

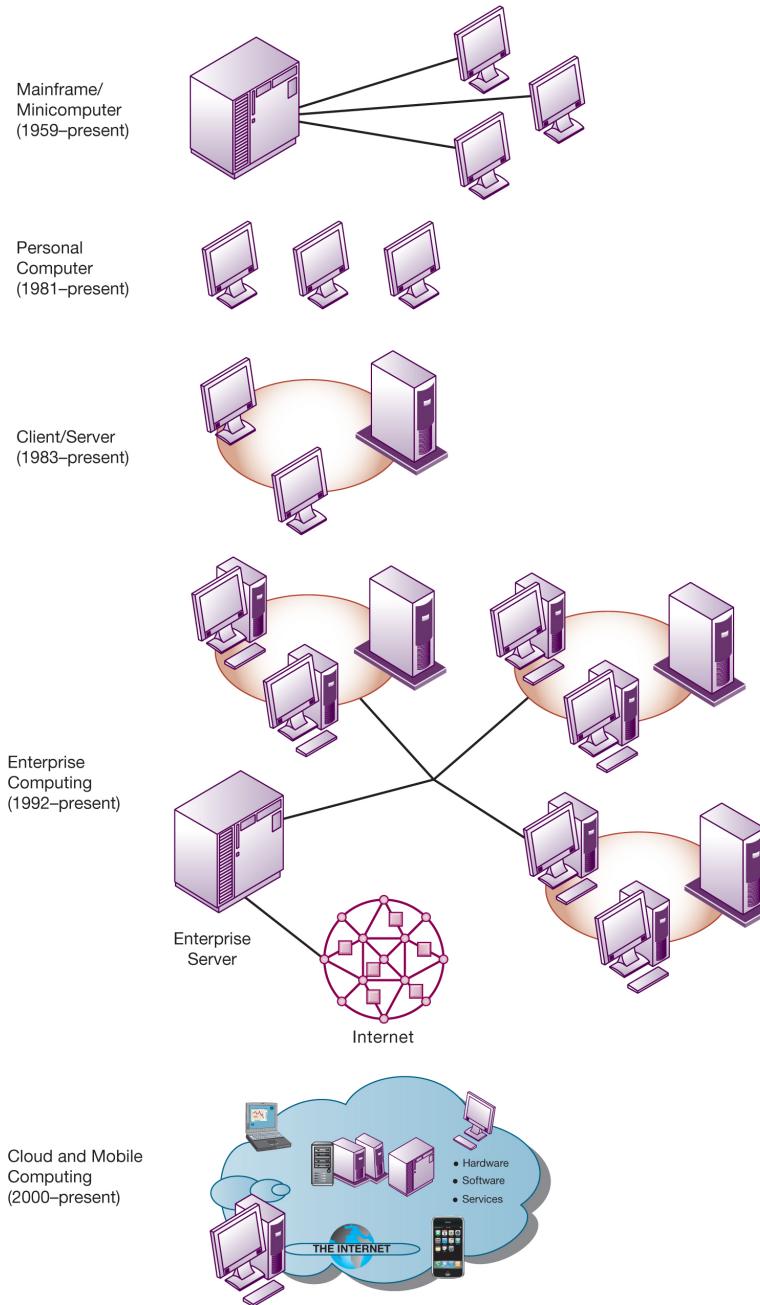
# Virtualization 15-03-2023

## Agenda

- Introduction
- It Infrastructures
- Cloud
- Azure

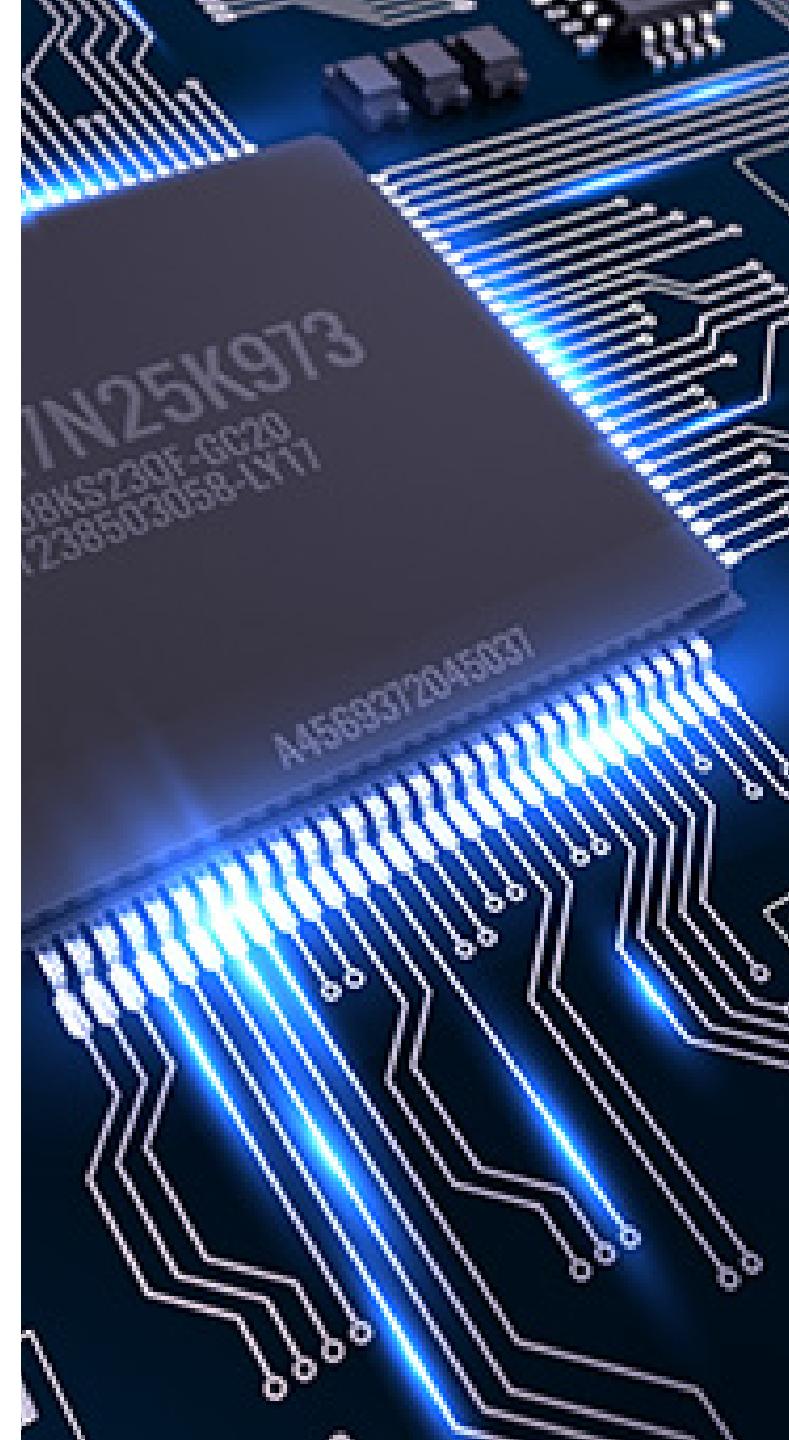


### Stages in IT Infrastructure Evolution



# Trends in computer hardware

- Mobile digital platforms
- BYOD, *Bring Your Own Device*
- Quantum Computing
- Virtualization
- Cloud Computing
- Edge Computing
- Green Computing
- High-Performance and Power-Saving Processors
- VR and AR
- IoT



