Red Teaming Devops

Jose Hernandez & Rod Soto

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Jose Hernandez

José is a Principal Security Researcher at Splunk. He started his professional career at Prolexic Technologies (now Akamai), fighting DDOS attacks from “*anonymous*” and “*lulzsec*” against Fortune 100 companies. As a engineering co-founder of Zenedge Inc. (acquired by Oracle Inc.), José helped build technologies to fight bots and web-application attacks. While working at Splunk as a Security Architect, he built and released an auto-mitigation framework that has been used to automatically fight attacks in large organizations. He has also built security operation centers and run a public threat-intelligence service. Although security information has been the focus of his career, José has found that his true passion is in solving problems and creating solutions. As an example, he built an underwater remote-control vehicle called the SensorSub, which was used to test and measure toxicity in Miami's waterways.

Rod Soto

Principal Security Research Engineer at Splunk. Worked at Prolexic, Akamai, Caspida. Won BlackHat CTF in 2012. Co-founded Hackmiami, Pacific Hackers meetup and conferences.

What is Devops

DevOps is the combination of cultural philosophies, practices, and tools that increases an organization’s ability to deliver applications and services at high velocity: evolving and improving products at a faster pace than organizations using traditional software development and infrastructure management processes. * Source AWS

Why is Devops so popular ?

- Faster deployment of applications
- Shared responsibility and collaboration among teams
- Apply security to software development practices and platform application deployment
- Scale and manage infrastructure and development of software
- Make applications and deployed infrastructure reliable by being able to apply updates & upgrades
- The Devops practices have become a key factor in the use and expansion of cloud platforms.

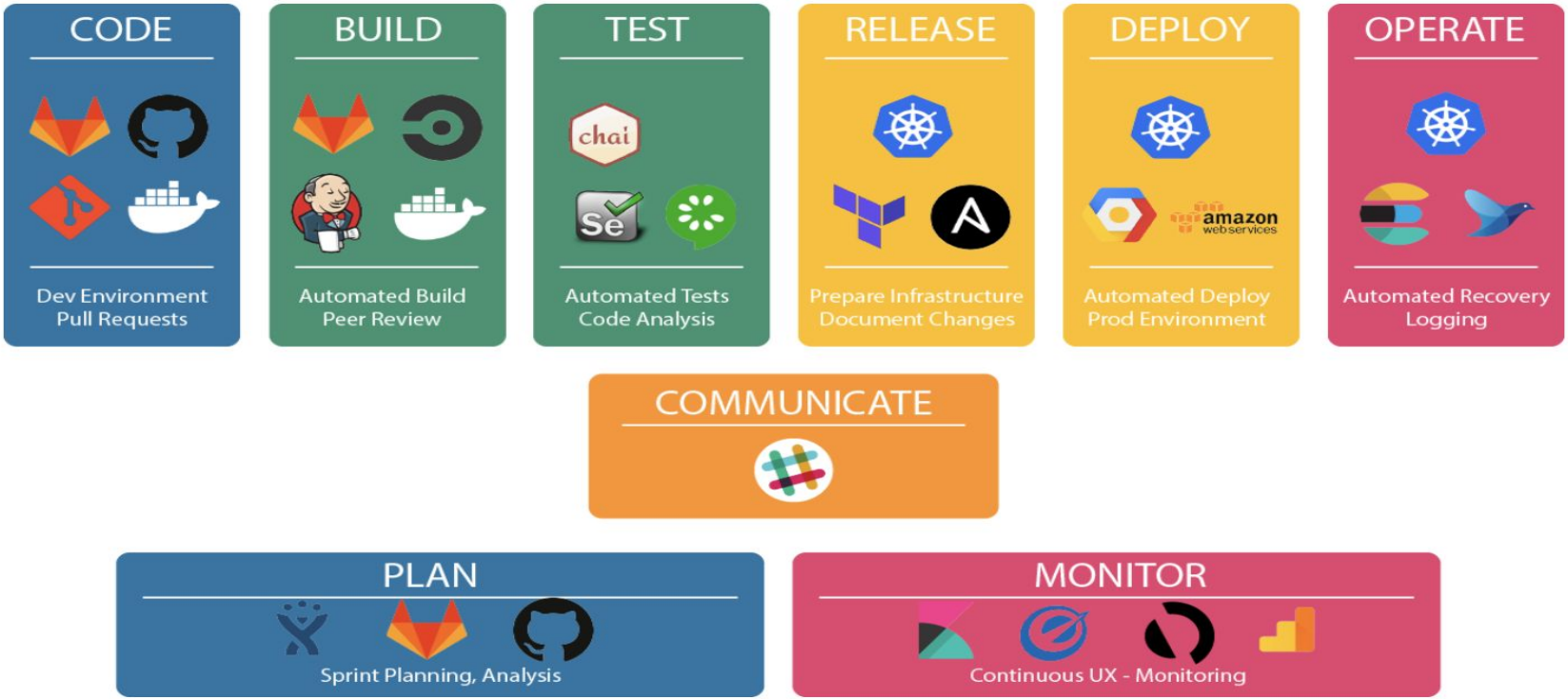
Devops practices are tied to a software development approach

