



# Cactus Ransomware: malware analysis



# Cactus Ransomware: malware analysis

# Important elements

- Attack vector with Fortinet FortiClient
- Auto-encryption of the ransomware
- Dynamic and consecutive file overwriting
- UPX packing
- OpenSSL, AES OCB, ChaCha20-Poly1305 encryption
- Scheduled tasks
- Restart management execution hook
- Enumeration of network shares
- Using the **C:\ProgramData** folder for persistence
- Encryption of files in buffers

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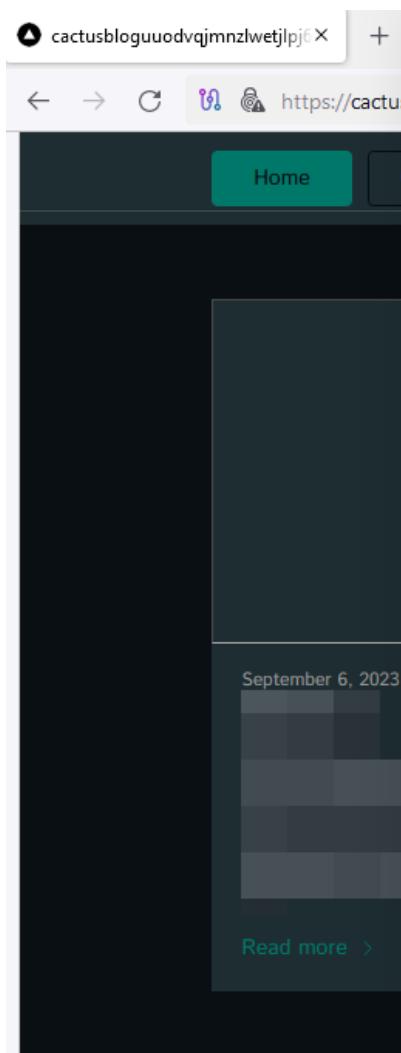
## Introduction

Cactus Ransomware is a new ransomware strain distributed in compromised software packages. It uses a multi-vector, allowing unauthorized users to encrypt files and demand payment for the decryption of the ransomware.

The sample can be easily detected by EDR, XDR and anti-malware. During the encryption process of the target files, the extensions used are dynamically changed from .cts0 to .cts1. During the execution phase, the malware checks, similar to what happens in a concurrent access, whether a file is accessible at a certain time or not.

The sample possesses the data leak portal

[http://cactusbloguodvqjmnzlwetlpj6aggc6iocwhuupb47laukux7ckid\[.\]onion](http://cactusbloguodvqjmnzlwetlpj6aggc6iocwhuupb47laukux7ckid[.]onion), which contains details of the various victims and their data.



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The communication channel  
and the TOX Chat with UR  
hxxps[://]tox[.]chat[/]:]7367~~b4zz0D/470D512A15515010/AB5218520C102/2A51BD4011E0121AE421AE~~

## Static analysis and assessment

The sample submitted for analysis has the hash

**78c16de9fc07f1d0375a093903f86583a4e32037a7da8aa2f90ecb15c4862c17**, it is in a packed state with the UPX packer.

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Below are the details of the

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Within the Overlay section,  
references to encryption fun

SURNAME\*

PHONE\*

Also within the Overlay data  
leaking context.

EMAIL\*

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With regard to imports, we  
are appending ReportEventW),  
and services using the resou  
WSOCK32.dll (in order to r



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The highest entropy coeffici

The PE manifest has an attr  
same permissions as the par



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From the strings extracted from the executable, one can see references to CBC encryption routines and CBC decryption routines relating to the AES algorithm.

Below are the details of some public key storage objects, for example  
EVP\_PKEY\_set1\_encoded\_public\_key:

The EVP\_PKEY\_verify\_rekey algorithm.

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Below is a detail on the chaotic question is a mix of ChaCha

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In the screenshot below, the

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Here is the UPX unpacking



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From the extracted strings the services.exe, the ProgramDa

Cactus Ransomware bypasses Windows Defender protection, uses TOR Browser to contact malcoders, the file (stored in the folder **C:\ProgramData**) is used for the purpose of storing the key for encrypting the executable file. It doesn't represent the original Windows ntuser.dat file, but rather a file so named in all likelihood to evade and confuse the nature of the file itself. In addition, the batch script rn.bat is most likely used for the file renaming phase. The log file **C:\ProgramData\update.log** is used for tracking the ransomware infection, while the threat also threatens to publish the victim's data if the ransom is not paid.

