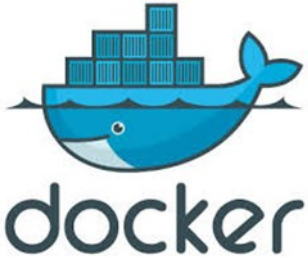
Empowered by Innovation NEC

Docker Containers



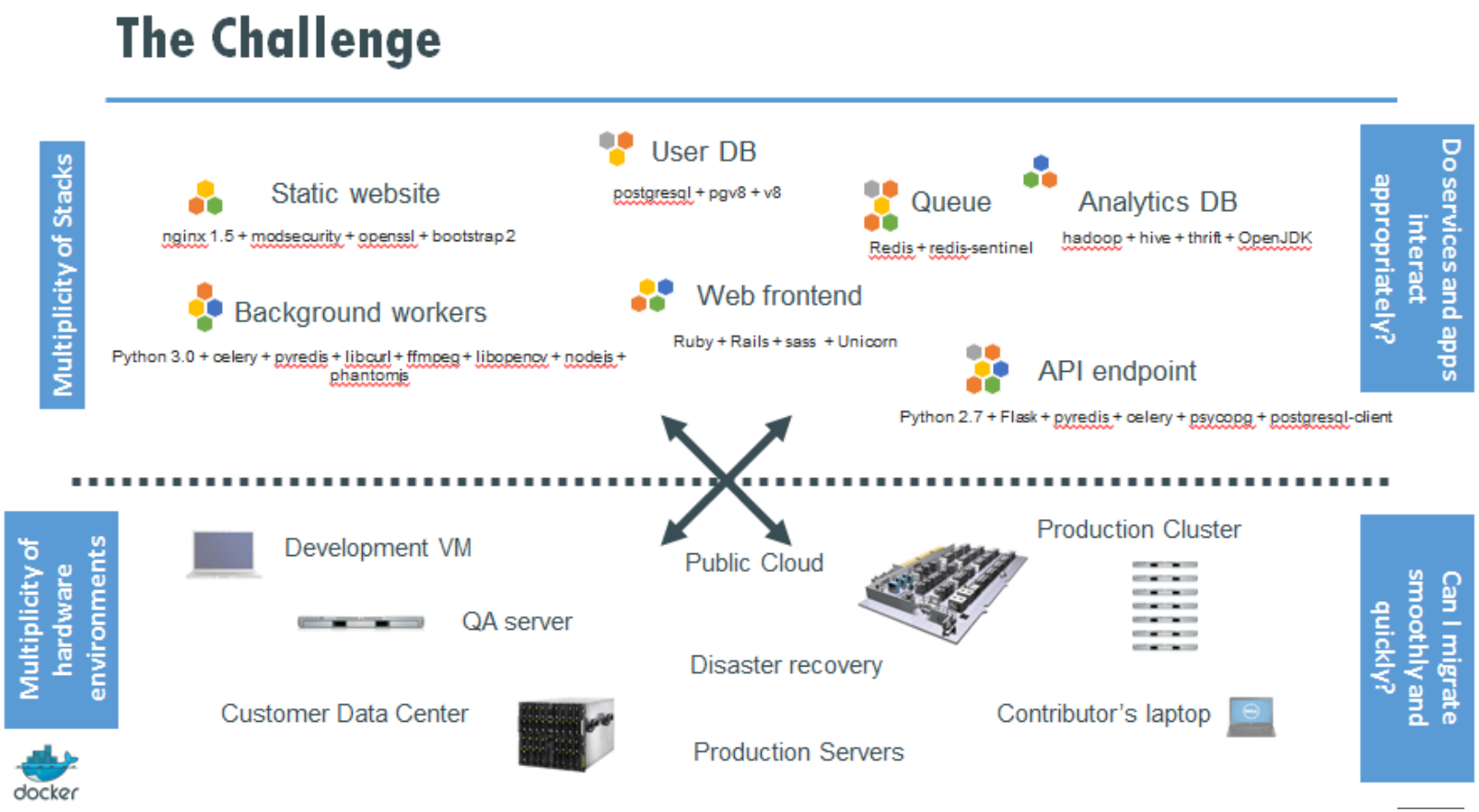
An Introduction

(Khelender Sasan)

Agenda

- Background
  - Software Industry Challenges
  - VM versus Containers
- Docker Technology
  - Introduction
  - Docker Architecture
- Technology usage demonstration
- Updates
- References

Challenge of Software Industry



Source: http://www.slideshare.net/Docker/dockerintronovember-131125185628phpapp02-37588934

Dependency Hell (libraries / packages / ....)

