
docker
docker

Containers, Docker, and Microservices

Jérôme Petazzoni (@jpetazzo)

- Grumpy French DevOps
  - Go away or I will replace you with a very small shell script
- Runs everything in containers
  - Docker-in-Docker
  - VPN-in-Docker
  - KVM-in-Docker
  - Xorg-in-Docker
  - …

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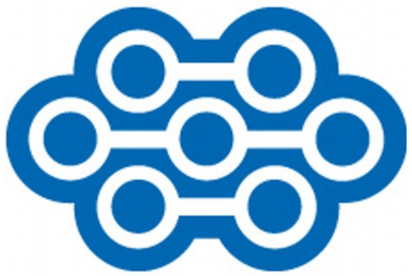
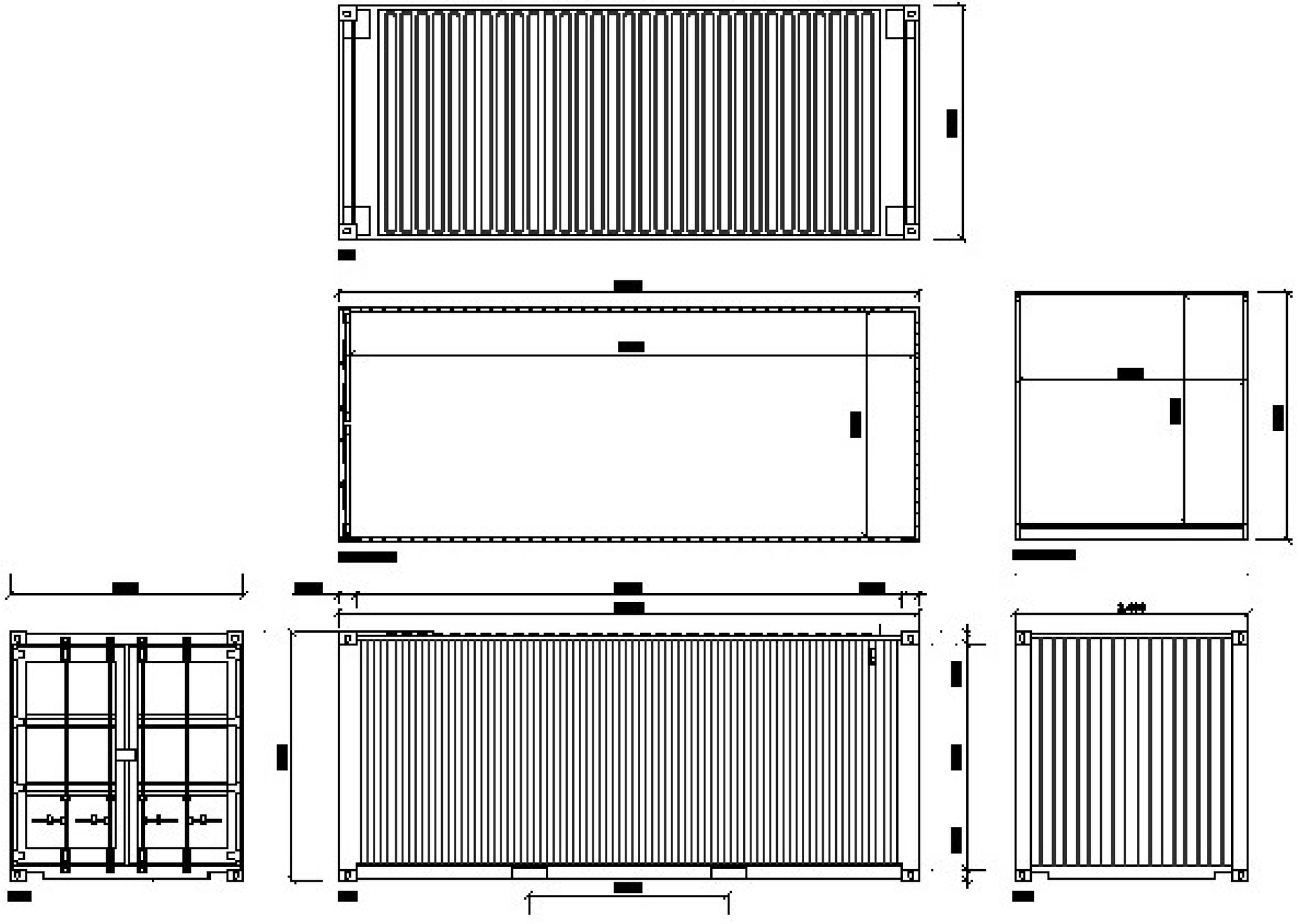
- Built and scaled dotCloud
- PAAS with 106 services (I counted them!)
  - some examples: hosts, nats, containers, builds, snapshots, metrics, billing, user permissions, infrastructure management, logs, ...





