Fundamentals of Docker and Kubernetes

1. Why ?
2. Implementation

Why ?

5 mins

industry experts

a.) Journey of a SWE project

b.) Microservices

c.) Problem Statements and Challenges

d.) Intro to Docker

e.) Key Terms

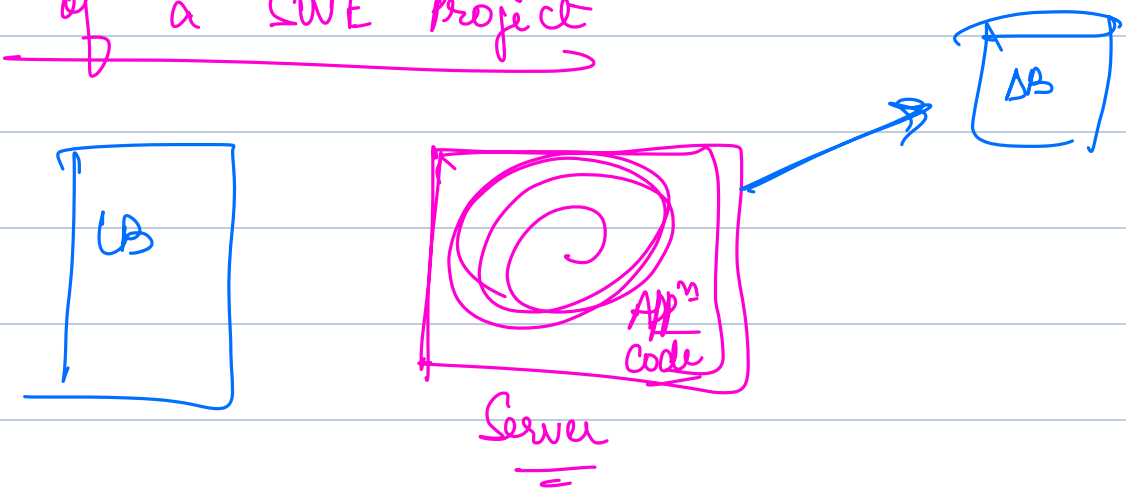
f.) Dockerize our Appn

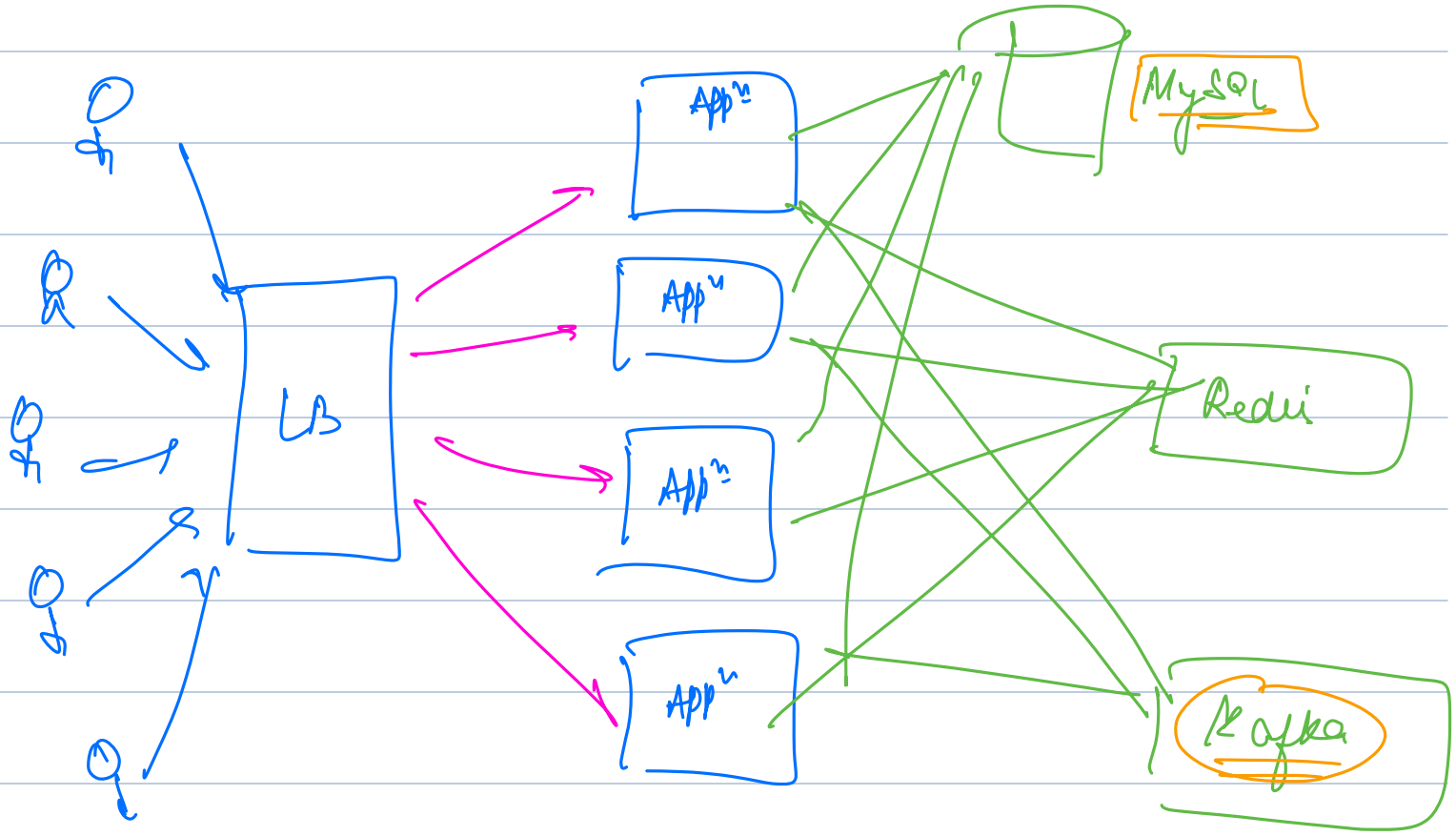
g.) Introduce Kubernetes

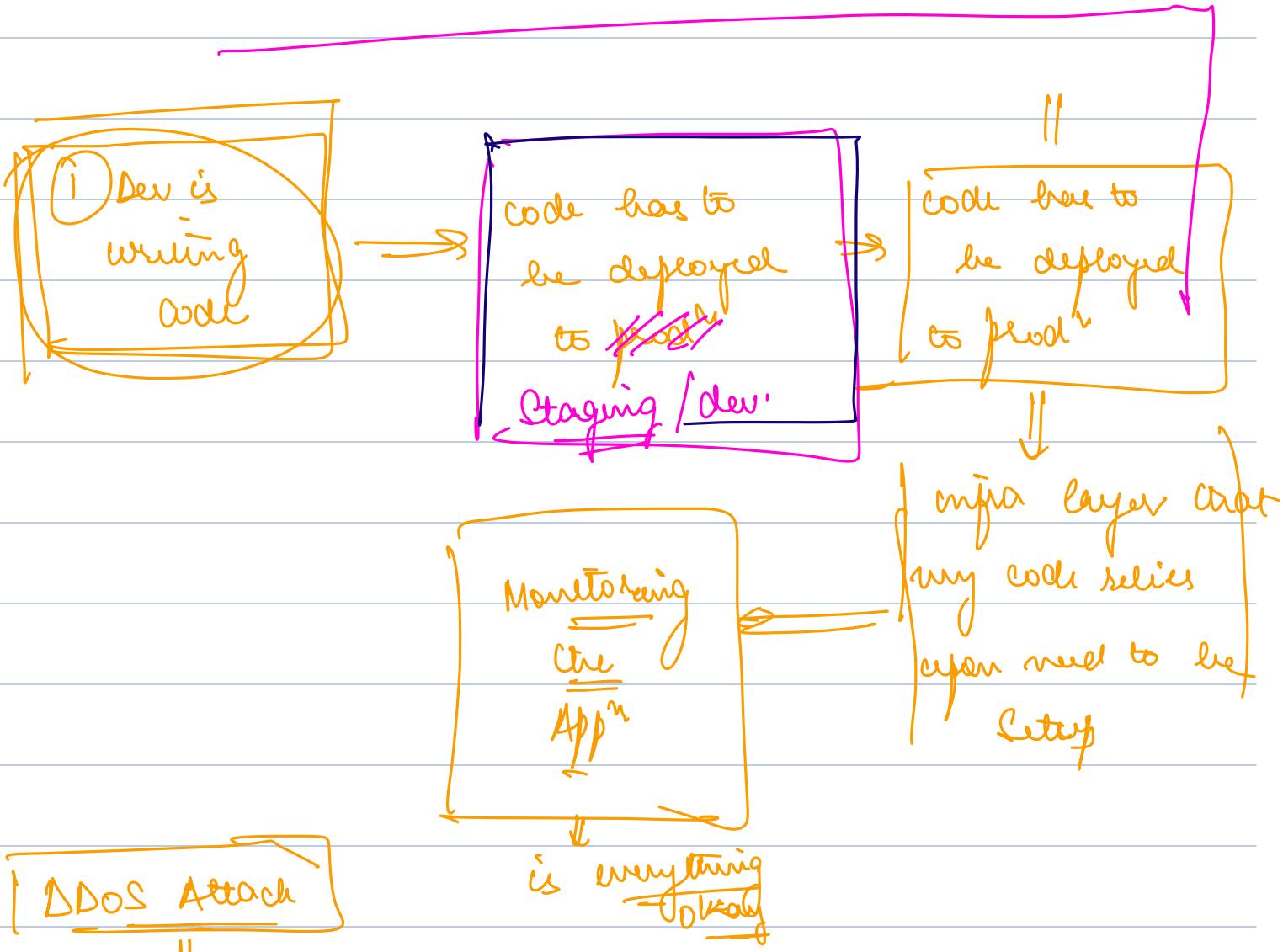
