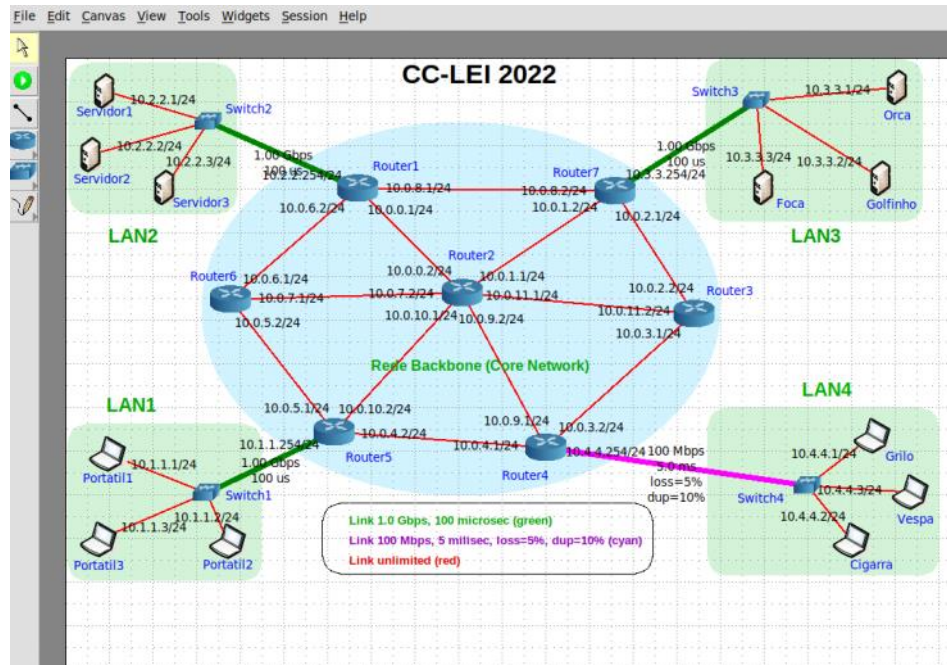


# CC - TP1

18 de setembro de 2023 11:24

CC - Topo - 2023.imm



São três os objetivos fundamentais:

- testar a conectividade e analisar as características gerais dos *links* (ligações com diferentes larguras de banda e diferentes atrasos) utilizando o comando "ping" e/ou "traceroute";
- depois transferir os ficheiros file1 e/ou file2 que colocámos na pasta /srv/ftp (partilhada em todos os nós da topologia), inicialmente para o cliente Portatil1, capturando a transferência com o *wireshark* no router Router1;
- comparar os tempos de transferência do ficheiro file2 para o cliente Portatil1 e para o cliente PC1.

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

No.	Time	Source	Destination	Protocol	Length	Info
200	271.251341605	10.1.1.1	10.4.4.1	ICMP	98	Echo (ping) request
201	271.251630252	10.4.4.1	10.1.1.1	ICMP	98	Echo (ping) reply
202	272.142488290	10.4.4.254	224.0.0.5	OSPF	78	Hello Packet
203	272.266057174	10.1.1.1	10.4.4.1	ICMP	98	Echo (ping) request
204	272.266534970	10.4.4.1	10.1.1.1	ICMP	98	Echo (ping) reply
205	273.295621762	10.1.1.1	10.4.4.1	ICMP	98	Echo (ping) request
206	273.295768225	10.4.4.1	10.1.1.1	ICMP	98	Echo (ping) reply
207	274.143316551	10.4.4.254	224.0.0.5	OSPF	78	Hello Packet
208	274.313866758	10.1.1.1	10.4.4.1	ICMP	98	Echo (ping) request
209	274.314012189	10.4.4.1	10.1.1.1	ICMP	98	Echo (ping) reply
210	275.338261219	10.1.1.1	10.4.4.1	ICMP	98	Echo (ping) request
211	275.338472236	10.4.4.1	10.1.1.1	ICMP	98	Echo (ping) reply
212	276.143707284	10.4.4.254	224.0.0.5	OSPF	78	Hello Packet
213	276.362184138	10.1.1.1	10.4.4.1	ICMP	98	Echo (ping) request
214	276.362464419	10.4.4.1	10.1.1.1	ICMP	98	Echo (ping) reply
215	277.386574070	10.1.1.1	10.4.4.1	ICMP	98	Echo (ping) request
216	277.387072882	10.4.4.1	10.1.1.1	ICMP	98	Echo (ping) reply
217	277.860710308	fe80::200:ff:feaa:10	ff02::5	OSPF	90	Hello Packet
218	278.144170818	10.4.4.254	224.0.0.5	OSPF	78	Hello Packet
219	279.401969057	fe80::1c0f:54ff:fe4...	ff02::2	ICMPv6	70	Router Solicitation from
220	280.144352060	10.4.4.254	224.0.0.5	OSPF	78	Hello Packet
221	282.145376480	10.4.4.254	224.0.0.5	OSPF	78	Hello Packet
222	284.145966673	10.4.4.254	224.0.0.5	OSPF	78	Hello Packet

