



## Réalisation du projet SAE 2.01 : Mise en place d'une infrastructure de réseau d'entreprise

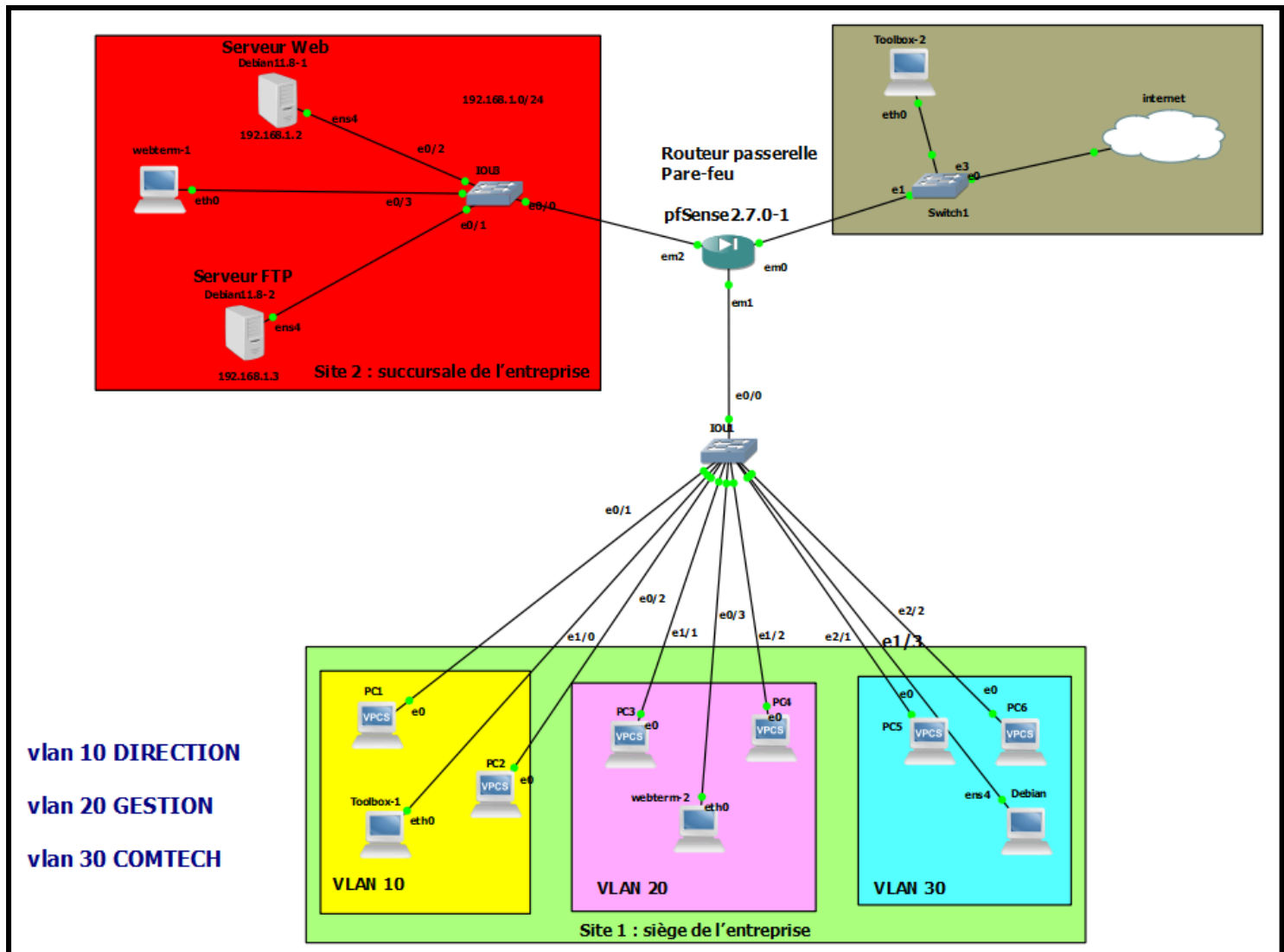
### PROBLÉMATIQUE PROFESSIONNELLE :

Vous travaillez au sein d'une société de services du domaine du numérique.

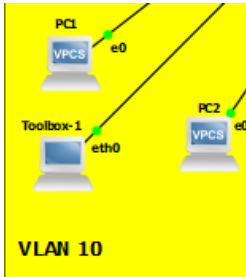
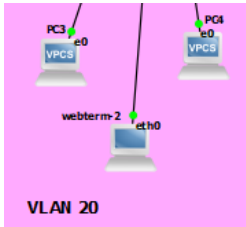
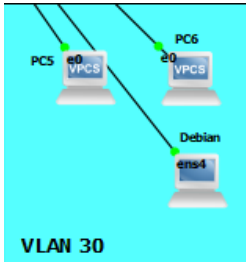
- Une entreprise passe une commande à votre société : Elle demande de déployer un réseau d'entreprise dans son nouveau siège.
- Votre mission consistera à :
  - Proposer et mettre en place une infrastructure de réseau d'entreprise dotée de services réseaux et de règles de sécurité ;
  - Mettre en place une DMZ pour héberger les serveurs publics de l'entreprise ;
  - Configurer l'accès à Internet ;
  - Mettre en place des règles de sécurité ;

- Produire une documentation technique sur la solution déployée.

## **Maquette du réseau de l'entreprise :**



### Étape 1 : Élaboration du plan d'adressage IPv4 :

Périphérique	interface	adresse ip	Masque	passerelle
serveur ftp	ens4	192.168.1.3	255.255.255.0	192.168.1.1
serveur web	ens4	192.168.1.2	255.255.255.0	192.168.1.1
pfsense	em0	192.168.122.19 (dhcp)	255.255.255.0	
	em1			
	em1.10	192.168.10.1	255.255.255.0	
	em1.20	192.168.20.1	255.255.255.0	
	em1.30	192.168.30.1	255.255.255.0	
	em2	192.168.1.1	255.255.255.0	
vlan 10		192.168.10.10-100(dhcp)	255.255.255.0	192.168.10.1
vlan 20		192.168.20.10-100(dhcp)	255.255.255.0	192.168.20.1
vlan 30		192.168.30.10-100(dhcp)	255.255.255.0	192.168.30.1

## Étape 2 : création d'un réseau segmenté avec la mise en place et la configuration des VLAN et Mise en place et configuration du routage inter-VLAN .

configure terminal

vlan 10

name Direction

no shut

int vlan 10

no shut

exit

vlan 20

name Gestion

no shut

int vlan 20

no shut

exit

vlan 30

name COMTECH

no shut

int vlan 30

no shut

exit

interface eth0/0

switchport trunk encapsulation dot1q

switchport mode trunk

no shut

exit

interface range eth0/1-3

switchport mode access

switchport access vlan 10

no shut

exit

interface range eth1/0-3

switchport mode access

switchport access vlan 20

no shut

exit

interface range eth2/0-3

switchport mode access

switchport access vlan 30

no shut

end

wr

## Configuration du switch

```
IOU2#show vlan br
```

VLAN	Name	Status	Ports
1	default	active	Et3/0, Et3/1, Et3/2, Et3/3
10	Direction	active	Et0/1, Et0/2, Et0/3
20	Gestion	active	Et1/0, Et1/1, Et1/2, Et1/3
30	COMTECH	active	Et2/0, Et2/1, Et2/2, Et2/3
1002	fddi-default	act/unsup	
1003	token-ring-default	act/unsup	
1004	fddinet-default	act/unsup	
1005	trnet-default	act/unsup	

```
IOU2#
```

```
IOU2#sh ip int br
```

Interface	IP-Address	OK?	Method	Status	Protocol
Ethernet0/0	unassigned	YES	unset	up	up
Ethernet0/1	unassigned	YES	unset	up	up
Ethernet0/2	unassigned	YES	unset	up	up
Ethernet0/3	unassigned	YES	unset	up	up
Ethernet1/0	unassigned	YES	unset	up	up
Ethernet1/1	unassigned	YES	unset	up	up
Ethernet1/2	unassigned	YES	unset	up	up
Ethernet1/3	unassigned	YES	unset	up	up
Ethernet2/0	unassigned	YES	unset	up	up
Ethernet2/1	unassigned	YES	unset	up	up
Ethernet2/2	unassigned	YES	unset	up	up
Ethernet2/3	unassigned	YES	unset	up	up
Ethernet3/0	unassigned	YES	unset	up	up
Ethernet3/1	unassigned	YES	unset	up	up
Ethernet3/2	unassigned	YES	unset	up	up
Ethernet3/3	unassigned	YES	unset	up	up
Vlan1	unassigned	YES	unset	up	up
Vlan10	unassigned	YES	unset	up	up
Vlan20	unassigned	YES	unset	up	up
Vlan30	unassigned	YES	unset	up	up







```
IOU2#
```

```
IOU2#show int trunk
```

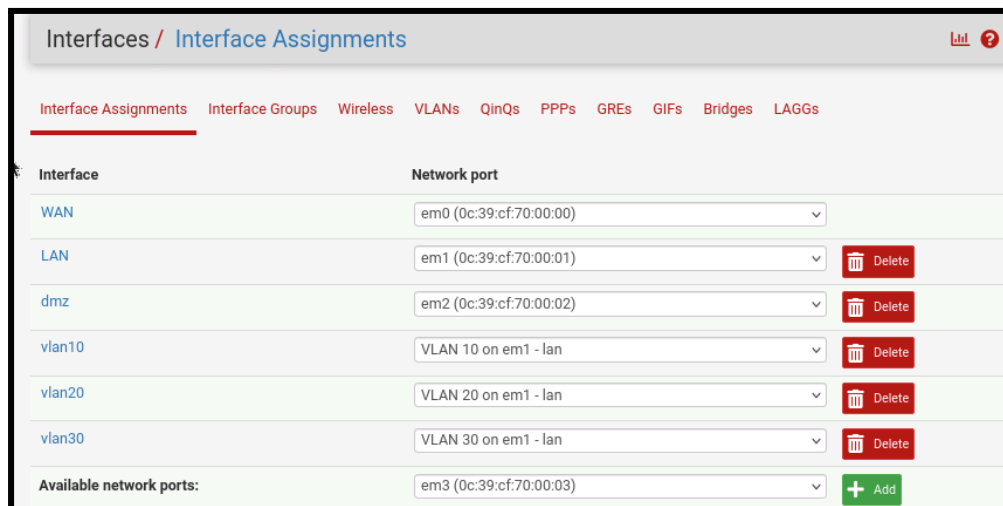
Port	Mode	Encapsulation	Status	Native vlan
Et0/0	on	802.1q	trunking	1
Port	Vlans allowed on trunk			
Et0/0	1-4094			
Port	Vlans allowed and active in management domain			
Et0/0	1,10,20,30			
Port	Vlans in spanning tree forwarding state and not pruned			
Et0/0	1,10,20,30			

