

# Institut Universitaire des Sciences (IUS)

## Faculté des Sciences et des Technologies (FST)

### Présentation du Lab 3

**Cours :** Réseaux

**Sujet :** Configuration de NAT et d'un réseau IoT (Internet des Objets) sur Cisco Packet Tracer

**Étudiant :** Wendy Colas

**Niveau :** L3

**Année :** 2025

## Introduction

Dans le cadre de ce projet, une configuration réseau a été réalisée en utilisant GNS3 et VMware Workstation afin de simuler un environnement de travail fonctionnel et sécurisé. Les services essentiels tels que Telnet, SSH, DNS et DHCP ont été configurés avec précision pour garantir la connectivité et la gestion efficaces des appareils réseau. Ce rapport vise à détailler les étapes clés de la configuration, tout en mettant en lumière les défis rencontrés et les solutions apportées. Ce projet a permis d'explorer et de configurer plusieurs services réseau clés, notamment Telnet, SSH, DNS et DHCP, dans un environnement simulé à l'aide de GNS3 et VMware Workstation. Deux topologies distinctes, intégrant des VPCs et des conteneurs Ubuntu Docker, ont été testées, offrant des résultats intéressants. Ce travail met en évidence l'importance d'une configuration méthodique et d'un choix soigné des composants pour assurer la connectivité et la gestion réseau.

---

## Reproduction de la topologie en configurant le protocole Telnet

### Étapes de configuration

#### 1. Définition de l'interface réseau

La première étape consiste à activer et configurer l'interface réseau de base.

#### 2. Attribution des adresses IP

La deuxième étape est l'attribution des adresses IP à l'interface.

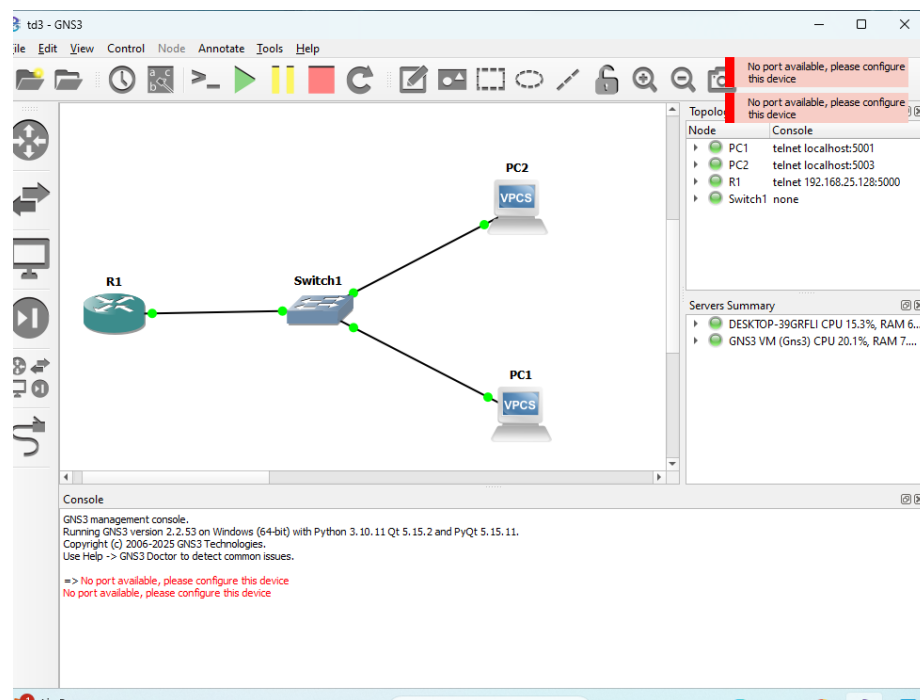


Figure 1: Configuration de l'interface

```

R1
Copyright (c) 1986-2010 by Cisco Systems, Inc.
Compiled Tue 17-Aug-10 05:40 by prod.rel.team
*Mar 1 00:00:09.463: %SNMP-5-COLDSTART: SNMP agent on host R1 is undergoing a c
old start
*Mar 1 00:00:10.032: %CRYPTO-6-ISAKMP_ON_OFF: ISAKMP is OFF
*Mar 1 00:00:10.040: %CRYPTO-6-GDOI_ON_OFF: GDOI is OFF
*Mar 1 00:01:09.541: %C2600-4-SMARTINITDISABLE: Warning! You have disabled SMAR
T INIT
and manually configured the amount of IO memory allocated. This is HIGHLY
discouraged on the Cisco 2600XM Series platforms as it may deprive the
system of memory necessary for normal operation. It is highly recommended
that SMART INIT not be disabled to ensure proper router operation.

R1#enable
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface FastEthernet0/0
^
% Invalid input detected at '^' marker.

R1(config)#interface FastEthernet0
^
% Invalid input detected at '^' marker.

R1(config)#interface Ethernet0
% Incomplete command.

R1(config)#interface Ethernet0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#
*Mar 1 00:03:23.938: %LINK-3-UPDOWN: Interface Ethernet0/0, changed state to up
R1(config)#
*Mar 1 00:03:24.939: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to up
R1(config)#exit
R1#
*Mar 1 00:03:45.934: %SYS-5-CONFIG_I: Configured from console by console
R1#
```

Figure 2: Attribution des adresses IP

### 3. Activation de Telnet

Configuration des lignes VTY pour permettre l'accès via Telnet.



```
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC2> ip 192.168.1.2 255.255.255.0 192.168.1.1
Checking for duplicate address...
PC1 : 192.168.1.2 255.255.255.0 gateway 192.168.1.1

PC2>
```

Figure 3: Activation de Telnet

### 4. Vérification de la connectivité

Tests de connectivité entre les appareils configurés pour Telnet.

### 5. Sauvegarde des configurations

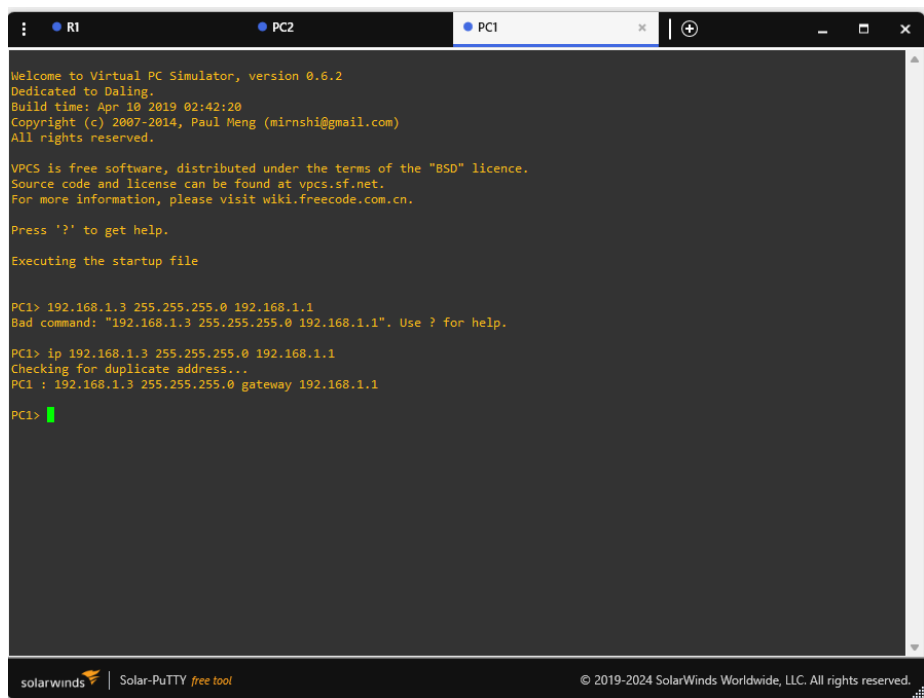
Confirmation et sauvegarde des configurations.

### 6. Résolution des erreurs

Gestion des erreurs lors de la configuration.

### 7. Résultat final

Topologie fonctionnelle avec le protocole Telnet entièrement opérationnel.



The image shows a window titled "Virtual PC Simulator" with three tabs: "R1", "PC2", and "PC1". The "PC1" tab is active, displaying a terminal window. The terminal output is as follows:

```
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC1> 192.168.1.3 255.255.255.0 192.168.1.1
Bad command: "192.168.1.3 255.255.255.0 192.168.1.1". Use ? for help.

PC1> ip 192.168.1.3 255.255.255.0 192.168.1.1
Checking for duplicate address...
PC1 : 192.168.1.3 255.255.255.0 gateway 192.168.1.1

PC1> 
```

The terminal window has a status bar at the bottom that reads "solarwinds | Solar-PuTTY free tool" on the left and "© 2019-2024 SolarWinds Worldwide, LLC. All rights reserved." on the right.

