Sarah Young

How to Lose a Container in 10 Mins

@_sarahyo

whoami

@_sarahyo

whoami

@_sarahyo

whoami

Azure
Cloud
Security
and
Compliance
Global
Black
Belt

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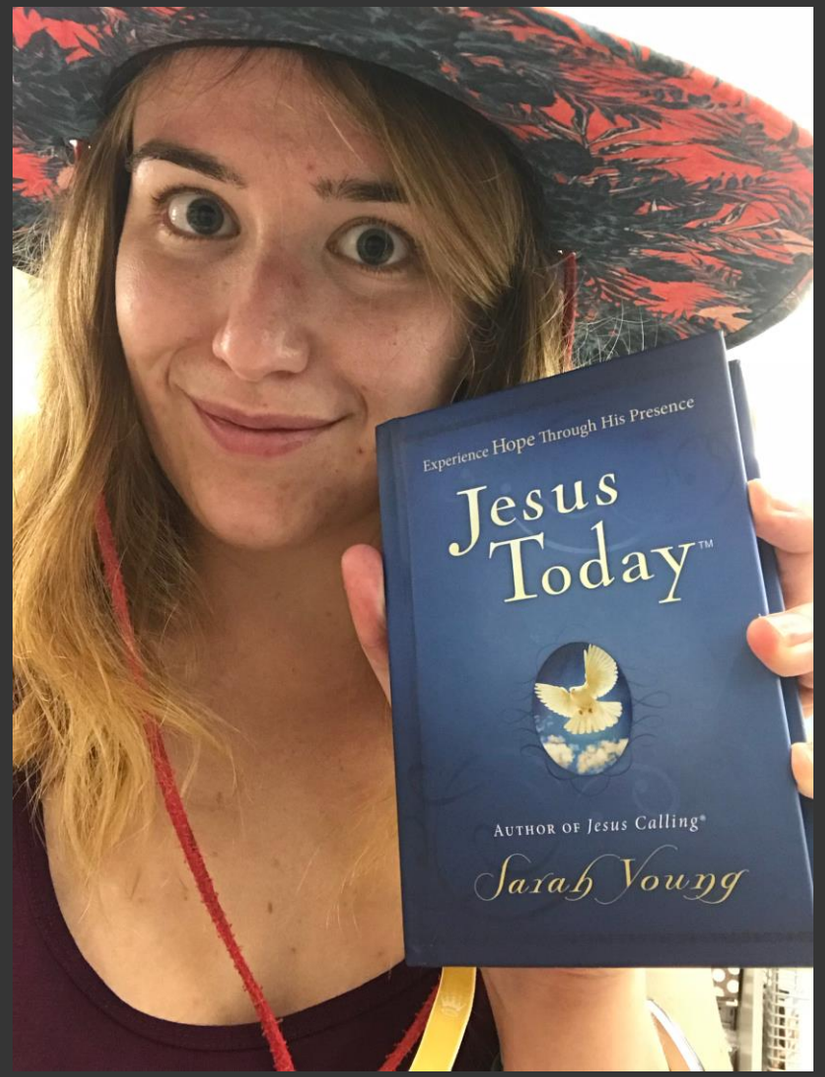
whoami



