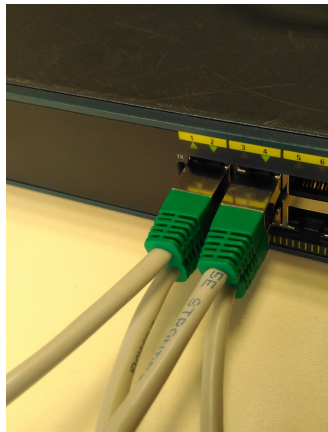


TP1 : Outils de base

**CAUMES Clément (PC1) - GUILLOT Benjamin (PC2) -
LAMMAMRA Aicha (PC4) - MTALSI MERIMI Mehdi (PC4)**

Exercice 1

Sachant que la plupart des concentrateurs ne fonctionnent pas, nous avons pris un commutateur pour connecter les 4 PCs.



Malheureusement, le PC3 ne fonctionne pas, nous avons donc effectué le TP avec uniquement 3 PCs, cependant nous avons tous effectué les commandes. Nous avons donc connecté chaque câble Ethernet à l'interface enp3s0 de chaque PC.

Exercice 2

Configuration de l'adresse IP et du mask du PC1 :

```
lrs@lrs-OptiPlex-3040:~$ sudo ifconfig enp3s0 inet 192.168.42.1 netmask 255.255.255.0
```

Configuration de l'adresse IP et du mask du PC2 :

```
lrs@lrs-OptiPlex-3040:~$ sudo ifconfig enp3s0 inet 192.168.42.2 netmask 255.255.255.0
```

Configuration de l'adresse IP et du mask du PC4 :

```
lrs@lrs-OptiPlex-3040:~$ sudo ifconfig enp3s0 inet 192.168.42.4 netmask 255.255.255.0
```

Après ces configurations, on vérifie la bonne connexion avec des pings par exemple entre le PC1-PC2 et PC1-PC4 :

```

irs@irs-OptiPlex-3040:~$ ping 192.168.42.2
PING 192.168.42.2 (192.168.42.2) 56(84) bytes of data.
64 bytes from 192.168.42.2: icmp_seq=1 ttl=64 time=0.427 ms
64 bytes from 192.168.42.2: icmp_seq=2 ttl=64 time=0.514 ms
64 bytes from 192.168.42.2: icmp_seq=3 ttl=64 time=0.520 ms
64 bytes from 192.168.42.2: icmp_seq=4 ttl=64 time=0.518 ms
64 bytes from 192.168.42.2: icmp_seq=5 ttl=64 time=0.519 ms
64 bytes from 192.168.42.2: icmp_seq=6 ttl=64 time=0.514 ms
64 bytes from 192.168.42.2: icmp_seq=7 ttl=64 time=0.516 ms
64 bytes from 192.168.42.2: icmp_seq=8 ttl=64 time=0.513 ms
64 bytes from 192.168.42.2: icmp_seq=9 ttl=64 time=0.516 ms
64 bytes from 192.168.42.2: icmp_seq=10 ttl=64 time=0.532 ms
64 bytes from 192.168.42.2: icmp_seq=11 ttl=64 time=0.246 ms
64 bytes from 192.168.42.2: icmp_seq=12 ttl=64 time=0.518 ms
64 bytes from 192.168.42.2: icmp_seq=13 ttl=64 time=0.240 ms
64 bytes from 192.168.42.2: icmp_seq=14 ttl=64 time=0.535 ms
64 bytes from 192.168.42.2: icmp_seq=15 ttl=64 time=0.518 ms
^C
--- 192.168.42.2 ping statistics ---
15 packets transmitted, 15 received, 0% packet loss, time 14293ms
rtt min/avg/max/mdev = 0.240/0.476/0.535/0.096 ms

```

```

irs@irs-OptiPlex-3040:~$ ping 192.168.42.4
PING 192.168.42.4 (192.168.42.4) 56(84) bytes of data.
64 bytes from 192.168.42.4: icmp_seq=1 ttl=64 time=0.242 ms
64 bytes from 192.168.42.4: icmp_seq=2 ttl=64 time=0.291 ms
64 bytes from 192.168.42.4: icmp_seq=3 ttl=64 time=0.543 ms
64 bytes from 192.168.42.4: icmp_seq=4 ttl=64 time=0.534 ms
64 bytes from 192.168.42.4: icmp_seq=5 ttl=64 time=0.522 ms
64 bytes from 192.168.42.4: icmp_seq=6 ttl=64 time=0.507 ms
^C
--- 192.168.42.4 ping statistics ---
6 packets transmitted, 6 received, 0% packet loss, time 5125ms
rtt min/avg/max/mdev = 0.242/0.439/0.543/0.126 ms

