A Storm is Brewing: IPStorm Now Has Linux Malware

intezer.com/blog/research/a-storm-is-brewing-ipstorm-now-has-linux-malware/

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Written by Nicole Fishbein and Avigayil Mechtinger - 1 October 2020

Introduction

The development of cross-platform malware is not new, however, we continue to observe a number of malware that were previously documented only targeting Windows now targeting the Linux platform. One of these threats is IPStorm.

In May 2019, researchers from Anomali discovered a new Golang malware targeting Windows, which they dubbed **IPStorm** (InterPlanetary Storm).IPStorm is a botnet that abuses a legitimate Peer-to-peer (p2p) network called InterPlanetary File System (IPFS) as a means to obscure malicious traffic. It was found the malware eventually allowed attackers to execute arbitrary PowerShell commands on the victim's Windows machine.

Our research team recently identified new Linux variants of IPStorm targeting various Linux architectures (ARM, AMD64, Intel 80386) and platforms (servers, Android, IoT). We have also detected a macOS variant. The macOS variant and most of the Linux samples are fully undetected in VirusTotal at the time of this publication. IPStorm is written in Golang, which enabled Intezer Analyze to detect cross-platform code connections between the Linux samples and the Windows malware first reported by Anomali.

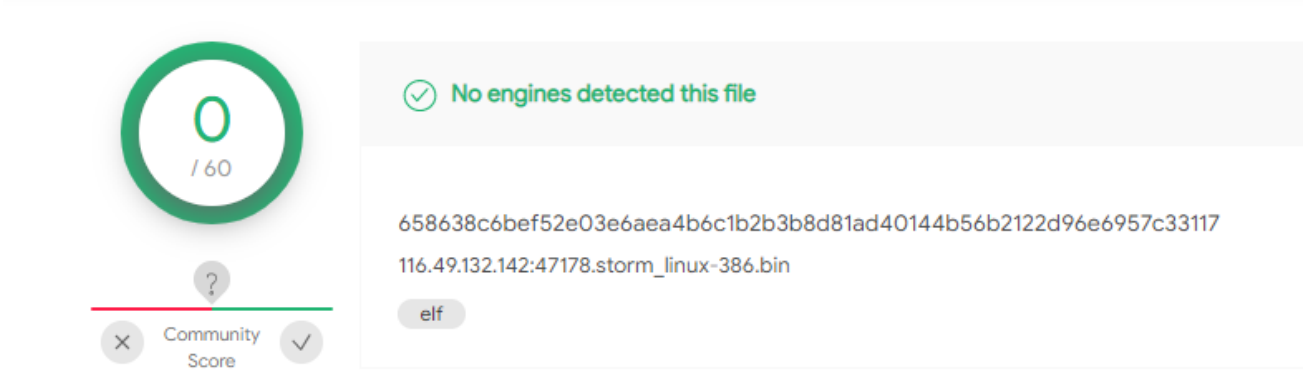
The Linux variant has additional features over the documented Windows version, such as using **SSH brute-force** as a means to spread to additional victims and **fraudulent network activity** abusing Steam gaming and advertising platforms. The Linux variant has adjusted some features in order to account for the fundamental differences that exist between this operating system and Windows.

In this post, we will present a code relations graph between the IPStorm Windows and Linux samples, analyze one of the Linux variant's behavior, and compare its features and capabilities to the old Windows samples to track its evolution. Following we will take a deeper dive into some notable features and explain how to respond to this threat.

Technical Analysis

Most of the IPStorm Linux samples were fully undetected before we submitted them for genetic analysis in Intezer Analyze.

In this post, we will focus on the **658638c6bef52e03e6aea4b6c1b2b3b8d81ad40144b56b2122d96e6957c33117** Linux sample.

