

Moodle in Azure

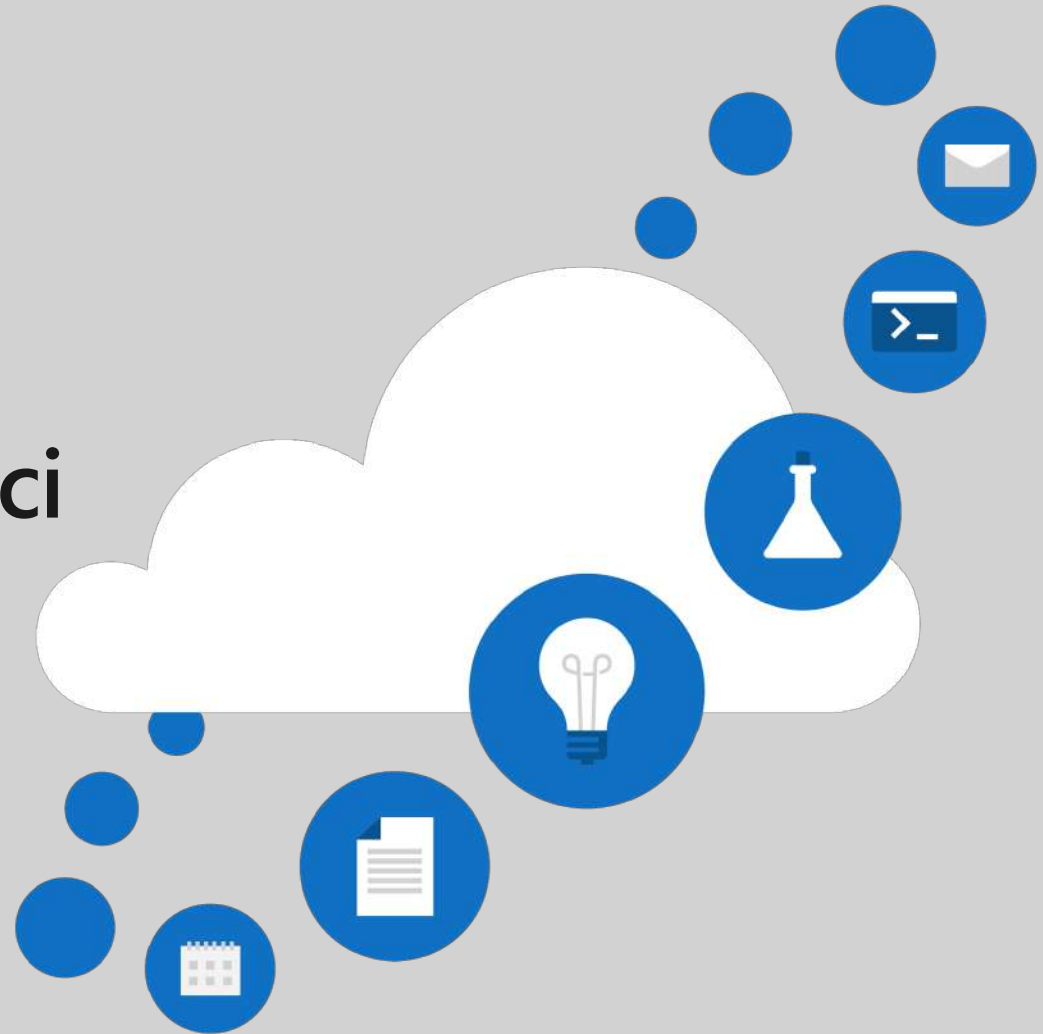
Architettura ed esempi pratici

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Matteo Ricci – Università di Bologna



Agenda

-
- Perché Moodle in Azure
 - Architettura di Moodle in Azure
 - Componenti principali in Azure
 - Monitoraggio
 - Estensioni ad altri servizi in Azure
 - Caso di riferimento Università di Bologna
 - Ottimizzazione costi

Perché Moodle in Azure



Perché Moodle in Azure



Gestione semplificata

Performance Elastiche

Crescita secondo le esigenze

Alta affidabilità (Business Continuity e
Disaster Recovery)

Integrazioni avanzate (moduli)

Architettura di Moodle



Frontend web

(web server,
PHP engine)



Moodledata folder

(dati conservati da
Moodle)



Database



Cache

(application cache,
session cache,
request cache)

Architettura di Moodle in Azure



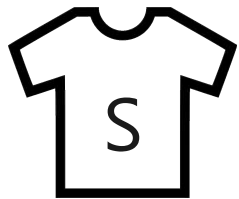
Elementi per la scalabilità e semplificazione

- Scomposizione dei ruoli in architettura cluster
- Identificazione colli di bottiglia nel proprio contesto
- Raccomandazioni della comunità Moodle
- Uso di componenti gestiti (PaaS)

https://docs.moodle.org/dev/Performance_and_scalability

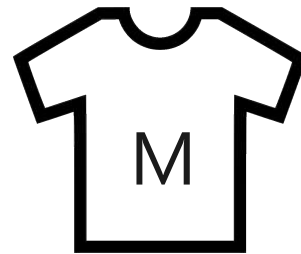
https://docs.moodle.org/310/en/Performance_recommendations

Github Azure/Moodle con template di partenza



Small

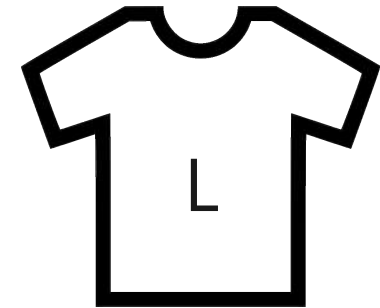
NFS, Azure DB,
small autoscale
web frontend VM



Medium

(<1.000 users)