# Trends in software platforms

- Open-Source Software
- Software for the Web: *Java, HTML, and HTML5*
- Web Services and Service-Oriented Architecture - *SOA*
- Outsourcing and Cloud Services
- Data Science - AI and ML
- VR and AR



cloud

# What is Cloud computing?

The cloud is sold through **services**

- Referring to some IT technology
- Sold as a product
- Provided by a Service Provider
- Bounded by a SLA (*Service Level Agreement*)
- Abstract - independent from the hardware
- Scalable - easy to expand or reduce (*amount of users, storage, etc.*)
- Accessed via a **browser** or an API





# Advantages

## Low Cost

- Cheap - *on demand, pay-per-use formula*
- No need of expertise in security, clusters, networks, etc.
- Accessibility
- Multiplatform
- No worries about updates, upgrades, new licenses
- Easy to use / integrate

# Disadvantages

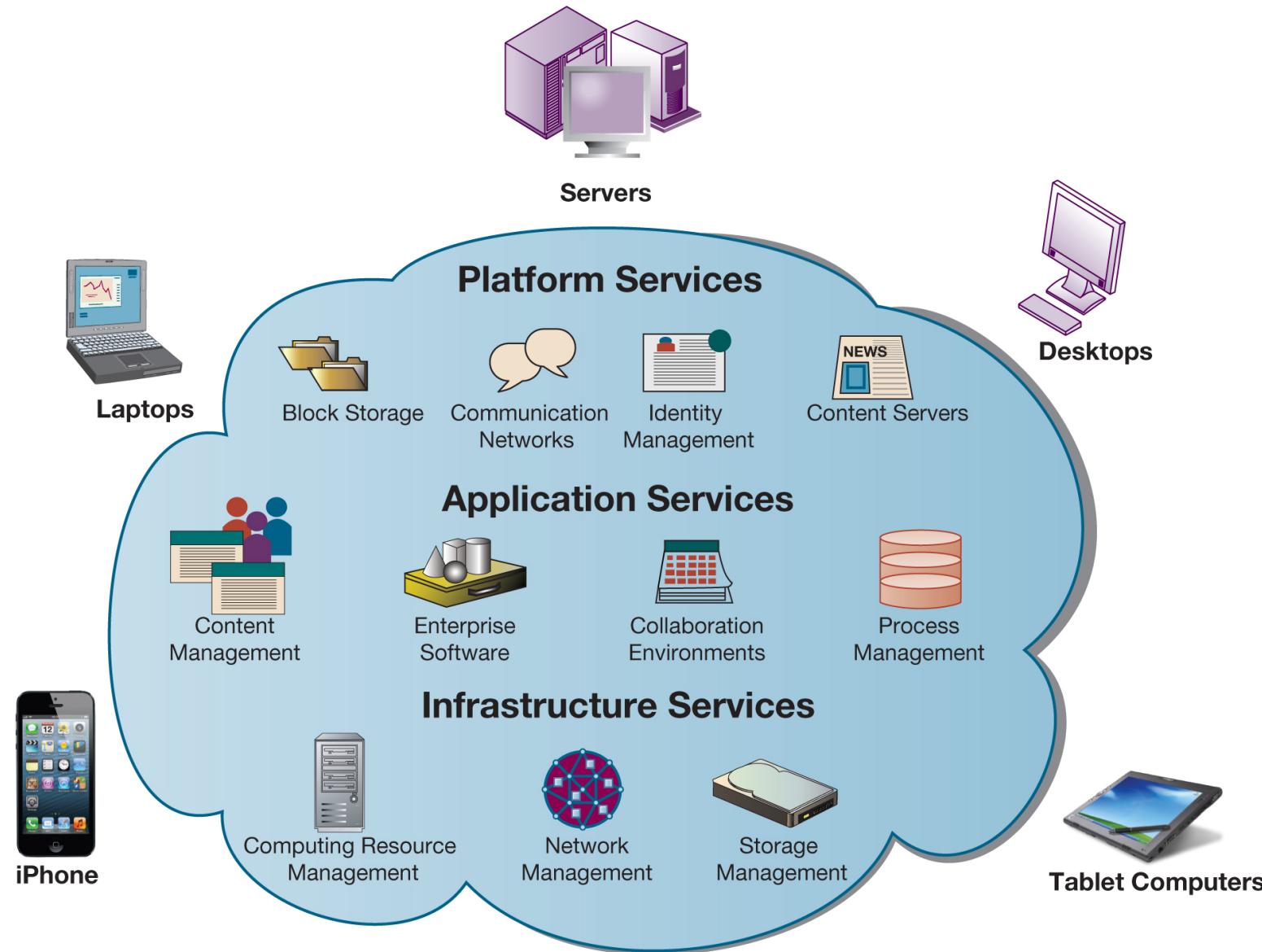
## Lack of control

- Once you go cloud, you cannot come back – *at least it is very difficult*
- Cannot easily switch cloud technologies
- Legal issues: data policy, storing private data...

## Who has ownership of the data?



## Cloud Computing



# Assignment - Oracle's Top 10 Cloud Predictions

Oracle have released their Top 10 : Oracle Cloud Computing prediction 2020.