	Development VM	QA Server	Single Prod Server	Onsite Cluster	Public Cloud	Contributor's laptop	Customer Servers
Static website	?	?	?	?	?	?	?
Web frontend	?	?	?	?	?	?	?
Background workers	?	?	?	?	?	?	?
User DB	?	?	?	?	?	?	?
Analytics DB	?	?	?	?	?	?	?
Queue	?	?	?	?	?	?	?

Source:
http://www.slideshare.net/Docker/dockerintronovember-131125185628phpapp02-37588934

Cargo transport (pre-1960….)

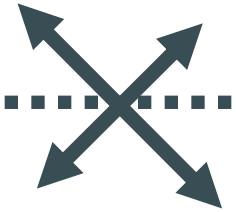
Multiplicity of Goods





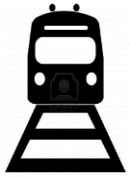


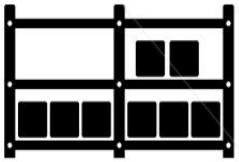
Do I worry about how goods interact (e.g.



Multipilicity of methods for





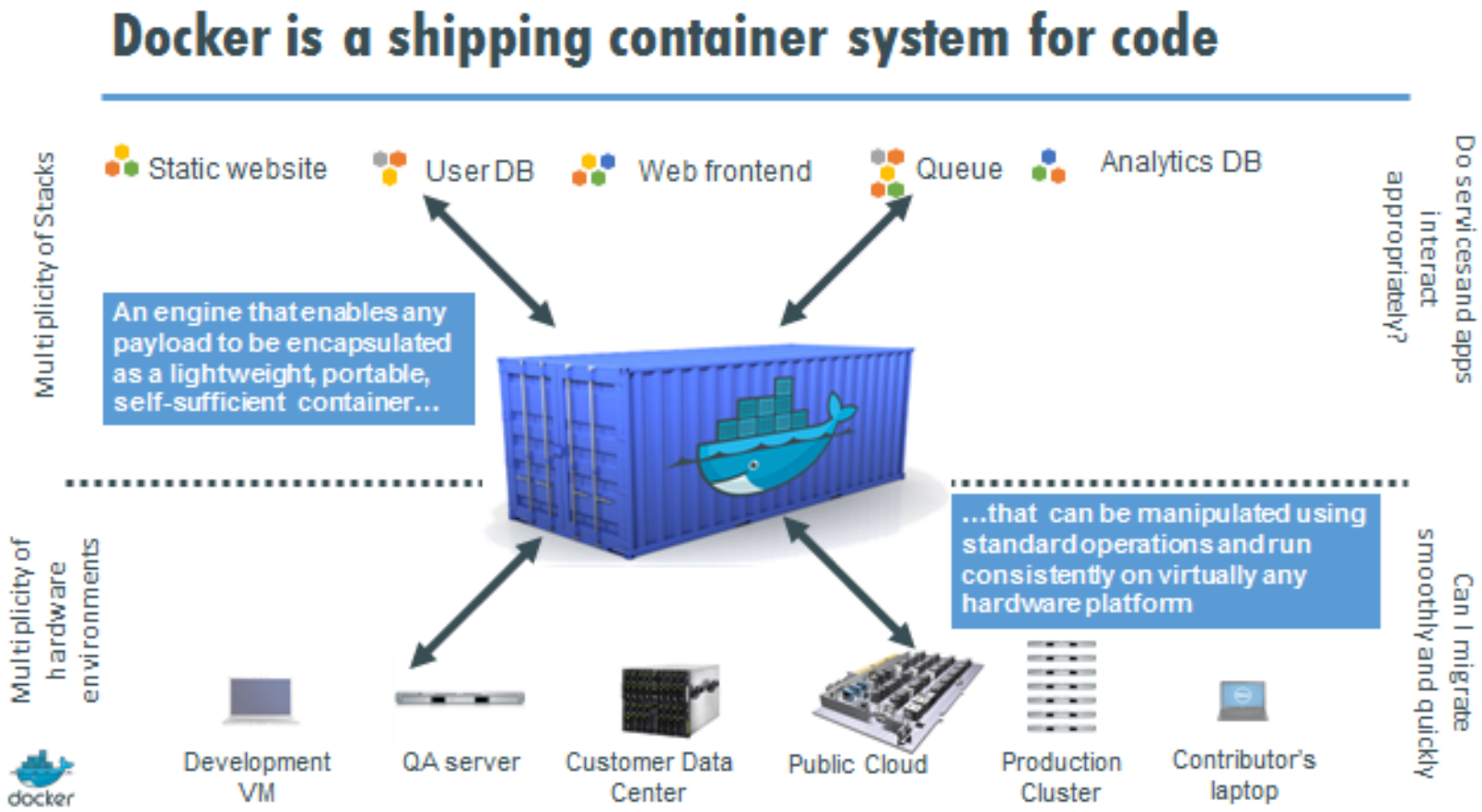

Can I transport quickly and smoothly

Source:
http://www.slideshare.net/Docker/docker-intronovember-131125185628phpapp02-37588934

Solution for Shipping Industry….

