

Tactics, Techniques, and Procedures of Indicted APT40 Actors Associated with China's MSS Hainan State Security Department

SUMMARY

This Joint Cybersecurity Advisory was written by the Federal Bureau of Investigation (FBI) and the Cybersecurity and Infrastructure Security Agency (CISA) to provide information on a Chinese Advanced Persistent Threat (APT) group known in open-source reporting as APT40. This advisory provides APT40's tactics, techniques, and procedures (TTPs) and indicators of compromise (IOCs) to help cybersecurity practitioners identify and remediate APT40 intrusions and established footholds.

APT40—aka BRONZE MOHAWK, FEVERDREAM, G0065, Gadolinium, GreenCrash, Hellsing, Kryptonite Panda, Leviathan, MUDCARP, Periscope, Temp.Periscope, and Temp.Jumper—is located in Haikou, Hainan Province, People's Republic of China (PRC), and has been active since at least 2009. APT40 has targeted governmental organizations, companies, and universities in a wide range of industries—including biomedical, robotics, and maritime research—across the United States, Canada, Europe, the Middle East, and the South China Sea area, as well as industries included in China's Belt and Road Initiative.

On July 19, 2021, the U.S. Department of Justice (DOJ) unsealed an indictment against four APT40 cyber actors for their illicit computer network exploitation (CNE) activities via front company Hainan Xiandun Technology Development Company (Hainan Xiandun) between 2011 and 2018. Hainan Xiandun employee Wu Shurong cooperated with and carried out orders from PRC Ministry of State Security (MSS) Hainan State Security Department (HSSD) intelligence officers Ding Xiaoyang, Zhu Yunmin, and Cheng Qingmin to conduct CNE. Wu's CNE activities resulted in the theft of trade secrets, intellectual property, and other high-value information from companies and organizations in the United States and abroad, as well as from multiple foreign governments. These MSS-affiliated actors targeted victims in the following industries: academia, aerospace/aviation, biomedical, defense industrial base, education, government, healthcare, manufacturing, maritime, research institutes, and transportation (rail and shipping).

To report suspicious or criminal activity related to information found in this Joint Cybersecurity Advisory, contact your local FBI field office at www.fbi.gov/contact-us/field, or the FBI's 24/7 Cyber Watch (CyWatch) at (855) 292-3937 or by e-mail at CyWatch@fbi.gov. 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. To request incident response resources or technical assistance related to these threats, contact CISA at CISAServiceDesk@cisa.dhs.gov.

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TECHNICAL DETAILS

This Joint Cybersecurity Advisory uses the MITRE ATT&CK® framework, version 9. See the [ATT&CK for Enterprise](#) framework for all referenced threat actor tactics and techniques.

APT40 [G0065] has used a variety of tactics and techniques and a large library of custom and open-source malware—much of which is shared with multiple other suspected Chinese groups—to establish initial access via user and administrator credentials, enable lateral movement once inside the network, and locate high value assets in order to exfiltrate data. Table 1 provides details on these tactics and techniques. **Note:** see the appendix for a list of the domains, file names, and malware MD5 hash values used to facilitate this activity.

Table 1: APT40 ATT&CK Tactics and Techniques

Tactics	Activities and Techniques
Reconnaissance [TA0043] and Resource Development [TA0042]	- Gathered victim identity information [T1589] by collecting compromised credentials [T1589.001] - Acquire infrastructure [T1583] to establish domains that impersonate legitimate entities [T1583.001], aka 'typosquatting', to use in watering hole attacks and as command and control (C2) [TA0011] infrastructure - Establish new [T1585.002] and compromise existing [T1586.002] email and social media accounts [T1585.001] to conduct social engineering attacks
Initial Access [TA0001]	- External remote services (e.g., virtual private network [VPN] services) [T1133] - Spearphishing emails with malicious attachments [T1566.001] and links [T1566.002] - Drive-by compromises [T1189] and exploitation of public-facing applications [T1190] - Access to valid [T1078], compromised administrative [T1078.001] accounts
Execution [TA0002]	- Command and scripting interpreters [T1059] such as PowerShell [T1059.001] - Exploitation of software vulnerabilities in client applications to execute code [T1203] using lure documents that dropped malware exploiting various Common Vulnerabilities and Exposures (CVEs)

