ConSol Consulting & Solutions | Wir unternehmen IT.

docker

Docker for Developers

Dr. Roland Huß, ConSol* Software GmbH

JBoss OneDayTalk, 29.9.2014, Germering

Agenda

- **Introduction into Docker**
  - What is Docker ?
  - Demo
  - Docker Advanced
  - Building Images
- **Docker for Developers**
  - Integration Tests
  - Deployment
  - Build Integration
  - Demo

Roland Huß ro14nd @

- Head of Research & Development
- Java Dev and Software Architect
- Open Source
  - www.jolokia.org
  - labs.consol.de & ro14nd.de
  - https://github.com/rhuss
- Conference Speaker
  - JavaZone 2014
  - W-JAX 2014
  - Devoxx 2014

ConSol
Consulting & Solutions

Docker

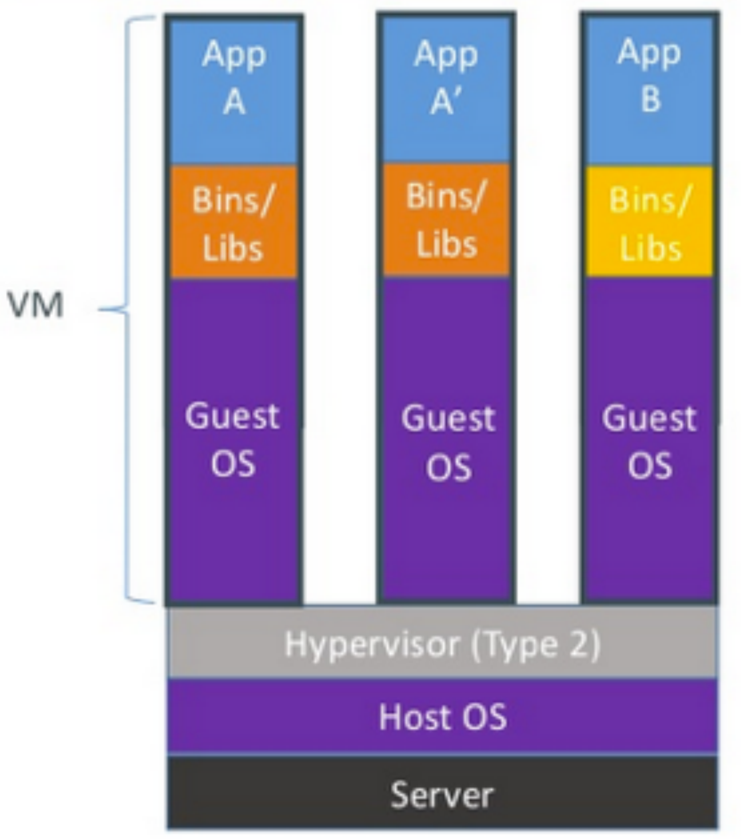
Docker is an open platform for developers and sysadmins to build, ship, and run distributed applications.

docker.io

Docker is ….

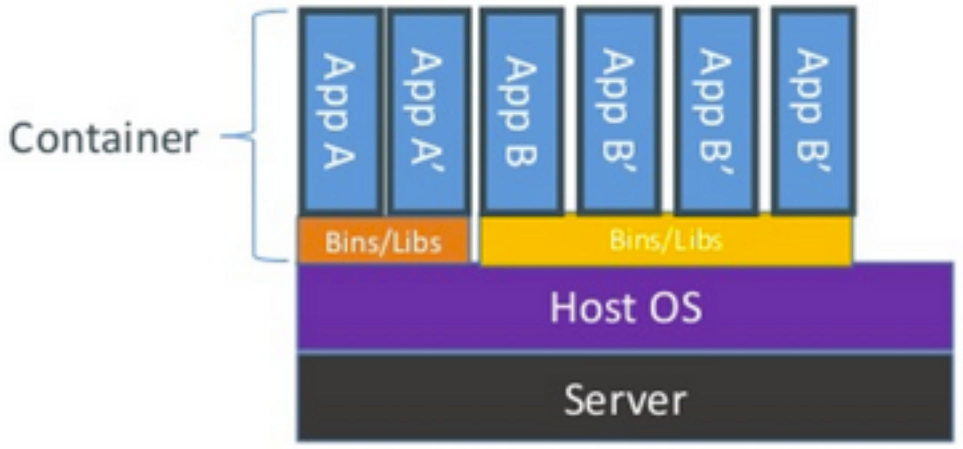
- … a **lightweight** Linux-Container
- … **portable**
  - VM, Cloud (Open-Stack, GCE, …), bare Metal, …
- … **very fast** and **scalable**
  - Laptop: 10 - 100, Server: 100 - 1000 Container
- … **scriptable**
  - via Dockerfiles
- … **„social imaging“**
  - Image sharing via Registries

