goto; chicago

Going Docker and Swarm Production Like a Pro

Bret Fisher

@bretfisher

DevOps Consultant, Docker Captain

Author of Udemy's Docker Mastery

goto; chicago

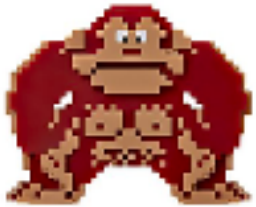
Click ‘Rate Session’
to rate session
and ask questions.

Why Are We Here?

- Want Docker in production
- Want to orchestrate containers
- Need to make educated project decisions
- Learn which requirements could be optional
- Learn 80's/90's video games
- Hear bad analogies relating retro games to Docker





A Bit About Me

- Geek since 5th Grade
- IT Sysadmin+Dev since 1994
- Currently Container Fanboy, Consultant/Trainer
- Owned *REAL* Atari 2600, NES, SNES, Sega Genesis, Sinclair, TRS-80, Packard Bell 386
- Likes Geek Trivia. Lets Have Some!


RYU
KO
50
RYU

HYPER FIGHTING

PRELIMINARY

1ST MATCH

4P

5P

1P

8P

Project Docker

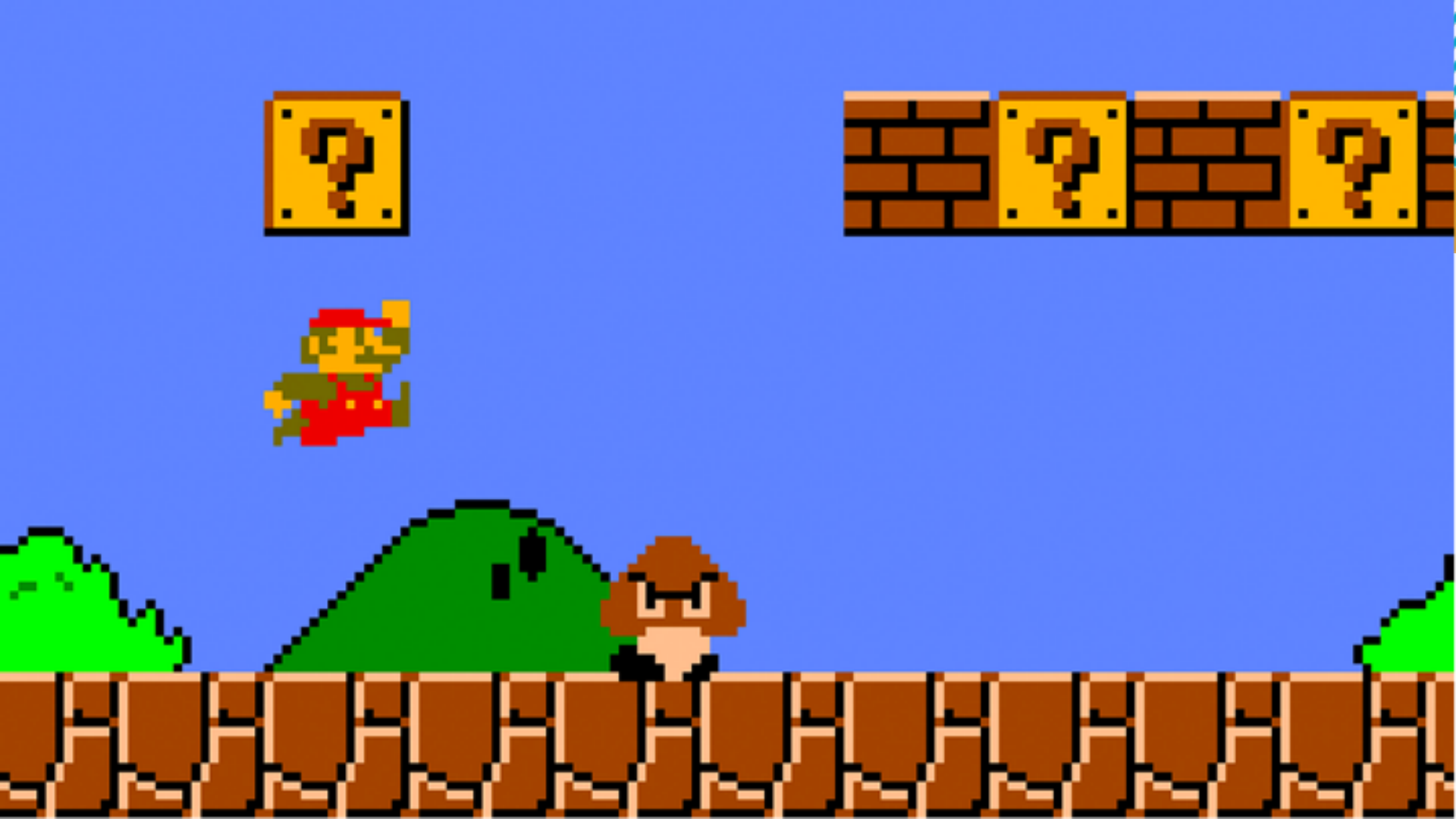
Super **Project Advice** Special Turbo Champion Edition