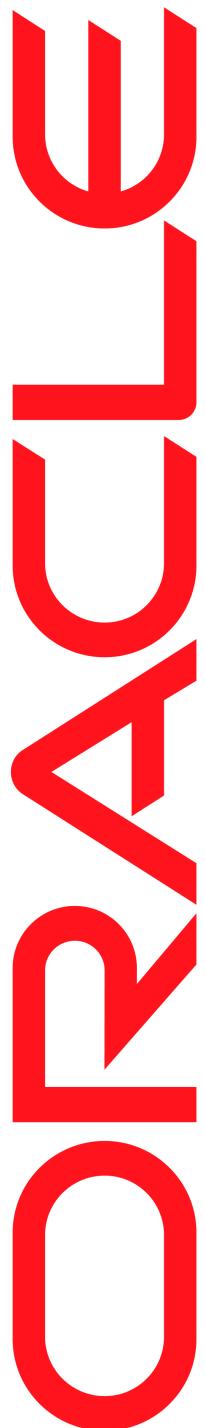
Read it, and discuss, in groups - **The impact you think it will have on:**

## Business

- The way we do business
- Business models
- Core competencies

## People

- Needed skills
- Kinds of jobs
- Types of employment
- Lifelong education



# Oracle's Top 10 Cloud Predictions

## Module 4.2

- Prediction 1 & 5 - *Automated tasks*
- Prediction 2 & 9 - **Security - Cybersecurity**
- Prediction 3 & 4 & 5 & 7 & 8 - **Data science - AI - ML**
- Prediction 6 & 10 - **NoSQL**

## What is cloud computing?

Cloud computing refers to the delivery of IT resources over the Internet. Instead of buying, owning, and maintaining physical infrastructure, you can access technology services, such as computing power, storage, and databases, on an as-needed basis from a cloud provider like AWS.



## Who is using cloud computing?

Cloud computing is being adopted across all industries. Businesses of all sizes and industry are using the cloud for a wide variety of use cases, such as data backup and recovery, disaster recovery, software development and testing, big data analytics, and customer-facing web applications. For example, pharmaceutical companies are using the cloud to develop new drugs faster and more efficiently. Personalized treatments for patients. Financial services companies are using the cloud to manage their complex financial systems. Video game makers are using the cloud to deliver online games to millions of players around the world.

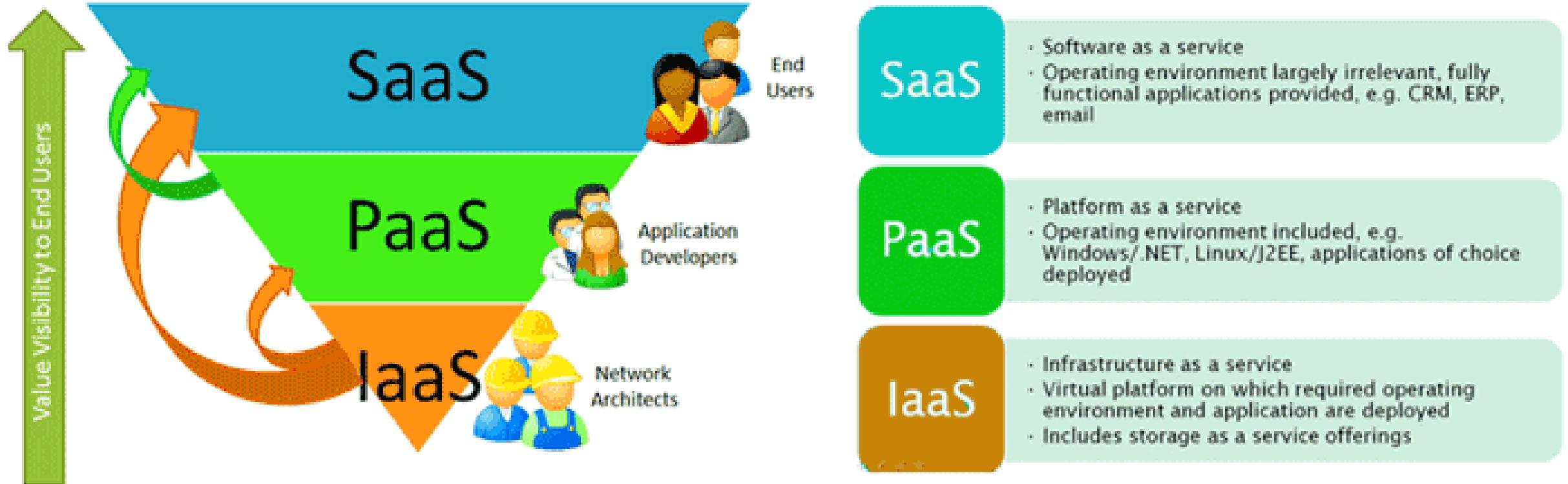
# AWS

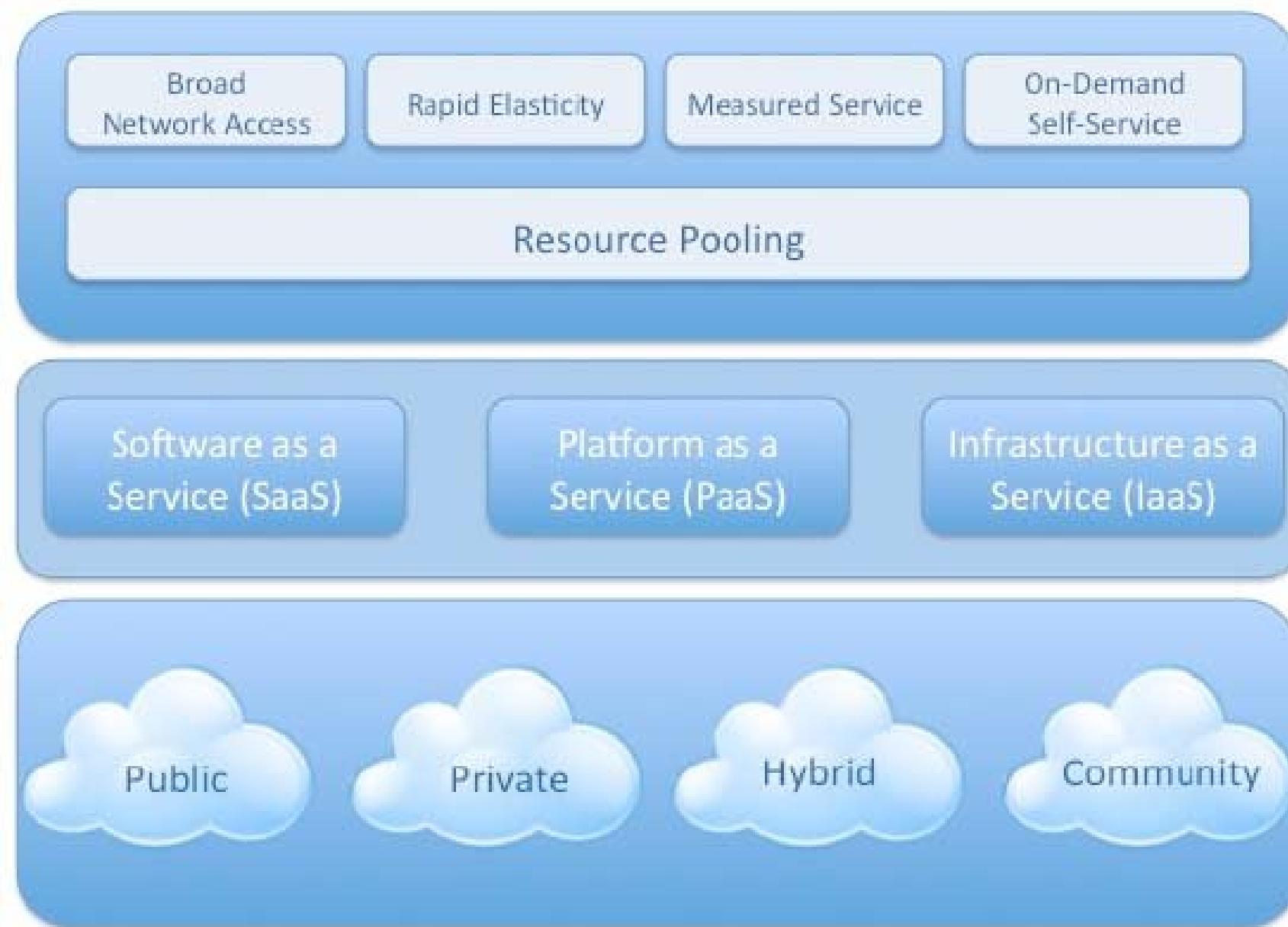
## Amazon Web Services - what-is-cloud-computing