Lightweight Container vs. VM



Containers are **isolated**, but sharing the Kernel and (some) Files

➜ faster & lighter



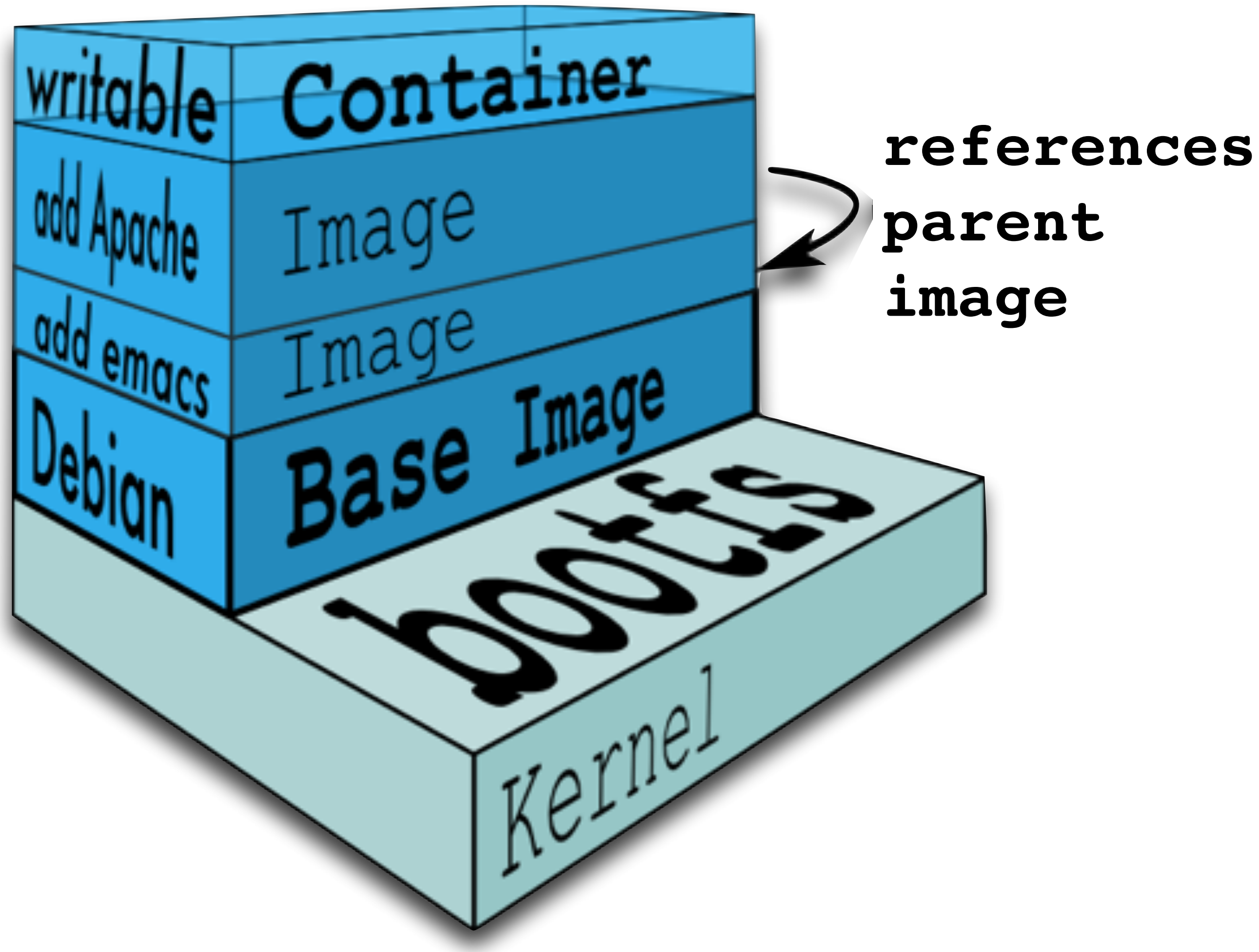
Docker Architecture

- Written in **Go** (current version: 1.2.0)
- Originally based on **Linux Container** (LXC)
  - since 0.90 : Own abstraction with **libcontainer**
- **Client-Server** Architecture
  - Server communicates via Unix- or INET-Sockets with a REST API
  - Docker Commandos vial CLI (Linux, OS X and Windows)

