



America's Cyber Defense Agency

NATIONAL COORDINATOR FOR CRITICAL INFRASTRUCTURE SECURITY AND RESILIENCE

CYBERSECURITY ADVISORY

#StopRansomware: AvosLocker Ransomware (Update)

Release Date: October 11, 2023

Alert Code: AA23-284A

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ACTIONS TO TAKE TODAY TO MITIGATE CYBER THREATS FROM AVOSLOCKER RANSOMWARE:

1. Securing remote access tools
2. Restricting RDP and other remote desktop services
3. Securing PowerShell and/or restrict usage
4. Update software to latest version and apply patching updates regularly

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SUMMARY

Note: This joint Cybersecurity Advisory (CSA) is part of an ongoing #StopRansomware effort to publish advisories for network defenders that detail various ransomware variants and ransomware threat actors. These #StopRansomware advisories include recently and historically observed tactics, techniques, and procedures (TTPs) and indicators of compromise (IOCs) to help organizations protect against ransomware. Visit [stopransomware.gov](https://www.cisa.gov/stopransomware) <<https://www.cisa.gov/stopransomware>> to see all #StopRansomware advisories and to learn more about other ransomware threats and no-cost resources.

The Federal Bureau of Investigation (FBI) and the Cybersecurity and Infrastructure Security Agency (CISA) are releasing this joint Cybersecurity Advisory (CSA) to disseminate known IOCs, TTPs, and detection methods associated with the AvosLocker variant identified through FBI investigations as recently as May 2023. AvosLocker operates under a ransomware-as-a-service (RaaS) model. AvosLocker affiliates have compromised organizations across multiple critical infrastructure sectors in the United States, affecting Windows, Linux, and VMware ESXi environments. AvosLocker affiliates compromise organizations' networks by using legitimate software and open-source remote system administration tools. AvosLocker affiliates then use exfiltration-based data extortion tactics with threats of leaking and/or publishing stolen data.

This joint CSA updates the March 17, 2022, AvosLocker ransomware joint CSA, Indicators of Compromise Associated with AvosLocker ransomware, released by FBI and the Department of the Treasury's Financial Crimes Enforcement Network (FinCEN). This update includes IOCs and TTPs not included in the previous advisory and a YARA rule FBI developed after analyzing a tool associated with an AvosLocker compromise.

FBI and CISA encourage critical infrastructure organizations to implement the recommendations in the Mitigations section of this CSA to reduce the likelihood and impact of AvosLocker ransomware and other ransomware incidents.

Download the PDF version of this report:

↓ AA23-284A #StopRansomware: AvosLocker Ransomware (Update)

</sites/default/files/2023-10/aa23-284a-joint-csa-stopransomware-avoslocker-ransomware-update.pdf>

(PDF, 528.00 KB)

For a downloadable copy of IOCs, see:

↓ AA23-284A STIX XML /sites/default/files/2023-10/aa23-284a.stix_.xml

(XML, 46.67 KB)

↓ AA23-284A STIX JSON /sites/default/files/2023-10/aa23-284a%20stopransomware%20avoslocker%20ransomware%20update.stix_.json

(JSON, 34.50 KB)

TECHNICAL DETAILS

Note: This advisory uses the *MITRE ATT&CK for Enterprise*

<https://attack.mitre.org/versions/v13/matrices/enterprise/> framework, version 13. See the MITRE ATT&CK Tactics and Techniques section for a table of the threat actors' activity mapped to MITRE ATT&CK[®] tactics and techniques. For assistance with mapping malicious cyber activity to the MITRE ATT&CK framework, see CISA and MITRE ATT&CK's *Best Practices for MITRE ATT&CK Mapping* <https://www.cisa.gov/news-events/news/best-practices-mitre-attckr-mapping> and CISA's *Decider Tool* <https://github.com/cisagov/decider/>.

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AvosLocker affiliates use legitimate software and open-source tools during ransomware operations, which include exfiltration-based data extortion. Specifically, affiliates use:

- Remote system administration tools—Splashtop Streamer, Tactical RMM, PuTTY, AnyDesk, PDQ Deploy, and Atera Agent—as backdoor access vectors [[T1133](https://attack.mitre.org/versions/v13/techniques/t1133/) <https://attack.mitre.org/versions/v13/techniques/t1133/>].
- Scripts to execute legitimate native Windows tools [[T1047](https://attack.mitre.org/versions/v13/techniques/t1047/) <https://attack.mitre.org/versions/v13/techniques/t1047/>], such as PsExec and Nltest.

