Cloud Introduction

Cloud Concepts, IaaS, PaaS, CaaS, SaaS, Public Cloud Platforms

Technical Trainers

SoftUni Team

Software University

SoftUni

Software University

https://softuni.bg

Have a Question?

Software University

sli.do

#Dev-Ops

Table of Contents

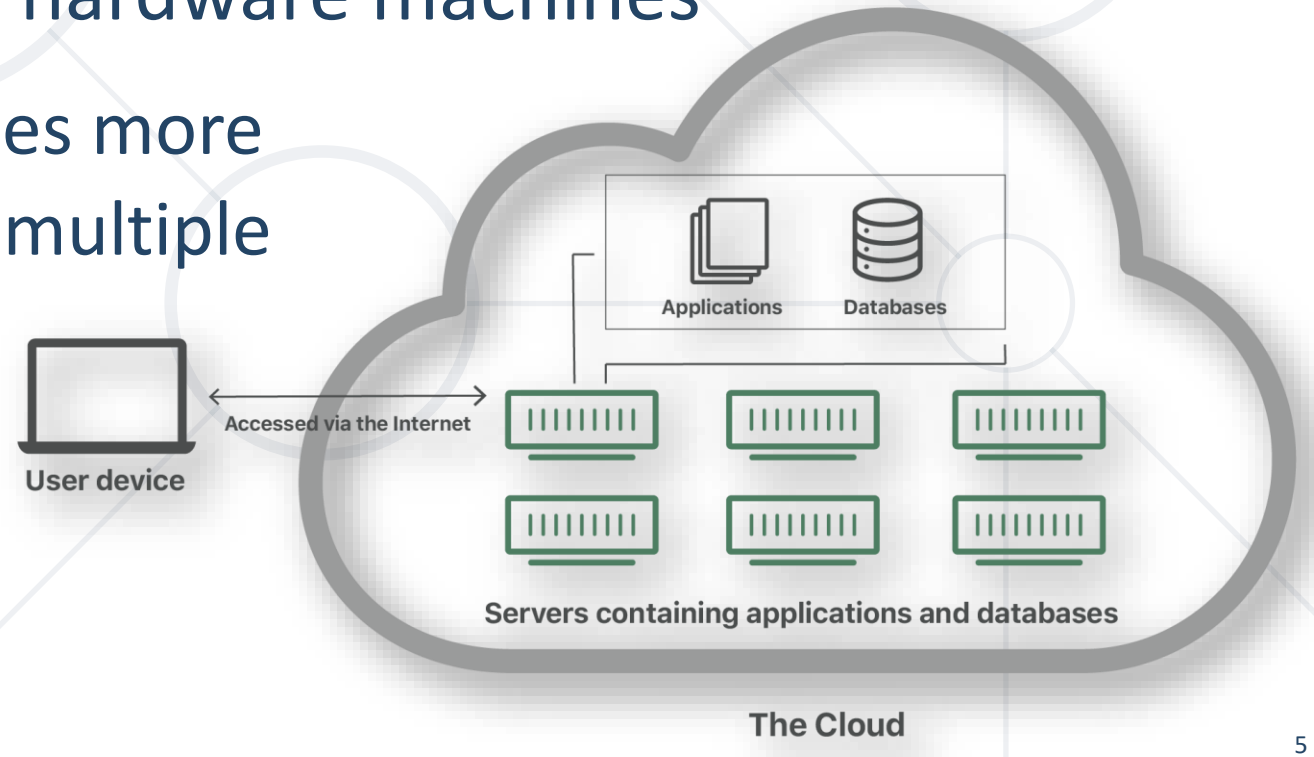
Software University

What is Cloud Computing?

On-demand Delivery of IT Resources over The Internet with Pay-as-you-go Pricing

What is Cloud?

- **Cloud** == **virtual space** (software and services) that runs on the **Internet**, instead of locally on your computer
- **Clouds** combine computing power and resources of multiple hardware machines
  - Share cloud resources more efficiently between multiple users and apps
  - Save costs
  - Better service

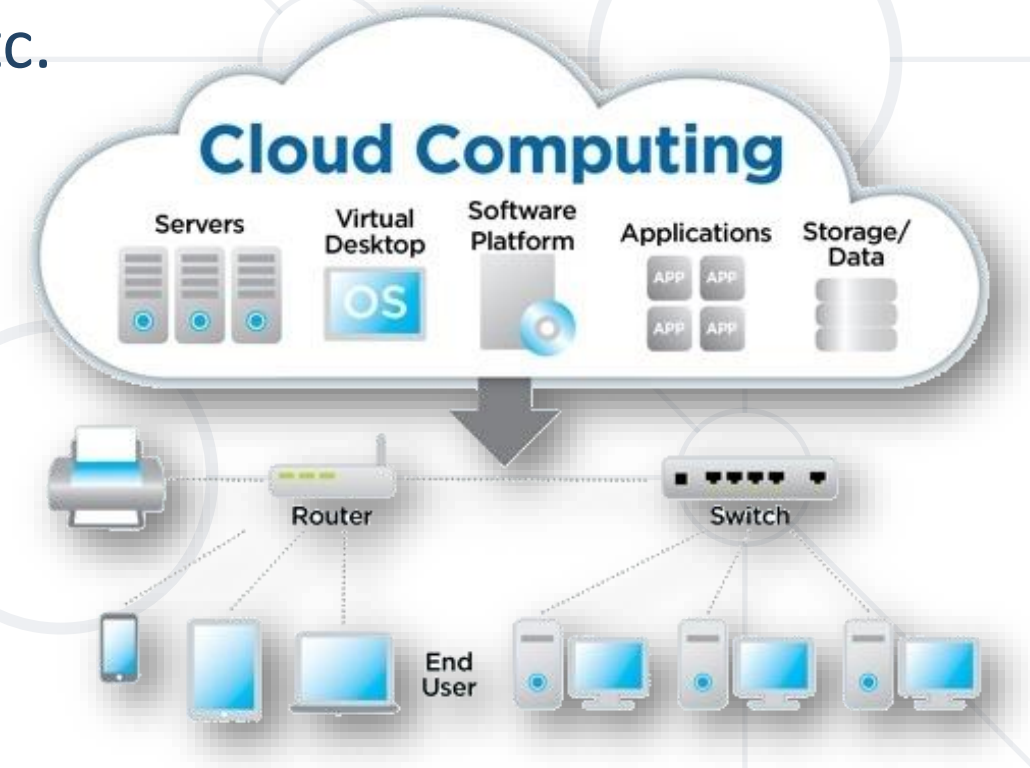


What is Cloud Computing?

