



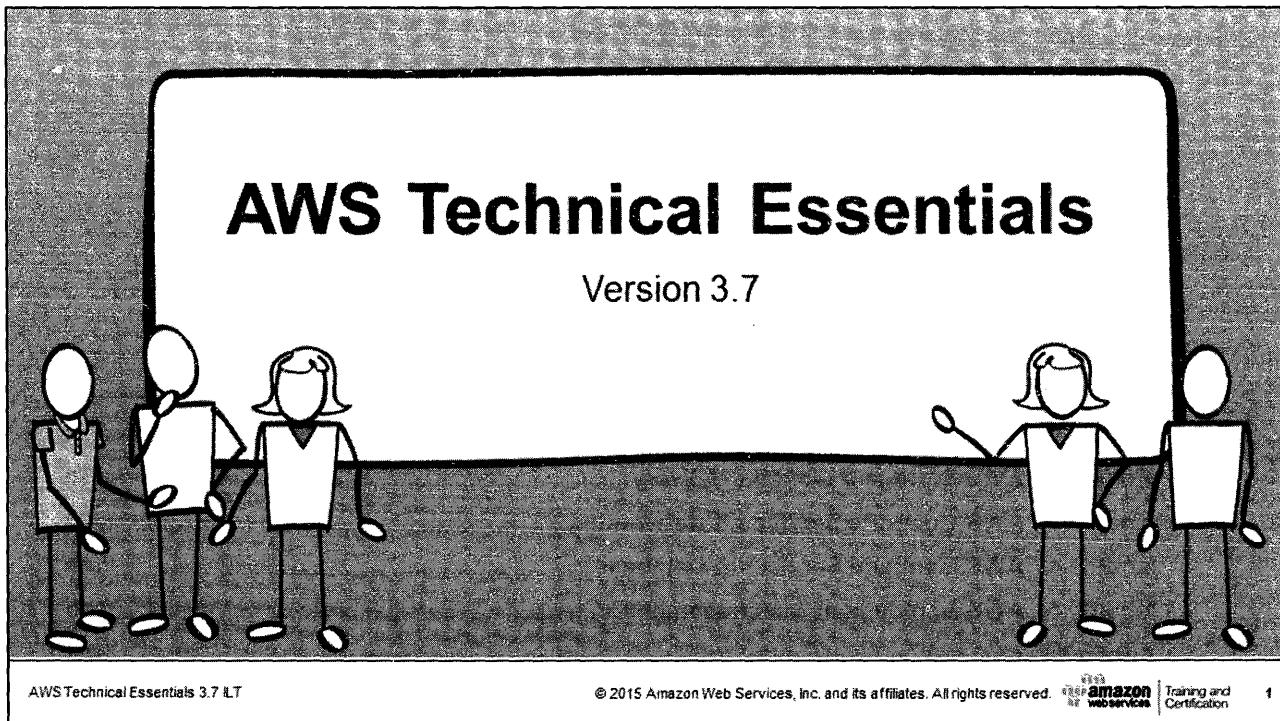
Training and
Certification

AWS Technical Essentials
Student Guide
Version 3.7

AWS-100-ESS-37-EN

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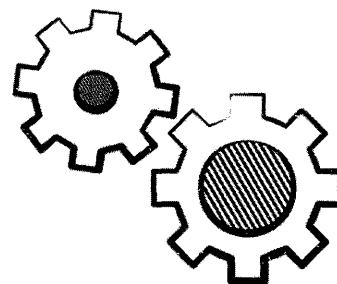
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This instructor-led training introduces AWS products and services with exercises and hands-on activities. This training is designed for anyone new to Amazon Web Services so you can gain proficiency in AWS services and make informed decisions about IT solutions based on your business requirements.

Introductions and Logistics

- Class Introductions
- Student Guide and *qwikLABS*
- Logistics, Bathrooms, Breaks
- Participation
- Parking Lot





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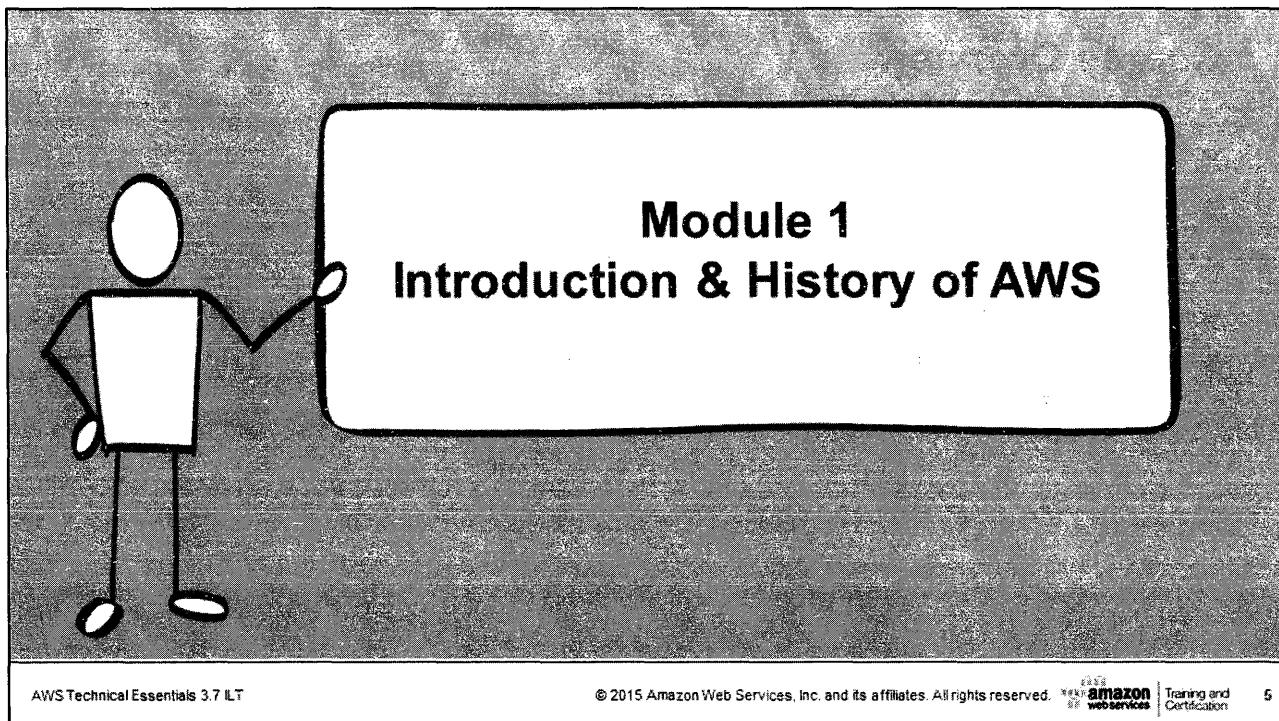
This course will have four hands-on labs in our sandbox environment, **qwikLABS**:
<http://www.qwiklabs.com>

Course Overview

- **Module 1: Introduction & History of AWS**
- **Module 2: AWS Storage & Content Delivery**
- **Module 3: AWS Compute Services & Networking**
- **Module 4: AWS Managed Services & Database**
- **Module 5: AWS Deployment & Management**

This 1-day course is broken up into 5 modules:

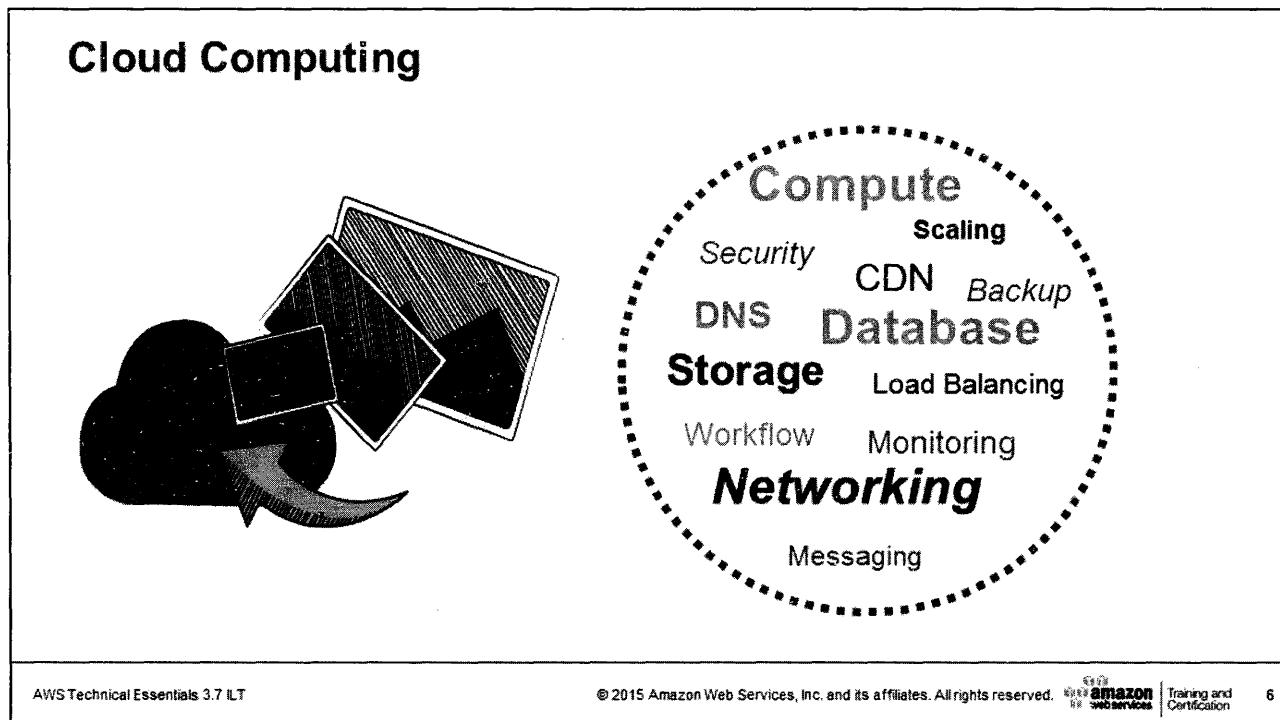
- **Module 1** describes the history and fundamental elements of Amazon Web Services (AWS), as well as how to navigate the AWS Management Console and identify its security features and basic principles.
- **Module 2** describes the fundamental elements of AWS Storage with a focus on Amazon Simple Storage Service (S3) and Amazon Elastic Block Store (EBS).
- **Module 3** describes the fundamental elements of AWS Compute and Networking, with a focus on Amazon Elastic Compute Cloud. This module will build on what you learned in Module 2 by verifying how to use Amazon Elastic Block Store (EBS).
- **Module 4** describes the fundamental elements of AWS Managed Services and Databases. This module will focus on key aspects of Amazon Relational Database Service (RDS) and how to execute Amazon RDS for a driven application.
- **Module 5** describes the fundamental elements of AWS deployment management products and services. This module focuses on AWS CloudFormation, Amazon CloudWatch metrics and alarms, and Amazon Identity and Access Management.



Module 1 describes the history and fundamental elements of Amazon Web Services (AWS), as well as how to navigate the AWS Management Console. It discusses the AWS Global Infrastructure, security measures provided by AWS, and basic principles of deploying on AWS.

By the end of this module you will be able to:

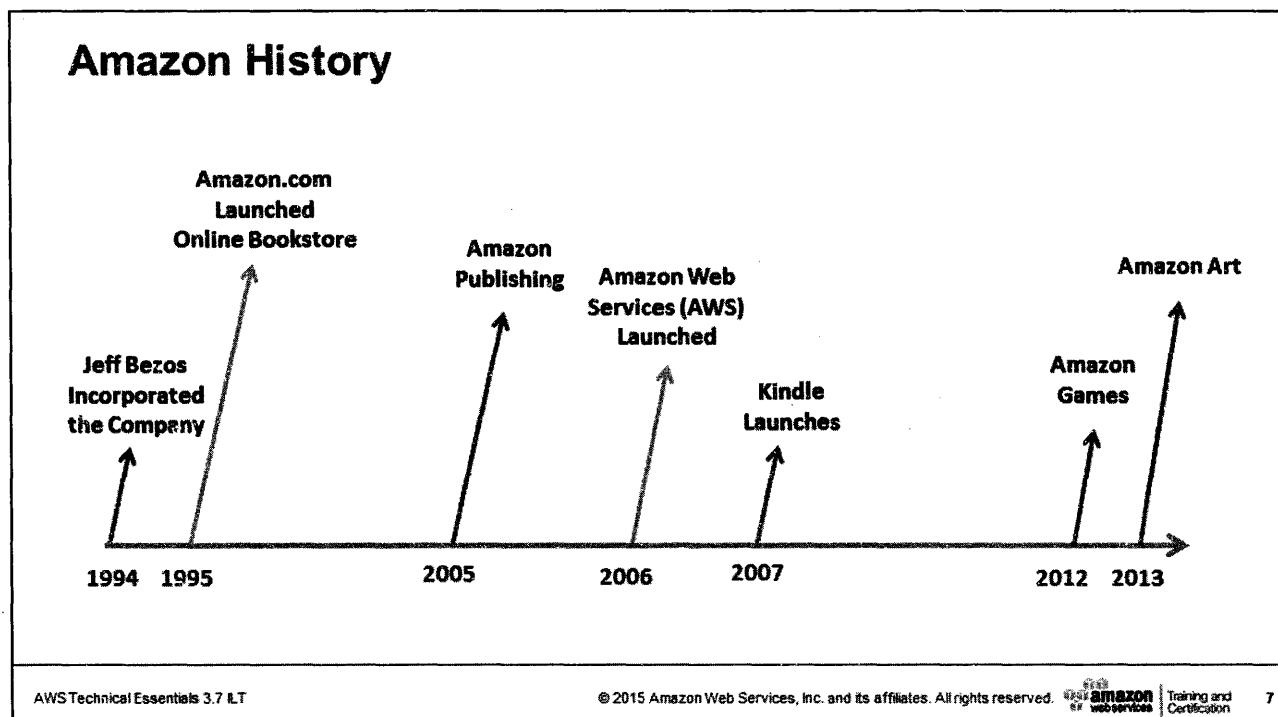
- Describe the history of AWS
- Recognize AWS Global Infrastructure
- Navigate the AWS Management Console
- Describe the security measures AWS provides



Cloud computing is a common term for a variety of computing concepts that involve large numbers of computers that are connected through a real-time communication network, like the Internet.

Cloud computing providers such as AWS offer their services according to several fundamental models. One of these models is infrastructure as a service, also known as IaaS.

Cloud computing is the use of computing resources (hardware and software) that are delivered as a service over a network (typically the Internet). The name comes from the use of a cloud-shaped symbol as an abstraction in system diagrams for the complex infrastructure it contains. Cloud computing entrusts remote services with a user's data, software, and computation.



Jeff Bezos incorporated the company in 1994 and Amazon.com was launched in 1995 as an online bookstore. Amazon.com, Inc. is an American multinational electronic commerce company with its headquarters in Seattle, Washington. It is the world's largest online retailer. Since then Amazon has continued to grow, and officially launched Amazon Web Services (AWS) in 2006. More came after, including Amazon Publishing, the Kindle, Amazon Games, and Amazon Art.

Other facts about Amazon and Amazon Web Services:

- AWS has hundreds of thousands of customers in [190] countries. AWS has more than [800] government agencies, [3,000] education institutions and more than [10,000] nonprofits leveraging the services.
- In 2011, we released over 80 significant services and features; in 2012, nearly 160; and in 2013, 280. This year we're ahead of last year's pace and have launched [300] since January 2014.
- AWS Marketplace has [25] product categories and more than [1,600] software listings for customers to choose from. Consumption of hourly software is up over 800% for the last 12 months.
- Every day, Amazon Web Services adds enough new server capacity to support all of Amazon's global infrastructure when it was a \$7 billion enterprise.

AWS History

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



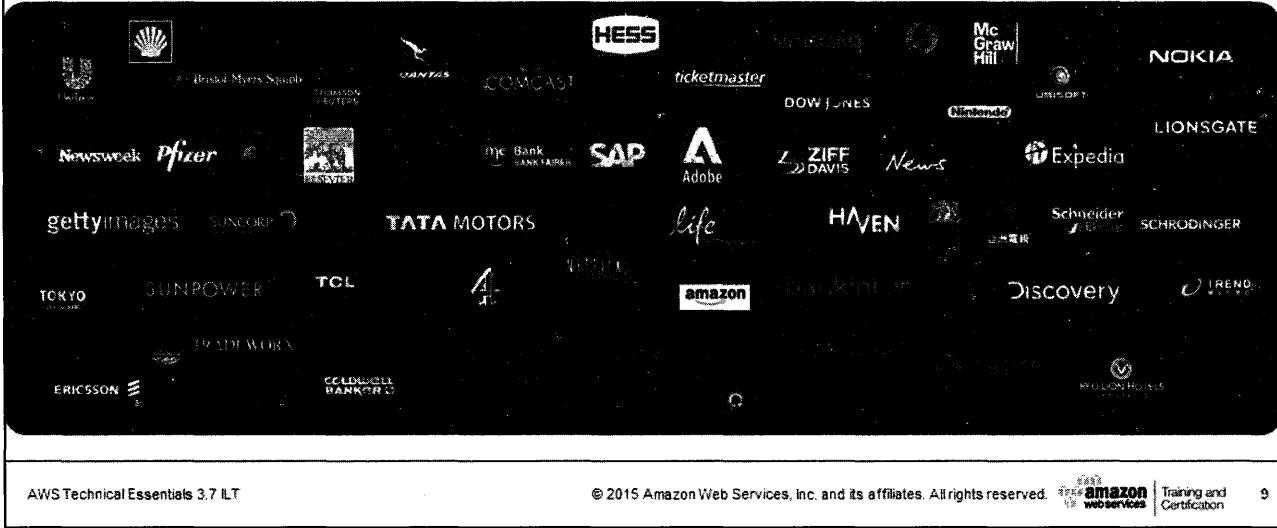
Amazon Web Services is 10+ years in the making. Amazon Web Services, also abbreviated AWS, is a collection of remote computing services called web services. These web services make up a cloud computing platform offered via the Internet. We deliver web-based cloud services for storage, computing, networking, database, and more.

The AWS mission is to enable businesses and developers to use web services to build scalable, sophisticated applications. Web services is what people now call “the cloud”.

Learn more about Amazon Web Services (AWS): <http://aws.amazon.com>

AWS Enterprise Customers

Enterprise cloud computing with AWS can help IT increase innovation, agility, and resiliency; all while reducing cost.



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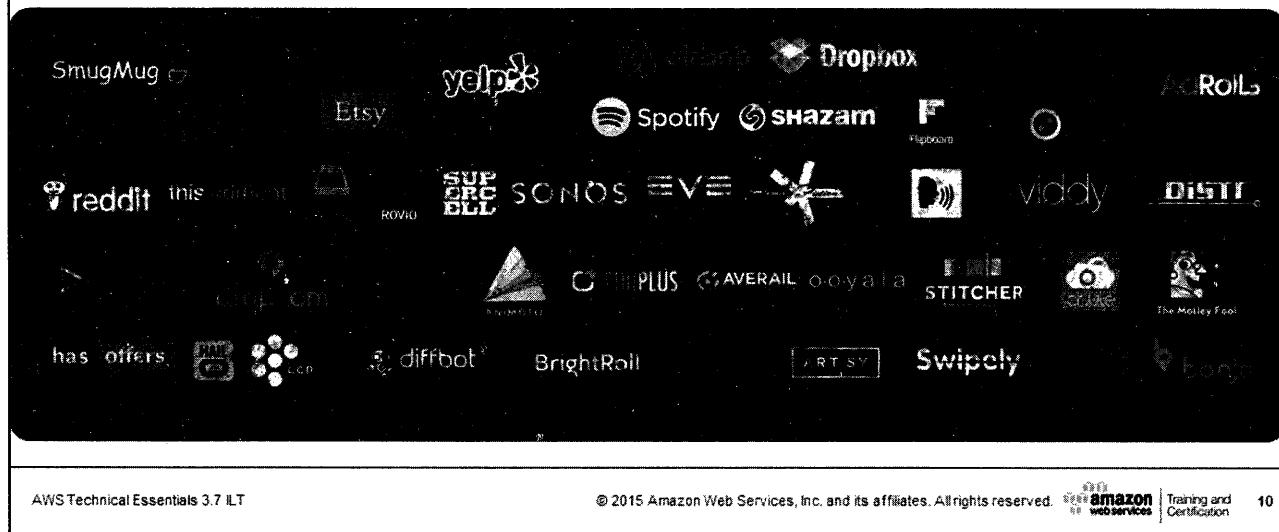
With AWS, you can build enterprise cloud solutions quickly and without a big up-front investment. The free tier allows you to prototype virtually any application for free.

Here are some Enterprise customers already using AWS.

More information about Enterprise Cloud Computing:
<http://aws.amazon.com/enterprise/>

AWS Startup Customers

Our innovations free you to scale quickly, go to market faster, control costs and stay lean.



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Here are some Startup customers already using AWS.

AWS Activate is a free program with resources for startups to get the most out of AWS from day one.

Apply online with a Self-Starter Package: <http://aws.amazon.com/activate/self-starters/>

More information about Startups on Amazon Web Services:
<http://aws.amazon.com/start-ups/>

AWS Public Sector Customers

AWS offers scalable, cost-effective cloud services that public sector customers can use to meet mandates, reduce costs, drive efficiencies, and accelerate innovation.



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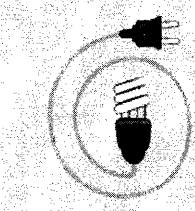
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Here are some Public Sector customers on AWS.

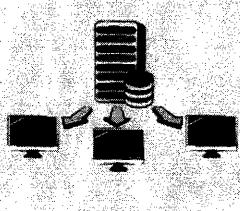
More information about Public Sector Contract Center:
<http://aws.amazon.com/contract-center/>

AWS Cloud Computing

On Demand



Uniform



Pay As You Go



Available



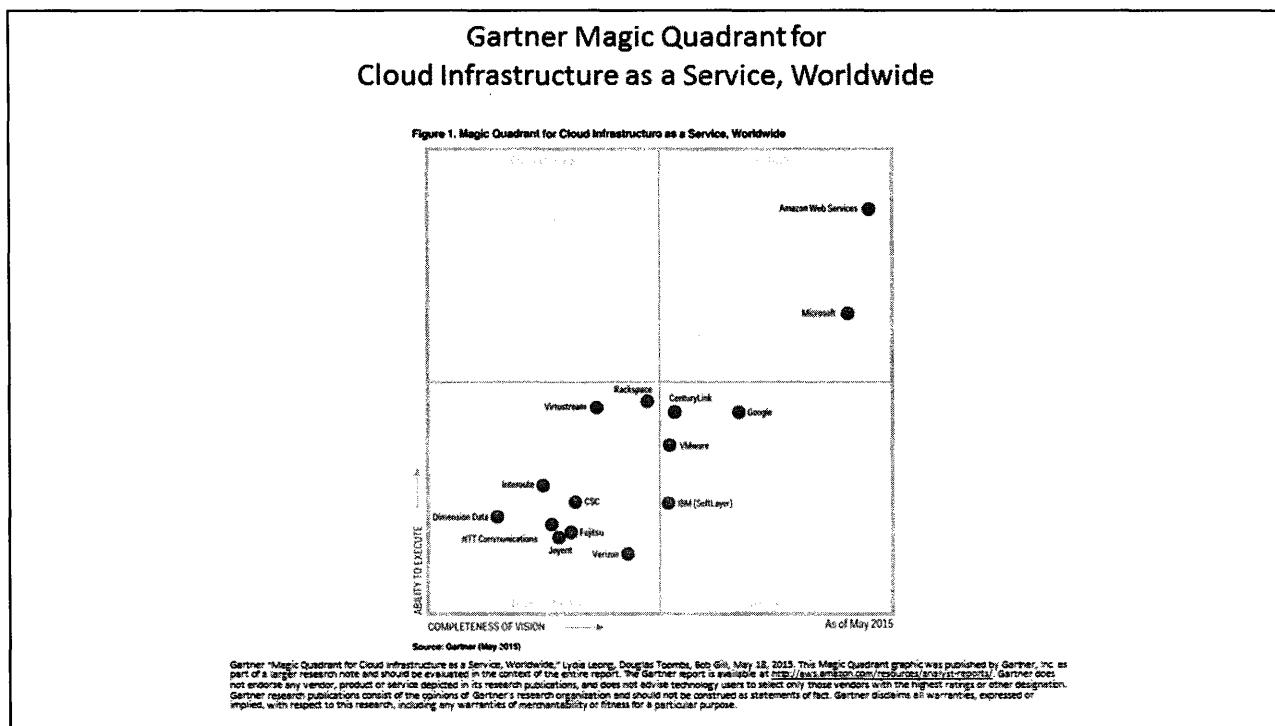
AWS provides a massive global cloud infrastructure that allows companies to quickly innovate, experiment, and iterate.

On Demand: AWS gives customers the benefits of utility-based services. Instead of waiting weeks or months for hardware, you can instantly deploy new applications, scale up as the workload grows, and scale down based on demand.

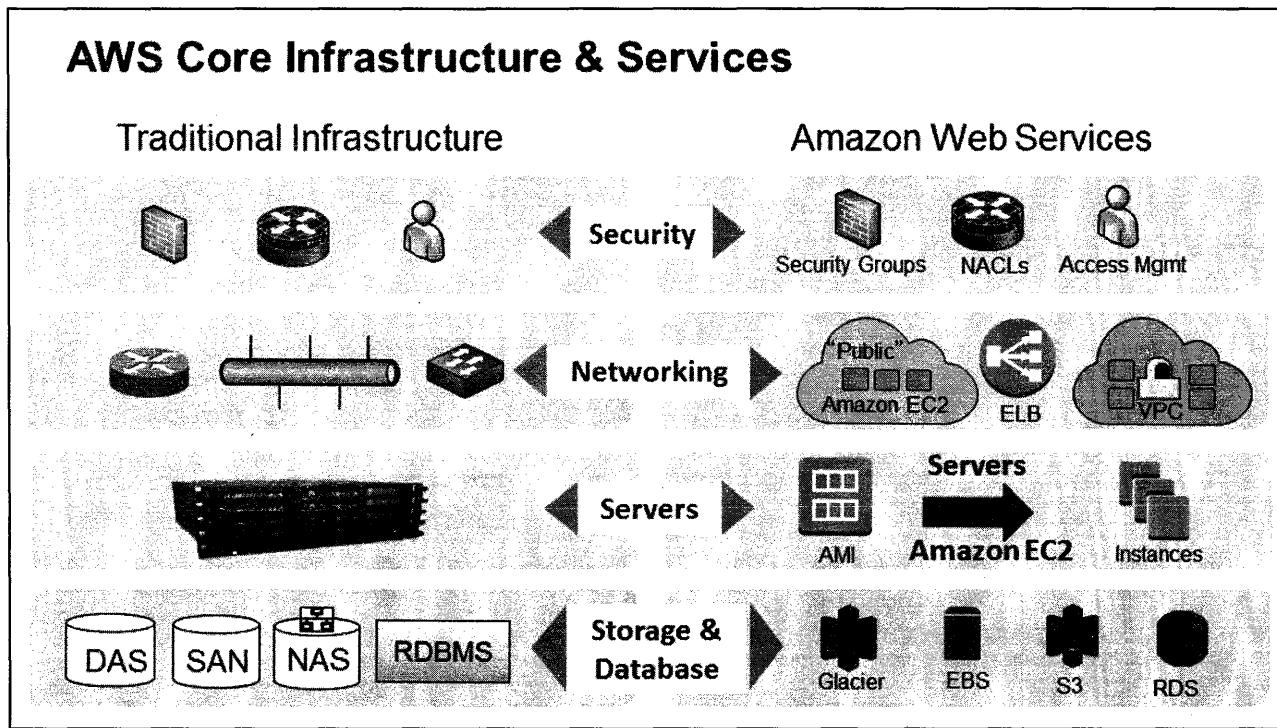
Uniform: Economy of scale and leveraging AWS expertise. AWS customers can leverage the cost effectiveness, scalability, and flexibility of running on AWS infrastructure.

Pay As You Go: With AWS there is zero capital expenditure and no long-term contract.

