Malware Analysis Report

https://github.com/j3rmcyber/MalwareAnalysis

WannaCry Ransomware Malware

Feb 2024 | j3rmcyber | v1.0

Table of Contents

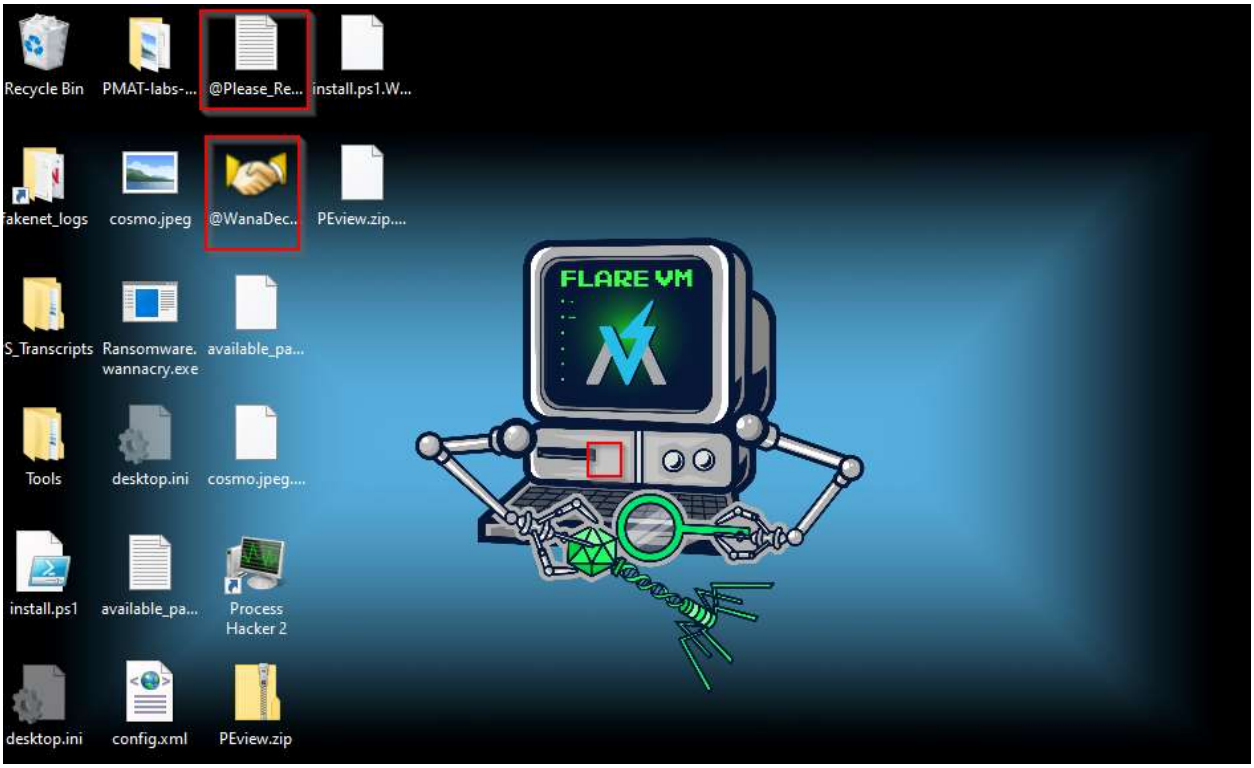
Executive Summary

SHA256 hash	24D004A104D4D54034DBCFFC2A4B19A11F39008A575AA614EA04703480B1022C

WannaCry is a ransomware malware introduced in 2017 that targets Windows computers. The program demands ransom in cryptocurrency (Bitcoin) and encrypts all data on the hard drive. The program will execute, then looks for remote systems to propagate to (worm capabilities). The program is also known as: WannaCrypt, Wana Decryptor 2.0, WanaCrypt0r 2.0, and Wanna Decryptor. The program contains packed executables which are dropped upon execution.

YARA signature rules are attached in Appendix A. Malware sample and hashes have been submitted to VirusTotal for further examination.

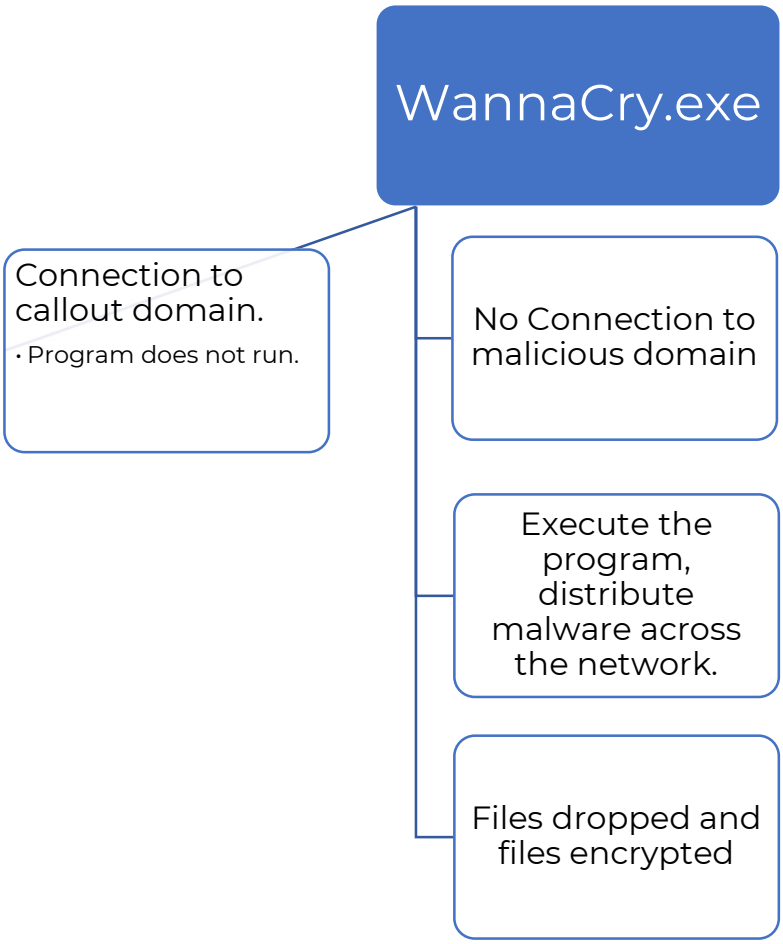
Dropped files on the desktop after execution:



The encryptor windows and wallpaper on the desktop:

High-Level Technical Summary

WannaCry consists of one executable that then drops several more files once the conditions are met:



Malware Composition

WannaCry consists of the following components:

File Name	SHA256 Hash
wannacry.exe	24D004A104D4D54034DBCFFC2A4B19A11F39008A575AA614EA04703480B1022C
Tasksche.exe	ed01ebfbc9eb5bbea545af4d01bf5f1071661840480439c6e5babe8e080e41aa
Taskse.exe	2ca2d550e603d74dedda03156023135b38da3630cb014e3d00b1263358c5f00d
Taskdl.exe	4a468603fdcb7a2eb5770705898cf9ef37aade532a7964642ecd705a74794b79

WannaCry.exe:

The initial executable that runs after successful conditions are met.

TaskSche.exe:

File drops after execution and sets a scheduled task. This also sets a startup program to persist when rebooted.

Taskse.exe:

This file performs the Wanna Decryptor pop-up window

Taskdl.exe:

This file performs the Wanna Decryptor pop-up window

Tasksvc.exe:

This opens a listening port on 9050

Basic Static Analysis

{Screenshots and description about basic static artifacts and methods}
Function calls of interest:

0000A134	0000A7DC	Hint/Name RVA	0092 InternetOpenA
0000A138	0000A7C8	Hint/Name RVA	0093 InternetOpenUrlA
0000A13C	0000A7B2	Hint/Name RVA	0069 InternetCloseHandle
0000A140	00000000	End of Imports	WININET.dll

0000A00C	0000A6AC	Hint/Name RVA	0244 SetServiceStatus
0000A010	0000A69A	Hint/Name RVA	01AD OpenSCManagerA
0000A014	0000A688	Hint/Name RVA	0064 CreateServiceA
0000A018	0000A672	Hint/Name RVA	003E CloseServiceHandle
0000A01C	0000A662	Hint/Name RVA	0249 StartServiceA
0000A020	0000A650	Hint/Name RVA	0096 CryptGenRandom
0000A024	0000A638	Hint/Name RVA	0085 CryptAcquireContextA
0000A028	0000A714	Hint/Name RVA	01AF OpenServiceA
0000A02C	00000000	End of Imports	ADVAPI32.dll

```
RegQueryValueExA
RegSetValueExA
RegCreateKeyW
CryptReleaseContext
CreateServiceA
CloseServiceHandle
StartServiceA
OpenServiceA
OpenSCManagerA
```

Strings of interest:

```
\%s\IPC$
Microsoft Base Cryptographic Provider v1.0
%d.%d.%d.%d
mssecsvc2.0
Microsoft Security Center (2.0) Service
%s -m security
C:\%s\qeriuwjhrf
C:\%s\%s
tasksche.exe
CloseHandle
WriteFile
CreateFileA
CreateProcessA
http://www.iuqerfsodp9ifjaposdfjhgosurijfaewrwergwea.com
!This program cannot be run in DOS mode.

WANACRY!
CloseHandle
DeleteFileW
MoveFileExW
MoveFileW
ReadFile
WriteFile
CreateFileW
kernel32.dll
2/O-_.X8w.+
Microsoft Enhanced RSA and AES Cryptographic Provider
CryptGenKey
CryptDecrypt
CryptEncrypt
CryptDestroyKey
CryptImportKey
CryptAcquireContextA
cmd.exe /c "%s"
115p7UMMngoj1pMvkpHijcRdfJNXj6LrLn
12t9YDPgwueZ9NyMgw519p7AA8isjr6SMw
13AM4VW2dhxYgXeQepoHkHSQuy6NgaEb94
Global\MsWinZonesCacheCounterMutexA
tasksche.exe
TaskStart
icacls . /grant Everyone:F /T /C /Q
attrib +h .
WNcry@2ol7
```

```
USER32.DLL
Windows 2000 2195
Windows 2000 5.0
\172.16.99.5\IPC$
Windows 2000 2195
Windows 2000 5.0
\192.168.56.20\IPC$
kernel32.dll
WanaCrypt0r
```

CAPA output:

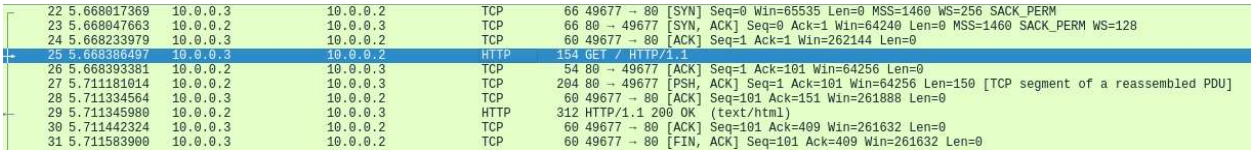
Capability	Namespace
reference analysis tools strings	anti-analysis
check for time delay via QueryPerformanceCounter	anti-analysis/anti-debugging/debugger-detection
contain obfuscated stackstrings	anti-analysis/obfuscation/string/stackstring
receive data (5 matches)	communication
send data (5 matches)	communication
connect to URL	communication/http/client
get socket status	communication/socket
initialize Winsock library	communication/socket
set socket configuration	communication/socket
create UDP socket (4 matches)	communication/socket/udp/send
act as TCP client	communication/tcp/client
generate random numbers via WinAPI	data-manipulation/prng
extract resource via kernel32 functions	executable/resource
contain an embedded PE file	executable/subfile/pe
get file size	host-interaction/file-system/meta
move file	host-interaction/file-system/move
read file on Windows	host-interaction/file-system/read
get number of processors	host-interaction/hardware/cpu
terminate process	host-interaction/process/terminate
run as service	host-interaction/service
create service	host-interaction/service/create
modify service	host-interaction/service/modify
start service	host-interaction/service/start
create thread (4 matches)	host-interaction/thread/create
terminate thread	host-interaction/thread/terminate
link function at runtime on Windows	linking/runtime-linking
linked against ZLIB	linking/static/zlib
inspect section memory permissions	load-code/pe
persist via Windows service	persistence/service

