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## **Faculté des Sciences et Technologie**

(FST)

**Niveau : L3-FST**

### **Systèmes**

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## **Projet 4 : Configuration Réseau sur Ubuntu et Dépannage des Problèmes**

### **Réseau Objectifs du Projet :**

**Apprendre à configurer un réseau sur Ubuntu.**

**Comprendre et appliquer la configuration IP statique et dynamique (DHCP).**

**Utiliser des outils de dépannage réseau pour diagnostiquer et résoudre des problèmes courants.**

## 1. Préparation et Installation de l'Environnement :

Installer les outils réseau nécessaires tels que net-tools , iproute2 , et dnsutils

```
Douda@Ubuntu-24:~$ sudo apt update
[sudo] password for Douda:
Hit:1 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:2 http://ht.archive.ubuntu.com/ubuntu noble InRelease
Hit:3 http://ht.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:4 http://ht.archive.ubuntu.com/ubuntu noble-backports InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
216 packages can be upgraded. Run 'apt list --upgradable' to see them.
Douda@Ubuntu-24:~$ sudo apt install -y net-tools
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  net-tools
0 upgraded, 1 newly installed, 0 to remove and 216 not upgraded.
Need to get 204 kB of archives.
After this operation, 811 kB of additional disk space will be used.
Get:1 http://ht.archive.ubuntu.com/ubuntu noble/main amd64 net-tools amd64 2.10-0.1ubuntu4 [204 kB]
Fetched 204 kB in 1s (184 kB/s)
Selecting previously unselected package net-tools.
(Reading database ... 149057 files and directories currently installed.)
Preparing to unpack .../net-tools_2.10-0.1ubuntu4_amd64.deb ...
Unpacking net-tools (2.10-0.1ubuntu4) ...
Setting up net-tools (2.10-0.1ubuntu4) ...
Processing triggers for man-db (2.12.0-4build2) ...
```

```
Douda@Ubuntu-24:~$ sudo apt install dnsutils
[sudo] password for Douda:
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
dnsutils is already the newest version (1:9.18.30-0ubuntu0.24.04.2).
0 upgraded, 0 newly installed, 0 to remove and 216 not upgraded.
```