outline

Outline

- Why microservices?
- What's the challenge?
- How does Docker help?
- Getting started with stacks of containers

why microservices

What is a microservice architecture?

- Break big application down into many small services
- Example: e-commerce
  - web front-end
  - catalog of products
  - inventory/stock management
  - shipping calculator
  - payment processor
  - billing/invoicing
  - recommendation engine
  - user profiles

Why is this useful?

- Use different stacks for different services
  (can be seen as both good and bad!)
- Replace (e.g. refactor) individual services easily
  (service boundary enforces API separation)
- Decouples deployment; requires less coordination
  (deploy early, deploy often; more agility)
- Helps implementing Jeff Bezos' “two-pizza rule”
  (many small teams overperform a single big team)
- More effective “ownership” of services

what's the challenge?

Complexity of deploying and operating a distributed system

http://highscalability.com/blog/2014/4/8/microservices-not-a-free-lunch.html

You need a lot of automation

Issues we will *not* address today

- Fast, efficient RPC calls
  - ZeroRPC
  - Cap'n Proto
  - XMLRPC
  - SOAP
  - Dnode
  - REST
  - Queues (like AMQP), for long-running/async operations

Issues we will *not* address today

- How to break application down in small parts
  - this is not always easy
  - try to get help from people who have already done it
  - but: it helps to achieve a better architecture (I promise)

Issues we *could* address today

- Our app is now spread across multiple services
- Those services might (will) end up on many machines
- Some of those services might (will) be scaled out
- Consequences:
  - our services will have to discover each other's location
  - we will have to learn about load balancing

Issues we *will* address today

- We're deploying 42 microservices instead of 1 app
- We want to be able to deploy often
- Obvious consequence: our deploy process must *rock*
  - it must be fast
  - it must be reliable
  - it must be automated

how does Docker help?

the big picture

Docker's mission

- *build, ship, and run any application, anywhere*

Say again?

- Build: package your application in a container
- Ship: move that container from a machine to another
- Run: execute that container (i.e. your application)
- Any application: anything that runs on Linux
- Anywhere: local VM, cloud instance, bare metal...

build

Dockerfile

```
FROM ubuntu:14.04
MAINTAINER Docker Team <education@docker.com>

RUN apt-get update
RUN apt-get install -y nginx
RUN echo 'Hi, I am in your container' \
    >/usr/share/nginx/html/index.html

CMD [ "nginx", "-g", "daemon off;" ]

EXPOSE 80
```

```
root@dockerhost:~#
```

ship

Docker Hub

- Image name should be <username>/<reponame>
  e.g.: jpetazzo/web
- docker push
- docker pull

```
root@dockerhost:~#
```

Docker Hub

- Image name should be <username>/<reponame> e.g.: jpetazzo/web
- docker push
- docker pull
- It's magic!

