DevOps
Introduction to Cloud Computing and Amazon Web Services (AWS)

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Why Cloud Computing?

- "70% of the budget to keep IT running, 30% available to create new value"

"…that needs to be inverted"

- "Weeks of planning, justification, and deployment and then we're stuck with it for 5 years – even if our needs change in a month…"

"…or we could just buy it as a service – right now"

- "Most of our legacy applications are stable and predictable"

"…we need to incrementally improve efficiency without disruption"

- "but, new, more dynamic and fluid approaches to IT must also be leveraged for new applications and changing legacy applications"

"…new, revolutionary IT model is required"

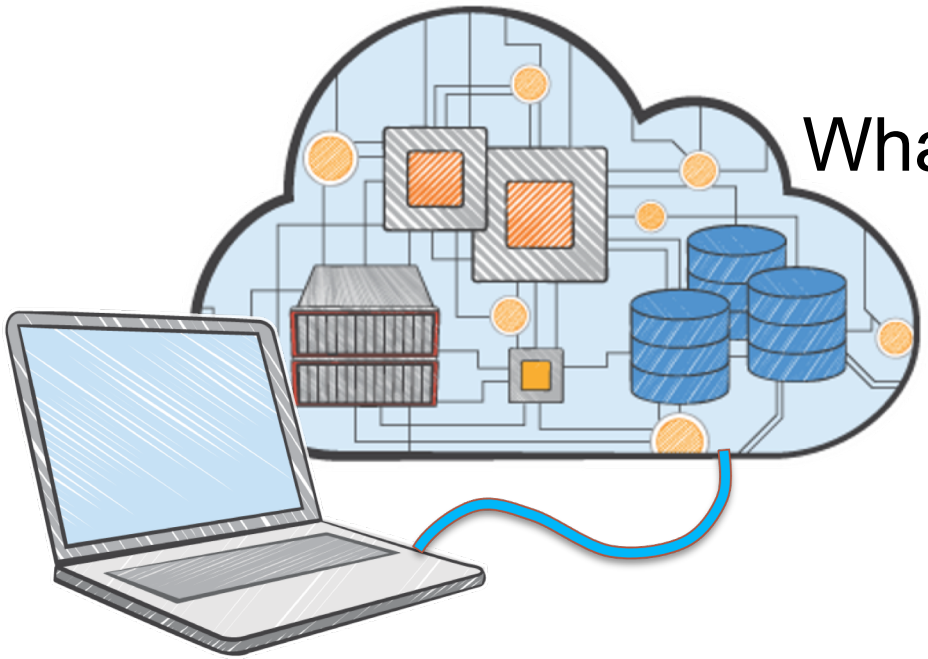
IT Challenges

- Globalization
- Aging data centers
- Storage growth
- Application explosion
- Cost of ownership
- Acquisitions

The 3 main resources of Cloud Computing

- Compute
- Storage
- Network

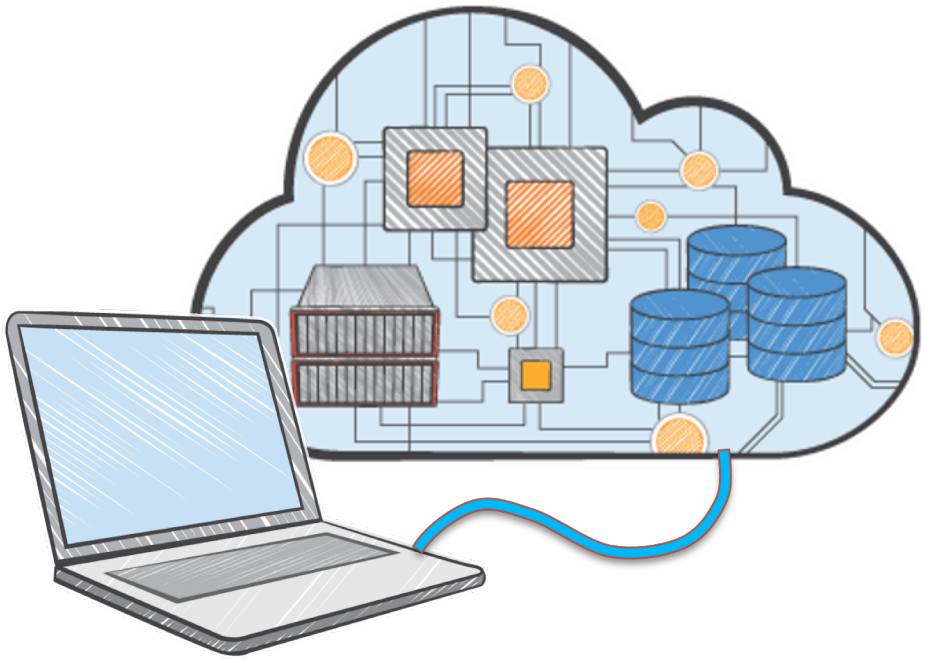
What is Cloud Computing



What does ***cloud computing*** mean to you?