## 2. Configuration de l'Adresse IP Statique :

Modification du fichier de configuration réseau. Vérification des changements appliqués.

```
Douda@Ubuntu-24:~$ sudo nano /etc/netplan/01-netcfg.yaml
Douda@Ubuntu-24:~$ sudo netplan apply

** (generate:5518): WARNING **: 19:43:23.299: Permissions for /etc/netplan/01-netcfg.yaml are too open. Netplan configuration should NOT be accessible by others.

** (generate:5518): WARNING **: 19:43:23.299: 'gateway4' has been deprecated, use default routes instead. See the 'Default routes' section of the documentation for more details.

** (generate:5518): WARNING **: 19:43:23.304: Permissions for /etc/netplan/01-network-manager-all.yaml are too open. Netplan configuration should NOT be accessible by others.

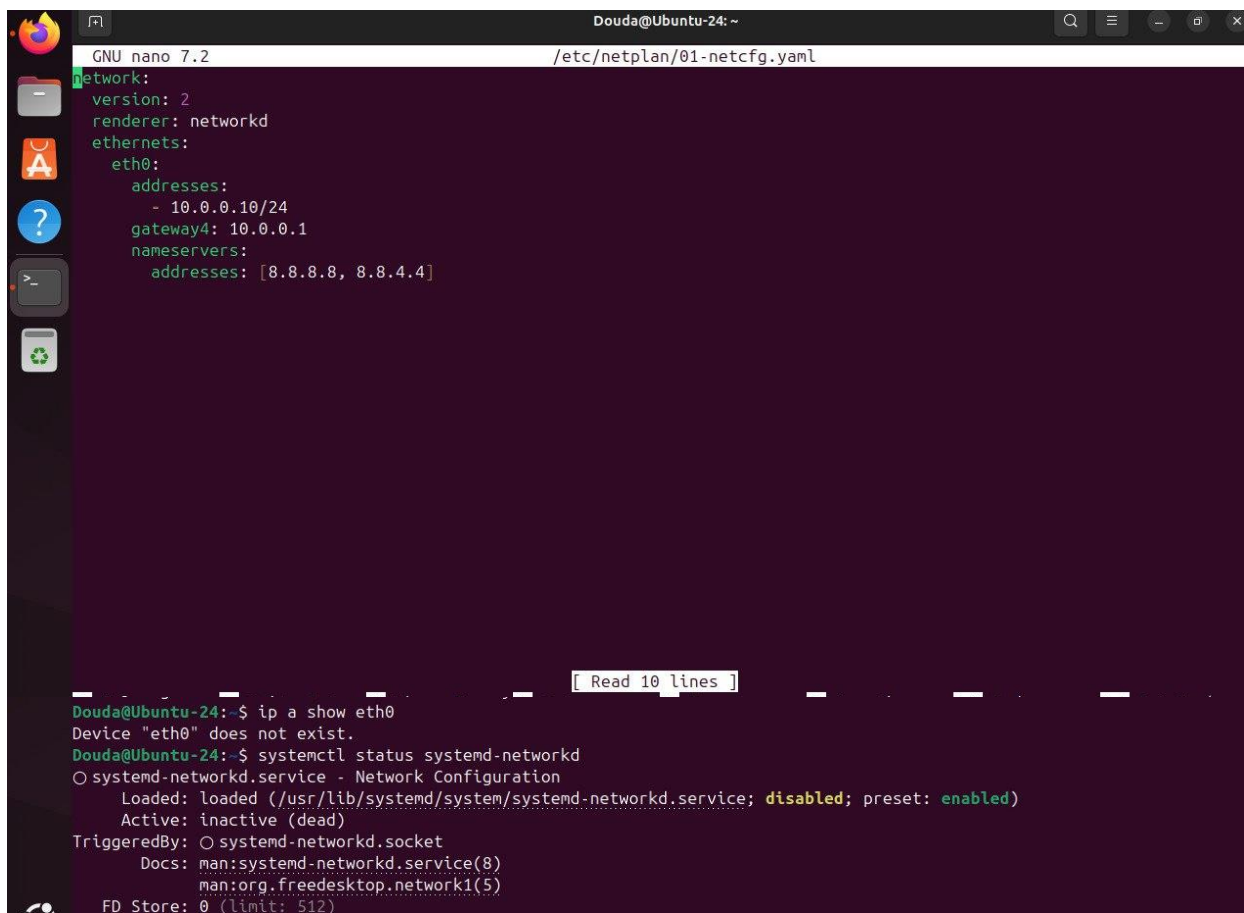
** (process:5517): WARNING **: 19:43:24.618: Permissions for /etc/netplan/01-netcfg.yaml are too open. Netplan configuration should NOT be accessible by others.

** (process:5517): WARNING **: 19:43:24.624: 'gateway4' has been deprecated, use default routes instead. See the 'Default routes' section of the documentation for more details.

** (process:5517): WARNING **: 19:43:24.624: Permissions for /etc/netplan/01-network-manager-all.yaml are too open. Netplan configuration should NOT be accessible by others.

** (process:5517): WARNING **: 19:43:25.017: Permissions for /etc/netplan/01-netcfg.yaml are too open. Netplan configuration should NOT be accessible by others.

** (process:5517): WARNING **: 19:43:25.018: 'gateway4' has been deprecated, use default routes instead. See the 'Default routes' section of the documentation for more details.
```

A terminal window on Ubuntu 24. The top part shows the nano editor editing /etc/netplan/01-netcfg.yaml. The configuration is for network version 2, using networkd as the renderer. It defines an ethernet interface eth0 with IP address 10.0.0.10/24, gateway 10.0.0.1, and DNS servers 8.8.8.8 and 8.8.4.4. The bottom part shows terminal commands and their outputs: 'ip a show eth0' returns an error that the device does not exist; 'systemctl status systemd-networkd' shows the service is loaded but inactive (dead).