YouTube video

<https://www.youtube.com/embed/dH0yz-Osy54>

<https://aws.amazon.com/what-is-cloud-computing/>





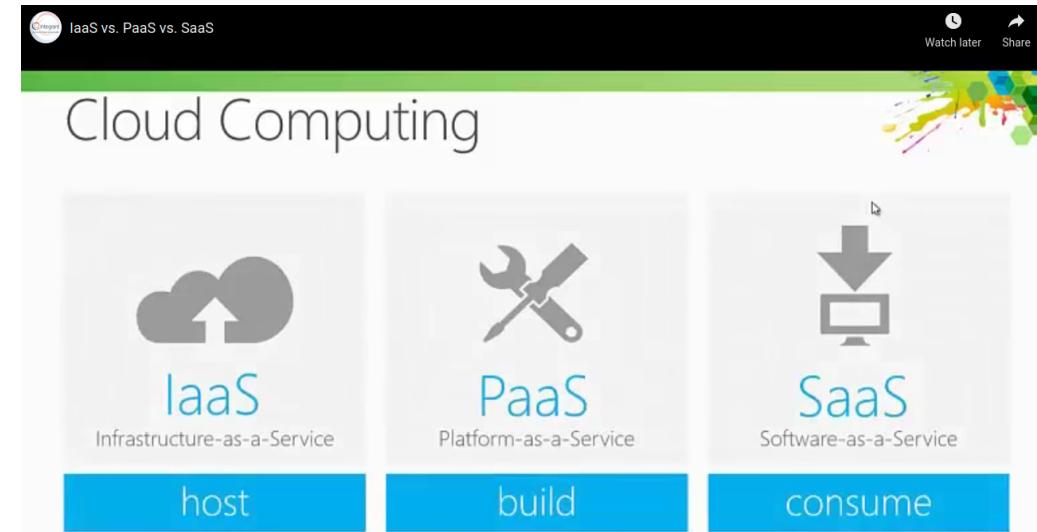
*Essential  
Characteristi*

*Service  
Models*

*Deployment  
Models*

# IntegrantSoftware - Cloud types

<https://www.youtube.com/embed/KgL3BfAc9Cs>



# IaaS - Infrastructure as a Service

- It offers everything, including the server - Network/Storage/Containers(Docker)
- Remember - That you don't get to own a server, but an instance of it (virtual machine)
- Constraints - The VM cannot offer more capabilities than the physical HW



You think you have the whole server, but actually your VM can travel across servers and run where it wants

# PaaS - Platform as a Service

- Offers a runtime environment
- The client has its own web applications and wants to host them (*i.e. a website*)
- Container orchestration (*Docker*)

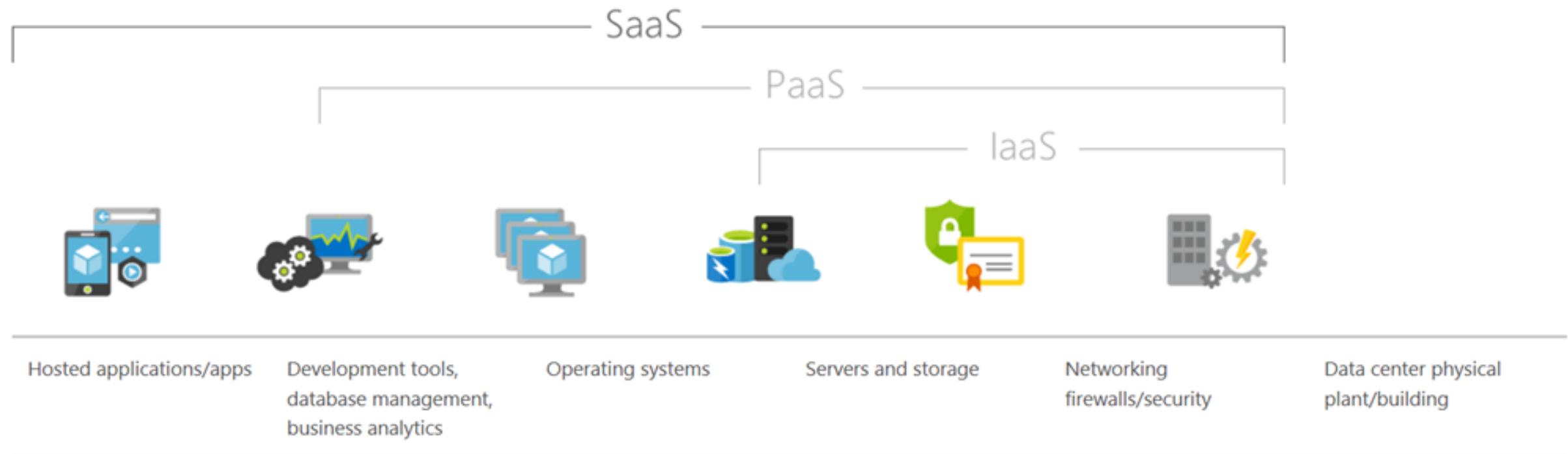




## SaaS - Software as a Service

- The applications are hosted in the cloud and offer a **WEB interface**
- The client accesses the applications through the **browser**

