Module 1: Working with Docker Images

Every Docker container is based on an image.

Till now we have been using images that were created by others and available in Docker Hub.

Docker can build images automatically by reading the instructions from a Dockerfile

A Dockerfile is a text document that contains all the commands a user could call on the command line to assemble an image.

Module 2: Overview of Dockerfile

Thee format of Dockerfile is similar to the below syntax:

Comment
INSTRUCTION arguments

A Dockerfile must start with a FROM` instruction.
The FROM instruction specifies the Base Image from which you are building.

There are multiple INSTRUCTIONS that are available in Dockerfile, some of these include:

- FROM
- RUN
- ENTRYPOINT
- CMD
- EXPOSE

Module 3: COPY vs ADD Instruction

COPY and ADD are both Dockerfile instructions that serve similar purposes.

They let you copy files from a specific location into a Docker image.

3.1 Difference between COPY and ADD

COPY takes in an src and destination. It only lets you copy in a local file or directory from your host

ADD lets you do that too, but it also supports 2 other sources.

First, you can use a URL instead of a local file/directory.
Secondly, you can extract a tar file from the source directly into the destination.

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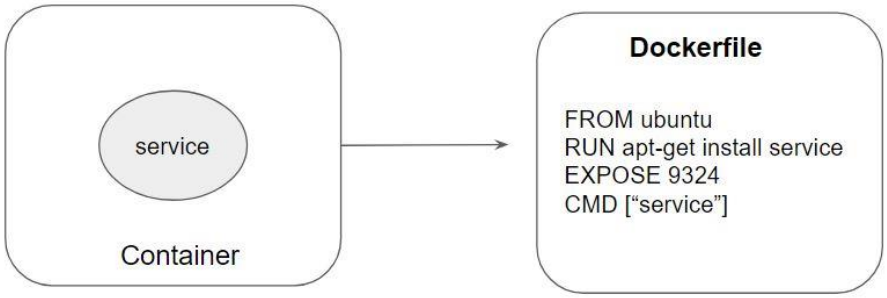
Module 4: EXPOSE Instruction

The EXPOSE instruction informs Docker that the container listens on the specified network ports at runtime.

The EXPOSE instruction does not actually publish the port.

It functions as a type of documentation between the person who builds the image and the person who runs the container, about which ports are intended to be published.



Module 5: ENTRYPOINT Instruction

The best use for ENTRYPOINT is to set the image's main command

ENTRYPOINT doesn't allow you to override the command.

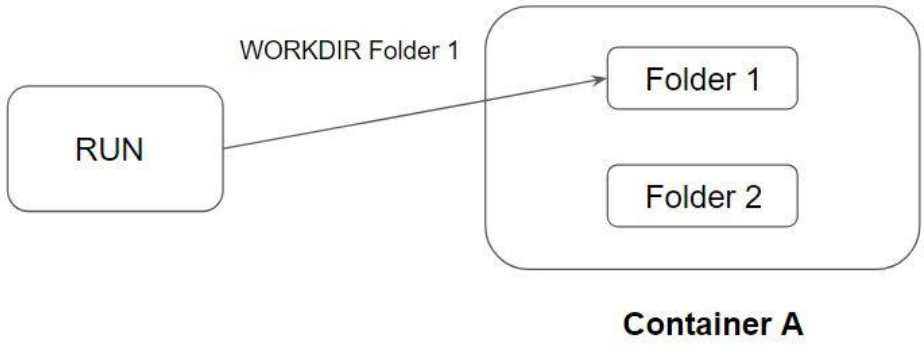
It is important to understand the distinction between CMD and ENTRYPOINT.

Sample Code Snippet:

```
FROM ubuntu
ENTRYPOINT ["top", "-b"]
CMD ["-c"]
```

Module 6: WORKDIR Instruction

The WORKDIR instruction sets the working directory for any RUN, CMD, ENTRYPOINT, COPY and ADD instructions that follow it in the Dockerfile



The WORKDIR instruction can be used multiple times in a Dockerfile

Sample Snippet:

- WORKDIR /a
- WORKDIR b

- WORKDIR c
- RUN pwd

Output = /a/b/c

Module 7: Tagging Docker Images

Docker tags convey useful information about a specific image version/variant.

They are aliases to the ID of your image which often look like this: 8f5487c8b942

```
[root@docker-demo ~]# docker images
REPOSITORY          TAG                 IMAGE ID            CREATED             SIZE
alpine              latest              caf27325b298        15 hours ago        5.53MB
<none>              <none>              7c116aacaae3        17 hours ago        172MB
```

docker tag 7c116aacaae sumitpuri/alpine:v2

Module 8: Docker Commit

Whenever you make changes inside the container, it can be useful to commit a container's file changes or settings into a new image.

By default, the container being committed and its processes will be paused while the image is committed.

Syntax:

docker container commit CONTAINER-ID myimage01

The --change option will apply Dockerfile instructions to the image that is created.

