JOINT
CYBERSECURITY ADVISORY

Co-Authored by:

TLP:CLEAR   Product ID: AA24-060A

February 29, 2024

MS-ISAC®
Multi-State Information
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#StopRansomware: Phobos Ransomware

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 to see all #StopRansomware advisories and to learn more about other ransomware threats and no-cost resources.

> **Actions to take today to mitigate Phobos ransomware activity:**
>
> - Secure RDP ports to prevent threat actors from abusing and leveraging RDP tools.
> - Prioritize remediating known exploited vulnerabilities.
> - Implement EDR solutions to disrupt threat actor memory allocation techniques.

The Federal Bureau of Investigation (FBI), the Cybersecurity and Infrastructure Security Agency (CISA), and the Multi-State Information Sharing and Analysis Center (MS-ISAC) are releasing this joint CSA, to disseminate known TTPs and IOCs associated with the Phobos ransomware variants observed as recently as February 2024, according to open source reporting. Phobos is structured as a ransomware-as-a-service (RaaS) model. Since May 2019, Phobos ransomware incidents impacting state, local, tribal, and territorial (SLTT) governments have been regularly reported to the MS-ISAC. These incidents targeted municipal and county governments, emergency services, education, public healthcare, and other critical infrastructure entities to successfully ransom several million U.S. dollars.[1],[2]

The FBI, CISA, and the MS-ISAC encourage organizations to implement the recommendations in the Mitigations section of this CSA to reduce the likelihood and impact of Phobos ransomware and other ransomware incidents.

For a downloadable copy of indicators of compromise (IOCs), see:

- AA24-060A (STIX XML, 148KB)
- AA24-060A (STIX JSON, 120KB)

U.S organizations: To report suspicious or criminal activity related to information found in this joint Cybersecurity Advisory, contact your local FBI field office or CISA's 24/7 Operations Center at Report@cisa.gov or (888) 282-0870. When available, please include the following information regarding the incident: date, time, and location of the incident; type of activity; number of people affected; type of equipment used for the activity; the name of the submitting company or organization; and a designated point of contact.

TECHNICAL DETAILS

Note: This advisory uses the MITRE ATT&CK for Enterprise framework, version 14. 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 and CISA's Decider Tool.

Overview

According to open source reporting, Phobos ransomware is likely connected to numerous variants (including Elking, Eight, Devos, Backmydata, and Faust ransomware) due to similar TTPs observed in Phobos intrusions. Phobos ransomware operates in conjunction with various open source tools such as Smokeloader, Cobalt Strike, and Bloodhound. These tools are all widely accessible and easy to use in various operating environments, making it (and associated variants) a popular choice for many threat actors.[3],[4]

Reconnaissance and Initial Access

Phobos actors typically gain initial access to vulnerable networks by leveraging phishing campaigns [T1598] to drop hidden payloads or using internet protocol (IP) scanning tools, such as Angry IP Scanner, to search for vulnerable Remote Desktop Protocol (RDP) ports [T1595.001] or by leveraging RDP on Microsoft Windows environments.[5],[6]

Once they discover an exposed RDP service, the actors use open source brute force tools to gain access [T1110]. If Phobos actors gain successful RDP authentication [T1133][T1078] in the targeted environment, they perform open source research to create a victim profile and connect the targeted IP addresses to their associated companies [T1593]. Threat actors leveraging Phobos have notably deployed remote access tools to establish a remote connection within the compromised network [T1219].[7]

Alternatively, threat actors send spoofed email attachments [T1566.001] that are embedded with hidden payloads [T1204.002] such as SmokeLoader, a backdoor trojan that is often used in conjunction with Phobos. After SmokeLoader's hidden payload is downloaded onto the victim's system, threat actors use the malware's functionality to download the Phobos payload and exfiltrate data from the compromised system.

