

# Fast Insights for a Microsoft-Signed Netfilter Rootkit

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Written by Giancarlo Lezama - 10 August 2021

**Malicious**  
Main Family: NetFilter Rootkit

01 SHA256  
10 d64f906376f21677d0585e93dae8b36248f94be7091b01fd1d4381916a326afe

Malicious: This file contains code from malicious software, therefore it's very likely that it's malicious.

Genetic Analysis | TTPs | IOCs | Behavior | Extended Dynamic Execution

Original File  
d64f906376f21677d0585e93dae8b362...  
Malicious: NetFilter Rootkit (41 Genes) | 113 KB

Dynamic Execution  
Powered by Cape | Show all

Memory  
d64f906376f21677d0585e93.exe | 1444

Dropped Files  
netfilter.sys  
Malicious: Generic Malware (0 Genes) | 55.91 KB

Static Extraction

Genetic Summary | Related Samples | Code (41) | Strings (44) | Capabilities (5)

d64f906376f21677d0585e93dae8b36248f94be7091b01fd1d438... NetFilter Rootkit (41 Genes) | embedded\_pe | 1386 | probably\_packed

NetFilter Rootkit  
Malware | 81.82%  
Related Samples: 41 Code genes, 4 Strings

Common  
Neutral | 17.73%  
1 Code genes, 39 Strings

File Metadata

Size	113 KB
SHA256	d64f906376f21677d0585e93dae8b36248f94be7091b01fd1d4381916a326afe
MD5	1c3db7002523e1acc621c90701c694ae
File Type	Win32 EXE
SHA1	ae092fd31772d33932a7a0235d373ede67f7db0
Ssdeep	1536:H.9RWXOQwIwEIBemT3p3EpoNyq+4R06#H05yOV177rLX0QwNOT+efq+8AvO17

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***Automate malware analysis of Netfilter rootkit and other advanced threats. Obtain deep insights without long, manual effort.***

News broke in June about a malicious Netfilter rootkit signed by Microsoft. This was significant in that Windows machines only run drivers with valid signatures. Since drivers can obtain the maximum level of permissions on a machine, they are gold for any threat actor who can obtain such access.

Thanks to malware analysts like Karsten Hahn, additional samples of this malware dating back to March were uncovered, along with details on how they operate. Let's look at the genetic analysis of these [samples](#) to see how you can quickly identify them as Netfilter rootkit, as well as understand their capabilities and obtain similar artifacts despite the valid signature.

The Netfilter rootkit was found in a driver signed by Microsoft. This rare technique bypasses defenses, such as Antivirus tools, by making the file appear legitimate, despite the fact that it is tampered with malicious code. Obfuscated strings were also found in this file, which is very uncommon for a legitimate file. When the file is executed, other URLs can be identified, each with a specific purpose, including redirecting infected endpoints to other IP addresses; for self-updating the malware and receiving the valid root certificate.

Detection of malware with valid signatures is challenging. Since these samples are signed legitimately by Microsoft, even Antivirus software can be fooled into trusting them. An analyst could try investigating the abnormal network connections made to the URLs during execution. The URLs might be useful for this variant but there is no way of telling what changes could be made to URLs in future malware variants, or whether the external server the rootkit connects to is hidden from network detection tools through methods such as DynDNS or proxies. Not to mention, how do you know the full extent of the capabilities in the driver? Once a rootkit is executed, it will totally own a machine with maximum permissions, hiding its activities from even endpoint detection solutions.

Let's take a look at the [analysis](#) of the Netfilter Dropper sample referenced in the aforementioned article.

The screenshot displays the Malicious.io analysis interface for a file identified as a NetFilter Rootkit. The interface is dark-themed and includes several sections:

- Header:** Shows the file name `d64f906376f21677d0585e93dae8b36248f94be7091b01fd1d4381916a326afe` and a warning: "Malicious. This file contains code from malicious software, therefore it's very likely that it's malicious." It also indicates the file was analyzed on Jun 29th 2021.
- Navigation:** Tabs for Genetic Analysis, TTPs (BETA), IOCs (BETA), and Behavior (BETA). A button for "Extended Dynamic Execution" is also present.
- Original File:** Lists the file `d64f906376f21677d0585e93dae8b36248f94be7091b01fd1d4381916a326afe` (113 KB) as Malicious (NetFilter Rootkit (41 Genes)).
- Dynamic Execution:** Shows a list of files executed, including `d64f906376f21677d0585e93.exe` (113.5 KB) and `regini.exe` (2516).
- Dropped Files:** Lists files dropped during execution, such as `netfilter.sys` (55.91 KB).
- Static Extraction:** Lists extracted files, including `e0af8b937a59077be55a1d1cc7574e...` (49.41 KB) and `63d61549030cf46f1dc138122580b4...` (55.91 KB).
- Genetic Summary:** Shows a "NetFilter Rootkit Edit" section with a "Malware" score of 81.82% and a "Common Edit" section with a "Neutral" score of 17.73%.
- File Metadata:** Provides technical details: Size (113 KB), SHA256, MD5, File Type (Win32 EXE), SHA1, Sddeep, and VIRUSTOTAL Report (54 / 69 Detections). It also lists the Target Machine (Intel 386 or later, and compatibles) and Compilation Timestamp (Invalid date).

