34562 (34562)
▼Trivial File Transfer Protocol
   [DESTINATION File: test7777k]
   Opcode: Data Packet (3)
   Block: 1
▶Data (512 bytes)
```

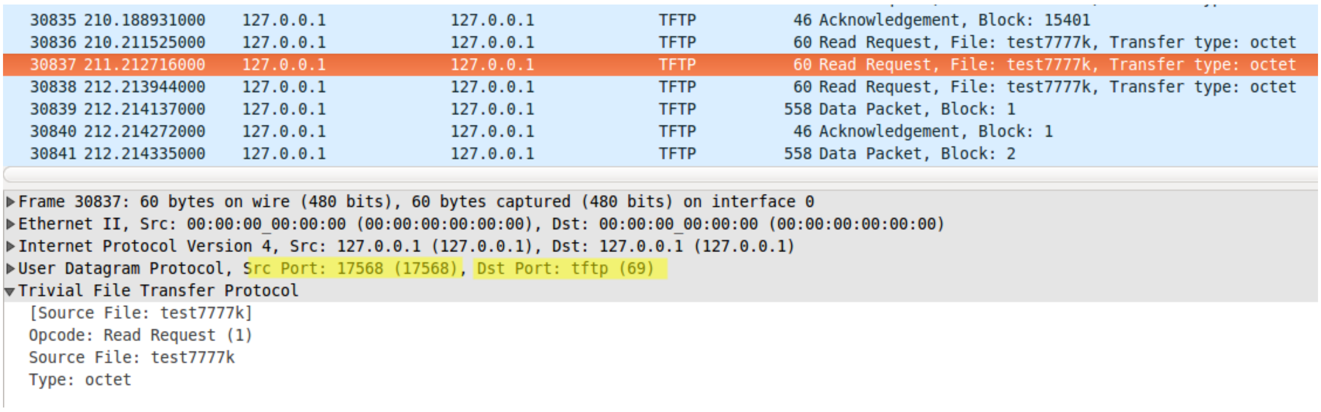
Multiples GET request

Lorsque le serveur met un peu de temps à répondre, on peut confirmer que le client tente une requête avec un nouveau port à chaque tentative:



```
 30835 210.188931000    127.0.0.1            127.0.0.1            TFTP          46 Acknowledgement, Block: 15401
 30836 210.211525000    127.0.0.1            127.0.0.1            TFTP          60 Read Request, File: test7777k, Transfer type: octet
 30837 211.212716000    127.0.0.1            127.0.0.1            TFTP          60 Read Request, File: test7777k, Transfer type: octet
 30838 212.213944000    127.0.0.1            127.0.0.1            TFTP          60 Read Request, File: test7777k, Transfer type: octet
 30839 212.214137000    127.0.0.1            127.0.0.1            TFTP         558 Data Packet, Block: 1
 30840 212.214272000    127.0.0.1            127.0.0.1            TFTP          46 Acknowledgement, Block: 1
 30841 212.214335000    127.0.0.1            127.0.0.1            TFTP         558 Data Packet, Block: 2

▶Frame 30836: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0
▶Ethernet II, Src: 00:00:00_00:00:00 (00:00:00:00:00:00), Dst: 00:00:00_00:00:00 (00:00:00:00:00:00)
▶Internet Protocol Version 4, Src: 127.0.0.1 (127.0.0.1), Dst: 127.0.0.1 (127.0.0.1)
▶User Datagram Protocol, Src Port: 19800 (19800), Dst Port: tftp (69)
▼Trivial File Transfer Protocol
   [Source File: test7777k]
   Opcode: Read Request (1)
   Source File: test7777k
   Type: octet
```

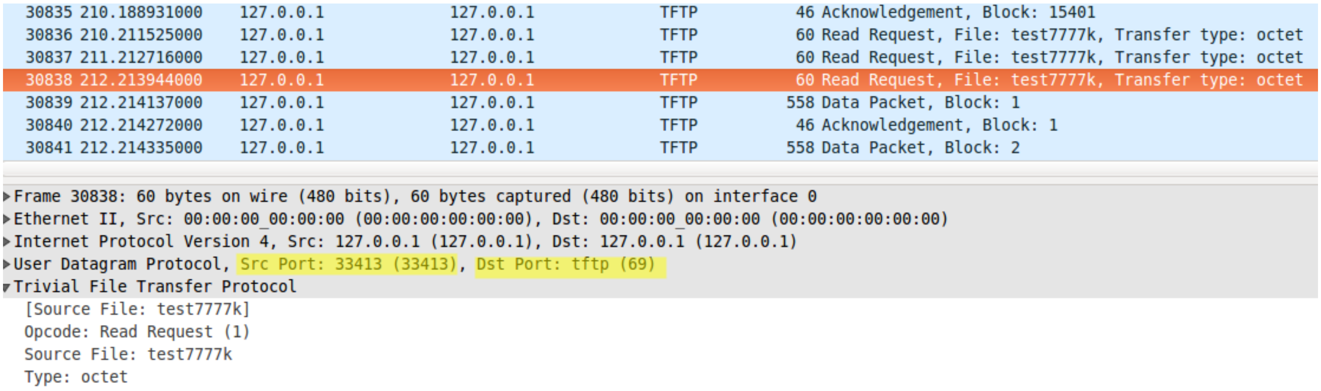


