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DOCKER CONTAINER LOADING

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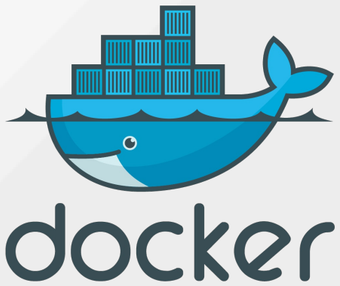
ROAD TRIP

Local	Remote / Cloud
Dockerfile	Docker Hub
Template	Continous Integration
Ansible-Container	Google Container Builder
Packer	OpenShift S2I
Rocker	
Build Integration	

DOCKER CLI



- docker commit

```
docker commit 3e3d3cf39 redis-server:1.0
```

- docker build

```
FROM ubuntu:14.04
RUN apt-get update && \
   apt-get install -y redis-server
EXPOSE 6379
ENTRYPOINT ["/usr/bin/redis-server"]
```

DOCKERFILE ARGS

- Dockerfile variables
- Since Docker 1.9
- Can not be used in FROM
- Filled in during build time

```
FROM busybox
ARG uid
USER ${uid:-jboss}
# ...
```

```
docker build --build-arg uid=daemon ....
```

PROBLEMS

- No composition
- Too simple parameterisation
- No influence on layers
- Limited feature set
- Security

DOCKERFILE TEMPLATE

- Dockerfile generation from templates
- Build with docker build
- Simple built-in support (ARG)
- Engines:

  fish-pepper, dogen, crane, App::Dockerfile::Template ...

FISH-PEPPER

- **Template** system based on node.js
- **Multidimensional** parameters
- Support for **fragments**
- Docker **build** and **push** support

https://github.com/fabric8io-images/fish-pepper

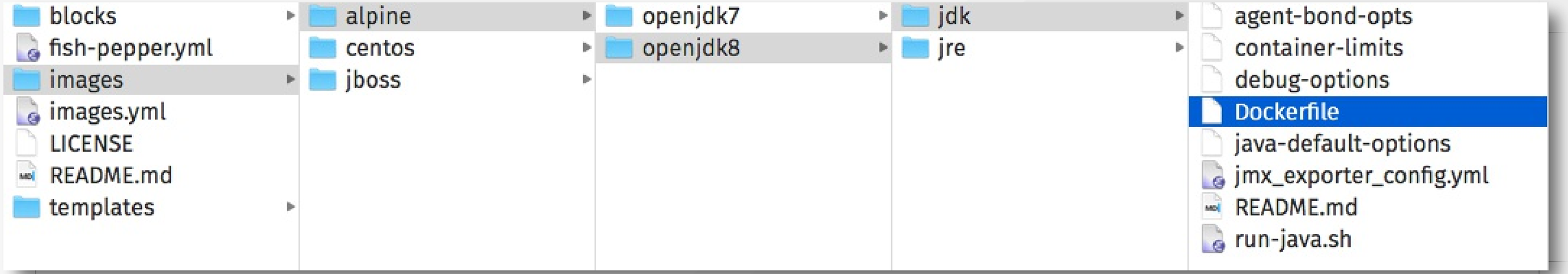
IMAGES.YML

```
fish-pepper:
 params:
  - "base"
  - "version"
  - "type"
 name: "jolokia/fish-pepper-java"
 maintainer: "Roland Huss <roland@jolokia.org>"
 # ... additional global params
config:
 version:
  openjdk7:
   java: "java:7u79"
  openjdk8:
   java: "java:8u45"
 type:
  jre:
   extension: "-jre"
  jdk:
   extension: "-jdk"
 base:
  alpine:
   from: "alpine:3.4"
  # ... additional base definitions for 'centos', 'jboss'
```

DOCKERFILE TEMPLATE

```
FROM {{= fp.config.base.from }}

MAINTAINER {{= fp.maintainer }}

ENV JOLOKIA_VERSION {{= fp.jolokiaVersion }}

RUN chmod 755 /bin/jolokia_opts \
  && mkdir /opt/jolokia \
  && wget {{= fp.jolokiaUrl}} -O /opt/jolokia/jolokia.jar

CMD java -jar /opt/jolokia/jolokia.jar --version
```

