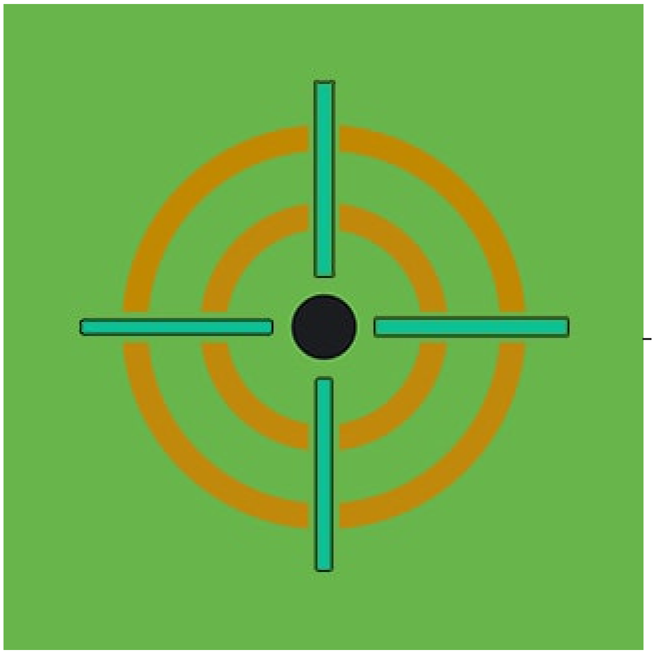
REvil Ransomware Threat Research Update and Detections

splunk.com/en_us/blog/security/revil-ransomware-threat-research-update-and-detections.html

July 6, 2021

SECURITY



By Splunk Threat Research Team July 06, 2021

On July 2, 2021, rumors of a "supply-chain ransomware" attack began circulating on Reddit and was later confirmed by Kaseya VSA, a remote monitoring management software. Kaseya shared in an open statement that this cyber attack was carried out by a ransomware criminal group called REvil, where they used Kaseya to distribute ransomware to its on-premises customers. On July 5, 2021, our team at Splunk pushed out a rapid response blog to help organizations detect REvil Ransomware Kaseya in Splunk. **While Splunk was not impacted by the ransomware attack**, as a security leader we want to help the industry by providing tools, guidance and support.

Today, we're here to provide more insights and research around this ransomware organization, in hopes to help businesses around the world understand the group and their tactics.

Introduction to REvil

The REvil payload (Ransomware Evil or also known as Sodinokibi) is ransomware as a service criminal enterprise. REvil is said to be related to the criminal group known as GandCrab. In a Ransomware as a service scheme, malicious actors partner with affiliates to extend their botnets and reap profits from new additions and attacks brought to them by affiliates. The profit is shared with affiliates which encourages them to infect more victims.

The REvil payload is associated with some of the following attack vectors:

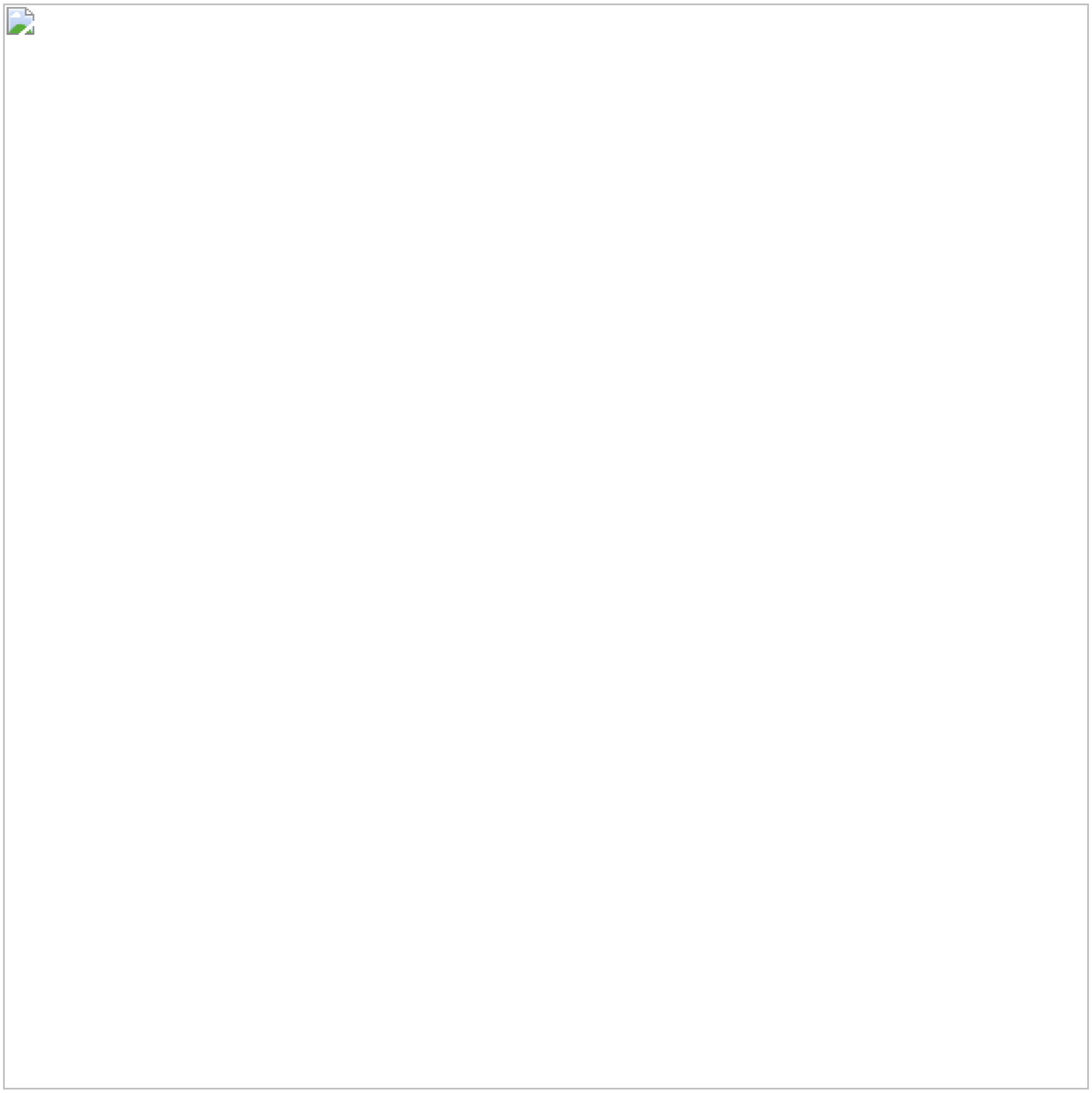
- Elliptic curve cryptography(ECC) for file encryption (files, shares)
- Windows Remote Desktop (RDP) brute force entry
- Double extortion threat
- Target VPN devices
- Phishing emails
- Affiliates may choose different attack vectors including specific software exploitation

Understanding How REvil Ransomware is Executed in a Simulation

The following images show REvil ransomware execution replicated via Splunk Attack Range. First, we can see the ransom note indicating the site located on the dark web where the victim needs to go for further information.

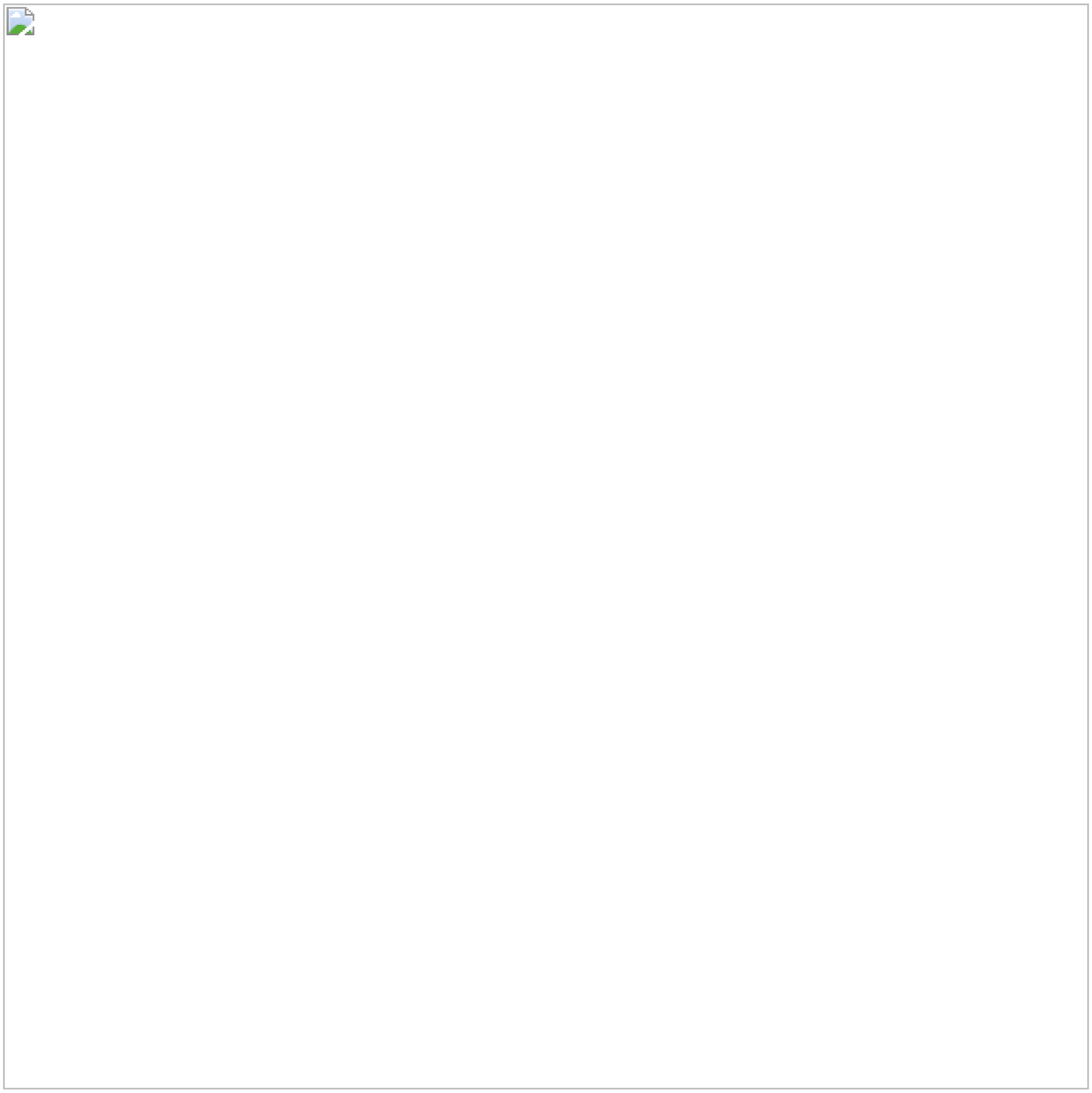
REvil ransomware execution replicated via Splunk Attack Range

The ransomware payload does not disable the systems completely, even though the documents are indeed encrypted, the system is left with enough capacity to download the TOR browser program and install it. Once a victim browses to the named site via TOR browser, they find a form where the key found in the ransom note is meant to be entered. Notice there is a captcha in this form.