- On-demand
- IT resources
- Accessible online
- Pay-as-you-go

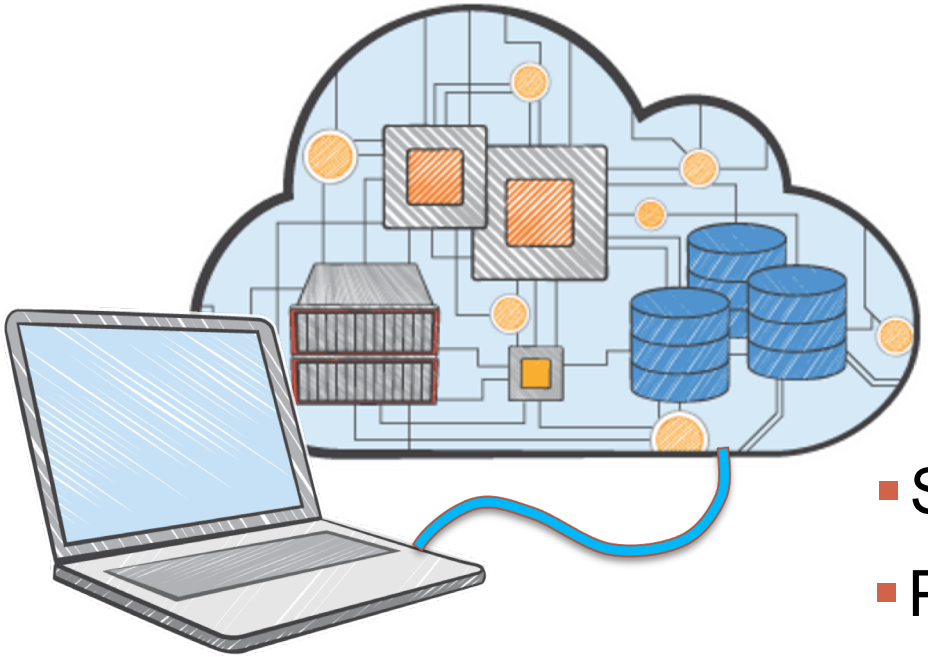
What is Cloud Computing



How might cloud computing address some of the issues in the ***traditional computing*** model?

- Low cost
- Elastic
- Flexible
- Secure

What is Cloud Computing



Cloud Computing Models:

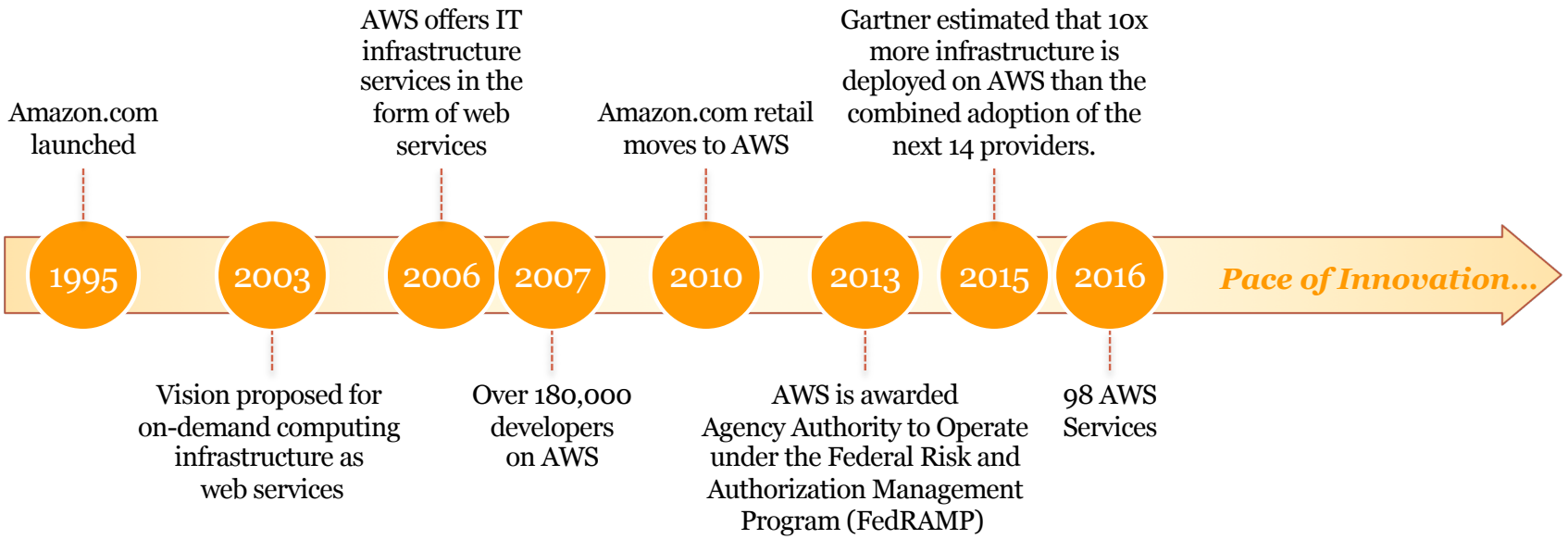
- Software as a service (**SaaS**)
- Platform as a service (**PaaS**)
- Infrastructure as a service (**IaaS**)
- X' as a service (**'X'aaS**)

What is AWS ?