Figure 4: Tests de connectivité

```
discouraged on the Cisco 2600XM Series platforms as it may deprive the
system of memory necessary for normal operation. It is highly recommended
that SMART INIT not be disabled to ensure proper router operation.

R1#enable
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface FastEthernet0/0
^
% Invalid input detected at '^' marker.

R1(config)#interface FastEthernet0
^
% Invalid input detected at '^' marker.

R1(config)#interface Ethernet0
% Incomplete command.

R1(config)#interface Ethernet0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#
*Mar 1 00:03:23.938: %LINK-3-UPDOWN: Interface Ethernet0/0, changed state to up
R1(config)#
*Mar 1 00:03:24.939: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to up
R1(config)#exit
R1#
*Mar 1 00:03:45.934: %SYS-5-CONFIG_I: Configured from console by console
R1#E{M'}T
R1#p)
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#line vty 0 4
R1(config-line)#password wendy
R1(config-line)#login
R1(config-line)#transport input telnet
R1(config-line)#exit
R1(config)#
```

solarwinds | Solar-PuTTY free tool © 2019-2024 SolarWinds Worldwide, LLC. All rights reserved.

Figure 5: Sauvegarde des configurations



```
R1
R1(config)#interface FastEthernet0
^
% Invalid input detected at '^' marker.
R1(config)#interface Ethernet0
% Incomplete command.
R1(config)#interface Ethernet0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#
*Mar  1 00:03:23.938: %LINK-3-UPDOWN: Interface Ethernet0/0, changed state to up
R1(config)#
*Mar  1 00:03:24.939: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to up
R1(config)#exit
R1#
*Mar  1 00:03:45.934: %SYS-5-CONFIG_I: Configured from console by console
R1#E{M'}T
R1#p}
R1#conf t
Enter configuration commands, one per line.  End with CNTL/Z.
R1(config)#line vty 0 4
R1(config-line)#password wendy
R1(config-line)#login
R1(config-line)#transport input telnet
R1(config-line)#exit
R1(config)#exit
R1#
*Mar  1 00:12:57.598: %SYS-5-CONFIG_I: Configured from console by console
R1#telnet 192.168.1.1
Trying 192.168.1.1 ... Open

User Access Verification

Password:
R1>
```

Figure 6: Gestion des erreurs



```

Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

Checking for duplicate address...
PC1 : 192.168.1.3 255.255.255.0 gateway 192.168.1.1

PC2> telnet 192.168.1.1
Bad command: "telnet 192.168.1.1". Use ? for help.

PC2> 
```

Figure 7: Topologie finale



# Reproduction de la topologie en configurant le protocole Telnet en utilisant un Ubuntu Docker guest

## Étapes de la configuration

### 1. Connexion initiale via Telnet

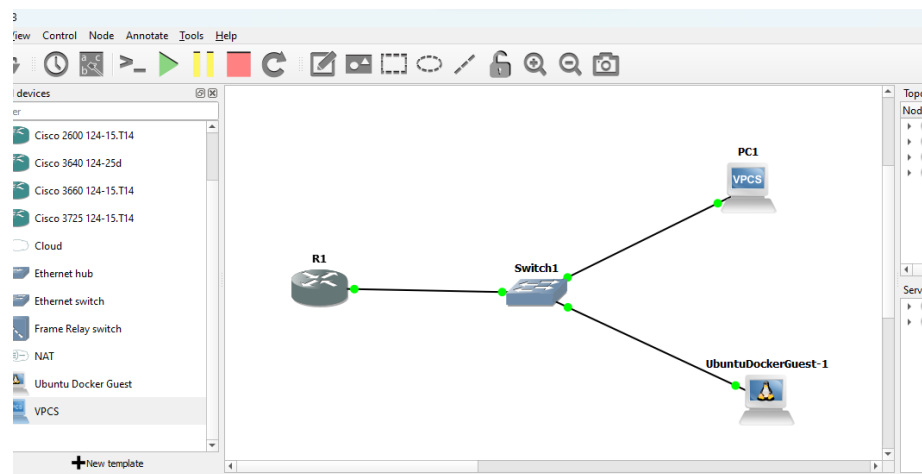


Figure 8: Connexion initiale

2. Interface réseau après configuration
  3. Vérification de l'état des interfaces
  4. Modification du fichier de configuration réseau
  5. Résultats après redémarrage des services
  6. Test de connectivité réseau
  7. Utilisation du protocole Telnet pour l'accès distant
  8. Résultats finaux de la configuration
-

```
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.

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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC1> ip 192.168.1.2 255.255.255.0 192.168.1.1
Checking for duplicate address...
PC1 : 192.168.1.2 255.255.255.0 gateway 192.168.1.1

PC1> exit
```

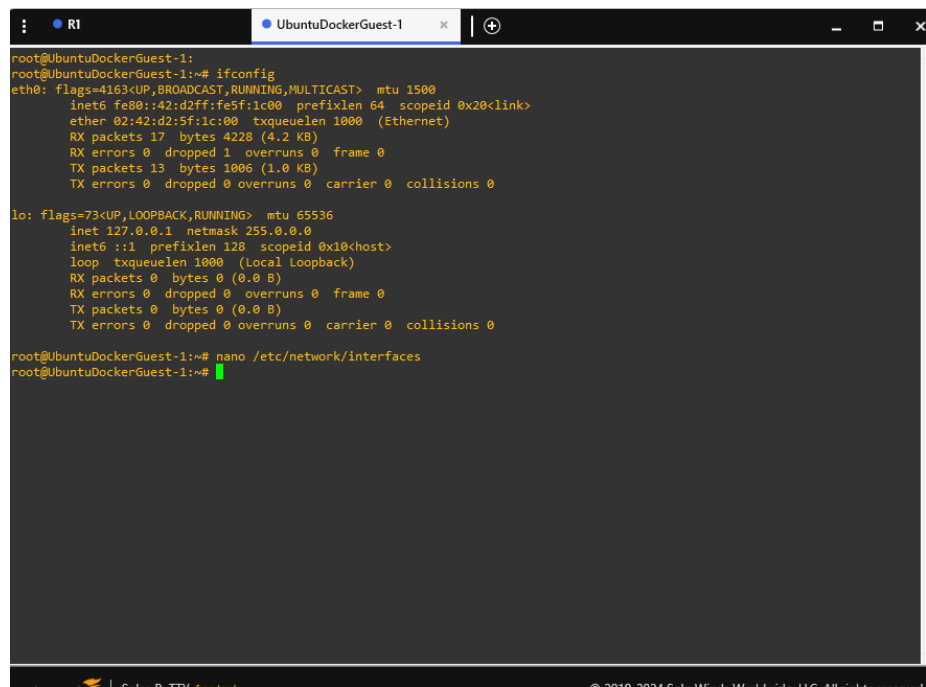
solarwinds | Solar-PuTTY free tool © 2019-2024 SolarWinds Worldwide, LLC. All rights reserved.

Figure 9: Interface réseau

```
R1
*Mar 1 00:00:08.722: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to down
*Mar 1 00:00:08.722: %LINK-5-CHANGED: Interface Ethernet0/0, changed state to administratively down
*Mar 1 00:00:08.862: %SYS-5-RESTART: System restarted -- Cisco IOS Software, C2600 Software (C2600-ADVENTERPRISEK9-M), Version 12.4(15)T14, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2010 by Cisco Systems, Inc.
Compiled Tue 17-Aug-10 05:40 by prod_rel_team
*Mar 1 00:00:08.862: %SNMP-5-COLDSTART: SNMP agent on host R1 is undergoing a cold start
*Mar 1 00:00:09.351: %CRYPTO-6-ISAKMP_ON_OFF: ISAKMP is OFF
*Mar 1 00:00:09.359: %CRYPTO-6-GDOI_ON_OFF: GDOI is OFF
*Mar 1 00:01:08.904: %C2600-4-SMARTINITDISABLE: Warning! You have disabled SMART INIT
and manually configured the amount of IO memory allocated. This is HIGHLY discouraged on the Cisco 2600XM Series platforms as it may deprive the system of memory necessary for normal operation. It is highly recommended that SMART INIT not be disabled to ensure proper router operation.

R1#en
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface Ethernet0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#
*Mar 1 00:05:37.088: %LINK-3-UPDOWN: Interface Ethernet0/0, changed state to up
R1(config)#
*Mar 1 00:05:38.090: %LINEPROTO-5-UPDOWN: Line protocol on Interface Ethernet0/0, changed state to up
R1(config)#line vty 0 4
R1(config-line)#password wendy
R1(config-line)#login
R1(config-line)#transport input telnet
R1(config-line)#exit
R1(config)#
```

