Cloud Introduction

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











Technical Trainers SoftUni Team







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Have a Question?





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What is Cloud Computing?

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

What is Cloud?

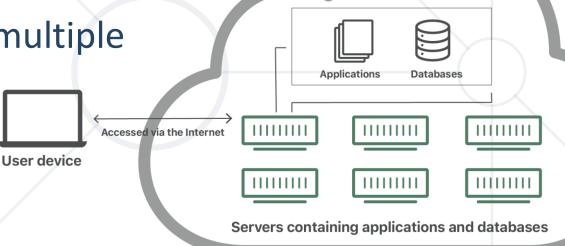


- Cloud == virtual space (software and services) that runs on the Internet, instead of locally on your computer
- Clouds combine computing power and resources of multiple hardware machines

 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

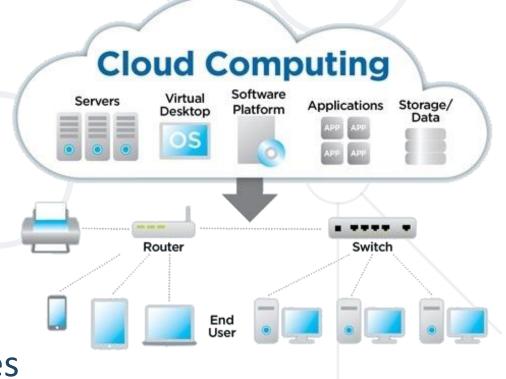
- Suppose we have 20-30 powerful machines
- We can run 100-200 virtual machines (VMs)
- We can deploy hundreds of applications
- We can serve millions of users



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



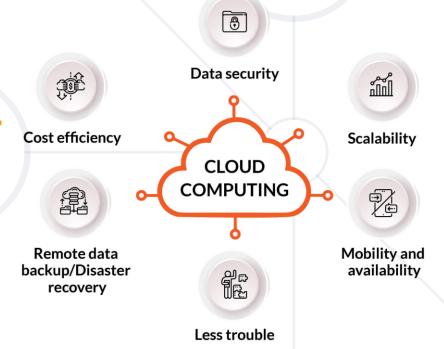
- It the rest of the time it does nothing (waits)
- The mail server on dedicated machine will use less than 1% of its power and resources
 - You can run 100 mail servers in the cloud on the same hardware
 - Less hardware, reduced costs, increased quality



Cloud Benefits



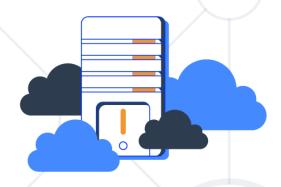
- Cloud provides computing resources on demand
 - Rent a hosting + CPU power + RAM + storage + IO operations + networking + other services (e.g. databases, CDN, analytics, ...)
 - Pay-as-you-go
- Cloud has better support and reliability
 - Your data lives in a professional data center
 - Has 24 x 7 monitoring + 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



- Scalability
- Automated management
- Self-serving
- Pay-as-you-go

- The cloud is an environment that delivers virtualized resources through the Internet
- Cloud computing uses
 virtualization technology to
 deliver services for user access to
 virtualized servers, apps, etc.

Types of Cloud





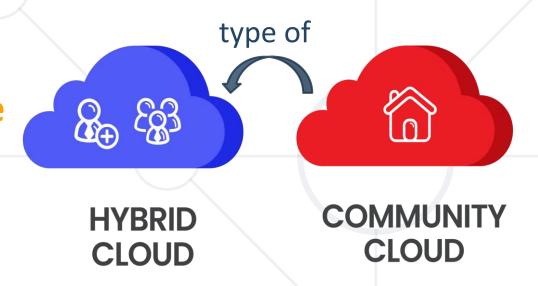
PUBLIC CLOUD

IT infrastructure, service or platform publicly accessible from the Internet (free or paid), e.g. Amazon AWS, Windows Azure



PRIVATE CLOUD

Cloud infrastructure (hardware + software) for internal use only, e.g. for banking / government

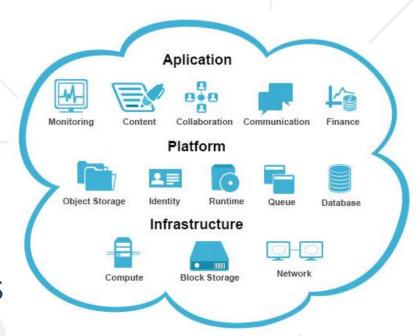


Mix of private and public cloud infrastructure and services, e.g. private cloud + backup in Amazon S3

What is Cloud Development?