- Open-source networking tunneling tools [T1572 <<https://attack.mitre.org/versions/v13/techniques/t1572/>>] Ligolo[1 <<https://github.com/sysdream/ligolo>>] and Chisel[2 <<https://github.com/jpillora/chisel>>].
- Cobalt Strike <<https://attack.mitre.org/versions/v13/software/s0154/>> and Sliver[3 <<https://github.com/bishopfox/sliver/tree/6c02971b54831884d30407b632a379947dd289ad>>] for command and control (C2).
- Lazagne and Mimikatz for harvesting credentials [T1555 <<https://attack.mitre.org/techniques/t1555/>>].
- FileZilla and Rclone for data exfiltration.
- Notepad++, RDP Scanner, and 7zip.

FBI has also observed AvosLocker affiliates:

1. Use custom PowerShell [T1059.001 <<https://attack.mitre.org/versions/v13/techniques/t1059/001/>>] and batch (.bat) scripts [T1059.003 <<https://attack.mitre.org/versions/v13/techniques/t1059/003/>>] for lateral movement, privilege escalation, and disabling antivirus software.
2. Upload and use custom webshells to enable network access [T1505.003 <<https://attack.mitre.org/versions/v13/techniques/t1505/003/>>].

For additional TTPs, see joint CSA Indicators of Compromise Associated with AvosLocker Ransomware.

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Indicators of Compromise (IOCs)

See Tables 1 and 2 below for IOCs obtained from January 2023–May 2023.

Table 1: Files, Tools, and Hashes as of May 2023

| Files and Tools | MD5 |
|-------------------------------------|----------------------------------|
| psscriptpolicytest_im2hdxqi.g0k.ps1 | 829f2233a1cd77e9ec7de98596cd8165 |

| Files and Tools | MD5 |
|-------------------------------------|----------------------------------|
| psscriptpolicytest_lysyd03n.o10.ps1 | 6ebd7d7473f0ace3f52c483389cab93f |
| psscriptpolicytest_1bokrh3l.2nw.ps1 | 10ef090d2f4c8001faadb0a833d60089 |
| psscriptpolicytest_nvuxllhd.fs4.ps1 | 8227af68552198a2d42de51cded2ce60 |
| psscriptpolicytest_2by2p21u.4ej.ps1 | 9d0b3796d1d174080cdfdbd4064bea3a |
| psscriptpolicytest_te5sbsfv.new.ps1 | af31b5a572b3208f81dbf42f6c143f99 |
| psscriptpolicytest_v3etgbxw.bmm.ps1 | 1892bd45671f17e9f7f63d3ed15e348e |
| psscriptpolicytest_fqa24ixq.dtc.ps1 | cc68eaf36cb90c08308ad0ca3abc17c1 |
| psscriptpolicytest_jzjombgn.sol.ps1 | 646dc0b7335cffb671ae3dfd1ebefe47 |
| psscriptpolicytest_rdm5qyy1.phg.ps1 | 609a925fd253e82c80262bad31637f19 |
| psscriptpolicytest_endvm2zz.qlp.ps1 | c6a667619fff6cf44f447868d8edd681 |
| psscriptpolicytest_s1mgcgdk.25n.ps1 | 3222c60b10e5a7c3158fd1cb3f513640 |

| Files and Tools | MD5 |
|-------------------------------------|--|
| psscriptpolicytest_xnjvzu5o.fta.ps1 | 90ce10d9aca909a8d2524bc265ef2fa4 |
| psscriptpolicytest_satzbifj.oli.ps1 | 44a3561fb9e877a2841de36a3698abc0 |
| psscriptpolicytest_grjck50v.nyg.ps1 | 5cb3f10db11e1795c49ec6273c52b5f1 |
| psscriptpolicytest_0bybivfe.x1t.ps1 | 122ea6581a36f14ab5ab65475370107e |
| psscriptpolicytest_bzoicrns.kat.ps1 | c82d7be7afdc9f3a0e474f019fb7b0f7 |
| Files and Tools | SHA256 |
| BEACON.PS1 | e68f9c3314beee640cc32f08a8532aa8dcda613543c54a83680c21d7cd49ca0f |
| Encoded PowerShell script | ad5fd10aa2dc82731f3885553763dfd4548651ef3e28c69f77ad035166d63db7 |
| Encoded PowerShell script | 48dd7d519dbb67b7a2bb2747729fc46e5832c30cafe15f76c1dbe3a249e5e731 |
| Files and Tools | SHA1 |
| PowerShell backdoor | 2d1ce0231cf8ff967c36bbfc931f3807ddba765c |

