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Cloud Computing with AWS

Agenda

- Introduction in Cloud Computing
- AWS Platform Overview
- Global Infrastructure
- Foundation Services
- Application Platform Services
- Management & Administration

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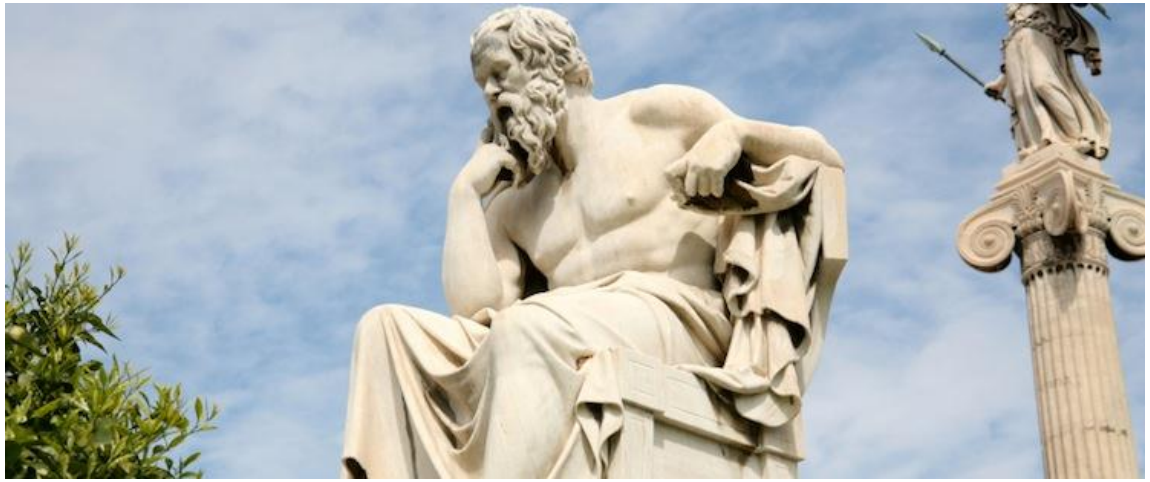
Introduction

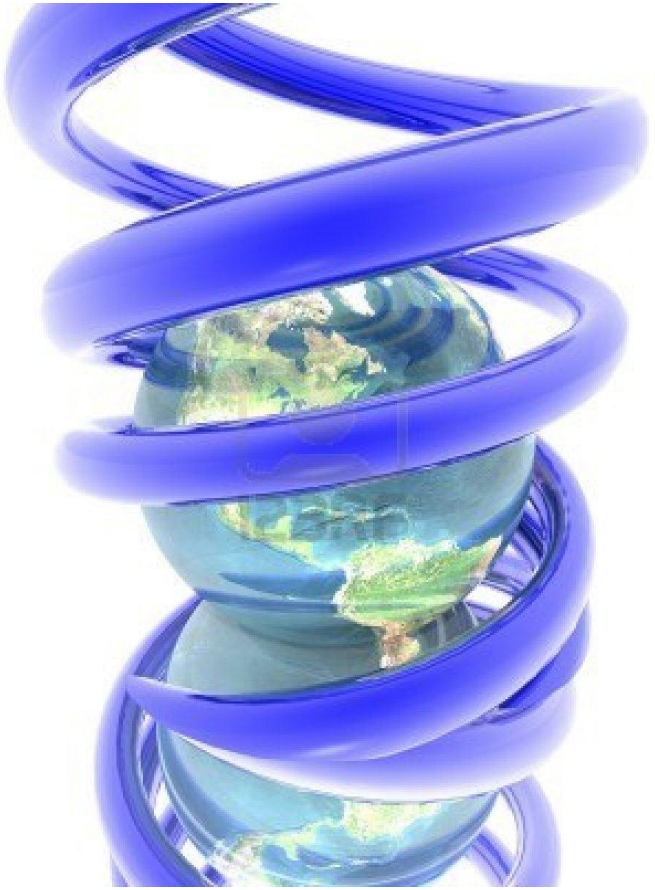
Cloud Computing Philosophy

- History of Cloud Computing
- Cloud Computing Key Components
- Capacity and Usage



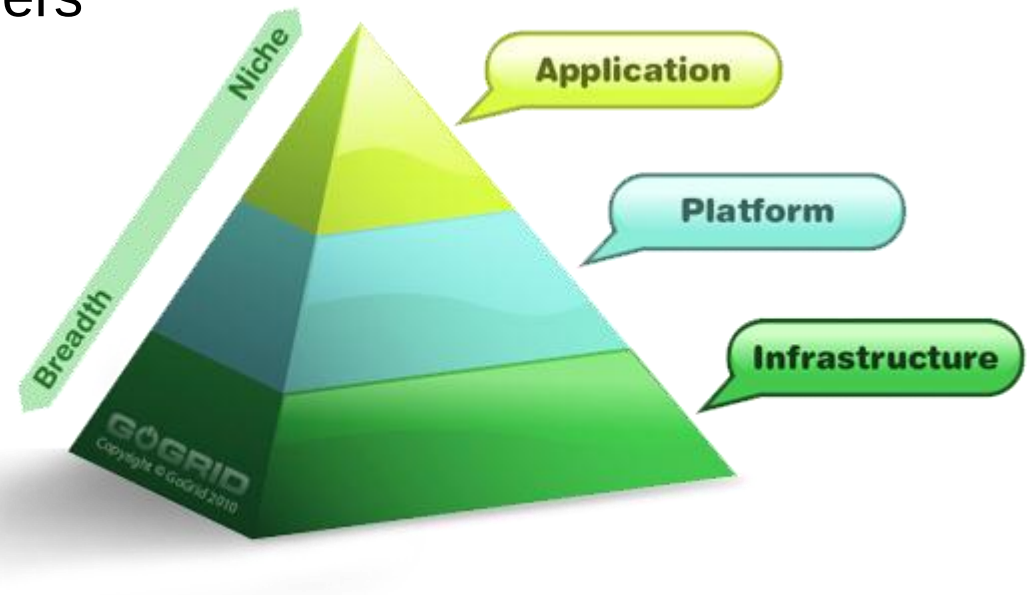
Cloud Computing Timeline

Amazon AWS Cloud	**2006**
Ebay, Amazon	**1995**
Mosaic Browser	**1993**
IBM PC	**1981**
Internet/ARPANET	**1970**
Mainframes and terminals	**1964**

