Flip the Script

Microsoft‘s Incident Response Language

Jared Atkinson, Specter Ops

Agenda

- Defensive PowerShell
- Security Models
- Threat Hunting
- Gather
  - CIMSweep
  - PSGumShoe
  - Uproot
- Analyze
- Investigate
  - PowerForensics

Black Eye for the Blue Shell

PowerShellEmpire

http://www.PowerShellEmpire.com

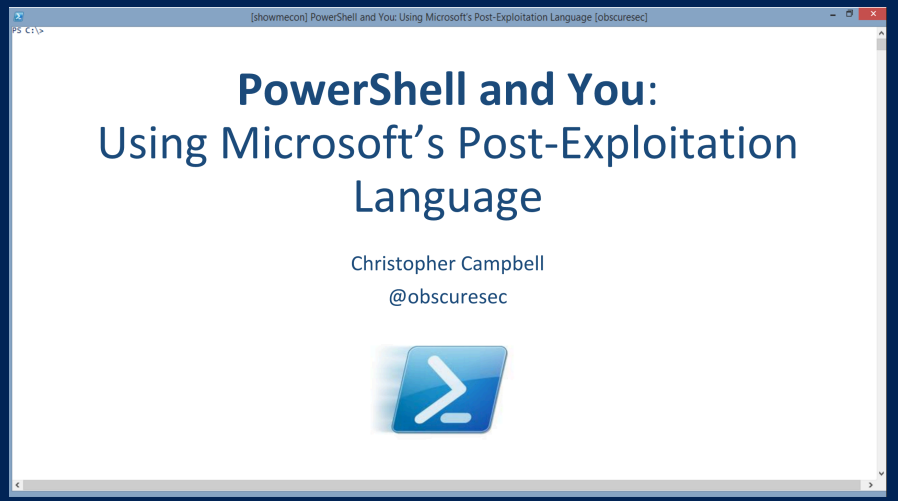
"The best tool these days for understanding windows networks is Powerview [1]."

-Phineas Fisher
http://pastebin.com/raw/0SNSvyjJ

PowerShellMafia / **PowerSploit**

Code | Issues 9 | Pull requests 5 | Pulse | Graphs

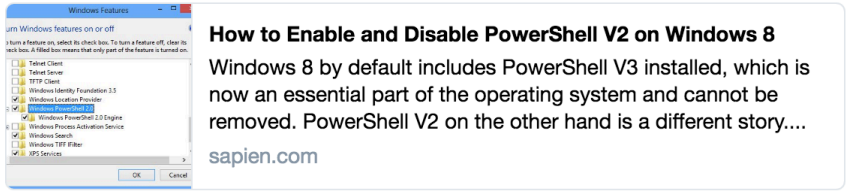
PowerSploit - A PowerShell Post-Exploitation Framework

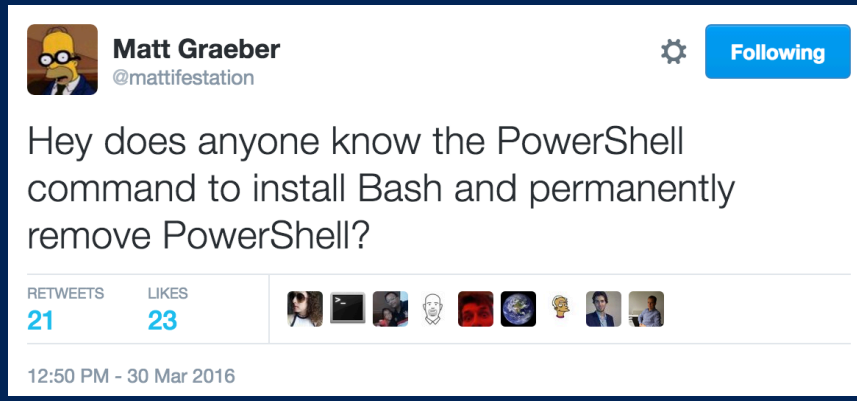


To Disable or Not To Disable…

Advising my customers to disable powershell using imagefileexecutionoptions until MS block this functionality or av vendors catchup.

