# Docker Introduction

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Minecraft Modding with Forge

A FAMILY-FRIENDLY GUIDE TO BUILDING FUN MODS IN JAVA

Arun Gupta & Aditya Gupta

Couchbase
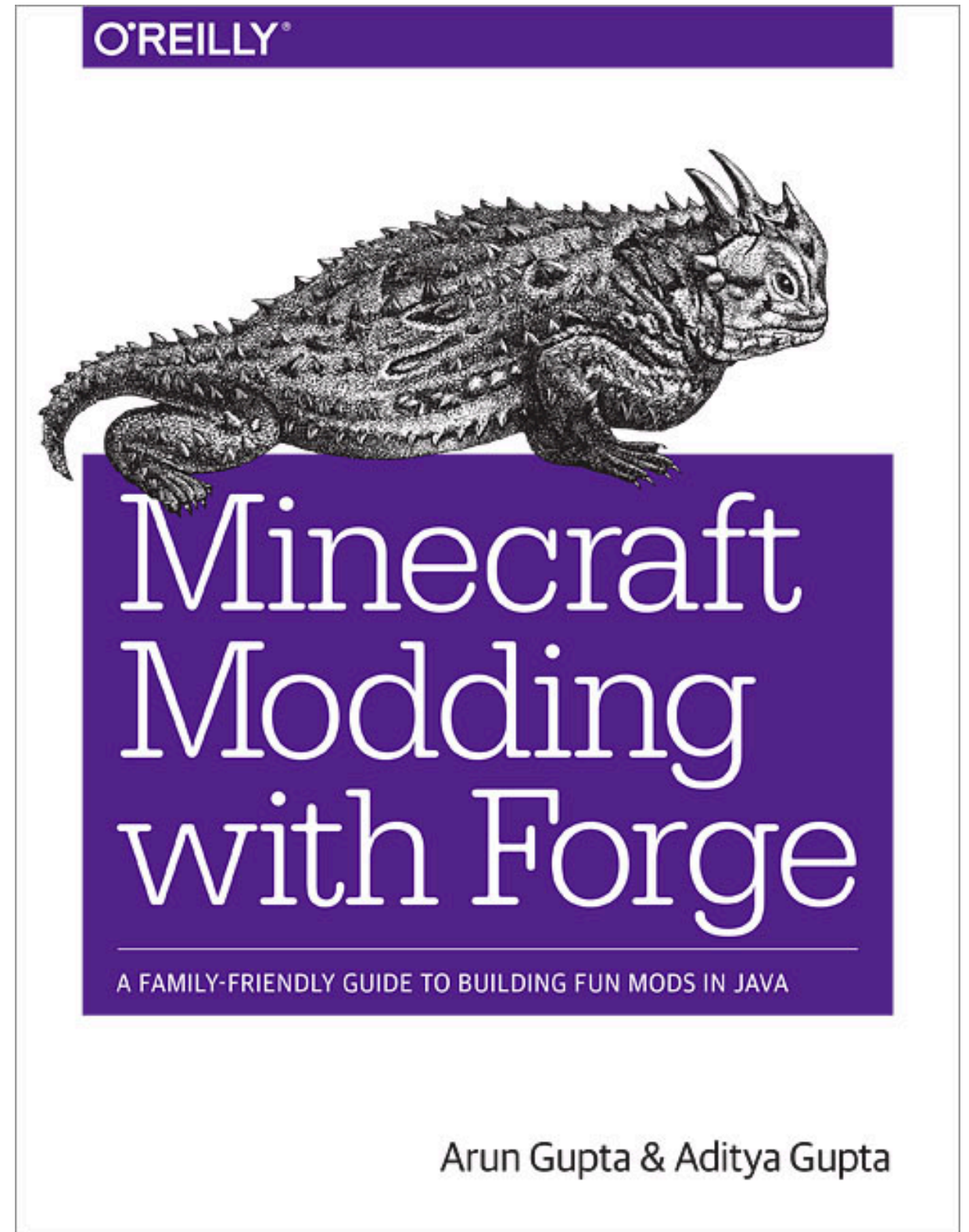
# What is Docker?