Source:
http://www.slideshare.net/Docker/dockerintronovember-131125185628phpapp02-37588934

Solution



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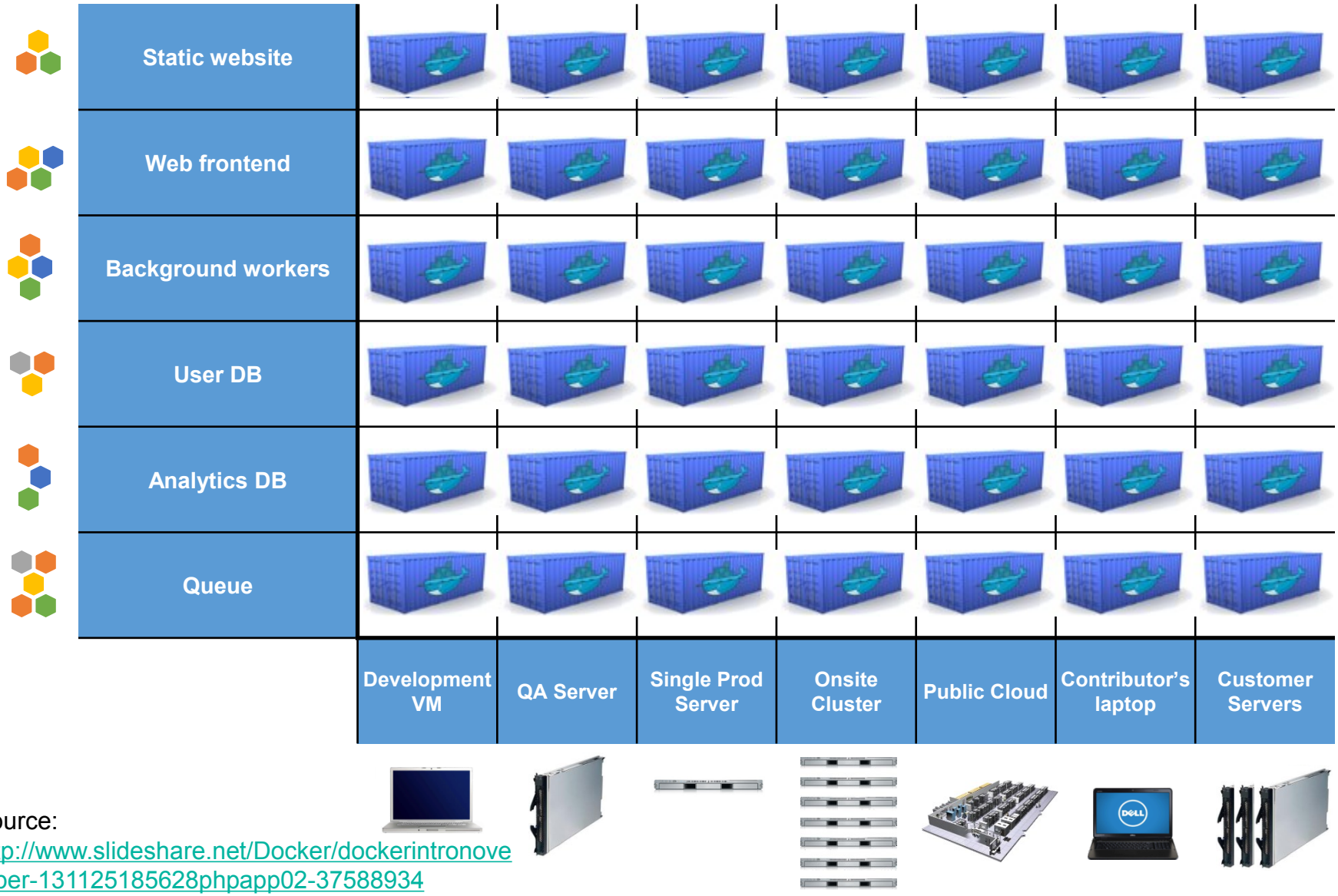
Solution for Software Industry….



