



Cloud-Based Software

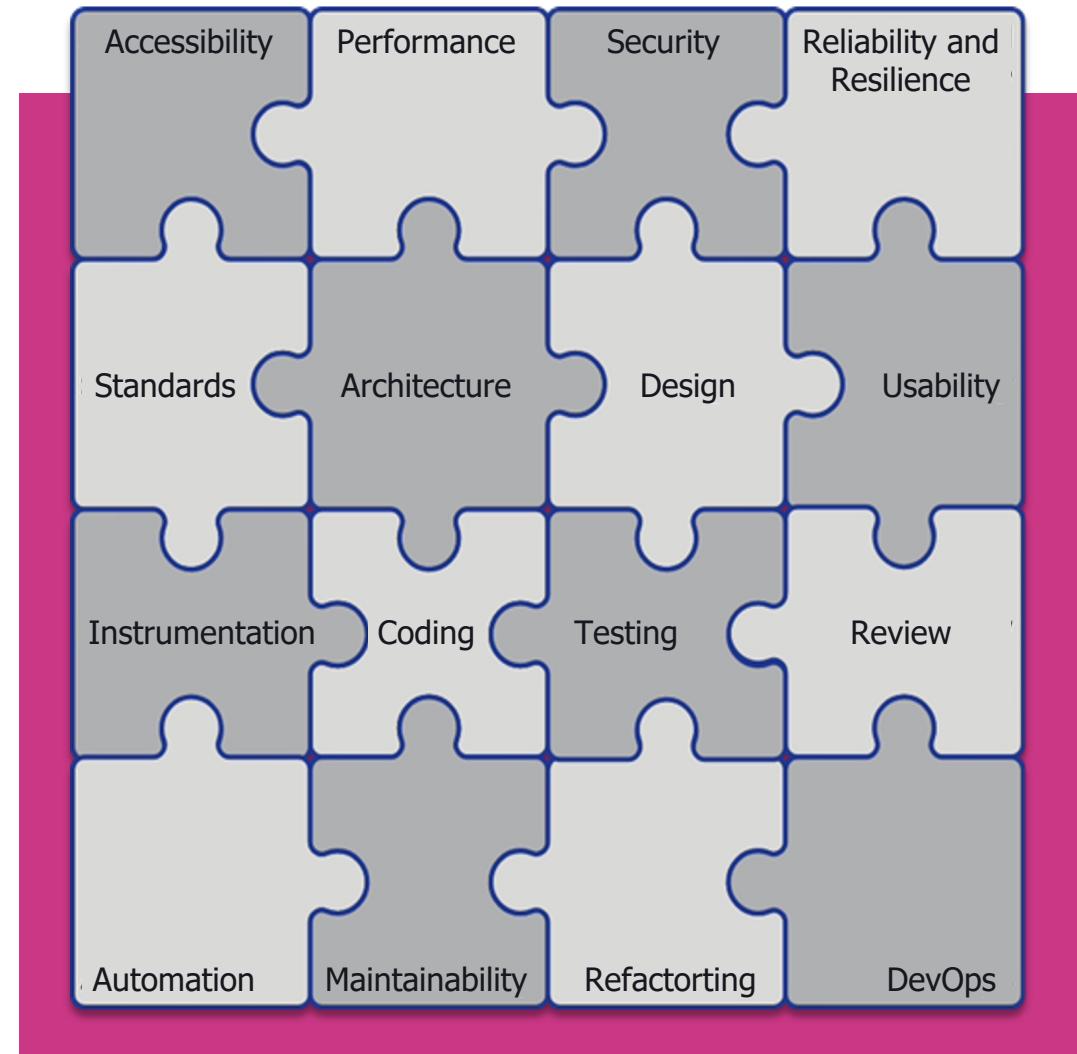


Welcome!



Software Engineering Careers

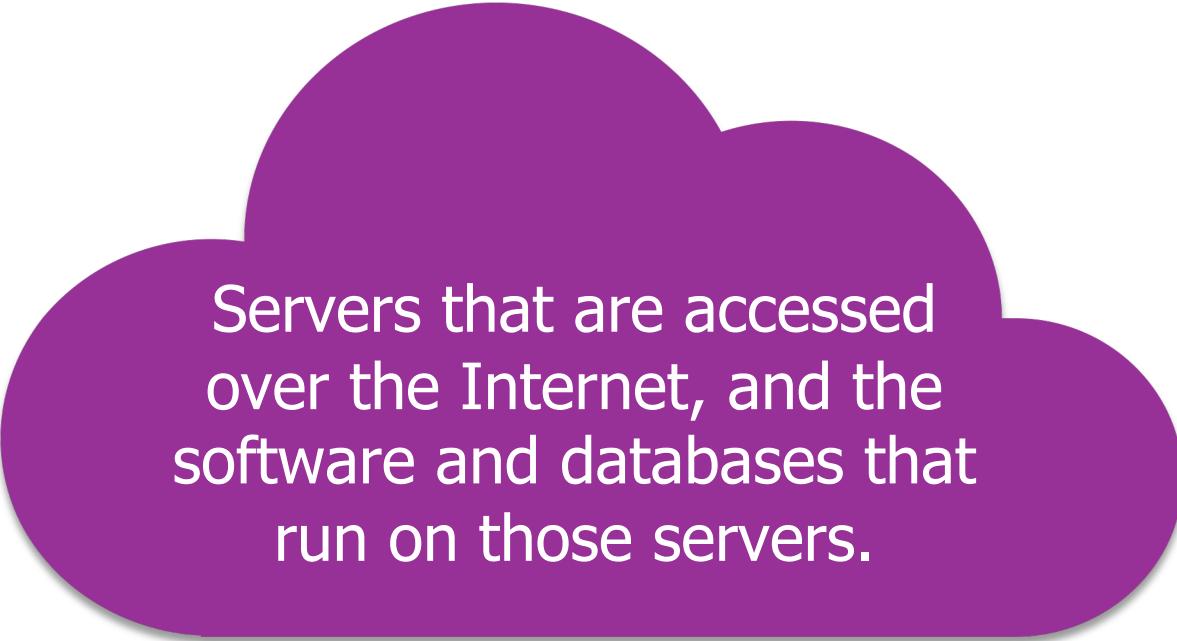
- + Internship / First job
- + Configurations Manager (Chapter 10)
- + Project Manager (Chapter 1)
- + **Cloud Engineer**
Responsible for any technological duties associated with cloud computing, including design, planning, management, maintenance and support
- + Cloud Engineer (Chapter 5)
- + Network Architect (Chapter 6)
- + Cybersecurity Analyst (Chapter 7)



(Adapted from Byststrone, 2021)



