Microsoft Azure

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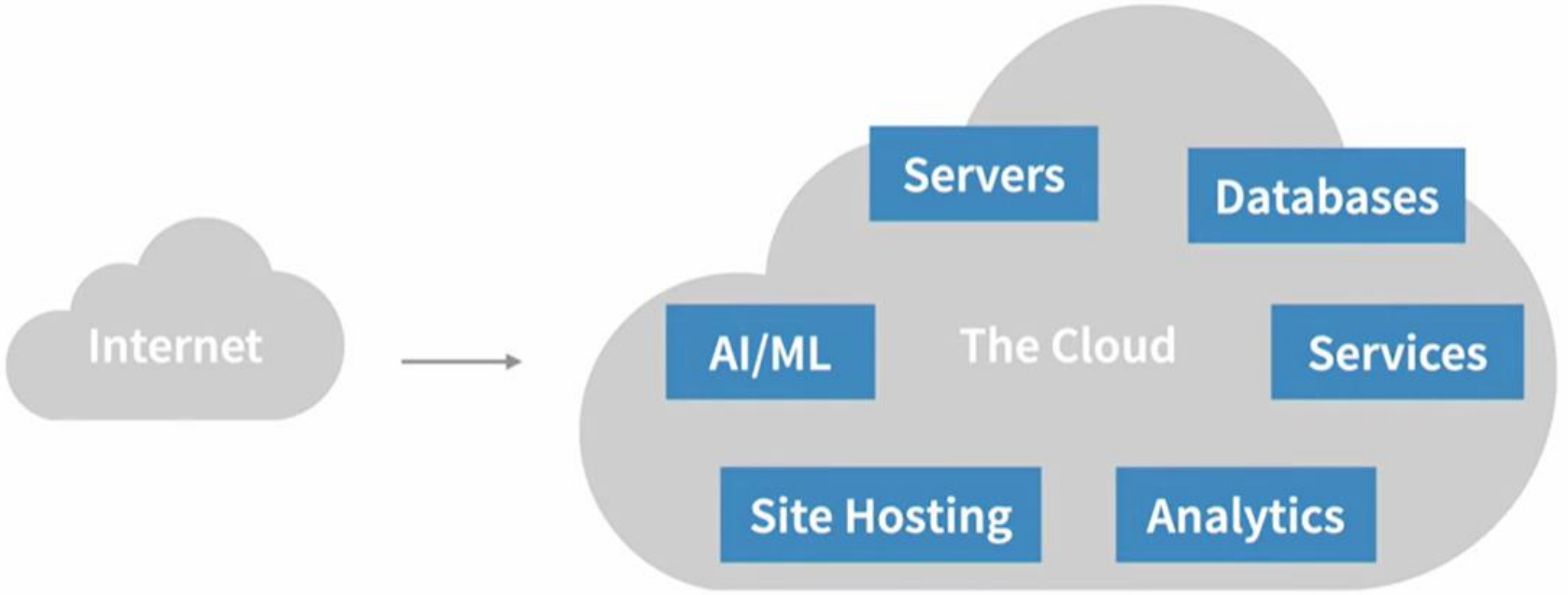
July 2024

- Microsoft Azure ☺



[Walt Ritscher – Azure: Understanding the big picture| Jun 2022]

Content

- Microsoft Azure
  - General Image
  - Structure
  - Services
  - Aplications in Azure

Microsoft Azure

Azure -Templu Buddhist
-Nord vest de Beijing ☺

Temple of Azure Clouds. [Implementing and Developing Cloud Computing Applications, David E.Y. Sarna]

Microsoft Azure

- Launched in February 2010

It is:

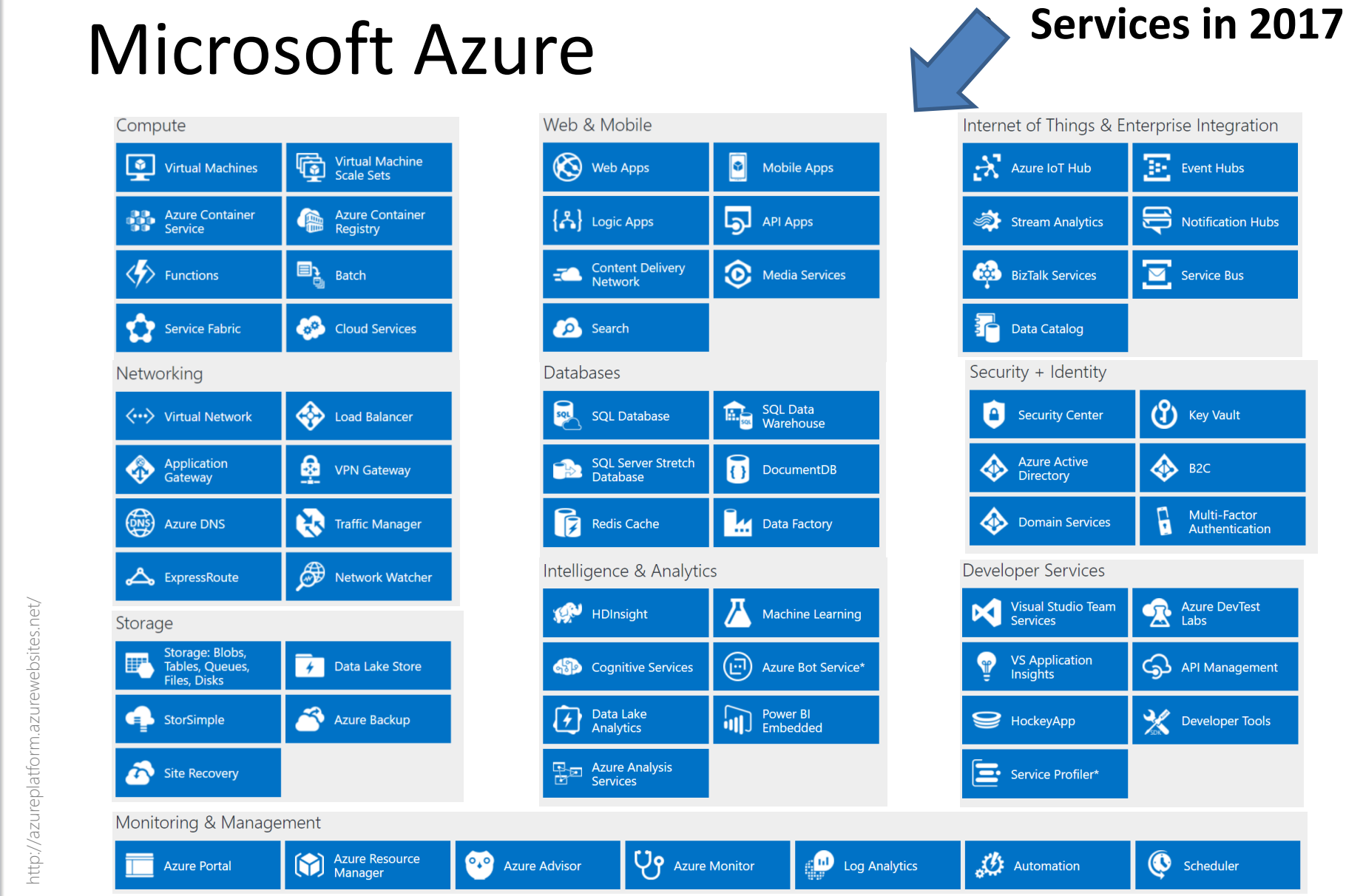
- It is an environment that ensures the running of applications
- It is a cloud-computing platform, so it has scaling capabilities,...
- It is a utility computing platform, so it ensures the pay-per-use mechanism
- Is it … IaaS? PaaS? SaaS? ….

Microsoft Azure

Services in 2015

Microsoft Azure

Services in 2017

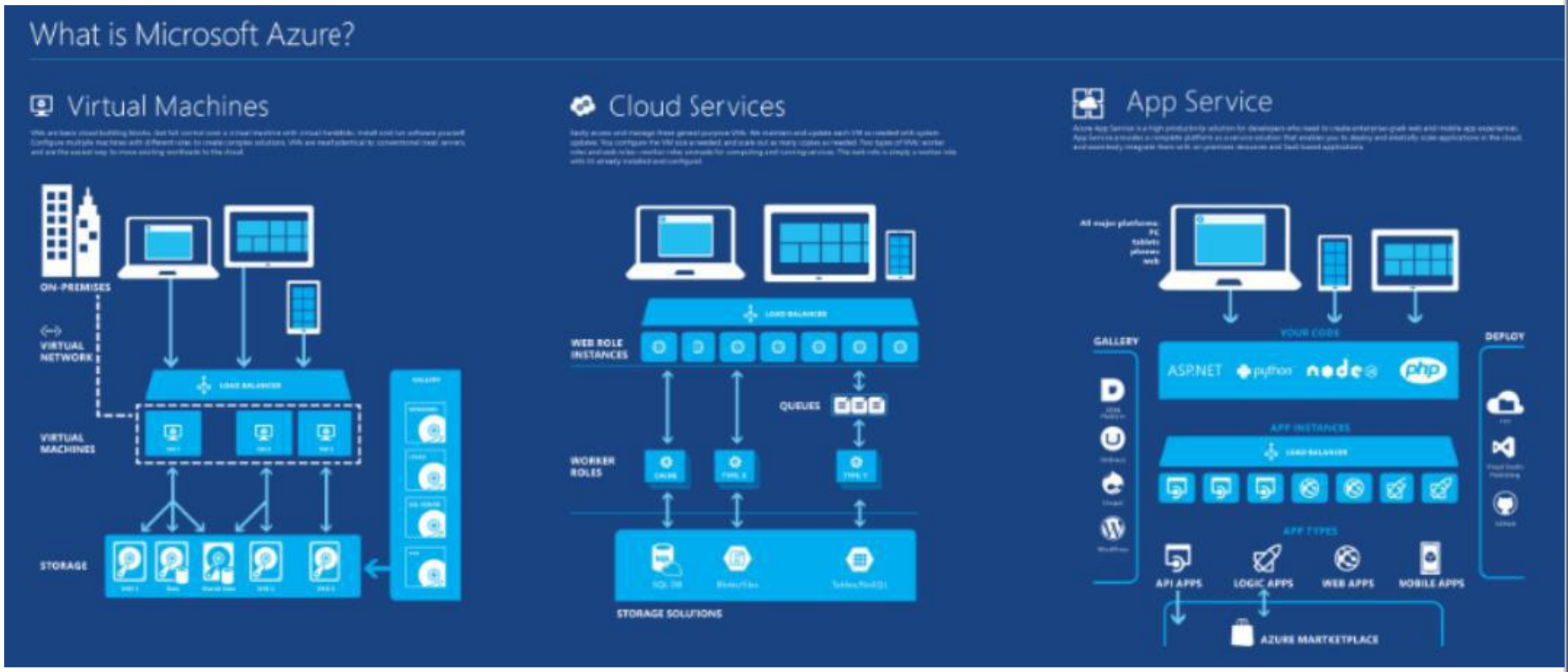


http://azureplatform.azurewebsites.net/

* Preview Services

[https://azureplatform.azurewebsites.net/en-us/]

- Microsoft Azure in 2017



Four primary models for building and running apps

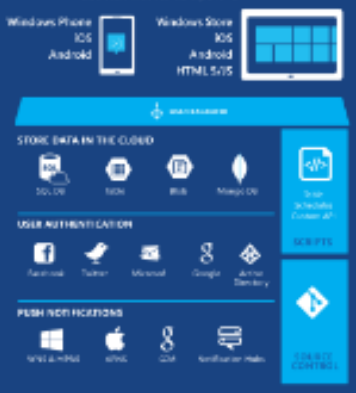
Microsoft Azure

1. Virtual Machines

2. Cloud Services

3. Web Sites

4. Mobile Services



Azure is an open and flexible cloud platform that enables you to quickly build, deploy, and manage applications across a global network of Microsoft-managed datacenters.

You can build applications using any language, tool, or framework. And you can integrate your public cloud applications with your existing IT environment.

Search azure.microsoft.com, WMSDN, or Twitter for keywords found in this poster

Here's just one way to get your first web app with a database running on Azure

Create a virtual network → Create a virtual machine using the SQL Server image in the gallery → Deploy your database to the server (or use the Import Export service) → Deploy your app code to the web site (publish from VS or the source control of your choice) → Sync your on-premises Active Directory to Azure Active Directory and add multifactor authentication → Test your app using VS Online to perform cloud-based load tests → Scale and tune your app performance, and configure autoscaling → Extend and monitor your app with a service from the Store, such as SendGrid or NewRelic

Choose from an extensive service catalog

Like it? Get it.

Microsoft

Microsoft Azure

Curious about developing for the cloud, or are you new to developing for the cloud? The concepts and patterns here are proven and practical. Adopt the basic strategies below to ensure long-term success and sustainability. Use the techniques at right as appropriate.

For full text and concrete examples, search Bing for "Building Real-World Cloud Apps."

Search azure.microsoft.com, MSDN, ASP.NET, or TechNet for the keywords referenced in this poster

AUTOMATE EVERYTHING

POWERSHELL

Repeatability is key. Everything in Azure can be automated using REST APIs and the scripting tool or programming language API of your choice.

USE SOURCE CONTROL

Store your source code in an easily accessible but secure repository. Store your automation scripts as well so old versions can be redeployed on command.

CONTINUOUSLY INTEGRATE AND DELIVER

Continuous integration (CI) means that when a developer checks in code to the source repository, a build is automatically triggered. Continuous delivery (CD) takes this one step further; after a build and automated unit tests are successful, the build is released.

DESIGN FOR FAILURE

A. Transient failures are self-healing, such as intermittent network connection issues

For transient failures, implement a retry policy to ensure that most of the time the app recovers quickly and automatically.

B. Enduring failures require intervention

For enduring failures, implement monitoring and logging that notifies you promptly when issues arise and that facilitates root cause analysis.

Microsoft

Web Development Best Practices

These practices are valid for all web development, not just for cloud apps. But they're especially important for cloud apps. They work together to help you make optimal use of the highly flexible scaling offered by the cloud environment.

CREATE STATELESS WEB TIERS

A stateless web tier means you don't store any application data in the web server memory or file system. Keeping your web tier stateless enables you to both provide a better customer experience and save money.

With Azure Web Sites, if your web tier is stateless, use the Scale tab in the management portal to easily configure autoscaling. Autoscale by CPU usage or by schedule.

USE CDN TO CACHE STATIC FILES

Content Delivery Network (CDN). You provide static file assets such as images and script files to a CDN provider. The provider caches these files in datacenters all over the world so that wherever people access your application, they get quicker response and low latency for the cached assets.

USE .NET ASYNC PROGRAMMING

- Use async programming to avoid blocking on I/O calls
- Async programming also enables more efficient use of web server resources — lower cost and better scalability
- Parallel processing lets you kick off multiple web service calls simultaneously

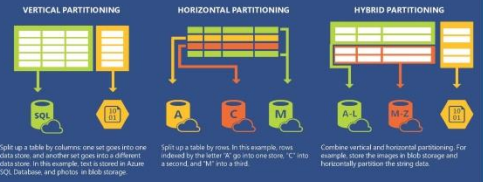
Dealing With Data

Cloud computing makes it practical to mix and match data storage approaches to best fit the needs of your application. If you're building a new application, think carefully about the options in order to pick approaches that will continue to work well when your application grows.

DATA OPTIONS

Most people are used to relational databases, and they tend to overlook other data storage options when they're designing a cloud app.

PARTITIONING



BLOB STORAGE

The Azure Storage Blob service provides a way to store files in the cloud. The Blob service has a number of advantages over storing files in a local network file system:

- Highly scalable — Store 100's of terabytes
- Durable — Automatically backed up
- High availability — 99.9% uptime SLA
- Platform as a Service — pay only for used storage
- REST API — Programmable
- Internet accessible — Available everywhere
- Secure — Limit access to authorized persons
- Low cost — for example, 1 GB costs $.07 a month

HDINSIGHT

The high volumes of data that you can store in NoSQL databases may be difficult to analyze efficiently. To do that you can use a framework like Hadoop which implements MapReduce functionality.

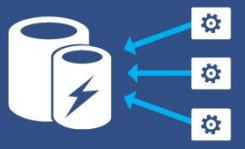
Messaging, Security, and Monitoring

The cloud makes it easier to implement strategies that optimize performance and scalability, that notify you quickly about problems, and that provide troubleshooting information that helps resolve problems.

DISTRIBUTED CACHING

A cache provides low-latency access to application data.

In a distributed cache, data is not stored in the web server's memory but on other cloud resources. This allows all of the application's web servers and VMs to access the data — even while servers are added or removed.



USE QUEUES

When the application gets a request, it puts a work item into a queue and immediately returns a response. Then a separate back-end process pulls work items from the queue and does the work. This allows:

- Increased app responsiveness, reliability, and scalability
- Tiers that can be scaled independently

SINGLE SIGN-ON

"I'm primarily building apps for the employees of my company; how do I host these apps in the cloud and still enable them to use the same security model that my employees know and use in the on-premises environment when they're running apps that are hosted inside the firewall?"

Azure Active Directory is the answer.

LOGGING AND TELEMETRY

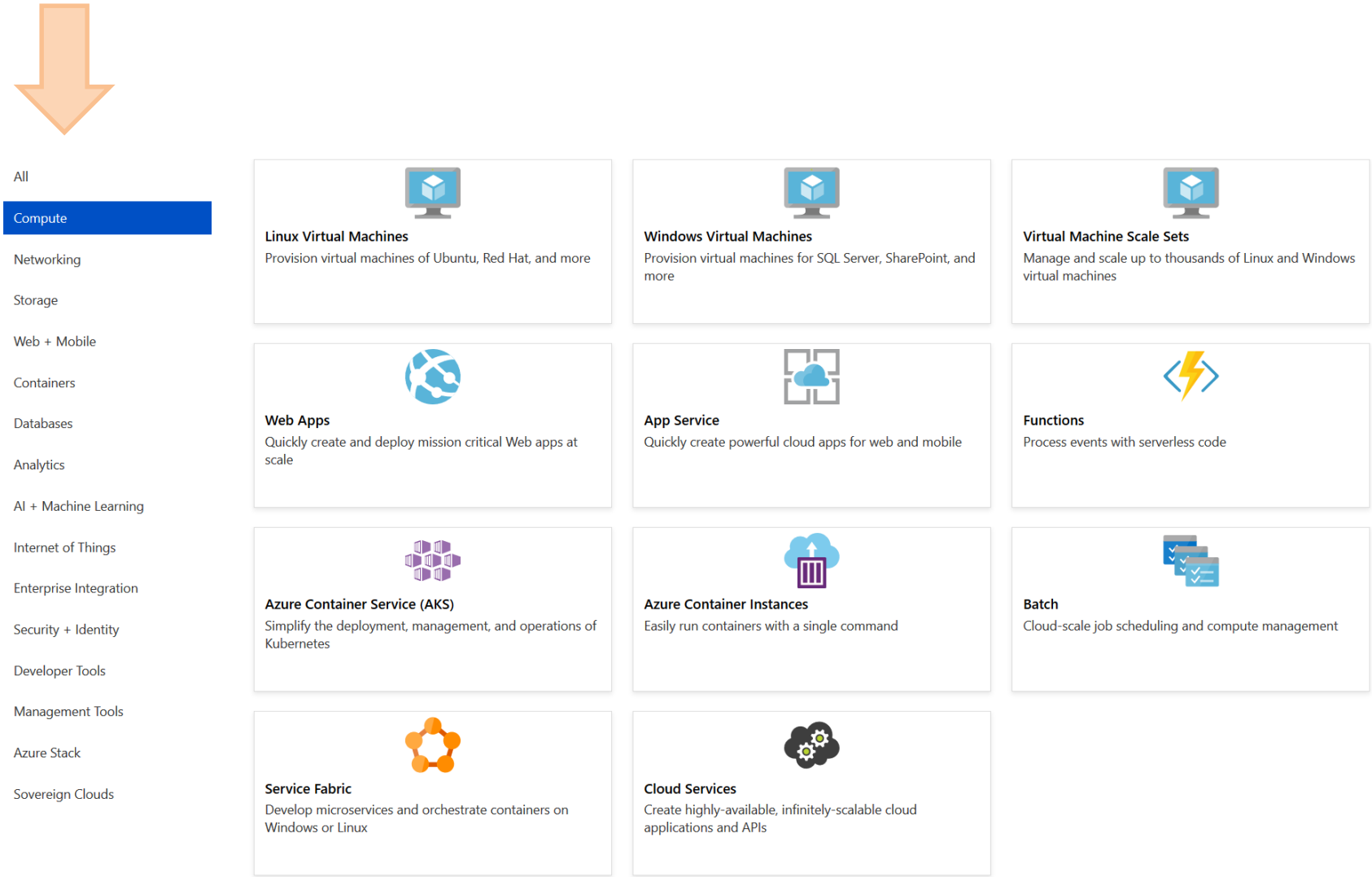
With good telemetry and logging systems, when something does go wrong you find out right away and have helpful troubleshooting information to work with.

Microsoft Azure: Building Real-World Cloud Apps

Created by the Azure poster team Email: AzurePoster@microsoft.com

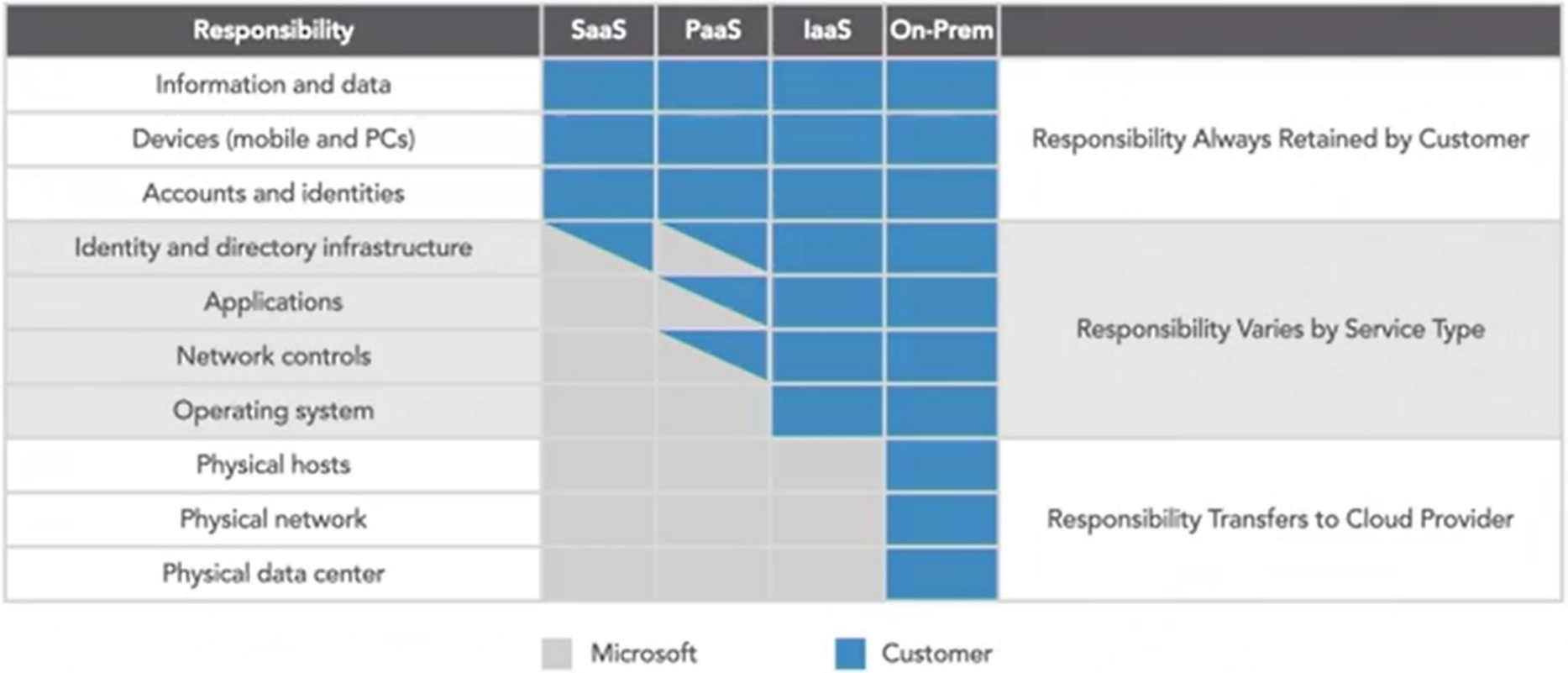
- **Services in 2018->…**

Microsoft Azure



[https://azure.microsoft.com/en-us/services/]

