Ransomware Groups to Watch: Emerging Threats

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Executive Summary

As part of Unit 42's commitment to stop ransomware attacks, we conduct ransomware hunting operations to ensure our customers are protected against new and evolving ransomware variants. We monitor the activity of existing groups, search for dark web leak sites and fresh onion sites, identify up-and-coming players and study tactics, techniques and procedures. During our operations, we have observed four emerging ransomware groups that are currently affecting organizations and show signs of having the potential to become more prevalent in the future:

- AvosLocker is ransomware as a service (RaaS) that started operations in late June, using a blue beetle logo to identify itself in communications with victims and "press releases" aimed at recruiting new affiliates. AvosLocker was observed promoting its RaaS program and looking for affiliates on dark web discussion forums and other forums. Like many of its competitors, AvosLocker offers technical support to help victims recover after they've been attacked with encryption software that the group claims is "fail-proof," has low detection rates and is capable of handling large files. This ransomware also has an extortion site, which claims to have impacted six organizations in the following countries: the U.S., the U.K., the U.A.E., Belgium, Spain and Lebanon. We have observed initial ransom demands ranging from $50,000 to $75,000.
- Hive Ransomware is double-extortion ransomware that started operations in June. Since then, Hive has impacted 28 organizations that are now listed on the group's extortion site, including a European airline company and three U.S.-based organizations. Hive uses all tools available in the extortion toolset to create pressure on the victim, including the date of initial compromise, countdown, the date the leak was actually disclosed on their site, and even the option to share the disclosed leak on social media.
- HelloKitty is not a new ransomware group; it can be tracked as early as 2020, mainly targeting Windows systems. However, in July, we observed a Linux variant of HelloKitty targeting VMware's ESXi hypervisor, which is widely used in cloud and on-premises data centers. We also observed two clusters of activity. Across the observed samples, some threat actors preferred email communications, while others used TOR chats for communication with the victims. The observed variants impacted five organizations in Italy, Australia, Germany, the Netherlands and the U.S. The highest ransom demand observed from this group was $10 million, but at the time of writing, the threat actors have only received three transactions that sum up to about $1.48 million.
- LockBit 2.0 (previously known as ABCD ransomware) is a three-year-old RaaS operator that has been linked to some high-profile attacks lately following the June launch of a slick marketing campaign to recruit new affiliates. It claims to offer the fastest encryption on the ransomware market. LockBit 2.0 has impacted multiple industries – 52 victims are listed on the group's leak site. Its victims include organizations in the U.S., Mexico, Belgium, Argentina, Malaysia, Australia, Brazil, Switzerland, Germany, Italy, Austria, Romania and the U.K.

Here, we share information we've gathered from our observations of the behavior of these ransomware groups to help organizations defend against them.

Palo Alto Networks Next-Generation Firewall customers are protected from these threats with Threat Prevention and WildFire security subscriptions. Customers are also protected with Cortex XDR and can use AutoFocus for tracking related entities.

AvosLocker

AvosLocker is new ransomware that was first observed on July 4, 2021, and follows the RaaS model. The ransomware operator of the same name, avos, advertised their affiliate program on Dread (Figure 1). Dread is a Reddit-like dark web discussion forum featuring news and sub-dreads around darknet markets. The announcement of the program includes information about features of the ransomware and lets affiliates know that AvosLocker operators will take care of negotiation and extortion practices. The user Avos has also been observed trying to recruit individuals on the Russian forum XSS.

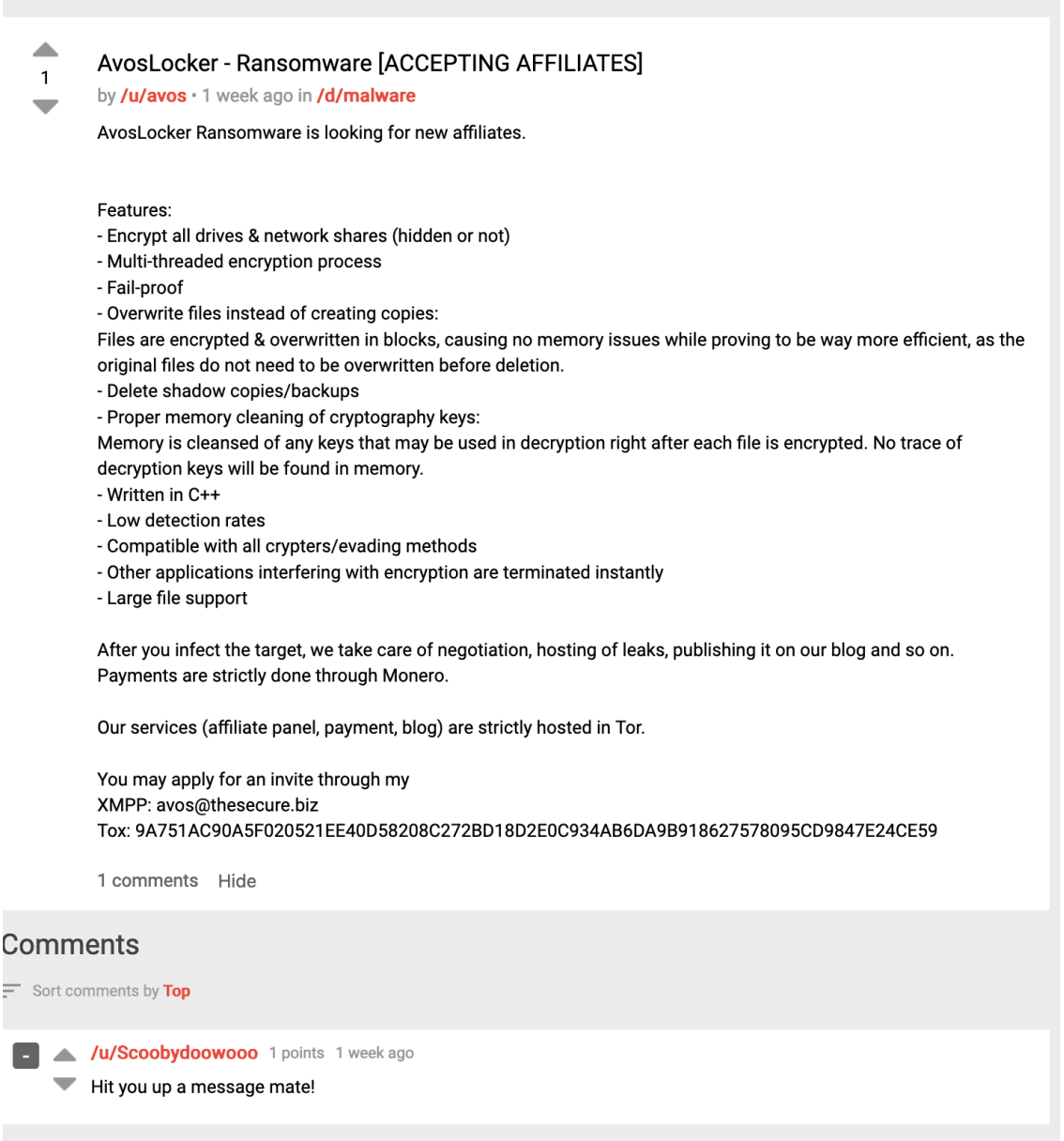

Figure 1. AvosLocker announcement in Dread.