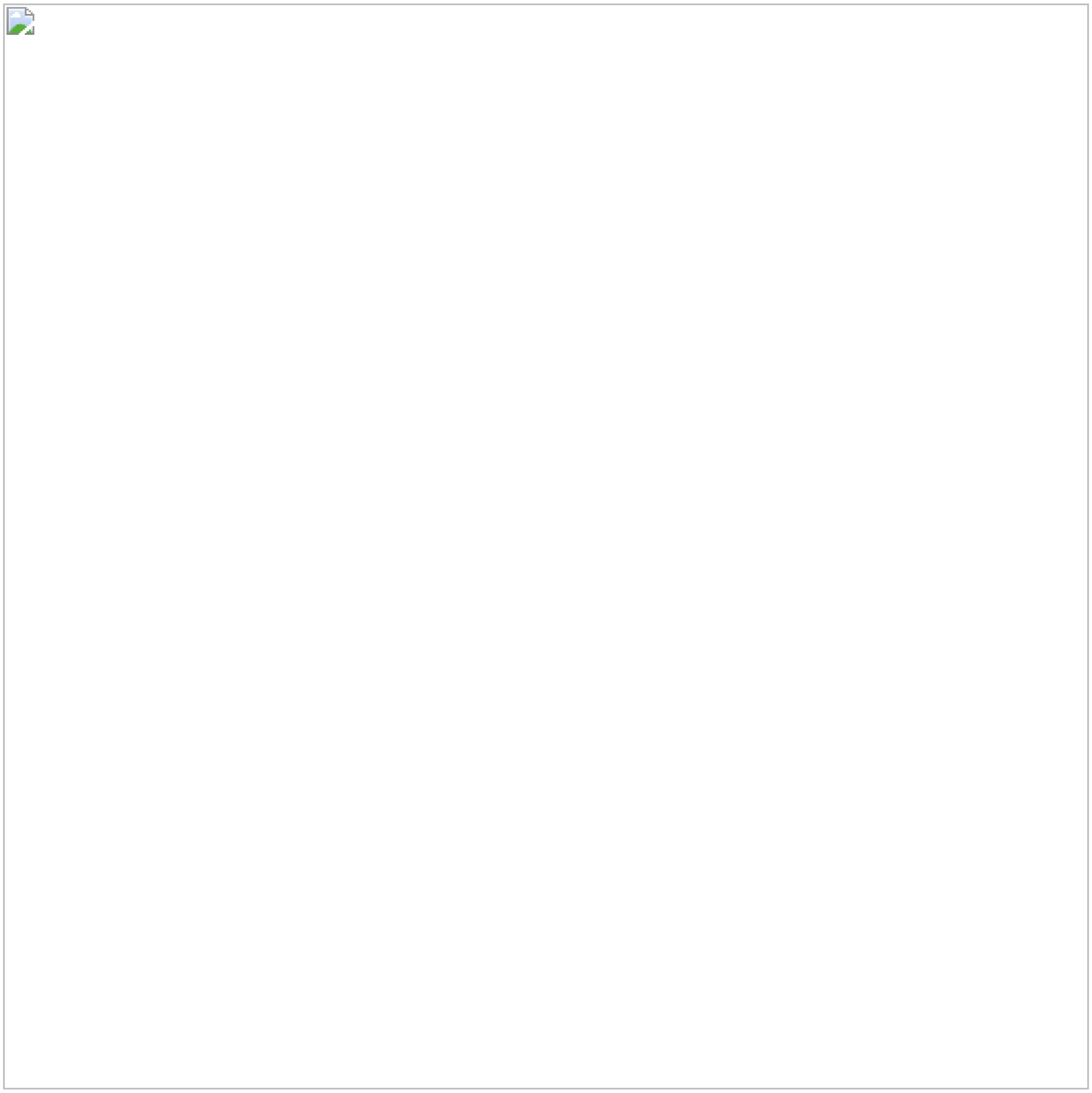


After entering the key the victim is presented with a page with instructions on the steps to follow to be able to decrypt the files.

In the following capture, the Monero (XMR) address where victims are supposed to send payment can be seen.

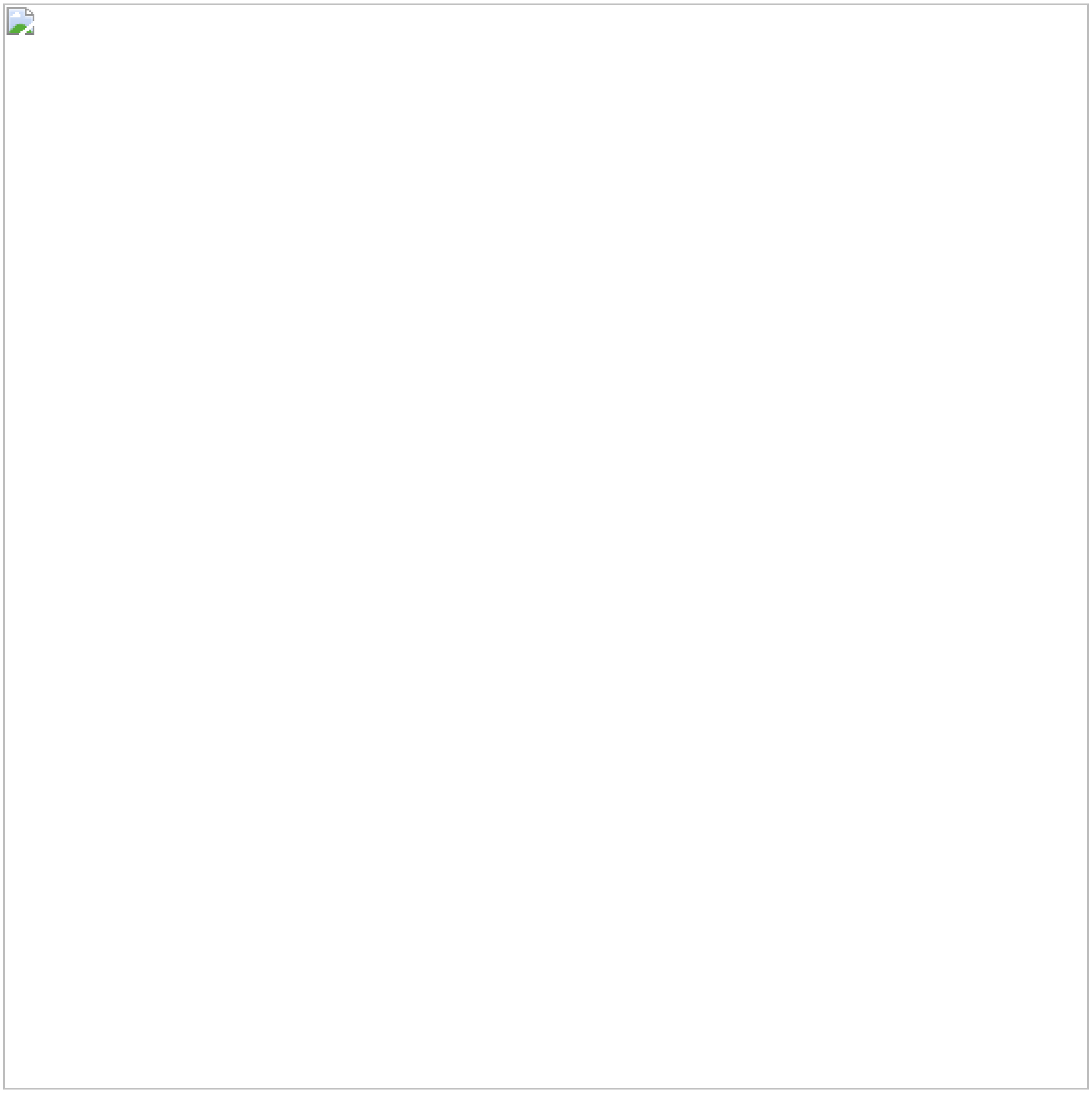


The next capture shows the Dark Web page where the REvil ransomware gang advertises the information they claim they obtained from victims that did not pay the ransom.



REvil Command-line Arguments

REvil Ransomware also has several command line parameters to dictate its behavior or features it wants to execute.



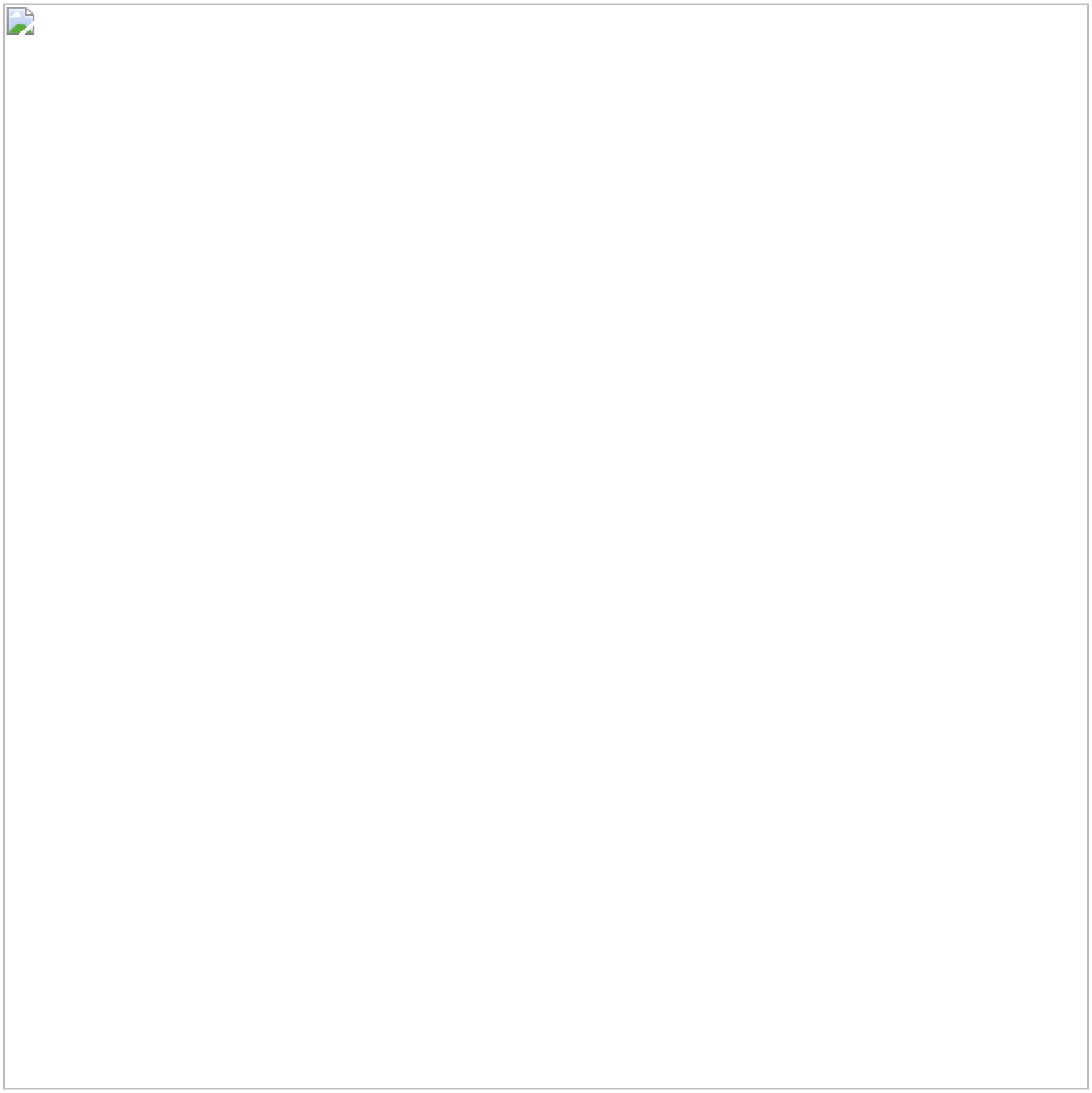
Command-line Parameter	Description
-nolan	Do not encrypt network share
-nolocal	Do not encrypt the local drive
-path	Encrypt specific folder path
-fast	Fast encryption