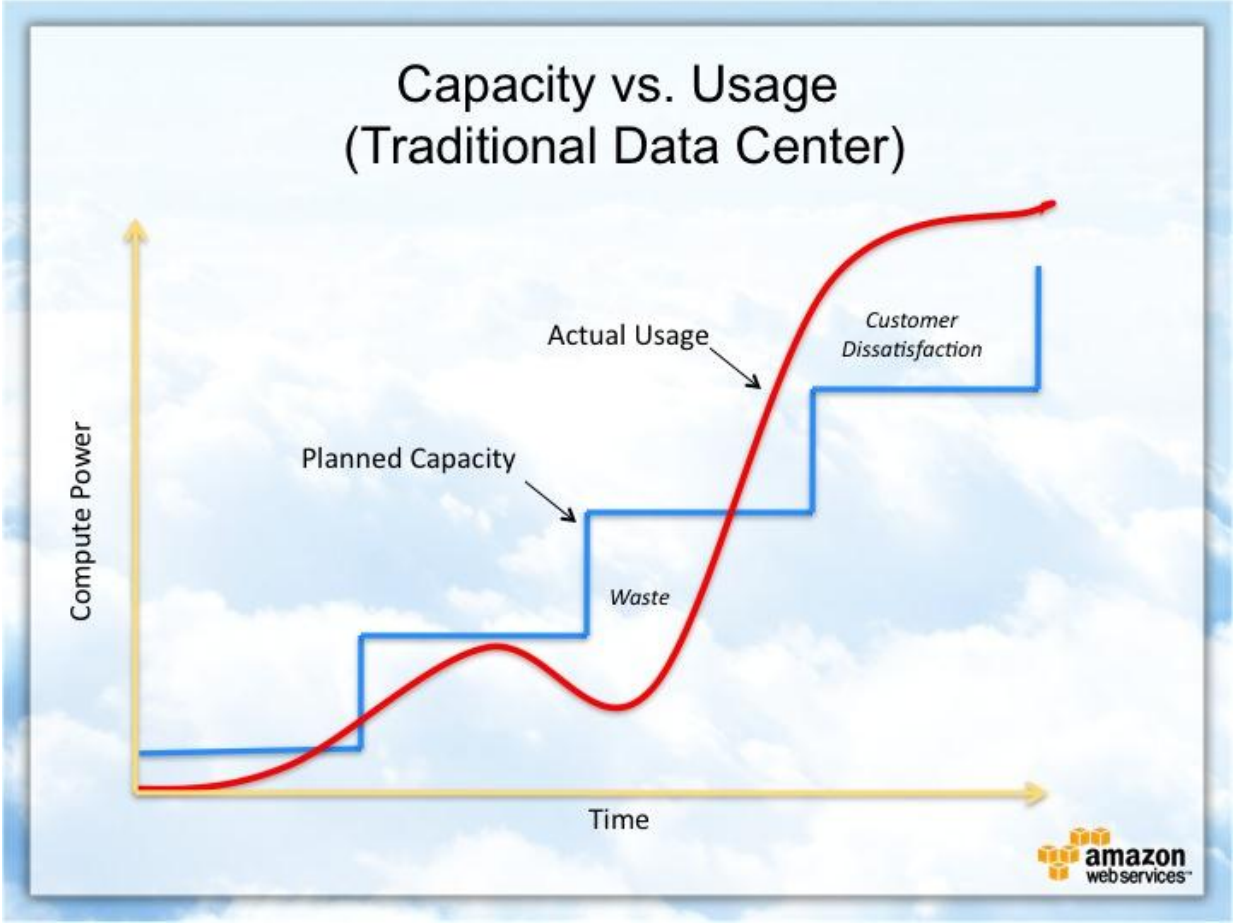


Cloud Key Components

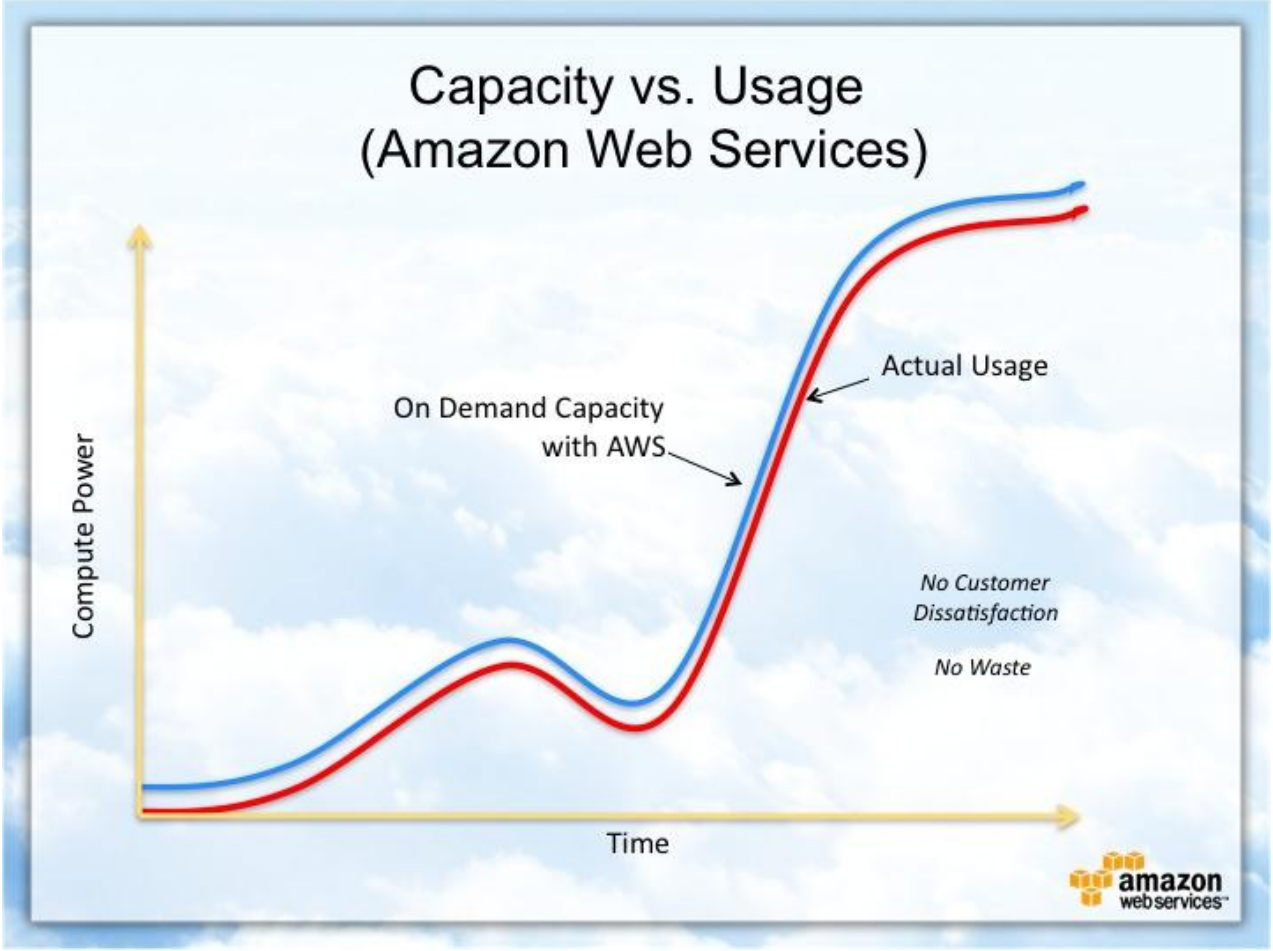
- Infrastructure
  - Hardware (servers, network, storage, power, etc.)
  - Virtualization
- Platform
  - Instances/Virtual Servers
  - Databases
  - Storage
  - Networking
- Service
  - Content
  - Messaging
  - Search
  - …



