**Metasploit: Introduction**

Introduction to Metasploit

Metasploit is the most widely used exploitation framework. Metasploit is a powerful tool that can support all phases of a penetration testing engagement, from information gathering to post-exploitation.

Metasploit has two main versions:

* **Metasploit Pro**: The commercial version that facilitates the automation and management of tasks. This version has a graphical user interface (GUI).
* **Metasploit Framework**: The open-source version that works from the command line. This room will focus on this version, installed on the AttackBox and most commonly used penetration testing Linux distributions.

The Metasploit Framework is a set of tools that allow information gathering, scanning, exploitation, exploit development, post-exploitation, and more. While the primary usage of the Metasploit Framework focuses on the penetration testing domain, it is also useful for vulnerability research and exploit development.

The main components of the Metasploit Framework can be summarized as follows;

* **msfconsole**: The main command-line interface.
* **Modules**: supporting modules such as exploits, scanners, payloads, etc.
* **Tools**: Stand-alone tools that will help vulnerability research, vulnerability assessment, or penetration testing. Some of these tools are msfvenom, pattern\_create and pattern\_offset. We will cover msfvenom within this module, but pattern\_create and pattern\_offset are tools useful in exploit development which is beyond the scope of this module.

This room will cover the main components of Metasploit while providing you with a solid foundation on how to find relevant exploits, set parameters, and exploit vulnerable services on the target system. Once you have completed this room, you will be able to navigate and use the Metasploit command line comfortably.

You can deploy and use the AttackBox to complete tasks and answer the questions.

Main Components of Metasploit

While using the Metasploit Framework, you will primarily interact with the Metasploit console. You can launch it from the AttackBox terminal using the msfconsole command. The console will be your main interface to interact with the different modules of the Metasploit Framework. Modules are small components within the Metasploit framework that are built to perform a specific task, such as exploiting a vulnerability, scanning a target, or performing a brute-force attack.

Before diving into modules, it would be helpful to clarify a few recurring concepts: vulnerability, exploit, and payload.

* **Exploit:** A piece of code that uses a vulnerability present on the target system.
* **Vulnerability:** A design, coding, or logic flaw affecting the target system. The exploitation of a vulnerability can result in disclosing confidential information or allowing the attacker to execute code on the target system.
* **Payload:** An exploit will take advantage of a vulnerability. However, if we want the exploit to have the result we want (gaining access to the target system, read confidential information, etc.), we need to use a payload. Payloads are the code that will run on the target system.

Modules and categories under each one are listed below. These are given for reference purposes, but you will interact with them through the Metasploit console (msfconsole).

Auxiliary

Any supporting module, such as scanners, crawlers and fuzzers, can be found here.

Terminal

root@ip-10-10-135-188:/opt/metasploit-framework/embedded/framework/modules# tree -L 1 auxiliary/

auxiliary/

├── admin

├── analyze

├── bnat

├── client

├── cloud

├── crawler

├── docx

├── dos

├── example.py

├── example.rb

├── fileformat

├── fuzzers

├── gather

├── parser

├── pdf

├── scanner

├── server

├── sniffer

├── spoof

├── sqli

├── voip

└── vsploit

20 directories, 2 files

Encoders

Encoders will allow you to encode the exploit and payload in the hope that a signature-based antivirus solution may miss them.

Signature-based antivirus and security solutions have a database of known threats. They detect threats by comparing suspicious files to this database and raise an alert if there is a match. Thus encoders can have a limited success rate as antivirus solutions can perform additional checks.

Terminal

root@ip-10-10-135-188:/opt/metasploit-framework/embedded/framework/modules# tree -L 1 encoders/

encoders/

├── cmd

├── generic

├── mipsbe

├── mipsle

├── php

├── ppc

├── ruby

├── sparc

├── x64

└── x86

10 directories, 0 files

Evasion

While encoders will encode the payload, they should not be considered a direct attempt to evade antivirus software. On the other hand, “evasion” modules will try that, with more or less success.