```

On vérifie la liste des interfaces :

```

irs@irs-OptiPlex-3040:~$ netstat -in
Table d'interfaces noyau
Iface MTU Met RX-OK RX-ERR RX-DRP RX-OVR TX-OK TX-ERR TX-DRP TX-OVR Flg
enp2s0 1500 0 267 0 0 0 58 0 0 0 BMU
enp3s0 1500 0 897 0 0 0 267 0 0 0 BMRU
lo 65536 0 15114 0 0 0 15114 0 0 0 LRU
irs@irs-OptiPlex-3040:~$

```

enp2s0 (anciennement eth0) et enp3s0 sont les interfaces réseau. Lo est l'interface de loopback. Son adresse par défaut est 127.0.0.1.

On interprètes ces données de la façon suivante :

RX-OK et TX-OK rendent compte du nombre de paquets reçus ou émis,
 RX-ERR ou TX-ERR nombre de paquets reçus ou transmis avec erreur,
 RX-DRP ou TX-DRP nombre de paquets éliminés (hypothèse : à cause d'une collision),

RX-OVR ou TX-OVR recouvrement, donc perdus à cause d'un débit trop important.

Pour enp2s0, le taux d'erreurs en entrée est de 0 % (267 réussites pour 0 erreurs) et celui en sortie est de 0 % (58 réussites pour 0 erreurs)

Pour enp3s0, le taux d'erreurs en entrée est de 0 % (897 réussites pour 0 erreurs) et celui en sortie est de 0 % (267 réussites pour 0 erreurs)

Pour lo le taux d'erreurs en entrée est de 0 % et en sortie également.

Exercice 3

On fixe l'adresse IP sur tous les PC de cette manière (ici pour le PC1) :

```

irs@irs-OptiPlex-3040:/$ cd etc/network/
irs@irs-OptiPlex-3040:/etc/network$ nano interfaces
irs@irs-OptiPlex-3040:/etc/network$ sudo nano interfaces
[sudo] Mot de passe de irs :

```

```

# interfaces(5) file used by ifup(8) and ifdown(8)
auto lo
auto enp2s0
auto enp3s0
iface lo inet loopback
iface enp2s0 inet dhcp
iface enp3s0 inet static
address 192.168.42.1
netmask 255.255.255.0

```

Puis, on redémarre les PC et on regarde les adresses IP sur les interfaces enp3s0 des fichiers etc/network/interfaces (sur la photo toujours le PC1 après le redémarrage):

```

# interfaces(5) file used by ifup(8) and ifdown(8)
auto lo
auto enp2s0
auto enp3s0
iface lo inet loopback
iface enp2s0 inet dhcp
iface enp3s0 inet static
address 192.168.42.1
netmask 255.255.255.0

```

```

enp3s0    Link encap:Ethernet  HWaddr 00:10:18:8a:10:7a
          inet adr:192.168.42.1  Bcast:192.168.42.255  Masque:255.255.255.0
          adr inet6: fe80::210:18ff:fe8a:107a/64 Scope:Lien
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          Packets reçus:1073 erreurs:0 :0 overruns:0 frame:0
          TX packets:282 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 lg file transmission:1000
          Octets reçus:136938 (136.9 KB) Octets transmis:35529 (35.5 KB)
          Interruption:18

```

On remarque ici que l'adresse IP a été fixée pour le PC1.
On fait de même pour les autres Pcs.