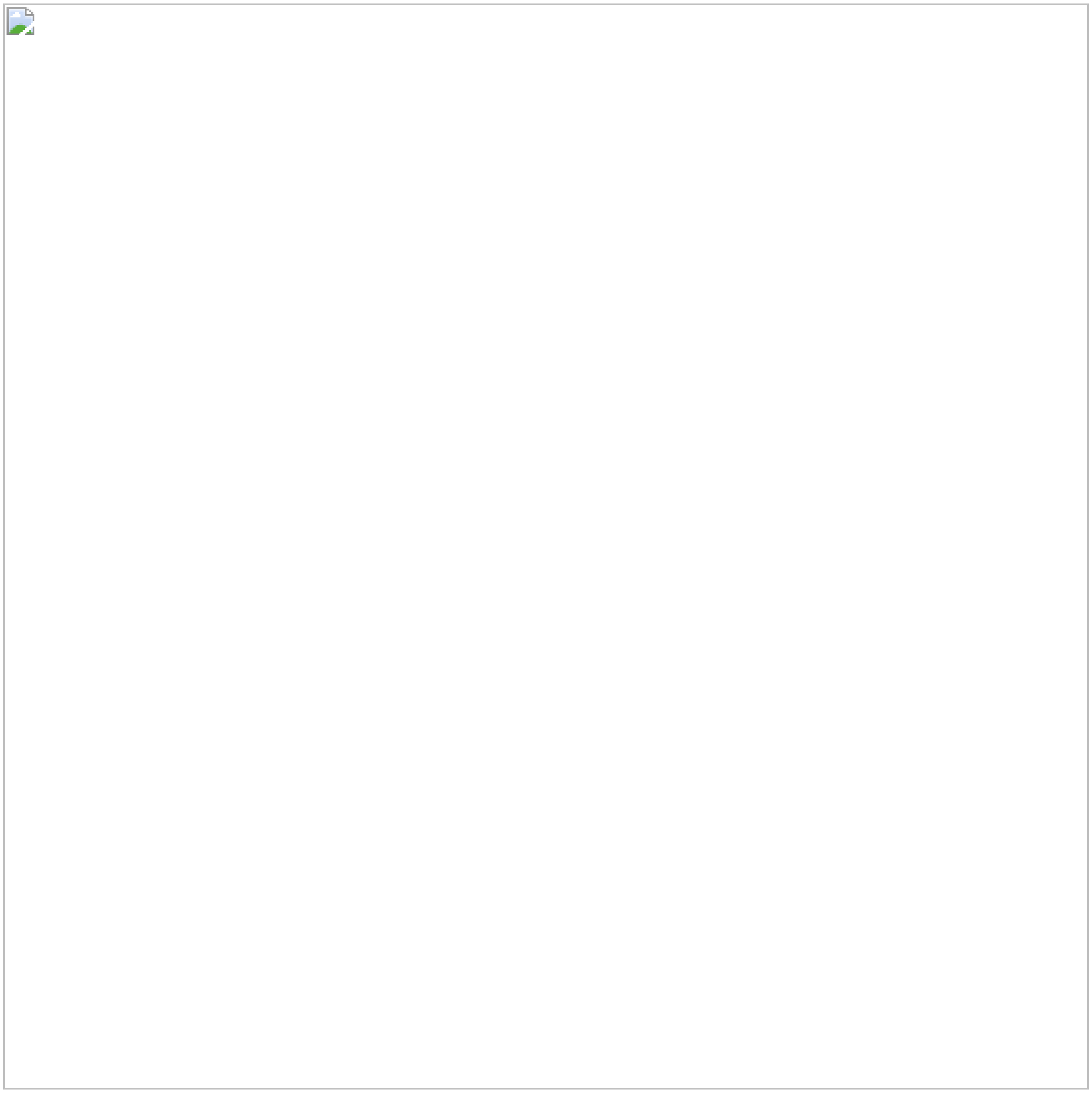
-full	Encrypt both network and local drive

REvil Configuration JSON File

REvil uses RC4 encryption/decryption algorithm to decrypt its notable strings and its configuration file. REvil does this by parsing the 0x20 bytes RC4 key placed in one of its sections and verifying the checksum hash of the encrypted config file in its code body. This configuration file (JSON format) contains information and conditions on how it will encrypt the files in the compromised machine.

Below is the screenshot and description of the notable field in that configuration file.





REvil Config Field Name	Description
pk	Public key (in Base64)
pid	REvil versioning ID
sub	REvil tag number
dbg	Is it dbg mode

wipe	Wipe folder flag
fld	folder list it wants to skip during the encryption process
fls	File list it wants to skip during the encryption process
ext	File extension it wants to skip during the encryption process
wfld	The folder it wants to wipe
prc	Process name list it wants to terminate
dmn	REvil C2 domain list
svc	Service name list it wants to stop
nbody	Ransomware notes in base64 format
nname	Ransomware notes file extension
img	Ransomware notes that will be in bitmap form
arn	Persistence flag
net	C2 communication flag

Kill Switch for REvil Ransomware

This ransomware also has a kill switch. It tries to avoid compromising a machine with a specific keyboard layout and languages like (Russian, Ukrainian, Belarusian, and many more) as shown in the screenshot below.

Privilege Escalation

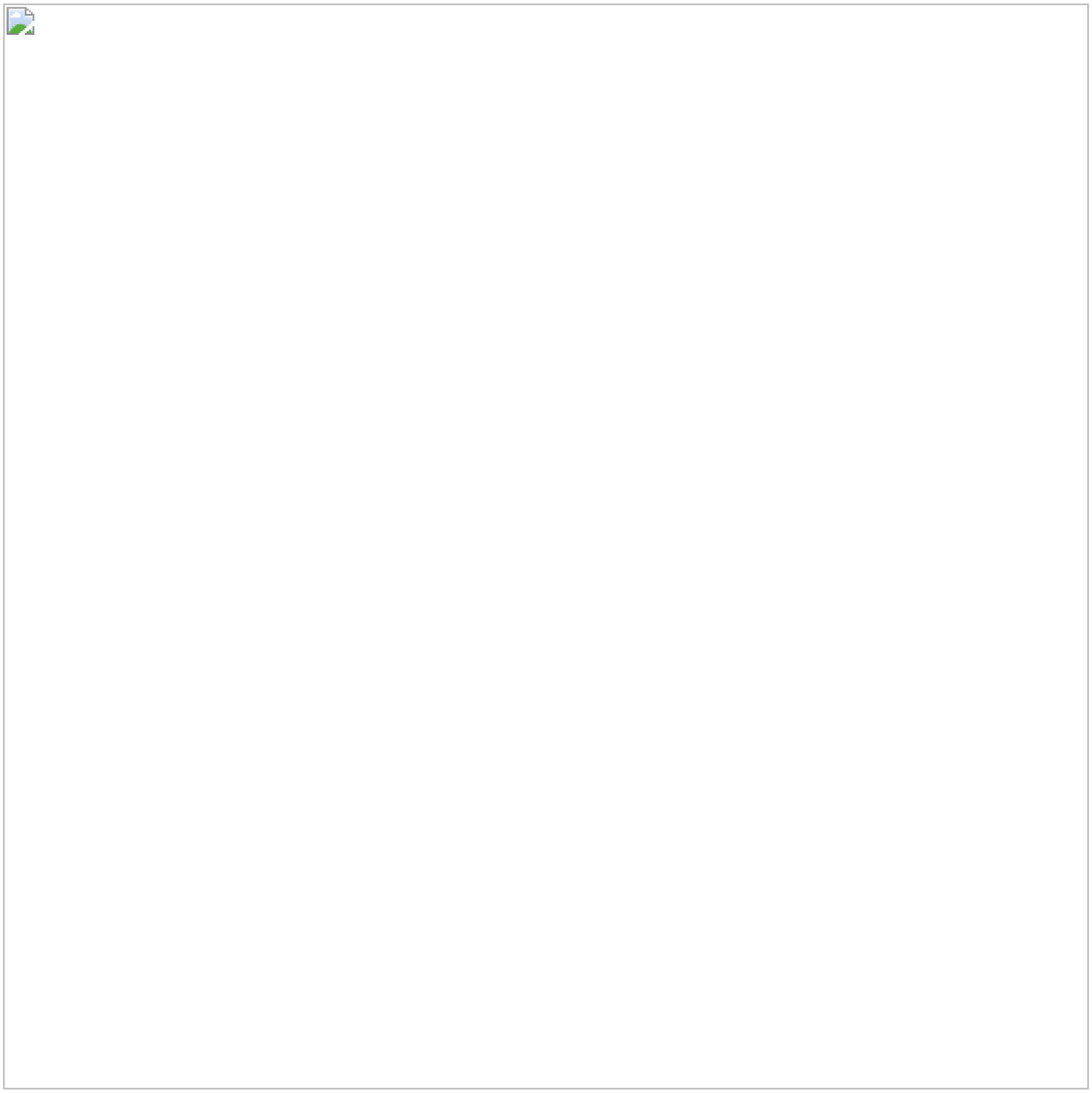
REvil Ransomware will try to run itself using “runas” command to have a privilege escalation of execution.

Persistence

If the “arn” field in its configuration file is enabled, it will create an autorun registry on the compromised machine as a persistence mechanism.