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whoami

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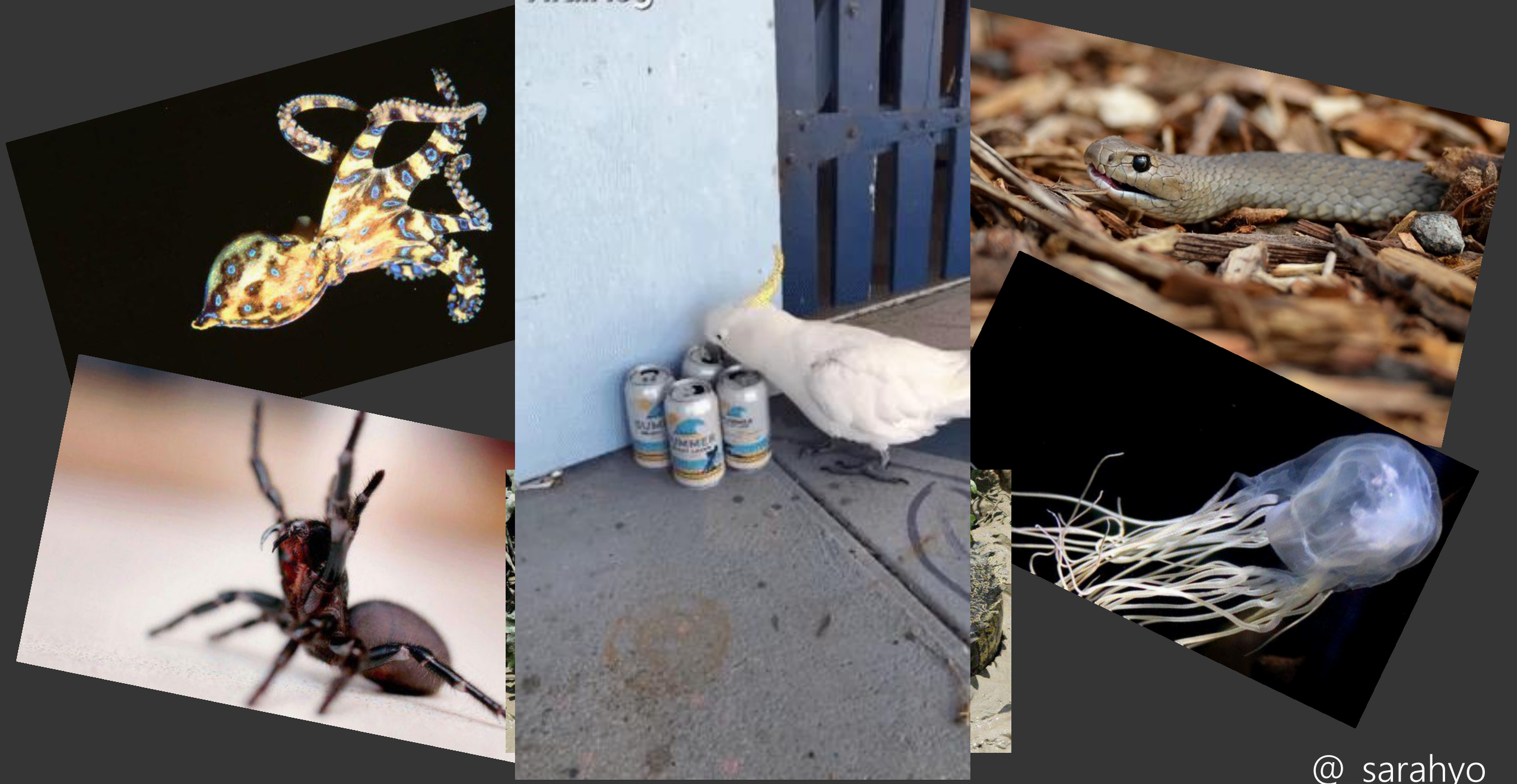
ViralHog
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Yes, everything in Australia is trying to kill you

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So, what am I going to talk about today?

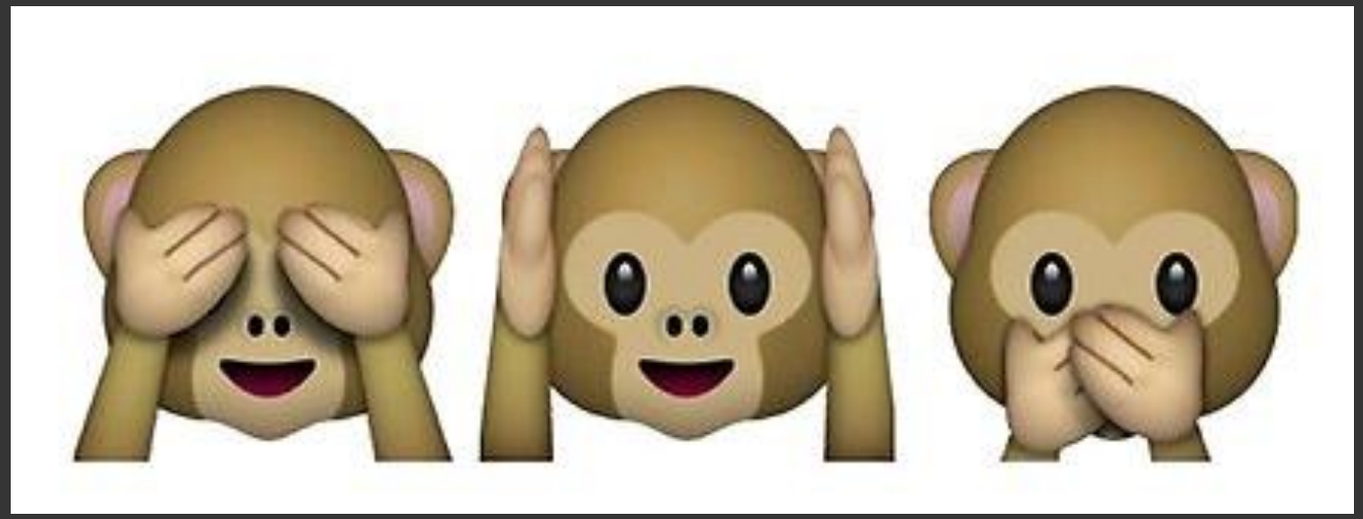
What am I talking about today?

