Cloud Computing Fundamentals with Microsoft Azure

Hello!

I am Radoslav Gatev

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About me

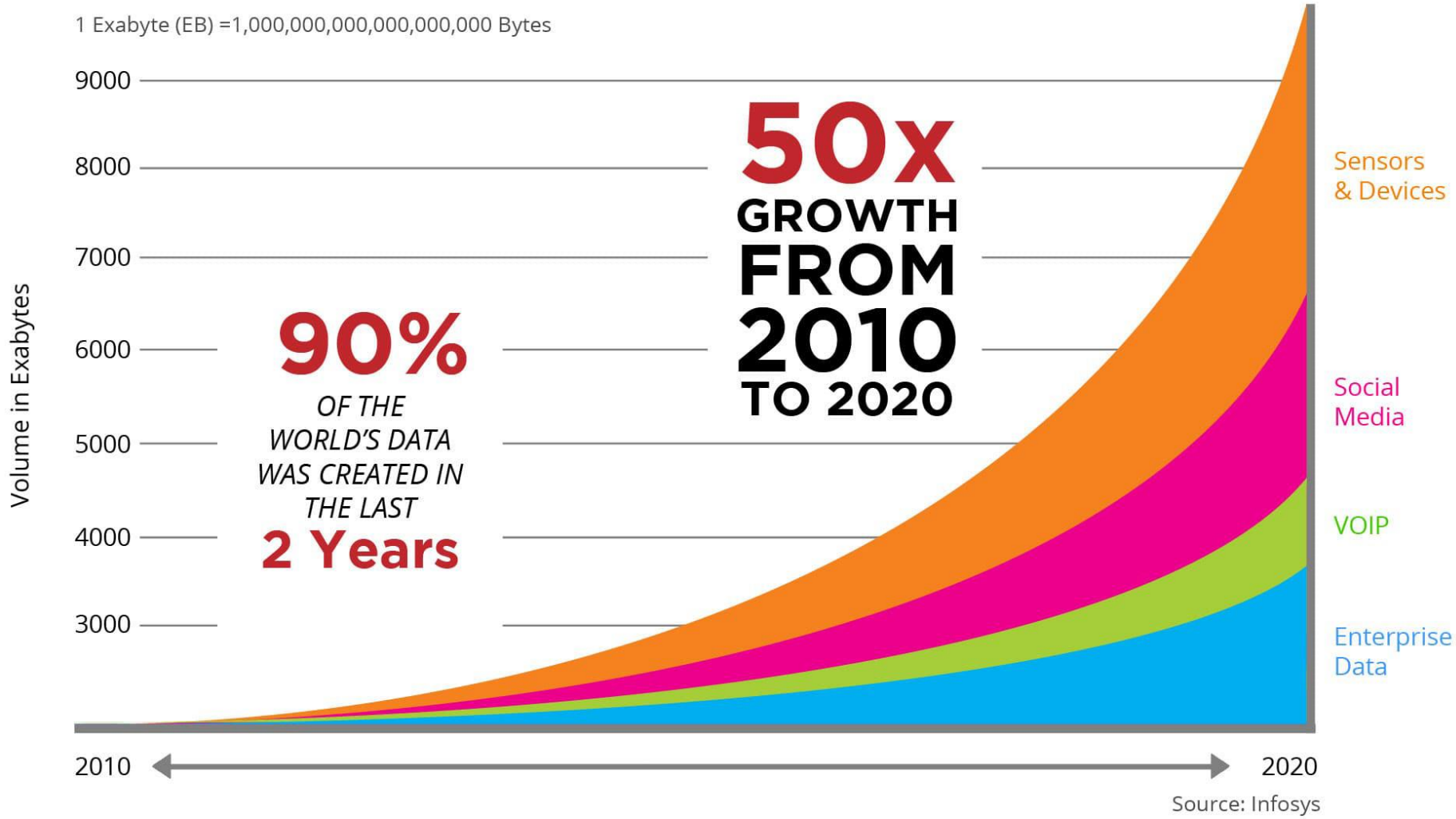
- Software Architect & Consultant
- Microsoft Azure MVP
- Advisor at Microsoft Azure Research
- www.gatevnotes.com

Agenda

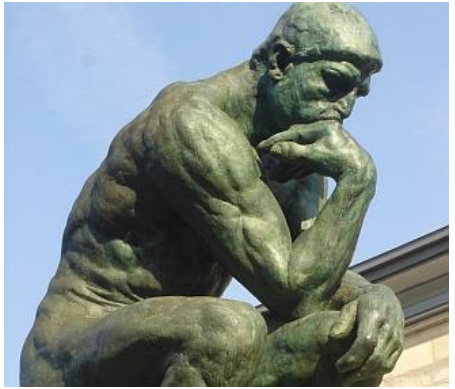
- What is cloud?
- Pros & Cons
- Deployment models
- Service Models
- SLAs
- Workloads
- Microsoft Azure
- Core Azure Services: Storage, App Service, SQL Database, Cosmos DB
- DevOps

The evolution

- In the beginning was the Personal Computer


1 Exabyte (EB) =1,000,000,000,000,000,000 Bytes
9000
8000
7000
6000
5000
4000
3000
Volume in Exabytes
50x
GROWTH
FROM
2010
TO 2020
90%
OF THE
WORLD'S DATA
WAS CREATED IN
THE LAST
2 Years
Sensors
& Devices
Social
Media
VOIP
Enterprise
Data
2010
2020
Source: Infosys

The evolution



- “Why do we need to buy and maintain our own servers and spend our lives upgrading and fixing them?”
- “Why do we need an expensive Disaster Recovery site that sits idle most of the time?”
- “Why can’t I just rent a file server or a database server or a webserver or an application and pay someone else to manage it?”

Cloud computing in a nutshell

Cloud Computing is the transformation of computer hardware, software and networks into a Utility just like the your Electric Company, Water Company, or Gas Company.

What is Cloud Computing?

- **Cloud computing** is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services)
- rapidly provisioned and released with minimal management effort
- provides high level abstraction of computation and storage model.
- has some essential **characteristics**, **service models**, and **deployment models**.

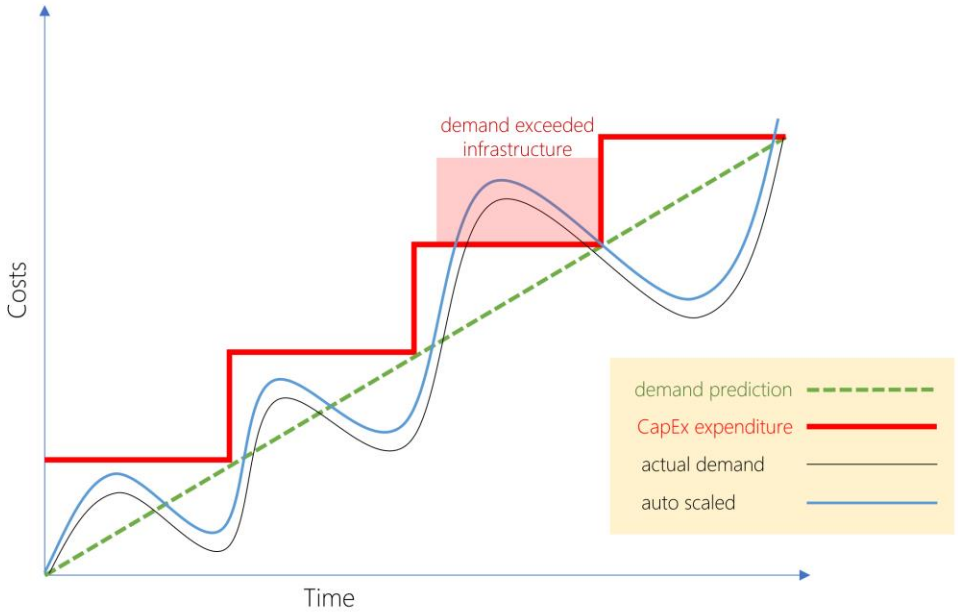
Essential Characteristics

- On-Demand self service
- Broad network access
- Resource pooling
- Rapid elasticity
- Measured Service!