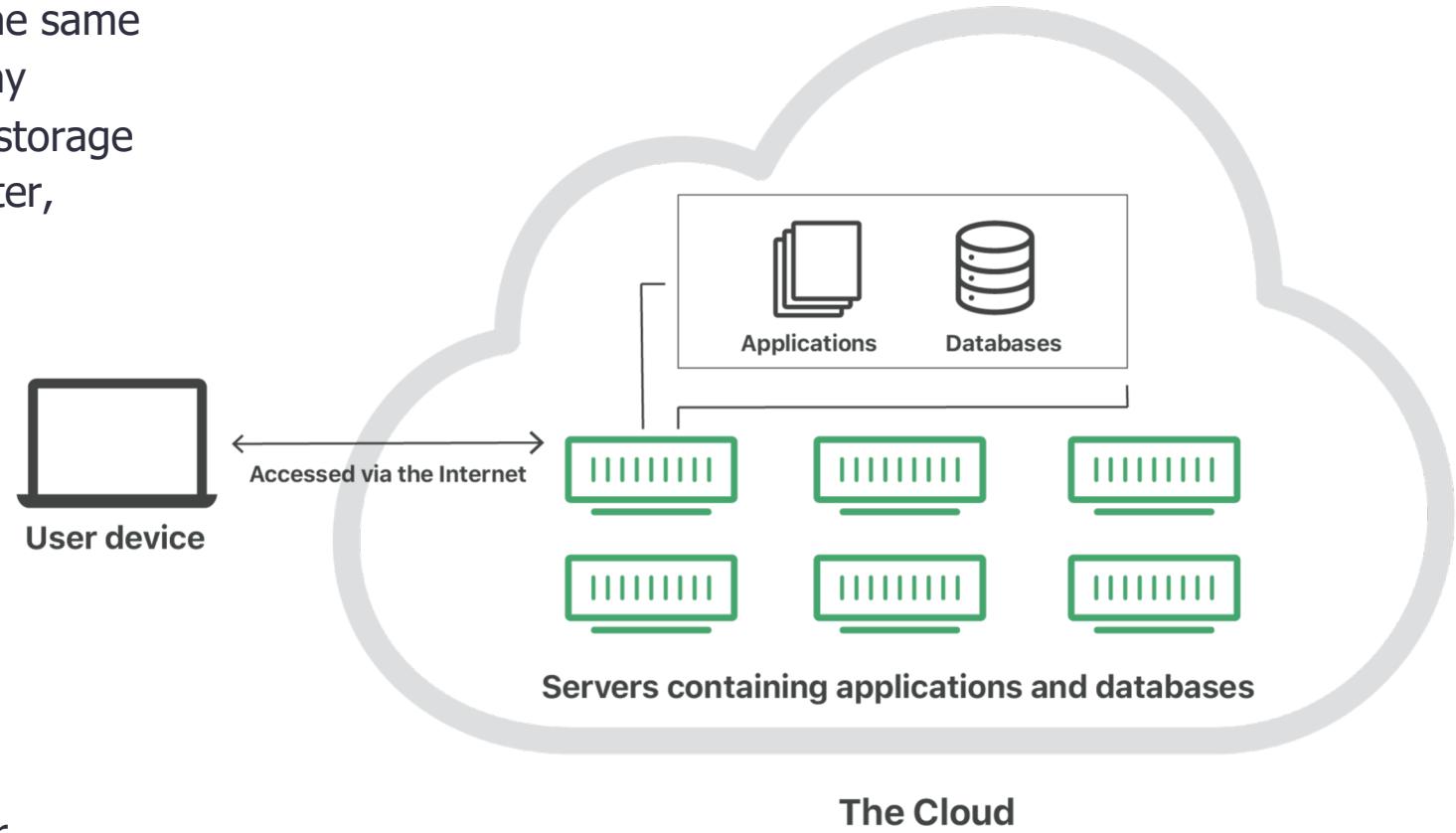
The Cloud



Servers that are accessed over the Internet, and the software and databases that run on those servers.