Execution and Privilege Escalation

Phobos actors run executables like `1saas.exe` or `cmd.exe` to deploy additional Phobos payloads that have elevated privileges enabled [TA0004]. Additionally, Phobos actors can use the previous commands to perform various windows shell functions. The Windows command shell enables threat actors to control various aspects of a system, with multiple permission levels required for different subsets of commands [T1059.003][T1105].[8]

Smokeloader Deployment

Phobos operations feature a standard three phase process to decrypt a payload that allows the threat actors to deploy additional destructive malware.[9]

For the first phase, Smokeloader manipulates either `VirtualAlloc` or `VirtualProtect` API functions—which opens an entry point, enabling code to be injected into running processes and allowing the malware to evade network defense tools [T1055.002]. In the second phase, a stealth process is used to obfuscate command and control (C2) activity by producing requests to legitimate websites [T1001.003].[10]

Within this phase, the shellcode also sends a call from the entry point to a memory container [T1055.004] and prepares a portable executable for deployment in the final stage [T1027.002][T1105][T1140].

Finally, once Smokeloader reaches its third stage, it unpacks a program-erase cycle from stored memory, which is then sent to be extracted from a SHA 256 hash as a payload.[7] Following successful payload decryption, the threat actors can begin downloading additional malware.

Additional Phobos Defense Evasion Capabilities

Phobos ransomware actors have been observed bypassing organizational network defense protocols by modifying system firewall configurations using commands like `netsh firewall set opmode mode=disable` [T1562.004]. Additionally, Phobos actors can evade detection by using the following tools: Universal Virus Sniffer, Process Hacker, and PowerTool [T1562].

Persistence and Privilege Escalation

According to open source reporting, Phobos ransomware uses commands such as `Exec.exe` or the `bcdedit[.]exe` control mechanism. Phobos has also been observed using Windows Startup folders and Run Registry Keys such as `C:/Users\Admin\AppData\Local\directory` [T1490][T1547.001] to maintain persistence within compromised environments.[5]

Additionally, Phobos actors have been observed using built-in Windows API functions [T1106] to steal tokens [T1134.001], bypass access controls, and create new processes to escalate privileges by leveraging the `SeDebugPrivilege` process [T1134.002]. Phobos actors attempt to authenticate using cached password hashes on victim machines until they reach domain administrator access [T1003.005].

Discovery and Credential Access

Phobos actors additionally use open source tools [T1588.002] such as Bloodhound and Sharphound to enumerate the active directory [T1087.002]. Mimikatz and NirSoft, as well as Remote Desktop Passview to export browser client credentials [T1003.001][T1555.003], have also been used. Furthermore, Phobos ransomware is able to enumerate connected storage devices [T1082], running processes [T1057], and encrypt user files [T1083].

Exfiltration

Phobos actors have been observed using `WinSCP` and `Mega.io` for file exfiltration.[11] They use `WinSCP` to connect directly from a victim network to an FTP server [T1071.002] they control [TA0010]. Phobos actors install `Mega.io` [T1048] and use it to export victim files directly to a cloud storage provider [T1567.002]. Data is typically archived as either a `.rar` or `.zip` file [T1560] to be later exfiltrated. They target legal documentation, financial records, technical documents (including network architecture), and databases for commonly used password management software [T1555.005].

Impact

After the exfiltration phase, Phobos actors then hunt for backups. They use `vssadmin.exe` and Windows Management Instrumentation command-line utility (WMIC) to discover and delete volume shadow copies in Windows environments. This prevents victims from recovering files after encryption has taken place [T1047][T1490].

`Phobos.exe` contains functionality to encrypt all connected logical drives on the target host [T1486]. Each Phobos ransomware executable has unique build identifiers (IDs), affiliate IDs, as well as a unique ransom note which is embedded in the executable. After the ransom note has populated on infected workstations, Phobos ransomware continues to search for and encrypt additional files.

Most extortion [T1657] occurs via email; however, some affiliate groups have used voice calls to contact victims. In some cases, Phobos actors have used onion sites to list victims and host stolen victim data. Phobos actors use various instant messaging applications such as ICQ, Jabber, and QQ to communicate [T1585]. See Figure 2 for a list of email providers used by the following Phobos affiliates: Devos, Eight, Elbie, Eking, and Faust.[6]