Capacity and Usage



Capacity and Usage



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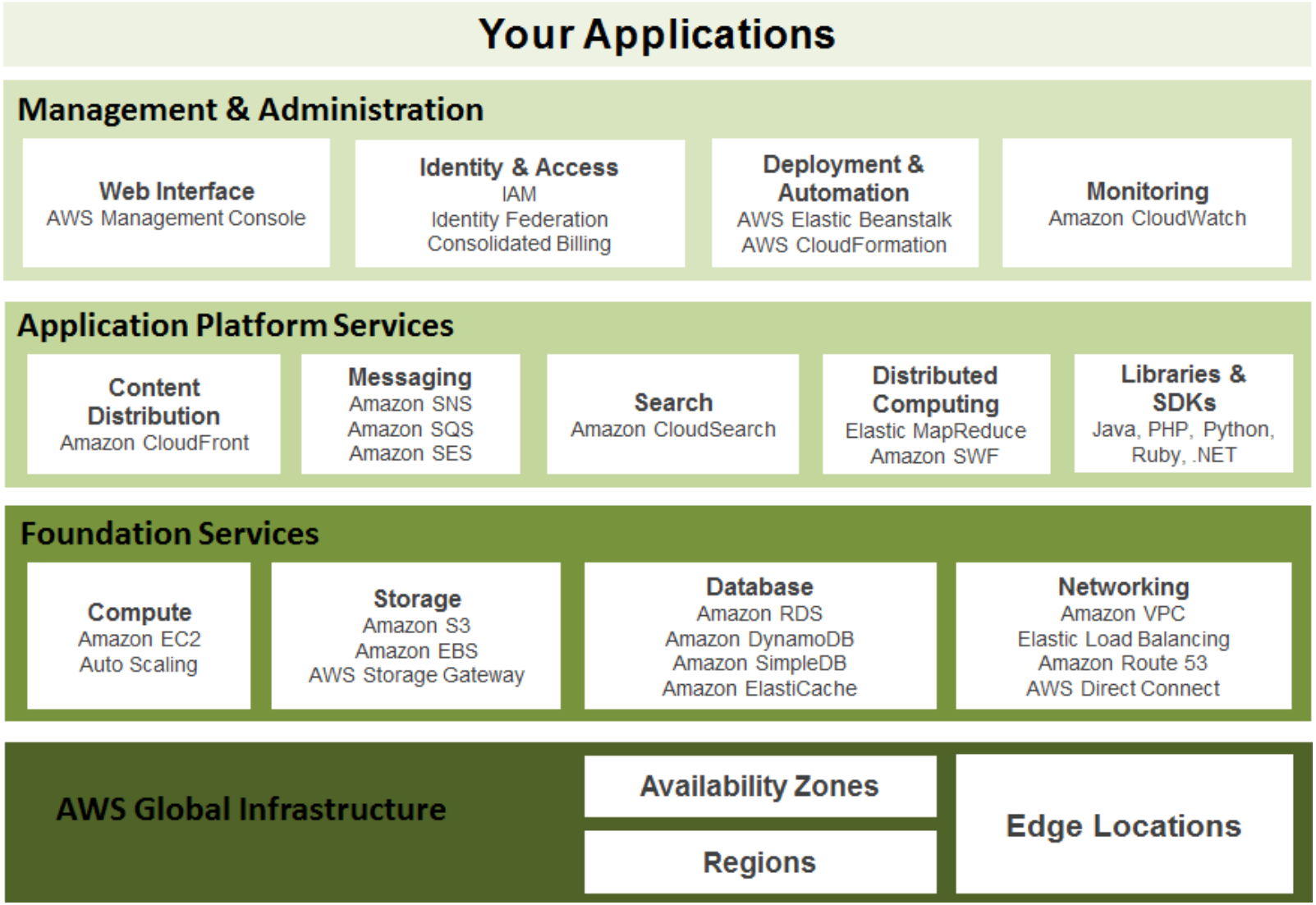
AWS Platform Overview


Your Applications
Management & Administration
Web Interface
AWS Management Console
Identity & Access
IAM
Identity Federation
Consolidated Billing
Deployment & Automation
AWS Elastic Beanstalk
AWS CloudFormation
Monitoring
Amazon CloudWatch
Application Platform Services
Content Distribution
Amazon CloudFront
Messaging
Amazon SNS
Amazon SQS
Amazon SES
Search
Amazon CloudSearch
Distributed Computing
Elastic MapReduce
Amazon SWF
Libraries & SDKs
Java, PHP, Python, Ruby, .NET
Foundation Services
Compute
Amazon EC2
Auto Scaling
Storage
Amazon S3
Amazon EBS
AWS Storage Gateway
Database
Amazon RDS
Amazon DynamoDB
Amazon SimpleDB
Amazon ElastiCache
Networking
Amazon VPC
Elastic Load Balancing
Amazon Route 53
AWS Direct Connect
AWS Global Infrastructure
Availability Zones
Regions
Edge Locations