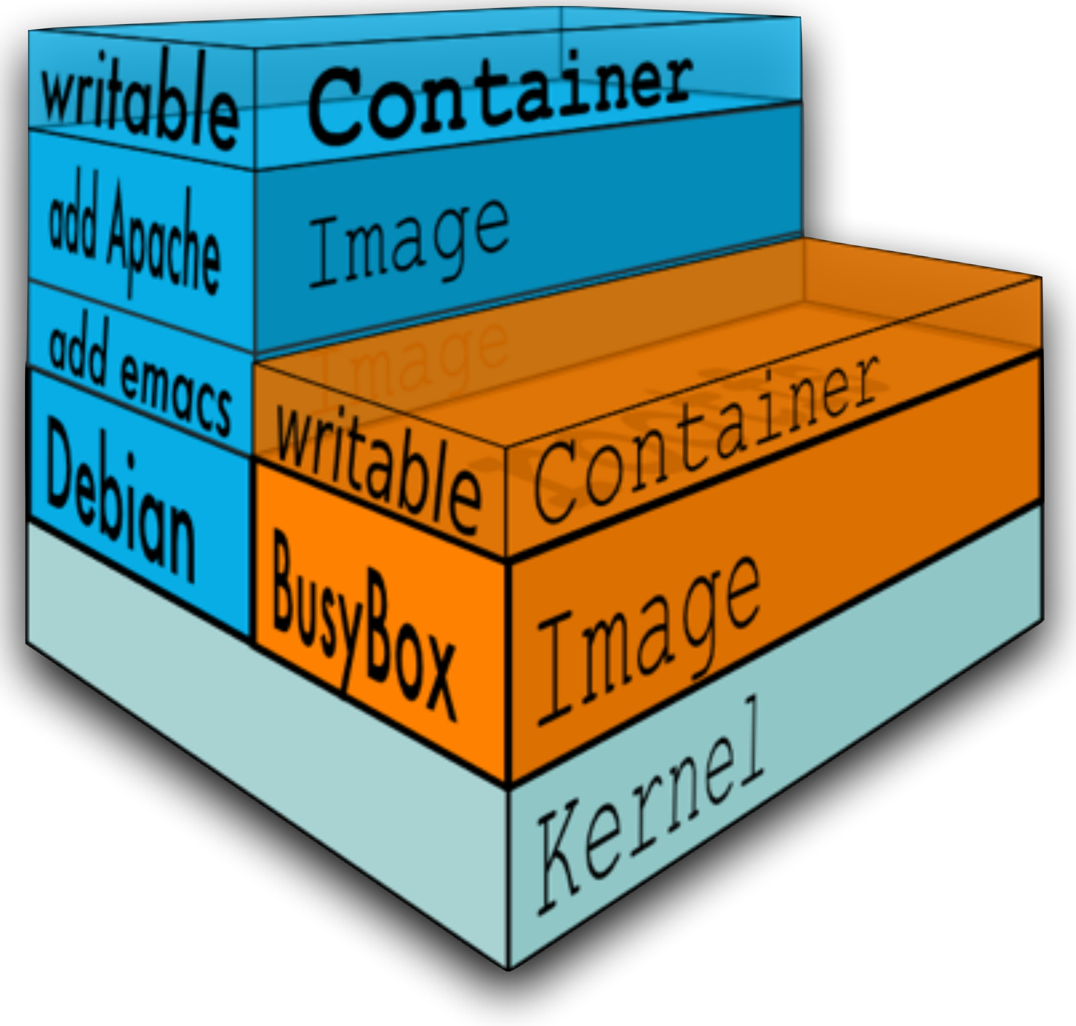
Terms

- **Image** :
  - read-only filesystem layer
  - can be deployed and shared
  - "Blueprint for Container"
- **Container**:
  - read-write filesystem layer on top of Image
  - copy on write (stateful)
  - can be started and stopped
  - can be committed to create an Image
  - typically short-lived
  - "Instance of an Image"

Image


writable
Container
add Apache
Image
add emacs
Image
Debian
Base Image
bootfs
Kernel
references parent image

Container


writable
Container
add Apache
Image
add emacs
Debian
writable
Container
BusyBox
Image
Kernel

Terms

- **Repository** : Collection of layered Images
  – Image name + Tag

```
[user_name]/repository_name[:version_tag]
```

- **Registry**: Storage of Repositories
  – Default: **index.docker.io:80**
  – Own private Registry can be easily used
    - https://github.com/docker/docker-registry

Docker Commands

`ps`	Show all containers
`images`	Show all images
`run`	Create and run a container
`search`	Search for images on a registry
`pull`	Download of images
`rm`	Remove container
`rmi`	Remove image

Demo

Port Mapping

- Containers can **expose** Ports
  - specified during build time
- Exported ports can be mapped to host ports.

`docker run -P`	Maps all exposed container ports dynamically to host ports in 49000 … 49900
`docker run -p 8080:8080 -p 2200:22`	Maps container ports 8080 and 22 to host ports 8080 and 2200
`docker run -p 8080 -p 22`	Maps container ports 8080 and 22 dynamically to host ports from 49000 … 49900

Volumes

- Sharing of file data between …
  - … Container and Container
  - … Container and Docker Host

```
docker run -v /var/volume1 \
           -v /var/volume2 \
           --name DATA busybox true
docker run -t -i --rm \
           --volumes-from DATA \
           --name client1 ubuntu bash
```

Container Linking

