

HowTo ASIX VPN / IPSEC

Virtual Private Network

Internet Protocol Security

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Objectius

En aquest manual es treballen els següents conceptes clau:

- OpenVPN
- Establiment d'un túnel no xifrat host to host.
- Establiment d'un túnel Host to Host amb xifrat simètric (pre-shared key)
- Establiment d'un túnel Host to Host amb xifrat TLS
- Establiment de tràfic xifrat amb VPN Network to Network.
- Generar subxarxes amb Docker

- Servei OpenVPN, serveis personalitzats amb el template `openvpn@.service`
 - Generar un servidor multiclient. Connetar diversos clients.
 - Generar diversos serveis template.
- Applet gràfic de xarxes openvpn.

Documentació

- Pàgina de [documentació](#) de OpenVPN
- [Exemples](#) (els 4 dels exercicis) de la documentació OpenVPN.
- [Man](#) pages de l'ordre openvpn (inclou els 4 exemples implementats).
- Fedora project: [openvpn](#)

Pendent

- VPN públiques per tràfic obscur a internet
- thor.
- docker network com a eina per fer exemples de xarxes diferents.
- iptables masquerade/NAT com a eina per fer xarxes diferents

Implementació de túnels amb OpenVPN

Descripció dels components

```
[root@profeN2I ~]# rpm -ql openvpn
/etc/openvpn
/usr/include/openvpn-plugin.h
/usr/lib/systemd/system/openvpn@.service
/usr/lib/tmpfiles.d/openvpn.conf
/usr/lib64/openvpn
/usr/lib64/openvpn/plugins
/usr/lib64/openvpn/plugins/openvpn-plugin-auth-pam.so
/usr/lib64/openvpn/plugins/openvpn-plugin-down-root.so
/usr/sbin/openvpn
/usr/share/doc/openvpn
/usr/share/doc/openvpn/AUTHORS
/usr/share/doc/openvpn/COPYING
/usr/share/doc/openvpn/COPYRIGHT.GPL
/usr/share/doc/openvpn/INSTALL
/usr/share/doc/openvpn/PORTS
/usr/share/doc/openvpn/README
/usr/share/doc/openvpn/README.auth-pam
/usr/share/doc/openvpn/README.down-root
/usr/share/doc/openvpn/contrib
/usr/share/doc/openvpn/contrib/OCSP_check
/usr/share/doc/openvpn/contrib/OCSP_check/OCSP_check.sh
/usr/share/doc/openvpn/contrib/README
/usr/share/doc/openvpn/contrib/multilevel-init.patch
/usr/share/doc/openvpn/contrib/openvpn-fwmarkroute-1.00
/usr/share/doc/openvpn/contrib/openvpn-fwmarkroute-1.00/README
/usr/share/doc/openvpn/contrib/openvpn-fwmarkroute-1.00/fwmarkroute.down
/usr/share/doc/openvpn/contrib/openvpn-fwmarkroute-1.00/fwmarkroute.up
/usr/share/doc/openvpn/contrib/pull-resolv-conf
/usr/share/doc/openvpn/contrib/pull-resolv-conf/client.down
/usr/share/doc/openvpn/contrib/pull-resolv-conf/client.up
/usr/share/doc/openvpn/sample
/usr/share/doc/openvpn/sample/Makefile
/usr/share/doc/openvpn/sample/Makefile.am
/usr/share/doc/openvpn/sample/Makefile.in
/usr/share/doc/openvpn/sample/sample-config-files
/usr/share/doc/openvpn/sample/sample-config-files/README
/usr/share/doc/openvpn/sample/sample-config-files/client.conf
/usr/share/doc/openvpn/sample/sample-config-files/firewall.sh
/usr/share/doc/openvpn/sample/sample-config-files/home.up
/usr/share/doc/openvpn/sample/sample-config-files/loopback-client
/usr/share/doc/openvpn/sample/sample-config-files/loopback-server
/usr/share/doc/openvpn/sample/sample-config-files/office.up
```

```
/usr/share/doc/opensvpn/sample/sample-config-files/opensvpn-shutdown.sh
/usr/share/doc/opensvpn/sample/sample-config-files/opensvpn-startup.sh
/usr/share/doc/opensvpn/sample/sample-config-files/roadwarrior-client.conf
/usr/share/doc/opensvpn/sample/sample-config-files/roadwarrior-server.conf
/usr/share/doc/opensvpn/sample/sample-config-files/server.conf
/usr/share/doc/opensvpn/sample/sample-config-files/static-home.conf
/usr/share/doc/opensvpn/sample/sample-config-files/static-office.conf
/usr/share/doc/opensvpn/sample/sample-config-files/tls-home.conf
/usr/share/doc/opensvpn/sample/sample-config-files/tls-office.conf
/usr/share/doc/opensvpn/sample/sample-config-files/xinetd-client-config
/usr/share/doc/opensvpn/sample/sample-config-files/xinetd-server-config
/usr/share/doc/opensvpn/sample/sample-keys
/usr/share/doc/opensvpn/sample/sample-keys/.gitignore
/usr/share/doc/opensvpn/sample/sample-keys/README
/usr/share/doc/opensvpn/sample/sample-keys/ca.crt
/usr/share/doc/opensvpn/sample/sample-keys/ca.key
/usr/share/doc/opensvpn/sample/sample-keys/client-ec.crt
/usr/share/doc/opensvpn/sample/sample-keys/client-ec.key
/usr/share/doc/opensvpn/sample/sample-keys/client-pass.key
/usr/share/doc/opensvpn/sample/sample-keys/client.crt
/usr/share/doc/opensvpn/sample/sample-keys/client.key
/usr/share/doc/opensvpn/sample/sample-keys/client.p12
/usr/share/doc/opensvpn/sample/sample-keys/dh2048.pem
/usr/share/doc/opensvpn/sample/sample-keys/gen-sample-keys.sh
/usr/share/doc/opensvpn/sample/sample-keys/openssl.cnf
/usr/share/doc/opensvpn/sample/sample-keys/server-ec.crt
/usr/share/doc/opensvpn/sample/sample-keys/server-ec.key
/usr/share/doc/opensvpn/sample/sample-keys/server.crt
/usr/share/doc/opensvpn/sample/sample-keys/server.key
/usr/share/doc/opensvpn/sample/sample-plugins
/usr/share/doc/opensvpn/sample/sample-plugins/defer
/usr/share/doc/opensvpn/sample/sample-plugins/defer/README
/usr/share/doc/opensvpn/sample/sample-plugins/defer/build
/usr/share/doc/opensvpn/sample/sample-plugins/defer/simple.c
/usr/share/doc/opensvpn/sample/sample-plugins/defer/simple.def
/usr/share/doc/opensvpn/sample/sample-plugins/defer/winbuild
/usr/share/doc/opensvpn/sample/sample-plugins/log
/usr/share/doc/opensvpn/sample/sample-plugins/log/build
/usr/share/doc/opensvpn/sample/sample-plugins/log/log.c
/usr/share/doc/opensvpn/sample/sample-plugins/log/log_v3.c
/usr/share/doc/opensvpn/sample/sample-plugins/log/winbuild
/usr/share/doc/opensvpn/sample/sample-plugins/simple
/usr/share/doc/opensvpn/sample/sample-plugins/simple/README
/usr/share/doc/opensvpn/sample/sample-plugins/simple/build
/usr/share/doc/opensvpn/sample/sample-plugins/simple/simple.c
/usr/share/doc/opensvpn/sample/sample-plugins/simple/simple.def
/usr/share/doc/opensvpn/sample/sample-plugins/simple/winbuild
/usr/share/doc/opensvpn/sample/sample-scripts
/usr/share/doc/opensvpn/sample/sample-scripts/auth-pam.pl
/usr/share/doc/opensvpn/sample/sample-scripts/bridge-start
```

```

/usr/share/doc/openvpn/sample/sample-scripts/bridge-stop
/usr/share/doc/openvpn/sample/sample-scripts/ucn.pl
/usr/share/doc/openvpn/sample/sample-scripts/verify-cn
/usr/share/doc/openvpn/sample/sample-windows
/usr/share/doc/openvpn/sample/sample-windows/sample.ovpn
/usr/share/man/man8/openvpn.8.gz
/var/run/openvpn

