

Gestió i administració de xarxes:
Pràctica 2

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Activitat 1.1 Servicio de conexi3n remota SSH

a) Instal·lar el servidor OpenSSH a les 3 màquines virtuals, comprovant el funcionament des de la mateixa màquina i des de les altres màquines (totes amb totes). En particular, comprovar de tenir definits correctament els noms de host, i la configuraci3 d'un domini local (FQDN) en /etc/hosts. Com domini es pot fer servir «.gax.org» o el que l'usuari prefereixi ja que és un domini intern. Com client del servei ssh es pot fer servir l'ordre del mateix nom i tenir en compte que l'usuari root per defecte no es pot connectar per ssh excepte que es modifiqui l'arxiu de configuraci3 corresponent al servidor que es troba en /etc/ssh i es reiniciï el servei de ssh.

Primero de todo vamos a modificar el archivo de configuraci3n /etc/hosts de la máquina master para incluir las ips de las máquinas a las cuales nos conectamos por ssh para poder acceder por el nombre de la máquina y no por la ip.

```
root@master:~# cat /etc/hosts
127.0.0.1    localhost
#127.0.1.1   debian.nteum.org      debian

10.0.2.15    sysetet.gax.org        sysetet
172.16.1.2    slave1.gax.org          slave1
172.16.1.1    master.gax.org          masterInternal
172.16.2.2    slave2.gax.org          slave2
172.16.2.1    slave1.1.gax.org        slave11

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

Seguidamente procederemos a iniciar el servidor de ssh en la máquina master con la siguiente comanda:

```
sudo /etc/init.d/ssh start
```

b) Configurar el sistema perquè el vostre usuari (o l'usuari adminp) pugui connectar-se sense haver d'entrar una contrasenya fent servir un parell de claus criptogràfiques - anomenades també clau pública i privada- (per exemple de tipus RSA) i que s'hauran de generar.

Llegados a este punto, nos podremos conectar via ssh a las máquinas slave1 y slave2, pero nos pedirá la contraseña cada vez que nos queramos conectar dado que no estaremos utilizando ningún sistema de identificaci3n por claves.

En las siguientes capturas mostramos como nos podemos conectar desde todas las máquinas por ssh

```
root@slave1:~# ssh adminp@slave2
ssh: Could not resolve hostname slave2: Name or service not known
root@slave1:~# vi /etc/hosts
root@slave1:~# ssh adminp@slave2
The authenticity of host 'slave2 (172.16.2.2)' can't be established.
ECDSA key fingerprint is SHA256:ybSnKdv0TKu2UQ+mW4mU/+eIuSlT0kcKpwRPHzR6NNc.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'slave2,172.16.2.2' (ECDSA) to the list of known hosts.
adminp@slave2's password:
Linux slave2 5.10.0-9-amd64 #1 SMP Debian 5.10.70-1 (2021-09-30) x86_64

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individual files in /usr/share/doc/*/copyright.

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permitted by applicable law.
Last login: Mon Oct 25 11:25:07 2021 from 172.16.1.1
adminp@slave2:~$ exit
logout
Connection to slave2 closed.
root@slave1:~# ssh adminp@master
The authenticity of host 'master (172.16.1.1)' can't be established.
ECDSA key fingerprint is SHA256:eJD86nLaqSqBwqUVvV+rK6ZH3FLLCLGeX0Cvk5NjR3o.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'master,172.16.1.1' (ECDSA) to the list of known hosts.
adminp@master's password:
Linux master 5.10.0-9-amd64 #1 SMP Debian 5.10.70-1 (2021-09-30) x86_64

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Last login: Thu Oct 28 11:24:15 2021 from 172.16.2.2
adminp@master:~$
```

```
root@slave2:~# ssh adminp@master
The authenticity of host 'master (172.16.1.1)' can't be established.
ECDSA key fingerprint is SHA256:eJD86nLaqSqBwqUVvV+rK6ZH3FLLCLGeX0Cvk5NjR3o.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'master,172.16.1.1' (ECDSA) to the list of known hosts.
adminp@master's password:
Linux master 5.10.0-9-amd64 #1 SMP Debian 5.10.70-1 (2021-09-30) x86_64

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individual files in /usr/share/doc/*/copyright.

