

Night Sky Ransomware

A short-lived threat from a long-lived threat actor

April 12, 2022

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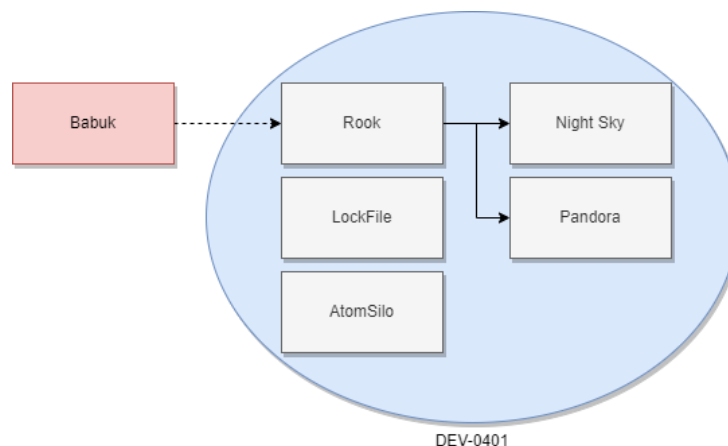
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1. Executive Summary

The Night Sky ransomware was first reported by [MalwareHunterTeam](#) on January 1, 2022. Victims were asked to contact the attackers on `contact[.]nightsky[.]cyou` to pay for the ransom. If the victims refused to pay, attackers threatened to expose their data on a leak site. This is known as a *double extortion ransomware*, which was first used by [Maze](#) and is now used by several ransomware groups. [Previous reports](#) suggest that Night Sky has been distributed by exploiting the Log4Shell vulnerability and is connected to a threat actor based in China, which is tracked by Microsoft as DEV-0401.

The Night Sky campaign was short and compromised two victims in Bangladesh and Japan. Currently, the Night Sky [infrastructure is offline](#), which suggests the threat actor may have rebranded.

Night Sky provides an interesting view into the relationships among several ransomware families. Night Sky was discovered to be a [fork of a ransomware family called Rook](#), which was itself derived from the leaked source code of [Babuk](#) and deployed by the same threat actor that used [LockFile](#) and [AtomSilo](#), which are so close they share the [same decryption tool](#). Shortly after the Night Sky and Rook leak sites went offline in January 2022, a new gang named Pandora appeared online, claiming one of the victims of Rook as its own – the Japanese automotive parts manufacturer Denso – and using malware samples that are still detected as Rook. The Pandora leak site (`vbfqeh5nugm6r2u2qvghsdxm3fotf5wbxb5ltv6vw77vus5frdpuaaid[.]onion`) is still active as of this writing. Currently, they claim a total of seven victims. These relationships are depicted in the figure below.



In this report, we analyze the behavior of the Night Sky malware on two samples obtained from [existing reports](#) (Section 2), present a list of IoCs extracted from our analysis (Section 3) and discuss mitigation (Section 4). To the best of our knowledge, there is no tool available to decrypt the targeted files. In addition, their website is no longer available, so there is no way to obtain the decryption keys.

2. Technical Analysis

Night Sky samples first appeared at [the beginning of January 2022](#). They are executables designed to run on Windows x64. The files disguised themselves under different names such as **update.txt**, **unknown** and **wzl6rs0i6.dll** (see [VirusTotal](#)). The malware is written in C/C++ using Microsoft Visual C 64 bit Universal and has the size of 5.7 MB, which is relatively large compared to [the average size of a malware sample](#).

[Figure 1](#) shows that the malware has a few abnormal section names and that the entry point of the executable lies outside of standard sections. This suggests the malware is packed. [A previous analysis](#) identified that [VMProtect](#) was used to pack the malware.

PE file contains sections with non-standard names		Hide sources
Source: 6v9g3tZszP.exe	Static PE information: section name: .2fU0	
Source: 6v9g3tZszP.exe	Static PE information: section name: .2fU1	
Source: 6v9g3tZszP.exe	Static PE information: section name: .2fU2	
Entry point lies outside standard sections		Hide sources
Source: initial sample	Static PE information: section where entry point is pointing to: .2fU2	

Figure 1: Abnormal section names of the Night Sky sample

In addition, the presence of the Windows **LoadLibraryA** and **GetProcAddress** APIs in Figure 1 suggests the malware imports other functions at runtime, which hinders static analysis. Figure 2 shows the malware also delays its execution to hinder automated dynamic analysis by triggering the **SleepEx** function to remain idle for a minute.