	User execution [T1204] of malicious files [T1204.002] and links [T1566.002] attached to spearphishing emails [T1566.001]
Persistence [TA0003], Privilege Escalation [TA0004], Credential Access [TA0006], Discovery [TA0007], and Lateral Movement [TA0008]	APT40 has used a combination of tool frameworks and malware to establish persistence, escalate privileges, map, and move laterally on victim networks. Additionally, APT 40 conducted internal spearphishing attacks [T1534] - BADFLICK/Greencrash - China Chopper [S0020] - Cobalt Strike [S0154] - Derusbi/PHOTO [S0021] - Gh0stRAT [S0032] - GreenRAT - jjdoor/Transporter - jumpkick - Murkytop (mt.exe) [S0233] - NanHaiShu [S0228] - Orz/AirBreak [S0229] - PowerShell Empire [S0363] - PowerSploit [S0194] - Server software component: Web Shell [TA1505.003]
Defense Evasion [TA0005], Command and Control [TA0011], Collection [TA0009], and Exfiltration [TA0010]	- Use of steganography [T1027.003] to hide stolen data inside other files stored on GitHub - Protocol impersonation [T1001.003] by using Application Programming Interface (API) keys for Dropbox accounts in commands to upload stolen data to make it appear that the activity was a legitimate use of the Dropbox service - Protocol tunneling [T1572] and multi-hop proxies [T1090.003], including the use of Tor [S0183] - Use of domain typosquatting for C2 infrastructure [T1583.001] - Archive [T1560], encrypt [T1532], and stage collected data locally [T1074.001] and remotely [T1074.002] for exfiltration - Exfiltration over C2 channel [T1041]

APT40 Indicators of Compromise

See [AA21-200.stix](#) and the appendix for IOCs.

MITIGATIONS

Network Defense-in-Depth

Proper network defense-in-depth and adherence to information security best practices can assist in mitigating the threat and reducing the risk. The following guidance may assist organizations in developing network defense procedures.

Patch and Vulnerability Management

- Install vendor-provided and verified patches on all systems for critical vulnerabilities, prioritizing timely patching of internet-connected servers and software processing internet data—such as web browsers, browser plugins, and document readers.
- Ensure proper migrating steps or compensating controls are implemented for vulnerabilities that cannot be patched in a timely manner.
- Maintain up-to-date antivirus signatures and engines.
- Routinely audit configuration and patch management programs to ensure the ability to track and mitigate emerging threats. Implementing a rigorous configuration and patch management program will hamper sophisticated cyber threat actors' operations and protect resources and information systems.
- Review the articles in the References section for more information on Chinese APT exploitation of common vulnerabilities.

Protect Credentials

- Strengthen credential requirements, regularly change passwords, and implement multi-factor authentication to protect individual accounts, particularly for webmail and VPN access and for accounts that access critical systems. Do not reuse passwords for multiple accounts.
- Audit all remote authentications from trusted networks or service providers.
- Detect mismatches by correlating credentials used within internal networks with those employed on external-facing systems.
- Log use of system administrator commands such as `net`, `ipconfig`, and `ping`.
- Enforce principle of least privilege.

Network Hygiene and Monitoring

- Actively scan and monitor internet-accessible applications for unauthorized access, modification, and anomalous activities.
- Actively monitor server disk use and audit for significant changes.
- Log Domain Name Service (DNS) queries and consider blocking all outbound DNS requests that do not originate from approved DNS servers. Monitor DNS queries for C2 over DNS.
- Develop and monitor the network and system baselines to allow for the identification of anomalous activity. Audit logs for suspicious behavior.

- Identify and suspend access of users exhibiting unusual activity.
- Use allowlist or baseline comparison to monitor Windows event logs and network traffic to detect when a user maps a privileged administrative share on a Windows system.
- Leverage multi-sourced threat-reputation services for files, DNS, URLs, IP addresses, and email addresses.
- Network device management interfaces—such as Telnet, Secure Shell (SSH), Winbox, and HTTP—should be turned off for wide area network (WAN) interfaces and secured with strong passwords and encryption when enabled.
- When possible, segment critical information on air-gapped systems. Use strict access control measures for critical data.