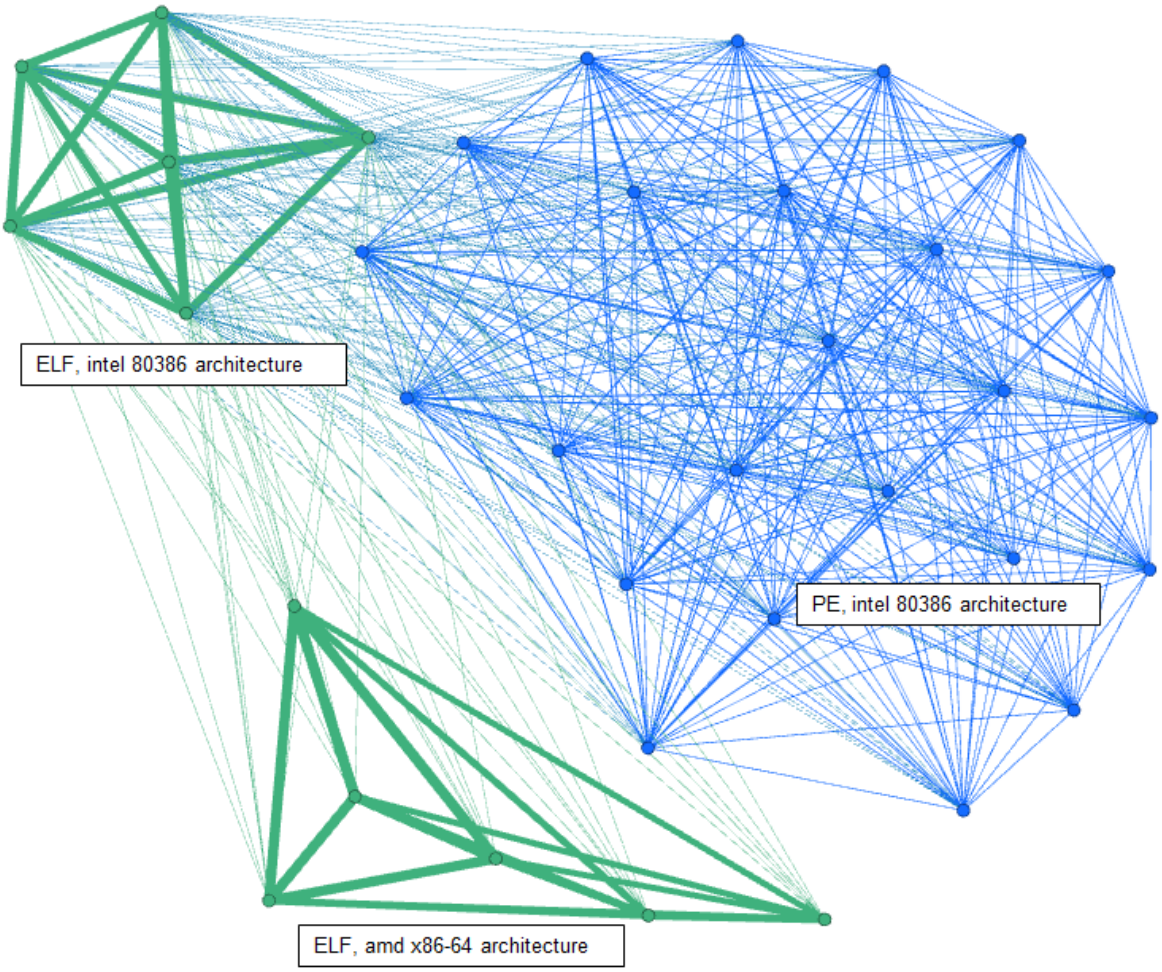


658638c6bef52e03e6aea4b6c1b2b3b8d81ad40144b56b2122d96e6957c33117 sample undetected in VirusTotal.

Because IPStorm is written in Golang, not only can we observe strong code connections between the different Linux variants, we can also identify connections to IPStorm's Windows samples uploaded to our system in 2019.

The following map emphasizes code similarities between the different versions and operating systems. The nodes represent the individual samples and the lines are the code relations between them. All samples are linked to each other in some way:

- **IPStorm PE files from 2019**
- **IPStorm ELF files from 2020**



The graph depicts three main clusters, with each cluster containing samples that have strong code connections between them:

- PE, intel 80386 architecture
- ELF, intel 80386 architecture
- ELF, amd x86-64 architecture

You will also notice shared code exists between the ELF clusters and the ELF and PE intel 80386 architecture clusters.

You can use the **cluster_directory.py** API script in this GitHub repository to create a cluster graph of your own.

Linux Variant Behavior Flow

The Linux variant symbols are stripped. Using the plugin IDAGolangHelper we retrieved the file's symbols and saw exactly which packages the malware contains. A package in Go is a bundle of Go source files which make up a specific functionality. Every Go source file belongs to a package.

The Linux malware's main logic is implemented in a package called **storm_starter**, a new package that was not in the Windows version. All logic was implemented via the main function in the Windows version.

Both versions have similarities in the way the main flow is implemented, however, the Linux instances have additional features and adjusted some logic due to the differences that exist between the two operating systems.

The Linux iteration starts by disabling the out-of-memory (OOM) killer in order to prevent it from terminating the malware. It then proceeds to check for any processes related to Antiviruses or other security tools that may prevent further execution of the malware. Next the malware generates and saves pubkeys in a file called **strom.key**. The location of where this key is saved is based on privileges that the malware was executed with. If the malware was executed with root privileges, the key will be stored at **/etc/storm.key**. Otherwise, it will be saved at **/tmp/storm.key**. The malware then tries to establish connections with other nodes in the peer to peer network.

The malware sends HTTP requests to different services such as **diagnostic[.]opendns[.]com/myip, ifconfig[.]io/ip**, and **myip[.]dnsomatic[.]com** to receive the external IP address of the victim server. If the malware is running as root, it will create a service under systemd to achieve persistence and copy itself to **/usr/bin/storm**. Otherwise, it will be copied to **/tmp/storm**. The malware will then relaunch itself from the new installation path.