Devos	Eight	Elbie	Eking	Faust
email[.]tg	gmx[.]com	tutanota[.]com	tutanota[.]com	gmx[.]com
cock[.]li	aol[.]com	onionmail[.]org	airmail[.]cc	tutanota[.]com
protonmail[.]com	protonmail[.]com	tuta[.]io	aol[.]com	onionmail[.]org
libertymail[.]net	tutanota[.]com	techmail[.]info	firemail[.]cc	waifu[.]club
qq[.]com	onionmail[.]org	cock[.]li	tuta[.]io	tuta[.]io
pressmail[.]ch	cock[.]li	privatemail[.]com	protonmail[.]com	gmail[.]com
medmail[.]ch	keemail[.]me	gmail[.]com	cock[.]li	airmail[.]cc
tutanota[.]com	mailfence[.]com	yandex[.]ru	criptext[.]com	mailfence[.]com
cumallover[.]me	zohomail[.]eu	msgsafe[.]io	ctemplar[.]com	xmpp[.]jp
airmail[.]cc	zohomail[.]com	cyberfear[.]com	gmx[.]com	zohomail[.]eu
countermail[.]com	ICQ@HONESTHORSE	aol[.]com	techmail[.]info	cock[.]li
mailfence[.]com	ICQ@VIRTUALHORSE		msgsafe[.]io	zohomail[.]com
mail[.]fr				lenta[.]ru
				proton[.]me
				privatemail[.]com

*Figure 1: **Phobos Affiliate Providers List***

INDICATORS OF COMPROMISE (IOCs)

See Table 1 through 6 for IOCs obtained from CISA and the FBI investigations from September through November 2023.

Table 1: Associated Phobos Domains

Associated Phobos Domains
adstat477d[.]xyz
demstat577d[.]xyz [12]
serverxlogs21[.]xyz

Table 2: Observed Phobos Shell Commands

Shell Commands
vssadmin delete shadows /all /quiet [T1490]
netsh advfirewall set currentprofile state off
wmic shadowcopy delete
netsh firewall set opmode mode=disable [T1562.004]
bcdedit /set {default} bootstatuspolicy ignoreallfailures [T1547.001]
bcdedit /set {default} recoveryenabled no [T1490]
wbadmin delete catalog -quiet
mshta C:\%USERPROFILE%\Desktop\info.hta [T1218.005]
mshta C:\%PUBLIC%\Desktop\info.hta
mshta C:\info.hta

The commands above are observed during the execution of a Phobos encryption executable. A Phobos encryption executable spawns a `cmd.exe` process, which then executes the commands listed in Table 1 with their respective Windows system executables. When the commands above are executed on a Windows system, volume shadow copies are deleted and Windows Firewall is

disabled. Additionally, the system's boot status policy is set to boot even when there are errors during the boot process, and automatic recovery options, like Windows Recovery Environment (WinRE), are disabled for the given boot entry. The system's backup catalog is also deleted. Finally, the Phobos ransom note is displayed to the end user using `mshta.exe`.

Table 3: Observed Phobos Registry Keys

Registry Keys
HKLM\SOFTWARE\Microsoft\Windows\CurrentVersion\Run\<Phobos exe name>
C:/Users\Admin\AppData\Local\directory

Table 4: Observed Phobos Actor Email Addresses

Email Addresses	
AlbetPattisson1981@protonmail[.]com	henryk@onionmail[.]org
atomicday@tuta[.]io	info@fobos[.]one
axdus@tuta[.]io	it.issues.solving@outlook[.]com
barenuckles@tutanota[.]com	JohnWilliams1887@gmx[.]com
Bernard.bunyan@aol[.]com	jonson_eight@gmx[.]us
bill.g@gmx[.]com	joshuabernandead@gmx[.]com
bill.g@msgsafe[.]io	LettoIntago@onionmail[.]com
bill.g@onionmail[.]org	Luiza.li@tutanota[.]com
bill.gTeam@gmx[.]com	MatheusCosta0194@gmx[.]com
blair_lockyer@aol[.]com	mccreight.ellery@tutanota[.]com
CarlJohnson1948@gmx[.]com	megaport@tuta[.]io
cashonlycash@gmx[.]com	miadowson@tuta[.]io
chocolate_muffin@tutanota[.]com	MichaelWayne1973@tutanota[.]com
claredrinkall@aol[.]com	normanbaker1929@gmx[.]com
clausmeyer070@cock[.]li	nud_satanakia@keemail[.]me
colexpro@keemail[.]me	please@countermail[.]com

