



Abuse of Legitimate Security Tools and Health Sector Cybersecurity

October 6, 2022





Agenda

The same tools used to operate, maintain and secure healthcare systems and networks can also be turned against their own infrastructure.

- Cobalt Strike
- PowerShell
- Mimikatz
- Sysinternals
- Anydesk
- Brute Ratel
- References

Slides Key:



Non-Technical: Managerial, strategic and high-level (general audience)



Technical: Tactical / IOCs; requiring in-depth knowledge (sysadmins, IRT)



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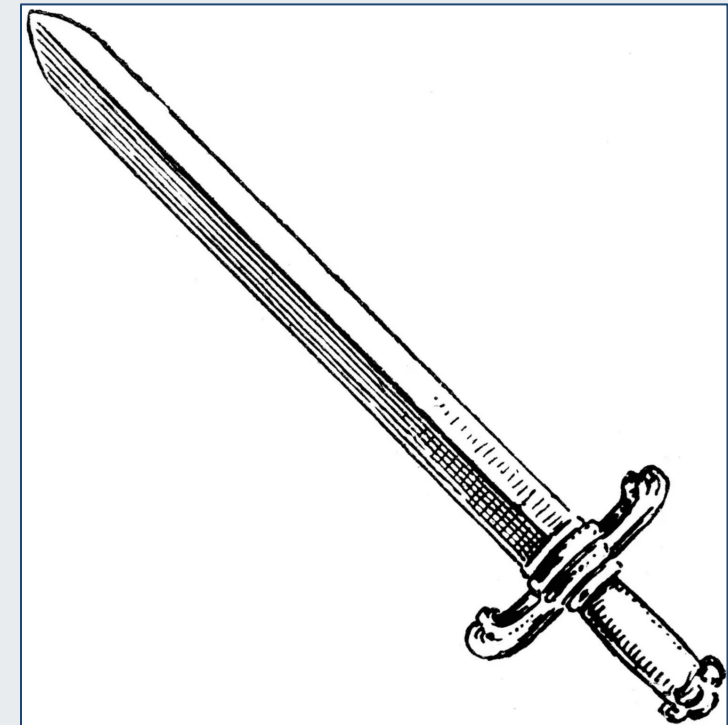


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A Few Caveats...

- This presentation is neither an endorsement nor a criticism of the tools that are described.
 - The HHS has no position on the legitimate use of these or any other open source or vendor tools/capabilities. Each should be evaluated based on its own merits and drawbacks.
 - This is also not a condemnation of these tools nor is it a call for healthcare organizations to avoid them. They have value, as evidenced by their popularity.
- Ultimately, healthcare organizations should weigh the risks and rewards of each of these tools and be aware of both the value and risk they bring with them.



*The proverbial double-edged sword cuts both ways.
(image source: US adult literacy)*



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Cobalt Strike

Red-team framework for adversary simulation



Cobalt Strike Background

“Since its introduction, Cobalt Strike has become one of the most prevalent threat emulation software packages used by infosec red teams.” – Dark Reading

- Created in 2012 by Raphael Mudge; one of the first widely-available red team frameworks
- Offered as a penetration testing/red team tool to simulate an attack
 - Used for risk/vulnerability assessments
- Abused with increasing frequency against many industries, including the Healthcare and Public Health (HPH) sector
 - Used by many threat actors who target the HPH sector specifically
 - Ransomware operators and Advanced Persistent Threats (APTs)
- Cobalt Strike has many functions – we will only cover a few in this presentation
 - For full coverage, please see our Cobalt Strike presentation:
<https://www.hhs.gov/sites/default/files/cobalt-strike-tlpwhite.pdf>



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Cobalt Strike as a Spear Phishing Tool

Cobalt Strike is capable of emulating one of the most prolific infection vectors – phishing.

This capability is highly customizable and can therefore simulate many environments.

More information can be found here:

https://hstechdocs.helpsystems.com/manuals/cobaltstrike/current/userguide/content/topics/init-access_spear-phishing.htm

Spear Phish

To: user@mint To_Name: Lou User

RCPT TO
Make sure target emails are in a domain that your SMTP server will deliver to.

DATA
1. Use %To% and %To_Name% to personalize
2. Update plaintext URL references to %URL%

Targets: /root/targets.txt

Template: /root/message.txt **File Attachment**
Don't attach an executable

Attachment:

Embed URL: http://www.myphishingdomain.com/whatever **URL (Replaced in Template)**
Replace IP address with FQDN

Mail Server: 192.168.95.187 **SMTP Server**
* Use MX record of target's domain OR
* Use server for phishing domain that you own

Bounce To: raffi@strategiccyber.com

MAIL FROM
1. Check that domain does not have SPF record
2. Do not use your target's domain here
3. Make sure From: address in Template matches (optional to get past some spam filters)



Cobalt Strike: Beacon

Cobalt Strike's beacon, a malleable command-and-control server, is the primary tool used for adversary emulation, allowing for several exploitation and post-exploitation capabilities.