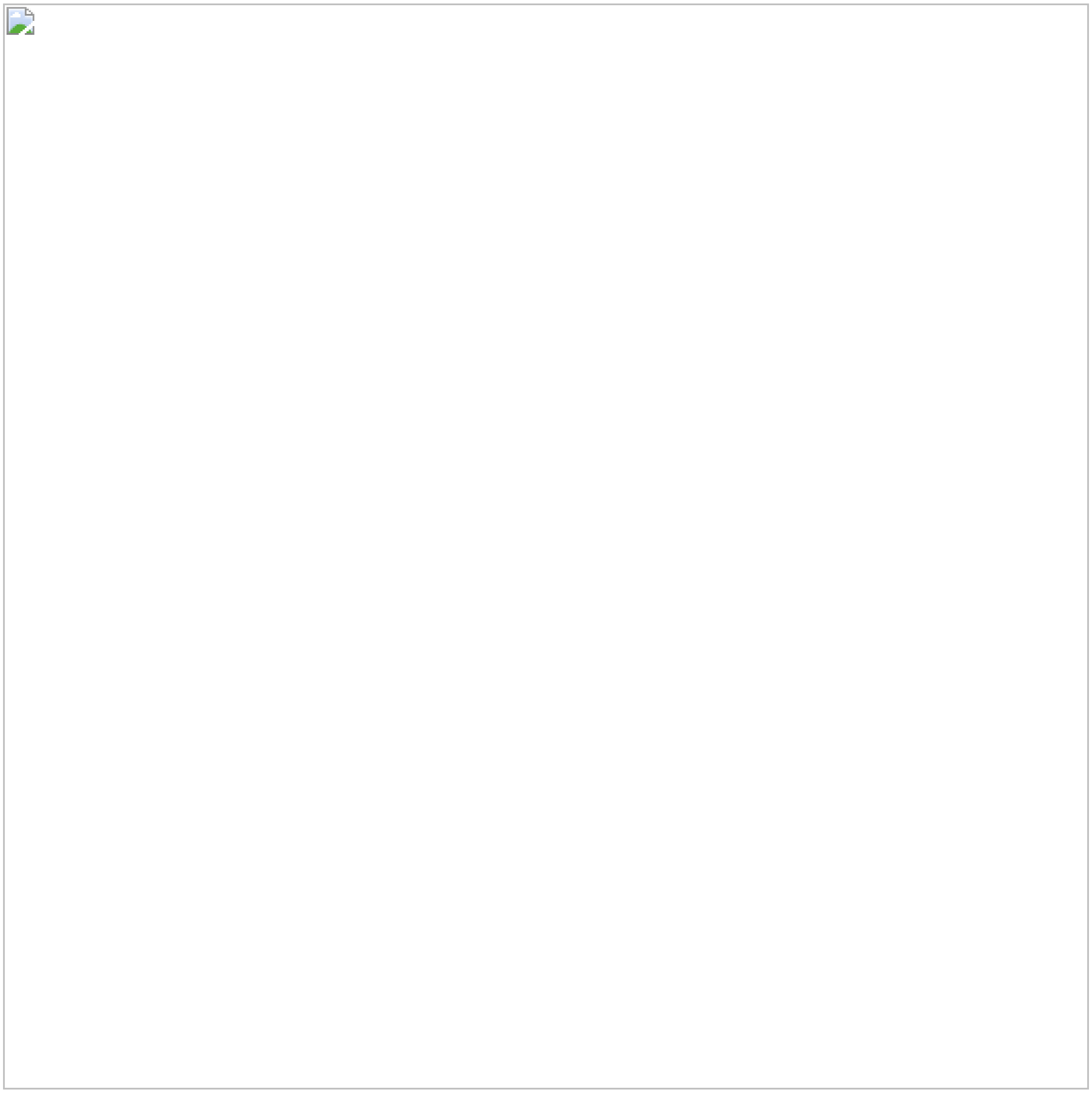
Defacement

Aside from the ransomware notes, it will generate in several folders in the compromised machine, it will also create a bitmap containing a note that the machine is also infected.



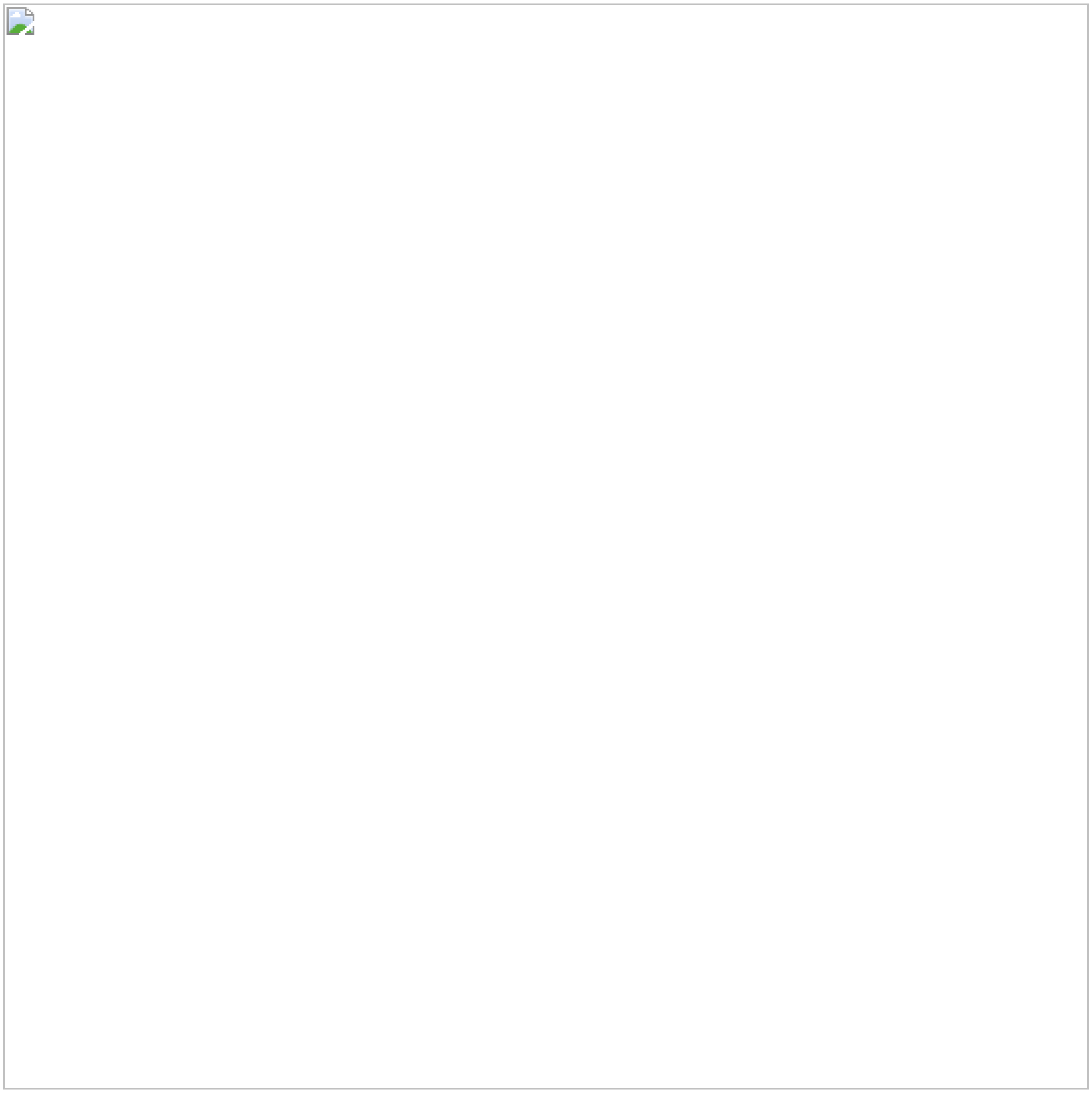
COM Object

The Splunk Threat Research team also found some function in REvil ransomware where it uses com object IWbemClassObject “4590f811-1d3a-11d0-891f-00aa004b2e24” and “49BD2028-1523-11D1-AD79-00C04FD8FDFF” to execute root/cimv2 namespace or privilege escalation.



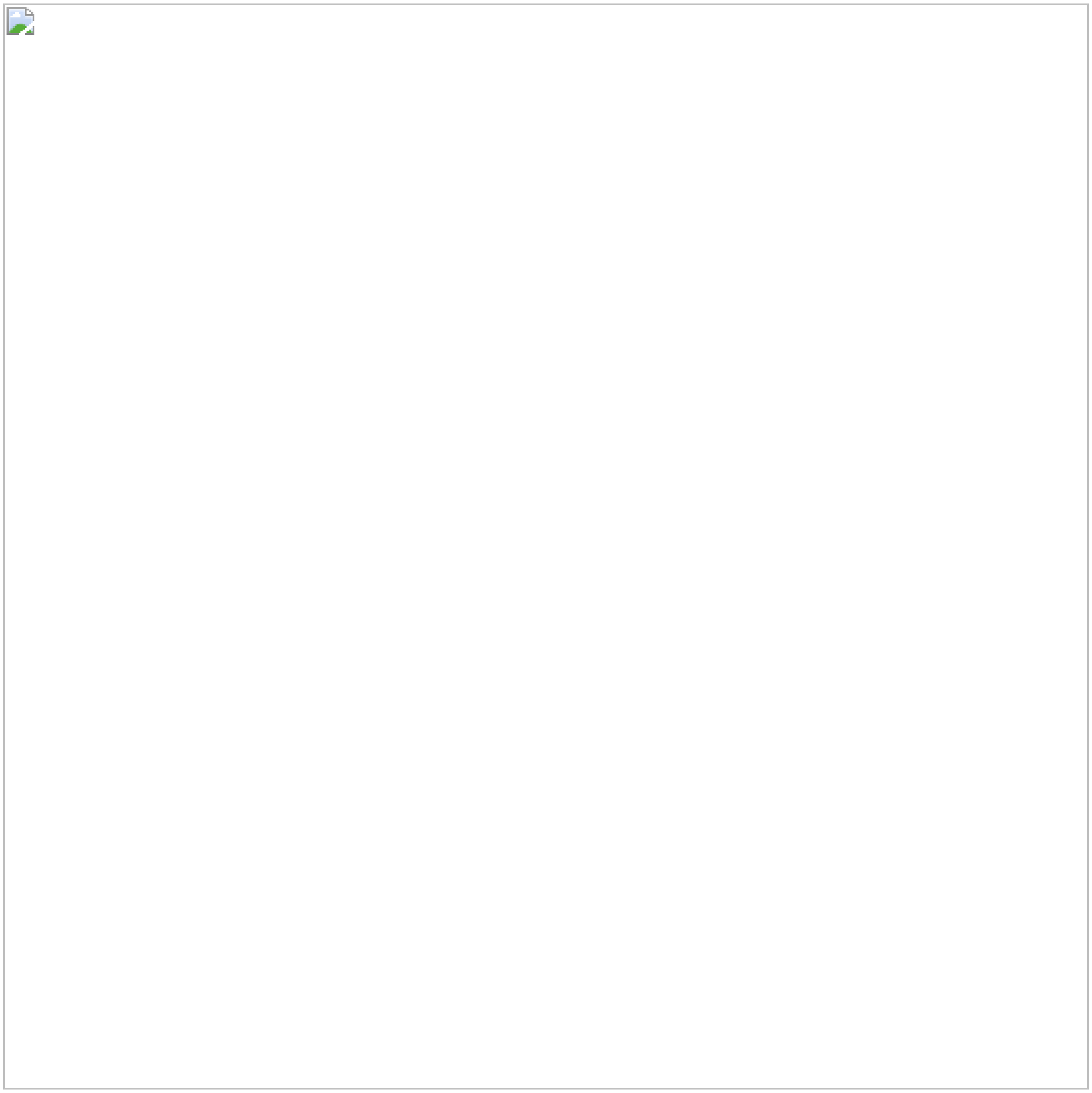
Other Registry Entry

REvil is known to have a randomly generated file extension (5-10 characters) that will be used for its ransomware notes filename and for the files it encrypts. This randomly generated string will also save in a unique registry key. In this case, the randomly generated file extension is “.teu459110”



Machine Info

REvil ransomware will also gather some information about the compromised machine like the computer name, user name, language used by the machine, product name, operating system, network group, OS version, and file extension it generates for the encrypted files. Below is the example of the information in json format.



Defense Evasion

It will also execute a base 64 encoded PowerShell script command that will delete the shadow copy of the compromised machine.