Table 2: Email Address and Virtual Currency Wallets

| Email Address |
|--|
| keishagrey994@outlook[.]com |
| Virtual Currency Wallets |
| a6dedd35ad745641c52d6a9f8da1fb09101d152f01b4b0e85a64d21c2a0845ee |
| bfacebcafff00b94ad2bff96b718a416c353a4ae223aa47d4202cdb31e09c92 |
| 418748c1862627cf91e829c64df9440d19f67f8a7628471d4b3a6cc5696944dd |
| bc1qn0u8un00nl6uz6uqrw7p50rg86gjr492jkwfn |

DETECTION

Based on an investigation by an advanced digital forensics group, FBI created the following YARA rule to detect the signature for a file identified as enabling malware.

NetMonitor.exe is a malware masquerading as a legitimate process and has the appearance of a legitimate network monitoring tool. This persistence tool sends pings from the network every five minutes. The NetMonitor executable is configured to use an IP address as its command server, and the program communicates with the server over port 443. During the attack, traffic between NetMonitor and the command server is encrypted, where NetMonitor functions like a reverse proxy and allows actors to connect to the tool from outside the victim's network.

YARA Rule

```
rule NetMonitor
{
  meta:
    author = "FBI"
    source = "FBI"
    sharing = "TLP:CLEAR"
    status = "RELEASED"
    description = "Yara rule to detect NetMonitor.exe"
    category = "MALWARE"
    creation_date = "2023-05-05"
    strings:
      $src4key = {11 4b 8c dd 65 74 22 c3}
      $op0 = {c6 [3] 00 00 05 c6 [3] 00 00 07 83 [3] 00 00 05 0f
85 [4] 83 [3] 00 00 01 75 ?? 8b [2] 4c 8d [2] 4c 8d [3] 00 00 48
8d [3] 00 00 48 8d [3] 00 00 48 89 [3] 48 89 ?? e8}
    condition:
      uint16(0) == 0x5A4D
      and filesize < 50000
      and any of them
}
```

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MITRE ATT&CK TACTICS AND TECHNIQUES

See Tables 3-7 for all referenced threat actor tactics and techniques in this advisory.

Table 3: AvosLocker Affiliates ATT&CK Techniques for Initial Access

| Initial Access | | |
|-----------------|----|-----|
| Technique Title | ID | Use |

| Initial Access | | |
|--------------------------|---|---|
| External Remote Services | T1133 <https://attack.mitre.org/versions/v13/techniques/t1133/> | AvosLocker affiliates use remote system administration tools — Splashtop Streamer, Tactical RMM, PuTTY, AnyDesk, PDQ Deploy, and Atera Agent — to access backdoor access vectors. |

Table 4: AvosLocker Affiliates ATT&CK Techniques for Execution

| Execution | | |
|--|---|--|
| Technique Title | ID | Use |
| Command and Scripting Interpreter: PowerShell | T1059.001 <https://attack.mitre.org/versions/v13/techniques/t1059/001/> | AvosLocker affiliates use custom PowerShell scripts to enable privilege escalation, lateral movement, and to disable antivirus. |
| Command and Scripting Interpreter: Windows Command Shell | T1059.003 <https://attack.mitre.org/versions/v13/techniques/t1059/003/> | AvosLocker affiliates use custom <code>.bat</code> scripts to enable privilege escalation, lateral movement, and to disable antivirus. |

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| Execution | | |
|------------------------------------|---|---|
| Windows Management Instrumentation | T1047 <https://attack.mitre.org/versions/v13/techniques/t1047/> | AvosLocker affiliates use legitimate Windows tools, such as PsExec and Nltest in their execution. |

