Cyber Threat Hunting Workshop

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T1033 : System Owner/User Discovery

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Workshop Agenda

1. Threat Hunting
2. Threat Intelligence
3. Honeypot

Threat Hunting

Threat Hunting

- Introduction to Threat, Dwell Time, Cyber Security Problems
- Introduction to Threat Hunting
- Threat Hunting People, Process, Tools & Technology
- Threat Hunting Framework
  - Pyramid of Pain
  - Cyber Kill Chain
  - MITRE ATT&CK
- Detection Engineering
  - Data Source Visibility (Endpoint & Network)
  - MITRE SHIELD
- Types of Threat Hunting
- Threat Hunting Use Case
- Threat Hunting Case Study

New Threat Paradigm

- Traditional Threat Definition:
  - Threat = Capability + Intent

  New Threat Definition:
  - Threat = Capability + Intent + Knowledge
    - **Capability** includes tools and ability to access
    - **Intent** is the motivation
    - **Knowledge** is specific, sophisticated ability to operate within a system/network after gaining access

New Threat Paradigm most applicable to high level threats

The Attacker’s Advantage

- They only need to be successful once
- Determined, skilled and often funded adversaries
- Custom malware, 0days, multiple attack vectors, social engineering
- Can be Persistent

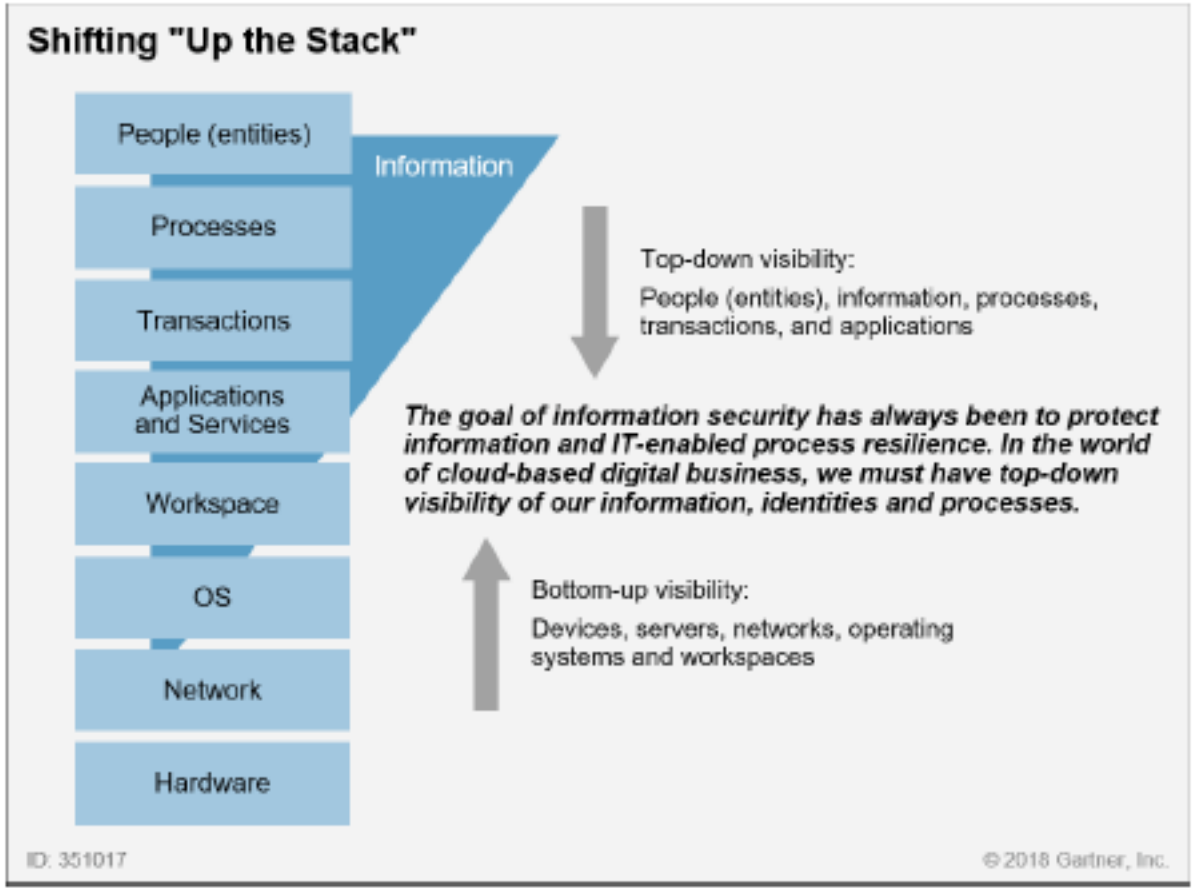
The Defender Disadvantage

- Unsung Hero.
- Understaffed, jack of all trades, underfunded
- Increasing complex IT infrastructure:
  - Moving to the cloud
  - Virtualization
  - Bring your own device
- Prevention controls fail to block everything
- Hundreds of systems and vulnerabilities to patch

Business Drivers

1. **Predict & Prevent** costly data breaches, security incidents, and disruptions to IT Services.
2. **Reduce costs and increase efficiency** in your cyber security operation
3. Extend **detection and response** capabilities with context correlated from across your endpoint, network, and cloud assets.
4. **Maximize** your existing **investment**

Shifting "Up the Stack" to Identities, Data and Transactions



Source: Gartner (April 2018)

Dwell Time

Dwell time is calculated as the number of days an attacker is present in a victim network before they are detected. The median represents a value at the midpoint of a data set sorted by magnitude.

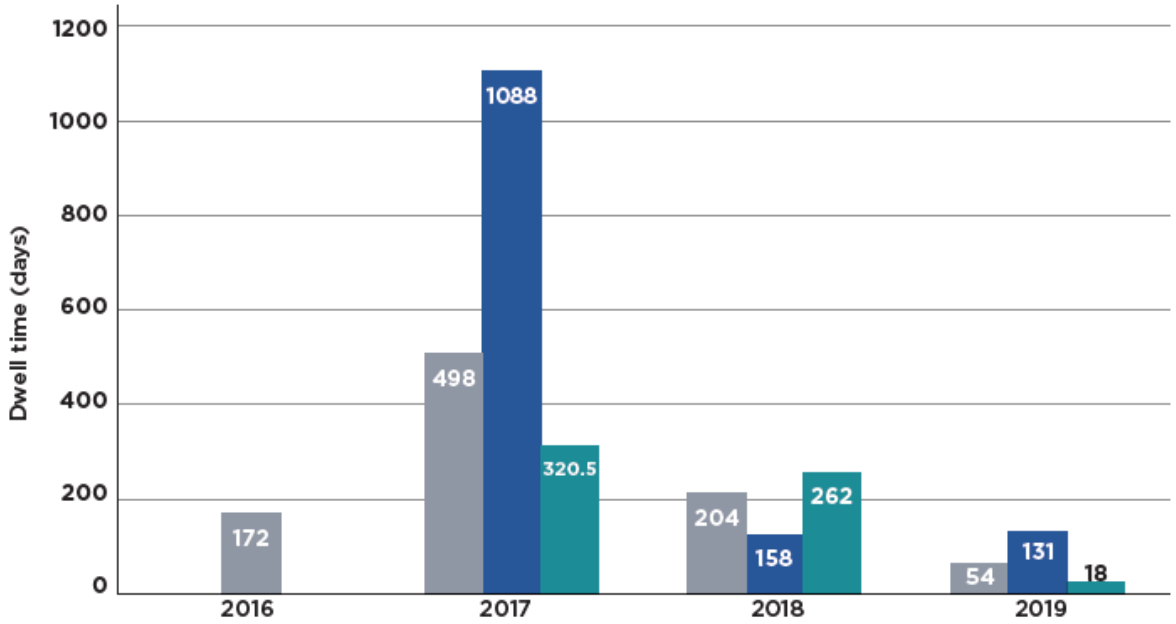
Median Dwell Time

204 > 54

DAYS IN 2018 DAYS IN 2019

APAC **MEDIAN DWELL TIME**

Notifications
- All
- External
- Internal



Mandiant M-Trend Report 2020

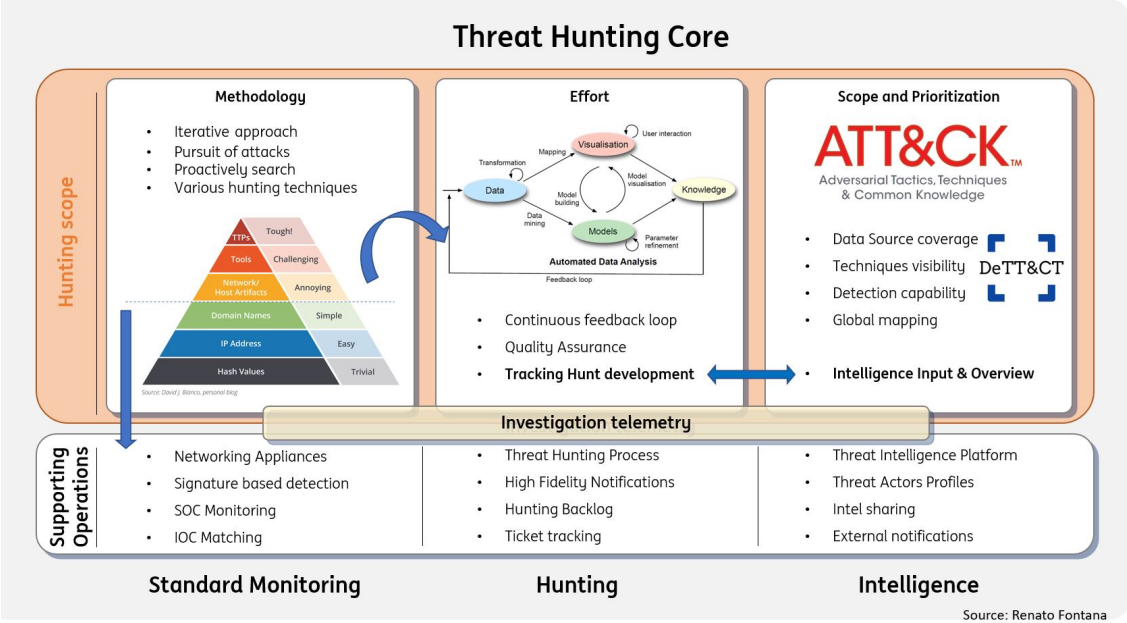
Problems

- Both Endpoint and Networks always have a certain level of vulnerability
- Organizations are struggling to prevent adversaries from getting into their networks.
- Advanced adversaries can remain hidden for months, sometimes years, before detection.

Without knowing the current state of compromise, we have an incomplete picture of Our Cyber Security Posture.

Introduction to Threat Hunting

- Threat hunting is a Proactive cyber defense approach. Threat hunting processes perform proactive and iterative discovery through networks, endpoints, and other infrastructure to detect and respond to cybersecurity threats that sometimes evade existing security solutions.



Source: Renato Fontana

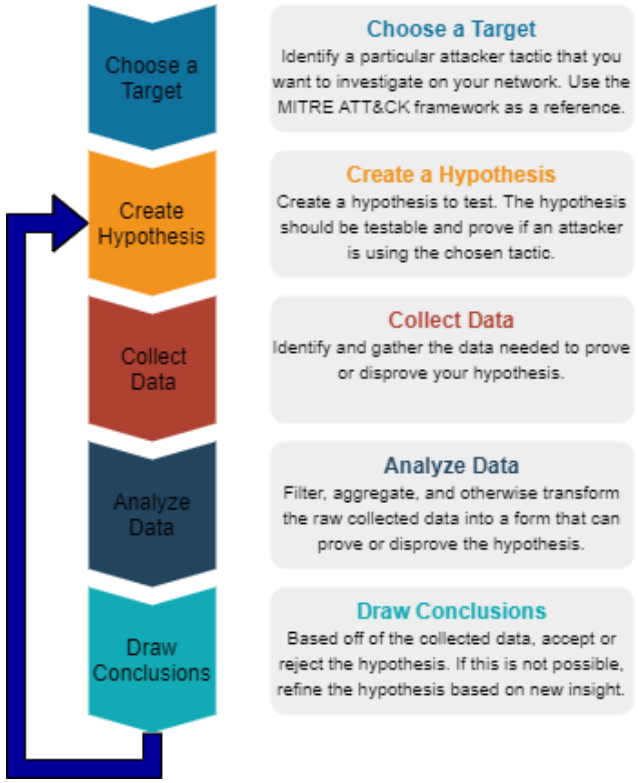
https://twitter.com/Rcfontana/status/1262407505776381952

Introduction to Threat Hunting

- Threat hunting is an proactive cyber defense activity. It is "the process of proactively and iteratively searching through networks to detect and isolate advanced threats that evade existing security solutions."
- This is in different to traditional threat management measures, such as firewalls, intrusion detection systems (IDS), malware sandbox (computer security) and SIEM systems, which typically involve an investigation of evidence-based data after there has been a warning of a potential threat.

Threat Hunting Principle

- Presumptions of Compromise : Your prevention technology will eventually fall or have already failed without your knowledge. With Adoption Assume breach mentality will increase your awareness of compromised assets



https://www.clearnetwork.com/cyber-threat-hunting-what-why-and-how/

Threat Hunting Benefit

- Finding adversaries who have gotten past your current security protection
- Continuous improvement of your detection capabilities
- With your existing technology, you can not have oversight of everything that's happening, at this point threat hunting help your organization
- Supports faster and early detection of potential compromise
- Increasing awareness of your environment and attack surface
- One of method to improve your data collection

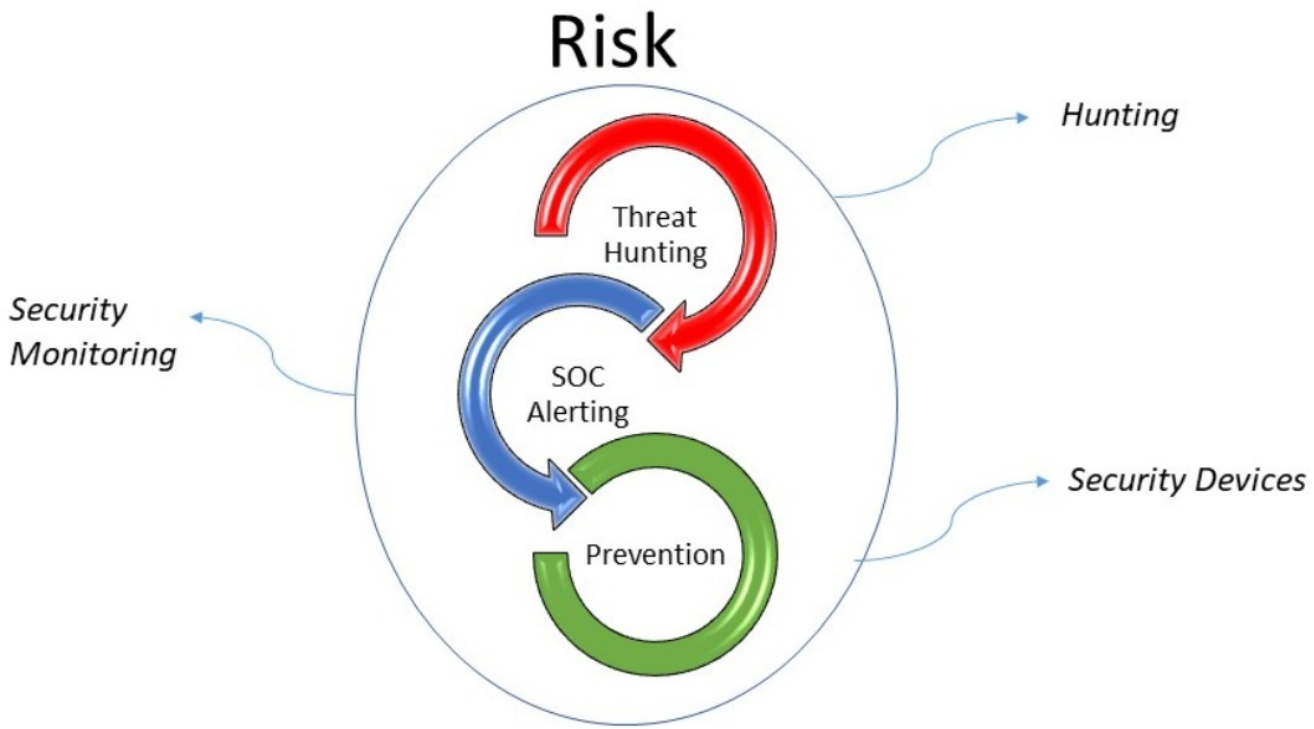
What is it for?