- Good security practices for containers, Kubernetes and related tools.

What am I talking about today?

- Protecting your data.
- Caring for your OS and orchestrators.
- Checking your privileges.
- Shifting left with containers.
- Getting my containers pwned.

This sums up container and k8s security for me



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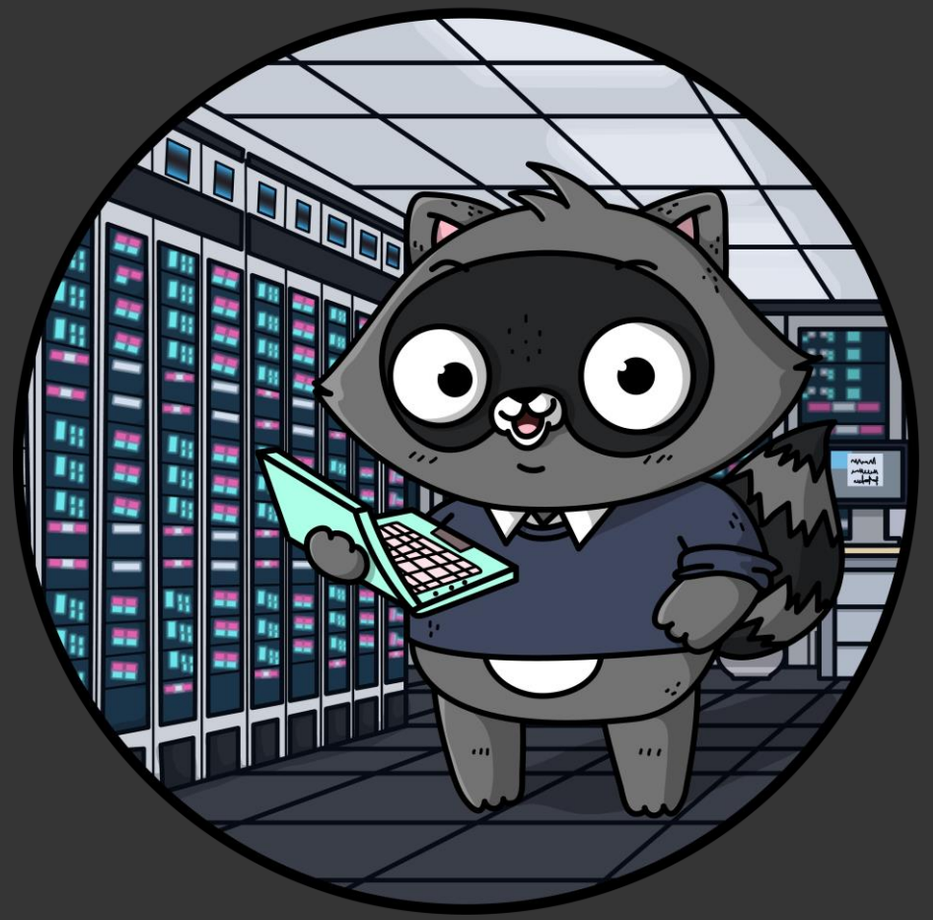
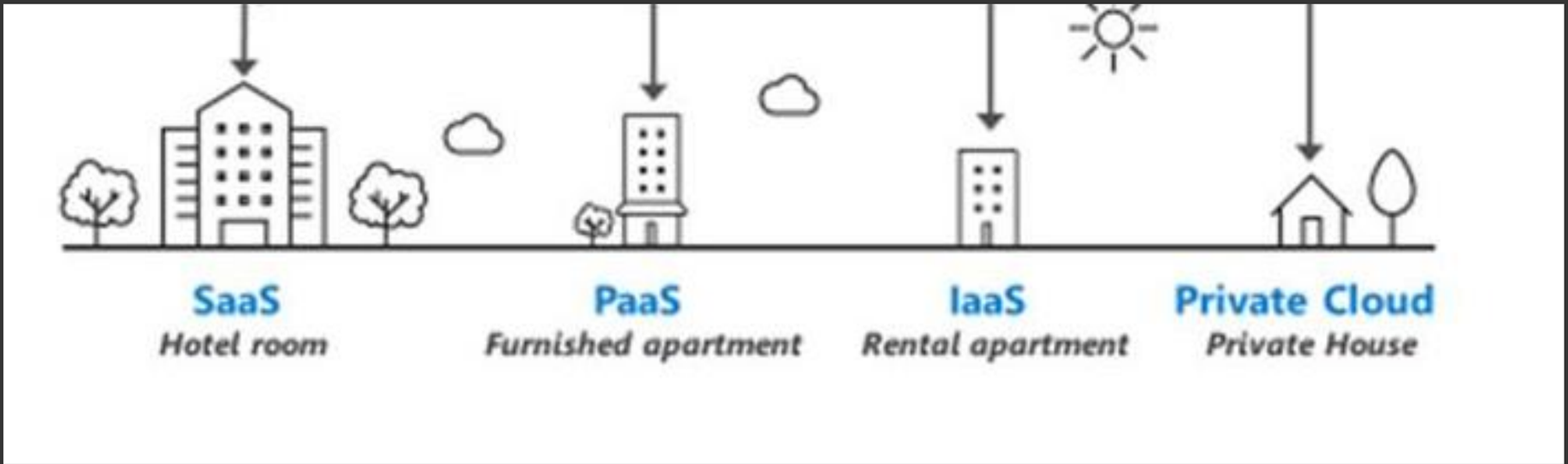
Good data protection practices