Beacon can discover client-side applications and conduct exploitation/post-exploitation activities.

Beacon can:

- Load a malleable command and control profile
- Uses HTTP/HTTPS/DNS to egress a network
- Use named pipes to control Beacons, peer-to-peer, over server message block (SMB)
- More information:
<https://www.cobaltstrike.com/blog/beacon-an-operators-guide/>



Covert Communication

Beacon's network indicators are malleable. Load a **C2 profile** to look like another actor. Use HTTP, HTTPS, and **DNS** to egress a network. **Use named pipes to control Beacons**, peer-to-peer, over the SMB protocol.



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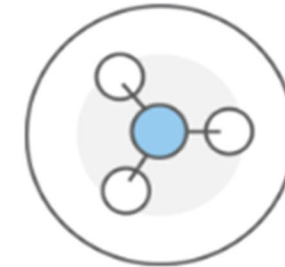
Cobalt Strike: Team Server

What is collaboration with regards to Cobalt Strike? For Cobalt Strike, collaboration is the ability of the two components of the tool (client and server) to communicate and work with each other.

Cobalt Strike Team Server controls the Beacon and the host for its social engineering capabilities.

The Cobalt Strike Team Server allows for:

- Data transfers
- Real-time communications
- Command/control of compromised systems
- More information:
https://hstechdocs.helpsystems.com/manuals/cobaltstrike/current/userguide/content/topics/welcome_starting-cs-team-server.htm



Collaboration

Connect to a **Cobalt Strike team server** to share data, communicate in real-time, and control systems compromised during the engagement.



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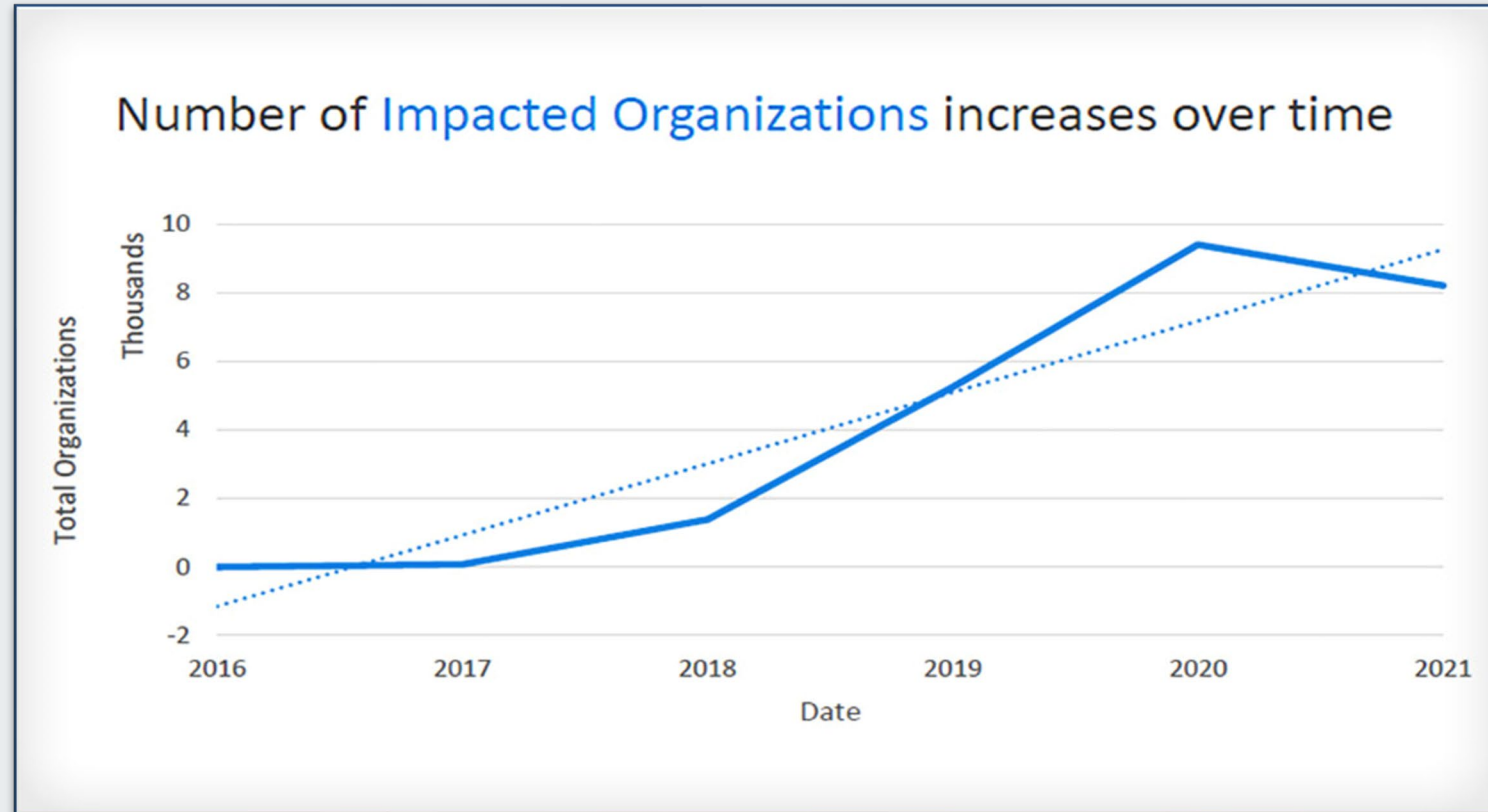