Pour le PC2 :

```
# interfaces(5) file used by ifup(8) and ifdown(8)
auto lo
auto enp2s0
auto enp3s0
iface lo inet loopback
iface enp2s0 inet dhcp
iface enp3s0 inet static
        address 192.168.42.2
        netmask 255.255.255.0
```

Pour le PC4 :

```
# interfaces(5) file used by ifup(8) and ifdown(8)
auto lo
auto enp2s0
auto enp3s0
iface lo inet loopback
iface enp2s0 inet dhcp
iface enp3s0 inet static
        address 192.168.42.4
        netmask 255.255.255.0
```

Exercice 4

Le PC1 envoie un ping au PC2 (voisin) :

```
irs@irs-OptiPlex-3040:/etc/network$ ping 192.168.42.2
PING 192.168.42.2 (192.168.42.2) 56(84) bytes of data.
64 bytes from 192.168.42.2: icmp_seq=1 ttl=64 time=0.435 ms
64 bytes from 192.168.42.2: icmp_seq=2 ttl=64 time=0.316 ms
64 bytes from 192.168.42.2: icmp_seq=3 ttl=64 time=0.512 ms
64 bytes from 192.168.42.2: icmp_seq=4 ttl=64 time=0.520 ms
64 bytes from 192.168.42.2: icmp_seq=5 ttl=64 time=0.513 ms
64 bytes from 192.168.42.2: icmp_seq=6 ttl=64 time=0.512 ms
64 bytes from 192.168.42.2: icmp_seq=7 ttl=64 time=0.514 ms
64 bytes from 192.168.42.2: icmp_seq=8 ttl=64 time=0.522 ms
64 bytes from 192.168.42.2: icmp_seq=9 ttl=64 time=0.516 ms
64 bytes from 192.168.42.2: icmp_seq=10 ttl=64 time=0.517 ms
64 bytes from 192.168.42.2: icmp_seq=11 ttl=64 time=0.422 ms
64 bytes from 192.168.42.2: icmp_seq=12 ttl=64 time=0.517 ms
64 bytes from 192.168.42.2: icmp_seq=13 ttl=64 time=0.550 ms
64 bytes from 192.168.42.2: icmp_seq=14 ttl=64 time=0.524 ms
^C
--- 192.168.42.2 ping statistics ---
14 packets transmitted, 14 received, 0% packet loss, time 13268ms
rtt min/avg/max/mdev = 0.316/0.492/0.550/0.060 ms
```

Sur ce test, 0 paquets ont été perdus. Le temps moyen d'aller retour d'un paquet est de 0.492ms (avg).

Le PC2 envoie un ping à son voisin (PC1) :

```
lrs@irs-OptiPlex-3040:/etc/network$ ping 192.168.42.1
PING 192.168.42.1 (192.168.42.1) 56(84) bytes of data.
64 bytes from 192.168.42.1: icmp_seq=1 ttl=64 time=0.415 ms
64 bytes from 192.168.42.1: icmp_seq=2 ttl=64 time=0.529 ms
64 bytes from 192.168.42.1: icmp_seq=3 ttl=64 time=0.462 ms
64 bytes from 192.168.42.1: icmp_seq=4 ttl=64 time=0.529 ms
64 bytes from 192.168.42.1: icmp_seq=5 ttl=64 time=0.531 ms
64 bytes from 192.168.42.1: icmp_seq=6 ttl=64 time=0.529 ms
64 bytes from 192.168.42.1: icmp_seq=7 ttl=64 time=0.538 ms
64 bytes from 192.168.42.1: icmp_seq=8 ttl=64 time=0.529 ms
64 bytes from 192.168.42.1: icmp_seq=9 ttl=64 time=0.538 ms
64 bytes from 192.168.42.1: icmp_seq=10 ttl=64 time=0.468 ms
^C
--- 192.168.42.1 ping statistics ---
10 packets transmitted, 10 received, 0% packet loss, time 9202ms
rtt min/avg/max/mdev = 0.415/0.506/0.538/0.049 ms
```

0 paquets ont été perdus. Le temps moyen d'aller retour d'un paquet est de 0.506ms (avg).