Figure 10: Vérification interfaces



```
root@UbuntuDockerGuest-1:~# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet6 fe80::42:d2:5f:1c:00 prefixlen 64 scopeid 0x20<link>
    ether 02:42:d2:5f:1c:00 txqueuelen 1000 (Ethernet)
    RX packets 17 bytes 4228 (4.2 KB)
    RX errors 0 dropped 1 overruns 0 frame 0
    TX packets 13 bytes 1006 (1.0 KB)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

root@UbuntuDockerGuest-1:~# nano /etc/network/interfaces
root@UbuntuDockerGuest-1:~#
```

Figure 11: Configuration réseau

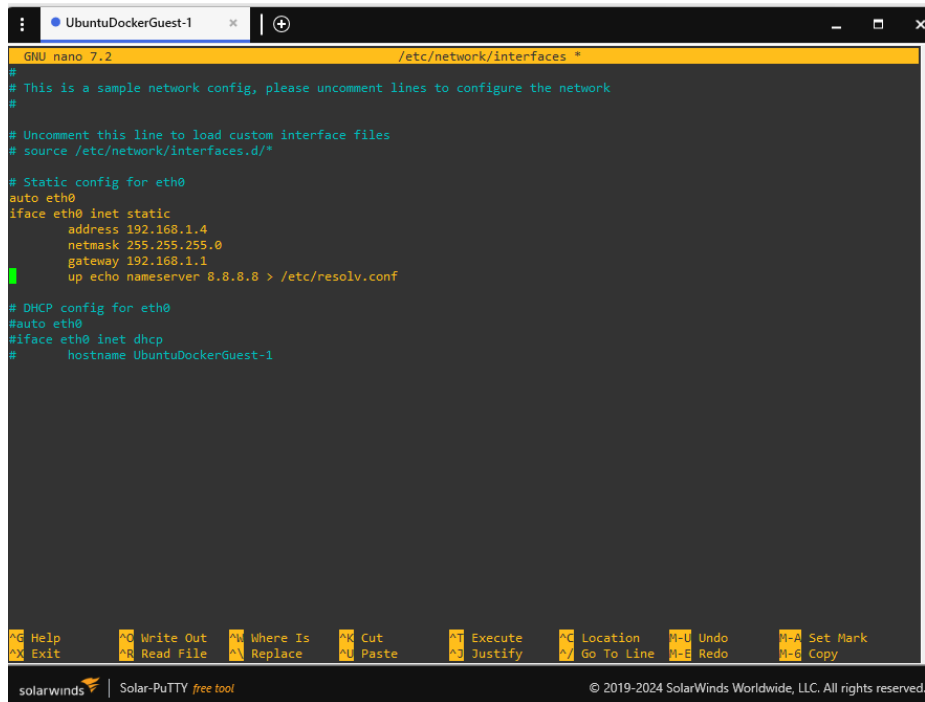
```
GNU nano 7.2 /etc/network/interfaces
# This is a sample network config, please uncomment lines to configure the network
#
# Uncomment this line to load custom interface files
# source /etc/network/interfaces.d/*
# Static config for eth0
#auto eth0
#iface eth0 inet static
#    address 192.168.1.3
#    netmask 255.255.255.0
#    gateway 192.168.1.1
#    up echo nameserver 8.8.8.8 > /etc/resolv.conf
# DHCP config for eth0
#auto eth0
#iface eth0 inet dhcp
#    hostname UbuntuDockerGuest-1
```

Read 19 lines

Help Exit Write Out Read File Where Is Replace Cut Paste Execute Justify Location Go To Line Undo Redo Set Mark Copy

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Figure 12: Résultats après redémarrage



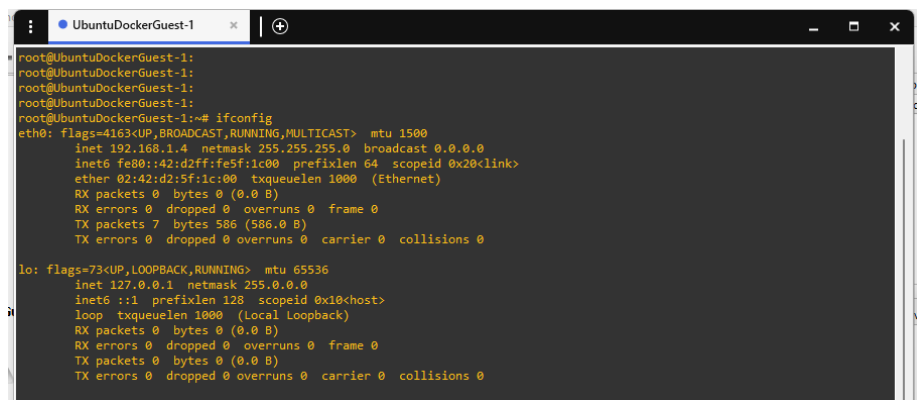
```
GNU nano 7.2 /etc/network/interfaces *
# This is a sample network config, please uncomment lines to configure the network
#
# Uncomment this line to load custom interface files
# source /etc/network/interfaces.d/*

# Static config for eth0
auto eth0
iface eth0 inet static
    address 192.168.1.4
    netmask 255.255.255.0
    gateway 192.168.1.1
    up echo nameserver 8.8.8.8 > /etc/resolv.conf

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

The screenshot shows a terminal window titled 'UbuntuDockerGuest-1' with a nano editor open at the file '/etc/network/interfaces'. The file contains network configuration for 'eth0', including static IP settings (192.168.1.4) and a DHCP section. The terminal status bar at the bottom shows 'solarwinds Solar-PuTTY free tool' and a copyright notice for 2019-2024 SolarWinds Worldwide, LLC.

Figure 13: Test connectivité



```
root@UbuntuDockerGuest-1:~# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.1.4 netmask 255.255.255.0 broadcast 0.0.0.0
    inet6 fe80::42:d2ff:fe5f:1c00 prefixlen 64 scopeid 0x20<link>
    ether 02:42:d2:5f:1c:00 txqueuelen 1000 (Ethernet)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 7 bytes 586 (586.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING> mtu 65536
    inet 127.0.0.1 netmask 255.0.0.0
    inet6 ::1 prefixlen 128 scopeid 0x10<host>
    loop txqueuelen 1000 (Local Loopback)
    RX packets 0 bytes 0 (0.0 B)
    RX errors 0 dropped 0 overruns 0 frame 0
    TX packets 0 bytes 0 (0.0 B)
    TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

The screenshot shows a terminal window titled 'UbuntuDockerGuest-1' displaying the output of the 'ifconfig' command. It shows details for the 'eth0' interface (IP: 192.168.1.4, MTU: 1500) and the 'lo' loopback interface (IP: 127.0.0.1, MTU: 65536).