Enable businesses and developers to use web services to build scalable, sophisticated applications.

amazon web services

History of AWS



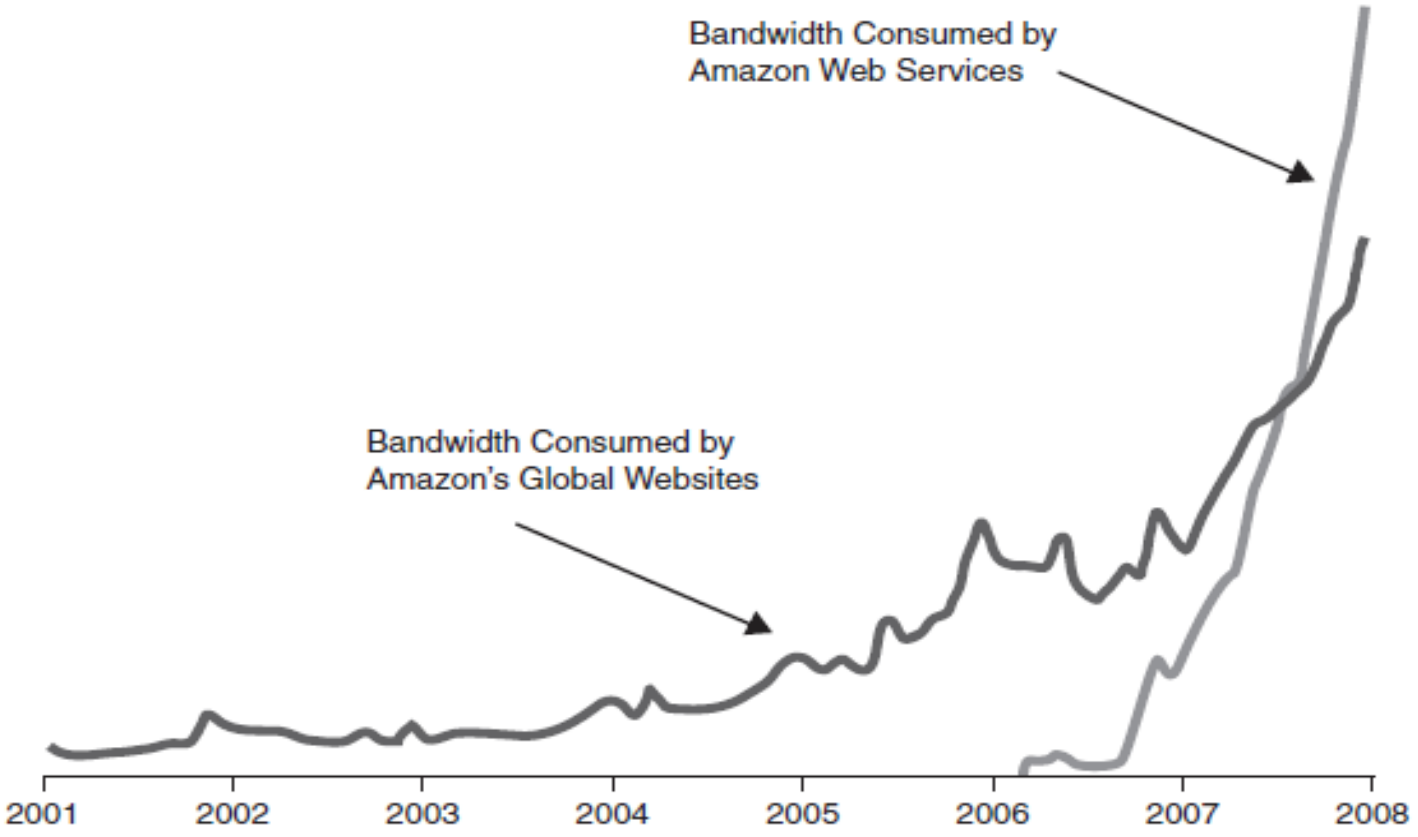


Figure 1.1 Amazon originally deployed a large IT infrastructure to support its global e-commerce platform. In less than 18 months after making the platform available as a cloud service to external users, its usage, as measured by amount of bandwidth consumed, outstripped bandwidth used internally.

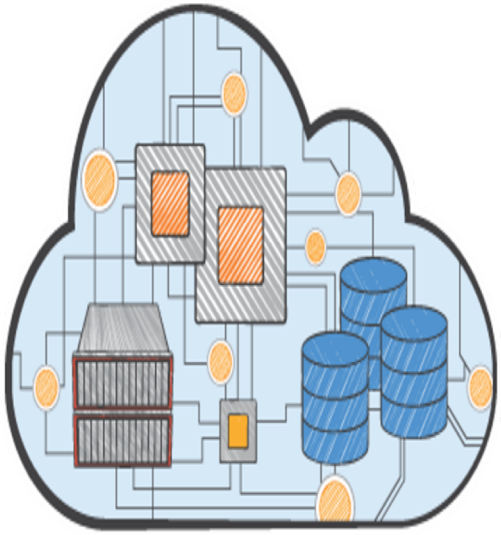
What you can do on AWS…

Some of the things you can use the AWS cloud computing platform to do include:

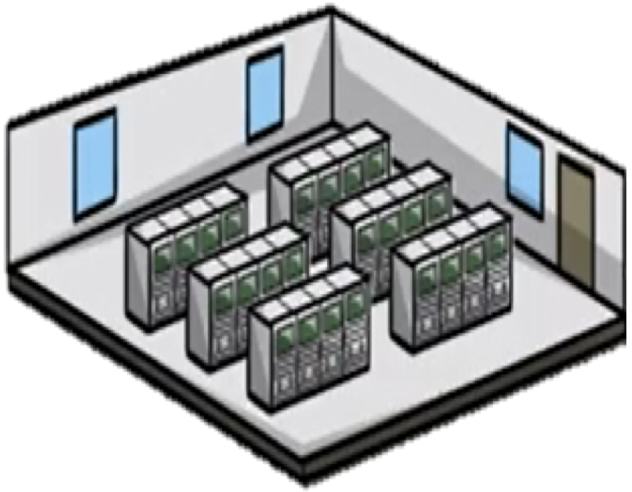
- Application Hosting
- Backup and Storage
- Content Delivery
- Websites
- Enterprise IT
- Databases

