

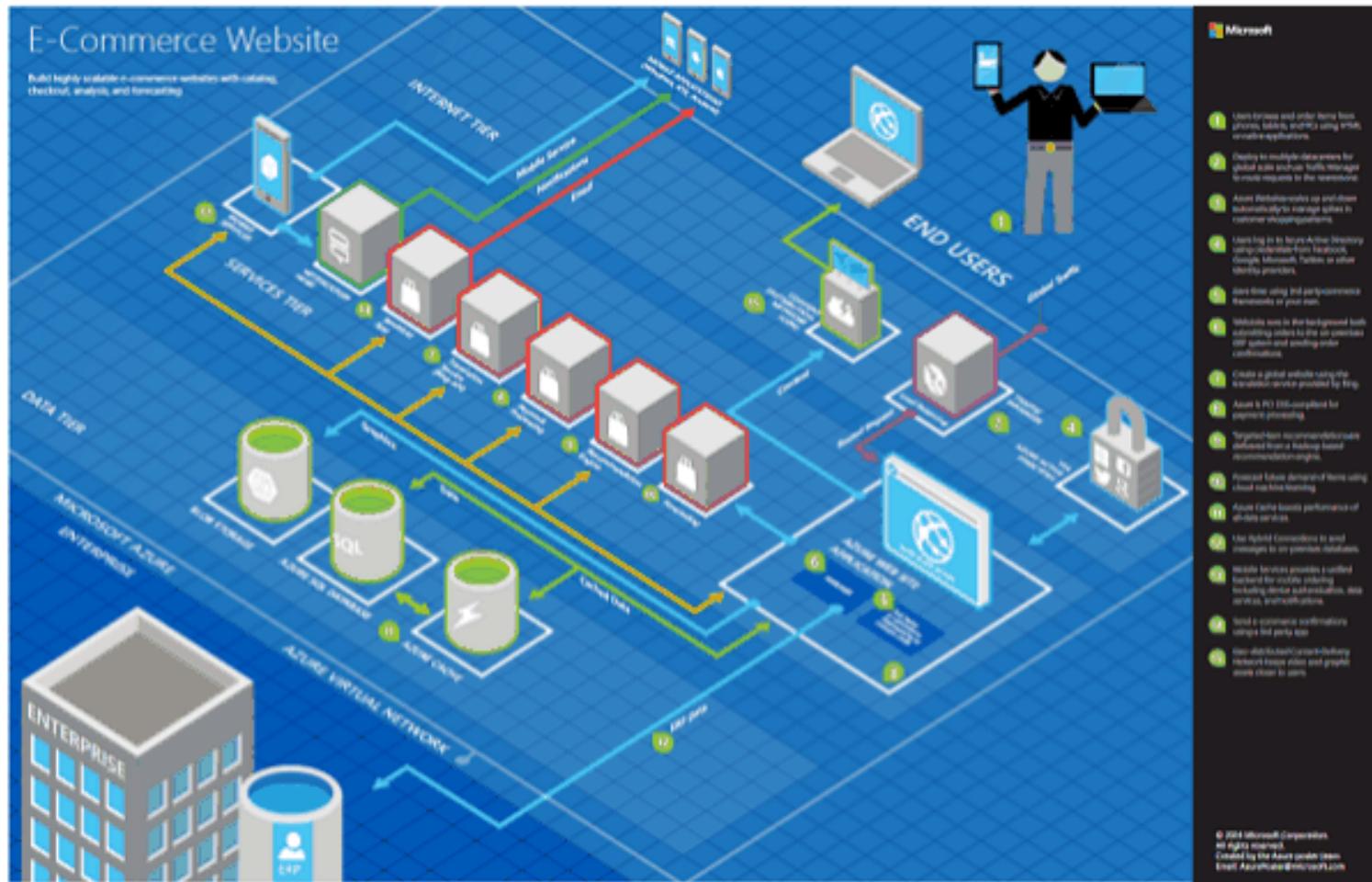
Universitatea "Alexandru Ioan Cuza"
Facultatea de Informatică

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adria@info.uaic.ro



Cuprins

- Windows Azure



[<http://azure.microsoft.com/en-us/documentation/articles/architecture-overview/>]

Cuprins

- Windows Azure
 - Imagine generală
 - Structură
 - Arhitectură
 - Aplicații în Azure

Windows Azure



Temple of Azure Clouds.

Azure -Templu
Buddhist
-Nord vest de
Beijing ☺

[Implementing
and Developing
Cloud
Computing
Applications,
David E.Y.
Sarna]

Windows Azure

- Aparut in 2009

Ce este:

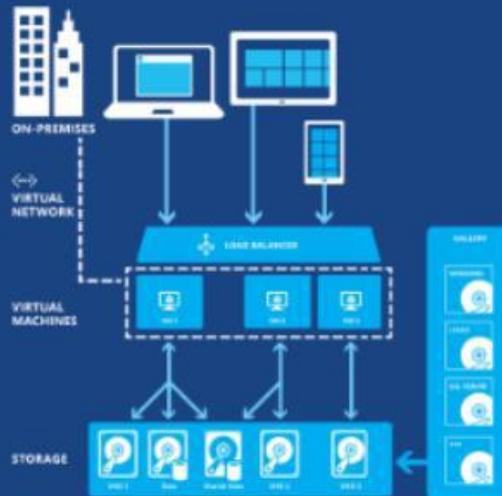
- Este un mediu care asigura rularea de aplicatii
- Este o platforma de tip cloud-computing, deci are abilitati de scalare,...
- Este o platforma de tip *utility computing* deci asigura mecanismul *pay-per-use*
- Este ... IaaS? PaaS? SaaS?

• Windows Azure in 2017

What is Microsoft Azure?

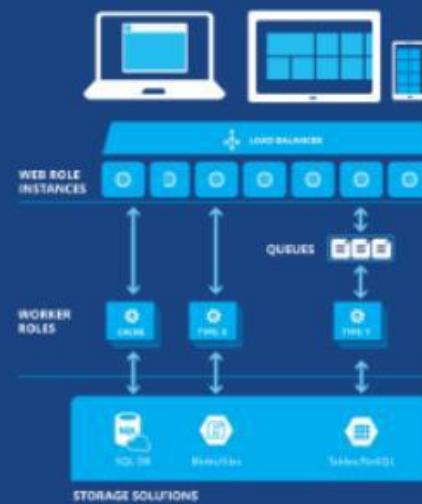
Virtual Machines

VMs are basic cloud building blocks. Don't have access to a server instance with virtual hardware? Install and run software yourself. Configure multiple machines with different roles for creating complex solutions. VMs are nearly identical to conventional cloud servers, and are the easiest way to move existing workloads to the cloud.



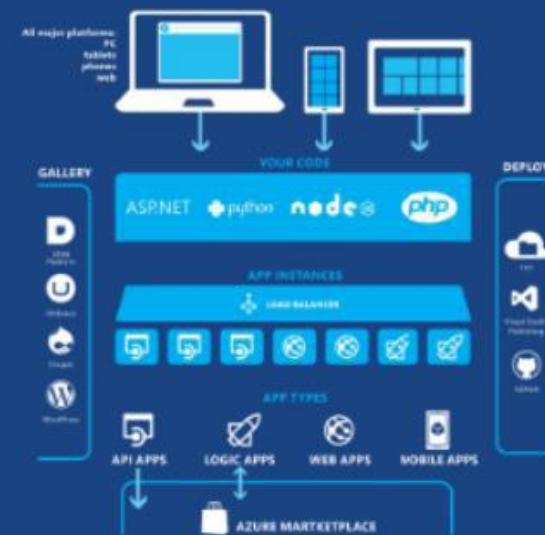
Cloud Services

Build access and manage cloud-based processing jobs. Add, remove and update each VM as needed until system updates. You configure the VM role as needed, and scale out as many copies as needed. Two types of VMs: worker roles and code roles - worker roles are used for computing and running services. The code role is simply a worker role with VM already created and configured.



App Service

Azure App Service is a high productivity solution for developers who need to create enterprise-grade web and mobile app experiences. Azure App Service includes a mobile platform as a service solution that enables you to develop and publish mobile apps quickly in the cloud. And it easily integrates them with on-premises databases and back-end applications.



Four primary models for building and running apps

Microsoft Azure



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



Choose from an extensive service catalog

Compute	Storage	Database	Analytics	Machine Learning	Cloud Services	Mobile Services	Cloud Infrastructure	Networking	Identity & Access	Security & Compliance	Integrations	Cloud Management
Virtual Machines	Web Sites	Mobile Services	Cloud Services	Storage	SQL Database	HDIgnite	SQL Data Sync	Hyper-V Recovery Manager	Backup	Caches	Store	
Get full control over your infrastructure and make it easier to migrate between platforms.	Get started with a set up for fast, reliable web hosting using a range of languages.	Add infrastructure required to run your app, from databases to storage and messaging.	Build and easily scale websites using static or dynamic content that scale as your traffic grows.	Manage data from anywhere using a range of storage options. Available in multiple tiers, from append-only log files to general-purpose blob storage.	Manage relational data with built-in high availability. Using our integrated management tools, manage every step of database usage.	Integrate your on-premises Active Directory with Azure Active Directory and add multifactor authentication.	Optimize database queries to run faster with intelligent query hints and reduced system overhead.	Protect important resources by monitoring for suspicious activity, including denial-of-service attacks and unauthorized access.	Automate backup of your local servers to Azure using PowerShell cmdlets.	Help your application scale under heavy traffic using caching, tiering, and regional replication.	Find a service, and bring it to your organization with a single click.	
Notification Hubs	Service Bus	Visual Studio Online	Media Services	BizTalk Services	Active Directory	Scheduler	CDN	Multi-Factor Authentication	Virtual Network	Traffic Manager	ExpressRoute	
Deliver real-time push notifications to your users from any application or service, no permission or device required.	Send the message exactly the way you want it, using a reliable service-oriented interface and API.	Develop, test, and host projects, and collaborate with others using a browser-based editor.	Deliver media assets, messages, and documents to internet users via streaming assets.	Build the solution that integrates with your existing systems and applications, and supports complex integration scenarios.	Use this tool to sync your on-premises Active Directory with Azure Active Directory, including users, groups, and organizational unit management.	Run jobs in the background to help reduce costs and complexity, and keep your data up-to-date.	Improve your delivery by caching static content or serving content from multiple locations using multiple edge locations.	Implement security controls to protect your data and applications through complex logic and policies.	Provide an easy way to connect to your on-premises network or to other parts of the Internet using private IP addresses.	Optimize your delivery path with a single endpoint for delivery to the same or different data centers.	Connect your on-premises infrastructure directly to Azure without a gateway. It's fast, secure, and reliable, giving you regional redundancy.	

Like it? Get it.



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



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. Secure 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



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



For enduring failures, implement monitoring and logging that immediately notify you when issues arise and that facilitate root cause analysis.



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

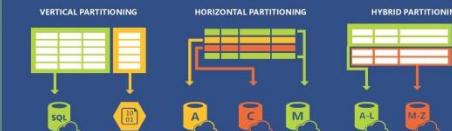
Cloud computing makes it practical to mix & match data storage approaches to best fit the needs of your application. If you're building a new application, think carefully about the options in order to pick approaches that will continue to work well when your application grows.

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 100s of terabytes
- Drastically reduce bandwidth costs
- High availability — up to 99.999999999% SLA
- Platform as a Service — pay only for used storage
- REST API — Programmatic
- Intelligent Caching — Available everywhere
- Secure — Limit access to authorized persons
- Low cost — for example, 1 GB costs \$0.07 a month

HD INSIGHT

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.

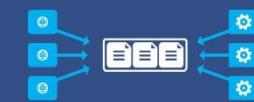
In a distributed cache, data is not stored in the web server's memory but on other cloud resources. This allows all of the application's web servers and VMs to access the data — even while servers are added or removed.



USE QUEUES

When the application gets a request, it puts a work item into a queue and immediately returns a response. Then a separate background 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?"

Active Directory is the answer.



LOGGING AND TELEMETRY

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



Microsoft Azure: Building Real-World Cloud Apps



COMPUTE	Virtual Machines	Websites	Cloud Services
DATA MANAGEMENT	SQL Database	Storage Blobs	Storage Tables
	File Service		
NETWORKING	Virtual Network	Traffic Manager	ExpressRoute
DEVELOPER & IT SERVICES	Visual Studio Online	Azure SDK	Azure Tools for Visual Studio
	Automation		
IDENTITY & ACCESS	Active Directory	Multi-Factor Authentication	
MOBILE	Mobile Services	Notification Hubs	
BACKUP	Site Recovery	Backup	
MESSAGING & INTEGRATION	Storage Queues	Service Bus Queues	Service Bus Relay
	BizTalk Hybrid Connections	BizTalk Services	Service Bus Topics
COMPUTE ASSISTANCE	Scheduler		
PERFORMANCE	Cache	Content Delivery Network	
BIG COMPUTE & BIG DATA	HDInsight		High Performance Computing (HPC)
MEDIA	Media Services		
COMMERCE	Store & Marketplace		

Windows Azure

← Servicii de baza
in 2015

Windows Azure



Servicii in 2016

Compute	Web & Mobile	Data & Storage	Analytics
Virtual Machines Cloud Services Batch RemoteApp Service Fabric Virtual Machine Scale Sets Azure Container Service	App Service Logic Apps Web Apps Mobile Apps API Management Functions Mobile Engagement	DocumentDB SQL Database Redis Cache Storage StorSimple Search SQL Data Warehouse SQL Server Stretch Database	HDIInsight Machine Learning Data Factory Data Catalog Data Lake Store Data Lake Analytics Power BI Embedded
Networking	Media & CDN	Hybrid Integration	Identity & Access Management
Virtual Network ExpressRoute Application Gateway Traffic Manager Azure DNS Load Balancer VPN Gateway	Media Services CDN	BizTalk Services Service Bus Backup Site Recovery	Azure Active Directory Multi-Factor Authentication Azure Active Directory Domain Services Azure Active Directory B2C
Developer Services	Management	Intelligence	Internet of Things
Visual Studio Application Insights Azure DevTest Labs	Key Vault Scheduler Automation Log Analytics Security Center	Cognitive Services	Machine Learning Stream Analytics Push Notifications Event Hubs Internet of Things Azure IoT Hub

Windows Azure

Compute

Virtual Machines	Virtual Machine Scale Sets
Azure Container Service	Azure Container Registry
Functions	Batch
Service Fabric	Cloud Services

Networking

Virtual Network	Load Balancer
Application Gateway	VPN Gateway
Azure DNS	Traffic Manager
ExpressRoute	Network Watcher

Storage

Storage: Blobs, Tables, Queues, Files, Disks	Data Lake Store
StorSimple	Azure Backup
Site Recovery	

Monitoring & Management

Azure Portal	Azure Resource Manager	Azure Advisor	Azure Monitor	Log Analytics	Automation	Scheduler
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Web & Mobile

Web Apps	Mobile Apps
Logic Apps	API Apps
Content Delivery Network	Media Services
Search	

Databases

SQL Database	SQL Data Warehouse
SQL Server Stretch Database	DocumentDB
Redis Cache	Data Factory

Intelligence & Analytics

HDInsight	Machine Learning
Cognitive Services	Azure Bot Service*
Data Lake Analytics	Power BI Embedded
Azure Analysis Services	

Servicii de baza
in 2017

Internet of Things & Enterprise Integration

Azure IoT Hub	Event Hubs
Stream Analytics	Notification Hubs
BizTalk Services	Service Bus
Data Catalog	

Security + Identity

Security Center	Key Vault
Azure Active Directory	B2C
Domain Services	Multi-Factor Authentication

Developer Services

Visual Studio Team Services	Azure DevTest Labs
VS Application Insights	API Management
HockeyApp	Developer Tools
Service Profiler*	

Windows Azure

- *Centre de date (Datacenter)*

- **Traditional Data Centers – e.g.**

- Microsoft Dublin Datacenter**

- 27,300 m²
 - 22.2 Megawatt (final phase)

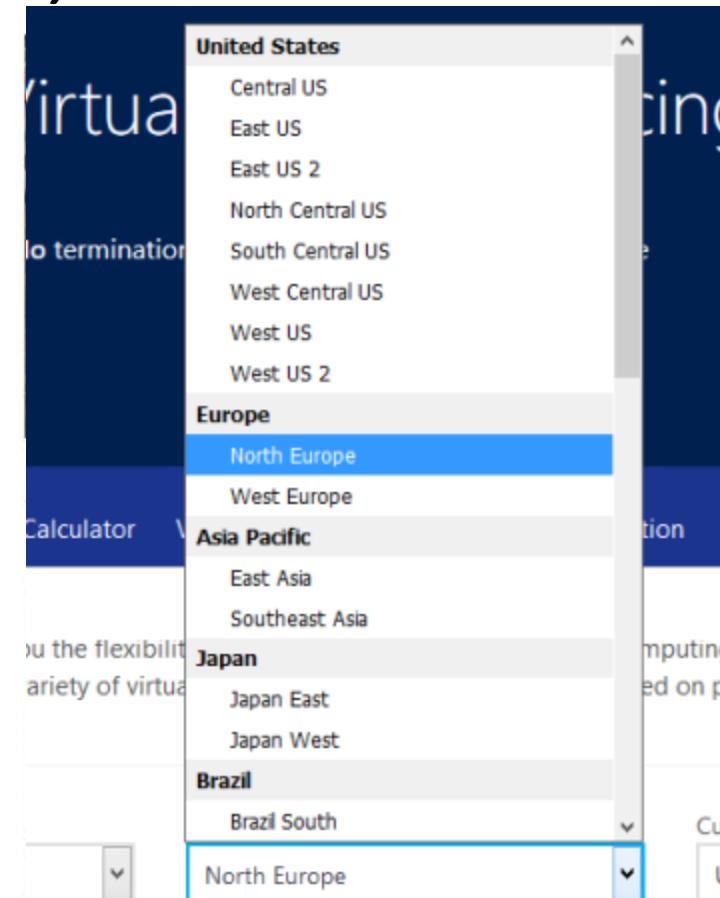
- **Container-based Data Centers – e.g.**

