Docker

Each container is seperate
To run container from same image

docker run -it ubuntu
- Each container is an isolated

Docker cannot run windows on Linux since that's different → to OS kernal

1. We have to create images with dependencies included

2. Adding Dockerfile

FROM
WORKDIR
COPY
ADD
RUN
ENV
EXPOSE
USER
CMD
ENTRYPOINT

To build image

```
docker -t react .
```

- -t → tag
- react → name
- . → for location of Dockerfile

docker images

or

docker image ls

To run the image

— docker run -it react

name or container id

This will run the container in shell but we want it in the bash mode so

```
# docker run -it react bash
```

Alpine doesn't come with bash.

↳ docker run -it react sh

Dockerfile

```
FROM node:(exact path)
WORKDIR /app
COPY . .
```

← To set default Working Directory

To copy files with spaces we use array ["A", "B"]

A = copy with space

B = To location

`ADD file.zip .` ← Automatically uncompressed

`ADD https://` . ← Add from URL

These are the two options for which we can use add else we going to copy cmd

- In project files there is folder called node_modules which contains the dependesies which are in the extracted format when creating a image we would like to avoid using these files since these files makes image bigger + extra transfer time every time.

→ What we can do is exclude the folder and thoes dependencies will be still downloaded

To exclude a folder `.dockerignore`

↓

Benefits

① lower size

② faster transfer

after running the build we have to install the dependencies using `npm install`

npm install can be added to Dockerfile

`RUN npm install`

- `ENV API_URL = Http://app.com`
- `ENV API_URL Http://app.com` } ← older syntax

To view this in container $ENV

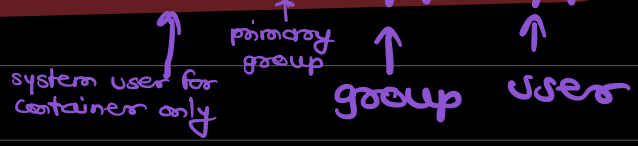
- Exposing Ports

`EXPOSE 3000`

By default Host mapping for the ports is required

- Setting the user

- `addgroup app` } → setting group first
- `adduser -S -G app app`



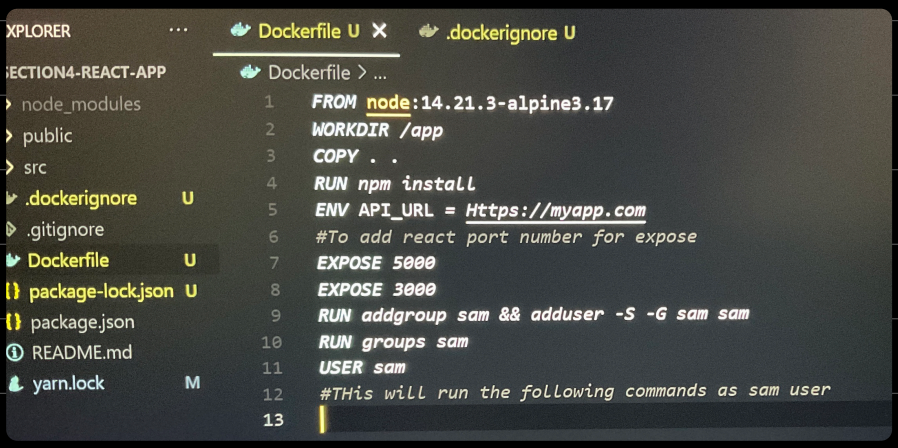
Adding user & then setting primary group as app

Combined — `addgroup app && adduser -S -G app app`

for security we take this step so we can add

This to our Dockerfile and add extra security layer

- Here is screenshot after adding Everything



- Defining Entrypoints

- CMD to run the commands specifically last mentioned command in Docker file

ex. CMD npm start

Difference bet^n RUN vs CMD

RUN runs at the start of container

- CMD is for running at runtime

Best use syntax for CMD ["npm", "start"]

ENTRYPOINT

Similar to CMD But it cannot be easily overwritten using | docker run react-app
echo hellow

This will overwrite the CMD from Dockerfile.

CMD or ENTRYPOINT is based on preference

• Speeding the Builds

To improve the Build we can make use of cache

Dockerfile optimization is important for this

— It checks if layers are re-used or not if no changes then it will use the same layer.

