CS 240
Computer
Systems

#18: Docker
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Containerization Solutions
We know that containers provide strong application isolation with medium-weight overhead. There are a few different containerization solutions available:

- **lxc**

- **rkt**

- **docker**

Docker Container Basic
docker is a containerization engine *(and associated management tools)* that allows for container images to run on your operating system.

- [A docker "image"]:

- [Operating System Abstractions]:

- [Operating System Resources]:

Creating a Docker for our MP4 Web Service:

18-docker/Dockerfile

```
1   FROM python:3.9
2
3   # Setup python libraries:
4   COPY mp4-flask/requirements.txt /
5   RUN pip install -r /requirements.txt
6
7   # Copy needed files to run:
8   COPY mp2-png/png-analyze /
9   COPY mp4-flask/app.py /
10  COPY mp4-flask/templates /templates
11
12  # Run server:
13  CMD ["python", "-m", "flask", "run",
    "--host=0.0.0.0"]
```

Line 1 (FROM):

Lines 4, 8-10 (COPY):

Line 5 (RUN):

LINE 13 (CMD):

Effectively, a dockerfile simply specifies the base image, all files needed, any setup commands (that are run during the build phase), and then the command to run during the run phase.

To build it:

```
$   docker build --tag cs240-mp4 .
```

Running a Docker Image

```
$  docker run --rm -it -p 5000:5000 cs240-mp4
```

- docker run

- --rm

- -it

- -p

- cs240-mp4

What do we expect to happen?

Mounting a Directory within Docker:

```
$  docker run --rm -it -v /home/waf/mp4-temp:/temp -p
   5000:5000 cs240-mp4
```

- -v

When is using the -v option critical?

Docker Images as Building Blocks

Every dockerfile starts with a `FROM <image>` -- all the way down to `FROM scratch` image that contains nothing.

cs240-mp4 image:

```
FROM python:3.9
...
```

python:3.9 image:

```
FROM buildpack-deps:buster
...
```

buildpack-deps:buster image:

```
FROM buildpack-deps:buster-scm
...
```

buildpack-deps:buster-scm image:

```
FROM buildpack-deps:buster-curl
...
```

buildpack-deps:buster-curl image:

```
FROM debian:buster
...
```

debian:buster image:

```
FROM scratch
ADD rootfs.tar.xz /
CMD ["bash"]
```

Modern Docker: "FROM alpine"