REFERENCES

- [DOJ Press Release](#)
- Talos Intelligence: China Chopper Still Active 9 Years Later – <https://blog.talosintelligence.com/2019/08/china-chopper-still-active-9-years-later.html?m=1>
- CISA China Cyber Threat Overview webpage – <https://us-cert.cisa.gov/china>
- CISA Alert TA15-314A: Compromised Web Servers and Web Shells - Threat Awareness and Guidance – <https://us-cert.cisa.gov/ncas/alerts/TA15-314A>
- CISA Alert AA20-133A: Top 10 Routinely Exploited Vulnerabilities – <https://us-cert.cisa.gov/ncas/alerts/AA20-133a>
- CISA Alert AA20-275A: Potential for China Cyber Response to Heightened U.S.-China Tensions – <https://us-cert.cisa.gov/ncas/alerts/AA20-275A>
- NSA Cybersecurity Advisory U/OO/179811-20: Chinese State-Sponsored Actors Exploit Publicly Known Vulnerabilities – https://media.defense.gov/2020/Oct/20/2002519884/-1/-1/0/CSA_CHINESE_EXPLOIT_VULNERABILITIES_UOO179811.PDF

APPENDIX: APT40 INDICATORS OF COMPROMISE

APT40 used the following domains and MD5 hash values to facilitate the CNE activity outlined in this CSA between 2009 through 2018.

Domains

airbusocean[.]com	https://pastebin[.]com/vfb5mbbu	santaclarasystem[.]us
cargillnotice[.]com	huntingtomingalls[.]com	scsnewstoday[.]com
ccidmeekparry[.]info	indiadigest[.]in	secbkav[.]com
ccvzvjhjdhf[.]website	jack-newnb[.]com	Soure7788.chickenkiller[.]com
cdigroups[.]com	kAty197.chickenkiller[.]com	tccoll[.]com
checkecc[.]com	louisdreyfu[.]com	teledynegroup[.]com
chemscalere[.]com	mail2.ignorelist[.]com	teledyneinstrument[.]com
cnnzapmeta[.]com	masterroot[.]pw	testdomain2019.chickenkiller[.]com
corycs[.]com	mysql-update[.]info	thestar[.]live
deltetimes[.]com	mihybb[.]com	thrivedataview[.]com
Engaction[.]com	mlcdailynews[.]com	thysssemkrupp[.]com
ens-smithjonathan.rhcloud[.]com	movyaction[.]net	thyssenkrupp-marinesystems[.]org
fishgatesite.wordpress[.]com	msusanode[.]com	togetno992.mo0o[.]com
goo2k88yyh2.chickenkiller[.]com	newbb-news[.]com	tojenner97.chickenkiller[.]com
gttdoskip[.]com	nfmybb[.]com	trafficeco[.]com
http://gkimertds.wordpress[.]com/fe ed/	nmw4xhipveaca7hm[.]onion.link/en _US/all.js	transupdate[.]com
http://stackoverflow[.]com/users/36 27469/angle-swift	nobug[.]uk.to	troubledat[.]com
http://stackoverflow[.]com/users/38 04206/swiftr-angle	notesof992.wordpress[.]com	ultrasocial[.]info
http://stackoverflow[.]com/users/38 63346/gkimertdssdads	onlinenewspapers[.]club	usdagroup[.]com
https://github[.]com/slotz/sharp- loader/commit/f9de338fb474fd970 a7375030642d04179b9245d	onlineobl[.]com	vser.mo0o[.]com
https://pastebin[.]com/p1mktQpD	oyukg43t[.]website	wsmcoff[.]com
	pacifichydrologic[.]org	www.yorkshire-espana- sa[.]com/english/servicios/
	philippinenewss[.]com	xbug.uk[.]to
	philstarnotice[.]com	yootypes[.]com
	porndec143.chickenkiller[.]com	

MD5 Hashes

(Updated July 19, 2021) **Note:** to uncover malicious activity, incident responders search for indicators of compromise (IOCs) in network- and host-based artifacts and assess the results—eliminating false positives during the assessment. For example, some MD5 IOCs in the table below identify legitimate tools—such as PuTTY, cmd.exe, svchost.exe, etc.—as indicators of compromise. Although the tools themselves are not malicious, APT40 attackers placed and used them from non-standard folders on victim systems during computer intrusion activity. If a legitimate tool is identified by an incident responder, then the location of the tool should be assessed to eliminate false positives or to uncover malicious activity. See [Technical Approaches to Uncovering and Remediating Malicious Activity](#) for more incident handling guidance.

