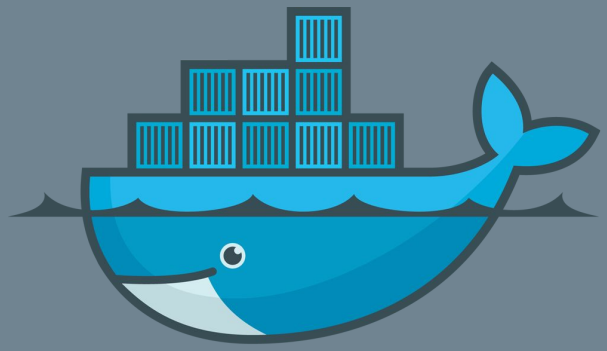


逢甲大學 docker 研習班

Docker.Taipei Philipz(鄭淳尹)

2017-01-17

https://github.com/philipz/workshop_fcu

Today Topics

1. Docker Hub introduction
2. Git CLI
3. Docker Hub Auto-build from Github
4. Docker Network CLI
5. Docker Volume CLI
6. Docker Compose CLI
   = Multi-Container on Single Host
7. Using Docker Compose & official voting application example

Live Restore

- Keep containers alive during daemon downtime
- Control and configure Docker with systemd

systemctl show --property=FragmentPath docker

debian/ubuntu - /lib/systemd/system/docker.service

ExecStart=/usr/bin/dockerd -H fd:// --live-restore

sudo systemctl daemon-reload
sudo systemctl restart docker

1. Docker Hub introduction

Docker Hub = App Store

- Public Docker Registry
- One free private repo.
- Auto-build & Webhook
- Security Scanning is not free.

Build, Ship, & Run
Any App, Anywhere
Dev-test pipeline automation, 100,000+ free apps, public and private registries

GitHub & Docker Hub

Search GitHub

Pull requests Issues Gist

Authorize application

Docker Hub Registry by @docker would like permission to access your account

Review permissions

Repositories
Public and private

Authorize application

Docker Hub Registry

Docker Hub Registry

Visit application's website

Learn more about OAuth

Vulnerability Analysis

CoreOS Clair

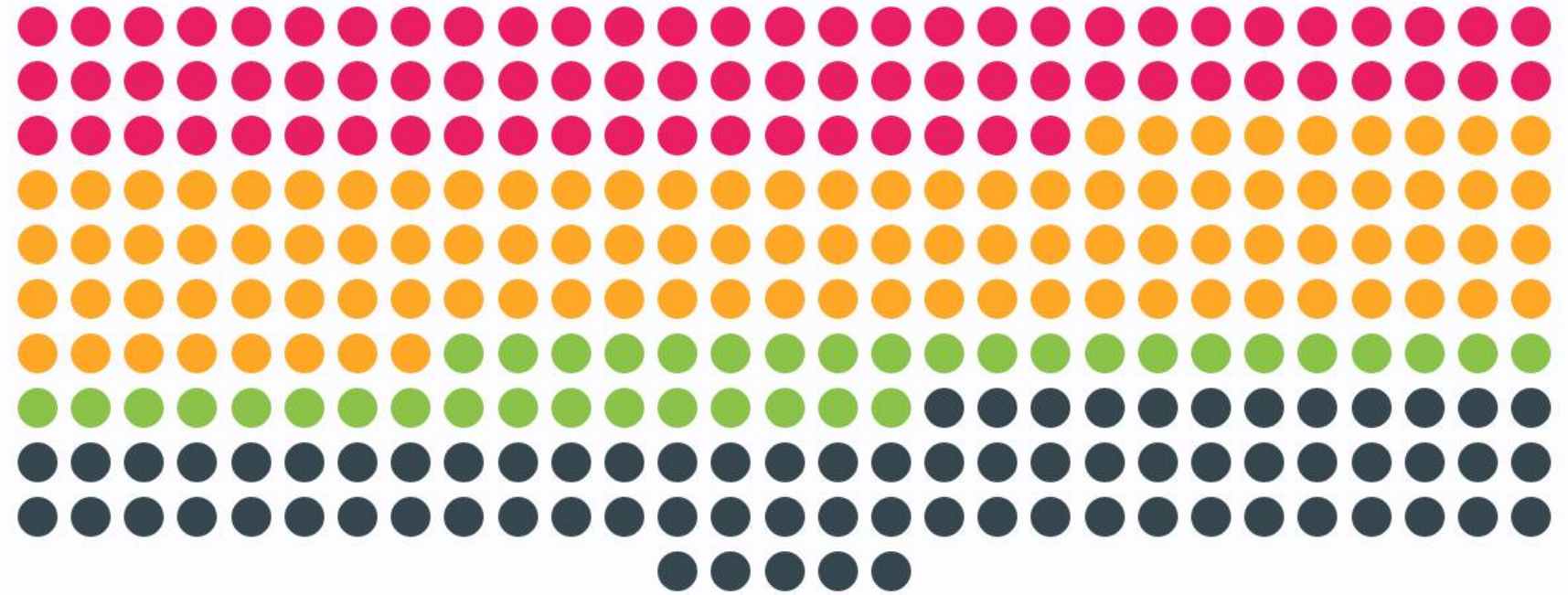
Anchore

CLAIR CONTROL REPORT

Image: jgsqware/vulnerable-image

Total : 295 vulnerabilities

- Unknown : **17**
- Negligible : **58**
- Low : **38**
- Medium : **104**
- High : **78**



sha256:204fff67067677bbe3db68ba5ab36eb0749cc7e1cb4ac0f35f5a0d07383e1635

linux 3.16.7-ckt20-1+deb8u2 - ⚠

- **CVE-2016-3134**
  The netfilter subsystem in the Linux kernel through 4.5.2 does not validate certain offset fields, which allows local users to gain privileges or cause a denial of service (heap memory corruption) via an IPT_SO_SET_REPLACE setsockopt call.
  Link

- **CVE-2015-8830**
  Integer overflow in the aio_setup_single_vector function in fs/aio.c in the Linux kernel 4.0 allows local users to cause a denial of service or possibly have unspecified other impact via a large AIO iovec. NOTE: this vulnerability exists because of a CVE-2012-6701 regression.
  Link

- **CVE-2015-8816**
  The hub_activate function in drivers/usb/core/hub.c in the Linux kernel before 4.3.5 does not properly maintain a hub-interface data structure, which allows physically proximate attackers to cause a denial of service (invalid memory access and system crash) or possibly have unspecified other impact by unplugging a USB hub device.
  Link

- **CVE-2013-7445**
  The Direct Rendering Manager (DRM) subsystem in the Linux kernel through 4.x mishandles requests for Graphics Execution Manager (GEM) objects, which allows context-dependent attackers to cause a denial of service (memory consumption) via an application that processes graphics data, as demonstrated by JavaScript code that creates many CANVAS elements for rendering by Chrome or Firefox.
  Link

- **CVE-2016-0758**
  Integer overflow in lib/asn1_decoder.c in the Linux kernel before 4.6 allows local users to gain privileges via crafted ASN.1 data.
  Link

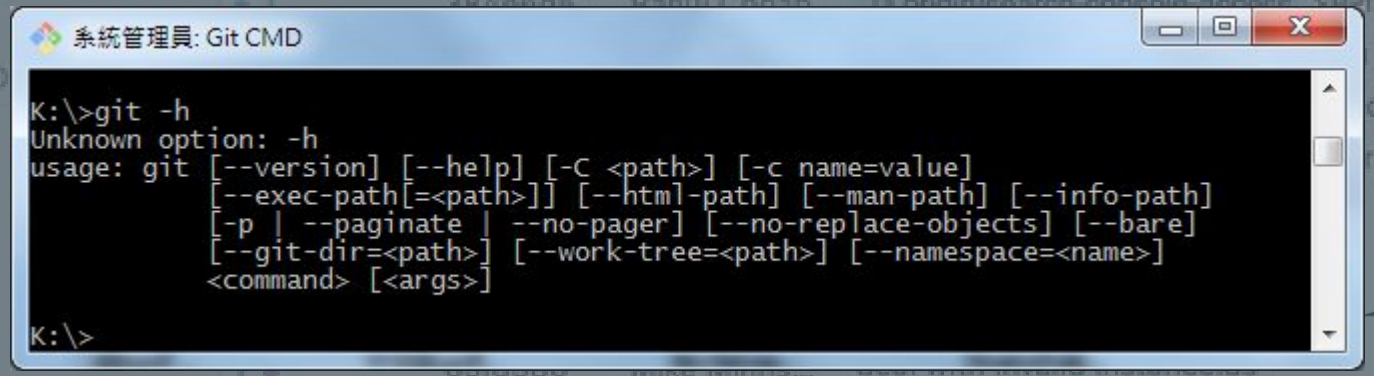
2. Git command-line

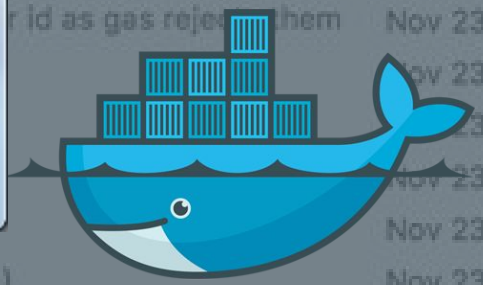
Git by Linus Torvalds

- VCS tool
- Open source community protocol
- GitHub, Bitbucket, GitLab…...