Advantages

- Quick Setup
- Scalability
- Cost Efficient
- Backup and High Availability
- Mobility
- Environmentally Friendly
- Innovation
- Security!

Cloudonomics, economies of scale: CapEx vs OpEx



Disadvantages

- Security and Privacy
- Dependency
- Loss of Control
- Reliability and Vulnerability
- Government Interference

Deployment models

- **Public cloud**

  IT infrastructure, platform or service publicly accessible from Internet e.g. Microsoft Azure, Amazon Web Services

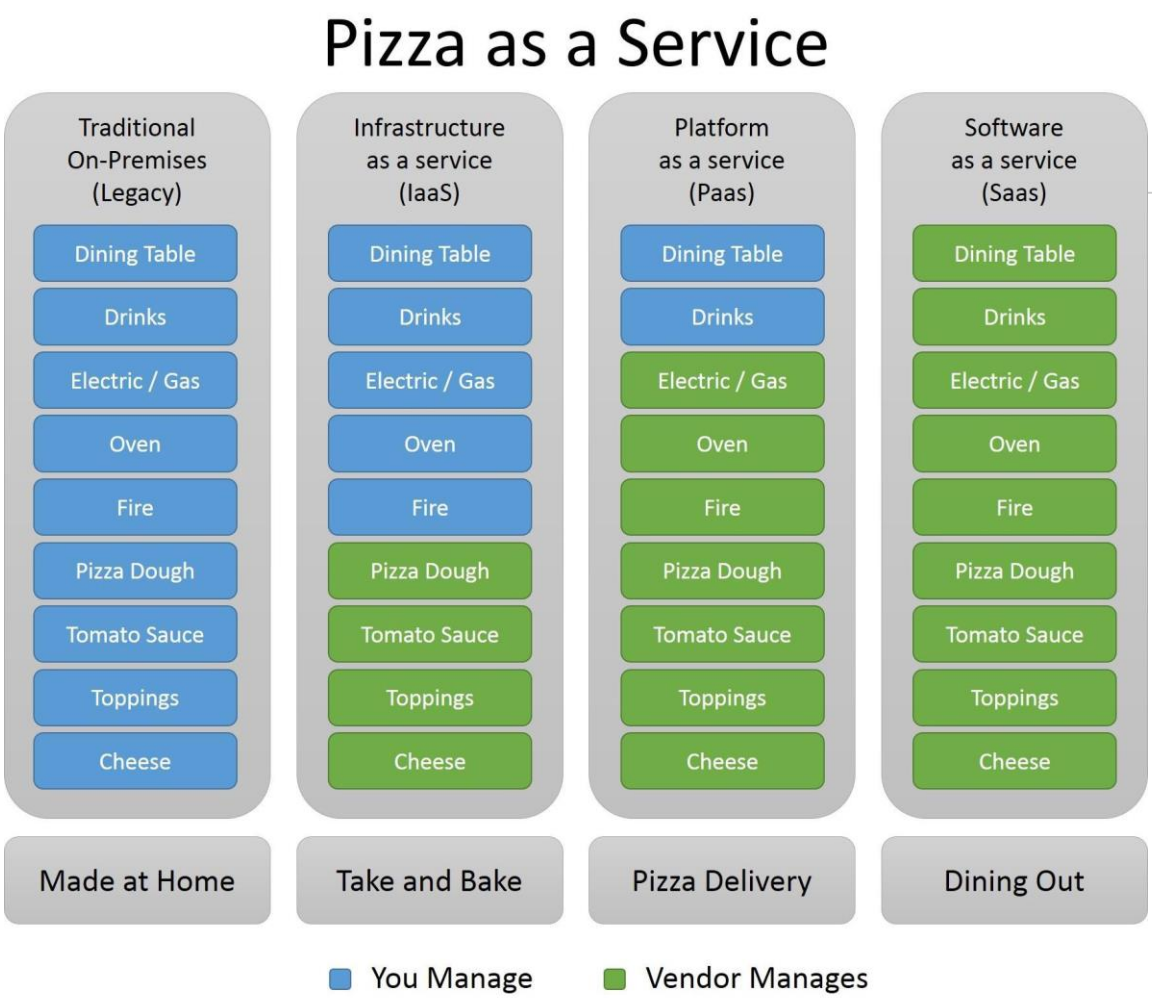
- **Private cloud**

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

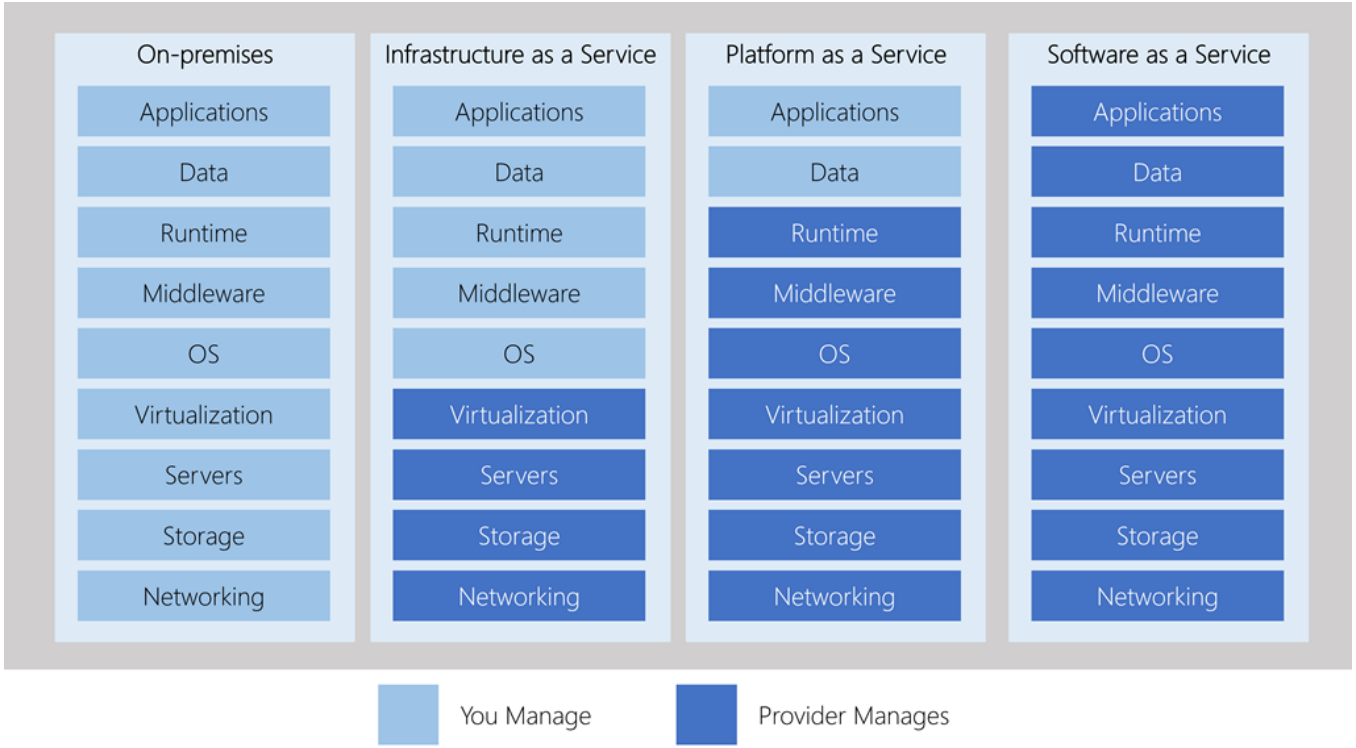
- **Hybrid cloud**

  Mix of private and public cloud infrastructure and services, e.g. private cloud + some services in Azure