Well begun is half done

- Sounds basic right?
- If you're making the move to the cloud and containerizing your application, use this as a opportunity to tidy it up.
- Use TLS 1.2 or 1.3.
- Don't send things in the clear.
- Everything should be encrypted at rest and in transit.
- Remove deprecated protocols.
- Tidy up your code.
- i.e. simplify.

Shared responsibility model



Traditional security model

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“Isolation doesn’t bother me at all.
It gives me a sense of security. “

-Jimmy Page

Caring for your OS and orchestrator

Do you care about your image?

- Make sure you know where your container images come from.
- Try and minimize your use of images from the Internet, keep your own base images.
- Don’t pull images from sources you can’t trust i.e. the whole of the Internet.
- Use a private image repository, there are many to choose from:
  - Clair
  - Notary
  - All major cloud platforms offer them

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The “fault” in default

- Kubernetes default configs aren’t too secure.
- You need to work through the orchestrator configs to secure them.
- Notable baddies in Kubernetes are:
  - The API server listening on 8080 where no checks take place.
  - Secrets management in Kubernetes using etcd.
- Use the CIS Kubernetes benchmark.

https://www.cisecurity.org/benchmark/kubernetes/

It’s a secret to everybody

- Don’t bake creds and secrets into containers.
- Pass them into your container as environment variables.
- Kubernetes stores secrets in etcd, encoded in base64.
- All major cloud providers have inbuilt secrets management that can be used.
- Utilize a third party secrets management system.
- Rotate your keys regularly.

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Horror story #1

- Dev needed a slight
- Pulled from a public
- We know what happ

Check your privilege

Check your privilege (containers)

- Don’t run as root.
- Don’t run as root.
- Don’t run as root.

- If you must run as root (e.g. if your container needs to modify the host system) use runtime security tools to limit what is accessible.
- Honorable mentions in this area go to Aqua Enforcer, SELinux, AppArmor and seccomp.

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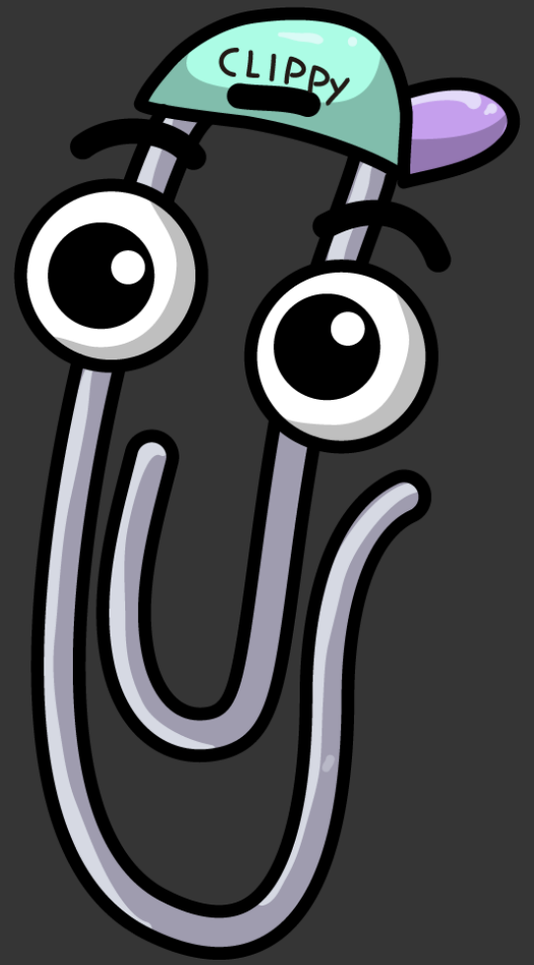
Check your privilege (orchestrators)