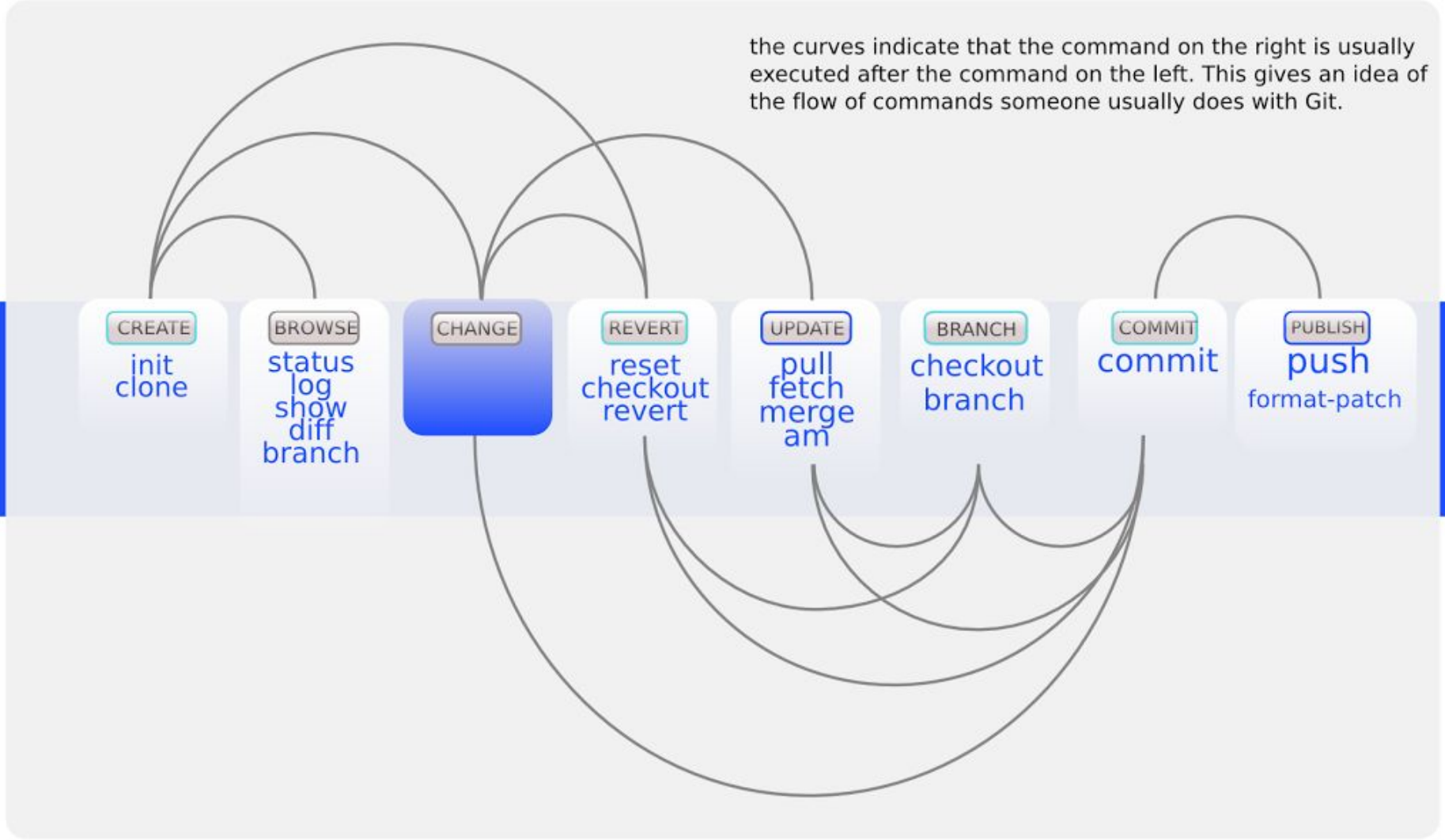
Install Git

- sudo apt-get install git
- Git cmd for windows
- SourceTree is best choice!
- GitHub is a git web-UI and repository.
- Git 教室





Commands Sequence



Update

Publish

Git Cheat Sheet

http://git.or.cz/

Remember: git command --help

Global Git configuration is stored in $HOME/.gitconfig (git config --help)

Create

From existing data

```
cd ~/projects/myproject
git init
git add .
```

From existing repo

```
git clone ~/existing/repo ~/new/repo
git clone git://host.org/project.git
git clone ssh://you@host.org/proj.git
```

Show

Files changed in working directory

Concepts

Git Basics

```
master    : default development branch
origin    : default upstream repository
HEAD      : current branch
HEAD^     : parent of HEAD
HEAD~4    : the great-great grandparent of HEAD
```

Revert

Return to the last committed state

```
git reset --hard
```

⚠ you cannot undo a hard reset

Com

Upd

Files changed in working directory
git status

Changes to tracked files
git diff

What changed between $ID1 and $ID2
git diff $id1 $id2

History of changes
git log

History of changes for file with diffs
git log -p $file $dir/ec/tory/

Who changed what and when in a file
git blame $file

A commit identified by $ID
git show $id

A specific file from a specific $ID
git show $id:$file

All local branches
git branch
(star '*' marks the current branch)

Cheat Sheet Notation

$id : notation used in this sheet to represent either a commit id, branch or a tag name
$file : arbitrary file name
$branch : arbitrary branch name

git reset --hard
you cannot undo a hard reset

Revert the last commit
git revert HEAD Creates a new commit

Revert specific commit
git revert $id Creates a new commit

Fix the last commit
git commit -a --amend
(after editing the broken files)

Checkout the $id version of a file
git checkout $id $file

Branch

Switch to the $id branch
git checkout $id

Merge branch1 into branch2
git checkout $branch2
git merge branch1

Create branch named $branch based on the HEAD
git branch $branch

Create branch $new_branch based on branch $other and switch to it
git checkout -b $new_branch $other

Delete branch $branch
git branch -d $branch

Upd

Fetch
git fet
(but th

Pull lat
git pu
(does

Apply
git an

Useful Commands

Find
gi
gi
gi
gi
gi
gi

Che
gi
gi

Sea
gi

Update

Fetch latest changes from origin

```
git fetch
```

(but this does not merge them).

Pull latest changes from origin

```
git pull
```

(does a fetch followed by a merge)

Apply a patch that some sent you

```
git am -3 patch.mbox
```

(in case of a conflict, resolve and use `git am --resolved`)

Publish

Commit all your local changes

```
git commit -a
```

Prepare a patch for other developers

```
git format-patch origin
```

Push changes to origin

```
git push
```

Mark a version / milestone

```
git tag v1.0
```

Useful Commands

Finding regressions

```
git bisect start        (to start)
git bisect good $id     ($id is the last working version)
git bisect bad $id      ($id is a broken version)

git bisect bad/good     (to mark it as bad or good)
git bisect visualize    (to launch gitk and mark it)
git bisect reset        (once you're done)
```

Check for errors and cleanup repository

```
git fsck
git gc --prune
```

Search working directory for foo()

Resolve Merge Conflicts

To view the merge conclicts

```
git diff          (complete conflict diff)
git diff --base  $file  (against base file)
git diff --ours  $file  (against your changes)
git diff --theirs $file (against other changes)
```

To discard conflicting patch

```
git reset --hard
git rebase --skip
```

After resolving conflicts, merge with

```
git add $conflicting_file (do for all resolved files)
```