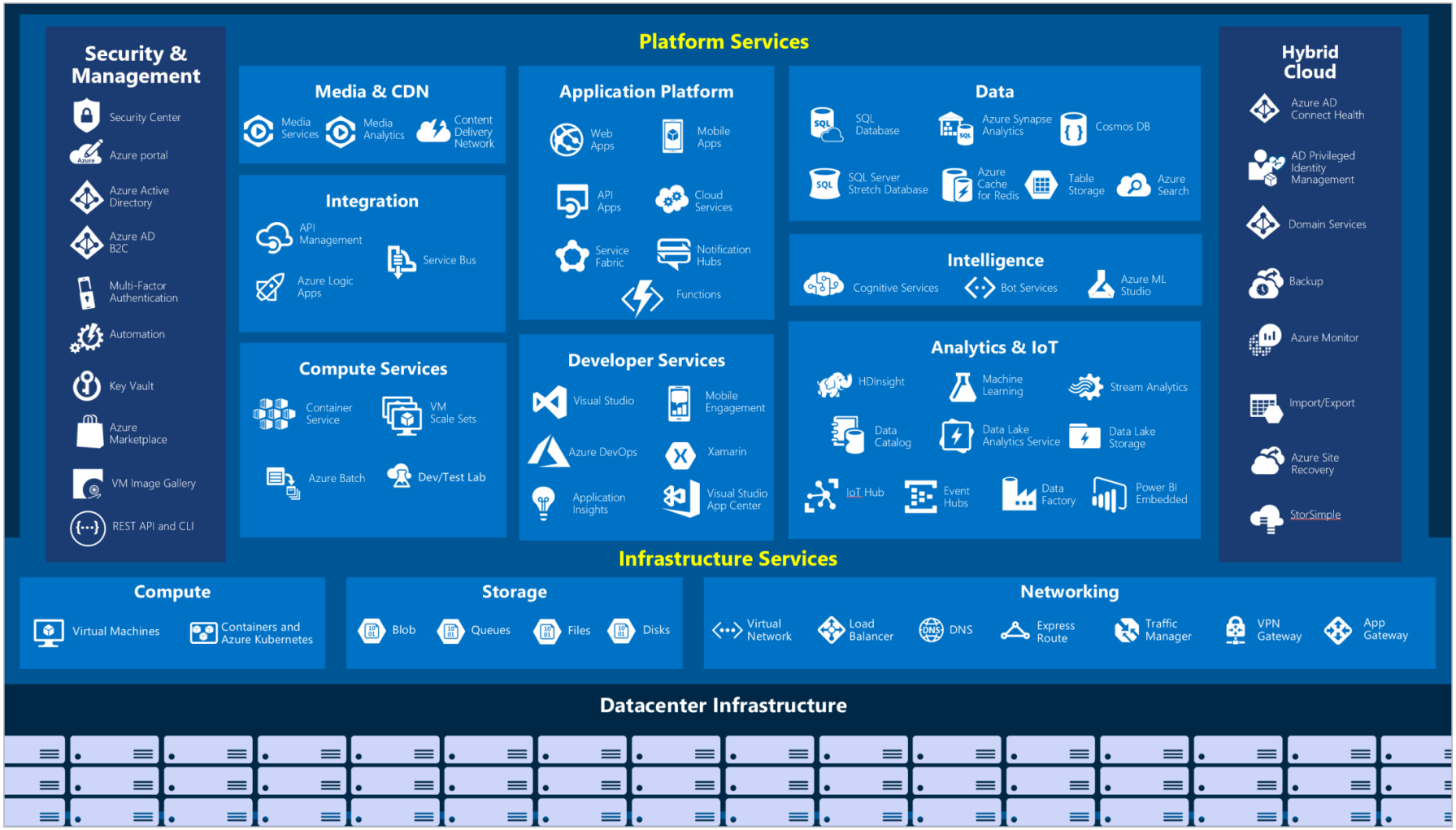
Microsoft Azure



[https://azure.microsoft.com/en-us/services/]

- **Services in 2022**

Microsoft Azure



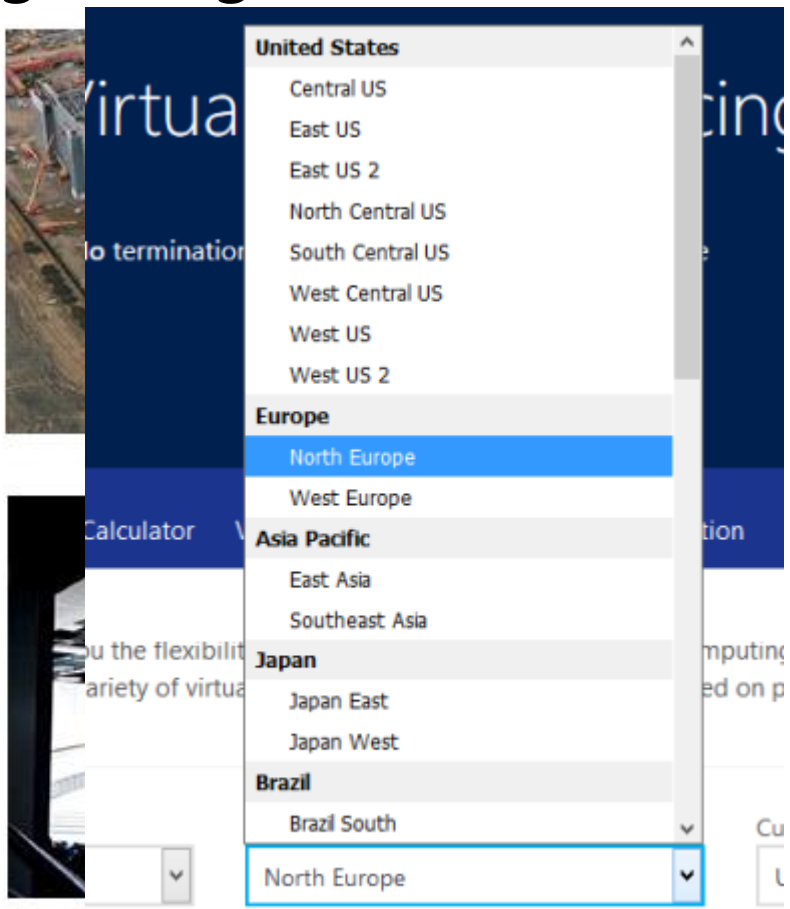
[https://azure.microsoft.com/en-us/services/]

Windows Azure

- *Datacenters – at the beginning*

- **Traditional Data Centers – e.g. Microsoft Dublin Datacenter**
  - 27,300 m^2
  - 22.2 Megawatt (final phase)
- **Container-based Data Centers – e.g. Chicago Data Center**
  - 65,000 m^2
  - 60 Megawatt (final phase)
  - Containers with up to 2500 servers

© www.datacenterknowledge.com



[J. Heinzelreiter, W. Kurschl, www.fh-hagenberg.at]

- Microsoft Azure – Regiuni in 2020

- Microsoft Azure – Regiuni in 2023

Why are regions important?

Azure has more global regions than any other cloud provider. These regions give you the flexibility to bring applications closer to your users no matter where they are. Global regions provide better scalability and redundancy. They also preserve data residency for your services.

Windows Azure

- A **region** is a geographical area on the planet that contains at least one but potentially **multiple data centers** that are nearby and **networked together** with a **low-latency network (< 2 milliseconds)**

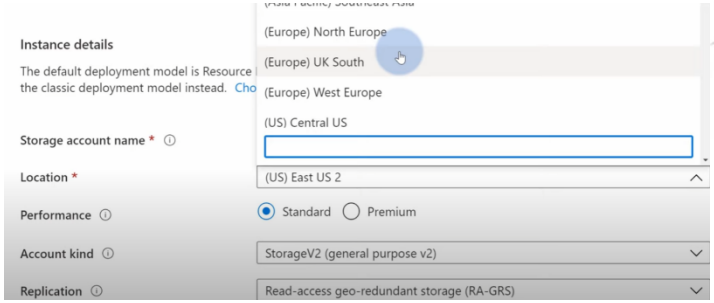
Special Azure regions

- **US DoD Central, US Gov Virginia, US Gov Iowa and more:** These regions are physical and logical network-isolated instances of Azure for U.S. government agencies and partners. These datacenters are operated by screened U.S. personnel and include additional compliance certifications.
- **China East, China North, and more:** These regions are available through a unique partnership between Microsoft and 21Vianet, whereby Microsoft doesn't directly maintain the datacenters.

Customers can select the data storage area ☺

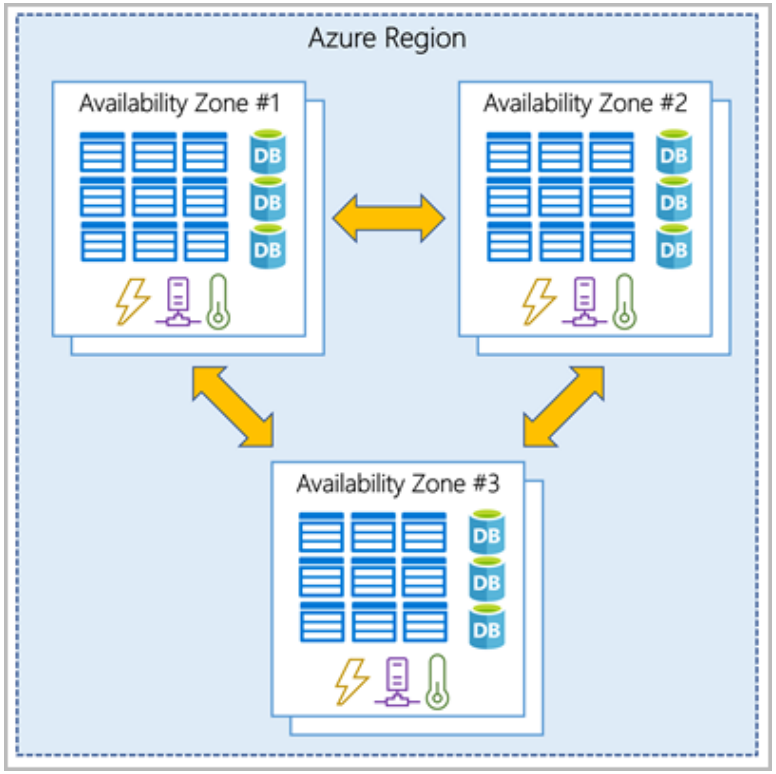
Concepts:

- *Availability zones*
- *Geographies*



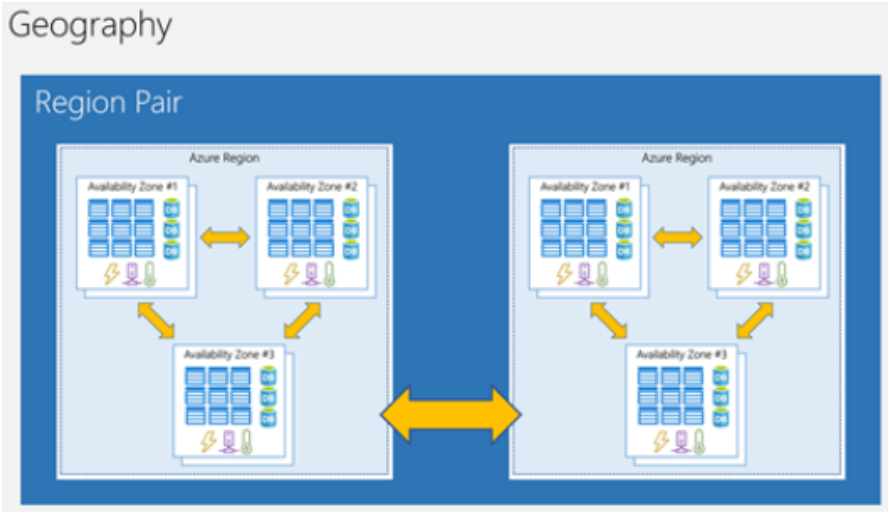
Windows Azure

- **Availability zones** are physically separate **data centers** within an Azure region
- An availability zone is set up to be an *isolation boundary*
- Availability zones are connected through high-speed, private fiber-optic networks



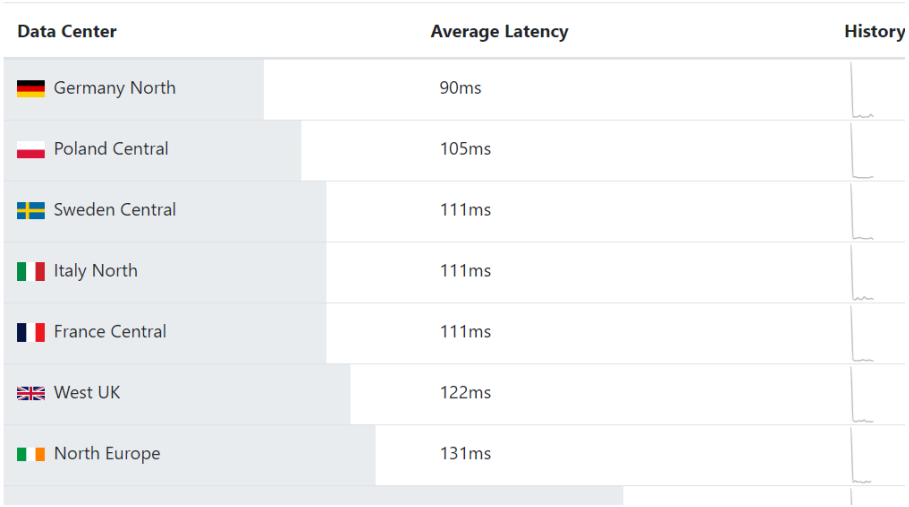
Windows Azure

- **Region pair**
  - Each Azure region is always paired with another region (such as US, Europe, or Asia) at least 300 miles away
- *Geographies* – contains two or more *Regions*
- => *reliable services and data redundancy*



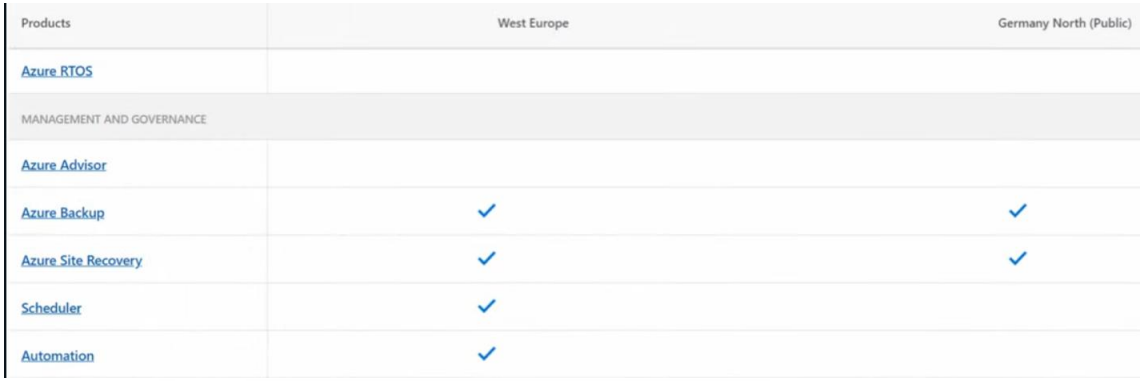
Windows Azure

- **Azure Speed test portal - https://azurespeedtest.azurewebsites.net/**



Data Center	Average Latency	History
Germany North	90ms	
Poland Central	105ms	
Sweden Central	111ms	
Italy North	111ms	
France Central	111ms	
West UK	122ms	
North Europe	131ms	

- **Products available by region - https://azure.microsoft.com/en-us/explore/global-infrastructure/products-by-region**



Products	West Europe	Germany North (Public)
Azure RTOS		
MANAGEMENT AND GOVERNANCE		
Azure Advisor		
Azure Backup	✓	✓
Azure Site Recovery	✓	✓
Scheduler	✓	
Automation	✓	

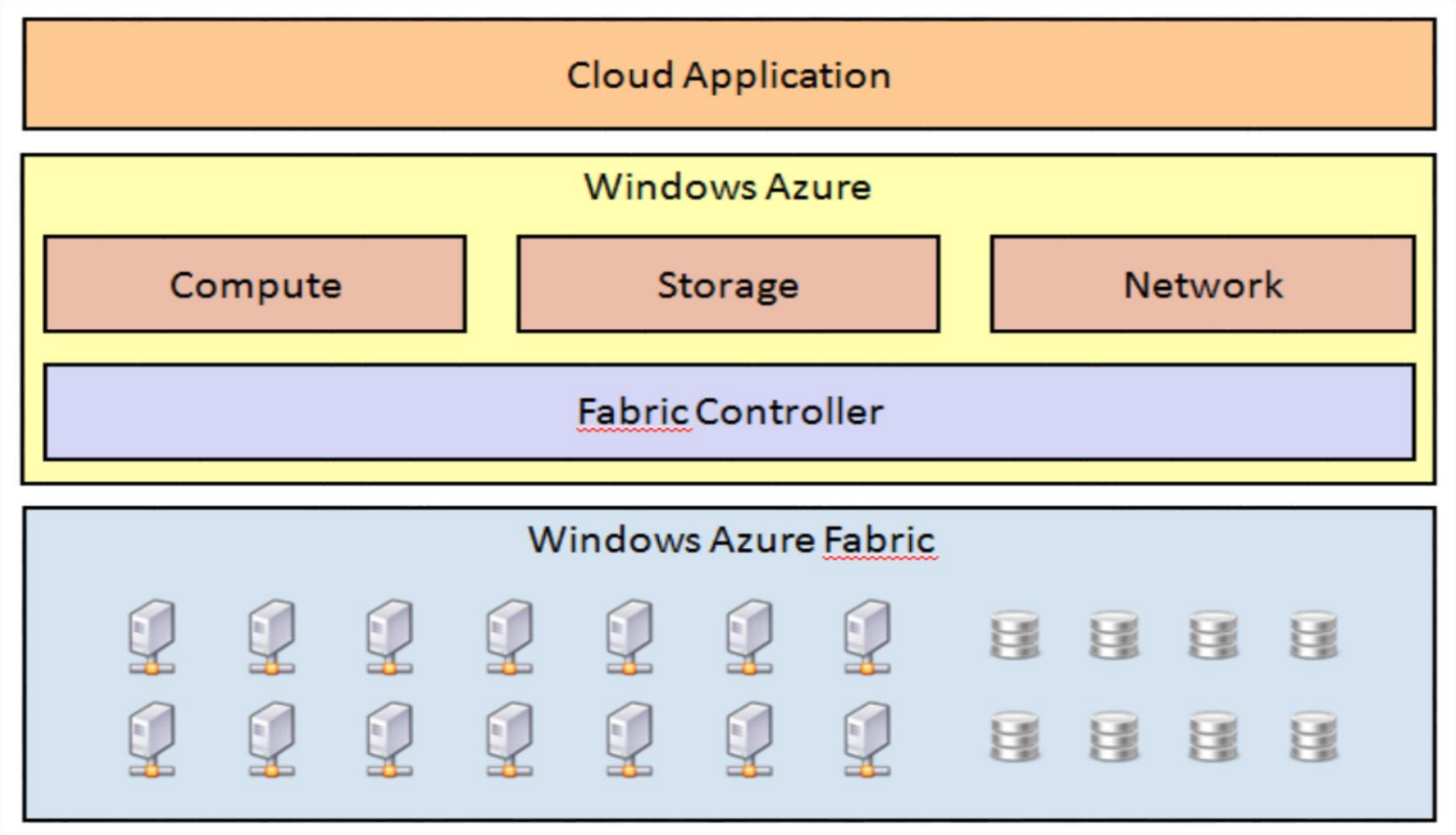
Windows Azure

- **Azure Resource**
- **Azure Resource Groups**
- **Azure Resource Manager**

https://www.youtube.com/watch?v=gIhf-S7BCdo&list=PLGjZwEtPN7j-Q59JYso3L4_yoCjj2syrM&index=9

Microsoft Azure

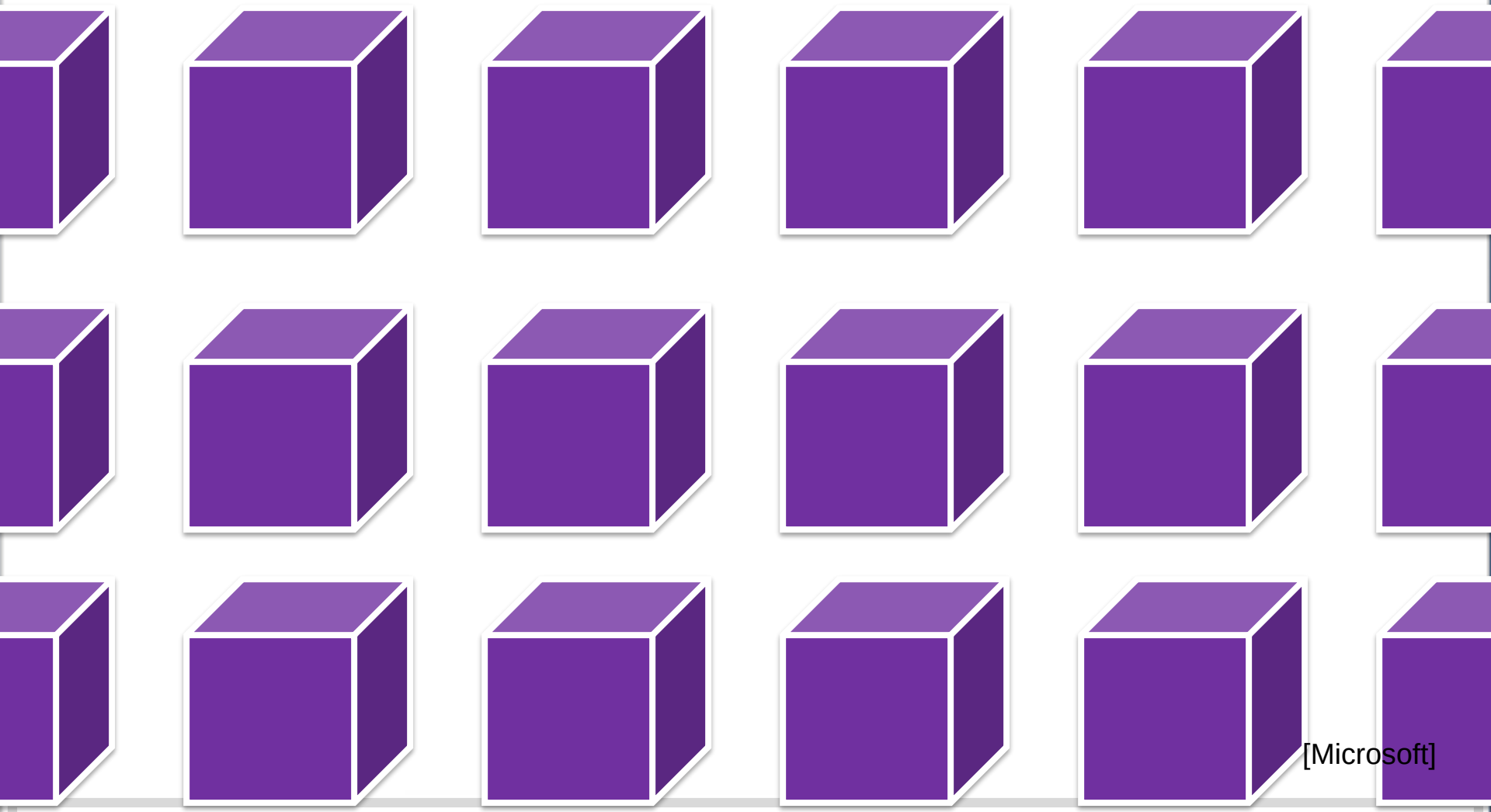
- General architecture



[J. Heinzelreiter, W. Kurschl, www.fh-hagenberg.at]

Microsoft Azure

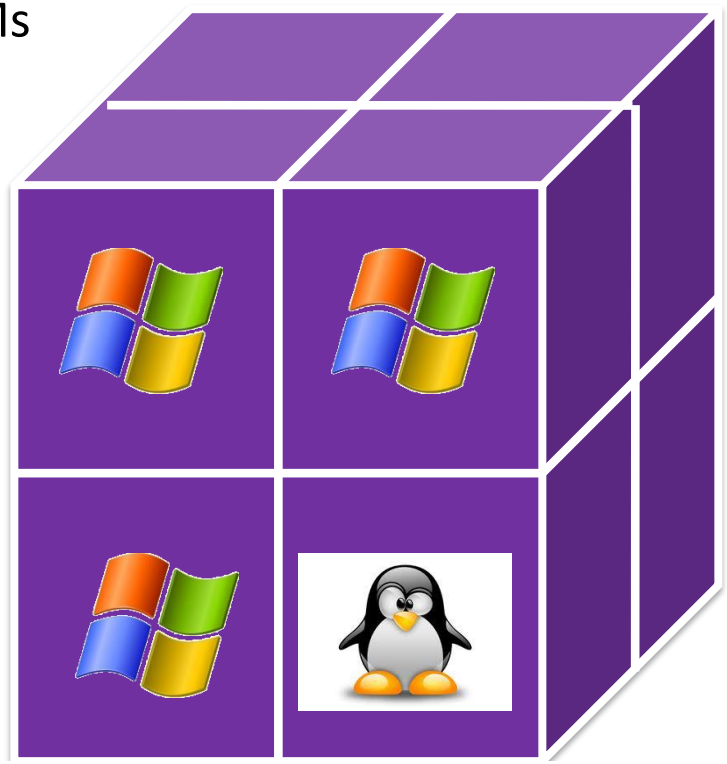
- *Data center* – *a* large number of servers=> Fabric



[Microsoft]

Microsoft Azure

- Servers with VMs running various OSs



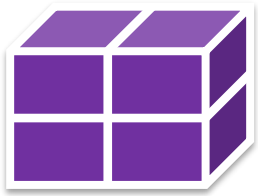
Initially Windows Azure offered several types of sizes for VMs:

- Extra Small
- Small
- Medium
- Large
- Extra Large

[Microsoft, 2014]

- Extra Small, with a shared core and 768 megabytes of memory.
- Small, with 1 core and 1.75 gigabytes of memory.
- Medium, with 2 cores and 3.5 gigabytes of memory.
- Large, with 4 cores and 7 gigabytes of memory.
- Extra Large, with 8 cores and 14 gigabytes of memory.

Microsoft Azure



- Categories

VM Sizes

The following table categorizes sizes into use cases.

