Cours Majeur Virtualisation

Nantes Ynov Campus – 2022-2023

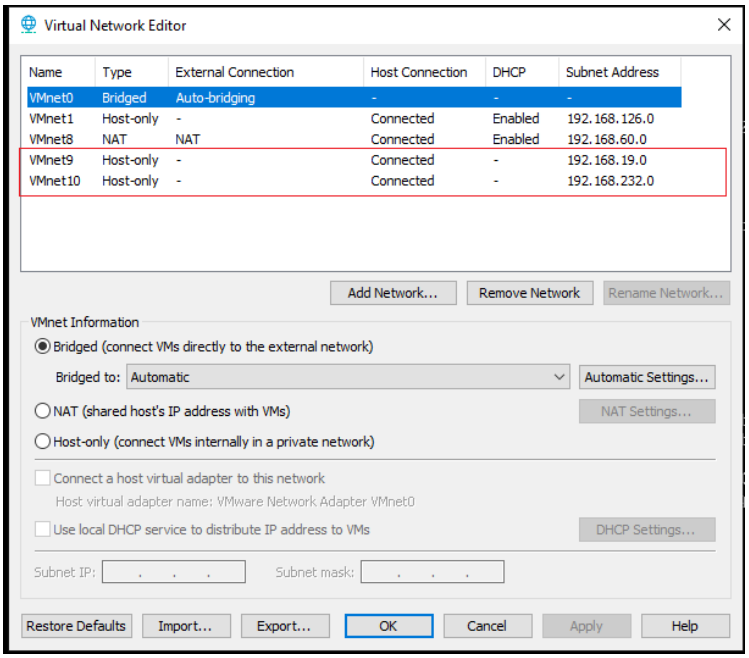
Activité Pratique 10
Introduction l'utilisation d'un routeur open source Pfsense

Introduction

Ce document a pour but de s'exercer sur quelques fonctionnalités disponibles sur un routeur open source Pfsense.

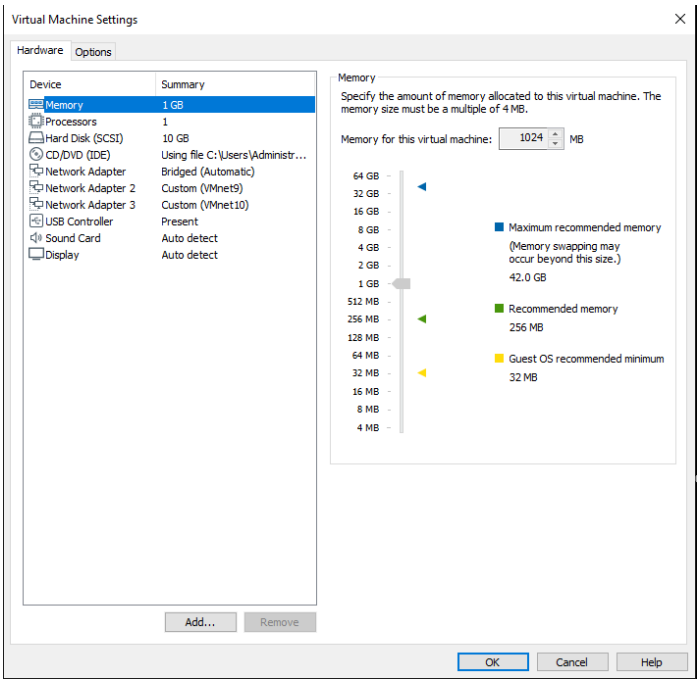
Pré requis

1 – réseau avec deux Vmnet host-only répondant aux caractéristiques suivantes :



Vous êtes libre de choisir les plages d'adresses selon vos possibilités

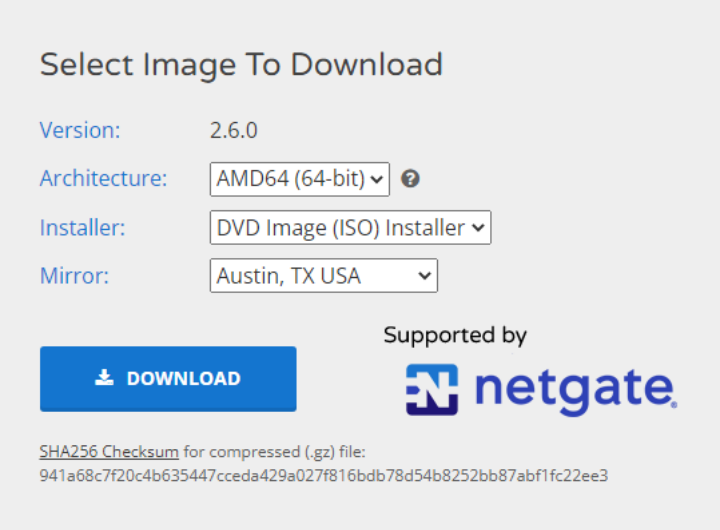
2 – VM qui fera office de routeur avec une carte principale configurée en bridge afin d'avoir l'accès internet et une carte sur chaque sous réseau



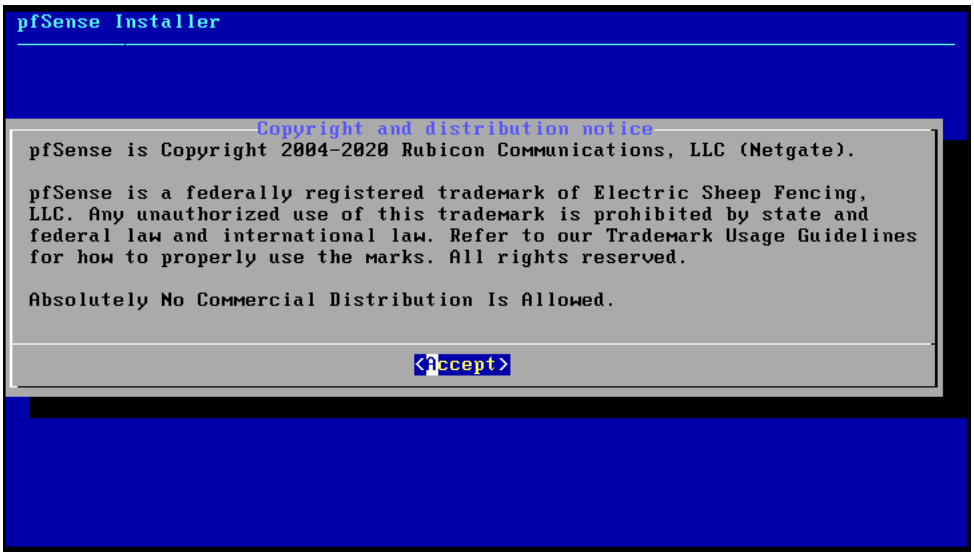
Partie 1 : Installation du routeur

Pour commencer nous allons télécharger le routeur qui sera à installer sur la machine VM Routeur.

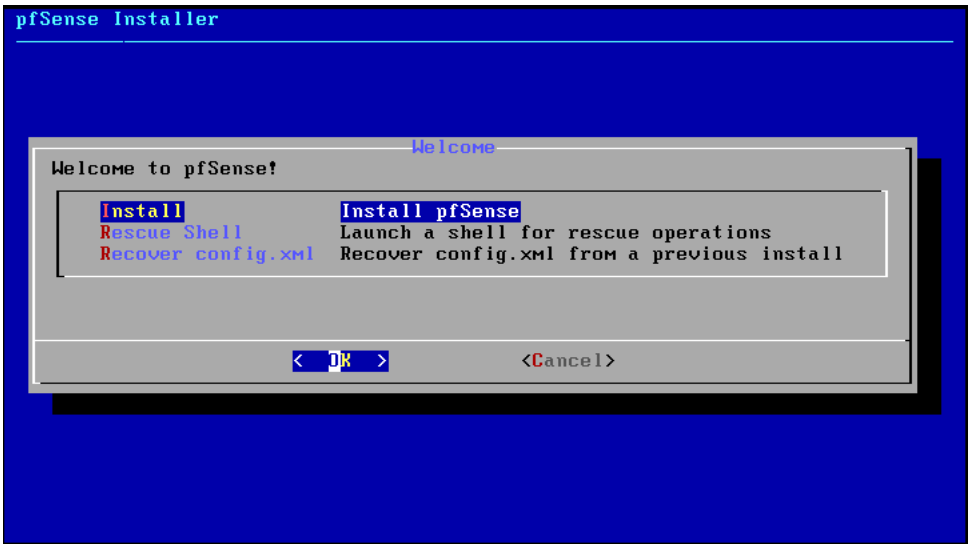
Se rendre sur le site : https://www.pfsense.org/download/ et télécharger l'ISO qui est aussi disponible dans le répertoire de téléchargement de vos TP (dossier ISO)