With Intezer Analyze you can analyze malware threats in seconds, with every tool you need to do so in one place: *genetic code analysis*, *sandboxing*, *memory analysis* and *static analysis*.

The original file is classified as Netfilter rootkit, where an analysis of the code finds that the file shares 41 code genes, or about 81% of its code (click Show common code), with previously identified Netfilter rootkit samples. It is clear that although the uploaded dropper has a valid signature, the code itself is identified as malicious and belongs to the Netfilter rootkit.

Sometimes, an analysis isn't always this easy. Files can be obfuscated by being packed, encoded, or delivered in the form of installers. For this reason, Intezer also has the ability to statically extract relevant files packed in the original file, as well as dynamically execute the original file in order to see how it executes. In this particular analysis, the driver is embedded in the dropper, which gets dropped onto the disk during execution in the sandbox.

**Dropped Files**

netfilter.sys 55.91 KB  
**Malicious** | NetFilter Rootkit (110 Genes)

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**Static Extraction**

Show all

49.41 KB  
e0afb8b937a5907fbe55a1d1cc7574e ...  
**Malicious** | NetFilter Rootkit (224 Genes)

55.91 KB  
63d61549030fcf46ff1dc138122580b4 ...  
**Malicious** | NetFilter Rootkit (110 Genes)

Genetic Summary | **Related Samples** | Code (114) | Strings (249) | Capabilities (3)

63d61549030fcf46ff1dc138122580b4364f0fe99e6b068bc6a3d6903656aff0.sample **Generic Malware** | pe | driver | amd64

- NetFilter Rootkit Edit**  
**Malware** | 78.2%  
Related Samples: 108 Code genes: 30 Strings: 3 Capabilities
- Generic Malware Edit**  
**Malware** | 2.81%  
0 Code genes: 35 Strings
- Malicious Library Edit**  
**Malware** | 1.4%  
2 Code genes: 0 Strings
- WinDivert Edit**  
**Admin Tool** | 0.64%  
0 Code genes: 8 Strings
- Microsoft Visual C/C++ Libraries Edit**  
**Library** | 0.56%  
0 Code genes: 7 Strings

With Intezer Analyze you don't get a blackbox. Instead, you can see exactly in which malware samples the malicious Netfilter rootkit code of the dropper (as well as the dropped files) have been seen before.

Genetic Summary | **Related Samples** | Code (114) | Strings (249) | Capabilities (3)

Family Related Samples

Related Families	(117 genes)	<b>Malware</b> NetFilter Rootkit							
NetFilter Rootkit	(108)	Name	First seen	Label	SHA256	Report	Reused Genes		
Malicious Library	(2)	bff9b75ae2ee44...	June 18th 2021		bff9b75ae2...	Report 53/68	41 Genes	↓	Edit
		d64f906376f21...	June 18th 2021		d64f90637...	Report 54/69	41 Genes	↓	Edit
Common	(3)	a5c873085f36f6...	June 18th 2021		a5c873085f...	Report 47/69	40 Genes	↓	Edit
		659e0d1b2405c...	June 18th 2021		659e0d1b2...	Report 34/70	33 Genes	↓	Edit
		e0afb8b937a59...	June 18th 2021		e0afb8b937...	Report 22/69	7 Genes	↓	Edit

Intezer's sandboxing capabilities capture what the file did during execution within the context of the MITRE ATT&CK® framework. This provides an immediate sense of what suspicious or malicious activity the file is capable of in order to help you assess the risk. The highest risk behavior found in this file is the ability to persist on an endpoint by making adjustments to the Windows Registry.