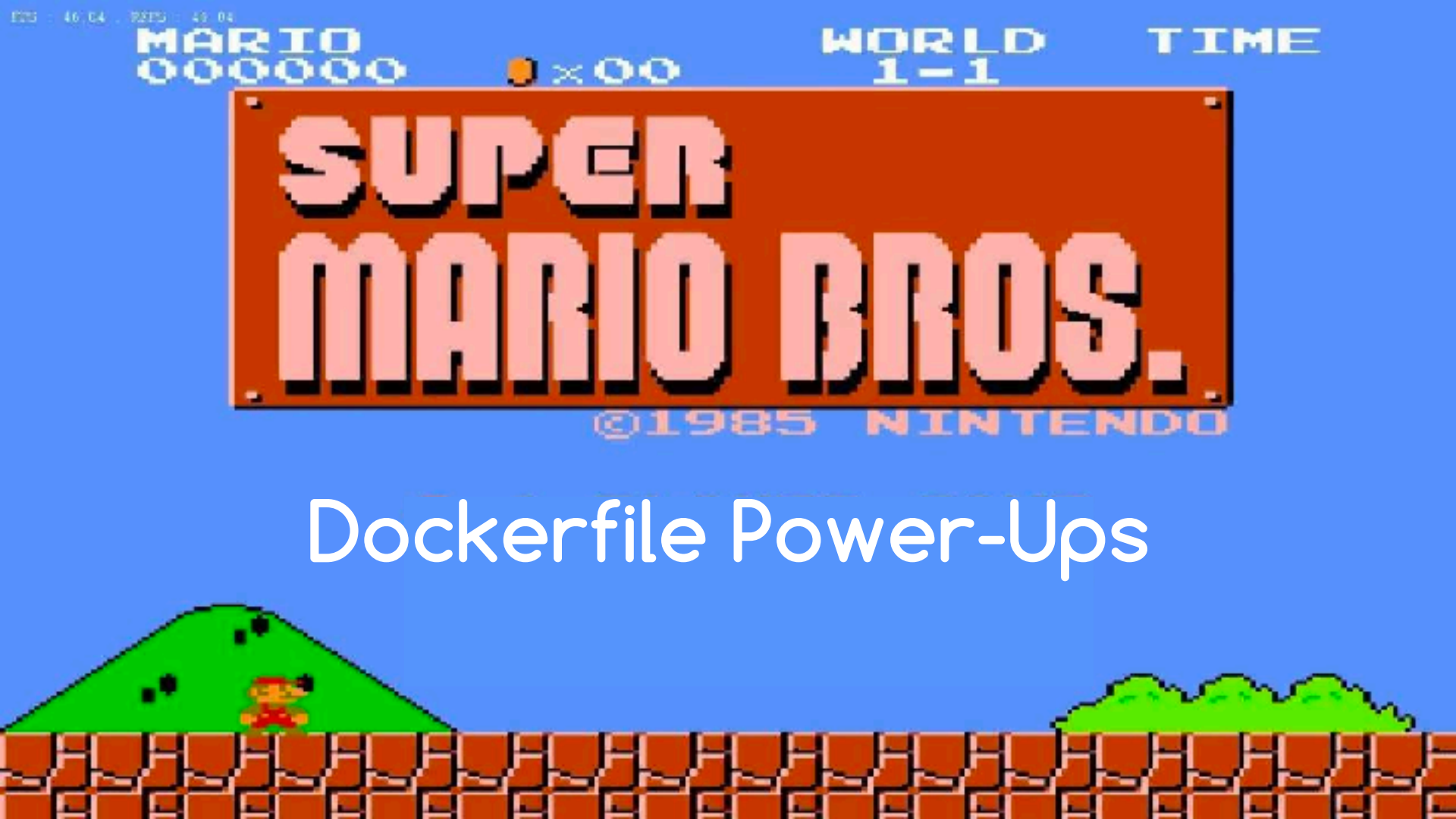
Limit Your Simultaneous Innovation

- Many initial container projects are too big in scope
- Solutions you maybe don't need day one:
  - Fully automatic CI/CD
  - Dynamic performance scaling
  - Containerizing all or nothing
  - Starting with persistent data

Legacy Apps Work In Containers Too

- Microservice conversion isn't required
- 12 Factor is a horizon we're always chasing
- Don't let these ideals delay containerization





Dockerfile Power-Ups

What To Focus On First: Dockerfiles

- More important than fancy orchestration
- It's your new build documentation
- Study Dockerfile/Entrypoint of Hub Officials
- Use FROM Official distros that are most familiar


SCORE 0
TIME 0:09
RINGS 10
SONIC
× 3


SONIC
THE HEDGEHOG

Dockerfile Anti-patterns

Dockerfile Anti-pattern: Trapping Data

- Problem: Storing unique data in container
- Solution: Define VOLUME for each location

```
VOLUME /var/lib/mysql

ENTRYPOINT ["docker-entrypoint.sh"]

CMD ["mysqld"]
```