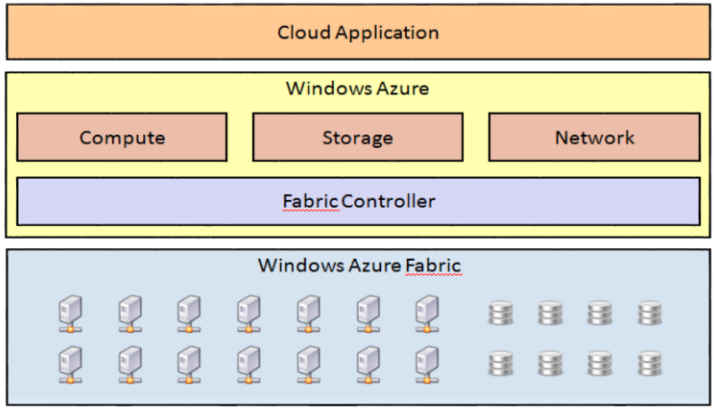
Type	Sizes	Description
General purpose	DSv2, Dv2, DS, D, Av2, A0-7	Balanced CPU-to-memory. Ideal for dev / test and small to medium applications and data solutions.
Compute optimized	Fs, F	High CPU-to-memory. Good for medium traffic applications, network appliances, and batch processes.
Memory optimized	GS, G, DSv2, DS, Dv2, D	High memory-to-core. Great for relational databases, medium to large caches, and in-memory analytics.
Storage optimized	Ls	High disk throughput and IO. Ideal for Big Data, SQL, and NoSQL databases.
GPU	NV, NC	Specialized VMs targeted for heavy graphic rendering and video editing.
High performance	H, A8-11	Our most powerful CPU VMs with optional high-throughput network interfaces (RDMA).

Find available VM sizes

PowerShell> Get-AZVMSize -Location WestEurope | less

Name	NumberOfCores	MemoryInMB	MaxDataDiskCount	OSDiskSizeInMB	ResourceDiskSizeInMB
Standard_B1ls	1	512	2	1047552	4096
Standard_B1ms	1	2048	2	1047552	4096
Standard_B1s	1	1024	2	1047552	4096
Standard_B2ms	2	8192	4	1047552	16384
Standard_B2s	2	4096	4	1047552	8192
Standard_B4ms	4	16384	8	1047552	32768
Standard_B8ms	8	32768	16	1047552	65536
Standard_B12ms	12	49152	16	1047552	98304

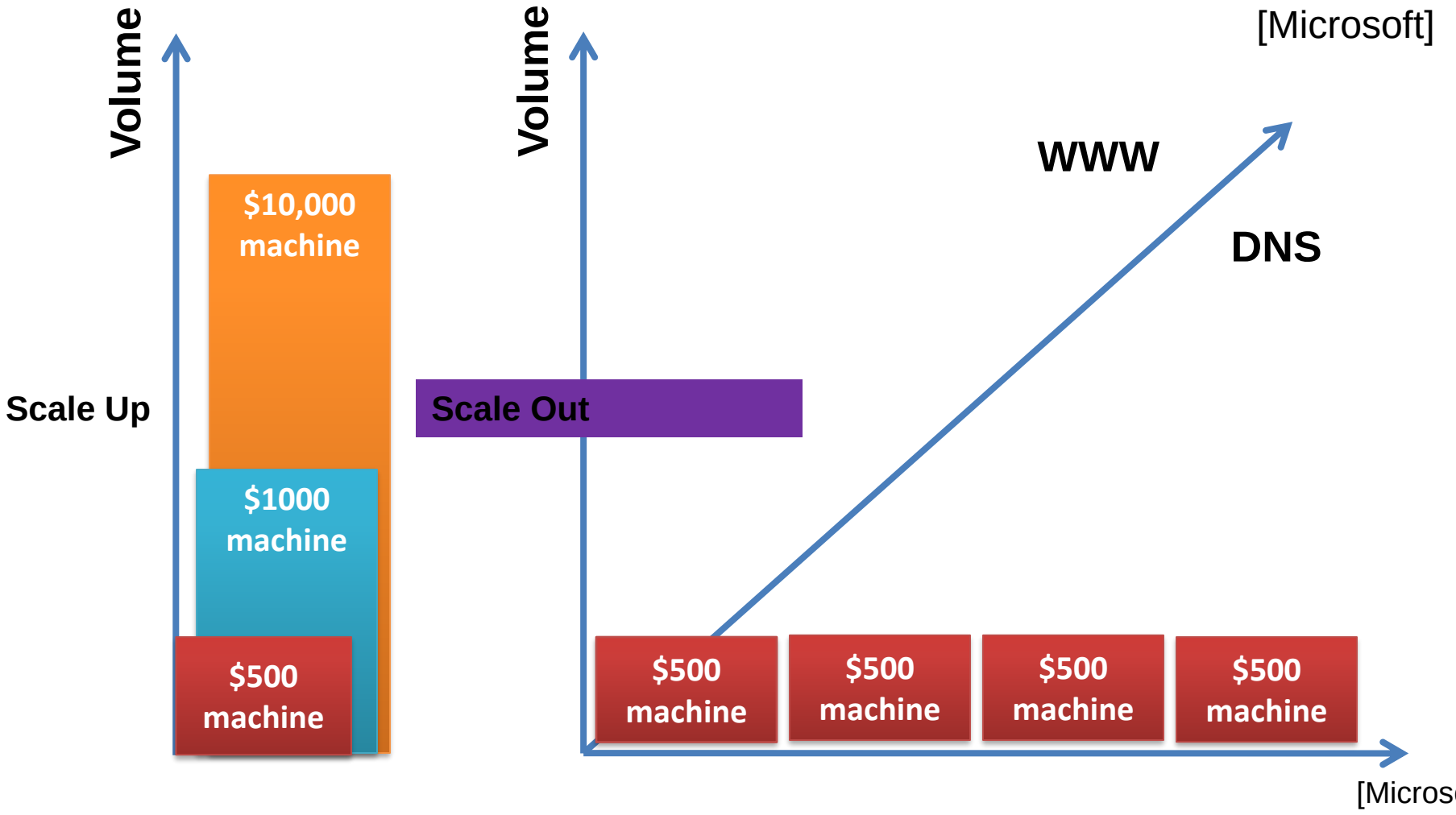
Windows Azure



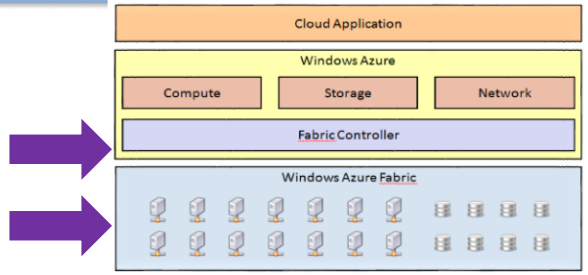
Fabric

- A network of interconnected nodes
  - Commodity servers (scale-out is ensured)
  - High-performance switches, routers, load balancers
  - Connection: fiber optic
- Azure Fabric Controller is the service that monitors, maintains, and provisions machines
  - Application monitoring (e.g. choosing the physical server on which an application will run,… => optimization of hardware use)
  - Management of operating systems (e.g. update for versions of Windows Server running in Windows Azure VM,…)
  - Management of load-balancing devices

Scale-up versus *Scale-out*



Windows Azure



Fabric

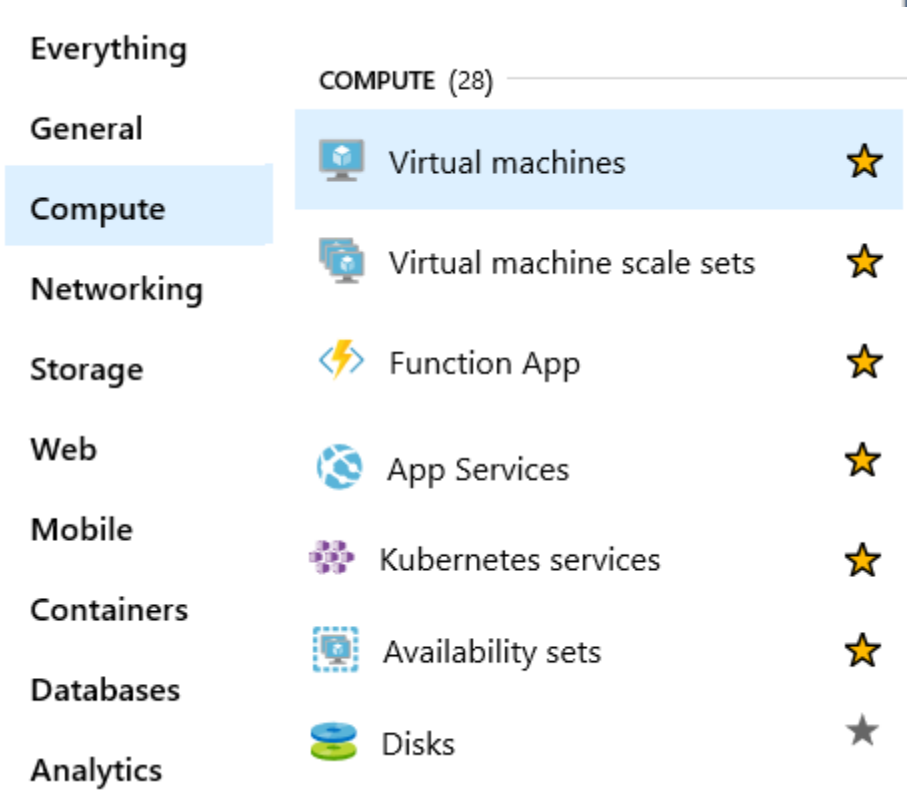
- **Azure Fabric Controller** actions can be configured using various mechanisms
  - Azure Resource Manager (ARM) Templates are JSON templates for defining and managing infrastructure
  - Azure Portal is a Web-based graphical interface for managing and configuring resources
  - Azure CLI and PowerShell are tools for programmatic configuration and management
  - Azure DevOps are CI/CD tools for automating the development and deployment of applications
  - Bicep is a simpler and more intuitive configuration language for Azure

Microsoft Azure| Compute

Service name	Service function
Azure Virtual Machines	Windows or Linux virtual machines (VMs) hosted in Azure.
Azure Virtual Machine Scale Sets	Scaling for Windows or Linux VMs hosted in Azure.
Azure Kubernetes Service	Cluster management for VMs that run containerized services.
Azure Service Fabric	Distributed systems platform that runs in Azure or on-premises.
Azure Batch	Managed service for parallel and high-performance computing applications.
Azure Container Instances	Containerized apps run on Azure without provisioning servers or VMs.
Azure Functions	An event-driven, serverless compute service.

Microsoft Azure| Compute

- Linux/Windows **Virtual Machines** – offers control over virtual machines (including OS) - IaaS
- **Azure Kubernetes Service** (AKS) – deployment, management, and operations using Kubernetes
- **Azure Container Instances** (ACI) – if a complete container orchestration solution is not needed
- **Azure App Services** - platform-as-a-service (PaaS) - for creating scalable ("infinite-scalable") and fault-resistant web, mobile, or API apps (Java, NodeJS, PHP, Python, .Net, Ruby)
- …



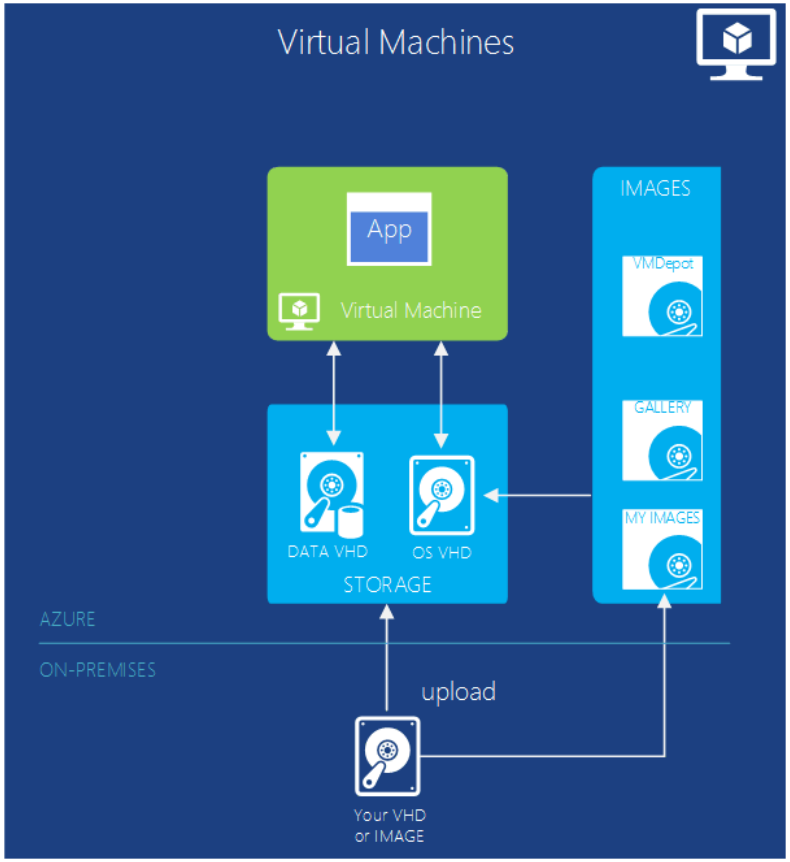
[https://azureplatform.azurewebsites.net/en-us/]

Microsoft Azure

Azure Virtual Machines

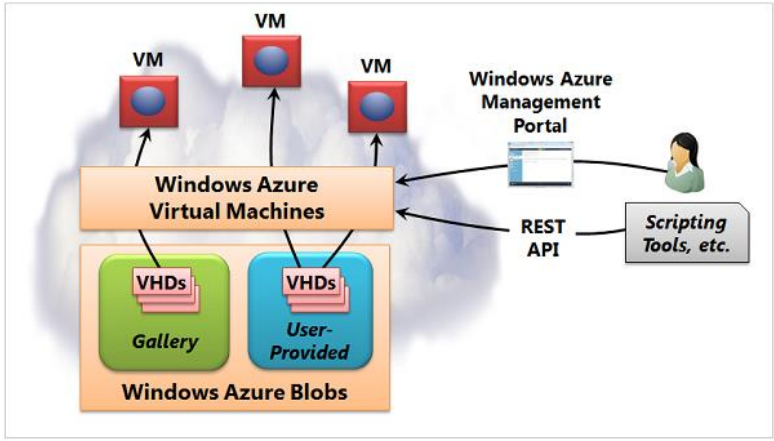
Linux/Windows Virtual Machines

- offers control over virtual machines (including OS) - IaaS
- allows developers, IT specialists to create and manage virtual machines in the cloud
- Utility?
  - VM for development and test
  - Running applications in the cloud
  - Expansion of own infrastructure
  - VNET (Virtual network)
  - Disaster recovery
- Example: Running a scalable application using SQL Server



[www.windowsazure.com]

Microsoft Azure



- ***Azure Virtual Machines***

➢ Virtual machine creation

– Windows Azure Resource Manager

– Windows Azure Service Management API or other services (e.g. Flexera)

➢ Operating system disk and VHDs

- The OS disk and image are virtual hard disks (VHDs) stored in an Azure storage account

– VHDs used in Azure are **vhd** files stored as **page blobs** in Azure's standard or premium storage account

– Virtual machines can also have one or more data disks that are also stored as VHDs

Steps

– Choosing a VHD (Virtual Hard Disk) for the VM image

– From the Windows Azure Virtual Machines gallery: Windows Server with SQL Server, ..., Suse, Ubuntu, CentOS or your own

– Specifying the expected characteristics of the virtual machine

– [https://docs.microsoft.com/en-us/azure/virtual-machines/windows/ https://azure.microsoft.com/en-us/pricing/details/virtual-machines/windows/]

- Region selection

- ***Virtual Machine scale sets*** *make it easy to build highly scalable applications by allowing you to effortlessly deploy and manage a set of VMs (Win/Linux) as a group*
  - https://azure.microsoft.com/en-gb/pricing/details/bandwidth/
  - => *availability, scalability, and redundancy*

Microsoft Azure

Flexera

Type	Technology company
Founded	1988; 35 years ago
Headquarters	Itasca, Illinois, U.S.
Website	www.flexera.com

Flexera (from 2018 includes RightScale)

RightScale partners with private cloud providers Apache CloudStack[10] and OpenStack[11] to help enterprises more easily build and manage their private clouds.[12] RightScale also enables users to manage hybrid cloud infrastructure by migrating workloads between their private clouds and public clouds operated by Amazon Web Services (AWS), Rackspace Cloud,[13] Windows Azure,[14] and Google Compute Engine[15] among others.

On November 5, 2012, RightScale announced that it had joined the open source cloud computing project OpenStack,[16] and was expanding its relationship with cloud hosting provider Rackspace to integrate with Rackspace Open Cloud products powered by OpenStack.[17]

In February 2013, RightScale became the first cloud management company to resell Google Compute Engine public cloud infrastructure.[18]

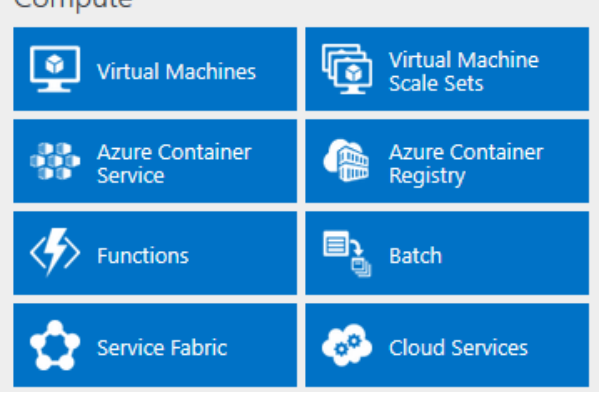
RightScale @ AWS Summit 2013 NYC

On April 15, 2013, RightScale announced that it would provide enterprise support for Windows Azure in conjunction with the Microsoft announcement of its general availability release of Windows Azure Infrastructure Services.[19]

….?

Cloud Report 2024 - https://info.flexera.com/CM-REPORT-State-of-the-Cloud-2024-Thanks

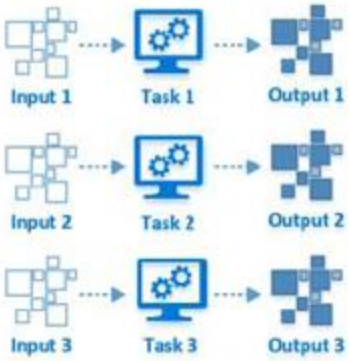
Microsoft Azure



Batch

Used for applications that require parallel processing (Batch APIs) and HPC

- Starts a pool of compute VMs for you.
- Installs applications and staging data.
- Runs jobs with as many tasks as you have.
- Identifies failures.
- Requeues work.
- Scales down the pool as work completes.



- Financial risk modeling
- Climate and hydrology data analysis
- Image rendering, analysis, and processing
- Media encoding and transcoding
- Genetic sequence analysis
- Engineering stress analysis
- Software testing

Microsoft Azure

- ***Virtual Machines***

➢ [2015-> http://azure.microsoft.com/en-us/pricing/details/virtual-machines/]

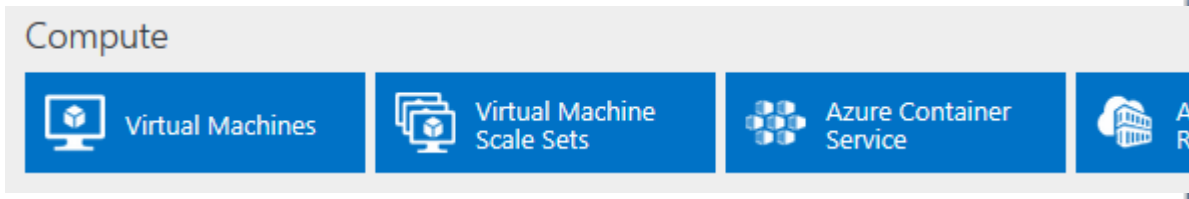
General purpose compute: Basic tier

An economical option for development workloads, test servers, and other applications that don't require load balancing, auto-scaling, or memory-intensive virtual machines.

INSTANCE	CORES	RAM	DISK SIZES	PRICE
A0	1	0.75 GB	20 GB	$0.018/hr (~$13/mo)
A1	1	1.75 GB	40 GB	$0.047/hr (~$35/mo)
A2	2	3.5 GB	60 GB	$0.094/hr (~$70/mo)
A3	4	7 GB	120 GB	$0.188/hr (~$140/mo)
A4	8	14 GB	240 GB	$0.376/hr (~$280/mo)

[www.windowsazure.com]

Microsoft Azure



- ***Virtual Machines***

➢ [2017-> http://azure.microsoft.com/en-us/pricing/details/virtual-machines/]

A0-4 – Basic

A Basic is an economical option for development workloads, test servers, build servers, code repositories, low-traffic websites and web applications, micro services, early product experiments and small databases.

More information >

Select columns

INSTANCE	CORES	RAM	DISK SIZES [1]	PRICE
A0	1	0.75 GiB	20 GB	$0.018/hr
A1	1	1.75 GiB	40 GB	$0.038/hr
A2	2	3.50 GiB	60 GB	$0.113/hr
A3	4	7.00 GiB	120 GB	$0.30/hr
A4	8	14.00 GiB	240 GB	$0.60/hr

[1] Storage values for disk sizes use a legacy "GB" label. They are actually calculated in gibibytes, and all values should be read as "X GiB"

[www.windowsazure.com]

Microsoft Azure

- ***Virtual Machines***

➢ [2015-> http://azure.microsoft.com/en-us/pricing/details/virtual-machines/]

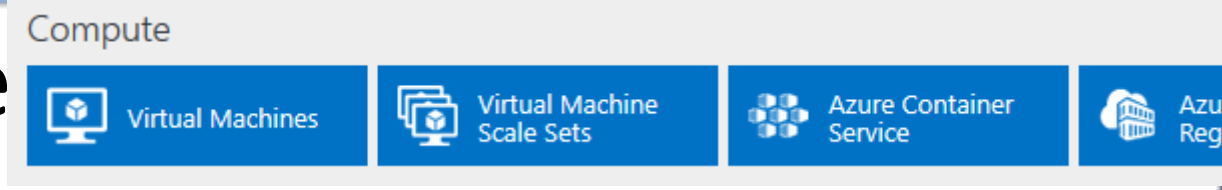
General purpose compute: Standard tier

Offers the most flexibility. Supports all virtual machine configurations and features.

INSTANCE	CORES	RAM	DISK SIZES	PRICE
A0	1	**0.75** GB	**20** GB	$0.02/hr (~$15/mo)
A1	1	**1.75** GB	**70** GB	$0.06/hr (~$45/mo)
A2	2	**3.5** GB	**135** GB	$0.12/hr (~$89/mo)
A3	4	**7** GB	**285** GB	$0.24/hr (~$179/mo)
A4	8	**14** GB	**605** GB	$0.48/hr (~$357/mo)
A5	2	**14** GB	**135** GB	$0.25/hr (~$186/mo)
A6	4	**28** GB	**285** GB	$0.50/hr

[www.windowsazure.com]

Microsoft Azure



- ***Virtual Machines***

➢ [2017-> http://azure.microsoft.com/en-us/pricing/details/virtual-machines/]

Av2 Standard

Av2 Standard is the latest generation of A series virtual machines with similar CPU performance and faster disk. These virtual machines are suitable for development workloads, build servers, code repositories, low-traffic websites and web applications, micro services, early product experiments and small databases. Like the prior A Standard generation, Av2 virtual machines will include load balancing and auto-scaling at no additional charge.

More information >

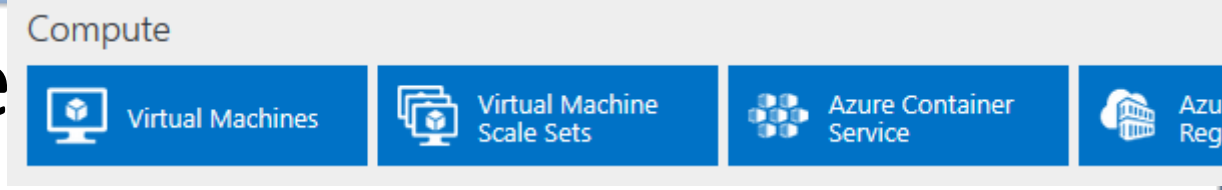
Select columns

INSTANCE	CORES	RAM	DISK SIZES [1]	PRICE
A1 v2	1	2.00 GiB	10 GB	$0.062/hr
A2 v2	2	4.00 GiB	20 GB	$0.13/hr
A4 v2	4	8.00 GiB	40 GB	$0.274/hr
A8 v2	8	16.00 GiB	80 GB	$0.575/hr
A2m v2	2	16.00 GiB	20 GB	$0.21/hr
A4m v2	4	32.00 GiB	40 GB	$0.441/hr
A8m v2	8	64.00 GiB	80 GB	$0.926/hr

[1] Storage values for disk sizes use a legacy "GB" label. They are actually calculated in gibibytes, and all values should be read as "X GiB"

[www.windowsazure.com]

Microsoft Azure



- ***Virtual Machines***

➢ http://azure.microsoft.com/en-us/pricing/details/virtual-machines/

– Compute optimized

High CPU-to-memory ratio. Good for medium traffic web servers, network appliances, batch processes, and application servers.

F Series

The F-Series virtual machines sport 2 GiB RAM and 16 GB of local solid state drive (SSD) per CPU core, and are optimized for compute intensive workloads. The F-series is based on the 2.4 GHz Intel Xeon® E5-2673 v3 (Haswell) processor, which can achieve clock speeds as high as 3.2 GHz with the Intel Turbo Boost Technology 2.0. These virtual machines are suitable for scenarios like batch processing, web servers, analytics and gaming.

For persistent storage, use the variant "Fs" virtual machines and purchase Premium Storage separately. The pricing and billing meters for Fs sizes are the same as F-series.