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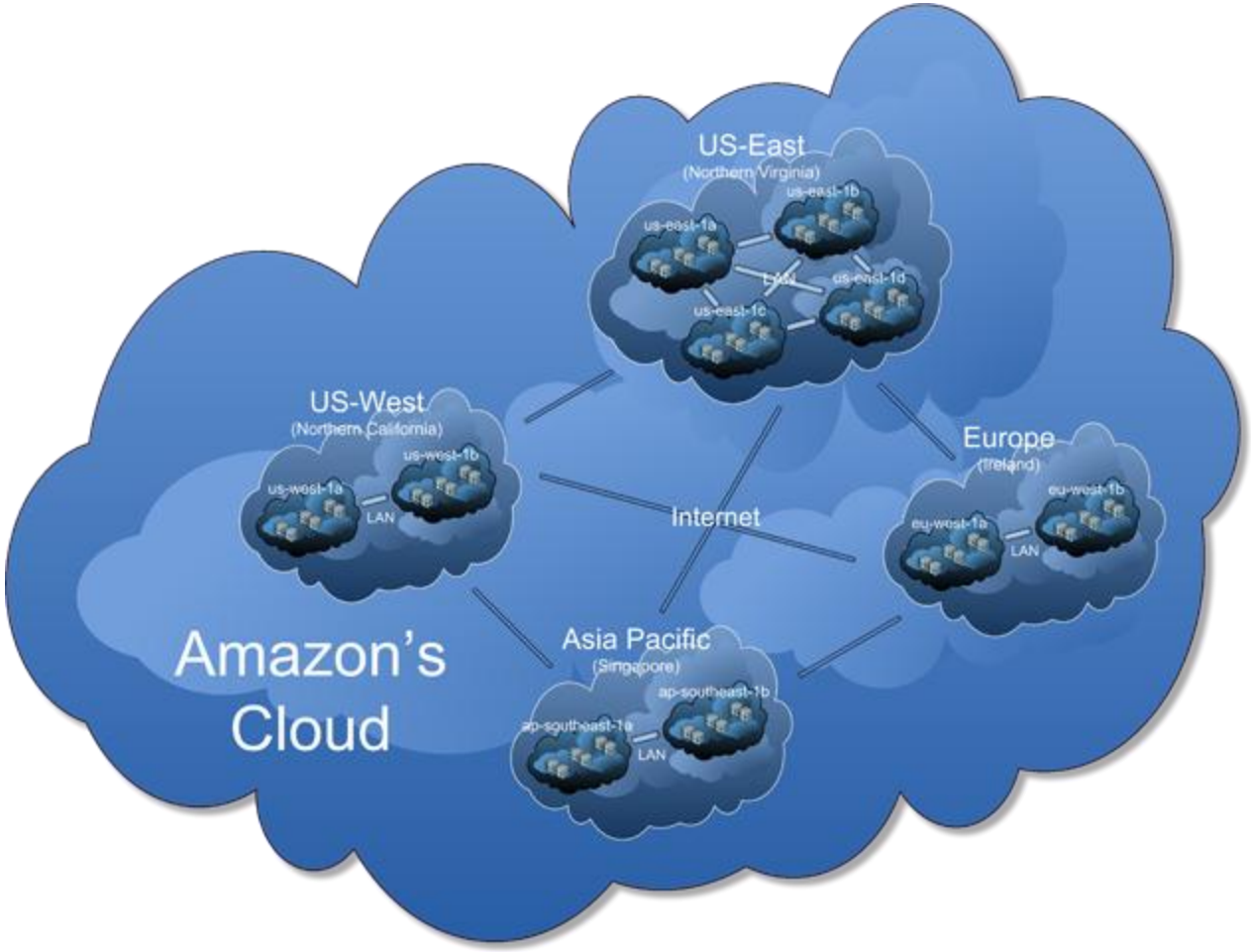
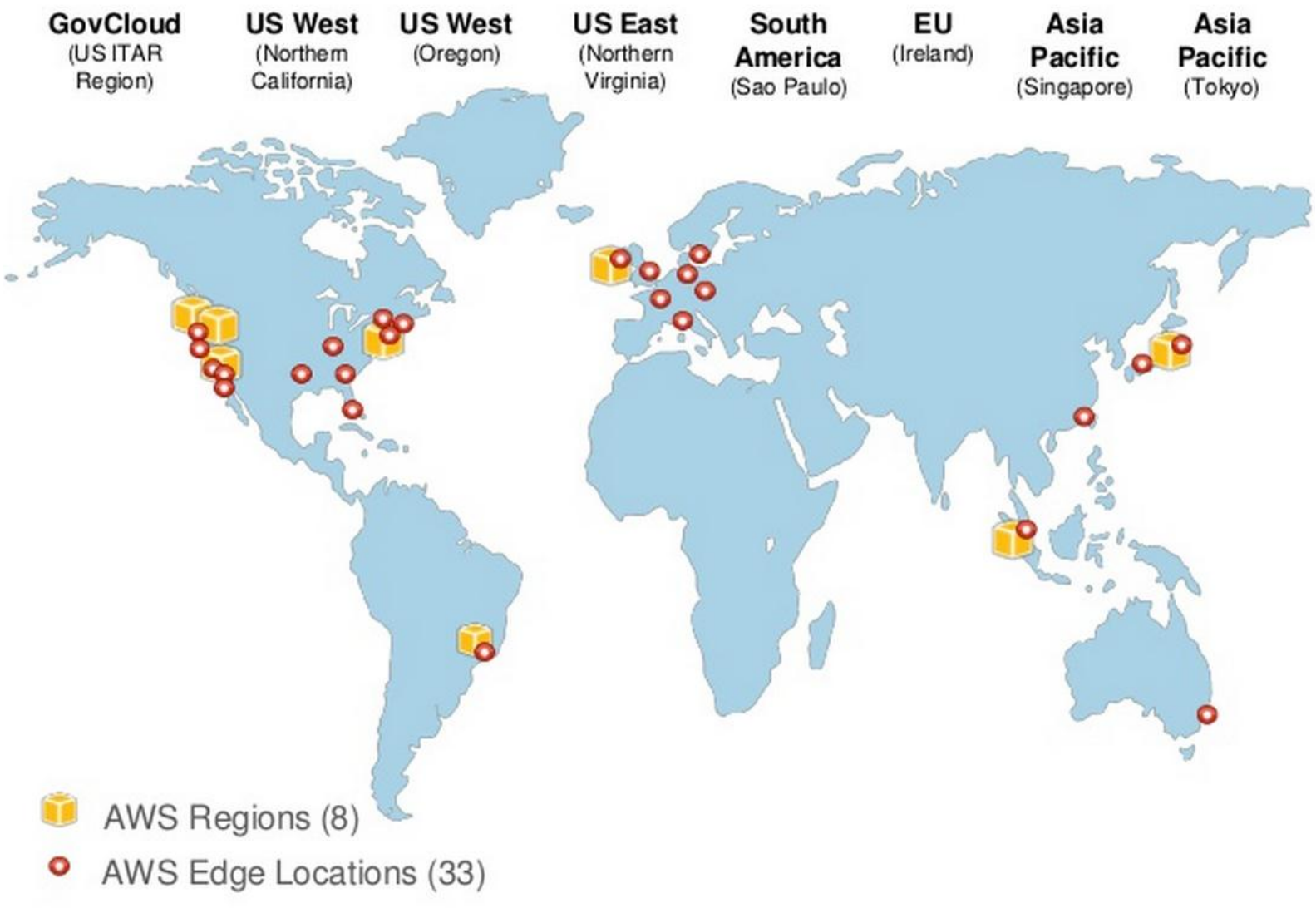
AWS Global Infrastructure