## Configuration du pfSense

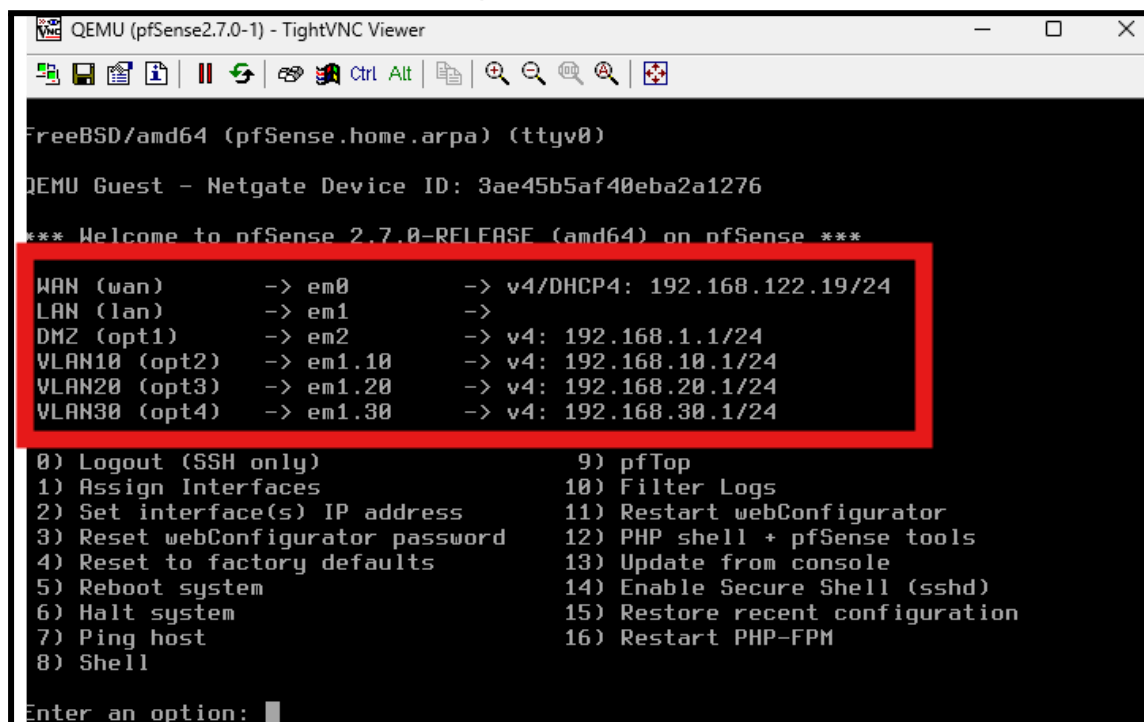
Attribution des vlans au port em1 (LAN)

Interfaces / VLANs					
Interface Assignments Interface Groups Wireless <b>VLANs</b> QinQs PPPs GREs GIFs Bridges LAGGs					
VLAN Interfaces					
Interface	VLAN tag	Priority	Description	Actions	
em1 (lan)	10				
em1 (lan)	20				
em1 (lan)	30				

## Création de l'interface Vlan 10-20-30



## Vérification des attribution des port



## Ping du PC1(vlan1) au PC des autre vlan et serveur WEB et FTP :

```

:  PC1  x  PC2

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Press '?' to get help.

VPCS> ip dhcp
DDORA IP 192.168.10.19/24 GW 192.168.10.1

VPCS> ping 192.168.10.20
84 bytes from 192.168.10.20 icmp_seq=1 ttl=64 time=1.066 ms
84 bytes from 192.168.10.20 icmp_seq=2 ttl=64 time=1.387 ms
84 bytes from 192.168.10.20 icmp_seq=3 ttl=64 time=1.221 ms
84 bytes from 192.168.10.20 icmp_seq=4 ttl=64 time=2.003 ms
84 bytes from 192.168.10.20 icmp_seq=5 ttl=64 time=2.791 ms

VPCS> ping 192.168.20.11
192.168.20.11 icmp_seq=1 timeout
192.168.20.11 icmp_seq=2 timeout
84 bytes from 192.168.20.11 icmp_seq=3 ttl=63 time=4.978 ms
84 bytes from 192.168.20.11 icmp_seq=4 ttl=63 time=2.536 ms
84 bytes from 192.168.20.11 icmp_seq=5 ttl=63 time=3.128 ms

VPCS> ping 192.168.20.18
192.168.20.18 icmp_seq=1 timeout
192.168.20.18 icmp_seq=2 timeout
84 bytes from 192.168.20.18 icmp_seq=3 ttl=63 time=25.336 ms
84 bytes from 192.168.20.18 icmp_seq=4 ttl=63 time=10.192 ms
84 bytes from 192.168.20.18 icmp_seq=5 ttl=63 time=3.690 ms

VPCS> ping 192.168.30.14
192.168.30.14 icmp_seq=1 timeout
192.168.30.14 icmp_seq=2 timeout
84 bytes from 192.168.30.14 icmp_seq=3 ttl=63 time=6.260 ms
84 bytes from 192.168.30.14 icmp_seq=4 ttl=63 time=3.201 ms
84 bytes from 192.168.30.14 icmp_seq=5 ttl=63 time=4.539 ms

VPCS> ping 192.168.30.15
192.168.30.15 icmp_seq=1 timeout
192.168.30.15 icmp_seq=2 timeout
84 bytes from 192.168.30.15 icmp_seq=3 ttl=63 time=11.613 ms
84 bytes from 192.168.30.15 icmp_seq=4 ttl=63 time=4.857 ms
84 bytes from 192.168.30.15 icmp_seq=5 ttl=63 time=5.783 ms

VPCS> ping 192.168.1.2
84 bytes from 192.168.1.2 icmp_seq=1 ttl=63 time=5.469 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=63 time=3.173 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=63 time=3.477 ms
84 bytes from 192.168.1.2 icmp_seq=4 ttl=63 time=4.893 ms
84 bytes from 192.168.1.2 icmp_seq=5 ttl=63 time=4.504 ms

VPCS> ping 192.168.1.3
84 bytes from 192.168.1.3 icmp_seq=1 ttl=63 time=6.739 ms
84 bytes from 192.168.1.3 icmp_seq=2 ttl=63 time=3.692 ms
84 bytes from 192.168.1.3 icmp_seq=3 ttl=63 time=6.358 ms
84 bytes from 192.168.1.3 icmp_seq=4 ttl=63 time=4.732 ms
84 bytes from 192.168.1.3 icmp_seq=5 ttl=63 time=2.820 ms
```

## Ping du PC3(vlan2) au PC des autre vlan et serveur WEB et FTP :

```
⋮ PC1 PC2

Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
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Press '?' to get help.

VPCS> ip dhcp
DDORA IP 192.168.20.11/24 GW 192.168.20.1

VPCS> ping 192.168.10.19
84 bytes from 192.168.10.19 icmp_seq=1 ttl=63 time=5.317 ms
84 bytes from 192.168.10.19 icmp_seq=2 ttl=63 time=3.306 ms
84 bytes from 192.168.10.19 icmp_seq=3 ttl=63 time=19.859 ms

VPCS> ping 192.168.20.18
84 bytes from 192.168.20.18 icmp_seq=1 ttl=64 time=1.009 ms
84 bytes from 192.168.20.18 icmp_seq=2 ttl=64 time=4.153 ms
84 bytes from 192.168.20.18 icmp_seq=3 ttl=64 time=1.212 ms

VPCS> ping 192.168.30.14
84 bytes from 192.168.30.14 icmp_seq=1 ttl=63 time=5.723 ms
84 bytes from 192.168.30.14 icmp_seq=2 ttl=63 time=9.268 ms
84 bytes from 192.168.30.14 icmp_seq=3 ttl=63 time=3.307 ms

VPCS> ping 192.168.1.2
84 bytes from 192.168.1.2 icmp_seq=1 ttl=63 time=2.888 ms
84 bytes from 192.168.1.2 icmp_seq=2 ttl=63 time=3.862 ms
84 bytes from 192.168.1.2 icmp_seq=3 ttl=63 time=6.123 ms

VPCS> ping 192.168.1.3
84 bytes from 192.168.1.3 icmp_seq=1 ttl=63 time=7.627 ms
84 bytes from 192.168.1.3 icmp_seq=2 ttl=63 time=4.036 ms
84 bytes from 192.168.1.3 icmp_seq=3 ttl=63 time=3.035 ms

VPCS> █
```



### Ping du PC5(vlan 3) au PC des autre vlan et serveur WEB et FTP :

```
VPCS> ip dhcp  
DDORA IP 192.168.30.14/24 GW 192.168.30.1
```

```
VPCS> ping 192.168.10.19  
84 bytes from 192.168.10.19 icmp_seq=1 ttl=63 time=4.671 ms  
84 bytes from 192.168.10.19 icmp_seq=2 ttl=63 time=4.556 ms  
84 bytes from 192.168.10.19 icmp_seq=3 ttl=63 time=3.874 ms
```

```
VPCS> ping 192.168.20.11  
84 bytes from 192.168.20.11 icmp_seq=1 ttl=63 time=5.950 ms  
84 bytes from 192.168.20.11 icmp_seq=2 ttl=63 time=4.212 ms  
84 bytes from 192.168.20.11 icmp_seq=3 ttl=63 time=3.153 ms
```