I see more and more malware uses Powershell for its execution. Just disable it. You don't need it anyway.





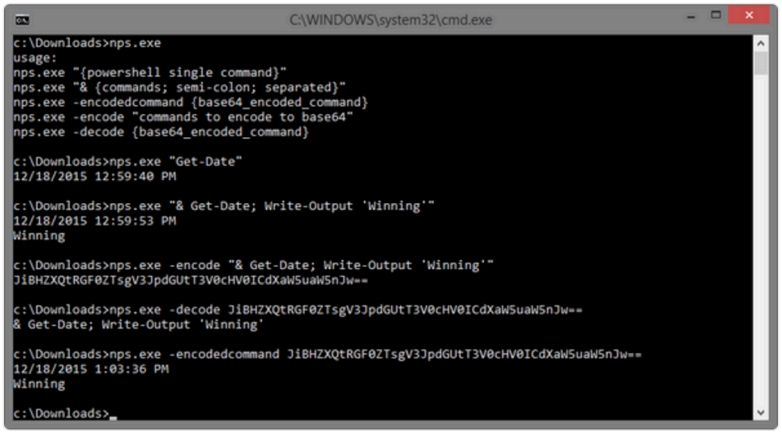
Question for pentesters/IT admins: Do you all disable Powershell, or see it being disabled on networks?

Where there's a will there's a way…

Ben Ten (0xA)
@Ben0xA

Following

I give you "Not PowerShell" (nps). Nice when you can drop a binary, also has encode/decode
github.com/Ben0xA/nps



Casey Smith
@subTee

Following

This is solid work by @jaredcatkinson
Remote PowerShell Exec as System via WMI.
Testing it more this morning.

leechristensen / **UnmanagedPowerShell**

Code | Issues 0 | Pull requests 0 | Wiki | Pulse | Graphs

Executes PowerShell from an unmanaged process

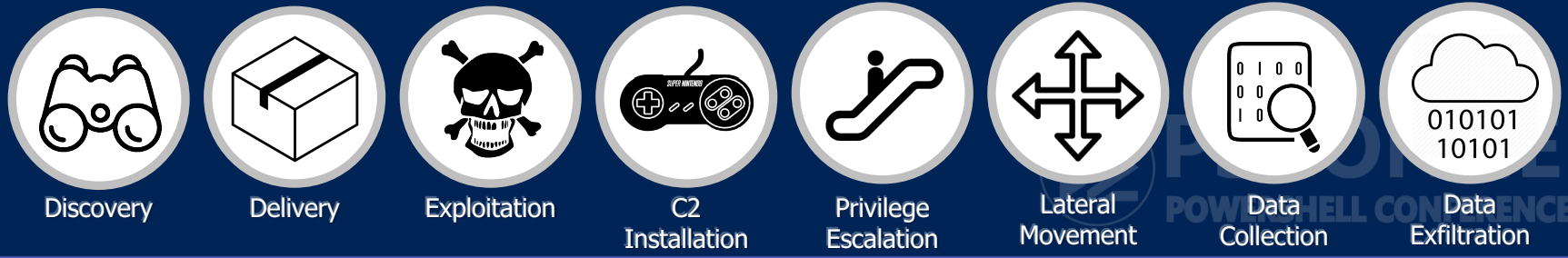
PS>Attack

build passing

A portable console aimed at making pentesting with PowerShell a little easier.