- Chicago Data Center**

- 65,000 m²
 - 60 Megawatt (final phase)
 - Containers with up to 2500 servers



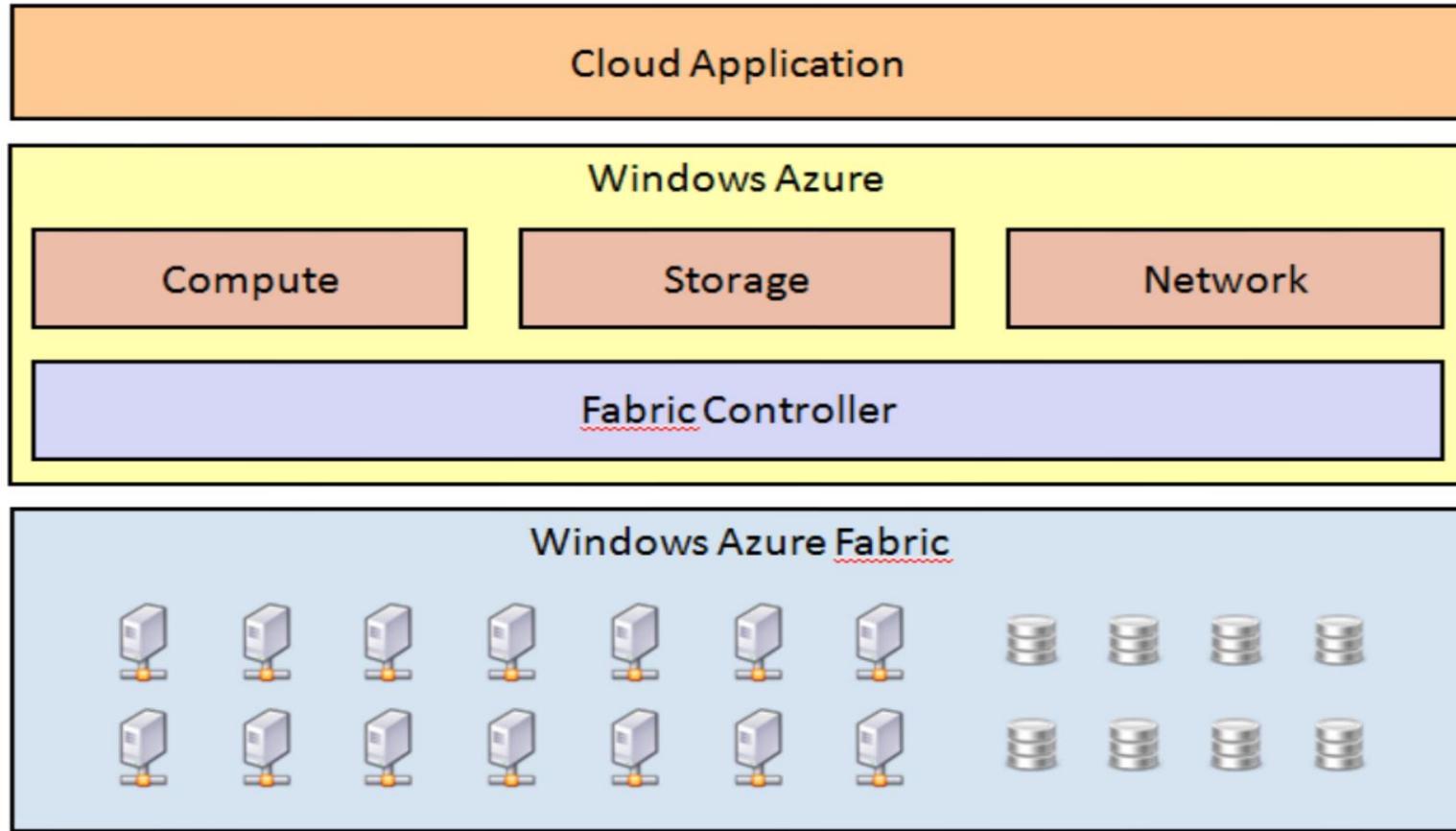
© www.datacenterknowledge.com



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

Windows Azure

- Arhitectura generala

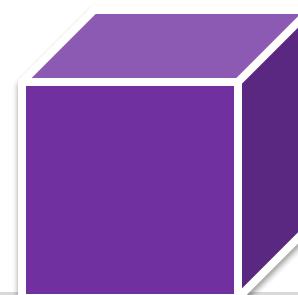
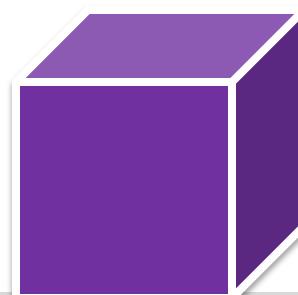
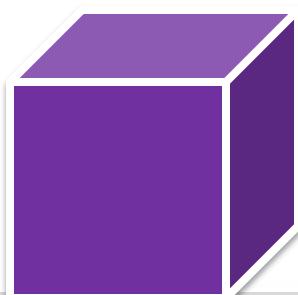
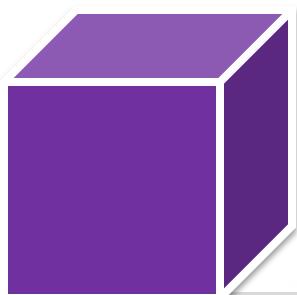
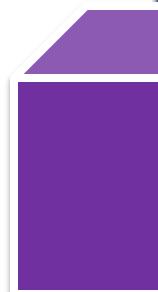
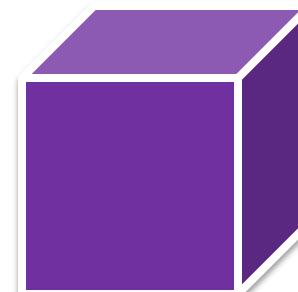
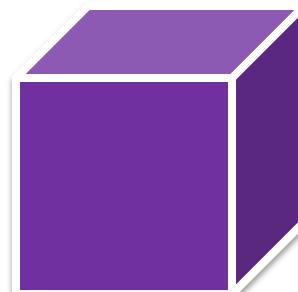
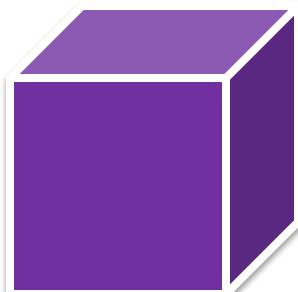
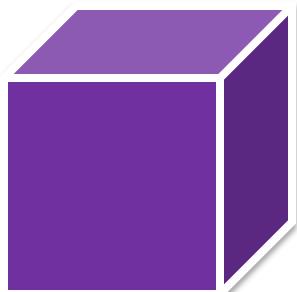
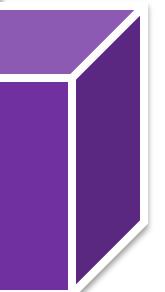
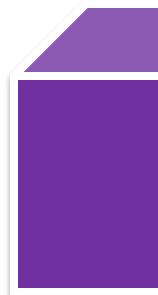
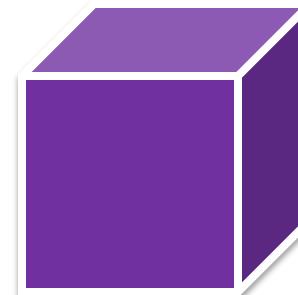
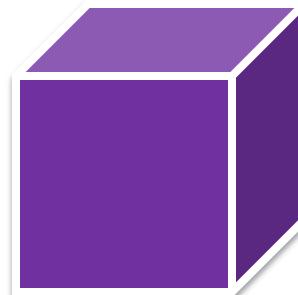
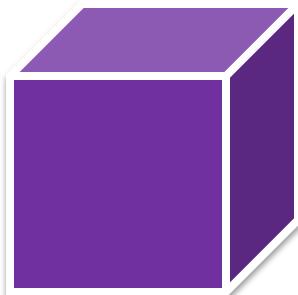
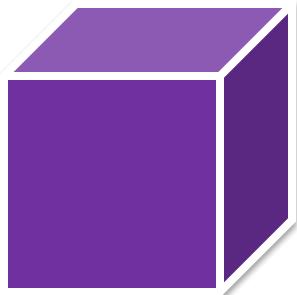


[J. Heinzelreiter, W. Kurschl, www.fh-hagenberg.at]

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Windows Azure

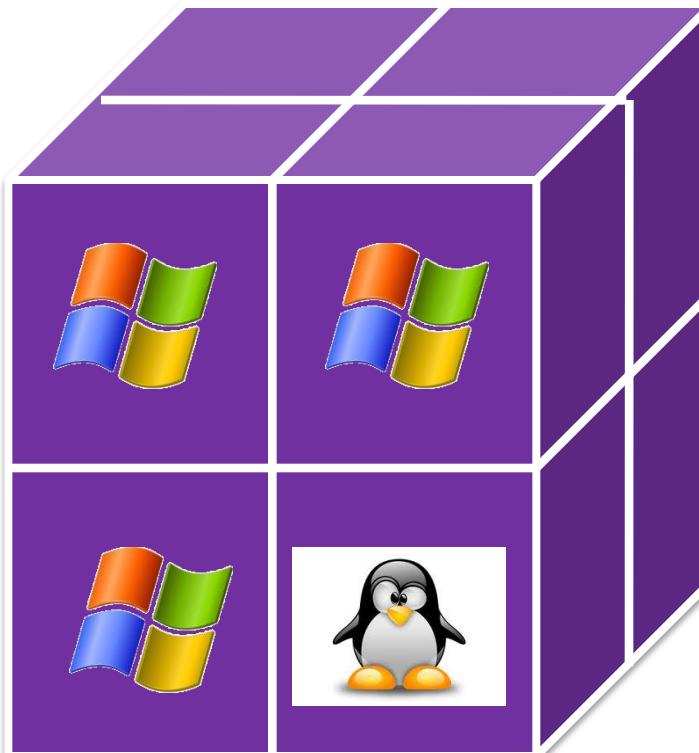
- *Data center* – numar mare de servere => Fabric (vezi curs anterior)



[Microsoft]

Windows Azure

- Servere cu VM care ruleaza diverse OS



Initial Windows Azure oferea cateva tipuri de dimensiuni pentru VM:

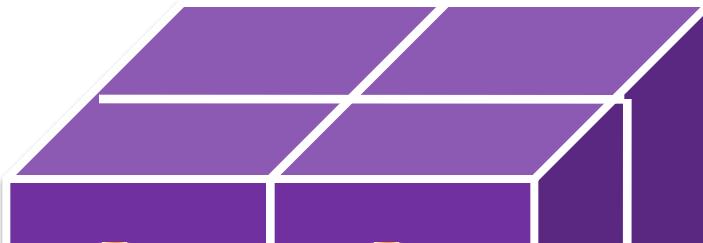
- Extra Small
- Small
- Medium
- Large
- Extra Large

[Microsoft]

- 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.

Windows Azure

- Servere cu VM care ruleaza diverse OS



VM Sizes

The following table categorizes sizes into use cases.

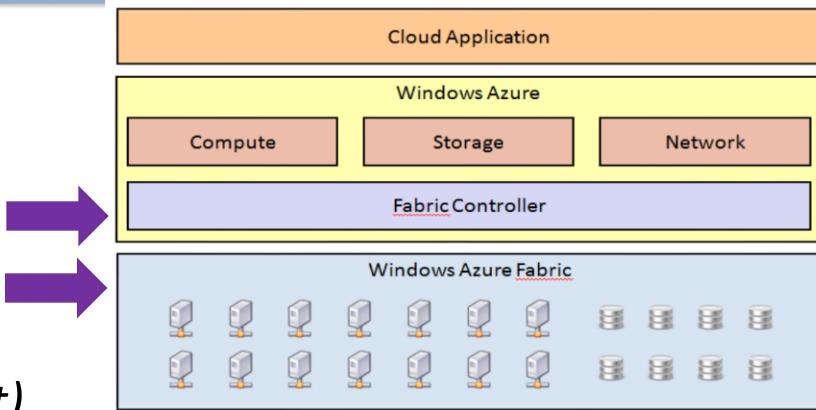
Type	Sizes	Description
General purpose	DSv2, Dv2, DS, D, Av2, A0-7	Balanced CPU-to-memory. Ideal for dev / test and small to medium applications and data solutions.
Compute optimized	Fs, F	High CPU-to-memory. Good for medium traffic applications, network appliances, and batch processes.
Memory optimized	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

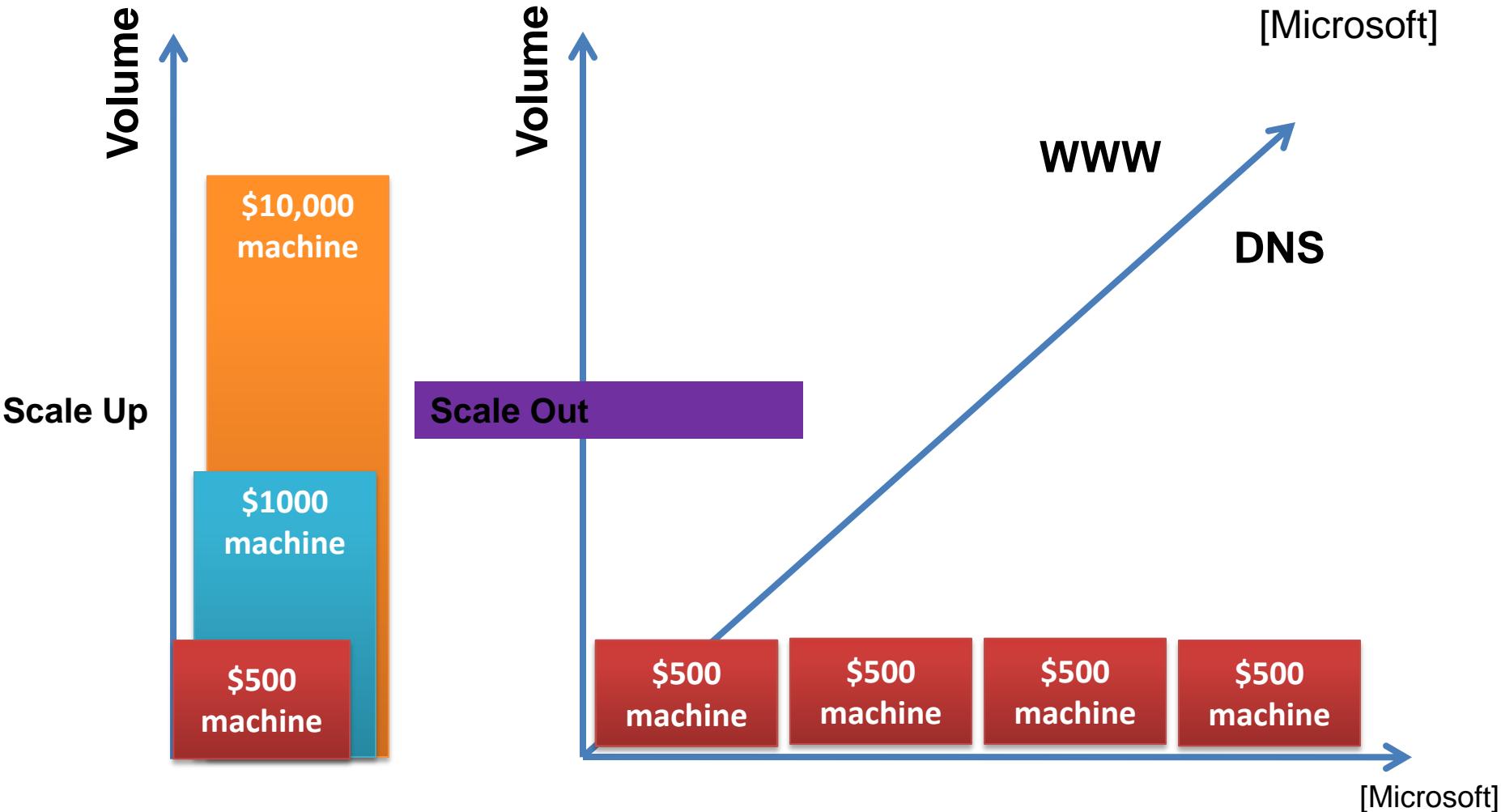
To see a list of VM sizes available in a particular region, use the [Get-AzureRmVmSize](#) command.