Dockerfile Anti-pattern: Using Latest

- Latest = Image builds will be ¯_(ツ)_/¯
- Problem: Image builds pull FROM latest
- Solution: Use specific FROM tags
- Problem: Image builds install latest packages
- Solution: Specify version for critical apt/yum/apk packages

Dockerfile

```
FROM php:7.0.24-fpm

ENV NGINX_VERSION 1.12.1-1~jessie \
    NJS_VERSION   1.12.1.0.1.10-1~jess
    COMPOSER_VERSION=1.5.2 \
    NODE_VERSION 6.11.4
```

Dockerfile

```
FROM ubuntu:xenial-20170915

RUN apt-get update && apt-get install
    ca-certificates \
    g++ \
    ldap-utils=2.4.40+dfsg-1+deb8u3 \
    libedit-dev=3.1-20140620-2 \
```

Dockerfile Anti-pattern: Leaving Default Config

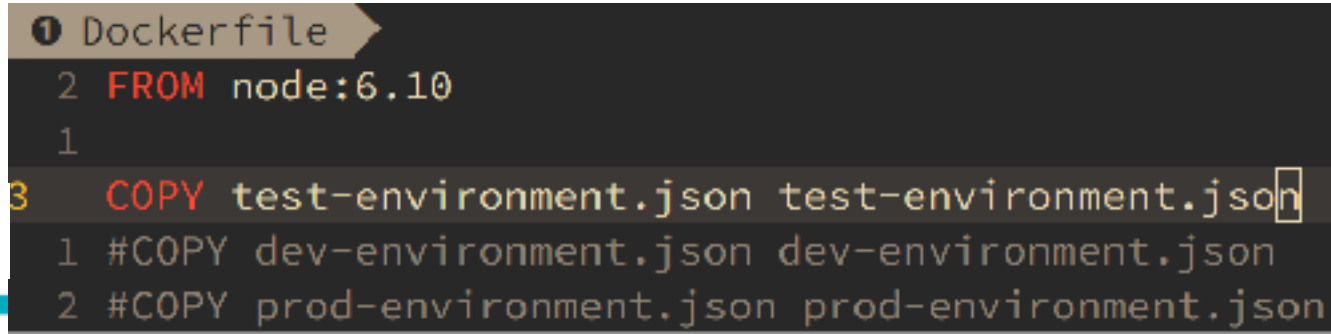
- Problem: Not changing app defaults, or blindly copying VM conf
  - e.g. php.ini, mysql.conf.d, java memory
- Solution: Update default configs via ENV, RUN, and ENTRYPOINT

```
ENV MYSQL_ALLOW_EMPTY_PASSWORD=true \
    MYSQL_DATABASE=sysbench \
    MYSQL_CONFIG=/etc/mysql/mysql.conf.d/mysqld.cnf \
    MYSQL_BUFFERSIZE=18G \
    MYSQL_LOGSIZE=512M \
    MYSQL_LOG_BUFFERSIZE=64M \
    MYSQL_FLUSHLOG=1 \
    MYSQL_FLUSHMETHOD=O_DIRECT

RUN echo "innodb_buffer_pool_size = ${MYSQL_BUFFERSIZE}" >> ${MYSQL_CONFIG} && \
    echo "innodb_log_file_size = ${MYSQL_LOGSIZE}" >> ${MYSQL_CONFIG} && \
    echo "innodb_log_buffer_size = ${MYSQL_LOG_BUFFERSIZE}" >> ${MYSQL_CONFIG} && \
    echo "innodb_flush_log_at_trx_commit = ${MYSQL_FLUSHLOG}" >> ${MYSQL_CONFIG} && \
    echo "innodb_flush_method = ${MYSQL_FLUSHMETHOD}" >> ${MYSQL_CONFIG}
```

Dockerfile Anti-pattern: Environment Specific

- Problem: Copy in environment config at image build
- Solution: Single Dockerfile with default ENV's, and overwrite per-environment with ENTRYPOINT script




Don Bluth Presents
DRAGON'S LAIR®
Tap to Begin


000049
Lets Slay Some Infrastructure Dragons
The Big 3 Decisions

Containers-on-VM or Container-on-Bare-Metal

- Do either, or both. Lots of pros/cons to either
- Stick with what you know at first
- Do some basic performance testing. You will learn lots!
- 2017 Docker Inc. and HPE whitepaper on MySQL benchmark
  - (authored by yours truly, and others)
  - bretfisher.com/gotochgo18

OS Linux Distribution/Kernel Matters

- Docker is very kernel and storage driver dependent
- Innovations/fixes are still happening here
- "Minimum" version != "best" version
- No pre-existing opinion? Ubuntu 16.04 LTS
  - Popular, well-tested with Docker
  - 4.x Kernel and wide storage driver support
- Or InfraKit and LinuxKit!
- Get correct Docker for your distro from store.docker.com

Container Base Distribution: Which One?

