

C&C environment installation and configuration for DoH communication with DNSCat2

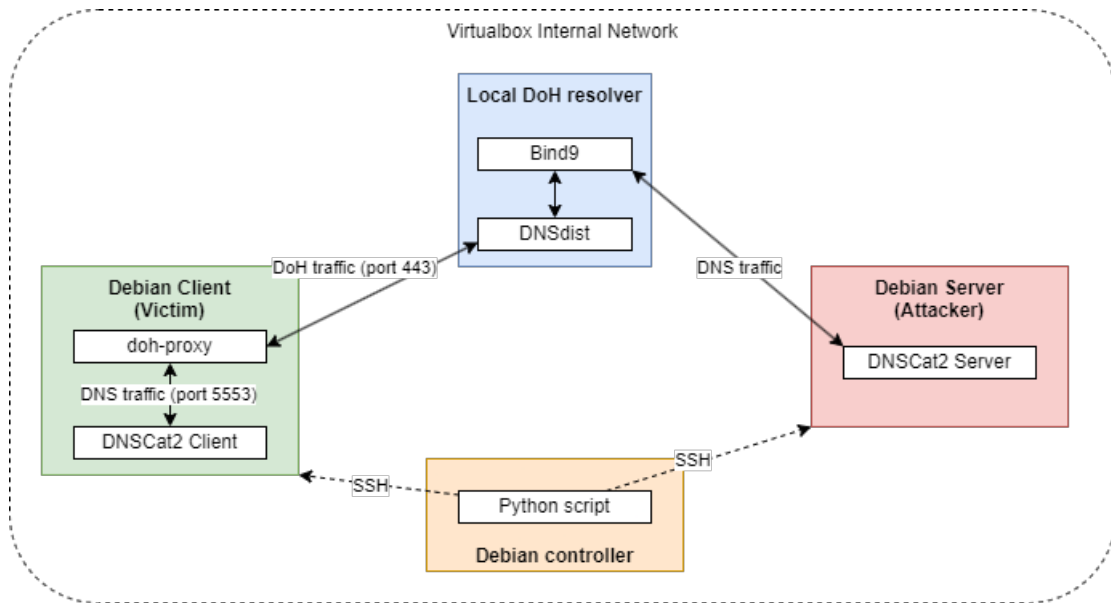
July 12, 2023

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1 VirtualBox Network setting

Create a "NAT network" which is named by default "NATNetwork" and set all the created machine to this network during the configuration before installation.



2 Server installation (Debian 11)

2.1 Installation configuration

- **CPU thread:** 2
- **RAM:** 1024 MB (512 MB if without desktop)
- **Storage:** 30 GB
- **Root Password:** root
- **Non-admin username:** attacker
- **Non-admin password:** notroot
- **Hostname:** dohserver
- **Enable SSH server**

2.2 Basic configuration

2.2.1 Power setting (Mandatory)

In Settings > Power > Power Saving, put:

- **Blank Screen:** Never
- **Automatic Suspend:**
 - On Battery Power: OFF
 - Plugged In: OFF

2.2.2 User configuration

Add the user to sudoers (if without desktop version):

```
1 $ su -
2 # usermod -a -G sudo attacker
```

Restart the machine.

2.2.3 Install packages

```
1 $ sudo apt install git make gcc dtach wireshark tcpdump ufw psmisc avahi-
daemon
```

2.2.4 Modify firewall rules

```
1 $ sudo ufw enable
2 $ sudo ufw allow 53/udp
3 $ sudo ufw allow 22/tcp
4 $ sudo ufw reload
5 $ sudo ufw status
```

2.2.5 Allow SSH connection as Root

Edit the following file: `$ sudo nano /etc/ssh/sshd_config`

- Comment the following line: `PermitRootLogin prohibit-password`
- Add below: `PermitRootLogin yes`
- Restart the SSH service: `$ sudo service ssh restart`