BUSINESS :

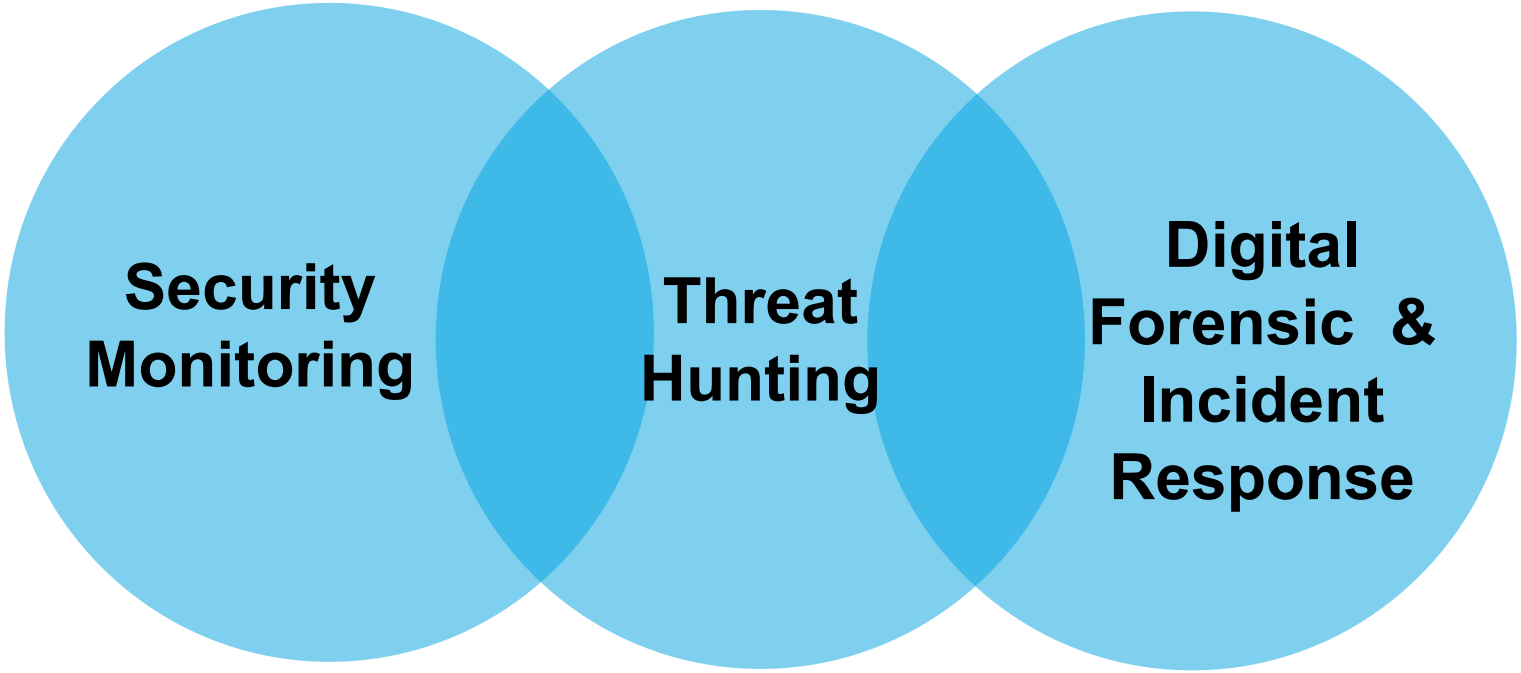
- Minimize residual risks
- Minimize the dwell time (time between attack and detection)

TECHNICAL :

- Advanced [targeted] attacks detection
- Non-malware attacks detection
- TTPs based detection



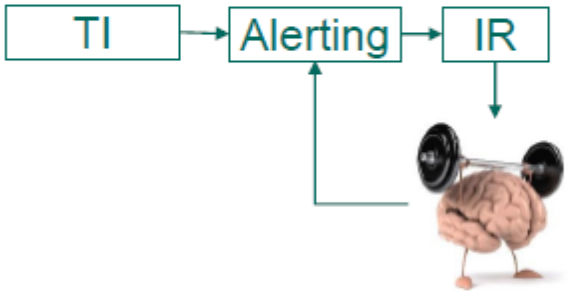
Sec Mon vs Threat Hunting vs DFIR



Threat Hunting Vs Alert Based Investigation

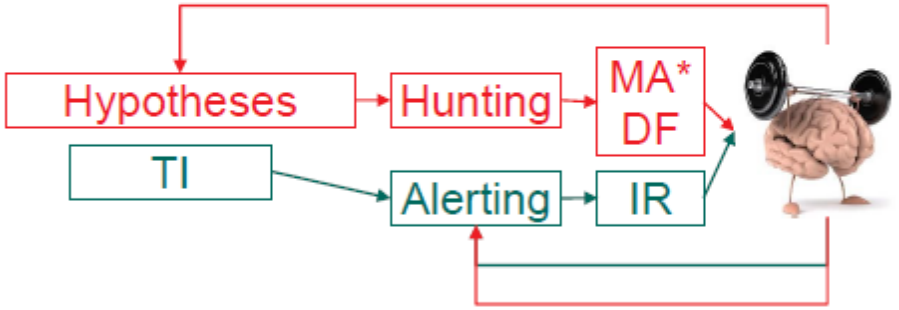
SOC/Alerting

- Reactive
- Detect/forget



Hunting/Mining

- Proactive
- Repeated searches



* MA – malware analysis, DF – digital forensics, IR – incident response

Source : https://2016.zeronights.ru/wp-content/uploads/2016/12/ZN16-KHS-Th_Soldatov.pdf

Threat Hunting vs Compromise Assessment

- What is the Main Differences Between Threat Hunting and Compromise Assessment?
- Basically Threat Hunting and Compromise Assessment is a same activity, but the main difference are :
  - ✓Situation & Condition : TH -> Assuming Compromise will happen ; and CA -> Compromise is Already happened
  - ✓Location & Object : TH -> All Object Within Organization ; CA -> Selected Network Segment / Zone Suspected for Compromised Area
  - ✓Actor (Who performed the activities?) : TH -> Empowered SOC Team (part of SOC Team) ; CA -> Mostly from DFIR Team

Hunting VS Reactive Response

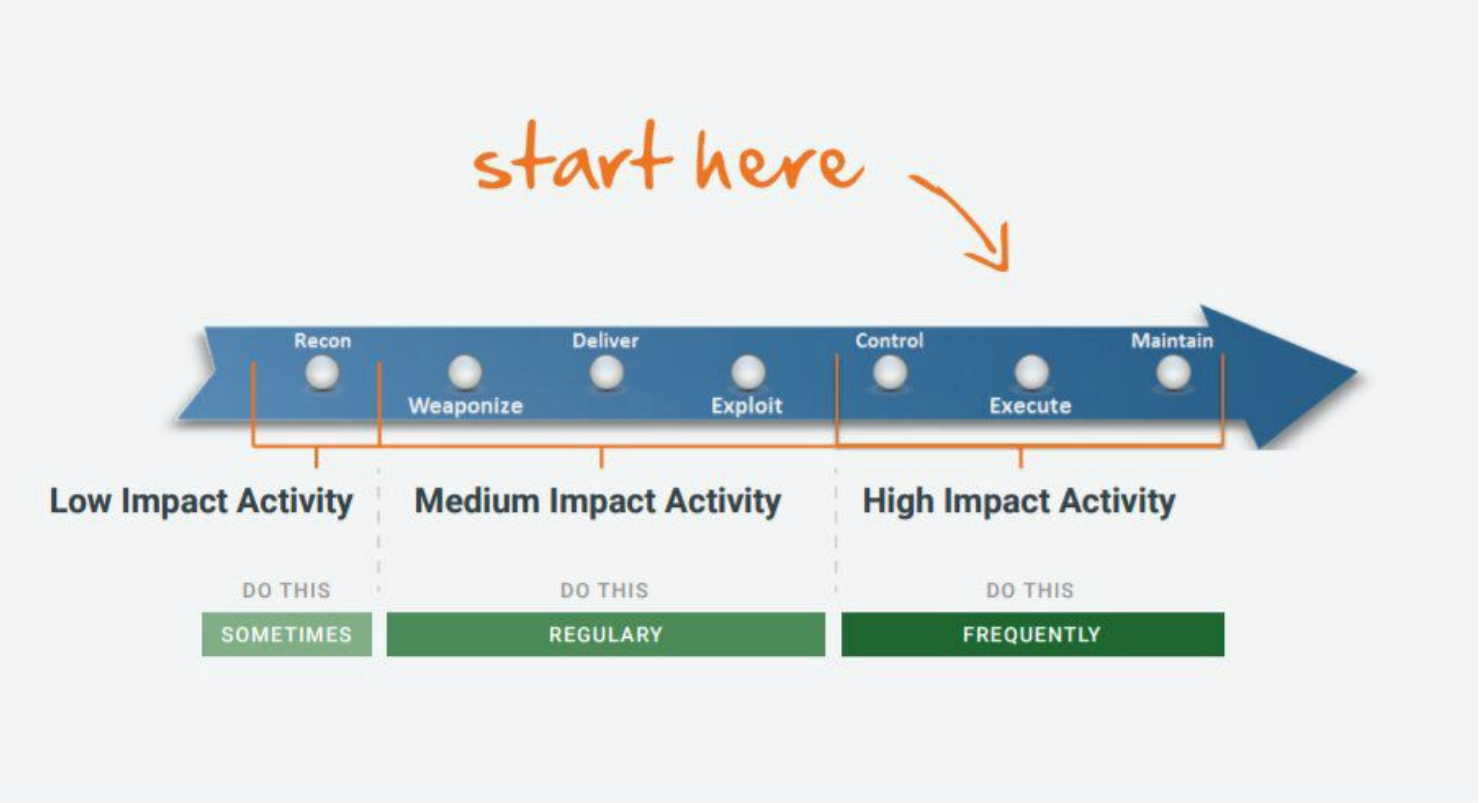
Hunting Organization

- Actively looking for Incidents
  - ✓ Known malware and variant
  - ✓ Patterns of activity : evil vs normal
  - ✓ Threat Intelligence

Reactive Organization

- Incident Starts when notification comes in
  - ✓ Call from government agency
  - ✓ Vendor / threat information
  - ✓ (NIDS, SIEM, Firewall, etc) Alert

Threat Hunting Activity



People - Threat Hunter Skillset (1)

- **Analytical Mindset** : Having a mindset of curiosity, Ability to generate and investigate hypotheses. As an analyst, it's increasingly important to be specific in what questions you're looking to answer during threat hunting.
- **Operating System** : Knowledge of Operating System internals, OS security mechanisms, knowledge of typical security issues of different operating systems,
- **Network Architecture**: understanding how computer networks work, OSI Layer, knowledge of TCP/IP, knowledge of basic protocols (DNS, DHCP, HTTP, SMTP, FTP, SMB);
- **Attack Methods/TTPs / Attack Life Cycle** : Knowledge of specific attack vectors, understanding how an attacker attempts to penetrate your network, which attack vectors and tools he/she can use on different attack stages;

People - Threat Hunter Skillset (2)

- **Log Analysis** : knowledge of different log sources and event types generated by different sources, the ability to analyze logs for anomalies and pivot between data sources to see the big picture;
- **Network Analysis** : the ability to read and understand packet capture data and determine the malicious nature of network traffic;
- **Cyber Threat Intelligence** : Having a skill and knowledge to leverage threat intelligence for threat hunting purposes, always seek for new information from threat intelligence report,
- **Malware Analysis** : Malware analysis a highly specialized skill that aims to determine the origin and purpose of an identified instance of malware.
- **Tools for Threat Hunting** : Understand how to use security analytics platform (e.g. ELK) and SIEM, how to use packet sniffer, how open PCAP, how to see and export logs in OS, how to collect logs from different source, etc

Process – Threat Hunting

While skilled threat hunters are one of the key for successful Threat Hunting capability, threat hunting process is also very important. Having a formal hunting process is ensured the consistency and efficiency across all hunts process.

Threat Hunting Life Cycle

SQRRL Threat Hunting Loop
https://medium.com/@sqrrldata/the-hunting-loop-10c7d451dec8

Process – Threat Hunting (1)

1. Creating a Hypotheses

Threat Hunting begins with questions, such as “How would a threat actor infiltrate our infrastructure?”

These questions then need to be broken down into specific and measurable hypotheses that state :

- **What is my crown jewel asset?**
- **What threats might be present in the network?**
- **How can we identified the threat actors?**

Hypotheses cannot be generated by tools. It is defined by threat hunter mindset and knowledge based on the condition in each of their environment.

Process – Threat Hunting (2)

Example Hypotheses

Threat Actor:
An organisational threat assessment identified Lazarus Group as a high priority threat. Techniques attributed to this threat actor are detailed within MITRE's ATT&CK Navigator.

We therefore hypothesis that if this threat actor is present in our network, we would be able to detect evidence of multiple techniques being deployed, in a manner consistent with their known attack paths.

Tool:
CTI and our situational awareness suggests that our organisation is currently vulnerable to a variant of the WannaCry ransomware, as SMBv1 is still used.

We therefore hypothesis that if our network is infected with WannaCry, we will see an increase in the rate of file renaming.

Technique:
Lateral Movement, via *Exploitation of Remote Services*, can be performed by exploiting vulnerability MS17-10. Specifically, this can be done via the Metasploit framework with a module that uses a Server Message Block (SMB) request of a specific size to attempt compromise.

We therefore hypothesise that we can see evidence of this technique being used by isolating this SMB request in our network logs.

https://hodigital.blog.gov.uk/wp-content/uploads/sites/161/2020/03/Detecting-the-Unknown-A-Guide-to-Threat-Hunting-v2.0.pdf

Process – Threat Hunting (3)

2. Investigate via Tools and Technique

Once observations have led to hypotheses being generated, these then need to be tested using all the relevant tools and techniques. The importance of Data sources and detection engineering capability from the organization, determine the result of this process.

Existing tools owned by organization, such as a **SIEM or security analytic platform, EDR, TIP** can be used to query the data, from basic searching to more advanced data science techniques, and also visualization can help threat hunters in identifying anomalies and anomalous patterns

Process – Threat Hunting (4)

3. Uncover New Pattern and TTPs

The objective of testing a hypothesis created by the threat hunters in the first process in threat hunting, is to prove whether the hypotheses is prove or not proven. Even if the hypotheses result is not proven, It does not necessarily mean that no malicious activity is present or the hunters create a wrong hypotheses. It can be the current visibility in the organization is not enough or the tools that used by threat hunters is not good enough to help them to investigate the case. In the future maybe this hypotheses can reveal a new TTPs that might be unknown before. The valid hypotheses then become the iterative process as a baseline.

Process – Threat Hunting (5)

4. Inform and Enrich Analytics

Successful hunting process and then should be automated to make the efficient process for the threat hunters to reduce Threat Hunting team's time and to limit them from continuously repeating the same process. This can be done in many ways, such scheduling a saved search, developing a new analytic within existing tools, or providing feedback to a supervised machine learning algorithm.

Let the security analytic platform repeat the successful hunting process from the previous activity of threat hunting, and the threat hunter then finding a new hypotheses to uncover the malicious process which unidentified before.

Tools and Technology – Threat Hunting

We already discuss about people and process in thereat hunting. Tools and Technology is also in need for threat hunting activities. While skilled people and effective processes are the critical factors for a successful Threat Hunting capability, tooling is of course still required to collect and interrogate data, automate analytics, and work collaboratively.