h.) Key Terms in Kubernetes

i.) Reading Material on using K8s in our Project

Journey of a SWE Project




LB
App^n
App^n
App^n
App^n
MySQL
Redis
Kafka

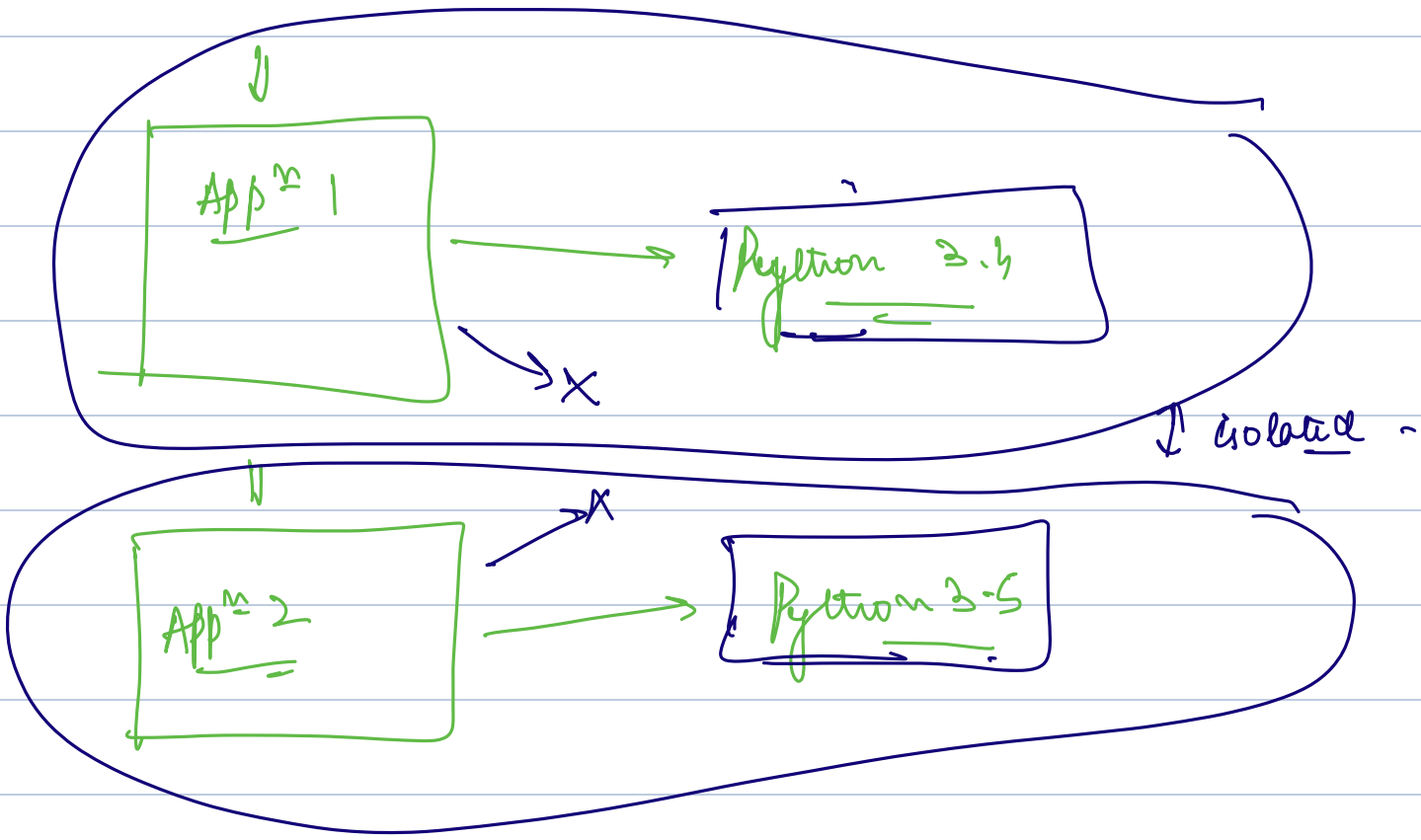

1 Dev is writing code
code has to be deployed to ~~prod^n~~ Staging / dev.
code has to be deployed to prod^n
infra layer that any code selies upon need to be setup
Monitoring the App^n
is everything okay
DDOS Attack