2.3 DNSCat2 server installation

2.3.1 Install Ruby and RubyGems

```
1 $ sudo apt install ruby-dev
```

2.3.2 DNSCat2 server

```
1 $ git clone https://github.com/iagox86/dnscat2.git
2 $ cd dnscat2/server/
3 $ sudo apt-get install build-essential
4 $ sudo gem install salsa20 -v '0.1.1'
5 $ sudo gem install bundler
6 $ sudo bundle install
```

Verify that the installation was well done with: `$ sudo ruby ./dnscat2.rb`

Possible errors:

- <https://github.com/iagox86/dnscat2/issues/173>
- <https://www.logsec.cloud/posts/dnscat2-demo-on-aws/>

3 Local DoH resolver

3.1 Installation configuration

- **CPU thread:** 2
- **RAM:** 1024 MB (512 MB if without desktop)
- **Storage:** 10 GB
- **Root Password:** root
- **Non-admin username:** resolver
- **Non-admin password:** notroot
- **Hostname:** doh.local
- **Enable SSH server**

3.2 Basic configuration

3.2.1 Power setting (Mandatory)

In Settings > Power > Power Saving, put:

- Blank Screen: Never
- Automatic Suspend:
 - On Battery Power: OFF
 - Plugged In: OFF

3.2.2 User configuration

Add the user to sudoers (if without desktop version):

```
1 $ su -
2 # usermod -a -G sudo resolver
```

Restart the machine.

3.2.3 Install packages

```
1 $ sudo apt install curl ufw wireshark avahi-daemon
```

3.2.4 Modify firewall rules

```
1 $ sudo ufw enable
2 $ sudo ufw allow 53/udp
3 $ sudo ufw allow 443/tcp
4 $ sudo ufw allow 22/tcp
5 $ sudo ufw reload
6 $ sudo ufw status
```

3.3 Bind9 installation

```
1 $ sudo apt install bind9 bind9utils bind9-doc
2 $ sudo systemctl status named
3 $ sudo nano /etc/bind/named.conf.local
```

Define a zone in which we need to forward all the requests containing the domain "testlab.lan":

```
1 zone "testlab.lan." {
2     type forward;
3     forward only;
4     forwarders {[server-IP] port 53;};
5 };
```

Modify the options of Bind: `$ sudo nano /etc/bind/named.conf.options`

Write these instructions:

```
1 options {
2     directory "/var/cache/bind";
3
4     dnssec-validation no;
5     listen-on-v6 {any; };
6 };
```

Check that the modifications are correct:

```
1 $ sudo named-checkconf
2 $ sudo systemctl restart bind9
```

3.4 DNSDist 1.8 installation

```
1 $ echo "deb [arch=amd64] http://repo.powerdns.com/debian bullseye-dnsdist-18
main" | sudo tee /etc/apt/sources.list.d/pdns.list
```

Modify the file in path `/etc/apt/preferences.d/dnsdist`:

```
1 Package: dnsdist*
2 Pin: origin repo.powerdns.com
3 Pin-Priority: 600
```

Then, execute the following commands:

```
1 $ curl https://repo.powerdns.com/FD380FBB-pub.asc | sudo apt-key add -
2 $ sudo apt-get update
3 $ sudo apt-get install dnsdist
```

Documentation source: <https://repo.powerdns.com/>

3.4.1 Configure the dnsdist server

Modify the configuration file of dnsdist:

```
1 $ sudo nano /etc/dnsdist/dnsdist.conf
```

We will first ask to dnsmasq to listen on a particular port since by default it is listening on port 53 which is also the port on which Bind9 is listening. To do this, we will add "addLocal" option.

Then, we will add an Access Control List with the "addACL" option. We want that any IP of any subnet will be able to query the dnsmasq server.

The next part is to add a recursive resolver to dnsmasq because it does not have its own recursive resolver by default since it is a loadbalancer. To this end, we will use the "newServer" option with the loopback address because the recursive resolver is the system itself.