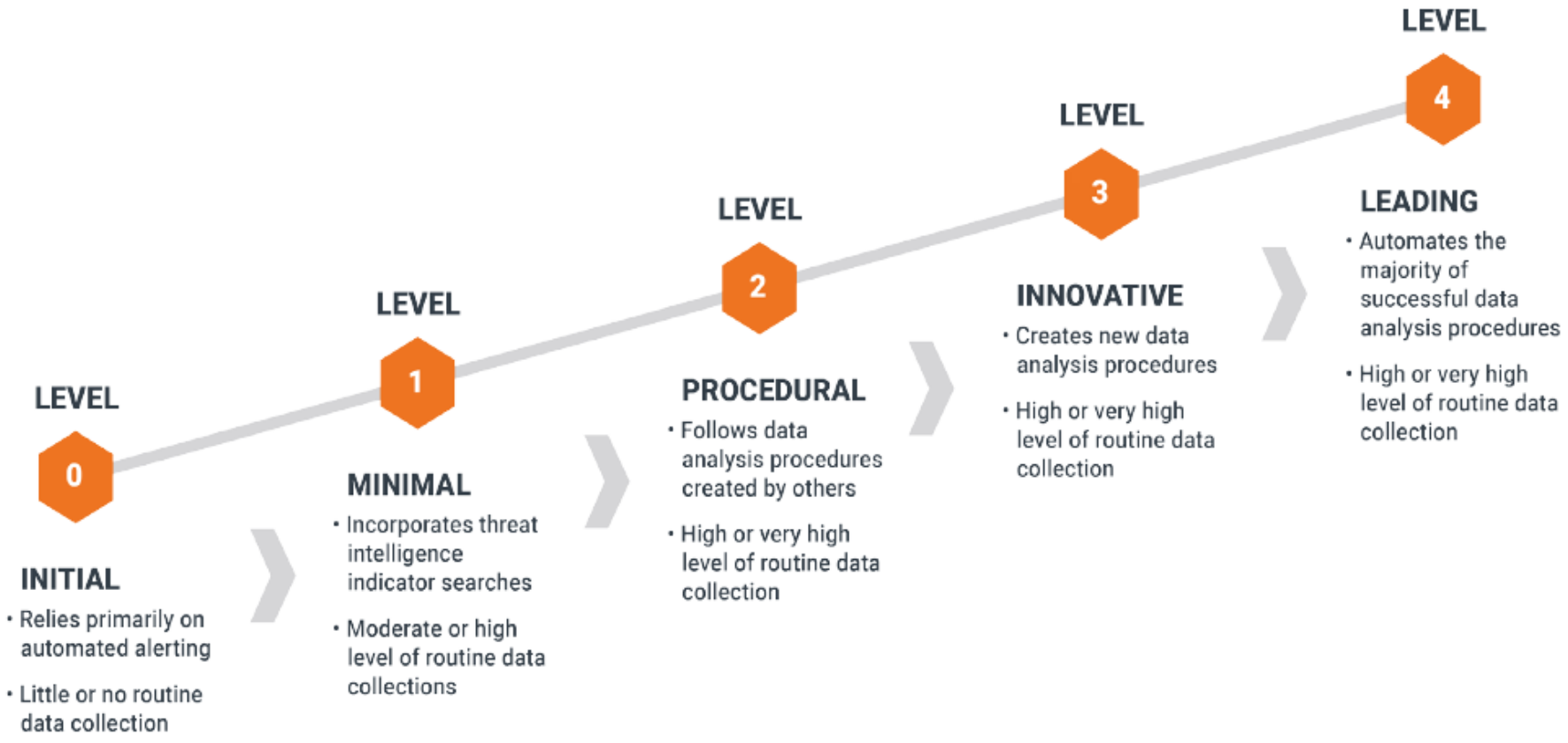
Existing security tools employed by SOC in your organization such as **SIEM, Security Analytic, EDR, Cyber Threat Intelligence Platform, DFIR tools**, can be used and utilized for threat hunting activities. Additional tools such as open source tools might be combined with existing tools to help threat hunters speed up the hunting process and analysis.

Tools and Technology – Threat Hunting

One of the part that also can help for efficiency in threat hunting process is Threat Hunting Playbook. The playbook consist of all hypotheses and step process for hunting created by threat hunters and prevent the threat hunters doing the same hunting process repetitively. The playbook can be also included the sample of dataset from previous hunt activity to help new threat hunters understand what this playbook talking about.

Example of Open Source Threat Hunting Playbook : **Jupyter Notebook and Mordor Datasets** (By Roberto Rodriguez). (https://medium.com/threat-hunters-forge/threat-hunter-playbook-mordor-datasets-binderhub-open-infrastructure-for-open-8c8aee3d8b4)

Threat Hunting Maturity Model



SQRRL Hunting Maturity Model
https://medium.com/@sqrrldata/the-cyber-hunting-maturity-model-6d506faa8ad5

Threat Hunting Capability Maturity Model

Threat Hunting Capability Maturity Model	Level 1 INITIAL	Level 2 MANAGED	Level 3 DEFINED	Level 4 QUANTITATIVELY MANAGED	Level 5 OPTIMISING
People	▪ Existing SOC analysts ▪ Resourcing needs not known ▪ Training needs not known ▪ Performance not managed ▪ Lack of career development plan ▪ Normal systems behaviour not sufficiently understood	▪ Threat Hunting lead ▪ Informal view of resourcing ▪ Informal view of training ▪ Performance is qualitatively managed ▪ Career development informally managed ▪ Normal systems behaviour is moderately understood	▪ Dedicated threat hunters ▪ Formal recruitment plan ▪ Formal training plan ▪ Performance expectations defined with role profiles ▪ Formalised career development plan ▪ Normal systems behaviour is fully understood	▪ SOC analysts rotated for L&D ▪ Succession plans in place ▪ Training completion tracked ▪ Metrics utilised for team performance ▪ Mission critical systems identified	▪ Teams integrated across SOC ▪ Resourcing needs integrated ▪ Training needs integrated ▪ Improvement plans to address underperformance ▪ Situational awareness
Process	▪ Hypothesis generation is unstructured ▪ *Hunts occur ad-hoc, if at all* ▪ *Little or no data collected* ▪ Little understanding of anomalies indicative of malicious activity ▪ Abnormalities not routinely searched for	▪ CTI and Domain Expertise used to generate hypotheses and prioritisation by lead ▪ Hunts occur occasionally ▪ *Moderate data collection from key areas* ▪ *Basic threat feeds with IOCs utilised* ▪ Targeting of IOCs at bottom of POP	▪ Formal hunting process ▪ Hunts occur regularly ▪ *High data collection from key areas* ▪ *CTI and previous experience used to detect malicious activity* ▪ Targeting of IOCs in middle of POP	▪ Manual risk scoring e.g. Crown Jewels ▪ Hunts occur frequently ▪ *Moderate data collection from most of estate* ▪ *CTI tailored to organisation* ▪ Targeting of IOCs at top of POP	▪ Automated risk scoring e.g. machine learning ▪ Hunts occur continuously ▪ *High data collection from full estate* ▪ Hunt analytics and IOCs shared across community ▪ Automated TTP and campaign tracking
Tools	▪ *Reactive SOC tools* ▪ Little or no automation ▪ Little or no documentation produced	▪ Basic searching via text or SQL-like queries ▪ *Automatic matching of IOCs* ▪ Documentation using basic office suites	▪ Statistical analysis techniques ▪ Library of hunt procedures automated on regular schedule ▪ Central workflow and knowledge repository tools ▪ Lab environments used to aid hypothesis generation and testing	▪ Visualisation tools utilised, and analytics tested for effectiveness ▪ Library of hunt procedures automated on frequent schedule ▪ Dashboards utilised	▪ Machine learning is leveraged, with horizon scanning maintained ▪ Library of hunt procedures automated continuously ▪ Central workflow and knowledge repository are integrated and shared
Note: Items in *italics* are not strictly part of a Threat Hunting capability, but are essential prerequisites and enablers.					

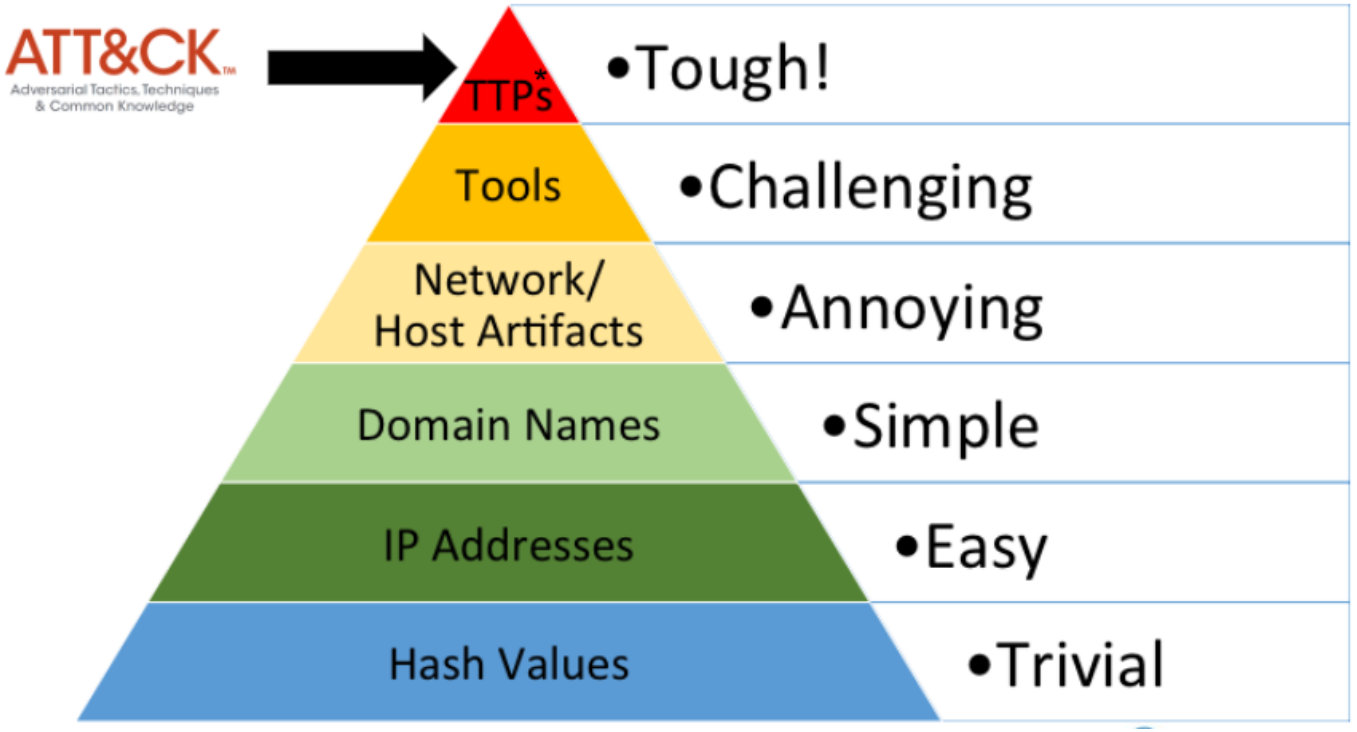
https://hodigital.blog.gov.uk/wp-content/uploads/sites/161/2020/03/Detecting-the-Unknown-A-Guide-to-Threat-Hunting-v2.0.pdf

Threat Hunting Framework

Threat Hunting needs a framework that can be a baseline or foundation for the threat hunters when starting they hunting process. The common framework in cyber security used by threat hunting are :

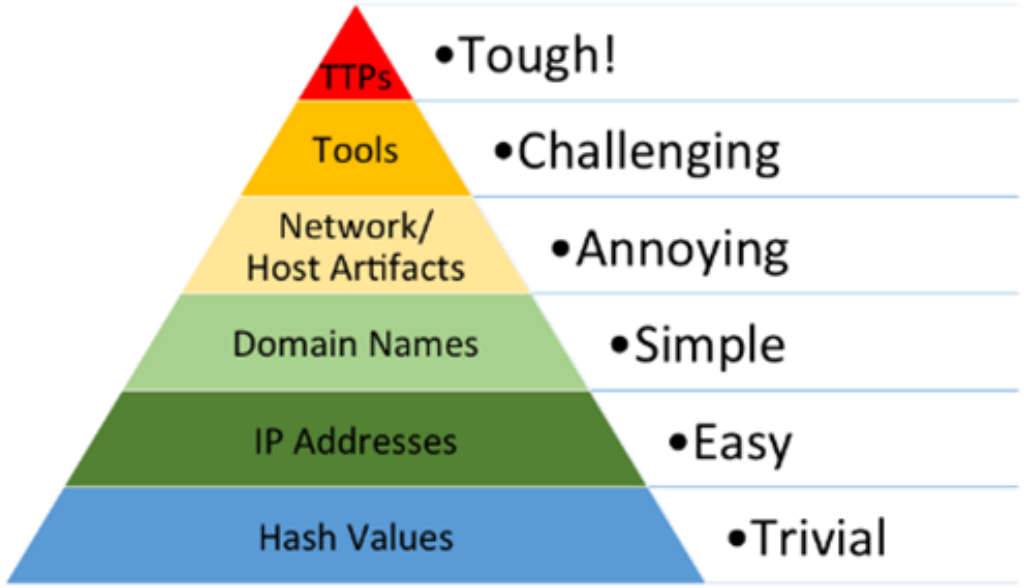
a. Pyramid of Pain
b. Cyber Kill Chain
c. MITRE ATT&CK

Pyramid of Pain



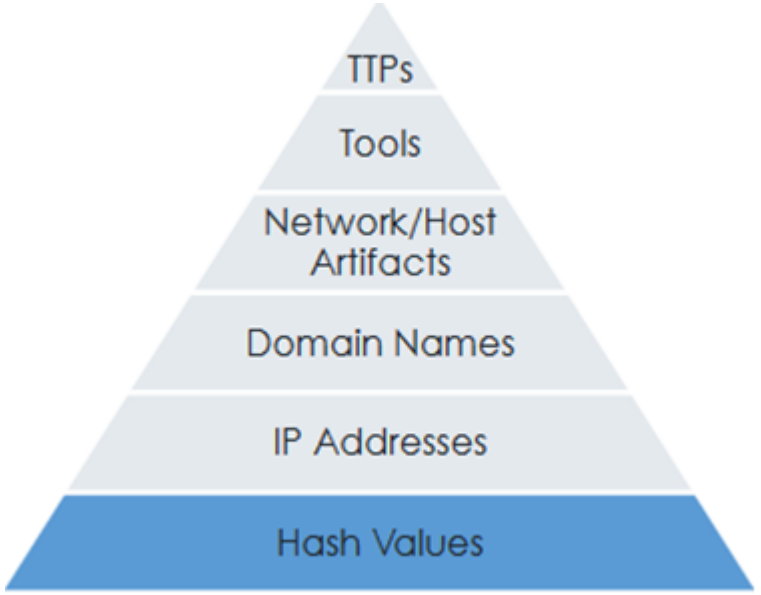
David Bianco Pyramid of Pain
Source : https://www.slideshare.net/KatieNickels/putting-mitre-attck-into-action-with-what-you-have-where-you-are

Pyramid of Pain



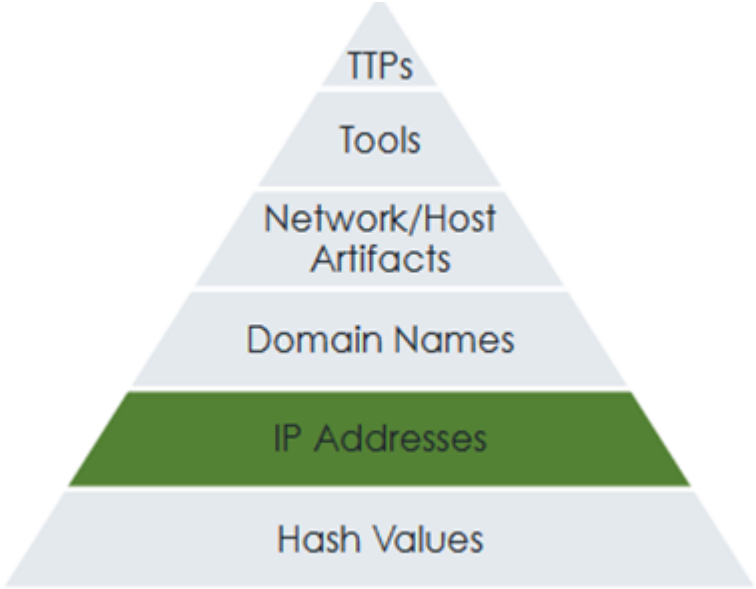
- Pyramid of pain represents the usefulness of your intelligence
- The higher of the stacks, the more adversaries have to expend for the resources.
- It also indicates to gather the artifacts or threat intelligence from adversaries