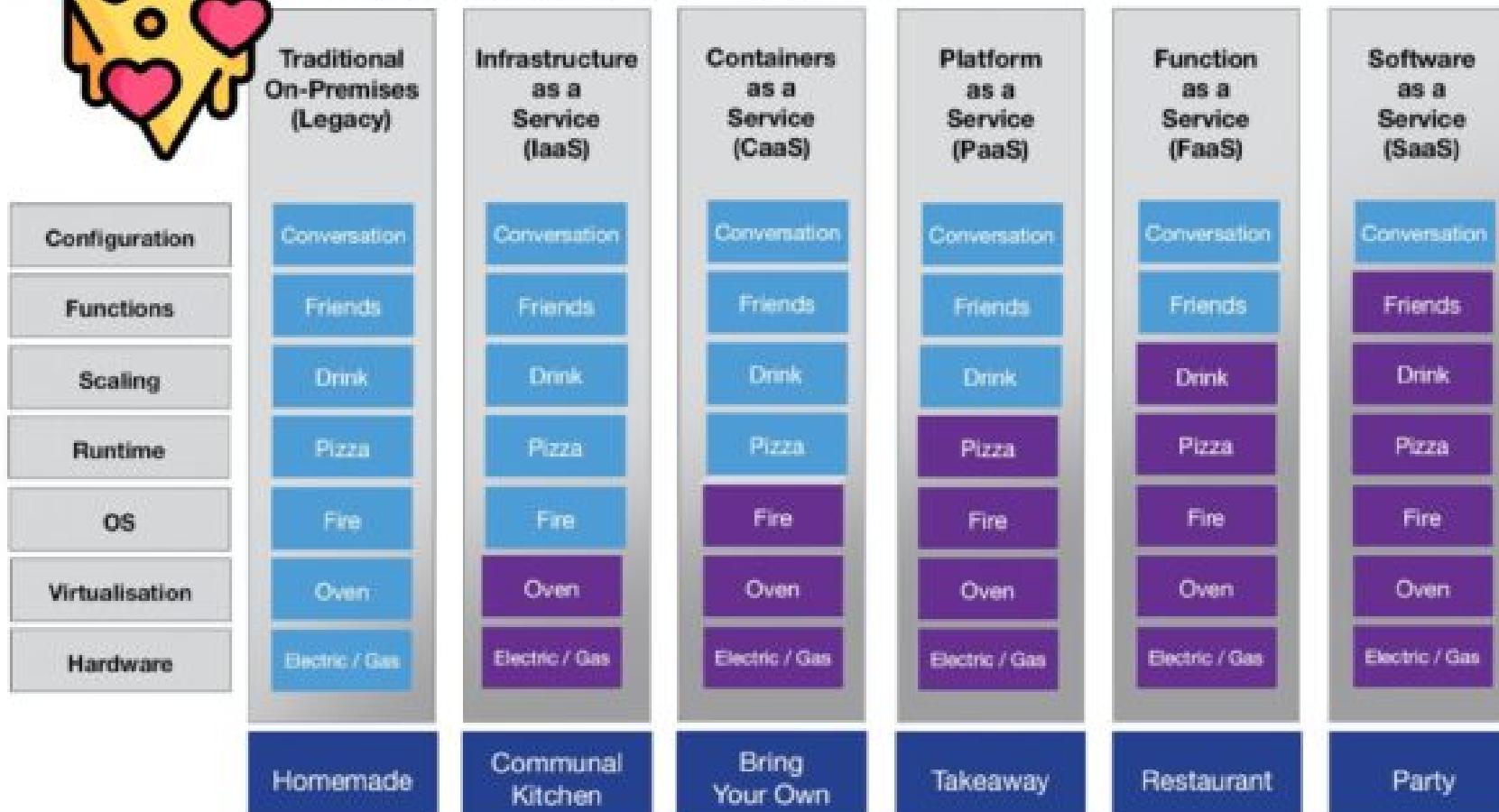






# Pizza as a Service Example

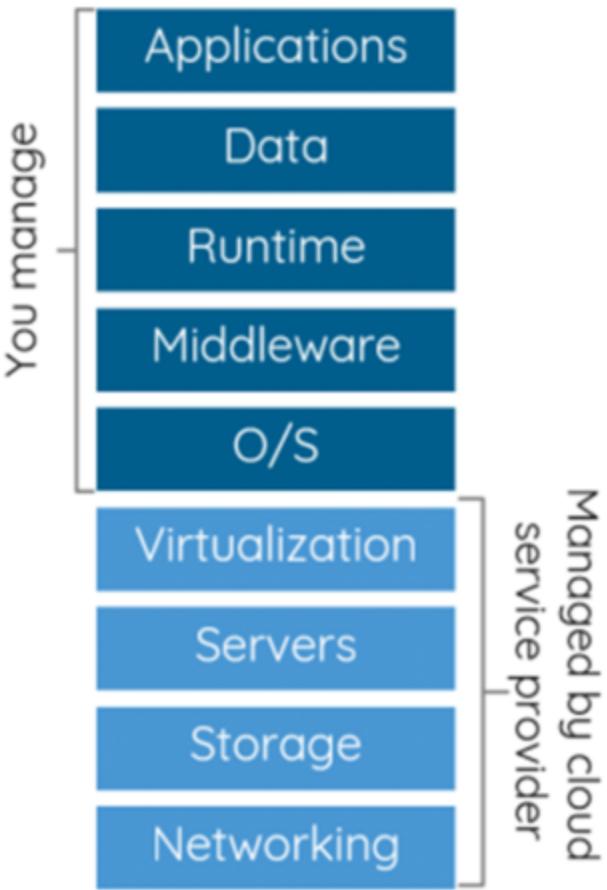
How to Choose the Level of Azure Service



