

# DevOps

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

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# Why Cloud Computing?

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- “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

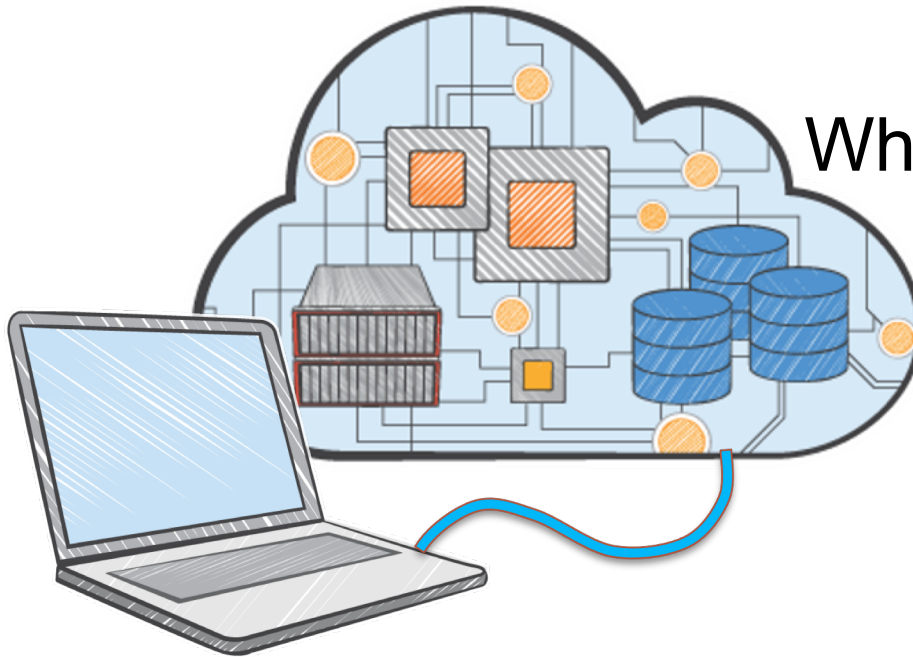
# The 3 main resources of Cloud Computing

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- Compute
- Storage
- Network

# What is Cloud Computing

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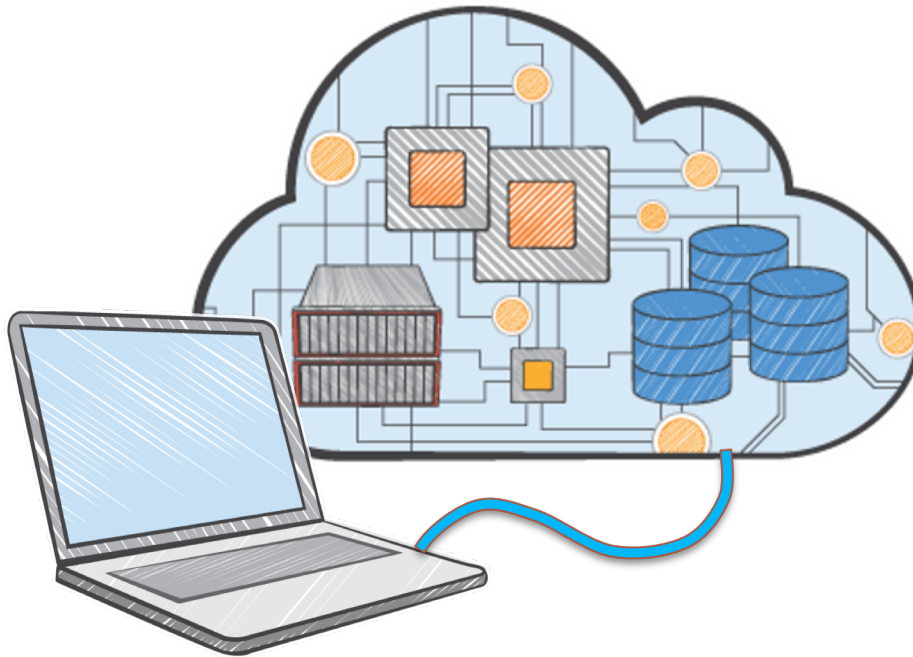


What does ***cloud computing*** mean to you?