- Which FROM image should you use?
- Don't make a decision based on image size (remember it's Single Instance Storage)
- At first: match your existing deployment process
- Consider changing to Alpine later, maybe much later


LUMBER: 200
GOLD: 1000
HP
KNIGHT
MENU

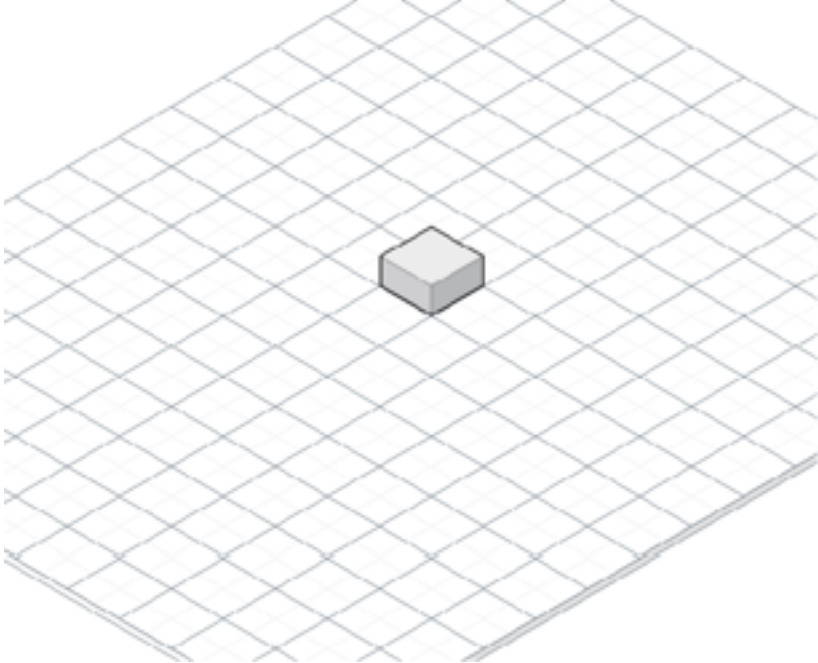

Build Your ~~Empire~~ Swarm
WARCRAFT
ORCS & HUMANS

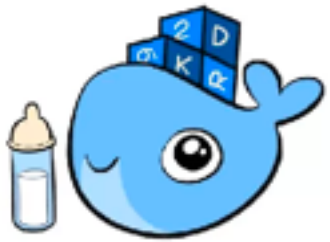
Good Defaults: Swarm Architectures

- Simple sizing guidelines based off:
  - Docker internal testing
  - Docker reference architectures
  - Real world deployments
  - Swarm3k lessons learned

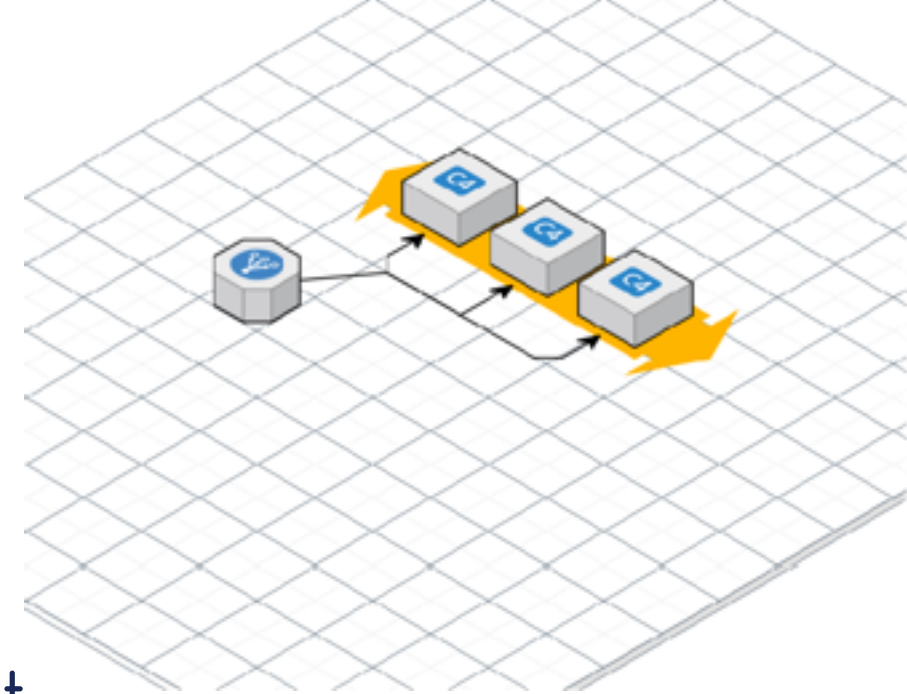
Baby Swarm: 1-Node

- "docker swarm init" done!
- Solo VM's do it, so can Swarm
- Gives you more features then docker run



