Chapitre 1 - Serveur Debian DS1: routage et translation d'adresses
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Sommaire

1. Rappels.

Récupération de la dernière liste des paquets disponibles et exécution de la commande apt-get update

```
permitted by applicable law.
root@DS1: ~#apt-get update
```

Mise en couleur du prompt via le fichier /root/.bashrc et la variable PS1

```
 GNU nano 8.4                                                    /root/.bashr
# ~/.bashrc: executed by bash(1) for non-login shells.

# Note: PS1 is set in /etc/profile, and the default umask is defined
# in /etc/login.defs. You should not need this unless you want different
# defaults for root.
# PS1='${debian_chroot:+($debian_chroot)}\h:\w\$ '
# umask 022

# You may uncomment the following lines if you want `ls' to be colorized:
# export LS_OPTIONS='--color=auto'
# eval "$(dircolors)"
alias ls='ls --color=auto'
# alias ll='ls $LS_OPTIONS -l'
# alias l='ls $LS_OPTIONS -lA'
#
# Some more alias to avoid making mistakes:
# alias rm='rm -i'
# alias cp='cp -i'
# alias mv='mv -i'
PS1='\[\033[01;32m\]\u@\h\[\033[00m\]:\[\033[01;34m\] \w\$\[\033[00m\] '
alias grep='grep --color=auto'
```

Activation ou création de l'alias grep et déconnexion puis reconnexion

```
root@DS1: ~#exit_
```

Renommage du serveur Debian en DS1 via modification des fichiers /etc/hostname et /etc/hosts

```
  GNU nano 8.4
127.0.0.1       localhost
127.0.1.1       DS1.sio-exupery.local   DS1

# The following lines are desirable for IPv6 capable hosts
::1     localhost ip6-localhost ip6-loopback
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
```

```
  GNU nano 8.4
DS1
```

Redémarrage de la machine

```
root@DS1: ~#reboot
```

2. Configuration réseau du serveur DS1.

Vérification de la configuration réseau actuelle (mode accès pont)

```
Debian GNU/Linux 13 DS1 tty1

DS1 login: root
Password:
Linux DS1 6.12.48+deb13-amd64 #1 SMP PREEMPT_DYNAMIC Debian 6.12.48-1 (2025-09-20) x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
root@DS1: ~#ip -4 address
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    altname enx0800271cbc21
    inet 192.168.1.100/24 brd 192.168.1.255 scope global enp0s3
       valid_lft forever preferred_lft forever
root@DS1: ~#
```

Installation du paquet resolvconf

```
       valid_lft forever preferred_lft forever
root@DS1: ~#apt-get install resolvconf
Lecture des listes de paquets... Fait
Construction de l'arbre des dépendances... Fait
Lecture des informations d'état... Fait
resolvconf est déjà la version la plus récente (1.94).
0 mis à jour, 0 nouvellement installés, 0 à enlever et 30 non mis à jour.
root@DS1: ~#_
```

Désactivation de la carte réseau enp0s3 avant spécification d'une adresse IP fixe

```
root@DS1: ~#ifdown enp0s3
root@DS1: ~#
```

Modification du fichier /etc/network/interfaces pour l'interface enp0s3 (passage de DHCP à IP fixe)

```
  GNU nano 8.4                                                    /etc/network/interfaces
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
allow-hotplug enp0s3
iface enp0s3 inet static
address 172.17.101.204
netmask 255.255.0.0
network 172.17.0.0
broadcast 172.17.255.255
gateway 172.17.250.3
dns-nameservers 172.17.254.1
```

Réactivation de la carte réseau

```
root@DS1: ~#ifup enp0s3
ifup: interface enp0s3 already configured
root@DS1: ~#ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:1c:bc:21 brd ff:ff:ff:ff:ff:ff
    altname enx0800271cbc21
    inet 192.168.1.100/24 brd 192.168.1.255 scope global enp0s3
       valid_lft forever preferred_lft forever
    inet6 fd17:625c:f037:2:a00:27ff:fe1c:bc21/64 scope global dynamic mngtmpaddr proto kernel_ra
       valid_lft 86202sec preferred_lft 14202sec
    inet6 fe80::a00:27ff:fe1c:bc21/64 scope link proto kernel_ll
       valid_lft forever preferred_lft forever
```

Vérification de la configuration IP

```
root@DS1: ~#ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:58:21:a3 brd ff:ff:ff:ff:ff:ff
    altname enx0800275821a3
    inet 172.17.101.204/16 brd 172.17.255.255 scope global enp0s3
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe58:21a3/64 scope link proto kernel_ll
       valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:67:d6:23 brd ff:ff:ff:ff:ff:ff
    altname enx08002767d623
    inet 192.168.4.254/24 brd 192.168.4.255 scope global enp0s8
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe67:d623/64 scope link proto kernel_ll
       valid_lft forever preferred_lft forever
```