- **Cloud computing** == the delivery of IT resources over the Internet
  - Instead of buying, owning, and maintaining physical data centers and servers, you can **access technology from a cloud**
  - Includes servers, storage, databases, software, networking, analytics, and intelligence
- **Cloud computing environment**
  - Suppose we have 20-30 powerful machines
  - We can run 100-200 virtual machines (VMs)
  - We can deploy hundreds of applications
  - We can serve millions of users

How the Cloud Works?

- In the **cloud** everyone consumes a portion of the **shared computing resources**
  - CPU, memory, storage, IO, networking, etc.
- If your business is small, you consume less cloud resources
  - If your business is growing, you consume more resources
- **Pay-as-you-go**
  - Start for free, pay when you grow and need more resources



Cloud Computing – Example

- Suppose we have a **mail server software**
  - It needs **computing resources** (CPU, disk operations, networking, etc.) only when sending or receiving emails
  - It the rest of the time it does nothing (**waits**)
- The mail server on **dedicated machine** will use less than 1% of its power and resources
  - You can run 100 mail servers in the **cloud** on the same hardware
  - Less hardware, reduced costs, increased quality

Cloud Benefits

- Cloud provides **computing resources on demand**
  - Rent a hosting + CPU power + RAM + storage + IO operations + networking + other services (e.g. databases, CDN, analytics, …)
  - Pay-as-you-go
- Cloud has better **support** and **reliability**
  - Your data lives in a **professional data center**
  - Has 24 x 7 **monitoring** + **backup** + **support**
  - **Reduces costs**: rent a piece of a data center instead of building your own IT infrastructure / data center

Virtualization vs Cloud

- **Virtualization** is a technology that transforms physical hardware into virtual resources
- Easy server maintenance
- Effective server utilization
- Separated physical infrastructure
- Infrastructure cost savings

- The **cloud** is an environment that delivers virtualized resources through the Internet
- Scalability
- Automated management
- Self-serving
- Pay-as-you-go
- **Cloud computing** uses **virtualization technology** to deliver services for user access to virtualized servers, apps, etc.

Types of Clouds

- **Public** cloud
  - IT infrastructure, service or platform **publicly accessible from the Internet** (free or paid)
  - Amazon AWS, Windows Azure
- **Private** cloud
  - Cloud infrastructure (hardware + software) for **internal use only**
  - **Two types**
    - Managed == deployed, configured and managed by third-party
    - Dedicated == cloud within another cloud
  - Banking / Government

Types of Clouds

- **Hybrid cloud**
  - Mix of private and public cloud infrastructure and services
  - At least 1 private cloud + at least 1 public cloud
  - Two or more private or public clouds
- **Multicloud**
  - Cloud approach made up of more than 1 cloud service from more than 1 cloud vendor
  - All hybrid clouds are multiclouds, but not all multiclouds are hybrid clouds
  - They become hybrid when multiple clouds are connected by orchestration

What is Cloud Development?

- **Cloud software development**
  - Design and develop an **app for the cloud**
    - e.g., for **public PaaS or CaaS platforms**
- Steps in cloud software development
  - Choose a **development stack** of technologies
  - Choose a **public cloud platform** + **services**
  - Design the app for to run in **containers** or in a **cloud**
  - Develop the app using **containers** / **microservices** / **cloud APIs**
  - Deploy, run and monitor the application in the **cloud**

What is a Cloud-First Strategy?

- **Cloud-first strategy** == adoption of **cloud technologies** for all new apps, platforms and infrastructure
  - Opting for **cloud-based solutions** before considering on-premises
  - Puts the cloud at the center
- May also include moving all or most of your **current infrastructure** onto a **cloud-computing platform**

Cloud Computing Models

IaaS, PaaS, SaaS, CaaS, BaaS

Infrastructure as a Service (IaaS)

- **Infrastructure as a Service (IaaS)**
  - VMs in the cloud on demand
  - Users install the OS and software they need
- Usage Scenarios
  - Web Hosting
  - Virtual Data Centers
- Examples
  - Amazon Web Services, Google Cloud, Microsoft Azure, Digital Ocean

Platform as a Service (PaaS)

- **Platform as a Service** (**PaaS**)
  - Platform, environment and services and APIs for developers
    - Develop, run and manage applications
    - Includes dev tools, DBs, operating systems, networking, storage, etc.
- Usage Scenarios
  - Web application hosting
  - Database and/or business process management
  - Development frameworks and middleware
- Examples
  - Google App Engine, Heroku, MS Azure, AWS

Typical PaaS Platform

Software University

Front-End: HTML5, JavaScript / Mobile Front-Ends

Middle-Tier Languages and Frameworks:
PHP, Java, C#, Python, Ruby, JavaScript, Symfony, Laravel, Zend Framework, JSF, ADF, Sprint MVC, Django, Rails, Sinatra, Play, ASP.NET, ASP.NET MVC, Node.js, Express, …