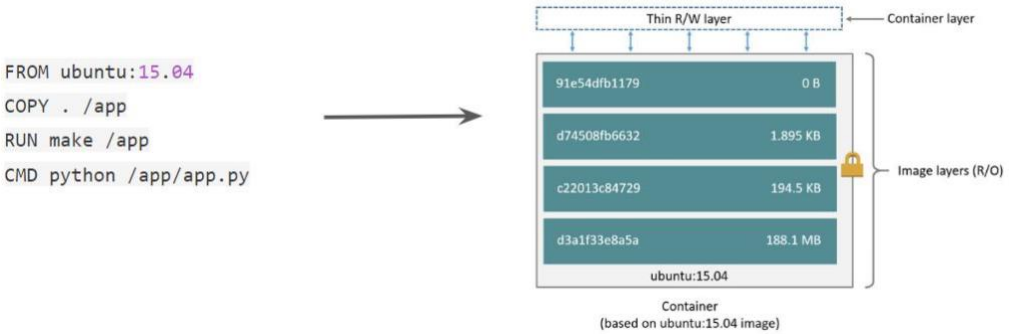
Supported Dockerfile instructions:

CMD | ENTRYPOINT | ENV | EXPOSE
LABEL | ONBUILD | USER | VOLUME | WORKDIR

Module 9: Docker Image Layers

A Docker image is built up from a series of layers.

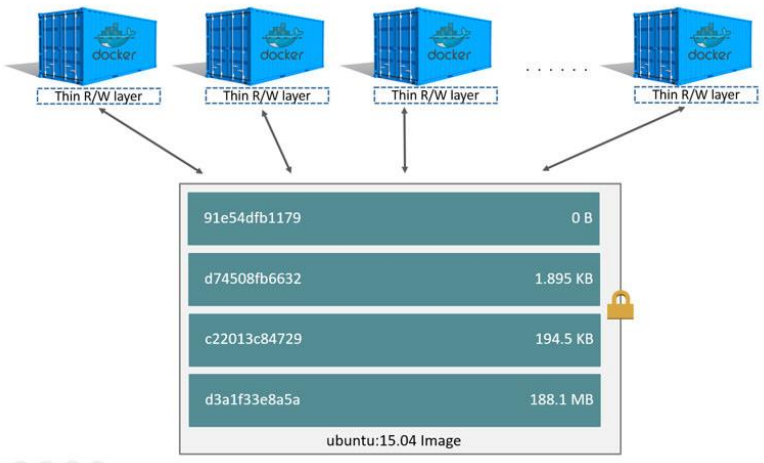
Each layer represents an instruction in the image's Dockerfile.



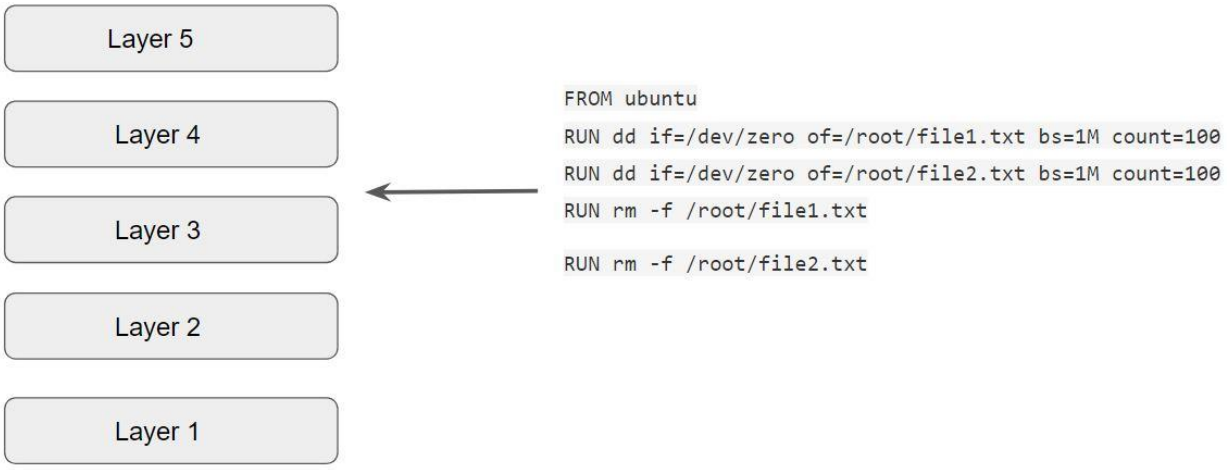
9.1 Difference Between Docker Containers and Docker Image

The major difference between a container and an image is the top writable layer.

All writes to the container that adds new or modifies existing data are stored in this writable layer.

