Defending off the land: Agentless defenses available today

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Black Hat EU 2024

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Agenda

- Background
- Defending Off the Land
- Primitives
- DoL Canarytokens
- What didn’t pan out
- Caveats
- Future directions
- Takeaways

Defending off the land: Agentless defenses available today

Why should you care?

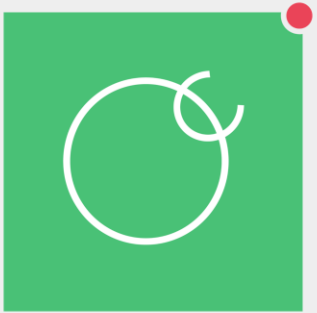
11+ techniques for detecting threat actors with no additional software.

This matters for places where EDR can’t or won’t.

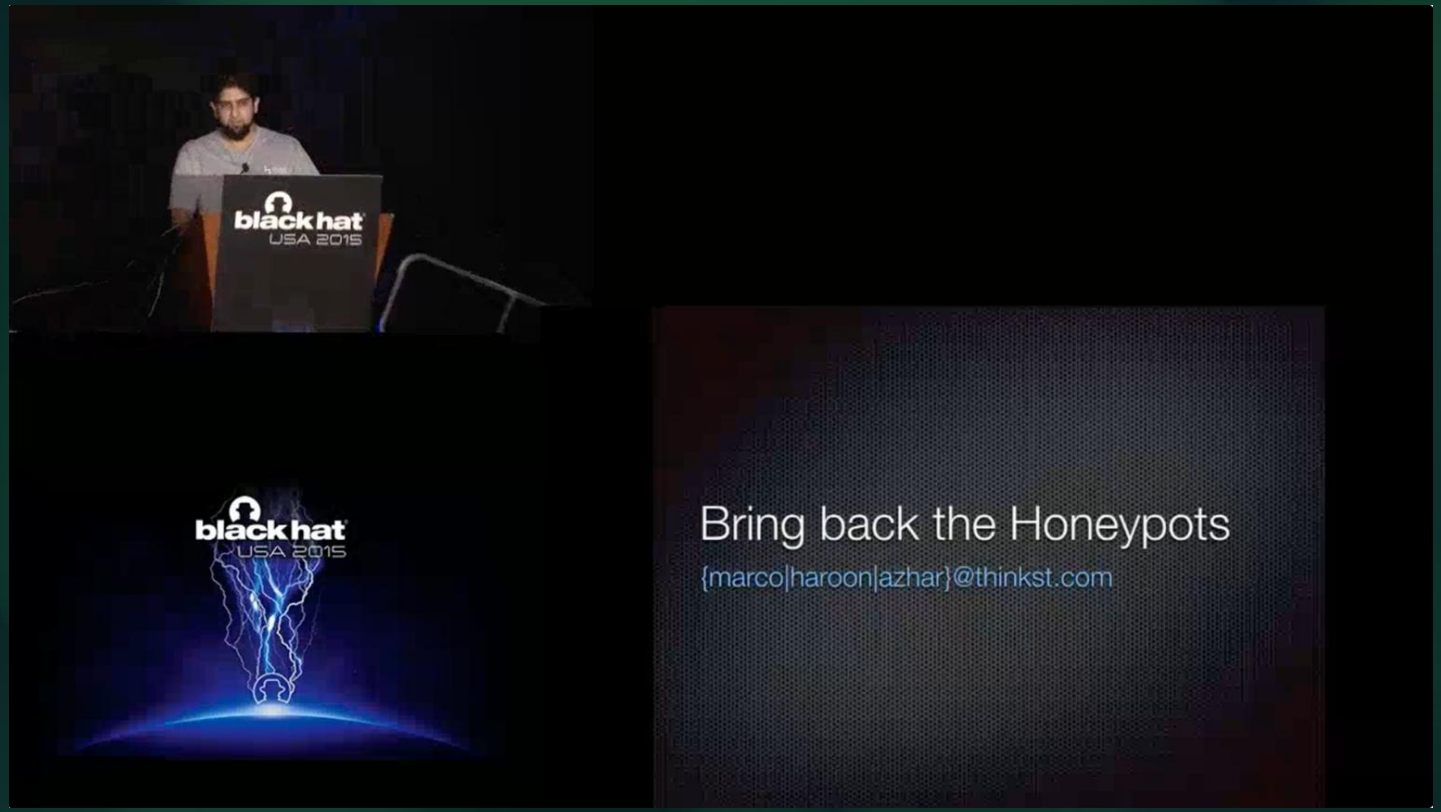
Background

Bread and butter

CANARY TOKENS



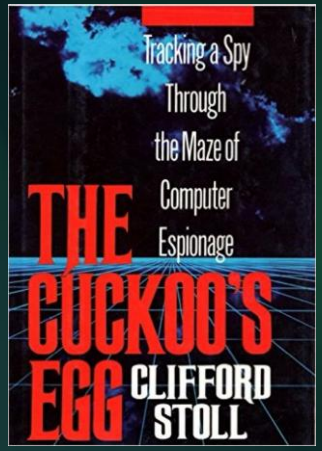
Deception is our game



https://www.youtube.com/watch?v=W7U2u-qLAB8

Honeypot aside

- Veteran idea
- Useful for breach detection
- Attacker research isn’t useful (unless in volume)
- Parallel infrastructure



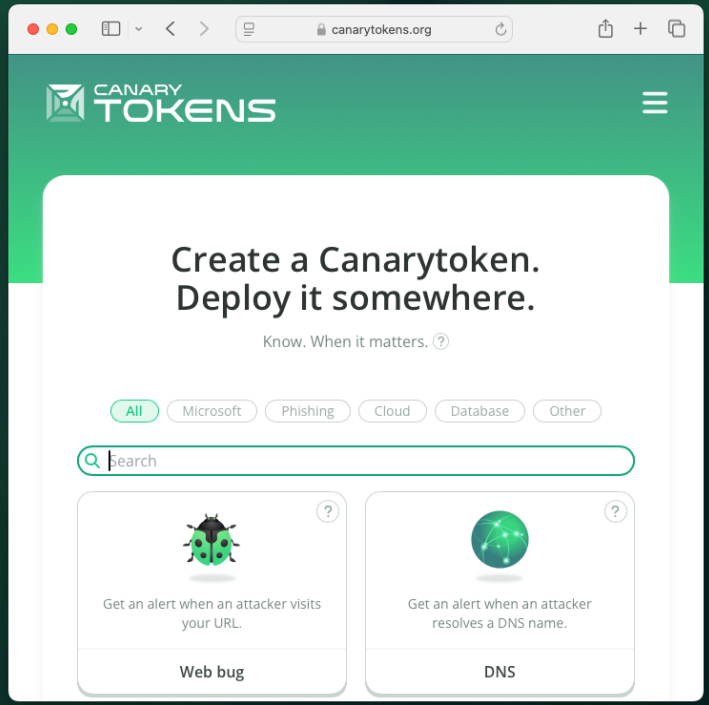
HN/P

Canarytokens

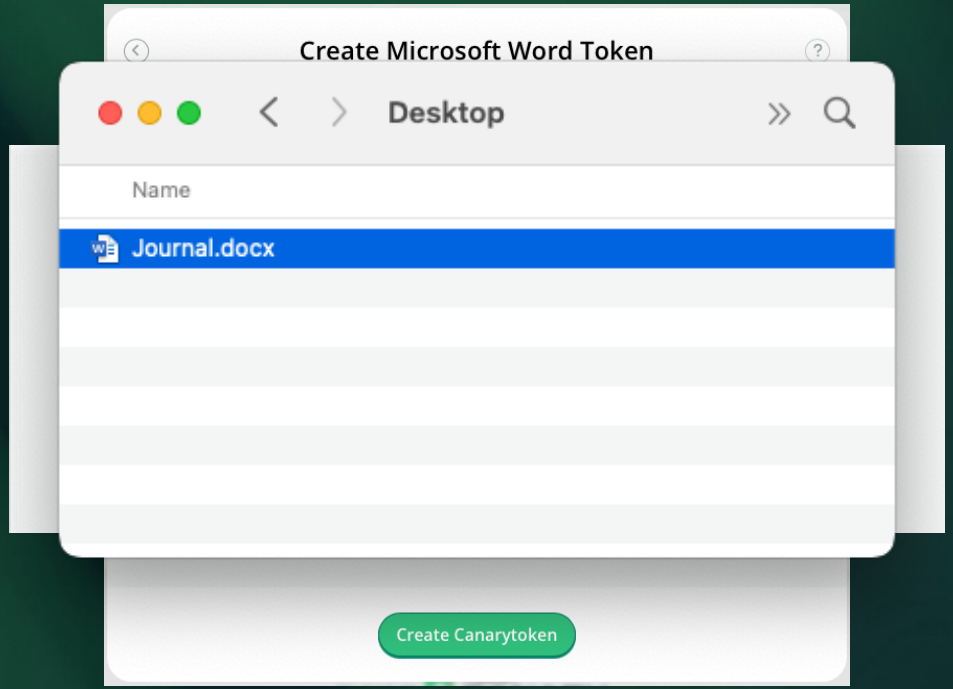
Canary tokens are simple

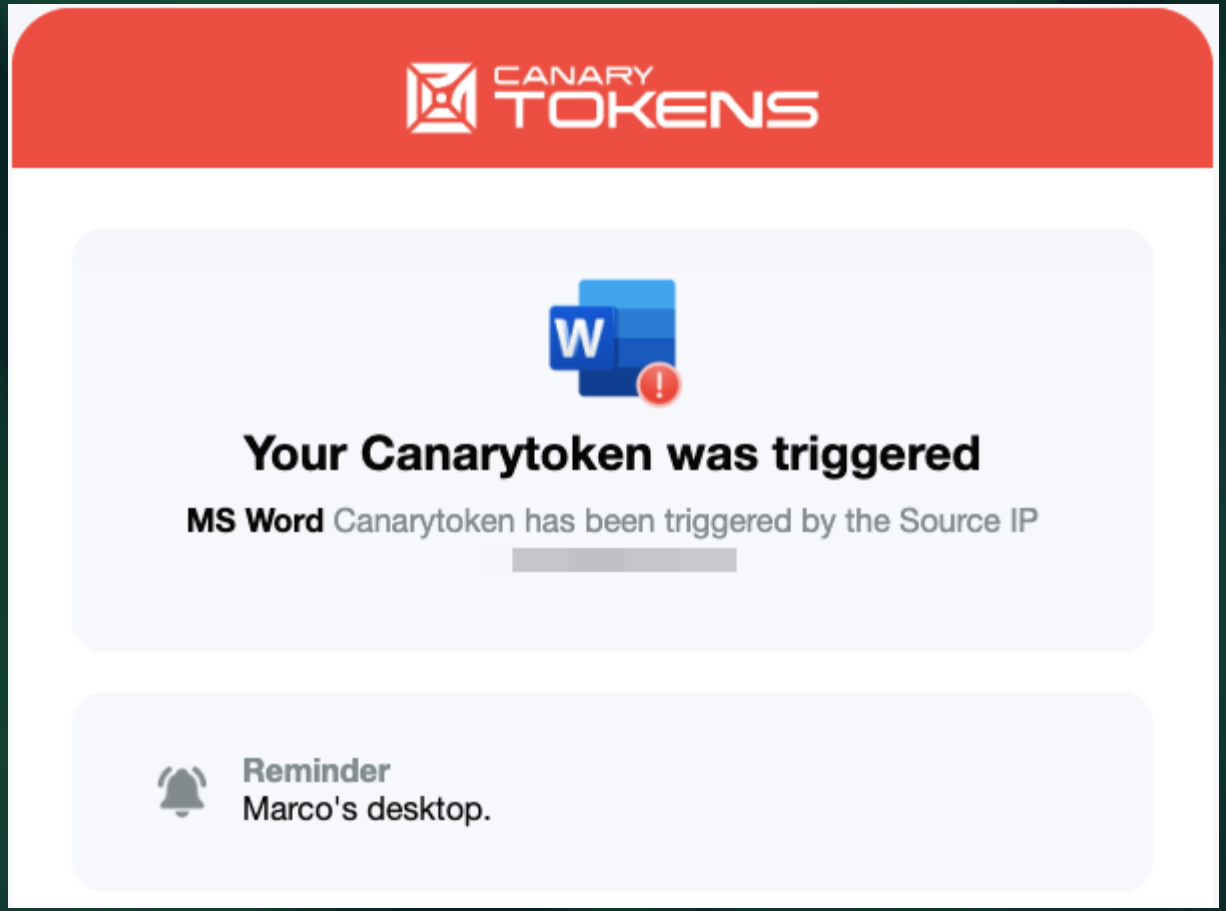
- Unique tags that can be embedded in a wide number of places.
  - Documents, emails, databases, file watchers, process watchers, LinkedIn, Bitcoin, Imgur
  - (And we've barely scratched the surface.)
- When that tag is triggered, you get an alert.

thinkst applied research

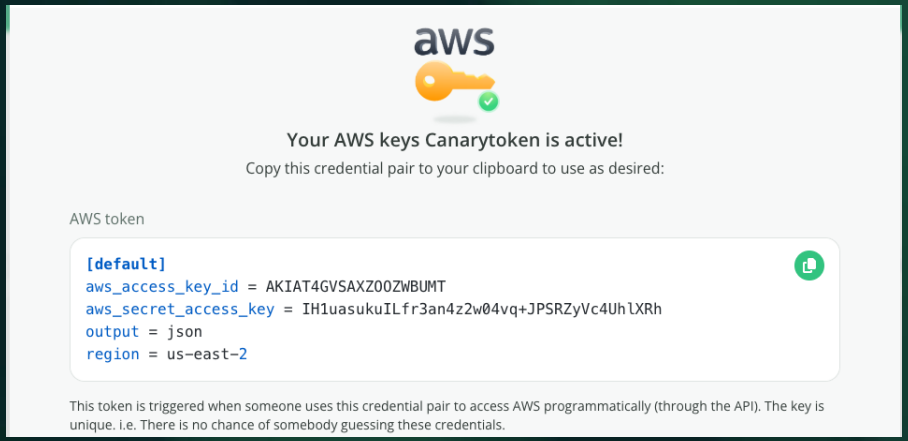


Canarytokens example




CANARY TOKENS
Your Canarytoken was triggered
MS Word Canarytoken has been triggered by the Source IP
Reminder
Marco's desktop.

