Curso de Especialização em Aprendizagem de Máquina em Inteligência Artificial

Disciplina: Computação em nuvem

Aula 05

Prof. Dr. Renato Manzan

10 de setembro de 2020

XBOX as a Service

Choose your console with Xbox All Access

The fastest, most powerful Xbox ever.

$34.99/mo. for 24 months
No upfront cost.
0% APR^

PRE-ORDER SEPTEMBER 22

- ✓ Xbox Series X console
- ✓ 24 months of Xbox Game Pass Ultimate

Next-gen performance in the smallest Xbox ever.

$24.99/mo. for 24 months
No upfront cost.
0% APR^

PRE-ORDER SEPTEMBER 22

- ✓ Xbox Series S console
- ✓ 24 months of Xbox Game Pass Ultimate

The best value in games and entertainment.

$22.99/mo. for 24 months
No upfront cost.
0% APR^

JOIN NOW ›

- ✓ Xbox One S console bundle
- ✓ 24 months of Xbox Game Pass Ultimate
- ✓ 18-month console upgrade option‡

Upgrade to an Xbox Series X in 18 months‡‡ with the purchase of an Xbox One

Fonte: *https://www.xbox.com/en-US/xbox-all-access*

Nespresso as a Service

PLANO 50 CÁPSULAS
DESCOBRIDOR

De 1 a 2 cafés **Nespresso** por dia

R$ 110,00/MÊS

GANHE MAIS 10% EXTRA

Sua conta será creditada com **R$ 121,00/mês**

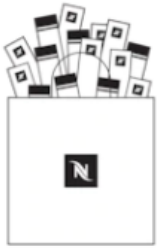
PLANO 70 CÁPSULAS
EXPLORADOR

2 cafés **Nespresso** em média por dia

R$ 155,00/MÊS

GANHE MAIS 10% EXTRA

Sua conta será creditada com **R$ 170,50/mês**



PLANO 100 CÁPSULAS
ESPECIALISTA

3 ou mais cafés **Nespresso** por dia

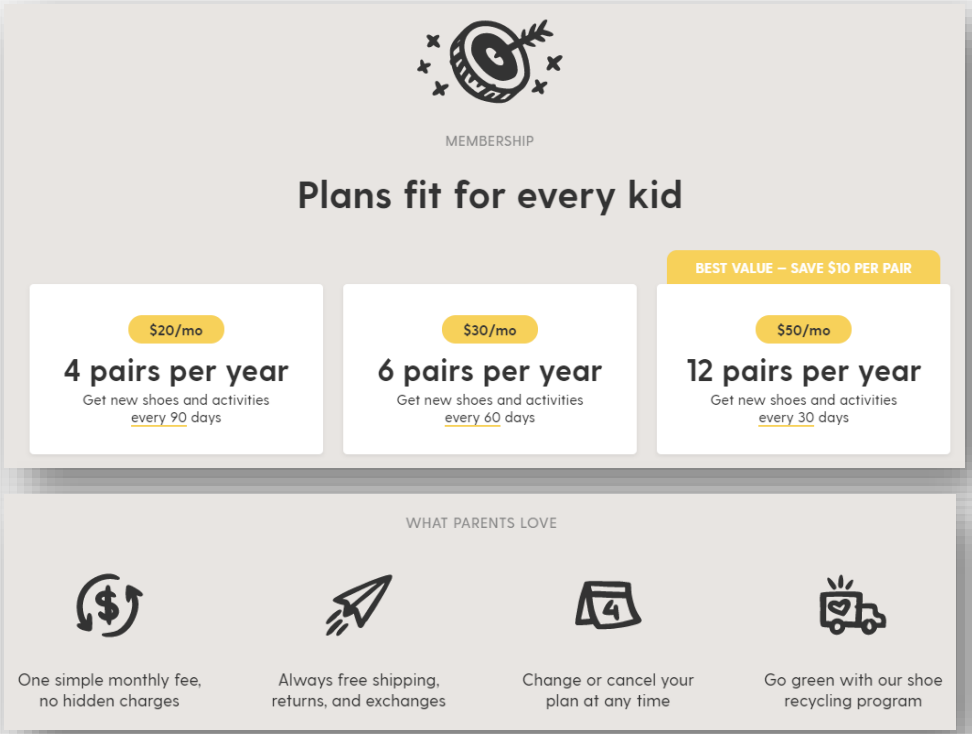
R$ 220,00/MÊS

GANHE MAIS 10% EXTRA

Sua conta será creditada com **R$ 242,00/mês**

Fonte: *https://www.nespresso.com/br/pt/assinatura#/*

Nike as a Service



Fonte: https://www.nikeadventureclub.com/

Objetivos da aula

1. Debrifieng da atividade da aula passada

2. Apresentar os principais conceitos e ferramentas dos seguintes tópicos:

- *Governança em Cloud Computing*
- *Escalabilidade*
- *Disponibilidade*

3. Atividade para a próxima aula

Debrifieng – Entrega Parcial 3 – Cloud Life Cycle |VM

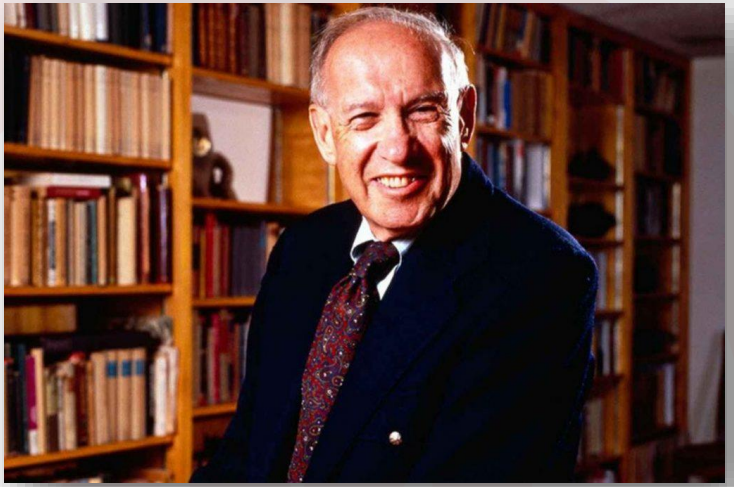
- **Erick Munekata:** RFs: elástica, tolerante a falhas e rápida | VM: **GCP**
- **Fernanda:** estreitar à relação com os clientes, acompanhar as campanhas, obter uma visão unificada dos clientes e acompanhar o nível de engajamento para possibilitar estratégias | VM: **AZURE**
- **Marcos Wada:** Escalabilidade, Multicloud | VM: **AWS**
- **Paulo Braga:** Validação dos objetivos da empresa. Aspectos Culturais | VM: **AZURE**
- **Paulo Sergio:** expectativas da empresa e troca de experiências com organizações com segmento semelhantes | VM: **AZURE**
- **Tarcizio:** Viabilidade do Projeto | VM: **AZURE**
- **Wal:** redução nos custos de operação, possibilidade de escalar a aplicação de acordo com a demanda | VM: **AWS**

Cloud Computing Governance

Nuvem ?

- Por que isso agora ? Não está funcionando do que jeito que sempre funcionou ?
- Vou ser demitido ? Vou perder poder....
- O servidor não está no meu *Datacenter*... E agora ?
- O que muda na nuvem?
- Qual será o meu papel e o da minha equipe?
- Minha equipe está pronta ?
- Como realizar a gestão da nuvem?
- *Disaster recovery* ? Backup ? O que fazer em casos de desastres ?
- Escalabilidade, redundância, desempenho, custos,.....

Nunca se esqueçam....



A Cultura devora a estratégia

no café da manhã...

Fonte: *https://www.napratica.org.br/peter-drucker-pai-da-administracao-moderna/*

Cloud Governance Context

- *Governance is a **loaded** word. It can evoke negative responses and is often incorrectly defined as strategy, policy or procedure.*

- *Misconceptions about what governance is, the level of effort needed to set up a program, and how it supports day-to-day operations may be the greatest barriers to an organization embarking on this necessary work.*

- *The results of good governance are measurable: some studies show that organizations with above average IT governance have over 20% higher profits than those with inadequate governance following an otherwise similar IT strategy*

Fonte: OMG – Practical Guide for Cloud Governance: https://www.omg.org/cloud/deliverables/practical-guide-to-cloud-governance

Cloud Governance Definition

- *Governance, generically, may be defined as an agreed-upon set of policies and standards, which is based on a risk assessment and an-agreed upon framework, inclusive of audit, measurement, and reporting procedures, as well as enforcement of policies and standards.*

- *Ponto Crucial:* ***CULTURA ORGANIZACIONAL***

Fonte: OMG – Practical Guide for Cloud Governance: https://www.omg.org/cloud/deliverables/practical-guide-to-cloud-governance

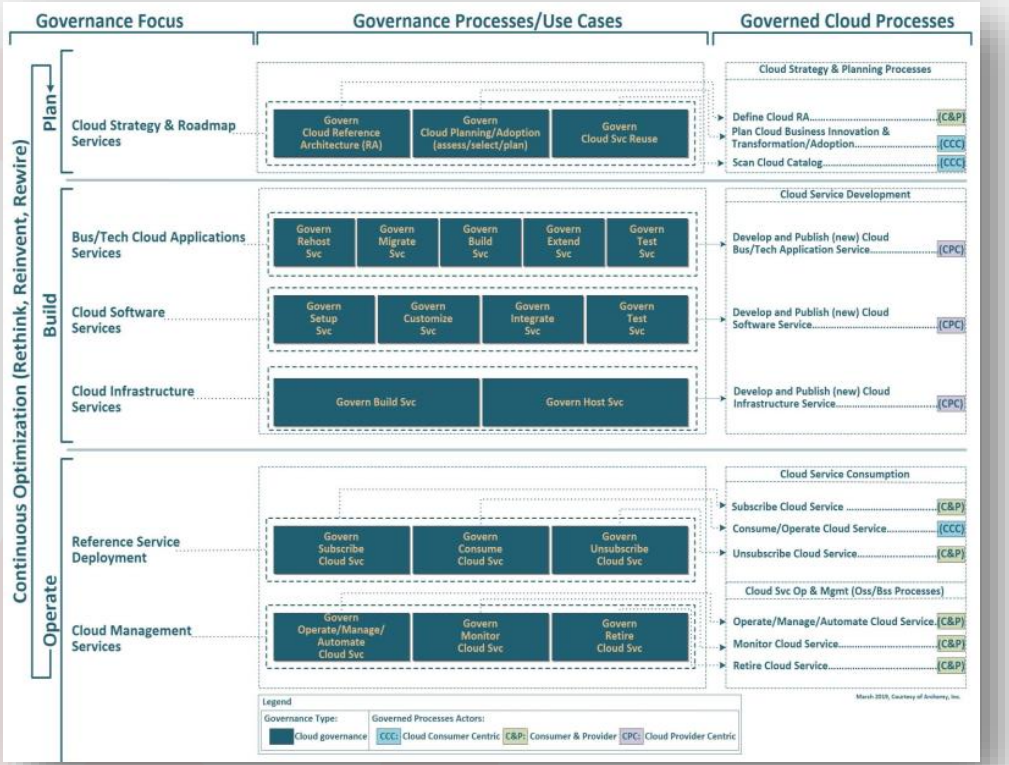
The Need for Cloud Governance

- *The introduction of cloud computing into an organization affects roles, responsibilities, processes and metrics.*

- *Without cloud governance in place to provide guidelines to navigate risk and efficiently procure and operate cloud services, an organization may find itself faced with these common problems:*
  - *Misalignment with enterprise objectives*
  - *Frequent policy exception reviews*
  - *Paused projects*
  - *Compliance or regulatory penalties or failures*
  - *Budget overruns*
  - *Incomplete risk assessments*

Fonte: OMG – Practical Guide for Cloud Governance: https://www.omg.org/cloud/deliverables/practical-guide-to-cloud-governance

The Need for Cloud Governance



Fonte: OMG – Practical Guide for Cloud Governance: https://www.omg.org/cloud/deliverables/practical-guide-to-cloud-governance