Affichage du contenu du fichier /etc/resolv.conf via cat

```
root@DS1: ~#cat etc/resolv.conf
cat: etc/resolv.conf: Aucun fichier ou dossier de ce nom
root@DS1: ~#cat /etc/resolv.conf
# Dynamic resolv.conf(5) file for glibc resolver(3) generated by resolvconf(8)
#     DO NOT EDIT THIS FILE BY HAND -- YOUR CHANGES WILL BE OVERWRITTEN
root@DS1: ~#
```

Consultez la table de routage de DS1 (visualisez la prise en compte de la passerelle par défaut 172.17.250.3) :

```
root@DS1: ~#ip route
default via 192.168.1.1 dev enp0s3 onlink
192.168.1.0/24 dev enp0s3 proto kernel scope link src 192.168.1.100
root@DS1: ~#
```

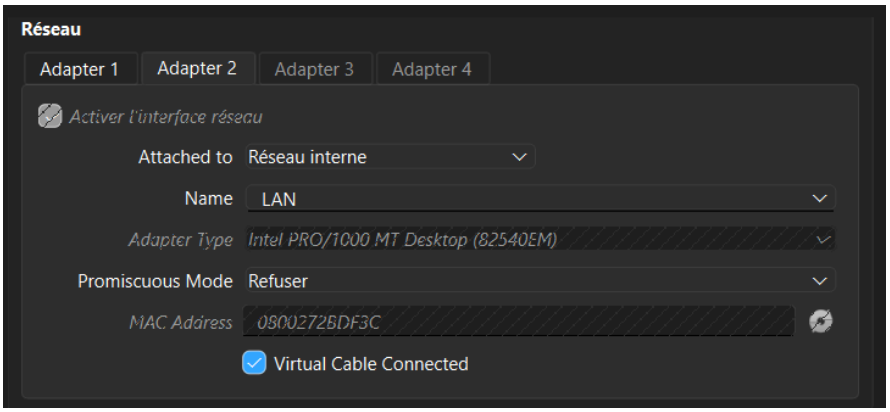
Pinguez la passerelle (172.17.250.3) ainsi que le serveur DNS (172.17.254.1) pour vous assurer de la bonne connectivité IP Vérifiez l'accès à Internet ainsi que la résolution DNS à l'aide, par exemple, des commandes ping 8.8.8.8 et ping www.ac-nice.fr :

```
root@DS1: ~#ping 172.17.254.1
PING 172.17.254.1 (172.17.254.1) 56(84) bytes of data.
64 bytes from 172.17.254.1: icmp_seq=1 ttl=128 time=599 ms
64 bytes from 172.17.254.1: icmp_seq=2 ttl=128 time=417 ms
64 bytes from 172.17.254.1: icmp_seq=3 ttl=128 time=439 ms
64 bytes from 172.17.254.1: icmp_seq=4 ttl=128 time=52.0 ms
64 bytes from 172.17.254.1: icmp_seq=5 ttl=128 time=273 ms
64 bytes from 172.17.254.1: icmp_seq=6 ttl=128 time=89.8 ms
64 bytes from 172.17.254.1: icmp_seq=7 ttl=128 time=113 ms
64 bytes from 172.17.254.1: icmp_seq=8 ttl=128 time=338 ms
64 bytes from 172.17.254.1: icmp_seq=9 ttl=128 time=457 ms
64 bytes from 172.17.254.1: icmp_seq=10 ttl=128 time=175 ms
64 bytes from 172.17.254.1: icmp_seq=11 ttl=128 time=402 ms
^C
--- 172.17.254.1 ping statistics ---
11 packets transmitted, 11 received, 0% packet loss, time 10027ms
rtt min/avg/max/mdev = 51.999/305.037/599.487/169.450 ms
```

```
root@DS1: ~#ping 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=116 time=152 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=116 time=480 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=116 time=195 ms
^C
--- 8.8.8.8 ping statistics ---
4 packets transmitted, 3 received, 25% packet loss, time 3008ms
rtt min/avg/max/mdev = 151.580/275.497/480.243/145.842 ms
root@DS1: ~#ping www.ac-nice.fr
PING www.ac-nice.fr.cdn.cloudflare.net (141.101.90.104) 56(84) bytes of data.
64 bytes from 141.101.90.104: icmp_seq=1 ttl=53 time=111 ms
64 bytes from 141.101.90.104: icmp_seq=2 ttl=53 time=28.9 ms
64 bytes from 141.101.90.104: icmp_seq=3 ttl=53 time=291 ms
64 bytes from 141.101.90.104: icmp_seq=4 ttl=53 time=301 ms
64 bytes from 141.101.90.104: icmp_seq=5 ttl=53 time=308 ms
^C
--- www.ac-nice.fr.cdn.cloudflare.net ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 6844ms
rtt min/avg/max/mdev = 28.901/207.674/307.597/115.666 ms
root@DS1: ~#
```