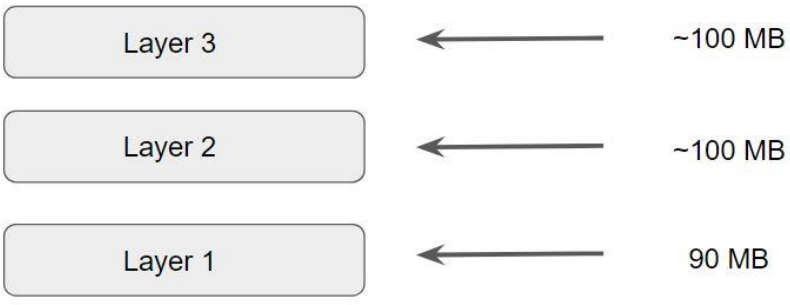


9.2 Understanding Image Layers:

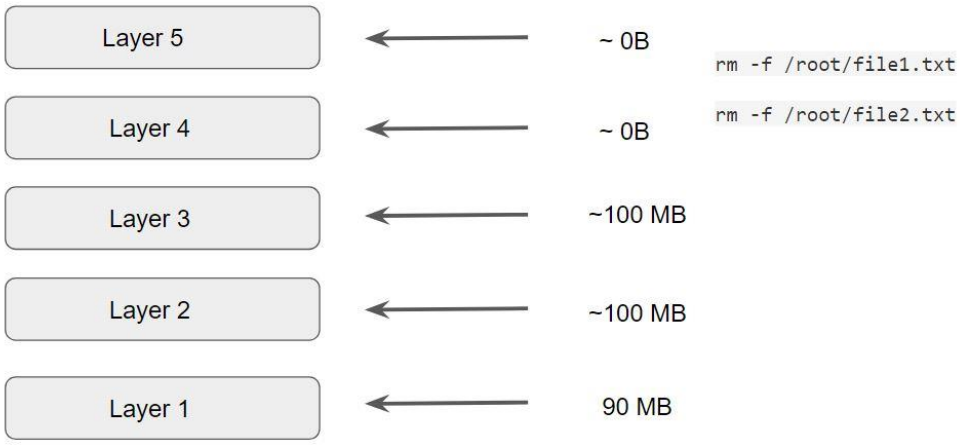


Analyzing the first three image layers:

```
FROM ubuntu
RUN dd if=/dev/zero of=/root/file1.txt bs=1M count=100
RUN dd if=/dev/zero of=/root/file2.txt bs=1M count=100
```



Analyzing the size of all the layers



Module 10: Managing Images with CLI

Docker CLI can be used to manage various aspects related to Docker Images which include building, removing, saving, tagging, and others.

We should be familiar with the docker image child-commands

Here are some of the sample commands that are available.

- docker image build
- docker image history
- docker image import
- docker image inspect
- docker image load
- docker image ls
- docker image prune
- docker image pull
- docker image push

Module 11: Inspecting Docker Images

A Docker Image contains lots of information, some of these include:

- Creation Date
- Command
- Environment Variables
- Architecture
- OS
- Size

docker image inspect command allows us to see all the information associated with a docker image.

Module 12: Docker Registry

A Registry a stateless, highly scalable server-side application that stores and lets you distribute Docker images.

Docker Hub is the simplest example that all of us must have used.

There are various types of registry available, which includes:

- Docker Registry
- Docker Trusted Registry
- Private Repository (AWS ECR)
- Docker Hub

To push the image to a central registry like DockerHub, there are three steps:

1. Authenticate your Docker client to the Docker Registry

```
[root@docker-demo ~]# docker login
Login with your Docker ID to push and pull images from Docker Hub. If you don't have a Docker ID,
ead over to https://hub.docker.com to create one.
Username: 5066
Password:
WARNING! Your password will be stored unencrypted in /root/.docker/config.json.
Configure a credential helper to remove this warning. See
https://docs.docker.com/engine/reference/commandline/login/#credentials-store

Login Succeeded
```

2. Tag Docker Image with Registry Repository and optional image tag.

   docker tag busybox sumitpuri/mydemo:v1

3. Push Image using docker push command:

   docker push sumitpuri/mydemo:v1

Module 13: Applying Filters for Docker Images

Description	Command
Search for Busybox image	docker search busybox
Search for Busybox image with Max Result of 5	docker search busybox --limit 5
Filter only official images	docker search --filter is-official=true nginx

Module 14: Moving Images Across Hosts

Example Use-Case:

James has created an application based on Docker. He has the image file in his laptop.

He wants to send the image to Matthew over email.

The **docker save** command will save one or more images to a tar archive

Example Snippet:

docker save busybox > busybox.tar

The **docker load** command will load an image from a tar archive

Example Snippet:

docker load < busybox.tar

Module 15: Build Cache

Docker creates container images using layers.

Each command that is found in a Dockerfile creates a new layer.

Docker uses a layer cache to optimize the process of building Docker images and make it faster.

```
[root@swarm02 build-cache]# docker build -t demo2
Sending build context to Docker daemon  3.072kB
Step 1/4 : FROM python:3.7-slim-buster
 ---> 87b1022604d5
Step 2/4 : COPY . .
 ---> Using cache
 ---> fe355c27a8ff
```

If the cache can't be used for a particular layer, all subsequent layers won't be loaded from the cache.