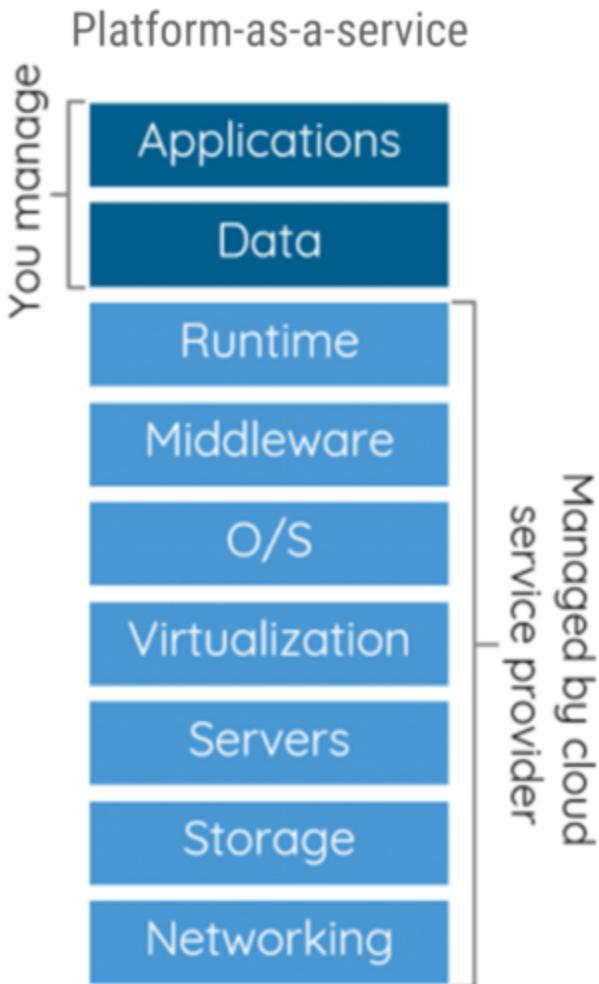
You Manage

Vendor Manages

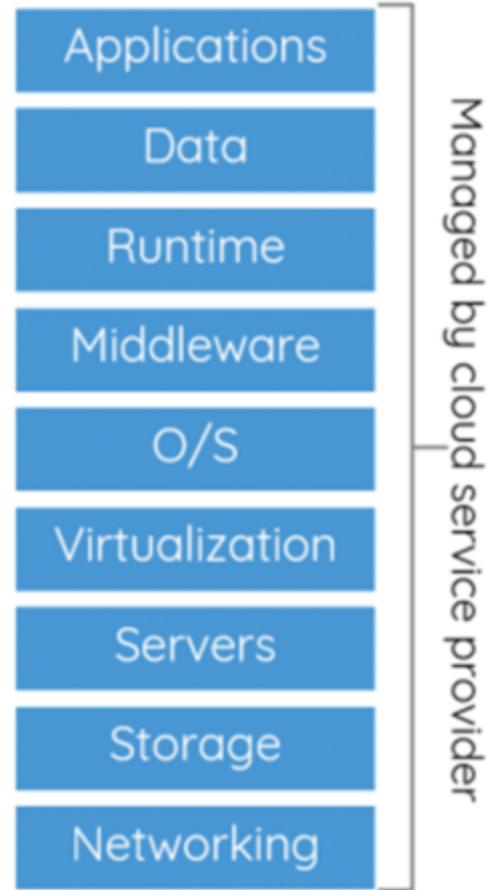
### Infrastructure-as-a-service



### Platform-as-a-service



### Software-as-a-service



Different ways to manage the stack

# Types of Cloud – types of implementation

## Public cloud (*Amazon, IBM, Google, Microsoft Azure*)

- The client and the service provider are different organizations
- The client doesn't necessarily know where the servers are
- Cheap: no investment, no HW maintenance, pay-per-use

## Private

- The company owns the data-center
- More expensive: same as not having the cloud
- Still using virtualization

## Hybrid

- Companies that own servers and also uses some cloud services
- Most common solutions for companies with data centers
  - *I.e. your monitoring solution is in the cloud but you own the data center*

Public

Private

Hybrid

Community

## Platform Services

### Security & Management

-  Cloud Services
-  Service Fabric
-  Batch
-  Remote App
-  Portal
-  Active Directory
-  Multi-Factor Authentication
-  Automation
-  Key Vault
-  Store / Marketplace
-  VM Image Gallery & VM Depot

### Compute



### Web and Mobile



### Developer Services



### Hybrid Operations



### Integration



### Analytics & IoT



### Data



### Media & CDN



### Compute



### Storage



### Networking



## Datacenter Infrastructure (38 Regions)



# E-economic

- Accounting software in the cloud
  - Design your own invoices
  - Free support
  - Safe and with backups of everything
  - API

# E-economic Developer

# E-economic DK



# Regnskabsprogram til den ambitiøse virksomhed

- ✓ Bruges af mere end 150.000 virksomheder
  - ✓ Giver dig frihed til at udvikle forretningen
  - ✓ Inkluderer gratis dansk support