May sleep (evasive loops) to hinder dynamic analysis			Jump to behavior
Source: C:\Users\user\Desktop\PJ7FvnkZ2S.exe TID: 2692	Thread sleep time: -60000s >= -30000s		

Figure 2: The malware tries to delay the execution to hinder dynamic analysis

Although the Windows API's **IsDebuggerPresent** function is present in the malware, it could be run with the **x64dbg debugger**.

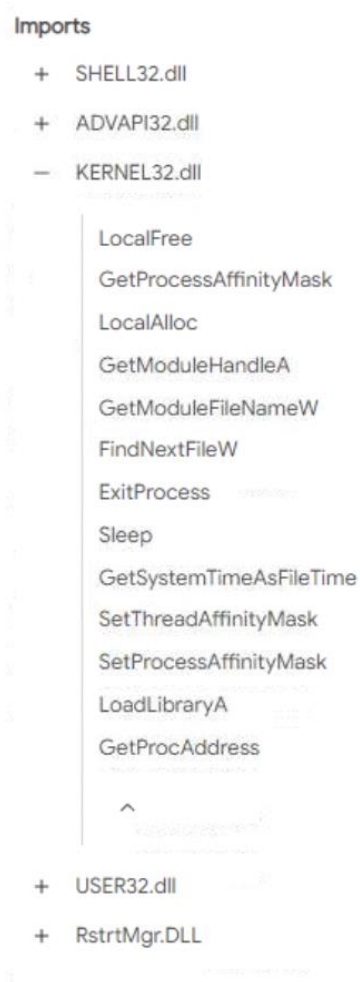


Figure 3: The malware uses LoadLibrary and GetProcAddress for dynamic imports

The malware enumerates the files in the victim's machine using the function **FindNextFileW** (shown in [Figure 3](#)) and encrypts them. However, the malware skips 31 folders (e.g., Program Files) and file types (e.g., dll) as shown in [Figure 4](#). This behavior is confirmed by running the ransomware in a physical Windows host.

```

aAppdata:      text "UTF-16LE", 'AppData',0
aBoot:         text "UTF-16LE", 'Boot',0
               align 20h
aWindows:      text "UTF-16LE", 'Windows',0
aWindowsOld:   text "UTF-16LE", 'Windows.old',0
aTorBrowser:   text "UTF-16LE", 'Tor Browser',0
aInternetExplor: text "UTF-16LE", 'Internet Explorer',0
               align 8
aGoogle:       text "UTF-16LE", 'Google',0
               align 8
aOpera:        text "UTF-16LE", 'Opera',0
               align 8
aOperaSoftware: text "UTF-16LE", 'Opera Software',0
               align 8
aMozilla:      text "UTF-16LE", 'Mozilla',0
aMozillaFirefox: text "UTF-16LE", 'Mozilla Firefox',0
aRecycleBin:   text "UTF-16LE", '$Recycle.Bin',0
               align 8
aProgramdata:  text "UTF-16LE", 'ProgramData',0
aAllUsers:     text "UTF-16LE", 'All Users',0

```

Figure 4: List of folders and files Night Sky skips the encryption. Source: Netskope

The encrypted files are then appended with an extension **“.nightsky”**. [Figure 5](#) shows an example of an encrypted file.

