PowerShell Conference EU 2016

Creating an Agent-less Host Intrusion Detection System using PowerShell and WMI

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About_Author

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- Hunt Technical Lead for Veris Group's Adaptive Threat Division
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- 2015 Black Hat Minesweeper Champion
- Moderator of PowerShell.com "Security Forum"
- Open Source Developer
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  - Uproot IDS

Agenda

- Introduktion to Uproot
  - Project Inspiration
- WMI Eventing Refresher
- Signature Development Methodology
  - Event Enumeration Demo
  - Signature Developmetn Demo
- Uproot Demo
- Questions

What is Uproot?

- Uproot (www.github.com/Invoke-IR/Uproot)
  - Host based Intrusion Detection System built on permanent WMI event subscriptions
  - Leverages WmiEvent module to easily manage subscriptions
- WmiEvent (www.github.com/Invoke-IR/WmiEvent)
  - PowerShell module that abstracts the complexities of permanent WMI event subscriptions

Why are we here?

- Matt – Some colleagues were investigating a breach involving WMI persistence and I was asked how one would effectively detect the creation of permanent WMI event subscriptions.

- Jared – As a consultant, we are often not allowed to dictate configuration changes or software additions, but are responsible for near real-time monitoring. Permanent WMI event subscriptions offer support across all versions of Windows (past and present) for monitoring system changes as they happen.

Refresher – Event Classes

Two types of event classes:

- Extrinsic:
  - "not linked to changes in the WMI data model"[1] – i.e. provider specific
  - Does not require a polling interval – i.e. no missed firings
  - Limited set
  - E.g. RegistryKeyChangeEvent
- Intrinsic:
  - "occurs in response to a change in the standard WMI data model"[1]
  - Requires polling interval – i.e. can miss firings
  - Limited only by the classes present in the WMI repository
  - E.g. InstanceCreationEvent

[1] – "Determining the Type of Event to Receive" https://msdn.microsoft.com/en-us/library/windows/desktop/aa390355(v=vs.85).aspx

Refresher – Events

- Local WMI events
  - Register-WmiEvent, Register-CimIndicationEvent
- Permanent WMI events
  - Set-WmiInstance, New-CimInstance
  - Requires the following instances:
    1. __EventConsumer – e.g. CommandLineEventConsumer
    2. __EventFilter – WMI event query
    3. __FilterToConsumerBinding

Refresher – __EventFilter

- Intrinsic event filter example:
  - SELECT * FROM __InstanceModificationEvent WITHIN 5 WHERE TargetInstance ISA 'Win32_Service' and TargetInstance.State = 'Running‘
  - SELECT * FROM __InstanceCreationEvent WITHIN 10 WHERE TargetInstance ISA 'Win32_StartupCommand'
- Extrinsic event filter example:
  - SELECT * FROM Win32_VolumeChangeEvent WHERE EventType = 2
  - SELECT * FROM Win32_ProcessStartTrace WHERE ProcessName LIKE '%chrome%'

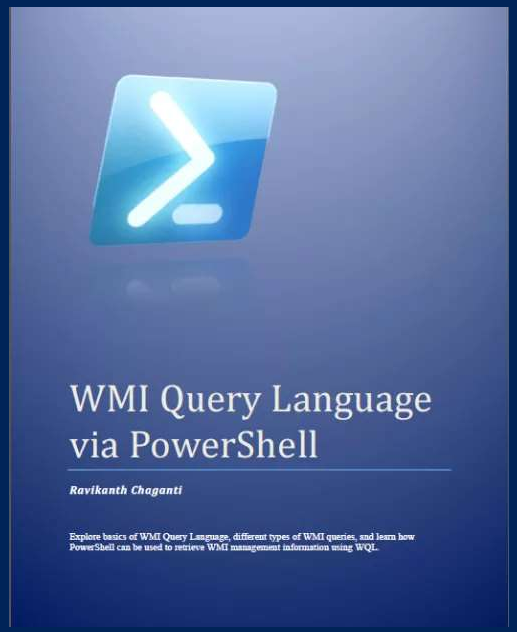
Refresher – __EventConsumer

Standard event consumers

- LogFileEventConsumer
- ActiveScriptEventConsumer
- NTEventLogEventConsumer
- SMTPEventConsumer
- CommandLineEventConsumer

WMI Query Language via PowerShell

http://www.ravichaganti.com/blog/publications/ebook-wmi-query-language-wql-via-powersahell/



"Signature" Development – Methodology

- Identify what you'd like to detect.
  - i.e. Identify common attacker actions
  1. Service creation
  2. Registry persistence – think Autoruns
  3. Lateral movement
  4. WMI persistence
  5. Etc.
- Consider if there is already current detection
  - Event log entries
  - Command-line auditing
  - Applocker