Canarytoken examples



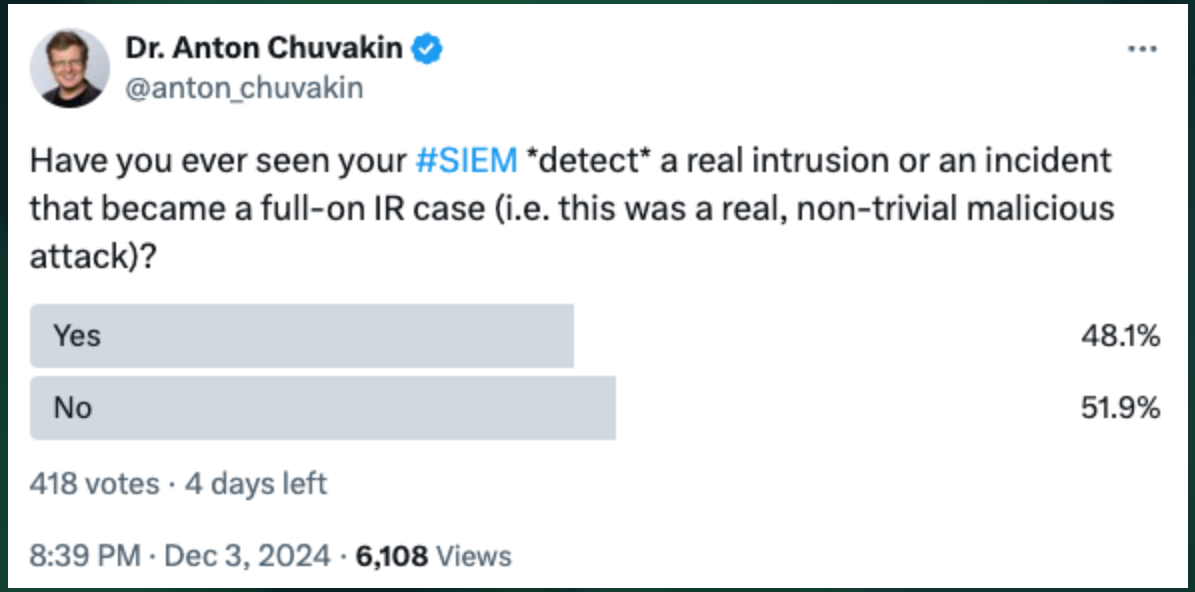
Meeting attackers where they are (not)

Early IPS:


```
$ tcpdump -X -s 0 -i eth0 | grep '%252E'
```

Just not feasible

Meeting attackers where they are



Dr. Anton Chuvakin
@anton_chuvakin

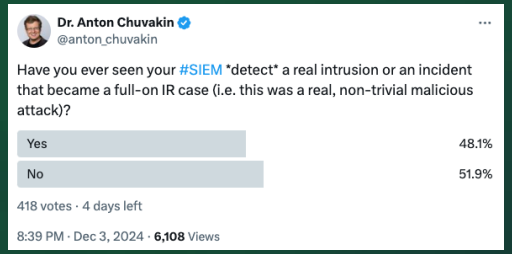
Have you ever seen your #SIEM *detect* a real intrusion or an incident that became a full-on IR case (i.e. this was a real, non-trivial malicious attack)?

Yes	48.1%
No	51.9%

418 votes · 4 days left

8:39 PM · Dec 3, 2024 · **6,108** Views

Meeting attackers where they are



Meeting attackers where they are

- Malicious actors expect endpoint monitoring or telemetry

- EDR cannot be installed on every machine
  - Too old
  - Too weird
  - Not yours
  - Competing agents
  - Hybrid environment

- What then?

The Washington Post
Democracy Dies in Darkness

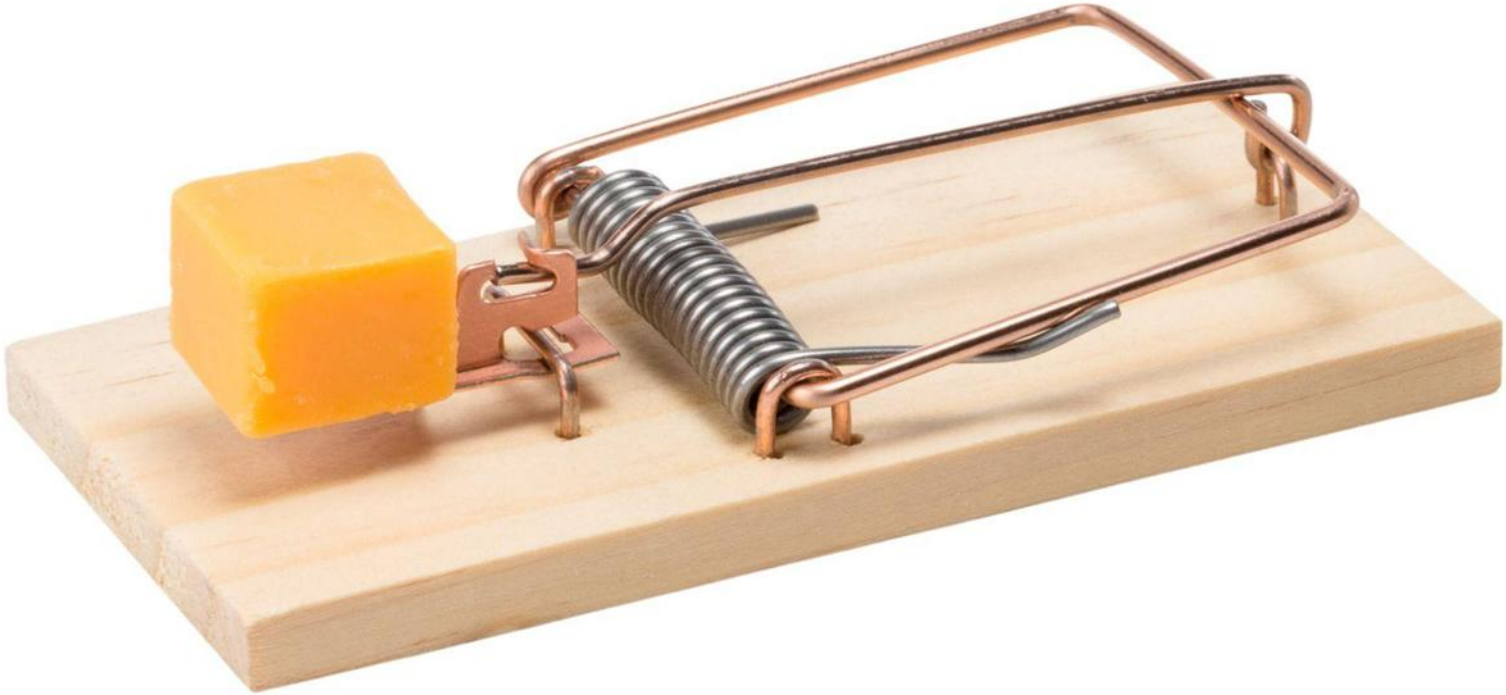
White House forms emergency team to deal with China espionage hack

The serious breach of telecommunications companies has now affected “about 10 or 12” firms, two people familiar with the investigation said.

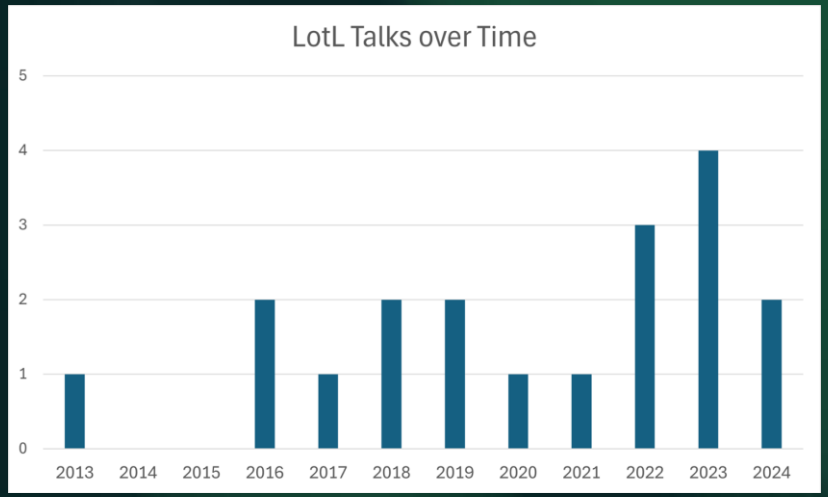
Exploiting the DRAM rowhammer bug to gain kernel privileges

How to cause and exploit
single bit errors

Mark Seaborn and Thomas Dullien



Attackers living off the land (LoL)



Windows 10

https://citation.thinkst.com/

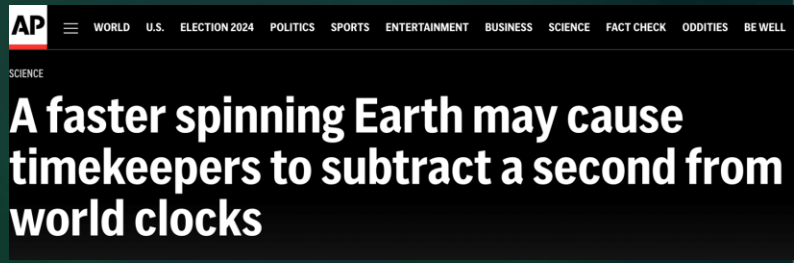
Attacker LoL 1

```
"C:\Windows\system32\netsh.exe" interface portproxy add
v4tov4 listenport=3390 listenaddress=REDACTED
connectport=3389 connectaddress=REDACTED

netsh advfirewall firewall add rule name=”forwarded”
protocol=TCP dir=in localip=REDACTED localport=3390
action=allow

Test-NetConnection -ComputerName REDACTED -Port 3390

"C:\Windows\system32\netsh.exe" interface portproxy show all
```

Ransomware incident: https://thedfirreport.com/2024/04/29/from-icedid-to-dagon-locker-ransomware-in-29-days/

Attacker LoL 2

```
C:\Windows\system32\schtasks.exe, /Create, /RU, NT
AUTHORITY\SYSTEM, /tn, ayttpnzc, /tr, regsvr32.exe -s
"c:\Users\[REDACTED]\Desktop\7611346142\c2ba065654f13612ae63b
ca7f972ea91c6fe97291caeaaa3a28a180fb1912b3a.dll", /SC, ONCE,
/Z, /ST, 15:21, /ET, 15:33
```