More information >

Select columns

INSTANCE	CORES	RAM	DISK SIZES [1]	PRICE
F1	1	2.00 GiB	16 GB	$0.102/hr
F2	2	4.00 GiB	32 GB	$0.204/hr
F4	4	8.00 GiB	64 GB	$0.408/hr
F8	8	16.00 GiB	128 GB	$0.816/hr
F16	16	32.00 GiB	256 GB	$1.632/hr

[1] Storage values for disk sizes use a legacy "GB" label. They are actually calculated in gibibytes, and all values should be read as "X GiB"

[www.windowsazure.com]

Microsoft Azure

- ***Virtual Machines***

➢ http://azure.microsoft.com/en-us/pricing/details/virtual-machines

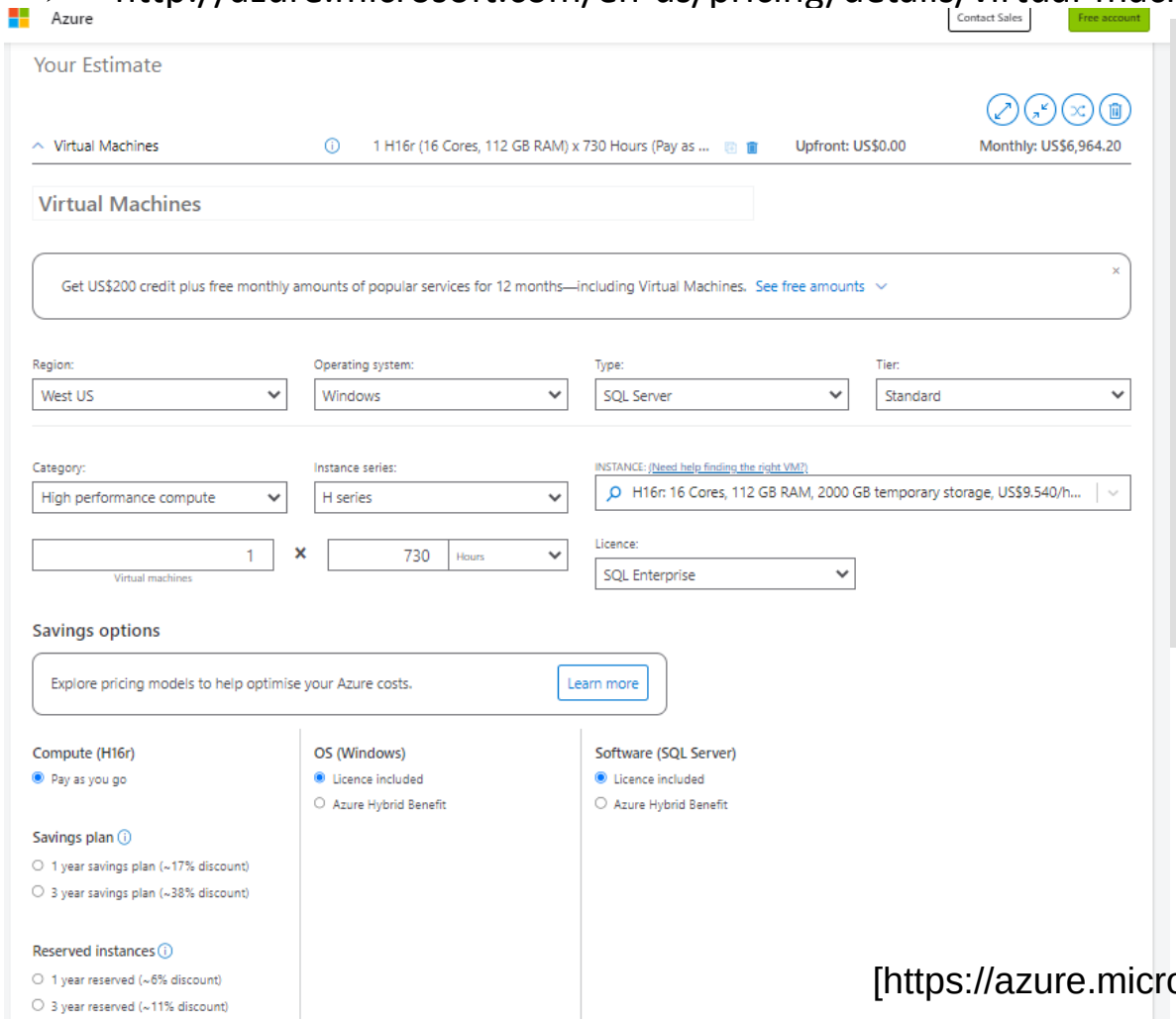
Burstable VMs—B1S	Compute optimized—Fv2	General purpose—Dv3	Memory optimized—Ev3
Most Economical	Raw Compute Power	Balanced CPU and memory	High memory-to-core ratio
Our B-series VMs provide an economical, low-cost solution for workloads that normally don't use a lot of CPU but occasionally need to burst to handle higher workloads. Free for 12 months.	Fv2 is our newest compute-optimized VM family and uses the Intel Skylake processor. Fv2 delivers the latest Intel CPU for raw compute power.	Our Dv3 family is the latest generation of our general purpose VMs. It's appropriate for a variety of workloads.	Ev3 is our latest generation memory-optimized VM. It's great for relational database servers, caches, and in-memory analytics.
Specs:	Specs:	Specs:	Specs:
B1S 1 vCPU 1 GiB RAM	F2 v2 2 vCPU 4 GiB RAM	D2 v3 2 vCPU 8 GiB RAM	E2 v3 2 vCPU 16 GiB RAM
Starting from	Starting from	Starting from	Starting from
$0.009/hour	$0.063/hour	$0.076/hour	$0.097/hour
+ Add to estimate	+ Add to estimate	+ Add to estimate	+ Add to estimate

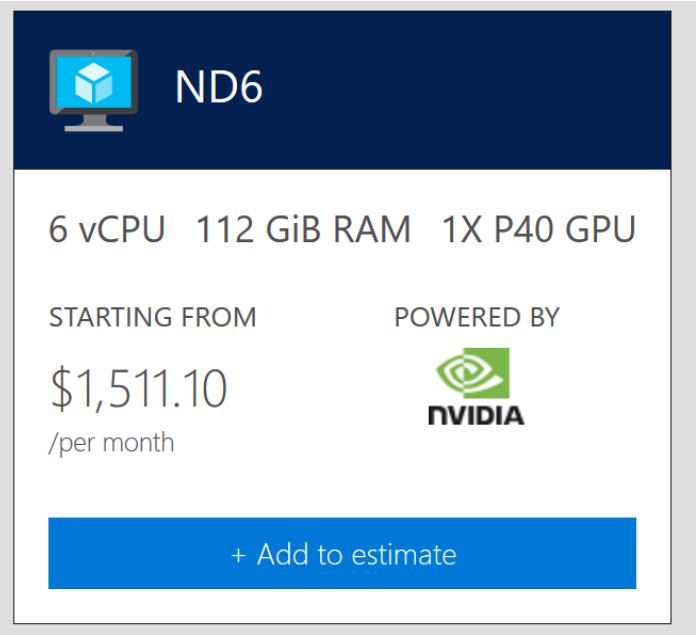
[www.windowsazure.com]

Microsoft Azure

- ***Virtual Machines***

➢ http://azure.microsoft.com/en-us/pricing/details/virtual-machines





[https://azure.microsoft.com/en-gb/pricing/calculator/]

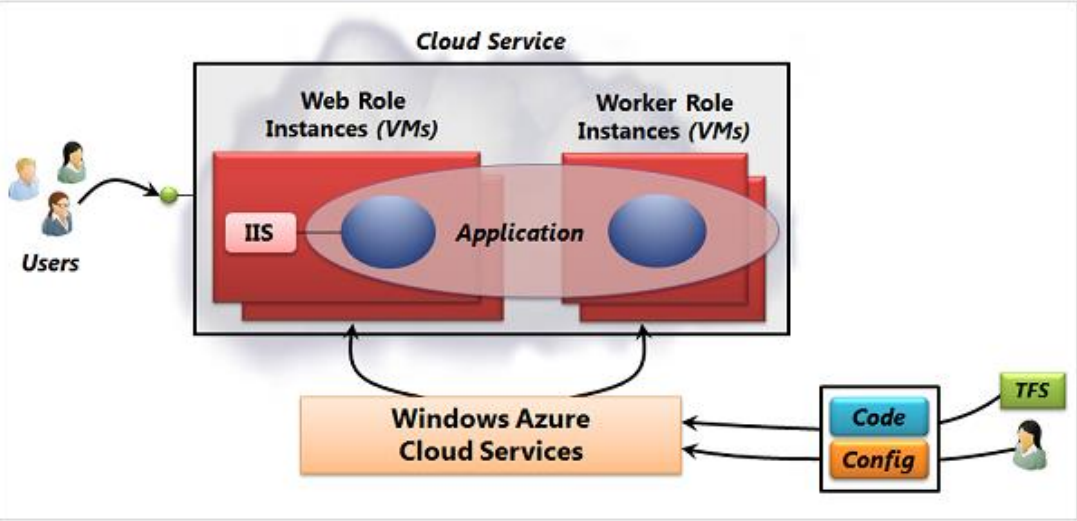
Microsoft Azure

Cloud Services (classic) is now deprecated for new customers and will be retired on August 31st, 2024 for all customers. New deployments should use the new Azure Resource Manager based deployment model Azure Cloud Services (extended support).

- **Azure Cloud Services (extended support)**

➢ **Windows Azure Cloud Services - PaaS (Platform as a Service)**

- ➢ It provides support for scalable, secure, low-cost applications
- ➢ The developers do not care about the management of the platform they use
- ➢ Obs. The virtual machines for an application run in a **resource group** which is a logical container
- ➢ Obs. Cloud Services does not offer IaaS services (the developer only provides a configuration file that indicates different parameters regarding the VM, but at this level, the VM is not explicitly manipulated)

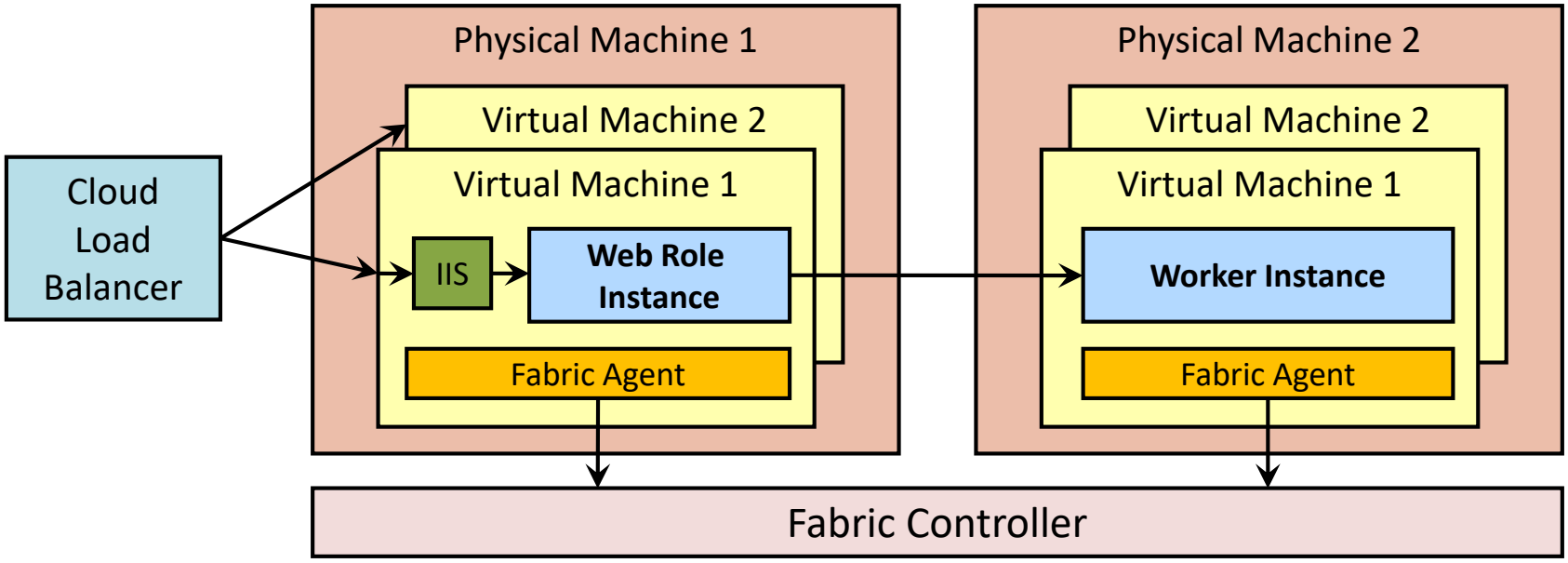


[https://azure.microsoft.com/en-us/blog/cloud-services-extended-support-is-generally-available-migration-tool-in-preview/]

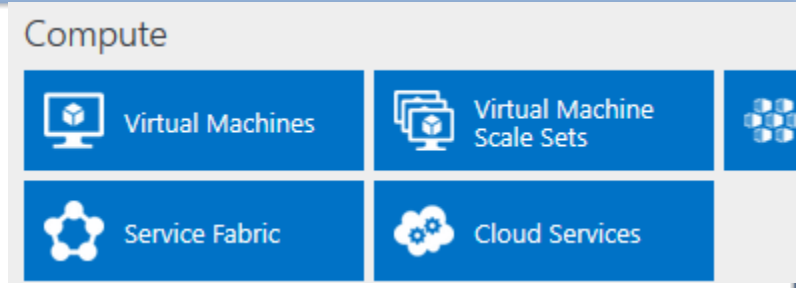
Microsoft Azure

Azure Cloud Services (classic)

- It allows the running of various applications that require it
- Simultaneous access by a large number of users (scale-out)
- Implementation mechanism:
  - An application can have multiple instances, each running in its own container/VM



Microsoft Azure



Azure Cloud Services (classic)

There are two types of instances

Web Roles

- can accept HTTPS requests
- Ex. Runs on VMs that include IIS (Internet Information Services)

Developers can create Web Role instances using: ASP.Net or other technologies supported by IIS (PHP, Java,…)

Worker Roles

- It represents background processes
- Often isolated from the outside world
- It doesn't have IIS configured, but it can allow a Web server to be installed

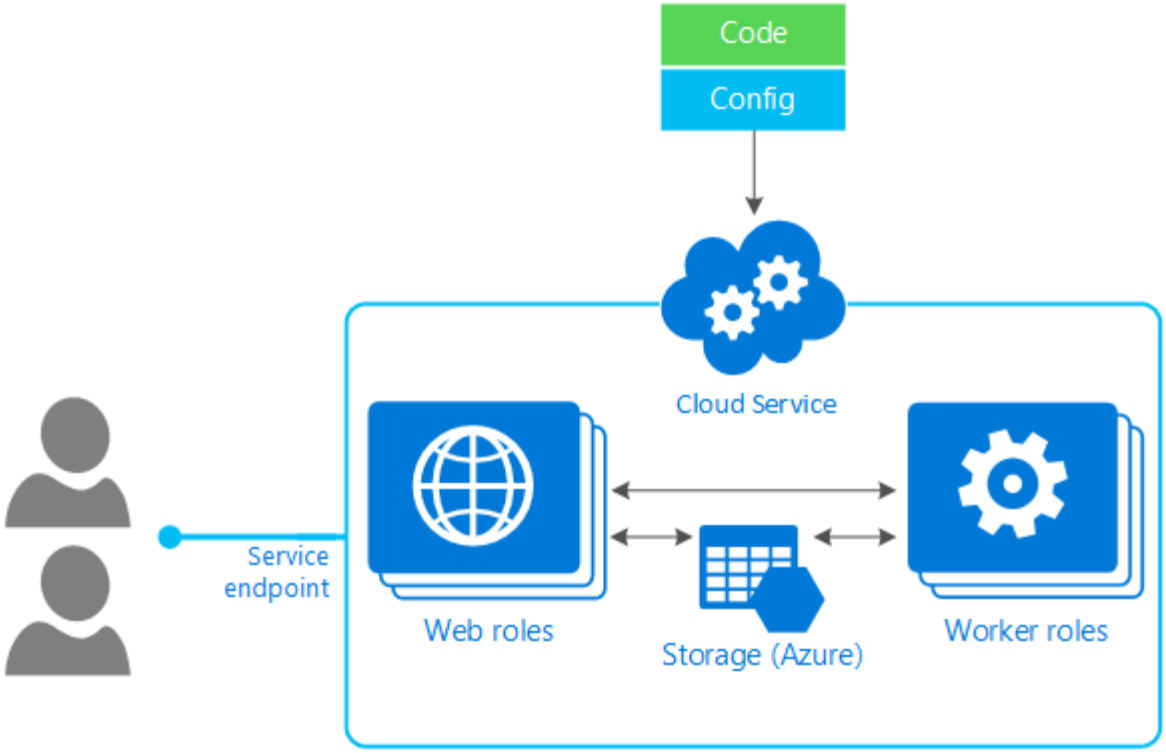
Hardware Load Balancer – manages requests between multiple Web Role instances of the same application

Fabric Agent – monitors and collects parameters: usage, failure, ...

Cloud Services (classic) is now deprecated for new customers and will be retired on August 31st, 2024 for all customers. New deployments should use the new Azure Resource Manager based deployment model Azure Cloud Services (extended support).

Cloud Services (classic)

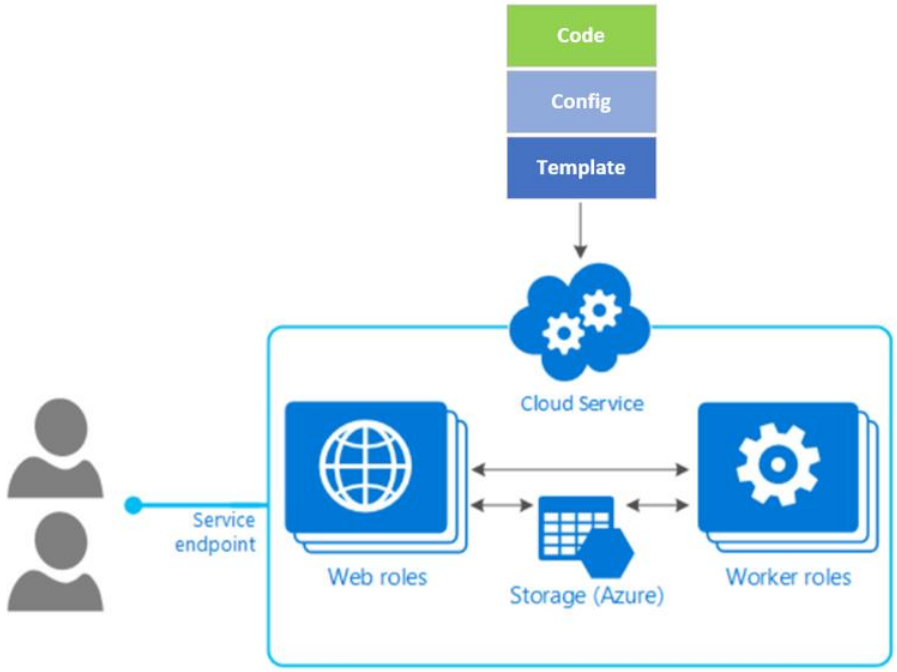
Steps for creating and running an application:



[https://docs.microsoft.com/en-us/azure/cloud-services/cloud-services-choose-me]

Microsoft Azure

Cloud Services Extended – *integrated with*
Azure Resource Manager



https://docs.microsoft.com/en-us/azure/cloud-services-extended-support/overview

What does not change

- You create the code, define the configurations, and deploy it to Azure. Azure sets up the compute environment, runs your code then monitors and maintains it for you.
- Cloud Services (extended support) also supports two types of roles, web and worker. There are no changes to the design, architecture, or components of web and worker roles.
- The three components of a cloud service, the service definition (.csdef), the service config (.cscfg), and the service package (.cspkg) are carried forward and there is no change in the formats, but there are minor changes in calling new Azure Resource Manager based APIs
- No changes are required to runtime code as data plane is the same and control plane is only changing.
- Azure GuestOS releases and associated updates are aligned with Cloud Services (classic)
- Underlying update process with respect to update domains, how upgrade proceeds, rollback and allowed service changes during an update don't change

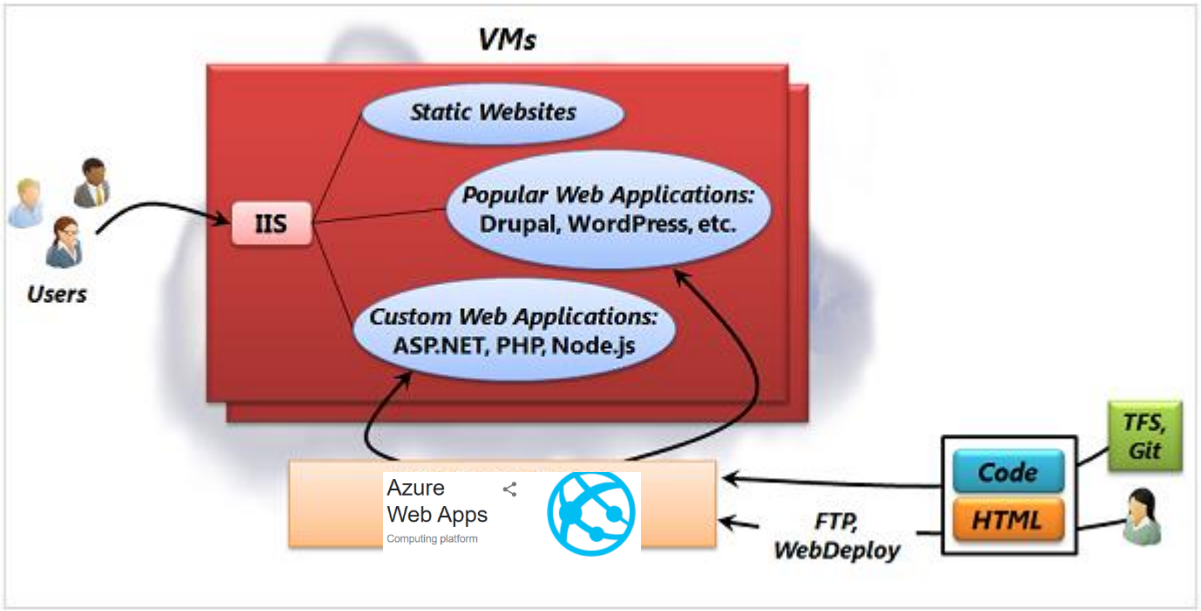
The major differences between Cloud Services (classic) and Cloud Services (extended support) are in respect to deployment

https://docs.microsoft.com/en-us/azure/cloud-services-extended-support/overview

Microsoft Azure

App Services

Azure App Service is an HTTP-based service for hosting web applications, REST APIs, and mobile back ends. You can develop in your favorite language, be it .NET, .NET Core, Java, Ruby, Node.js, PHP, or Python. Applications run and scale with ease on both Windows and Linux-based environments.



