



AWS Training

by

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Amazon Web Services 101

Learning outcomes

- Get an overview of AWS Cloud Services
- Develop a clear understanding of AWS Foundation services in Compute, Storage, Networking, and Management
- Understand the development ecosystem for AWS Cloud

AWS Introduction

Why are enterprises choosing AWS?

What are enterprises using AWS for?

How are enterprise getting started with AWS?

AWS Provides Broad and Deep Services to Support Any Cloud Workload

Deployment & Administration

Application Services

Compute

Storage

Database

Networking

AWS Global Infrastructure

AWS Global Infrastructure

10 Regions*

26 Availability Zones*

53 Edge Locations



*China (Beijing) Region – in limited preview

Trusted by Enterprises Around the World



S&P
CAPITAL IQ



bankinter



intuit.



ERICSSON



htc

SHARP

TOSHIBA
Leading Innovation >>>



SEGA



TATA MOTORS

CONDÉ NAST

LIONSGATE

News International

ticketmaster

Newsweek



Bristol-Myers Squibb



Schneider
Electric

NOVARTIS

Used by Government Agencies & Educational Institutions Worldwide



“AWS is the overwhelming market share leader, with **more than five times the compute capacity** in use than the aggregate total of the other fourteen providers.”



Source: Gartner (May 2014)

Gartner “Magic Quadrant for Cloud Infrastructure as a Service,” Lydia Leong, Douglas Toombs, Bob Gill, Gregor Petri, Tiny Haynes, May 28, 2014. This Magic Quadrant graphic was published by Gartner, Inc. as part of a larger research note and should be evaluated in the context of the entire report.. The Gartner report is available upon request from [Steven Armstrong](mailto:a.steven@amazon.com) (a.steven@amazon.com). Gartner does not endorse any vendor, product or service depicted in its research publications, and does not advise technology users to select only those vendors with the highest ratings. Gartner research publications consist of the opinions of Gartner's research organization and should not be construed as statements of fact. Gartner disclaims all warranties, expressed or implied, with respect to this research, including any warranties of merchantability or fitness for a particular purpose.

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Lower Costs with AWS Up-Front and Increase Savings as Your Usage Grows

1

Replace up-front capital expense with low variable cost

“Average of 400 servers replaced per customer”

2

Economies of scale have allowed us to consistently lower costs

44 Price Reductions

3

Pricing model choice to support variable & stable workloads

On-demand
Reserved
Spot

4

Save more money as you grow bigger

Tiered Pricing
Volume Discounts



Source: IDC Whitepaper, sponsored by Amazon, “The Business Value of Amazon Web Services Accelerates Over Time.”

July 2012

4X More Reliable & 1/4 the Cost of On-Premises Infrastructure

END USERS BENEFITED FROM FEWER SERVICE DISRUPTIONS AND QUICKER RECOVERY ON AMAZON CLOUD INFRASTRUCTURE, REDUCING DOWNTIME BY 72%

AMAZON CLOUD INFRASTRUCTURE REPRESENTS A
70% SAVINGS COMPARED WITH ON-PREMISE SOLUTIONS



IDC
Analyze the Future

WHITE PAPER

The Business Value of Amazon Web Services Accelerates Over Time

Sponsored by: Amazon

Randy Perry Stephen D. Hendrick
July 2012

EXECUTIVE SUMMARY

In early 2012, IDC interviewed 11 organizations that deployed applications on Amazon cloud infrastructure services. The purpose of the IDC analysis was to understand the economic impact of Amazon cloud infrastructure services over time, beyond the well-documented benefit of reduction in capex and opex. Specifically, IDC set out to understand the long-term economic implications of moving workloads onto Amazon cloud infrastructure services, the impact of moving applications on developer productivity and business agility, and the new opportunities that businesses could address by moving resources onto Amazon cloud infrastructure services. The organizations interviewed ranged from small and medium-sized companies to companies with as many as 160,000 employees. Organizations in our study had been Amazon Web Services (AWS) customers for as few as seven months to as many as 5.3 years. Our interviews were designed to elicit both quantifiable information and anecdotes so that IDC could interpret the full return-on-investment (ROI) impact of Amazon cloud infrastructure services on these organizations. The study represents a broad range of

Business Value Highlights: Applications Running on AWS

- ☒ Five-year ROI: 625%
- ☒ Payback period: 7.1 months
- ☒ Software development productivity increase: 507%
- ☒ Average savings per application: \$518,990
- ☒ Downtime reduction: 72%
- ☒ IT productivity increase: 52%
- ☒ Five-year TCO savings: 70%



Architected for Enterprise Security Requirements

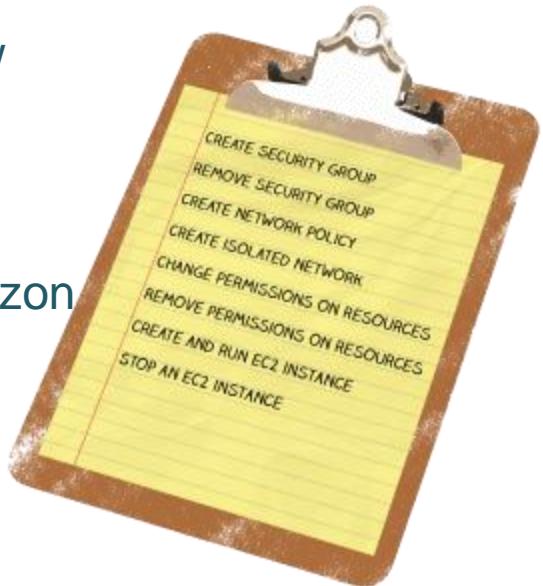
Certifications and accreditations for workloads that matter



AWS CloudTrail - AWS API call logging for governance & compliance

Log and review user activity

Stores data in Amazon S3, or archive to Amazon Glacier



Increased agility has
become the #1 reason
businesses use the AWS cloud



Enterprises Can't Afford to be Slow

Old World: Infrastructure in Weeks



AWS: Infrastructure in Minutes



- Add New Dev Environment
- Add New Prod Environment
- Add New Environment in Japan
- Add 1,000 Servers
- Remove 1,000 servers
- Deploy 2 PB Data warehouse
- Shut down 2 PB Data warehouse

Everything changes with this kind of agility

A Culture of Innovation: Experiment Often and Fail Without Risk



On-Premises
Experiment Infrequently
Failure is expensive
Less Innovation



Experiment Often
Fail quickly at a low cost
More Innovation

Many Enterprises Worry That These are the Only Two Choices

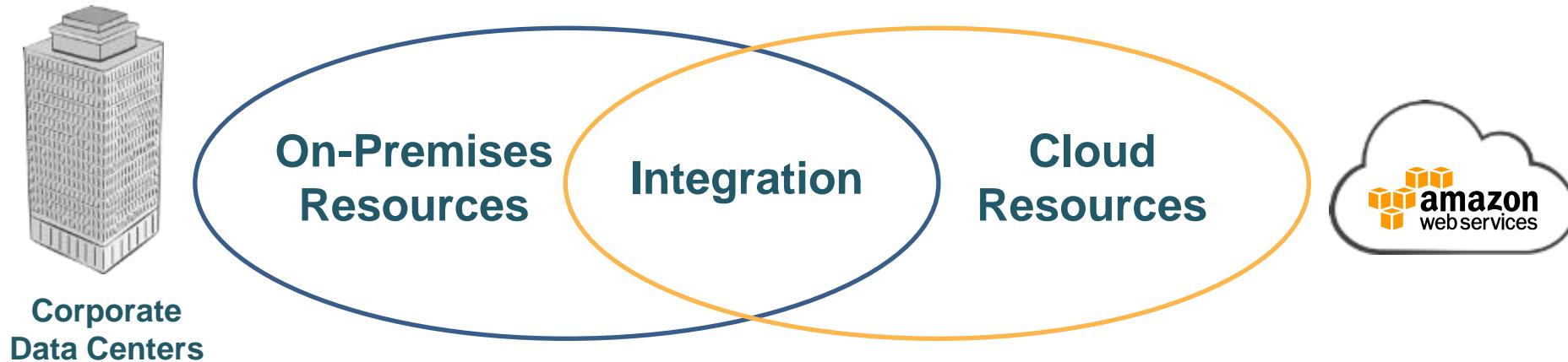
Build a
“private”
cloud



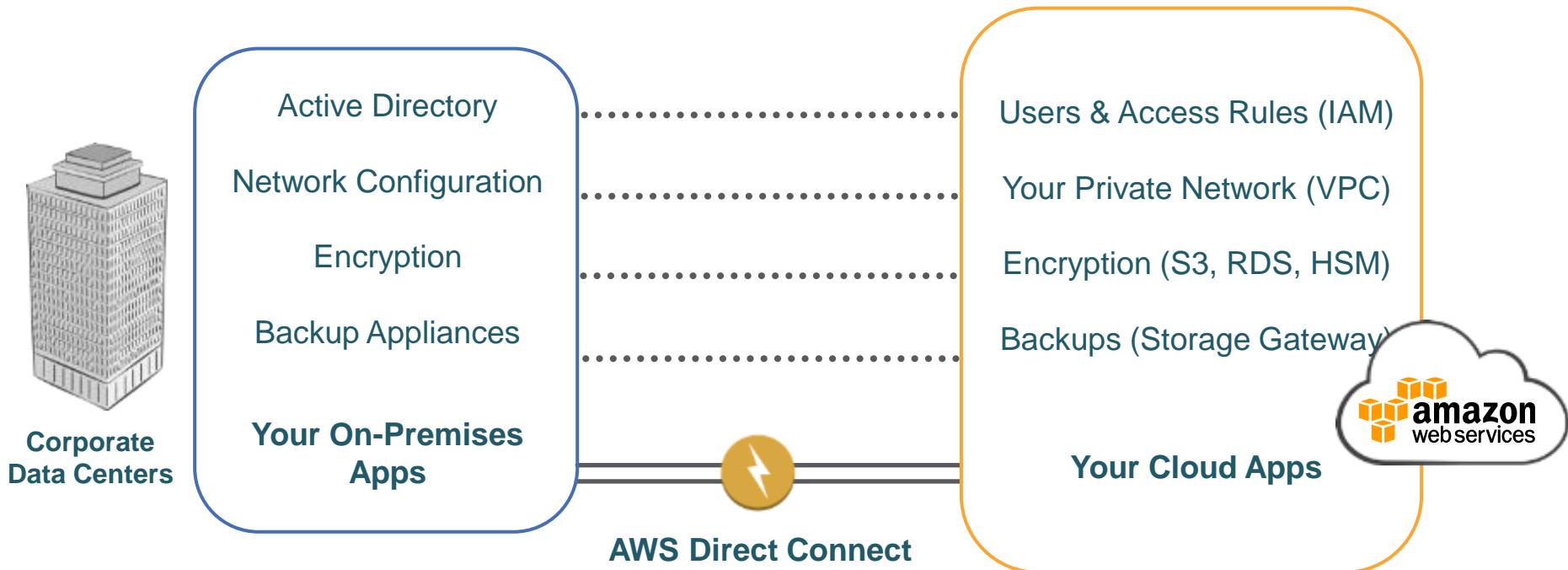
Rip everything out
and move to
AWS



The Good News is that Cloud isn't an 'All or Nothing' Choice



Integrating AWS with Your Existing On-Premises Infrastructure



Tools to Help Customers Manage Resources Across Environments



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Enterprises Use Cases on AWS

Enterprise
Apps and
Dev/Test

Big Data and
HPC

Storage,
Backup and
Archival

Web, Mobile, and
Social Apps

Disaster
Recovery

Virtual
Desktops

...Including Entire Data Center Migrations



Moved out of Hong Kong Data Center into AWS for all WSJ.com production traffic in Asia



Operations, finance and accounting, and training services in AWS today.

Moving entire infrastructure to AWS and closing its Geneva data center.



Currently running tens of thousands of servers on AWS.



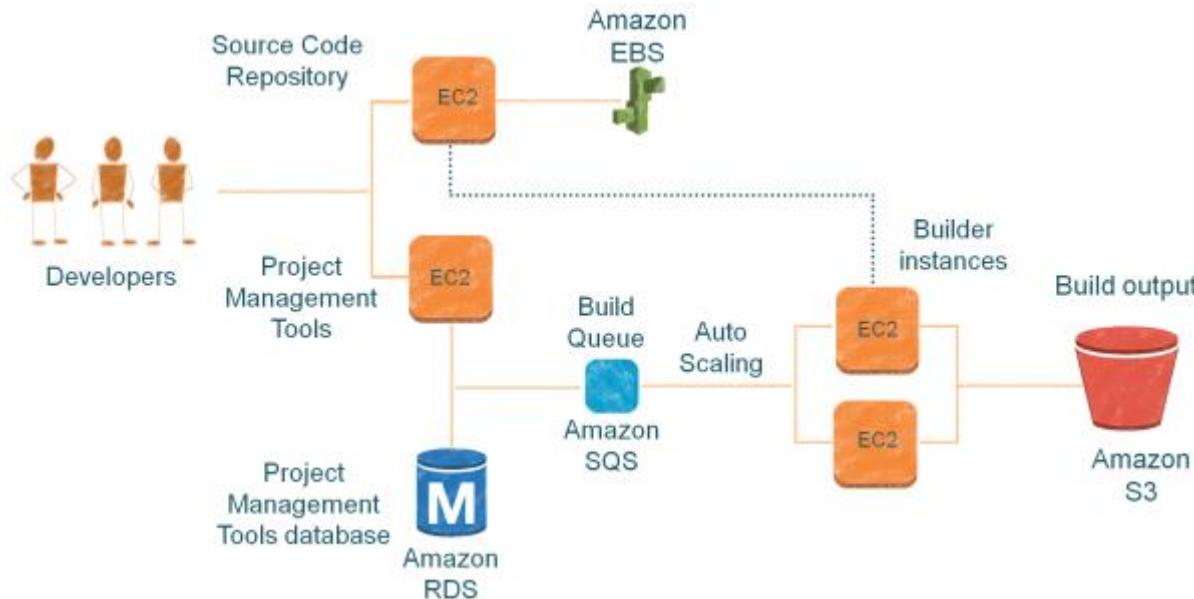
25% of servers running on AWS with plans to exceed 75% within the next three years.

Enterprise Applications



- Amazon RDS for Oracle provides managed Oracle database deployments
- Oracle Applications are fully supported on AWS
- Oracle licenses owned by customers are fully portable to AWS
- AWS is an SAP-certified Global Cloud Services Partner and Global Technology Partner
- Most SAP products are now certified for production deployment on AWS
- Full, real, licensed Windows Server OS on AWS
- Easily install services that you know - AD, ADFS, SCOM, SQL, Exchange, SharePoint etc.
- Use your existing MS licenses on AWS using BYOL

Development and Test Environments



AWS Dev./Test Scenarios

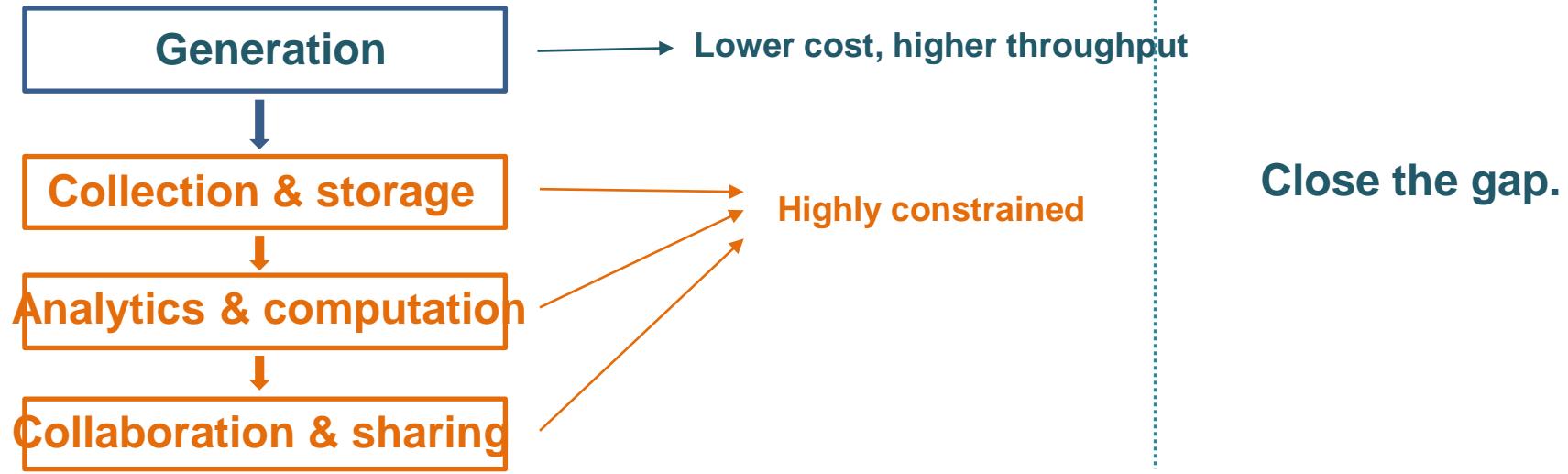
On-demand Dev. environments

On-Demand Builds

Automated Test environments

Load Testing

Big Data



Technologies and techniques for working productively with data, **at any scale**

Elastic and highly scalable + No upfront CapEx + Only pay for what you use + Available on-demand
= Remove constraints

Big Data

Amazon EMR (Elastic MapReduce)

Managed Hadoop Service

Easily launch, customize, and resize your managed Hadoop cluster



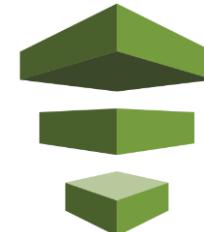
Amazon Redshift

Petabyte-scale data warehouse service



AWS Data Pipeline

More data among AWS Services and on-premises data sources



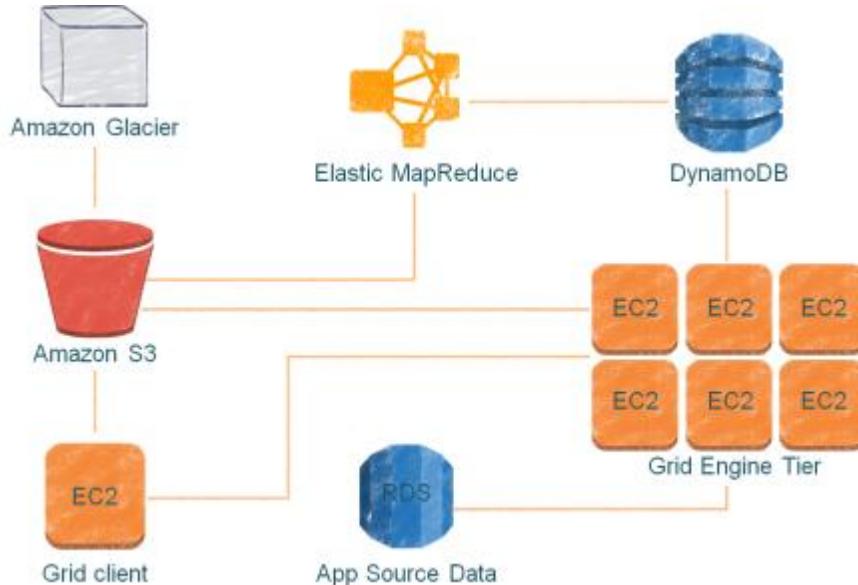
Amazon Kinesis - Fully-managed service for real time processing of streaming data, at any scale.

Plug and play with a simple, pre-built client library

Deploy Amazon Kinesis-enabled applications to Amazon EC2

Integrates with Amazon Redshift, Amazon DynamoDB, Amazon EMR, and Amazon S3

High Performance Computing (HPC)

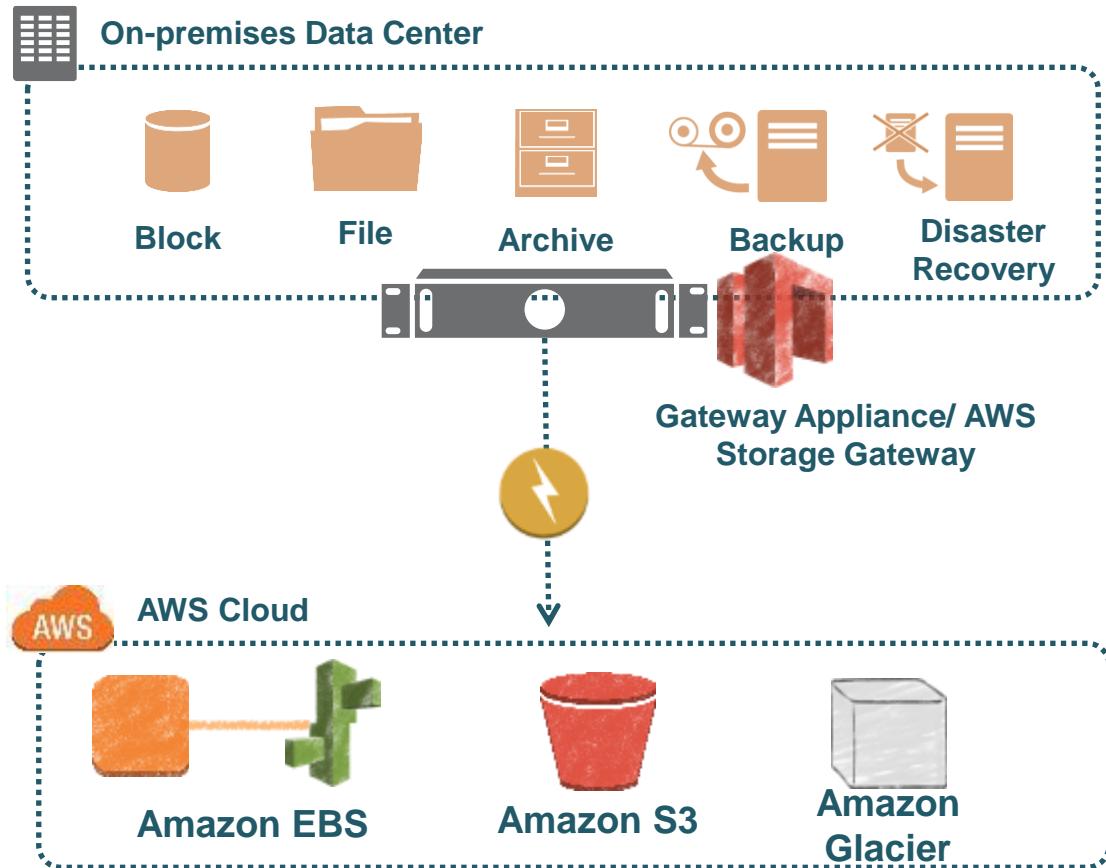


C3 instances

Instance Name	vCPU Count	Total ECU	RAM	Local Storage
c3.large	2	7	3.75 GiB	2 x 16 GB SSD
c3.xlarge	4	14	7 GB	2 x 40 GB SSD
c3.2xlarge	8	28	15 GiB	2 x 80 GB SSD
c3.4xlarge	16	55	30 GiB	2 x 160 GB SSD
c3.8xlarge	32	108	60 GiB	2 x 320 GB SSD

**Improved Network Performance
SSD based Platform**

Storage, Backup, and Archival



AWS Storage Gateway

Corporate File Sharing & seamless backup of enterprise data to Amazon S3

Amazon Elastic Block Store

Persistent Block Storage for EC2

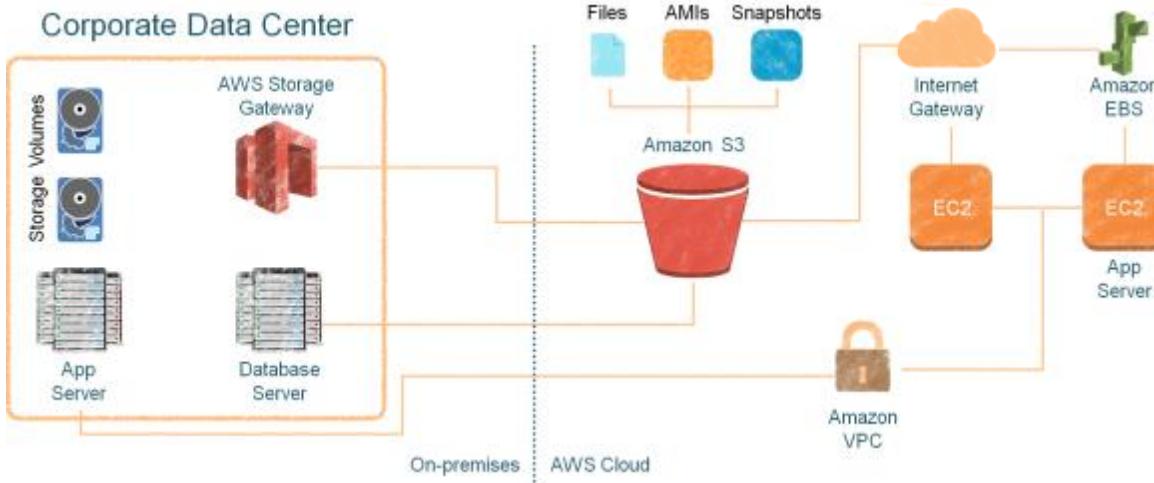
Amazon S3

Redundant, High-Scale Object Store

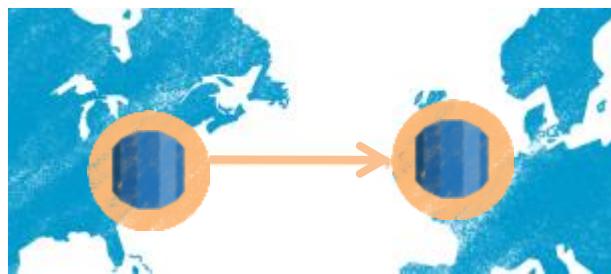
Amazon Glacier

Low-cost Archive Storage in the Cloud

Disaster Recovery



AWS DR Scenarios Backup and Restore
Pilot Light for Simple Recovery into AWS
Warm Standby Solution
Multi-site Solution

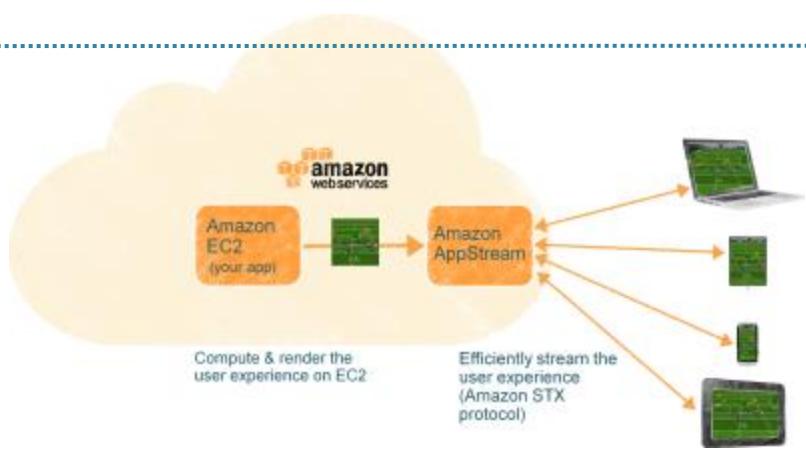


Amazon RDS – Cross Region Read Replicas



Improved disaster recovery operations.
Readable copies for cross-region applications.
Easy migration between regions

