CROWDSTRIKE

INVESTIGATING INTRUSIONS AT ADVERSARY SPEED

CHRISTOPHER WITTER, SENIOR MANAGER FALCON OVERWATCH

- Intro
- The Problem
- Example Intrusion Timeline
- The Keys to Success
- The Technologies
- Winning!

INTRO

- DFIR since early 2000s
  - Service Providers
  - Financial Institutions
  - Defense and Government
- 2 x DFIR Summit Speaker (USA)
- Manager Falcon Overwatch
  - International Team of Hunters \ Intrusion Analysts
- Outdoor Enthusiast

THE PROBLEM

- Adversaries can compromise hosts at a rate faster than we can investigate and respond with reasonable accuracy in a timely fashion. Traditional tools and methods don't scale to meet the demands of today's intrusions.
  - 15-30 minutes timeline for a smash and grab
  - 10-20 hosts impacted
  - Mixed TTPs
    - Powershell
    - Custom tools
    - Built in operating system commands

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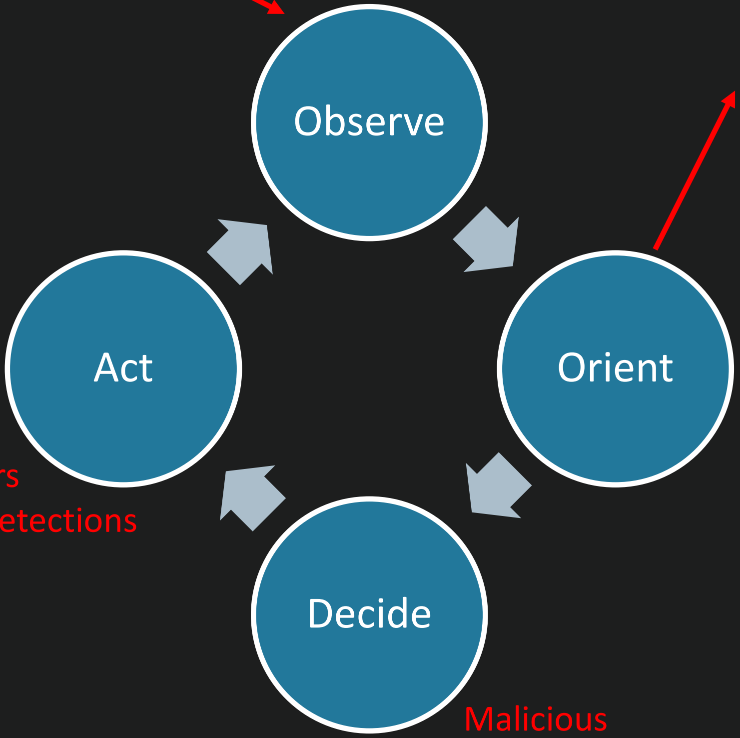
YOUR OODA LOOP

Detections



Start IR
Block Indicators
Add/Change detections

Malicious
Suspicious
Benign

(1) Understand the detection mechanism

(2) Review the detection details

(3) What’s normal for this computer\user

(4) What’s normal for this segment\BU

(5) What’s normal across the environment

(6) Peer review

EXAMPLE INTRUSION TIMELINE

Stage	Actor	Date Added	Host Name	Date (UTC)	Activity
1	[redacted]	[redacted]/2015	[redacted]171	2015- 26T16[redacted]Z	[redacted]"C:\Program Files (x86)\Google\Chrome\Application\chrome.exe" -- "https://[redacted]354.ZIP"
	[redacted]	[redacted]/2015	[redacted]140	2015- 26T18[redacted]Z	C:\Windows\System32\cmd.exe /c net use \\docs.live.net@[redacted] /U:[redacted]@outlook.com
3	[redacted]	[redacted]/2015	[redacted]140	2015- 26T18[redacted]Z	C:\Windows\system32\cmd.exe /c "reg add HKCU\Software\Microsoft\Windows\CurrentVersion\Run\ /f /v "AdobeARM" /t REG_SZ /d "C:\Users[redacted]AdobeARM.exe""
3	[redacted]	[redacted]/2015	[redacted]140	2015- 26T18[redacted]Z	powershell.exe -windowstyle hidden -enc Uw[redacted]C AA[redacted]3w AE[redacted]A=
3	[redacted]	[redacted]/2015	[redacted]140	2015- 26T18[redacted]Z	C:\Windows\system32\cmd.exe /c "whoami"
3	[redacted]	[redacted]/2015	[redacted]140	2015- 26T19[redacted]Z	"C:\Windows\System32\cmd.exe" /c dir /s /b \\network.local\SYSVOL > C:\Users\[redacted]\AppData\Local\Temp\waudit\dc\network.local\network.local.txt

