Understanding the Dockerfile Format

What is Dockerfile?

Frequently used Dockerfile command

Difference between CMD, RUN, and ENTRY POINT?

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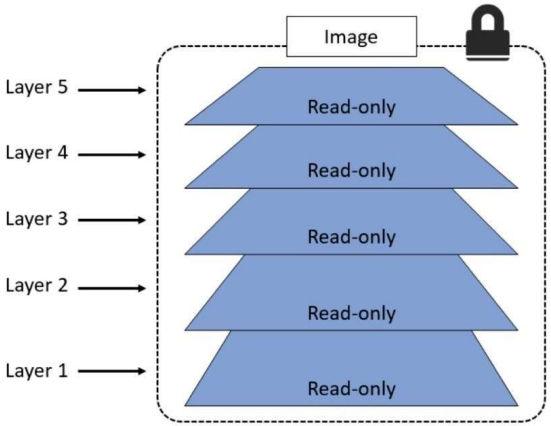
"Blueprint for creating a docker image"

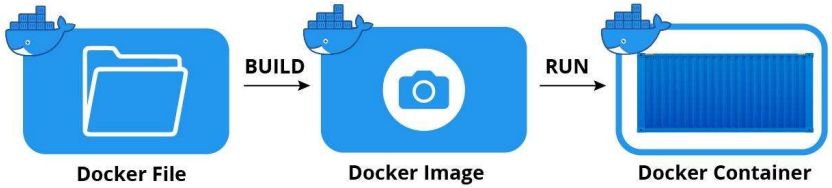
Docker builds images automatically by reading the instructions from a Dockerfile. It is a text file without any ***.txt extensions*** *that contains all commands in order, needed to build a given image. It is always named* ***Dockerfile.***

Docker image consists of read-only layers each of which represents a Dockerfile instruction. The layers are stacked and each one is a delta of the changes from the previous layer.

Containers are read-write layers that are created by docker images.

In simple words, a Dockerfile is a set of instructions that creates a stacked-layer for each instruction that collectively makes an image(which is a prototype or template for containers)





Frequently used Dockerfile commands -

INSTRUCTION	DESCRIPTION
FROM	Defines a base image, it can be pulled from docker hub (for example- if we want to create a javascript application with node as backend then we need to have node as a base image, so it can run node application.)
RUN	Executes command in a new image layer(we can have multiple run commands)
CMD	Command to be executed when running a container(It is asked to have one CMD command, If a Dockerfile has multiple CMDs, it only applies the instructions from the last one.
EXPOSE	Documents which ports are exposed (It is only used for documentation)
ENV	Sets environment variables inside the image
COPY	Copies files/directories into the image

