DOCKER 101

What, Why, How?

Hello!

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SDE - 1 @ Scalereal | Python | Django

Agenda

- What is Docker?

- What is an Image?

- What is Container?

- How Docker works?

- Why Docker?

- Docker vs Virtual Machine

- Important Docker Commands

- Dockerfile

- Docker Compose

- Docker Hub

- Practical

What is Docker?

- Open Platform for developing, shipping and running applications

- Enables you to separate your applications from your infrastructure so you can deliver software quickly

- 3.9k stars and counting on Github

- Solomon Hykes created Docker

- Making developers lives easier since 2013

What is an Image?

- A template which is used to create Docker Containers

- Building blocks of a Docker Container

- Created using docker build command
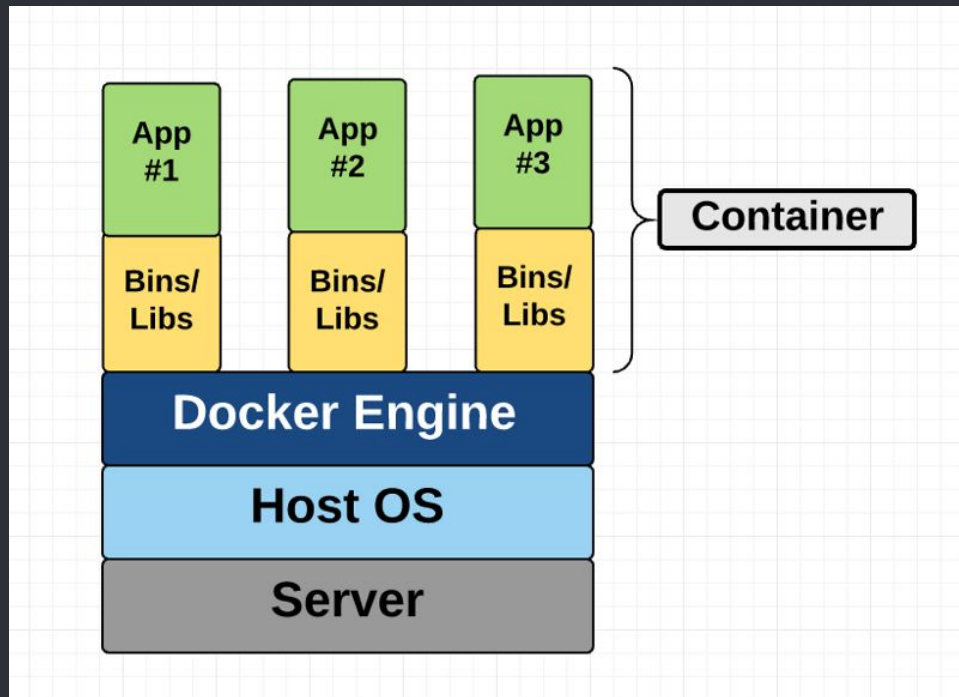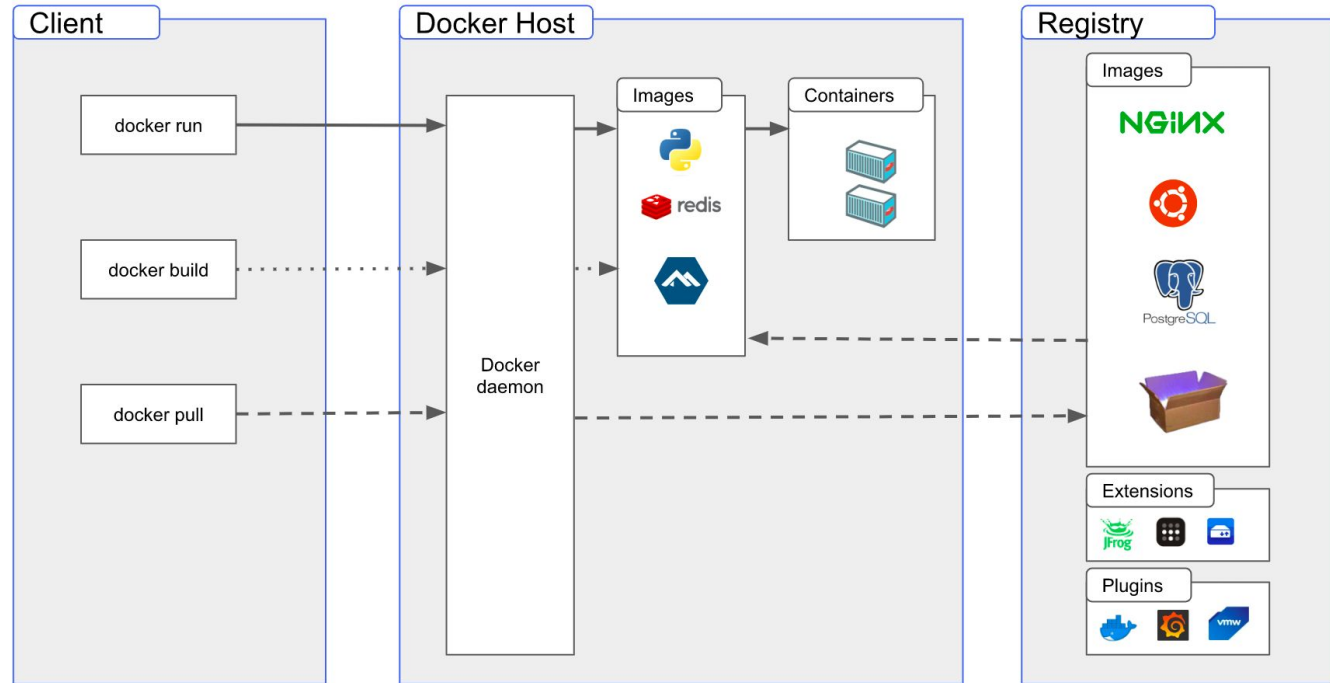