This new process is responsible for executing the main features of the IPStorm malware, including reverse shell, which was previously seen in the Windows variant—maintaining connection with other peers in the P2P network and a new feature for spreading the malware to other victims.

```
06:26:42   INFO           node Disabling OOM killer for pid 6821 os.go:64
06:26:42  ERROR           node write /proc/6821/oom_adj: permission denied os.go:72
06:26:47   INFO          storm Starting storm v0.2.05a linux-386 (/home/paul/658638c6bef52e03e6aea4b6c1b2b3b8d81ad40144b56b2122d96e6957c33117) starter.go:146
06:26:47   INFO   malware-guard malware_guard.CloseVulnerabilities not implemented on platform linux-386 firewall.go:8
06:26:47   INFO       identity Trusted pubkeys initialized identity.go:23
06:26:48   INFO   malware-guard Killing 733:/usr/bin/python3::/usr/bin/python3 /usr/bin/networkd-dispatcher --run-startup-triggers malware-guard.go:37
06:26:48   INFO   malware-guard Killing 772:polkitd::/usr/lib/policykit-1/polkitd --no-debug malware-guard.go:37
06:26:48   INFO           node node QmSSZFvcHS1WzM3eYpFh1HtreSVEyrmiy9dLunfDDmYz9F addrs: [/ip4/127.0.0.1/tcp/45111 /ip4/192.168.1.31/tcp/45111] node.go:171
06:26:50   INFO           node Connection established with bootstrap peer: /ip4/104.131.131.82/tcp/4001/p2p/QmaCpDMGvV2BGHeYERUEnRQAwe3N8SzbUtfsmvsqQLuvuJ bootstrap.go:4
06:26:51   INFO           node Connection established with bootstrap peer: /ip4/147.75.83.83/tcp/4001/p2p/QmbLHAnMoJPWSCR5Zhtx6BHJX9KiKNN6tpvbUcqanj75Nb bootstrap.go:49
06:26:52   INFO           node Connection established with bootstrap peer: /ip4/147.75.109.213/tcp/4001/p2p/QmNnooDu7bfjPFoTZYxMNLWUQJyrVwtbZg5gBMjTezGAJN bootstrap.go:4
06:26:52   INFO           node Connection established with bootstrap peer: /ip4/147.75.94.115/tcp/4001/p2p/QmcZf59bWwK5XFi76CZX8cbJ4BhTzzA3gU1ZjYZcYW3dwt bootstrap.go:49
06:26:52   INFO   malware-guard Killing 733:/usr/bin/python3::/usr/bin/python3 /usr/bin/networkd-dispatcher --run-startup-triggers malware-guard.go:37
06:26:52   INFO   malware-guard Killing 772:polkitd::/usr/lib/policykit-1/polkitd --no-debug malware-guard.go:37
06:26:57   INFO   malware-guard Killing 733:/usr/bin/python3::/usr/bin/python3 /usr/bin/networkd-dispatcher --run-startup-triggers malware-guard.go:37
06:26:57   INFO   malware-guard Killing 772:polkitd::/usr/lib/policykit-1/polkitd --no-debug malware-guard.go:37
06:27:02   INFO   malware-guard Killing 733:/usr/bin/python3::/usr/bin/python3 /usr/bin/networkd-dispatcher --run-startup-triggers malware-guard.go:37
06:27:02   INFO   malware-guard Killing 772:polkitd::/usr/lib/policykit-1/polkitd --no-debug malware-guard.go:37
06:27:07   INFO   malware-guard Killing 733:/usr/bin/python3::/usr/bin/python3 /usr/bin/networkd-dispatcher --run-startup-triggers malware-guard.go:37
06:27:07   INFO   malware-guard Killing 772:polkitd::/usr/lib/policykit-1/polkitd --no-debug malware-guard.go:37
06:27:12   INFO   malware-guard Killing 733:/usr/bin/python3::/usr/bin/python3 /usr/bin/networkd-dispatcher --run-startup-triggers malware-guard.go:37
06:27:12   INFO   malware-guard Killing 772:polkitd::/usr/lib/policykit-1/polkitd --no-debug malware-guard.go:37
06:27:17   INFO   malware-guard Killing 733:/usr/bin/python3::/usr/bin/python3 /usr/bin/networkd-dispatcher --run-startup-triggers malware-guard.go:37
06:27:17   INFO   malware-guard Killing 772:polkitd::/usr/lib/policykit-1/polkitd --no-debug malware-guard.go:37
06:27:18   INFO           node advertising fmi4kYtTp9789G3sCRgMZVG7D3uKalwtCuWw1j8LSPHQEGVBU5hfbNdnHvt3kyR1fYUlGNAO0zactmIMIZodsOha9tnfe25Xef1 discovery.go:104
06:27:18   INFO    filetransfer HTTP server listening on [::]:41951 http-server.go:74
06:27:21   INFO    filetransfer Serving file storm_linux-386 (7555610 bytes) with sha256 134e53d82a09ba671b7314f68b5d489ff1c572fcc7b155224b6e84c19eaf2d9f
 server.go:159
06:27:21 WARNING    filetransfer remove /tmp/storm: no such file or directory persistence_unix.go:42
06:27:21   INFO           node advertising stfadv:134e53d82a09ba671b7314f68b5d489ff1c572fcc7b155224b6e84c19eaf2d9f discovery.go:104
06:27:21  ERROR    filetransfer You must have root user privileges. Possibly using 'sudo' command should help persistence_unix.go:105
06:27:21   INFO    filetransfer Service remove status: Removing storm:                                [FAILED] persistence_unix.go:107
06:27:21  ERROR    filetransfer You must have root user privileges. Possibly using 'sudo' command should help persistence_unix.go:111
06:27:21   INFO    filetransfer Service install status: Install storm:                                [FAILED] persistence_unix.go:113
06:27:21  ERROR    filetransfer You must have root user privileges. Possibly using 'sudo' command should help persistence_unix.go:117
06:27:21   INFO    filetransfer Service start status: Starting storm:                                 [FAILED] persistence_unix.go:119
06:27:21   INFO    filetransfer Started storm in another process: 14659 persistence_unix.go:88
```

IPStorm Linux output non-privileged user.

Linux vs. Windows Comparison

Comparing IPStorm **Linux version 0.2.05a** to **Windows version 0.0.2m**, it became clear the developer added features and altered existing ones to attack Linux platforms.

Packages Comparison

The malware is composed of different Golang packages with each package providing a different feature. The following table categorizes package comparisons between the two versions:

Golang Package	Functionality	Linux Version Version 0.2.05a (2020)	Windows Version Version 0.0.2m (2019)
scan_tools	Scans for potential victims	+	–
web_api_client	Handles HTTP requests and responses	+	–
p2p (part of the web API)	HTTP over P2P	+	–
reque_client	Handles the communication of peers in the network	+	–
commander	Handles HTTP requests	+	–
starter	Implements the main logic of the malware (basically the “main function”)	+	–
malware-guard	Antivirus evasion	+	–
avbypass	Antivirus evasion	–	+
backshell	In charge of the reverse shell	+	+
ddb	Database	+	+
filetransfer	Persistence and managing file transfering to other peers	+	+
logging	Output log	+	+
node	Responsible for advertising the node, getting the external IP, and maintaining connection with other nodes.	+	+