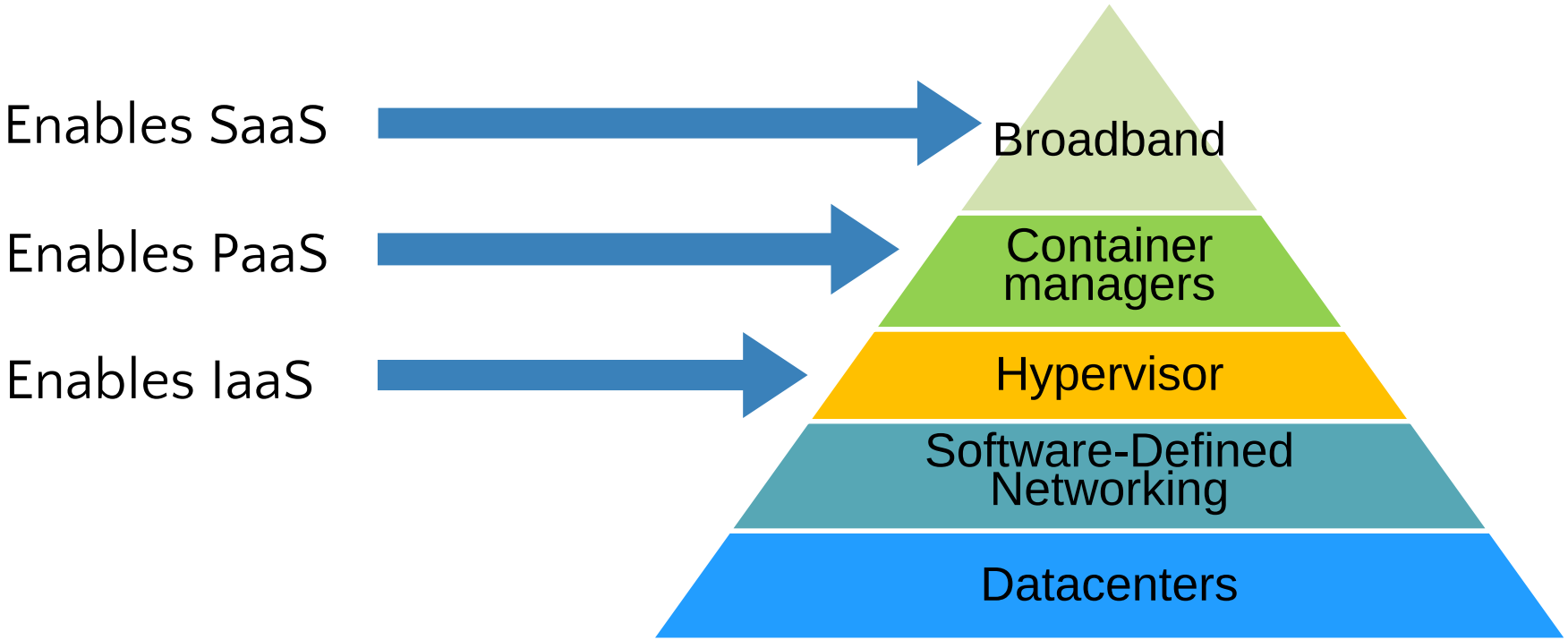
Service Models

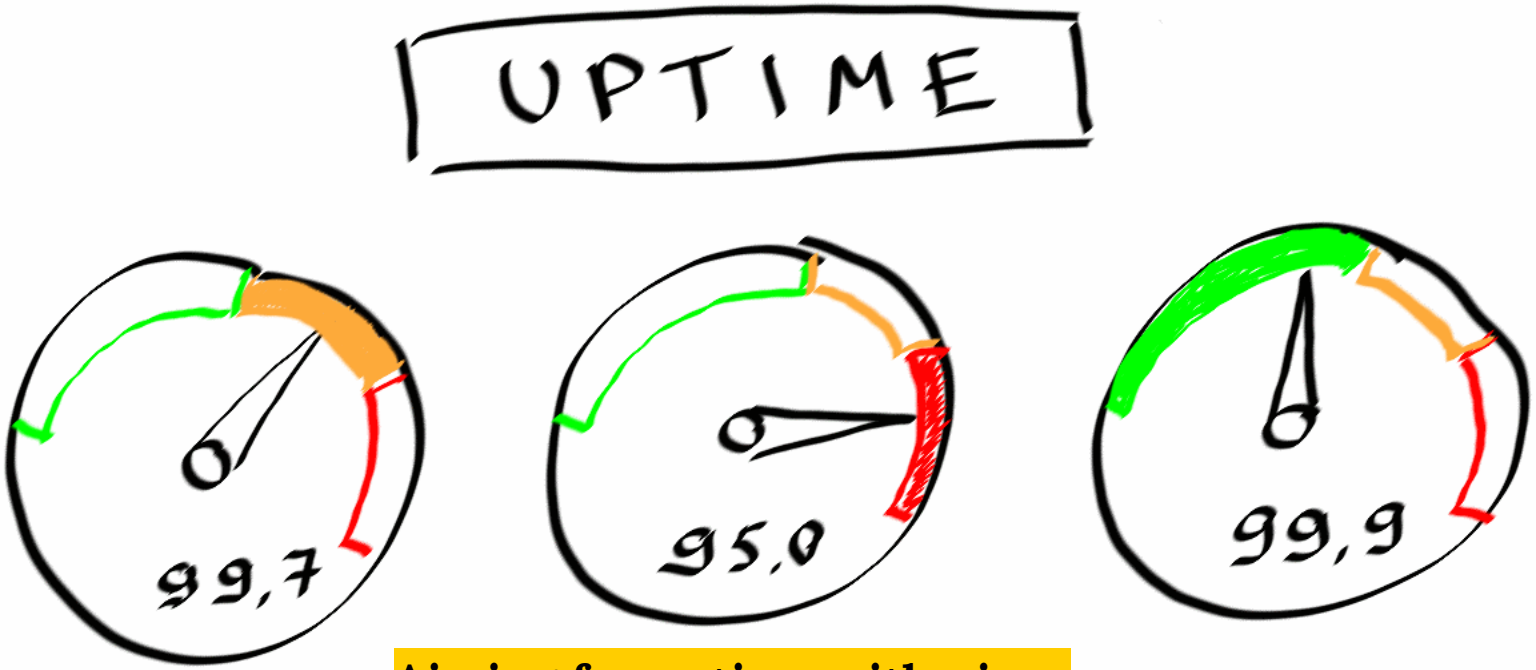


Service Models



The technology of the cloud





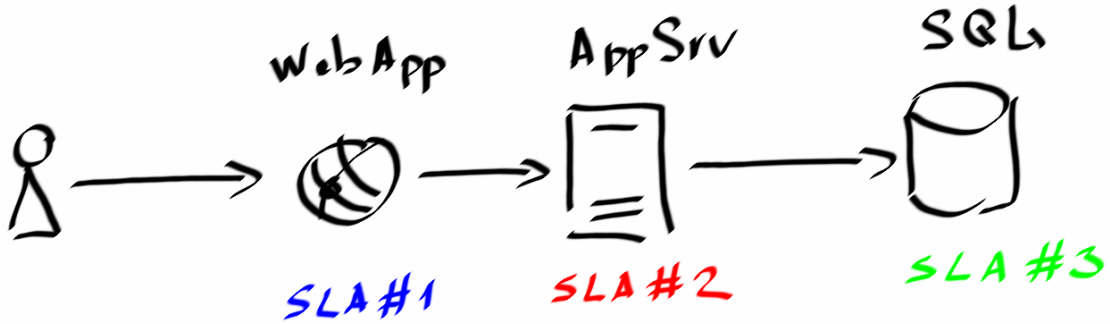
Aiming for uptime with nines

What does each 9 cost?