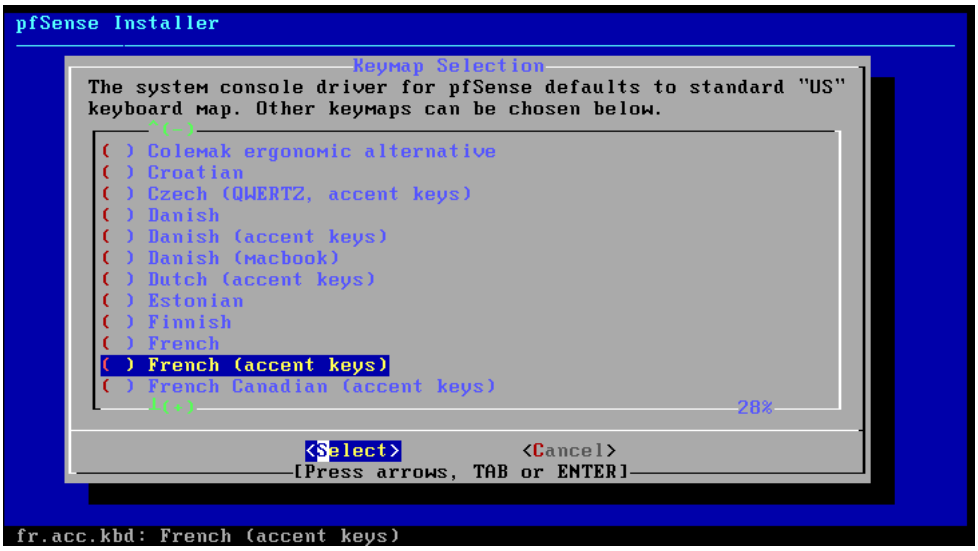
Créer la VM et lancer l'installation



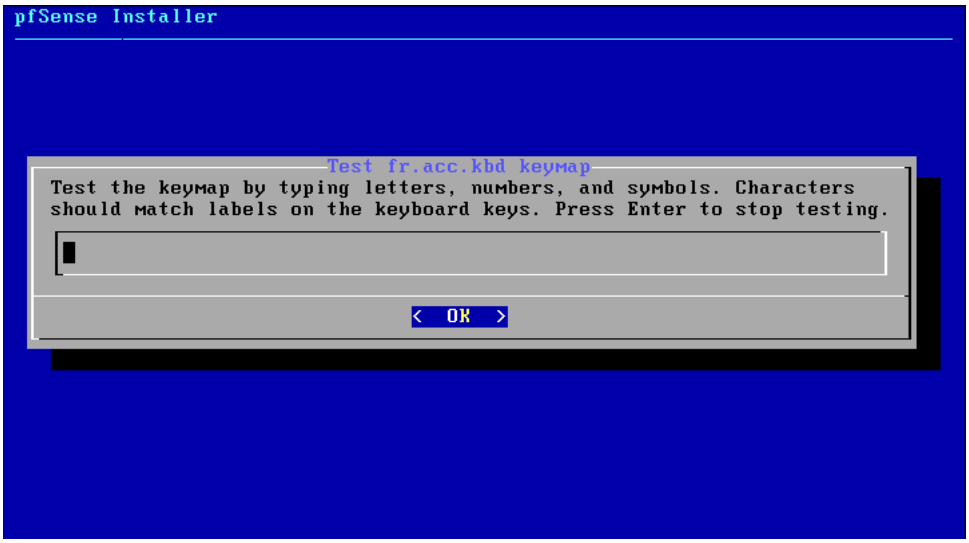
Accepter et valider l'installation



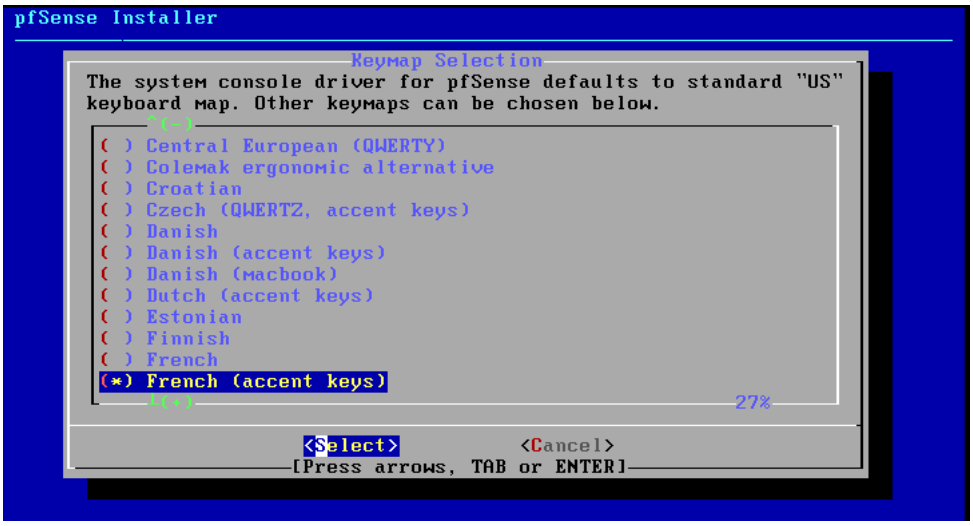
Sélectionner la langue du clavier



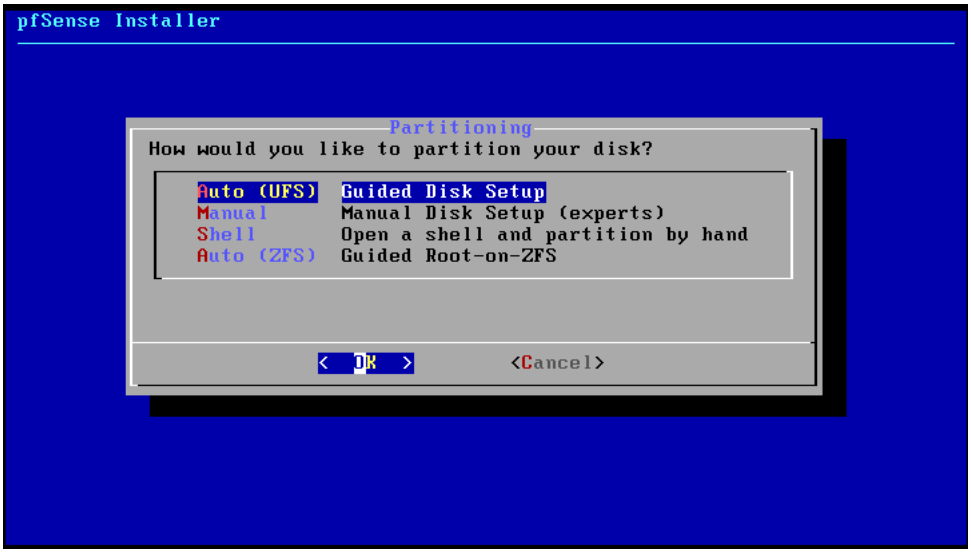
Vérifier que le clavier est bien reconnu



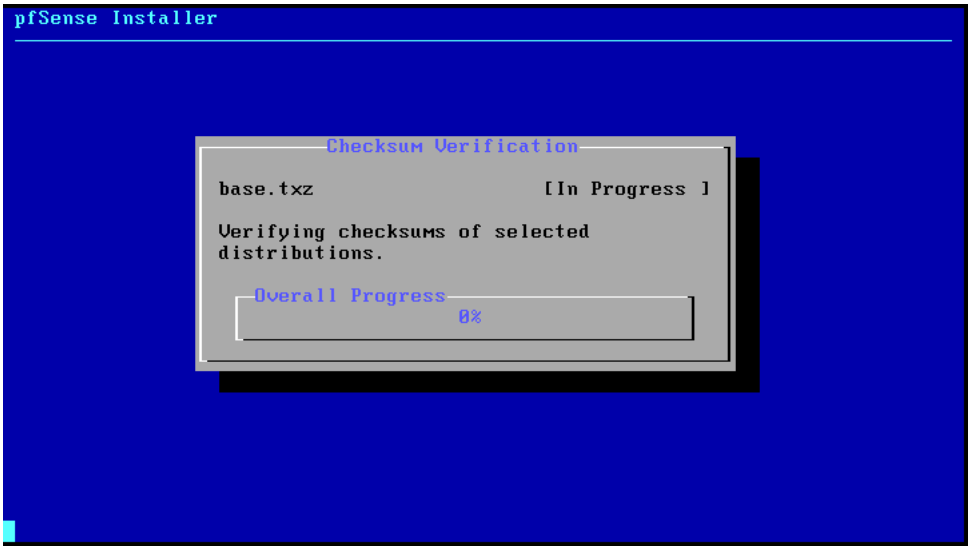
Valider



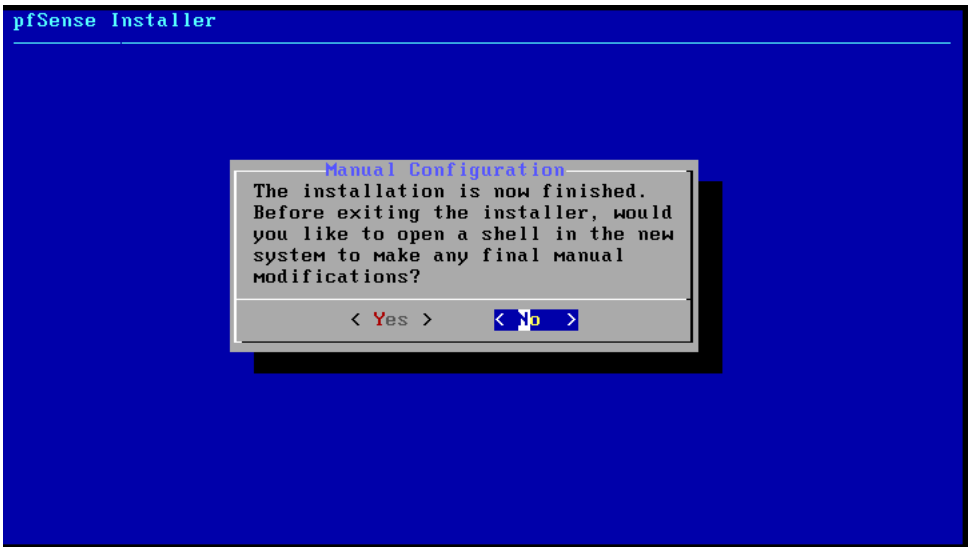
La validation de la langue vous remonte au-dessus puis sélectionner l'option « continuer »



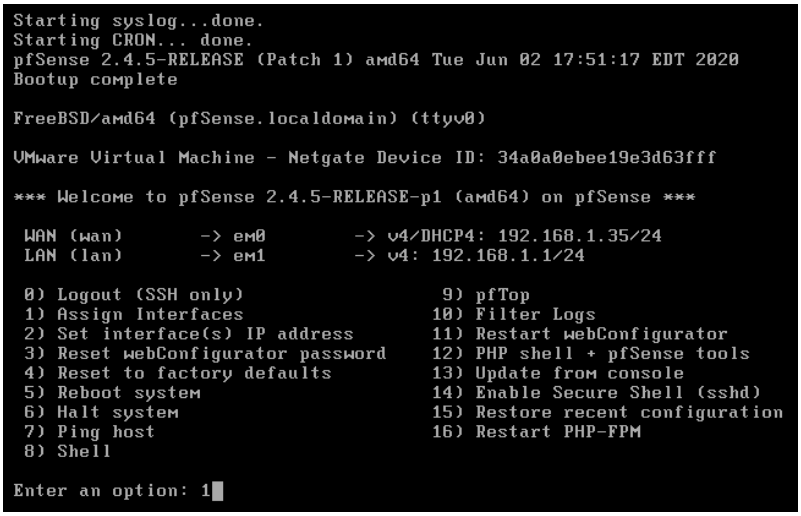
Valider le type de partition et l'installation se lance