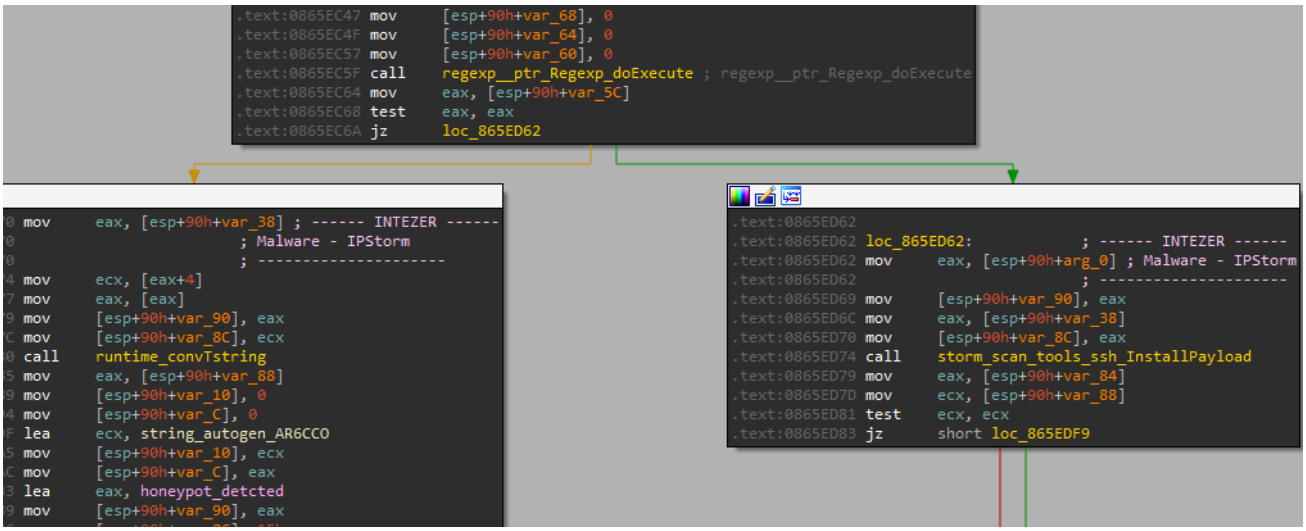
powershell	In Windows, in charge of the powershell artifact in the backdoor. In the Linux variant, the package has only one function copied from the Windows version and is used for achieving reverse shell.	+	
util	Utility functions	+	+
ddbinterface	DB functions	+	+
proxy	Implements Socks5 Proxy	+	+

Note: We compared **Linux version 0.2.05a** to **Windows version 0.0.2m** which was analyzed in Anomali's report. However, the malware is frequently being updated and we have observed multiple different versions since, so functionalities may differ between them.

Features Comparison

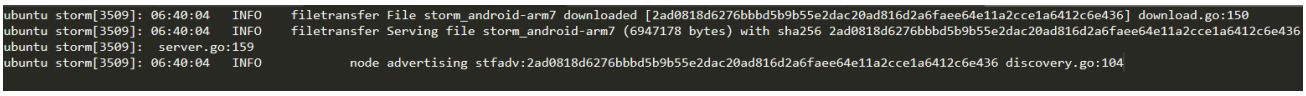
Scanning tools – Android and SSH brute-force

The Linux variant attempts to spread and infect other victims on the internet by using SSH brute-force. Once a connection is established, the malware will check if the victim server is a honeypot by comparing the hostname of the attacked server to the string "svr04", which is the default hostname of Cowrie SSH honeypot. If the malware identifies a honeypot it will close the connection, otherwise it will proceed to download the payload and infect the server.



Validation of whether the server is a honeypot or not.

Another spreading method that is unique to the Linux version is searching for potential Android victims. The malware checks for devices connected with ADB (Android Debug Bridge) to the victim node. Once identified, it will upload an Android version of IPStorm to the device, which was previously downloaded from the P2P network.



Screen capture from the log of the storm service showing the downloaded file.

Antivirus Evasion

Both IPStorm Windows and Linux versions implement features related to detection evasion and each variant uses a different technique. In the Linux version, the package in charge of this logic is called ***storm_malware_guard***. The file iterates through all current running processes in order to find and terminate ones that might detect the malware's activity.

The function under the ***storm_malware_guard*** package that implements this technique is called ***KillSuspiciousProcesses***. Other functions in this package are responsible for obtaining information about the CPU and memory usage, number of I/O ports, and functions that return information about processes and threads.

In the Windows version, the AV evasion logic is implemented in a package called ***avbypass***.

This technique is based on random sleep times and multiple function calls. The purpose of this method is to make tracing the original process harder for Antivirus solutions.

It appears that due to the different operating systems, each IPStorm version has its own way to evade detection.

Reverse Shell

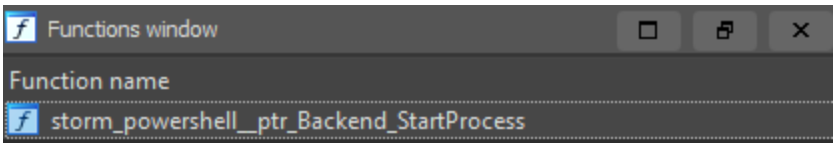
Both IPStorm versions use the name backshell to refer to the feature of reverse shell.

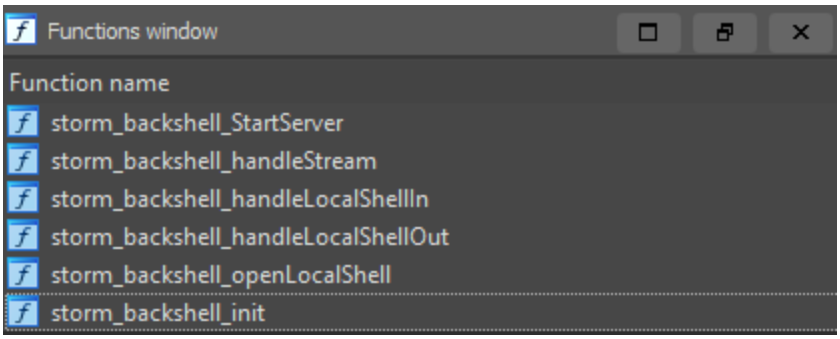
The backshell functions of the Linux variant are identical to those of the Windows variant.