Cloud Governance – Proposed RACI Matrix

	BoD	CEO	COO	CFO	CIO	CISO	CLO
Strategy & Use Case	I	C	R, A	C	R	C	C
Business Requirements	I	C	C	R, A	R	C	C
Compliance	I	C	R	R	R, A	R	C
Contracts & SLAs	I	I	R	I	C	C	R, A
Asset & Data Governance	I	C	C	I	R	R, A	I
Information & Data Management	I	C	C	I	R, A	R, A	I
Continuity & Elasticity	I	C	R, A	I	R	C	I
Technology & Service Provider Governance	I	C	C	I	R	R, A	R
Service Orchestration & Interoperability	I	C	R, A	C	R	R	I
IT Operations Management	I	C	R, A	C	R	R	I
Sustain Governance	I, C	C	R, A	R, A	R, A	R	C
Innovation or Transformation	I, C	C	R, A	I	R, A	R	R

Fonte: OMG – Practical Guide for Cloud Governance: https://www.omg.org/cloud/deliverables/practical-guide-to-cloud-governance

Cloud Governance – Governance Focus

Governance Focus	Cloud Processes Governed	Governance Use Cases
Plan	**Cloud Strategy & Roadmap Definition** The cloud services governed are focused on helping define the "Approach to Cloud," which entails strategizing and planning the use of business/technical solutions or applications, fog and edge Services, cloud platform/infrastructure services, and cloud software. These activities should involve the Cloud Service Provider(s).	• Plan/Adopt • Reference Architecture • Service Reuse

Fonte: OMG – Practical Guide for Cloud Governance: https://www.omg.org/cloud/deliverables/practical-guide-to-cloud-governance

Cloud Governance – Governance Focus

Governance Focus	Cloud Processes Governed	Governance Use Cases
Build	**Cloud Solution / Application Service Development** The cloud services governed are focused on building business/technical solutions or application services "on cloud," which covers IaaS or PaaS, Custom PaaS, SaaS, BPaaS (business process as a service_, and other cloud services ("XaaS").	• Rehost • Migrate • Build • Extend • Test
	Cloud Software Service Usage The cloud services governed are focused on building "cloud software services from cloud," which covers third-party, SaaS, fog and edge services, cloud platform services, and on-demand solutions.	• Setup • Customize • Integrate • Test
	Cloud Infrastructure Service Usage The cloud services governed are focused on using "infrastructure services for cloud," which covers private IaaS, multi-tenant IaaS, virtual private cloud (VPC), and scalability-related solutions.	• Build • Host

Fonte: OMG – Practical Guide for Cloud Governance: https://www.omg.org/cloud/deliverables/practical-guide-to-cloud-governance

Cloud Governance – Governance Focus

Governance Focus	Cloud Processes Governed	Governance Use Cases
Operate	**Cloud Service Deployment** The cloud services governed are focused on "leveraging clouds," which covers business/technical solutions, applications, platform services, compute services (virtual machines, containers, microkernels), and storage services.	• Subscribe • Consume • Unsubscribe
	Cloud Service Management The cloud services governed are focused on "management of clouds," which covers business/technical solutions, applications, platform services, compute services (virtual machines, containers, microkernels), and storage services.	• Operate / manage / automate • Monitor • Retire

Fonte: OMG – Practical Guide for Cloud Governance: https://www.omg.org/cloud/deliverables/practical-guide-to-cloud-governance

Cloud Governance – Some KPIs

- *Ratio of planned versus actual cloud services*
- *Frequency of exceptions to policies*
- *Operational Efficiency*
- *Average time to onboard*
- *Cost reduction*
- *% of total and departmental budgets allocated to cloud services.*
- *Business Value Alignment –how the organization measures project results (earned vs. planned value, cost variance, etc.)*
- *Used vs. idle cloud services*
- *% of business service-level requirements met*

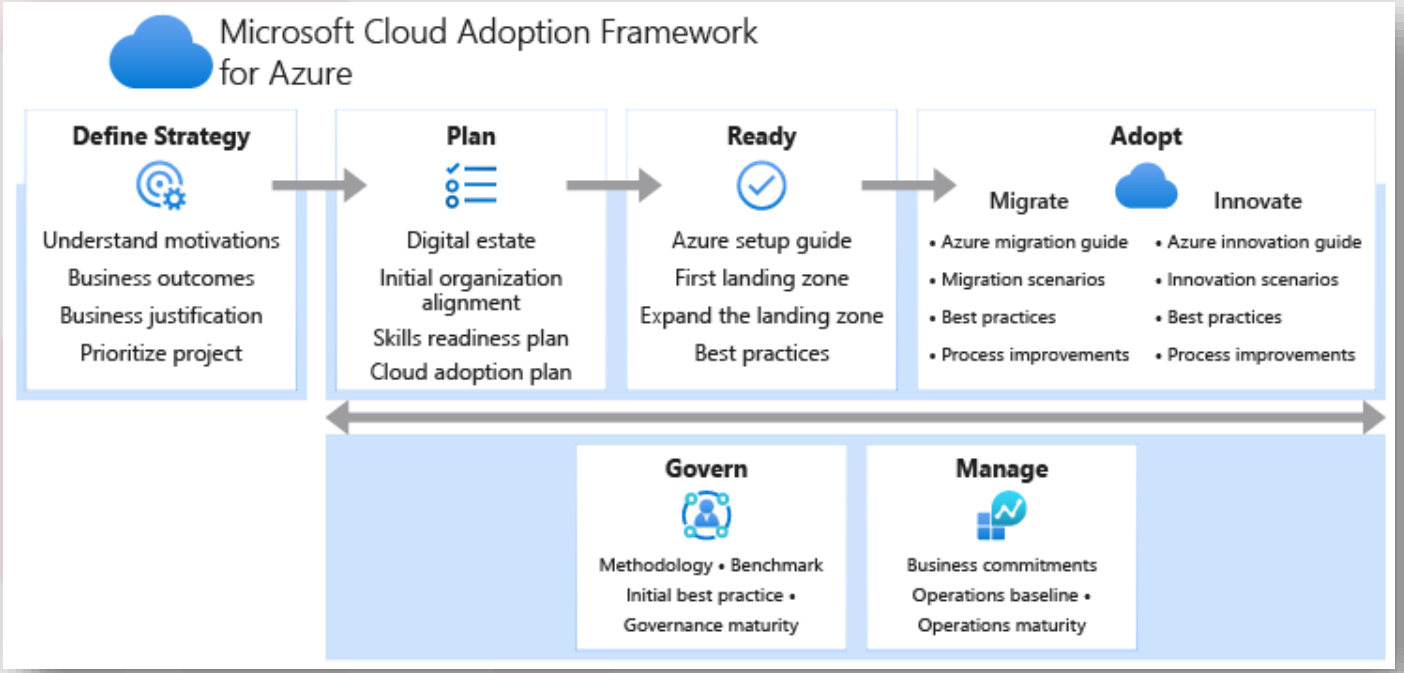
Fonte: OMG – Practical Guide for Cloud Governance: https://www.omg.org/cloud/deliverables/practical-guide-to-cloud-governance

Cloud Governance – Microsoft Perspective

Fonte: https://docs.microsoft.com/en-us/azure/cloud-adoption-framework/govern/governance-disciplines

Cloud lifecycle – Microsoft Perspective

The Cloud Adoption Framework is a full lifecycle framework, supporting customers throughout each phase of adoption by providing methodologies as specific approaches to overcoming common blockers