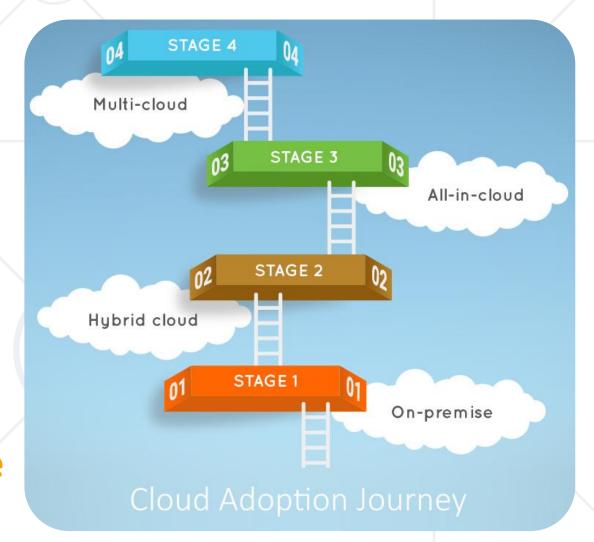
- Cloud software development
 - Design and develop an app for the cloud
 - E. g. for public PaaS or CaaS platforms
- Steps in cloud software development
 - Choose a development stack of technologies
 - Choose a public cloud platform + services
 - Design the app for to run in containers or in a cloud
 - 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

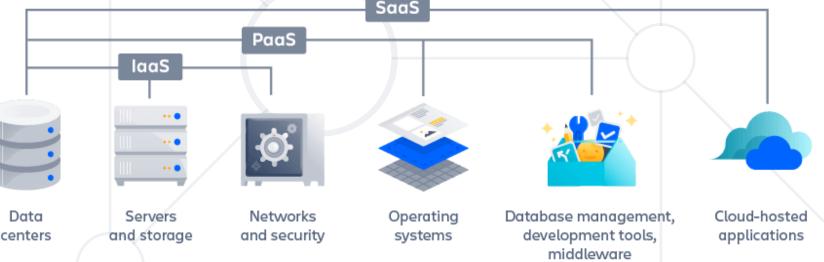
laaS, CaaS, PaaS, BaaS, SaaS

Cloud Computing Models



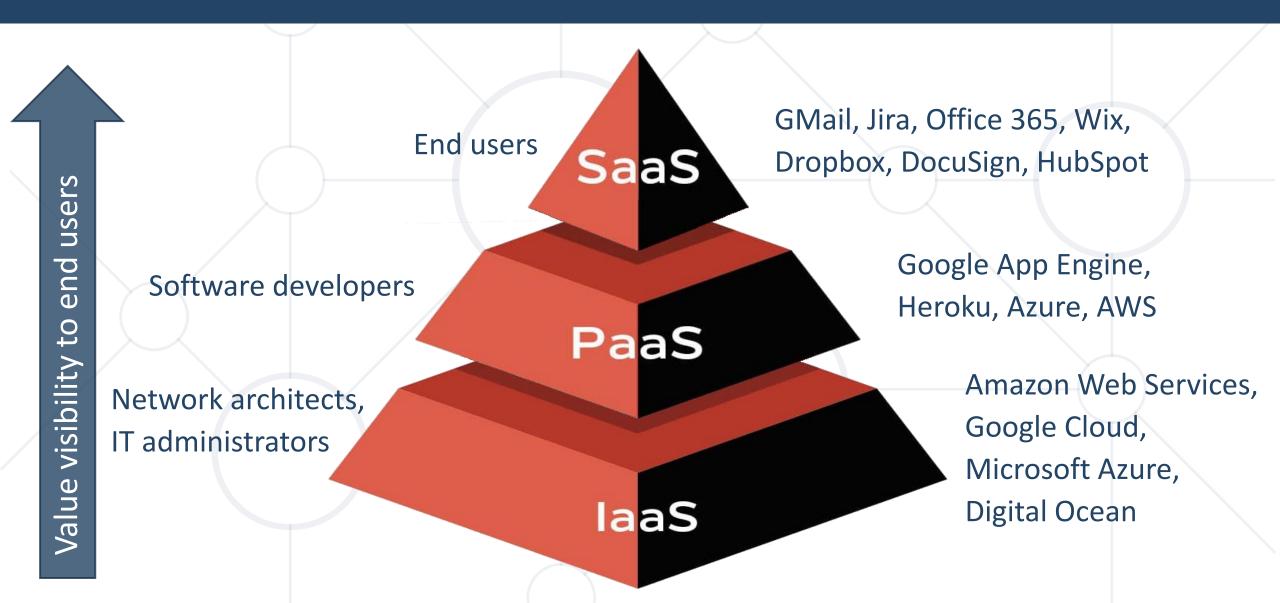
- Infrastructure as a Service (laaS) VMs in the cloud on demand
 - Users install the OS and software they need
- Platform as a Service (PaaS) platform, services and APIs for developers
 - E.g. [JavaScript + Node.js + MongoDB] or [Docker + Kubernetes]
- Software as a
 Service (SaaS) –
 hosted application
 on demand