- Open source project and company



- Used to create containers for software applications

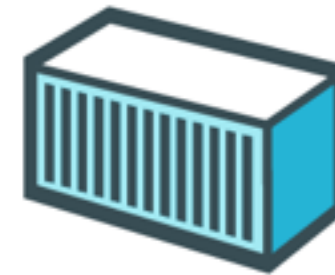- Package Once Deploy Anywhere (PODA)

# Advantages of Containers

- Immutability

- Reproducibility

- Isolation

- Faster deployments

- Portability - "it works on my machine"

- Snapshotting

- Security sandbox

- Limit resource usage

- Simplified dependency

- Sharing

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## Build

Develop an app using Docker containers with any language and any toolchain.
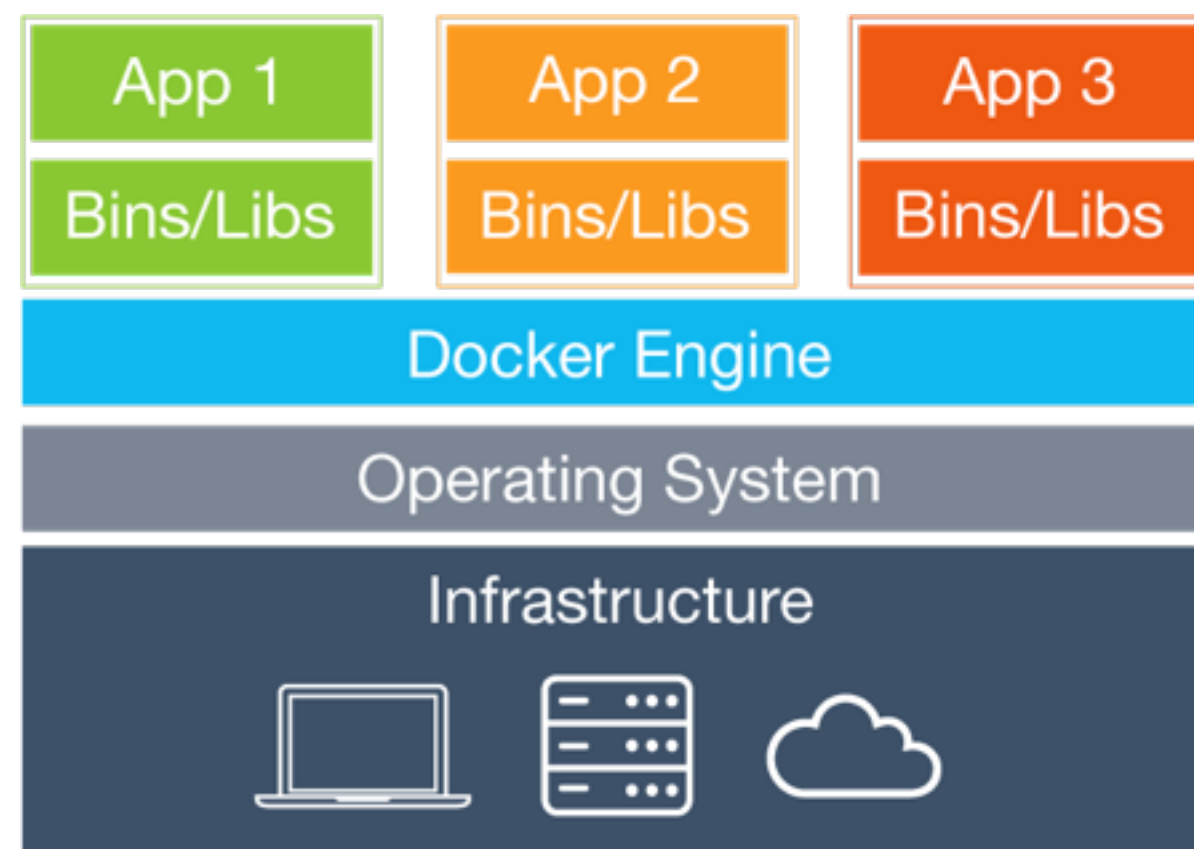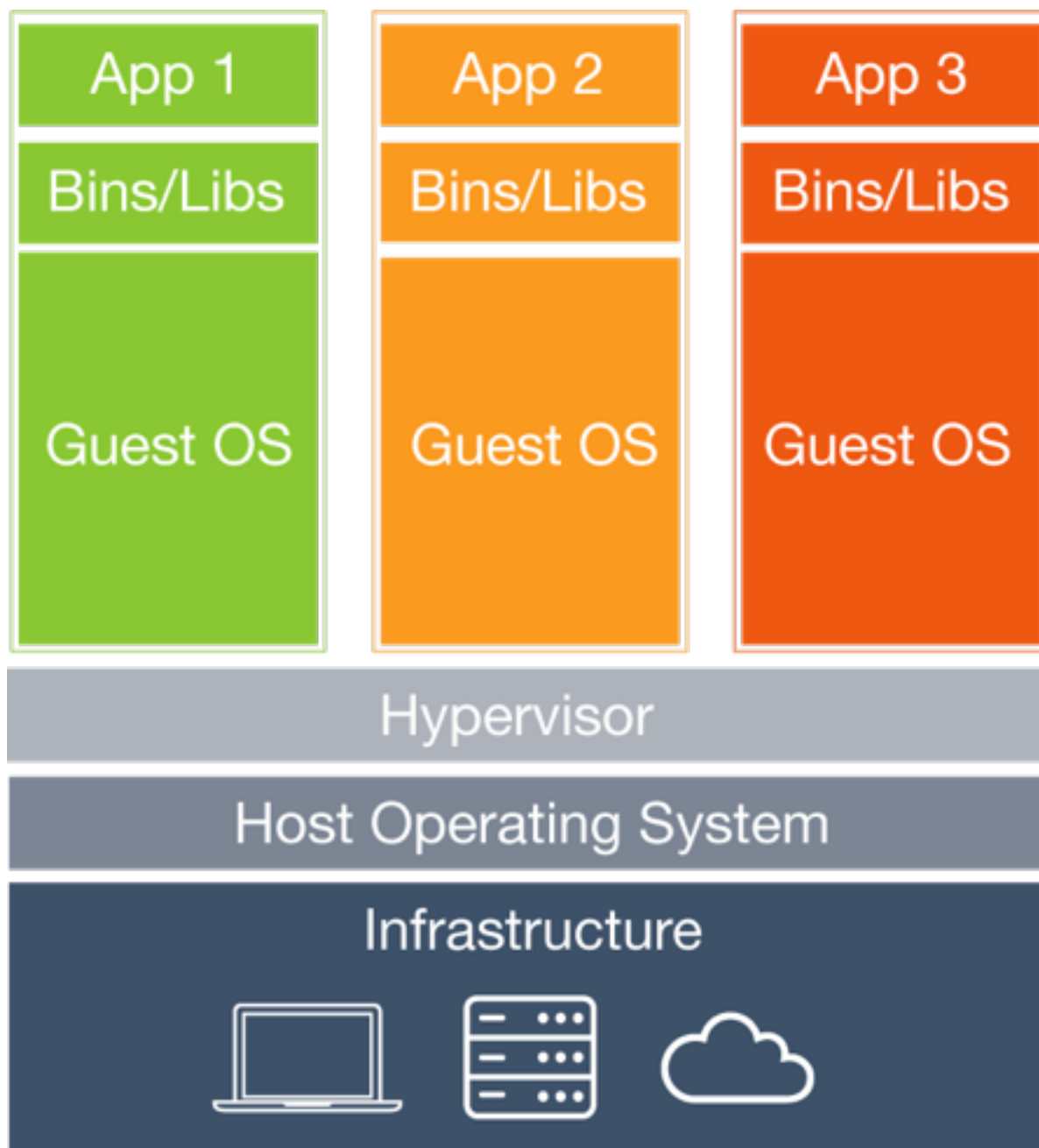
## Ship