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Cobalt Strike Malicious Usage: 2017 – 2021

Cobalt Strike has been increasingly used for malicious purposes over the last five years.



Data courtesy of Proofpoint



Noteworthy Cobalt Strike Attacks: 2016 – 2018

Cobalt Strike has been increasingly used for malicious purposes over the last five years.

BRIEF TIMELINE OF

COBALT STRIKE THREATS

COBALT STRIKE USE IN CYBERATTACKS IS INCREASING. THE FOLLOWING HIGH-PROFILE EVENTS INCLUDED COBALT STRIKE USE.

JANUARY 2016

FIN7 aka Carabank targeted financial organizations globally, features Cobalt Strike implants

MAY 2017

The Cobalt Group targets banks, banking software vendors, and ATM software and hardware vendors

OCTOBER 2017

Leviathan espionage actor targeted defense and maritime targets in the U.S. and Western Europe

APRIL 2018

APT10 threat actors use Cobalt Strike in attacks on multiple Japanese organizations



Noteworthy Cobalt Strike Attacks: 2018 – 2020

Cobalt Strike has been increasingly used for malicious purposes over the last five years.

A vertical timeline on the right side of the slide, marked with blue circles and connected by a blue line. The timeline lists five notable Cobalt Strike attacks. The first entry is for August 2018, involving TA505 distributing malicious attachments. The second entry is for November 2018, involving APT29 targeting multiple industries. The third entry is for 2019, involving APT41 targeting Indian government computers, with a note that the specific timing was not detailed in a U.S. Department of Justice indictment. The fourth entry is for November 2019, involving TA2101 targeting German institutions. The fifth entry is for June 2020, involving TA800 leveraging COVID-19 themes to distribute BazaLoader, BazaBackdoor, and Cobalt Strike.

AUGUST 2018
TA505 distributes tens of thousands of malicious attachments containing macros which, if enabled, download Cobalt Strike backdoor

NOVEMBER 2018
APT29 targeted multiple industries masquerading as the U.S. Department of State

2019
APT41 threat actors use Cobalt Strike on Indian government computers
Note: The specific timing of this campaign was not detailed in the U.S. Department of Justice indictment.

NOVEMBER 2019
TA2101 targeting German institutions impersonating the Bundeszentralamt für Steuern, the German Federal Ministry of Finance

JUNE 2020
TA800 leverages COVID-19 themes to distribute BazaLoader > BazaBackdoor > Cobalt Strike



Noteworthy Cobalt Strike Attacks: 2020 – 2021

Cobalt Strike has been increasingly used for malicious purposes over the last five years.





Cobalt Strike: Threat Actors

Cobalt Strike is used maliciously by several state-sponsored actors and cybercriminal groups, many of whom pose a significant threat to the health sector.

THREAT ACTOR (associations are not 100% confidence)	APPROXIMATE ATTRIBUTION
APT29, Dukes, Group 100, Cozy Duke, EuroAPT, CozyCar, Cozer, Office Monkeys, OfficeMonkeys, Cozy Bear, The Dukes, Minidionis, SeaDuke, Hammer Toss, YTTRIUM, Iron Hemlock, Grizzly Steppe	Russian Intelligence Agency (Possibly Federal Security Service [FSB] or their Foreign Intelligence Service [SVR])
APT32, OceanLotus Group, Ocean Lotus, OceanLotus, Cobalt Kitty, APT-C-00, SeaLotus, Sea Lotus, APT-32, Ocean Buffalo, POND LOACH, TIN WOODLAWN, BISMUTH	Vietnamese government
FIN7, Carbanak, Anunak, Carbon Spider, Gold Waterfall	Cybercriminal group (Ukraine-based)
Cobalt Group, Cobalt Gang, GOLD KINGSWOOD, COBALT SPIDER	Cybercriminal group (Unknown location but possibly Russia/CIS)
UNC1878, RYUK, FIN12	Cybercriminal group (Likely located in Russia/CIS)
FIN6, SKELETON SPIDER, ITG08, MageCart Group 6, White Giant, GOLD FRANKLIN	Cybercriminal group (Unknown location)