SaaS, PaaS and IaaS – Value and Examples





CaaS, KaaS, DBaaS and FaaS



- Container as a Service (CaaS) managed Docker environment to deploy your containerized apps
 - A kind of subset of laaS, based on Docker containers
- Kubernetes as a Service (KaaS) managed Kubernetes cluster to deploy your containerized apps
- Database as a Service (DBaaS) –
 managed database service in the cloud
- Function as a Service (FaaS) –
 hosting of serverless apps in the cloud



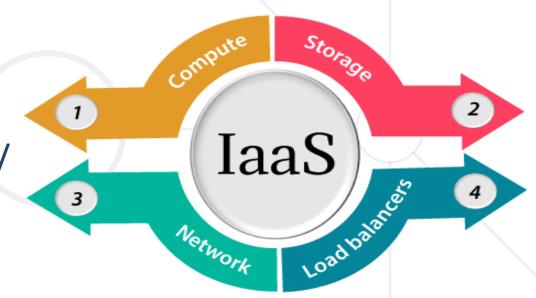




laaS – Example



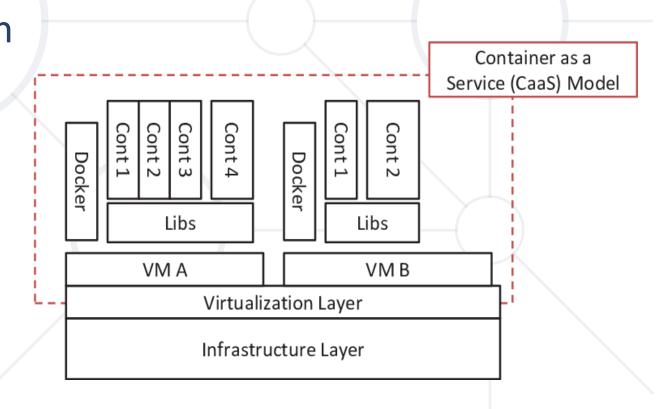
- laaS ≈ rent a flexible virtual machine (VM, VPS) in the cloud
 - Flexible VM == you could change your VM resources at runtime
 - E.g. add more 100 GB HDD storage + 2 GB RAM at runtime
 - Also known as "rent a cloud server / cloud VPS"
- laaS provides an API for managing the cloud infrastructure
 - E.g. programmable create a new VM / allocate more resources / configure network / install software / etc.
- laaS providers offer different pricing models



CaaS – Example



- CaaS a cloud service that helps manage and deploy apps using container-based abstraction
- Container engines, orchestration and the compute resources are delivered to users as a service from a cloud provider
- Examples: Amazon Elastic
 Container Service (ECS),
 Amazon Fargate,
 Azure Container Instances (ACI), etc.



PaaS – Example



- PaaS ≈ rent a complete development / production platform
 - Full development stack as a service

e.g., Linux + Python + Django + MongoDB + Nginx load balancer +
 cron jobs + Gunicorn web server

Back-end technologies

e.g., relational and NoSQL DBs,
 blob storage, file storage, CDN, ...

