VERITAS

Introduction to Container Technology

Presented by Aayush Kumaria

How Does a Laptop Work?

A Typical Laptop

What Does a Laptop Contain?

NICs

Disks / SSD

Microprocessor

Memory

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How does a Laptop Work?

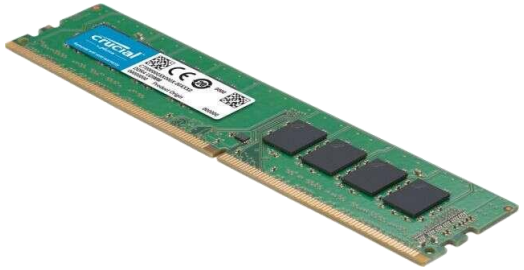
NICs

Operating System

Kernel

Disks / SSD

CPU



Memory

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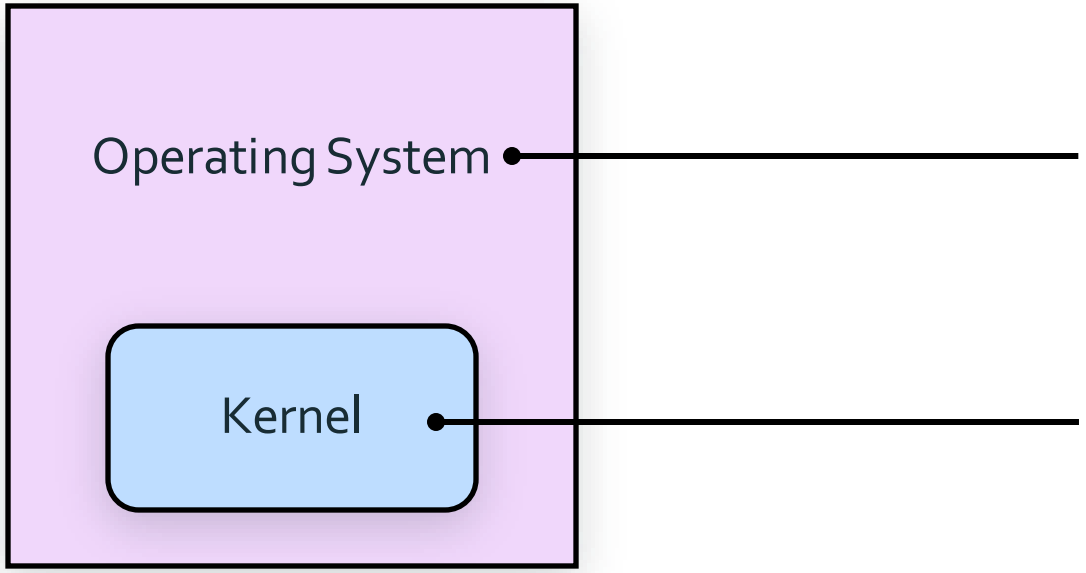
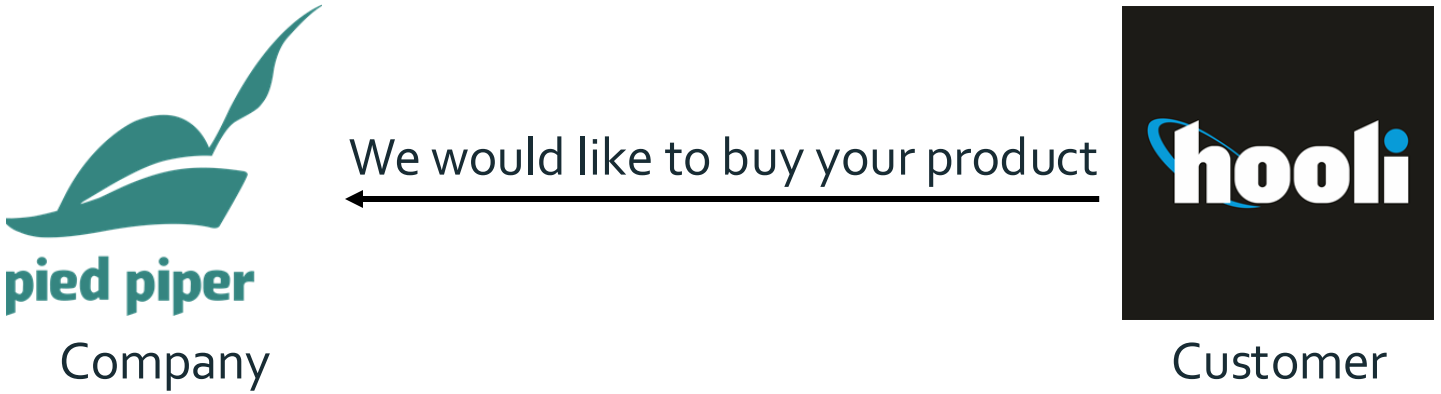
The OS and The Kernel



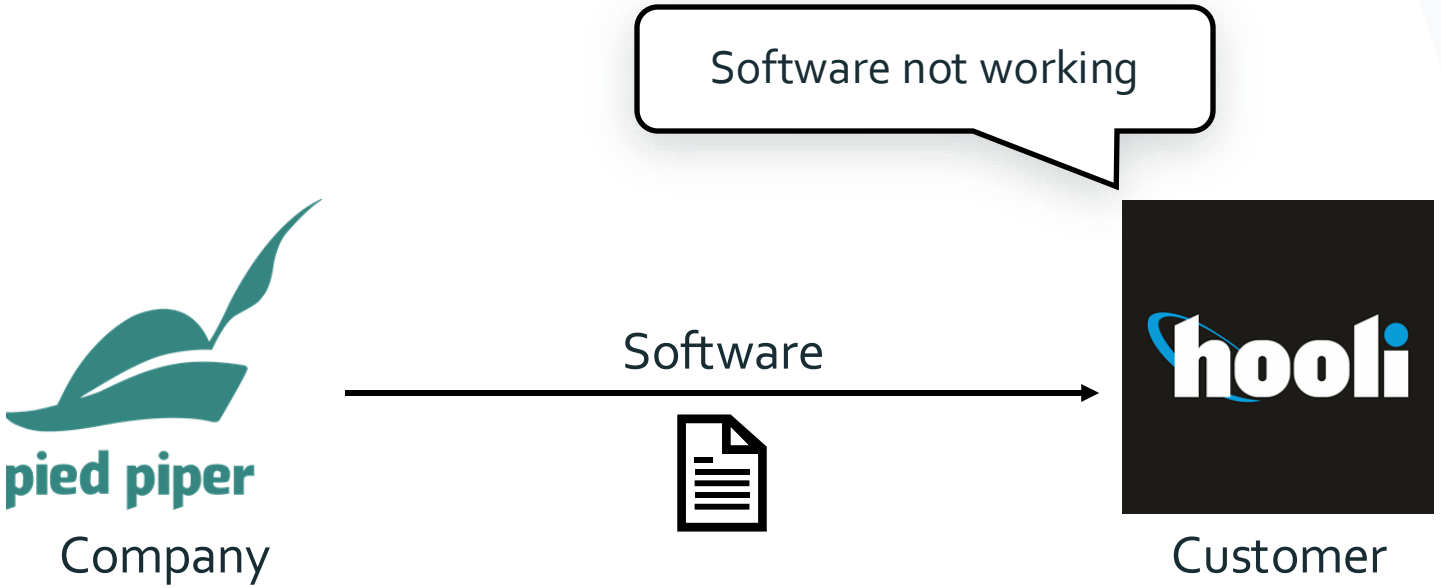
- First Program to Boot Up
- Manage User Space

- Schedule Programs
- Manage Devices
- Read / Write Address on Memory

Corporates Selling A Product



Corporates Selling A Product



What is Virtualization?

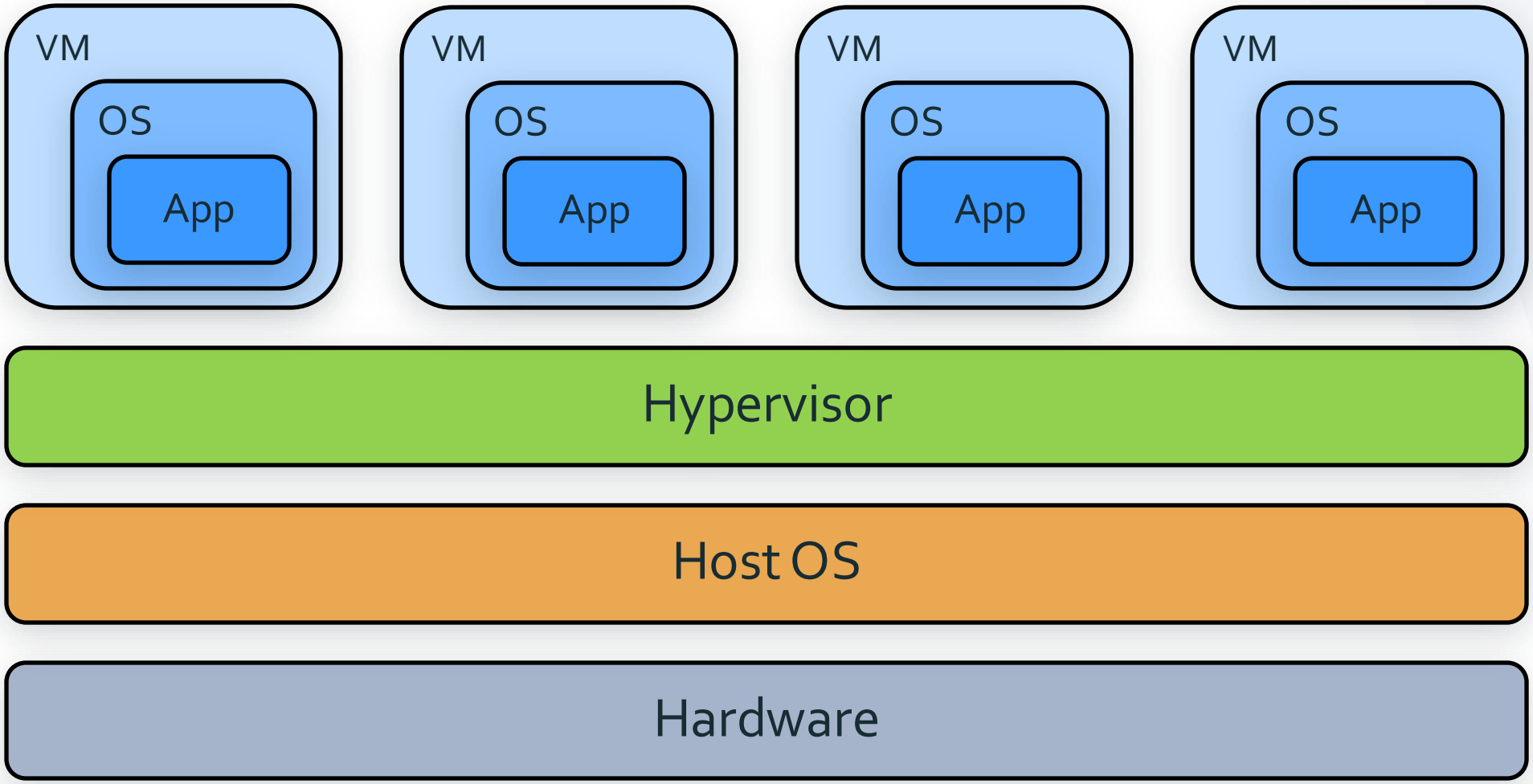
What is Proxy in College?