Ship the "Dockerized" app and dependencies anywhere - to QA, teammates, or the cloud - without breaking anything.

## Run

Scale to 1000s of nodes, move between data centers and clouds, update with zero downtime and more.

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- Image defined in text-based **Dockerfile**

- List of commands to build the image

```
FROM fedora:latest

CMD echo "Hello world"
```

```
FROM jboss/wildfly

RUN curl -L https://github.com/javaee-samples/javaee7-hol/raw/master/solution/
movieplex7-1.0-SNAPSHOT.war -o /opt/jboss/wildfly/standalone/deployments/
movieplex7-1.0-SNAPSHOT.war
```
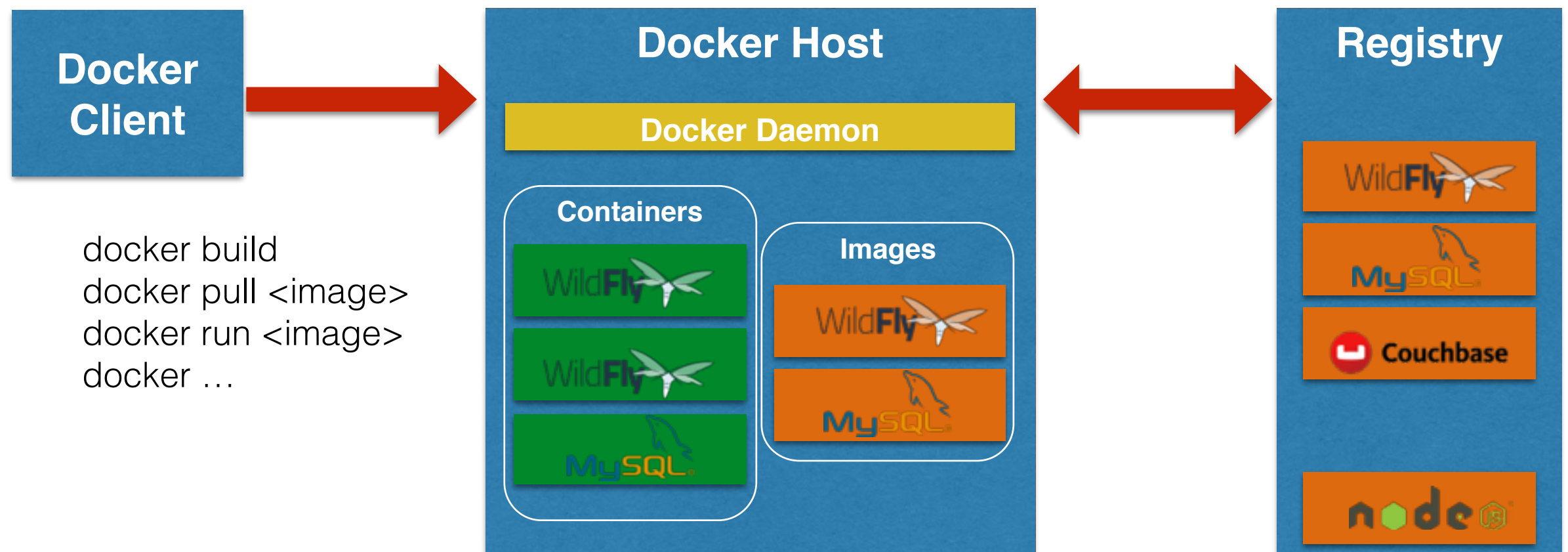
# Ansible
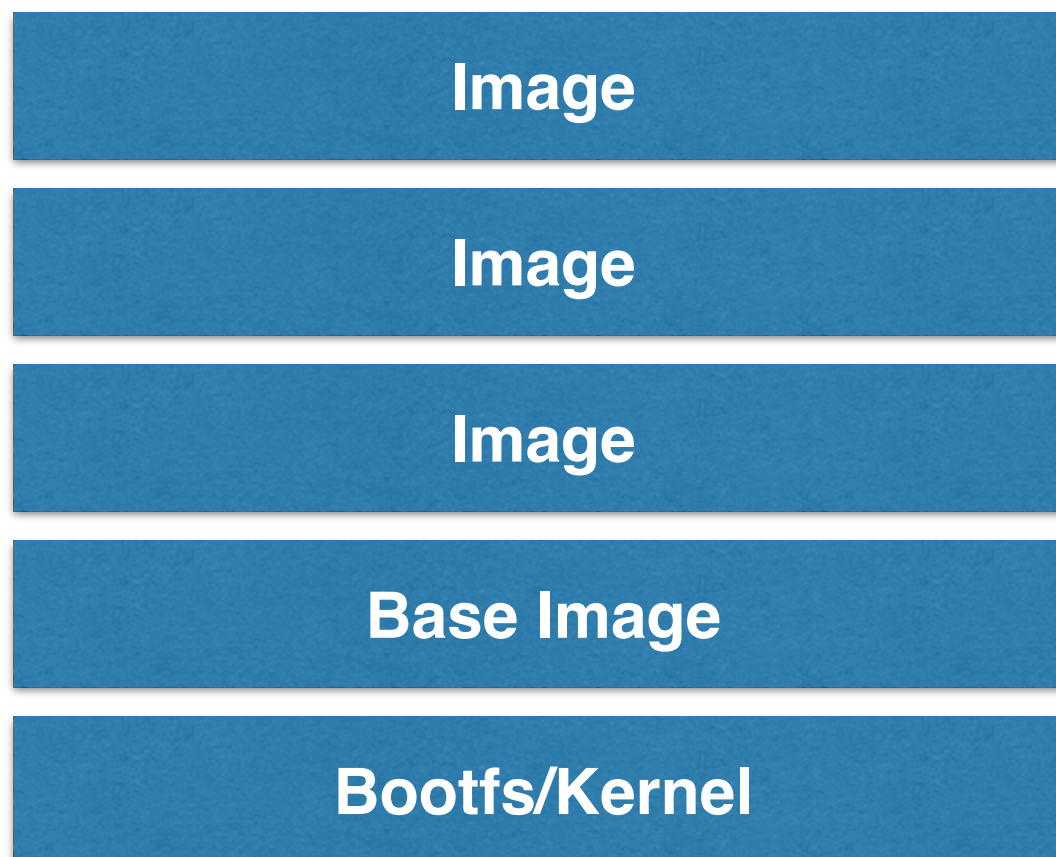
Build

Develop an app using Docker containers with
any language and any toolchain.