Business-tier technologies and languages

e.g., Java, Java EE, PHP, Python, Ruby, C#, JS

Frameworks: Django, Rails, Symfony, Spring, JSF, ASP.NET MVC



Typical PaaS Platform



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:

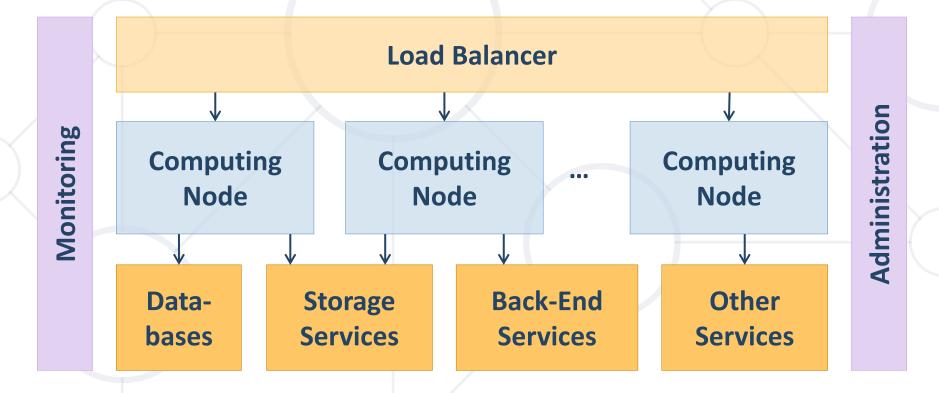
Relational DBs, NoSQL DBs, Blob Storage, Message Queues, Notifications, CDN, Search, Email, ...

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

SaaS (Software As a Service)



- SaaS ≈ rent an application in the cloud
 - Fully managed application → just login and use it
- Examples of public SaaS services
 - WordPress.com managed hosting of WordPress sites
 - MailChimp managed email marketing platform



- Adobe Creative Cloud cloud for designers and creative artists
- Autodesk 360 cloud for building architects / AutoCAD users

BaaS (Backend As a Service)



- BaaS ≈ rent a backend in the cloud
 - Also known as mBaaS
 (Mobile Backend as a Service)
 - Fully managed backend for your mobile or SPA application



- Typically provides DB + REST API + storage services + notifications
- Register, create your data model and use it through API
- Examples of public BaaS clouds: Parse, Firebase, AWS Amplify
- Often provide also users, roles, permissions, file storage, push notifications, analytics, GEO points, etc.

laaS vs CaaS vs PaaS vs BaaS vs 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

25



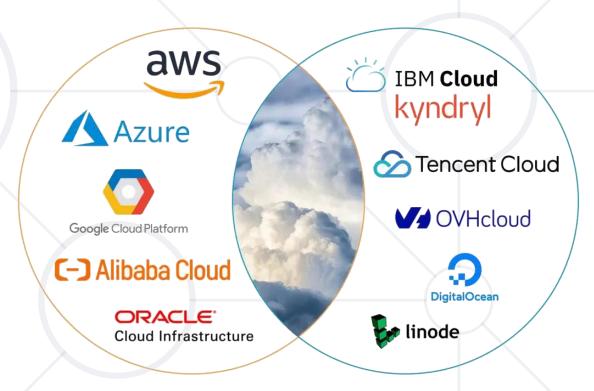
Cloud Service Providers

Amazon Web Services, Azure, Google Cloud, etc.

Cloud Service Providers



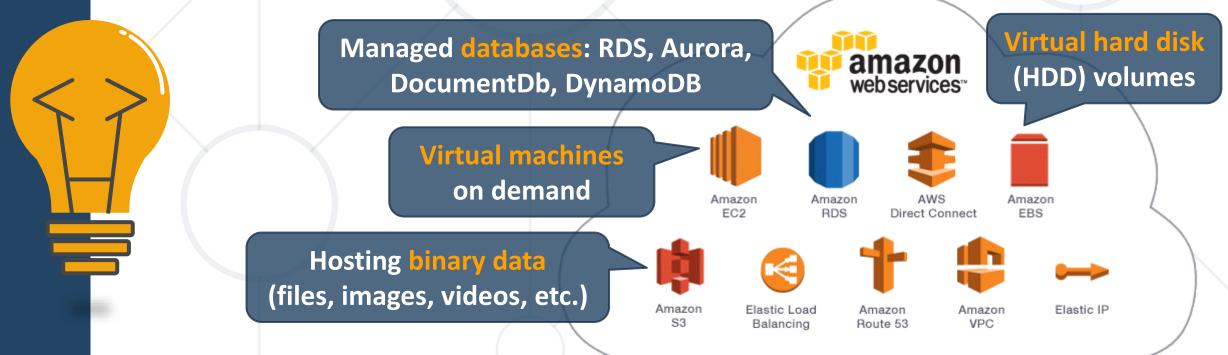
- Top cloud service providers for 2022
 - Amazon Web Services (AWS)
 - Microsoft Azure
 - Google Cloud
 - Digital Ocean
 - Alibaba Cloud
 - Oracle Cloud
 - IBM Cloud (Kyndryl)