QBOT, https://www.elastic.co/security-labs/exploring-the-qbot-attack-pattern

Attacker LoL 3

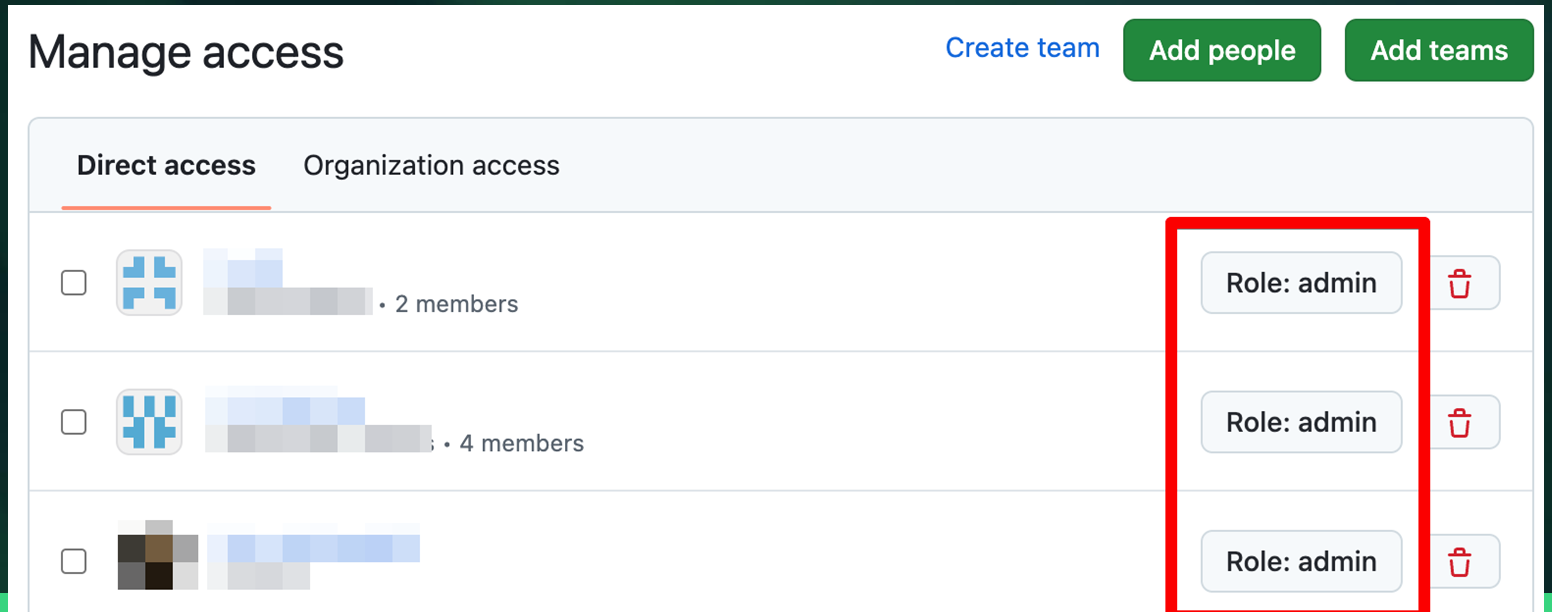
https://redcanary.com/threat-detection-report/techniques/rundll32/

Attacker LoL 4

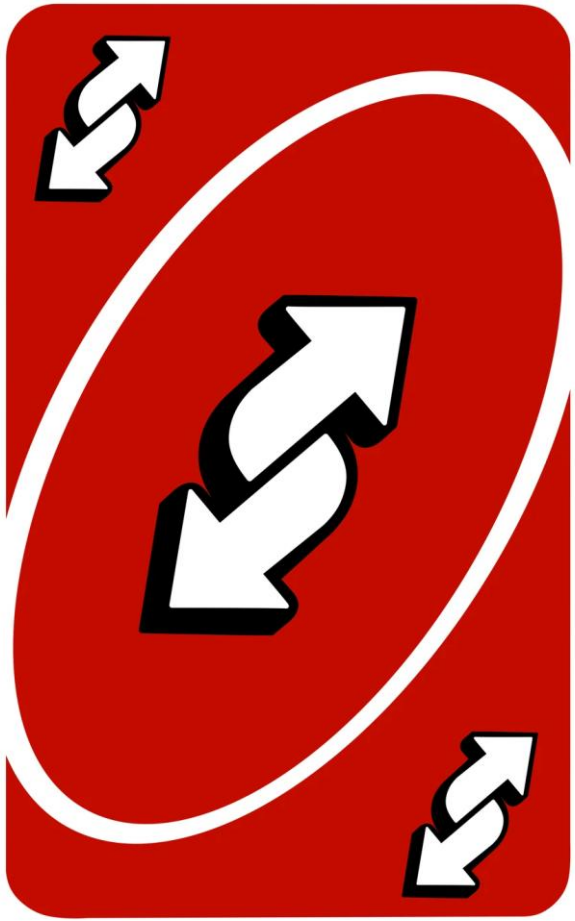
https://www.bleepingcomputer.com/news/microsoft/microsoft-signed-malicious-windows-drivers-used-in-ransomware-attacks/

LoL: Sysadmin + malicious intent = Threat actor

```
$ echo '%sudo ALL=(ALL) NOPASSWD: ALL' >> /etc/sudoers

C:\> icacls C:\* /grant Everyone:(R) /t /c /q
```



Defending off the land (DoL)



https://matteluno.fandom.com/wiki/User:Gooperblooper1

What is defending off the land?

- Lightweight and built-in
- Agentless detection techniques leveraging already present tools
  - I.e. no installs
- Can be deployed to systems where EDR can’t be
  - Appliances / 3rd party vendor systems / non-enterprise assets
- Free and extensible
- Includes much deception, a bit of scripting
- Is it new?

briankrebs 
@briankrebs

Pro tip for the "but how do we protect ourselves?" folks. DarkSide ransomware, like many other strains, will not install on systems where certain Cyrillic keyboard and other scripts are already installed. So, install the Russian keyboard. You don't have to use it.

7:01 PM · May 11, 2021

Russian / GoRussian.reg

cgtyoder Update GoRussian.reg

Code | Blame | 8 lines (6 loc) · 193 Bytes

```
1  Windows Registry Editor Version 5.00
2
3  [HKEY_LOCAL_MACHINE\SYSTEM\Keyboard Layout\Preload]
4  "1"="00000419"
5
6  [HKEY_USERS\.DEFAULT\Keyboard Layout\Preload]
7  "1"="00000409"
8  "2"="00000419"
```

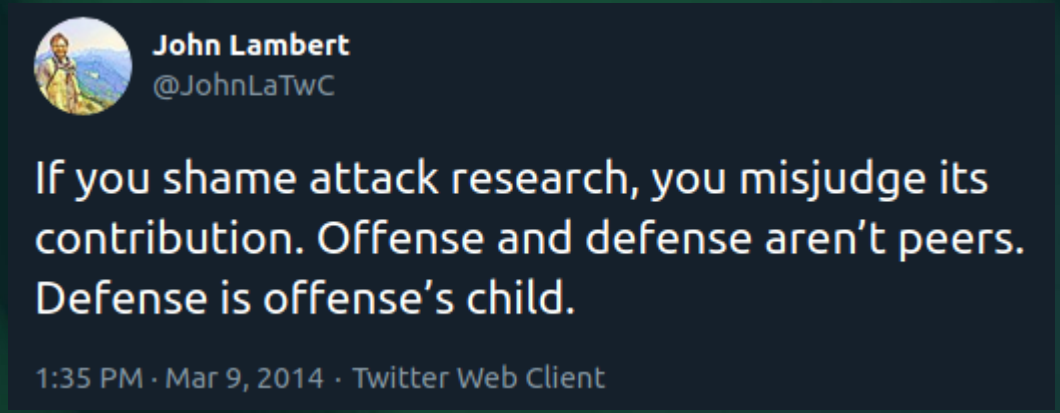
This sounds like work

- Yes, products won’t save you
- An empowered experienced sysadmin is worth their weight in gold

Why Windows only?

- Lots of baked-in features
- Most targeted platform
- Certainly options for other platforms, but we don't go there

Where do we get ideas from?



- DFIR reports (especially https://thedfirreport.com/)
- Papers (https://citation.thinkst.com)
- Visibility gaps

Background is done

The Map

1. **Primitives**
2. Local threat actor detections
    a. Sensitive command detection
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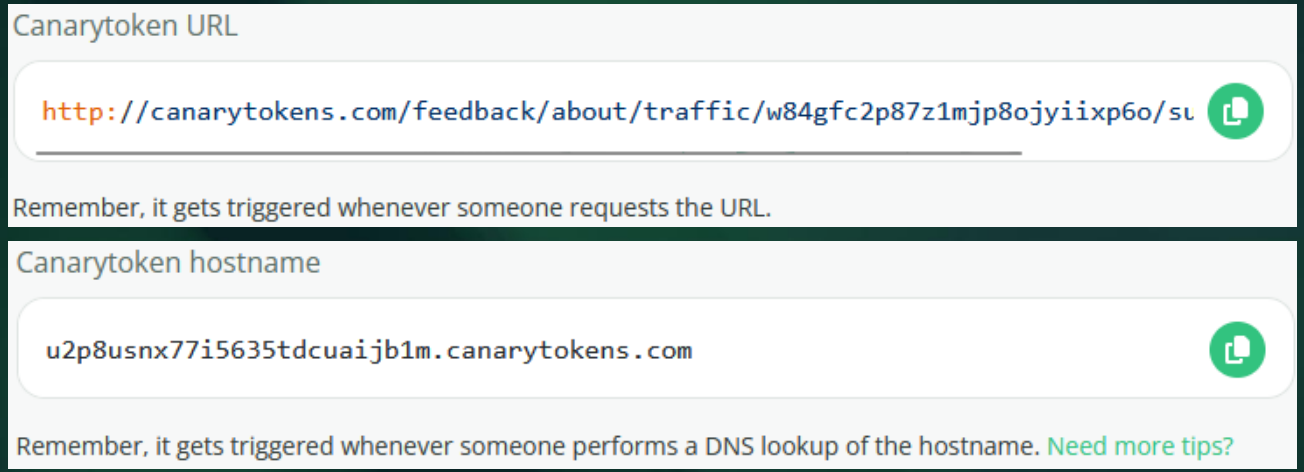
    a. IdP compromise

Primitives

DNS & HTTP Web bugs

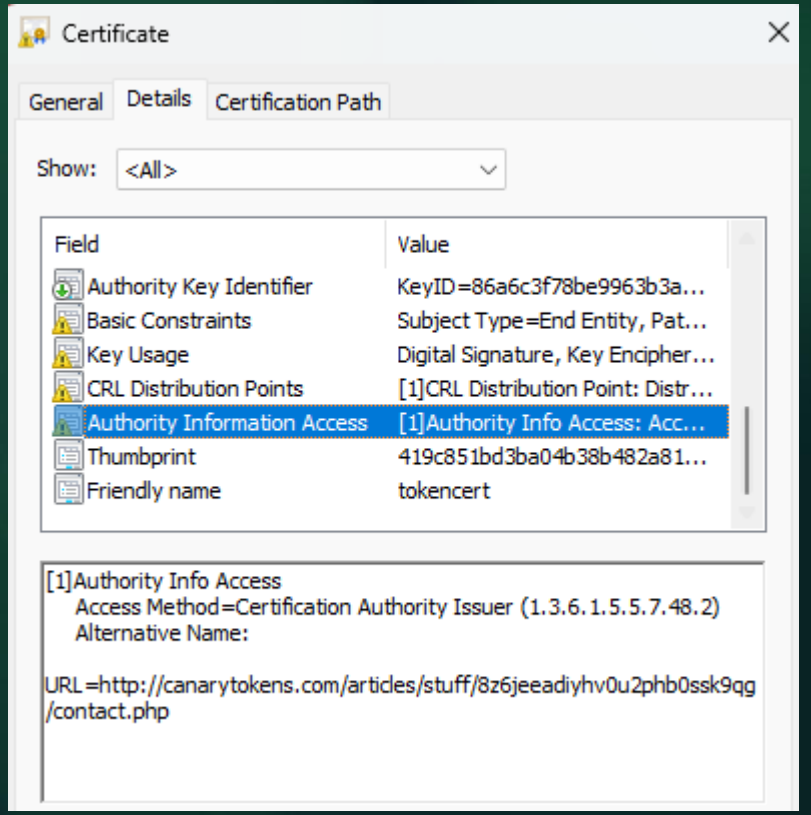
- Most Canarytokens are built on a unique hostname or URL
  - If they are accessed/resolved, someone is snooping



- Simple way to add alerting is to embed DNS/HTTP token into script or action that triggers with additional information

Certificate AIA & CryptoAPI

- Authority Information Access is an x.509 field with a URL to the parent certificate authority
- In order to validate an unknown leaf certificate, Windows CryptoAPI fetches the URL
- Create a TLS certificate with an AIA of a web Canarytoken URL!