AvosLocker, when executed, first opens a Windows shell showing the progress of the encryption process. After encryption is complete, it then appends the

.avos

extension to the encrypted files and drops the ransom note

GET_YOUR_FILES_BACK.TXT

in every encrypted directory (Figure 2). We observed another AvosLocker sample that behaves exactly the same way as the initial observed sample, but also included a string called “Message from the agent” letting the victim know their files were exfiltrated.

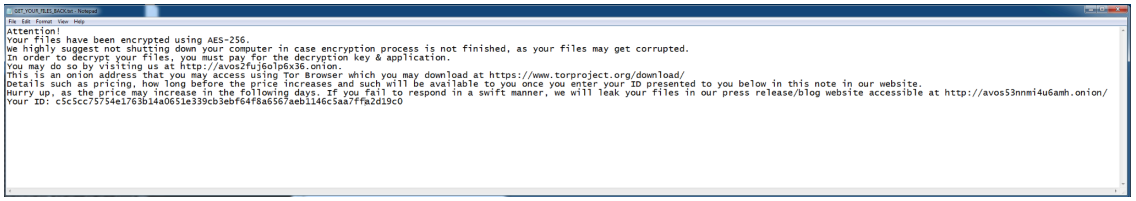

Figure 2a. AvosLocker ransom note

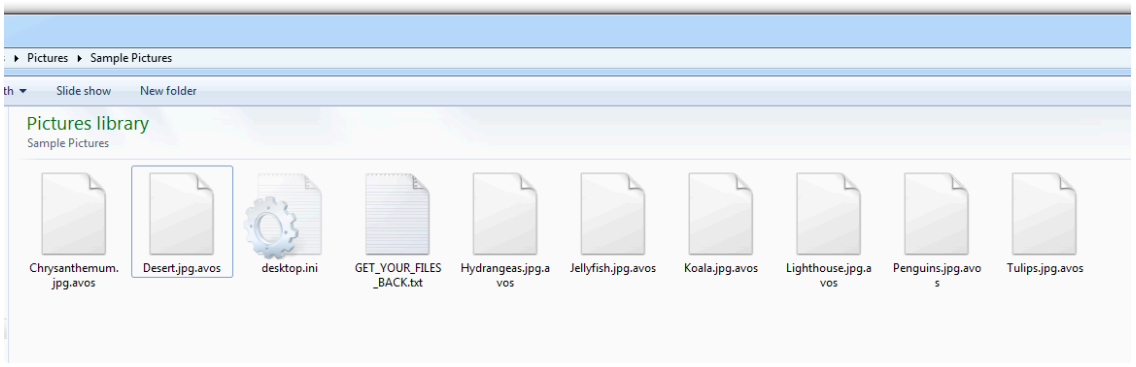

Figure 2b. Encrypted files.

The ransom note includes information and an ID used to identify victims, and instructs the victim to visit the AvosLocker TOR site (Figure 3).

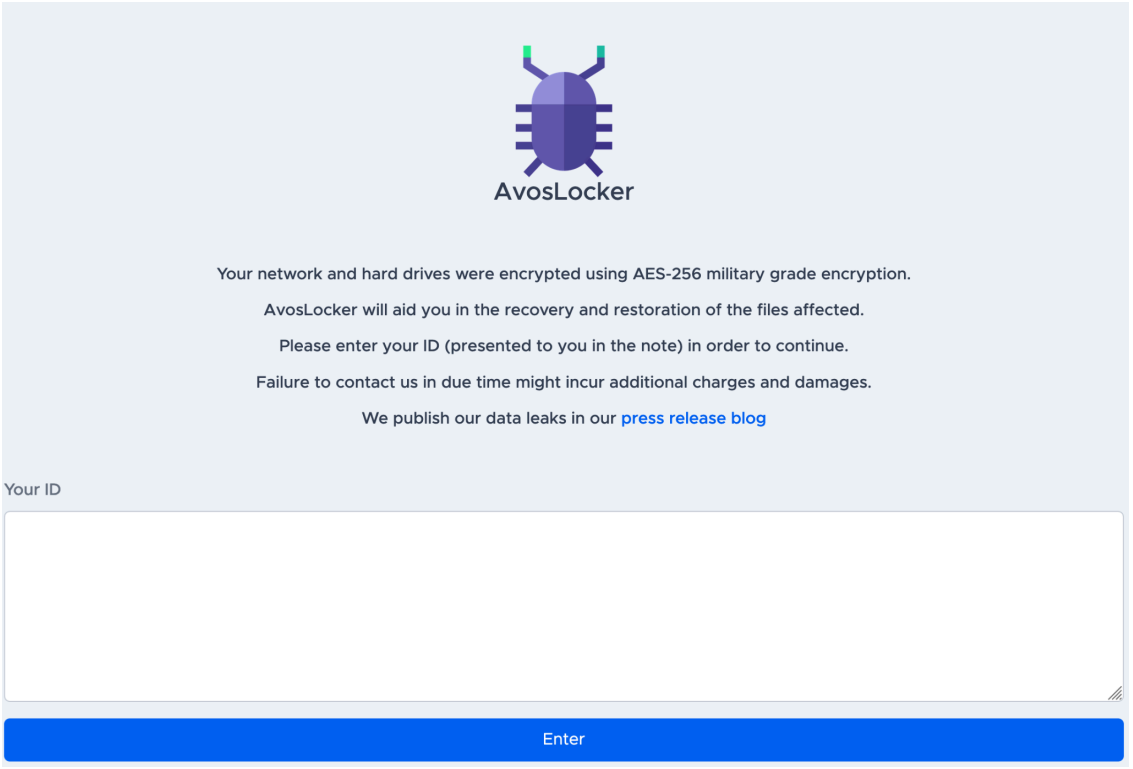

Figure 3. AvosLocker landing page.