Windows Azure

- **Fabric**
- O retea de noduri interconectate
 - *Commodity servers* (se asigura *scale-out*)
 - Switch-uri performante, rootere, echipamente de tip *load balancers*
 - Conectarea: fibra optica
- *Azure Fabric Controller* este serviciul care monitorizeaza, mentine si furnizeaza masini
 - Monitorizarea aplicatiilor (e.g. alegerea serverului fizic pe care va rula o aplicatie => optimizarea utilizarii hardware)
 - Managementul sistemelor de operare (e.g. update pentru versiuni de Windows Server care ruleaza in VM Windows Azure)
 - Managementul dispozitivelor de tip *load balancing*
 - ...
- Actiunile *Azure Fabric Controller* depind de un fisier de configurare XML specific fiecarei aplicatii Windows Azure



Scale-up versus Scale-out



Windows Azure

Compute



Virtual Machines



Virtual Machine Scale Sets



Azure Container Service



Azure Container Registry



Functions



Batch



Service Fabric



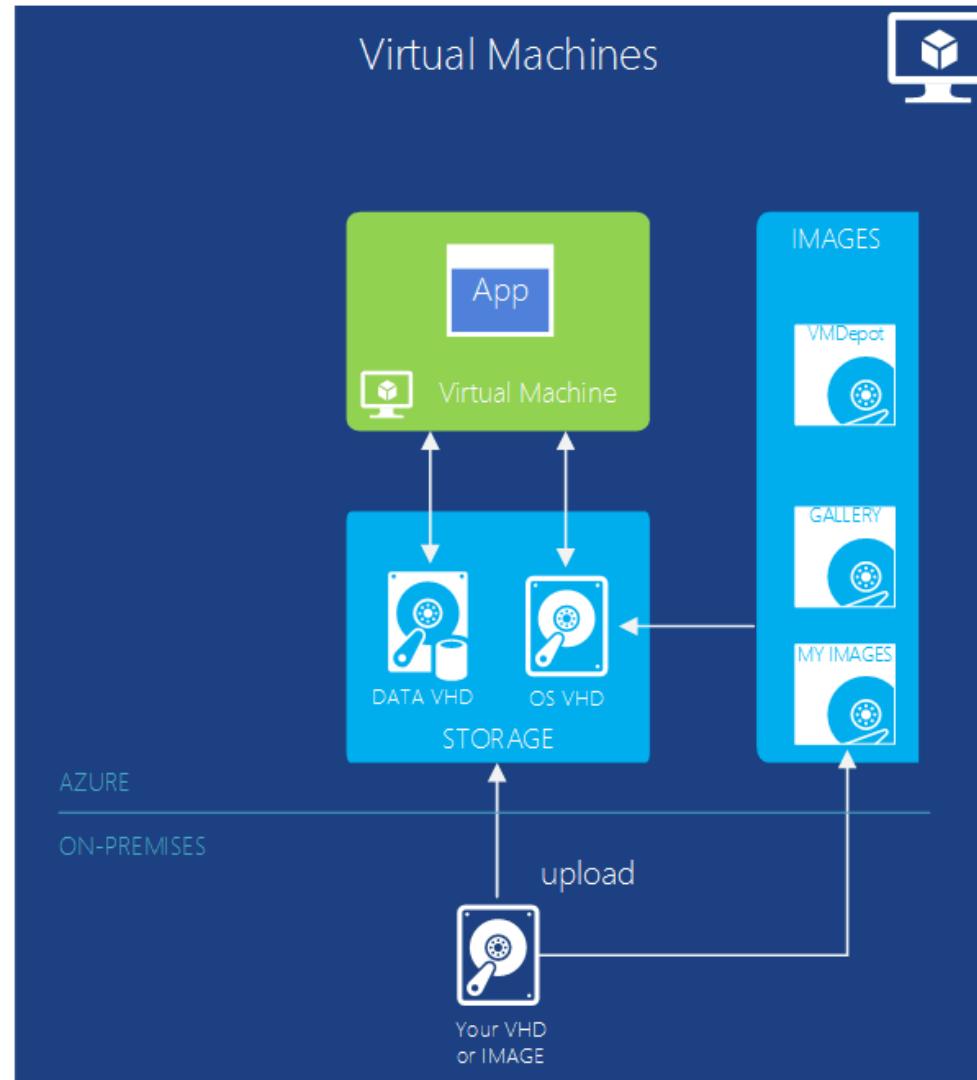
Cloud Services

- **Virtual Machines** – ofera controlul asupra masinilor virtuale (inclusiv asupra SO)
- **Azure Container Services** – service de lucru cu containere
- **Cloud Services** - platform-as-a-service (PaaS) - pentru crearea de aplicatii scalabile si *fault resistant* (Java, NodeJS, PHP, Python, .Net, Ruby)
- ...

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

Windows Azure

- ***Virtual Machines***



[www.windowsazure.com]

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Windows Azure

Compute



Virtual Machines



Virtual Machine
Scale Sets



Azure Container
Service



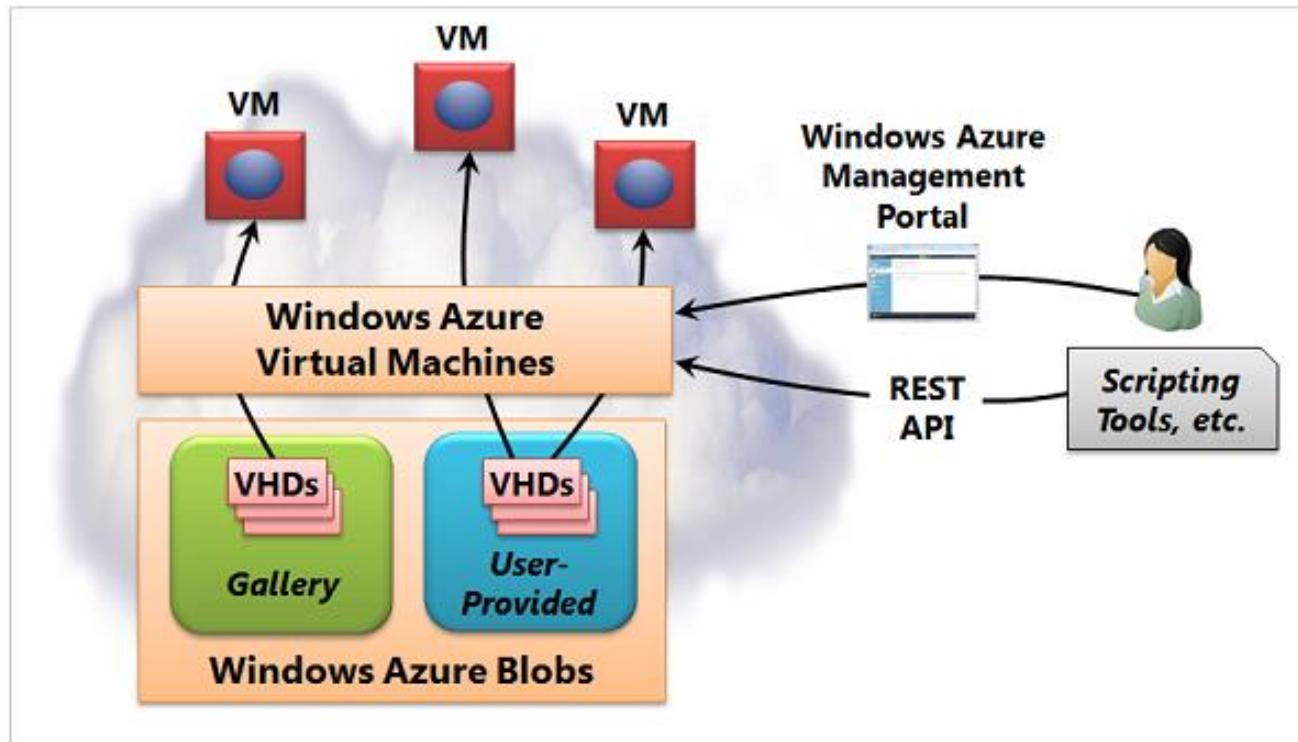
Azu
Reg

- **Virtual Machines**

- Ofera IaaS (Infrastructure as a Service)

- Permite dezvoltatorilor, specialistilor IT crearea si

- utilizarea masinilor virtuale in cloud



[www.windowsazure.com] ₂₁



Windows Azure

- ***Virtual Machines***

- Crearea de masini virtuale

- Windows Azure Management Portal
 - Windows Azure Service Management API sau alte servicii (e.g. RightScale,..)

Pasi:

- Alegerea unui VHD (Virtual Hard Disk) pentru imaginea VM
 - Din galeria Windows Azure Virtual Machines: Windows Server 2008 R2, Windows Server 2008 R2 cu SQL Server, Windows Server 2012, Suse, Ubuntu, CentOS sau propriu
 - Fiecare VM are asociat un *OS disk* care este tinut intr-un *blob*
 - Specificarea caracteristicilor preconizate a masinii virtuale
 - [<https://docs.microsoft.com/en-us/azure/virtual-machines/windows/>
 - <https://azure.microsoft.com/en-us/pricing/details/virtual-machines/windows/>
 - Alegerea *datacenter*-ului



Virtual Machines

Virtual Machine
Scale SetsAzure Container
Service

Reg

Windows Azure

RightScale



Michael Crandell, Co-founder and
CEO, speaks at "The Cloud Rises: The
Latest From a Ten-Year-Old Trend" at
the Fortune Brainstorm TECH, Aspen
Institute Campus, July 20, 2011

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]

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]



RightScale @ AWS Summit 2013
NYC

....?



- **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)



Windows Azure

- Virtual Machines**

- [2015-> <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"



- **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



Windows Azure

- ***Virtual Machines***

- [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"

Windows Azure

Compute



Virtual Machines



Virtual Machine
Scale Sets



Azure Container
Service



Azu
Reg

- **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

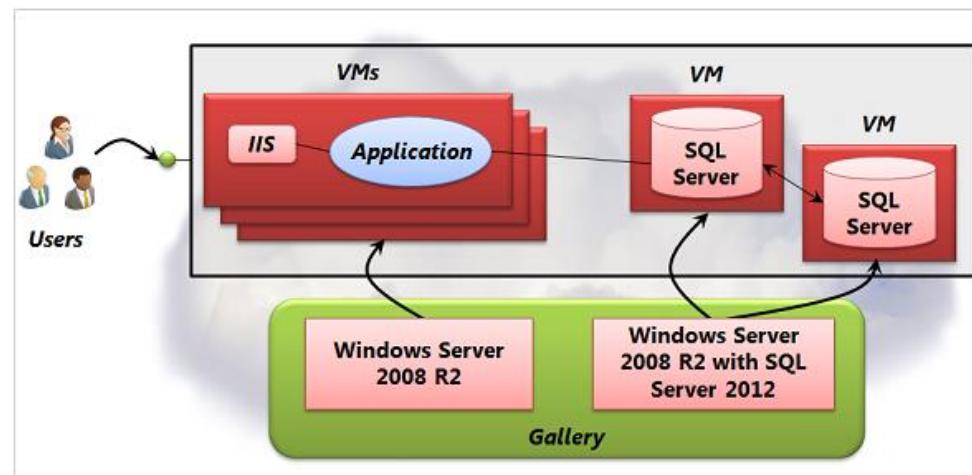
¹ Storage values for disk sizes use a legacy "GB" label. They are actually calculated in gibibytes, and all values should be read as "X GiB"



Windows Azure

- ***Virtual Machines***

- Monitorizarea nivelului hardware care realizeaza gazduirea VMs
- Utilitate?
 - VM pentru dezvoltare si test
 - Rularea de aplicatii in cloud
 - Extinderea infrastructurii proprii
 - VNET (*Virtual network*)
 - Recuperarea in caz de dezastru
- Exemplu: Rularea unei aplicatii scalabile folosind SQL Server



[www.windowsazure.com] 29

Windows Azure

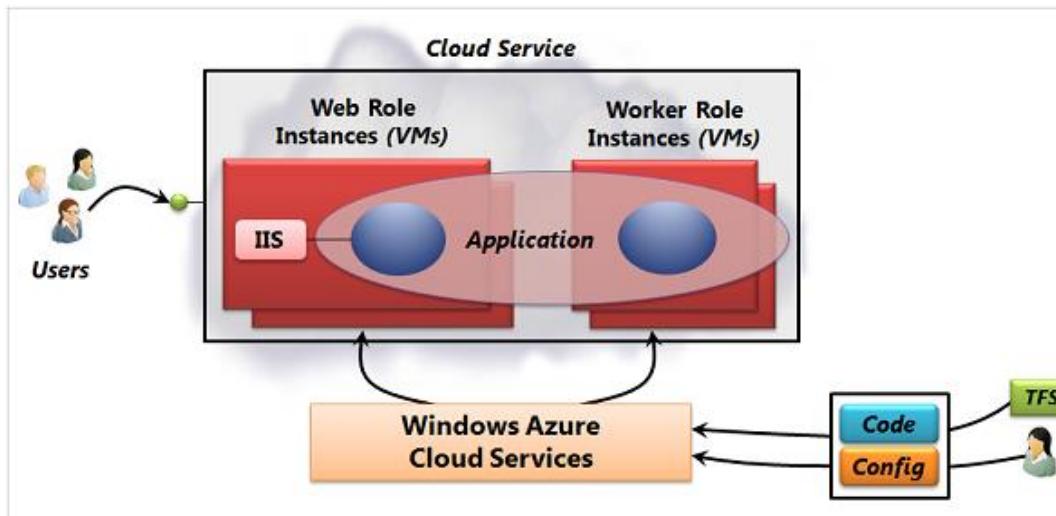
- **Cloud Services**

Compute

 Virtual Machines	 Virtual Machine Scale Sets	
 Service Fabric	 Cloud Services	

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

- Ofere suport pentru aplicatii scalabile, sigure, la costuri scazute
- Dezvoltatorii nu se preocupa de managementul platformei pe care o utilizeaza
- Obs. Masinile virtuale pentru o aplicatie ruleaza intr-un *resource group* care este un container logic
- Obs Cloud Services nu ofera servicii IaaS (dezvoltatorul ofera doar un fisier de configurare care sa indice diferiti parametri privind VM, dar la acest nivel nu se manipuleaza explicit VM)



Sisteme de control a codului sursa:
Team Foundation
Server, Git

[www.windowsazure.com]
30

Windows Azure

Compute



Virtual Machines



Virtual Machine Scale Sets



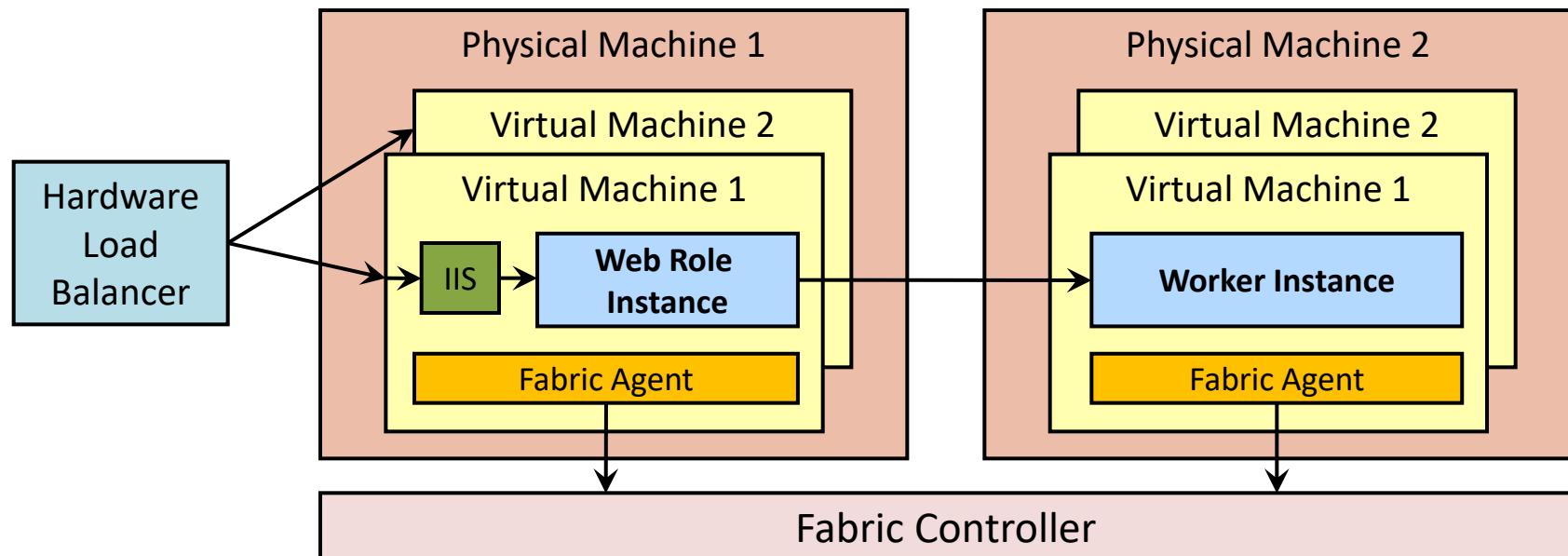
Service Fabric



Cloud Services

Cloud Services

- Permite rularea a diferitelor aplicatii care necesita
 - Accesarea simultana de catre un numar mare de utilizatori (*scale-out*)
- Mecanism de realizare:
- O aplicatie poate avea instante multiple, fiecare se executa in propria VM





Virtual Machines



Virtual Machine Scale Sets



Service Fabric



Cloud Services

Windows Azure

Cloud Services

Exista doua tipuri de instante

- **Web Role**

- Pot accepta cereri HTTP sau HTTPS
- Ruleaza pe VM care includ IIS (Internet Information Services)
- Dezvoltatorii pot crea instante de tip Web Role folosind: ASP.Net, WCF, sau alte tehnologii suportate de IIS (PHP, Java,...)

