DOCKERFILES : BUILDING DOCKER IMAGES AUTOMATICALLY - FROM, MAINTAINER, AND BUILD CONTEXT

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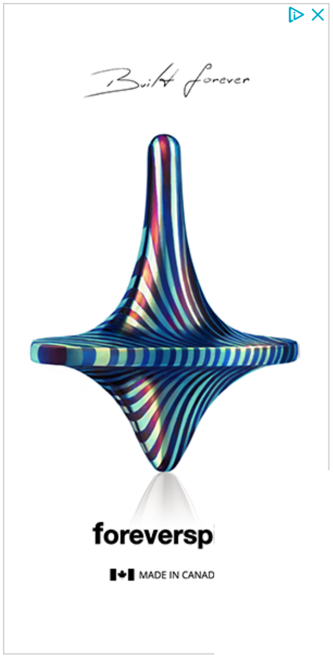

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Introduction

We create Docker containers using **[base]** images. An image can be basic, with nothing but the operating-system fundamentals, or it can consist of a sophisticated pre-built application stack ready for launch.

When we build images with docker, each action taken (i.e. a command executed such as **apt-get install**) forms a new layer on top of the previous one. These base images then can be used to create new containers.

Docker & K8s

Docker install on Amazon Linux AMI (/DevOps/Docker/Docker_Install_O

Docker install on EC2 Ubuntu

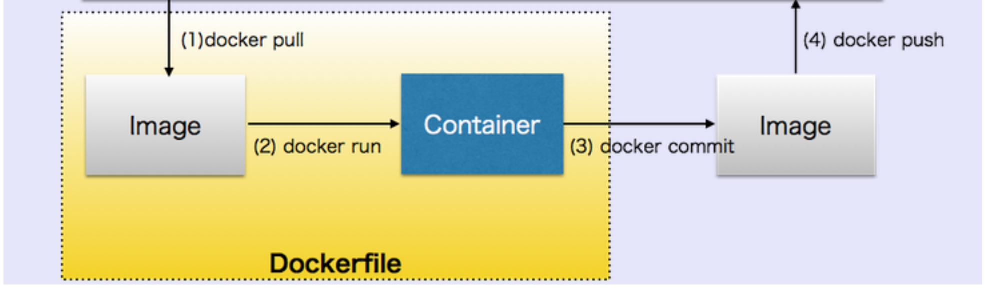

Image source: Docker (http://hondou.homedns.org/pukiwiki/pukiwiki.php?Docker%20%A4%B6%A4%C3%A4%AF%A4%EA%B8%C0%A4%A6%A4%C8%B2%BF%3F)

In this chapter, we're going to learn how to automate this process via instructions in **Dockerfiles**. A Dockerfile is a text document that contains all the commands we would normally execute manually in order to build a Docker image. By calling `docker image build` from our terminal, we can have Docker build our image executing the instructions successively step-by-step, layer-by-layer, automatically from a source (base) image.

The docker project offers higher-level tools which work together, built on top of some Linux kernel features. The goal is to help developers and system administrators port applications with all of their dependencies included, and get them running across systems and machines headache free.

Docker achieves this by creating safe, `LXC (Linux Containers)` based environments for applications called `docker containers`. These containers are created using docker images, which can be built either by executing commands manually or automatically through `Dockerfiles`.

Dockerfile

Each `Dockerfile` is a script, composed of various commands (instructions) and arguments listed successively to automatically perform actions on a base image in order to create (or form) a new one. They are used for organizing things and greatly help with deployments by simplifying the process start-to-finish.

`Dockerfiles` begin with defining an image `FROM` which the build process starts. Followed by various other methods, commands and arguments (or conditions), in return, provide a new image which is to be used for creating docker containers.

Sample Dockerfile

Here is our Dockerfile we're going to playing with in this chapter. We'll run instructions from this file step by step by uncommenting and commenting each line.

```
FROM debian:latest
MAINTAINER devops@bogotobogo.com

# 1 - RUN
RUN apt-get update && DEBIAN_FRONTEND=noninteractive apt-get install -yq apt-utils
RUN DEBIAN_FRONTEND=noninteractive apt-get install -yq htop
RUN apt-get clean

# 2 - CMD
CMD ["htop"]
CMD ["ls", "-l"]

# 3 - WORKDIR and ENV
WORKDIR /root
ENV DZ version1

# 4 - ADD
ADD run.sh /root/run.sh
CMD ["./run.sh"]

# 5 - ENTRYPOINT (vs CMD)
ENTRYPOINT ["./run.sh"]
CMD ["arg1"]
```

Dockerfile format

Here is the format of the `Dockerfile`:

```
# Comment
INSTRUCTION arguments
```

The Instruction is not case-sensitive, however convention is for them to be UPPERCASE in order to distinguish them from arguments more easily.