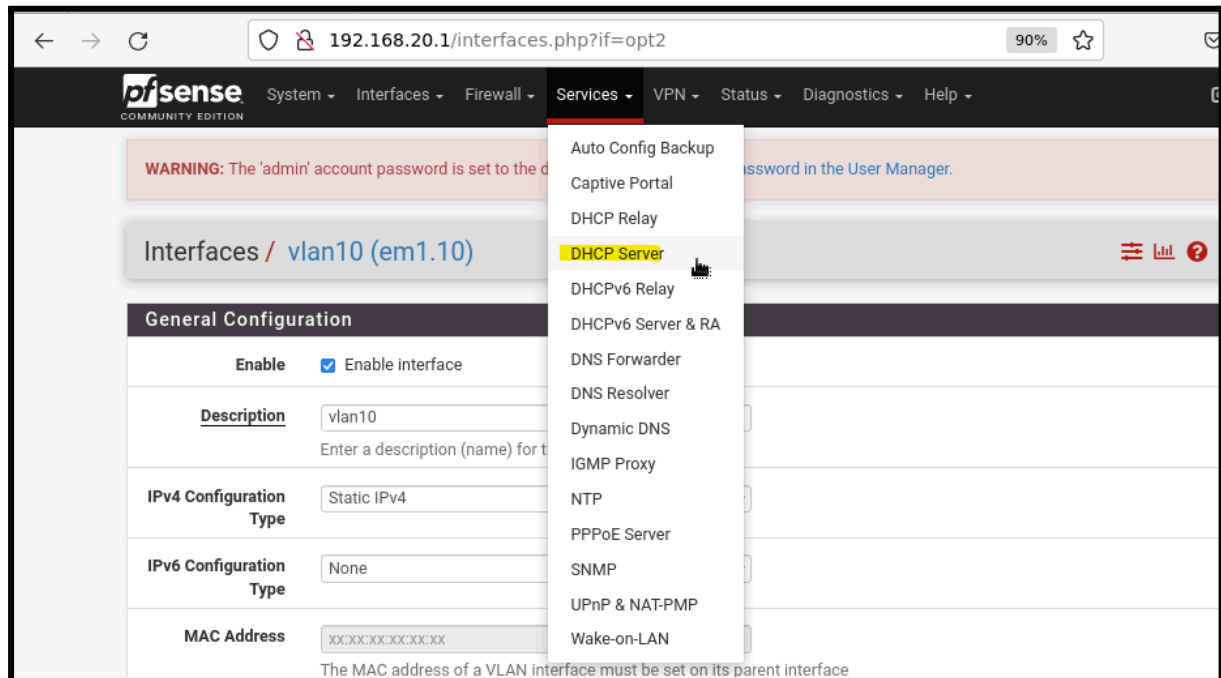
```
VPCS> ping 192.168.30.15  
84 bytes from 192.168.30.15 icmp_seq=1 ttl=64 time=1.221 ms  
84 bytes from 192.168.30.15 icmp_seq=2 ttl=64 time=1.554 ms  
84 bytes from 192.168.30.15 icmp_seq=3 ttl=64 time=3.758 ms
```

```
VPCS> ping 192.168.1.2  
84 bytes from 192.168.1.2 icmp_seq=1 ttl=63 time=4.580 ms  
84 bytes from 192.168.1.2 icmp_seq=2 ttl=63 time=3.071 ms  
84 bytes from 192.168.1.2 icmp_seq=3 ttl=63 time=2.597 ms
```

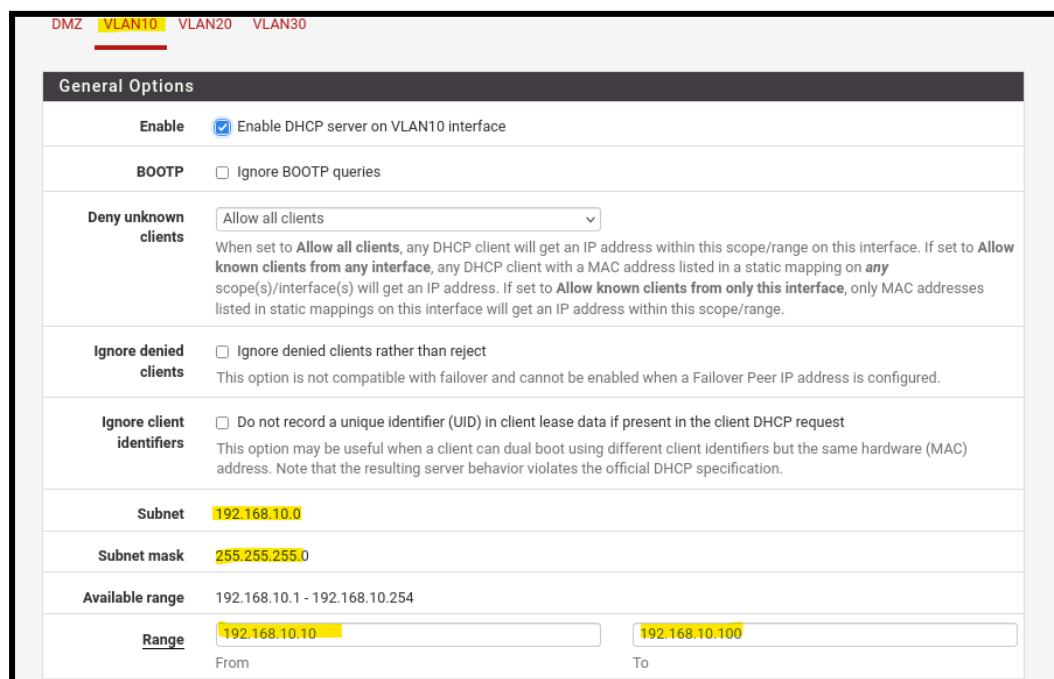
```
VPCS> ping 192.168.1.3  
84 bytes from 192.168.1.3 icmp_seq=1 ttl=63 time=5.712 ms  
84 bytes from 192.168.1.3 icmp_seq=2 ttl=63 time=3.001 ms  
84 bytes from 192.168.1.3 icmp_seq=3 ttl=63 time=5.529 ms
```

## Etape 3 - installation et configurations des services DHCP, SSH, FTP et HTTP sur des serveurs (virtualisés) de l'infrastructure réseau -> prendre machine Debian 11.8

### Configuration du **DHCP**(dans pfSense) :



### Configuration de la plage d'adresse ip VLAN 10 192.168.10-100:



## configuration de la plage d'adresse ip VLAN20 192.168.10-100:

DMZ VLAN10 **VLAN20** VLAN30

General Options

Enable

☒ Enable DHCP server on VLAN20 interface

BOOTP

☐ Ignore BOOTP queries

Deny unknown clients

Allow all clients

When set to **Allow all clients**, any DHCP client will get an IP address within this scope/range on this interface. If set to **Allow known clients from any interface**, any DHCP client with a MAC address listed in a static mapping on **any** scope(s)/interface(s) will get an IP address. If set to **Allow known clients from only this interface**, only MAC addresses listed in static mappings on this interface will get an IP address within this scope/range.

Ignore denied clients

☐ Ignore denied clients rather than reject  
This option is not compatible with failover and cannot be enabled when a Failover Peer IP address is configured.

Ignore client identifiers

☐ Do not record a unique identifier (UID) in client lease data if present in the client DHCP request  
This option may be useful when a client can dual boot using different client identifiers but the same hardware (MAC) address. Note that the resulting server behavior violates the official DHCP specification.

Subnet

192.168.20.0

Subnet mask

255.255.255.0

Available range

192.168.20.1 - 192.168.20.254

Range

192.168.20.10

192.168.20.100

From

To

## Configuration de la plage d'adresse ip VLAN 30 192.168.10-100:

DMZ VLAN10 VLAN20 **VLAN30**

General Options

Enable

☒ Enable DHCP server on VLAN30 interface

BOOTP

☐ Ignore BOOTP queries

Deny unknown clients

Allow all clients

When set to **Allow all clients**, any DHCP client will get an IP address within this scope/range on this interface. If set to **Allow known clients from any interface**, any DHCP client with a MAC address listed in a static mapping on **any** scope(s)/interface(s) will get an IP address. If set to **Allow known clients from only this interface**, only MAC addresses listed in static mappings on this interface will get an IP address within this scope/range.

Ignore denied clients

☐ Ignore denied clients rather than reject  
This option is not compatible with failover and cannot be enabled when a Failover Peer IP address is configured.

Ignore client identifiers

☐ Do not record a unique identifier (UID) in client lease data if present in the client DHCP request  
This option may be useful when a client can dual boot using different client identifiers but the same hardware (MAC) address. Note that the resulting server behavior violates the official DHCP specification.

Subnet

192.168.30.0

Subnet mask

255.255.255.0

Available range

192.168.30.1 - 192.168.30.254

Range

192.168.30.10

192.168.30.100

From

To

Test du **dhcp** sur les différents PCs de chaque Vlan : "ip dhcp"

```
PC1
```

```
Can't find dhcp server

VPCS> ip dhcp
DDORA IP 192.168.10.13/24 GW 192.168.10.1
```

```
PC3
```

```
Welcome to Virtual PC Simulator, version 0.
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Build time: Apr 10 2019 02:42:20
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Press '?' to get help.

VPCS> ip dhcp
DDORA IP 192.168.20.11/24 GW 192.168.20.1
```

```
PC5
```

```
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Press '?' to get help.

VPCS> ip dhcp
DDORA IP 192.168.30.12/24 GW 192.168.30.1
```