Le PC4 envoie un ping à son voisin (PC1) :

```

irs@irs-OptiPlex-3040: ~
19 packets captured
19 packets received by filter
0 packets dropped by kernel
irs@irs-OptiPlex-3040:~$ ping 192.168.42.1
PING 192.168.42.1 (192.168.42.1) 56(84) bytes of data.
64 bytes from 192.168.42.1: icmp_seq=1 ttl=64 time=0.420 ms
64 bytes from 192.168.42.1: icmp_seq=2 ttl=64 time=0.534 ms
64 bytes from 192.168.42.1: icmp_seq=3 ttl=64 time=0.544 ms
64 bytes from 192.168.42.1: icmp_seq=4 ttl=64 time=0.540 ms
64 bytes from 192.168.42.1: icmp_seq=5 ttl=64 time=0.541 ms
64 bytes from 192.168.42.1: icmp_seq=6 ttl=64 time=0.473 ms
64 bytes from 192.168.42.1: icmp_seq=7 ttl=64 time=0.539 ms
64 bytes from 192.168.42.1: icmp_seq=8 ttl=64 time=0.552 ms
64 bytes from 192.168.42.1: icmp_seq=9 ttl=64 time=0.542 ms
64 bytes from 192.168.42.1: icmp_seq=10 ttl=64 time=0.295 ms
64 bytes from 192.168.42.1: icmp_seq=11 ttl=64 time=0.549 ms
64 bytes from 192.168.42.1: icmp_seq=12 ttl=64 time=0.297 ms
64 bytes from 192.168.42.1: icmp_seq=13 ttl=64 time=0.547 ms
64 bytes from 192.168.42.1: icmp_seq=14 ttl=64 time=0.492 ms
64 bytes from 192.168.42.1: icmp_seq=15 ttl=64 time=0.533 ms
64 bytes from 192.168.42.1: icmp_seq=16 ttl=64 time=0.552 ms
64 bytes from 192.168.42.1: icmp_seq=17 ttl=64 time=0.465 ms
64 bytes from 192.168.42.1: icmp_seq=18 ttl=64 time=0.190 ms
64 bytes from 192.168.42.1: icmp_seq=19 ttl=64 time=0.535 ms
64 bytes from 192.168.42.1: icmp_seq=20 ttl=64 time=0.531 ms
64 bytes from 192.168.42.1: icmp_seq=21 ttl=64 time=0.551 ms
^C
--- 192.168.42.1 ping statistics ---
21 packets transmitted, 21 received, 0% packet loss, time 20482ms
rtt min/avg/max/mdev = 0.190/0.486/0.552/0.103 ms

```

0 paquets ont été perdus. Le temps moyen d'aller retour d'un paquet est de 0.486ms (avg).

Exercice 5

1. On affiche la table ARP : On remarque que 192.168.42.3 est incomplet sachant que le PC3 n'a pas pu fonctionner.

Pour le PC1 :

```

irs@irs-OptiPlex-3040:/etc/network$ arp
Address          HWtype  HWaddress      Flags Mask    Iface
192.168.42.4      ether    00:10:18:8a:1d:e0  C             enp3s0
192.168.42.2      ether    00:10:18:8a:10:84  C             enp3s0
192.168.42.3      (incomplet)
irs@irs-OptiPlex-3040:/etc/network$

```

Pour le PC2 :

```

irs@irs-OptiPlex-3040:/etc/network$ arp
Address          HWtype  HWaddress      Flags Mask    Iface
192.168.42.1      ether    00:10:18:8a:10:7a  C             enp3s0
192.168.42.4      ether    00:10:18:8a:1d:e0  C             enp3s0
192.168.42.3      (incomplet)
irs@irs-OptiPlex-3040:/etc/network$

```

Pour le PC4 :

```

irs@irs-OptiPlex-3040:/etc/network$ arp
Address          HWtype  HWaddress      Flags Mask    Iface
192.168.42.1      ether    00:10:18:8a:10:7a  C             enp3s0
192.168.42.2      ether    00:10:18:8a:10:84  C             enp3s0
192.168.42.3      (incomplet)
irs@irs-OptiPlex-3040:/etc/network$

```


2. On vide le contenu de la table ARP :

Pour le PC1 :

```
irs@irs-OptiPlex-3040:/etc/network$ sudo arp -d 192.168.42.2
irs@irs-OptiPlex-3040:/etc/network$ sudo arp -d 192.168.42.3
irs@irs-OptiPlex-3040:/etc/network$ sudo arp -d 192.168.42.4
irs@irs-OptiPlex-3040:/etc/network$ arp
Address                HWtype  HWaddress           Flags Mask            Iface
192.168.42.4           (incomple)          enp3s0
192.168.42.2           (incomple)          enp3s0
192.168.42.3           (incomple)          enp3s0
irs@irs-OptiPlex-3040:/etc/network$
```

