

J-TECH
TALK

编写Dockerfile的 最佳实践

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线上直播分享回顾



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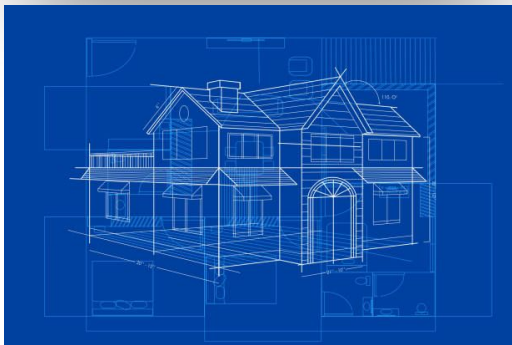
What is Dockerfile?

01

What is Dockerfile?

Dockerfile/Blueprint

```
FROM ubuntu:18.04
LABEL author="zhaofeng.miao@jina.ai"
COPY . /app
RUN touch /app/test
RUN rm -r /app/test
CMD echo 'hello S&T'
```



Build

```
docker build -t hello-world .
```



Use

```
docker run hello-world
```



Why it's important to write a good Dockerfile?

02

Write a good Dockerfile

Why?

1. **Reduce the size of Docker image.**
 - a. **Easier for transmission
(faster push/pull)**
 - b. **Smaller storage
requirements**

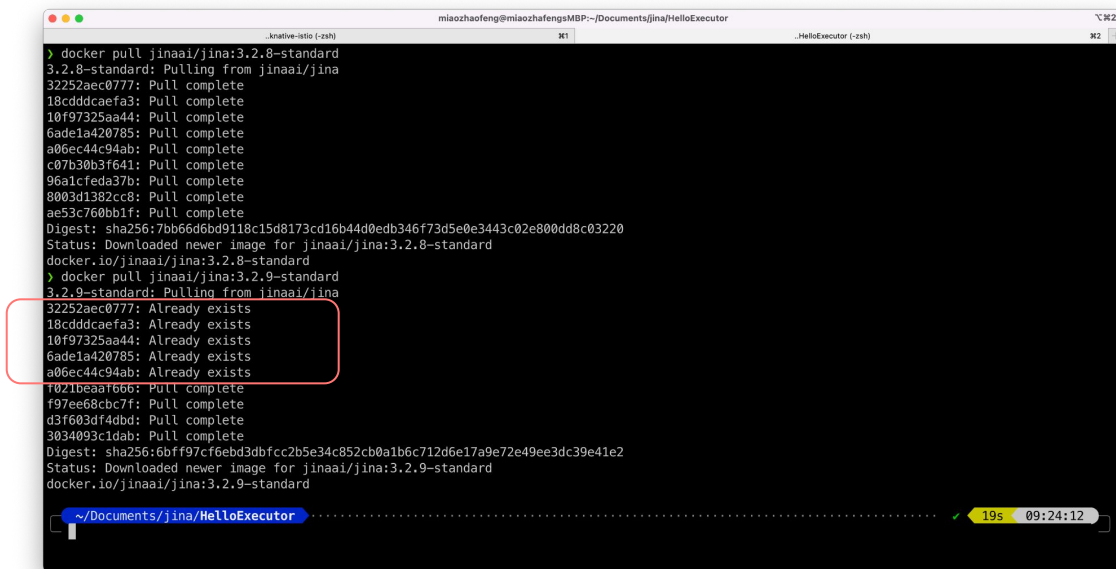


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Write a good Dockerfile

Why?