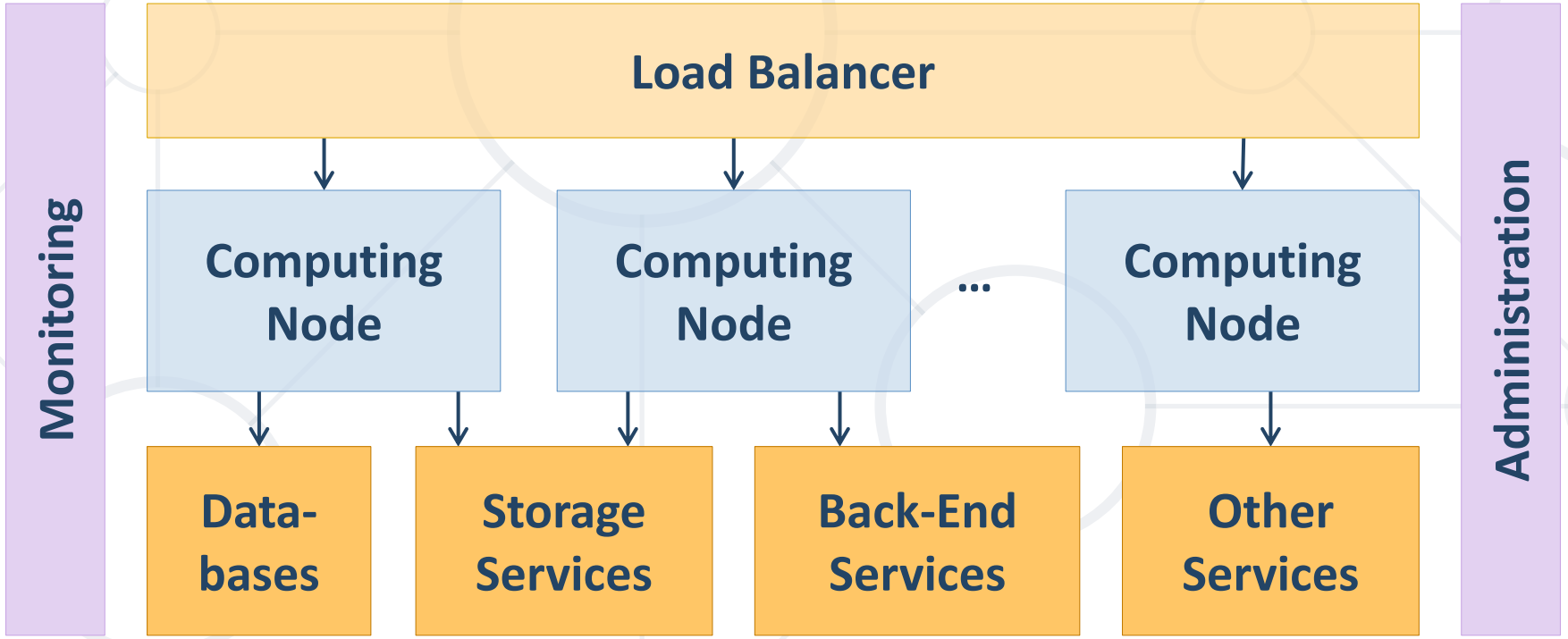
Computing Nodes (VMs):
Amazon EC2, Azure Compute, App Engine Backends, …

Back-End Technologies:
Relational DBs, NoSQL DBs, Blob Storage, Message Queues, Notifications, CDN, Search, Email, …

Operating Systems: Linux / Windows / other

Typical PaaS Architecture

- The **typical cloud architecture** is multi-tier, SOA, highly-scalable and highly-available



- Each **tier** hosts different managed services and technologies

Software as a Service (SaaS)

- **Software as a Service (SaaS)**
  - Hosted application on demand
    - Typically accessed by a web browser, eliminating the need for installation
- Usage Scenarios
  - CRM systems
  - Accounting software
  - Project management tools
- Examples
  - GMail, Jira, Office 365, Wix, Dropbox, DocuSign, HubSpot

Containers as a Service (CaaS)

- **Containers as a Service (SaaS)**
  - Container engines, orchestration and the compute resources are delivered to users as a service from a cloud provider
- Usage Scenarios
  - CI/CD Pipelines
  - Microservices architecture
- Examples
  - Docker Datacenter, Azure Kubernetes, Amazon Elastic Kubernetes Service

Kubernetes as a Service (KaaS)

- **Kubernetes as a Service (KaaS)**
  - Managed Kubernetes cluster to deploy your containerized apps
- Usage Scenarios
  - CI/CD Pipelines
  - Microservices deployment
- Examples
  - Google Kubernetes Engine, Azure Kubernetes, Amazon Elastic Kubernetes Service

Database as a Service (DBaaS)

- **Database as a Service** (**DBaaS**)
  - Managed database service in the cloud
  - No need for setting up and maintaining physical hardware
- Usage Scenarios
  - E-commerce platforms storing product and user data
  - Data backup and archiving solutions
  - Analytics and reporting platforms processing large data sets
- Examples
  - Azure SQL Database, Amazon RDS, Amazon DynamoDB, Google Cloud SQL, Firebase

Function as a Service (FaaS)

- **Function as a Service (FaaS)**
  - Hosting of serverless apps in the cloud
  - Enable execution of individual functions or pieces of code in stateless compute containers that are event-triggered
- Usage Scenarios
  - Web APIs
  - Serverless applications
  - Automation and integrations
- Examples
  - Azure Functions, AWS Lambda, Google Cloud Functions

Backend As a Service (BaaS)

- **Backend as a Service (BaaS)**
  - Ready-to-use backend stack that can be integrated with applications
- Usage Scenarios
  - Mobile applications
  - Web applications
  - Rapid prototyping
- Examples
  - Firebase, AWS Amplify, Kinvey, Parse

IaaS vs CaaS vs PaaS vs BaaS vs SaaS

Software University

	IaaS	CaaS	PaaS	BaaS	SaaS
CUSTOM	Applications	Applications	Applications	Applications	Applications
	Data	Data	Data	Data	Data
	Runtime	Runtime	Runtime	Runtime	Runtime
	Containers	Containers	Containers	Containers	Containers
	O/S	O/S	O/S	O/S	O/S
AS SERVICE	Virtualization	Virtualization	Virtualization	Virtualization	Virtualization
	Servers	Servers	Servers	Servers	Servers
	Storage	Storage	Storage	Storage	Storage
	Networking	Networking	Networking	Networking	Networking

Cloud Service Providers

Amazon Web Services, Azure, Google Cloud, etc.

