Introduction to Cloud

upGrad

Session: Virtualisation and Containerisation

Instructor: Siben Nayak

Virtualisation and Containerisation

SESSION INTRODUCTION

What is Virtualisation?

Virtual Machines and Hypervisors

What is Containerisation

Containers vs Virtual Machines

Docker

Virtualisation

WHAT IS VIRTUALISATION

01 Use of software to simulate hardware, i.e., creating a virtual version of a hardware component

02 Abstraction layer over hardware that allows to divide the hardware of a single machine into multiple virtual machines

03 Enables more efficient utilisation of physical computer hardware

04 Cloud providers serve users with their existing physical computer hardware

05 Cloud users purchase only the computing resources they need

VIRTUAL MACHINES

01 Virtual representation of a physical computer

02 Guest machine on a physical host machine

03 Ability to create multiple virtual machines, each with their own operating system and applications, on a single physical machine

VIRTUAL MACHINES (CONTD.)

04	Better resource utilisation since multiple virtual machines (VMs) can run on same hardware
05	Quickly spin up a VM and deploy multiple copies to handle increasing loads
06	Isolated from physical machines and can be easily backed up and restored

HYPERVISORS

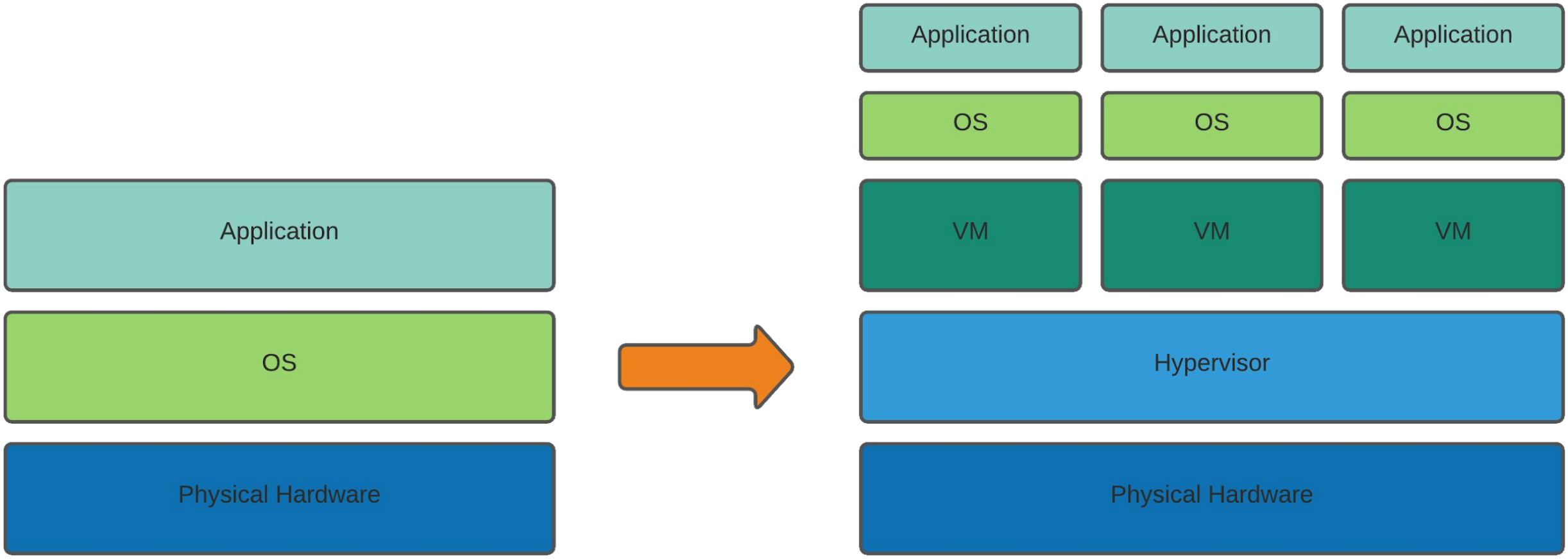
01 **Lightweight software layer** called a hypervisor to coordinate between a VM and the underlying physical hardware