Pyramid of Pain : Hashes



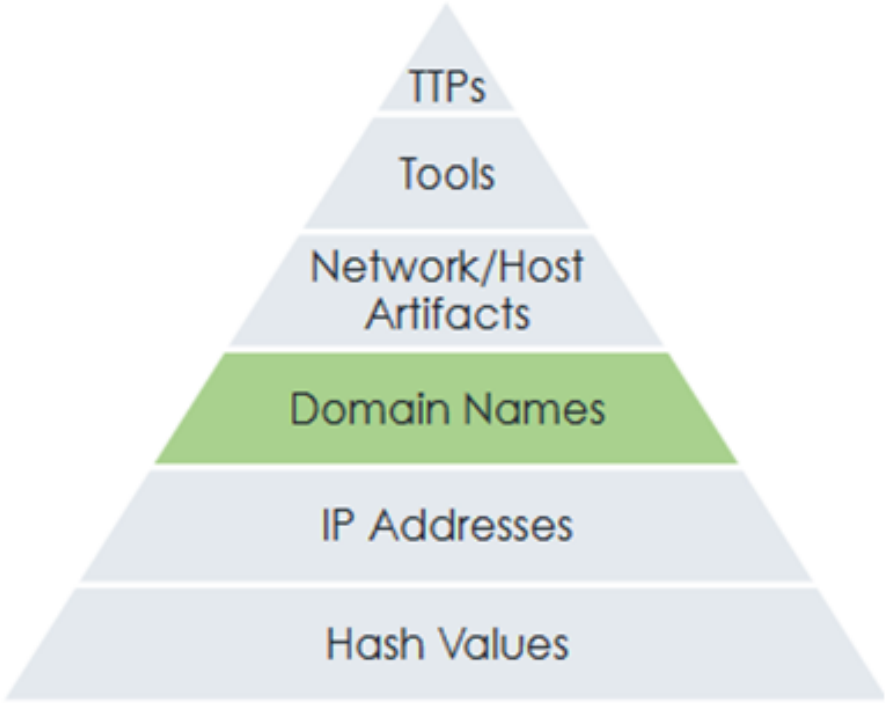
- Hash is so far the **highest confidence level** from artifacts collected or gathered from intel resources
- But, hash is **very easy to change**. Adversaries only need a lil bit effort to modify and create a new hash for their tradecraft
- It is maybe the reason why hash positioned **in the bottom of the pyramid** stack

Pyramid of Pain : IP Address



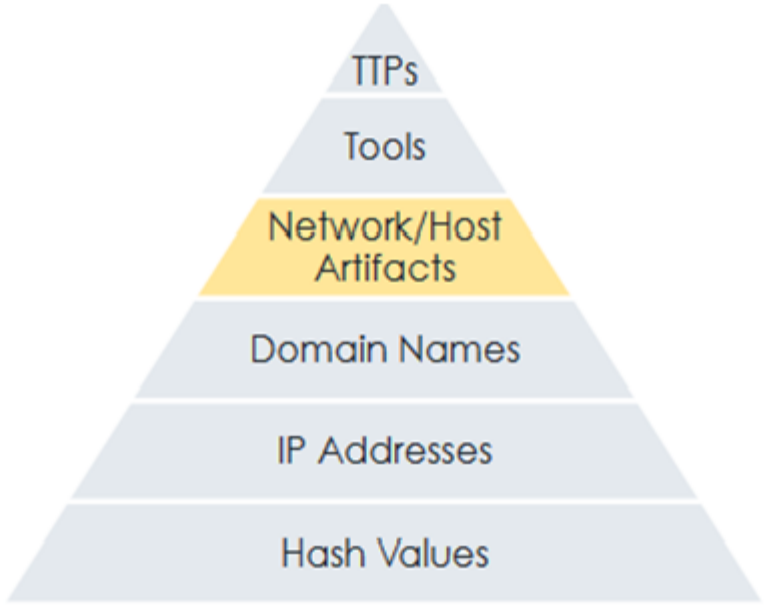
- Attacker mostly not using their real IP Address. Adversary used VPN, Proxy, ToR, Compromised Server to hide from their real IP Address.
- They can changed the IP address for their infra once it is blocked / blacklisted. Only need some money and effort to move to the new IP for their infrastructure. More effort and money than hash, therefore IP Address positioned 1 level up from hash in the Pyramid of Pain

Pyramid of Pain : Domain



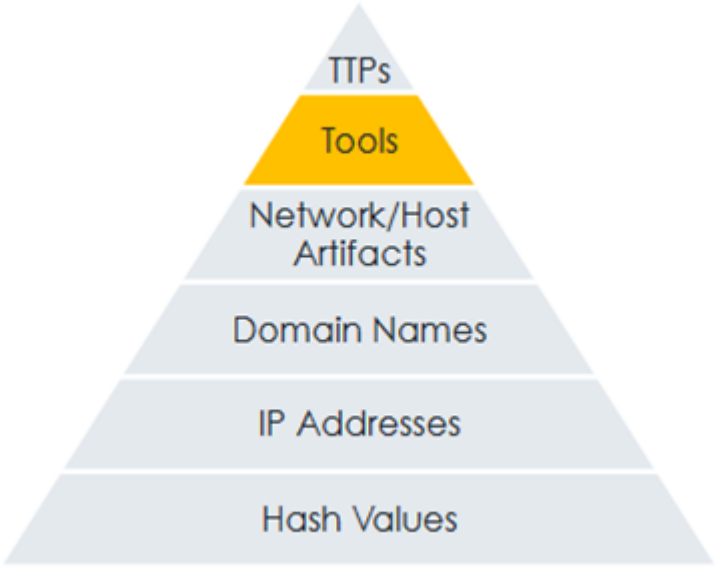
- Almost easy as IP Address to change the domain name. But need more time (Domain propagation in DNS)
- Need some registration, and for some reason they mostly hide the whois for domain privacy offered by domain registrars. Need more money for this services.
- Need to define the domain name. And it is not easy. Sometimes adversaries made bot to automatically create a new domain using certain algorithm (DGA)

Pyramid of Pain : Network / Host Artifact



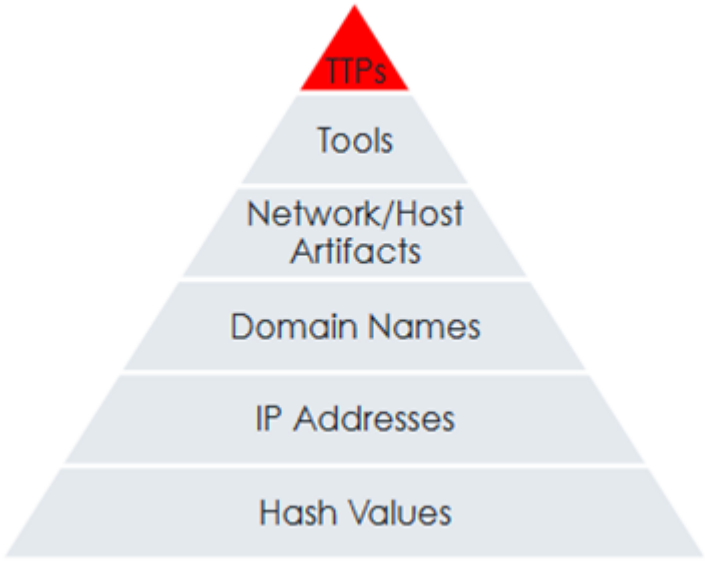
- Network Artifacts : indicators of activities performed by the adversaries on the network. Anything communicated over the network by the adversary can be referred to as network artifact, which includes URI patterns, SMTP mailer values, HTTP user agent, and the like.
- Host Artifact : Indicators of activities performed by the adversaries on the hosts. Artifacts like registry keys or values created by malware. Files or directories injected in specific locations, and the like are considered as host artifacts.

Pyramid of Pain : Tools



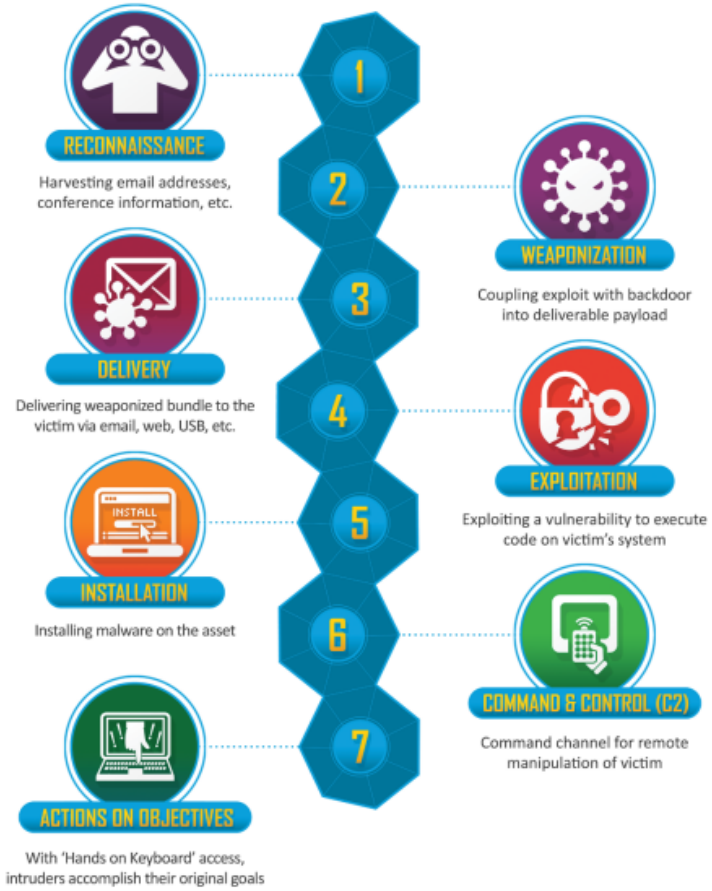
- Software used by the adversary to accomplish their mission
- This can be include software designed to create malicious documents for spearphishing, backdoors used to establish CNC, or password cracking tools or other software that adversaries may want to use for post-exploitation activities.
- Considered to be more difficult than the all previous stack in pyramid of pain, because sometimes adversaries **need to create their custom tools and obfuscate it to evade the detection and prevention technology**.

Pyramid of Pain : TTPs



- The very Top Level in Pyramid of Pain, indicate the most painful (especially for blue teamers and defenders)
- Need to combine all the stack below to define the attacker Tactic, Technique and Procedures + Combining with Threat Intelligence to define attacker motivation and attribution
- If Blue Teamers, Defenders, and Threat Hunters can reach at this point for detection and response of the adversaries activities, the adversaries only have 2 options **: Give Up on their mission or creating their TTPs from the scratch**. (http://detect-respond.blogspot.com/2013/03/the-pyramid-of-pain.html)

Cyber Kill Chain

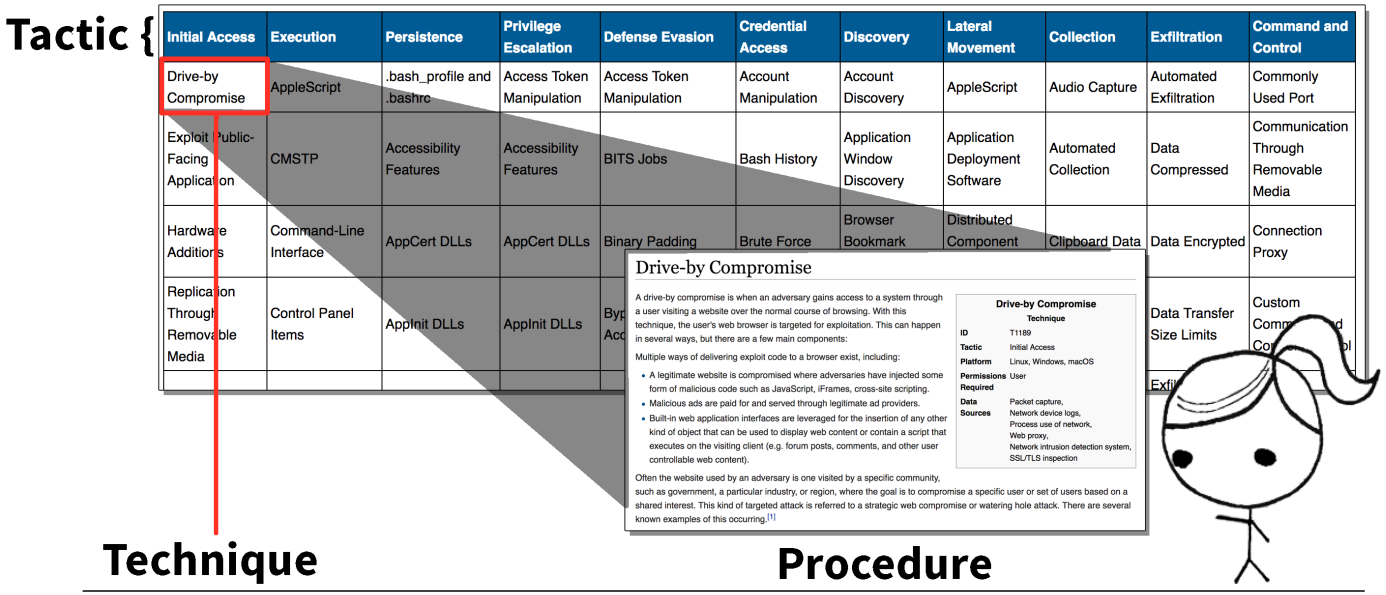


https://www.lockheedmartin.com/en-us/capabilities/cyber/cyber-kill-chain.html

Threat Hunting Framework

Threat Hunting Framework Based on MITRE ATT&CK Framework

- **https://attack.mitre.org/**



Initial Access	Execution	Persistence	Privilege Escalation	Defense Evasion	Credential Access	Discovery	Lateral Movement	Collection	Exfiltration	Command and Control
Drive-by Compromise	AppleScript	.bash_profile and .bashrc	Access Token Manipulation	Access Token Manipulation	Account Manipulation	Account Discovery	AppleScript	Audio Capture	Automated Exfiltration	Commonly Used Port
Exploit Public-Facing Application	CMSTP	Accessibility Features	Accessibility Features	BITS Jobs	Bash History	Application Window Discovery	Application Deployment Software	Automated Collection	Data Compressed	Communication Through Removable Media
Hardware Additions	Command-Line Interface	AppCert DLLs	AppCert DLLs	Binary Padding	Brute Force	Browser Bookmark	Distributed Component	Clipboard Data	Data Encrypted	Connection Proxy
Replication Through Removable Media	Control Panel Items	AppInit DLLs	AppInit DLLs	Byp...	Acc...				Data Transfer Size Limits	Custom Comm... Co...

Sources : https://threatexpress.com/redteaming/mitre_attack/

MITRE ATT&CK Framework

- MITRE ATT&CK™ is a globally-accessible knowledge base of **adversary tactics and techniques based on real-world observations. The ATT&CK knowledge base is used as a foundation for the development of specific threat models and methodologies** in the private sector, in government, and in the cybersecurity product and service community.

  With the creation of ATT&CK, MITRE is fulfilling its mission to solve problems for a safer world — by bringing communities together to develop more effective cybersecurity. ATT&CK is open and available to any person or organization for use at no charge

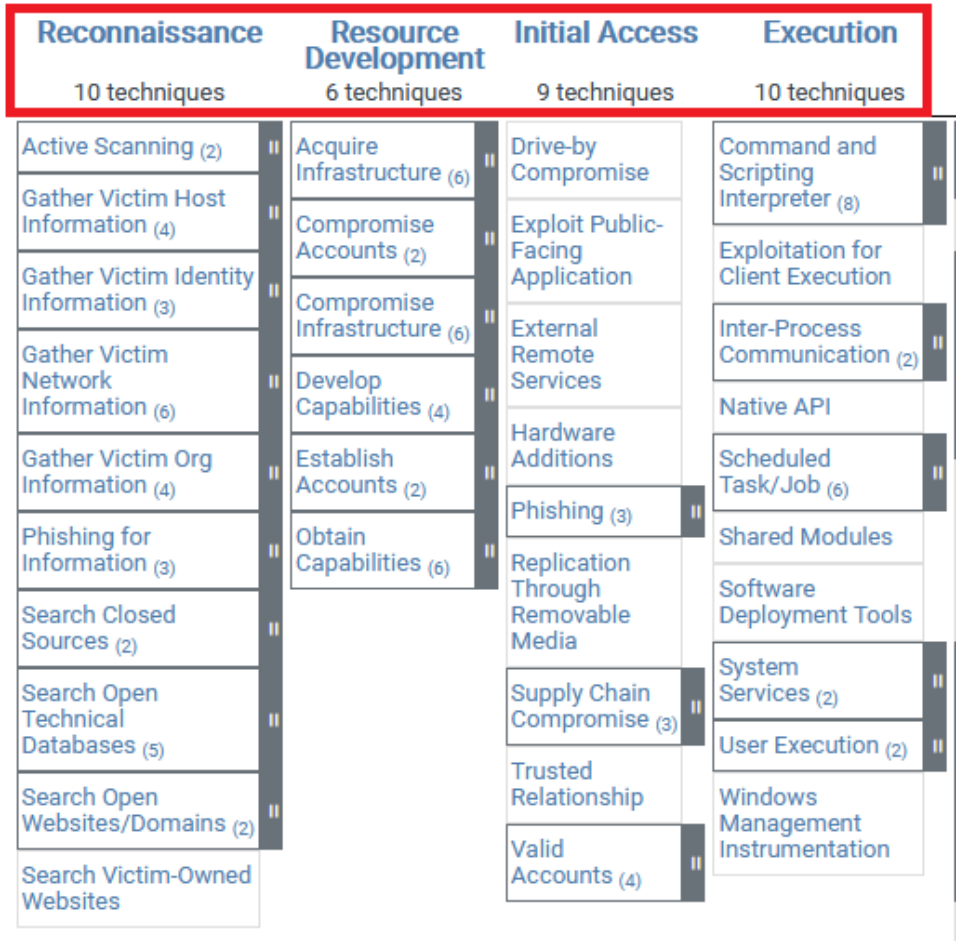
MITRE ATT&CK Matrix

Sources : https://attack.mitre.org/matrices/enterprise/

MITRE ATT&CK Matrix

How to Read It?