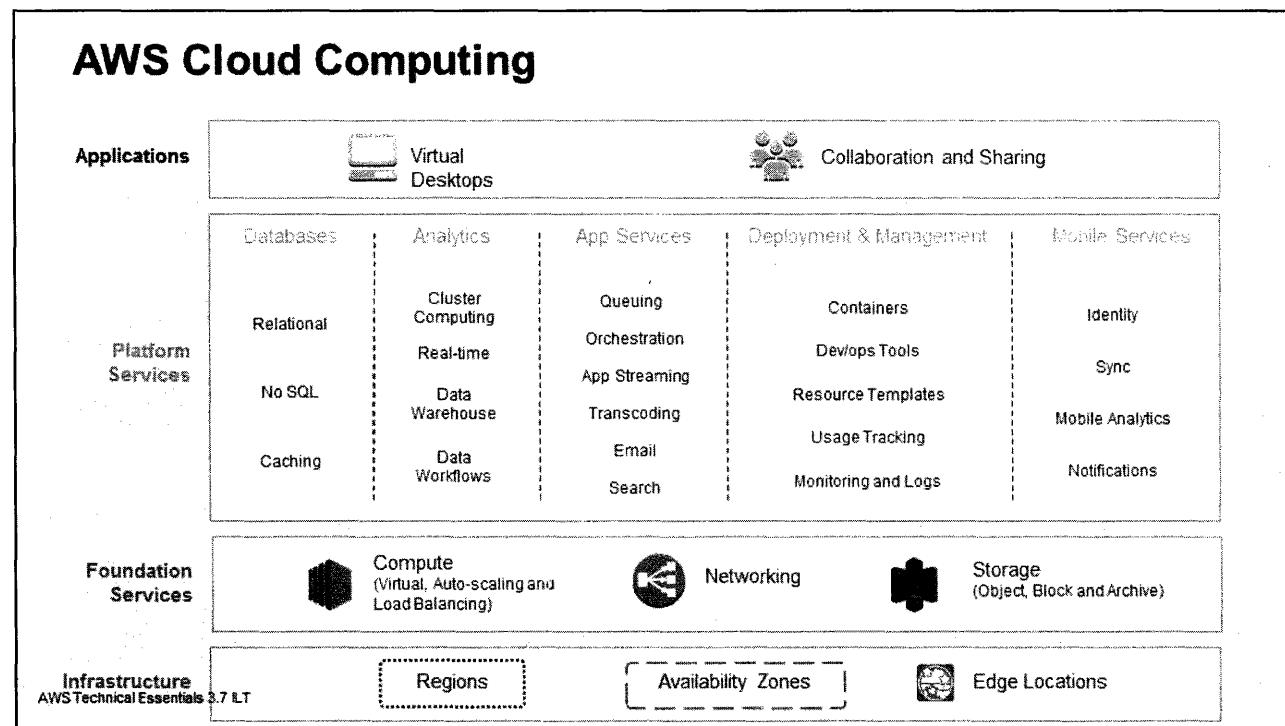
Available: AWS is accessible via the Web Console, Command Line, API, and SDK.



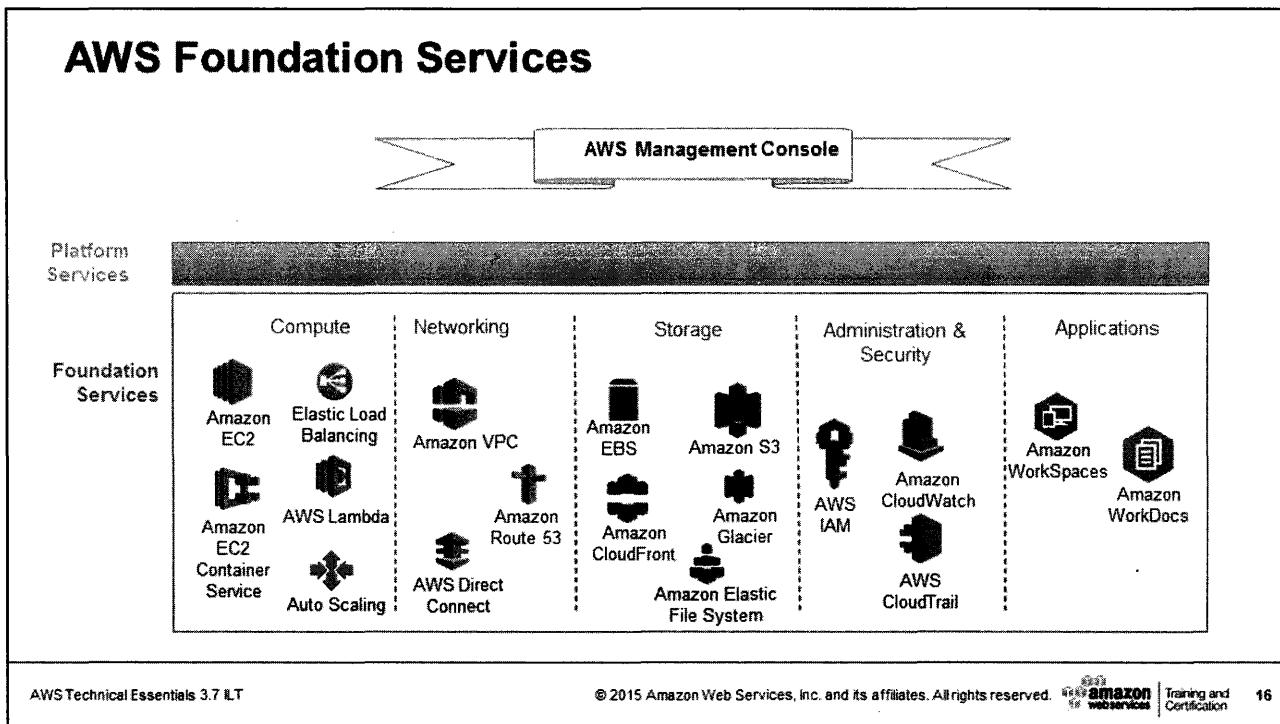
The Gartner report is available at <http://aws.amazon.com/resources/analyst-reports/>



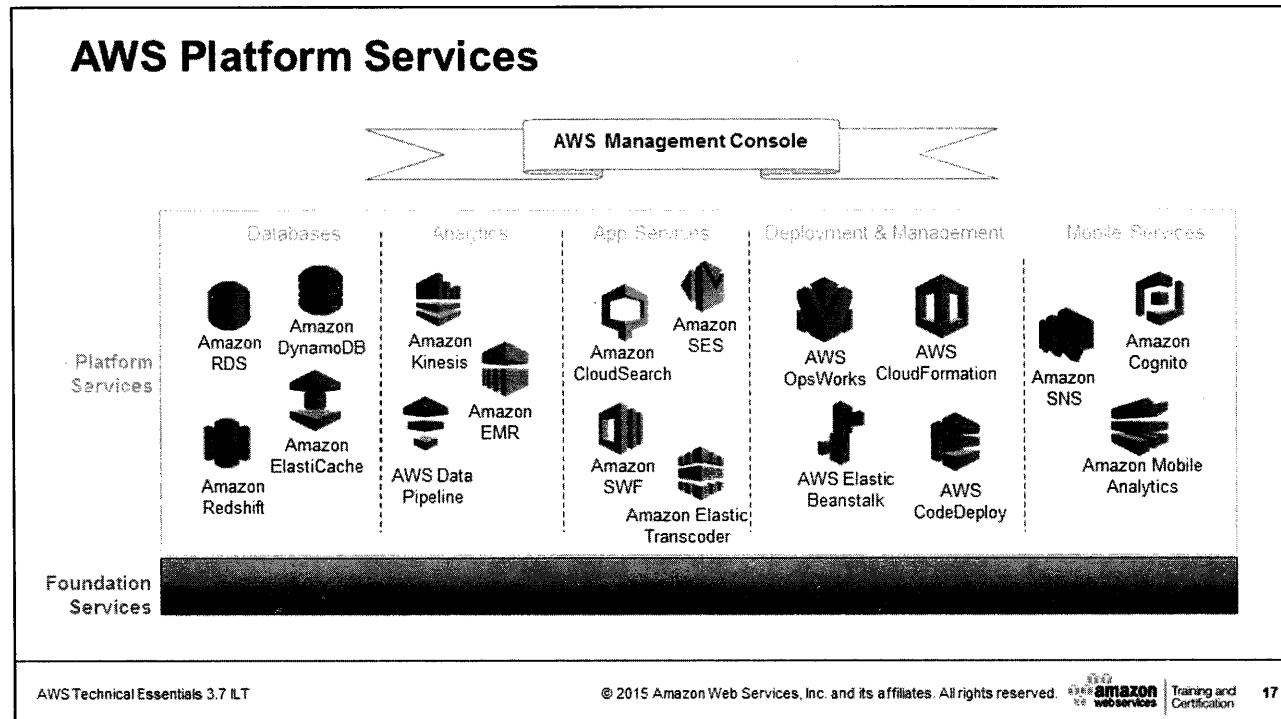
Many of our services have analogs in the Traditional IT space and terminology. This side-by-side comparison shows how AWS mirrors a traditional infrastructure with AWS product and services.



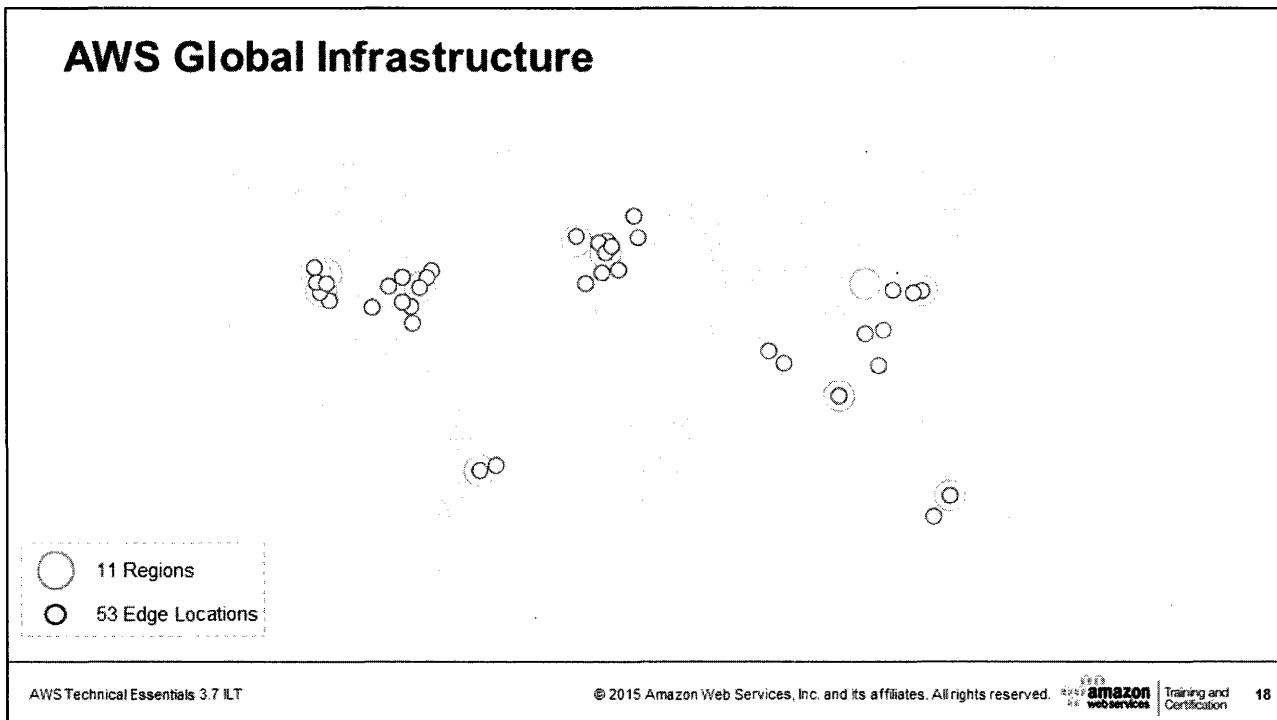
AWS cloud computing provides a simple way to access servers, storage, databases and a broad set of application services over the Internet. AWS owns and maintains the network-connected hardware required for these application services, while you provision and use what you need.



AWS offers a broad set of tools you can access via the AWS Management Console.



AWS offers a rich set of platform services that enable you to process a massive number of events from different sources, effectively work with databases, and more.



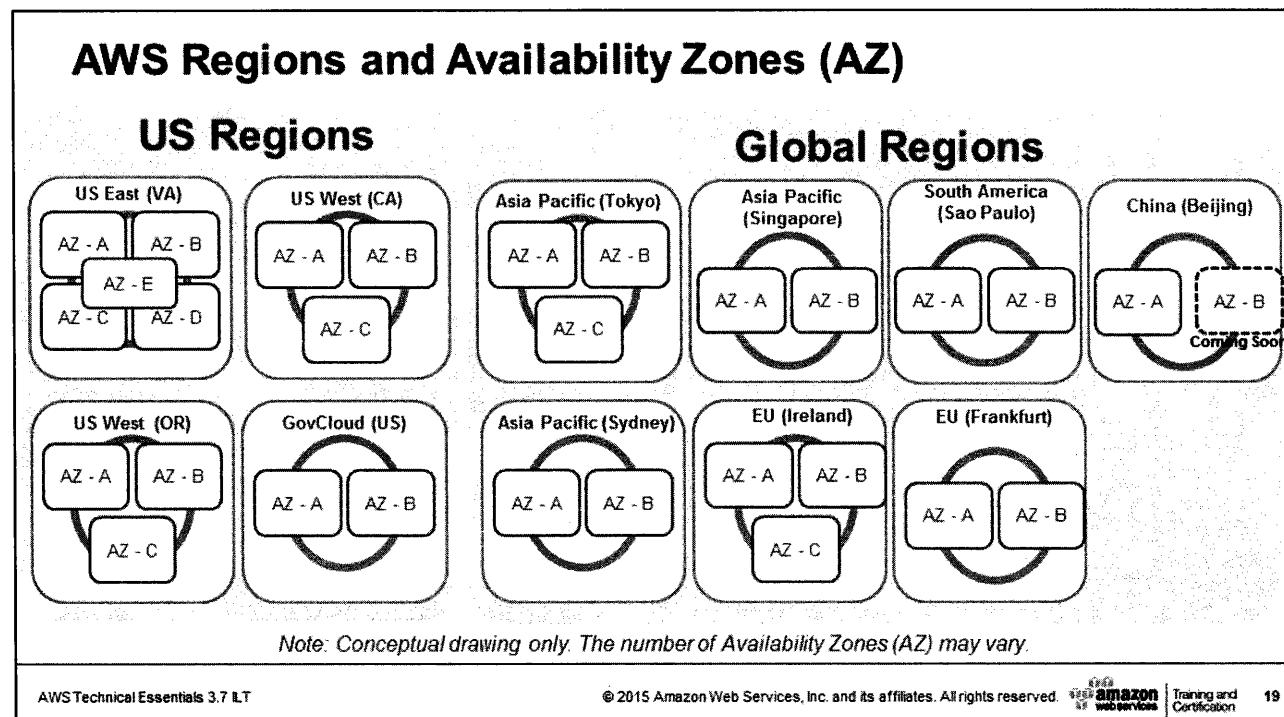
AWS is steadily expanding the global infrastructure to help customers achieve lower latency and higher throughput, and to ensure that your data resides only in the region you specify. As you and all customers grow their businesses, AWS will continue to provide infrastructure that meets your global requirements.

As of Jan 2015, AWS has 53 edge locations and 11 regions. The GovCloud (US) is an isolated region designed to allow US government agencies and customers to move sensitive workloads into the cloud by addressing their specific regulatory and compliance requirements. Our newest region is Frankfurt, launched in October 2014. AWS Products and Services are available by region so you may not see all regions available for a given service.

You can run applications and workloads from a region to reduce latency to end-users while avoiding the up-front expenses, long-term commitments, and scaling challenges associated with maintaining and operating a global infrastructure.

Edge locations helps lower latency and improves performance for end users.

More details and up-to-date information on global infrastructure can be found on the AWS website: <http://aws.amazon.com/about-aws/globalinfrastructure/>



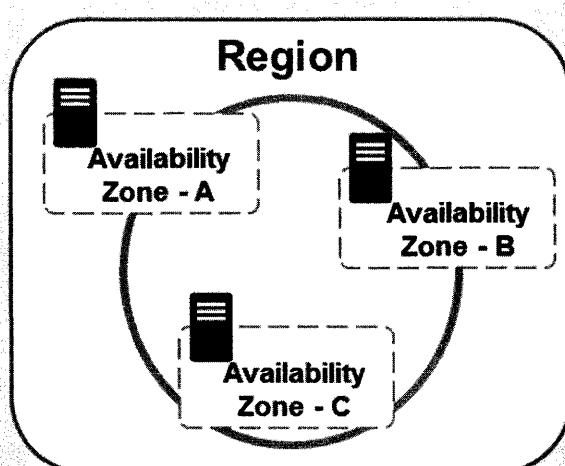
AWS products and services like Amazon Elastic Compute Cloud (Amazon EC2) are offered by region. All regions have at least two Availability Zones (AZ) for redundancy.

Availability Zones are analogous to clusters of datacenters. Where natural disasters or fault lines are a consideration, we isolate them so that they are not easily affected at the same time. There is a latency of less than 10 milliseconds between Availability Zones. Availability Zones are physically distinct groups of data centers. A region is made of multiple availability zones so as to allow our customers the ability to spread their computing resource across multiple power providers. Where natural disasters are a serious consideration we do our best to isolate AZs from each other. For example, where earthquakes are a problem we would not build two AZs on the same fault line.

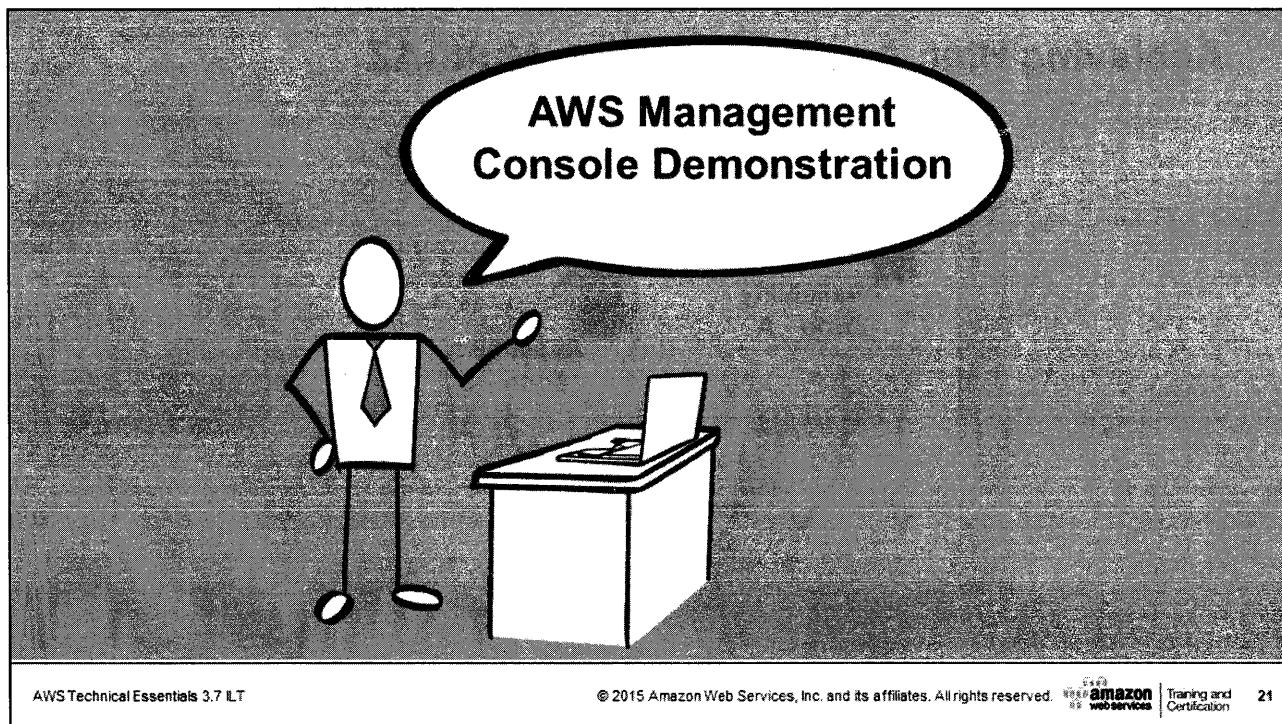
More information about AWS global infrastructure can be found online:
<http://aws.amazon.com/about-aws/global-infrastructure/regional-product-services/>

More information about the China Region: <https://www.amazonaws.cn/en/>

Achieving High Availability Using Multi-AZ



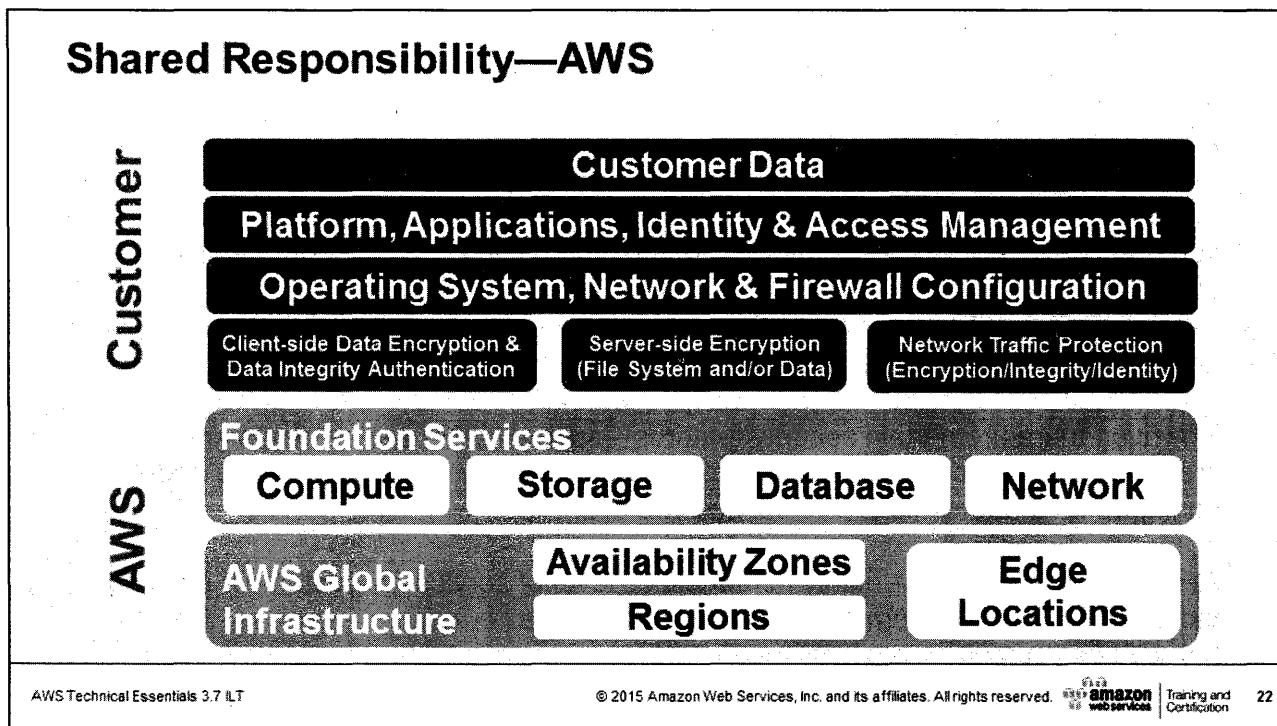
AWS highly recommends provisioning your resources across multiple Availability Zones. If you have multiple servers, you can run them across more than one AZ and get added redundancy. If a single AZ has a problem, all assets in your second AZ will be unaffected.



Let's start by taking a look at the AWS Management Console so you can get familiar with the navigation:

- Selecting a region.
- Dragging and dropping service icons at the top for quick use.
- Verifying what is included in the left navigation menu pane.

AWS Management Console: <https://console.aws.amazon.com/console/home>



When we talk about cloud security, we like to start with a discussion of the Shared Security Responsibility Model. While AWS takes care of provisioning and maintaining the underlying cloud infrastructure, you will still need to perform several security configuration tasks to ensure that you stay safe in the cloud. Our responsibility goes from the ground up to the hypervisor. We secure the hardware, software, facilities, and networks that run all of our products and services. Customers are responsible for securely configuring the services they sign up for as well as anything they put on those services.

AWS:

- Obtaining industry certifications and independent third party attestations
- Publishing information about AWS security and control practices in whitepapers and web site content
- Providing certificates, reports, and other documentation directly to AWS customers under NDA (as required).

AWS Security Process:

http://d36cz9buwru1tt.cloudfront.net/pdf/AWS_Security_Whitepaper.pdf

The amount of security configuration work you have to do varies, depending on how sensitive your data is and which services you select. For example, AWS services such as EC2 and S3 are completely under your control and require you to perform all of the necessary security configuration and management tasks. In the case of

EC2, you're responsible for management of the guest OS (including updates and security patches), any application software or utilities you install on the instances, as well as the configuration of the AWS-provided firewall (called a security group) on each instance.

When you use any of AWS's managed services like RDS or RedShift or WorkDocs, you don't have to worry about launching and maintaining instances or patching the guest OS or applications—AWS handles that for you. For these managed services, basic security configuration tasks like data backups, database replication, and firewall configuration happen automatically.

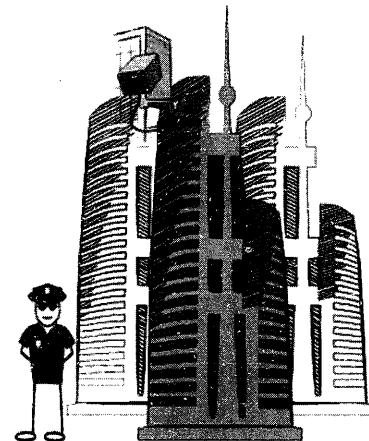
However, there are certain security features—such as IAM user accounts and credentials, SSL for data transmissions, and user activity logging—that you should configure no matter which AWS service you use.

AWS Support provides a highly personalized level of service for customers seeking technical help. More information can be found online:

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

Physical Security

- 24/7 trained security guards
- Locations in nondescript, undisclosed facilities
- Two-factor authentication for ingress
- Authorization for datacenter access



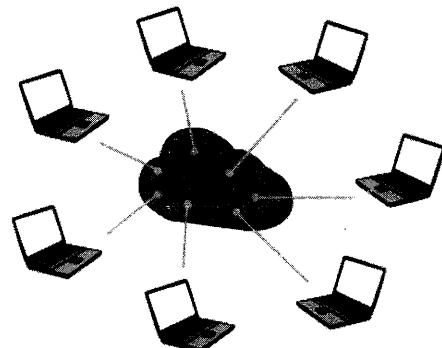
One of the main security responsibilities of AWS is the physical security of the datacenters that house the AWS cloud infrastructure. Amazon has many years of experience designing, constructing, and operating large-scale datacenters.

The physical security measures that protect these datacenters are some of the most comprehensive in the industry and include: 24/7 trained security guards; locations in nondescript, undisclosed facilities; two-factor authentication for ingress; authorization for data center access only for an approved; specific need and continuous monitoring, logging, and auditing of physical access controls.

Security Center: <http://aws.amazon.com/security>

Hardware, Software, and Network

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



The hardware and software that supports AWS' cloud services has been architected to be not only highly available and redundant, but also extremely secure. All changes to AWS hardware and software are managed through a centralized, automated change control process, and all access to hardware or software must be authorized.

Privileged access to software and systems requires SSH logon and is allowed only through bastion servers that record all access attempts. AWS network devices, including firewall and other boundary devices, monitor and control communications at the external boundary of the network and at key internal boundaries.

AWS monitoring tools are designed to detect unusual or unauthorized activities and conditions at ingress and egress communication points. These tools monitor server and network usage, port scanning activities, application usage, and unauthorized intrusion attempts. AWS security monitoring tools help identify several types of denial of service (DoS) attacks, including distributed, flooding, and software/logic attacks.

SSL Endpoints

SSL Endpoints

Secure Transmission

Establish secure communication sessions (HTTPS) using SSL

Security Groups

Instance Firewalls

Configure firewall rules for instances using Security Groups

IAM

User Accounts

Create individual IAM accounts so that each of your users has their own AWS security credentials

VPC

Subnet Control

In your Virtual Private Cloud, create low-level networking constraints for resource access, such as public and private subnets, internet gateways, and NATs

AWS provides customer access points, also called API endpoints, that allow HTTPS access so that you can establish secure communication sessions with your AWS services including SSL. SSL encrypts the transmission, protecting each request or the response from being viewed in transit.

