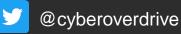
## To catch a Banshee: How Kimsuky's tradecraft betrays its complementary campaigns and mission

Sveva Vittoria Scenarelli September 2020



## Presenter + team





Senior Threat Intelligence Analyst... @PwC UK

#### Sveva Vittoria Scenarelli

- Focus on APAC-based APTs
- "Malware intertextuality" & codebase evolution analysis
- CONFidence Online 2020, CyberThreat 2019

... but really, it takes a team.

# John Southworth @BitsOfBinary

Jason Smart
@pewpew\_lazors

## Kimsuky: a timeline

Disclosure of a campaign targeting entities involved with the PveongChang Olympics with a PowerShell implant and GoldDragon RAT.

A multi-stage, script-based

downloader is used to target

policy, national security, and cryptocurrency entities in the

South Korea targeted

using server-side scripts

similar to BabyShark ones

02 • • • 11 12 2019 • • 03 • 05 • 09 • • • • •

US, South Korea, Europe

BabyShark begins

Disclosure of an espionage campaign targeting the South Korean government with a new RAT, MyDogs

More WildCommand

WildCommand RAT

in South-East Asia

resurfaces. is used to

target financial entities

2020

#### AppleSeed campaign

Since at least February 2019, Kimsuky introduces a RAT used to target Japanese defence contractors. The website of Washington University is compromised and used for C2.

#### FlowerPower identified

A new first-stage victim profiling tool, used since at least November 2019. has links to GoldDragon

2013

**KHNP Breach** 

KHNP employees hacked,

am I = No Nuclear Power"

threatens sabotage attacks

Kimsuky poses as "Who

hacktivist persona and

#### 09 · 2014 · · 11 2015 • • • • 2016

The Kimsuky Operation

campaign targeting South Korean defence think tanks and Korea unification policy

Disclosure of an espionage organisations

Government & research credential phishing South Korean authorities attributed to Kimsukv a spear phishing campaign impersonating the

Cheongwadae

01 . .

Universities and public

sector entities receive

malicious documents

of Kimsuky implants

created by author "MOFA"

and leading to installation

2017 • • •

#### Kimsuky Winter Interests

Credential phishing campaign since at least August 2018, targeting orgs and government depts, (mainly in the US) involved in North Korea research, policy, international relations, and sanctions

#### Malicious HWP Spear phishing continues: GoldDragon / GHOST419

2018

The continuing spearphishing campaigns deliver an implant known as GHOST419 or GoldDragon RAT

#### Autumn Aperture

The BabyShark campaign continues targeting US entities in the defence and national security space

Since at least December 2018. Kimsuky introduces a RAT used to target South Korean government and media. In May 2019, the same RAT is used to target the defence and aerospace sector

Credential phishing campaign targeting Japanese government and technology sector, diplomatic missions

NOW

#### Kimsuky supranational targeting

02 03 04 ... 06 .....

Since at least December 2019, a credential phishing campaign targets the Office of the UN High Commissioner for Human Rights

#### Return of the GoldDragon

Malicious HWP files are used to deliver GoldDragon malware to private sector entities in South Korea

September 2020 3

To catch a Banshee PwC UK

## This presentation has many questions

How do Black Banshee's tools, infrastructure, targeting and strategic objectives intersect?

How do they connect Black Banshee's campaigns in a tight-knight web of activity?

What function do Black Banshee's campaigns perform, among other North Korea-based cyber threats?