Cloud vs. On-Premises Comparison

Cloud



On-Premises



Cloud vs. On-Premises Comparison

Cloud

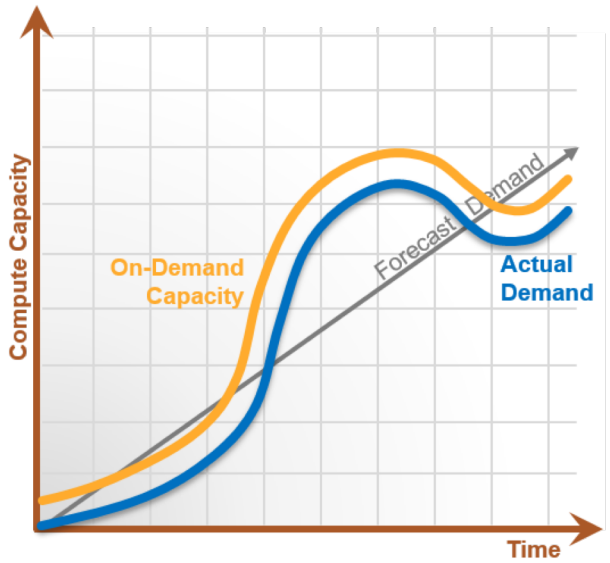
- No upfront investment
  - Click to order resources
  - Immediate access
  - Go!
- Low on-going costs
- Focus on innovation
- Flexible capacity
- Speed and agility
- Global reach on demand

On-Premises

- Large initial purchases
  - Install and configure
  - Physical space, cooling, power
  - Cabling, networking, racks, servers, storage
  - Labor, certification…
- Labor, patches and upgrade cycles
- Systems administration
- Fixed capacity
- Procurement and setup
- Limited geographic regions