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http://www.slideshare.net/Docker/dockerintronovember-131125185628phpapp02-37588934

Hypervisor VM versus Docker Containers

Virtual Machine (Hardware virtualization)

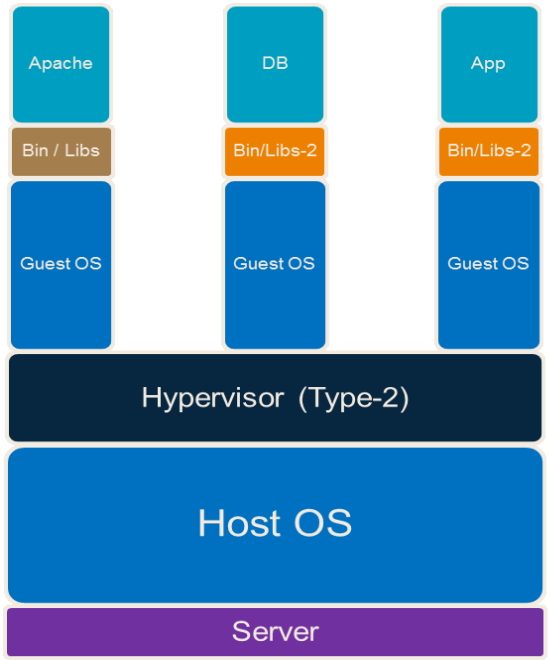
- Includes hardware simulation & OS execution
- Requires order of GB – 100s of MBs of memory for each instance (Heavy Weight)
- Can simulate few VMs per server (Expensive)
- Instance launch complete takes several seconds minute (slower)

Docker containers (os level virtualization)

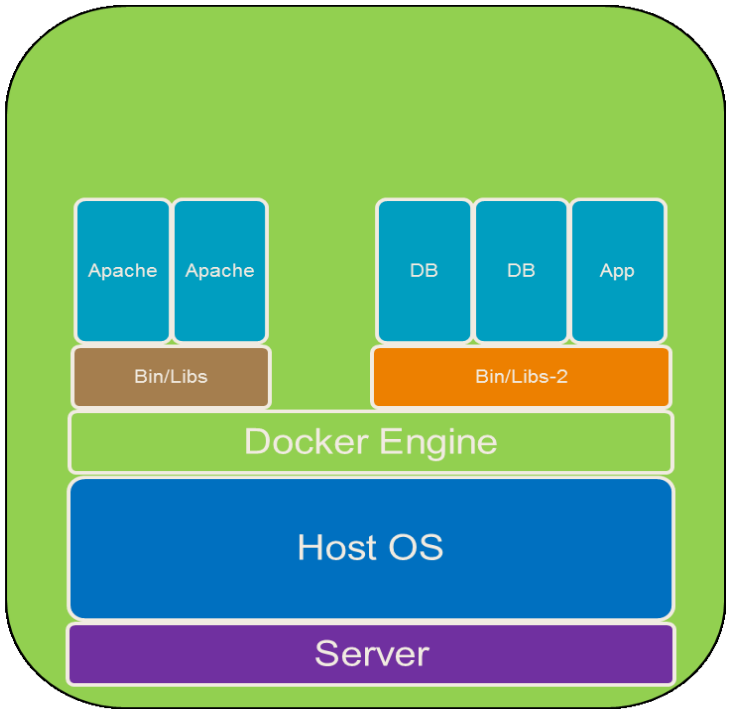
- Based on Linux Containers and Union File System.
- Requires order of few MBs of memory for each instance (Light Weight)
- Can simulate much higher containers per server (Cheaper)
- Instance launched in sub-second time-frame (much faster)

Docker Technology : Introduction

Framework built on top of Linux containers that can package an application and its dependencies => Can be launched / deployed in form of **software container** on any Linux server (providing **portability** of underlying platform: **cloud, bare-metal, server, desktop or laptop**)



Traditional Hypervisor based VMs

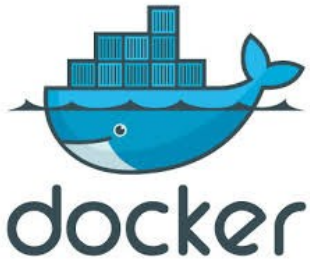


Container based Application execution

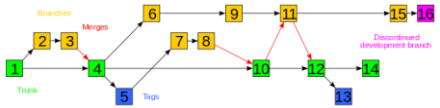
Docker Technology Introduction….continued…

Container relies on Linux kernel facilities: **chroot**, **cgroups** and **name-space** facilities that provide resource isolation (CPU, memory, block I/O, network, etc.) => Doesn't require a separate OS instance.

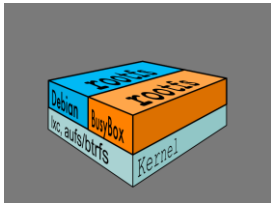
Docker provides **framework** & a **high level API** over Linux containers for portable deployment of applications across machines