```
30835 210.188931000    127.0.0.1           127.0.0.1           TFTP          46 Acknowledgement, Block: 15401
30836 210.211525000    127.0.0.1           127.0.0.1           TFTP          60 Read Request, File: test7777k, Transfer type: octet
30837 211.212716000    127.0.0.1           127.0.0.1           TFTP          60 Read Request, File: test7777k, Transfer type: octet
30838 212.213944000    127.0.0.1           127.0.0.1           TFTP          60 Read Request, File: test7777k, Transfer type: octet
30839 212.214137000    127.0.0.1           127.0.0.1           TFTP         558 Data Packet, Block: 1
30840 212.214272000    127.0.0.1           127.0.0.1           TFTP          46 Acknowledgement, Block: 1
30841 212.214335000    127.0.0.1           127.0.0.1           TFTP         558 Data Packet, Block: 2

▶Frame 30837: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0
▶Ethernet II, Src: 00:00:00_00:00:00 (00:00:00:00:00:00), Dst: 00:00:00_00:00:00 (00:00:00:00:00:00)
▶Internet Protocol Version 4, Src: 127.0.0.1 (127.0.0.1), Dst: 127.0.0.1 (127.0.0.1)
▶User Datagram Protocol, Src Port: 17568 (17568), Dst Port: tftp (69)
▼Trivial File Transfer Protocol
   [Source File: test7777k]
   Opcode: Read Request (1)
   Source File: test7777k
   Type: octet
```

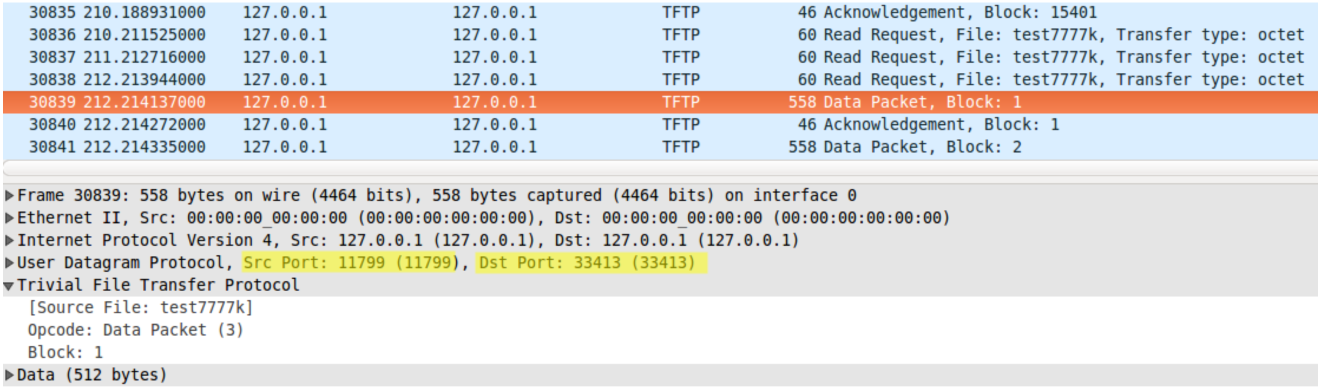
Connexion avec GET request

Enfin, nous vérifions que le changement de port se fasse correctement avec les Get Request.



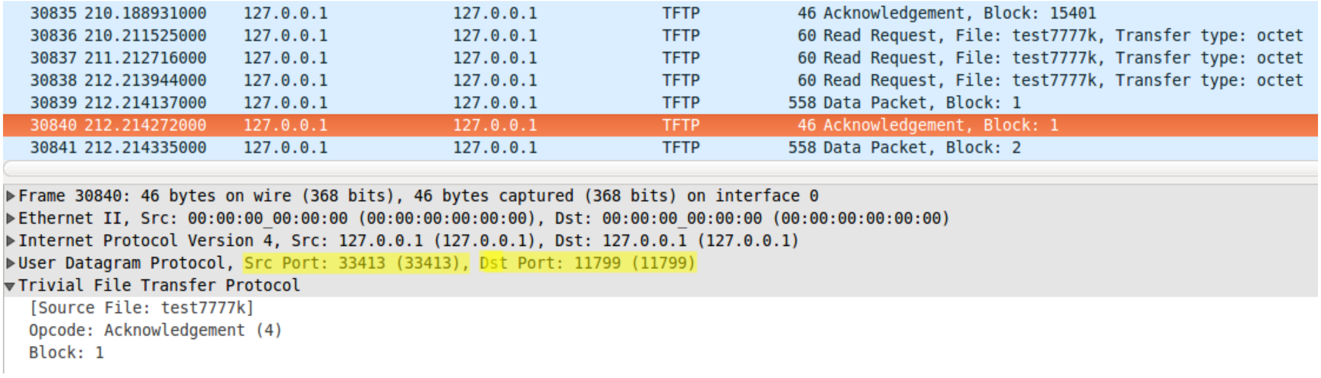
```
30835 210.188931000    127.0.0.1           127.0.0.1           TFTP          46 Acknowledgement, Block: 15401
30836 210.211525000    127.0.0.1           127.0.0.1           TFTP          60 Read Request, File: test7777k, Transfer type: octet
30837 211.212716000    127.0.0.1           127.0.0.1           TFTP          60 Read Request, File: test7777k, Transfer type: octet
30838 212.213944000    127.0.0.1           127.0.0.1           TFTP          60 Read Request, File: test7777k, Transfer type: octet
30839 212.214137000    127.0.0.1           127.0.0.1           TFTP         558 Data Packet, Block: 1
30840 212.214272000    127.0.0.1           127.0.0.1           TFTP          46 Acknowledgement, Block: 1
30841 212.214335000    127.0.0.1           127.0.0.1           TFTP         558 Data Packet, Block: 2