run

Execution is *fast* and *lightweight*

- Let's look at a few benchmarks

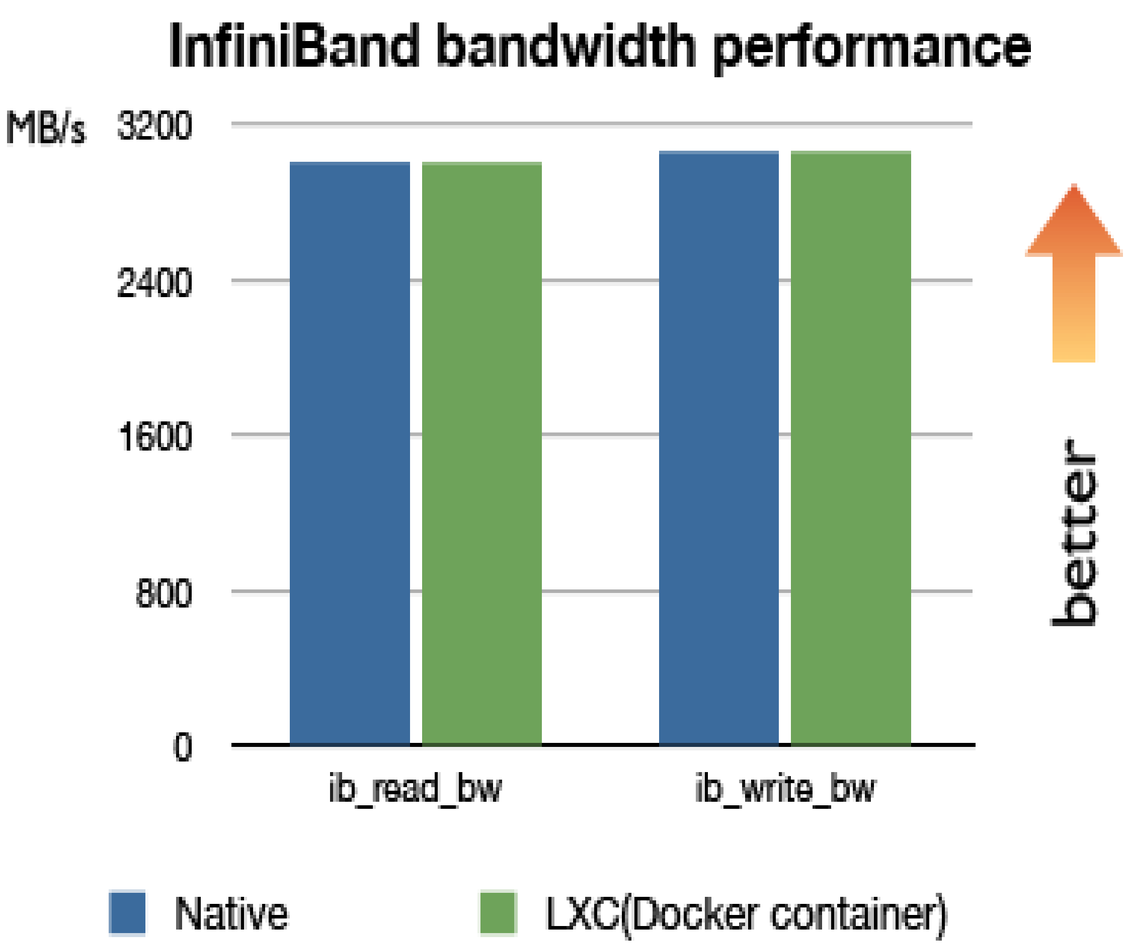
Benchmark: container creation

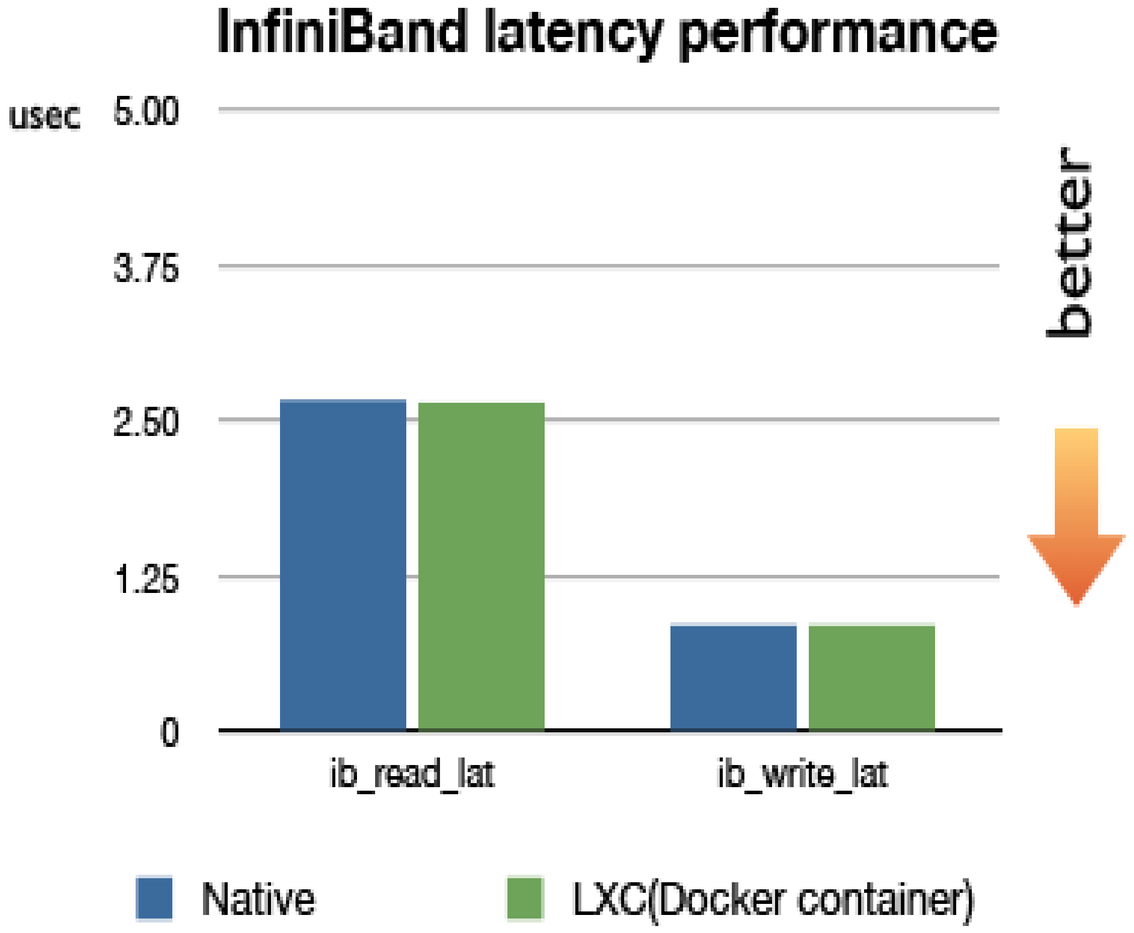
```
$ time docker run ubuntu echo hello world
hello world
real 0m0.258s
```