Amazon Web Services (AWS)



- AWS (Amazon) is the pioneer of the public clouds
- Provides cloud platform and services from 2002
- Provides laaS and PaaS on demand



Google Cloud



- Google Cloud is a suite of cloud services by Google
- Its infrastructure is similar to the one driving Gmail,
 Google Search, Google Drive and YouTube
- Google App Engine (GAE) PaaS public cloud for Java, Python, JavaScript, C#, PHP, Go, Ruby







Microsoft's Public Cloud Platform

Microsoft Azure



- 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, ...

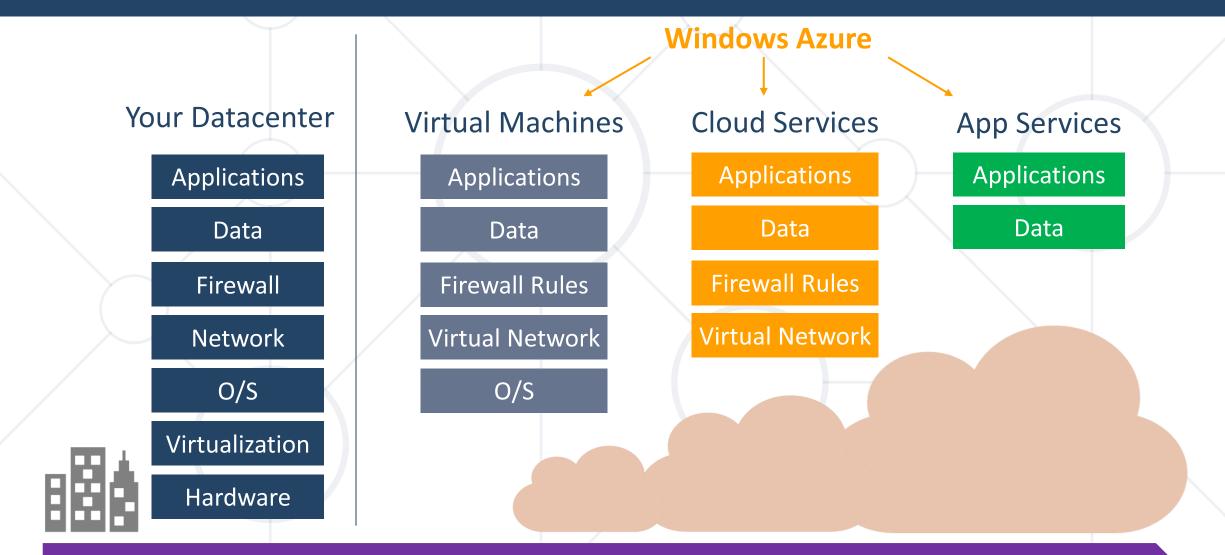






Azure – Focus on the Application





Focus on the Application

Azure Services



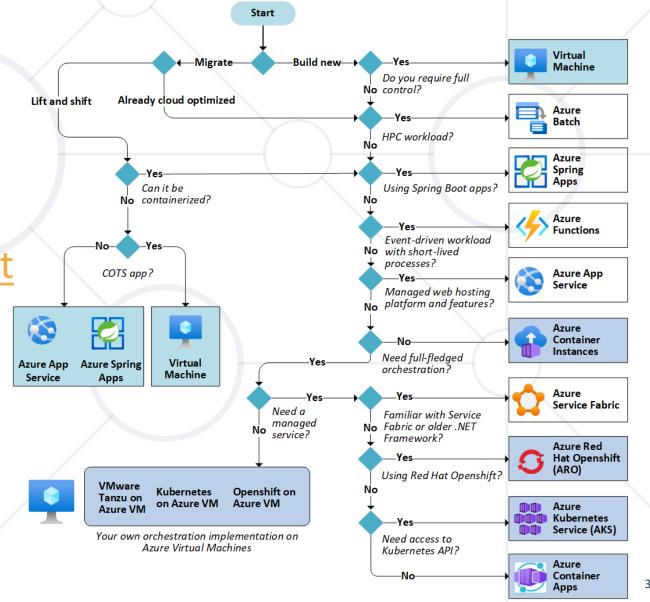
- Azure DevOps DevOps toolchain for app development and deploy
- Azure Virtual Machines VMs in cloud
- Azure Cosmos DB NoSQL db service
- Azure Backup allows secure and costeffective data backup and recovery
- Azure Active Directory cloud-based identity and access management
- Azure Logic Apps helps in creating automated workflows
- Look at all Azure services here: https://azurecharts.com/overview