Regions & AZ


US-East
(Northern Virginia)
us-east-1a
us-east-1b
us-east-1c
us-east-1d
LAN
US-West
(Northern California)
us-west-1a
us-west-1b
LAN
Internet
Europe
(Ireland)
eu-west-1a
eu-west-1b
LAN
Amazon's
Cloud
Asia Pacific
(Singapore)
ap-southeast-1a
ap-southeast-1b
LAN


GovCloud
(US ITAR Region)
US West
(Northern California)
US West
(Oregon)
US East
(Northern Virginia)
South America
(Sao Paulo)
EU
(Ireland)
Asia Pacific
(Singapore)
Asia Pacific
(Tokyo)
AWS Regions (8)
AWS Edge Locations (33)

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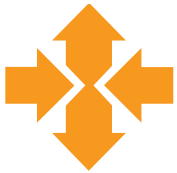
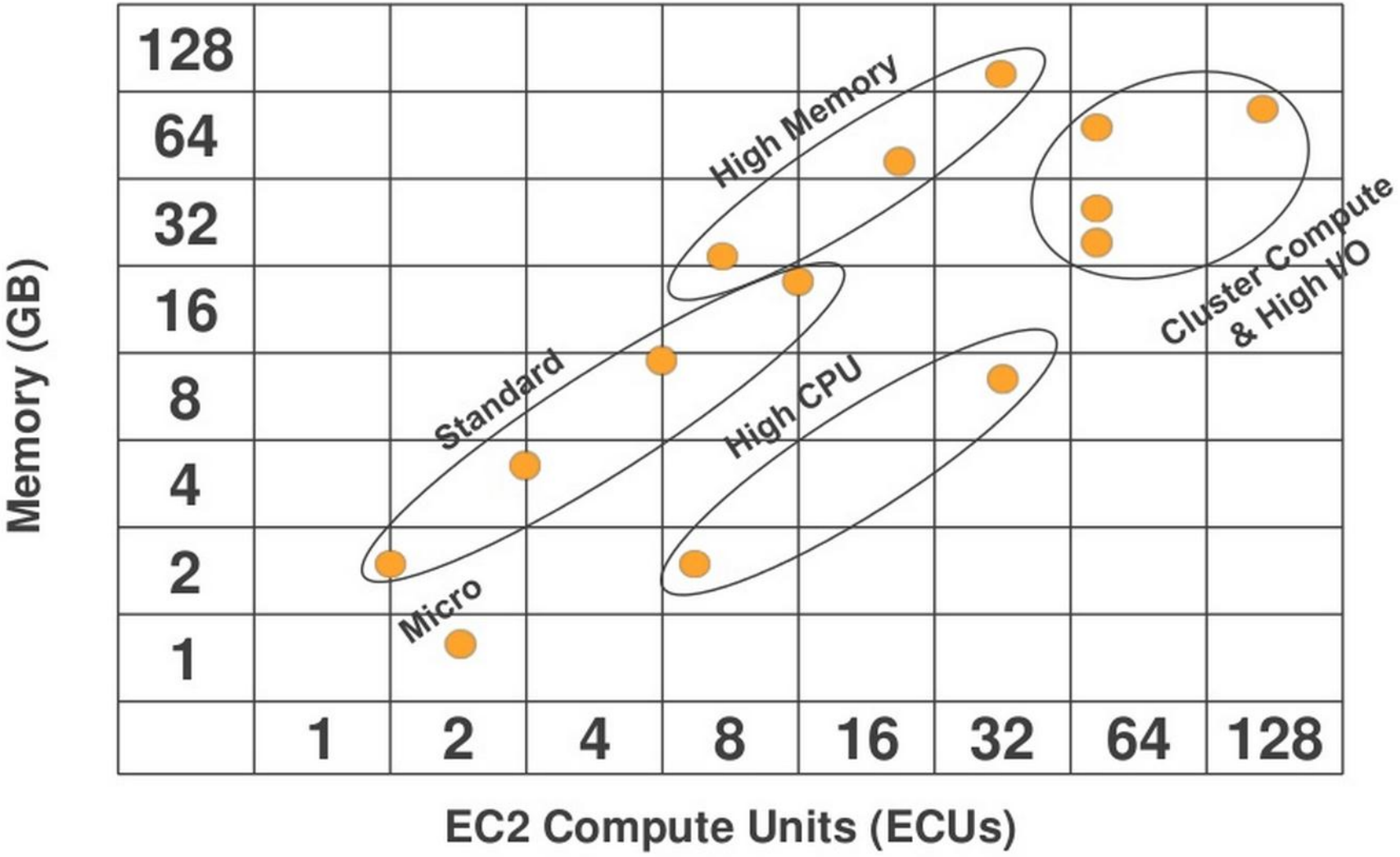
Foundation Services

Compute

Amazon Elastic Compute Cloud (EC2)

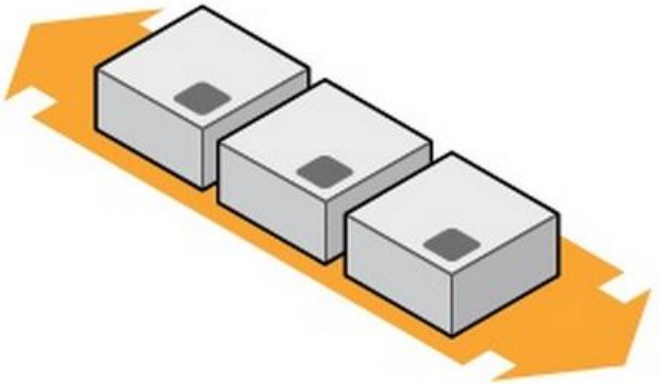


Auto Scaling


Memory (GB)
128
64
32
16
8
4
2
1
1
2
4
8
16
32
64
128
EC2 Compute Units (ECUs)
High Memory
Cluster Compute & High I/O
Standard
High CPU
Micro