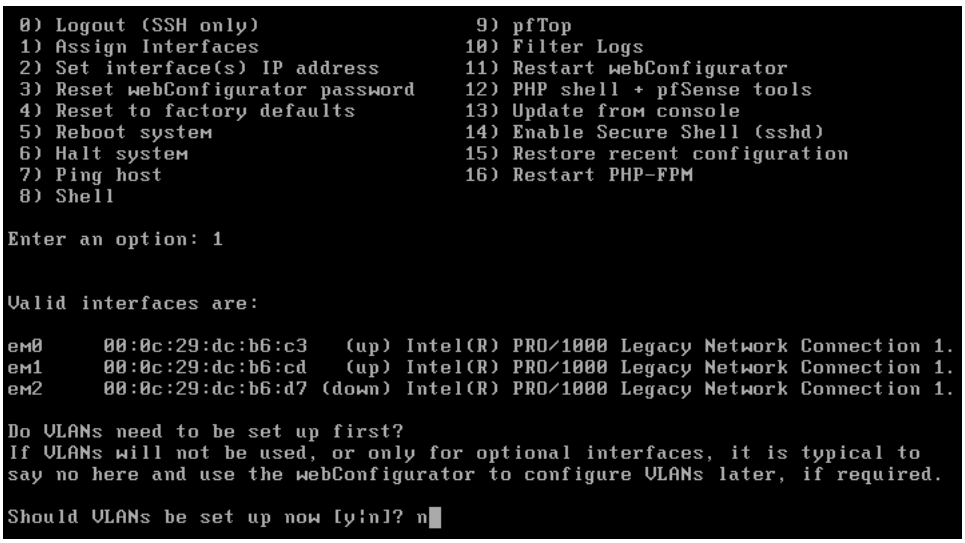
Refuser la modification de l'installation par défaut



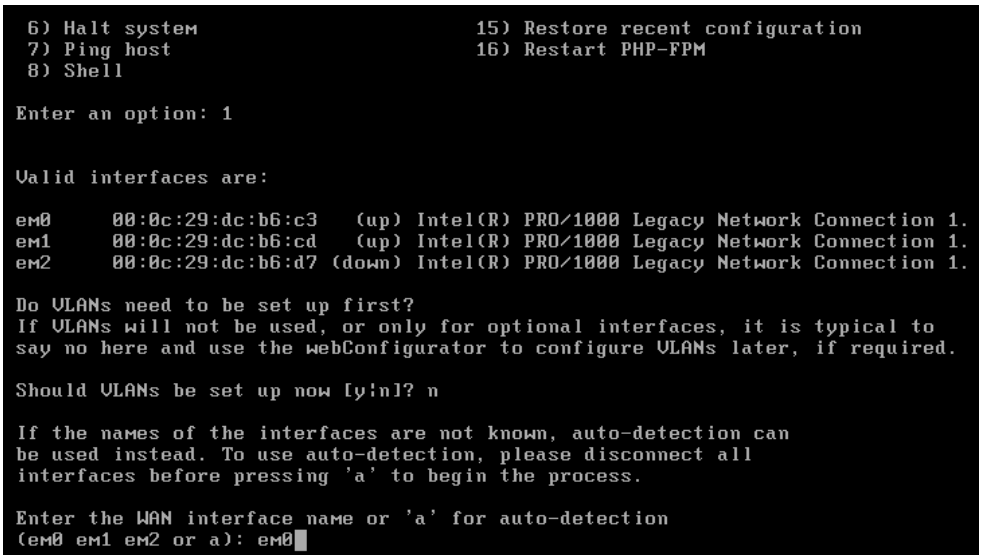
A la fin de l'installation la machine va redémarrer automatiquement et vous devriez être redirigé vers l'écran d'accueil ci-dessous à ce niveau il n'est pas possible pour l'instant de voir vos 3 cartes :



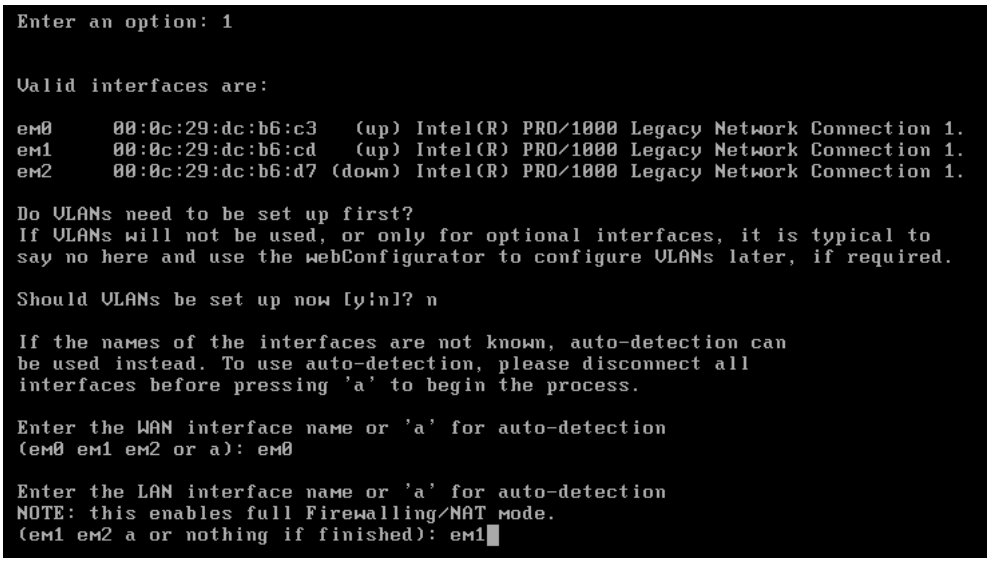
Sélectionner l'option 1 pour démarrer la configuration des cartes.



Choisir l'interface réseau à configurer en premier ici em0. Attention il arrive assez souvent que le clavier se retrouve en qwerty mais cela n'est pas bien grave pour les prochaines manipulations. Refuser sur l'écran ci-dessus la création de VLANs



Entrer ensuite le nom de l'interface LAN associé à l'une des cartes



Puis la dernière carte optionnelle

```
Valid interfaces are:

em0     00:0c:29:dc:b6:c3   (up) Intel(R) PRO/1000 Legacy Network Connection 1.
em1     00:0c:29:dc:b6:cd   (up) Intel(R) PRO/1000 Legacy Network Connection 1.
em2     00:0c:29:dc:b6:d7 (down) Intel(R) PRO/1000 Legacy Network Connection 1.

Do VLANs need to be set up first?
If VLANs will not be used, or only for optional interfaces, it is typical to
say no here and use the webConfigurator to configure VLANs later, if required.

Should VLANs be set up now [y|n]? n

If the names of the interfaces are not known, auto-detection can
be used instead. To use auto-detection, please disconnect all
interfaces before pressing 'a' to begin the process.

Enter the WAN interface name or 'a' for auto-detection
(em0 em1 em2 or a): em0

Enter the LAN interface name or 'a' for auto-detection
NOTE: this enables full Firewalling/NAT mode.
(em1 em2 a or nothing if finished): em1

Enter the Optional 1 interface name or 'a' for auto-detection
(em2 a or nothing if finished): em2
```

Valider la procédure

```
say no here and use the webConfigurator to configure VLANs later, if required.

Should VLANs be set up now [y|n]? n

If the names of the interfaces are not known, auto-detection can
be used instead. To use auto-detection, please disconnect all
interfaces before pressing 'a' to begin the process.

Enter the WAN interface name or 'a' for auto-detection
(em0 em1 em2 or a): em0

Enter the LAN interface name or 'a' for auto-detection
NOTE: this enables full Firewalling/NAT mode.
(em1 em2 a or nothing if finished): em1

Enter the Optional 1 interface name or 'a' for auto-detection
(em2 a or nothing if finished): em2

The interfaces will be assigned as follows:

WAN  -> em0
LAN  -> em1
OPT1 -> em2

Do you want to proceed [y|n]? y
```

Ensuite il va falloir fixer les adresses sur chaque carte pour cela sélectionner le choix 2

```
*** Welcome to pfSense 2.4.5-RELEASE-p1 (amd64) on pfSense ***

 WAN (wan)       -> em0        -> v4/DHCP4: 192.168.1.92/24
 LAN (lan)       -> em1        -> v4: 192.168.1.1/24
 OPT1 (opt1)     -> em2        ->

 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

Enter an option: 2
```

Sélectionner la première carte à configurer

```
 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

Enter an option: 2

Available interfaces:

1 - WAN (em0 - dhcp, dhcp6)
2 - LAN (em1 - static)
3 - OPT1 (em2)

Enter the number of the interface you wish to configure: 1
```

Pas de DHCP pour cette adresse vous devrez la fixer en fonction de votre réseau

```
 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

Enter an option: 2

Available interfaces:

1 - WAN (em0 - dhcp, dhcp6)
2 - LAN (em1 - static)
3 - OPT1 (em2)

Enter the number of the interface you wish to configure: 1

Configure IPv4 address WAN interface via DHCP? (y/n) n
```

Saisir la nouvelle adresse IP

```
 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

Enter an option: 2

Available interfaces:

1 - WAN (em0 - dhcp, dhcp6)
2 - LAN (em1 - static)
3 - OPT1 (em2)

Enter the number of the interface you wish to configure: 1

Configure IPv4 address WAN interface via DHCP? (y/n) n

Enter the new WAN IPv4 address.  Press <ENTER> for none:
> 192.168.1.92
```

Choisir le masque associé

```
Available interfaces:

1 - WAN (em0 - dhcp, dhcp6)
2 - LAN (em1 - static)
3 - OPT1 (em2)

Enter the number of the interface you wish to configure: 1

Configure IPv4 address WAN interface via DHCP? (y/n) n

Enter the new WAN IPv4 address.  Press <ENTER> for none:
> 192.168.1.92

Subnet masks are entered as bit counts (as in CIDR notation) in pfSense.
e.g. 255.255.255.0 = 24
     255.255.0.0   = 16
     255.0.0.0     = 8

Enter the new WAN IPv4 subnet bit count (1 to 31):
> 24
```