3. Ajout de l'interface enp0s8.

Arrêt de la machine virtuelle et ajout d'une seconde carte réseau en mode Réseau Interne (LAN)



Vérification de la prise en compte de la carte enp0s8 via ip a

```
root@DS1: ~#ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:58:21:a3 brd ff:ff:ff:ff:ff:ff
    altname enx080027581a3
    inet 172.17.101.204/16 brd 172.17.255.255 scope global enp0s3
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe58:21a3/64 scope link proto kernel_ll
       valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST> mtu 1500 qdisc noop state DOWN group default qlen 1000
    link/ether 08:00:27:67:d6:23 brd ff:ff:ff:ff:ff:ff
    altname enx08002767d623
```

Ajout de l'interface enp0s8 dans /etc/network/interfaces avec IP fixe 192.168.4.254/24

```
  GNU nano 8.4                                                    /etc/network/interfaces
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*

# The loopback network interface
auto lo
iface lo inet loopback

# The primary network interface
allow-hotplug enp0s3
iface enp0s3 inet static
address 172.17.101.204
netmask 255.255.0.0
network 172.17.0.0
broadcast 172.17.255.255
gateway 172.17.250.3
dns-nameservers 172.17.254.1

allow-hotplug enp0s8
iface enp0s8 inet static
addess 192.168.4.254
netmask 255.255.255.0
network 192.168.4.0
broadcast 192.168.4.255
# This is an autoconfigured IPv6 interface
```

Activation de la carte en up avec ip a pour vérifier

```
root@DS1: ~#ifup enp0s8
root@DS1: ~#ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:58:21:a3 brd ff:ff:ff:ff:ff:ff
    altname enx0800275821a3
    inet 172.17.101.204/16 brd 172.17.255.255 scope global enp0s3
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe58:21a3/64 scope link proto kernel_ll
       valid_lft forever preferred_lft forever
3: enp0s8: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:67:d6:23 brd ff:ff:ff:ff:ff:ff
    altname enx08002767d623
    inet 192.168.4.254/24 brd 192.168.4.255 scope global enp0s8
       valid_lft forever preferred_lft forever
    inet6 fe80::a00:27ff:fe67:d623/64 scope link proto kernel_ll
       valid_lft forever preferred_lft forever
root@DS1: ~#_
```

Vérification de la configuration réseau de DS1 par ping sur ses deux interfaces roi et moi-même

```
root@DS1: ~#ping 192.168.4.254
PING 192.168.4.254 (192.168.4.254) 56(84) bytes of data.
64 bytes from 192.168.4.254: icmp_seq=1 ttl=64 time=0.155 ms
64 bytes from 192.168.4.254: icmp_seq=2 ttl=64 time=0.032 ms
64 bytes from 192.168.4.254: icmp_seq=3 ttl=64 time=0.032 ms
^C
--- 192.168.4.254 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2042ms
rtt min/avg/max/mdev = 0.032/0.073/0.155/0.057 ms
root@DS1: ~#ping 172.17.101.204
PING 172.17.101.204 (172.17.101.204) 56(84) bytes of data.
64 bytes from 172.17.101.204: icmp_seq=1 ttl=64 time=0.055 ms
64 bytes from 172.17.101.204: icmp_seq=2 ttl=64 time=0.040 ms
64 bytes from 172.17.101.204: icmp_seq=3 ttl=64 time=0.038 ms
^C
--- 172.17.101.204 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2054ms
rtt min/avg/max/mdev = 0.038/0.044/0.055/0.007 ms
root@DS1: ~#
```

Affichage de la table de routage de DS1

```
root@DS1: ~#ip route
default via 172.17.250.3 dev enp0s3 onlink
172.17.0.0/16 dev enp0s3 proto kernel scope link src 172.17.101.204
192.168.4.0/24 dev enp0s8 proto kernel scope link src 192.168.4.254
root@DS1: ~#
```

4. Transformation du serveur en routeur.

Activation du routage via modification du processus ip_forward (valeur 1)

```
root@DS1: ~#echo 1 > /proc/sys/net/ipv4/ip_forward
root@DS1: ~#cat /proc/sys/net/ipv4/ip_forward
1
root@DS1: ~#
```