Agile software development comprises various approaches to software development under which requirements and solutions evolve through the collaborative effort of self-organizing and cross-functional teams and their customer(s)/end user(s).[1] It advocates adaptive planning, evolutionary development, early delivery, and continual improvement, and it encourages rapid and flexible response to change. Wikipedia

Devops toolchains

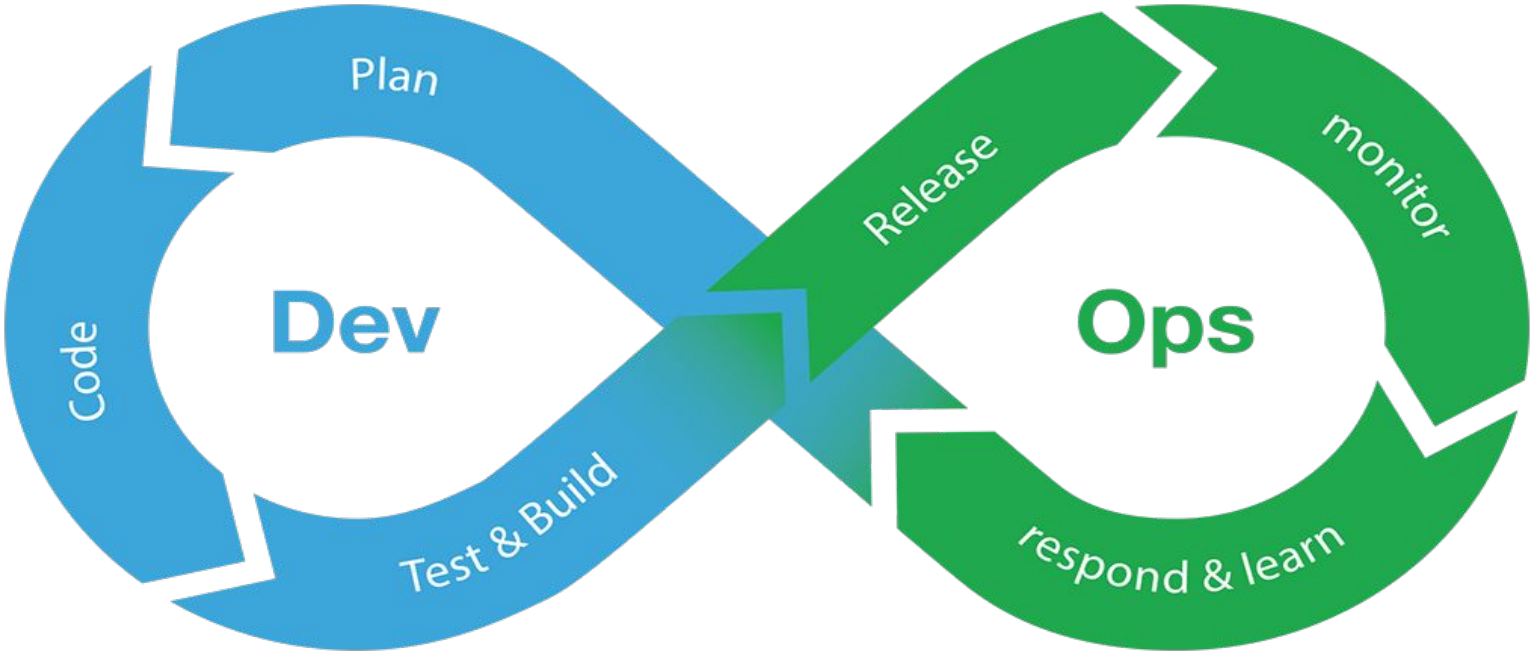
A **DevOps toolchain** is a set or combination of tools that aid in the delivery, development, and management of software applications throughout the systems development life cycle, as coordinated by an organisation that uses **DevOps** practices.*Wikipedia