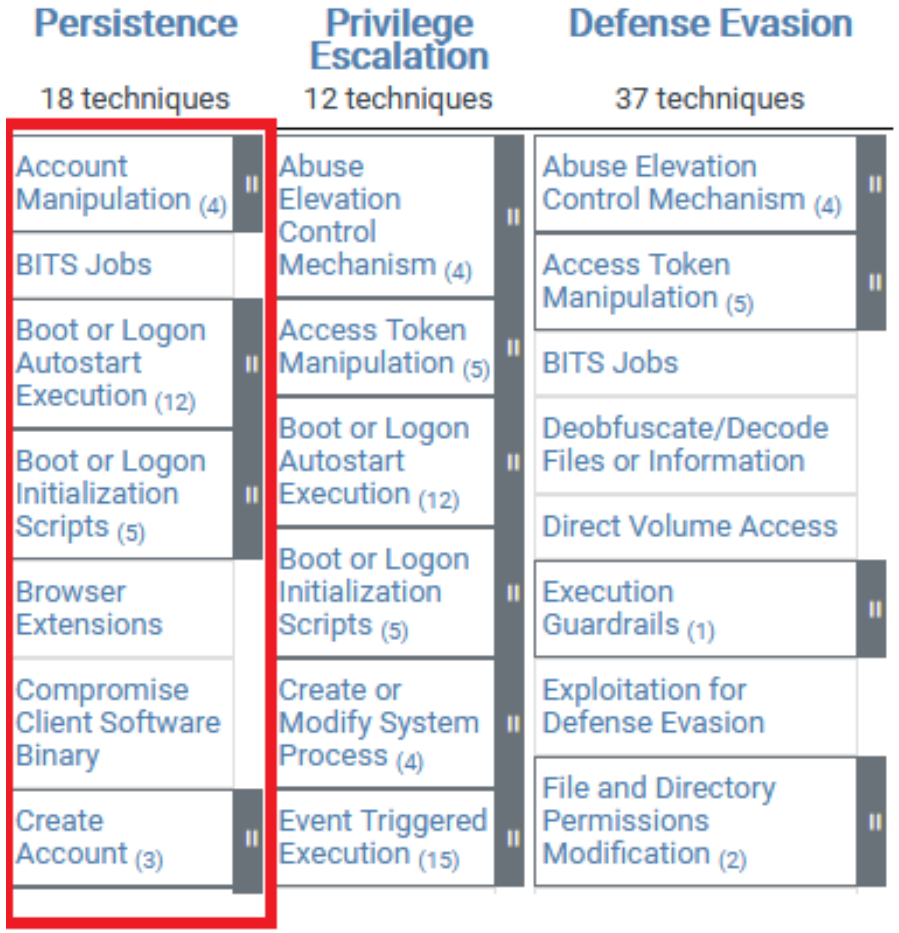
- **Tactics** across the top
  - ✓ What technique accomplish



MITRE ATT&CK Matrix

How to Read It?

- **Technique for each column**
  - ✓ **The way adversaries accomplishing the tactics**
  - ✓ **Same Technique can be in different Tactics**



Tactic Vs Technique

Tactic : The What”	Technique : The How”
Reconnaissance	Active Scanning
Resource Development	Compromise Account
Initial Access	Drive by Compromise
Execution	Command and Scripting Interpreter

MITRE ATT&CK Use Case

- **ATT&CK can help you create a threat-informed defense**
- **Do what you can, with what you have, where you are**:
  - Detection
  - Assessment and Engineering
  - Threat Intelligence
  - Adversary Emulation
  - Threat Hunting
- **Choose a starting point that works for your team**

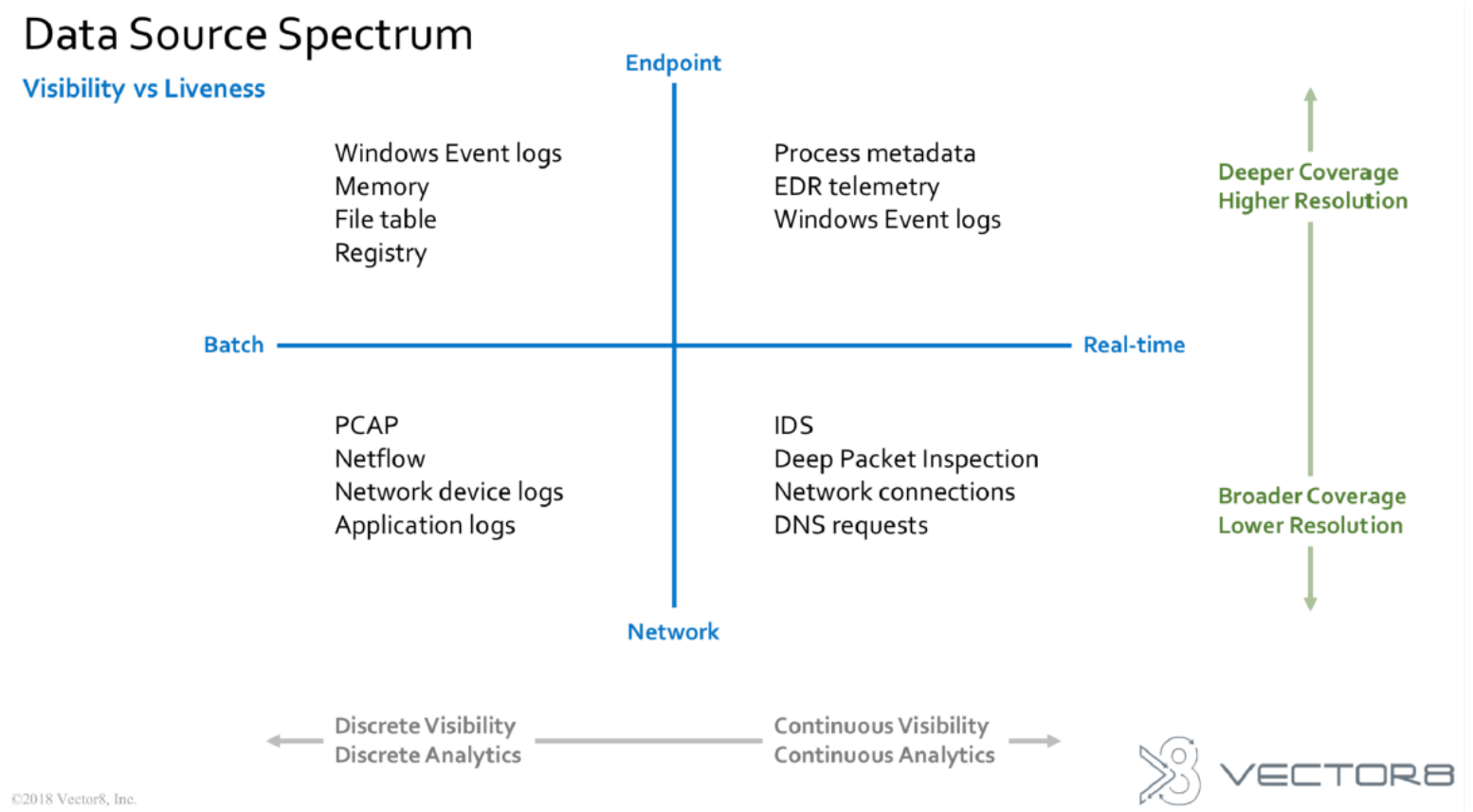
Detection Engineering

Detection engineering is a set of practices and systems to deliver modern and effective threat detection.

When building a solid detection engineering, the main goal is to catch malicious things and to not catch too many not malicious things. If the detection system interrupt an analyst's activities because calling attention to things that are not malicious, then you're creating more work for the analysts.

Detection products only create value by detecting things that are truly bad, and most detection products lean towards detecting more activity so as to not miss anything.

Detection Engineering



Source : Fidelis Cyber Security and Vector8 About Data Source Spectrum

Example of Data Sources from Endpoint

Type of Data	Description	Tools
Operating System logs	Useful Data sources. By Default capabilities for each OS.	Built in Function from OS
Process Activity	Process start, DLL libraries loading, Process install driver, Process perform code injection, Process open port for incoming network connections, connections, Process initiate network connection, Process create/change file, Process create/change registry key/value	Sysmon (Windows) Auditd (Linux) Osquery Endpoint Detection Response Operating System Logs
Volatile Artifacts	Temporary artifact collected from endpoint data sources for the purposes of hunting that might not touch the disk on the host Data Collection : Memory, Network Conn, Process Conn,	Winpmem, Comae, (for Collecton) EDR Volatility Google Rapid Response (GRR) Velociraptor
Non-Volatile Artifacts	Artifacts that resides on the endpoint / host disk. Data Collection : Prefetch, Amcache, Shimcache, MFT, Registry, bash_history, Task Scheduler	Brimorlabs KAPE Kansa FastIR Collector

Example of Data Sources from Network

Type of Event	Description	Tools
Netflow	Network traffic flow metadata. NetFlow data is analyzed to create a picture of network traffic flow and volume. used as a network traffic analyzer to determine its point of origin, destination, volume and paths on the network	Silk Nfsen & Nfdump
Packet Capture	Packet Capture is a networking term for intercepting a data packet that is crossing a specific point in a data network. Once a packet is captured in real-time, it is stored for a period of time so that it can be analyzed, and then either be downloaded, archived or discarded.	Moloch, Tcpdump, Wireshark, tshark
Network IDS	A network-based intrusion detection system (NIDS) detects malicious traffic on a network. NIDS usually require promiscuous network access in order to analyze all traffic	Snort, Suricata Bro Commercial NIDS Product
Proxy Log	Proxy server logs contain the requests made by users and applications on your network. This does not only include the most obvious part : web site request by users but also application or service requests made to the internet (for example application updates).	Squid Commercial Proxy Product
DNS Log	One of the constantly re-occurring techniques is DNS-based activities like exfiltration via DNS *(Domain Name System)* or C2 *(Command and Control)* communication via DNS. Still, a lot of companies are lacking in DNS logging, missing DNS-based detection rules, or not aware of their own blindspots. Data collected : DNS Server, DNS Collected from Network, Host Based (Sysmon 10),	Passive DNS Log DNS Server

MITRE SHIELD

- Shield is an active defense knowledge base MITRE is developing to capture and organize what we are learning about active defense and adversary engagement.
- Derived from over 10 years of adversary engagement experience, it spans the range from high level, CISO ready considerations of opportunities and objectives, to practitioner friendly discussions of the TTPs available to defenders.

MITRE SHIELD MATRIX

Channel	Collect	Contain	Detect	Disrupt	Facilitate	Legitimize	Test
Admin Access	API Monitoring	Admin Access	API Monitoring	Admin Access	Admin Access	Application Diversity	Admin Access
API Monitoring	Application Diversity	Baseline	Application Diversity	Application Diversity	Application Diversity	Burn-In	API Monitoring
Application Diversity	Backup and Recovery	Decoy Account	Behavioral Analytics	Backup and Recovery	Behavioral Analytics	Decoy Account	Application Diversity
Decoy Account	Decoy Account	Decoy Network	Decoy Account	Baseline	Burn-In	Decoy Content	Backup and Recovery
Decoy Content	Decoy Content	Detonate Malware	Decoy Content	Behavioral Analytics	Decoy Account	Decoy Credentials	Decoy Account
Decoy Credentials	Decoy Credentials	Hardware Manipulation	Decoy Credentials	Decoy Content	Decoy Content	Decoy Diversity	Decoy Content
Decoy Network	Decoy Network	Isolation	Decoy Network	Decoy Credentials	Decoy Credentials	Decoy Network	Decoy Credentials
Decoy Persona	Decoy System	Migrate Attack Vector	Decoy System	Decoy Network	Decoy Diversity	Decoy Persona	Decoy Diversity
Decoy Process	Detonate Malware	Network Manipulation	Email Manipulation	Email Manipulation	Decoy Persona	Decoy Process	Decoy Network
Decoy System	Email Manipulation	Security Controls	Hunting	Hardware Manipulation	Decoy System	Decoy System	Decoy Persona
Detonate Malware	Network Diversity	Software Manipulation	Isolation	Isolation	Network Diversity	Network Diversity	Decoy System
Migrate Attack Vector	Network Monitoring		Network Manipulation	Network Manipulation	Network Manipulation	Pocket Litter	Detonate Malware
Network Diversity	PCAP Collection		Network Monitoring	Security Controls	Peripheral Management		Migrate Attack Vector
Network Manipulation	Peripheral Management		PCAP Collection	Standard Operating Procedure	Pocket Litter		Network Diversity
Peripheral Management	Protocol Decoder		Pocket Litter	User Training	Security Controls		Network Manipulation
Pocket Litter	Security Controls		Protocol Decoder	Software Manipulation	Software Manipulation		Peripheral Management
Security Controls	System Activity Monitoring		Standard Operating Procedure				Pocket Litter
Software Manipulation	Software Manipulation		System Activity Monitoring				Security Controls
			User Training				Software Manipulation
			Software Manipulation				

Source : https://shield.mitre.org/matrix/

MITRE SHIELD

In the cybersecurity arena, active defense means defenses that increase costs to cyber-attackers by reducing costs to cyber-defenders. An active defense is the use of offensive actions to outmaneuver an attacker and make an attack more difficult to carry out. Slowing down or derailing the attacker so they cannot advance or complete their attack increases the probability that they will make a mistake and expose their presence or reveal their attack vector.

The Shield matrix consists of the following core components :

- **Tactics,** denoting what the defender is trying to accomplish.
- **Techniques,** describing how the defense achieves the tactic.

Types of Threat Hunting

1. IOC Based Threat Hunting
2. Hypotheses Based Threat Hunting
3. Baseline Based Threat Hunting
4. Anomaly Based Threat Hunting

IOC Based Threat Hunting

- Hunting based on IOC collected from Threat Intelligence
- More like into Compromise Assessment
- Checking whether the IOC is present in the environment
- Checking on Specific Threat Actor or Specific Threat Intel Report

Hypotheses Based Threat Hunting

- Creating a hypotheses for certain TTPs
  - e.g : Hypotheses for hunting on endpoint, hypotheses for hunting on network,
- Leverage Framework such as MITRE ATT&CK Framework for creating hypotheses on TTPs of Threat Actor
- Defining specific asset for hunting (such as Crown Jewel Asset)

Baseline Based Threat Hunting

- Detect something haven’t seen before based on baseline data in the environment
- Needs larger set of data available about your infra for creating the baseline
- Sometimes triggers lot of False Positives
- Quite effective to spot changes in your infra

Anomaly Based Threat Hunting

- Siting through the log data available for the threat hunters to spot irregularities that might be malicious
- Additionally applying patterns on your infra
- Quite useful in Fraud detection

Threat Hunting Use Case

Use Case 1 : Process Spawn cmd.exe

MITRE Reference : CAR-2013-02-003 https://car.mitre.org/analytics/CAR-2013-02-003/ : Processes Spawning cmd.exe

- **Hypothesis** : The Windows Command Prompt (cmd.exe) is a utility that provides command line interface to Windows operating systems. It provides the ability to run additional programs and also has several built-in commands such as dir, copy, mkdir, and type, as well as batch scripts (.bat).
- Typically, when a user runs a command prompt, the parent process is explorer.exe or another instance of the prompt. There may be automated programs, logon scripts, or administrative tools that launch instances of the command prompt in order to run scripts or other built-in commands. Spawning the process cmd.exe from certain parents may be more indicative of malice.
- **Example Use Case Hunting** : **if Adobe Reader or Outlook launches a command shell**, this may suggest that a malicious document has been loaded and should be investigated. Thus, by looking for abnormal parent processes of cmd.exe, it may be possible to detect adversaries.