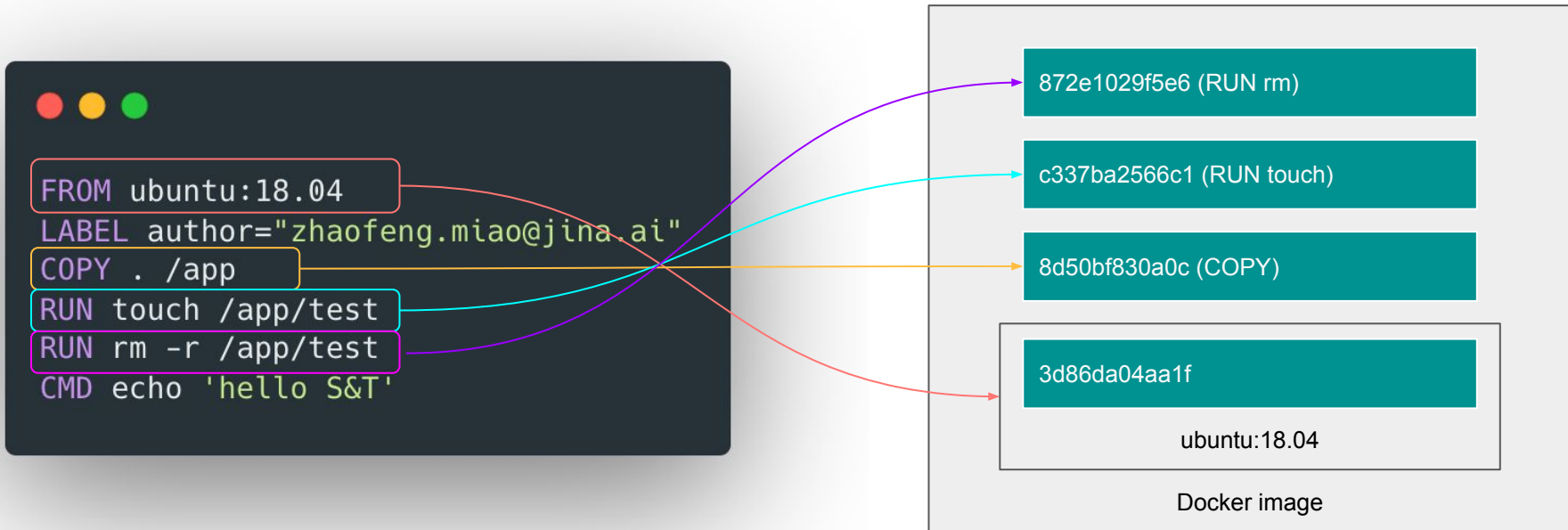
1. Reduce the size of Docker image.
 - a. Easier for transmission (faster push/pull)
 - b. Smaller storage requirements
2. Get more opportunities to take advantage existing cache layer



```
miaozaofeng@miaozaofengMBP:~/Documents/jina>HelloExecutor
> docker pull jinaai/jina:3.2.8-standard
3.2.8-standard: Pulling from jinaai/jina
32252aec0777: Pull complete
18cdddcaefa3: Pull complete
10f97325aa44: Pull complete
6ade1a420785: Pull complete
a06ec44c94ab: Pull complete
c07b30b3f641: Pull complete
96a1cfeda37b: Pull complete
8003d1382cc8: Pull complete
ae53c760bb1f: Pull complete
Digest: sha256:7bb66d6bd9118c15d8173cd16b44d0edb346f73d5e0e3443c02e800dd8c03220
Status: Downloaded newer image for jinaai/jina:3.2.8-standard
docker.io/jinaai/jina:3.2.8-standard
> docker pull jinaai/jina:3.2.9-standard
3.2.9-standard: Pulling from jinaai/jina
32252aec0777: Already exists
18cdddcaefa3: Already exists
10f97325aa44: Already exists
6ade1a420785: Already exists
a06ec44c94ab: Already exists
f021beaa1666: Pull complete
f97ee68cbc7f: Pull complete
d3f603df4dbd: Pull complete
3034093c1dab: Pull complete
Digest: sha256:6bfff97cf6ebd3dbfcc2b5e34c852cb0a1b6c712d6e17a9e72e49ee3dc39e41e2
Status: Downloaded newer image for jinaai/jina:3.2.9-standard
docker.io/jinaai/jina:3.2.9-standard
```

What's a Docker image underneath?

What does “cache layer” means?





What's a Docker image underneath?

What does “cache layer” means?