Table 5: AvosLocker Affiliates ATT&CK Techniques for Persistence

| Persistence | | |
|---------------------------|---|---|
| Technique Title | ID | Use |
| Server Software Component | T1505.003 <https://attack.mitre.org/versions/v13/techniques/t1505/003/> | AvosLocker affiliates have uploaded and used custom webshells to enable network access. |

Table 6: AvosLocker Affiliates ATT&CK Techniques for Credential Access

| Credential Access | | |
|----------------------------------|---|--|
| Technique Title | ID | Use |
| Credentials from Password Stores | T1555 <https://attack.mitre.org/techniques/t1555/> | AvosLocker affiliates use open-source applications Lazagne and Mimikatz to steal credentials from system stores. |

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Table 7: AvosLocker Affiliates ATT&CK Techniques for Command and Control

| Command and Control | | |
|---------------------|---|--|
| Technique Title | ID | Use |
| Protocol Tunneling | T1572 <https://attack.mitre.org/versions/v13/techniques/t1572/> | AvosLocker affiliates use open source networking tunneling tools like Ligolo and Chisel. |

MITIGATIONS

These mitigations apply to all critical infrastructure organizations and network defenders. The FBI and CISA recommend that software manufacturers incorporate secure-by-design and -default principles and tactics into their software development practices to limit the impact of ransomware techniques (such as threat actors leveraging backdoor vulnerabilities into remote software systems), thus, strengthening the secure posture for their customers.

For more information on secure by design, see CISA's [Secure by Design and Default](https://www.cisa.gov/securebydesign) [<https://www.cisa.gov/securebydesign>](https://www.cisa.gov/securebydesign) webpage and [joint guide](https://www.cisa.gov/resources-tools/resources/secure-by-design-and-default) [<https://www.cisa.gov/resources-tools/resources/secure-by-design-and-default>](https://www.cisa.gov/resources-tools/resources/secure-by-design-and-default).

Give Feedback

FBI and CISA recommend organizations implement the mitigations below to improve your cybersecurity posture on the basis of the threat actor activity and to reduce the risk of compromise by AvosLocker ransomware. These mitigations align with the Cross-Sector Cybersecurity Performance Goals (CPGs) developed by CISA and the National Institute of Standards and Technology (NIST). The CPGs provide a minimum set of practices and protections that CISA and NIST recommend all organizations implement. CISA and NIST based the CPGs on existing cybersecurity frameworks and guidance to protect against the most common and impactful threats, tactics, techniques, and procedures. Visit CISA's

Cross-Sector Cybersecurity Performance Goals <<https://www.cisa.gov/cross-sector-cybersecurity-performance-goals>> for more information on the CPGs, including additional recommended baseline protections.

- Secure remote access tools by:
 - **Implementing application controls** to manage and control execution of software, including allowlisting remote access programs. Application controls should prevent installation and execution of portable versions of unauthorized remote access and other software. A properly configured application allowlisting solution will block any unlisted application execution. Allowlisting is important because antivirus solutions may fail to detect the execution of malicious portable executables when the files use any combination of compression, encryption, or obfuscation.
 - Applying recommendations in CISA's joint [Guide to Securing Remote Access Software](https://www.cisa.gov/sites/default/files/2023-06/guide%20to%20securing%20remote%20access%20software_clean%20final_508c.pdf) </sites/default/files/2023-06/guide%20to%20securing%20remote%20access%20software_clean%20final_508c.pdf>.
- **Strictly limit the use of RDP and other remote desktop services.** If RDP is necessary, rigorously apply best practices, for example [[CPG 2.W](https://www.cisa.gov/sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf) </sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf>]:
 - Audit the network for systems using RDP.
 - Close unused RDP ports.
 - Enforce account lockouts after a specified number of attempts.
 - Apply [phishing-resistant multifactor authentication \(MFA\)](https://www.cisa.gov/sites/default/files/publications/fact-sheet-implementing-phishing-resistant-mfa-508c.pdf) </sites/default/files/publications/fact-sheet-implementing-phishing-resistant-mfa-508c.pdf>.
 - Log RDP login attempts.
- **Disable command-line and scripting activities and permissions** [[CPG 2.N](https://www.cisa.gov/sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf) </sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf>].
- **Restrict the use of PowerShell**, using Group Policy, and only grant access to specific users on a case-by-case basis. Typically, only those users or administrators who manage the network or Windows operating systems (OSs) should be permitted to use PowerShell [[CPG 2.E](https://www.cisa.gov/sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf) </sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf>].