Dist Serial
of Service

Problems when a code is deployed

(1) Why do problems happen when installing a s/w

→ dependencies missing
→ conflicts with versions



⇒ Code is running perfectly fine in my laptop

3 years ago

- ⇒ java 17

2 years ago

⇒ installed mysql

= ssl certificates

https

/Desktop/abc.txt

now

⇒ Start work on appⁿ

⇒ Creation of file at a path

⇒ Test the appⁿ

⇒ Appⁿ worked

⇒ Code works fine on dev env but fails on a server

↓

Setup of local != setup of server

Server

1. Create file
2. Put the code of app
3. Run the app

⇒ App doesn't start

Dev ⟺ Server

Windows

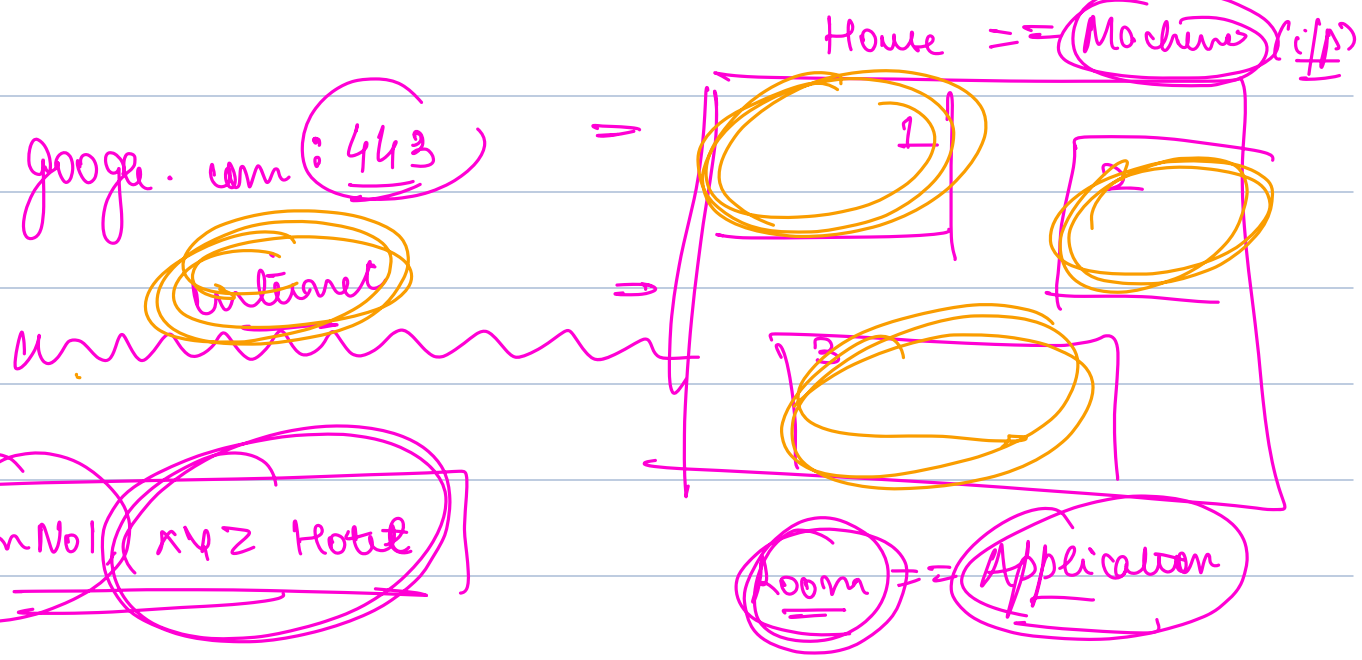
MacOS

Python3

Linux

Nothing default

app was running on port 8080 ⇒ Something lies on port



65535

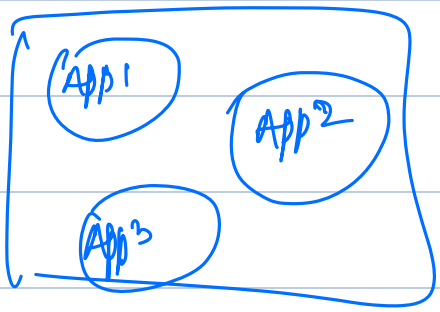
192.168.1.1 : 8080

i/p and Machine

⇓

1. Missing Dependencies
2. Conflicts with other app^n

⇒ Docker



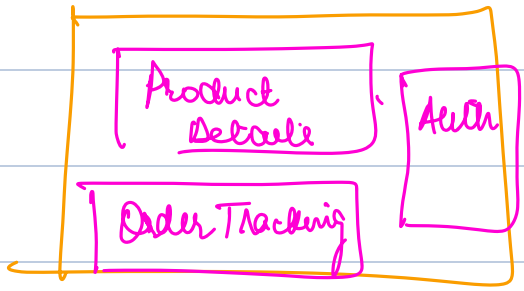
⇒ No conflicts

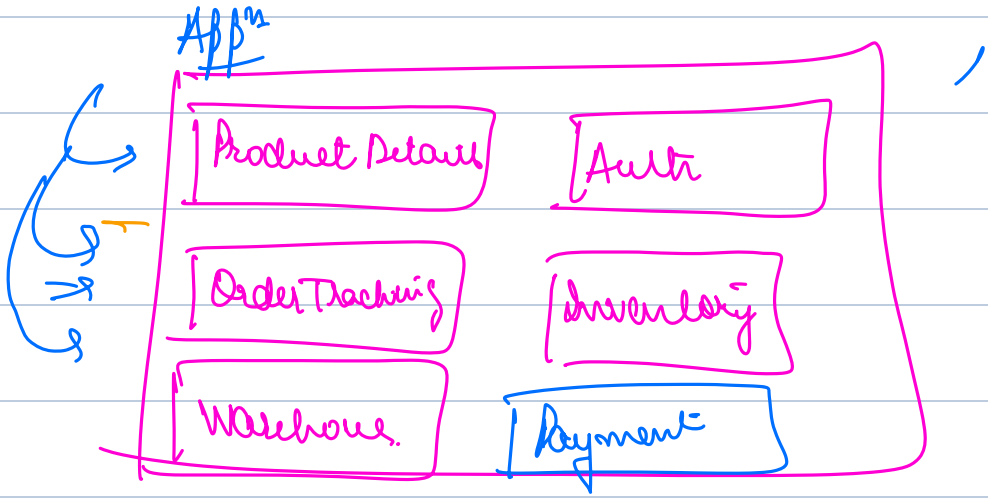
Flipkart