C:\Users\Default\NTUSER.DAT.LOG1.nightsky	
Process:	C:\Users\user\Desktop\Pj7FvnkZ2S.exe
File Type:	data
Category:	dropped
Size (bytes):	192016
Entropy (8bit):	7.999077239802471
Encrypted:	true
SSDEEP:	3072 L011X7pIZ8Hi1wm/dsqFqje+cKvMjUoBV2nzPqjFmVL0x0+1TEuie L011XNlb8g6qscyIY32nzPqlv0Boule
MD5:	DF83312939486F6BA43A32DBA9493003
SHA1:	BB09BC024E3C1A680BB25D097F030BE8621BC0CD
SHA-256:	8DB4A92BA58DEB2D835CBFF88926F3C33F3CCB8548F053A94336546E41CE56C3
SHA-512:	C54A97B53A160DA53A1541B52A7F0D0C3951B6B107703758ADD57EF153EB15FA10A949C7922D197A85D4C68F067E0144D676DCE3422A9B5E49F900B69A0FD80
Malicious:	false
Preview:	hmr.....B4-f.L.....Z^..C.....Q..)=..A.A...j.Y..K.I.....U.v.....4>xN..D~.NR..2.mT.j ..-.....^.._B.....4IT3.....).@..e.{..A..C.K...B.....3:1...'.o.6.w^..N...I.f.Co.&S.0+... 1! v.@..c.O+.....%.Io[1".R..+6s.O....Ye..xP.n"......0'...BF..~..o^..#913.T.....e.g.,[.:.{.....^%.....2.....dK...X..2.....o/I.... 'f.Lu006.k....T...P...3h&..A..4...K... K.....3..)H.....{2".b...)}.....V...Int..S..+mf.....80.....N.[..@.....A..B"...Q P...2..[a.N.T.....3...{...y..j.....d...16.....)}...<R...2.B.H.....VKB..e..xf.u.... <..Q.. ..R..4w.....{("8&.....(u.l....D3.R..'.z)'*^8...Q.SB..'(7.l.g..H..u9x...Z...#8.....c...f...g..N...44tb.....*..b..j.kmz.y.c&R...^Th..e Q..)}..3u3k...^..4.U.H....y..F...t.m3..Pf.....o)...@.0B.s"...d..)}..)\0.H..l...iI<.d.H.....X.....P..Kc5..v P.H.K.....U.w.p&..Q.Bc.WR.....'..Z../<K"...O../.7yJB..is~/2s.^b..^..l..o.C[b]b&...V... ...X..K...>n..u.....on.....?N.Zs...{.Au>d.T.....L

Figure 5: Example of an encrypted file

The malware drops ransom notes in various folders, including the **Start Menu** folder as shown in [Figure 6](#). The victims would see the ransom note after restarting the system.

Stores files to the Windows start menu directory		Hide sources
Source: C:\Users\user\Desktop\6v9g3tZsP.exe	File created: C:\Documents and Settings\Default\Start Menu\NightSkyReadMe.hta	Jump to behavior
Source: C:\Users\user\Desktop\6v9g3tZsP.exe	File created: C:\Documents and Settings\Default\Start Menu\Programs\NightSkyReadMe.hta	Jump to behavior
Source: C:\Users\user\Desktop\6v9g3tZsP.exe	File created: C:\Documents and Settings\Default\Start Menu\Programs\Accessibility\NightSkyReadMe.hta	Jump to behavior
Source: C:\Users\user\Desktop\6v9g3tZsP.exe	File created: C:\Documents and Settings\Default\Start Menu\Programs\Accessories\NightSkyReadMe.hta	Jump to behavior
Source: C:\Users\user\Desktop\6v9g3tZsP.exe	File created: C:\Documents and Settings\Default\Start Menu\Programs\Maintenance\NightSkyReadMe.hta	Jump to behavior
Source: C:\Users\user\Desktop\6v9g3tZsP.exe	File created: C:\Documents and Settings\Default\Start Menu\Programs\System Tools\NightSkyReadMe.hta	Jump to behavior
Source: C:\Users\user\Desktop\6v9g3tZsP.exe	File created: C:\Documents and Settings\Default\Start Menu\Programs\Windows PowerShell\NightSkyReadMe.hta	Jump to behavior

Figure 6: The ransom note added to Start Menu

In the ransom note shown in [Figure 7](#), Night Sky hackers provide a link to a web chat channel that a victim can join to communicate with them. The channel is currently off. For those victims who refuse to pay the ransom, the hackers threaten to publish their data on a .onion site. The leak site is also offline currently.

NIGHT SKY

WARNING!

Your company has been hacked by us.

Internal files have been stolen and encrypted by us.

But don't worry, we didn't destroy them, and we won't leak data right away.

If your company is willing to meet our requirements,

we will decrypt the data and destroy the stolen data without data leakage.