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

# What is Cloud Computing

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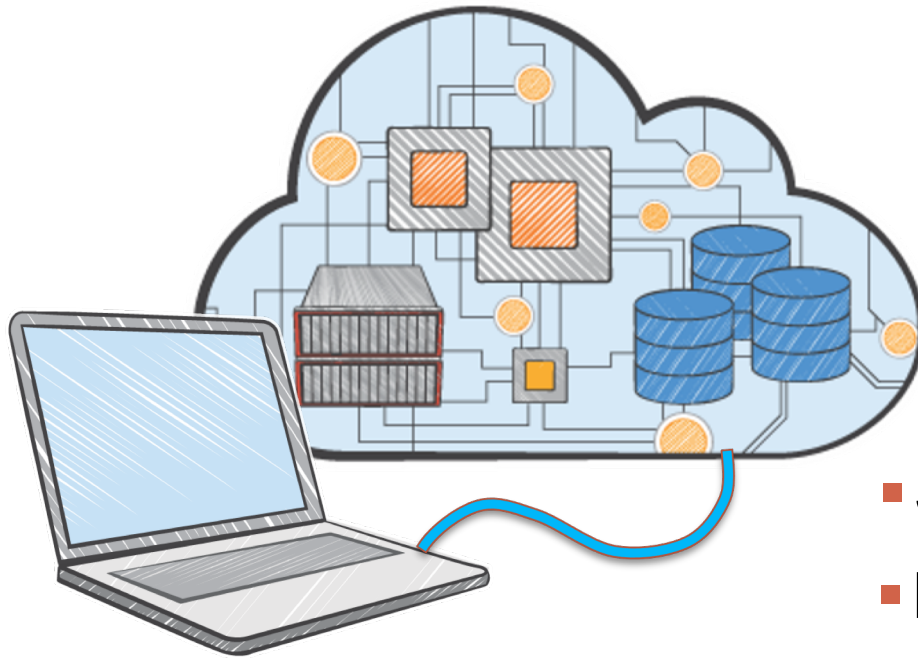


How might cloud computing address some of the issues in the ***traditional computing*** model?

- Low cost
- Elastic
- Flexible
- Secure

# What is Cloud Computing

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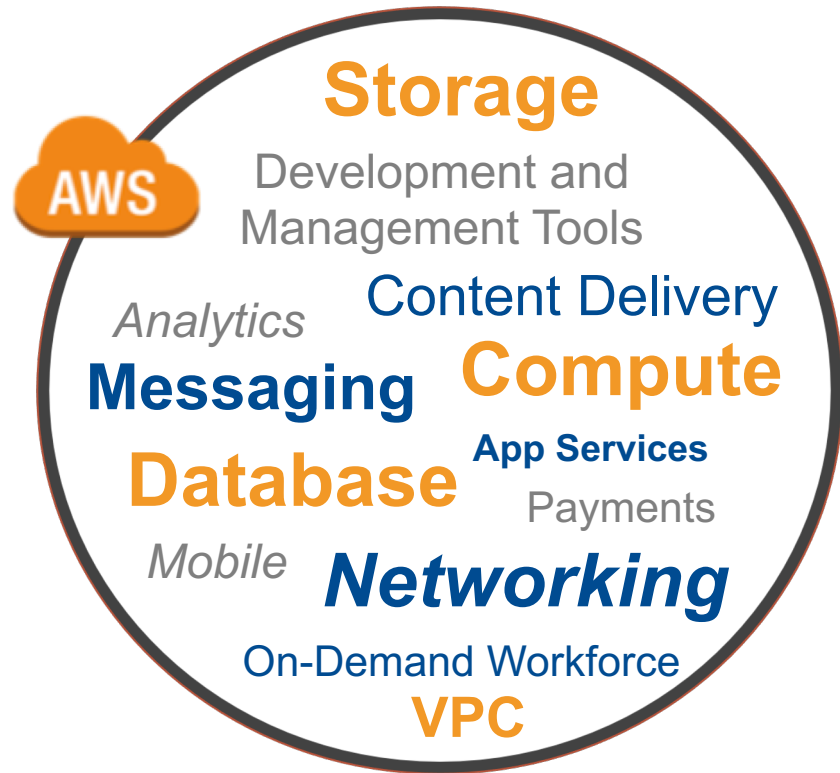
## Cloud Computing Models:

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

# What is AWS ?

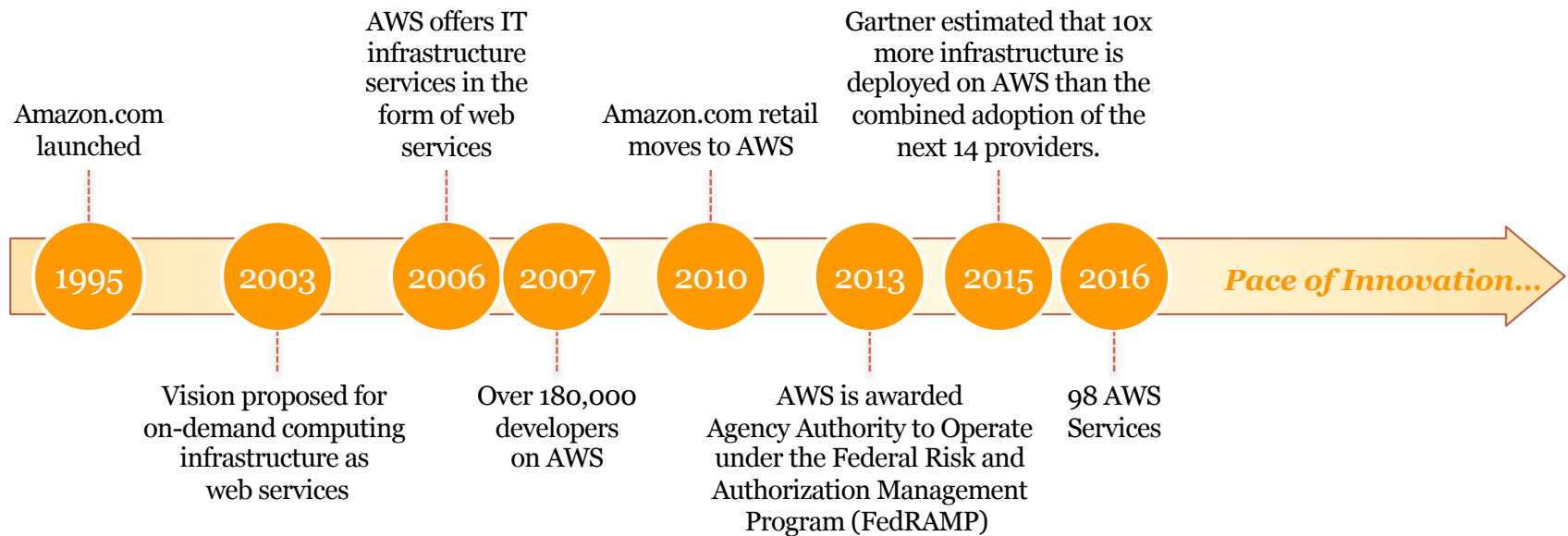
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*Enable businesses and developers to use web services to build scalable, sophisticated applications.*

