



Malware Analysis Report

Clop Ransomware

December 6 | BY Fahad Ali | v1.0



Table of Contents

Table of Contents	2
Executive Summary	3
Programme Flow:.....	4
TTPS:	5
LIST OF TOOLS USED	6
Basic Static Analysis	7
Basic Dynamic Analysis	12
Advanced Static Analysis	18
Advanced Dynamic Analysis	23

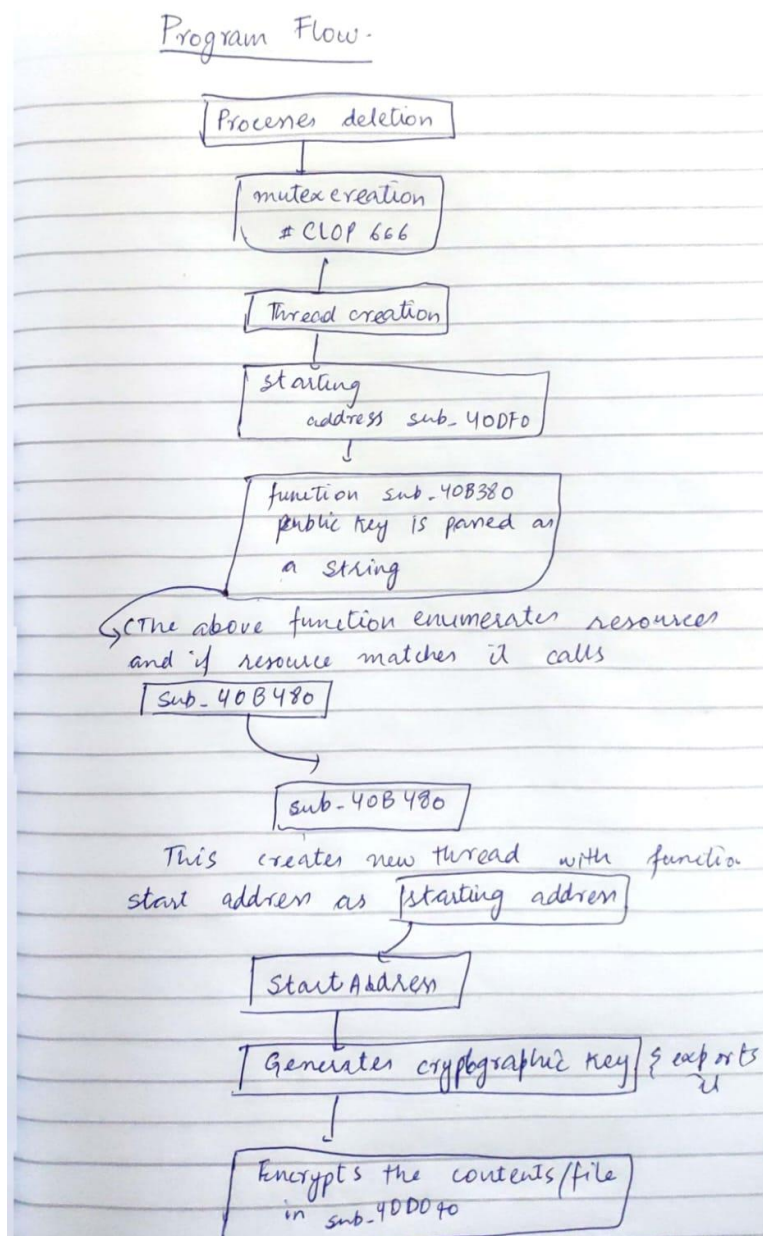
Executive Summary

SHA256 HASH	3320f11728458d01eef62e10e48897ec1c2277c1fe1aa2d471a16b4dcc fc1207
----------------	--

Clop Ransomware belonging to a popular Crypto mix ransomware family is a dangerous file encrypting virus which actively avoids the security unprotected system and encrypts the saved files by planting the .Clop extension. It exploits AES cipher to encrypt pictures, videos, music, databases papers, and attach .CLOP or .CIOP file extension, which prevents victims from accessing personal data. For example, "sample.jpg" is renamed to "sample.jpg.Clop". Recently, Clop ransomware has been associated with cybercriminals who have been using Accellion File Transfer Appliance (FTA) vulnerabilities: CVE-2021-27101, CVE-2021-27102, CVE-2021-27103, and CVE-2021-27104. The exploitation of these flaws led to the compromise of high-profile organizations starting in February. Also, there has been evidence of an affiliate utilizing a webshell dubbed DEWMODE that was being used to steal data from Accellion FTA devices.



Programme Flow:





TTPS:

Attack Segment	Initial Access	Execution	Persistence	Privilege Escalation	Defense Evasion	Credential Access	Discovery	Lateral Movement	Collection	Command and Control	Exfiltration	Impact
Content Injection	Client Administration Command	Account Manipulation	Account Manipulation	Account Manipulation	Account Manipulation	Account Manipulation	Account Discovery	Exploitation of Remote Services	Adversary in the Middle	Application Layer Protocol	Automated Exfiltration	Account Access Removal
Directory Compromise	Directory Compromise	Directory Compromise	Directory Compromise	Directory Compromise	Directory Compromise	Directory Compromise	Directory Compromise	Directory Compromise	Directory Compromise	Directory Compromise	Directory Compromise	Directory Compromise
Explicit Public Facing Application	Explicit Public Facing Application	Explicit Public Facing Application	Explicit Public Facing Application	Explicit Public Facing Application	Explicit Public Facing Application	Explicit Public Facing Application	Explicit Public Facing Application	Explicit Public Facing Application	Explicit Public Facing Application	Explicit Public Facing Application	Explicit Public Facing Application	Explicit Public Facing Application
External Remote Services	External Remote Services	External Remote Services	External Remote Services	External Remote Services	External Remote Services	External Remote Services	External Remote Services	External Remote Services	External Remote Services	External Remote Services	External Remote Services	External Remote Services
Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware
Additions	Additions	Additions	Additions	Additions	Additions	Additions	Additions	Additions	Additions	Additions	Additions	Additions
Phishing	Phishing	Phishing	Phishing	Phishing	Phishing	Phishing	Phishing	Phishing	Phishing	Phishing	Phishing	Phishing
Supply Chain Compromise	Supply Chain Compromise	Supply Chain Compromise	Supply Chain Compromise	Supply Chain Compromise	Supply Chain Compromise	Supply Chain Compromise	Supply Chain Compromise	Supply Chain Compromise	Supply Chain Compromise	Supply Chain Compromise	Supply Chain Compromise	Supply Chain Compromise
Trusted Relationship	Trusted Relationship	Trusted Relationship	Trusted Relationship	Trusted Relationship	Trusted Relationship	Trusted Relationship	Trusted Relationship	Trusted Relationship	Trusted Relationship	Trusted Relationship	Trusted Relationship	Trusted Relationship
Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts
Shared Modules	Shared Modules	Shared Modules	Shared Modules	Shared Modules	Shared Modules	Shared Modules	Shared Modules	Shared Modules	Shared Modules	Shared Modules	Shared Modules	Shared Modules
Software Deployment Tools	Software Deployment Tools	Software Deployment Tools	Software Deployment Tools	Software Deployment Tools	Software Deployment Tools	Software Deployment Tools	Software Deployment Tools	Software Deployment Tools	Software Deployment Tools	Software Deployment Tools	Software Deployment Tools	Software Deployment Tools
System Services	System Services	System Services	System Services	System Services	System Services	System Services	System Services	System Services	System Services	System Services	System Services	System Services
User Execution	User Execution	User Execution	User Execution	User Execution	User Execution	User Execution	User Execution	User Execution	User Execution	User Execution	User Execution	User Execution
Power Settings	Power Settings	Power Settings	Power Settings	Power Settings	Power Settings	Power Settings	Power Settings	Power Settings	Power Settings	Power Settings	Power Settings	Power Settings
Pre-OS Boot	Pre-OS Boot	Pre-OS Boot	Pre-OS Boot	Pre-OS Boot	Pre-OS Boot	Pre-OS Boot	Pre-OS Boot	Pre-OS Boot	Pre-OS Boot	Pre-OS Boot	Pre-OS Boot	Pre-OS Boot
Scheduled Tasks	Scheduled Tasks	Scheduled Tasks	Scheduled Tasks	Scheduled Tasks	Scheduled Tasks	Scheduled Tasks	Scheduled Tasks	Scheduled Tasks	Scheduled Tasks	Scheduled Tasks	Scheduled Tasks	Scheduled Tasks
Server Software Component	Server Software Component	Server Software Component	Server Software Component	Server Software Component	Server Software Component	Server Software Component	Server Software Component	Server Software Component	Server Software Component	Server Software Component	Server Software Component	Server Software Component
Traffic Signaling	Traffic Signaling	Traffic Signaling	Traffic Signaling	Traffic Signaling	Traffic Signaling	Traffic Signaling	Traffic Signaling	Traffic Signaling	Traffic Signaling	Traffic Signaling	Traffic Signaling	Traffic Signaling
Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts	Valid Accounts