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TRADITIONAL ANALYSIS:

- Network Forensics:
  - Intrusion Detection
  - Full PCAP
  - DNS Logs
  - Proxy Logs
- Disk Forensics:
  - Encase
  - Autopsy
  - FTK
  - X-Ways
- Memory Forensics:
  - Volatility
  - RedLine
- Windows Log Analysis

KEYS TO SUCCESS

- Reduce your time to **Orient**
- Increase what you have at your disposal to **Decide**
- Decrease your time to **Action**

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REDUCE YOUR TIME TO **ORIENT**

- Automate repetition
  - Evidence collection
  - Data enrichment
- Bring the data closer to your analyst
  - Unified views
  - Workflow automation
  - Context rich sources of information

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INCREASE WHAT YOU HAVE … TO **DECIDE**

- Our Example Intrusion Timeline:
  - Full PCAPS required to extract artifacts from initial infection, exfiltration determination
  - DNS or Proxy logs for C2 determination
  - Registry Analysis for Persistence
  - Powershell logging to determine intent and actions taken by the script
  - Memory Dumps
  - Traditional forensics
    - Timeline generation
    - Carve or capture reconnaissance files
    - Command line executions …maybe

THE TECHNOLOGIES: PART 1

- Endpoint Polling \ Forensics – targeted post incident collection or polling of forensic artifacts.
  - Commercial:
    - Mandiant MIR
    - Encase Endpoint Investigator
  - Opensource \ Free
    - Crowd Response
    - Google Rapid Response (GRR)
    - Creative administrative solutions

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END POINT POLLING \ FORENSICS

- Pros:
  - Easy to implement
  - Low storage requirements
  - Targeted collection
  - Leverages more traditional skills and analysis techniques
  - Faster than traditional forensics
- Cons:
  - Slower than EDR
  - Requires separate network collection
  - Need separate Network infrastructure for network logs etc.
  - Can’t tie network events to processes

CROWD RESPONSE

- Scan all running processes, loaded DLLs
- Scan on-disk image binaries
- Scan arbitrary files and folders
- YARA detection engine
- Collect Task Scheduler & AT jobs, Registry, SHIM Cache, Pre\SuperFetch
- Limit scanning by regular expression
- Download rules from a central URL
- Splunk App available for data ingestion

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CROWD RESPONSE

- Pros:
  - Detection capabilities
  - Enables Hunting for known \ unknown (Frequency analysis)
  - Splunk ingestion App w/prebuilt dashboards
- Cons
  - Missing some required traditional artifacts
    - Windows logs
    - MFT

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THE BARE MINIMUM TO **DECIDE**

- Process information OR Command Lines
- Windows event logs OR Login information (type of login: Remote, Interactive, Network, etc)
- Powershell logs (PS 5.0) OR Command Lines
- Registry persistence keys
- Full PCAP OR (DNS, Proxy, and Network Flow information)

THE TECHNOLOGIES: PART 2

- Endpoint Detection and Response (EDR) – real time streaming of operating system events (process creation, files written, registry changes, DNS events, user identity events, and network events, etc.)
  - Commerical:
    - CrowdStrike Falcon Host (Windows, OSX, Linux)
    - Carbon Black (Windows, OSX, Linux)
    - Windows Defender ATP (Windows 10 only)
  - Opensource \ Free:
    - Lima Charlie (Multi-platform, contains detection components)
    - Sysmon (Windows logging only)
    - Windows Event Forwarding (Windows only)

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ENDPOINT DETECTION RESPONSE (EDR)

- Pros:
  - Process information - > CMD LINES
  - Network information
  - DNS information
  - File writes
  - Registry changes
  - Detection components
  - Linkage between events
  - Logon information
  - One team, one tool
- Cons:
  - Events can be voluminous
  - Depending on the solution may require significant tuning to start
  - Data storage, searching, and analytics requirements vary and impacts on privacy laws based on country

SYSMON

- Process Creations
  - Parent \ Child relationships
  - Hashes of processes, loaded DLLs & drivers
- Network Connections (Ties it to source process)
  - Source \ Destination
  - Ports
  - Hostnames
- File creation times