Création d'un fichier dans /etc/sysctl.d/ pour persistance du routage

```
 GNU nano 8.4                                    /etc/sysctl.d/sysctl.conf
net.ipv4.ip_forward=1
```

Redémarrage de la machine

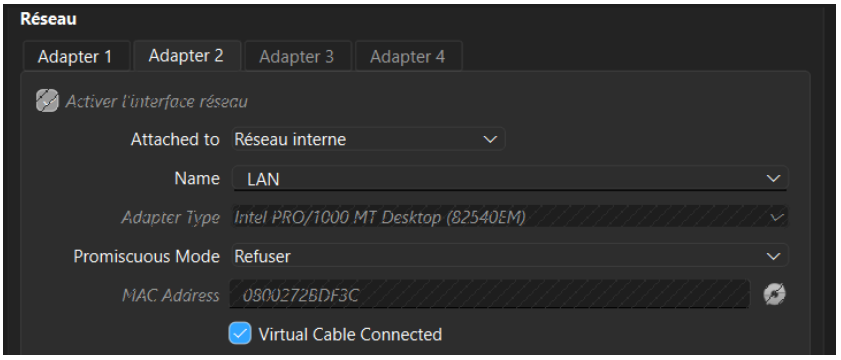
```
root@DS1: ~#reboot
```

Vérification de la mise en place du routage

```
root@DS1: ~#cat /proc/sys/net/ipv4/ip_forward
1
```

5. Configuration du poste client Ubuntu (Desktop 24.04 LTS).

Récupération de l'ISO ubuntu-24.04.1-desktop-amd64, création de la VM UD1 et sélection du mode Réseau Interne (LAN)



Configuration IP via Network Manager (IP: 192.168.4.1/24, GW: 192.168.4.254, DNS: 172.17.254.1)

Vérification de la configuration IP de la carte réseau

```
ubuntu@ubuntu:~$ ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group defaul
t qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host noprefixroute
       valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP
group default qlen 1000
    link/ether 08:00:27:9a:bb:cf brd ff:ff:ff:ff:ff:ff
    inet 192.168.4.1/24 brd 192.168.4.255 scope global noprefixroute enp0s3
       valid_lft forever preferred_lft forever
ubuntu@ubuntu:~$
```

Consultation de la table de routage et de la route par défaut

```
ubuntu@ubuntu: ~
ubuntu@ubuntu:~$ ip route
default via 192.168.4.254 dev enp0s3 proto static metric 20100
192.168.4.0/24 dev enp0s3 proto kernel scope link src 192.168.4.1 metric 100
```

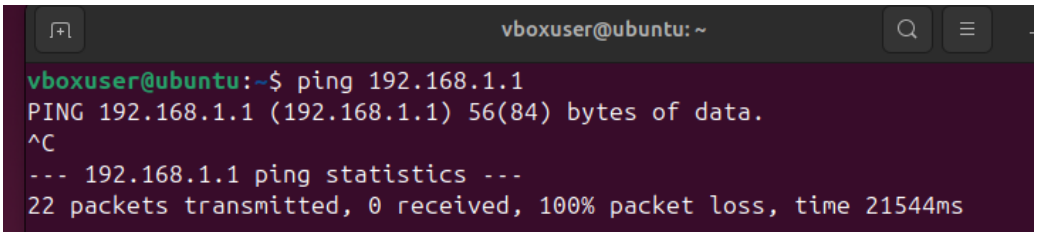
Test de connectivité par ping depuis UD1 vers les deux interfaces de DS1