Security Groups

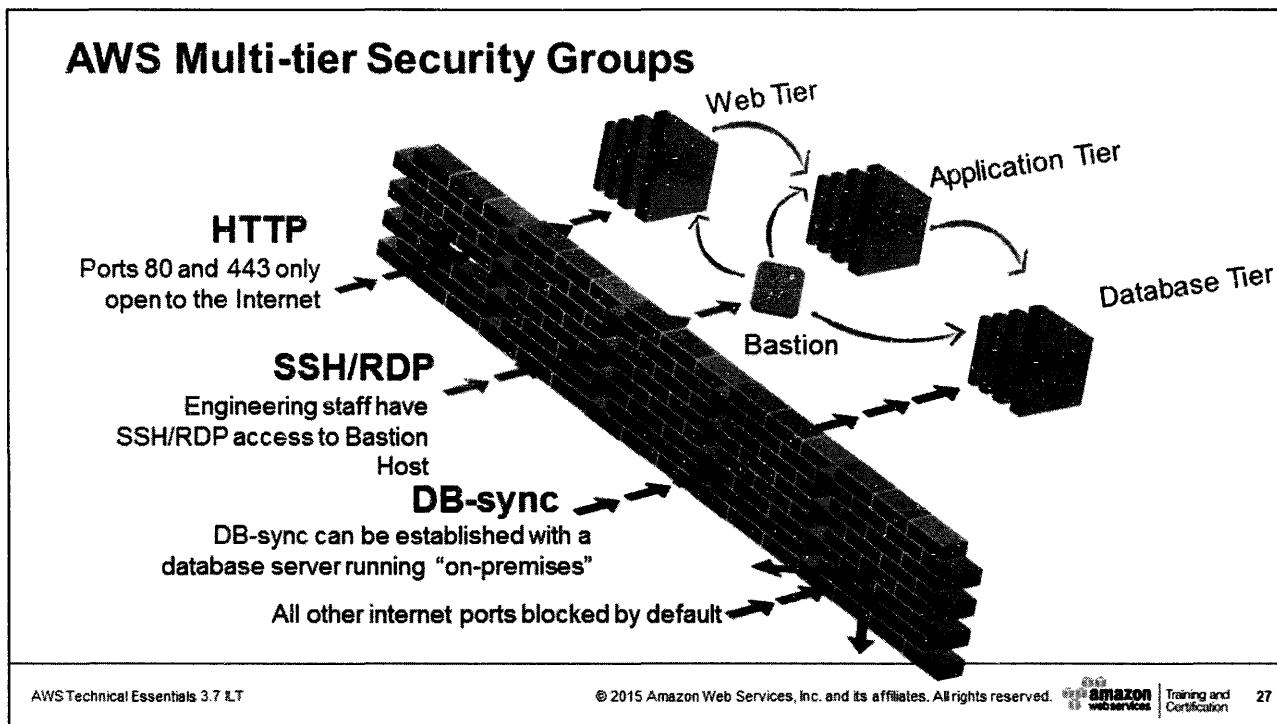
SSL Endpoints	Security Groups	IAM	VPC
<p>Secure Transmission</p> <p>Establish secure communication sessions (HTTPS) using SSL</p>	<p>Instance Firewalls</p> <p>Configure firewall rules for instances using Security Groups</p>	<p>User Accounts</p> <p>Create individual IAM accounts so that each of your users has their own AWS security credentials</p>	<p>Subnet Control</p> <p>In your Virtual Private Cloud, create low-level networking constraints for resource access, such as public and private subnets, internet gateways, and NATs</p>

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AWS also provides security groups, which act like built-in firewalls for your virtual servers. You can control how accessible your instances are by configuring security group rules—from totally public to completely private, or somewhere in between. And when your instances reside within a Virtual Private Cloud (VPC) subnet, you can control egress as well as ingress.



You can set up security group rules for your EC2 instances to create a traditional multi-tiered web architecture:

The web tier security group can accept traffic on port 80/443 from anywhere on the Internet if you select source 0.0.0.0/0. Alternatively, it might make more sense to only accept traffic from a load balancer so that individual clients cannot overload a single server and the load balancer can perform its job.

Similarly, the app tier can only accept traffic from the web tier, and the DB tier can only accept traffic from the app tier.

Lastly, we have also added a set of rules to allow remote administration over SSH port 22. We have restricted remote access by funneling all traffic through the app tier and allowing access only from a specific IP. After you use SSH to access an app tier server, you can then connect to machines on the web and DB security groups.

AWS Identity and Access Management (IAM)

SSL Endpoints	Security Groups	IAM	VPC
<p>Secure Transmission</p> <p>Establish secure communication sessions (HTTPS) using SSL</p>	<p>Instance Firewalls</p> <p>Configure firewall rules for instances using Security Groups</p>	<p>User Accounts</p> <p>Create individual IAM accounts so that each of your users has their own AWS security credentials</p>	<p>Subnet Control</p> <p>In your Virtual Private Cloud, create low-level networking constraints for resource access, such as public and private subnets, internet gateways, and NATs</p>

AWS IAM is a centralized access management tool for users and applications that need access to your AWS resources. IAM allows you to create multiple user accounts within your AWS Account, providing each user with their own unique security credentials and eliminating the need to share passwords or secret keys. It enables you to implement security best practices, such as least privilege, by only granting permission to access the AWS services and resources required for the users to perform their jobs.

AWS Identity and Access Management (IAM), enables you to securely control access to AWS services and resources for your users. Using IAM, you can create and manage AWS users and groups and use permissions to allow and deny them access to AWS resources.

Amazon Virtual Private Cloud (VPC)

SSL Endpoints

Secure Transmission

Establish secure communication sessions (HTTPS) using SSL

Security Groups

Instance Firewalls

Configure firewall rules for instances using Security Groups

IAM

User Accounts

Create individual IAM accounts so that each of your users has their own AWS security credentials

VPC

Subnet Control

In your Virtual Private Cloud, create low-level networking constraints for resource access, such as public and private subnets, internet gateways, and NATs

The Amazon Virtual Private Cloud (VPC) service allows you to add another layer of network security to your instances by creating private subnets and even adding an IPsec VPN tunnel between your home network and your AWS VPC. VPC allows you to define your own network topology, including definitions for subnets, network access control lists, Internet gateways, routing tables, and virtual private gateways. The subnets that you create can be defined as either private or public.

Learn more about Amazon VPC: <http://aws.amazon.com/vpc/>

Certifications and Accreditations

- AWS publishes SOC 1 Type II, SOC 2 Type II and SOC 3 reports
- AWS is PCI DSS Level 1 compliant and ISO 27001 certified
- AWS has achieved FedRAMP compliance, received authorization from the U.S. Government
- FISMA Moderate level
- Authorities to Operate (ATOs) under the Defense Information Assurance Certification and Accreditation Program (DIACAP)

AWS has successfully completed multiple audits, attestations and certifications. AWS publishes a Service Organization Controls SOC 1 report, published under both the SSAE 16 and the ISAE 3402 professional standards, as SOC 2-Security and SOC 3 Report.

In addition, AWS has achieved ISO 27001 certification, has been successfully validated as a Level 1 service provider under the Payment Card Industry (PCI) Data Security Standard (DSS), and currently offers HIPAA Business Associate Agreements to covered entities and their business associates subject to HIPAA.

In the realm of public sector certifications, AWS has achieved FedRAMP compliance, has received authorization from the U.S. General Services Administration to operate at the FISMA Moderate level, and is also the platform for applications with Authorities to Operate (ATOs) under the Defense Information Assurance Certification and Accreditation Program (DIACAP).

Learn more about AWS Compliance: <http://aws.amazon.com/compliance/>

AWS CloudTrail

- ▶ Records API calls for accounts
- ▶ Delivers log files with information about API calls made using the AWS Management Console, AWS SDKs, command line tools, and higher-level AWS services

AWS CloudTrail is a web service that records API calls to supported AWS services in your account and delivers log files to you.

AWS Case Study with Vodafone Italy

- **Who:** Vodafone Italy, based in Milan, is a subsidiary of Vodafone Group Plc, a leading mobile communications corporation that operates in more than 30 countries worldwide.
- **Challenge:** Vodafone wanted to make it easy for customers to use a debit or credit card to top up mobile phones. The company needed a reliable and secure solution.
- **Benefit:** They wanted a flexible infrastructure with the ability to scale.



vodafone

"Using AWS, we were able to launch a security-compliant solution in three months while reducing our capital expenses by 30%."

Stefano Harak
Online Senior Product
Manager for
Vodafone Italy

More information online about Vodafone Italy AWS Case Study:
<http://aws.amazon.com/solutions/case-studies/vodafone-italy/>

Knowledge Check

Q: Where can you locate AWS products and services?

Q: If you have more than one server, which feature will help achieve high availability?

Q: How would you control protocol level access to your EC2 instances?

Congratulations, you have reached the end of this training module. In summary, you have been shown how to navigate the AWS Management Console, how to describe the security measures AWS provides, and what global infrastructure is.

Test out some of your new skills!

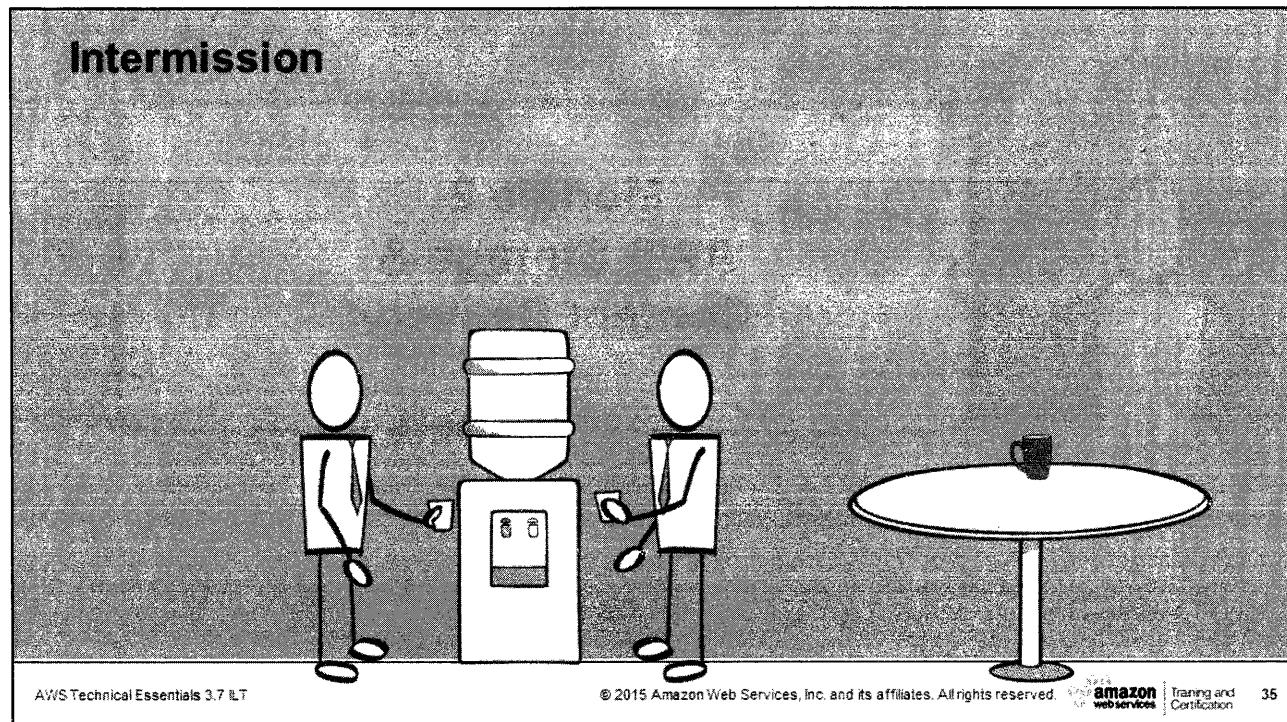
Knowledge Check

Q: Where can you locate AWS products and services? AWS Management Console

Q: If you have more than one server, which feature will help achieve high availability? Multiple Availability Zones

Q: How would you control protocol level access to your EC2 instances? Security Group

Here are the answers.



- Create an Amazon S3 bucket and manage associated objects
- Describe Amazon EBS
- Identify key AWS storage options

By the end of this module you will be able to:

Module 2 describes the key features of AWS storage and content delivery.

Module 2

AWS Storage & Content Delivery



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AWS Storage Products and Services

The diagram displays six AWS storage services, each with a corresponding icon in a dashed box:

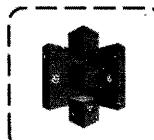
- Amazon Simple Storage Service (S3): Represented by a stylized hexagonal icon.
- Amazon Glacier: Represented by a dark rectangular icon.
- Amazon Elastic Block Store (EBS): Represented by a dark rectangular icon.
- AWS Storage Gateway: Represented by a dark rectangular icon.
- AWS Import/Export: Represented by a dark cylindrical icon with arrows.
- Amazon CloudFront: Represented by a dark cloud-like icon.

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Here are some of the most used AWS storage service options: Amazon Simple Storage Service, also known as Amazon S3; Amazon Elastic Block Store, known as Amazon EBS; Amazon Glacier; AWS Storage Gateway; Amazon Import/Export, and Amazon CloudFront.

Amazon Simple Storage Service (S3) is storage for the Internet. It is designed to make web-scale computing easier for developers.

Amazon Simple Storage Service (S3)



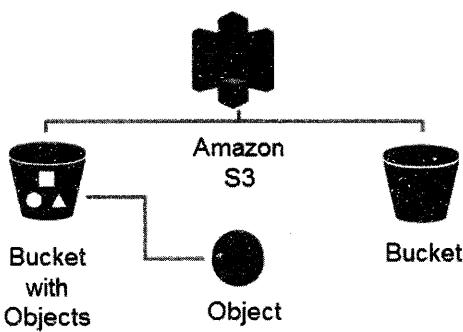
Amazon S3

- Storage for the Internet
- Natively online, HTTP access
- Store and retrieve **any amount of data**, any time, from anywhere on the web
- **Highly scalable**, reliable, fast and durable

Amazon S3 is designed to make web-scale computing easier for developers. Amazon S3 provides a simple web services interface that can be used to store and retrieve any amount of data, at any time, from anywhere on the web. It gives any developer access to the same highly scalable, reliable, secure, fast, inexpensive infrastructure that Amazon uses to run its own global network of web sites.

Learn more about Amazon S3: <http://aws.amazon.com/s3/>

Amazon S3 Concepts



- Amazon S3 stores data as objects within buckets
- An object is comprised of a file and optionally any metadata that describes that file
- You can have up to 100 buckets in each account
- You can control access to the bucket and its objects

To get the most out of Amazon S3, you need to understand a few simple concepts. First, Amazon S3 stores data as objects within buckets.

An object is composed of a file, and any metadata that describes that file. To store an object in Amazon S3, you upload the file you want to store into a bucket. When you upload a file, you can set permission on the object as well as any metadata.

Buckets are logical containers for objects. You can have one or more buckets in your account. For each bucket, you can control access, in other words, who can create, delete and list objects in the bucket. You can also view access logs for the bucket, and its objects, and choose the geographical region where Amazon S3 will store the bucket and its contents.

Amazon S3 Buckets



- Objects are stored in Buckets
- Objects can be accessed via a URL:

<http://johnsmith.s3.amazonaws.com/photos/puppy.jpg>

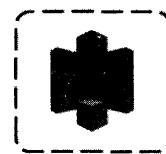


- Organize Amazon S3 namespace at highest level
- Identify account – storage and data transfer charges
- Access Control
- Unit of aggregation for usage reporting

A bucket is a logical container for objects stored in Amazon S3. Every object is contained in a bucket. For example, if the object named photos/puppy.jpg is stored in the johnsmith bucket, it can be accessed using the URL shown on the screen.

Buckets serve several purposes: they organize the Amazon S3 namespace at the highest level, they identify the account responsible for storage and data transfer charges, they play a role in access control, and they serve as the unit of aggregation for usage reporting. You can also configure buckets so that they are created in a specific region.

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 as object within its bucket

Objects are the fundamental entities stored in Amazon S3. When using the console, you can think of them as being 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. These include some default metadata such as the date last modified, and standard HTTP metadata such as Content-Type. You can also specify custom metadata at the time the object is stored. An object is uniquely identified within a bucket by a key.

Amazon S3 Developer Guide:
<http://docs.aws.amazon.com/AmazonS3/latest/dev/s3-dg.pdf>

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

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: if you are uploading periodic logs to your bucket, your application might need these logs for a week or a month after creation, and after that you might want to delete them. Some documents are frequently accessed for a limited period of time. After that, you might not need real-time access to these objects, but your organization might require you to archive them for a longer period and then optionally delete them.

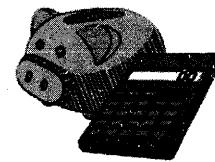
Digital media archives, financial and healthcare records, raw genomics sequence data, long-term database backups, and data that must be retained for regulatory compliance are some kinds of objects that you might upload to Amazon S3 primarily for archival purposes.

Yelp Amazon Case Study on how they leveraged Amazon S3:
<http://aws.amazon.com/solutions/case-studies/yelp/>

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**

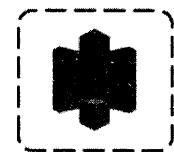


Amazon S3 pricing is based on capacity and bandwidth actually used. Since Amazon S3 is an internet-scale service that runs natively across an entire region, it can handle significant request throughput and bandwidth output. All bandwidth into Amazon S3 is free, but we charge a rate on bandwidth out. Most importantly, since Amazon S3 can handle any amount of data, it is important to note that you only pay for the amount of space you use. Prices are based on a prorated GB per month.

There is also a pricing calculator online as a reference. Note that pricing listed is in the US East (Northern Virginia) region at the time this training was developed.

Online Pricing Calculator: <http://calculator.s3.amazonaws.com/calc5.html>

Amazon S3 Facts



- Able to store **unlimited number of Objects** in a Bucket
- Objects **up to 5TB**; no bucket size limit
- Designed for **99.99999999% durability** and **99.99% availability** of objects over a given year
- HTTP/S endpoint to store and retrieve any amount of data, at any time, from anywhere on the web
- Highly scalable, reliable, fast, and inexpensive
- Optional server-side encryption using AWS or customer-managed provided client-side encryption
- Access logs for auditing
- Provides standards-based REST and SOAP interfaces

Here are some facts about Amazon S3. There is a 100-bucket limit per account. You can store unlimited number of objects in a bucket. The size of an object can be up to 5 TB and there is no limit to the size of a bucket. Amazon S3 is designed for 99.99999999% durability and 99.99% availability of objects over a given year. You can use HTTP or HTTPS endpoints to store and retrieve any amount of data, at any time, from anywhere on the web. Most importantly, Amazon S3 is highly scalable, reliable, fast, and inexpensive.

Introduction to Amazon S3 video with a free self-paced lab: <http://bit.ly/1syNCEH>

AWS Storage Products and Services



Amazon
Simple
Storage
Service



Amazon
Glacier



Amazon
Elastic
Block
Store



AWS
Storage
Gateway



AWS
Import/Export



Amazon
CloudFront

Amazon Glacier is an extremely low-cost storage service that provides secure and durable storage for data archiving and backup.

Amazon Glacier



Amazon
Glacier

- Extremely **low-cost** storage
- Secure, durable storage for **data archiving and backup**
- Optimized for data that is **infrequently accessed**

Amazon Glacier is optimized for data that is infrequently accessed and for which retrieval times of several hours are suitable. You store data in Amazon Glacier as archives. An archive can represent a single file or you can combine several files to be uploaded as a single archive. Retrieving archives from Amazon Glacier requires the initiation of a job. Jobs are typically complete in three to five hours.

More information on Amazon Glacier: <http://aws.amazon.com/glacier/>
Amazon Glacier Pricing: <http://aws.amazon.com/glacier/pricing/>

Amazon Glacier Facts



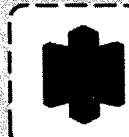
- Offload the administrative burdens of operating and scaling archival storage to AWS, and make retaining data for long periods, whether measured in years or decades, especially simple.
- Optimized for data that is infrequently accessed and for which retrieval time of several hours are suitable.
- No limit to the amount of data you can store in Amazon Glacier.
- Automatic Server-side Encryption using AES 256-bit symmetric keys.
- Designed to provide average annual durability of 99.99999999% for an archive.

Amazon Glacier allows you to offload the administrative burdens of operating and scaling archival storage to AWS, and makes retaining data for long periods, whether measured in years or decades, especially simple. With Amazon Glacier, you can reliably store large or small amounts of data for as little as \$0.01 per gigabyte per month, a significant savings compared to on-premises solutions, which makes this suitable for information archival.

AWS Storage Products and Services



Amazon
Simple
Storage
Service



Amazon
Glacier



Amazon
Elastic
Block
Store



AWS
Storage
Gateway



AWS
Import/Export



Amazon
CloudFront

Amazon Elastic Block Store (EBS) provides persistent block-level storage volumes for use with Amazon EC2 instances in the AWS cloud.

Amazon Elastic Block Store (EBS)

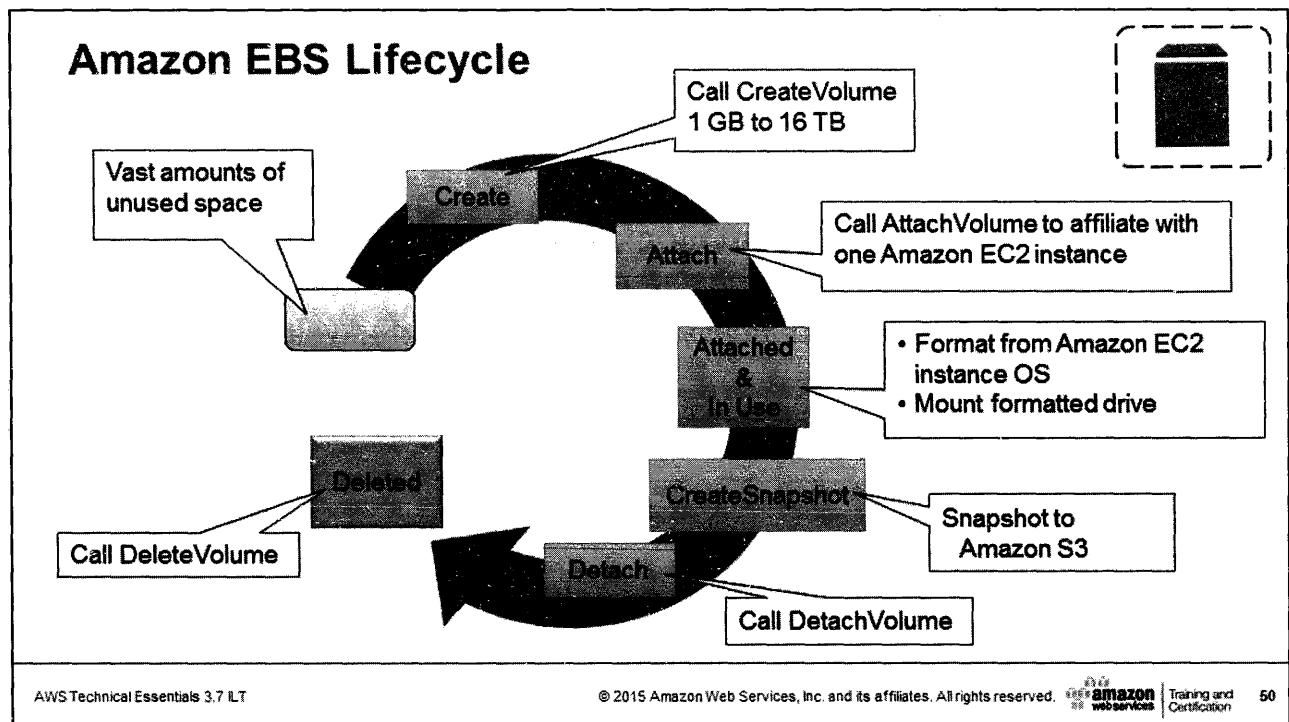


Amazon
EBS

- **Persistent block level storage volumes** offering consistent and low-latency performance
- Automatically replicated within its Availability Zone
- Snapshots stored durably in Amazon S3

Amazon Elastic Block Store, also known as Amazon EBS, provides persistent block-level storage volumes for use with Amazon EC2 instance offering consistent and low-latency performance. Amazon EBS is particularly suited for applications that require a database, file system, or access to raw block-level storage. Amazon EBS Snapshots are durable and automatically replicated within its Availability Zone. Snapshots can be stored in Amazon S3.

Introduction to Amazon EBS video: <https://us-east-1.aws-training.s3.amazonaws.com/intro/ebs.html>



Amazon EBS provides block-level storage volumes for use with Amazon EC2 instances. Amazon EBS volumes are highly available and reliable storage volumes that can be attached to any running instance in the same Availability Zone. The Amazon EBS volumes attached to an Amazon EC2 instance are exposed as storage volumes that persist independently from the life of the instance. When the volumes are not attached to an EC2 instance, you pay only for the cost of storage.

Amazon EBS Facts



- Three volume types: General Purpose (SSD), Provisioned IOPS (SSD), and Magnetic
- Can use to create RAID configuration for a server
- Off-instance block storage that persists independently
- Volumes behave like unformatted block devices for Linux or Windows instances
- Designed for 99.999% availability
- Seamless AES-256 encryption of EBS data volumes and snapshots
- Encryption of data as it moves between EC2 instances and EBS data volumes
- Provisioned IOPS (SSD) volume supports a maximum volume size of 16 TB and 20,000 IOPS/volume

Amazon EBS has three volume types to fit your business needs. You can attach multiple Amazon EBS volumes to an Amazon EC2 instance and create a RAID configuration for a server. Amazon EBS volumes are off-instance block storage that persist independently of the EC2 instance itself. Volumes behave like unformatted block devices for Linux or Windows instances. Amazon EBS is designed for 99.999% availability. Amazon EBS offers seamless AES-256 encryption of EBS data volumes and snapshots and encryption of data as it moves between EC2 instances and EBS data volume.

Amazon EBS Use Cases



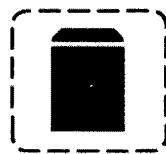
- OS – use for boot/root volume, secondary volumes
- Databases – scales with your performance needs
- Enterprise applications – provides reliable block storage to run mission-critical applications
- Business continuity – Minimize data loss and recovery time by regularly backing up using EBS Snapshots

The Amazon EBS service is simply a virtual hard drive. So, a great use case for Amazon EBS is when you want the hard drive to persist past the life of the Amazon EC2 instance. Before Amazon EBS existed as a service, AWS only used physical local attached hard drives called ephemeral storage. The problem with that was that you couldn't stop an Amazon EC2 instance without losing all your data, because of the temporary nature of local storage.

That's why we created Amazon EBS to decouple the lifecycle of data persistence from the lifecycle of an EC2 instance. Amazon EBS volumes are ideal for root volumes you need to store and have block-level access to your operating system, database storage, and datasets that are smaller than 1 TB. Given its simple snapshot mechanism Amazon EBS is a great use case for simplifying distributed backups as well.

Dropcam Case Study using AWS and Amazon EBS:
<http://aws.amazon.com/solutions/case-studies/dropcam/>

Amazon EBS Pricing



Pay for what you Provision:

- Pricing based on Region
- AWS GovCloud (US) Pricing page
- Review Pricing Calculator online



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

Amazon EBS pricing is based on allocated storage, whether you use it or not. This is unlike Amazon S3, whose pricing is based on space actually in use. Prices may vary based on region or for IOPS.

Check online for current pricing for all regions. <http://aws.amazon.com/ebs/pricing/>

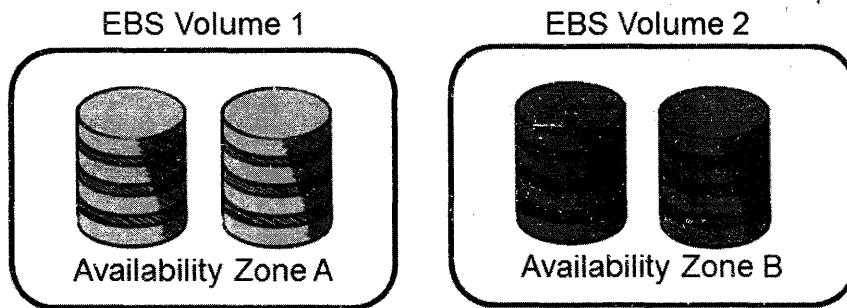
Gov. Cloud Pricing Page: <http://aws.amazon.com/govcloud-us/pricing/>

AWS Simple Monthly Calculator: <http://calculator.s3.amazonaws.com/index.html>

Amazon EBS Best Practices



Amazon EBS Volumes are in a Single Availability Zone



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

Amazon EBS volumes are designed to be highly available and reliable. Amazon EBS volume data is replicated across multiple servers in an Availability Zone to prevent the loss of data from the failure of any single component.

The durability of your volume depends on both the size of your volume and the percentage of the data that has changed since your last snapshot.

As an example, volumes that operate with 20 GB or less of modified data since their most recent Amazon EBS snapshot can expect an annual failure rate (AFR) of between 0.1 percent – 0.5 percent, where failure refers to a complete loss of the volume. This is compared with commodity hard disks that will typically fail with an AFR of around 4 percent, making EBS volumes 10 times more reliable than typical commodity.

Since Amazon EBS servers are replicated within a single Availability Zone, mirroring data across multiple Amazon EBS volumes in the same Availability Zone will not significantly improve volume durability.

For those interested in even more durability, with Amazon EBS you can create point-in-time consistent snapshots of your volumes that are then stored in Amazon S3, and automatically replicated across multiple Availability Zones.

Taking frequent snapshots of your volume is a convenient and cost-effective way to

increase the long-term durability of your data. In the unlikely event that your Amazon EBS volume does fail, all snapshots of that volume will remain intact, and will allow you to recreate your volume from the last snapshot point.