Pour le PC2 :

```
irs@irs-OptiPlex-3040:/etc/network$ sudo arp -d 192.168.42.1
[sudo] Mot de passe de irs :
irs@irs-OptiPlex-3040:/etc/network$ sudo arp -d 192.168.42.4
irs@irs-OptiPlex-3040:/etc/network$ sudo arp -d 192.168.42.3
irs@irs-OptiPlex-3040:/etc/network$ arp
irs@irs-OptiPlex-3040:/etc/network$
Address                HWtype  HWaddress           Flags Mask            Iface
192.168.42.1           (incomple)          enp3s0
192.168.42.4           (incomple)          enp3s0
192.168.42.3           (incomple)          enp3s0
irs@irs-OptiPlex-3040:/etc/network$
```

Pour le PC4 :

```
irs@irs-OptiPlex-3040:/etc/network$ sudo arp -d 192.168.42.1
irs@irs-OptiPlex-3040:/etc/network$ sudo arp -d 192.168.42.2
irs@irs-OptiPlex-3040:/etc/network$ sudo arp -d 192.168.42.3
irs@irs-OptiPlex-3040:/etc/network$ arp
irs@irs-OptiPlex-3040:/etc/network$
Address                HWtype  HWaddress           Flags Mask            Iface
192.168.42.1           (incomple)          enp3s0
192.168.42.2           (incomple)          enp3s0
192.168.42.3           (incomple)          enp3s0
irs@irs-OptiPlex-3040:/etc/network$
```

3. Si PC2 envoie un ping au PC1 alors la table ARP de PC1 va se remplir pour l'adresse 192.168.42.2 car le PC2 a renseigné au PC1 son adresse Mac en envoyant ce ping. De plus, la table ARP de PC2 pour l'adresse 192.168.42.1 sera remplie également.

Exemple : PC2 envoie un ping au PC1 :

```
irs@irs-OptiPlex-3040:/etc/network$ ping 192.168.42.1
PING 192.168.42.1 (192.168.42.1) 56(84) bytes of data.
64 bytes from 192.168.42.1: icmp_seq=1 ttl=64 time=0.386 ms
64 bytes from 192.168.42.1: icmp_seq=2 ttl=64 time=0.459 ms
64 bytes from 192.168.42.1: icmp_seq=3 ttl=64 time=0.529 ms
^C
--- 192.168.42.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2050ms
rtt min/avg/max/mdev = 0.386/0.458/0.529/0.058 ms
```

PC1 voit qu'une ligne de sa table ARP a été renseignée :

```
irs@irs-OptiPlex-3040:/etc/network$ arp
Address          HWtype  HWaddress          Flags Mask          Iface
192.168.42.4      ether   (incomplet)        C                   enp3s0
192.168.42.2      ether   00:10:18:8a:10:84   C                   enp3s0
192.168.42.3      ether   (incomplet)        C                   enp3s0
irs@irs-OptiPlex-3040:/etc/network$
```

Exercice 6

Tout d'abord, on met un PC en mode promiscuous (permettant d'écouter les trames du réseau) par exemple le PC1 :

```
irs@irs-OptiPlex-3040:/etc/network$ sudo ifconfig enp3s0 promisc
irs@irs-OptiPlex-3040:/etc/network$ ifconfig
enp2s0:  Link encap:Ethernet  HWaddr 64:00:6a:47:5e:fc
          inet addr:192.168.42.1  Bcast:192.168.42.255  Masque:255.255.255.0
          adr inet6: fe80::6600:6aff:fe47:5efc/64 Scope:Lien
          UP BROADCAST MULTICAST  MTU:1500  Metric:1
          Packets reçus:267 erreurs:0 :0 overruns:0 frame:0
          TX packets:58 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 lg file transmission:1000
          Octets reçus:41198 (41.1 KB) Octets transmis:9899 (9.8 KB)

enp3s0:  Link encap:Ethernet  HWaddr 00:10:18:8a:10:7a
          inet addr:192.168.42.1  Bcast:192.168.42.255  Masque:255.255.255.0
          adr inet6: fe80::210:18ff:fe8a:107a/64 Scope:Lien
          UP BROADCAST RUNNING PROMISC MULTICAST  MTU:1500  Metric:1
          Packets reçus:1677 erreurs:0 :4 overruns:0 frame:0
          TX packets:542 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 lg file transmission:1000
          Octets reçus:198970 (198.9 KB) Octets transmis:60382 (60.3 KB)
          Interruption:18

lo:      Link encap:Boucle locale
          inet addr:127.0.0.1  Masque:255.0.0.0
          adr inet6: ::1/128 Scope:Hôte
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          Packets reçus:31890 erreurs:0 :0 overruns:0 frame:0
          TX packets:31890 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 lg file transmission:1
          Octets reçus:2386308 (2.3 MB) Octets transmis:2386308 (2.3 MB)
```