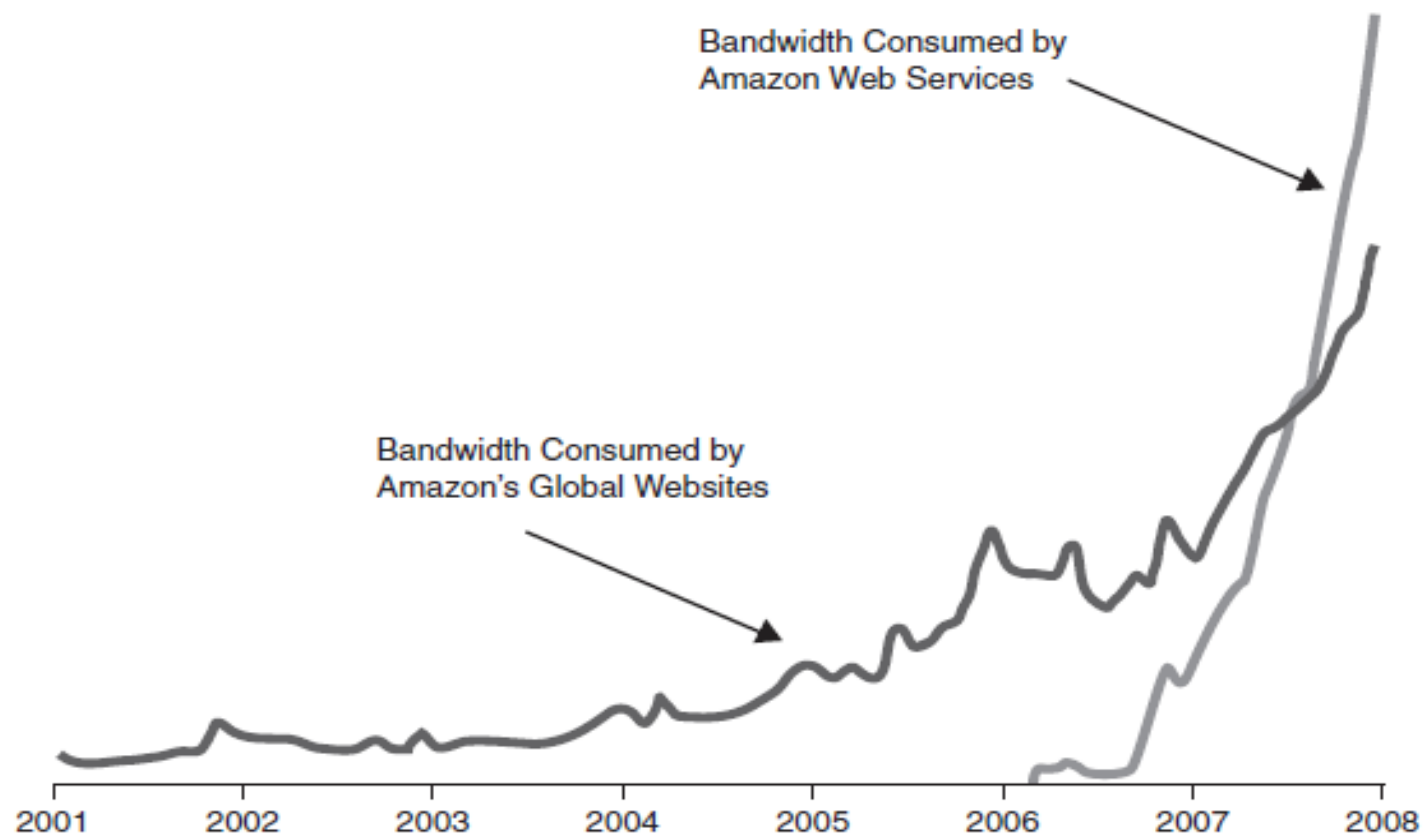


# History of AWS

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**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...

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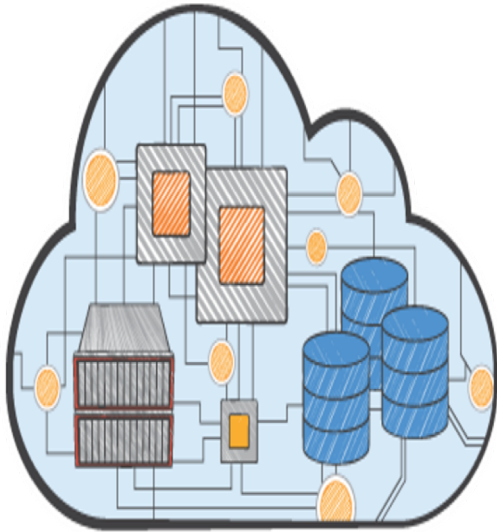
Some of the things you can use the AWS cloud computing platform to do include:

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

# Cloud vs. On-Premises Comparison

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## Cloud



## On-Premises



# Cloud vs. On-Premises Comparison

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## 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

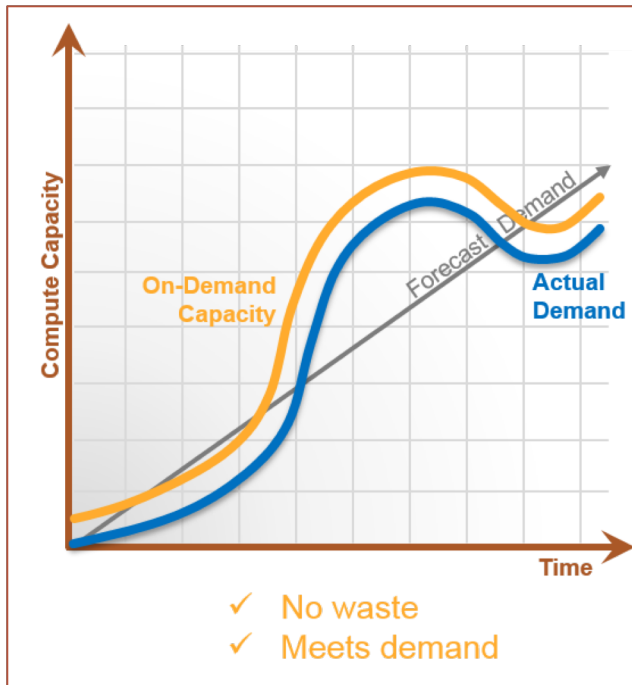
## On-Premises

- 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

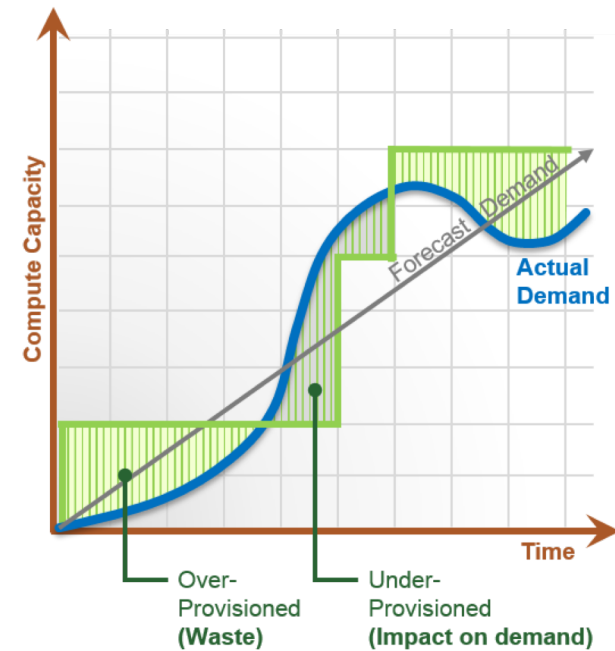
# Cloud vs. On-Premises Comparison

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## Cloud



## On-Premises



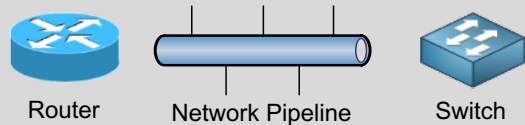
# On-demand Services Through AWS

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## Traditional Infrastructure



### Security



### Networking

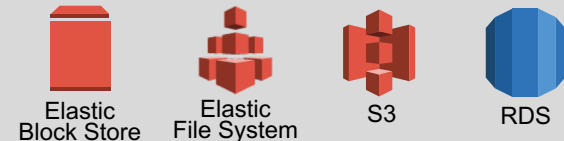
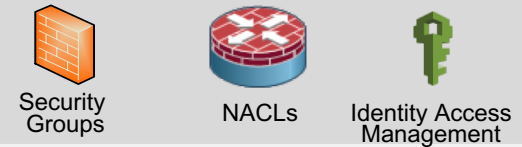