Docker runs the instructions in a Dockerfile in order. The first instruction must be `FROM` in order to specify the Base Image from which we are building.

Docker will treat lines that begin with # as a comment.

automatically IV - CMD
(/DevOps/Docker/Docker_Dockerfi

Dockerfile - Build Docker images automatically V - WORKDIR, ENV, ADD, and ENTRYPOINT
(/DevOps/Docker/Docker_Dockerfi

Docker - Apache Tomcat
(/DevOps/Docker/Docker_Apache_

Docker - NodeJS
(/DevOps/Docker/Docker-NodeJS.php)

Docker - NodeJS with hostname
(/DevOps/Docker/Docker-NodeJS-with-hostname.php)

Docker Compose - NodeJS with MongoDB
(/DevOps/Docker/Docker-Compose-Node-MongoDB.php)

Docker - Prometheus and Grafana with Docker-compose
(/DevOps/Docker/Docker_Prometh

Docker - StatsD/Graphite/Grafana
(/DevOps/Docker/Docker_StatsD_G

Docker - Deploying a Java EE JBoss/WildFly Application on AWS Elastic Beanstalk Using Docker Containers
(/DevOps/Docker/Docker_Containe

Docker : NodeJS with GCP Kubernetes Engine
(/DevOps/Docker/Docker-NodeJS-GCP-Kubernetes-Engine.php)

Docker : Jenkins Multibranch Pipeline with Jenkinsfile and Github (/DevOps/Docker/Docker-Jenkins-Multibranch-Pipeline-with-Jenkinsfile-and-Github.php)

Docker : Jenkins Master and Slave (/DevOps/Docker/Docker-Jenkins-Master-Slave-Agent-ssh.php)

Docker - ELK : ElasticSearch, Logstash, and Kibana
(/DevOps/Docker/Docker_ELK_Elas

Docker - ELK 7.6 : Elasticsearch on Centos 7
(/DevOps/Docker/Docker_ELK_7_6_
Docker - ELK 7.6 : Filebeat on

FROM

The `FROM` instruction sets the `Base Image` for subsequent instructions. As such, a valid Dockerfile must have `FROM` as its first instruction. The image can be any valid image. But it is especially easier to start by pulling an image from the Public Repositories (http://docs.docker.com/userguide/dockerrepos/#using-public-repositories).

MAINTAINER

```
MAINTAINER <name>
```

The `MAINTAINER` instruction allows us to set the Author field of the generated images.

Docker image build & context

To build an image from a source repository, we create a description file called `Dockerfile` at the root of our repository. This file will describe the steps to assemble the image.

Then we call `docker image build` with the path of our source repository as the argument:

```
Usage: docker image build [OPTIONS] PATH | URL | -
```

It will build a new image from the source code at PATH.

Here is an example using the current directory (".") as its path:

```
$ sudo docker image build .
```

The path to the source repository defines where to find the `context` of the build. The build is run by the Docker daemon, not by the CLI, so the whole context must be transferred to the daemon. The Docker CLI reports "Sending build context to Docker daemon" when the context is sent to the daemon.

Note: Avoid using root directory, /, as the root of the source repository. The docker image build command will use whatever directory contains the `Dockerfile` as the `build context` (including all of its subdirectories). The build context will be sent to the Docker daemon before building the image, which means if we use / as the source repository, the entire contents of our hard drive will get sent to the daemon (and thus to the machine running the daemon). We probably don't want that. In most cases, it's

Centos 7
(/DevOps/Docker/Docker_ELK_7_6

Docker - ELK 7.6 : Logstash on Centos 7
(/DevOps/Docker/Docker_ELK_7_6

Docker - ELK 7.6 : Kibana on Centos 7 Part 1
(/DevOps/Docker/Docker_ELK_7_6

Docker - ELK 7.6 : Kibana on Centos 7 Part 2
(/DevOps/Docker/Docker_ELK_7_6

Docker - ELK 7.6 : Elastic Stack with Docker Compose
(/DevOps/Docker/Docker_ELK_7_6

Docker - Deploy Elastic Cloud on Kubernetes (ECK) via Elasticsearch operator on minikube
(/DevOps/Docker/Docker_Kuberne

Docker - Deploy Elastic Stack via Helm on minikube
(/DevOps/Docker/Docker_Kuberne

Docker Compose - A gentle introduction with WordPress
(/DevOps/Docker/Docker-Compose.php)

Docker Compose - MySQL
(/DevOps/Docker/Docker-Compose-MySQL.php)