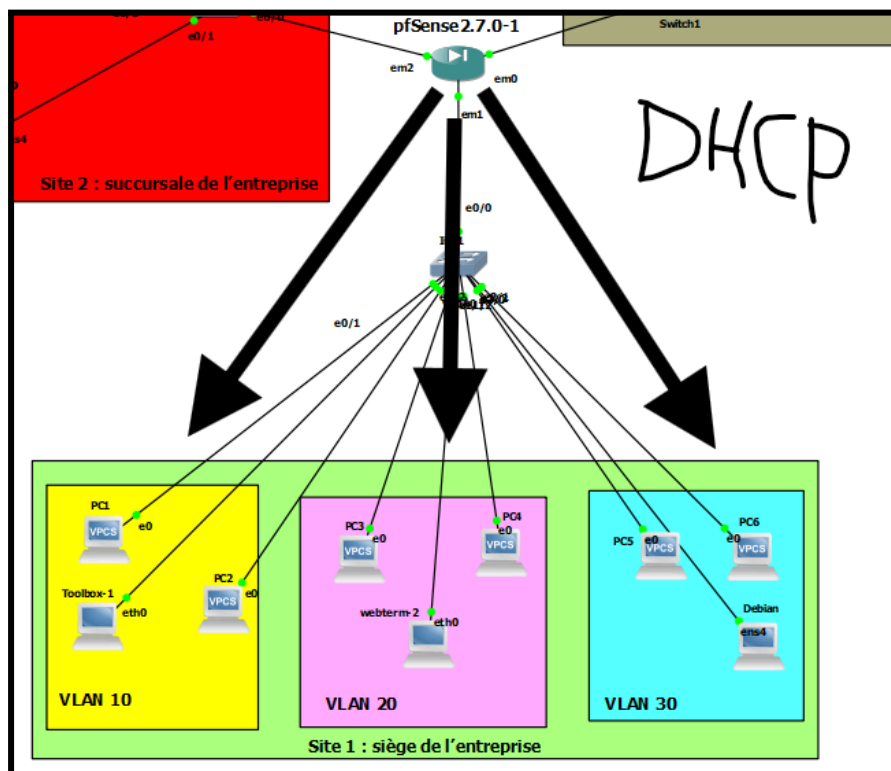
## Activer le service **dhcp** sur un webterm(linux) :

```
Bash
File Edit Tabs Help
GNU nano 7.2 /etc/network/interfaces *
#
# This is a sample network config, please uncomment lines to configure the network
#
# Uncomment this line to load custom interface files
# source /etc/network/interfaces.d/*

# Static config for eth0
auto eth0
iface eth0 inet dhcp
#     address 192.168.0.2
#     netmask 255.255.255.0
#     gateway 192.168.0.1
#     up echo nameserver 192.168.0.1 > /etc/resolv.conf

# DHCP config for eth0
#auto eth0
#iface eth0 inet dhcp
#     hostname webterm-1
```

## Schema du service **dhcp** sur les vlans :



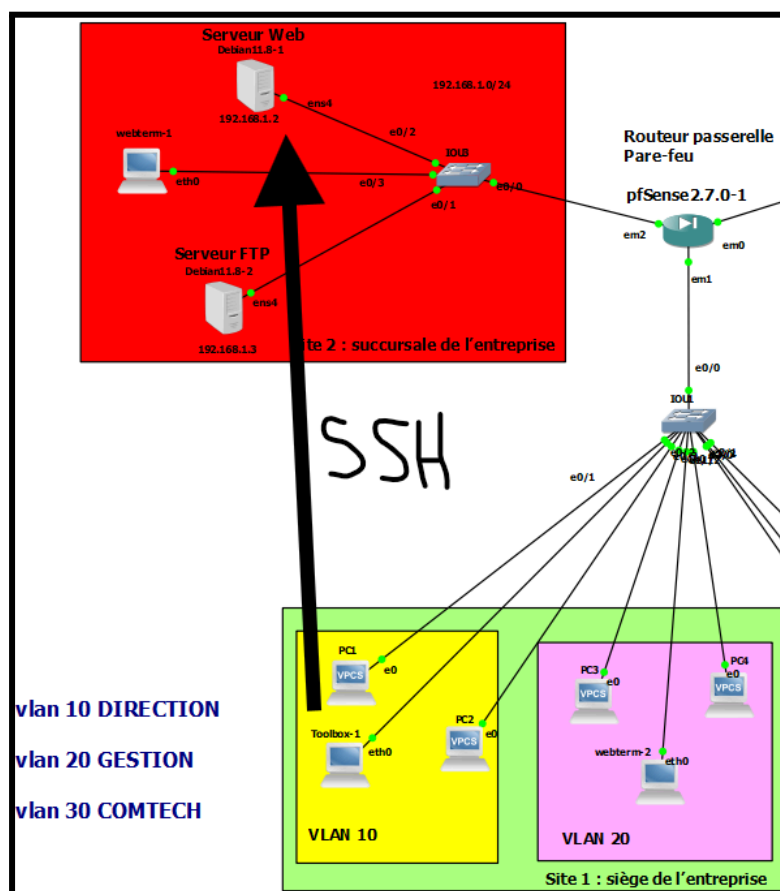
## Test du **SSH** depuis un PC de la vlan 10 au serveur WEB :

```
root@Toolbox-1:~# ip -c 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
        valid_lft forever preferred_lft forever
41: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UNKNOWN group default qlen 1000
    link/ether 22:2a:d5:7c:ec:10 brd ff:ff:ff:ff:ff:ff
    inet 192.168.10.17/24 scope global eth0
        valid_lft forever preferred_lft forever
root@Toolbox-1:~# ssh debian@192.168.1.2
debian@192.168.1.2's password:
Linux debian 5.10.0-30-cloud-amd64 #1 SMP Debian 5.10.218-1 (2024-06-01) 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.
Last login: Sun Jun 16 21:32:58 2024
debian@debian:~$ sudo -i
root@debian:~#
```

## Schéma SSH :



## Installation et configuration de **FTP** et de ses utilisateur :

### - sudo apt install vsftpd

```
debian@debian:~$ sudo apt install vsftpd
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  vsftpd
0 upgraded, 1 newly installed, 0 to remove and 31 not upgraded.
Need to get 153 kB of archives.
After this operation, 358 kB of additional disk space will be used.
Get:1 http://deb.debian.org/debian bullseye/main amd64 vsftpd amd64 3.0.3-12+b1 [153 kB]
Fetched 153 kB in 0s (759 kB/s)
Preconfiguring packages ...
Selecting previously unselected package vsftpd.
(Reading database ... 22642 files and directories currently installed.)
Preparing to unpack .../vsftpd_3.0.3-12+b1_amd64.deb ...
Unpacking vsftpd (3.0.3-12+b1) ...
Setting up vsftpd (3.0.3-12+b1) ...
Created symlink /etc/systemd/system/multi-user.target.wants/vsftpd.service → /lib/systemd/system/vsftpd.service.
Processing triggers for man-db (2.9.4-2) ...
debian@debian:~$
```

### Création du dossier partagé share

```
debian@debian:~$ sudo mkdir -p /srv/ftp/share
debian@debian:~$ sudo chmod 777 /srv/ftp/share
```

### Création d'utilisateur ftp1 et ftp2

```
debian@debian:~$ sudo adduser ftp1
Adding user `ftp1' ...
Adding new group `ftp1' (1004) ...
Adding new user `ftp1' (1004) with group `ftp1' ...
Creating home directory `/home/ftp1' ...
Copying files from `/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for ftp1
Enter the new value, or press ENTER for the default
  Full Name []:
    Room Number []:
    Work Phone []:
    Home Phone []:
    Other []:
Is the information correct? [Y/n] y
debian@debian:~$
```

```
debian@debian:~$ sudo adduser ftp2
Adding user `ftp2' ...
Adding new group `ftp2' (1005) ...
Adding new user `ftp2' (1005) with group `ftp2' ...
Creating home directory `/home/ftp2' ...
Copying files from `/etc/skel' ...
New password:
Retype new password:
passwd: password updated successfully
Changing the user information for ftp2
Enter the new value, or press ENTER for the default
  Full Name []:
    Room Number []:
    Work Phone []:
    Home Phone []:
    Other []:
Is the information correct? [Y/n] y
debian@debian:~$
```

ajout des utilisateurs aux groupe ftpaccess et commande pour donner les droits :

```
debian@debian:~$ sudo groupadd ftpaccess
debian@debian:~$ sudo usermod -aG ftpaccess ftp1
debian@debian:~$ sudo usermod -aG ftpaccess ftp2
debian@debian:~$ sudo chgrp ftpaccess /srv/ftp/share/
debian@debian:~$ sudo chmod 770 /srv/ftp/share/
debian@debian:~$
```

Test “ftp 192.168.1.3” des deux compte crée (ftp1 et ftp2) depuis un PC de la **Vlan 30** sur le serveur ftp 192.168.1.3 :

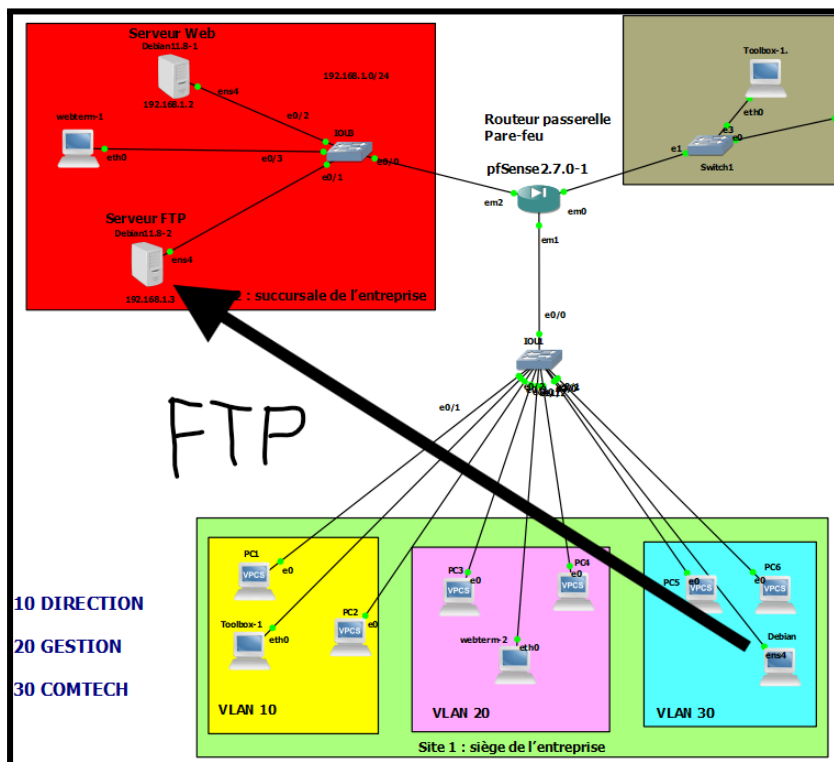
```
debian@debian:~$ ip -c a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: ens4: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
    link/ether 0c:fe:30:4f:00:00 brd ff:ff:ff:ff:ff:ff
    al name enpos4
    inet 192.168.30.10/24 brd 192.168.30.255 scope global dynamic ens4
        valid_lft forever preferred_lft 6843sec
    inet6 fe80::cfe3:4fff:fe30::10/64 scope link
        valid_lft forever preferred_lft forever
```

```
debian@debian:~$ ftp 192.168.1.3
Connected to 192.168.1.3.
220 Bienvenue !
Name (192.168.1.3:debian): ftp1
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> get test
local: test remote: test
200 PORT command successful. Consider using PASV.
150 Opening BINARY mode data connection for test (0 bytes).
226 Transfer complete.
ftp> ls -l
200 PORT command successful. Consider using PASV.
150 Here comes the directory listing.
-rwxrwxrwx  1 1005  1005      0 Jun 16 17:22 test
226 Directory send OK.
ftp>
```

```
debian@debian:~$ ftp 192.168.1.3
Connected to 192.168.1.3.
220 Bienvenue !
Name (192.168.1.3:debian): ftp2
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> ls -l
200 PORT command successful. Consider using PASV.
150 Here comes the directory listing.
-rwxrwxrwx  1 1005  1005      0 Jun 16 17:22 test
226 Directory send OK.
ftp>
```