100000

2000

2%





(1) Will it be only 1 appⁿ / multiple appⁿ

Single Appⁿ

Multiple Appⁿ

Pros :

(1) Lower latency ⇒ fast

(2) Easier to manage proper

(3) Debugging

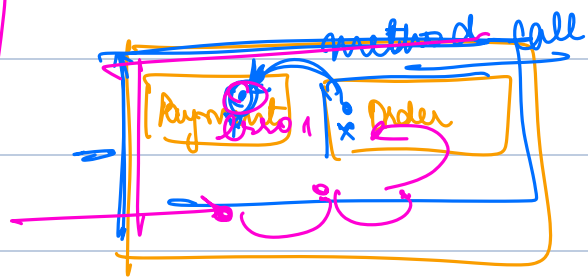
(4) Testing

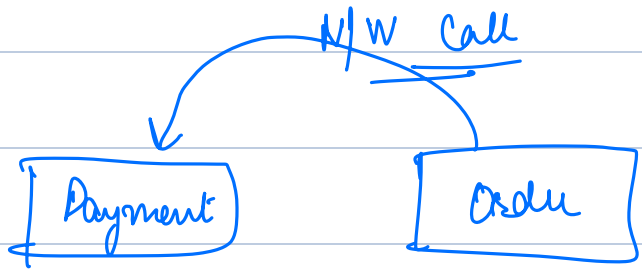
⇒ con in MS

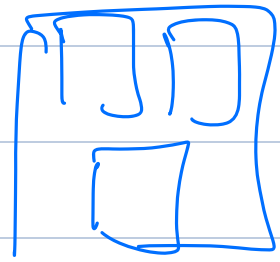
⇒ diff

⇒ Harder

— Harder.







Cons

- Everything on same code
- Dev time increase
- Diff to move to newer tech
- No Selective Scaling → Reduce Cost → Not all parts of my app have same load
- Diff to onboard a dev as well

Code → Build → Deployed

compiling all code files

↓

Executable

↑

Scale → 50 mins

> 1K

1990

Java

App^n

new feature

fixing bug

```
class Java {
    public static ____ () {
        print(1 + 1)
    }
}
```

~ 1,00,000

JOM

Auth

I don't need same H of Server

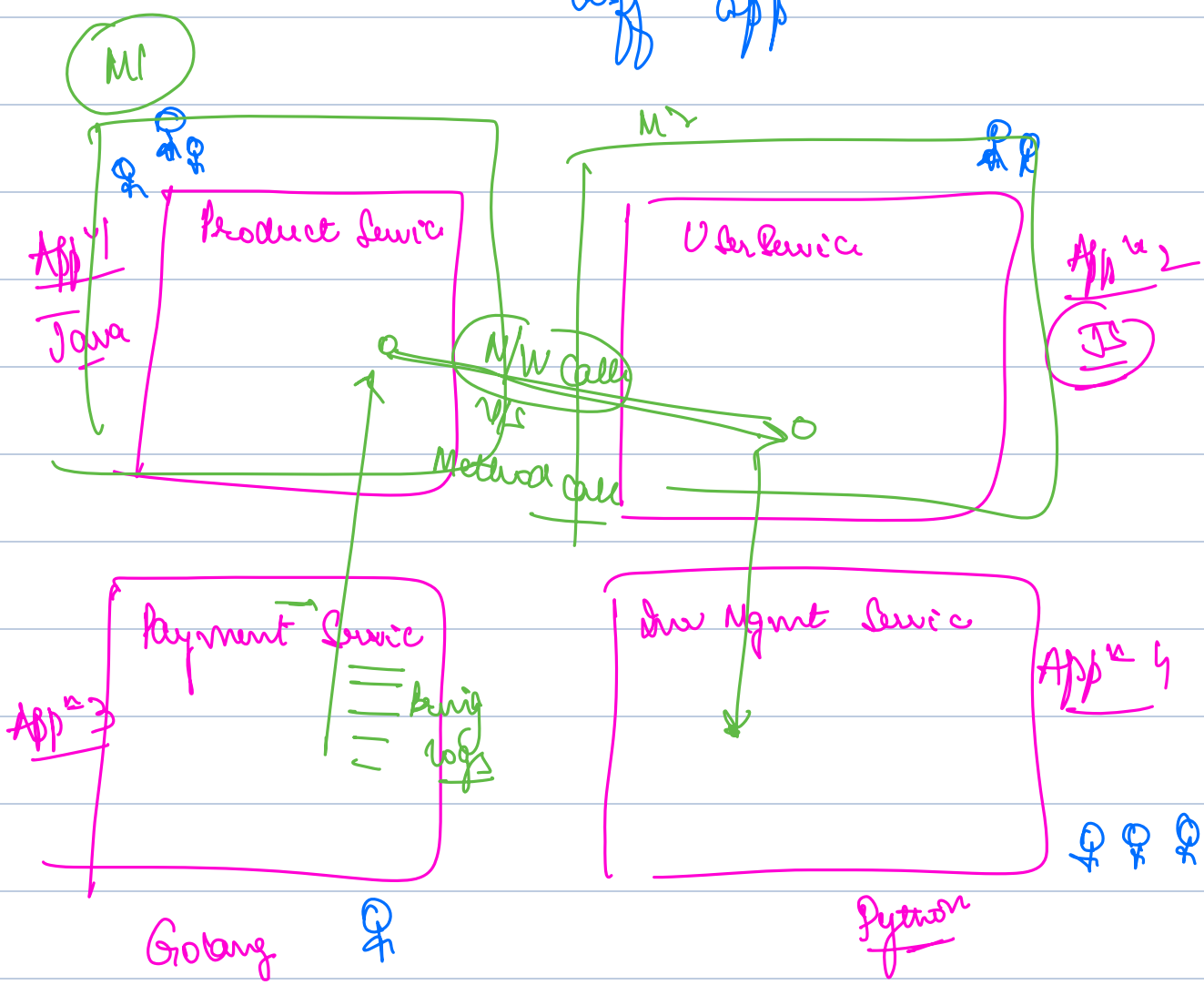
Payment

Monolithic ⇒ ALL code in one appⁿ

Appⁿ

↓

Microservice Appⁿ ⇒ the diff use cases of that appⁿ are broken into multiple diff appⁿ