- Proxy is the process of marking the attendance of a person who is absent in a lecture or class.
- It involves having one physical person who can sign on behalf of multiple people hence showing that a lot of people attended a lecture
- Virtualization is very similar to this concept.

What is Virtualization?

- Virtualization is a technology that you can use to create virtual representations of servers, storage, networks, and other physical machines.
- This allows organizations to operate multiple OS, more than one virtual system and various applications on a single server.
- Virtual Machines are created and managed via a software component called a Hypervisor.

Virtualization Picturized



How does a Virtual Machine work?

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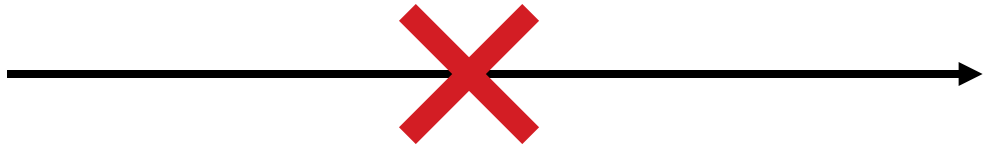
Where would a VM be required?

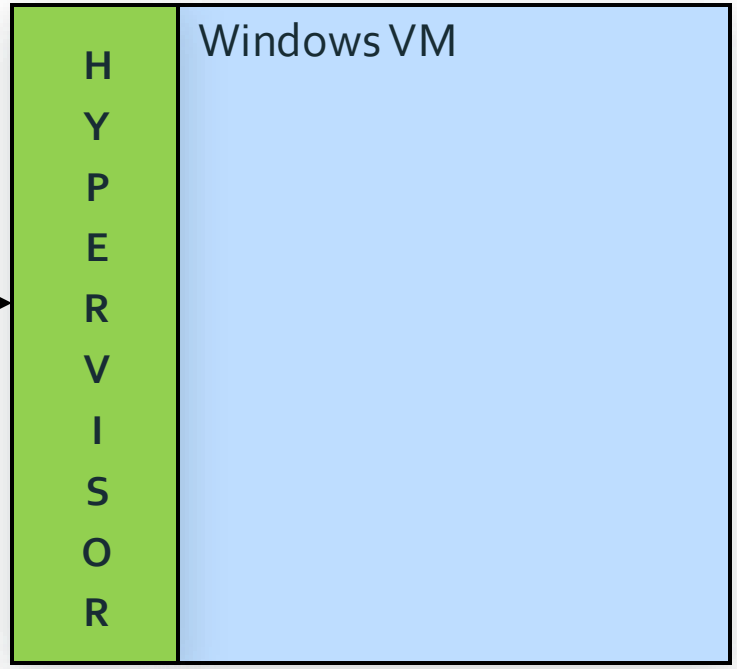
Your MacBook



The game you want to play

Where would a VM be required?

Your MacBook



The game you want to play

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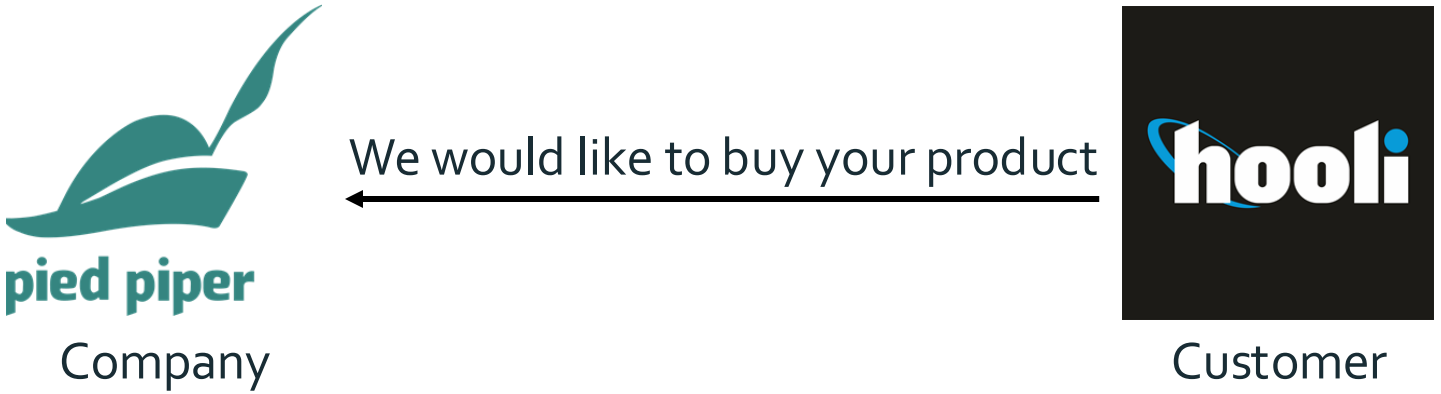
What is a Virtual Machine?

- Virtual Machines are software-defined machines that run inside a Physical Computer with its own Operating System and computing resources.

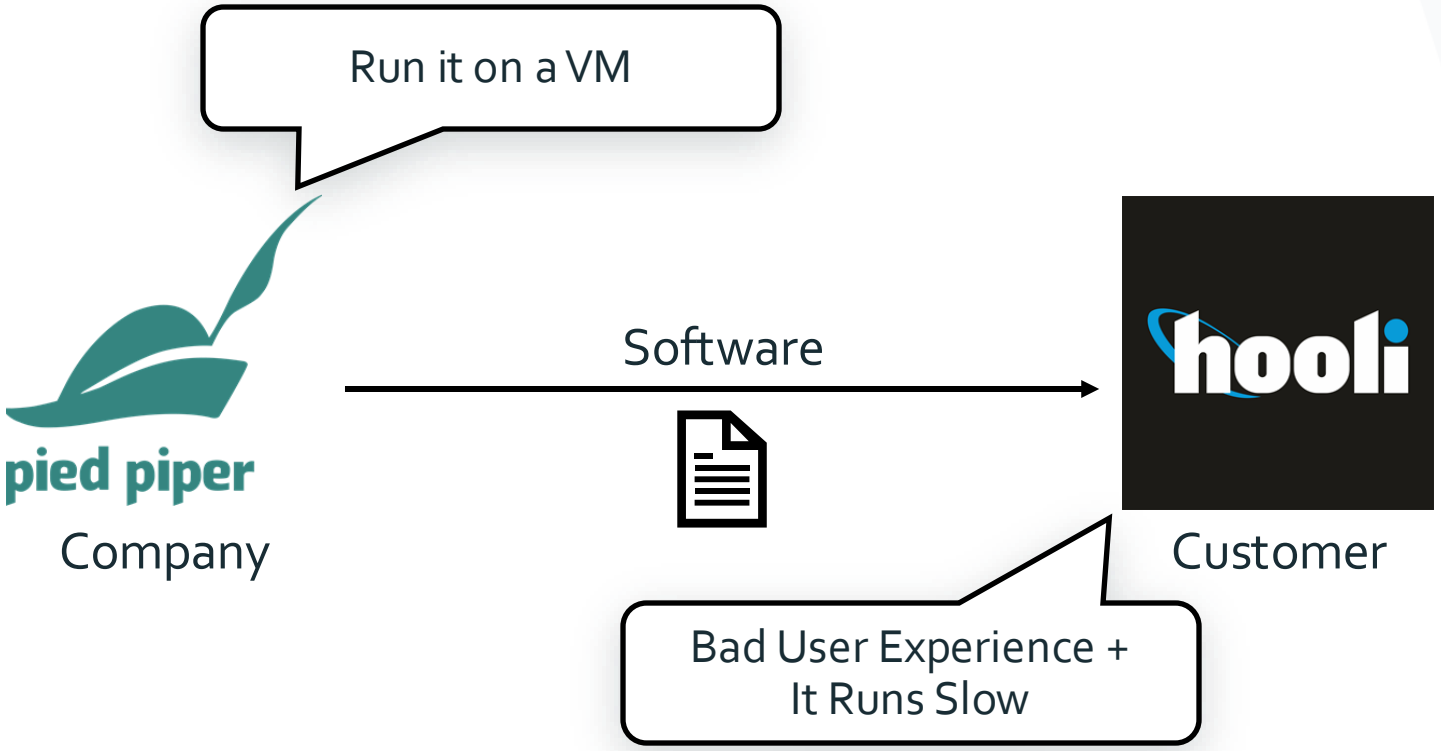
- It allows a business to run an OS that behaves like a separate computer in an app window on a desktop

- Multiple Virtual Machines can be created on a single Host Machine with each machine running a separate Operating System.