The Windows variant has a package called **powershell** which contains functions for achieving reverse shell. The same package is present in the Linux variant but it contains only one function: **storm_powershell__ptr_Backend_StartProcess**. The function is used to get a reverse shell on the infected system.

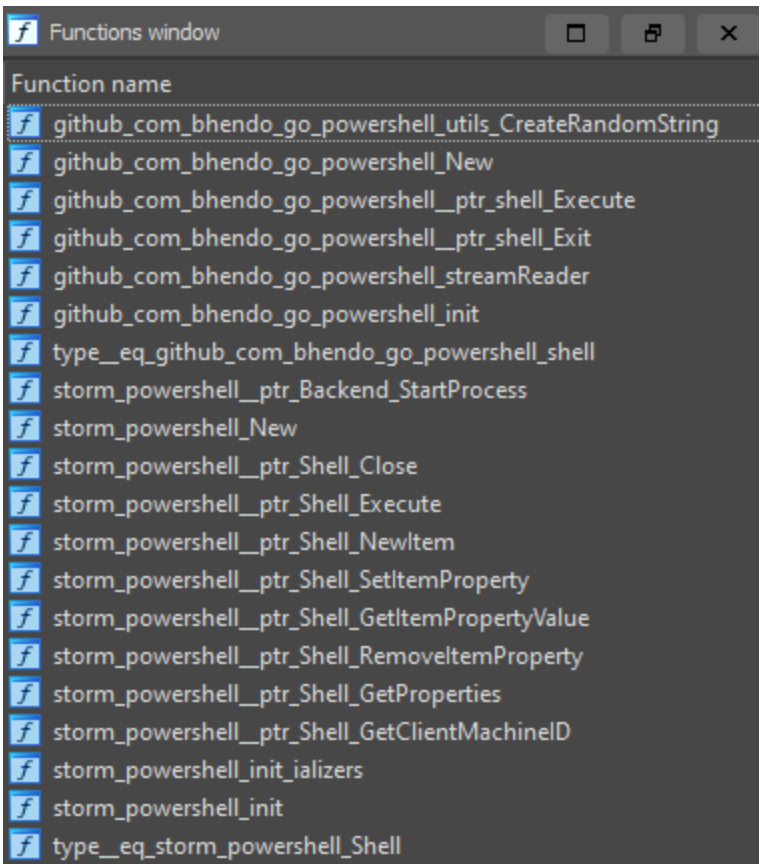
The implementation of the reverse shell is a clear example of the code reuse connections between the two IPStorm variants. The screengrabs below demonstrate changes in the file names and the identical function names found in the two versions:

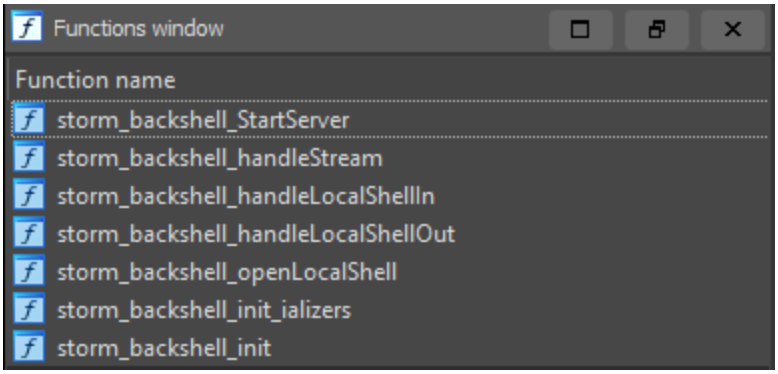
Linux:





Windows:





Persistence

The Linux version will attempt to gain persistence only if it was executed with root privileges. The Windows version, on the other hand, will always look to gain persistence. It

is evident that each variant of the malware, Linux and Windows, uses a different technique to gain persistence since the operating systems they target are fundamentally different.

The Windows variant achieves persistence by copying itself to a random location and adding the program to the:
HKCU:SoftwareMicrosoftWindowsCurrentVersionRunregistry key.

The Linux version achieves persistence by creating a **systemd** service under /etc/systemd/system/storm.service.

```
[Unit]
Description=storm
Requires=
After=

[Service]
PIDFile=/var/run/storm.pid
ExecStartPre=/bin/rm -f /var/run/storm.pid
ExecStart=/usr/bin/storm
Restart=on-failure

[Install]
WantedBy=multi-user.target
```

/etc/systemd/system/storm.service

```
.text:08469240
.text:08469240
.text:08469240 ; storm_filetransfer__ptr_File_Persist
.text:08469240 storm_filetransfer__ptr_File_Persist proc near
.text:08469240
.text:08469240 var_84= dword ptr -84h
.text:08469240 var_80= dword ptr -80h
.text:08469240 var_7C= dword ptr -7Ch
.text:08469240 var_78= dword ptr -78h
.text:08469240 var_74= dword ptr -74h
```

The function that archives persistence in the Linux variant.

Another difference is the location to which the file is copied. The Windows variant uses random file paths while the Linux version uses fixed paths.

Network Traffic
On top of creating a reverse shell, we have detected that IPStorm's Linux variant takes advantage of its being widespread to perform different fraudulent activity in the background,

abusing gaming and ads monetization. Because it's a botnet, the malware utilizes the large amount of requests from different trusted sources, thus not being blocked nor traceable. This activity was not observed in the Windows variant.

Steam Gaming Fraud

Steam is a popular gaming service from Valve Corporation and is used by hundreds of millions users worldwide. It also provides an API for developers who want to use Steam data on their own websites.

As part of the monetization process for game developers, Steam users can buy and sell different items such as equipment, skins, and other in-game elements. This platform is so popular that it has become a hot target for cybercriminals. A known method used by attackers is creating phishing websites to lure users to submit their Steam login credentials. With access to a user's credentials the attacker has full access to the the account, API key included.