- Kubernetes had (and still has) some terrible defaults here:
  - Anonymous user access isn't disabled.
  - The dashboard had full admin privileges by default (prior to v1.7).
  - No RBAC before v1.8.
- If it sounds too onerous to go through and do yourself:
  - Use a managed Kubernetes cluster e.g. EKS, AKS, etc.
  - Have a play with interesting open source tools.



Horror story #2

- Kubernetes cluster le
- Left exposed to the
- We know what happ

Contain your enthusiasm

(for shifting left)

Deploying a container/k8s aware security toolset

- Don’t assume your old toolset will be adequate for your needs when you move to the cloud/when containerizing applications.
- Most security tools need to be specifically container/k8s aware, or may need additional plugins:
  - IDS/heuristics
  - Vulnerability scanning
  - SIEM
  - Runtime security
  - Auditing

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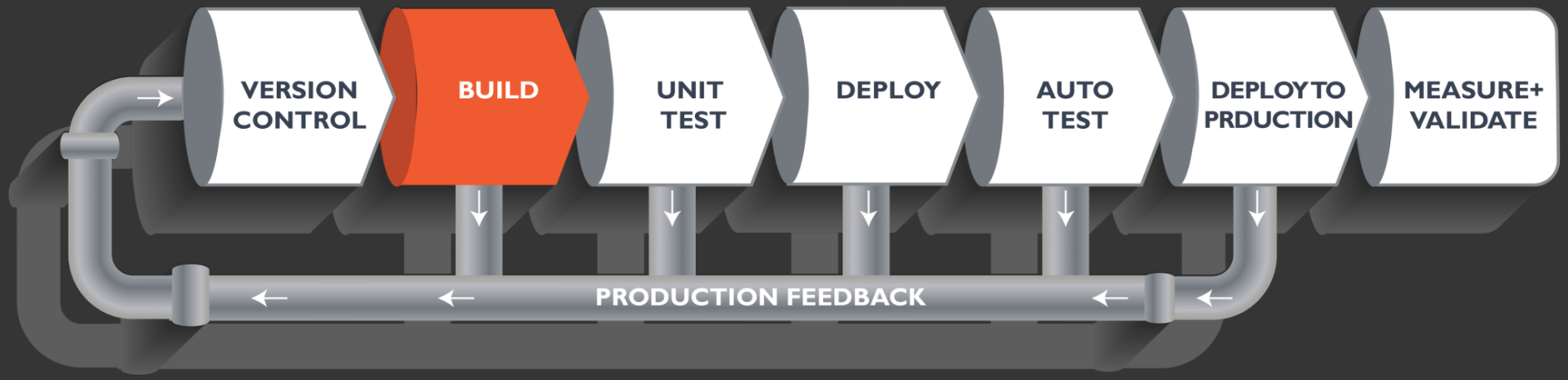
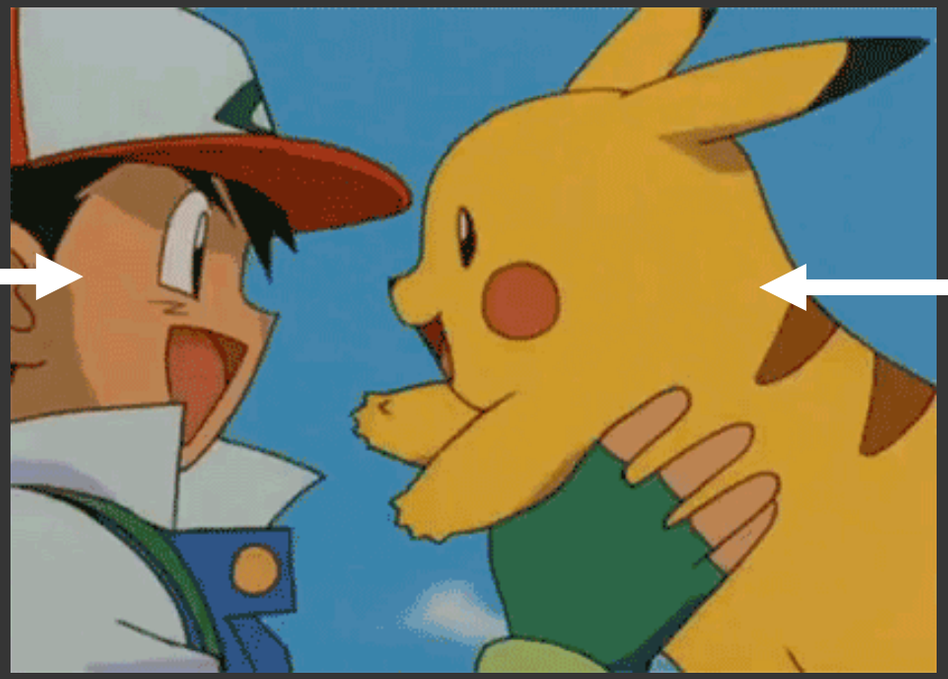
Get your plumbing in order