* We have to seperate the copy of dependencies in the dockerfiles to better optimize it
→ Because if we changed like a single line that will affect the dockerfile and

the whole file has to be copied again. that slows down the build.

soln → Copying dependencies seperately

* Optimization →
  Dockerfiles which doesn't change frequently has to be on the top.
  — Because Whenever there is change in docker file it will copy all the changed data and all files will also be transfered again

• Removing Image

`docker image prune` ← To remove temp images

- `docker container prune`
- `docker images` ← To see list of images

• Tagging images

- It is necessary to tag images properly for production build

`docker build -t react:main .`

(:) used for tagging

Same image can have multiple tags
to remove the same with multiple tag

- `docker image remove react2.1:latest`

tag name

- To change the tag of current build image

→ `docker image tag react2.2:latest`
`react2.2:updated`

- latest tag to images doesn't mean the latest tag in reality.

Pushing image to docker

- set the appropriate tag similar to your docker repo name
name /react-app

`docker image tag 511 name/react-app:1`

↓

Once done we can run docker push

```
docker push name/react-app:1
```

- Saving and loading images

- Saving

```
docker image save -o react.tar react-app
```

image name

Loading

- `docker image load -i react.tar`

- Section - 5
- Working with Containers

Running Container in detatched mode

- `docker run -d react2.1`

Will run the container in background

- docker running with name

- `docker run -d --name blue react2.1`

```
PS Z:\Subjects\DevOps\docker_files\Section 4- Images\section4-react-app\section4-react-app> docker ps
CONTAINER ID   IMAGE                  COMMAND                  CREATED         STATUS         PORTS      NAMES
596290d34e9d   aprazors/react-app:1   "docker-entrypoint.s…"   4 seconds ago   Up 3 seconds   3000/tcp   boring_maxwell
PS Z:\Subjects\DevOps\docker_files\Section 4- Images\section4-react-app\section4-react-app> docker run -d --name sky-high aprazors/react-app:1
a8f38d85b92f4cf7e4cd14cd7d32179f6406b6e01eb432a619cb88e720a462c7
PS Z:\Subjects\DevOps\docker_files\Section 4- Images\section4-react-app\section4-react-app> docker ps
CONTAINER ID   IMAGE                  COMMAND                  CREATED          STATUS          PORTS      NAMES
a8f38d85b92f   aprazors/react-app:1   "docker-entrypoint.s…"   4 seconds ago    Up 3 seconds    3000/tcp   sky-high
596290d34e9d   aprazors/react-app:1   "docker-entrypoint.s…"   47 seconds ago   Up 45 seconds   3000/tcp   boring_maxwell
PS Z:\Subjects\DevOps\docker_files\Section 4- Images\section4-react-app\section4-react-app>
```

- logs

`docker logs (container-id)`

`docker logs --help` for more

Publishing a port

EXPOSE 3000 ← let's container know that we are using port 3000 at container level. However, we need to enable this ports at Host level.

- `docker run -d -p 3000:3000 --name PS react2.1`

  ↑

  - Host port can be set anything

- Executing commands in running container

- docker exec ← to run commands on running container

- docker run ← to start the container and run commands

- `docker exec 3f3 ls-l`

`docker run` ← running new container
`docker start` ← running stopped container

- Container file system
- Containers have ephemeral storage like AWS instance store.
- We have to use EBS like storage for persistancy in containers.

Volumes

- `docker volume create app-data`
- `docker volume inspect app-data`

- `docker run -d -p 3000:3000 -v app-data:/app/data react2:1`

- We added RUN mkdir data in docker file to create directory for mount point in the dockerfile for the volume.
  (It should be added after creating user & WORKDIR)

- Best way to create volume is to do with running container but make sure you have the entrypoint in dockerfile for

mounting the dsire.

- `docker run -d -p 500:3000 -v app-data --name reactx2 react2.2`

- Copying files bet^n the host & containers

↓ Container → Host

docker cp `containerid:/app/log.txt` .

name : location

↓ Host to container cp

docker cp Hello.txt aod:/app

- Sharing source code with container.

- for production always create new build with proper tag for minor changes

- for development we can create a mapping

- Removing docker images at once

- `docker rmi -f $(docker image ls -q)`

To remove with stopped container

- `docker image rmi -f $(docker image ls -aq)`

Docker Compose

- docker-compose.yml
  → To install all the dependencies of frontend, Backend and other in one file

1. `docker-compose up`

- creating compose file
  — is more like a configuration file

`docker compose --help`
— This commands works a whole
impacts multiple services
↳ made necessary changes into
compose

2. Docker compose build

To force full rebuild
- docker-compose build --no-cache

starting Applications

- docker-compose up --help
- docker-compose up --build
- docker-compose up -d
- docker compose ps

To take it down
- docker compose down

- Docker Networking
  - Automatic networking bet^n each Application in that containers.
-

- Viewing logs

docker compose logs
docker logs imageid -f
↑
To follow.