Web, Mobile, and Social Apps



Amazon AppStream
HD Video Quality Application Streaming
Captures user input to send back to the cloud. Responsive and consistent experience across devices

Virtual Desktops - Half the Price of On-Premises VDI



Amazon WorkSpaces

No hardware or virtualization software

Access through browser or tablet device

Monthly pricing—no long-term commitments

License software from us or bring your own licenses

Easy integration with MS Active Directory

No Server Hardware



No Storage Infrastructure



No VDI Software



No VDI Administration



Today's “Cloud Native” Applications



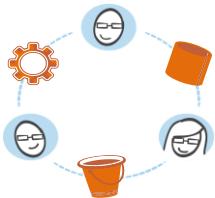
Deployed and
managed, automatically



Cost aware



Globally distributed



Composed and
orchestrated



Encrypted,
end to end



Content follows
you across devices

Sync state and data
across devices, offline
access, customer identity
and login

Continual improvement
based on customer
usage

Building feature-rich, engaging apps is “increasingly reliant” on “back end” services

Safeguard customer data and
credentials, Interact with
broad set of AWS services

Overcome the Challenge of Multiple Devices



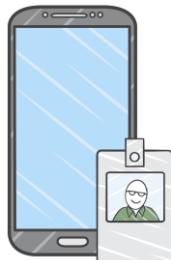
Amazon Cognito new

Fully managed user identity and data synchronization service

Manage unique identities & support multiple login providers

Seamlessly sync across devices & work offline via local data store

Identity



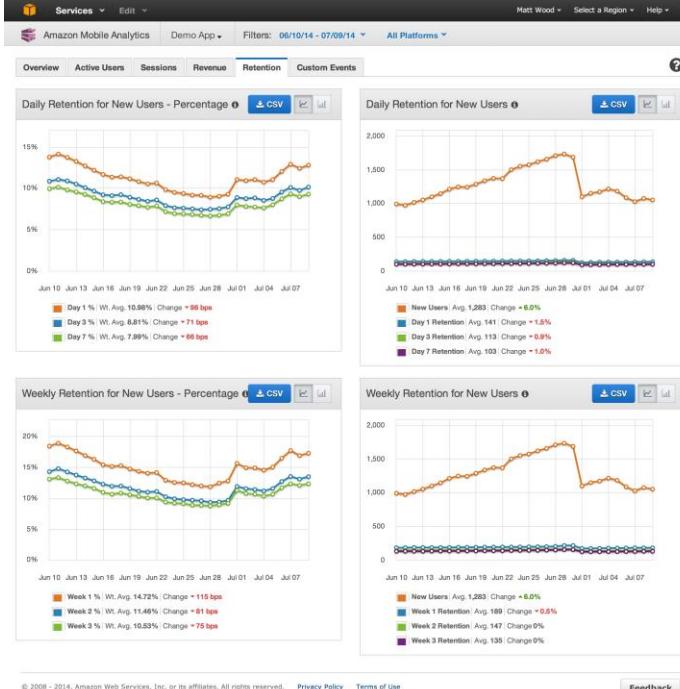
Synchronization



Security



Fast, Reliable, User Engagement Metrics



Amazon Mobile Analytics

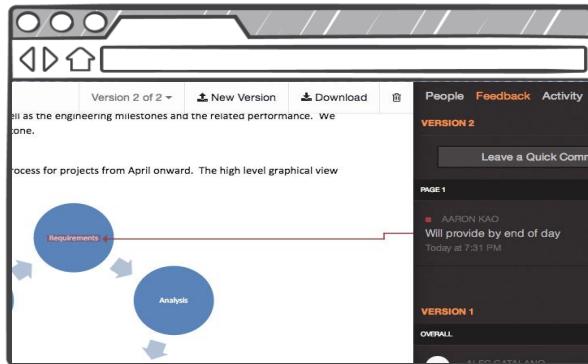
Fast: get your data within an hour

Automatic MAU, DAU, session and retention reports

Design and track custom app events

Data is not mined or sold by Amazon

Document Sharing and Collaboration – The Next Enterprise IT



– Document sharing and collaboration

AWS is Solving

Amazon Zocalo



Fully managed, secure document storage and sharing

Simple document feedback

Access from any device

Secure and reliable

Integrate your corporate directory

Easy sharing
Simple document
feedback



Access from
any device



Integrate your
corporate directory



Secure

Low cost

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Strategy 1: Cloud for Development & Test Environments

LIONSGATE

SAP

Reduced deployment time
from weeks to days



Oracle Enterprise
Applications

Reduced test
environment costs



SAP

70% reduction in
operational costs

Strategy 2: Build New Apps in the Cloud



Financial record archiving



Global deals engine



Product Prototyping & Design



Hotel booking engine



Video streaming



App streaming



Firmware upgrades

Faster to build



Bristol-Myers Squibb

Clinical trial simulations



Unilever

Global web properties



Audience management & creative design



Biological data research



SIM card credit



News distribution



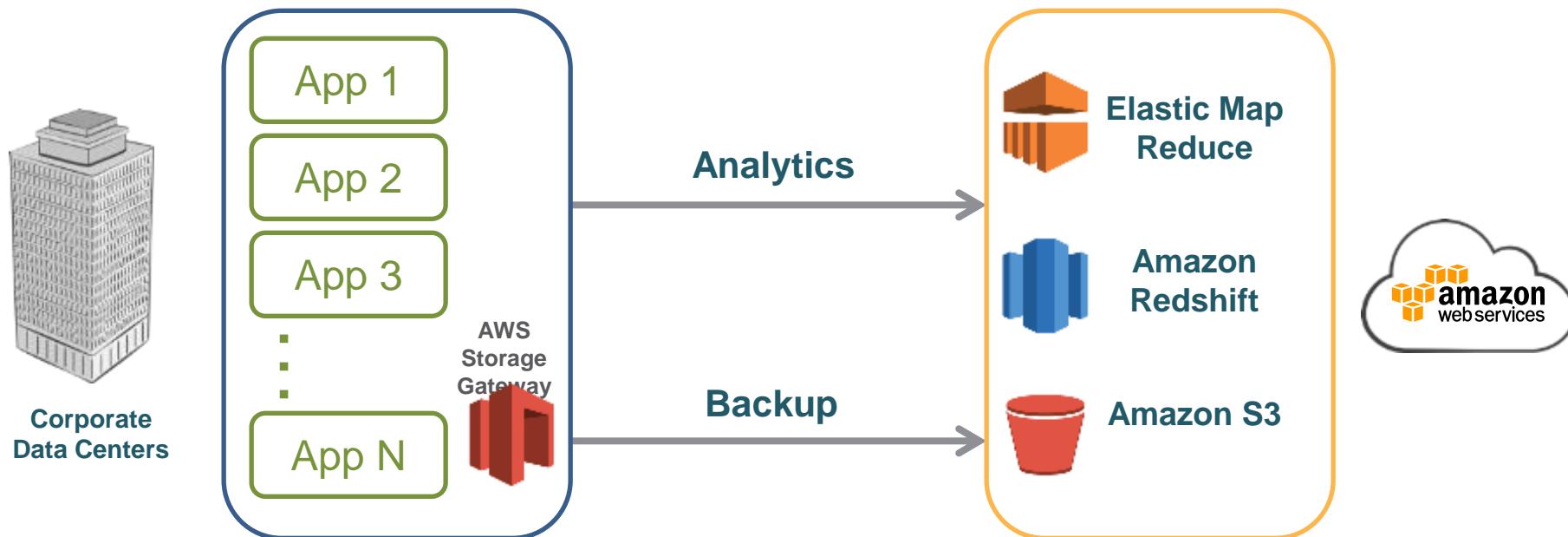
Mobile games

Easier to manage

Less expensive to run

Distributed architectures for high availability

Strategy 3: Use Cloud to Make On-Premises Apps Better



Strategy 3: Use Cloud to Make On-Premises Apps Better



Big Data Analytics

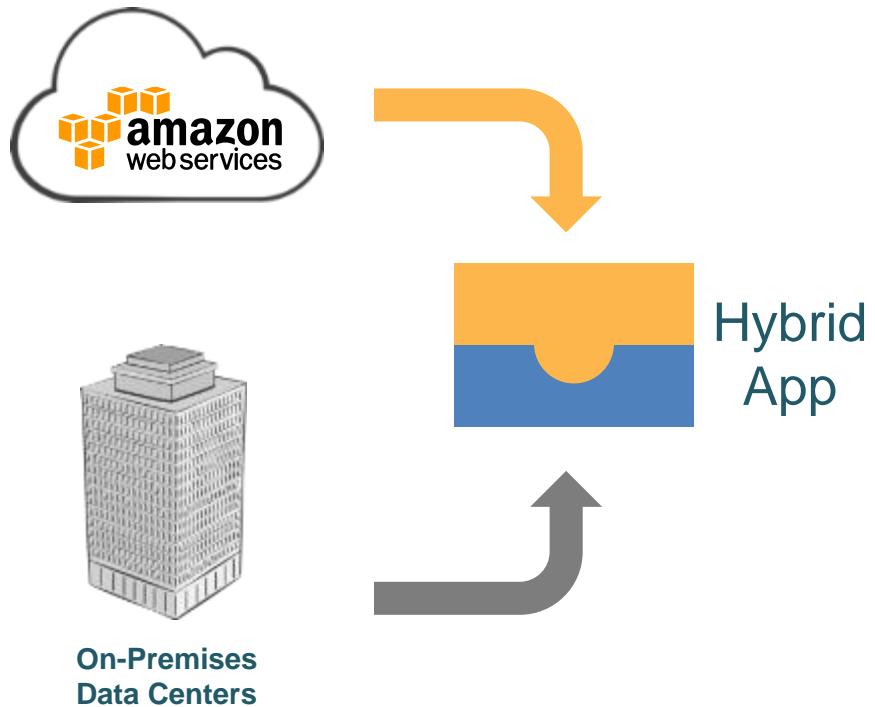
**Export operational data
to AWS for analytics
processing**



Big Data Analytics

**50% cost reduction with 2x
faster queries using
Amazon Redshift**

Strategy 4: Cloud Apps that Integrate with On-Premises Apps



AWS serves
application
content & data

Integration to
Samsung
data centers
for financial
transactions

Strategy 5: Migrate Existing Apps to the Cloud



1/3 of servers
migrated to AWS

Saved
£1.5 Million

On-Premises
Data Centers



Migrated 500 web
properties in 5
months

New product web
sites live in 2 days
vs. 2 weeks

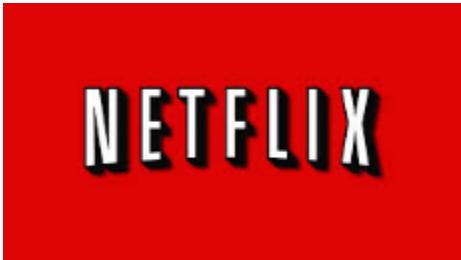


Bristol-Myers Squibb

Migrated clinical
trials simulations
platform

Simulations in
1.2hrs vs. 60hrs
64% reduction in
costs

Strategy 6: All In



100s of applications supporting 33M+ global members

10,000s of EC2 instances in multiple regions & zones

At peak consumes 1/3 of US Internet bandwidth

Amazon Elastic Compute Cloud (EC2)

Amazon Elastic Compute Cloud (EC2)



Amazon
EC2

- **Resizable** compute capacity
- Complete control of your computing resources
- **Reduced time required** to obtain and boot new server instances

Amazon EC2 Facts



- **Scale capacity** as your computing requirements change
- Pay only for capacity that you actually use
- Choose **Linux or Windows**
- Deploy across **AWS Regions** and **Availability Zones** for reliability
- Use **tags** to help manage your Amazon EC2 resources

Launching an Amazon EC2 Instance via the Management Console



- 1. Determine the AWS Region** in which you want to launch the Amazon EC2 instance.
- 2. Launch** an Amazon EC2 instance from a pre-configured Amazon Machine Image (AMI).
- 3. Choose an instance type** based on CPU, memory, storage, and network requirements.
- 4. Configure** network, IP address, security groups, storage volume, tags, and key pair.

Amazon Machine Image (AMI) Details



An AMI includes the following:

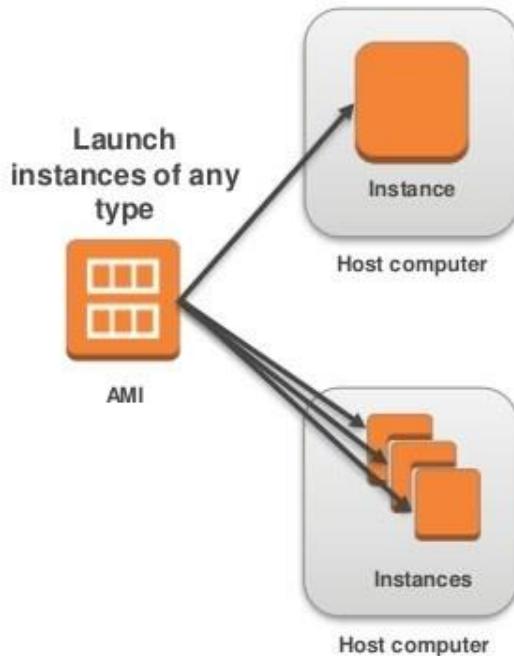
- A template for the **root volume** for the instance (for example, an operating system, an application server, and applications).
- **Launch permissions** that control which AWS accounts can use the AMI to launch instances.
- A block device mapping that specifies the **volumes to attach** to the instance when it is launched.

Instances and AMIs



Select an AMI based on:

- Region
- Operating system
- Architecture (32-bit or 64-bit)
- Launch permissions
- Storage for the root device



Amazon EC2 Instances



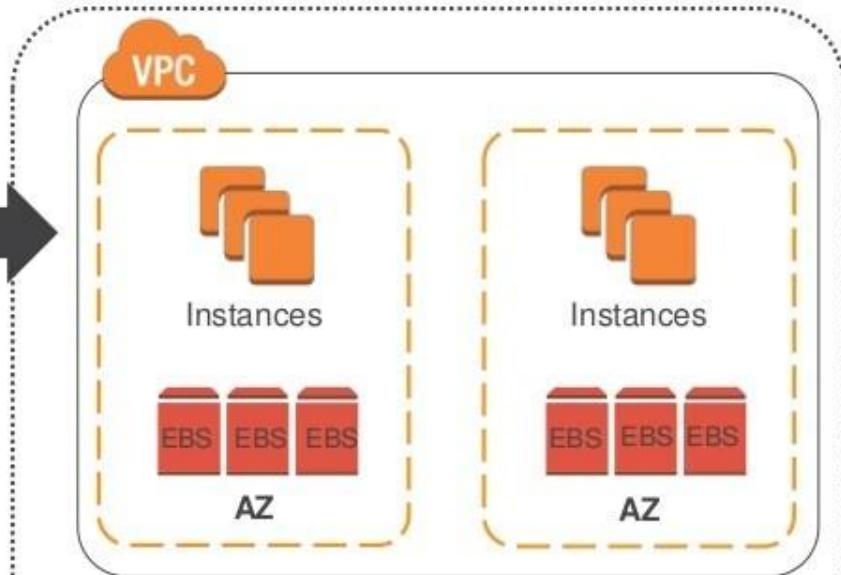
AMI



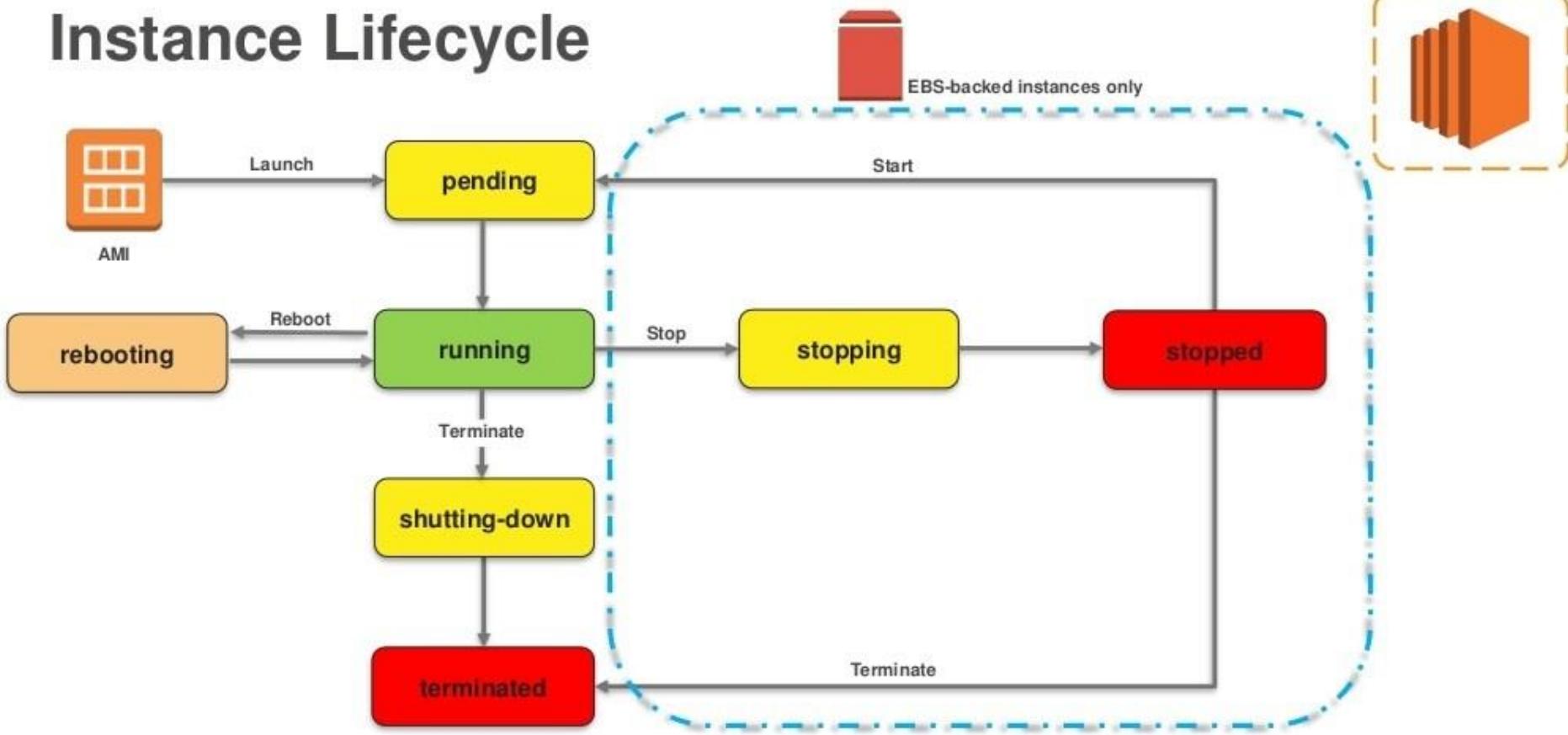
Instances

OS, Applications,
and
Configuration

Running or
Stopped VM



Instance Lifecycle



AWS Marketplace – IT Software Optimized for the Cloud



- Online store to discover, purchase, and deploy IT software on top of the AWS infrastructure.
- Catalog of **3,800+** IT software solutions including Paid, BYOL, Open Source, SaaS, and free-to-try options.
- Pre-configured to operate on AWS.
- Software checked by AWS for security and operability.
- Deploys to AWS environment in minutes.
- Flexible, usage-based billing models.
- Software charges billed to AWS account.

Includes AWS Test Drive.

<https://aws.amazon.com/marketplace>

The screenshot shows the AWS Marketplace homepage. On the left, there's a sidebar with categories such as Desktop Apps, Software Infrastructure, Application Development, Application Servers, Application Stacks, Big Data, Databases & Caching, Network Infrastructure, Operating Systems, Security, Developer Tools, Issue & Bug Tracking, Monitoring, Status Checks, Testing, Business Software, Business Intelligence, Financial Services, Collaboration, Content Management, CRM, eCommerce, Education & Research, Ingest Performance, Consulting, Media, Project Management, Storage & Backup. The main area features a banner about cluster deployments with CloudFormation, followed by sections for Featured Products (TIBCO Clarity, Sophos UTM 9, SoftNAS Cloud) and Popular Products (TIBCO Jaspersoft, Ubuntu Server 14.04 LTS (64-bit), Oracle Linux 7.0). At the bottom, there's an Amazon Web Services logo and a link to Training and Certification.

Choosing the Right Amazon EC2 Instance



AWS uses Intel® Xeon® processors to provide customers with high performance and value. EC2 instance types are optimized for different use cases and workload requirements and come in multiple sizes.

Consider the following when choosing your instances:

- Core count
- Memory size
- Storage size and type
- Network performance
- CPU technologies

AWS EC2 Instances with Intel® Technologies

AWS Instance Type	High Memory X1	Compute-Optimized C4	Storage-Optimized D2	General Purpose M4	Memory-Optimized R3	IO-Optimized I3	Graphics-Optimized G2	Burstable Performance T2
Intel Processor	E7-8880 v3	E5-2666 v3	E5-2676 v3	E5-2686 v4 E5-2676 v3	E5-2670 v2	E5-2686 v4	E5-2670	Intel Xeon Family
Intel AVX	AVX 2.0	AVX 2.0	AVX 2.0	AVX 2.0	Yes	Yes	Yes	Yes
Intel AES-NI	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Intel Turbo Boost	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Intel TSX	Yes	No	No	No	No	No	No	No
Per core P- and C-state control	No	Yes (8xlarge only)	No	No	No	No	No	No
SSD Storage	EBS Optimized by default	EBS Optimized by default	No	EBS Optimized by default	Yes	Yes	Yes	EBS only

Current Generation Instances



Instance Family	Some Use Cases
General purpose (t2, m4, m3)	<ul style="list-style-type: none">Low-traffic websites and web applicationsSmall databases and mid-size databases
Compute-optimized (c4, c3)	<ul style="list-style-type: none">High performance front-end fleetsVideo-encoding
Memory-optimized (x1, r4, r3)	<ul style="list-style-type: none">High performance databasesDistributed memory caches
Storage-optimized (i3, d2)	<ul style="list-style-type: none">Data warehousingLog or data-processing applications
Accelerated Computing (p2, g3, f1)	<ul style="list-style-type: none">Genomics researchMachine learning3D application streaming

Instance Metadata



- Is **data** about your **instance**.
- Can be used to **configure or manage** a running instance.

Retrieving Instance Metadata



To view all categories of instance metadata from within a running instance, use the following URI:

`http://169.254.169.254/latest/meta-data/`

On a Linux instance, you can use:

```
$ curl http://169.254.169.254/latest/meta-data/  
$ GET http://169.254.169.254/latest/meta-data/
```

All metadata is returned as text (content type `text/plain`).



A screenshot of a web browser window displaying the URL `http://169.254.169.254/latest/meta-data/`. The page lists various instance metadata keys as links:

- ami-id
- ami-launch-index
- ami-manifest-path
- block-device-mapping/
- hostname
- instance-action
- instance-id
- instance-type
- local-hostname
- local-ipv4
- mac
- metrics/
- network/
- placement/
- profile
- public-hostname
- public-ipv4
- public-keys/
- reservation-id
- security-groups
- services/

Instance User Data



- Can be passed to the instance **at launch**.
- Can be used to perform common **automated configuration tasks**.
- Runs scripts after the instance starts.

Adding User Data



- You can specify user data when launching an instance.
- User data can be:
 - Linux script – executed by **cloud-init**
 - Windows batch or PowerShell scripts – executed by **EC2Config** service
- User data scripts run once per instance ID by default.

User Data Example Linux



```
#!/bin/sh
```

User data shell scripts must start with the #! characters and the path to the interpreter you want to read the script.

```
yum -y install httpd  
chkconfig httpd on  
/etc/init.d/httpd start
```

Install Apache web server
Enable the web server
Start the web server

User Data Example Windows



```
<powershell>
```

```
Import-Module ServerManager
```

Import the Server Manager module
for Windows PowerShell.

```
Install-WindowsFeature web-server, web-webserver
```

```
Install-WindowsFeature web-mgmt-tools
```

```
</powershell>
```

Install IIS
Install Web Management Tools

Retrieving User Data



To retrieve user data, use the following URI:

`http://169.254.169.254/latest/user-data`

On a Linux instance, you can use:

```
$ curl http://169.254.169.254/latest/user-data/  
$ GET http://169.254.169.254/latest/user-data/
```

A screenshot of a terminal window titled "ec2-user@ip-172-31-31-72:~". The window shows the user is authenticated with the public key "imported-openssh-key". The background of the terminal is light blue with white text. A yellow arrow points from the text "curl http://169.254.169.254/latest/user-data/" in the slide's code block to the corresponding line in the terminal window. The terminal output includes commands like "curl", "yum update", "yum install", "service", "chkconfig", "groupadd", "usermod", "chown", "chmod", "find", and "echo". The bottom of the terminal shows a green prompt symbol.

```
Using username "ec2-user".
Authenticating with public key "imported-openssh-key"

[ec2-user@ip-172-31-31-72 ~] curl http://169.254.169.254/latest/user-data
#!/bin/bash
yum update -y
yum install -y httpd24 php56 mysql55-server php56-mysqlnd
service httpd start
chkconfig httpd on
groupadd www
usermod -a -G www ec2-user
chown -R root:www /var/www
chmod 2775 /var/www
find /var/www -type d -exec chmod 2775 {} +
find /var/www -type f -exec chmod 0664 {} +
echo "<?php phpinfo(); ?>" > /var/www/html/phpinfo.php[ec2-user@ip-172-31-31-72 ~]$
```

Amazon EC2 Purchasing Options



On-Demand Instances

Pay by the hour.

Reserved Instances

Purchase, at a significant discount, instances that are always available.

1-year to 3-year terms.

Scheduled Instances

Purchase instances that are always available on the specified recurring schedule, for a one-year term.

Spot Instances

Bid on unused instances, which can run as long as they are available and your bid is above the Spot price.

Dedicated Instances

Pay, by the hour, for instances that run on single-tenant hardware.

Dedicated Hosts

Pay for a physical host that is fully dedicated to running your instances.

