Using ATT&CK® for Containers to Level Up your Cloud Defenses

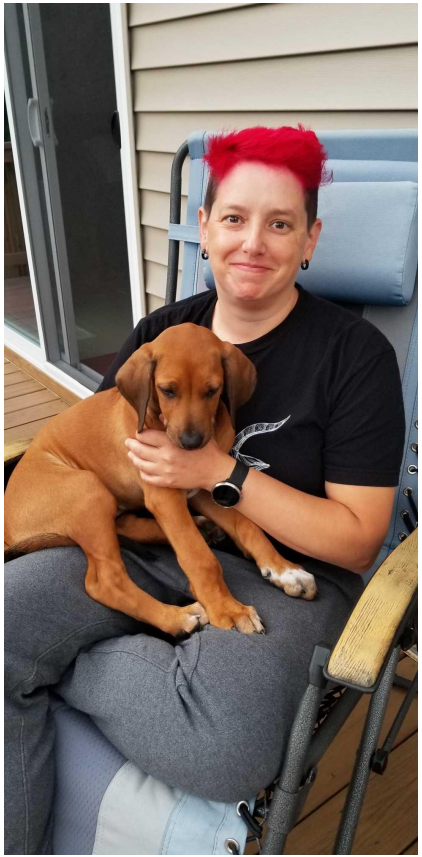
Jen Burns @snarejen

fwd:cloudsec 2021

whoami?

T1033 - System Owner/User Discovery

- Senior Security Engineer at HubSpot
- Former ATT&CK for Cloud Lead
- Solid drummer
- Somewhat decent climber
- Lover of bad puns
- Fan of most animals despite being allergic to most animals

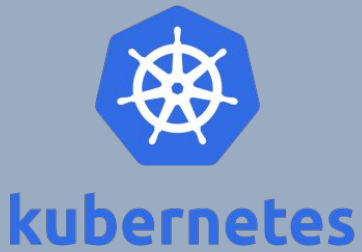


HubSpot

Grow Better

What's on the docke(r)t for today?

1. What is ATT&CK?
2. Why did Containers get added to ATT&CK?
3. How can I use ATT&CK for Containers?



MITRE | ATT&CK®

What is ATT&CK?

Note that I am NOT a representative of MITRE or ATT&CK!

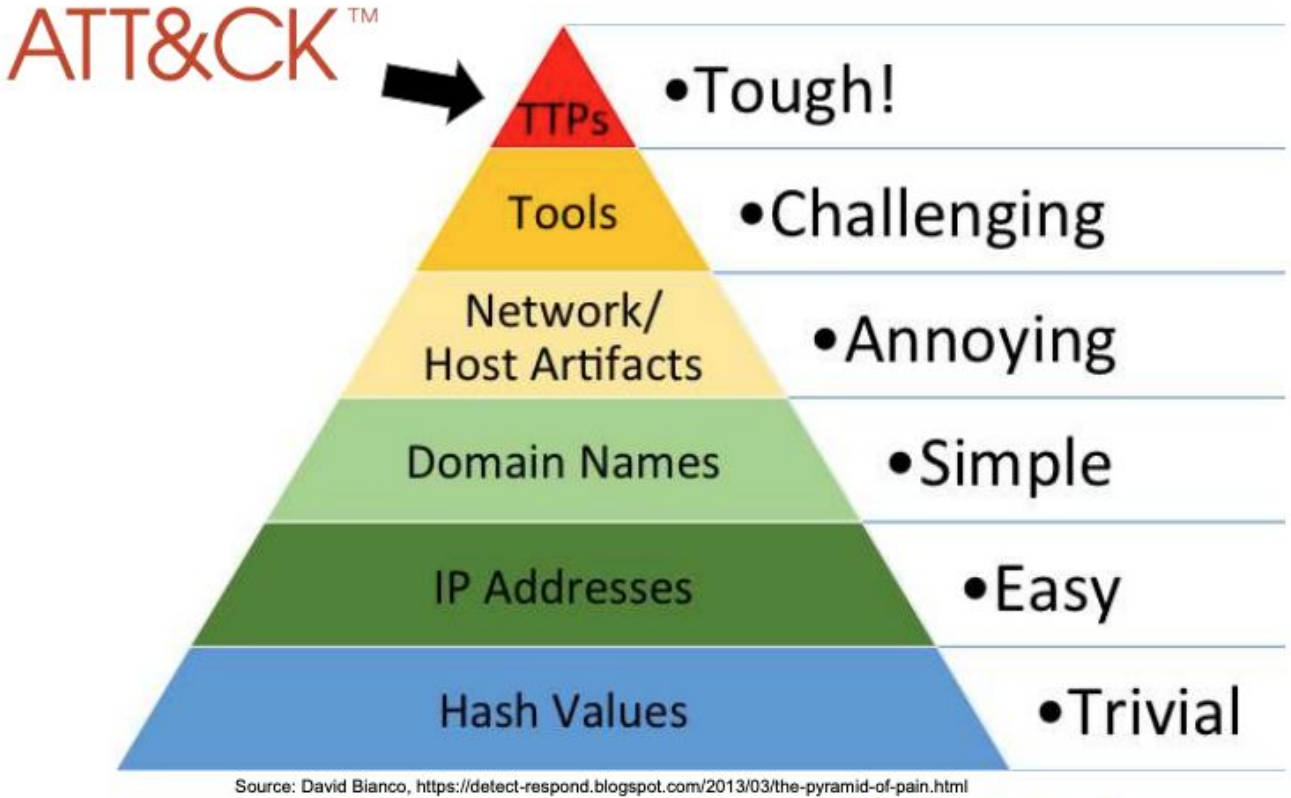
What is ATT&CK?