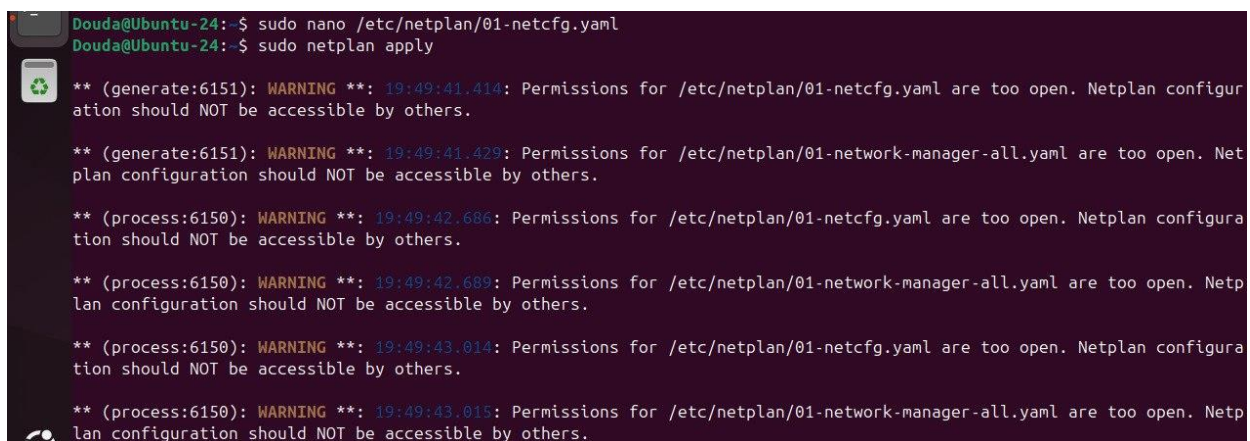
```
GNU nano 7.2 /etc/netplan/01-netcfg.yaml
network:
  version: 2
  renderer: networkd
  ethernet:
    eth0:
      addresses:
        - 10.0.0.10/24
      gateway4: 10.0.0.1
      nameservers:
        addresses: [8.8.8.8, 8.8.4.4]

Douda@Ubuntu-24:~$ ip a show eth0
Device "eth0" does not exist.
Douda@Ubuntu-24:~$ systemctl status systemd-networkd
○ systemd-networkd.service - Network Configuration
   Loaded: loaded (/usr/lib/systemd/system/systemd-networkd.service; disabled; preset: enabled)
   Active: inactive (dead)
   TriggeredBy: ○ systemd-networkd.socket
   Docs: man:systemd-networkd.service(8)
         man:org.freedesktop.network1(5)
   FD Store: 0 (limit: 512)
```