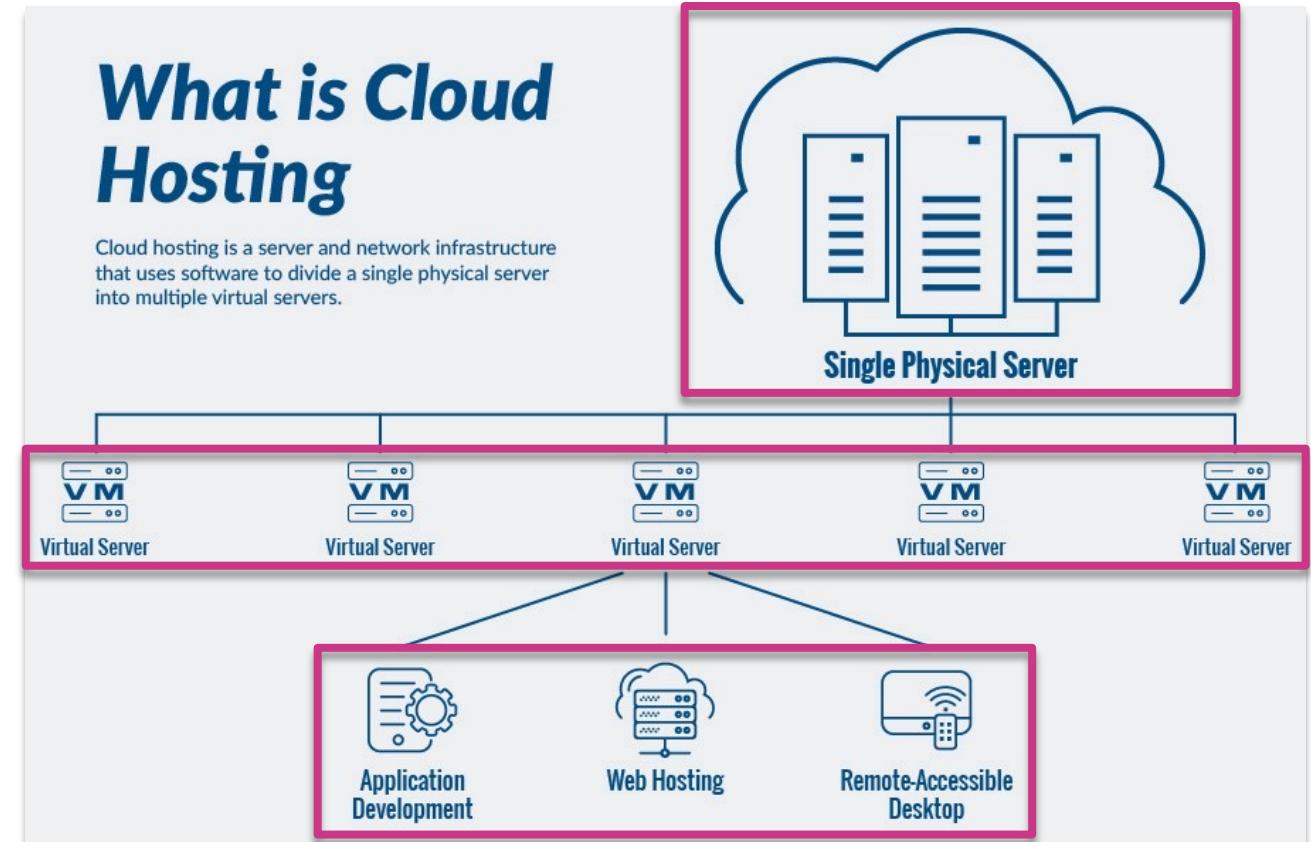
Cloud Functionality

- + The cloud enables users to access the same files and applications from almost any device, because the computing and storage takes place on servers in a data center, instead of locally on the user device.
- + For businesses, switching to cloud computing removes some IT costs and overhead
- + This especially makes an impact for small businesses.
- + The cloud can also make it easier for companies to operate internationally.



Cloud-Based Software

- + The cloud is made up of very large number of remote servers that are offered for rent by companies that own these servers.
- + **Virtual servers** are implemented in software rather than hardware.
- + You can rent as many servers as you need, run your software on these servers and make them available to your customers.
- + You may rent a server and install your own software, or you may pay for access to software products that are available on the cloud.
- + **Virtual machines** (VMs), running on physical server hardware, can be used to implement virtual servers.



(Murtaza, 2019)

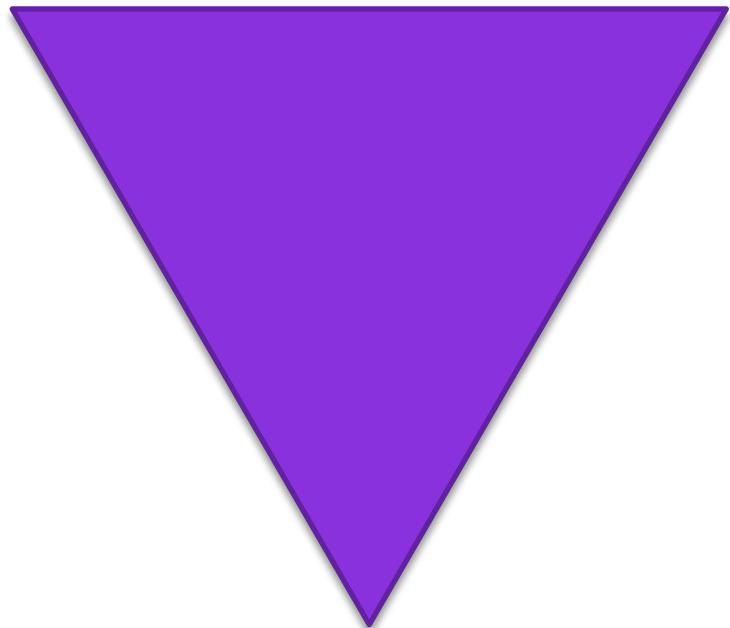
Scalability, Elasticity, and Resilience

Scalability

Maintain performance
as load increases

Elasticity

Adapt the server configuration
to changing demands



Resilience

Maintain service in the
event of server failure

Other Benefits

- Cost
- Startup time
- Server choice
- Distributed development



Virtualization

What Are Virtual Servers Typically Used For?