Base 64 encoded:

```
powershell -e
RwBlAHQALQBXAG0AaQBPAGIAagBlAGMAdAAgAFcAaQBuADMAMgBfAFMAaABhAGQAbwB3AGMAbwBwAHkAIAB8A
```

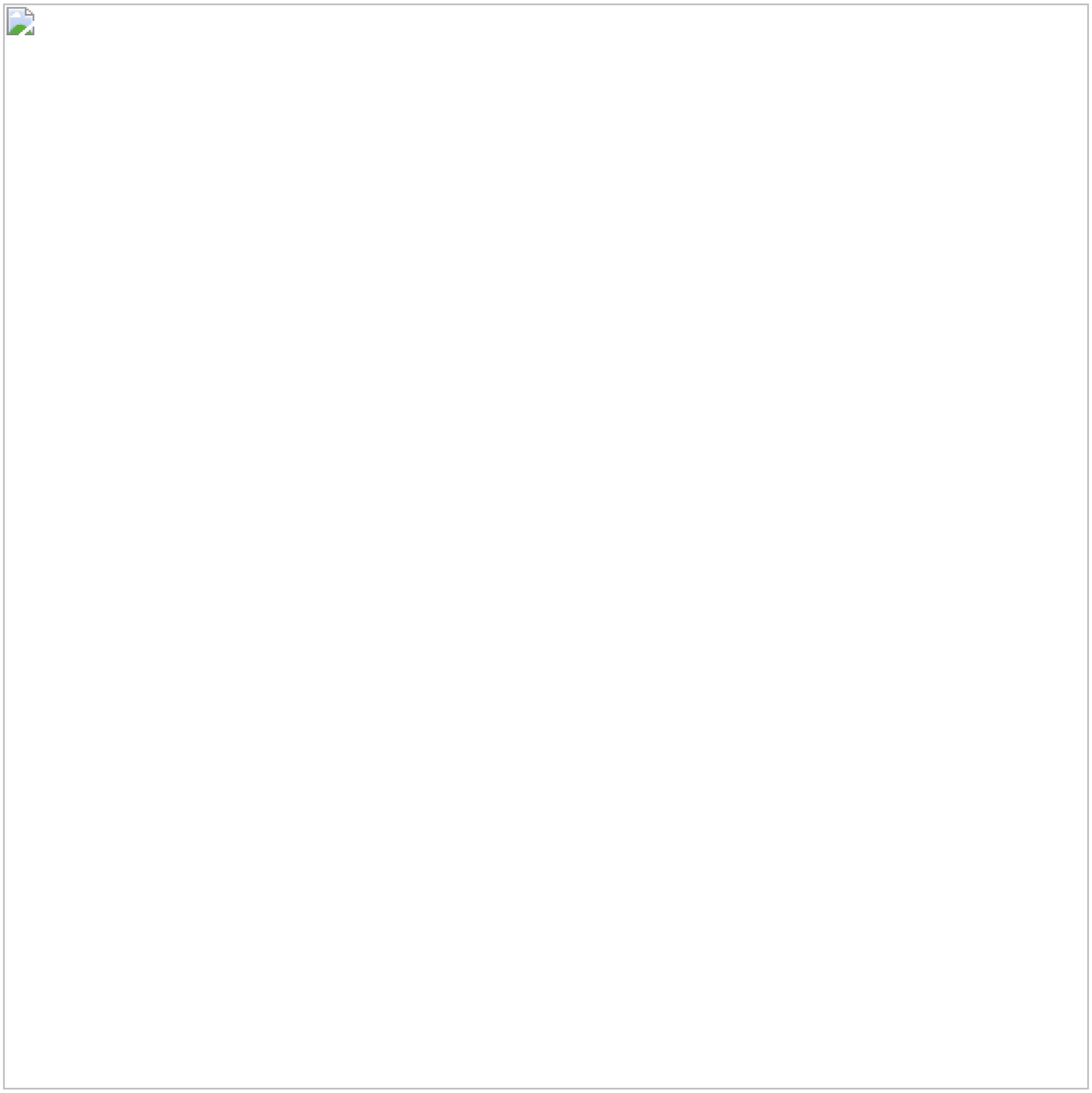
Base 64 decoded:

```
Get-WmiObject Win32_Shadowcopy | ForEach-Object {$_.Delete();}
```

Detect REvil Ransomware with Splunk

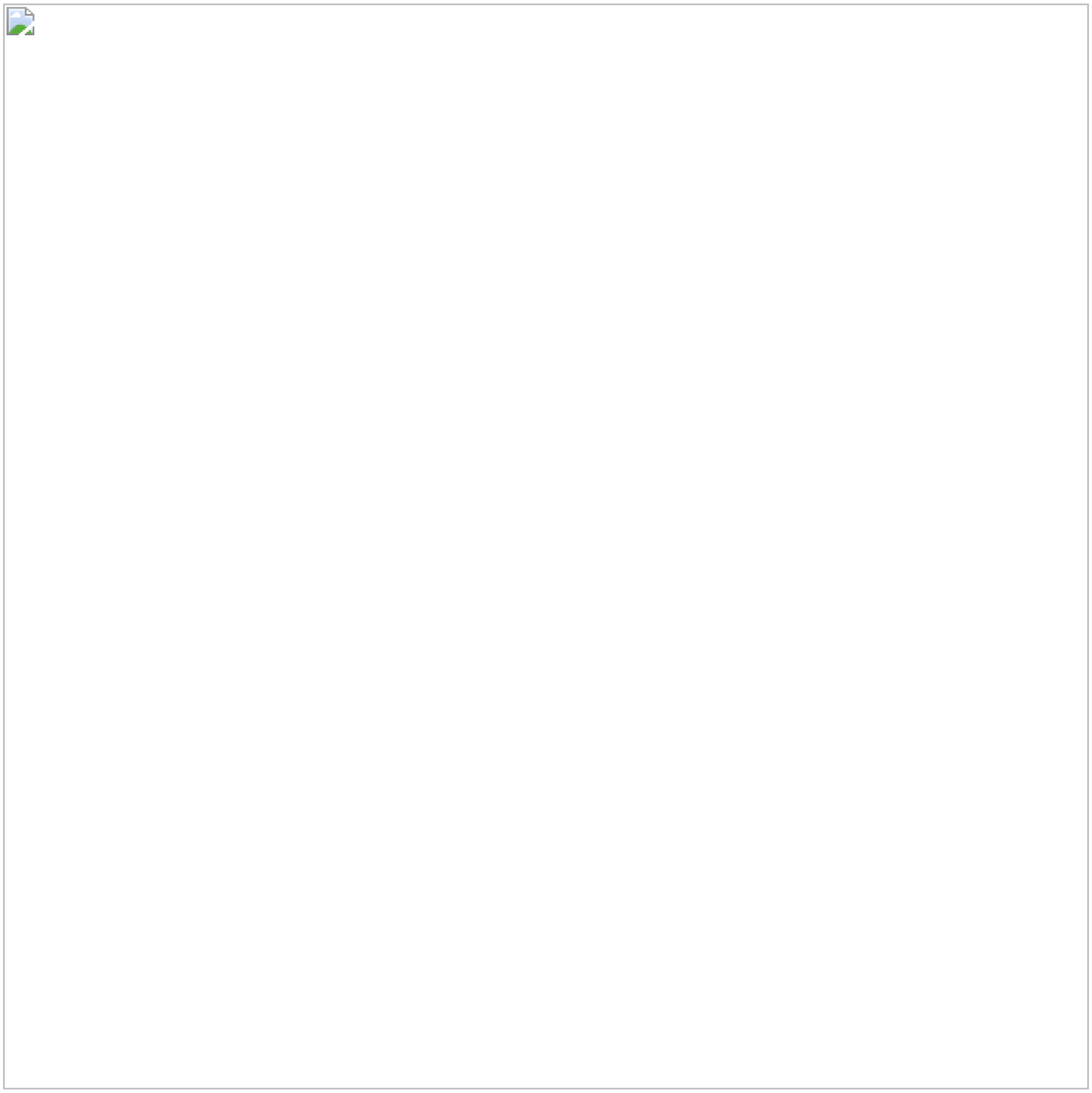
REvil Registry Entry (New)

```
| tstats `security_content_summariesonly` count values(Registry.registry_key_name)

  as registry_key_name values(Registry.registry_path) as registry_path min(_time)

  as firstTime max(_time) as lastTime FROM datamodel=Endpoint.Registry where
(Registry.registry_path="*\\SOFTWARE\\WOW6432Node\\Facebook_Assistant\\*" OR
Registry.registry_path="*\\SOFTWARE\\WOW6432Node\\BlackLivesMatter*")

  AND (Registry.registry_value_name = "\.*" OR Registry.registry_value_name =
"Binary

  Data") by Registry.registry_value_name Registry.dest Registry.user

| `security_content_ctime(lastTime)`

| `security_content_ctime(firstTime)`

| `drop_dm_object_name(Registry)`
```



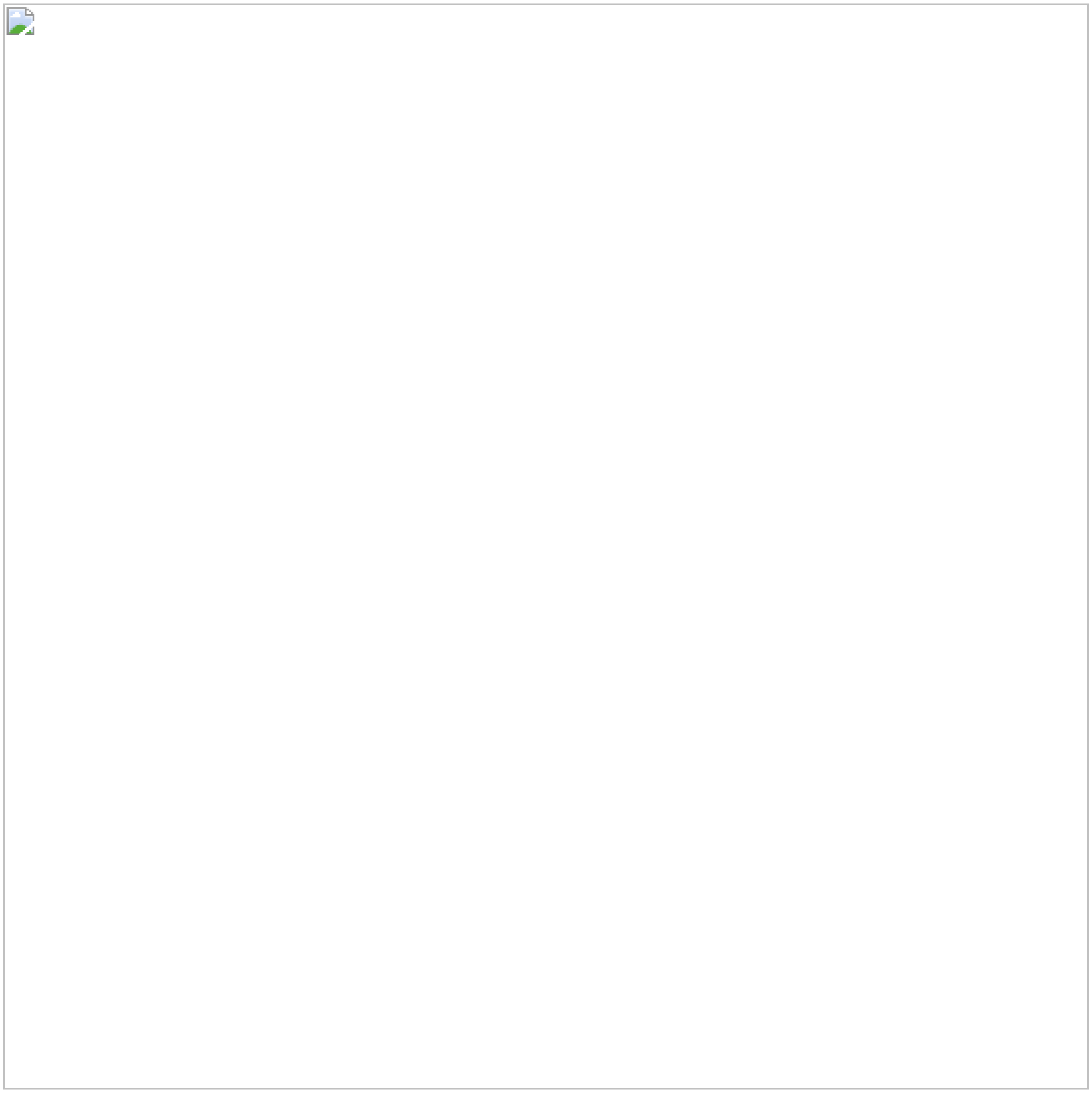
REvil Common Exec Parameter (New)

```
| tstats count min(_time) as firstTime max(_time) as lastTime from
datamodel=Endpoint.Processes

  where Processes.process = "*-nolan*" OR Processes.process = "*-nolocal*"
OR Processes.process = "*-fast*" OR Processes.process = "*-full*"

  by Processes.process_name Processes.process Processes.parent_process_name
Processes.parent_process Processes.dest Processes.user Processes.process_id
Processes.process_guid
```