- Same goes for your CI/CD pipeline.
- Tools may need to be altered to work in your pipeline.
- Some may need to be replaced entirely.
- Do your research.



Actually go benchmark your tools, seriously

- Benchmark your tools.
- Get both developers and security involved in this process.

Security →  ← Devs

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Horror story #3

- I have seen an organization try to use old-school vulnerability scanners on their containers.
- Unsurprisingly, the results weren't very useful.

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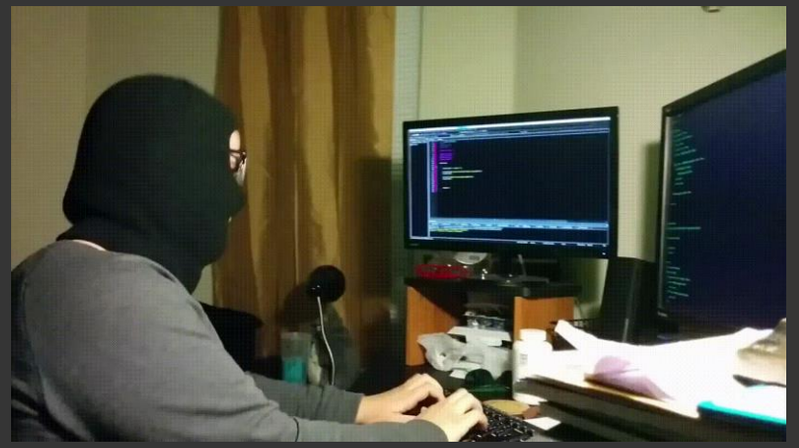
Getting myself pwned

Have I been pwned?

- I've been spinning up containers, Kubernetes clusters and leaving them open to the Internet for a few months now.
- Spun up some standalone containers on a cloud hosting provider.
- Yes, I'm not brave enough to have them on any infrastructure I own.
- Also I could pay for it through PayPal so to not run myself up a huge bill.
- Basically I tried to do the opposite of everything that I've just encouraged you to do.



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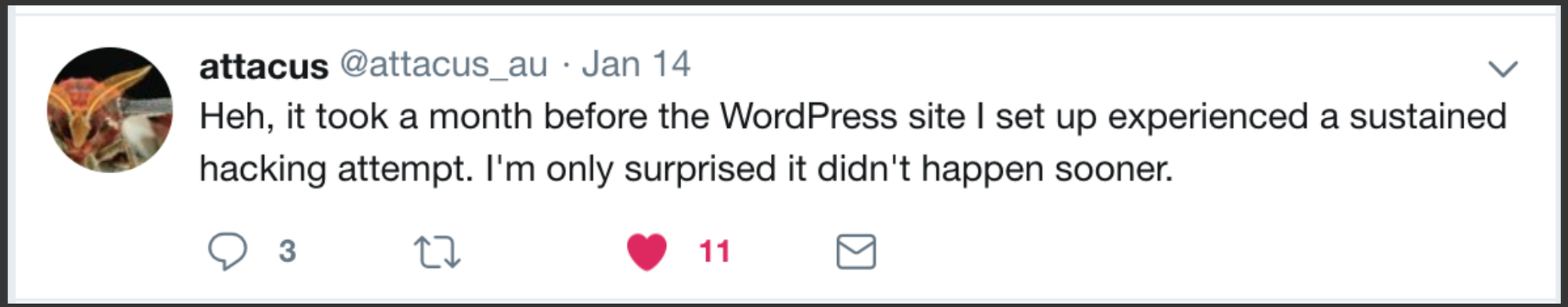
Guessing game