Cobalt Strike: Threat Actors

THREAT ACTOR (associations are not 100% confidence)	APPROXIMATE ATTRIBUTION
Leviathan, TEMP.Periscope, TEMP.Jumper, APT40, BRONZE MOHAWK, GADOLINIUM, Kryptonite Panda	Chinese Ministry of State Security's (MSS) Hainan State Security Department
BRONZE PRESIDENT, HoneyMyte, Red Lich, Mustang Panda	Chinese government
APT 19, KungFu Kittens, Black Vine, Group 13, PinkPanther, Sh3llCr3w, BRONZE FIRESTONE, Shell Crew, Deep Panda	Chinese government
APT10, MenuPass, Menupass Team, menuPass, menuPass Team, happyyongzi, POTASSIUM, DustStorm, Red Apollo, CVNX, HOGFISH, Cloud Hopper, BRONZE RIVERSIDE, Stone Panda	Chinese government
Winnti, Axiom, APT17, and Ke3chang	Chinese government
APT41 (possibly BARIUM and Winnti Group)	Chinese government
DarkHydrus, LazyMeerkat, ATK77 (APT 19, Deep Panda, C0d0so0 and Turbine Panda, APT 26, Shell Crew, WebMasters, KungFu Kittens)	Iranian government
CopyKittens, Slayer Kitten	Iranian government





Cobalt Strike: Protection/Detection

- Cobalt Strike's versatility makes defense a headache
 - How do you contain so many capabilities at once?
 - Apply resources knowing that containment is not nearly sufficient
 - The MITRE D3FEND framework can be helpful for general guidance: <https://d3fend.mitre.org/>
 - Prevention, detection and containment are paramount
- How do you prevent Cobalt Strike from being used maliciously on your infrastructure?
 - Reduce attack surface against common infection vectors such as phishing, known vulnerabilities, and remote access capabilities
- How do you detect Cobalt Strike?
 - Signatures for intrusion detection and endpoint security systems
 - YARA Rules:
 - Intel471: Cobalt Strike - A Toolkit for Pentesters Whitepaper: <https://intel471.com/resources/whitepapers/cobalt-strike-a-toolkit-for-pentesters>
 - Technical Analysis of Operation Diànxùn: <https://www.mcafee.com/enterprise/en-us/assets/reports/rp-operation-dianxun.pdf>





PowerShell

A Microsoft scripting language and command-line tool for configuration management and task automation



PowerShell Basics

- Command shell and scripting language
- Automation and configuration management
- Microsoft developed a command line interface in 2002 called Monad
- Monad renamed PowerShell in 2006
- Made open-source and cross-platform in 2016
- Includes extensive help (similar to manpages)

```
Administrator: Windows PowerShell (x86)
Windows PowerShell
Copyright (C) 2014 Microsoft Corporation. All rights reserved.

PS C:\Windows\system32> update-help
PS C:\Windows\system32> get-help get-process -examples

NAME
    Get-Process

SYNOPSIS
    Gets the processes that are running on the local computer or a remote computer.

----- EXAMPLE 1 -----

PS C:\>Get-Process

This command gets a list of all of the running processes running on the local computer. For a definition of each
column, see the "Additional Notes" section of the Help topic for Get-Help.

----- EXAMPLE 2 -----

PS C:\>Get-Process winword, explorer | format-list *

This command gets all available data about the Winword and Explorer processes on the computer. It uses the Name
parameter to specify the processes, but it omits the optional parameter name. The pipeline operator (|) passes the
data to the Format-List cmdlet, which displays all available properties (*) of the Winword and Explorer process
objects.

You can also identify the processes by their process IDs. For example, "get-process -id 664, 2060".

----- EXAMPLE 3 -----

PS C:\>get-process | where-object {$_.WorkingSet -gt 20000000}

This command gets all processes that have a working set greater than 20 MB. It uses the Get-Process cmdlet to get
all running processes. The pipeline operator (|) passes the process objects to the Where-Object cmdlet, which
selects only the object with a value greater than 20,000,000 bytes for the WorkingSet property.

WorkingSet is one of many properties of process objects. To see all of the properties, type "Get-Process |
Get-Member". By default, the values of all amount properties are in bytes, even though the default display lists
them in kilobytes and megabytes.
```



PowerShell Cmdlets

These cmdlets give administrators the ability to manage their networks, but also allow for opportunities for attackers to compromise resources.