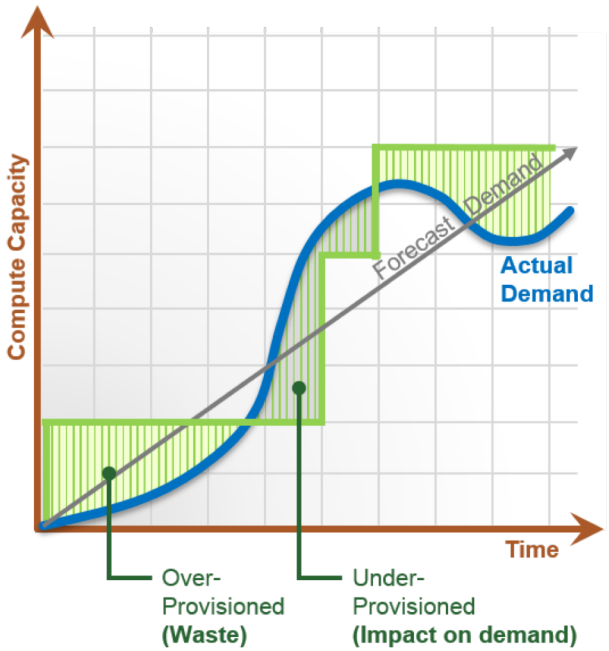
Cloud vs. On-Premises Comparison

Cloud

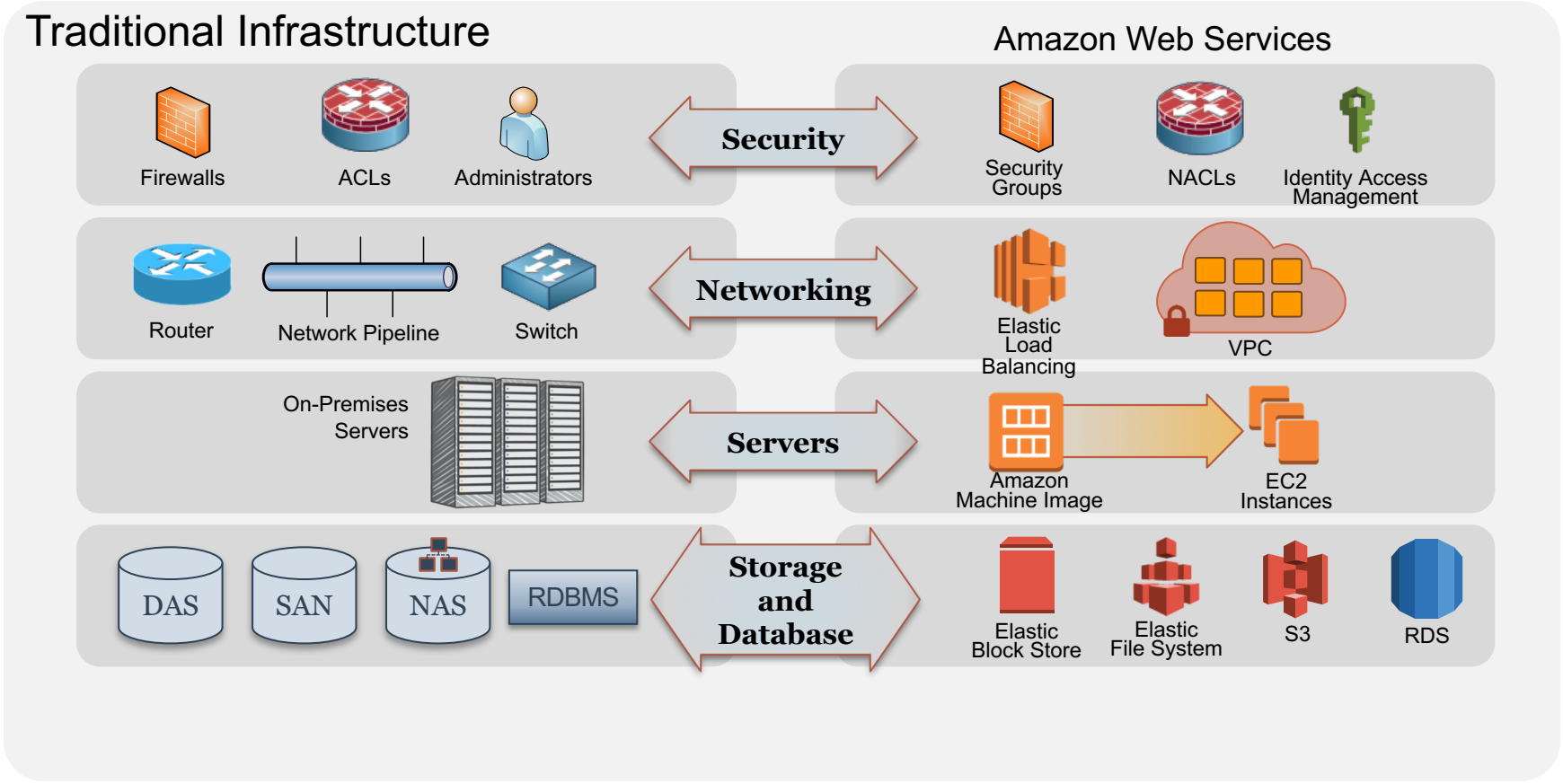


- ✓ No waste
- ✓ Meets demand

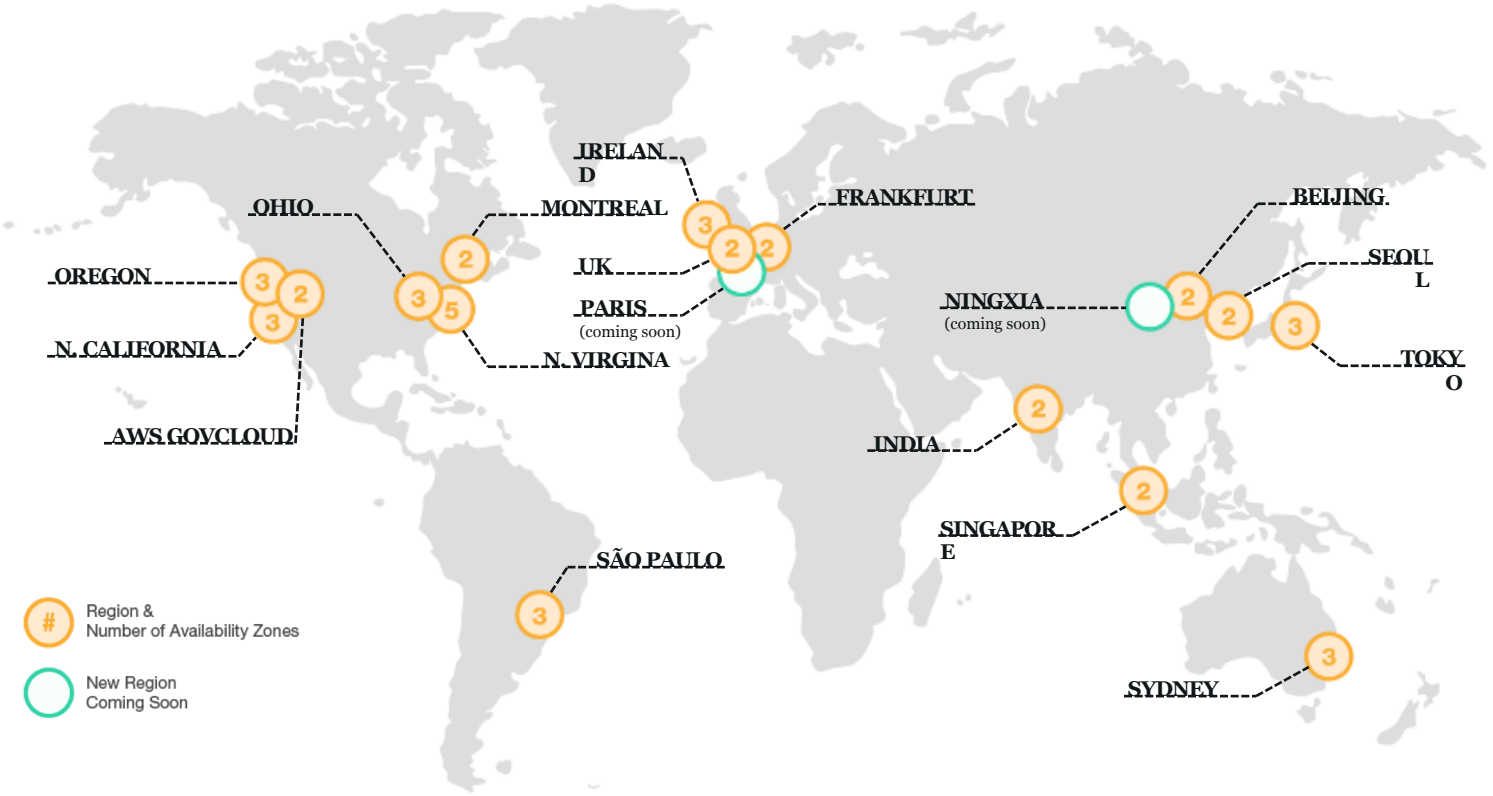
On-Premises



On-demand Services Through AWS

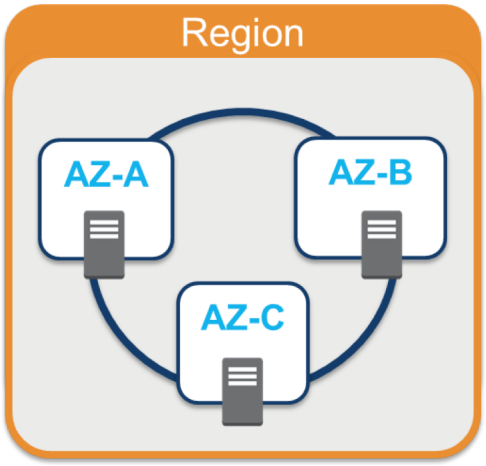


Regions and Availability Zones



https://aws.amazon.com/about-aws/global-infrastructure/

Regions and Availability Zones



Note: Conceptual drawing only. The number of Availability Zones (AZ) may vary.

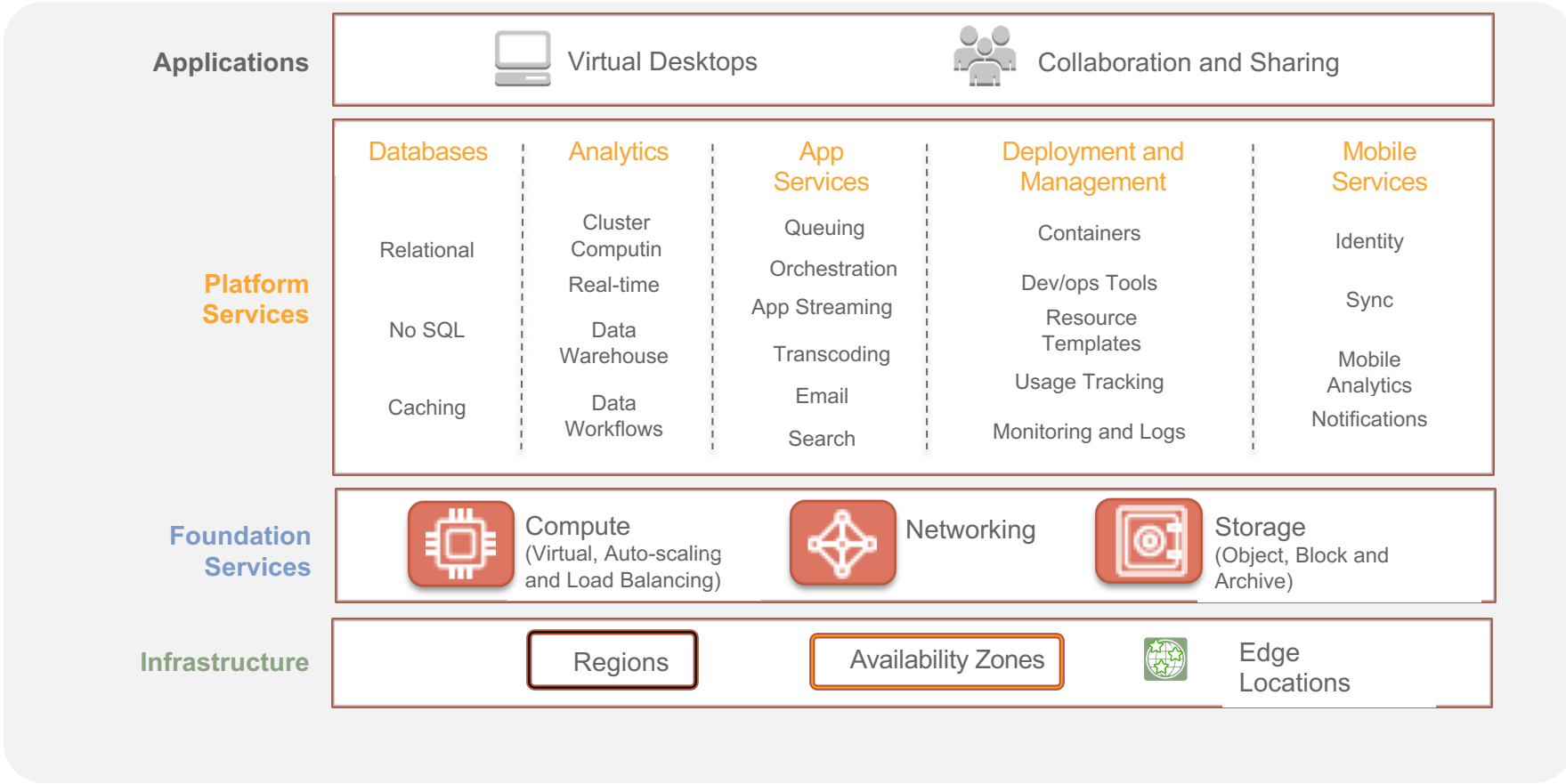
Regions

- Geographic locations
- Consists of **at least two** Availability Zones(AZs)

Availability Zones

- Clusters of data centers
- **Isolated from failures** in other Availability Zones
- Connected through low-latency links

AWS Cloud Computing



AWS Foundation Services

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Compute

- Amazon EC2
- Amazon EC2 Container Registry
- Amazon EC2 Container Service
- **Amazon Lightsail**
- Amazon VPC
- AWS Batch
- AWS Elastic Beanstalk
- AWS Lambda
- Elastic Load Balancing

Network

- Amazon CloudFront
- Amazon Route 53
- Amazon VPC
- AWS Direct Connect
- Elastic Load Balancing