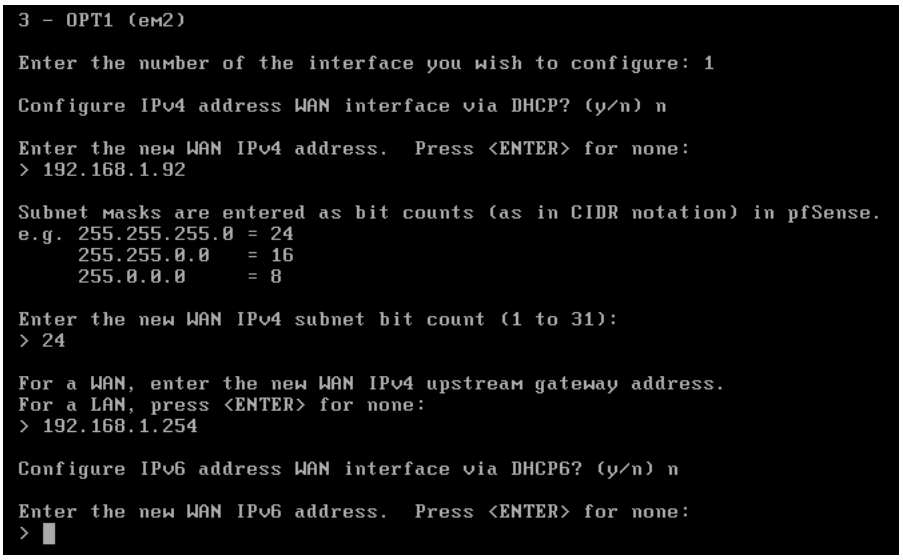
Indiquer l'adresse de la passerelle de votre routeur

```
Available interfaces:

1 - WAN (em0 - dhcp, dhcp6)
2 - LAN (em1 - static)
3 - OPT1 (em2)

Enter the number of the interface you wish to configure: 1

Configure IPv4 address WAN interface via DHCP? (y/n) n

Enter the new WAN IPv4 address.  Press <ENTER> for none:
> 192.168.1.92

Subnet masks are entered as bit counts (as in CIDR notation) in pfSense.
e.g. 255.255.255.0 = 24
     255.255.0.0   = 16
     255.0.0.0     = 8

Enter the new WAN IPv4 subnet bit count (1 to 31):
> 24

For a WAN, enter the new WAN IPv4 upstream gateway address.
For a LAN, press <ENTER> for none:
> 192.168.1.254
```

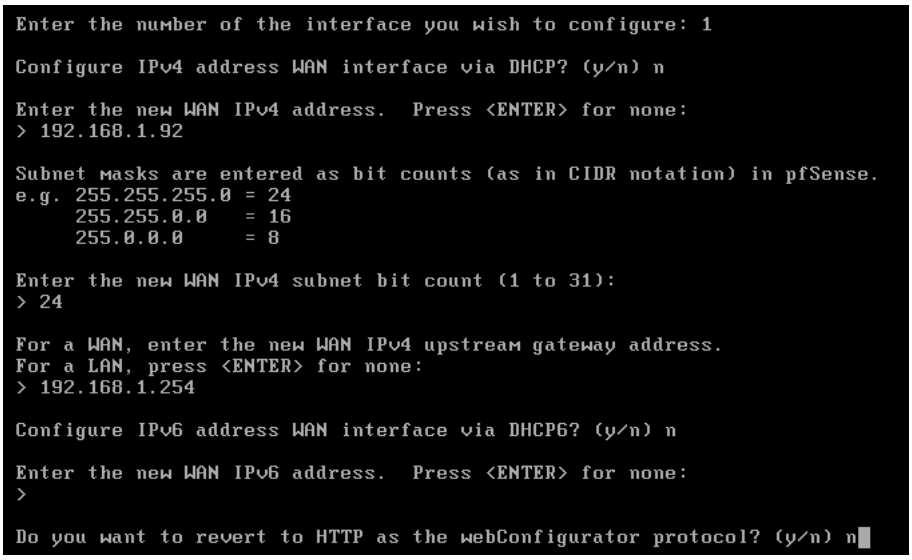
On ne souhaite pas configurer de DHCP6 pour nos utilisations

```
1 - WAN (em0 - dhcp, dhcp6)
2 - LAN (em1 - static)
3 - OPT1 (em2)

Enter the number of the interface you wish to configure: 1

Configure IPv4 address WAN interface via DHCP? (y/n) n

Enter the new WAN IPv4 address.  Press <ENTER> for none:
> 192.168.1.92

Subnet masks are entered as bit counts (as in CIDR notation) in pfSense.
e.g. 255.255.255.0 = 24
     255.255.0.0   = 16
     255.0.0.0     = 8

Enter the new WAN IPv4 subnet bit count (1 to 31):
> 24

For a WAN, enter the new WAN IPv4 upstream gateway address.
For a LAN, press <ENTER> for none:
> 192.168.1.254

Configure IPv6 address WAN interface via DHCP6? (y/n) n
```

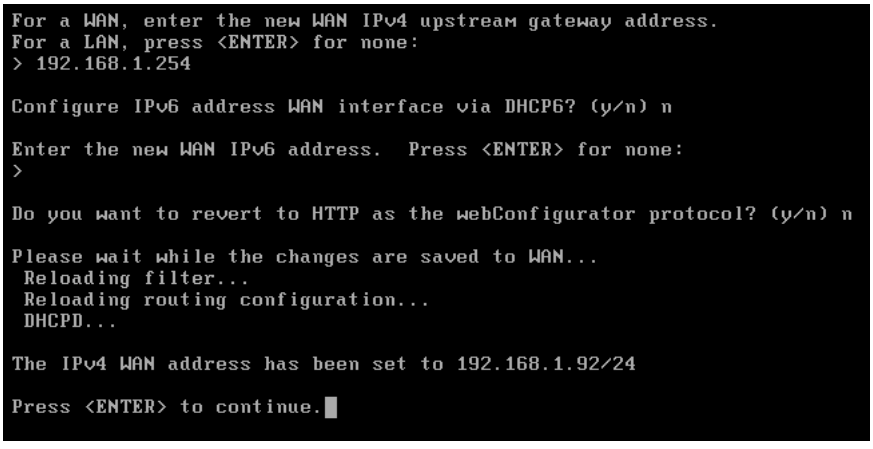
Laisser l'emplacement vide puis appuyer sur la touche « Entrée »



La question posée ici est de savoir si nous souhaitons configurer notre routeur sur l'interface WAN.
Répondre non



Vous devriez maintenant avoir terminé de configurer votre interface WAN



Reprendre la procédure maintenant pour configurer l'interface LAN em1

```
*** Welcome to pfSense 2.4.5-RELEASE-p1 (amd64) on pfSense ***

 WAN (wan)       -> em0        -> v4: 192.168.1.92/24
 LAN (lan)       -> em1        -> v4: 192.168.1.1/24
 OPT1 (opt1)     -> em2        ->

 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

Enter an option: 2

Available interfaces:

1 - WAN (em0 - static)
2 - LAN (em1 - static)
3 - OPT1 (em2)

Enter the number of the interface you wish to configure: 2
```

Choisir l'adresse IP du nouveau réseau LAN

```
 LAN (lan)       -> em1        -> v4: 192.168.1.1/24
 OPT1 (opt1)     -> em2        ->

 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

Enter an option: 2

Available interfaces:

1 - WAN (em0 - static)
2 - LAN (em1 - static)
3 - OPT1 (em2)

Enter the number of the interface you wish to configure: 2

Enter the new LAN IPv4 address.  Press <ENTER> for none:
> 192.168.19.5
```

Indiquer le masque de sous réseau

```
 5) Reboot system                    14) Enable Secure Shell (sshd)
 6) Halt system                      15) Restore recent configuration
 7) Ping host                        16) Restart PHP-FPM
 8) Shell

Enter an option: 2

Available interfaces:

1 - WAN (em0 - static)
2 - LAN (em1 - static)
3 - OPT1 (em2)

Enter the number of the interface you wish to configure: 2

Enter the new LAN IPv4 address.  Press <ENTER> for none:
> 192.168.19.5

Subnet masks are entered as bit counts (as in CIDR notation) in pfSense.
e.g. 255.255.255.0 = 24
     255.255.0.0   = 16
     255.0.0.0     = 8

Enter the new LAN IPv4 subnet bit count (1 to 31):
> 24
```

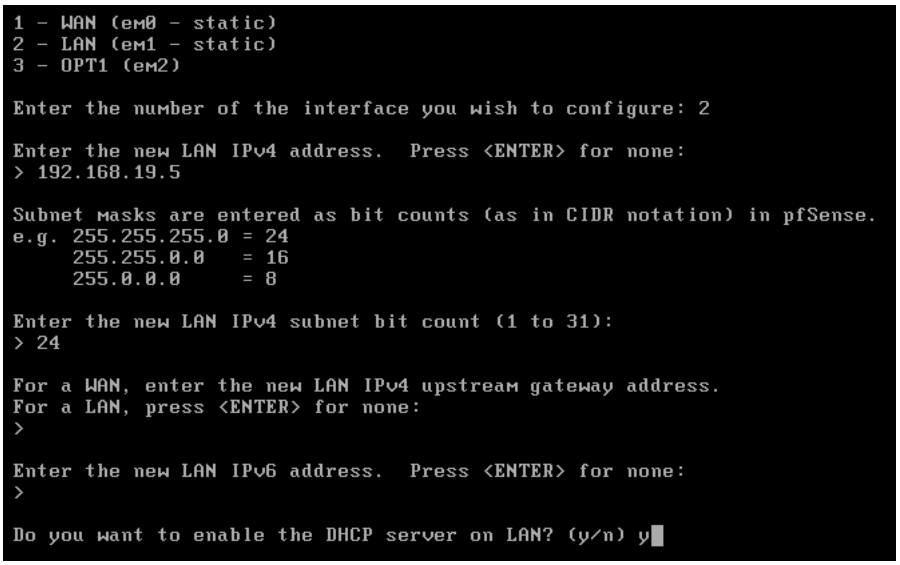
Nous ne sommes plus dans la configuration d'un LAN donc nous pouvons laisser cette section vide

```
Enter an option: 2

Available interfaces:

1 - WAN (em0 - static)
2 - LAN (em1 - static)
3 - OPT1 (em2)

Enter the number of the interface you wish to configure: 2

Enter the new LAN IPv4 address.  Press <ENTER> for none:
> 192.168.19.5

Subnet masks are entered as bit counts (as in CIDR notation) in pfSense.
e.g. 255.255.255.0 = 24
     255.255.0.0   = 16
     255.0.0.0     = 8

Enter the new LAN IPv4 subnet bit count (1 to 31):
> 24

For a WAN, enter the new LAN IPv4 upstream gateway address.
For a LAN, press <ENTER> for none:
>
```