Amazon EBS and Amazon S3

	Amazon EBS	Amazon S3
Paradigm	File system	Object store
Performance	Very fast	Fast
Redundancy	Across multiple servers in an Availability Zone	Across multiple facilities and on multiple devices within each facility
Security	EBS Encryption – Data volumes and Snapshots	Server Side Encryption
Access from the Internet?	No (1)	Yes (2)
Typical use case	It is a disk drive	Write once, read many
(1) Accessible from the Internet if mounted to server and set up as FTP, etc. (2) Only with proper credentials, unless ACLs are world-readable		

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This table demonstrates significant differences between Amazon S3 and Amazon EBS. Amazon EBS volumes are network-attached hard drives that can be written to or read from at a block level. Amazon S3 is an object-level storage medium.

This means that you must write whole objects at a time. If you change one small part of a file, you must still rewrite the entire file in order to commit the change to Amazon S3. This can be very time-consuming if you have frequent writes to the same object.

Amazon S3 is optimized for write once/read many use cases. The other major difference is cost. With Amazon S3 you pay for what you use, and with Amazon EBS you pay for what you provision.

AWS Storage Products and Services



Amazon
Simple
Storage
Service



Amazon
Glacier



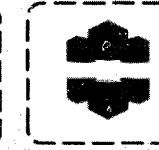
Amazon
Elastic
Block
Store



AWS
Storage
Gateway



AWS
Import/Export



Amazon
CloudFront

AWS Storage Gateway Is a service connecting an on-premises software appliance with cloud-based storage to provide seamless and secure integration between an organization's on-premises IT environment and the AWS' storage infrastructure.

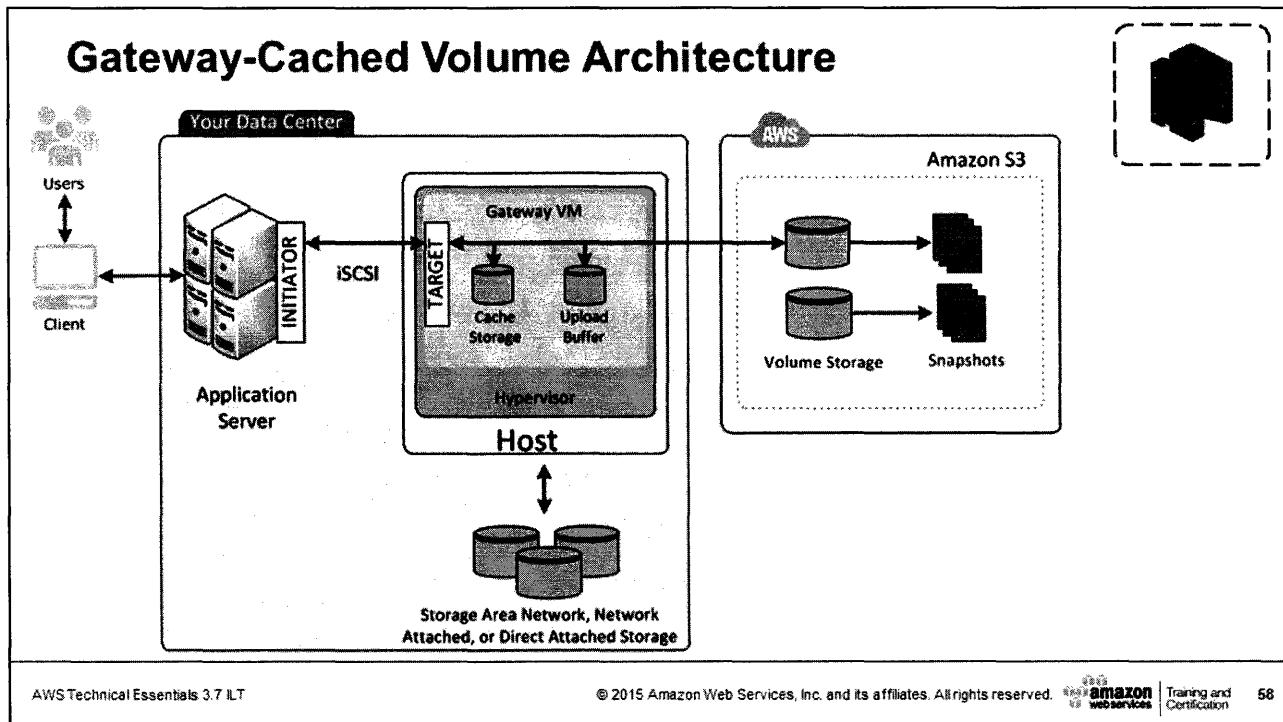
AWS Storage Gateway



- Connect an on-premises software appliance with **cloud-based storage**
- **Securely upload data** to the AWS cloud for cost effective backup and rapid disaster recovery
- Mirror your on-premises data to Amazon EC2 instances

AWS Storage Gateway provides low-latency performance by maintaining frequently accessed data on-premises while securely storing all of your data encrypted in Amazon S3. It is a service connecting an on-premises software appliance with cloud-based storage to provide seamless and secure integration between an organization's on-premises IT environment and the AWS' storage infrastructure.

Using the AWS Storage Gateway, you can back up point-in-time snapshots of your on-premises application data to Amazon S3 for future recovery. If you need to replace capacity for disaster recovery purposes, or leverage Amazon EC2's on-demand compute capacity for additional capacity during peak periods, new projects, or as a more cost-effective way to run normal workloads, you can use the AWS Storage Gateway to mirror your on-premises data to Amazon EC2 instances.



This diagram provides an overview of the AWS Storage Gateway-cached volume deployment.

After you have installed AWS Storage Gateway's software appliance (the virtual machine or VM) on a host in your data center and activated it you can then use the AWS Management Console to provision storage volumes backed by Amazon S3. You can also provision storage volumes programmatically by using the AWS Storage Gateway API or the AWS SDK libraries. You then mount these storage volumes to your on-premises application servers as iSCSI devices.

More information about this solution can be found online:
<http://docs.aws.amazon.com/storagegateway/latest/userguide/storage-gateway-cached-concepts.html>

AWS Storage Products and Services



Amazon
Simple
Storage
Service



Amazon
Glacier



Amazon
Elastic
Block
Store



AWS
Storage
Gateway



AWS
Import/Export



Amazon
CloudFront

AWS Import/Export Accelerates moving large amounts of data into and out of AWS, using portable storage devices for transport.

AWS Import/Export



AWS
Import/Export

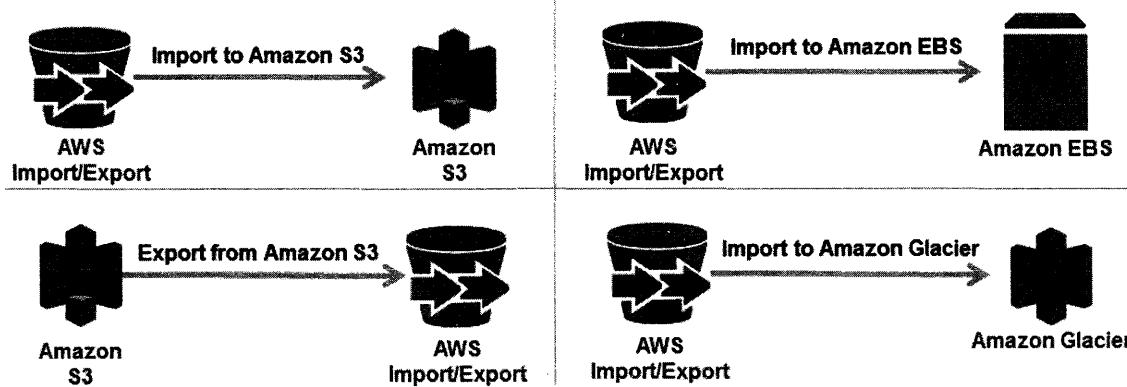
- Accelerates moving large amounts of data into and out of Amazon S3 or Amazon EBS
- Transfers your data directly onto and off of storage devices
- Uses Amazon high-speed internal network

AWS Import/Export accelerates moving large amounts of data into and out of AWS, using portable storage devices for transport. AWS Import/Export moves data into and out of Amazon S3 buckets, Amazon Glacier, or Amazon EBS. Portable device can be shipped to AWS and the data is processed and securely transferred to an AWS datacenter, where the device is attached to an AWS Import/Export station. After the data load is completed, the device is returned.

AWS Import/Export Support



AWS Import/Export supports:



AWS Import/Export Support:

- Accelerates moving large amounts of data into and out of Amazon S3 or Amazon EBS
- Transfers your data directly to and from storage devices
- Uses the AWS high-speed internal network

AWS Import/Export accelerates transferring large amounts of data between the AWS cloud and portable storage devices that you mail to us. AWS transfers data directly to and from your storage devices using Amazon's high-speed internal network. Your data load typically begins the next business day after your storage device arrives at AWS. After the data export or import is completed, we return your storage device. For large data sets, AWS Import/Export can be significantly faster than Internet transfer and more cost-effective than upgrading your connectivity.

AWS Storage Products and Services



Amazon
Simple
Storage
Service



Amazon
Glacier



Amazon
Elastic
Block
Store



AWS
Storage
Gateway



AWS
Import/Export



Amazon
CloudFront

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Amazon CloudFront is a content delivery web service.

Amazon CloudFront



Amazon
CloudFront

- Easy and cost effective way to **distribute content** to end users
- **Low latency, high data transfer speeds**
- Deliver your entire website, including dynamic, static, streaming, and interactive content using a global network of edge locations

Amazon CloudFront integrates with other Amazon Web Services to give developers and businesses an easy way to distribute content to end users with low latency, high data transfer speeds, and no minimum commitments. You can use Amazon CloudFront to deliver your entire website.

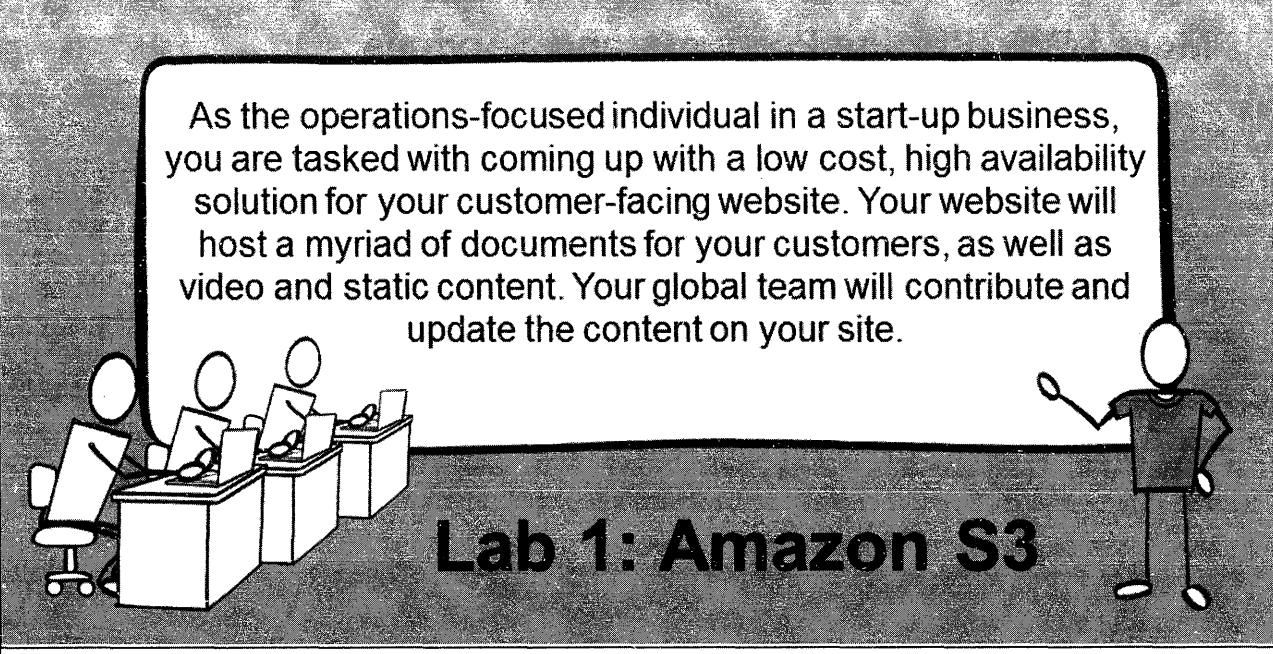
More AWS Storage Products and Services



Amazon
Elastic File
System

- Is a fully managed file storage service
- Is ideal for on-demand scaling of file system capacity and performance
- Supports Network File System version 4 (NFSv4) protocol

Amazon Elastic File system is a fully managed file storage service. Amazon EFS supports NFSv4 protocol. The service is designed to be highly available and durable.



As the operations-focused individual in a start-up business, you are tasked with coming up with a low cost, high availability solution for your customer-facing website. Your website will host a myriad of documents for your customers, as well as video and static content. Your global team will contribute and update the content on your site.

Lab 1: Amazon S3

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Go online and create an account in [qwikLABS](#) to complete Lab 1 if you haven't already done so.

Overview

Amazon Simple Storage Service (Amazon S3) is a scalable object storage service designed for the Internet. In this lab you will create an Amazon S3 bucket and configuring access logging. You will then upload an object, and manage its permissions and access the object via a web browser.

You will have a chance to modify the object metadata, including encrypting objects with Server Side Encryption, creating a folder to apply bucket-wide security with a bucket policy and Enabling Life Cycle policies to archive and delete logs, if you have additional time to do something a little more challenging.

Learning Objectives

By the end of this lab you will be able to do the following with Amazon S3:

- Create an Amazon S3 bucket and manage properties.
- Upload objects and manage object-level permissions.
- Access objects in an Amazon S3 bucket from a web browser.
- Creating folders and apply bucket-wide security using bucket policies.

Learn more about actions and policy types:

<http://docs.aws.amazon.com/AmazonS3/latest/dev/example-bucket-policies.html>

Knowledge Check

Q: What AWS service would help support your web application to offload serving static assets and store user uploaded images and video off-instance?

Q: Important application and operations data (logs, user content, etc.) needs to be durably backed up and archived. What AWS service can help?

Q: What AWS service will help with your relational database on EC2 with log and data files that consume 40GB and grow at a rate of 5%/month?

Q: Your web application's static assets – and some of its dynamic content can be cached. What AWS service would support this?

Congratulations, you have reached the end of this training module. In summary, you been shown the key AWS storage options, what is an Amazon Elastic Block Store is, and how to create an Amazon S3 bucket and manage associated objects.

Test out some of your new skills!

Knowledge Check Answers

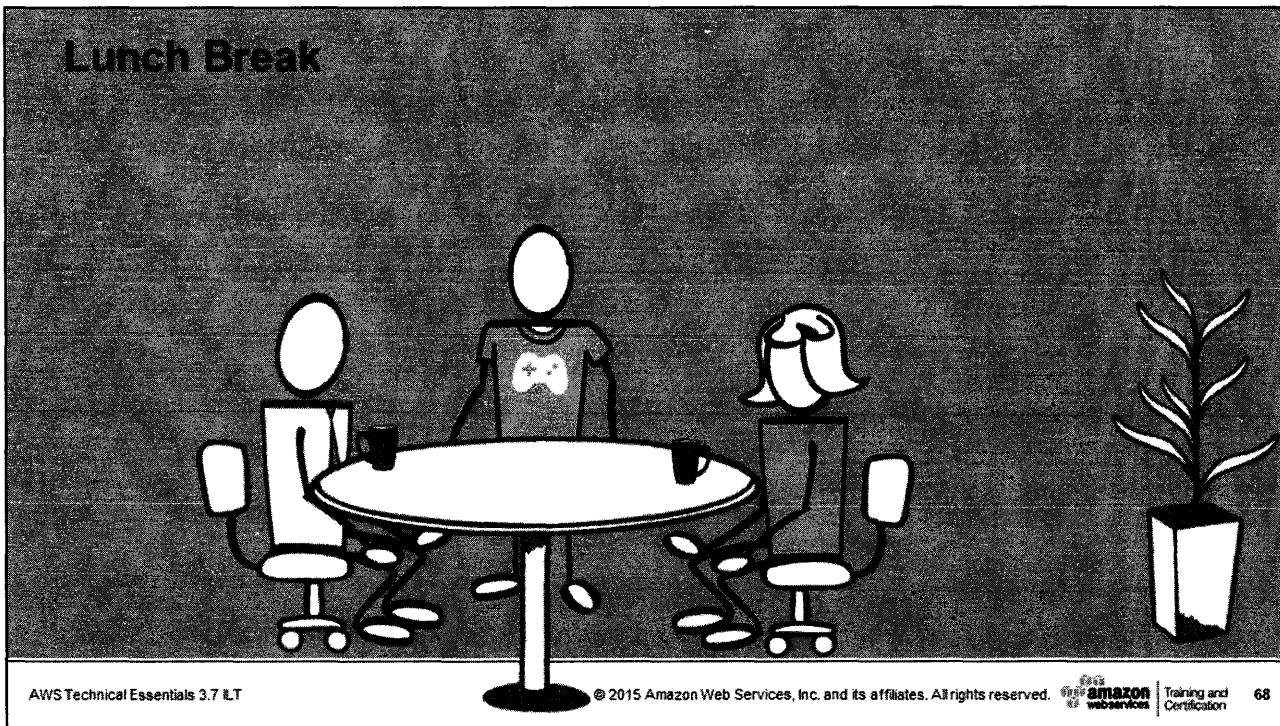
Q: What AWS service would help support your web application to offload serving static assets and store user uploaded images and video off-instance? Amazon S3

Q: Important application and operations data (logs, user content, etc.) needs to be durably backed up and archived. What AWS service can help? Amazon Glacier

Q: What AWS service will help with your relational database on EC2 with log and data files that consume 40GB and grow at a rate of 5%/month? Amazon EBS

Q: Your web application's static assets – and some of its dynamic content can be cached. What AWS service would support this? Amazon CloudFront

Here are the answers.



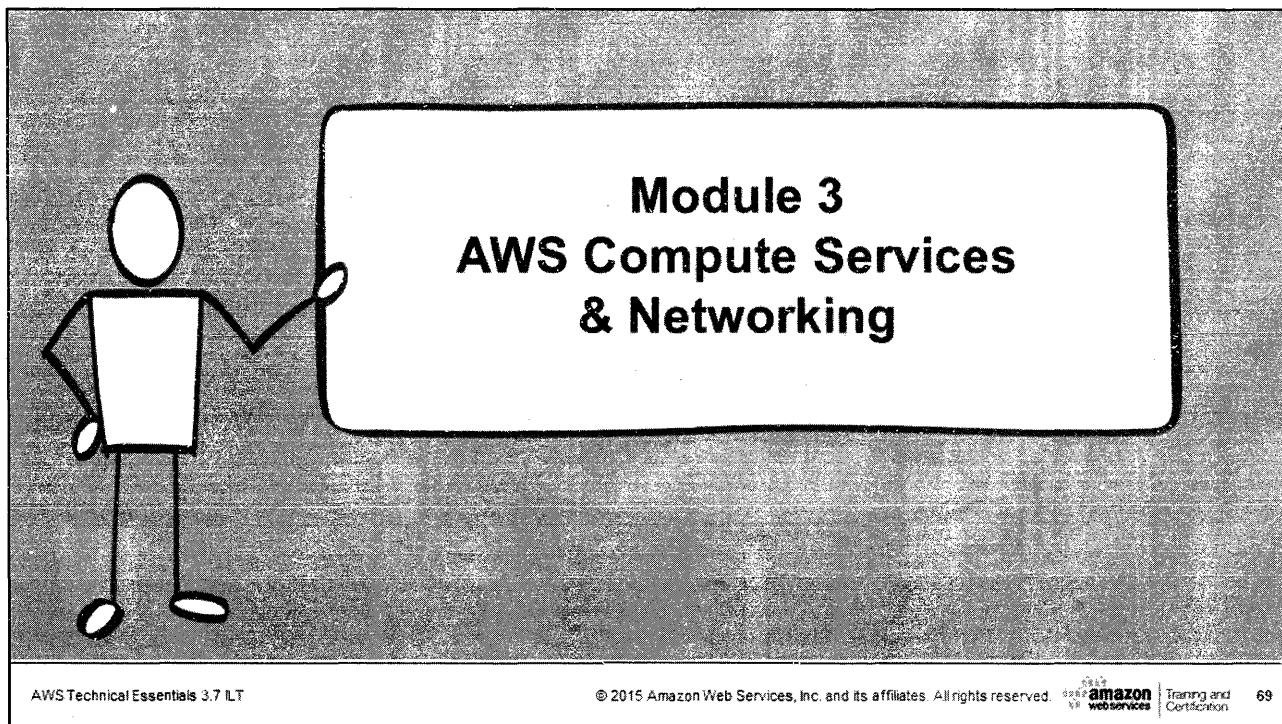
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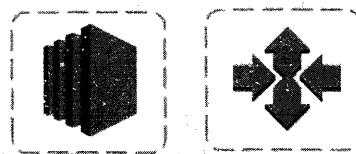


This module describes the fundamental elements of AWS Compute and Networking, with a focus on Amazon Elastic Compute Cloud. This module will build on what you learned in Module 2 by verifying how to use Amazon Elastic Block Storage.

By the end of this module you will be able to:

- Identify the different AWS compute and networking options
- Describe what Amazon Virtual Private Cloud is
- Create an Amazon Elastic Compute Cloud instance
- Verify how to use Amazon Elastic Block Storage

AWS Compute Products



Amazon
Elastic
Compute
Cloud

Auto
Scaling

AWS offers several services that address the computational needs of users operating in the cloud. The compute and networking services that we will discuss are Amazon Elastic Compute Cloud also known as Amazon EC2, Amazon Route 53, Auto Scaling, and AWS Direct Connect.

Amazon EC2 is a web service that provides resizable compute capacity in the cloud.

Amazon Elastic Compute Cloud (EC2)



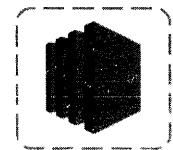
Amazon
EC2

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

Amazon EC2 is designed to make web-scale computing easier for developers. Amazon EC2's simple web service interface allows you to obtain and configure capacity with minimal friction. It provides you with complete control of your computing resources and allows you to run on Amazon's proven computing environment.

Amazon EC2 reduces the time required to obtain and boot new server instances, allowing you to quickly scale capacity, both up and down, as your computing requirements change. Amazon EC2 changes the economics of computing by allowing you to pay only for capacity that you actually use. Amazon EC2 provides the tools for you to build failure-resilient applications and isolate themselves from common failure scenarios.

Amazon EC2 Facts

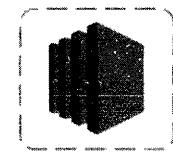


- Scale capacity as your computing requirements change
- Pay only for capacity that you actually use
- Choose Linux or Windows
- Deploy across AWS regions and Availability Zones for reliability

Amazon EC2 presents a true virtual computing environment, allowing you to use web service interfaces to launch instances with a variety of operating systems, load them with your custom application environment, manage your network's access permissions, and run your image using as many or few systems as you need.

You have the ability to programmatically scale your computing capacity as your requirements change. You pay only for capacity that you actually use and can choose Linux or Windows. You can leverage the AWS' global infrastructure to deploy across regions and Availability Zones (AZs) for reliability.

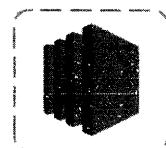
How to Use Amazon EC2



1. Determine the AWS region 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, tag, and key pair.

Before you create your first Amazon EC2 instance think about what region you want to have that instance in. Then launch and an Amazon Machine Image (AMI) configuration to provide tight integration with Amazon Web Services. This allows the AMI to launch and work correctly within Amazon EC2 from the first boot. The AMI comes pre-installed with many AWS API tools as well as CloudInit. AWS API tools enable scripting of important provisioning tasks from within an Amazon EC2 instance. AMI's are like building blocks of EC2 instances. They are templates of a computer's root volume. AMI's can have public or private access and focus on two main security goals: limiting access and reducing software vulnerabilities. You can also create gold master images of your EC2 infrastructure, which allow you to decrease your boot times. After that you will choose an instance type based on CPU, memory, storage and network requirements. Last you will configure network, IP address, security group, storage volume, tag, and key pair.

Infrastructure and Applications



- Oracle
- SAP
- Microsoft
-  awsmarketplace

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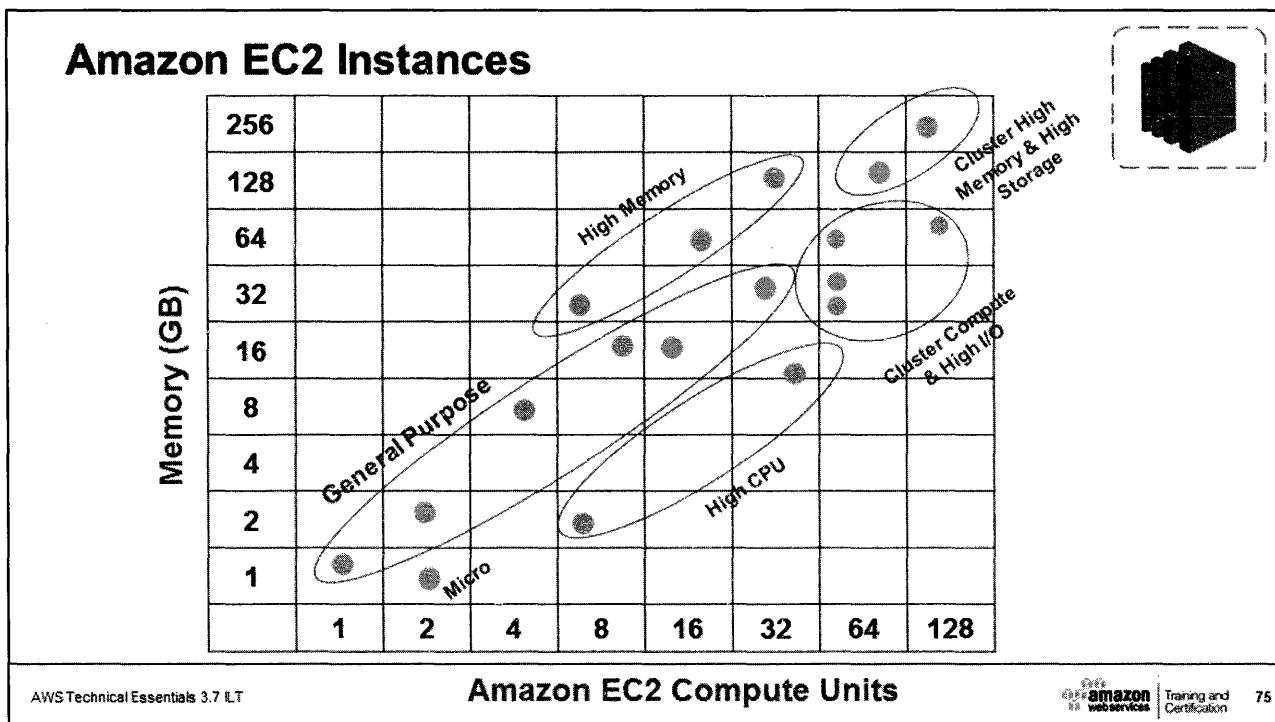
AWS and Oracle have worked together to offer customers convenient options for deploying enterprise applications in the cloud. Customers can not only build enterprise-grade solutions hosted by Amazon Web Services using database and middleware software by Oracle, but they can also launch entire enterprise software stacks from Oracle on EC2.

New and existing SAP customers can deploy their SAP solutions on SAP certified Amazon EC2 instances in production environments knowing that SAP and AWS have tested the performance of the underlying AWS resources, verified their performance, and certified them against the same standards that apply to servers and virtual platforms.

AWS also provides infrastructure services that allow customers to easily run Microsoft Windows Server applications in the cloud, without the cost and complexity of having to purchase or manage servers or data centers. AMI's are available, which allow customers to start running fully supported Windows Server virtual machine instances in minutes.

Customers may also rely on the global infrastructure of AWS to power everything from custom .NET applications to enterprise deployments of Microsoft Exchange Server, SQL Server or SharePoint Server.

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



Amazon EC2 lets you choose from a number of different instance types to meet your computing needs. Each instance provides a predictable amount of dedicated compute capacity and is charged per instance-hour consumed. First-generation (M1) general purpose instances provide a balanced set of resources and a low-cost platform that is well suited for a wide variety of applications. Second-generation (M3) general purpose instances provide a balanced set of resources and a higher level of processing performance compared to First-generation general purpose instances. Instances in this family are ideal for applications that require higher absolute CPU and memory performance. Applications that can benefit from the performance of second-generation general purpose instances include encoding applications, high traffic content management systems, and Memcached applications. High-memory instances offer large memory sizes for high throughput applications, including database and memory caching applications. High-CPU Instances have proportionally more CPU resources than memory (RAM) and are well suited for compute-intensive applications. There are also various high-storage and cluster-computer instance types available.

Choosing the Right Amazon EC2 Instance



- EC2 Instance types are optimized for different use cases & come in multiple sizes. This allows you to optimally scale resources to your workload requirements.
- AWS uses Intel® Xeon® processors for EC2 Instances providing customers with high performance and value.
- Consider the following when choosing your instances: Core count, Memory size, Storage size & type, Network performance, & CPU technologies.
- Hurry Up & Go Idle - A larger compute instance can save you time and money, therefore paying more per hour for a shorter amount of time can be less expensive.