- Uptime ≠ Availability
- At some point, as you continue to increase the number of 9s, the ROI starts to decrease

SLA %	Downtime per week	Downtime per month	Downtime per year
99	1.68 hours	7.2 hours	3.65 days
99.9	10.1 minutes	43.2 minutes	8.76 hours
99.95	5 minutes	21.6 minutes	4.38 hours
99.99	1.01 minutes	4.32 minutes	52.56 minutes
99.999	6 seconds	25.9 seconds	5.26 minutes

Calculate SLA



Overall SLA = Web Tier SLA * Middleware Tier SLA * Backend Tier SLA
= 99.95% * 99.9% * 99.99% = 99.84% or 99.8% roughly

Workload types

http://www.cloudcomputingpatterns.org/#cloud_computing_fundamentals

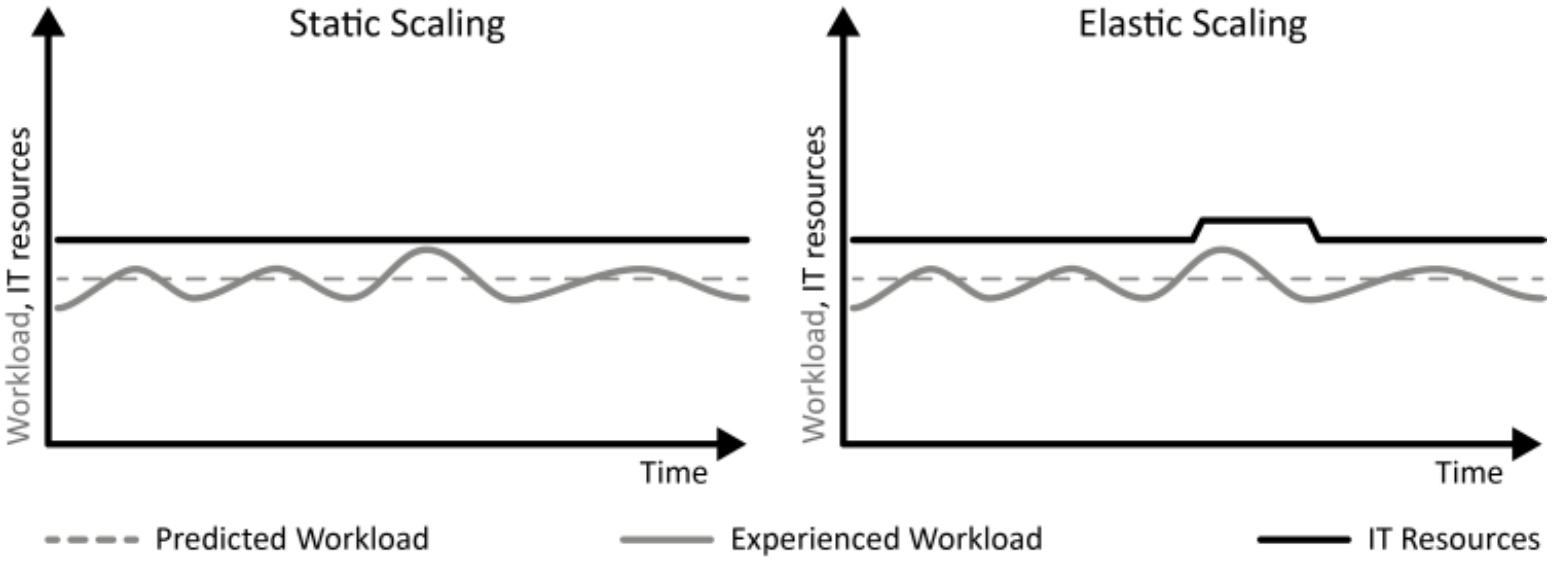
Elasticity

The degree to which a system is able to adapt to workload changes by provisioning and deprovisioning resources in an autonomic manner, such that at each point in time the available resources match the current demand as closely as possible

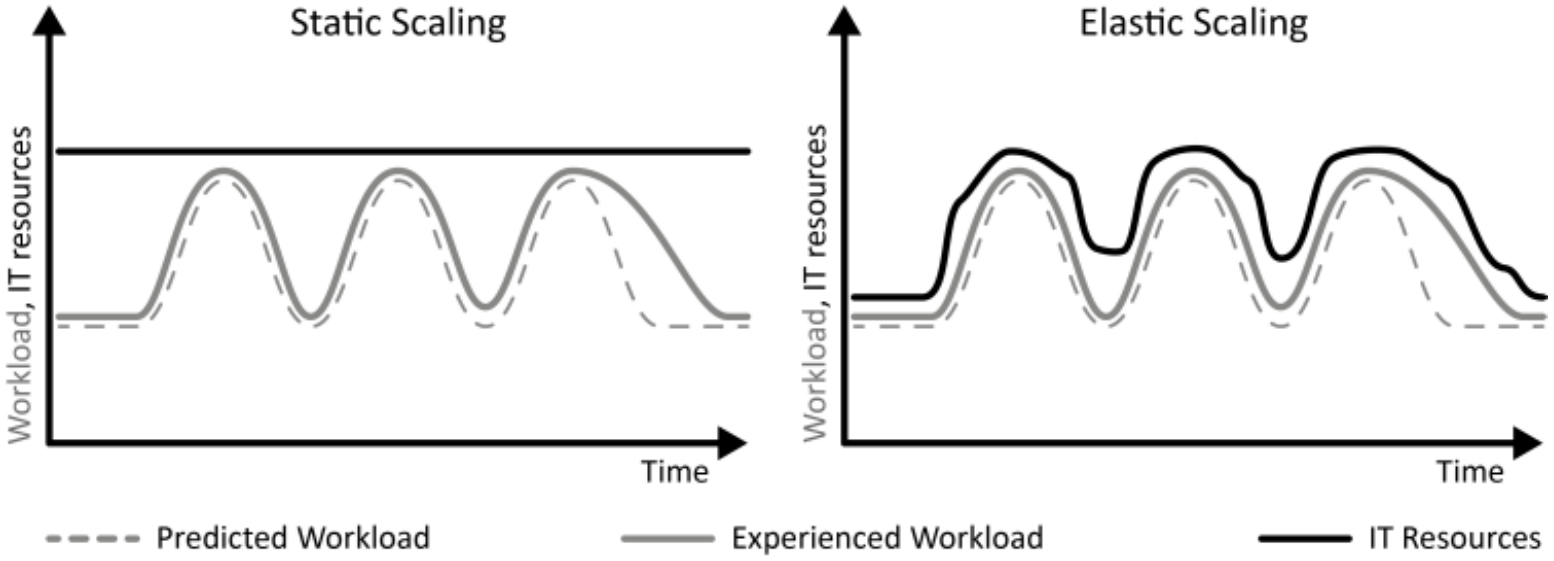
Concerns:

- Resource provisioning time
- Application monitoring
- Stakeholder requirements

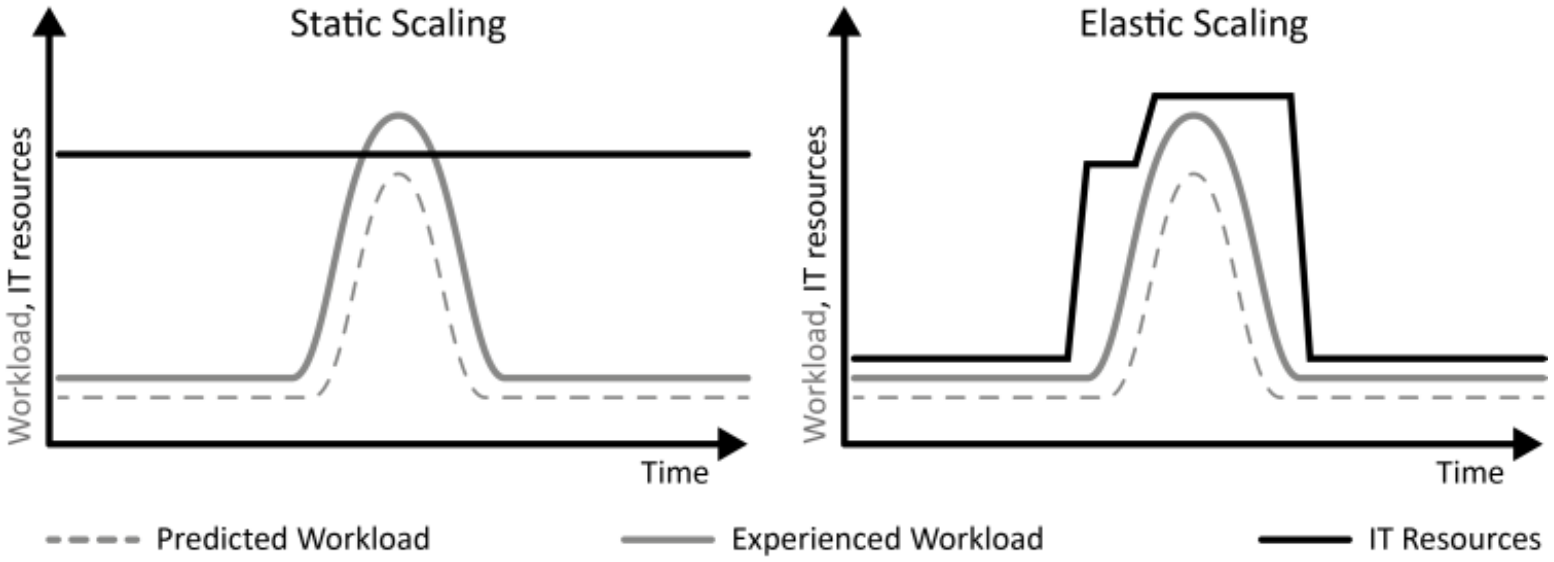
Static Workload



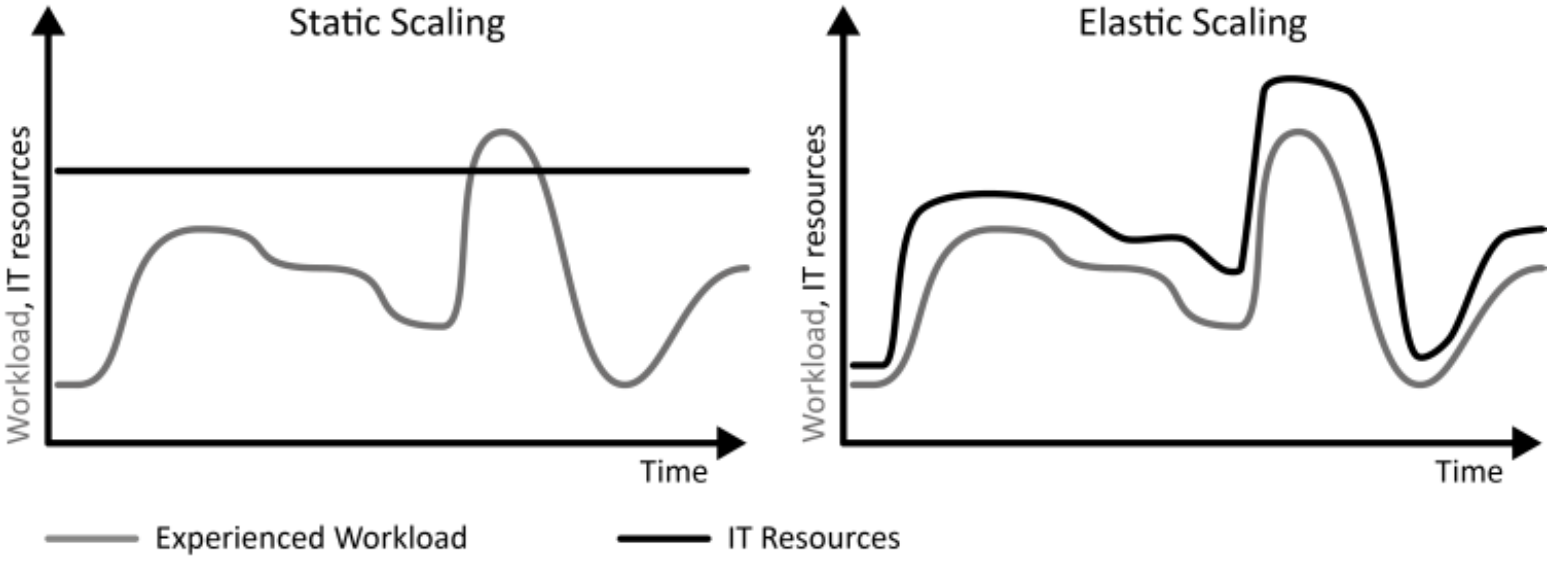
Periodic Workload



Once-in-a-lifetime Workload (Black Friday)

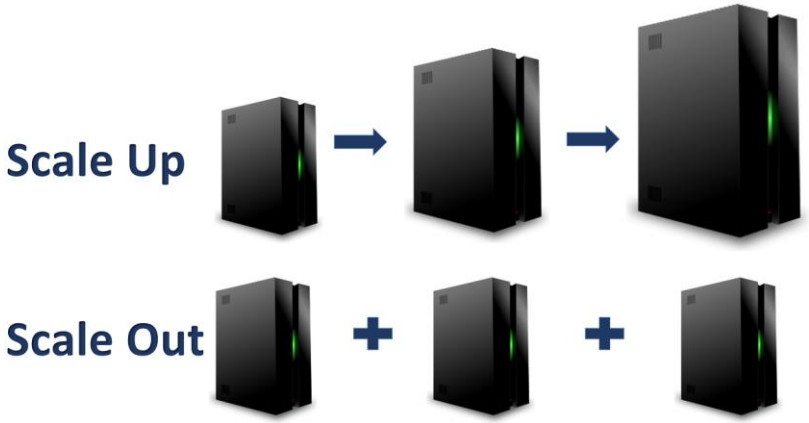


Unpredictable Workload



Scaling

The ability of a system, network, or process to handle a growing amount of work in a capable manner or its ability to be enlarged to accommodate that growth–Wikipedia



How to treat servers?

Pets

You name them and when they got sick, you nurse them back to health

Cattle

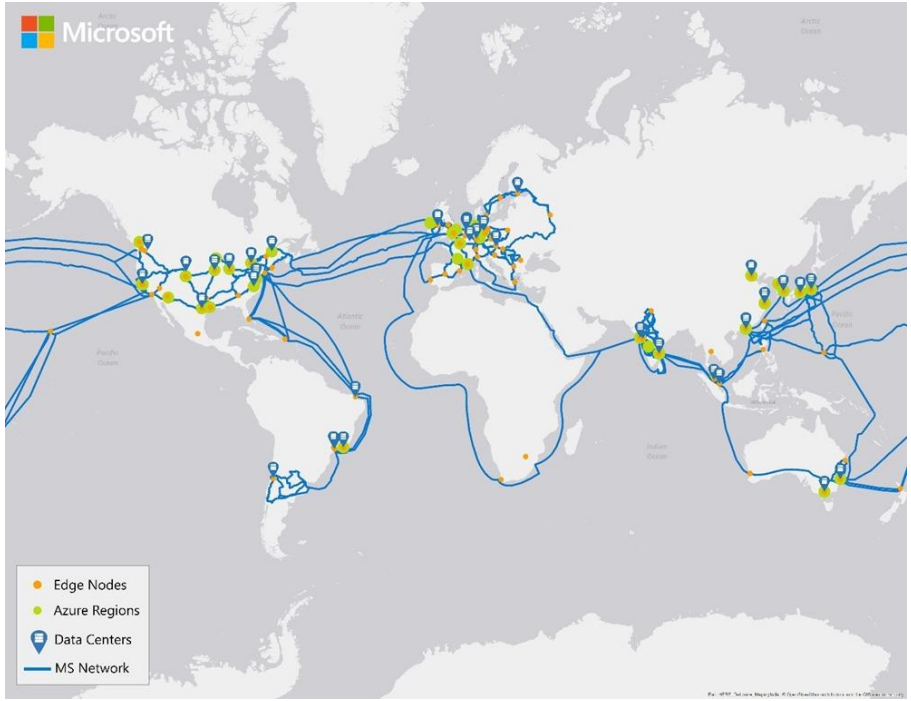
You number them and when they get sick, you shoot them and get new ones

What is Microsoft Azure?