After submitting the ID, the victim will encounter a support chat and the request for ransom. From the available instances observed, we have seen payment requests as low as $50,000 and as high as $75,000 in Monero (XMR). As seen with other ransomware groups, AvosLocker increases the ransom price if the victim doesn't pay in the designated time period, as shown in Figure 4.

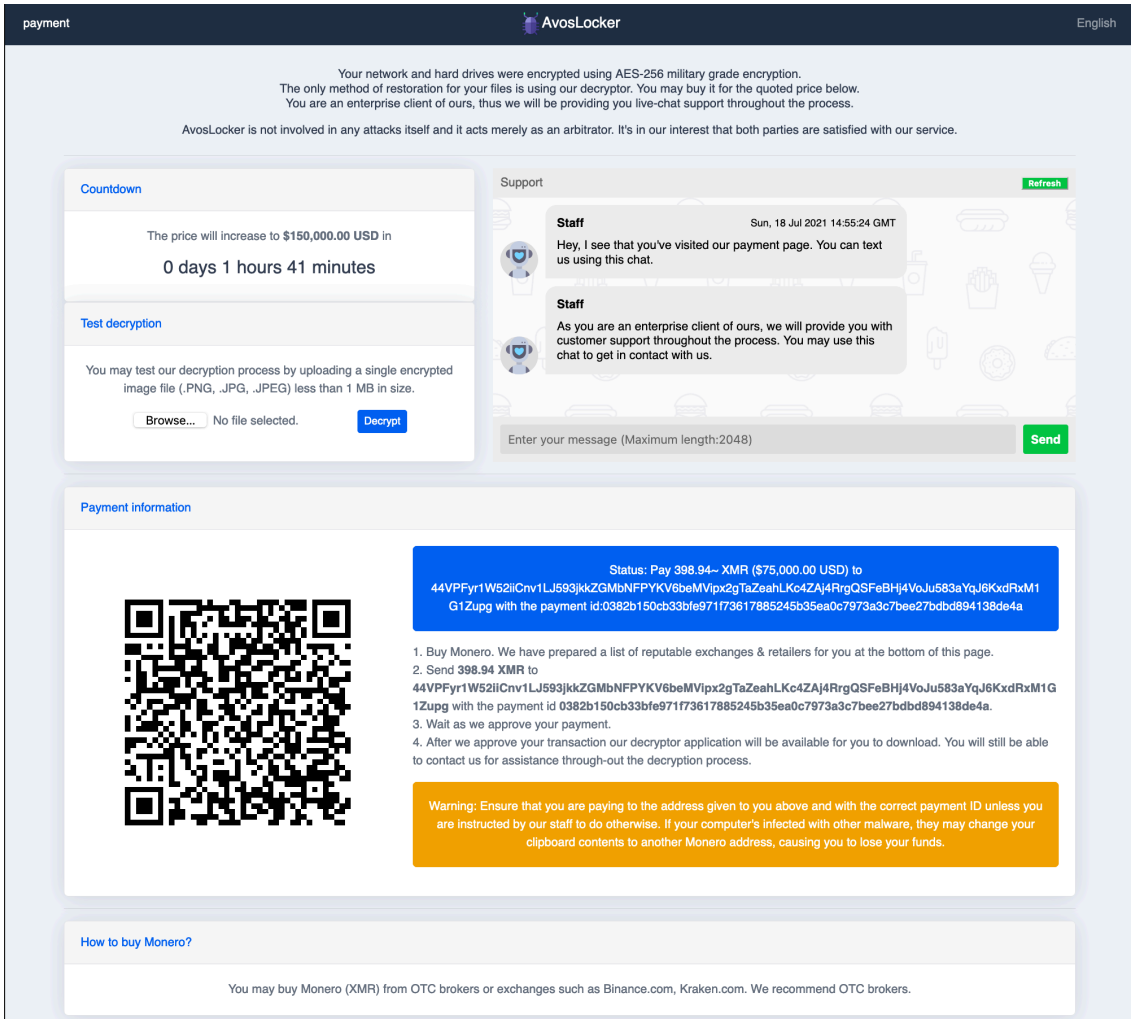

Figure 4. AvosLocker support page.

While exploring their site, we discovered that this group has already affected seven organizations: two law firms, one in the U.K. and one in the U.S.; a logistics company in Spain; a real estate agency in Belgium; a holdings company in Turkey; a Syrian transportation organization and a city in the U.S. Some of the leaked data displayed on their site include private organization documents and personal identifiable information.

AvosLocker's first site post, on Jan. 1, 2021, was an announcement that the site was officially online (Figure 5). The user avos also announced they started leaking data on multiple sub-dreads as well. We believe this was done to attract more affiliates and traffic to their site.