LIST OF TOOLS USED

1. Basic static analysis

- Strings and Floss
- PE-View
- PE-Studio
- Capa

2. Basic Dynamic Analysis

- Wireshark
- Process Hacker
- Procmon

3. Advanced Static Analysis

- Cutter
- Ida Pro

4. Advanced Dynamic Analysis

- X32dbg



Basic Static Analysis

PE-View and PE-Studio:

PE-Studio

pestudio 9.15 - Malware Initial Assessment - www.winitor.com [c:\users\husky\desktop\3320f11728458d01eef62e10e48897ec1c2277c1fe1aa2d471a16b4dccfc1207.exe]

file settings about

c:\users\husky\desktop\3320f11728458d01eef62e10e48897ec1c2277c1fe1aa2d471a16b4dccfc1207.exe

- indicators (39)
- virustotal (warning)
- dos-header (64 bytes)
- dos-stub (192 bytes)
- rich-header (12)
- file-header (Feb.2019)
- optional-header (GUI)
- directories (6)
- sections (file)
- libraries (blacklist) *
- imports (149) *
- exports (n/a)
- tls-callbacks (n/a)
- resources (unknown) *
- strings (1628)
- debug (PGO)
- manifest (asInvoKer)
- version (n/a)
- certificate (n/a)
- overlay (n/a)

property	value
md5	8752A7A052BA75239B86B0DA1D483DD7
sha1	6EEEF883D209D02A05AE9E6A2F37C6CBF69F4D89
sha256	3320F11728458D01EEF62E10E48897EC1C2277C1FE1AA2D471A16B4DCCFC1207
md5-without-overlay	n/a
sha1-without-overlay	n/a
sha256-without-overlay	n/a
first-bytes-hex	4D 5A 90 00 03 00 00 00 04 00 00 00 FF FF 00 00 B8 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
first-bytes-text	M Z
file-size	102912 (bytes)
size-without-overlay	n/a
entropy	6.080
imphash	117E13D006A6767ED68A883857EC6B70
signature	Microsoft Visual C++ 8
entry-point	E8 90 03 00 00 E9 8E FF FF 55 8B EC 6A 00 FF 15 90 E1 40 00 FF 75 08 FF 15 8C E1 40 00 68 09 04
file-version	n/a
description	n/a
file-type	executable
cpu	32-bit
subsystem	GUI
compiler-stamp	0x5C59D4CE (Tue Feb 05 10:24:14 2019)
debugger-stamp	0x5C59D4CE (Tue Feb 05 10:24:14 2019)
resources-stamp	0x00000000 (empty)
import-stamp	0x00000000 (empty)
exports-stamp	n/a
version-stamp	n/a
certificate-stamp	n/a

sha256: 3320F11728458D01EEF62E10E48897EC1C2277C1FE1AA2D471A16B4DCCFC1207 cpu: 32-bit file-type: executable subsystem: GUI entry-point: 0x00001237

Clop Ransomware



Capa:

MBC Objective	MBC Behavior
CRYPTOGRAPHY	Decrypt Data [C0031] Encrypt Data::RC4 [C0027.009] Encrypt Data [C0027] Generate Pseudo-random Sequence::RC4 PRGA [C0021.004]
DATA	Encoding::XOR [C0026.002]
DEFENSE EVASION	Obfuscated Files or Information::Encoding-Standard Algorithm [E1027.m02]
FILE SYSTEM	Delete File [C0047] Read File [C0051] Set File Attributes [C0050] Write File [C0052]
PROCESS	Allocate Thread Local Storage [C0040] Check Mutex [C0043] Create Mutex [C0042] Create Thread [C0038] Set Thread Local Storage Value [C0041] Terminate Process [C0018]


CAPABILITY	NAMESPACE
decode data using Base64 via WinAPI	data-manipulation/encoding/base64
encode data using XOR (2 matches)	data-manipulation/encoding/xor
encrypt or decrypt via WinCrypt	data-manipulation/encryption
encrypt data using RC4 PRGA	data-manipulation/encryption/rc4
contain a resource (.rsrc) section	executable/pe/section/rsrc
extract resource via kernel32 functions	executable/resource
accept command line arguments	host-interaction/cli
query environment variable	host-interaction/environment-variable
get common file path	host-interaction/file-system
delete file	host-interaction/file-system/delete
enumerate files recursively (2 matches)	host-interaction/file-system/files/list
set file attributes	host-interaction/file-system/meta
move file	host-interaction/file-system/move
read file	host-interaction/file-system/read
write file (7 matches)	host-interaction/file-system/write
get disk information	host-interaction/hardware/storage
check mutex and exit	host-interaction/mutex
enumerate network shares	host-interaction/network
allocate thread local storage (2 matches)	host-interaction/process
get thread local storage value	host-interaction/process
set thread local storage value (2 matches)	host-interaction/process
enumerate processes	host-interaction/process/list
terminate process (5 matches)	host-interaction/process/terminate
terminate process via fastfail (4 matches)	host-interaction/process/terminate
create thread (6 matches)	host-interaction/thread/create
link function at runtime	linking/runtime-linking
parse PE header (3 matches)	load-code/pe

Clop Ransomware



VIRTUAL TOTAL RESULT

The scanned results display the number of antivirus engines that detect the sample as malicious and the total number of engines that analyzed it.

 3320f11728458d01eef62e10e48897ec1c2277c1fe1aa2d471a16b4dccfc1207

62
/ 72

Community Score

62 security vendors and 4 sandboxes flagged this file as malicious

Reanalyze Similar More

3320f11728458d01eef62e10e48897ec1c2277c1fe1aa2d471a16b4dccfc1207

Size: 100.50 KB | Last Analysis Date: 11 days ago

EXE

peexe checks-cpu-name runtime-modules detect-debug-environment long-sleeps direct-cpu-clock-access checks-user-input checks-usb-bus

DETECTION

DETAILS

RELATIONS

BEHAVIOR

COMMUNITY 21 +

Join the VT Community and enjoy additional community insights and crowdsourced detections, plus an API key to automate checks.

Popular threat label ransomware.clop/encoder

Threat categories ransomware trojan

Family labels clop encoder hydracrypt

Security vendors' analysis

Do you want to automate checks?