We noticed IPStorm generates a large amount of traffic to Steam's API, querying data pertaining to various Steam users and using multiple valid API keys.

```
HTTP/1.1 200 OK  (application/json)
GET /ISteamUser/GetPlayerSummaries/v2/?key=[redacted]
HTTP/1.1 200 OK  (application/json)
GET /IPlayerService/GetSteamLevel/v1/?key=[redacted]
HTTP/1.1 200 OK  (application/json)
GET /ISteamUser/GetPlayerSummaries/v2/?key=[redacted]
HTTP/1.1 200 OK  (application/json)
GET /ISteamUser/GetPlayerSummaries/v2/?key=[redacted]
HTTP/1.1 200 OK  (application/json)
GET /IPlayerService/GetCommunityBadgeProgress/v1/?
HTTP/1.1 200 OK  (application/json)
GET /ISteamUser/GetPlayerSummaries/v2/?key=[redacted]
HTTP/1.1 200 OK  (application/json)
GET /ISteamUser/GetPlayerSummaries/v2/?key=[redacted]
HTTP/1.1 200 OK  (application/json)
GET /ISteamUser/GetPlayerSummaries/v2/?key=[redacted]
HTTP/1.1 200 OK  (application/json)
GET /ISteamUser/GetPlayerSummaries/v2/?key=[redacted]
HTTP/1.1 200 OK  (application/json)
GET /IPlayerService/GetCommunityBadgeProgress/v1/?
HTTP/1.1 200 OK  (application/json)
GET /IPlayerService/GetCommunityBadgeProgress/v1/?
HTTP/1.1 200 OK  (application/json)
GET /ISteamUser/GetPlayerSummaries/v2/?key=[redacted]
HTTP/1.1 200 OK  (application/json)
```

We suspect these are stolen accounts that are being monitored as part of a fake trade scam. Browse here for more information about this scam.

Ad Fraud

The malware generates requests which imitate fake advertisements clicks. All the ads we have traced are related to pornographic websites. The malware crawls through different predefined sites, searches for advertisement iframes, and imitates a user “click” by

browsing through the iframes.

```
GET /ads-iframe-display.php?
idzone=2898530&type=300x250&p=1&dt=1600942146388&sub=&tags=&screen_resolutio
n=1280x1024&el=%22 HTTP/1.1
Accept: text/html,application/xhtml+xml,application/xml;q=0.9,*/*;q=0.8
Referer: http://a.xxe2.com/api/spots/41050?p=1
User-Agent: Mozilla/5.0 (Windows NT 10.0; WOW64) AppleWebKit/537.36 (KHTML,
like Gecko) Chrome/56.0.2924.87 Safari/537.36
Cookie:
impressions=x%9C%ABV210%B6042%D25165%B1%B00%B5P%B2%8A6%D41430%B041201%D1Q241
1P%8A%AD%05%00%BF%CD%09%01;
tag=v3%7C52.232.68.130%7CNLD%7C3981550%7C43548858%7C0%7C%7C508%7C41%7C2%7C40
%7C0%7C0%7C0%7C346%7C2749879%7C2759794%7C0%7C0%7C2%7C2%7C0%7C0%7C1%7C0%7C0%7
C1%7C%7C%7C0%7Citalian-porn.net%7C%7C%7C0%7C0%7C0%7C56%7C0%7C0%7Cok; exo-
splash-i=0;
__uvt=a%3A1%3A%7Bi%3A0%3Bs%3A33%3A%225f6c6fdc0d47b5.489690013603344063%22%3B
%7D
Connection: Keep-Alive
Accept-Encoding: gzip
Accept-Language: en-US,*
Host: syndication.realsrv.com
```

Example of a request the malware generates to an ad platform.

Protocol	Length	Info
DNS	83	Standard query 0x4588 AAAA promo-bc.com OPT
DNS	83	Standard query 0x82eb A promo-bc.com OPT
DNS	164	Standard query response 0xa73e AAAA www.wetclassicporn.com SOA ns1.wetclassicporn.com OPT
DNS	129	Standard query response 0x6dab A www.wetclassicporn.com A 109.206.164.168 OPT
DNS	160	Standard query response 0x4588 AAAA promo-bc.com SOA ns1.gnsbc.com OPT
DNS	119	Standard query response 0x82eb A promo-bc.com A 185.75.253.87 OPT
DNS	90	Standard query 0x2c4d AAAA www.vintagewiki.com OPT
DNS	90	Standard query 0xbce8 A www.vintagewiki.com OPT
DNS	86	Standard query 0x3f64 AAAA www.pornhub.com OPT
DNS	86	Standard query 0x531f A www.pornhub.com OPT
DNS	126	Standard query response 0xbce8 A www.vintagewiki.com A 213.174.132.102 OPT
DNS	156	Standard query response 0x2c4d AAAA www.vintagewiki.com SOA ns1.vintagewiki.com OPT
DNS	89	Standard query 0x7dfa AAAA cdn.tsyndicate.com OPT
DNS	89	Standard query 0xeb90 A cdn.tsyndicate.com OPT
DNS	136	Standard query response 0x531f A www.pornhub.com CNAME pornhub.com A 66.254.114.41 OPT

Websites the malware crawls through.

IPStorm Detection and Response

Compromised System Detection

You can take the following steps to check if your system has been attacked by the IPStorm malware.

Check if the process of IPStorm is running on your system.
Run: **pstree | grep storm**

```
roota@ubuntu:~$ pstree | grep storm
        |-storm---6*[{storm}]
        |         |-storm---7*[{storm}]
```

IPStorm will usually run with multiple threads.