MEAN Stack app on Docker containers : micro services
(/MEAN-Stack/MEAN-Stack-NodeJS-Angular-Docker.php)

Docker Compose - Hashicorp's Vault and Consul Part A (install vault, unsealing, static secrets, and policies)
(/DevOps/Docker/Docker-Vault-Consul.php)

Docker Compose - Hashicorp's Vault and Consul Part B (EaaS, dynamic secrets, leases, and revocation)
(/DevOps/Docker/Docker-Vault-Consul-B.php)

Docker Compose - Hashicorp's Vault and Consul Part C (Consul)
(/DevOps/Docker/Docker-Vault-Consul-C.php)

Docker Compose with two

best to put each Dockerfile in an empty directory, and then add only the files needed for building that Dockerfile to that directory. To further speed up the build, we can exclude files and directories by adding a `.dockerignore` file to the same directory.

The Docker daemon will run our steps one-by-one, committing the result to a new image if necessary, before finally outputting the ID of our new image. The Docker daemon will automatically clean up the context we sent.

Note that each instruction is run independently, and causes a new image to be created.

Whenever possible, Docker will re-use the intermediate images, accelerating docker build significantly.

```
$ docker build --help

Usage: docker build [OPTIONS] PATH | URL | -

Build a new image from the source code at PATH

  -t, --tag=""          Repository name (and optionally a tag) to be applied to the resulting imag
```

Continued in Dockerfile - Build Docker images automatically II - revisiting FROM, MAINTAINER, build context, and caching (http://www.bogotobogo.com/DevOps/Docker/Docker_Dockerfile_to_build_images_automatically_2.php).

Docker & K8s

1. Docker install on Amazon Linux AMI (/DevOps/Docker/Docker_Install_On_Amazon_Linux_AMI.php)
2. Docker install on EC2 Ubuntu 14.04 (/DevOps/Docker/Docker_Install_On_EC2_Ubuntu.php)
3. Docker container vs Virtual Machine (/DevOps/Docker/Docker_Container_vs_Virtual_Machine.php)
4. Docker install on Ubuntu 14.04 (/DevOps/Docker/Docker_Install_On_Ubuntu_14.php)
5. Docker Hello World Application (/DevOps/Docker/Docker_Hello_World_Application.php)
6. Nginx image - share/copy files, Dockerfile (/DevOps/Docker/Docker_Nginx_WebServer.php)
7. Working with Docker images : brief introduction (/DevOps/Docker/Docker_Working_with_images.php)
8. Docker image and container via docker commands (search, pull, run, ps, restart, attach, and rm) (/DevOps/Docker/Docker_Commands_for_Images_Container.php)
9. More on docker run command (docker run -it, docker run --rm, etc.) (/DevOps/Docker/Docker_Run_Command.php)
10. Docker Networks - Bridge Driver Network (/DevOps/Docker/Docker-Bridge-Driver-Networks.php)
11. Docker Persistent Storage (/DevOps/Docker/Docker_Container_Persistent_Storage_Data_Share.php)

containers - Flask REST API service container and an Apache server container (/DevOps/Docker/Docker-Compose-FlaskREST-Service-Container-and-Apache-Container.php)

Docker compose : Nginx reverse proxy with multiple containers (/DevOps/Docker/Docker-Compose-Nginx-Reverse-Proxy-Multiple-Containers.php)

Docker compose : Nginx reverse proxy with multiple containers (/DevOps/Docker/Docker-Compose-Nginx-Reverse-Proxy-Multiple-Containers.php)

Docker & Kubernetes : Envoy - Getting started (/DevOps/Docker/Docker-Envoy-Getting-Started.php)

Docker & Kubernetes : Envoy - Front Proxy (/DevOps/Docker/Docker-Envoy-Front-Proxy.php)

Docker & Kubernetes : Ambassador - Envoy API Gateway on Kubernetes (/DevOps/Docker/Docker-Envoy-Ambassador-API-Gateway-for-Kubernetes.php)

Docker Packer (/DevOps/Docker/Docker-Packer.php)

Docker Cheat Sheet (/DevOps/Docker/Docker-Cheat-Sheet.php)

Docker Q & A (/DevOps/Docker/Docker_Q_and_A

Kubernetes Q & A - Part I (/DevOps/Docker/Docker_Kuberne

Kubernetes Q & A - Part II (/DevOps/Docker/Docker_Kuberne

Docker - Run a React app in a docker (/DevOps/Docker/Docker-React-App.php)

Docker - Run a React app in a docker II (snapshot app with nginx) (/DevOps/Docker/Docker-React-App-2-SnapShot.php)