Portatil 1

vcmd

```

64 bytes from 10.4.4.1: icmp_seq=2 ttl=61 time=0.480 ms
64 bytes from 10.4.4.1: icmp_seq=3 ttl=61 time=0.435 ms
64 bytes from 10.4.4.1: icmp_seq=4 ttl=61 time=0.365 ms
64 bytes from 10.4.4.1: icmp_seq=5 ttl=61 time=0.883 ms
64 bytes from 10.4.4.1: icmp_seq=6 ttl=61 time=0.847 ms
64 bytes from 10.4.4.1: icmp_seq=7 ttl=61 time=0.474 ms
64 bytes from 10.4.4.1: icmp_seq=8 ttl=61 time=0.539 ms
64 bytes from 10.4.4.1: icmp_seq=9 ttl=61 time=0.445 ms
64 bytes from 10.4.4.1: icmp_seq=10 ttl=61 time=10.5 ms
64 bytes from 10.4.4.1: icmp_seq=11 ttl=61 time=1.26 ms
64 bytes from 10.4.4.1: icmp_seq=12 ttl=61 time=0.502 ms
64 bytes from 10.4.4.1: icmp_seq=13 ttl=61 time=0.945 ms
64 bytes from 10.4.4.1: icmp_seq=14 ttl=61 time=0.518 ms
64 bytes from 10.4.4.1: icmp_seq=15 ttl=61 time=0.789 ms
64 bytes from 10.4.4.1: icmp_seq=16 ttl=61 time=0.423 ms
64 bytes from 10.4.4.1: icmp_seq=17 ttl=61 time=0.382 ms
64 bytes from 10.4.4.1: icmp_seq=18 ttl=61 time=0.500 ms
64 bytes from 10.4.4.1: icmp_seq=19 ttl=61 time=0.794 ms
64 bytes from 10.4.4.1: icmp_seq=20 ttl=61 time=1.05 ms

--- 10.4.4.1 ping statistics ---
20 packets transmitted, 20 received, 0% packet loss, time 19390ms
rtt min/avg/max/mdev = 0.365/1.144/10.453/2.149 ms
root@Portatil1:/tmp/pycore.35365/Portatil1.conf# SS

```

Frame 1: 78 bytes on wire (624 bits), 78 bytes captured (624 bits) on interface 0  
 Ethernet II, Src: 00:00:00:aa:00:10 (00:00:00:aa:00:10), Dst: 01:00:5e:00:00:05  
 Internet Protocol Version 4, Src: 10.4.4.254, Dst: 224.0.0.5  
 Open Shortest Path First

0000 01 00 5e 00 00 05 00 00 00 aa 00 10 08 00  
 0010 00 40 2e a9 00 00 01 59 9a f5 0a 04 04 fe  
 0020 00 05 02 01 00 2c 0a 00 00 01 00 00 00 00  
 0030 00 00 00 00 00 00 00 00 00 00 ff ff ff 00  
 0040 02 01 00 00 00 06 0a 04 04 fe 00 00 00 00