Auto Scaling

- *Client Defined Business Rules*
- *Scale your Amazon EC2 capacity automatically once you define the conditions (may be 1000's of servers)*
- *Can scale up just a little…doesn't need to be massive number of servers (may be simply 2 servers)*
- *Well suited for applications that experience variability in usage*
- *Set minimum and maximum scaling policies*
- *Alternate Use is for Fault Tolerance*

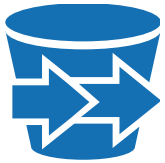


Storage

Amazon Elastic Block Storage (EBS)

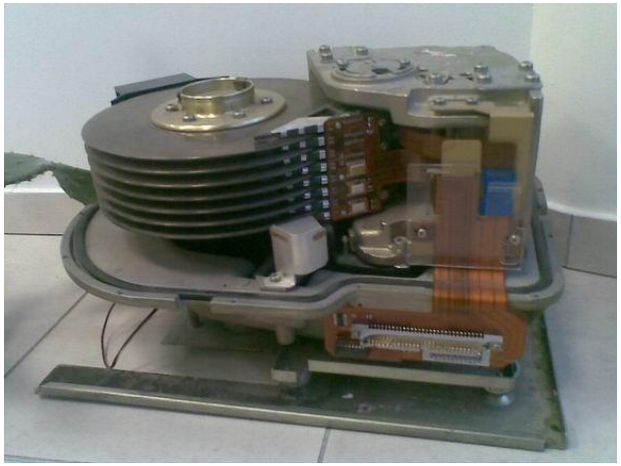
Amazon Simple Storage Service (S3)

AWS Glacier



AWS Import/Export

AWS Storage Gateway Service

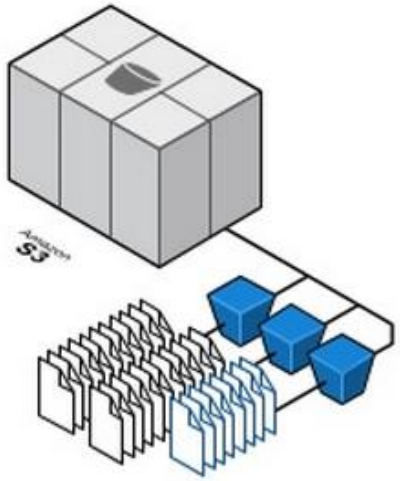


Elastic Block Store (EBS)

EBS Volumes = Virtual Disk Drives for EC2

- *Off-instance block storage with independent lifetime*
- *Storage volumes for use with Amazon EC2 instances – create, attach, backup, restore and delete*
- *Can use to create RAID configuration for a server*
- *Can be attached to a running Amazon EC2 instance and exposed as a block device for raw or formatted (filesystem) access*
- *Volumes behave like unformatted block devices for Linux or Windows instances*
- *Ideas use cases:*
    - *OS Boot device / root file system; secondary volumes/filesystems*
    - *Typical basis for database storage*
    - *Raw block devices for RAID, some databases*

Simple Storage Service (S3)



Web-scale Internet Storage

- *Highly available storage for the Internet (object store)*
- *HTTP/S endpoint to store and retrieve any amount of data, at any time, from anywhere on the web*
- *A "Bucket" is equivalent to a "folder"*
- *Objects from 1B-5 TB; no bucket size limit*
- *Highly scalable, reliable, fast, and inexpensive*
- *Over 1 trillion objects stored*
- *Peak requests 750,000+ per second*
- *Ideal Use Cases:*
    - *Static web content – often used with CloudFront CDN*
    - *Source and output storage for large-scale "Big Data" analytics*
    - *Backup, archival, and DR storage that is always "live"*

AWS Glacier

- *A low-cost storage service for backup and data archiving*
- *$0.01 per GB / Month*
- *Optimized for data that is infrequently accessed*
- *Retrieval times measured in hours not days or weeks*
- *Annual durability of 99.999999999% for an archive*
- *AES 256 data at rest encryption*
- *Data stored as archives within a vault. Vaults are located within a specific AWS region*
- *Archives can be up-to 40 TB in size*

AWS Import/Export

- *Accelerates moving large amounts of data into and out of S3 or EBS*
- *Transfers your data directly onto and off of USB or SATA storage devices shipped to AWS with manifest file*
- *Final copy uses high-speed datacenter network*

Database

Amazon SimpleDB

Amazon Relational Database Service (RDS)

Amazon DynamoDB

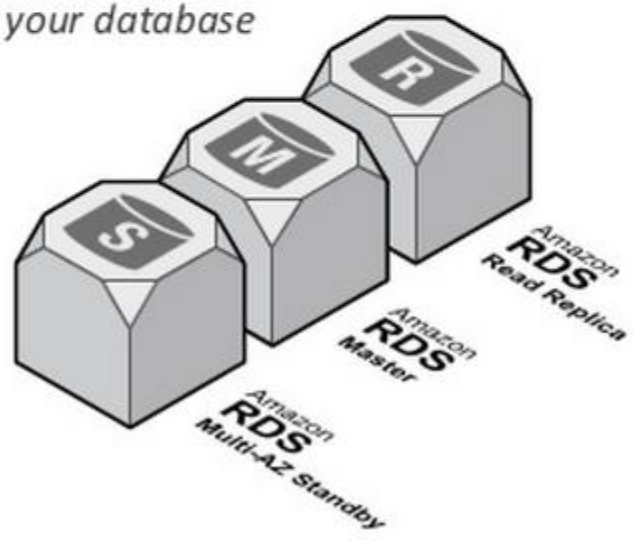
Amazon ElastiCache

Amazon SimpleDB

- *Core database functions of data indexing and querying of text data*
- *No schema, automatic indexing*
- *Eliminates the administrative burden of data modeling, index maintenance, and performance tuning*
- *Real-time lookup and simple querying of structured data*
- *Use cases:*
    - *Metadata storage -- often used in conjunction with S3*
    - *Structured, fine-grained data needing query*
    - *Data needing flexible schema*

Amazon Relational Database Service (RDS)

- *Fully-managed, tuned MySQL, Oracle 11g, or MS SQL databases*
- *Cost-efficient and resizable capacity*
- *Manages time-consuming database admin tasks*
- *Code, applications, and tools you already use today work seamlessly*
- *Automatically patches the database software and backs up your database*
- *Flexible Licensing: BYOL or License Include*