More information on cmdlets can be found here:

<https://learn.microsoft.com/en-us/powershell/scripting/developer/cmdlet/cmdlet-overview?view=powershell-7.2>

- **Active Directory (module):** This module is used by PowerShell to extend management capabilities to Active Directory objects, including computers, users, and groups and attributes stored within accounts.
- **Exchange Server (module):** This module is used by PowerShell to enable full administration of Exchange Servers. Included within the module are additional cmdlets that fully support all aspects of your Exchange email server.
- **Get-Help (cmdlet):** This built-in cmdlet within PowerShell core provides helpful information, including syntax use and examples of commands and what they accomplish.
- **Get-Command (cmdlet):** When executed, this built-in cmdlet within PowerShell core provides a list of commands that are available. It's useful in identifying which commands are available for each module.
- **Set-Variable (cmdlet):** This built-in cmdlet within PowerShell allows the user to create variables used to store data, such as file paths, multiple objects, or snippets of code you wish to reuse.
- **Invoke-Command (cmdlet):** This built-in cmdlet within PowerShell calls upon another cmdlet, usually run from a local computer, to execute the invoked command on remote computers.
- **Pipeline (|):** One of the features of PowerShell is the ability to chain commands together by means of the pipe character. Piping commands causes PowerShell to run the first part of the command and then output the results for use by the second command and so on until the entire sequence is run. It is useful when performing a multiple-step task, such as creating a username, adding the username to a security group, and resetting the default password.
- **Function ({ }):** Similar to the pipeline feature in that cmdlets may be linked together, functions allow for greater control over the scripting process. By wrapping cmdlets in braces, a function is created that serves to run the sequence one or more times.
- **Out-File (cmdlet):** This built-in cmdlet within PowerShell allows a command's output to be exported to a file. Typically used with the pipe feature, a user can get a list of user accounts that are disabled in Active Directory, for example, and export that list to a text file for future use.
- **Import-Module (cmdlet):** This built-in cmdlet within PowerShell imports one or more modules into PowerShell to further its feature set, cmdlets, and functionality.
- **Third-party Modules:** Software developers can program code to group multiple cmdlets together as Third-party modules that are imported into PowerShell to extend functionality and support for specific applications. Notable third-party modules exist from VMware (virtualization), Dell (PowerEdge servers), and PowerSploit (Security/Pentesting).



Threat Actors Using PowerShell

- APT19
- APT28
- APT29
- APT3
- APT32
- APT33
- APT38
- APT39
- APT41
- Aquatic Panda
- Blue Mockingbird
- BRONZE BUTLER
- Chimera
- Cobalt Group
- Confucius
- CopyKittens
- DarkHydrus
- DarkVishnya
- Deep Panda
- Dragonfly
- FIN10
- FIN6
- FIN7
- FIN8
- Fox Kitten
- Frankenstein
- GALLIUM
- Gallmaker
- Gamaredon Group
- GOLD SOUTHFIELD
- Gorgon Group
- HAFNIUM
- Inception
- Indrik Spider
- Kimsuky
- Lazarus Group
- LazyScripter
- Leviathan
- Magic Hound
- menuPass





Threat Actors Using PowerShell, part 2

- Molerats
- MuddyWater
- Mustang Panda
- Nomadic Octopus
- OilRig
- Operation Wocao
- Patchwork
- Poseidon Group
- Sandworm Team
- Sidewinder
- Silence
- Stealth Falcon
- TA459
- TA505
- TeamTNT
- TEMP.Veles
- Threat Group-3390
- Thrip
- Tonto Team
- Turla
- WIRTE
- Wizard Spider



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Protection/Defense Against PowerShell

- Options for defending against PowerShell:
 - Disable it if you don't need it
 - Block using Group Policy
 - Block using Security Policy
 - Disable access to PowerShell ISE
- The U.S. federal government recommends NOT disabling it due to its functionality
 - NSA/CISA/NSCS/NCSC-UK have provided guidance:
https://media.defense.gov/2022/Jun/22/2003021689/-1/-1/1/CSI_KEEPING_POWERSHELL_SECURITY_MEASURES_TO_USE_AND_EMBRACE_20220622.PDF



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Mimikatz

Post-exploitation credential theft tool



Mimikatz: Overview

“One of the world's most powerful password stealers” – Wired Magazine

- Released by Benjamin Delpy in 2011 (closed source)
 - Microsoft initially declined to fix the flaw it exploited (WDigest), noting that it requires access first
 - Mimikatz exploitation capabilities expanded beyond exploitation of WDigest in 2013
- Moscow, 2012
 - Hotel room incident: Russian attempt to acquire the code from his laptop
 - Conference incident: Russian demand that he provide code and presentation slides
 - Release of source code
- Repurposed for NotPetya
- Repurposed for BadRabbit

```
.#####.  mimikatz 2.0 alpha (x64) release "Kiwi en C" (Apr 26 2014 00:25:11)
.## ^ ##.
## / \ ## /* * *
## \ / ## Benjamin DELPY `gentilkiwi` ( benjamin@gentilkiwi.com )
'## v ##' http://blog.gentilkiwi.com/mimikatz           (oe.eo)
'#####'                                     with 14 modules * * */

mimikatz #
```

Image of Mimikatz prompt after initial startup.
Image source: Mimikatz GitHub page





Features of Mimikatz

Mimikatz began as a credential theft tool but has since been expanded with other capabilities.