PC 1

```

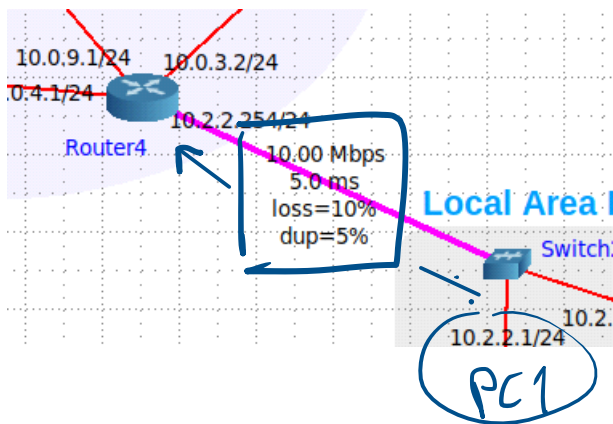
rtt min/avg/max/mdev = 5.373/12.056/22.048/6.517 ms
<.conf# ping -c 20 10.4.4.1 | tee file-ping-output-2
PING 10.4.4.1 (10.4.4.1) 56(84) bytes of data:
64 bytes from 10.4.4.1: icmp_seq=1 ttl=61 time=6.09 ms
64 bytes from 10.4.4.1: icmp_seq=2 ttl=61 time=7.79 ms
64 bytes from 10.4.4.1: icmp_seq=3 ttl=61 time=10.2 ms
64 bytes from 10.4.4.1: icmp_seq=4 ttl=61 time=16.1 ms
64 bytes from 10.4.4.1: icmp_seq=5 ttl=61 time=9.12 ms
64 bytes from 10.4.4.1: icmp_seq=6 ttl=61 time=9.62 ms
64 bytes from 10.4.4.1: icmp_seq=7 ttl=61 time=8.09 ms
64 bytes from 10.4.4.1: icmp_seq=8 ttl=61 time=13.8 ms
64 bytes from 10.4.4.1: icmp_seq=10 ttl=61 time=18.1 ms
64 bytes from 10.4.4.1: icmp_seq=12 ttl=61 time=23.8 ms
64 bytes from 10.4.4.1: icmp_seq=13 ttl=61 time=6.38 ms
64 bytes from 10.4.4.1: icmp_seq=16 ttl=61 time=26.3 ms
64 bytes from 10.4.4.1: icmp_seq=17 ttl=61 time=11.8 ms
64 bytes from 10.4.4.1: icmp_seq=18 ttl=61 time=13.9 ms
64 bytes from 10.4.4.1: icmp_seq=19 ttl=61 time=9.24 ms
64 bytes from 10.4.4.1: icmp_seq=20 ttl=61 time=5.89 ms
64 bytes from 10.4.4.1: icmp_seq=20 ttl=61 time=5.90 ms (DUP!)

--- 10.4.4.1 ping statistics ---
20 packets transmitted, 18 received, +1 duplicates, 20% packet loss, time 19115ms
rtt min/avg/max/mdev = 5.893/11.892/26.321/5.963 ms
root@PC1:/tmp/pycore.35365/PC1.conf#

```

1 duplicados  
 20% packet loss

20% packet loss



Link from Switch2 to Router4

unlimited >>

Symmetric link effects:

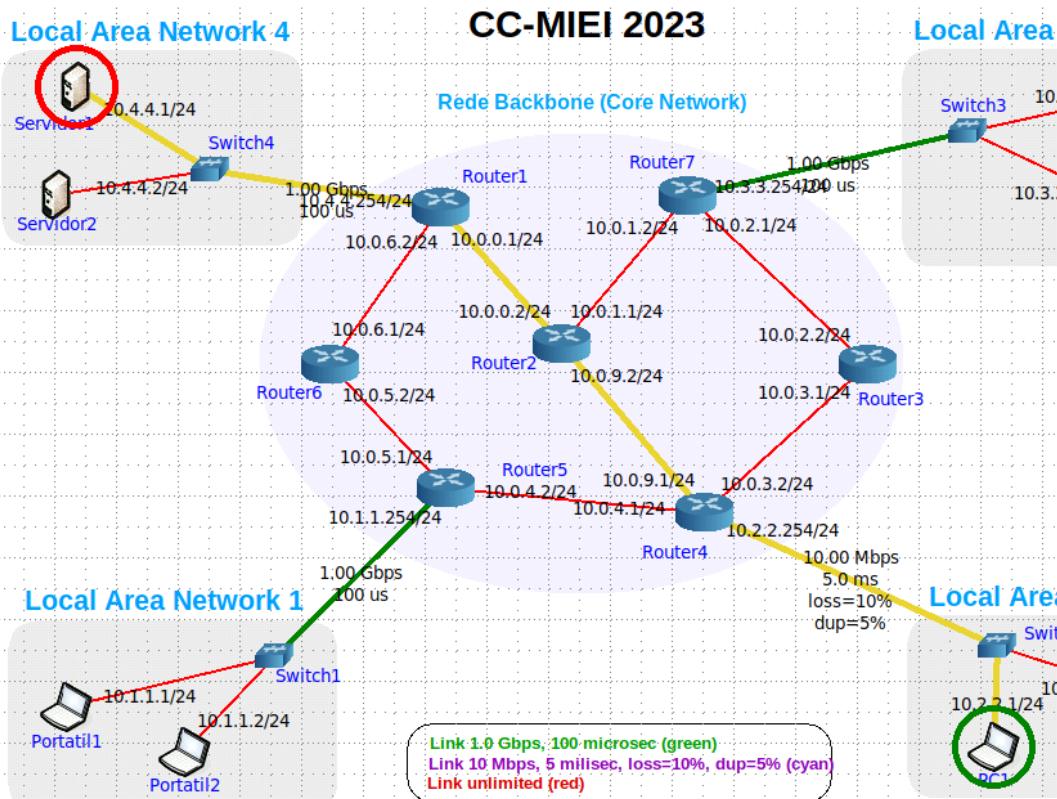
Bandwidth (bps): 10000000

Delay (us): 5000

Jitter (us):

Loss (%): 10

Duplicate (%): 5



```
root@Servidor1:/tmp/pycore.35365/Servidor1.conf# ps -ef | grep ssh
root      32      1  0 11:57 ?        00:00:00 sshd: /usr/sbin/sshd -f /etc
/ssh/sshd_config [listener] 0 of 10-100 startups
root      41      33  0 12:26 pts/2    00:00:00 grep --color=auto ssh
root@Servidor1:/tmp/pycore.35365/Servidor1.conf#
```

Problema  
SSH em  
instalação

## 1. SSH (Secure Shell):

- O SSH é o protocolo de rede seguro usado para estabelecer conexões criptografadas entre computadores em uma rede.
- O SSH é usado principalmente pelos clientes SSH para iniciar sessões seguras com servidores remotos.
- Quando você executa um comando SSH (por exemplo, `ssh username@hostname`), você está iniciando uma conexão SSH do cliente SSH para o servidor SSHD.

## 2. SSHD (Secure Shell Daemon):

- O SSHD, por outro lado, é o servidor SSH que fica em um sistema remoto e recebe conexões SSH entrantes.
- O SSHD é responsável por autenticar usuários, gerenciar sessões SSH, verificar permissões de acesso, registrar eventos de conexão e aplicar políticas de segurança no servidor remoto.
- Ele executa em segundo plano no servidor e fica esperando por conexões SSH.

```
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address   Foreign Address  State
tcp        0      0 0.0.0.0:22      0.0.0.0:*        LISTEN
tcp6       0      0 :::22          :::*             LISTEN
Active UNIX domain sockets (servers and established)
Proto RefCnt Flags   Type       State       I-Node     Path
```

Porta 22

SFTP, que significa "SSH File Transfer Protocol" (Protocolo de Transferência de Arquivos SSH), é um protocolo seguro usado para transferir arquivos e gerenciar sistemas de arquivos remotamente por meio de uma conexão SSH (Secure Shell). Ele fornece uma maneira segura e criptografada de transferir dados entre sistemas, tornando-o uma alternativa segura ao FTP (File Transfer Protocol) e ao FTPS (FTP Secure).

```
root@Portatil1:/tmp/pycore.35365/Portatil1.conf# rm /root/.ssh/known_hosts
rm: cannot remove '/root/.ssh/known_hosts': No such file or directory
root@Portatil1:/tmp/pycore.35365/Portatil1.conf#
```