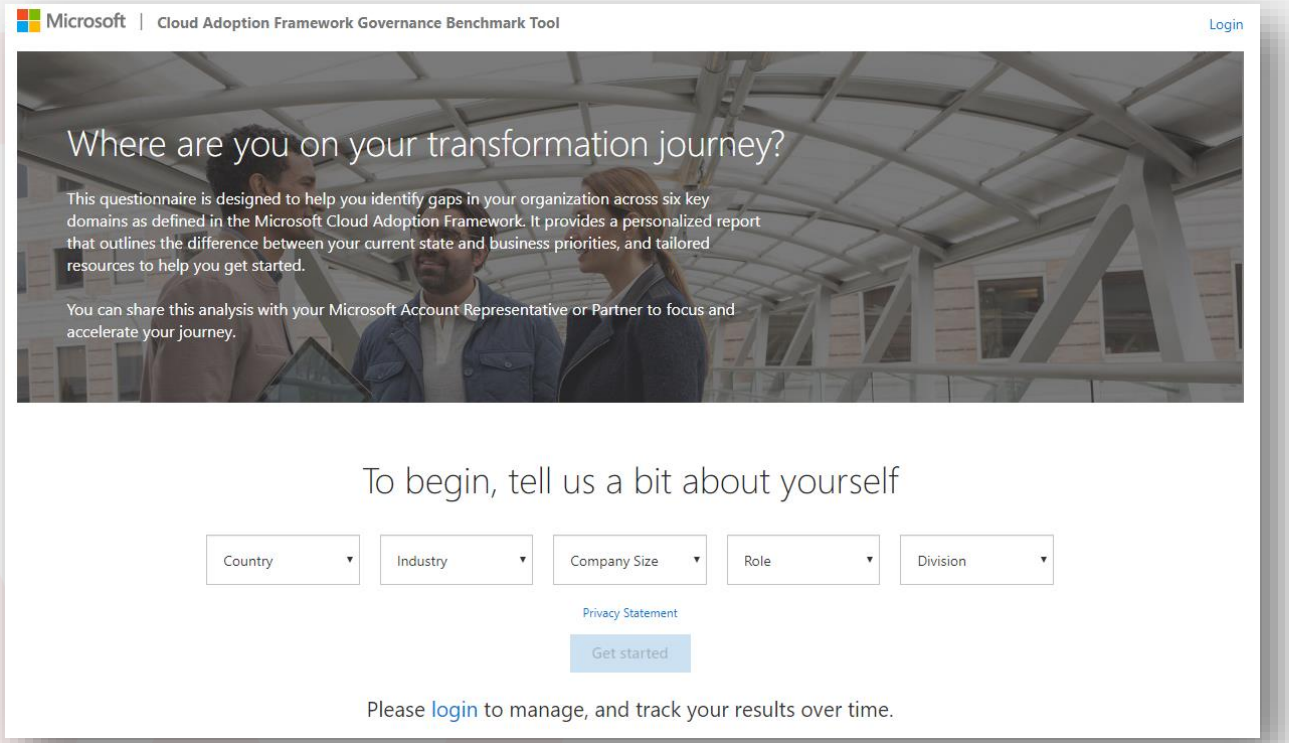


Fonte: https://docs.microsoft.com/pt-br/azure/cloud-adoption-framework/overview

Cloud Life-Cycle & Cloud Governance

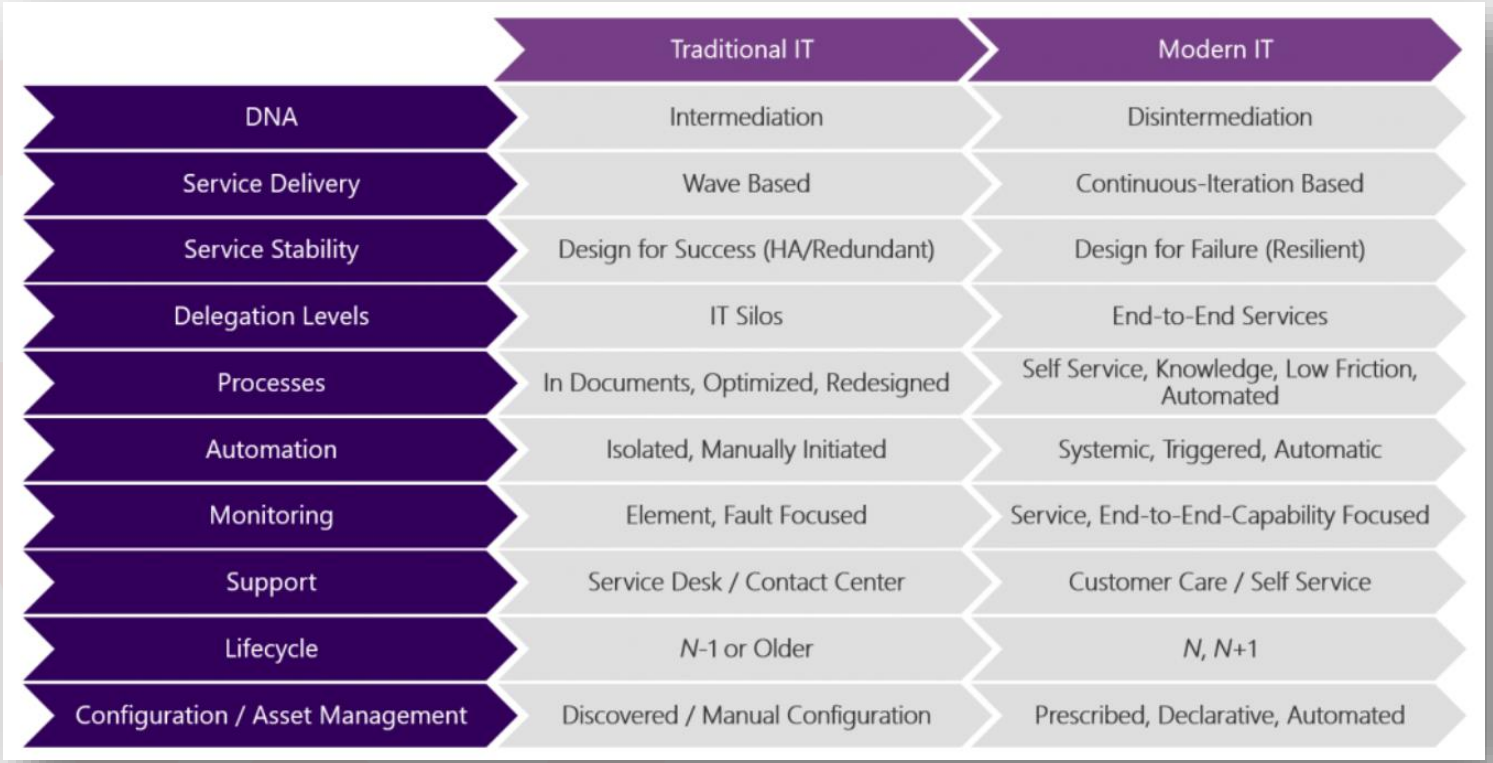
***Discussão em sala**: Qual é a diferença entre Cloud Life-Cycle e Cloud Governance ?*

Cloud Adoption Framework Governance Benchmark Tool



** Fonte: https://cafbaseline.com*

Traditional IT vs. Modern IT



	Traditional IT	Modern IT
DNA	Intermediation	Disintermediation
Service Delivery	Wave Based	Continuous-Iteration Based
Service Stability	Design for Success (HA/Redundant)	Design for Failure (Resilient)
Delegation Levels	IT Silos	End-to-End Services
Processes	In Documents, Optimized, Redesigned	Self Service, Knowledge, Low Friction, Automated
Automation	Isolated, Manually Initiated	Systemic, Triggered, Automatic
Monitoring	Element, Fault Focused	Service, End-to-End-Capability Focused
Support	Service Desk / Contact Center	Customer Care / Self Service
Lifecycle	*N*-1 or Older	*N*, *N*+1
Configuration / Asset Management	Discovered / Manual Configuration	Prescribed, Declarative, Automated

Fonte: *https://cloudblogs.microsoft.com/industry-blog/government/2018/04/30/is-your-government-itsm-falling-behind/*

Shadow IT

This Photo by Unknown Author is licensed under CC BY

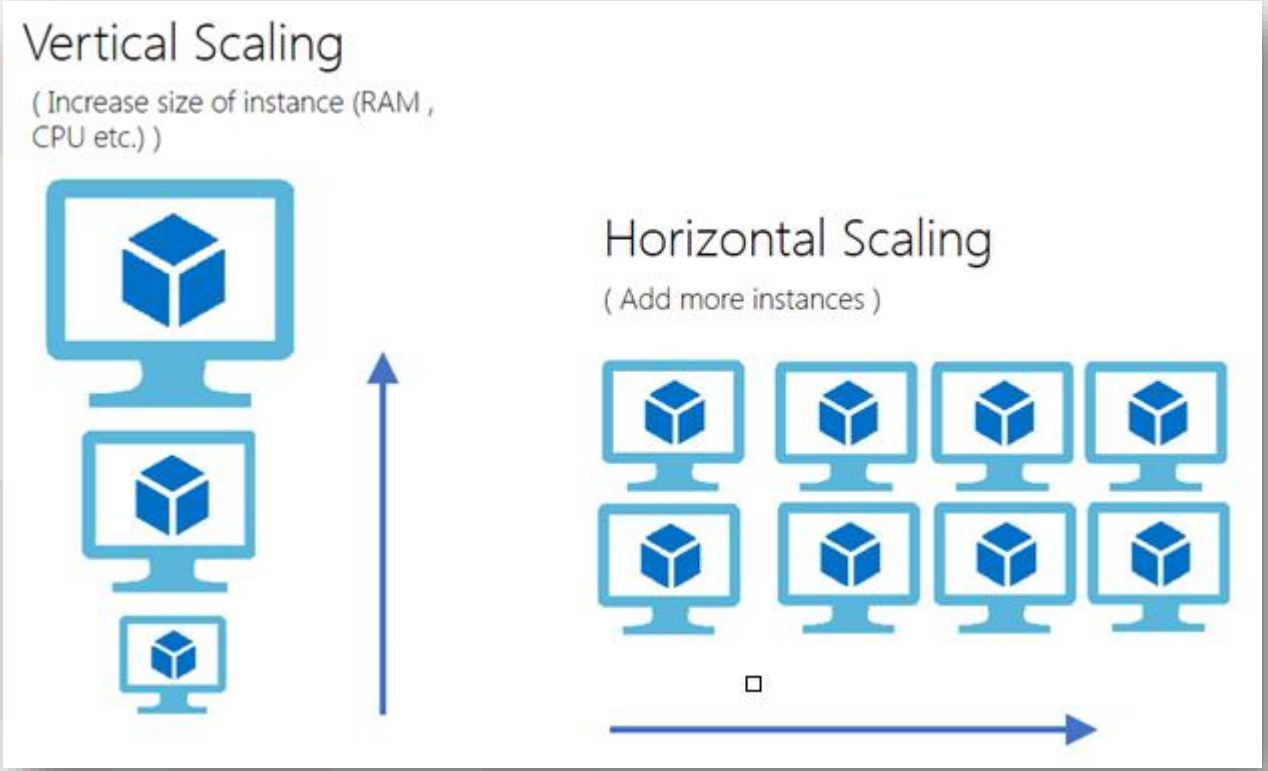
***Discussão em sala**: Experiências de Shadow IT ?*

Escalabilidade

***Capability**: degree to which the maximum limits of a product or system parameter meet requirements (performance efficiency subcharactersitic)*

***Fonte:** "INTERNATIONAL STANDARD ISO / IEC 25010 First edition 2011-0301 Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — System and software quality models." (2013).*

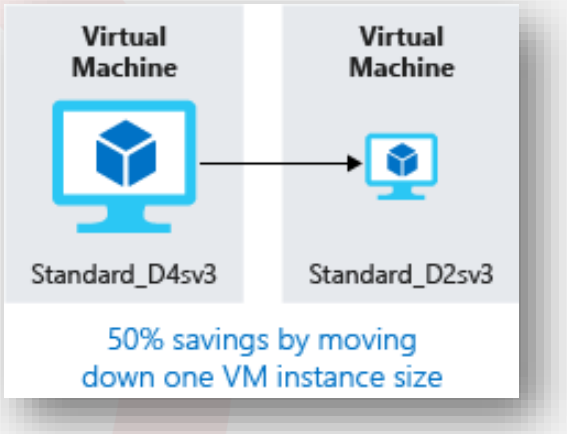
Vertical and horizontal scaling



Fonte: *http://abhijitkakade.com/2019/04/horizontal-vs-vertical-scaling-azure-autoscaling/*

Scale up/down

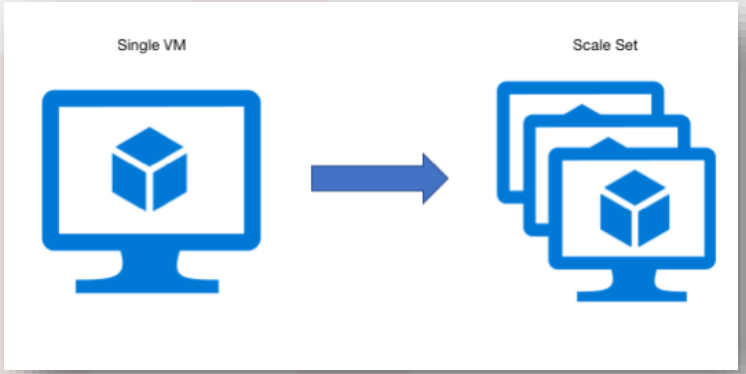
Scaling up, or vertical scaling, means to increase the memory, storage, or compute power on an existing virtual machine. For example, you can add additional memory to a web or database server to make it run faster.



Fonte: *https://daryusman.wordpress.com/2019/01/23/scale-up/*

Scale out/in

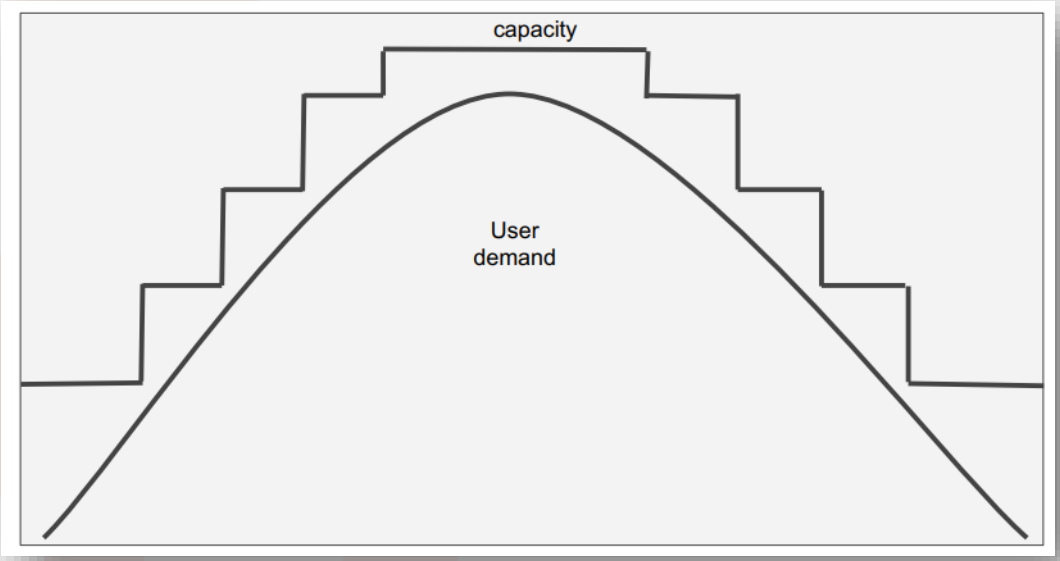
Scaling out, or horizontal scaling, means to add extra virtual machines to power your application. For example, you might create many virtual machines configured in exactly the same way and use a load balancer to distribute work across them.