A knowledge base of adversary behavior

- ***Based on real-world observations***
- ***Free, open, and globally accessible***
- ***A common language***
- ***Community-driven***

Want to contribute to ATT&CK?

- Check out guidelines at https://attack.mitre.org/resources/contribute/
- Send your contribution to attack@mitre.org

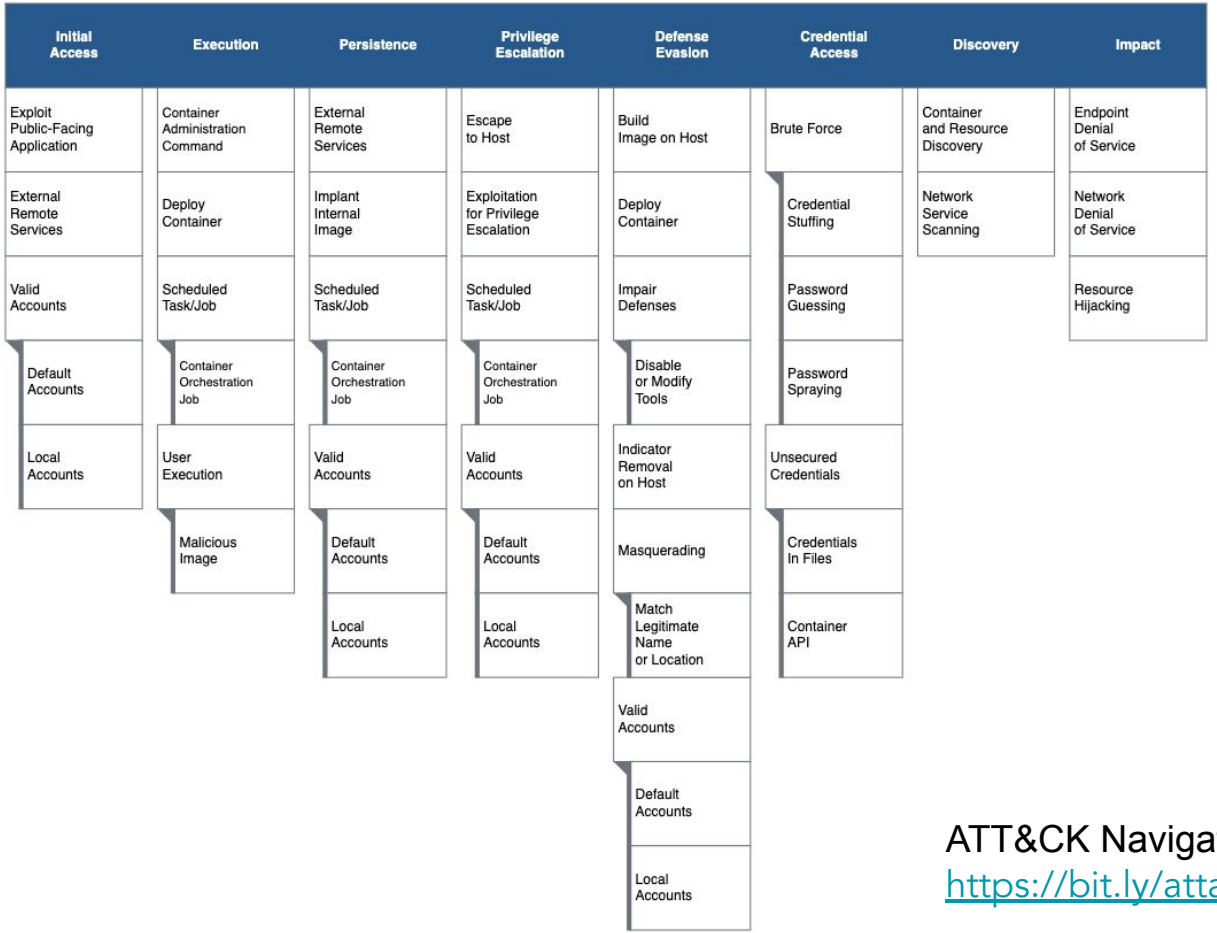


Source: David Bianco, https://detect-respond.blogspot.com/2013/03/the-pyramid-of-pain.html

David Bianco's Pyramid of Pain

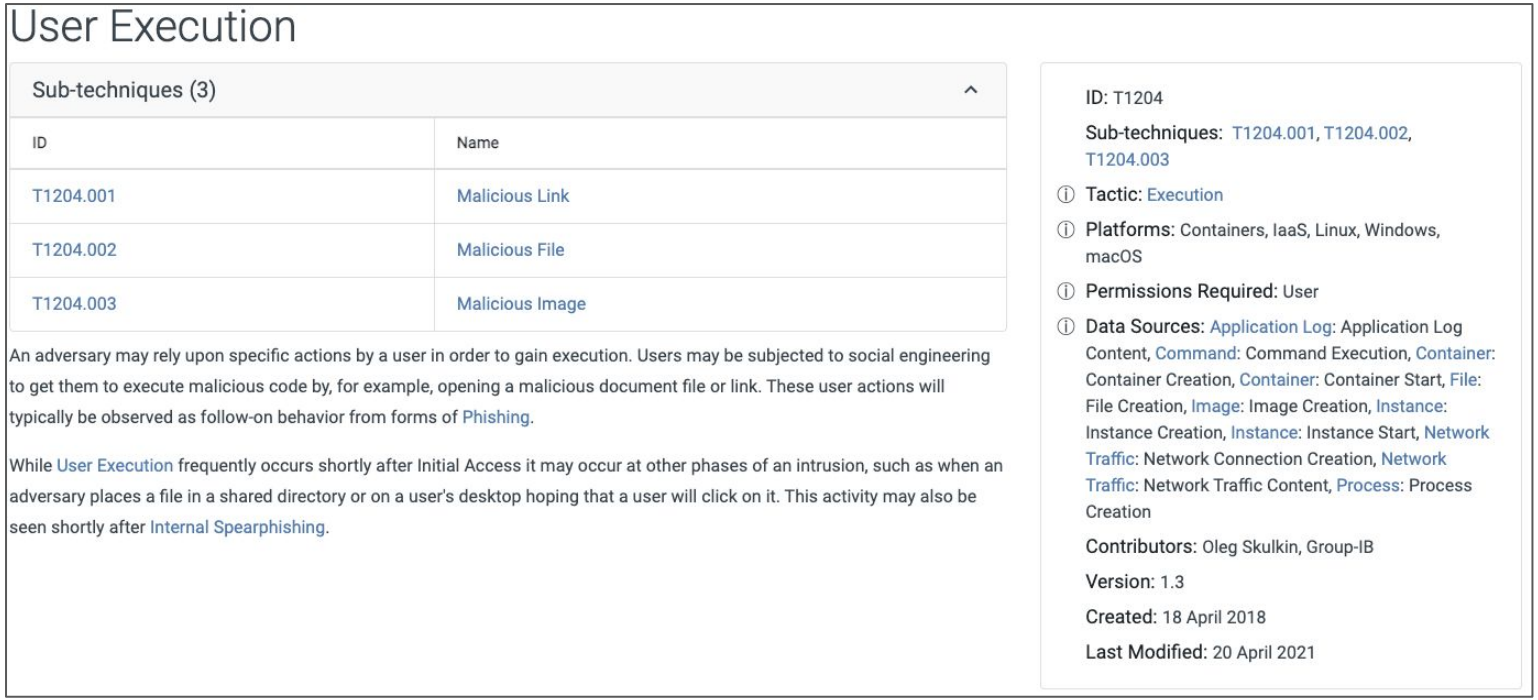
Tactics: the adversary's technical goals