NFS, Azure DB (8 vCores),
no cache



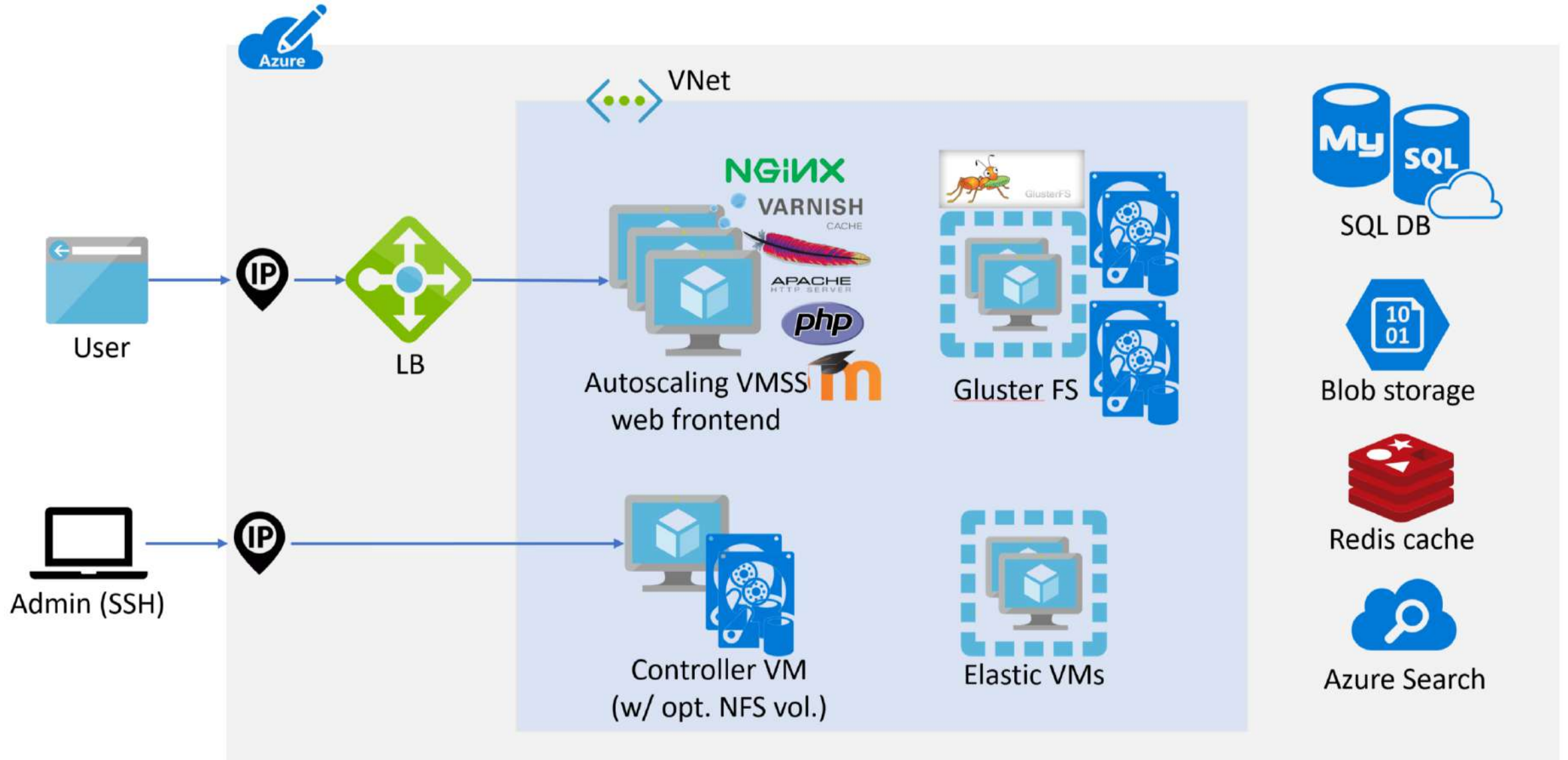
Large

(>2.000 utenti)

GlusterFS (3 VMs), Azure
DB (16 vCores) e Redis
cache,

[GitHub - Azure/Moodle: Tooling and guidance on deploying Scalable Moodle Clusters on Azure.](#)
[Deploying Moodle on Azure – things you should know - Microsoft Tech Community](#)

Architettura in Azure versione 1



Architettura in Azure versione 2



Moodle directories:

dirroot = '/var/www/moodle/html' → local vhd
 dataroot = '/var/www/moodle/data' → NFS
 cachedir = '/var/www/moodle/cache' → NFS
 tempdir = '/var/www/moodle/temp' → NFS
 localcachedir = '/var/www/moodle/local' → local vhd

Azure Backup



Backup:

application data and application configuration

Azure Monitor

+

Log Analytics



Monitor:

service health
 diagnostics



application logs and performances
 gateway access and performance logs
 firewall logs

Azure Security Center



Security Center:

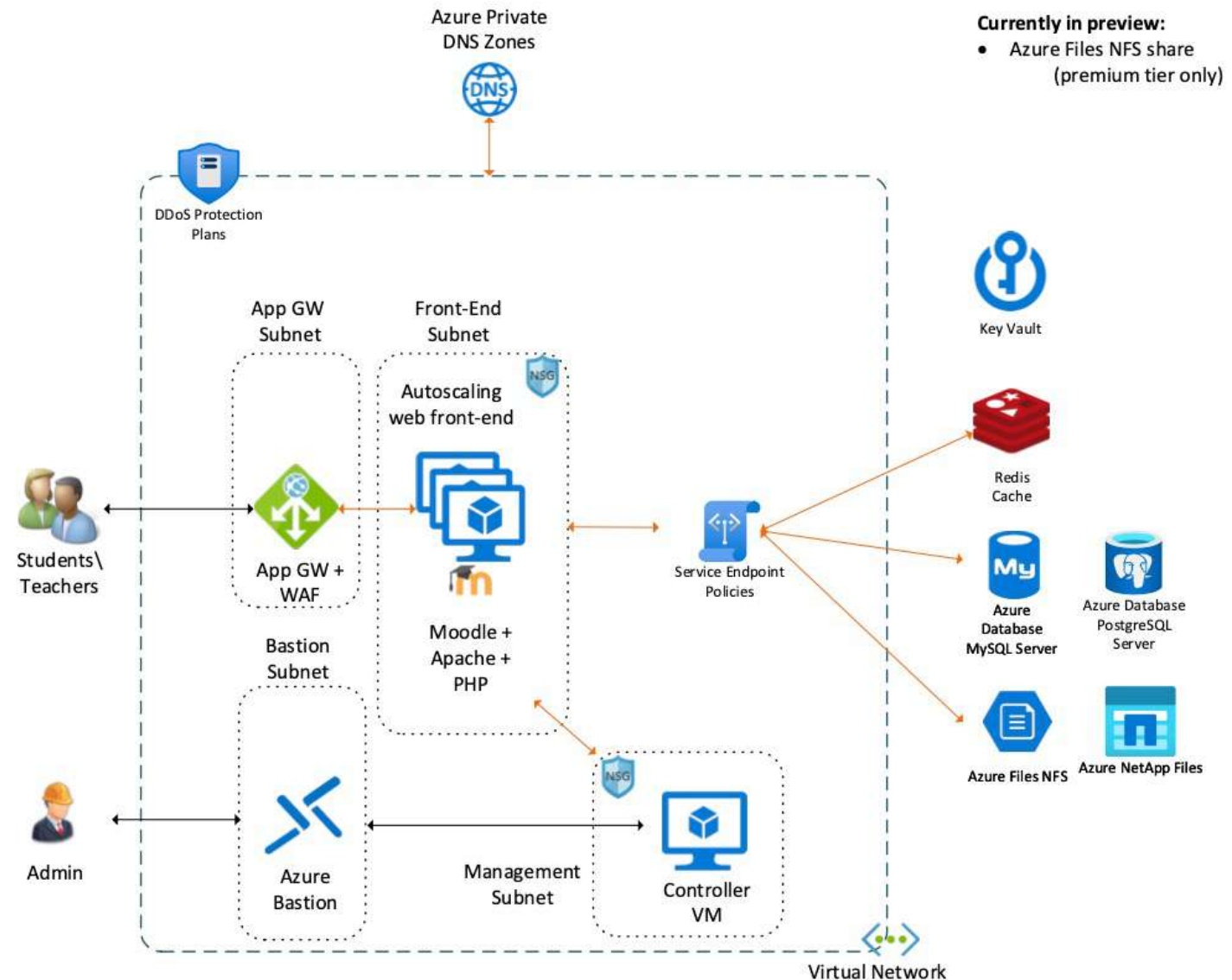
security assessment
 threat protection and prevention
 security recommendations
 security alerts

Azure Automation



Automation:

OS patching
 automation runbooks
 integration with Azure Monitor e Azure Security Center



Currently in preview:

- Azure Files NFS share (premium tier only)