Cost



Remote access



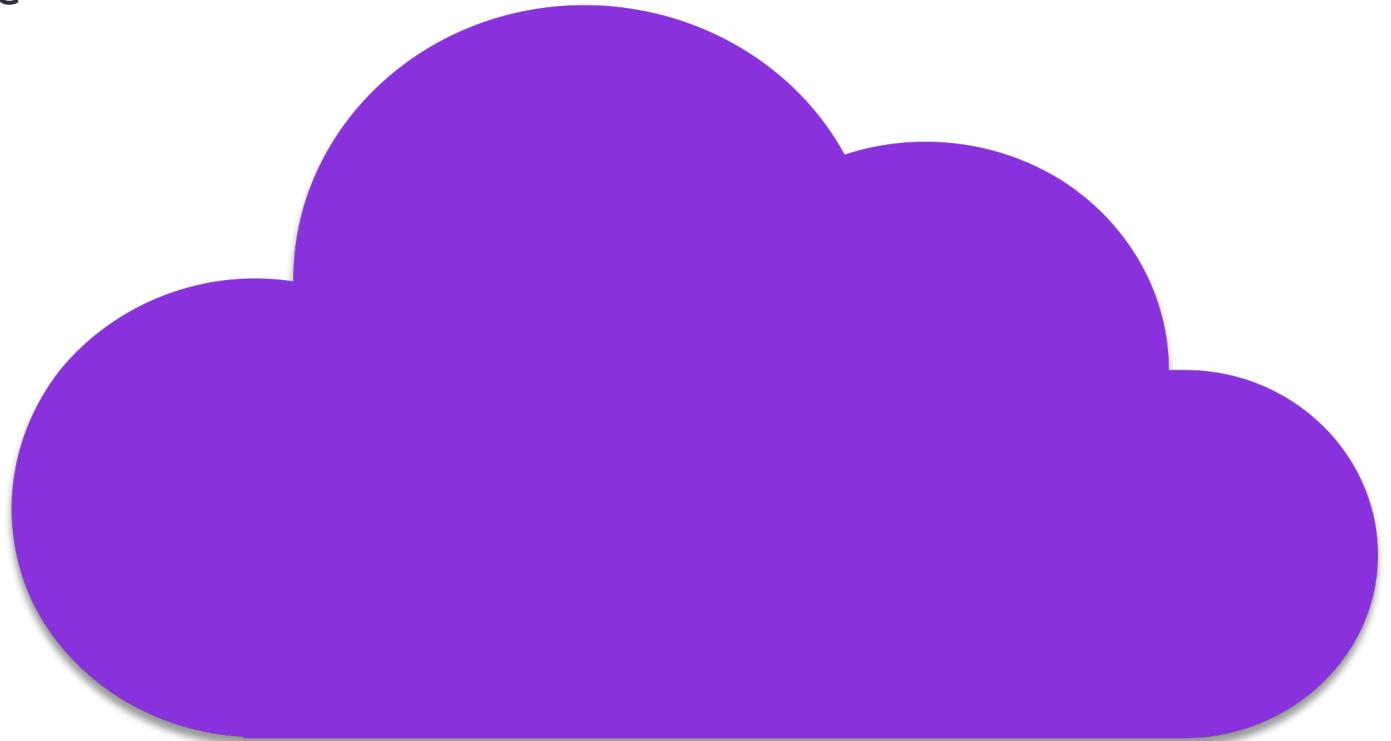
Web hosting



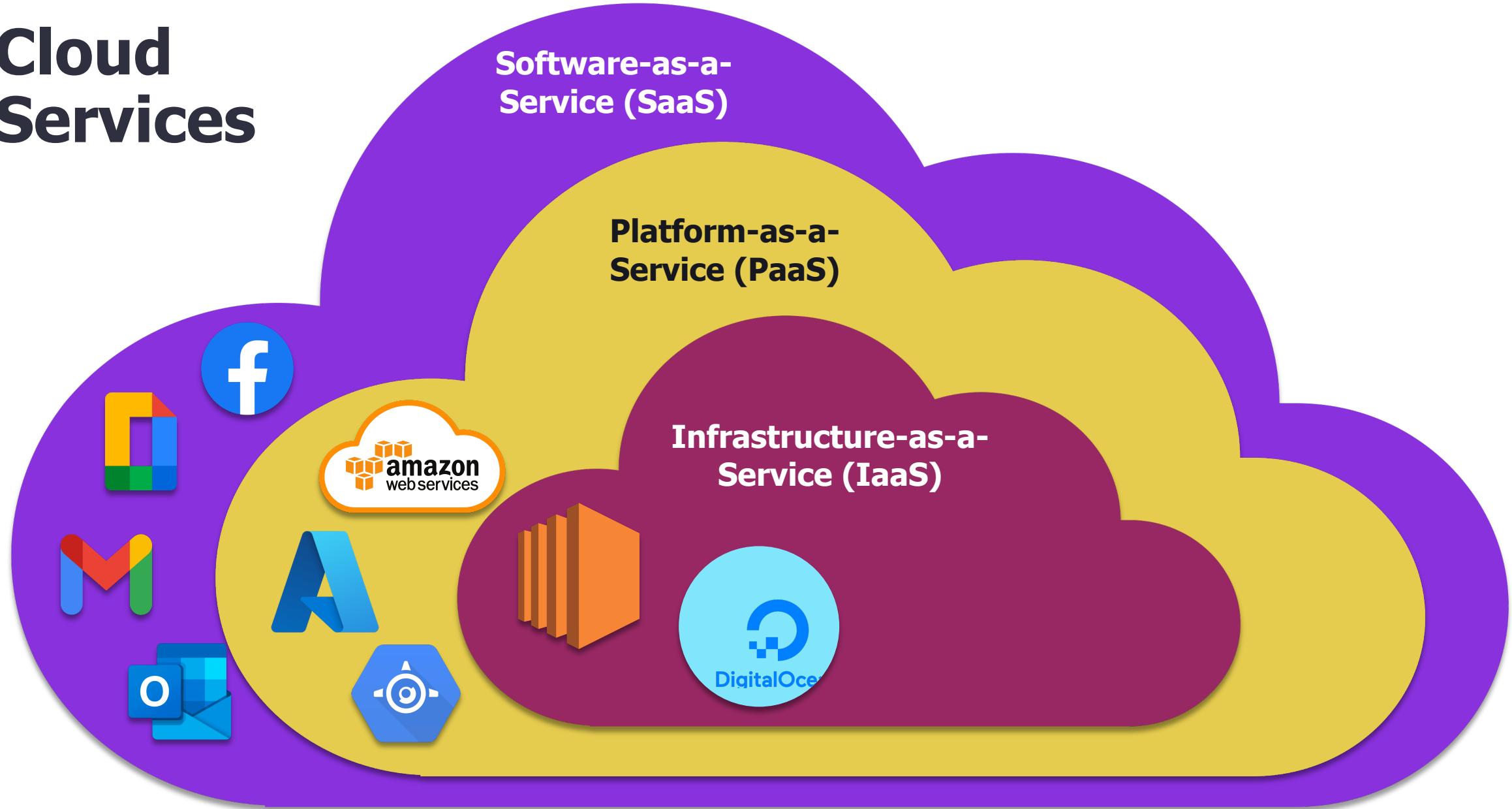
Software development
and testing

Cloud Services

- + A service that is rented rather than owned
- + Software products delivered as a service
- + Customer access
- + Subscription payment model

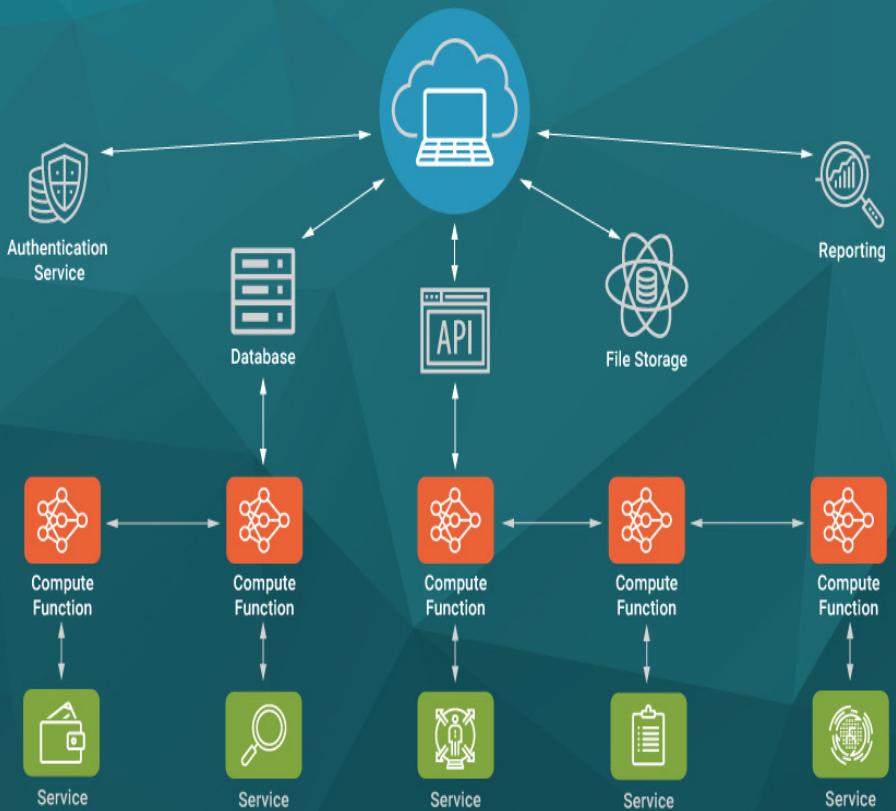


Cloud Services



SERVERLESS ARCHITECTURE

Pay-as-you-go



(SentinelOne, 2021)