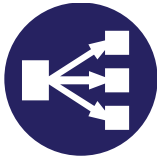
DynamoDB

- *Fully managed NoSQL database.*
- *Eliminates the administrative burden of data modeling, index maintenance, and performance tuning.*
- *Durability and high-availability - stores data on Solid State Drives (SSDs) and replicates it synchronously across multiple AWS Availability Zones in an AWS Region.*
- *Scalability - With AWS Console, you can grow your DynamoDB table from 10 to 100,000 writes per sec.*
- *See video: http://www.youtube.com/watch?v=oz-7wJJ9HZ0*

Amazon ElastiCache

- *Fully-managed, distributed, in-memory cache*
- *Memcached compliant cache cluster on-demand*
- *Manages patching, cache node failure detection and recovery*
- *Simple APIs calls to grow and shrink the cache cluster*
- *Seamlessly caches in front of SimpleDB or RDS instances*
- *Integrated with CloudWatch and SNS for monitoring and alerts*

Networking



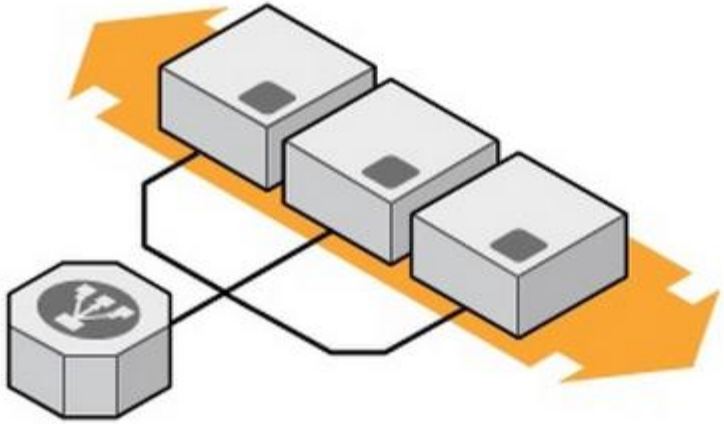
Elastic Load Balancer

Amazon Route 53

Amazon Virtual Private Cloud (VPC)

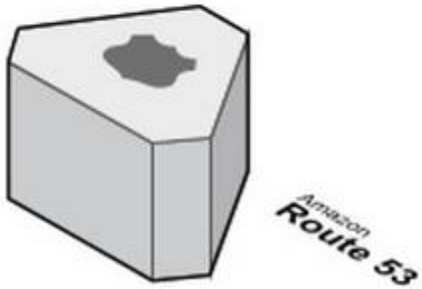
Amazon Elastic Load Balancing

- *Supports the routing and load balancing of HTTP, HTTPS and generic TCP traffic to EC2 instances*
- *Supports health checks to ensure detect and remove failing instances*
- *Dynamically grows and shrinks required resources based on traffic*
- *Seamlessly integrates with Auto-scaling to add and remove instances based on scaling activities*
- *Single CNAME provides stable entry point for DNS configuration*



Amazon Route 53

- *Route end users to Internet applications*
- *Answers DNS queries with low latency by using a global network of DNS servers*
- *Latency based routing to closest AWS endpoint (e.g. EC2 instances, Elastic IPs or ELBs)*
- *Deep integration with other AWS services (ELB, EC2 NAT/EIP, etc.)*



Amazon Virtual Private Cloud (VPC)

- *Secure and seamless bridge between a company's existing private network and the AWS cloud*
- *Connect existing infrastructure to a set of isolated AWS compute resources via a Virtual Private Network (VPN) connection*
- *Bring your own address space and extend existing management capabilities*

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Application Platform Services

Amazon CloudFront

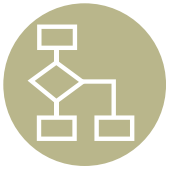
- *Web service for content delivery*
- *Distribute content to end users with low latency, high data transfer speeds, and no commitments*
- *Delivers your content using a global network of 33 edge locations*
- *Supports download, streaming, live streaming, and dynamic content*
    - *Key features: RTMP Streaming, HTTPS Delivery, Private Content for HTTP & Streaming, Programmatic Invalidation, Detailed Logs for HTTP & Streaming, Default Root Object*
- *Use Cases: Video and Rich Media, Online Gaming, Interactive Agencies, Software Downloads, Static Websites*
    - *Static web content that must be delivered to global user base at Highest bandwidth / Lowest latency / Lowest cost*

Application Services

Amazon Simple Notification Service (SNS)

Amazon Simple Queue Service (SQS)

Amazon Simple Email Service (SES)



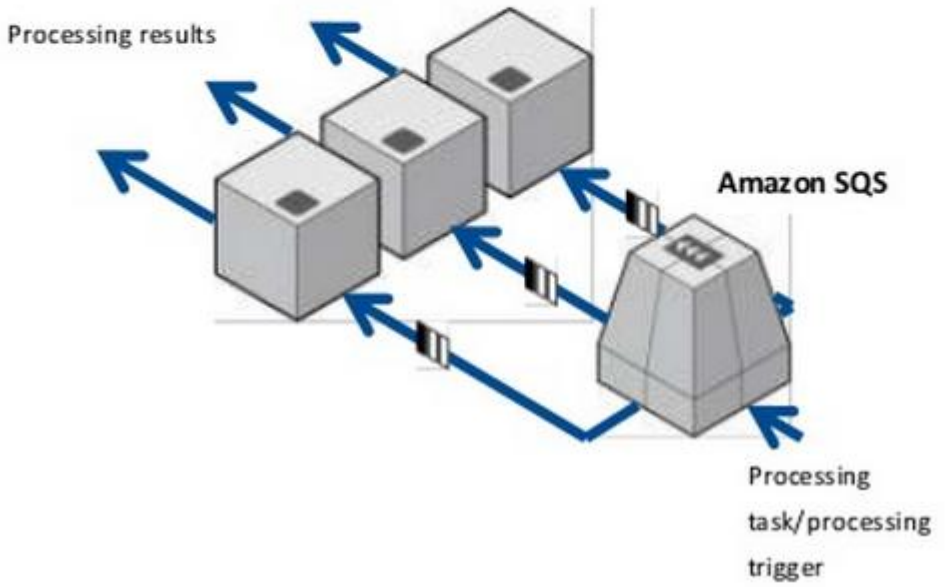
Amazon Simple Workflow Service (SWF)

Amazon Simple Notification Service (SNS)

- *Set up, operate, and send notifications*
- *Publish messages from an application and immediately deliver them to subscribers or other applications*

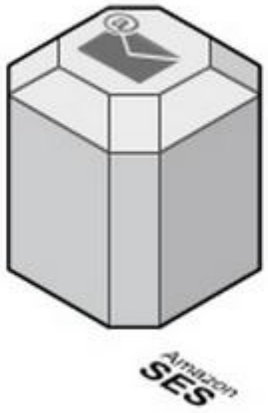
Amazon Simple Queue Service (SQS)