Use Case 2 : RDP Activities

MITRE Reference: CAR-2016-04-005: https://car.mitre.org/wiki/CAR-2016-04-005

- **Hypothesis**: A remote desktop logon, through RDP, may be typical of a system administrator or IT support, but only from select workstations.
- Monitoring remote desktop logons and comparing to known/approved originating systems can detect lateral movement of an adversary.
- **Example Use Case Hunting :**

Looking for Successful RDP Login not from your Country GeoIP login and after office hour

Use Case 3 : Stopping Windows Defensive Services

MITRE Reference: CAR-2016-04-003: https://car.mitre.org/wiki/CAR-2016-04-003

- **Hypothesis**: Spyware and malware remain a serious problem and Microsoft developed security services, Windows Defender and Windows Firewall, to combat this threat. In the event Windows Defender or Windows Firewall is turned off, administrators should correct the issue immediately to prevent the possibility of infection or further infection and investigate to determine if caused by crash or user manipulation.
- **Example Use Case Hunting :**

Antivirus services stopped not long after there is a successful logon from internal network via network services

Use Case 4 : Task Scheduler

MITRE Reference:

CAR-2020-09-001 : Scheduled Task – FileAccess: https://car.mitre.org/analytics/CAR-2020-09-001/

- **Hypothesis**: In order to gain persistence, privilege escalation, or remote execution, an adversary may use the Windows Task Scheduler to schedule a command to be run at a specified time, date, and even host. Task Scheduler stores tasks as files in two locations - C:\Windows\Tasks (legacy) or C:\Windows\System32\Tasks. Accordingly, this analytic looks for the creation of task files in these two locations.
- **Example Use Case Hunting :**

a. Task Scheduler running from a suspicious folder location (e.g : C:\Users\.. ; C:\Windows\temp\)

b. Task Scheduler running using suspicious Scripting Utilities (LOLBAS) : cscript.exe, rundll32.exe, mshta.exe, powershell.exe, regsvr32.exe

Use Case 5 : Credential Dumping via Windows Task Manager

MITRE Reference:

CAR-2020-09-001 : Credential Dumping via Windows Task Manager : https://car.mitre.org/analytics/CAR-2019-08-001/

- **Hypothesis** : The Windows Task Manager may be used to dump the memory space of lsass.exe to disk for processing with a credential access tool such as Mimikatz. This is performed by launching Task Manager as a privileged user, selecting lsass.exe, and clicking “Create dump file”. This saves a dump file to disk with a deterministic name that includes the name of the process being dumped.
- **Example Use Case Hunting :**

Hunting for File Creation (thinking about Sysmon Event ID 11 for example), with the process image is taskmgr.exe

Case Study End to End Threat Hunting Process

Threat Hunters defined the Hypotheses and Start Hunting

1. Hypotheses 1 : User visiting malicious website from Phishing Email
2. Hypotheses 2 : User downloading malicious file after visiting the Malicious Website (Drive by Download maybe?
3. Hypotheses 3 : Malware Run on the User System after being downloaded
4. Hypotheses 4 : Malware doing persistence mechanism on Infected / Exploited Machine
5. Hypotheses 5 : Malware contacting Command and Control Server
6. Hypotheses 6 : Threat Actor exfiltrate Sensitive document to Command and Control Server
7. Hypotheses 7 : Sensitive Data Leaked on the Internet

Hypotheses 1 : User visiting malicious website from Phishing Email

- Data Source for Hunting
  - Passive DNS Log, DNS Server Log, Proxy Log, NGFW Log, Sysmon Log, Email Log, Mail Security Gateway Log
- Platform for Hunting
  - SIEM, Security Analytics Platform
- Analysis and Enrichment Data
  - DNSTwist, Phishing Domain List, Threat Intelligence Feeds, VirusTotal, HybridAnalysis, URL / Domain Sandbox Analysis

Hypotheses 2 : User downloading malicious file after visiting the Malicious Website (Drive by Download maybe?)

- Data Source for Hunting
  - Passive DNS Log, DNS Server Log, Proxy Log, NGFW Log, Sysmon Log,
- Platform for Hunting
  - SIEM, Security Analytics Platform,
- Analysis and Enrichment Data
  - Threat Intelligence Feeds, Alexa top 1M Domain, VirusTotal, HybridAnalysis, URL / Domain Sandbox Analysis, Blacklisted Domain Checker

Hypotheses 3 : Malware Run on the User System after being downloaded

- Data Source for Hunting
  - Prefetch, Shimcache, Amcache, Process Running, Volatile Data (Memory), Sysmon, Auditd,
- Platform for Hunting
  - SIEM, Security Analytics Platform, EDR
- Analysis and Enrichment Data
  - File Hash of Process Executed, Parent-Child Process Analysis(SANS Find Evil Poster as Reference), Folder Location of Executables, Signed of Binary Files, VirusTotal, HybridAnalysis,

Hypotheses 4 : Malware doing persistence mechanism on Infected / Exploited Machine

- Data Source for Hunting
  - ASEP (Auto Start Extensibility Points), Registry, Startup Services and Folder, Task Scheduler, Cron Job,
- Platform for Hunting
  - SIEM, Security Analytics Platform, EDR
- Analysis and Enrichment Data
  - Signature Check, Autoruns Sysinternals, File Hash Check, Date of Creation,

Hypotheses 5 : Malware contacting Command and Control Server

- Data Source for Hunting
  - Netflow, Firewall Log, NGFW Log, IDS, Proxy Logs, Full Packet Capture, DNS Log
- Platform for Hunting
  - SIEM, Security Analytics Platform, NDR, XDR,
- Analysis and Enrichment Data
  - Date of Creation Domain, SSL Cert Attribute Checks, JA3 SSL Fingerprint, GeoIP Location Data, Threat Intelligence Feeds

Hypotheses 6 : Threat Actor exfiltrate Sensitive document to Command and Control Server

- Data Source for Hunting
  - Netflow, Firewall Log, NGFW Log, IDS, Proxy Logs, Full Packet Capture, DNS Log
- Platform for Hunting
  - SIEM, Security Analytics Platform, NDR, XDR,
- Analysis and Enrichment Data
  - Date of Creation Domain, SSL Cert Attribute Checks, JA3 SSL Fingerprint, GeoIP Location Data, Threat Intelligence Feeds

Hypotheses 7 : Sensitive Data Leaked on the Internet

- Data Source for Hunting
  - OSINT, Dark Web Search, Underground Forum, Threat Intelligence Feeds
- Platform for Hunting
  - Threat Intelligence Platform
- Analysis and Enrichment Data
  - Pastebin, Github, Honeypot

Threat Intelligence

Threat Intelligence

Threat intelligence, or cyber threat intelligence, is information an organization uses to understand the threats that have, will, or are currently targeting the organization.

By identifying the threat actors the organization may be targeted by, defenses and monitoring solutions can be created to better protect from attacks.

Threat Hunting is also closely associated with Threat Intelligence, as hunting is the process of using intelligence to search for evidence of sophisticated threat actors, who are already in the network

Benefit of Threat Intelligence

- By identifying relevant threat actors, and consuming intelligence from a number of sources, a Threat Intelligence function can help the business better understand risks from cyber-attacks. In short, it helps security teams focus on attackers that are likely to target the organization, and work to develop defences and other measures to prevent or limit the impact of attacks.
- Threat Actors have the skills, knowledge, and resources to evade most of security perimeter and tools owned by the organizations. That is why it is quite important to keep up to date with their tactics, and develop unique solutions to detect, response and prevent them to get into our network.

Indicator of Compromise

IOCs are artifacts that have been identified as acting maliciously or attributed to threat actors. Some of the most common ones include

- **IP Addresses** : An IP that has been observed doing a scanning or exploitation to our network
- **Domains** : A domain that hosts a credential harvesting site or hosting malicious payload
- **Email Addresses** : An email address that has been sending phishing emails with a malicious attachment
- **File Names** : Malicious file names dropped by the attacker during the compromised
- **File Hashes** : The unique hash of a piece of malware / malicious tools used by threat actors

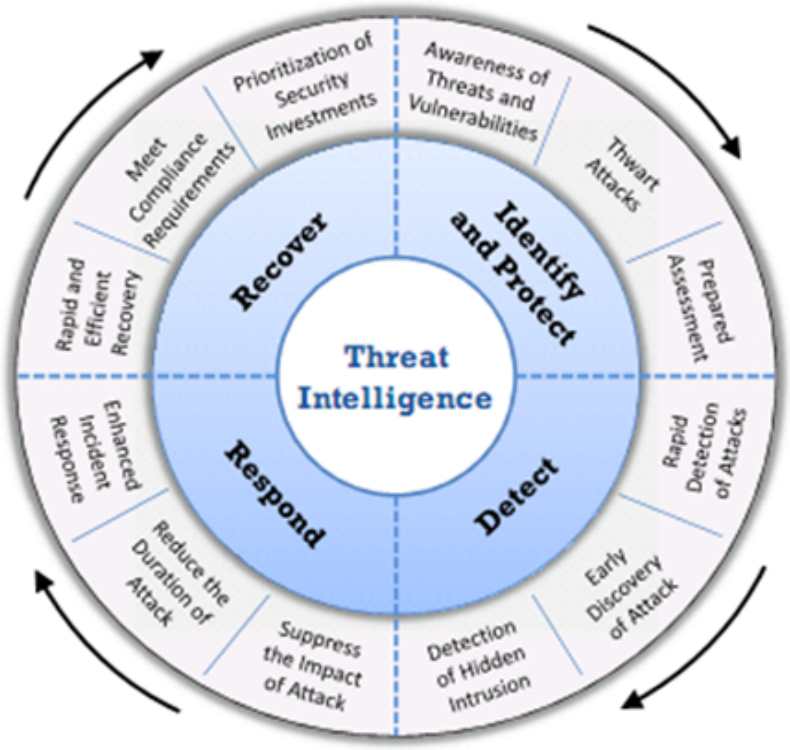
Threat Intelligence

Remember IOC != Threat Intelligence

Threat Intelligence and Threat Hunting

- Threat intelligence and threat hunting are two distinct security area that can be complimentary for each other. For example, threat intelligence can make up a small portion of the threat hunting process. However, subscribing to a threat intelligence feed does not automatically satisfy the need to threat hunt your network. A proper threat hunt can identify threats even when they have not yet been seen in the wild.

Threat Intelligence and Threat Hunting



EC Council CTIA Threat Intelligence

"one organization's detection to become another's prevention"

Honeypot

Chapter 3 : Honeypot

1. Honeypot Concept
   a. What is and Why Honeypot?
   b. Who made it?
   c. How to make it work?
   d. Types of honeypot?
   e. What is Honeynets?
2. Examples of Honeypot
   a. Honeypot Dionaea
   b. Honeypot Cowrie
   c. What is and Why MHN?

Honeypot Concept

What is Honeypot?

- Its is a computer program that used **to lure** cyber adversaries to attack it.
- Its capable **to mimicking** a live system. To lure attackers, honeypot is made to be identical like a real system
- Its able **to retrieve information** from the intrusion attempt. From this attempt we can pick up a things or two about current attack

If we want to summarise what is a honeypot, we could say it is a “TRAP”

What is Honeypot?

The principle behind this technology is really simple:

1.We don’t look for hackers, We attract them to come to us, like preparing a cheese in mouse trap.
2.But you have to be smart! You need to make sure that the honeypot is believable enough

https://us.norton.com/internetsecurity-iot-what-is-a-honeypot.html

Why honeypot?

You may be asking yourself what's big deal of honeypot, although we have already other alternatives, such as:

1. NIDS(Network Intrusion Detection System)
2. IPS(Intrusion Prevention System)
3. Firewall

Why Honeypot

You should understand the nature of these tools to truly fully utilize it:

- NIDS, IPS and Firewall is meant for prevention to stop unauthorized access, misuse and abuse of computer resources. You can think like building shield around your network, however, you need to know that this device obey certain rules to detect the threats and if there is a new threat these tools is unable to stop it.
- Contrast with honeypot that is not meant for prevention but rather for studying or capturing a new threat. You should not think that honeypot or IDS as the key to all of the network security problem, but you need to collaborate this tools in order to extend your overall security system.

Why Honeypot

In short this is advantages of collaborating honeypots into your network security monitoring system:

1. More information regarding vulnerabilities and intrusion pattern
2. More robust detection on all unwanted traffic including internal system and external system
3. Hiding sensitive system from attacker
4. Detecting zero days
5. Increasing overall quality of your security posture

Who Made it?

1. We don’t know actually, sike!
2. However, “Fred Cohen's Deception ToolKit” in 1998 is known as the first known honeypot in the world.
3. As malwares become more famous in the beginning 2000, honeypot also gain a lot of attention since its proves efficient to capture malware samples.

References: https://www.cse.wustl.edu/~jain/cse571-09/ftp/honey.pdf

How to make it work?

It’s pretty simple:

1. You can use **VM (Virtual Machine)** or an unused machine
2. Install the honeypot inside the VM
3. Configure them to make it as similar as your application
4. Make the security little bit weaker
    a. Fake account
    b. Guessable password
    c. Unpatch version
    d. Turn off firewall
    e. Put some interesting files(Honeytoken), example:
        i. Bank statement
        ii. Appointment
        iii. Bank account

Types of Honeypot?

We can divide honeypots into two categories based on its aim:

- Research Honeypots: the purpose of these honeypots is to get the maximum data regarding the adversaries activities by allowing them to have a full access.
- Production Honeypots: the purpose of these honeypots is to shift the adversaries focus away from the production system, thus making system safer.

Types of Honeypot?

We can divide honeypots into two categories based on its interaction:

- Low Interaction Honeypots:
  - The environment is limited only able to support several basic requirement of interaction in operating system
  - Less risk
  - Limited information
- High Interaction Honeypots:
  - More research oriented
  - Similar to live system
  - Riskier
  - Verbose information

Types of honeypot?

Based on integration we can divide into three types:

1. LAN(Local Area Network) region, putting honeypots in the same regions as production server. Using this approach honeypot able to capture internal and external threats.
2. DMZ(demilitarized zone) region, putting only in DMZ network region. This approach is not giving full coverage of analysis since the LAN network area is not touched.
3. Internet region, putting honeypots directly on the internet, thus no firewall protecting them.

What is Honeynets?

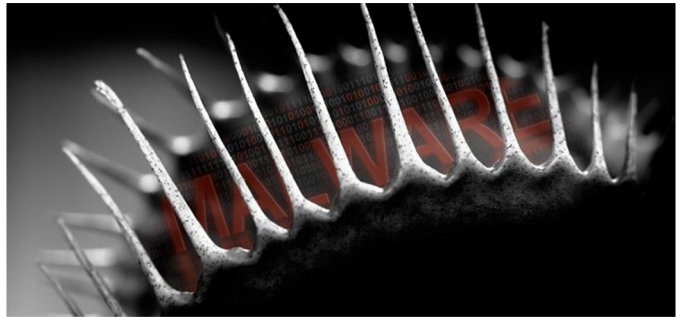
As the name suggest, honeynets is a collection of honeypots or a group of honeypots.

Collecting honeypots into one system can lead to numerous advantages rather than deploying a single node of honeypots. You should realize that examples of honeypot that we going to cover in the next few slides have some flaws too, thus, combining this into one synergise system can help to fill the gap.