• SFTP

```
root@Portatil1:/tmp/pycore.35365/Portatil1.conf# sftp core@10.4.4.1
The authenticity of host '10.4.4.1 (10.4.4.1)' can't be established.
RSA key fingerprint is SHA256:ppB0Ivrbq+h7uCOAxd16XIs1ER28MP0kDAxGj01jFhU.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '10.4.4.1' (RSA) to the list of known hosts.
core@10.4.4.1's password:
Connected to 10.4.4.1.
sftp> pwd
Remote working directory: /home/core
sftp> cd /srv/ftp
sftp> dir
file1  file2
sftp> get file1
Fetching /srv/ftp/file1 to file1
/srv/ftp/file1          100% 224 114,6KB/s   00:00
sftp> quit
root@Portatil1:/tmp/pycore.35365/Portatil1.conf#
```



Comandos	Observações
<pre>\$ sudo mkdir -p /srv/ftp</pre> <pre>\$ sudo usermod -d /srv/ftp ftp</pre> <pre>\$ sudo cp /etc/hosts /srv/ftp/file1</pre> <pre>\$ sudo cp /bin/ls /srv/ftp/file2</pre>	<p>O servidor FTP instala um novo utilizador no sistema com <i>username</i> "ftp" sem password para poder servir ficheiros da <i>home</i> desse utilizador de forma anónima a qualquer cliente FTP. A pasta a criar chama-se <i>"/srv/ftp"</i>. O comando <i>mkdir</i> criará a pasta se ela não existir (e todas as incluídas no path que forem necessárias – opção <i>"-p"</i>). O comando <i>usermod</i> faz dela a <i>"home"</i> do user <i>"ftp"</i>.</p> <p>Depois são copiados para lá dois ficheiros: o <i>"/etc/hosts"</i> que é um ficheiro de texto pequeno e que vai ser o <i>"file1"</i> e o ficheiro executável <i>"/bin/ls"</i> que será o ficheiro binário (executável) <i>"file2"</i>. Pode optar por colocar ou editar outros ficheiros nessa pasta. Tudo o que estiver lá ficará acessível.</p>

```
root@PC1:/tmp/pycore.41989/PC1.conf# rm /root/.ssh/known_hosts
root@PC1:/tmp/pycore.41989/PC1.conf# sftp core@10.4.4.1
The authenticity of host '10.4.4.1 (10.4.4.1)' can't be established.
RSA key fingerprint is SHA256:DgwWmfM0r0Vbq7ipET1xWYct0MDp+0uhVkdUcQzLpe0.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '10.4.4.1' (RSA) to the list of known hosts.
core@10.4.4.1's password:
Connected to 10.4.4.1.
sftp> pwd
Remote working directory: /home/core
sftp> cd /srv
sftp> cd /srv/ft
sftp> cd /srv/ftp/
sftp> dir
file1  file2
sftp> get file1
sftp> get file1
Fetching /srv/ftp/file1 to file1
/srv/ftp/file1                                100% 224    9.0KB/s    00:00
sftp> quit
root@PC1:/tmp/pycore.41989/PC1.conf#
```

114.6 KB/s      (VS)      9.0 KB/s

## • FTP (File Transfer Protocol)

```
root@Servidor1:/tmp/pycore.41989/Servidor1.conf# chmod a-w /srv/ftp
```

a → all

w → write

Remove permissão de escrita  
a todos os utilizadores na  
directoria */srv/ftp*

⇒ Ninguém pode escrever  
na pasta

anónimo

anonymous FTP

na pasta

configuração

anonymous FTP  
access is allowed

```
root@Servidor1:/tmp/pycore.41989/Servidor1.conf# chmod a-w /srv/ftp
root@Servidor1:/tmp/pycore.41989/Servidor1.conf# vsftpd /etc/vsftpd.conf -o secure_chroot_dir=/srv/ftp -o anonymous_enable=YES
```