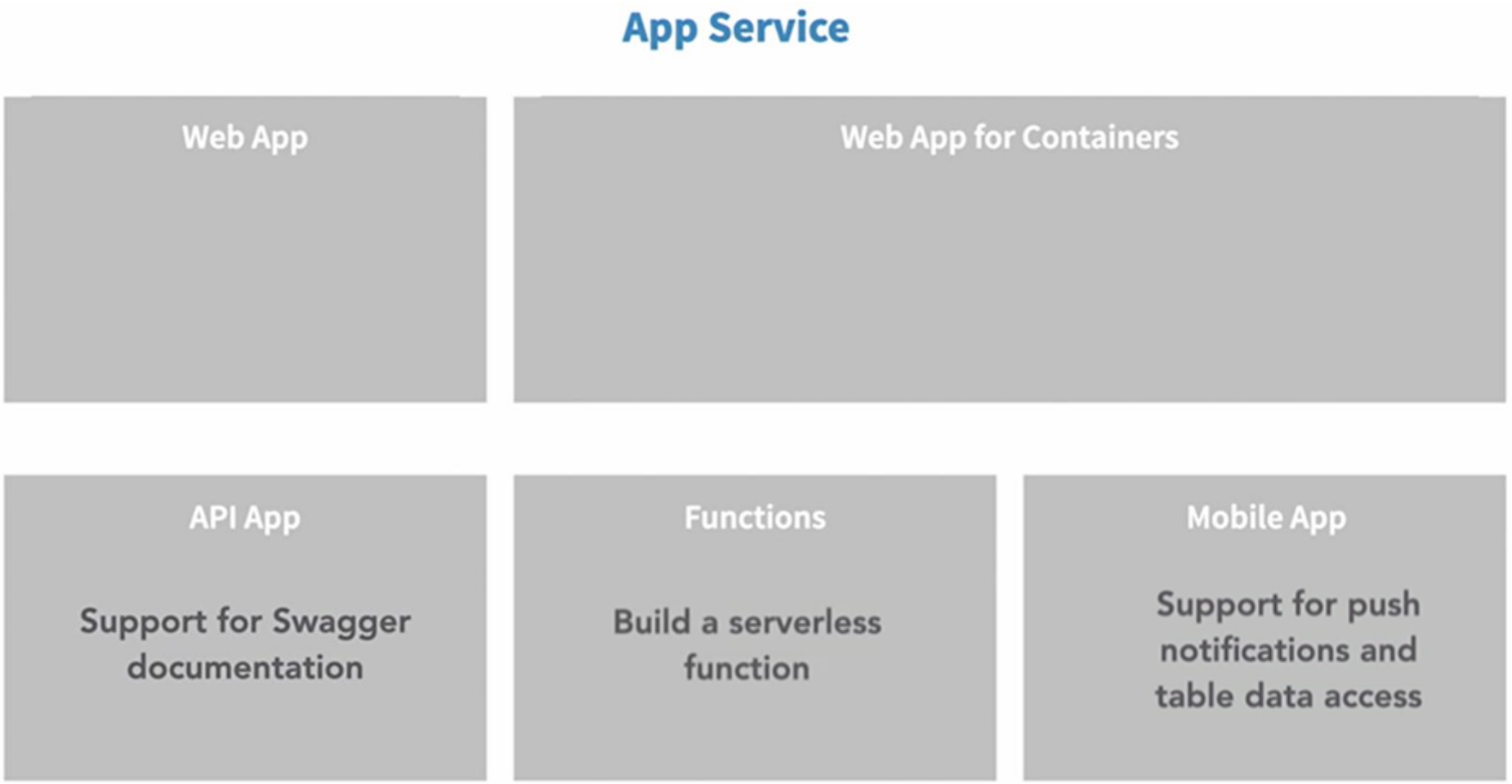
Support for DevOps tooling
Source code control systems
Azure DevOps Server/Team Foundation
Server, Git repo

- Is built upon the Azure Virtual Machine layer
  - OS and web server are abstracted
  - Choose from preconfigured servers (Win/Linux)… a free Tier☺
- An openness to a wide range of users is ensured

[https://docs.microsoft.com/en-us/azure/app-service/quickstart-nodejs?tabs=windows&pivots=development-environment-vscode]

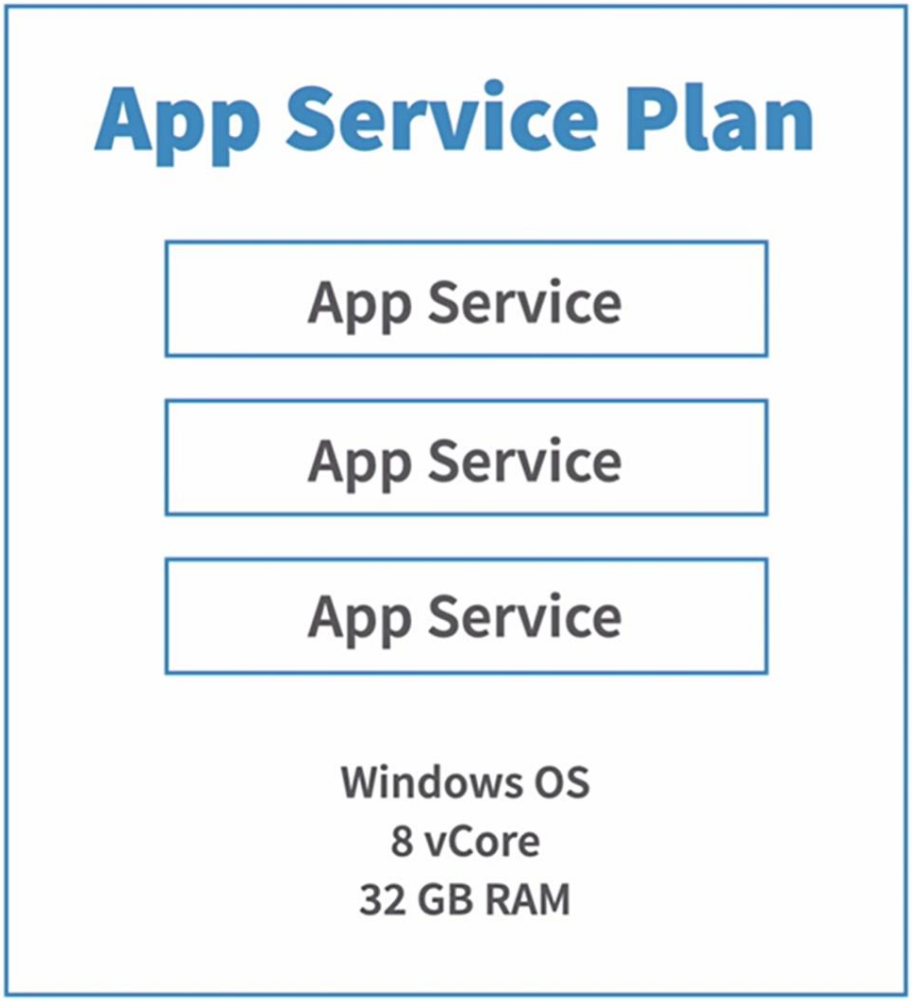
Microsoft Azure

App Services



Microsoft Azure

App Services Plan and App Services



- The plan affects the availability of features like autoscaling, custom domains, and the number of apps you can host.
- It's a balance between cost and the features your applications require.

All App Service instances in the plan share the same resources.

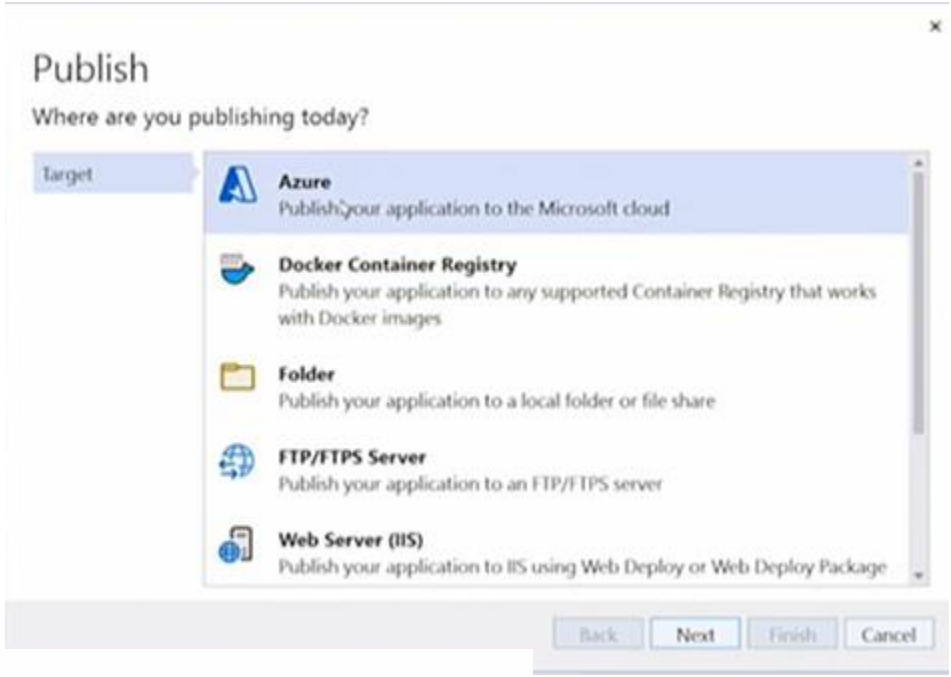
Microsoft Azure

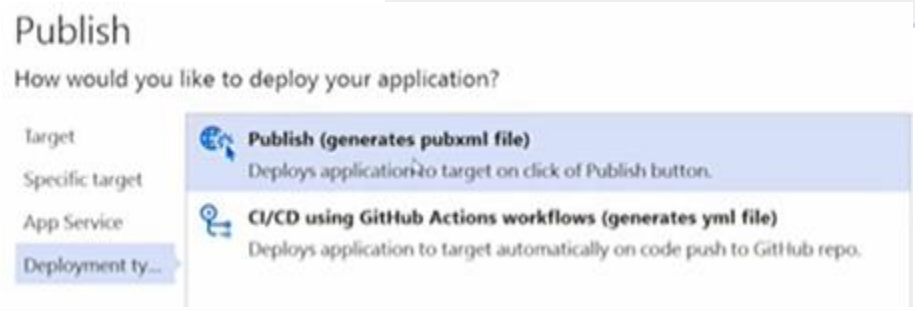
- Build a new App Services Plan

- Create an App Services

E.g. Run a WebPage with App Services

- Create Web App (.azurewebsites.net)
  - Runtime stack (.Net, Node,….)
  - Region
  - App Service Plan
  - Review and create☺
- with Visual Studio
  - Code modification
  - Continuous integration or continuous delivery pipeline using Azure DevOps or GitHub DevOps or built-in features of VisualStudio (Publish)

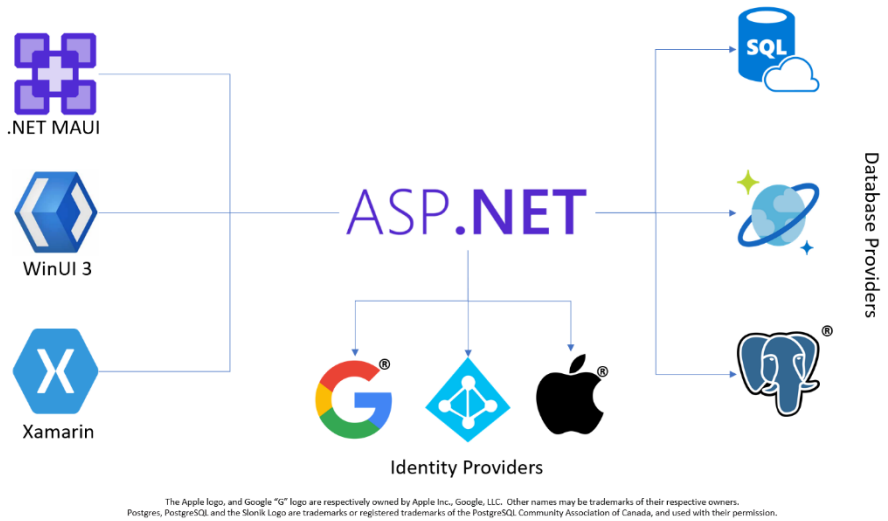




Microsoft Azure

App Services | Mobile Apps

- SDK for Windows, Android, iOS or cross-platform applications (e.g. .NET MAUI (Multi-platform App UI))
- Mobile Services (storage in Azure SQL, Blob,... or third-party)
- Service Bus Relay – connecting with on-premise databases
- => applications integrated with any platform
  - benefit from the facilities offered by Azure (scalability, availability, ..)

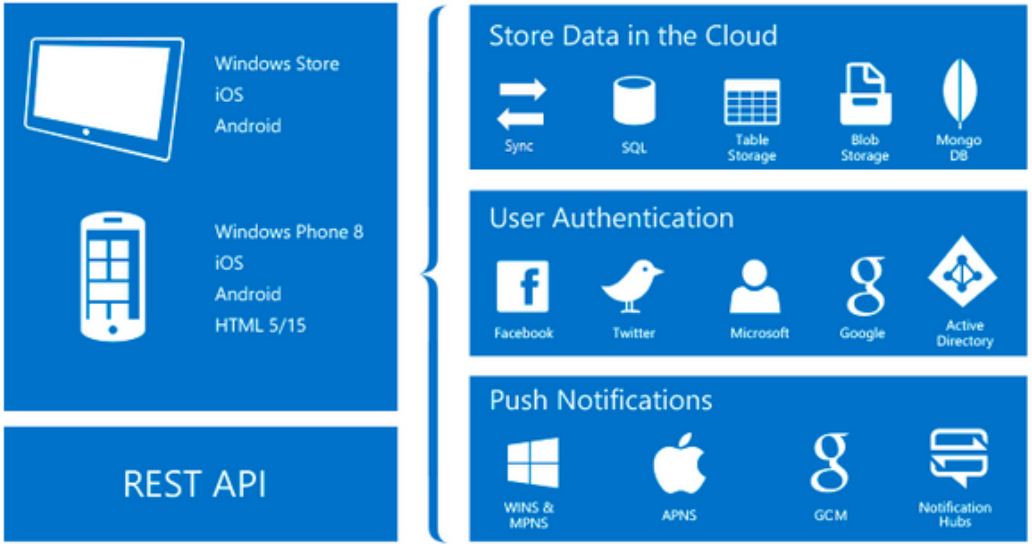


[https://learn.microsoft.com/en-us/azure/developer/mobile-apps/azure-mobile-apps/overview]

Microsoft Azure

App Services | Mobile Apps

- **Build native and cross platform apps** - whether you're building native iOS, Android, and Windows apps or cross-platform Xamarin or Cordova (Phonegap) apps, you can take advantage of App Service using native SDKs.
- **Connect to your enterprise systems** - with Mobile Apps you can add corporate sign on in minutes, and connect to your enterprise on-premises or cloud resources.
- **Build offline-ready apps with data sync** - make your mobile workforce productive by building apps that work offline and use Mobile Apps to sync data in the background when connectivity is present with any of your enterprise data sources or SaaS APIs.
- **Push Notifications to millions in seconds** - engage your customers with instant push notifications on any device, personalized to their needs, sent when the time is right.



[www.windowsazure.com]

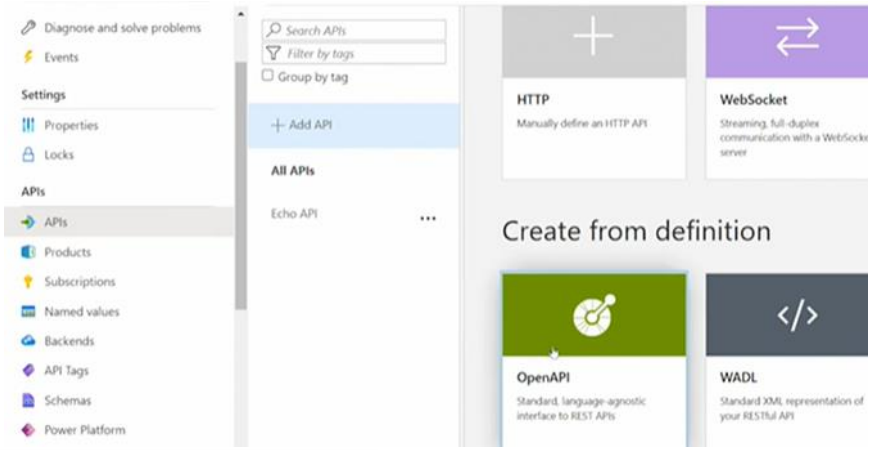
Microsoft Azure

API Applications (API Apps)

– web components hosted on a web server

- have a programmatic interface that can be used by other applications
- An API app run in the App Service (provision of a service plan, adding app service to the plan)
  - API app can be developed in any technology (see Lab 1-4) in order to develop a REST API
  - Extra Features: Swagger – to document the API interface
  - Azure App Service offer CORS

Azure API Management **-** offers support to companies that expose services (public or internal) in the form of APIs in the form of an API proxy ensuring caching, throttling, access control, etc.



Microsoft Azure

Azure API Management

Figure 1: Magic Quadrant for Full Life Cycle API Management

Source: Gartner (September 2021)

[https://idcdocserv.com/download/US48618721.pdf]

Microsoft was recognized by Gartner as a Leader in the 2021 Magic Quadrant for Full Life Cycle API Management

Microsoft Azure

	Azure Web Apps	Cloud Services
Supported Platforms	Support for ASP.NET, Node.js, Java, PHP, or Python	Support for Java, Node.js, PHP, Python, .NET and Ruby
URL	<AppName>.AzureWebSites.Net	<CloudServiceName>.CloudApp.Net
DevOps	Supports CI, CD using Visual Studio Team Services, GitHub or BitBucket.	Supports CI, CD using Visual Studio Team Services, GitHub or BitBucket.
Support for Multi-Tier architecture	Yes	Yes
Swap build between staging and production environment	Yes (free)	Yes (additional cost)
Access to server desktop	No control	Some control
Webserver maintenance	Not required, Azure does OS patching and other activities.	Not required, Azure does OS patching and other activities.
Visual studio integration	Yes	Yes
Access to other services like storage, service bus	Yes	Yes
Configure Start-Up tasks	No (must use WebJob)	Yes

	Azure Web Apps	Cloud Services
Deployment time	Fast	Very Slow
Multiple applications on same servers	Yes	No
Scale up without redeploy	Yes	No
Auto-scaling	Yes	Yes

[https://stackify.com/comparison-azure-app-services-vs-cloud-services/]

Microsoft Azure| Code and Workflows

Functions

Process events with serverless code

Azure Functions is a serverless compute service that enables you to run code on-demand without having to explicitly provision or manage infrastructure. Use Azure Functions to run a script or piece of code in response to a variety of events.

- **Abstraction of servers**: Serverless computing abstracts the servers you run on

- **Event-driven scale**: Serverless computing is an excellent fit for workloads that respond to incoming events. Events include triggers by:
  - Timers, for example, if a function needs to run every day at 10:00 AM UTC.
  - HTTP, for example, API and webhook scenarios.
  - Queues, for example, with order processing.

- **Micro-billing**: Traditional computing bills for a block of time like paying a monthly or annual rate for website hosting. This method of billing is convenient but isn't always cost effective. Even if a customer's website gets only one hit a day, they still pay for a full day's worth of availability. With serverless computing, they pay only for the time their code runs. If no active function executions occur, they're not charged. For example, if the code runs once a day for two minutes, they're charged for one execution and two minutes of computing time.

[https://azure.microsoft.com/en-gb/products/functions]

Microsoft Azure| Code and Workflows

Azure has two implementations of serverless compute:

- **Azure Functions**: Functions can execute code in almost any modern language.
- **Azure Logic Apps**: Logic apps are designed in a web-based designer and can execute logic triggered by Azure services without writing any code.

Logic Apps or Functions?……(see next slides)

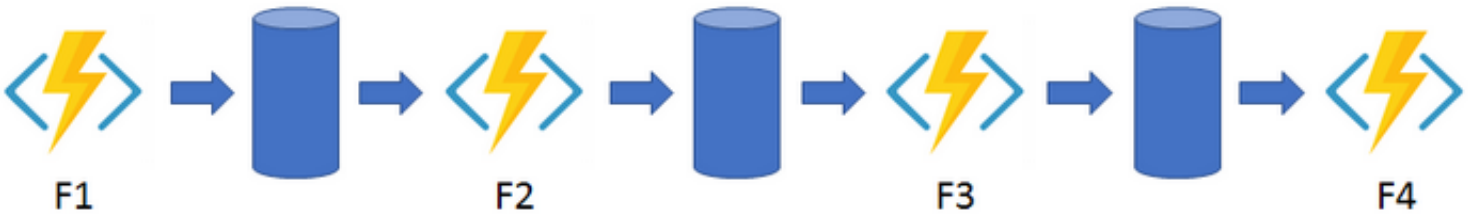
Durable Functions

Durable Functions is an extension of Azure Functions that lets you write stateful functions in a serverless compute environment.

Behind the scenes, the extension manages state, checkpoints, and restarts for you, allowing you to focus on your business logic.

Pattern #1: Function chaining

In the function chaining pattern, a sequence of functions executes in a specific order. In this pattern, the output of one function is applied to the input of another function.



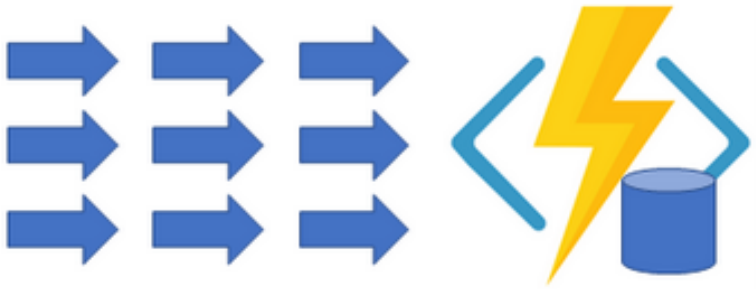
[https://docs.microsoft.com/en-us/azure/azure-functions/durable/durable-functions-overview?tabs=csharp]

Microsoft Azure| Code and Workflows

Durable Functions

Pattern #6: Aggregator (stateful entities)

The sixth pattern is about aggregating event data over a period of time into a single, addressable *entity*. In this pattern, the data being aggregated may come from multiple sources, may be delivered in batches, or may be scattered over long-periods of time. The aggregator might need to take action on event data as it arrives, and external clients may need to query the aggregated data.



The tricky thing about trying to implement this pattern with normal, stateless functions is that concurrency control becomes a huge challenge. Not only do you need to worry about multiple threads modifying the same data at the same time, you also need to worry about ensuring that the aggregator only runs on a single VM at a time.

You can use Durable entities to easily implement this pattern as a single function.

[https://docs.microsoft.com/en-us/azure/azure-functions/durable/durable-functions-overview?tabs=csharp]

Microsoft Azure| Code and Workflows

Azure Logic Apps

- Assure creating logic app workflows by using a visual designer on the Azure portal or in Visual Studio. The workflows are persisted as a JSON file with a known workflow schema.
- Azure provides more than 200 different connectors and processing blocks to interact with different services

Quickly build powerful integration solutions

- Create business processes and workflows visually
- Integrate with your SaaS and enterprise applications
- Unlock value from on-premises and cloud applications
- Automate EAI, B2B, and business processes
- Take advantage of the Microsoft Cloud to enhance your integration solutions

Microsoft Azure| Code and Workflows

Functions versus Logic Apps

	Functions	Logic Apps
State	Normally stateless, but Durable Functions provide state.	Stateful.
Development	Code-first (imperative).	Designer-first (declarative).
Connectivity	About a dozen built-in binding types. Write code for custom bindings.	Large collection of connectors. Enterprise Integration Pack for B2B scenarios. Build custom connectors.
Actions	Each activity is an Azure function. Write code for activity functions.	Large collection of ready-made actions.
Monitoring	Azure Application Insights.	Azure portal, Log Analytics.
Management	REST API, Visual Studio.	Azure portal, REST API, PowerShell, Visual Studio.
Execution context	Can run locally or in the cloud.	Runs only in the cloud.

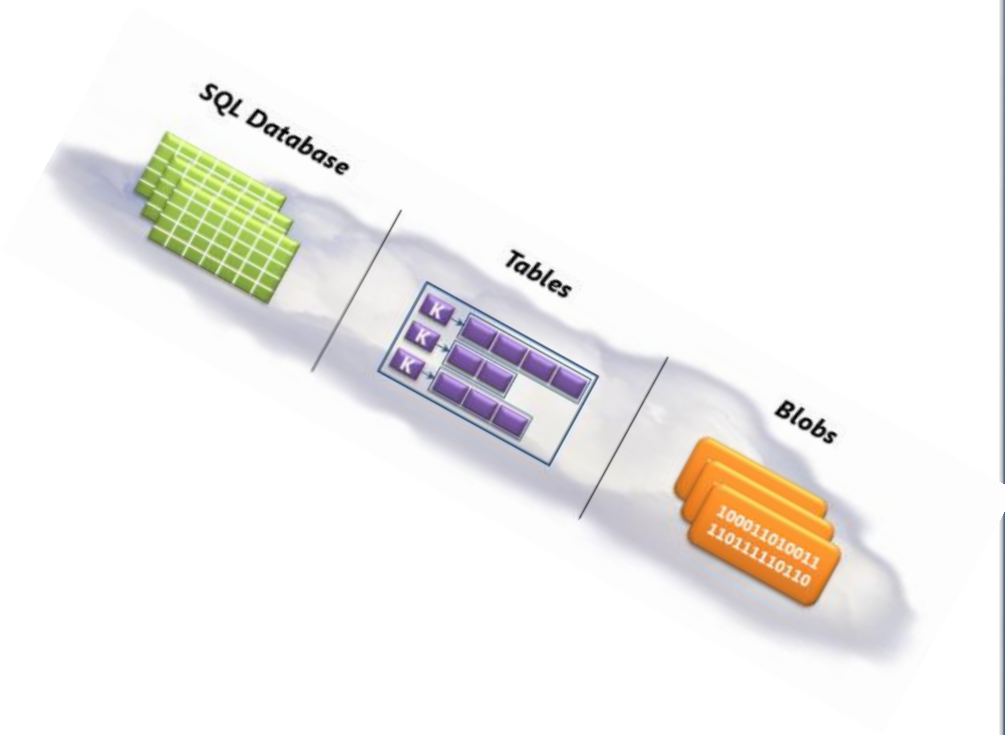
….running on Azure Arc-enabled Kubernetes, you can also extend these workflows outside of Azure, onto on-premises servers and other clouds, maintaining some of the cloud advantages

Microsoft Azure

Storage

- Provides a storage mechanism for huge amounts of data
  - Data is stored in server farms (geographies/regions)
- It is massively scalable
  - Data can be distributed across multiple nodes
  - Access to data is controlled by load-balancing mechanisms
- It provides a reliable persistence mechanism
  - The data is replicated on different storage nodes (3 replications), located in different data centers
  - The storage account is the entry point for all storage services (the storage account can be created using e.g. the Azure Portal)
- Windows Azure storage can be accessed by a Windows Azure application, an on-premise application or an application running in another cloud
  - All Azure storage styles use REST conventions for identifying and exposing data (blobs, Queue, File Storage, ... are named using URIs and accessed via HTTP verbs)
- Data is encrypted at rest
- Access is protected by authentication and authorization

Microsoft Azure



Azure Storage – Core Services

- *Blobs*
- *Disk*
- *File*
- *Table Storage*
- *Queues*

It solves different needs: from access to relational databases, to fast access to large amounts of data with simple types, to unstructured binary storage,...