▶Frame 30838: 60 bytes on wire (480 bits), 60 bytes captured (480 bits) on interface 0
▶Ethernet II, Src: 00:00:00_00:00:00 (00:00:00:00:00:00), Dst: 00:00:00_00:00:00 (00:00:00:00:00:00)
▶Internet Protocol Version 4, Src: 127.0.0.1 (127.0.0.1), Dst: 127.0.0.1 (127.0.0.1)
▶User Datagram Protocol, Src Port: 33413 (33413), Dst Port: tftp (69)
▼Trivial File Transfer Protocol
   [Source File: test7777k]
   Opcode: Read Request (1)
   Source File: test7777k
   Type: octet
```



```
30835 210.188931000    127.0.0.1           127.0.0.1           TFTP          46 Acknowledgement, Block: 15401
30836 210.211525000    127.0.0.1           127.0.0.1           TFTP          60 Read Request, File: test7777k, Transfer type: octet
30837 211.212716000    127.0.0.1           127.0.0.1           TFTP          60 Read Request, File: test7777k, Transfer type: octet
30838 212.213944000    127.0.0.1           127.0.0.1           TFTP          60 Read Request, File: test7777k, Transfer type: octet
30839 212.214137000    127.0.0.1           127.0.0.1           TFTP         558 Data Packet, Block: 1
30840 212.214272000    127.0.0.1           127.0.0.1           TFTP          46 Acknowledgement, Block: 1
30841 212.214335000    127.0.0.1           127.0.0.1           TFTP         558 Data Packet, Block: 2

▶Frame 30839: 558 bytes on wire (4464 bits), 558 bytes captured (4464 bits) on interface 0
▶Ethernet II, Src: 00:00:00_00:00:00 (00:00:00:00:00:00), Dst: 00:00:00_00:00:00 (00:00:00:00:00:00)
▶Internet Protocol Version 4, Src: 127.0.0.1 (127.0.0.1), Dst: 127.0.0.1 (127.0.0.1)
▶User Datagram Protocol, Src Port: 11799 (11799), Dst Port: 33413 (33413)
▼Trivial File Transfer Protocol
   [Source File: test7777k]
   Opcode: Data Packet (3)
   Block: 1
▶Data (512 bytes)
```



```
30835 210.188931000    127.0.0.1           127.0.0.1           TFTP          46 Acknowledgement, Block: 15401
30836 210.211525000    127.0.0.1           127.0.0.1           TFTP          60 Read Request, File: test7777k, Transfer type: octet
30837 211.212716000    127.0.0.1           127.0.0.1           TFTP          60 Read Request, File: test7777k, Transfer type: octet
30838 212.213944000    127.0.0.1           127.0.0.1           TFTP          60 Read Request, File: test7777k, Transfer type: octet
30839 212.214137000    127.0.0.1           127.0.0.1           TFTP         558 Data Packet, Block: 1
30840 212.214272000    127.0.0.1           127.0.0.1           TFTP          46 Acknowledgement, Block: 1
30841 212.214335000    127.0.0.1           127.0.0.1           TFTP         558 Data Packet, Block: 2

▶Frame 30840: 46 bytes on wire (368 bits), 46 bytes captured (368 bits) on interface 0
▶Ethernet II, Src: 00:00:00_00:00:00 (00:00:00:00:00:00), Dst: 00:00:00_00:00:00 (00:00:00:00:00:00)
▶Internet Protocol Version 4, Src: 127.0.0.1 (127.0.0.1), Dst: 127.0.0.1 (127.0.0.1)
▶User Datagram Protocol, Src Port: 33413 (33413), Dst Port: 11799 (11799)
▼Trivial File Transfer Protocol
   [Source File: test7777k]
   Opcode: Acknowledgement (4)
   Block: 1
```