Ensuite, on supprime la ligne de 192.168.42.4 de la table ARP du PC2 (pour qu'une requête ARP se fasse au moment du ping entre PC2 et PC4) :


```

irs@irs-OptiPlex-3040:/etc/network$ sudo arp -d 192.168.42.4
irs@irs-OptiPlex-3040:/etc/network$ ping 192.168.42.4
PING 192.168.42.4 (192.168.42.4) 56(84) bytes of data.
64 bytes from 192.168.42.4: icmp_seq=1 ttl=64 time=0.645 ms
64 bytes from 192.168.42.4: icmp_seq=2 ttl=64 time=0.546 ms
64 bytes from 192.168.42.4: icmp_seq=3 ttl=64 time=0.550 ms
64 bytes from 192.168.42.4: icmp_seq=4 ttl=64 time=0.568 ms
^C
--- 192.168.42.4 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 3073ms
rtt min/avg/max/mdev = 0.546/0.577/0.645/0.043 ms

```

Au même moment, PC1 écoute les trames ARP du réseau entre PC2 et PC4 :

```

irs@irs-OptiPlex-3040:/etc/network$ sudo tcpdump host 192.168.42.2 and host 192.168.42.4
tcpdump: verbose output suppressed, use -v or -vv for full protocol decode
listening on enp3s0, link-type EN10MB (Ethernet), capture size 262144 bytes
10:17:19.549821 ARP, Request who-has 192.168.42.4 tell 192.168.42.2, length 46
^C
1 packet captured
1 packet received by filter
0 packets dropped by kernel

```

On voit qu'un paquet ARP a bien été capturé entre PC4 et PC2.

Exercice 7

On fait de même avec le logiciel Wireshark en mettant un filtre permettant de récupérer toutes les trames ARP du réseau :

arp						
No.	Time	Source	Destination	Protocol	Length	Info
256	73.323855678	Broadcom_8a:10:7a	Broadcom_8a:10:84	ARP	42	Who has 192.168.42.2? Tell 192.168.42.1
257	73.324336825	Broadcom_8a:10:84	Broadcom_8a:10:7a	ARP	60	192.168.42.2 is at 00:10:18:8a:10:84

Ici, on peut voir que PC1 demande l'adresse MAC de 192.168.42.2. Le PC2 a donc l'adresse MAC 00:10:18:8a:10:84.

Exercice 8

On peut voir des paquets ICMP, ARP, STP avec un commutateur. Cela est visible avec Wireshark ou bien tcpdump.

Exercice 9

LE PC4 va envoyer une requête ping de broadcast :

```

irs@irs-OptiPlex-3040:/$ ping 192.168.42.255 -b
WARNING: pinging broadcast address
PING 192.168.42.255 (192.168.42.255) 56(84) bytes of data.
^C
--- 192.168.42.255 ping statistics ---
11 packets transmitted, 0 received, 100% packet loss, time 10226ms

```

PC1 va sniffer le réseau avec Wireshark :