Techniques: how the goals are achieved



ATT&CK Navigator
https://bit.ly/attacknav

Technique Example



User Execution

Sub-techniques (3)

ID	Name
T1204.001	Malicious Link
T1204.002	Malicious File
T1204.003	Malicious Image

An adversary may rely upon specific actions by a user in order to gain execution. Users may be subjected to social engineering to get them to execute malicious code by, for example, opening a malicious document file or link. These user actions will typically be observed as follow-on behavior from forms of Phishing.

While User Execution frequently occurs shortly after Initial Access it may occur at other phases of an intrusion, such as when an adversary places a file in a shared directory or on a user's desktop hoping that a user will click on it. This activity may also be seen shortly after Internal Spearphishing.

ID: T1204

Sub-techniques: T1204.001, T1204.002, T1204.003

ⓘ Tactic: Execution

ⓘ Platforms: Containers, IaaS, Linux, Windows, macOS

ⓘ Permissions Required: User

ⓘ Data Sources: Application Log: Application Log Content, Command: Command Execution, Container: Container Creation, Container: Container Start, File: File Creation, Image: Image Creation, Instance: Instance Creation, Instance: Instance Start, Network Traffic: Network Connection Creation, Network Traffic: Network Traffic Content, Process: Process Creation

Contributors: Oleg Skulkin, Group-IB

Version: 1.3

Created: 18 April 2018

Last Modified: 20 April 2021

Screenshot from https://attack.mitre.org/techniques/T1204/

NOTE: Techniques and sub-techniques ALSO include mitigations, detections, and procedures

Why did Containers get added to ATT&CK?

NOT THESE CONTAINERS!!!

ATT&CK Matrices Tactics Techniques Mitigations Groups Software Resources Blog Contribute Search

Home > Groups > Ever Given

Ever Given

Ever Given is a Panama-based threat group that laun s worldwide. [1]

Techniques Used

Domain	ID	Name	Use
Containers	T1896	Global Economy Denial of Service	
Containers	T1874	Boat-In-the-Middle	
Containers	T1877	Indicator Removal on Canal	

https://twitter.com/MITREattack/status/1377615020465520640

Why did Containers get added to ATT&CK?

1 It's a logical expansion of ATT&CK.

Originally ATT&CK just covered the Windows platform. In the past few years it expanded to include techniques carried out in Linux, macOS, industrial control systems, the cloud, and network devices.

Why did Containers get added to ATT&CK?

2 MITRE Engenuity's CTID provided support.

MITRE Engenuity's Center for Threat-Informed Defense and its members (including Microsoft and the folks who produced their K8s threat matrix) sponsored an investigation into adding containers into ATT&CK and contributed to the platform's creation.

Why did Containers get added to ATT&CK?