Block Storage Service

Amazon Elastic Block Store (EBS)

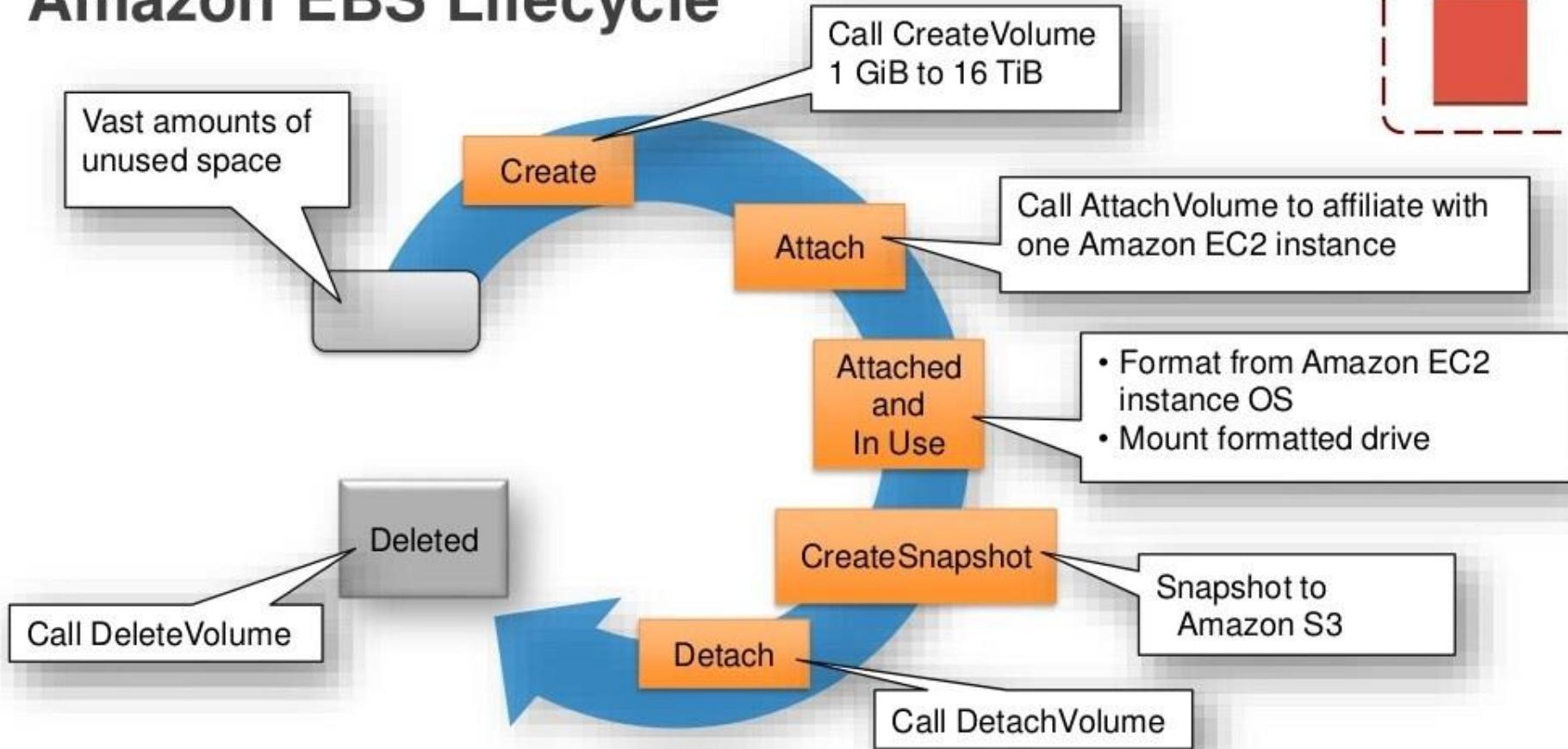
Amazon Elastic Block Store (EBS)



Amazon
EBS

- **Persistent block level storage** volumes offer consistent and low-latency performance.
- Stored data is automatically replicated within its Availability Zone.
- Snapshots are stored durably in Amazon S3.

Amazon EBS Lifecycle



Amazon EBS Volume Types



- SSD-backed volumes are
 - Optimized for **transactional** workloads that involve **frequent read/write** operations with **small I/O** size.
 - Dominant in **IOPS** performance.
- HDD-backed volumes are
 - Optimized for **large streaming** workloads.
 - Dominant in **throughput** (measured in MiB/s).

Amazon EBS Volume Types



	SSD		HDD	
Volume Type	General Purpose SSD (gp2)	Provisioned IOPS SSD (io1)	Throughput Optimized HDD (st1)	Cold HDD (sc1)
Description	Balances price and performance for a wide variety of transactional loads.	Highest-performance SSD volume designed for mission-critical applications.	Low-cost HDD designed for frequently accessed, throughput-intensive workloads.	Lowest cost HDD designed for less frequently accessed workloads.
Volume Sizes	1 GiB – 16 TiB	4 GiB – 16 TiB	500 GiB – 16 TiB	500 GiB – 16 TiB
Dominant Performance Attribute	IOPS	IOPS	MiB/s	MiB/s

Amazon EBS Facts



- EBS is recommended when data must be **quickly accessible** and requires **long-term persistence**.
- You can launch your EBS volumes as **encrypted** volumes – data stored at rest on the volume, disk I/O, and snapshots created from the volume are all encrypted.
- You can create **point-in-time snapshots** of EBS volumes, which are persisted to Amazon S3.

Amazon EBS Use Cases



- **OS:** Use for boot/root volume, secondary volumes
- **Databases:** Scales with your performance needs
- **Enterprise applications:** Provides reliable block storage to run mission-critical applications
- **Business continuity:** Minimize data loss and recovery time by regularly backing up using EBS Snapshots
- **Applications:** Install and persist any application

Amazon EBS Pricing

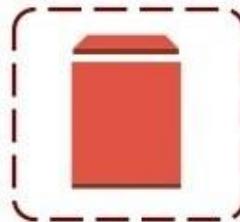


Pay for what you provision:

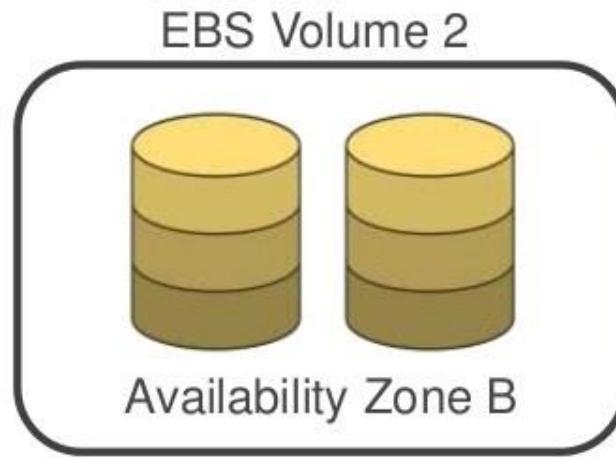
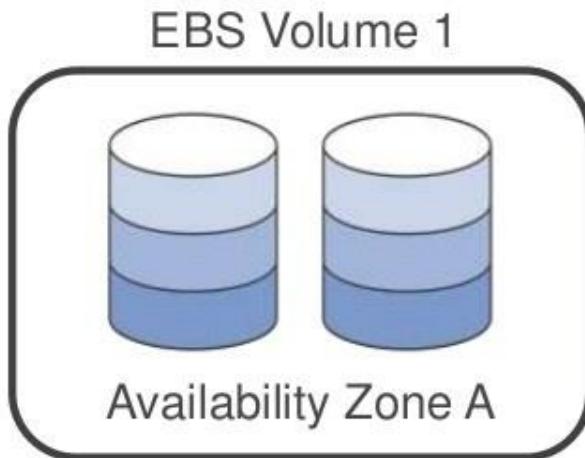
- Pricing based on region
- Review Pricing Calculator online
- Pricing is available as:
 - Storage
 - IOPS

* Check Amazon EBS Pricing page for current pricing for all regions.

Amazon EBS Scope



Amazon EBS volumes are in a single Availability Zone



Volume data is replicated across multiple servers in an Availability Zone.

Amazon EC2 Instance Store

- Is local, complimentary **direct attached block storage**.
- Includes availability, number of disks, and size **based on EC2 instance type**.
- Is optimized for **up to 365,000 Read IOPS** and 315,000 First Write IOPS.
- Is SSD or magnetic.
- Has **no persistence**.
- **Automatically deletes** data when an EC2 instance stops, fails or is terminated.

Amazon EBS vs. Amazon EC2 Instance Store

Amazon EBS

- Data stored on an Amazon EBS volume can persist independently of the life of the instance.
- Storage is **persistent**.

Amazon EC2 Instance Store

- Data stored on a local instance store persists only as long as the instance is alive.
- Storage is **ephemeral**.

Reboot vs. Stop vs. Terminate

Characteristic	Reboot	Stop/Start (EBS-backed instances only)	Terminate
Host computer	The instance stays on the same host computer .	The instance runs on a new host computer .	
Public IP address	No change	New address assigned	
Elastic IP addresses (EIP)	EIP remains associated with the instance.	EIP remains associated with the instance.	EIP is disassociated from the instance.
Instance store volumes	Preserved	Erased	Erased
EBS volume	Preserved	Preserved	Boot volume is deleted by default .
Billing	Instance billing hour doesn't change.	You stop incurring charges as soon as state is changed to <i>stopping</i> .	You stop incurring charges as soon as state is changed to <i>shutting-down</i> .

Networking Amazon VPC

Amazon Virtual Private Cloud (VPC)



Amazon
VPC

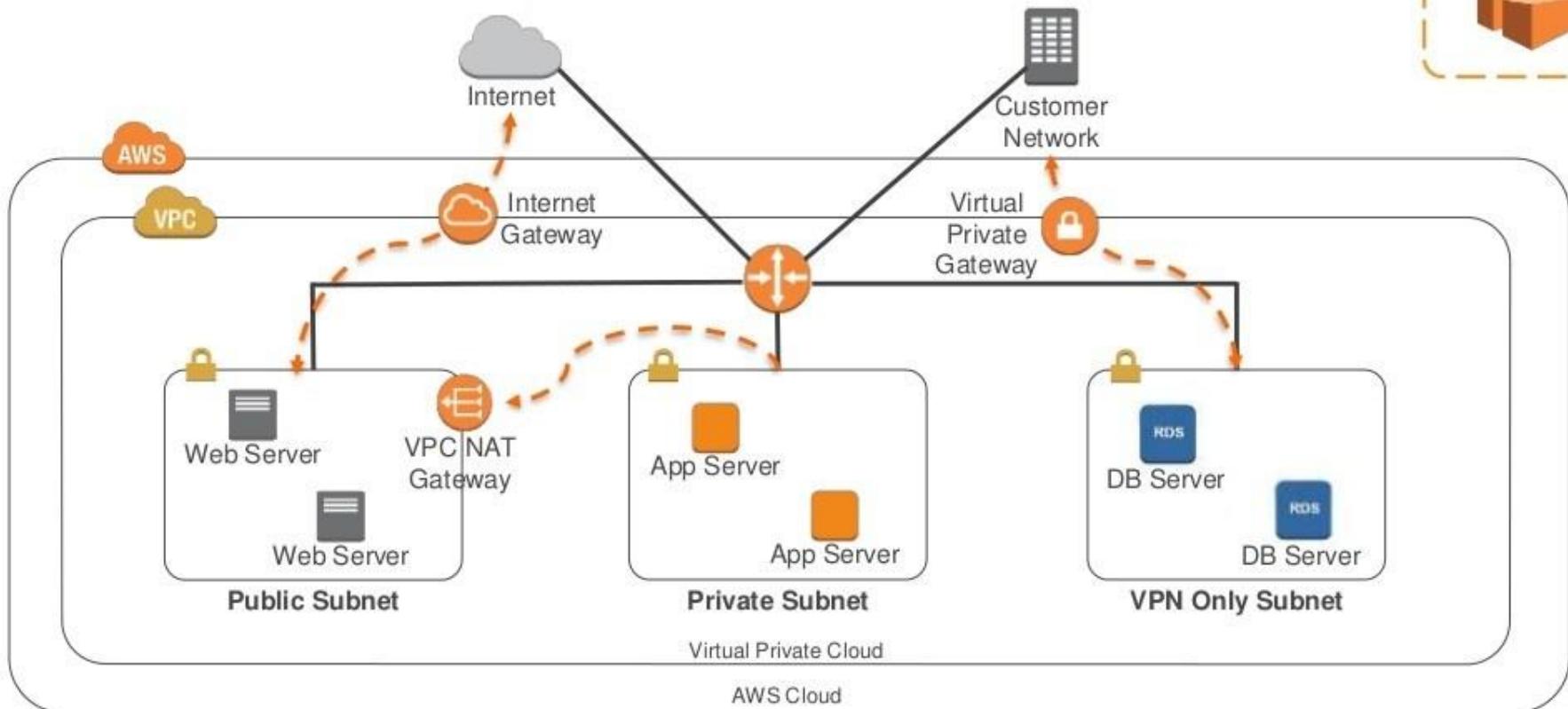
- Provision a **private, isolated virtual network** on the AWS cloud.
- Have complete control over your virtual networking environment.

VPCs and Subnets



- A **subnet** defines a range of IP addresses in your VPC.
- You can launch AWS resources into a subnet that you select.
- A **private subnet** should be used for resources that won't be accessible over the Internet.
- A **public subnet** should be used for resources that will be accessed over the Internet.
- Each subnet must reside entirely within one Availability Zone and cannot span zones.

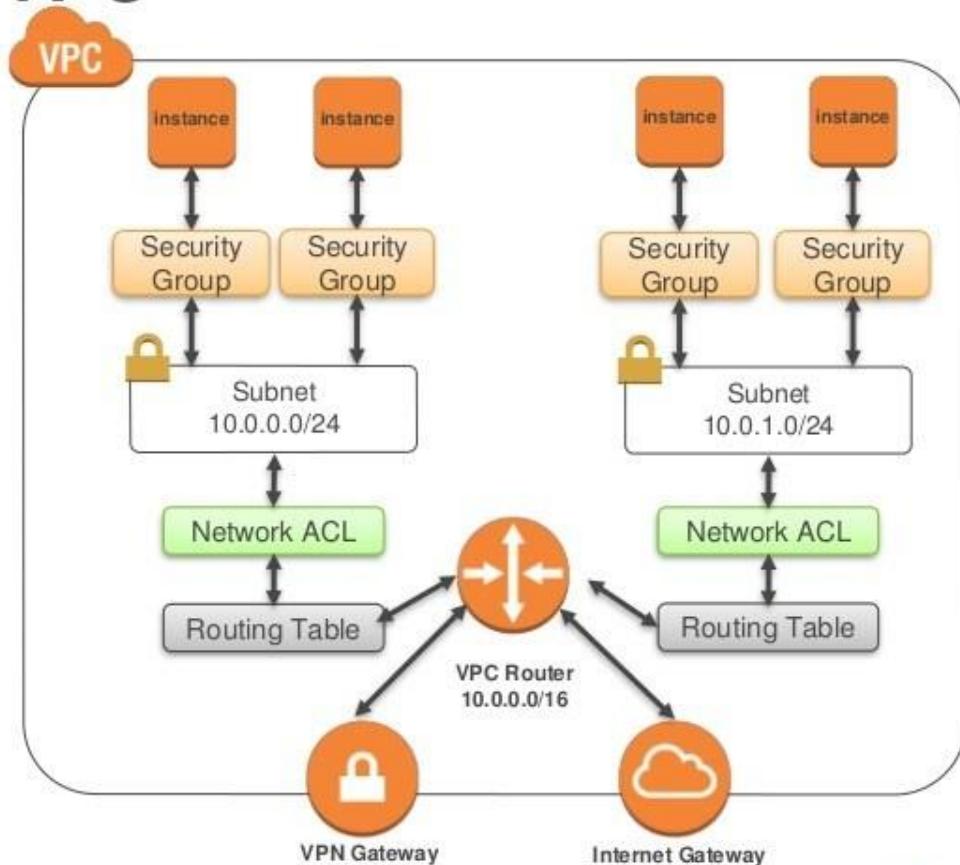
Amazon VPC Example



Security in Your VPC



- EC2 Key Pairs
- Security groups
- Network access control lists (ACLs)
- Route Table



VPN Connections

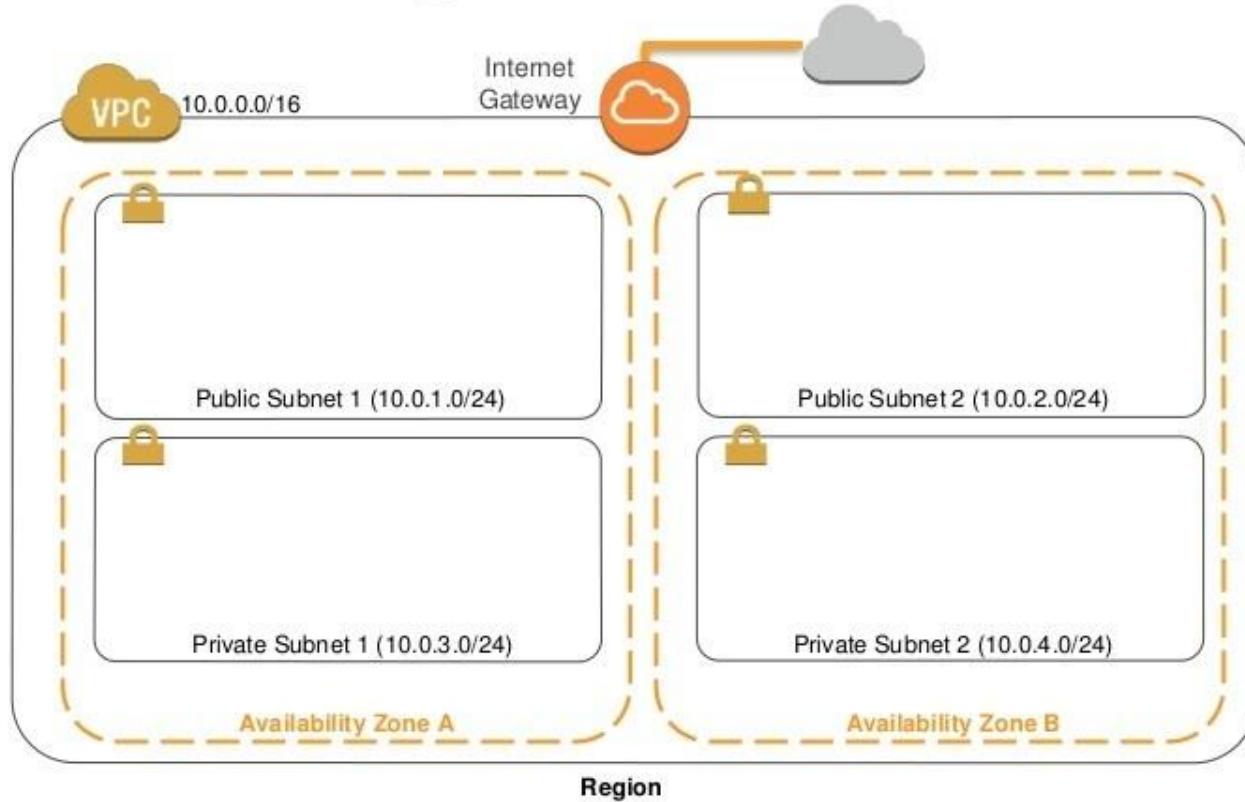


VPN Connectivity option	Description
AWS Hardware VPN	You can create an IPsec hardware VPN connection between your VPC and your remote network.
AWS Direct Connect	AWS Direct Connect provides a dedicated private connection from a remote network to your VPC.
AWS VPN CloudHub	You can create multiple AWS hardware VPN connections via your VPC to enable communications between various remote networks.
Software VPN	You can create a VPN connection to your remote network by using an Amazon EC2 instance in your VPC that's running a software VPN appliance .

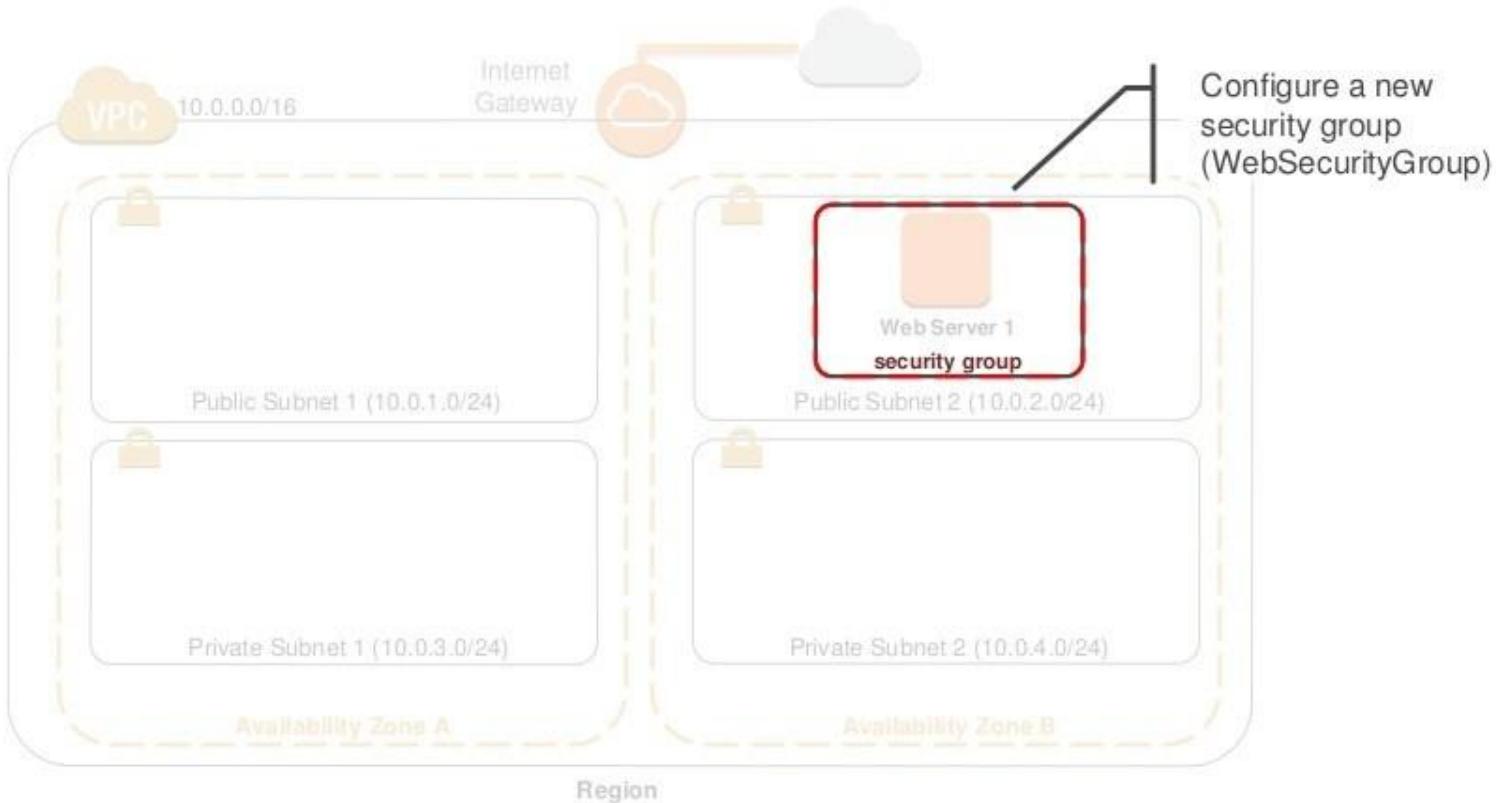
Instructor Demo

Launch a Web Server

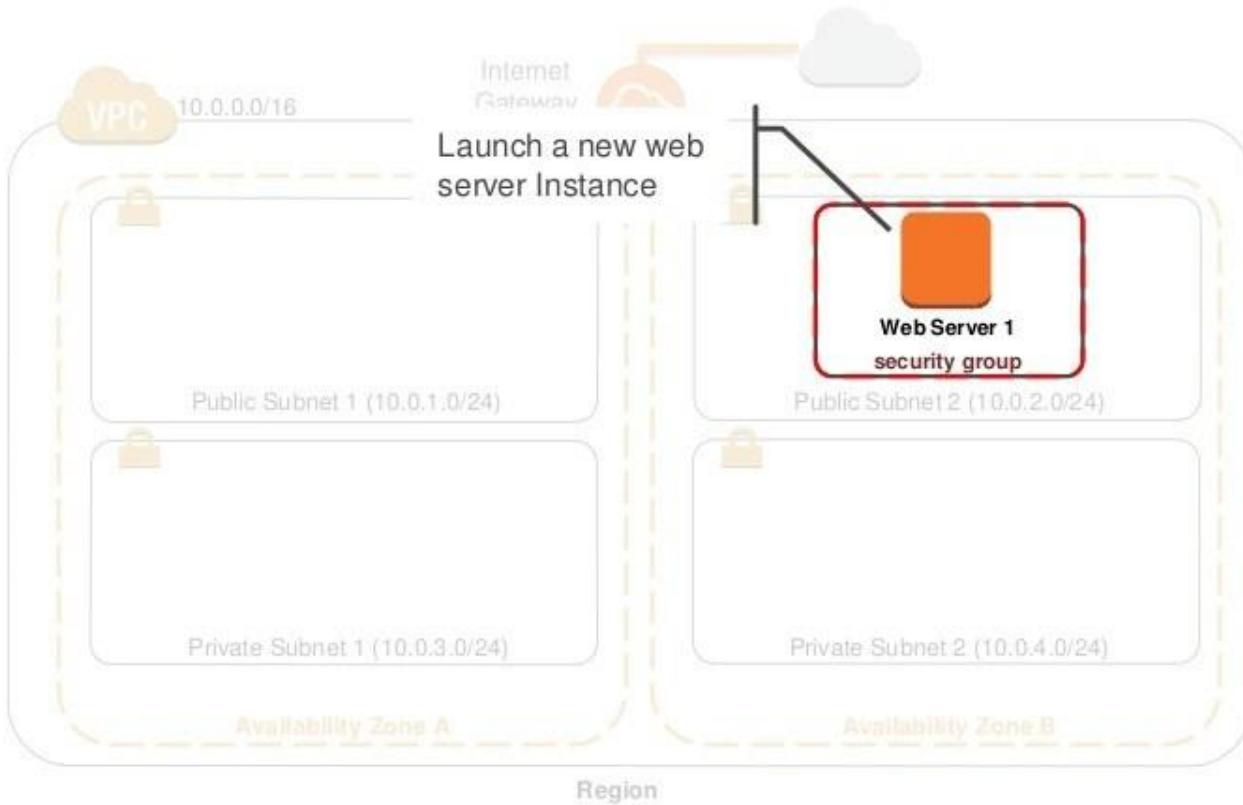
What We're Starting With



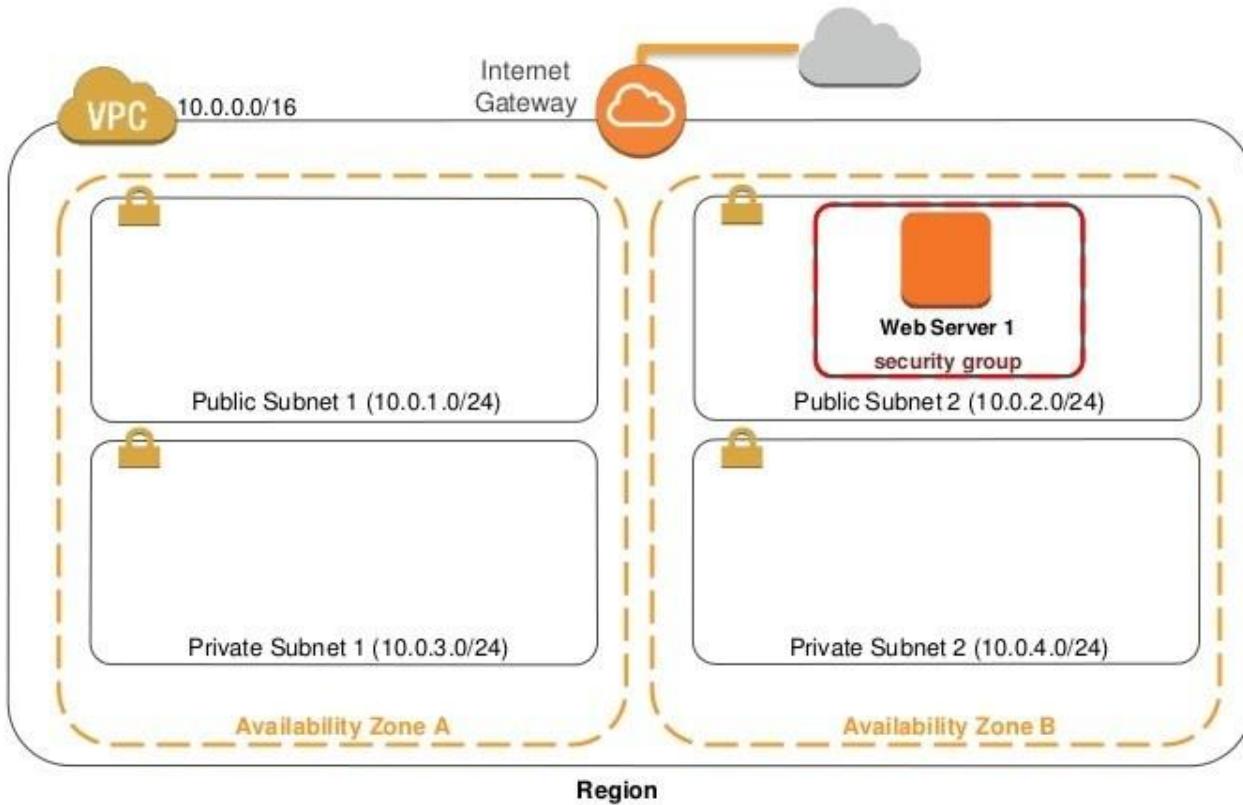
Launch a Web Server



Launch a Web Server



Launch a Web Server



Module 2

Security, Identity, and Access Management

AWS Shared Responsibility Model

Customers

Customer Applications & Content

Platform, Applications, Identity, and Access Management

Operating System, Network, and Firewall Configuration

Client-side Data
Encryption

Server-side Data
Encryption

Network Traffic
Protection

Customers are
responsible for
security **IN** the cloud

AWS Foundation Services

Compute

Storage

Database

Networking

AWS Global
Infrastructure

Availability Zones

Regions

Edge Locations

AWS is responsible
for the security **OF**
the cloud



Physical Security

- 24/7 trained **security staff**
- AWS data centers in **nondescript** and **undisclosed** facilities
- **Two-factor authentication** for authorized staff
- **Authorization** for data center access



Hardware, Software, and Network

- Automated **change-control** process
- Bastion servers that **record all access attempts**
- **Firewall** and other **boundary devices**
- AWS **monitoring** tools



Certifications and Accreditations



ISO 9001, ISO 27001, ISO 27017, ISO 27018, IRAP (Australia), MLPS Level 3 (China),
MTCS Tier 3 Certification (Singapore) and more ...