Figure 14: Telnet accès distant

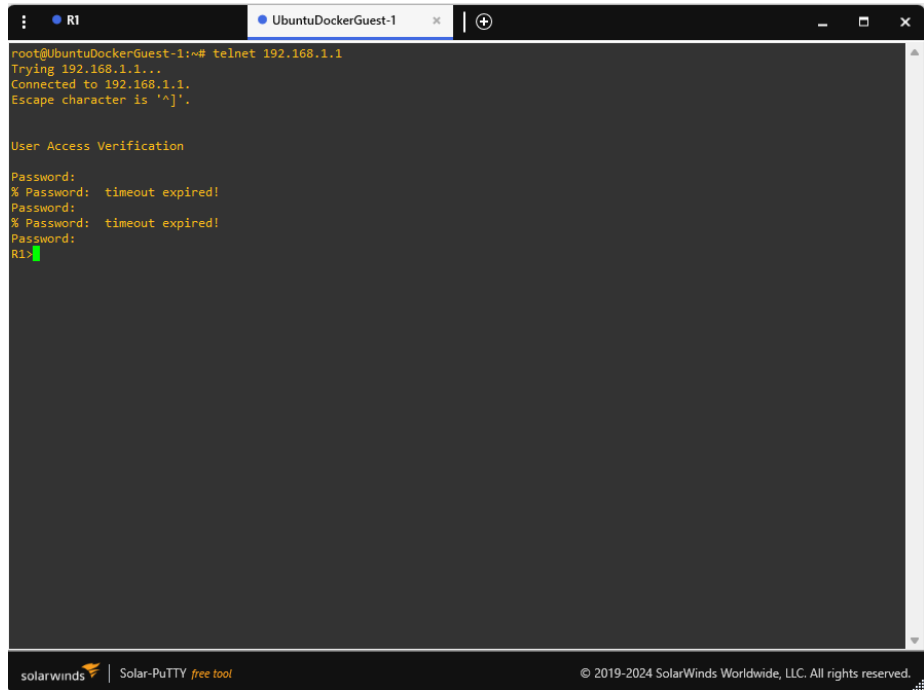


Figure 15: Résultats finaux

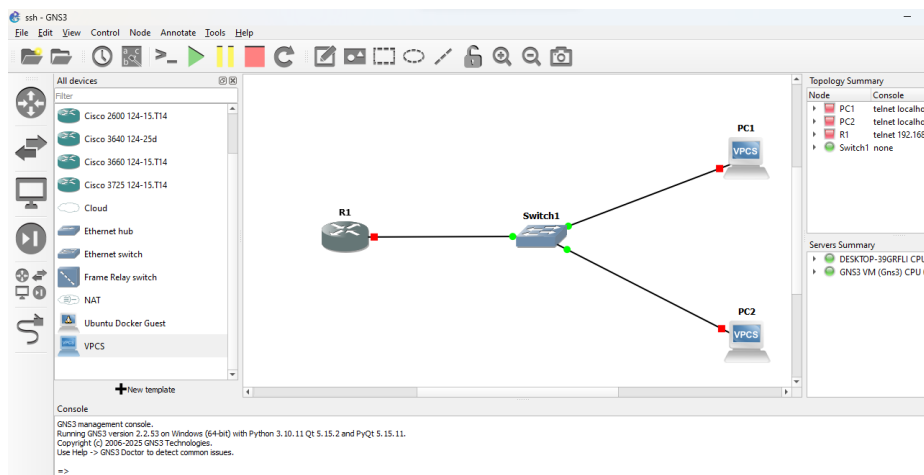
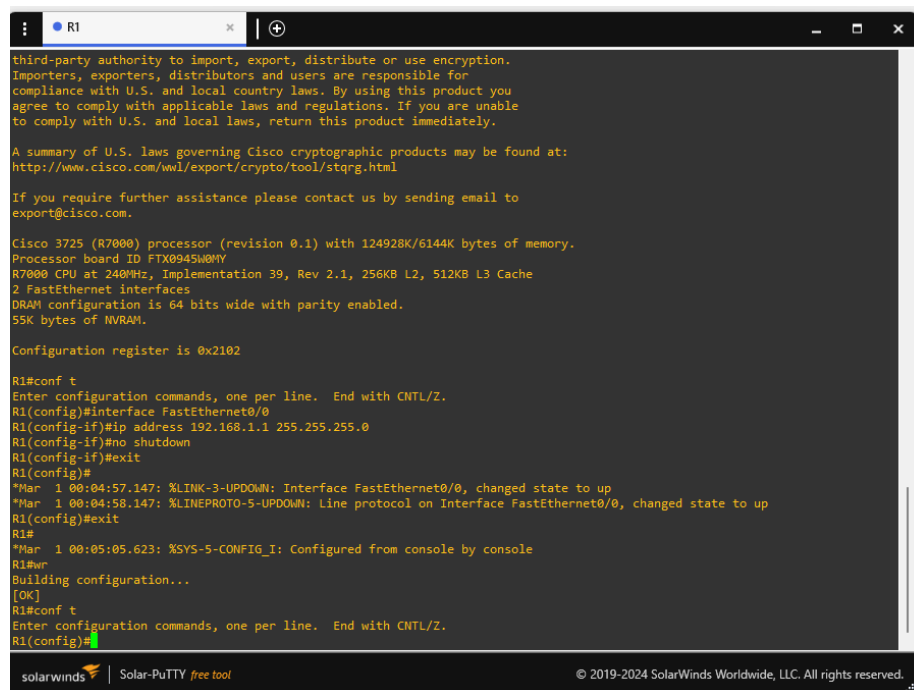


Figure 16: Image 65

## Reproduction de la topologie en configurant le protocole SSH

Image 1 : Vue globale de la topologie

Image 2 : Configuration de l'interface FastEthernet



```
R1
third-party authority to import, export, distribute or use encryption.
Importers, exporters, distributors and users are responsible for
compliance with U.S. and local country laws. By using this product you
agree to comply with applicable laws and regulations. If you are unable
to comply with U.S. and local laws, return this product immediately.

A summary of U.S. laws governing Cisco cryptographic products may be found at:
http://www.cisco.com/wll/export/crypto/tool/stqrg.html

If you require further assistance please contact us by sending email to
export@cisco.com.

Cisco 3725 (R7000) processor (revision 0.1) with 124928K/6144K bytes of memory.
Processor board ID FTX0945W0MY
R7000 CPU at 240MHz, Implementation 39, Rev 2.1, 256KB L2, 512KB L3 Cache
2 FastEthernet interfaces
DRAM configuration is 64 bits wide with parity enabled.
55K bytes of NVRAM.

Configuration register is 0x2102

R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface FastEthernet0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#
*Mar 1 00:04:57.147: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar 1 00:04:58.147: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config)#exit
R1#
*Mar 1 00:05:05.623: %SYS-5-CONFIG_I: Configured from console by console
R1#wr
Building configuration...
[OK]
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#
```