Linux/Unix:

Is `/var/lib/docker/overlay2`

Mac:

Not easy to see this folder since it's
using Hyperkit (Virtualized)

```
/ # cd /var/lib
/var/lib # ls
apk      docker      ip6tables  iptables  misc      udhcpd
/var/lib # cd docker/
/var/lib/docker # ls
buildkit  containers  network    plugins    swarm      trust
containerd image        overlay2    runtimes    tmp         volumes
/var/lib/docker # cd overlay2/
/var/lib/docker/overlay2 # ls
014c28c6bc19d290b6aa87a833d8e7ad313ac824207033b4ac2d0755f035c9a0
01910d1ba970901d4e199e6162714a097ca433c1bcd49bd244da391937b6de4b
024afb859ae5ae99df689294287c3565c2c6b1a40ee4157763c667dc8b99c871
036b61ea5aec54dce67f39a876968d511615fbee498ff94eb90e96e8b327591e2
03e796aa95e15027ce6baaae704a57458f9c73752f1f9f82e206ad9709766fa9
0496cb06c38f33556acaf2d0b16b299ae96a815fe9ff0298200682a166cf72
0520739c7b5484caa814353dd890be1e56501374379cfb047a091654deecb801
058c327ab7d0a02b663f0c92e589e68fbdcb2a3bf4413b13bbec5e3e652959b3
061f6e6600d959b3138cd0f7e7e4c32d3e43c99ae66b6e99fa04b92ae556af
06682845cbad19310b8e301d7d08138b1fac0a2a09acf929d39090e2fdad99b5
06948b78068769c7388054389cb1081ef99ae0144846f2c53aef23b16b10c104
06e7f41e02b115838c702c156914ea2e201d52587039da2df876952d715ba2b5
06f1cb621007a597da327c61695b512e764d23dfd9bc4dbbf049b162e7981a9b
0708c718e30ece68518f7ad42c538a549777555d44bac14b88afe2c8aaf9e153
0795bd9e71bc2ecc2ea277088da7acb0c1ecf9f79a1e4f4b12acaa4de2dfc5f65
07ab9d26691396c7aee3d4b400bf6e47f525945be05ff643ea0a37a548790028
0a65e149df3ef351b308a4ebc299d669f97058a05bca2d2b6c39064f8a7adb
0aac9a00f78562f99b201d8a7f7fb9f575a6c02f2e95f75fea386a94b1323e58
0c4be128433b543410a622eab2edea5adf222680b133f45c7453cc432273191
0ce053e40693b922060d49106eae355c77aa242f2eee904d9bdfb59e767fff4040
0dl87002b6fecb5d5cae00f2b8443592c88a4882cea8b4d591db74a60b990a61
0ee813e359a874cf92112465f07d56b49713c4822726d7fd100a7c2ccd0a247
0f97a30f09c7ef3d4c85cc8cd47ef369602bfdc995da4cf7fedb13660a277f2
0ffbdc6d5f338d03e9f502b7df10e183c6606b2f288f56369e950d74dd46642a
1019a0a5ecbce661dec50c859f3656d3f319493e4a168ea750a381c7a64b013
10409c3948c2877fac9846c83cea098b399d741157521cafe5c8be68ee4272be
1184c6457d7b88bd4c57f038a91f90bc452cea6d214f9c48fbcld5d066cc8ff1
131a7efc7bbb8e18ac0af3f3afb868e0eab39f845deb87c2ce0f151a9b0ad13
13e81a6eec3586b750182053d9e38956ceccc7b25956bd89676b45b34dd41768
1737759bce7c6ccea0124b3188c671b212aff88a8b68a7b3fbcd7a8596546111
173cc2eac451ed2bb4e112a9b222993bf9e2024548245862d3aa7a23efc8f11
```

Principles

03

Principles for writing Dockerfile

1. Only contains minimum things

Smaller, faster and easier to share



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Principles for writing Dockerfile

2. Always remember you are building several layers instead of one image

Understand the actual way to store is important for writing a good Dockerfile



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Action items

04

Action items for writing Dockerfile

1. Use popular image as base image

For example: **alpine**, **busybox**, **python**...

Not just because they are more reliable, **but also there is more opportunities to take advantage of existing layer in users' machine.**



alpine

Official Image

Updated a day ago

1B+ 8.6K
Downloads Stars



busybox

Official Image

Updated 18 days ago

1B+ 2.5K
Downloads Stars



python

Official Image

Updated 2 hours ago

1B+ 7.2K
Downloads Stars

Python is an interpreted, interactive, object-oriented,...