Check the services that run on your system, since if the malware was executed with root privileges it would create a service for persistence.
Run: **sudo systemctl status strom.service**

```
roota@ubuntu:~$ sudo systemctl status storm.service
● storm.service - storm
   Loaded: loaded (/etc/systemd/system/storm.service; enabled; vendor preset: enabled)
   Active: active (running) since Thu 2020-10-01 02:08:38 PDT; 28min ago
  Process: 9369 ExecStartPre=/bin/rm -f /var/run/storm.pid (code=exited, status=0/SUCCESS)
 Main PID: 9370 (storm)
    Tasks: 7 (limit: 1085)
   CGroup: /system.slice/storm.service
           └─9370 /usr/bin/storm
```

Check if IPStorm's files exist in your system.
Run: **sudo find / -name "storm*" -type f**

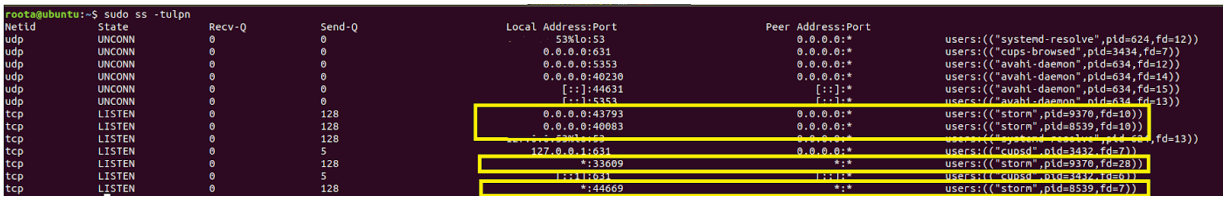
- In case of a non-root execution the output will look similar to the screen capture below:

```
roota@ubuntu:~$ sudo find / -name "storm*" -type f
/tmp/storm
/tmp/storm.key
```

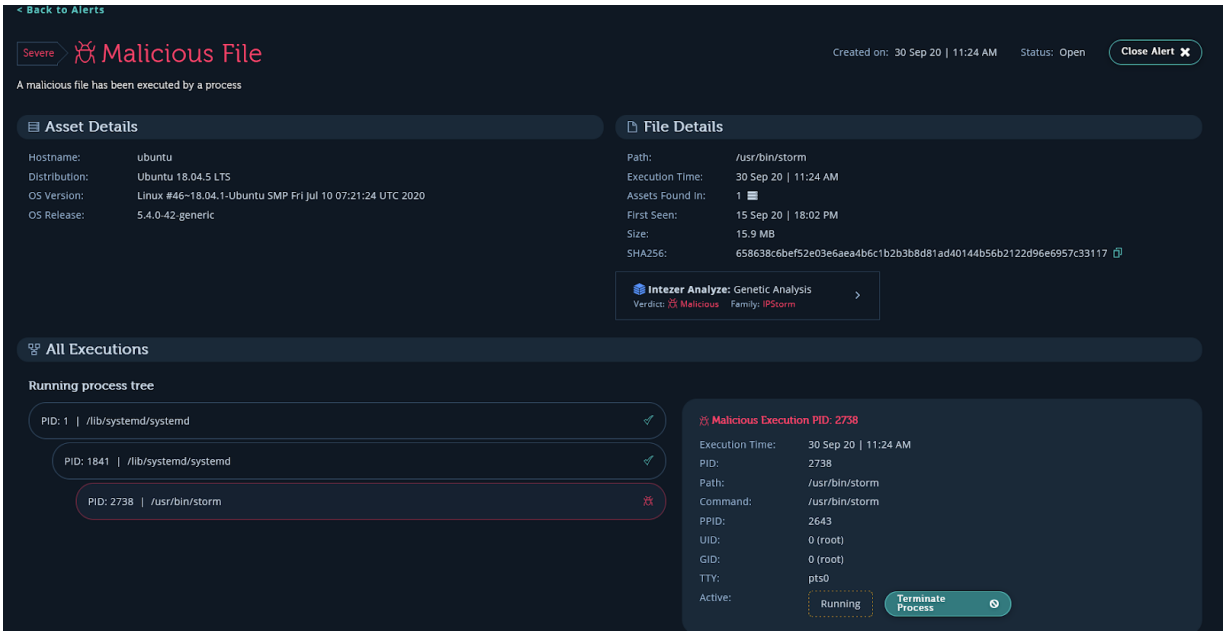
- If the malware was executed with root privileges, the output will look similar to the screen capture below:

```
roota@ubuntu:~$ sudo find / -name "storm*" -type f
/etc/storm.key
/etc/systemd/system/storm.service
/usr/bin/storm
find: '/run/user/1000/gvfs': Permission denied
```

Check the open ports on your system and the processes that are associated with them. Run: **sudo ss -tulpn**
In the screen capture below a number of processes that belong to the IPStorm malware listen on specific ports.



Use freely the Intezer Protect community beta to identify which process is running on your system. The screen capture below is taken from the alert of IPStorm executed on a server. The info provided by the system includes the malware family name, full path of the executable, the process ID, execution time, and a link to Intezer Analyze where you can observe code reuse prevalent in this malware.



How to Terminate IPStorm on a Compromised System

- If the malware runs as a service you should stop the service by executing the command:
  sudo systemctl stop storm.service
- Delete all the files that are related to the IPStorm malware. The file paths are mentioned in the previous section.
- Kill the process by running: **sudo pkill -9 storm**

Response

We are providing a YARA rule intended to be run against in-memory artifacts in order to be able to detect these implants.

System Security Hardening

- Make sure your SSH connection is secured. Use a key instead of a password or use multi-factor authentication. Browse here for more tips about SSH hardening.
- Make sure your system is updated to the latest software and aligned with most recent security best practices.
- Use a runtime cloud workload protection solution such as Intezer Protect. Protect provides full runtime visibility over the code in your system and alerts on any suspicious or unauthorized code that deviates from the secure baseline.

