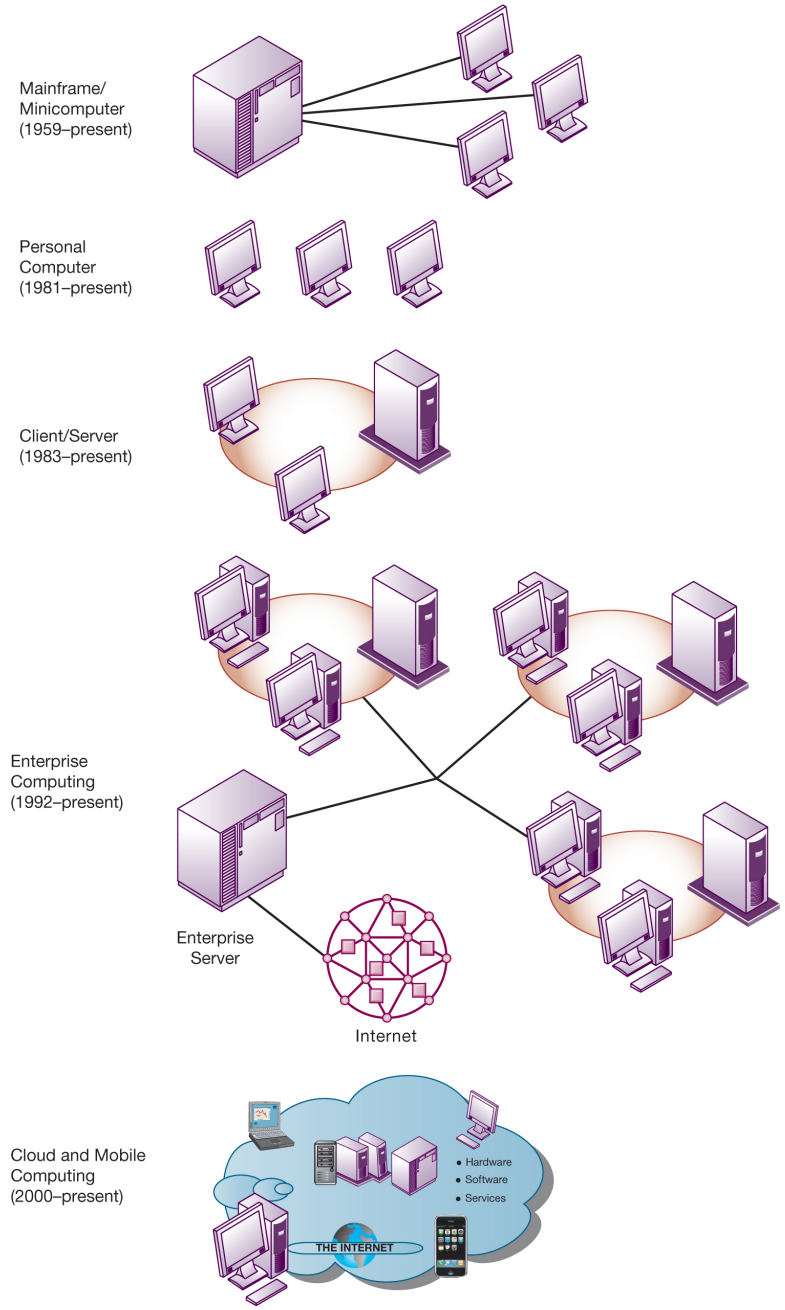
Virtualization

Agenda

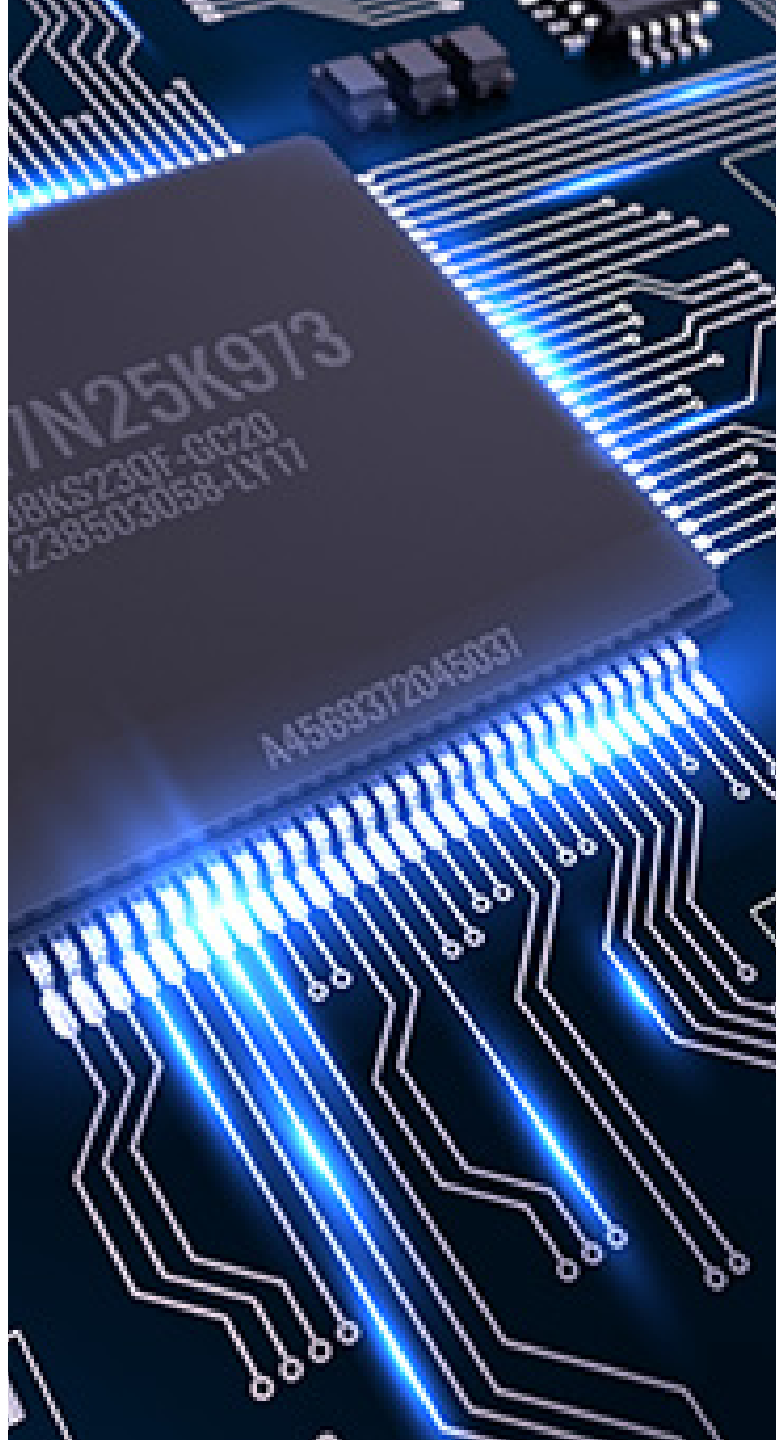
- Introduction
- It Infrastructures
- Cloud
- Azure