Game Service

Rust

⇒ Think of each service as a diff company

Pros:

- No conflicts b/w teams
- → Dev Productivity incr
- → New Tech Stack
- → Selective Scaling
- → Easier onboarding

Cons

Dist Tracing

- → N/W call
  - ↳ Higher latencies
  - ↳ APIs more slower
- →

Amazon Prime MS → Monolith

↳ Cost

↳ latency

Startup

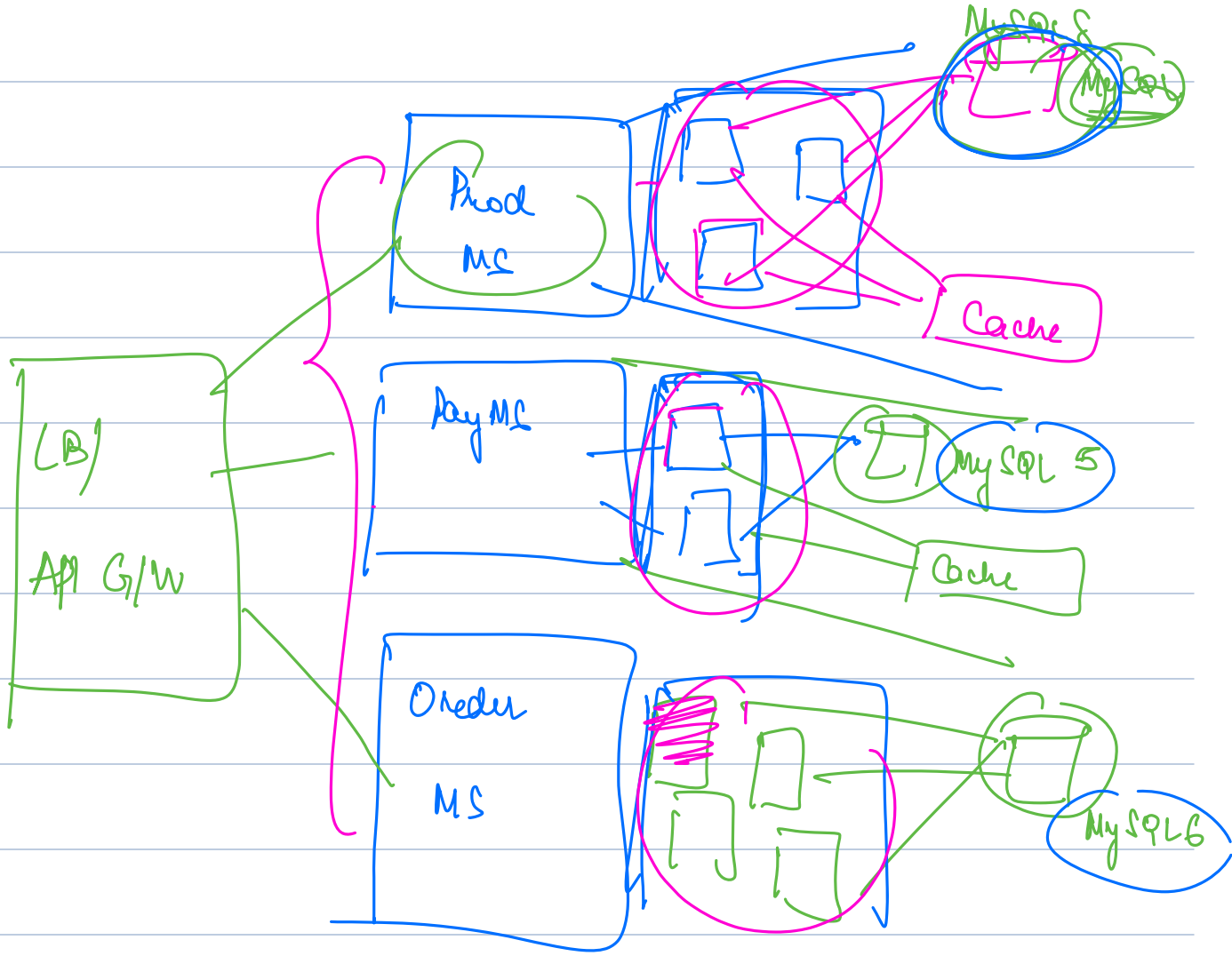
→ Monolithic → More code

↓

Break into diff microservice

Monolith → Auth Service

Monolith → Access Service



Dev v/s DevOps

increase DevOps Overhead.

Who will ensure each service is running as expected

⇒ Manual → Scalable? ✗

People will not like

- Kubernetes

⇒ Orchestrator of Microservice

⇒ automates the orchestration

Service of diff MS

Break till 6:45PM

Code → Build → Deploy

Docker ⇒ { Diff env / Clean / dev } { Conflicts with other appⁿ }

Appⁿ → Multiple Appⁿ → How to Monitor

Micro service → How to ensure enough # of servers of everything

Kubernetes

Docker

→ every machine is diff

→ it can cause issue while you are running appⁿ

Manual Solⁿ

written by you | devops

① Create a document with very very clear instructions on how to setup server.

→ buy a machine

(2) get a person who can follow this doc diligently

Docker

→ we need a way that is less ambiguous

↳ no chance of confusion.

