Attacking and Defending Kubernetes

Chemnitzer Linux-Tage 2021

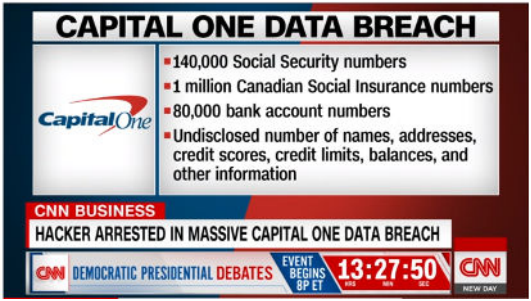
kubernetes

Andy Wirtz, ATIX AG

Capital One

A hacker gained access to 100 million Capital One credit card applications and accounts

By Rob McLean, CNN Business
Updated 2117 GMT (0517 HKT) July 30, 2019



https://edition.cnn.com/2019/07/29/business/capital-one-data-breach/index.html

Docker Hub & Microsoft Azure

Docker Images Containing Cryptojacking Malware Distributed via Docker Hub

June 25, 2020 ▲ Ravie Lakshmanan

With Docker gaining popularity as a service to package and deploy software applications, malicious actors are taking advantage of the opportunity to target exposed API endpoints and craft malware-infested images to facilitate distributed denial-of-service (DDoS) attacks and mine cryptocurrencies.

Popular This Week

New Chrome 0-day Bug Under Active Attacks – Update Your Browser ASAP!

Extortion Gang Breaches Cybersecurity Firm Qualys Using Accellion Exploit

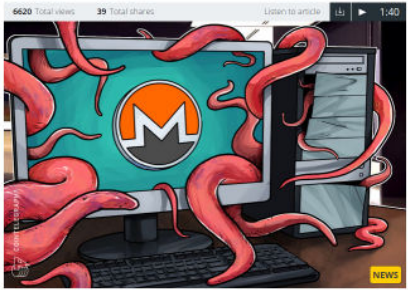
Marafaka – Elite Hacking

https://thehackernews.com/2020/06/cryptocurrency-docker-image.html

JACK MARTIN JUN 12, 2020

Microsoft Azure Machine Learning Clusters Cryptojacked to Mine Monero

Hackers have attacked badly configured machine learning clusters on Microsoft's Azure cloud computing network, and hijacked them to mine Monero.



Microsoft announced on June 10 that it had discovered a number of cryptojacking attacks on powerful machine-learning clusters on its Azure cloud computing network.

https://cointelegraph.com/news/microsoft-azure-machine-learning-clusters-cryptojacked-to-mine-monero

#kubernetes #security

Tesla & Jenkins

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Research

Lessons from the Cryptojacking Attack at Tesla

by RedLock CSI Team | 02.20.18, 6:00 AM

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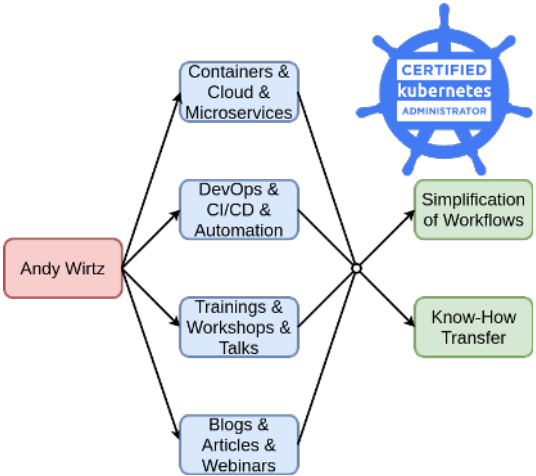
#kubernetes #security

Andy Wirtz – Senior IT Consultant at ATIX AG, Germany



- Phone: +49 (0)89 452 35 38-248
- Email: wirtz@atix.de
- www.xing.com/profile/Andy_Wirtz2
- www.linkedin.com/in/andy-wirtz

#kubernetes #security

Agenda

1. Attack Kubernetes
2. Demo of an Attack Path
3. Defend Kubernetes
4. Mitigate the Attack Path

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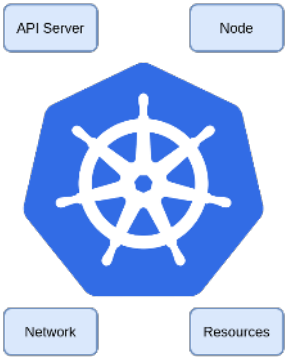
Kubernetes