What can Mimikatz do?



Pass-the-hash: Attackers use Mimikatz to pass an exact hash string to log in to the target computer.



Pass-the-ticket: Mimikatz provides functionality for a user to pass a Kerberos ticket to another computer and log in with that user's ticket.



Overpass-the-hash: This technique passes a unique key obtained from a domain controller to impersonate a user.



Kerberoast golden tickets: A golden ticket gives you non-expiring domain admin credentials to any computer on the network.



Kerberoast silver tickets: Kerberos grants a user a TGS ticket that's used to log into any services on the network.



Pass-the-cache: Generally the same as a pass-the-ticket, but uses the saved and encrypted login data on a Mac/UNIX/Linux system.

Image source:
Varonis



Mimikatz – Capabilities Mapped to MITRE ATT&CK

ATT&CK ID	Name
T1134	Access Token Manipulation: SID-History Injection
T1098	Account Manipulation
T1547	Boot or Logon Autostart Execution: Security Support Provider
T1555	Credentials from Password Stores
T1555	Credentials from Web Browsers
T1555	Windows Credential Manager
T1003	OS Credential Dumping: LSASS Memory
T1003	OS Credential Dumping: Security Account Manager
T1003	OS Credential Dumping: LSA Secrets
T1003	OS Credential Dumping: DCSync

ATT&CK ID	Name
T1207	Rogue Domain Controller
T1558	Steal or Forge Kerberos Tickets: Golden Ticket
T1558	Steal or Forge Kerberos Tickets: Silver Ticket
T1552	Unsecured Credentials: Private Keys
T1550	Use Alternate Authentication Material: Pass the Hash
T1550	Use Alternate Authentication Material: Pass the Ticket





How Popular is Mimikatz?

Mimikatz is referenced in the second season of the USA Network television show *Mr. Robot*, when one of the characters used it to compromise password credentials.



Season 2, episode 9 of the show *Mr. Robot*.
Image source: Eventsentry



Threat Actors Using Mimikatz

- APT1
- APT28
- APT29
- APT32
- APT33
- APT38
- APT39
- APT41
- FIN6
- FIN7
- Wizard Spider
- Kimsuky
- Threat Group-3390
- Cobalt Group
- menuPass
- Dragonfly
- Whitefly
- Tonto Team
- Chimera
- TEMP.Veles
- Magic Hound
- GALLIUM
- Thrip
- Blue Mockingbird
- BackdoorDiplomacy
- Operation Wocao
- Ke3chang
- MuddyWater
- Indrik Spider
- Turla
- Carbanak
- DarkHydrus
- OilRig
- Sandworm Team
- BRONZE BUTLER
- PittyTiger
- Cleaver
- Leafminer





Mimikatz: Defense

Mimikatz requires administrative access, and so if a threat actor is using it, the bigger problem would be that access.

Developing, implementing and enforcing basic administrative policies can help protect an enterprise network.

Four ways to defend against Mimikatz attacks:

- 1 Change admin privileges.
- 2 Change caching policy.
- 3 Turn off debugging privileges.
- 4 Increase local security authority.



Sysinternals

Windows system utilities that can be used for nefarious purposes

Sysinternals: Overview

- Advanced system utilities and resources, first developed in 1996 and acquired by Microsoft in 2006
- Dozens of tools, including:
 - File and Disk Utilities
 - Networking Utilities
 - Process Utilities
 - Security Utilities
 - System Information
 - Miscellaneous
- Some of the more noteworthy:
 - PSEXec
 - ProcDump
 - PSList



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Sysinternals Tools: File and Disk Utilities

AccessEnum

This simple yet powerful security tool shows you who has what access to directories, files and Registry keys on your systems. Use it to find holes in your permissions.

DiskExt

Display volume disk-mappings.

DiskMon

This utility captures all hard disk activity or acts like a software disk activity light in your system tray.

DiskView

Graphical disk sector utility.

Disk Usage (DU)

View disk usage by directory.

EFSDump

View information for encrypted files.

MoveFile

Schedule file rename and delete commands for the next reboot. This can be useful for cleaning stubborn or in-use malware files.

PendMoves

See what files are scheduled for deletion or rename the next time the system boots.

Process Monitor

Monitor file system, Registry, process, thread and DLL activity in real-time.

PsFile

See what files are opened remotely.

PsTools

The PsTools suite includes command-line utilities for listing the processes running on local or remote computers, running processes remotely, rebooting computers, dumping event logs, and more.