```

```

[root@profeN2I ~]# cat /usr/lib/systemd/system/openvpn@.service
[Unit]
Description=OpenVPN Robust And Highly Flexible Tunneling Application On %I
After=network.target

[Service]
PrivateTmp=true
Type=forking
PIDFile=/var/run/openvpn/%i.pid
ExecStart=/usr/sbin/openvpn --daemon --writepid /var/run/openvpn/%i.pid --cd
/etc/openvpn/ --config %i.conf

[Install]
WantedBy=multi-user.target

```

```

[root@profeN2I ~]# cat /usr/lib/tmpfiles.d/openvpn.conf
D /var/run/openvpn 0710 root openvpn -

```

```

[root@hp01 ~]# tree /etc/openvpn/
/etc/openvpn/
├── keys
│   ├── ca.crt
│   ├── dh2048.pem
│   ├── server.crt
│   └── server.key
├── myserver.conf
├── roadwarrior-server.conf
└── sample.server.conf

```

Exemples VPN manuals (ordre openvpn)

Aquesta secció està extreta dels exemples del Man openvpn. Implememnta un a un els quatre exemples:

- Host-2-Host no encriptat.
- Host-2-Host xifrat simètric (pre-shared key)
- Host-2-Host TLS (xifrat asimètric claus Pública/Secreta)
- Network-2-Network

Descripció del model que es treballa:

VPN Address Setup:

For purposes of our example, our two machines will be called may.kg and june.kg. If you are constructing a VPN over the internet, then replace may.kg and june.kg with the internet hostname or IP address that each machine will use to contact the other over the internet.

Now we will choose the tunnel endpoints. Tunnel endpoints are private IP addresses that only have meaning in the context of the VPN. Each machine will use the tunnel endpoint of the other machine to access it over the VPN. In our example, the tunnel endpoint for may.kg will be 10.4.0.1 and for june.kg, 10.4.0.2.

Once the VPN is established, you have essentially created a secure alternate path between the two hosts which is addressed by using the tunnel endpoints. You can control which network traffic passes between the hosts (a) over the VPN or (b) independently of the VPN, by choosing whether to use (a) the VPN end-point address or (b) the public internet address, to access the remote host. For example if you are on may.kg and you wish to connect to june.kg via ssh without using the VPN (since ssh has its own built-in security) you would use the command `ssh june.kg`. However in the same scenario, you could also use the command `telnet 10.4.0.2` to create a telnet session with june.kg over the VPN, that would use the VPN to secure the session rather than ssh.

You can use any address you wish for the tunnel endpoints but make sure that they are private addresses (such as those that begin with 10 or 192.168) and that they are not part of any existing subnet on the networks of either peer, unless you are bridging. If you use an address that is part of your local subnet for either of the tunnel endpoints, you will get a weird feedback loop

Exemple 1: Túnel Host to Host [no xifrat]

Example 1: A simple tunnel without security

On may:

```
openvpn --remote june.kg --dev tun1 --ifconfig 10.4.0.1 10.4.0.2 --verb 9
```

On june:

```
openvpn --remote may.kg --dev tun1 --ifconfig 10.4.0.2 10.4.0.1 --verb 9
```

Now verify the tunnel is working by pinging across the tunnel.

On may:

```
ping 10.4.0.2
```

On june:

```
ping 10.4.0.1
```

The `--verb 9` option will produce verbose output, similar to the `tcpdump(8)` program. Omit

the `--verb 9` option to have OpenVPN run quietly.

Exemple 2: Túnel Host to Host [pre-shared key]

Example 2: A tunnel with static-key security (i.e. using a pre-shared secret)

First build a static key on may.

```
openvpn --genkey --secret key
```

This command will build a random key file called key (in ascii format). Now copy key to june over a secure medium such as by using the scp(1) program.

On may:

```
openvpn --remote june.kg --dev tun1 --ifconfig 10.4.0.1 10.4.0.2 --verb 5  
--secret key
```

On june:

```
openvpn --remote may.kg --dev tun1 --ifconfig 10.4.0.2 10.4.0.1 --verb 5  
--secret key
```

Now verify the tunnel is working by pinging across the tunnel.

On may:

```
ping 10.4.0.2
```

On june:

```
ping 10.4.0.1
```

Exemple 3: Túnel Host to Host [TLS Public/Secret Key]

Example 3: A tunnel with full TLS-based security

For this test, we will designate may as the TLS client and june as the TLS server. Note that client or server designation only has meaning for the TLS subsystem. It has no bearing on OpenVPN's peer-to-peer, UDP-based communication model.

First, build a separate certificate/key pair for both may and june (see above where `--cert` is discussed for more info). Then construct Diffie Hellman parameters (see above where `--dh` is discussed for more info).

You can also use the included test files client.crt, client.key, server.crt, server.key and ca.crt. The .crt files are certificates/public-keys, the .key files are private keys, and ca.crt is a certification authority who has signed both client.crt and server.crt. For Diffie Hellman parameters you can use the included file dh1024.pem. Note that all client, server, and certificate authority certificates and keys included in the OpenVPN distribution are totally insecure and should be used for testing only.

On may:

```
openvpn --remote june.kg --dev tun1 --ifconfig 10.4.0.1 10.4.0.2 --tls-client  
--ca ca.crt --cert client.crt --key client.key --reneg-sec 60 --verb 5
```

On june:

```
openvpn --remote may.kg --dev tun1 --ifconfig 10.4.0.2 10.4.0.1 --tls-server  
--dh dh1024.pem --ca ca.crt --cert server.crt --key server.key --reneg-sec 60  
--verb 5
```

Now verify the tunnel is working by pinging across the tunnel.

On may:

```
ping 10.4.0.2
```

On june:

```
ping 10.4.0.1
```

Notice the `--reneg-sec 60` option we used above. That tells OpenVPN to renegotiate the data channel keys every minute. Since we used `--verb 5` above, you will see status information on each new key negotiation.

For production operations, a key renegotiation interval of 60 seconds is probably too frequent. Omit the `--reneg-sec 60` option to use OpenVPN's default key renegotiation interval of one hour.