Virtual data center

- for container apps
- manages compute resources

Wide spread use

- interesting for attackers
- various attack surfaces



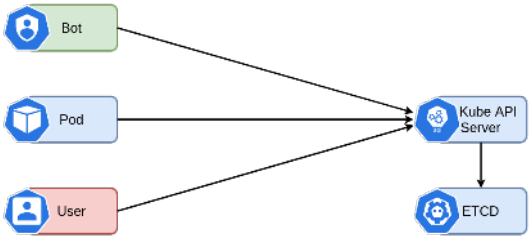
Kubernetes API Server

Access control

- to Kubernetes objects
- can be annulled

Unwarranted access

- read secrets, write workloads
- administer cluster



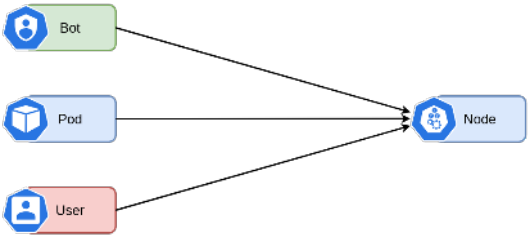
Container Hosts

Container isolation

- of process, network, filesystem
- can be softened

Container outbreak

- access host file system
- root in container = root on host



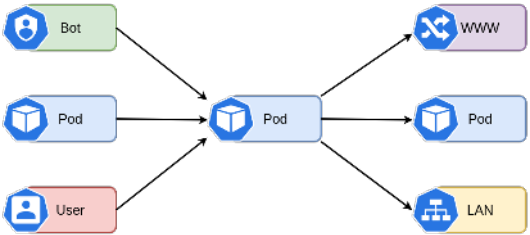
Container Network

Container communication

- in a flat network
- can be unlimited

Unwanted communication

- download malware
- talk to other apps



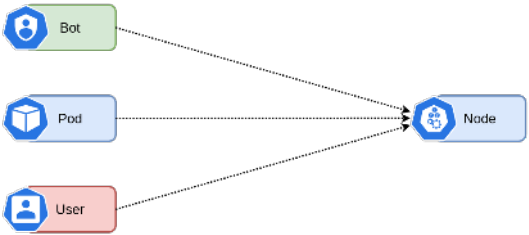
Compute Resources

Allocatable resources

- are CPU, memory, storage
- can be misused

Consume resources

- crypto mining
- fork bombs



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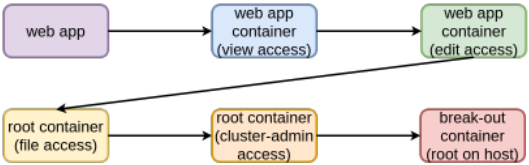
Goals

Privilege escalation to control

- Kubernetes
- container hosts



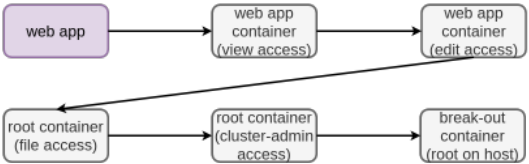
Crypto Mining without detection

- divert compute resources
- share over network

Web application

Command injection

- ping servers
- execute additional commands



Access via reverse shell

- target machine initiates connection
- user's computer listens

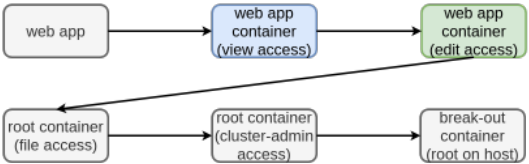
Web application container

View access to Kubernetes

- read ServiceAccounts
- read Secrets

Edit access to Kubernetes

- create root container on master
- log into new container



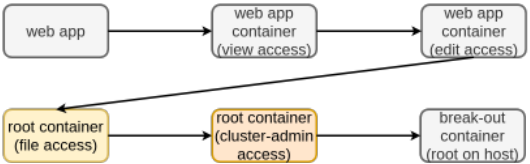
Root container

Root user in container on master

- use hostPath
- read admin.conf

Cluster-admin access to Kubernetes

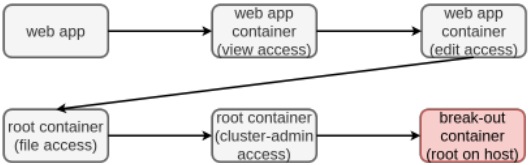
- create break-out container
- log into new container