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

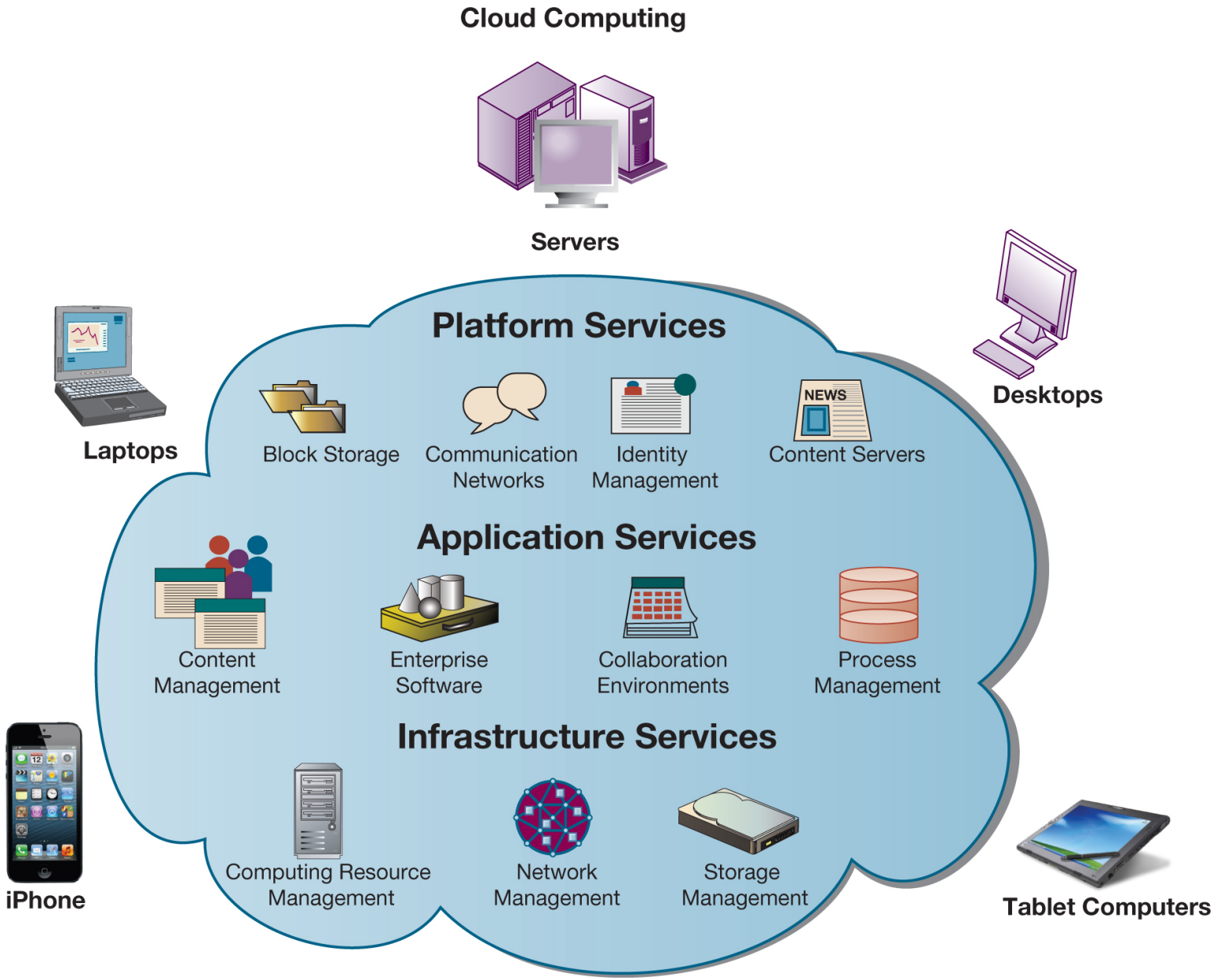
- Cheap - *on demand, pay-per-use formula*
- No need of expertise in security, clusters, networks, etc.
- Accessibility
- Multiplatform
- No worries about updates, upgrades, new licenses
- Easy to use / integrate

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
Servers
Desktops
Laptops
Platform Services
Block Storage
Communication Networks
Identity Management
NEWS
Content Servers
Application Services
Content Management
Enterprise Software
Collaboration Environments
Process Management
Infrastructure Services
Computing Resource Management
Network Management
Storage Management
iPhone
Tablet Computers

