

Containers and their advantages

INTRODUCTION TO DOCKER



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Prerequisites



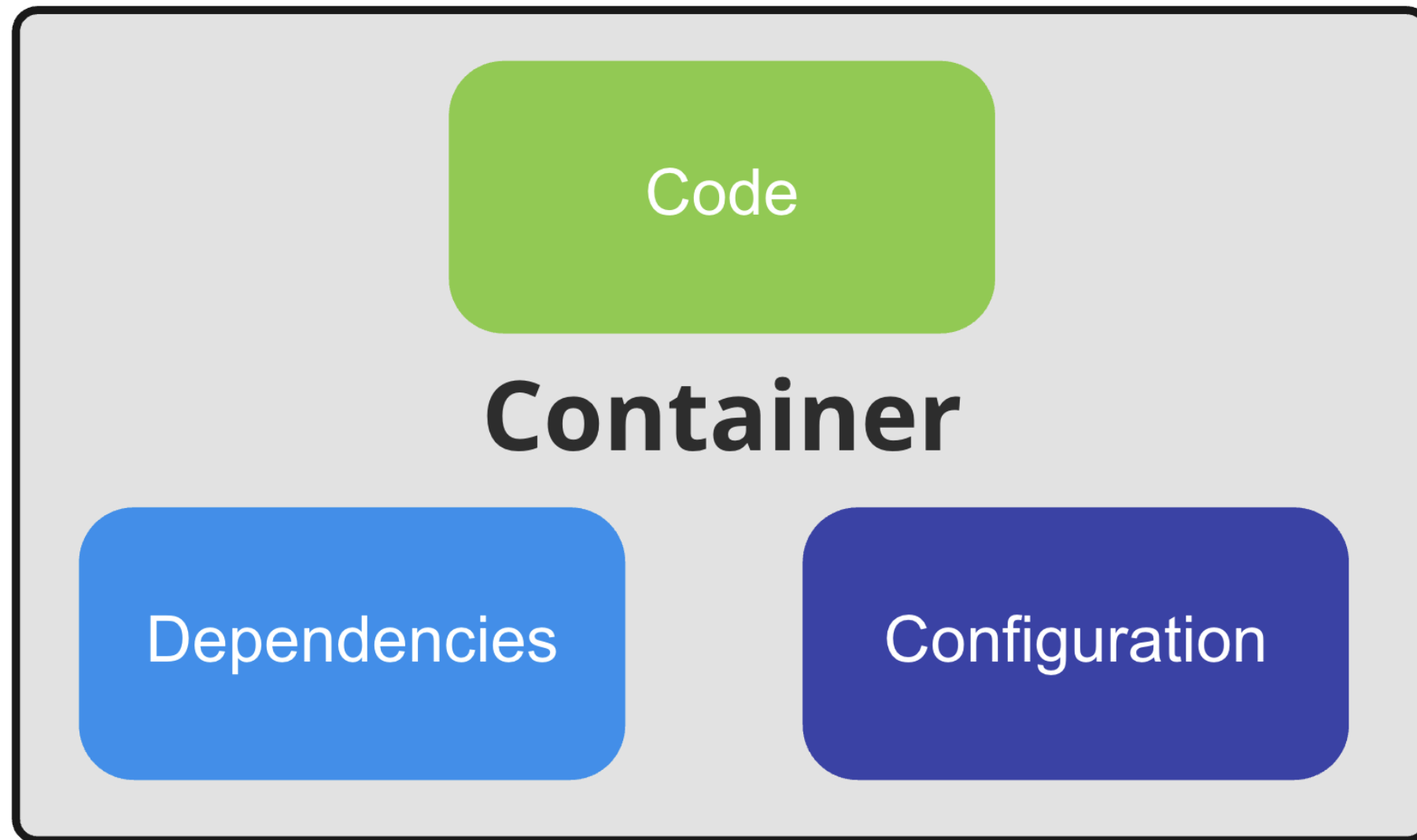
Please take DataCamp's [Introduction to Shell](#) before starting this course.

We will use:

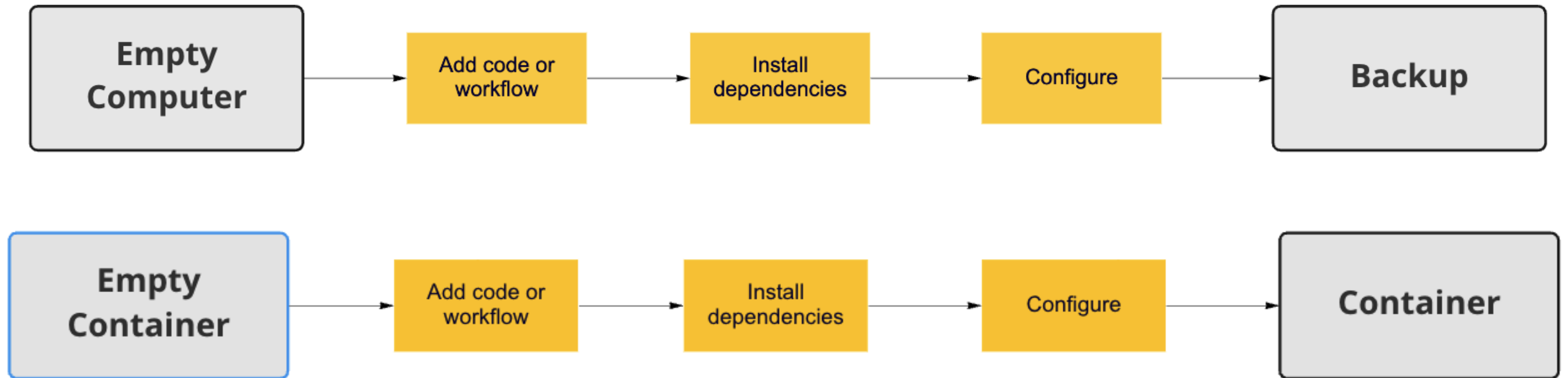
- `nano` to edit files.
- `ls`, `cd`, and `mkdir` to find our way in and manage the file system.