3. Docker Hub Auto-build

Dockerfile

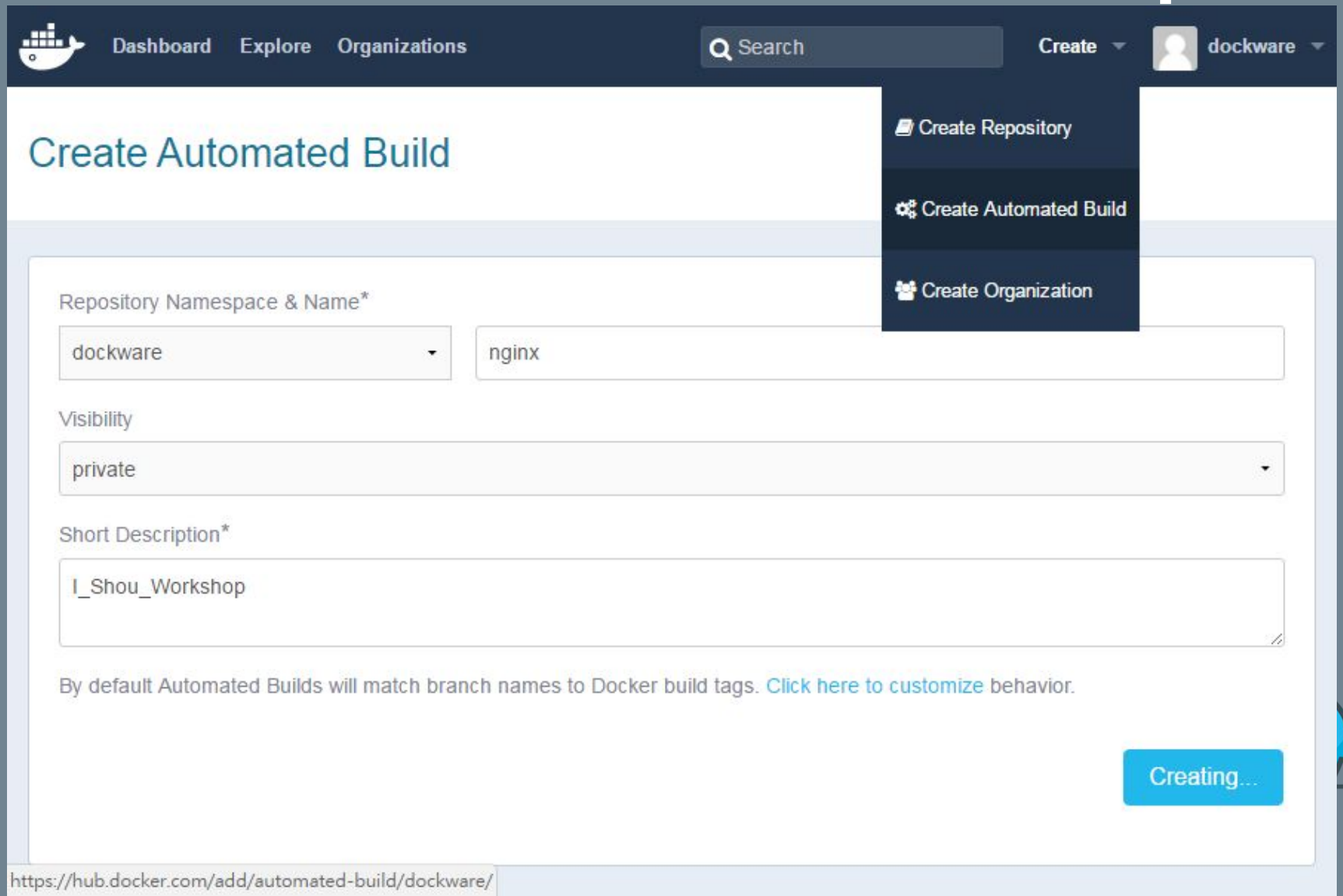
Sample:

```
FROM debian:jessie
MAINTAINER docker "docker@nginx.com"
RUN apt-get update && apt-get install -y nginx
CMD ["nginx", "-g", "daemon off;"]
```

Git Workflow

1. git init or init on GitHub.
2. git add Dockerfile
3. git commit -m “First init”
4. git remote add origin
   https://github.com/YOURNAME/docker_build.git
5. git push origin master

Create Auto-build Repo.



Build Settings

PUBLIC | AUTOMATED BUILD

philipz/rpi-raspbian ☆

Last pushed: 3 months ago

Repo Info | Tags | Dockerfile | Build Details | Build Settings | Collaborators | Webhooks | Settings

Build Settings

☐ When active, builds will happen automatically on pushes.

The build rules below specify how to build your source into Docker images. The name can be a string or a regex. The Docker Tag name may contain variables. We currently support {sourceref}, which refers to the source branch/tag name. Show more

Source Repository
philipz/docker-rpi-raspbian

Type	Name	Dockerfile Location	Docker Tag Name	
Branch	master	/	latest	+ Trigger

docker pull YOURNAME/IMAGENAME

Save Changes

4. Docker Network command-line

TCP/IP Foundation

www.google.com, www is hostname, google.com is domain name.

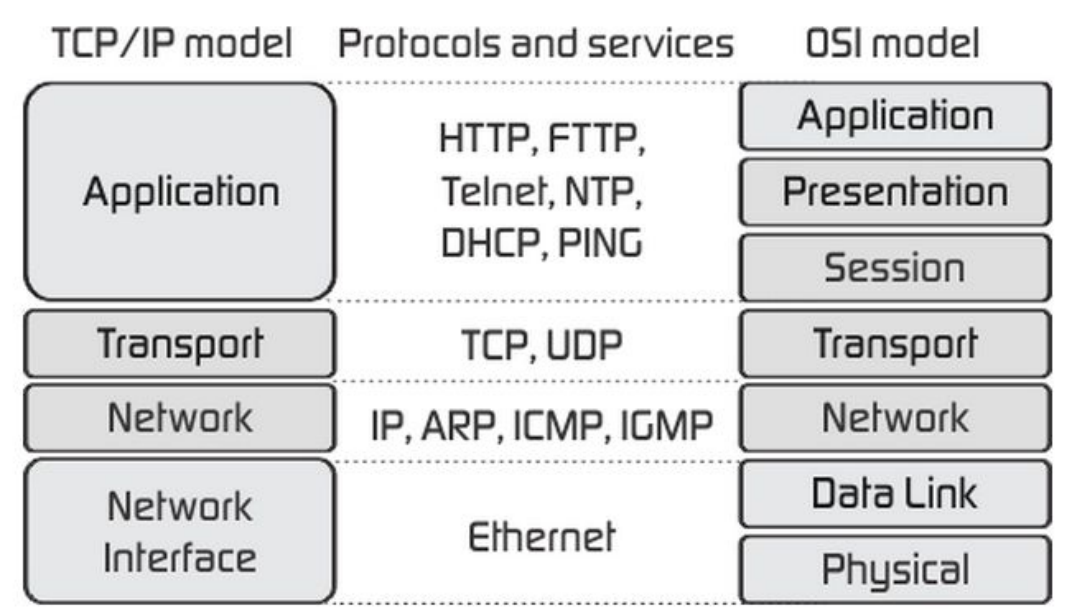
Localhost: 127.0.0.1

TCP/UDP Port: 0-65535 = 2^16,

but 0 is a reserved port.

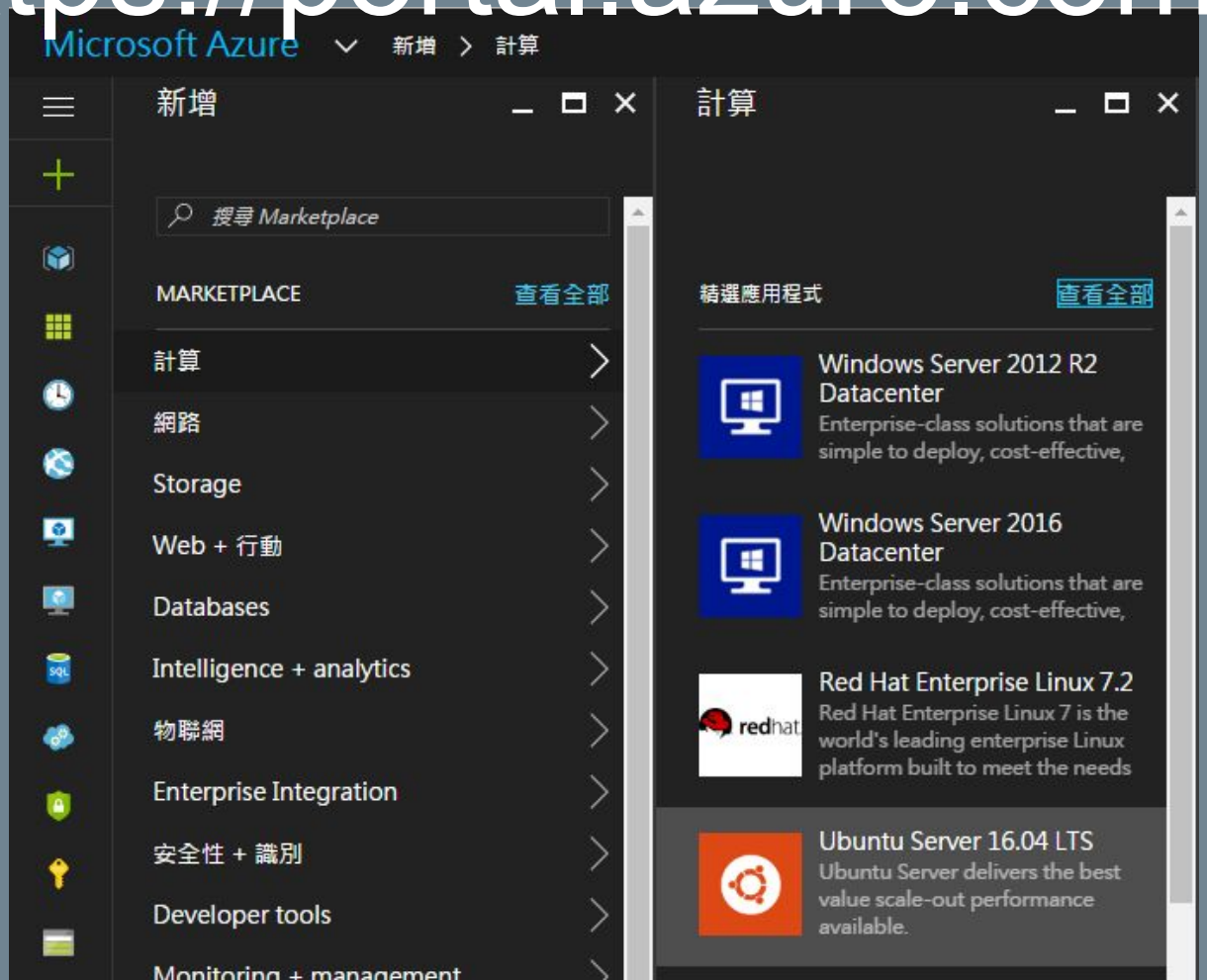
Private IP:

- 10.0.0.0/8
- 172.16.0.0/12 ~ 172.31.0.0/12
- 192.168.0.0/16



Microsoft Azure

https://portal.azure.com/



Network and connectivity commands

Command	Description
network connect	Connect a container to a network
network create	Create a new network
network disconnect	Disconnect a container from a network
network inspect	Display information about a network
network ls	Lists all the networks the Engine `daemon` knows about
network rm	Removes one or more networks

https://docs.docker.com/engine/userguide/networking/

Docker Built-In Network Drivers

- Bridge
- Overlay
- MACVLAN
- Host
- None

Docker Plug-In Network Drivers

- weave
- calico

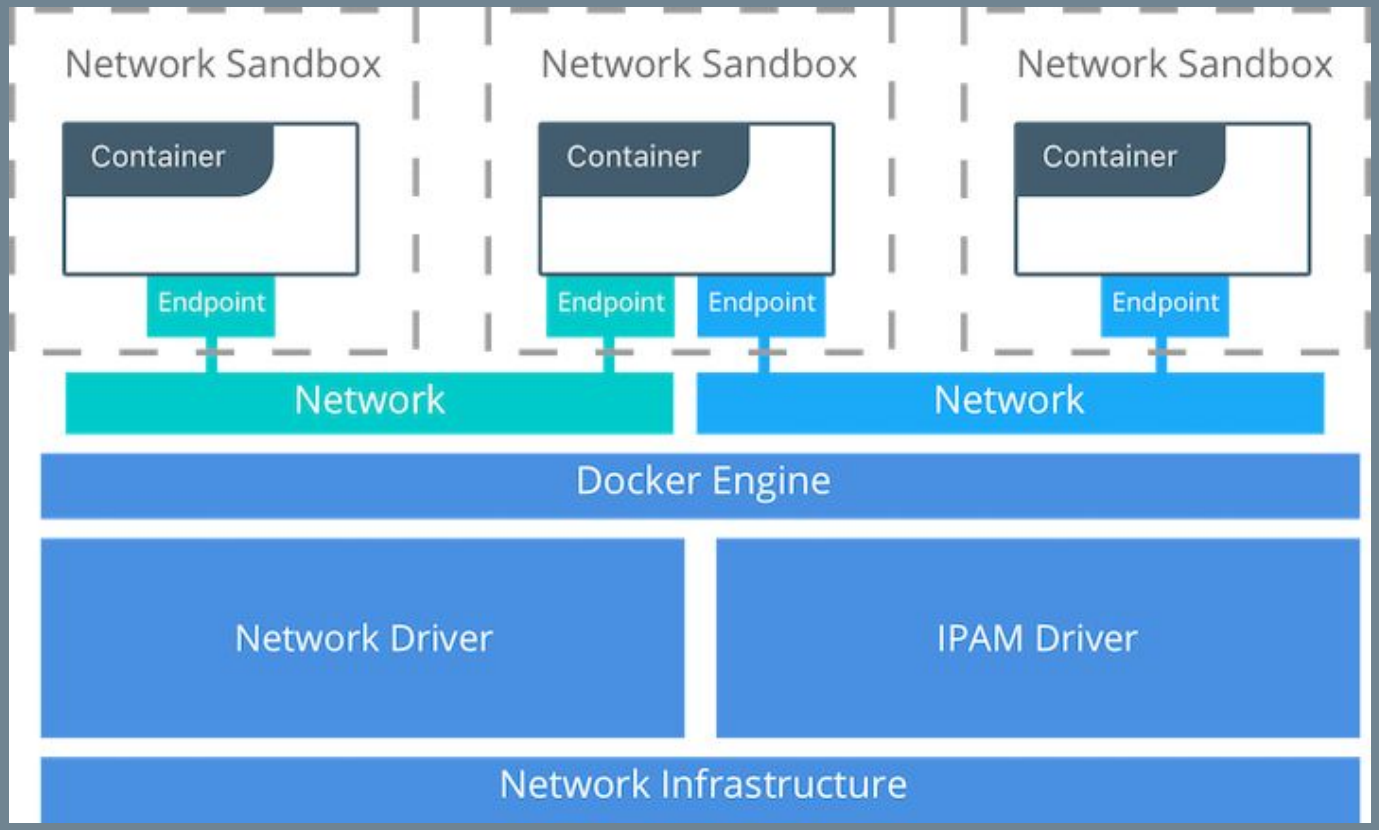
Docker Plug-In IPAM Drivers

- infoblox

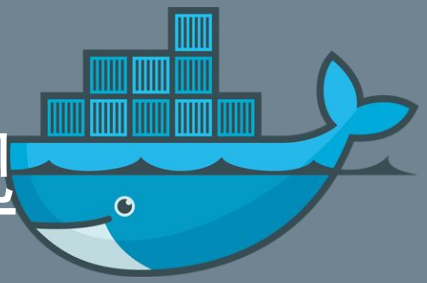
No more “link”, just use network.

Docker Reference Architecture: Designing Scalable, Portable Docker Container Networks

CNM vs CNI



[容器网络聚焦:CNM和CNI，原文](#)
[SDNLAB技术分享(十五):容器网络大观](#)



Exercise 1

$ docker network ls

$ ifconfig

$ docker run -ti --rm busybox sh

cat /etc/hosts, ifconfig

$ docker network inspect bridge

$ docker run -itd --name=container1 busybox
$ docker run -itd --name=container2 busybox
$ docker exec -ti container2 sh

ping -w3 172.17.0.2, ping container1

Exercise 2

$ docker network create vlan_1

$ docker network inspect vlan_1

$ ifconfig | more

$ docker run --network=vlan_1 -itd --name=container3 busybox

$ docker network inspect vlan_1

$ docker run --network=vlan_1 -itd --name=container4 busybox

$ docker exec -ti container4 sh

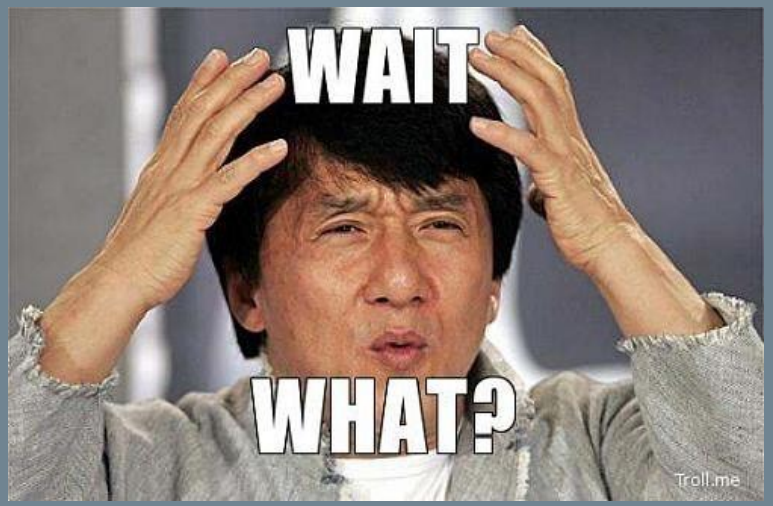
ping -w3 172.17.0.2, ping container1, ping container3

Exercise 3

```
$ docker network create wp_db

$ docker pull mysql:5.7

$ docker pull wordpress

$ docker run -d --name db --network=wp_db
        -e MYSQL_ROOT_PASSWORD=wordpress
        -e MYSQL_DATABASE=wordpress
        -e MYSQL_USER=wordpress
        -e MYSQL_PASSWORD=wordpress
        mysql:5.7

$ docker run -d --name wp -p 80:80 --network=wp_db
        -e WORDPRESS_DB_HOST=db:3306
        -e WORDPRESS_DB_PASSWORD=wordpress
        wordpress
```

Exercise 4

$ docker network create -d macvlan
    --subnet=10.0.0.0/24
    --gateway=10.0.0.1
    -o parent=eth0 mvnet