↳ Dockerfile

↳ gives the exact set of commands that need to be run to provision your app^n

→ platform independent

Dockerfile

→ get ubuntu 20.04

→ download xyz file

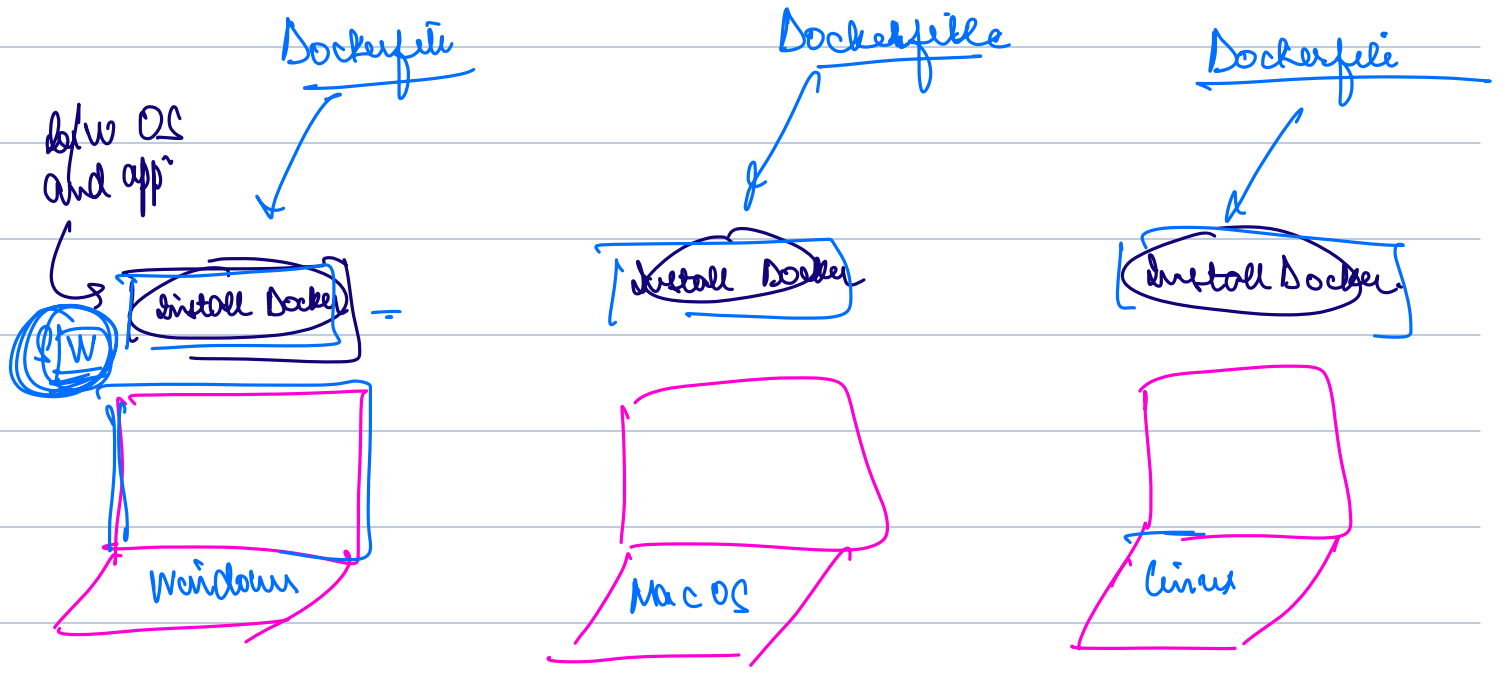
→ put the file at a particular loc^n

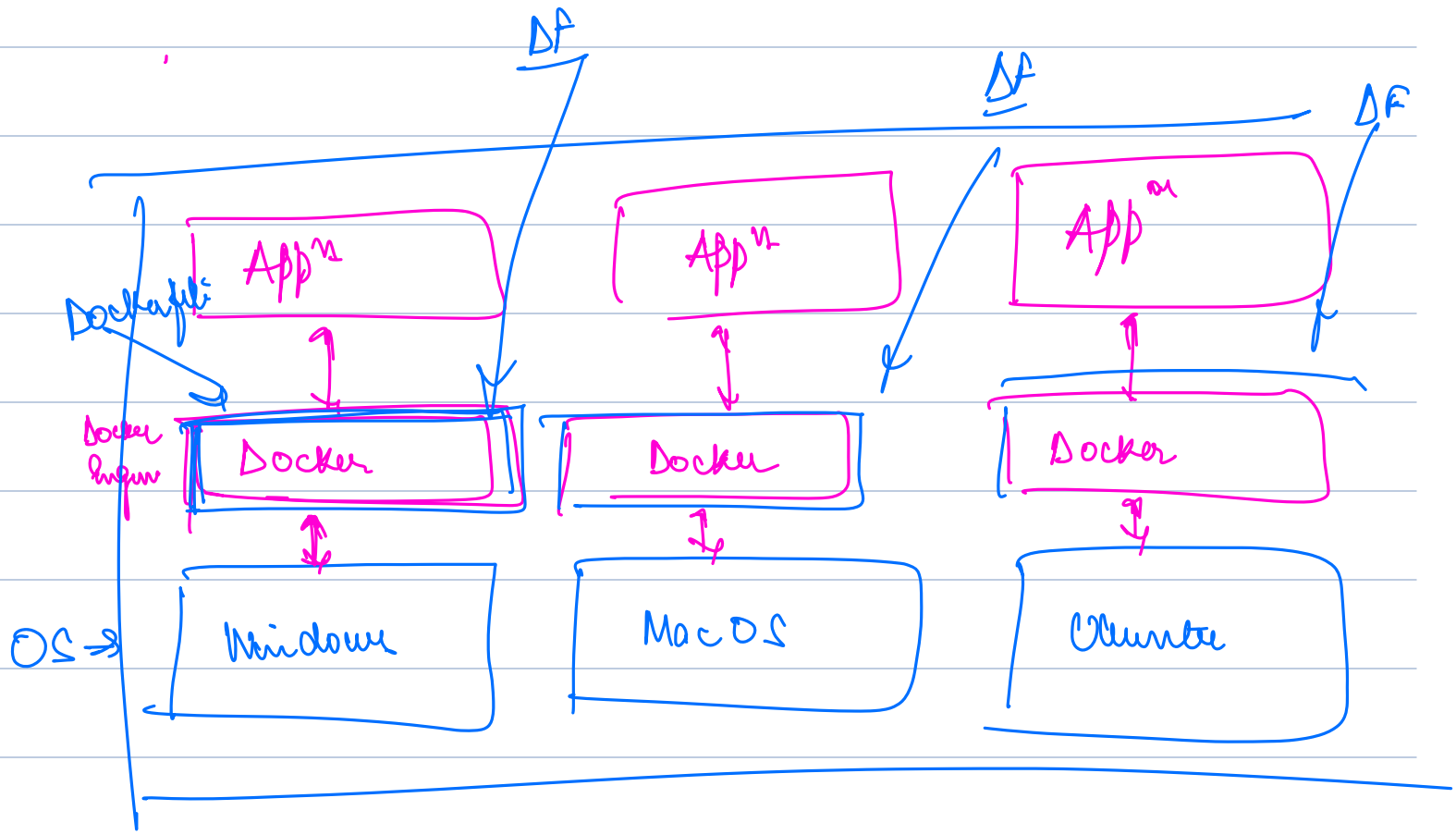
→ run xyz command

→ delete folder.

set of commands

* if everything runs you can well be exactly what you expect


Dockerfile
Dockerfile
Dockerfile
b/w OS and app
W
install Docker
install Docker
install Docker
Windows
MacOS
Linux



⇒ ask Docker to start with a base image

↳ a preconfigure environment.