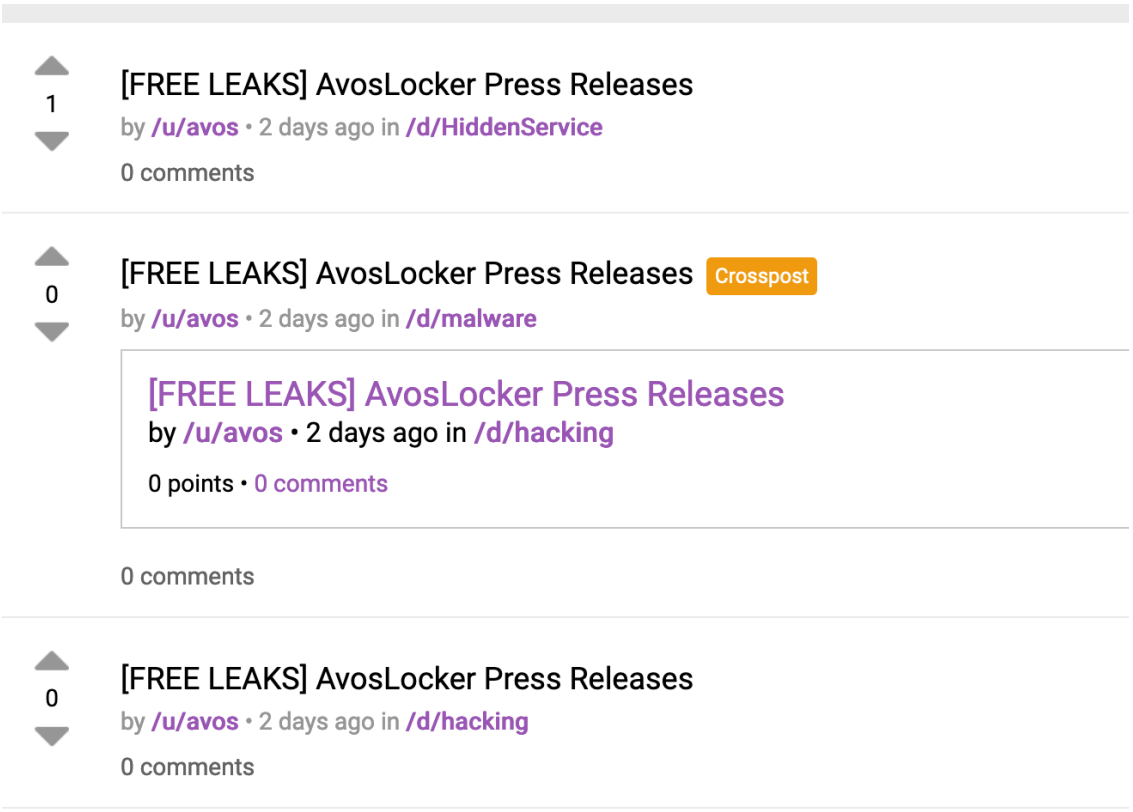

Figure 5. AvosLocker leak site and multiple advertisements on Dread.

Hive Ransomware

Hive ransomware began operations in June 2021 and has already shown notable disregard for its victims' welfare, attacking organizations including healthcare providers and mid-size organizations ill-equipped for managing a ransomware attack. Hive published their first victim on their leak site, Hive Leaks, in late June (Figure 6). Since then, 28 victims have been published on the Hive Leaks site, including a European airline company and three U.S.-based organizations, one each in hardware retail, manufacturing and law. The posts include the date and time the victim was affected.

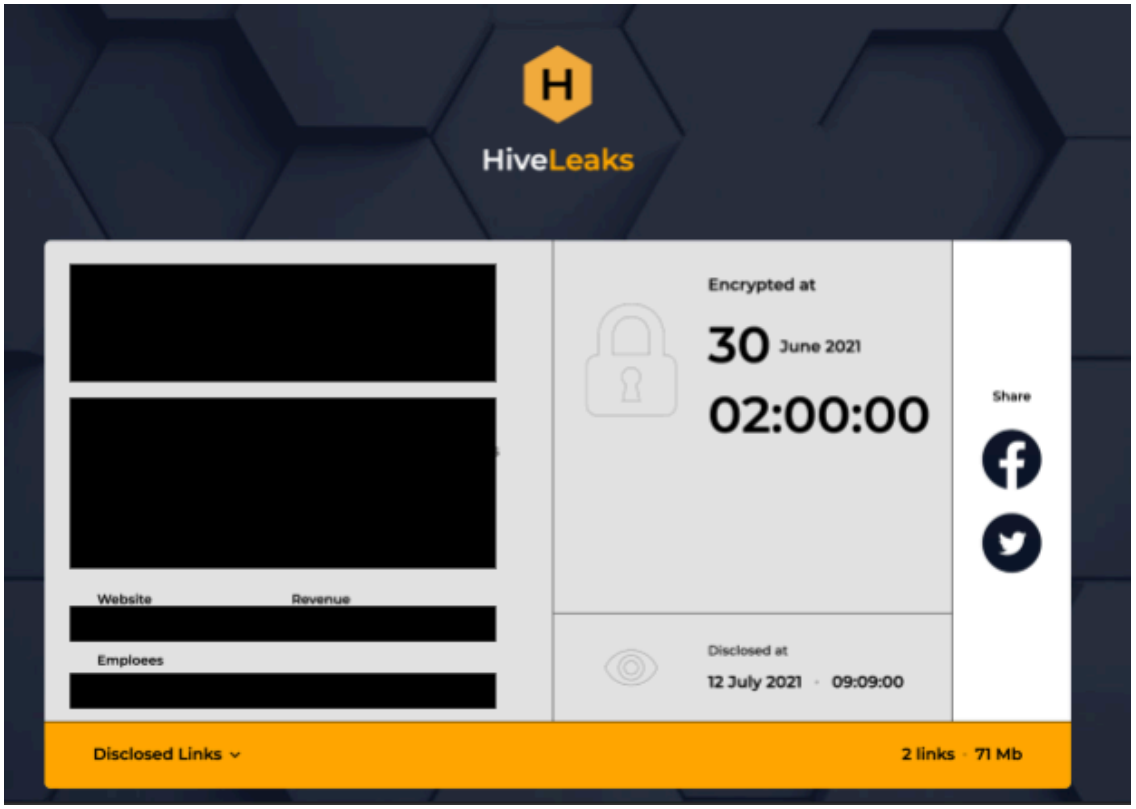

Figure 6. Hive Leaks.

When this ransomware is executed, it drops two batch scripts. The first script, hive.bat, tries to delete itself, and the second script is in charge of deleting the shadow copies of the system (shadow.bat). Hive ransomware adds the [randomized characters].hive extension to the encrypted files and drops a ransom note titled HOW_TO_DECRYPT.txt containing instructions and guidelines to prevent data loss (Figure 7). The ransom note includes a generated login credential for the victim to chat with what the threat actors claim is their “sales” department. The TOR link directs the “customer” to a login page, and after the credentials are submitted, it opens up a chat room for communication between the operators and the victim (Figure 8).