Fonte: *https://daryusman.wordpress.com/2019/01/23/scale-up/*

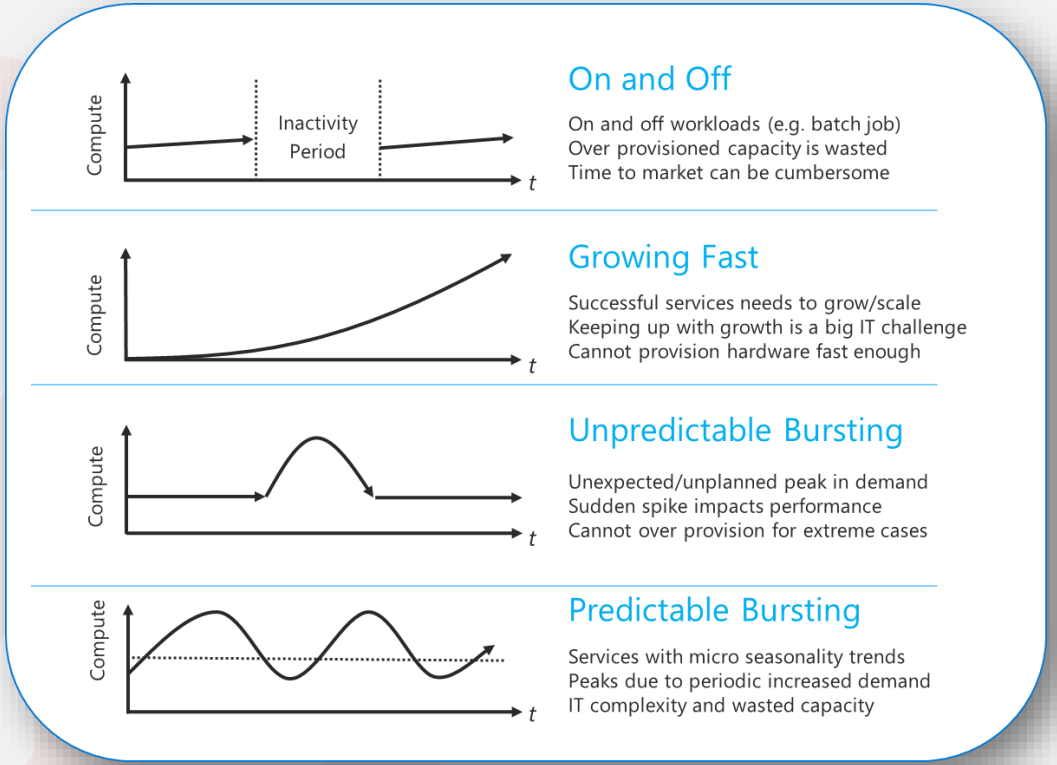
Cloud elasticity

The ability of a system to automatically grow and shrink based on application demand



Fonte: 2019 Scott Duffy, softwarearchitect.ca - AZ-900 Microsoft Azure Fundamentals - https://www.udemy.com/az900-azure/

Cloud elasticity

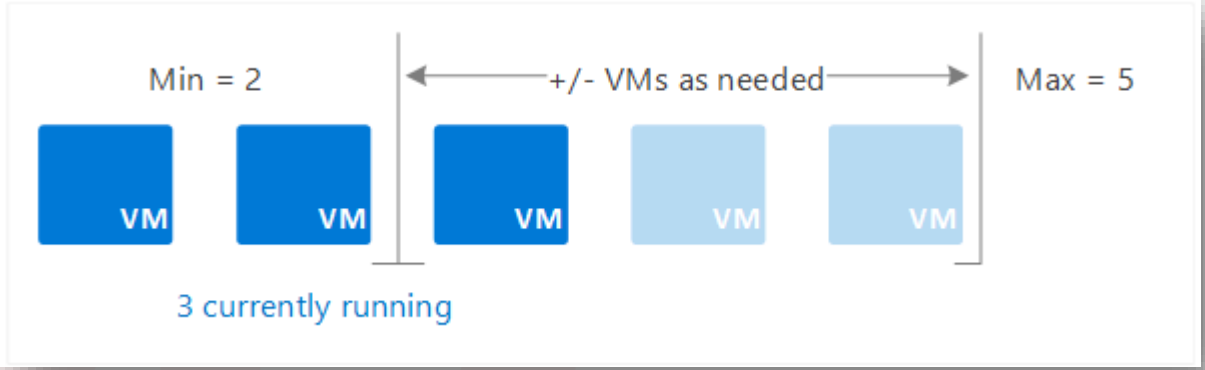


Fonte: Windows Azure Overview for IT Pros - https://slideplayer.com/slide/9894614/

Azure Auto Scale

- *Autoscaling is the process of dynamically allocating resources to match performance requirements.*

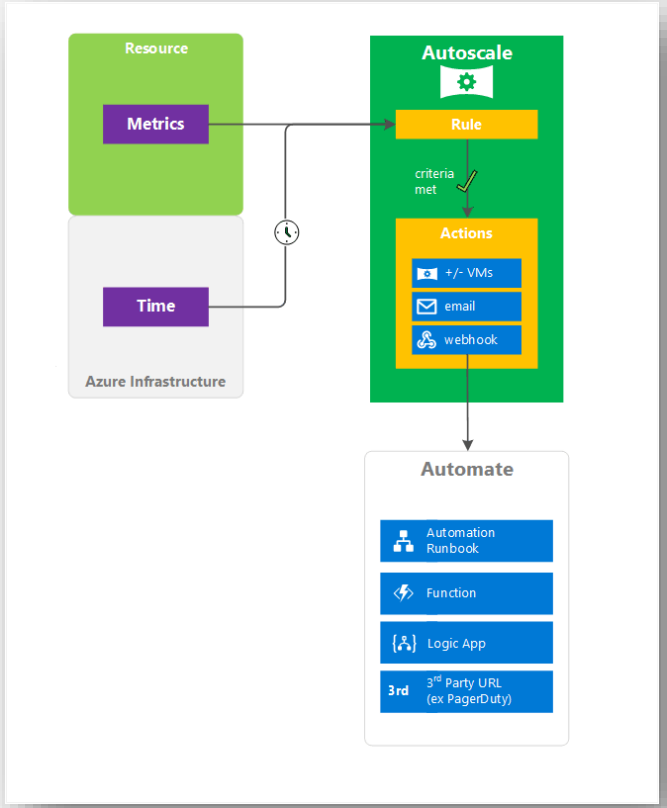
- *As the volume of work grows, an application may need additional resources to maintain the desired performance levels and satisfy service-level agreements (SLAs).*



Fonte: *Overview of autoscale in Microsoft Azure*

Auto scale mechanism

- *When rule conditions are met, one or more auto scale actions are triggered. The auto scale process can add and remove VMs, or perform other actions.*



Fonte: *Overview of autoscale in Microsoft Azure*

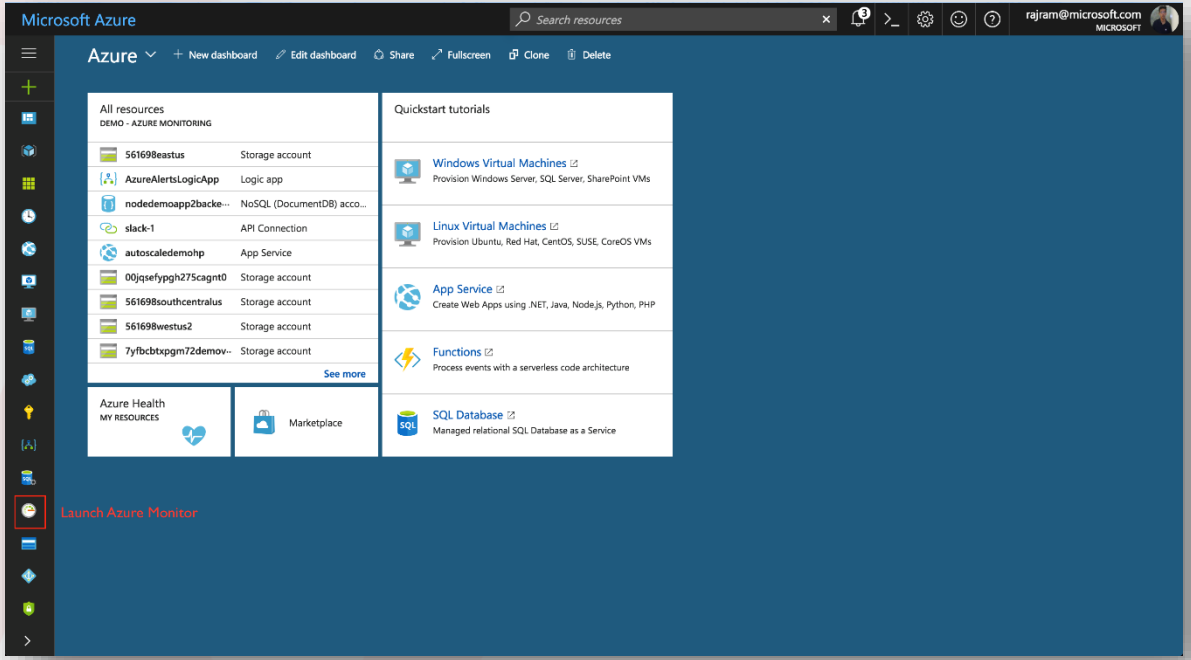
Azure Auto Scale

- *Examples:*
  - *Scale out to 10 instances on weekdays, and scale in to 4 instances on Saturday and Sunday.*
  - *Scale out by one instance if average CPU usage is above 70%, and scale in by one instance if CPU usage falls below 50%.*
  - *Scale out by one instance if the number of messages in a queue exceeds a certain threshold*

Fonte: Auto Scaling - https://docs.microsoft.com/pt-br/azure/architecture/best-practices/auto-scaling

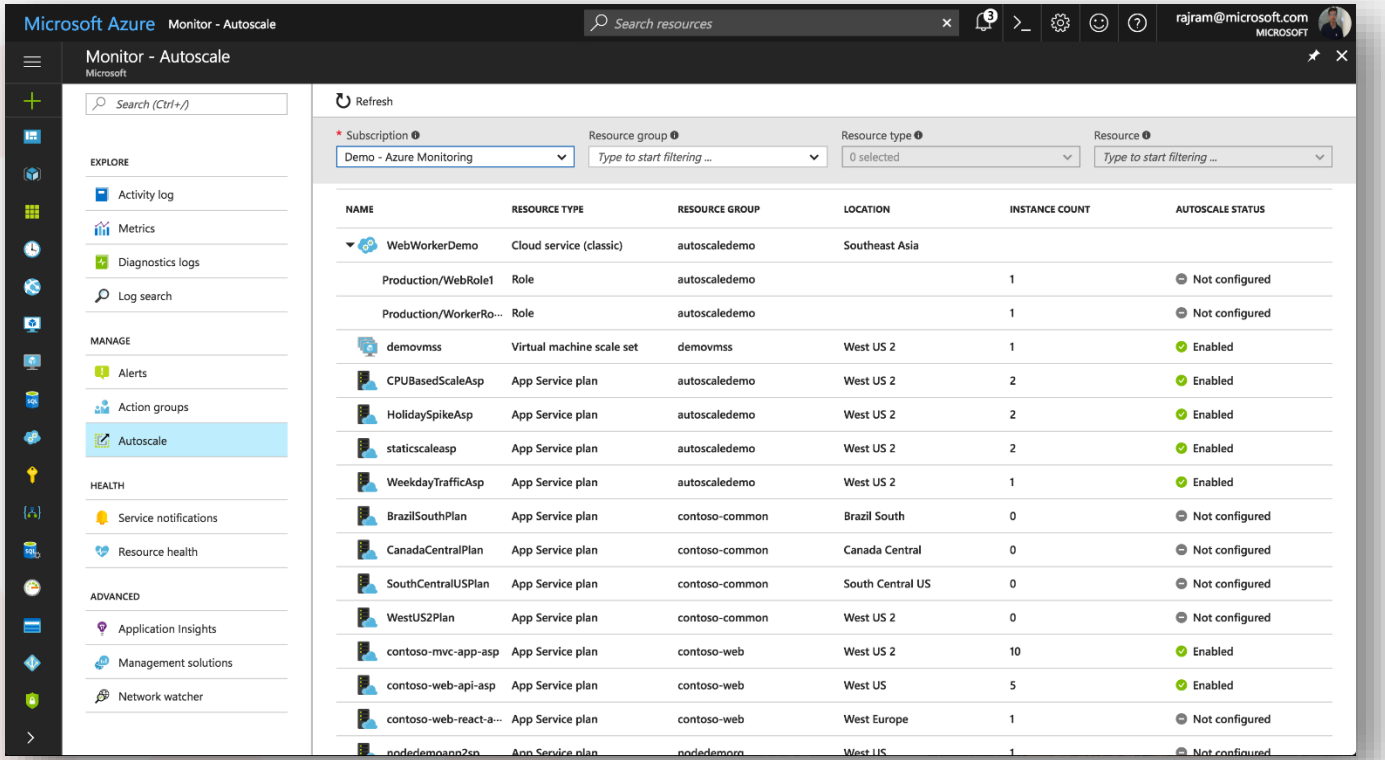
Azure Auto Scale Setup

Azure Monitor autoscale applies Virtual Machine Scale Sets, Cloud Services, App Service - Web Apps, and API Management services.