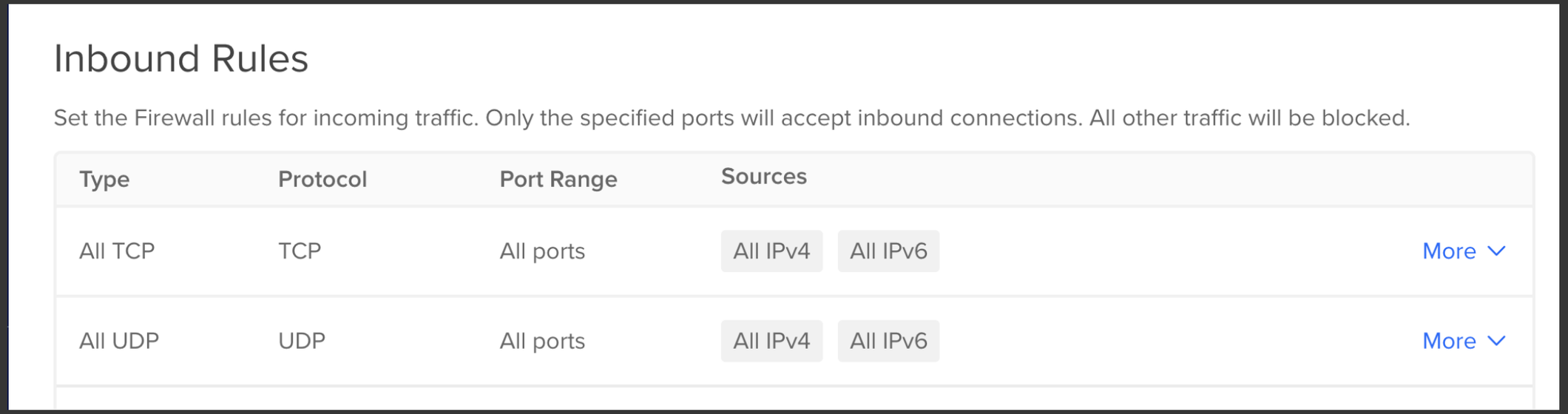
So what happened…?

So what happened…?



Source: Twitter, @attacus

So what happened...?



Inbound Rules

Set the Firewall rules for incoming traffic. Only the specified ports will accept inbound connections. All other traffic will be blocked.

Type	Protocol	Port Range	Sources	
All TCP	TCP	All ports	All IPv4 All IPv6	More
All UDP	UDP	All ports	All IPv4 All IPv6	More

So what happened...?

```
irt:            IRT-CNNIC-CN
address:        Beijing, China
e-mail:         ipas@cnnic.cn
abuse-mailbox:  ipas@cnnic.cn
admin-c:        IP50-AP
tech-c:         IP50-AP
auth:           # Filtered
remarks:        Please note that CNNIC is not an ISP and is not
remarks:        empowered to investigate complaints of network abuse.
remarks:        Please contact the tech-c or admin-c of the network.
mnt-by:         MAINT-CNNIC-AP
last-modified:  2017-11-01T08:57:39Z
source:         APNIC
```

```
inetnum:        185.142.236.0 - 185.142.236.255
netname:        BlackHOST-CLOUD
descr:          Black.HOST CLOUD Network
descr           Specially crafted and optimized for bandwidth hungry applications
descr:
descr:          Direct all copyright, legal, spam and abuse complaints to:
descr:          https://black.host/legal/abuse
descr:
country:        NL
org:            ORG-BLCK1-RIPE
admin-c:        ABUS-BH
tech-c:         SPRT-BH
status:         ASSIGNED PA
mnt-by:         BlackHOST-LTD
created:        2016-03-29T13:14:40Z
last-modified:  2017-12-16T17:30:08Z
source:         RIPE
mnt-routes:     COGENT-ROUTE-MNT

organisation:   ORG-BLCK1-RIPE
org-name:       BlackHOST Ltd.
descr:
descr:          Take advantage of the best deal of bandwidth on the planet.
descr:          UNMETERED Dedicated & VPS Servers, Premium web & email hosting
descr:          Check out our offer on: https://black.host
descr:
language:       EN
org-type:       OTHER
address:        1201 Geneva, Switzerland
admin-c:        CREW-BH
abuse-c:        ABUS-BH
tech-c:         SPRT-BH
mnt-ref:        BlackHOST-LTD
```

```
[+] TCP scan signatures:

   "MISC Microsoft SQL Server communication attempt"
       dst port:  1433 (no server bound to local port)
       flags:     SYN
       psad_id:   100205
       chain:     INPUT
       packets:   1
       classtype: attempted-admin
```

```
person:         security trouble
e-mail:         cloud-cc-sqcloud@list.alibaba-inc.com
address:        5th,floor,Building D,the West Lake International Plaza of S&T,391#Wen'er Road
address:        Hangzhou, Zhejiang, China
phone:          +86-0571-85022600
country:        CN
mnt-by:         MAINT-CNNIC-AP
nic-hdl:        ZM876-AP
last-modified:  2013-07-08T02:56:02Z
source:         APNIC
```