Moodle cluster



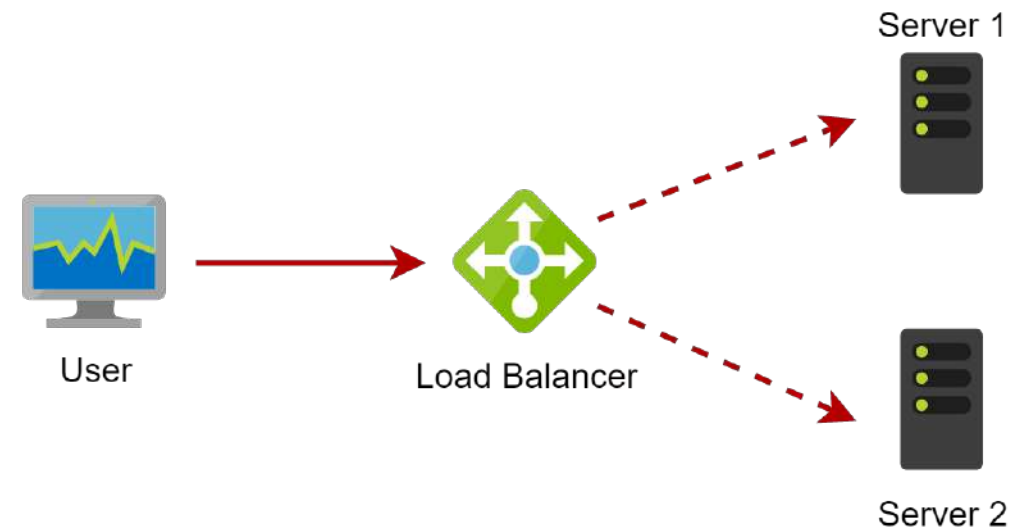
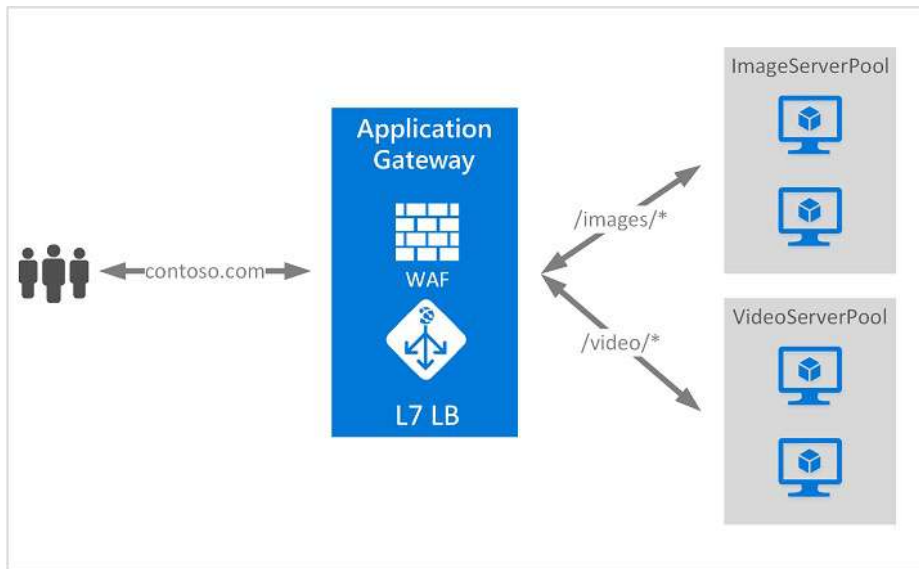
- Scegliere il livello di manutenzione dell'infrastruttura che si intende sostenere
- Individuare una modalità di lavoro per gestire il ciclo di vita di Moodle e dei plugin

Componenti principali in Azure



Frontend web in Azure – Bilanciamento

Azure Application Gateway / Load Balancer

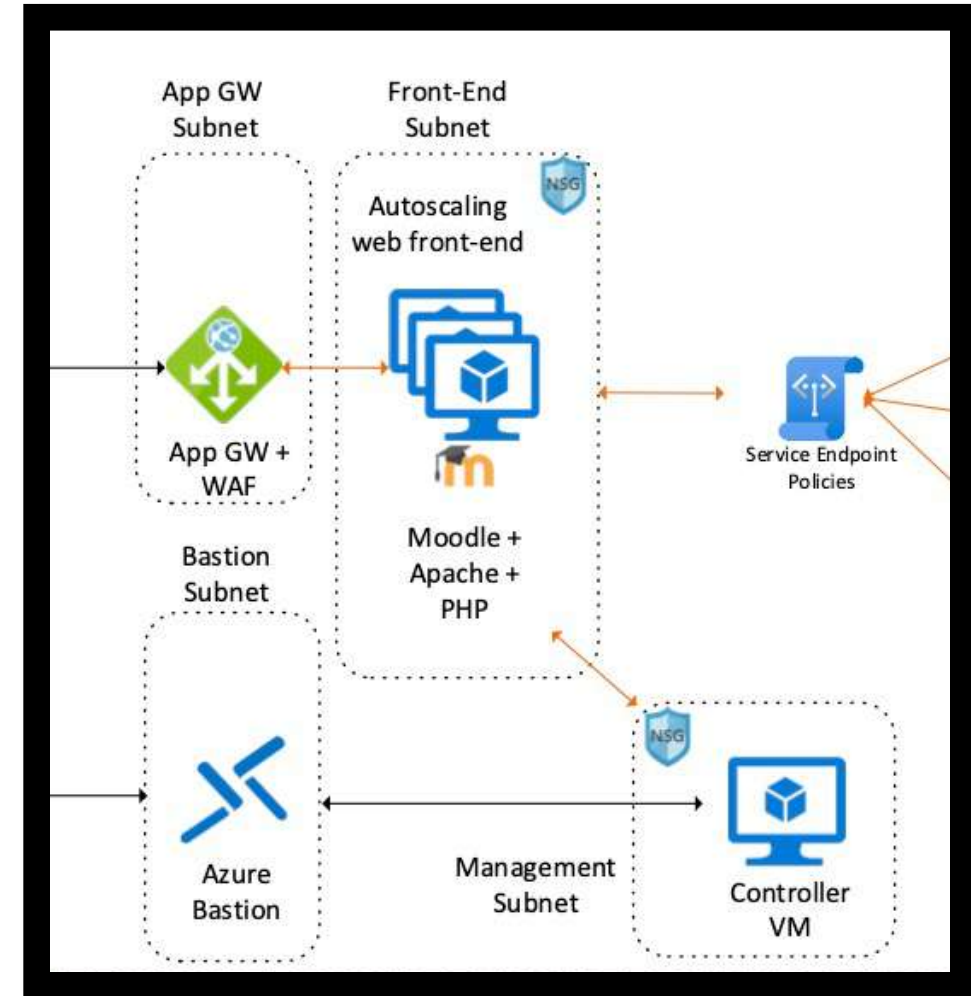


<https://docs.microsoft.com/en-us/azure/application-gateway/overview>

<https://docs.microsoft.com/en-us/azure/load-balancer/load-balancer-overview>

Frontend web in Azure: Web + PHP

- **Azure VM** in bilanciamento
- **Azure VM scaleset**
- **Azure App Service** autoscale



Moodledata directory in Azure

- **Storage account** NFS
- **Azure Netapp Files** NFS
- Volume distribuito GlusterFS 3-node replica su VM: consigliato l'uso di un tool di configuration management)



[Azure NetApp Files performance calculator: https://anftechteam.github.io/calc/advanced/](https://anftechteam.github.io/calc/advanced/)

<https://docs.gluster.org/en/latest/Quick-Start-Guide/Quickstart/>

Parametri NFS raccomandati: <https://moodle.org/mod/forum/discuss.php?d=310501#p1242382>