Choosing an Azure Compute Service



 Compute refers to the hosting model for the resources that your app runs on

Comparing Azure container options: https://learn.microsoft.com/azure/container-apps
 /compare-options



Azure Container Instances (ACI)



 Azure Container Instances service offers running of isolated containers in Azure







Azure Container Registry

 Docker + Azure integration enables using native Docker commands to run apps in
 ACI when building cloud-native apps



 You can run a single container instance or a multi-container group



 Azure Container Registry is a registry service for storing private container images



Azure File Share

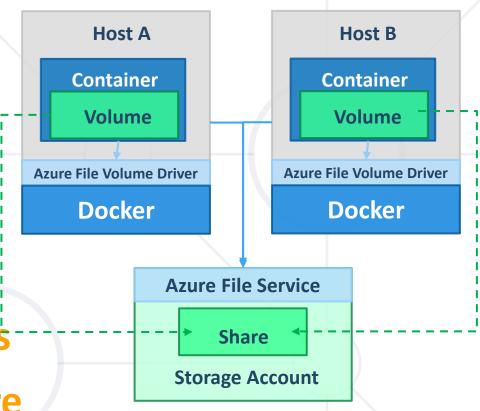


 Azure File Share is a fully managed, cloud-based file storage service for files, documents and data

 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

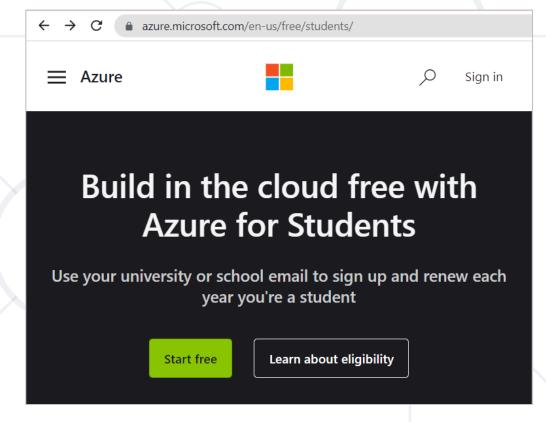
Azure for Students



 Azure for Students provides free Azure access for students

 Use your university email to sign up for free

https://azure.microsoft.com/free/students





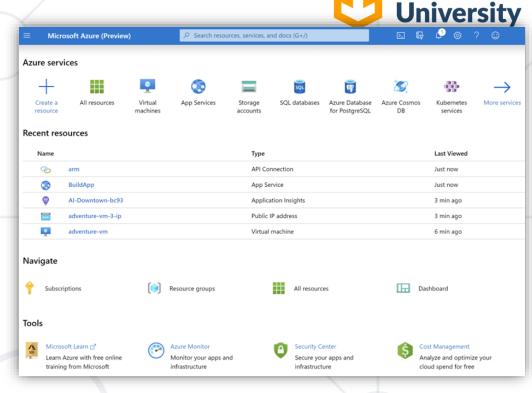


Azure Portal

Single Portal to Access and Manage All Your Apps

Azure Portal

- Azure Portal is a webbased, unified console
 - https://portal.azure.com
 - It provides an alternative to command-line tools