Disk usage: less than 100 kB

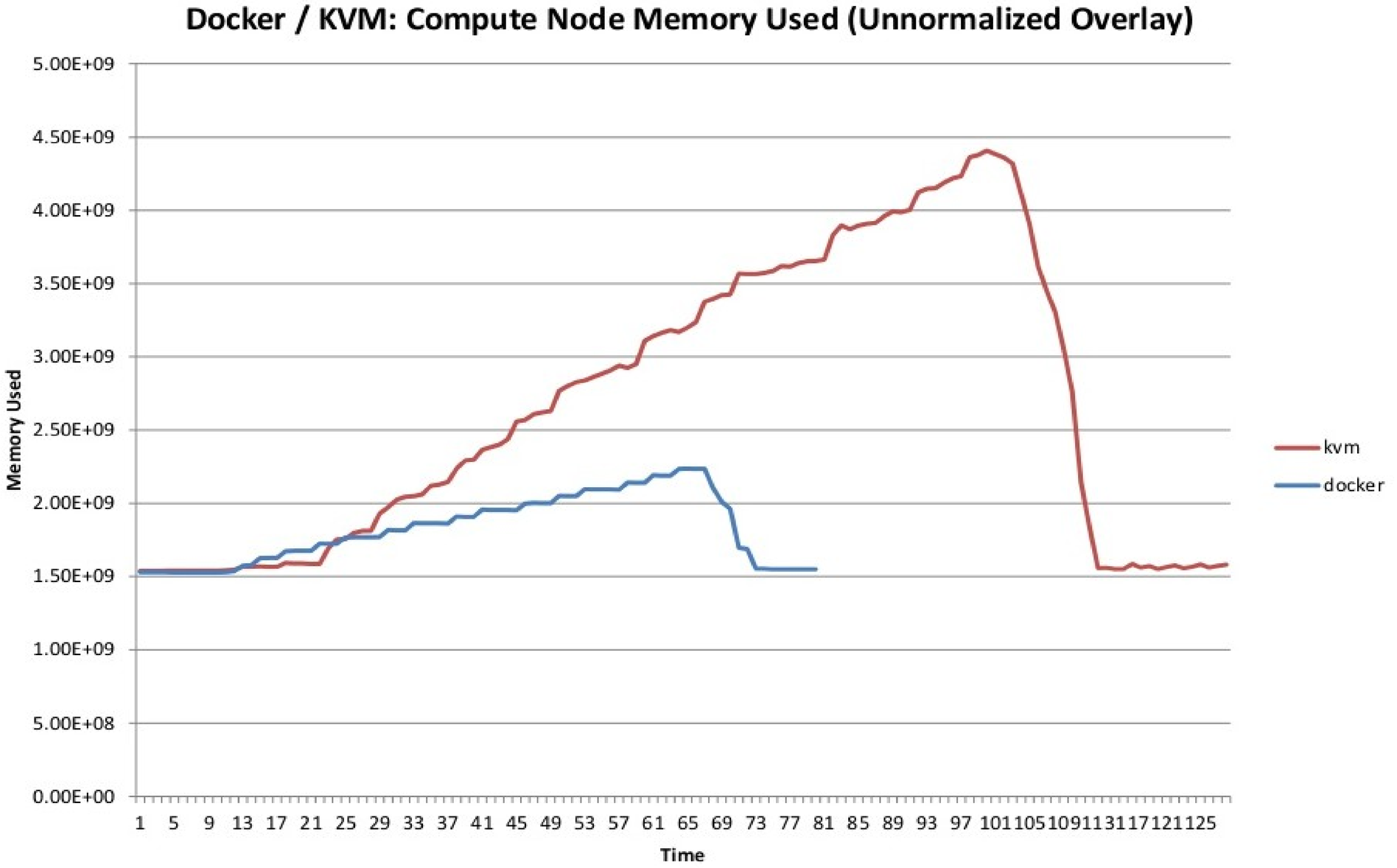
Memory usage: less than 1.5 MB

Benchmark: infiniband

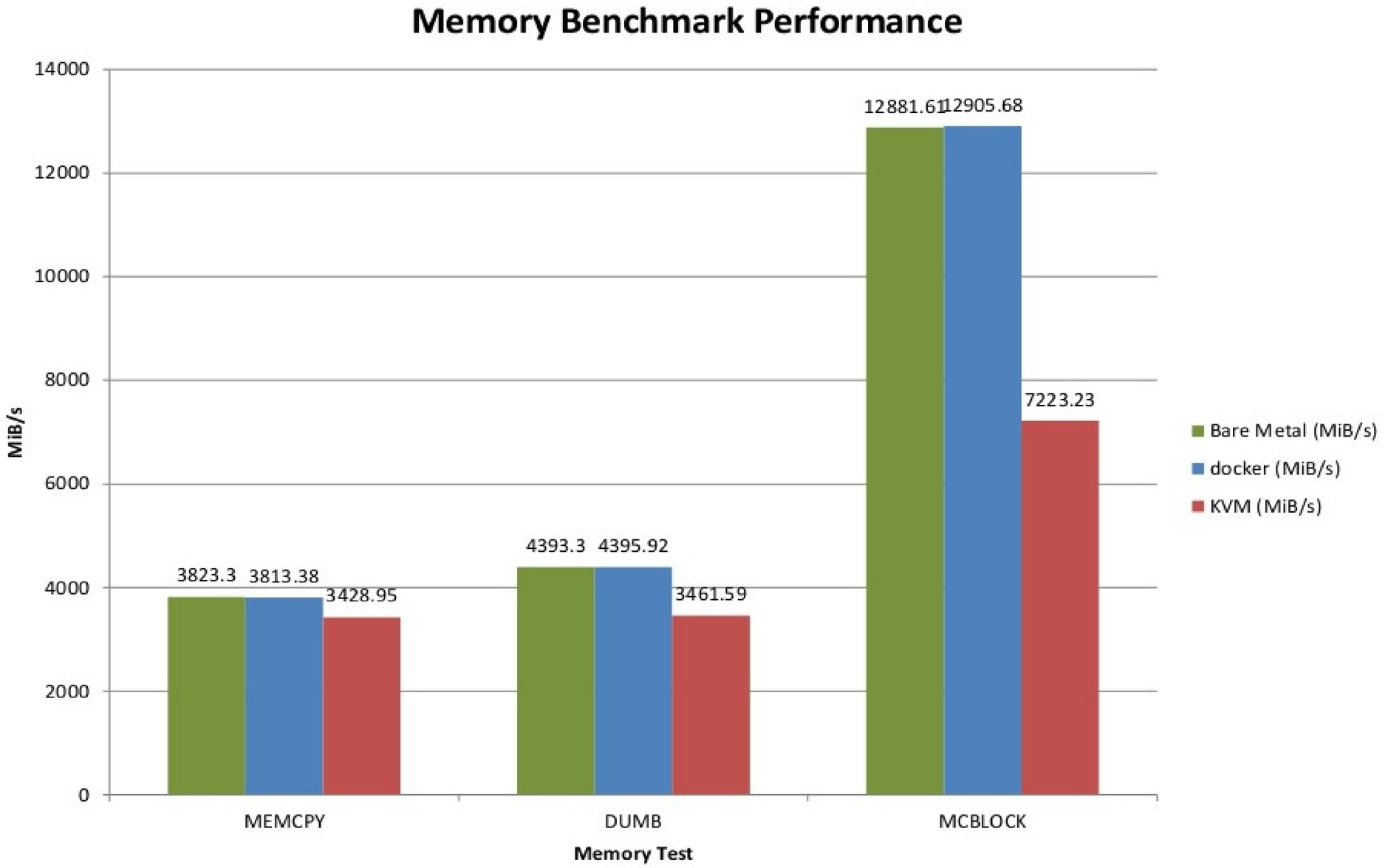




Benchmark: boot OpenStack instances



Benchmark: memory speed




HAMBURG SÜD

Let's start a few containers