Terminal

root@ip-10-10-135-188:/opt/metasploit-framework/embedded/framework/modules# tree -L 2 evasion/

evasion/

└── windows

├── applocker\_evasion\_install\_util.rb

├── applocker\_evasion\_msbuild.rb

├── applocker\_evasion\_presentationhost.rb

├── applocker\_evasion\_regasm\_regsvcs.rb

├── applocker\_evasion\_workflow\_compiler.rb

├── process\_herpaderping.rb

├── syscall\_inject.rb

├── windows\_defender\_exe.rb

└── windows\_defender\_js\_hta.rb

1 directory, 9 files

Exploits

Exploits, neatly organized by target system.

Terminal

root@ip-10-10-135-188:/opt/metasploit-framework/embedded/framework/modules# tree -L 1 exploits/

exploits/

├── aix

├── android

├── apple\_ios

├── bsd

├── bsdi

├── dialup

├── example\_linux\_priv\_esc.rb

├── example.py

├── example.rb

├── example\_webapp.rb

├── firefox

├── freebsd

├── hpux

├── irix

├── linux

├── mainframe

├── multi

├── netware

├── openbsd

├── osx

├── qnx

├── solaris

├── unix

└── windows

20 directories, 4 files

NOPs

NOPs (No OPeration) do nothing, literally. They are represented in the Intel x86 CPU family they are represented with 0x90, following which the CPU will do nothing for one cycle. They are often used as a buffer to achieve consistent payload sizes.

Terminal

root@ip-10-10-135-188:/opt/metasploit-framework/embedded/framework/modules# tree -L 1 nops/

nops/

├── aarch64

├── armle

├── cmd

├── mipsbe

├── php

├── ppc

├── sparc

├── tty

├── x64

└── x86

10 directories, 0 files

Payloads

Payloads are codes that will run on the target system.

Exploits will leverage a vulnerability on the target system, but to achieve the desired result, we will need a payload. Examples could be; getting a shell, loading a malware or backdoor to the target system, running a command, or launching calc.exe as a proof of concept to add to the penetration test report. Starting the calculator on the target system remotely by launching the calc.exe application is a benign way to show that we can run commands on the target system.

Running command on the target system is already an important step but having an interactive connection that allows you to type commands that will be executed on the target system is better. Such an interactive command line is called a "shell". Metasploit offers the ability to send different payloads that can open shells on the target system.

Terminal

root@ip-10-10-135-188:/opt/metasploit-framework/embedded/framework/modules# tree -L 1 payloads/

payloads/

├── adapters

├── singles

├── stagers

└── stages

4 directories, 0 files

You will see four different directories under payloads: adapters, singles, stagers and stages.

* **Adapters:** An adapter wraps single payloads to convert them into different formats. For example, a normal single payload can be wrapped inside a Powershell adapter, which will make a single powershell command that will execute the payload.
* **Singles:** Self-contained payloads (add user, launch notepad.exe, etc.) that do not need to download an additional component to run.
* **Stagers:** Responsible for setting up a connection channel between Metasploit and the target system. Useful when working with staged payloads. “Staged payloads” will first upload a stager on the target system then download the rest of the payload (stage). This provides some advantages as the initial size of the payload will be relatively small compared to the full payload sent at once.
* **Stages:**Downloaded by the stager. This will allow you to use larger sized payloads.

Metasploit has a subtle way to help you identify single (also called “inline”) payloads and staged payloads.

* generic/shell\_reverse\_tcp
* windows/x64/shell/reverse\_tcp

Both are reverse Windows shells. The former is an inline (or single) payload, as indicated by the “\_” between “shell” and “reverse”. While the latter is a staged payload, as indicated by the “/” between “shell” and “reverse”.

Post

Post modules will be useful on the final stage of the penetration testing process listed above, post-exploitation.

Terminal

root@ip-10-10-135-188:/opt/metasploit-framework/embedded/framework/modules# tree -L 1 post/

post/

├── aix

├── android

├── apple\_ios

├── bsd

├── firefox

├── hardware

├── linux

├── multi

├── networking

├── osx

├── solaris

└── windows

12 directories, 0 files

If you wish to familiarize yourself further with these modules, you can find them under the modules folder of your Metasploit installation. For the AttackBox these are under /opt/metasploit-framework/embedded/framework/modules

***Answer the questions below***

What is the name of the code taking advantage of a flaw on the target system?



Correct Answer

What is the name of the code that runs on the target system to achieve the attacker's goal?



Correct Answer

What are self-contained payloads called?



Correct Answer

Is "windows/x64/pingback\_reverse\_tcp" among singles or staged payload?