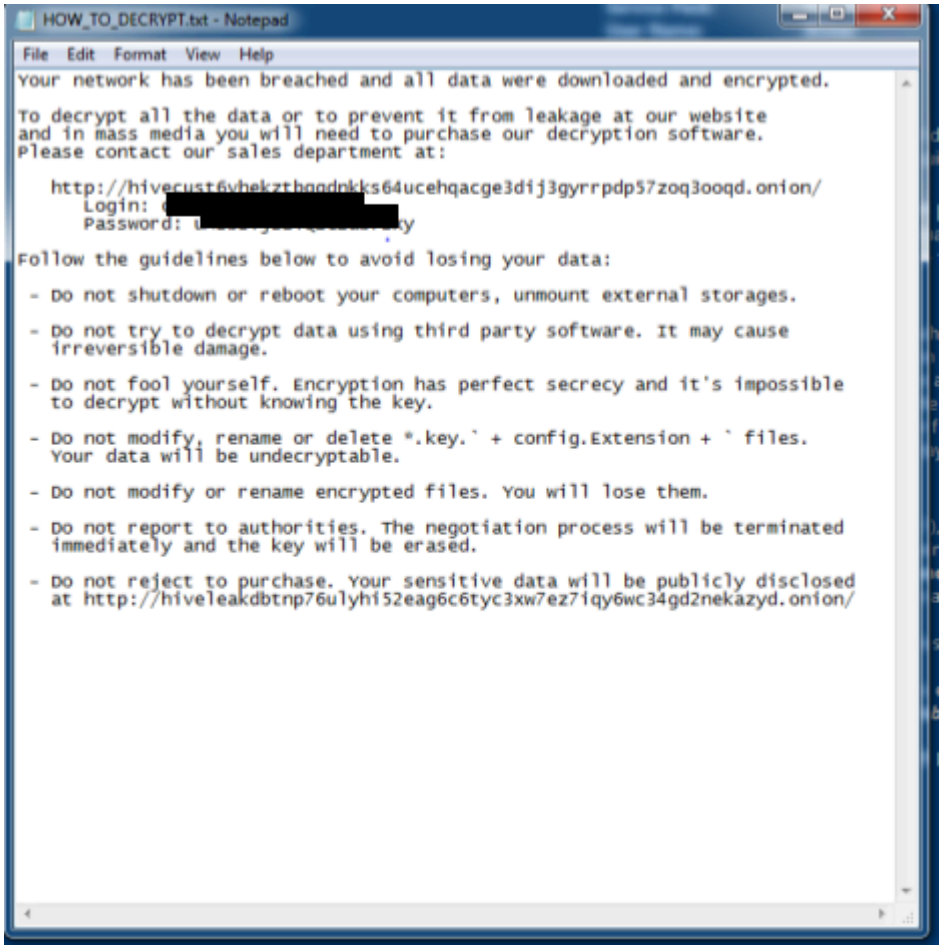

Figure 7. Hive ransom note.

We noticed that the login credentials provided by the ransom note were for a specific victim. With this in mind, we then hunted for additional samples and found two more victims that were affected but not yet listed on the leak site at the time of writing. After logging in, the victim will see a chat where they can talk to the operators and get their decryptors (Figure 8).

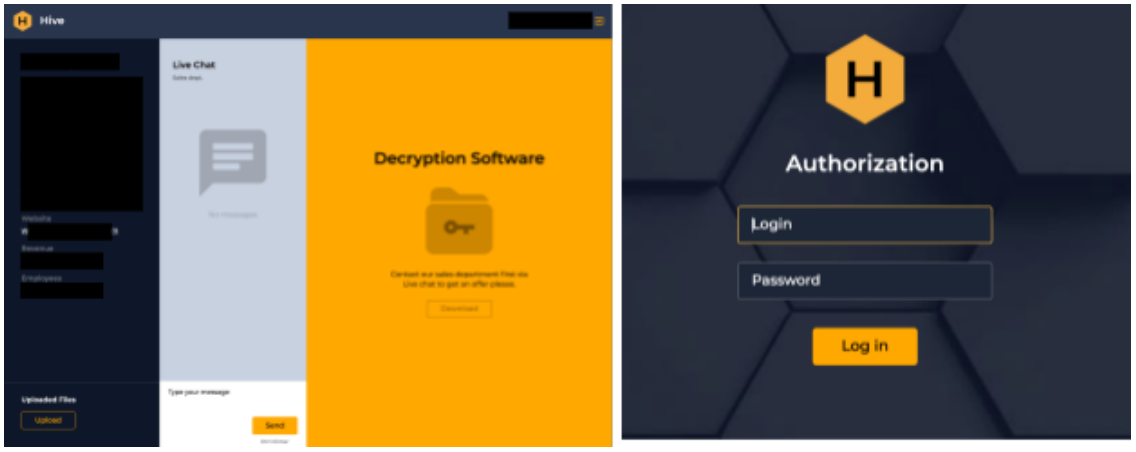

Figure 8. Hive chat (left) and login page (right).

We don’t yet have information on how Hive ransomware is being delivered, but ransomware operators are known for buying access to certain networks, brute-forcing credentials or spear-phishing for initial access.

HelloKitty: Linux Edition

HelloKitty is a ransomware family that first surfaced at the end of 2020, primarily targeting Windows systems. The malware family got its name due to its use of a Mutex with the same name: HelloKittyMutex. The ransomware samples seem to evolve quickly and frequently, with different versions making use of the .crypted or .kitty file extensions for encrypted files. Some newer samples make use of a Golang packer that ensures the final ransomware code is only loaded in memory, most likely to evade detection by security solutions.

In July 2021, we came across a Linux (ELF) sample with the name funny_linux.elf containing a ransom note with verbiage that directly matched ransom notes seen in later samples of HelloKitty for Windows. This led to the discovery of other samples of this Linux strain of the HelloKitty ransomware, dating as far back as October 2020. However, starting in March, the samples began targeting ESXi, a target of choice for recent Linux ransomware variants.

Oddly enough, the preferred mode of communication shared by attackers in the ransom notes across the different samples is a mix between TOR URLs and victim-specific Protonmail email addresses. This could indicate different campaigns or even entirely different threat actors making use of the same malware codebase. Since the samples we found contained victim-specific ransom notes, we were able to get an idea of the ransomware's targets. We observed six organizations impacted by Hello Kitty, including Italian and Dutch pharmaceutical organizations, a Germany-based manufacturer, an Australian industrial automation solutions organization, and a medical office and a stock broker in the U.S. One sample, oddly enough, didn't contain any contact information in its ransom note.

We also observed that the ransom demanded by the operator varies depending on the impacted organization; we saw demands as high as $10 million and as low as $950,000 in Monero (Figure 9). The operators behind HelloKitty are also open to using bitcoin (BTC), but they charge higher for bitcoin transactions due to its associated fees. We were able to look up the BTC wallet address they provided for victims (bc1ql5f3m75qx3ueu2pz5eeveyqsw6pdjs3ufk8r20) and confirm that three transactions were made to that address, summing up to $1,477,872.41.