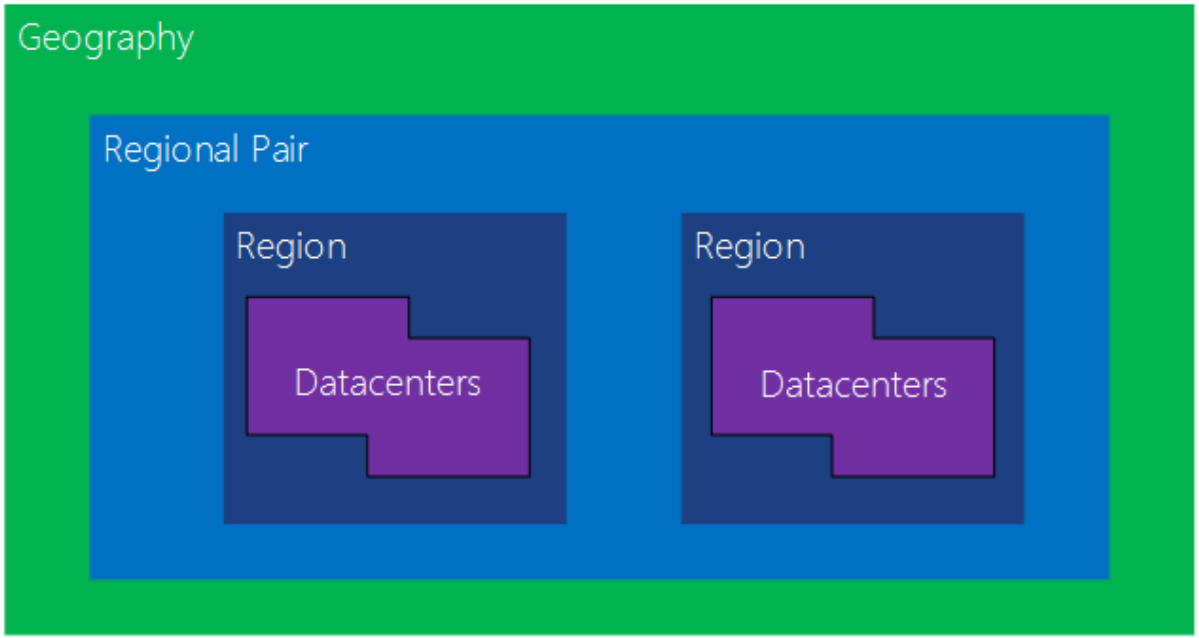
Filled with thousands of rows of server racks housing customer data

Made up of massive datacenters of concrete and steel

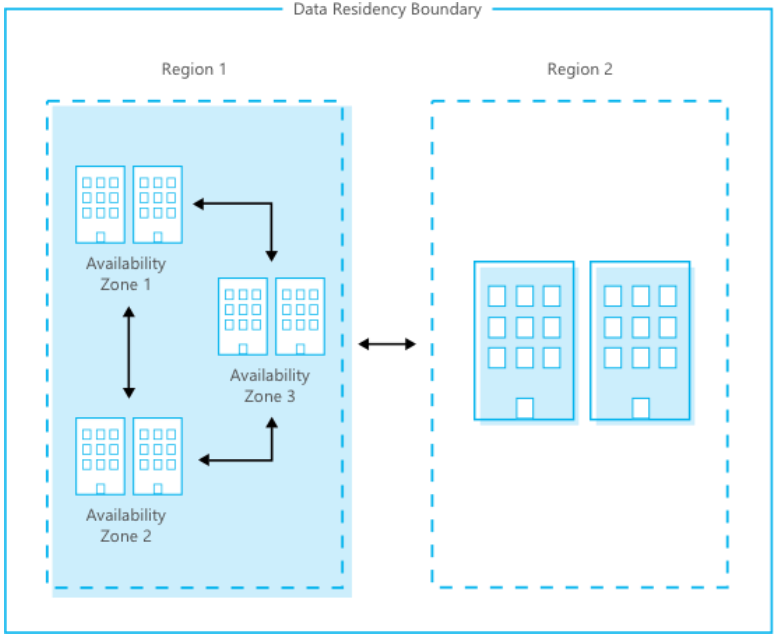
What is Microsoft Azure?