Scripting & dynamic compilation

- PowerShell allows for accessing Win32 and .NET APIs
- It also allows for running a string containing C#
  - Compiled into memory as a new type from dynamically-generated string
- Allows for very powerful capabilities to be deployed as a PS script
  - No explicit compilation step
  - No compiler suite needed

Windows Events and Event Triggers

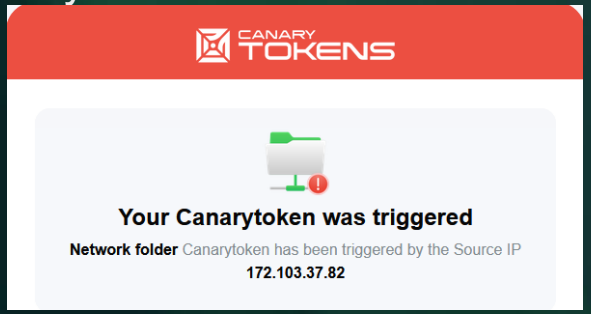
- Windows tracks 1000s of events across OS and user-space
  - Many must be enabled

- Task Scheduler can use Event as Trigger
  - Provides Event XML as argument to task Action

Alerting primitives

- PowerShell can pop toast/balloon notifications for local alerting

- Canarytokens.org is a handy site to handle the “downstream” aspects of alerts
  - Robust listeners
  - Good reputation email
  - Webhook support
  - Affordable ;)



In the capabilities we present here, we use a combination of the above

DoL Canarytokens

We’ll go through these quickly

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    a. IdP compromise

Sensitive command token

- Alerts on execution of a sensitive command (e.g., `klist`)
  - Rarely used benignly
  - DFIR reports show they are frequently used by attackers to orient themselves
  - Command doesn’t have to exist at deployment time

- Registry key that sets PowerShell script to be run with target process

- Resolves a token domain that also encodes the computer and user names
  - Can be pushed out broadly via GPO

```
PS C:\Users\casey\Desktop> reg import .\canarytoken.reg
The operation completed successfully.
PS C:\Users\casey\Desktop>
```

```
PS C:\Users\casey\Desktop> nltest.exe /?
Usage: nltest [/OPTIONS]


    /SERVER:<ServerName> - Specify <ServerName>

    /QUERY - Query <ServerName> netlogon service
    /REPL - Force partial sync on <ServerName> BDC
    /SYNC - Force full sync on <ServerName> BDC
    /PDC_REPL - Force UAS change message from <ServerName> PDC

    /SC_QUERY:<DomainName> - Query secure channel for <Domain> on <ServerName>
    /SC_RESET:<DomainName>[\<DcName>] - Reset secure channel for <Domain> on <ServerName> to <DcName>
    /SC_VERIFY:<DomainName> - Verify secure channel for <Domain> on <ServerName>
    /SC_CHANGE_PWD:<DomainName> - Change a secure channel  password for <Domain> on <ServerName>
    /DCLIST:<DomainName> - Get list of DC's for <DomainName>
    /DCNAME:<DomainName> - Get the PDC name for <DomainName>
    /DSGETDC:<DomainName> - Call DsGetDcName /PDC /DS /DSP /GC /KDC
        /TIMESERV /GTIMESERV /WS /NETBIOS /DNS /IP /FORCE /WRITABLE /AVOIDSELF /LDAPONLY /BACKG /DS_6 /DS_8 /DS_9 /DS_10
        /KEYLIST /TRY_NEXT_CLOSEST_SITE /SITE:<SiteName> /ACCOUNT:<AccountName> /RET_DNS /RET_NETBIOS
    /DNSGETDC:<DomainName> - Call DsGetDcOpen/Next/Close /PDC /GC
        /KDC /WRITABLE /LDAPONLY /FORCE /SITESPEC
    /DSGETFTI:<DomainName> - Call DsGetForestTrustInformation
        /UPDATE_TDO
```

Run nltest & alert us behind the scene, quick and easy :)

CASEYBCD8.UN.casey.CMD.pvd6nto02timeqnrp8675309.canarytokens.com

Canarytoken triggered

ALERT

A DNS Canarytoken has been triggered by the Source IP 192.168.16.1. Please note that the source IP refers to a DNS server, rather than the host that triggered the token.

Basic Details:

Channel	DNS
Time	2022-12-30 16:37:53 (UTC)
Canarytoken	0mpmy260rq80sillуue12345
Token Reminder	Create Token to monitor for nltest.exe at branch offices. This should be a rare command (This token was created to monitor the execution of: nltest.exe)
Token Type	cmd
Source IP	192.168.16.1
Sensitive Command Information	User casey executed "nltest.exe" on the host caseyce69

Canarytoken Management Details:

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    a. IdP compromise

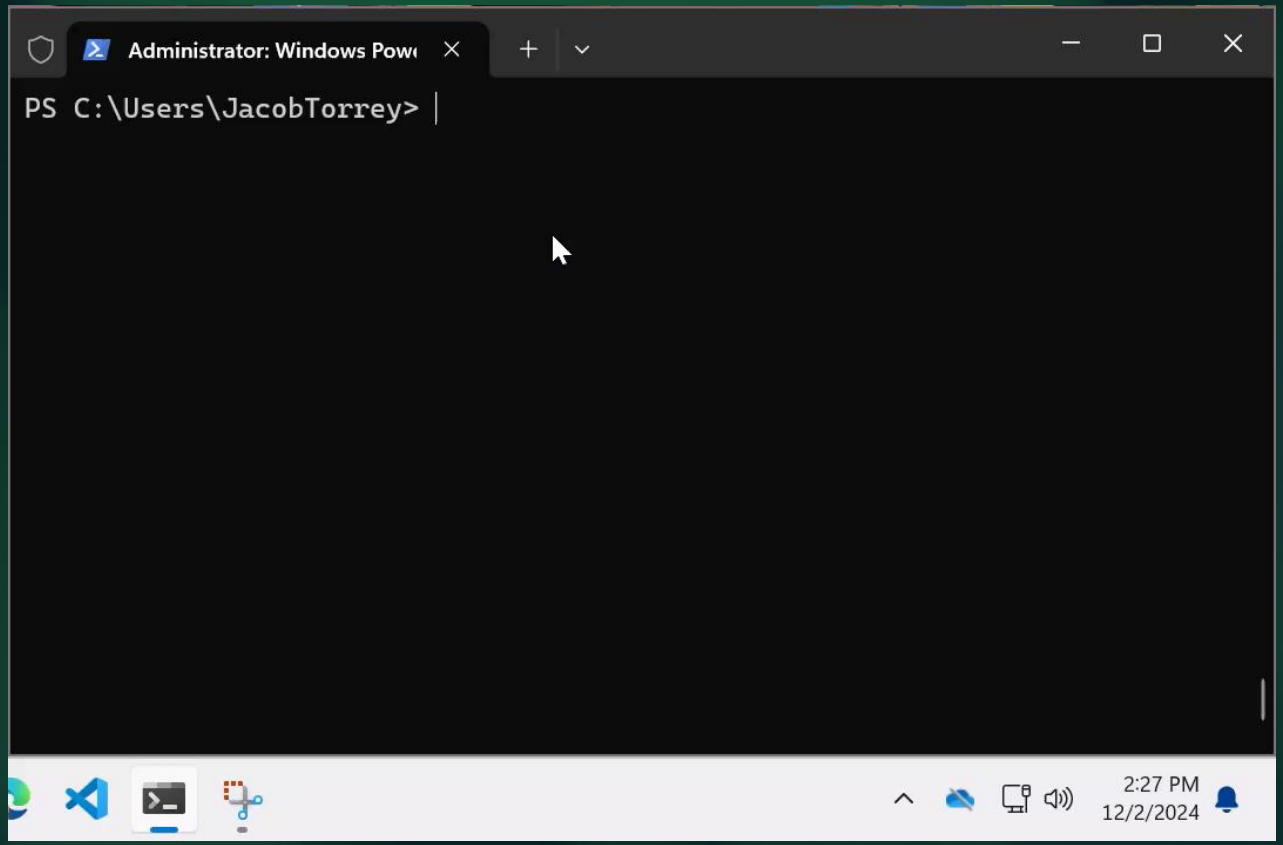
Scheduled task monitor

- Scheduled task that alerts on suspicious creation of new scheduled tasks
  - Running powershell.exe, cmd.exe, mshta.exe, .bat files, etc.
  - Process that is writable by the user
  - Arguments in user-writable user

- Scheduled task is triggered on Windows event 4698 (new scheduled task)

Schedul

- Schedul d tasks
  - Run
  - Proc
  - Argu
- Schedul


Administrator: Windows Pow
PS C:\Users\JacobTorrey>
2:27 PM
12/2/2024

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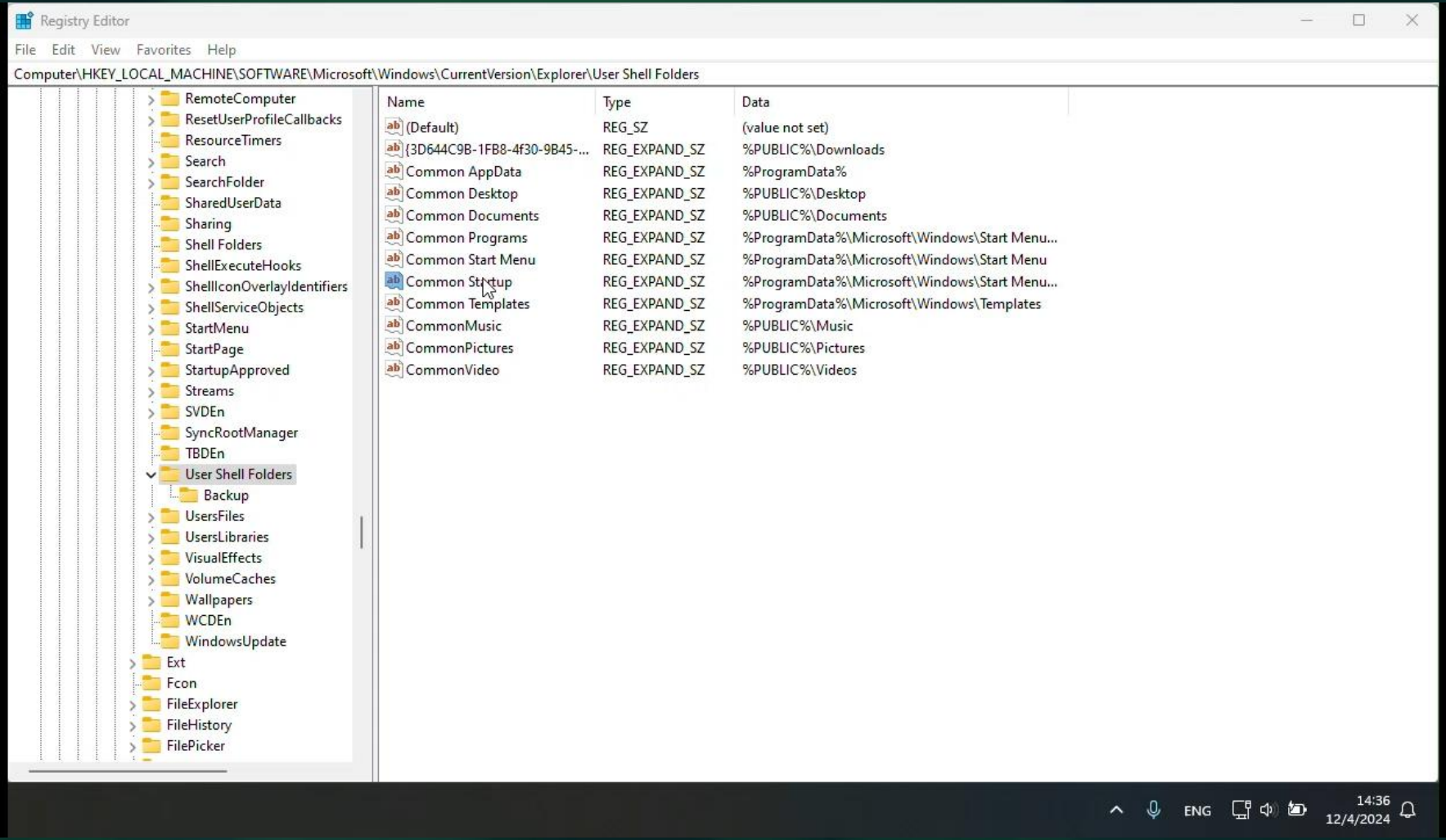
Registry monitor