Figure 17: Image 66

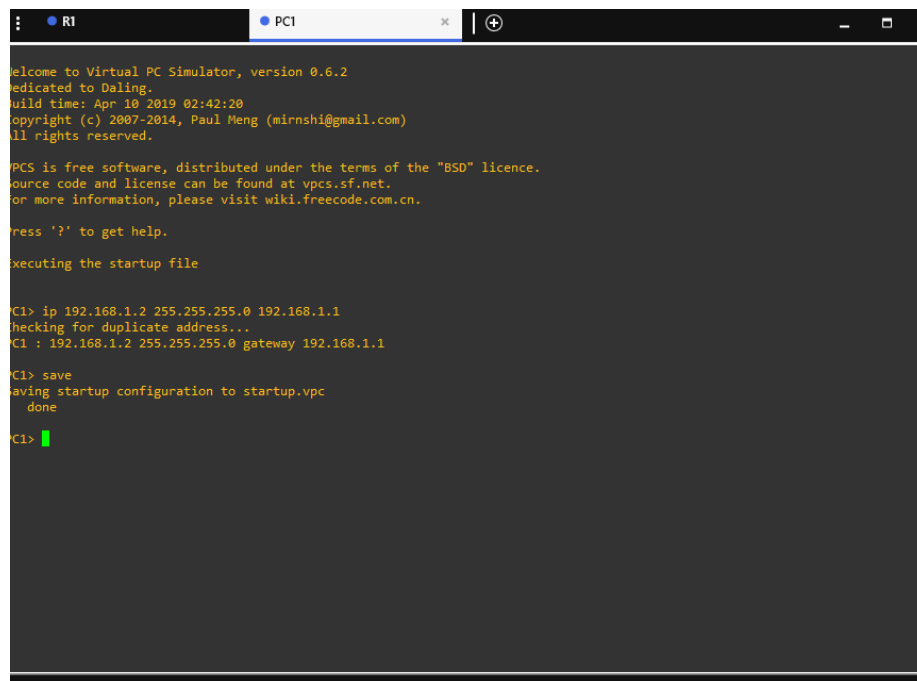
Image 3 : Configuration du PC1

Image 4 : Configuration du PC2

Image 5 : Configuration de SSH sur le routeur

Image 6 : Vérification des connexions réseau





```

Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.

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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

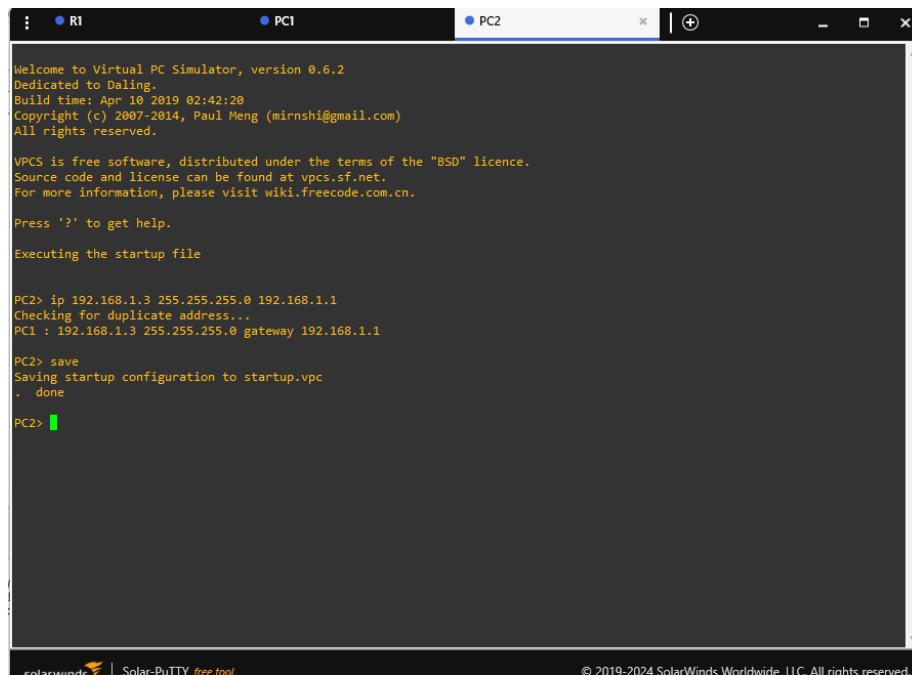
Executing the startup file

C1> ip 192.168.1.2 255.255.255.0 192.168.1.1
Checking for duplicate address...
C1 : 192.168.1.2 255.255.255.0 gateway 192.168.1.1

C1> save
Saving startup configuration to startup.vpc
done

C1> 
```

Figure 18: Image 67



```
Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
Copyright (c) 2007-2014, Paul Meng (mirnshi@gmail.com)
All rights reserved.

VPCS is free software, distributed under the terms of the "BSD" licence.
Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.
Executing the startup file

PC2> ip 192.168.1.3 255.255.255.0 192.168.1.1
Checking for duplicate address...
PC1 : 192.168.1.3 255.255.255.0 gateway 192.168.1.1

PC2> save
Saving startup configuration to startup.vpc
. done

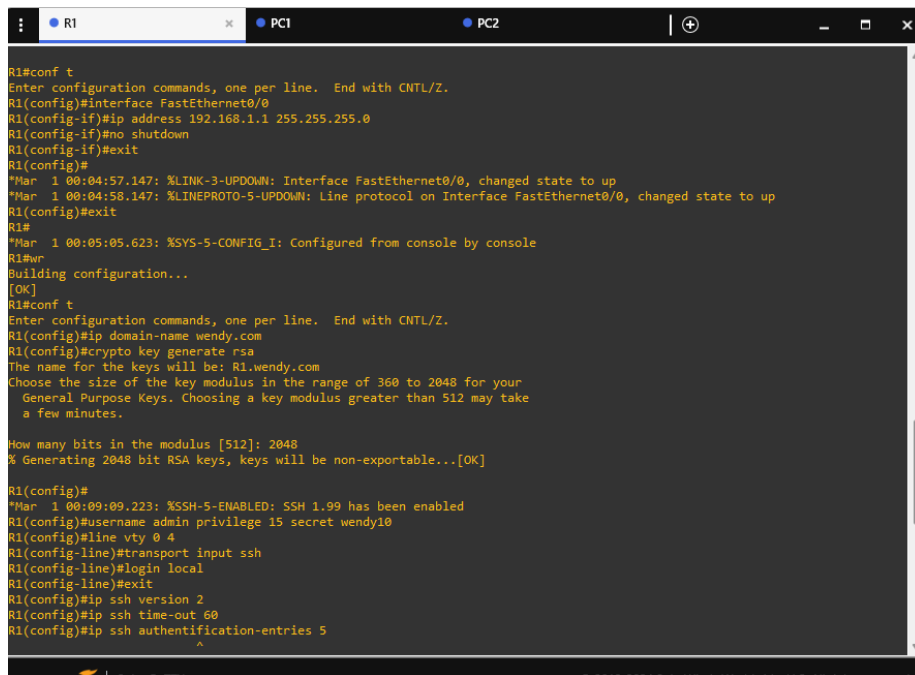
PC2> █
```

Figure 19: Image 68

## Reproduction de la topologie du réseau en configurant SSH avec un Ubuntu Docker guest

Étapes principales :

1. Configuration initiale avec Solar-PuTTY
2. Configuration d'un PC virtuel (VPCS)
3. SSH et génération de clés RSA
4. Résultat de la commande ifconfig
5. Fichier réseau statique modifié
6. Configuration réseau dans Ubuntu Docker
7. Configuration du client SSH
8. Session SSH réussie



```
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface FastEthernet0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#
*Mar 1 00:04:57.147: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar 1 00:04:58.147: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config)#exit
R1#
*Mar 1 00:05:05.623: %SYS-5-CONFIG_I: Configured from console by console
R1#wr
Building configuration...
[OK]
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ip domain-name wendy.com
R1(config)#crypto key generate rsa
The name for the keys will be: R1.wendy.com
Choose the size of the key modulus in the range of 360 to 2048 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.
How many bits in the modulus [512]: 2048
% Generating 2048 bit RSA keys, keys will be non-exportable...[OK]
R1(config)#
*Mar 1 00:09:09.223: %SSH-5-ENABLED: SSH 1.99 has been enabled
R1(config)#username admin privilege 15 secret wendy10
R1(config)#line vty 0 4
R1(config-line)#transport input ssh
R1(config-line)#login local
R1(config-line)#exit
R1(config)#ip ssh version 2
R1(config)#ip ssh time-out 60
R1(config)#ip ssh authentication-entries 5
```

Figure 20: Image 69

```
PC1> ip 192.168.1.2 255.255.255.0 192.168.1.1
Checking for duplicate address...
PC1 : 192.168.1.2 255.255.255.0 gateway 192.168.1.1

PC1> save
Saving startup configuration to startup.vpc
. done

PC1> ssh admin@192.168.1.1
Bad command: "ssh admin@192.168.1.1". Use ? for help.

PC1> ?

?                Print help
! COMMAND [ARG ...] Invoke an OS COMMAND with optional ARG(s)
arp              Shortcut for: show arp. Show arp table
clear ARG       Clear IPv4/IPv6, arp/neighbor cache, command history
dhcp [OPTION]   Shortcut for: ip dhcp. Get IPv4 address via DHCP
disconnect      Exit the telnet session (daemon mode)
echo TEXT       Display TEXT in output. See also set echo ?
help            Print help
history         Shortcut for: show history. List the command history
ip ARG ... [OPTION] Configure the current VPC's IP settings. See ip ?
load [FILENAME] Load the configuration/script from the file FILENAME
ping HOST [OPTION ...] Ping HOST with ICMP (default) or TCP/UDP. See ping ?
quit           Quit program
relay ARG ...   Configure packet relay between UDP ports. See relay ?
rlogin [ip] port Telnet to port on host at ip (relative to host PC)
save [FILENAME] Save the configuration to the file FILENAME
set ARG ...     Set VPC name and other options. Try set ?
show [ARG ...]  Print the information of VPCs (default). See show ?
sleep [seconds] [TEXT] Print TEXT and pause running script for seconds
trace HOST [OPTION ...] Print the path packets take to network HOST
version         Shortcut for: show version

To get command syntax help, please enter '?' as an argument of the command.

PC1>
```