- Use for Clone git repo

- Build base image

- Generate dynamic file

- Generate templates

- Upload images

- Test the images before publishing

# Docker Workflow

**Docker Client**

docker build
docker pull <image>
docker run <image>
docker …

**Docker Host**

**Docker Daemon**

**Containers**

**Images**

**Registry**

| | |
|---|---|
| **Image** | jboss/wildfly |
| **Image** | jboss/base-jdk:8 |
| **Image** | jboss/base |
| **Base Image** | centos:7 |
| **Bootfs/Kernel** | |

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# Docker Machine

- Create Docker Host on computer or cloud provider

  `docker-machine create --driver=virtualbox myhost`

  - Configure Docker client to talk to host

  - Create and pull images

  - Start, stop, restart containers

  - Upgrade Docker

- Not recommended for production yet

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# Docker Machine Providers

# Docker Compose

- Defining and running multi-container applications

- Configuration defined in a single file

- Great for dev, staging, and CI

- Not recommended for production yet

# docker-compose.yml

```yaml
mysqldb:
  image: mysql
  environment:
    MYSQL_DATABASE: sample
    MYSQL_USER: mysql
    MYSQL_PASSWORD: mysql
    MYSQL_ROOT_PASSWORD: supersecret
mywildfly:
  image: arungupta/wildfly-mysql-javaee7
  links:
    - mysqldb:db
```
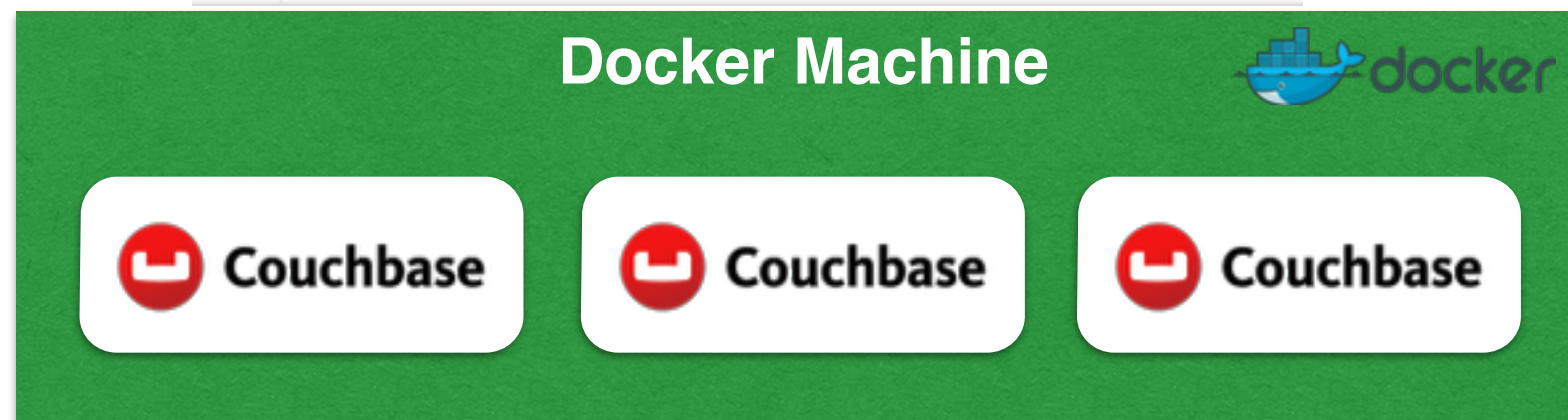
# Couchbase Cluster using Docker Compose

```
1   couchbase1:
2     image: couchbase/server
3     volumes:
4       - ~/couchbase/node1:/opt/couchbase/var
5   couchbase2:
6     image: couchbase/server
7     volumes:
8       - ~/couchbase/node2:/opt/couchbase/var
9   couchbase3:
10    image: couchbase/server
11    volumes:
12      - ~/couchbase/node3:/opt/couchbase/var
13    ports:
14      - 8091:8091
15      - 8092:8092
16      - 8093:8093
17      - 11210:11210
```
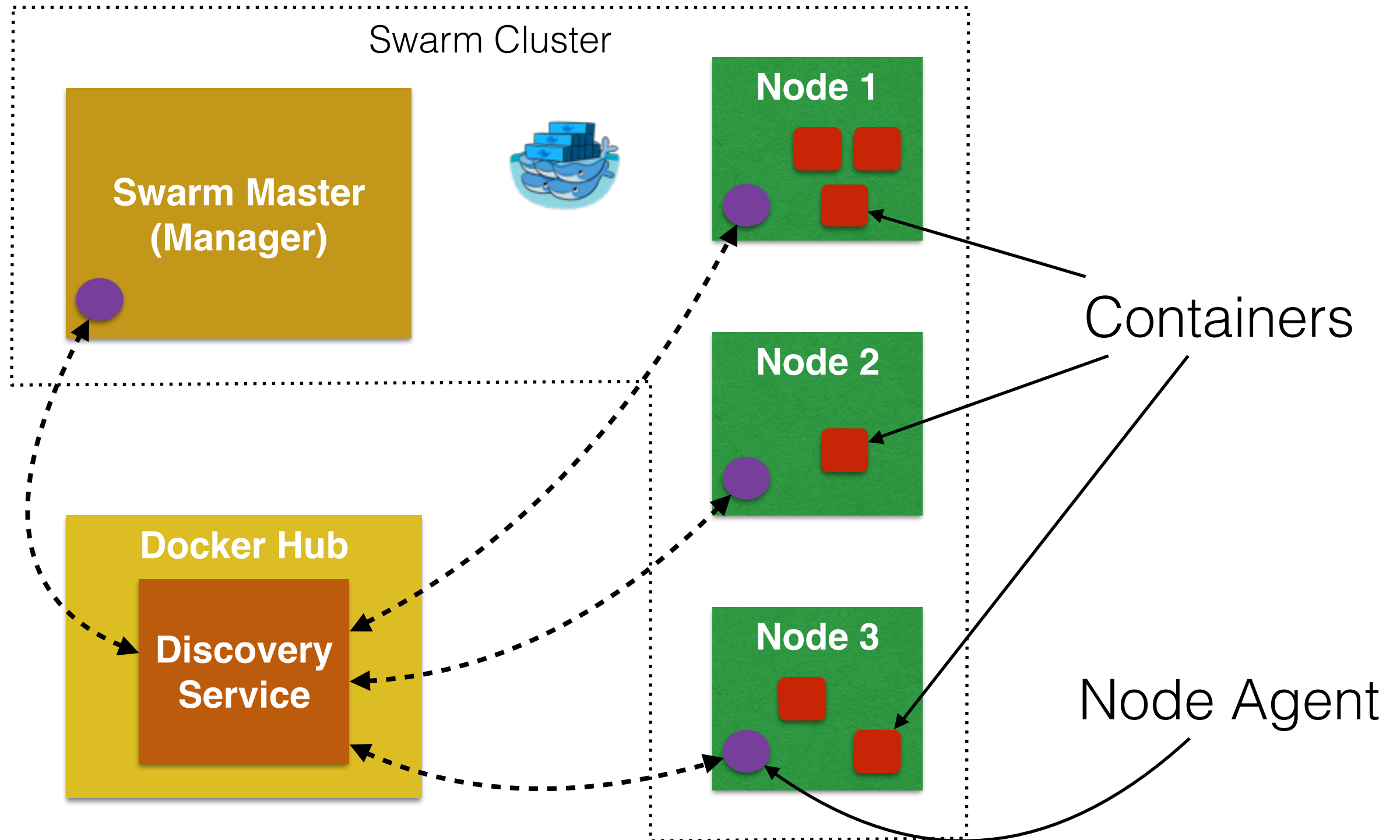