TLP:CLEAR

Email Addresses	
cox.barthel@aol[.]com	precorpman@onionmail[.]org
crashonlycash@gmx[.]com	recovery2021@inboxhub[.]net
everymoment@tuta[.]io	recovery2021@onionmail[.]org
expertbox@tuta[.]io	SamuelWhite1821@tutanota[.]com
fastway@tuta[.]io	SaraConor@gmx[.]com
fquatela@techie[.]com	secdatltd@gmx[.]com
fredmoneco@tutanota[.]com	skymix@tuta[.]io
getdata@gmx[.]com	sory@countermail[.]com
greenbookBTC@gmx[.]com	spacegroup@tuta[.]io
greenbookBTC@protonmail[.]com	stafordpalin@protonmail[.]com
helperfiles@gmx[.]com	starcomp@keemail[.]me
helpermail@onionmail[.]org	xdone@tutamail[.]com
helpfiles@onionmail[.]org	xgen@tuta[.]io
helpfiles102030@inboxhub[.]net	xspacegroup@protonmail[.]com
helpforyou@gmx[.]com	zgen@tuta[.]io
helpforyou@onionmail[.]org	zodiacx@tuta[.]io

Table 5: Observed Phobos Actor Telegram Username

Telegram Username
@phobos_support

Table 6: Observed Phobos Actor Wickr Address

Wickr Address
•   Vickre me

Disclaimer: Organizations are encouraged to investigate the use of the IOCs in Table 7 for related signs of compromise prior to performing remediation actions.

Table 7: Phobos IOCs from September through December 2023

Associated IP Address	File Type	File Name	SHA 256 Hash
194.165.16[.]4 (October 2023)	Win32.exe	Ahpdate.exe [13]	0000599cbc6e5b0633c5a6261c79e4d3d810 05c77845c6b0679d854884a8e02f
45.9.74[.]14 (December 2023) 147.78.47[.]224 (December 2023)	Executable and Linkable Format (ELF) [14]	1570442295 (Trojan Linux Mirai)	7451be9b65b956ee667081e1141531514b1 ec348e7081b5a9cd1308a98eec8f0
185.202.0[.]111 (September 2023)	Win32.exe [15]	cobaltstrike_shellcode[.]exe (C2 activity)	
185.202.0[.]111 (December 2023)	.txt [16]	f1425cff3d28afe5245459afa6d7 985081bc6a62f86dce64c63dae b2136d7d2c.bin (Trojan)	

Disclaimer: Organizations are encouraged to investigate the use of the file hashes in Tables 8 and 9 for related signs of compromise prior to performing remediation actions.

Table 8: Phobos Actor File Hashes Observed in October 2023

Phobos Ransomware SHA 256 Malicious Trojan Executable File Hashes
518544e56e8ccee401ffa1b0a01a10ce23e49ec21ec441c6c7c3951b01c1b19c
9215550ce3b164972413a329ab697012e909d543e8ac05d9901095016dd3fc6c
482754d66d01aa3579f007c2b3c3d0591865eb60ba60b9c28c66fe6f4ac53c52
c0539fd02ca0184925a932a9e926c681dc9c81b5de4624250f2dd885ca5c4763

Table 9: Phobos Actor File Hashes from Open Source from November 2023 [17]

Phobos Ransomware SHA 256 File Hashes
58626a9bfb48cd30acd0d95debcaefd188ae794e1e0072c5bde8adae9bccafa6
f3be35f8b8301e39dd3dffc9325553516a085c12dc15494a5e2fce73c77069ed
518544e56e8ccee401ffa1b0a01a10ce23e49ec21ec441c6c7c3951b01c1b19c
32a674b59c3f9a45efde48368b4de7e0e76c19e06b2f18afb6638d1a080b2eb3

Phobos Ransomware SHA 256 File Hashes
2704e269fb5cf9a02070a0ea07d82dc9d87f2cb95e60cb71d6c6d38b01869f66
fc4b14250db7f66107820ecc56026e6be3e8e0eb2d428719156cf1c53ae139c6
a91491f45b851a07f91ba5a200967921bf796d38677786de51a4a8fe5ddeafd2

MITRE ATT&CK TECHNIQUES

See Table 10 through 22 for all threat actor tactics and techniques referenced in this advisory.