ATT&CK Tactic	ATT&CK Technique
DEFENSE EVASION	Obfuscated Files or Information::Indicator Removal from Tools T1027.005
DISCOVERY	File and Directory Discovery T1083 System Information Discovery T1082 System Network Configuration Discovery T1016
EXECUTION	Shared Modules T1129 System Services::Service Execution T1569.002
PERSISTENCE	Create or Modify System Process::Windows Service T1543.003

Basic Dynamic Analysis

{Screenshots and description about basic dynamic artifacts and methods}

TCP Connection:



22	5.668017369	10.0.0.3	10.0.0.2	TCP	66	49677 → 80 [SYN] Seq=0 Win=65535 Len=0 MSS=1460 WS=256 SACK_PERM
23	5.668047663	10.0.0.2	10.0.0.3	TCP	66	80 → 49677 [SYN, ACK] Seq=0 Ack=1 Win=64240 Len=0 MSS=1460 SACK_PERM WS=128
24	5.668233979	10.0.0.3	10.0.0.2	TCP	60	49677 → 80 [ACK] Seq=1 Ack=1 Win=262144 Len=0
25	5.668386497	10.0.0.3	10.0.0.2	HTTP	154	GET / HTTP/1.1
26	5.668393381	10.0.0.2	10.0.0.3	TCP	54	80 → 49677 [ACK] Seq=1 Ack=101 Win=64256 Len=0
27	5.711181014	10.0.0.2	10.0.0.3	TCP	204	80 → 49677 [PSH, ACK] Seq=1 Ack=101 Win=64256 Len=150 [TCP segment of a reassembled PDU]
28	5.711334564	10.0.0.3	10.0.0.2	TCP	60	49677 → 80 [ACK] Seq=101 Ack=151 Win=261888 Len=0
29	5.711345980	10.0.0.2	10.0.0.3	HTTP	312	HTTP/1.1 200 OK (text/html)
30	5.711442324	10.0.0.3	10.0.0.2	TCP	60	49677 → 80 [ACK] Seq=101 Ack=409 Win=261632 Len=0
31	5.711583900	10.0.0.3	10.0.0.2	TCP	60	49677 → 80 [FIN, ACK] Seq=101 Ack=409 Win=261632 Len=0

Domain callout:

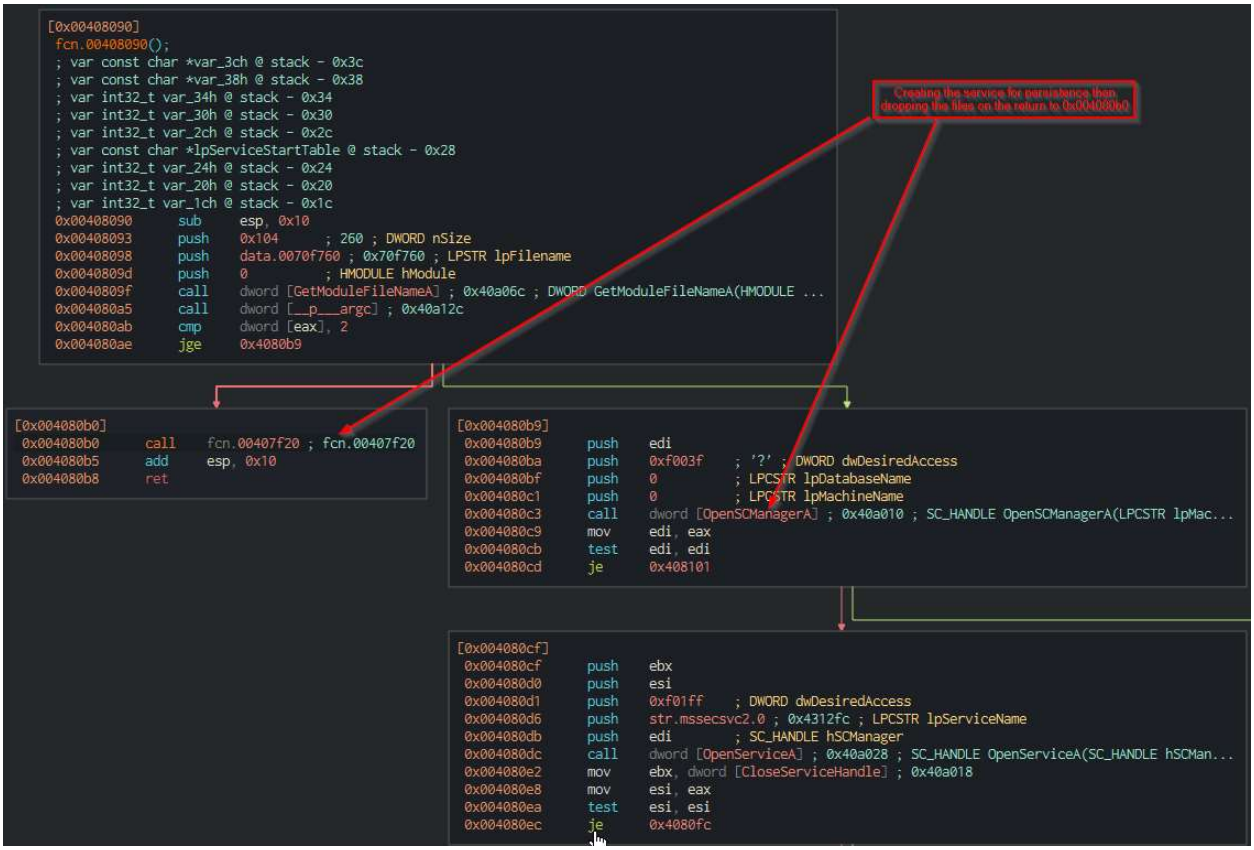
```
▾ Hypertext Transfer Protocol
  ▸ GET / HTTP/1.1\r\n
    Host: www.iuqerfsodp9ifjaposdfjhgosurijfaewrwergwea.com\r\n
    Cache-Control: no-cache\r\n
    \r\n
    [Full request URI: http://www.iuqerfsodp9ifjaposdfjhgosurijfaewrwergwea.com/]
    [HTTP request 1/1]
    [Response in frame: 29]
```