- Just for run. Eh, for fun.

```
root@dockerhost:~#
```

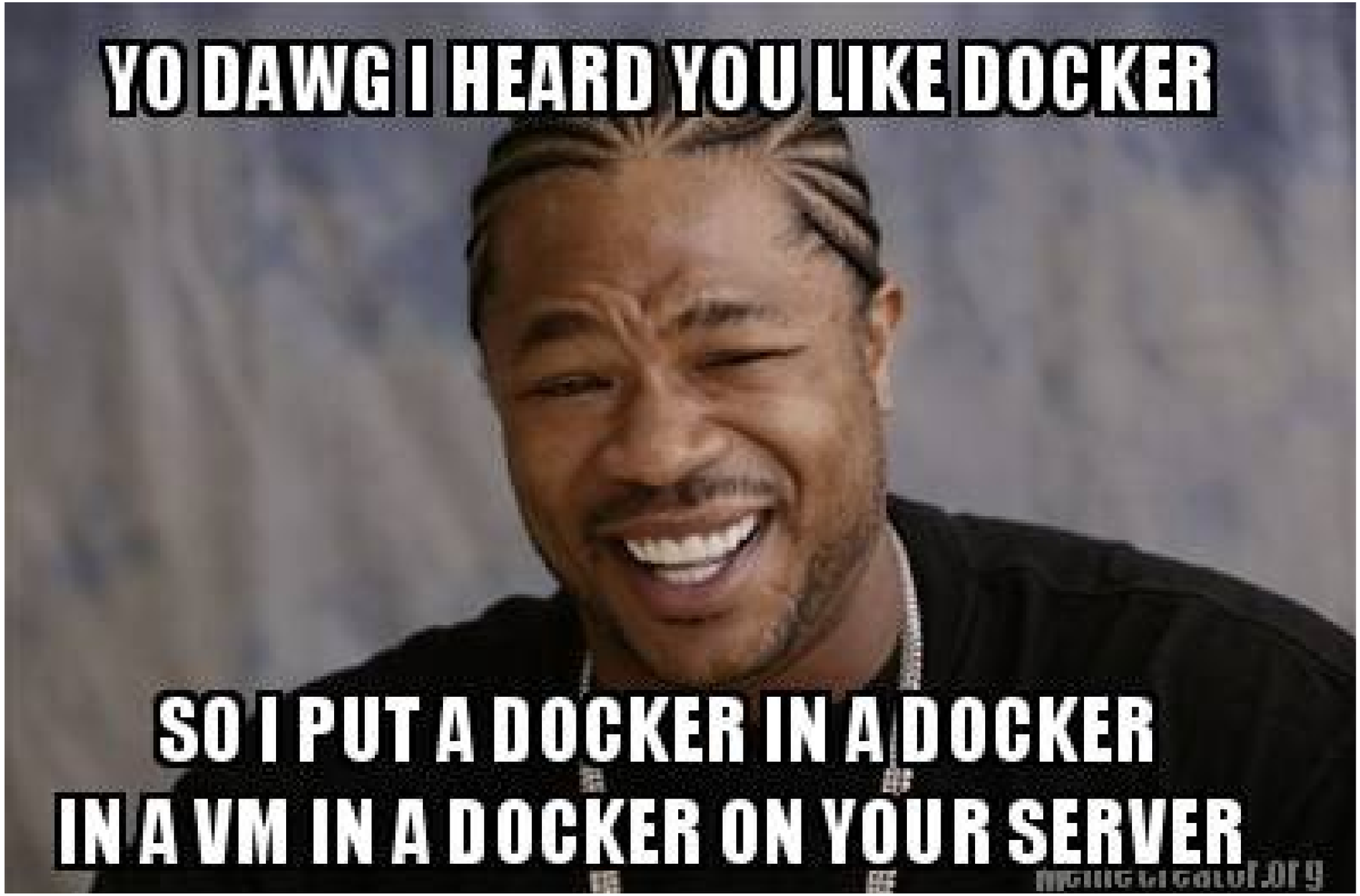
any app

If it runs on Linux, it will run in Docker

- Web apps
- API backends
- Databases (SQL, NoSQL)
- Big data
- Message queues
- And more

If it runs on Linux, it will run in Docker

- Firefox-in-Docker