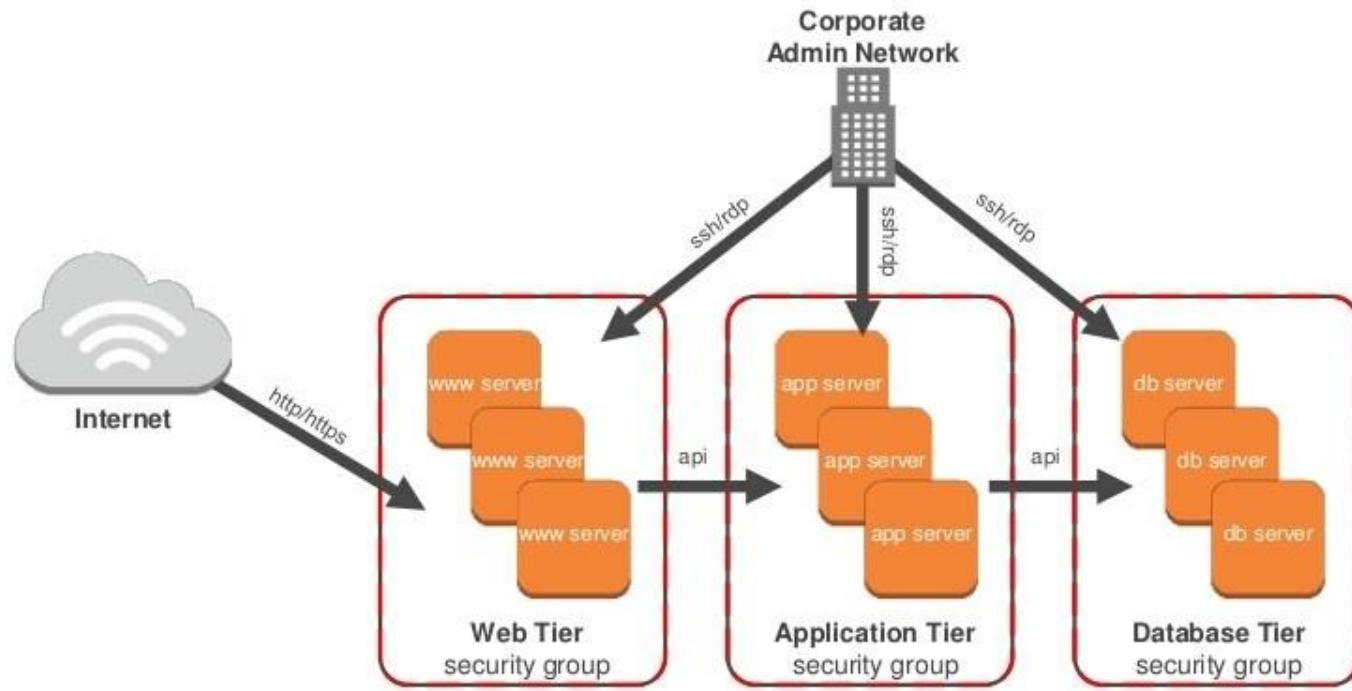
SSL Endpoints

SSL Endpoints	Security Groups	VPC
<p>Secure Transmission</p> <p>Use secure endpoints to establish secure communication sessions (HTTPS).</p>	<p>Instance Firewalls</p> <p>Use security groups to configure firewall rules for instances.</p>	<p>Network Control</p> <p>Use public and private subnets, NAT, and VPN support in your virtual private cloud to create low-level networking constraints for resource access.</p>

Security Groups

SSL Endpoints	Security Groups	VPC
<p>Secure Transmission</p> <p>Use secure endpoints to establish secure communication sessions (HTTPS).</p>	<p>Instance Firewalls</p> <p>Use security groups to configure firewall rules for instances.</p>	<p>Network Control</p> <p>Use public and private subnets, NAT, and VPN support in your virtual private cloud to create low-level networking constraints for resource access.</p>

AWS Multi-Tier Security Groups



(all other ports are blocked)

Amazon Virtual Private Cloud (VPC)

SSL Endpoints	Security Groups	VPC
<p>Secure Transmission</p> <p>Use secure endpoints to establish secure communication sessions (HTTPS).</p>	<p>Instance Firewalls</p> <p>Use security groups to configure firewall rules for instances.</p>	<p>Network Control</p> <p>Use public and private subnets, NAT, and VPN support in your virtual private cloud to create low-level networking constraints for resource access.</p>

AWS Identity and Access Management (IAM)



1

**Manage AWS IAM users
and their access**

2

**Manage AWS IAM roles
and their permissions**

3

**Manage federated users
and their permissions**

AWS IAM Authentication



- **Authentication**
 - **AWS Management Console**
 - User Name and Password



IAM User

Account:

User Name:

Password:

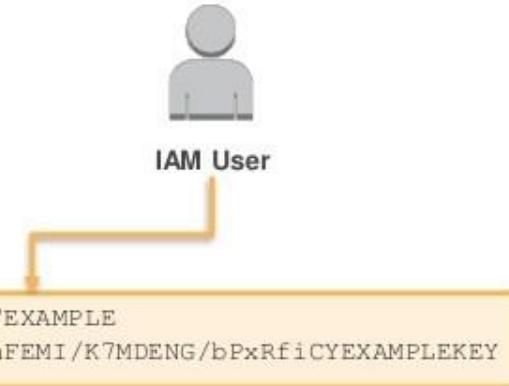
MFA users, enter your code on the next screen.



AWS IAM Authentication



- **Authentication**
- **AWS CLI or SDK API**
 - Access Key and Secret Key



AWS CLI

```
:~ $ aws configure
AWS Access Key ID [*****O22A]:
AWS Secret Access Key [*****4m8i]:
Default region name [ap-southeast-1]:
Default output format [json]:
```

AWS SDK & API



Java

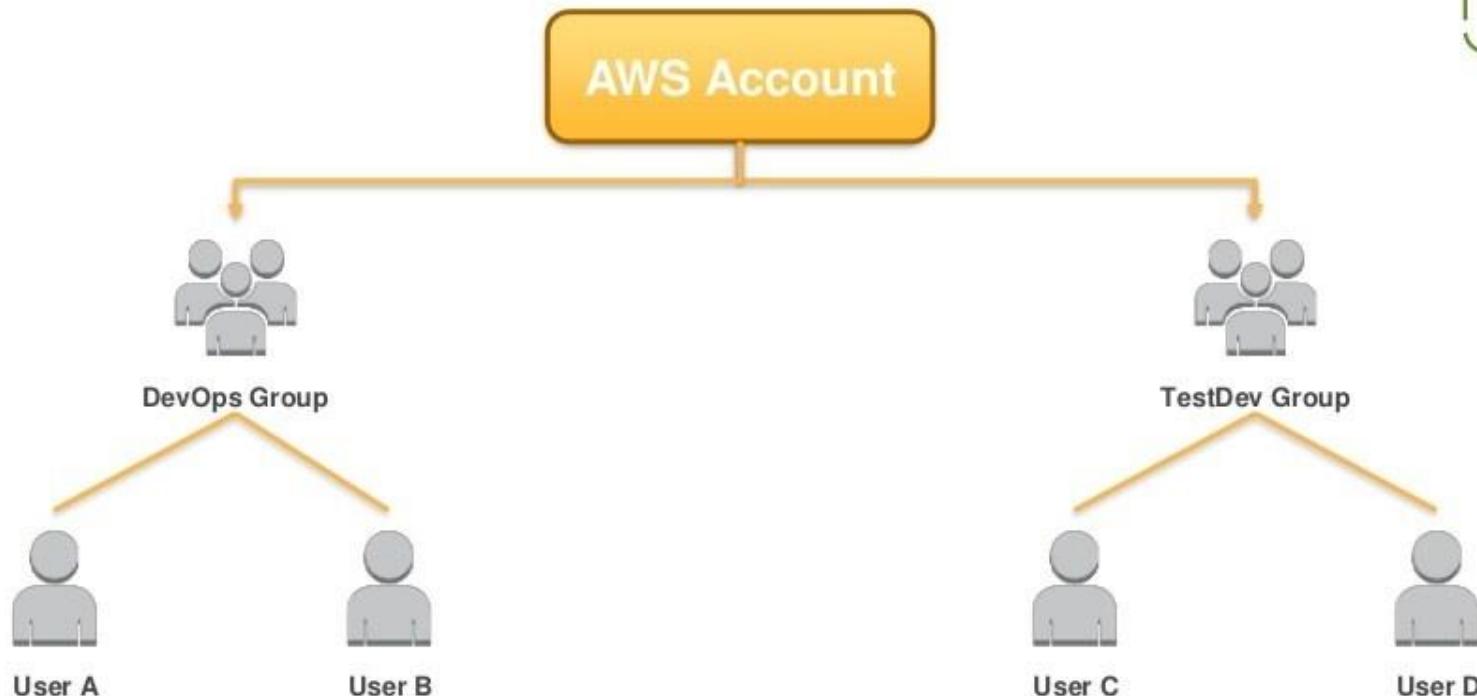


Python



.NET

AWS IAM User Management - Groups



AWS IAM Authorization



Authorization

- Policies:
 - Are JSON documents to describe permissions.
 - Are assigned to users, groups or roles.



IAM User



IAM Group

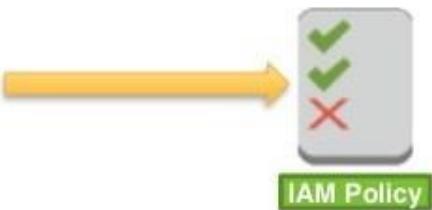


IAM Roles

AWS IAM Policy Elements



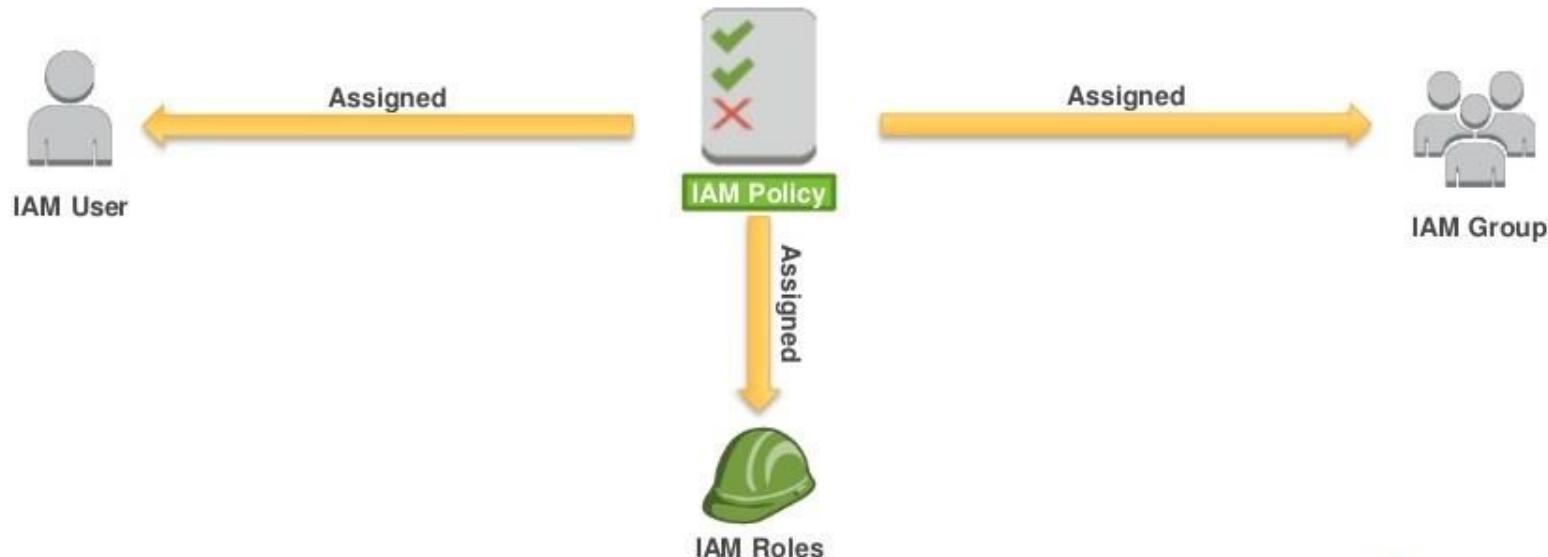
```
"Version": "2012-10-17",
"Statement": [
    {
        "Sid": "Stmt1453690971587",
        "Action": [
            "ec2:Describe*",
            "ec2:StartInstances",
            "ec2:StopInstances"
        ],
        "Effect": "Allow",
        "Resource": "*",
        "Condition": [
            "IpAddress": {
                "aws:SourceIp": "54.64.34.65/32"
            }
        ]
    },
    {
        "Sid": "Stmt1453690998327",
        "Action": [
            "s3:GetObject*"
        ],
        "Effect": "Allow",
        "Resource": "arn:aws:s3:::example_bucket/*"
    }
]
```



AWS IAM Policy Assignment



AWS IAM Policy Assignment



AWS IAM Roles

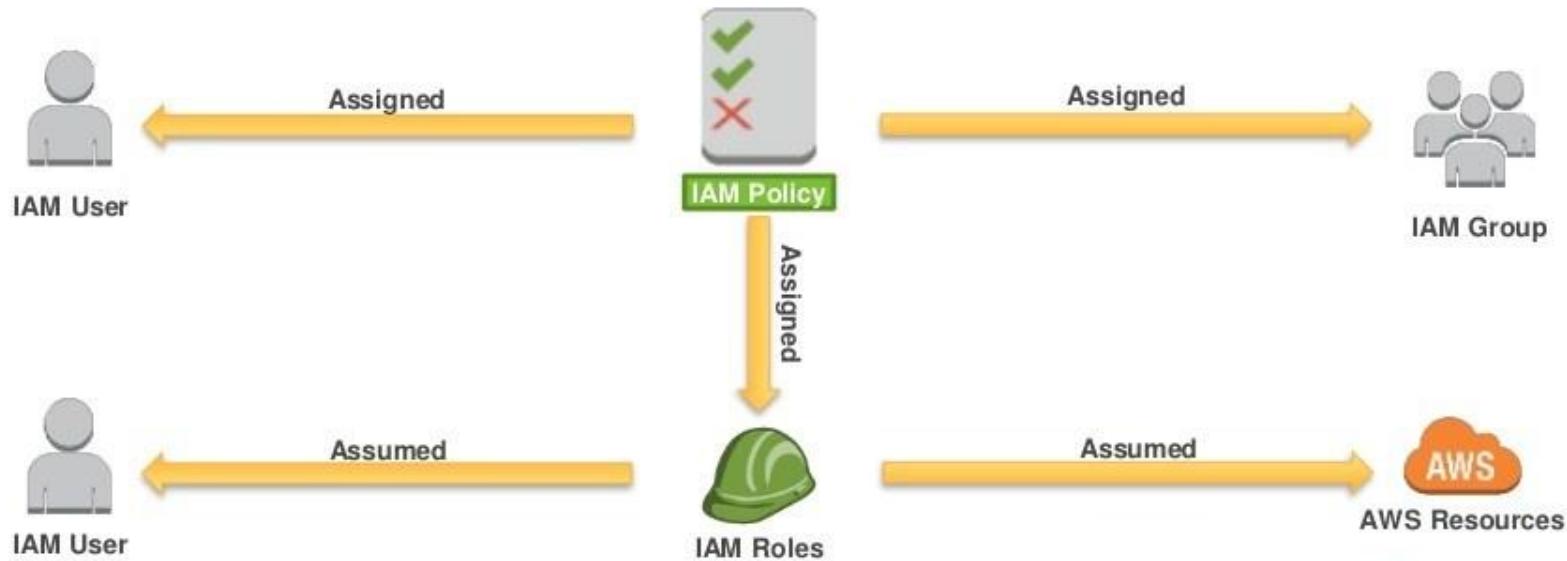


- An IAM role uses a policy.
- An IAM role has no associated credentials.
- IAM users, applications, and services may assume IAM roles.



IAM Roles

AWS IAM Policy Assignment



Example: Application Access to AWS Resources



- Python application hosted on an Amazon EC2 Instance needs to interact with Amazon S3.
- AWS credentials are required:
 - Option 1: Store AWS Credentials on the Amazon EC2 instance.
 - Option 2: Securely distribute AWS credentials to AWS Services and Applications.



IAM Roles

AWS IAM Roles - Instance Profiles

Amazon EC2



Create Instance

Select IAM Role

App &



Screenshot of the AWS EC2 'Create Instance' wizard, Step 3: Configure Instance Details. The 'IAM role' dropdown is highlighted and shows a list of roles:

- aws-elasticbeanstalk-ec2-role
- AmazonEC2_DefaultRole
- AmazonEC2_AccessRole

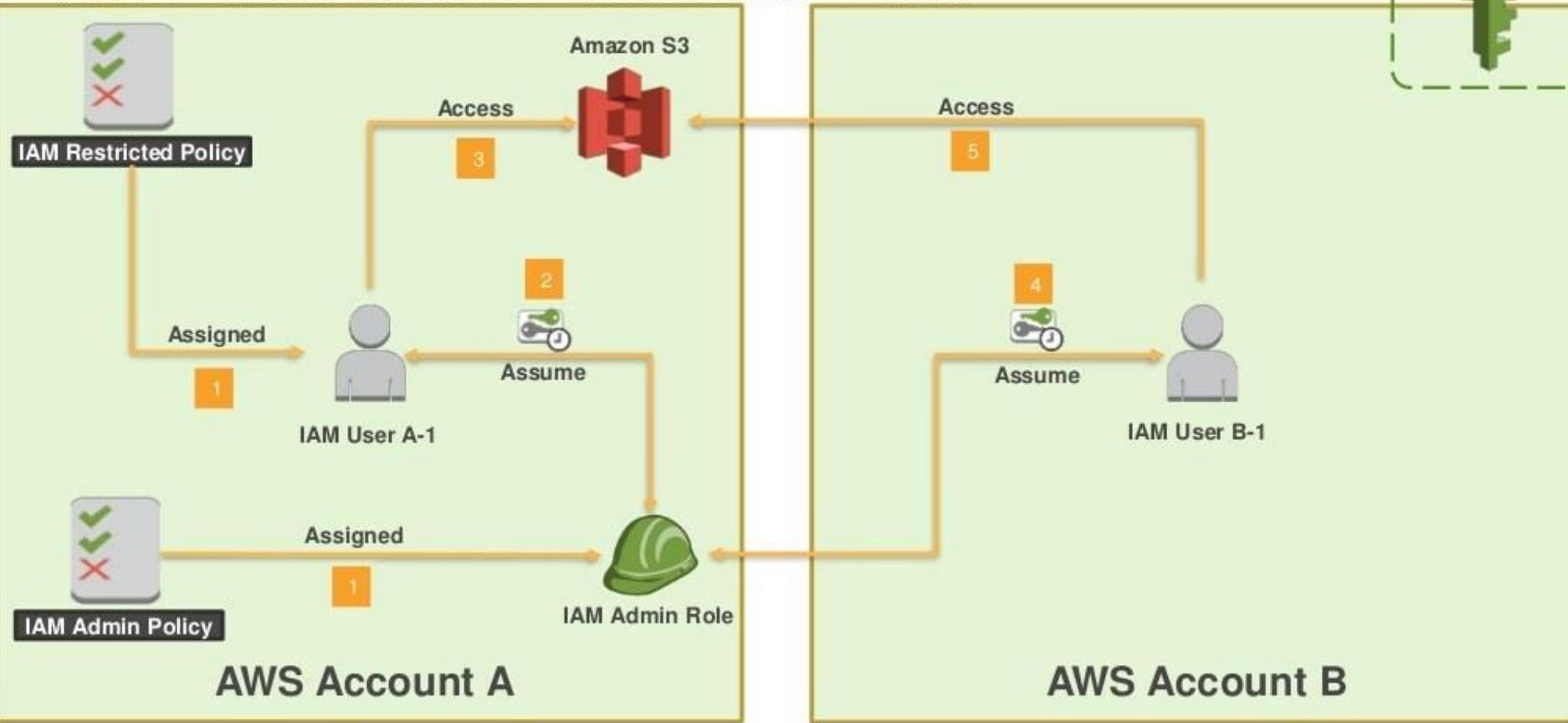
Amazon S3



Application interacts with S3

EC2 MetaData Service
<http://169.254.169.254/latest/meta-data/iam/security-credentials/rolename>

AWS IAM Roles – Assume Role



Temporary Security Credentials (AWS STS)



Session

- Access Key ID
- Secret Access Key
- Session Token
- Expiration

Temporary Security Credentials

15 minutes to 36 hours



Use Cases

- Cross account access
- Federation
- Mobile Users
- Key rotation for Amazon EC2-based apps

Application Authentication



AWS IAM Authentication and Authorization



Authentication

- **AWS Management Console**
 - User Name and Password
- **AWS CLI or SDK API**
 - Access Key and Secret Key



IAM User



IAM Group



IAM Roles

Authorization

- Policies

AWS IAM Best Practices



- **Delete** AWS account (root) access keys.
- Create **individual** IAM users.
- **Use groups** to assign permissions to IAM users.
- Grant **least privilege**.
- Configure a **strong password policy**.
- Enable **MFA** for privileged users.



AWS IAM Best Practices (cont.)



- Use **roles for applications** that run on Amazon EC2 instances.
- Delegate by **using roles** instead of by sharing credentials.
- **Rotate credentials** regularly.
- **Remove unnecessary** users and credentials.
- Use **policy conditions** for extra security.
- **Monitor activity** in your AWS account.

AWS CloudTrail



- Records AWS API calls for accounts.
- Delivers log files with information to an Amazon S3 bucket.
- Logs calls made using the AWS Management Console, AWS SDKs, AWS CLI and higher-level AWS services.