- Registry is a common feature for LotL
  - Persistence with/without files
  - Disable security protections
  - Enable remote acces
- Monitor the ~80 most security-sensitive keys for changes
  - Alert when they change
    - Local balloon notification or via canarytokens.org
  - Drawn from Elastic's detection rules
- PowerShell script to access the Registry
  - Can be automatically run periodically


Registry Editor
File Edit View Favorites Help
Computer\HKEY_LOCAL_MACHINE\SOFTWARE\Microsoft\Windows\CurrentVersion\Explorer\User Shell Folders
RemoteComputer
ResetUserProfileCallbacks
ResourceTimers
Search
SearchFolder
SharedUserData
Sharing
Shell Folders
ShellExecuteHooks
ShellIconOverlayIdentifiers
ShellServiceObjects
StartMenu
StartPage
StartupApproved
Streams
SVDEn
SyncRootManager
TBDEn
User Shell Folders
Backup
UsersFiles
UsersLibraries
VisualEffects
VolumeCaches
Wallpapers
WCDEn
WindowsUpdate
Ext
Fcon
FileExplorer
FileHistory
FilePicker
Name
Type
Data
(Default) REG_SZ (value not set)
{3D644C9B-1FB8-4f30-9B45-... REG_EXPAND_SZ %PUBLIC%\Downloads
Common AppData REG_EXPAND_SZ %ProgramData%
Common Desktop REG_EXPAND_SZ %PUBLIC%\Desktop
Common Documents REG_EXPAND_SZ %PUBLIC%\Documents
Common Programs REG_EXPAND_SZ %ProgramData%\Microsoft\Windows\Start Menu...
Common Start Menu REG_EXPAND_SZ %ProgramData%\Microsoft\Windows\Start Menu
Common Startup REG_EXPAND_SZ %ProgramData%\Microsoft\Windows\Start Menu...
Common Templates REG_EXPAND_SZ %ProgramData%\Microsoft\Windows\Templates
CommonMusic REG_EXPAND_SZ %PUBLIC%\Music
CommonPictures REG_EXPAND_SZ %PUBLIC%\Pictures
CommonVideo REG_EXPAND_SZ %PUBLIC%\Videos
ENG
14:36
12/4/2024

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Windows Service token

- A common post-exploitation technique is to disable security and backup services (ATT&CK T1489)
- Create shell services that alert on stopping
- PowerShell that dynamically creates Service and registers a pipe to PowerShell
  - Once started, it will auto-start on boot
  - If stopped, it will trigger an alert

Based on: https://github.com/JFLarvoire/SysToolsLib/blob/master/PowerShell/PSService.ps1

Sign in | Alerts History

https://canarytokens.org/nest/history/06ff17b6024cabb44b5274de4a553640/b9mjavxydfjcpk3fcul2dd1t2

CANARY TOKENS

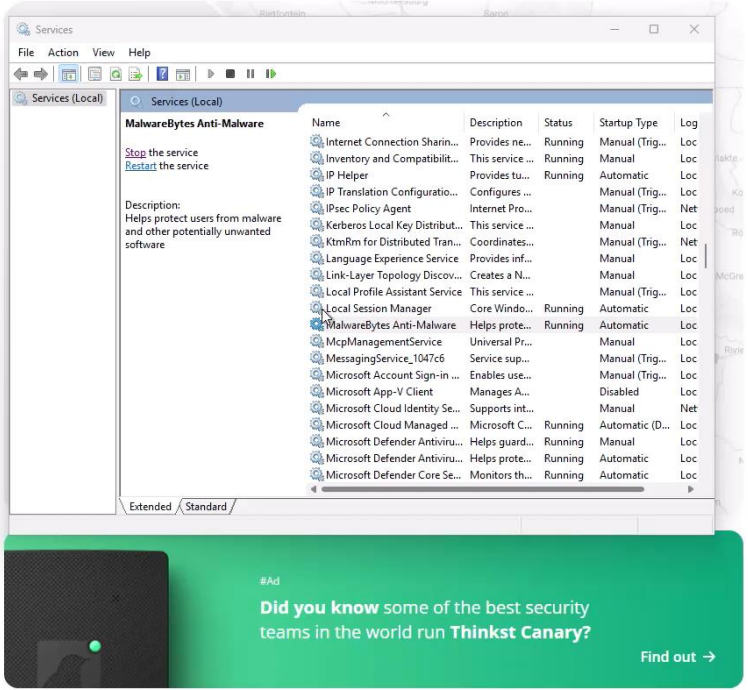
NEW CANARYTOKEN | ALERTS HISTORY | MANAGE | DOCUMENTATION | THINKST CANARY

Alerts History

Web bug Canarytoken ID: **b9mjavxydfjcpk3fcul2dd1t2**

Alerts list

There are no alerts for this Canarytoken.



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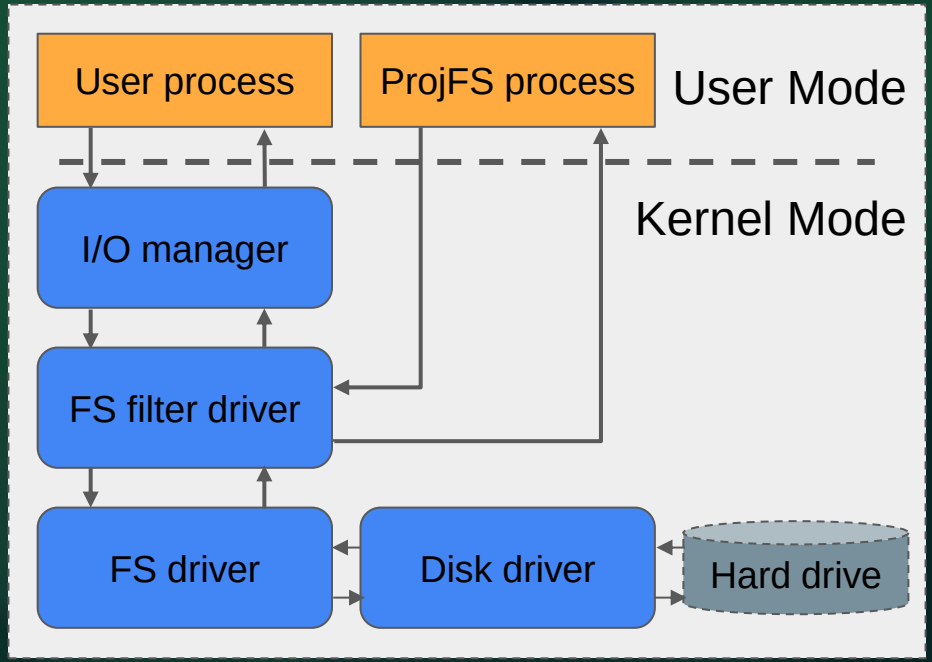
Monitoring file access

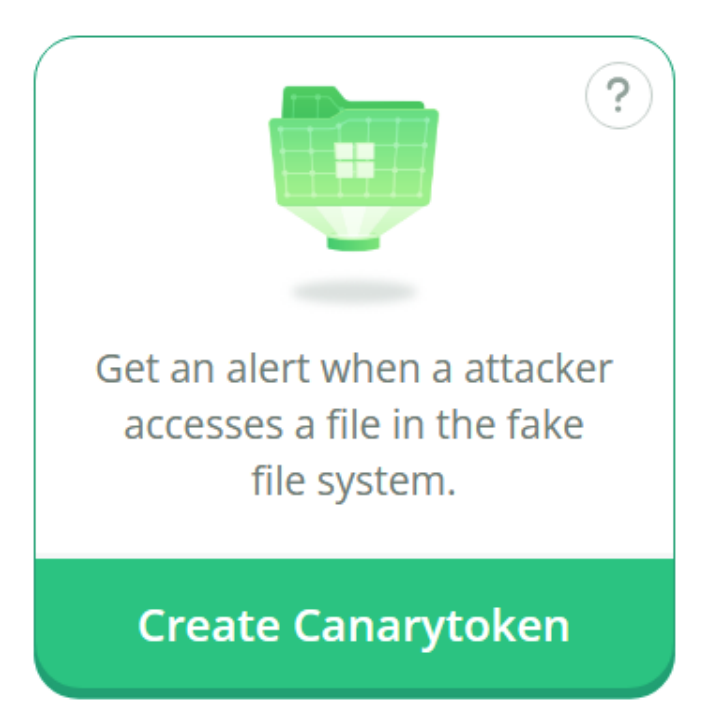
OS Feature	Implementation	Performance impact	File content monitoring	Scalability
ProjFS	User mode & MS driver	Low	Yes	High
File System Watcher	User mode	Moderate	No	Limited
Object Auditing / SACLs	OS subsystem	High	Yes	Fair
Controlled Folder Access	OS-$$ / MSFT Defender	Low	Low	High

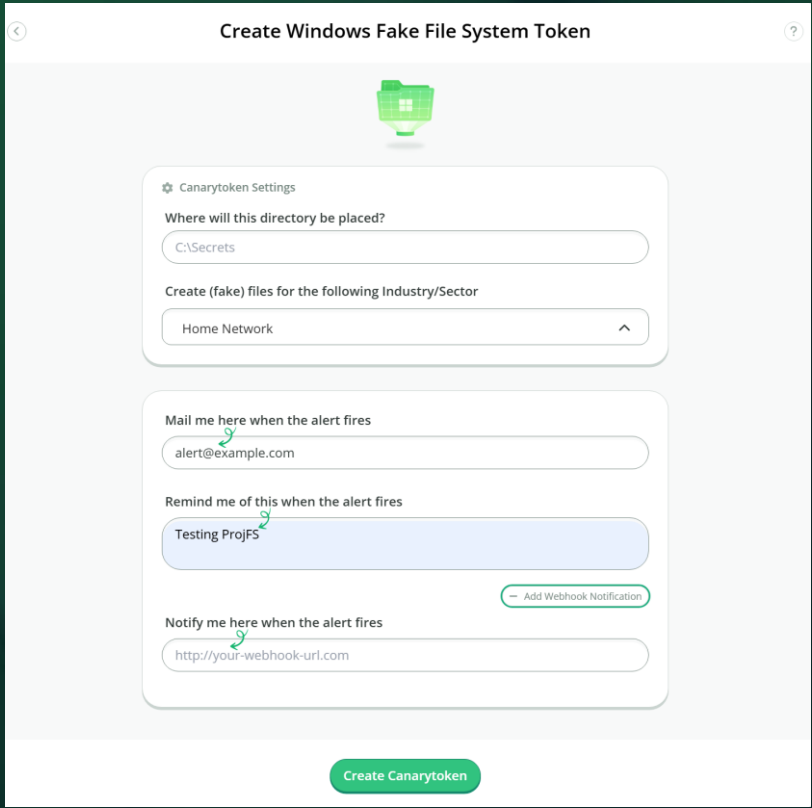
Windows Projected File System

- ~FUSE for Windows
- API to manipulate the file system
  - Non-admin
  - User mode
  - C#, Python, or even PS
- Used to create file structures on-demand
  - RegistryFS
  - Git
- Even used for file tar pits!