Exemple 4: Túnel Network to Network

Routing:

Assuming you can ping across the tunnel, the next step is to route a real subnet over the secure tunnel. Suppose that may and june have two network interfaces each, one connected to the internet, and the other to a private network. Our goal is to securely connect both private networks. We will assume that may's private subnet is 10.0.0.0/24 and june's is 10.0.1.0/24.

First, ensure that IP forwarding is enabled on both peers. On Linux, enable routing:

```
echo 1 > /proc/sys/net/ipv4/ip_forward
```

and enable TUN packet forwarding through the firewall:

```
iptables -A FORWARD -i tun+ -j ACCEPT
```

On may:

```
route add -net 10.0.1.0 netmask 255.255.255.0 gw 10.4.0.2
```

On june:

```
route add -net 10.0.0.0 netmask 255.255.255.0 gw 10.4.0.1
```

Now any machine on the 10.0.0.0/24 subnet can access any machine on the 10.0.1.0/24

subnet over the secure tunnel (or vice versa).
In a production environment, you could put the route command(s) in a script and execute with the `--up` option.

Servei OpenVPN

Fitxers del servei i de configuració

```
[root@profeN2I ~]# cat /usr/lib/systemd/system/openvpn@.service
[Unit]
Description=OpenVPN Robust And Highly Flexible Tunneling Application On %i
After=network.target

[Service]
PrivateTmp=true
Type=forking
PIDFile=/var/run/openvpn/%i.pid
ExecStart=/usr/sbin/openvpn --daemon --writepid /var/run/openvpn/%i.pid --cd
/etc/openvpn/ --config %i.conf

[Install]
WantedBy=multi-user.target
```

```
/usr/lib/systemd/system/docker.service
--fixed-cidr=172.17.0.0/16
# systemctl daemon-reload
# systemctl restart docker.service
```

```
[root@hp01 ~]# tree /etc/openvpn/
/etc/openvpn/
├── keys
│   ├── ca.crt
│   ├── dh2048.pem
│   ├── server.crt
│   └── server.key
├── myserver.conf
├── roadwarrior-server.conf
└── sample.server.conf
```

```
[root@hp01 keys]# ll /usr/share/doc/openvpn/sample/sample-keys/
-rw-r--r-- 1 root root 2195 18 mai 2015 ca.crt
-rw-r--r-- 1 root root 3272 18 mai 2015 ca.key
-rw-r--r-- 1 root root 5934 18 mai 2015 client.crt
-rw-r--r-- 1 root root 4798 18 mai 2015 client-ec.crt
```

```
-rw-r--r-- 1 root root 237 18 mai 2015 client-ec.key
-rw-r--r-- 1 root root 1704 18 mai 2015 client.key
-rw-r--r-- 1 root root 4533 18 mai 2015 client.p12
-rw-r--r-- 1 root root 1766 18 mai 2015 client-pass.key
-rw-r--r-- 1 root root 424 18 mai 2015 dh2048.pem
-rw-r--r-- 1 root root 2883 17 jul 2015 gen-sample-keys.sh
-rw-r--r-- 1 root root 4312 18 mai 2015 openssl.cnf
-rw-r--r-- 1 root root 737 18 mai 2015 README
-rw-r--r-- 1 root root 6391 18 mai 2015 server.crt
-rw-r--r-- 1 root root 5254 18 mai 2015 server-ec.crt
-rw-r--r-- 1 root root 237 18 mai 2015 server-ec.key
-rw-r--r-- 1 root root 1704 18 mai 2015 server.key
```

```
[root@hp01 keys]# ll /usr/share/doc/openvpn/sample/sample-config-files/
```

```
-rw-r--r-- 1 root root 3441 17 jul 2015 client.conf
-rw-r--r-- 1 root root 3562 18 mai 2015 firewall.sh
-rw-r--r-- 1 root root 62 18 mai 2015 home.up
-rw-r--r-- 1 root root 642 17 jul 2015 loopback-client
-rw-r--r-- 1 root root 645 17 jul 2015 loopback-server
-rw-r--r-- 1 root root 62 18 mai 2015 office.up
-rw-r--r-- 1 root root 63 18 mai 2015 openvpn-shutdown.sh
-rw-r--r-- 1 root root 776 18 mai 2015 openvpn-startup.sh
-rw-r--r-- 1 root root 131 18 mai 2015 README
-rw-r--r-- 1 root root 820 4 ago 2015 roadwarrior-client.conf
-rw-r--r-- 1 root root 1498 4 ago 2015 roadwarrior-server.conf
-rw-r--r-- 1 root root 10441 17 jul 2015 server.conf
-rw-r--r-- 1 root root 1742 18 mai 2015 static-home.conf
-rw-r--r-- 1 root root 1688 18 mai 2015 static-office.conf
-rw-r--r-- 1 root root 1937 18 mai 2015 tls-home.conf
-rw-r--r-- 1 root root 1948 18 mai 2015 tls-office.conf
-rw-r--r-- 1 root root 199 18 mai 2015 xinetd-client-config
-rw-r--r-- 1 root root 989 18 mai 2015 xinetd-server-config
```

```
[root@hp01 ~]# cat /etc/openvpn/myserver.conf
```

```
#####
```

```
# Sample OpenVPN config file for
```

```
# 2.0-style multi-client udp server
```

```
#
```

```
# Adapted from http://openvpn.sourceforge.net/20notes.html
```

```
#
```

```
# tun-style tunnel
```

```
port 1194
```

```
dev tun
```

```
# Use "local" to set the source address on multi-homed hosts
```

```
#local [IP address]
```

```
# TLS parms
tls-server
ca /etc/openvpn/keys/ca.crt
cert /etc/openvpn/keys/server.crt
key /etc/openvpn/keys/server.key
dh /etc/openvpn/keys/dh2048.pem

# Tell OpenVPN to be a multi-client udp server
mode server

# The server's virtual endpoints
ifconfig 10.8.0.1 10.8.0.2

# Pool of /30 subnets to be allocated to clients.
# When a client connects, an --ifconfig command
# will be automatically generated and pushed back to
# the client.
ifconfig-pool 10.8.0.4 10.8.0.255

# Push route to client to bind it to our local
# virtual endpoint.
push "route 10.8.0.1 255.255.255.255"

# Push any routes the client needs to get in
# to the local network.
push "route 192.168.0.0 255.255.255.0"

# Push DHCP options to Windows clients.
push "dhcp-option DOMAIN example.com"
push "dhcp-option DNS 192.168.0.1"
push "dhcp-option WINS 192.168.0.1"

# Client should attempt reconnection on link
# failure.
keepalive 10 60

# Delete client instances after some period
# of inactivity.
inactive 600

# Route the --ifconfig pool range into the
# OpenVPN server.
route 10.8.0.0 255.255.255.0

# The server doesn't need privileges
user openvpn
group openvpn

# Keep TUN devices and keys open across restarts.
persist-tun
```

```
persist-key
```

```
verb 4
```

```
[root@hp01 ~]# cat /etc/openvpn/sample.server.conf
#####
# Sample OpenVPN 2.0 config file for      #
# multi-client server.                    #
#                                         #
# This file is for the server side        #
# of a many-clients <-> one-server        #
# OpenVPN configuration.                  #
#                                         #
# OpenVPN also supports                   #
# single-machine <-> single-machine       #
# configurations (See the Examples page   #
# on the web site for more info).         #
#                                         #
# This config should work on Windows     #
# or Linux/BSD systems. Remember on      #
# Windows to quote pathnames and use     #
# double backslashes, e.g.:              #
# "C:\\Program Files\\OpenVPN\\config\\foo.key" #
#                                         #
# Comments are preceded with '#' or ';'   #
#####

# Which local IP address should OpenVPN
# listen on? (optional)
;local a.b.c.d

# Which TCP/UDP port should OpenVPN listen on?
# If you want to run multiple OpenVPN instances
# on the same machine, use a different port
# number for each one. You will need to
# open up this port on your firewall.
port 1194

# TCP or UDP server?
;proto tcp
proto udp

# "dev tun" will create a routed IP tunnel,
# "dev tap" will create an ethernet tunnel.
# Use "dev tap0" if you are ethernet bridging
# and have precreated a tap0 virtual interface
# and bridged it with your ethernet interface.
# If you want to control access policies
# over the VPN, you must create firewall
```

```
# rules for the the TUN/TAP interface.
# On non-Windows systems, you can give
# an explicit unit number, such as tun0.
# On Windows, use "dev-node" for this.
# On most systems, the VPN will not function
# unless you partially or fully disable
# the firewall for the TUN/TAP interface.
;dev tap
dev tun

# Windows needs the TAP-Win32 adapter name
# from the Network Connections panel if you
# have more than one. On XP SP2 or higher,
# you may need to selectively disable the
# Windows firewall for the TAP adapter.
# Non-Windows systems usually don't need this.
;dev-node MyTap