### 3. Configuration DHCP :

**Vérifier l'acquisition automatique de l'adresse IP via DHCP.**

**Analyser les configurations de dhclient pour un dépannage en cas de problème.**

A terminal window showing the execution of 'sudo netplan apply'. The command is successful, but it generates five warnings. Each warning states that the permissions for /etc/netplan/01-netcfg.yaml or /etc/netplan/01-network-manager-all.yaml are too open and should not be accessible by others. The warnings are timestamped and include process IDs.

```
Douda@Ubuntu-24:~$ sudo nano /etc/netplan/01-netcfg.yaml
Douda@Ubuntu-24:~$ sudo netplan apply

** (generate:6151): WARNING **: 19:49:41.414: Permissions for /etc/netplan/01-netcfg.yaml are too open. Netplan configuration should NOT be accessible by others.

** (generate:6151): WARNING **: 19:49:41.429: Permissions for /etc/netplan/01-network-manager-all.yaml are too open. Netplan configuration should NOT be accessible by others.

** (process:6150): WARNING **: 19:49:42.686: Permissions for /etc/netplan/01-netcfg.yaml are too open. Netplan configuration should NOT be accessible by others.

** (process:6150): WARNING **: 19:49:42.689: Permissions for /etc/netplan/01-network-manager-all.yaml are too open. Netplan configuration should NOT be accessible by others.

** (process:6150): WARNING **: 19:49:43.014: Permissions for /etc/netplan/01-netcfg.yaml are too open. Netplan configuration should NOT be accessible by others.

** (process:6150): WARNING **: 19:49:43.015: Permissions for /etc/netplan/01-network-manager-all.yaml are too open. Netplan configuration should NOT be accessible by others.
```

```
GNU nano 7.2 /etc/netplan/01-netcfg.yaml *
network:
  version: 2
  renderer: networkd
  ethernets:
    eth0:
      dhcp4: true

Douda@Ubuntu-24:~$ ip a show eth0
Device "eth0" does not exist.
Douda@Ubuntu-24:~$ ip route show default
default via 10.0.2.2 dev enp0s3 proto dhcp src 10.0.2.15 metric 100
Douda@Ubuntu-24:~$ ip a show enp0s3
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:df:6b:ab brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
        valid_lft 86303sec preferred_lft 86303sec
    inet6 fd00::db43:5a46:927e:bb71/64 scope global temporary dynamic
        valid_lft 86305sec preferred_lft 14305sec
    inet6 fd00::a00:27ff:fedf:6bab/64 scope global dynamic mngtmpaddr
        valid_lft 86305sec preferred_lft 14305sec
    inet6 fe80::a00:27ff:fedf:6bab/64 scope link
        valid_lft forever preferred_lft forever
```

#### 4. Configurer et Vérifier le Résolveur DNS :

Modifier /etc/resolv.conf pour spécifier les serveurs DNS.

Vérifier la résolution DNS à l'aide de commandes comme nslookup , dig , et host .

```
FD Store: 0 (limit: 512)
Douda@Ubuntu-24:~$ sudo nano /etc/resolv.conf
Douda@Ubuntu-24:~$ nslookup google.com
Server:      8.8.8.8
Address:     8.8.8.8#53

Non-authoritative answer:
Name:   google.com
Address: 142.250.217.174
Name:   google.com
Address: 2607:f8b0:4008:80a::200e

Douda@Ubuntu-24:~$ dig ubuntu.com

;<<>> DiG 9.18.30-0ubuntu0.24.04.2-Ubuntu <<>> ubuntu.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 42223
;; flags: qr rd ra; QUERY: 1, ANSWER: 3, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:; udp: 512
;; QUESTION SECTION:
;ubuntu.com.                IN      A

;; ANSWER SECTION:
ubuntu.com.                 14      IN      A      185.125.190.29
```



```
GNU nano 7.2 /etc/resolv.conf
# This is /run/systemd/resolve/stub-resolv.conf managed by man:systemd-resolved(8).
# Do not edit.
#
# This file might be symlinked as /etc/resolv.conf. If you're looking at
# /etc/resolv.conf and seeing this text, you have followed the symlink.
#
# This is a dynamic resolv.conf file for connecting local clients to the
# internal DNS stub resolver of systemd-resolved. This file lists all
# configured search domains.
#
# Run "resolvectl status" to see details about the uplink DNS servers
# currently in use.
#
# Third party programs should typically not access this file directly, but only
# through the symlink at /etc/resolv.conf. To manage man:resolv.conf(5) in a
# different way, replace this symlink by a static file or a different symlink.
#
# See man:systemd-resolved.service(8) for details about the supported modes of
# operation for /etc/resolv.conf.

nameserver 8.8.8.8
nameserver 1.1.1.1

;; OPT PSEUDOSECTION:
;; EDNS: version: 0, flags:; udp: 512
;; QUESTION SECTION:
;ubuntu.com.                IN      A

;; ANSWER SECTION:
ubuntu.com.                 14      IN      A      185.125.190.29
ubuntu.com.                 14      IN      A      185.125.190.20
ubuntu.com.                 14      IN      A      185.125.190.21

;; Query time: 54 msec
;; SERVER: 8.8.8.8#53(8.8.8.8) (UDP)
;; WHEN: Fri Feb 14 19:53:06 UTC 2025
;; MSG SIZE rcvd: 87

Douda@Ubuntu-24:~$ host example.com
example.com has address 23.215.0.136
example.com has address 96.7.128.175
example.com has address 23.192.228.80
example.com has address 96.7.128.198
example.com has address 23.215.0.138
example.com has address 23.192.228.84
example.com has IPv6 address 2600:1408:ec00:36::1736:7f31
example.com has IPv6 address 2600:1406:bc00:53::b81e:94c8
example.com has IPv6 address 2600:1408:ec00:36::1736:7f24
example.com has IPv6 address 2600:1406:bc00:53::b81e:94ce
example.com has IPv6 address 2600:1406:3a00:21::173e:2e66
example.com has IPv6 address 2600:1406:3a00:21::173e:2e65
example.com mail is handled by 0 .
```