Top Cloud Service Providers for 2023

Software University

- Amazon Web Services (AWS)
  - The pioneer of the public clouds
  - Provides cloud platform and services from 2002
  - Provides IaaS and PaaS on demand
- Microsoft Azure
  - Management and development of applications and servers
  - On focus during the course

Top Cloud Service Providers for 2023

Software University

- Google Cloud Platform (GCP)
  - Suite of cloud services by Google
  - Google App Engine (GAE) – PaaS public cloud for Java, Python, JavaScript, C#, PHP, Go, Ruby
- Alibaba Cloud
- Oracle Cloud
- IBM Cloud (Kyndryl)
- Tencent Cloud

Microsoft Azure

Microsoft's Public Cloud Platform

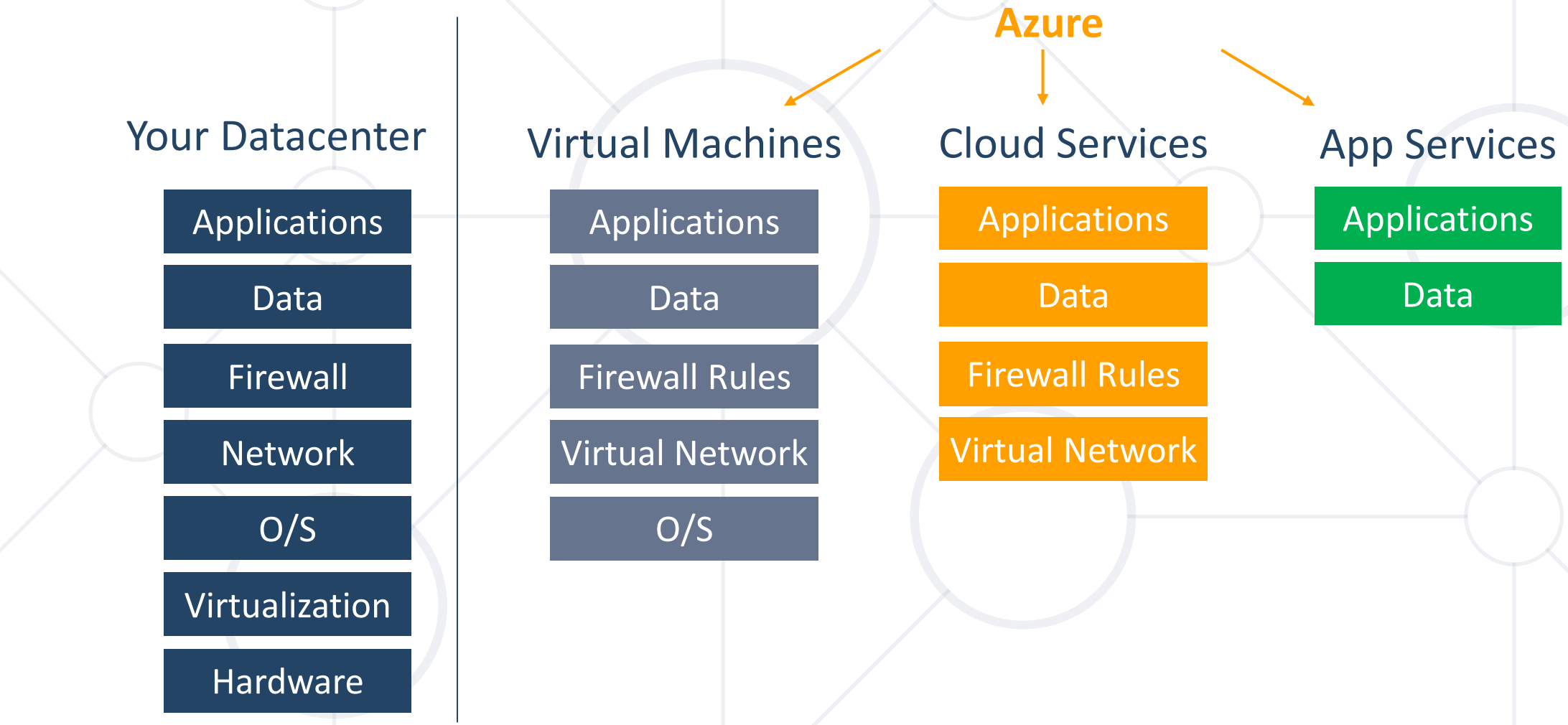
Microsoft Azure

Software University

- Fast-growing **public cloud** from Microsoft
- Provides **rich PaaS platform**
  - Mainly for .NET developers
  - Provides also Java, PHP, Python, and Node.js APIs
  - Databases, storage, mobile back-ends, CDN, …

- Provides **IaaS cloud** (Windows and Linux VMs)