3 The community asked for it!

The community also helped conclude that the vast majority of activity that they observed *did* lead to cryptomining. However, evidence from a number of parties led the ATT&CK team to also conclude that adversaries utilizing containers for more “traditional” purposes, such as exfiltration and collection of sensitive data, is publicly under reported.

ATT&CK for Containers Contributors

- Brad Geesaman, @bradgeesaman
- Center for Threat-Informed Defense (CTID)
- Cisco
  - Idan Frimark, Ariel Shuper
- Palo Alto Networks
  - Yuval Avrahami, Jay Chen, Nathaniel Quist
- Rory McCune, Aqua Security
- Team Nautilus Aqua Security
  - Yaniv Agman (@AgmanYaniv), Ziv Karliner (@ziv_kr), Michael Katchinskiy (@michael64194968), Roi Kol (@roykol1), Assaf Morag (@MoragAssaf), Idan Revivo (@idanr86), Gal Singer (@galsinger29)
- Trend Micro
  - David Fiser (@anu4is), Pawan Kinger (@kingerpawan), Magno Logan (@magnologan), Alfredo Oliveira
- Vishwas Manral, McAfee
- Yossi Weizman, Azure Defender Research Team

https://www.vecteezy.com/free-vector/industrial

How can I use ATT&CK for Containers?

Four Main Use Cases for ATT&CK

How can ATT&CK for Containers help?

- Assessments and Engineering ⇦
- Threat Intelligence ⇦
- Adversary Emulation ⇦
- Building Detections

Getting Started with ATT&CK blog series:
https://medium.com/mitre-attack/getting-started/home

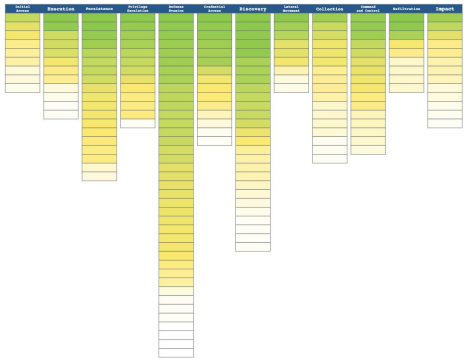
Pro Tip!

If it's hard to understand how an ATT&CK technique relates to containers, check out the MITRE Engenuity Medium blogs that have some container specific definitions.

- https://medium.com/mitre-engenuity/update-help-shape-att-ck-for-containers-bfcd24515df5
- https://medium.com/mitre-engenuity/att-ck-for-containers-now-available-4c2359654bf1

Assessments and Engineering

How can ATT&CK for Containers help?



- Helps us measure the status of our current defenses
  - *What's our confidence level that we would detect a particular technique?*
  - *Which techniques are sufficiently mitigated?*

- Gives us an understanding of where we can improve
  - *Do I need to capture different data sources in my environment?*
  - *Should I buy product X because we aren't detecting a particular set of techniques?*

Assessments and Engineering Example

External Remote Services

Adversaries may leverage external-facing remote services to initially access and/or persist within a network. Remote services such as VPNs, Citrix, and other access mechanisms allow users to connect to internal enterprise network resources from external locations. There are often remote service gateways that manage connections and credential authentication for these services. Services such as Windows Remote Management can also be used externally.

Access to Valid Accounts to use the service is often a requirement, which could be obtained through credential pharming or by obtaining the credentials from users after compromising the enterprise network.[1] Access to remote services may be used as a redundant or persistent access mechanism during an operation.

Access may also be gained through an exposed service that doesn't require authentication. In containerized environments, this may include an exposed Docker API, Kubernetes API server, kubelet, or web application such as the Kubernetes dashboard.[2][3]

Consider starting with a single technique….

External Remote Services

(Testing unauthenticated initial access into your environment)

01

Exposed Docker Daemon/API

External access to port 2375? Is the TCP socket enabled? Is an nmap scan successful? Are you gathering Docker daemon logs for processing?

02

K8s API Server

Is authentication required to access the API server? Can the API server be reached externally? Are you gathering audit logs for analysis?