- Naming a container during startup:

```
docker run -d --name redis crosby/redis
```

- Reference container via name:

```
docker run -t -i --link redis:db ubuntu bash
```

- Connection information to referenced container
  - via `/etc/hosts`

```
172.17.0.3       db
```

  - via environment variables

```
DB_PORT_5432_TCP=tcp://172.17.0.3:5432
DB_ENV_PG_VERSION=9.3.5-1.pgdg70+1
......
```

Building Images - Run & Commit

- Select a base image
  - `docker run -t -i ubuntu bash`
- Installation of software, etc within container
- Stop container
  - `docker commit <container-id> <image>`
  - `docker tag <image> <repository>`
  - `docker push <user-name>`

Building Images - Dockerfile

```
FROM dockerfile/java

MAINTAINER roland@jolokia.org

EXPOSE 8080

RUN wget http://archive.apache.org/tomcat-7/.. -O /tmp/c.tgz
RUN tar xzf /tmp/c.tgz -C /opt
RUN rm /tmp/c.tgz
CMD ["/opt/apache-tomcat-7/bin/catalina.sh", „run" ]
```

```
docker build -t jolokia/tomcat-7 .
```

Demo

Docker for Java Developers ?

Boost your Integration Tests

Ship your Applications

Integration Tests

Integration tests exercise applications within a **realistic context** that is as close as possible to the **production** environment.

Integration Tests

- Good Integration Tests are …
  - **Robust** (aka Repeatable)
    Work always or fail always with the same error
  - **Independent**
    Minimal external requirements, self-contained
  - **Isolated**
    Parallel executions of similar tests
  - **Fast**
    Tight feedback loop

External Testsystems

~~Robust~~	Test system are externally managed and configured.
~~Independent~~	Test systems must be installed, available and running.
~~Isolated~~	Parallel tests access the same test systems and might interfere.
~~Fast~~	Often slow because of network latency and parallel usage.

but ***close*** to the real thing !