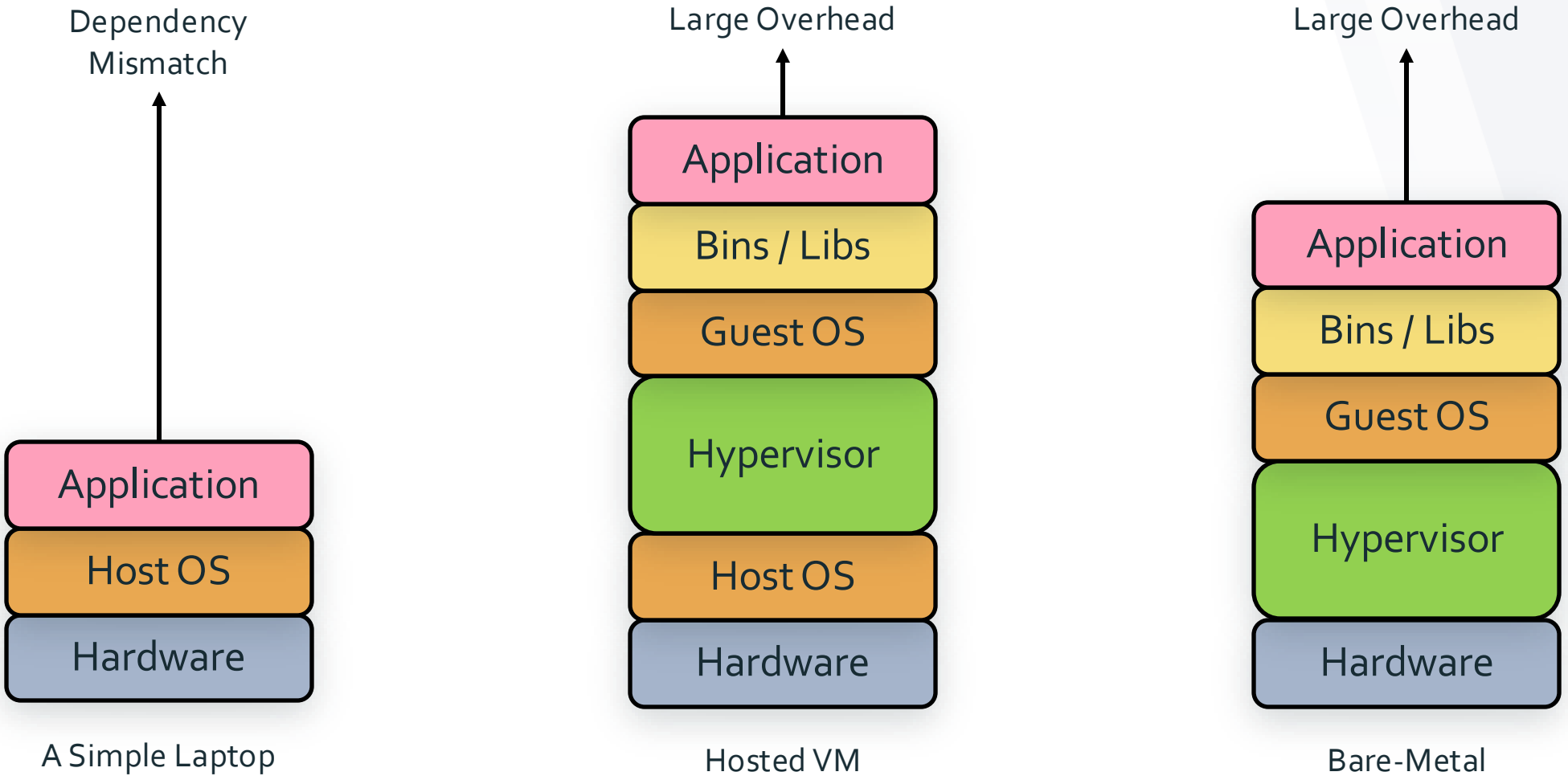
Corporates Selling A Product



Corporates Selling A Product



Why are VMs slow?



What is Containerization?

Picture a Wallet…

What does a Wallet Contain?

Cards

- To purchase stuff on Amazon with discounts
- To pay for food at fancy restaurants
- And much more…

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What does a Wallet Contain?

Cash

- To pay Auto Rickshaw Drivers
- To pay for Parking
- And to do whatever Cards cannot do

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What does a Wallet Contain?

Identification

- To show Traffic Police
- To let the college watchman let you enter the premise

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What is a Wallet?

Cash

Cards

Identification

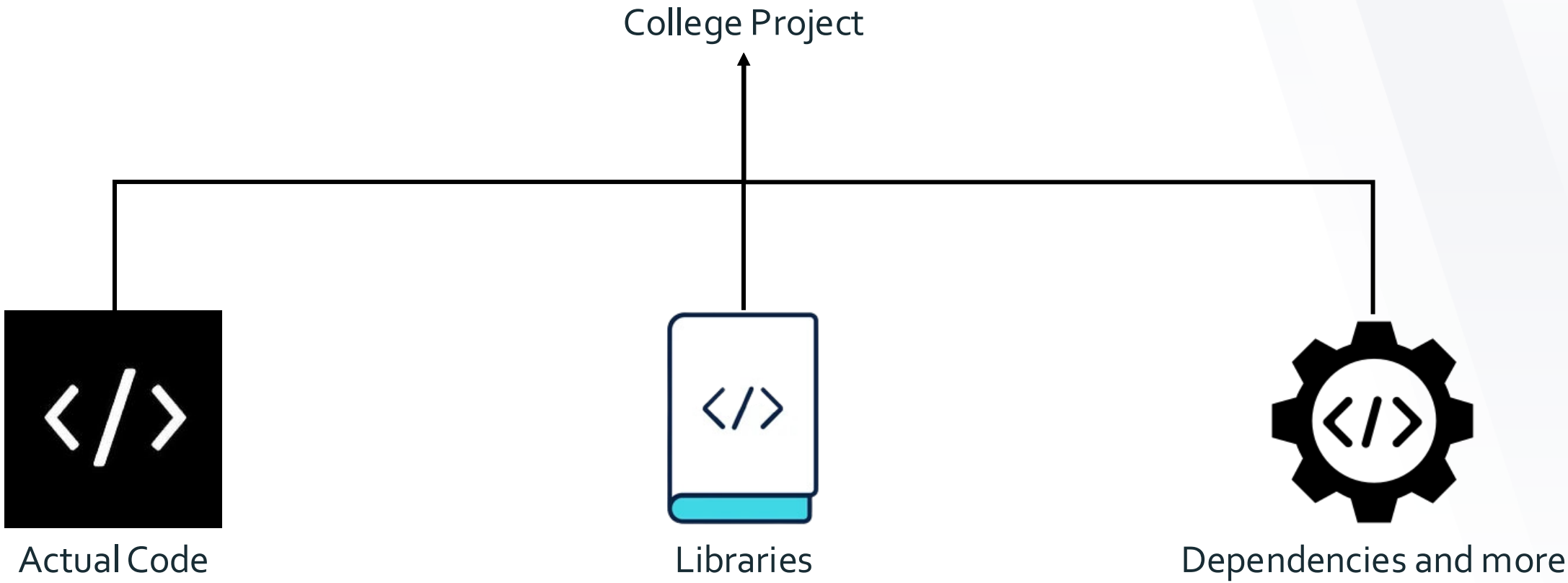
Bundled Up

What Is Containerization?

- It is the Software Deployment Process of packaging an application into a single lightweight executable called a Container.
- This Container includes the Application's Code, the OS Files, Libraries, and other Dependencies, bundled together.
- This ensures that the software can run on any infrastructure.

- Just like how a wallet is bundled with Cards, Cash, and Identification and can be used in various scenarios.

Containerization of Software



Why is Containerization Required?

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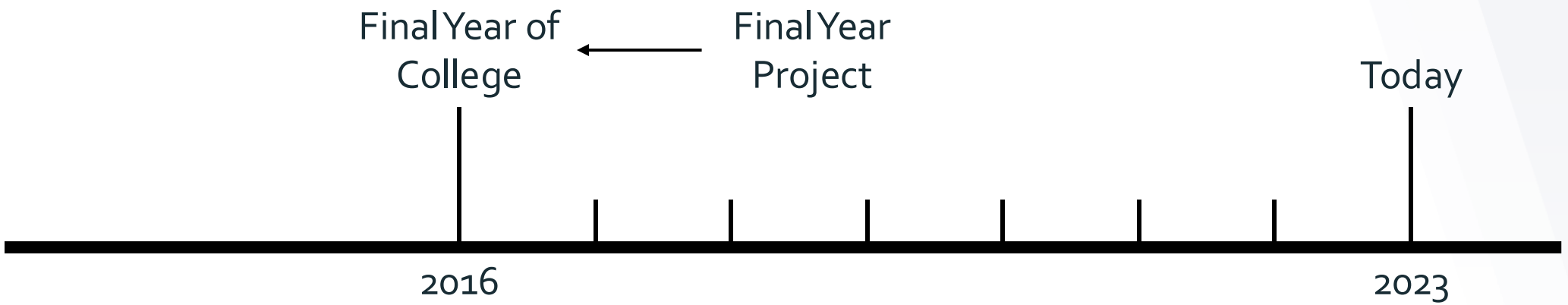
Project Fiasco…