Devops toolchains



DevOps Pipeline Tool Overview (selection of tools, note: image/logo rights are with the respective copyright owners)

Continuous Integration/Delivery/Deployment



Source: Radview

Devops Attack Surface (CI / CD Pipeline)

Source Code Repository (Code)

Bitbucket, Beanstalk, Github, Gitlab, SVN, S3 buckets

CI / CD Platform (Build)

TravisCI, Jenkins, CircleCI, Gitlab

Container Repository (Code, Build, Test)

Docker, Vagrant

Planning Ticket (Plan)

Github, JIRA,Trello

IaaS Provider (Release, Deploy, Operate)

Kubernetes flavor, OpenStack (this may also be local in some private, hybrid environments)

IaC (Release, Deploy)

Ansible, Terraform, Chef, Cloudformation, PowerShell DSC

Monitor tool (Monitor)

ELK, Splunk

Testing toolset (Test)

Selenium, Chai

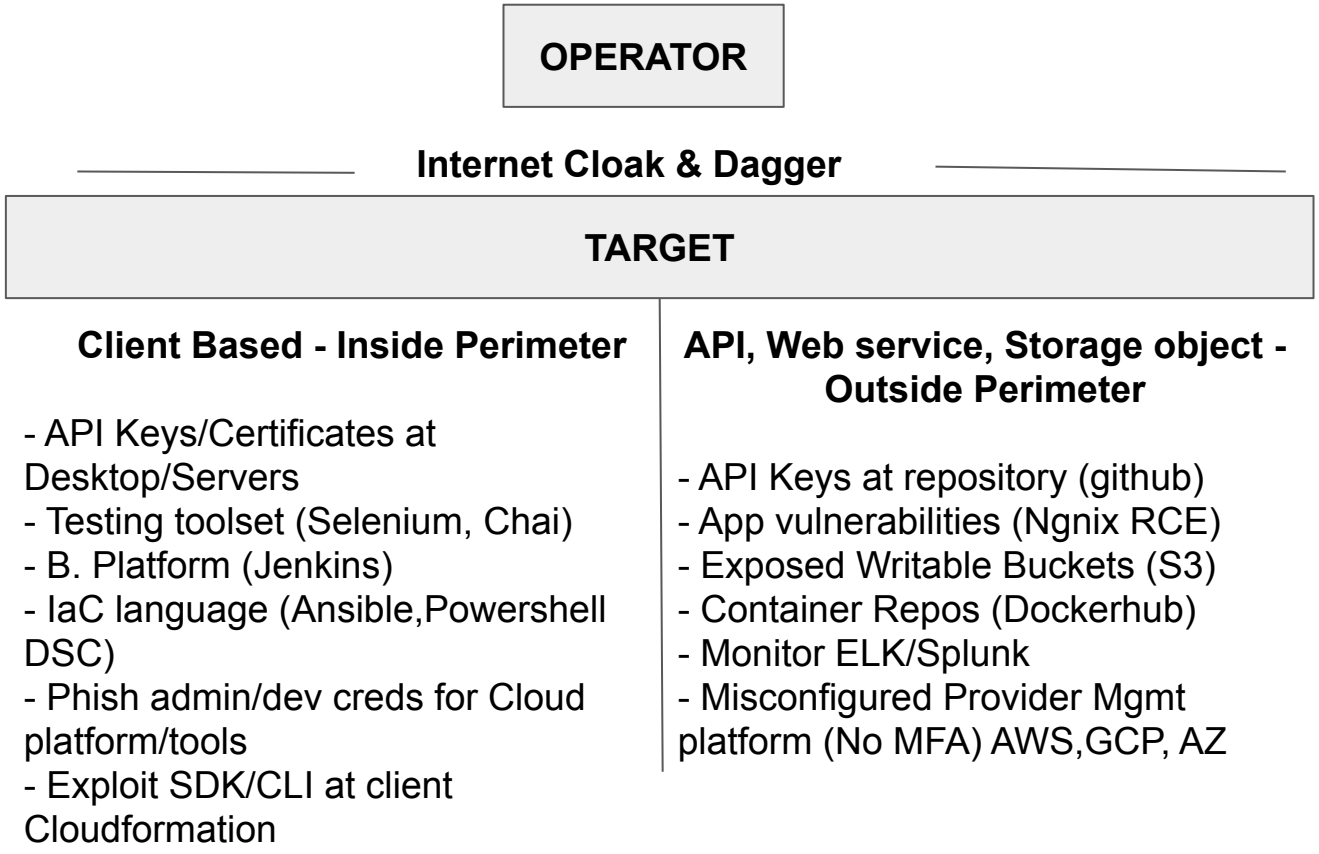
Red teaming Devops

due to less polution, the files stored on cloud are now clearly visible

Red teaming Devops - hypothesis / adv sim

- Is the target organization aware of Devops CI/CD attack surface?
- Is this being addressed or just dismissed as another 3rd party (pre cloud adoption mentality)
- Are there any mechanisms to assess risk and deploy operational controls based on threat likelihood?
- Is there any type of monitoring or detection against related threats?
- What is the organization’s defense posture and possible stop-gap measures against these attack vectors (resilience)?

Red Teaming Devops



Red teaming Devops

- Use 3rd party SaaS PaaS IaaS C2s (Gmail, Github, Twitter, Box, AWS, GCP, Azure, etc)
- Research 3rd parties (DB, Analytic providers, SaaS)
- Usually common misconfigurations and or NO asset management at all
- Open source projects are usually based on SHARING info and code…
- Many organizations do not have ANY control on Container repo version uploading rights or even sharing

Red teaming Devops

- Target release/deploy languages (Powershell DSC, Ansible, Terraform)
- Dependance on the cloud means many times there is no communication between cloud provider and actual security/support team
- If access is achieved then emulate target behavior, many cloud operating environments have very poor vision on cross-account activity unless is noisy or obvious
- Cloud facing applications in many environments have partial or direct connection to internal environments. Pivoting north south is possible now as lateral movement.

Pick your toolchain target...