Prøv e-economic gratis

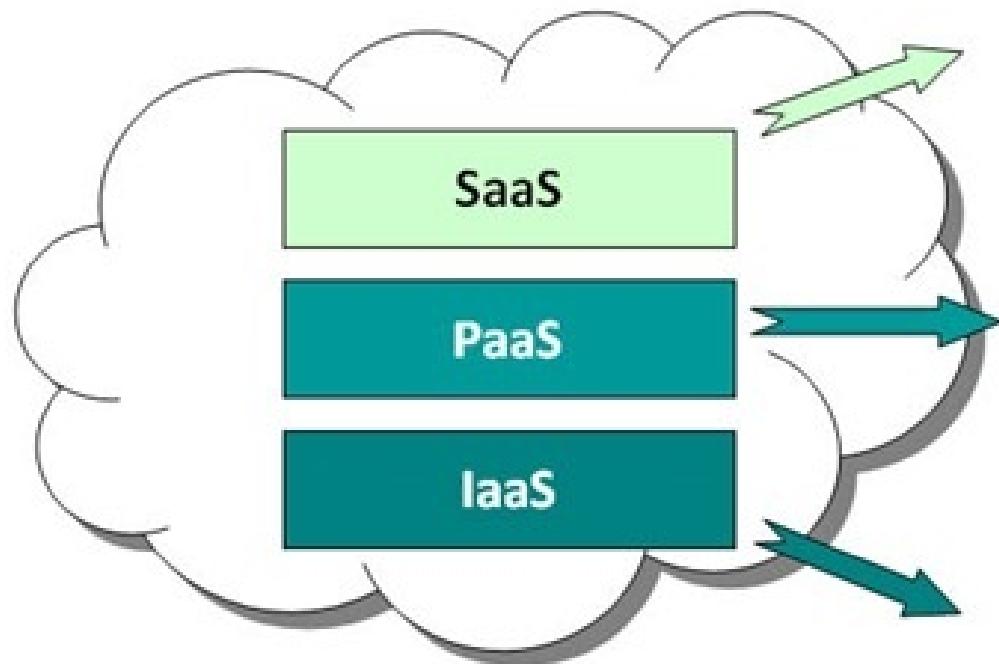
# Assignment

NIST Definition of Cloud Computing



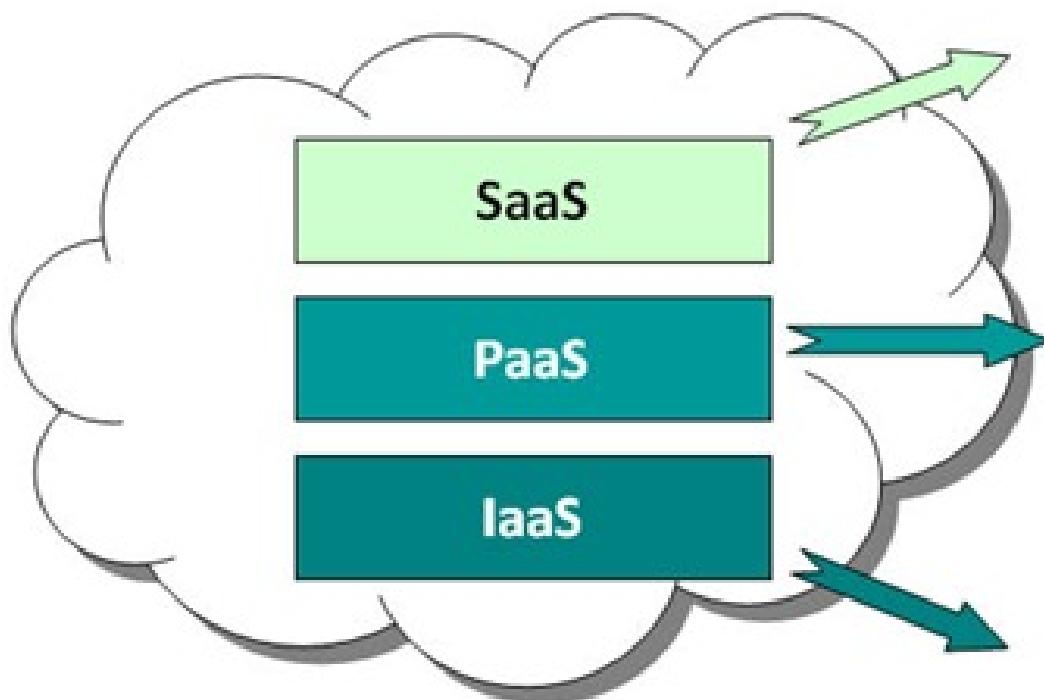
Fill in the blanks - Read NIST Definition of Cloud Computing -

<https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf>



Who Uses It	What Services are available	Why use it?

<https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf>



Who Uses It	What Services are available	Why use it?
Business Users	EMail, Office Automation, CRM, Website Testing, Wiki, Blog, Virtual Desktop ...	To complete business tasks
Developers and Deployers	Service and application test, development, integration and deployment	Create or deploy applications and services for users
System Managers	Virtual machines, operating systems, message queues, networks, storage, CPU, memory, backup services	Create platforms for service and application test, development, integration and deployment

# Google server centers

Tour with BBC

<https://www.youtube.com/embed/PBx7rgqeGG8>





## Google server centers

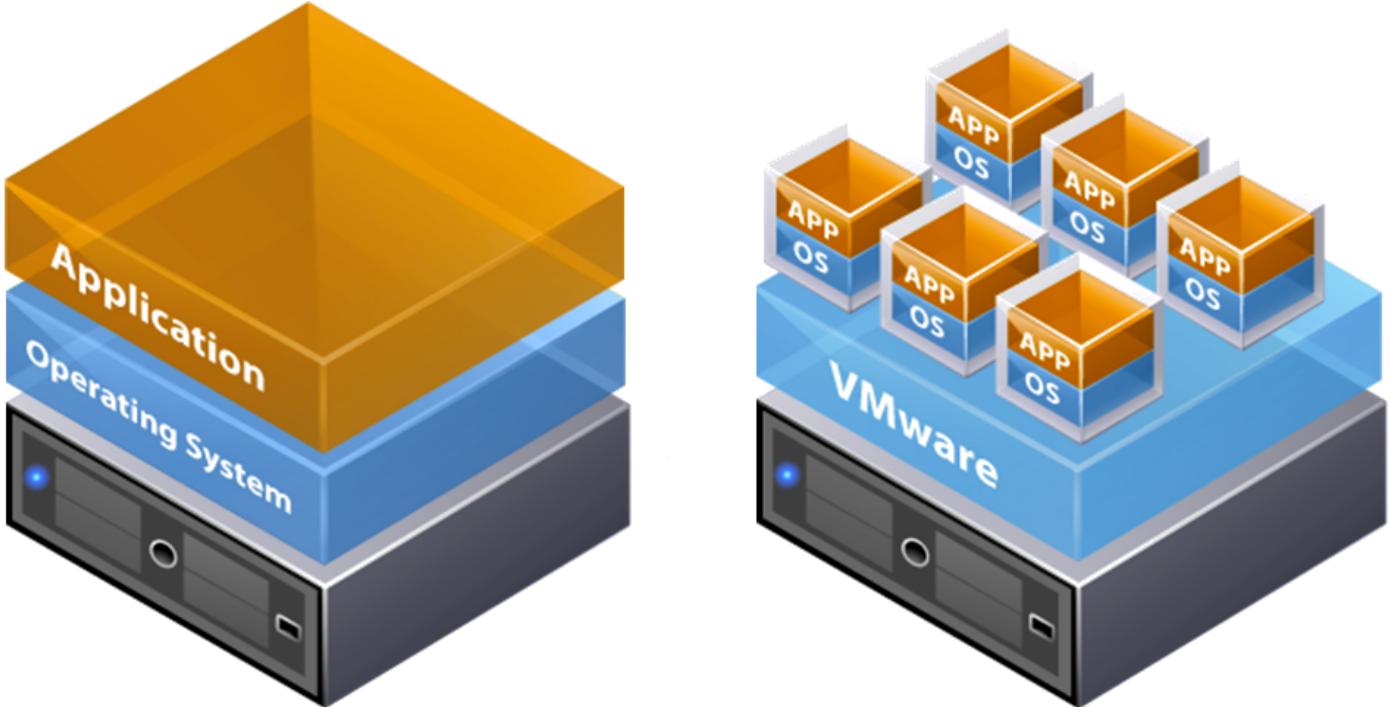
More on Data Security

<https://www.youtube.com/embed/4IDD8BP2EmU>

# Virtualization

# Virtualization basics

Virtualization is the practice of breaking down the **physical infrastructure** of computing and networking resources into smaller, reusable and more flexible **software units**.



# Reasons why you should use virtualization

- **Server consolidation** – Virtualization can reduce capital investments. In traditional environments it is common to dedicate each server to a single application. Virtualization enables you to consolidate all the workloads on one server, which reduces the number of physical machines
- **Virtual labs** – Run a virtual machine to try out application
- **Security purposes** – Use Virtual machines for specific purposes
- **Faster server provisioning** – With a virtual machine, you can quickly clone an image, master template, or existing virtual machine to get a server up and running within a few minutes
- **Cost saving** – On the physical server hardware, power and cooling of the servers. Time used to administer physical servers