Choosing the right EC2 Instance type matters. Selecting an appropriate instance type for your workload can save time and money. AWS has a wide variety of EC2 compute instance types to choose from. Each Instance type or family (like T2, M3, C4,C3, G2, R3, and so on) is optimized for different workloads or use cases. Within an EC2 family, you can choose from different sizes for example micro, small, medium, large, xlarge, 2xlarge, and so on. AWS utilizes Intel® Xeon® processors for the EC2 Instances to provide customers with high performance and value for their computing needs.

When you choose your instance type you should consider the several different attributes of each family; such as number of cores, amount of memory, amount & type of storage, network performance, and processor technologies.

Another important consideration is TCO. A lowest-price per hour instance is not necessarily a money saver; a larger compute instance can sometimes save both money and time. It is important to evaluate all the options to see what is best for your workload.

Get the Intel® Advantage



Intel's latest 22nm Haswell microarchitecture on new C4 instances, with custom Intel® Xeon® v3 processors, provides new features:

- Haswell microarchitecture has better branch prediction; greater efficiency at prefetching instructions and data; along with other improvements that can **boost existing applications' performance by 30% or more**
- P state and C state control provides the ability to individually tune each cores performance and sleep states to improve application performance
- Intel® AVX2.0 instructions can double the floating-point performance for compute-intensive workloads over Intel® AVX, and provide additional instructions useful for compression and encryption

AWS recently launched C4 compute-optimized instances which utilize Intel's latest 22nm Haswell microarchitecture. C4 instances use custom Intel® Xeon® v3 processors designed and built especially for AWS.

Through its relationship with Intel®, AWS provides its customers with the latest and greatest Intel® Xeon® processors that help in delivering the highest level of processor performance in EC2.

Intel® Processor Technologies

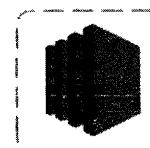


- Intel® AVX – Get dramatically better performance for highly parallel HPC workloads such as life science engineering, data mining, financial analysis, or other technical computing applications. AVX also enhances image, video, and audio processing.
- Intel® AES-NI – Enhance your security with these new encryption instructions that reduce the performance penalty associated with encrypting/decrypting data.
- Intel® Turbo Boost Technology – Get more computing power when you need it with performance that adapts to spikes in your workload with Intel® Turbo Boost Technology 2.0

Intel® Xeon® processors have several other important technology features that can be leveraged by EC2 Instances.

- Intel® AVX is perfect for highly parallel HPC workloads such as life sciences or financial analysis.
- Intel® AES-NI accelerates encryption/decryption of data and therefore reduces the performance penalty that usually comes with encryption.
- Intel® Turbo Boost Technology automatically gives you more computing power when your workloads are not fully utilizing all CPU cores. Think of it as automatic overclocking when you have thermal headroom.

EC2 Instances with Intel® Technologies

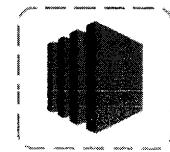


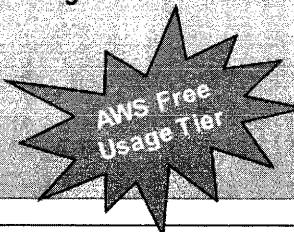
AWS Instance Type:	Compute Optimized C4	Memory Optimized R3	I/O Optimized I2	Balanced M3 & T2	General Purpose Burstable	GPU G2	Storage Optimized HS1
Intel® processor	Intel® Xeon® E5-2666 v3	Intel® Xeon® E5-2670 v2	Intel® Xeon® E5-2670 v2	Intel® Xeon® E5-2670 v2	Intel® Xeon® family	Intel® Xeon® E5-2670	Intel® Xeon® family
Intel® process technology	22nm Haswell	22nm Ivy Bridge	22nm Ivy Bridge	22nm Ivy Bridge	✓	32nm Sandy Bridge	✓
Intel® AVX	AVX 2.0	✓	✓	✓	✓	✓	✓
Intel® AES-NI	✓	✓	✓	✓	✓		
Intel® Turbo Boost	✓	✓	✓	✓	✓		
SSD Storage	EBS-OPT by default	✓	✓	✓		✓	

The matrix on the slide highlights the individual Intel® technologies that were discussed previously and the EC2 instance family that can leverage each of these technologies.

A complete list of Amazon EC2 Instance types can be found here:
<http://aws.amazon.com/ec2/instance-types/>

Amazon EC2 Purchasing Options



On-Demand Instances	Reserved Instances	Spot Instances
<ul style="list-style-type: none"> ✓ Pay as you go for compute power ✓ Pay only for what you use, no up-front commitments or long-term contracts 	<ul style="list-style-type: none"> ✓ 1- or 3-year terms ✓ Pay 1-time low up-front fee, receive significant hourly discount ✓ Compute capacity is available when needed 	<ul style="list-style-type: none"> ✓ Bid on unused Amazon EC2 capacity ✓ Spot Price based on supply/demand, determined automatically ✓ Spot Price below bid, instances start ✓ Spot Price above bid, instances terminate

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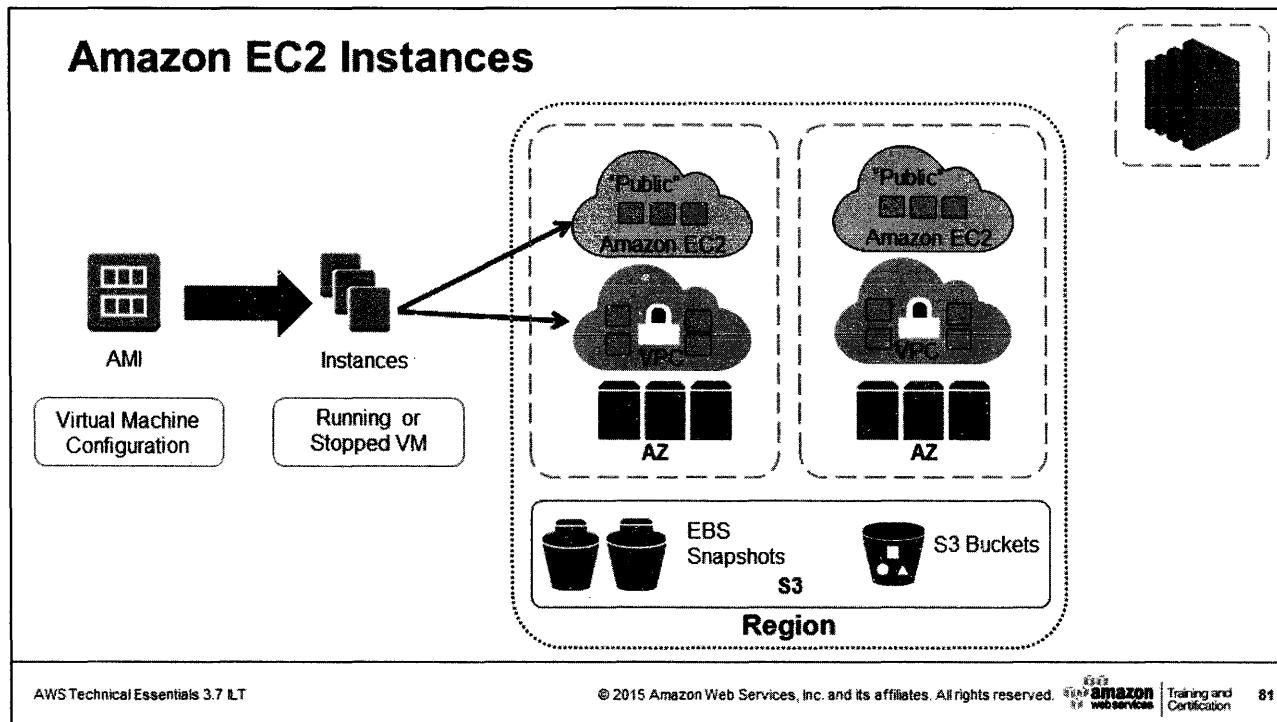
Training and Certification

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Amazon EC2 Reserved Instance pricing allows you to pay an up-front fee to receive a significant hourly discount. The cost is predictable and you get priority compute capacity when needed. Ideal use cases are applications with steady state or predictable usage or applications that require reserved capacity and disaster recovery.

Unless your usage is highly specialized, the bulk of your AWS charges will be a combination of compute, storage and data transfer. Let us take a look at each of these components in turn. With On-Demand, you pay as you go for compute power. It has the lowest up-front cost and the most flexibility. You pay for an hour at a time with no up-front commitments or long-term contracts. This is great for applications with short-term, spiky, or unpredictable workloads.

Amazon EC2 Spot Instance pricing is based on supply and demand, and pricing is determined automatically. It is good for large-scale and dynamic workload handling. Use spot instances when time is not a concern so you can leverage the best price. You cannot count on having compute capacity when you want it; capacity is available only when the prices are low enough and the market controls that. Spot instances are served from AWS spare or unused capacity. Don't forget, there is also the AWS Free Usage Tier to help new AWS customers get started in the cloud.



You can launch multiple instances of different types from a single AMI when launching an EC2 instance. An instance type essentially determines the hardware of the host computer used for your instance. Each instance type offers different compute and memory capabilities. Select an instance type based on the amount of memory and computing power that you need for the application or software that you plan to run on the instance. Your instance keeps running until you stop or terminate it, or until it fails. If an instance fails, you can launch a new one from the AMI.

Instances are deployed in Amazon EC2 public cloud or Amazon Virtual Private Cloud in an Availability Zone (AZ) within a region. You can configure security and network access on your Amazon EC2 instance.

Customers can deploy to multiple AZs within a region. You choose which instance types you want, and then start, terminate, and monitor as many instances of your AMI as needed, using the web service APIs or the variety of management tools provided.

Amazon EC2 instances can leverage AWS Elastic Block Storage volumes in each Availability Zone. Determine whether you want to run in multiple locations, utilize static IP endpoints, or attach persistent block storage to your instances. EBS volumes can be saved via "snapshots". Additionally Amazon S3 buckets can be used to store data objects needed by Amazon EC2 instances. Pay only for the resources that you actually consume, like instance-hours or data transfer.

AWS Case Study with Zumba Fitness

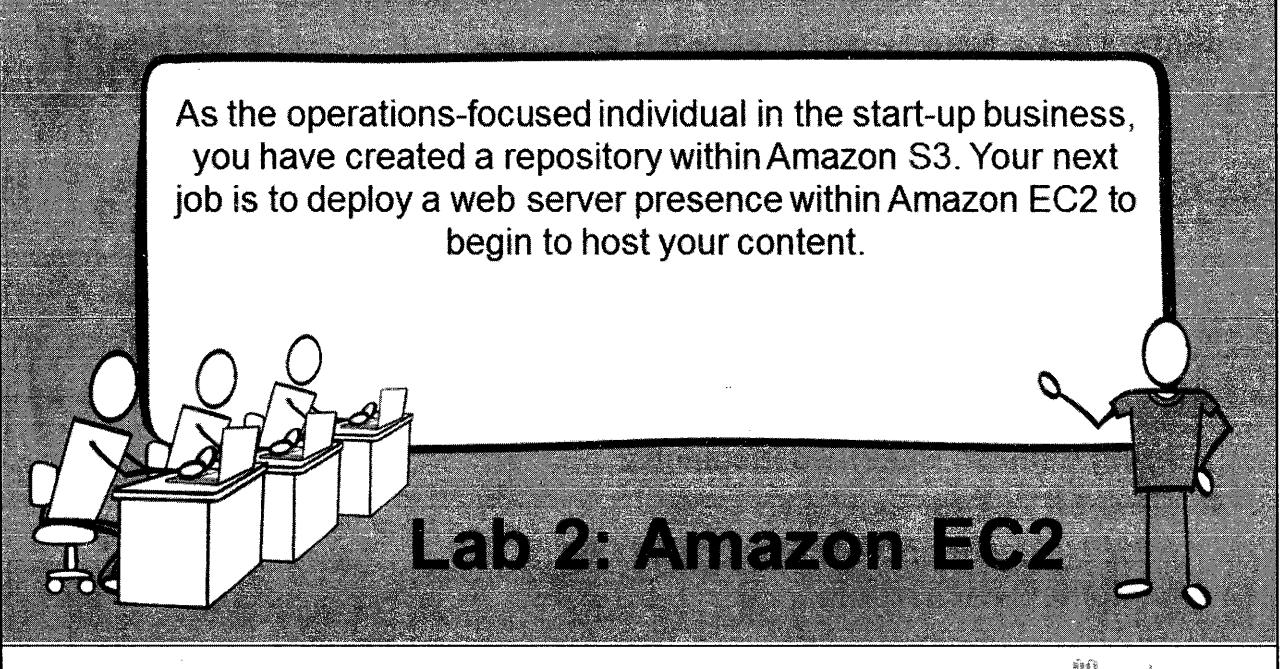
- **Who:** As one of the worlds largest dance fitness programs, Zumba Fitness needed a scalable and high-performance website.
- **Challenge:** When Zumba migrated its website to AWS in 2009, the company saved 39% on computing resources by using Amazon Reserved Instances.
- **Benefit:** Zumba could also scale easily to serve up 7 TB of images to its customers each month.



"My experience working with AWS is that it has been very easy to migrate a lot of our solutions and easily get up and running with AWS."

Alfredo Moreno
Lead Dev Ops Engineer
Zumba Fitness

Video from Zumba and more information online:
<http://aws.amazon.com/solutions/case-studies/zumba-fitness/>



As the operations-focused individual in the start-up business, you have created a repository within Amazon S3. Your next job is to deploy a web server presence within Amazon EC2 to begin to host your content.

Lab 2: Amazon EC2

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Lab 2: Amazon EC2

Overview

Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. Amazon EC2 reduces the time required to obtain and boot new server instances to minutes, allowing you to quickly scale capacity as your computing requirements change.

In this lab you will launch an Amazon EC2 instance, connect to the instance, and create Elastic Block Store (EBS) volumes.

Learning Objectives

By the end of this lab you will be able to do the following with Amazon EC2:

- Create an EC2 key pair and a security group.
- Launch an Amazon EC2 Windows instance.
- Activate Termination Protection for an Amazon EC2 instance.
- Create EBS volumes and snapshots.

AWS Compute Products

The diagram illustrates the integration of two AWS services: Amazon EC2 and Auto Scaling. On the left, a large hexagonal icon represents Amazon EC2. To its right, a dashed line connects to a smaller rectangular icon containing two vertical arrows pointing in opposite directions, representing Auto Scaling. Below these icons, the text "Amazon Elastic Compute Cloud" is displayed above "Auto Scaling".

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Auto Scaling allows you to automatically scale your Amazon EC2 capacity up or down according to conditions you define.

Auto Scaling



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

Auto Scaling is particularly well suited for applications that experience hourly, daily, or weekly variability in usage. Auto Scaling is enabled by Amazon CloudWatch and available at no additional charge beyond the Amazon CloudWatch fees.

Auto Scaling Benefits



Elastic Capacity



Ease of Use



Cost Savings



Geographic Flexibility



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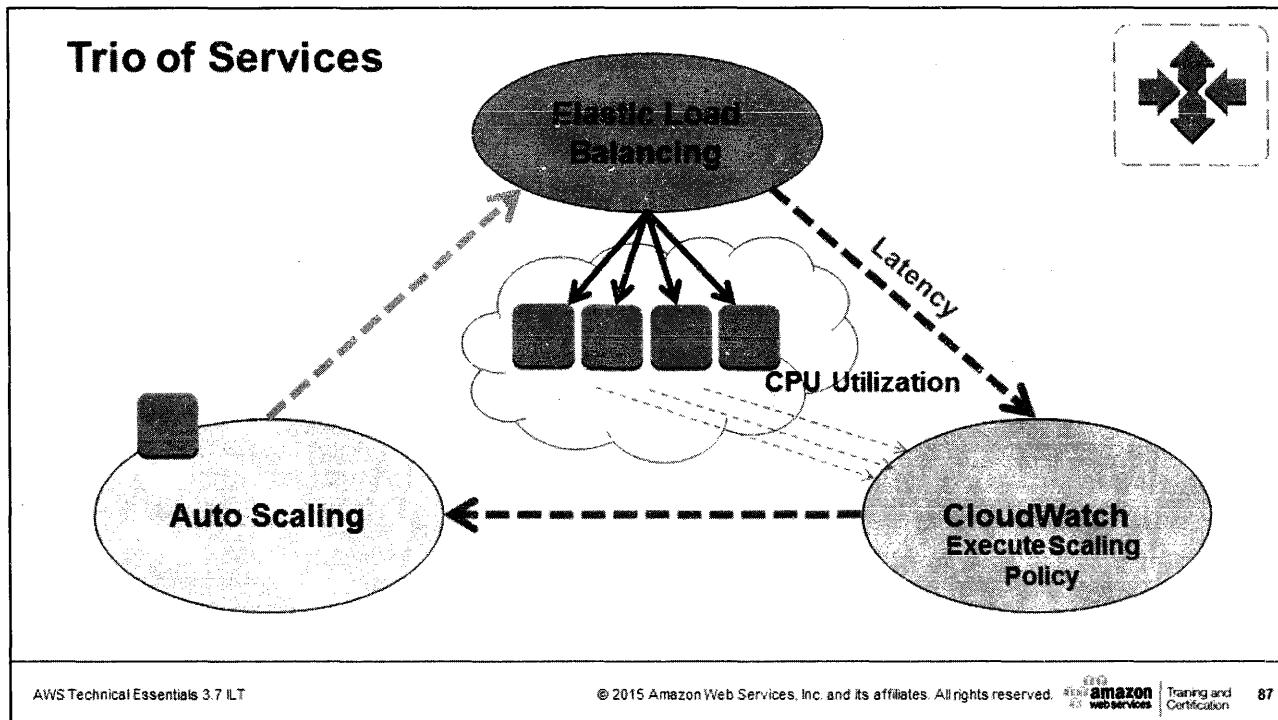
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Elastic capacity: With Auto Scaling, you can ensure that the number of Amazon EC2 instances you are using **increases seamlessly during demand spikes** to maintain performance, and decreases automatically during demand lulls to **minimize costs**.

Ease of use: Manage your instances as a single collective entity and define rules for when instances should be added and removed. **Replace lost or unhealthy instances automatically** based on predefined thresholds.

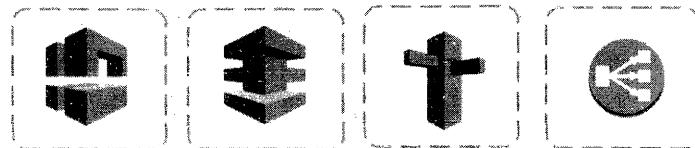
Cost savings: Save compute costs by **terminating underused instances automatically** and launching new instances when you need them, without the need for manual intervention.

Geographic flexibility: Distribute, scale, and balance applications automatically over **multiple Availability Zones** within a region to support scalability and geographic redundancy.



Auto Scaling works as a triad of services working in sync. Elastic Load Balancing and EC2 instances feed metrics to Amazon CloudWatch. Auto Scaling defines a group with launch configurations and Auto Scaling policies. Amazon CloudWatch alarms execute Auto Scaling policies to affect the size of your fleet. All of these services work well individually, but together they become more powerful and increase the control and flexibility our customers demand.

AWS Networking Products and Services



Amazon
Virtual
Private
Cloud

AWS Direct
Connect

Amazon
Route 53

Elastic
Load
Balancing

AWS offers several networking options. The networking services that we will discuss are Amazon Virtual Private Cloud, AWS Direct Connect, Amazon Route 53 and Elastic Load Balancing.

Amazon Virtual Private Cloud (VPC) A service you can use to define a virtual network topology that closely resembles a traditional network that you might operate in your own datacenter.

Amazon Virtual Private Cloud (VPC)



- Provision a **private, isolated section** of the AWS Cloud where you can launch AWS resources in a **virtual network** that you define.
- Have complete control over your virtual networking environment.

With Amazon Virtual Private Cloud (VPC), you can define a virtual network topology that closely resembles a traditional network that you might operate in your own datacenter. You have complete control over your virtual networking environment and you can easily customize the network configuration for your Amazon VPC such as selection of IP address range, creation of subnets, configuration of route tables, and network gateways.

Amazon VPC

The diagram illustrates the Amazon VPC architecture. At the top center is a cloud icon labeled "Amazon VPC". Below it is a "Lock" icon. Two arrows point from the VPC cloud to the "Internet" and "Corporate Datacenter" icons. The "Corporate Datacenter" icon is labeled "Corporate Datacenter" and has a gear-like base. To the left of the VPC is a box containing the text: "Create an Amazon VPC and specify its private IP address range from any range you choose." To the right of the VPC is a box containing: "Divide your VPC's private IP address range into multiple subnets." Below the VPC is a box containing: "Control inbound and outbound access to subnets by using Network Access Control Lists." At the bottom left is a box containing: "Bridge your Amazon VPC to your own IT infrastructure via an encrypted VPN connection." At the bottom right is a box containing: "Attach an Amazon Elastic IP address to any instance in your VPC so it can be reached directly from the Internet."

Create an Amazon VPC and specify its private IP address range from any range you choose.

Divide your VPC's private IP address range into multiple subnets.

Control inbound and outbound access to subnets by using Network Access Control Lists.

Bridge your Amazon VPC to your own IT infrastructure via an encrypted VPN connection.

Attach an Amazon Elastic IP address to any instance in your VPC so it can be reached directly from the Internet.

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With Amazon VPC, you can **create** a virtual private cloud on the scalable AWS' infrastructure and specify its private IP address range from any range you choose.

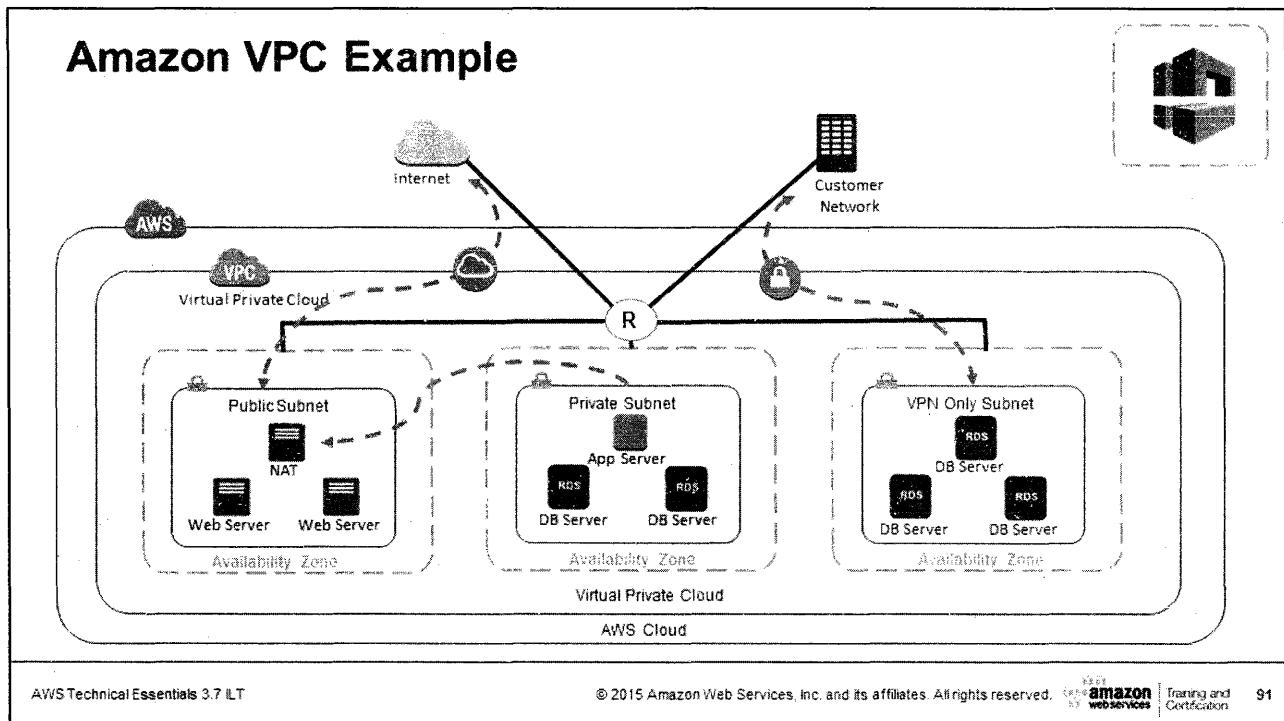
Divide your cloud's private IP address range into one or more public or private subnets to facilitate running applications and services in your VPC.

Control access to and from individual subnets by using network access control lists.

Store data in Amazon S3 and set permissions so the data can only be accessed from within your VPC.

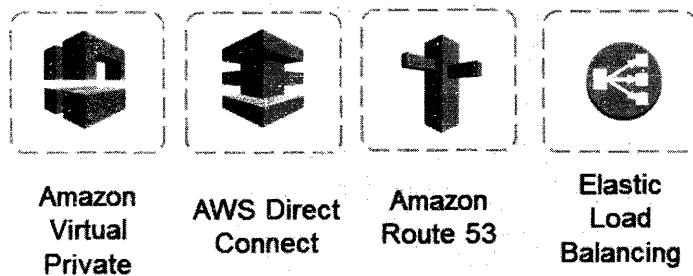
Attach an Amazon Elastic IP address to any instance in your VPC so it can be reached directly from the Internet.

Bridge your VPC and your onsite IT infrastructure with an encrypted VPN connection, extending your existing security and management policies to your Amazon VPC instances as if they were running within your infrastructure.



Amazon Virtual Private Cloud also known as Amazon VPC, allows you provision a logically isolated section of the AWS cloud where you can launch AWS resources in a virtual network that you define. You have complete control over your virtual networking environment; including selection of your own IP address range, creation of subnets, configuration of route tables, network access control lists, and network gateways. You can easily customize the network and configuration for your Amazon VPC instance. For example, you can create a public-facing subnet for your web servers that require access to the Internet, and place your backend systems such as databases or application servers in a private-facing subnet with no Internet access. You can leverage multiple layers of security, including security groups and network access control lists, to help control access to Amazon EC2 instances in each subnet. Additionally, you can create a hardware virtual private network (VPN) connection between your corporate datacenter and your VPC, allowing you to leverage the AWS cloud as an extension of your corporate datacenter.

AWS Networking Products and Services



AWS Direct Connect makes it easy to establish a dedicated network connection from your premises to AWS.

AWS Direct Connect



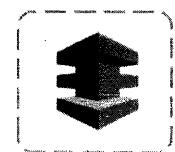
AWS Direct Connect

- Establish a **dedicated network connection** from your premises to AWS
- Reduce network costs, increase bandwidth throughput and provide a more consistent network experience
- Compatible with all AWS Services

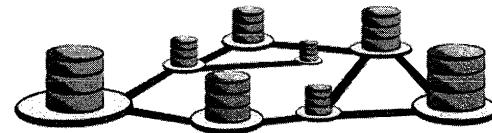
Using AWS Direct Connect, you can establish private connectivity between AWS and your datacenter, office, or colocation environment, which in many cases can reduce your network costs, increase bandwidth throughput, and provide a more consistent network experience than Internet-based connections. With AWS Direct Connect you can reduce network costs, increase bandwidth throughput and provide a more consistent network experience. AWS Direct Connect is compatible with all AWS services that are accessible over the Internet. An AWS Direct Connect location provides access to Amazon Web Services in the region it is associated with. You can establish connections with AWS Direct Connect locations in multiple regions, but a connection in one region does not provide connectivity to other regions.

APN Partners supporting AWS Direct Connect:
<http://aws.amazon.com/directconnect/partners/>

How to Use AWS Direct Connect

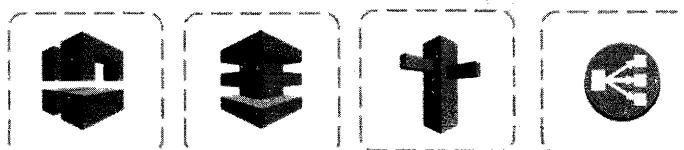


1. AWS Direct Connect location
2. Create connection request
3. Confirmation email
4. Provide the Letter of Authorization, Connecting Facility Assignment (LOA-CFA)
5. Configure virtual interfaces



1. Decide on an AWS Direct Connect location, number of connections and the port size.
2. Create your connection requests using the AWS Management Console.
3. Once your request is confirmed, you will receive an email which contains a Letter of Authorization, Connecting Facility Assignment (LOA-CFA).
4. Provide the LOA-CFA to an APN Partner or your service provider who will establish the connection on your behalf.
5. Once the connection is up, use the AWS Management Console to configure one or more virtual interfaces to establish network connectivity.

AWS Networking Products and Services



Amazon
Virtual
Private
Cloud

AWS Direct
Connect

Amazon
Route 53

Elastic
Load
Balancing

Amazon Route 53 provides secure and reliable routing to your application instances.