- **Update Windows PowerShell or PowerShell Core** to the latest version and uninstall all earlier PowerShell versions. Logs from Windows PowerShell prior to version 5.0 are either non-existent or do not record enough detail to aid in enterprise monitoring and incident response activities [[CPG 1.E, 2.S, 2.T </sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf>](#)].
- **Enable enhanced PowerShell logging** [[CPG 2.T, 2.U </sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf>](#)].
 - PowerShell logs contain valuable data, including historical OS and registry interaction and possible TTPs of a threat actor's PowerShell use.
 - Ensure PowerShell instances, using the latest version, have module, script block, and transcription logging enabled (enhanced logging).
 - The two logs that record PowerShell activity are the PowerShell Windows Event Log and the PowerShell Operational Log. FBI and CISA recommend turning on these two Windows Event Logs with a retention period of at least 180 days. These logs should be checked on a regular basis to confirm whether the log data has been deleted or logging has been turned off. Set the storage size permitted for both logs to as large as possible.

Configure the Windows Registry to require User Account Control (UAC) approval for any PsExec operations requiring administrator privileges to reduce the risk of lateral movement by PsExec.

In addition, FBI and CISA recommend network defenders apply the following mitigations to limit potential adversarial use of common system and network discovery techniques and to reduce the impact and risk of compromise by ransomware or data extortion actors:

- **Disable File and Printer sharing services.** If these services are required, use strong passwords or Active Directory authentication.
- **Implement a recovery plan** to maintain and retain multiple copies of sensitive or proprietary data and servers in a physically separate, segmented, and secure location (e.g., hard drive, storage device, or the cloud).

- **Maintain offline backups of data**, and regularly maintain backup and restoration (daily or weekly at minimum). By instituting this practice, an organization minimizes the impact of disruption to business practices as they will not be as severe and/or only have irretrievable data [CPG 2.R /sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf].
Recommend organizations follow the 3-2-1 backup strategy in which organizations have three copies of data (one copy of production data and two backup copies) on two different media such as disk and tape, with one copy kept off-site for disaster recovery.
- **Require all accounts** with password logins (e.g., service account, admin accounts, and domain admin accounts) **to comply** with **NIST's standards** <https://pages.nist.gov/800-63-3/> for developing and managing password policies.
 - Use longer passwords consisting of at least 15 characters [CPG 2.B /sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf].
 - Store passwords in hashed format using industry-recognized password managers.
 - Add password user “salts” to shared login credentials.
 - Avoid reusing passwords [CPG 2.C /sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf].
 - Implement multiple failed login attempt account lockouts [CPG 2.G /sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf].
 - Disable password “hints.”
 - Refrain from requiring password changes more frequently than once per year.
Note: NIST guidance suggests favoring longer passwords instead of requiring regular and frequent password resets. Frequent password resets are more likely to result in users developing password “patterns” cyber criminals can easily decipher.
 - Require administrator credentials to install software.
- **Require phishing-resistant multifactor authentication** for all services to the extent possible, particularly for webmail, virtual private networks, and accounts that access critical systems [CPG 2.H /sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf].

- **Keep all operating systems, software, and firmware up to date.** Timely patching is one of the most efficient and cost-effective steps an organization can take to minimize its exposure to cybersecurity threats. Organizations should patch vulnerable software and hardware systems within 24 to 48 hours of vulnerability disclosure. Prioritize patching [known exploited vulnerabilities](https://www.cisa.gov/known-exploited-vulnerabilities-catalog) <<https://www.cisa.gov/known-exploited-vulnerabilities-catalog>> in internet-facing systems [CPG 1.E </sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf>].
- **Segment networks** to prevent the spread of ransomware. Network segmentation can help prevent the spread of ransomware by controlling traffic flows between—and access to—various subnetworks, restricting further lateral movement [CPG 2.F </sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf>].
- **Identify, detect, and investigate abnormal activity and potential traversal of the indicated ransomware with a networking monitoring tool.** To aid in detecting ransomware, implement a tool that logs and reports all network traffic, including lateral movement activity on a network. Endpoint detection and response (EDR) tools are particularly useful for detecting lateral connections, as they have insight into common and uncommon network connections for each host [CPG 3.A </sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf>].
- **Install, regularly update, and enable real time detection for antivirus software** on all hosts.
- **Disable unused ports** [CPG 2.V </sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf>].
- **Consider adding an email banner to emails** received from outside your organization [CPG 2.M </sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf>].
- **Ensure all backup data is encrypted, immutable** (i.e., cannot be altered or deleted), and covers the entire organization's data infrastructure [CPG 2.K, 2.L, 2.R </sites/default/files/2023-03/cisa_cpg_report_v1.0.1_final.pdf>].