Containers

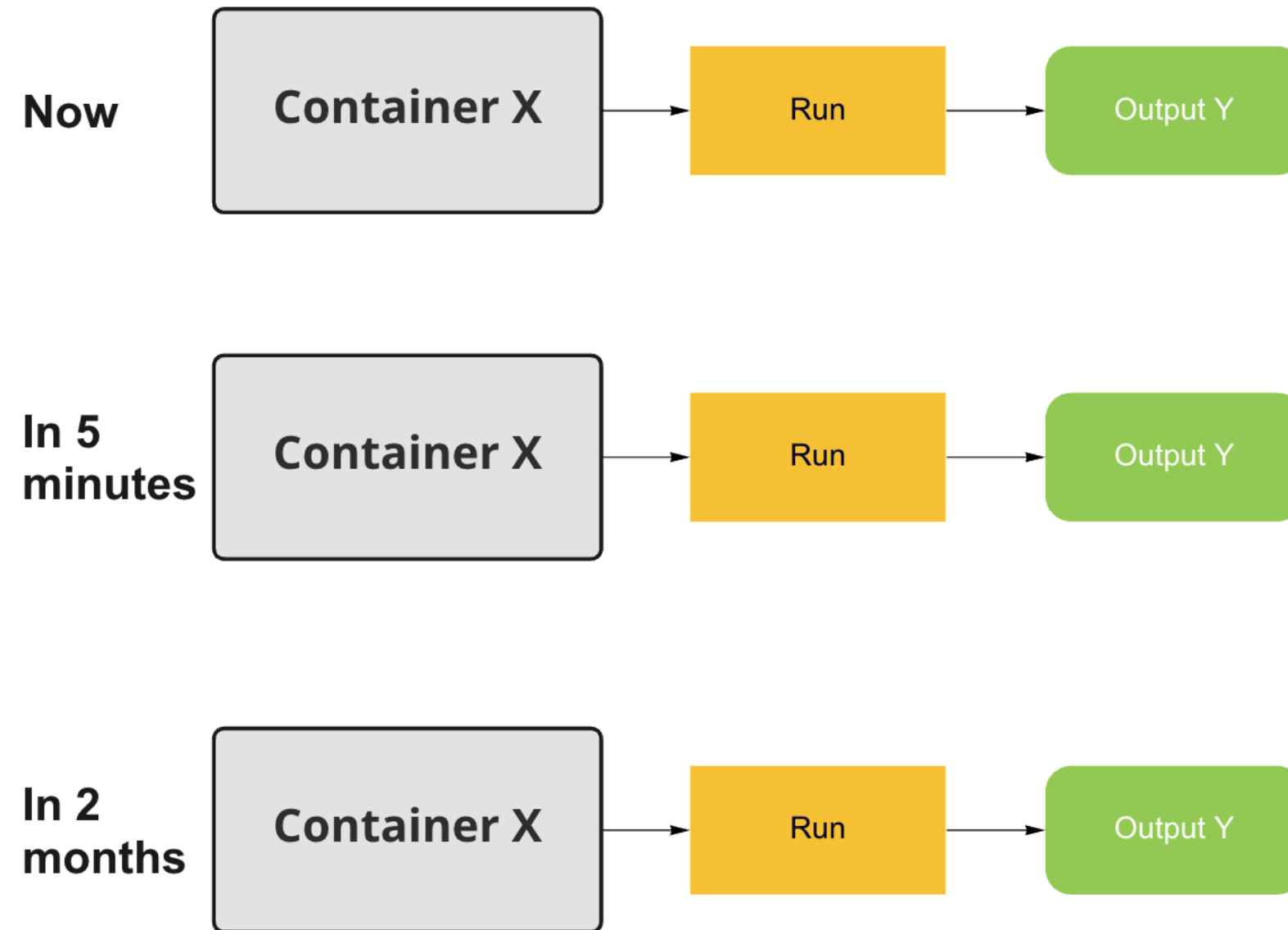
A portable computing environment



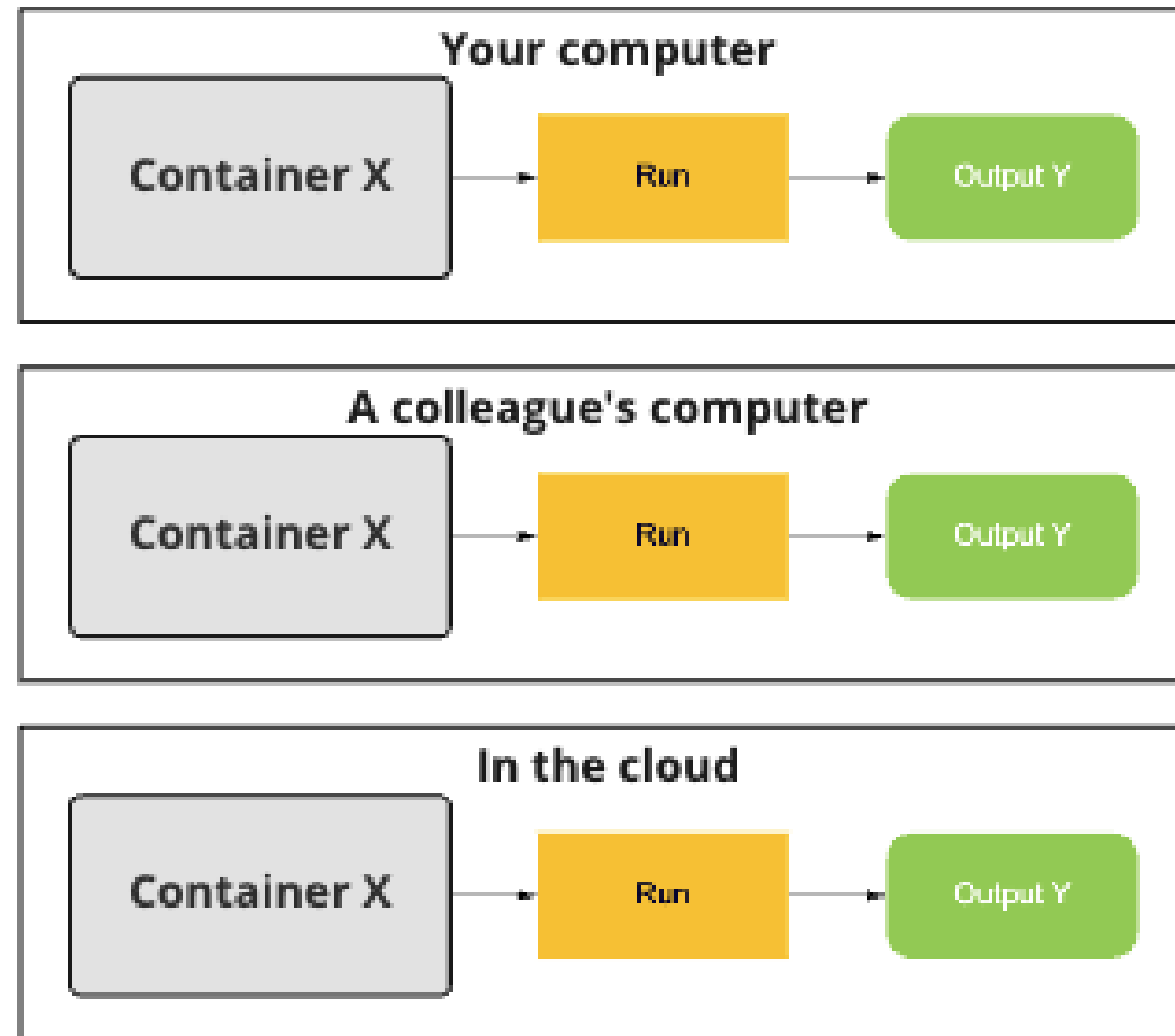
Making it less abstract



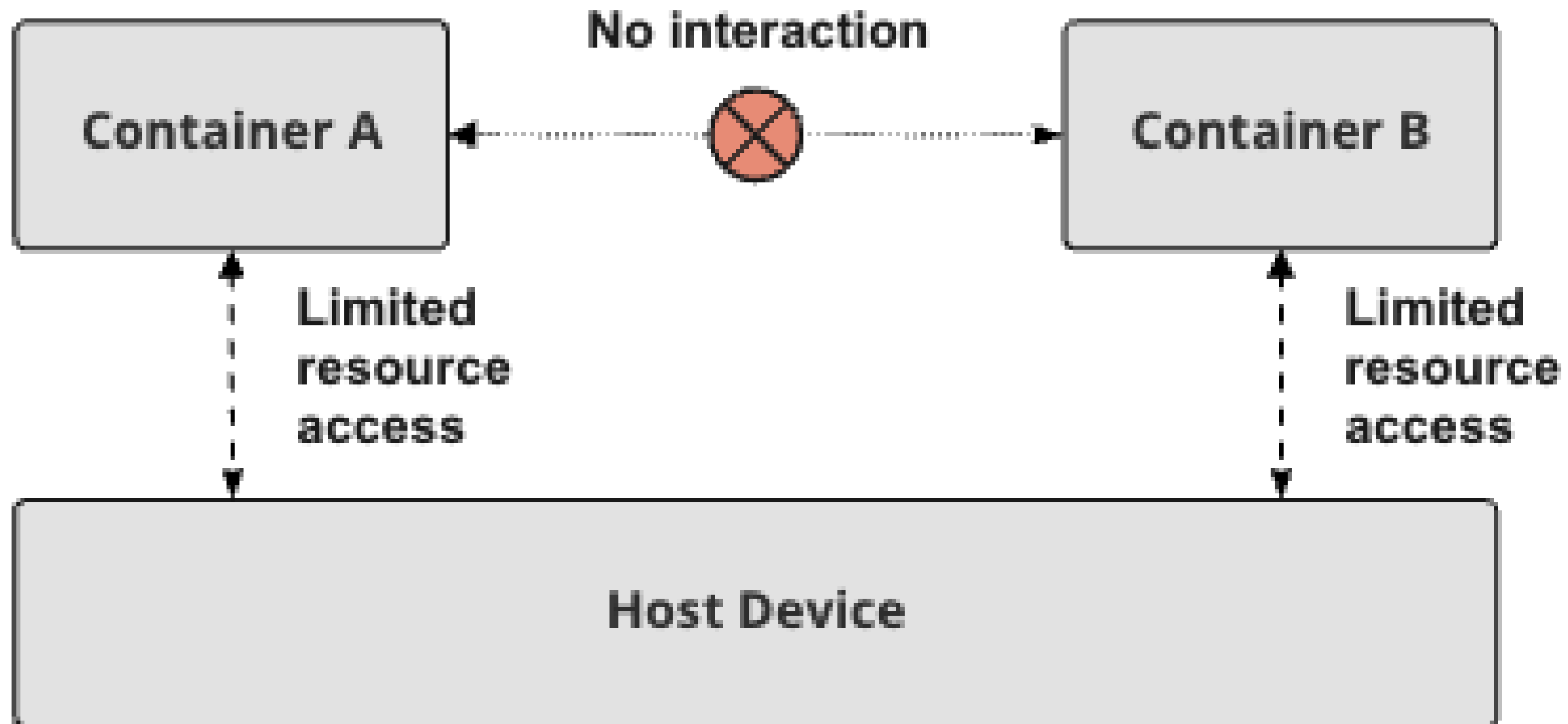
Containers run identically every time



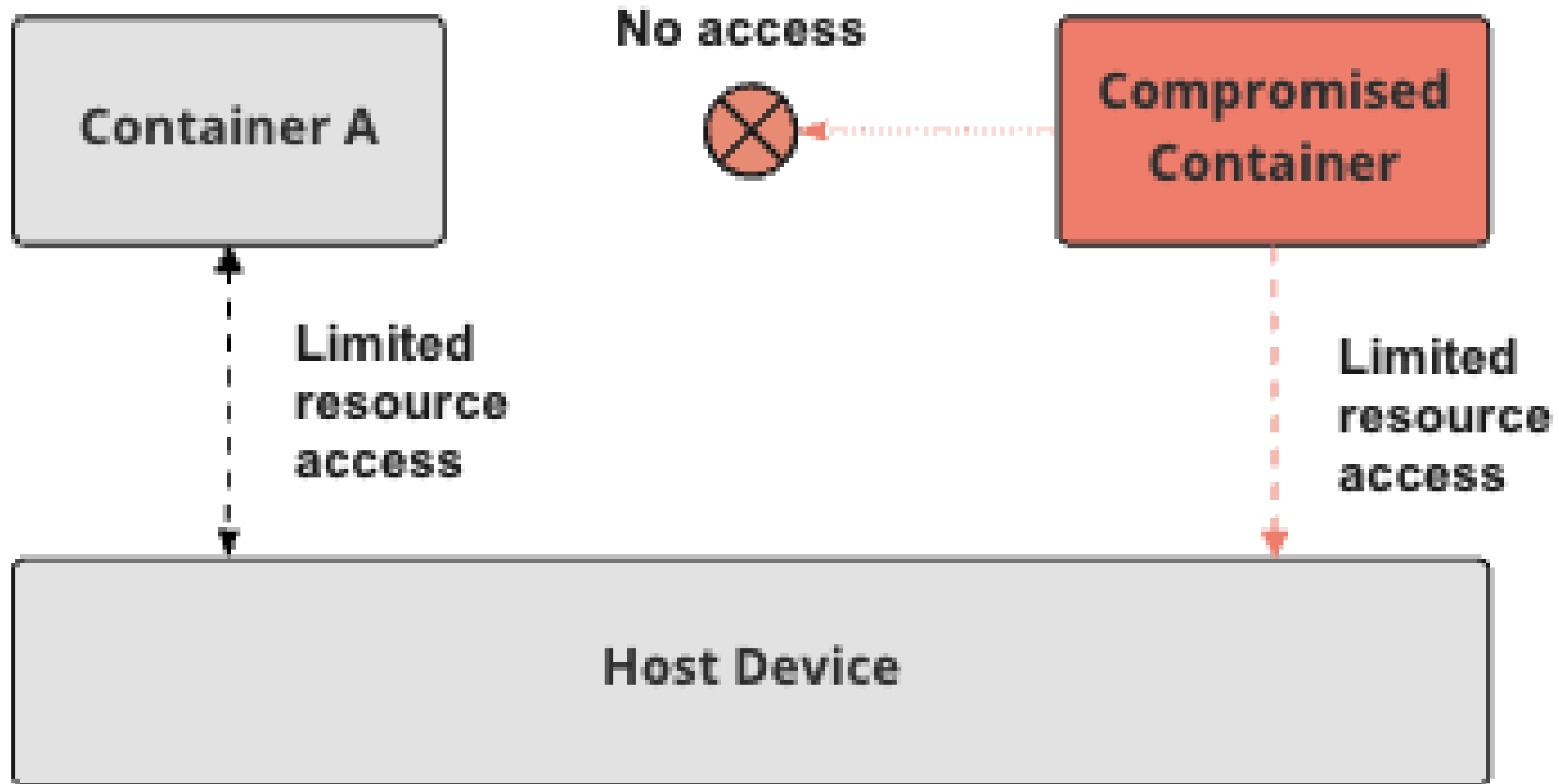
Containers run identically everywhere



Isolation



Containers provide security



Containers are lightweight

- Security
- Portability
- Reproducibility
- **Lightweight**
 - In comparison to running an application:
 - Outside of a container
 - Using a virtual machine