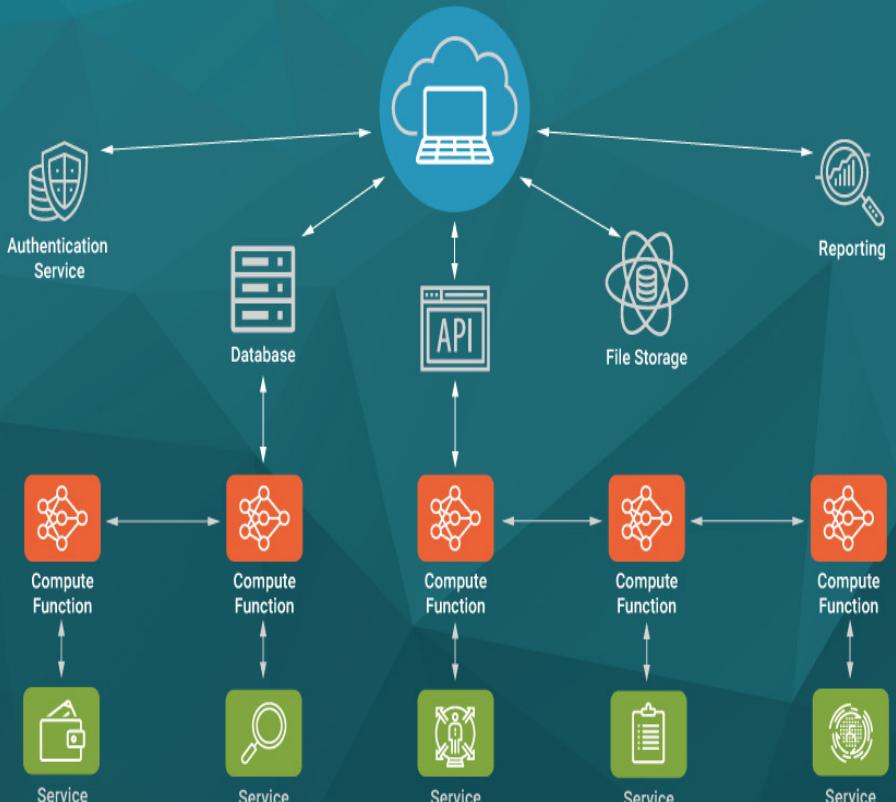
Cloud Services

Function as a Service (FaaS)

- + Breaks cloud applications down into even smaller components that only run when they are needed
- + Developers write the codes and create several functions which, when triggered, can generate responses.
- + This helps the developers in the execution of the application's code without even building an infrastructure for it.
- + No need to deploy the whole application in the cloud; can deploy a part of it

SERVERLESS ARCHITECTURE

Pay-as-you-go



(SentinelOne, 2021)

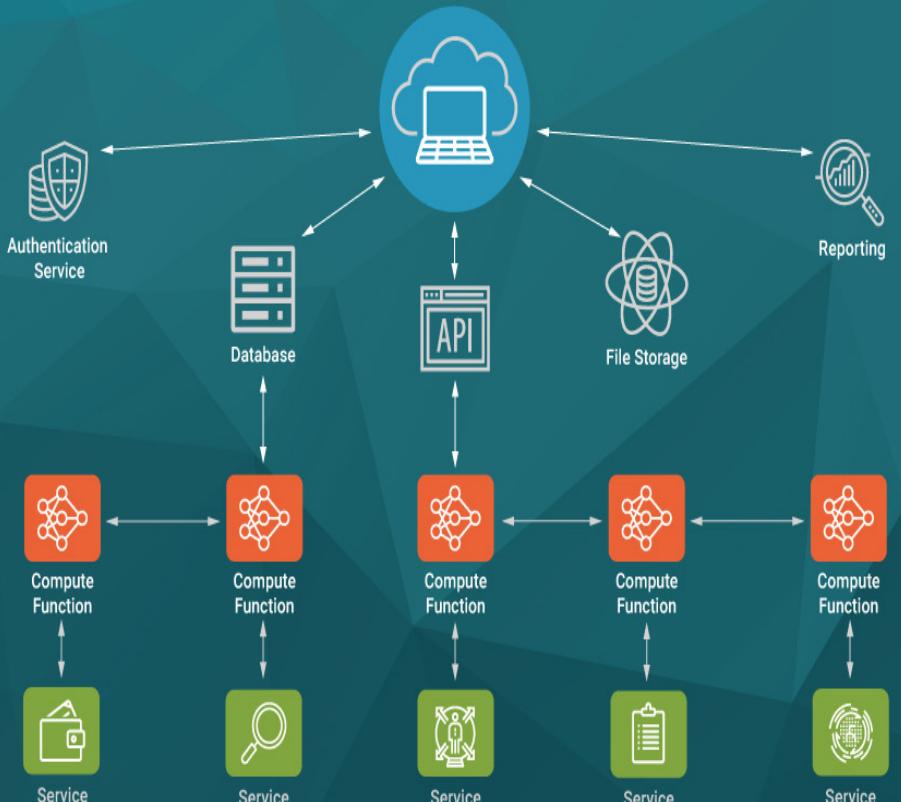
Cloud Services

Function as a Service (FaaS)

- + One of the fastest-growing cloud delivery models
- + Gives users the option to execute code such as Javascript, Linux, or HTML in response to events – without having to build any complex infrastructure
- + Examples of FaaS providers include:
 - IBM Cloud Functions
 - Microsoft Azure Functions (open-source)
 - AWS Lambda (by Amazon)
 - Google Cloud Functions
 - OpenFaaS (open-source)

SERVERLESS ARCHITECTURE

Pay-as-you-go



(SentinelOne, 2021)

Cloud Services

Function as a Service (FaaS)

- + Being able to focus on code rather than infrastructure.
- + FaaS offers users the ability to scale automatically, instantaneously, and independently whenever required.
- + FaaS runtime is extremely fast.
- + No capacity planning is required.