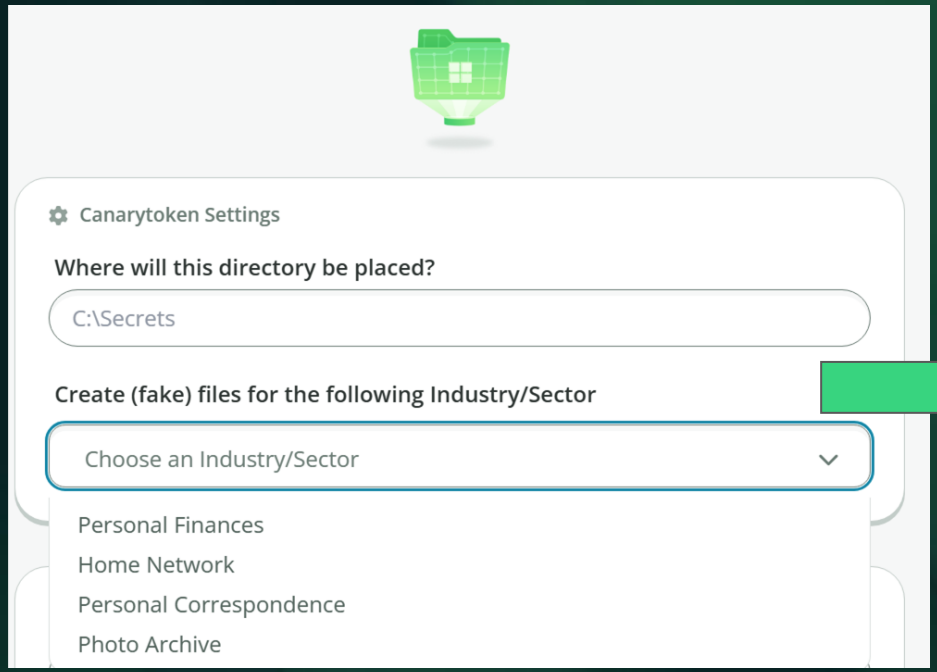


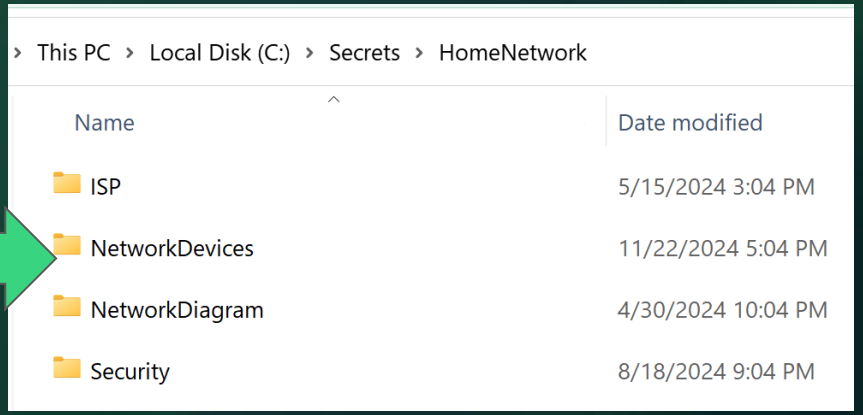
We've made this easy to use and effective





We provide some files to start you off, easy to change



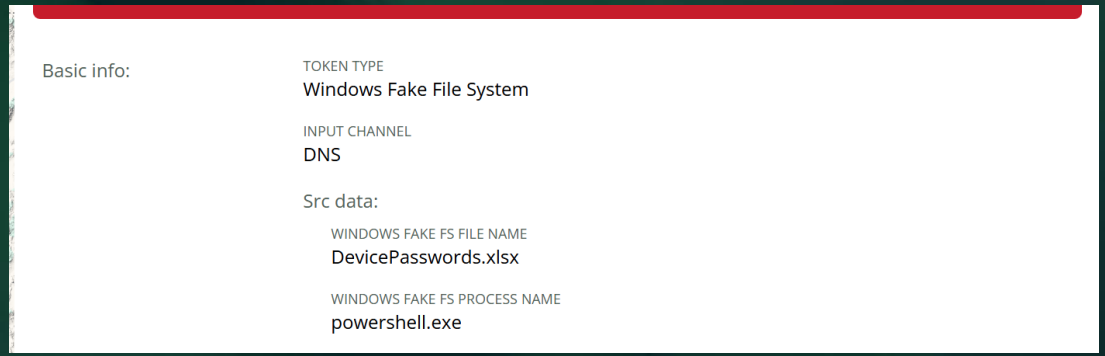


Alert on file open or copy

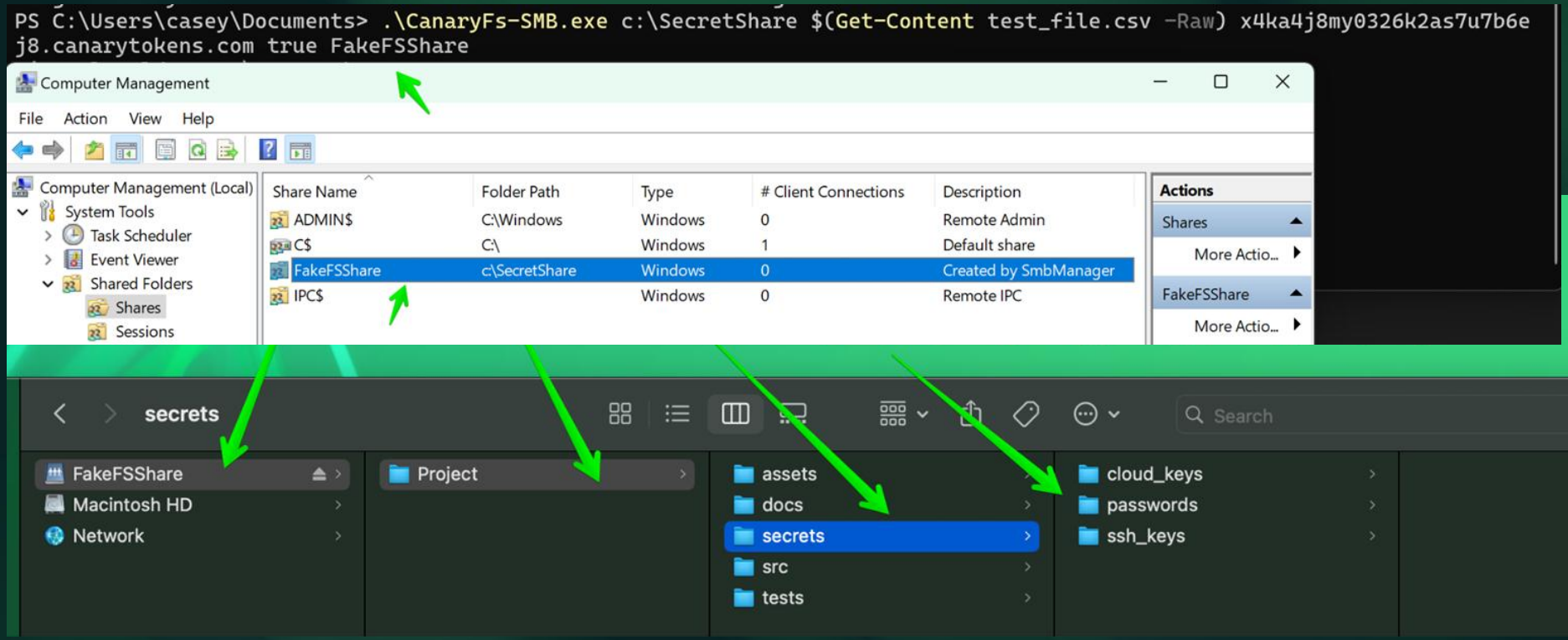
```
    Directory: C:\Secrets\HomeNetwork\Security


Mode                 LastWriteTime         Length Name
----                 -------------         ------ ----
------         7/25/2024   3:04 AM           1652 DevicePasswords.xlsx
------        11/10/2024   1:04 PM          30926 FirewallRules.docx
------         3/2/2024   9:04 PM          41708 SecurityChecklist.pdf


PS C:\Secrets\HomeNetwork\Security> cat .\DevicePasswords.xlsx
This is the content of DevicePasswords.xlsx
PS C:\Secrets\HomeNetwork\Security>
```



SMB remote sessions - on remote open | copy



Testing results

Tool Name	Allows Enumeration	Detects on File Open/Copy
ShareFinder	✅	✅
FRansom	✅	✅
Snaffler	✅	✅
Get-FileHash		✅
Compress (7z/Zip)		✅
Full AV scan	✅	✅
Windows Search indexer	✅	✅

The Map

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    f. File access monitoring (WebDAV)
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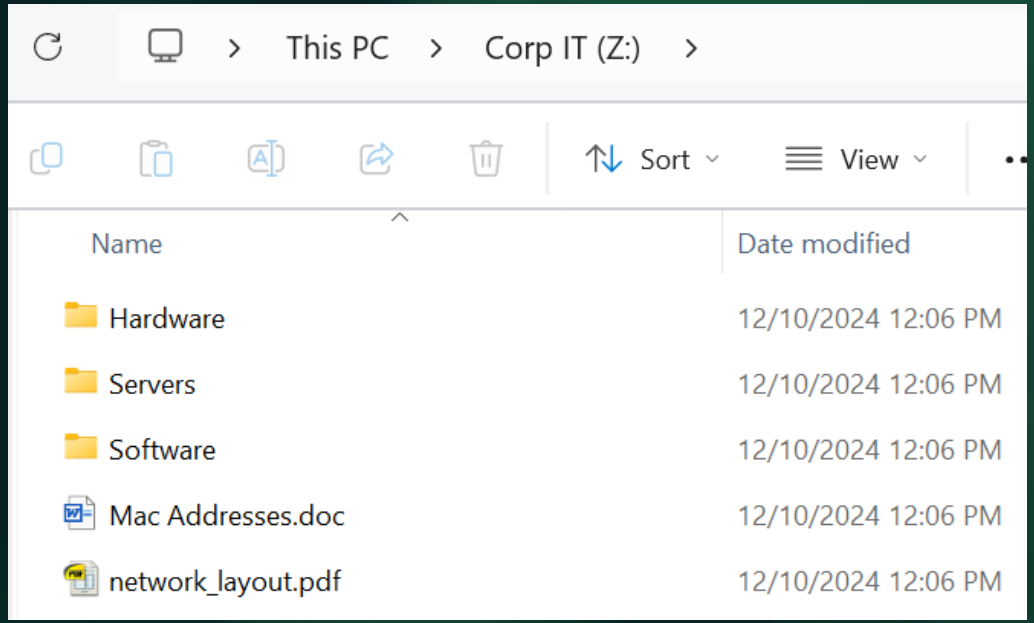
    d. AD logins
4. Cloud threat actor detections
    a. IdP compromise

Network mount token

- Network drives are common
  - Z: → internal file share
- We built a lightweight WebDAV server in Cloudflare workers
  - Fast responses
- Users map a drive to a WebDAV URL with custom credentials
- If the drive contents are accessed, you get an alert



Your Canarytoken was triggered

Network folder Canarytoken has been triggered by the Source IP **165.225.10.148**

Reminder
Framework network mount

Source IP
165.225.10.148

Date
2024/12/06

Time
21:59 UTC

File Path
/network_layout.pdf

WebDAV Client User-Agent
Microsoft-WebDAV-MiniRedir/10.0.26100

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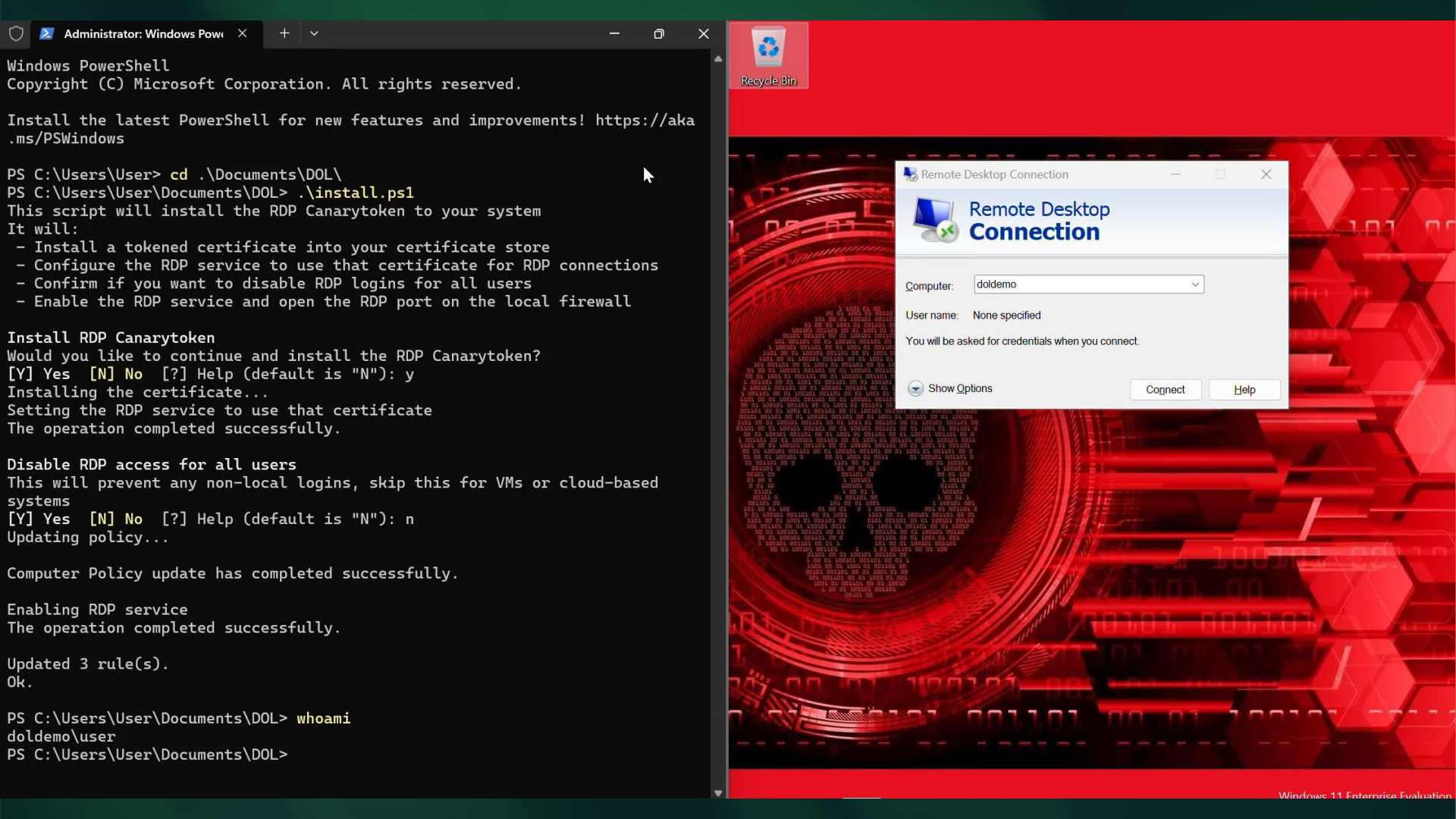
RDP token