Containers and data science

- Automatically reproducible
- Dependencies are automatically included
- Datasets can be included
- Code will work on your colleagues machine
- Easier sharing than alternatives

Let's practice!

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The Docker Engine

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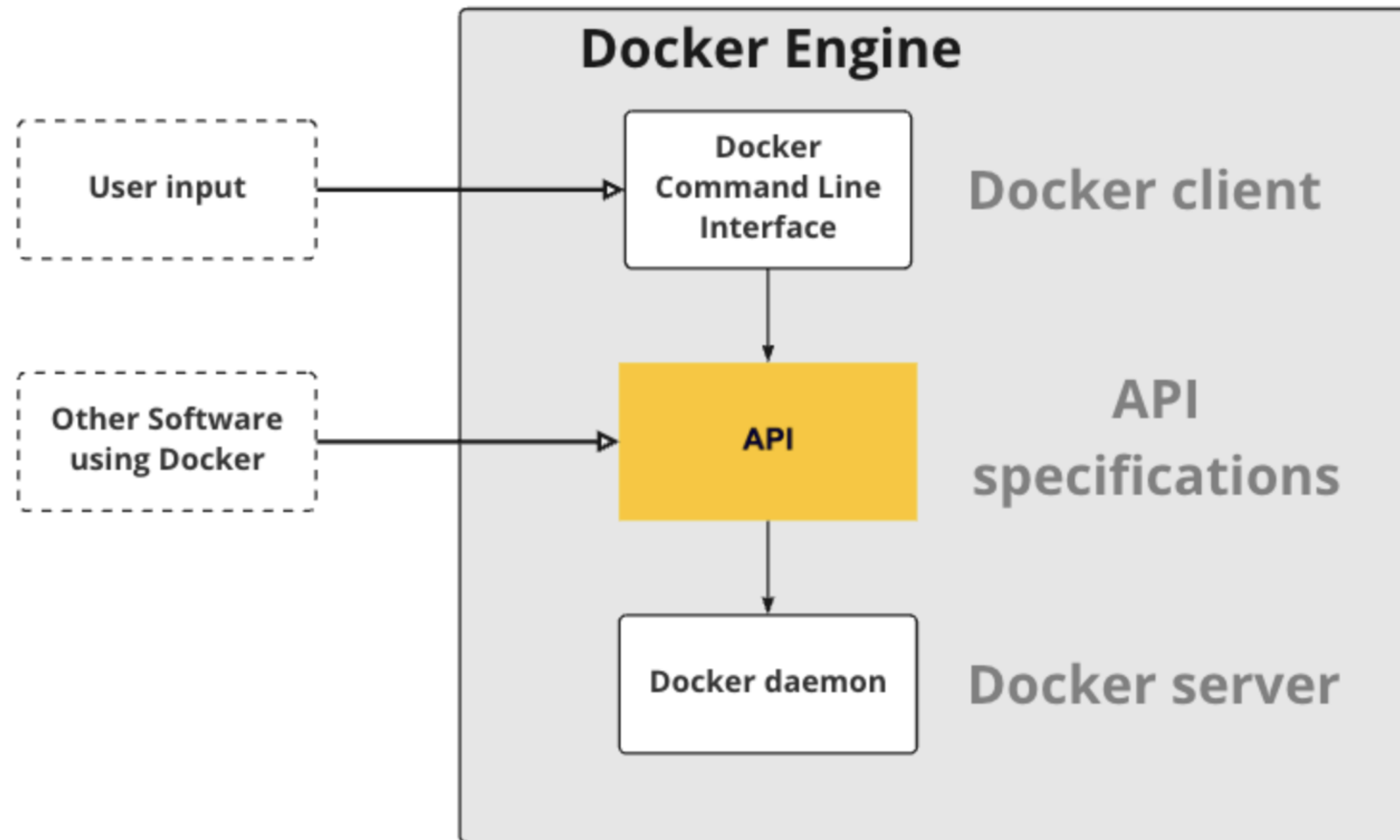
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Docker ecosystem