- Publishing changes
* Mapping a directory. in compose.

- Some dependencies related to particular Application might be missing thoes has to be installed.

Simplest way
npm install in that folder

We can add persistant storage into Docker-compose.yml

```
api:-
  volumes:
    - ./backend:/app
```

So we mapped volume into backend folder so whenever there is change in backend that can automatically can

be reflected.

- Migrating the database

- To view the volumes
  - docker volume ls
  - ex. vidly_vidly ← vo
    - ↑ Application name

- docker-entrypoint.sh

Contains all the scripts or entrypoint command that should run

- Running Test

~ learn on your own.

Section - 7

• Deployment

- Deployment option.

  - Docker orchestration - kubernetes.

kodekloud.

Docker Basics

① Docker run image-name

② Docker run -d image-name

detached mode to make sure it's running

③ To again attach to it
Docker attach container_id-start.

④ Docker ps -a
if exit code is 137 that means killed manually
if exit code 0 means exited auto.

⑤ docker rm
docker rmi ← to rm image
docker rm first

⑥ docker pull just to pull & store
docker run to pull and run

⑦ docker exec cid cat /root

This will run cat on container

⑧ To map directory inside container

docker run -v /opt/datadir:/var/lib/mysql mysql

docker inspect blissful_hopper

⑨ Logs on background cid = containerid

docker logs cid

⑩ To append cmd's

docker run ubuntu cat/etc/

⑪ Enviornment

docker run -e APP_COLOR=blue name

- To know the env of images
  - docker inspect cid

- To know from the running containers

  - docker exec -it blue-app env

•• Commands vs Entrypoint

CMD command param1
CMD sleep 5

In case of cmd → the commandline parameter passed will get replaced

o but in entrypoint the get added.

- Entrypoint is a command which will run at the start of that container
So ex.

docker run ubuntu-sleeper 10

Here we only mentioned argument of 10 becoz the entrypoint has already mentioned the cmd sleep in entrypoint

ENTRYPOINT ["sleep"]

To overwrite the entrypoint

--entrypoint sleep ubuntu-sleeper 10

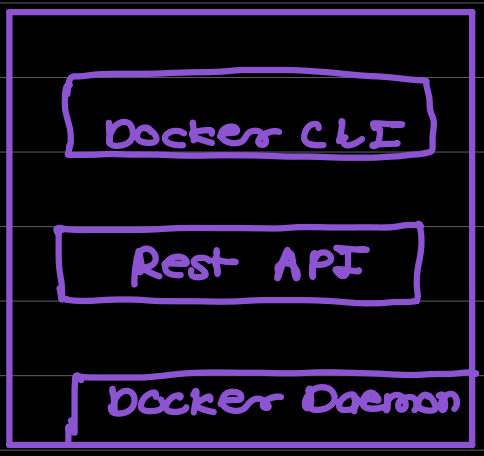
Docker Compose

v1: oldest and simplest version

v2: has a key called service
more options like networks,
depends_on and environment.

v3: Latest compatible with Docker compose
and docker swarm.

- Docker Engine



Docker Engine

- Docker uses cgroups to add restrictions to the resources

ex. docker run --cpu=.5 ubuntu
will just use 50% of the cpu

- Docker storage

— /var/lib/docker

In docker we can create a volume

→ - docker volume create data_volume

This step can also be skipped because if we just run the Below command docker will automatically create that volume.

docker run -v data_volume:/var/lib/mysql mysql

- To save it on different location

docker run -v /data/mysql:/var/lib/mysql mysql

↑ Bind mounting

New way for mounting
-- mount

```
docker run \
--mount type=bind,source=/data/mysql,\
target=/var/lib/mysql  mysql
```

Storage drivers

- AUFS
- ZFS
- BTRFS
- Device Mapper
- Overlay

Networking

① Bridge - Private internal network
To access containers internally we just map them to the port.

② Host network

```
docker run ubuntu --network=host
```

You will not be able to run multiple containers on the same host on the same ports as ports are now common.

③ none

docker run Linux --network=none

Debugg

- docker network ls
- docker inspect Linux
- docker has a built-in DNS to resolve to each other with DNS.
- Built-in dns is at 127.0.0.11 by default