CODE	BUILD	TEST	RELEASE	DEPLOY
Hardcoded APIs	Docker (CVE-2019-16884) Vagrant (CVE-2017-1617)	Docker (CVE-2019-16884) Vagrant (CVE-2017-1617)	Kubernetes (CVE-2018-1002105)	Ansible (CVE-2019-14905) CloudFormation (CVE-2017-9450)
Application, dev language Vulnerabilities	Container Implantation Mitre T1125	CircleCI (Breach)	Gitlab (CVE-2019-15737)	Kubernetes (CVE-2019-1002100)
Weak Authentication	Jenkins CVE-2019-1003000 CircleCI (Breach)	Selenium (CVE-2016-10589) Chai -> based on nodejs	Ansible (CVE-2019-3828)	Terraform (CVE-2018-9057) Powershell DSC

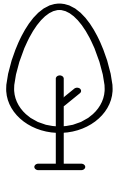
Pick your toolchain target...

OPERATE	PLAN	MONITOR
Kubernetes (CVE-2019-11246)	Github (CVE-2019-1349)	ELK (CVE-2019-7609)
Terraform (CVE-2018-9057)	JIRA (CVE-2019-11581) Trello (CVE-2017-9244)	Splunk (CVE-2017-17067)

Practical Examples 

Exploiting Github for secrets

Low Hanging Fruit



Easy to commit mistakes, usually high priv accounts

Industry Standard

Very commonly used by devops

Many Targets

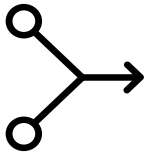
Gitlabs, BitBucket, and others

Exposition #1 🤫 shhgit 📺 demo