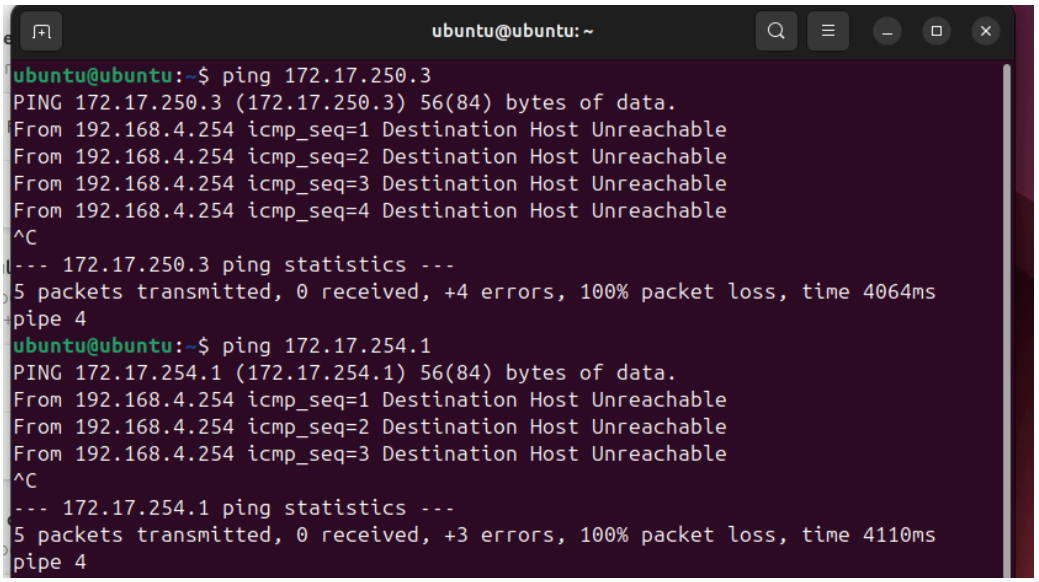
```
ubuntu@ubuntu:~$ ping -c 3 192.168.4.254
PING 192.168.4.254 (192.168.4.254) 56(84) bytes of data.
64 bytes from 192.168.4.254: icmp_seq=1 ttl=64 time=1.25 ms
64 bytes from 192.168.4.254: icmp_seq=2 ttl=64 time=2.84 ms
64 bytes from 192.168.4.254: icmp_seq=3 ttl=64 time=1.59 ms

--- 192.168.4.254 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2010ms
rtt min/avg/max/mdev = 1.245/1.891/2.842/0.686 ms
ubuntu@ubuntu:~$ ping -c 3 172.17.101.204
PING 172.17.101.204 (172.17.101.204) 56(84) bytes of data.
64 bytes from 172.17.101.204: icmp_seq=1 ttl=64 time=1.29 ms
64 bytes from 172.17.101.204: icmp_seq=2 ttl=64 time=1.22 ms
64 bytes from 172.17.101.204: icmp_seq=3 ttl=64 time=1.28 ms

--- 172.17.101.204 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2006ms
rtt min/avg/max/mdev = 1.219/1.261/1.289/0.030 ms
ubuntu@ubuntu:~$
```

Test de ping vers l'interface du routeur Stormshield (172.17.250.3) et le serveur Roi (172.17.254.1)

Observation attendue : Le ping échoue (pas de réponse ICMP Echo reply)

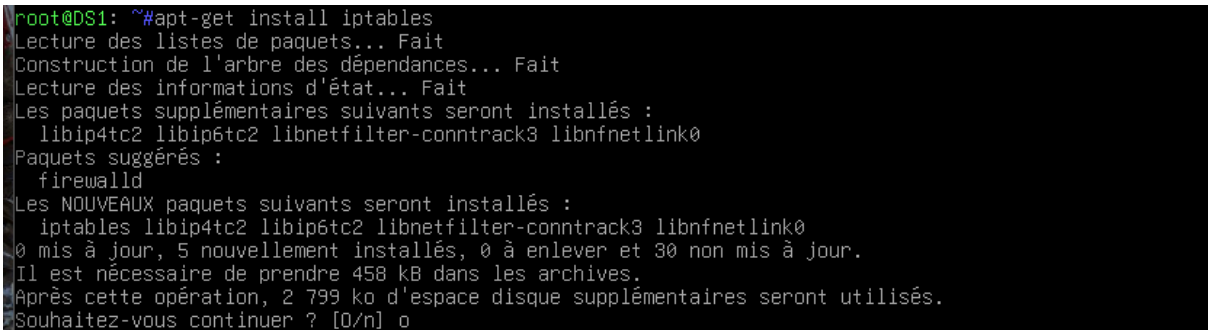
Cause : pour stormshield c'est normal il n'accepte pas les ping et pour le serveur roi c'est la translation d'address qui n'a pas été activé pour l'instant