Moodle Database e cache in Azure

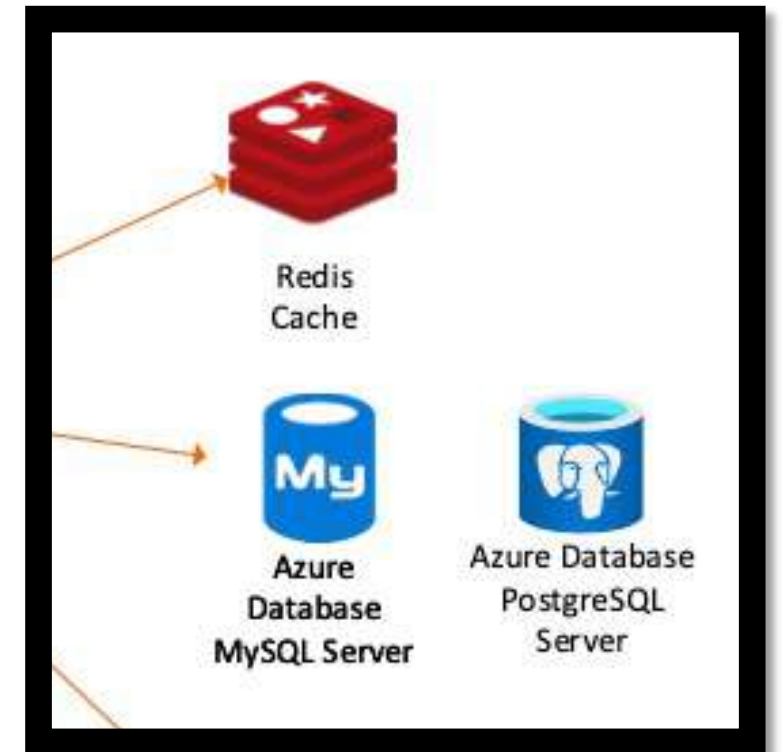
- **Azure Database for MySQL/PostgreSQL** (PaaS con flessibilità di vCore, Storage, IOPS, memory)
- **Redis Cache**: application caching, condivisibile tra più istanze Moodle

<https://docs.microsoft.com/en-us/azure/postgresql/overview>

<https://docs.microsoft.com/en-us/azure/mysql/overview>

https://docs.moodle.org/310/en/Moodle_migration

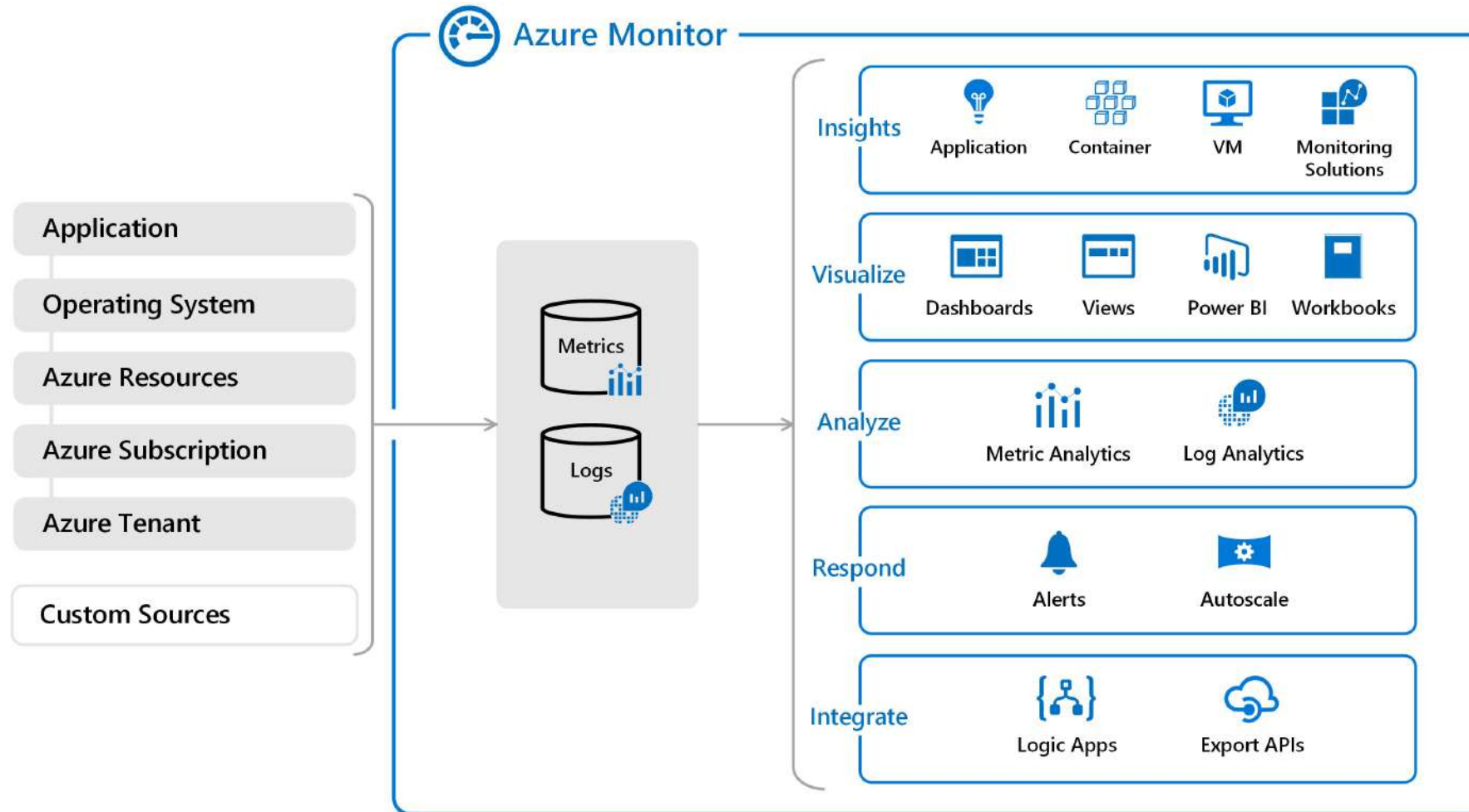
<https://docs.moodle.org/39/en/Caching>



Monitoraggio



Azure monitor



<https://docs.microsoft.com/en-us/azure/azure-monitor/overview>

Metriche



Metrics Explorer



Log Analytics



Show legacy language converter

Event | where EventLevelName == "Error" | project TimeGenerated, Computer, EventLevelName, Source, EventID