Amazon Route 53



Amazon
Route 53

- Route end users to Internet applications
- Answers DNS queries with **low latency** by using a global network of DNS servers
- Provides **health-checks** to route traffic to healthy endpoints
- Offers **Domain Name Registration**

Amazon Route 53 provides secure and reliable routing to your application instance. Amazon Route 53 automatically routes queries to the nearest DNS server in a global network of DNS servers, resulting in low latency. You can use Amazon Route 53 to configure DNS health-checks to route traffic to healthy endpoints or to independently monitor the health of your application and its endpoints. Amazon Route 53 offers Domain Name Registration so you can purchase and manage domain names such as example.com and Route 53 will automatically configure DNS settings for your domains.

More information about Amazon Route 53: <http://aws.amazon.com/route53/>

How to Use Amazon Route 53



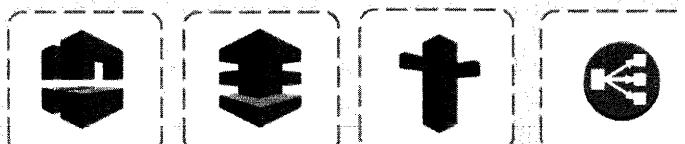
- If you don't already have a domain name:
 - Register domain name
 - Automatically creates hosted zones
- If you already have a domain name:
 - Create a hosted zone
 - Transfer your domain name or update DNS servers

Amazon Route 53 has a simple web service interface that lets you get started in minutes. If you don't already have a domain name, then you would register your new domain name. Amazon Route 53 will automatically create a hosted zone that stores DNS records for your domain. Much like a phone book, the Internet's DNS system manages mapping between names and numbers. With DNS, the names are domain names (www.example.com) that are easy for your users to remember.

Instead of phone numbers, in DNS, these names are mapped to IP addresses (192.0.2.1) that specify the location of computers on the Internet. Route 53 performs two DNS functions; first, it allows you to manage the IP addresses listed for your domain names in the Internet's DNS phone book. These listings are called DNS "records." Second, like a directory assistance service, Amazon Route 53 answers requests to translate specific domain names into their corresponding IP addresses. These requests are called "queries." You pay only for managing domains through the service and for the number of queries that the service answers.

If you already have a domain name, then you would create a hosted zone that can store DNS records for your domain. You can also transfer your domain name to Amazon Route 53 and inform the registrar to update the name servers for your domain to the ones associated with your hosted zone.

AWS Networking Products and Services



Amazon
Virtual
Private
Cloud

AWS Direct
Connect

Amazon
Route 53

Elastic
Load
Balancing

Elastic Load Balancing automatically distributes incoming application traffic across multiple Amazon EC2 instances.

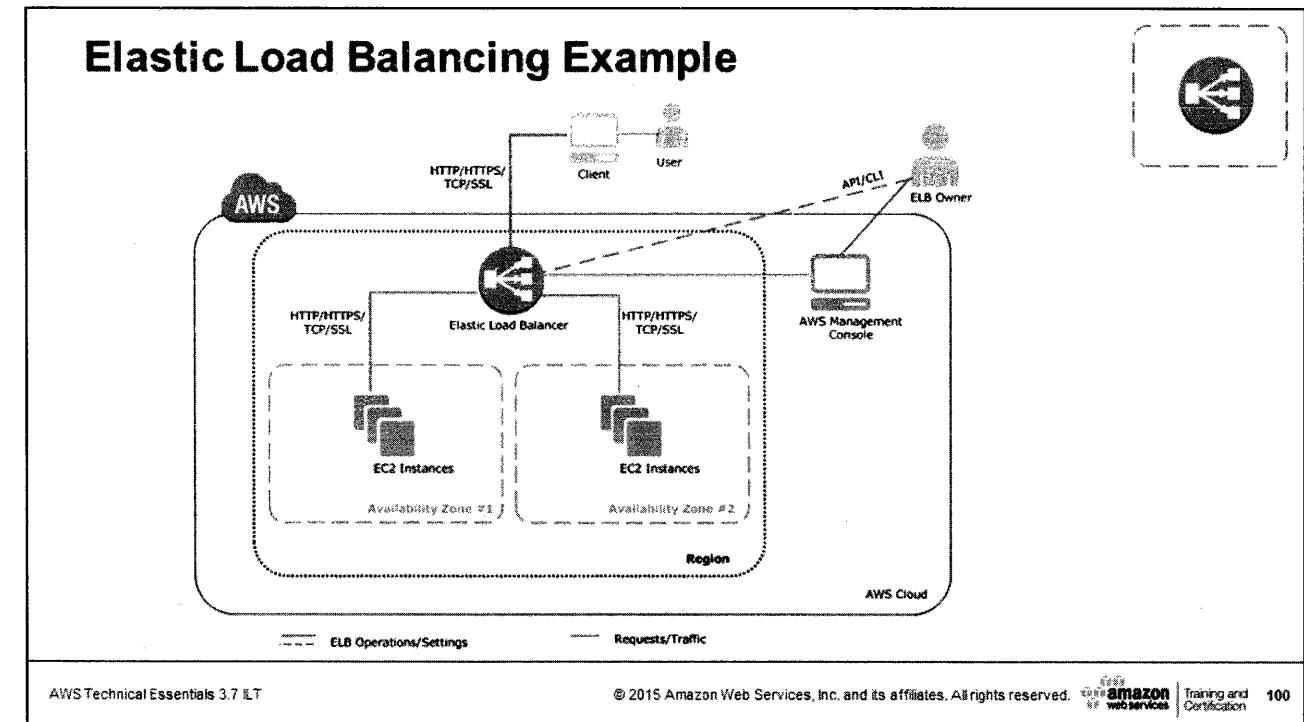
Elastic Load Balancing



Elastic Load
Balancing

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

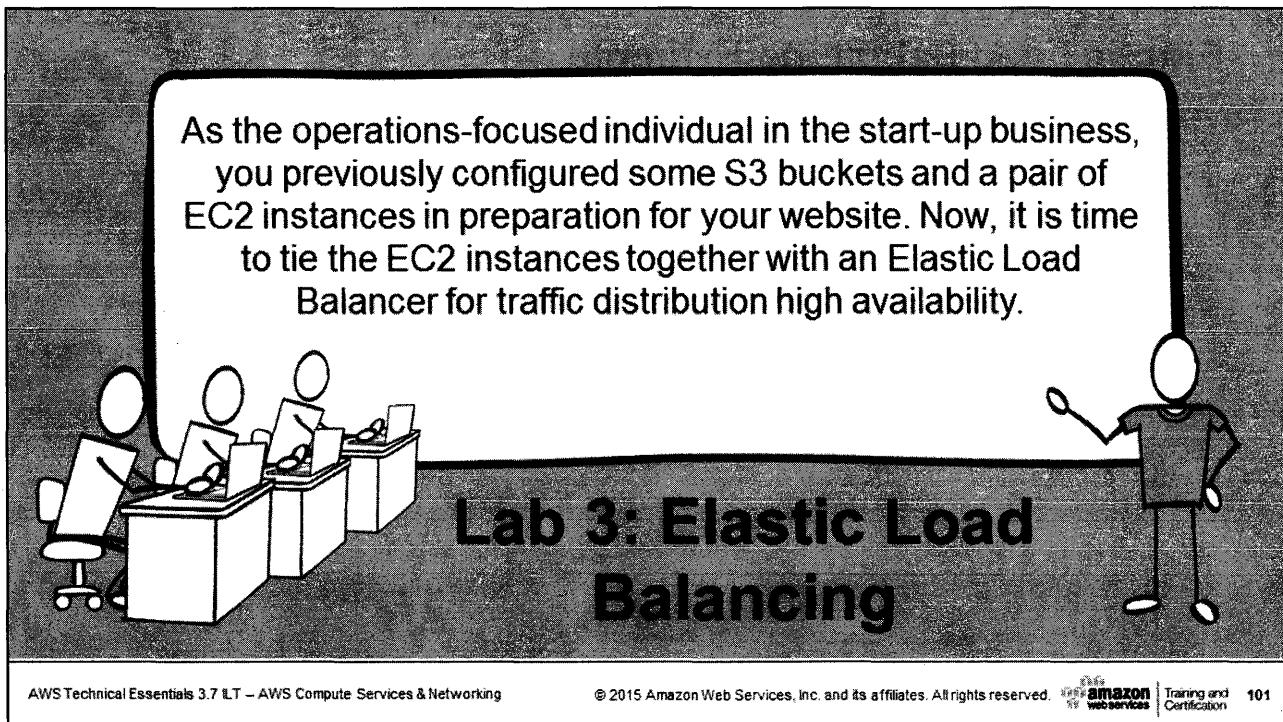
Elastic Load Balancing automatically distributes incoming application traffic across multiple Amazon EC2 instances. It enables you to achieve greater fault tolerance in your applications, seamlessly providing the amount of load balancing capacity needed in response to incoming application traffic. Elastic Load Balancing detects unhealthy instances within a pool and automatically reroutes traffic to healthy instances until the unhealthy instances have been restored. You can enable Elastic Load Balancing within a single Availability Zone or across multiple zones for even more consistent application performance.



Elastic Load Balancing automatically scales its request handling capacity in response to incoming traffic. The diagram shows how the various components of Elastic Load Balancing work together. You can access and work with your load balancer using one of the following interfaces:

- AWS Management Console—A simple web-browser interface that you can use to create and manage your load balancers without using additional software or tools.
- Command Line Interfaces —A Java-based command-line client that wraps the SOAP API.

Short training video on Elastic Load Balancing with a free self-paced lab: <https://us-east-1-aws-training.s3.amazonaws.com/intro/elb.html>



As the operations-focused individual in the start-up business, you previously configured some S3 buckets and a pair of EC2 instances in preparation for your website. Now, it is time to tie the EC2 instances together with an Elastic Load Balancer for traffic distribution high availability.

Lab 3: Elastic Load Balancing

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Lab 3: Elastic Load Balancing.

Overview

Elastic Load Balancing (ELB) automatically distributes incoming application traffic across multiple Amazon EC2 instances. It enables you to achieve even greater fault tolerance in your applications, seamlessly providing the amount of load balancing capacity needed in response to incoming application traffic.

In this lab you will create an ELB for HTTP traffic as we review the various properties.

Learning Objectives

By the end of this lab you will be able to do the following with Elastic Load Balancing:

- Create an ELB for HTTP traffic.
- Test ELB configuration.

Knowledge Check

- Q: You need to allow your web servers to access your application servers on port 8080. What would you use to make this happen?
- Q: What do you use to extend your corporate network to Amazon EC2?
- Q: What service provides scalable load balancing for your application's public-facing web servers or private application servers?
- Q: What service allows you to automatically scale Amazon EC2 capacity out or in based on conditions you define.

You have reached the end of this training module. In summary, you have learned that Amazon Virtual Private Cloud lets you provision a logically isolated section with complete control over your virtual networking environment, including IP address range, creation of subnets, and configuration of route tables and network gateways. A VPN and AWS Direct Connect allow you to leverage the AWS cloud as an extension of your corporate datacenter.

Test out some of your new skills!

Knowledge Check Answers

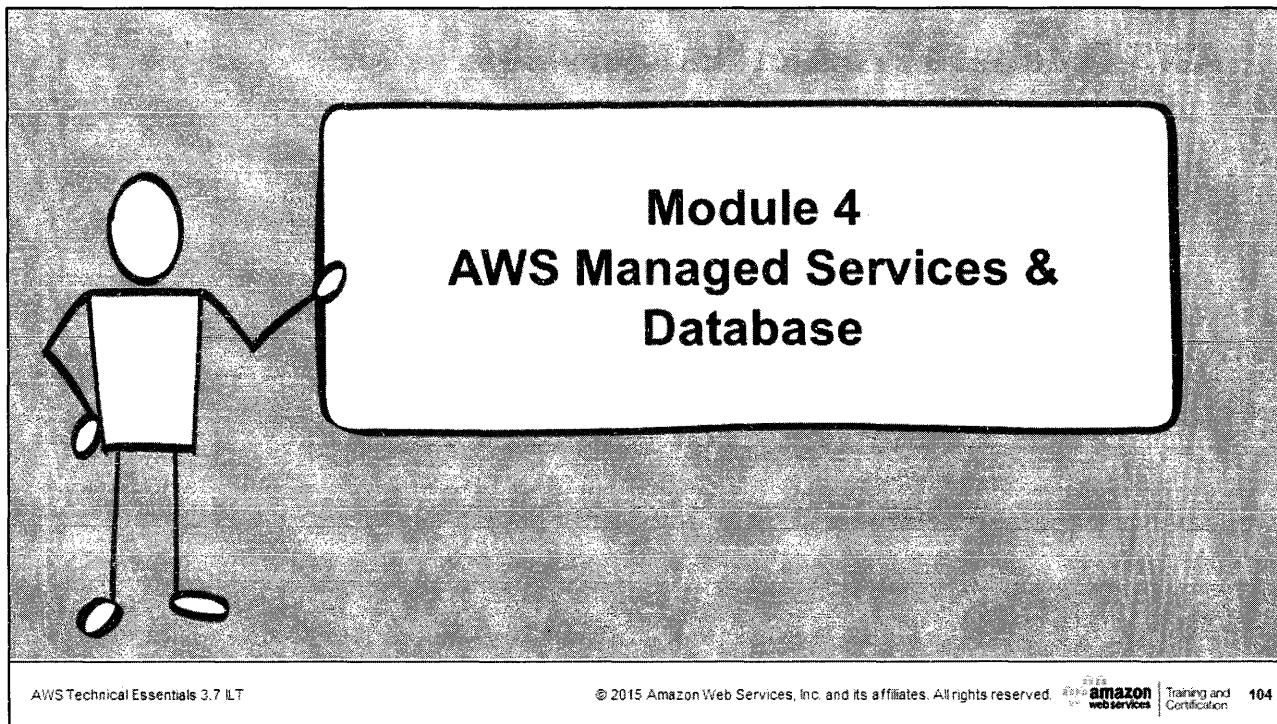
Q: You need to allow your web servers to access your application servers on port 8080. What would you use to make this happen? Modify EC2 Security Group

Q: What do you use to extend your corporate network to Amazon EC2? VPN/Direct Connect

Q: What service provides scalable load balancing for your application's public-facing web servers or private application servers? Elastic Load Balancing

Q: What service allows you to automatically scale Amazon EC2 capacity out or in based on conditions you define. Auto Scaling

Here are the answers.



The slide features a simple black and white illustration of a stick figure on the left, pointing its right arm towards a large, rounded rectangular speech bubble on the right. The speech bubble contains the text "Module 4" on top, followed by "AWS Managed Services & Database" below it. The background of the slide is a textured gray.

AWS Technical Essentials 3.7 ILT

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This module describes the fundamental elements of AWS Managed Services and Databases. This module will focus on key aspects of Amazon Relational Database Service and how to execute Amazon RDS.

By the end of this module you will be able to:

- Describe Amazon DynamoDB
- Verify they key aspects of Amazon Relational Database Service
- How to execute Amazon RDS

AWS Database Product and Services



Amazon
Relational
Database
Service

Amazon
DynamoDB

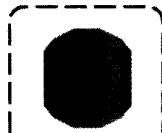
Amazon
ElastiCache

Amazon
Redshift

Here are some of the key AWS Database product and services, Amazon Relational Database Service, Amazon DynamoDB, Amazon ElastiCache, and Amazon Redshift.

Amazon Relational Database Service also known as Amazon RDS is cost-efficient and manages time consuming database administration tasks.

Amazon Relational Database Service (RDS)



Amazon
RDS

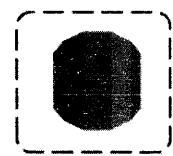
- Cost-efficient and **resizable capacity**
- Manages time-consuming **database administration** tasks
- Access to the full capabilities of **MySQL, PostgreSQL, Oracle, SQL Server, Amazon Aurora** databases

With Amazon RDS, you can access the full capabilities of a familiar MySQL, PostgreSQL, Oracle or SQL Server database. In addition, Amazon RDS for MySQL provides two distinct but complementary replication features: Multi-AZ deployments and read replicas that can be used in conjunction to gain enhanced database availability, protect your latest database updates against unplanned outages, and scale beyond the capacity constraints of a single DB instance for read-heavy database workloads.

Amazon Aurora is a MySQL compatible relational database engine that is part of Amazon RDS.

Here is a quick training video on Amazon RDS with a free self-paced lab: <https://us-east-1-aws-training.s3.amazonaws.com/intro/rds.html>

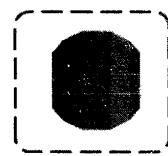
Amazon RDS



- Easy to set up, operate, and scale a **relational database**
- **Automatically patches** the database software and backs up your database
- Ability to **scale the compute resources** or storage capacity associated with your relational database instance via a single API call

Amazon RDS is a web service that makes it easy to set up, operate, and scale a relational database in the cloud. It provides cost-efficient and resizable capacity while managing time-consuming database administration tasks, freeing you up to focus on your applications and business. Amazon RDS gives you access to the full capabilities of a MySQL, Oracle, SQL Server, or Amazon Aurora database engine. This means that the code, applications, and tools you already use today with your existing databases can be used with Amazon RDS. Amazon RDS automatically patches the database software and backs up your database, storing the backups for a user-defined retention period and enabling point-in-time recovery. You benefit from the flexibility of being able to scale the compute resources or storage capacity associated with your relational database instance via a single API call.

Amazon RDS and VPC



- You can select your own IP address range.
- You can create subnets and configure routing and access control lists.
- The basic functionality of Amazon RDS is the same whether it is running in a VPC or not: Amazon RDS manages backups, software patching, automatic failure detection, and recovery.
- There is no additional cost to run your DB instance in a VPC.

You can use Amazon Virtual Private Cloud (VPC,) where you can launch an Amazon RDS DB instance. When you use VPC, you have control over your virtual networking environment, and you can select your own IP address range, create subnets, and configure routing and access control lists. The basic functionality of Amazon RDS is the same whether it is running in a VPC or not. Amazon RDS manages backups, software patching, automatic failure detection, and recovery. There is no additional cost to run your DB instance in a VPC. The following image shows the Amazon EC2, VPC-supported platform information for an AWS account that does not have a default VPC in the selected region. Amazon RDS supports two VPC platforms in each region: the EC2, VPC-supported platform, which requires you to use the Amazon VPC service to create a VPC, and the VPC-supported platform, which provides your AWS account with a default VPC in a region.

AWS Database Product and Services



Amazon
Relational
Database
Service



Amazon
DynamoDB



Amazon
ElastiCache



Amazon
Redshift

Amazon DynamoDB is ideal for database applications that require very low latency and predictable performance at any scale but do not need complex querying capabilities like joins or transactions.

Amazon DynamoDB



Amazon
DynamoDB

- Store any amount of data with **no limits**
- Fast, predictable performance using **SSDs**
- Easily provision and change the **request capacity** needed for each table

Amazon DynamoDB is a fully-managed NoSQL database service that offers high performance, predictable throughput and low cost. It is easy to set up, operate, and scale. With Amazon DynamoDB, you can start small, specify the throughput and storage you need, and easily scale your capacity requirements in seconds, as needed. It automatically partitions data over a number of servers to meet your requested capacity. In addition, Amazon DynamoDB automatically replicates your data synchronously across multiple Availability Zones within an AWS region to ensure high availability and data durability.

Introduction training on Amazon DynamoDB with a free self-paced lab:
<http://youtu.be/2qjwub2jzfA>

Amazon RDS and Amazon DynamoDB

Factors	Relational (Amazon RDS)	NoSQL (Amazon DynamoDB)
Application Type	<ul style="list-style-type: none"> Existing database apps Business process–centric apps 	<ul style="list-style-type: none"> New web-scale applications Large number of small writes and reads
Application Characteristics	<ul style="list-style-type: none"> Relational data models, transactions Complex queries, joins, and updates 	<ul style="list-style-type: none"> Simple data models, transactions Range queries, simple updates
Scaling	Application or DBA–architected (clustering, partitions, sharding)	Seamless, on-demand scaling per application needs
QoS	<ul style="list-style-type: none"> Performance—depends on data model, indexing, query, and storage optimization Reliability and availability—Managed Durability—Managed 	<ul style="list-style-type: none"> Performance—Automatically optimized by the system Reliability and availability—Managed Durability—Managed

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One type does not fit all. The choice depends on several factors. You can use both relational and NoSQL databases in one application, depending on requirements. This table provides a side-by-side comparison of relational or non-relational database.

Database Considerations

If You Need	Consider Using
A relational database service with minimal administration	Amazon RDS , a fully managed service that offers a choice of MySQL, PostgreSQL, Oracle, SQL Server, or Amazon Aurora database engines, scale compute and storage, Multi-AZ availability, and more. 
A fast, highly scalable NoSQL database service	Amazon DynamoDB , a fully managed service that offers extremely fast performance, seamless scalability and reliability, low cost, and more. 
A relational database or NoSQL database you can manage on your own	Your choice of AMIs on Amazon EC2 and Amazon EBS that provide scale compute and storage, complete control over instances, and more. 

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AWS provides a number of database alternatives for developers. You can run fully managed relational and NoSQL services, or you can operate your own database in the cloud on Amazon EC2 and Amazon EBS. If you need a relational database service with minimal administration, consider using Amazon RDS. If you need a fast, highly scalable NoSQL database service, consider using Amazon DynamoDB. If you need a relational database you can manage on your own, consider using your choice of relational AMIs.

AWS Database Product and Services



Amazon
Relational
Database
Service

Amazon
DynamoDB

Amazon
ElastiCache

Amazon
Redshift

Amazon ElastiCache is a web service that makes it easy to deploy, operate, and scale an in-memory cache in the cloud.

Amazon ElastiCache



Amazon
ElastiCache

- Memcached compliant and Redis compliant cache cluster on demand
- Manages patching, cache node failure detection and recovery
- Caches in front of Database Tier instances
- A cache to be used with other AWS Services

Amazon ElastiCache improves the performance of web applications by allowing you to retrieve information from a fast, managed, in-memory caching system, instead of relying entirely on slower disk-based databases. With a few clicks on the AWS Management Console, you can launch a cache cluster consisting of a collection of cache nodes, each running Memcached software. You can then scale the amount of memory associated with your cache cluster in minutes by adding or deleting cache nodes to meet the demands of your changing workload. In addition, Amazon ElastiCache automatically detects and replaces failed cache nodes, providing a resilient system that mitigates the risk of overloaded databases, which slow website and application load times.

More information on Amazon ElastiCache: <http://aws.amazon.com/elasticsearch/>

Amazon ElastiCache Facts



- Improves latency and throughput for many read-heavy application workloads.
- Existing applications that use Memcached or Redis can use ElastiCache with almost no modification.
- ElastiCache Auto Discovery feature lets your applications identify all of the nodes in a cache cluster.

User guide for Amazon ElastiCache security groups:

<http://docs.aws.amazon.com/AWSCloudFormation/latest/UserGuide/aws-properties-elasticache-security-group.html>

AWS Database Product and Services



Amazon
Relational
Database
Service

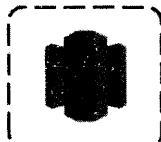
Amazon
DynamoDB

Amazon
ElastiCache

Amazon
Redshift

Amazon Redshift is a fast and powerful, fully managed, petabyte-scale data warehouse service in the cloud.

Amazon Redshift



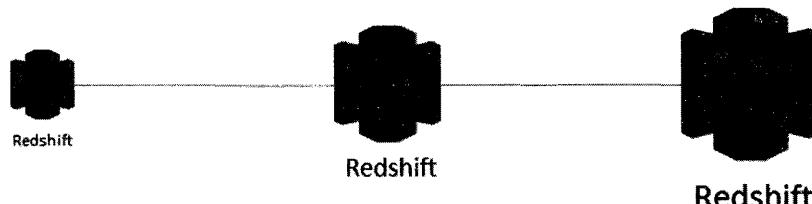
Amazon
Redshift

- Petabyte-scale service that manages all the work needed to set up, operate, and scale a data warehouse cluster
- Continuously monitors the health of the cluster and replaces any component
- Dramatically reduces I/O

Amazon Redshift offers you fast query performance when analyzing virtually any size data set using the same SQL-based tools and business intelligence applications you use today. Amazon Redshift uses a variety of innovations to obtain very high query performance on datasets ranging in size from hundreds of gigabytes to a petabyte or more. First, it uses columnar storage and data compression to reduce the amount of I/O needed to perform queries. Second, it runs on hardware that is optimized for data warehousing, with local attached storage and 10-GB network connections between nodes. Finally, it has a massively parallel processing (MPP) architecture, which enables you to scale up or down, without downtime, as your performance and storage needs change.

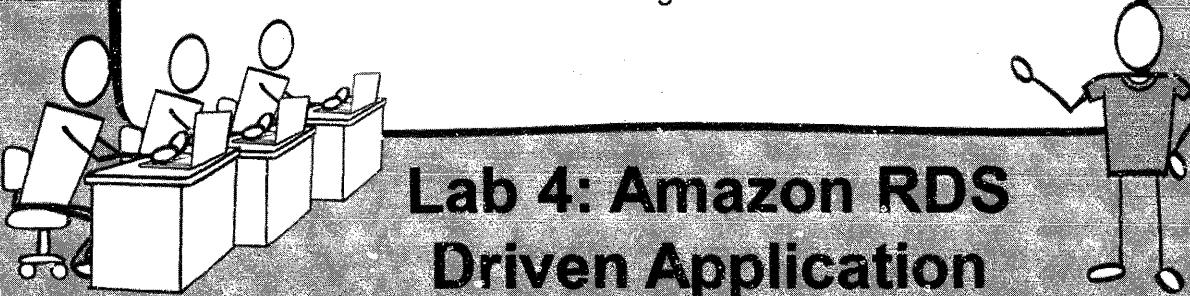
Amazon Redshift Facts

- Amazon Redshift manages all the work needed
- Simple way to scale a cluster to improve performance
- Continuously monitors the health of the cluster



Amazon Redshift manages all the work needed to set up, operate, and scale a data warehouse cluster, from provisioning capacity, to monitoring and backing up the cluster, to applying patches and upgrades. Scaling a cluster to improve performance or increase capacity is simple and incurs no downtime. The service continuously monitors the health of the cluster and automatically replaces any component, if needed.

Your company wants to launch a public Wiki page to keep your customers informed and to give them the ability to edit, share and voice their opinion and feedback. You have an application and some graphics you want to use and will be leveraging Amazon RDS, Amazon EC2, and Amazon S3 to get this new Wiki page up and running.



Lab 4: Amazon RDS Driven Application

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Lab 4: Amazon RDS Driven Application.

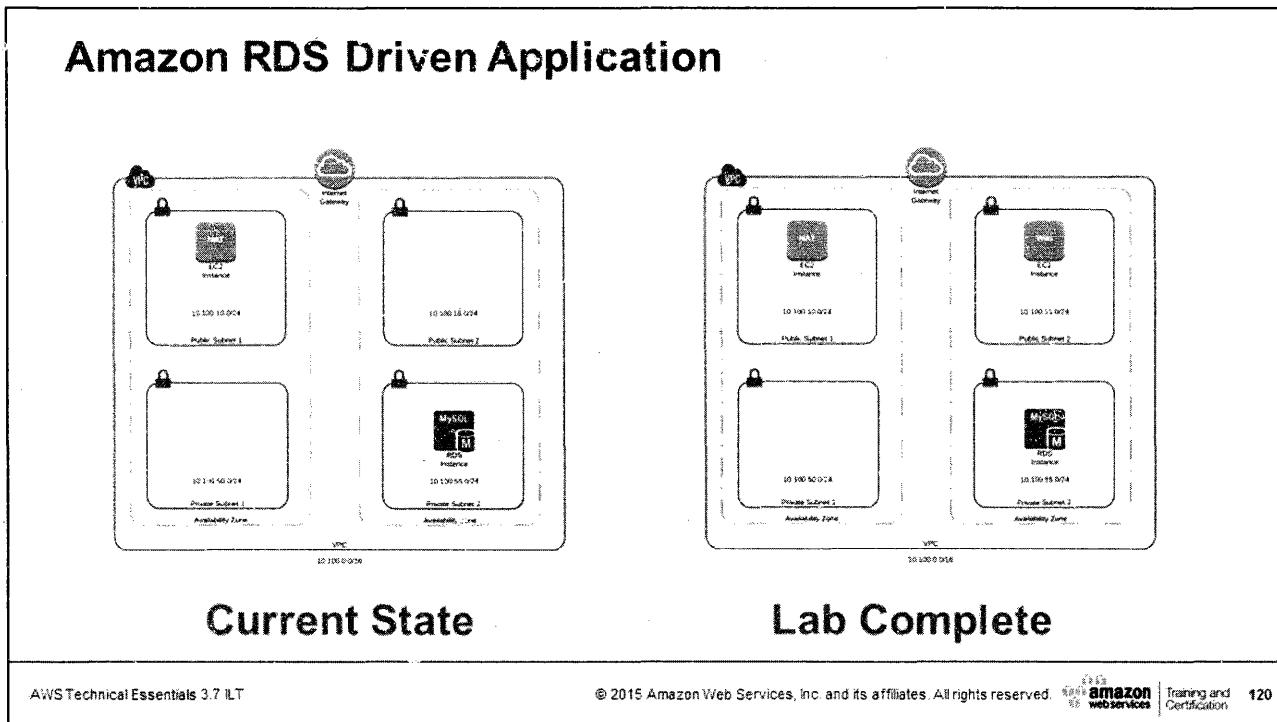
Overview

Amazon Relational Database Service (Amazon RDS) is a web service that makes it easy to set up, operate and scale a relational database in the cloud. In this lab we are using RDS to launch a MediaWiki application. This is a free software open source wiki package written in PHP, originally for use on Wikipedia. It is now also used by several other projects of the non-profit Wikimedia Foundation and by many other wikis, including this website, the home of MediaWiki.