# SSL/TLS root certificate (ca), certificate
# (cert), and private key (key). Each client
# and the server must have their own cert and
# key file. The server and all clients will
# use the same ca file.
#
# See the "easy-rsa" directory for a series
# of scripts for generating RSA certificates
# and private keys. Remember to use
# a unique Common Name for the server
# and each of the client certificates.
#
# Any X509 key management system can be used.
# OpenVPN can also use a PKCS #12 formatted key file
# (see "pkcs12" directive in man page).
ca ca.crt
cert server.crt
key server.key # This file should be kept secret

# Diffie hellman parameters.
# Generate your own with:
# openssl dhparam -out dh2048.pem 2048
dh dh2048.pem

# Network topology
# Should be subnet (addressing via IP)
# unless Windows clients v2.0.9 and lower have to
# be supported (then net30, i.e. a /30 per client)
# Defaults to net30 (not recommended)
;topology subnet

# Configure server mode and supply a VPN subnet
```

```
# for OpenVPN to draw client addresses from.
# The server will take 10.8.0.1 for itself,
# the rest will be made available to clients.
# Each client will be able to reach the server
# on 10.8.0.1. Comment this line out if you are
# ethernet bridging. See the man page for more info.
server 10.8.0.0 255.255.255.0

# Maintain a record of client <-> virtual IP address
# associations in this file. If OpenVPN goes down or
# is restarted, reconnecting clients can be assigned
# the same virtual IP address from the pool that was
# previously assigned.
ifconfig-pool-persist ipp.txt

# Configure server mode for ethernet bridging.
# You must first use your OS's bridging capability
# to bridge the TAP interface with the ethernet
# NIC interface. Then you must manually set the
# IP/netmask on the bridge interface, here we
# assume 10.8.0.4/255.255.255.0. Finally we
# must set aside an IP range in this subnet
# (start=10.8.0.50 end=10.8.0.100) to allocate
# to connecting clients. Leave this line commented
# out unless you are ethernet bridging.
;server-bridge 10.8.0.4 255.255.255.0 10.8.0.50 10.8.0.100

# Configure server mode for ethernet bridging
# using a DHCP-proxy, where clients talk
# to the OpenVPN server-side DHCP server
# to receive their IP address allocation
# and DNS server addresses. You must first use
# your OS's bridging capability to bridge the TAP
# interface with the ethernet NIC interface.
# Note: this mode only works on clients (such as
# Windows), where the client-side TAP adapter is
# bound to a DHCP client.
;server-bridge

# Push routes to the client to allow it
# to reach other private subnets behind
# the server. Remember that these
# private subnets will also need
# to know to route the OpenVPN client
# address pool (10.8.0.0/255.255.255.0)
# back to the OpenVPN server.
;push "route 192.168.10.0 255.255.255.0"
;push "route 192.168.20.0 255.255.255.0"

# To assign specific IP addresses to specific
```

```
# clients or if a connecting client has a private
# subnet behind it that should also have VPN access,
# use the subdirectory "ccd" for client-specific
# configuration files (see man page for more info).

# EXAMPLE: Suppose the client
# having the certificate common name "Thelonious"
# also has a small subnet behind his connecting
# machine, such as 192.168.40.128/255.255.255.248.
# First, uncomment out these lines:
;client-config-dir ccd
;route 192.168.40.128 255.255.255.248
# Then create a file ccd/Thelonious with this line:
# iroute 192.168.40.128 255.255.255.248
# This will allow Thelonious' private subnet to
# access the VPN. This example will only work
# if you are routing, not bridging, i.e. you are
# using "dev tun" and "server" directives.

# EXAMPLE: Suppose you want to give
# Thelonious a fixed VPN IP address of 10.9.0.1.
# First uncomment out these lines:
;client-config-dir ccd
;route 10.9.0.0 255.255.255.252
# Then add this line to ccd/Thelonious:
# ifconfig-push 10.9.0.1 10.9.0.2

# Suppose that you want to enable different
# firewall access policies for different groups
# of clients. There are two methods:
# (1) Run multiple OpenVPN daemons, one for each
#     group, and firewall the TUN/TAP interface
#     for each group/daemon appropriately.
# (2) (Advanced) Create a script to dynamically
#     modify the firewall in response to access
#     from different clients. See man
#     page for more info on learn-address script.
;learn-address ./script

# If enabled, this directive will configure
# all clients to redirect their default
# network gateway through the VPN, causing
# all IP traffic such as web browsing and
# and DNS lookups to go through the VPN
# (The OpenVPN server machine may need to NAT
# or bridge the TUN/TAP interface to the internet
# in order for this to work properly).
;push "redirect-gateway def1 bypass-dhcp"

# Certain Windows-specific network settings
```

```
# can be pushed to clients, such as DNS
# or WINS server addresses. CAVEAT:
# http://openvpn.net/faq.html#dhcpcaveats
# The addresses below refer to the public
# DNS servers provided by opendns.com.
;push "dhcp-option DNS 208.67.222.222"
;push "dhcp-option DNS 208.67.220.220"

# Uncomment this directive to allow different
# clients to be able to "see" each other.
# By default, clients will only see the server.
# To force clients to only see the server, you
# will also need to appropriately firewall the
# server's TUN/TAP interface.
;client-to-client

# Uncomment this directive if multiple clients
# might connect with the same certificate/key
# files or common names. This is recommended
# only for testing purposes. For production use,
# each client should have its own certificate/key
# pair.
#
# IF YOU HAVE NOT GENERATED INDIVIDUAL
# CERTIFICATE/KEY PAIRS FOR EACH CLIENT,
# EACH HAVING ITS OWN UNIQUE "COMMON NAME",
# UNCOMMENT THIS LINE OUT.
;duplicate-cn

# The keepalive directive causes ping-like
# messages to be sent back and forth over
# the link so that each side knows when
# the other side has gone down.
# Ping every 10 seconds, assume that remote
# peer is down if no ping received during
# a 120 second time period.
keepalive 10 120

# For extra security beyond that provided
# by SSL/TLS, create an "HMAC firewall"
# to help block DoS attacks and UDP port flooding.
#
# Generate with:
# openvpn --genkey --secret ta.key
#
# The server and each client must have
# a copy of this key.
# The second parameter should be '0'
# on the server and '1' on the clients.
;tls-auth ta.key 0 # This file is secret
```



```
# Select a cryptographic cipher.
# This config item must be copied to
# the client config file as well.
;cipher BF-CBC      # Blowfish (default)
;cipher AES-128-CBC # AES
;cipher DES-EDE3-CBC # Triple-DES

# Enable compression on the VPN link.
# If you enable it here, you must also
# enable it in the client config file.
comp-lzo

# The maximum number of concurrently connected
# clients we want to allow.
;max-clients 100

# It's a good idea to reduce the OpenVPN
# daemon's privileges after initialization.
#
# You can uncomment this out on
# non-Windows systems.
;user nobody
;group nobody

# The persist options will try to avoid
# accessing certain resources on restart
# that may no longer be accessible because
# of the privilege downgrade.
persist-key
persist-tun

# Output a short status file showing
# current connections, truncated
# and rewritten every minute.
status openvpn-status.log

# By default, log messages will go to the syslog (or
# on Windows, if running as a service, they will go to
# the "%Program Files%\OpenVPN\log" directory).
# Use log or log-append to override this default.
# "log" will truncate the log file on OpenVPN startup,
# while "log-append" will append to it. Use one
# or the other (but not both).
;log    openvpn.log
;log-append openvpn.log

# Set the appropriate level of log
# file verbosity.
#
```

```
# 0 is silent, except for fatal errors
# 4 is reasonable for general usage
# 5 and 6 can help to debug connection problems
# 9 is extremely verbose
verb 3

# Silence repeating messages. At most 20
# sequential messages of the same message
# category will be output to the log.
;mute 20
```