Correct Answer

**Msfconsole**

﻿As previously mentioned, the console will be your main interface to the Metasploit Framework. You can launch it using the msfconsole command on your AttackBox terminal or any system the Metasploit Framework is installed on.

msfconsole

root@ip-10-10-220-191:~**#** msfconsole

\_---------.

.' **#**###### ;."

.---,. ;@ @@`; .---,..

." @@@@@'.,'@@ @@@@@',.'@@@@ ".

'-.@@@@@@@@@@@@@ @@@@@@@@@@@@@ @;

`.@@@@@@@@@@@@ @@@@@@@@@@@@@@ .'

"--'.@@@ -.@ @ ,'- .'--"

".@' ; @ @ `. ;'

|@@@@ @@@ @ .

' @@@ @@ @@ ,

`.@@@@ @@ .

',@@ @ ; \_\_\_\_\_\_\_\_\_\_\_\_\_

( 3 C ) /|\_\_\_ / Metasploit! \

;@'. \_\_\*\_\_,." \|--- \\_\_\_\_\_\_\_\_\_\_\_\_\_/

'(.,...."/

=[ metasploit v6.0 ]

+ -- --=[ 2048 exploits - 1105 auxiliary - 344 post ]

+ -- --=[ 562 payloads - 45 encoders - 10 nops ]

+ -- --=[ 7 evasion ]

Metasploit tip: Search can apply complex filters such as search cve:2009 type:exploit, see all the filters with help search

msf6 >

Once launched, you will see the command line changes to msf6 (or msf5 depending on the installed version of Metasploit). The Metasploit console (msfconsole) can be used just like a regular command-line shell, as you can see below. The first command is ls which lists the contents of the folder from which Metasploit was launched using the msfconsole command.

It is followed by a ping sent to Google's DNS IP address (8.8.8.8). As we operate from the AttackBox, which is Linux we had to add the -c 1 option, so only a single ping was sent. Otherwise, the ping process would continue until it is stopped using CTRL+C.

Linux Commands in Metasploit

msf6 > ls

[\*] exec: ls

burpsuite\_community\_linux\_v2021\_8\_1.sh Instructions Scripts

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msf6 > ping -c 1 8.8.8.8

[\*] exec: ping -c 1 8.8.8.8

PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.

64 bytes from 8.8.8.8: icmp\_seq=1 ttl=109 time=1.33 ms

--- 8.8.8.8 ping statistics ---

1 packets transmitted, 1 received, 0**%** packet loss, time 0ms

rtt min/avg/max/mdev = 1.335/1.335/1.335/0.000 ms

msf6 >

It will support most Linux commands, including clear (to clear the terminal screen), but will not allow you to use some features of a regular command line (e.g. does not support output redirection), as seen below.

Failed Output Redirection

msf6 > help > help.txt

[-] No such command

msf6 >

While on the subject, the help command can be used on its own or for a specific command. Below is the help menu for the set command we will cover soon.

Help feature

msf6 > help set

Usage: set [option] [value]

Set the given option to value. If value is omitted, print the current value.

If both are omitted, print options that are currently set.

If run from a module context, this will set the value in the module's

datastore. Use -g to operate on the global datastore.

If setting a PAYLOAD, this command can take an index from `show payloads'.

msf6 >

You can use the history command to see commands you have typed earlier.

History command

msf6 > history

1 use exploit/multi/http/nostromo\_code\_exec

2 set lhost 10.10.16.17

3 set rport 80

4 options

5 set rhosts 10.10.29.187

6 run

7 exit

8 exit -y

9 version

10 use exploit/multi/script/web\_delivery

An important feature of msfconsole is the support of tab completion. This will come in handy later when using Metasploit commands or dealing with modules. For example, if you start typing he and press the tab key, you will see it auto-completes to help.

Msfconsole is managed by context; this means that unless set as a global variable, all parameter settings will be lost if you change the module you have decided to use. In the example below, we have used the ms17\_010\_eternalblue exploit, and we have set parameters such as RHOSTS. If we were to switch to another module (e.g. a port scanner), we would need to set the RHOSTS value again as all changes we have made remained in the context of the ms17\_010\_eternalblue exploit.

Let us look at the example below to have a better understanding of this feature. We will use the MS17-010 “Eternalblue” exploit for illustration purposes.