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

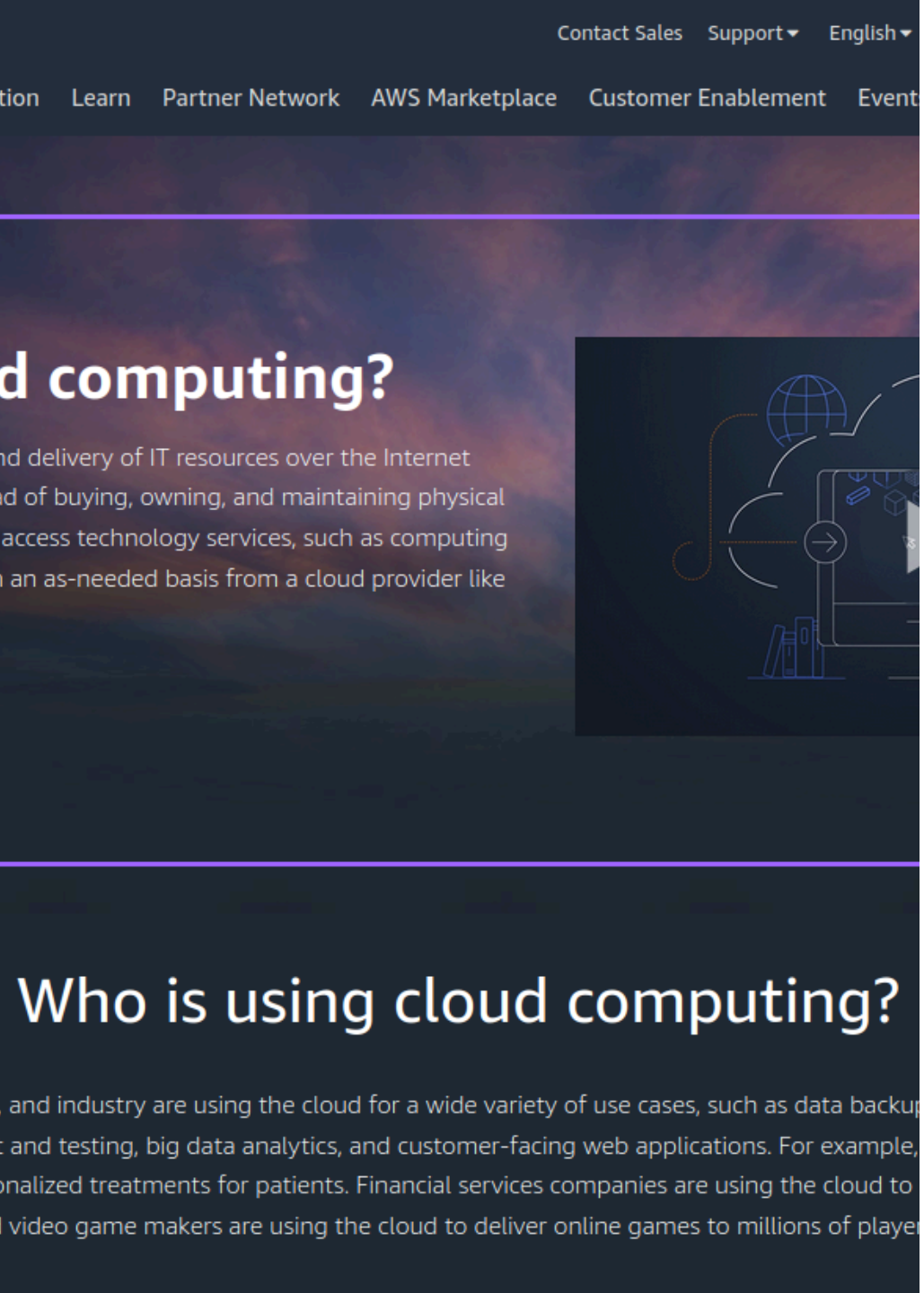
Oracle's Top 10 Cloud Predictions

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**

https://www.oracle.com/a/ocom/docs/cloud/oracle-cloud-predictions-2020.pdf

ORACLE



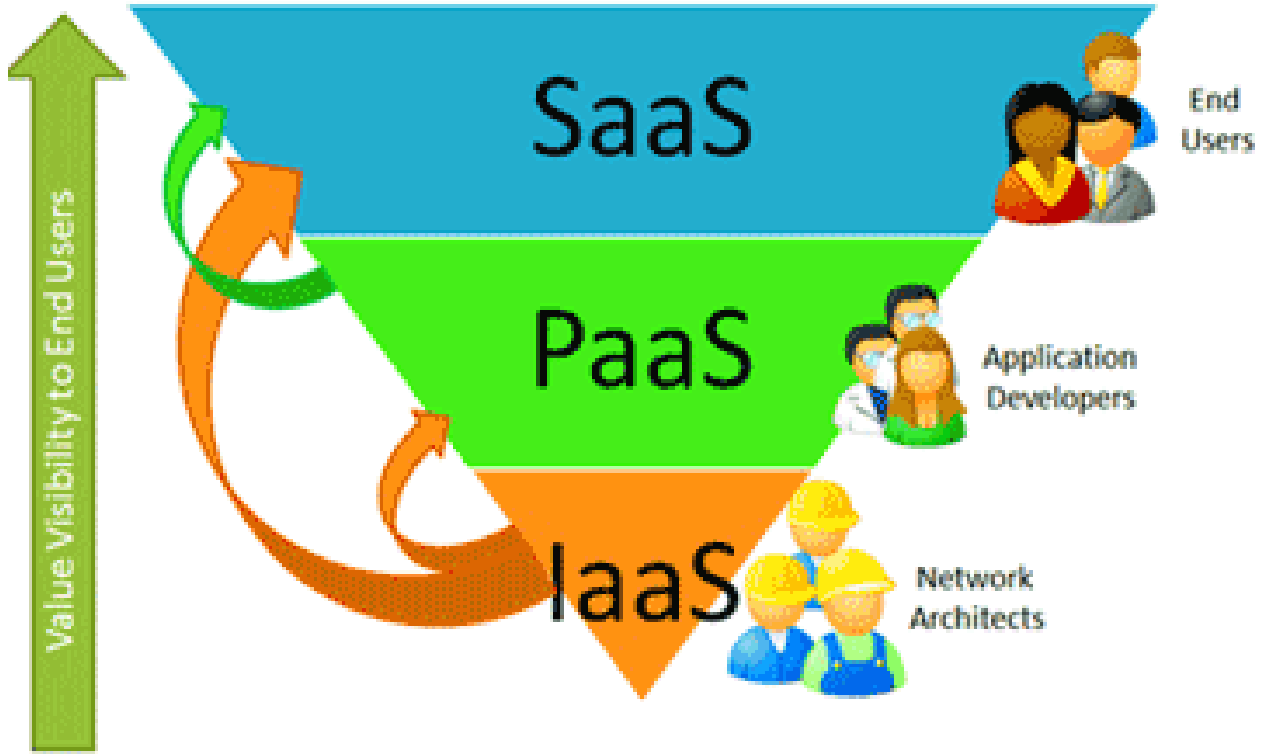
AWS

Amazon Web Services - what-is-cloud-computing

YoyTube video

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

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



SaaS