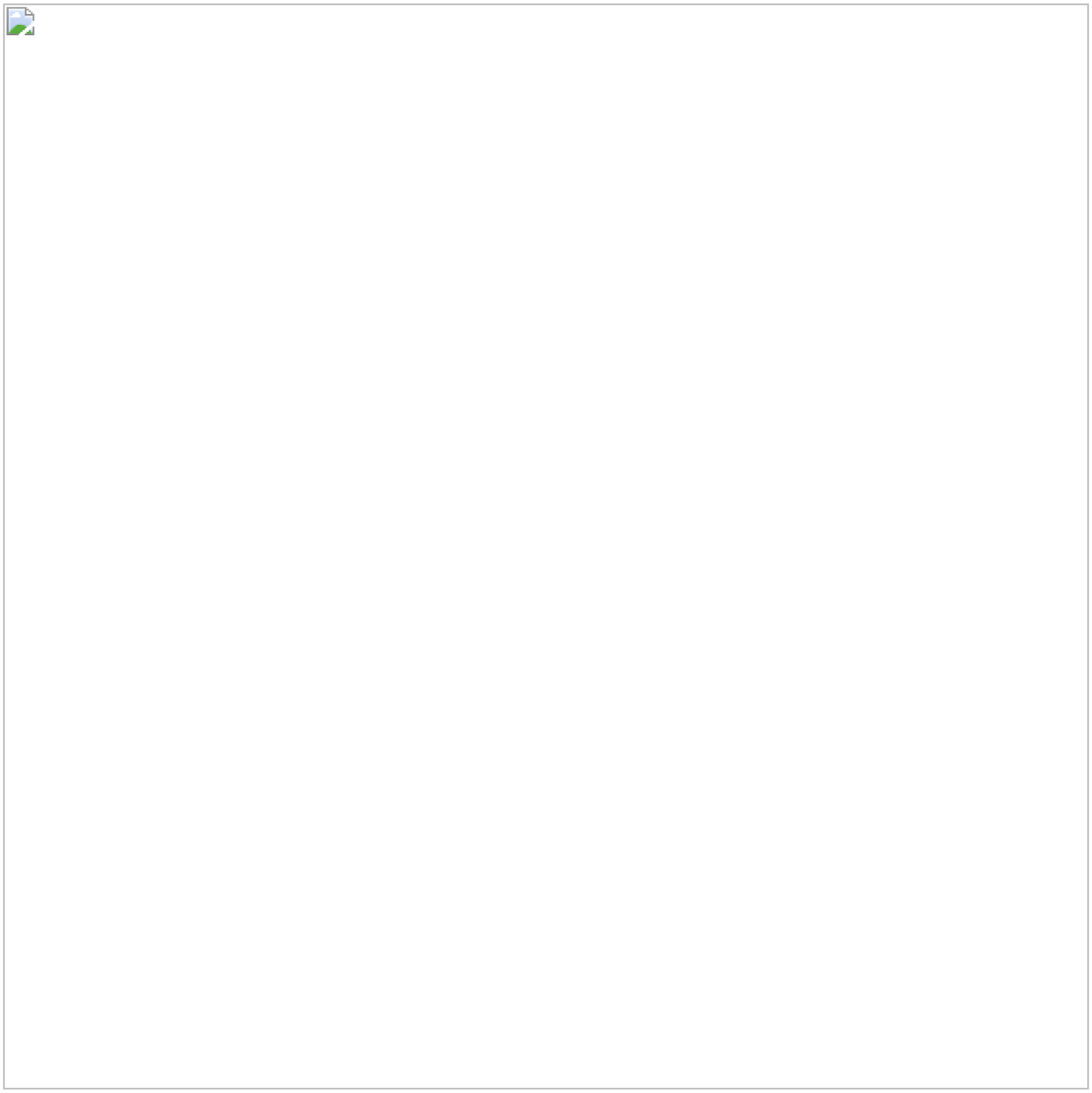
Modification Of Wallpaper (New)

```
sourcetype=XmlWinEventLog:Microsoft-Windows-Sysmon/Operational OR

source=XmlWinEventLog:Microsoft-Windows-Sysmon/Operational

 EventCode =13  (TargetObject= "*\\Control Panel\\Desktop\\Wallpaper" AND Image !=
"*\\explorer.exe")

  OR (TargetObject= "*\\Control Panel\\Desktop\\Wallpaper" AND Details =
"*\\temp\\*")

  | stats count min(_time) as firstTime max(_time) as lastTime by EventCode Image
TargetObject Details  Computer process_guid process_id user_id
```



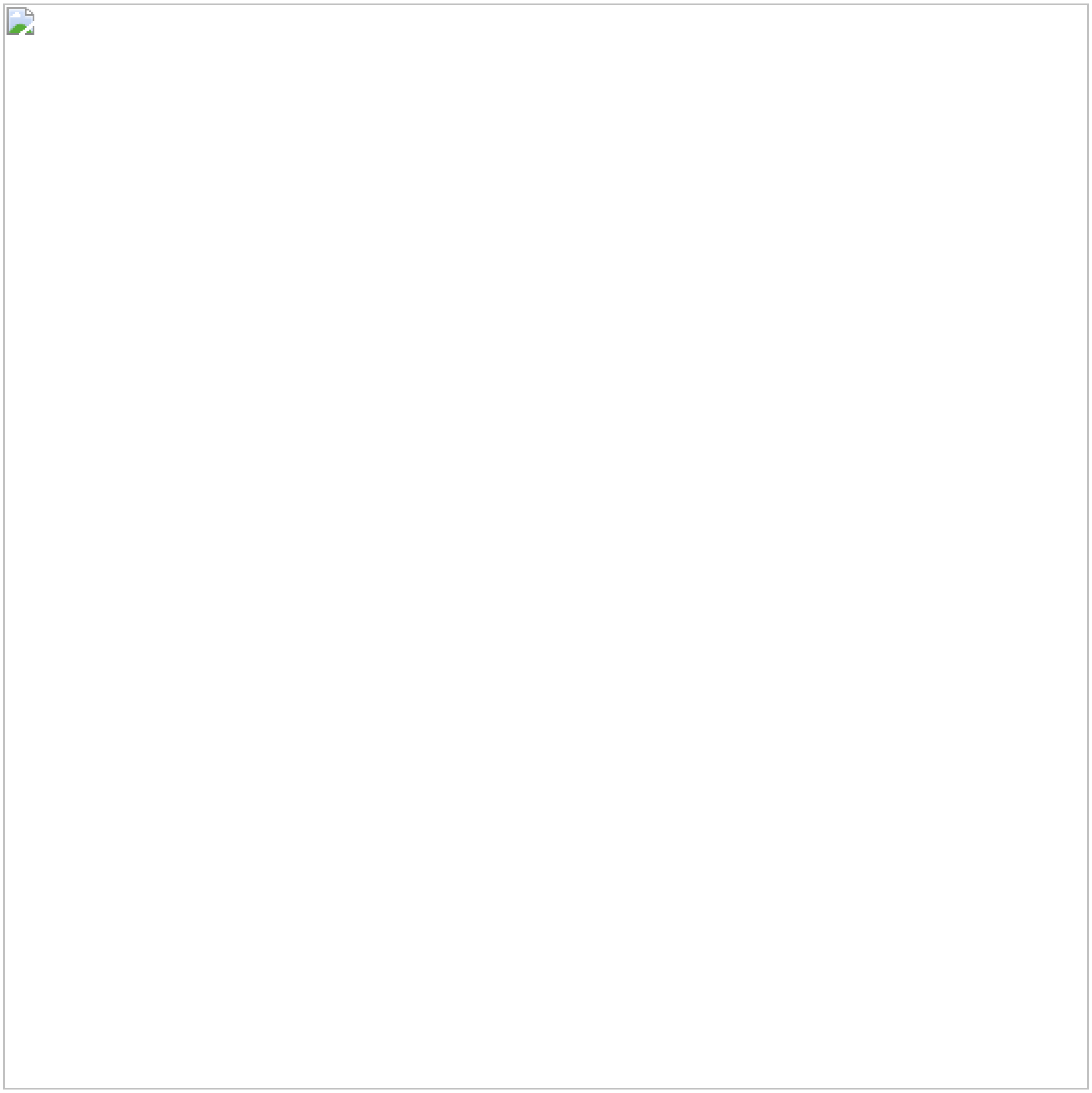
Wbemprox COM Object Execution (New)

```
sourcetype=XmlWinEventLog:Microsoft-Windows-Sysmon/Operational OR

source=XmlWinEventLog:Microsoft-Windows-Sysmon/Operational

 EventCode=7  ImageLoaded IN ("*\\fastprox.dll", "*\\wbemprox.dll",
"*\\wbemcomn.dll")

  NOT (process_name IN ("wmiprvse.exe", "WmiApSrv.exe", "unsecapp.exe")) NOT(Image
IN("*\\windows\\*","*\\program files*", "*\\wbem\\*"))

  | stats count min(_time) as firstTime max(_time) as lastTime by Image ImageLoaded
process_name Computer EventCode Signed ProcessId Hashes IMPHASH
```