Fonte: *Get started with Autoscale in Azure*

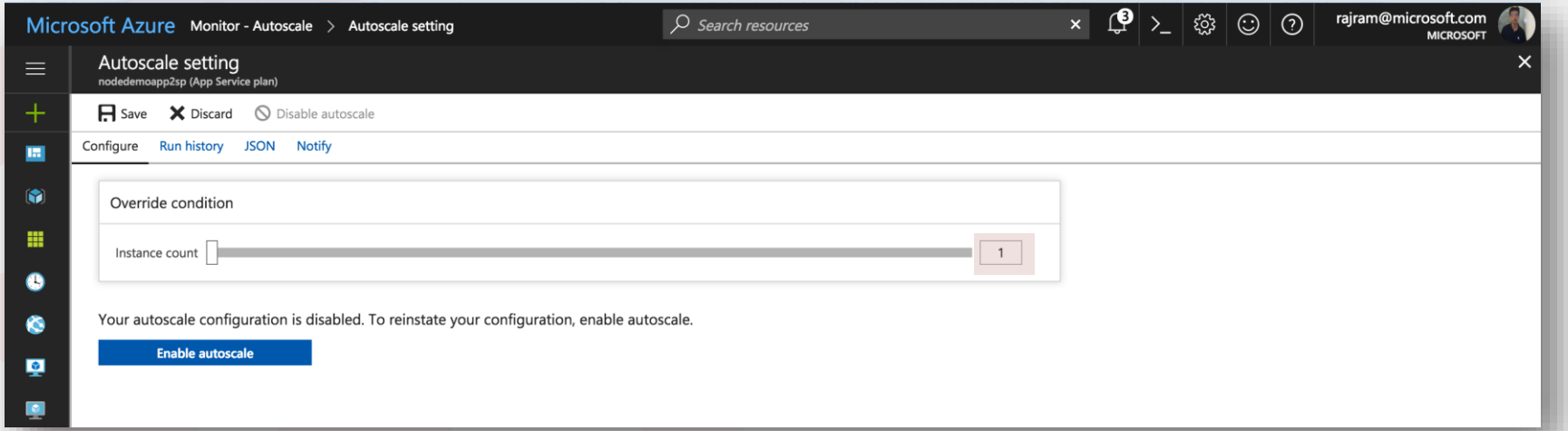
Auto Scale Resources



Fonte: [Get started with Autoscale in Azure]

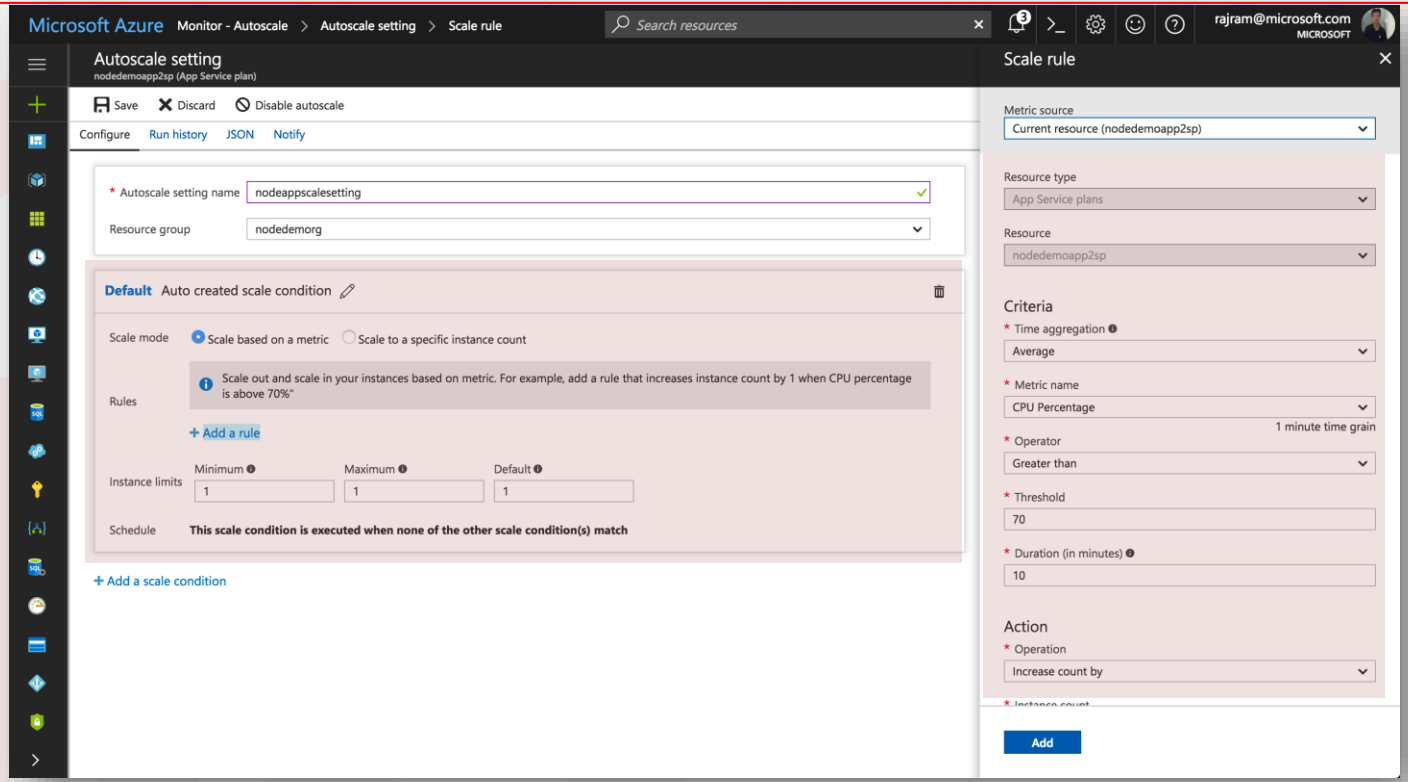
Setting an auto scale resource

Scaling up a Web App



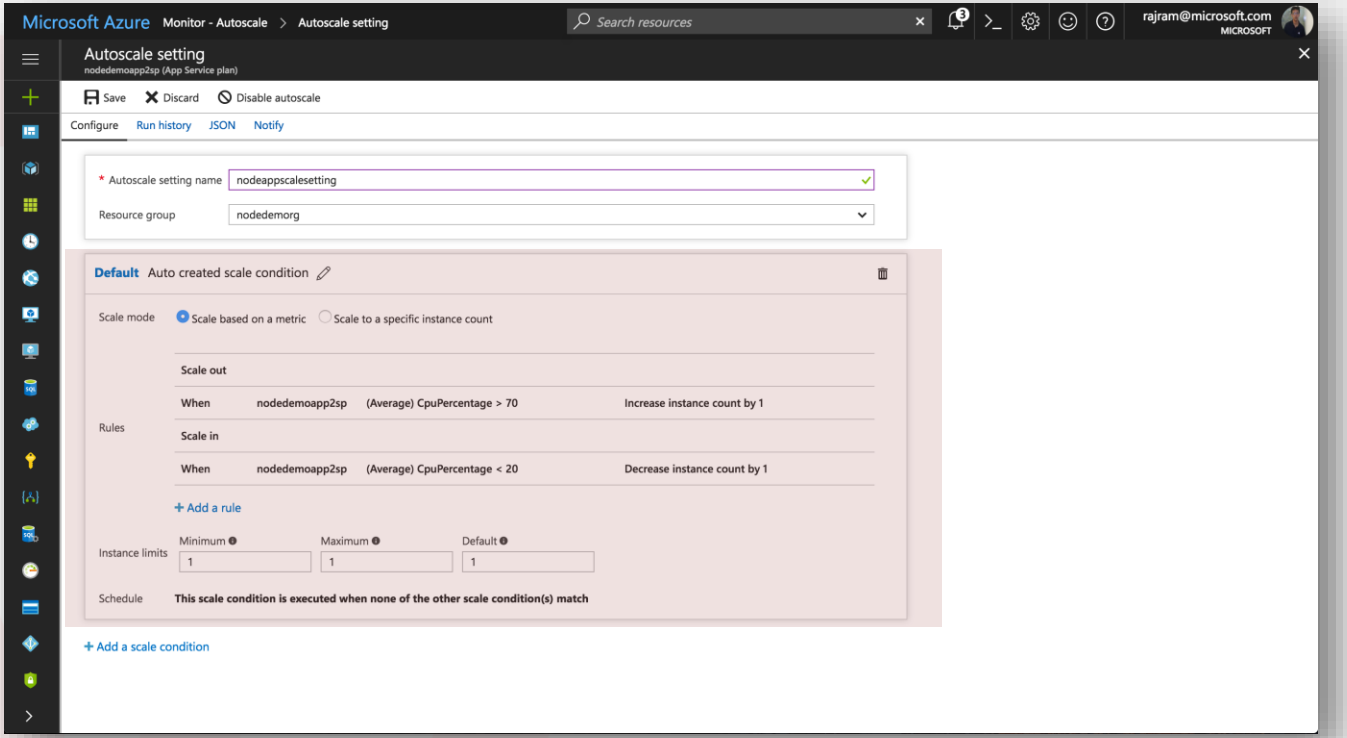
Fonte: *Get started with Autoscale in Azure*

Adding a rule for Auto Scale



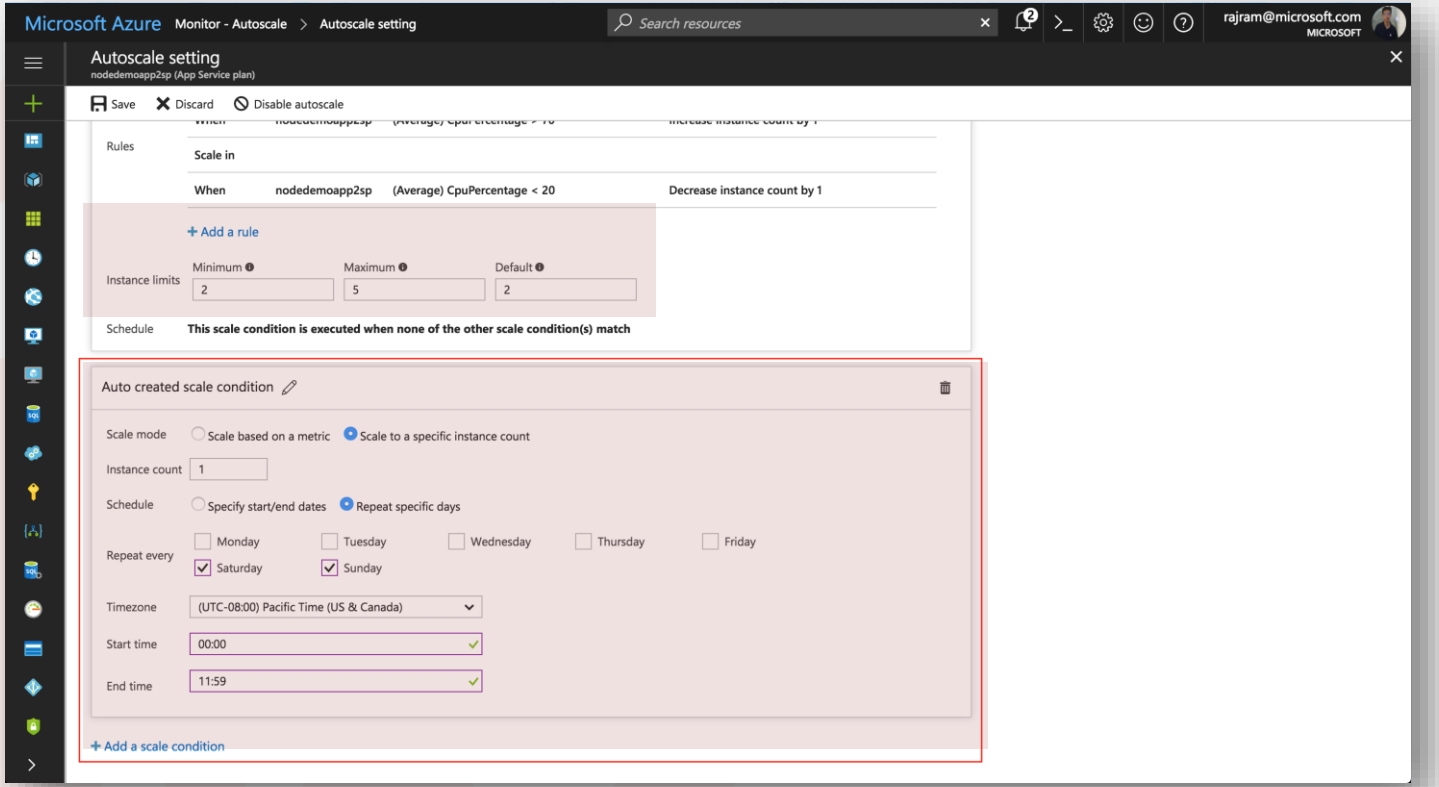
Fonte: [Get started with Autoscale in Azure]