4K Results [List](#) [Table](#) Advanced Analytics 00:00:00.339

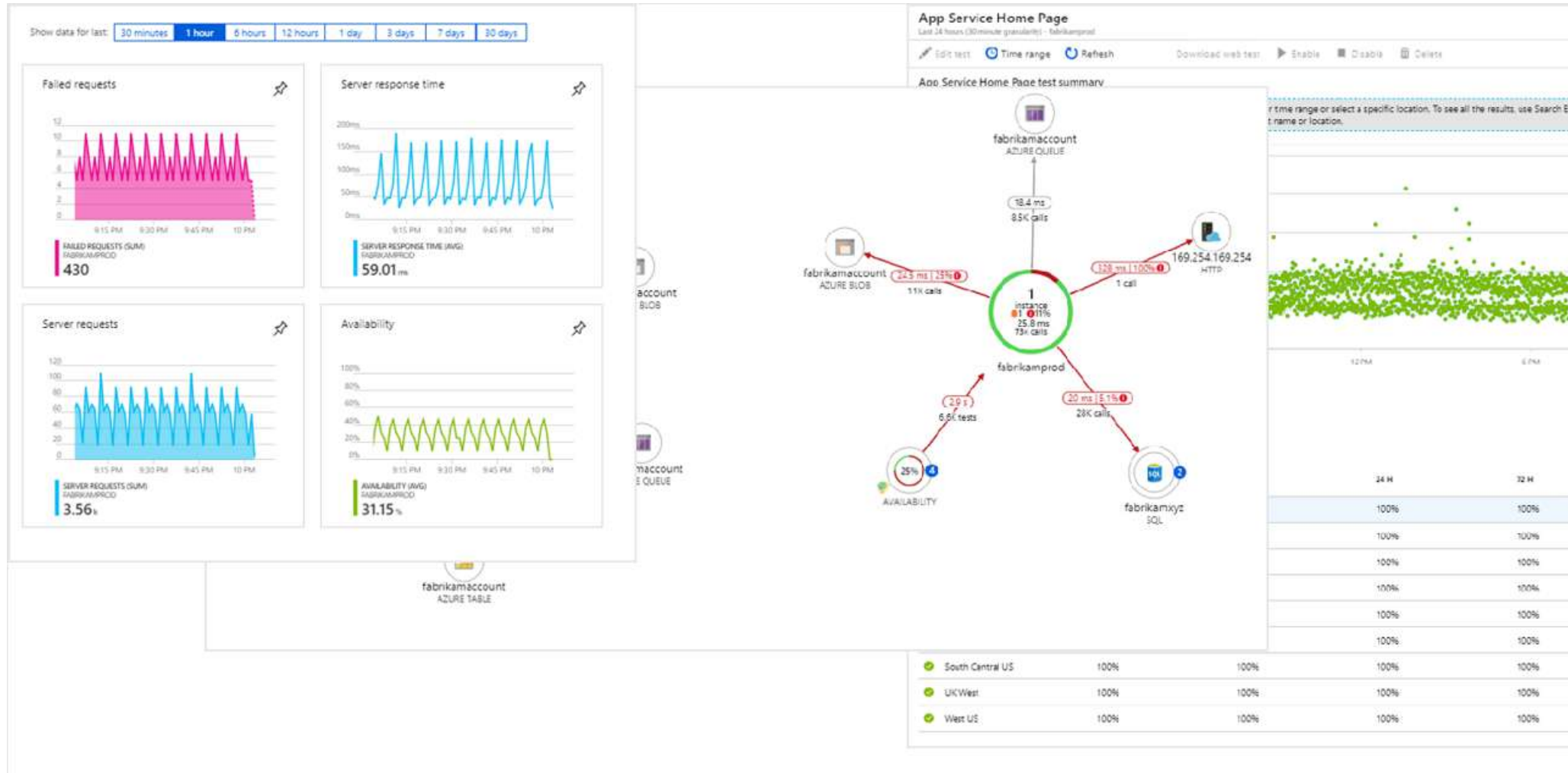
Drag a column header and drop it here to group by that column

TimeGenerated	Computer	EventLevelName	Source	EventID
7/17/2017 11:29:02 AM	srv01.contoso.com	Error	Microsoft.Windows-L...	5873
7/17/2017 11:29:12 AM	srv01.contoso.com	Error	HealthService	4502
7/17/2017 11:29:12 AM	srv02.contoso.com	Error	HealthService	4502
7/17/2017 11:29:12 AM	srv01.contoso.com	Error	HealthService	4502
7/17/2017 11:29:12 AM	srv02.contoso.com	Error	HealthService	4502
7/17/2017 11:29:26 AM	srv03.contoso.com	Error	NSM Agent	100
7/17/2017 11:29:36 AM	srv01.contoso.com	Error	NSM Agent	100