Implementació Multi-client

Servidor Multi-client

Per implementar un servidor openvpn multi-client:

- Usarem TLS, per tal cal disposar a mà dels elements: ca.crt, server.crt, server.key i dh2048.pem.
- Generarem un fitxer de configuració del servidor usant com a model [server.conf](#) (és el mateix que sample-server.conf). Farem una còpia per personalitzar el servei i anomenarem el fitxer: [hisxserver.conf](#).
- [cal que la ubicació dels fitxers sigui localitzable pel servei]
- Com que 'tunejarem' el servei el copiarem a [/etc/systemd/system](#) i caldrà fer el **daemon-reload** un cop modificat.
- Engegar el servei tenint en compte que és un template.

Generar els fitxers de treball:

```
# cp /etc/openvpn/sample-server.conf hisxserver.conf

# cp /usr/lib/systemd/system/openvpn@service /etc/systemd/system/.
```

Tunejar el template per fer un echo del argument rebut (es veu al journald)

```
[root@hp01 keys]# cat /etc/systemd/system/openvpn@.service
[Unit]
Description=OpenVPN Robust And Highly Flexible Tunneling Application On %i hisx
After=network.target

[Service]
PrivateTmp=true
Type=forking
PIDFile=/var/run/openvpn/%i.pid
ExecStartPre=/usr/bin/echo servei %i %i
ExecStart=/usr/sbin/openvpn --daemon --writepid /var/run/openvpn/%i.pid --cd
/etc/openvpn/ --config %i.conf

[Install]
```