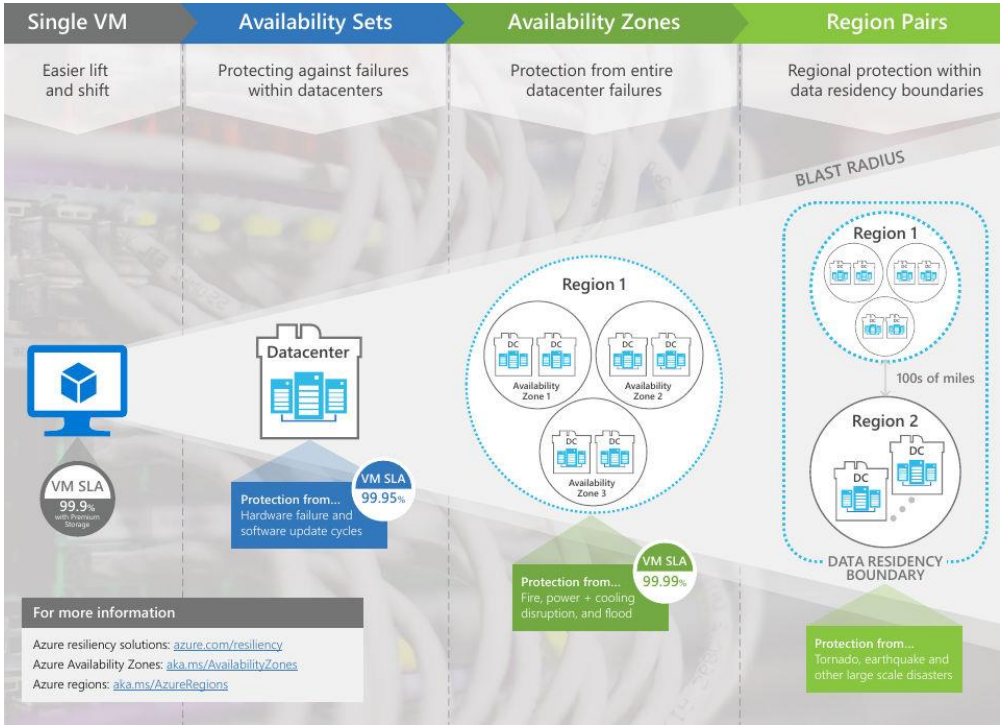
Physical dimensions of Microsoft Azure



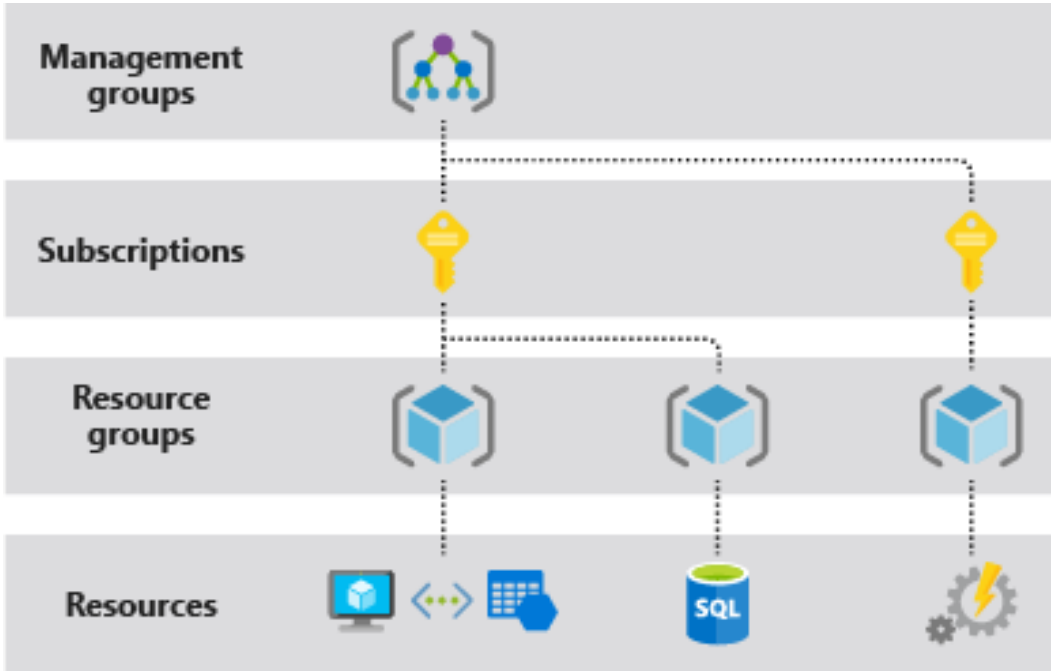
Physical dimensions: Even further...

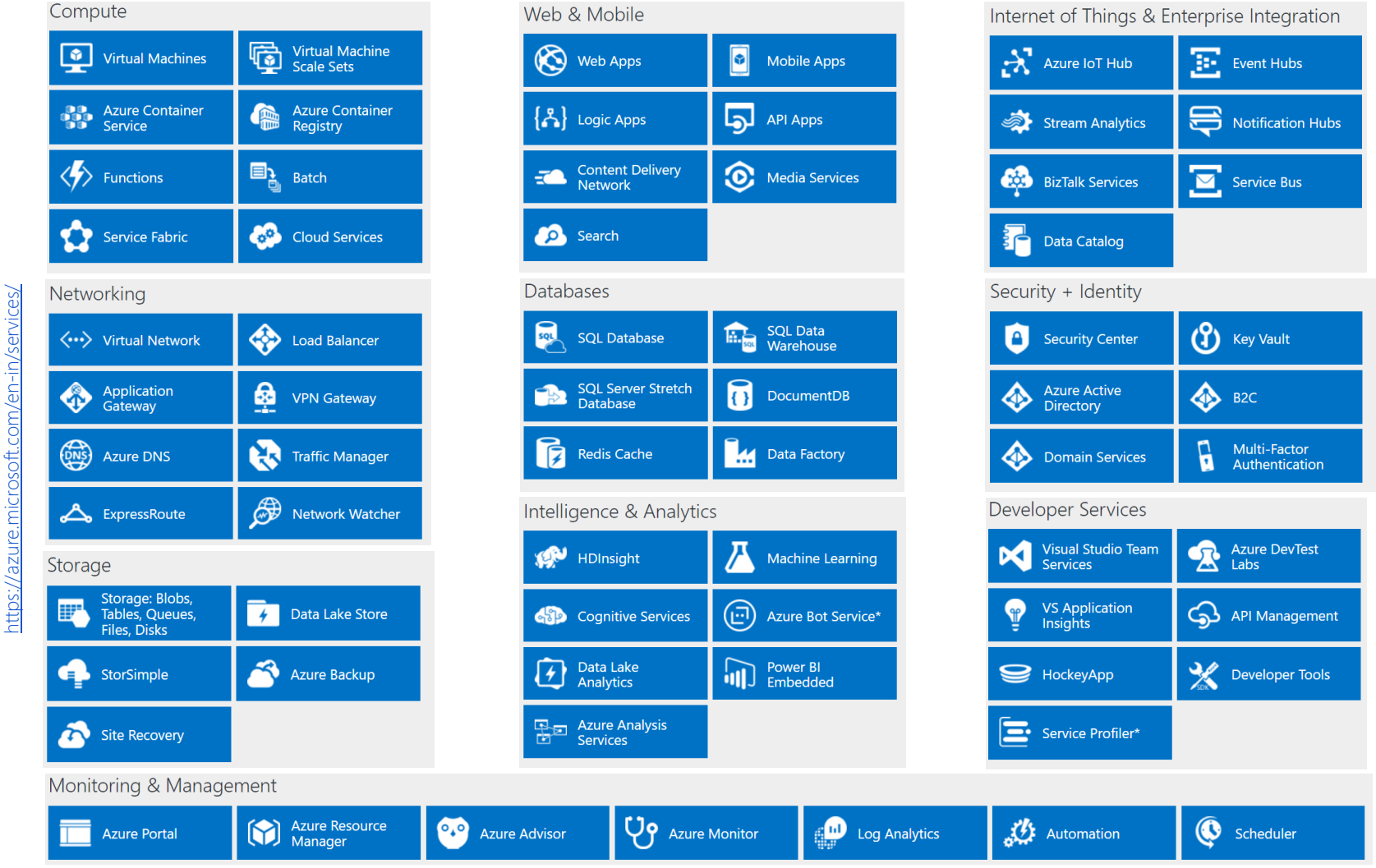


Physical dimensions: ...and further...



Logical structure of your Azure accounts




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
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
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*
Monitoring & Management
Azure Portal
Azure Resource Manager
Azure Advisor
Azure Monitor
Log Analytics
Automation
Scheduler
https://azure.microsoft.com/en-in/services/

Azure Storage

- Durable and highly available
- Secure
- Scalable
- Managed
- Accessible

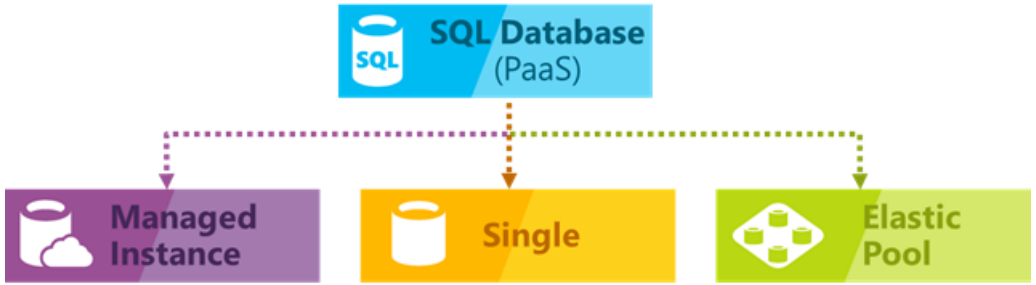
Azure Storage services

- **Azure Blobs**: A massively scalable object store for text and binary data
- **Azure Files**: Managed file shares for cloud or on-premises deployments
- **Azure Queues**: A messaging store for reliable messaging between application components
- **Azure Tables**: A NoSQL store for schemaless storage of structured data.