Break-out container

Root user on host

- create mining container
- use docker



Cleanup

- delete root container
- delete break-out container

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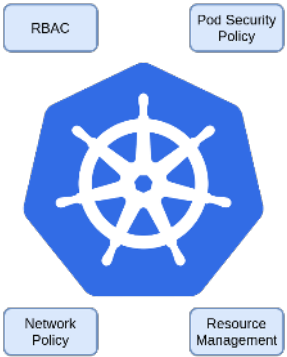
Security Basics

Defence in depth

- attackers pick their targets
- layered security needed

Best practices

- limit attack surface
- principle of least privilege



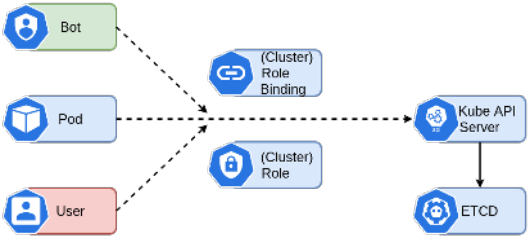
Role-Based Access Control

Kubernetes bouncer

- for Kubernetes resources and others
- namespace- or cluster-wide

Least privilege access

- no access for apps and humans
- access for tools (CD, monitoring)



PodSecurityPolicies

Container prison

- drop capabilities
- ensure separation

Prevent outbreak

- deny privileged/root/privilege escalation
- ensure isolation & RO root filesystem

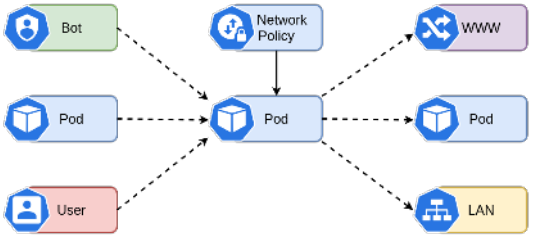
NetworkPolicy

Container firewall

- for ingress and egress
- with labels, namespaces, ip-blocks

Restrict communication

- default deny all
- allow-list specific traffic



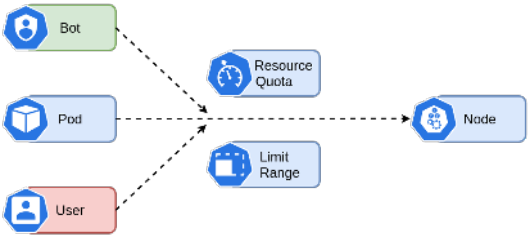
Resource Management

Kubernetes limiter

- quotas for namespaces
- limits for containers, pods, pvcs

Assign resources

- split resources for tenants
- define min, max, default resources



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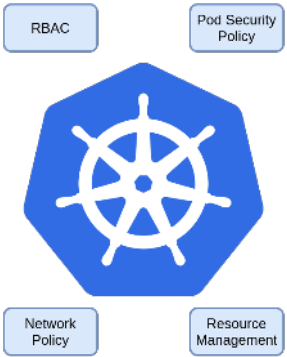
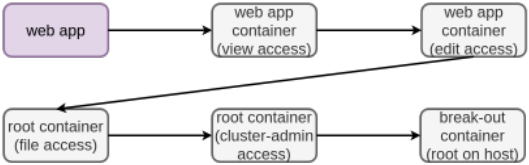


Mitigate 1

Mitigate reverse shell for container

- scan container images for vulnerabilities
- remove unnecessary software
- restrict traffic with NetworkPolicies



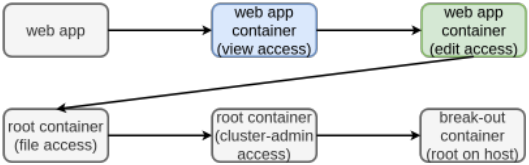
Mitigate installation of new software

- scan container images for vulnerabilities
- remove unnecessary software
- restrict traffic with NetworkPolicies