Table 10: Phobos Threat Actors ATT&CK Techniques for Enterprise – Reconnaissance

Technique Title	ID	Use
Search Open Websites/Domains	T1593	Phobos actors perform open source research to find information about victims that can be used during targeting to create a victim profile.
Scanning IP Blocks	T1595.001	Phobos actors used IP scanning tools to include Angry IP Scanner to search for vulnerable RDP ports.
Phishing for Information	T1598	Phobos actors use phishing campaigns to social engineer information from users and gain access to vulnerable RDP ports.

Table 11: Phobos Threat Actors ATT&CK Techniques for Enterprise – Resource Development

Technique Title	ID	Use
Establish Accounts	T1585	Phobos actors establish accounts to communicate.
Obtain Capabilities: Tool	T1588.002	Phobos actors used open source tools in their attack.

Table 12: Phobos Threat Actors ATT&CK Techniques for Enterprise – Initial Access

Technique Title	ID	Use
Valid Accounts	T1078	Following successful RDP authentication, Phobos actors search for IP addresses and pair them with their associated computer to create a victim profile.
External Remote Services	T1133	Phobos actors may leverage external-facing remote services to initially access and/or persist within a network.

Phishing: Spearphishing Attachment	T1566.001	Phobos actors used a spoofed email attachment to execute attack.

Table 13: Phobos Threat Actors ATT&CK Techniques for Enterprise – Execution

Technique Title	ID	Use
Windows Management Instrumentation	T1047	Phobos actors used Windows Management Instrumentation command-line utility (WMIC) to prevent victims from recovering files.
Windows Command Shell	T1059.003	Phobos actors can use the previous commands to perform commands with windows shell functions.
Native API	T1106	Phobos actors used open source tools to enumerate the active directory.
Malicious File	T1204.002	Phobos actors attached a malicious email attachment to deliver ransomware.

Table 14: Phobos Threat Actors ATT&CK Techniques for Enterprise – Persistence

Technique Title	ID	Use
Registry Run Keys / Startup Folder	T1547.001	Phobos ransomware operates using the `Exec.exe` control mechanism and has been observed using Windows Startup folders and Run Registry Keys.

Table 15: Phobos Threat Actors ATT&CK Techniques for Enterprise – Privilege Escalation

Technique Title	ID	Use
Privilege Escalation	TA0004	Phobos actors use run commands like `1saas.exe`, or `cmd.exe` to deploy additional Phobos payloads with escalated privileges.
Portable Executable Injection	T1055.002	Phobos actors use Smokeloader to inject code into running processes to identify an entry point through enabling a `VirtualAlloc` or `VirtualProtect` process.
Asynchronous Procedure Call	T1055.004	During phase two of execution, Phobos ransomware sends a call back from an identified entry point.
Access Token Manipulation: Token Impersonation/Theft	T1134.001	Phobos actors can use Windows API functions to steal tokens.

Create Process with Token	T1134.002	Phobos actors used Windows API functions to steal tokens, bypass access controls and create new processes.

Table 16: Phobos Threat Actors ATT&CK Techniques for Enterprise – Defense Evasion

Technique Title	ID	Use
Software Packing	T1027.002	Phobos actors deployed a portable executable (PE) to conceal code.
Embedded Payloads	T1027.009	Phobos actors embedded the ransomware as a hidden payload by using Smokeloader.
Deobfuscate/Decode Files or Information	T1140	During phase two of execution, Phobos actors' malware stores and decrypts information.
System Binary Proxy Execution: Mshta	T1218.005	Phobos actors used Mshta to execute malicious files.
Impair Defenses	T1562	Phobos actors can use Universal Virus Sniffer, Process Hacker, and PowerTool to evade detection.
Disable or Modify System Firewall	T1562.004	Phobos ransomware has been observed bypassing organizational network defense protocols through modifying system firewall configurations.