Detailing the trigger for auto scaling



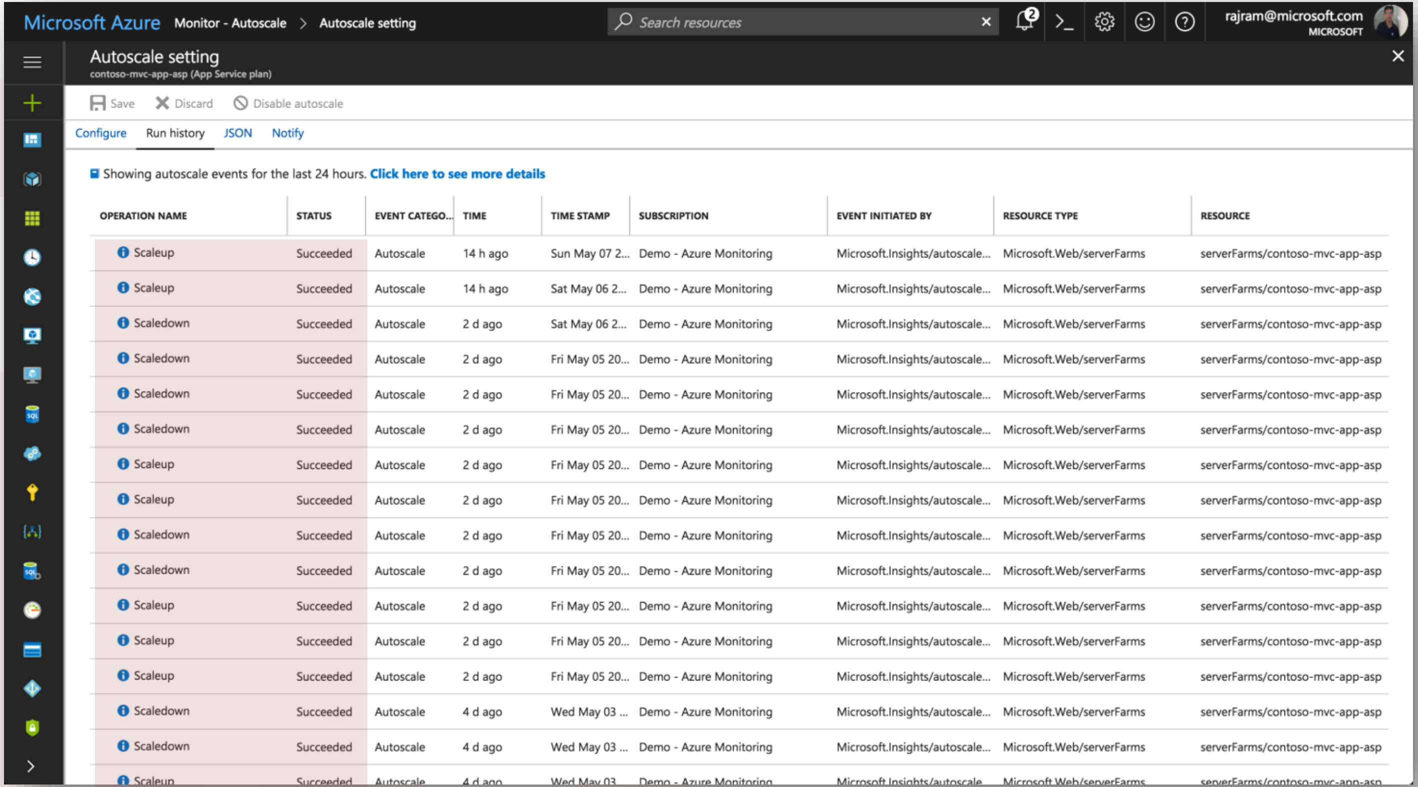
Fonte: *Get started with Autoscale in Azure*

Setting thresholds



Fonte: *Get started with Autoscale in Azure*

Scale history



Fonte: *[Get started with Autoscale in Azure]*

Autoscale best practices

- *Ensure the maximum and minimum values are different and have an adequate margin between them*
- *Manual scaling is reset by auto scale min and max*
- *Always use a scale-out and scale-in rule combination that performs an increase and decrease*
- *Choose the appropriate statistic for your diagnostics metric*
- *Configure autoscale notifications*

Fonte: *Get started with Autoscale in Azure*

Disponibilidade

Availability: *Degree to which a system, product or component is operational and accessible when required for use.*

Fonte: *"INTERNATIONAL STANDARD ISO / IEC 25010 First edition 2011-0301 Systems and software engineering — Systems and software Quality Requirements and Evaluation (* ***SQuaRE*** *) — System and software quality models." (2013).*

The basic elements of high availability

- ***Redundancy:*** *ensuring that any elements critical to system operations have an additional, redundant component that can take over in case of failure.*

- ***Monitoring:*** *collecting data from a running system and detecting when a component fails or stops responding.*

- ***Failover:*** *a mechanism that can switch automatically from the currently active component to a redundant component, if monitoring shows a failure of the active component.*

Fonte: *Azure High Availability: Basic Concepts and a Checklist*

Technical components enabling high availability

- ***Data backup and recovery:*** a system that automatically backs up data to a secondary location and recovers back to the source. This can be used to set up redundancy and failover.

- ***Load balancing:*** a load balancer manages traffic, routing it between more than one system that can serve that traffic. It can be aware that one of the target systems has failed, and redirect traffic to another available system, thus implementing monitoring and failover.

- ***Clustering:*** cluster contains several nodes that serve a similar purpose, and users typically access and view the entire cluster as one unit. Each node in the cluster can potentially failover to another node if failure occurs.

Fonte: *Azure High Availability: Basic Concepts and a Checklist*

The basic elements of high availability

- ***Redundancy:*** *ensuring that any elements critical to system operations have an additional, redundant component that can take over in case of failure.*

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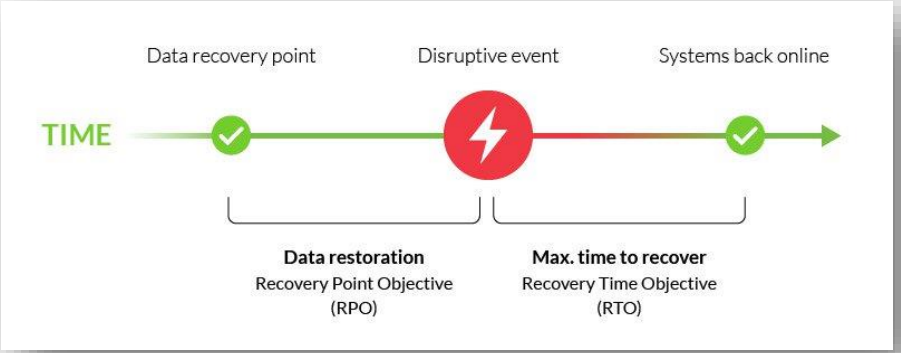
Fonte: *Azure High Availability: Basic Concepts and a Checklist*

High Availability Checklist

Define Availability Requirements

- *Percentage of Uptime*
- *Mean Time to Recovery (MTTR)*
- *Mean Time between Failures (MTBR)*
- *Recovery Time Objective (RTO)*
- *Recovery Point Objective (RPO)*



Fonte: https://www.imperva.com/learn/availability/recovery-point-objective-rpo/

Fonte: *Azure High Availability: Basic Concepts and a Checklist*

High Availability Checklist

Plan your High Availability Architecture

- *Start with a Failure Mode Analysis (FMA)*
- *Consider costs*
- *Consider resiliency*
- *Replicate data*
- *Document everything (processo)*

Fonte: *Azure High Availability: Basic Concepts and a Checklist*

High Availability Checklist

Perform End-to-End Testing: ensure reliability you should test the system under realistic failure conditions

- *Identify failures under load*
- *Run disaster recovery exercises*
- *Test health probes*
- *Test monitoring systems*

Fonte: *Azure High Availability: Basic Concepts and a Checklist*

High Availability Checklist

Deploy Applications Consistently

- Any change can result in failure
- Consider availability in your release process
- Plan for rollback
- Use probes and check functions to detect failure in time

Fonte: *Azure High Availability: Basic Concepts and a Checklist*

High Availability Checklist

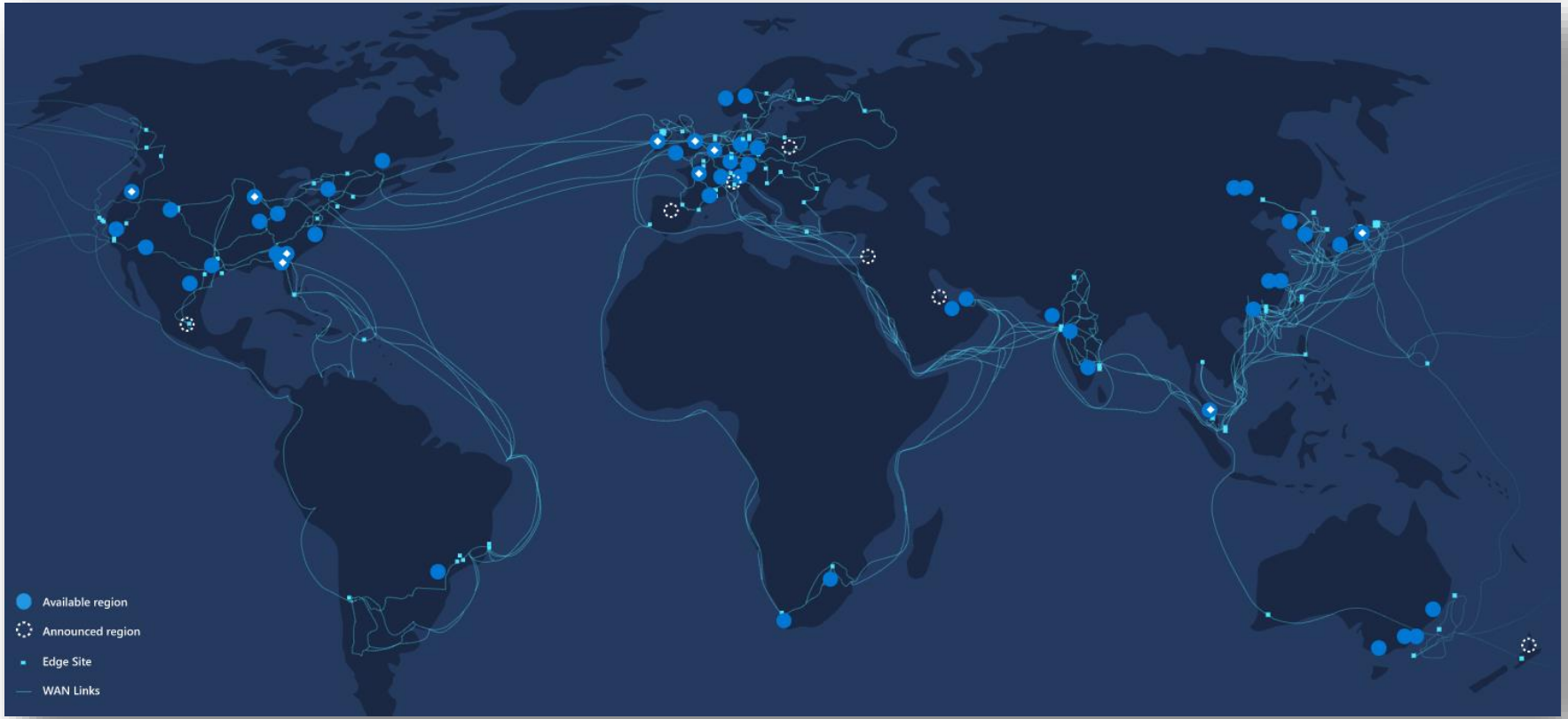
Monitor Application Health

- Watch degrading health metrics
- Leverage logging and auditing
- Watch subscription limits