Cyber Kill Chain

- Discovery
- Delivery
- Exploitation
- C2 Installation
- Privilege Escalation
- Lateral Movement
- Data Collection
- Data Exfiltration

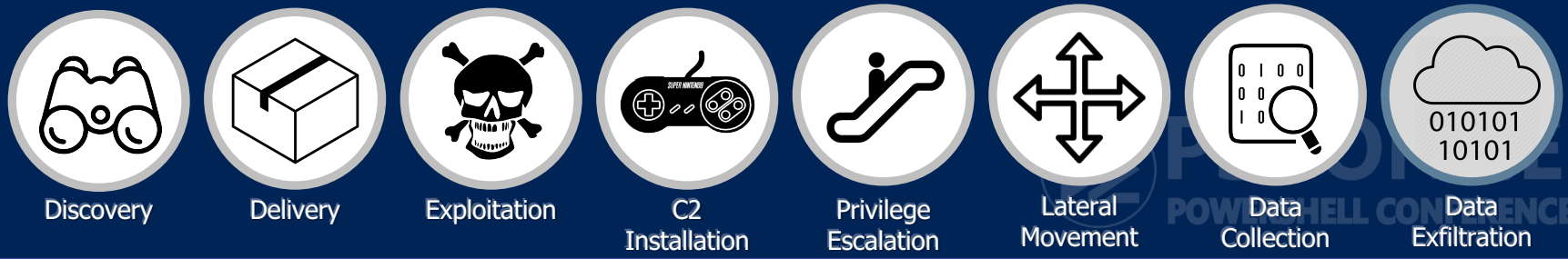


Defense in Depth

- Stop the attack before it happens!
- Defense in Depth
  - Firewall
  - Anti-Virus
  - Web Proxy
  - Signature based Intrusion Detection Systems
- Users are weakest link
  - Attackers target humans to bypass technical controls
  - "...more than two-thirds of [Cyber Espionage] incidents ... have featured phishing." -Verizon

Incident Response

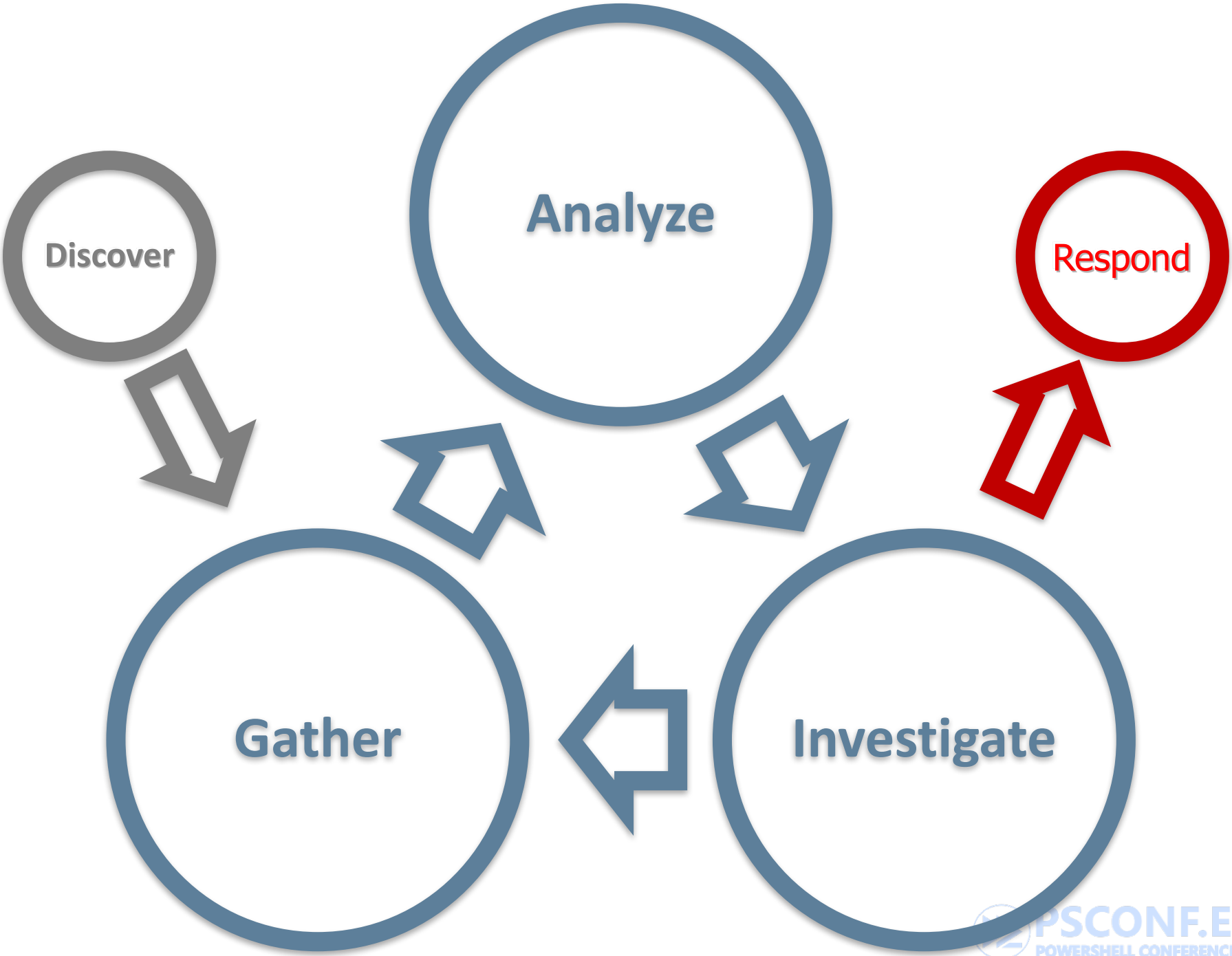
- Initiated by:
  - Network security monitoring alerts
  - Third party notification
  - Public disclosure
- Focuses on incident post-mortem
  - How did the attacker get in?
  - What data was taken?
  - What is the scale of attacker footprint?
  - Remediation
- Often too late to alleviate repercussions