Item list

- All files in the file server 287GB
- ERP System Database and file 613GB(include ARL,AAL,AVL,AJL,AJL domain)
- Mail server data(include emails of all company directors within two years) 47GB
- Citibank loan 2.7GB
- business system databases(including company and customer data) 45GB
- All website Copied database backup 107GB
- Personal computer desktop file(210,000 office documents within one year) 62GB
- All employee resumes

Notice

We do not contact third party to restore the file, the file can't be decrypted without the key.The third party only contact us to buy the key at a lower price to earn the difference

Our condition

- Contact us within a week to get a price
- We may reconsider our price if you contact and pay within 3 days.
- We will deactivate the communication account after a week,then no one can contact us anymore

Contact information

- Web Chat

You can use the username and password provided by us to login to the chat room to communicate with us.
url:https://contact.nightcity.com
username:super-admin
password:ad3f1ker11j3M0UP102kx289
- Email

You can contact us by email:
Email: ad000101-act1@nightcity.com

Data release website

- Where we use to disclose the data of customers who do not pay

<http://ggtyrfqgqzhtnckshdy17agWdmsufL0bn0Ztqpcv7c7rvgvcasat.onion>

Remark

- Memo to access disk with other software(please use it like common web browser)C:\Program Files\Internet Explorer\iexplore.exe

Figure 7: A ransom note *NightSkyReadMe.hta* dropped by Night Sky

The “Steal list” in [Figure 7](#) seemed to be statically set, as our analysis environment did not have the mentioned files. To confirm this hypothesis, we analyzed the malware code. [Figure 8](#) shows that it leverages the Windows’s [WriteFile](#) with the ransom note content pointed by the **Buffer** variable.

```

27  lstrcatw(v3, L"\\NightSkyReadMe.hta");
28  FileW = CreateFileW(v3, 0x40000000u, 1u, 0i64, 1u, 0, 0i64);
29  if ( FileW != (HANDLE)-1i64 )
30  {
31      v5 = lstrlenA(&Buffer);
32      WriteFile(FileW, &Buffer, v5, &NumberOfBytesWritten, 0i64);
33      CloseHandle(FileW);
34  }

```

Figure 8: The ransom note is stored in the 'Buffer' variable which points to the data in .rdata

The ransom note is hard coded in the `.rdata` section of the executable. Figure 9 indicates the ransomware does not seem to calculate the actual ransom data in the victim's machine. This shows that executables are created by dynamically embedding victim information, something that is done by other ransomware such as ALPHV and that makes detection more difficult since file hash IoCs would be different per victim.

```

.rdata:00007FF63BBE2488 db 32h ; 2
.rdata:00007FF63BBE2489 db 39h ; 9
.rdata:00007FF63BBE248A db 37h ; 7
.rdata:00007FF63BBE248B db 47h ; G
.rdata:00007FF63BBE248C db 42h ; B

```

Figure 9: A hard-coded string "297GB" in the ransom note

Figure 10 shows that the malware deletes files in the **Recycle Bin** folder before performing other activities.

```

30 | SHEmptyRecycleBinA_0(0i64, 0i64, 7u);
31 | GetSystemInfo(&SystemInfo);
32 | v3 = (4 * SystemInfo.dwNumberOfProcessors) >> 1;
33 | v4 = 24 * SystemInfo.dwNumberOfProcessors;
34 | dword_7FF63BBF6278 = 24 * SystemInfo.dwNumberOfProcessors;
35 | do
36 |     Heap = RtlAllocateHeap(hHeap, 8u, 8i64 * v4 + 64);
37 | while ( !Heap );
38 | qword_7FF63BBF6280 = (__int64)Heap;
39 | hSemaphore = CreateSemaphoreA(0i64, v4, v4, 0i64);

```

Figure 10: The ransomware deletes all files in the Recycle Bin

The malware creates a mutex **tset123155465463213**, as shown in Figure 11. The mutex is used to avoid re-encrypting files on the infected system. This mutex name can be used to prevent the infection of the ransomware. (See the **Mitigation Recommendations** section at the end).

Creates mutexes	
Source: C:\Users\user\Desktop\Pj7FvknZ2S.exe	Mutant created: \Sessions\1\BaseNamedObjects\tset123155465463213

Figure 11: The mutex used by Night Sky

Figure 12 shows that the mutex is hard coded and checked in the **main** function using **CreateMutexA** and **OpenMutexA**, respectively.

```

if ( !OpenMutexA(0x1F0001u, 0, "tset123155465463213") )
{
    CreateMutexA(0i64, 0, "tset123155465463213");
}