Azure – Focus on the Application



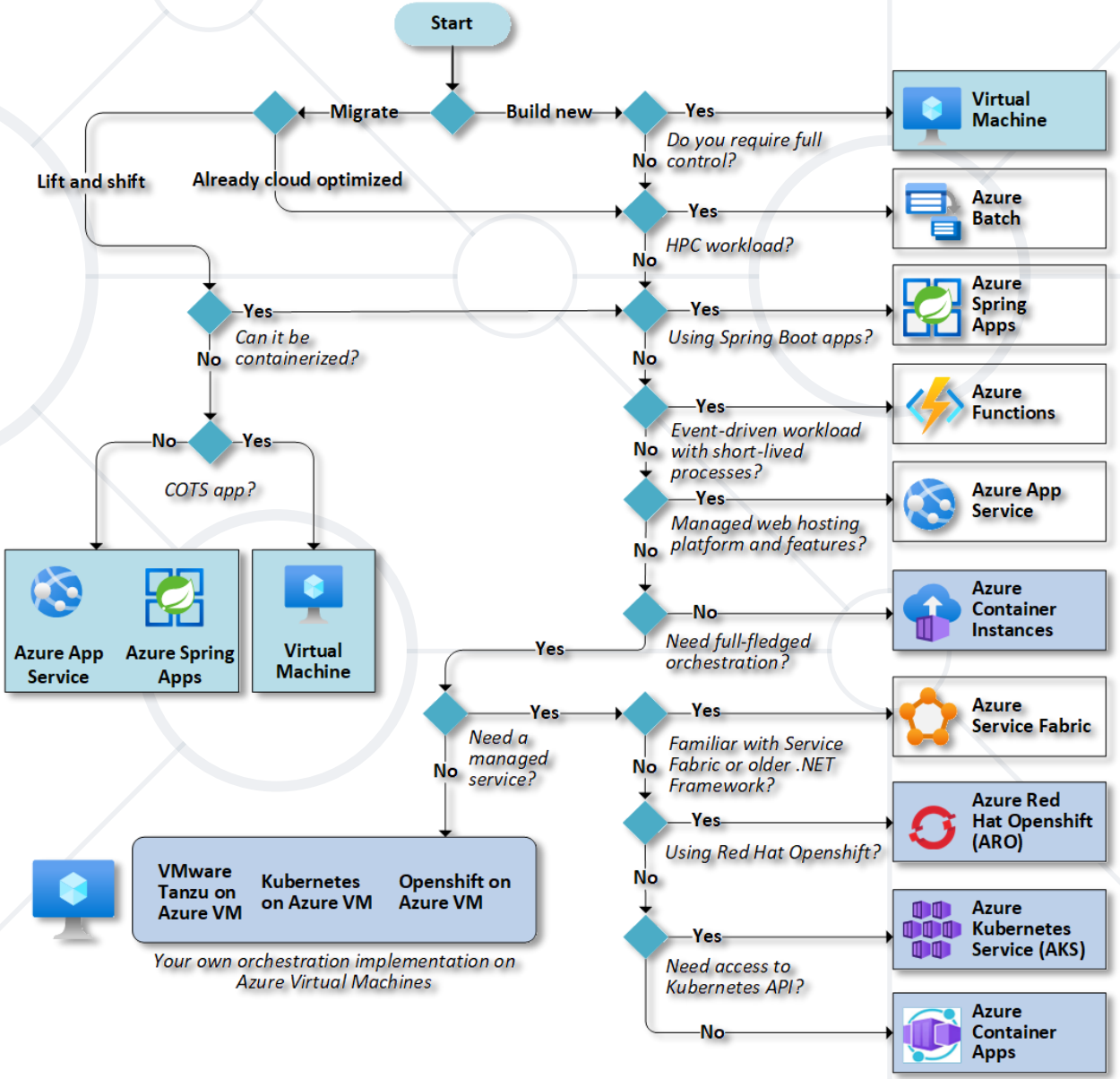
Focus on the Application

Azure Services – Examples

- **Azure DevOps**
  - DevOps toolchain for app development and deploy
- **Azure Virtual Machines**
  - VMs in cloud
- **Azure Backup**
  - Allows secure and cost-effective data backup and recovery
- **Azure Active Directory**
  - Cloud-based identity and access management
- **Azure Logic Apps**
  - Helps in creating automated workflows

Choosing an Azure Compute Service

- **Compute** refers to the **hosting model** for the resources that your app runs on
- You can read more about comparing Azure container options here



Azure File Share

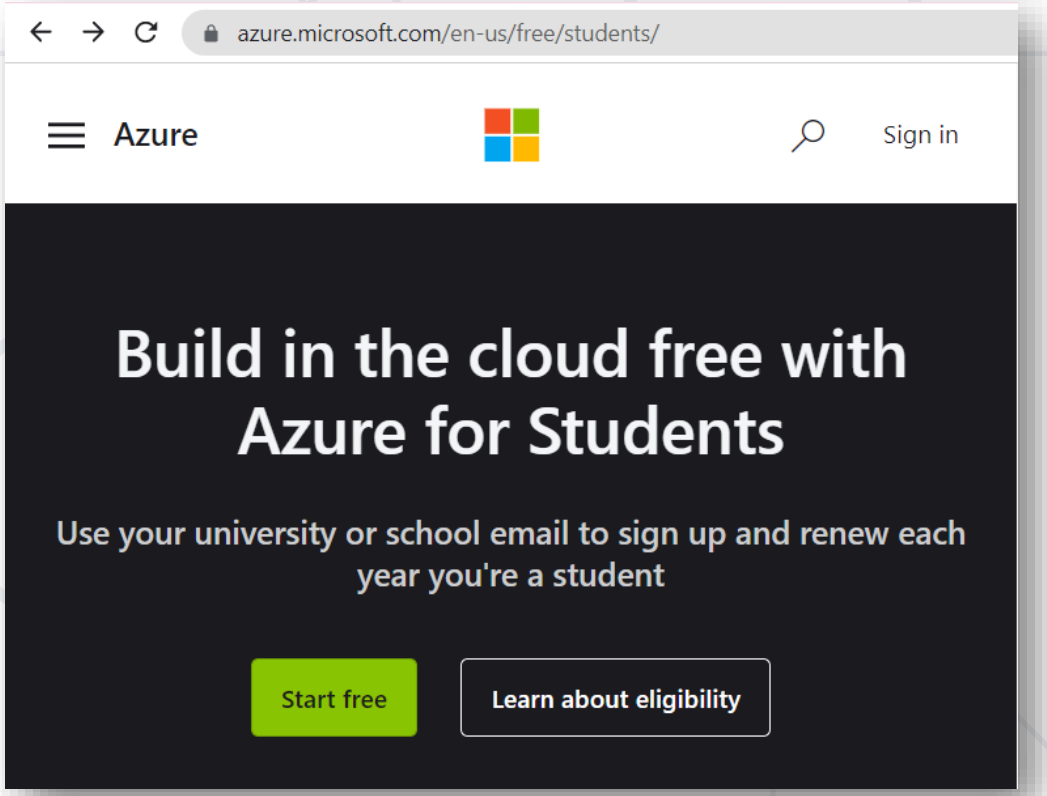
- **Azure File Share** is a fully managed, cloud-based **file storage service** for files, documents and data
- You can use Azure File Share as **Docker volumes** for **Azure Container Instances containers**
- Azure File Share needs an **Azure storage account** that provides a centralized location to store and access data
  - Such as blobs, files, queues, tables, and disks