To answer them, we need to:

Understand the malware

Map out the infrastructure

Cluster the campaigns

Pinpoint their intersections

Identify the strategic targets

# Black Banshee: Malware to C2s



#### <u>SHA256: 66AC66A8E2D8560F8287BFB23F0964CCB930585A96C0029292C4963FF896011A</u>

VBScript-based, sequential malware: persistent downloader / loader, executing further scripts/payloads

#### Track through...

Encoding routine (roughly the same since at least 2018, different key; there is at least one other variant) URL paths (incremental parameters; server-side script names)

```
On Error Resume Next
Function Co00(c): L=Len(c):s="":For jx=0 To d-1:For ix=0 To Int(L/d)-1:s=s&Mid(c,ix*d+jx+1,1):Next:Next:s=
s&Right(c,L-Int(L/d)*d):Co00=s:End Function
set fso = CreateObject("Scripting.FileSystemObject")
path= wscript.scriptfullname
Set f = fso.OpenTextFile(path, 1, True)
data = f.ReadLine
f.Close
strl=Right(data,Len(data)=1)
sdgf:d=3:strl=Co00(strl):Execute(strl):sdfg
```

DabyShark: C2 testing		hxxps://jonashartley[.]com /hilaryolsen/wp-includes/ customize/1111/Brzol0.hta			
	hxxp://jonashartley[.]com /archive/css/0924/ zjirz0.hta	hxxps://jonash /hilaryolsen/w customize/1111 14.0	p-includes/	hxxps://jonas /hilaryolsen/ customize/111	wp-includes/
2018-06-13 2018-06-21	2019-10-01 2019-11-1	2 2019-11-21	2019-11-2	2 2019-11-24	4 2019-11-26
<pre>hxxp://jonashartley[.]com /hilaryolsen/wp-admin/ network/run.php hxxp://jonashartley[.]com /hilaryolsen/wp- admin/network/cow.php</pre>	hxxps://jonas hilaryolsen/w customize/111		hxxp://jonasha /hilaryolsen/w includes/image 1122/upload.ph hxxp://jonasha /hilaryolsen/w includes/image 1122/dbrcn0.ht	<pre>wp- es/crystal/ p artley[.]com wp- es/crystal/</pre>	<pre>hxxp://jonashartley[.] com/hilaryolsen/wp- includes/customize/1111 /res.php?op=12.0 hxxps://jonashartley[.] com/hilaryolsen/wp- includes/random_compat/ 10006</pre>
To catch a Banshee			hxxps://jonasl	<pre>hartley[.]com/</pre>	1122/expres.php September 2020

To catch a Banshee PwC UK hxxps://jonashartley[.]com/
archive/css/0924/Zjirz.hta

September 2020

7



# BabyShark: C2 hunting

### BabyShark URL structure:

## Known server-side scripts:

- expres.php?op=
- cow.php

## Recent server-side scripts and payloads:

- cross.php?op=
- res.php?op=
- .php?er=
- pre.hta
- suf.hta

URLS 39 entity:url url:"expres.php"
http://jmable.mireene.com/shop/kcp/js/com/expres.php?op=2 jmable.mireene.com
http://finalist.org-help.com/expres.php?op=2 finalist.org-help.com 92.249.44.201 text/html; charset=UTF-8
http://finalist.org-help.com/expres.php%20op=2 finalist.org-help.com 92.249.44.201 text/html
http://finalist.org-help.com/expres.php?op=1 finalist.org-help.com 92.249.44.201 text/html; charset=UTF-8
http://ricefarm.kr/bbs/sp2/expres.php?op=2 ricefarm.kr 183.111.138.186 text/html; charset=iso-8859-1
http://finalist.org-help.com/expres.php? finalist.org-help.com 92.249.44.201 text/html; charset=UTF-8
https://www.mohanimpex.com/include/tempdoc/891250/expres.php?op=1 www.mohanimpex.com 66.45.241.82 text/html; charset=iso-8859-1
http://finalist.org-help.com/expres.php%20op=1 finalist.org-help.com 92.249.44.201 text/html



#### SHA256: 9e004a659e8cb6236ac56671e4afa4b8fbb6f394807aa3decf6e268e17359ec6

Backdoor that uses temporary JavaScript files (executed via WScript) to connect with the C2