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permitted by applicable law.
adminp@master:~$ exit
logout
Connection to master closed.
root@slave2:~# ssh adminp@slave1
The authenticity of host 'slave1 (172.16.2.1)' can't be established.
ECDSA key fingerprint is SHA256:k2s0kBwpFUD8clndwZA90NkLWdwlbc+9h1EeXyoGEPm.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'slave1,172.16.2.1' (ECDSA) to the list of known hosts.
adminp@slave1's password:
Linux slave1 5.10.0-9-amd64 #1 SMP Debian 5.10.70-1 (2021-09-30) x86_64

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permitted by applicable law.
Last login: Mon Oct 25 11:40:29 2021 from 172.16.1.1
adminp@slave1:~$
```

```
root@master:~# ssh adminp@slave1
The authenticity of host 'slave1 (172.16.1.2)' can't be established.
ECDSA key fingerprint is SHA256:k2s0kBwpFUD8cLndwZA90NkLWdwlbc+9h1EeXyoGEPm.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'slave1,172.16.1.2' (ECDSA) to the list of known hosts.
adminp@slave1's password:
Linux slave1 5.10.0-9-amd64 #1 SMP Debian 5.10.70-1 (2021-09-30) x86_64

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permitted by applicable law.
Last login: Mon Oct 25 14:02:00 2021 from 172.16.2.2
adminp@slave1:~$ exit
logout
Connection to slave1 closed.
root@master:~# ssh adminp@slave2
The authenticity of host 'slave2 (172.16.2.2)' can't be established.
ECDSA key fingerprint is SHA256:ybSnKdv0TKu2UQ+mW4mU/+eIuSlT0kcKpwRPHzR6NNc.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'slave2,172.16.2.2' (ECDSA) to the list of known hosts.
adminp@slave2's password:
Linux slave2 5.10.0-9-amd64 #1 SMP Debian 5.10.70-1 (2021-09-30) x86_64

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Last login: Mon Oct 25 13:59:56 2021 from 172.16.2.1
adminp@slave2:~$
```

Para poder acceder a las máquinas sin necesidad de introducir contraseña, vamos a configurar las máquinas para utilizar claves públicas y privadas con RSA, también configuraremos las máquinas para que el usuario root pueda conectarse por ssh a las máquinas.

Para permitir que el usuario root se pueda conectar en las máquina slave, en el archivo sshd_config, configuramos a yes el PermitLoginRoot i configuramos rsa:

HostKey /etc/ssh/ssh_host_rsa_key

```

$OpenBSD: sshd_config,v 1.103 2018/04/09 20:41:22 tj Exp $

# This is the sshd server system-wide configuration file. See
# sshd_config(5) for more information.

# This sshd was compiled with PATH=/usr/bin:/bin:/usr/sbin:/sbin

# The strategy used for options in the default sshd_config shipped with
# OpenSSH is to specify options with their default value where
# possible, but leave them commented. Uncommented options override the
# default value.

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

#Port 22
#AddressFamily any
#ListenAddress 0.0.0.0
#ListenAddress ::

#HostKey /etc/ssh/ssh_host_rsa_key
#HostKey /etc/ssh/ssh_host_ecdsa_key
#HostKey /etc/ssh/ssh_host_ed25519_key

# Ciphers and keying
#RekeyLimit default none

# Logging
#SyslogFacility AUTH
#LogLevel INFO

# Authentication:

#LoginGraceTime 2m
#PermitRootLogin yes
#StrictModes yes
#MaxAuthTries 6
#MaxSessions 10

#PubkeyAuthentication yes

# Expect .ssh/authorized_keys2 to be disregarded by default in future.
#AuthorizedKeysFile .ssh/authorized_keys .ssh/authorized_keys2

#AuthorizedPrincipalsFile none

#AuthorizedKeysCommand none
#AuthorizedKeysCommandUser nobody

# For this to work you will also need host keys in /etc/ssh/ssh_known_hosts
#HostbasedAuthentication no
# Change to yes if you don't trust ~/.ssh/known_hosts for
# HostbasedAuthentication
"/etc/ssh/sshd_config" [readonly] 123L, 3274B

```

Ahora podremos acceder con el usuario root desde la maquina master a la maquina slave2.