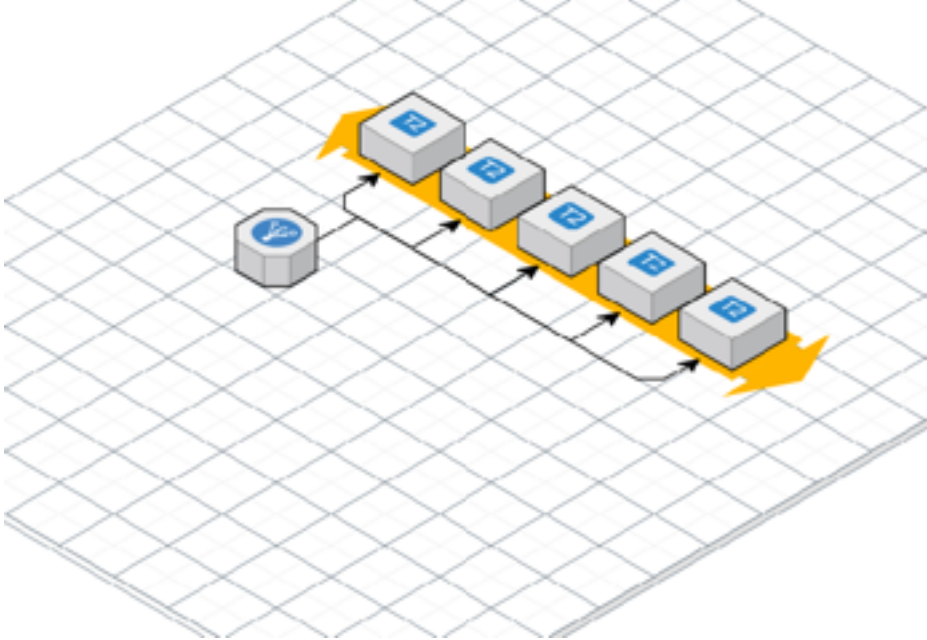


HA Swarm: 3-Node



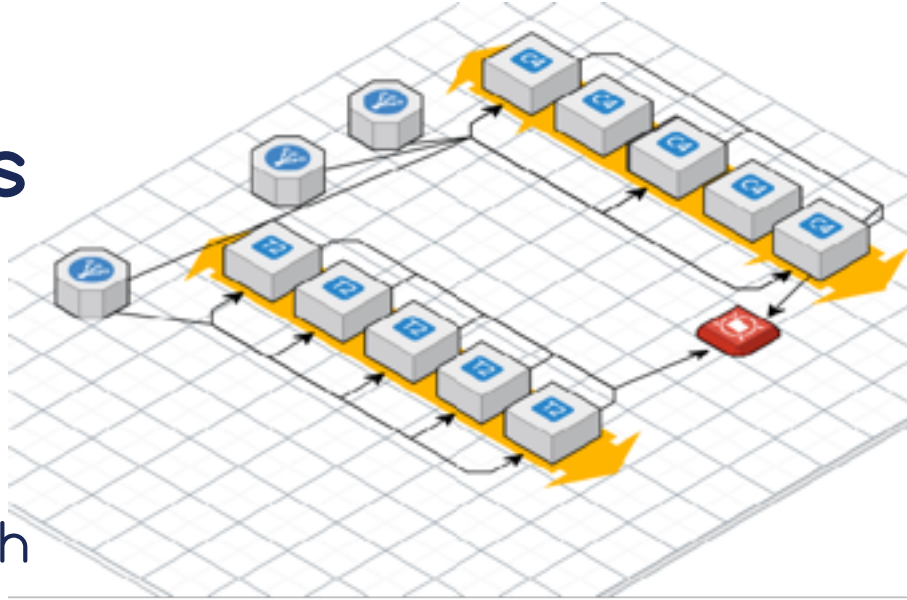
- Minimum for HA
- All Managers
- One node can fail
- Use when very small budget
- Pet projects or Test/CI

Biz Swarm: 5-Node



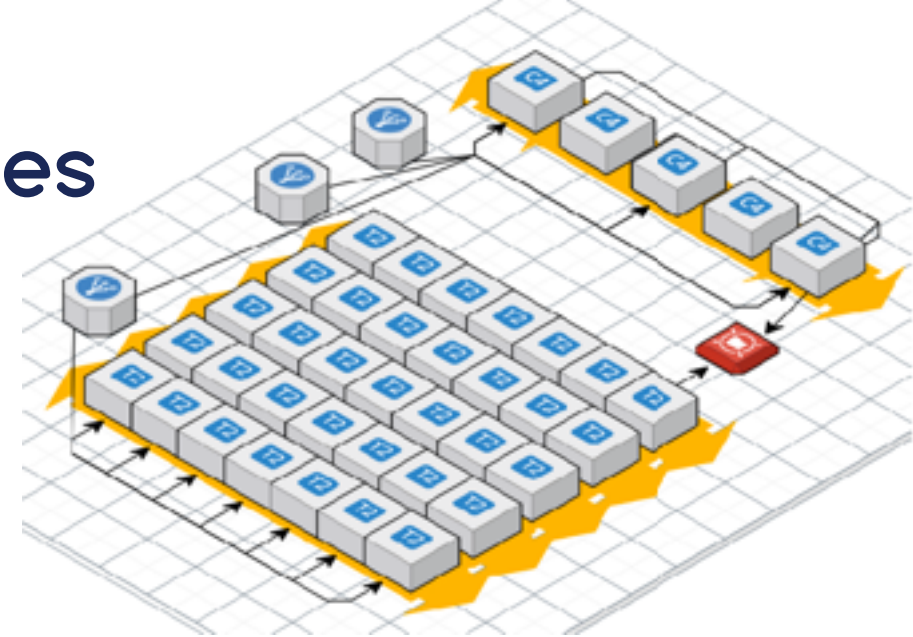
- Better high-availability
- All Managers
- Two nodes can fail
- My minimum for uptime that affects $$$