AhnLab-V3	Trojan:Win32.ClopRansom.R356895	Alibaba	Trojan:Win32/Clop.ali1000152
ALYac	Trojan.Ransom.Filecoder	Antiy-AVL	Trojan[Ransom]/Win32.Ta505
Arcabit	Generic.Ransom.Clop.A771CD1F	Avast	Win32:Malware-gen
AVG	Win32:Malware-gen	Avira (no cloud)	TR/AD.Nekark.iemki
BitDefender	Generic.Ransom.Clop.A771CD1F	BitDefender Theta	Gen:NN.ZexaF.36792.gyW@aaF7llpi
Bkav Pro	W32.Common.FEDBF8B1	CrowdStrike Falcon	Win/malicious_confidence_100% (W)

Clop Ransomware



Strings and Floss Output

Interesting Strings	<p>BEGIN PUBLIC KEY----- MIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQCpEnzYAtPzcmKn w41bLkkkDDmZ 1YB4weOpyx0IY8gVl0gvveTMKhmhYNzjc5uQfXH3fbGmbbdELLe/u7Ysd XkuNHRQ ThnFfs+q7Slw1nibfYa4c9KA4ftfr69dZTt4T/RzRzsiSVNU1Q6me59k9bBq xgiy DRjJhl79BT65Ggn+uQIDAQAB -----END PUBLIC KEY----- Clomp //...// 1234567890 Clompdwsjkr23LKhuifdhwui73826ygGKUJFHGdwsiefkdsj324765tZPKQ WLjwNVBFHewiuhryui32JJKG</p> <p>CryptReleaseContext CryptGenKey CryptExportKey CryptEncrypt CryptAcquireContextW CryptDestroyKey ADVAPI32.dll</p> <p><u>Antidebugger technique:</u></p> <p>IsDebuggerPresent</p> <p>Program Files (x86) PROGRAM FILES (X86) Program Files PROGRAM FILES \\?\%s \\?\%s *.* Desktop DESKTOP *.* -*. * zoolz.exe mysqld-nt.exe syntime.exe agntsv.exe</p>
---------------------	---

Clomp Ransomware



	mysqld-opt.exe tbirdonfig.exe dbeng50.exe oautoupds.exe thebat.exe dbsnmp.exe oomm.exe thebat64.exe ensv.exe ossd.exe thunderbird.exe exel.exe onenote.exe visio.exe firefoxconfig.exe orale.exe winword.exe infopath.exe outlook.exe wordpad.exe isqlplussv.exe powerpnt.exe xfssvon.exe msaess.exe sqboreserve.exe tmlisten.exe msftesql.exe sqlagent.exe PNTMon.exe msspub.exe sqlbrowser.exe NTAoSMgr.exe mydesktopqos.exe sqlservr.exe Ntrtsan.exe mydesktopservie.exe sqlwriter.exe mbamtray.exe mysqld.exe steam.exe CLOP#666 A%s\ClopReadMe.txt SIXSIX ClopReadMe.txt
--	--



Basic Dynamic Analysis

Network Indicators

No host indicators found on execution of the malware sample.

HOST INDICATORS

INDICATOR: After successfully encrypting files and compromising the system, clop drops following files in the desktop ,RecycleBin, Program Data waindows folder and many other also it encrypt the python files present in the python27 folder. All the files are replaced by .clop extension.

```
File Edit Format View Help
Your network has been penetrated.
All files on each host in the network have been encrypted with a strong algorithm.
Backups were either encrypted or deleted or backup disks were formatted.
Shadow copies also removed, so F8 or any other methods may damage encrypted data but not recover.
We exclusively have decryption software for your situation
No decryption software is available in the public.
DO NOT RESET OR SHUTDOWN - files may be damaged.
DO NOT RENAME OR MOVE the encrypted and readme files.
DO NOT DELETE readme files.
This may lead to the impossibility of recovery of the certain files.
Photorec, RannohDecryptor etc. repair tools are useless and can destroy your files irreversibly.
If you want to restore your files write to emails (contacts are at the bottom of the sheet) and attach
(Less than 5 Mb each, non-archived and your files should not contain valuable information
(Databases, backups, large excel sheets, etc.)).
You will receive decrypted samples and our conditions how to get the decoder.

Attention!!!
Your warranty - decrypted samples.
Do not rename encrypted files.
Do not try to decrypt your data using third party software.
We don't need your files and your information.

But after 2 weeks all your files and keys will be deleted automatically.
Contact emails:
servicedigilogos@protonmail.com
or
managersmaers@tutanota.com

The final price depends on how fast you write to us.

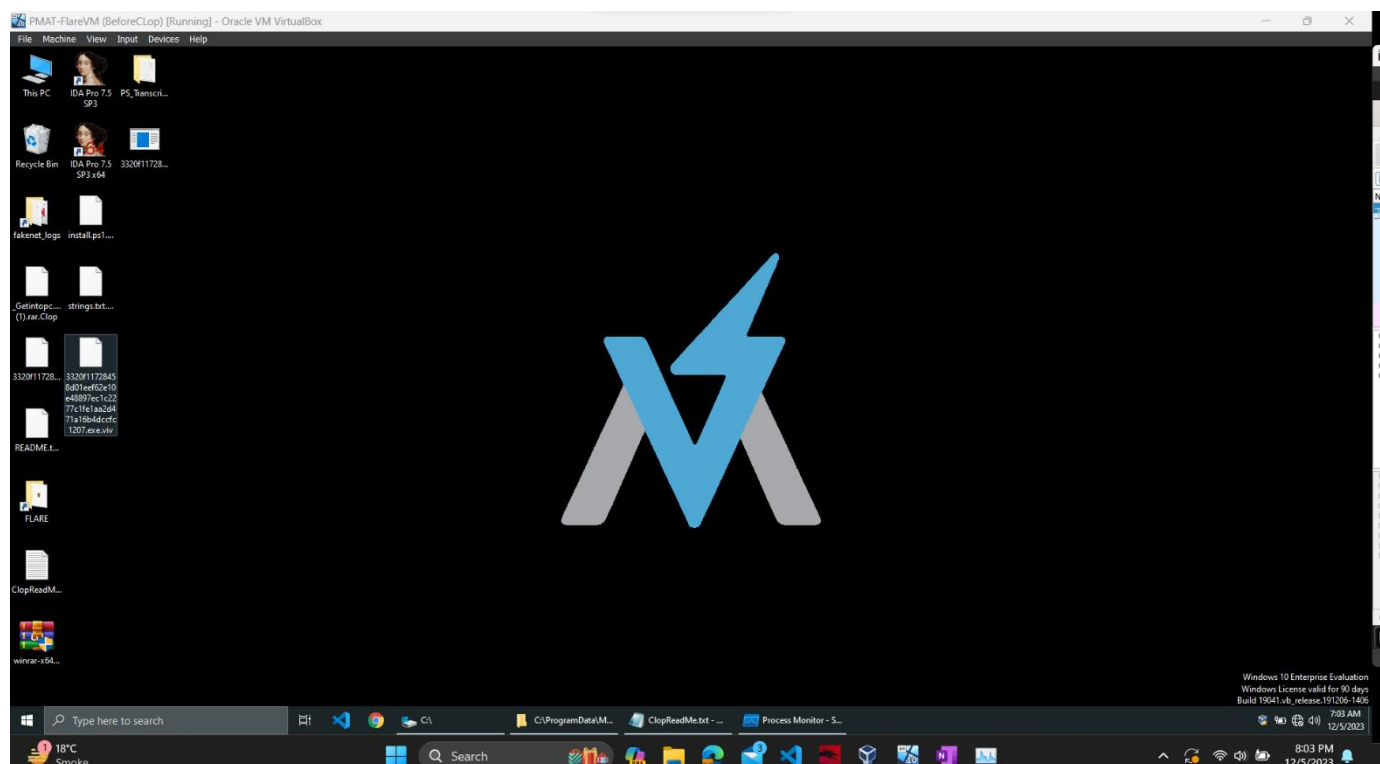
Clop
```

Clop Ransomware



Procmon Process tree :

Procmon104.exe (8000)	Process Monitor	C:\Users\hmsky\AppData\Local\Temp\Procmon104.exe	sysinternals - www.sysinternals.com
3320f11728458d01eef62e10e4		C:\Users\hmsky\Desktop\3320f11728458d01eef62e10e4	
NOTEPAD.EXE (7264)	Notepad	C:\Windows\system32\NOTEPAD.EXE	Microsoft Corporation
NOTEPAD.EXE (7964)	Notepad	C:\Windows\system32\NOTEPAD.EXE	Microsoft Corporation
NOTEPAD.EXE (8252)	Notepad	C:\Windows\system32\NOTEPAD.EXE	Microsoft Corporation
Idle (0)		Idle	



Clop Ransomware



Process Tree

☐ Only show processes still running at end of current trace
☒ Timelines cover displayed events only