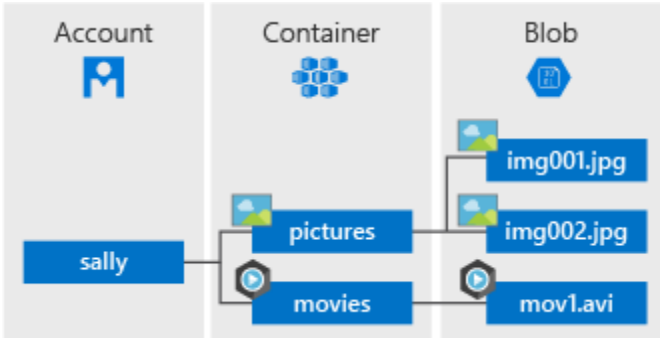
"Massively Scalable
Durable storage
Highly Available
Secure"

Supported Data Types

- Structured data
- Semi-structured data
- Unstructured data

[www.windowsazure.com]

Microsoft Azure

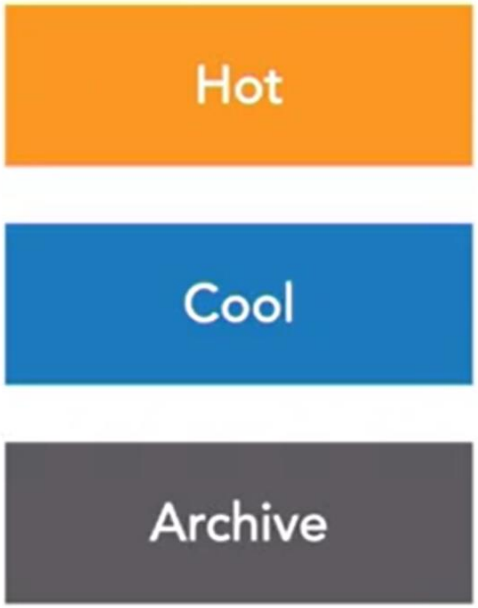


Storage

- ***Blobs***
  - Contains unstructured binary data
  - A storage account can have one or more containers, each holding one or more blobs
  - Can be large (aprox 190.7TB)
  - They can have metadata associated with them

  Usage scenarios:
  - Applications that need an inexpensive storage mechanism for resources such as: video or large files, backups
  - Often used in conjunction with CDN

Microsoft Azure



Storage | Blobs

- Storage Tiers
  - **Hot** Tiers(default when a storage account is created)
    - Data that is frequently accessed
    - *Highest-storage costs*
    - *Lowest-access costs*
  - ***Cool*** *Storage Tier*
    - Optimized for data that is not accessed so often (~30 days) – infrequent access
    - *Ex:* short-term backups
    - *Lower-storage costs*
    - *Higher-access costs*
  - ***Archive*** *Storage Tier*
    - Data not accessed for more than 180 days (rare access)
    - Data is stored offline
    - *High-retrieval latency (~hours or days); low-storage costs; highest costs to rehydrate and access data;*

Microsoft Azure

Storage

- ***Disk Storage***
  - Provides persistent storage for *Azure Virtual Machines (.vhd images)*
  - Types:
    - *Operating Systems disks*
    - *Data disks*
      - They can be attached to virtual machines for data storage


OS disk

NAME	SIZE	STORAGE ACCOUNT TYPE	ENCRYPTION
Win10_OsDisk_1_aaa04c6c9ad14f0a9a11ee204d61bd33	127 GiB	Standard HDD	Not enabled

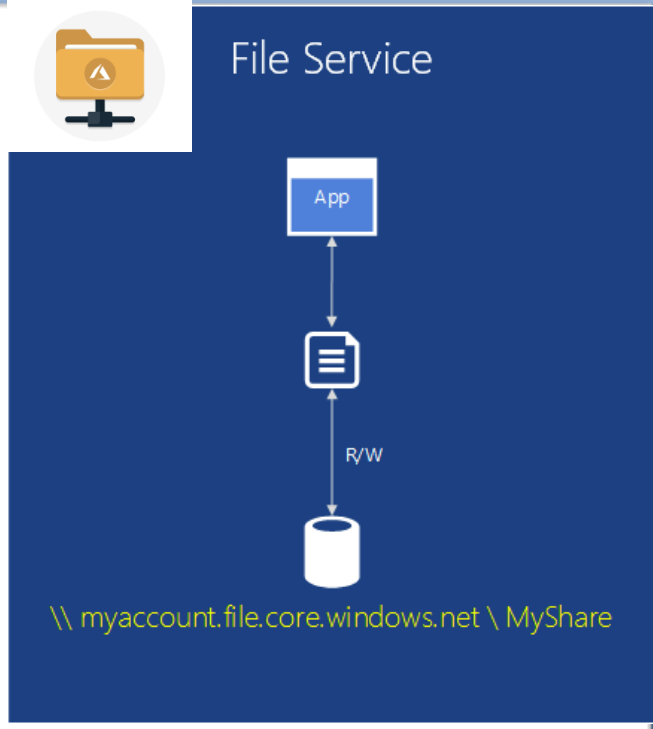
Data disks

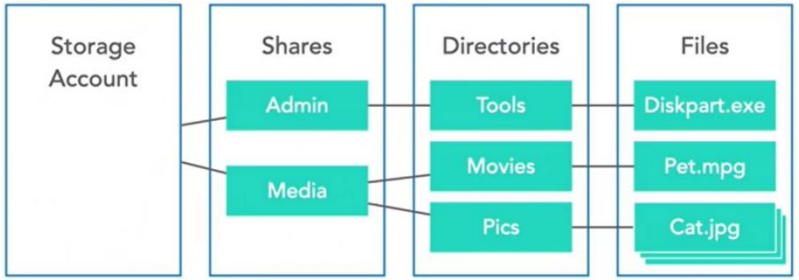
LUN	NAME	SIZE	STORAGE ACCOUNT TYPE	ENCRYPTION
0	Data	1023 GiB	Standard HDD	Not enabled

Microsoft Azure

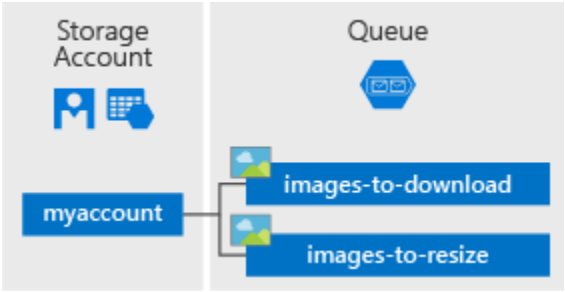
Storage

- ***Azure File Service***
  - Built on top of Server Message Block (SMB) => availability, durability, geo-redundancy
  - Allows file sharing between VMs by calling an API similar to the file system: ReadFile, WriteFile;
  - REST queries are also allowed, which allow queries on shared on-premises files (Each file has a URL endpoint)
  - Useful for lift and shift an application to the cloud, which already uses the native file system APIs to share data between it and other applications running in Azure





Microsoft Azure



Storage

- ***Queues***

Azure Queue storage is a service for storing large numbers of messages that can be accessed from anywhere in the world via authenticated calls using HTTP or HTTPS. A single queue message can be up to 64 KB in size, and a queue can contain millions of messages, up to the total capacity limit of a storage account.

  - Ex: a way for Web Roles instances to communicate asynchronously with Worker role instances
  - Example of use: we have a video-sharing application. The PHP code runs in a web role that allows uploading and viewing videos. The application also has a worker role implemented in C# that does the conversion in various formats.

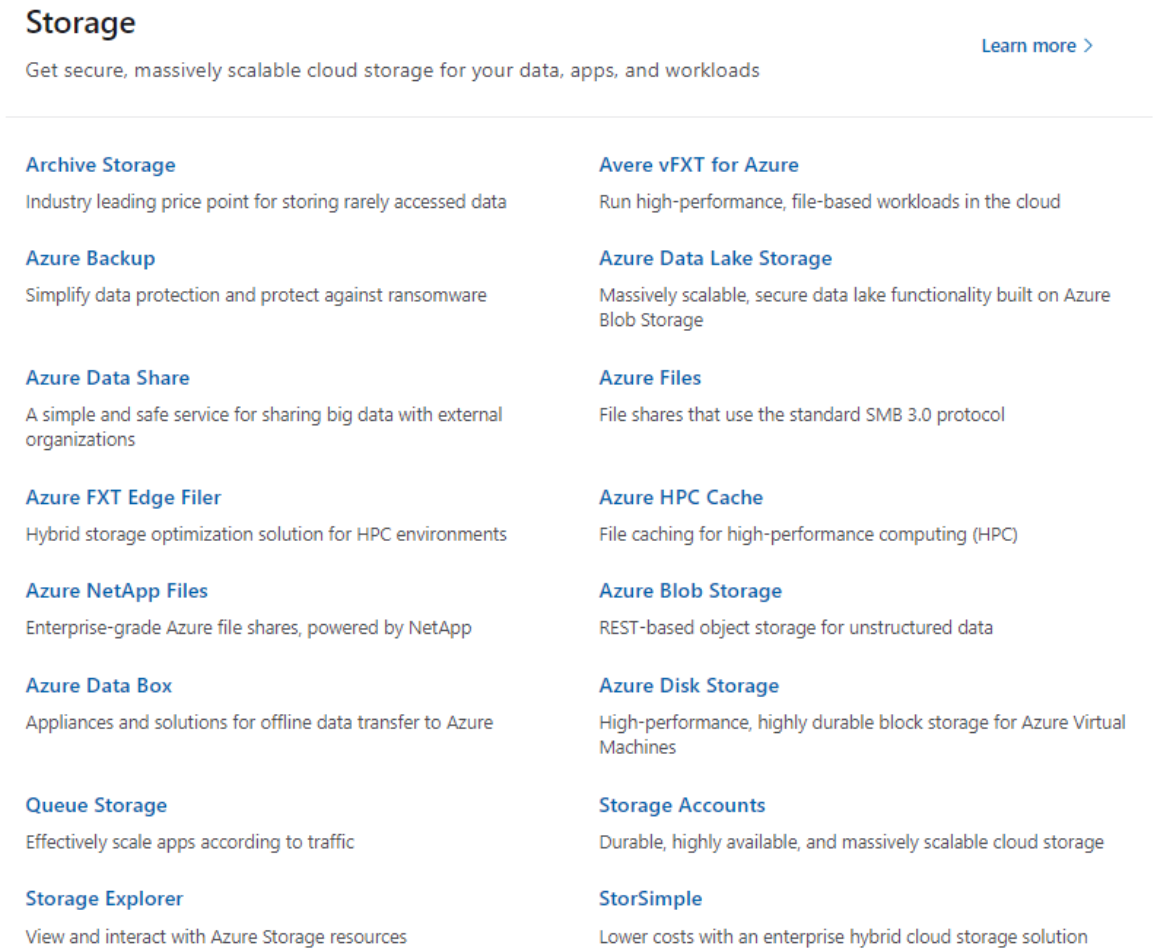
  When a web role instance receives a video from a user, it stores it in a blob and sends a message to a worker role with where it can find the new resource.

  It reads the message from the queue and does the processing in the background => asynchronous processing allows the scalability of the application (the number of a web role and worker role instances may vary)

[www.windowsazure.com]

Microsoft Azure

Storage



Storage

Get secure, massively scalable cloud storage for your data, apps, and workloads

Learn more >

Archive Storage
Industry leading price point for storing rarely accessed data

Avere vFXT for Azure
Run high-performance, file-based workloads in the cloud

Azure Backup
Simplify data protection and protect against ransomware

Azure Data Lake Storage
Massively scalable, secure data lake functionality built on Azure Blob Storage

Azure Data Share
A simple and safe service for sharing big data with external organizations

Azure Files
File shares that use the standard SMB 3.0 protocol

Azure FXT Edge Filer
Hybrid storage optimization solution for HPC environments

Azure HPC Cache
File caching for high-performance computing (HPC)

Azure NetApp Files
Enterprise-grade Azure file shares, powered by NetApp

Azure Blob Storage
REST-based object storage for unstructured data

Azure Data Box
Appliances and solutions for offline data transfer to Azure

Azure Disk Storage
High-performance, highly durable block storage for Azure Virtual Machines

Queue Storage
Effectively scale apps according to traffic

Storage Accounts
Durable, highly available, and massively scalable cloud storage

Storage Explorer
View and interact with Azure Storage resources

StorSimple
Lower costs with an enterprise hybrid cloud storage solution

StorSimple Documentation

Learn how to use Azure StorSimple, an integrated storage solution that manages storage tasks between on-premises devices and Azure cloud storage. Tutorials and other documentation show you how set up storage management, location-independent backup, and disaster recovery.

Data Lake Store Documentation

Learn how to use Data Lake Store to create a hyper-scale, Hadoop-compatible repository for analytics on data of any size, type, and ingestion speed. Tutorials, API references, and other documentation show you how to set up, manage, and access a data lake repository for operational and exploratory analytics.

Microsoft Azure

Databases

Databases

Support rapid growth and innovate faster with secure, enterprise-grade, and fully managed database services

Learn more >

Azure API for FHIR

Easily create and deploy a FHIR service for health data solutions and interoperability

(Fast Healthcare Interoperability Resources)

Azure Cache for Redis

Accelerate applications with high-throughput, low-latency data caching

Azure Cosmos DB

Fast NoSQL database with open APIs for any scale

Azure Database for MariaDB

Managed MariaDB database service for app developers

Azure Database for MySQL

Fully managed, scalable MySQL Database

Azure Database for PostgreSQL

Fully managed, intelligent, and scalable PostgreSQL

Azure Database Migration Service

Simplify on-premises database migration to the cloud

Azure SQL

Managed, always up-to-date SQL instance in the cloud

Azure SQL Database

Managed, intelligent SQL in the cloud

Azure SQL Edge

Consume Services privately on Azure Platform

Azure SQL Managed Instance

Managed, always up-to-date SQL instance in the cloud

SQL Server on Virtual Machines

Host enterprise SQL Server apps in the cloud

Table Storage

NoSQL key-value store using semi-structured datasets

Azure Managed Instance for Apache Cassandra PREVIEW

Cloud Cassandra with flexibility, control, and scale

https://azure.microsoft.com/en-us/services/#databases

Microsoft Azure

Databases

- ***SQL Database***
  - It is a relational database that is offered as a cloud service
  - It provides the same specific features of SQL Server running *on-premise* (atomic transactions, concurrent data access, integrity assurance)
  - Former name: SQL Azure
  - Accessing can be done using: Entity Framework, ADO.NET, JDBC, etc.
  - It is a PaaS service
    - The developer controls the data, access to it, replication, restoring point - in-time
    - Sql Database manages the hardware infrastructure, updates
  - It offers the option of federation: data distribution on multiple servers => increased performance

Microsoft Azure

Databases

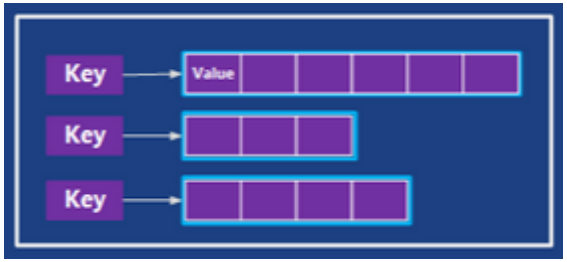
*2017 – DocumentDB (*e.g. NuGet package*), included in =>* ***2018 Azure Cosmos DB***

- Advantages:
  - ***Elastically scalable throughput and storage***
  - ***Ad hoc queries with familiar SQL syntax***
  - ***Fully managed***
  - ***Open by design***
- *"Application scenarios may include user data for interactive web, mobile, and gaming applications as well as storage, retrieval, and processing of IoT device generated JSON data. A database can store any volume of JSON documents, as DocumentDB is well suited for applications that run at scale on the internet."*

data - ensuring that 99% of your reads are served under 10 milliseconds and 99% of your writes are served under 15 milliseconds. These unique benefits make DocumentDB a great fit for web, mobile, gaming, and IoT, and many other applications that need seamless scale and global replication.

[https://docs.microsoft.com/en-us/azure/documentdb/documentdb-introduction]

Microsoft Azure



Databases

- ***Tables*** *included in* Azure Cosmos DB Table API (2018)
  - They are not relational database tables
  - Provides (semi-) data structuring
  - They contain a set of entities, which contain sets of properties of different types (string, integer, data, etc.). An application can obtain a group of properties by providing a unique key for the entire group.

    ..the NoSQL approach – key/value
  - **Complex operations are not supported** (e.g. complex joins, ...)
  - There is no fixed scheme, entities can have different structures
  - Ensure scale-out storage (scaling by spreading data on several machines)
  - In general, a board contains billions of entities containing terabytes of data

Microsoft Azure

Databases |Azure Cosmos DB

As a solution for **Three Vs**

- Volume: the amount of information stored in the system
- Velocity: refers to the speed requirement for collecting, processing, and using the data
  - E.g. Twitter process 350.000 tweets/minute
- Variety: the increasing array of data types: text, audio, video, image ….satellite images, medical CT scan videos et.al.
  - Modern data doesn't easily fit into a relational schema

[https://azure.microsoft.com/en-us/services/cosmos-db/?v=17.45b]

Microsoft Azure

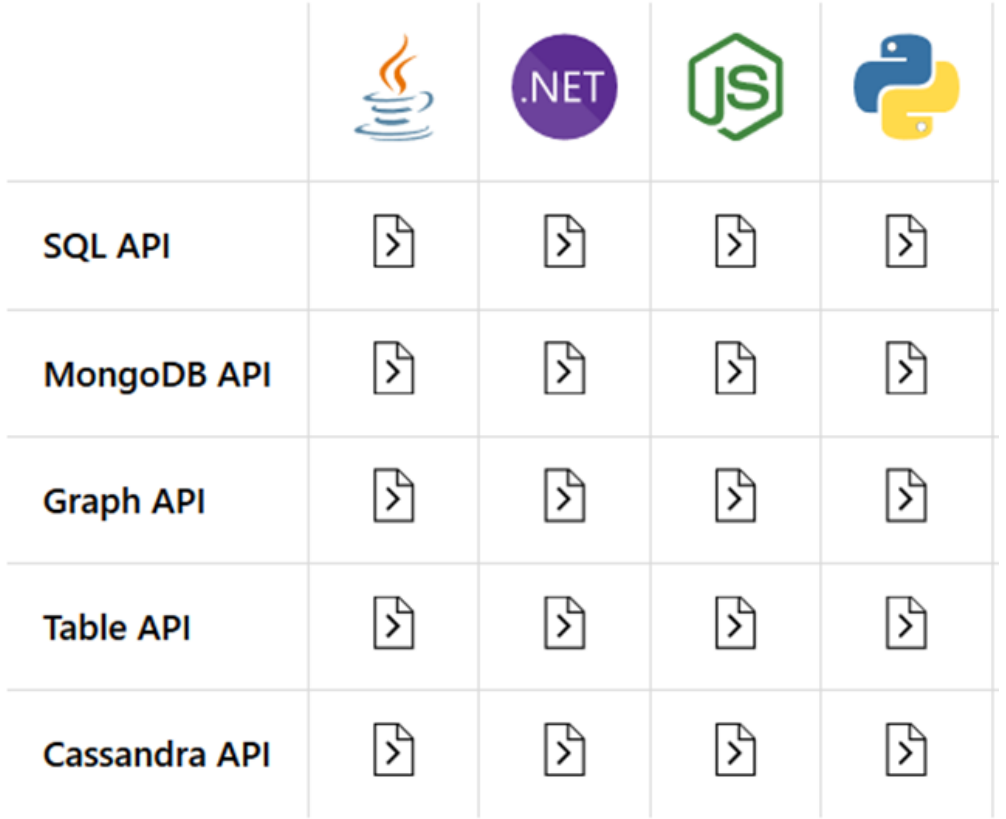
Databases | Azure Cosmos DB

– Microsoft version of a big-data database engine

- A globally distributed multi-model database system
- Vision: planetary scale database

Cosmos DB API

- JSON – use SQL API
- Graph – use Gremlin API
- Key-value – use Table API
- Columnar – use Cassandra API
- Data is stored the same; use the API you like to manipulate the data



[https://azure.microsoft.com/en-us/services/cosmos-db/?v=17.45b]

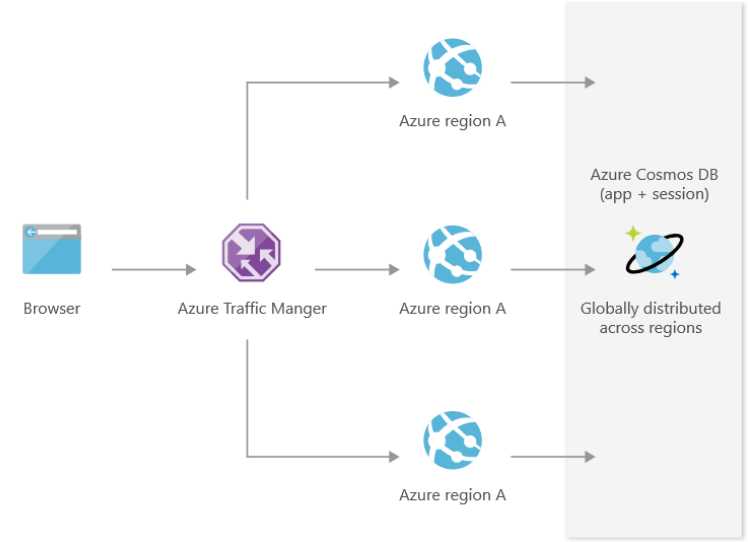
Microsoft Azure

Databases

Azure Cosmos DB| Possible applications

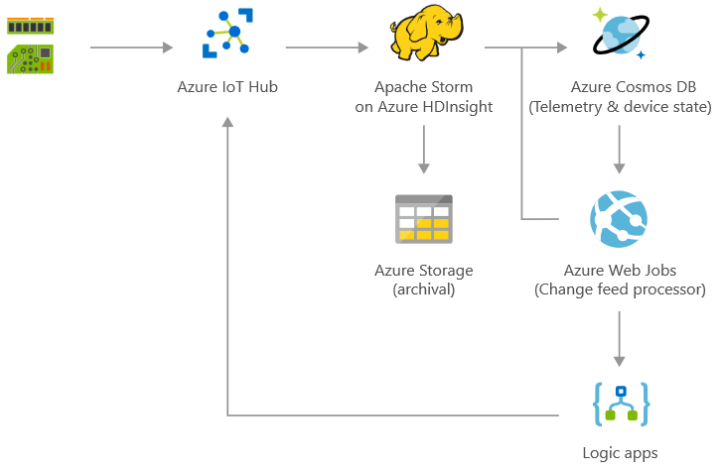
Globally distributed mission-critical applications

Guarantee access to users around the world with the high-availability and low-latency capabilities built into Microsoft's global datacenters.



IoT

Scale instantly and elastically to accommodate diverse and unpredictable IoT workloads without sacrificing ingestion or query performance.



[https://azure.microsoft.com/en-us/services/cosmos-db/?v=17.45b]

Microsoft Azure

Databases

Caching

- Accessing data from memory is faster than accessing data from SQL Databases, tables or Blobs => Azure Caching for Redis
- The cache can be maintained in the same VM as the application or on a dedicated VM
- The cache can be distributed

Azure Redis Cache is available in the following tiers:

- Basic—Single node, multiple sizes, ideal for development/test and non-critical workloads. The basic tier has no SLA.
- Standard—A replicated cache in a two node Primary/Secondary configuration managed by Microsoft, with a high availability SLA.
- Premium—The new Premium tier includes a high availability SLA and all the Standard-tier features and more, such as better performance over Basic or Standard-tier Caches, bigger workloads, disaster recovery, and enhanced security. Additional features include:
  - Redis persistence allows you to persist data stored in Redis cache. You can also take snapshots and back up the data which you can load in case of a failure.
  - Redis cluster automatically shards data across multiple Redis nodes, so you can create workloads of bigger memory sizes (greater than 53 GB) and get better performance.
  - Azure Virtual Network (VNET) deployment provides enhanced security and isolation for your Azure Redis Cache, as well as subnets, access control policies, and other features to further restrict access.