WantedBy=multi-user.target

Fitxer de configuració del servei personalitzat:

```
[root@hp01 keys]# cat /etc/openvpn/hisxserver.conf

#####
# Sample OpenVPN 2.0 config file for      #
# multi-client server.                    #
#                                         #
# This file is for the server side        #
# of a many-clients <-> one-server        #
# OpenVPN configuration.                  #
#                                         #
# OpenVPN also supports                   #
# single-machine <-> single-machine       #
# configurations (See the Examples page   #
# on the web site for more info).         #
#                                         #
# This config should work on Windows      #
# or Linux/BSD systems. Remember on      #
# Windows to quote pathnames and use     #
# double backslashes, e.g.:              #
# "C:\\Program Files\\OpenVPN\\config\\foo.key" #
#                                         #
# Comments are preceded with '#' or ';'   #
#####

# Which local IP address should OpenVPN
# listen on? (optional)
;local a.b.c.d

# Which TCP/UDP port should OpenVPN listen on?
# If you want to run multiple OpenVPN instances
# on the same machine, use a different port
# number for each one. You will need to
# open up this port on your firewall.
port 1194

# TCP or UDP server?
;proto tcp
proto udp

# "dev tun" will create a routed IP tunnel,
# "dev tap" will create an ethernet tunnel.
# Use "dev tap0" if you are ethernet bridging
# and have precreated a tap0 virtual interface
# and bridged it with your ethernet interface.
# If you want to control access policies
# over the VPN, you must create firewall
```

```
# rules for the the TUN/TAP interface.
# On non-Windows systems, you can give
# an explicit unit number, such as tun0.
# On Windows, use "dev-node" for this.
# On most systems, the VPN will not function
# unless you partially or fully disable
# the firewall for the TUN/TAP interface.
;dev tap
dev tun

# Windows needs the TAP-Win32 adapter name
# from the Network Connections panel if you
# have more than one. On XP SP2 or higher,
# you may need to selectively disable the
# Windows firewall for the TAP adapter.
# Non-Windows systems usually don't need this.
;dev-node MyTap

# SSL/TLS root certificate (ca), certificate
# (cert), and private key (key). Each client
# and the server must have their own cert and
# key file. The server and all clients will
# use the same ca file.
#
# See the "easy-rsa" directory for a series
# of scripts for generating RSA certificates
# and private keys. Remember to use
# a unique Common Name for the server
# and each of the client certificates.
#
# Any X509 key management system can be used.
# OpenVPN can also use a PKCS #12 formatted key file
# (see "pkcs12" directive in man page).
ca ca.crt
cert server.crt
key server.key # This file should be kept secret

# Diffie hellman parameters.
# Generate your own with:
# openssl dhparam -out dh2048.pem 2048
dh dh2048.pem

# Network topology
# Should be subnet (addressing via IP)
# unless Windows clients v2.0.9 and lower have to
# be supported (then net30, i.e. a /30 per client)
# Defaults to net30 (not recommended)
;topology subnet

# Configure server mode and supply a VPN subnet
```

```
# for OpenVPN to draw client addresses from.
# The server will take 10.8.0.1 for itself,
# the rest will be made available to clients.
# Each client will be able to reach the server
# on 10.8.0.1. Comment this line out if you are
# ethernet bridging. See the man page for more info.
server 10.8.0.0 255.255.255.0

# Maintain a record of client <-> virtual IP address
# associations in this file. If OpenVPN goes down or
# is restarted, reconnecting clients can be assigned
# the same virtual IP address from the pool that was
# previously assigned.
ifconfig-pool-persist ipp.txt

# Configure server mode for ethernet bridging.
# You must first use your OS's bridging capability
# to bridge the TAP interface with the ethernet
# NIC interface. Then you must manually set the
# IP/netmask on the bridge interface, here we
# assume 10.8.0.4/255.255.255.0. Finally we
# must set aside an IP range in this subnet
# (start=10.8.0.50 end=10.8.0.100) to allocate
# to connecting clients. Leave this line commented
# out unless you are ethernet bridging.
;server-bridge 10.8.0.4 255.255.255.0 10.8.0.50 10.8.0.100

# Configure server mode for ethernet bridging
# using a DHCP-proxy, where clients talk
# to the OpenVPN server-side DHCP server
# to receive their IP address allocation
# and DNS server addresses. You must first use
# your OS's bridging capability to bridge the TAP
# interface with the ethernet NIC interface.
# Note: this mode only works on clients (such as
# Windows), where the client-side TAP adapter is
# bound to a DHCP client.
;server-bridge

# Push routes to the client to allow it
# to reach other private subnets behind
# the server. Remember that these
# private subnets will also need
# to know to route the OpenVPN client
# address pool (10.8.0.0/255.255.255.0)
# back to the OpenVPN server.
;push "route 192.168.10.0 255.255.255.0"
;push "route 192.168.20.0 255.255.255.0"

# To assign specific IP addresses to specific
```

```
# clients or if a connecting client has a private
# subnet behind it that should also have VPN access,
# use the subdirectory "ccd" for client-specific
# configuration files (see man page for more info).

# EXAMPLE: Suppose the client
# having the certificate common name "Thelonious"
# also has a small subnet behind his connecting
# machine, such as 192.168.40.128/255.255.255.248.
# First, uncomment out these lines:
;client-config-dir ccd
;route 192.168.40.128 255.255.255.248
# Then create a file ccd/Thelonious with this line:
# iroute 192.168.40.128 255.255.255.248
# This will allow Thelonious' private subnet to
# access the VPN. This example will only work
# if you are routing, not bridging, i.e. you are
# using "dev tun" and "server" directives.

# EXAMPLE: Suppose you want to give
# Thelonious a fixed VPN IP address of 10.9.0.1.
# First uncomment out these lines:
;client-config-dir ccd
;route 10.9.0.0 255.255.255.252
# Then add this line to ccd/Thelonious:
# ifconfig-push 10.9.0.1 10.9.0.2

# Suppose that you want to enable different
# firewall access policies for different groups
# of clients. There are two methods:
# (1) Run multiple OpenVPN daemons, one for each
#     group, and firewall the TUN/TAP interface
#     for each group/daemon appropriately.
# (2) (Advanced) Create a script to dynamically
#     modify the firewall in response to access
#     from different clients. See man
#     page for more info on learn-address script.
;learn-address ./script

# If enabled, this directive will configure
# all clients to redirect their default
# network gateway through the VPN, causing
# all IP traffic such as web browsing and
# and DNS lookups to go through the VPN
# (The OpenVPN server machine may need to NAT
# or bridge the TUN/TAP interface to the internet
# in order for this to work properly).
;push "redirect-gateway def1 bypass-dhcp"

# Certain Windows-specific network settings
```

```
# can be pushed to clients, such as DNS
# or WINS server addresses. CAVEAT:
# http://openvpn.net/faq.html#dhcpcaveats
# The addresses below refer to the public
# DNS servers provided by opendns.com.
;push "dhcp-option DNS 208.67.222.222"
;push "dhcp-option DNS 208.67.220.220"

# Uncomment this directive to allow different
# clients to be able to "see" each other.
# By default, clients will only see the server.
# To force clients to only see the server, you
# will also need to appropriately firewall the
# server's TUN/TAP interface.
;client-to-client

# Uncomment this directive if multiple clients
# might connect with the same certificate/key
# files or common names. This is recommended
# only for testing purposes. For production use,
# each client should have its own certificate/key
# pair.
#
# IF YOU HAVE NOT GENERATED INDIVIDUAL
# CERTIFICATE/KEY PAIRS FOR EACH CLIENT,
# EACH HAVING ITS OWN UNIQUE "COMMON NAME",
# UNCOMMENT THIS LINE OUT.
;duplicate-cn

# The keepalive directive causes ping-like
# messages to be sent back and forth over
# the link so that each side knows when
# the other side has gone down.
# Ping every 10 seconds, assume that remote
# peer is down if no ping received during
# a 120 second time period.
keepalive 10 120

# For extra security beyond that provided
# by SSL/TLS, create an "HMAC firewall"
# to help block DoS attacks and UDP port flooding.
#
# Generate with:
# openvpn --genkey --secret ta.key
#
# The server and each client must have
# a copy of this key.
# The second parameter should be '0'
# on the server and '1' on the clients.
;tls-auth ta.key 0 # This file is secret
```

```
# Select a cryptographic cipher.
# This config item must be copied to
# the client config file as well.
;cipher BF-CBC      # Blowfish (default)
;cipher AES-128-CBC # AES
;cipher DES-EDE3-CBC # Triple-DES

# Enable compression on the VPN link.
# If you enable it here, you must also
# enable it in the client config file.
comp-lzo

# The maximum number of concurrently connected
# clients we want to allow.
;max-clients 100

# It's a good idea to reduce the OpenVPN
# daemon's privileges after initialization.
#
# You can uncomment this out on
# non-Windows systems.
;user nobody
;group nobody

# The persist options will try to avoid
# accessing certain resources on restart
# that may no longer be accessible because
# of the privilege downgrade.
persist-key
persist-tun

# Output a short status file showing
# current connections, truncated
# and rewritten every minute.
status openvpn-status.log

# By default, log messages will go to the syslog (or
# on Windows, if running as a service, they will go to
# the "%Program Files%\OpenVPN\log" directory).
# Use log or log-append to override this default.
# "log" will truncate the log file on OpenVPN startup,
# while "log-append" will append to it. Use one
# or the other (but not both).
;log      openvpn.log
;log-append openvpn.log

# Set the appropriate level of log
# file verbosity.
#
```



```
# 0 is silent, except for fatal errors
# 4 is reasonable for general usage
# 5 and 6 can help to debug connection problems
# 9 is extremely verbose
verb 3

# Silence repeating messages. At most 20
# sequential messages of the same message
# category will be output to the log.
;mute 20

# Notify the client that when the server restarts so it
# can automatically reconnect.
#explicit-exit-notify 1
```