02 Ensures that the VMs do not **interfere** with each other

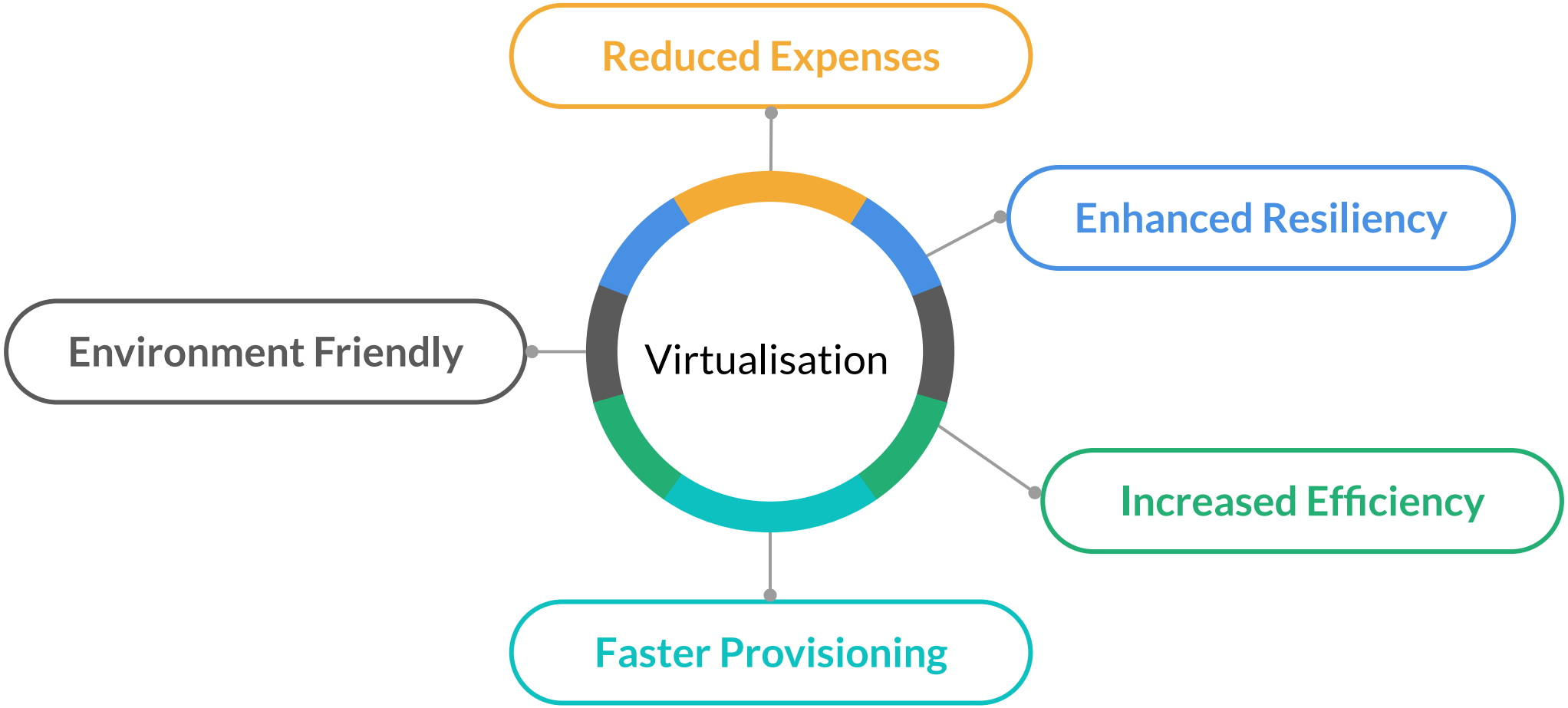
03 **Type 1** hypervisors run directly on the physical hardware (usually a server), taking the place of the operating system (OS)

04 **Type 2** hypervisors run as an application within a host OS and usually target single-user desktop or notebook platforms