Demo: Azure Storage

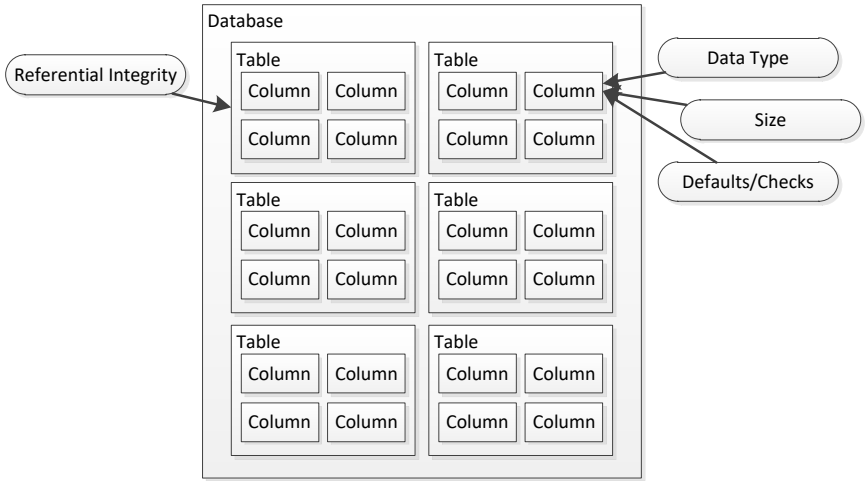
Azure SQL Database

- Based on the latest stable version of the Microsoft SQL Server database engine
- Newest capabilities of SQL Server are released to SQL Database
- Fully managed, no patching or upgrading



Demo: SQL Database

The truths we hold



- A database has a schema
- We transform the data into that schema
- Data conforms to the schema we define
- The schema defines the business

Azure Cosmos DB

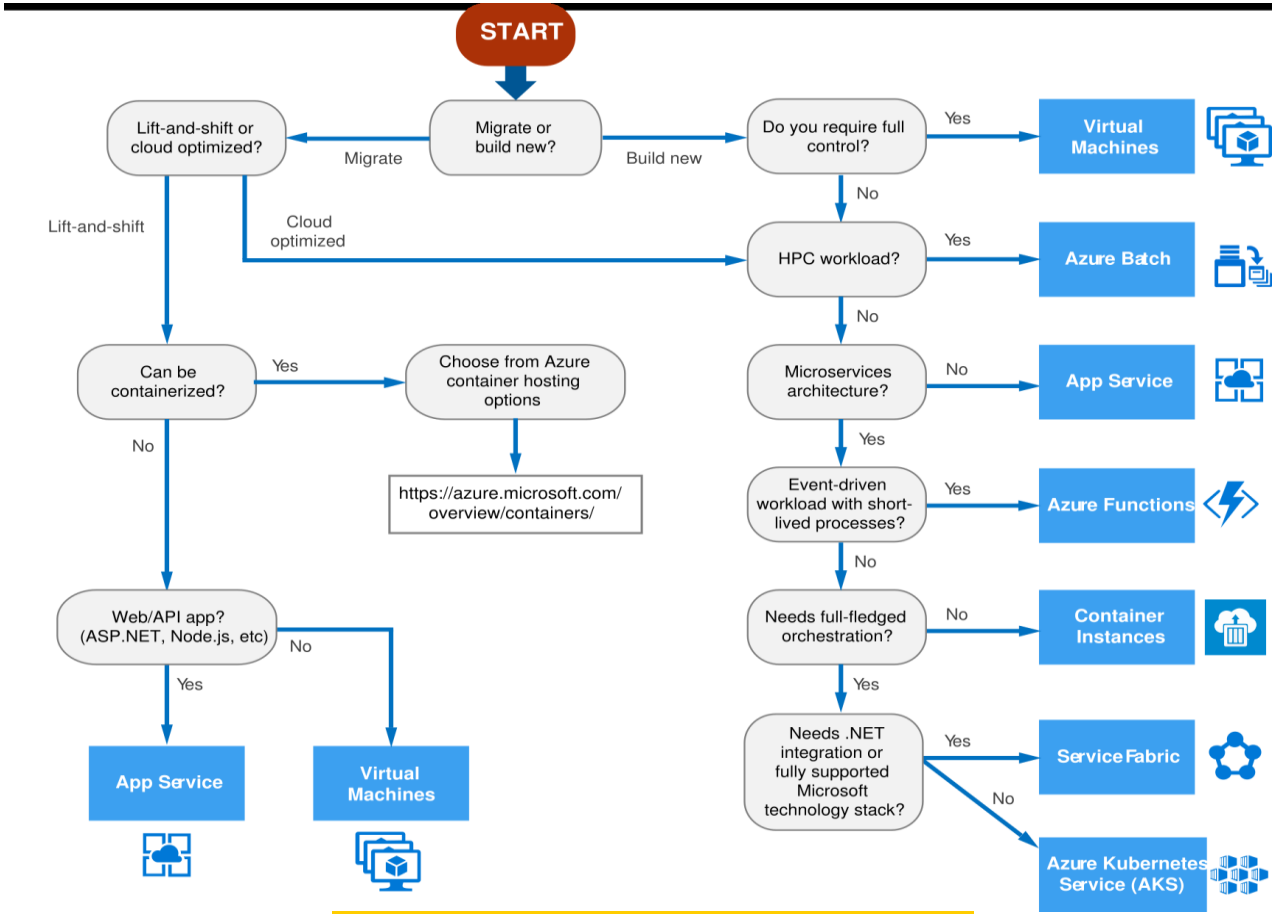
- NoSQL Database
- Supports several APIs: SQL, MongoDB, Cassandra, Tables, or Gremlin
- Multi-model: Key-Value, Column-Family, Documents, Graph
- Five consistency models: Strong -> Eventual
- Global Distribution
- 99.999% high availability for both reads and writes when multi-region writes are enabled

Demo: Cosmos DB

Azure App Service

- Web apps hosting
- Multiple languages and frameworks
- Global scale with high availability
- DevOps optimization
- Connections to SaaS platforms and on-premises data
- Security and compliance
- Visual Studio integration

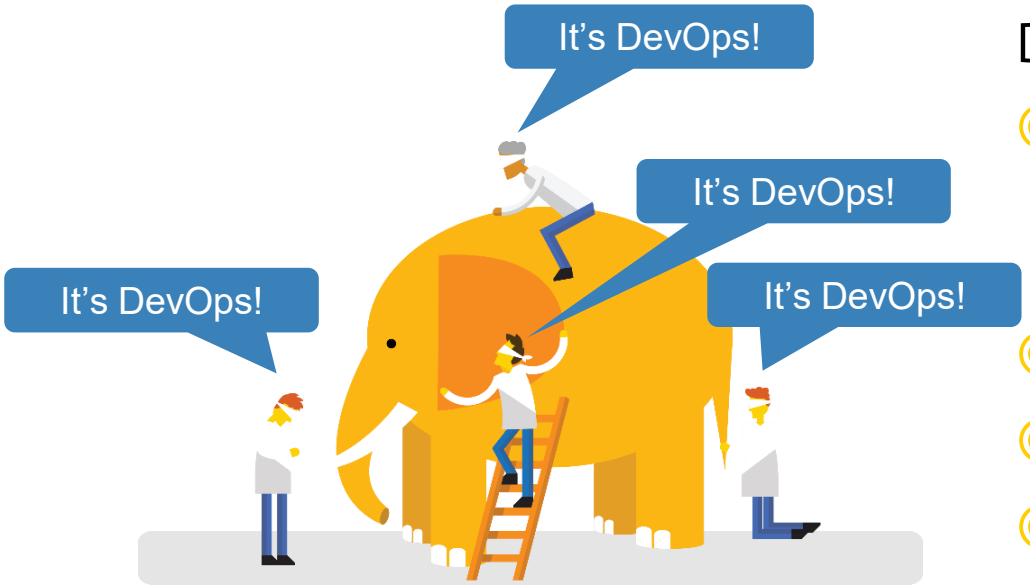
Demo: App Service



Choosing a compute service

What is DevOps?

DevOps elephant



DevOps is...

- ...is a person who can perform both Dev/Ops roles
- ...is continuous delivery
- ...is automation
- ...is monitoring
- ...is small deployments

“Do painful things more frequently, so you can make it less painful…”

Adrian Cockcroft

VP Cloud Architecture Strategy at AWS

So what is it?

- A software engineering culture
- Operations and development engineers participating in the entire service lifecycle
- People, Processes and Tools converging to achieve common goals
- The collaboration starts well before and continues long after deployment

Technologies

- Azure DevOps
- GitHub Actions for Azure
- Jenkins/TeamCity/Bamboo...
- Azure App Service - Deployment Center

Thanks!

Any questions ?

You can find me at:

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www.twitter.com/radoslavgatev

Demo apps

- https://github.com/Microsoft/SmartHotel360-Website