Azure for Students

Free Azure Access for University / School Students

Azure for Students

- **Azure for Students** provides free Azure access for students
  - Use your **university email** to sign up for free
  - Use the provided instruction on how to activate your free account



Azure Portal

Single Portal to Access and Manage All Your Apps

Azure Portal

Software University

- Azure Portal is a web-based, unified console
  - It provides an alternative to command-line tools
- With the Azure Portal, you can access **Azure resources** and manage your **Azure subscription** with a **GUI**
- You can **build**, **manage**, and **monitor** everything from simple web apps to complex cloud deployments

Azure Dashboard

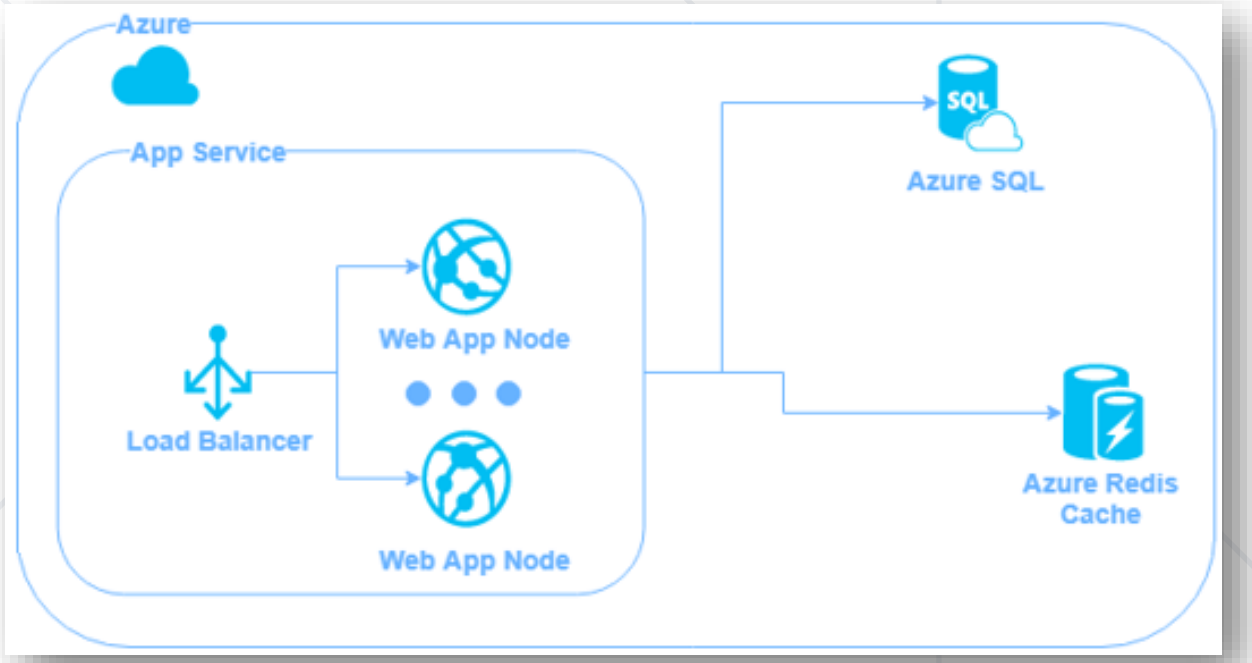
- **Azure dashboard** is a customizable **view of the resources** in your subscription
- You can
  - Create **custom dashboards** for an organized view of resources
  - Configure **accessibility options** for an optimal experience
  - Customize the **user interface** so that you are more productive
- Learn how to customize your dashboard by following this tutorial