```

root@master:~# ssh root@slave2
root@slave2's password:
Linux slave2 5.10.0-9-amd64 #1 SMP Debian 5.10.70-1 (2021-09-30) x86_64

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Last login: Thu Oct 21 13:17:14 2021 from 172.16.1.1
root@slave2:~# █

```

Master:

Generamos una clave RSA con el siguiente comando:

```
sudo ssh-keygen -f /etc/ssh/ssh_host_rsa_key -b 4096
```

```

adminp@master:~/.ssh$ ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/home/adminp/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/adminp/.ssh/id_rsa
Your public key has been saved in /home/adminp/.ssh/id_rsa.pub
The key fingerprint is:
SHA256:gkG7dJizqNXdjhVl4Wr3RNPd/8t2KS2Rv0FPFWHb05k adminp@master
The key's randomart image is:
+---[RSA 3072]-----+
|  .  +.  +. |
|  . +  +  ...0|
|   B   . . . o .E+|
|  + 0 . o . .  +|
|  o = o S . . . o|
| o   * . o o..o|
| .   . . . .+ +|
|   o.=+|
|      ++o|
+-----[SHA256]-----+
adminp@master:~/.ssh$ ssh-copy-id adminp@172.16.1.2
The authenticity of host '172.16.1.2 (172.16.1.2)' can't be established.
ECDSA key fingerprint is SHA256:VOYQbn8qJCgdz0jy+BRrwd0HIAR9Z0J0+JDTHOV+jx8.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
/usr/bin/ssh-copy-id: INFO: attempting to log in with the new key(s), to filter out any that are already installed
/usr/bin/ssh-copy-id: INFO: 1 key(s) remain to be installed -- if you are prompted now it is to install the new keys
adminp@172.16.1.2's password:

Number of key(s) added: 1

Now try logging into the machine, with:  "ssh 'adminp@172.16.1.2'"
and check to make sure that only the key(s) you wanted were added.

adminp@master:~/.ssh$ ssh 172.16.1.2
Linux slave1 5.10.0-9-amd64 #1 SMP Debian 5.10.70-1 (2021-09-30) x86_64

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Last login: Mon Oct 25 14:11:53 2021 from 172.16.1.1
adminp@slave1:~$

```

Seguidamente pasamos la claves públicas a las demás máquinas usando:

ssh-copy-id adminp@slaveX

```

adminp@master:~/.ssh$ ssh-copy-id adminp@slave2
The authenticity of host 'slave2 (172.16.2.2)' can't be established.
ECDSA key fingerprint is SHA256:2+aiMwqN3lzbAAm8hUWF9IifH0JzJr4z0ZjVMNaiGfw.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
/usr/bin/ssh-copy-id: INFO: attempting to log in with the new key(s), to filter out any that are already installed
/usr/bin/ssh-copy-id: INFO: 1 key(s) remain to be installed -- if you are prompted now it is to install the new keys
adminp@slave2's password:

Number of key(s) added: 1

Now try logging into the machine, with:  "ssh 'adminp@slave2'"
and check to make sure that only the key(s) you wanted were added.

adminp@master:~/.ssh$ ssh 172.16.2.2
Linux slave2 5.10.0-9-amd64 #1 SMP Debian 5.10.70-1 (2021-09-30) x86_64

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Last login: Mon Oct 25 14:11:15 2021 from 172.16.1.1
adminp@slave2:~$

```

Entramos en las distintas máquinas slave desde la master, y la primera vez nos pedirá una autenticación para registrar la master en las distintas slave. Una vez registrada la master, nos podremos conectar usando el login de la clave pública RSA.

c) Fer proves que es poden fer còpies segures amb SCP i també fent servir el protocol SFTP per a la transferència d'arxius copiant/transferint fitxers de prova en un i altre sentit.

Generamos un archivo sample.txt con la siguiente comanda:

```
shred -7 sample.txt
```

Seguidamente enviamos el archivo sample.txt, por scp desde la máquina master hacia las slave:

```
scp sample.txt adminp@slaveX:/home/adminp/Documents
```

En la máquina master y slaveX hacemos un hasheado del archivo sample.txt:

```
md5sum sample.txt
```

Comprobamos que efectivamente tienen el mismo hash, por lo que la transmisión de datos entre la master y las slave se ha realizado de forma correcta.