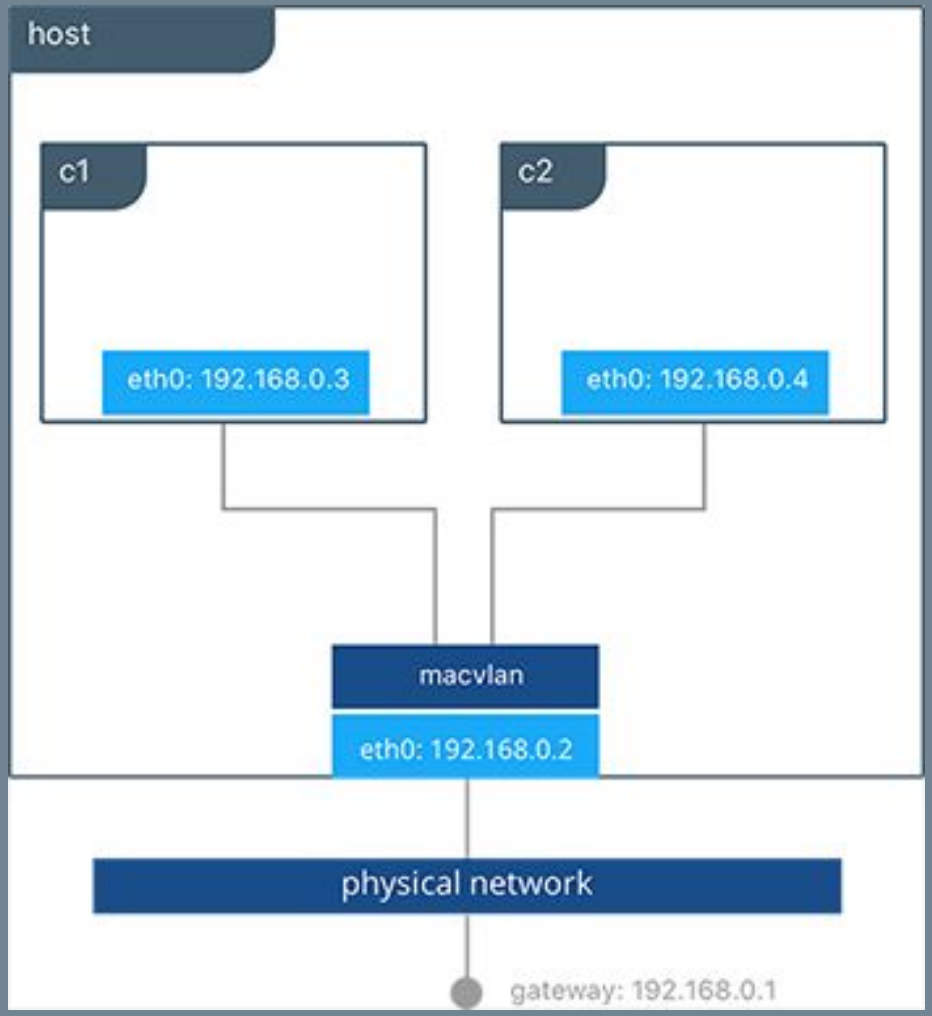
$ docker run -itd --name c1 --net mvnet --ip 10.0.0.5 busybox

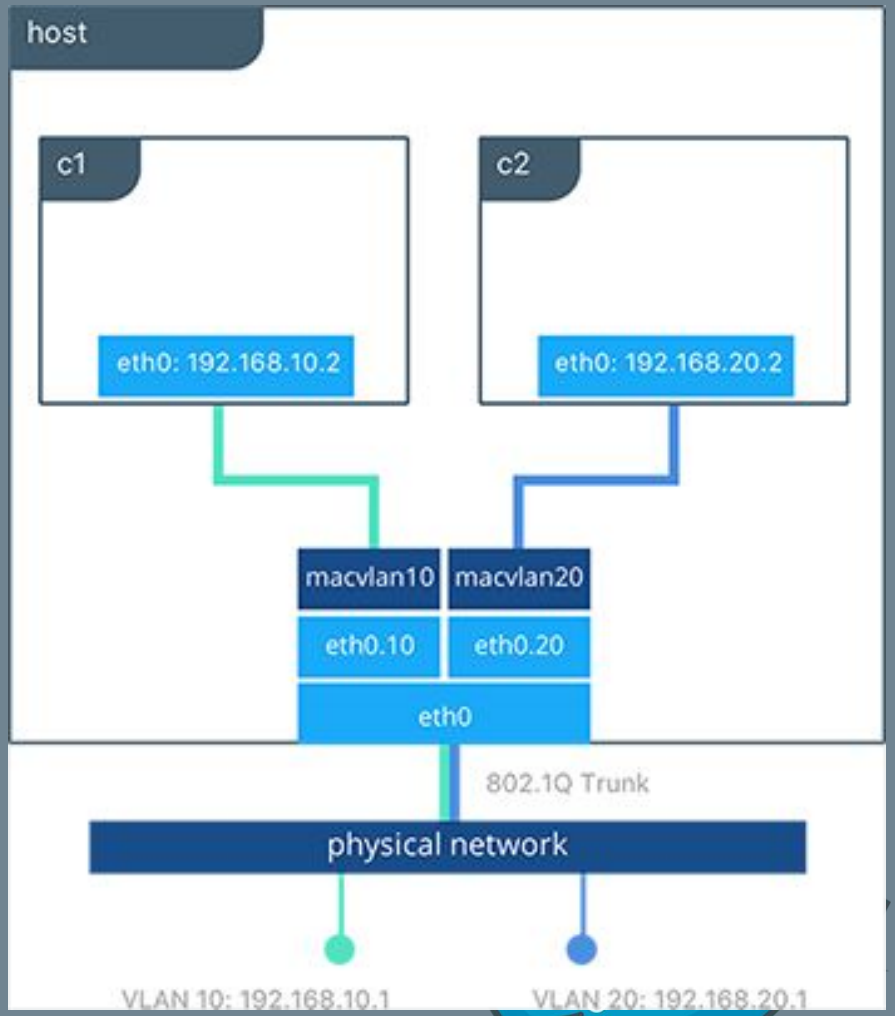
$ docker run -it --name c2 --net mvnet --ip 10.0.0.6 busybox sh

ping -c 4 10.0.0.5
ip a show eth0, ip route

Get started with Macvlan network driver

Macvlan Networking





SDN

Software Define Network

Dynamic Network Topology

- Telecom, Cloud service…
- Resource allocation
- Cost down

5. Docker Volume command-line

Shared data volume commands

Command	Description
volume create	Creates a new volume where containers can consume and store data
volume inspect	Display information about a volume
volume ls	Lists all the volumes Docker knows about
volume rm	Remove one or more volumes

Manage data in containers

Exercise

```
$ docker volume create \
    --name composewp_db_data

$ docker pull mysql:5.7

$ docker pull wordpress

$ docker run -d --name db --network=wp_db
      -e MYSQL_ROOT_PASSWORD=wordpress
      -e MYSQL_DATABASE=wordpress
      -e MYSQL_USER=wordpress
      -e MYSQL_PASSWORD=wordpress
      -v composewp_db_data:/var/lib/mysql
      mysql:5.7

$ docker run -d --name wp -p 80:80 --network=wp_db
      -e WORDPRESS_DB_HOST=db:3306
      -e WORDPRESS_DB_PASSWORD=wordpress
```

SDS

Software Define Storage

EMC: REX-Ray

Azure: File storage

AWS: Elastic File System

6. Docker Compose command-line

Install Docker Compose

sudo curl -L "https://github.com/docker/compose/releases/download/1.9.0/docker-compose-$(uname -s)-$(uname -m)" -o /usr/local/bin/docker-compose

and

sudo chmod +x /usr/local/bin/docker-compose

docker-compose -v

Docker Compose commands (1/2)

Commands:

build	Build or rebuild services
bundle	Generate a Docker bundle from the Compose file
config	Validate and view the compose file
create	Create services
down	Stop and remove containers, networks, images, and volumes
events	Receive real time events from containers
exec	Execute a command in a running container
help	Get help on a command
kill	Kill containers
logs	View output from containers
pause	Pause services
port	Print the public port for a port binding

Docker Compose commands (2/2)

Commands:

ps	List containers
pull	Pull service images
push	Push service images
restart	Restart services
rm	Remove stopped containers
run	Run a one-off command
scale	Set number of containers for a service
start	Start services
stop	Stop services
unpause	Unpause services
up	Create and start containers
version	Show the Docker-Compose version information

Compose File Reference

Run Multi-container at the same time.

Must be docker-compose.yml

Same folder, docker-compose up -d

Docker will build the Dockerfile of subfolders.

Docker Network, Volume supports

Swarm mode is not support yet.