**Docker Machine**

# Docker Swarm

- Native clustering for Docker

- Provides a unified interface to a pool of Docker hosts

- Fully integrated with Machine

- Serves the standard Docker API

- Partially integrated with Compose
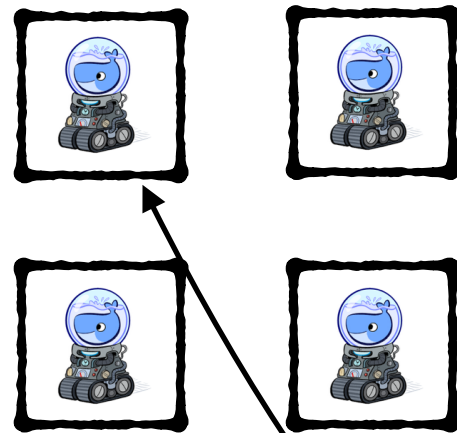
- 1.0.0 - Ready for production
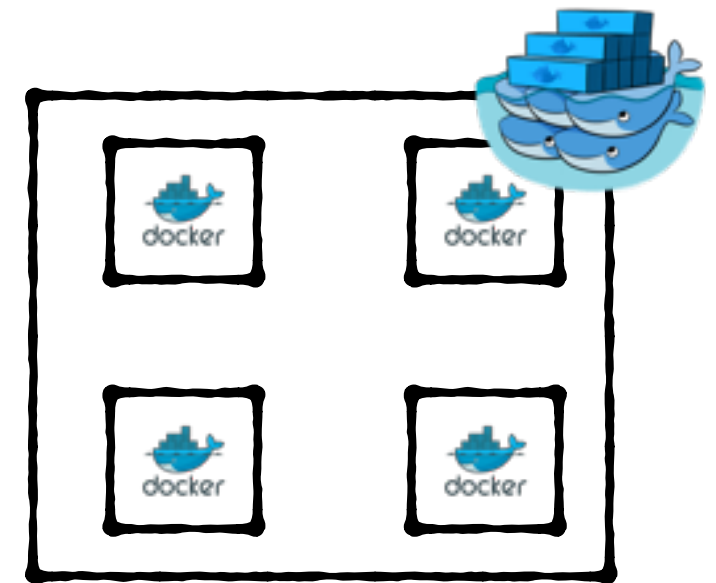
# Docker Swarm

- Simple scheduling backends included, API for pluggable backends (e.g. Mesos) coming

  - Based on CPU (`-c`), RAM (`-m`), number of containers

  - `spread` (default): node with least number of running containers

  - `binpack`: node with most number of running containers

  - `random`: mostly for debugging

  - Specified using `--strategy`
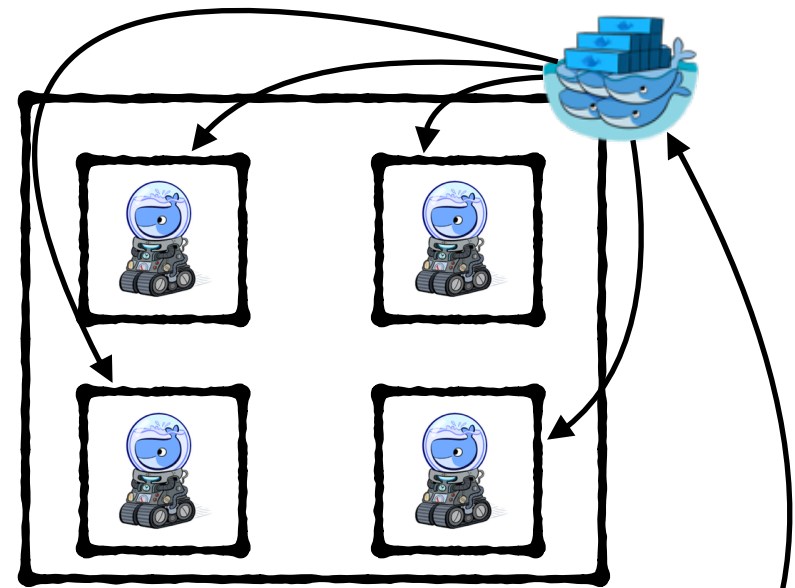
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# Docker Swarm