01234c0e41fc23bb5e1946f69e6c6221	0c4fa4dfbe0b07d3425fea3efe60be1c
018d3c34a296edd32e1b39b7276dcf7f	0ca936a564508a1f9c91cb7943e07c30
019b68e26df8750e2f9f580b150b7293	0d69eefede612493afd16a7541415b95
01fa52a4f9268948b6c508fef0377299	0da08b4bfe84eacc9a1d9642046c3b3c
022bd2040ec0476d8eb80d1d9dc5cc92	0dd7f10fdf60fc36d81558e0c4930984
039d9ca446e79f2f4310dc7dcc60ec55	0e01ec14c25f9732cc47cf6344107672
043f6cdca33ce68b1ebe0fd79e4685af	10191b6ce29b4e2bddb9e57d99e6c471
04918772a2a6ccd049e42be16bcbee39	105757d1499f3790e69fb1a41e372fd9
04dc4ca70f788b10f496a404c4903ac6	11166f8319c08c70fc886433a7dac92d
060067666435370e0289d4add7a07c3b	1223302912ec70c7c8350268a13ad226
062c759d04106e46e027bbe3b93f33ef	139e071dd83304cdcf5280022a0f958
07083008885d2d0b31b137e896c7266c	13c93dc9186258d6c335b16dc7bb3c8c
079068181a728d0d603fe72ebfc7e910	14e2b0e47887c3bfbddb3b66012cb6e8
0803f8c5ee4a152f2108e64c1e7f0233	15437cfedfc067370915864feec47678
09143a14272a29c56ff32df160dfdb30	15e1816280d6c2932ff082329d0b1c76
0985f757b1b51533b6c5cf9b1467f388	166694d13ac463ea1c2bed64fbbb7207
09aab083fb399527f8ff3065f7796443	16a344cd612cca4f0944ba688609e3ac
0b7bb3e23a1be2f26b9adf7004fc6b52	16c0011ea01c4690d5e76d7b10917537
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0bbe092a2120b1be699387be16b5f8fb	18144e860d353600bbd2e917aed21fde
0bbe769505ca3db6016da400539f77aa	1815c3a7a4a6d95f9298abb5855a3701
0c3c00c01f4c4bad92b5ba56bd5a9598	181a5b55b7987b62b5236965f473ba3b

18c26c5800e9e2482f1507c96804023e
1932ce50b7b6c88014cf082228486e5c
1af78c50aca90ee3d6c3497848ac5705
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1bb8f32e6e0e089d6a9c10737cf19683
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1c945a6b0deccc6cd2f63c31f255d0ec
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239a22c0431620dc937bc36476e5e245
2499390148fc99a0f38148655d8059e7
24dbcd8e8e478a35943a05c7adfc87cc
25a06ab7675e8f9e231368d328d95344
25b79ba11f4a22c962fea4a13856da7f
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6b930be55ed4bf8e16b30eadc3873dfd
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6e97bf1b7c44edc66622b43e81105779
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70206725df8da51f26d6362e21d8fadb
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72a7fd2b3d1b829a9f01db312fdd1cd7
7327993142260cee445b846a12cf4e85
7525bc47e2828464ce07fa8a0db6844f
76adaa87f429111646a27c2e60bda61e
76c5dca8dc9b1241b8c9a376abab0cc5
782202b09f72b3cfdc93ffb096ca27de
7836c4a36cc66d4bcbdb84abb25857d21
78a0af31a5c7e4aee0f9acde74547207
7969dc3c87a3d5e672b05ff2fe93f710
7a09bf329b0b311cc552405a38747445
7a63ea3f49a96fa0b53a84e59f005019
7b3f959ab775032a3ca317ebb52189c4

7b710f9731ad3d6e265ae67df2758d50
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