GENERATED BUILDS



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PRO

- Simple
- Uses Docker builtin mechanism
- Docker Hub automated builds still possible
- Good for many similar builds

CONTRA

- Restricted to Dockerfiles

ANSIBLE-CONTAINER

- Tool for building Docker images with Ansible
- Simple Orchestration for containers
- Manages multiple tools at once
- Easy to setup
- Uses `docker exec` and `docker cp` in Ansible connector

SETUP

```
ansible/
  # Docker compose file for base containers
  container.yml

  # Ansible playbook
  main.yml

  # Additional roles
  roles/
   dev-gulp/
     ....
    ...

  # Python and Role dependencies
  requirements.txt
  requirements.yml

  # Ansible configuration
  ansible.cfg
```

CONTAINER.YML

```
version: "1"
defaults:
 POSTGRES_USER: django
 ...
services:
 django:
  image: centos:7
  environment:
   DATABASE_URL: "pgsql://{{ POSTGRES_USER }}:...."
  expose:
   - "{{ DJANGO_PORT }}"
  working_dir: "{{ DJANGO_ROOT }}"
  links:
   - postgresql
  command: ['{{ DJANGO_VENV }}/bin/gunicorn', .... ]
 postgresql:
  image: postgres:9.4
  expose:
   - "5432"
  volumes:
   - '/var/lib/postgresql/data'
```

MAIN.YML

```
version: "1"
---
- hosts: django
  roles:
    - django-gunicorn
```

HOW IT WORKS

- **Start up base containers** from the specification given in container.yaml
- Create Ansible **inventory** on the fly
- Run ansible-playbook on main.yml for **provisioning**
- **Stop** containers
- **Commit** containers as images

PRO

- Flexible
- Reuse of Ansible roles
- Single layered images

CONTRA

- Complex system
- Longer Build times
- Single layered images

PACKER DOCKER BUILDER

- Packer: Tool for creating machine images
- Docker as a Builder
- Support of multiple provisioner
  - Shell, Ansible, Chef, Puppet ...
- Post-Processor for pushing and tagging

EXAMPLE

```
{
 "builders":[{
  "type": "docker",
  "image": "fedora",
  "export_path": "image.tar"
 }],
 "provisioners":[
 {
  "type": "ansible",
  "playbook_file": "playbooks/local.yml"
 }],
 "post-processors": [{
  "type": "docker-import",
  "repository": "demo/packer-ansible",
  "tag": "0.1"
 }]
}
```

PRO

- Easy (re)usable for other builders
- Many ways to provision

CONTRA

- No Meta information configurable
- Ansible only via SSH
- No caching

ROCKER

- Extension to the Dockerfile syntax
- Multiple FROM
- EXPORT/ IMPORT for copying files
- MOUNT allows reuse during build
- Tag and Push directly from Rockerfile
- Templating

EXAMPLE

```
FROM google/golang:1.4
ADD . /src
WORKDIR /src
RUN CGO_ENABLED=0 go build -a -installsuffix cgo \
            -v -o ball.o ball.go
EXPORT ball.o

FROM busybox
IMPORT ball.o /bin/ball
CMD ["/bin/ball"]

TAG ball:latest
```

PRO

- Usuable extensions used in the wild
- Natural extension of a Dockerfile
- Backwards compatible

CONTRA

- Custom format
- Lock-In

BUILD INTEGRATION

- Create Docker images from within a build

fabric8

- Maven plugins (Java)
  - fabric8io/docker-maven-plugin
  - fabric8io/fabric8-maven-plugin

DOCKER-MAVEN-PLUGIN

- Building images within Maven build
- Versioned
- Assembly with dependencies
- No Docker client required

https://github.com/fabric8io/docker-maven-plugin

D-M-P CONFIGURATION

```
<image>
 <name>jolokia/jolokia-itest</name>
 <build>
  <from>consol/tomcat-7.0</from>
  <assemblyDescriptor>
   assembly.xml
  </assemblyDescriptor>
 </build>
 <run>
  <ports>
   <port>jolokia.port:8080</port>
  </ports>
 </run>
</image>
```