Process	Description	Image Path	Life Time	Company	Owner	Comr
svchost.exe (3452)	Host Process for ...	C:\Windows\Syst...		Microsoft Corporat...	NT AUTHORITY\...	C:\Wi
ctfmon.exe (464)	CTF Loader	C:\Windows\syst...		Microsoft Corporat...	DESKTOP-M87P...	"ctfmo
Explorer.EXE (3276)	Windows Explorer	C:\Windows\Expl...		Microsoft Corporat...	DESKTOP-M87P...	C:\Wi
VBoxTray.exe (4860)	VirtualBox Guest ...	C:\Windows\Syst...		Oracle and/or its ...	DESKTOP-M87P...	"C:\W
WinRAR.exe (5868)	WinRAR archiver	C:\Program Files\...		Alexander Roshal	DESKTOP-M87P...	"CAP
ProcessHacker.exe (2016)	Process Hacker	C:\Program Files\...		wj32	DESKTOP-M87P...	"CAP
3320f11728458d01eef62e10e4		C:\Users\husky\...			DESKTOP-M87P...	"C:\U
Procmon.exe (8164)	Process Monitor	C:\ProgramData\...		Sysinternals - ww...	DESKTOP-M87P...	"CAP
Procmon64.exe (5744)	Process Monitor	C:\Users\husky\A...		Sysinternals - ww...	DESKTOP-M87P...	"C:\U
NOTEPAD.EXE (19296)	Notepad	C:\Windows\syst...		Microsoft Corporat...	DESKTOP-M87P...	"C:\W
Idle (0)	Idle					
System (4)	System				NT AUTHORITY\...	
Registry (100)	Registry				NT AUTHORITY\...	
smss.exe (356)	Windows Session ...	C:\Windows\Syst...		Microsoft Corporat...	NT AUTHORITY\...	\Syste
MemCompression (1976)	MemCompression				NT AUTHORITY\...	
csrss.exe (452)	Client Server Runt...	C:\Windows\syst...		Microsoft Corporat...	NT AUTHORITY\...	%Syst
wininit.exe (528)	Windows Start-Up...	C:\Windows\syst...		Microsoft Corporat...	NT AUTHORITY\...	wininit
services.exe (672)	Services and Cont...	C:\Windows\syst...		Microsoft Corporat...	NT AUTHORITY\...	C:\Wi

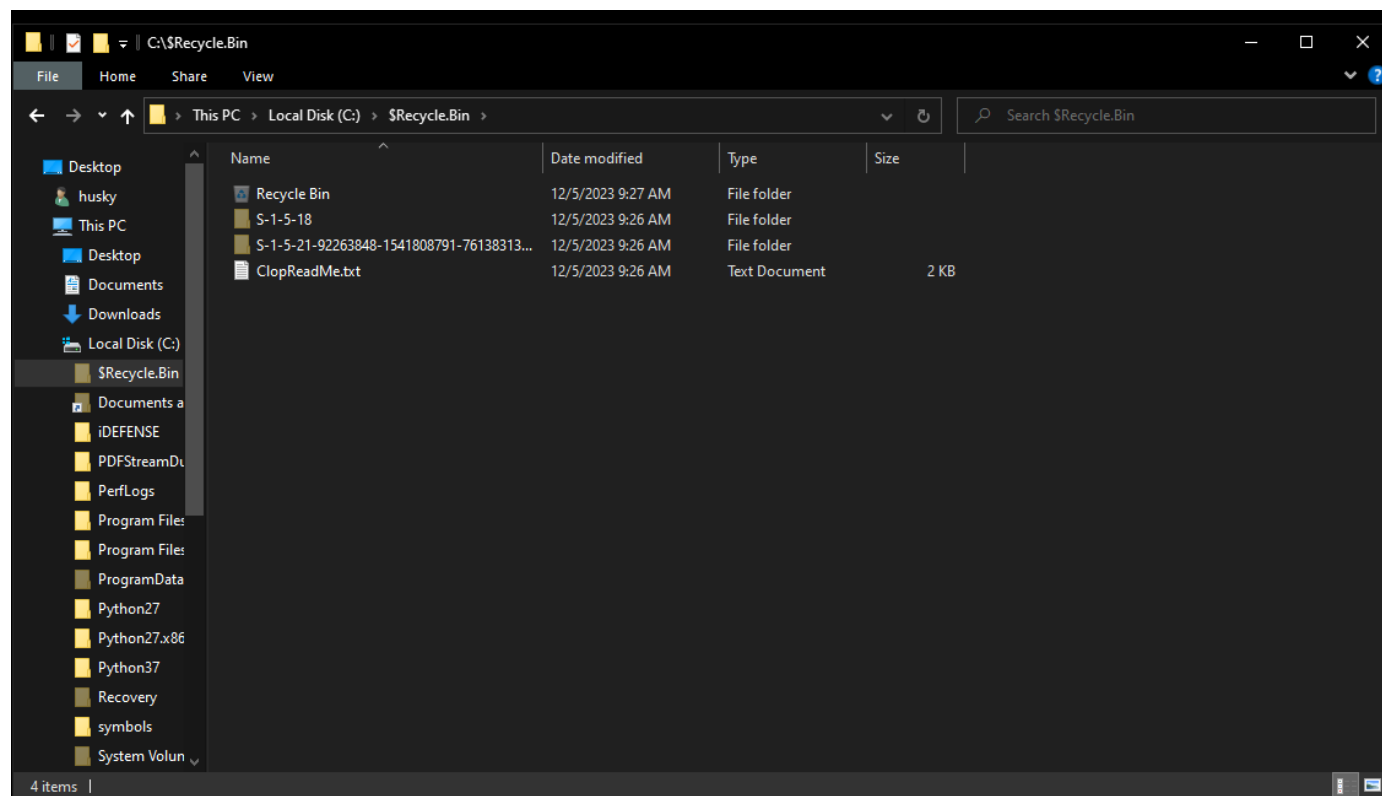
Description: Notepad
Company: Microsoft Corporation
Path: C:\Windows\system32\NOTEPAD.EXE
Command: "C:\Windows\system32\NOTEPAD.EXE" C:\Users\husky\Desktop\ClopReadMe.txt
User: DESKTOP-M87PSAK\husky
PID: 19296 Started: 12/5/2023 10:04:09 AM
 Exited: 12/5/2023 10:04:11 AM