03

Kubelet

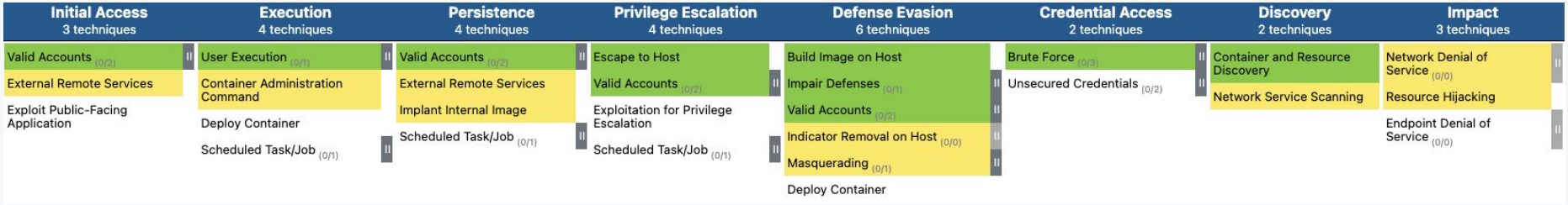
Is the kubelet locked down with something like webhook token auth? Are you gathering kubelet logs for analysis?

04

K8s Dashboard (or other web app)

Is the K8s dashboard or other control plane apps externally accessible? Does it require authentication to access?

Assessments and Engineering Example



2 - High Confidence of Detection
1 - Low Confidence of Detection
0 - No Confidence of Detection

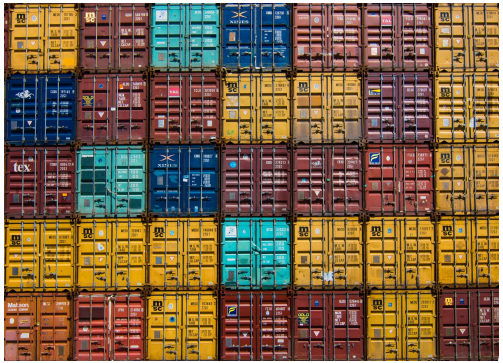
...or maybe

2 - Sufficiently Mitigated
1 - Partially Mitigated
0 - Not Mitigated

Threat Intelligence

How can ATT&CK for Containers help?

- Gives us a common language across teams
  - *Red Team*
  - *Blue Team*
  - *Cyber Threat Intel Team*
  - *Cloud Security/Operations Team*
  - *CISO*
  - *…*



https://unsplash.com/photos/uBe2mknURG4?utm_source=unsplash&utm_medium=referral&utm_content=creditShareLink

- Helps us better understand what behaviors adversaries are actually doing in Kubernetes, Docker, etc.

Threat Intelligence Example

Initial Access

kubelet is an agent running on each Kubernetes node. It takes RESTful requests from various components (mainly kube-apiserver) and performs pod-level operations. Depending on the configuration, kubelet may or may not accept unauthenticated requests. Standard Kubernetes deployments come with anonymous access to kubelet by default. However, most managed Kubernetes services such as Azure Kubernetes Service (AKS), Google Kubernetes Engine (GKE) and Kubernetes operations (Kops) all enforce proper authentication by default.

We discovered that TeamTNT gained initial access with the Hildegard malware by executing commands on kubelets that allow anonymous access. This was achieved by accessing the kubelet's run command API and executing commands on running containers.

Execution

Hildegard uses kubelet's API to execute commands inside containers. The initial commands create a tmate reverse shell that allows the attacker to carry out the subsequent operation. Unlike the techniques that TeamTNT used in the past, this malware campaign did not pull or run any new container image.

Privilege Escalation

Although Unit 42 researchers have not observed an attempt to perform privilege escalation, the malware dropped two adversarial tools, Peirates and BOtB, which are capable of breaking out of containers via known vulnerabilities or accessing cloud resources via exposed cloud credentials.