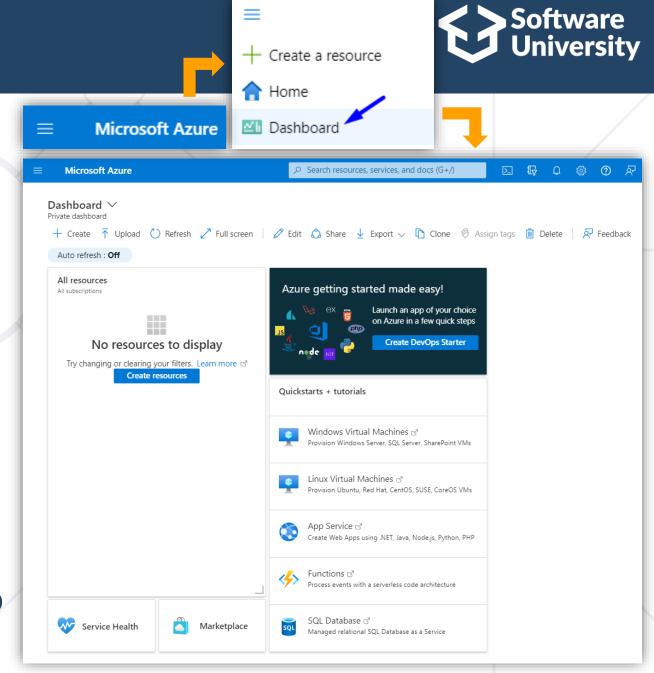
Software

- 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



Explore Azure Portal

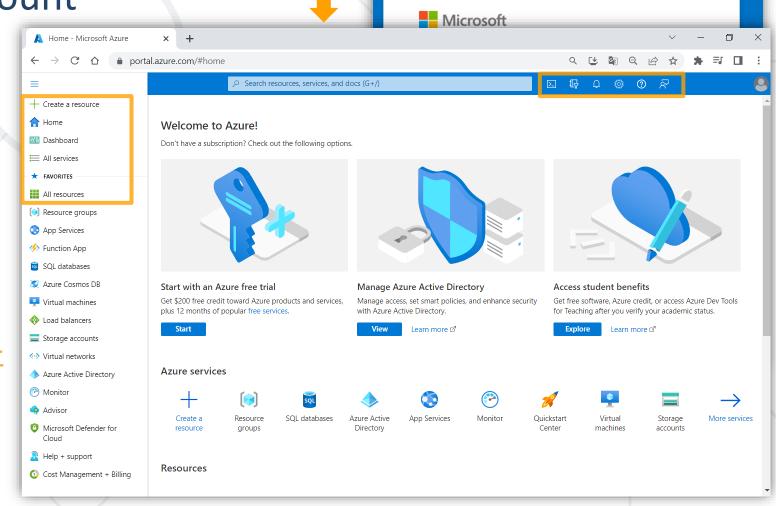


Microsoft Azure

Go to https://portal.azure.com and log in with your Microsoft account

- Examine the menus in Azure Portal
- Learn how to customize your dashboard by following this tutorial

https://learn.microsoft.com/enus/training/modules/exploreazure-portal





Azure App Service

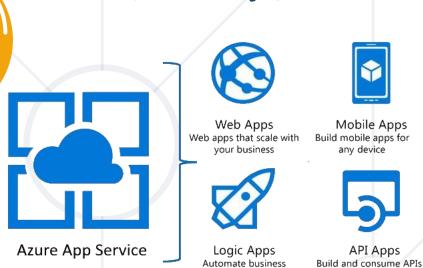
Cloud-based Platform for Hosting Web Apps

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

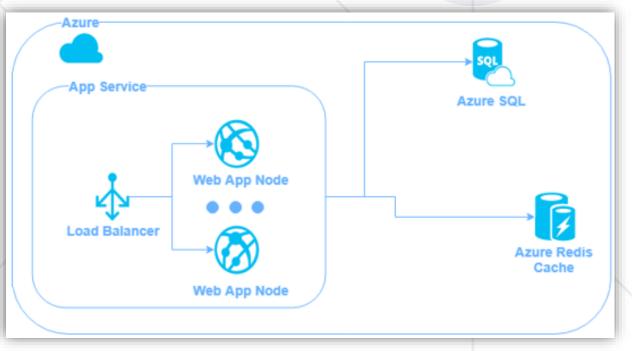
 .NET, Python, PHP, Java, Node.js, etc.



processes across SaaS and

on-premises

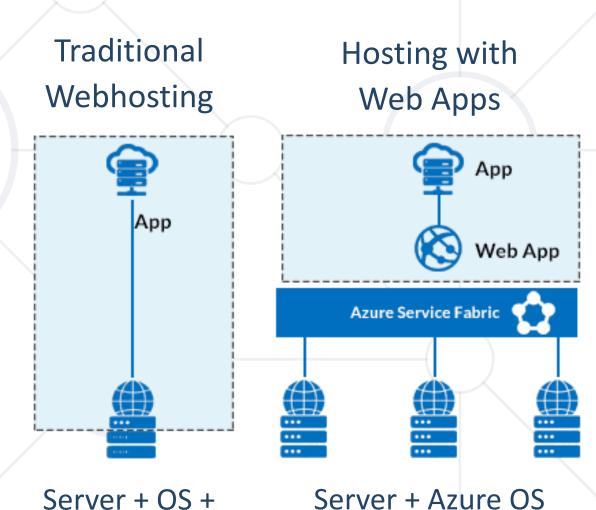
in the cloud



Azure Web Apps Benefits



- Easily create, manage and scaleWeb 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