## 5. Utilisation des Commandes de Diagnostic Réseau :

**ping** : Tester la connectivité réseau.

**traceroute** ou **tracpath** : Suivre le chemin d'un paquet jusqu'à sa destination. **netstat** ou **ss** : Examiner les connexions réseau.

**ifconfig** ou **ip** : Vérifier l'état des interfaces réseau.

```
Douda@Ubuntu-24: ~  
Douda@Ubuntu-24:~$ ping -c 4 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=255 time=27.3 ms  
64 bytes from 8.8.8.8: icmp_seq=2 ttl=255 time=36.4 ms  
64 bytes from 8.8.8.8: icmp_seq=3 ttl=255 time=27.4 ms  
64 bytes from 8.8.8.8: icmp_seq=4 ttl=255 time=30.9 ms  
  
--- 8.8.8.8 ping statistics ---  
4 packets transmitted, 4 received, 0% packet loss, time 3003ms  
rtt min/avg/max/mdev = 27.326/30.510/36.358/3.669 ms  
Douda@Ubuntu-24:~$  
  
Douda@Ubuntu-24:~$ traceroute google.com  
Command 'traceroute' not found, but can be installed with:  
sudo apt install inetutils-traceroute # version 2:2.4-3ubuntu1, or  
sudo apt install traceroute # version 1:2.1.5-1  
Douda@Ubuntu-24:~$ sudo apt install traceroute  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
The following NEW packages will be installed:  
  traceroute  
0 upgraded, 1 newly installed, 0 to remove and 216 not upgraded.  
Need to get 60.5 kB of archives.  
After this operation, 162 kB of additional disk space will be used.  
Get:1 http://ht.archive.ubuntu.com/ubuntu noble/universe amd64 traceroute amd64 1:2.1.5-1 [60.5 kB]  
Fetched 60.5 kB in 1s (118 kB/s)  
Selecting previously unselected package traceroute.  
(Reading database ... 149109 files and directories currently installed.)  
Preparing to unpack .../traceroute_1%3a2.1.5-1_amd64.deb ...  
Unpacking traceroute (1:2.1.5-1) ...  
Setting up traceroute (1:2.1.5-1) ...  
update-alternatives: using /usr/bin/traceroute.db to provide /usr/bin/traceroute (traceroute) in auto mode  
Douda@Ubuntu-24:~$ sudo apt install inetutils-traceroute  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
The following NEW packages will be installed:  
  inetutils-traceroute  
0 upgraded, 1 newly installed, 0 to remove and 216 not upgraded.  
Need to get 42.2 kB of archives.  
After this operation, 113 kB of additional disk space will be used.  
Get:1 http://ht.archive.ubuntu.com/ubuntu noble/universe amd64 inetutils-traceroute amd64 2:2.5-3ubuntu4 [42.2 kB]  
Fetched 42.2 kB in 0s (95.6 kB/s)  
Selecting previously unselected package inetutils-traceroute.  
(Reading database ... 149129 files and directories currently installed.)  
Preparing to unpack .../inetutils-traceroute_2%3a2.5-3ubuntu4_amd64.deb ...  
Unpacking inetutils-traceroute (2:2.5-3ubuntu4) ...  