Is something missing?

Threat Hunting

- Rooted in the Assume Breach ideology
  - Determined adversaries can and will gain access to YOUR network
- Focuses on portion of kill chain between exploitation and exfiltration
- Proactively search for attacker actions (tactics) on network
- Defense with an Offensive Mindset
  - Covert
  - Step ahead of adversary
  - Plugging holes in the traditional defenses



Gather

- Gather host data from endpoints
  - Auto Start Entry Points
  - Evidence of Code Injection

  - Processes (Creation/Termination)
  - Services (Creation/Modification/Deletion)
  - Network Connections (Creation)
  - Registry (Writes/Reads/Deletes)
  - Files System details
  - Logs

Gather Protocols (Supported by PS)

- WMI
  - Available since Windows 95
  - (Almost) always available on network
  - Data is limited to WMI classes
- WinRM
  - Downlevelable to Windows XP (kind of)
  - Unlocks remote PowerShell functionality (.Net and Win32 API)

To Pull or To Push

- Pull
  - Pros
    - Little to no setup required
    - Great for long lasting artifacts
      - Auto Start Entry Points
      - Injected Code
  - Cons
    - Relatively slow
    - Redundant data points
    - Blind to activity between "pulls"
  - Example Projects:
    - CIMSweep
    - PSGumshoe
    - Infocyte (commercial)
- Push
  - Pros
    - Near real-time
    - Distributed
    - No missed events
  - Cons
    - Requires "agent" on endpoints
  - Example Projects:
    - Sysmon + WEF
    - Uproot
    - Carbon Black (commercial)

Value of WinRM

- Single port (5985/5986)
- Encrypted by default
- Enables numerous valuable capabilities
  - PowerShell Remoting (Pull)
  - Windows Event Forwarding (Push)
- Provides alternative to vulnerabilities of current admin protocols
  - SMB
    - Many of the most prolific exploits have targeted this service
      - MS 08-067 (CONFICKER)
      - MS 17-010 (ETERNALBLUE)
  - RDP
    - Interactive logon (exposes administrator credentials to be stolen)