docker
image

Docker container

What is Container?

- Standard unit of software that packages up code and all its dependencies

- Provides operating-system-level virtualization by abstracting the "**user space**".
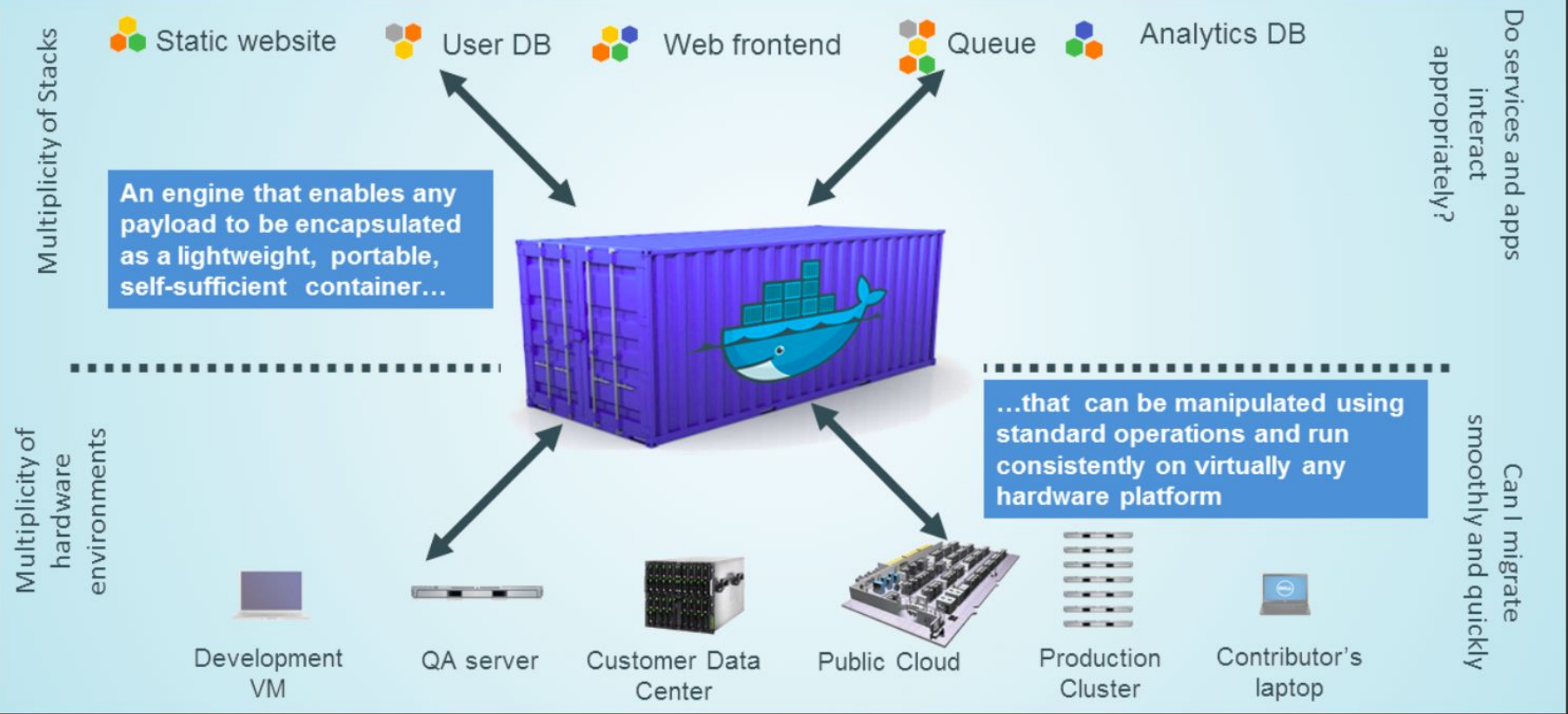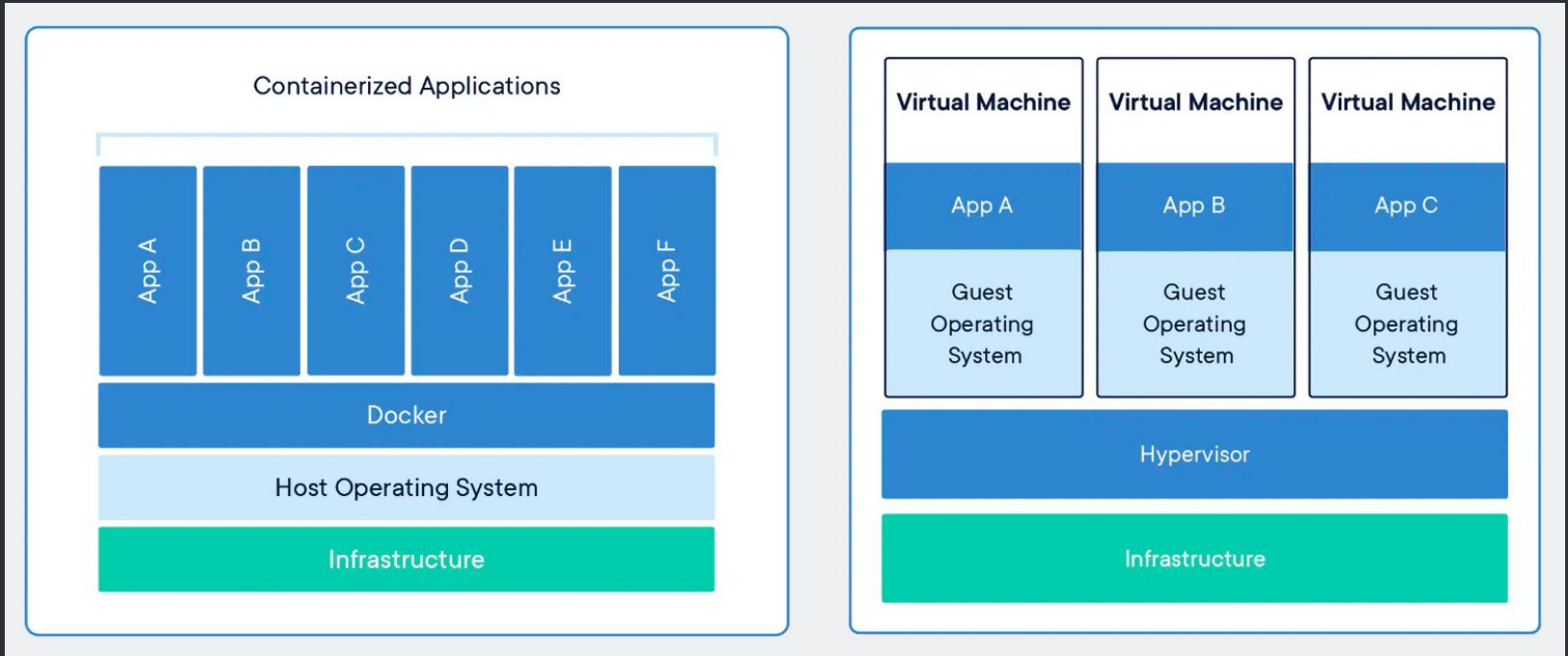
How Docker works?

Why Docker?