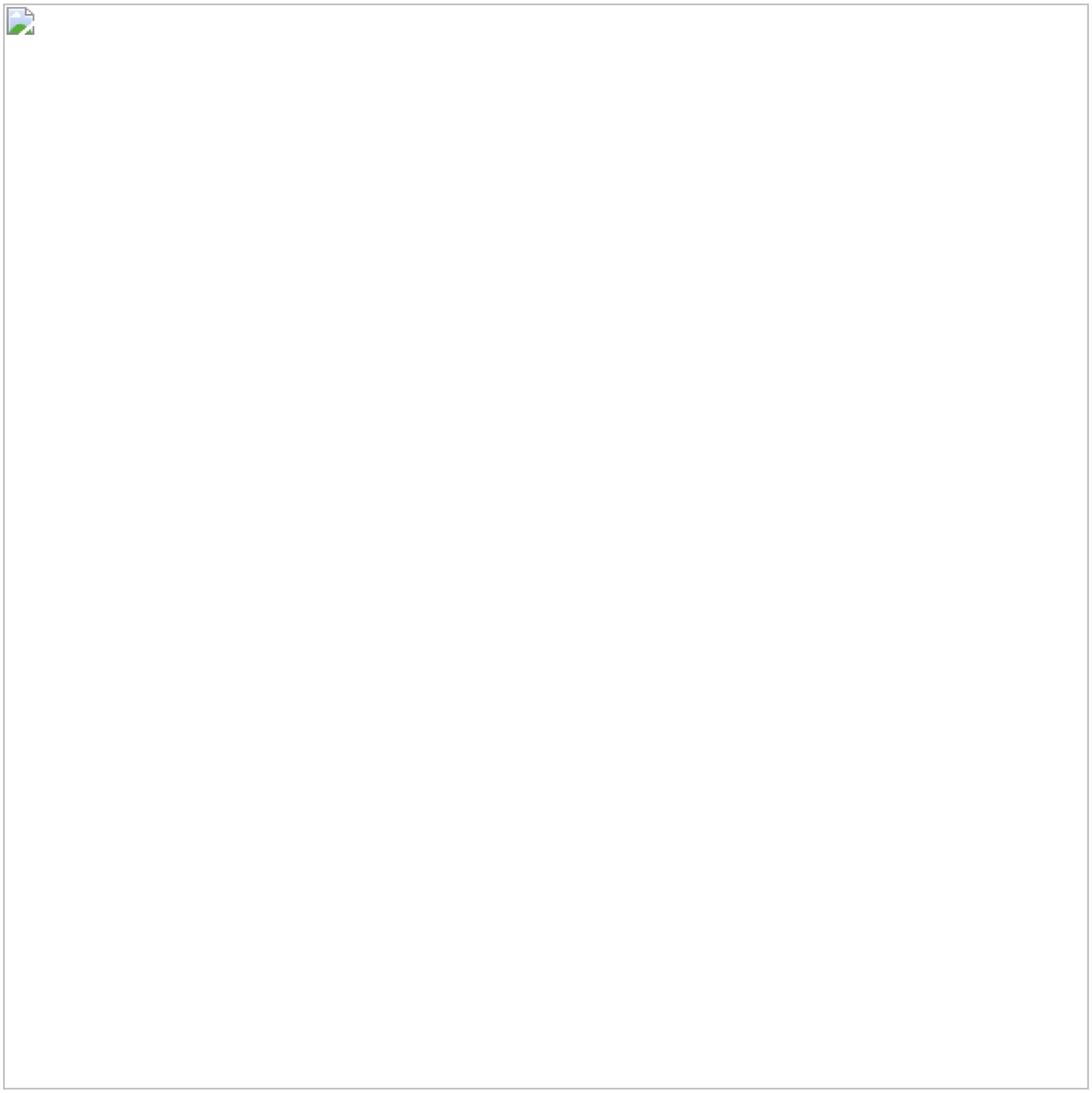
Known Services Killed by Ransomware (New)

```
Sourcetype=WinEventLog:System  EventCode=7036 Message IN
("*VSS*", "*backup*", "*sophos*", "*sql*", "*memtas*", "*mepocs*", "*veeam*",
"*svc$*")

  Message="*service entered the stopped state*"

  | stats count min(_time) as firstTime max(_time) as lastTime by EventCode Message
dest Type
```



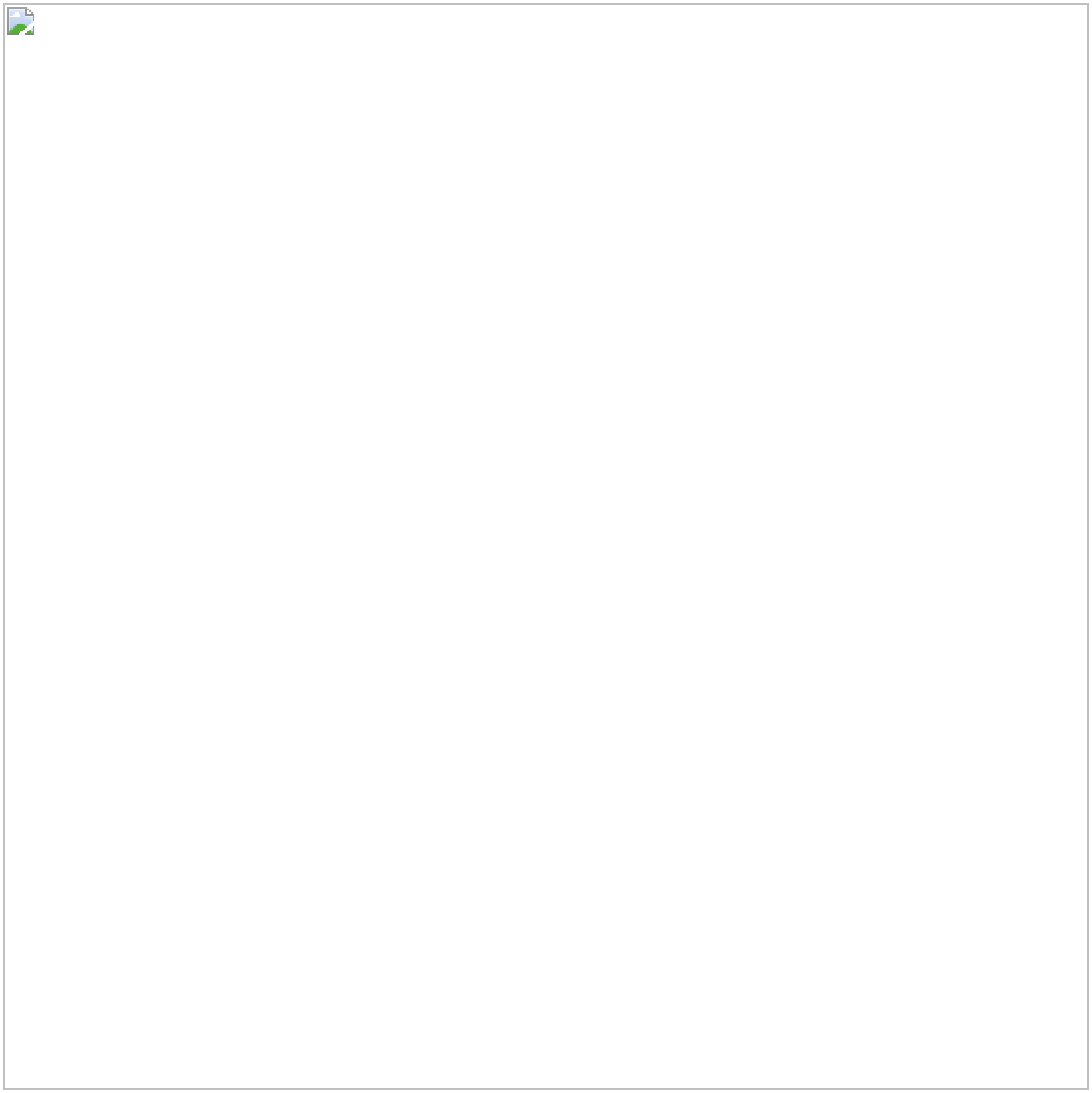
Allow network Discovery In Firewall (New)

```
| tstats `security_content_summariesonly` count min(_time) as firstTime max(_time)

  as lastTime from datamodel=Endpoint.Processes where
Processes.process_name=netsh.exe

  Processes.process= "*firewall*" Processes.process= "*group=\"Network
Discovery\"*"  Processes.process="*enable*" Processes.process="*Yes*"

  by Processes.dest Processes.user Processes.parent_process Processes.process_name

  Processes.process Processes.process_id Processes.parent_process_id
Processes.parent_process_name

  | `drop_dm_object_name(Processes)` | `security_content_ctime(firstTime)` |
`security_content_ctime(lastTime)`
```