Simulated (Mock) Testsystems

Robust	Can be started during the test run
Independent	Can be configured declaratively (e.g. Citrus)
Isolated	Different ports can be selected via configuration
Fast	Speed depends on framework and setup

but ***not*** the real thing !

Docker to the rescue

Robust	Each build has its dedicated container and hence its own distinguished execution context.
Independent	No build external requirements except a Docker installation required.
Isolated	Perfect isolation for the System-Under-Test.
Fast	Fast container startup because of OS level virtualization.

and it ***can*** be the real thing !

Shipping Applications

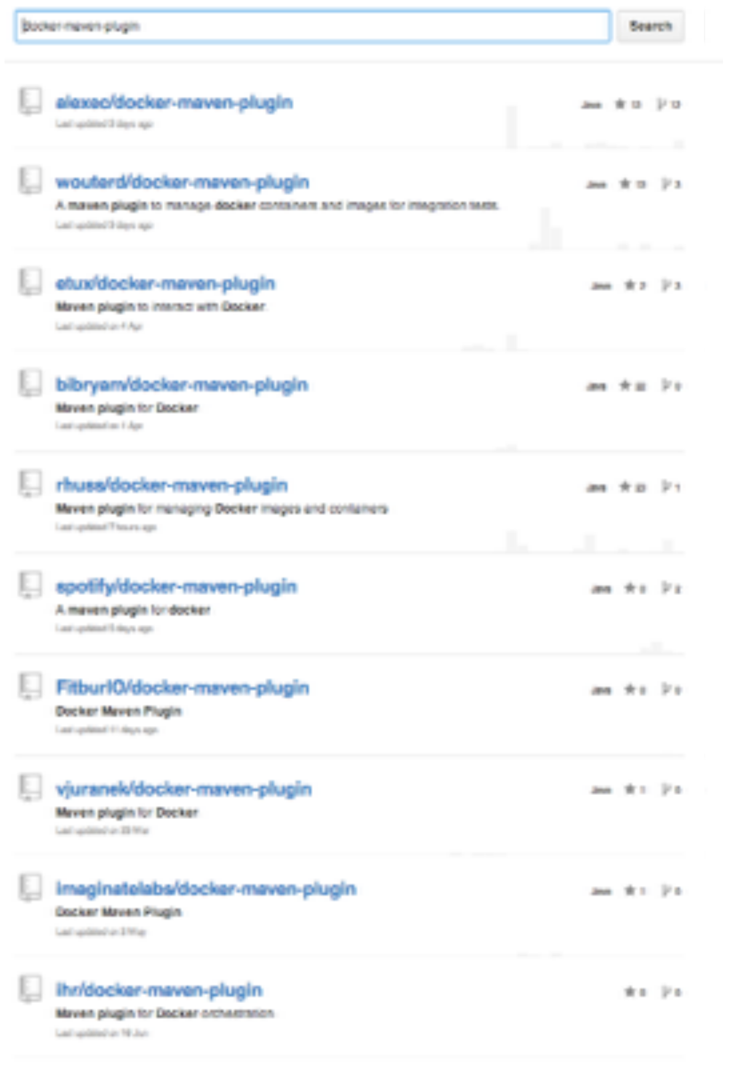
- Data Container:
  - Application artifacts are stored in **data containers**
  - Data containers are linked to **platform container**
  - Application gets deployed during startup

- Service Container:
  - Artifacts and application server are stored in the **same container**.
  - Ideal for Microservices.