Project Fiasco…

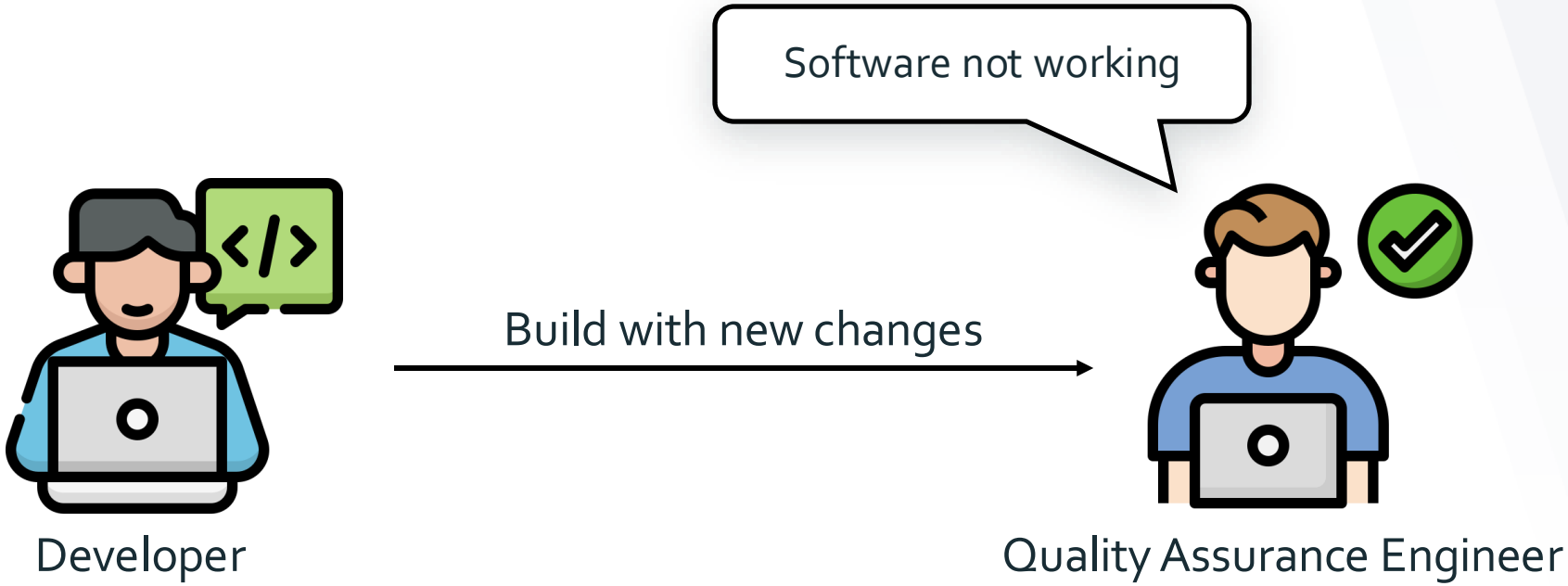
Project Fiasco…

Laptop
Destroyed

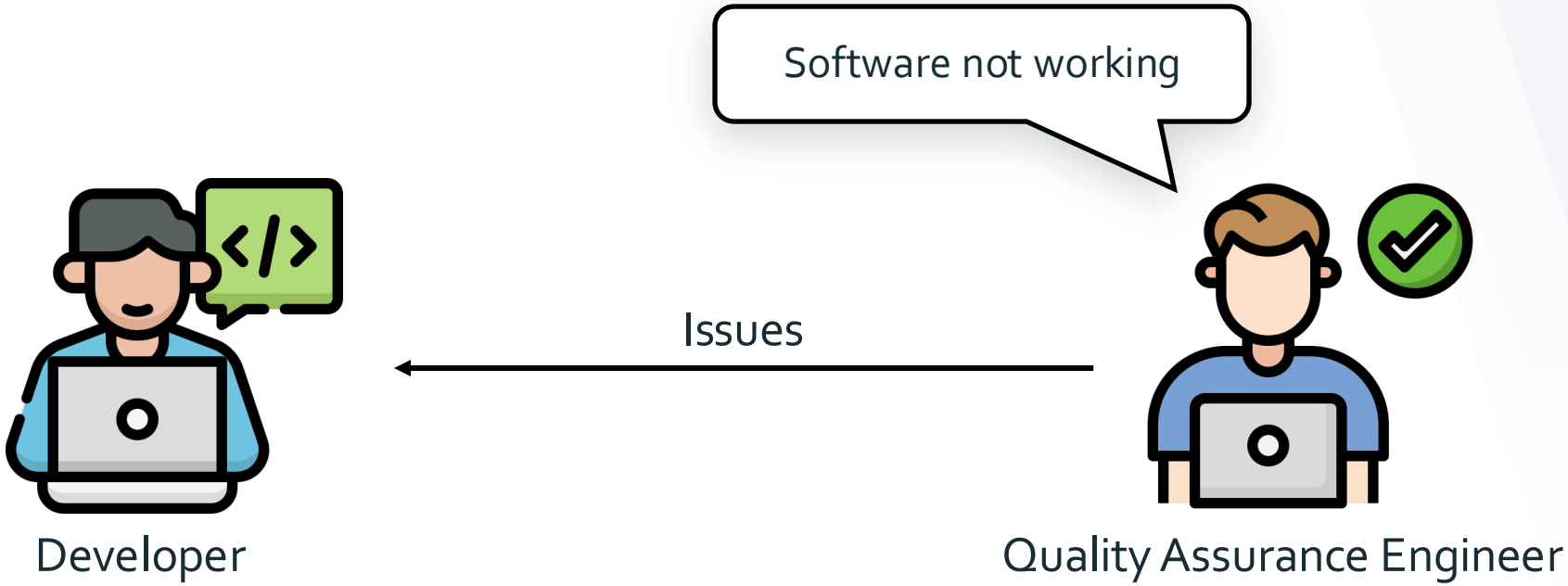
Dependency
Mismatch

OS Mismatch

QA – Dev Scenario



QA – Dev Scenario



Advantages of Containerization - 1

- Portability
  - Creating an executable software package abstracted away from the host OS, hence, removing dependency on the OS.
- Speed
  - Containers share the host machine's OS kernel and aren't subject to extra overhead hence allowing fast boot-up.
- Scalability
  - An application deployed on a container can handle increasing workloads by reconfiguring the existing architecture.

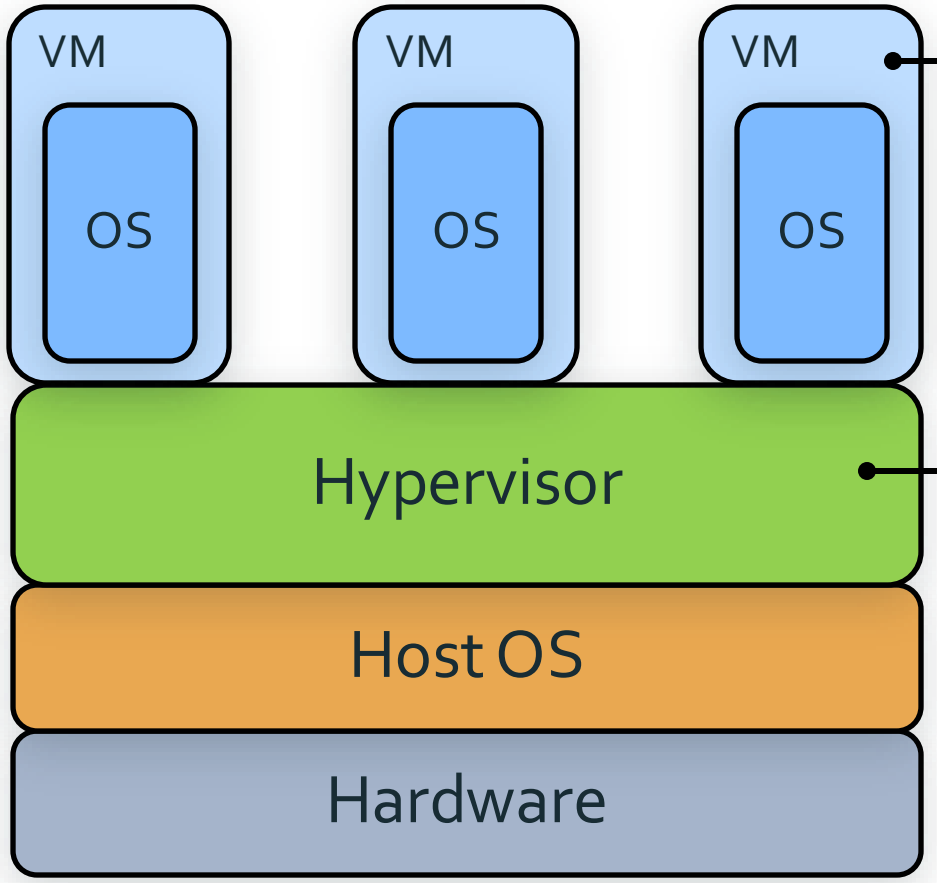
Advantages of Containerization - 2

- Fault Isolation
  - Each Containerized Application works independent of the others and hence a fault in one would not affect the other
- Ease Of Management
  - Using certain platforms you can automate the installation, management, and scaling of containerized applications.
- Developer Friendly
  - One Common Container for Development and Production

And Much More…..

What is a Container?

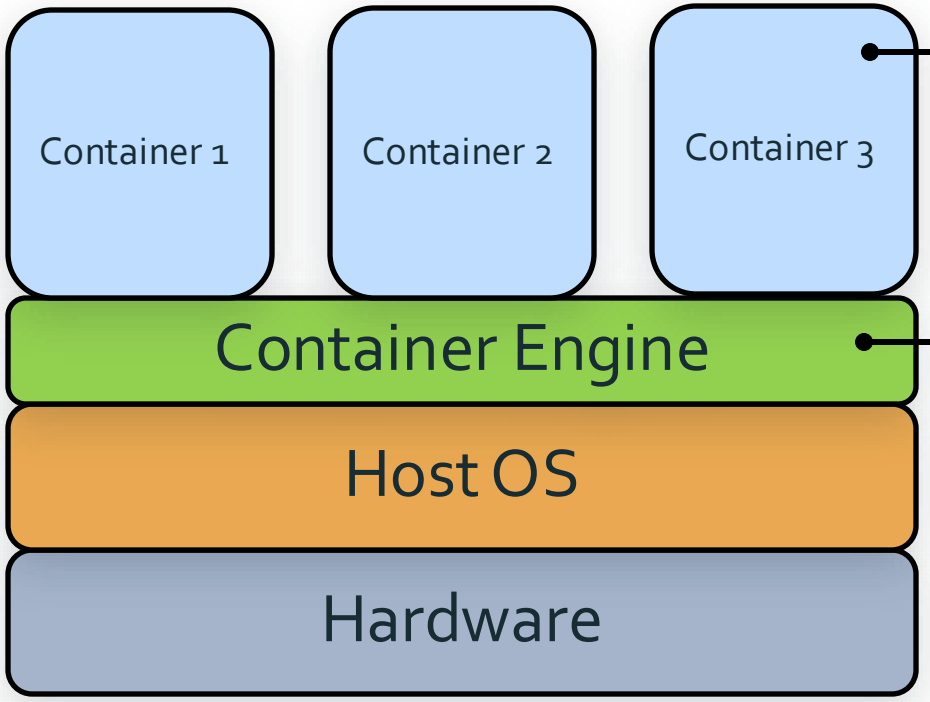
The Difference between a VM and a Container



Hosted VM

- Each VM has its own OS
- The Hypervisor (which is heavy) Virtualizes the Hardware