1	0.00000000	CiscoInc_33:9a:01	Spanning-tree-(for-...	STP	60	Conf. Root = 32768/1/6c:50:4d:33:9a:00 Cost = 0 Port = 0x8001
2	1.116255849	192.168.42.2	192.168.42.1	ICMP	98	Echo (ping) request id=0x0c1e, seq=1/256, ttl=64 (reply in 3)
3	1.116289081	192.168.42.1	192.168.42.2	ICMP	98	Echo (ping) reply id=0x0c1e, seq=1/256, ttl=64 (request in 2)
4	1.650559831	192.168.42.4	192.168.42.255	ICMP	98	Echo (ping) request id=0x181a, seq=1/256, ttl=64 (no response found!)
5	2.009008229	CiscoInc_33:9a:01	Spanning-tree-(for-...	STP	60	Conf. Root = 32768/1/6c:50:4d:33:9a:00 Cost = 0 Port = 0x8001
6	2.122148116	192.168.42.2	192.168.42.1	ICMP	98	Echo (ping) request id=0x0c1e, seq=2/512, ttl=64 (reply in 7)
7	2.122179097	192.168.42.1	192.168.42.2	ICMP	98	Echo (ping) reply id=0x0c1e, seq=2/512, ttl=64 (request in 6)
8	2.660640491	192.168.42.2	192.168.42.255	ICMP	98	Echo (ping) request id=0x181a, seq=2/512, ttl=64 (no response found!)
9	3.146176387	192.168.42.2	192.168.42.1	ICMP	98	Echo (ping) request id=0x0c1e, seq=3/768, ttl=64 (reply in 10)
10	3.146197844	192.168.42.1	192.168.42.2	ICMP	98	Echo (ping) reply id=0x0c1e, seq=3/768, ttl=64 (request in 9)
11	3.684627581	192.168.42.4	192.168.42.255	ICMP	98	Echo (ping) request id=0x181a, seq=3/768, ttl=64 (no response found!)
12	4.009676081	CiscoInc_33:9a:01	Spanning-tree-(for-...	STP	60	Conf. Root = 32768/1/6c:50:4d:33:9a:00 Cost = 0 Port = 0x8001
13	4.170150415	192.168.42.2	192.168.42.1	ICMP	98	Echo (ping) request id=0x0c1e, seq=4/1024, ttl=64 (reply in 14)
14	4.170170756	192.168.42.1	192.168.42.2	ICMP	98	Echo (ping) reply id=0x0c1e, seq=4/1024, ttl=64 (request in 13)
15	4.708431714	192.168.42.4	192.168.42.255	ICMP	98	Echo (ping) request id=0x181a, seq=4/1024, ttl=64 (no response found!)
16	5.194153488	192.168.42.2	192.168.42.1	ICMP	98	Echo (ping) request id=0x0c1e, seq=5/1280, ttl=64 (reply in 17)
17	5.194172422	192.168.42.1	192.168.42.2	ICMP	98	Echo (ping) reply id=0x0c1e, seq=5/1280, ttl=64 (request in 16)
18	5.732606359	192.168.42.4	192.168.42.255	ICMP	98	Echo (ping) request id=0x181a, seq=5/1280, ttl=64 (no response found!)
19	6.014020896	CiscoInc_33:9a:01	Spanning-tree-(for-...	STP	60	Conf. Root = 32768/1/6c:50:4d:33:9a:00 Cost = 0 Port = 0x8001
20	6.218137412	192.168.42.2	192.168.42.1	ICMP	98	Echo (ping) request id=0x0c1e, seq=6/1536, ttl=64 (reply in 21)
21	6.218157615	192.168.42.1	192.168.42.2	ICMP	98	Echo (ping) reply id=0x0c1e, seq=6/1536, ttl=64 (request in 20)
22	6.417251665	CiscoInc_33:9a:01	CiscoInc_33:9a:01	LOOP	60	Reply
23	6.756633094	192.168.42.4	192.168.42.255	ICMP	98	Echo (ping) request id=0x181a, seq=6/1536, ttl=64 (no response found!)
24	7.242142314	192.168.42.2	192.168.42.1	ICMP	98	Echo (ping) request id=0x0c1e, seq=7/1792, ttl=64 (reply in 25)
25	7.242160569	192.168.42.1	192.168.42.2	ICMP	98	Echo (ping) reply id=0x0c1e, seq=7/1792, ttl=64 (request in 24)
26	7.780614111	192.168.42.4	192.168.42.255	ICMP	98	Echo (ping) request id=0x181a, seq=7/1792, ttl=64 (no response found!)
27	8.019482668	CiscoInc_33:9a:01	Spanning-tree-(for-...	STP	60	Conf. Root = 32768/1/6c:50:4d:33:9a:00 Cost = 0 Port = 0x8001
28	8.804608259	192.168.42.4	192.168.42.255	ICMP	98	Echo (ping) request id=0x181a, seq=8/2048, ttl=64 (no response found!)

On voit les différentes adresses IP du réseau avec les adresses de destination des pings broadcast envoyés par PC4. On a donc comme adresses IP dans le réseau : 192.168.42.1, 192.168.42.2 et 192.168.42.4.