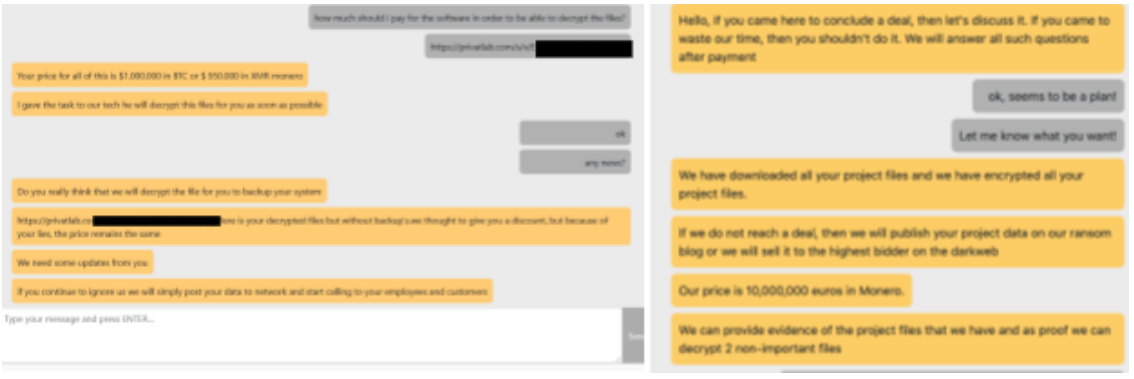

Figure 9 HelloKitty chats.

The samples found primarily made use of different combinations of the arguments described in Table 1.

Argument	Description	Value(s)

v	Verbose mode	0 or 1
d	Run the process as a daemon	0 or 1
e	When the flag is set, the ransomware only encrypts files with the extensions .vmdk, .vmx, .vmsd and .vmsn It is not set by default, which means that all files under the start path that don't match certain ransomware-specific file extensions will be encrypted	0 or 1
k	When this flag is set, the ransomware tries to kill VMs running on the host using the esxcli tool. It is not set by default	0 or 1
m	Mode	5 (default) or 10 or 20 or 25 or 33 or 50
c	(Unsure of purpose)	

Table 1. Arguments accepted by the Linux HelloKitty ransomware.

The following esxcli commands are executed to kill running VMs, when the k flag is set:

esxcli vm process list
esxcli vm process kill -t=soft -w=%d %(PID)
esxcli vm process kill -t=force -w=%d %(PID)

The malware samples log their output to a work.log file in their execution path.

Finally, the ransomware makes use of the Elliptic Curve Digital Signature Algorithm (ECDSA) for encrypting files using functions from the shared library libcrypto.so for encryption. The encrypted file is saved with the extension .crypt. Each encrypted file has a corresponding file with the extension .README_TO_RESTORE containing the ransom note. Additional details can be found in the appendix of this report.

LockBit 2.0

LockBit is another ransomware group that follows the RaaS model. According to their website, this ransomware affiliate program has been active since September 2019. While LockBit has been known for some time, we included this group in this blog because of their recent evolution to LockBit 2.0. In June 2021, the operators behind this ransomware revamped their site and rebranded as LockBit 2.0.

Since June 2021, they have compromised 52 organizations in accounting ,automotive, consulting, engineering, finance, high tech, hospitality, insurance, law enforcement,l egal services, manufacturing, non-profit energy, retail, transportation and logistics industries, utilities in the following countries: Argentina, Australia, Austria, Belgium,

Brazil, Germany, Italy, Malaysia, Mexico, Romania, Switzerland, the U.K. and the U.S. All the posts by the threat actors on their leak site include a countdown until confidential information is released to the public, which creates additional pressure on the victim (Figure 10).

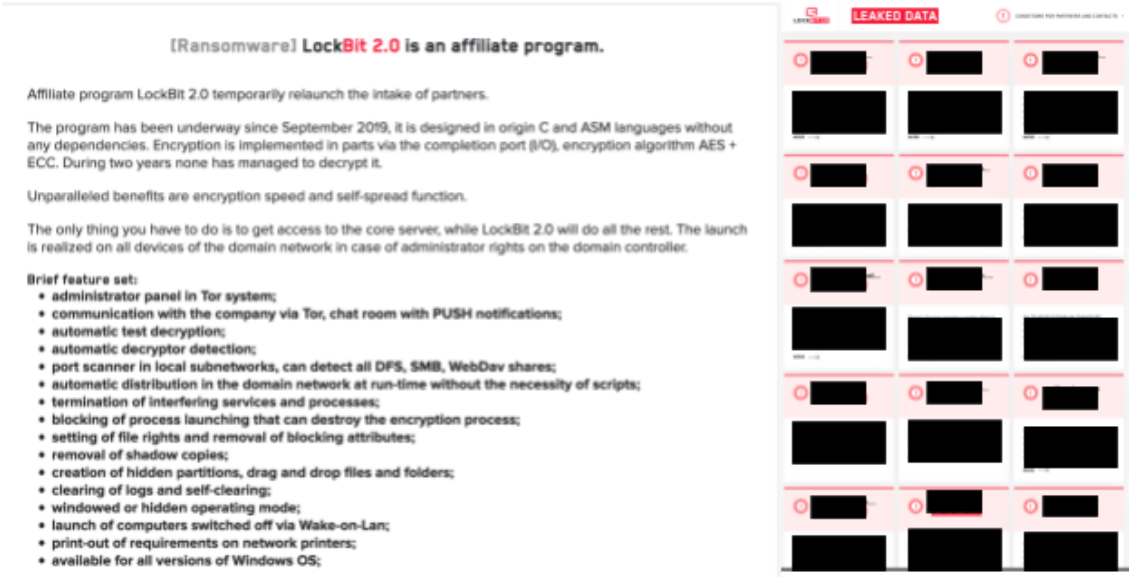

Figure 10. Affiliation program description (left) and leak site (right).

The threat actors behind this ransomware claim that their current variant is the fastest encryption software in operation. To attract more affiliates, they include a table comparing different ransomware families, including their previous variant (Figure 11).