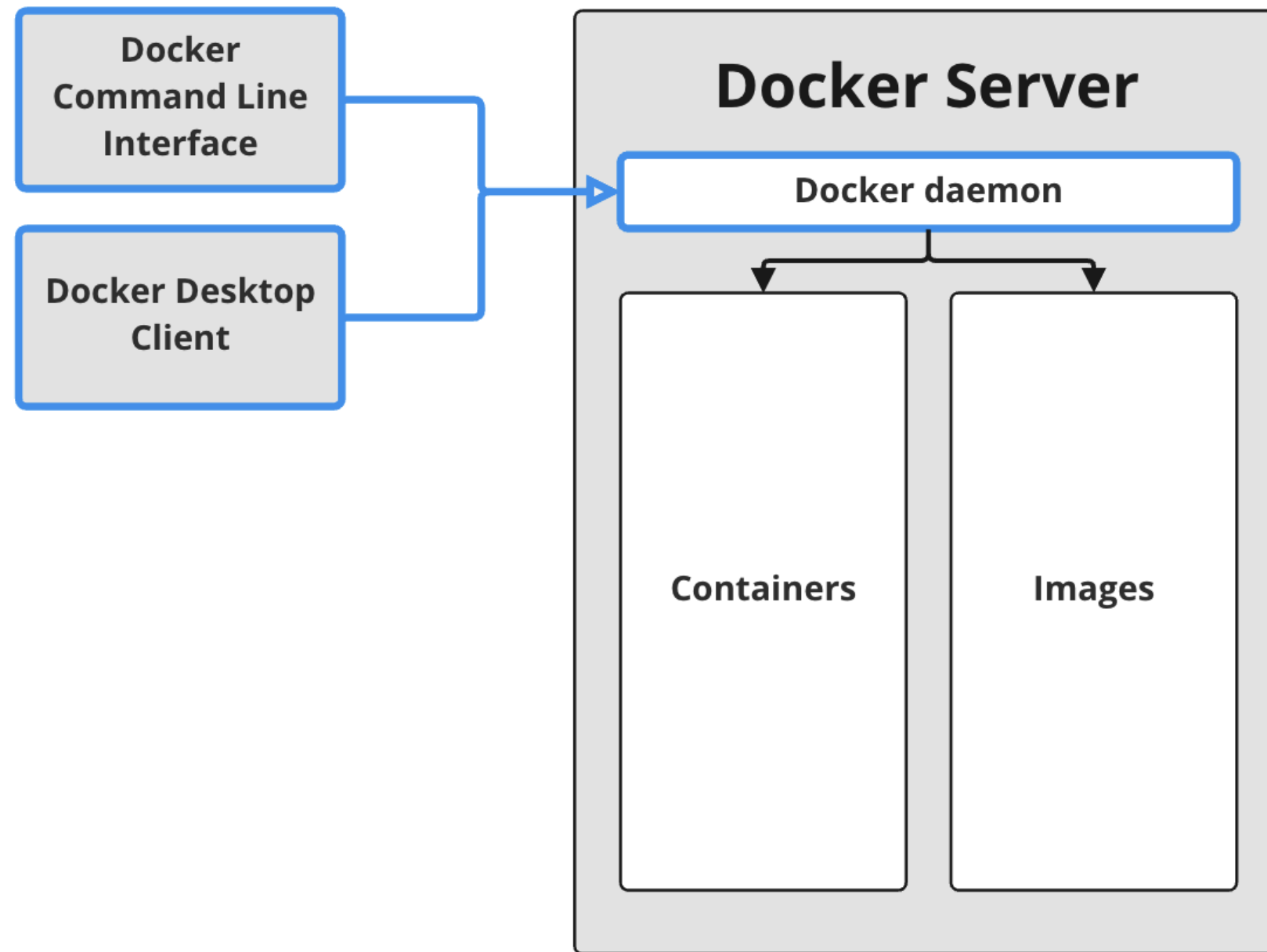


Docker Engine



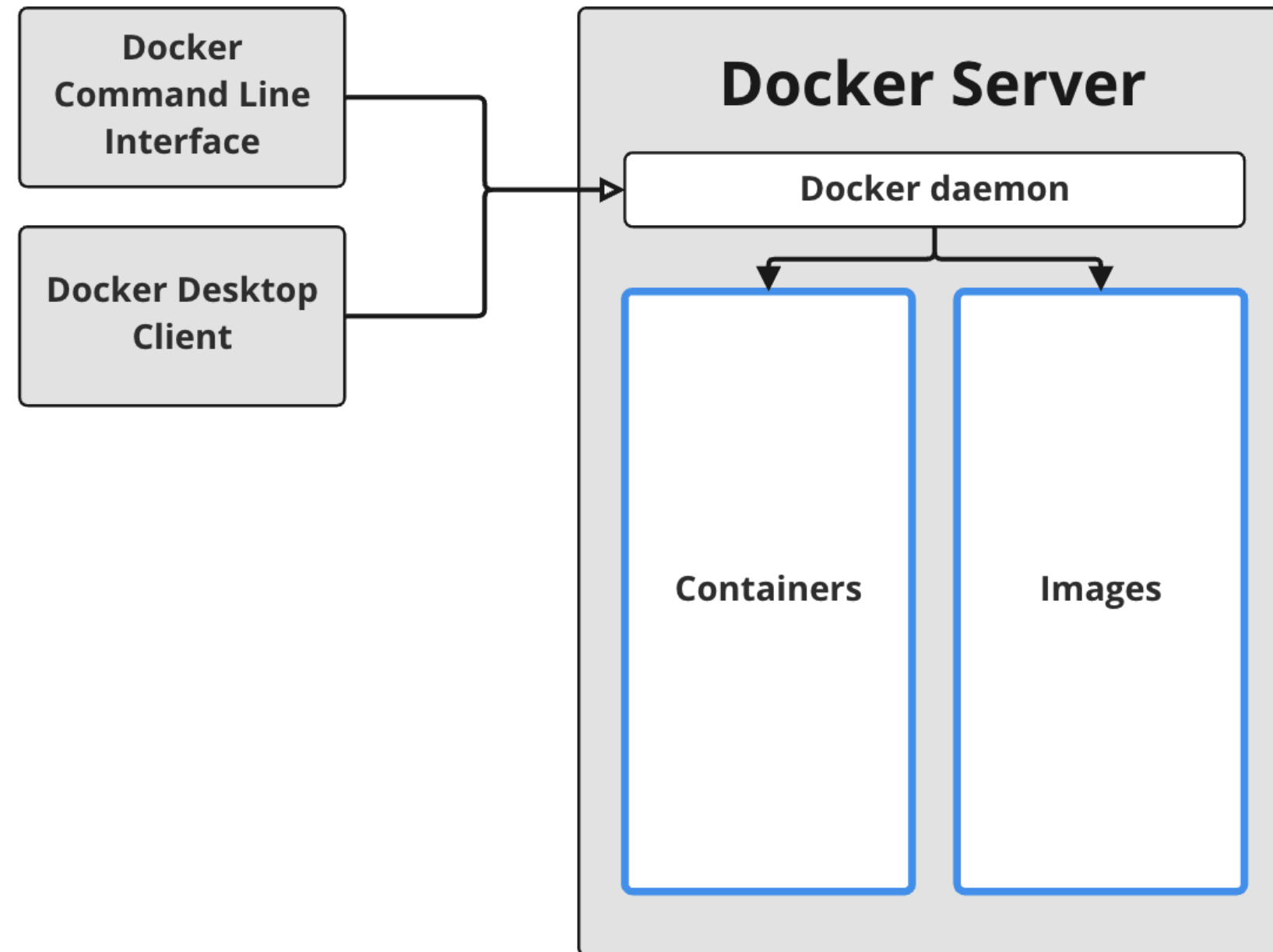
¹ <https://docs.docker.com/engine/>

The Docker daemon



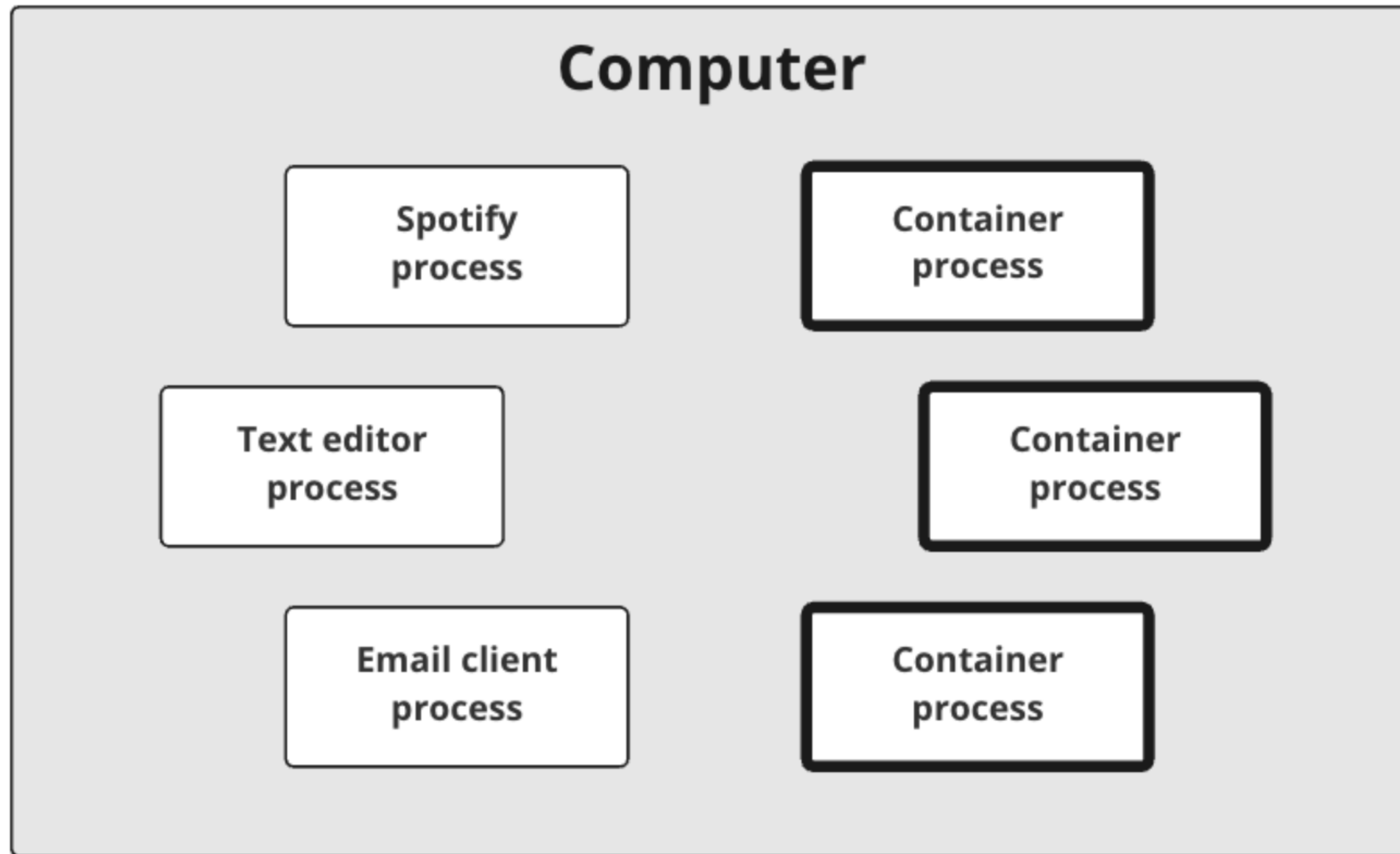
¹ <https://docs.docker.com/engine/> ² <https://docs.docker.com/get-started/overview/#docker-architecture>

Images and Containers

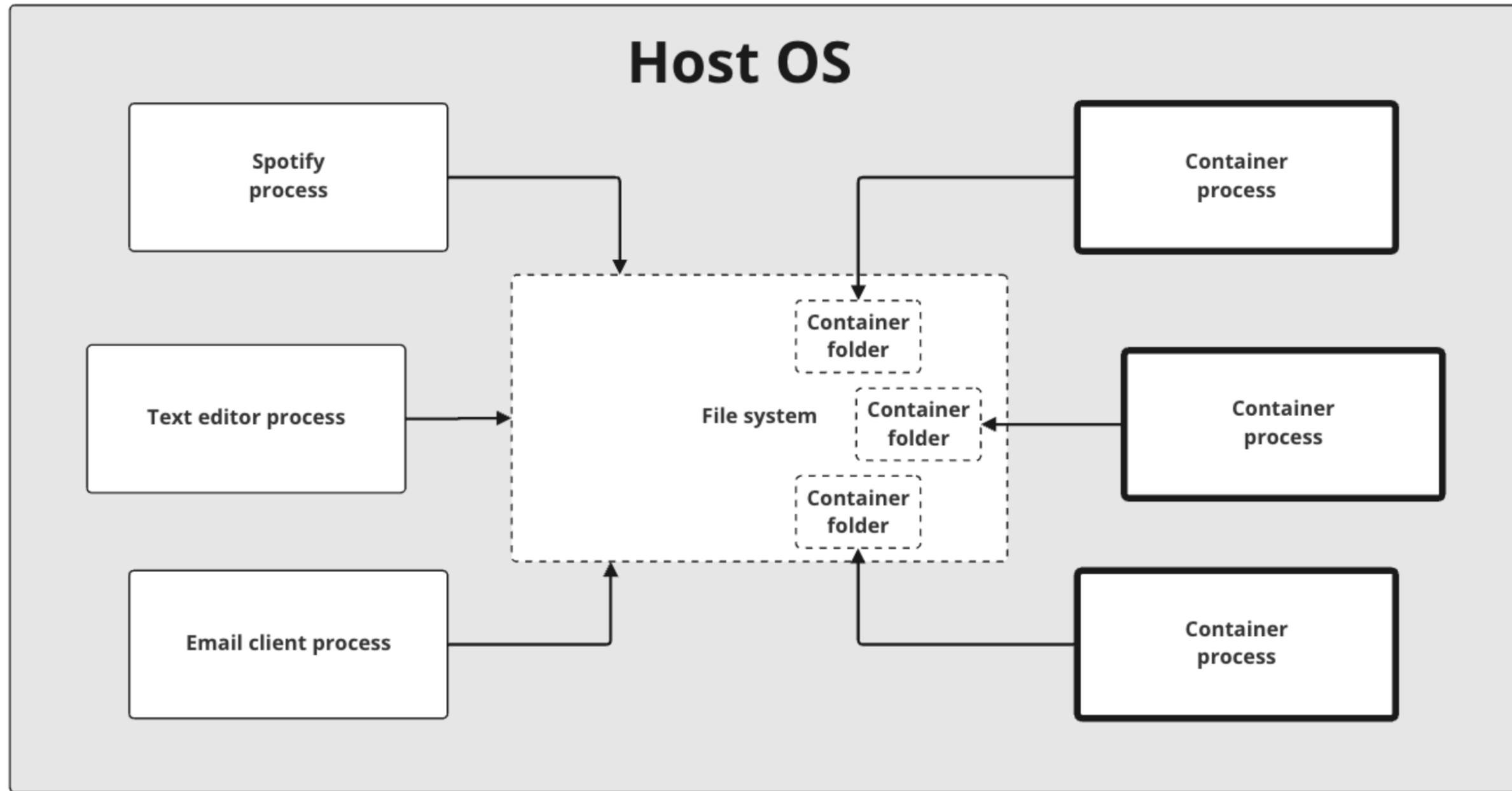


¹ <https://docs.docker.com/engine/> ² <https://docs.docker.com/get-started/overview/#docker-architecture>