```

Figure 12: The mutex created by the ransomware

Night Sky uses AES-128-CBC to encrypt files and RSA to encrypt the keys. By looking at the disassembly of the ransomware, we identified the public key stored in the **.data** section shown in Figure 13.

```

.data:00007FF63BBF18F0 |aBeginPublicKey db '-----BEGIN PUBLIC KEY-----',0Ah
.data:00007FF63BBF18F0 ; DATA XREF: sub_7FF63BBA10F0+10010
.data:00007FF63BBF18F0 db 'MIIBIjANBgkqhkiG9w0BAQEFAAOCAQ8AMIIBCgKCAQEAwetDt+9kp5JJGcb3YrqH',0Ah
.data:00007FF63BBF18F0 db '48g0rxFIaj5/NjMBvxtpa+7n0/LS0FQXxwJ078dT6xw/UgVLPK4MvbGeIj17aQF',0Ah
.data:00007FF63BBF18F0 db 'SqGHbRxTeoPrHufp4sM4J2IQYLc6YLYZMS6XT02rH0jumBjPEKyR0Q+df5KU/06o',0Ah
.data:00007FF63BBF18F0 db 'Rrh1jc0Qco+qW8q/xYJQ9VFas7IJM6WM3wsydHVDDeGuWi4/PMUT4/GAa8/WMUyW',0Ah
.data:00007FF63BBF18F0 db '9EbW7/hXd/aNX5LykeonN+nkJfbj1fZNTU81tc8Kx4rykLvMVE1H3AaT5ssCBt7p',0Ah
.data:00007FF63BBF18F0 db 'AFkLLjp10Xz3XmhH+J5vm5If17T85j4D6003qoc02gwezIikCDU2YA0OpJzkb5Ab',0Ah
.data:00007FF63BBF18F0 db '+wIDAQAB',0Ah
.data:00007FF63BBF18F0 db '-----END PUBLIC KEY-----',0Ah,0

```

Figure 13: The public key used by the ransomware

To generate a random key or initialization vector, Night Sky might have used the **CryptGenRandom** Windows API as shown in Figure 14.

functions (21)	blacklist (5)	ordinal (0)	library (6)
FindNextFileW	x	-	kernel32.dll
SHEmptyRecycleBinA	x	-	shell32.dll
RmStartSession	x	-	rstrtmgr.dll
CryptGenRandom	x	-	advapi32.dll
RtlExitUserThread	x	-	ntdll.dll

Figure 14: List of suspicious imports by the malware

3. IoCs

IoC	Type	Description
8c1a72991fb04dc3a8cf89605fb85150ef0e742472a0c58b8fa942a1f04877b0	File hash	Night Sky Windows PE executable
a077a55608ced7cea2bd92e2ce7e43bf51076304990ec7bb40c2b384ce2e5283	File hash	Night Sky Windows PE executable
1fca1cd04992e0fcaa714d9dfa97323d81d7e3d43a024ec37d1c7a2767a17577	File hash	Unpacked Night Sky executable
.hta	File extension	File extension of the ransom notes
.nightsky	File extension	File extension of encrypted files
contact[.]nightsky[.]cyou	URL	Web chat used to communicate with attackers
45[.]76.188[.]137	IP	IP address of the contact domain
mail[.]nightsky[.]cyou	URL	The mail domain

87[.]120.36[.]12	IP	IP address of the mail domain
http://gg5ryfgogainisskdv4y373ap3b2mxafcibeh2lvq5x7fx76ygcosad[.]onion	URL	Website where attackers publish victim's data if ransom is not paid
tset123155465463213	Mutex	The mutex used by Night Sky to avoid double encryption

4. Mitigation Recommendations

- Regularly back up your data and confirm the backup works.
- Scan systems using YARA rules provided [here](#) to detect malware samples.
- Run the code provided [here](#) to create the same mutex created by Night Sky to prevent the infections.

5. References

- <https://www.netskope.com/pt/blog/netskope-threat-coverage-night-sky>
- <https://blog.malwarebytes.com/ransomware/2022/01/night-sky-the-new-corporate-ransomware-demanding-a-sky-high-ransom/>
- <https://www.bleepingcomputer.com/news/security/night-sky-ransomware-uses-log4j-bug-to-hack-vmware-horizon-servers/>
- <https://www.bankinfosecurity.com/night-sky-ransomware-distributed-via-log4j-exploits-a-18294>
- https://github.com/Dump-GUY/Malware-analysis-and-Reverse-engineering/blob/main/NightSky_Ransomware%E2%80%93just_a_Rook_RW_fork_in_VMPProtect_suit/NightSky_Ransomware%E2%80%93just_a_Rook_RW_fork_in_VMPProtect_suit.md

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