VSFPD Server

Users  
restricted  
to that root

```
root@Servidor1:/tmp/pycore.41989/Servidor1.conf# bg
[1]+ vsftpd /etc/vsftpd.conf -o secure_chroot_dir=/srv/ftp -o anonymous_enable=YES &
root@Servidor1:/tmp/pycore.41989/Servidor1.conf#
```

Execução

em  
background

-o → configuration  
option

— Transformar o ficheiro a partir  
do Portátil 1

```
NAME
  vsftpd - Very Secure FTP Daemon

SYNOPSIS
  vsftpd [configuration file and / or options]

DESCRIPTION
  vsftpd is the Very Secure File Transfer Protocol Daemon. The server can
  be launched via a "super-server" such as inetd(8) or xinetd(8). Alterna-
  tively, vsftpd can be launched in standalone mode, in which case vsftpd
  itself will listen on the network. This latter mode is easier to use, and
  recommended. It is activated by setting listen=YES in /etc/vsftpd.conf.
  Direct execution of the vsftpd binary will then launch the FTP service
  ready for immediate client connections.

OPTIONS
  An optional configuration file or files may be given on the command line.
  These files must be owned as root if running as root. Any command line
  option not starting with a "-" character is treated as a config file that
  will be loaded. Note that config files are loaded in the strict order
  that they are encountered on the command line. If no config files are
```

```

root@Portatil1:/tmp/pycore.41989/Portatil1.conf# ftp 10.4.4.1
Connected to 10.4.4.1.
220 (vsFTPD 3.0.3)
Name (10.4.4.1:root): anonymous
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> status
Connected to 10.4.4.1.
No proxy connection.
Connecting using address family: any.
Mode: stream; Type: binary; Form: non-print; Structure: file
Verbose: on; Bell: off; Prompting: on; Globbing: on
Store unique: off; Receive unique: off
Case: off; CR stripping: on
Quote control characters: on
Ntrans: off
Nmap: off
Hash mark printing: off; Use of PORT cmds: on
Tick counter printing: off
ftp> pwd
257 "/" is the current directory
ftp> dir
200 PORT command successful. Consider using PASV.
150 Here comes the directory listing.
-rw-r--r--  1 0      0          224 Sep 18 11:45 file1
-rwxr-xr-x  1 0      0        142144 Sep 18 11:45 file2
226 Directory send OK.
ftp> get file1
local: file1 remote: file1
200 PORT command successful. Consider using PASV.
150 Opening BINARY mode data connection for file1 (224 bytes).
226 Transfer complete.
224 bytes received in 0.00 secs (3,5604 MB/s)
ftp> quit
221 Goodbye.
root@Portatil1:/tmp/pycore.41989/Portatil1.conf# 

```

— Transfêrencia a partir do PC1

```

root@PC1:/tmp/pycore.41989/PC1.conf# ftp 10.4.4.1
Connected to 10.4.4.1.
220 (vsFTPd 3.0.3)
Name (10.4.4.1:root): anonymous
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> status
Connected to 10.4.4.1.
No proxy connection.
Connecting using address family: any.
Mode: stream; Type: binary; Form: non-print; Structure: file
Verbose: on; Bell: off; Prompting: on; Globbing: on
Store unique: off; Receive unique: off
Case: off; CR stripping: on
Quote control characters: on
Ntrans: off
Nmap: off
Hash mark printing: off; Use of PORT cmds: on
Tick counter printing: off
ftp> pwd
257 "/" is the current directory
ftp> dir
200 PORT command successful. Consider using PASV.
150 Here comes the directory listing.
-rw-r--r--  1 0      0          224 Sep 18 11:45 file1
-rwxr-xr-x  1 0      0       142144 Sep 18 11:45 file2
226 Directory send OK.
ftp> get file1
local: file1 remote: file1
200 PORT command successful. Consider using PASV.
150 Opening BINARY mode data connection for file1 (224 bytes).
226 Transfer complete.
224 bytes received in 0.00 secs (623.2194 kB/s)
ftp> quit
221 Goodbye.
root@PC1:/tmp/pycore.41989/PC1.conf# 