Once you type the use exploit/windows/smb/ms17\_010\_eternalblue command, you will see the command line prompt change from msf6 to “msf6 exploit(windows/smb/ms17\_010\_eternalblue)”. The "EternalBlue" is an exploit allegedly developed by the U.S. National Security Agency (N.S.A.) for a vulnerability affecting the SMBv1 server on numerous Windows systems. The SMB (Server Message Block) is widely used in Windows networks for file sharing and even for sending files to printers. EternalBlue was leaked by the cybercriminal group "Shadow Brokers" in April 2017. In May 2017, this vulnerability was exploited worldwide in the WannaCry ransomware attack.

Using an exploit

msf6 > use exploit/windows/smb/ms17\_010\_eternalblue

[\*] No payload configured, defaulting to windows/x64/meterpreter/reverse\_tcp

msf6 exploit(windows/smb/ms17\_010\_eternalblue) >

The module to be used can also be selected with the use command followed by the number at the beginning of the search result line.

While the prompt has changed, you will notice we can still run the commands previously mentioned. This means we did not "enter" a folder as you would typically expect in an operating system command line.

Linux commands within a context

msf6 exploit(windows/smb/ms17\_010\_eternalblue) > ls

[\*] exec: ls

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Desktop Pictures thinclient\_drives

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msf6 exploit(windows/smb/ms17\_010\_eternalblue) >

The prompt tells us we now have a context set in which we will work. You can see this by typing the show options command.

Show options

msf6 exploit(windows/smb/ms17\_010\_eternalblue) > show options

Module options (exploit/windows/smb/ms17\_010\_eternalblue):

Name Current Setting Required Description

---- --------------- -------- -----------

RHOSTS yes The target host(s), range CIDR identifier, or hosts file with syntax 'file:'

RPORT 445 yes The target port (TCP)

SMBDomain . no (Optional) The Windows domain to use for authentication

SMBPass no (Optional) The password for the specified username

SMBUser no (Optional) The username to authenticate as

VERIFY\_ARCH true yes Check if remote architecture matches exploit Target.

VERIFY\_TARGET true yes Check if remote OS matches exploit Target.

Payload options (windows/x64/meterpreter/reverse\_tcp):

Name Current Setting Required Description

---- --------------- -------- -----------

EXITFUNC thread yes Exit technique (Accepted: '', seh, thread, process, none)

LHOST 10.10.220.191 yes The listen address (an interface may be specified)

LPORT 4444 yes The listen port

Exploit target:

Id Name

-- ----

0 Windows 7 and Server 2008 R2 (x64) All Service Packs

msf6 exploit(windows/smb/ms17\_010\_eternalblue) >

This will print options related to the exploit we have chosen earlier. The show options command will have different outputs depending on the context it is used in. The example above shows that this exploit will require we set variables like RHOSTS and RPORT. On the other hand, a post-exploitation module may only need us to set a SESSION ID (see the screenshot below). A session is an existing connection to the target system that the post-exploitation module will use.

Options for a post-exploitation module

msf6 post(windows/gather/enum\_domain\_users) > show options

Module options (post/windows/gather/enum\_domain\_users):

Name Current Setting Required Description

---- --------------- -------- -----------

HOST no Target a specific host

SESSION yes The session to run this module on.

USER no Target User for NetSessionEnum

msf6 post(windows/gather/enum\_domain\_users) >

The show command can be used in any context followed by a module type (auxiliary, payload, exploit, etc.) to list available modules. The example below lists payloads that can be used with the ms17-010 Eternalblue exploit.

The show payloads command

msf6 exploit(windows/smb/ms17\_010\_eternalblue) > show payloads

Compatible Payloads

===================

**#** Name Disclosure Date Rank Check Description

- ---- --------------- ---- ----- -----------

0 generic/custom manual No Custom Payload

1 generic/shell\_bind\_tcp manual No Generic Command Shell, Bind TCP Inline

2 generic/shell\_reverse\_tcp manual No Generic Command Shell, Reverse TCP Inline

3 windows/x64/exec manual No Windows x64 Execute Command

4 windows/x64/loadlibrary manual No Windows x64 LoadLibrary Path

5 windows/x64/messagebox manual No Windows MessageBox x64

6 windows/x64/meterpreter/bind\_ipv6\_tcp manual No Windows Meterpreter (Reflective Injection x64), Windows x64 IPv6 Bind TCP Stager

7 windows/x64/meterpreter/bind\_ipv6\_tcp\_uuid manual No Windows Meterpreter (Reflective Injection x64), Windows x64 IPv6 Bind TCP Stager with UUID Support

If used from the msfconsole prompt, the show command will list all modules.