### Servers



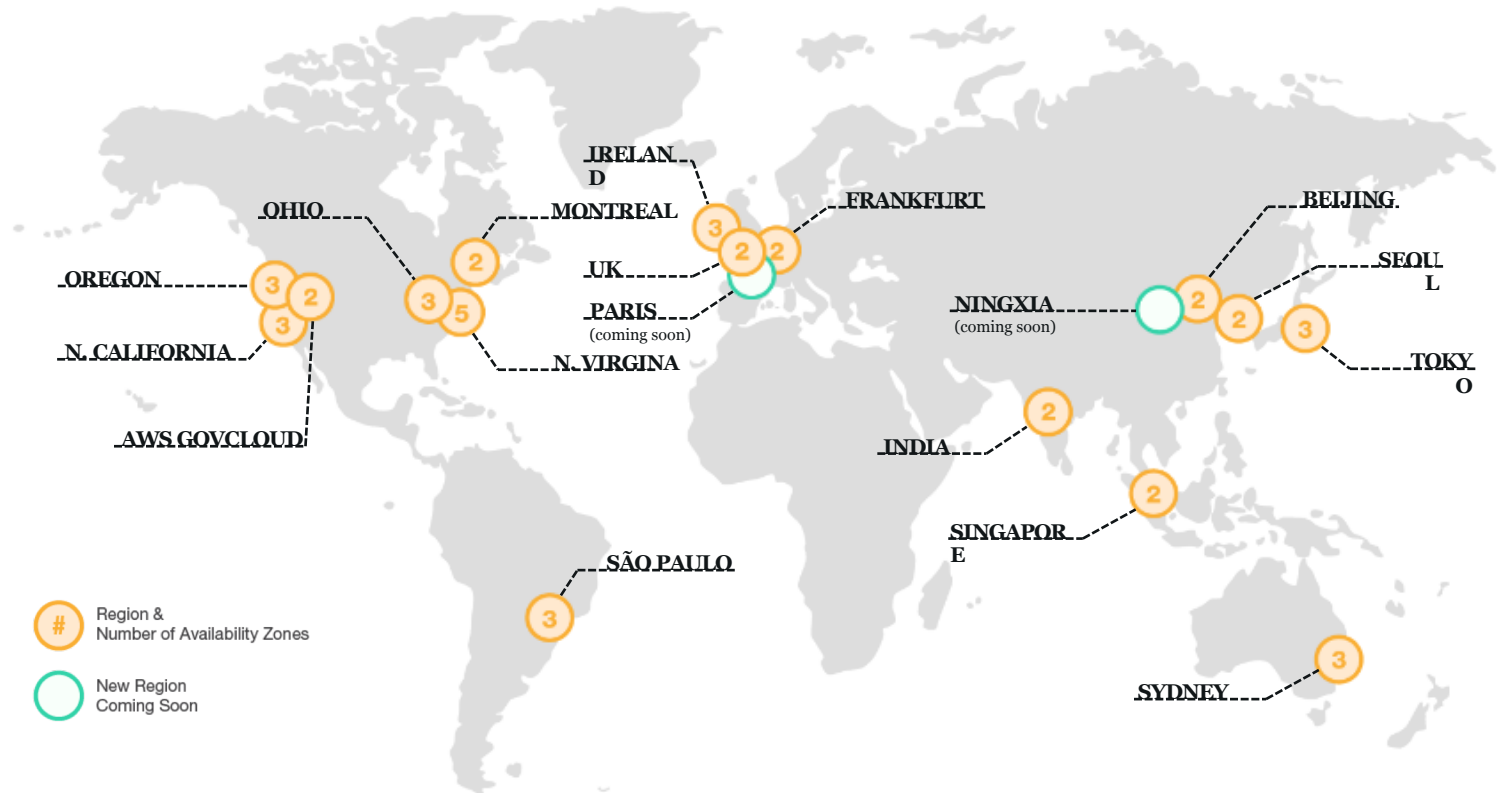
### Storage and Database

## Amazon Web Services



# Regions and Availability Zones

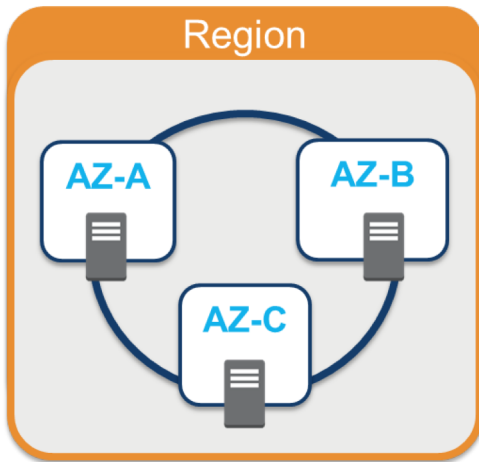
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<https://aws.amazon.com/about-aws/global-infrastructure/>

# Regions and Availability Zones

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*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

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## Applications



Virtual Desktops



Collaboration and Sharing

## Platform Services

### Databases

Relational

No SQL

Caching

### Analytics

Cluster  
Computin

Real-time

Data  
Warehouse

Data  
Workflows

### App Services

Queuing

Orchestration

App Streaming

Transcoding

Email

Search

### Deployment and Management

Containers

Dev/ops Tools

Resource  
Templates

Usage Tracking

Monitoring and Logs

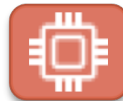
### Mobile Services

Identity

Sync

Mobile  
Analytics  
Notifications

## Foundation Services



Compute  
(Virtual, Auto-scaling  
and Load Balancing)



Networking



Storage  
(Object, Block and  
Archive)

## Infrastructure

Regions

Availability Zones



Edge  
Locations

# 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

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## 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