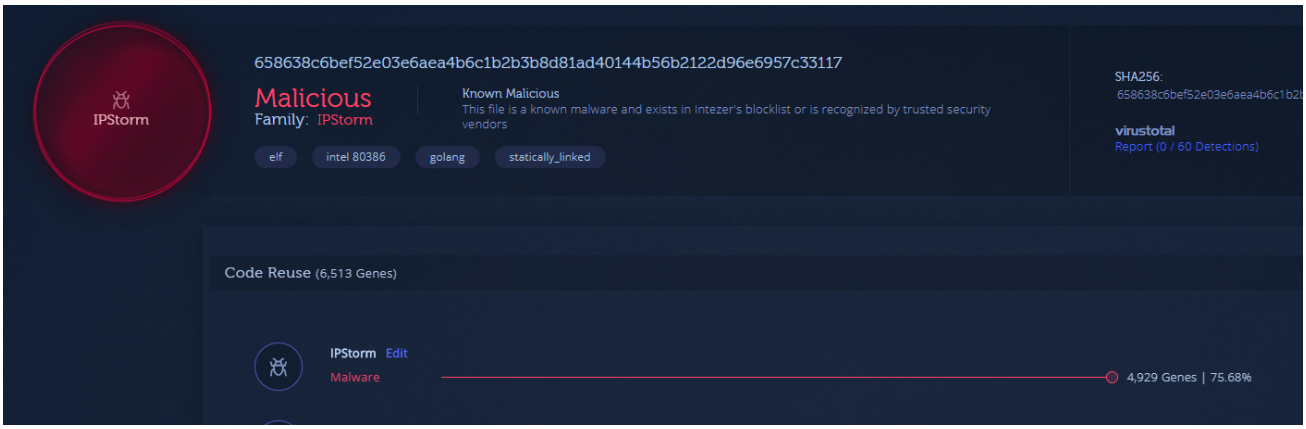
Summary

IPStorm now with Linux malware is the latest example of a cross-platform malware developed in Golang. Platforms that are compromised by IPStorm are not only exposed to a backdoor to their services but are also added to the IPStorm Botnet which attempts to spread to other victims. The attackers behind IPStorm are very active evidenced by the frequent release of updated versions with new features and improvements, as well as the expansion to several different platforms and architectures.

IPStorm is part of a growing list of Golang ELF malware that have been spotted attacking live servers in the past six months alone, together with Kaiji, Kinsing, and FritzFrog.

We want to give a special thanks to Paul Litvak and Michael Kajiloti for their help contributing to this analysis.

Both IPStorm Linux and Windows samples are indexed in Intezer Analyze and you can detect this and other cross-platform malware with the code reuse feature for Golang, just by uploading a file or hash to the system. Below is the analysis of one of the Linux samples.



Subscribe to our weekly threat feed to receive the latest low-detected Linux threat hashes.

IOCs

Linux

3aff4695c73709e2e0e55665c4850aa45064723a2c83e75325b27e77ec5f6d97

b80346c4d31d77fba9427024d34af2f43e64a5272b5bbef28c6bf045a06143ff

d233c37f2d49badbf53d054bce7fb8e787c9973067e8dcd79835d7816aacfa43

658638c6bef52e03e6aea4b6c1b2b3b8d81ad40144b56b2122d96e6957c33117

bfb69eadee1918a9402478c76dd15696bbac3e3e3e57c9a94c7d51e594b8c657

64abc2cf5866e932b0731a6deb487aa3d9756724250de26bac2fb930cd478dc0

52f215521ba59cb6a51314bd1527f1c540ffc04df924ad971ca2160405879778

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cae8a782765dd0f97e7a812a245cc5b94b3179ced9c8181d0fda13978c9f17be

5103133574615fb49f6a94607540644689be017740d17005bc08b26be9485aa7

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984c5e980fb8a5b7bbc673f923f22ddf06c5dd89fcd0acf774d79d4d193b44c8

591770835066958e912ceb445bd865e961ac946e8cf70ced9f0bd75c851d9478

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f4f1fb65df80666fe67b22b84d9d8f967449d1249c33ad97f4305784fa41e747

ef226de8cc53e59c9431838085f3bbd1b8a32f7cc135682033a3fdba19a0ee97

dfeecdd23f28f80e42e58c87c9a4858648964b3100dfb899c61b54aed7856cf7

db9c95bdc4247ff6cdaf8a8e47b4add21a730461d8f6e2693136aecd346b3fb5

b4c75e1d94bc4c8affd6d9f433585ace2738772e6a04403ab67cce3df9574068

b07c2dfb4c57175446b6188bb4b1722272f63a301f18c5f46ee6401347894fea

a5468b6130d90bc74cf8e458297f6d4c7fc42b87184623aefd535bca658542ed

7c41de95313dc98a3fc4f6fe3910759c3561743dacc629dab11e754290f8c7aa

7b044b8eddd20d8e1c7d499a6c34b1bc373f5fe9d59bab7b4e3a341a5f4ce0b5

79ec318a968679f94d2ab0ba15daaeeb71406d2f744eb0cd1b314c4bb403114d

52b081dbaafbbae8ad812f9c50a1a5f7d8b0850b3c6dc69eccb3322f34286c2e

50406ec7fa22c78e9b14da4ccc127a899db21f7a23b1916ba432900716e0db3d

1d0e003ee653d1a7b80ff5e69c33689af04e45fc836a29e0853219dd100fd534

16bcb323bfb464f7b1fcfb7530ecb06948305d8de658868d9c3c3c31f63146d4

macOS

522a5015d4d11833ead6d88d4405c0f4119ff29b1f64b226c464e958f03e1434

Nicole Fishbein
Nicole is a malware analyst and reverse engineer. Prior to Intezer she was an embedded researcher in the Israel Defense Forces (IDF) Intelligence Corps.

Avigayil Mechtinger
Avigayil is a product manager at Intezer, leading Intezer Analyze product lifecycle. Prior to this role, Avigayil was part of Intezer's research team and specialized in malware analysis and threat hunting. During her time at Intezer, she has uncovered and documented different malware targeting both Linux and Windows platforms.