- **Worker Role**

- Reprezinta procese *background*
- Adesea izolate de lumea exterioara
- Nu are IIS configurat, dar se poate permite instalarea unui server Web

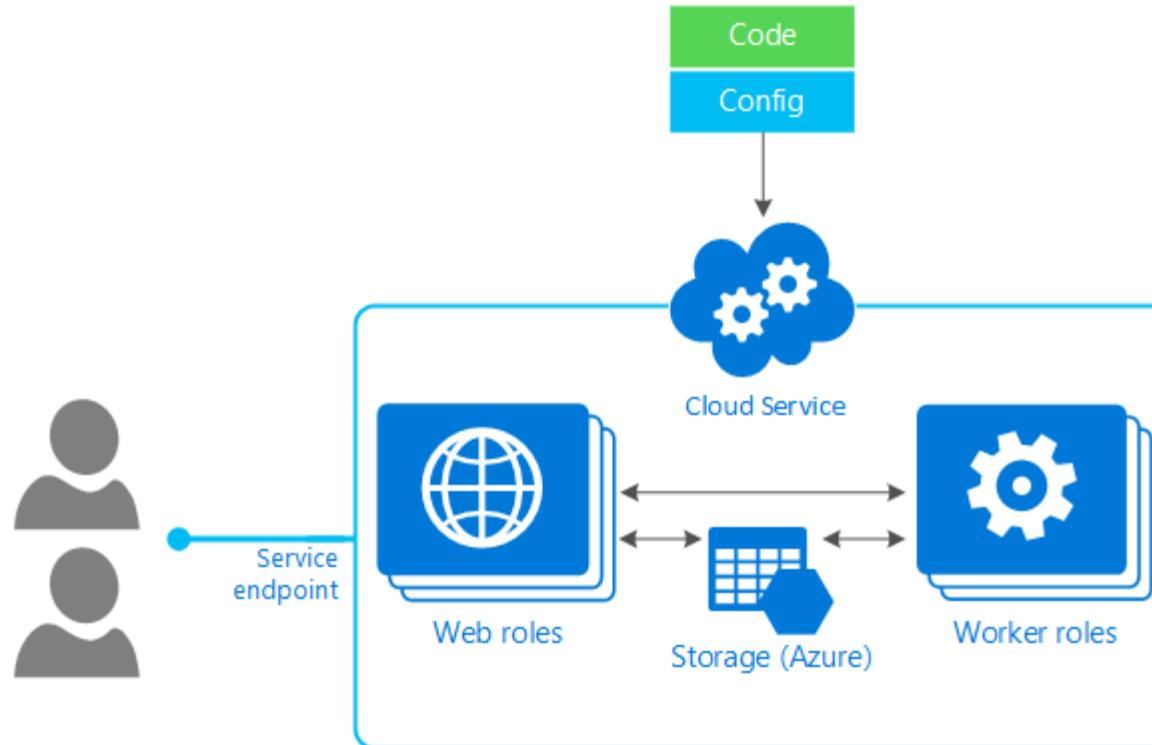
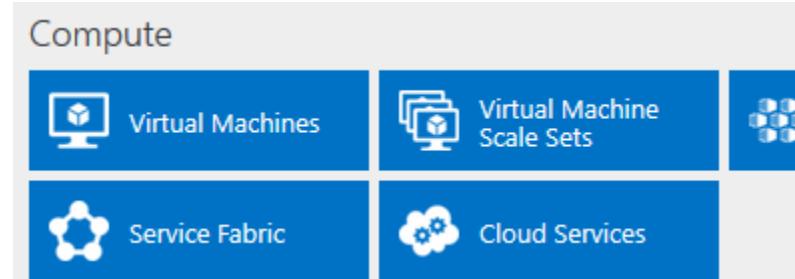
Hardware Load Balancer – face managementul cererilor intre multiple instante de tip Web Role ale aceleiasi aplicatii

Fabric Agent – monitorizeaza si colectioneaza parametri: utilizare, esec, ...

Windows Azure

Cloud Services

Pasi pentru crearea si rularea unei aplicatii:



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



Virtual Machines

Virtual Machine
Scale Sets

Service Fabric



Cloud Services

Windows Azure

Cloud Services

Pasi pentru crearea si rularea unei aplicatii

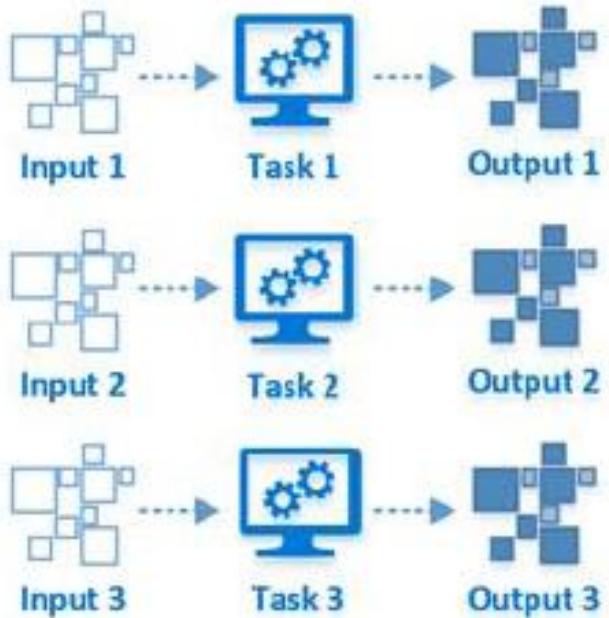
- Accesarea portalului Windows Azure (folosind Windows Live ID)
- Crearea unui hosting account si/sau storage account
- Incarcarea aplicatiei
 - Dezvoltatorul poate folosi : doar instante Web Role, doar instante Worker role, sau o combinatie dintre ele
- Windows Azure va crea VM-urile necesare si va rula aplicatia

Windows Azure

 Virtual Machines	 Virtual Machine Scale Sets
 Azure Container Service	 Azure Container Registry
 Functions	 Batch
 Service Fabric	 Cloud Services

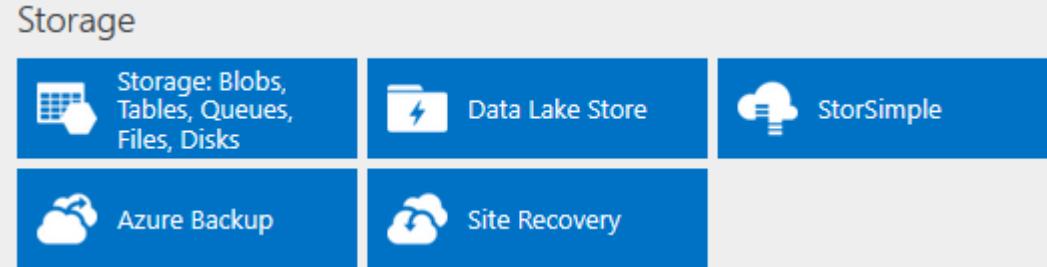
Batch

Folosit pentru aplicatii care necesita procesare paralela (Batch APIs)



- 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

Windows Azure

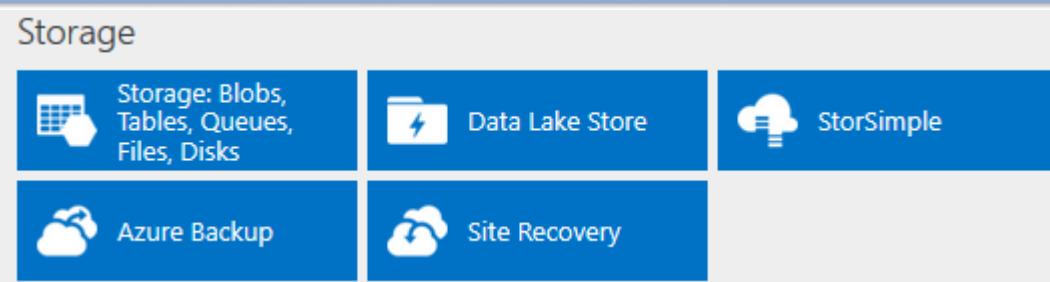


Storage

- furnizeaza mecanism de stocare pentru cantitati imense de date
 - Data este stocata in ferme de servere
- este *massive scalable*
 - Data poate fi distribuita pe mai multe noduri
 - Accesul la date este controlat de mecanisme de load-balancing
- Furnizeaza un mecanism de persistenta fiabil
 - Data este replicata pe noduri de stocare diferite (3 replicari), aflate in centre de date diferite
 - Contul de *storage* este punctul de intrare pentru toate serviciile de stocare (contul de stoarge se poate crea folosind Portalul Azure)
- *Windows Azure storage* poate fi accesat de o aplicatie Windows Azure, de o aplicatie *on-premise* sau de o aplicatie rulind intr-un alt cloud
 - Toate stilurile de stocare Azure folosesc conventiile REST pentru identificarea si expunerea datelor (*blobs*, *tables* sunt numite folosind URI-uri si accesate via verbe HTTP)

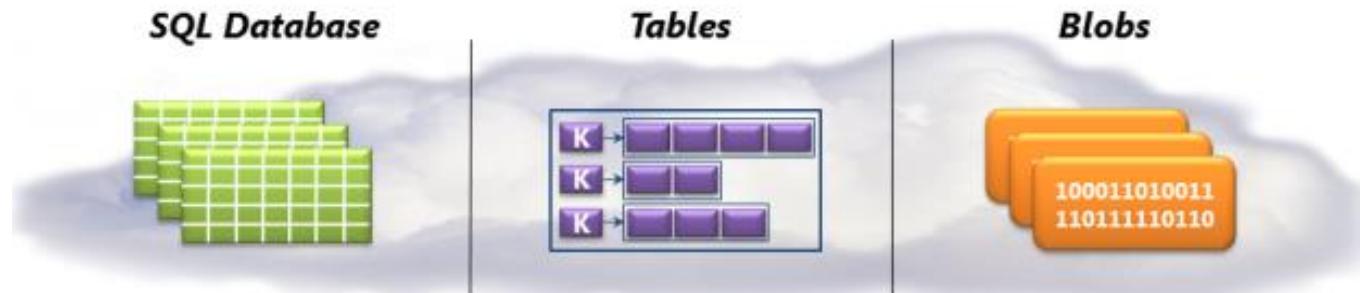
Windows Azure

Storage & Databases



Stocarea datelor in Windows Azure se poate realiza:

- *Blobs*
- *Tables*
- Baze de date relationale (SQL Azure)



Rezolva nevoi diferite: acces la BD relationale, acces rapid la cantitati mari de date avand tipuri simple, storage binar nestructurat

“Stateless compute + Durable storage => Scalable application”

[www.windowsazure.com] 37

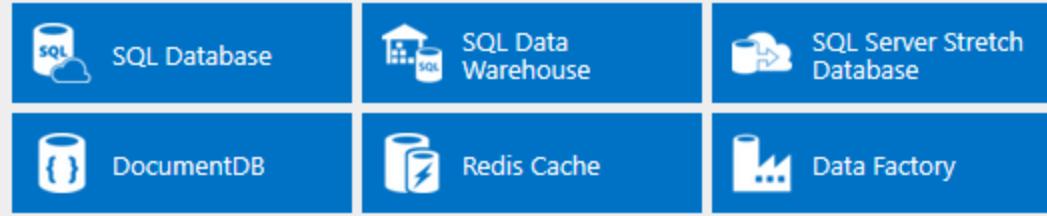
Windows Azure

Databases

- ***SQL Database***

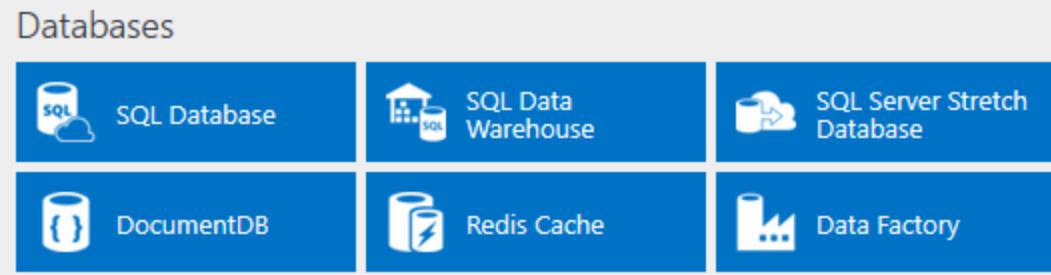
- Este o baza de date relationala care este oferita ca serviciu cloud
- Furnizeaza aceleasi caracteristici specifice de SQL Server rulind *on-premise* (tranzactii atomice, acces concurrent la date, asigurarea integritatii)
- Denumire anterioara: SQL Azure
- Accesarea se poate face folosind: Entity Framework, ADO.NET, JDBC etc.
- Este un serviciu PaaS
 - Dezvoltatorul controleaza datele, accesul la acestea, replicarea, *restoring point – in-time*
 - Sql Database face managementul infrastructurii hardware, update-uri
- Ofera optiunea de *federation*: distribuirea datelor pe servere multiple => performante crescute

Databases



Windows Azure

Databases



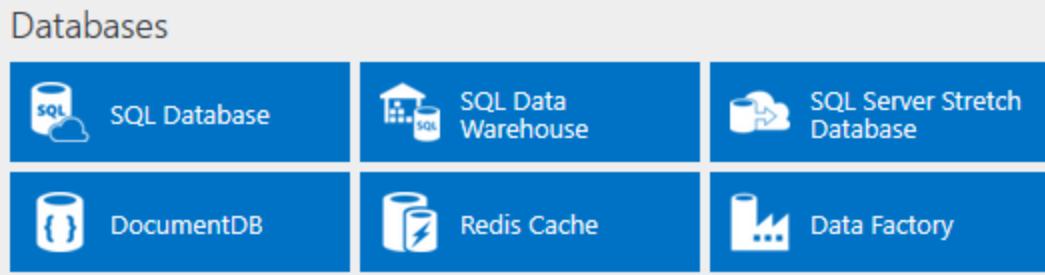
DocumentDB

- Avantaje:
 - *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>]

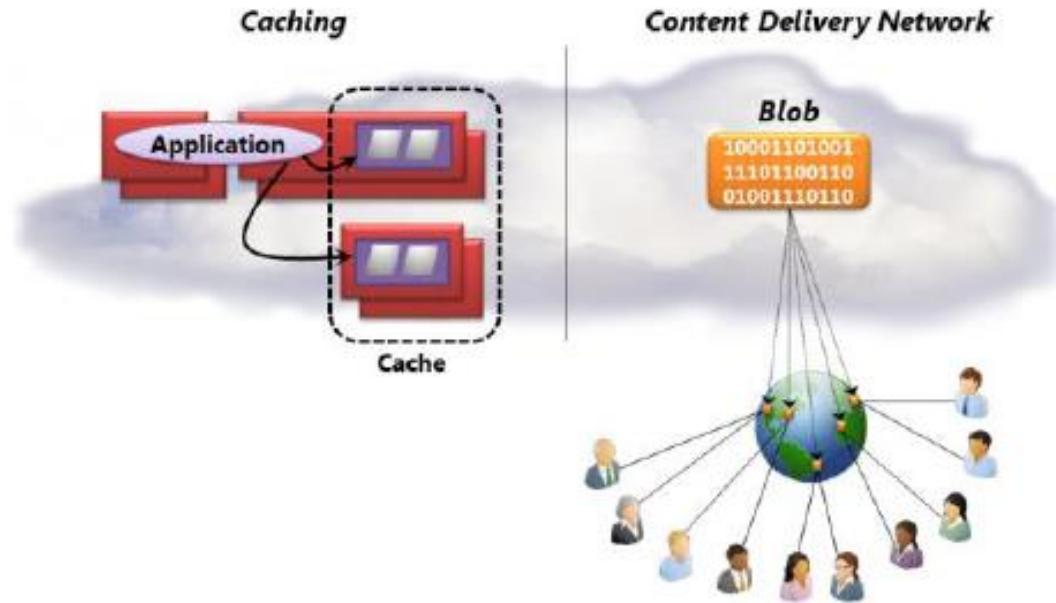
Windows Azure

Databases



Caching

Aplicatiile tind sa acceseze aceleasi informatii permanent => imbunatatirea performantei este mentinerea unei copii a datelor in apropierea aplicatiei si scaderea timpului pentru obtinerea lor



Windows Azure

Databases

Caching

- Accesarea datelor din memorie este mai rapida decat accesarea din SQL Databases, Tables sau Blob => se poate utiliza Azure Caching -> Redis Cache
- Cache-ul poate fi mentinut in VM in care este aplicatia sau pe o VM dedicata pentru cache
- Cache-ing-ul poate fi distribuit

Azure Redis Cache is available in the following tiers:

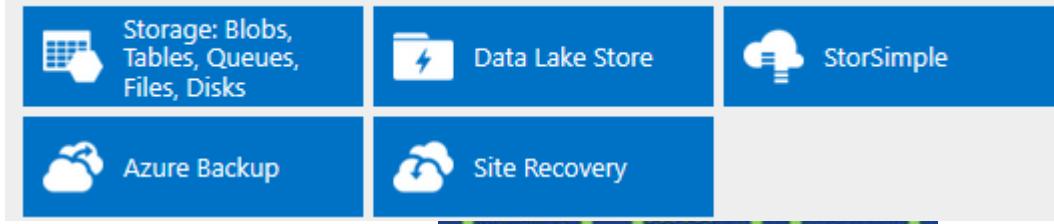
- Basic—Single node, multiple sizes, ideal for development/test and non-critical workloads. The basic tier has no SLA.
- Standard—A replicated cache in a two node Primary/Secondary configuration managed by Microsoft, with a high availability SLA.
- Premium—The new Premium tier includes a high availability 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 available in sizes up to 53 GB, and Premium caches are available in sizes up to 530 GB with more on request.