Flexy Swarm: 10+ Nodes

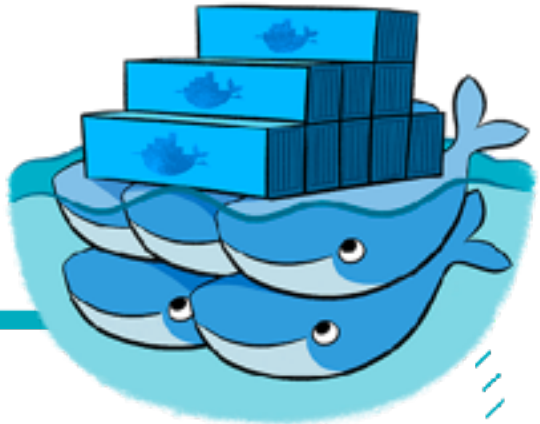


- 5 dedicated Managers
- Workers in DMZ
- Anything beyond 5 nodes, stick with 5 Managers and rest Workers
- Control container placement with labels + constraints

Swole Swarm: 100+ Nodes



- 5 dedicated managers
- Resize Managers as you grow
- Multiple Worker subnets on Private/DMZ
- Control container placement with labels + constraints



Don't Turn Cattle into Pets

- Assume nodes will be replaced
- Assume containers will be recreated
- Docker for (AWS/Azure) does this
- LinuxKit and InfraKit expect it

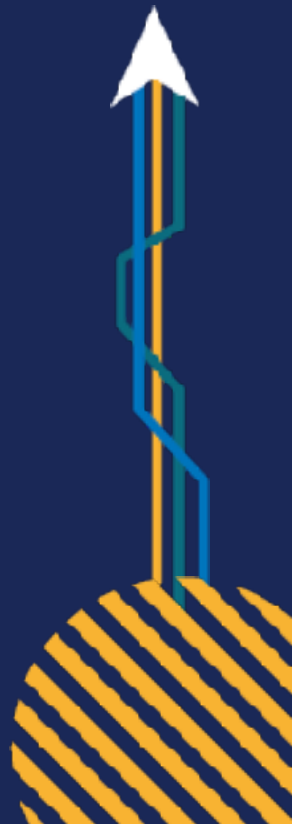
Reasons for Multiple Swarms

Bad Reasons

- Different hardware configurations (or OS!)
- Different subnets or security groups
- Different availability zones
- Security boundaries for compliance

Good Reasons

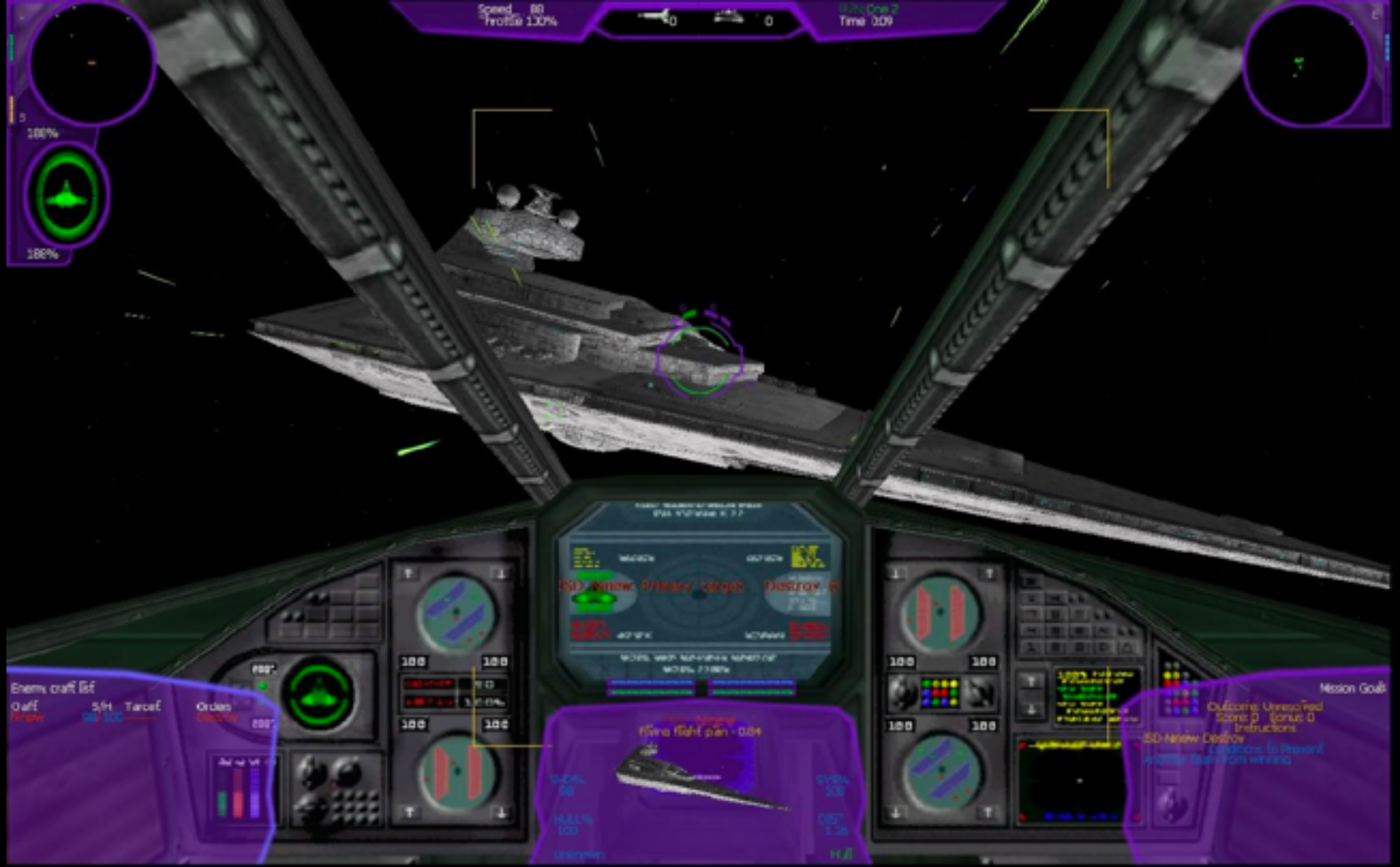
- Learning: Run Stuff on Test Swarm
- Geographical boundaries
- Management boundaries using Docker API (or Docker EE RBAC, or other auth plugin)