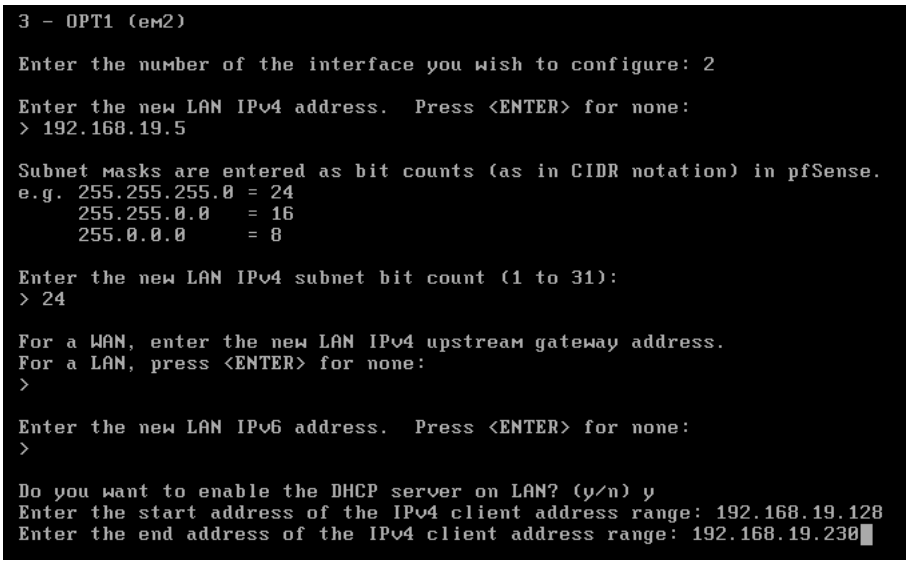
Pas de configuration IPV6 pour ce réseau

```
Available interfaces:

1 - WAN (em0 - static)
2 - LAN (em1 - static)
3 - OPT1 (em2)

Enter the number of the interface you wish to configure: 2

Enter the new LAN IPv4 address.  Press <ENTER> for none:
> 192.168.19.5

Subnet masks are entered as bit counts (as in CIDR notation) in pfSense.
e.g. 255.255.255.0 = 24
     255.255.0.0   = 16
     255.0.0.0     = 8

Enter the new LAN IPv4 subnet bit count (1 to 31):
> 24

For a WAN, enter the new LAN IPv4 upstream gateway address.
For a LAN, press <ENTER> for none:
>

Enter the new LAN IPv6 address.  Press <ENTER> for none:
>
```

Activer le DHCP sur ce sous réseau



Indiquer la plage du nouveau sous réseau



Autoriser la configuration du routeur sur ce réseau

```
Enter the number of the interface you wish to configure: 2

Enter the new LAN IPv4 address.  Press <ENTER> for none:
> 192.168.19.5

Subnet masks are entered as bit counts (as in CIDR notation) in pfSense.
e.g. 255.255.255.0 = 24
     255.255.0.0   = 16
     255.0.0.0     = 8

Enter the new LAN IPv4 subnet bit count (1 to 31):
> 24

For a WAN, enter the new LAN IPv4 upstream gateway address.
For a LAN, press <ENTER> for none:
>

Enter the new LAN IPv6 address.  Press <ENTER> for none:
>

Do you want to enable the DHCP server on LAN? (y/n) y
Enter the start address of the IPv4 client address range: 192.168.19.128
Enter the end address of the IPv4 client address range: 192.168.19.230
Disabling IPv6 DHCPD...
Do you want to revert to HTTP as the webConfigurator protocol? (y/n) y
```

Votre nouveau réseau LAN est maintenant crée

```
For a WAN, enter the new LAN IPv4 upstream gateway address.
For a LAN, press <ENTER> for none:
>

Enter the new LAN IPv6 address.  Press <ENTER> for none:
>

Do you want to enable the DHCP server on LAN? (y/n) y
Enter the start address of the IPv4 client address range: 192.168.19.128
Enter the end address of the IPv4 client address range: 192.168.19.230
Disabling IPv6 DHCPD...
Do you want to revert to HTTP as the webConfigurator protocol? (y/n) y

Please wait while the changes are saved to LAN...
 Reloading filter...
 Reloading routing configuration...
 DHCPD...
 Restarting webConfigurator...

The IPv4 LAN address has been set to 192.168.19.5/24
You can now access the webConfigurator by opening the following URL in your web
browser:
               http://192.168.19.5/

Press <ENTER> to continue.
```

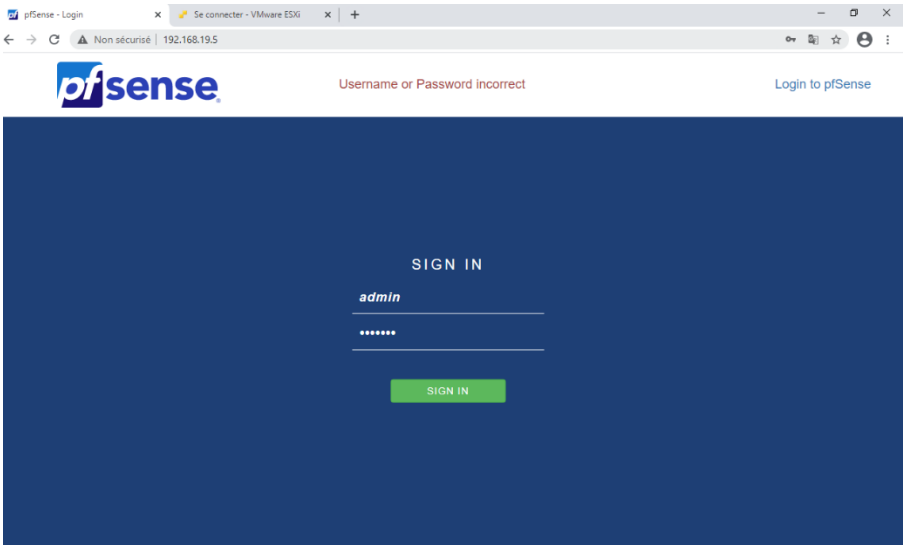
Reprendre cette procédure pour votre 3ème carte. Vous devriez maintenant avoir la visibilité sur vos 3 cartes avec leurs adresses.

```
*** Welcome to pfSense 2.4.5-RELEASE-p1 (amd64) on pfSense ***

 WAN (wan)       -> em0        -> v4: 192.168.1.92/24
 LAN (lan)       -> em1        -> v4: 192.168.19.5/24
 OPT1 (opt1)     -> em2        -> v4: 192.168.232.6/24

 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

Enter an option:
```

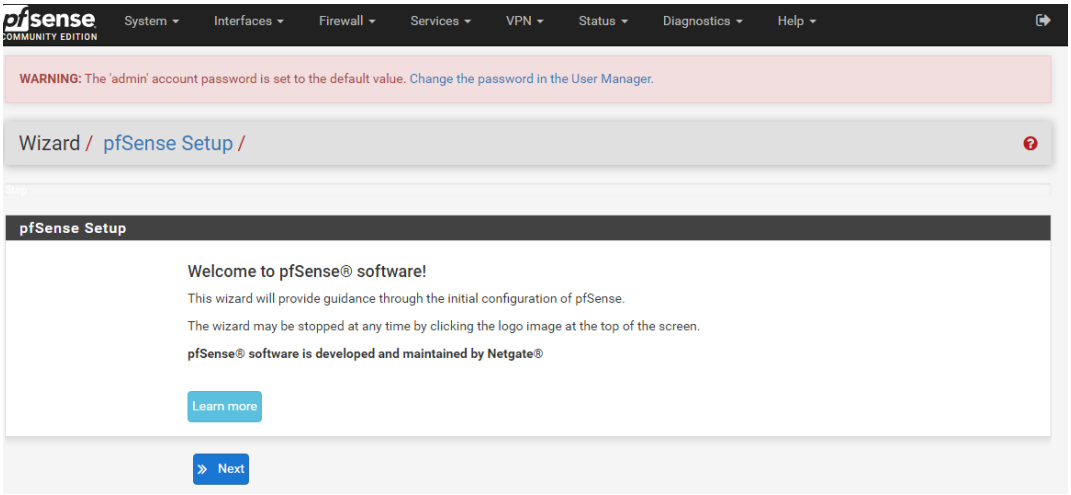
Afin de vérifier que votre routeur reçoit bien internet, sélectionner l'option 7 pour effectuer un ping sur une adresse internet.

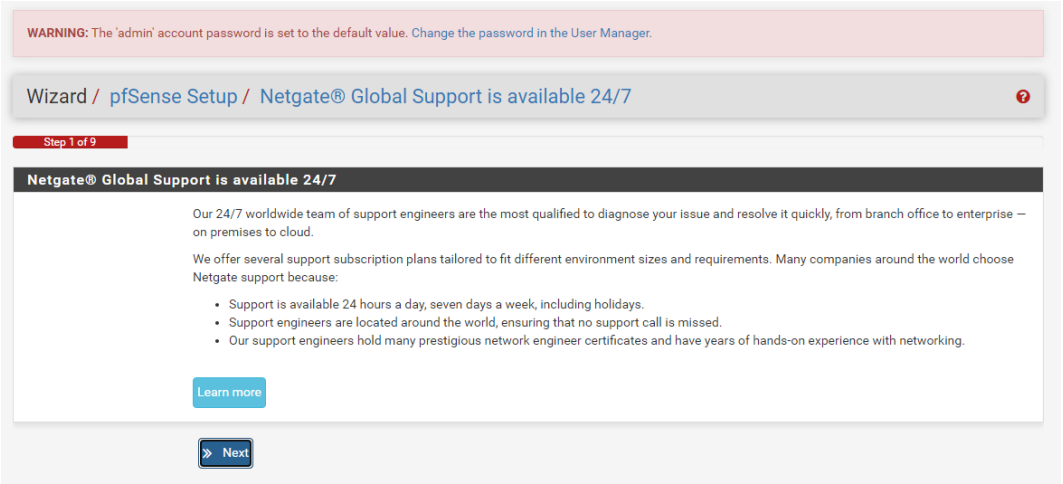
```
 1) Assign Interfaces                10) Filter Logs
 2) Set interface(s) IP address      11) Restart webConfigurator
 3) Reset webConfigurator password   12) PHP shell + pfSense tools
 4) Reset to factory defaults        13) Update from console
 5) Reboot system                    14) Enable Secure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

Enter an option: 7


Enter a host name or IP address: 8.8.8.8

PING 8.8.8.8 (8.8.8.8): 56 data bytes
64 bytes from 8.8.8.8: icmp_seq=0 ttl=115 time=9.007 ms
64 bytes from 8.8.8.8: icmp_seq=1 ttl=115 time=11.411 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=115 time=7.091 ms

--- 8.8.8.8 ping statistics ---
3 packets transmitted, 3 packets received, 0.0% packet loss
round-trip min/avg/max/stddev = 7.091/9.170/11.411/1.767 ms

Press ENTER to continue.
```

Maintenant devez-vous connecter sur l'interface graphique disponible à l'adresse de votre LAN pour finaliser le paramétrage. Identifiant : admin/pfsense