- **Portability** - Can be run on any machine

- **Consistency** - Helps avoid "*It runs on my machine*" problem

- **Isolation** - Reduces risk of conflicts or compatibility issues

- **Scalability** - Can run multiple containers across multiple machines

- **Speed** - Lightweight & start-up quickly

- **Ecosystem** - Services to simplify CI / CD, monitoring

Multiplicity of Stacks

Static website · User DB · Web frontend · Queue · Analytics DB

An engine that enables any payload to be encapsulated as a lightweight, portable, self-sufficient container…

…that can be manipulated using standard operations and run consistently on virtually any hardware platform

Multiplicity of hardware environments

Development VM · QA server · Customer Data Center · Public Cloud · Production Cluster · Contributor's laptop

Do services and apps interact appropriately?

Can I migrate smoothly and quickly

Docker vs Virtual Machine

Docker Container   vs   Virtual Machine

- Abstraction at the app layer that packages code and dependencies together

- Multiple containers can run on the same machine and share the OS kernel with other containers, each running as isolated processes in user space

- Take up less space than VMs (typically tens of MBs in size)

- Abstraction of physical hardware turning one server into many servers

- Hypervisor allows multiple VMs to run on a single machine

- Each VM includes a full copy of an operating system, the application, necessary binaries and libraries – taking up tens of GBs

- VMs can also be slow to boot.
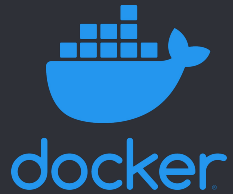
Important Docker Commands

- docker --version
- docker ps
- docker images
- docker container
- docker build
- docker start
- docker stop
- docker restart

- docker run
- docker exec
- docker logs
- docker rm
- docker rmi
- docker login
- docker pull
- docker exec --help

Dockerfile

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

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

```
Dockerfile > ...
1    FROM python:3.11-slim-buster
2    ENV PYTHONBUFFERED=1
3    WORKDIR /django
4    COPY requirements.txt requirements.txt
5    RUN pip3 install -r requirements.txt
```

Docker Compose

- A tool developed to help define and share multi-container applications

- We can create a YAML file to define the services and with a single command, can spin everything up or tear it all down

- Need to install separately. Instructions here

- Create and run the container using docker compose up -d

```yaml
version: '3.8'
services:
  app:
    build: .
    volumes:
      - .:/django
    ports:
      - 8000:8000
    image: app:django
    container_name: dj_docker_compose
    command: python3 manage.py runserver 0.0.0.0:8000
    depends_on:
      - db
  db:
    image: postgres
    volumes:
      - ./data/db:/var/lib/postgresql/data
    environment:
      - POSTGRES_DB=postgres
      - POSTGRES_USER=postgres
      - POSTGRES_PASSWORD=postgres
    container_name: postgres_db
```

Docker Hub

- A repository service where people push their Docker images and pull whenever required

- Also called Docker Repository / Docker Registry

- Can have private / public repos
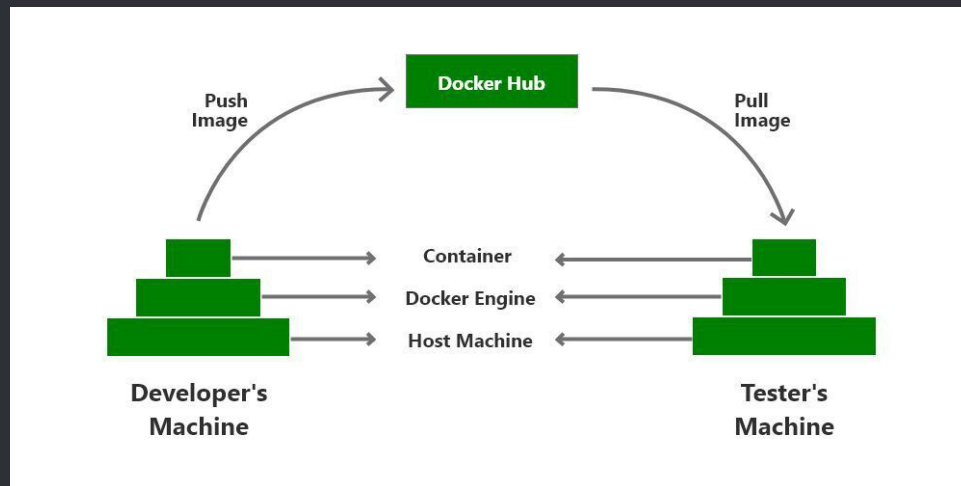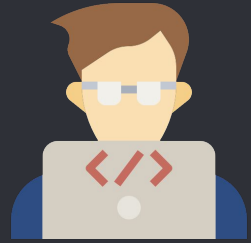
Practical

Let's get our hands dirty with Docker

Thanks!

ANY QUESTIONS?

You can find me here 👉

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