Basic and Standard caches are availabe in sizes up to 53 GB, and Premium caches are available in sizes up to 530 GB with more on request.(<- in 2023)

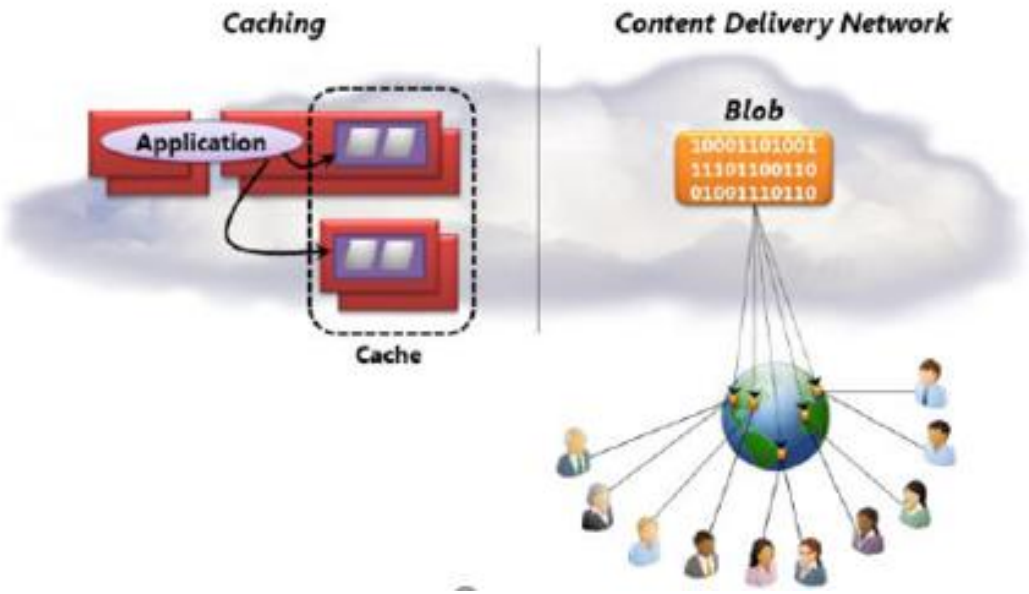
[https://docs.microsoft.com/en-us/azure/redis-cache/cache-premium-tier-intro]

Microsoft Azure

Databases

Caching

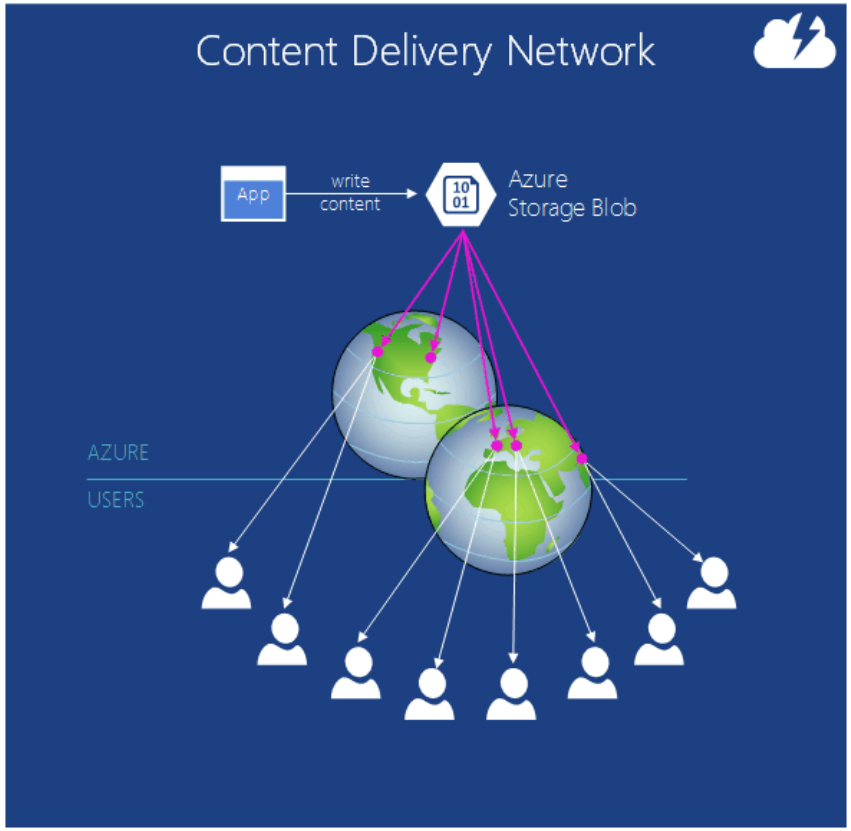
Applications want to access the same information => improving performance is keeping a copy of the data close to the consumer and reducing the time to obtain it

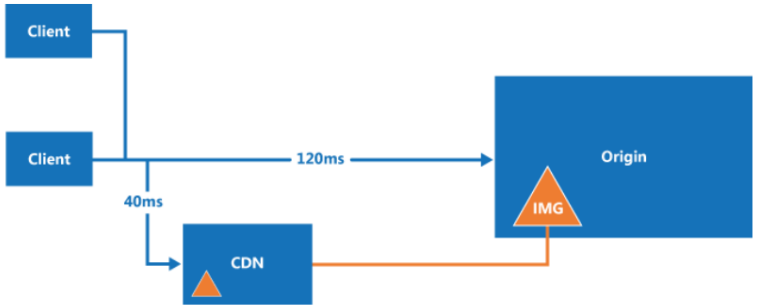


Microsoft Azure

CDN

- When a user accesses the resource from a blob, the information is copied from the Azure datacenter to a CDN storage located in the user's geographic area

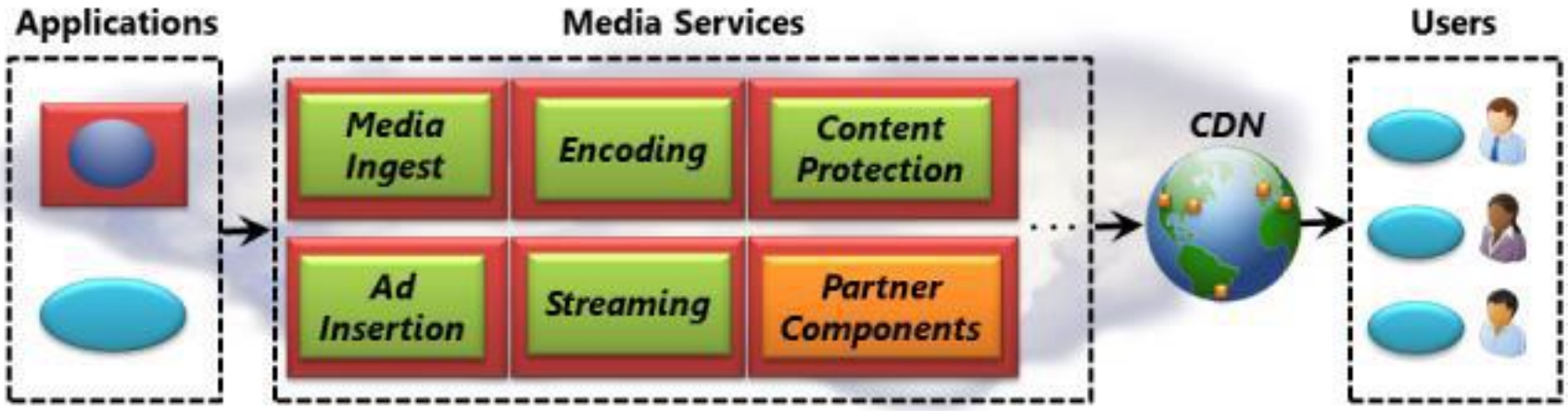




[www.windowsazure.com]

Microsoft Azure

- ***Media Services***
  - Useful for applications that provide video and other media resources to clients
  - ?coding algorithms, the display resolution for customers, the increase no. of users on Saturday night?



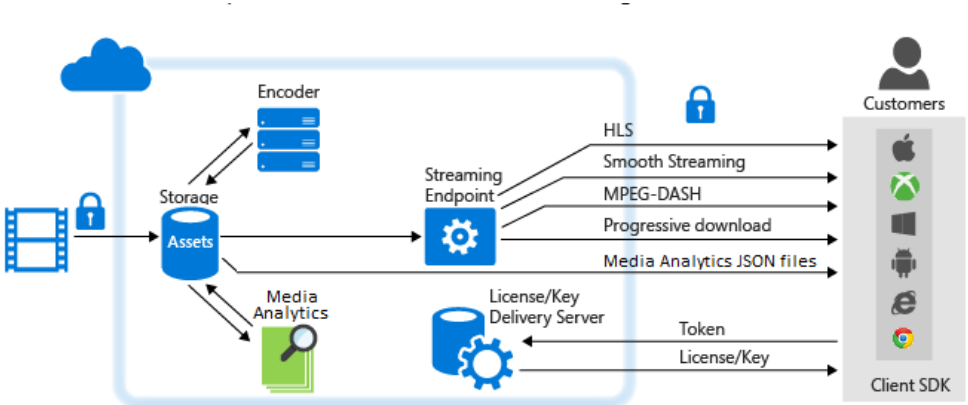
[https://azure.microsoft.com/en-us/products/media-services]

Microsoft Azure

Media Services

To build Media Services solutions, you can use:

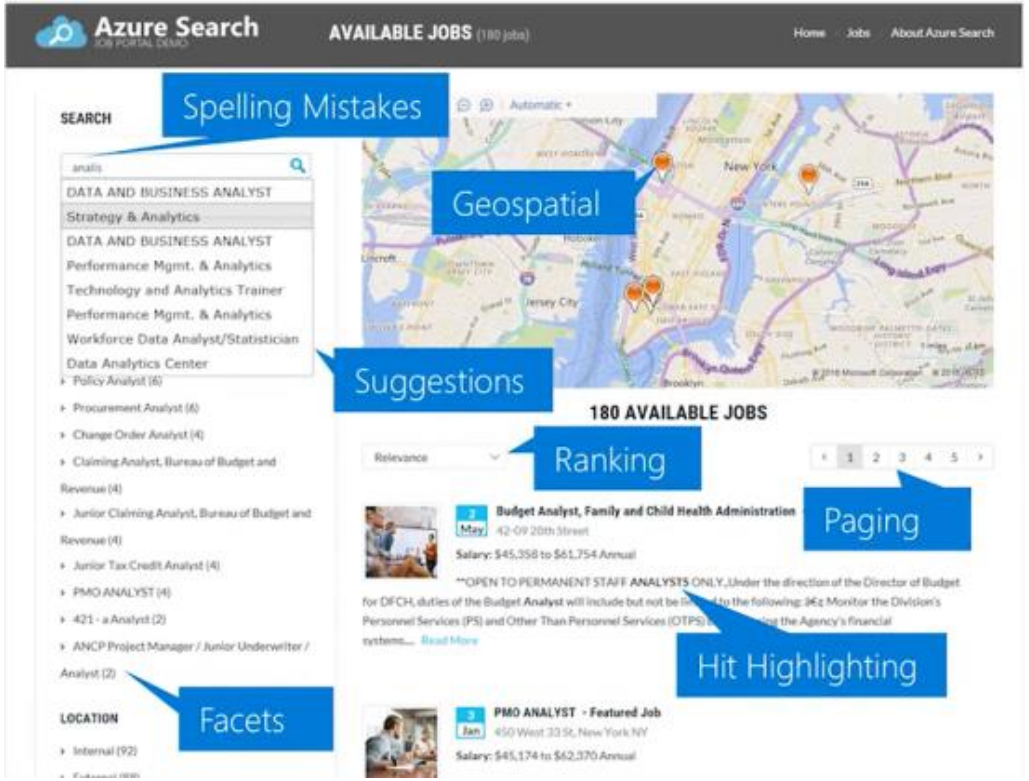
- Media Services REST API
- One of the available client SDKs:
  - Azure Media Services SDK for .NET,
  - Azure SDK for Java,
  - Azure PHP SDK,
  - Azure Media Services for Node.js (This is a non-Microsoft version of a Node.js SDK. It is maintained by a community and currently does not have a 100% coverage of the AMS APIs).
- Existing tools:
  - Azure Classic Portal
  - Azure-Media-Services-Explorer (Azure Media Services Explorer (AMSE) is a Winforms/C# application for Windows)



Microsoft Azure

Uncover latent insights from all your content

Azure Cognitive Search is the cloud search service with built-in AI capabilities that enrich all types of information to help you identify and explore relevant content at scale.



Azure Search Documentation

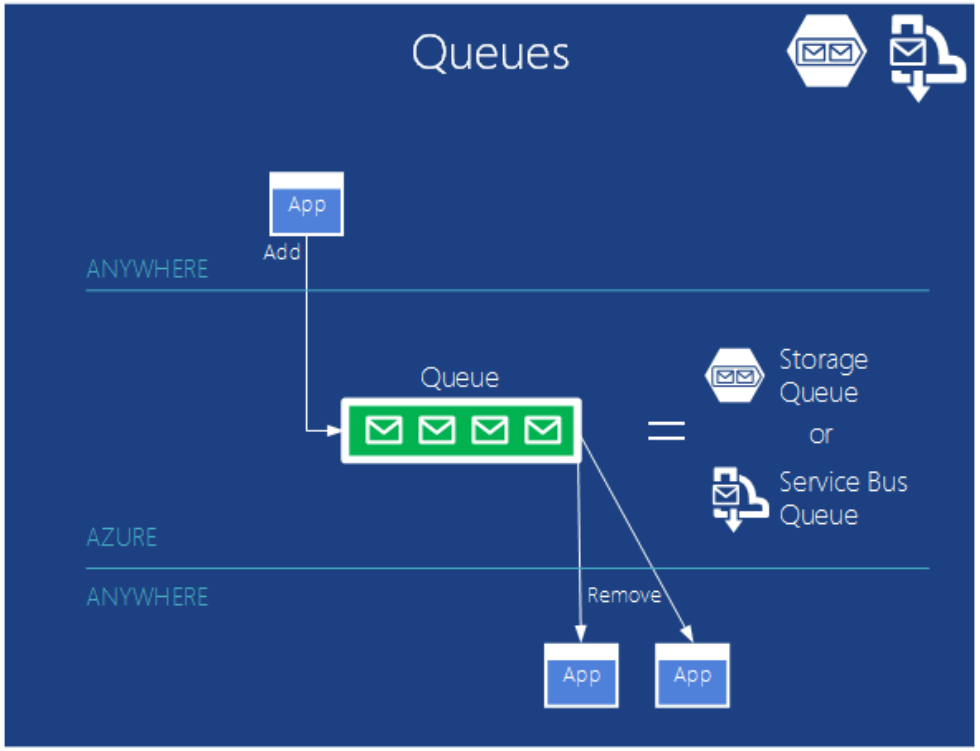
Learn how to create an enterprise search solution over private, heterogenous content using Azure Search. Tutorials, API references, and other docs show you how to consolidate searchable content into a single fast index, queryable using simple-to-advanced syntax for a broad range of scenarios.

[https://azure.microsoft.com/en-us/products/search]

Microsoft Azure

Enterprise Integration

- "code needs to interact with other code"
- For connected applications, Azure offers mechanisms such as: queues, publish/subscribe



[www.windowsazure.com]

Microsoft Azure

Enterprise Integration

- ***Service Bus Queues***
  - It wants to allow applications from "anywhere" to interact in a loosely coupled way
  - Mechanism:

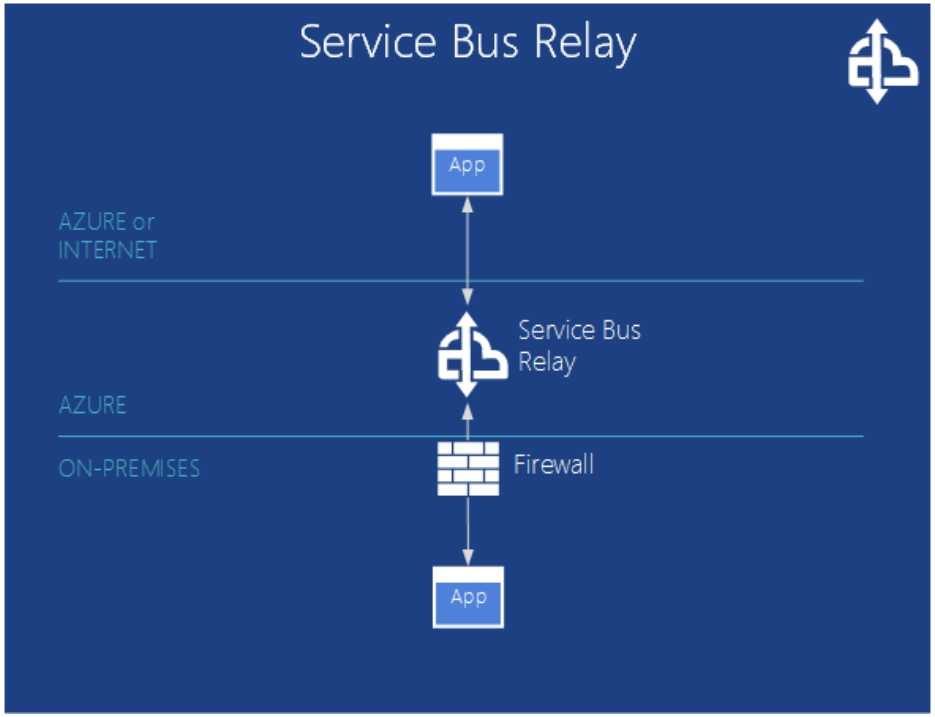
    Service Bus provides a publish-and-subscribe mechanism; an application can send messages to a channel, and other applications can subscribe to that channel => one-to-many communication, the same message can be read by multiple receivers
  - Example: an airline that implements reservation services in its own data center. These services must be exposed to many customers (check-in kiosks in airports, reservation agencies, etc.)

[www.windowsazure.com]

Microsoft Azure

Enterprise Integration

- ***Service Bus Topics –*** it allows applications to post messages and other applications "subscribe" to receive messages that comply with certain criteria
- ***Service Bus Relay –*** it allows communication between applications that are on one side and the other of a firewall



[www.windowsazure.com]

Microsoft Azure | **Networking**

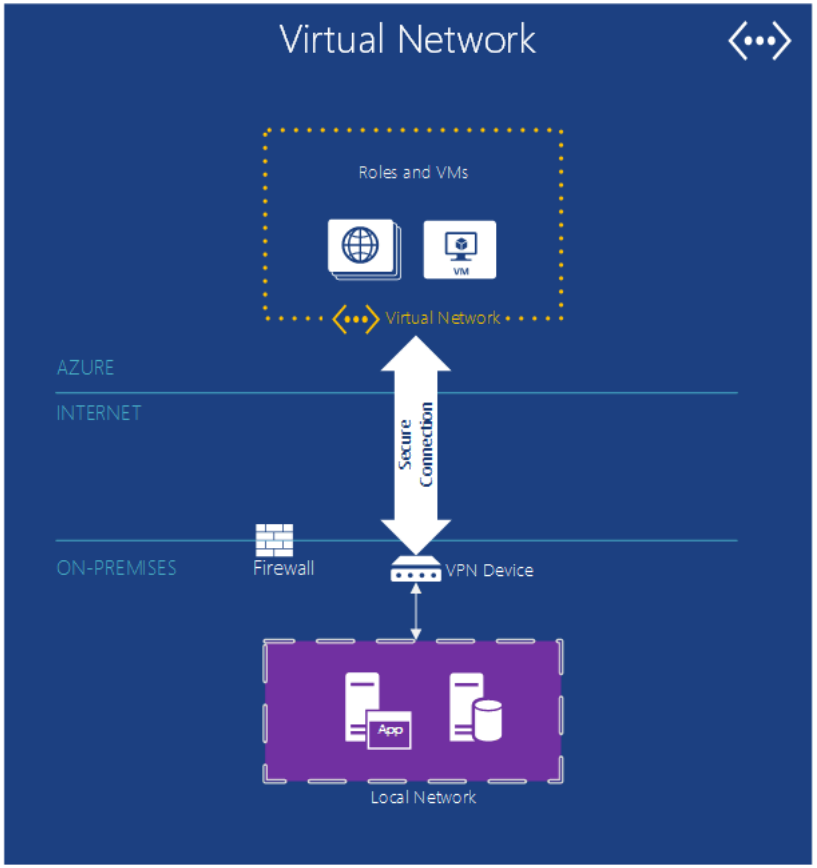
Azure virtual networks enable Azure resources, such as VMs, web apps, and databases, to communicate with each other, with users on the internet, and with your on-premises client computers. You can think of an Azure network as an extension of your on-premises network with resources that links other Azure resources.

[https://docs.microsoft.com/en-gb/learn/modules/azure-networking-fundamentals/azure-virtual-network-settings]

Virtual Network

- Azure VPN Gateway is a service that uses a specific type of virtual network gateway to send encrypted traffic between an Azure virtual network and on-premises locations over the public Internet
- The connectivity is secure and uses the industry-standard protocols Internet Protocol Security (IPsec) and Internet Key Exchange (IKE)

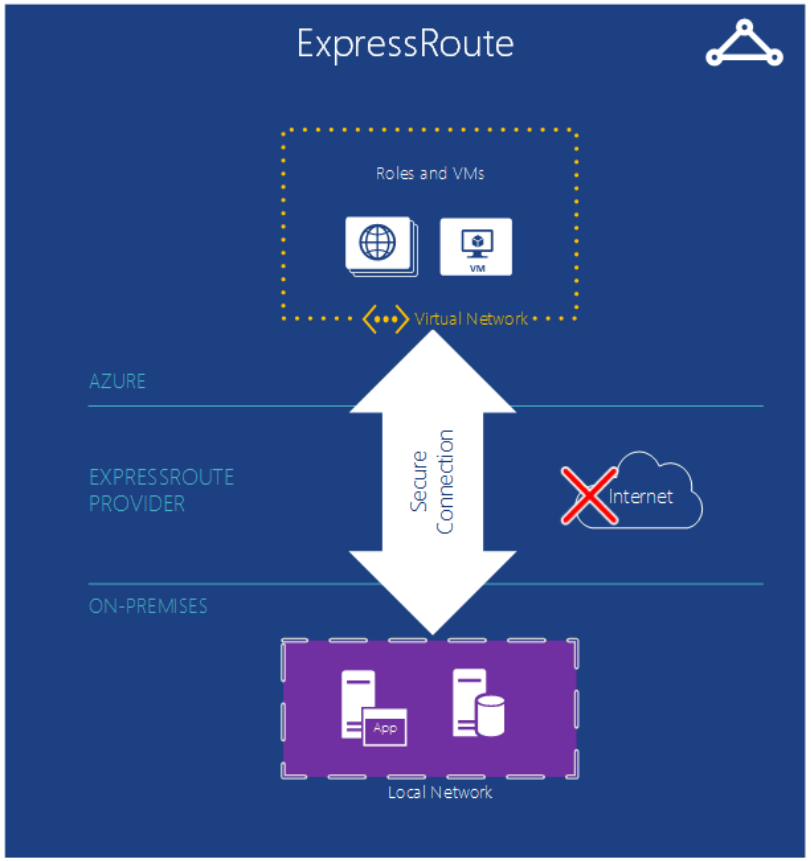
(=> hybrid infrastructure)



Microsoft Azure | **Networking**

Express Route

- provides direct connectivity to Azure cloud services and connects Microsoft's global network.
- Useful for environments where high bandwidth and high level of security are needed
- To use the service we need a contract with a network service provider to have a dedicated connection
- ExpressRoute connections offer reliability, high speed, low latency, and increased security.



[https://docs.microsoft.com/en-gb/learn/modules/azure-networking-fundamentals/express-route-fundamentals]

Microsoft Azure

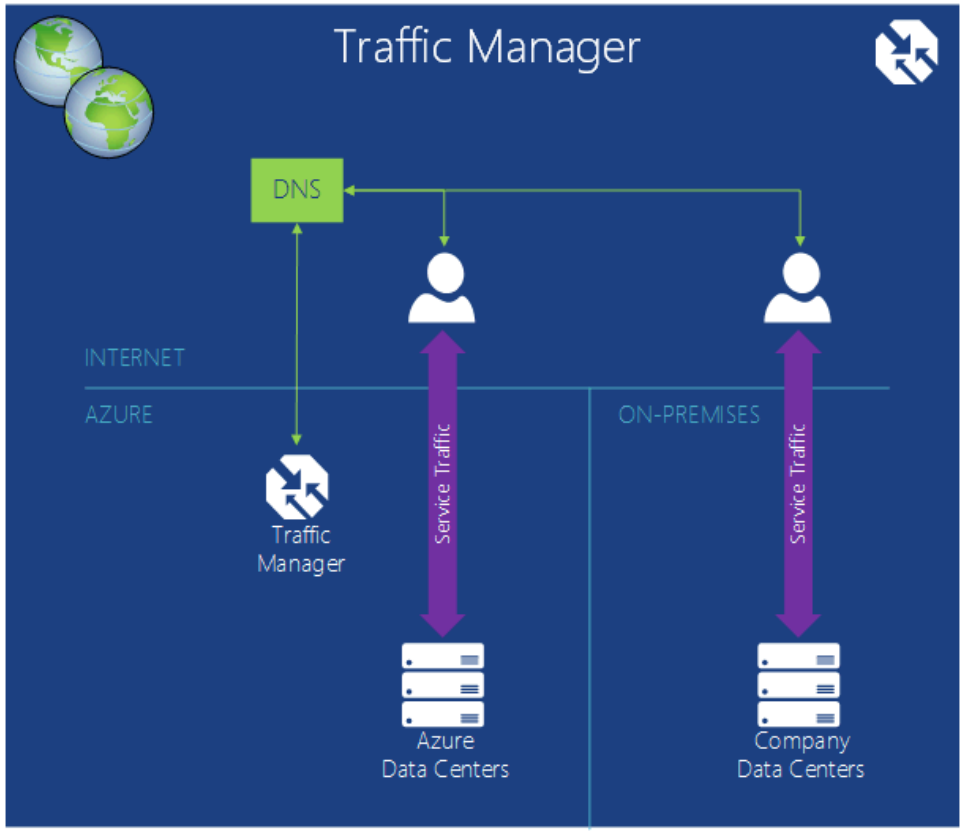
Networking

Traffic Manager

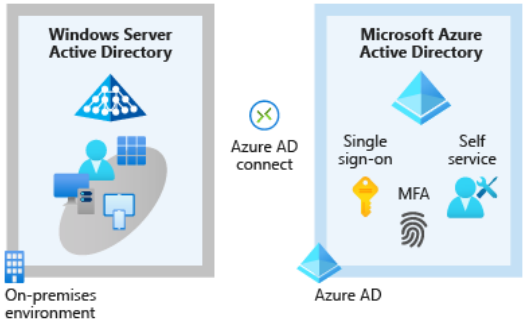
- allows you to distribute traffic to your public-facing applications across the global Azure regions.