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Cactus Ransomware creates

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Here a detailed MD5 and SI



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Note the functions IsFileFree  
canWriteDirectory (to check  
purpose of terminating process)  
order to check whether a ce



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## Dynamic analysis and disassembling

Contextually with ChaCha20 executions, in the label loc\_14010E1BE, there are numerous movaps, movdqa and movdqqu operations inherent in xmm registers

There are references to attrib

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.xdata:

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Cactus Ransomware makes PHONE\*

added to the update.log trac

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The e-mail address cactus@



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Here is an introduction strin

Within the cryptFullFile function, the file is called up to manage the file



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Initially, the extension “.cts0

It is subsequently replaced by



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There is the use of the wildcard “\*” for filesystem enumeration:

Here the enumeration function of the compromised machine's disks:

Following are the details of the resources of the files to be encrypted:

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Below is a reference that we will need to access to the files to be encrypted. Please provide confirmation:

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Here the check of longpaths by Cactus Ransomware taking in consideration UNC (Uniform Naming Convention) paths:

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The rn.bat script is most likely to add a chain:

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The extractDirPath function

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Cactus Ransomware has a global variable named extBlackList:

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The function hexEncode takes the rbp register, to load the memory address

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The makeNtUserFile function is used during the infection-deployment:

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Here, the wildcard “\*” is used in the encryption process:

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The files taken in consideration  
them, an error string is produced



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Here is a detail of logging a disk infection:

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The operation of reading the ransomware itself:

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Here, in fact, the reference to



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Second malware assessment

This sample of Cactus Rans



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Suspicious indicators in the system include: unusual file extensions, file corruption, file locking, file modification, file deletion, file compression, file encryption, configuration management, and system resource utilization.



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The entropy of the .text section is **0.092**:

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Functions to watch out for in the ransomware:

GetLogicalDriveStringsW, C

CryptAcquireContextW, Cry

RmRegisterResources, acce



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The RVA (Relative Virtual Address) entrypoint of the sample under consideration is **000013F0**:

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Here are details of some sec

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The send function of socket

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Within the disassembled .tex

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There are also references to



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The OptionalHeader has a s



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The size of the full image is **67B000**, while the size of the headers is **600**:

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Here are the addresses for the  
directories.

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The largest section is .text, c

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In the screenshots below, th  
mentioned concerning the co  
connections management.



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Here below a reference to p

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Here is a reference to the mingw compilation command:

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Assembly dumping

By dumping the low-level as  
isFileFree function.

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At address **0x140002ab7**, a  
the rax register.

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The SearchFiles function us  
function.



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The memory address for cr



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It is also checked if a file or



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The content of the Cactus R



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At the same time as encrypt  
files is defined:



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The enumerated disks on th



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Here a detail of the loading



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Here, the AES decryption function  
ciphertext\_len, key, iv and p

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Within the EVP\_DecryptInit  
is saved in register r13 at ad

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The EVP\_CIPHER\_CTX\_

attributes and parameters of the encryption object available and the randomly generated public key, respectively:

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At the same time as obtainir

followed by a call to a function to randomize the private key bytes and a subsequent XOR instruction. This resets the value of the eax register to zero.

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Here the details of a Boolean variable to contact the Data Controller, and the session key variables:

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Here are the details of the handling of personal data. The following management are evident:

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## Debugging session

Following are some details of the debugging session carried out, where we note references to the Cactus Ransomware readme TXT file, the unique ID of the ransomware infection, a reference to **TOX chat** for

contact with malcoders:

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If files and folders that have  
encryption process.



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Here the details of some stri  
**ntuser.dat** file, scheduled ta



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The **C:\ProgramData\ntus**  
ransomware sample:



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Here are the ASCII and hexadecimal details of the processes taken over by the infection kill chain and the call of the AES\_init\_key function:

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Here we can see encryption attributes of OpenSSL and ChaCha20Poly1305:

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MESSAGE\*

Note the details regarding the types %s (string) and %C (char).



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PHONE\*

EMAIL\*

MESSAGE\*



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The sample is recognized as malicious by OSINT sources and identified as **trojan.cactus/genericfca**:

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Here a detail of a key finding  
file:

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By decoding the string in qu  
Act domain and the justice[.  
as the public key for encryp

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MESSAGE\*



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## IOCs:

- 78c16de9fc07f1d0375a093903f86583a4e32037a7da8aa2f90ecb15c4862c17

- cb570234349507a204c558
- e28db6a65da2ebcf304873
- Updates Check Task sched
- CaCtUs.ReAdMe.txt
- cactus[@]mexicomail[.]co
- TOX Chat ID:  
7367B422CD7498D5F2AA
- cactus787835[@]proton[.]
- cactusbloguuodvqjmnzlwe
- sonarmsng5vzwqezlvtu2iiv

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## YARA rule:

rule CactusRule

{

strings:

\$cactusStr = "CaCtUs"



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condition:

\$cactusStr or \$cactusHex

}

# CONCLUSION

Cactus Ransomware has several known variants and multiple infection vectors. The ransomware uses a specific file extension and the consecutive changes in the file names to identify the files themselves. It also includes a file named 'Cactus' in the encrypted folder. The ransomware samples are signed with certificates concerning the use of the Cactus ransomware. The malware samples are signed with certificates from various sources, including the National Security Agency (NSA) and the Central Intelligence Agency (CIA). The encryption of the ransomware is done using RSA-2048 encryption. To understand the ransomware's behavior, it is important to analyze its code and identify its peculiarities: it uses the UPX compressor to compress the malware samples before they are subjected to the encryption process. The ransomware also includes a self-destruct mechanism that deletes the management of encrypted files after a certain period of time.

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 Journey into Raccoon's lair

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**SUBMIT**

I declare that I have read [the information](#) and expressly consent to the processing of my data and the activation of the newsletter service.

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