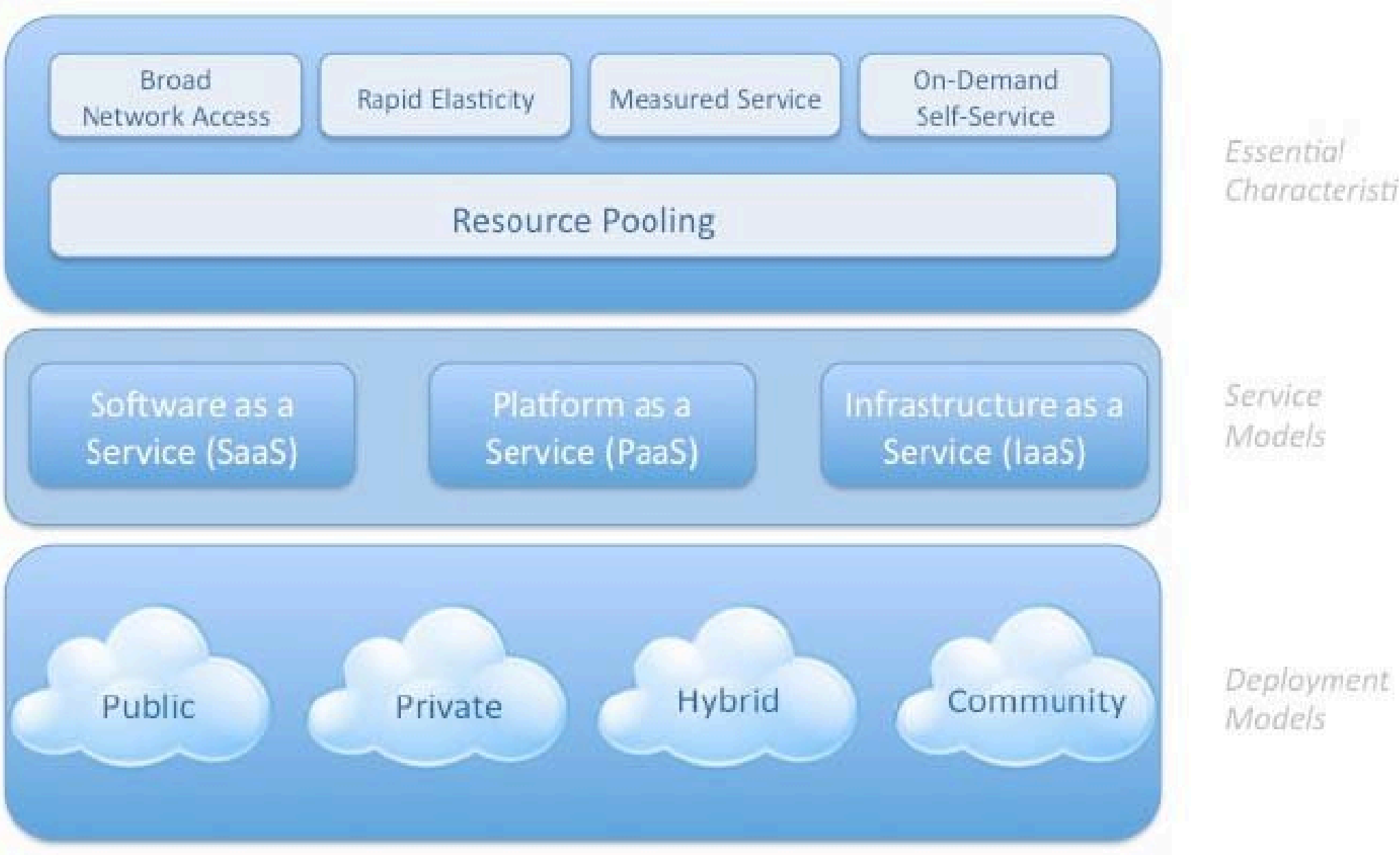
- Software as a service
- Operating environment largely irrelevant, fully functional applications provided, e.g. CRM, ERP, email

PaaS

- Platform as a service
- Operating environment included, e.g. Windows/.NET, Linux/J2EE, applications of choice deployed

IaaS

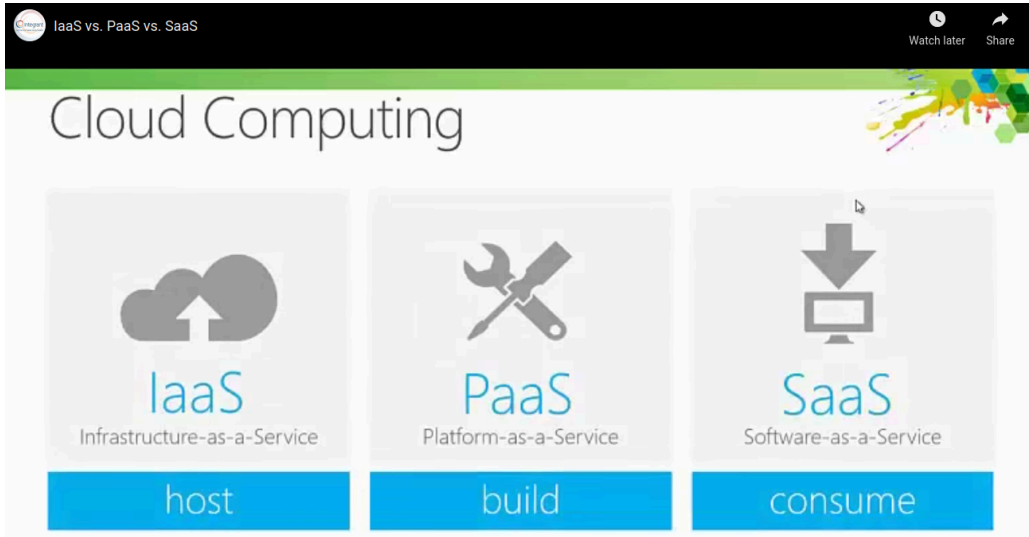
- Infrastructure as a service
- Virtual platform on which required operating environment and application are deployed
- Includes storage as a service offerings