Traditional vs Virtualisation



BENEFITS OF VIRTUALISATION



Containerisation

WHAT IS CONTAINERISATION

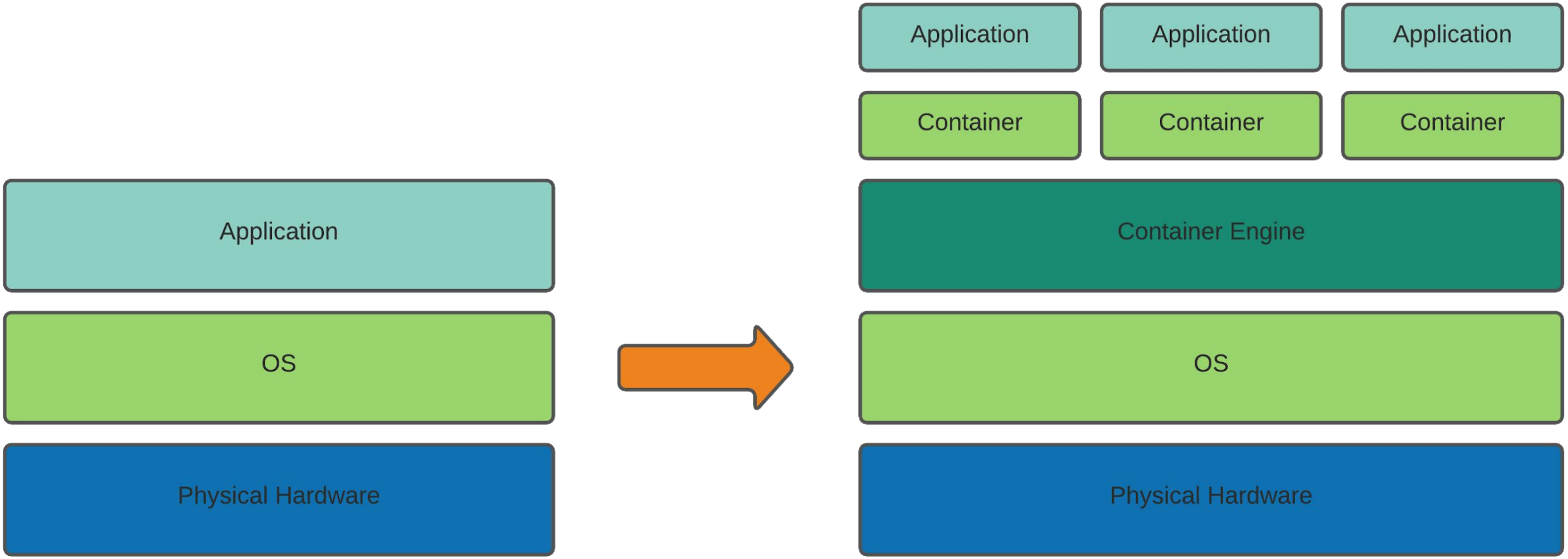
01 Encapsulating or packaging software code and all its dependencies so that it can run uniformly and consistently on any infrastructure

02 Bundling the application code together with the related configuration files, libraries and dependencies required for it to run

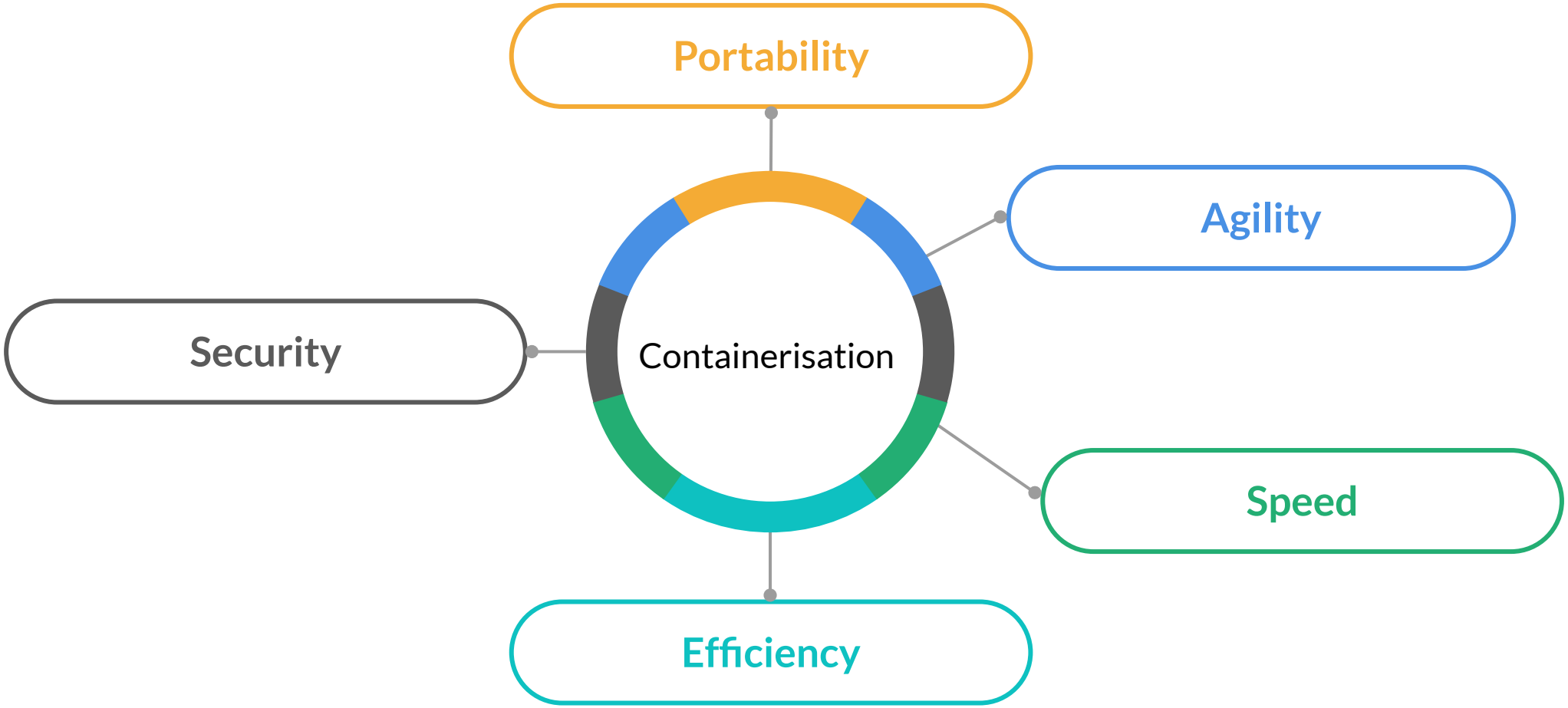
03 Allows applications to follow the 'write once and run anywhere' principle