Encryption speed comparative table for some ransomware							
PC for testing: Windows Server 2016 x64 \ 8 core Xeon E5-2680@2.40GHz \ 16 GB RAM \ SSD							
Name of the ransomware	Date of a sample	Speed in megabytes per second	Time spent for encryption of 100 GB	Time spent for encryption of 10 TB	Self spread	Size sample in KB	The number of the encrypted files (All file in a system 257472)
LOCKBIT 2.0	5 Jun, 2021	373 MB/s	4M 28S	7H 26M 40S	Yes	855	109964
LOCKBIT	14 Feb, 2021	266 MB/s	6M 16S	10H 26M 40S	Yes	146	110029
Cuba	8 Mar, 2020	185 MB/s	9M	15H	No	1130	110468
Babuk	20 Apr, 2021	166 MB/s	10M	16H 40M	Yes	79	109969
Sodinokibi	4 Jul, 2019	151 MB/s	11M	18H 20M	No	253	95490
Ragnar	11 Feb, 2020	151 MB/s	11M	18H 20M	No	40	110651
NetWalker	19 Oct, 2020	151 MB/s	11M	18H 20M	No	902	109892
MAKOP	27 Oct, 2020	138 MB/s	12M	20H	No	115	111002
RansomEXX	14 Dec,2020	138 MB/s	12M	20H	No	156	109700
Pysa	8 Apr, 2021	128 MB/s	13M	21H 40M	No	500	108430
Avaddon	9 Jun, 2020	119 MB/s	14M	23H 20M	No	1054	109952
Thanos	23 Mar, 2021	119 MB/s	14M	23H 20M	No	91	81081
Ranzy	20 Dec, 2020	111 MB/s	15M	1D 1H	No	138	109918
PwndLocker	4 Mar, 2020	104 MB/s	16M	1D 2H 40M	No	17	109842
Sekhmet	30 Mar, 2020	104 MB/s	16M	1D 2H 40M	No	364	random extension
Sun Crypt	26 Jan, 2021	104MB/s	16M	1D 2H 40M	No	1422	random extension
REvil	8 Apr, 2021	98 MB/s	17M	1D 4H 20M	No	121	109789
Conti	22 Dec, 2020	98 MB/s	17M	1D 4H 20M	Yes	186	110220
Ryuk	21 Mar, 2021	92 MB/s	18M	1D 6H	Yes	274	110784
Zeppelin	8 Mar, 2021	92 MB/s	18M	1D 6H	No	813	109963
DarkSide	1 May, 2021	83 MB/s	20M	1D 9H 20M	No	30	100549
DarkSide	16 Jan, 2021	79 MB/s	21M	1D 11H	No	59	100171
Nephilim	31 Aug, 2020	75 MB/s	22M	1D 12H 40M	No	3061	110404
DearCry	13 Mar, 2021	64 MB/s	26M	1D 19H 20M	No	1292	104547
MountLocker	20 Nov, 2020	64 MB/s	26M	1D 19H 20M	Yes	200	110367
Nemty	3 Mar, 2021	57 MB/s	29M	2D 0H 20M	No	124	110012
MedusaLocker	24 Apr, 2020	53 MB/s	31M	2D 3H 40M	Yes	661	109615
Phoenix	29 Mar, 2021	52 MB/s	32M	2D 5H 20M	No	1930	110026
Hades	29 Mar, 2021	47 MB/s	35M	2D 10H 20M	No	1909	110026
DarkSide	18 Dec, 2020	45 MB/s	37M	2D 13H 40M	No	17	114741
Babuk	4 Jan, 2021	45 MB/s	37M	2D 13H 40M	Yes	31	110760
REvil	7 Apr, 2021	37 MB/s	45M	3D 3H	No	121	109790
BlackKingdom	23 Mar, 2021	32 MB/s	52M	3D 14H 40M	No	12460	random extension

Figure 11. Encryption speeds comparison released by LockBit.

When LockBit is executed, it starts encrypting files and appends the .lockbit extension. Additionally, the ransomware changes the icon of the encrypted file to the LockBit 2.0 logo (Figure 12.b). After encryption is complete, LockBit then drops the ransom note titled, Restore-My-Files.txt (Figure 12.a).

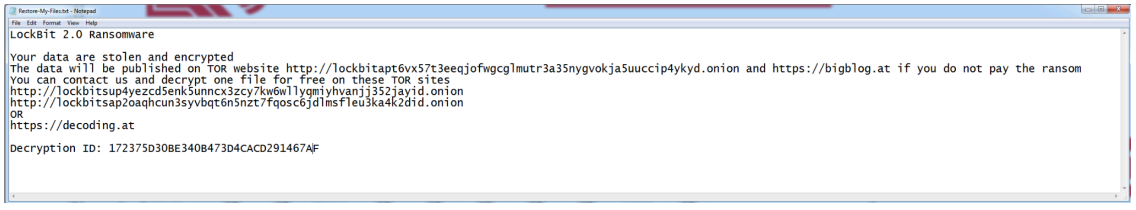

Figure 12a. Ransom Note.

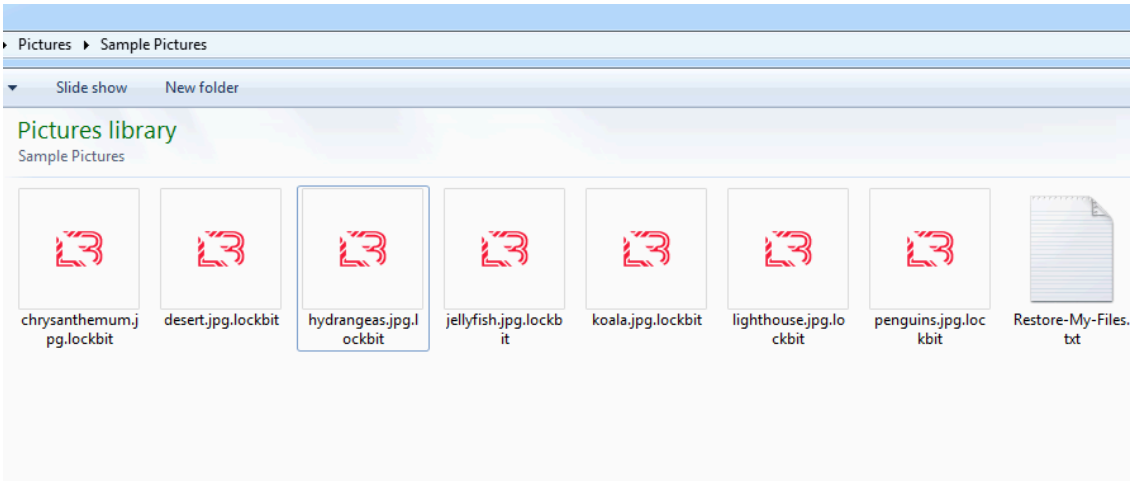

Figure 12b. Encrypted files.

Similar to REvil, LockBit 2.0 ransomware modifies the victim's desktop wallpaper if the encryption process is successful, making the victim aware of their compromise. The wallpaper also includes an advertisement aimed at encouraging insider threats that all organizations could fall prey to. (Figure 13).

Figure 13. Modified LockBit 2.0 wallpaper.

The advertisement states that the threat actors are interested in methods of access, such as RDP, VPN and corporate email credentials. In exchange, they offer a cut of paid ransom.

If the victim wants to communicate with Lockbit operators to get their data back, the operators include a "Decryption ID" and a TOR link (and their clearnet mirror: decoding[.]at) on the ransom note. This information allows the user to log in and start the negotiation process (Figure 14).