## SCHÉMA DU PROTOCOLE **FTP** EFFECTUE :



## Installation et configuration de **HTTP** et de ses utilisateur :

```
sudo apt update
```

```
sudo apt install apache2
```

```
debian@debian:~$ sudo apt install apache2
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
apache2 is already the newest version (2.4.59-1~deb11u1).
0 upgraded, 0 newly installed, 0 to remove and 0 not upgraded.
```

ls -l pour voir les fichier dans /var/www/html pour le fichier de la page web

```
debian@debian:~$ cd /var/www/html/
debian@debian:/var/www/html$ ls
index.html
```

## Modification du code html pour avoir un rendu personnel

```
GNU nano 5.4 index.html *
<!DOCTYPE html>
<html>
<head>
  <title>Bienvenue sur sae201.com</title>
</head>
<body>
  <h1>Serveur WEB SAE201</h1>
  <p>SERVEUR DE SUCURSAL</p>
</body>
</html>
```

## Accès à la page apache de la vm depuis pc vlan 20

pfSense.home.arpa - Ser x moodle reunion - Recher Bienvenue sur SAE201.com x +

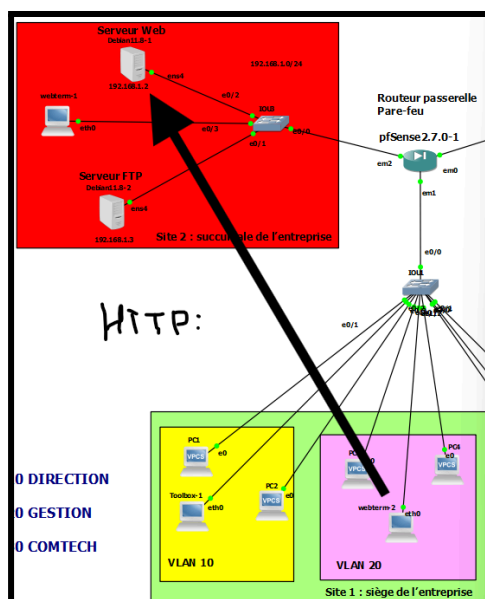
192.168.1.2

# Serveur WEB SAE201

SERVEUR DE SUCURSAL

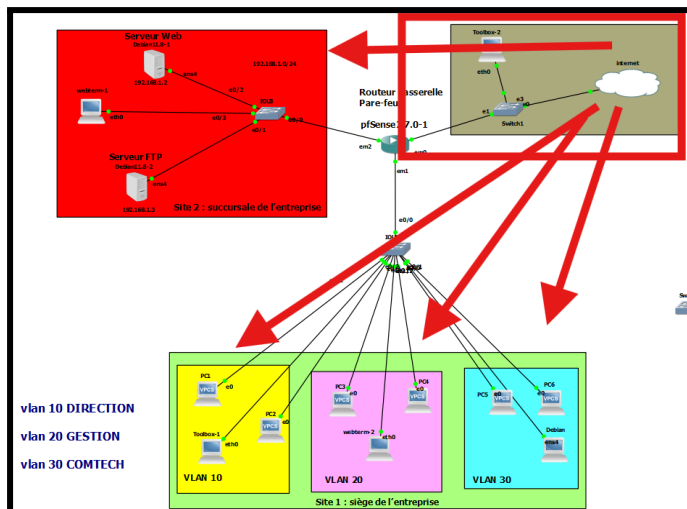
```
Bash
File Edit Tabs Help
root@webterm-2:~# ip -c a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
39: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UNKNOWN group default qlen 1000
    link/ether 6a:36:9c:04:72:6b brd ff:ff:ff:ff:ff:ff
    inet 192.168.20.15/24 scope global eth0
        valid_lft forever preferred_lft forever
root@webterm-2:~#
```

## SCHÉMA DU PROTOCOLE HTTP EFFECTUE



## Etape 4 - Mise en place et configuration de l'accès à Internet

Grâce au nuage (NAT) on nous donne ici internet



Test ping Serveur google (8.8.8.8) des périphérique de chaque vlan :

```
PC1 PC3 PC5
VPCS> ip dhcp
DORA IP 192.168.10.13/24 GW 192.168.10.1

VPCS> ping 8.8.8.8
84 bytes from 8.8.8.8 icmp_seq=1 ttl=126 time=50.592 ms
84 bytes from 8.8.8.8 icmp_seq=2 ttl=126 time=48.116 ms
84 bytes from 8.8.8.8 icmp_seq=3 ttl=126 time=51.183 ms
84 bytes from 8.8.8.8 icmp_seq=4 ttl=126 time=47.510 ms
84 bytes from 8.8.8.8 icmp_seq=5 ttl=126 time=49.920 ms

VPCS>
```

```
PC1 PC3 PC5
Bad command: "[3~". Use ? for help.

VPCS> ip dhcp
DORA IP 192.168.20.11/24 GW 192.168.20.1

VPCS> ping 8.8.8.8
84 bytes from 8.8.8.8 icmp_seq=1 ttl=126 time=49.809 ms
84 bytes from 8.8.8.8 icmp_seq=2 ttl=126 time=66.074 ms
84 bytes from 8.8.8.8 icmp_seq=3 ttl=126 time=48.242 ms
84 bytes from 8.8.8.8 icmp_seq=4 ttl=126 time=50.608 ms
84 bytes from 8.8.8.8 icmp_seq=5 ttl=126 time=50.205 ms

VPCS>
```

```
PC1 PC3 PC5
VPCS> ip dhcp
DORAping IP 192.168.30.12/24 GW 192.168.30.1

VPCS> ping 8.8.8.8
84 bytes from 8.8.8.8 icmp_seq=1 ttl=126 time=51.351 ms
84 bytes from 8.8.8.8 icmp_seq=2 ttl=126 time=47.163 ms
84 bytes from 8.8.8.8 icmp_seq=3 ttl=126 time=47.484 ms
84 bytes from 8.8.8.8 icmp_seq=4 ttl=126 time=50.816 ms
84 bytes from 8.8.8.8 icmp_seq=5 ttl=126 time=47.905 ms

VPCS> █
```

### (LAN) PC de la vlan 20 vers internet (ex: moodle reunion)

The screenshot shows a Mozilla Firefox browser window with the address bar displaying `https://www.google.com/search?q=moodle+reunion+&client=firefox-b-e&sca_e`. The search bar contains the text "moodle reunion", which is circled in red. Below the search bar, the search results for "Moodle-Central: Accueil" are visible, including links to "UFR DE" and "UFR LSH".

Overlaid on the bottom right of the browser window is a terminal window titled "Bash". The terminal shows the output of the command `ip -c a` on a system named "root@webterm-2". The output displays the configuration for the loopback interface `lo` and the Ethernet interface `eth0`. The `eth0` configuration includes the IP address `192.168.20.15/24`, which is circled in red. The terminal output is as follows:

```
root@webterm-2:~# ip -c 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
        valid_lft forever preferred_lft forever
39: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UNKNOWN group default qlen 1000
    link/ether 0a:50:96:04:72:6b brd ff:ff:ff:ff:ff:ff
    inet 192.168.20.15/24 scope global eth0
        valid_lft forever preferred_lft forever
root@webterm-2:~# █
```

## Test du ping **internet** depuis les serveurs (WEB et FTP)

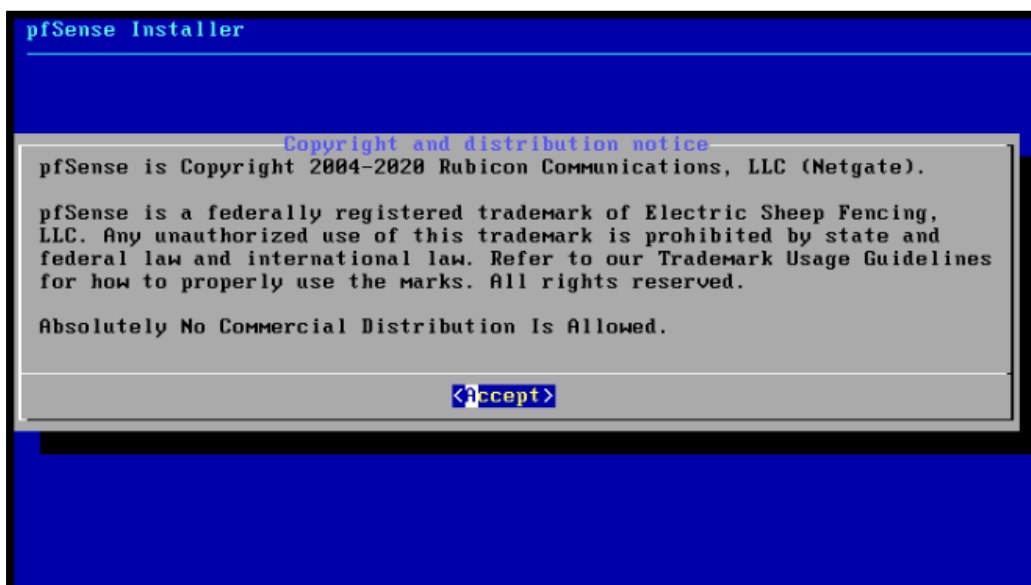
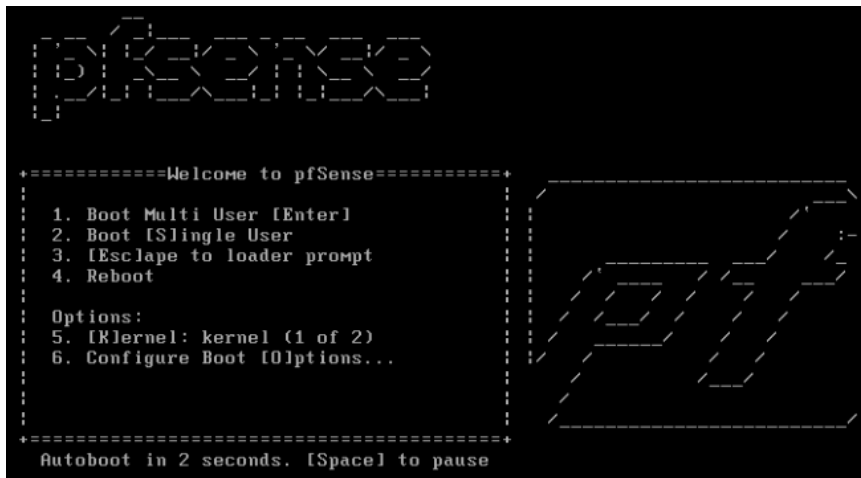
### Serveur web -