NIST Definition of Cloud Computing - https://nvlpubs.nist.gov/nistpubs/Legacy/SP/nistspecialpublication800-145.pdf

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

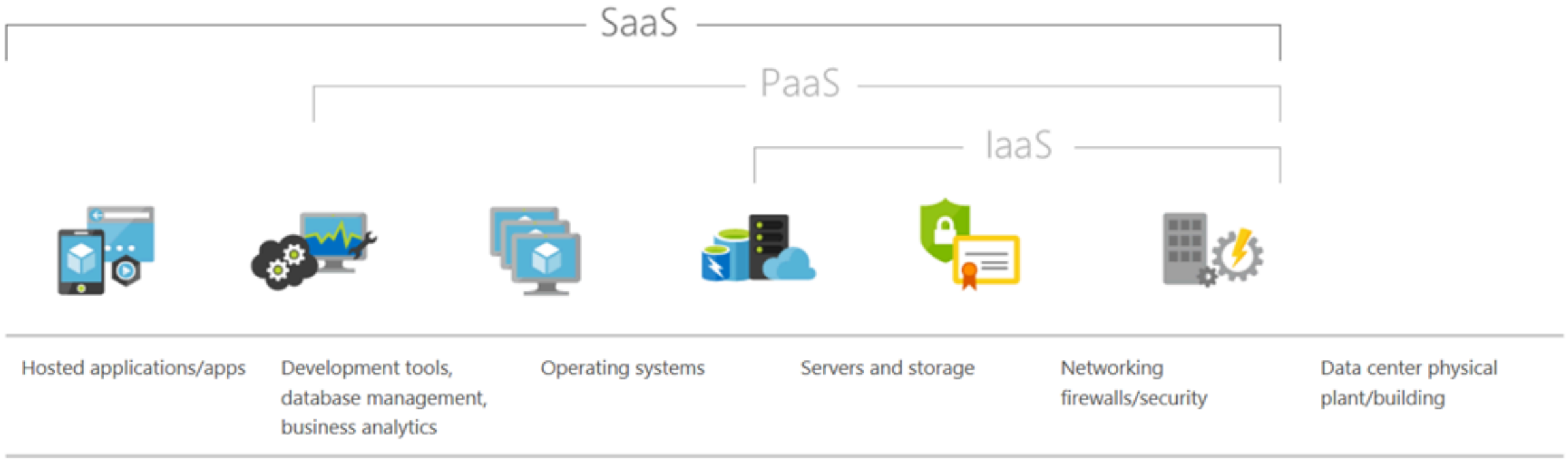
You think you have the whole server, but actually your VM can travel across servers and run where it wants

PaaS - Platform as a Service

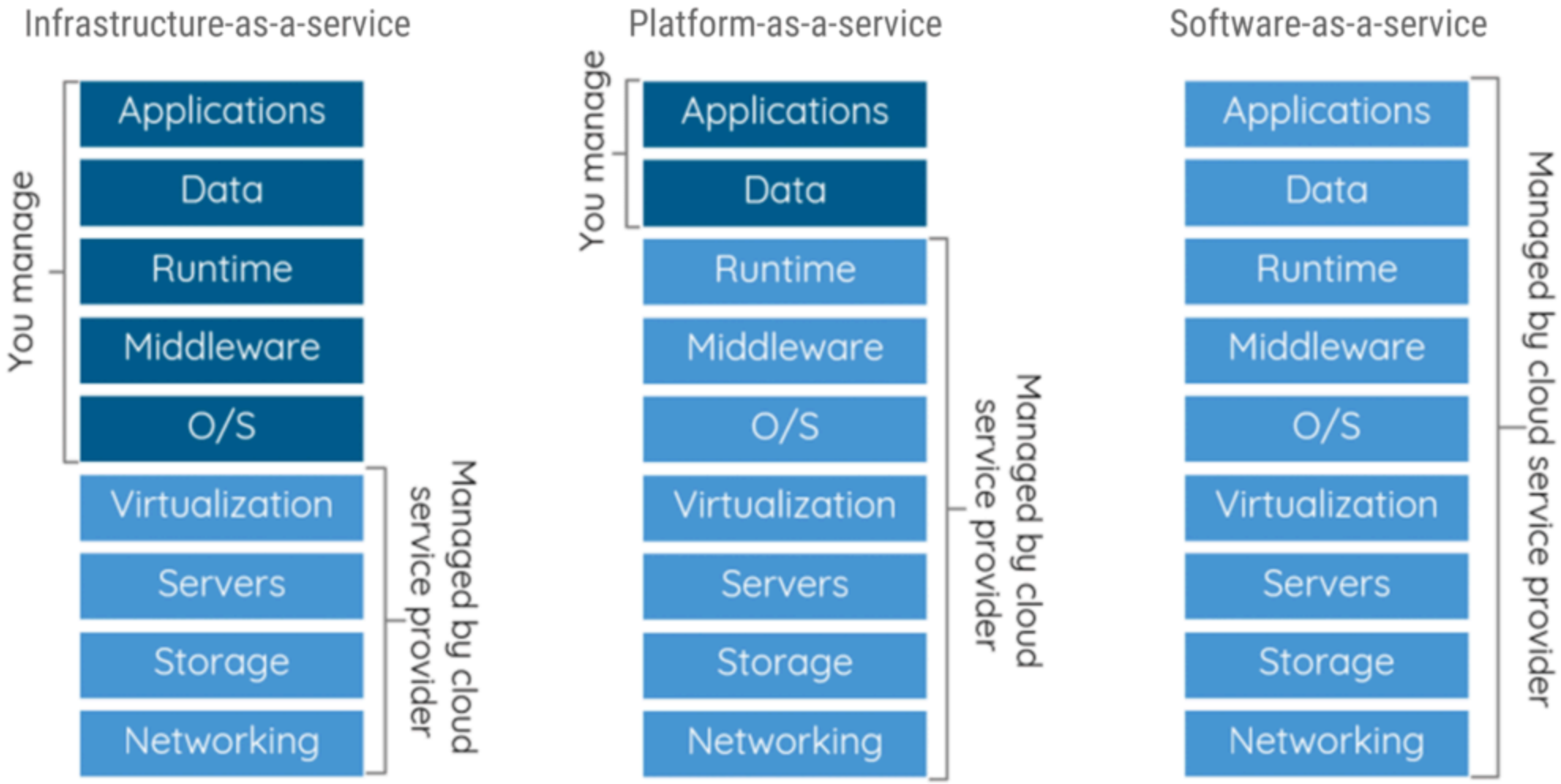
- Offers a runtime environment
- The client has it’s own web applications and wants to host them (*i.e. a website*)
- Container orchestration (*Docker*)