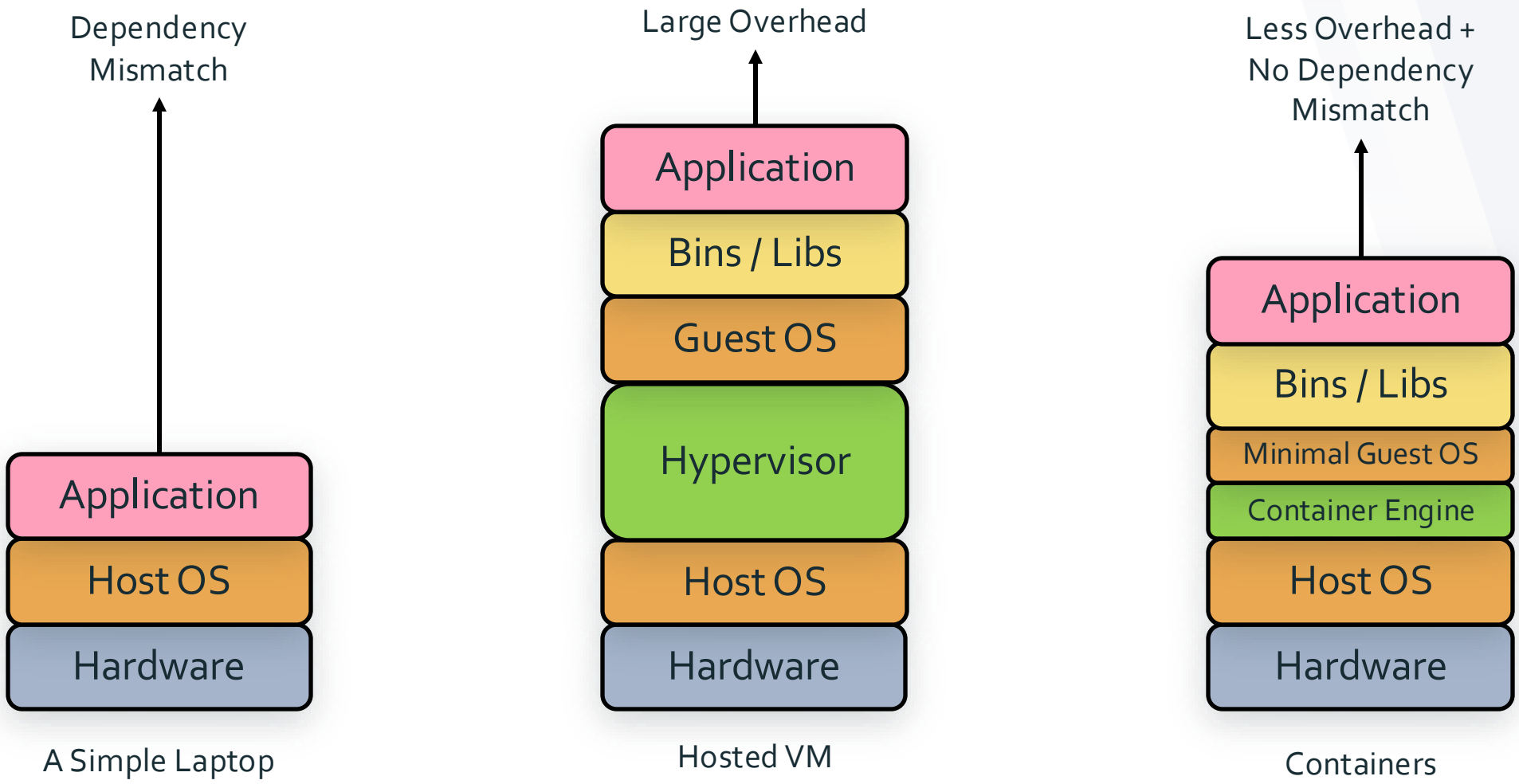
The Difference between a VM and a Container



Containers

- Has Minimal Guest OS files
- The Container Engine (which is light) creates isolated environment by virtualizing the OS
- The Kernel is shared

The Difference between a VM and a Container



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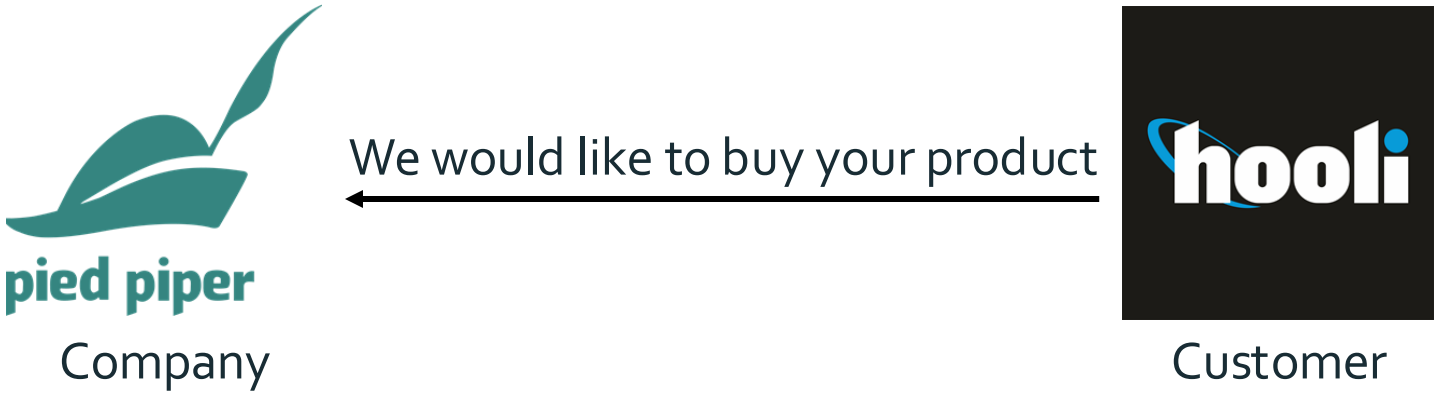
What is a Container?

- A Container is a lightweight, standalone, executable package of software that includes everything needed to run an application: code, runtime, system tools, system libraries and settings

- It contains less overhead compared to a VM and removes the dependency mismatch issue

- Containers work just like a VM but contain bare minimum OS Files unlike a Virtual Machine, which houses the entire OS.