↳ a machine with preconfigured OS and a list of dependencies

Dockerfile

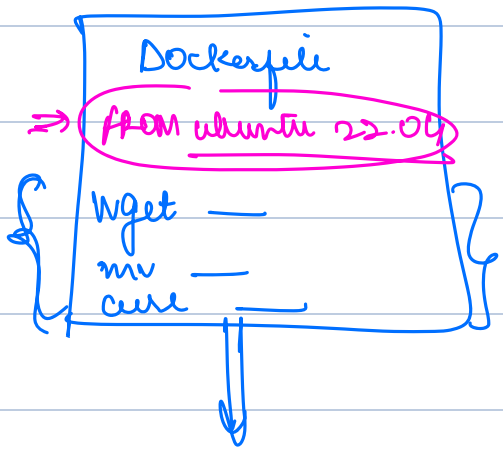
```
FROM ubuntu-20.04
wget ~~http://~~
mv
sudo apt-get install python3
```

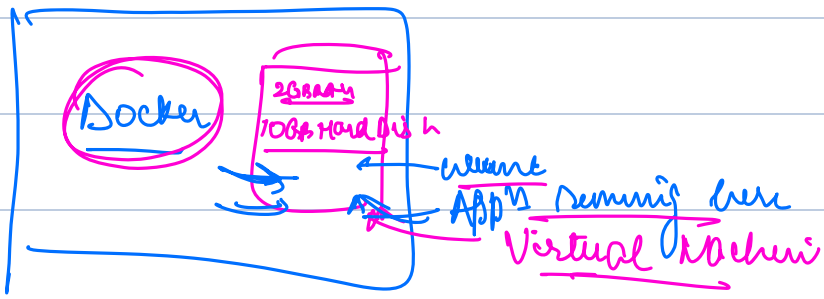
all commands to set up

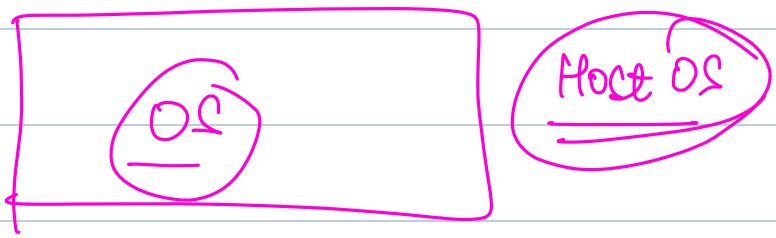
your em.

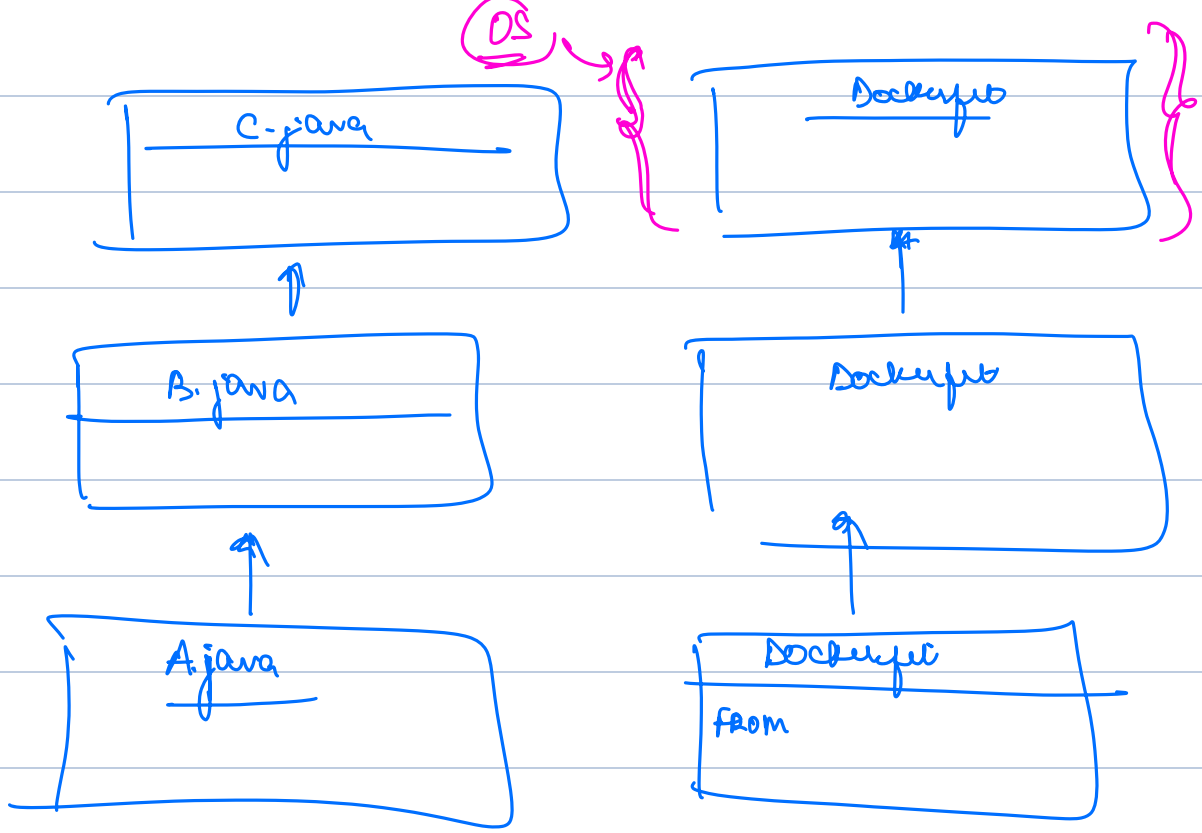
python -3 hello.py =

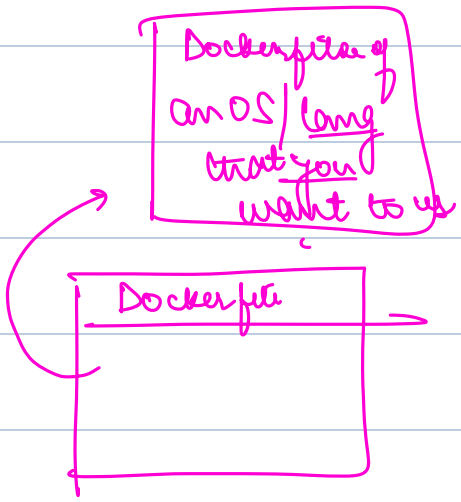
by the last command your appⁿ is running