- Windows ships with RDP service, catch people attempting to login with RDP
  - Popular lateral movement technique
  - Client is also built-in
- Enable RDP service and configure with a TLS certificate that points to a token URL
- Add all users to a group that is denied access to RDP sessions
- Clients verify TLS certificate, trigger alert, and even with credentials are not given a session


Administrator: Windows Pow
Windows PowerShell
Copyright (C) Microsoft Corporation. All rights reserved.
Install the latest PowerShell for new features and improvements! https://aka.ms/PSWindows
PS C:\Users\User> cd .\Documents\DOL\
PS C:\Users\User\Documents\DOL> .\install.ps1
This script will install the RDP Canarytoken to your system
It will:
- Install a tokened certificate into your certificate store
- Configure the RDP service to use that certificate for RDP connections
- Confirm if you want to disable RDP logins for all users
- Enable the RDP service and open the RDP port on the local firewall
Install RDP Canarytoken
Would you like to continue and install the RDP Canarytoken?
[Y] Yes [N] No [?] Help (default is "N"): y
Installing the certificate...
Setting the RDP service to use that certificate
The operation completed successfully.
Disable RDP access for all users
This will prevent any non-local logins, skip this for VMs or cloud-based systems
[Y] Yes [N] No [?] Help (default is "N"): n
Updating policy...
Computer Policy update has completed successfully.
Enabling RDP service
The operation completed successfully.
Updated 3 rule(s).
Ok.
PS C:\Users\User\Documents\DOL> whoami
doldemo\user
PS C:\Users\User\Documents\DOL>
Recycle Bin
Remote Desktop Connection
Remote Desktop Connection
Computer: doldemo
User name: None specified
You will be asked for credentials when you connect.
Show Options
Connect
Help
Windows 11 Enterprise Evaluation

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WinRM token

- Windows ships with a management service, WinRM
  - Popular lateral movement technique (PSRemoting)
  - Client is also built-in
- Enable HTTPS WinRM service and configure with a TLS certificate that points to a token URL
- Install a SDDL that denies WinRM logins
- Clients verify TLS certificate, trigger alert, and even with credentials are not given a session

Administrator: Windows Pow

```
PS C:\Users\User\Documents\DOL> .\install-winrm.ps1
This script will install the WinRM Canarytoken to your system
It will:
 - Install a tokened certificate into your certificate store
 - Configure the WinRM service to use that certificate for HTTPS connections
 - Disable WinRM logins for all users
 - Enable the WinRM service and open the WinRM HTTPS port on the local firew
all

Install WinRM Canarytoken
Would you like to continue and install the WinRM Canarytoken?
[Y] Yes  [N] No  [?] Help (default is "N"): y
Installing the certificate...
Setting the WinRM service to use that certificate
Enabling WinRM service
WinRM is not set up to receive requests on this machine.
The following changes must be made:

Start the WinRM service.
Set the WinRM service type to delayed auto start.

WinRM has been updated to receive requests.

WinRM service type changed successfully.
WinRM service started.
WinRM is not set up to allow remote access to this machine for management.
The following changes must be made:

Enable the WinRM firewall exception.
Configure LocalAccountTokenFilterPolicy to grant administrative rights remot
ely to local users.

WinRM has been updated for remote management.

WinRM firewall exception enabled.
Configured LocalAccountTokenFilterPolicy to grant administrative rights remo
tely to local users.
ResourceCreated
    Address = http://schemas.xmlsoap.org/ws/2004/08/addressing/role/anonymou
s
```

Windows PowerShell

```
PS C:\Users\User> whoami
attackerdemo\user
PS C:\Users\User> winrs -r:https://doldemo:5986 -u:"Savvy Defender" -p:demod
emo whoami
```

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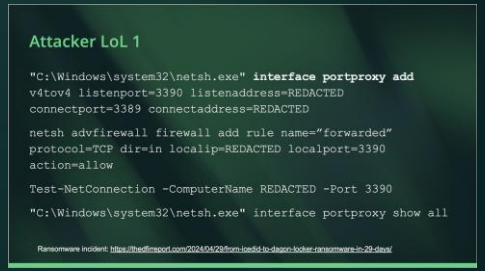
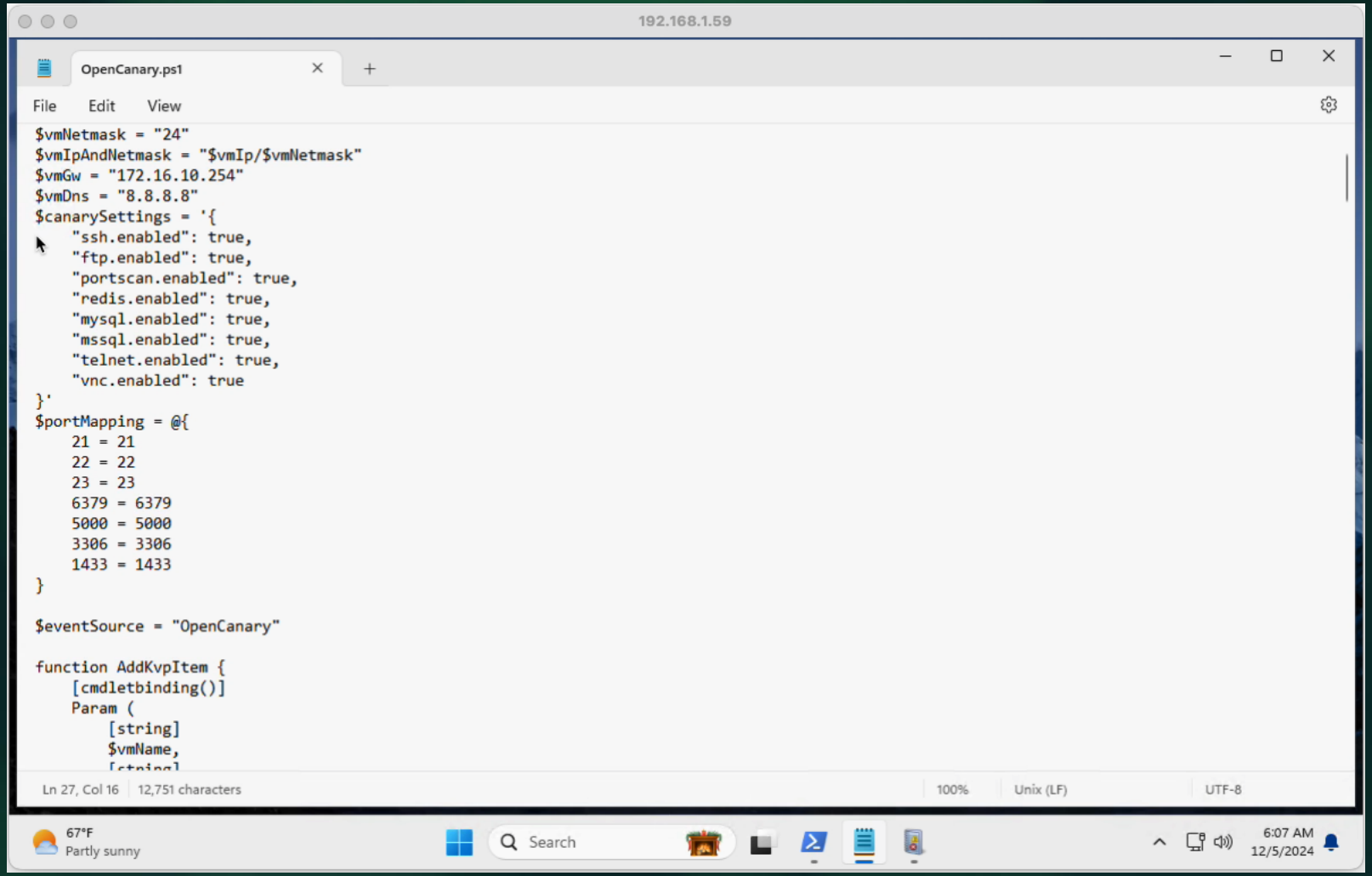
Local non-risky honeypots with Hyper-V

- Windows 11 includes Hyper-V by default[1]
- Run a Linux honeypot VM on the machine
- Use Windows NAT to redirect incoming traffic to the honeypot
  - windows:22 -> honeypot:22 (fake that you're running SSH)
  - windows:80 -> honeypot:80 (run a fake "local" website)
  - windows:3389 -> honeypot:3389 (see when people try to login to your RDP)
- Honeypot communicates with a Windows monitoring script via Hyper-V KVPs to show alerts

[1] For Enterprise and Pro editions, on CPUs with VM extensions




192.168.1.59
OpenCanary.ps1
File
Edit
View
$vmNetmask = "24"
$vmIpAndNetmask = "$vmIp/$vmNetmask"
$vmGw = "172.16.10.254"
$vmDns = "8.8.8.8"
$canarySettings = '{
"ssh.enabled": true,
"ftp.enabled": true,
"portscan.enabled": true,
"redis.enabled": true,
"mysql.enabled": true,
"mssql.enabled": true,
"telnet.enabled": true,
"vnc.enabled": true
}'
$portMapping = @{
21 = 21
22 = 22
23 = 23
6379 = 6379
5000 = 5000
3306 = 3306
1433 = 1433
}
$eventSource = "OpenCanary"
function AddKvpItem {
[cmdletbinding()]
Param (
[string]
$vmName,
Ln 27, Col 16
12,751 characters
100%
Unix (LF)
UTF-8
67°F
Partly sunny
Search
6:07 AM
12/5/2024

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AD login token

```
PS > type .\creds.txt
Username: MarcoS
Password: OothaY8u
```

- Scheduled task that alerts on failed AD login attempts for token usernames
  - Make fake usernames
  - Drop their “credentials” in places
  - Alert upon usage

Alerts History

Web bug Canarytoken ID: [redacted]

Alerts list

Download list CSV JSON

Date: **December 7, 2024 at 1:26:23 PM**
IP: [redacted]
Channel: **HTTP**

Date: **December 7, 2024 at 1:26:23 PM**
IP: [redacted]
Channel: **HTTP**

USER-AGENT
Mozilla/5.0 (Windows NT; Windows NT 6.2; en-US) WindowsPowerShell/3.0

Request args:

USERNAME
MarcoS

WORKSTATION NAME

WORKSTATION IP

RECORD ID
20916402

MACHINE NAME
win2k19-domainsrv.corp.thinkst.com

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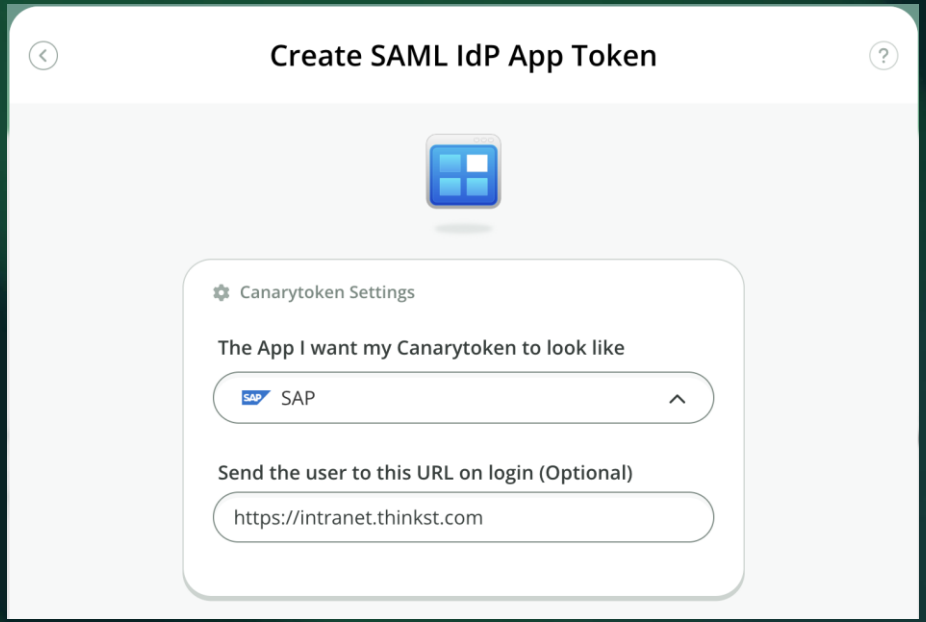
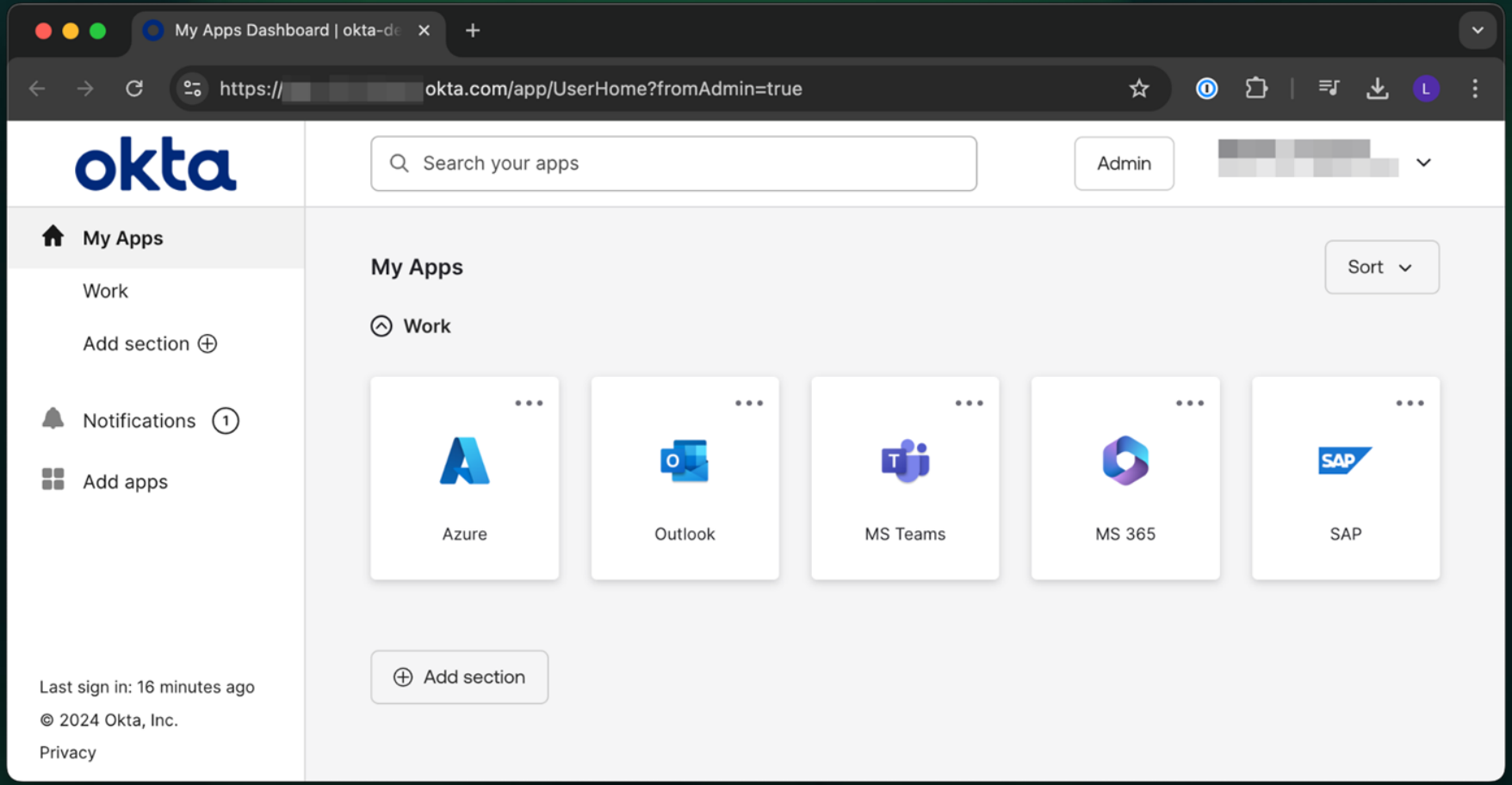
IdP token

- “Identity is the new {perimeter,attack surface,firewall}”
- Threat actors love SSO compromise
  - Hybrid AD means that local environments are part of cloud enterprise
- Detect when identities are compromised, with deception



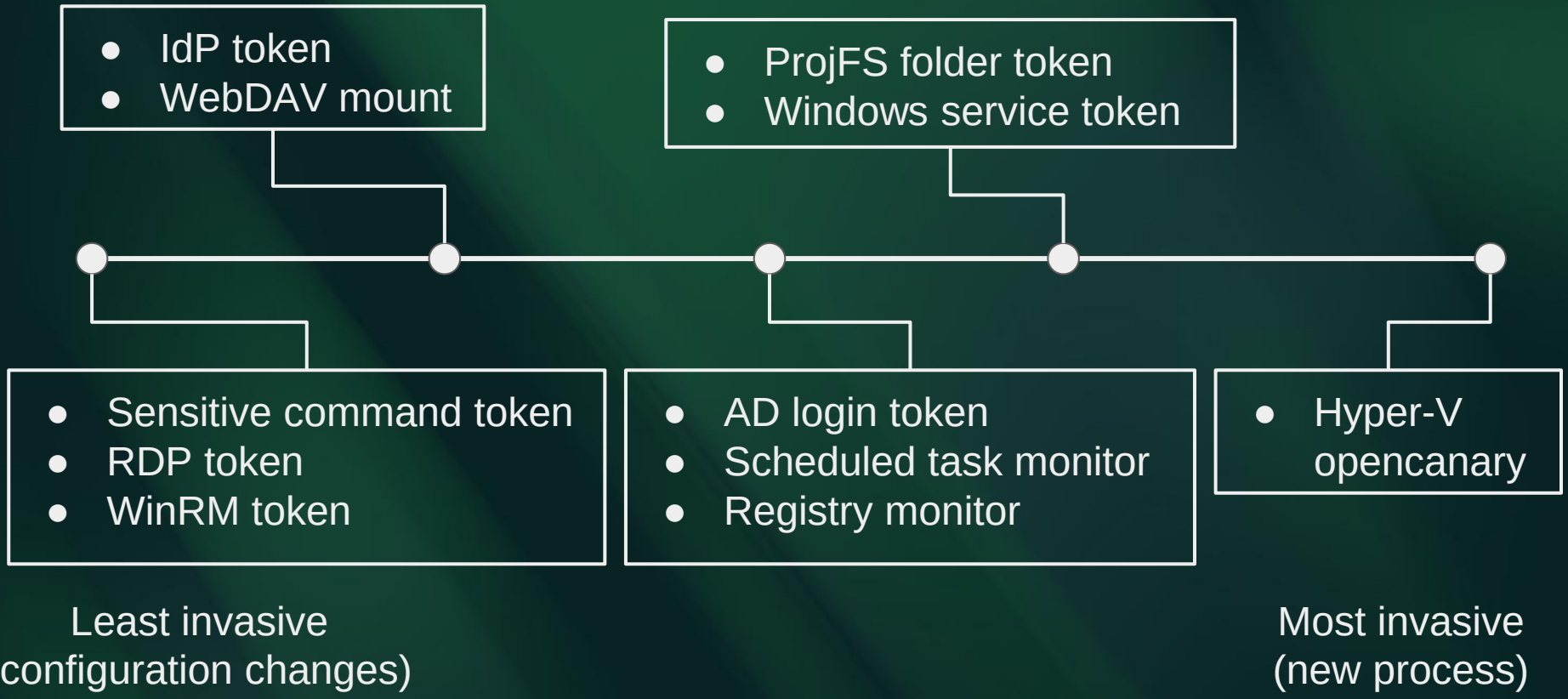
okta

onelogin
by ONE IDENTITY


My Apps Dashboard | okta-de
https:// okta.com/app/UserHome?fromAdmin=true
okta
Search your apps
Admin
My Apps
Work
Add section
Notifications 1
Add apps
Last sign in: 16 minutes ago
© 2024 Okta, Inc.
Privacy
My Apps
Sort
Work
Azure
Outlook
MS Teams
MS 365
SAP
Add section

</techniques>

Spectrum of capabilities



What didn’t pan out

Fruitless directions

- Windows Sandbox
  - Spins up read-only Windows in VM
  - XML configuration for which application is run and if any state can be saved
  - Start-up times too high for dynamic usage
  - Long-running processes (e.g., browser) see less security benefit

- DPAPI as token
  - Useful for breadcrumbs, but doesn’t provide sufficient auditing to token
  - Windows credential unprotect is not audit logged
  - Chrome and Edge protect all passwords with auditable credential
    - Cannot alert on specific password fill

Caveats

Caveats

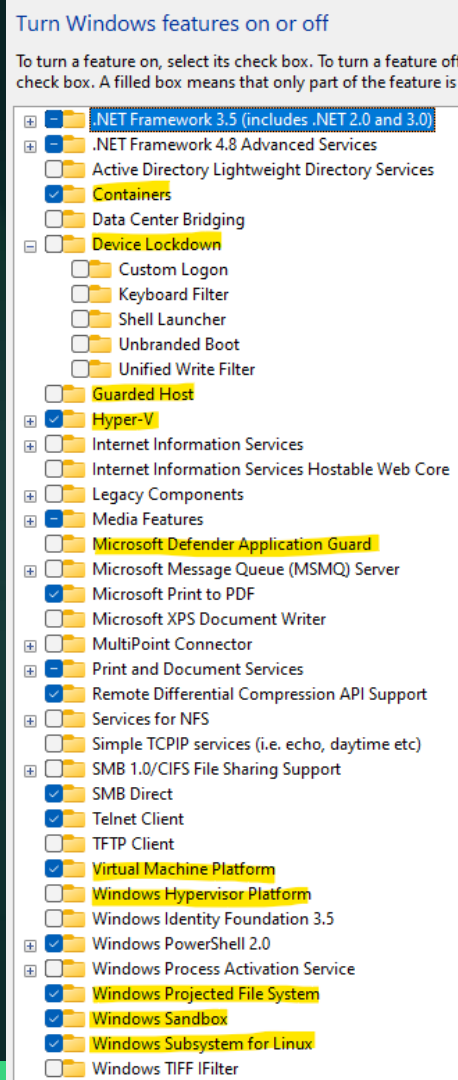
- PowerShell is restricted in many environments
  - Tension between allowing for unconstrained execution and improved defense
- Enabling visibility into audit events can reduce log retention
- Relying on existing functionality means that an update can change behavior
  - Managing version differences at scale is painful
  - Some features linger on unsupported
- Many of these capabilities leave visible fingerprints for attackers to look for

Future directions

Future directions

- More primitives to be explored

- New features can bear fruit
  - Inject token data into Windows Recall?
  - More hybrid functionality can mean there is Azure-based visibility



Wrap-up

Takeaways

- Introduced Defending-off-the-Land
  - Repurposing built-in OS functionality

- Showed 11 techniques for defenders
  - Four are immediately available from https://canarytokens.org
  - Seven are available from https://github.com/thinkst/defending-off-the-land

- Celebrate your sysadmins, let them get clever

Thank you!

Links

- Tools demonstrated in this talk
  - https://canarytokens.org
  - https://github.com/thinkst/defending-off-the-land

- Additional Links
  - https://github.com/thinkst/canarytokens
  - https://lolbas-project.github.io/
  - https://gtfobins.github.io/
  - https://www.loldrivers.io/
  - https://github.com/JFLarvoire/SysToolsLib/blob/master/PowerShell/PSService.ps1