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

Windows Azure

Storage



Storage

- **Blobs**

- Contine date binare nestructurate
- Un cont de *storage* poate avea unul sau mai multe *containers*, fiecare detinind unul sau mai multe *blob*-uri
- Pot avea dimensiuni mari (pana la 1TB)
- Pot avea asociate metadate
- Exemplu: VHDs sunt stocate in Windows Azure blobs, care asigura o stocare persistenta



Scenarii de utilizare:

- Aplicatii care au nevoie de un mecanism de storage necostisitor a resurselor de tip: video sau fisiere de dimensiuni mari
- Adeseori folosite in conjunctie cu CDN

Windows Azure

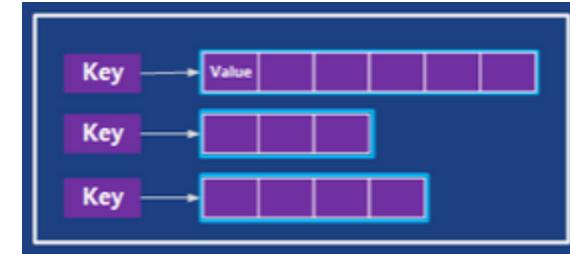
Storage



Storage

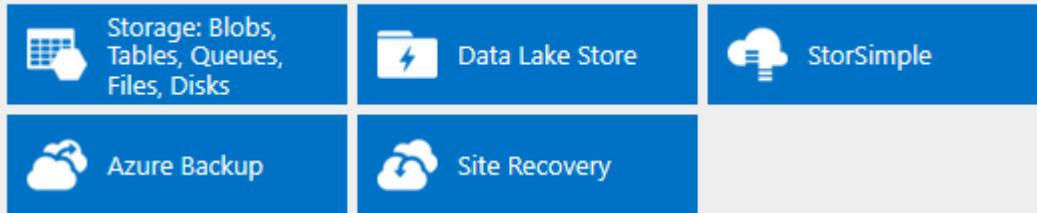
- **Tables**

- Nu sunt tabele din bazele de date relationale
- Furnizeaza (semi-) structurarea datelor
- Contin un set de entitati, care contin seturi de proprietati de tipuri diferite (string, integer, date, etc.). O aplicatie poate obtine un grup de proprietati furnizand o cheie unica pentru intregul grup.
 - ..abordarea NoSQL – *key/value*
- Nu sunt suportate operatii complexe (e.g. join..)
- Nu exista o schema fixa, entitatile pot avea structuri diferite
- Asigura *scale-out storage* (sclare prin imbrastierea datelor pe mai multe masini)
- In general, un *table* contine bilioane de entitati care contin terabytes de date



Windows Azure

Storage



Storage

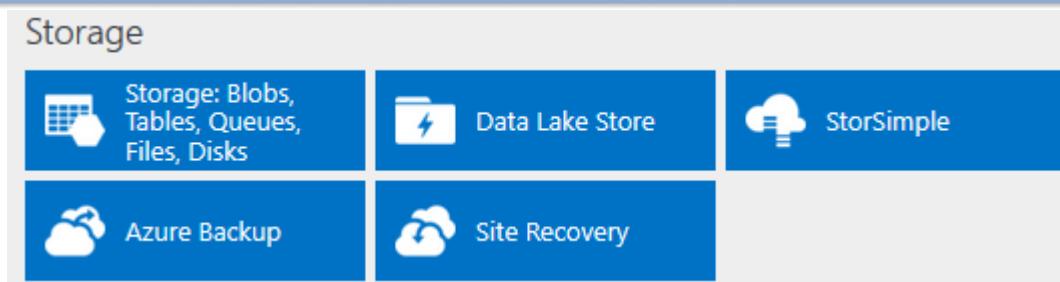
- **Queues**

- Un prim scop este de a furniza o modalitate prin care instantele Web Roles pot comunica asincron cu instantele Worker role
- **Exemplu** de utilizare: avem o aplicatie de video sharing. Codul php ruleaza intr-un *web role* care permite incarcarea si vizualizarea video-urilor. Aplicatia mai are si un *worker role* implementat in C# care face convertirea in diverse formate.

Atunci cand o instantă *web role* primește un video de la un utilizator, o stochează în blob și trimită un mesaj la un *worker role* cu locul unde poate găsi noua resursă. Acesta citează mesajul din coada și face prelucrările în background => procesarea asincronă permite scalabilitatea aplicației (numărul de instantă *web role* și *worker role* poate varia)

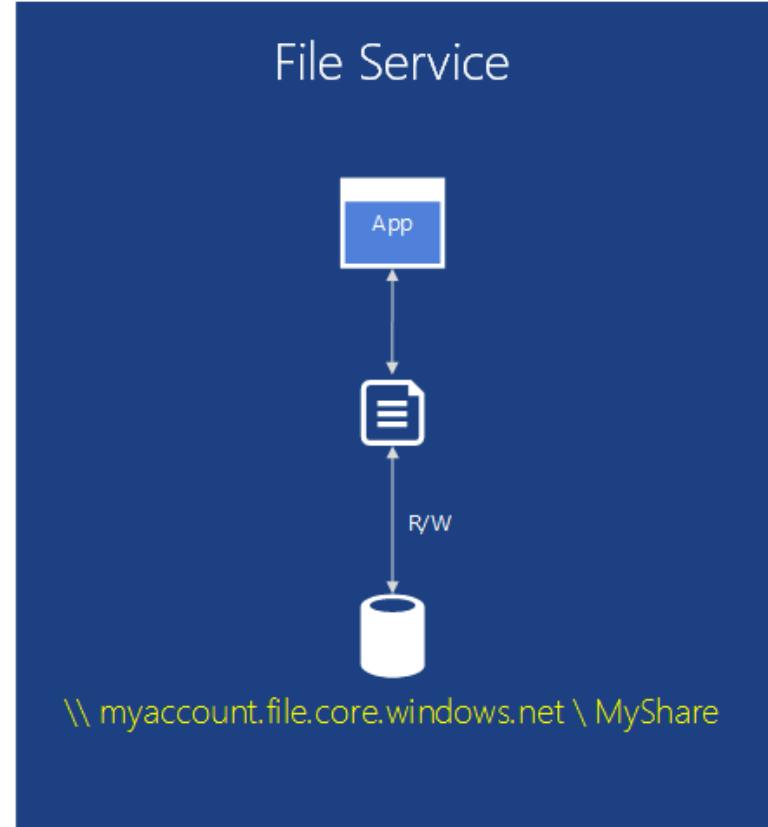
Windows Azure

Storage



- ***Azure File Service***

- Construit deasupra seviciilor blob => availability, durability, geo-redundancy
- Permite partajarea de fisiere intre VMs apeland la un API similar sistemului de fisiere: ReadFile, WriteFile;
- Se permit si interogari REST, care permit interogari asupra fisierelor on-premise partajate

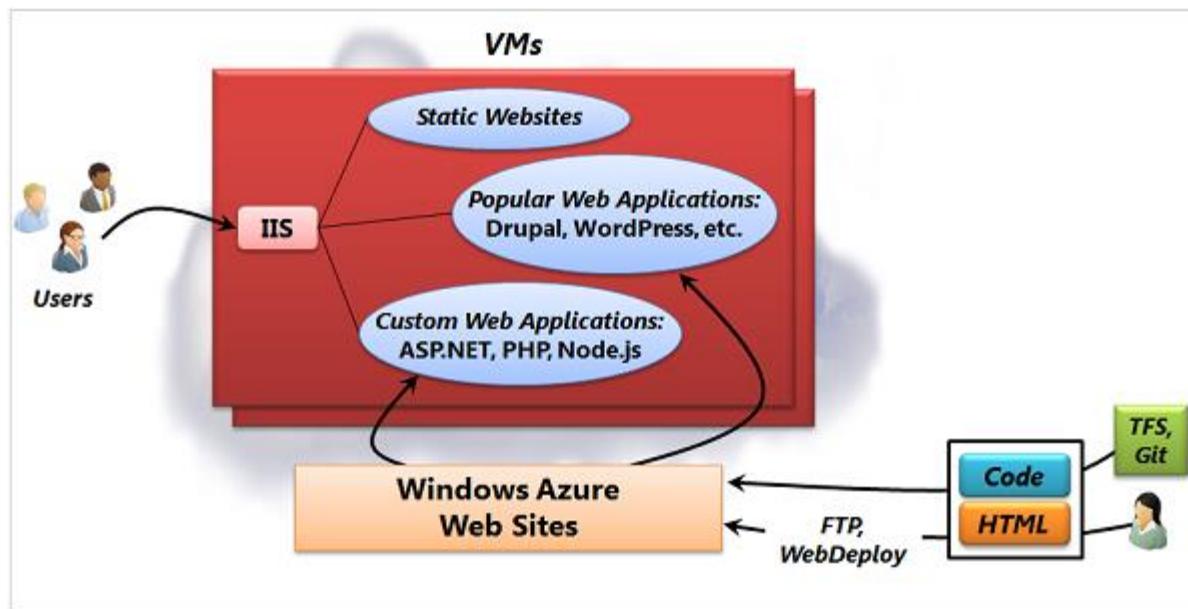
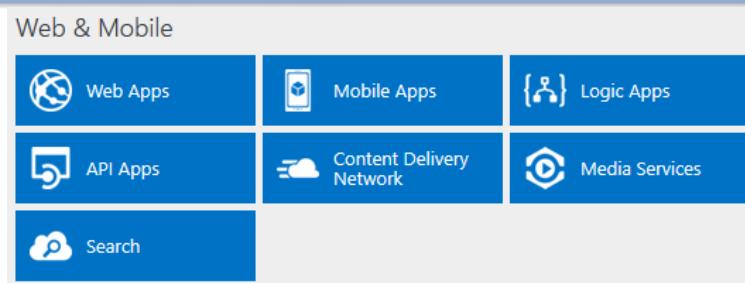


Windows Azure

Web & Mobile

Web Apps

- Exemplu:
 - Ruleaza Windows Server si IIS intr-o masina virtuala
 - ofera suport pentru siteuri web, aplicatii web diferite ce se pot baza pe tehnologii diverse -> *web hosting*

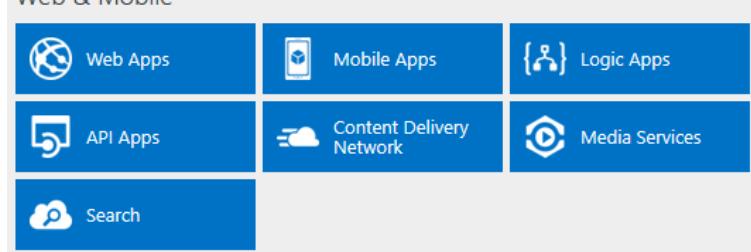


Sisteme de control a codului sursa:
Team Foundation Server, Git

- Se asigura o deschidere catre o gama larga de utilizatori

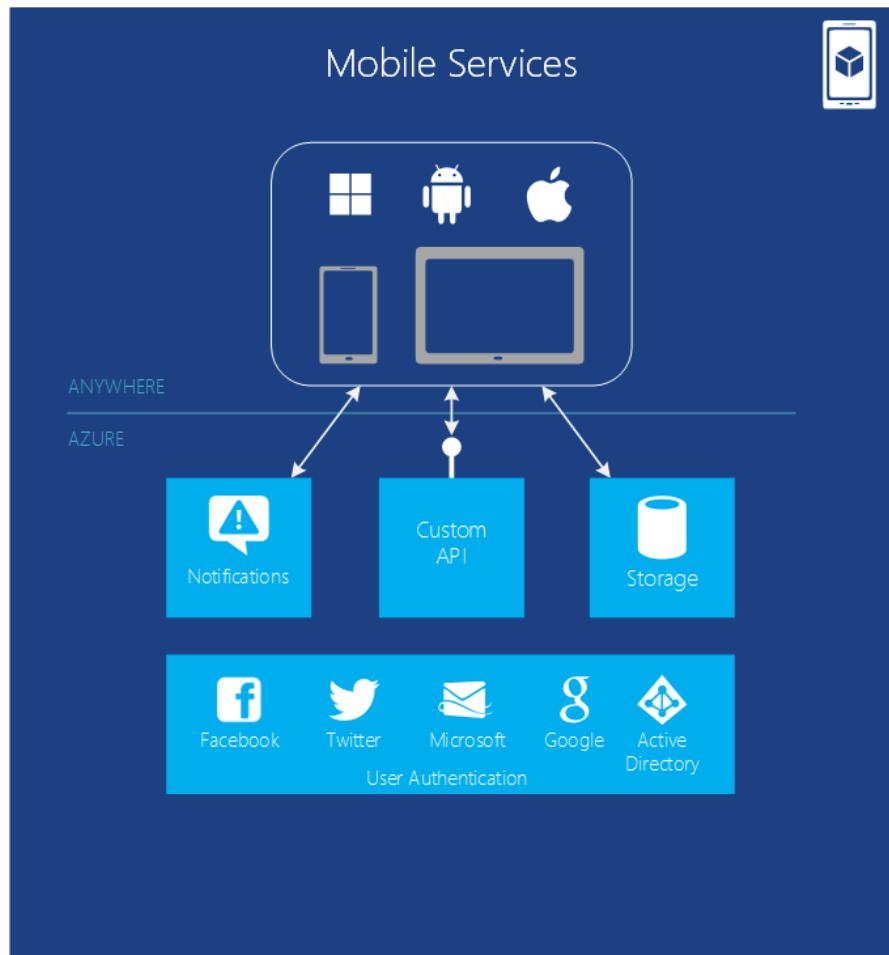
[www.windowsazure.com] 46

Windows Azure



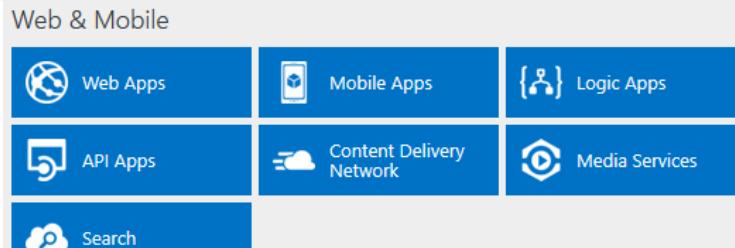
Web&Mobile / Mobile Apps

- SDK pentru Windows, Android, iOS
- Mobile Services (storage in Azure SQL, Blob,... sau tird-party (e.g. MongoDB))
- Service Bus Relay – conectarea cu baze de date on-premise
 - => aplicatii integrate cu orice platforma
 - beneficiaza de facilitatile oferite de Azure (scalabilitate, disponibilitate, ...)

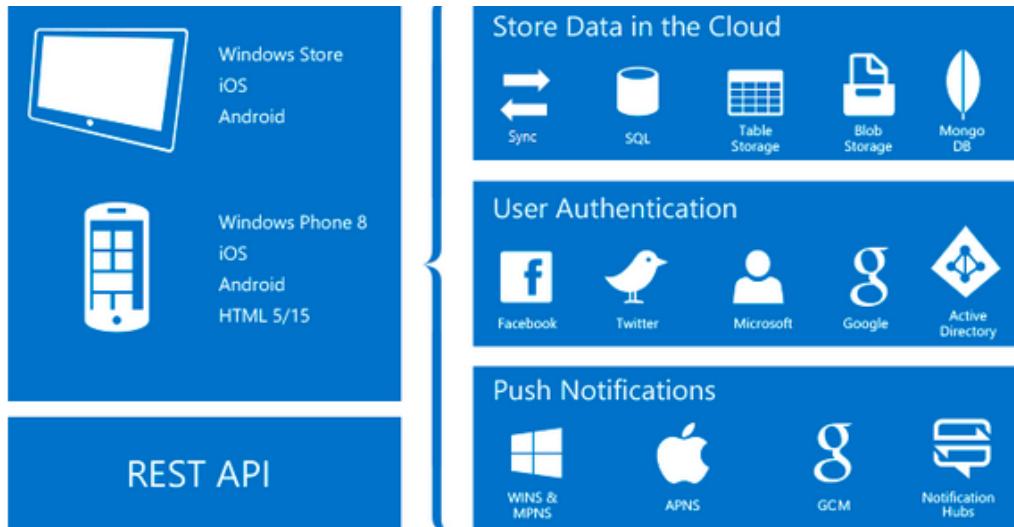


Windows Azure

Web&Mobile | 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]

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Windows Azure

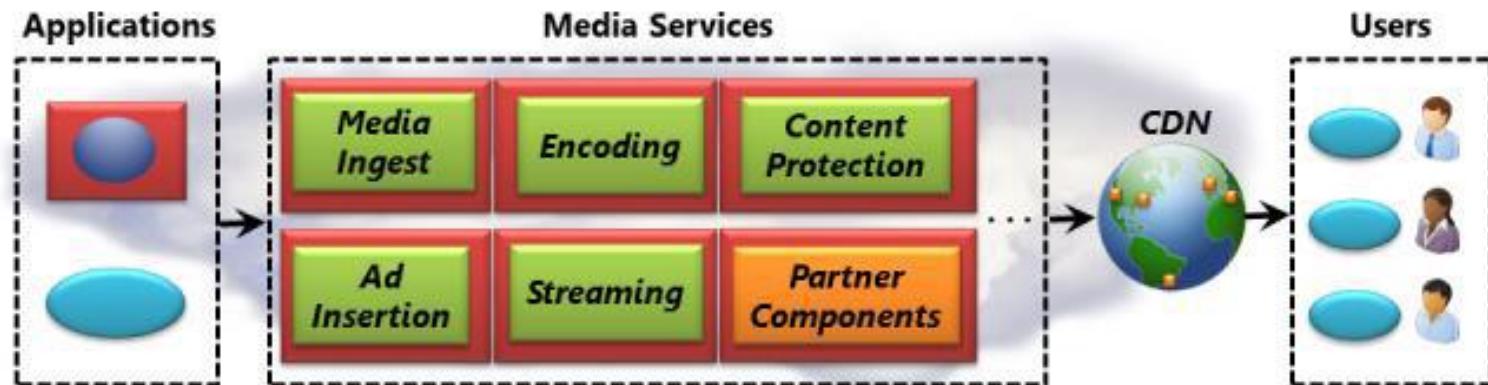
Web & Mobile

 Web Apps	 Mobile Apps	 Logic Apps
 API Apps	 Content Delivery Network	
 Search		 Media Services

Web&Mobile

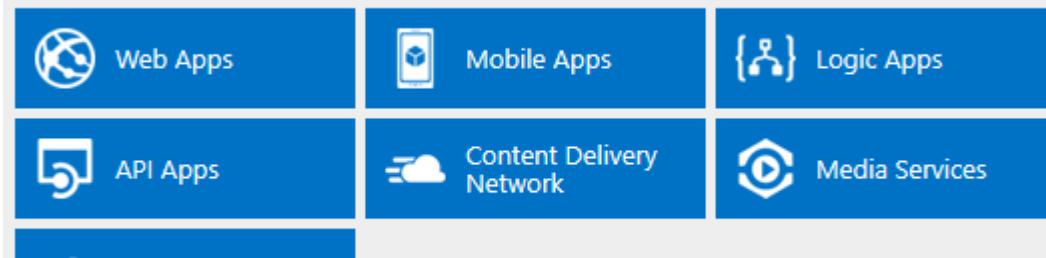
- **Media Services**

- Platforma pentru aplicatii care furnizeaza video si alte resurse media clientilor
- ?algoritmi de codificare, rezolutia de afisare la clienti, cresterea nr. de utilizatori sambata seara?