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**



https://azure.microsoft.com/en-us/



Different ways to manage the stack

Types of Cloud – types of implementation

Public cloud (*Amazon, IBM, Googl, 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*

Microsoft Azure

Platform Services

Security & Management
- Portal
- Active Directory
- Multi-Factor Authentication
- Automation
- Key Vault
- Store / Marketplace
- VM Image Gallery & VM Depot

Compute
- Cloud Services
- Service Fabric
- Batch
- Remote App

Web and Mobile
- Web Apps
- API Apps
- API Management
- Mobile Apps
- Logic Apps
- Notification Hubs

Developer Services
- Visual Studio
- Azure SDK
- Team Project
- Application Insights

Hybrid Operations
- Azure AD Connect Health
- AD Privileged Identity Management
- Backup
- Operational Insights
- Import/Export
- Site Recovery
- StorSimple

Integration
- Storage Queues
- Biztalk Services
- Hybrid Connections
- Service Bus

Media & CDN
- Media Services
- Content Delivery Network (CDN)

Analytics & IoT
- HDInsight
- Machine Learning
- Data Factory
- Event Hubs
- Stream Analytics
- Mobile Engagement

Data
- SQL Database
- SQL Data Warehouse
- Redis Cache
- Search
- DocumentDB
- Tables

Infrastructure Services

Compute
- Virtual Machines
- Containers

Storage
- BLOB Storage
- Azure Files
- Premium Storage

Networking
- Virtual Network
- Load Balancer
- DNS
- Express Route
- Traffic Manager
- VPN Gateway
- Application Gateway

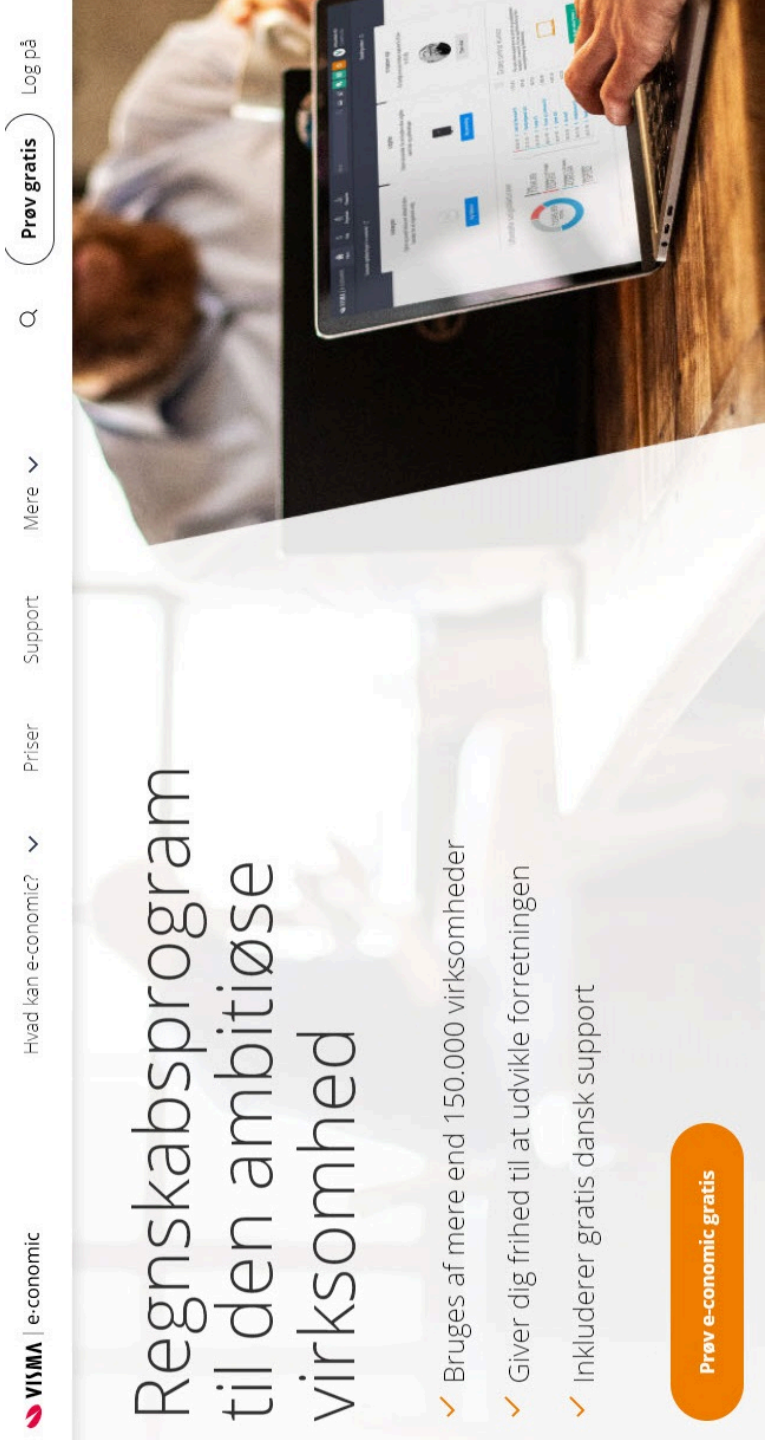
Datacenter Infrastructure (38 Regions)