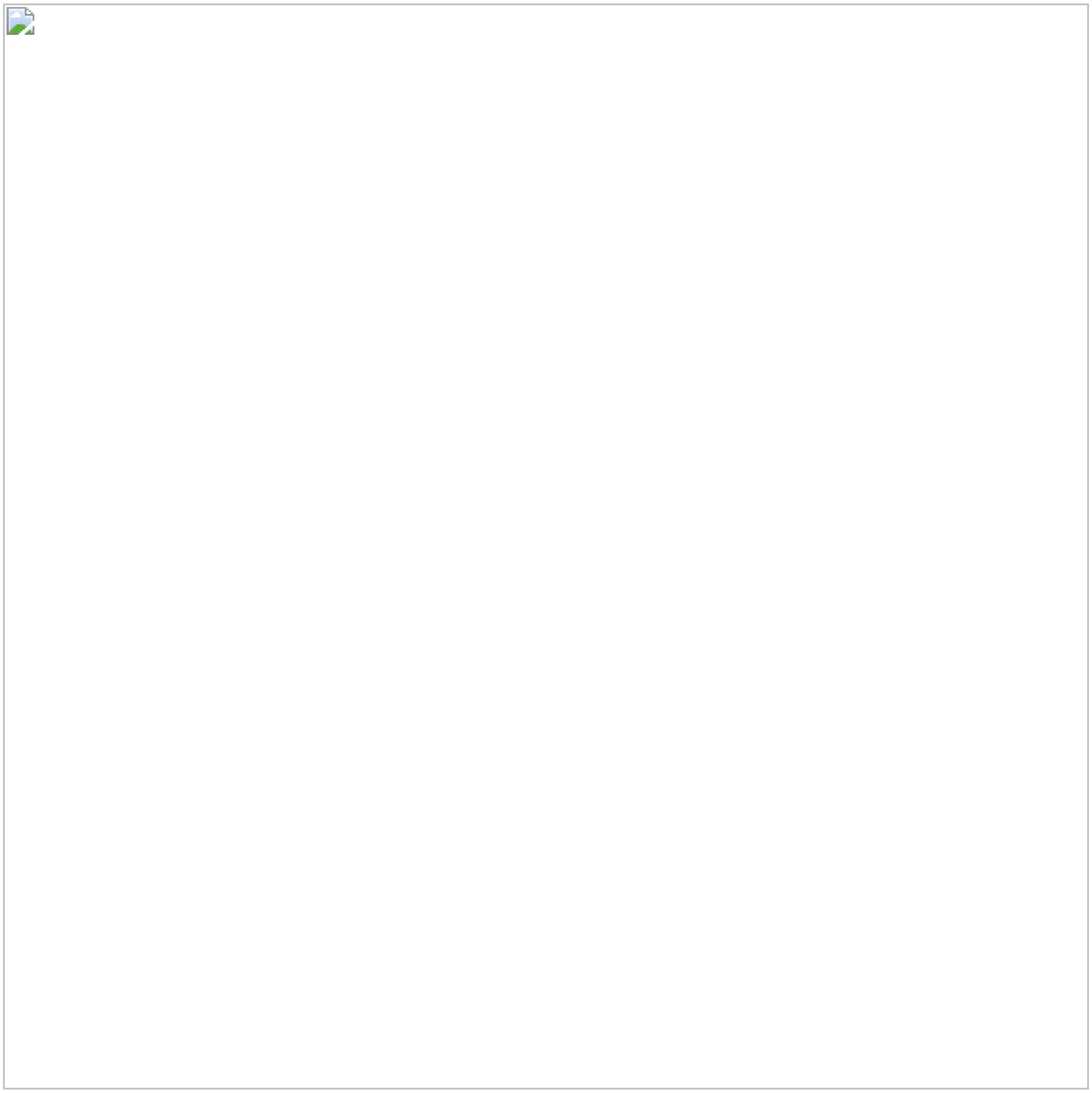


Disable Windows Behavior Monitoring (Updated)

```
| tstats `security_content_summariesonly` count min(_time) as firstTime max(_time)

  as lastTime from datamodel=Endpoint.Registry where

  Registry.registry_path= "*\\SOFTWARE\\Policies\\Microsoft\\Windows Defender\\Real-Time Protection\\DisableBehaviorMonitoring" OR

  Registry.registry_path= "*\\SOFTWARE\\Policies\\Microsoft\\Windows Defender\\Real-Time Protection\\DisableOnAccessProtection" OR

  Registry.registry_path= "*\\SOFTWARE\\Policies\\Microsoft\\Windows Defender\\Real-Time Protection\\DisableScanOnRealtimeEnable" OR

  Registry.registry_path= "*\\SOFTWARE\\Microsoft\\Windows Defender\\Real-Time Protection\\DisableRealtimeMonitoring" OR
  Registry.registry_path= "*\\Real-Time
Protection\\DisableIntrusionPreventionSystem" OR

  Registry.registry_path= "*\\Real-Time Protection\\DisableIOAVProtection" OR

  Registry.registry_path= "*\\Real-Time Protection\\DisableScriptScanning"

  Registry.registry_value_name = "DWORD (0x00000001)"

  by Registry.registry_path Registry.registry_key_name Registry.registry_value_name

  Registry.dest

  | `drop_dm_object_name(Registry)`

  | `security_content_ctime(firstTime)`

  |`security_content_ctime(lastTime)`
```

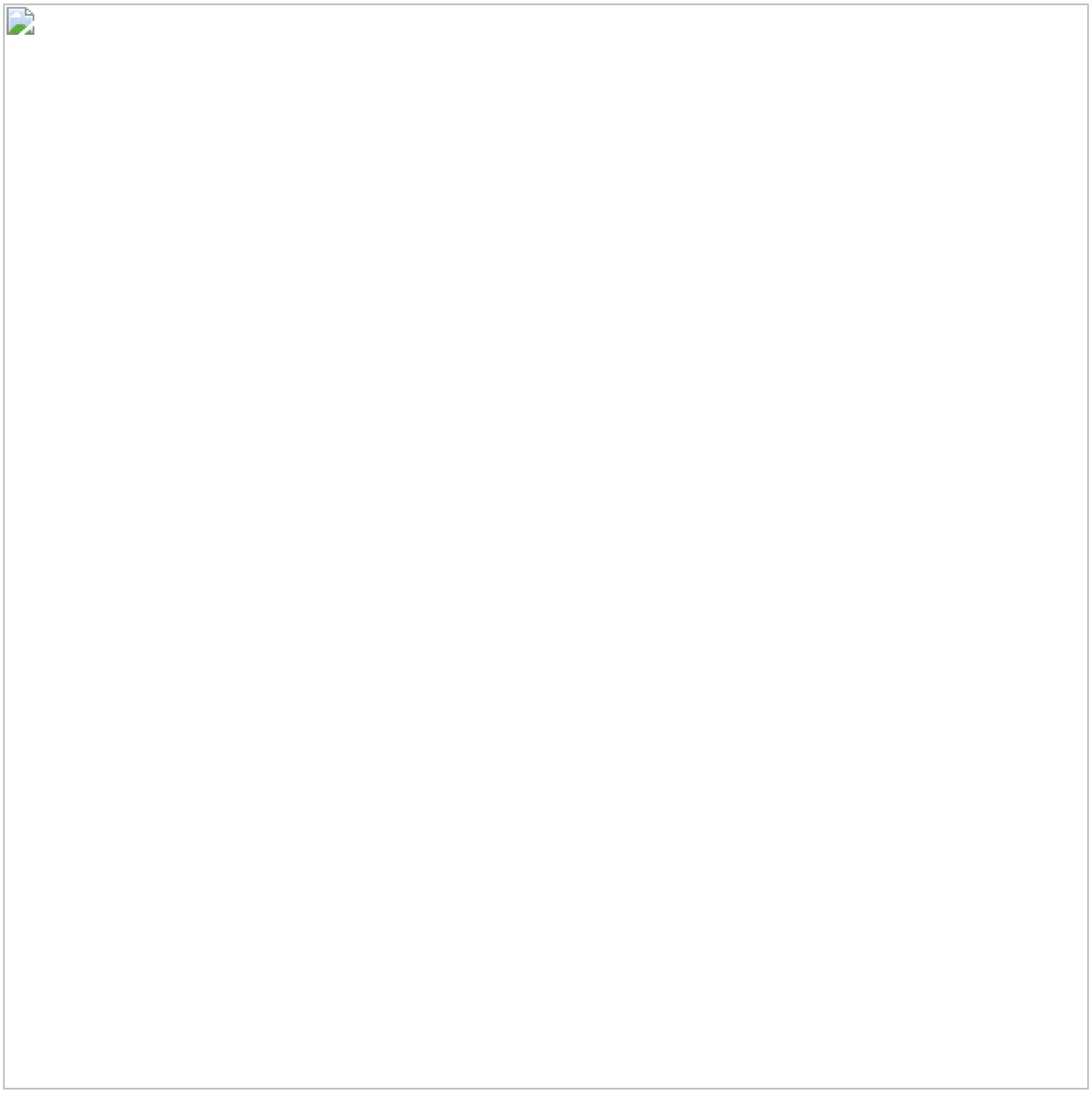


```
| tstats `security_content_summariesonly` count min(_time) as firstTime max(_time)

  as lastTime from datamodel=Endpoint.Processes where Processes.process_name IN
("powershell.exe", "pwsh.exe", "sqlps.exe", "sqltoolsps.exe")

  Processes.process="*set-mppreference*" AND

  Processes.process IN
("*disablerealtimemonitoring*","*disableioavprotection*","*disableintrusionpreventior


  by Processes.dest Processes.user Processes.parent_process Processes.process_name
Processes.process Processes.process_id Processes.parent_process_id

  | `drop_dm_object_name(Processes)`

  | `security_content_ctime(firstTime)`
  | `security_content_ctime(lastTime)`
```



Msmpeng Application DLL Side (New)

```
| tstats `security_content_summariesonly` values(Filesystem.file_path) as

  file_path count min(_time) as firstTime max(_time) as lastTime from
datamodel=Endpoint.Filesystem

  where (Filesystem.file_name = "msmpeng.exe" OR Filesystem.file_name =
"mpsvc.dll")  AND Filesystem.file_path != "*\\Program Files\\windows defender\\*"

  by Filesystem.file_create_time Filesystem.process_id  Filesystem.file_name
Filesystem.user

  | `drop_dm_object_name(Processes)`
  | `security_content_ctime(firstTime)`

  | `security_content_ctime(lastTime)`
```



Detection	Techniques ID	Tactics	Description
Delete ShadowCopy With PowerShell (Existing)	T1490	Impact	Detects deletion of shadow copy with PowerShell

Registry Keys Used For Persistence (Existing)	T1547.001	Persistence, Privilege Escalation	Detects registry entry for persistence or privilege escalation
Ransomware Notes bulk creation (Existing)	T1486	Impact	Detects suspicious bulk creation of ransomware notes (.txt, hta, html) in compromised machine
High Process Termination Frequency(Existing)	T1486	Impact	Detects a suspicious big number of terminated processes within a time frame.
Suspicious Process File Path (Existing)	T1543	Persistence, Privilege Escalation	Detects process with suspicious file path
Revil Registry Entry (New)	T1112	Defense Evasion	Detects registry entry of REvil ransomware
Revil Common Exec Parameter (New)	T1204	Execution	Detects common parameter of REvil ransomware
Modification Of Wallpaper (New)	T1491	Impact	Detects suspicious events that modify the wallpaper of a host.
Wbemprox COM Object Execution (New)	T1218.003	Defense Evasion	Detects a suspicious wbemprox COM OBJ execution
Known Services Killed by Ransomware (New)	T1490	Impact	Detects termination of Known Services killed by ransomware
Allow Network Discovery In Firewall (New)	T1562.004	Defense Evasion	Allow or Enable network discovery in firewall rules
Disable Windows Behavior Monitoring (Updated)	T1562.001	Defense Evasion	Disabling Windows Defender Artifacts in Registry

Powershell Disable Security Monitoring (New)	T1562.001	Defense Evasion	Disabling Windows Defender Artifacts in Registry
Msmpeng Application DLL Side Loading	T1574.002	Hijack Execution Flow: dll Side loading	Execute dll side loading of msmpeng.exe application

Hashes

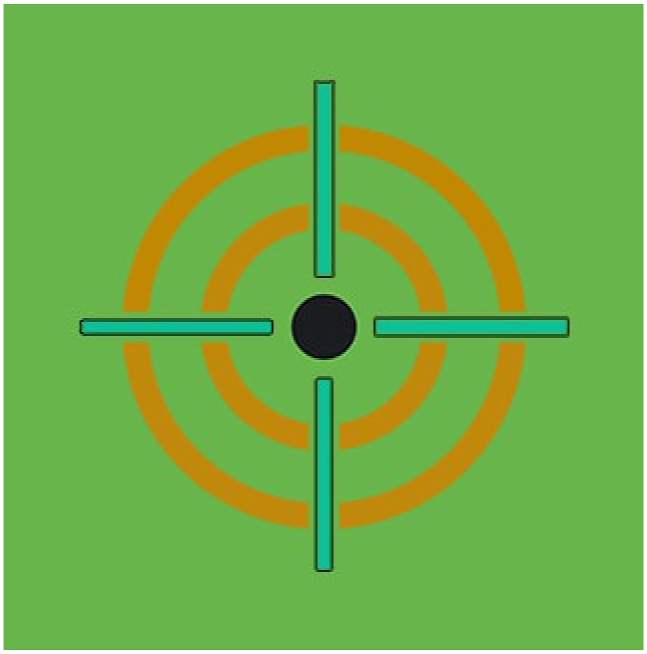
REvil Ransomware:

SHA256: 33026ba868a6159223b486b57caebe40926208bb80b89749318e51dcd5b8b883

Mitigation

For mitigation of this and similar ransomware threats please use CISA guidance for reference: https://www.cisa.gov/ransomware

We hope that this information is helpful. Our team is standing by to help if you need it.



Posted by

Splunk Threat Research Team

The Splunk Threat Research Team is an active part of a customer’s overall defense strategy by enhancing Splunk security offerings with verified research and security content such as use cases, detection searches, and playbooks. We help security teams around the globe strengthen operations by providing tactical guidance and insights to detect, investigate and respond against the latest threats. The Splunk Threat Research Team focuses on understanding how threats, actors, and vulnerabilities work, and the team replicates attacks which are stored as datasets in the Attack Data repository.

Our goal is to provide security teams with research they can leverage in their day to day operations and to become the industry standard for SIEM detections. We are a team of industry-recognized experts who are encouraged to improve the security industry by sharing our work with the community via conference talks, open-sourcing projects, and writing white papers or blogs. You will also find us presenting our research at conferences such as Defcon, Blackhat, RSA, and many more.

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