https://www.youtube.com/watch?v=JYI8zt0Czkg

Challenges with Hunting for Secrets in Public Repos

API Limits



APIs usually limit you to query by user or repo

Scale Verification

Verifying secrets by hand does not scale

No Automation

Workflow of Parsing, Storing, Reporting is ripe for automation

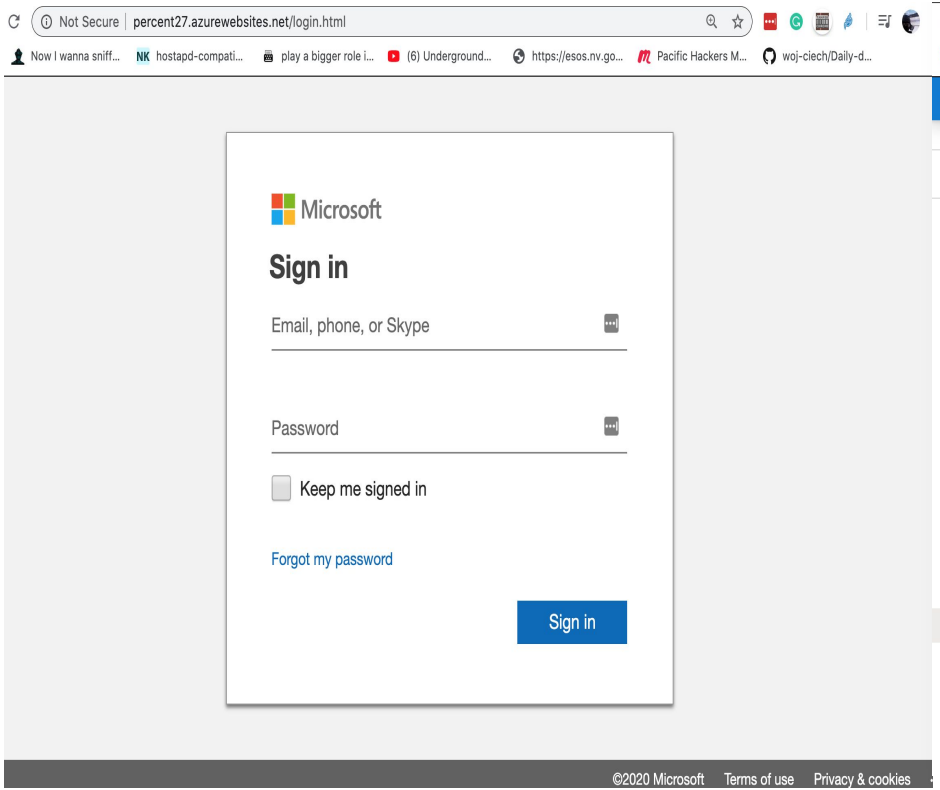
git-wild-hunt 📺 demo

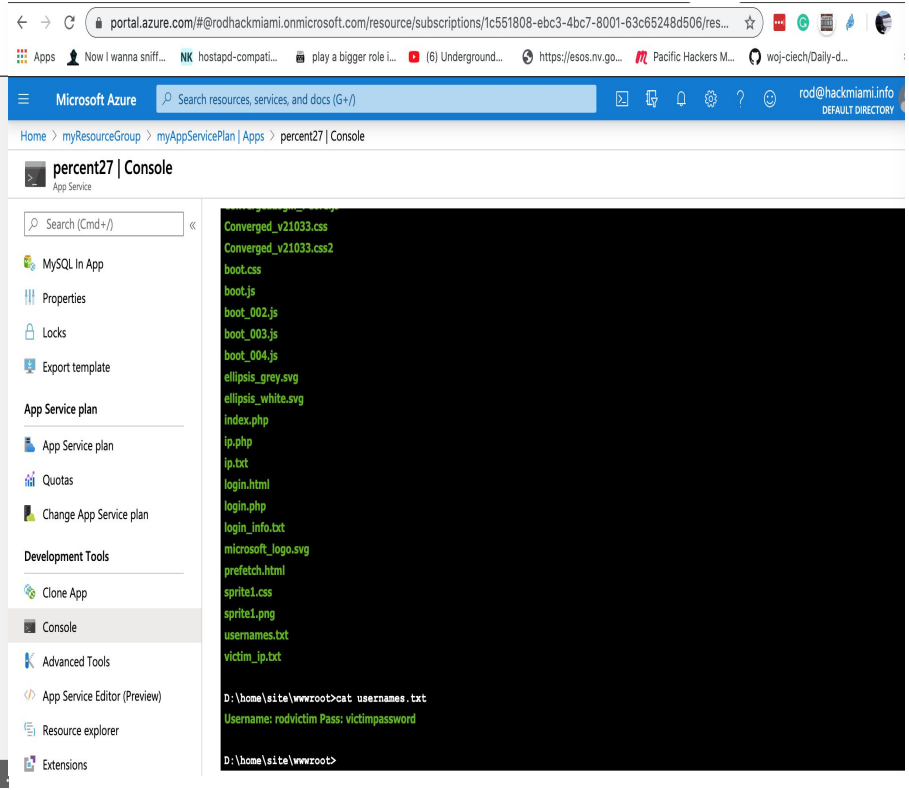
https://www.youtube.com/watch?v=dtAcPuy8TR8

Good old Phishing

https://github.com/htr-tech/zphisher

https://medium.com/@rvrsh3ll/azure-app-services-for-offensive-operations-f1de99a83fa0





Now you have creds now what?

How you heard of the MITRE ATT&CK Matrix .. for cloud 😂

Implant Container Image

Amazon Web Service (AWS) Amazon Machine Images (AMI), Google Cloud Platform (GCP) Images, and Azure Images as well as popular container runtimes such as Docker can be implanted or backdoored to include malicious code. Depending on how the infrastructure is provisioned, this could provide persistent access if the infrastructure provisioning tool is instructed to always use the latest image.[1]