- *Hosted queue for storing messages as they travel between computers*
- *Move data between distributed components of their applications*



Amazon Simple Email Service (SES)

- *Bulk and transactional email-sending service*
- *Eliminates the hassle of email server management, network configuration, and meeting rigorous Internet Service Provider (ISP) standards*
- *Provides a built-in feedback loop, which includes notifications of bounce backs, failed and successful delivery attempts, and spam complaints*



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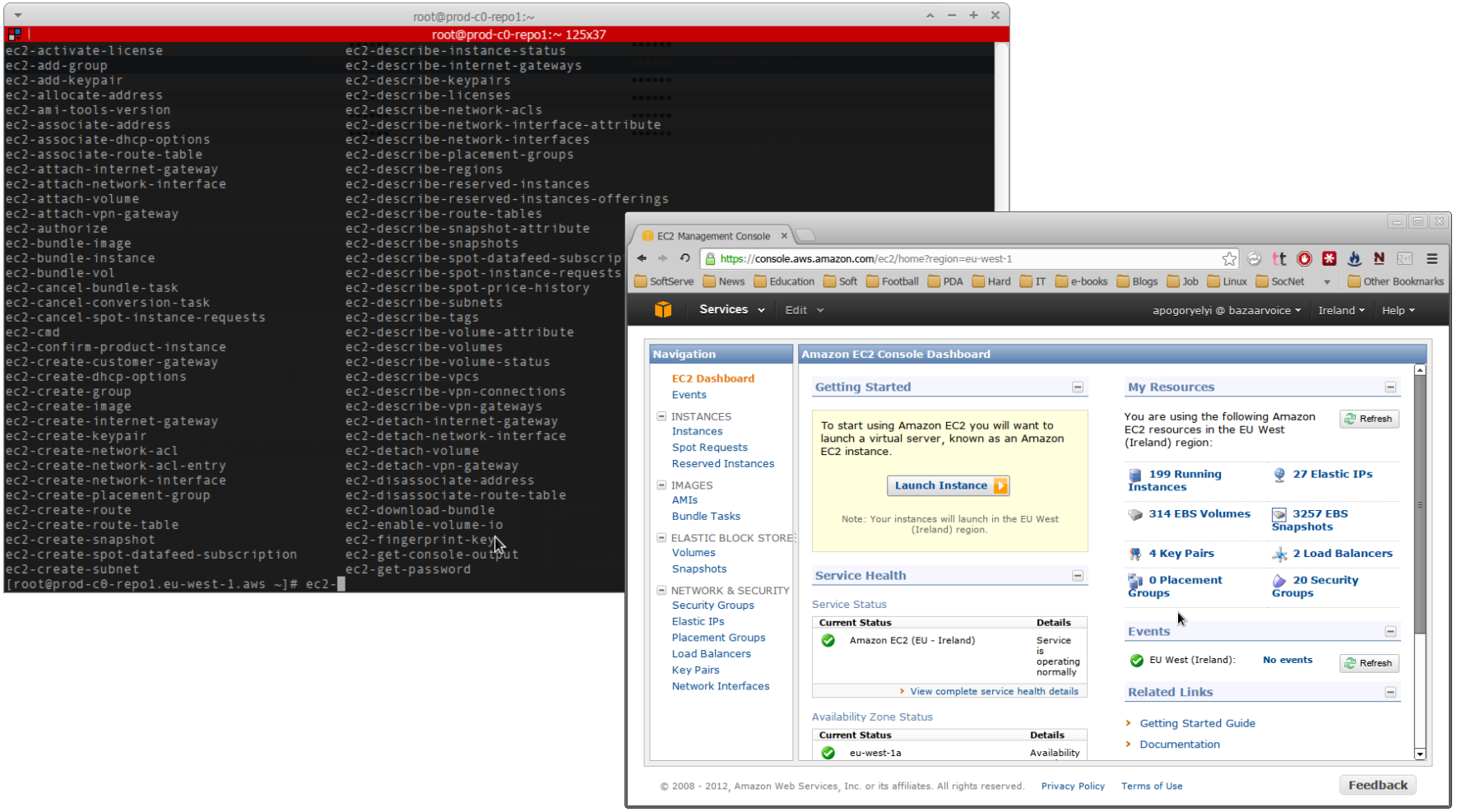
Management & Administration

Web Console and CLI



AWS CloudFormation

- *Create templates of stack of resources*
- *Deploy stack from template with runtime parameters*
- *Templates are simple JSON formatted text files*
- *CloudFormer supports generating templates from running environments*

Template

Refresh

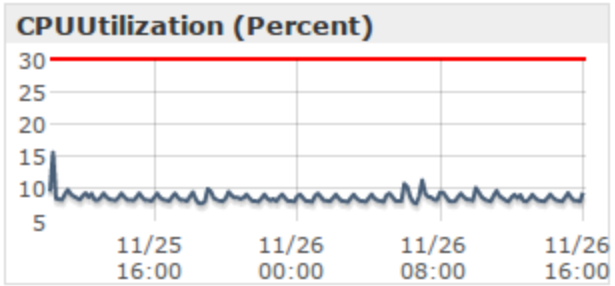
```
{
    "AWSTemplateFormatVersion" : "2010-09-09",

    "Description" : "AWS CloudFormation Template to start Nightly QA c7 environment",

    "Parameters" : {

        "Environment" : {
            "Description" : "Environment",
            "Type" : "String",
            "Default" : "nightlyqa",
            "AllowedValues" : [ "nightlyprod","nightlystg","nightlyqa","nightlydev" ],
            "ConstraintDescription" : "Must be a valid BV environment."
        },

        "Cluster" : {
            "Description" : "Server cluster",
            "Type" : "String",
            "Default" : "c7",
            "AllowedValues" : [ "c7" ],
            "ConstraintDescription" : "Must be a valid BV cluster."
        },
```

Amazon CloudWatch

- *Visibility into resource utilization, operational performance, and overall demand patterns*
- *Metrics such as CPU utilization, disk reads and writes, and network traffic*
- *Accessible via the AWS Management Console, web service APIs or Command Line Tools*
- *Add custom metrics of your own*
- *Alarms (which tie into auto-scaling, SNS, SQS, etc.)*
- *Billing Alerts to help manage charges on AWS bill*

This alarm will enter the ALARM state when CPUUtilization is < ▾ 30 for 10 minutes.

Metric: CPUUtilization
Period:
Statistic: Average



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