Design Issues for Software Delivered as a Service



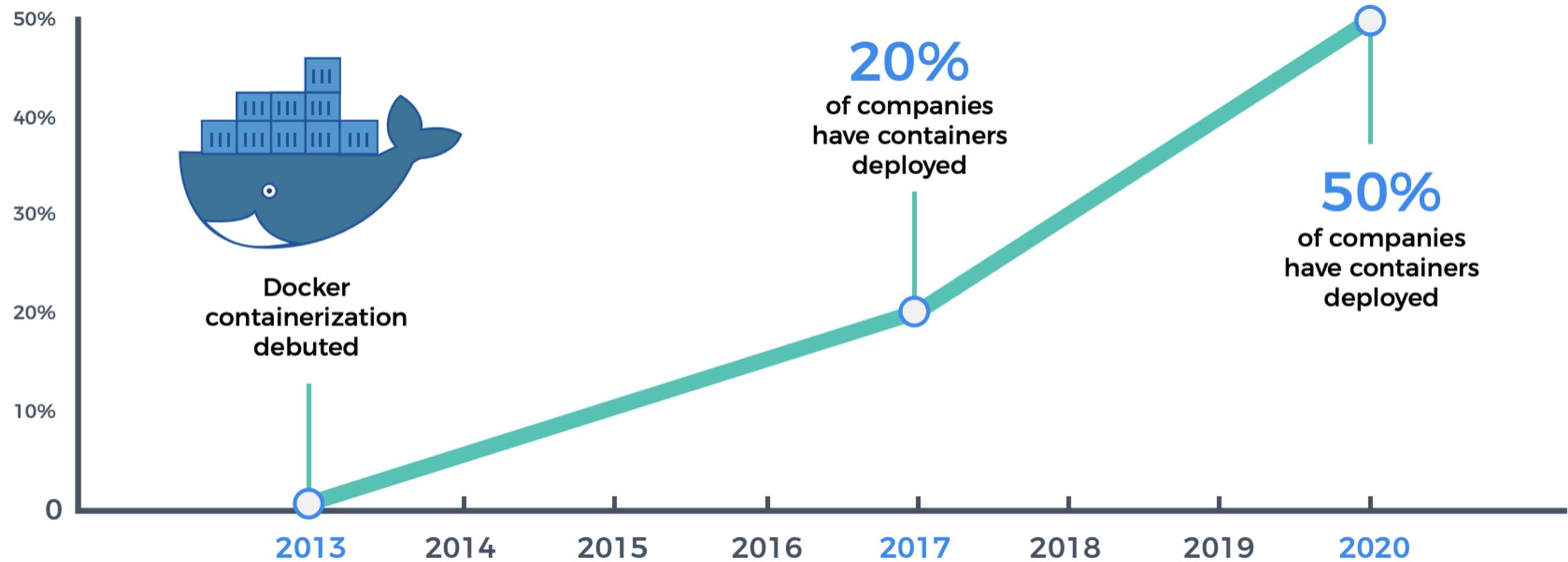
Container-Based Virtualization

- + Containers isolate an application and its dependencies into a self-contained unit that can run anywhere.
- + Using containers accelerates the process of deploying virtual servers on the cloud.
- + Containers are an operating system virtualization technology that allows independent servers to share a single operating system.
- + Containerization provides a clean separation of concerns.



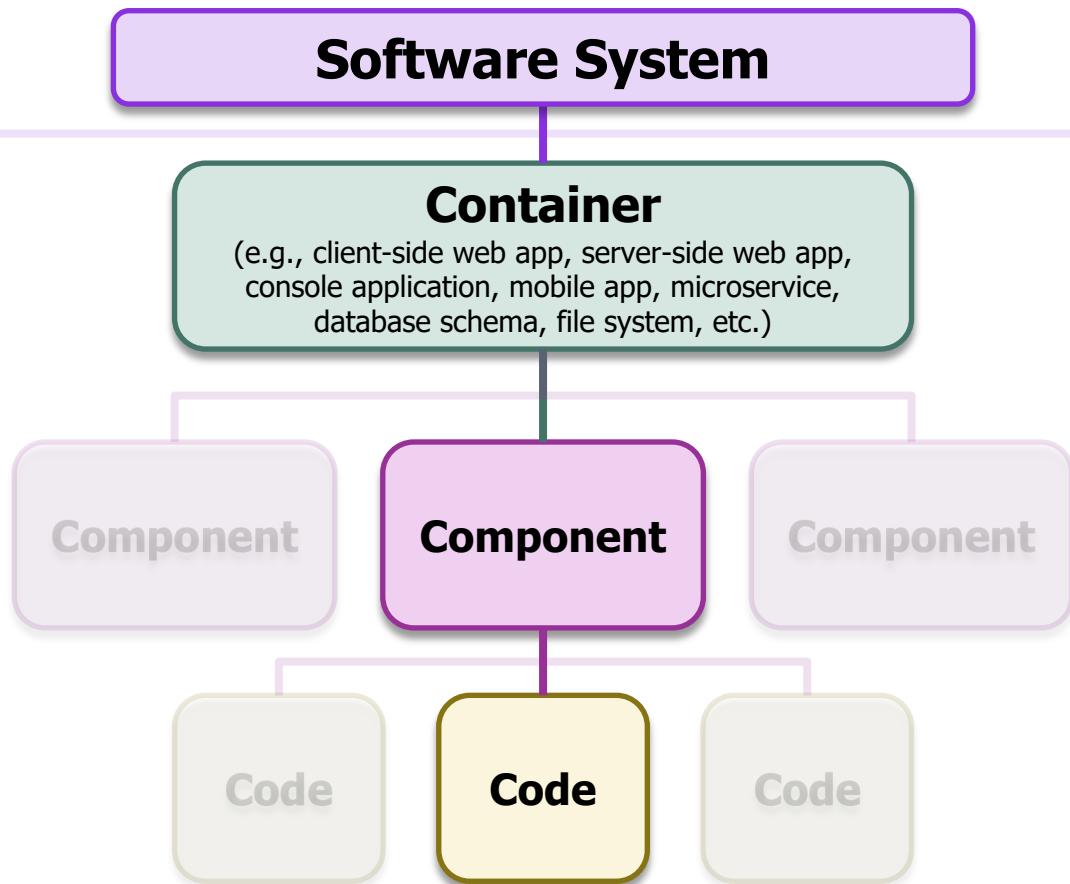
(VirtuIT, 2021)