6. Configuration du NAT sur le serveur DS1.

Installation du paquet iptables



Mise en place de l'IP Masquerading via la politique MASQUERADE

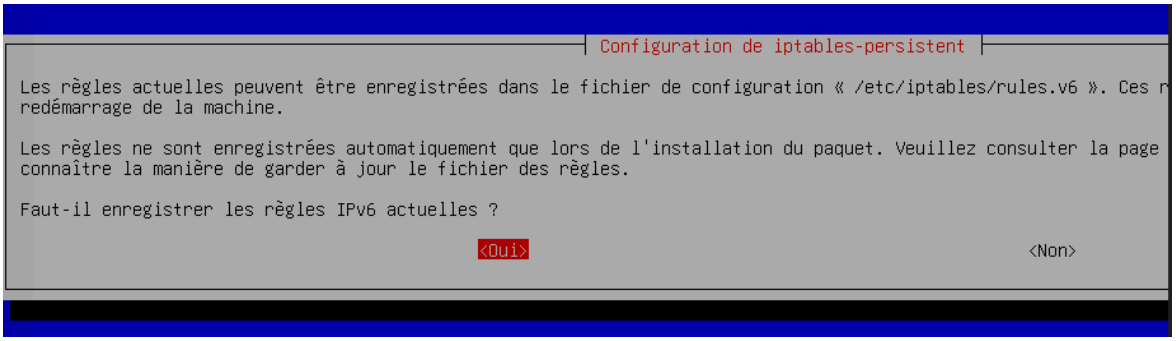
```
root@DS1: ~#iptables -t nat -A POSTROUTING -o enp0s3 -s 192.168.4.0/24 -j MASQUERADE
root@DS1: ~#iptables -t nat -L -v
Chain PREROUTING (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination

Chain INPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination

Chain POSTROUTING (policy ACCEPT 1 packets, 70 bytes)
 pkts bytes target     prot opt in     out     source               destination
    0     0 MASQUERADE  all  --  any    enp0s8  192.168.4.0/24       anywhere
    0     0 MASQUERADE  all  --  any    enp0s3  192.168.4.0/24       anywhere
```

Installation du paquet iptables-persistent

```
root@DS1: ~#apt-get install iptables-persistent
```

```
root@DS1: ~#apt-get install iptables-persistent
Lecture des listes de paquets... Fait
Construction de l'arbre des dépendances... Fait
Lecture des informations d'état... Fait
iptables-persistent est déjà la version la plus récente (1.0.23).
0 mis à jour, 0 nouvellement installés, 0 à enlever et 30 non mis à jour.
root@DS1: ~#
```

Enregistrement des règles dans /etc/iptables/rules.v4 et rules.v6



Redémarrage du système

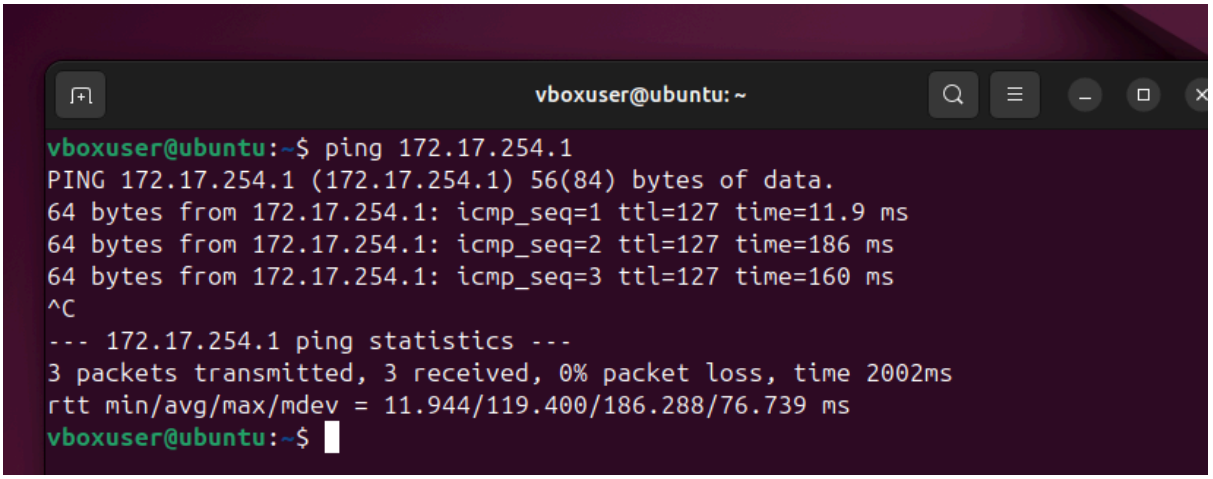
```
root@DS1: ~#reboot
```

Vérification de l'existence de la règle NAT

```
root@DS1: ~#iptables -t nat -L -v
Chain PREROUTING (policy ACCEPT 8 packets, 2254 bytes)
 pkts bytes target     prot opt in     out     source               destination

Chain INPUT (policy ACCEPT 2 packets, 612 bytes)
 pkts bytes target     prot opt in     out     source               destination

Chain OUTPUT (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination

Chain POSTROUTING (policy ACCEPT 0 packets, 0 bytes)
 pkts bytes target     prot opt in     out     source               destination
    0     0 MASQUERADE  all  --  any    enp0s8  192.168.4.0/24       anywhere
    0     0 MASQUERADE  all  --  any    enp0s3  192.168.4.0/24       anywhere
root@DS1: ~#
```

```
root@DS1: ~#iptables -t nat -L
Chain PREROUTING (policy ACCEPT)
target     prot opt source               destination

Chain INPUT (policy ACCEPT)
target     prot opt source               destination

Chain OUTPUT (policy ACCEPT)
target     prot opt source               destination

Chain POSTROUTING (policy ACCEPT)
target     prot opt source               destination
MASQUERADE  all  --  192.168.4.0/24       anywhere
MASQUERADE  all  --  192.168.4.0/24       anywhere
root@DS1: ~#
```