Figure 21: Image 70

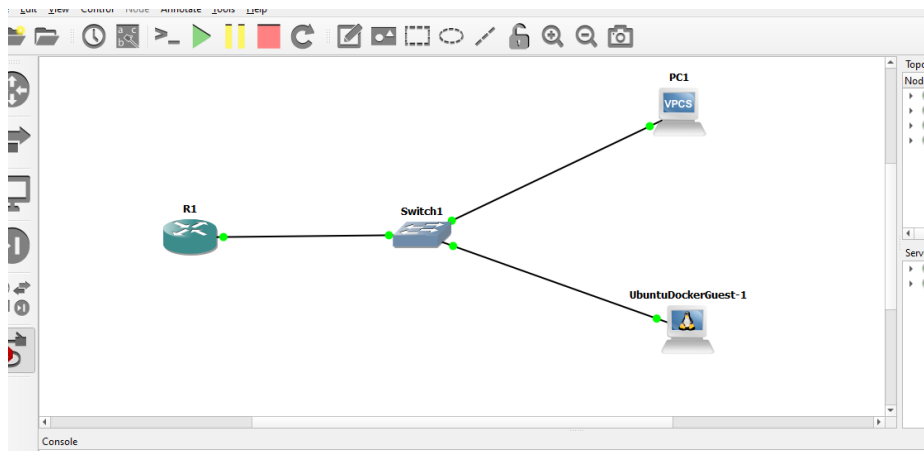


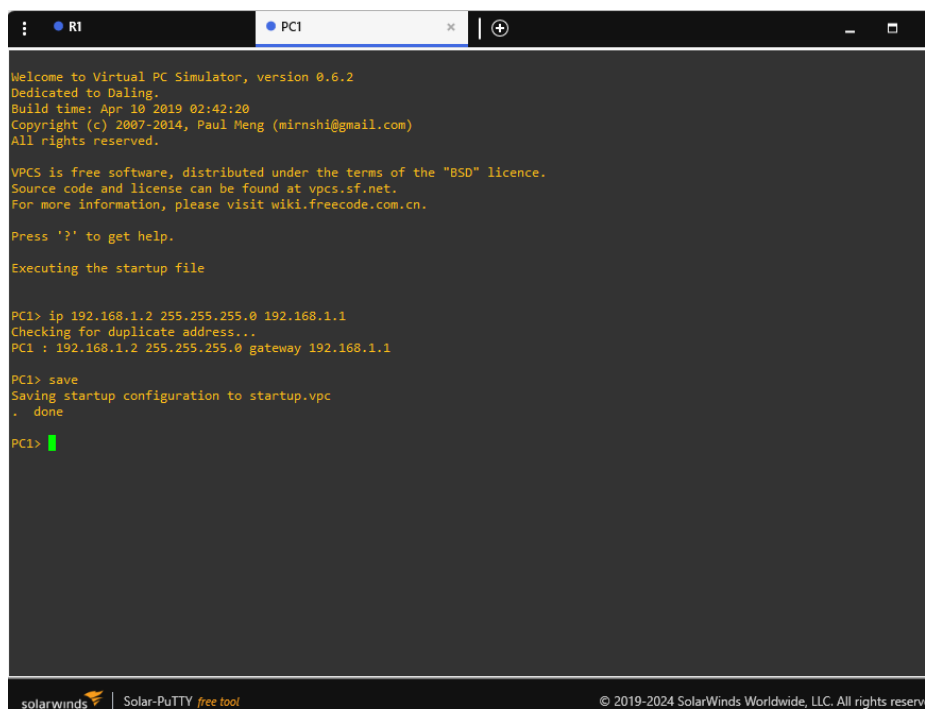
Figure 22: Image 71

```

/ bytes transferred = 0
*Mar 1 00:00:05.847: %LINEPROTO-5-UPDOWN: Line protocol on Interface VoIP-Null0
, changed state to up
*Mar 1 00:00:05.851: %LINEPROTO-5-UPDOWN: Line protocol on Interface IPv6-mpls,
changed state to up
*Mar 1 00:00:06.000: %SYS-5-CONFIG_I: Configured from memory by console
*Mar 1 00:00:06.335: %LINK-5-CHANGED: Interface FastEthernet0/1, changed state
to administratively down
*Mar 1 00:00:06.335: %LINK-5-CHANGED: Interface FastEthernet0/0, changed state
to administratively down
*Mar 1 00:00:06.467: %SYS-5-RESTART: System restarted --
Cisco IOS Software, 3700 Software (C3725-ADVENTERPRISEK9-M), Version 12.4(15)T14
, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2010 by Cisco Systems, Inc.
Compiled Tue 17-Aug-10 12:08 by prod_rel_team
*Mar 1 00:00:06.479: %SNMP-5-COLDSTART: SNMP agent on host R1 is undergoing a c
old start
*Mar 1 00:00:06.531: %CRYPTO-6-ISAKMP_ON_OFF: ISAKMP is OFF
*Mar 1 00:00:06.531: %CRYPTO-6-GDOI_ON_OFF: GDOI is OFF
*Mar 1 00:00:07.335: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/1, changed state to down
*Mar 1 00:00:07.335: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/0, changed state to down
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface FastEthernet0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#
*Mar 1 00:01:09.043: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar 1 00:01:10.043: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthernet0/0, changed state to up
R1(config)#exit
R1#
*Mar 1 00:01:15.515: %SYS-5-CONFIG_I: Configured from console by console
R1#wr
Building configuration...

```

Figure 23: Image 72



```

Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC1> ip 192.168.1.2 255.255.255.0 192.168.1.1
Checking for duplicate address...
PC1 : 192.168.1.2 255.255.255.0 gateway 192.168.1.1

PC1> save
Saving startup configuration to startup.vpc
. done

PC1> 
```

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Figure 24: Image 73



```
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#ip domain-name ius.com
R1(config)#crypto key generate rsa
The name for the keys will be: R1.ius.com
Choose the size of the key modulus in the range of 360 to 2048 for your
General Purpose Keys. Choosing a key modulus greater than 512 may take
a few minutes.

How many bits in the modulus [512]: 2048
% Generating 2048 bit RSA keys, keys will be non-exportable...[OK]

R1(config)#
*Mar 1 00:03:29.219: %SSH-5-ENABLED: SSH 1.99 has been enabled
R1(config)#username admin privilege 15 secret wendy
R1(config)#line vty 0 4
R1(config-line)#transport input ssh
R1(config-line)#login local
R1(config-line)#exit
R1(config)#ip ssh version
% Incomplete command.

R1(config)#ip ssh version 2
R1(config)#ssh time-out 60
R1(config)#ssh authentication-retries 5
% Invalid input detected at '^' marker.

R1(config)#end
R1#
*Mar 1 00:05:19.315: %SYS-5-CONFIG_I: Configured from console by console
R1#wr
Building configuration...
[OK]
R1#
```

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Figure 25: Image 74

The image shows a SolarWinds Solar-PuTTY terminal window with three tabs: 'R1', 'PC1', and 'UbuntuDockerGuest-1'. The active tab is 'UbuntuDockerGuest-1'. The terminal output shows the command 'ifconfig' being executed, displaying details for the 'eth0' and 'lo' interfaces. The 'eth0' interface is an Ethernet card with an MTU of 1500, showing 12 RX packets and 12 TX packets. The 'lo' interface is a loopback device with an MTU of 65536, showing 0 RX and TX packets. The prompt 'root@UbuntuDockerGuest-1:~# nano' is visible at the bottom of the terminal.

```
UbuntuDockerGuest-1 console is now available... Press RETURN to get started.
root@UbuntuDockerGuest-1:~# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
        inet6 fe80::42:62ff:fe95:0  prefixlen 64  scopeid 0x20<link>
        ether 02:42:62:95:00:00  txqueuelen 1000  (Ethernet)
        RX packets 12  bytes 2800 (2.8 KB)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 12  bytes 936 (936.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

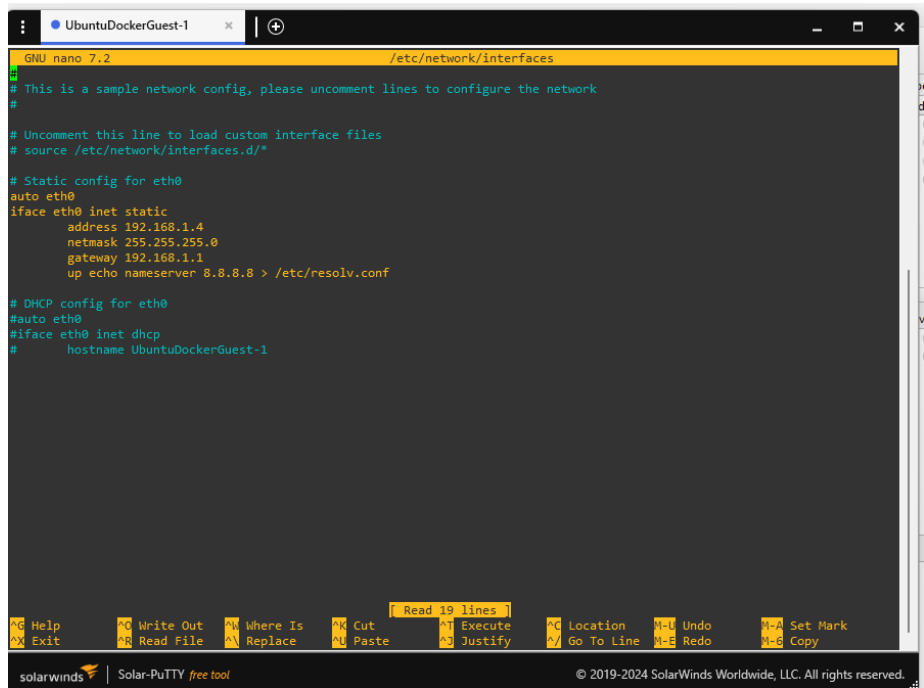
lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
        inet 127.0.0.1  netmask 255.0.0.0
        inet6 ::1  prefixlen 128  scopeid 0x10<host>
        loop txqueuelen 1000  (Local Loopback)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
        TX packets 0  bytes 0 (0.0 B)
        TX errors 0  dropped 0 overruns 0  carrier 0  collisions 0

root@UbuntuDockerGuest-1:~# nano
```