Fonte: *Azure High Availability: Basic Concepts and a Checklist*

Fonte: https://www.afcea.org/content/smarter-commercial-cloud

60+ Azure regions



* Fonte: https://azure.microsoft.com/en-us/global-infrastructure/geographies/

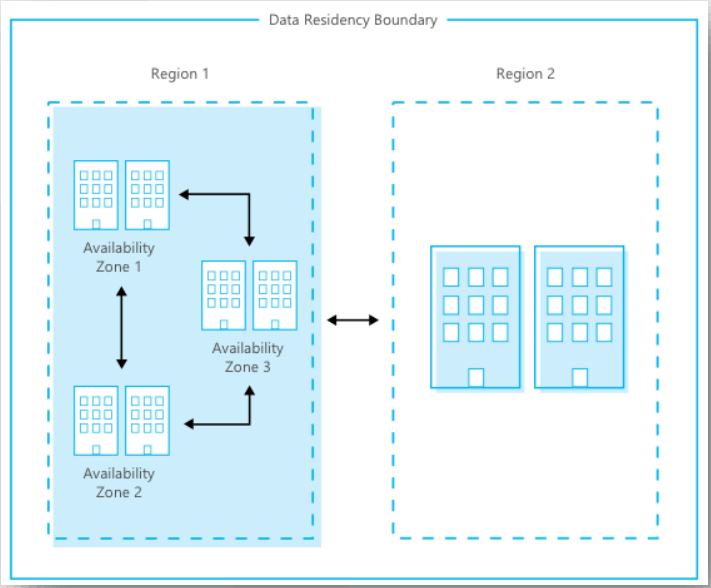
Some definitions

Region	A set of datacenters deployed within a latency-defined perimeter and connected through a dedicated regional low-latency network.
Geography	An area of the world containing at least one Azure region. Geographies define a discrete market that preserve data residency and compliance boundaries. Geographies allow customers with specific data-residency and compliance needs to keep their data and applications close.
Recommended region	A region that provides the broadest range of service capabilities and is designed to support Availability Zones now, or in the future. These are designated in the Azure portal as Recommended.
Alternate (other) region	A region that extends Azure's footprint within a data residency boundary where a recommended region also exists. Alternate regions help to optimize latency and provide a second region for disaster recovery needs.

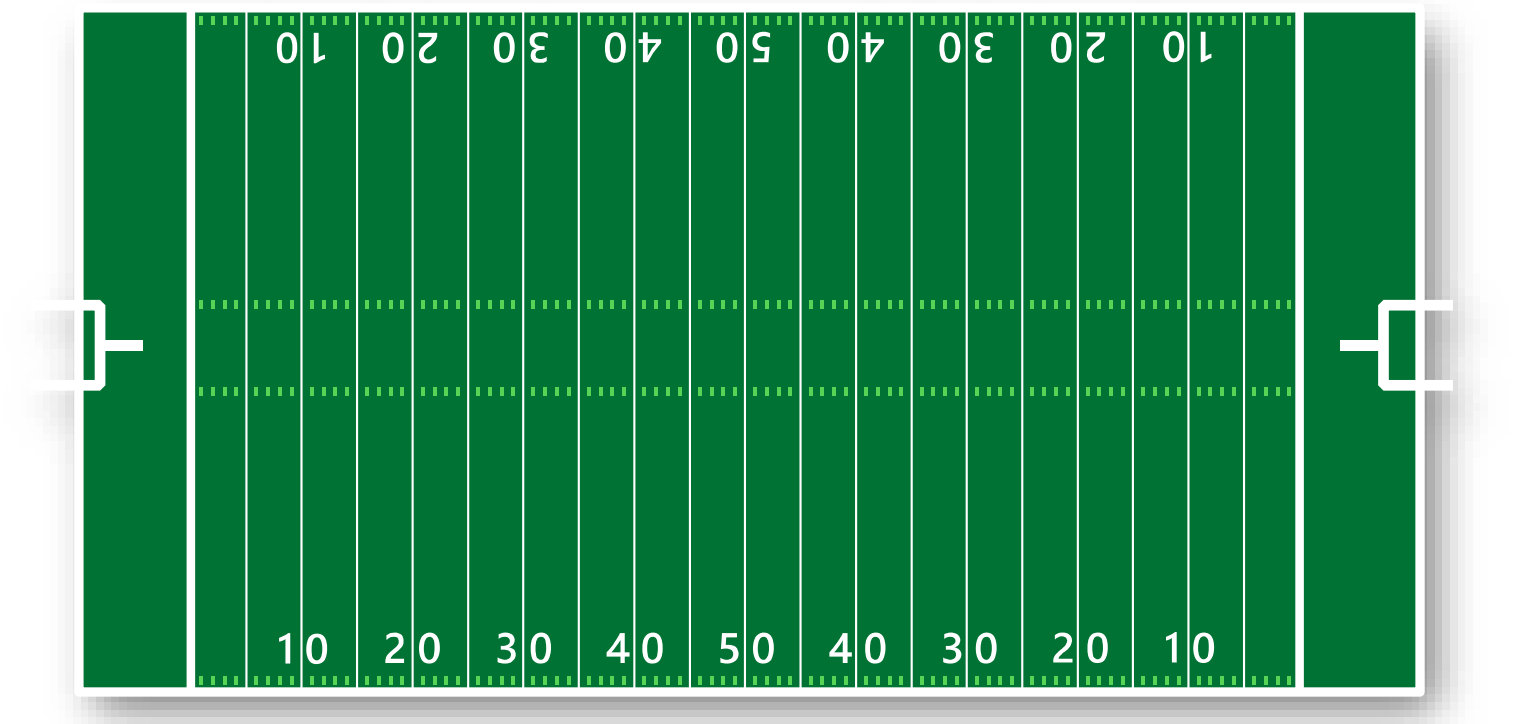
Fonte: *https://docs.microsoft.com/pt-br/azure/availability-zones/az-overview*

Azure Region

- *A region is a set of datacenters deployed within a latency-defined perimeter and connected through a dedicated regional low-latency network.*

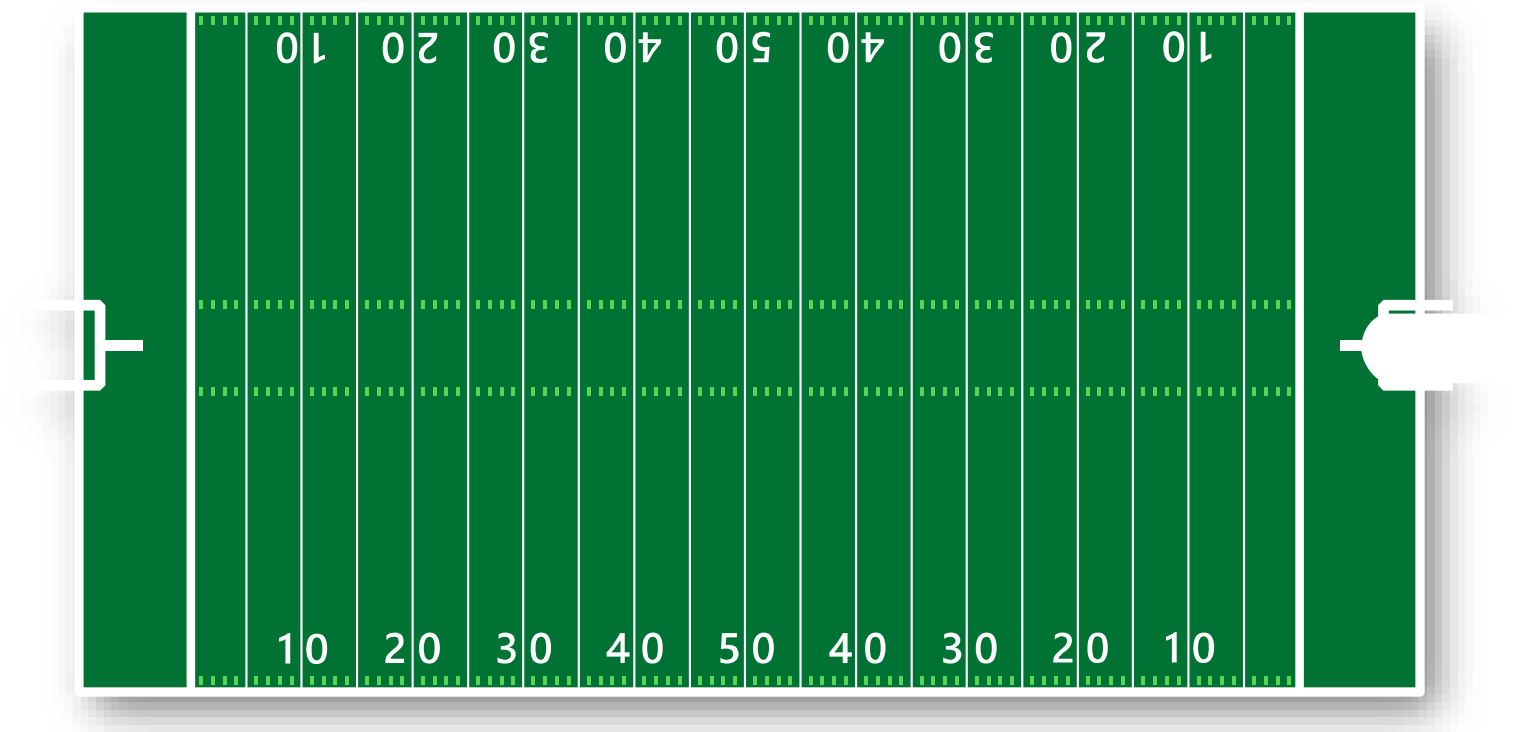


Fonte: *https://azure.microsoft.com/en-us/global-infrastructure/regions/*



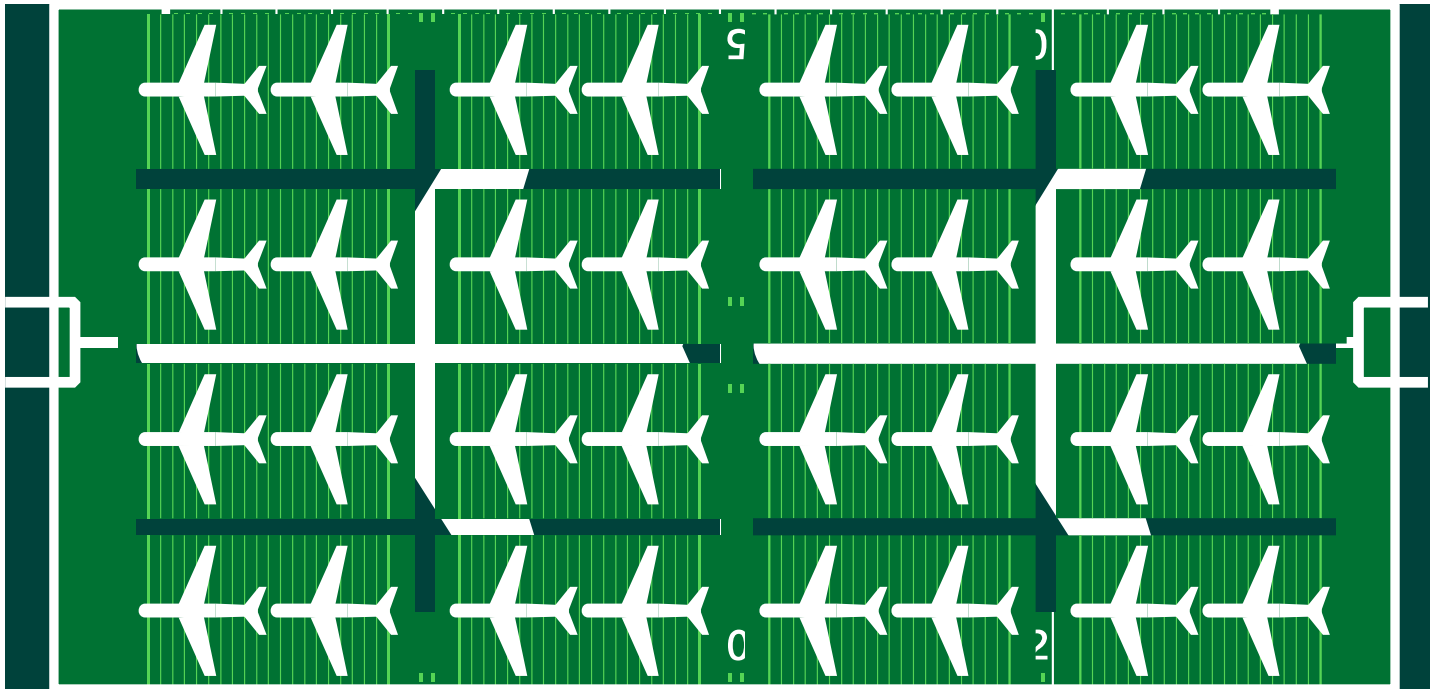
Datacenter buildings are about one football field in size