FABRIC8-MAVEN-PLUGIN

- Embeds docker-maven-plugin
- Creates Kuberentes & OpenShift descriptors
- Creates image configuration from build info
- https://maven.fabric8.io

mvn package fabric8:build

ZERO CONFIG

- **Generators** for Image generation

```
<build>
 <plugins>
  <plugin>
   <groupid>io.fabric8</groupid>
   <artifactid>fabric8-maven-plugin</artifactid>
   <version>3.2.7</version>
  </plugin>
  <plugin>
   <groupid>org.springframework.boot</groupid>
   <artifactid>spring-boot-maven-plugin</artifactid>
  </plugin>
 </plugins>
</build>
```

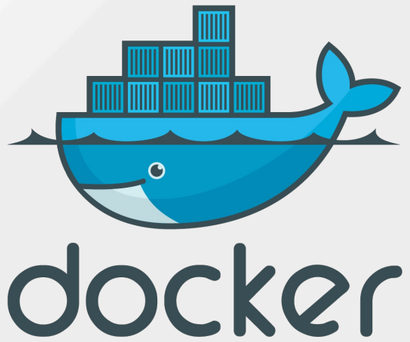
PRO

- Self contained builds
- No external requirements
- Reuse of existing build configuration

CONTRA

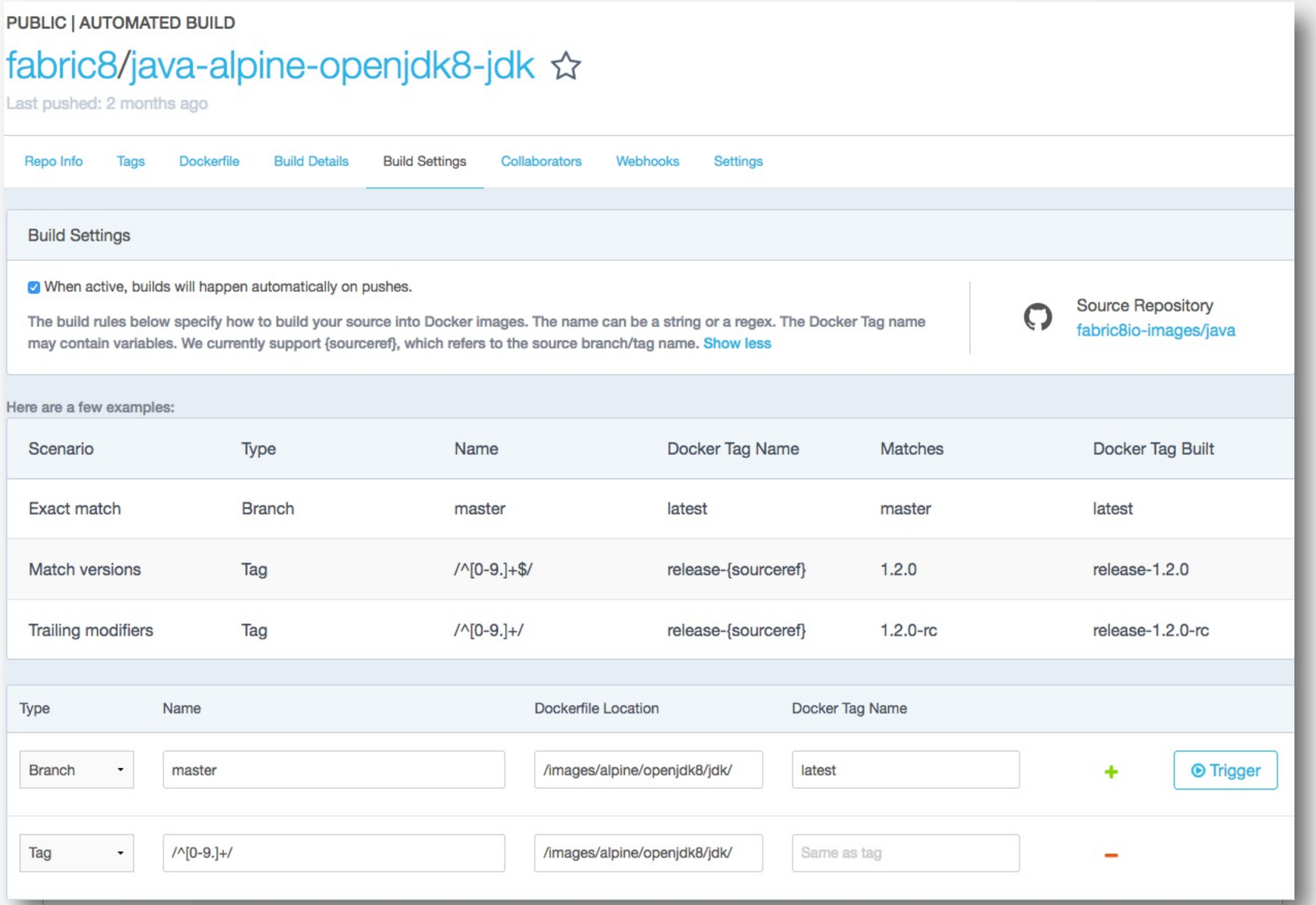
- Own configuration syntax
- More than one way