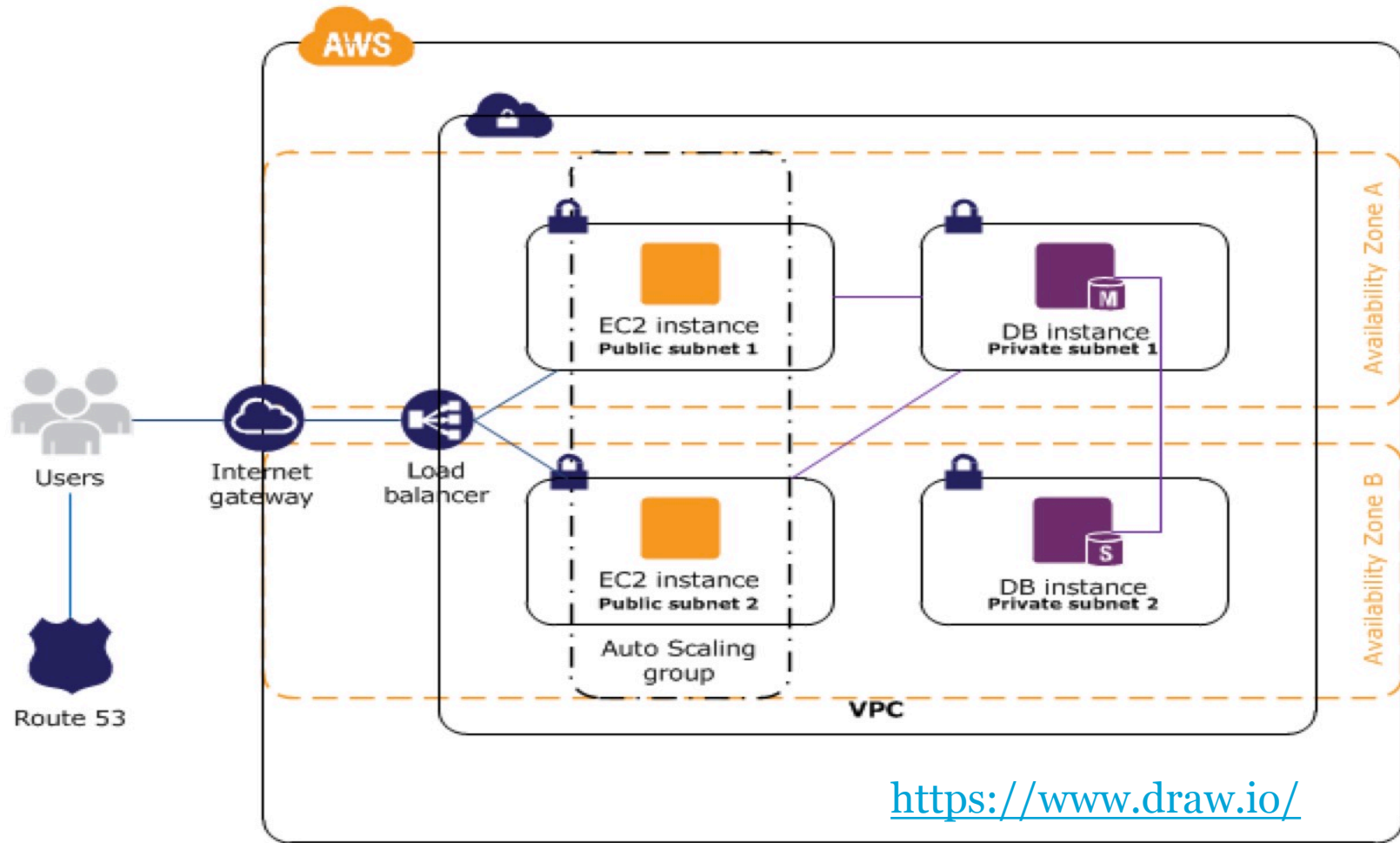
# AWS

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- 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

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# AWS Management Console/ Dashboard

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AWS ▾

Services ▾

Edit ▾

rfrisby @ witdev ▾

Ireland ▾

Support ▾

## EC2 Dashboard

Events

Tags

Reports

Limits

### INSTANCES

Instances

Spot Requests

Reserved Instances

### IMAGES

AMIs

Bundle Tasks

### ELASTIC BLOCK STORE

Volumes

Snapshots

### NETWORK & SECURITY

Security Groups

Elastic IPs

Placement Groups

Key Pairs

Network Interfaces

## Resources

You are using the following Amazon EC2 resources in the EU West (Ireland) region:

2 Running Instances

5 Volumes

6 Key Pairs

0 Placement Groups

0 Elastic IPs

7 Snapshots

0 Load Balancers

8 Security Groups

... Easily deploy and operate applications - use Chef recipes, manage SSH users, and more. [Try OpsWorks now.](#)

Hide

## Create Instance

To start using Amazon EC2 you will want to launch a virtual server, known as an Amazon EC2 instance.

[Launch Instance](#)

Note: Your instances will launch in the EU West (Ireland) region

## Service Health

### Service Status:

✓ EU West (Ireland):  
This service is operating normally

### Availability Zone Status:

✓ eu-west-1a:  
Availability zone is operating normally

## Scheduled Events

### EU West (Ireland):

No events

## Account Attributes

[Supported Platforms](#)

VPC

[Default VPC](#)

vpc-71602a1a

## Additional Information

[Getting Started Guide](#)

[Documentation](#)

[All EC2 Resources](#)

[Forums](#)

[Pricing](#)

[Contact Us](#)

## AWS Marketplace

Find **free software trial** products in the AWS Marketplace from the [EC2 Launch Wizard](#).

Or try these popular AMIs:

[Wowza Streaming Engine 4: Pro Edition \(HVM\)](#)

Provided by Wowza Media Systems, Inc.

Rating ★★★★★

Pay by the hour for software and AWS

# AWS Services - Advantages

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- 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)

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- 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)

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- 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