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VALIDATE SECURITY CONTROLS

In addition to applying mitigations, FBI and CISA recommend exercising, testing, and validating your organization's security program against the threat behaviors mapped to the MITRE ATT&CK for Enterprise framework in this advisory. FBI and CISA recommend testing

your existing security controls inventory to assess how they perform against the ATT&CK techniques described in this advisory.

To get started:

1. Select an ATT&CK technique described in this advisory (see Tables 3-7).
2. Align your security technologies against the technique.
3. Test your technologies against the technique.
4. Analyze your detection and prevention technologies' performance.
5. Repeat the process for all security technologies to obtain a set of comprehensive performance data.
6. Tune your security program, including people, processes, and technologies, based on the data generated by this process.

FBI and CISA recommend continually testing your security program, at scale, in a production environment to ensure optimal performance against the MITRE ATT&CK techniques identified in this advisory.

RESOURCES

- [Stopransomware.gov](https://www.stopransomware.gov/) <<https://www.stopransomware.gov/>> is a whole-of-government approach that gives one central location for ransomware resources and alerts.
- The [Joint Ransomware Guide](https://www.cisa.gov/resources-tools/resources/stopransomware-guide) <<https://www.cisa.gov/resources-tools/resources/stopransomware-guide>> provides preparation, prevention, and mitigation best practices as well as a ransomware response checklist.
- [Cyber Hygiene Services](https://www.cisa.gov/cyber-hygiene-services) <<https://www.cisa.gov/cyber-hygiene-services>> and [Ransomware Readiness Assessment](https://github.com/cisagov/cset/releases/tag/v10.3.0.0) <<https://github.com/cisagov/cset/releases/tag/v10.3.0.0>> provide no-cost cyber hygiene and ransomware readiness assessment services.

REPORTING

The FBI is seeking any information that can be shared, to include boundary logs showing communication to and from foreign IP addresses, a sample ransom note, communications with AvosLocker affiliates, Bitcoin wallet information, decryptor files, and/or a benign sample of an encrypted file. The FBI and CISA do not encourage paying ransom as payment does not guarantee victim files will be recovered. Furthermore, payment may also embolden adversaries to target additional organizations, encourage other criminal actors to engage in the distribution of ransomware, and/or fund illicit activities. Regardless of whether you or your organization have decided to pay the ransom, the FBI and CISA urge you to promptly report ransomware incidents to the FBI Internet Crime Complaint Center (IC3) at [ic3.gov](https://www.ic3.gov/) <<https://www.ic3.gov/>>, [local FBI Field Office](https://www.fbi.gov/contact-us/field-offices) <<https://www.fbi.gov/contact-us/field-offices>>, or CISA via the agency's [Incident Reporting System](https://www.cisa.gov/forms/report) <<https://www.cisa.gov/forms/report>> or its 24/7 Operations Center at report@cisa.gov or by calling 1-844-Say-CISA (1-844-729-2472).

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REFERENCES

[1] [GitHub sysdream | ligolo repository](https://github.com/sysdream/ligolo) <<https://github.com/sysdream/ligolo>>

[2] [GitHub jpillora | chisel repository](https://github.com/jpillora/chisel) <<https://github.com/jpillora/chisel>>

[3] [GitHub BishopFox | sliver repository](https://github.com/BishopFox/sliver)

<<https://github.com/bishopfox/sliver/tree/6c02971b54831884d30407b632a379947dd289ad>>

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MITRE ATT&CK TTP: Command and Control (TA0011), Credential Access (TA0006), Execution (TA0002), Initial Access (TA0001), Persistence (TA0003)

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