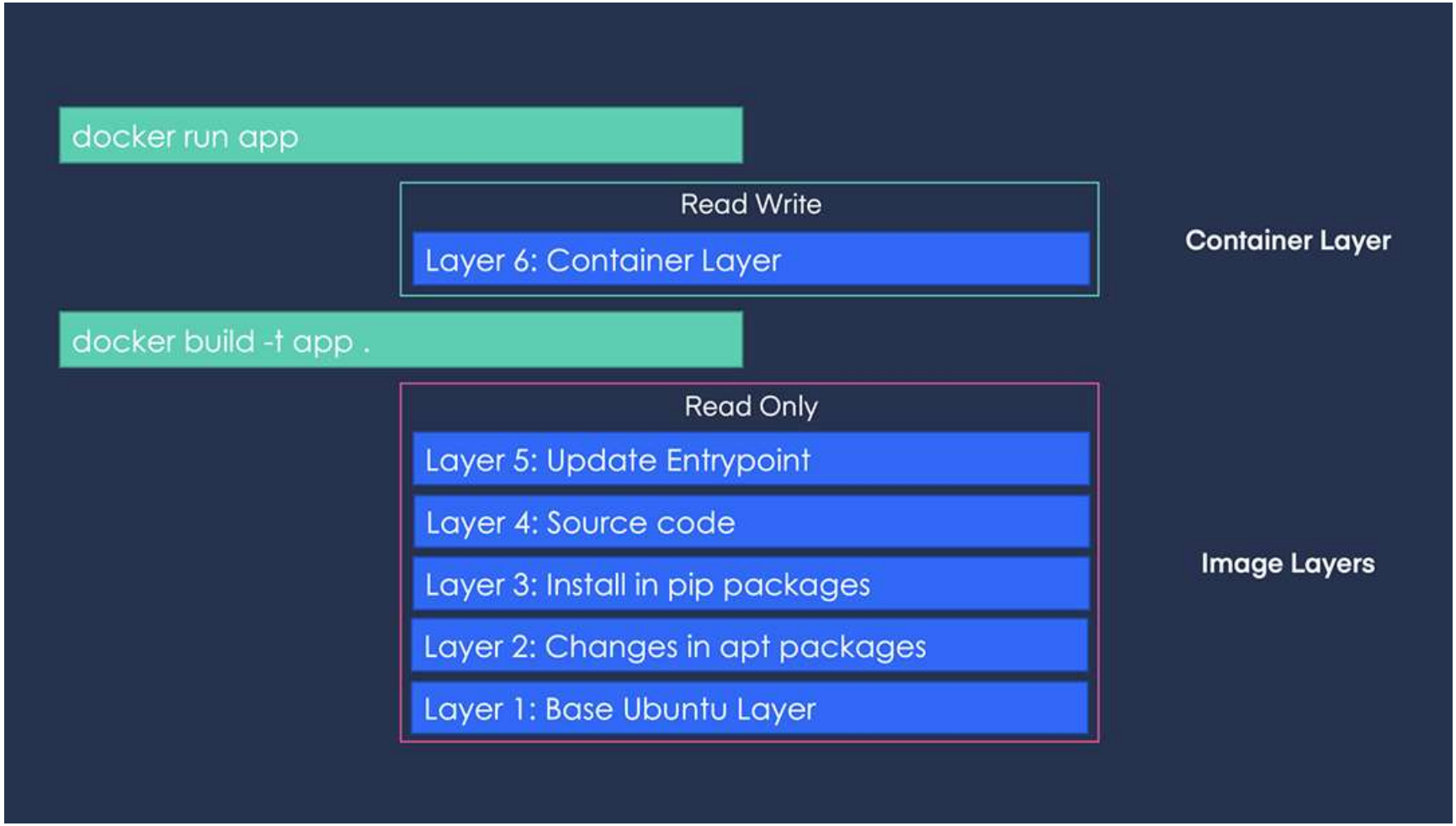
INSTRUCTION	DESCRIPTION
`ADD`	A more feature-rich version of the `COPY` instruction. COPY is preferred over `ADD`.
`ENTRYPOINT`	Define a container's executable (You cannot override and ENTRYPOINT when starting a container unless you add the `--entrypoint` flag.)
`VOLUME`	Defines which directory in an image should be treated as a volume. The volume will be given a random name which can be found using `docker inspect` command.
`WORKDIR`	Defines the working directory for subsequent instructions in the `Dockerfile`
`ARG`	Defines variables that can be passed by the `docker build --build-arg` command and used within the `Dockerfile`.

```
#Basic Dockerfile

FROM ubuntu:18.04

COPY . /app

RUN make /app

CMD python /app/app.py
```

Each instruction creates one layer:

- `FROM` creates a layer from the `ubuntu:18.04` Docker image.
- `COPY` adds files from your Docker client's current directory.
- `RUN` builds your application with `make`.
- `CMD` specifies what command to run within the container.

Let's see this demo example of Docker layer architecture-



If some files should be prevented from being copied into the Docker image(it can be sensitive informations like .env files which contains API keys or any other files that are not much important), a **.dockerignore** file can be added at the same level as

the `Dockerfile` where files that should not be copied over into the Docker image can be specified. By this if we are using a `COPY` or `ADD` instruction in a `Dockerfile` to specify the files to be added into a Docker image, any file specified in the `.dockerignore` file will be ignored and not added into the Docker image.

Difference between RUN,CMD and ENTRYPOINT?

Shell and Exec forms

All three instructions (RUN, CMD and ENTRYPOINT) can be specified in *shell* form or *exec* form.

Shell form

```
<instruction> <command>
```

```
RUN apt-get install python3
```

```
CMD echo "Hello world"
```

```
ENTRYPOINT echo "Hello world"
```

Exec form

This is the preferred form for CMD and ENTRYPOINT instructions. <instruction> ["executable", "param1", "param2", ...]

```
RUN ["apt-get", "install", "python3"]

CMD ["/bin/echo", "Hello world"]

ENTRYPOINT ["/bin/echo", "Hello world"]
```

RUN - RUN instruction allows you to install your application and packages required for it. It executes any commands on top of the current image and creates a new layer by committing the results. Often you will find multiple RUN instructions in a Dockerfile.

```
RUN apt-get install python
```

CMD - CMD instruction allows you to set a default command, which will be executed only when you run container without specifying a command. If Docker container runs with a command, the default command will be ignored. If Dockerfile has more than one CMD instruction, all but last CMD instructions are ignored.

```
CMD "echo" "Hello World!"
```

ENTRYPOINT - ENTRYPOINT instruction allows you to configure a container that will run as an executable. It looks similar to CMD, because it also

allows you to specify a command with parameters. The difference is ENTRYPOINT command and parameters are not ignored when Docker container runs with command line parameters.

Prefer ENTRYPOINT to CMD when building executable Docker image and you need a command always to be executed. Additionally use CMD if you need to provide extra default arguments that could be overwritten from command line when docker container runs.

Choose CMD if you need to provide a default command and/or arguments