Sdelete

Securely overwrite your sensitive files and cleanse your free space of previously deleted files using this DoD-compliant secure delete program.

ShareEnum

Scan file shares on your network and view their security settings to close security holes.





Sysinternals Tools: Networking Utilities

AD Explorer

Active Directory Explorer is an advanced Active Directory (AD) viewer and editor.

AD Insight

AD Insight is an LDAP (Light-weight Directory Access Protocol) real-time monitoring tool aimed at troubleshooting Active Directory client applications.

AdRestore

Undelete Server 2003 Active Directory objects.

PipeList

Displays the named pipes on your system, including the number of maximum instances and active instances for each pipe.

PsFile

See what files are opened remotely.

PsPing

Measures network performance.

PsTools

The PsTools suite includes command-line utilities for listing the processes running on local or remote computers, running processes remotely, rebooting computers, dumping event logs, and more.

ShareEnum

Scan file shares on your network and view their security settings to close security holes.

TCPView

Active socket command-line viewer.

Whois

See who owns an Internet address.



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Sysinternals Tools: Process Utilities

Autoruns

See what programs are configured to startup during system boot. Displays list of Registry and file locations that contain auto-start settings.

Handle

This handy command-line utility will show you what files are open by which processes, and much more.

ListDLLs

List all the DLLs that are currently loaded, including where they are loaded and their version numbers. Version 2.0 prints the full path names of loaded modules.

PortMon

Monitor serial and parallel port activity with this advanced monitoring tool. Version 3.x has powerful new UI enhancements and advanced filtering capabilities.

ProcDump

This command-line utility is aimed at capturing process dumps of otherwise difficult to isolate and reproduce CPU spikes.

Process Explorer

Identify files, registry keys and other objects processes have open, and which DLLs they have loaded, and the process owner.

Process Monitor

Monitor file system, Registry, process, thread and DLL activity.

PsExec

Execute processes remotely.

PsKill

Terminate local or remote processes.

PsList

Show information about processes and threads.

PsService

View and control services.

PsTools

List processes running on local or remote computers, run processes remotely, reboot systems, dump event logs, and more.





Sysinternals Tools: System Information

AccessChk

This tool shows you the accesses the user or group you specify has to files, Registry keys or Windows services.

AccessEnum

This simple yet powerful security tool shows you who has what access to directories, files and Registry keys on your systems. Use it to find holes in your permissions.

Autologon

Bypass password screen during logon.

Autoruns

See what programs configured to startup during system boot. Displays list of Registry and file locations containing auto-start settings.

LogonSessions

List active logon sessions

Process Explorer

Find out what files, registry keys and other objects processes have open, which DLLs they have loaded, and more. This uniquely powerful utility will even show you who owns each process.

PsLoggedOn

Show users logged on to a system.

PsLogList

Dump event log records.

Rootkit Revealer

RootkitRevealer is an advanced rootkit detection utility.

Sdelete

Securely overwrite your sensitive files and cleanse your free space of previously deleted files using this DoD-compliant secure delete program.

ShellRunas

Launch programs as a different user via a convenient shell context-menu entry.

Sigcheck

Dump file version information and verify that images on your system are digitally signed.

Sysmon

Monitors and reports key system activity via the Windows event log.





Sysinternals Tools Used by Malicious Actors

- ProcDump
 - APT1
 - APT28
 - KE3chang
 - Lazarus Group
 - TG-3390
- PsList
 - KE3chang
 - Black Energy
 - APT33
 - APT34
 - APT35
- PsExec
 - Cleaver
 - Cobalt Group
 - Turla
 - Kimsuky
 - KE3chang
 - Indrik Spider
 - DarkVishnya
 - CostaRicto
 - menuPass
 - OilRig
 - Threat Group-1314
 - Night Dragon
- GALLIUM
- BlackTech
- Magic Hound
- Leafminer
- Chimera
- Dragonfly
- TEMP.Veles
- HAFNIUM
- Sandworm Team
- Carbanak
- Wizard Spider
- Naikon
- Fox Kitten
- Thrip
- Black Energy
- APT1
- APT29
- APT33
- APT34
- APT35
- APT39
- FIN5
- FIN6





AnyDesk

Remote Desktop Software used for good and evil



AnyDesk: Overview

- Yet another way attackers will compromise remote desktop technologies
- Facilitates legitimate uses:
 - Remote access to several operating systems (Windows, macOS, Linux, as well as mobile platforms)
 - File transfers
 - Virtual private network services
 - Auto-discovery
 - Session protocol
- Leverages TLS 1.2 and AES-256
- Utilized by ransomware operators





Elicit Usage of AnyDesk

AnyDesk has garnered attention for its abuse in recent months, utilized especially to deliver ransomware to targets.