Azure App Service

Cloud-based Platform for Hosting Web Apps

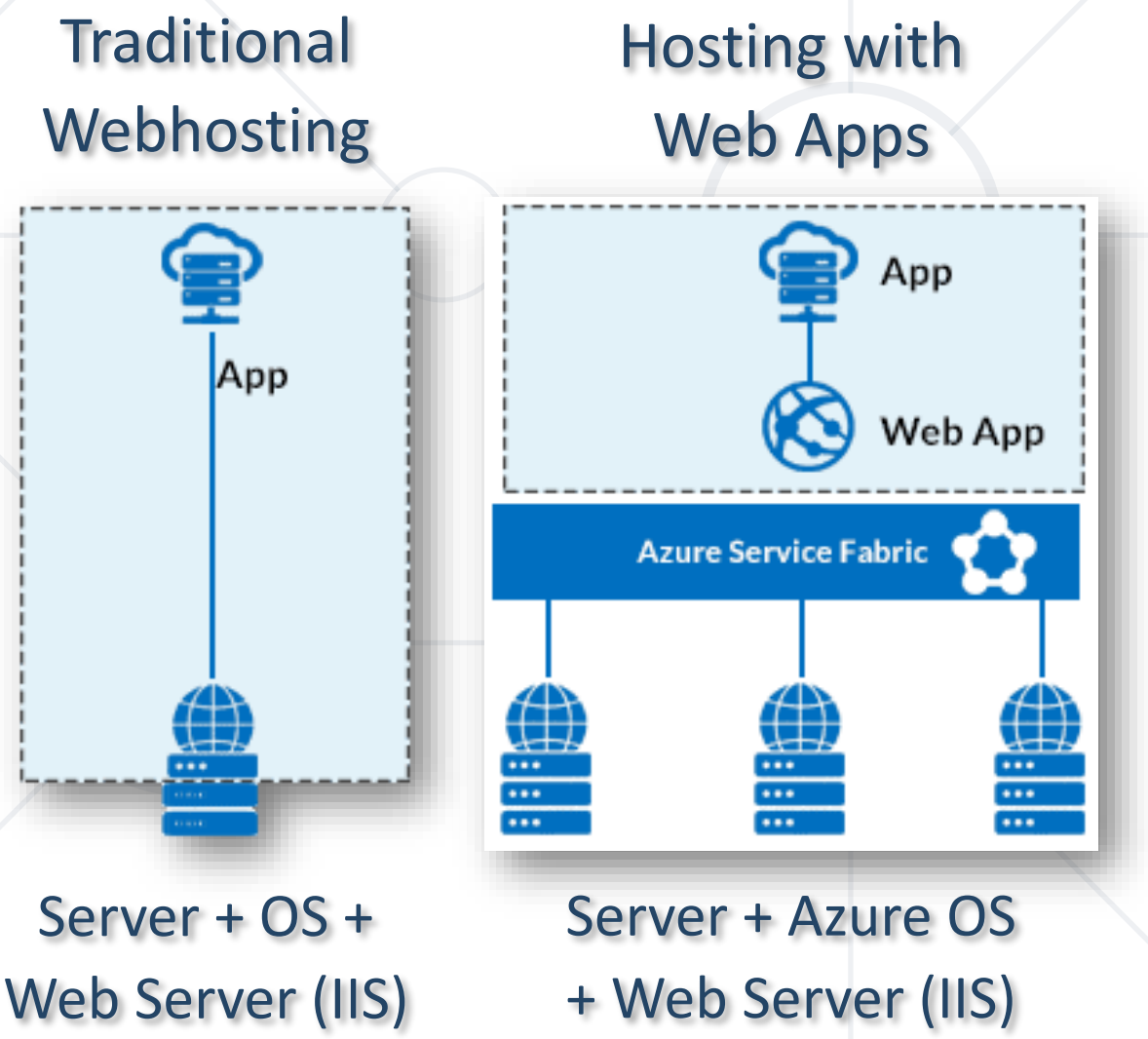
What is Azure App Service?

- **Azure App Service** (or **Web Apps**) is a Platform-as-a-Service
- Cloud computing based platform for **hosting websites**
- Allows publishing web apps written in different platforms
  - .NET, Python, PHP,
    Java, Node.js, etc.