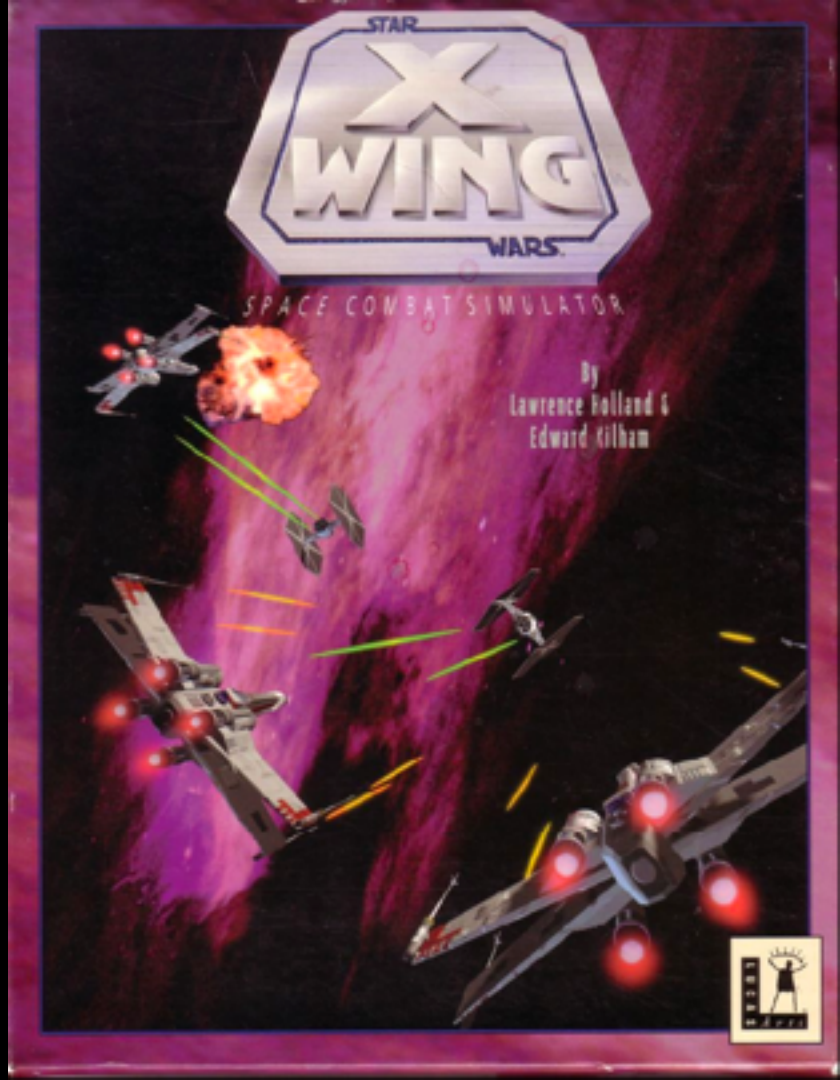
What About Windows Server 2016 Swarm?