MITRE ATT&CK Technique Detection													
Reconnaissance	Resource Development	Initial Access	Execution	Persistence	Privilege Escalation	Defense Evasion	Credential Access	Discovery	Lateral Movement	Collection	Command And Control	Exfiltration	Impact
				Boot or Logon Autostart Execution::Registry Run Keys / Startup Folder									

  

MITRE ATT&CK	Indicator	Severity	Details
✓ Persistence:Boot or Logon Autostart Execution::Registry Run Keys / Startup Fold...	Installs itself for autorun at Windows startup	High	key:HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\services... key:HKEY_LOCAL_MACHINE\SYSTEM\ControlSet001\services\inetfilter\ImagePath data:\?%:\Users\mike\AppData\Roaming\inetfilter.sys
-	Network activity detected but not expressed in API logs	High	-
✓ -	Loads a driver	Medium	driver_service_name:\Registry\Machine\System\CurrentContr...
-	A process created a hidden window	Medium	Process:d64f906376f21677d0585e93.exe -> regini
✓ -	HTTP traffic contains suspicious features which may be indicative of malware rela...	Medium	get_no_useragent:HTTP traffic contains a GET request with n... get_no_useragent:HTTP traffic contains a GET request with no user-agent header ip_hostname:HTTP connection was made to an IP address rather than domain name suspicious_request:http://110.42.4.180:2081/u suspicious_request:http://110.42.4.180:2081/s suspicious_request:http://110.42.4.180:2081/c suspicious_request:http://110.42.4.180:2081/?v=6&m=0bd3b9f55a2d3a13f506d9d8b970e0de suspicious_request:http://110.42.4.180:2081/h?c=1F8BFBF00050656 suspicious_request:http://110.42.4.180:2081/p
✓ -	Performs some HTTP requests	Medium	url:http://110.42.4.180:2081/u url:http://110.42.4.180:2081/s url:http://110.42.4.180:2081/c url:http://110.42.4.180:2081/?v=6&m=0bd3b9f55a2d3a13f506d9d8b970e0de url:http://110.42.4.180:2081/h?c=1F8BFBF00050656 url:http://110.42.4.180:2081/p

Another interesting behavior is the resulting network activity from the file's execution, providing us with network IoCs for this file. These network IoCs, along with the file's IoCs uncovered when the file was executed or via static extraction, make up the full list of IoCs shown in a separate tab for ease of access.

Genetic Analysis			
TTPs	IOCs	Behavior	Extended Dynamic Execution
Think we missed something? Try using our previous analysis engine.			
Download CSV			
<b>Network IOCs (7)</b>			
Type	IOC	Source Type	
IP	110.42.4.180	Network communication	
URL	http://110.42.4.180:2081/u	Network communication	
URL	http://110.42.4.180:2081/s	Network communication	
URL	http://110.42.4.180:2081/c	Network communication	
URL	http://110.42.4.180:2081/?v=6&m=0bd3b9f55a2d3a13f506d9d8b970e0de	Network communication	
URL	http://110.42.4.180:2081/h?c=1F8BFBF00050656	Network communication	
URL	http://110.42.4.180:2081/p	Network communication	
Download CSV			
<b>Files IOCs (3)</b>			
SHA256	Path	Type	Classification
d64f906376f21677d0585e93dae8b36248f94be7091b01fd1d4381916a32...	d64f906376f21677d0585e93dae8b36248f94be7091b01fd1d4381916a32...	Main file	Malicious NetFilter Rootkit
63d61549030cf46ff1dc138122580b4364f0fe99e6b068bc6a3d6903656af...	C:\Users\mike\AppData\Roaming\inetfilter.sys	Dropped file	Malicious Generic Malware
e0afb8b937a5907be55a1d1cc7574e9304007ef33fa80ff3896e997a1beaf...	e0afb8b937a5907be55a1d1cc7574e9304007ef33fa80ff3896e997a1beaf...	Extracted file	Malicious NetFilter Rootkit

The network IoCs are identical to the ones provided in the GData article, each with a distinct purpose as mentioned.



To summarize, there is a lot of information related to the investigation of this malware that can be easily extracted through genetic code analysis and other fundamental techniques with Intezer 's [malware analysis tool](#).

Consider that most malware must evolve into new variants in order to evade detection but their code mostly remains the same. Behavioral analysis and signatures can be evaded by advanced malware like this Netfilter rootkit, but the code doesn't lie.

Intezer Analyze covers every malware-related incident. Scan files, live machines, memory dumps and URLs (coming soon) to get fast verdicts, TTPs, IoCs and more. [Sign up](#) for free and start with 50 file uploads per month.



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Giancarlo is an experienced cybersecurity solutions architect. He has helped demonstrate, architect, and deploy security solutions for organizations across various industries.