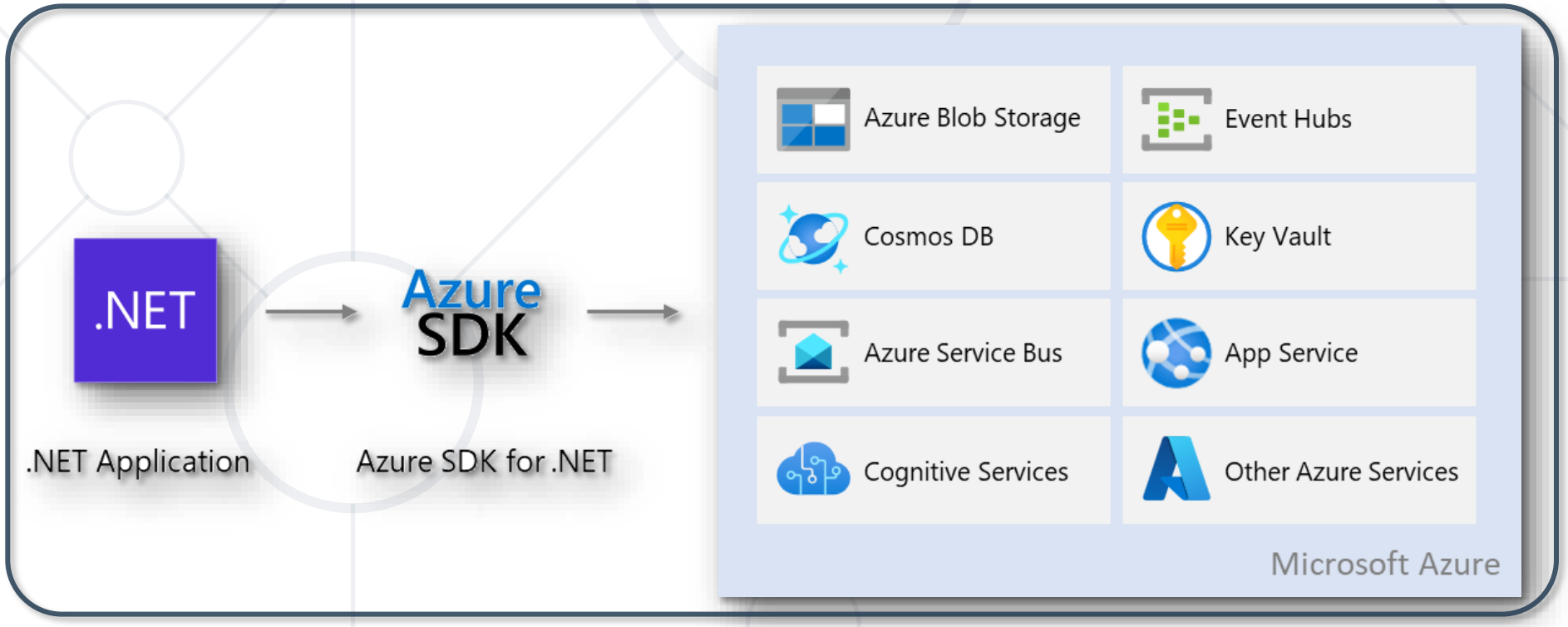
Azure Web Apps Benefits

- Easily create, **manage** and **scale** Web apps
- Automatic **load balancing** and **shared storage** across instances
- Use ASP.NET, PHP, Node.js, etc.
- Supports any **Web development tool** on any **platform**
  - Windows, OSX, Linux
- **Azure SQL** or **MySQL databases**
- Hosted on **virtual machines**



Azure SDK

- The Azure SDKs are collections of libraries built to make it easier to use Azure services from your language of choice
- Azure SDK components are integrated into Visual Studio

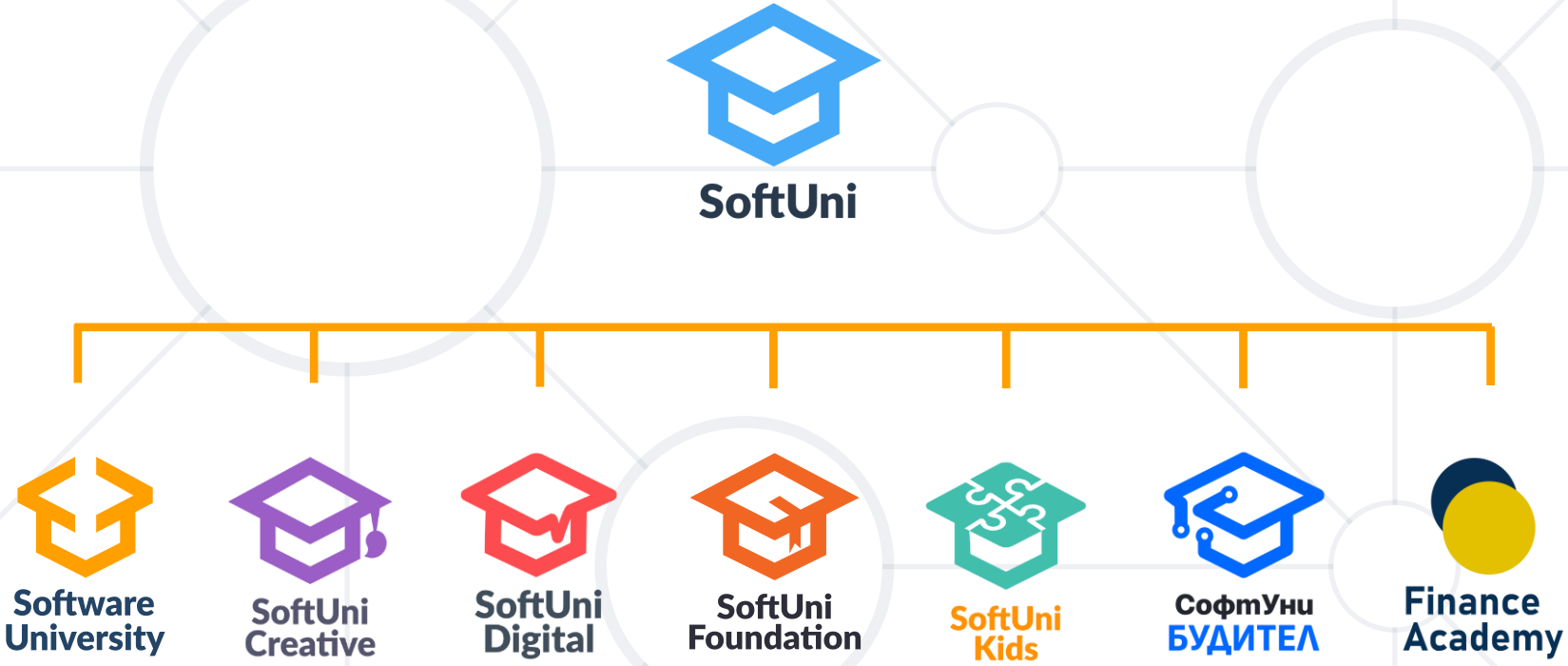


Summary

Software University

- **Cloud computing** == the on-demand delivery of IT resources over the Internet with pay-as-you-go pricing
- Cloud **benefits**: cost savings, security, flexibility, scalability, etc.
- **Types of cloud**: public, private, hybrid, multicloud
- Types of **cloud computing models**: IaaS, CaaS, PaaS, BaaS, SaaS, KaaS, DBaaS, FaaS
- **Cloud service providers** include AWS, Azure, Google Cloud, etc.
- **Azure** is a public cloud computing platform with services for analytics, databases, migration, networking, storage, etc.
- You can easily manage apps in **Azure Portal**, deploy apps with **Azure App Service**, deploy a containerized apps with **ACI** and many more

Questions?



SoftUni Diamond Partners

Software University

Trainings @ Software University (SoftUni)

- Software University – High-Quality Education, Profession and Job for Software Developers
  - softuni.bg, about.softuni.bg
- Software University Foundation
  - softuni.foundation
- Software University @ Facebook
  - facebook.com/SoftwareUniversity

License

- This course (slides, examples, demos, exercises, homework, documents, videos and other assets) is **copyrighted content**
- Unauthorized copy, reproduction or use is illegal
- © SoftUni – https://about.softuni.bg/
- © Software University – https://softuni.bg