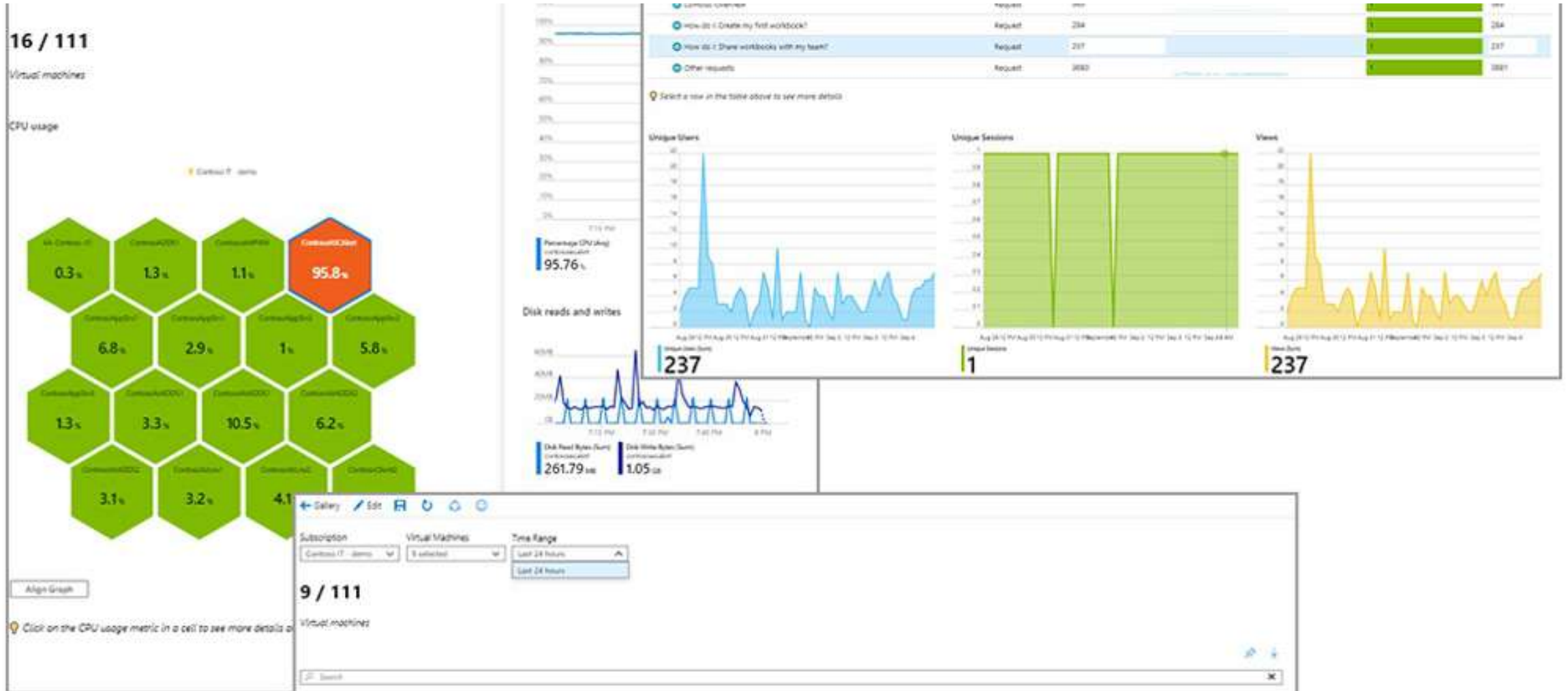


Log Analytics

Application performance



Dashboards & Workbooks

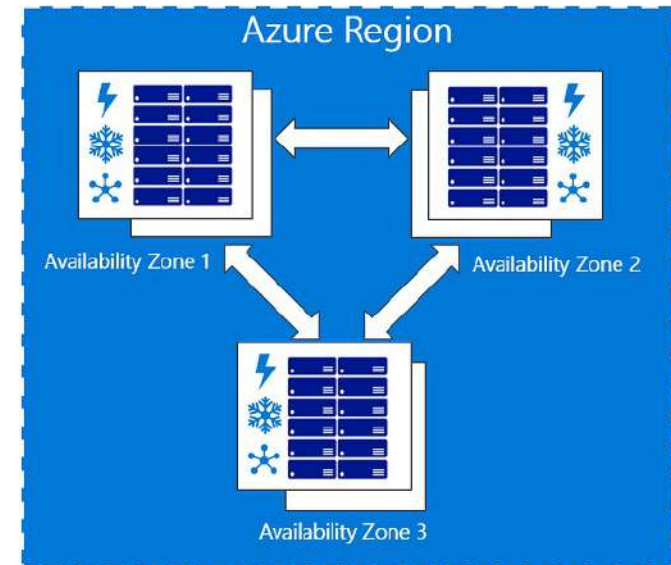


Estensioni ad altri servizi in Azure



Business Continuity e Disaster Recovery

- Ogni servizio ha relativo SLA
- Primo livello di miglioramento: uso di Availability Zone
- I servizi PaaS hanno gestione di Availability Zone integrata
- Secondo livello di miglioramento: distribuzione geografica su paired region (passiva o attiva)
- Azure Backup o Site Recovery offrono nativamente un sistema integrato per protezione di dati e workload



Sicurezza – Web Application Firewall

Servizio PaaS di bilanciamento e protezione L7

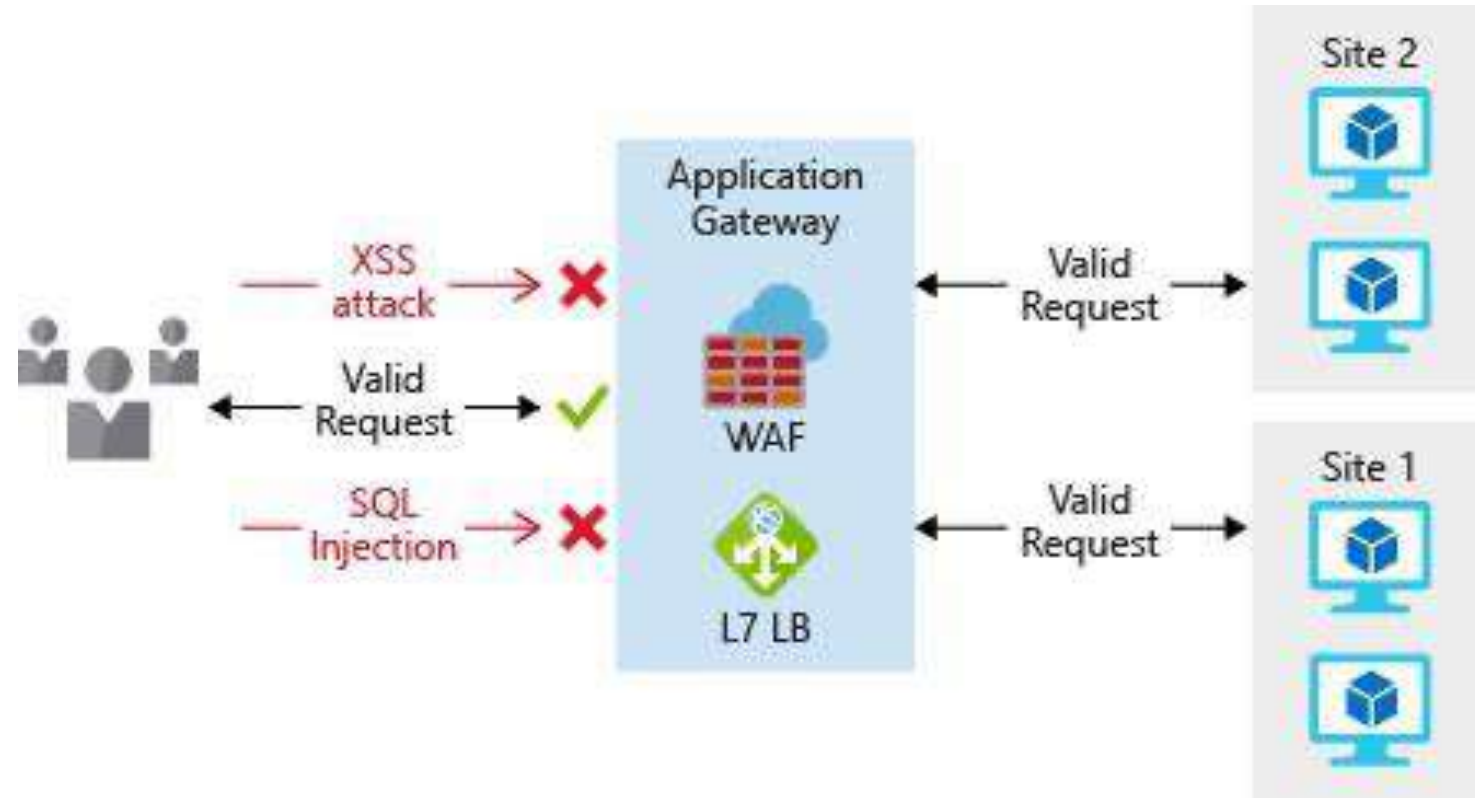
Scalabilità automatica

Regole di detection o blocking

OWASP Core Rule Sets

Basato su modsecurity

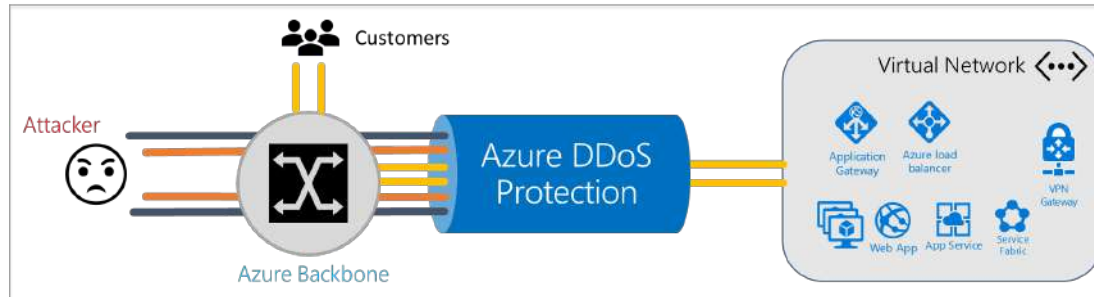
Se necessaria CDN può essere sostituito da servizio integrato Azure Frontdoor