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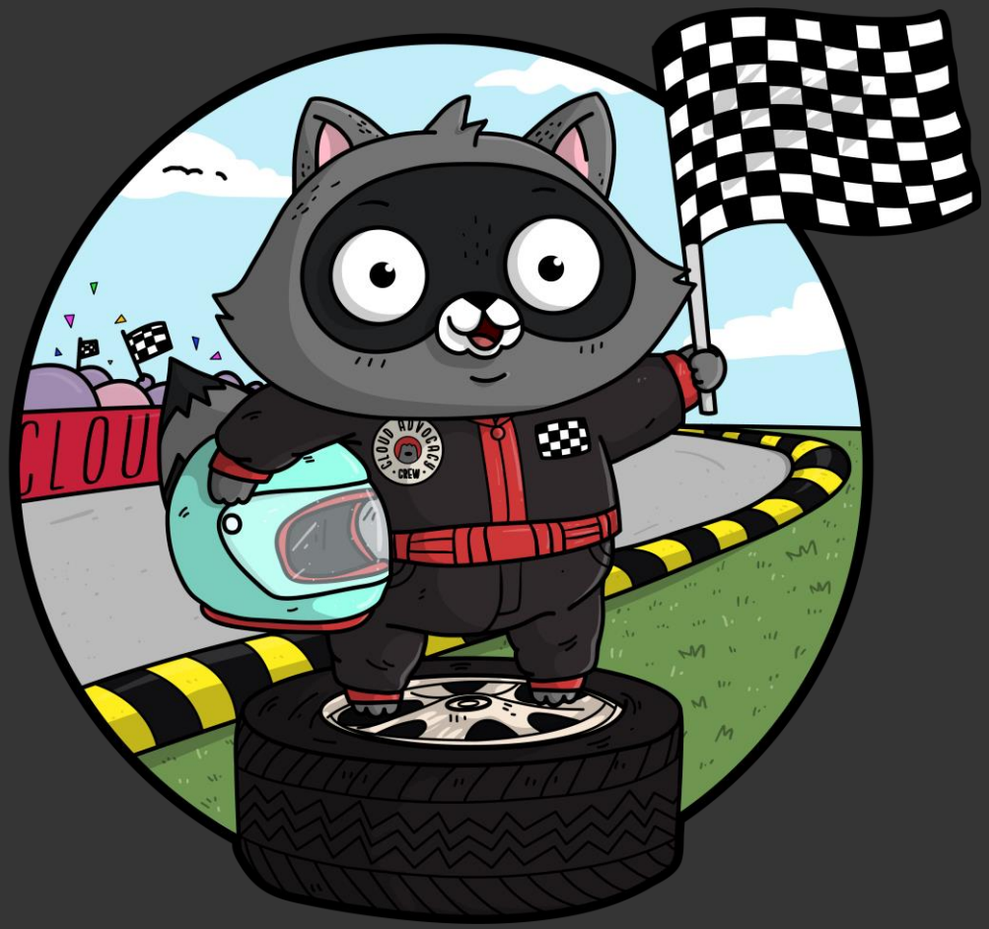
In conclusion…



Tidy up your application before your cloud migration and/or containerization.

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Orchestrator defaults are terrible: change them.

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Please, please, please make sure you know where your container images come from.

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Don’t run as root.*

* Unless you have very good reasons for doing so.

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Keep your secrets secret.

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Shift left, but make sure you have the right tools to support this.

Purposely trying to get containers hacked is harder than one would expect. *

* Or maybe I was just unlucky. Don’t quote me on this.

Useful links

- CIS Kubernetes security benchmark - https://www.cisecurity.org/benchmark/kubernetes/
- CIS Docker security benchmark - https://www.cisecurity.org/benchmark/docker/
- NIST Special Publication 800-190 - https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.800-190.pdf
- Kubernetes Security book by Liz Rice and Michael Hausenblas - https://info.aquasec.com/kubernetes-security
- Security concepts for Kubernetes - https://docs.microsoft.com/en-us/azure/aks/concepts-security
- PSAD - http://www.cipherdyne.org/psad/index.html

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Thank you!

Any questions?

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