The use and show options commands we have seen so far are identical for all modules in Metasploit.

You can leave the context using the back command.

The back command

msf6 exploit(windows/smb/ms17\_010\_eternalblue) > back

msf6 >

Further information on any module can be obtained by typing the info command within its context.

The info command

msf6 exploit(windows/smb/ms17\_010\_eternalblue) > info

Name: MS17-010 EternalBlue SMB Remote Windows Kernel Pool Corruption

Module: exploit/windows/smb/ms17\_010\_eternalblue

Platform: Windows

Arch:

Privileged: Yes

License: Metasploit Framework License (BSD)

Rank: Average

Disclosed: 2017-03-14

Provided by:

Sean Dillon

Dylan Davis

Equation Group

Shadow Brokers

thelightcosine

Available targets:

Id Name

-- ----

0 Windows 7 and Server 2008 R2 (x64) All Service Packs

Check supported:

Yes

Basic options:

Name Current Setting Required Description

---- --------------- -------- -----------

RHOSTS yes The target host(s), range CIDR identifier, or hosts file with syntax 'file:'

RPORT 445 yes The target port (TCP)

SMBDomain . no (Optional) The Windows domain to use for authentication

SMBPass no (Optional) The password for the specified username

SMBUser no (Optional) The username to authenticate as

VERIFY\_ARCH true yes Check if remote architecture matches exploit Target.

VERIFY\_TARGET true yes Check if remote OS matches exploit Target.

Payload information:

Space: 2000

Description:

This module is a port of the Equation Group ETERNALBLUE exploit,

part of the FuzzBunch toolkit released by Shadow Brokers. There is a

buffer overflow memmove operation in Srv!SrvOs2FeaToNt. The size is

calculated in Srv!SrvOs2FeaListSizeToNt, with mathematical error

where a DWORD is subtracted into a WORD. The kernel pool is groomed

so that overflow is well laid-out to overwrite an SMBv1 buffer.

Actual RIP hijack is later completed in

srvnet!SrvNetWskReceiveComplete. This exploit, like the original may

not trigger 100**%** of the time, and should be run continuously until

triggered. It seems like the pool will get hot streaks and need a

cool down period before the shells rain in again. The module will

attempt to use Anonymous login, by default, to authenticate to

perform the exploit. If the user supplies credentials in the

SMBUser, SMBPass, and SMBDomain options it will use those instead.

On some systems, this module may cause system instability and

crashes, such as a BSOD or a reboot. This may be more likely with

some payloads.

References:

https://docs.microsoft.com/en-us/security-updates/SecurityBulletins/2017/MS17-010

https://cvedetails.com/cve/CVE-2017-0143/

https://cvedetails.com/cve/CVE-2017-0144/

https://cvedetails.com/cve/CVE-2017-0145/

https://cvedetails.com/cve/CVE-2017-0146/

https://cvedetails.com/cve/CVE-2017-0147/

https://cvedetails.com/cve/CVE-2017-0148/

https://github.com/RiskSense-Ops/MS17-010

Also known as:

ETERNALBLUE

msf6 exploit(windows/smb/ms17\_010\_eternalblue) >

Alternatively, you can use the info command followed by the module’s path from the msfconsole prompt (e.g. info exploit/windows/smb/ms17\_010\_eternalblue). Info is not a help menu; it will display detailed information on the module such as its author, relevant sources, etc.

**Search**

One of the most useful commands in msfconsole is search. This command will search the Metasploit Framework database for modules relevant to the given search parameter. You can conduct searches using CVE numbers, exploit names (eternalblue, heartbleed, etc.), or target system.