Docker Build Integration

- CI Server
  - Pre and Post-Hooks for starting and stopping Docker containers
- Calling Docker CLI from build
  - `exec` Task in Ant
  - `exec-maven-plugin` for Maven
  - via Groovy in Gradle
- Dedicated Maven and Gradle Plugins

docker-maven-plugin



docker-maven-plugin

Search

alexec/docker-maven-plugin
Last updated 3 days ago

wouterd/docker-maven-plugin
A maven plugin to manage docker containers and images for integration tests.
Last updated 3 days ago

etux/docker-maven-plugin
Maven plugin to interact with Docker
Last updated on 4 Apr

bibryam/docker-maven-plugin
Maven plugin for Docker
Last updated on 1 Apr

rhuss/docker-maven-plugin
Maven plugin for managing Docker images and containers
Last updated 7 hours ago

spotify/docker-maven-plugin
A maven plugin for docker
Last updated 5 days ago

Fitbur10/docker-maven-plugin
Docker Maven Plugin
Last updated 11 days ago

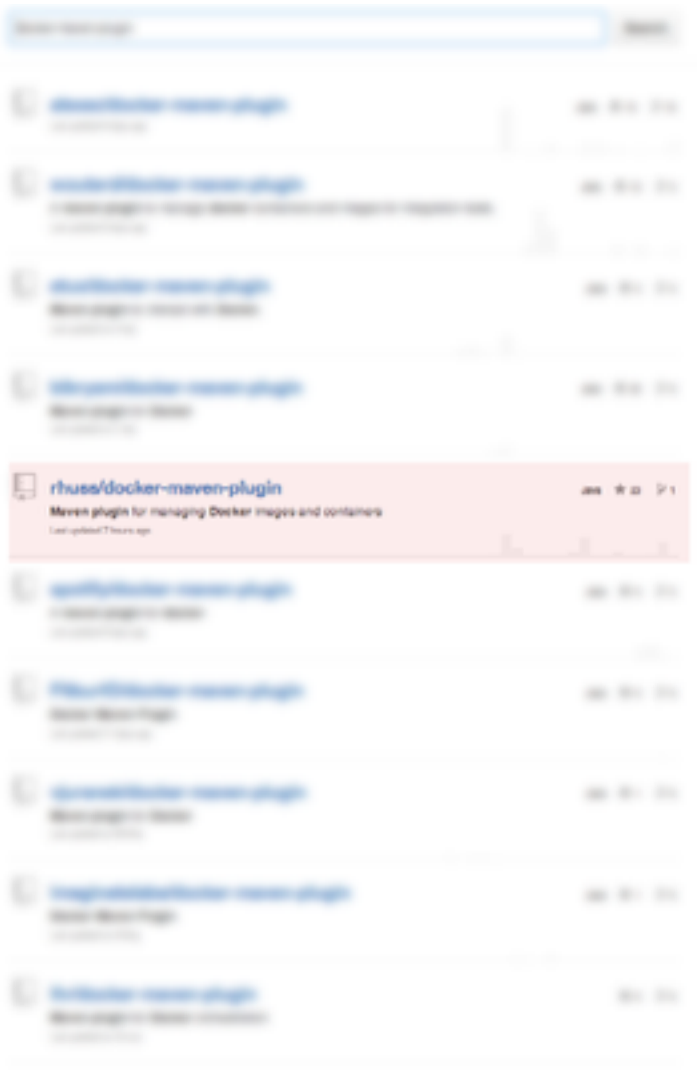
vjuranek/docker-maven-plugin
Maven plugin for Docker
Last updated on 23 Mar

imaginatelabs/docker-maven-plugin
Docker Maven Plugin
Last updated on 3 May

lhr/docker-maven-plugin
Maven plugin for Docker orchestration
Last updated on 16 Jun

WTF or
FTW ?

docker-maven-plugin



rhuss/docker-maven-plugin

Maven plugin for managing Docker images and containers

Last updated 7 hours ago

rhuss/docker-maven-plugin

rhuss/docker-maven-plugin

- **Simple** configuration
- Automatic **pull** of required images
- Dynamic **portmapping**
- Maven **artifacts** and their dependencies should be available within the container
- **Pushing** containers to a registry
- Doing it the **Maven** way

Supported goals

docker:start	Start a container (`pre-integration-test`)
docker:stop	Stop a container (`post-integration-test`)
docker:build	Build a data image
docker:push	Push data image to registry