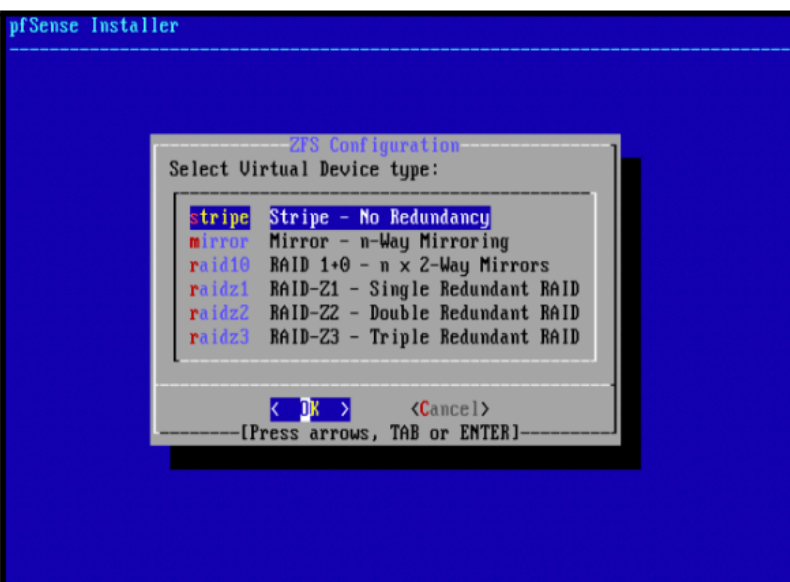
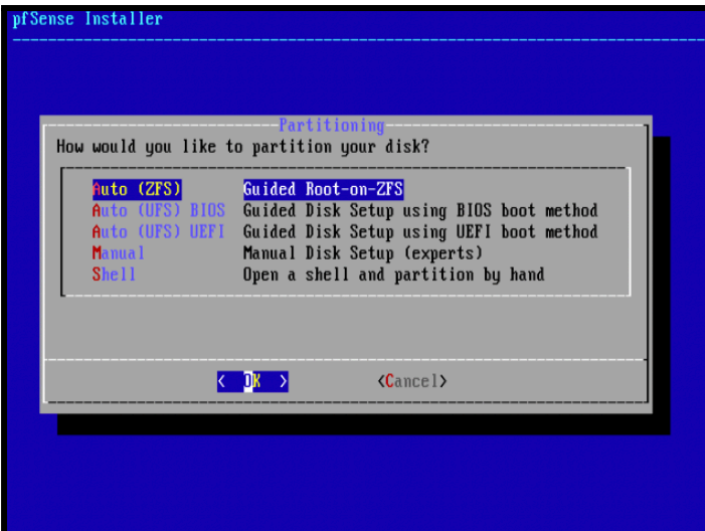
```
PC1 PC3 PC5 Debian11.8-1 x
debian@debian:~$ ip -c a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default
   link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
   inet 127.0.0.1/8 scope host lo
       valid_lft forever preferred_lft forever
   inet6 ::1/128 scope host
       valid_lft forever preferred_lft forever
2: ens4: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default
   link/ether 0c:e9:cc:42:00:00 brd ff:ff:ff:ff:ff:ff
   altname enp0s4
   inet 192.168.1.2/24 brd 192.168.1.255 scope global ens4
       valid_lft forever preferred_lft forever
   inet6 fe80::e9:cc:42:00:00/64 scope link
       valid_lft forever preferred_lft forever
debian@debian:~$ 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=126 time=47.8 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=126 time=47.6 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=126 time=47.0 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=126 time=50.6 ms
64 bytes from 8.8.8.8: icmp_seq=5 ttl=126 time=47.1 ms
64 bytes from 8.8.8.8: icmp_seq=6 ttl=126 time=46.6 ms
64 bytes from 8.8.8.8: icmp_seq=7 ttl=126 time=48.9 ms
64 bytes from 8.8.8.8: icmp_seq=8 ttl=126 time=46.2 ms
64 bytes from 8.8.8.8: icmp_seq=9 ttl=126 time=46.2 ms
64 bytes from 8.8.8.8: icmp_seq=10 ttl=126 time=51.1 ms
64 bytes from 8.8.8.8: icmp_seq=11 ttl=126 time=49.4 ms
64 bytes from 8.8.8.8: icmp_seq=12 ttl=126 time=47.8 ms
64 bytes from 8.8.8.8: icmp_seq=13 ttl=126 time=47.7 ms
64 bytes from 8.8.8.8: icmp_seq=14 ttl=126 time=47.9 ms
64 bytes from 8.8.8.8: icmp_seq=15 ttl=126 time=46.4 ms
```

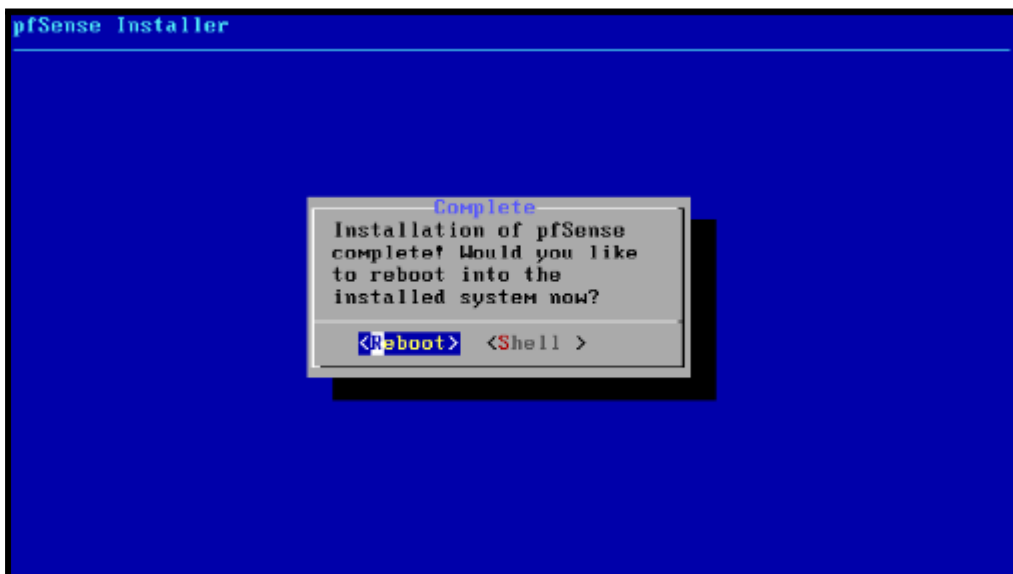
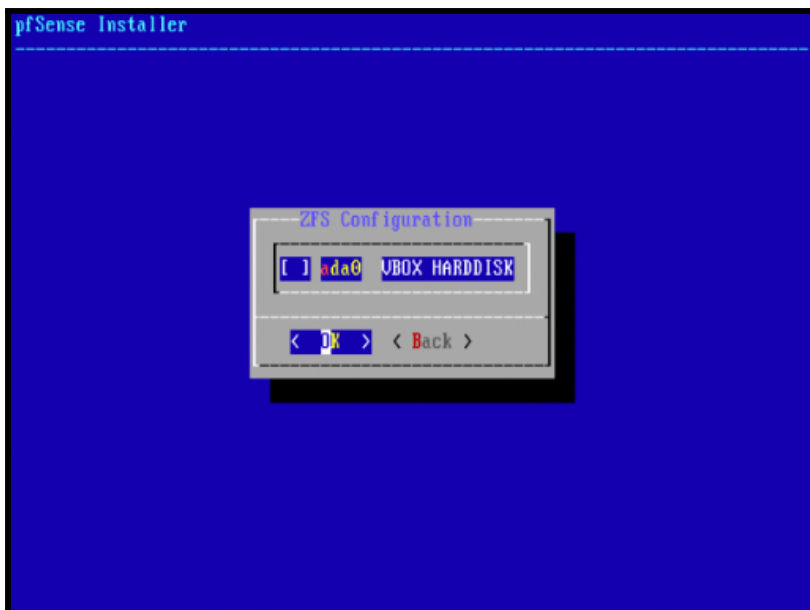
### Serveur FTP-

```
PC1 PC3 PC5 Debian11.8-1 Debian11.8-2 x +
debian@debian:~$ ip -c 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
       valid_lft forever preferred_lft forever
2: ens4: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state UP group default qlen 1000
   link/ether 0c:db:5c:77:00:00 brd ff:ff:ff:ff:ff:ff
   altname enp0s4
   inet 192.168.1.3/24 scope global ens4
       valid_lft forever preferred_lft forever
   inet6 fe80::db:5c:77:00:00/64 scope link
       valid_lft forever preferred_lft forever
debian@debian:~$ 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=126 time=46.6 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=126 time=48.5 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=126 time=47.8 ms
64 bytes from 8.8.8.8: icmp_seq=4 ttl=126 time=45.3 ms
```