Learning Objectives

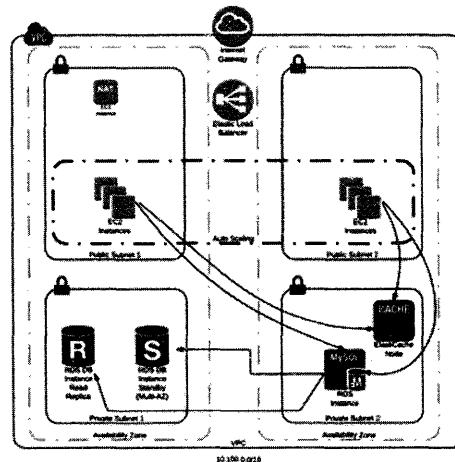
By the end of this lab you will be able to do the following:

- Create an Amazon RDS instance.
- Install an application on an Amazon EC2 instance.
- Create a Amazon EC2 Security Group.
- Create and use an Amazon S3 bucket for the application.
- Launch the application.



This diagram on the left is your current Amazon RDS application on AWS when you start the lab. The diagram on the right is what your application on AWS would like once the lab is complete.

Amazon RDS Driven Application



Future Growth

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Possible next steps for future growth on AWS if we have had more time.

Knowledge Check

Q: What service is designed to eliminate the undifferentiated heavy lifting often involved with administering a relational database?

Q: What service is designed to eliminate the undifferentiated heavy lifting often involved with administering a Memcached or Redis cluster?

You have reached the end of this training module. In summary, you have learned how to describe Amazon DynamoDB, verify they key aspects of Amazon Relational Database Service, and how to execute Amazon RDS.

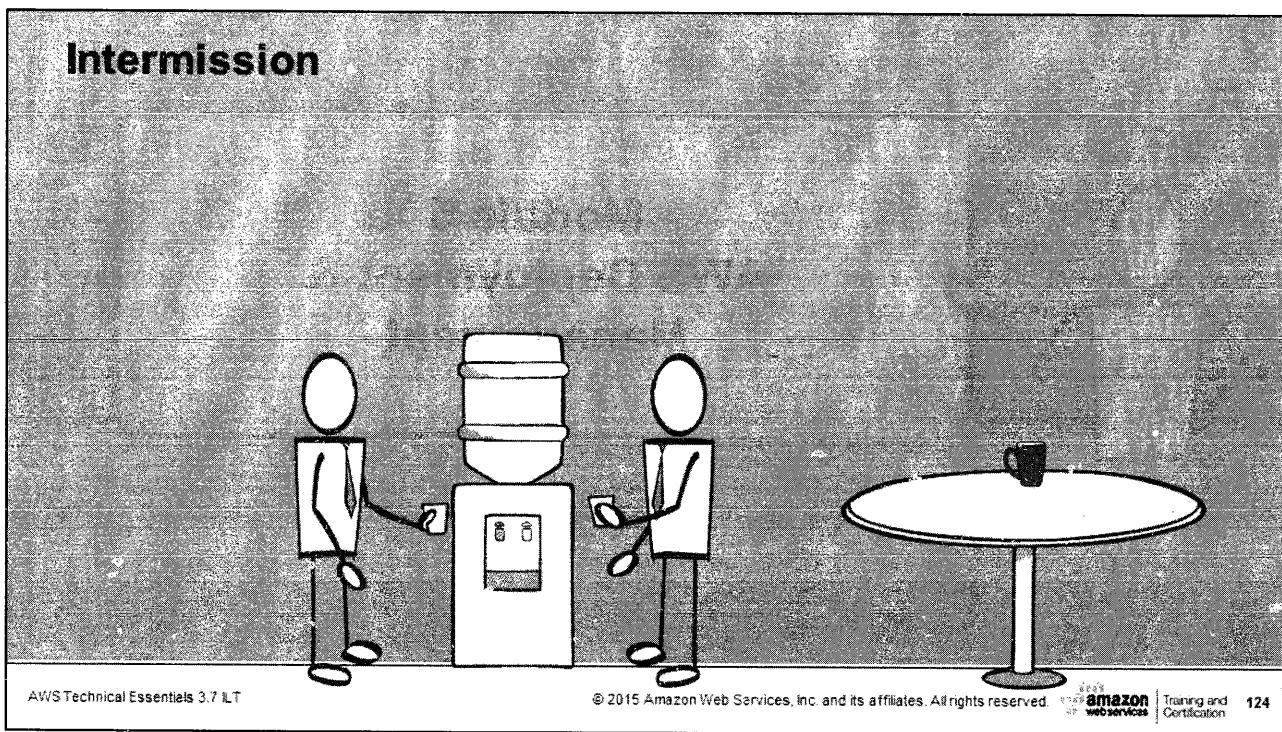
Test out some of your new skills!

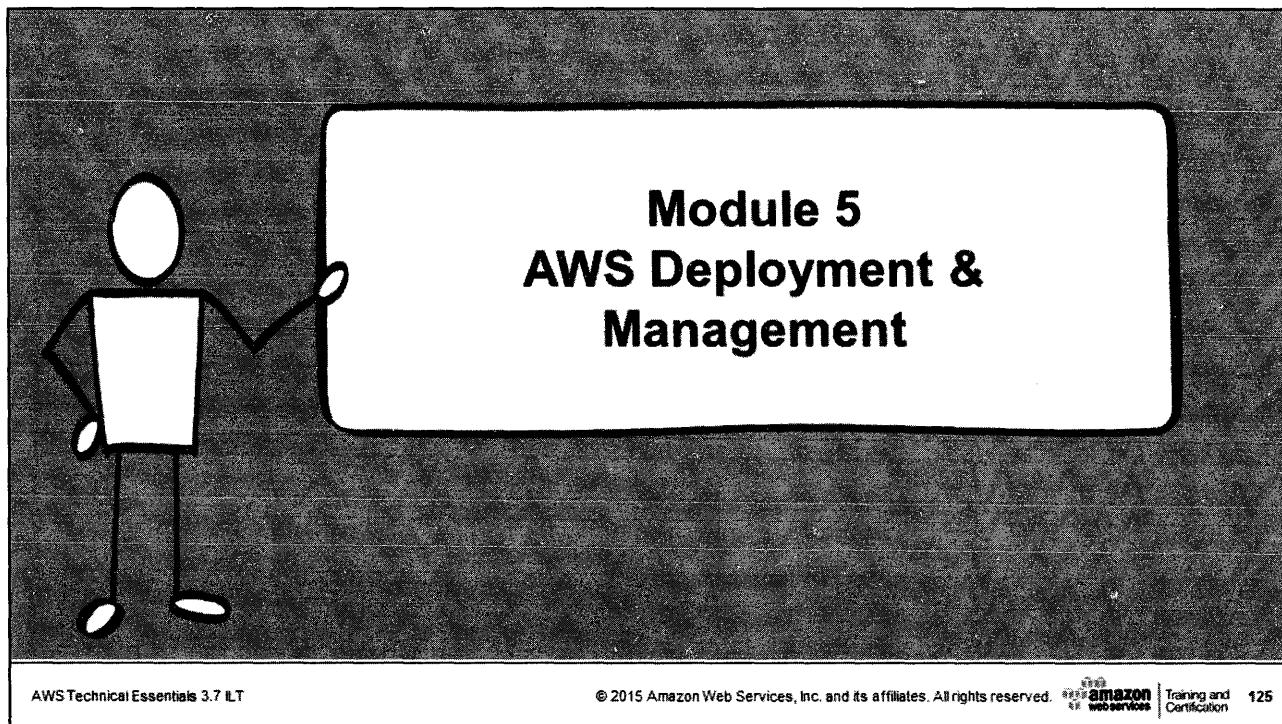
Knowledge Check Answers

Q: What service is designed to eliminate the undifferentiated heavy lifting often involved with administering a relational database? Amazon RDS

Q: What service is designed to eliminate the undifferentiated heavy lifting often involved with administering a Memcached or Redis cluster? Amazon ElastiCache

Here are the answers.





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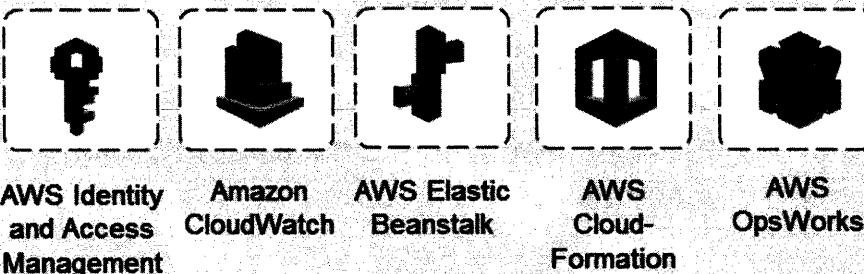
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This module describes the fundamental elements of AWS deployment and management products and services.

By the end of this module you will be able to:

- Identify AWS CloudFormation
- Describe Amazon CloudWatch metric and alarms
- Describe AWS IAM

Deployment & Management Product and Services



AWS Identity
and Access
Management

Amazon
CloudWatch

AWS Elastic
Beanstalk

AWS
Cloud-
Formation

AWS
OpsWorks

Here are AWS Deployment and Management services: AWS Identity and Access Management (IAM), Amazon CloudWatch, AWS Elastic Beanstalk, AWS CloudFormation, and AWS OpsWorks.

AWS Identity and Access Management also known as AWS IAM will enable you to securely control access to AWS services and resources for your users by creating and managing user groups.

AWS Identity and Access Management (IAM)



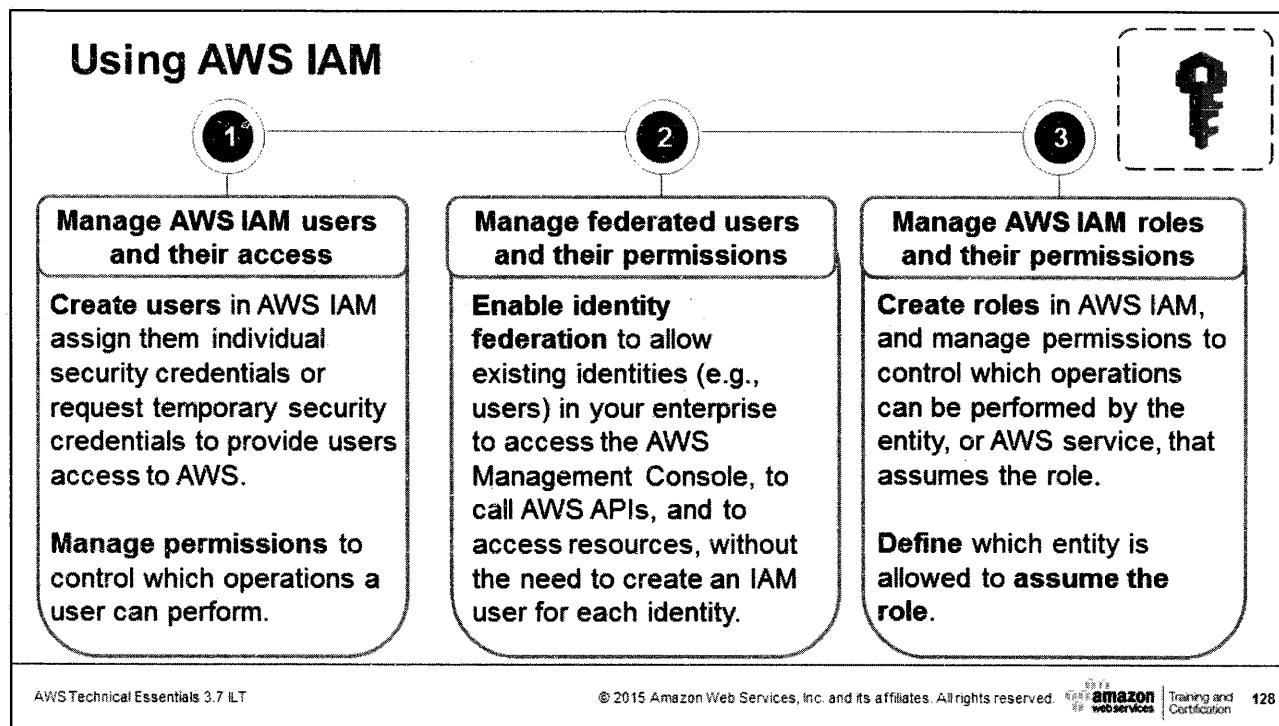
AWS IAM

- Create and manage AWS **users** and **groups**
- Enables **identity federation** between your corporate directory and AWS services
- Provides **fine-grained access control** to AWS resources

Using AWS IAM you can create and manage AWS users and groups and use permissions to allow and deny their access to AWS resources. You can use existing corporate identities to grant secure access to AWS resources, such as Amazon S3 buckets, without creating any new AWS identities.

Introduction training video on AWS IAM and a free self-paced lab:

<http://youtu.be/yv0RByTsYf4>



AWS Identity and Access Management is a web service that enables AWS customers to manage users and user permissions in AWS. With IAM, you can centrally manage users, security credentials such as access keys, and permissions that control which AWS resources users can access.

IAM allows you to manage IAM users and their access. You can create users in IAM, assign them individual security credentials or request temporary security credentials to provide users access to AWS services and resources. You can manage permissions in order to control which operations a user can perform.

Optionally, you can create IAM roles and their permissions. A role is a set of permissions to access specific AWS resources, but these permissions are not tied to a specific IAM user or group. You can create roles in IAM, and manage permissions to control which operations can be performed by an entity that assumes the role. An entity can be a user, application, or service.

Finally, you can manage federated users and their permissions. You can enable identity federation to allow non-AWS users in your enterprise to authenticate with an external service (such as Microsoft Active Directory, LDAP, or Kerberos) to access the AWS Management Console, to call AWS APIs, and to access resources, without the need to create an IAM user for each identity.

Deployment & Management Product and Services



AWS Identity
and Access
Management



Amazon
CloudWatch



AWS Elastic
Beanstalk



AWS
Cloud-
Formation



AWS
OpsWorks

Amazon CloudWatch is part of the AWS Deployment and Management services that enables you to monitor, manage, and publish various metrics, as well as configure alarm actions based on data from metrics.

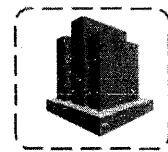
Amazon CloudWatch



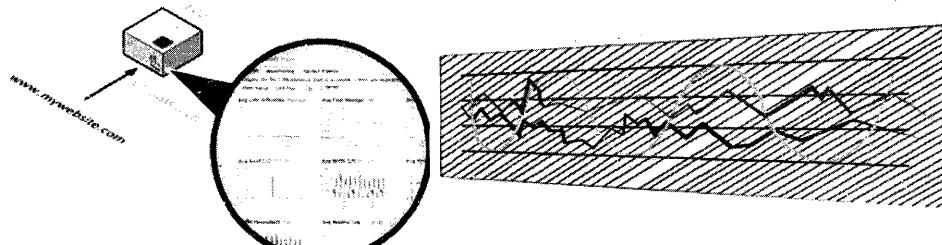
- **Visibility** into resource utilization, operational performance, and overall demand patterns
- **Custom application-specific metrics** of your own
- **Accessible** via AWS Management Console, APIs, SDK, or CLI

CloudWatch lets you view graphs, set alarms to troubleshoot, spot trends, and take automated action based on the state. It is accessible via the AWS Management Console, APIs, SDK or CLI. You can customize with your own metrics or use a sample template found online.

Amazon CloudWatch Facts



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



For Amazon EC2 instances, Amazon CloudWatch basic monitoring collects and reports metrics for CPU utilization, data transfer, and disk usage activity from each Amazon EC2 instance at a five-minute frequency. Amazon CloudWatch detailed monitoring provides these same metrics at one-minute intervals, and also enables data aggregation by Amazon EC2 AMI ID and instance type.

Set alarms on any of your metrics to receive notifications. You can also use Auto Scaling to add or remove Amazon instances.

Here is a step-by-step guide on creating Amazon CloudWatch Alarms:
<http://docs.aws.amazon.com/AmazonCloudWatch/latest/DeveloperGuide/AlarmThatSendsEmail.html>

More information about monitoring other AWS resources:
<https://aws.amazon.com/cloudwatch/details/#other-aws-resource-monitoring>

Deployment & Management Product and Services



AWS Identity
and Access
Management

Amazon
CloudWatch

AWS Elastic
Beanstalk

AWS
Cloud-
Formation

AWS
OpsWorks

AWS Elastic Beanstalk is used to upload your application to AWS.

AWS Elastic Beanstalk



AWS Elastic
Beanstalk

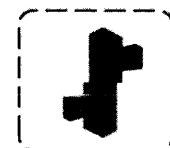
- Easy-to-use service for **deploying and scaling** web applications and services
- Automatically **handles** the deployment details
- Retain **full control** over the AWS resources powering your application

With AWS Elastic Beanstalk, you simply upload your application, and AWS Elastic Beanstalk automatically handles the deployment details of capacity provisioning, load balancing, auto-scaling, and application health monitoring. You can retain full control over the AWS resources powering your application.

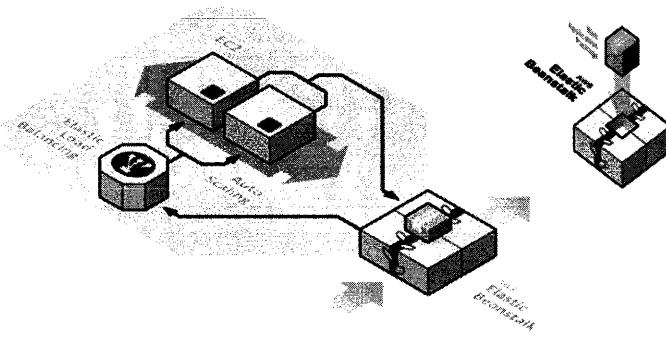
AWS Elastic Beanstalk is an easy-to-use service for deploying and scaling web applications and services developed with Java, .NET, Python, PHP, Ruby, and Docker on familiar services such as Apache, Nginx, Passenger, and IIS.

Introduction training video on AWS Elastic Beanstalk with a free self-paced lab:
<http://youtu.be/dvmssHHBnII>

AWS Elastic Beanstalk Facts



- Quickly deploy and manage applications in the AWS cloud without worrying about the infrastructure that runs those applications.
- Reduce management complexity without restricting choice or control.



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With AWS Elastic Beanstalk, you can quickly deploy and manage applications in the AWS cloud without worrying about the infrastructure that runs those applications. AWS Elastic Beanstalk reduces management complexity without restricting choice or control.

Deployment & Management Product and Services



AWS Identity
and Access
Management

Amazon
CloudWatch

AWS Elastic
Beanstalk

AWS
Cloud-
Formation

AWS
OpsWorks

AWS CloudFormation gives developers and systems administrators an easy way to create a collection of related AWS resources and provision them in an orderly and predictable fashion.

AWS CloudFormation



AWS
CloudFormation

- Create templates** of stack of resources
- Deploy stack from template with runtime parameters
- Use templates as a starting point or **create your own**

The AWS CloudFormation samples package contains a collection of templates that illustrate various usage cases. Stacks can be created from the templates via the AWS Management Console, AWS CloudFormation command line tools, or AWS CloudFormation APIs.

AWS CloudFormation Example

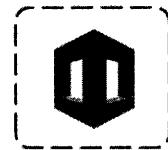


- Templates are simple JSON-formatted text files
- CloudFormer supports generating templates from running environments

```
"Resources" : {  
    "WebServer" : {  
        "Type" : "AWS::EC2::Instance",  
        "Properties" : {  
            "SecurityGroups" : [ { "Ref" : "WebSecurityGroup" } ],  
            "ImageId" : { "Fn::FindInMap" : [ "RegionMap", { "Ref" : "AWS::Region" }, "AMI" ] },  
            "Tags" : [{  
                "Key" : "MyTag",  
                "Value" : "TagValue"  
            }]  
        }  
    },  
},
```

AWS CloudFormation templates are simple JSON-formatted text files. This service supports generated templates from running environments. You can use AWS CloudFormation sample templates or create your own templates to describe the AWS resources, and any associated dependencies or runtime parameters, required to run your application. You do not need to figure out the order in which AWS services must be provisioned or the subtleties of how to make those dependencies work. AWS CloudFormation takes care of this for you.

AWS CloudFormation Templates

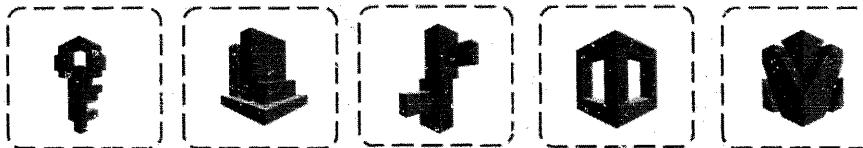


- Deploy and update a template and its associated collection of resources, “called a stack” via the AWS Management Console, AWS CloudFormation command line tools, or APIs.
- AWS CloudFormation is available at no additional charge, and you pay only for the AWS resources needed.



You can deploy and update a template and its associated collection of resources (called a stack) via the AWS Management Console, AWS CloudFormation command line tools or APIs. AWS CloudFormation is available at no additional charge, and you pay only for the AWS resources needed to run your applications.

Deployment & Management Product and Services



AWS Identity
and Access
Management

Amazon
CloudWatch

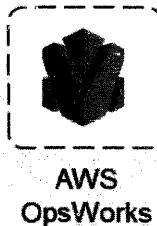
AWS Elastic
Beanstalk

AWS
Cloud-
Formation

AWS
OpsWorks

AWS OpsWorks is a cloud application management service that makes it easy to deploy and operate applications of all shapes and sizes.

AWS OpsWorks

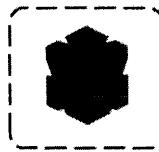


- Flexible application management solution
- Leverage **sample templates** or build your own
- Includes automation to scale your application
- Configuration as code** using Chef recipes and/or Bash scripts

AWS OpsWorks is a flexible management solution, you can define the application's architecture and the specification of each component, including package installation,, software configuration, and resources such as storage. Start from templates for common technologies like application server and database or build your own to perform a task. Deploy and operate applications of all shapes and sizes. AWS OpsWorks includes automation to scale your application based on the time or load and dynamic configuration to orchestrate changes as your environment scales. You can do configuration as code using Chef recipes and Bash script.

Learn more about AWS OpsWorks online: <http://aws.amazon.com/opsworks/>

AWS OpsWorks Elements



Stack



A **stack** represents the computer infrastructure and the applications that you want to manage together.

Layers



A **layer** defines how to set up and configure a set of instances and related resources.

Instances



Decide how to scale manually, with 24/7 **instances**, or automatically, with load-based or time-based instances.

Apps



Then deploy your **app** to specific instances and customize the deployment with Chef recipes.

A **stack** represents the computer infrastructure and the applications that you want to manage together. A **layer** defines how to set up and configure a set of instances and related resources. Decide how to scale manually, with 24/7 **instances**, or automatically, with load-based or time-based instances. Then deploy your **app** to specific instances and customize the deployment with Chef recipes.

Knowledge Check

Q: Your web application needs credentials and authorization to read/write a Amazon DynamoDB table and an Amazon S3 bucket. What AWS service would you use?

Q: What service would you use if your developers need a simple, scalable location to easily deploy their Java, .NET, Python, PHP, or Ruby applications?

You have reached the end of this training module. In summary, you have learned the key fundamental elements of AWS deployment management products and services.

Test out some of your new skills!

Knowledge Check Answers

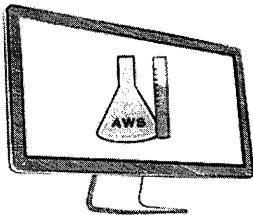
Q: Your web application needs credentials and authorization to read/write a Amazon DynamoDB table and an Amazon S3 bucket. What AWS service would you use? AWS IAM

Q: What service would you use if your developers need a simple, scalable location to easily deploy their Java, .NET, Python, PHP, Ruby, and Docker applications? Amazon Elastic Beanstalk

Here are the answers.

AWS Training & Certification

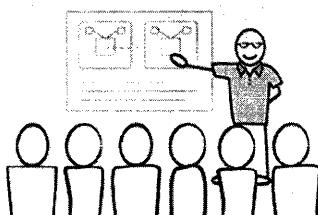
Self-Paced Labs



Try products, gain new skills, and get hands-on practice working with AWS technologies

[aws.amazon.com/training/
self-paced-labs](http://aws.amazon.com/training/self-paced-labs)

Training



Skill up and gain confidence to design, develop, deploy and manage your applications on AWS

aws.amazon.com/training

Certification



Demonstrate your skills, knowledge, and expertise with the AWS platform

aws.amazon.com/certification

We have several programs available to help you deepen your knowledge and proficiency with AWS. We encourage you to check out the following resources:

- Get hands-on, practical experience testing products and working with AWS technologies by taking an AWS Self-Paced Lab at run.qwiklab.com. You can take self-paced labs on-demand and learn at your own pace. AWS self-paced labs were designed by AWS subject matter experts and provide an opportunity to use the AWS console in a variety of pre-designed scenarios and common use cases, giving you hands-on practice in a live AWS environment to help you gain confidence working with AWS. You have flexibility to choose from topics and products about which you want to learn more.
- Take an instructor-led AWS training course. We have a variety of role-based courses to meet the requirements of your job role and business need, whether you're a Solutions Architect, Developer, SysOps Administrator, or just interested in learning AWS fundamentals.
- AWS Certification validates your skills, knowledge and expertise in working with AWS services. Earning certification enables you to gain visibility and credibility for your skills.

Thank You

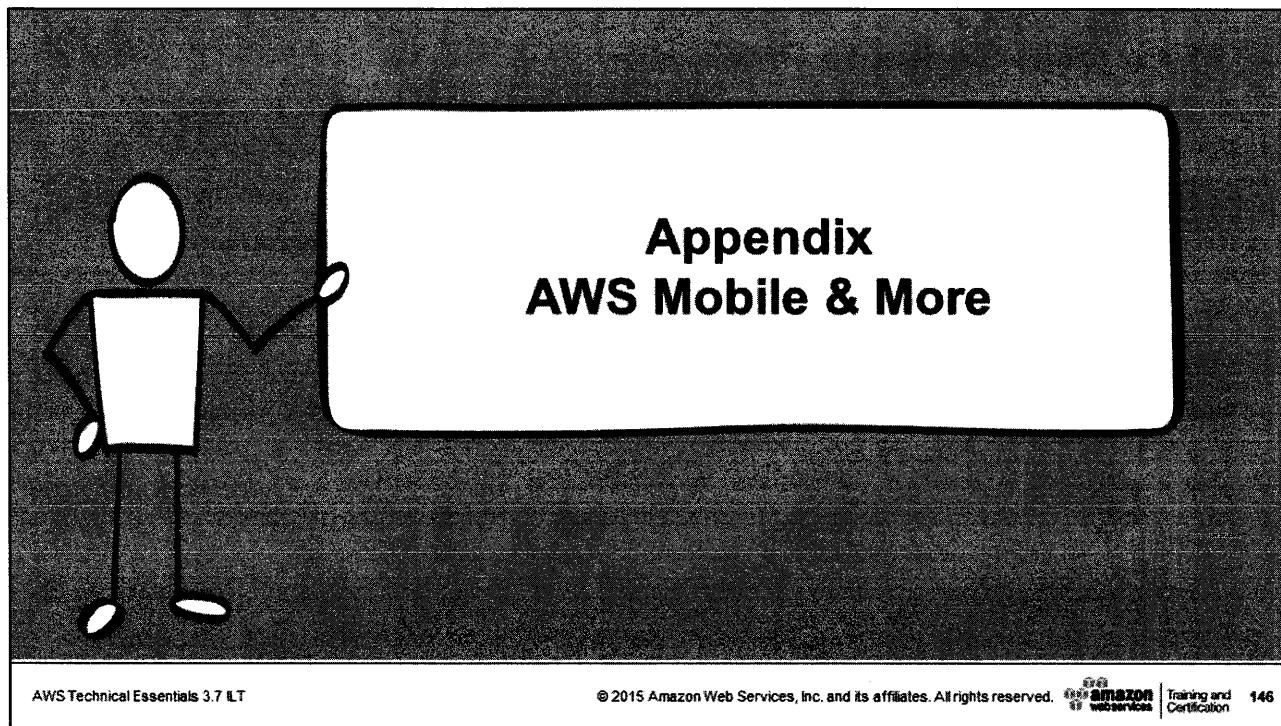
Hope you enjoyed the training!