E-conomic

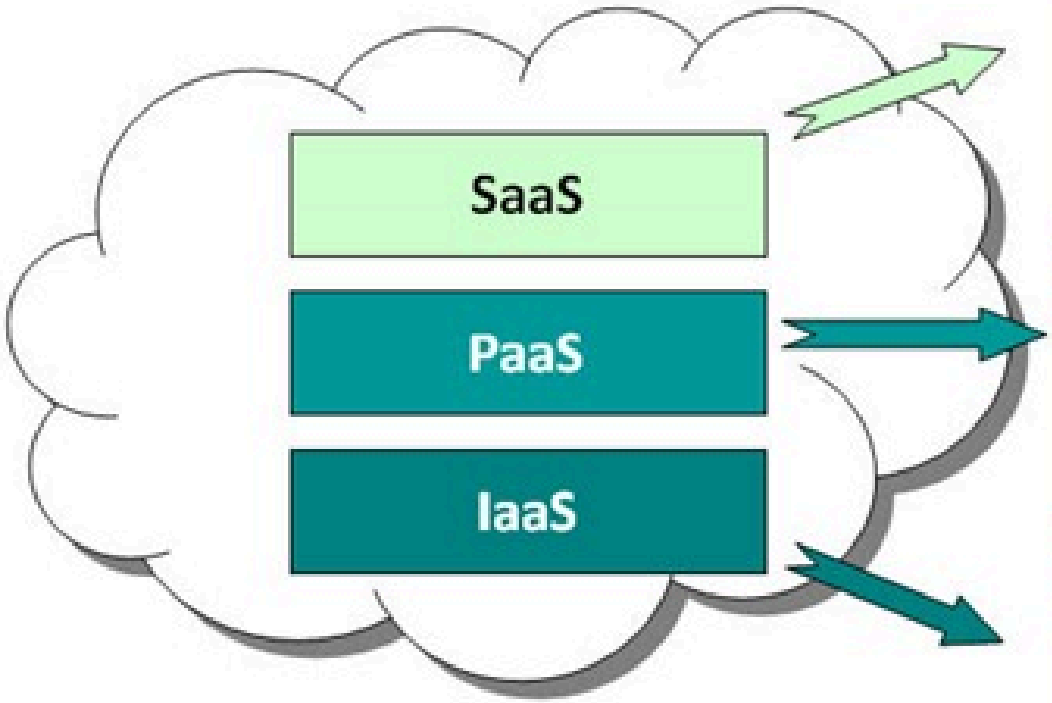
- Accounting software in the cloud
- Design your own invoices
- Free support
- Safe and with backups of everything
- API

E-conomic Developer

E-conomic DK



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

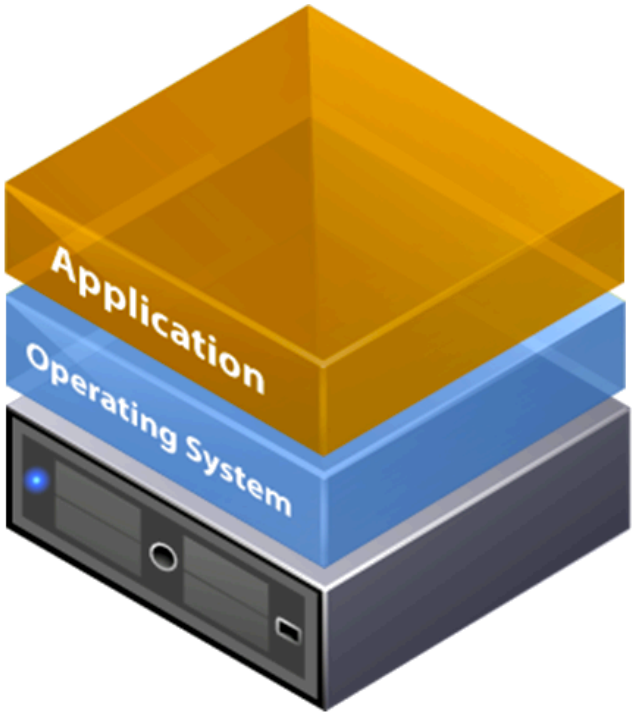
https://www.youtube.com/embed/PBx7rgqeGG8

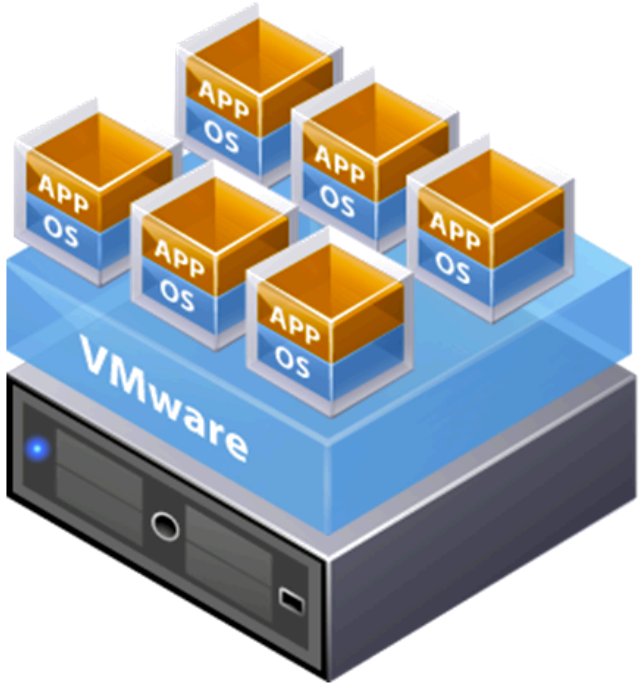
Google server centers

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** – Uae 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