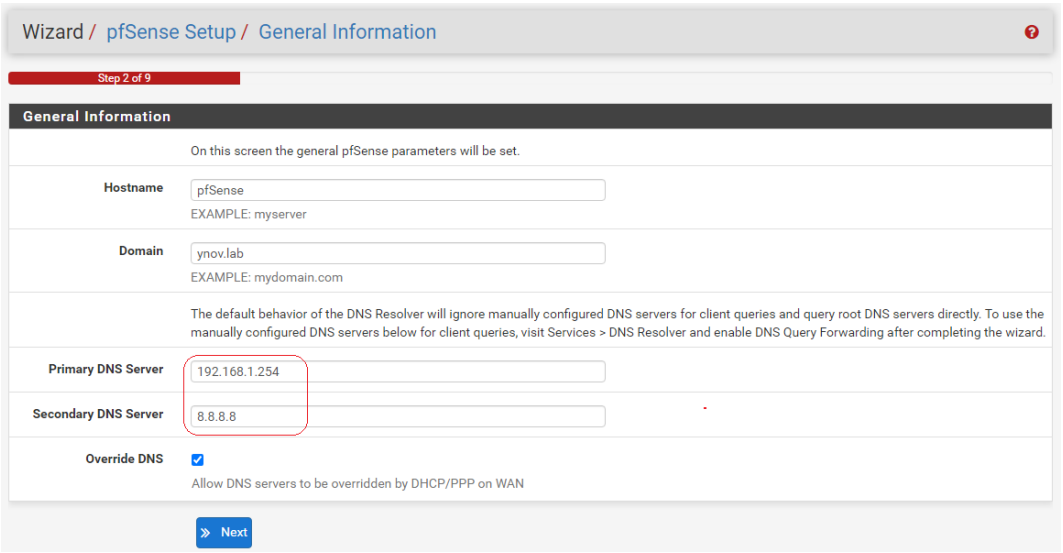


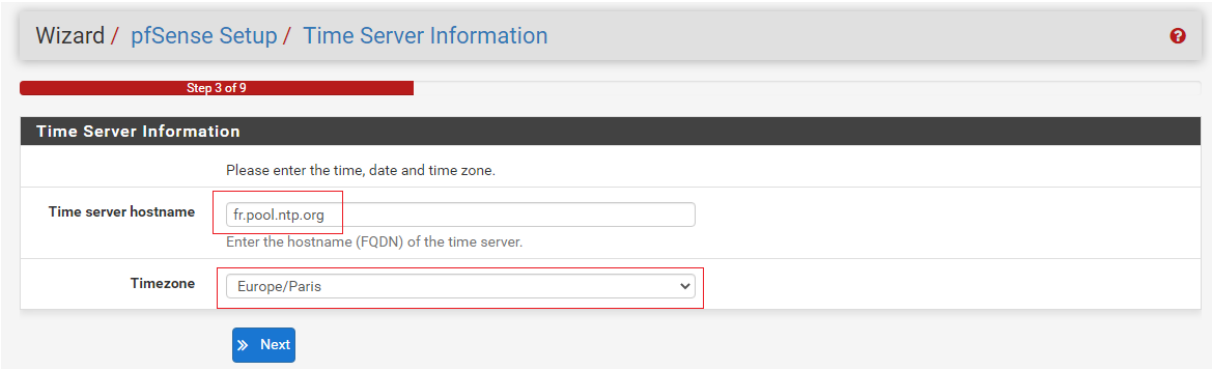
Cliquer sur next



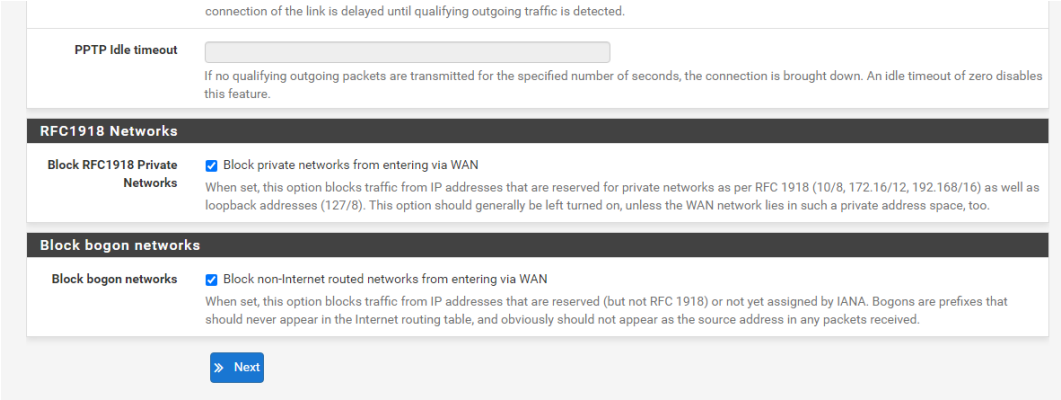


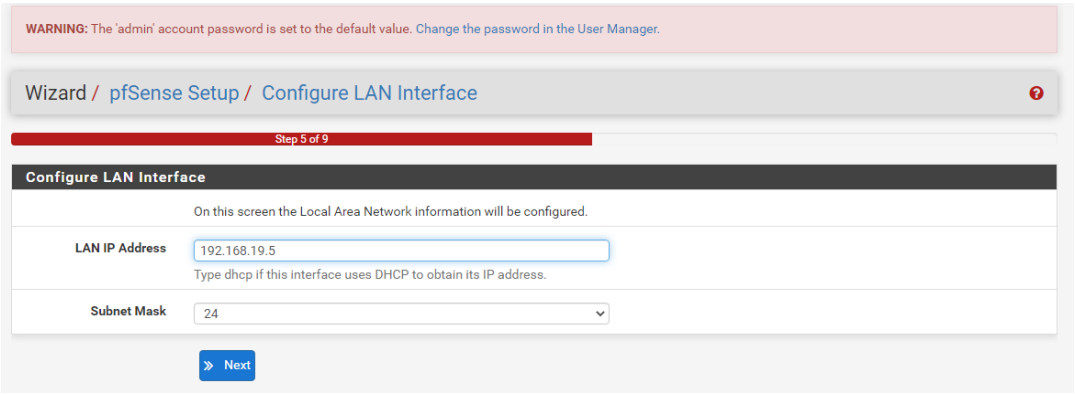
Saisir l'adresse IP de votre routeur en DNS