```

- TFTP (Trivial File Transfer Protocol)
  - ↳ Versão simplificada do FTP
  - Menos seguro

```

<tftpd --verbose=3 --user root.ftp --logfile atftpd.log --bind-address 10.4.4.1 --daemon --no-fork /srv/ftp
^Z
[2]+  Stopped                  atftpd --verbose=3 --user root.ftp --logfile atftpd.log --bind-address 10.4.4.1 --daemon --no-fork /srv/ftp
root@Servidor1:/tmp/pycore.41989/Servidor1.conf# bg
[2]+  atftpd --verbose=3 --user root.ftp --logfile atftpd.log --bind-address 10.4.4.1 --daemon --no-fork /srv/ftp &
root@Servidor1:/tmp/pycore.41989/Servidor1.conf# 

```

- ↑ Ativação manual do servidor TFTP
- Portátil 1



```

root@Portatil1:/tmp/pycore.41989/Portatil1.conf# atftp 10.4.4.1
tftp> status
Connected: 10.4.4.1 port 69
Mode:      octet
Verbose:    off
Trace:      off
Options
  tsize:    disabled
  blksize:  disabled
  timeout:  disabled
  multicast: disabled
mtftp variables
  client-port: 76
  mcast-ip:    0.0.0.0
  listen-delay: 2
  timeout-delay: 2
Last command: quit
tftp> get file1
Overwrite local file [y/n]? y
tftp> quit
root@Portatil1:/tmp/pycore.41989/Portatil1.conf#

```

PC1

```

root@PC1:/tmp/pycore.41989/PC1.conf# atftp 10.4.4.1
tftp> status
Connected: 10.4.4.1 port 69
Mode:      octet
Verbose:    off
Trace:      off
Options
  tsize:    disabled
  blksize:  disabled
  timeout:  disabled
  multicast: disabled
mtftp variables
  client-port: 76
  mcast-ip:    0.0.0.0
  listen-delay: 2
  timeout-delay: 2
Last command: ---
tftp> get file1
Overwrite local file [y/n]? y
tftp> quit
root@PC1:/tmp/pycore.41989/PC1.conf#

```

Não forcei as diferenças.

- HTTP

```

root@Servidor1:/tmp/pycore.41989/Servidor1.conf# mini_httpd: started as root wit
hout requesting chroot(), warning only
root@Servidor1:/tmp/pycore.41989/Servidor1.conf# ps -ef
UID          PID    PPID  C STIME TTY          TIME CMD
root         1        0  0 17:01 ?           00:00:00 vncd -v -c /tmp/pycore.41989/Servidor1 -l
root        32        1  0 17:01 ?           00:00:00 sshd: /usr/sbin/sshd -f /etc/ssh/sshd_config
root        33        1  0 17:01 pts/2     00:00:00 /bin/bash
root        44       33  0 17:03 pts/2     00:00:00 atftpd --verbose=3 --user root ftp --logfile
nobody      64        1  0 17:07 ?           00:00:00 mini_httpd -d /srv/ftp
root        65       33  0 17:08 pts/2     00:00:00 ps -ef
root@Servidor1:/tmp/pycore.41989/Servidor1.conf#

```

Em execução

— Portatil 1

```

root@Portatil1:/tmp/pycore.41989/Portatil1.conf# wget http://10.4.4.1/file1
--2023-09-18 17:09:42-- http://10.4.4.1/file1
Connecting to 10.4.4.1:80... connected.
HTTP request sent, awaiting response... 200 Ok
Length: 224 [text/plain]
Saving to: 'file1.1'

file1.1          100%[=====>]      224  --.-KB/s    in 0s
2023-09-18 17:09:42 (70,1 MB/s) - 'file1.1' saved [224/224]

```

```

root@Portatil1:/tmp/pycore.41989/Portatil1.conf# wget http://10.4.4.1/file2
--2023-09-18 17:10:41-- http://10.4.4.1/file2
Connecting to 10.4.4.1:80... connected.
HTTP request sent, awaiting response... 200 Ok
Length: 142144 (139K) [text/plain]
Saving to: 'file2'

file2            100%[=====>] 138,81K  --.-KB/s    in 0,02s
2023-09-18 17:10:41 (7,25 MB/s) - 'file2' saved [142144/142144]

```

200 OK = Successful Request

- Content included
- Successful outcome