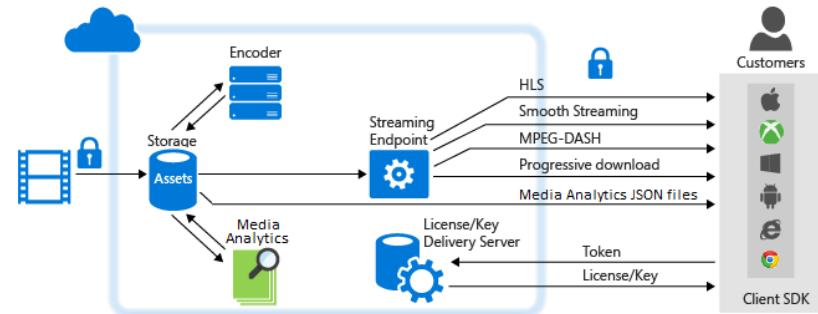
Windows Azure

Web&Mobile



To build Media Services solutions, you can use:

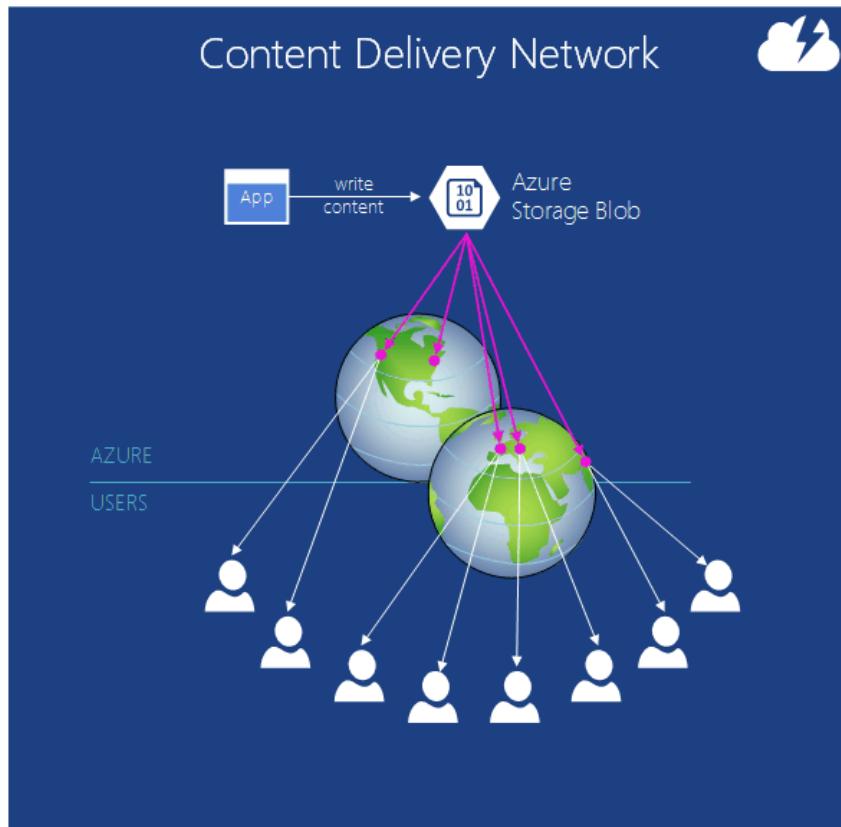
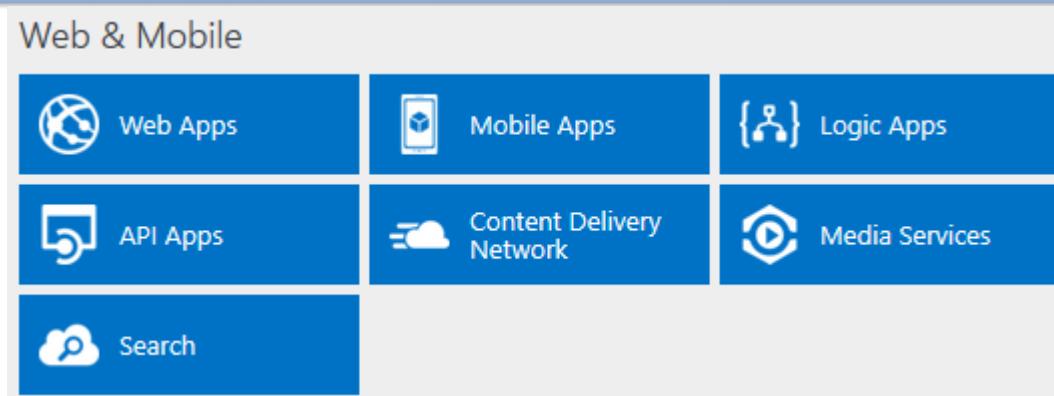
- [Media Services REST API](#)
- One of the available client SDKs:
 - [Azure Media Services SDK for .NET](#),
 - [Azure SDK for Java](#),
 - [Azure PHP SDK](#),
 - [Azure Media Services for Node.js](#) (This is a non-Microsoft version of a Node.js SDK. It is maintained by a community and currently does 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)



Windows Azure

CDN

- Cand un utilizator acceseaza o resursa dintr-un blob, informatia de acolo este copiata din datacenter-ul Azure intr-un storage CDN aflat in aria geografica a utilizatorului



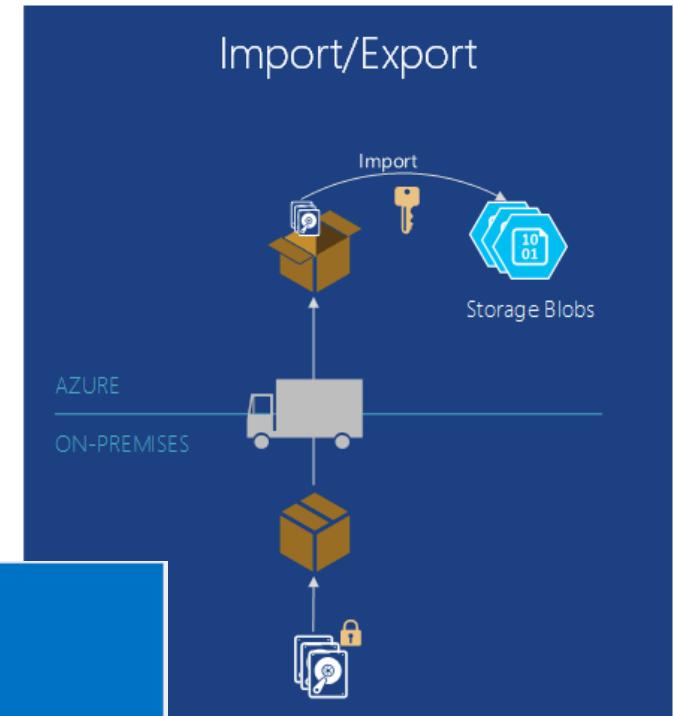
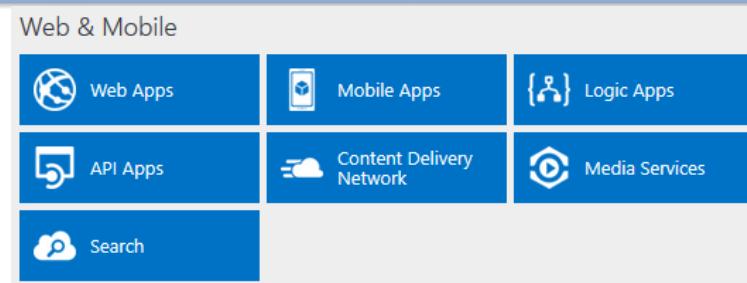
[www.windowsazure.com] 51

Windows Azure

Web&Mobile

Logic Apps

- Servicii de migrare a datelor locale inspre/dinspre centrele de date Azure
 - datele sunt stocate automat de Azure in blob-uri de unde pot fi accesate in moduri variate (ca Table, SQL DataBase, etc)



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

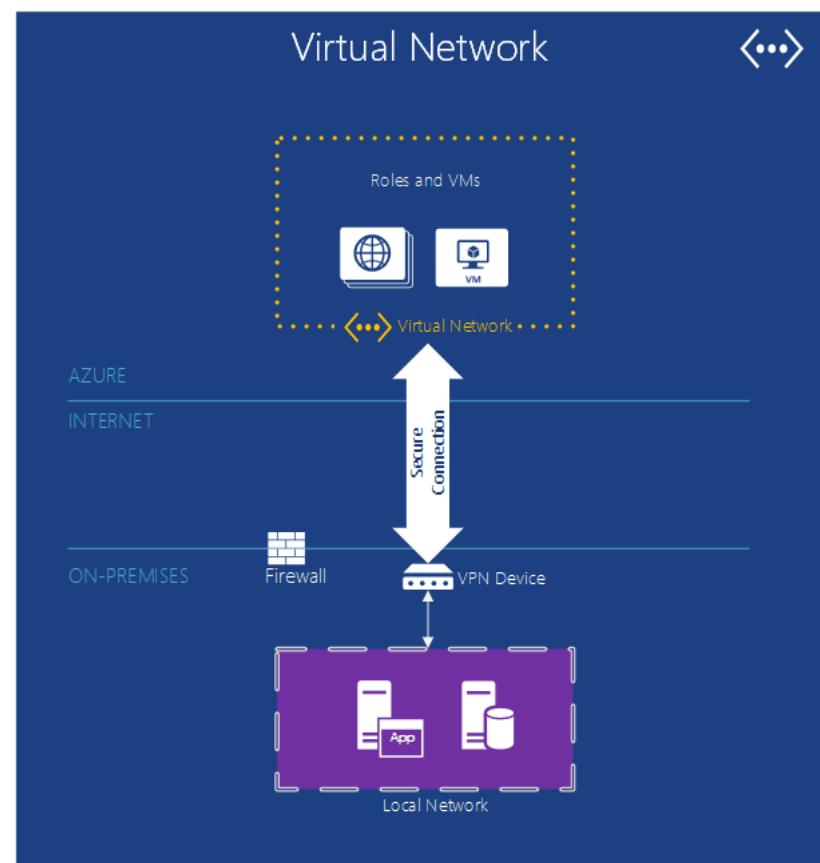
Windows Azure

Networking

Virtual Network

- **Windows Azure** ruleaza in centre de date multiple in US, Europa, Asia
- La rularea unei aplicatii sau cand se stocheaza datele se poate alege si conecta unul sau mai multe centre de date ce se doresc sa fie utilizate
 - Se face apel la un dispozitiv VPN gateway cu ajutorul caruia administratorul poate crea un VPN intre retea locala si Azure
(=>infrastructura hibrida)

 Virtual Network	 Load Balancer	 Application Gateway
 VPN Gateway	 Azure DNS	 Traffic Manager
 ExpressRoute	 Network Watcher	



Windows Azure

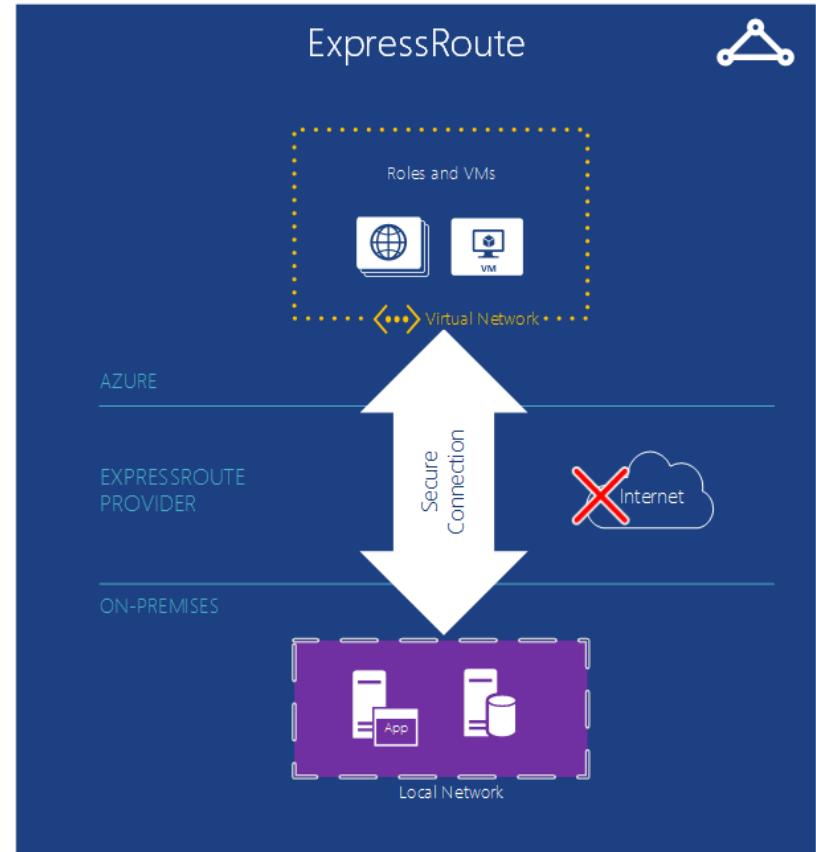
Networking

Express Route

- Pentru utilizarea serviciului avem nevoie de un contract cu un furnizor de servicii de retea pentru a avea o conexiune dedicata
- Conexiunile ExpressRoute ofera incredere, viteza ridicata, latenta scazuta, securitate sporita.