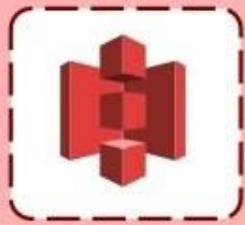
Instructor Demo

IAM

Object Storage Service

Amazon S3

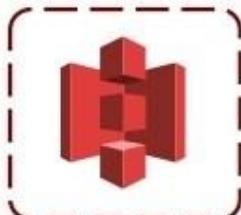
Amazon Simple Storage Service (S3)



Amazon S3

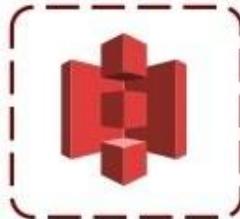
- Storage for the Internet
- Natively online, HTTP/S access
- Storage that allows you to store and retrieve **any amount of data**, any time, from anywhere on the web
- **Highly scalable**, reliable, fast and durable

Amazon S3 Facts



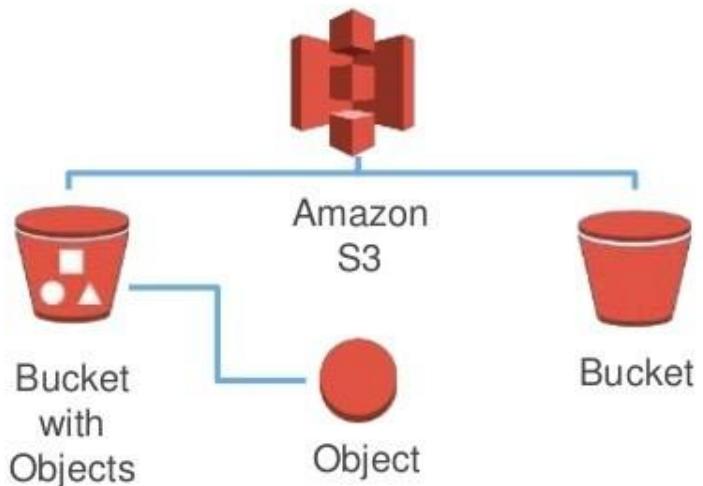
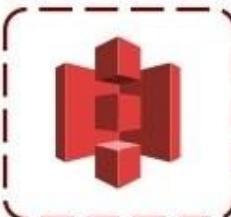
- Can store an **unlimited number of objects** in a bucket
- Objects can be **up to 5 TB**; no bucket size limit
- Designed for **99.999999999%** durability and **99.99%** availability of objects over a given year
- Can use **HTTP/S** endpoints to store and retrieve any amount of data, at any time, from anywhere on the web
- Is highly scalable, reliable, fast, and inexpensive
- Can use optional server-side **encryption** using AWS or customer-managed provided client-side encryption
- Auditing is provided by access logs
- Provides standards-based **REST** and **SOAP** interfaces

Common Use Scenarios



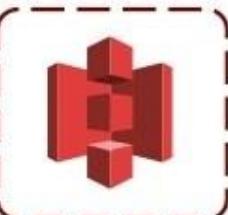
- Storage and backup
- Application file hosting
- Media hosting
- Software delivery
- Store AMIs and snapshots

Amazon S3 Concepts



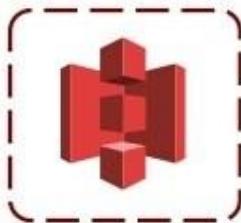
- Amazon S3 stores data as objects within **buckets**
- An object is composed of a file and optionally any **metadata** that describes that file
- You **control access** to the bucket and its objects

Amazon S3 Objects



- Objects are the fundamental entities stored in Amazon S3.
- When using the console, you can think of them as files.
- **Objects consist of data and metadata.** The data portion is opaque to Amazon S3. The metadata is a set of name-value pairs that describe the object.
 - Default metadata such as the date last modified
 - Standard HTTP metadata such as Content-Type
 - Custom metadata at the time the object is stored
 - A key that uniquely identifies the object within its bucket

Object Keys



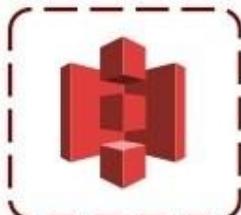
An object key is the unique identifier for an object in a bucket.

`http://doc.s3.amazonaws.com/2017-07-28/AmazonS3.html`

Bucket

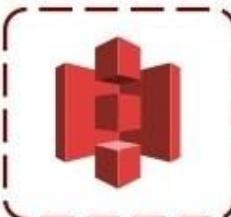
Object Key

Amazon S3 Region Considerations



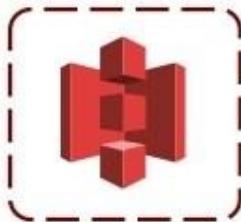
- Amazon S3 creates a bucket in the region you select.
- You can choose a region to:
 - Optimize latency
 - Minimize costs
 - Address regulatory requirements
- Objects stored in a region never leave the region unless you explicitly transfer them to another region.

Amazon S3 Security



- You can **control access** to buckets and objects with:
 - Access Control Lists (ACLs)
 - Bucket policies
 - Identity and Access Management (IAM) policies
- You can upload or download data to Amazon S3 via **SSL** encrypted endpoints.
- You can **encrypt data** Client-Side using AWS SDKs.

Amazon S3 Versioning

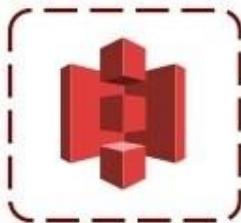


- Protects from **accidental overwrites and deletes** with no performance penalty.
- Generates a **new version with every upload**.
- Allows easily retrieval of deleted objects or **roll back** to previous versions.
- Three states of an Amazon S3 bucket
 - Un-versioned (default)
 - Versioning-enabled
 - Versioning-suspended



Versioning Enabled

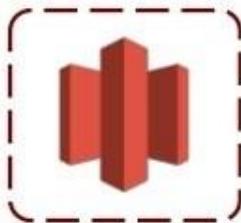
Amazon S3 Pricing



- Pay only for what you use
- No minimum fee
- Prices based on location of your Amazon S3 bucket
- Estimate monthly bill using the **AWS Simple Monthly Calculator**
- Pricing is available as:
 - Storage Pricing
 - Request Pricing
 - Data Transfer Pricing: data transferred out of Amazon S3



Amazon Glacier

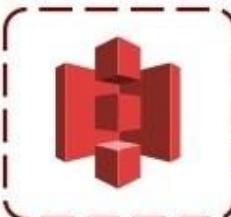


- Long term low-cost archiving service
- Optimal for infrequently accessed data
- Designed for 99.99999999% durability
- Retrieval time
 - Expedited: 1 – 5 minutes
 - Standard: 3 – 5 hours
 - Bulk: 5 – 12 hours
- \$0.0045 per GB/month in Canada (Central) region

Amazon S3 Storage Classes

Storage Class	Durability	Availability	Other Considerations
Amazon S3 Standard	99.99999999%	99.99%	
Amazon S3 Standard - Infrequent Access (IA)	99.99999999%	99.9%	<ul style="list-style-type: none">• Retrieval fee associated with objects• Most suitable for infrequently accessed data
Glacier	99.99999999%	99.99% (once restored)	<ul style="list-style-type: none">• Not available for real-time access• Must restore objects before you can access them• Restoring objects can take 1-5 minutes, 3-5 hours or 5-12 hours

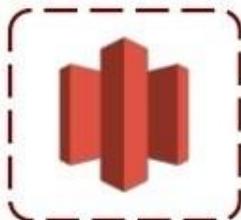
Amazon S3 Object Lifecycle



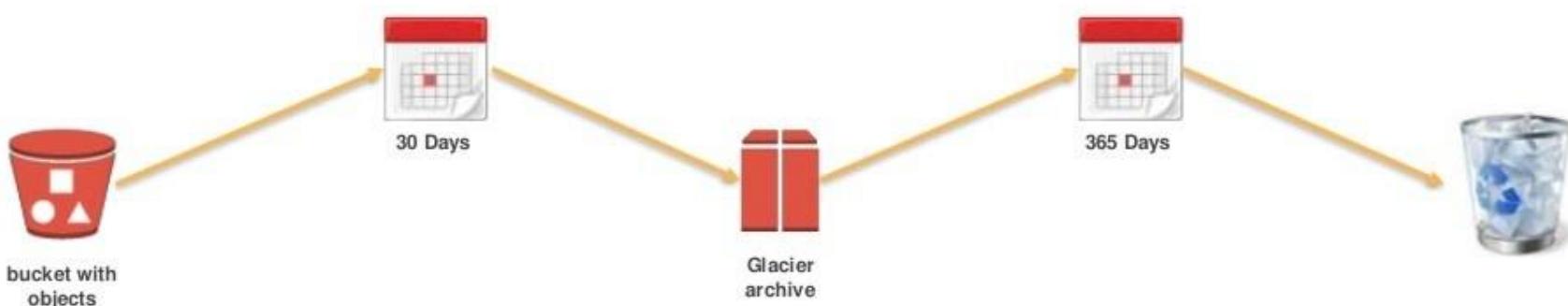
Lifecycle management defines how Amazon S3 manages objects during their lifetime. Some objects that you store in an Amazon S3 bucket might have a well-defined lifecycle:

- Log files
- Archive documents
- Digital media archives
- Financial and healthcare records
- Raw genomics sequence data
- Long-term database backups
- Data that must be retained for regulatory compliance

Amazon S3 + Amazon Glacier



S3 Lifecycle policies allow you to delete or move objects based on age and set rules per S3 bucket.



Amazon EBS and Amazon S3



	Amazon EBS	Amazon S3
Paradigm	Block storage with file system	Object store
Performance	Very fast	Fast
Redundancy	Across multiple servers in an Availability Zone	Across multiple facilities in a Region
Security	EBS Encryption – Data volumes and Snapshots	Encryption
Access from the Internet?	No (1)	Yes (2)
Typical use case	It is a disk drive	Online storage

- (1) Accessible from the Internet if mounted to server and served with FTP, etc.
(2) Only with proper credentials, unless ACLs are world-readable

Instructor Demo

Amazon S3

Module 3

Databases

SQL and NoSQL Databases

	SQL	NoSQL
Data Storage	Rows and Columns	Key-Value, documents, graphs
Schemas	Fixed	Dynamic
Querying	Using SQL	Focused on collection of documents
Scalability	Vertical	Horizontal

SQL

ISBN	Title	Author	Format
9182932465265	Cloud Computing Concepts	Wilson, Joe	Paperback
3142536475869	The Database Guru	Gomez, Maria	eBook

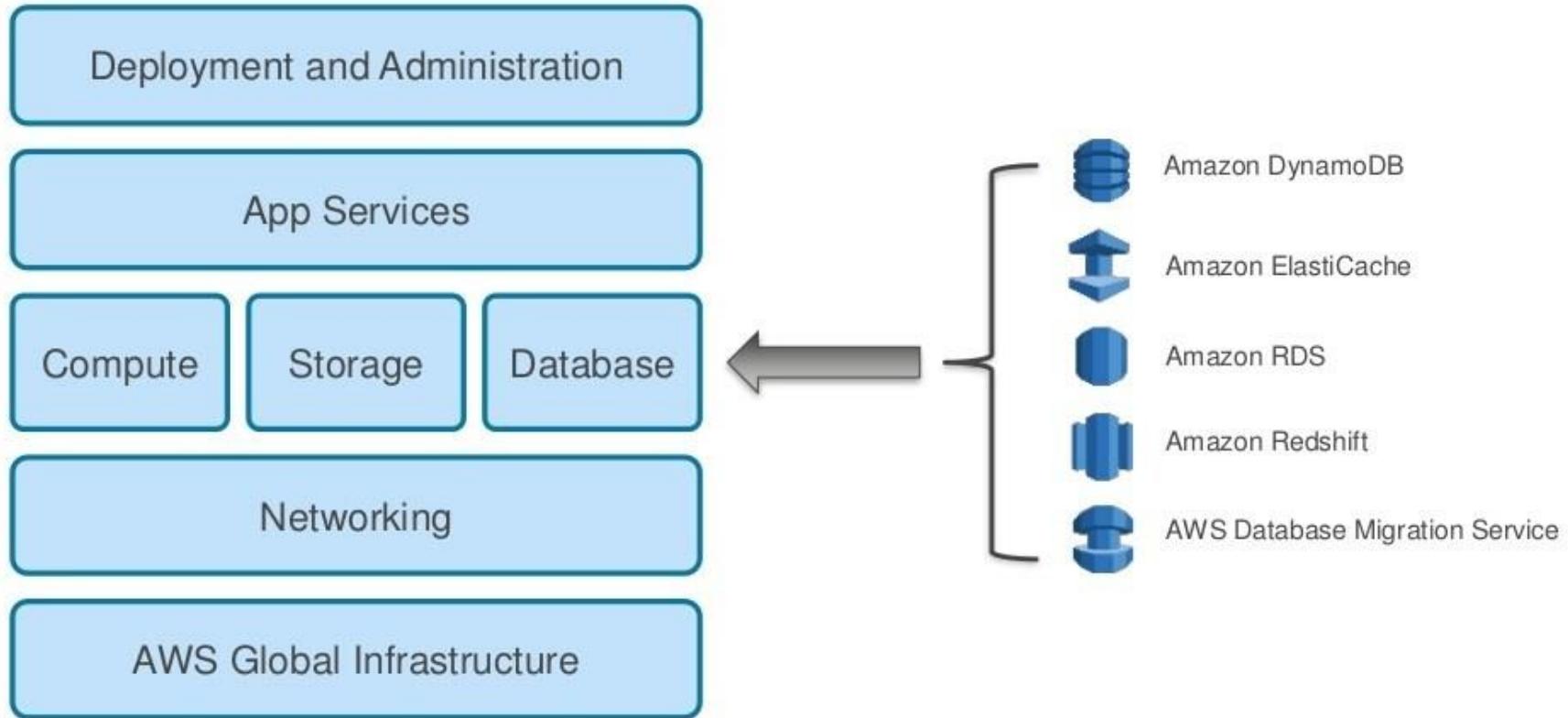
NoSQL

```
{  
  ISBN: 9182932465265,  
  Title: "Cloud Computing Concepts",  
  Author: "Wilson, Joe",  
  Format: "Paperback"  
}
```

Data Storage Considerations

- No one size fits all.
- Analyze your data requirements by considering:
 - Data formats
 - Data size
 - Query frequency
 - Data access speed
 - Data retention period

AWS Managed Database Services



Amazon Relational Database Service (RDS)



Amazon
RDS

- Cost-efficient and **resizable capacity**
- Manages time-consuming **database administration** tasks
- Access to the full capabilities of **Amazon Aurora, MySQL, MariaDB, Microsoft SQL Server, Oracle, and PostgreSQL** databases

Amazon RDS



- Simple and **fast to deploy**
- Manages common database administrative tasks
- **Compatible** with your applications
- Fast, predictable performance
- Simple and **fast to scale**
- Secure
- Cost-effective



DB Instances



- DB Instances are the basic building blocks of Amazon RDS.
- They are an **isolated database environment** in the cloud.
- They can **contain multiple user-created databases**.

How Amazon RDS Backups Work



Automatic Backups:

- Restore your database to a point in time.
- Are enabled by default.
- Let you choose a retention period up to 35 days.



Manual Snapshots:

- Let you build a new database instance from a snapshot.
- Are initiated by the user.
- Persist until the user deletes them.
- Are stored in Amazon S3.

Cross-Region Snapshots



- Are a **copy** of a **database** snapshot stored in a **different AWS Region**.
- Provide a backup for disaster **recovery**.
- Can be used as a **base** for **migration** to a different region.

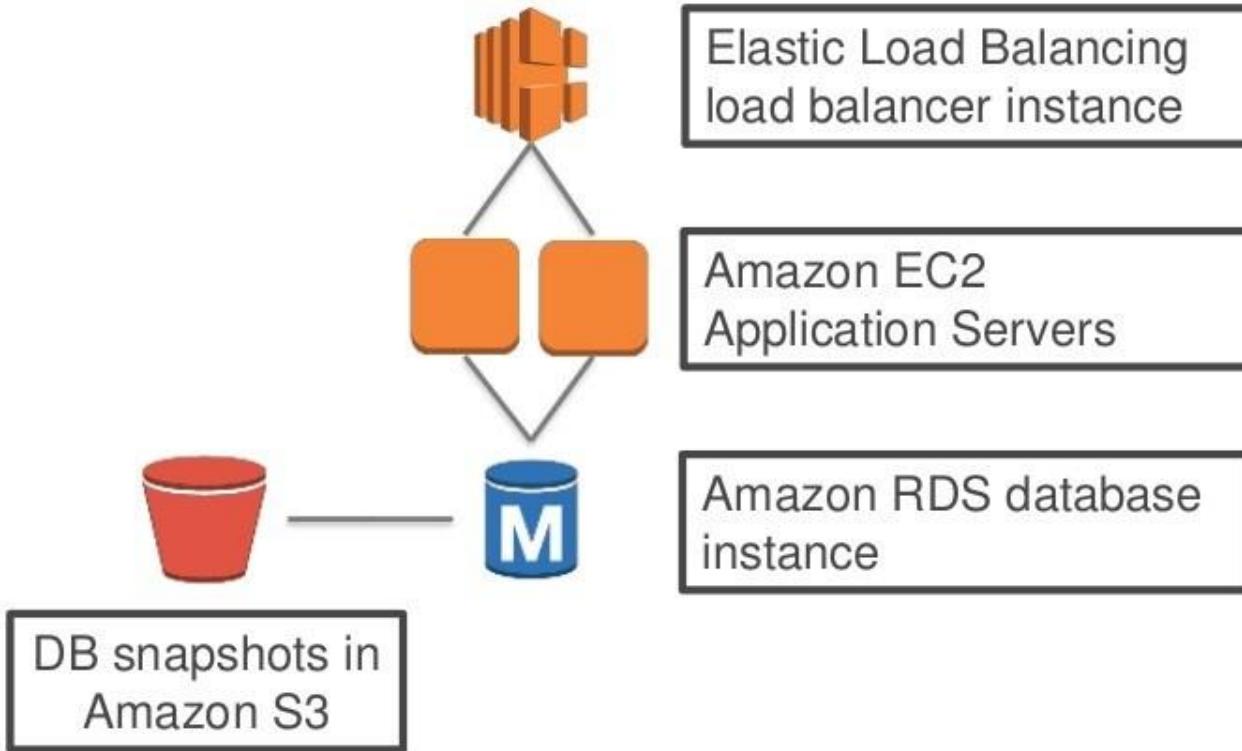


Amazon RDS Security



- Run your DB instance in an **Amazon VPC**.
- Use **IAM policies** to grant access to RDS resources.
- Use **Security Groups**.
- Use Secure Socket Layer (**SSL**) connections with DB instances (Amazon Aurora, Oracle, MySQL, MariaDB, PostgreSQL, Microsoft SQL Server).
- Use RDS **encryption** to secure instances and snapshots at rest.
- Use network encryption and transparent data encryption (**TDE**) with Oracle DB and Microsoft SQL Server instances.
- Use security features of your DB engine to **control access** to DB instance.

A Simple Application Architecture

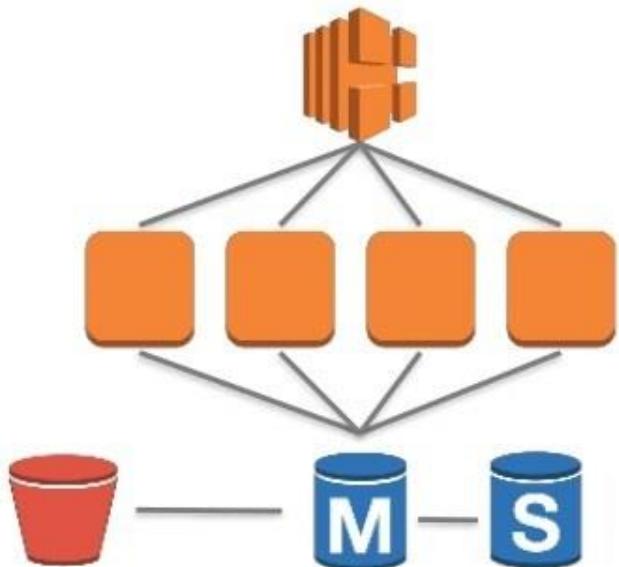


Multi-AZ RDS Deployment



- With **Multi-AZ** operation, your database is **synchronously replicated to another Availability Zone** in the same AWS Region.
- **Failover** to the standby **automatically** occurs in case of master database failure.
- Planned maintenance is applied first to standby databases.

A Resilient, Durable Application Architecture



Elastic Load Balancing
load balancer instance

Application, in Amazon
EC2 instances

Amazon RDS database instances:
Master and Multi-AZ standby

DB snapshots in
Amazon S3

Amazon RDS Best Practices

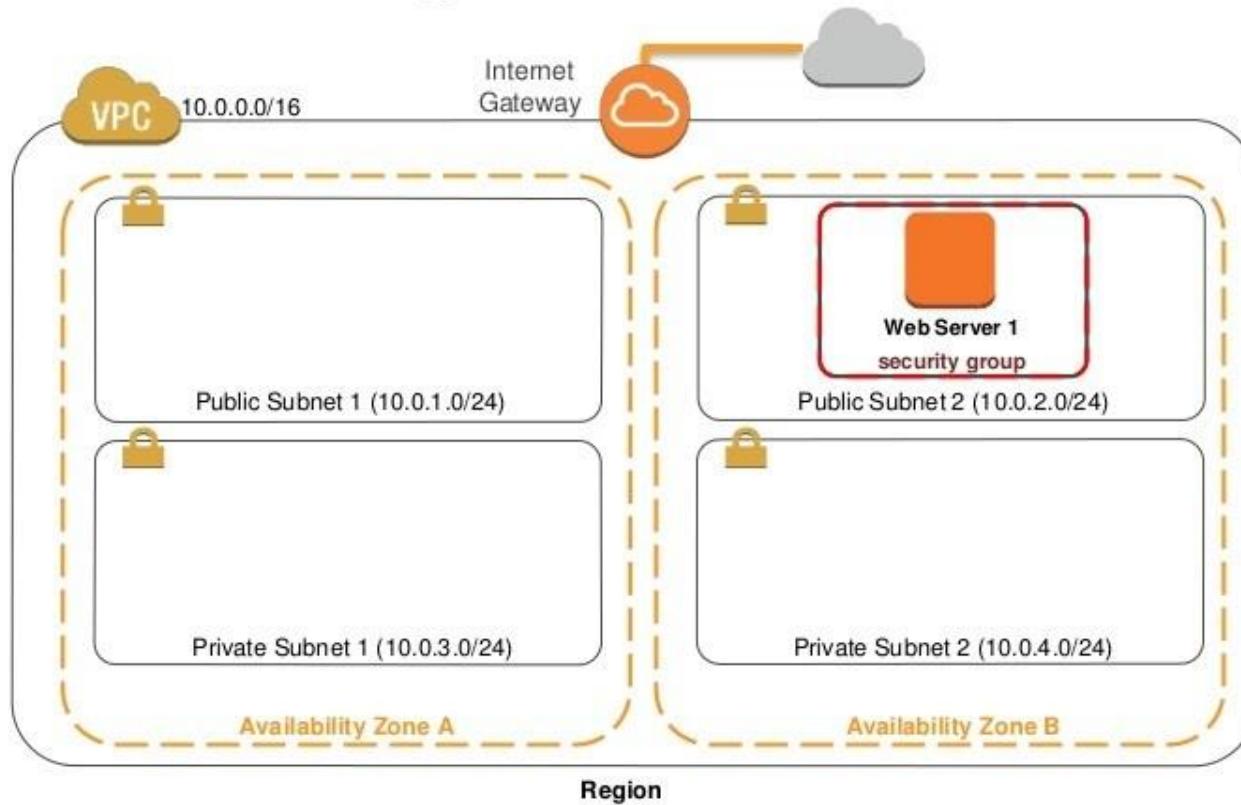


- **Monitor** your memory, CPU, and storage usage.
- Use **Multi-AZ** deployments to automatically provision and maintain a synchronous standby in a different Availability Zone.
- Enable **automatic backups**.
- Set the **backup window** to occur during the daily low in WriteIOPS.
- To increase the I/O capacity of a DB instance:
 - Migrate to a DB instance class with high I/O capacity.
 - Convert from standard storage to provisioned IOPS storage and use a DB instance class optimized for **provisioned IOPS**.
 - Provision additional throughput capacity (if using provisioned IOPS storage).
- If your client application is caching the DNS data of your DB instances, set a TTL of less than 30 seconds.
- **Test** failover for your DB instance.

Instructor Demo (Part 1)

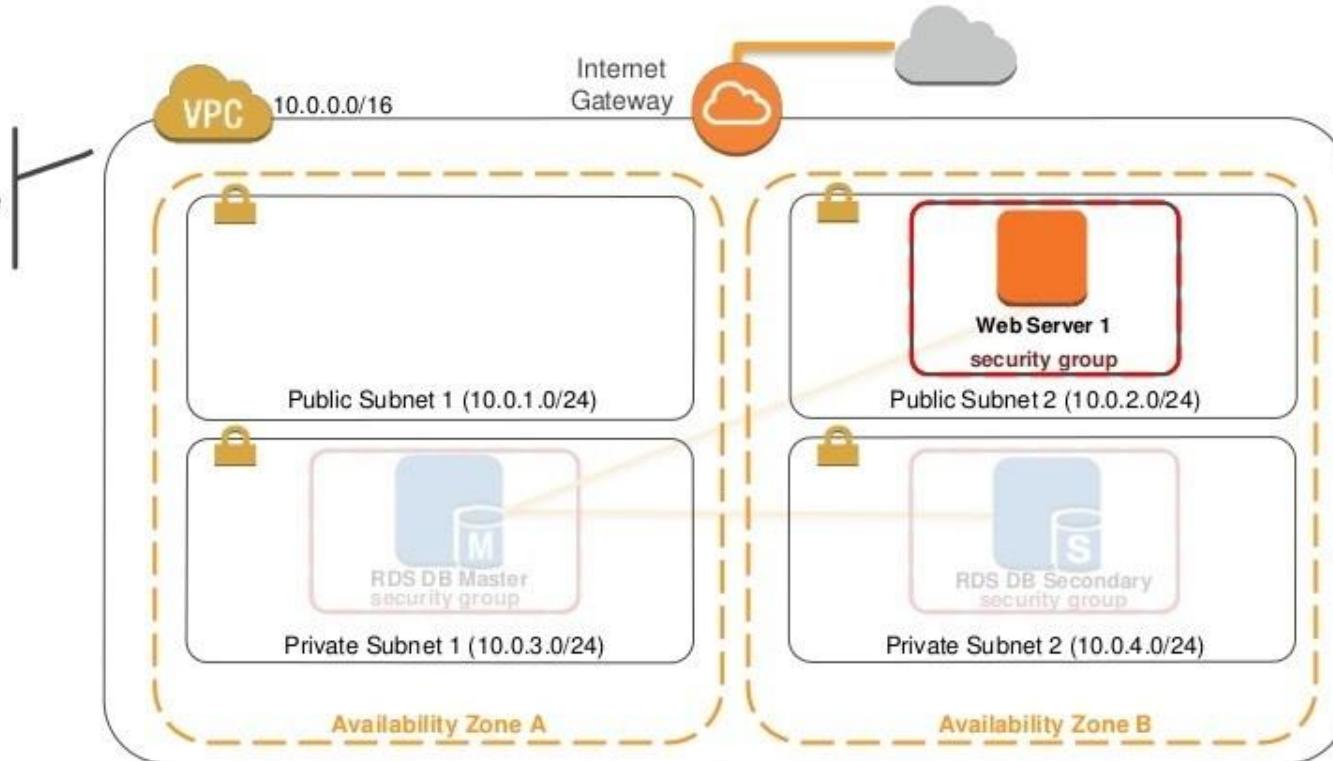
Build a database server

What We're Starting With



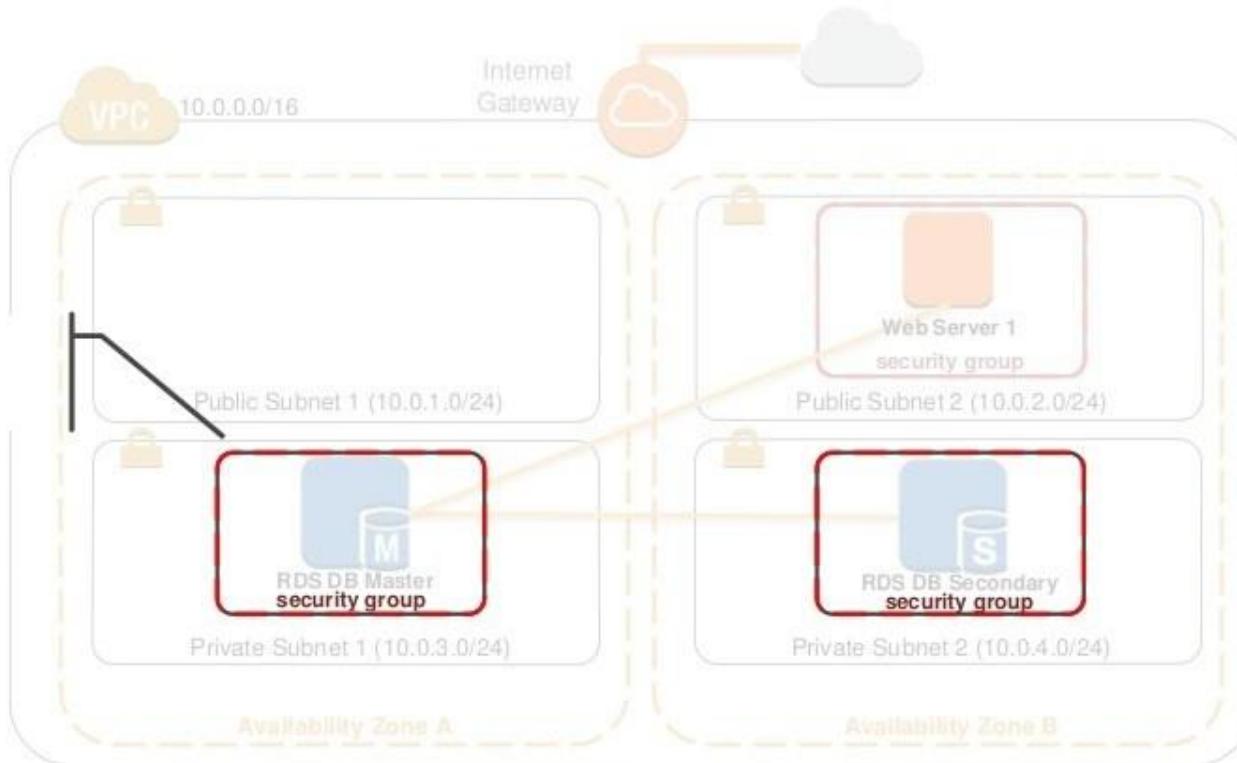
Build a Database Server and Connect to It