Setting up inetutils-traceroute (2:2.5-3ubuntu4) ...  
Processing triggers for man-db (2.12.0-4build2) ...  
Douda@Ubuntu-24:~$ traceroute google.com  
traceroute to google.com (142.250.217.174), 30 hops max, 60 byte packets  
 1  10.0.2.2 (10.0.2.2)  1.022 ms  0.316 ms  0.955 ms  
 2  * * *  
 3  * * *  
 4  * * *  
 5  * * *  
 6  * * *
```

```

Douda@Ubuntu-24:~$ ss -tuln
Netid      State      Recv-Q     Send-Q      Local Address:Port      Peer Address:Port      Process
udp        UNCONN     0           0            0.0.0.0:5353             0.0.0.0:*
udp        UNCONN     0           0            127.0.0.54:53            0.0.0.0:*
udp        UNCONN     0           0            127.0.0.53%lo:53         0.0.0.0:*
udp        UNCONN     0           0            0.0.0.0:35167            0.0.0.0:*
udp        UNCONN     0           0            [::]:5353                [::]:*
udp        UNCONN     0           0            [::]:45156                [::]:*
tcp        LISTEN     0           4096         127.0.0.54:53            0.0.0.0:*
tcp        LISTEN     0           4096         127.0.0.1:631            0.0.0.0:*
tcp        LISTEN     0           4096         127.0.0.53%lo:53         0.0.0.0:*
tcp        LISTEN     0           4096         [::1]:631                [::]:*

Douda@Ubuntu-24:~$ ip addr
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 pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:df:6b:ab brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
        valid_lft 85867sec preferred_lft 85867sec
    inet6 fd00::78cc:a67e:31f1:ef3/64 scope global temporary dynamic
        valid_lft 86331sec preferred_lft 14331sec
    inet6 fd00::a00:27ff:fedf:6bab/64 scope global dynamic mngtmpaddr
        valid_lft 86331sec preferred_lft 14331sec
    inet6 fe80::a00:27ff:fedf:6bab/64 scope link
        valid_lft forever preferred_lft forever

```

## 6. Résolution des Problèmes Courants :

### Problème de connectivité :

Analyser la configuration de la passerelle par défaut avec `route -n` ou `ip route`. Examiner les règles de pare-feu avec `iptables` ou `ufw` .

### Problème de DNS :

Vérifier que les serveurs DNS configurés sont accessibles. Réinitialiser le service réseau avec `systemctl restart NetworkManager` . Problèmes de configuration IP :

Valider l'adresse IP attribuée avec `ip a` et comparer avec la configuration attendue.

```

Douda@Ubuntu-24:~$ ip route show
default via 10.0.2.2 dev enp0s3 proto dhcp src 10.0.2.15 metric 100
10.0.2.0/24 dev enp0s3 proto kernel scope link src 10.0.2.15 metric 100
Douda@Ubuntu-24:~$ sudo ufw status
Status: inactive
Douda@Ubuntu-24:~$ systemctl restart NetworkManager