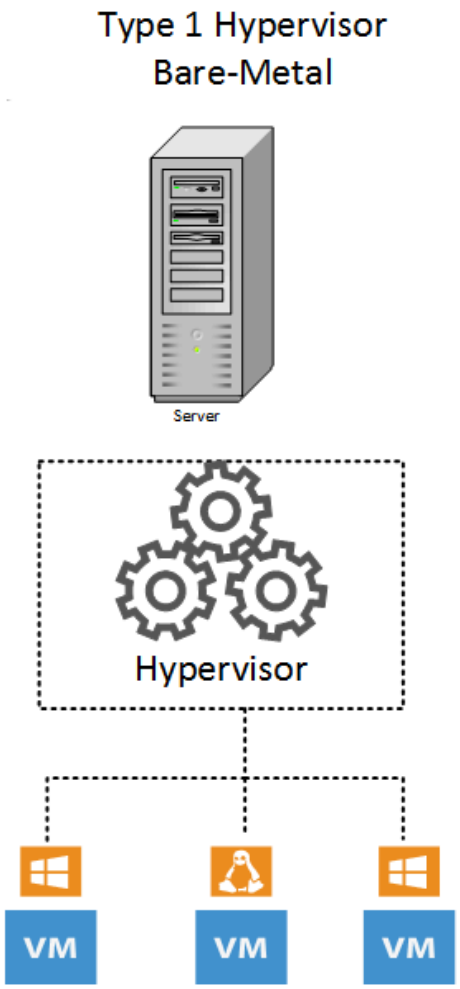
What is a Hypervisor?

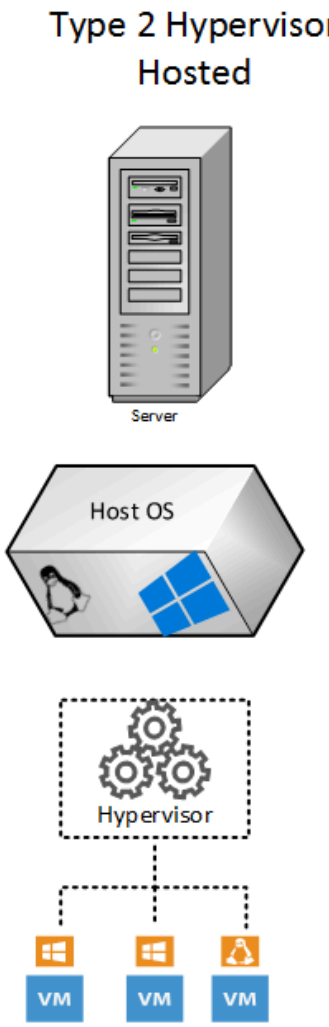
What is a Bare-Metal Hypervisor?

What is VirtualBox?

What is Docker?

What is JupyterLab

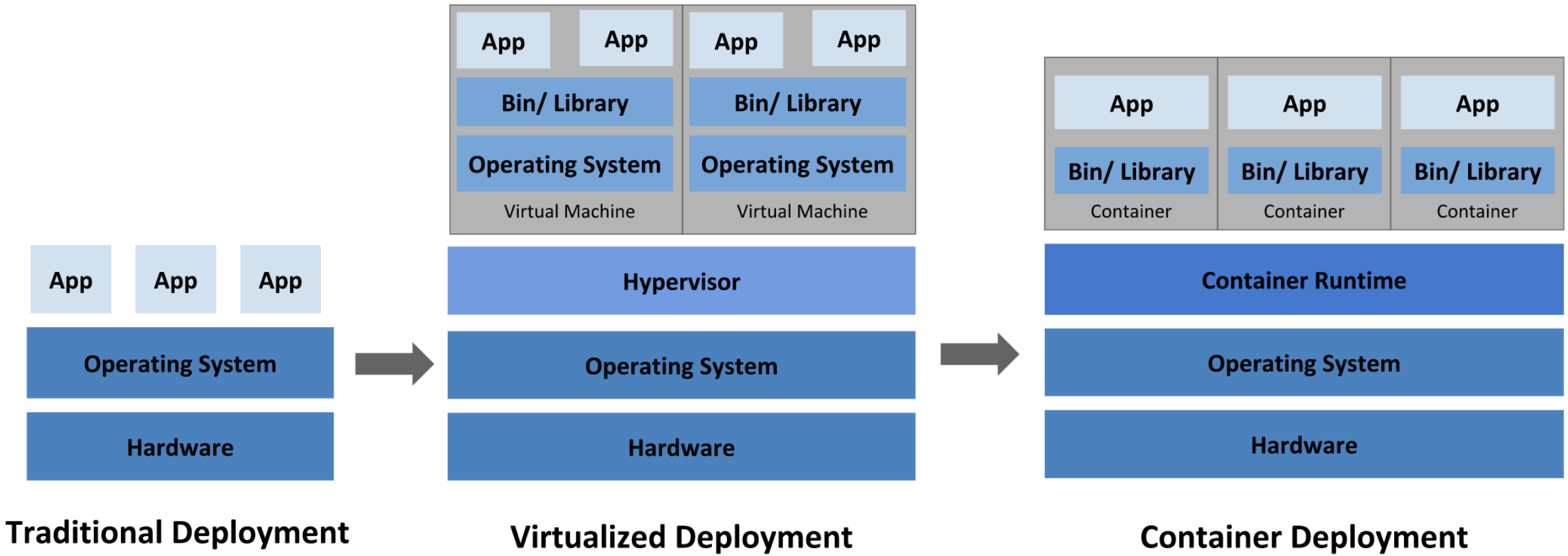




Hypervisor

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*


App
App
App
Operating System
Hardware
Traditional Deployment
App
App
App
App
Bin/ Library
Bin/ Library
Operating System
Operating System
Virtual Machine
Virtual Machine
Hypervisor
Operating System
Hardware
Virtualized Deployment
App
App
App
Bin/ Library
Bin/ Library
Bin/ Library
Container
Container
Container
Container Runtime
Operating System
Hardware
Container Deployment

Links

- azure.microsoft.com
- IBM Learn Cloud computing
- IBM Cloud
- aws.amazon.com

LinkedIN Learning - Cloud

Learning Cloud Computing: Core Concepts