- Xorg-in-Docker
- VPN-in-Docker
- Firewall-in-Docker
- Docker-in-Docker
- KVM-in-Docker


YO DAWG I HEARD YOU LIKE DOCKER
SO I PUT A DOCKER IN A DOCKER
IN A VM IN A DOCKER ON YOUR SERVER

anywhere

anywhere*

**Limitations may apply.*

Docker has official support for:

- Intel 64 bits (x86_64) code
- Recent kernels (3.8 and above)
- Coming soon: Windows Containers
  (If you have questions about this, ask Microsoft!)

“Rumors” say that people also run on:

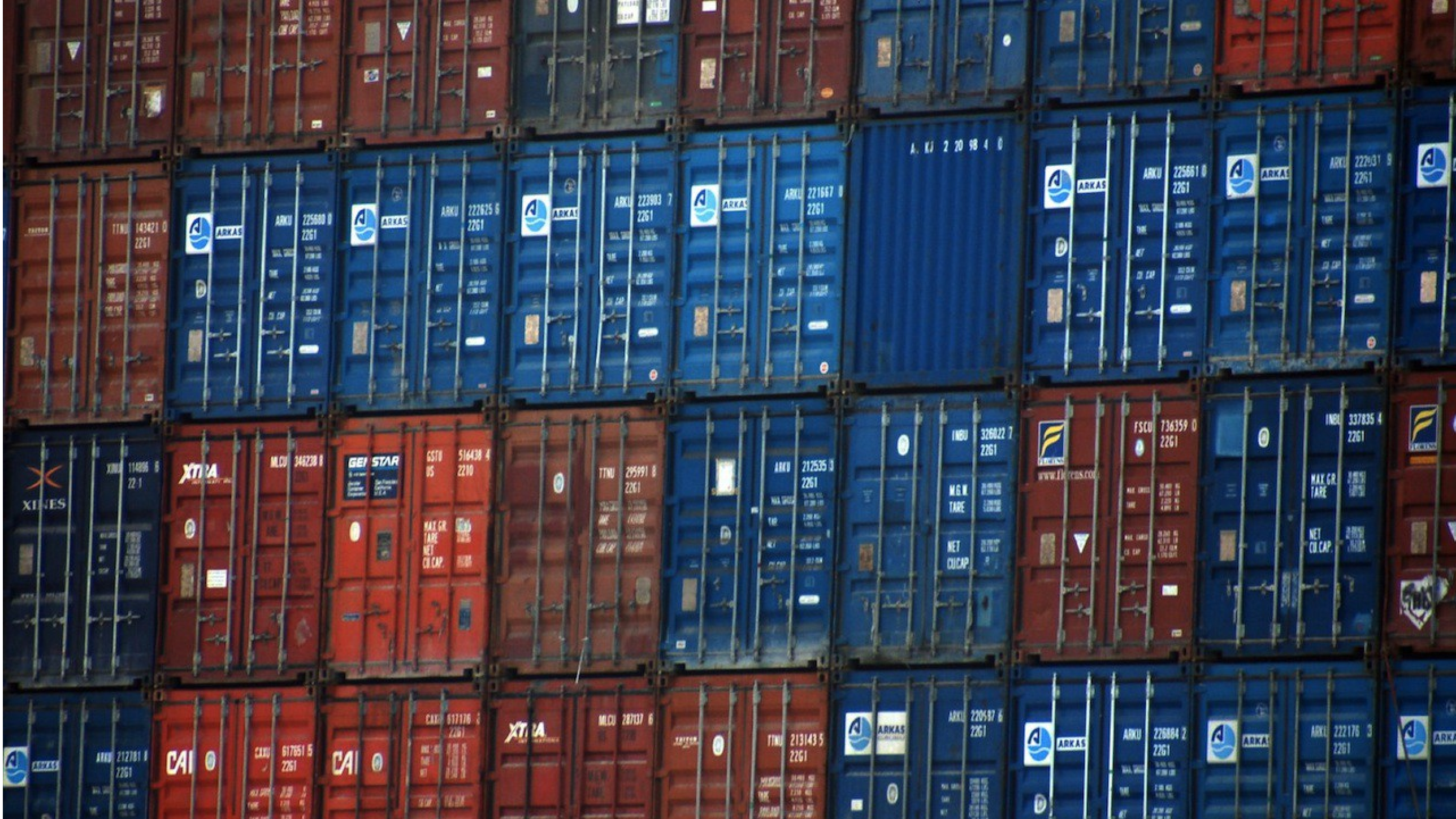
- Intel 32 bits
- ARM 32 and 64 bits
- MIPS
- Power8
- Older kernels (please don't)