Swarm Cluster

**Swarm Master (Manager)**

**Docker Hub**

**Discovery Service**

**Node 1**

**Node 2**

**Node 3**

Containers

Node Agent

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**Machine**

**Swarm**

YAML

**Compose**

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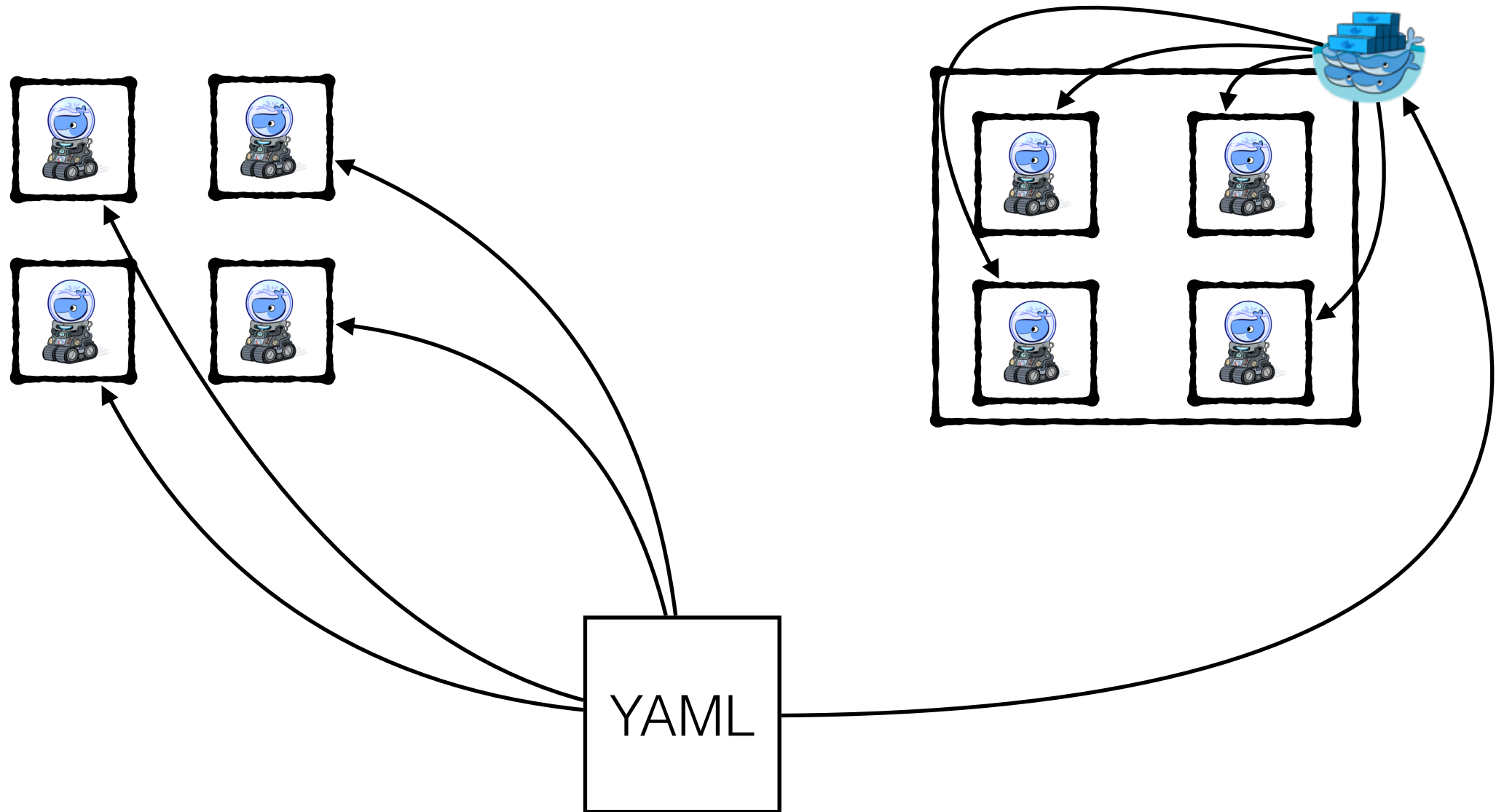
# Docker Toolbox

- Docker Client 1.9.0

- Docker Machine 0.5.0

- Docker Compose 1.5.0 ~~(Mac only)~~

- Docker Kitematic 0.9.3

- Boot2Docker ISO 1.9.0

- Virtualbox 5.0.8

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# Persistent Storage

- Data volumes - used to persist data independent of container's lifecycle

- Multiple plugins: Flocker, Ceph, . . .

- `docker run -d -P` **`-v /opt/couchbase/var`** `couchbase/server`

- `docker run -d -P` **`-v ~/couchbase/:/opt/couchbase/var`** `couchbase/server`

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# Multi-host Networking

- Create virtual networks and attach containers

  - Software defined networking

- *Bridge* network span single host

- *Overlay* network spans multiple hosts

- Works with Swarm and Compose

- Pluggable: Calico, Cisco, Weave, . . .

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# Networking vs Links

- Connect containers to each other across different physical or virtual hosts

- Containers can be easily stopped, started and restarted w/o disrupting connection to other containers

- Can be created in any order

# docker network

```
docker network --help

Usage: docker network [OPTIONS] COMMAND [OPTIONS]

Commands:
  disconnect                Disconnect container from a network
  inspect                   Display detailed network information
  ls                        List all networks
  rm                        Remove a network
  create                    Create a network
  connect                   Connect container to a network

Run 'docker network COMMAND --help' for more information on a command.

  --help=false       Print usage
```

# Continuous Delivery using Docker and Jenkins Workflow

Git Server

web hook or poll

git push

clone

Checkout & Build

Run Tests

arquillian

Create Docker Image

Docker Registry

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