Storage

- Amazon EFS
- Amazon Glacier
- Amazon S3
- AWS Snowball
- AWS Storage Gateway

Security & Identity

- **Amazon Inspector**
- **AWS Artifact**
- **AWS Certificate Manager**
- **AWS CloudHSM**
- **AWS Directory Service**
- **IAM**
- **AWS KMS**
- **AWS Organizations**
- **AWS Shield**
- **AWS WAF**

Applications

- Amazon WorkDocs
- Amazon WorkMail
- Amazon AppStream
- Amazon WorkSpaces

AWS Platform Services

Databases

- Amazon DynamoDB
- Amazon ElastiCache
- Amazon RDS
- Amazon Redshift

Analytics

- Amazon Athena
- Amazon CloudSearch
- Amazon EMR
- Amazon Kinesis
- Amazon QuickSight
- Amazon Redshift

App Services

- Amazon API Gateway
- Amazon AppStream 2.0
- Amazon Elastic Transcoder
- Amazon SWF
- AWS Step Functions

Management Tools

- Amazon CloudWatch
- AWS CloudFormation
- AWS CloudTrail
- AWS Config
- AWS Managed Services
- AWS OpsWorks
- AWS Service Catalog
- AWS Trusted Advisor

Developer Tools

- AWS CodeBuild
- AWS CodeCommit
- AWS CodeDeploy
- AWS CodePipeline
- AWS X-Ray

Mobile Services

- Amazon API Gateway
- Amazon Cognito
- Amazon Mobile Analytics
- Amazon Pinpoint
- AWS Device Farm
- AWS Mobile Hub