Quickstart: Compose and WordPress

Compose File Sample (1/2)

```
version: '2'
services:
  db:
    image: mysql:5.7
    volumes:
      - db_data:/var/lib/mysql
    restart: always
    environment:
      MYSQL_ROOT_PASSWORD: wordpress
      MYSQL_DATABASE: wordpress
      MYSQL_USER: wordpress
      MYSQL_PASSWORD: wordpress
```

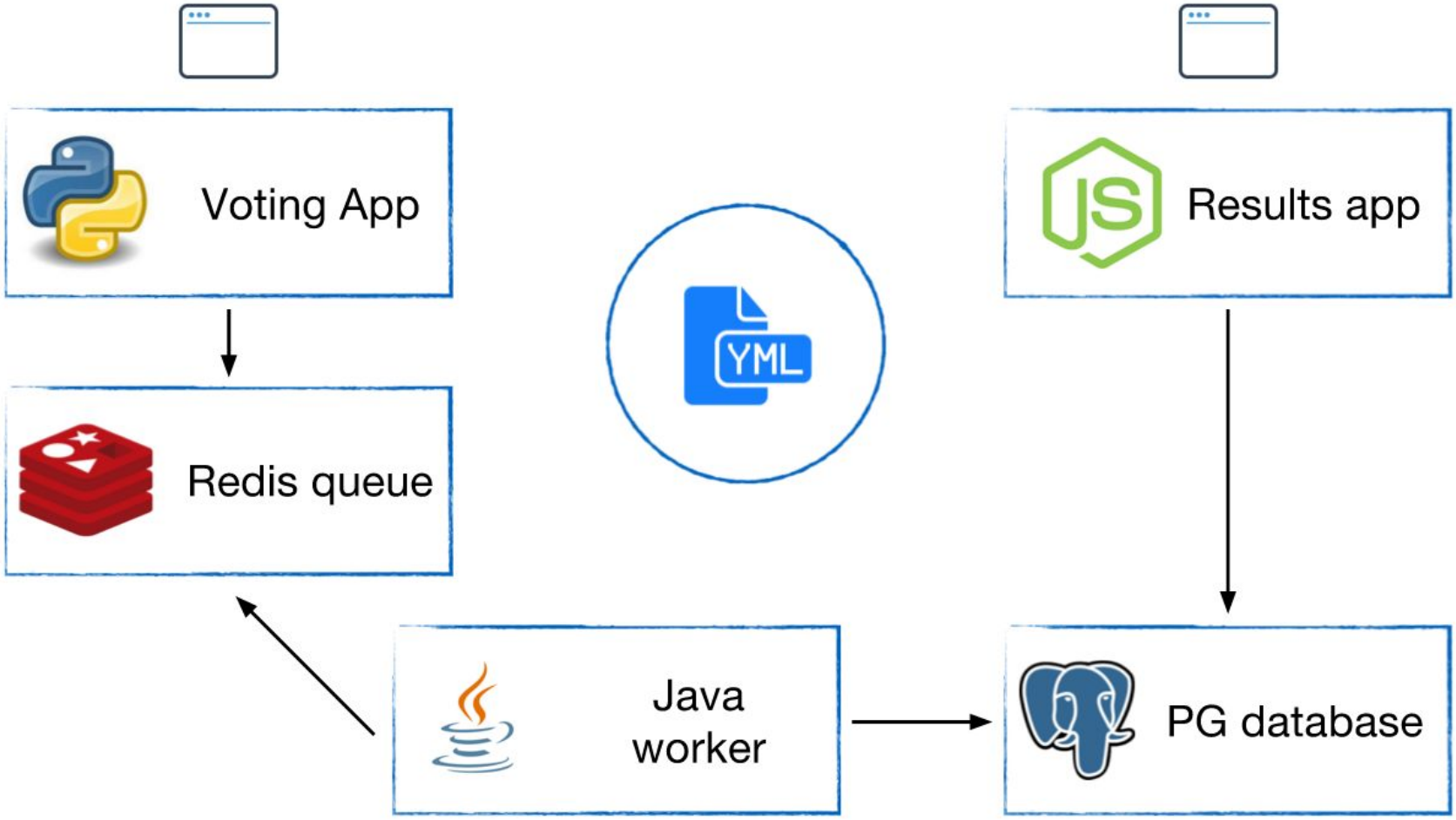
Compose File Sample (1/2)

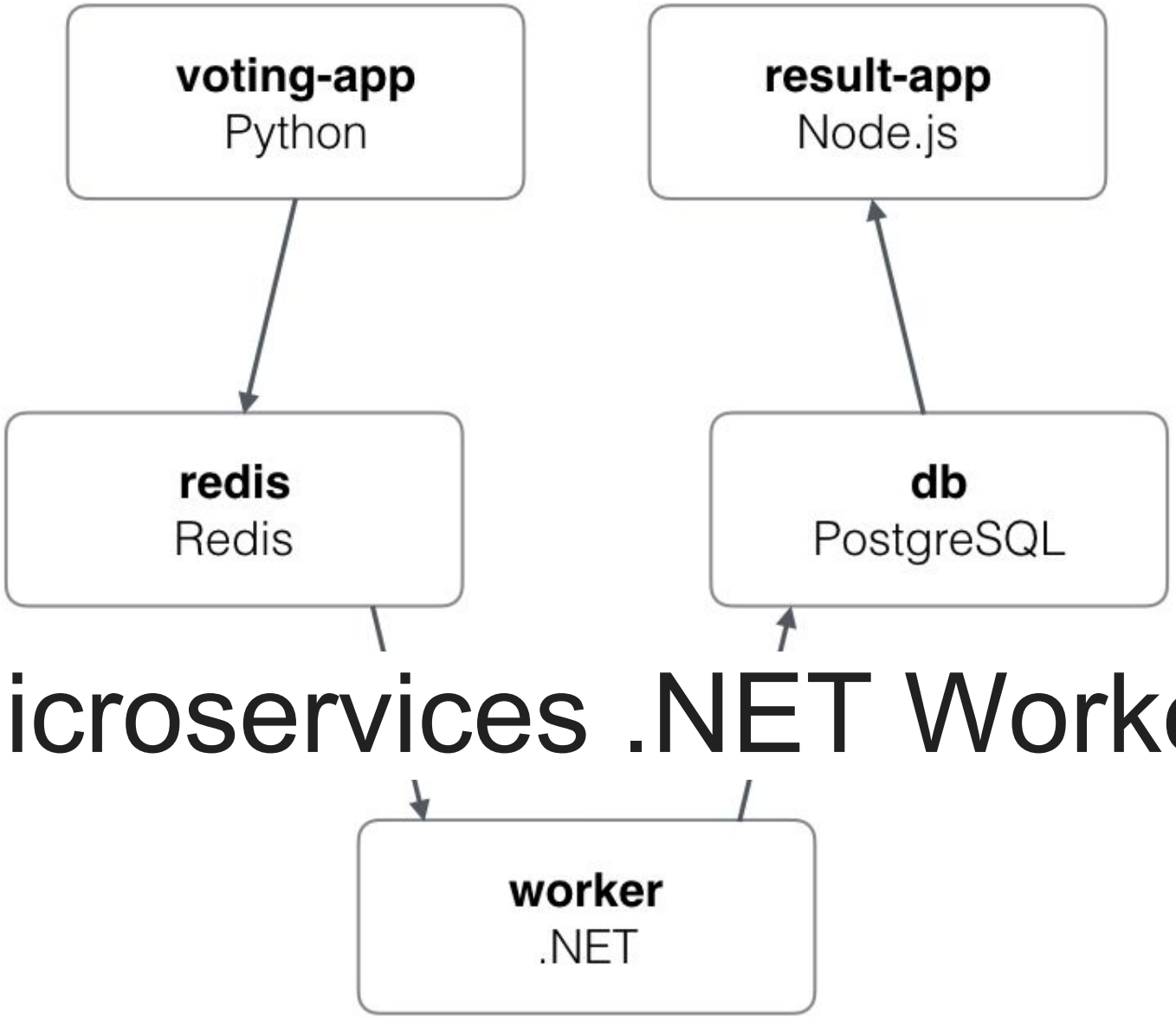
```
  wordpress:
    depends_on:
      - db
    image: wordpress:latest
    ports:
      - "8000:80"
    restart: always
    environment:
      WORDPRESS_DB_HOST: db:3306
      WORDPRESS_DB_PASSWORD: wordpress
volumes:
  db_data:
```