Fonte: *Soluções de IoT no Microsoft Azure - https://www.slideshare.net/fabriciolopessanchez/solues-de-iot-no-microsoft-azure*



…large enough to hold
two jumbo jets

Fonte: *Soluções de IoT no Microsoft Azure - https://www.slideshare.net/fabriciolopessanchez/solues-de-iot-no-microsoft-azure*



That’s up to 600,000 servers in each Azure region.

And there are 16 building per region…

Fonte: *Soluções de IoT no Microsoft Azure* - *https://www.slideshare.net/fabriciolopessanchez/solues-de-iot-no-microsoft-azure*

Availability Sets

Logical grouping capability for isolating VM resources from each other

Azure makes sure that the VMs you place within an Availability Set run across multiple physical servers, compute racks, storage units, and network switches.

If a hardware or software failure happens, only a subset of your VMs are impacted and your overall solution stays operational.

Fonte: *https://docs.microsoft.com/pt-br/azure/availability-zones/az-overview*

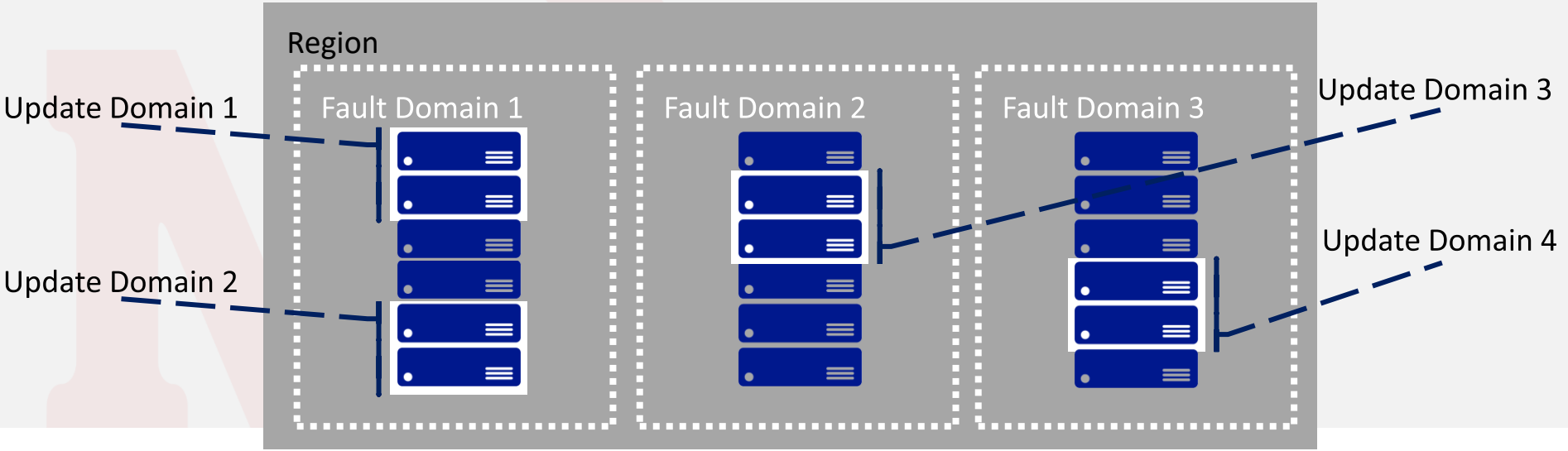
Availability Sets

Fault Domains

Segments clusters within a region (Up to 3)

Update Domains

Segments updates and patches to clusters (Up to 20)



Availability Zone

Availability Zones is a high-availability offering that protects your applications and data from ***datacenter failures****.*

Availability Zones are unique physical locations within an Azure region. Each zone is made up of one or more datacenters equipped with independent power, cooling, and networking.

To ensure resiliency, there's a minimum of three separate zones in all enabled regions.

Fonte: *https://docs.microsoft.com/pt-br/azure/availability-zones/az-overview*

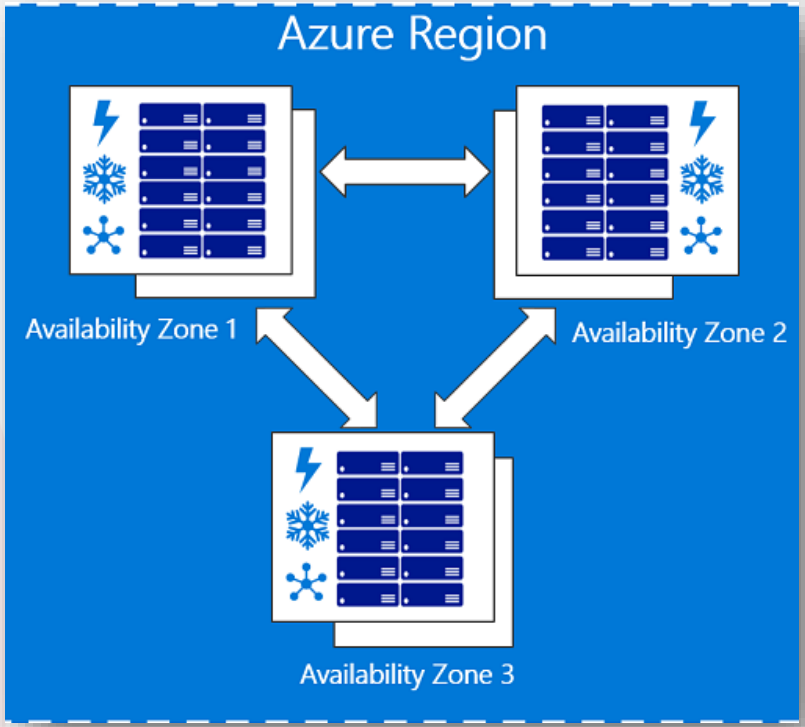
Availability Zone

Separate locations

Independent

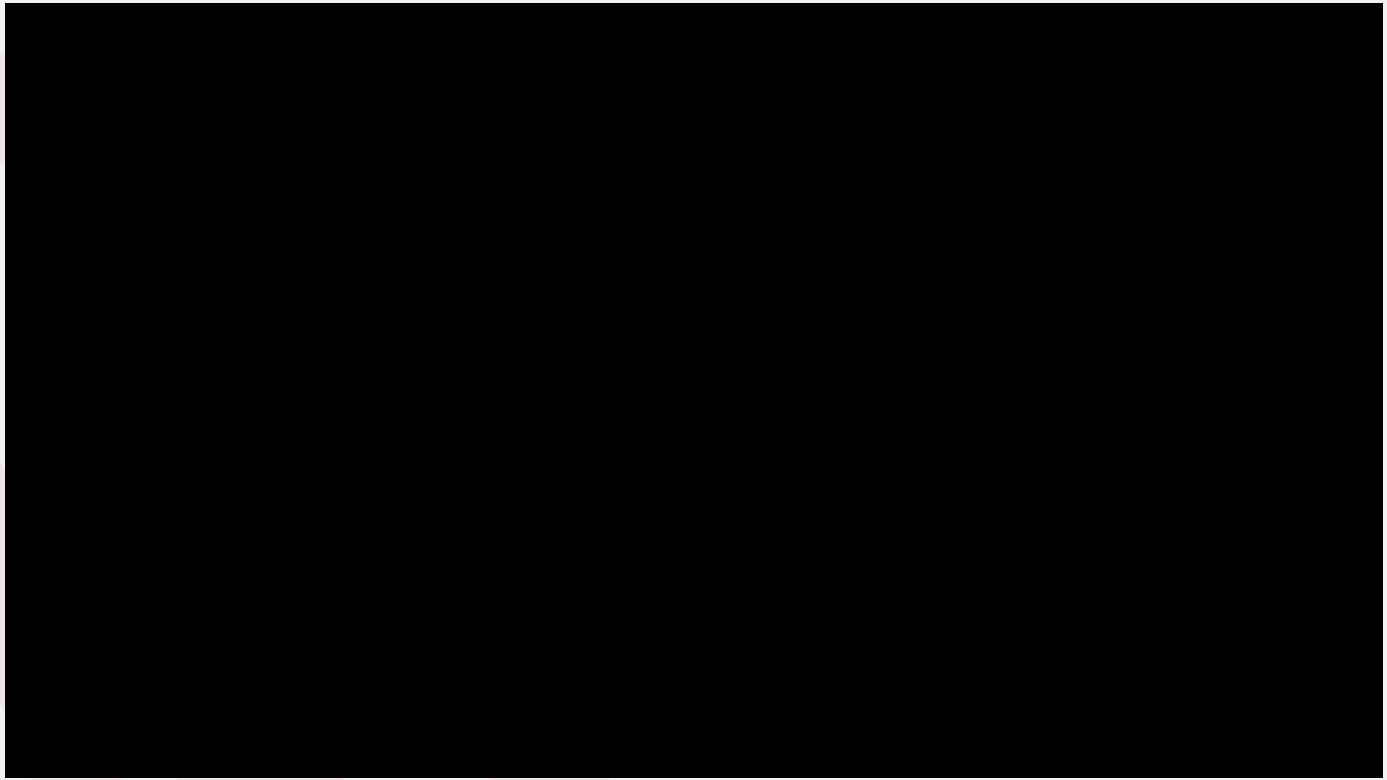
- *Power*
- *Cooling*
- *Networking*

Isolation Boundary



Fonte: *https://docs.microsoft.com/pt-br/azure/availability-zones/az-overview*

Business continuity and disaster recovery on Azure



Fonte: *https://www.youtube.com/watch?time_continue=2&v=SbL3vY41USc&feature=emb_logo*

Entrega Parcial 04 – Data de Entrega: 17/09/2020 até às 12:00

Considerando o seu tema de trabalho, responda os itens abaixo:

- Quais são os elementos de governança fundamentais que devem ser considerados em seu trabalho de curso para que o uso da nuvem seja bem sucedido ? Justifique. Sugestões de referências abaixo:
  - **Azure Governance:**
    - https://docs.microsoft.com/en-us/azure/cloud-adoption-framework/govern/
    - https://docs.microsoft.com/en-us/azure/cloud-adoption-framework/govern/governance-disciplines
  - **AWS Governance:**
    - https://aws.amazon.com/products/management-tools/
  - **GCP Governance:**
    - https://cloud.google.com/solutions/policies/designing-gcp-policies-enterprise#governance_and_visibility

- Dos itens visto nesta aula (Escalabilidade e Disponibilidade), descreva quais mecanismos poderia usar na implementação em Cloud do seu tema de trabalho em um provedor de nuvem de sua escolha.

- ***Forma de entrega:*** enviar por e-mail para *manzan@uol.com.br* até a data de entrega.

Até a próxima aula

Muito Obrigado!

Feedbacks ?