Excerpt from Palo Alto Networks about the Hildegard malware from TeamTNT

https://unit42.paloaltonetworks.com/hildegard-malware-teamtnt/

T1133 - External Remote Services

T1609 - Container Administration Command

T1611 - Escape to Host

T1552.005 - Unsecured Credentials: Cloud Instance Metadata API

Adversary Emulation

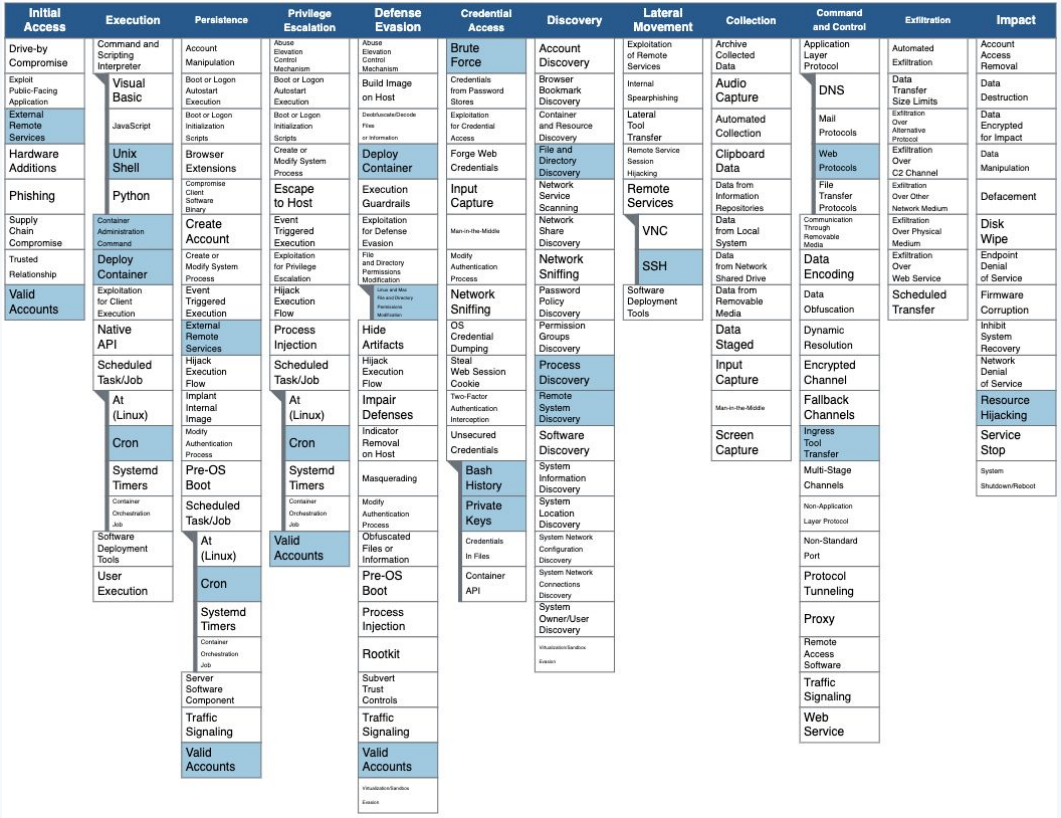
How can ATT&CK for Containers help?

- Helps ensure that you can actually detect/mitigate what you expect

- Provides a sanity check for your red team on what behaviors are being carried out by adversaries in-the-wild

https://unsplash.com/photos/ayog-lKRrp8?utm_source=unsplash&utm_medium=referral&utm_content=creditShareLink

Adversary Emulation Example - Kinsing Malware



Carry out an engagement across Containers and Linux
https://attack.mitre.org/software/S0599/

Use procedure examples from ATT&CK and threat intelligence as your guide!

Adversary Emulation/Assessments

There are lots of tools to help!

- red-kube - collection of kubectl commands written to evaluate security posture of K8s clusters
- kube-hunter - tool that searches for security weaknesses in K8s clusters
- kubernetes-goat - intentionally vulnerable cluster to learn/practice K8s security
- kubescape - tool for testing if K8s is deployed securely as defined in Kubernetes Hardening Guidance by NSA and CISA
- kube-bench - checks K8s deployment against the CIS K8s Benchmark

Thank you

Jen Burns  @snarejen

https://bit.ly/fwdcs21-burns