# Installation et configuration d'un pare-feu **PfSense** :

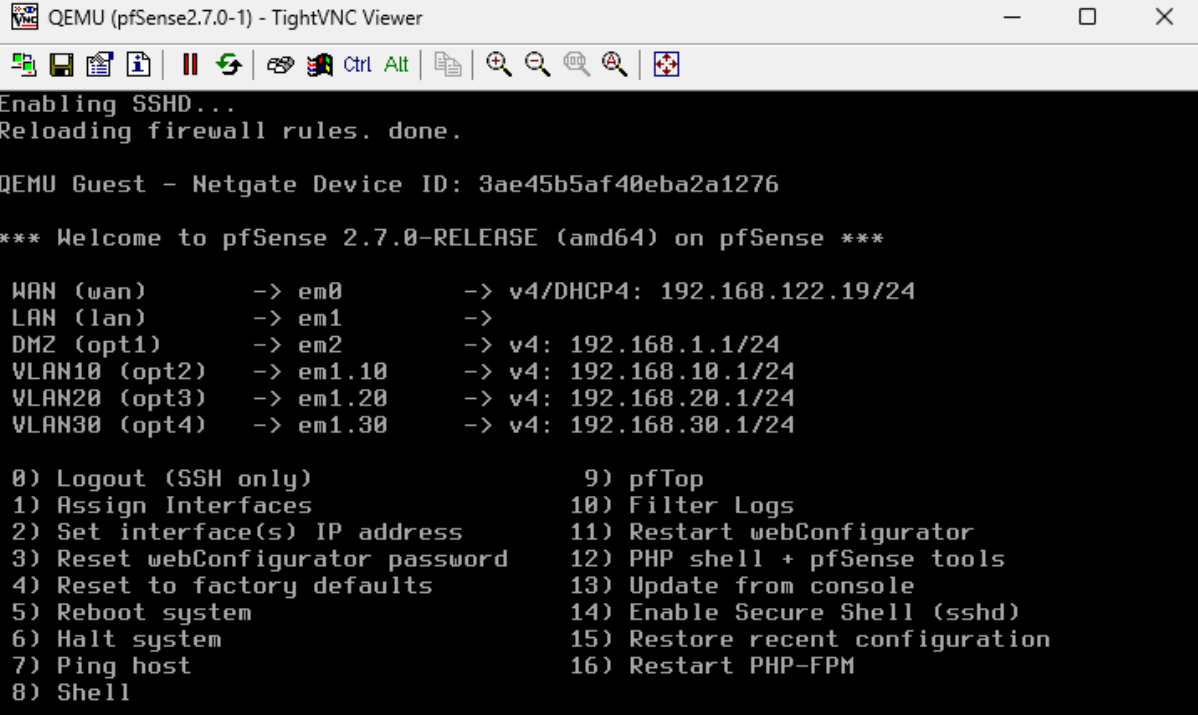








on arrive dans les options :



```
QEMU (pfSense2.7.0-1) - TightVNC Viewer
Enabling SSHD...
Reloading firewall rules. done.

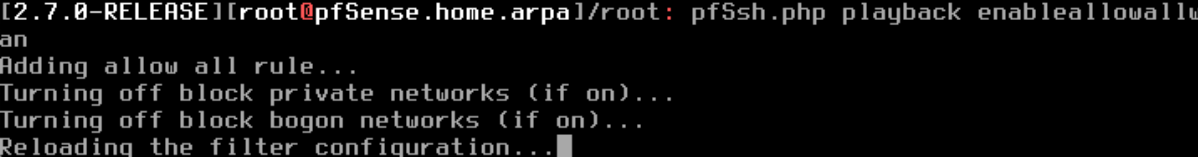
QEMU Guest - Netgate Device ID: 3ae45b5af40eba2a1276

*** Welcome to pfSense 2.7.0-RELEASE (amd64) on pfSense ***

WAN (wan)      -> em0      -> v4/DHCP4: 192.168.122.19/24
LAN (lan)      -> em1      ->
DMZ (opt1)     -> em2      -> v4: 192.168.1.1/24
VLAN10 (opt2)  -> em1.10   -> v4: 192.168.10.1/24
VLAN20 (opt3)  -> em1.20   -> v4: 192.168.20.1/24
VLAN30 (opt4)  -> em1.30   -> v4: 192.168.30.1/24

0) Logout (SSH only)          9) pfTop
1) Assign Interfaces          10) Filter Logs
2) Set interface(s) IP address 11) Restart webConfigurator
3) Reset webConfigurator password 12) PHP shell + pfSense tools
4) Reset to factory defaults   13) Update from console
5) Reboot system              14) Enable Secure Shell (sshd)
6) Halt system                 15) Restore recent configuration
7) Ping host                   16) Restart PHP-FPM
8) Shell
```

Commande pour attribuer les règles de base au port WAN pour les protocoles qui passent par lui:



```
[2.7.0-RELEASE][root@pfSense.home.arpal/root: pfSsh.php playback enableallowallwan
Adding allow all rule...
Turning off block private networks (if on)...
Turning off block bogon networks (if on)...
Reloading the filter configuration...
```

## Règles sur le parefeu pfSense (Mettre en place et configurer la DMZ pour les serveurs FTP et Web (HTTP)):

### règle du port pour le WAN ( on laisse passer le protocole ssh sur les deux serveur:

Firewall / Rules / WAN

Floating WAN LAN DMZ VLAN10 VLAN20 VLAN30

Rules (Drag to Change Order)

	States	Protocol	Source	Port	Destination	Port	Gateway	Queue	Schedule	Description	Actions
<input type="checkbox"/>	✓	0/0 B	IPv4	*	*	192.168.1.3	22 (SSH)	*	none		
<input type="checkbox"/>	✓	0/0 B	IPv4	*	*	192.168.1.2	22 (SSH)	*	none		
<input type="checkbox"/>	✓	0/0 B	IPv4	*	*	192.168.1.2	80 (HTTP)	*	none		
<input type="checkbox"/>	✓	0/0 B	IPv4	*	*	192.169.1.3	21 (FTP)	*	none		
<input type="checkbox"/>	✓	0/0 B	IPv4+6	*	*	*	*	*	none	Allow all ipv4+ipv6 via pfSsh.php	

↑ Add ↓ Add Delete Toggle Copy Save + Separator

### règle du port pour le Vlan 10(on laisse tout passer)

Firewall / Rules / VLAN10

Floating WAN LAN DMZ VLAN10 VLAN20 VLAN30

Rules (Drag to Change Order)

	States	Protocol	Source	Port	Destination	Port	Gateway	Queue	Schedule	Description	Actions
<input type="checkbox"/>	✓	0/44 KiB	IPv4	*	*	*	*	*	none		

↑ Add ↓ Add Delete Toggle Copy Save + Separator

### règle du port pour le Vlan 20(on laisse tout passer)

Firewall / Rules / VLAN20

Floating WAN LAN DMZ VLAN10 VLAN20 VLAN30

Rules (Drag to Change Order)

	States	Protocol	Source	Port	Destination	Port	Gateway	Queue	Schedule	Description	Actions
<input type="checkbox"/>	✓	9/30.97 MiB	IPv4	*	*	*	*	*	none		

↑ Add ↓ Add Delete Toggle Copy Save + Separator

## règle du port pour le Vlan 30(on laisse tout passer)

Firewall / Rules / VLAN30

Floating WAN LAN DMZ VLAN10 VLAN20 VLAN30

Rules (Drag to Change Order)

	States	Protocol	Source	Port	Destination	Port	Gateway	Queue	Schedule	Description	Actions
<input type="checkbox"/>	✓	0/90 KiB	IPv4 *	*	*	*	*	none			<a href="#">Anchor</a> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a> <a href="#">Toggle</a>

[↑ Add](#) [↓ Add](#) [Delete](#) [Toggle](#) [Copy](#) [Save](#) [+ Separator](#)

## règle du port pour le DMZ(on laisse tout passer)

Firewall / Rules / DMZ

Floating WAN LAN DMZ VLAN10 VLAN20 VLAN30

Rules (Drag to Change Order)

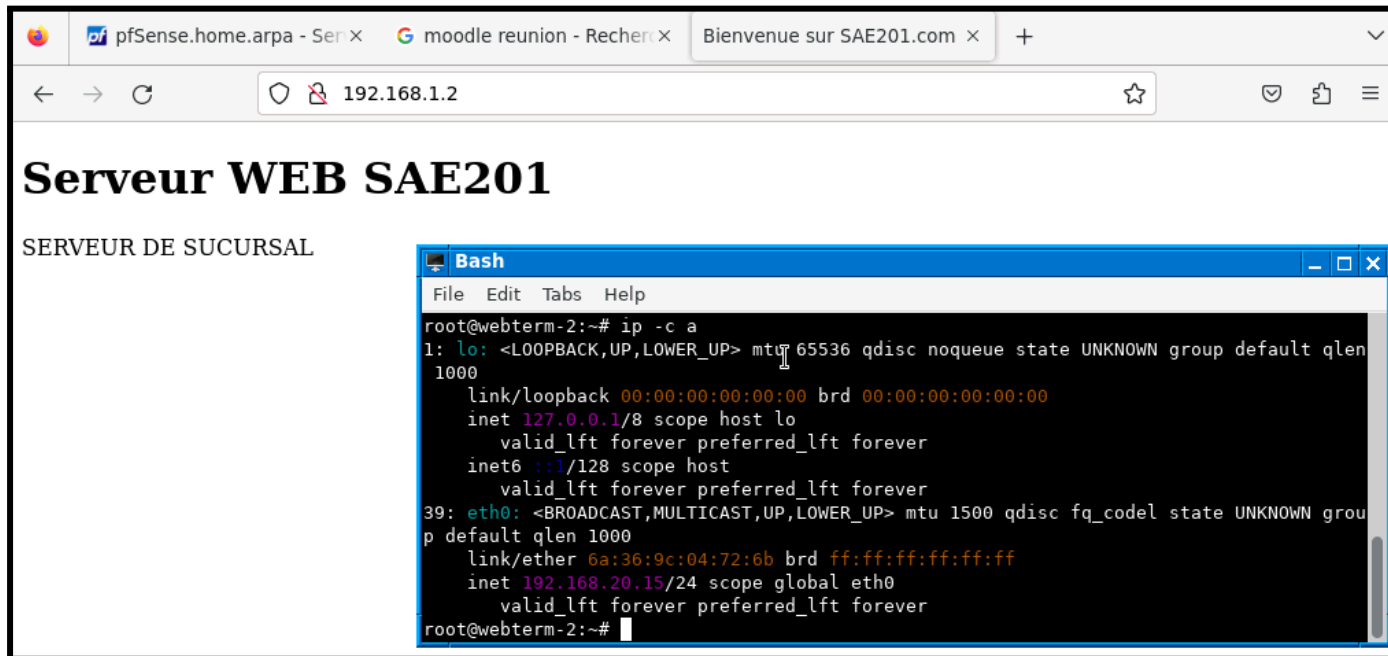
	States	Protocol	Source	Port	Destination	Port	Gateway	Queue	Schedule	Description	Actions
<input type="checkbox"/>	✓	1/235 KiB	IPv4 *	*	*	*	*	none			<a href="#">Anchor</a> <a href="#">Edit</a> <a href="#">Copy</a> <a href="#">Delete</a> <a href="#">Toggle</a>