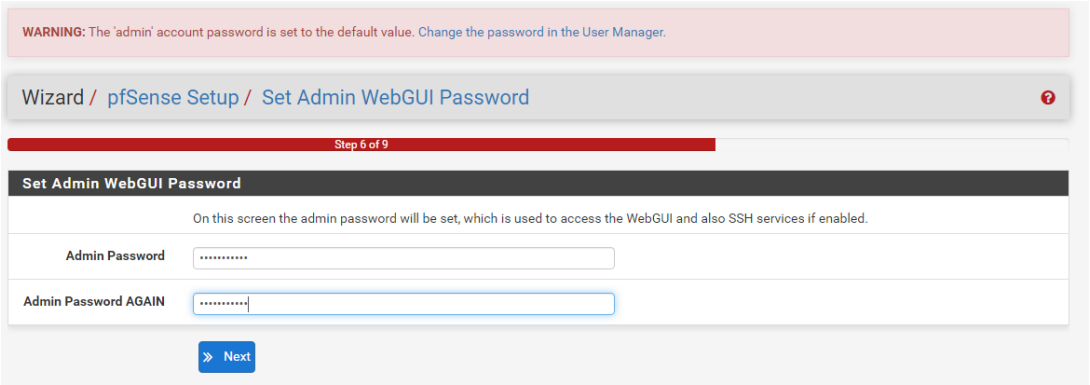


Rappel sur les informations de configuration

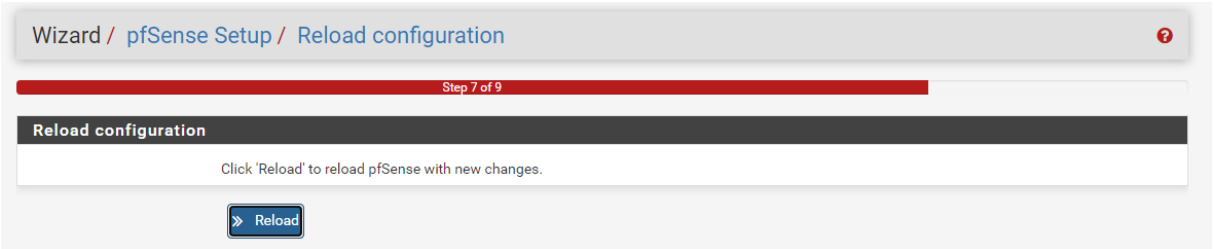


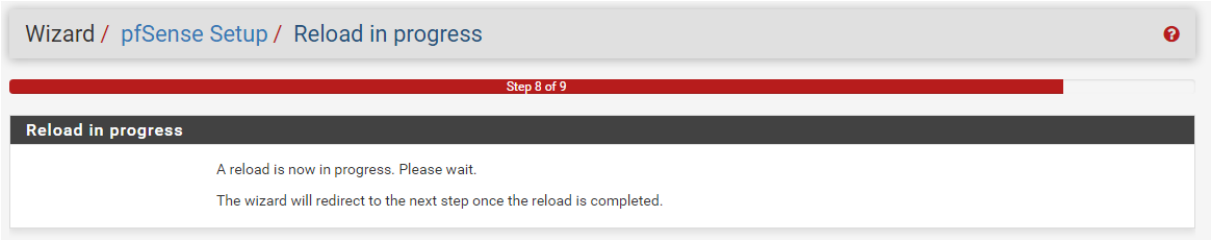


Saisir le nouveau mot de passe

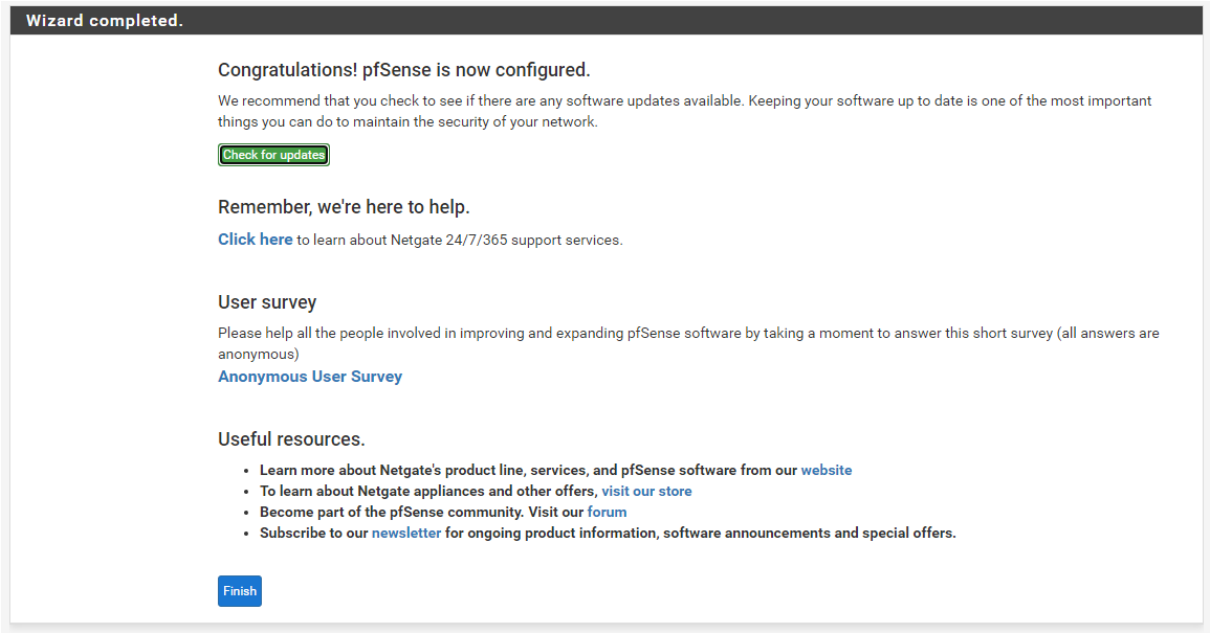


Cliquer sur recharger pour valider votre nouvelle configuration

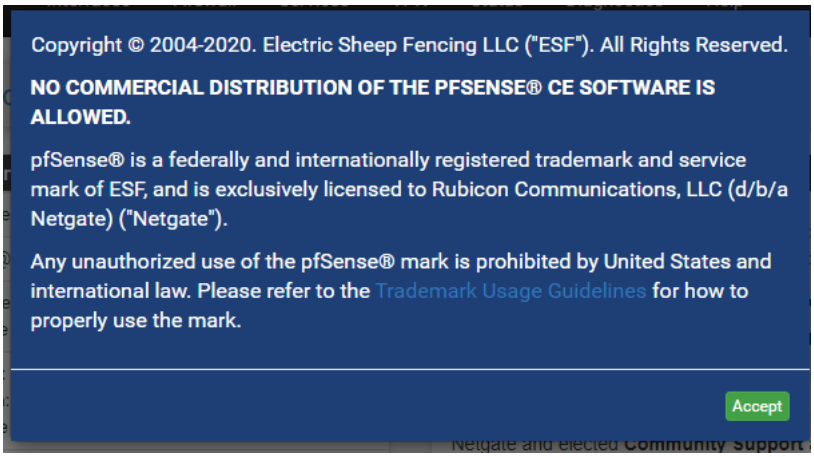


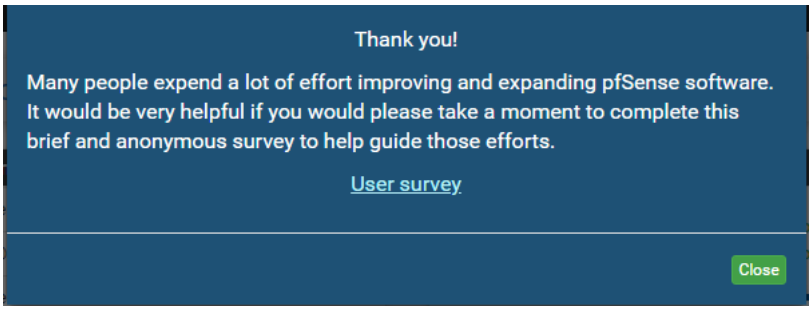


Cliquer sur « finish »

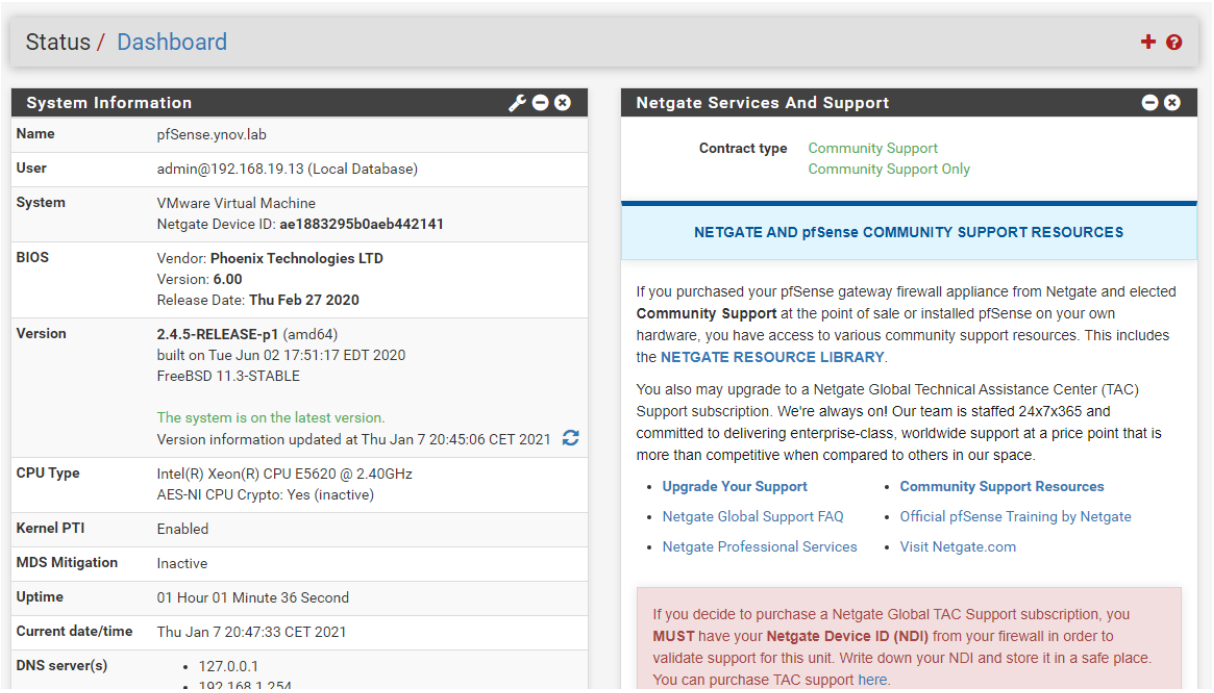


S'affiche un petit rappel sur les droits et remerciements

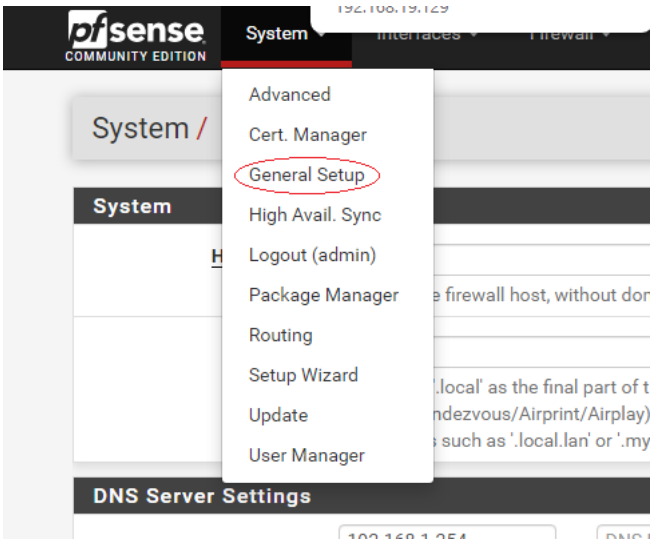




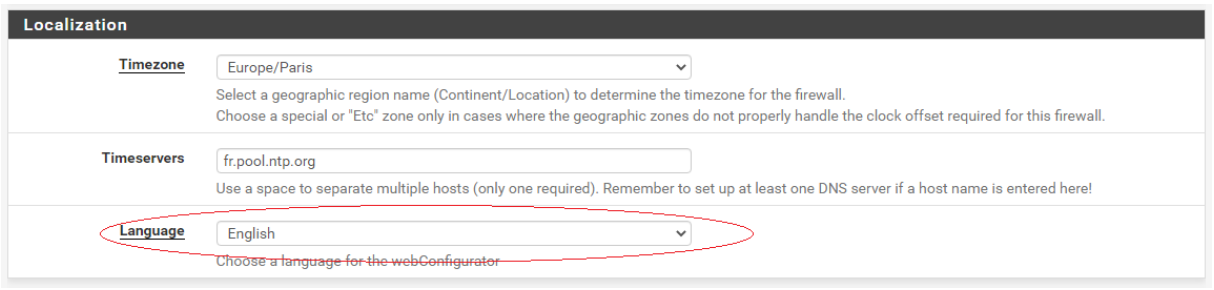
Votre routeur est maintenant prêt



Vous pouvez maintenant changer la langue en allant dans la rubrique System> General Setup