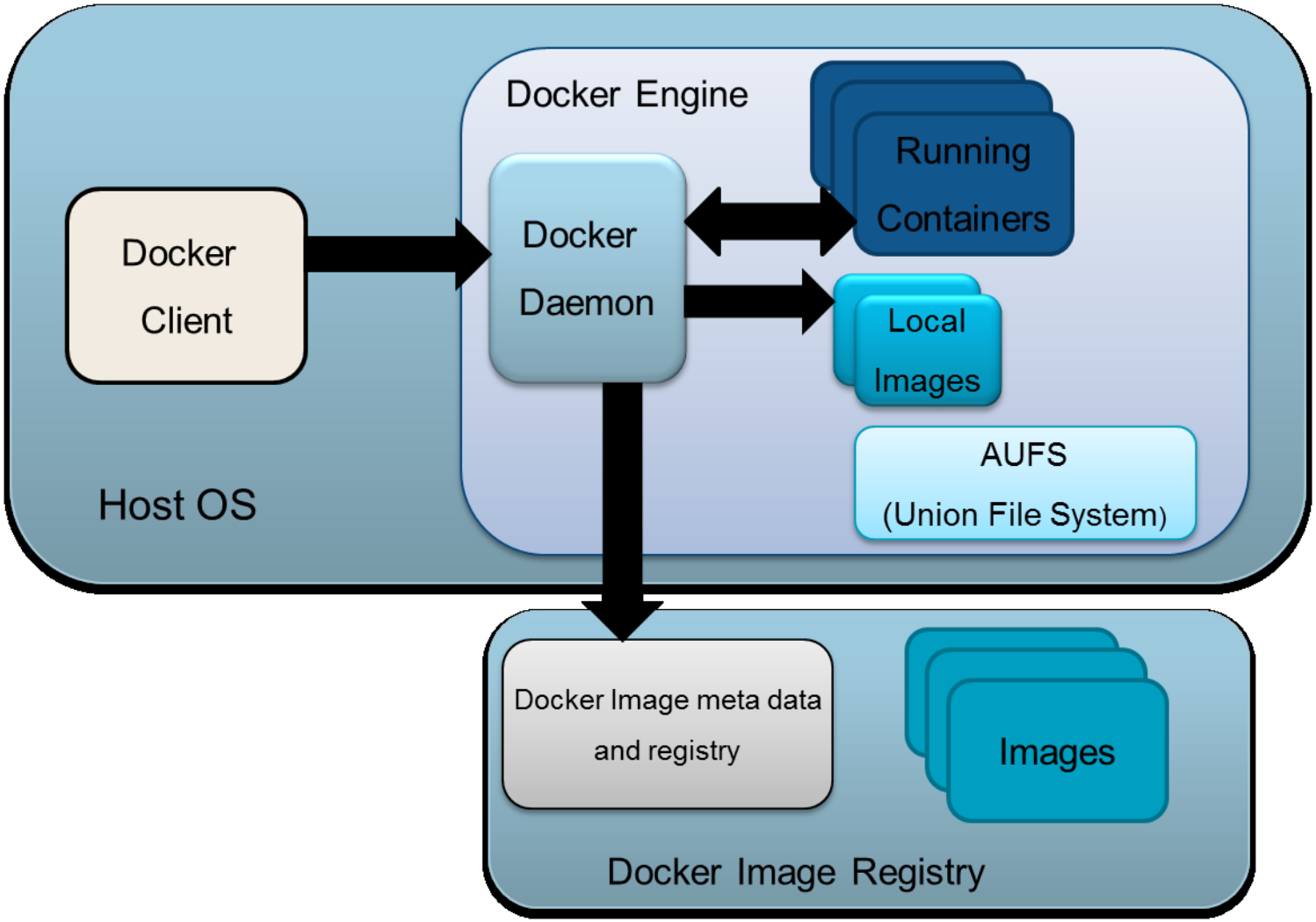
Docker provides **versioning capability** to track successive versions of a container



