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Cybereason vs. BlackCat Ransomware

WRITTEN BY Cybereason Nocturnus

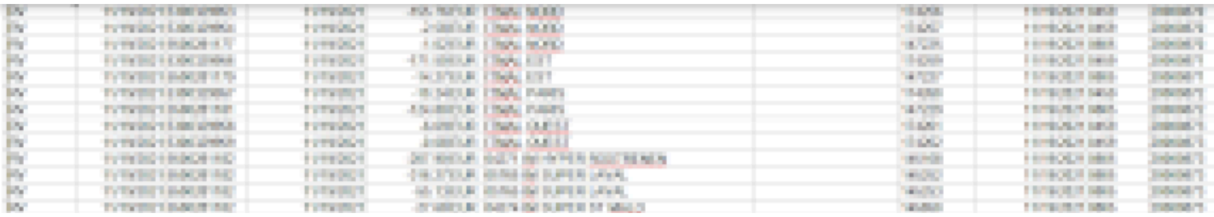
Since its first emergence in November 2021, the Cybereason Nocturnus team has been tracking the BlackCat Ransomware (aka ALPHV), which has been called "2021's most sophisticated ransomware".

The Cybereason XDR Platform Detects and Blocks BlackCat Ransomware

Since its recent emergence, BlackCat has attacked various industries, including telecommunication, commercial services, insurance, retail, machinery, pharmaceuticals, transportation, and construction industries. Among the affected regions are Germany, France, Spain, the Philippines, and the Netherlands, with the most victims being located in the US.

The ransomware was given the name “BlackCat” due to the favicon of a black cat being used on every victim's Tor payment site. The operators of BlackCat have been using the names “alphv” and “ransom” in Cybercrime forums (ramp_v2, exploit.in) in order to recruit affiliates.

The operators of the ransomware appear to be from Russian speaking regions. Like many others, BlackCat uses a RaaS model (Ransomware-as-a-service). Affiliates of BlackCat are offered between 80-90% of the ransom payment, and once approved, are given access to a control panel that manages access:



Leaked document from BlackCat Leaks website

One of the unique elements of the BlackCat ransomware is that it is written in Rust, which is not a common coding language for malware and ransomware. *"Rust is a multi-paradigm, general-purpose programming language designed for performance and safety."*

Because of Rust's emphasis on performance, the process of encryption is very fast, and in addition, Rust is cross-platform, which makes it easier to create variants for both Windows and Linux.

The operators of BlackCat confirmed that they are affiliates of DarkSide/BlackMatter ransomware gang. They claim to be apolitical in regards to geopolitical relations and to refrain from attacking medical institutions and hospitals.

The group has adopted the popular double extortion paradigm, which means that in addition to encrypting files, they also steal them and later threaten to publish stolen data unless the ransom is paid. In some cases even, triple extortion is used - threatening to perform DDOS attacks.

KEY DETAILS

- **Sophisticated Ransomware:** BlackCat has been called "2021's most sophisticated ransomware
- **High Severity**: The Cybereason Nocturnus Team assesses the threat level as HIGH given the destructive potential of the attacks.
- **Developed in Rust**: BlackCat was developed in rust which is unusual for ransomware.
- **Triple Extortion**: The BlackCat operators used double extortion and sometimes triple extortion to make victims pay the ransom

- **Detected and Prevented**: The Cybereason XDR Platform fully detects and prevents the Lorenz ransomware.

TECHNICAL ANALYSIS

BREAKING DOWN BLACKCAT RANSOMWARE

The BlackCat ransomware has both Windows and Linux variants. The ransomware includes multiple execution flags which grant its operators control over operations like whether to stop executions of virtual machines or if the ransomware should change the desktop wallpaper or not:

BlackCat help menu

In order to execute properly, BlackCat must be executed with the "--access-token" flag, although the value of the string that is passed on to it can be any string.

Upon execution, BlackCat may attempt to perform Privilege escalation in the following manners:

- UAC bypass by abusing the Connection Manager Admin API Helper for Setup COM interface (cmstplua.dll)
- Abusing CVE-2016-0099 (Secondary Logon Service exploit)
- Adjusting access token token privileges

Next, BlackCat checks the UUID (universally unique identifier) of the machine by running a WMI command, which is used later for the recovery URL in the ransom note:

- *wmic csproduct get UUID*

BlackCat enables local and remote *symbolic links* on the infected machine. A symbolic link is a type of file that contains a reference to another file. This is probably done to make sure that the ransomware is able to follow shortcuts on the machine in order to find the original file to encrypt:

BlackCat also attempts to stop Internet services on the infected machine using the iisreset.exe:

- *iisreset.exe /stop*

The ransomware changes the number of outstanding requests that can be maintained. An outstanding request is a request that is still waiting for a response. These are used when performing SMB requests, the change is probably done to raise the number of possible PsExec requests the machine could make so the ransomware may spread:

- *reg add HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\LanmanServer\Parameters /v MaxMpxCt /d 65535 /t REG_DWORD /f*

Then, it deletes the shadow copies from the infected machine using both “vssadmin” and “wmic”:

- *vssadmin.exe delete shadows /all /quiet*
- wmic shaodwcopy delete

BlackCat Execution as seen in the Cybereason XDR Platform

BlackCat enumerates all local disk partitions on the infected machine, and any hidden partition that is found is mounted in order to make it possible to encrypt more files.

The ransomware also attempts to propagate through the network via the use of the “net use” command and PsExec which is embedded inside the BlackCat executable. The ransomware executes the tools using credentials that are configured in the ransomware config:

Credentials in the configuration

Additionally, BlackCat disables windows’ automatic repair and clears the machine's event log, by running the following commands:

- *bcdedit /set {default} recoveryenabled No* processes and services on the machine in order to decrease the number of locked files that are not accessible due to another program (full list in appendix). In addition, BlackCat's configuration includes a list of directories to be excluded from encryption. (see appendix):

BlackCat Configuration

To encrypt the files, BlackCat may use AES or ChaCha20 for encryption, based on the configuration. It drops a ransom note titled : "*RECOVER-[encrypted file extension]- FILES.txt*" in each folder and in the end, the ransomware changes the desktops wallpaper:

Wallpaper after BlackCat change

BlackCat ransom note

LINUX VARIANT SPECIFIC COMMANDS

The Linux variant was observed executing commands in order to delete VMware ESXi snapshots. The ransomware generates a list of running virtual machines:

-
  ```
  esxcli --formatter=csv --format-param=fields=="WorldID,DisplayName" vm process list
  ```

Each virtual machine is then terminates using the command:

-
  ```
  awk -F "\"*,\"*" '{system("esxcli vm process kill --type=force --world-id="$1)}'
  ```

Finally all snapshots of the virtual machines are deleted:

-
  ```
  for i in `vim-cmd vmsvc/getallvms| awk '{print$1}'`;do vim-cmd vmsvc/snapshot.removeall $i & done
  ```

BLACKCAT AND LOCKBIT CONNECTION

The Nocturnus team observed interesting overlaps between tools and infrastructure used by BlackCat ransomware and LockBit ransomware. The Nocturnus team

The launcher contains the following PDB path:

- *"D:\my\Documents\Visual Studio 2019\setup\obj\Release\setup.pdb*".

When searching for files that share the PDB, we encountered several additional malware with the same name that have remarkable similarities to the BlackCat launcher. When examining the code and Infrastructure of these malware, we see overlaps between BlackCat infrastructure and LockBit infrastructure.

BLACKCAT LAUNCHER

The launcher downloads the BlackCat executable from the C2 and executes it using the "--access-token" argument, which is required in order to run BlackCat:

BlackCat Launcher code

Additionally, the tool collects basic profiling information about the infected machine and uploads it to the C2. The information collected is:

- A screen capture
- Username
- OS name
- OS language
- Timezone
- Windows UUID
- Keyboard language
- Installed users
- Installed software
- Drives

LOCKBIT PROFILER TOOL

The Nocturnus team discovered striking similarities with the BlackCat launcher and a profiler associated with LockBit ransomware. The profiler variants which are linked to

The only difference in functionality is that they do not attempt to download anything, they only collect profiling data, with the difference being that instead of collecting the machine’s “Windows UUID”, the profiler checks if LockBit is already installed on the machine:

Left: LockBit profiler code Right: BlackCat Launcher code

When checking the Infrastructure used by these tools, we see connections and similarities in the IP addresses, URI structure, and file names:

BlackCat and LockBot infrastructure comparison

All the IP addresses that are used by the BlackCat launcher and LockBit profiler, share the URI paths “files” and “upload”. In addition, BlackCat and LockBit samples sometimes share file names. For example, we observed BlackCat samples with the name:

- “*test_**4mmc**_x86_32_windows_encrypt_app.exe*” and LockBit samples with the name “**4mmc.exe**”

Another example of shared file names is a LockBit sample named “*screensaver.exe*”, which is also the default name used for the BlackCat executable that is downloaded using the launcher:

“Screensaver.exe” used in BlackCat Launcher

This connection between some of the tools and infrastructure between BlackCat ransomware and LockBit ransomware might indicate sharing of code and tools between cybercriminals, or there could be individuals that worked for both ransomware operators:

BlackCat and LockBit Infrastructure map

CYBEREASON DETECTION AND PREVENTION

Additionally, when the Anti-Ransomware feature is enabled, behavioral detection techniques in the platform are able to detect and prevent any attempt to encrypt files and generates a MalOp for it:

Cybereason Detects and Blocks BlackCat Ransomware

SECURITY RECOMMENDATIONS

- **Enable the Anti-Ransomware Feature on Cybereason NGAV:** Set Cybereason Anti-Ransomware protection mode to Prevent - more information for Cybereason customers can be found here
- **Enable Anti-Malware Feature on Cybereason NGAV**: Set Cybereason Anti-Malware mode to Prevent and set the detection mode to Moderate and above - more information for Cybereason customers can be found here
- **Keep Systems Fully Patched**: Make sure your systems are patched in order to mitigate vulnerabilities
- **Regularly Backup Files to a Remote Server**: Restoring your files from a backup is the fastest way to regain access to your data
- **Use Security Solutions**: Protect your environment using organizational firewalls, proxies, web filtering, and mail filtering

MITRE ATT&CK BREAKDOWN

Reconnaissance	Execution	Privilege Escalation	Discovery	Lateral Movement	Collection	Impact
Gather Victim Host Information	Command-line interface	Signed Binary Proxy Execution	Process Discovery	Lateral Tool Transfer	Data from Local System	Data Encrypted for Impact

		Manipulation	Discovery			
		Exploitation for Privilege Escalation	File and Directory Discovery			Inhibit System Recovery

APPENDIX

Process to kill list:

agntsvc , dbeng50 , dbsnmp , encsvc , excel , firefox , infopath , isqlplussvc , msaccess , mspub , mydesktopqos , mydesktopservice , notepad , ocautoupds , ocomm , ocssd , onenote , oracle , outlook , powerpnt , sqbcoreservice , sql , steam , synctime , tbirdconfig , thebat , thunderbird , visio , winword , wordpad , xfssvccon , *sql* , bedbh , vxmon , benetns , bengien , pvlsvr , beserver , raw_agent_svc , vsnapvss , CagService , QBIDPService , QBDBMgrN , QBCFMonitorService , SAP , TeamViewer_Service , TeamViewer , tv_w32 , tv_x64 , CVMountd , cvd , cvfwd , CVODS , saphostexec , saposcol , sapstartsrv , avagent , avscc , DellSystemDetect , EnterpriseClient , VeeamNFSSvc , VeeamTransportSvc , VeeamDeploymentSvc

Services to kill list:

mepocs , memtas , veeam , svc$, backup , sql , vss , msexchange , sql$, mysql , mysql$, sophos , MSExchange , MSExchange$, WSBExchange , PDVFSService , BackupExecVSSProvider , BackupExecAgentAccelerator , BackupExecAgentBrowser , BackupExecDiveciMediaService , BackupExecJobEngine , BackupExecManagementService , BackupExecRPCService , GxBlr , GxVss , GxCIMgrS , GxCVD , GxCIMgr , GXMMM , GxVssHWProv , GxFWD , SAPService , SAP , SAP$, SAPD$, SAPHostControl , SAPHostExec , QBCFMonitorService , QBDBMgrN , QBIDPService , AcronisAgent , VeeamNFSSvc , VeeamDeploymentService , VeeamTransportSvc , MVArmor , MVarmor64 , VSNAPVSS , AcrSch2Svc

ABOUT THE RESEARCHERS

Tom Fakterman

tools for automated cyber investigations.

Ohav Peri

Ohav Peri, cyber security analyst with the Cybereason Nocturnus Research Team, focusing on malware analysis and defense platforms research. Ohav began his career as a security researcher and software engineer in the intelligence corps of the military forces.

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ABOUT THE AUTHOR

Cybereason Nocturnus

The Cybereason Nocturnus Team has brought the world's brightest minds from the military, government intelligence, and enterprise security to uncover emerging threats across the globe. They specialize in analyzing new attack methodologies, reverse-engineering malware, and exposing unknown system vulnerabilities. The Cybereason Nocturnus Team was the first to release a vaccination for the 2017 NotPetya and Bad Rabbit cyberattacks.

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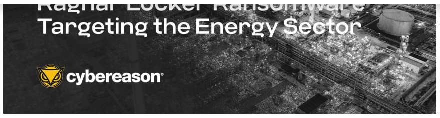

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In just two months, Black Basta has added nearly 50 victims to their list, making them one of the more prominent ransomware gangs. The attackers infiltrate and move laterally throughout the network in a fully-developed RansomOps attack. The Cybereason Nocturnus Team assesses the threat level as HIGH SEVERITY given the destructive potential of the attacks...

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