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Figure 26: Image 75





The image shows a terminal window titled 'UbuntuDockerGuest-1' with a tab icon and a '+' button. The terminal is running the GNU nano 7.2 editor, editing the file '/etc/network/interfaces'. The content of the file is as follows:

```
# 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 static
    address 192.168.1.4
    netmask 255.255.255.0
    gateway 192.168.1.1
    up echo nameserver 8.8.8.8 > /etc/resolv.conf
# DHCP config for eth0
auto eth0
iface eth0 inet dhcp
#
hostname UbuntuDockerGuest-1
```

The nano editor's status bar at the bottom shows 'Read 19 lines'. Below the status bar is a menu bar with the following options: Help, Exit, Write Out, Read File, Where Is, Replace, Cut, Paste, Read 19 lines, Execute, Justify, Location, Go To Line, M-U Undo, M-E Redo, Set Mark, and Copy. The bottom of the terminal window displays the 'solarwinds' logo and the text 'Solar-PuTTY free tool' on the left, and '© 2019-2024 SolarWinds Worldwide, LLC. All rights reserved.' on the right.

Figure 27: Image 76



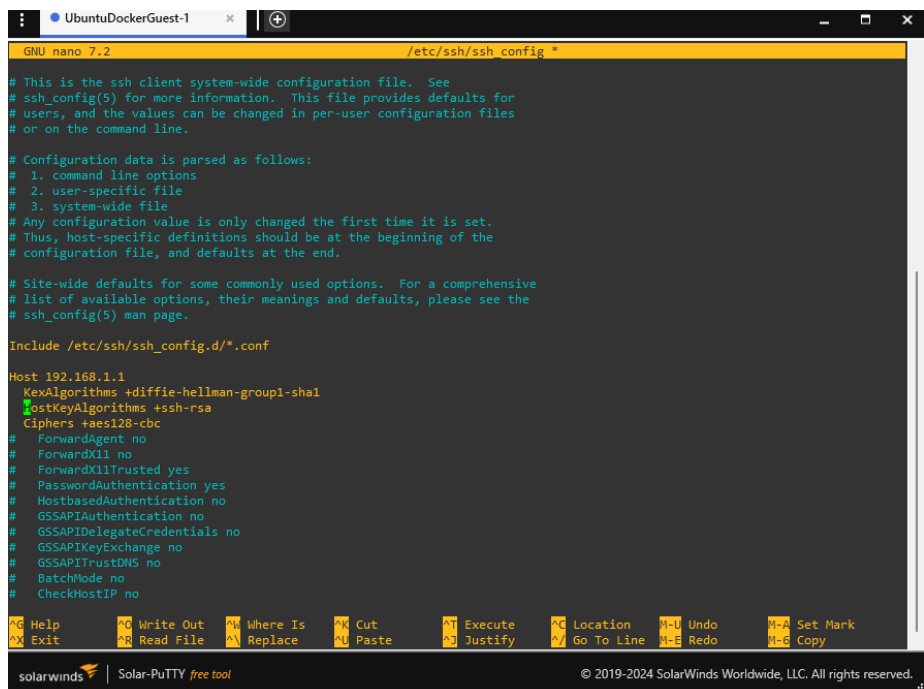
```
root@UbuntuDockerGuest-1:~# ifconfig
root@UbuntuDockerGuest-1:~# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST>  mtu 1500
    inet 192.168.1.4  netmask 255.255.255.0  broadcast 0.0.0.0
    inet6 fe80::42:62ff:fe05:0  prefixlen 64  scopeid 0x20<link>
    ether 02:42:62:95:00:00  txqueuelen 1000  (Ethernet)
    RX packets 9  bytes 1465 (1.4 KB)
    RX errors 0  dropped 1  overruns 0  frame 0
    TX packets 9  bytes 726 (726.0 B)
    TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0

lo: flags=73<UP,LOOPBACK,RUNNING>  mtu 65536
    inet 127.0.0.1  netmask 255.0.0.0
    inet6 ::1  prefixlen 128  scopeid 0x10<host>
    loop  txqueuelen 1000  (Local Loopback)
    RX packets 0  bytes 0 (0.0 B)
    RX errors 0  dropped 0  overruns 0  frame 0
    TX packets 0  bytes 0 (0.0 B)
    TX errors 0  dropped 0  overruns 0  carrier 0  collisions 0

root@UbuntuDockerGuest-1:~# nano /etc/network/interfaces
root@UbuntuDockerGuest-1:~#
```

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Figure 28: Image 77



The image shows a SolarWinds Solar-PuTTY terminal window titled "UbuntuDockerGuest-1". The terminal is running the GNU nano 7.2 text editor, editing the file /etc/ssh/ssh\_config. The file content is as follows:

```
# This is the ssh client system-wide configuration file. See
# ssh_config(5) for more information. This file provides defaults for
# users, and the values can be changed in per-user configuration files
# or on the command line.

# Configuration data is parsed as follows:
# 1. command line options
# 2. user-specific file
# 3. system-wide file
# Any configuration value is only changed the first time it is set.
# Thus, host-specific definitions should be at the beginning of the
# configuration file, and defaults at the end.

# Site-wide defaults for some commonly used options. For a comprehensive
# list of available options, their meanings and defaults, please see the
# ssh_config(5) man page.

Include /etc/ssh/ssh_config.d/*.conf

Host 192.168.1.1
  KexAlgorithms +diffie-hellman-group1-sha1
  HostKeyAlgorithms +ssh-rsa
  Ciphers +aes128-cbc
  ForwardAgent no
  ForwardX11 no
  ForwardX11Trusted yes
  PasswordAuthentication yes
  HostbasedAuthentication no
  GSSAPIAuthentication no
  GSSAPIDelegateCredentials no
  GSSAPIKeyExchange no
  GSSAPITrustDNS no
  BatchMode no
  CheckHostIP no
```

The bottom of the terminal window features a status bar with the SolarWinds logo, the text "Solar-PuTTY free tool", and the copyright notice "© 2019-2024 SolarWinds Worldwide, LLC. All rights reserved." Above the status bar is a menu bar with various keyboard shortcuts and actions such as Help, Exit, Write Out, Read File, Where Is, Replace, Cut, Paste, Execute, Justify, Location, Go To Line, Undo, Redo, Set Mark, and Copy.