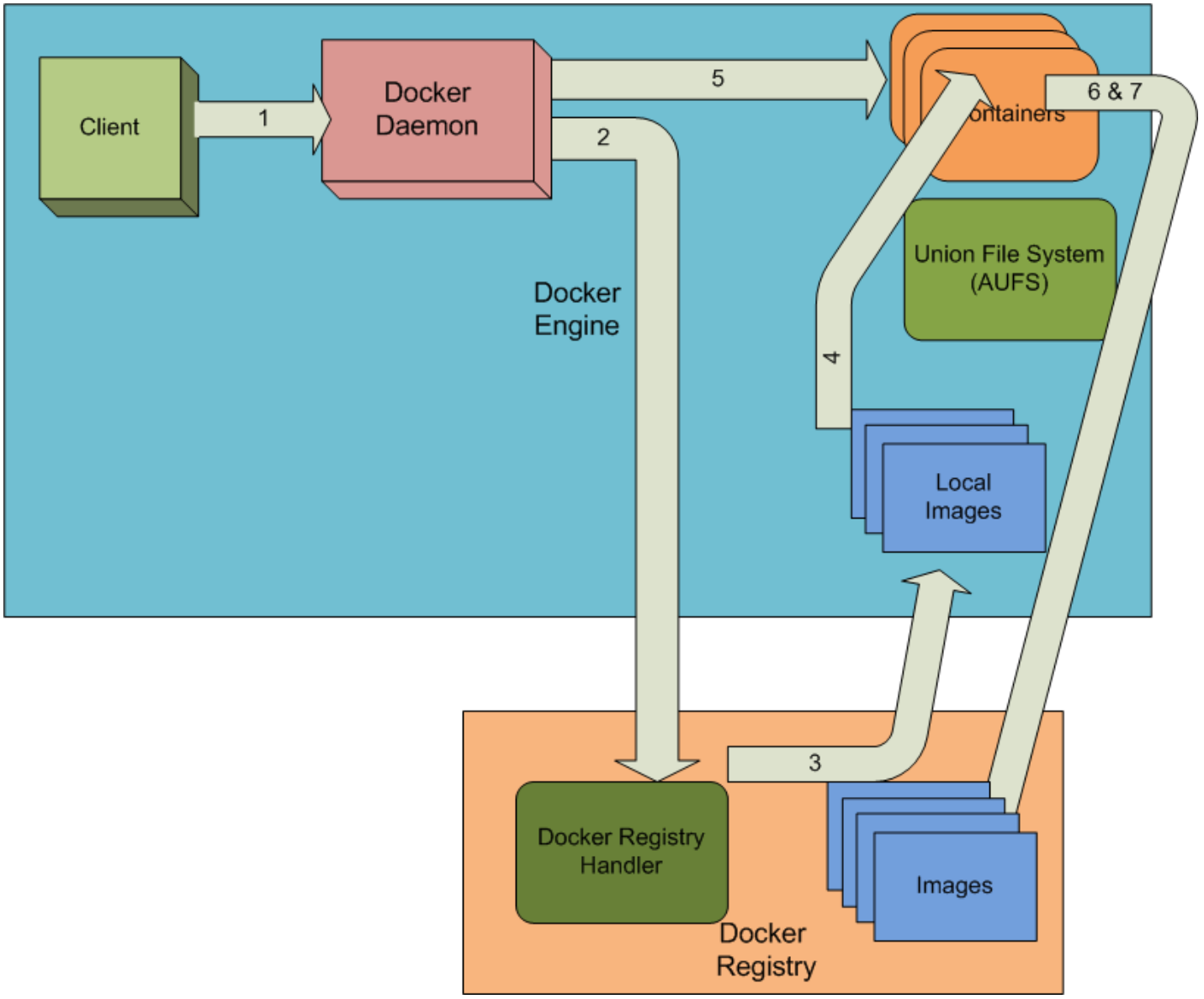
Docker uses **AUFS** (Advanced multi-layered Unification File System) – It greatly enhances the **performance** of docker containers and provides for **optimized** usage of underlying disk resources



Docker Architecture



Usage Flow



Technology Usage Demonstration (1/5)

Docker installation

```
divya@ubuntu64-1:~$ sudo apt-get install docker.io
```

```
divya@ubuntu64-1:~$ ps -aef | grep docker.io | grep -v grep
root       491   484  5 14:45 ?        00:01:17 /usr/bin/docker.io -d
divya@ubuntu64-1:~$
```

Download an existing container image from public docker registry

```
divya@ubuntu64-1:~$ sudo docker pull ubuntu:14.04
Pulling repository ubuntu
53bf7a53e890: Download complete
511136ea3c5a: Download complete
134b5dc84bc7: Download complete
692254366b1a: Download complete
ed98671f0531: Download complete
bffdbd3bc4b2: Download complete
964692831e07: Download complete
divya@ubuntu64-1:~$
```

Technology Usage Demonstration (2/5)

- Spawning container from downloaded container image

```
divya@ubuntu64-1:~$ sudo docker run -i -t ubuntu:14.04 /bin/bash
root@9f87c3b3a066:/#
```

- OS level virtualization demonstration

```
root@9f87c3b3a066:/# sleep 100 &
[1] 8
root@9f87c3b3a066:/# ps -aef
UID        PID  PPID  C STIME TTY          TIME CMD
root         1     0  0 09:41 ?        00:00:00 /bin/bash
root         8     1  0 09:42 ?        00:00:00 sleep 100
root         9     1  0 09:42 ?        00:00:00 ps -aef
root@9f87c3b3a066:/#
```

```
divya@ubuntu64-1:~$ ps -aef | grep sleep
root      2800  2724  0 15:12 pts/11   00:00:00 sleep 100
divya     2803  2752  0 15:13 pts/24   00:00:00 grep --color=auto sleep
divya@ubuntu64-1:~$ ps -aef | grep /bin/bash
root      2716  2365  0 15:11 pts/4    00:00:00 sudo docker run -i -t ubuntu:14.04 /bin/bash
root      2717  2716  0 15:11 pts/4    00:00:00 docker run -i -t ubuntu:14.04 /bin/bash
root      2724   491  0 15:11 pts/11   00:00:00 /bin/bash
divya     2805  2752  0 15:13 pts/24   00:00:00 grep --color=auto /bin/bash
divya@ubuntu64-1:~$
```