Engegar el servei

```
[root@hp01 system]# systemctl daemon-reload

[root@hp01 system]# systemctl start openvpn@hisxserver.service

[root@hp01 system]# systemctl status openvpn@hisxserver.service
● openvpn@hisxserver.service - OpenVPN Robust And Highly Flexible Tunneling
Application On hisxserver hisx
   Loaded: loaded (/etc/systemd/system/openvpn@.service; disabled)
   Active: active (running) since dc 2017-03-22 17:46:25 CET; 5s ago
   Process: 5774 ExecStart=/usr/sbin/openvpn --daemon --writepid /var/run/openvpn/%i.pid
--cd /etc/openvpn/ --config %i.conf (code=exited, status=0/SUCCESS)
   Process: 5772 ExecStartPre=/usr/bin/echo servei %i %l (code=exited,
status=0/SUCCESS)
   Main PID: 5776 (openvpn)
   CGroup: /system.slice/system-openvpn.slice/openvpn@hisxserver.service
           └─5776 /usr/sbin/openvpn --daemon --writepid /var/run/openvpn/hisxserver.pid
--cd /etc/openvpn/ --config his...

mar 22 17:46:25 hp01 openvpn[5776]: do_ifconfig, tt->ipv6=0,
tt->did_ifconfig_ipv6_setup=0
mar 22 17:46:25 hp01 openvpn[5776]: /usr/sbin/ip link set dev tun0 up mtu 1500
mar 22 17:46:25 hp01 openvpn[5776]: /usr/sbin/ip addr add dev tun0 local 10.8.0.1 peer
10.8.0.2
mar 22 17:46:26 hp01 openvpn[5776]: /usr/sbin/ip route add 10.8.0.0/24 via 10.8.0.2
mar 22 17:46:26 hp01 openvpn[5776]: UDPv4 link local (bound): [undef]
mar 22 17:46:26 hp01 openvpn[5776]: UDPv4 link remote: [undef]
mar 22 17:46:26 hp01 openvpn[5776]: MULTI: multi_init called, r=256 v=256
mar 22 17:46:26 hp01 openvpn[5776]: IFCONFIG POOL: base=10.8.0.4 size=62, ipv6=0
mar 22 17:46:26 hp01 openvpn[5776]: IFCONFIG POOL LIST
mar 22 17:46:26 hp01 openvpn[5776]: Initialization Sequence Completed
```

Observar el journalct -f

```

mar 22 17:44:56 hp01 systemd[1]: Unit openvpn@hisxserver.service entered failed state.
mar 22 17:44:56 hp01 systemd[1]: openvpn@hisxserver.service failed.
mar 22 17:46:25 hp01 echo[5772]: servei hisxserver hisxserver
mar 22 17:46:25 hp01 openvpn[5774]: OpenVPN 2.3.8 x86_64-redhat-linux-gnu [SSL
(OpenSSL)] [LZO] [EPOLL] [PKCS11] [MH] [IPv6] built on Aug  4 2015
mar 22 17:46:25 hp01 openvpn[5774]: library versions: OpenSSL 1.0.1k-fips 8 Jan 2015,
LZO 2.08
mar 22 17:46:25 hp01 openvpn[5776]: NOTE: your local LAN uses the extremely common
subnet address 192.168.0.x or 192.168.1.x. Be aware that this might create routing
conflicts if you connect to the VPN server from public locations such as internet cafes that
use the same subnet.
mar 22 17:46:25 hp01 openvpn[5776]: Diffie-Hellman initialized with 2048 bit key
mar 22 17:46:25 hp01 openvpn[5776]: WARNING: file 'server.key' is group or others
accessible
mar 22 17:46:25 hp01 openvpn[5776]: Socket Buffers: R=[212992->131072]
S=[212992->131072]
mar 22 17:46:25 hp01 openvpn[5776]: ROUTE_GATEWAY 192.168.1.1/255.255.255.0
IFACE=wls1 HWADDR=00:26:c7:08:4d:18
mar 22 17:46:25 hp01 openvpn[5776]: TUN/TAP device tun0 opened
mar 22 17:46:25 hp01 openvpn[5776]: TUN/TAP TX queue length set to 100
mar 22 17:46:25 hp01 openvpn[5776]: do_ifconfig, tt->ipv6=0,
tt->did_ifconfig_ipv6_setup=0
mar 22 17:46:25 hp01 openvpn[5776]: /usr/sbin/ip link set dev tun0 up mtu 1500
mar 22 17:46:25 hp01 NetworkManager[587]: <info> (tun0): carrier is OFF
mar 22 17:46:25 hp01 NetworkManager[587]: <info> (tun0): new Tun device (driver:
'unknown' ifindex: 7)
mar 22 17:46:25 hp01 NetworkManager[587]: <info> (tun0): exported as
/org/freedesktop/NetworkManager/Devices/6
mar 22 17:46:25 hp01 openvpn[5776]: /usr/sbin/ip addr add dev tun0 local 10.8.0.1 peer
10.8.0.2
mar 22 17:46:25 hp01 NetworkManager[587]: <info> (tun0): link connected
mar 22 17:46:26 hp01 openvpn[5776]: /usr/sbin/ip route add 10.8.0.0/24 via 10.8.0.2
mar 22 17:46:26 hp01 openvpn[5776]: UDPv4 link local (bound): [undef]
mar 22 17:46:26 hp01 openvpn[5776]: UDPv4 link remote: [undef]
mar 22 17:46:26 hp01 openvpn[5776]: MULTI: multi_init called, r=256 v=256
mar 22 17:46:26 hp01 openvpn[5776]: IFCONFIG POOL: base=10.8.0.4 size=62, ipv6=0
mar 22 17:46:26 hp01 openvpn[5776]: IFCONFIG POOL LIST
mar 22 17:46:26 hp01 openvpn[5776]: Initialization Sequence Completed

```

Host Client

Per connectar un client openvpn a un servidor multi-client cal:

- Generar un servei openvpn template en el host client (com s'ha fet amb el servidor). Podem personalitzar-lo o usar l'estàndard.
- Crear un fitxer de configuració personalitzat. Per exemple usar **client.conf** (proporcionat als exemples) i editar-lo o fer-ne una còpia amb un nom personalitzat segons la finalitat del túnel vpn. Per exemple aquí usarem **hisxclient.conf**.

Crear un fitxer de configuració client personalitzat:

```
# cp /usr/share/doc/openvpn/sample/sample-config-files/client.conf /etc/openvpn/.
# cp /etc/openvpn/client.conf /etc/openvpn/hisxclient.conf
```