- Hard to be "Windows Only Swarm", mix with Linux nodes
- Much of those tools are Linux only
- Windows = Less choice, but easier path
- My recommendation:
  - Managers on Linux
  - Reserve Windows for Windows-exclusive workloads


E L S
THROTTLE
SPD
Proton torpedo fired.


Speed 80
Throttle 130%
Time 0:09
100%
100%
Enemy craft list
Craft
S/H
Target
Order
Mission Goals
Outcome Unresolved
Score 0 Bonus 0
Instructions
ISD-Neimoidia: Destroy
Conditions to Prevent
Another Team from winning
HULL
SHIELDS

Bring In Reinforcements



Outsource Well-Defined Plumbing

- Beware the "not implemented here" syndrome
- My formula for "Do we use SaaS/Commercial"?
  - If it's a challenge to implement and maintain
  - + SaaS/commercial market is mature
  - = Opportunities for outsourcing

Outsourcing: For Your Consideration

- Image registry
- Logs
- Monitoring and alerting
  - Big Tools/Projects: github.com/cncf/landscape
  - All The Things: github.com/veggiemonk/awesome-docker

Tech Stacks

Designs for a full-featured cluster

Pure Open Source Self-Hosted Tech Stack

Swarm GUI	Portainer	
Central Monitoring	Prometheus + Grafana	
Central Logging	ELK	
Layer 7 Proxy	Flow-Proxy	Traefik
Registry	Docker Distribution + Portus	
CI/CD	Jenkins	Drone
Storage	REX-Ray	
Networking	Docker Swarm	
Orchestration	Docker Swarm	
Runtime	Docker	
HW / OS	InfraKit	Terraform

Docker for X: Cheap and Easy Tech Stack

Swarm GUI	Portainer	
Central Monitoring	Librato	Sysdig
Central Logging	Docker for AWS/Azure	
Layer 7 Proxy	Flow-Proxy	Traefik
Registry	Docker Hub	Quay
CI/CD	Codeship	TravisCI
Storage	Docker for AWS/Azure	
Networking	Docker Swarm	
Orchestration	Docker Swarm	
Runtime	Docker	
HW / OS	Docker for AWS/Azure	

Docker Enterprise Edition + Docker for X

Swarm GUI	**Docker EE (UCP)**	
Central Monitoring	Prometheus	Sysdig
Central Logging	Docker for AWS/Azure	
Layer 7 Proxy	**Docker EE (UCP)**	
Registry	**Docker EE (DTR)**	
CI/CD	Jenkins	TravisCI
Storage	Docker for AWS/Azure	
Networking	Docker Swarm	
Orchestration	Docker Swarm	
Runtime	**Docker EE**	
HW / OS	Docker for AWS/Azure	

LEVEL 4

WARRIOR
SCORE 650
HEALTH 605

VALKYRIE
4x SCORE 7260
HEALTH 214

WIZARD
5x SCORE 4720
HEALTH 447

ELF
3x SCORE 8030
HEALTH 2900

GAUNTLET

LEVEL 4

WARRIOR
SCORE 650
HEALTH 605

VALKYRIE
4x SCORE 7260
HEALTH 214

WIZARD
5x SCORE 4720
HEALTH 447

ELF
3x SCORE 8030
HEALTH 2900

4 Can Co-Op, But 1 Plays Just Fine

Must We Have An Orchestrator?

- Let's accelerate your docker migration even more
- Already have good infrastructure automation?
- Maybe you have great VM autoscale?
- Like the security boundary of the VM OS?

One Container Per VM

- Why don't we talk about this more?
- Least amount of infrastructure change but also:
  - Run on Dockerfile recipes rather then Puppet etc.
  - Improve your Docker management skills
  - Simplify your VM OS build

One Container Per VM: Not New

- Windows is doing it with Hyper-V Containers
- Linux is doing it with Intel Clear Containers
- LinuxKit will make this easier: Immutable OS
- Windows "LCOW" using LinuxKit


LEATHER SHIELD
WOODEN SWORD

DUNGEONS OF DAGGORATH

TANDY®


TIMEX User Manual
TIMEX sinclair 1000


TANDY

Summary

- Trim the optional requirements at first
- First, focus on Dockerfile/docker-compose.yml
- Watch out for Dockerfile anti-patterns
- Stick with familiar OS and FROM images
- Grow Swarm as you grow
- Find ways to outsource plumbing
- Realize parts of your tech stack may change, stay flexible

goto; chicago

Please

Remember to rate this session

Thank you!

follow us @gotochgo

Thank You!
@bretfisher

Slides & Links:
bretfisher.com/gotochgo18

Honorable Mentions

- Metroid ('83 NES)
- Mega Man ('87 NES)
- Wolfenstein 3D ('92 PC)
- Homeworld ('99 PC)
- Legend Of Zelda ('86 NES)
- Mortal Kombat ('92)
- Doom/Quake ('93 PC)
- Contra/Castlevania ('86 NES)
- Hitchhiker's GTTG ('84 TRS-80)
- Zenophobe ('87 Arcade)
- Battlezone ('80 Arcade)
- Joust/Dig Dug ('82 Arcade)