Technology Usage Demonstration (3/5)

Concept of chroot and aufs

```
root@9f87c3b3a066:/# touch sampleFile
root@9f87c3b3a066:/# ls -l sampleFile
-rw-r--r-- 1 root root 0 Sep 25 09:45 sampleFile
root@9f87c3b3a066:/#
```

```
divya@ubuntu64-1:~$ sudo find /var/lib/docker -name "sampleFile"
/var/lib/docker/containers/9f87c3b3a066bf1131a49d57213874c2e12abd428eb97f87944f47e0d528397c/root/sampleF
ile
/var/lib/docker/aufs/diff/9f87c3b3a066bf1131a49d57213874c2e12abd428eb97f87944f47e0d528397c/sampleFile
/var/lib/docker/aufs/mnt/9f87c3b3a066bf1131a49d57213874c2e12abd428eb97f87944f47e0d528397c/sampleFile
divya@ubuntu64-1:~$
```

Setting up local private docker registry

```
divya@ubuntu64-1:~$ sudo docker pull samalba/docker-registry:latest
Pulling repository samalba/docker-registry
6b86e5be37f9: Download complete
511136ea3c5a: Download complete
b3553b91f79f: Download complete
ca63a3899a99: Download complete
ff01d67c9471: Download complete
7428bd008763: Download complete
c7c7108e0ad8: Download complete
826544226fdc: Download complete
2e2525381d8a: Download complete
ac45f5b4c074: Download complete
86be4d0e9e36: Download complete
ab76794dacab: Download complete
6802e92c2da8: Download complete
5f3425169d60: Download complete
d4cf7d2a4a02: Download complete
c57ea96fb80a: Download complete
a1123aa3c2a1: Download complete
3249ad30604a: Download complete
0f729653c534: Download complete
divya@ubuntu64-1:~$
```

Technology Usage Demonstration (4/5)

```
divya@ubuntu64-1:~$ sudo docker images
REPOSITORY                TAG                 IMAGE ID            CREATED             VIRTUAL SIZE
ubuntu                    14.04               c4ff7513909d        6 weeks ago         225.4 MB
samalba/docker-registry   latest              baf4b735e5c9        9 weeks ago         421 MB
divya@ubuntu64-1:~$
```

```
divya@ubuntu64-1:~$ sudo docker run -d -p 5000:5000 samalba/docker-registry:latest
695e3f28361c3149b2e13aa862d4ce6c217654b2405706a81efbe58b3a7531b5
```

- Uploading images in local private docker registry

```
divya@ubuntu64-1:~$ sudo docker tag ubuntu:14.04 localhost:5000/ubuntu_local
divya@ubuntu64-1:~$ sudo docker push localhost:5000/ubuntu_local
The push refers to a repository [localhost:5000/ubuntu_local] (len: 1)
Sending image list
Pushing repository localhost:5000/ubuntu_local (1 tags)
511136ea3c5a: Image successfully pushed
1c9383292a8f: Image successfully pushed
9942dd43ff21: Image successfully pushed
d92c3c92fa73: Image successfully pushed
0ea0d582fd90: Image successfully pushed
cc58e55aa5a5: Image successfully pushed
c4ff7513909d: Image successfully pushed
Pushing tag for rev [c4ff7513909d] on {http://localhost:5000/v1/repositories/ubuntu_local/tags/latest}
divya@ubuntu64-1:~$
```

Technology Usage Demonstration (5/5)

Versioning (Committing changes as new image)

```
divya@ubuntu64-1:~$ sudo docker run -i -t localhost:5000/ubuntu_local touch file1
```

```
divya@ubuntu64-1:~$ sudo docker ps -a
CONTAINER ID        IMAGE                                  COMMAND               CREATED             STA
TUS                 PORTS                    NAMES
99ebaa84bc0a        localhost:5000/ubuntu_local:latest   touch file1           About a minute ago   Exi
t 0                                          happy_tesla
695e3f28361c        samalba/docker-registry:latest       /bin/sh -c exec dock   7 minutes ago        Up
7 minutes           0.0.0.0:5000->5000/tcp   stupefied_nobel
divya@ubuntu64-1:~$
```

```
divya@ubuntu64-1:~$ sudo docker commit 99ebaa84bc0a localhost:5000/ubuntu_update
550c086e7245bc9d0effad72cc4a8d295b726e55ec053cb01bca709871c39245
divya@ubuntu64-1:~$
```

```
divya@ubuntu64-1:~$ sudo docker push localhost:5000/ubuntu_update
The push refers to a repository [localhost:5000/ubuntu_update] (len: 1)
Sending image list
Pushing repository localhost:5000/ubuntu_update (1 tags)
Image 511136ea3c5a already pushed, skipping
Image 1c9383292a8f already pushed, skipping
Image 9942dd43ff21 already pushed, skipping
Image d92c3c92fa73 already pushed, skipping
Image 0ea0d582fd90 already pushed, skipping
Image cc58e55aa5a5 already pushed, skipping
Image c4ff7513909d already pushed, skipping
550c086e7245: Image successfully pushed
Pushing tag for rev [550c086e7245] on {http://localhost:5000/v1/repositories/ubuntu_update/tags/latest}
divya@ubuntu64-1:~$
```