Note: the main issue is that the Docker Hub registry is not arch-aware, and images are not compatible.

CONTAINERS

They're stable, they said. Stack them, they said.

running stacks of containers


ARKAS
XTRA
GESTAR
MAX GR.
TARE
NET
CU.CAP.

First steps

- Online tutorial (in browser, JS based, zero install)
  http://www.docker.com/tryit/
- boot2docker (25 MB universal VM image)
  http://boot2docker.io/
- Scary install script
  curl -sSL https://get.docker.com/ | sh
- We have ordinary packages too!
- And most clouds have Docker images

Checklist

- Install boot2docker
- Run your first container (echo hello world)
- Write your first Dockerfile
- Create your Docker Hub account (free)
- Push image to Docker Hub
- Setup automated build
- Run your first complex app with Fig

Fig

Fig

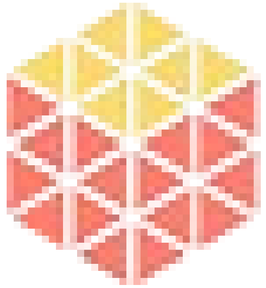
- Run your stack with *one* command: `fig up`
- Describe your stack with *one* file: `fig.yml`
- Example: run a (one node) Mesos cluster
  - Mesos master
  - Mesos slave
  - Volt framework

```
master:
  image: redjack/mesos-master
  command: mesos-master --work_dir=/mesos
  ports:
    - 5050:5050

slave:
  image: redjack/mesos-slave
  links:
    - master:master
  command: mesos-slave --master=master:5050 --containerizers=docker,mesos
  volumes:
    - /sys/fs/cgroup:/sys/fs/cgroup
    - /var/run/docker.sock:/var/run/docker.sock
    - /usr/bin/docker:/bin/docker

volt:
  image: volt/volt
  links:
    - master:master
  command: --master=master:5050
  ports:
    - 8080:8080
```

```
root@dockerhost:~#
```

Fig

MESOS



Volt

?

what's next?


TT 095
PSA

Advanced topics

- All Things Docker
  http://blog.docker.com/
- Running your own private registry
  https://github.com/docker/docker-registry
- Containers and security
  http://www.slideshare.net/jpetazzo/docker-linux-containers-lxc-and-security
  https://medium.com/@ewindisch/on-the-security-of-containers-2c60ffe25a9e
- Service discovery
  (look for “ambassador pattern”)
- … And more!

thank you!

questions?

Would You Like To Know More?

- Get in touch on Freenode
  #docker #docker-dev
- Ask me tricky questions
  jerome@docker.com
- Get your own Docker Hub on prem
  sales@docker.com
- Follow us on Twitter
  @docker, @jpetazzo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