Containerization Timeline



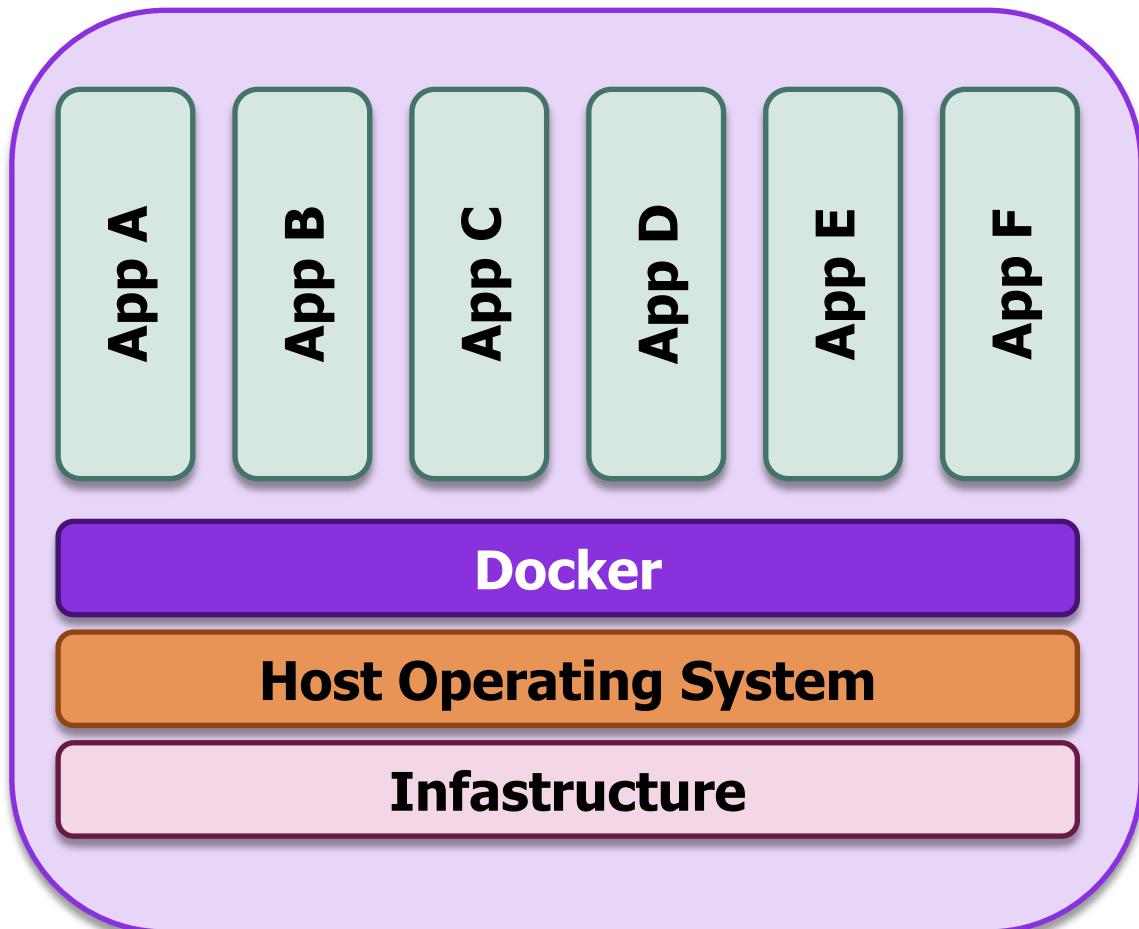


Software System





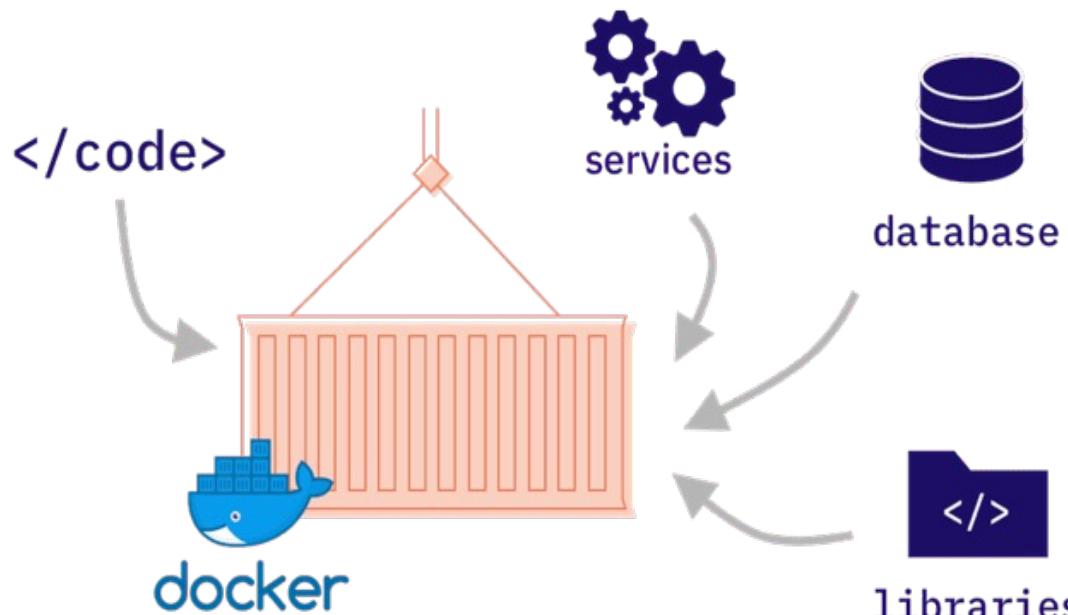
Container



Containers and Docker

Docker

An open platform for developing, shipping, and running applications.



(Accesco, 2021)

- + Docker enables you to separate your applications from your infrastructure so you can deliver software quickly.
- + Imagine you would like to build a website or a web application.
- + Docker is a tool that allows you to take all the parts and bundle them together into one package, called the container.
- + A Dockerfile is a text document that contains all the commands a user could call on the command line to assemble an image.
- + You can use Docker to launch a box on any server (including cloud) or a local machine (e.g., developers computer) you want.



With and Without Docker

can you help me to launch this project?

you will need an npm installed first

which version do I need?

not sure, maybe John will know

he helped me yesterday

but no luck

...

X without Docker

can you help me to launch this project?