Web Server (IIS)

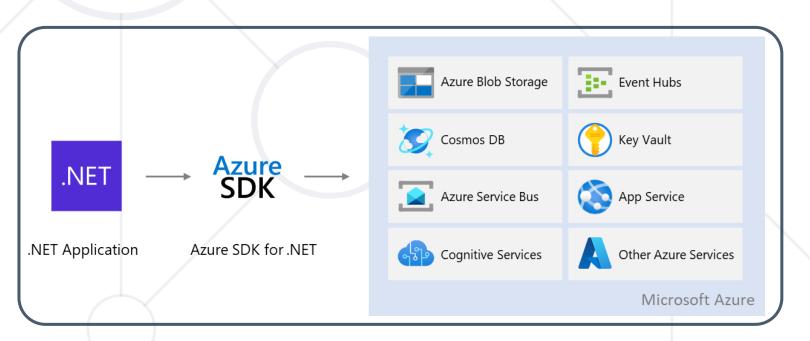
+ Web Server (IIS)

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
- Available SDKs: https://azure.microsoft.com/downloads/





Summary



- 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
- Types of cloud computing models: laaS, CaaS, PaaS, BaaS, SaaS
- 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?

















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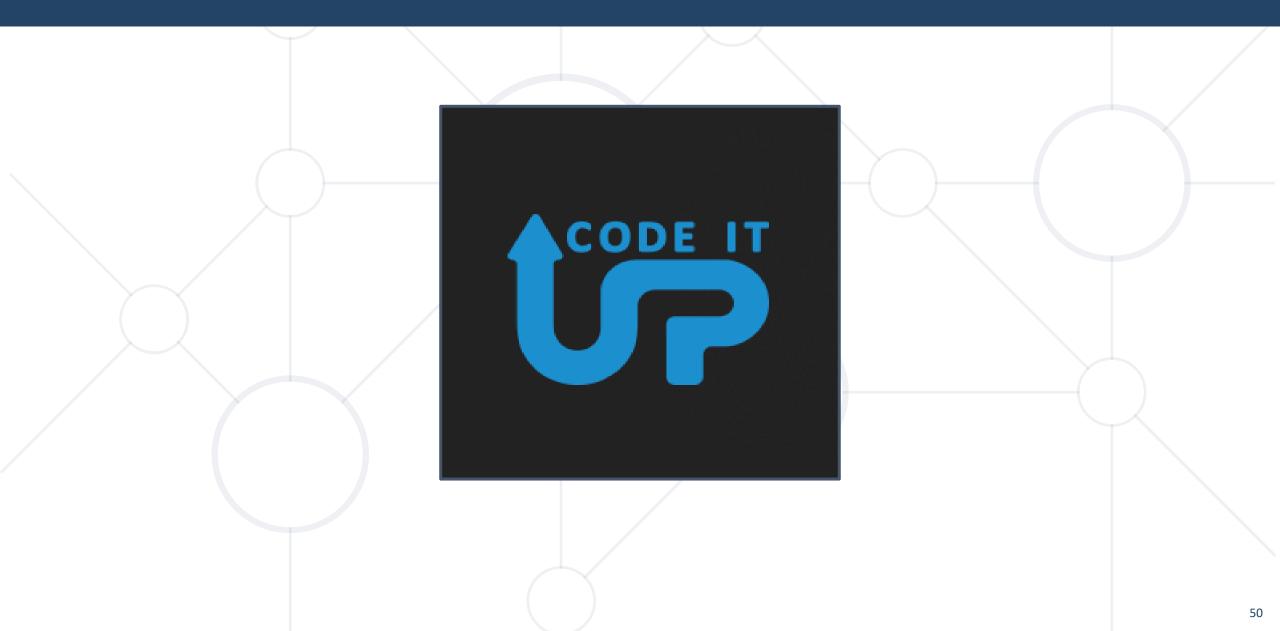






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