<https://owasp.org/www-project-modsecurity-core-rule-set>

<https://docs.microsoft.com/en-us/azure/web-application-firewall/ag/ag-overview>

Sicurezza – Distributed Denial of Service Protection

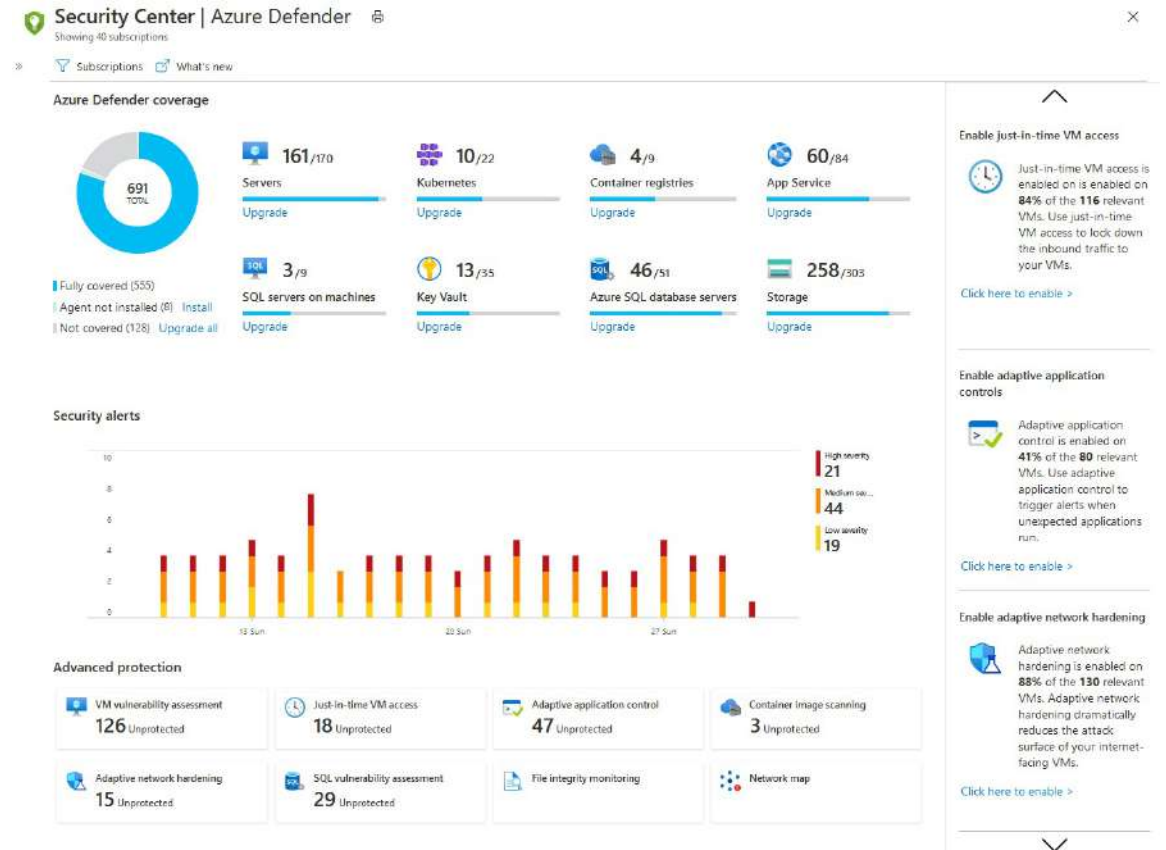


- DDoS protection basic applicata ad ogni Virtual Network Azure
- DDoS protection standard aumenta monitoraggio, l'automazione e l'accuratezza del machine learning sui pattern di traffico
- DDoS protection standard è un investimento significativo ma comprende copertura fino a 100 risorse

Feature	DDoS Protection Basic	DDoS Protection Standard
Active traffic monitoring & always on detection	●	●
Automatic attack mitigations	●	●
Availability guarantee	●	●
Cost Protection	●	●
Mitigation policies tuned to customers application	●	●
Metrics & alerts	●	●
Mitigation reports	●	●
Mitigation flow logs	●	●
DDoS rapid response support	●	●

Sicurezza – Azure Security Center e Defender

- Azure Security Center basic attivo di default: monitoraggio applicazione di best practice di sicurezza
- Azure Defender [integra protezioni specifiche](#), anche all'interno del perimetro privato per risorse quali: Storage, Database, Key Vault, Virtual Machine, App Service



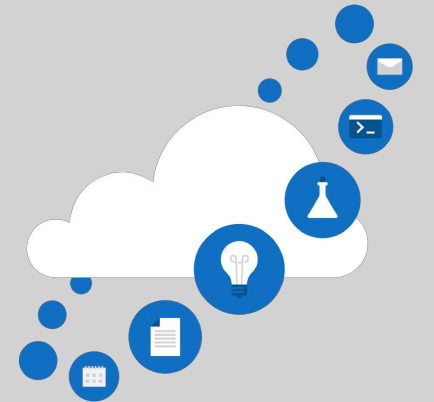
Altre risorse Moodle + Azure

- [Overview of Moodle manual migration - Cloud Adoption Framework](#)
- [Azure-connector moodle: An Azure Logic App connector for Moodle](#)
- [Moodle-tool objectfs: Object file storage system for Moodle](#)
- [Moodle plugins Microsoft 365](#)
- [Moodle-Teams-Bot: The Moodle Assistant Bot helps teachers and students answer questions about their Moodle assignments and courses while keeping them updated with notifications -- right within Teams.](#)