```
adminp@master:~$ ls
Desktop Documents Downloads Music Pictures Public sampleleft.txt sample.txt Templates Videos
adminp@master:~$ scp sample.txt adminp@slave2:/home/adminp/Documents
sample.txt
adminp@master:~$ md5sum sample.txt
e0c57c7381738b4cba81f01b6de0dea0 sample.txt
adminp@master:~$ ssh slave2
Linux slave2 5.10.0-9-amd64 #1 SMP Debian 5.10.70-1 (2021-09-30) x86_64

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Last login: Mon Oct 25 14:49:53 2021 from 172.16.1.1
adminp@slave2:~$ ls
Desktop Documents Downloads Music Pictures Public sampleleft.txt sample.txt Templates Videos
adminp@slave2:~$ cd Documents/
adminp@slave2:~/Documents$ ls
sample.txt
adminp@slave2:~/Documents$ md5sum sample.txt
e0c57c7381738b4cba81f01b6de0dea0 sample.txt
adminp@slave2:~/Documents$ █
```

Para transferir archivos al sistema remoto con sftp deberemos realizar la comanda **sftp slave2**, una vez estemos dentro nos dejará ubicarnos en el directorio donde queremos subir el archivo y utilizar la comanda **put fichero**.

Igual que en el ejemplo anterior comprobaremos con md5sum que el fichero se ha subido correctamente y no ha sido modificado.

```

adminp@master:~$ ls
Desktop Documents Downloads Music Pictures Public sampleftp.txt sample.txt Templates Videos
adminp@master:~$ sftp slave2
Connected to slave2.
sftp> ls
Desktop Documents Downloads Music Pictures Public Templates
sampleftp.txt
sftp> cd Do
Documents/ Downloads/
sftp> cd Documents/
sftp> put sam
sample.txt sampleftp.txt
sftp> put sampleftp.txt
Uploading sampleftp.txt to /home/adminp/Documents/sampleftp.txt
sampleftp.txt
sftp> ls
sample.txt sampleftp.txt
sftp> exit
adminp@master:~$ ssh slave2
Linux slave2 5.10.0-9-amd64 #1 SMP Debian 5.10.70-1 (2021-09-30) x86_64

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permitted by applicable law.
Last login: Mon Oct 25 16:17:54 2021 from 172.16.1.1
adminp@slave2:~$ cd Documents/
adminp@slave2:~/Documents$ md5sum sampleftp.txt
1906e1997f03622574d90960ad8243e7 sampleftp.txt
adminp@slave2:~/Documents$ exit
logout
Connection to slave2 closed.
adminp@master:~$ md5sum sampleftp.txt
1906e1997f03622574d90960ad8243e7 sampleftp.txt
adminp@master:~$ █

```

d) Verificar que es pot fer un X-tunneling de forma que a través de ssh es pot connectar de forma interactiva a una màquina i executar una aplicació gràfica visualitzant aquesta sobre la màquina origen (és a dir fer un remote display a través del tunneling del protocol X)

Modificamos X11Forwarding a “yes” y X11UseLocalHost a “no” en sshd_config, en slave2 Seguidamente ejecutamos *systemctl restart ssh* para reiniciar el servicio del ssh


```
#AllowAgentForwarding yes
#AllowTcpForwarding yes
#GatewayPorts no
X11Forwarding yes
#X11DisplayOffset 10
X11UseLocalhost no
#PermitTTY yes
PrintMotd no
#PrintLastLog yes
#TCPKeepAlive yes
#PermitUserEnvironment no
#Compression delayed
#ClientAliveInterval 0
#ClientAliveCountMax 3
#UseDNS no
#PidFile /var/run/sshd.pid
#MaxStartups 10:30:100
#PermitTunnel no
#ChrootDirectory none
#VersionAddendum none

# no default banner path
#Banner none

# Allow client to pass locale environment variables
AcceptEnv LANG LC_*

# override default of no subsystems
Subsystem          sftp          /usr/lib/openssh/sftp-server

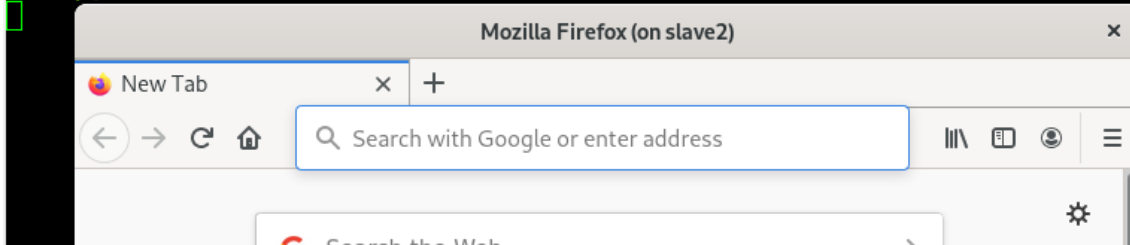
# Example of overriding settings on a per-user basis
#Match User anoncvs
#      X11Forwarding no
#      AllowTcpForwarding no
#      PermitTTY no
#      ForceCommand cvs server
adminp@slave2:/etc/ssh$
```

Desde la master, nos conectamos a la slave2 con **ssh -X slave2** y ejecutamos el comando, firefox y se nos abre una ventana de firefox que realmente está en la máquina slave2 pero se visualiza en la master.