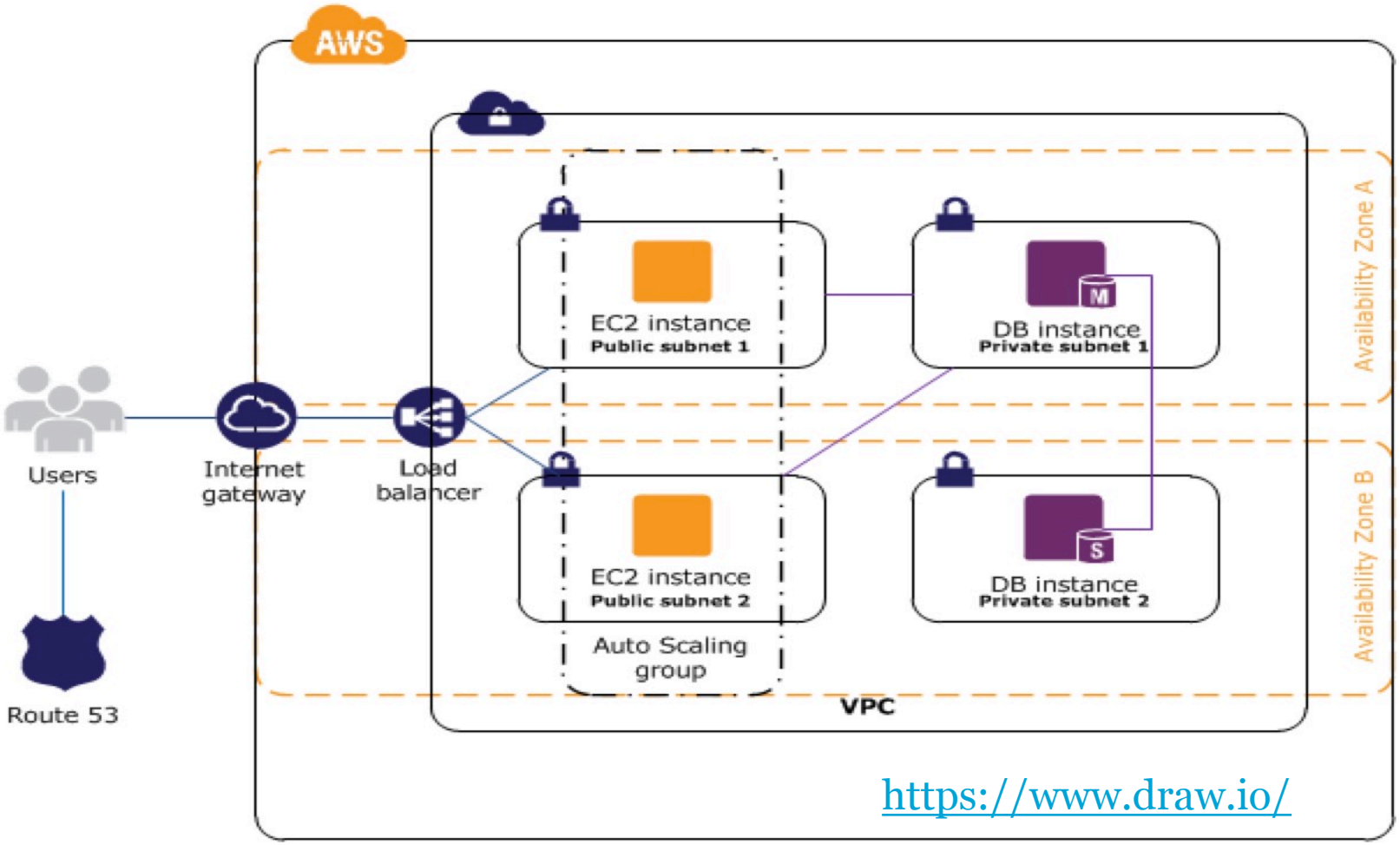
Internet of Things

- AWS IoT
- AWS Greengrass

AWS

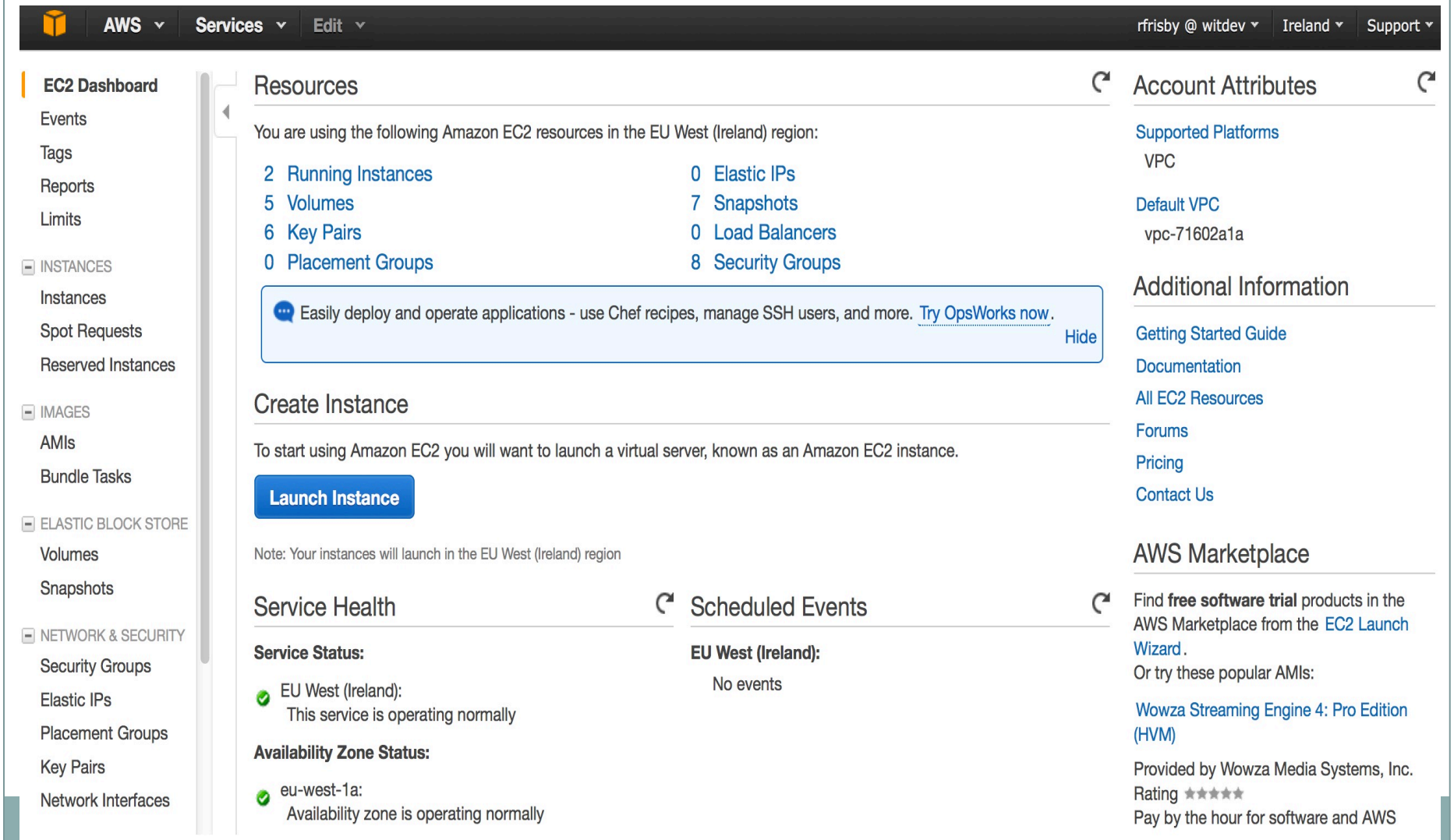
- Set of services that provide access to Amazon's ready-to-use computing infrastructure
- Available to anyone over the Internet
- Provides for some of the core needs of distributed systems
  - Scalability, Reliability, Availability, etc….
- Provides a 'virtual' infrastructure
- Can get a scalable web service up, running and publicly available in minutes
  - How long would that take traditionally? (Contact ISP to provision server, perhaps buy infrastructure hardware?)
- Analogy: Power supply
  - Plug into grid managed by experts to get low cost power
  - Pay for what you use. Have an account and metered usage.
  - Or you could generate your own …

AWS Web App Hosting Architecture



https://www.draw.io/

AWS Management Console/ Dashboard



AWS Services - Advantages

- No up front expenditure
- Pay as you go
- Scale up/down automatically
- Quick production time
- Focus on business/application rather than infrastructure
- We'll look scalability in more detail in later classes

Amazon Elastic Compute Cloud (EC2)

- Way of creating “Virtual Machines”
- Easily scale your capacity up or down based on demand
  - quickly launch virtual instances and then terminate them once your demand decreases
  - Can be automated using Auto Scaling.
- Can create Amazon machine images (AMIs) that are templates for your instances.
  - E.g. Linux server with Tomcat and MySQL.
- Support for Windows/Linux
- All major web and application platforms(Java EE, PHP)
- Can chose deployment location (Dublin)
  - Can introduce redundancy/QoS through load balancing
- Status and usage can be monitored

Amazon Simple Storage Service (S3)

- Storage and retrieval of data
  - any kind of data from anywhere on the Internet (object based)
- Unlimited number of objects, each object must be less than 5GB
- Objects stored in *buckets (*not unlike folders in regular operating systems)
- 99.9 percent uptime