"Signature" Development – Methodology

1. Prioritize utilization of extrinsic event classes
   - No chance of missing events – no polling interval required

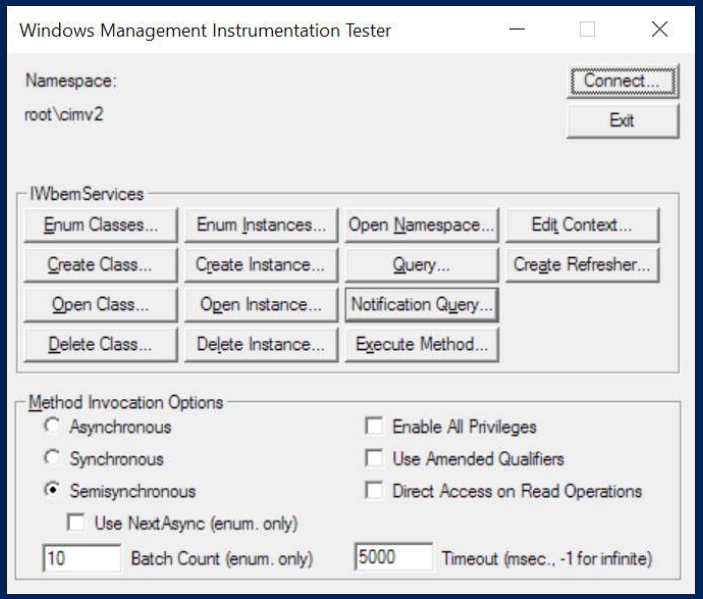
2. Fall back to intrinsic events if necessary

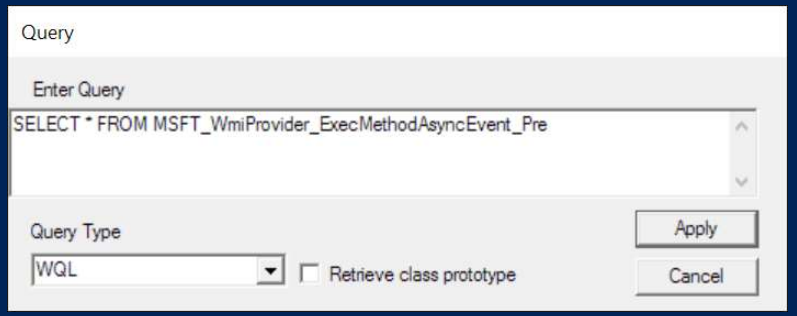
But how do I know what events are available???

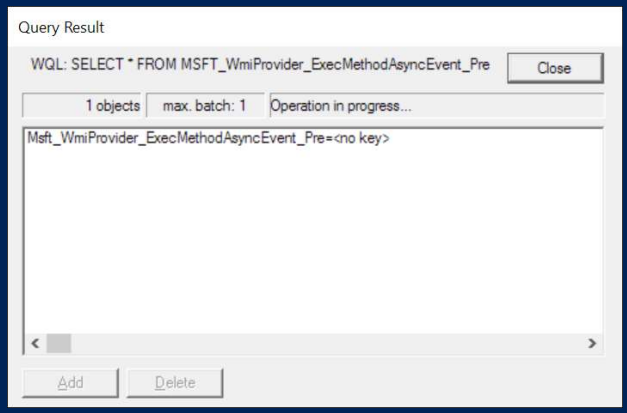
- PowerShell, of course!

Event Enumeration Demo

“Signature” Development – Methodology







wbemtest.exe

“Signature” Development – Scenario

- You have a good idea of attacker actions but you don’t have a specific WMI class for detection in mind.
  - E.g. lateral movement
  - Is there a Win32_LateralMovement class??? No. ☹
- Let’s explore a bit and see if there are any events that stand out.
- Some creativity required…

Demo time

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Signature Development Demo

“Signature” Development – Methodology

- As a result of exploring extrinsic events, we came up with some of the following signatures:
  1. SELECT * FROM MSFT_WmiProvider_ExecMethodAsyncEvent_Pre WHERE ObjectPath="Win32_Process" AND MethodName="Create"
  2. SELECT * FROM MSFT_WmiProvider_ExecMethodAsyncEvent_Pre WHERE ObjectPath="StdRegProv"
  3. SELECT * FROM Win32_ModuleLoadTrace WHERE FileName LIKE "%System.Management.Automation%.dll%"
  4. SELECT * FROM __ClassCreationEvent
  5. SELECT * FROM MSFT_WmiProvider_CreateInstanceEnumAsyncEvent_Pre WHERE ClassName="Win32_Process"

Uproot Demo

Questions?