[↑ Add](#) [↓ Add](#) [Delete](#) [Toggle](#) [Copy](#) [Save](#) [+ Separator](#)

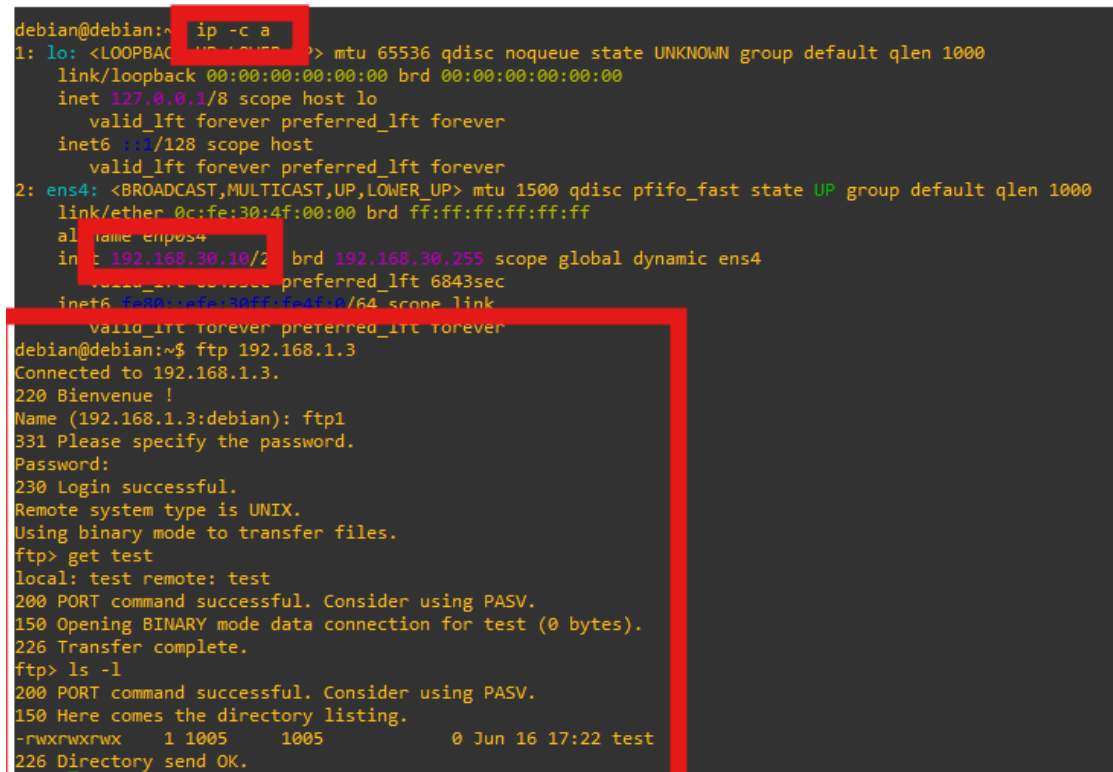
## TEST FINAUX :

- Vérifier qu'un utilisateur interne à l'entreprise peut accéder aux services réseaux installés :

### Test du ping d'un pc du vlan 20 au serveur WEB



### Test "ftp 192.168.1.3" des deux compte crée (ftp1 et ftp2) depuis un PC de la **Vlan 30** sur le serveur ftp 192.168.1.3 :



```

debian@debian:~$ ftp 192.168.1.3
Connected to 192.168.1.3.
220 Bienvenue !
Name (192.168.1.3:debian): ftp2
331 Please specify the password.
Password:
230 Login successful.
Remote system type is UNIX.
Using binary mode to transfer files.
ftp> ls -l
200 PORT command successful. Consider using PASV.
150 Here comes the directory listing.
-rwxrwxrwx  1 1005  1005          0 Jun 16 17:22 test
226 Directory send OK.
ftp>

```

## Vérifier qu'un utilisateur interne à l'entreprise peut se connecter à Internet

(LAN) PC de la vlan 20 vers internet (ex: wikipedia)

The screenshot shows a TIGHTVNC Viewer window with a Mozilla Firefox browser displaying the Wikipedia homepage. The address bar shows `https://www.wikipedia.org`, which is highlighted with a red rectangle. Below the browser, a terminal window titled "Bash" is open, showing the output of the `ip -c a` command. The terminal output includes details for the loopback interface `lo` and the ethernet interface `eth0`. The `eth0` configuration is highlighted with a red rectangle, showing the IP address `192.168.20.20/24` and the MAC address `9e:68:16:49:1:aa`.

```

root@webterm-2:~# ip -c a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group
    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
        valid_lft forever preferred_lft forever
8: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state U
    group default qlen 1000
    link/ether 9e:68:16:49:1:aa brd ff:ff:ff:ff:ff:ff
    inet 192.168.20.20/24 scope global eth0
        valid_lft forever preferred_lft forever
root@webterm-2:~#

```

Vérifier si un utilisateur externe à l'entreprise peut se connecter au serveur Web depuis l'extérieur (placer un objet webterm ou Firefox dans la partie WAN)

The image displays a network configuration in a virtual environment. On the left, a red box represents the internal network containing a 'Serveur Web' (Web Server) with IP 192.168.1.2. A green arrow points from the 'Internet' cloud on the right towards the web server, indicating an external connection attempt. The central part shows a 'Routeur passerelle Pare-feu' (Gateway Firewall) labeled 'pfSense 2.7.0-1'. To its right, a 'Switch1' connects to 'Toolbox-1' and 'webterm-1'. The 'Internet' is represented by a cloud icon. Below the network diagram, a screenshot of a 'x11 - TightVNC Viewer' window is shown. The window contains a Mozilla Firefox browser displaying 'Bienvenue sur SAE201.com' with the address bar showing '192.168.1.2' highlighted by a green box. Below the browser, a terminal window titled 'Bash' shows network configuration commands for 'eth0' and 'lo' interfaces, with the IP '192.168.122.232' highlighted by a green box.

```
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
    valid_lft forever preferred_lft forever
11: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UNK
N group default qlen 1000
    link/ether 82:e2:e2:ae:f7:c6 brd ff:ff:ff:ff:ff:ff
    inet 192.168.122.232/24 brd 192.168.122.255 scope global eth0
        valid_lft forever preferred_lft forever
root@webterm-1:~# ip -c a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group def
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
    valid_lft forever preferred_lft forever
11: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UNK
N g
link/ether 82:e2:e2:ae:f7:c6 brd ff:ff:ff:ff:ff:ff
inet 192.168.122.232/24 brd 192.168.122.255 scope global eth0
    valid_lft forever preferred_lft forever
```

## Vérifier si l'administrateur réseau de l'entreprise peut gérer les équipements à l'aide d'une connexion SSH à l'intérieur de l'entreprise

### Test du pc de la vlan 10 en ssh au serveur web

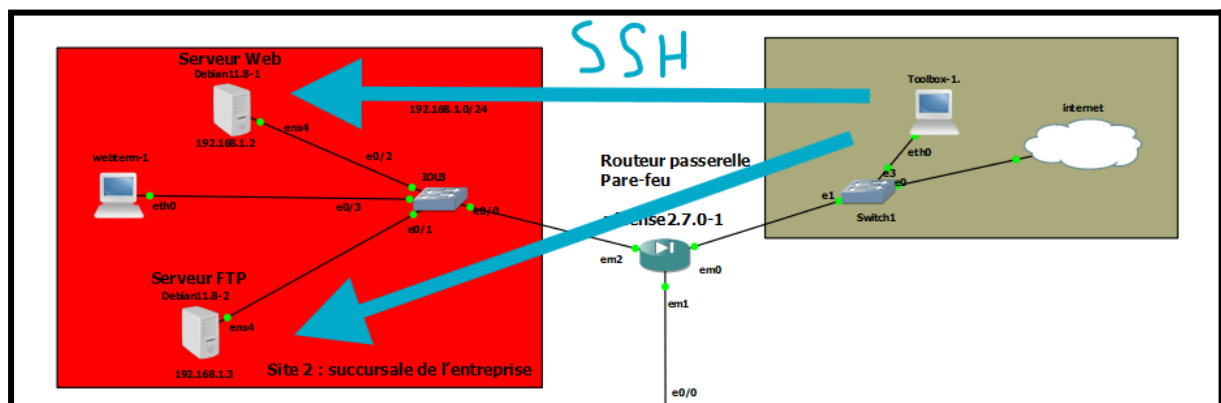
```
root@Toolbox-1:~# ip -c a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
41: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UNKNOWN group default qlen 1000
    link/ether 22:2a:05:7c:ec:10 brd ff:ff:ff:ff:ff:ff
    inet 192.168.10.17/24 scope global eth0
        valid_lft forever preferred_lft forever
root@Toolbox-1:~# ssh debian@192.168.1.2
debian@192.168.1.2's password:
Linux debian 5.10.0-30-cloud-amd64 #1 SMP Debian 5.10.218-1 (2024-06-01) 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.
Last login: Sun Jun 16 21:32:58 2024
debian@debian:~$ sudo -i
root@debian:~#
```

## Vérifier si l'administrateur réseau de l'entreprise peut gérer les équipements à l'aide d'une connexion SSH hors de l'entreprise

### TEST SSH DEPUIS LE WAN



## SSH sur le serveur WEB

```
root@Toolbox-1:~# ssh debian@192.168.1.2
debian@192.168.1.2's password:
Linux debian 5.10.0-30-cloud-amd64 #1 SMP Debian 5.10.218-1 (2024-06-01) 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.
Last login: Sun Jun 16 21:42:56 2024 from 192.168.10.17
debian@debian:~$ sudo -i
root@debian:~# exit
logout
debian@debian:~$ exit
logout
Connection to 192.168.1.2 closed.
```

## SSH sur le serveur FTP

```
root@Toolbox-1:~# ssh debian@192.168.1.3
debian@192.168.1.3's password:
Linux debian 5.10.0-26-cloud-amd64 #1 SMP Debian 5.10.197-1 (2023-09-29) 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.

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permitted by applicable law.
Last login: Mon Jun 17 06:15:33 2024
debian@debian:~$ sudo -i
root@debian:~# █
```