Editar el fitxer client per personalitzar-lo:

```
[root@hp01 keys]# cat /etc/openvpn/hisxclient.conf

#####
# Sample client-side OpenVPN 2.0 config file #
# for connecting to multi-client server.      #
#                                           #
# This configuration can be used by multiple #
# clients, however each client should have  #
# its own cert and key files.               #
#                                           #
# On Windows, you might want to rename this #
# file so it has a .ovpn extension          #
#####

# Specify that we are a client and that we
# will be pulling certain config file directives
# from the server.
client

# Use the same setting as you are using on
# the server.
# On most systems, the VPN will not function
# unless you partially or fully disable
# the firewall for the TUN/TAP interface.
;dev tap
dev tun

# Windows needs the TAP-Win32 adapter name
# from the Network Connections panel
# if you have more than one.  On XP SP2,
# you may need to disable the firewall
# for the TAP adapter.
;dev-node MyTap

# Are we connecting to a TCP or
# UDP server?  Use the same setting as
# on the server.
;proto tcp
proto udp

# The hostname/IP and port of the server.
# You can have multiple remote entries
# to load balance between the servers.
remote hp01 1194
;remote my-server-2 1194
```

```
# Choose a random host from the remote
# list for load-balancing. Otherwise
# try hosts in the order specified.
;remote-random

# Keep trying indefinitely to resolve the
# host name of the OpenVPN server. Very useful
# on machines which are not permanently connected
# to the internet such as laptops.
resolv-retry infinite

# Most clients don't need to bind to
# a specific local port number.
nobind

# Downgrade privileges after initialization (non-Windows only)
;user nobody
;group nobody

# Try to preserve some state across restarts.
persist-key
persist-tun

# If you are connecting through an
# HTTP proxy to reach the actual OpenVPN
# server, put the proxy server/IP and
# port number here. See the man page
# if your proxy server requires
# authentication.
;http-proxy-retry # retry on connection failures
;http-proxy [proxy server] [proxy port #]

# Wireless networks often produce a lot
# of duplicate packets. Set this flag
# to silence duplicate packet warnings.
;mute-replay-warnings

# SSL/TLS parms.
# See the server config file for more
# description. It's best to use
# a separate .crt/.key file pair
# for each client. A single ca
# file can be used for all clients.
ca ca.crt
cert client.crt
key client.key

# Verify server certificate by checking that the
# certificate has the correct key usage set.
```

```
# This is an important precaution to protect against
# a potential attack discussed here:
# http://openvpn.net/howto.html#mitm
#
# To use this feature, you will need to generate
# your server certificates with the keyUsage set to
# digitalSignature, keyEncipherment
# and the extendedKeyUsage to
# serverAuth
# EasyRSA can do this for you.
remote-cert-tls server
```

```
# If a tls-auth key is used on the server
# then every client must also have the key.
;tls-auth ta.key 1
```

```
# Select a cryptographic cipher.
# If the cipher option is used on the server
# then you must also specify it here.
;cipher x
cipher AES-256-CBC
```

```
# Enable compression on the VPN link.
# Don't enable this unless it is also
# enabled in the server config file.
comp-lzo
```

```
# Set log file verbosity.
verb 3
```

```
# Silence repeating messages
;mute 20
```

Engregar el client:

```
[root@asus01 openvpn]# systemctl daemon-reload
```

```
[root@asus01 openvpn]# systemctl start openvpn@hisxclient.service
```

```
[root@asus01 openvpn]# systemctl -l status openvpn@hisxclient.service
```

```
• openvpn@hisxclient.service - OpenVPN Robust And Highly Flexible Tunneling
Application On hisxclient
  Loaded: loaded (/etc/systemd/system/openvpn@.service; disabled)
  Active: active (running) since Wed 2017-03-22 17:58:01 CET; 6s ago
  Process: 2972 ExecStart=/usr/sbin/openvpn --daemon --writepid /var/run/openvpn/%i.pid
  --cd /etc/openvpn/ --config %i.conf (code=exited, status=0/SUCCESS)
  Process: 2970 ExecStartPre=/usr/bin/echo client %i %l (code=exited,
status=0/SUCCESS)
  Main PID: 2974 (openvpn)
  CGroup: /system.slice/system-openvpn.slice/openvpn@hisxclient.service
```

```
└─2974 /usr/sbin/openvpn --daemon --writepid /var/run/openvpn/hisxclient.pid --cd
/etc/openvpn/ --config hisxclient.conf
```

```
Mar 22 17:58:03 asus01 openvpn[2974]: OPTIONS IMPORT: --ifconfig/up options
modified
Mar 22 17:58:03 asus01 openvpn[2974]: OPTIONS IMPORT: route options modified
Mar 22 17:58:03 asus01 openvpn[2974]: ROUTE_GATEWAY 192.168.1.1/255.255.255.0
IFACE=wlp3s0 HWADDR=00:13:02:33:8e:4e
Mar 22 17:58:03 asus01 openvpn[2974]: TUN/TAP device tun0 opened
Mar 22 17:58:03 asus01 openvpn[2974]: TUN/TAP TX queue length set to 100
Mar 22 17:58:03 asus01 openvpn[2974]: do_ifconfig, tt->ipv6=0,
tt->did_ifconfig_ipv6_setup=0
Mar 22 17:58:03 asus01 openvpn[2974]: /usr/sbin/ip link set dev tun0 up mtu 1500
Mar 22 17:58:03 asus01 openvpn[2974]: /usr/sbin/ip addr add dev tun0 local 10.8.0.6 peer
10.8.0.5
Mar 22 17:58:03 asus01 openvpn[2974]: /usr/sbin/ip route add 10.8.0.1/32 via 10.8.0.5
Mar 22 17:58:03 asus01 openvpn[2974]: Initialization Sequence Completed
```

Examinar el túnel

En el server:

```
[root@hp01 ~]# ip a s dev tun0
7: tun0: <POINTOPOINT,MULTICAST,NOARP,UP,LOWER_UP> mtu 1500 qdisc
pfifo_fast state UNKNOWN group default qlen 100
    link/none
    inet 10.8.0.1 peer 10.8.0.2/32 scope global tun0
        valid_lft forever preferred_lft forever

[root@hp01 ~]# ip r
default via 192.168.1.1 dev wls1 proto static metric 1024
10.8.0.0/24 via 10.8.0.2 dev tun0
10.8.0.2 dev tun0 proto kernel scope link src 10.8.0.1
192.168.1.0/24 dev wls1 proto kernel scope link src 192.168.1.36
```

En el client:

```
[root@asus01 ~]# ip a s dev tun0
7: tun0: <POINTOPOINT,MULTICAST,NOARP,UP,LOWER_UP> mtu 1500 qdisc
pfifo_fast state UNKNOWN group default qlen 100
    link/none
    inet 10.8.0.6 peer 10.8.0.5/32 scope global tun0
        valid_lft forever preferred_lft forever

[root@asus01 ~]# ip r
default via 192.168.1.1 dev wlp3s0 proto static metric 1024
10.8.0.1 via 10.8.0.5 dev tun0
```

```
10.8.0.5 dev tun0 proto kernel scope link src 10.8.0.6
192.168.1.0/24 dev wlp3s0 proto kernel scope link src 192.168.1.38
192.168.122.0/24 dev virbr0 proto kernel scope link src 192.168.122.1
```

Exemple multiclients que es veuen entre ells

Exemple 07: connexions client/servidor amb systemctl

Exemple 08: connexions systemctl amb certificats propis de Veritat absoluta

Del fitxer de configuració openvpn@hisxserver.service assegurar-se de comentar la última línia:

```
#explicit-exit-notify 1
```

En el client openvpn@hisxclient.service afegir el tipus de cipher que s'ha definit en el servidor:

```
cipher AES-256-CBC
```

Atenció que client i server tinguin o no configurada la compressió:

```
;comp-lzo
```

Cas a)

si engegem un server i dos clients que usen el mateix certificat de client es genera un problema, en engegar-ne un aturem l'altre, comparteixen idem ip 10.8.0.6

cas b)

configurem les directives per permetre múltiples repeticions del mateix certificat: duplicate-cn

i també configurem que els clients es vegin entre ells amb la directiva:

```
client-to-client
```

Ara tenim un server 10.8.0.1 i dos clients 10.8.0.6 i 10.8.0.10. Entre els tres es veuen.

Applet gràfic VPN



Eines d'internet per a tràfic obscur