Advanced Static Analysis

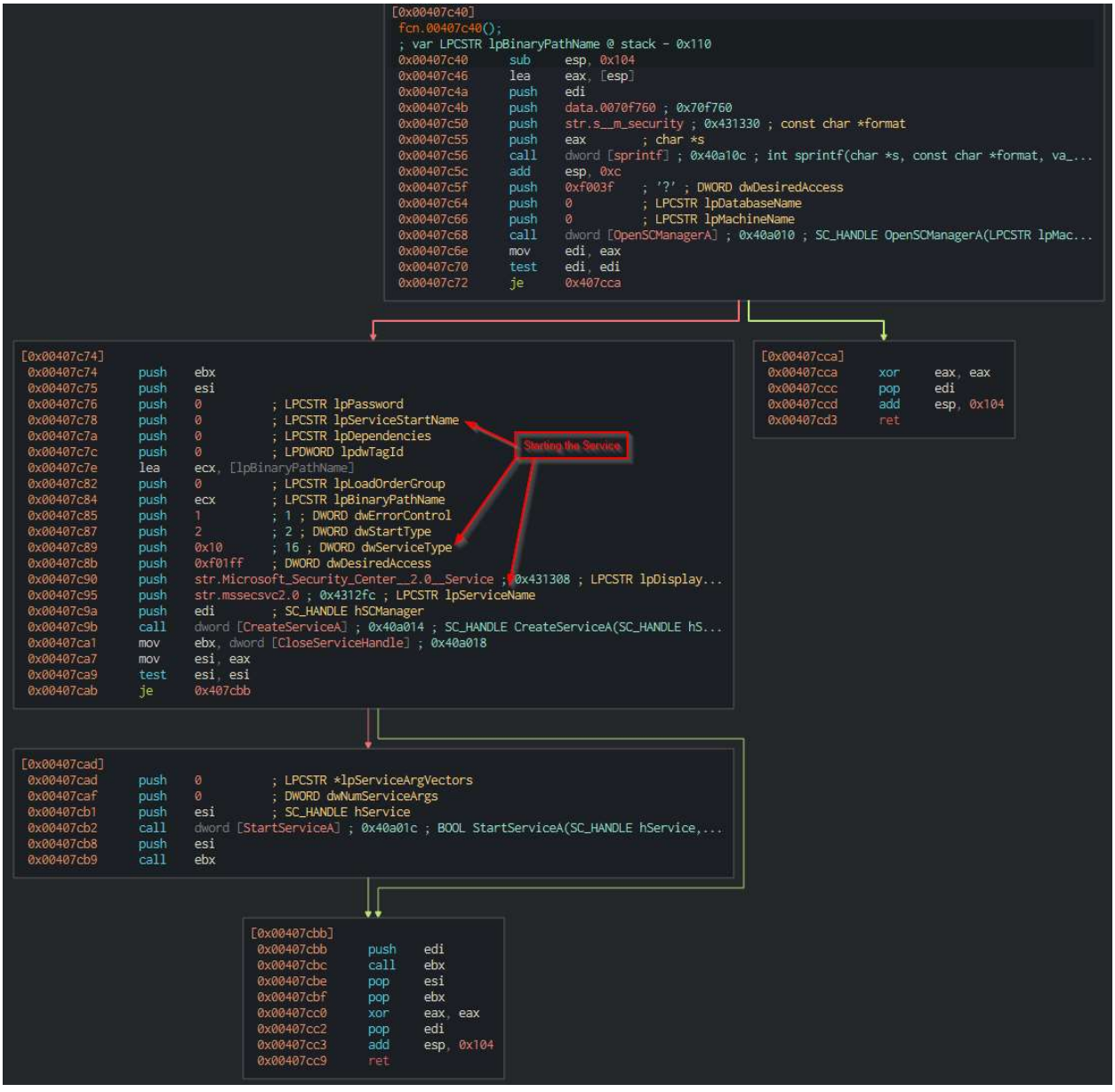
{Screenshots and description about findings during advanced static analysis}

The main function that contains the kill switch:

The file then checks for a service, if not found it creates one:



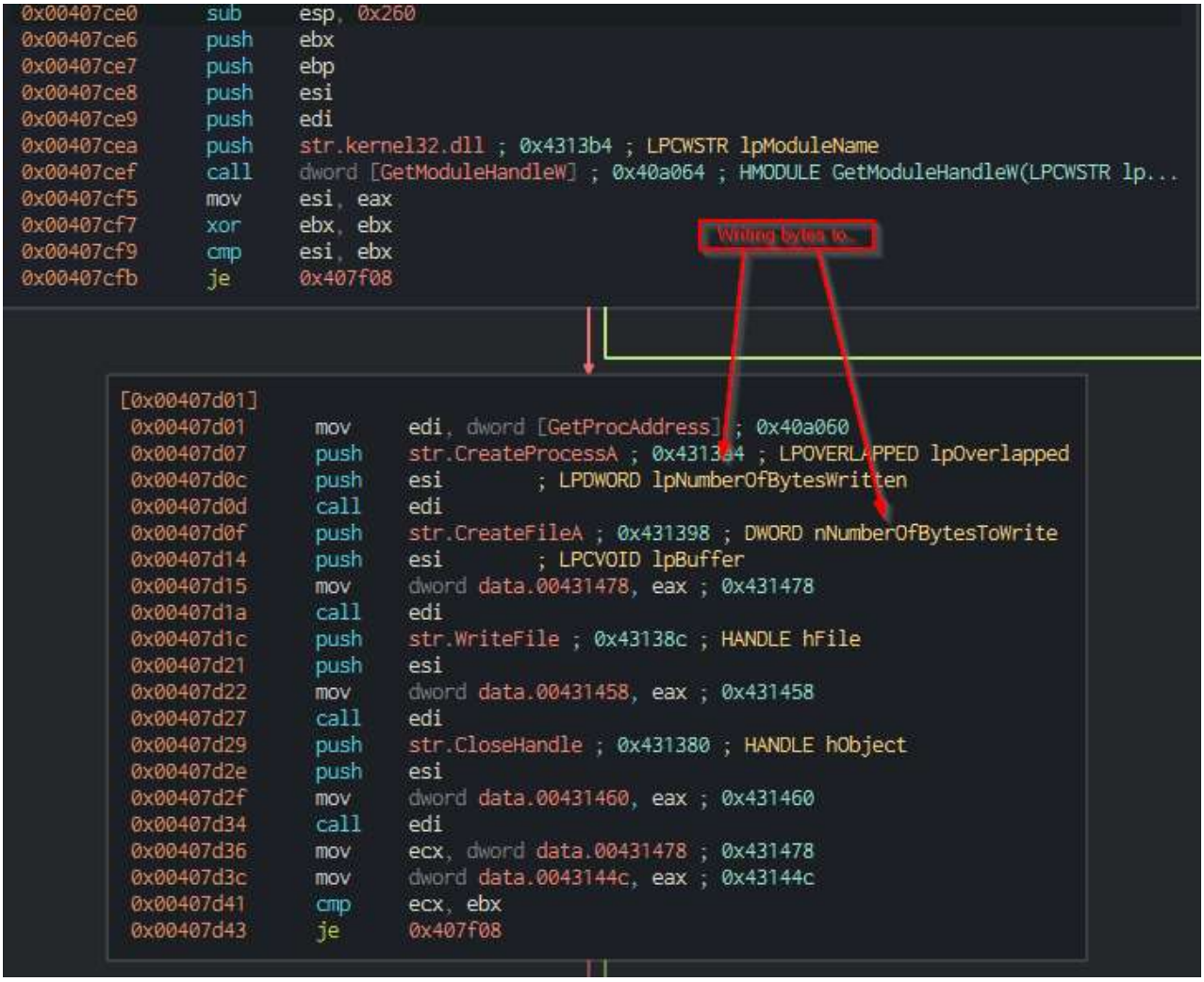
Service creation:



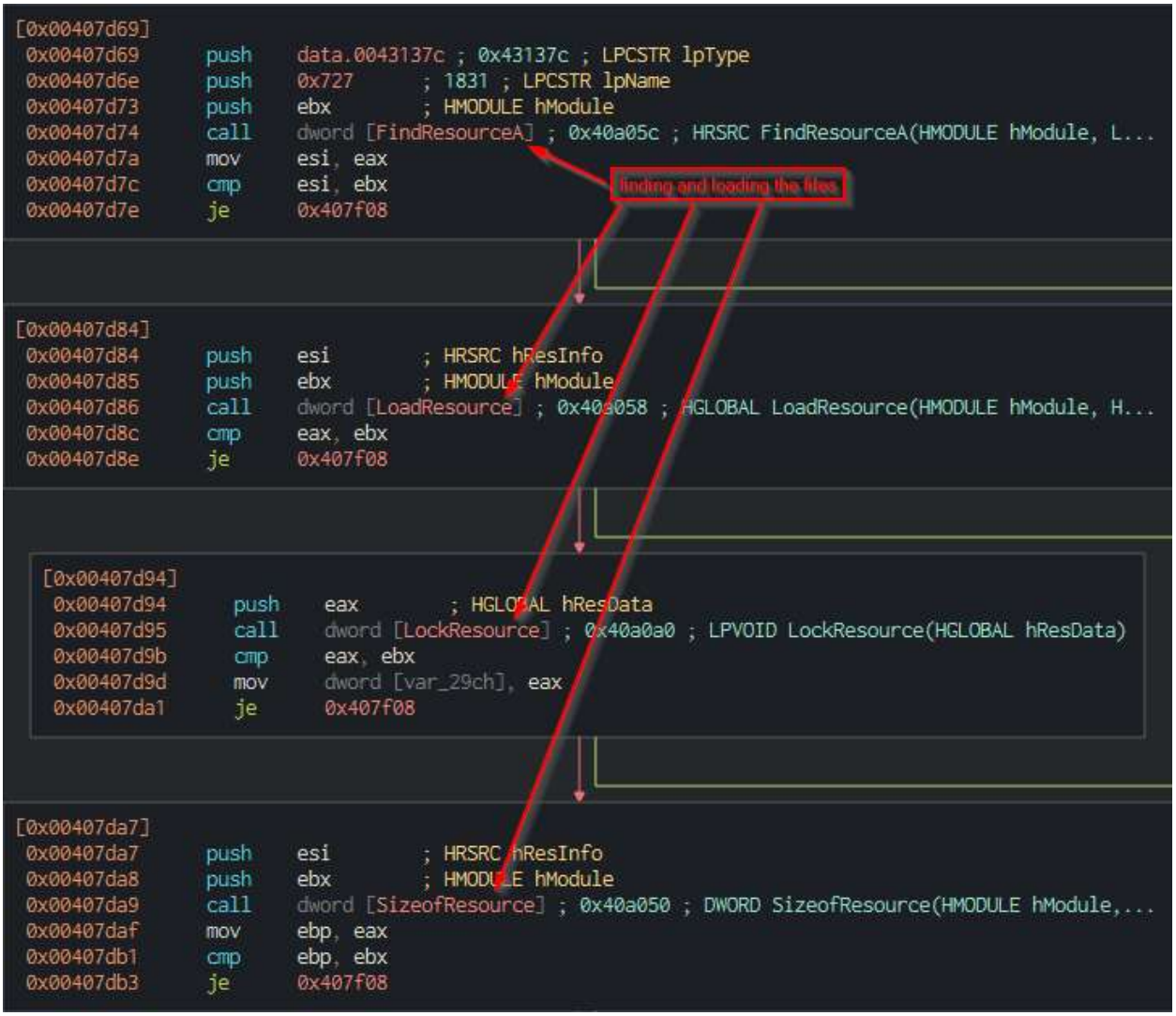
The program then creates the staging directory:

```
[0x00407db9]
 0x00407db9      mov     ecx, 0x40  ; '@' ; 64
 0x00407dbe      xor     eax, eax
 0x00407dc0      lea     edi, [lpExistingFileName + 0x1]
 0x00407dc4      mov     byte [lpExistingFileName], bl
 0x00407dc8      rep     stosd dword es:[edi], eax
 0x00407dca      stosw   word es:[edi], ax
 0x00407dcc      stosb   byte es:[edi], al
 0x00407dcd      mov     ecx, 0x40  ; '@' ; 64
 0x00407dd2      xor     eax, eax
 0x00407dd4      lea     edi, [lpNewFileName + 0x1]
 0x00407ddb      mov     byte [lpNewFileName], bl
 0x00407de2      rep     stosd dword es:[edi], eax
 0x00407de4      mov     esi, dword [sprintf] ; 0x40a10c
 0x00407dea      push    str.tasksche.exe ; 0x43136c
 0x00407def      stosw   word es:[edi], ax
 0x00407df1      stosb   byte es:[edi], al
 0x00407df2      push    str.WINDOWS ; 0x431364
 0x00407df7      lea     eax, [lpExistingFileName]
 0x00407dfb      push    str.C:__s__s ; 0x431358
 0x00407e00      push    eax
 0x00407e01      call    esi
 0x00407e03      add     esp, 0x10
 0x00407e06      lea     ecx, [lpNewFileName]
 0x00407e0d      push    str.WINDOWS ; 0x431364
 0x00407e12      push    str.C:__s_qeriuwjhrf ; 0x431344
 0x00407e17      push    ecx
 0x00407e18      call    esi
 0x00407e1a      add     esp, 0xc
 0x00407e1d      lea     edx, [lpNewFileName]
 0x00407e24      lea     eax, [lpExistingFileName]
 0x00407e28      push    1               ; 1 ; DWORD dwFlags
 0x00407e2a      push    edx             ; LPCSTR lpNewFileName
 0x00407e2b      push    eax             ; LPCSTR lpExistingFileName
 0x00407e2c      call    dword [MoveFileExA] ; 0x40a04c ; BOOL MoveFileExA(LPCSTR lpExistingFileNa...
 0x00407e32      push    ebx
 0x00407e33      push    4               ; 4
 0x00407e35      push    2               ; 2
 0x00407e37      push    ebx
 0x00407e38      push    ebx
 0x00407e39      lea     ecx, [var_258h]
 0x00407e3d      push    0x40000000
 0x00407e42      push    ecx
 0x00407e43      call    dword [data.00431458] ; 0x431458
 0x00407e49      mov     esi, eax
 0x00407e4b      cmp     esi, 0xffffffff
 0x00407e4e      je      0x407f08
```

Then begins to drop files:



Final file drop:



Indicators of Compromise

The full list of IOCs can be found in the Appendices.

Network Indicators

Opens listening port:

taskhsvc.exe (6032)	DESKTOP-L88K1DR	9050			TCP	Listen	
taskhsvc.exe (6032)	DESKTOP-L88K1DR	50471	DESKTOP-L88K1DR	50472	TCP	Establish...	
taskhsvc.exe (6032)	DESKTOP-L88K1DR	50472	DESKTOP-L88K1DR	50471	TCP	Establish...	
taskhsvc.exe (6032)	DESKTOP-L88K1DR	9050	DESKTOP-L88K1DR	8643	TCP	Establish...	

taskhsvc.exe	4664	TCP	Listen	127.0.0.1	9050	0.0.0.0	0	3/2/2024 3:07:33 PM	taskhsvc.exe
taskhsvc.exe	4664	TCP	Established	127.0.0.1	9050	127.0.0.1	50925	3/2/2024 3:08:07 PM	taskhsvc.exe
taskhsvc.exe	4664	TCP	Established	127.0.0.1	50165	127.0.0.1	50166	3/2/2024 3:07:33 PM	taskhsvc.exe
taskhsvc.exe	4664	TCP	Established	127.0.0.1	50166	127.0.0.1	50165	3/2/2024 3:07:33 PM	taskhsvc.exe