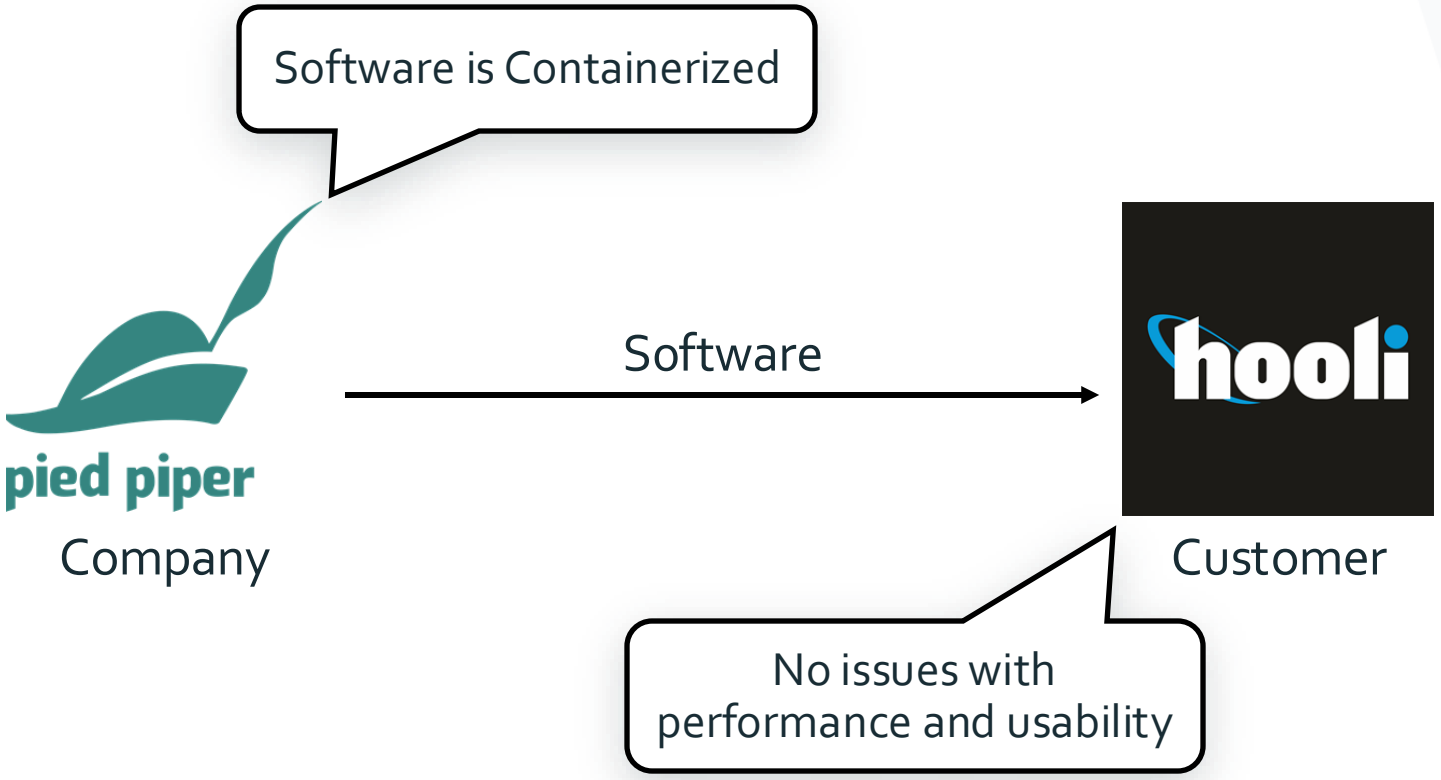
Again, Back to the Use-Case



Company

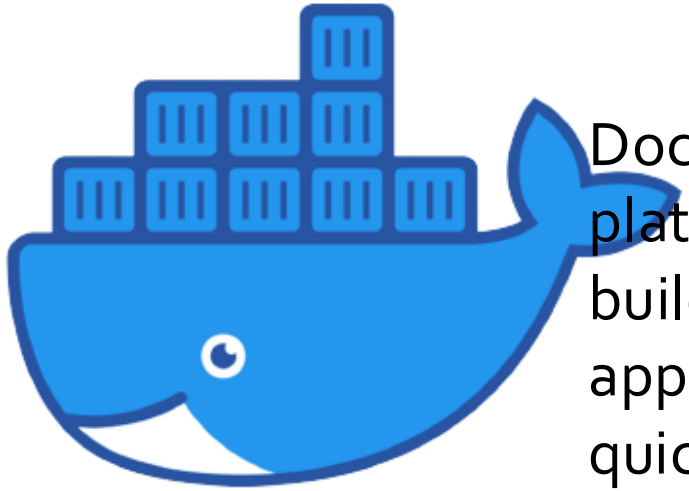
Customer

Back to the Use-Case



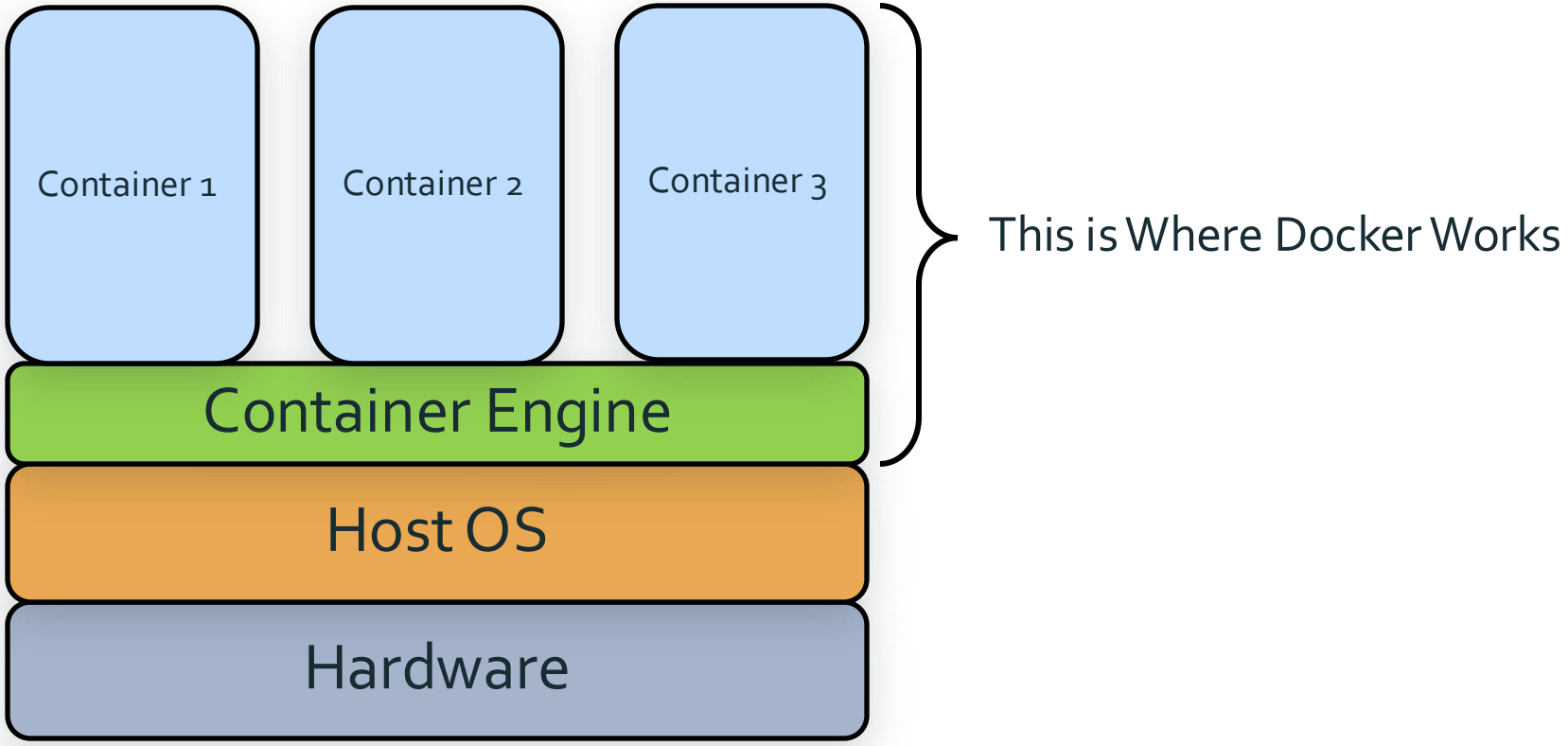
What is Docker?

This Whale represents Docker

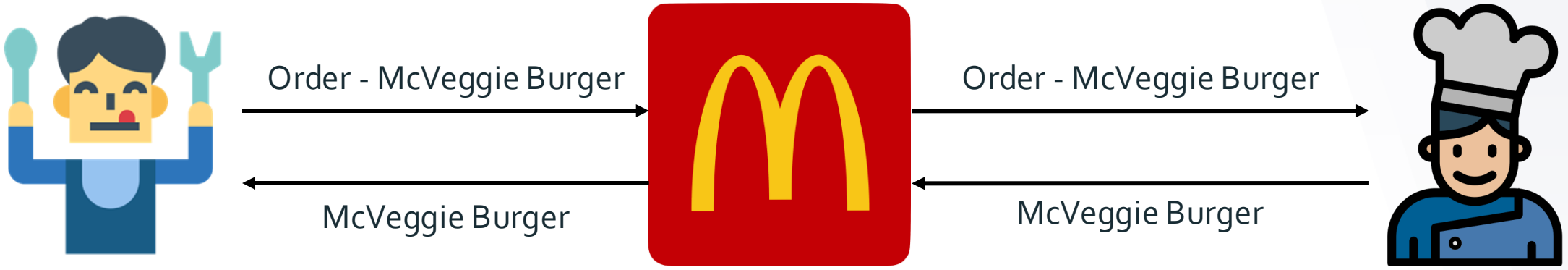


Docker is a software platform that allows you to build, test, and deploy applications on containers quickly

Where Is The Ocean of this Whale?



The McDonald's Burger Use-Case



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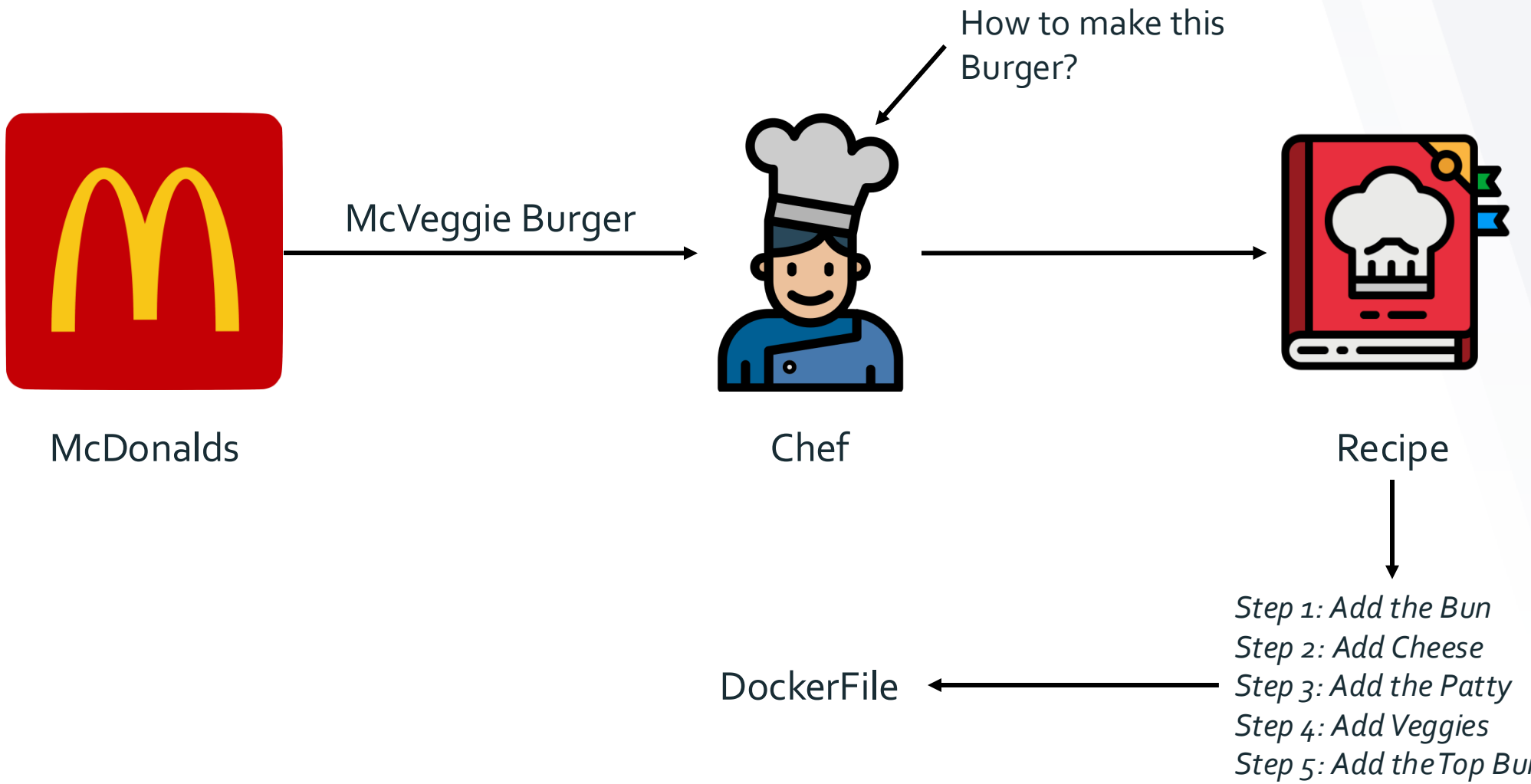