Go To Event Include Process Include Subtree Close

Clop Ransomware



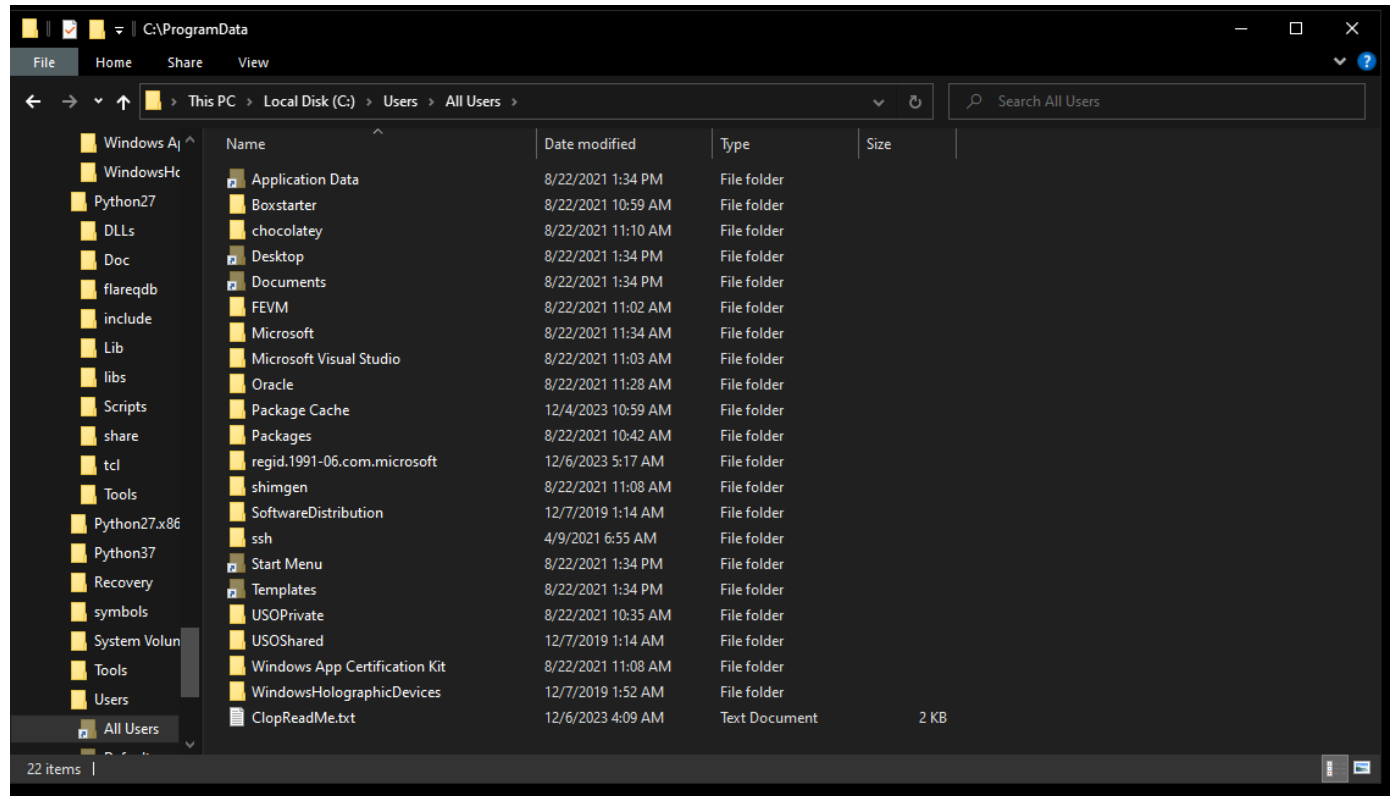
INDICATOR: Files dropped in recyclebin.



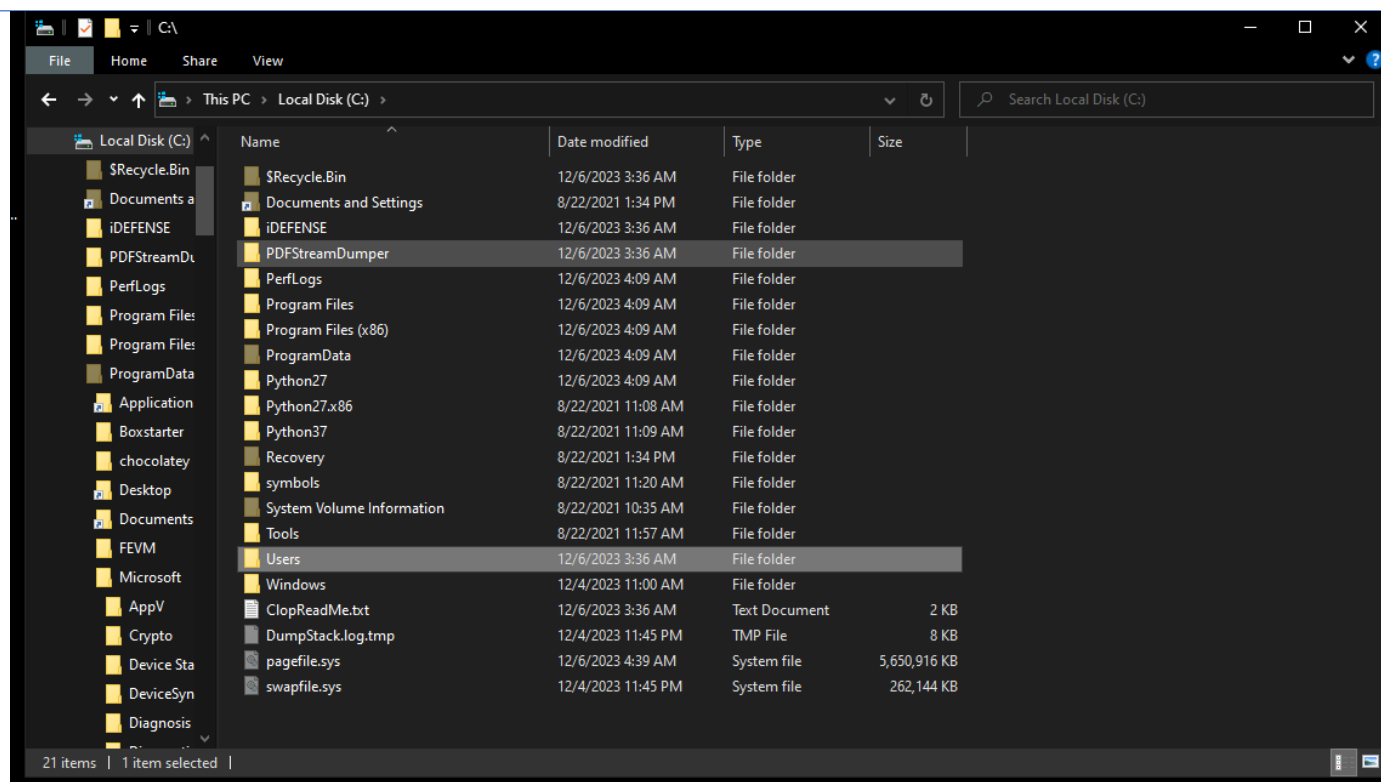
Clop Ransomware



INDICATOR: Files dropped in c drive ,user and allusers folder



Clop Ransomware



Clap Ransomware



Advanced Static Analysis

IdaPro Details:

Main Function:

```
Pseudocode-A
1 int __stdcall WinMain(HINSTANCE hInstance, HINSTANCE hPrevInstance, LPSTR lpCmdLine, int nShowCmd)
2 {
3     int v4; // esi
4     signed int i; // esi
5     HANDLE v6; // esi
6     int j; // ebx
7     UINT v8; // eax
8     WCHAR pszPath[260]; // [esp+Ch] [ebp-214h] BYREF
9     WCHAR RootPathName; // [esp+214h] [ebp-Ch] BYREF
10    DWORD v12; // [esp+218h] [ebp-8h]
11
12    CreateFileA("popup.txt", 0, 7u, 0, 3u, 0, 0);
13    v4 = 0;
14    v12 = GetLastError();
15    while ( (unsigned int)GetCurrentProcess() <= 1 || (unsigned int)GetCurrentThread() <= 1 || v12 != 0 )
16    {
17        Sleep(0x32u);
18        ++v4;
19    }
20    Sleep(0x1388u);
21    sub_40D7C0();
22    for ( i = 0; i < 666000; ++i )
23    {
24        EraseTape(0, i, 0);
25        GlobalDeleteAtom(0);
26        if ( DefineDosDeviceA(i, "1234567890", "///...//") )
27            FindAtomA("27");
28        else
29            GetCurrentThread();
30    }
31    GetACP();
32    Sleep(0x1388u);
33    sub_40D8D0(L"zoolz.exe");
34    sub_40D8D0(L"mysqld-nt.exe");
35    sub_40D8D0(L"syntime.exe");
36
37    0000C8C5 _WinMain@16:24 (40D4C5) (Synchronized with IDA View-A, Hex View-1)
38
```