Test du bon fonctionnement du routage et du NAT depuis UD1 vers 172.17.250.3 ou 172.17.254.1 et Réception attendue de la trame ICMP Echo reply



Installation du paquet tcpdump sur DS1

```
root@DS1: ~#apt-get install tcpdump
Lecture des listes de paquets... Fait
Construction de l'arbre des dépendances... Fait
Lecture des informations d'état... Fait
Les paquets supplémentaires suivants seront installés :
  libpcap0.8t64
Les NOUVEAUX paquets suivants seront installés :
  libpcap0.8t64 tcpdump
0 mis à jour, 2 nouvellement installés, 0 à enlever et 30 non mis à jour.
Il est nécessaire de prendre 640 kB dans les archives.
Après cette opération, 1 775 ko d'espace disque supplémentaires seront utilisés.
Souhaitez-vous continuer ? [O/n] o
Réception de : 1 http://deb.debian.org/debian trixie/main amd64 libpcap0.8t64 amd64 1.10.5-2 [169 kB]
0% [1 libpcap0.8t64 3 506 B/169 kB 2%]_
```

Capture des trames ICMP sur chaque interface de DS1 avec tcpdump

```
root@DS1: ~#tcpdump -i enp0s3 icmp -n
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), snapshot length 262144 bytes

13:38:22.821925 IP 172.17.101.204 > 172.17.254.1: ICMP echo request, id 3507, seq 1, length 64
13:38:23.178479 IP 172.17.254.1 > 172.17.101.204: ICMP echo reply, id 3507, seq 1, length 64
13:38:23.822751 IP 172.17.101.204 > 172.17.254.1: ICMP echo request, id 3507, seq 2, length 64
13:38:24.111877 IP 172.17.254.1 > 172.17.101.204: ICMP echo reply, id 3507, seq 2, length 64
13:38:24.824762 IP 172.17.101.204 > 172.17.254.1: ICMP echo request, id 3507, seq 3, length 64
13:38:24.837305 IP 172.17.254.1 > 172.17.101.204: ICMP echo reply, id 3507, seq 3, length 64
13:38:25.829566 IP 172.17.101.204 > 172.17.254.1: ICMP echo request, id 3507, seq 4, length 64
13:38:26.083985 IP 172.17.254.1 > 172.17.101.204: ICMP echo reply, id 3507, seq 4, length 64
13:38:26.832513 IP 172.17.101.204 > 172.17.254.1: ICMP echo request, id 3507, seq 5, length 64
13:38:27.127498 IP 172.17.254.1 > 172.17.101.204: ICMP echo reply, id 3507, seq 5, length 64
^C
10 packets captured
10 packets received by filter
0 packets dropped by kernel
root@DS1: ~#tcpdump -i enp0s8 icmp -n
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on enp0s8, link-type EN10MB (Ethernet), snapshot length 262144 bytes
^[      13:42:05.789565 IP 192.168.4.1 > 172.17.254.1: ICMP echo request, id 3518, seq 1, length 64
13:42:05.938640 IP 172.17.254.1 > 192.168.4.1: ICMP echo reply, id 3518, seq 1, length 64
13:42:06.790979 IP 192.168.4.1 > 172.17.254.1: ICMP echo request, id 3518, seq 2, length 64
13:42:07.500582 IP 172.17.254.1 > 192.168.4.1: ICMP echo reply, id 3518, seq 2, length 64
13:42:07.790734 IP 192.168.4.1 > 172.17.254.1: ICMP echo request, id 3518, seq 3, length 64
13:42:08.507537 IP 172.17.254.1 > 192.168.4.1: ICMP echo reply, id 3518, seq 3, length 64
13:42:08.793007 IP 192.168.4.1 > 172.17.254.1: ICMP echo request, id 3518, seq 4, length 64
13:42:09.421566 IP 172.17.254.1 > 192.168.4.1: ICMP echo reply, id 3518, seq 4, length 64
```