Table 17: Phobos Threat Actors ATT&CK Techniques for Enterprise – Credential Access

Technique Title	ID	Use
OS Credential Dumping: LSASS Memory	T1003.001	Phobos actors used Mimikatz to export credentials.
OS Credential Dumping: Cached Domain Credentials	T1003.005	Phobos actors use cached domain credentials to authenticate as the domain administrator in the event a domain controller is unavailable.
Brute Force	T1110	Phobos actors may use brute force techniques to gain access to accounts when passwords are unknown or when password hashes are obtained.
Credentials from Password Stores	T1555	Phobos actors may search for common password storage locations to obtain user credentials.
Credentials from Password Stores: Credentials from Web Browsers	T1555.003	Phobos actors use Nirsoft or Passview to export client credentials from web browsers.

Technique Title	ID	Use
		Phobos actors search for stored credentials in browser clients once they gain initial network access.
Credentials from Password Stores: Password Managers	T1555.005	Phobos actors targeted victim's databases for password management software.

Table 18: Phobos Threat Actors ATT&CK Techniques for Enterprise – Discovery

Technique Title	ID	Use
Process Discovery	T1057	Phobos ransomware is able to run processes.
System Information Discovery	T1082	Phobos ransomware is able to enumerate connected storage devices.
File and Directory Discovery	T1083	Phobos ransomware can encrypt user files.
Domain Account	T1087.002	Phobos threat actor used Bloodhound and Sharphound to enumerate the active directory.

Table 19: Phobos Threat Actors ATT&CK Techniques for Enterprise – Collection

Technique Title	ID	Use
Archive Collected Data	T1560	Phobos threat actors archive data as either a `.rar` or `.zip` file to be later exfiltrated.

Table 20: Phobos Threat Actors ATT&CK Techniques for Enterprise – Command and Control

Technique Title	ID	Use
Data Obfuscation: Protocol Impersonation	T1001.003	Phobos actors used a stealth process to obfuscate C2 activity.
File Transfer Protocols	T1071.002	Phobos threat actors used `WinSCP` to connect the victim's network to an FTP server.
Ingress Tool Transfer	T1105	Phobos ransomware extracts its final payload from the hashed file.
Remote Access Software	T1219	Phobos threat actors used remote access tools to establish a remote connection within victim's network.

Table 21: Phobos Threat Actors ATT&CK Techniques for Enterprise – Exfiltration

Technique Title	ID	Use
Exfiltration	TA0010	Phobos threat actors may use exfiltration techniques to steal data from your network.

Technique Title	ID	Use
Exfiltration Over Alternative Protocol	T1048	Phobos threat actors use software to export files to a cloud.
Exfiltration to Cloud Storage	T1567.002	Phobos threat actors use `Mega.io` to exfiltrate data to a cloud storage service rather than over their primary command and control channel.

Table 22: Phobos Threat Actors ATT&CK Techniques for Enterprise – Impact

Technique Title	ID	Use
Data Encrypted for Impact	T1486	Phobos threat actors use the `Phobos.exe` command to encrypt data on all logical drives connected to the network.
Inhibit System Recovery	T1490	Phobos threat actors may delete or remove backups to include volume shadow copies from Windows environments to prevent victim data recovery response efforts.
Financial Theft	T1657	Phobos threat actor's extort victims for financial gain.

MITIGATIONS

The FBI, CISA, and MS-ISAC recommend organizations implement the mitigations below to improve your organization's cybersecurity posture against actors' activity. 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 for more information on the CPGs, including additional recommended baseline protections.

> **Secure by Design and Default Mitigations:**
>
> These mitigations apply to all critical infrastructure organizations and network defenders. The FBI, CISA, and MS-ISAC recommend that software manufacturers incorporate secure by design and default principles and tactics into their software development practices limiting the impact of ransomware techniques, thus, strengthening the secure posture for their customers.
>
> For more information on secure by design, see CISA's Secure by Design webpage and joint guide.

- **Secure remote access software by** applying recommendations from the joint Guide to Securing Remote Access Software.