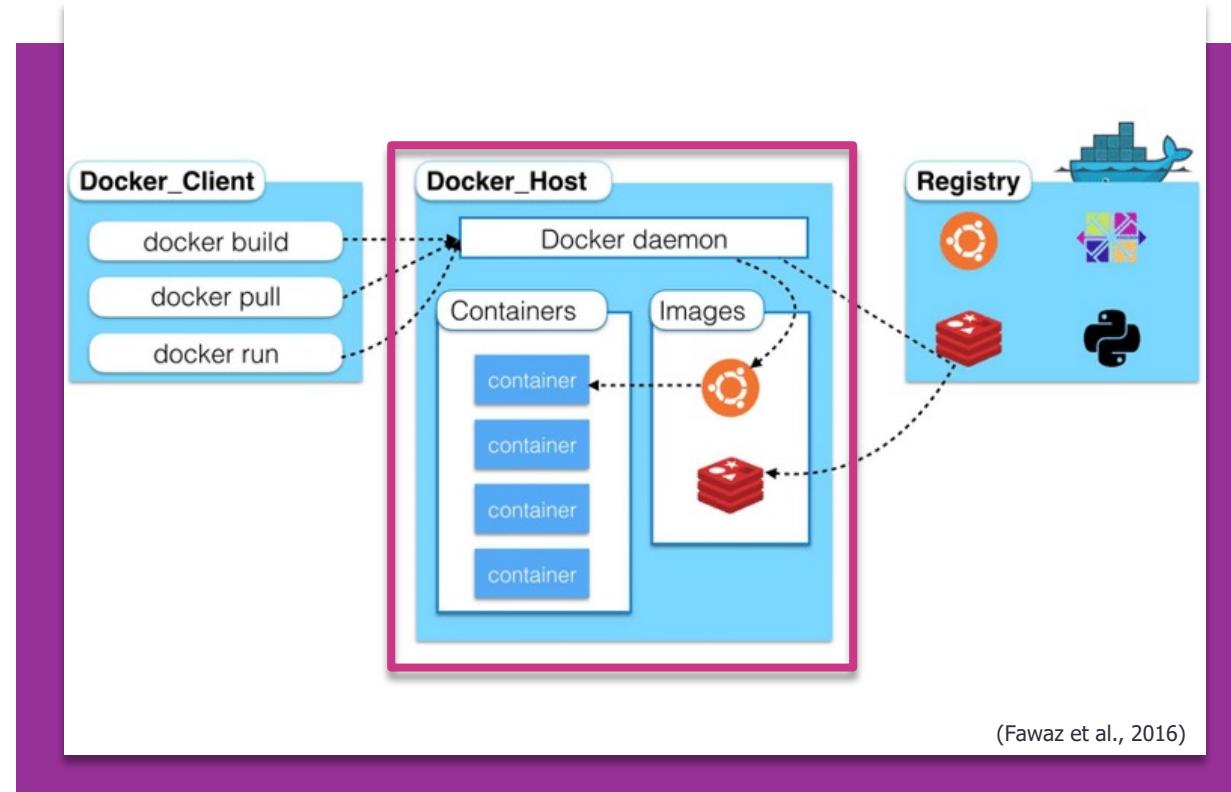
sure, just run this command:

docker-compose up

thanks!

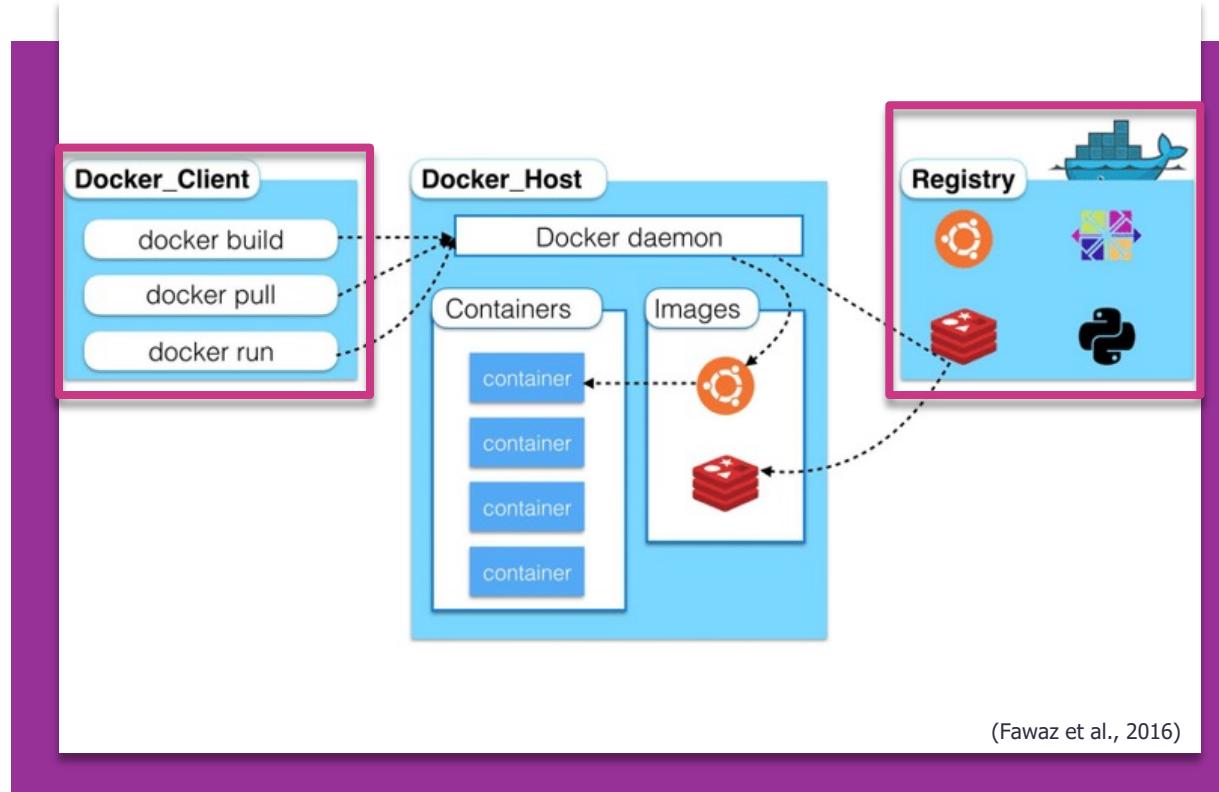
✓ with Docker

The Docker Container System



- + Docker takes away repetitive, mundane configuration tasks and is used throughout the development lifecycle.
- + The Docker daemon is responsible for creating, running, and monitoring containers, as well as building and storing images.
- + Docker client is software is used by developers and system managers to define and control containers.

The Docker Container System



- + Dockerfiles define runnable applications (images) as a series of setup commands that specify the software to be included in a container.
- + A Dockerfile is interpreted to create a Docker image, which is a set of directories with the specified software and data installed in the right places.
- + Docker hub is a registry of images that has been created.
- + Containers are executing images.

Chapter Summary

1 The Cloud

Made up of a large number of virtual servers that you can rent for your own use

3 Virtual Machines

Physical server replicas on which you run your own operating system, technology stack and applications

2 Virtualization

Allows multiple server instances to be run on the same physical computer

4 Containers

Lightweight virtualization technology that allow rapid replication and deployment of virtual servers

Chapter Summary

5

Everything can be delivered as a service.

A service is rented rather than owned and is shared with other users.

7

Docker

An open platform for developing, shipping, and running applications

6

Infrastructure-as-a-service (IaaS)

Computing, storage and other services are available over the cloud

Platform-as-a-service (PaaS)

Using services provided by a cloud platform vendor to make it possible to auto-scale your software in response to demand

Software-as-a-service (SaaS)

Application software is delivered as a service to users

Wrap Up





Thank You





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