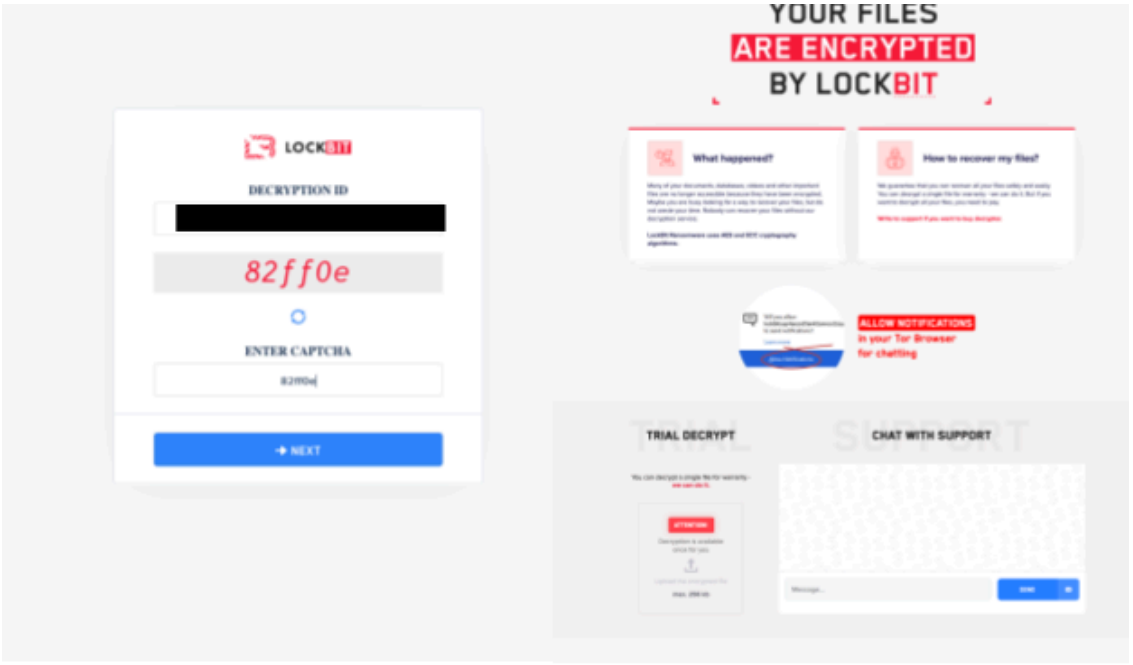

Figure 14. Support site login (left) and LockBit Support chat (right).

Conclusion

With major ransomware groups such as REvil and Darkside lying low or rebranding to evade law enforcement heat and media attention, new groups will emerge to replace the ones that are no longer actively targeting victims. Here, we shared information on some of the observed malicious activity of the ransomware groups trying to become the next key players. While LockBit and HelloKitty have been previously active, their recent evolution makes them a good example of how old groups can re-emerge and remain persistent threats. Unit 42 will continue to monitor these ransomware families – and new ones that may emerge in the future.

Palo Alto Networks customers are protected against these ransomware families with Cortex XDR or the Next-Generation Firewall with Threat Prevention and WildFire security subscriptions. Customers can use AutoFocus for tracking related entities using the AvosLocker, Hive, LockBit and HelloKitty tags, respectively. Full visualization of the techniques observed can be seen in the Unit 42 ATOM viewer.

Palo Alto Networks has shared these findings, including file samples and indicators of compromise, with our fellow Cyber Threat Alliance members. CTA members use this intelligence to rapidly deploy protections to their customers and systematically disrupt malicious cyber actors. Visit the Cyber Threat Alliance for more information.

If you think you may have been impacted by any of these ransomware families, please email unit42-investigations@paloaltonetworks.com or call (866) 486-4842 – (866) 4-UNIT42 – for U.S. toll-free; (31-20) 299-3130 in EMEA; or (65) 6983-8730 in JAPAC. The Unit 42 Incident Response team is available 24/7/365. You can also take preventative steps by requesting a Ransomware Readiness Assessment.

Indicators of Compromise

AvosLocker

43b7a60c0ef8b4af001f45a0c57410b7374b1d75a6811e0dfc86e4d60f503856
fb544e1f74ce02937c3a3657be8d125d5953996115f65697b7d39e237020706f
3984968230c96d52d78af1905ea1b224e7de36776a6af398a0462321f3c22020
01792043e07a0db52664c5878b253531b293754dc6fd6a8426899c1a66ddd61f

Hive Ransomware

A0b4e3d7e4cd20d25ad2f92be954b95eea44f8f1944118a3194295c5677db749
1e21c8e27a97de1796ca47a9613477cf7aec335a783469c5ca3a09d4f07db0ff
Fdbc66ebe7af710e15946e1541e2e81ddfd62aa3b35339288a9a244fb56a74cf
88f7544a29a2ceb175a135d9fa221cbfd3e8c71f32dd6b09399717f85ea9afd1

Hello Kitty (Linux)

16a0054a277d8c26beb97850ac3e86dd0736ae6661db912b8782b4eb08cfd36e
556e5cb5e4e77678110961c8d9260a726a363e00bf8d278e5302cb4bfccc3eed
9f82f22c137688d0b3e7912d415605d2bbc56478311fd0b3dc265f8d0006aa8c
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bedf30bbcefc54bc48432674255856f47c0ba2ec46e913d078a53e66ac9dcff8
Ca607e431062ee49a21d69d722750e5edbd8ffabcb54fa92b231814101756041
b4f90cff1e3900a3906c3b74f307498760462d719c31d008fc01937f5400fb85

Lockbit 2.0

F32e9fb8b1ea73f0a71f3edaebb7f2b242e72d2a4826d6b2744ad3d830671202
4de287e0b05e138ab942d71d1d4d2ad5fb7d46a336a446f619091bdace4f2d0a
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717585e9605ac2a971b7c7537e6e311bab9db02ecc6451e0efada9b2ff38b474
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Domains

Decoding[.]at
bigblog[.]at
lockbit-decryptor[.]com
lockbit-decryptor[.]top

Appendix (Hello Kitty)

Extensions that are ignored for encryption:

.crypt
.README_TO_RESTORE
.tmp_
.a
.so
.la

Directories ignored for encryption:

/bin
/boot
/dev
/etc
/lib
/lib32
/lib64
/lost+found
/proc
/run
/sbin
/usr/bin
/usr/include
/usr/lib
/usr/lib32
/usr/lib64
/usr/sbin
/sys
/usr/libexec
/usr/share
/var/lib

Source: https://unit42.paloaltonetworks.com/emerging-ransomware-groups/