CimSweep - Pull

- CIM/WMI-based tools that enables the ability to perform hunting operations remotely across all versions of Windows
- Built on PowerShell's CIM cmdlets
  - Can use DCOM or WSMan for transport
  - WMI is running by default on Windows 2000 and later OS's
  - CIM Sessions can be established once and reused to speed up Sweeps

www.github.com/PowerShellMafia/CimSweep

PSGumshoe - Pull

- Windows PowerShell module for the collection of OS and domain artifacts for the purposes of performing live response, hunt, and forensics.
  - Analytic Scripts (Damerau-Levenshtein)
  - Artifact (Named Pipes)
  - Attacker Techniques (Get-InjectedThread)
- Transport agnostic
- Backward compatible
- Call to Action

https://github.com/PSGumshoe/PSGumshoe

Get-InjectedThread

- Built on PSReflect
- PowerShell function to identify injected threads via detection methodology:
  - Use Windows Toolhelp API to get all threads
  - Iterate through each thread
  - Identify the thread's Base (Memory) Address
  - Query the memory page for the Base Address
  - if ($_.State -eq MEM_COMMIT -and $_.Type -ne MEM_IMAGE)
- Returns details regarding offending process and thread

Get-InjectedThread Demo

https://youtu.be/9TIxt0Z3iZI

Uproot - Push

- WMI based Intrusion Detection System
- Leverages WMI Permanent Event Subscriptions to detect/report:
  - General System Information
  - Introduction of Persistence
  - Lateral Movement
- Reports Events via:
  - Windows Event Log (Windows Event Forwarding)
  - HTTP POST

www.github.com/Invoke-IR/Uproot

Uproot Demo

https://youtu.be/uBKeG1GEh8s

Analyze - Your SIEM of Choice

1. Identify and (sometimes) exclude known goods
2. Identify and report known bad activity
3. Tactics, Techniques, and Procedures (TTP)
   - MITRE ATT&CK (attack.mitre.org)
4. Least Frequency of Occurrence (compared to peers)
   - The “WinUpdate” service is running on 1 of 10,000 endpoints
5. First Seen
   - Connections to never before seen domains
6. Identify unknown unknowns that need further investigation
   - Avoid polarizing words like “malicious”, “indicator”, or “finding”
   - Use words like “item of interest” or “anomaly”

Investigate

- Determine context surrounding events identified in the Analyze phase
  - Data Pivoting
    - Network Connections
    - Running Processes
    - Persistence Locations
  - Temporal context (Timelining)
    - File System activity
  - Historical context
    - Event Logs
    - Proxy Logs

PowerForensics

- C# PowerShell based Forensic Toolkit
- Allows inspection of NTFS and FAT data structures
- Create an event timeline based on forensic artifacts
  - File Operations
  - Registry Activity
  - Program Execution
  - User Activity
- Upcoming HFS+ and EXT4 File System Support