```
adminp@master:~$ ssh -X slave2
Linux slave2 5.10.0-9-amd64 #1 SMP Debian 5.10.70-1 (2021-09-30) x86_64

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Last login: Wed Nov  3 17:40:42 2021 from 172.16.1.1
adminp@slave2:~$ firefox
```



e) Com es podria millorar de forma bàsica la seguretat del servei SSH?

Para mejorar la seguridad del servicio SSH tenemos varias opciones:

- Cambiar el puerto por defecto del servicio ssh. Por defecto está establecido el puerto 22 para las conexiones. Podríamos cambiar el puerto a 2245 en el fichero de configuración.
- Podríamos revocar las conexiones root, ya que por defecto hemos activado PermitRootLogin yes. Desactivando este parámetro las conexiones root quedarán bloqueadas.
- En el archivo sshd_config podemos configurar varios parámetros como:
 - LoginGraceTime: Tiempo mínimo para introducir contraseña.
 - MaxAuthTries: Número máximo de intentos para introducir la contraseña.
 - MaxStartups: Máximo número de logins desde una misma IP.
 - AllowUsers: Lista de usuarios que se podrán conectar, los demás no.
 - DenyUsers: Lista negra de usuarios que no se podrán conectar.
 - AllowGroups/DenyUsers: Lo mismo pero creando grupos de usuarios.

Activitat 1.2 Servei DNS

Si bé no es podrà vincular el DNS cap a fora (arbre de DNS) es generarà un DNS cache intern basat en el paquet dnsmasq i que tingui en compte les màquines definides en /etc/hosts sobre A (en aquest arxiu hauran d'estar totes les màquines A,B,C definides amb FQDN).

Configurar i fer les proves de concepte que resolgui els noms de la xarxa interna com per la resolució de noms externs i des de totes les màquines (A, B i C). Fer servir ordres com host o dig (aquest últim s'instal·la amb el paquet dnsutils)

Una vez hayamos instalado el dnsmasq deberemos acceder al fichero ubicado en /etc/dhcp/dhclient.conf y añadir el domain name server tal como se muestra en la imagen.

cat dhclient.conf → prepend domain-name-servers 127.0.0.1

```

#supersede domain-name "fugue.com home.vix.com";
prepend domain-name-servers 127.0.0.1;
#require subnet-mask, domain-name-servers;
#timeout 60;
#retry 60;
#reboot 10;
#select-timeout 5;
#initial-interval 2;
#script "/sbin/dhclient-script";
#media "-link0 -link1 -link2", "link0 link1";
#reject 192.33.137.209;

#alias {
#   interface "eth0";
#   fixed-address 192.5.5.213;
#   option subnet-mask 255.255.255.255;
#}

#lease {
#   interface "eth0";
#   fixed-address 192.33.137.200;
#   medium "link0 link1";
#   option host-name "andare.swiftmedia.com";
#   option subnet-mask 255.255.255.0;
#   option broadcast-address 192.33.137.255;
#   option routers 192.33.137.250;
#   option domain-name-servers 127.0.0.1;
#   renew 2 2000/1/12 00:00:01;
#   rebind 2 2000/1/12 00:00:01;
#   expire 2 2000/1/12 00:00:01;
#}
adminp@master:/etc/dhcp$ █

```

Entramos en etc/hosts indicamos todas las direcciones para cada interfaz y añadimos el resolve.conf nuestra máquina para preguntarnos a nosotros mismos primero.