Networking

 Virtual Network	 Load Balancer	 Application Gateway
 VPN Gateway	 Azure DNS	 Traffic Manager
 ExpressRoute	 Network Watcher	



Windows Azure

Networking

Traffic Manager

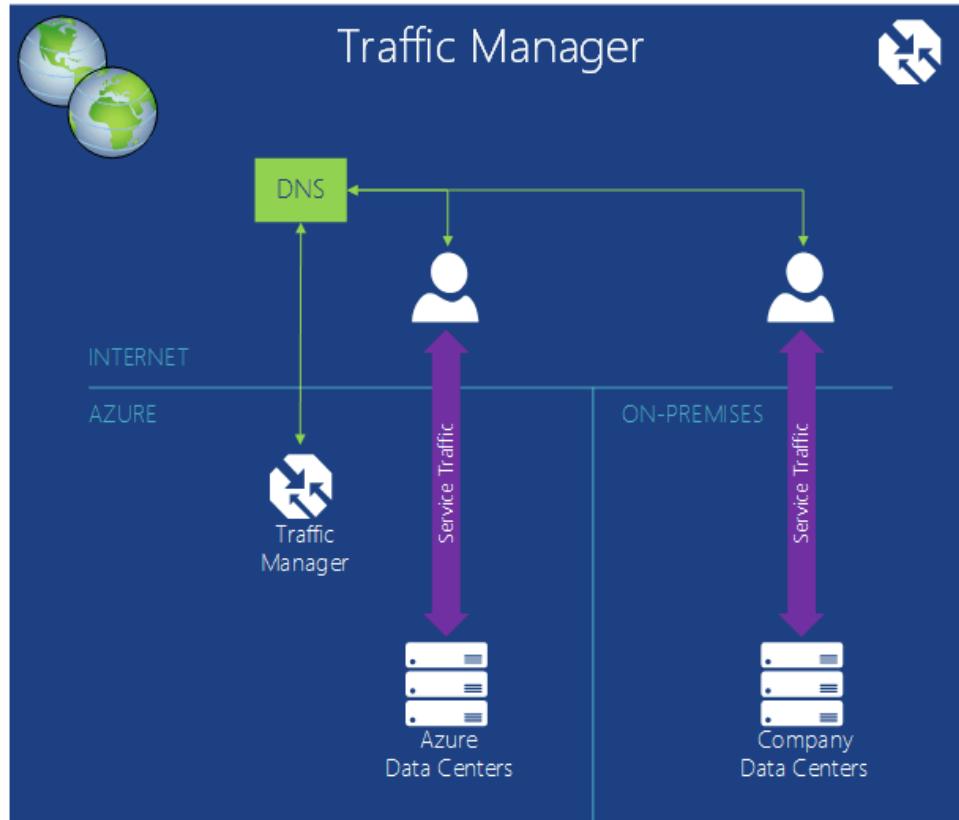
Rutarea cererilor utilizatorilor catre instante multiple a unei aplicatii care ruleaza in centre de date multiple

Utilizare

- Cresterea disponibilitatii pentru aplicatiile critice
- Upgrade-ul si serviciile de intretinere se pot face fara “downtime”
- Distribuirea traficului in mod echilibrat pentru sisteme complexe
- Suport pentru A/B (split) testing

Networking

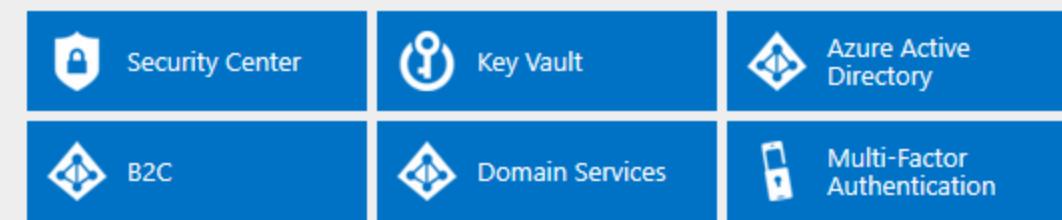
 Virtual Network	 Load Balancer	 Application Gateway
 VPN Gateway	 Azure DNS	 Traffic Manager
 ExpressRoute	 Network Watcher	



Windows Azure

Security & Identity

Active Directory



- *Windows Azure Active Directory*, stocheaza informatii despre utilizatori si organizatiile apartinatoare
- Permite sincronizarea informatiilor utilizatorului cu un server *active directory* ruland on-premise
- *Windows Azure Active Directory*, furnizeaza un Rest API (*Windows Azure Active Directory Graph*) care permite accesarea informatiilor detinute
- O alta facilitatea *Windows Azure Active Directory Access Control*, permite unei aplicatii acceptarea de informatii privind identitatea preluata de pe Facebook, Google, Windows Live ID etc. Access Control le serializeaza intr-un format comun.
- *Access Control* permite si login-uri din domenii *Active Directory* diferite => *single sign-on*

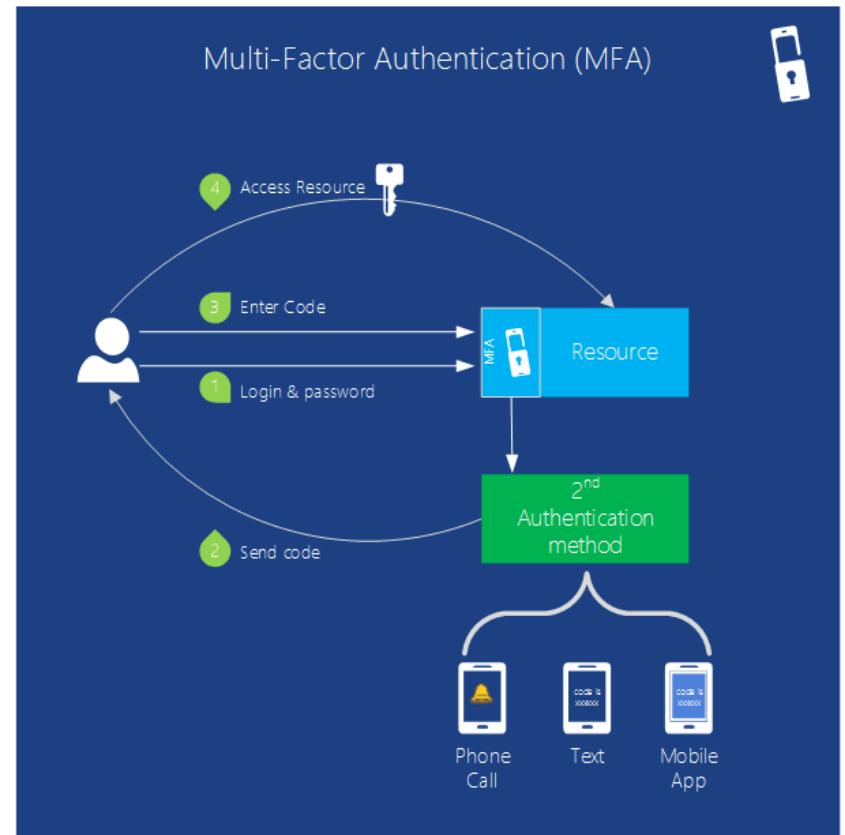
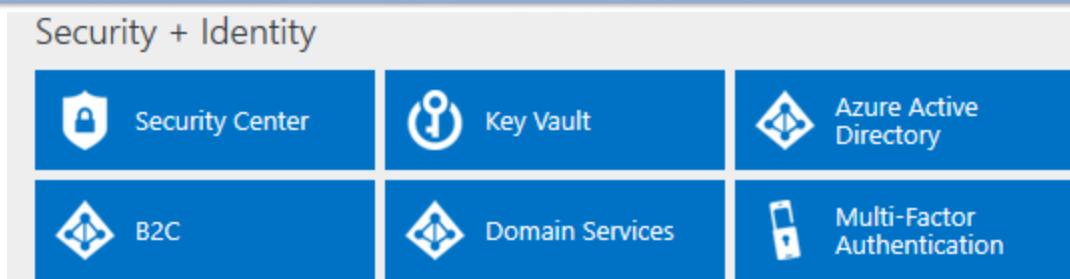
Windows Azure

Security & Identity

Multi-Factor

Authenticatioon (MFA)

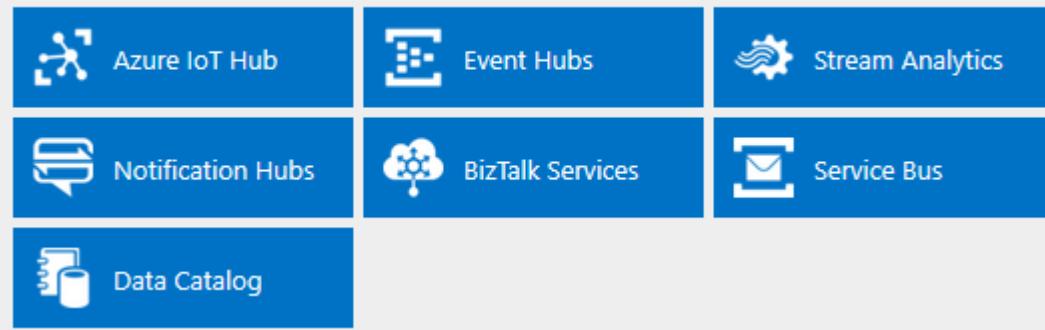
- 2FA – cere din partea utilizatorului multiple metode de verificare a identitatii



Windows Azure

Internet of Things & Enterprise Integration

Internet of Things & Enterprise Integration

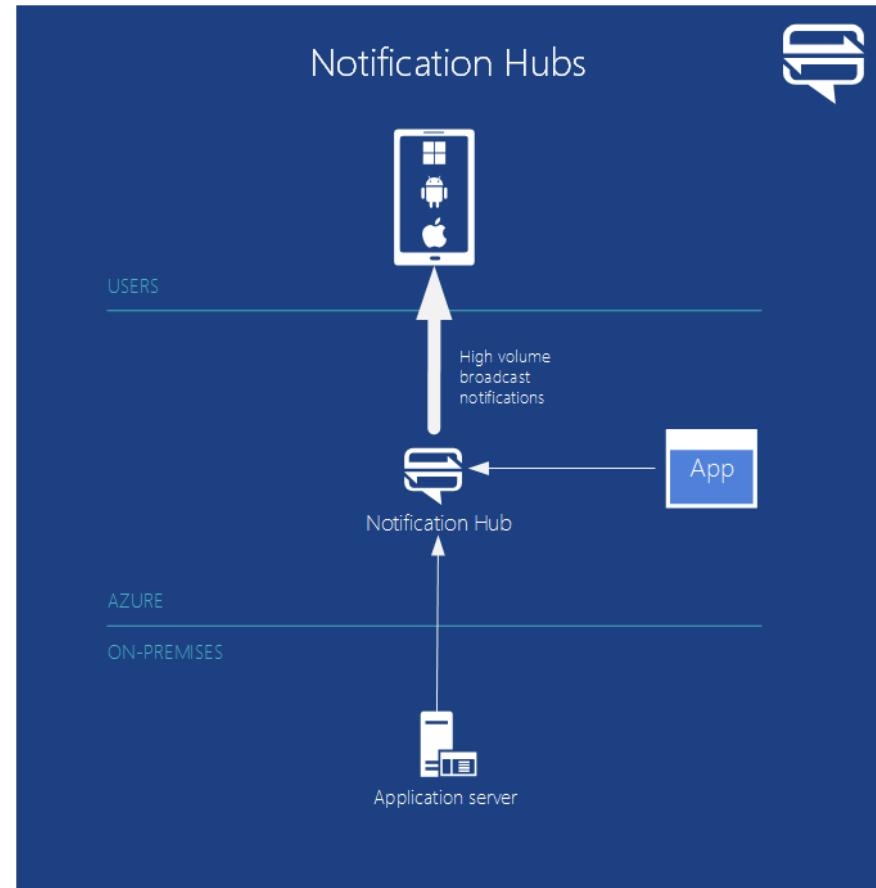


Notification Hubs

- Serviciu optimizat pentru broadcastul a milioane de *push notifications* personalizate

Scenarii de utilizare:

- *Breaking news*, evenimente sportive, notificari asupra unor produse etc.





Azure IoT Hub



Event Hubs



Stream Analytics



Notification Hubs



BizTalk Services



Service Bus

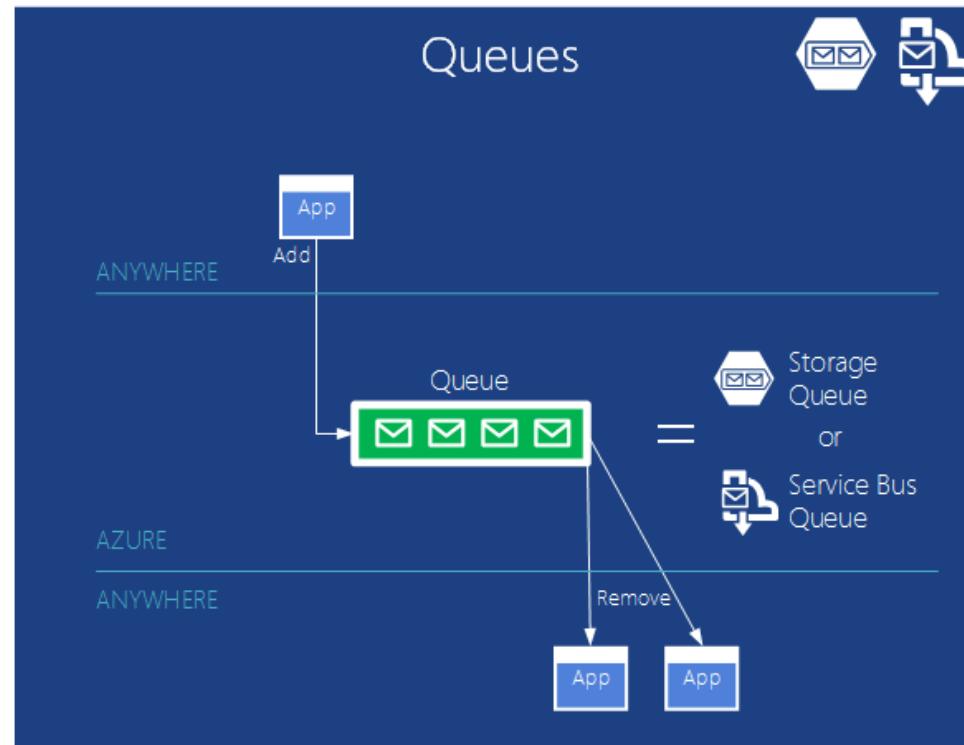


Data Catalog

Windows Azure

Internet of Things & Enterprise Integration

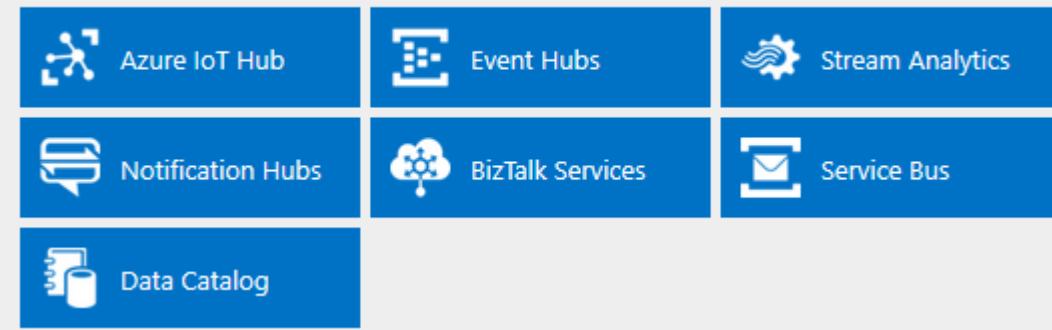
- “codul are nevoie sa interactioneze cu alt cod”
- Pentru aplicatii conectate, Azure ofera mecanisme de tiul: *queues*, *publish/subscribe*, conexiuni sincrone



[www.windowsazure.com] 59

Windows Azure

Internet of Things & Enterprise Integration



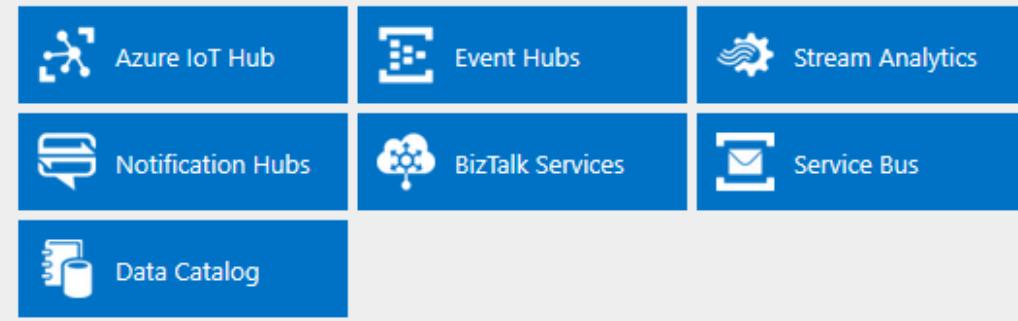
- ***Service Bus Queues***

- Doreste sa permita aplicatiilor de “oriunde” sa interactioneze intr-un mod *loosely coupled*
- Mecanism:
 - Service Bus furnizeaza un serviciu de *queuing*, diferit de *Queues*
 - Service Bus furnizeaza un mecanism *publish-and-subscribe*; o aplicatie poate trimite mesaje unui canal, alte aplicatii pot face *subscribing* la acel canal => comunicare *one-to-many*, acelasi mesaj poate fi citit de receptori multipli
- Exemplu: companie aeriana care implementeaza servicii de rezervare in propriul datacenter. Aceste servicii trebuie expuse multor clienti (*check-in kiosks* din aeroporturi, agentii de rezervare, etc)

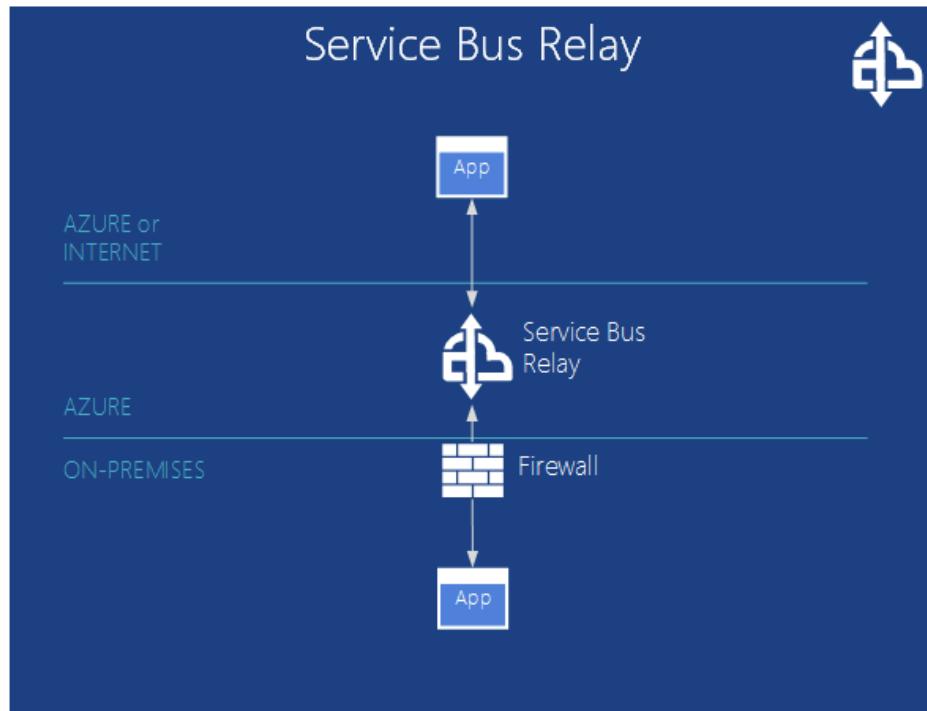
[www.windowsazure.com] 60

Windows Azure

Internet of Things & Enterprise Integration

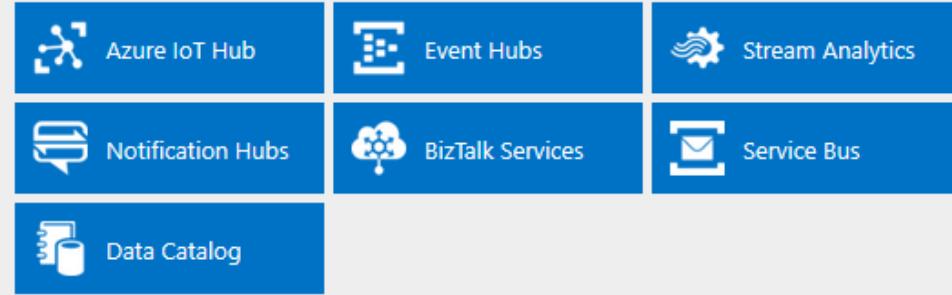


- ***Service Bus Topics*** – permite aplicatiilor sa posteze mesaje si alte aplicatii fac “subscribe” pentru a primi mesaje care se conformeaza unor criterii
- ***Service Bus Relay Scenarios*** – permite comunicarea intre aplicatii care sunt de o parte si de alta a unui firewall



Windows Azure

Internet of Things & Enterprise Integration



Internet of Things & Enterprise Integration

- ***BizTalk Services*** – furnizeaza, in cloud, abilitatea de a transforma mesajele XML vehiculate in alt format XML care sa fie intrelesede partile ce doresc sa comunice

Enterprise application integration

BizTalk Services provides out-of-the box, cloud to on-premises and line-of-business application integration for SAP, Oracle EBS, SQL Server, and PeopleSoft. It lets you connect with any HTTP, FTP, SFTP, or REST data source. You can route messages by using various Azure artifacts such as Service Bus queues, Topics, SQL Database, and Blob storage.