7. Using Docker Compose

Microservices Java Worker

Docker Birthday #3 training





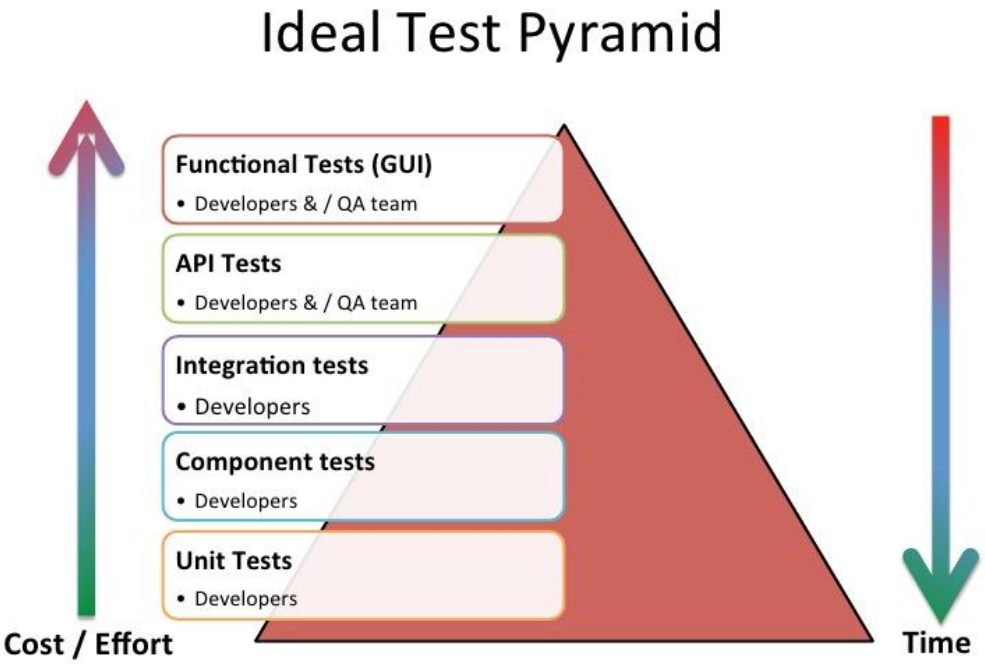
Microservices .NET Worker

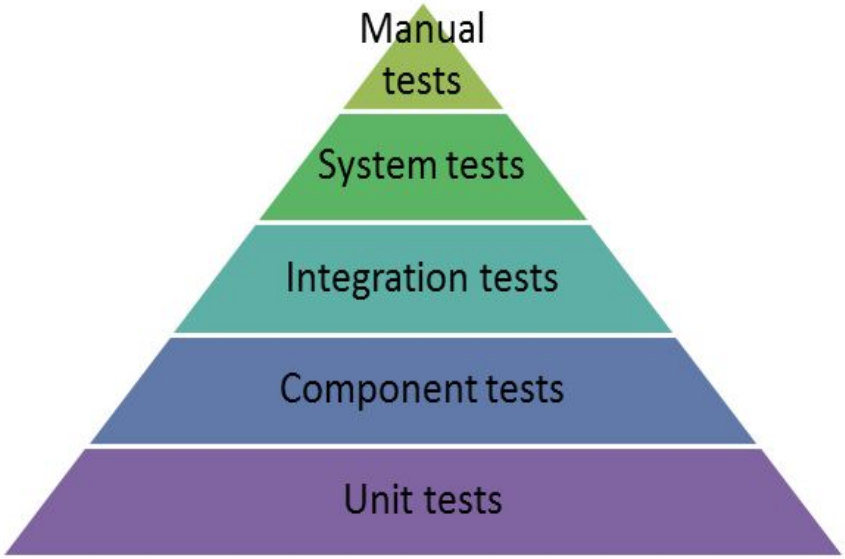
Docker Birthday #3 training

Docker Compose & CI/CD

~~Github~~, ~~CircleCI~~, ~~Docker Hub~~ = GitLab

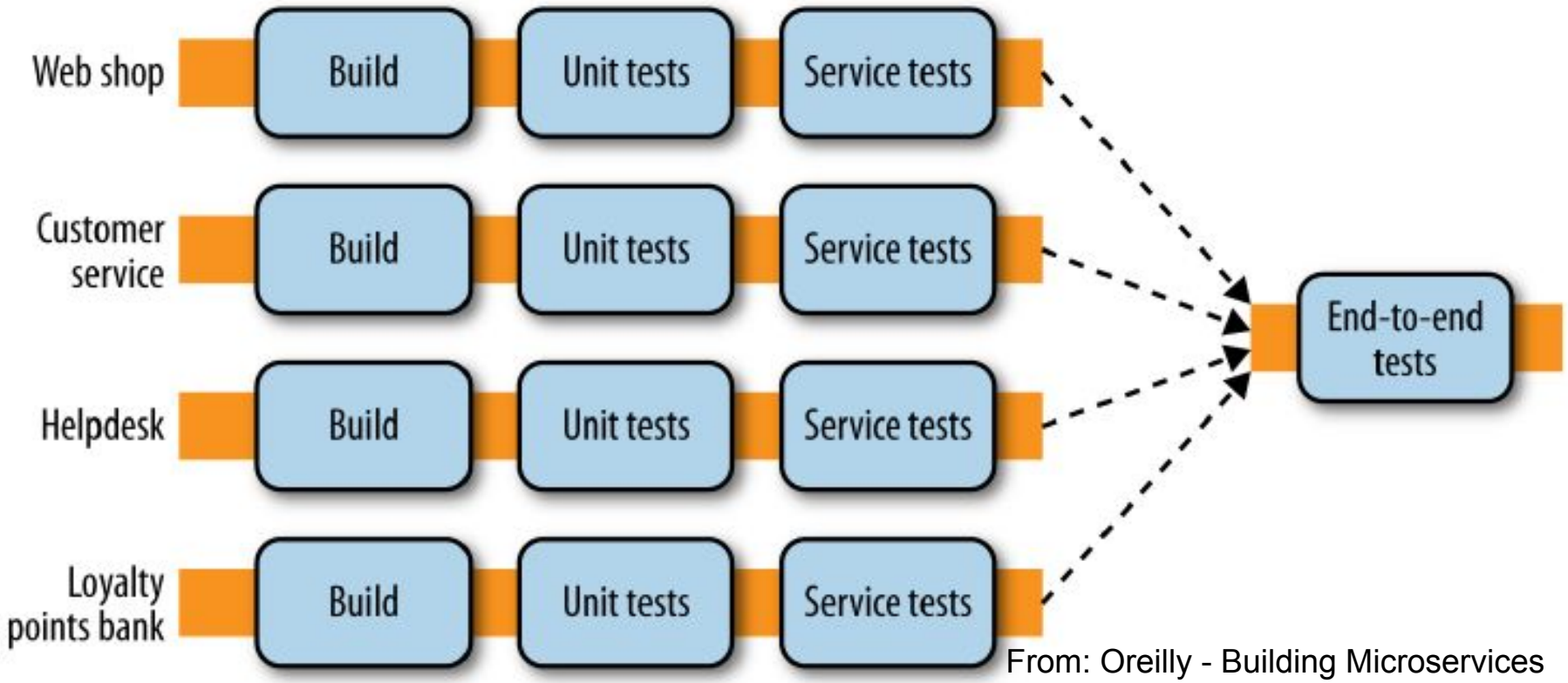
Testing level? Coding effort? Env. build-up





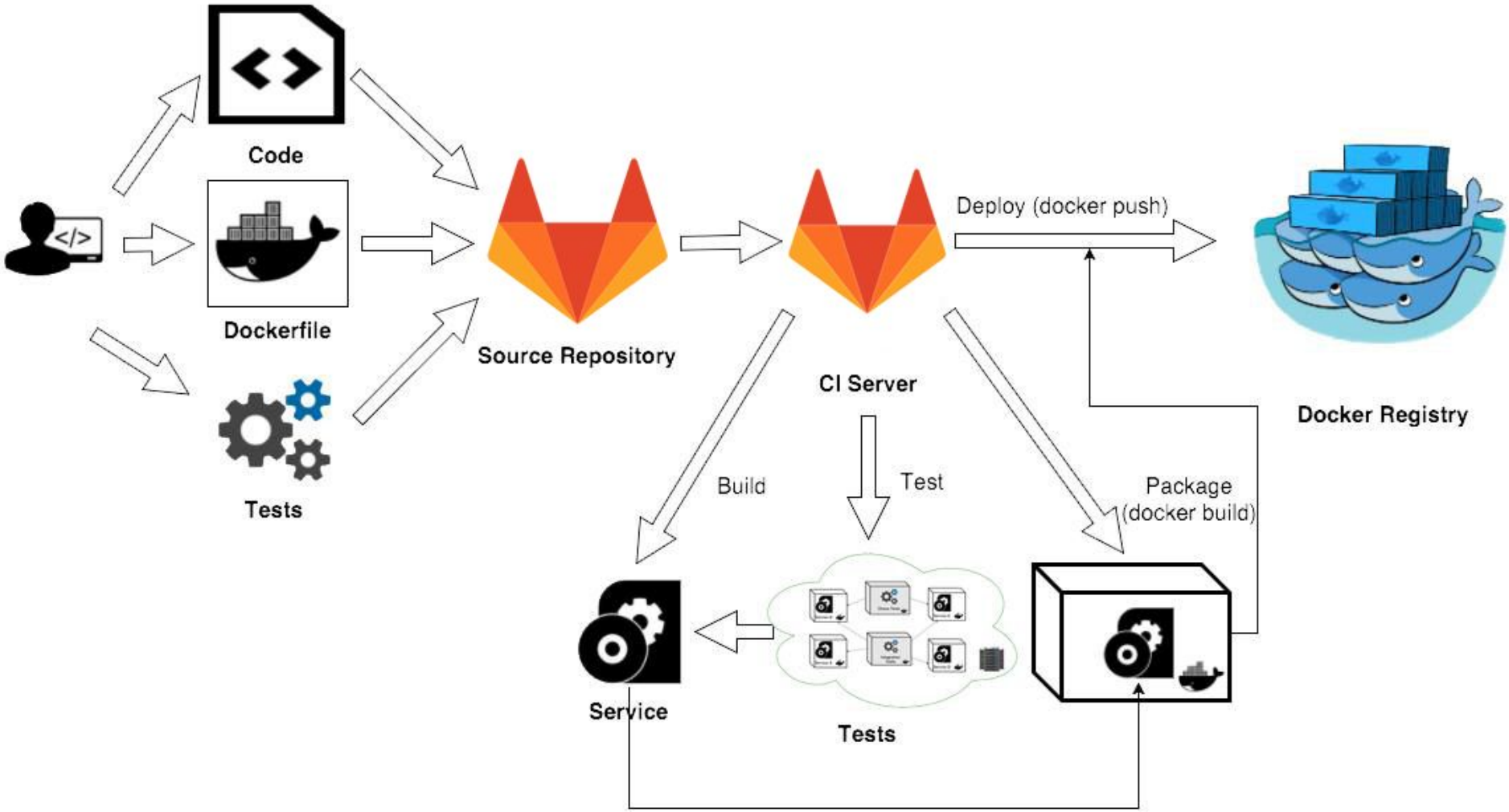
End to End Tests

CI with Docker Compose is easy to implement.