Docker Containers and technology business ecosystem

Microsoft & Docker

- Docker and Microsoft partner to bring container applications across platforms (15-Oct-2014)

Google & Docker

- Google Launches Managed Service For Running Docker-Based Applications On Its Cloud Platform (4-Nov-2014)
- Google Container Engine to use Kubernetes for providing "Docker as a Service" ("Cluster As a Service"?)

Linux Distros & Docker

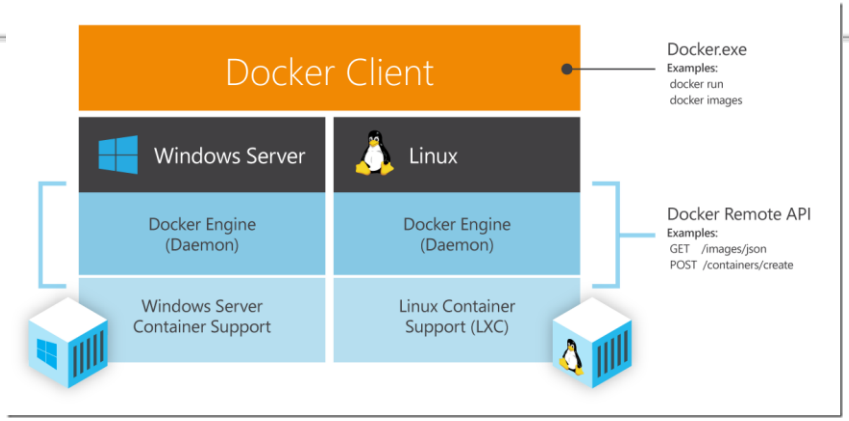
- Canonical Releases Ubuntu 14.10 With Tighter Docker and Cloud Foundry Integrations (24-Oct-2014)
- SUSE bundles Docker and processor optimizations into major new Linux distro (27-Oct-2014)
- Red Hat To Bring Docker Support To Enterprise Linux And OpenShift (15-Apr-2014)

Docker acquisitions

- Docker acquires Orchard (for Orchestration & integration platforms)
- Docker Acquires Koality In Engineering Talent Grab (7-Oct-2014)

Server Environment Optimization (CoreOS) : Planning to serve a diet Linux Platform

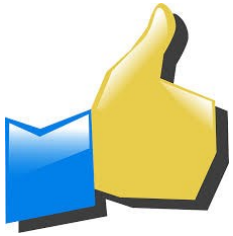
- Every App / Service will be served using docker container !

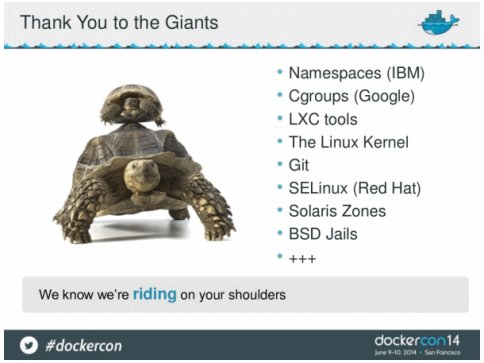


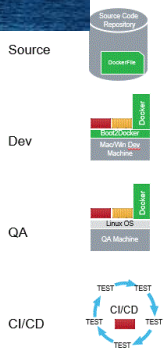
Solomon Hykes: person behind Docker Container

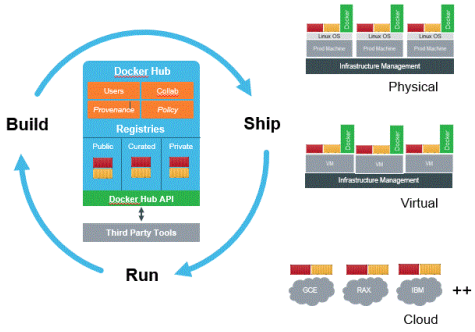
- DotCloud : Provides Cloud solutions
- Brain behind Docker : Solomon Hykes
- Theme / Motto :
  - "The real value of Docker is not technology, **it's getting people to agree on something**."
- Got inspiration of solution for software troubles from Shipping Industry
- Nothing New => Just recipe was required !
  - Acknowledged all recipe ingredients in Docker Conf'14

dotCloud









Questions?

Thanks

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