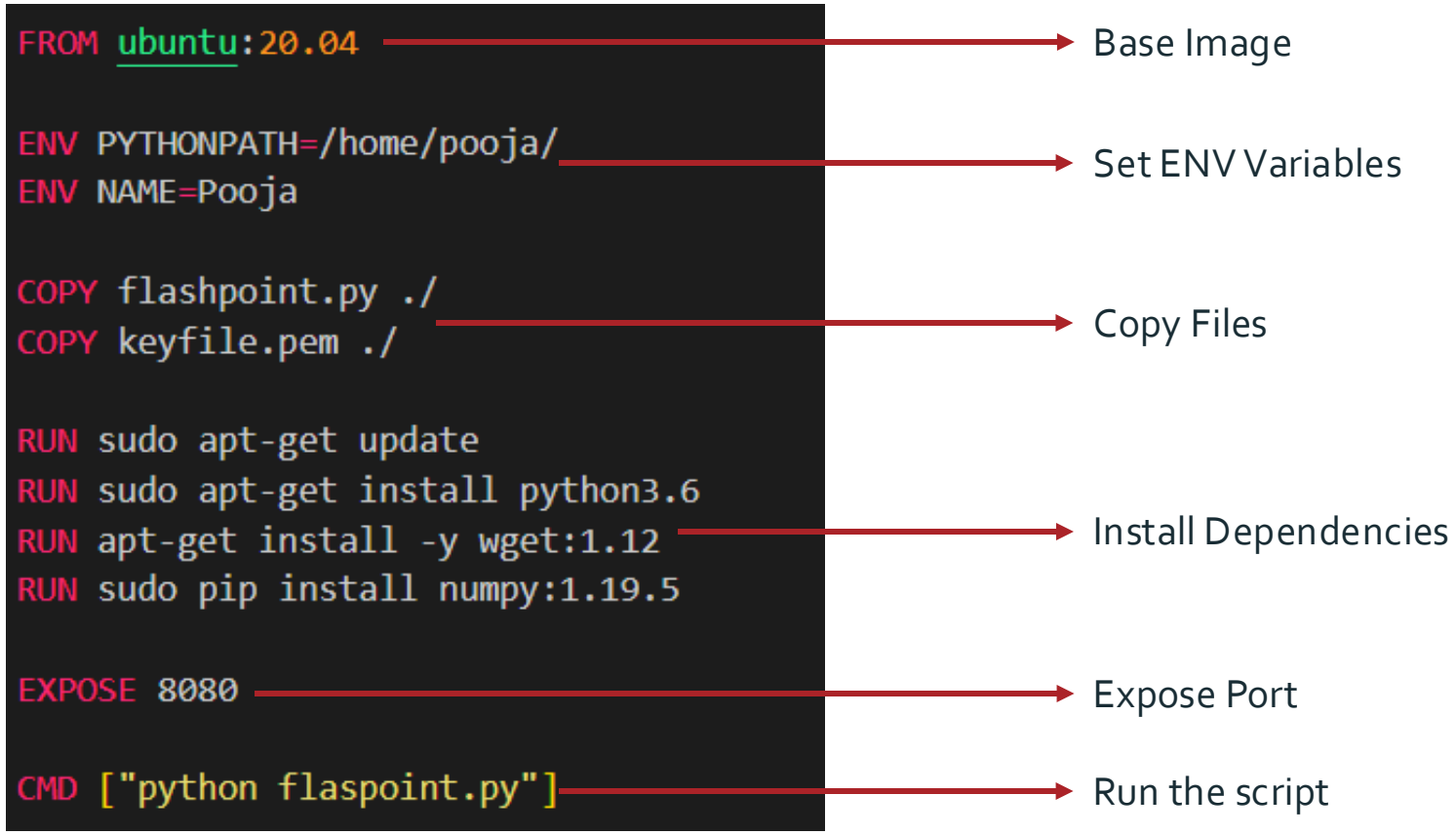
What is a Dockerfile

- A Dockerfile is basically a text document that contains all the commands a user would perform, from start to finish, to create the environment.

- Dockerfile is essentially the build instructions to build the Docker Image (In this case the McVeggie Burger)

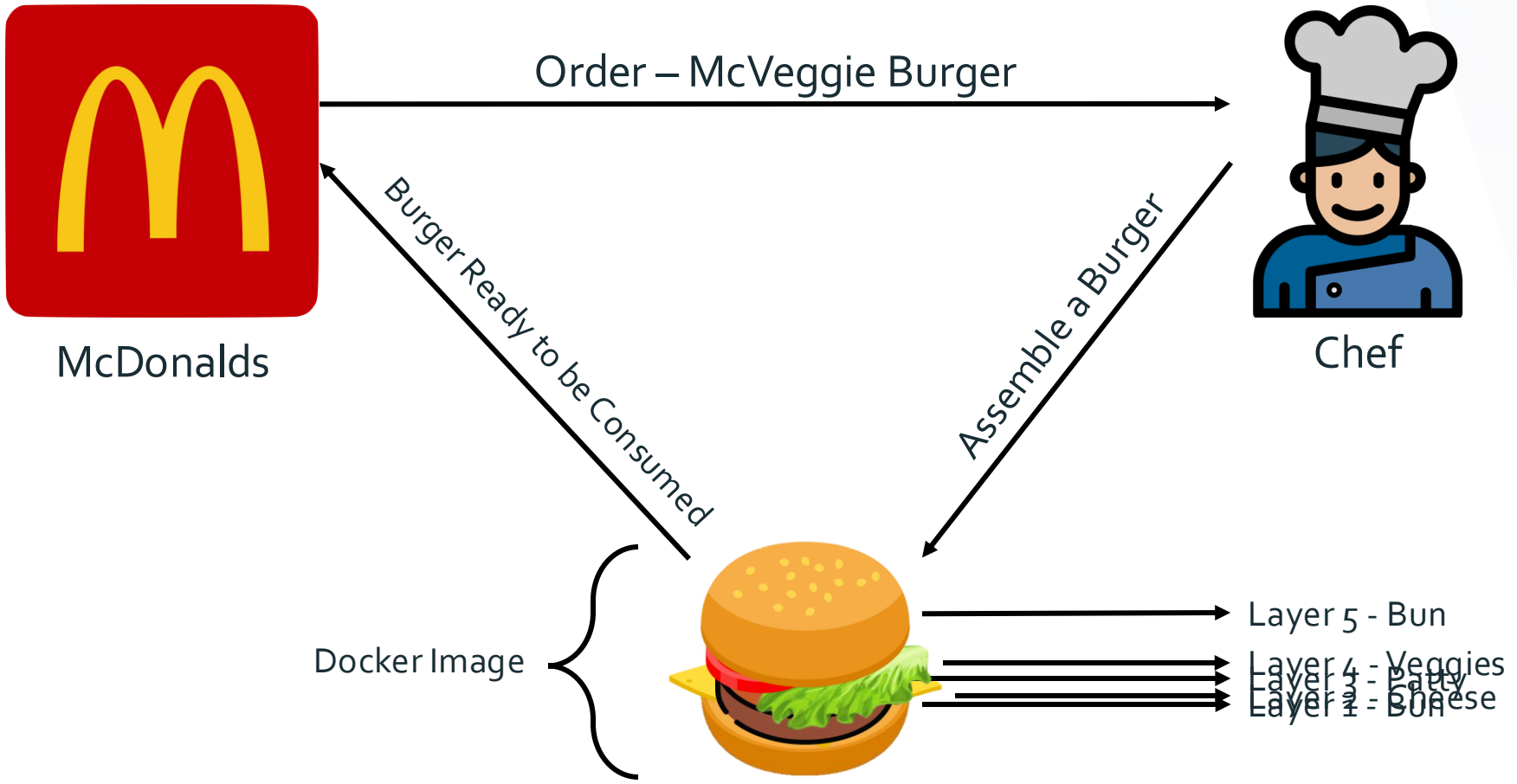
- The commands or instructions in the Dockerfile are executed successively to perform actions on the base image

Example of a Dockerfile



Dockerfile

The McDonald's Burger Use-Case



What is a Docker Image

- A Docker image is a read-only template containing instructions for creating a container.

- An Image is like a Blueprint of the Container when it runs. These Images contain the code or binary, runtimes, dependencies, and other filesystem objects to run an application.

- An Image is composed of multiple stacked layers, with each layer changing something in the environment.

Example of a Docker Image

```
FROM ubuntu:20.04

ENV PYTHONPATH=/home/pooja/
ENV NAME=Pooja

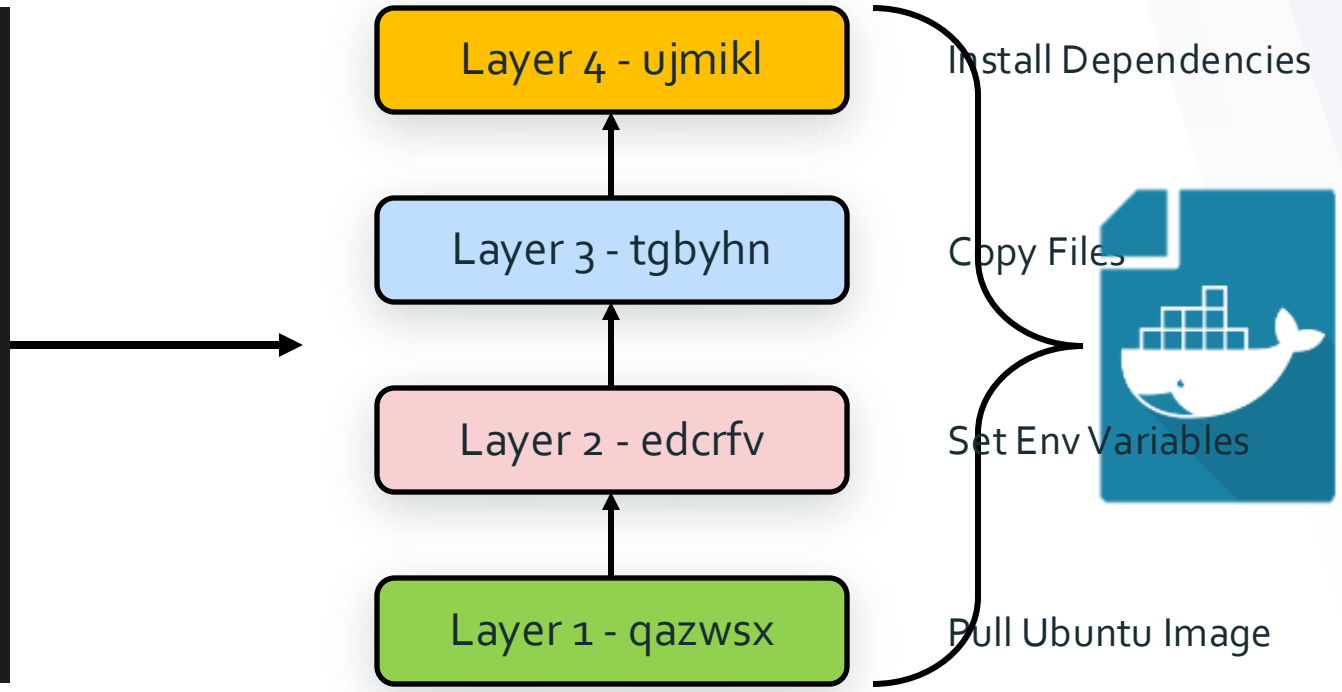
COPY flashpoint.py ./
COPY keyfile.pem ./

RUN sudo apt-get update
RUN sudo apt-get install python3.6
RUN apt-get install -y wget:1.12
RUN sudo pip install numpy:1.19.5

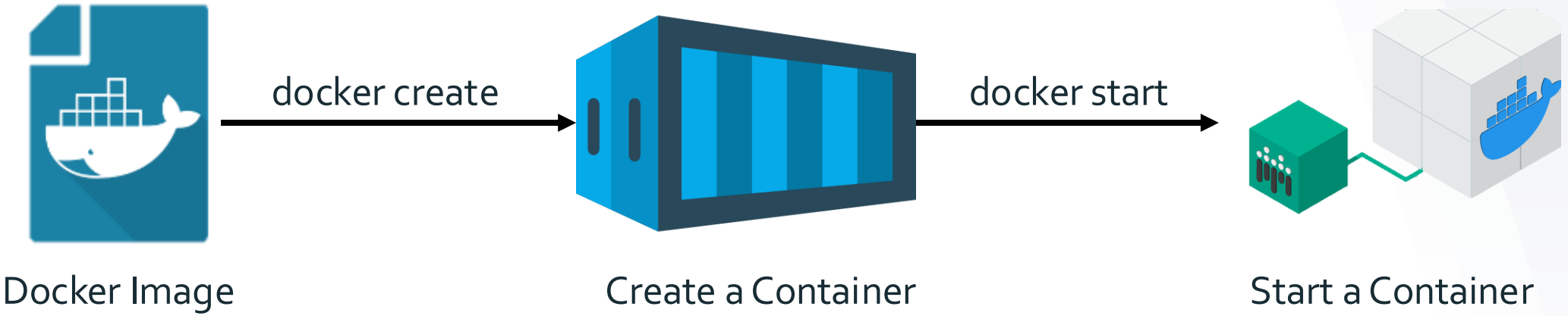
EXPOSE 8080

CMD ["python flaspoint.py"]
```