Example of Honeypots

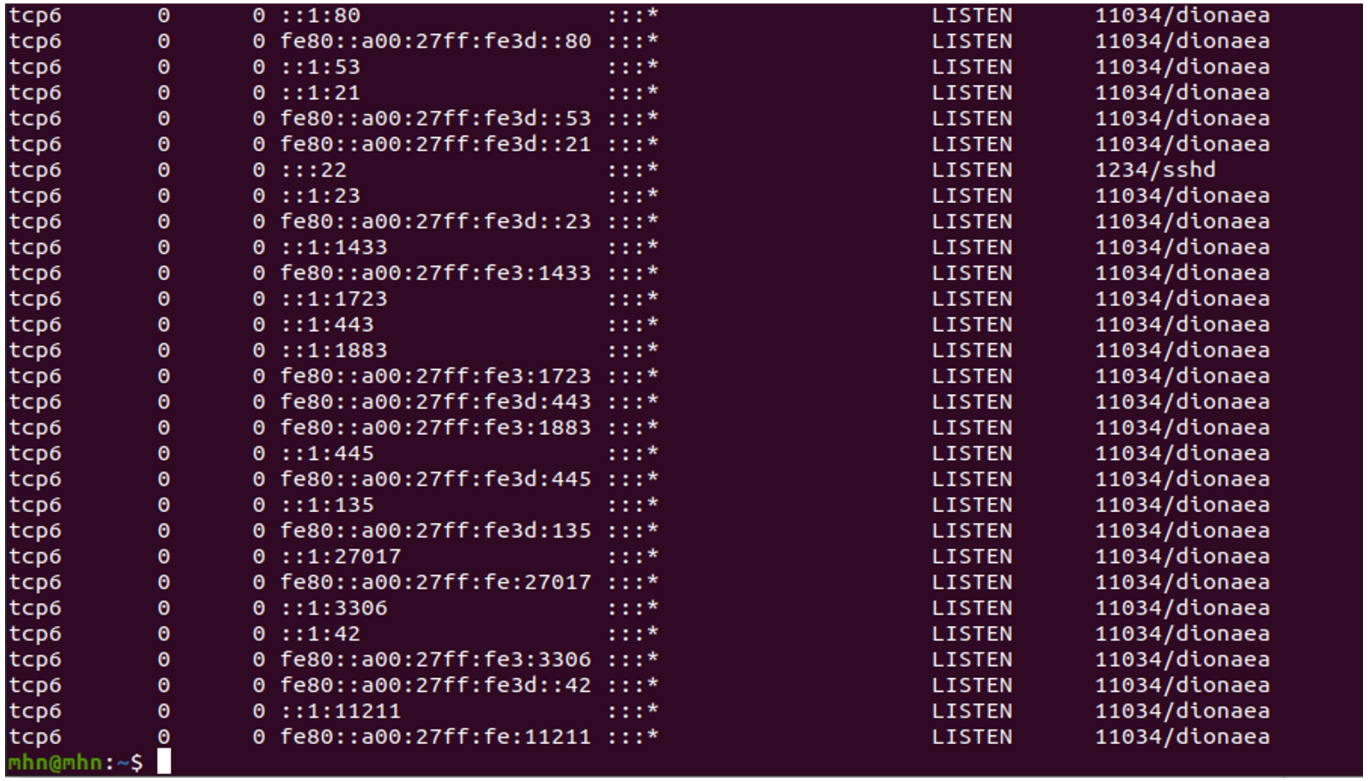
Honeypot Dionaea?

1. Categorized as low interaction honeypot
2. Able to emulate the variety of network protocol(Ex: FTP, HTTP, MQTT, MSSQL, MYSQL and etc) to be attacked by adversaries.
3. Meant to capture malware and detect its payload using **LibEmu(mostly used for shellcode emulation and detection).**
4. Dionaea collects all the intrusion in **log SQL database**.



Honeypot Dionaea?

The following is the list of the services that run in dionaea honeypot(Live system).



```
tcp6       0      0 ::1:80                  :::*                    LISTEN      11034/dionaea
tcp6       0      0 fe80::a00:27ff:fe3d::80 :::*                    LISTEN      11034/dionaea
tcp6       0      0 ::1:53                  :::*                    LISTEN      11034/dionaea
tcp6       0      0 ::1:21                  :::*                    LISTEN      11034/dionaea
tcp6       0      0 fe80::a00:27ff:fe3d::53 :::*                    LISTEN      11034/dionaea
tcp6       0      0 fe80::a00:27ff:fe3d::21 :::*                    LISTEN      11034/dionaea
tcp6       0      0 :::22                   :::*                    LISTEN      1234/sshd
tcp6       0      0 ::1:23                  :::*                    LISTEN      11034/dionaea
tcp6       0      0 fe80::a00:27ff:fe3d::23 :::*                    LISTEN      11034/dionaea
tcp6       0      0 ::1:1433                :::*                    LISTEN      11034/dionaea
tcp6       0      0 fe80::a00:27ff:fe3:1433 :::*                    LISTEN      11034/dionaea
tcp6       0      0 ::1:1723                :::*                    LISTEN      11034/dionaea
tcp6       0      0 ::1:443                 :::*                    LISTEN      11034/dionaea
tcp6       0      0 ::1:1883                :::*                    LISTEN      11034/dionaea
tcp6       0      0 fe80::a00:27ff:fe3:1723 :::*                    LISTEN      11034/dionaea
tcp6       0      0 fe80::a00:27ff:fe3d:443 :::*                    LISTEN      11034/dionaea
tcp6       0      0 fe80::a00:27ff:fe3:1883 :::*                    LISTEN      11034/dionaea
tcp6       0      0 ::1:445                 :::*                    LISTEN      11034/dionaea
tcp6       0      0 fe80::a00:27ff:fe3d:445 :::*                    LISTEN      11034/dionaea
tcp6       0      0 ::1:135                 :::*                    LISTEN      11034/dionaea
tcp6       0      0 fe80::a00:27ff:fe3d:135 :::*                    LISTEN      11034/dionaea
tcp6       0      0 ::1:27017               :::*                    LISTEN      11034/dionaea
tcp6       0      0 fe80::a00:27ff:fe:27017 :::*                    LISTEN      11034/dionaea
tcp6       0      0 ::1:3306                :::*                    LISTEN      11034/dionaea
tcp6       0      0 ::1:42                  :::*                    LISTEN      11034/dionaea
tcp6       0      0 fe80::a00:27ff:fe3:3306 :::*                    LISTEN      11034/dionaea
tcp6       0      0 fe80::a00:27ff:fe3d::42 :::*                    LISTEN      11034/dionaea
tcp6       0      0 ::1:11211               :::*                    LISTEN      11034/dionaea
tcp6       0      0 fe80::a00:27ff:fe:11211 :::*                    LISTEN      11034/dionaea
mhn@mhn:~$
```

Honeypot Dionaea?

This what's look like in the eye of the attacker

```
~/Downloads » nmap 172.20.10.3 -T5
Starting Nmap 7.80 ( https://nmap.org ) at 2020-11-08 23:05 WIB
Warning: 172.20.10.3 giving up on port because retransmission cap hit (2).
Nmap scan report for 172.20.10.3
Host is up (0.083s latency).
Not shown: 940 filtered ports, 47 closed ports
PORT     STATE SERVICE
21/tcp   open  ftp
22/tcp   open  ssh
23/tcp   open  telnet
42/tcp   open  nameserver
53/tcp   open  domain
80/tcp   open  http
135/tcp  open  msrpc
443/tcp  open  https
445/tcp  open  microsoft-ds
1433/tcp open  ms-sql-s
1723/tcp open  pptp
3306/tcp open  mysql
5060/tcp open  sip

Nmap done: 1 IP address (1 host up) scanned in 32.06 seconds
~/Downloads »
```

Honeypot Dionaea?

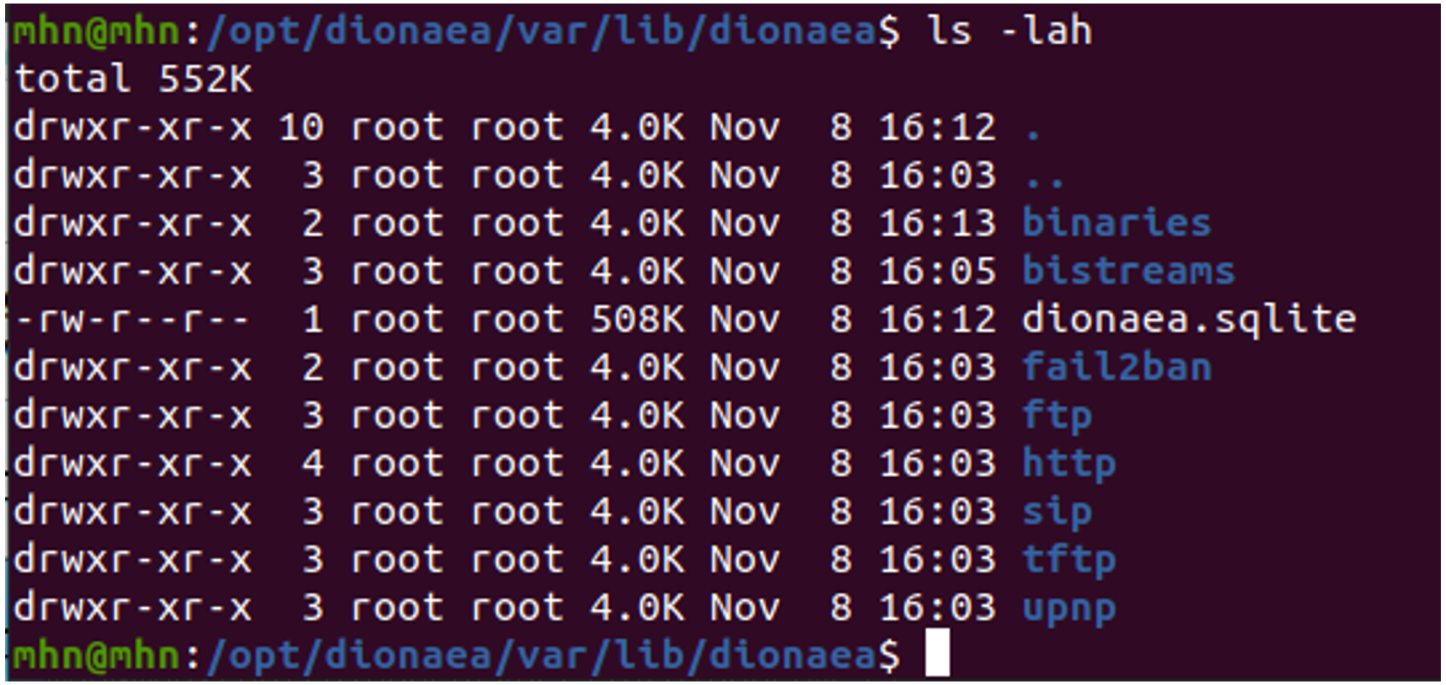
As mentioned before, dionaea is categorized as low interaction honeypot although the service that cover by it is wide but the amount of the interaction that provide by the honeypot is limited. That's why when you try to to attacked the honeypot most of the time, it will failed. But not to worry, although is failed this doesn't mean that the honeypot is failed to capture the exploit

```
msf5 exploit(windows/smb/ms17_010_eternalblue) > run

[*] Started HTTP reverse handler on http://172.20.10.4:4444
[*] 172.20.10.3:445 - Using auxiliary/scanner/smb/smb_ms17_010 as check
[+] 172.20.10.3:445       - Host is likely VULNERABLE to MS17-010! - Windows 5.1
[!] 172.20.10.3:445       - Host is likely INFECTED with DoublePulsar! - Arch: x86 (32-bit), XOR Key: 0x5E367352
[*] 172.20.10.3:445       - Scanned 1 of 1 hosts (100% complete)
[*] 172.20.10.3:445 - Connecting to target for exploitation.
[+] 172.20.10.3:445 - Connection established for exploitation.
[+] 172.20.10.3:445 - Target OS selected valid for OS indicated by SMB reply
[*] 172.20.10.3:445 - CORE raw buffer dump (11 bytes)
[*] 172.20.10.3:445 - 0x00000000  57 69 6e 64 6f 77 73 20 35 2e 31                 Windows 5.1
[+] 172.20.10.3:445 - Target arch selected valid for arch indicated by DCE/RPC reply
[*] 172.20.10.3:445 - Trying exploit with 12 Groom Allocations.
[*] 172.20.10.3:445 - Sending all but last fragment of exploit packet
```

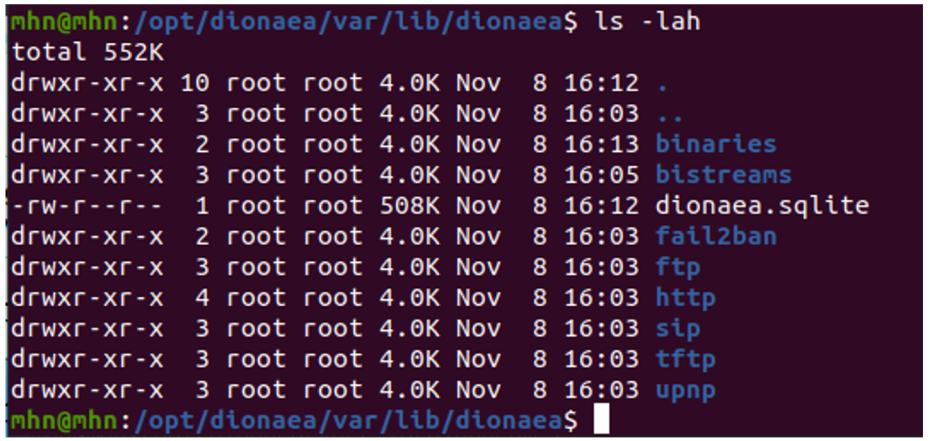
Honeypot Dionaea

Closer look in dionaea, inside the honeypot all of the intrusion attempt is stored inside the folder /opt/dionaea/var/lib/dionaea



Honeypot Dionaea

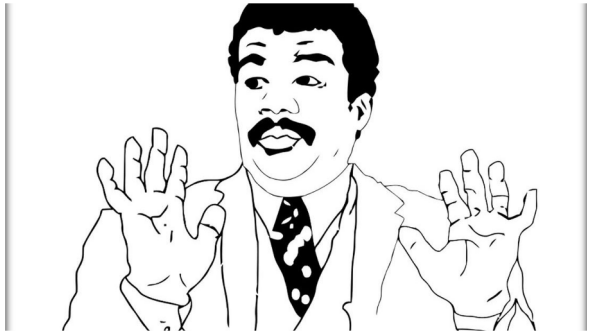
- Folder binaries will contain the payload and malware that is captured
- Bistreams will contain all of the network intrusion attempt this include port scanning
- Dionaea aggregate all of this information into sqlite3 database
- Whereas the remaining directory is stored the payload that is captured based on their respective services.



Honeypot Dionaea

One thing you need to watch out, when deploying dionaea

1. Dionaea will create a massive log system, thus it is wise to delete or disable the logging features to make sure you're running out of storage.
2. This also include files contain in bistreams because dionaea will separate each file of network intrusion based on the ip address and time. I suggest to create a crontab to do some cleaning inside this directory after couple of months

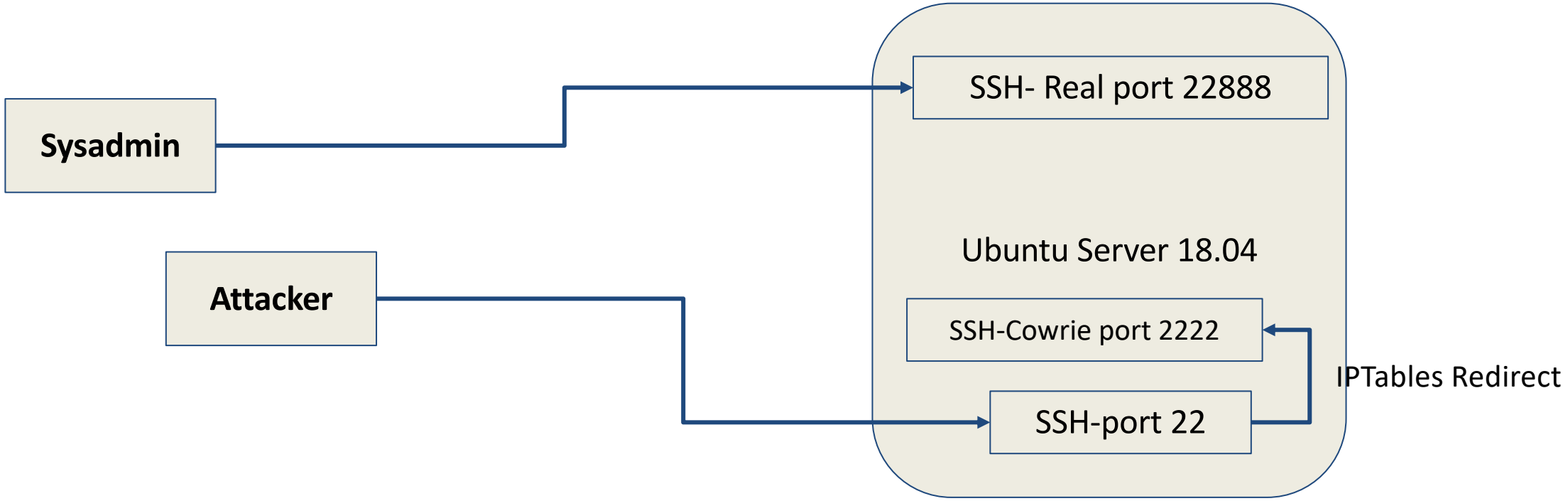


Honeypot Cowrie?

1. It’s categorized as medium-high ish honeypot
2. It’s an SSH honeypot
3. Able to log all information of brute-force password and command that passed inside its emulated UNIX environment.