DOCKER HUB



- Public Docker registry
- Automated Builds
  - via manual trigger
  - via GitHub webhook
  - via update of dependant build
  - via HTTP POST request
- Multiple builds per repository
  - directory, tag, branch
- Tagging configurable

AUTOMATED BUILD



PRO

- Free for Open Source
- Easy to use
- Many triggers

CONTRA

- Dockerfile only
- No free private repository

CONTINOUS INTEGRATION

- Jenkins: Docker build step plugin
- Docker as Service in :
  - Travis CI, Circle CI, Codeship, Drone.io ...

CIRCLE CI

```
machine:
 services:
  - docker

deployment:
 latest:
  branch: master
  commands:
  - |
    test -n "$CI_PULL_REQUEST" || \
     ( cd java/images/jboss \
      && docker build -t fabric8/s2i-java:latest . | cat -  \
      && docker push fabric8/s2i-java:latest ) | cat - )
 release:
  tag: /v[0-9]+(\.[0-9]+){2}/
  commands:
  - |
    cd java/images/jboss && \
    ( docker build -t fabric8/s2i-java:${CIRCLE_TAG/#v/} . | cat - )
```

PRO

- CI Integration
- Flexible configuration

CONTRA

- Lock-in

GOOGLE CONTAINER BUILDER

- Build service for Google Cloud Platform
- Image will be stored in **GCR**
- **Build Step** : Docker container executed as part of the build

EXAMPLE

- cloudbuild.yaml :

```
steps:
- name: "gcr.io/cloud-builders/docker",
  args: [ "build", "-t", "gcr.io/devopscon-2016/java", "." ]
images: [ "gcr.io/devopscon-2016/java" ]
```

- Build:

```
gcloud container builds submit --config cloudbuild.yaml \
 gs://devopscon-2016/container-build-example.tar.gz
...
gcloud container builds describe $BUILD_ID
gcloud container builds list
```

BUILD STEP IMAGES

- bazel (Google's build tool)
- **docker**
- gcloud (Google Cloude SDK tool)
- git
- go
- golang-project (Go project)
- gsutil (Cloud storage access)
- wget

PRO

- Good integration into Google Cloud Platform
- Full access to all Docker features
- Easy to use

CONTRA

- Still Beta
- Not useful if not running in GCE

OPENSHIFT S2I

- OpenShift: PaaS on top of Kubernetes
- S2I : Source-to-image
- Two ingredients:
  - Source code (local or Git remote)
  - S2I Builder Image

EXAMPLE

```
oc new-app \
  centos/ruby-22-centos7~https://github.com/openshift/ruby-ex.git
```

- Start builder container
- Checkout from GitHub
- Run build
- Stop container
- Commit container to app image
- Start the app container

PRO

- Improved security
- Easy to use

CONTRA

- Limited possibilities
- Source S2I for Java is slow
- Lock-In

WRAP UP

- Dockerfiles are OK but limited
- There are many alternative ways to create Docker images
- Pick the one which fits your use case best

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QUESTIONS ?

Blog	https://ro14nd.de
Slides	https://github.com/ro14nd-talks/docker-container-loading

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