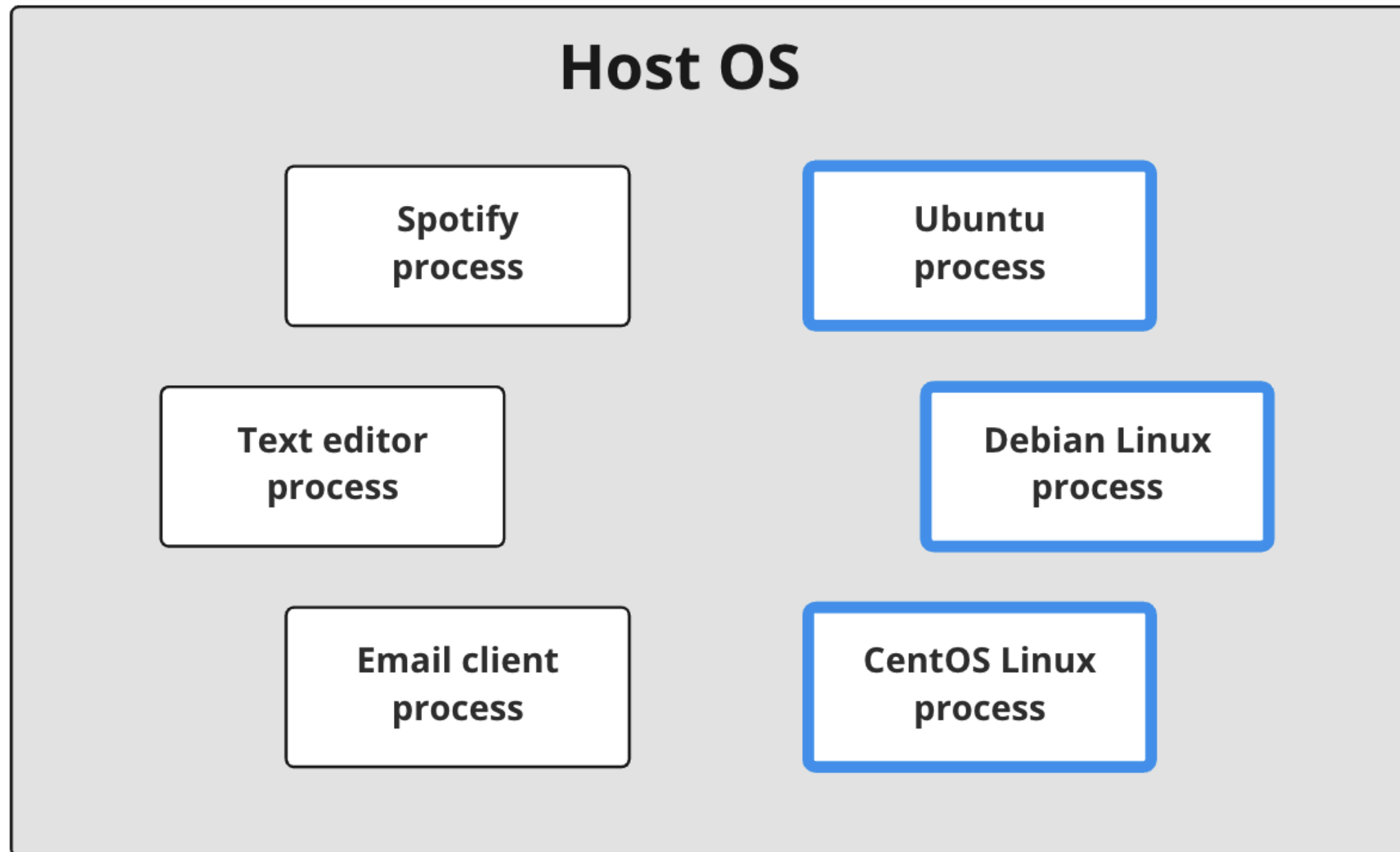
Containers are processes



Containers are processes



Containers are isolated processes



Let's practice!

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Containers vs. Virtual Machines

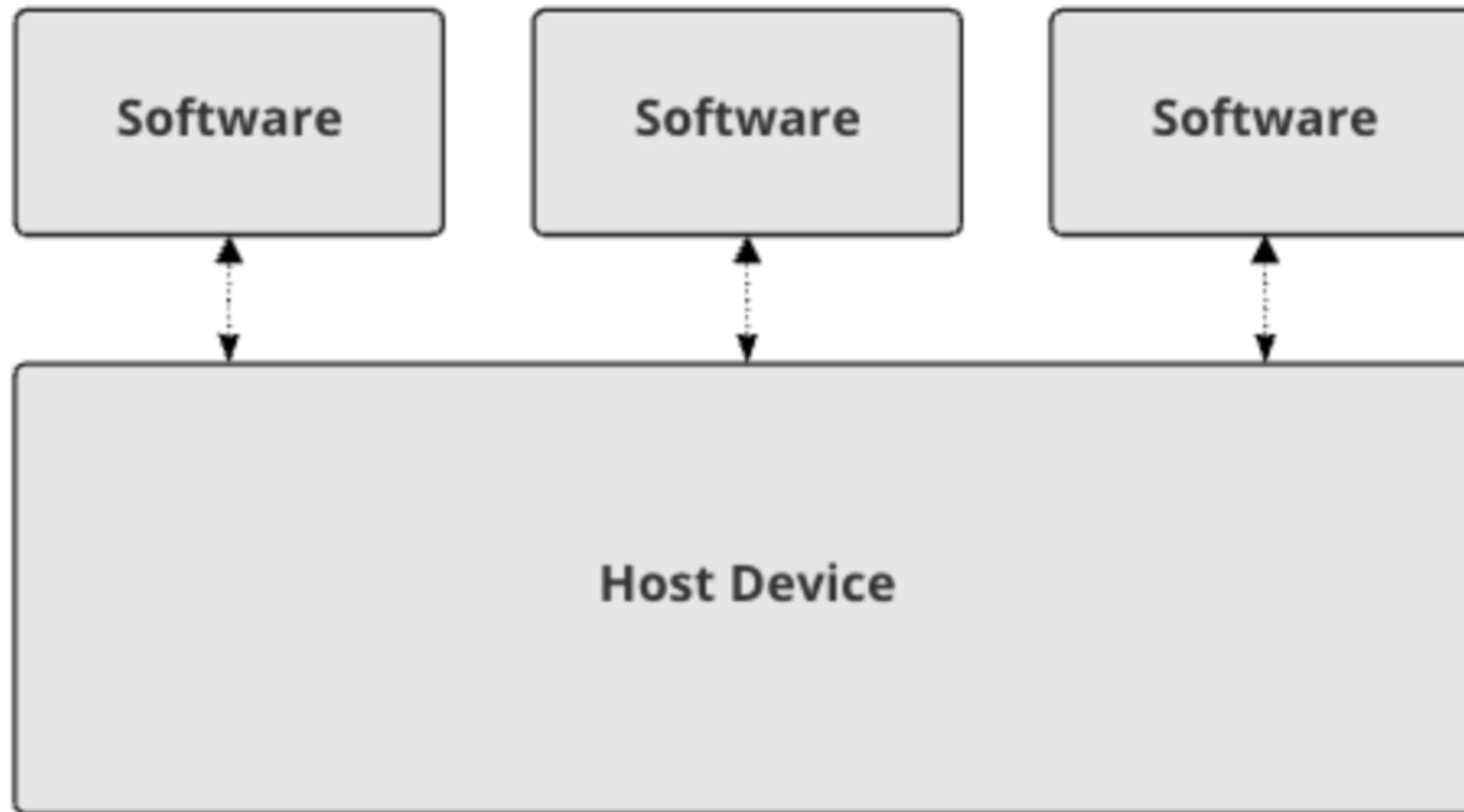
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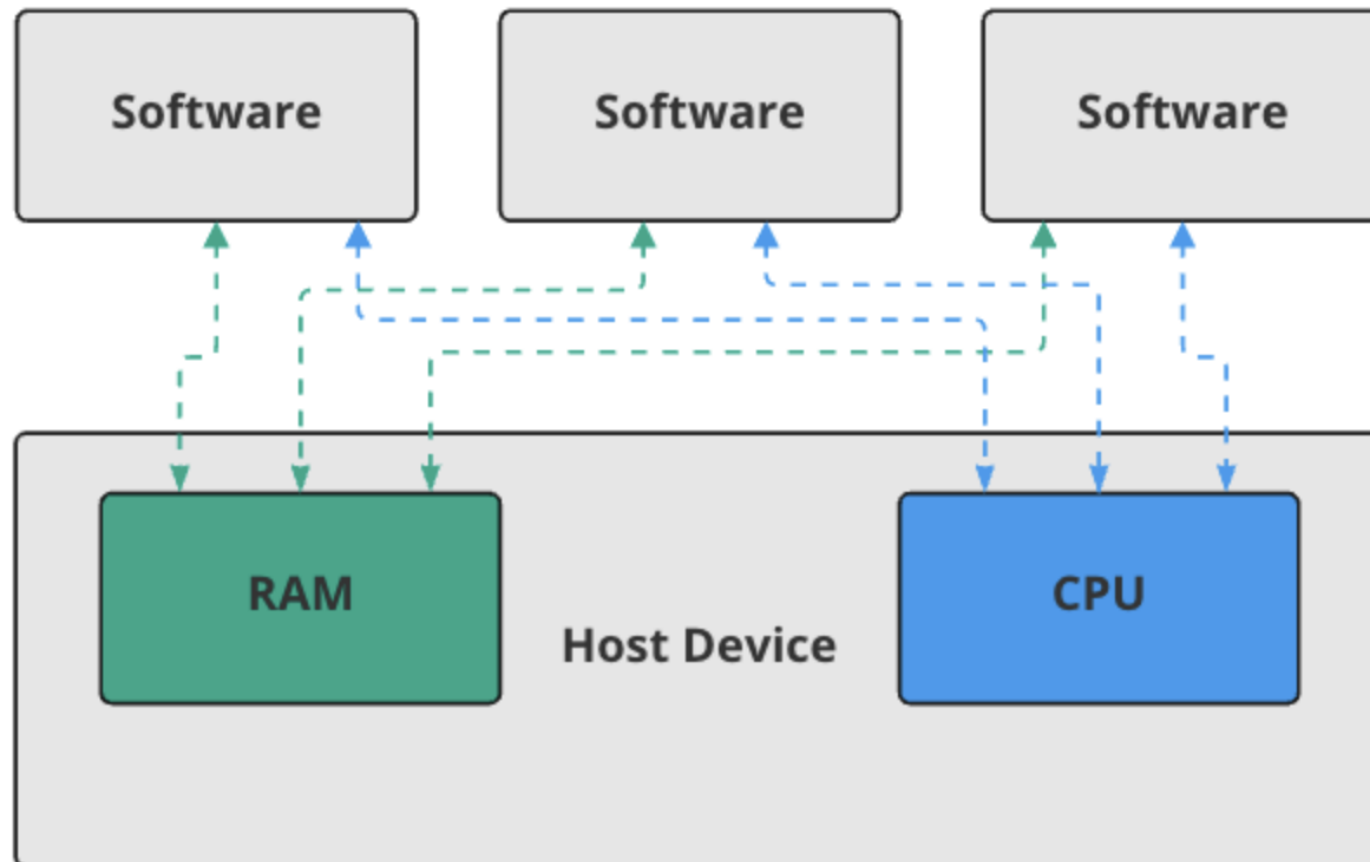
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Containers and Virtual Machines