**What is a Hypervisor?**

**What is a Bare-Metal Hypervisor?**

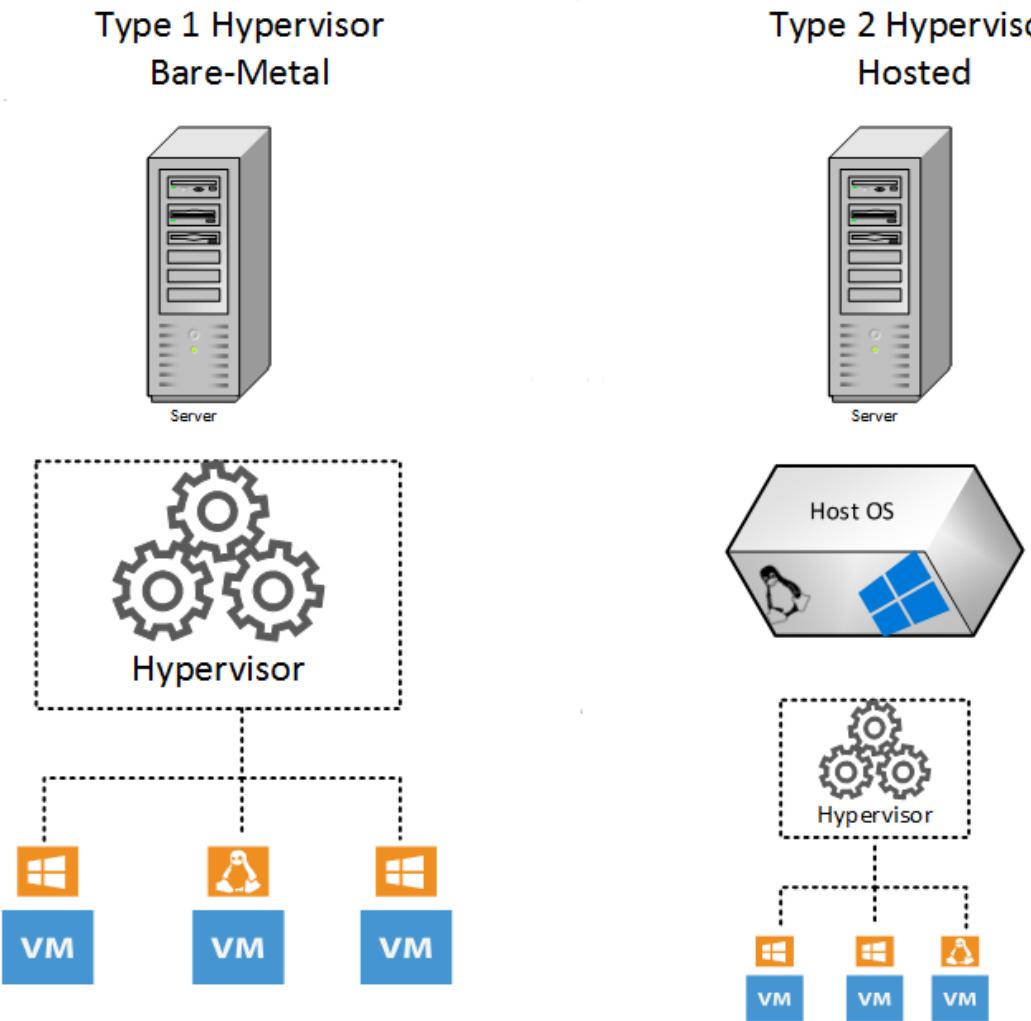
**What is VirtualBox?**

**What is Docker?**

**What is JupyterLab**

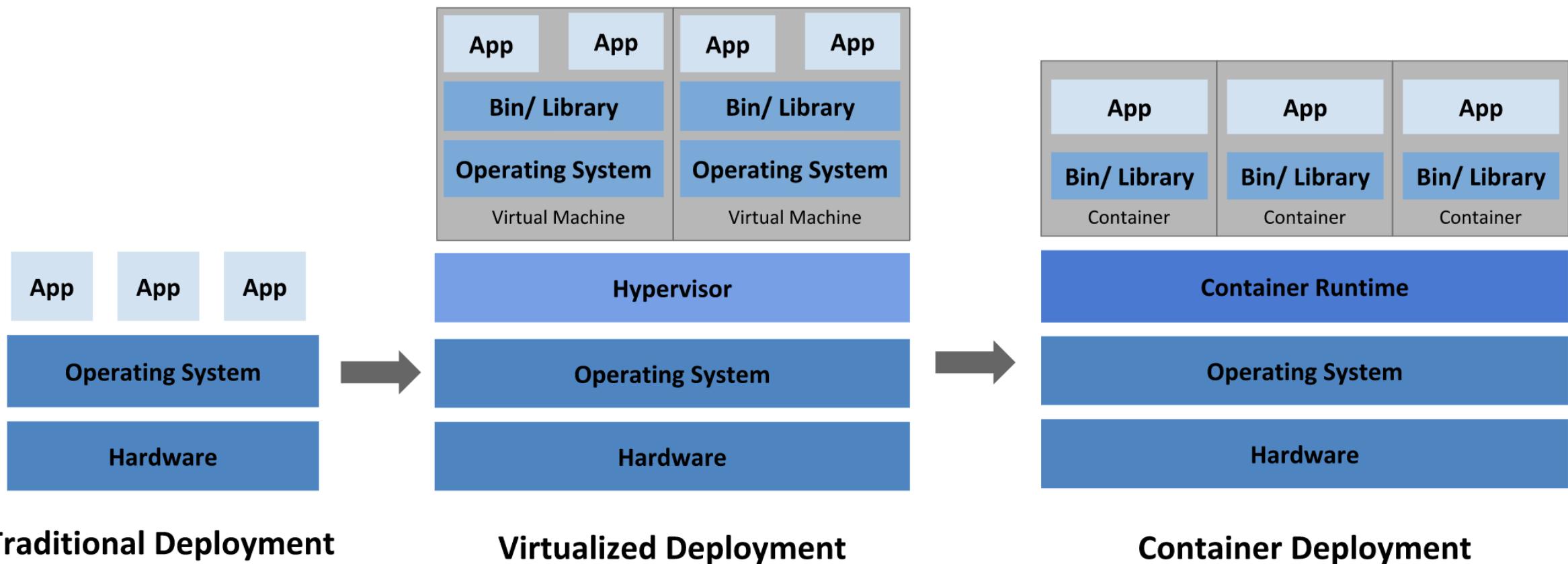


# Hypervisor



A hypervisor is a program for creating and running virtual machines.

- 1. Native - *Bare metal*** hypervisors that run guest virtual machines directly on a system's hardware, essentially behaving as an operating system - *Microsoft Hyper-V, Oracle VM server*
- 2. Hosted** hypervisors behave like traditional applications that can be started and stopped like a normal program - *Microsoft Virtual PC, Oracle VirtualBox*



# Links

- [azure.microsoft.com](https://azure.microsoft.com)
- [IBM Learn Cloud computing](https://www.ibm.com/learn/cloud-computing)
- [IBM Cloud](https://www.ibm.com/cloud)
- [aws.amazon.com](https://aws.amazon.com)

# LinkedIn Learning - Cloud

[Learning Cloud Computing: Core Concepts](#)