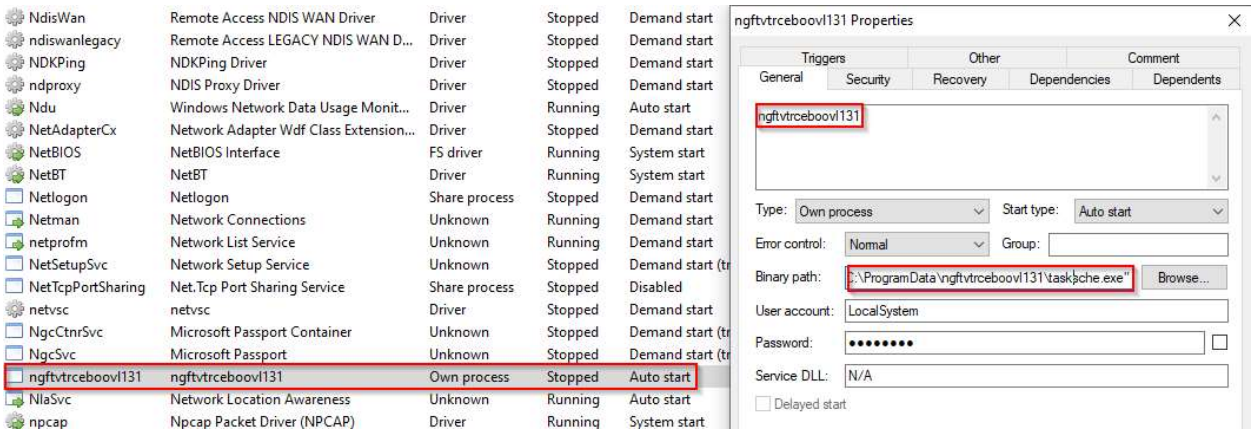
Scans the network for worm capabilities:

80 16.291492	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.4? Tell 10.0.0.3
81 16.715662	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.12? Tell 10.0.0.3
82 16.782115	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.13? Tell 10.0.0.3
83 16.788257	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.5? Tell 10.0.0.3
84 16.788311	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.6? Tell 10.0.0.3
85 16.788339	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.7? Tell 10.0.0.3
86 16.788375	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.8? Tell 10.0.0.3
87 16.788411	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.9? Tell 10.0.0.3
88 16.788431	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.10? Tell 10.0.0.3
89 16.788448	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.11? Tell 10.0.0.3
90 16.838749	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.14? Tell 10.0.0.3
91 16.908368	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.15? Tell 10.0.0.3
92 16.960695	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.16? Tell 10.0.0.3
93 17.013477	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.17? Tell 10.0.0.3
94 17.076332	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.18? Tell 10.0.0.3
95 17.132366	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.19? Tell 10.0.0.3
96 17.194917	VMware_d8:06:c1	Broadcast	ARP	42	Who has 10.0.0.20? Tell 10.0.0.3

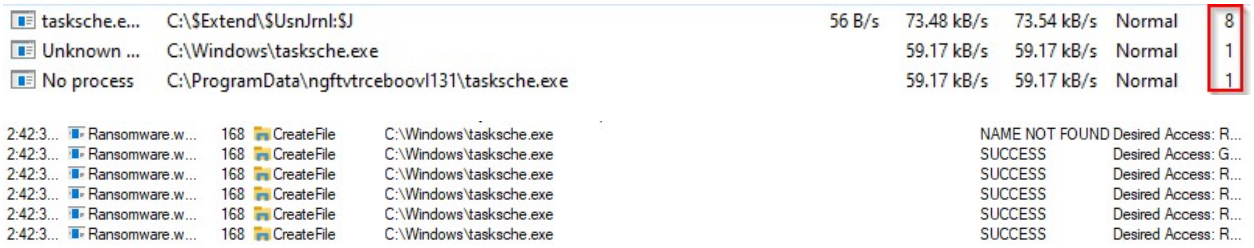
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49713	10.0.0.30	445	3/2/2024 3:07:05 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49716	10.0.0.31	445	3/2/2024 3:07:06 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49717	10.0.0.32	445	3/2/2024 3:07:06 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49719	10.0.0.33	445	3/2/2024 3:07:06 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49720	10.0.0.34	445	3/2/2024 3:07:06 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49721	10.0.0.35	445	3/2/2024 3:07:06 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49722	10.0.0.36	445	3/2/2024 3:07:06 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49723	10.0.0.37	445	3/2/2024 3:07:06 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49724	10.0.0.38	445	3/2/2024 3:07:06 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49725	10.0.0.39	445	3/2/2024 3:07:06 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49726	10.0.0.40	445	3/2/2024 3:07:06 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49692	10.0.0.12	445	3/2/2024 3:07:04 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49700	10.0.0.20	445	3/2/2024 3:07:04 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49693	10.0.0.13	445	3/2/2024 3:07:04 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49694	10.0.0.14	445	3/2/2024 3:07:04 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49695	10.0.0.15	445	3/2/2024 3:07:04 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49696	10.0.0.16	445	3/2/2024 3:07:04 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49697	10.0.0.17	445	3/2/2024 3:07:04 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49698	10.0.0.18	445	3/2/2024 3:07:04 PM	mssecsvc2.0
Ransomware.wannacr...	1224	TCP	Syn Sent	10.0.0.3	49699	10.0.0.19	445	3/2/2024 3:07:04 PM	mssecsvc2.0

Host-based Indicators:

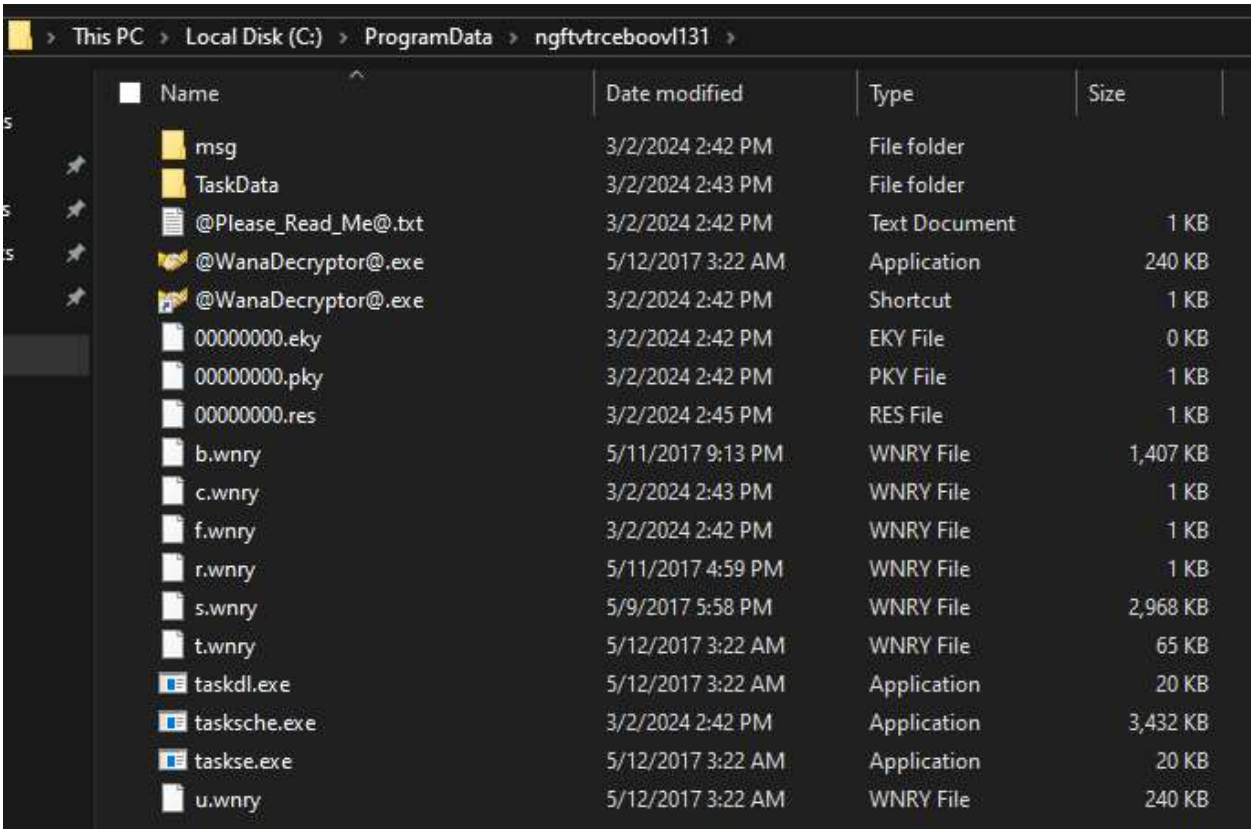
Service created:



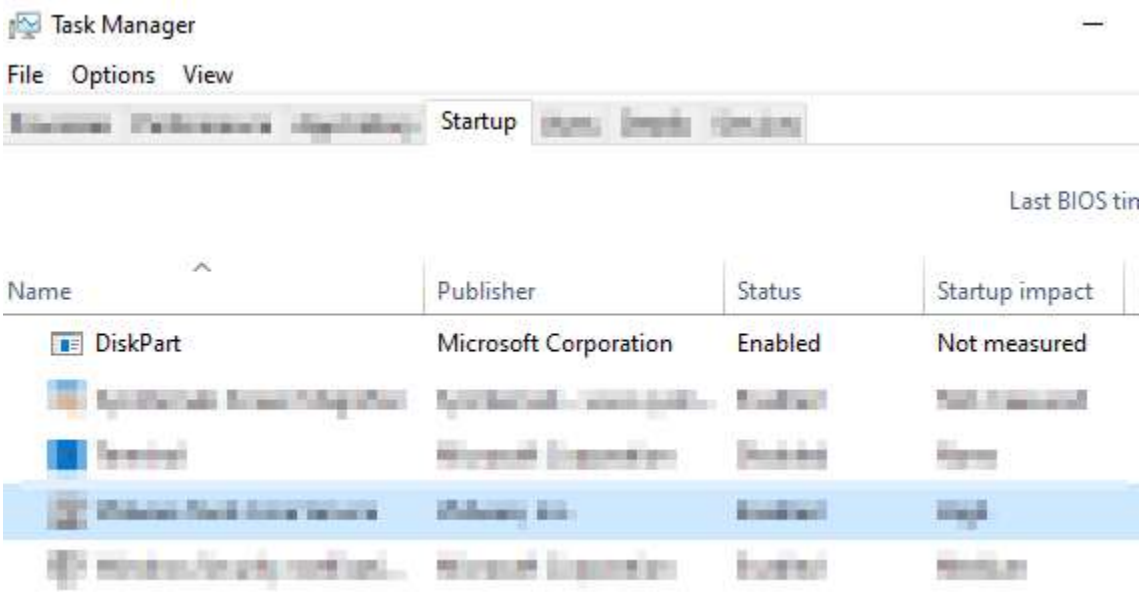
Dropped / created files:



Created Directory and Dropped files (WannaCry Staging location):



Startup file:



Appendices

A. Yara Rules

Full Yara repository located at: https://github.com/j3rmcyber/MalwareAnalysis

```
rule WannaCry_Ransomware {

    meta:
        last_updated = "2024-3-11"
        author = "j3rmcyber"
        description = "YARA Rule for Detecting WannaCry"

    strings:
        // Fill out identifying strings and other criteria
        $string1 = "iuqerfsodp9ifjaposdfjhgosurijfaewrwergwea.com"
        $string2 = "qeriuwjhrf"
        $string3 = “WANACRY!” ascii
        $string4 = “WNcry@2ol7” ascii
        $string5 = “tasksche.exe”
        $PE_magic_byte = "MZ"

    condition:
        // Fill out the conditions that must be met to identify the binary
        $PE_magic_byte at 0 and
        4 of them
}
```

B. Callback URLs

Domain	Port
hxxp[://]www.iuqerfsodp9ifjaposdfjhgosurijfaewrwergwea[.]com	80
127.0.0.1	9050