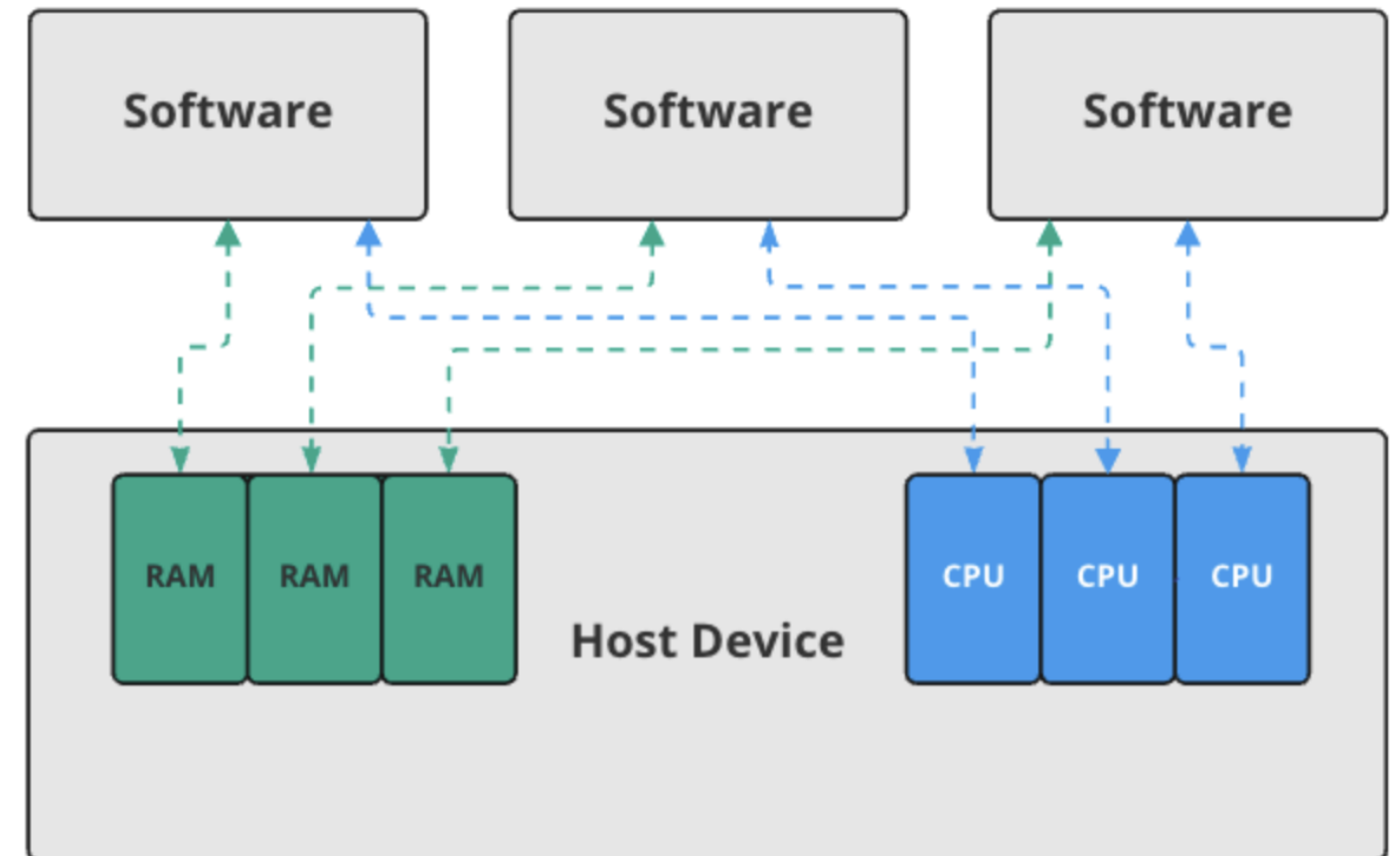


Resource Virtualization

Without Virtualization

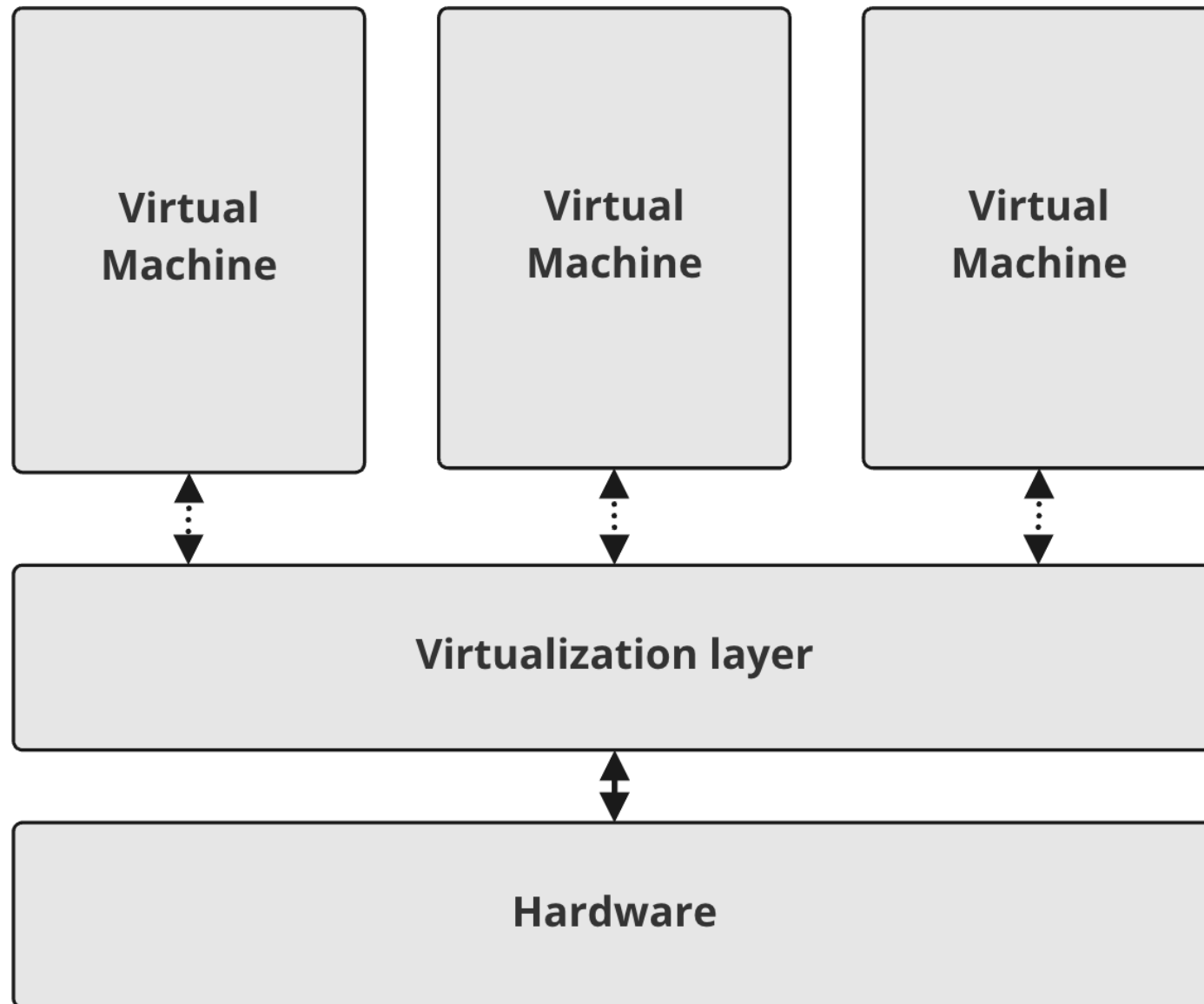


With Virtualization

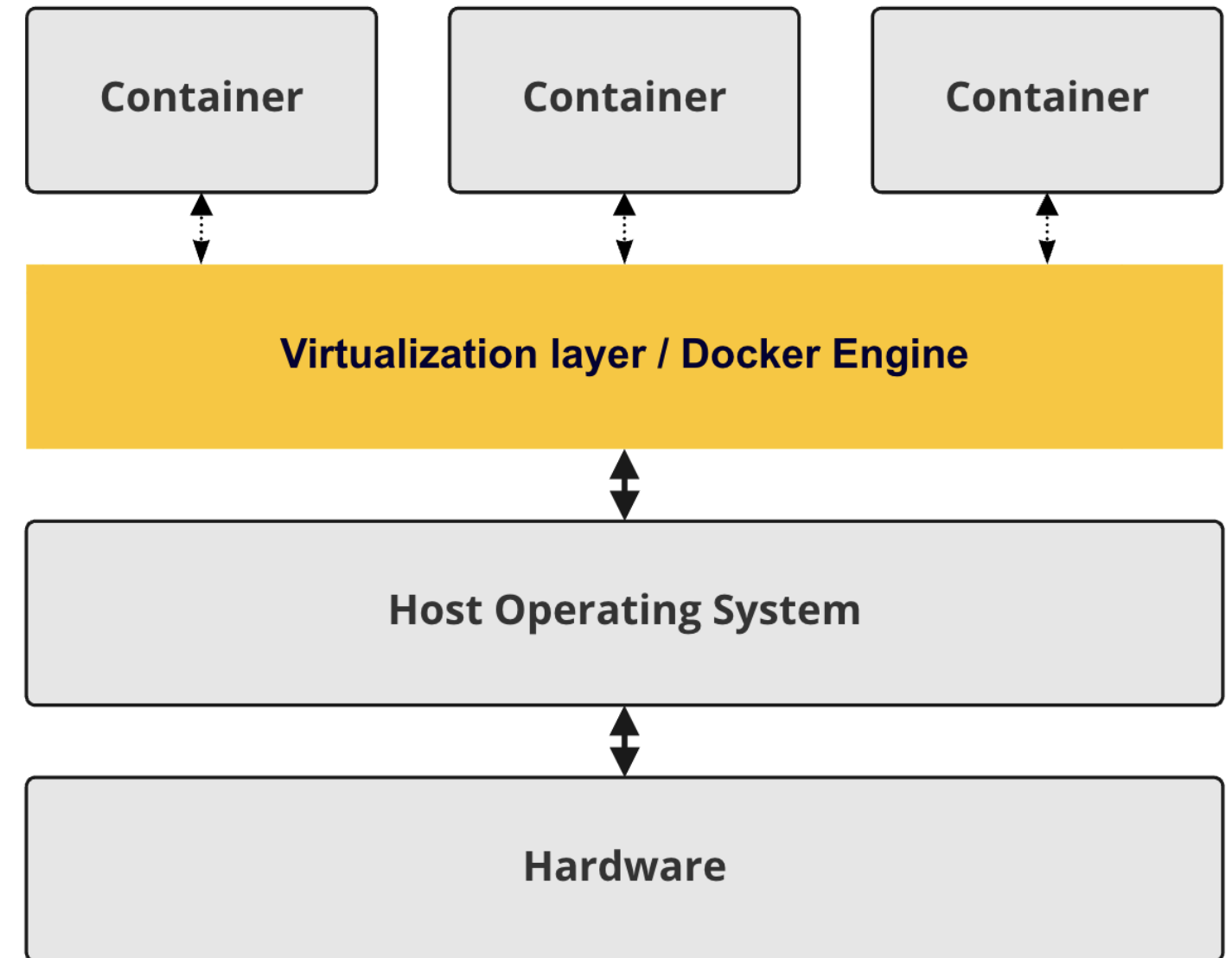


Containers vs Virtual Machines

Virtual Machines

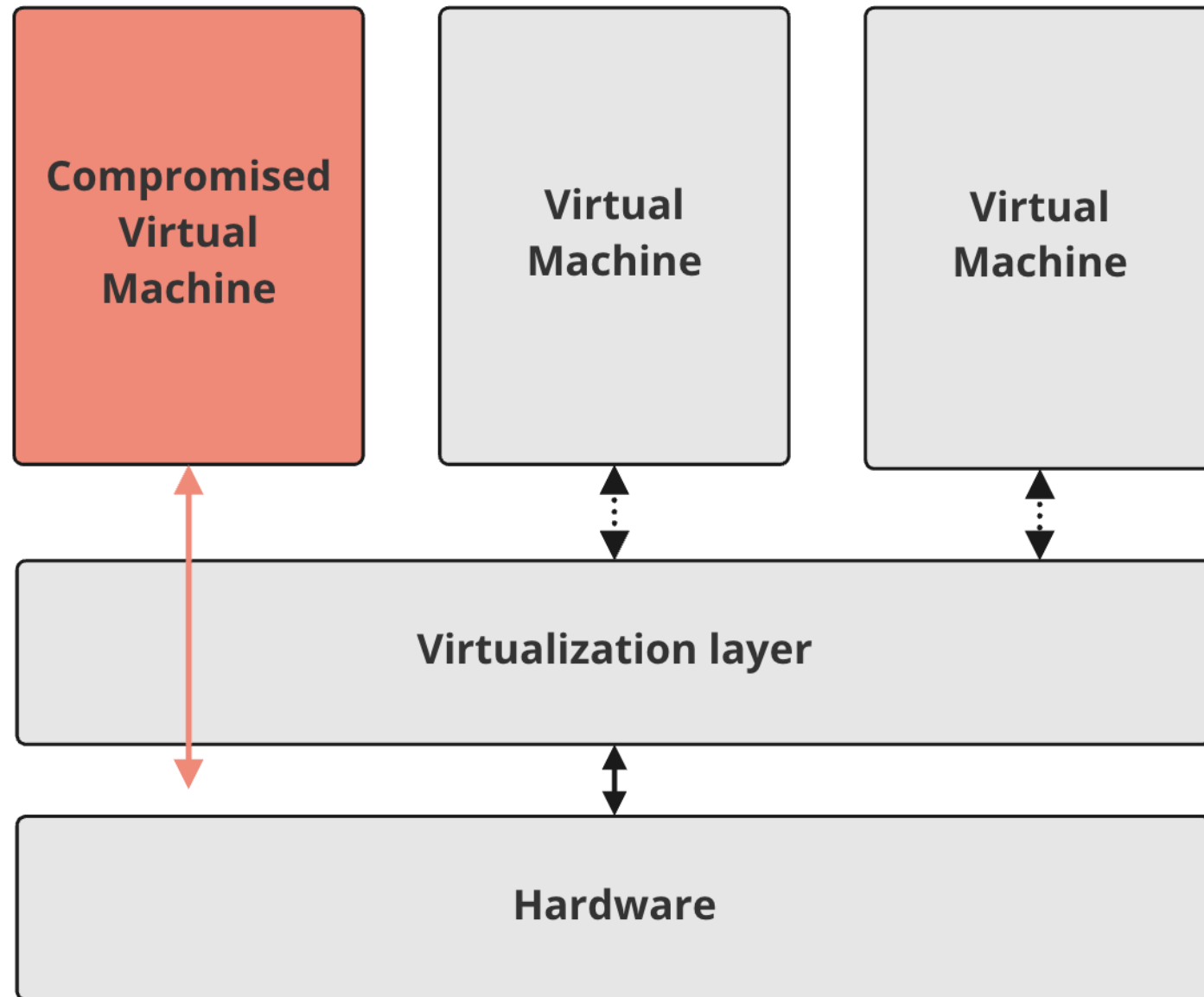


Containers

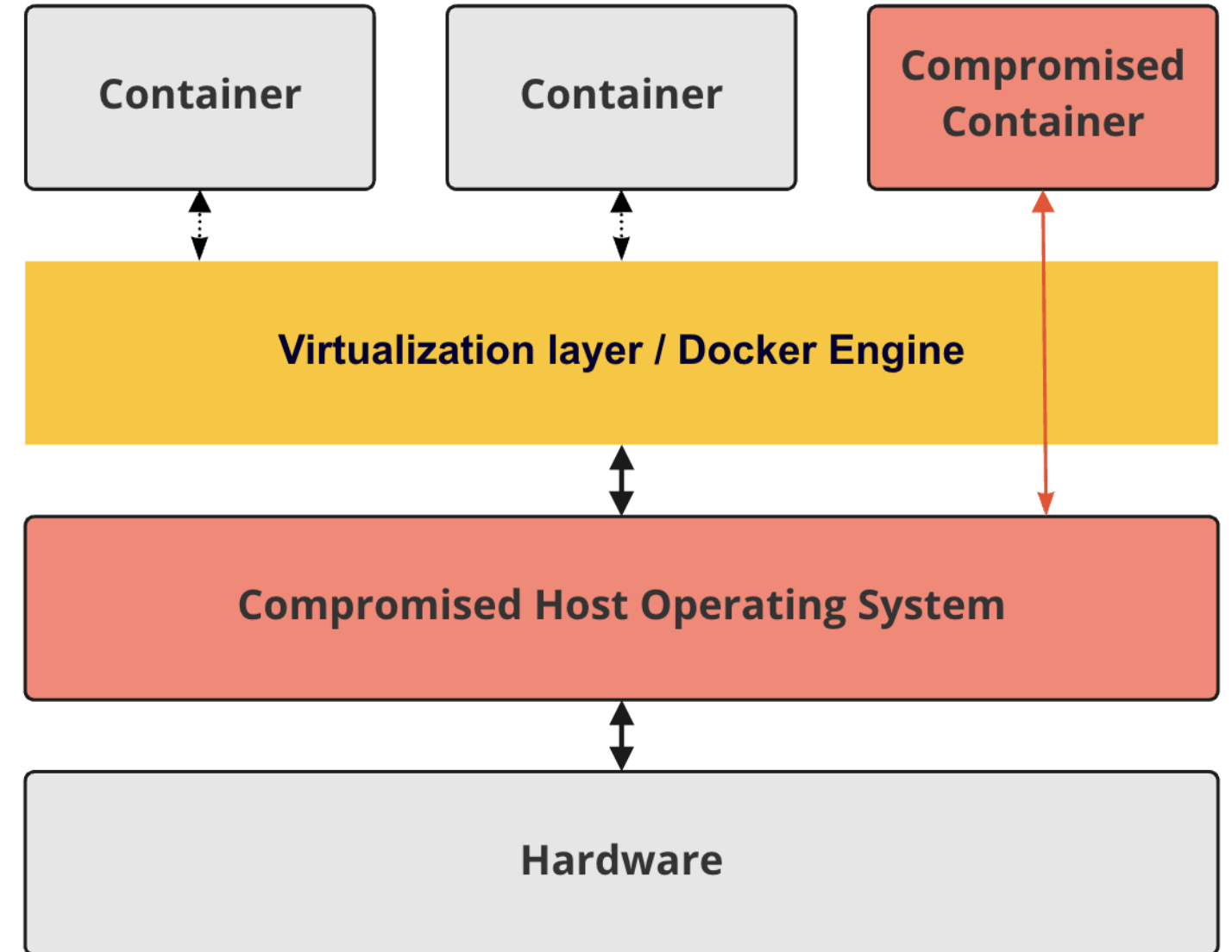


Security of Virtualization

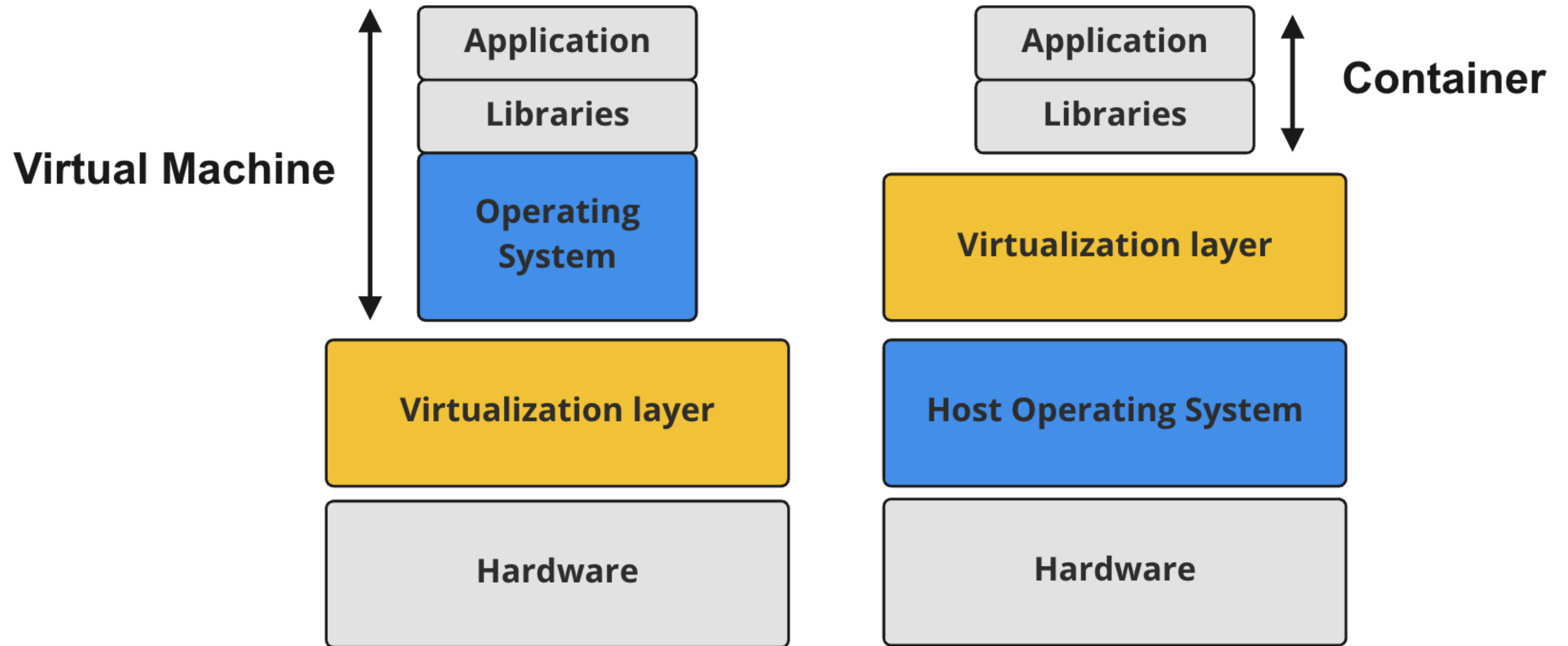
VMs have no lower layer to access