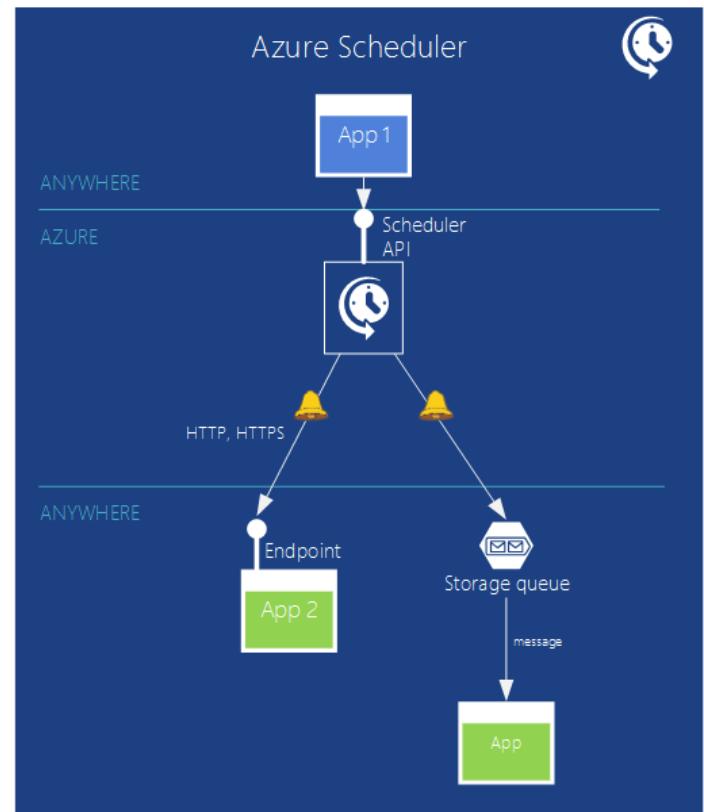
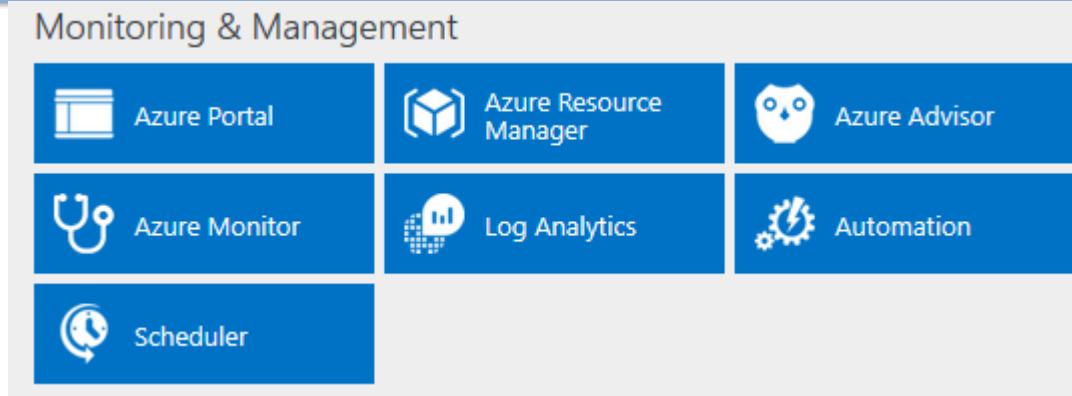
Thousands of customers trust BizTalk Services for solutions such as payment processing, supply chain management, business-to-business interactions, real-time decision making, and reporting. [Learn more about Microsoft integration.](#)

Windows Azure

Monitoring & Management

- **Scheduler**

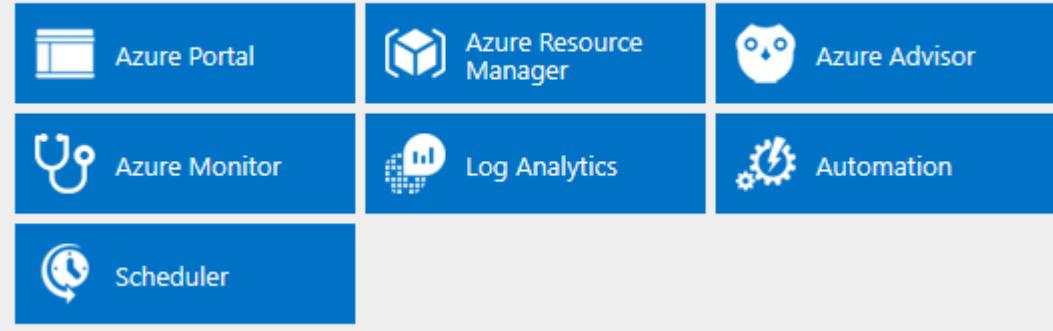
- Azure furnizeaza asistenta pentru servicii care nu ruleaza tot timpul
- Mecanism: cand apare alarma programata, Scheduler trimite mesaje HTTP/HTTPS la un endpoint sau plaseaza mesajul intr-o StorageQueue
- Exista un Scheduler API: *create, update, delete, view* pentru managementul colectiei de job-uri



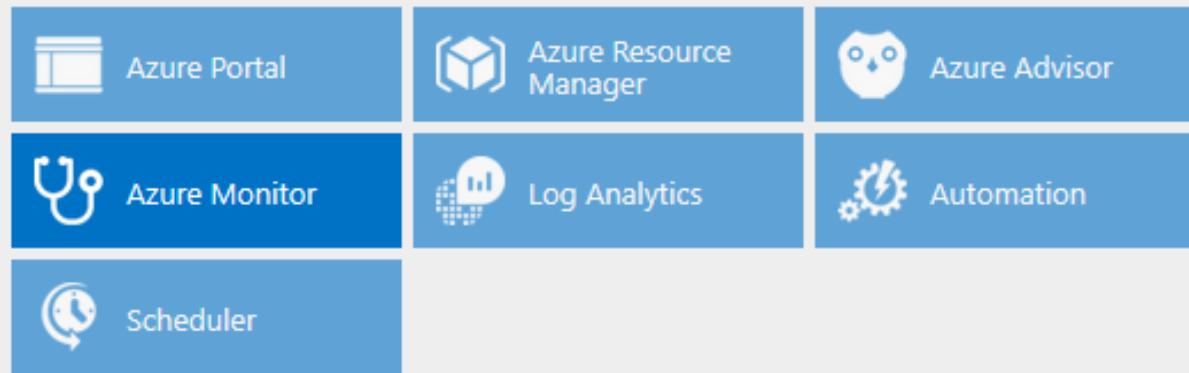
Windows Azure

Monitoring & Management

Monitoring & Management



Monitoring & Management



Get the granular, up-to-date monitoring data you need—all in one place

- Monitor your Azure resources with detailed logs
- Set up alerts, and take proactive, automated actions
- Use flexible configuration and data consumption options
- Integrate with analytics and notification tools familiar to you

[Overview](#) [Pricing](#) [SLA](#) [Service Updates](#)

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Windows Azure

Intelligence & Analytics

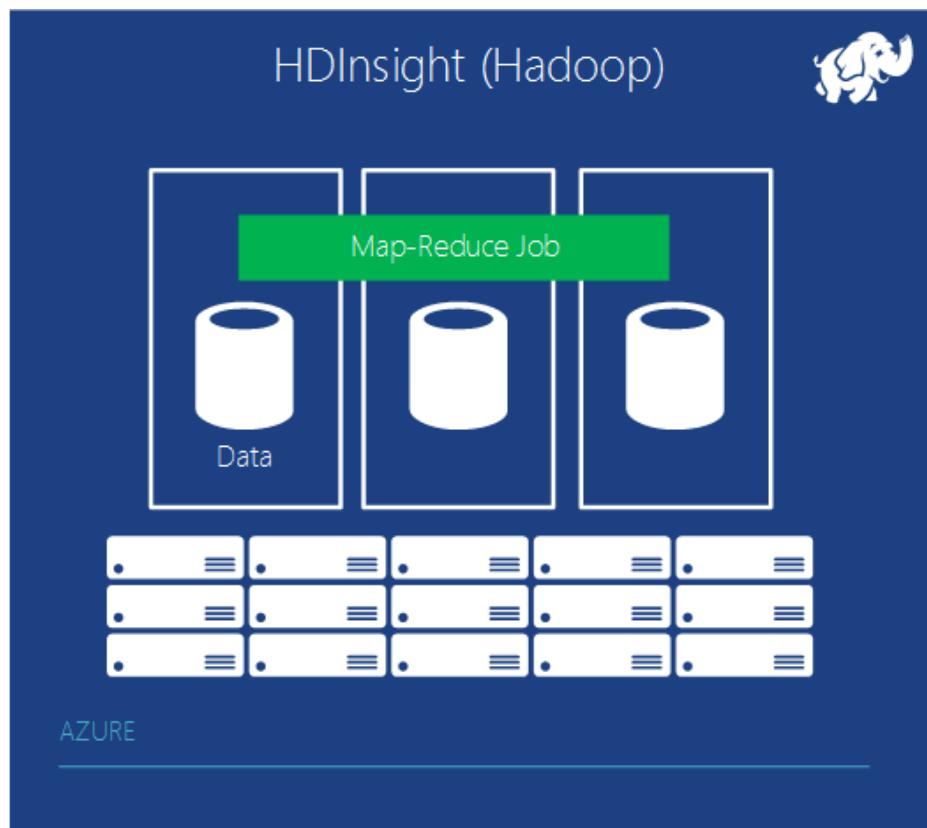
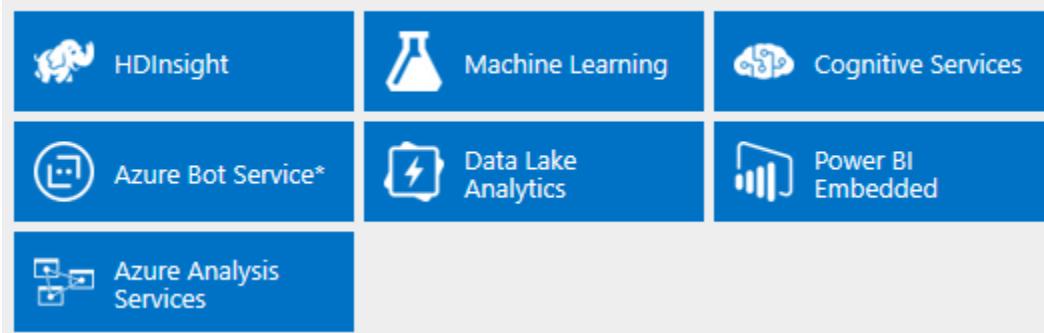
- Analiza datelor reprezinta un element fundamental a modului in

care domeniul business foloseste IT-ul

(Business Analytics)

- HDInsight: Hadoop & MapReduce**
 - + Hive, Pig, HiveODBC, DataExplorer
 - Stocarea datelor se face folosind HDFS
 - ...
 - Detalii la Master..si nu numai ☺

Big compute: executia de cod simultan pe masini multiple
(e.g. A8, A9...)



[www.windowsazure.com]

Visual Studio Team
ServicesAzure DevTest
LabsVS Application
Insights

API Management



HockeyApp



Service Profiler*



Developer Tools

Windows 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++)
- Necesarea la crearea de aplicatii Windows Azure, dar si la aplicatii care ruleaza on-premise dar folosesc servicii Azure

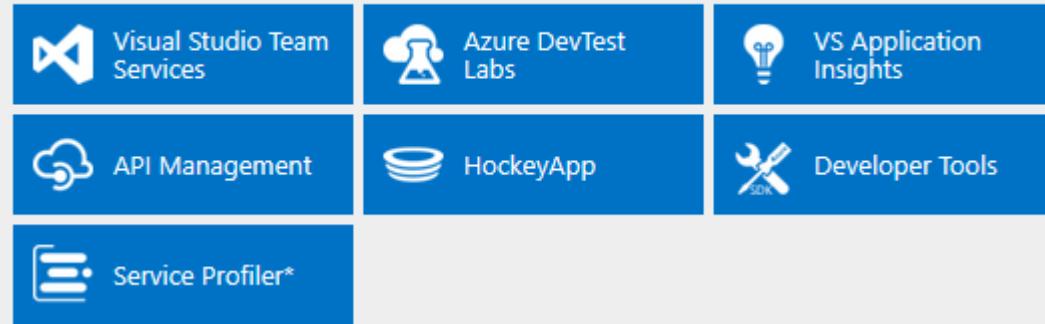
Visual Studio Online

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

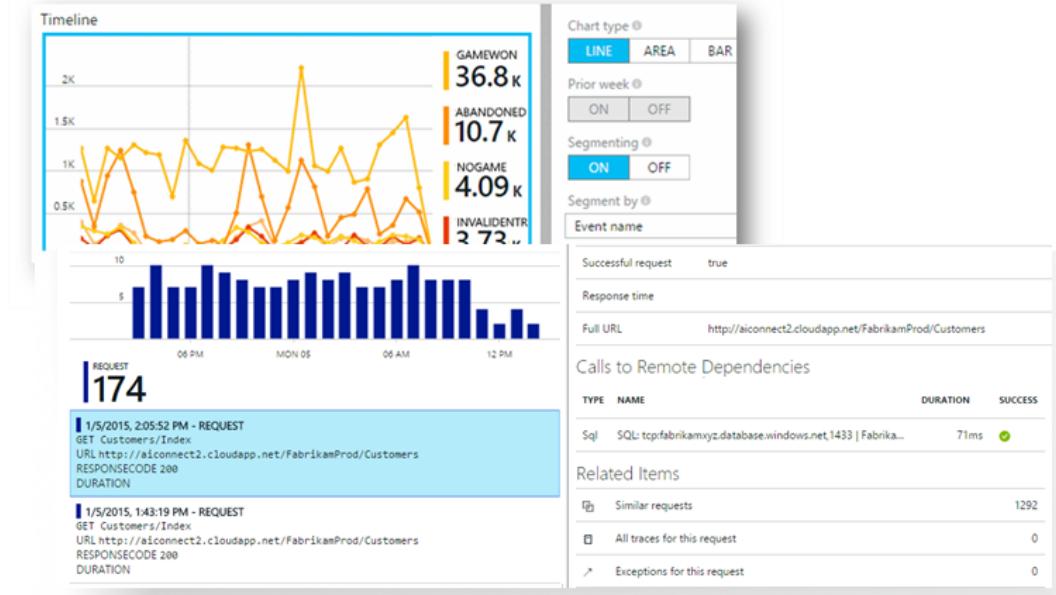
API Management – ofera suport companiilor care expun servicii sub forma de API-uri sub forma unui *proxy API* asigurand *caching*, *throttling*, *access control et.al.*

Windows Azure

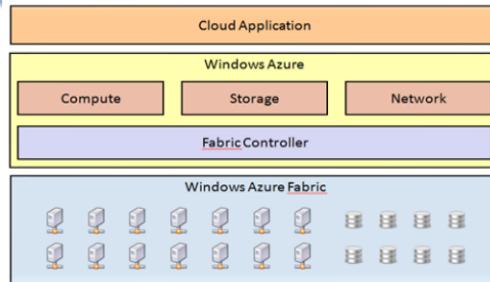
Developer Services



- ***Visual Studio Application Insights*** – serviciu de monitorizare a aplicatiei (detectarea si diagnoza aspectelor care tin de performanta, monitorizarea actiunilor utilizatorilor)



Windows Azure



Exemple de scenarii de utilizare:

- Aplicatii Web scalabile
 - Mai multe instante de tip Web Roles
 - Date stocate in *tables*
 - Exemplu: game multiplayer online
- Aplicatii de procesare paralela
 - Mai multe instante de tip Worker Role pentru procesarea de date si realizarea de calcul
 - Data este stocata in *blobs*
 - O singura instantă Web Role
 - Instantele comunică între ele prin *queues*

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Facultatea de Informatică

Întrebări?