www.github.com/Invoke-IR/PowerForensics

PowerForensics Demo

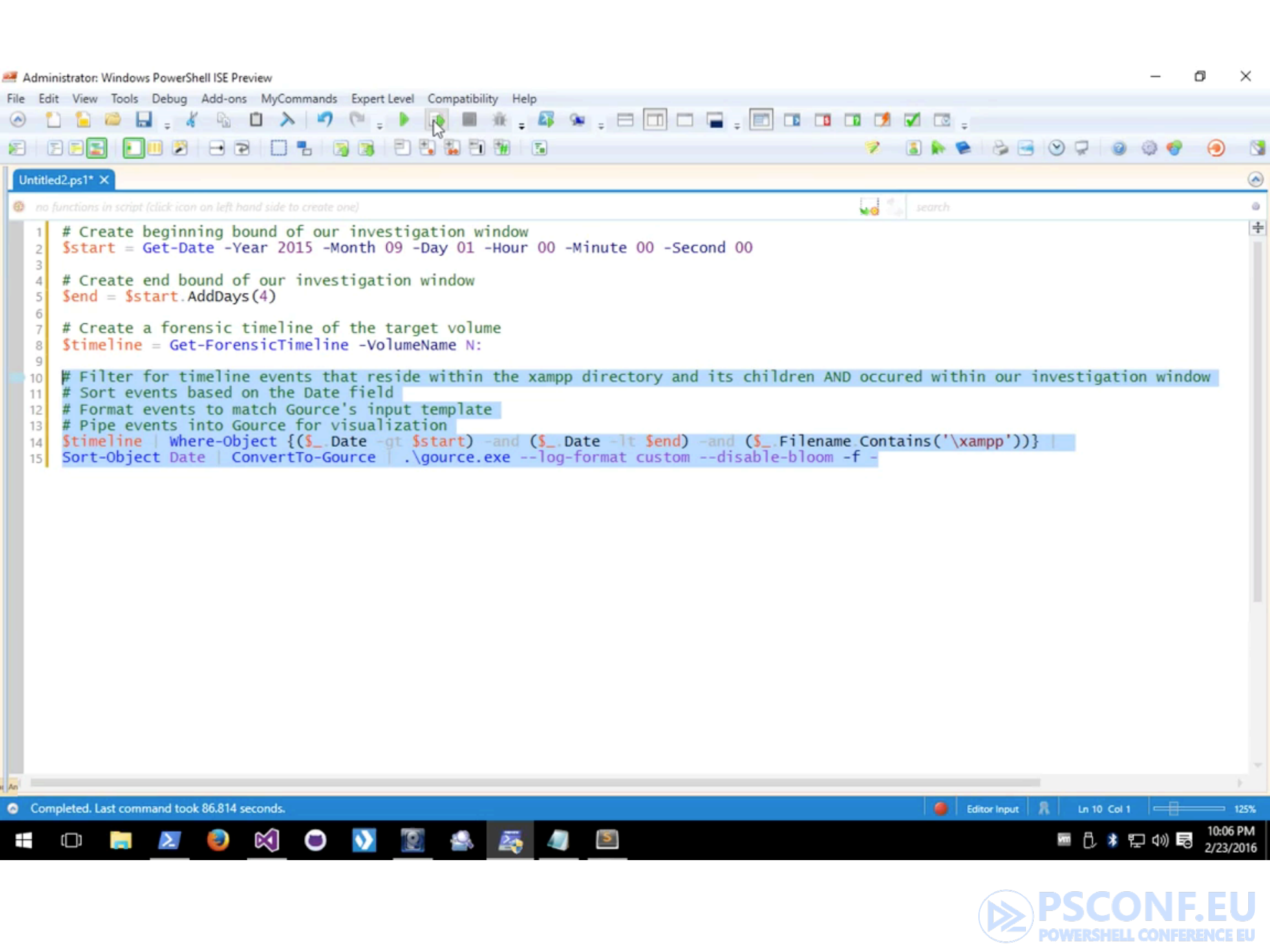
This demo is based on the @security4arabs Digital Forensics challenge by @binaryz0ne. Please visit http://goo.gl/CVoEpo to download a copy of the challenge.

https://youtu.be/H7clQOhbHIQ

Timeline Visualization Demo

This demo builds on work by @_RyanBenson . For more information on leveraging Gource for timelining, please see Ryan's blog post https://www.obsidianforensics.com/blog/visualizing-usn-journal-activity

https://youtu.be/v5mYegFG1DA



Summary

- PowerShell for Threat Hunting
- Gather -eq Push or Pull
  - CIMSweep
  - PSGumShoe
  - Uproot
- Investigate
  - PowerForensics

Questions?

About_Author

- Jared Atkinson
  - Technical Director, Adversary Detection – Specter Ops LLC
  - Former
    - U.S. Air Force Hunt (2011 – 2015)
    - Veris Group's Adaptive Threat Division (2015-2017)
  - 2015 Black Hat Minesweeper Champion
  - Microsoft MVP (Cloud and Datacenter Management/PowerShell)
  - Open Source Developer
    - PowerForensics
    - Uproot IDS
    - PSGumShoe
  - Researcher of forensic artifact file formats