Clop Ransomware



```
Pseudocode-A
1 BOOL __thiscall sub_40D8D0(LPCWSTR lpString2)
2 {
3     HANDLE v2; // ebx
4     void (__stdcall *v3)(LPWSTR, LPCWSTR); // esi
5     int v4; // eax
6     int v5; // eax
7     HANDLE v6; // eax
8     void *v7; // esi
9     const WCHAR *v9; // [esp-4h] [ebp-650h]
10    PROCESSENTRY32W pe; // [esp+Ch] [ebp-640h] BYREF
11    WCHAR String[260]; // [esp+238h] [ebp-414h] BYREF
12    WCHAR String1[260]; // [esp+440h] [ebp-20Ch] BYREF
13
14    v2 = CreateToolhelp32Snapshot(2u, 0);
15    v9 = lpString2;
16    v3 = (void (__stdcall *) (LPWSTR, LPCWSTR))lstrcpw;
17    lstrcpw(String1, v9);
18    v4 = lstrlenW(String1);
19    CharUpperBuffW(String1, v4);
20    if ( v2 != (HANDLE)-1 )
21    {
22        pe.dwSize = 556;
23        if ( Process32FirstW(v2, &pe) )
24        {
25            do
26            {
27                v3(String, pe.szExeFile);
28                v5 = lstrlenW(String);
29                CharUpperBuffW(String, v5);
30                if ( !lstrcmpW(String, String1) )
31                {
32                    v6 = OpenProcess(1u, 0, pe.th32ProcessID);
33                    v7 = v6;
34                    if ( v6 )
35                    {
36                        TerminateProcess(v6, 0xFFFFFFFF);
37                        CloseHandle(v7);
38                    }
39                    else
40                    {
41                        CloseHandle(0);
42                    }
43                }
44            } while ( Process32NextW(v2, &pe) );
45        }
46    }
47    return v2;
48 }
```

- The function takes a wide-string (LPCWSTR) parameter lpString2.
- It creates a snapshot of the system processes using CreateToolhelp32Snapshot.
- It copies and converts the input string to uppercase.
- It iterates through the processes in the snapshot using Process32FirstW and Process32NextW.
- For each process, it compares the uppercase executable name with the uppercase input string.
- If a match is found, it attempts to terminate the process using OpenProcess, TerminateProcess, and CloseHandle.
- The function returns CloseHandle(v2), where v2 is the handle to the process snapshot.



```
Pseudocode-A
31 GetACP();
32 Sleep(0x1388u);
33 sub_40D8D0(L"zoolz.exe");
34 sub_40D8D0(L"mysqld-nt.exe");
35 sub_40D8D0(L"syntime.exe");
36 sub_40D8D0(L"agntsv.exe");
37 sub_40D8D0(L"mysqld-opt.exe");
38 sub_40D8D0(L"tbirdonfig.exe");
39 sub_40D8D0(L"dbeng50.exe");
40 sub_40D8D0(L"oautoupds.exe");
41 sub_40D8D0(L"thebat.exe");
42 sub_40D8D0(L"dbsnmp.exe");
43 sub_40D8D0(L"oomm.exe");
44 sub_40D8D0(L"thebat64.exe");
45 sub_40D8D0(L"ensv.exe");
46 sub_40D8D0(L"ossd.exe");
47 sub_40D8D0(L"thunderbird.exe");
48 sub_40D8D0(L"exel.exe");
49 sub_40D8D0(L"onenote.exe");
50 sub_40D8D0(L"visio.exe");
51 sub_40D8D0(L"firefoxconfig.exe");
52 sub_40D8D0(L"orale.exe");
53 sub_40D8D0(L"winword.exe");
54 sub_40D8D0(L"infopath.exe");
55 sub_40D8D0(L"outlook.exe");
56 sub_40D8D0(L"wordpad.exe");
57 sub_40D8D0(L"isqlplussv.exe");
58 sub_40D8D0(L"powerpnt.exe");
59 sub_40D8D0(L"xfssvon.exe");
60 sub_40D8D0(L"msaess.exe");
61 sub_40D8D0(L"sqboreservie.exe");
62 sub_40D8D0(L"tmlisten.exe");
63 sub_40D8D0(L"msftesql.exe");
64 sub_40D8D0(L"sqlagent.exe");
65 sub_40D8D0(L"PNTMon.exe");
```

```
sub_40D8D0(L"mysql.exe");
sub_40D8D0(L"mysqld.exe");
sub_40D8D0(L"steam.exe");
v6 = CreateMutexW(0, 0, L"CLOP#666");
if ( WaitForSingleObject(v6, 0) )
```

```
SetErrorMode(1u);
CreateThread(0, 0, sub_40D9F0, 0, 0, 0);
```

```
1 DWORD __stdcall sub_40D9F0(LPVOID lpThreadParameter)
2 {
3     sub_40B380(
4         "-----BEGIN PUBLIC KEY----- MIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQCpEnzYAtPzcmKnw41bLkkkDDmZ 1YB4weOp
5         "KhmhYNzjc5uQfXH3fbGmbbdELIe/u7YsdXkuNHRQ ThnFfs+q7SIw1nibfYa4c9KA4ftfr69dZTt4T/RzRzsISVNU1Q6me59k9b8
6         "65Ggn+uQIDAQAB -----END PUBLIC KEY-----");
7     Sleep(0x1388u);
8     return 0;
9 }
```

Clop Ransomware



```
Structures  Enums  Imports  Exports
Pseudocode-A  Stack of sub_40B380  Stack of StartAddress
7 PCERT_PUBLIC_KEY_INFO pvStructInfo; // [esp+10h] [ebp-101Ch] BYREF
8 DWORD Size; // [esp+14h] [ebp-1018h] BYREF
9 HCRYPTPROV phProv; // [esp+18h] [ebp-1014h] BYREF
10 DWORD pcbBinary; // [esp+1Ch] [ebp-1010h] BYREF
11 HCRYPTKEY phKey; // [esp+20h] [ebp-100Ch] BYREF
12 DWORD pdwDataLen; // [esp+24h] [ebp-1008h] BYREF
13 BYTE pbBinary[2048]; // [esp+28h] [ebp-1004h] BYREF
14 CHAR pszString[2048]; // [esp+828h] [ebp-804h] BYREF
15
16 Src = a2;
17 SetErrorMode(1u);
18 v4 = strlenA(lpString);
19 memmove_0(pszString, lpString, v4);
20 pcbBinary = 2048;
21 phProv = 0;
22 phKey = 0;
23 if ( !CryptStringToBinaryA(pszString, 0, 0, pbBinary, &pcbBinary, 0, 0) )
24     return 0;
25 if ( !CryptDecodeObjectEx(1u, (LPCSTR)8, pbBinary, pcbBinary, 0x8000u, 0, &pvStructInfo, &pcbStructInfo) )
26     return 0;
27 if ( !CryptAcquireContextW(&phProv, 0, 0, 1u, 0xF0000000) )
28     return 0;
29 if ( !CryptImportPublicKeyInfoEx(phProv, 1u, pvStructInfo, 0, 0, 0, &phKey) )
30     return 0;
31 Size = 117;
32 pdwDataLen = 117;
33 if ( !CryptEncrypt(phKey, 0, 1, 0, 0, &pdwDataLen, 0x75u) )
34     return 0;
35 v6 = GlobalAlloc(0x40u, pdwDataLen);
36 memset(v6, 0, pdwDataLen);
37 memmove_0(v6, Src, Size);
38 if ( !CryptEncrypt(phKey, 0, 1, 0, (BYTE *)v6, &Size, pdwDataLen) )
39     return 0;
40 *a1 = pdwDataLen;
41 return v6;
42 }
```

0000C440 sub_40D040:7 (40D040) (Synchronized with IDA View-A, Hex View-1)



```
Pseudocode-A Stack of sub_40B380 Stack of StartAddress
1 int __fastcall sub_40D200(void **a1, DWORD *a2)
2 {
3     BYTE *v4; // esi
4     HCRYPTPROV phProv; // [esp+Ch] [ebp-8h] BYREF
5     HCRYPTKEY phKey; // [esp+10h] [ebp-4h] BYREF
6
7     SetErrorMode(1u);
8     phProv = 0;
9     phKey = 0;
10    if ( !CryptAcquireContextW(&phProv, 0, L"Microsoft Enhanced RSA and AES Cryptographic Provider", 0x18u, 0)
11        && !CryptAcquireContextW(&phProv, 0, L"Microsoft Enhanced RSA and AES Cryptographic Provider", 0x18u, 8u) )
12    {
13        return 0;
14    }
15    if ( !CryptGenKey(phProv, 1u, 0x4000u, &phKey) )
16        return 0;
17    if ( !CryptExportKey(phKey, 0, 6u, 0, 0, a2) )
18        return 0;
19    v4 = (BYTE *)*a1;
20    memSet(*a1, 0, *a2);
21    if ( !CryptExportKey(phKey, 0, 6u, 0, v4, a2) )
22        return 0;
23    if ( phKey )
24        CryptDestroyKey(phKey);
25    if ( phProv )
26        CryptReleaseContext(phProv, 0);
27    return 1;
28 }
```