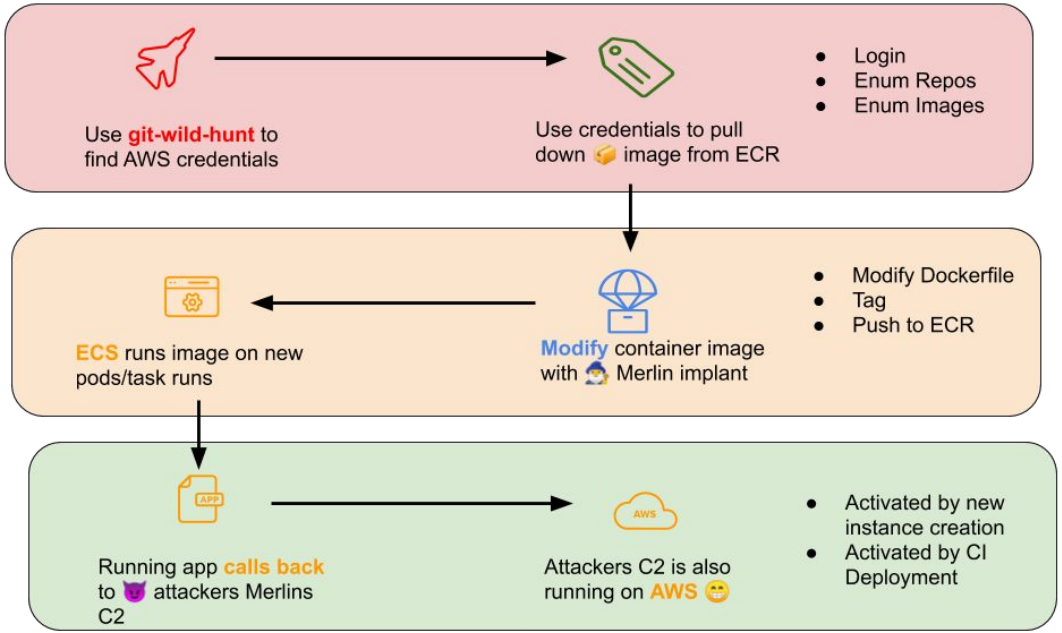
A tool has been developed to facilitate planting backdoors in cloud container images.[2] If an attacker has access to a compromised AWS instance, and permissions to list the available container images, they may implant a backdoor such as a web shell.[1] Adversaries may also implant Docker images that may be inadvertently used in cloud deployments, which has been reported in some instances of cryptomining botnets.[3]

ID: T1525
Tactic: Persistence
Platform: GCP, Azure, AWS
Permissions Required: User
Contributors: Praetorian
Version: 1.0
Created: 04 September 2019
Last Modified: 22 October 2019

Mitigations

Mitigation	Description
Audit	Periodically check the integrity of images and containers used in cloud deployments to ensure they have not been modified to include malicious software.
Code Signing	Several cloud service providers support content trust models that require container images be signed by trusted sources.[4][5]
Privileged Account Management	Limit permissions associated with creating and modifying platform images or containers based on the principle of least privilege.

Attack Flow


Use git-wild-hunt to find AWS credentials
Use credentials to pull down image from ECR
Login
Enum Repos
Enum Images
ECS runs image on new pods/task runs
Modify container image with Merlin implant
Modify Dockerfile
Tag
Push to ECR
Running app calls back to attackers Merlins C2
Attackers C2 is also running on AWS
Activated by new instance creation
Activated by CI Deployment

Implantation with 🧙Merlin C2 📺 demo

https://youtu.be/Nv9bMnCrKD8

Other post exploitation opportunities to consider

Master_Of_Servers (MOSE) - Ansible/Chef/Puppet post exploitation tool

Splunk backdoors - backdoored apps

Enumerate further cloud resources for further compromise

Find hybrid cloud/perimeter assets North->South - East<=>West

Find pre-stage potentially production bound code, creds and data

Apply what you learned today

 Tools of the Trade:

- Shhgit to see real time secrets leaked
- Git-wild-hunt search github for secrets
- Merlin C2 (Go) Precompiled HTTPS C2
- Azure Phishing zphisher
- MOSE Configuration Management Systems post-exploitation
- Videos of demos here https://www.youtube.com/playlist?list=PLzU1TULfG3ozAlWZ1RUTAcekOJX7uJCEh

Chat with us in Discord:

https://redteamvillage.io/discord/

Or  Twitter

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