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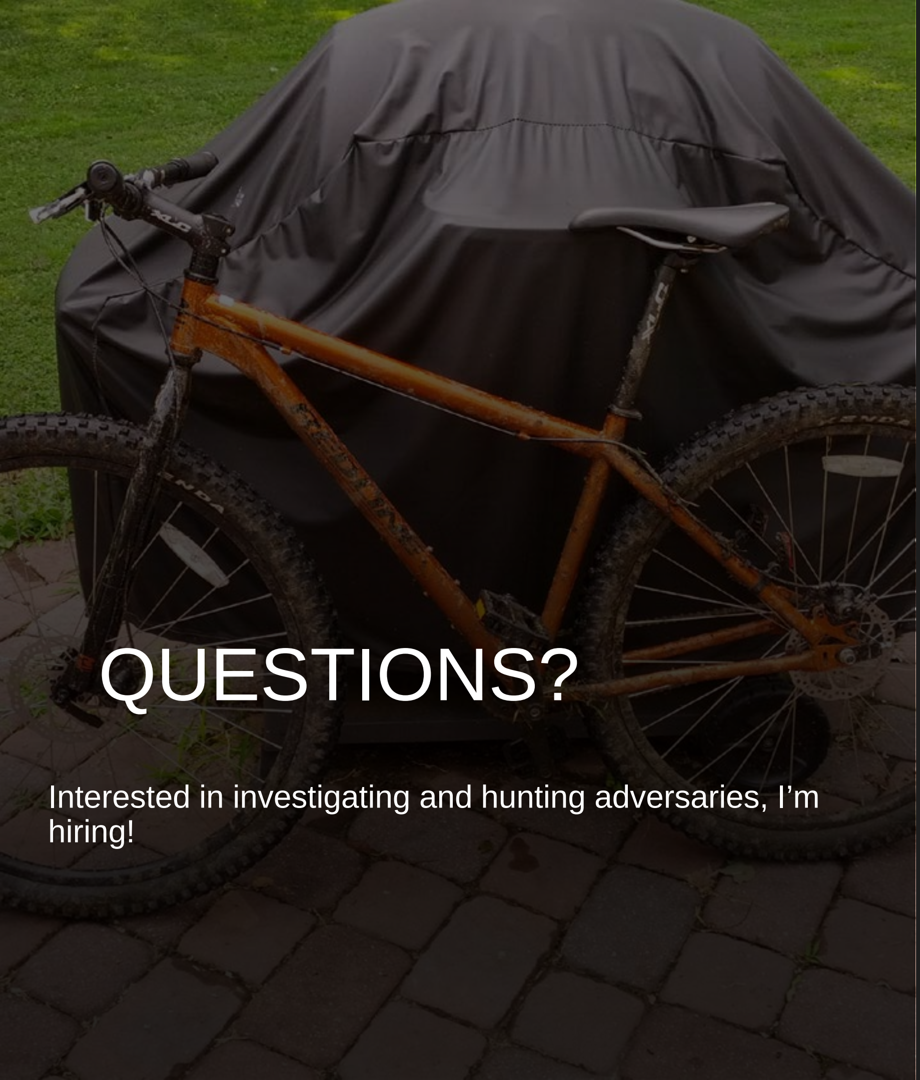
SYSMON

- Pros:
  - Free (Windows 7 +, Windows Server 2012 +)
  - A great data source for hunting
  - Can be stored locally or sent to central collection points
  - COMMAND LINES
  - Splunk Add-ons
- Cons:
  - Windows Only
  - Missing Registry artifacts
  - Will need extensive tuning based on environment
  - No built in detection capabilities
  - Should be supplemented with additional windows logs
    - Powershell logs Optional (with the command line arugments you would gain very little)
    - Windows Event logs (logon events, etc.)

EDR = WINNING

- EDR
  - Single Data OR minimal data sources - > reduced **ORIENT**
  - Streaming data - > reduced **ORIENT**
    - Real time or near real time situational awareness
  - Increased Contextual awareness - > reduced **DECIDE**
    - Did they open the attachment?
    - What did they get?
    - We recovered the exfil files but they're password protected and encrypted. Do we have the password?
    - What process made the connection to the C2?
    - No longer need to interview employees for "context"
  - Story time!



QUESTIONS?

Interested in investigating and hunting adversaries, I'm hiring!

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