- In use since at least October 2019
- Mutex: I'M POSSIBLE or <\*IMPOSSIBLE\*>
- Masquerading as AVs
  - o ESTsoft\Common
  - %APPDATA%\software\microsoft\windows\
     Autopatch\autopatch.dll
  - %PROGRAMDATA%\software\microsoft\ windows\defender\autoupdate.dll
- Tiny Banshee self-delete batch script



909d3f529b6990d0129ba356ec8163e9f30658649a9f d3201ad776aaa56fa35c26712ce488a6a3ec813337ee23 e9117e9bfc06571fb2c36fbc693 lb24f3b562dd37640999ae1c6be7fcbb7834a67d7acbd1 8e30d3e083cf31c9f918270bd1c40290a1 37c666b69c8e69731fa7838f40b7ddac73c7ce08e40f14 p2=%s-%s-v%d http:// http://%s/%s/ 455301367a247db9eec4da21193c0c1135077227353f26 3cf84870abc8e7c8490a20594520c9d66ff8d6d20ea732 4811f7391203be771804e6d62c888aa31f67fea3deaa67

.bat		
:repeat		
del "%s"		
if exist "%s"	goto	repeat
del "%%~f0"		



# AppleSeed: C2 Hunting

### Track through...

Unique encoding routine:

- Hex strings, each with unique 16-byte key
- Each char XOR'ed with corresponding key byte + XOR'ed with previous char

### AppleSeed URL structure:

hxxp://suzuki[.]datastore[.]pe[.]hu/m=[letter, a-e] &p1=[victim ID]]&p2=[resource]&p3=[victim info]

### e.g.

hxxp://suzuki[.]datastore[.]pe[.]hu<mark>/?m=a&p1=</mark> 1253dc67f01a**&p2=**win\_6.1.7601-x64\_DROPPER

URLS 22 entity:url url:"m=a&p1=" http://depts.washington.edu/dswkshp/wordpress/wp-content/themes/twentyfifteen/inc/io/?m=a&p1=gweasdzxc&p2=... depts.washington.edu 140.142.11.80 text/html: charset=UTF-8 http://eastsea.or.kr/?m=a&p1=0000009&p2=Win6.1.7601x64-Spy-v2370390 eastsea.or.kr 45.13.135.103 text/html: charset=UTF-8 http://www.gotoclean.com.co/wp-content/themes/purify/manapater/?m=a&p1=1866da123456&p2=win 6.1.7601-x64.. www.gotoclean.com.co 23.111.164.98 text/html; charset=UTF-8 http://dongnam2014.cafe24.com/image/main/sub/?m=a&p1=00163eebca74&p2=win 6.1.7601-x32 SPY dongnam2014.cafe24.com 183.111.174.11 text/html; charset=iso-8859-1 http://dept.lab.hol.es/?m=a&p1=080027ce3723&p2=win\_10.0.18363-x64\_SPY dept.lab.hol.es http://upload.bigfile.hol.es/?m=a&p1=[ID]&p2=version-x32\_DROPPER3 upload bigfile holles 45, 13, 135, 103 text/html; charset=UTF-8 http://upload.bigfile.hol.es/?m=a&p1=[ID]&p2=version-x32\_DROPPER upload bigfile.hol.es 45.13.135.103 text/html: charset=UTF-8 http://dept.lab.hol.es/?m=a&p1=b4c87b339433&p2=win 6.1.7601-x64 SPY dept lab hol es 45 13 135 103 text/html: charset=UTF-8 http://suzuki.datastore.pe.hu/?m=a&p1=a86dd8e43948&p2=win 6.1.7601-x64 DROPPER suzuki.datastore.pe.hu 45.13.135.103 text/html: charset=UTF-8



SHA256: d36ac36d278c264362ec31e116a46daaa4a7287a9dcd689d665a5ab1fd5416b8

PowerShell victim profiling tool: Initial persistent implant; identify victim and/or drop further payloads

Server-side folders names change every time; but sometimes there is correspondence: e.g. "mybobo" payload and "mybobo" C2 domain; "flower", as per below, was where the name came from)