Container	Windows	Linux	386	mips64le
PowerPC 64 LE	IBM Z	ARM	x86-64	ARM 64
Programming Languages				



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Action items for writing Dockerfile

2. Use multi-stage builds as possible as you can (recommend)

Keep in mind that sometimes to leverage cache layers, this might not be the right way to go.

```
# syntax=docker/dockerfile:1
FROM golang:1.16-alpine AS build

# Install tools required for project
# Run `docker build --no-cache .` to
update dependencies
RUN apk add --no-cache git
RUN go get
github.com/golang/dep/cmd/dep

# List project dependencies with
Gopkg.toml and Gopkg.lock
# These layers are only re-built when
Gopkg files are updated
COPY Gopkg.lock Gopkg.toml
/go/src/project/
WORKDIR /go/src/project/
# Install library dependencies
RUN dep ensure -vendor-only

# Copy the entire project and build
it
# This layer is rebuilt when a file
changes in the project directory
COPY . /go/src/project/
RUN go build -o /bin/project

# This results in a single layer
image
FROM scratch
COPY --from=build /bin/project
/bin/project
ENTRYPOINT ["/bin/project"]
CMD ["--help"]
```

Action items for writing Dockerfile

3. Batch multi command that have same purpose into a single RUN

```
RUN apt-get update && apt-get install -y \  
    bzip2 \  
    cvs \  
    git \  
    mercurial \  
    subversion \  
    && rm -rf /var/lib/apt/lists/*
```



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4. Remove useless stuff

```
RUN apt-get update && apt-get install -y \  
    bzip2 \  
    cvs \  
    git \  
    mercurial \  
    subversion \  
    && rm -rf /var/lib/apt/lists/*
```

Action items for writing Dockerfile

5. Use .dockerignore

Exclude files not relevant to the build, such as .gitignore to git



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Action items for writing Dockerfile

6. Add proper labels

The [OCI Containers Specification](#) defines several conventional labels that encapsulate common use cases for container images.

- `org.opencontainers.image.created`
- `org.opencontainers.image.title`
- etc.

Pre-Defined Annotation Keys

This specification defines the following annotation keys, intended for but not limited to [image index](#) and [image manifest](#) authors:

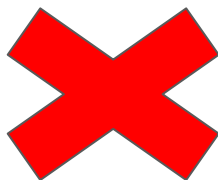
- **org.opencontainers.image.created** date and time on which the image was built (string, date-time as defined by [RFC 3339](#)).
- **org.opencontainers.image.authors** contact details of the people or organization responsible for the image (freeform string)
- **org.opencontainers.image.url** URL to find more information on the image (string)
- **org.opencontainers.image.documentation** URL to get documentation on the image (string)
- **org.opencontainers.image.source** URL to get source code for building the image (string)
- **org.opencontainers.image.version** version of the packaged software
 - The version MAY match a label or tag in the source code repository
 - version MAY be [Semantic versioning-compatible](#)
- **org.opencontainers.image.revision** Source control revision identifier for the packaged software.
- **org.opencontainers.image.vendor** Name of the distributing entity, organization or individual.
- **org.opencontainers.image.licenses** License(s) under which contained software is distributed as an [SPDX License Expression](#).
- **org.opencontainers.image.ref.name** Name of the reference for a target (string).
 - SHOULD only be considered valid when on descriptors on `index.json` within [image layout](#).
 - Character set of the value SHOULD conform to alphanum of `A-Za-z0-9` and separator set of `-._:@/+`
 - The reference must match the following [grammar](#):

```
ref      ::= component ("/" component)*
component ::= alphanum (separator alphanum)*
alphanum  ::= [A-Za-z0-9]+
separator ::= [-._:@/+] | "--"
```

Action items for writing Dockerfile

7. Assume only have one cpu (Application)

Leave the multi-cores leveraging to orchestrator.



Daemon process
Worker process



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8. Assume can stop anytime (Application)

- Stateless
- Graceful stop
- etc.



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A useful tool for debugging docker image – **dive**

Sum up

- **Docker image consists of layers**
- **2 Principles**
- **Several action items**

References:

- [Best practices for writing Dockerfile](#)
- [About storage drivers](#)
- [GitHub Repo: Dive](#)

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