04 The Open Container Initiative (OCI) was established in June 2015 by Docker and other industry leaders to promote common, minimal, open standards and specifications around container technology

Traditional vs Containerisation



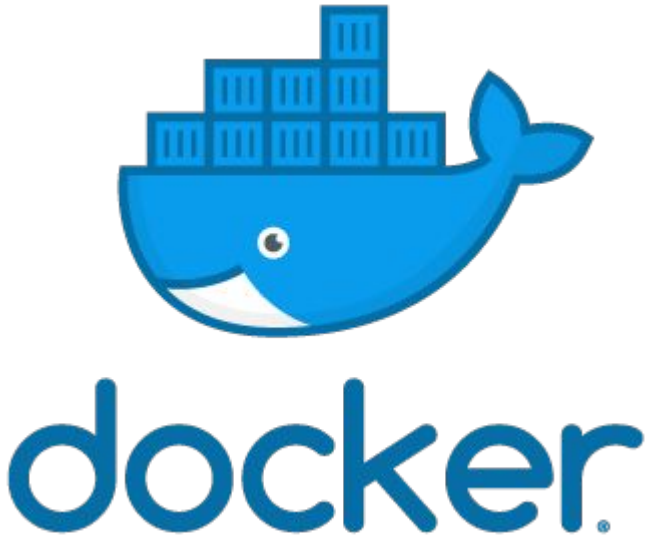
BENEFITS OF CONTAINERISATION



CONTAINERS VS VMS

Feature	Virtual Machine	Container
Operating system	Runs a complete operating system	Runs only the user mode and applications required
Storage	Creates and uses a virtual hard disk per VM	Shares the storage of the host across multiple containers
Isolation	Complete isolation from the host and other VMs	Lesser isolation than VMs due to shared host OS
Patching and updates	Updates need to be downloaded and installed in each VM	Dockerfile needs to be updated and rebuilt
Guest compatibility	Can run any OS in the VM	Needs to run on the same OS as host
Fault tolerance	VMs can fail over to other VMs in cluster when they fail	Containers are just recreated immediately after failing

Docker



DOCKER

01 An open-source containerisation platform for building, deploying and managing containerised applications

02 A toolkit that enables developers to build, deploy, run, update and stop containers using simple commands and work-saving automation

03 Docker Desktop runs on Mac/Windows machine and allows to install and run docker images locally

04 About 130 billion docker downloads till date

DOCKER TERMINOLOGIES

01 **Dockerfile**: A list of commands that Docker Engine will run in order to assemble the image

02 **Docker image**: Contains executable application source code as well as all the tools, libraries and dependencies that the application code needs to run as a container

03 **Docker Container**: The live, running instances of Docker images

04 **Docker Hub**: The public repository of Docker images that calls itself the 'world's largest library and community for container images'.

Summary

SUMMARY

- **Virtualisation** is the use of software to **simulate** hardware
- **Containerisation** enables **multiple applications** to run in their own **isolated shells**
- **Docker** is the leading container technology