The search command

msf6 > search ms17-010

Matching Modules

================

**#** Name Disclosure Date Rank Check Description

- ---- --------------- ---- ----- -----------

0 auxiliary/admin/smb/ms17\_010\_command 2017-03-14 normal No MS17-010 EternalRomance/EternalSynergy/EternalChampion SMB Remote Windows Command Execution

1 auxiliary/scanner/smb/smb\_ms17\_010 normal No MS17-010 SMB RCE Detection

2 exploit/windows/smb/ms17\_010\_eternalblue 2017-03-14 average Yes MS17-010 EternalBlue SMB Remote Windows Kernel Pool Corruption

3 exploit/windows/smb/ms17\_010\_psexec 2017-03-14 normal Yes MS17-010 EternalRomance/EternalSynergy/EternalChampion SMB Remote Windows Code Execution

4 exploit/windows/smb/smb\_doublepulsar\_rce 2017-04-14 great Yes SMB DOUBLEPULSAR Remote Code Execution

Interact with a module by name or index, for example use 4 or use exploit/windows/smb/smb\_doublepulsar\_rce

msf6 >

The output of the search command provides an overview of each returned module. You may notice the “name” column already gives more information than just the module name. You can see the type of module (auxiliary, exploit, etc.) and the category of the module (scanner, admin, windows, Unix, etc.). You can use any module returned in a search result with the command use followed by the number at the beginning of the result line. (e.g. use 0 instead of use auxiliary/admin/smb/ms17\_010\_command)

Another essential piece of information returned is in the “rank” column. Exploits are rated based on their reliability. The table below provides their respective descriptions.

A screenshot of a computer

Description automatically generated with low confidence

Source: <https://github.com/rapid7/metasploit-framework/wiki/Exploit-Ranking>

You can direct the search function using keywords such as type and platform.

For example, if we wanted our search results to only include auxiliary modules, we could set the type to auxiliary. The screenshot below shows the output of the search type:auxiliary telnet command.

Search by module type

msf6 > search type:auxiliary telnet

Matching Modules

================

**#** Name Disclosure Date Rank Check Description

- ---- --------------- ---- ----- -----------

0 auxiliary/admin/http/dlink\_dir\_300\_600\_exec\_noauth 2013-02-04 normal No D-Link DIR-600 / DIR-300 Unauthenticated Remote Command Execution

1 auxiliary/admin/http/netgear\_r6700\_pass\_reset 2020-06-15 normal Yes Netgear R6700v3 Unauthenticated LAN Admin Password Reset

2 auxiliary/dos/cisco/ios\_telnet\_rocem 2017-03-17 normal No Cisco IOS Telnet Denial of Service

3 auxiliary/dos/windows/ftp/iis75\_ftpd\_iac\_bof 2010-12-21 normal No Microsoft IIS FTP Server Encoded Response Overflow Trigger

4 auxiliary/scanner/ssh/juniper\_backdoor 2015-12-20 normal No Juniper SSH Backdoor Scanner

5 auxiliary/scanner/telnet/brocade\_enable\_login normal No Brocade Enable Login Check Scanner

6 auxiliary/scanner/telnet/lantronix\_telnet\_password normal No Lantronix Telnet Password Recovery

7 auxiliary/scanner/telnet/lantronix\_telnet\_version normal No Lantronix Telnet Service Banner Detection

8 auxiliary/scanner/telnet/satel\_cmd\_exec 2017-04-07 normal No Satel Iberia SenNet Data Logger and Electricity Meters Command Injection Vulnerability

9 auxiliary/scanner/telnet/telnet\_encrypt\_overflow normal No Telnet Service Encryption Key ID Overflow Detection

10 auxiliary/scanner/telnet/telnet\_login normal No Telnet Login Check Scanner

11 auxiliary/scanner/telnet/telnet\_ruggedcom normal No RuggedCom Telnet Password Generator

12 auxiliary/scanner/telnet/telnet\_version normal No Telnet Service Banner Detection

13 auxiliary/server/capture/telnet normal No Authentication Capture: Telnet

Interact with a module by name or index, for example use 13 or use auxiliary/server/capture/telnet

msf6 >

Please remember that exploits take advantage of a vulnerability on the target system and may always show unexpected behavior. A low-ranking exploit may work perfectly, and an excellent ranked exploit may not, or worse, crash the target system.

***Answer the questions below***

How would you search for a module related to Apache?



Correct Answer

Who provided the auxiliary/scanner/ssh/ssh\_login module?



Correct Answer

 Hint