Lab environment starts with the following resources

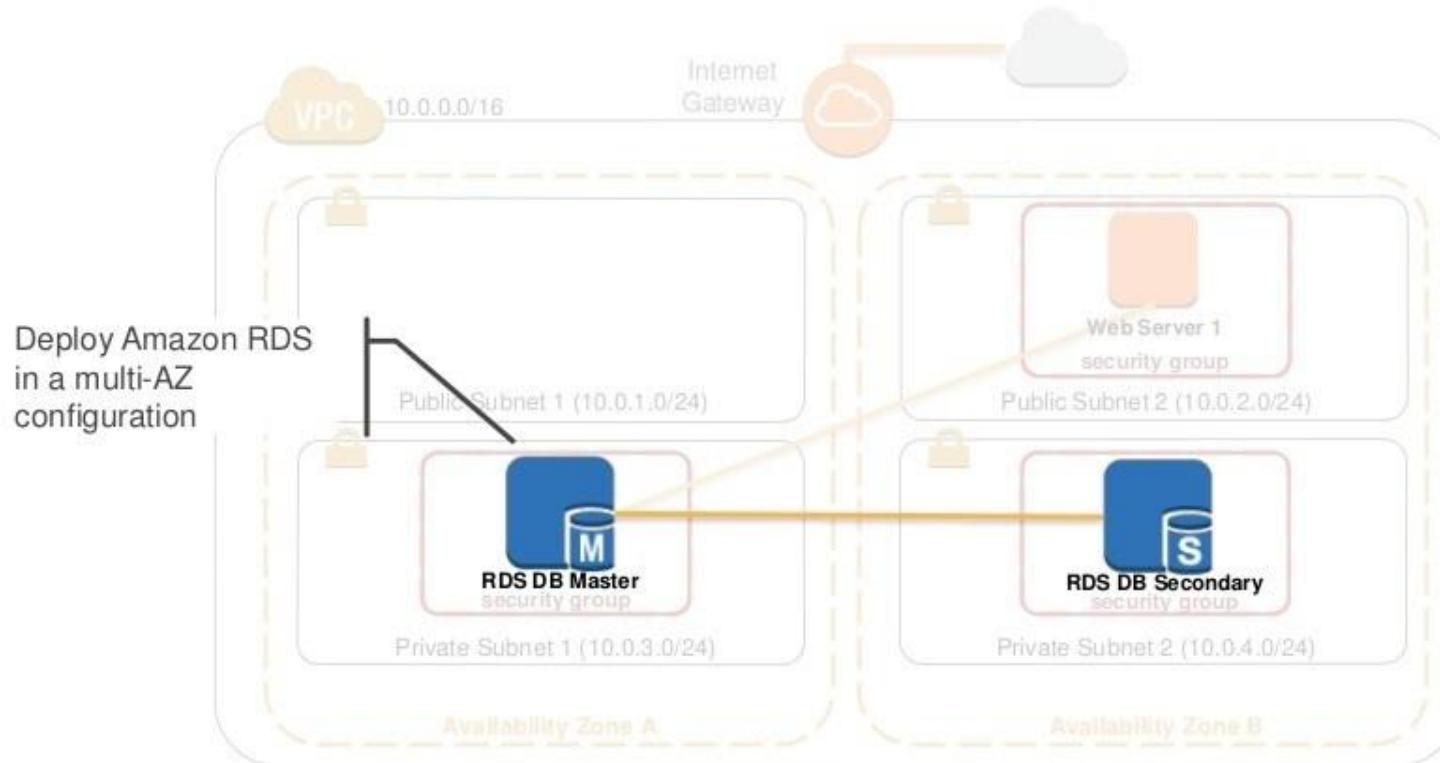


Build a Database Server and Connect to It

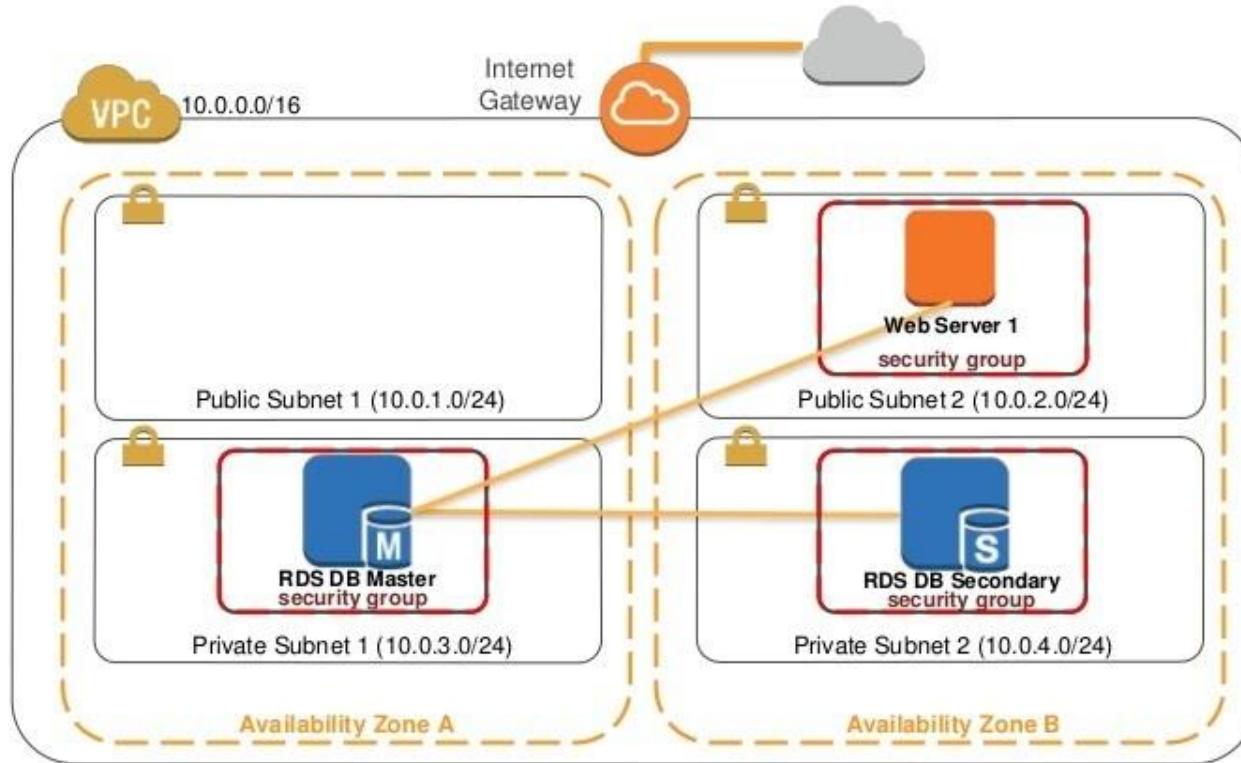
Create a security group for the RDS instances



Build a Database Server and Connect to It



Build a Database Server and Connect to It



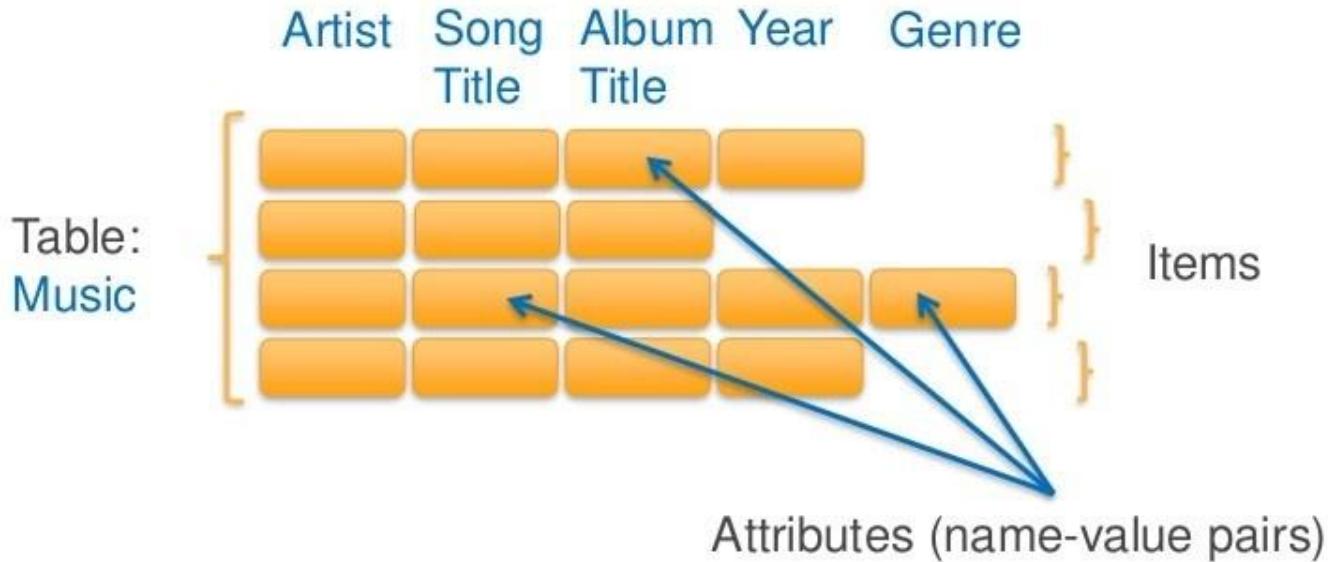
Amazon DynamoDB



Amazon
DynamoDB

- Allows you to store any amount of data with **no limits**.
- Provides fast, predictable performance using **SSDs**.
- Allows you to easily provision and change the **request capacity** needed for each table.
- Is a **fully managed, NoSQL** database service.

DynamoDB Data Model



Primary Keys



Table: Music
Partition Key: Artist
Sort Key: Song Title

Provisioned Throughput



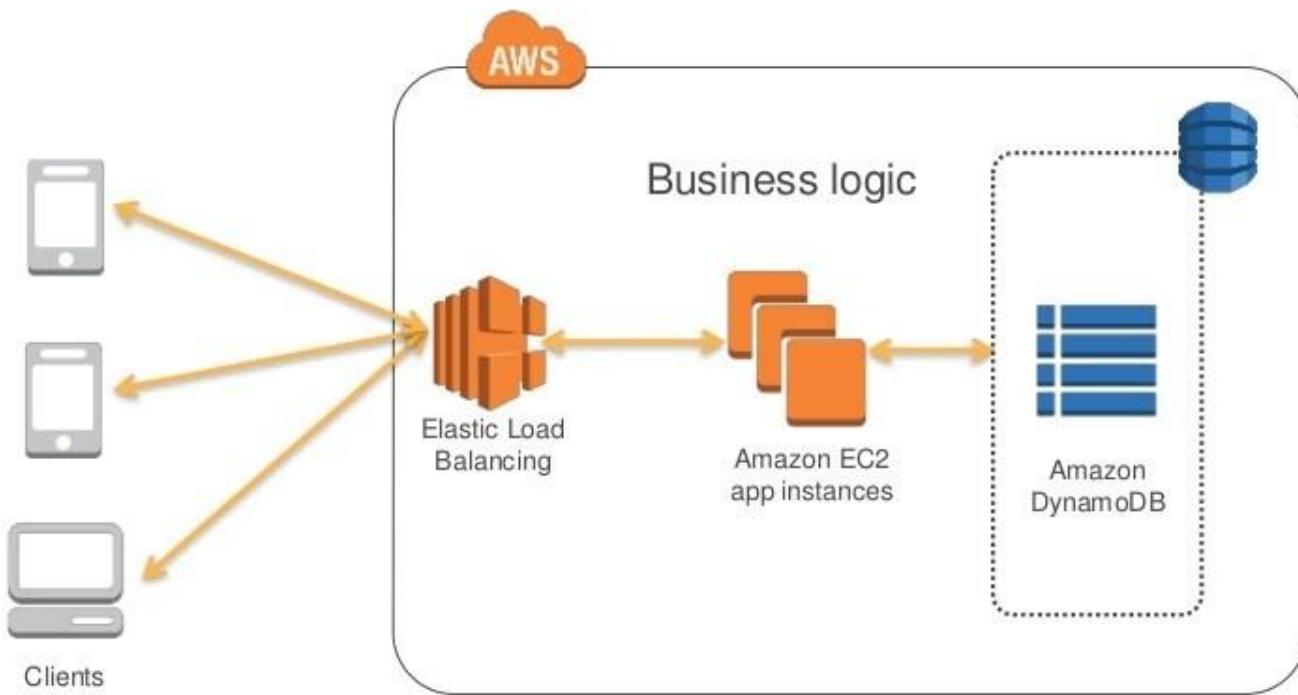
- You specify how much **provisioned throughput capacity** you need for reads and writes.
- Amazon DynamoDB allocates the necessary machine resources to meet your needs.

Supported Operations



- **Query:**
 - Query a table using the partition key and an optional sort key filter.
 - If the table has a secondary index, query using its key.
 - It is the **most efficient way to retrieve items** from a table or secondary index.
- **Scan:**
 - You can scan a table or secondary index.
 - Scan reads every item – **slower than querying**.
- You can use conditional expressions in both Query and Scan operations.

Simple Application Architecture



Amazon RDS and Amazon DynamoDB

Factors	Relational (Amazon RDS)	NoSQL (Amazon DynamoDB)
Application Type	<ul style="list-style-type: none">Existing database appsBusiness process–centric apps	<ul style="list-style-type: none">New web-scale applicationsLarge number of small writes and reads
Application Characteristics	<ul style="list-style-type: none">Relational data models, transactionsComplex queries, joins, and updates	<ul style="list-style-type: none">Simple data models, transactionsRange queries, simple updates
Scaling	Application or DBA –architected (clustering, partitions, sharding)	Seamless, on-demand scaling based on application requirements
QoS	<ul style="list-style-type: none">Performance—depends on data model, indexing, query, and storage optimizationReliability and availabilityDurability	<ul style="list-style-type: none">Performance—Automatically optimized by the systemReliability and availabilityDurability

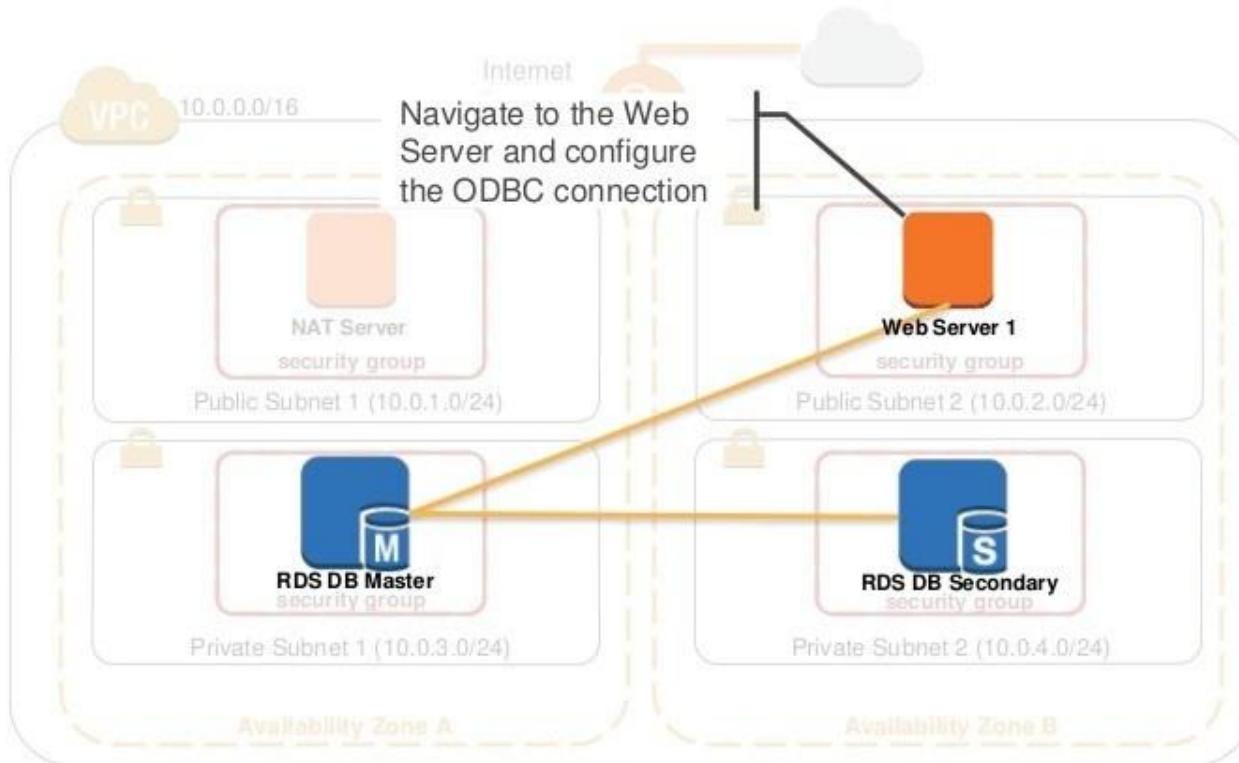
Database Considerations

If You Need	Consider Using	
A relational database service with minimal administration	Amazon RDS <ul style="list-style-type: none">• Choice of Amazon Aurora, MySQL, MariaDB, Microsoft SQL Server, Oracle, or PostgreSQL database engines• Scale compute and storage• Multi-AZ availability	
A fast, highly scalable NoSQL database service	Amazon DynamoDB <ul style="list-style-type: none">• Extremely fast performance• Seamless scalability and reliability• Low cost	
A database you can manage on your own	Your choice of AMIs on Amazon EC2 and EBS that provide scaling for compute and storage, complete control over instances, and more.	

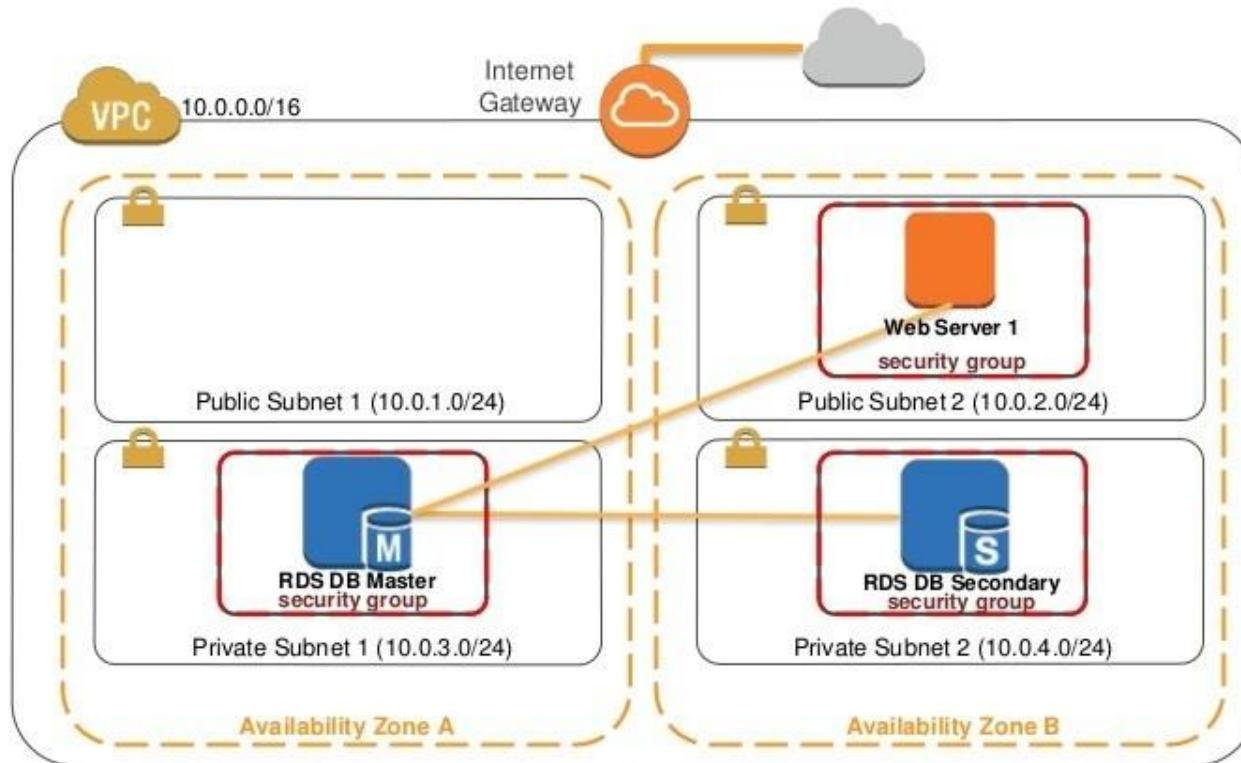
Instructor Demo (Part 2)

Interact with the database using
an application

Build a Database Server and Connect to It



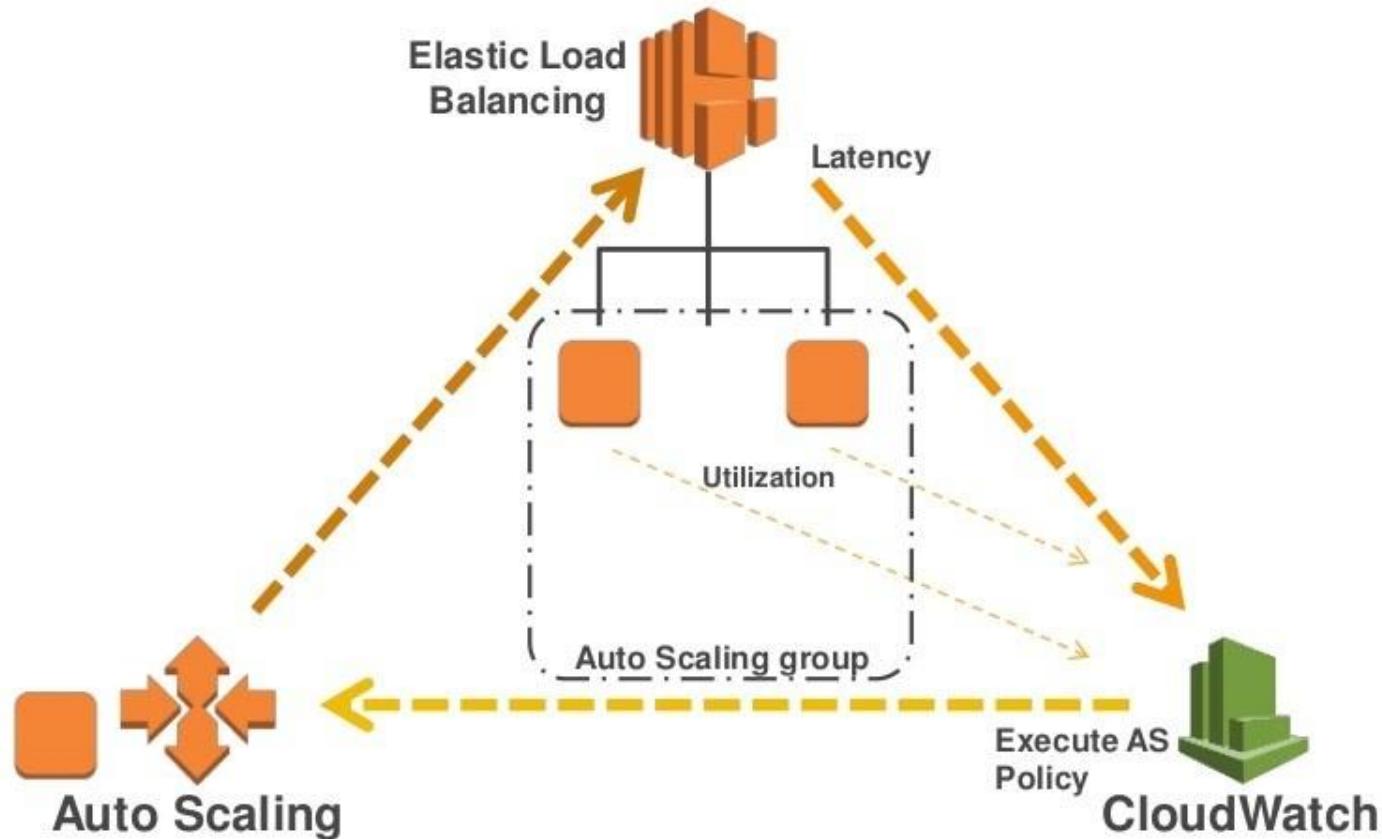
Build a Database Server and Connect to It