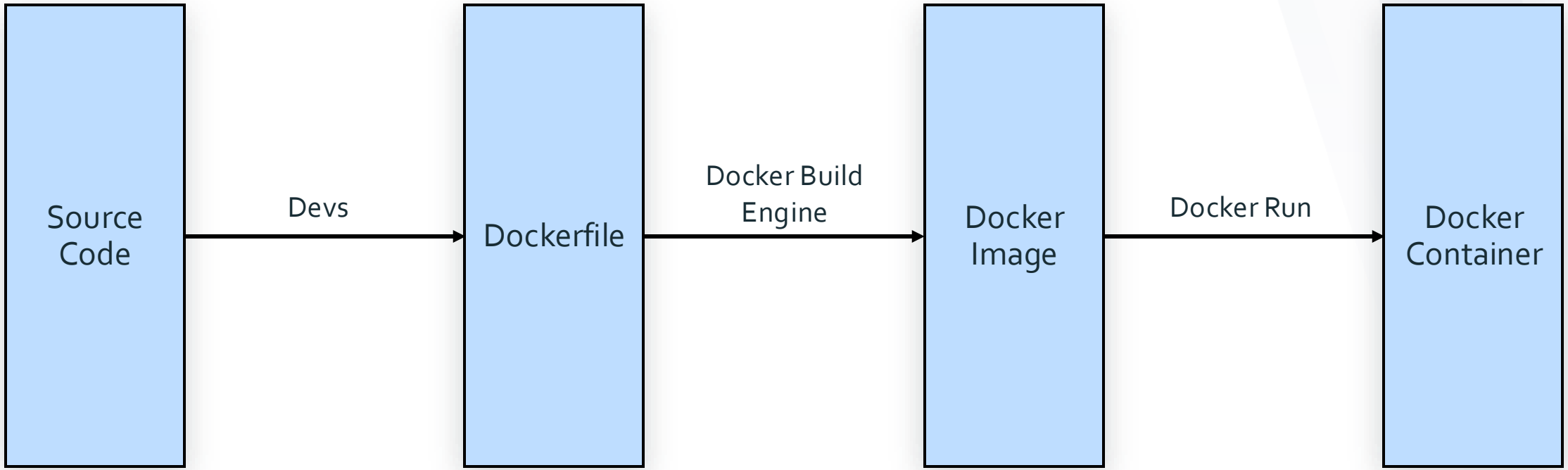
Dockerfile



Docker Image to Container



Start to Finish with Docker



What are Container Registries?

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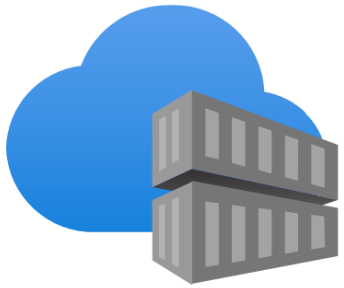
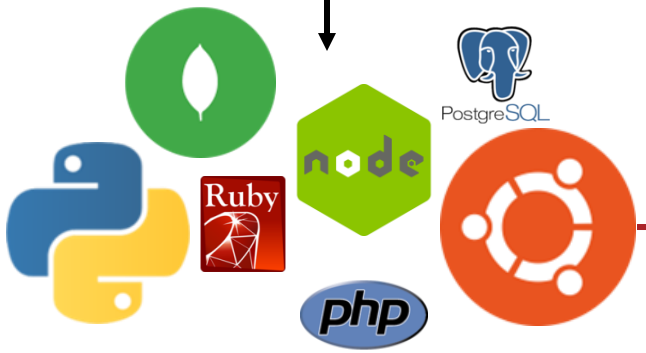
Container Registry

Where do we get this from?



Container Registry

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RUN sudo pip install numpy:1.19.5

EXPOSE 8080

CMD ["python flaspoint.py"]
```

Types of Container Registries

Docker Hub

Third Party Registries Services

docker login

What is a Container Registry?

- A container registry is essentially acts as a place for developers to store container images and share them out via a process of uploading (pushing) to the registry and downloading (pulling) into another system.

- A Container Registry can have multiple images. Each image can have multiple versions. Each image is identified by the tag (version) or its own unique hash.

- Container registries make efficient use of storage space by sharing any layers that are common to more than one image.

Trends with Containers

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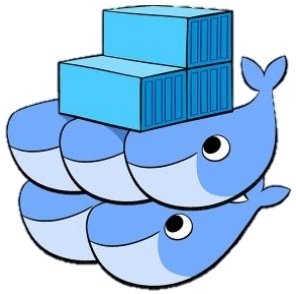
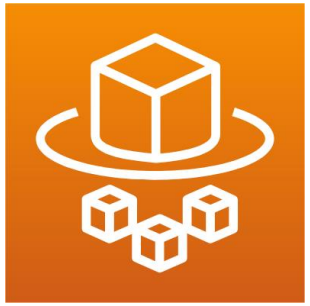
Current Trends Of Container Technology

Kubernetes



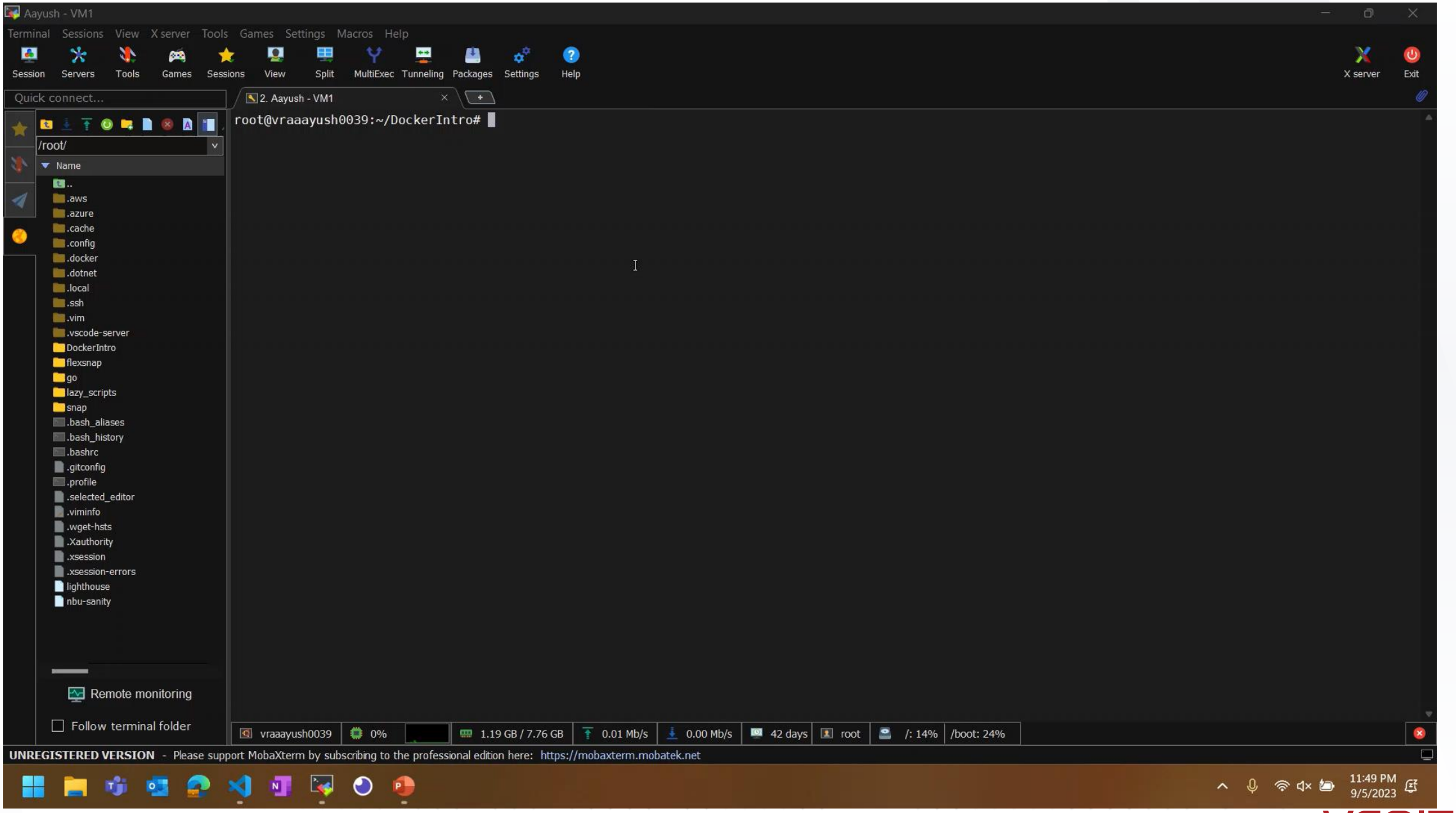
Docker Swarm



Amazon Fargate

OpenShift

Demo


Aayush - VM1
Terminal Sessions View X server Tools Games Settings Macros Help
Session Servers Tools Games Sessions View Split MultiExec Tunneling Packages Settings Help
X server Exit
Quick connect...
2. Aayush - VM1
root@vraaayush0039:~/DockerIntro#
/root/
Name
..
.aws
.azure
.cache
.config
.docker
.dotnet
.local
.ssh
.vim
.vscode-server
DockerIntro
flexsnap
go
lazy_scripts
snap
.bash_aliases
.bash_history
.bashrc
.gitconfig
.profile
.selected_editor
.viminfo
.wget-hsts
.Xauthority
.xsession
.xsession-errors
lighthouse
nbu-sanity
Remote monitoring
Follow terminal folder
vraaayush0039 0% 1.19 GB / 7.76 GB 0.01 Mb/s 0.00 Mb/s 42 days root /: 14% /boot: 24%
UNREGISTERED VERSION - Please support MobaXterm by subscribing to the professional edition here: https://mobaxterm.mobatek.net
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Thank You