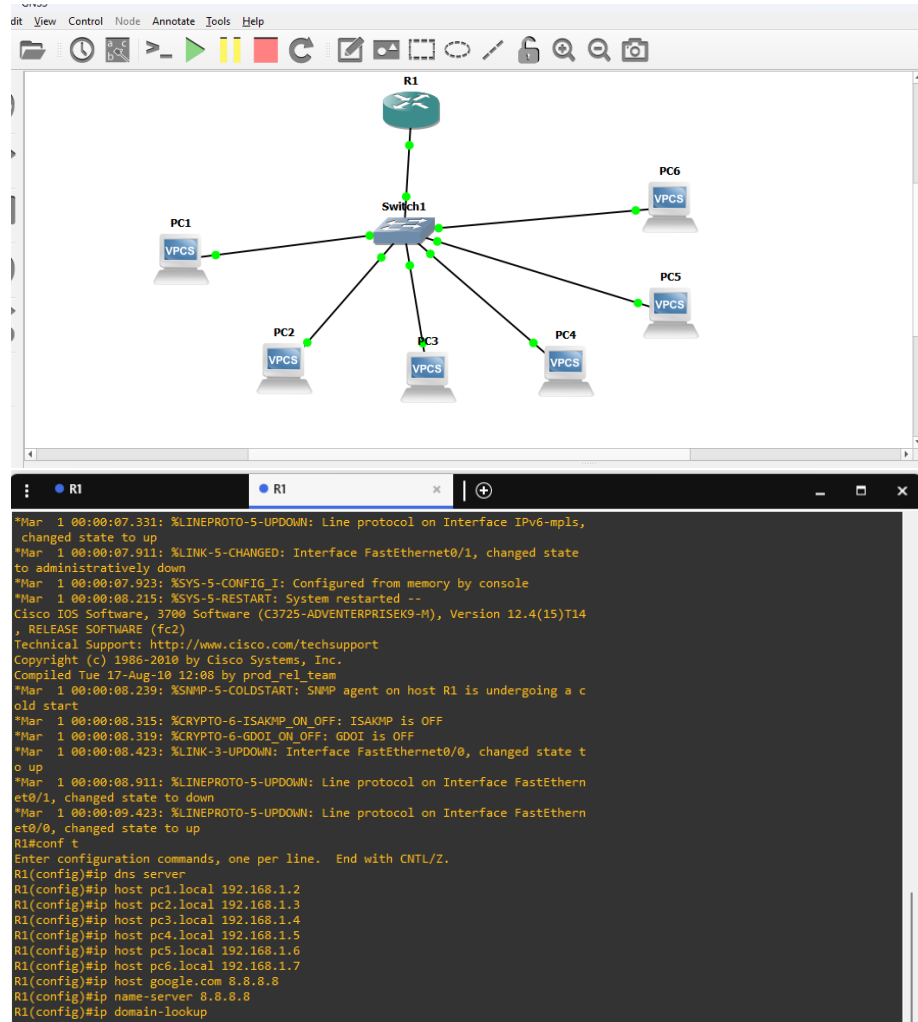
Figure 29: Image 78

## Reproduction de la topologie du réseau en configurant le serveur DNS

Étapes principales :

1. Activation du DNS sur le routeur.
2. Configuration des interfaces et attribution des adresses IP.
3. Paramétrage des passerelles par défaut et des adresses IP des PC.
4. Test de résolution DNS avec `ping` et `nslookup`.

## Images supplémentaires :



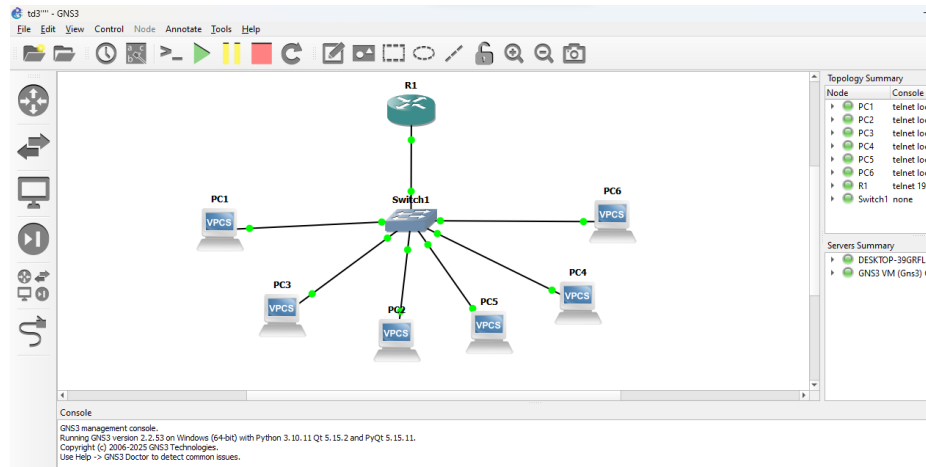


Figure 30: Image 91

```

R1
Press RETURN to get started!

*Mar 1 00:00:06.883: %SW_VLAN-4-IF5_FAILURE: VLAN manager encountered file oper
ation error: call = ifs_open/read / _code = 3588 (No device available)
/ bytes transferred = 0
*Mar 1 00:00:06.987: %LINEPROTO-5-UPDOWN: Line protocol on Interface VoIP-Null0
, changed state to up
*Mar 1 00:00:06.911: %LINEPROTO-5-UPDOWN: Line protocol on Interface IPv6-mpls,
changed state to up
*Mar 1 00:00:07.159: %SYS-5-CONFIG_I: Configured from memory by console
*Mar 1 00:00:07.587: %SYS-5-RESTART: System restarted --
Cisco IOS Software, 3700 Software (C3725-ADVENTERPRISEK9-M), Version 12.4(15)T14
, RELEASE SOFTWARE (fc2)
Technical Support: http://www.cisco.com/techsupport
Copyright (c) 1986-2010 by Cisco Systems, Inc.
Compiled Tue 17-Aug-10 12:08 by prod_rel_team
*Mar 1 00:00:07.515: %SNMP-5-COLDSTART: SNMP agent on host R1 is undergoing a c
old start
*Mar 1 00:00:07.559: %LINK-5-CHANGED: Interface FastEthernet0/0, changed state
to administratively down
*Mar 1 00:00:07.559: %LINK-5-CHANGED: Interface FastEthernet0/1, changed state
to administratively down
*Mar 1 00:00:07.579: %CRYPTO-6-ISAKMP_ON_OFF: ISAKMP is OFF
*Mar 1 00:00:07.579: %CRYPTO-6-GDOI_ON_OFF: GDOI is OFF
*Mar 1 00:00:08.559: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/0, changed state to down
*Mar 1 00:00:08.559: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/1, changed state to down
R1#conf t
Enter configuration commands, one per line. End with CNTL/Z.
R1(config)#interface FastEthernet0/0
R1(config-if)#ip address 192.168.1.1 255.255.255.0
R1(config-if)#no shutdown
R1(config-if)#exit
R1(config)#
*Mar 1 00:01:08.151: %LINK-3-UPDOWN: Interface FastEthernet0/0, changed state to up
*Mar 1 00:01:09.151: %LINEPROTO-5-UPDOWN: Line protocol on Interface FastEthern
et0/0, changed state to up
R1(config)#

```

Figure 31: Image 92

## Reproduction de la topologie du réseau en configurant DHCP

Étapes principales :

1. Configuration initiale
2. Vérification des paramètres de DHCP
3. Simulation de la connectivité des PC



```

Welcome to Virtual PC Simulator, version 0.6.2
Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.
Executing the startup file

PC1> ip dhcp
DDORA IP 192.168.1.11/24 GW 192.168.1.1

PC1> show ip
NAME       : PC1[1]
IP/MASK    : 192.168.1.11/24
GATEWAY    : 192.168.1.1
DNS        : 8.8.8.8
DHCP SERVER : 192.168.1.1
DHCP LEASE  : 86387, 86400/43200/75600
MAC        : 00:50:79:66:68:00
LPORT      : 10013
RHOST:PORT : 127.0.0.1:10014
MTU        : 1500

PC1> save
Saving startup configuration to startup.vpc
. done

PC1>

```

Figure 32: Image 93

4. Résultats du ping test
  5. Finalisation et sauvegarde de la configuration
-

```

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Dedicated to Daling.
Build time: Apr 10 2019 02:42:20
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Source code and license can be found at vpcs.sf.net.
For more information, please visit wiki.freecode.com.cn.

Press '?' to get help.

Executing the startup file

PC6> ip dhcp
DORA IP 192.168.1.16/24 GW 192.168.1.1

PC6> show ip
NAME       : PC6[1]
IP/MASK    : 192.168.1.16/24
GATEWAY    : 192.168.1.1
DNS        : 8.8.8.8
DHCP SERVER : 192.168.1.1
DHCP LEASE  : 86395, 86400/43200/75600
MAC        : 00:50:79:66:68:05
LPORT      : 10023
RHOST:PORT  : 127.0.0.1:10024
MTU        : 1500

PC6> save
Saving startup configuration to startup.vpc
. done

PC6> 
```

Figure 33: Image 94

```

MAC       : 00:50:79:66:68:00
LPORT     : 10013
RHOST:PORT : 127.0.0.1:10014
MTU       : 1500

PC1> save
Saving startup configuration to startup.vpc
. done

PC1> ping 192.168.1.1
64 bytes from 192.168.1.1 icmp_seq=1 ttl=255 time=17.596 ms
64 bytes from 192.168.1.1 icmp_seq=2 ttl=255 time=17.636 ms
64 bytes from 192.168.1.1 icmp_seq=3 ttl=255 time=14.887 ms
64 bytes from 192.168.1.1 icmp_seq=4 ttl=255 time=13.181 ms
64 bytes from 192.168.1.1 icmp_seq=5 ttl=255 time=13.870 ms

PC1> 
```

Figure 34: Image 95