```

adminp@master:~$ cat /etc/hosts
127.0.0.1    localhost
#127.0.1.1  debian.nteum.org    debian

10.0.2.15    sysetet.gax.org     sysetet
172.16.1.2   slave1.gax.org       slave1
172.16.1.1   master.gax.org       masterInternal
172.16.2.2   slave2.gax.org       slave2
172.16.2.1   slave1.1.gax.org     slave1

# The following lines are desirable for IPv6 capable hosts
::1    localhost ip6-localhost ip6-loopback
ff02::1 ip6-allnodes
ff02::2 ip6-allrouters
adminp@master:~$ █

```

```
adminp@master:/etc/dhcp$ cat /etc/resolv.conf
nameserver 127.0.0.1
nameserver 192.168.0.1
adminp@master:/etc/dhcp$
```

Una vez realizados los cambios levantamos el servicio de dnsmasq podemos probar si el servicio de dns cach está funcionando.

Tal como podemos ver la primera vez que se pregunta al servicio para resolver el nombre de twitter.com tarda 28ms, la segunda vez tarda 0 ms dado que se ha guardado la resolución del nombre de twitter y no debe salir a preguntar hacia fuera.

```
adminp@master:/etc/dhcp$ dig twiter.com

; <<>> DiG 9.16.15-Debian <<>> twiter.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 49080
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1220
; COOKIE: 048a80802786fa4113bf34fe6182be03409f16793acec15d (good)
;; QUESTION SECTION:
;twiter.com.                IN      A

;; ANSWER SECTION:
twiter.com.                900     IN      A      199.59.148.10

;; Query time: 28 msec
;; SERVER: 127.0.0.1#53(127.0.0.1)
;; WHEN: Wed Nov 03 17:51:15 CET 2021
;; MSG SIZE rcvd: 83

adminp@master:/etc/dhcp$ dig twiter.com

; <<>> DiG 9.16.15-Debian <<>> twiter.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 44151
;; flags: qr rd ra; QUERY: 1, ANSWER: 1, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;twiter.com.                IN      A

;; ANSWER SECTION:
twiter.com.                892     IN      A      199.59.148.10

;; Query time: 0 msec
;; SERVER: 127.0.0.1#53(127.0.0.1)
;; WHEN: Wed Nov 03 17:51:23 CET 2021
;; MSG SIZE rcvd: 55

adminp@master:/etc/dhcp$
```

Si resolvemos desde slave2 el nombre de zara.com vemos que la primera vez tarda 40ms y la segunda 4ms, esto es debido a que debe ir a preguntar a la máquina master que es la máquina que nos hace de DNS Server. De igual forma se puede ver la diferencia entre la primera vez que se pretende resolver el nombre teniendo que salir fuera de la máquina master y la segunda donde lo resuelve en la máquina master.

```
adminp@slave2:/etc/ssh$ dig zara.com

; <<>> DiG 9.16.15-Debian <<>> zara.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 1036
;; flags: qr rd ra; QUERY: 1, ANSWER: 8, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 1220
; COOKIE: 90187409ac0581e7a6af28306182be953ea40efcd8c39454 (good)
;; QUESTION SECTION:
;zara.com.                IN      A

;; ANSWER SECTION:
zara.com.                20      IN      A      2.17.211.169
zara.com.                20      IN      A      2.17.211.168
zara.com.                20      IN      A      2.17.211.161
zara.com.                20      IN      A      2.17.211.162
zara.com.                20      IN      A      2.17.211.154
zara.com.                20      IN      A      2.17.211.159
zara.com.                20      IN      A      2.17.211.153
zara.com.                20      IN      A      2.17.211.160

;; Query time: 40 msec
;; SERVER: 8.8.8.8#53(8.8.8.8)
;; WHEN: Wed Nov 03 17:53:41 CET 2021
;; MSG SIZE rcvd: 193

adminp@slave2:/etc/ssh$ dig zara.com

; <<>> DiG 9.16.15-Debian <<>> zara.com
;; global options: +cmd
;; Got answer:
;; ->>HEADER<<- opcode: QUERY, status: NOERROR, id: 54407
;; flags: qr rd ra; QUERY: 1, ANSWER: 8, AUTHORITY: 0, ADDITIONAL: 1

;; OPT PSEUDOSECTION:
; EDNS: version: 0, flags:; udp: 4096
;; QUESTION SECTION:
;zara.com.                IN      A