Usage scenarios:

- Increased availability and quick responsiveness for critical applications
- The upgrade and maintenance services can be done without "downtime"
- Balanced traffic distribution for complex systems
- Support for A/B (split) testing



Microsoft Azure



Security & Identity

Active Directory

- Windows Azure Active Directory stores information about users and their organizations
- It allows the synchronization of user information with an active directory server running on-premise
- Windows Azure Active Directory provides a Rest API (Windows Azure Active Directory Graph) that allows access to the information held
- Another Windows Azure Active Directory Access Control facility allows an application to accept identity information taken from Facebook, Google, Windows Live ID, etc. Access Control serializes them in a common format
- Access Control allows logins from different Active Directory domains => single sign-on

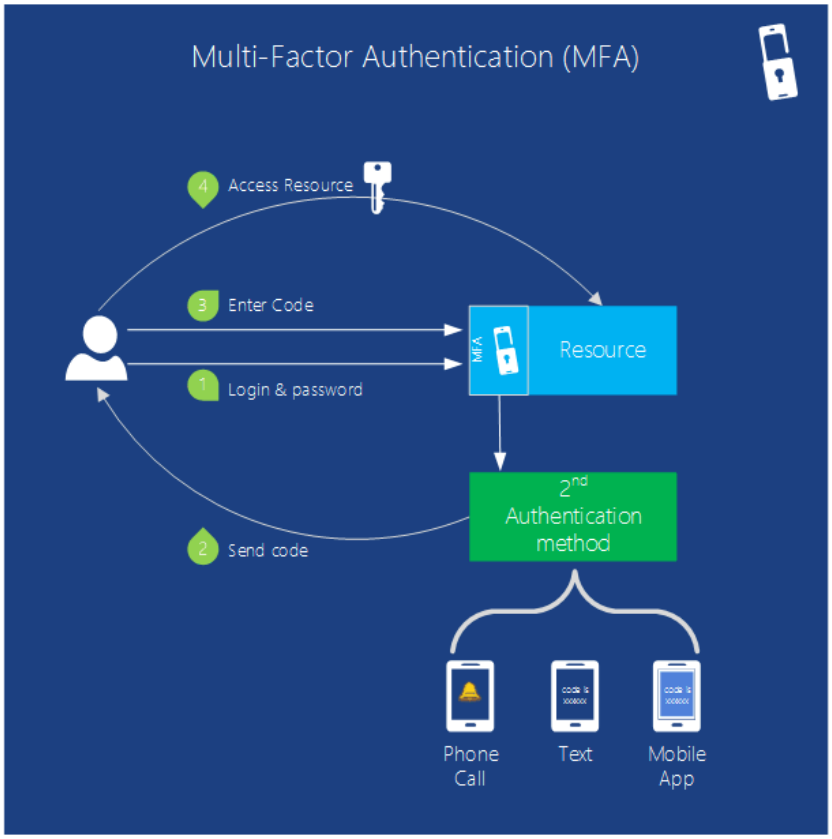
[https://docs.microsoft.com/en-gb/learn/modules/secure-access-azure-identity-services/3-what-is-azure-active-directory]

Microsoft Azure

Security & Identity

Azure AD Multi-Factor Authentication (MFA)

- 2FA - requires multiple methods of identity verification from the user
- Conditional Access is a tool that Azure Active Directory uses to allow (or deny) access to resources based on identity signals. These signals include who the user is, where the user is, and what device the user is requesting access from
- It can use MFA together with Azure AD or with custom applications and directories by using the MFA SDK



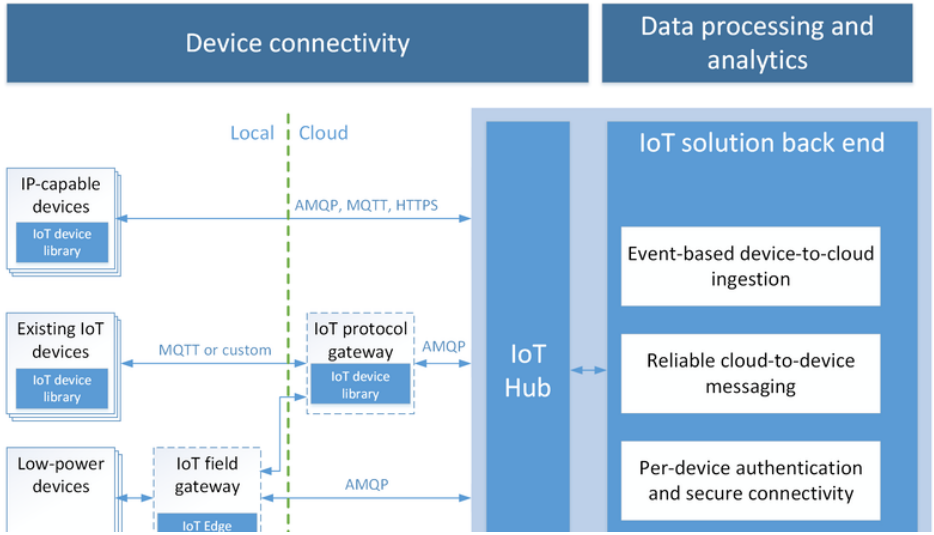
[www.windowsazure.com]

Microsoft Azure

Internet of Things

IoT Hub Documentation

Learn how to use IoT Hub to connect, monitor, and control billions of Internet of Things assets.



Azure IoT Edge

Azure IoT Edge is an Internet of Things (IoT) service that builds on top of IoT Hub. This service is meant for customers who want to analyze data on devices, a.k.a. "at the edge", instead of in the cloud. By moving parts of your workload to the edge, your devices can spend less time sending messages to the cloud and react more quickly to changes in status.

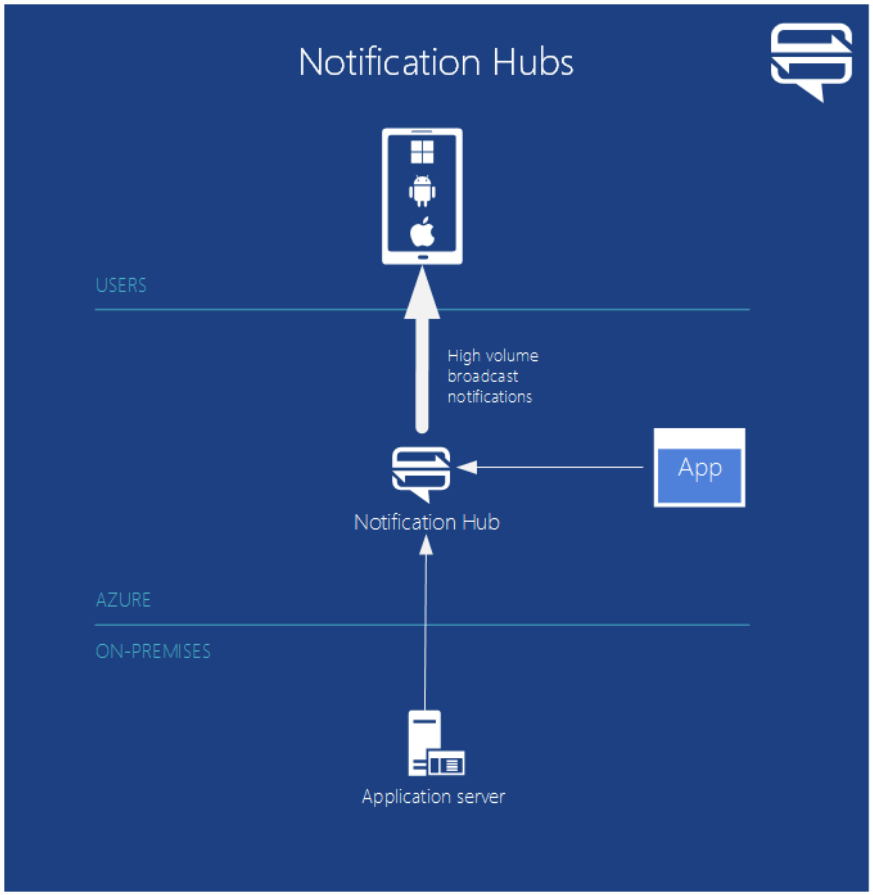
Microsoft Azure

Internet of Things

Notification Hubs

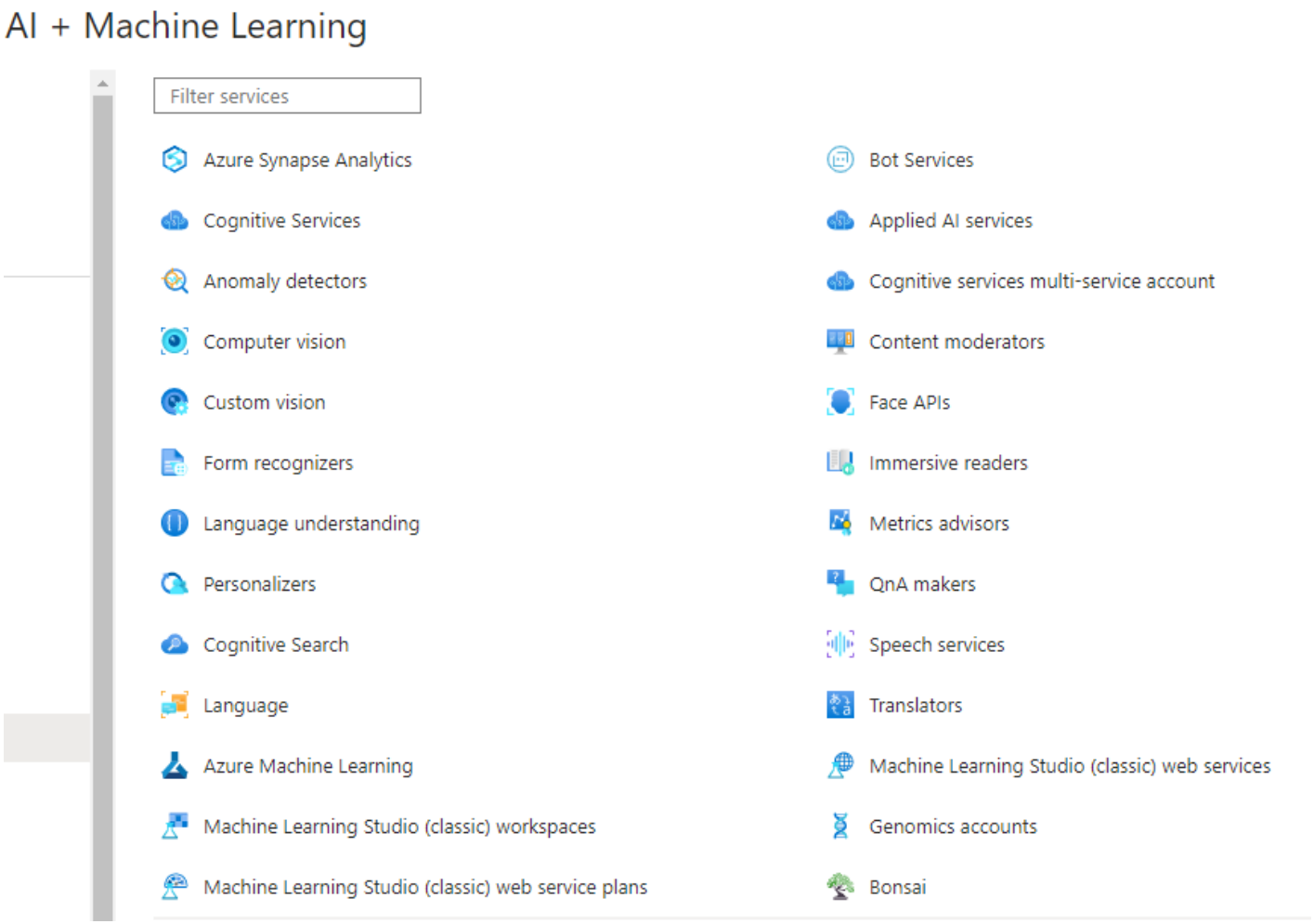
- Service optimized for the broadcast of millions of personalized push notifications
- Usage scenarios:

Breaking news, sports events, product notifications, etc.



Microsoft Azure

AI + Machine Learning

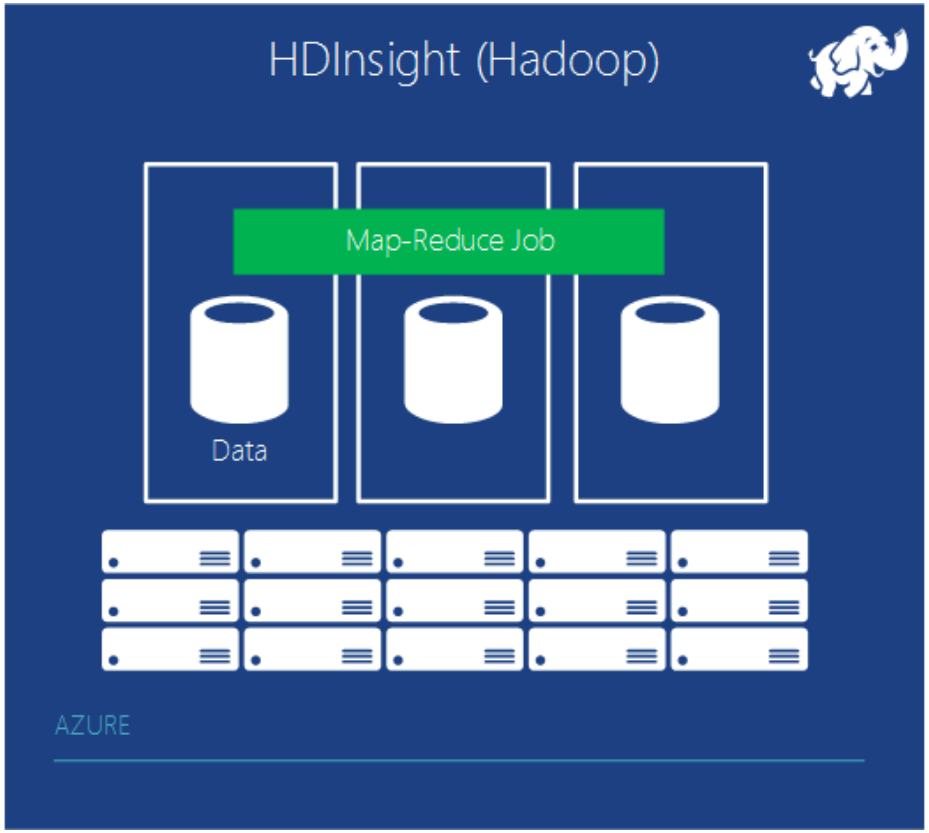


Microsoft Azure

Analytics

- Data analysis is an important aspect of using IT-based mechanisms in the business field (Business Analytics)
- **HDInsight: Hadoop & MapReduce**
  - + Hive, Pig, HiveODBC, DataExplorer
  - Data is stored using

  HDFS

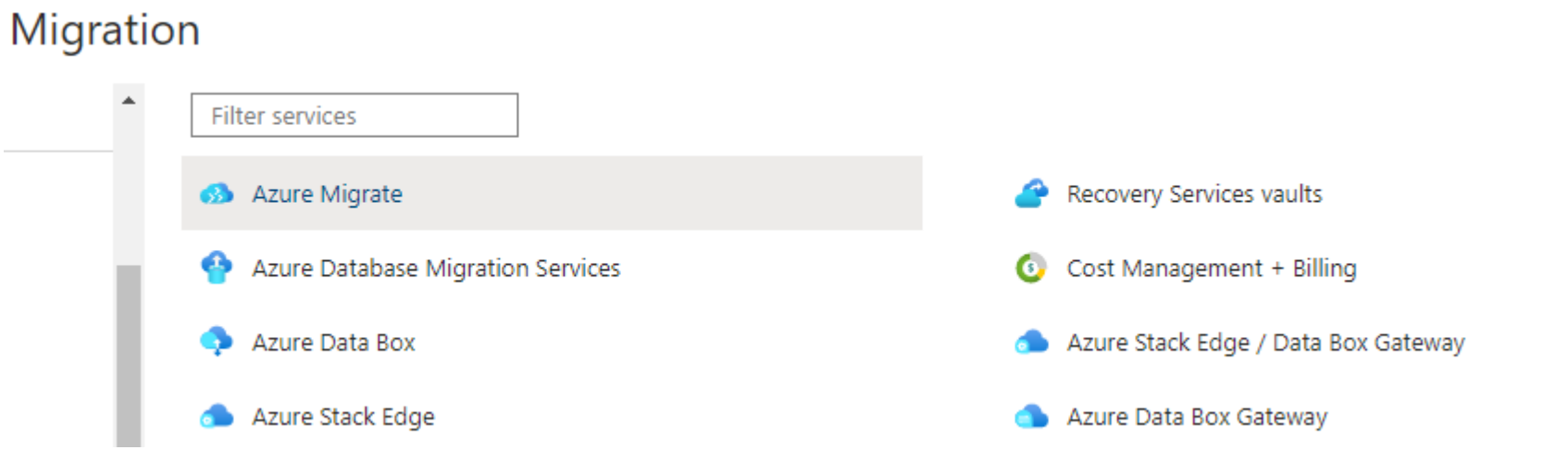


[www.windowsazure.com]

Microsoft Azure

Migration

- Plan your migration path to the cloud for your virtual machines, with Azure migration tools
- Migrate your SQL Server or non-relational databases with SQL Database and Azure Cosmos DB
- Take advantage of App Service, Azure Functions, and Logic Apps to help refactor, re-architect, and rebuild your apps in Azure



[https://azure.microsoft.com/en-gb/free/azure-migrate]

Microsoft Azure

SDKs

- In 2008: doar .Net
- Astazi: .NET, Java, PHP, Node.js, Python,…
- Exista un Windows Azure SDK general care ofera suport de baza pentru orice limbaj (e.g. C++)
- Necesare la crearea de aplicatii Windows Azure, dar si la aplicatii care ruleaza on-premise dar folosesc servicii Azure

Visual Studio Online

- Nu inlocuieste Visual Studio local, dar ofera un control al versiunilor, integrare cu Git, serviciu de *load testing,* Application Insights, ….

Microsoft Azure

Management Tools

Azure Cost Management
Optimize what you spend on the cloud, while maximizing cloud potential

Azure Monitor
Highly granular and real-time monitoring data for any Azure resource

Site Recovery
Orchestrate protection and recovery of private clouds

Log Analytics
Collect, search, and visualize machine data from on-premises and cloud

Backup
Simple and reliable server backup to the cloud

Billing
Learn how to read/understand the usage and bill for your Azure subscription

Azure Advisor
Your personalized Azure best practices recommendation engine

Azure Service Health
Get personalized guidance and support for when issues in Azure services affect you

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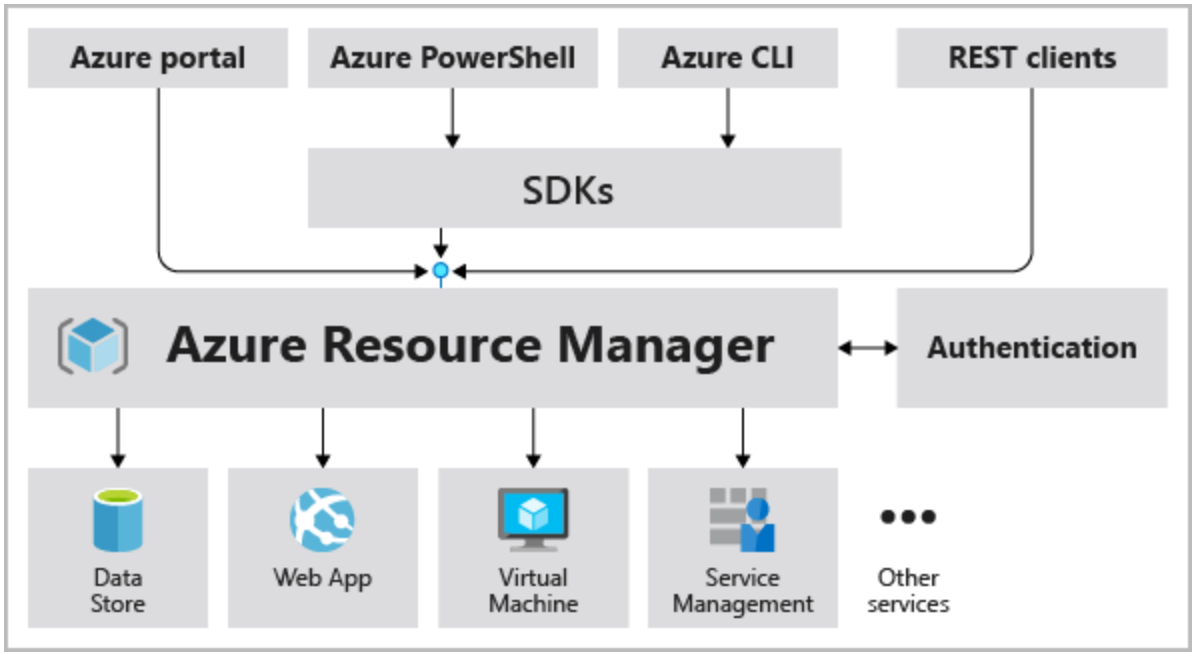
[www.windowsazure.com]

Microsoft Azure

- **Azure Resource Manager** is the deployment and management service for Azure. It provides a management layer that enables you to create, update, and delete resources in your Azure account. You use management features like access control, locks, and tags to secure and organize your resources after deployment.



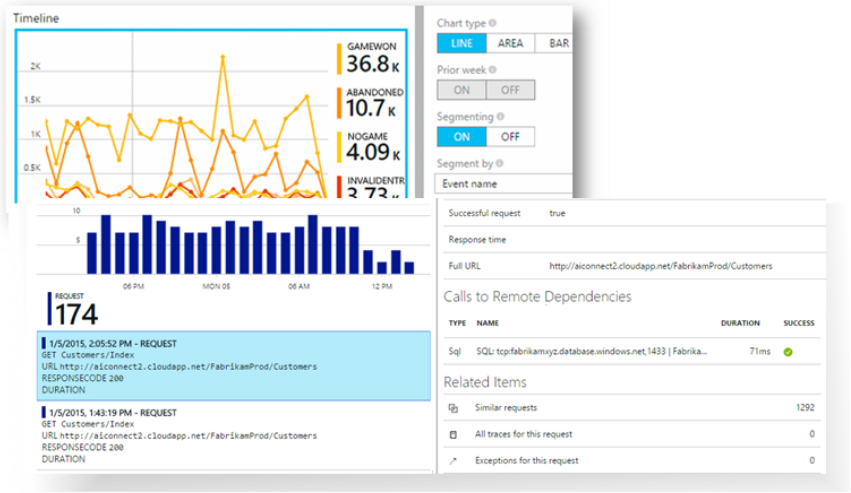
Microsoft Azure

With Resource Manager, you can:

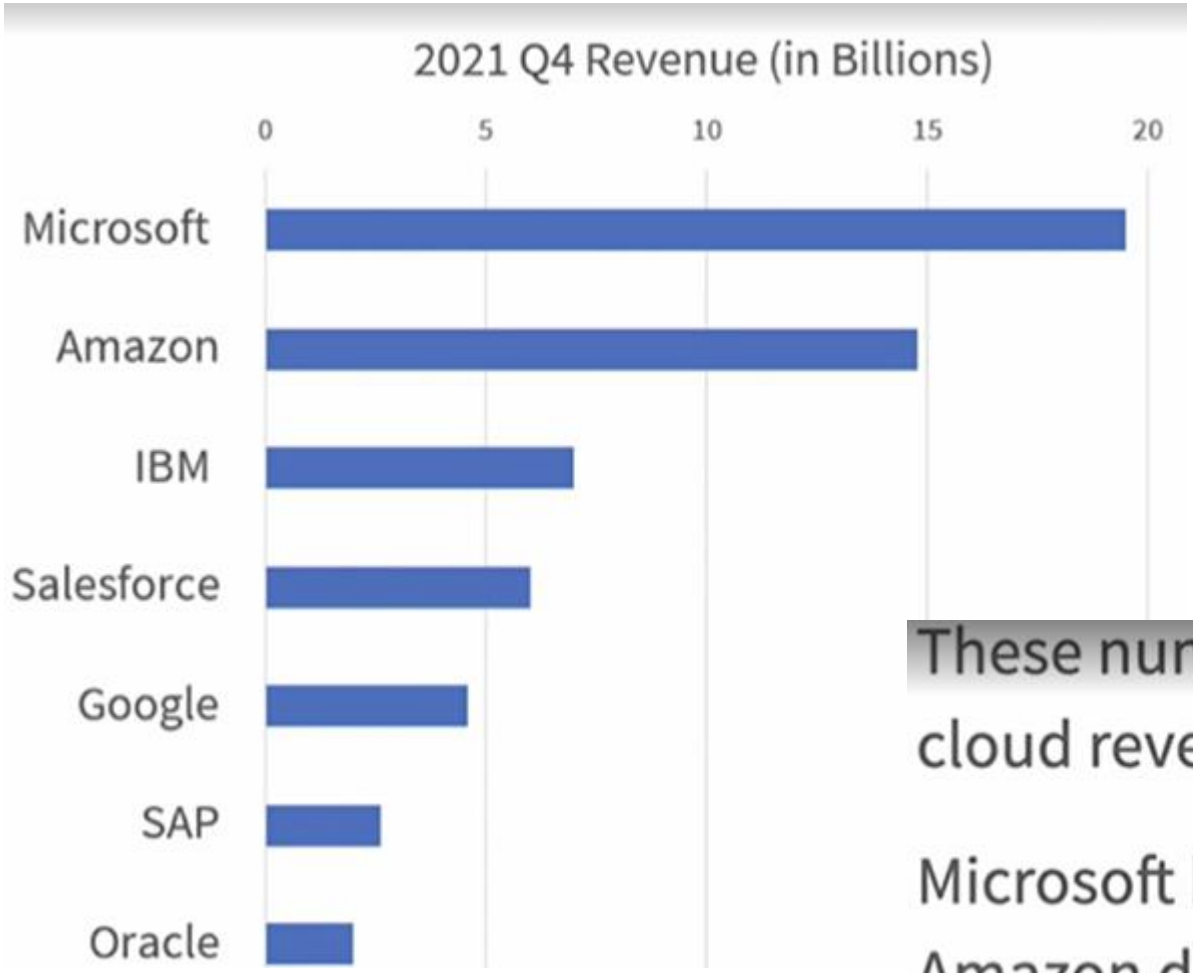
- **Manage your infrastructure** through declarative templates rather than scripts. A Resource Manager template is a JSON file that defines what you want to deploy to Azure.
- **Deploy, manage, and monitor** all the resources for your solution as a group, rather than handling these resources individually.
- **Redeploy your solution** throughout the development life cycle and have confidence your resources are deployed in a consistent state.
- **Define the dependencies** between resources so they're deployed in the correct order.
- **Apply access control** to all services because RBAC is natively integrated into the management platform.
- **Apply tags to resources** to logically organize all the resources in your subscription.
- **Clarify your organization's billing** by viewing costs for a group of resources that share the same tag.

Microsoft Azure

- ***Azure Monitor Application Insights –*** application monitoring service (detection and diagnosis of aspects related to performance, monitoring of user actions)
- With Visual Studio, you can connect any of the following to Azure Application Insights by using the **Connected Services** feature:
- .NET Framework console app
- ASP.NET MVC (.NET Framework)
- ASP.NET Core
- .NET Core (including console app, W
- .NET Core Worker Role
- Azure Functions
- Universal Windows Platform App
- ….



Azure & Big Picture of Cloud Market Leaders



These numbers include all cloud revenue.

Microsoft has SaaS; Amazon doesn't.

Azure Subscriptions

Azure Licensing Areas

- Azure for business
- Azure for US government
- Azure for nonprofits
- Azure for students
- Azure for individuals

For Students

- Available for verified STEM students and faculty
- No cost, no credit card
- Free products
- Get Azure credits

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Microsoft Azure

Întrebări?