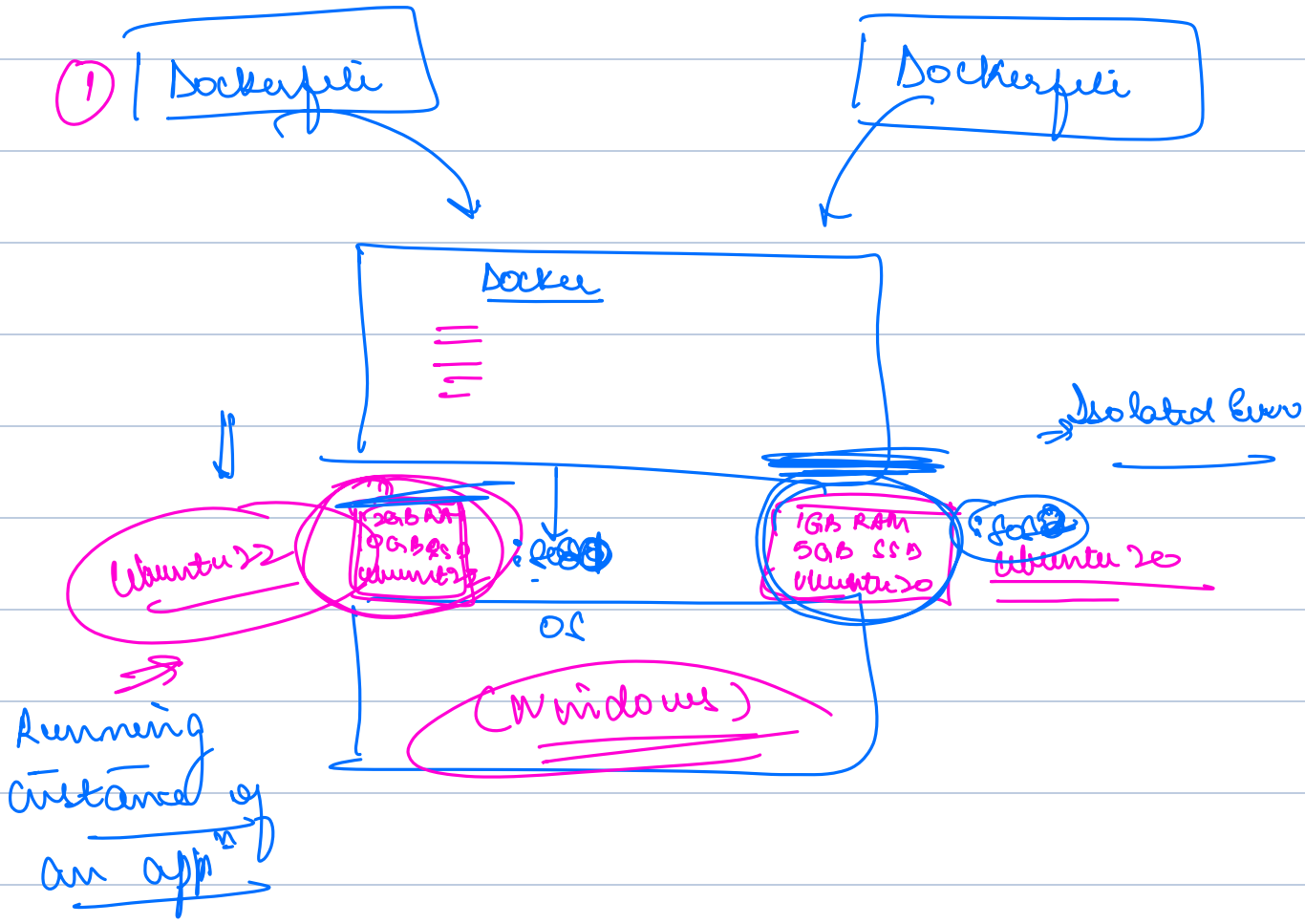

OS
C.java
Dockerfile
B.java
Dockerfile
A.java
Dockerfile
from


Dockerfile of an OS lang that you want to use
Dockerfile

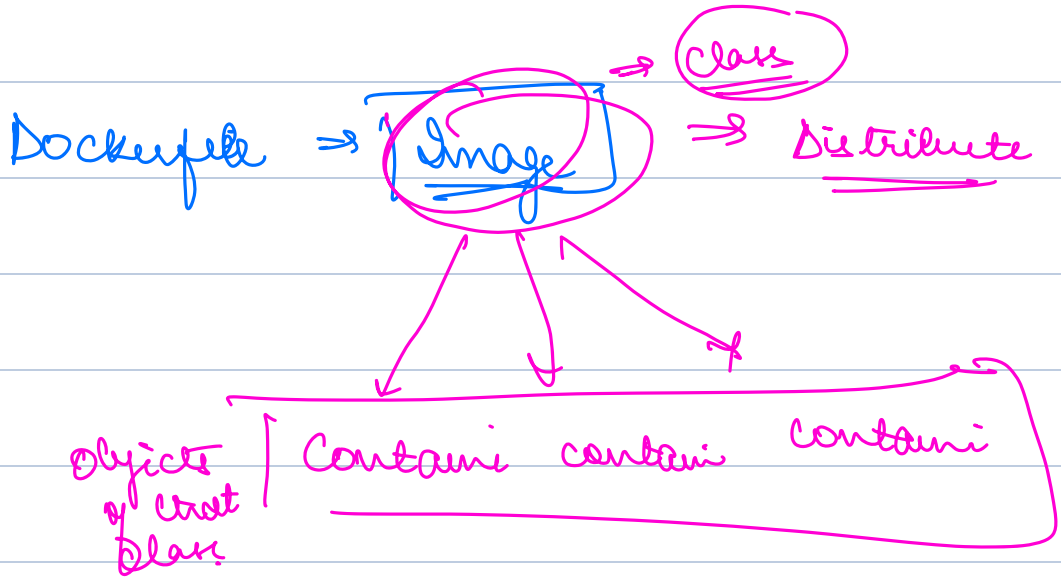
⇒ For every appⁿ, you will give a diff Dockerfile to docker

⇒ Docker creates a container for each of the appⁿ

isolated env



Docker Image : Dockerfile ⇒ set of instruction and everything else that will be used to configure env / container



Cgroups / virtual Machine

Reading Material

1. Intro to K8S
2. Kubernetes Architecture

→ Notes

→ Instructions to create your own dockerfile

AWS EBS

↓

Docker

Borg

↓

2005

Docker and Kubernetes

↳ 1.5 months

↳ Certificate