Configuration

```
<configuration>

  <image>consol/tomcat-7.0</image>

  <ports>
     <port>jolokia.port:8080</port>
  </ports>

  <waitHttp>http://localhost:${jolokia.port}/jolokia</waitHttp>
  <wait>10000</wait>

  <assemblyDescriptor>src/main/assembly.xml</assemblyDescriptor>
  <dataImage>jolokia/agents</dataImage>
  <mergeData>false</mergeData>
</configuration>
```

Data Image

```xml
<assembly>
  <dependencySets>
    <dependencySet>
      <includes>
        <include>org.jolokia:jolokia-war</include>
      </includes>
      <outputDirectory>.</outputDirectory>
      <outputFileNameMapping>jolokia.war</outputFileNameMapping>
    </dependencySet>
  </dependencySets>
</assembly>
```

Data Image

- Assembly Descriptor from **`maven-assembly-plugin`**
- Predefined descriptors
- Data image exports **`/maven`** as Docker volume
- **`mergeData`**
  - **`false`**: Assembly gets own container
  - **`true`**: Assembly is merged into given image

Demo

docker-maven-plugin

	wouterd	*alexec*	*spotify*	*rhuss*
API	jaxrs	docker-java (forked)	spotify/docker-client	UniREST
Start/Stop	✔	✔	✘	✔
Building	✔	✔	✔	✔
Data Image	Dockerfile + Maven Config	Dockerfile + customYML	Maven config	Maven config + Assembly
Push	✔	✔	✔	✔

docker-maven-plugin

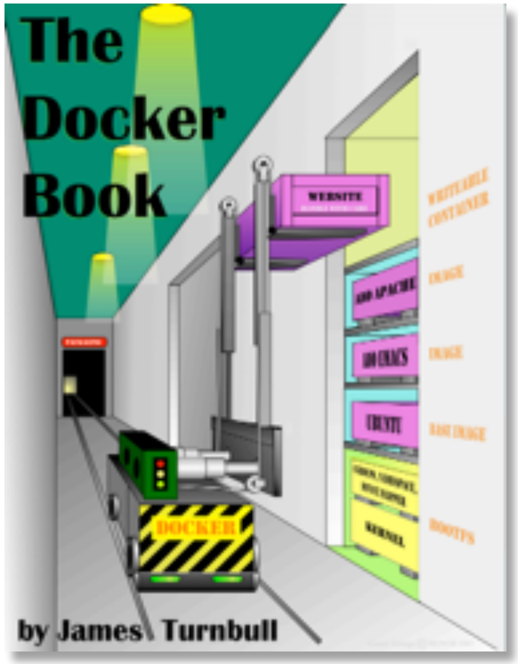
	wouterd	*alexec*	*spotify*	*rhuss*
Cleanup	✔	✔	✘	✔
Security	Plain	Plain	✘	Encrypted/ Plain
URL Wait	✘	✔	✘	✔
Version	2.1	2.0.0	0.0.21	0.9.9
Size LOC	2100	1000	600	1500

Wrap up

- Docker is a lightweight virtualization technology which can improve the development process:
  - It can help building **good integration tests**
  - It introduces a new paradigm for **shipping applications**.
- Build support is growing but still in the beginning.

Resources

- index.docker.io - Public Docker Registry
- „Docker Introduction“ by Palo Alto
  - 91 pages full of technical Details
  - http://bit.ly/RlrznC
- „Are VM Passé?“ by Ben Golub
  - Management Overview „Why Docker ?“
  - http://bit.ly/1kWxJaL
- Slidedeck
  - http://ro14nd.de/talks/2014/docker-onedaytalk.pdf
- "The Docker Book"
  - highly recommended !
  - http://www.dockerbook.com/



Thank you!

```
docker_nuke() {
    docker ps -q | xargs docker stop
    docker ps -q -a | xargs docker rm
}

docker_rmi_none() {
    docker images | grep '<none>' | \
    awk '{ print $3 }' | \
    xargs docker rmi
}

docker_go() {
   docker run --rm -t -i $@
}
```

ConSol* Software GmbH

Franziskanerstraße 38
D-81669 München

Tel: +49-89-45841-100
Fax: +49-89-45841-111

info@consol.de
www.consol.de