Attacker breaks out of container



Containers are lightweight



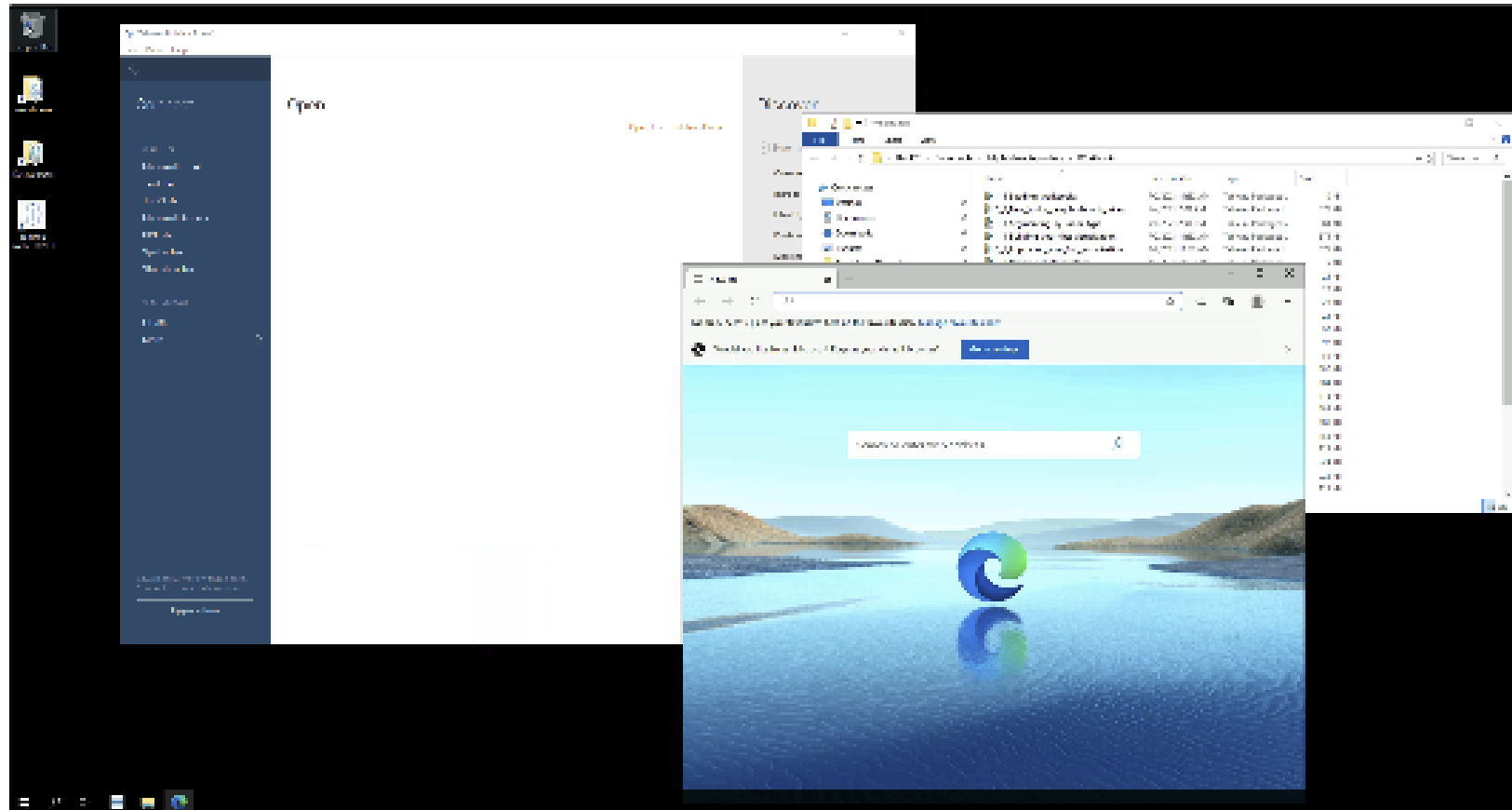
Advantages of containers

Because of their smaller size containers

- Are faster to
 - Start
 - Stop
 - Distribute
 - To change or update
- Have a large ecosystem of pre-made containers

Advantages of Virtual Machines

Graphical User Interface (GUI)



Command Line Interface (CLI)

```
root@47ac41fb1ff3:/# ls
bin boot dev etc home lib media mnt opt proc root run sbin srv sys tmp usr var
root@47ac41fb1ff3:/# cd tmp
root@47ac41fb1ff3:/tmp# ls
my_folder
root@47ac41fb1ff3:/tmp# cd my_folder/
root@47ac41fb1ff3:/tmp/my_folder# ls -ld
.  example.txt
root@47ac41fb1ff3:/tmp/my_folder# rm example.txt
root@47ac41fb1ff3:/tmp/my_folder# ls
root@47ac41fb1ff3:/tmp/my_folder# cd /
root@47ac41fb1ff3:/#
```

Let's practice!

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