```



```
udp UNCONN 0 0 127.0.0.53%lo:53 0.0.0.0:*
udp UNCONN 0 0 0.0.0.0:35167 0.0.0.0:*
udp UNCONN 0 0 [::]:5353 [::]:*
udp UNCONN 0 0 [::]:45156 [::]:*
tcp LISTEN 0 4096 127.0.0.54:53 0.0.0.0:*
tcp LISTEN 0 4096 127.0.0.1:631 0.0.0.0:*
tcp LISTEN 0 4096 0.0.0.0:*
tcp LISTEN 0 4096 [::]:*

Douda@Ubuntu-24:~$ ip addr
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 pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:df:6b:ab brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
        valid_lft 86335sec preferred_lft 86335sec
    inet6 fd00::6c97:5249:c712:7ccb/64 scope global temporary dynamic
        valid_lft 86336sec preferred_lft 14336sec
    inet6 fd00::a00:27ff:fedf:6bab/64 scope global dynamic mngtmpaddr
        valid_lft 86336sec preferred_lft 14336sec
    inet6 fe80::a00:27ff:fedf:6bab/64 scope link
        valid_lft forever preferred_lft forever

Douda@Ubuntu-24:~$ ip route show
default via 10.0.2.2 dev enp0s3 proto dhcp src 10.0.2.15 metric 100
10.0.2.0/24 dev enp0s3 proto kernel scope link src 10.0.2.15 metric 100

Douda@Ubuntu-24:~$ sudo ufw status
Status: inactive

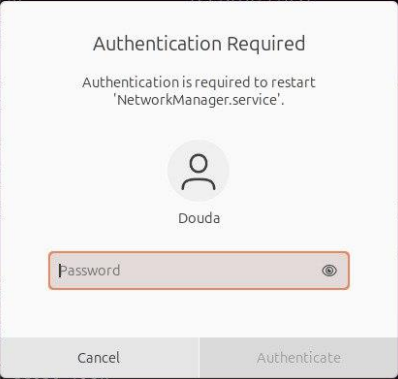
Douda@Ubuntu-24:~$ systemctl restart NetworkManager

Douda@Ubuntu-24:~$ sudo nano /etc/resolv.conf
Douda@Ubuntu-24:~$ 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 pfifo_fast state UP group default qlen 1000
    link/ether 08:00:27:df:6b:ab brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
        valid_lft 86335sec preferred_lft 86335sec
    inet6 fd00::6c97:5249:c712:7ccb/64 scope global temporary dynamic
        valid_lft 86336sec preferred_lft 14336sec
    inet6 fd00::a00:27ff:fedf:6bab/64 scope global dynamic mngtmpaddr
        valid_lft 86336sec preferred_lft 14336sec
    inet6 fe80::a00:27ff:fedf:6bab/64 scope link
        valid_lft forever preferred_lft forever

Douda@Ubuntu-24:~$ ip -4 addr show eth0
Device "eth0" does not exist.

Douda@Ubuntu-24:~$ ip -4 addr show enp0s3
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic noprefixroute enp0s3
        valid_lft 86162sec preferred_lft 86162sec

Douda@Ubuntu-24:~$
```



## **Conclusion**

Ce projet a permis de maîtriser les fondamentaux de la configuration et du dépannage réseau sur Ubuntu, en couvrant des compétences essentielles pour tout administrateur système.

### **Points clés réalisés**

#### **1. Configuration IP statique et DHCP :**

- Utilisation de netplan pour définir des adresses IP fixes ou activer l'acquisition dynamique via DHCP.
- Validation des paramètres avec des outils comme ip a, ip route, et systemd-networkd.

#### **2. Gestion DNS :**

- Configuration temporaire ou permanente des serveurs DNS via /etc/resolv.conf ou Netplan.
- Tests de résolution avec nslookup, dig, et host.

#### **3. Diagnostic réseau :**

- Utilisation de commandes comme ping, traceroute, ss, et netstat pour analyser la connectivité, les ports ouverts, et le routage.

#### **4. Dépannage efficace :**

- Identification des problèmes de passerelle (ip route), de pare-feu (ufw), ou de DNS (systemctl restart NetworkManager).
- Vérification des adresses IP et comparaison avec les configurations attendues (ip -4 addr show eth0).

En résumé, ce projet renforce les bases nécessaires pour aborder des défis réseau complexes avec confiance.