Mitigate 2

Mitigate privlige escalation to edit access

- avoid existence of unnecessary secrets
- restrict traffic with NetworkPolicies
- restrict access to API server with RBAC



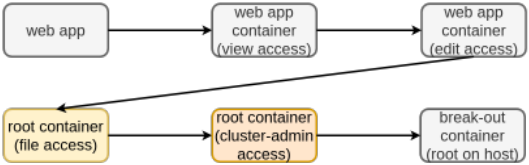
Mitigate root container on master

- restrict with NetPol and RBAC
- don’t tolerate container on master
- forbid root container with PSP

Mitigate 3

Mitigate shell for root container

- forbid root container with PSP
- restrict traffic with NetworkPolicies
- restrict access to API server with RBAC



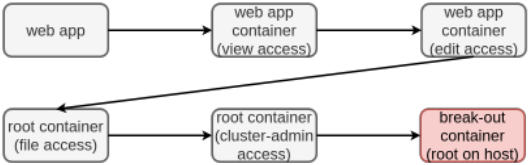
Mitigate privlige escalation to cluster-admin

- don’t tolerate container on master
- forbid root container with PSP
- forbid hostPath with PSP

Mitigate 4

Mitigate break-out container

- restrict with NetPol and RBAC
- forbid privileged container with PSP
- forbid hostPID with PSP



Mitigate docker run

- restrict with NetPol and RBAC
- forbid privileged container with PSP
- forbid hostPID with PSP

Summary

Defence in depth

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Best practices

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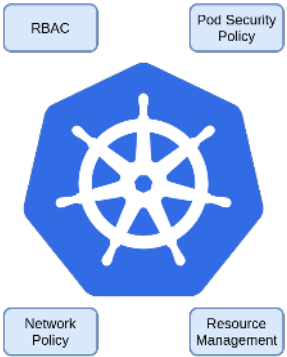

Outlook

Secure applications

- container image scanning and signing
- sandbox technologies

Use agents

- policy agent for compliance
- RT security agent for anomaly detection

Tesla & Jenkins

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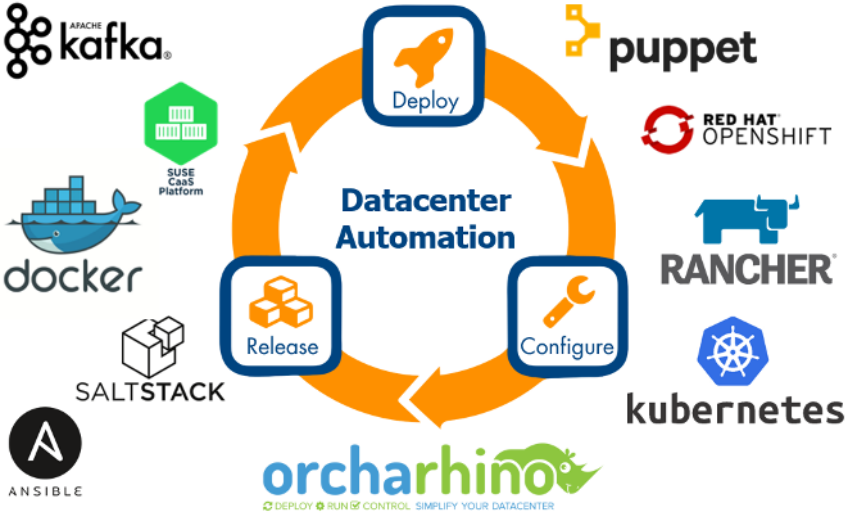
ATIX – SIMPLIFY YOUR DATACENTER



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Herzlich Willkommen bei der

Open Source Automation Days: Münchens größte herstellerunabhängige Open Source Konferenz

Topics 2021:

- GitOps / DataOps
- Cloud:
  - Cloud-Native
  - Cloud-Management
  - Public-Cloud
  - Private-Cloud
  - Hybrid-Cloud
- Containerisierung
- Open Source
- IT-Automation
- Artificial Intelligence
- Security Automation
- *SPECIAL 2021 TOPIC:* "*Pandemy War - IT-Automatisierung in Zeiten von Corona*"

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