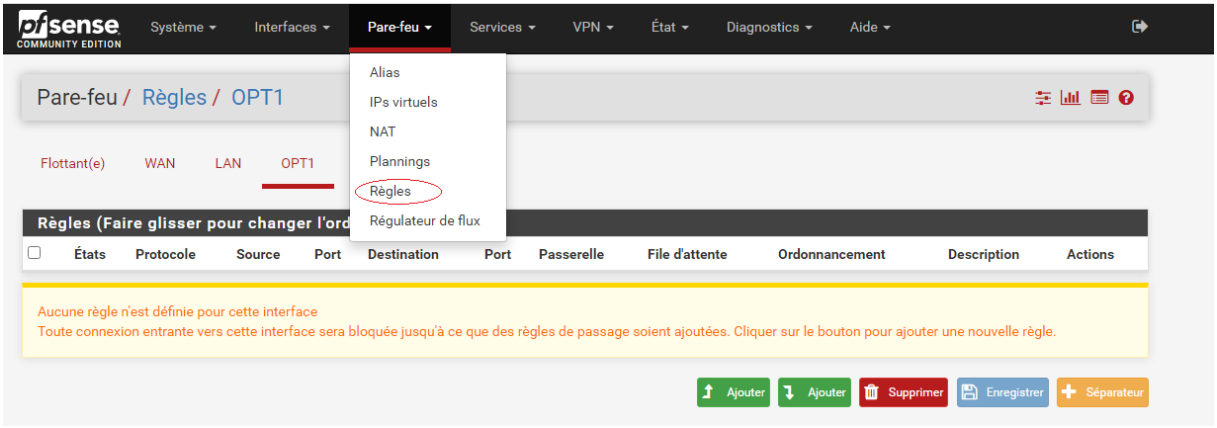


Modifier la ligne pour choisir la langue française

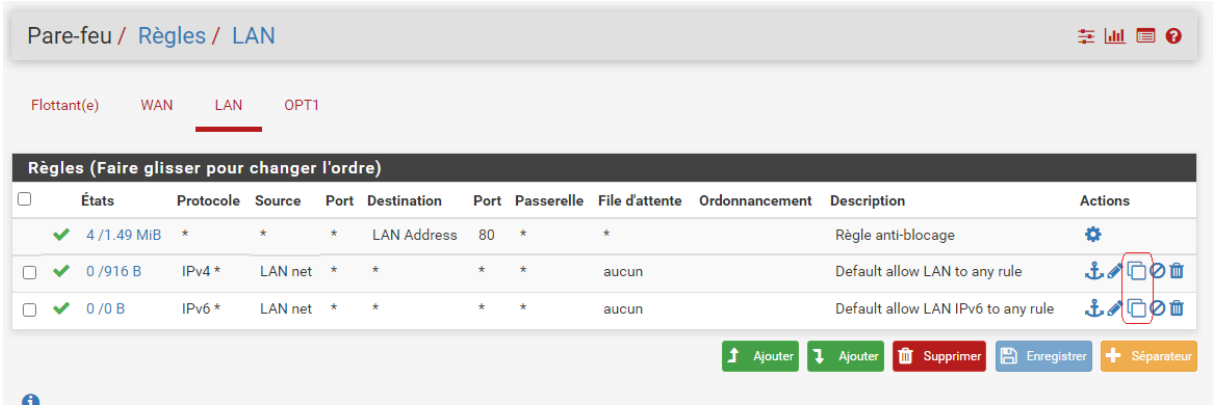


Cliquer tout en bas sur le bouton « Save » pour enregistrer vos modifications et recharger la page.

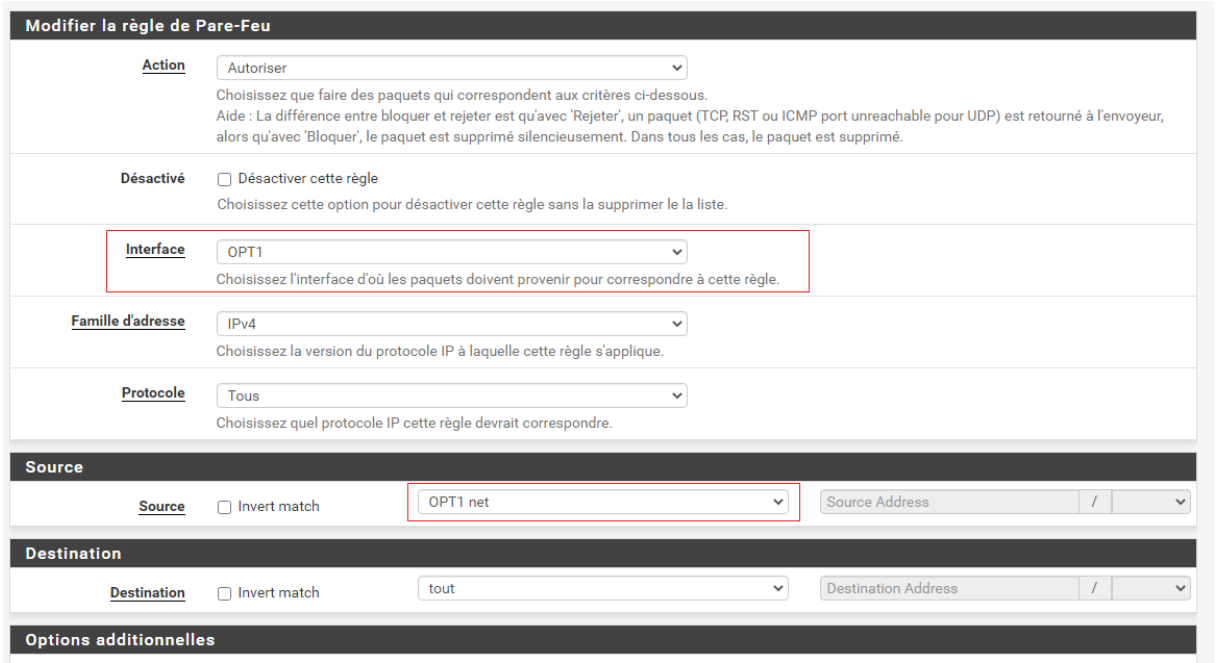
Par défaut la carte optionnelle (em3) ne dispose d'aucune règle de pare-feu et donc n'est pas accessible. Afin de palier à ce problème copier les règles du réseau LAN vers OPT1.



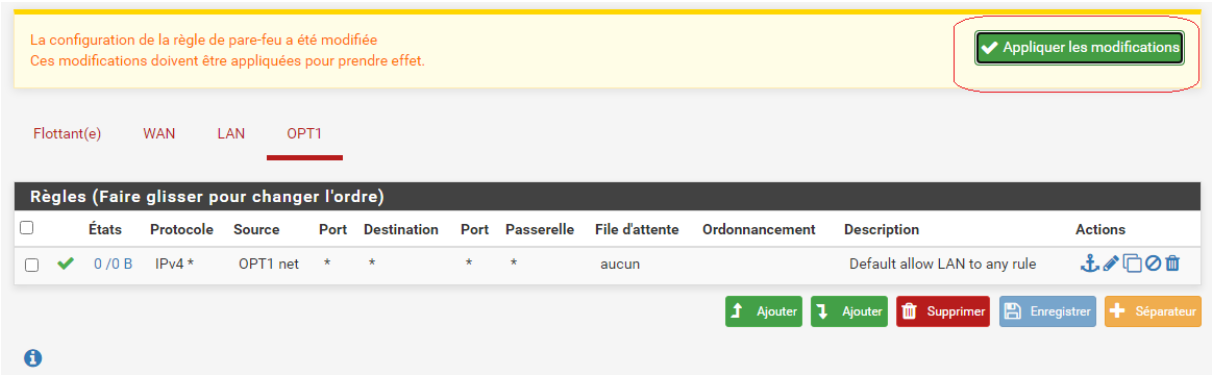
Copier les règles à partir de cet endroit

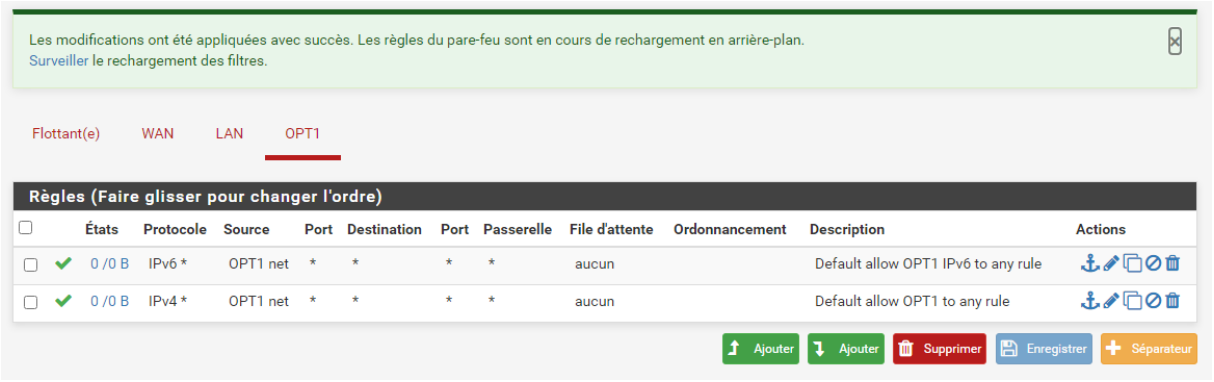


Modifier les sections suivantes :



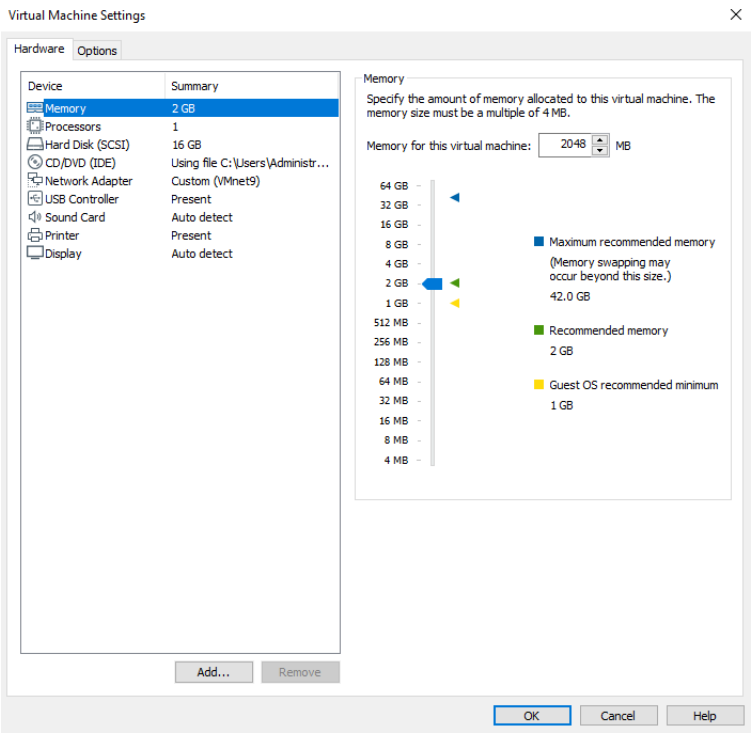
Appliquer les règles du changement





Partie 2 : Installation des VM

1 - Maintenant vous devez procéder à l'installation de 2 VM (debian) chacune d'elle devra être attachée à l'une des cartes du réseau. Assurez-vous qu'un serveur ssh est installé sur chacune des machines. Exemple de configuration ci-dessous :



2 - Vérifier que chacune de vos VM est bien identifiée sur le réseau et dispose d'un accès internet.

3 - Configurer le serveur ssh sur chacune des machines pour qu'elles puissent communiquer

4 – Installer un serveur Web sur l'une de vos machines et vérifier que vous y avez accès depuis l'autre