### Track through...

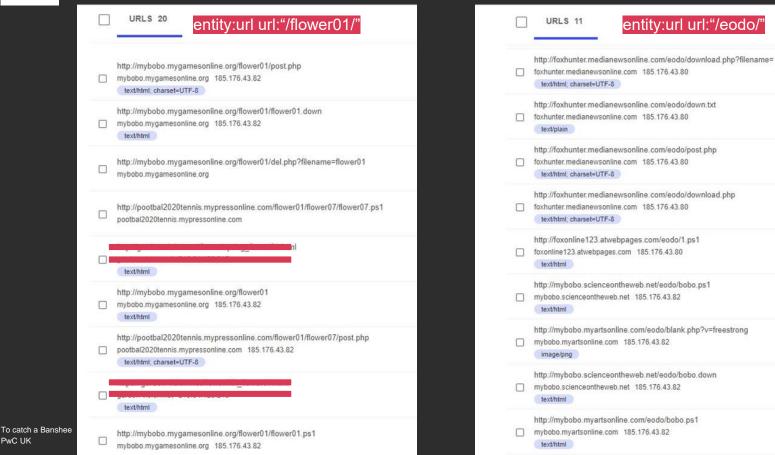
Unobfuscated functions and execution logs (e.g. "Success"; "UpLoad Fail!!!")

Function name	Functionality
main	Sets persistence through a Run Key, creates a log file, and executes all other functions in the script in this order: Get_Info, FileUploading, and Download.
Get_info	Gathers basic system information and performs basic file listing.
FileUploading	Calls UpLoadFunc and echoes whether UpLoadFunc worked successfully.
UpLoadFunc	Encodes all data in the log file and sends it to the C2 via HTTP POST.
Download	Downloads a resource from the C2 and executes it through PowerShell.
decode	Uses a 160-bit key to encode data sent to the C2 and decode data received.

To catch a Banshee PwC UK

PwC UK

## FlowerPower: C2 Hunting



## To catch a Banshee: WebForm Boundaries

WebForm boundaries are a KEY component in tracking Black Banshee malware as well as C2 Infrastructure.

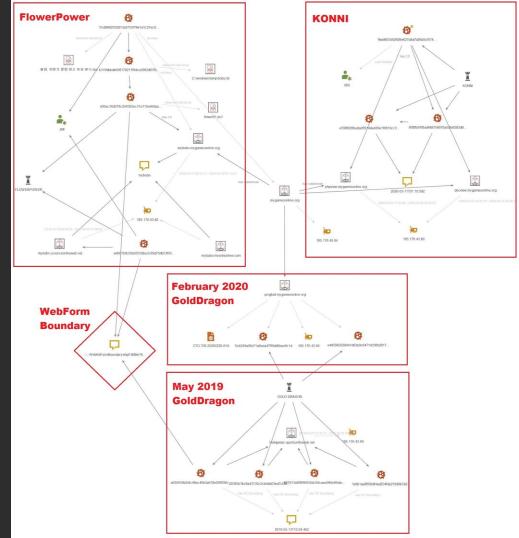
Notable examples:

----WebKitFormBoundarywhpFxMBe19cSjFnG

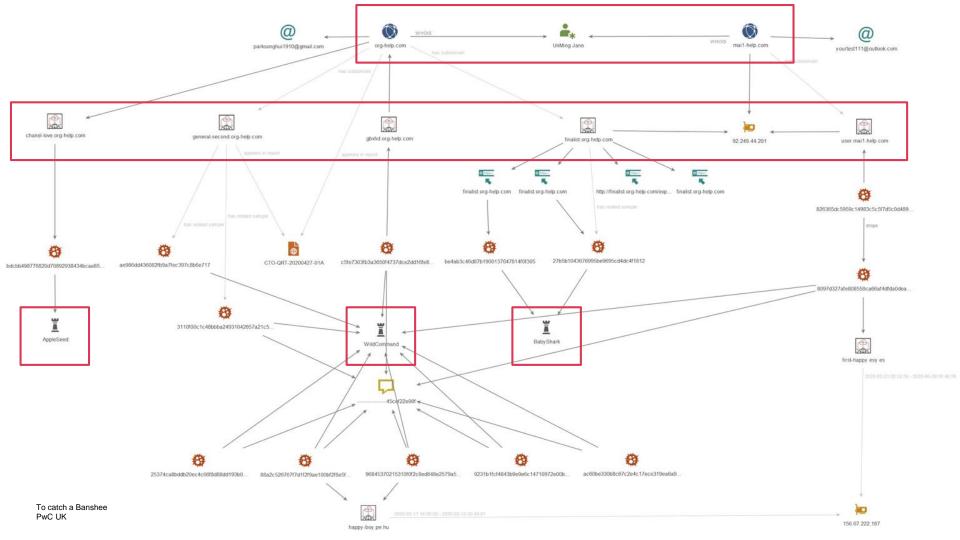
• In both GoldDragon and FlowerPower

-----4cef22e90f

• Across samples of WildCommand



To catch a Banshee PwC UK



# Black Banshee: C2s to more C2s

## To catch a Banshee: One pivot to find them

Black Banshee C2 infrastructure tends to have many overlaps

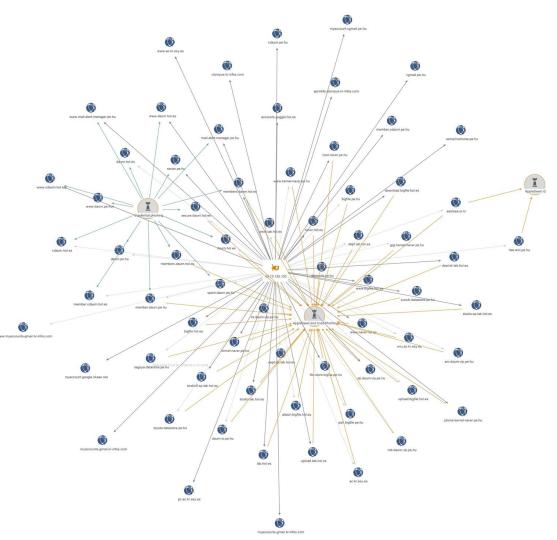
Let's take a single IP: **45.13.135[.]103** 

- Different domains over months
- Goldmine of email phishing (Gmail, Naver, Daum...)
- Crossover with AppleSeed C2s
- MIND THE HYPHEN

More specific targeting examples:

```
snu[.]ac-kr[.]esy[.]es
toyota[.]datastore[.]pe[.]hu
suzuki[.]datastore[.]pe[.]hu
```

To catch a Banshee PwC UK



# To catch a Banshee: Domain names & patterns

Generic Themes	Specific Themes	Banshee-registered domains	(Shared) parent domains
Account	AhnLab	org-help[.]com	pe[.]hu
Login	Alyac	ma1l-help[.]com	hol[.]es
Mail	Daum	manager-alert[.]com	esy[.]es
Manage	Kakao	org-view[.]work	*[.]work
Member	Naver	doc-view[.]work	atwebpages[.]com
Secure	NTT Docomo	account-protect[.]work	mygamesonline[.]org
User	OHCHR	com-ssinet[.]work	myartsonline[.]com