- Per Sophos (December 2021), the [AvosLocker Ransomware gang is using AnyDesk to deploy ransomware](#).
- Per [FBI \(March 2022\)](#), AvosLocker continues to leverage AnyDesk for ransomware.
- Per [Broadcom \(December 2021\)](#), Babuk ransomware leverages fake AnyDesk sites to deploy ransomware.
- Per [Asec \(July 2022\)](#), AnyDesk is being used in cyberattacks.
- Per the [DFIR Report \(December 2021\)](#), Bazarloader uses AnyDesk to deploy ransomware.
- Solution: Secure use of remote tools in your organization.
 - Limit people, times and port access as much as possible.

“...even if the ransomware fails to run, until every trace of the attackers’ AnyDesk deployment is gone from every impacted machine, the targets will remain vulnerable to repeated attempts...”
— Sophos





Brute Ratel

“Customized command and control center for red team and adversary simulation”



Brute Ratel: Overview

Provides adversary emulation, attack timelines and graphs, as well as OpSec features.

- Features:
 - SMB and TCP payloads for functionality to write custom external C2 channels over legitimate sites such as Slack, Discord, MS Teams
 - Built-in debugger to detect EDR userland hooks
 - Hide memory artifacts
 - Direct Windows SYS calls
 - Egress over HTTP, HTTPS, DNS Over HTTPS, SMB, TCP
 - GUI interface to analyze
 - LDAP queries to domain/forest.
 - Multiple C2 channels, pivot options such as SMB, TCP, WMI, WinRM and managing remote services over RPC
 - Screenshots.
 - x64 shellcode loader
 - Reflective & object file loader
 - Decoding KRB5 ticket and converting it to hashcat
 - Patching Event Tracing for Windows (ETW) and Anti Malware Scan Interface (AMSI).
 - Create Windows system services.
 - Upload and download files.
 - Create files via CreateFileTransacted.
 - Port scans



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Brute Ratel: Elicit Use and Defense

- Unit42: [“While this capability has managed to stay out of the spotlight and remains less commonly known than its Cobalt Strike brethren, it is no less sophisticated”](#)
- Per AdvIntel CEO Vitali Kremez, [“ex-Conti ransomware members have also started to acquire licenses by creating fake US companies to pass the licensing verification system.”](#)
- Sophos (July 14): [BlackCat ransomware operators leveraging Brute Ratel](#)
- Most importantly, [Brute Ratel was cracked, and the source code was leaked](#) for anyone to leverage. It is now being leveraged by a group that has attacked healthcare.
- Mitigation actions are similar to Cobalt Strike – challenging to mitigate against a versatile tool.
- Part of building a defense against Brute Ratel will be maintaining situational awareness of both its developing capabilities and its increasing use.
- Monitor both open source and proprietary threat feeds for possible indicators of compromise.





Conclusions

- The tools in this presentation represent especially challenging security issues.
 - Mitigating the risk associated with them is not as simple as deploying a patch or reconfiguring an application.
 - Several of them are resident on common systems, making them even more challenging to detect when used maliciously.
- This list is not comprehensive, but simply highlights some of the more common and powerful tools that have a legitimate and valuable purpose but are also abused.
- This presentation is neither an endorsement nor a condemnation of these tools – each healthcare organization should evaluate these tools against their own risk posture and make decisions to employ them accordingly.



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Questions

FAQs

Upcoming Briefing

- 11/3 – Iranian Threat Actors

Product Evaluations

Recipients of this and other Healthcare Sector Cybersecurity Coordination Center (HC3) Threat Intelligence products are **highly encouraged** to provide feedback. To provide feedback, please complete the [HC3 Customer Feedback Survey](#).

Requests for Information

Need information on a specific cybersecurity topic? Send your request for information (RFI) to HC3@HHS.GOV.

Disclaimer

These recommendations are advisory and are not to be considered as federal directives or standards. Representatives should review and apply the guidance based on their own requirements and discretion. The HHS does not endorse any specific person, entity, product, service, or enterprise.



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About HC3

The Health Sector Cybersecurity Coordination Center (HC3) works with private and public sector partners to improve cybersecurity throughout the Healthcare and Public Health (HPH) Sector. HC3 was established in response to the Cybersecurity Information Sharing Act of 2015, a federal law mandated to improve cybersecurity in the U.S. through enhanced sharing of information about cybersecurity threats.



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What We Offer

Sector and Victim Notifications

Direct communications to victims or potential victims of compromises, vulnerable equipment, or PII/PHI theft, as well as general notifications to the HPH about current impacting threats via the HHS OIG.

Alerts and Analyst Notes

Documents that provide in-depth information on a cybersecurity topic to increase comprehensive situational awareness and provide risk recommendations to a wide audience.

Threat Briefings

Presentations that provide actionable information on health sector cybersecurity threats and mitigations. Analysts present current cybersecurity topics, engage in discussions with participants on current threats, and highlight best practices and mitigation tactics.



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