0000C692 sub_40D200:20 (40D292) (Synchronized with IDA View-A, Hex View-1)



Advanced Dynamic Analysis

Breakpoints	Memory Map	Call Stack	SEH	Script	Symbols	Source	References	Threads	Handles	Trac
004AD4F8	81FE 90290A00	cmp esi, A2990								
004AD4FE	7C C0	j1 3320f11728458d01eef62e10e48897ec1c22								
004AD500	FF15 A8E04A00	call dword ptr ds:[<&GetACP>]								
004AD506	68 88130000	push 1388								
004AD508	FFD7	call edi								
004AD50D	B9 40314800	mov ecx, 3320f11728458d01eef62e10e48897e				4B3140:L"zoolz.exe"				
004AD512	E8 B9030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD517	B9 54314800	mov ecx, 3320f11728458d01eef62e10e48897e				4B3154:L"mysqld-nt.exe"				
004AD51C	E8 AF030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD521	B9 70314800	mov ecx, 3320f11728458d01eef62e10e48897e				4B3170:L"syntime.exe"				
004AD526	E8 A5030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD52B	B9 88314800	mov ecx, 3320f11728458d01eef62e10e48897e				4B3188:L"agntsv.exe"				
004AD530	E8 98030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD535	B9 A0314800	mov ecx, 3320f11728458d01eef62e10e48897e				4B31A0:L"mysqld-opt.exe"				
004AD53A	E8 91030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD53F	B9 C0314800	mov ecx, 3320f11728458d01eef62e10e48897e				4B31C0:L"tbirdonfig.exe"				
004AD544	E8 87030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD549	B9 E0314800	mov ecx, 3320f11728458d01eef62e10e48897e				4B31E0:L"dbeng50.exe"				
004AD54E	E8 7D030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD553	B9 F8314800	mov ecx, 3320f11728458d01eef62e10e48897e				4B31F8:L"oautoupds.exe"				
004AD558	E8 73030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD55D	B9 14324800	mov ecx, 3320f11728458d01eef62e10e48897e				4B3214:L"thebat.exe"				
004AD562	E8 69030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD567	B9 2C324800	mov ecx, 3320f11728458d01eef62e10e48897e				4B322C:L"dbsnmp.exe"				
004AD56C	E8 5F030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD571	B9 44324800	mov ecx, 3320f11728458d01eef62e10e48897e				4B3244:L"oomm.exe"				
004AD576	E8 55030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD57B	B9 58324800	mov ecx, 3320f11728458d01eef62e10e48897e				4B3258:L"thebat64.exe"				
004AD580	E8 48030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD585	B9 74324800	mov ecx, 3320f11728458d01eef62e10e48897e				4B3274:L"ensv.exe"				
004AD58A	E8 41030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD58F	B9 88324800	mov ecx, 3320f11728458d01eef62e10e48897e				4B3288:L"ossd.exe"				
004AD594	E8 37030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD599	B9 9C324800	mov ecx, 3320f11728458d01eef62e10e48897e				4B329C:L"thunderbird.exe"				
004AD59E	E8 2D030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD5A3	B9 BC324800	mov ecx, 3320f11728458d01eef62e10e48897e				4B32BC:L"exe1.exe"				
004AD5A8	E8 23030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD5AD	B9 D0324800	mov ecx, 3320f11728458d01eef62e10e48897e				4B32D0:L"onenote.exe"				
004AD5B2	E8 19030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD5B7	B9 E8324800	mov ecx, 3320f11728458d01eef62e10e48897e				4B32E8:L"visio.exe"				
004AD5BC	E8 0F030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD5C1	B9 FC324800	mov ecx, 3320f11728458d01eef62e10e48897e				4B32FC:L"firefoxonfig.exe"				
004AD5C6	E8 05030000	call 3320f11728458d01eef62e10e48897ec1c								
004AD5CB	B9 20334800	mov ecx, 3320f11728458d01eef62e10e48897e				4B3320:L"orale.exe"				

Mutex Creation

004AD6B6	E8 15020000	call 3320f11728458d01eef62e10e48897ec1c	
004AD6B8	B9 B4354800	mov ecx, 3320f11728458d01eef62e10e48897e	4B35B4:L"steam.exe"
004AD6C0	E8 08020000	call 3320f11728458d01eef62e10e48897ec1c	
004AD6C5	68 C8354800	push 3320f11728458d01eef62e10e48897ec1c	4B35C8:L"CLOP#666"
004AD6CA	6A 00	push 0	
004AD6CC	6A 00	push 0	

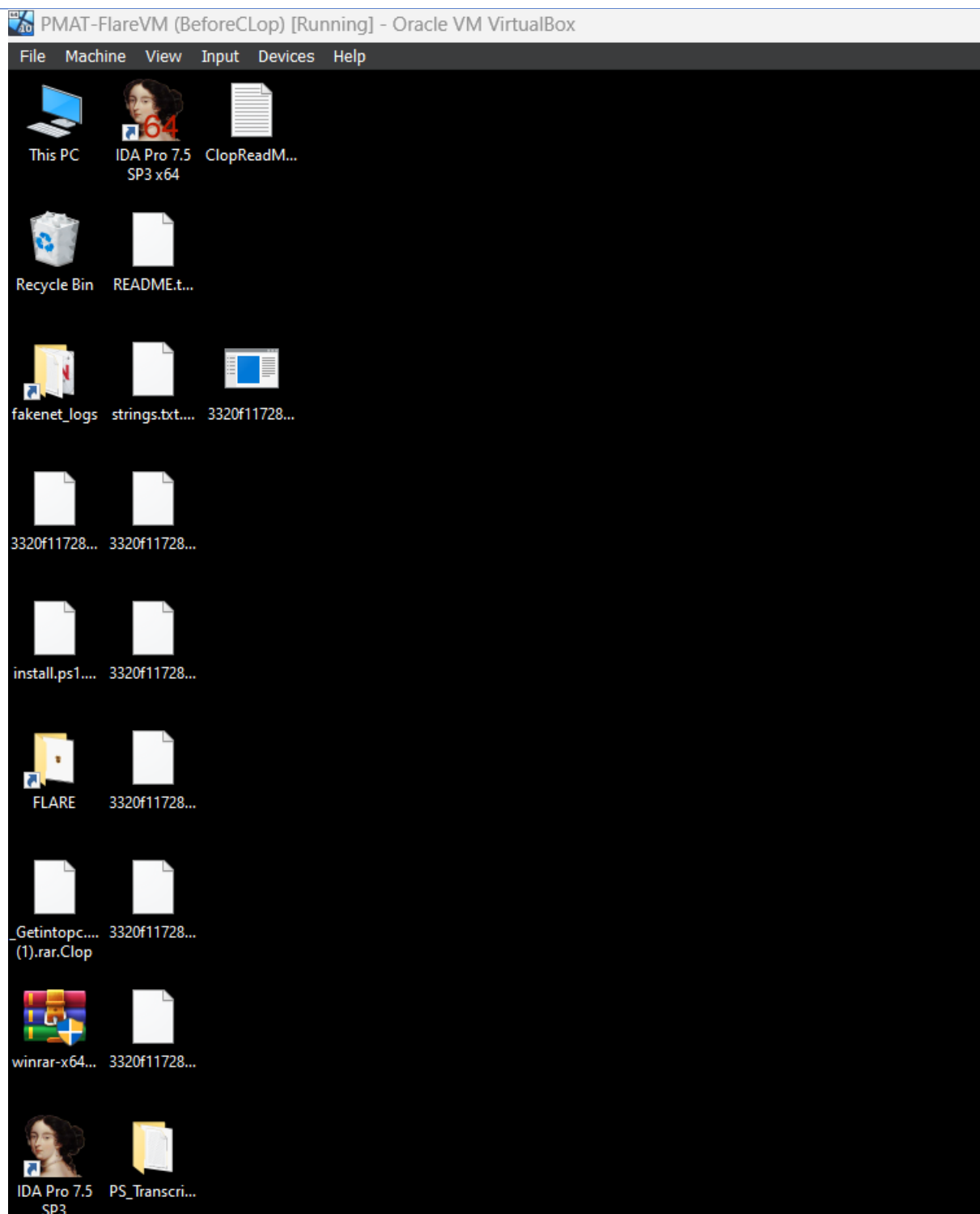
Thread Creation:

004AD6F2	6A 01	push 1	
004AD6F4	FF15 60E14A00	call dword ptr ds:[<&SetErrorMode>]	
004AD6FA	8B35 4CE04A00	mov esi, dword ptr ds:[<&CreateThread>]	
004AD700	6A 00	push 0	
004AD702	6A 00	push 0	

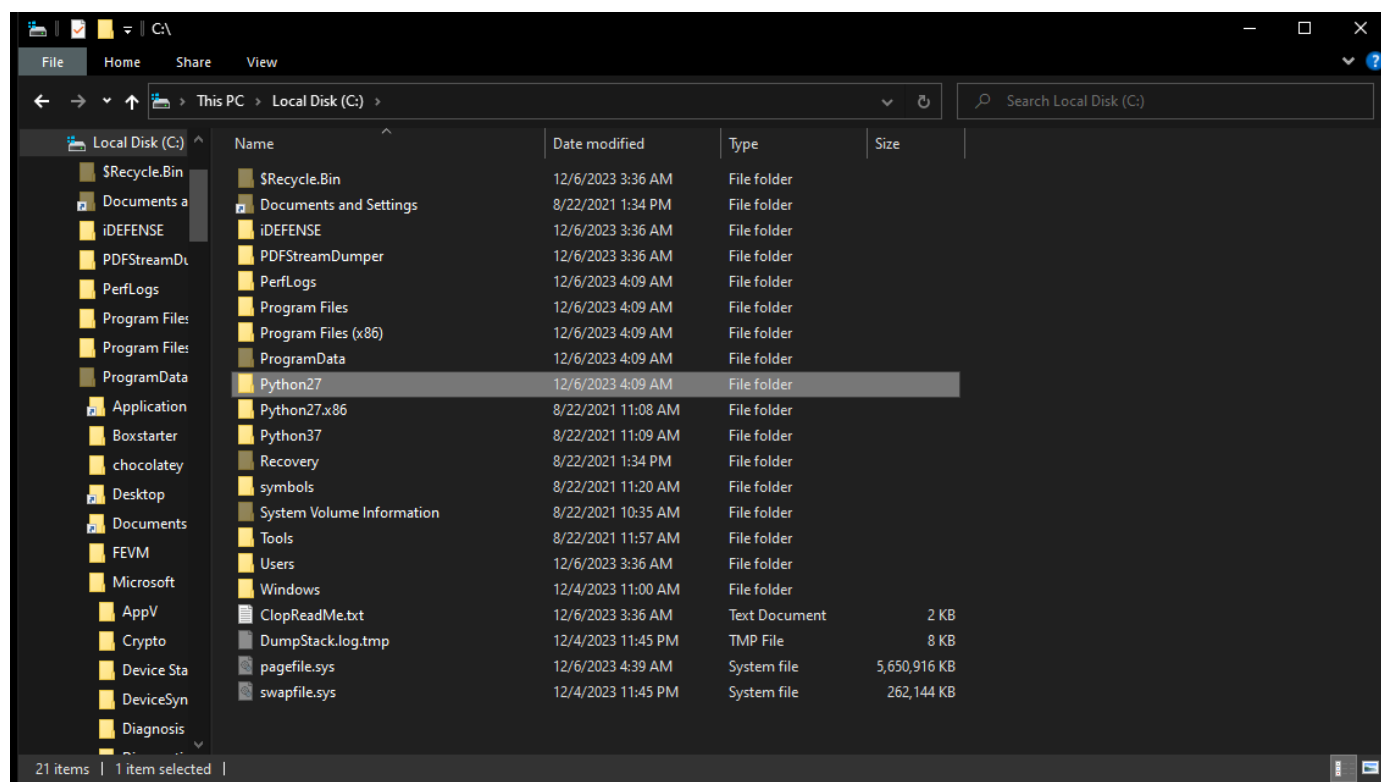
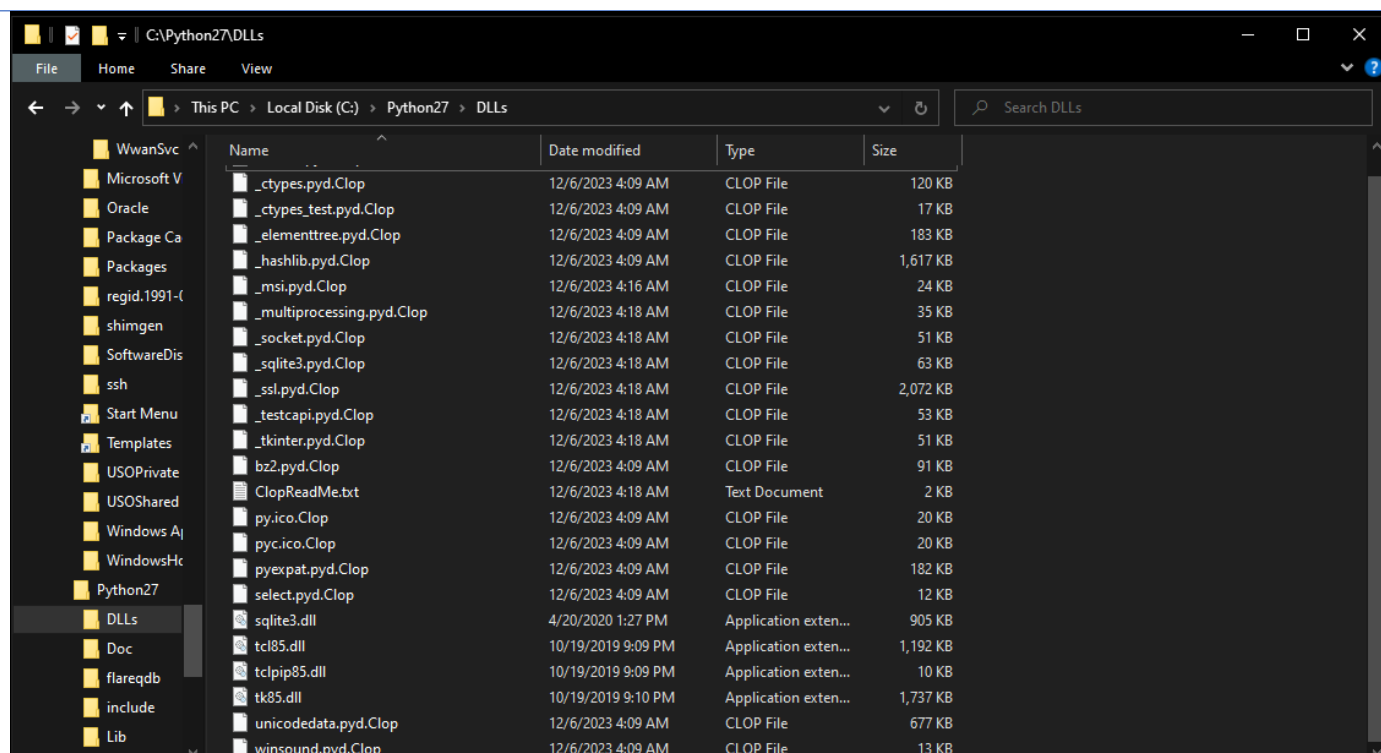
Clop Ransomware



Clop Ransomware



Clop Ransomware



Clop Ransomware