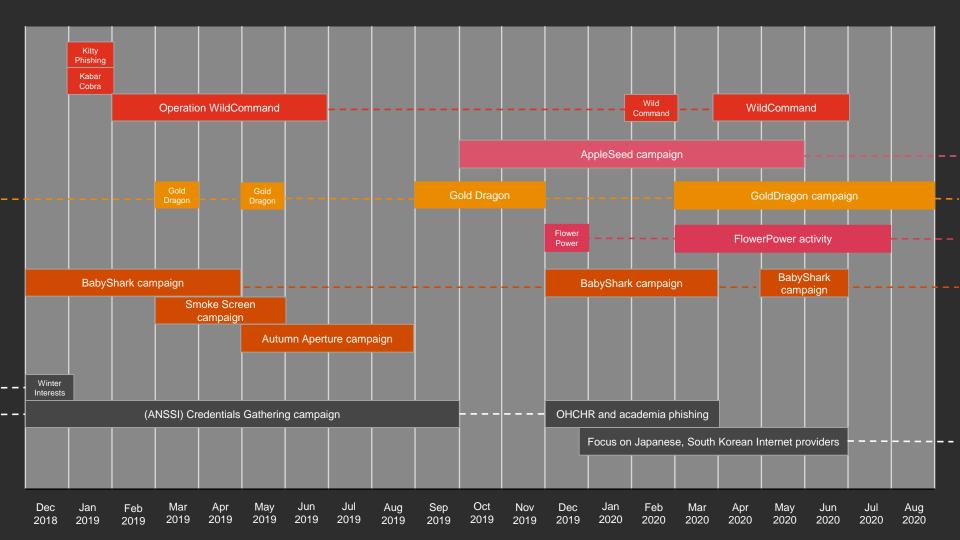
#### **Recent examples:**

user[.]mai1-help[.]com

ohchr[.]org-view[.]work

ramble[.]myartsonline[.]com

# Black Banshee: campaigns



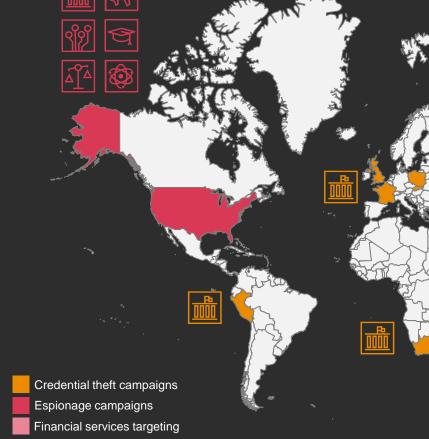
## Targeting

Supranational targeting









To catch a Banshee PwC UK (0)

▶ ₽ ₽

# Pieces of a puzzle

**Black Banshee** 

From our visibility & collection, Black Banshee has focused mostly on:

- South Korea
- Japan (defence)
- US policy
- Supranational bodies

Strategic targets (sanctions; THAAD deployment issues)



## Black Shoggoth

Progressive evolution from Banshee's 2019 targeting, in 2020 Black Artemis has "picked up" some traditional Black Banshee targets (e.g. energy, nuclear).

Black Shoggoth & Banshee continue overlapping in targeting of journalists, NGOs, plus East & SE Asia.

# Thank you

pwc.co.uk/cybersecurity

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## PwC public reporting on Black Banshee

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'Tracking 'Kimsuky', the North Korea-based cyber espionage group: Part 2', PwC UK, <u>https://www.pwc.co.uk/issues/cyber-security-services/research/tracking-kimsuky-north-korea-based-cyber-espionage-group-part-2.html</u> (9th March 2020)

### Tracking 'Kimsuky', the North Korea-based cyber espionage group: Part 1

18 February, 2020

For years, we have tracked the espionage threat actor we call Black Banshee (also known in open source as Kimsuky). In 2019, it launched multiple parallel cyber espionage campaigns, from large-scale credential harvesting to narrowly targeted espionage and exfiltration operations.

The foundations for this activity began in August 2018, when we observed Black Banshee setting up a substantial number of domains impersonating organisations across the government, academia, and policy sectors. This formed the basis for multiple spear-phishing and credential harvesting campaigns.

Tracking 'Kimsuky', the North Korea-based cyber espionage group: Part 2

09 March, 2020

In 2019, PwC observed an increase in activity by North Korea-based threat actor Black Banshee, also known as 'Kimsuky'.

In our previous blog, we examined some of the tradecraft exhibited by Black Banshee in its infrastructure setup. We discussed the threat actor's reliance on certain IP ranges and domains, as well as its naming conventions for malicious domains and command and control server paths.

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