From: Oreilly - Building Microservices

Container Development Flow



From: [Testing Strategies for Docker Containers]

philipz / docker-compose-example

This project Search

Project Activity Repository Pipelines Registry Graphs Issues 0 Merge Requests 0 Wiki Snippets

```
Status: Downloaded newer image for philipz/gitlab-docker-compose:latest
$ docker-compose up -d
Creating network "dockercomposeexample_default" with the default driver
Pulling redis (redis:alpine)...
alpine: Pulling from library/redis
Digest: sha256:99105b7a83dd67a0b4a86ca5f64335801c62d4f3b685eebd4fb66fdb87c66b7b
Status: Downloaded newer image for redis:alpine
Pulling db (postgres:9.4)...
9.4: Pulling from library/postgres
Digest: sha256:9149f6309b83c9b99ae2e1ecab3e14a9662a1a8d0159320c24e34827ffe4c930
Status: Downloaded newer image for postgres:9.4
Pulling worker (philipz/votingapp_worker:latest)...
latest: Pulling from philipz/votingapp_worker
Digest: sha256:beb71b89b4b95eaca33b4ac77f1e20c0a924ab2c4d59b525d9019ba20c169707
Status: Downloaded newer image for philipz/votingapp_worker:latest
Pulling result (philipz/votingapp_result:latest)...
latest: Pulling from philipz/votingapp_result
Digest: sha256:7b89d4589099b171ad2feb96afadbdbd11b0ff9a093b1594994f3648de2fa5a8
Status: Downloaded newer image for philipz/votingapp_result:latest
Creating dockercomposeexample_redis_1
Creating dockercomposeexample_db_1
Creating dockercomposeexample_result_1
Creating dockercomposeexample_vote_1
Creating dockercomposeexample_worker_1
$ cd tests && docker build -t philipz/node-test .
Sending build context to Docker daemon 4.096 kB


Step 1 : FROM node
latest: Pulling from library/node
6a5a5368e0c2: Already exists
7b9457ec39de: Pulling fs layer
ff18e19c2db4: Pulling fs layer
```

Build details

Duration: 7 minutes 9 seconds

Finished: a month ago

Runner: #21099

Raw Erase

Commit title

Remove port mapping.

build

test

Dashboard → Set Up Create Detailed Event Template

YOUR ZAP IS ON

gitlab_cal

Add a note

TRIGGER

1. Catch Hook

ACTION

2. Create Detailed Event

- Google Calendar
- Create Detailed Event
- Google Calendar Account #1
- Edit Template
- Test this Step
- Rename Step
- Delete

Get Help Response Time: ~2h | M-F 9am-5pm PST

Set up Google Calendar Detailed Event

Calendar (required)

Note: You must be able to edit the selected calendar from the Google Calendar account you connected.

GitLab

Summary (optional)

Summary of the new event

Step 1 Project Name | Step 1 Object Kind

Description (optional)

Description of the new event

Step 1 Commit Author Name | Step 1 Commit Author Email

Project: Step 1 Project Path With Namespace

Branch: Step 1 Project Default Branch

Step 1 Commit Message

Step 1 Object Attributes Url

Google 日曆 - 2016年10

https://calendar.google.com/cal

應用程式 Plex It! DL Shields 其他書籤

Google 搜尋日曆

日曆 今天 2016年10月3日 – 9日 天 週 月 4 天 待辦事項 更多

建立

2016年10月

一	二	三	四	五	六	日
26	27	28	29	30	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	1	2	3	4	5	6

我的日曆
- Philip Zheng
- 生日
- 提醒
- GitLab

其他日曆
- 新增朋友的日曆
- 天氣
- 台灣的節慶假日
- 台灣的節慶假日
- 程式交易機器人交易...
- OptionsBot SMS
- TradingBot SMS
- 台北市法拍屋行事曆
- 新北市法拍屋行事曆

條款 - 隱私設定

10/3 (週一) 10/4 (週二) 10/5 (週三) 10/6 (週四) 10/7 (週五) 10/8 (週六) 10/9 (週日)

重陽節
重陽節

GMT+08

上午6點 上午7點 上午8點 上午9點 上午10點 上午11點 下午12點 下午1點 下午2點 下午3點 下午4點

10:5

maven-java-example issue

時間

10月 5日 (週三), 上午10:54

日曆 GitLab

建立者 philipzheng@gmail.com

複製到我的日曆 刪除 編輯活動

ThoughtWorks Tech. Radar

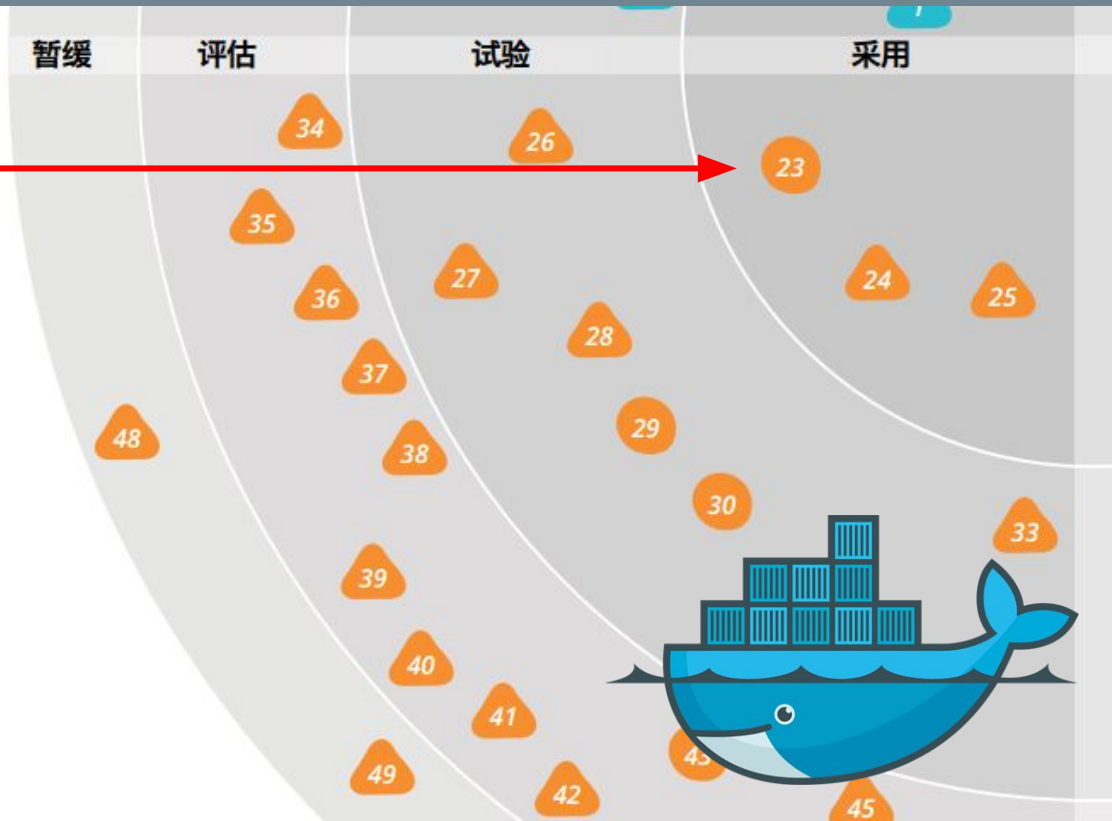
"Docker as process, PaaS as machine, microservices architecture as programming model"

平台

采用
23. Docker
24. HSTS
25. Linux security modules

试验
26. Apache Mesos
27. Auth0 new
28. AWS Lambda
29. Kubernetes
30. Pivotal Cloud Foundry
31. Rancher
32. Realm
33. Unity beyond gaming new

评估
34. .NET Core
35. Amazon API □□
36. Apache Flink
37. AWS Application Load Balancer new
38. Cassandra carefully new
39. Electron new
40. Ethereum new
41. HoloLens new



Tomorrow Topics

1. Docker Machine introduction & CLI
2. Docker Machine to create cloud VM
3. Docker Swarm introduction & CLI
4. Machine and Swarm Cluster
5. Docker Swarm networking
6. Docker Swarm playground & Swarm service
7. The future of cloud computing and cloud service scope.

See You Next Week