Module 4

AWS Elasticity and Management Tools

Triad of Services



Elastic Load Balancing



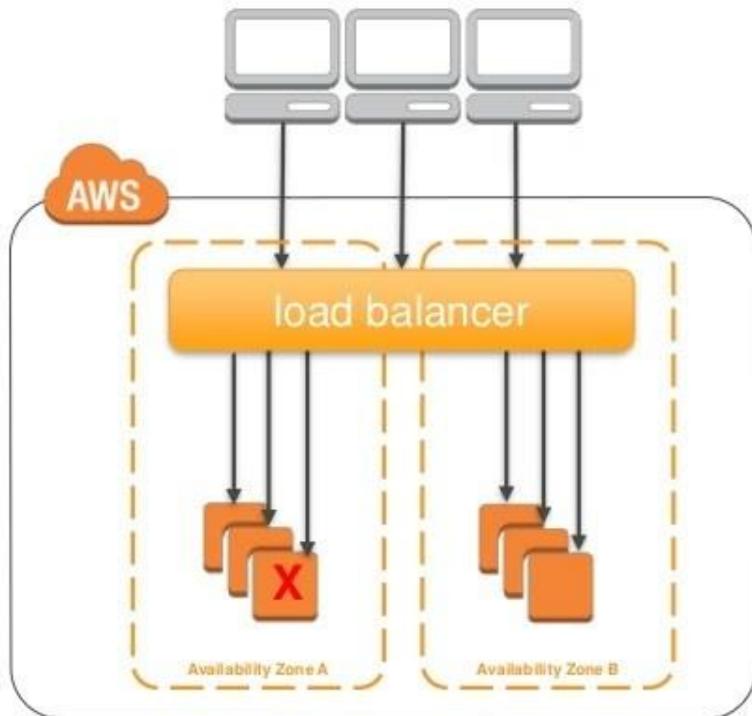
Elastic Load
Balancing

- **Distributes** traffic across multiple EC2 instances, in multiple Availability Zones
- Supports **health checks** to detect unhealthy Amazon EC2 instances
- Supports the **routing and load balancing** of HTTP, HTTPS, SSL, and TCP traffic to Amazon EC2 instances

Classic Load Balancer - How It Works



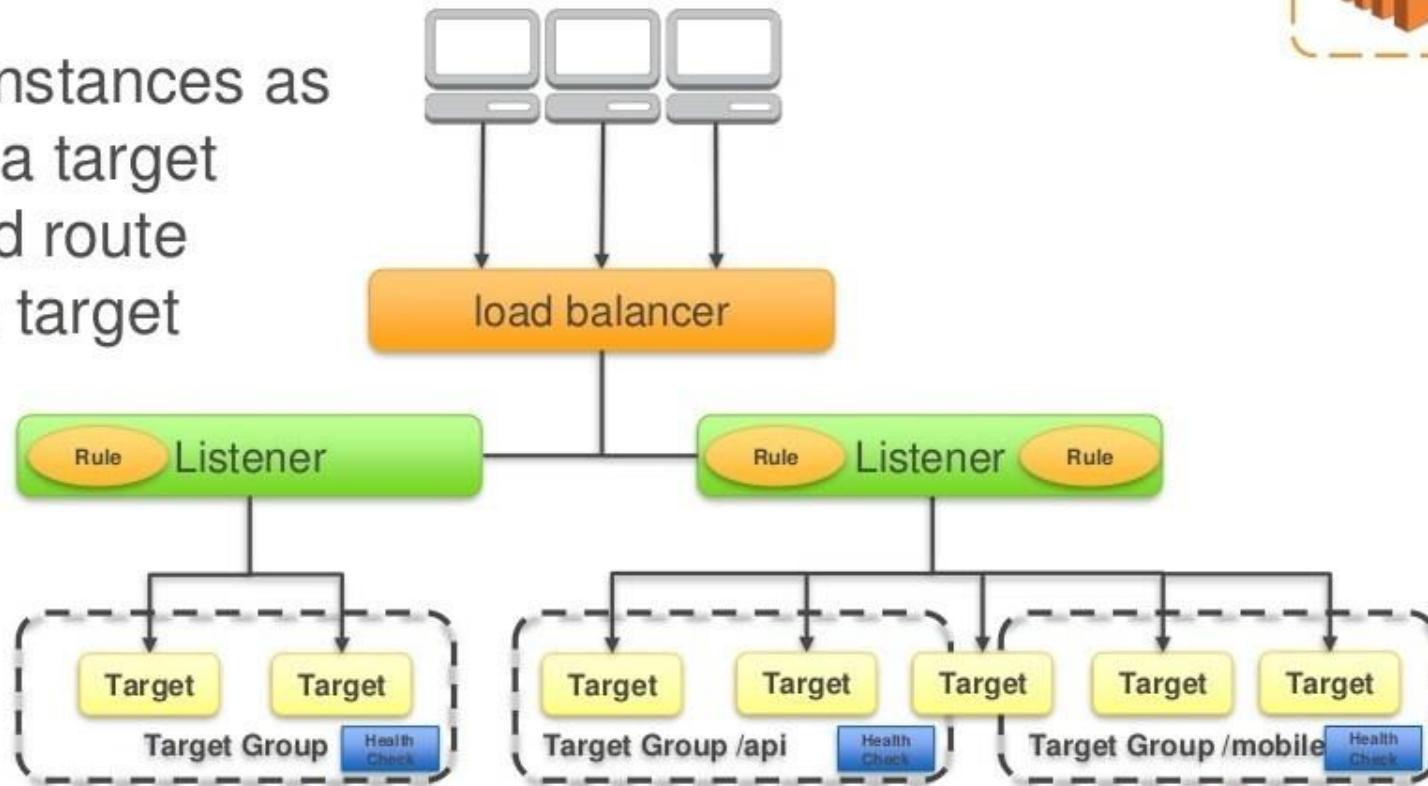
Register instances with your load balancer.



Application Load Balancer – How It Works



Register instances as targets in a target group, and route traffic to a target group.



Load Balancer Comparison



Classic Load Balancer benefits include support for:

- VPC.
- TCP and SSL listeners.
- Sticky sessions.
- OSI Layer 4 and 7

ALB benefits include support for:

- Path and Host Header based routing.
- Routing requests to multiple services on a single EC2 instance.
- Containerized applications.
- Monitoring the health of each service independently.
- OSI Layer 7

Amazon CloudWatch



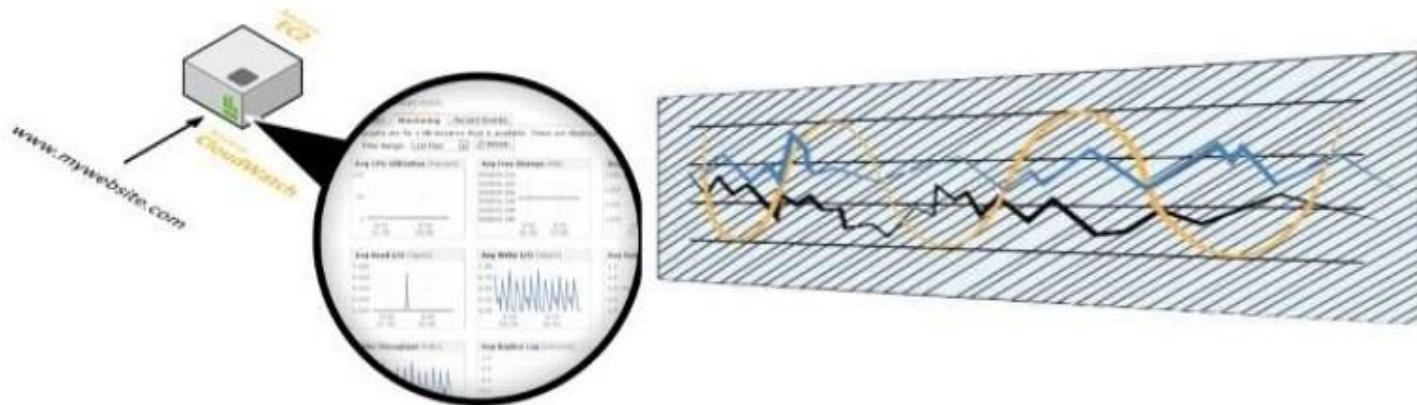
Amazon
CloudWatch

- A **monitoring service** for AWS cloud resources and the applications you run on AWS
- **Visibility into** resource utilization, operational performance, and overall demand patterns
- **Custom application-specific** metrics of your own
- **Accessible** via AWS Management Console, APIs, SDK, or CLI

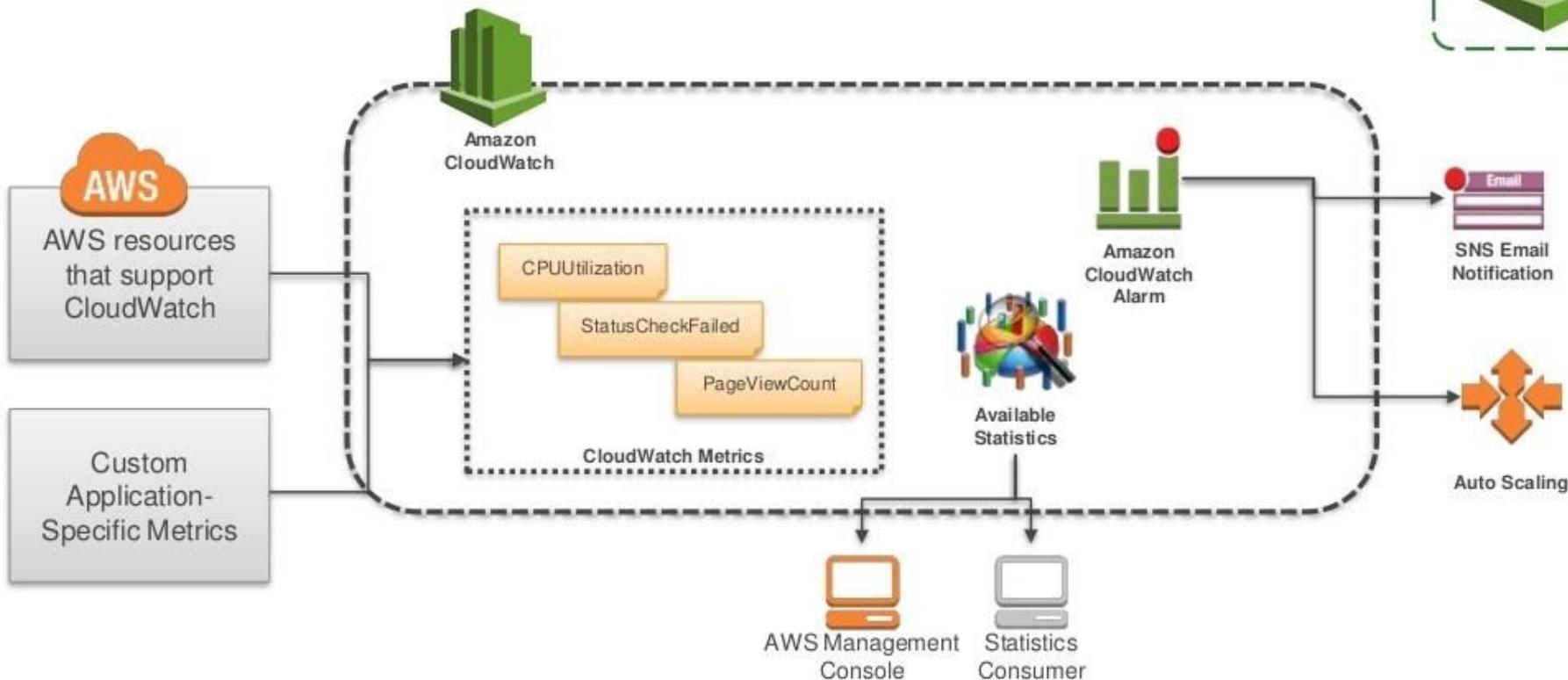
Amazon CloudWatch Facts



- Monitor other AWS resources
 - View graphics and statistics
- Set Alarms



Amazon CloudWatch Architecture

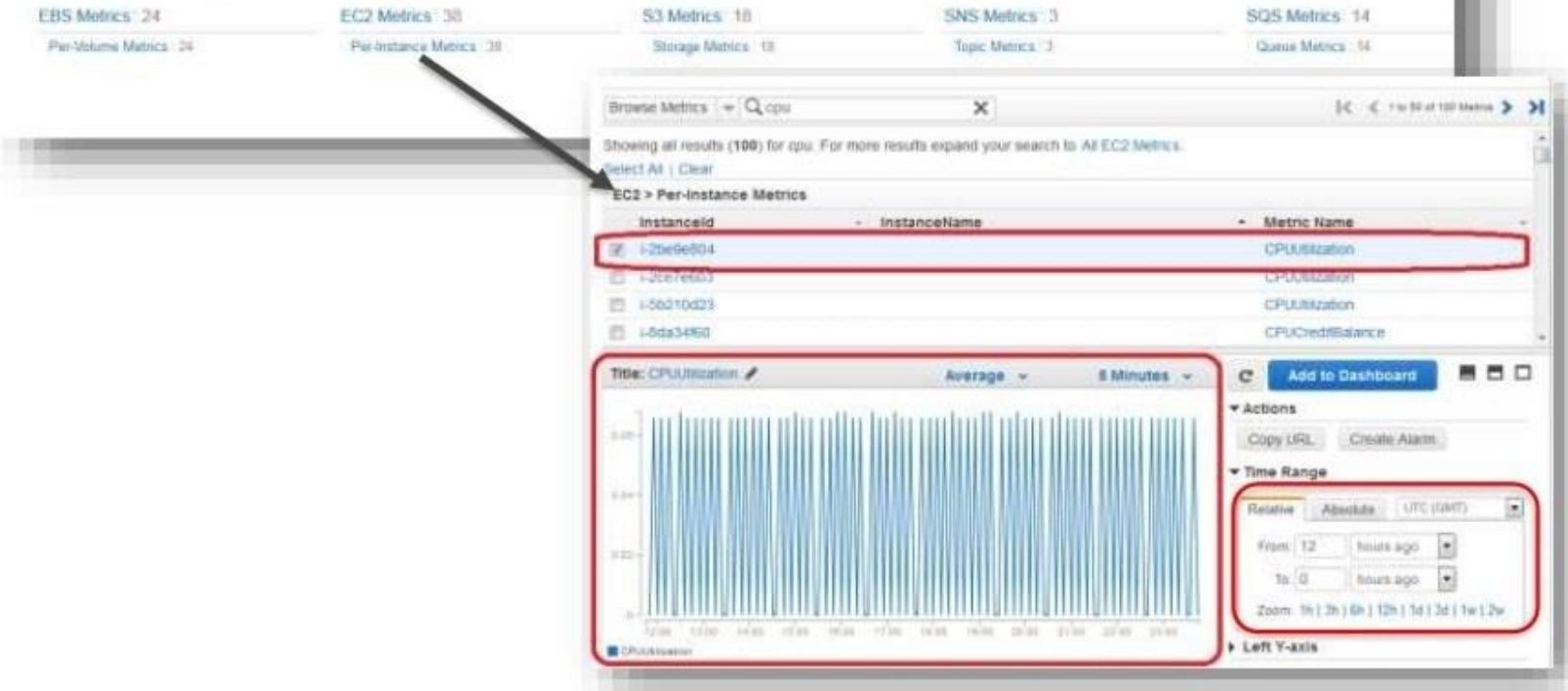


CloudWatch Metrics Examples



CloudWatch Metrics by Category

Your CloudWatch metric summary has loaded. Total metrics: 97



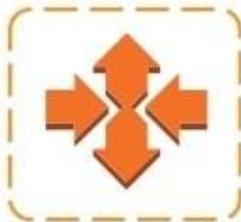
Auto Scaling



Auto
Scaling

- **Scale** your Amazon EC2 capacity **automatically**
- Well-suited for applications that experience **variability in usage**
- Available at no additional charge

Auto Scaling Benefits



Better Fault Tolerance



Better Availability



Better Cost Management



Auto Scaling Components



Launch Configuration

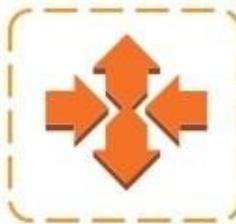


Auto Scaling Group



Scaling Plan

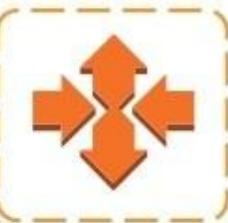
Launch Configurations



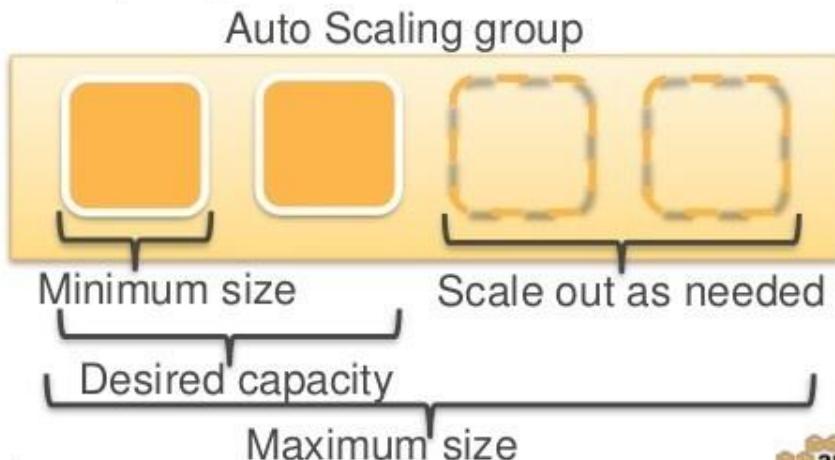
- A **launch configuration** is a template that an Auto Scaling group uses to launch EC2 instances.
- When you create a launch configuration, you can specify:
 - AMI ID
 - Instance type
 - Key pair
 - Security groups
 - Block device mapping
 - User data



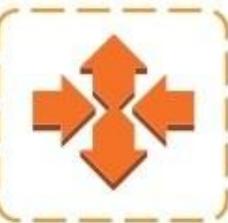
Auto Scaling Groups



- Contain a collection of EC2 instances that share similar characteristics.
- Instances in an Auto Scaling group are treated as a **logical grouping** for the purpose of instance scaling and management.



Scaling Plans



Auto Scaling Minimum

Health Check monitors running instances within an Auto Scaling group.

If an unhealthy instance is found, it can be replaced.

Manual Scaling

Specify a new minimum for your Auto Scaling group.

Manually invoke Auto Scaling policies.

Scheduled Scaling

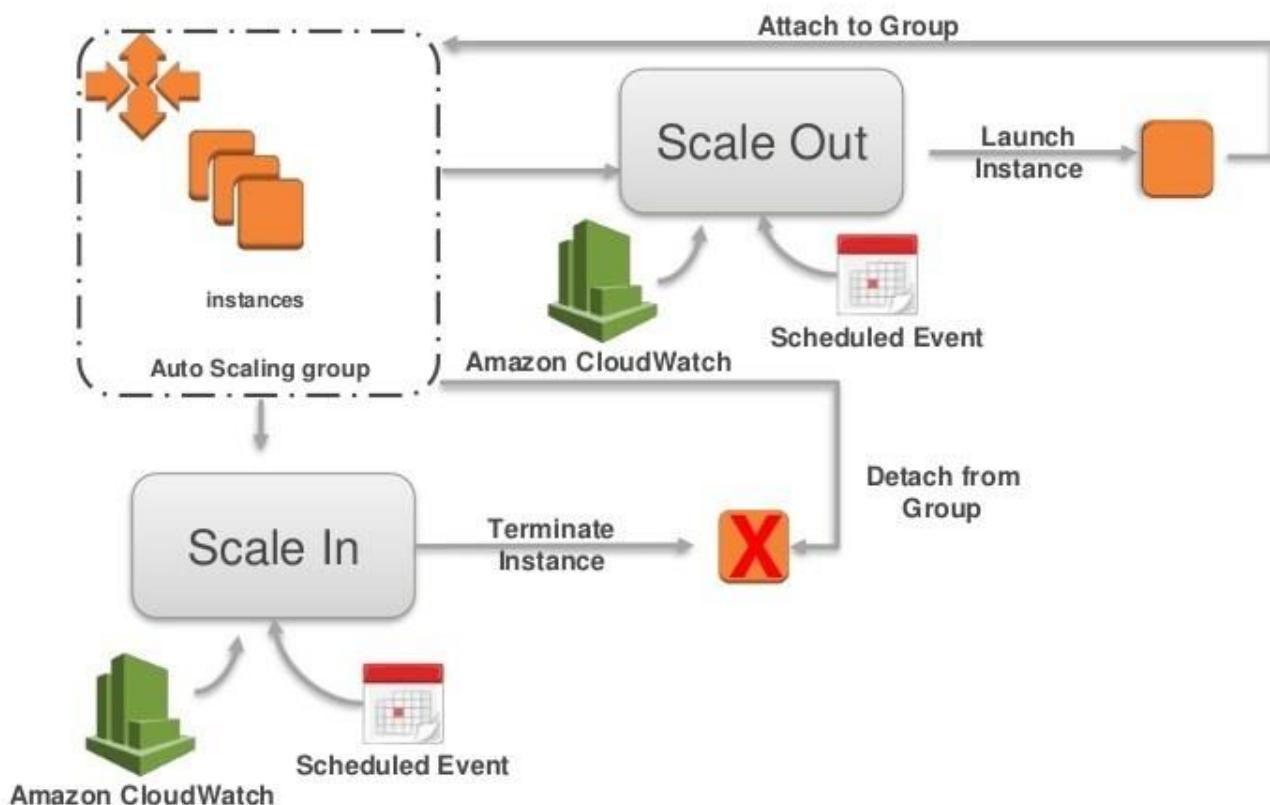
Scaling functions are performed as a function of time and date.

On Demand Scaling

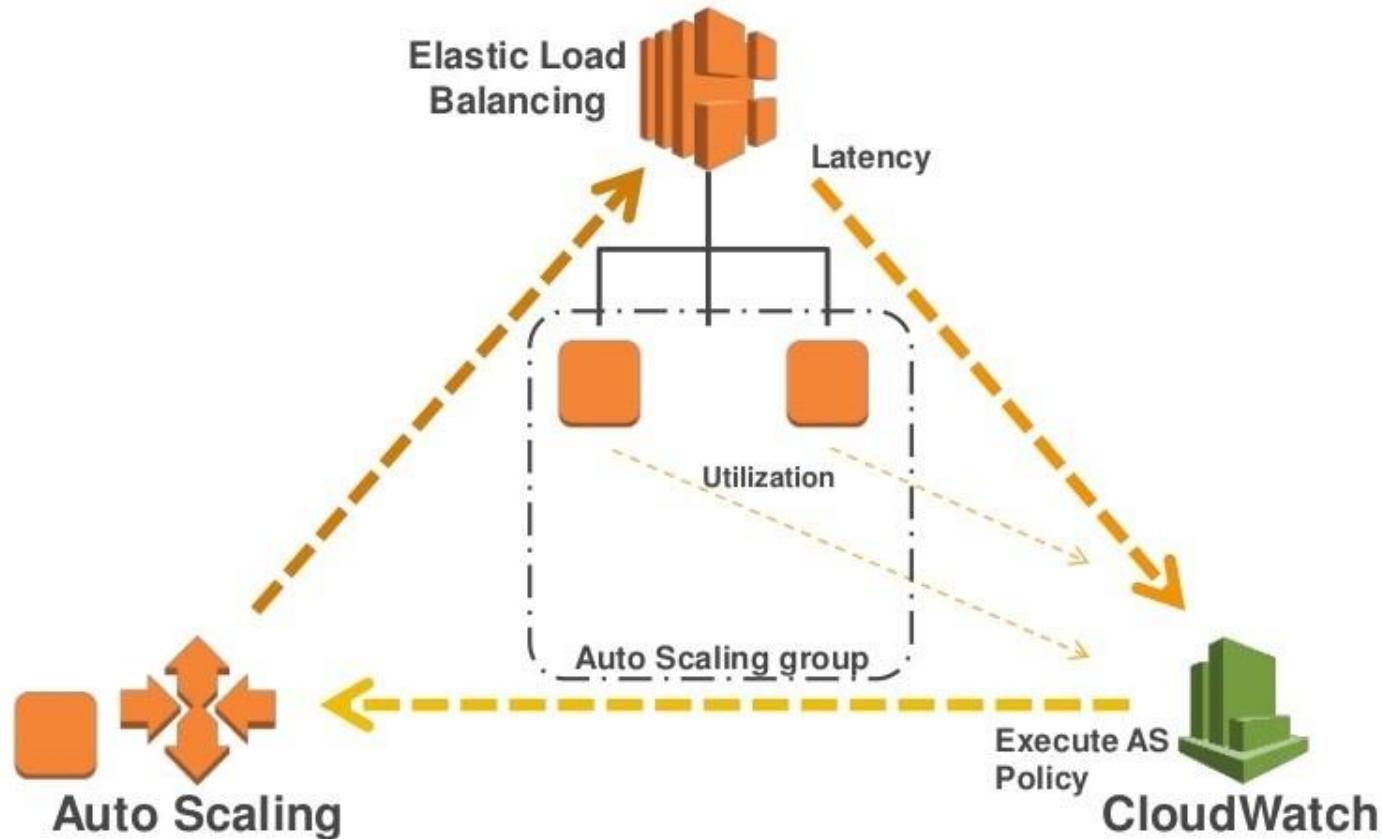
Create a policy to scale your resources.

Define when to scale using CloudWatch Alarms.

Auto Scaling Basic Lifecycle



Triad of Services



AWS Trusted Advisor



AWS Trusted
Advisor

- **Best practice** and recommendation engine.
- Provides AWS customers with performance and security recommendations in four categories:
 - **Cost optimization**
 - **Security**
 - **Fault tolerance**
 - **Performance improvement.**

Cost Optimization



- Amazon EC2 Reserved Instance Optimization
- Low-utilization Amazon EC2 Instances
- Idle load balancers
- Underutilized Amazon EBS volumes
- Unassociated Elastic IP addresses
- Amazon RDS idle DB instances

Cost Optimization



2 ✓ 4 ▲

0 ⓘ

0 excluded items

Security



- Security groups
- AWS IAM use
- Amazon S3 bucket permissions
- MFA on Root Account
- AWS IAM password policy
- Amazon RDS security group access risk

Security



4 ✓ 2 ▲

3 !

1 excluded items

Fault Tolerance



- Amazon EBS Snapshots
- Load balancer optimization
- Auto Scaling Group Resources
- Amazon RDS Multi-AZ
- Amazon Route 53 name server delegations
- ELB connection draining

Fault Tolerance



9 ✓ 2 ▲

2 !