Finally, we will add the capability to manage DoH. But for this, we need to generate a private and a public key for the encryption of the traffic and a self-signed certificate. We will use OpenSSL to generate that.

```
1 addLocal ( '0.0.0.0:5300 ' )
2 addACL( '0.0.0.0/0 ' )
3 newServer({ address="127.0.0.1:53" })
```

Generation of the encryption key pair and the certificate (we will not encrypt the private key in this case ⇒ -nodes):

```
1 $ cd /opt/
2 $ sudo openssl req -x509 -nodes -days 365 -newkey rsa:2048 -out dohpub.pem -
  keyout dohpvt.pem
```

Fill in the form:

```
1 Country Name (2 letter code) [AU]:BE
2 State or Province Name (full name) [Some-State]:Belgium
3 Locality Name (eg, city) []:Bruxelles
4 Organization Name (eg, company) [Internet Widgits Pty Ltd]:ULB
5 Organizational Unit Name (eg, section) []:MSECUC
6 Common Name (e.g. server FQDN or YOUR name) []:doh.local
7 Email Address []:admin@doh.local
```

Change the permission of the files created:

```
1 $ sudo chmod 777 dohp*
```

We go back to the dnsmasq configuration file: `$ sudo nano /etc/dnsmasq/dnsmasq.conf`

Add the line to allow DoH communications:

```
1 addDOHLocal( '0.0.0.0:443 ', '/opt/dohpub.pem', '/opt/dohpvt.pem', '/dns-query ', {
  doTCP=true, reusePort=true, sessionTimeout=43200})
```

Restart the dnsmasq service and check the configuration:

```
1 $ sudo dnsmasq --check-config
2 $ sudo systemctl restart dnsmasq
```

4 Client DNSCat2 (Debian 11)

4.1 Installation configuration

- **CPU thread:** 2
- **RAM:** 1024 MB (512 MB if without desktop)
- **Storage:** 30 GB

- **Root Password:** root
- **Non-admin username:** client
- **Non-admin password:** notroot
- **Hostname:** dohclientX (where X is the number of the client)
- **Enable SSH server**

4.2 Basic configuration

4.2.1 Power setting (Mandatory)

In Settings > Power > Power Saving, put:

- Blank Screen: Never
- Automatic Suspend:
 - On Battery Power: OFF
 - Plugged In: OFF

4.2.2 User configuration

Add the user to sudoers (if without desktop version):

```
1 $ su -
2 # usermod -a -G sudo client
```

Restart the machine.

4.2.3 Install packages

```
1 $ sudo apt install git make gcc dtach wireshark tcpdump avahi-daemon psmisc
```

4.3 DNSCat2 client installation

```
1 $ git clone https://github.com/iagox86/dnscat2.git
2 $ cd dnscat2/client
3 $ make
```

4.4 DoH-proxy installation

In order to execute the DoH proxy, we need to install a Conda environment. Take the most recent Anaconda version on the Website and download it. Then, execute the following commands:

```
1 $ wget https://repo.anaconda.com/archive/Anaconda3-2023.03-1-Linux-x86_64.sh
2 $ bash Anaconda3-2023.03-1-Linux-x86_64.sh
3 $ sudo shutdown -h now
4 $ conda config --set auto_activate_base false
5 $ conda update conda
6 $ conda create --name DoH_proxyConda python=3.5
7 $ conda activate DoH_proxyConda
8 (DoH_proxyConda)$ pip install doh-proxy
```

Try if the installation works with the following command and observe the connection with Wireshark (\$ sudo wireshark).

```
1 (DoH_proxyConda)$ doh-stub --listen-address 127.0.0.1 --listen-port 5553 --  
domain dns.google
```

You can test a DNS request through the DoH proxy with: `$ dig @127.0.0.1 -p 5553 twitch.tv`

If you are on the "without desktop" version, create a folder named "Documents" on `/home/client`
with: `$ mkdir Documents`

Retrieve the certificate generated on the DoH server (DNSDist machine) by using:

```
1 $ scp resolver@doh.local:/opt/dohpub.pem /home/client/Documents/dohpub.pem
```