Moodle in Azure all'Università di Bologna

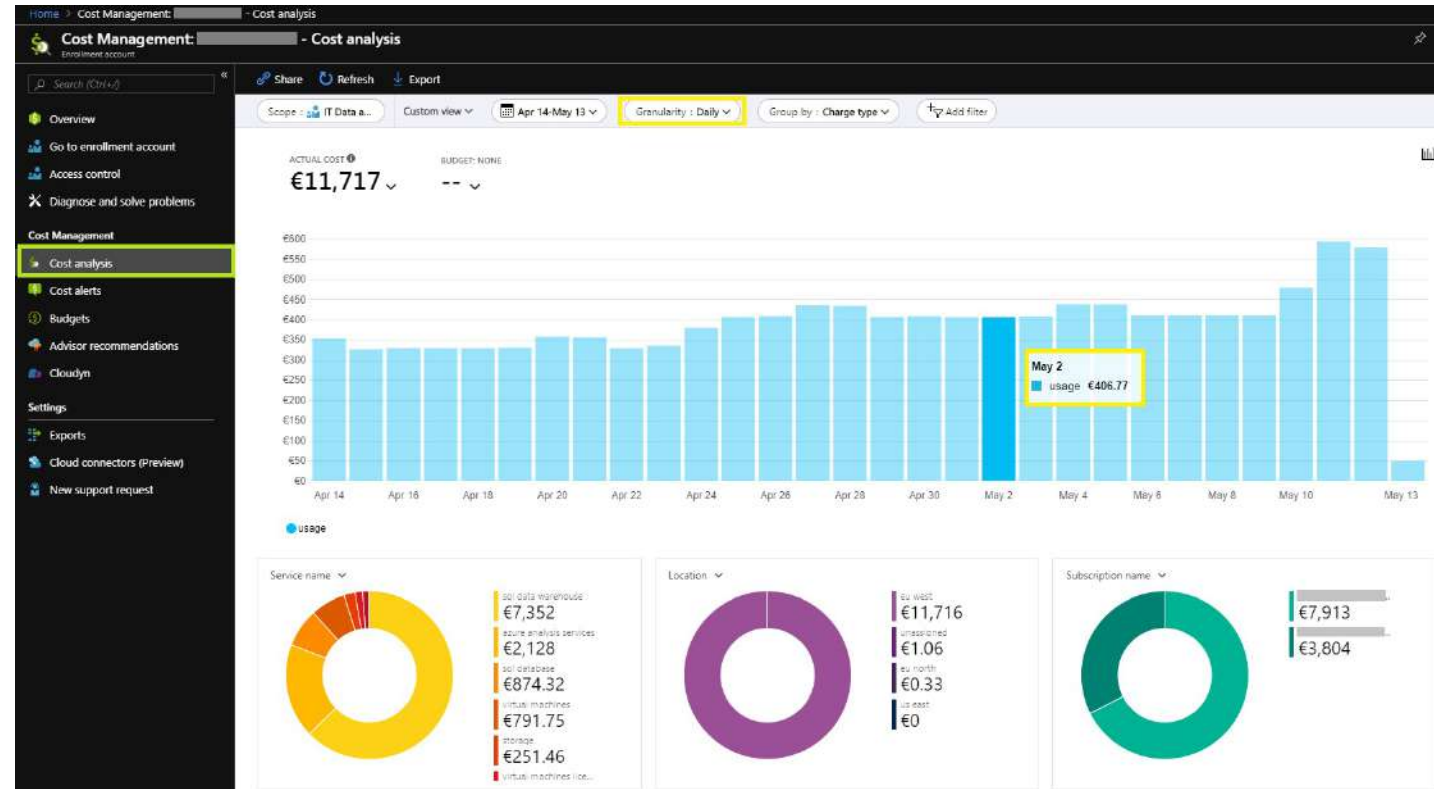


Ottimizzazione costi



Analisi dei costi

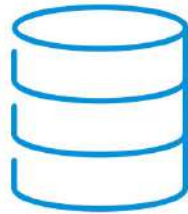
- Monitoraggio
- Ottimizzazione dell'elasticità
- Evoluzione coordinata dell'infrastruttura



Reservations (Prenotazioni)

- Risparmio sui costi dei servizi 24/7 fino a 60% su periodo di tre anni
- Flessibilità nella rimodulazione e scambio
- Rimborso su richiesta (early termination fee dipende dalla risorsa)
- Addebito mensile anticipato senza distinzione di costi

DATABASE



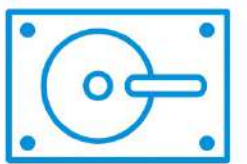
- ✓ SQL Database
- ✓ Cosmos DB
- ✓ Database for PostgreSQL
- ✓ Database for MySQL

COMPUTE



- ✓ Virtual Machines
- ✓ App Services
- ✓ Dedicated Hosts

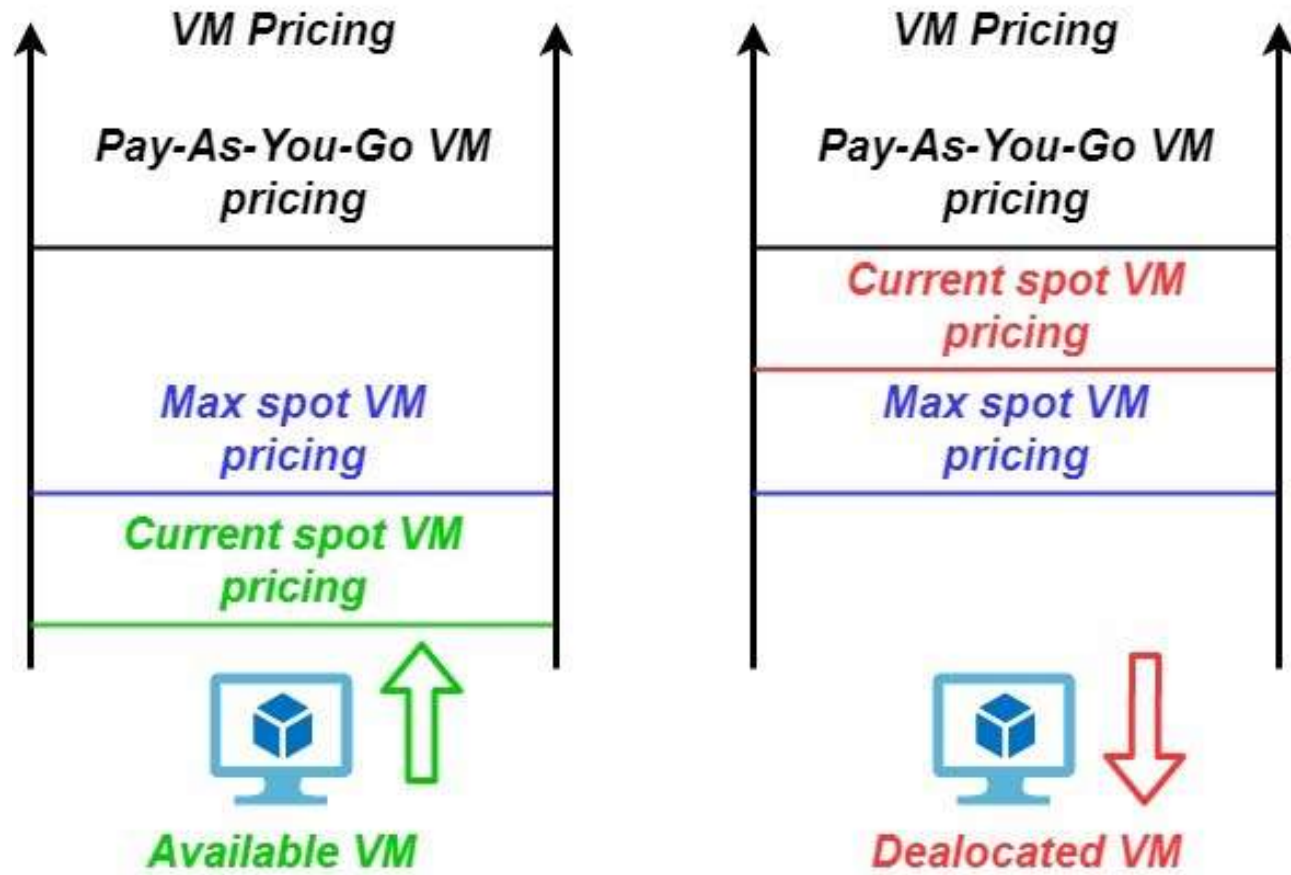
STORAGE



- ✓ Blob Storage
- ✓ Managed Disks
- ✓ Cache for Redis

Spot Instances

- Prezzo dinamico in base alla disponibilità dei Data Center
- Risparmio possibile fino a 1 ordine di grandezza
- Deallocazione automatica in caso raggiungimento prezzo soglia
- Indicati per sistemi di continuità non critica



Pricing calculator

- Scelta dei componenti
- Scelta dei livelli di servizio
- Stima costi variabili
- Ottimizzazione costi

The screenshot shows the Azure Pricing Calculator interface. At the top, it says "Pricing calculator" and "Configure and estimate the costs for Azure products". On the right, there is a digital display showing "07734". Below this, a blue bar contains the text "Select a product to include it in your estimate." Below the bar is a search box labeled "Search products". To the left of the search box is a vertical menu with categories: "Featured", "Compute", "Networking", "Storage", "Web + Mobile", and "Containers". To the right of the search box are six product cards:

- Virtual Machines**: Provision Windows and Linux virtual machines in seconds
- Storage**: Durable, highly available and massively scalable cloud storage
- SQL Database**: Managed, relational SQL Database as a service
- App Service**: Quickly create powerful cloud apps for web and mobile
- Azure Cosmos DB**: Globally distributed, multi-model database for any scale
- Machine Learning Studio**: Easily build, deploy and manage predictive analytics solutions

[Moodle Small: https://azure.com/e/a3ecbc46cb3a4e7d9d7b873997921192](https://azure.com/e/a3ecbc46cb3a4e7d9d7b873997921192)

[Moodle Medium: https://azure.com/e/de5df79cc09e4f988fc878bda3c9ea65](https://azure.com/e/de5df79cc09e4f988fc878bda3c9ea65)

[Moodle Large: https://azure.com/e/fcf6127f88774cc2a66c4a2976d55573](https://azure.com/e/fcf6127f88774cc2a66c4a2976d55573)