1 excluded items

Performance Improvement



- High-utilization Amazon EC2 instances
- Service limits
- Large number of rules in EC2 security group
- Over-utilized Amazon EBS magnetic volumes
- Amazon EC2 to EBS throughput optimization
- Amazon CloudFront alternate domain names

Performance



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AWS Support

Support Comparison

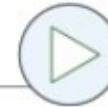
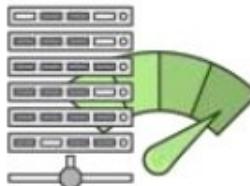
	Enterprise	Business	Developer	Basic
Customer Service 24x7x365	✓	✓	✓	✓
Support Forums	✓	✓	✓	✓
Documentation, White Papers, Best Practice Guides	✓	✓	✓	✓
AWS Trusted Advisor	Full Checks	Full Checks	Basic Checks	Basic Checks
Access to Technical Support	Phone, chat, email, live screen sharing, TAM (24/7)	Phone, chat, email, live screen sharing	Email (local business hours)	Support for Health Checks
Primary Case Handling	Sr. Cloud Support Engineer	Cloud Support Engineer	Cloud Support Associate	Technical Customer Service Associate
Users who can create Technical Support cases	Unlimited (IAM supported)	Unlimited (IAM supported)	1 (account credentials only)	
Case Severity/Response Times	Critical: < 15 minutes Urgent: < 1 hour High: < 4 hours Normal: < 12 hours Low: < 24 hours	Urgent: < 1 hour High: < 4 hours Normal: < 12 hours Low: < 24 hours	Normal: < 12 hours Low: < 24 hours	
Architecture Support	Application Architecture	Use case guidance	Building blocks	
Best Practice Guidance	✓	✓	✓	
Client-Side Diagnostic Tools	✓	✓	✓	
AWS Support API	✓	✓		
Third-Party Software Support	✓	✓		
Infrastructure Event Management	✓	Available at additional cost		
AWS Concierge	✓			
Direct access to Technical Account Manager (TAM)	✓			
Prioritized Case Routing	✓			
Management Business Reviews	✓			

Support Options



The Technical Account Manager provides...

- ✓ A dedicated **voice within AWS** to serve as your **advocate**.
- ✓ **Proactive guidance** and **insight** into ways to optimize AWS through business and performance reviews.
- ✓ Orchestration and access to the full **breadth and depth of technical expertise** across the full range of AWS.
- ✓ Access to resources and **best practice recommendations**.



Infrastructure Event Management provides...

- ✓ A common understanding of event objectives and use cases through **pre-event planning and preparation**.
- ✓ Resource **recommendations** and deployment **guidance** based on anticipated capacity needs.
- ✓ **Dedicated attention** of your AWS Support team during your event.
- ✓ The ability to immediately **scale down resources** to normal operating levels post-event.

Support Options



The Concierge Service provides...

- ✓ A primary contact to help **manage AWS resources.**
- ✓ **Personalized handling** of billing inquiries, tax questions, service limits, and bulk reserve instance purchases.
- ✓ Direct access to an agent to help **optimize costs**, and identify **underutilized resources**.



AWS Trusted Advisor provides...

- ✓ Insight into how and where you can get the **most impact for your AWS spend.**
- ✓ Opportunities to **reduce your monthly spend** and retain or **increase productivity.**
- ✓ Guidance on getting the **optimal performance and availability** based on your requirements.
- ✓ Confidence that your environment is **secure.**

Cost Optimization



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Performance



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Security



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Fault Tolerance

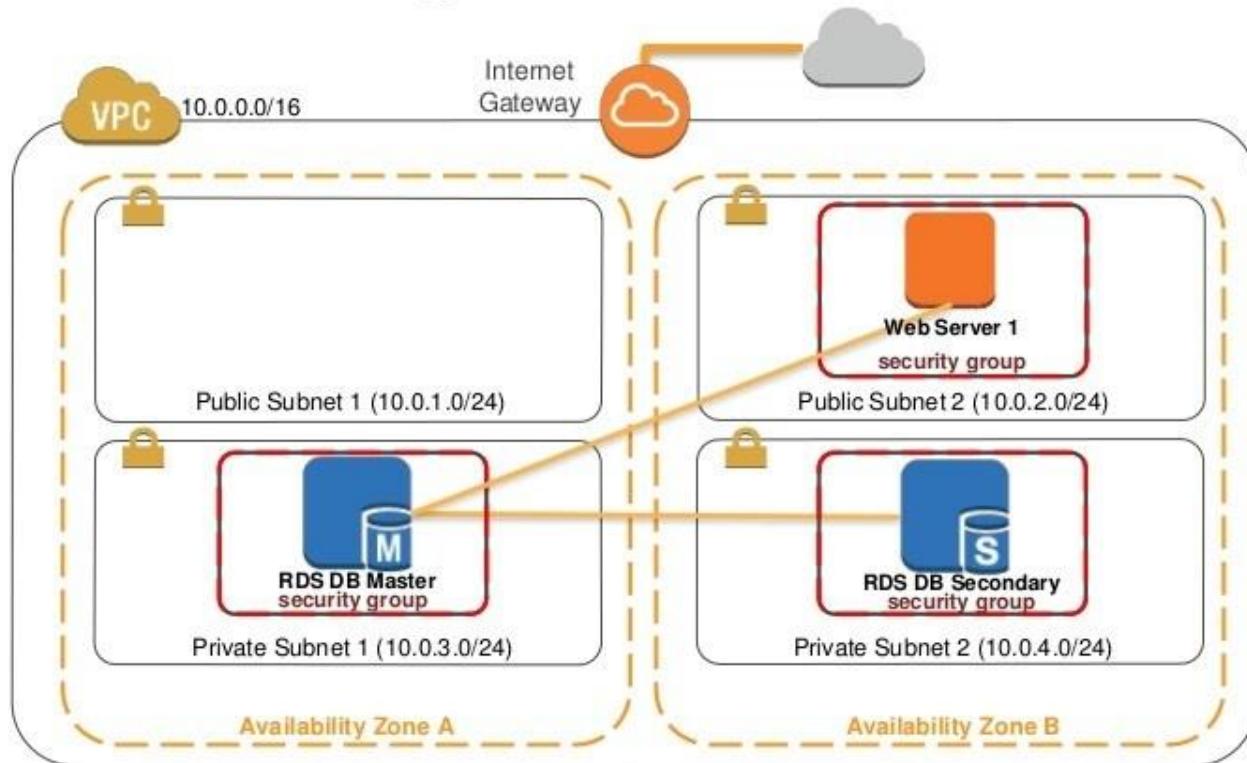


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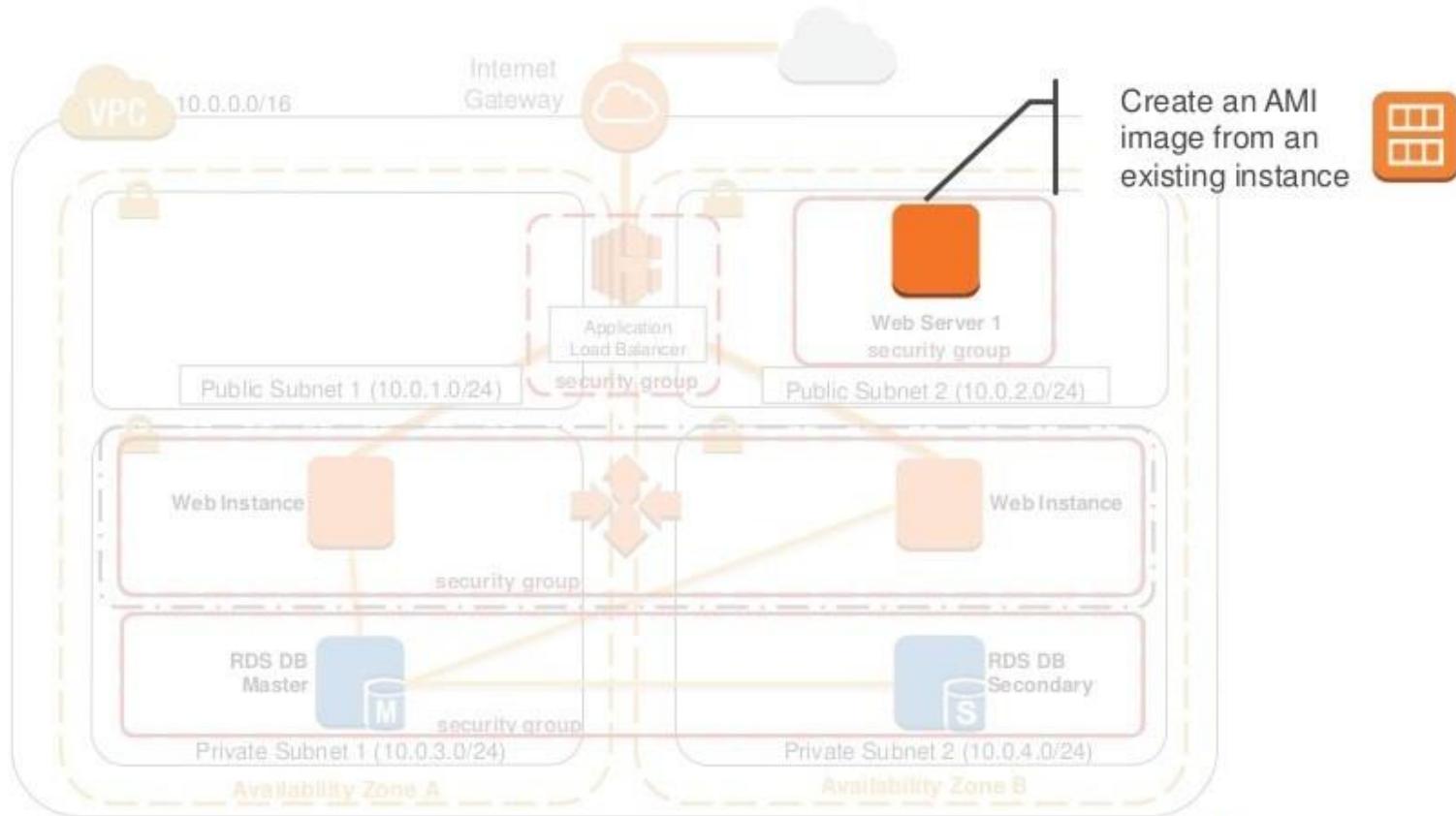
Instructor Demo

Scale and Load Balance the Architecture

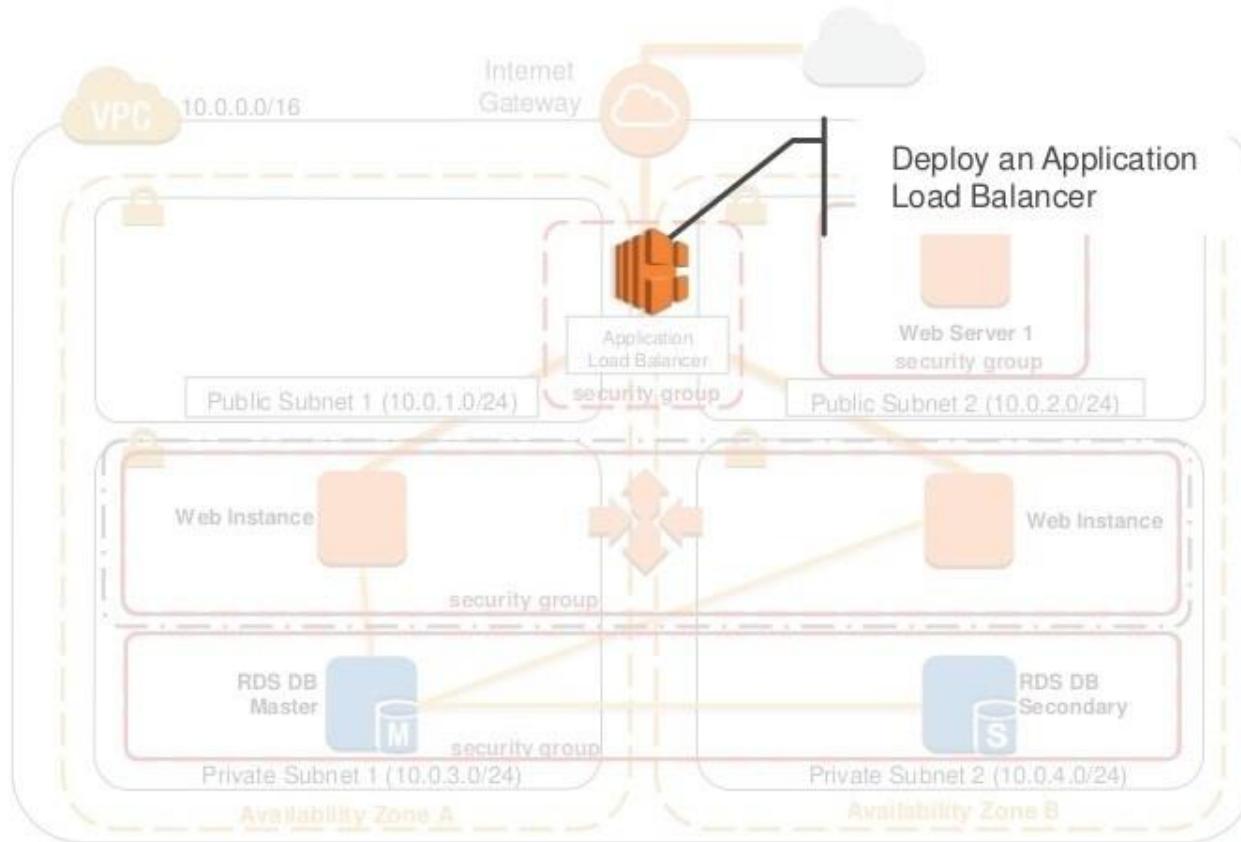
What We're Starting With



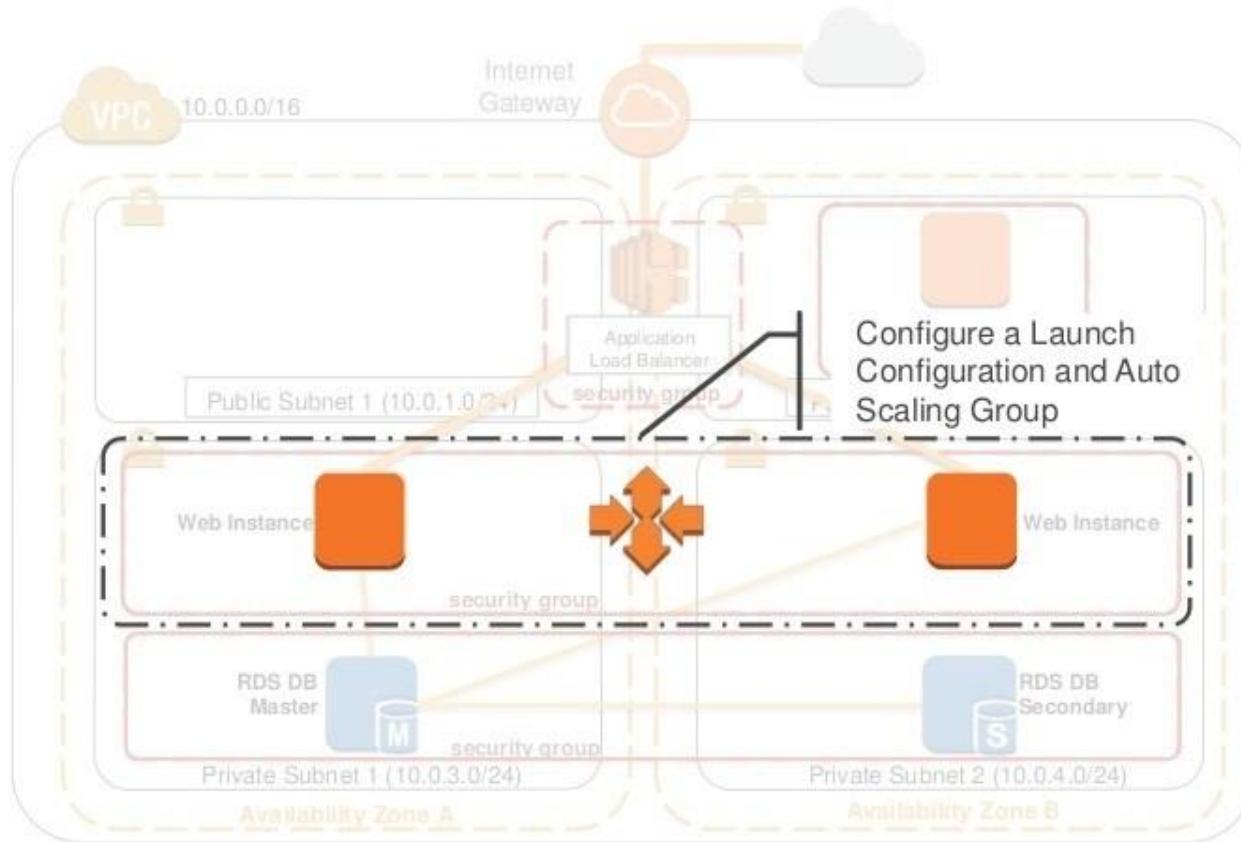
Scale and Load Balance the Architecture



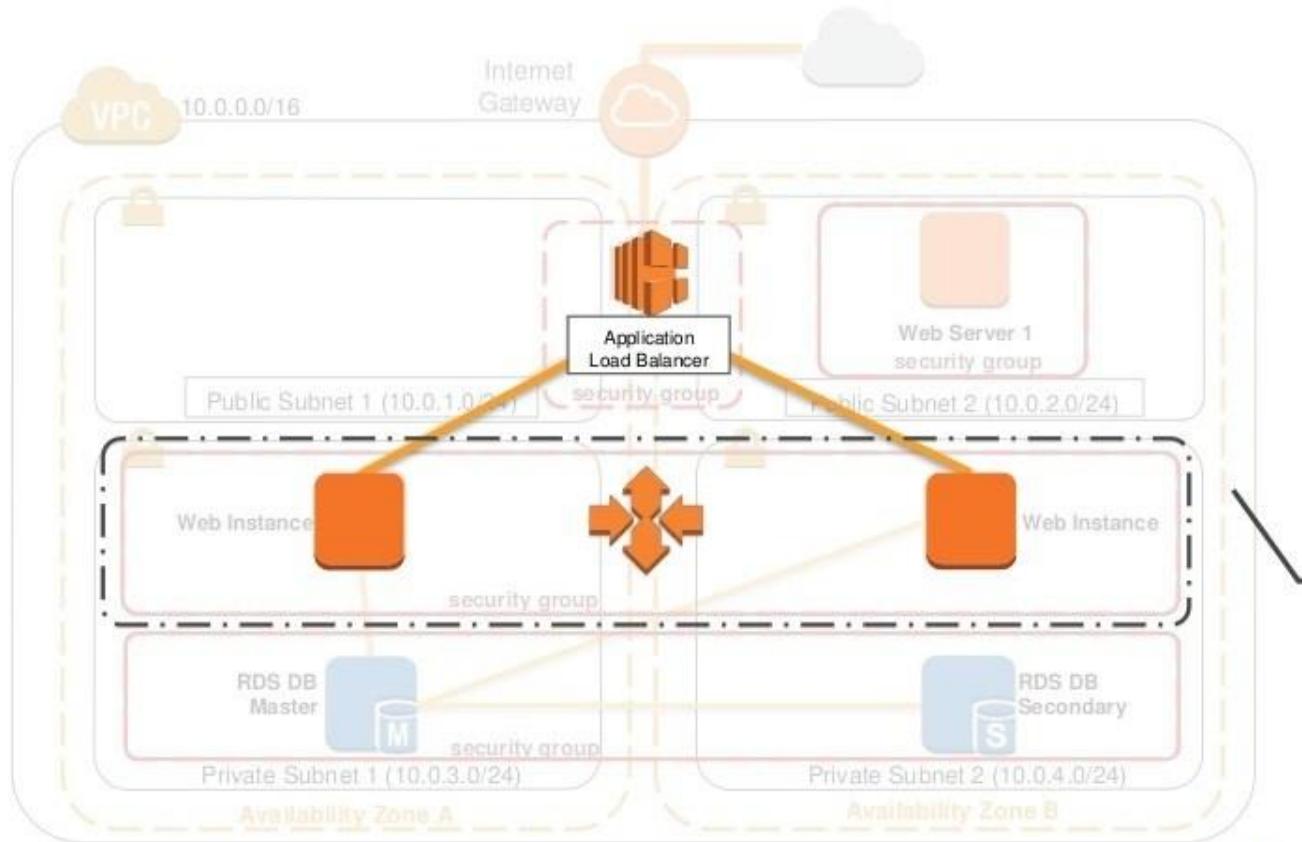
Scale and Load Balance the Architecture



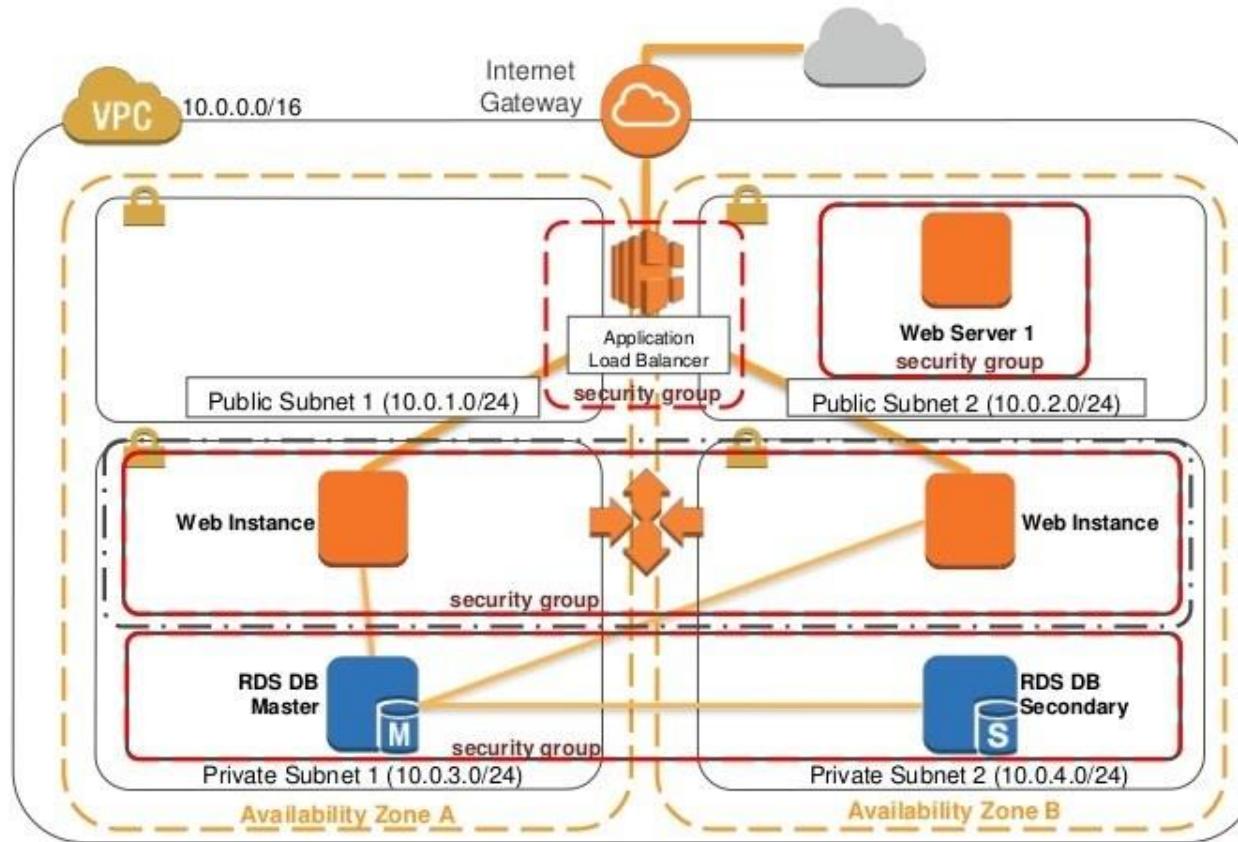
Scale and Load Balance the Architecture



Scale and Load Balance the Architecture



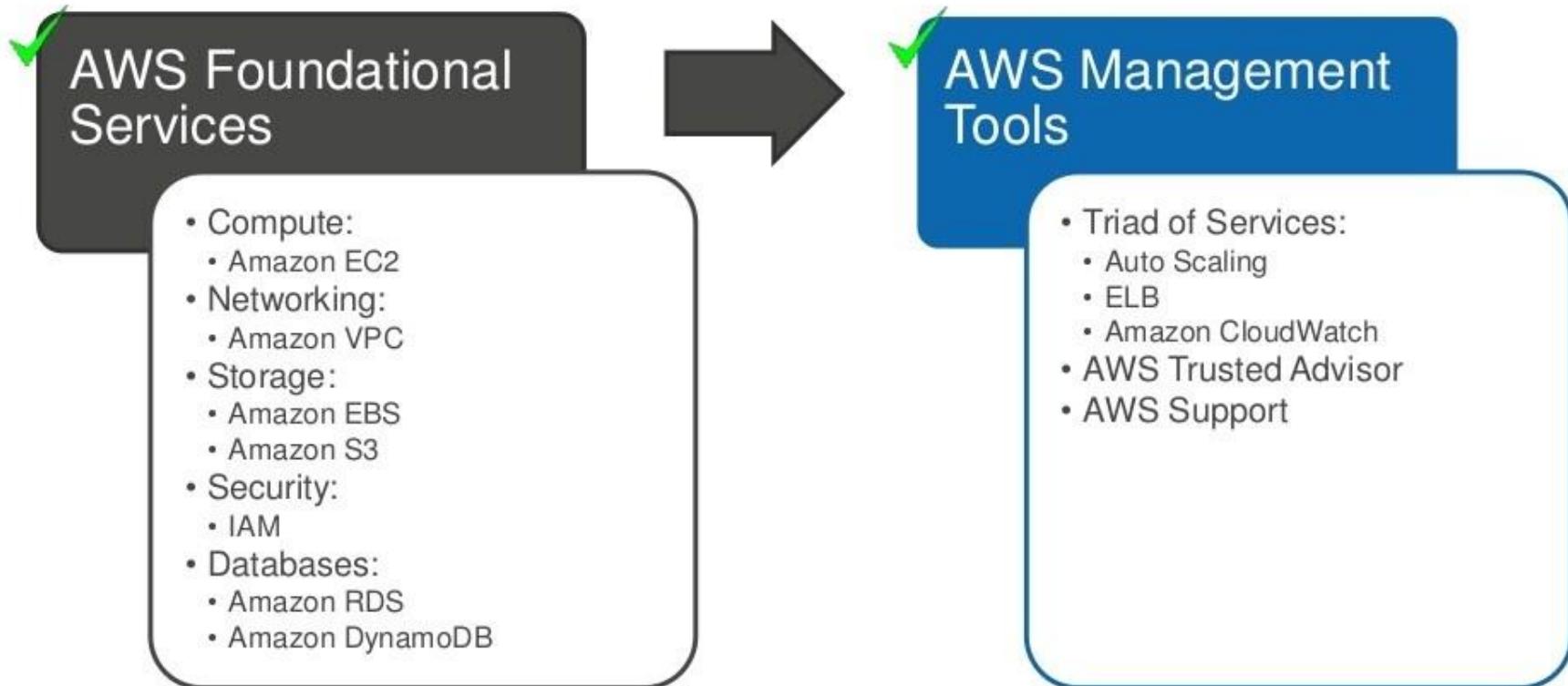
Scale and Load Balance the Architecture



Module 5

Course Wrap-Up

Learning Path



Self-Paced Labs

- Learn an individual [AWS Service topic](#)
- Follow a Learning Quest by [AWS Service Area or Use Case](#)
- Practice working with AWS as you [prepare for an exam](#)



For more information, see aws.amazon.com/training/self-paced-labs/.