- **Implement 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 allowlist 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.
- **Implement log collection best practices** and use intrusion detection systems to defend against threat actors manipulating firewall configurations through early detection [CPG 2.T].
  - Implement EDR solutions to disrupt threat actor memory allocation techniques.
- **Strictly limit the use of RDP and other remote desktop services**. If RDP is necessary, rigorously apply best practices, for example [CPG 2.W]:
  - 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).
  - Log RDP login attempts.
- **Disable command-line and scripting** activities and permissions [CPG 2.N].
- **Review domain controllers, servers, workstations, and active directories** for new and/or unrecognized accounts [CPG 4.C].
- **Audit user accounts with administrative privileges** and configure access controls according to the principle of least privilege (PoLP) [CPG 2.E].
- **Reduce the threat of credential compromise** via the following:
  - Place domain admin accounts in the protected users' group to prevent caching of password hashes locally.
  - Refrain from storing plaintext credentials in scripts.
- **Implement time-based access for accounts** at the admin level and higher [CPG 2.A, 2.E].

In addition, the authoring authorities of this CSA 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:

- **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 (i.e., 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 limits the severity of disruption to its business practices [CPG 2.R].
- **Require all accounts** with password logins (e.g., service account, admin accounts, and domain admin accounts) **to comply** with NIST's standards for developing and managing password policies.
  - Use longer passwords consisting of at least 15 characters and no more than 64 characters in length [CPG 2.B].

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- o Store passwords in hashed format using industry-recognized password managers.
- o Add password user "salts" to shared login credentials.
- o Avoid reusing passwords [CPG 2.C].
- o Implement multiple failed login attempt account lockouts [CPG 2.G].
- o Disable password "hints."
- o 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.
- o Require administrator credentials to install software.

- **Require phishing-resistant multifactor authentication (MFA)** for all services to the extent possible, particularly for webmail, virtual private networks (VPNs), and accounts that access critical systems [CPG 2.H].
- **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 and by restricting adversary lateral movement [CPG 2.F].
- **Identify, detect, and investigate abnormal activity and potential traversal of the indicated ransomware with a networking monitoring tool.** To aid in detecting the ransomware, implement a tool that logs and reports all network traffic and activity, including lateral movement, 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].
- **Install, regularly update, and enable real time detection for antivirus software** on all hosts.
- **Disable unused ports and protocols** [CPG 2.V].
- **Consider adding an email banner to emails** received from outside your organization [CPG 2.M].
- **Disable hyperlinks** in received emails.
- **Ensure all backup data is encrypted, immutable** (i.e., ensure backup data cannot be altered or deleted), and covers the entire organization's data infrastructure [CPG 2.K, 2.L, 2.R].

VALIDATE SECURITY CONTROLS

In addition to applying mitigations, the FBI, CISA, and MS-ISAC 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. The FBI, CISA, and MS-ISAC 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 4-16).
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.

The FBI, CISA, and MS-ISAC 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 is a whole-of-government approach that gives one central location for ransomware resources and alerts.
- Resource to mitigate a ransomware attack: CISA, NSA, FBI, and Multi-State Information Sharing and Analysis Center's (MS-ISAC) Joint #StopRansomware Guide.
- SLTT organizations are encouraged to implement MS-ISAC's Ransomware Defense-in-Depth guidance.
- No-cost cyber hygiene services: Cyber Hygiene Services and Ransomware Readiness Assessment.
- CISA: Known Exploited Vulnerabilities Catalog
- CISA, MITRE: Best Practices for MITRE ATT&CK Mapping
- CISA: Decider Tool
- CISA: Cross-Sector Cybersecurity Performance Goals
- CISA: Secure by Design
- CISA: Implementing Phishing-Resistant MFA
- CISA: Guide to Securing Remote Access Software

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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 Phobos actors, Bitcoin wallet information, decryptor files, and/or a benign sample of an encrypted file.

Additional details requested include: a targeted company point of contact, status and scope of infection, estimated loss, operational impact, transaction IDs, date of infection, date detected, initial attack vector, and host and network-based indicators.

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), a local FBI Field Office, or to CISA at report@cisa.gov or (888) 282-0870.

DISCLAIMER

The FBI does not conduct its investigative activities or base attribution solely on activities protected by the First Amendment. Your company has no obligation to respond or provide information back to the FBI in response to this engagement. If, after reviewing the information, your company decides to provide referral information to the FBI, it must do so in a manner consistent with federal law. The FBI does not request or expect your company to take any particular action regarding this information other than holding it in confidence due to its sensitive nature.

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