Honeypot Cowrie

The following is the architecture design in cowrie



Honeypot Cowrie

As mentioned before, cowrie is a ssh honeypot this means that the real ssh service that used by the sysadmin need to relocate into another port number. In this case based on the figure in slide 23 it moved to port 22888

Thus, the honeypot cowrie can use the default port 22 SSH. Another alternative will be redirect all port 22 traffic to port 2222 where it lies the honeypot

The choice is yours :)

Honeypot Cowrie

The following is the service that run when cowrie is installed in live system where the real ssh port is moved to 22888 and cowrie honeypot is put at port 22

```
mhn@mhn:~$ sudo netstat -aptn
Active Internet connections (servers and established)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 127.0.0.53:53           0.0.0.0:*               LISTEN      852/systemd-resolve
tcp        0      0 0.0.0.0:22              0.0.0.0:*               LISTEN      10699/python2
tcp        0      0 0.0.0.0:22888           0.0.0.0:*               LISTEN      10568/sshd
tcp        0     36 172.20.10.3:22888       172.20.10.2:57954       ESTABLISHED 2545/sshd: mhn [pri
tcp        0      0 172.20.10.3:42132       172.20.10.14:10000      ESTABLISHED 10699/python2
tcp6       0      0 :::22888                :::*                    LISTEN      10568/sshd
mhn@mhn:~$
```

Honeypot Cowrie

This what's look like in the eye of the attacker and as you can see it is pretty similar with ordinary linux server.

```
~/Documents/ios_pentest/ios_tweak/showbatteries » ssh root@172.20.10.3
The authenticity of host '172.20.10.3 (172.20.10.3)' can't be established.
RSA key fingerprint is SHA256:Krnx1EElsIPSjhfPPr9P54vktkSvytPcXdNUPZo79Y8.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added '172.20.10.3' (RSA) to the list of known hosts.
root@172.20.10.3's password:

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
root@server_production_web:~# cat /etc/passwd
root:x:0:0:root:/root:/bin/bash
daemon:x:1:1:daemon:/usr/sbin:/usr/sbin/nologin
bin:x:2:2:bin:/bin:/usr/sbin/nologin
sys:x:3:3:sys:/dev:/usr/sbin/nologin
sync:x:4:65534:sync:/bin:/bin/sync
games:x:5:60:games:/usr/games:/usr/sbin/nologin
man:x:6:12:man:/var/cache/man:/usr/sbin/nologin
lp:x:7:7:lp:/var/spool/lpd:/usr/sbin/nologin
mail:x:8:8:mail:/var/mail:/usr/sbin/nologin
news:x:9:9:news:/var/spool/news:/usr/sbin/nologin
uucp:x:10:10:uucp:/var/spool/uucp:/usr/sbin/nologin
proxy:x:13:13:proxy:/bin:/usr/sbin/nologin
www-data:x:33:33:www-data:/var/www:/usr/sbin/nologin
backup:x:34:34:backup:/var/backups:/usr/sbin/nologin
list:x:38:38:Mailing List Manager:/var/list:/usr/sbin/nologin
irc:x:39:39:ircd:/var/run/ircd:/usr/sbin/nologin
gnats:x:41:41:Gnats Bug-Reporting System (admin):/var/lib/gnats:/usr/sbin/nologin
nobody:x:65534:65534:nobody:/nonexistent:/usr/sbin/nologin
systemd-network:x:100:102:systemd Network Management,,,:/run/systemd/netif:/usr/sbin/nologin
systemd-resolve:x:101:103:systemd Resolver,,,:/run/systemd/resolve:/usr/sbin/nologin
syslog:x:102:106::/home/syslog:/usr/sbin/nologin
messagebus:x:103:107::/nonexistent:/usr/sbin/nologin
_apt:x:104:65534::/nonexistent:/usr/sbin/nologin
lxd:x:105:65534::/var/lib/lxd/:/bin/false
uuidd:x:106:110::/run/uuidd:/usr/sbin/nologin
dnsmasq:x:107:65534:dnsmasq,,,:/var/lib/misc:/usr/sbin/nologin
landscape:x:108:112::/var/lib/landscape:/usr/sbin/nologin
pollinate:x:109:1::/var/cache/pollinate:/bin/false
sshd:x:110:65534::/run/sshd:/usr/sbin/nologin
mongodb:x:111:113::/var/lib/mongodb:/usr/sbin/nologin
redis:x:112:114::/var/lib/redis:/usr/sbin/nologin
jeremy:x:1001:1001:,,,:/home/jeremy:/bin/bash
joe:x:1002:1002:,,,:/home/joe:/bin/bash
christ:x:1003:1003:,,,:/home/christ:/bin/bash

root@server_production_web:~#
```

Honeypot Cowrie

Some features that you need to be aware in cowrie:

1. You can actually customized the list of username and password that allowed to be used in the cowrie.
2. You can modify the file system structure in the cowrie simulation, this include changing the /etc/passwd and /etc/shadow file without affecting your real system.
3. Cowrie offers “tty” log file that able to replay the interaction done by the attacker. This could give a valuable insight to study what is the current technique used by hacker

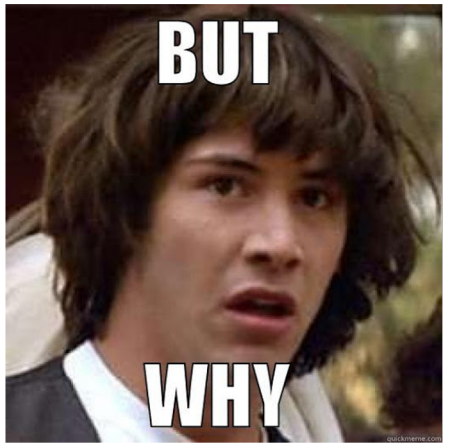
What is MHN?

MHN(Modern Honey Network):

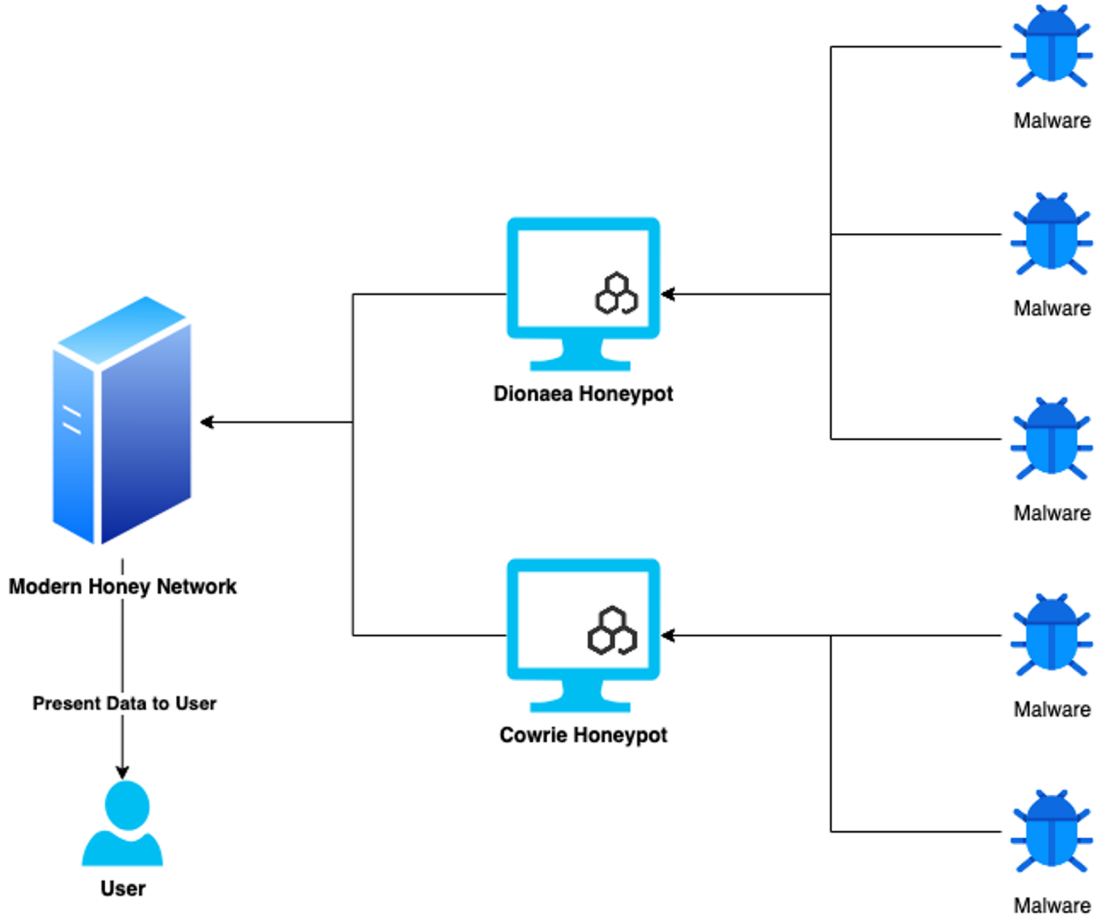
1. It is a centralized data management and collection for honeypot sensor
2. Display the data with a really cool dashboard
3. Include deployment script for various honeypot including Dionaea and Cowrie
4. Based on Flask-python

Why MHN?

- Deploying honeypot for beginner can take a considerable amount of time
- In the process of installation sometimes it leads to dependency failure
- Using MHN, all of the data in honeypot could be put in one place(centralized) to be analyzed and aggregate into nice one dashboard. This will give valuable insight for SOC(Security Operation Center)
- MHN will do all the heavy lifting for you.

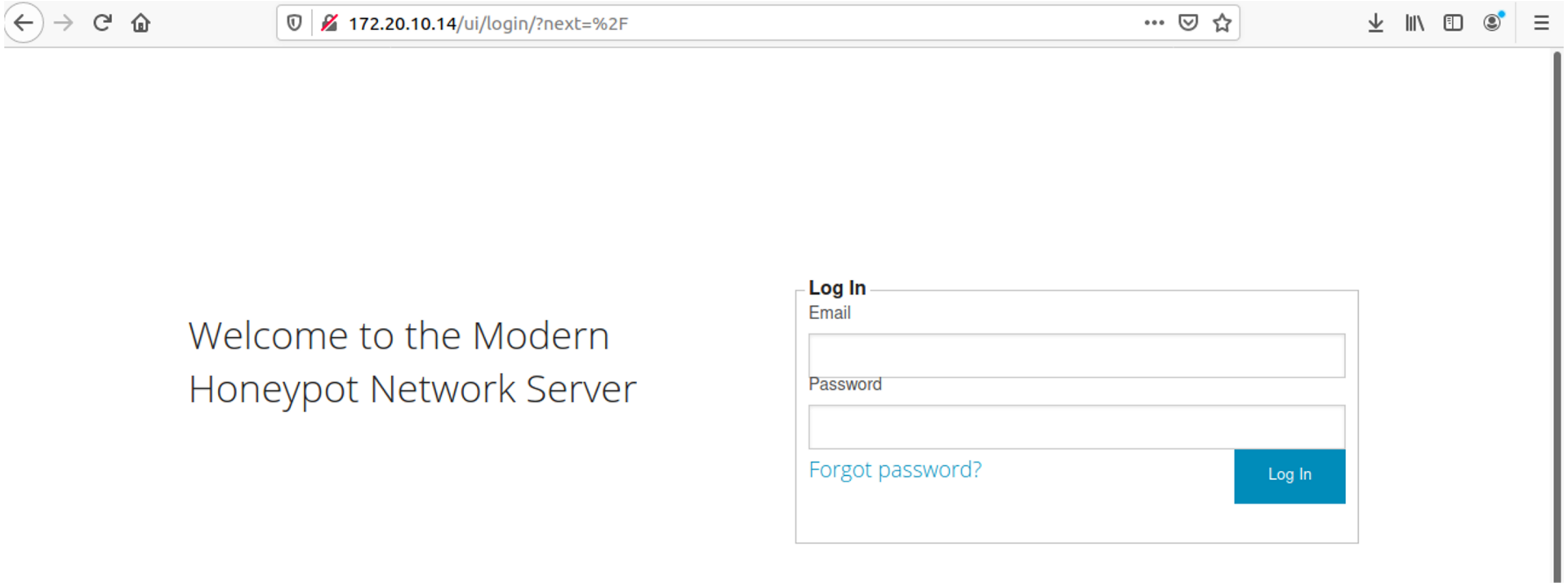


The architecture design(Example)



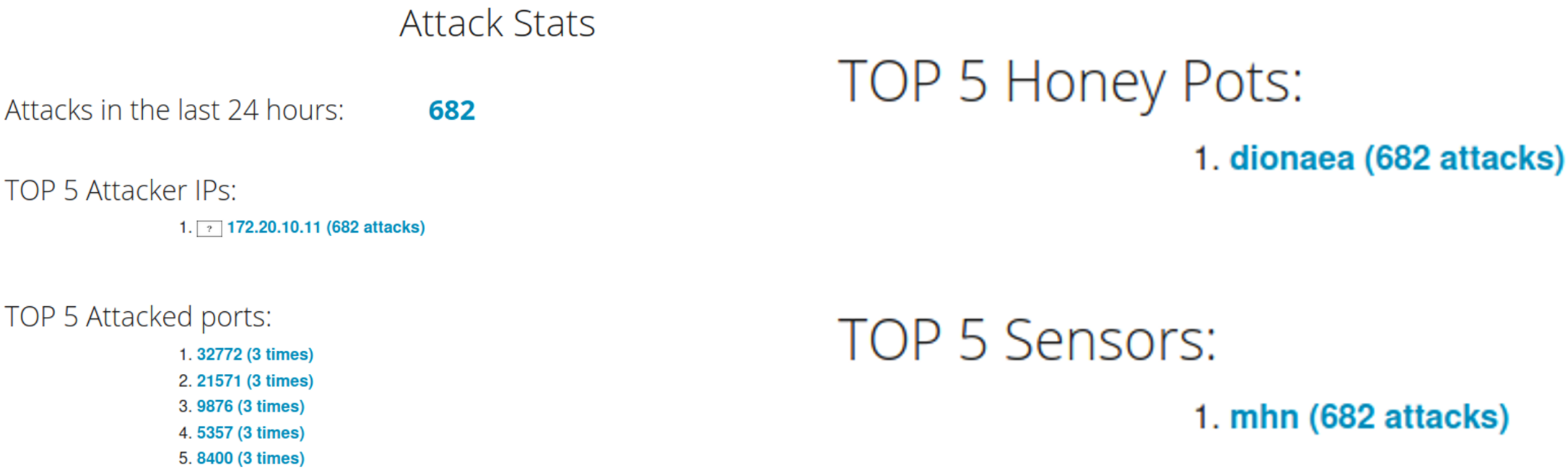
Sneak peek in MHN

The following is the sneak peek of MHN dashboard:



Sneak peek in MHN

MHN offers statistic of the current attack in all of the honeypots(real time)



Sneak peek in MHN

Attacks Report

Search Filters

Sensor: All | Honeypot: dionaea | Date: MM-DD-YYYY | Port: 445 | IP Address: 8.8.8.8 | GO

	Date	Sensor	Country	Src IP	Dst port	Protocol	Honeypot
1	2020-11-08 16:05:46	mhn	?	172.20.10.11	1094	pcap	dionaea
2	2020-11-08 16:05:46	mhn	?	172.20.10.11	691	pcap	dionaea
3	2020-11-08 16:05:46	mhn	?	172.20.10.11	55600	pcap	dionaea
4	2020-11-08 16:05:45	mhn	?	172.20.10.11	7019	pcap	dionaea
5	2020-11-08 16:05:45	mhn	?	172.20.10.11	5987	pcap	dionaea
6	2020-11-08 16:05:45	mhn	?	172.20.10.11	9220	pcap	dionaea
7	2020-11-08 16:05:45	mhn	?	172.20.10.11	6001	pcap	dionaea
8	2020-11-08 16:05:45	mhn	?	172.20.10.11	3001	pcap	dionaea
9	2020-11-08 16:05:45	mhn	?	172.20.10.11	5718	pcap	dionaea
10	2020-11-08 16:05:45	mhn	?	172.20.10.11	5960	pcap	dionaea

Summary and Takeaway

- Threat Hunting needs visibility from your Detection Engineering
- Threat Hunter mindset and knowledge is one of key component in hunting process
- Automation can help Threat Hunting but still need manual activities
- MITRE ATT&CK can be used as the main framework in threat hunting process
- Threat Intelligence != Threat Hunting
- Deception Technology is needed to study the attacker behavior and keep the bad guy busy

Thank you