;; ANSWER SECTION:
zara.com.                16      IN      A      2.17.211.160
zara.com.                16      IN      A      2.17.211.153
zara.com.                16      IN      A      2.17.211.159
zara.com.                16      IN      A      2.17.211.154
zara.com.                16      IN      A      2.17.211.162
zara.com.                16      IN      A      2.17.211.161
zara.com.                16      IN      A      2.17.211.168
zara.com.                16      IN      A      2.17.211.169

;; Query time: 4 msec
```

1.3. Servei d'arxius en xarxa: NFS

En aquest exercici configurarem un servidor NFS per a disposar de un directori comú centralitzat sobre A. a) Configurar un servidor de fitxers remot NFS, de manera que el Master (A) sigui el servidor (definir un punt al sistema de fitxers a compartir per exemple /nfs-dir), i que tan el MV-B, com MV-C puguin muntar aquest directori en /mnt. Fer proves d'escriptura/lectura mesurant el temps per fer-ho des de B/C (ordre time) i analitzar si es pot millorar aquestes prestacions per exemple canviant els buffers de lectura/escriptura.

En la máquina master creamos un directorio nfs-dir que sera la raiz de nuestro sistema

```
adminp@master:/$ ls
bin  dev  home  lib    lib64  lost+found  mnt    opt  root  sbin  sys  usr  vmlinuz
boot etc  initrd.img  lib32  libx32  media    nfs-dir  proc  run  srv   tmp  var
```

Seguidamente añadimos al archivo /etc/exports los directorios que forman parte del nfs-dir
/nfs-dir red que tiene permisos 172.16.1.0/24(rw,sync,no_subtree_check)
/nfs-dir red que tiene permisos 172.16.2.0/24(rw,sync,no_subtree_check)

```
adminp@master:/$ cat /etc/exports
# /etc/exports: the access control list for filesystems which may be exported
#                to NFS clients.  See exports(5).
#
# Example for NFSv2 and NFSv3:
# /srv/homes      hostname1(rw,sync,no_subtree_check) hostname2(ro,sync,no_subtree_check)
#
# Example for NFSv4:
# /srv/nfs4       gss/krb5i(rw,sync,fsid=0,crossmnt,no_subtree_check)
# /srv/nfs4/homes gss/krb5i(rw,sync,no_subtree_check)
/nfs-dir 172.16.1.0/24(rw,sync,no_subtree_check)
/nfs-dir 172.16.2.0/24(rw,sync,no_subtree_check)
adminp@master:/$
```

Después reiniciamos el **servicio systemctl restart nfs-server**

Es importante dar permisos al directorio dado que sino no podrán acceder para escribir.

Accedemos a las máquinas slave y montamos el directorio compartido.

mount -t nfs ip:/dirserver /dirslave

```
adminp@slave2:/$ sudo mount -t nfs master:/nfs-dir /mnt
adminp@slave2:/$ ls
bin  dev  home  lib    lib64  lost+found  mnt    proc  run  srv  tmp  var
boot etc  initrd.img  lib32  libx32  media    opt  root  sbin  sys  usr  vmlinuz
adminp@slave2:/$ cd /mnt/
adminp@slave2:/mnt$ ls
samplenfsmaster.txt  sampleslave1.txt  sampleslave2.txt
adminp@slave2:/mnt$
```

Ver pagina web <https://chachocool.com/como-instalar-nfs-server-en-debian-9-stretch/>

b) fer proves de prestacions sobre el rendiment per a copiar un arxiu (que sigui > 60Mbytes) utilitzant scp, sftp (exercici 1.1.c) o nfs. Per crear un arxiu de 60M (fake) podeu fer servir:

```
truncate --size 60M sample.txt
shred --iterations 1 sample.txt
```

```
adminp@master:~$ time scp sample.txt adminp@slave2:/home/adminp/Documents
sample.txt                                     100% 60MB 28.6MB/s 00:02

real    0m2.312s
user    0m0.035s
sys     0m1.885s
adminp@master:~$ time sftp slave2
Connected to slave2.
sftp> put sa
sample.txt      sampleftp.txt
sftp> put sample.txt
Uploading sample.txt to /home/adminp/sample.txt
sample.txt      100% 60MB 24.6MB/s 00:02
sftp> exit

real    0m12.150s
user    0m0.081s
sys     0m1.718s
adminp@master:~$ cd /nfs-dir/
adminp@master:/nfs-dir$ time truncate --size 60M sampleTime.txt

real    0m0.005s
user    0m0.002s
sys     0m0.000s
adminp@master:/nfs-dir$ █
```