Observation de l'IP source originale (192.168.4.1) sur enp0s8 avant translation Vérification du bon fonctionnement de la translation et de la résolution DNS par ping vers www.ac-nice.fr

```
root@DS1: ~#ping www.ac-nice.fr
PING www.ac-nice.fr.cdn.cloudflare.net (141.101.90.105) 56(84) bytes of data.
64 bytes from 141.101.90.105: icmp_seq=1 ttl=53 time=1019 ms
64 bytes from 141.101.90.105: icmp_seq=2 ttl=53 time=308 ms
64 bytes from 141.101.90.105: icmp_seq=3 ttl=53 time=491 ms
^C
--- www.ac-nice.fr.cdn.cloudflare.net ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2079ms
rtt min/avg/max/mdev = 307.788/605.962/1019.006/301.500 ms
```

```
root@DS1: ~#tcpdump -i enp0s8 icmp -n
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on enp0s8, link-type EN10MB (Ethernet), snapshot length 262144 bytes
13:45:01.230777 IP 192.168.4.1 > 141.101.90.104: ICMP echo request, id 3527, seq 1, length 64
13:45:01.360969 IP 141.101.90.104 > 192.168.4.1: ICMP echo reply, id 3527, seq 1, length 64
13:45:02.232991 IP 192.168.4.1 > 141.101.90.104: ICMP echo request, id 3527, seq 2, length 64
13:45:03.236103 IP 192.168.4.1 > 141.101.90.104: ICMP echo request, id 3527, seq 3, length 64
13:45:03.578182 IP 141.101.90.104 > 192.168.4.1: ICMP echo reply, id 3527, seq 3, length 64
13:45:03.578663 IP 141.101.90.104 > 192.168.4.1: ICMP echo reply, id 3527, seq 2, length 64
13:45:04.242171 IP 192.168.4.1 > 141.101.90.104: ICMP echo request, id 3527, seq 4, length 64
13:45:04.582097 IP 141.101.90.104 > 192.168.4.1: ICMP echo reply, id 3527, seq 4, length 64
^C
8 packets captured
8 packets received by filter
0 packets dropped by kernel
root@DS1: ~#tcpdump -i enp0s3 icmp -n
tcpdump: verbose output suppressed, use -v[v]... for full protocol decode
listening on enp0s3, link-type EN10MB (Ethernet), snapshot length 262144 bytes
13:45:28.254629 IP 172.17.101.204 > 141.101.90.106: ICMP echo request, id 3532, seq 1, length 64
13:45:28.728767 IP 141.101.90.106 > 172.17.101.204: ICMP echo reply, id 3532, seq 1, length 64
13:45:29.256391 IP 172.17.101.204 > 141.101.90.106: ICMP echo request, id 3532, seq 2, length 64
13:45:29.518707 IP 141.101.90.106 > 172.17.101.204: ICMP echo reply, id 3532, seq 2, length 64
13:45:30.257430 IP 172.17.101.204 > 141.101.90.106: ICMP echo request, id 3532, seq 3, length 64
13:45:30.419570 IP 141.101.90.106 > 172.17.101.204: ICMP echo reply, id 3532, seq 3, length 64
^C
6 packets captured
6 packets received by filter
0 packets dropped by kernel
S1: ~#_
```

```
vboxuser@ubuntu: ~
64 bytes from 172.17.254.1: icmp_seq=3 ttl=127 time=615 ms
^C
--- 172.17.254.1 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 1999ms
rtt min/avg/max/mdev = 606.210/609.881/614.958/3.707 ms
vboxuser@ubuntu:~$ ping www.ac-nice.fr
PING www.ac-nice.fr.cdn.cloudflare.net (141.101.90.104) 56(84) bytes of data.
64 bytes from 141.101.90.104: icmp_seq=1 ttl=52 time=132 ms
64 bytes from 141.101.90.104: icmp_seq=3 ttl=52 time=344 ms
64 bytes from 141.101.90.104: icmp_seq=2 ttl=52 time=1347 ms
^C
--- www.ac-nice.fr.cdn.cloudflare.net ping statistics ---
4 packets transmitted, 3 received, 25% packet loss, time 3010ms
rtt min/avg/max/mdev = 131.739/607.515/1346.711/529.830 ms, pipe 2
vboxuser@ubuntu:~$ ping www.ac-nice.fr
PING www.ac-nice.fr.cdn.cloudflare.net (141.101.90.106) 56(84) bytes of data.
64 bytes from 141.101.90.106: icmp_seq=1 ttl=52 time=476 ms
64 bytes from 141.101.90.106: icmp_seq=2 ttl=52 time=265 ms
64 bytes from 141.101.90.106: icmp_seq=3 ttl=52 time=165 ms
^C
--- www.ac-nice.fr.cdn.cloudflare.net ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 164.517/301.808/476.058/129.843 ms
vboxuser@ubuntu:~$
```

Test équivalent via navigateur web vers le site de l'Académie de Nice