Let us know what you think and email us at: aws-course-feedback@amazon.com



Please let us know what you think and thanks for attending.

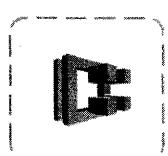
Let us know what you think and email us at: aws-course-feedback@amazon.com



The fundamental elements of AWS mobile services, AWS applications, AWS analytics, and AWS app services:

- Identify AWS key mobile services
- Describe AWS applications
- Verify AWS analytics
- Identify AWS app services

More AWS Compute Products



Amazon EC2
Container Service

- Supports Docker containers
- Enables you to run applications on managed cluster of EC2 instances



AWS Lambda

- Runs code in response to events
- Automatically manages compute resources

Amazon EC2 Container Service (ECS) is a highly scalable, high performance container management service that supports Docker containers and allows you to easily run applications on a managed cluster of Amazon EC2 instances.

AWS Lambda is a compute service that runs your code in response to events and automatically manages the compute resources for you.

More Deployment & Management Product and Services



Automates code deployment
Enables you to rapidly release features

AWS CodeDeploy handles the complexity of deploying your applications. With AWS CodeDeploy, you can fully automate your deployment, perform rolling updates across your Amazon EC2 instances, and track the status of your deployments using the AWS CodeDeploy console.

AWS Analytics Product & Services



Amazon Kinesis

- Collect and process hundreds of terabytes of data per hour from hundreds of thousands of sources
- Build real-time dashboards



AWS Data Pipeline

- Access data where it's stored, transform and process it at scale
- Create complex data processing workloads



Amazon Elastic MapReduce

- Is highly scalable
- Utilizes a hosted Hadoop framework

AWS Technical Essentials 3.7 ILT

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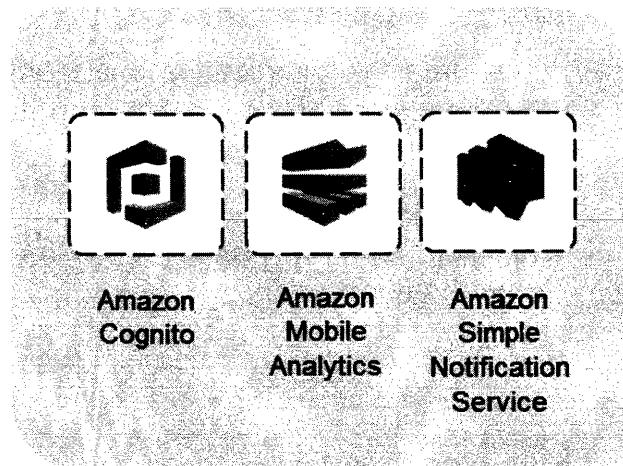
Training and

Certification

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Here are AWS analytics products and services, Amazon Kinesis, AWS Data Pipeline, and Amazon Elastic MapReduce.

AWS Mobile Products & Services



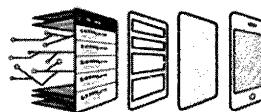
Here are AWS mobile services, Amazon Cognito, Amazon Mobile Analytics, and Amazon SNS.

Amazon Cognito



Amazon
Cognito

- User-data synchronization and identity service
- Securely store and sync user app data in the AWS Cloud
- Manage and synchronize app data for your users across mobile devices
- Allows to **save app data locally on the device** to work offline



Amazon Cognito is a simple user-data synchronization and identity service that helps you manage and synchronize app data for your users across their mobile devices. It simplifies the task of authenticating users and storing, managing, and syncing their data across multiple devices, platforms, and applications by securely storing the user app data in the AWS Cloud which can then be synchronized across multiple devices and OS platforms. It works online or offline, and allows you to securely save user-specific data such as application preferences and game state without writing any backend code or managing any infrastructure. Amazon Cognito works with multiple existing identity providers (such as Google, Facebook, and Amazon) and also supports unauthenticated guest users.

Learn more about Amazon Cognito: <http://aws.amazon.com/cognito/>

AWS Mobile Products & Services

Amazon
CognitoAmazon
Mobile
AnalyticsAmazon
Simple
Notification
Service

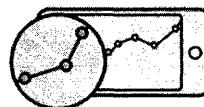
Amazon Mobile Analytics is a service that lets you easily collect, visualize, and understand app usage data at scale.

Amazon Mobile Analytics



Amazon
Mobile Analytics

- **Usage reports** within 60 minutes
- Built to scale with your app
- Access data in the AWS Management Console



Many mobile app analytics solutions deliver usage data several hours after the events occur. Amazon Mobile Analytics is designed to deliver usage reports within 60 minutes of receiving data from an app so that you can act on the data more quickly. Amazon Mobile Analytics is built to scale with your app, allowing you to collect and process billions of events per day from millions of users. Simply add the AWS Mobile SDK to your app and publish the app using your existing distribution mechanism (such as the iTunes Store, Google Play or Amazon Appstore), and you can start accessing reports in the AWS Management Console.

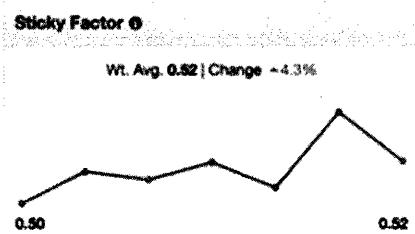
Learn more about Amazon Mobile Analytics:

<http://aws.amazon.com/mobileanalytics/>

Using Amazon Mobile Analytics



- Free for up to 100 million events per month
- Integrated with Amazon Cognito
- Graphical Reports: Overview, Active Users, Sessions, Revenue, Retention, and Custom Events

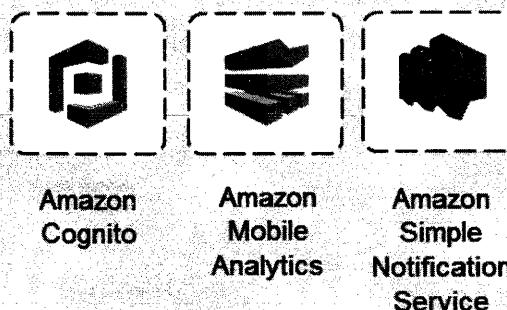


Amazon Mobile Analytics is free for up to 100 million events per month. An event corresponds to activity in your app such as the start of a session or an in-app purchase.

Amazon Mobile Analytics is integrated with Amazon Cognito, which enables you to follow security best practices by not hardcoding credentials in your app.

You can use the AWS Management Console to view graphical reports for your app or download data in CSV format.

AWS Mobile Products & Services



Amazon Simple Notification Service also known as Amazon SNS, is a fast, flexible, fully managed push messaging service.

Amazon Simple Notification Service (SNS)



Amazon
Mobile SNS

- Push notifications to smart devices
- Notifications by SMS text or email
- Messages stored across Availability Zones

Amazon SNS makes it simple and cost-effective to push notifications to Apple, Google, Fire OS, and Windows devices, as well as Android devices in China with Baidu Cloud Push.

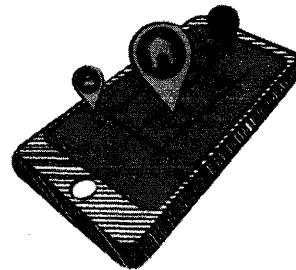
You can also use Amazon SNS to push notifications to Internet-connected smart devices, as well as other distributed services. Amazon SNS can deliver notifications by SMS text message or email, to Amazon Simple Queue Services (SQS) queues, or to any HTTP endpoint. To prevent messages from being lost, all messages published to Amazon SNS are stored redundantly across multiple Availability Zones.

Learn more about Amazon SNS: <http://aws.amazon.com/sns/>

Amazon Mobile SNS Pricing



- No upfront costs and you can pay as you go
- Get started with a SNS free tier
- First 1 million Amazon SNS requests per a month are free



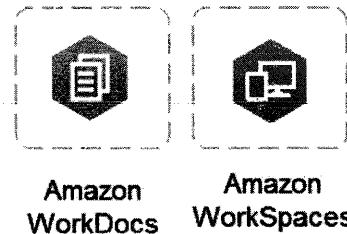
Amazon SNS has no upfront costs and you can pay as you go. You pay based on the number of notifications you publish, the number of notifications you deliver, and any additional API calls for managing topics and subscriptions. Delivery pricing varies by endpoint type. You can get started for free with SNS free tier.

It costs \$1 US dollar to send one million mobile push notifications at the time this training was developed.

Check online for more up-to-date pricing information:
<http://aws.amazon.com/sns/pricing/>

Getting started guide to help you get going with Amazon SNS:
<http://aws.amazon.com/sns/getting-started/>

AWS Applications Products & Services



Here are AWS applications: Amazon WorkDocs and Amazon WorkSpaces.

Amazon WorkDocs is a fully managed, secure enterprise storage and sharing service with strong administrative controls and feedback capabilities that improve user productivity.

Amazon WorkDocs



Amazon
WorkDocs

- Fully managed, secure enterprise storage and sharing service**
- Strong administrative controls and feedback capabilities**
- Access and sync from any device**
- Free trial for up to 50 users**

With Amazon WorkDocs users can comment on files, send them to others for feedback, and upload new versions without having to resort to emailing multiple versions of their files as attachments. Users can take advantage of these capabilities wherever they are, using the device of their choice, including PCs, Macs, and tablets. Amazon WorkDocs offers IT administrators the option of integrating with existing corporate directories, flexible sharing policies, audit logs, and control of the location where data is stored.

Customers can get started using Amazon WorkDocs with a 30-day free trial providing 200 GB of storage per user for up to 50 users.

Learn more about Amazon WorkDocs: <http://aws.amazon.com/workdocs/>

Using Amazon WorkDocs

The diagram illustrates three key features of Amazon WorkDocs:

- Low Cost:** Represented by a stack of coins with an arrow pointing upwards.
- Secure:** Represented by a cloud icon containing a padlock.
- Integrate:** Represented by a network of connected devices (laptop, smartphone, tablet) and databases.

AWS Technical Essentials 3.7 ILT

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amazon
webservices

Training and
Certification

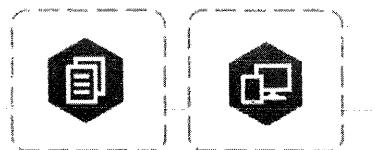
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Low Cost: Priced at \$5 per user per month, including 200 GB of storage, Amazon WorkDocs is a low-cost solution that is also fully managed. This means that there is no hardware to purchase and maintain and no software to deploy. You simply enable Amazon WorkDocs for your organization and invite users. A 30-day free trial for up to 50 users is available to get you started.

Secure: Amazon WorkDocs offers flexible security settings access controls to manage data storage and sharing. You can use policies to control users' sharing behavior, choose the AWS region where users' data is stored, and view audit logs to track documents and user activity. All data is encrypted in transit and at rest, and users don't have to send documents as email attachments.

Integrate: Amazon WorkDocs can integrate with your existing Active Directory. This means that your users can easily access Amazon WorkDocs with their existing credentials, and you can control which users in your organization are permitted to access the service.

AWS Applications Products & Services



Amazon WorkDocs Amazon WorkSpaces

Amazon WorkSpaces is a fully managed desktop computing service in the cloud.

Amazon WorkSpaces



Amazon
WorkSpaces

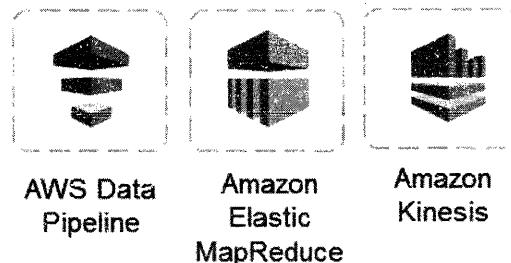
- Easily provision **cloud-based desktop**
- Multiple **device options**
- Infinite users**
- Access to persistent storage**

Amazon WorkSpaces allows you to easily provision cloud-based desktop that allow you to access the document, applications, and resources you need with the device of your choice, including: laptops, iPad, Kindle Fire, or Android tablets. With a few click in the AWS Management Console, you can provision a high-quality cloud desktop experience for any number of user.

Amazon WorkSpaces provides each user with access to persistent storage in the AWS cloud. When users access their cloud desktops using Amazon WorkSpaces, you control whether your corporate data is stored on multiple client devices, helping you keep your data secure.

Learn more about Amazon WorkSpaces: <http://aws.amazon.com/workspaces/>

AWS Analytics Product & Services



Here are AWS analytics products and services AWS Data Pipeline, Amazon Elastic MapReduce, and Amazon Kinesis.

AWS Data Pipeline is a web service that helps you reliably process and move data between different AWS compute and storage services as well as on-premises data sources, at specified intervals.

AWS Data Pipeline



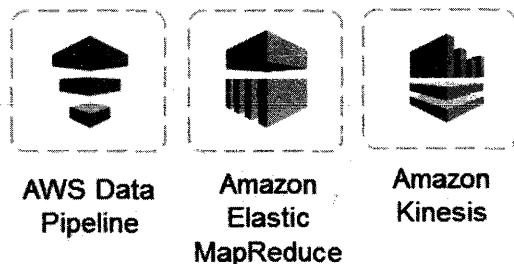
AWS Data Pipeline

- Access data where it's stored, transform and process it at scale
- Create complex data processing workloads
- No need to create failure notification systems
- Move previously locked up on-premises data silos

With AWS Data Pipeline, you can regularly access your data where it's stored, transform and process it at scale, and efficiently transfer the results to AWS services such as Amazon S3, Amazon RDS, Amazon DynamoDB, and Amazon Elastic MapReduce. AWS Data Pipeline helps you easily create complex data processing workloads that are fault tolerant, repeatable, and highly available. You don't have to worry about ensuring resources availability, managing inter-task dependencies, retrying transient failures or timeouts in individual tasks, or creating a failure notification system. AWS Data Pipeline allows you to move and process data that was previously locked up in on-premises data silos.

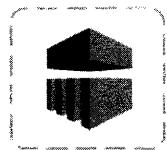
Learn more about AWS Data Pipeline: <http://aws.amazon.com/datapipeline/>

AWS Analytics Product & Services

AWS Data
PipelineAmazon
Elastic
MapReduceAmazon
Kinesis

AWS Elastic MapReduce is a web service that enables businesses, researchers, data analysts, and developers to easily and cost-effectively process vast amounts of data.

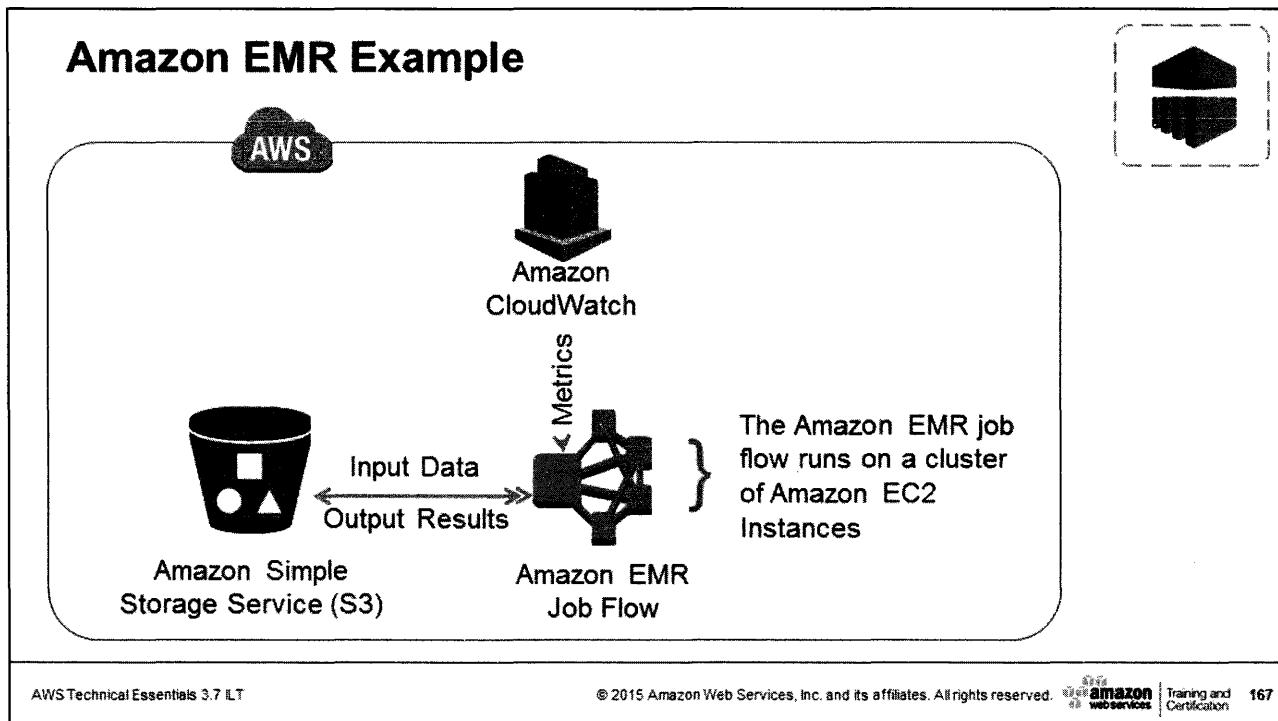
Amazon Elastic MapReduce (EMR)



Amazon
EMR

- **Highly scalable**
- Utilizes a hosted **Hadoop** framework
- Easily and cost-effectively **processes vast amounts of data**

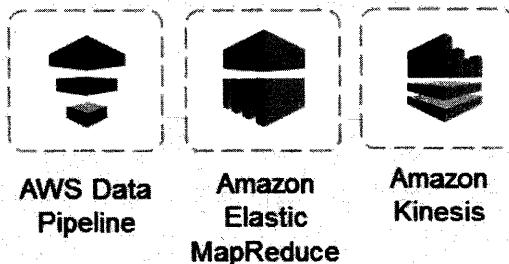
Amazon Elastic MapReduce, uses a hosted Hadoop framework running on the web-scale infrastructure of Amazon EC2 and Amazon S3. Using Amazon Elastic MapReduce, you can instantly provision as much or as little capacity as you like to perform data-intensive tasks for applications such as web indexing, data mining, log file analysis, data warehousing, machine learning, financial analysis, scientific simulation, and bioinformatics research.



Amazon EMR uses Apache Hadoop as its distributed data processing engine. Hadoop is an open source, Java software framework that supports data-intensive distributed applications running on large clusters of commodity hardware. Hadoop implements a programming model named “MapReduce,” where the data is divided into many small fragments of work, each of which may be executed on any node in the cluster. This framework has been widely used by developers, enterprises and startups and has proven to be a reliable software platform for processing up to petabytes of data on clusters of thousands of commodity machines. Amazon EMR has made enhancements to Hadoop and other open-source applications to work seamlessly with AWS. For example, Hadoop clusters running on Amazon EMR use Amazon EC2 instances as virtual Linux servers for the master and slave nodes, Amazon S3 for bulk storage of input and output data, and Amazon CloudWatch to monitor cluster performance and raise alarms. You can also move data into and out of Amazon DynamoDB using Amazon EMR and Hive. All of this is orchestrated by Amazon EMR control software that launches and manages the Hadoop cluster. This process is called an Amazon EMR job flow.

Learn more about Amazon EMR: <http://aws.amazon.com/elasticmapreduce/>
 Take a free brief training on Amazon EMR with a free self-paced lab:
<http://bit.ly/1mHcsQj>

AWS Analytics Product & Services



Amazon Kinesis is a fully managed service for real-time processing of streaming data at massive scale.

Amazon Kinesis



Amazon
Kinesis

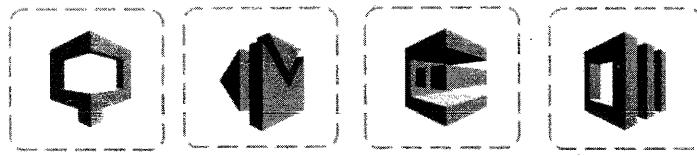
- Collect and process hundreds of terabytes of data per hour from hundreds of thousands of sources
- **Build real-time dashboards**
- Capture exceptions and generate alerts
- Send data to a variety of other services

Amazon Kinesis can collect and process hundreds of terabytes of data per hour from hundreds of thousands of sources, allowing you to easily write applications that process information in real-time, from sources such as website click-streams, marketing and financial information, manufacturing instrumentations and social media, and operations logs and metering data.

You can build real-time dashboards, capture exceptions and generate alerts, drive recommendations, and make other real-time business or operational decisions. You can easily send data to a variety of other services such as Amazon S3, Amazon DynamoDB, and Amazon Redshift. With a few clicks and a couple of lines of code, you can start building applications that respond to changes in your data stream in seconds at any scale, while only paying for the resources you use.

Learn more about Amazon Kinesis: <http://aws.amazon.com/kinesis/>

AWS App Services



Amazon
Cloud-
Search

Amazon
Simple Email
Service

Amazon
Simple
Queue
Service

Amazon
Simple
Workflow

Here are AWS app services: Amazon CloudSearch, Amazon SES, Amazon SQS, and Amazon SWF.

Amazon CloudSearch is a fully-managed service in the AWS cloud that makes it simple and cost-effective to set up, manage, and scale a search solution for your website or application.

Amazon CloudSearch

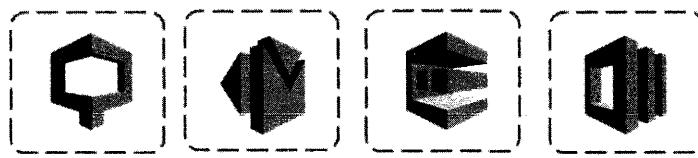


- Supports 34 languages
- **Popular search features**
- Seamlessly scales to meet your needs
- Easily change your search parameters
- Apply new settings at any time without having to re-upload your data

Amazon CloudSearch supports 34 languages and popular search features such as highlighting, autocomplete, and geospatial search. As your volume and data traffic fluctuates, Amazon CloudSearch seamlessly scales to meet your needs. You can easily change your search parameters, fine-tune search relevance, and apply new settings at any time without having to re-upload your data.

Learn more about Amazon CloudSearch: <http://aws.amazon.com/cloudsearch/>

AWS App Services

Amazon
Cloud-
SearchAmazon
Simple Email
ServiceAmazon
Simple
Queue
ServiceAmazon
Simple
Workflow

Amazon Simple Email Service (SES) is a cost-effective outbound-only email-sending service built on the reliable and scalable infrastructure that Amazon.com has developed to serve its own customer base.

Amazon Simple Email Service (SES)



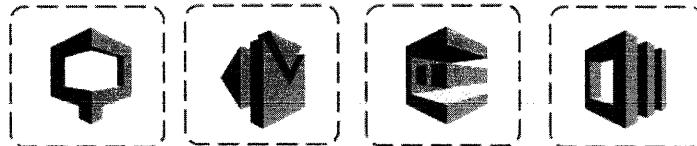
- **Transactional email**, marketing messages, or any other type of high-quality content
- **Real-time access** to your sending statistics
- SMTP interface or calling an API
- **High availability and data durability**

With Amazon SES, you can send transactional email, marketing messages, or any other type of high-quality content and you only pay for what you use. Along with high deliverability, Amazon SES provides easy, real-time access to your sending statistics and built-in notifications for bounces, complaints, and deliveries to help you fine-tune your email-sending strategy. Sending email through Amazon SES is as simple as using the SMTP interface or calling an API, and you can easily monitor your sending activity and deliverability statistics at any time.

There are no up-front fees or fixed expenses with Amazon SES. Outgoing messages are stored redundantly across multiple servers and datacenters to provide high availability and data durability.

Learn more about Amazon SES: <http://aws.amazon.com/ses/>

AWS App Services



Amazon
Cloud-
Search

Amazon
Simple Email
Service

Amazon
Simple
Queue
Service

Amazon
Simple
Workflow

Amazon Simple Queue Service (SQS) is a fast, reliable, scalable, fully managed message queuing service.

Amazon Simple Queue Service (SQS)



- Decouple the components of cloud application
- **Transmit any volume of data**, at any level of throughput, without losing messages
- Offload the administrative burden
- Unlimited number of services to read and write

Amazon SQS makes it simple and cost-effective to decouple the components of a cloud application. You can use Amazon SQS to transmit any volume of data, at any level of throughput, without losing messages or requiring other services to be always available. With SQS, you can offload the administrative burden of operating and scaling a high-available messaging cluster, while paying a low price for only what you use. Get started with Amazon SQS by using only five APIs. Amazon SQS is designed to enable an unlimited number of services to read and write an unlimited number of messages at any time.

Learn more about Amazon SQS: <http://aws.amazon.com/sqs/>

AWS App Services



Amazon
Cloud-
Search

Amazon
Simple Email
Service

Amazon
Simple
Queue
Service

Amazon
Simple
Workflow

Amazon Simple Workflow (SWF) helps developers build, run, and scale background jobs that have parallel or sequential steps.

Amazon Simple Workflow (SWF)



Amazon
SWF

- State tracker and task coordinator in the cloud
- Separation between the control flow of your background job's **stepwise logic**
- Scales with your applications usage
- No manual administration of the workflow service is required

You can think of Amazon SWF as a fully-managed state tracker and task coordinator in the cloud. Amazon SWF can help you if your app's steps take more than 500 milliseconds to complete, you need to track the state of processing, and you need to recover or retry if a task fails.

Amazon SWF promotes a separation between the control flow of your background job's stepwise logic and the actual units of work that contain your unique business logic. This allows you to separately manage, maintain, and scale "state machinery" of your application.

Amazon SWF scales with your applications usage. No manual administration of the workflow service is required as you add more workflows to your applications or increase the complexity of your workflow.

Learn more about Amazon SWF: <http://aws.amazon.com/swf/>



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Version 3.7**

AWS-100-ESS-37-EN

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<https://aws.amazon.com/contact-us/aws-training/>.

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Lab 1: Amazon S3

Overview	<p>Amazon Simple Storage Service (Amazon S3) is a scalable object storage service designed for the Internet. In this lab you will create an Amazon S3 bucket and configure access logging. You will then upload an object and manage its permissions. When this is done, you can access the object via a web browser.</p> <p>You will have a chance to modify the object metadata, encrypt objects with Server Side Encryption, create folders, apply bucket-wide security with a bucket policy, and enable lifecycle policies to archive and delete logs.</p>
-----------------	---

Objectives	<p>After completing this lab, you will be able to:</p> <ul style="list-style-type: none">• Create an Amazon S3 bucket and manage properties.• Upload objects and manage object-level permissions.• Access objects in an Amazon S3 bucket from a web browser.• Create folders and apply bucket-wide security using bucket policies.
-------------------	---

Pre-requisites	<p>This lab requires:</p> <ul style="list-style-type: none">• Access to a notebook computer with Wi-Fi running Microsoft Windows, Mac OS X, or Linux (Ubuntu, SuSE, or Red Hat).<ul style="list-style-type: none">○ Note The qwikLABS lab environment is not accessible using an iPad or tablet device, but you can use these devices to access the student guide.• For Microsoft Windows users: Administrator access to the computer.• An Internet browser such as Chrome, Firefox, or Internet Explorer 9 (previous versions of Internet Explorer are not supported).
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Command Reference File	<p>At various points, this lab will instruct you to copy and paste text as part of lab procedures. This text should be copied from the lab's associated command reference file, which is available on the Instructions tab of your lab in qwikLABS.</p> <p>It is not recommended to copy and paste text from this lab manual, as the manual's rich formatting may inject characters that cannot properly be parsed by the command line</p>
Scenario	<p>As the operations-focused individual in a start-up business, you are tasked with coming up with a low cost, high availability solution for your customer-facing website. Your website will host a myriad of documents for your customers, as well as video and static content. Your global team will contribute and update the content on your site.</p>

Task 1-1: Amazon S3 Basics

Overview	You need to build the public-facing website. In this section, you will access the Amazon S3 Console, create a new Amazon S3 bucket to contain Asperatus Tech's website content, configure logging, upload an object, and then access that object.
-----------------	---

Step	Instruction
1.1.1	Log in to your AWS Management Console . Use the instructions in Appendix A of this lab manual to log in to the AWS Management Console using the pre-configured student account.
1.1.2	In the AWS Management Console , on the Services menu, click S3 .
1.1.3	Click Create Bucket to create a new bucket. Note: There is already a bucket named “QLtrail-Lab...”. This is just for the sandbox environment. You will be creating a new bucket.
1.1.4	In the Create a Bucket – Select a Bucket Name and Region dialog box, enter the following values: <ul style="list-style-type: none"> Bucket Name: Type a bucket name that will be unique across Amazon S3. We recommend that you name your bucket with your initials and today’s date to ensure uniqueness. This value will be referred to as <i>s3-bucket-name</i> in subsequent procedures. Region: Choose a region closest to your location. If unsure, choose Oregon.
1.1.5	Click Create .
1.1.6	In the S3 Console , click the name of your bucket to view its contents. You will receive a message indicating that the bucket is empty.

1.1.7	Click Upload to add a new file object to your bucket.
1.1.8	In the Upload – Select Files and Folders dialog box, click Add Files .
1.1.9	Select a file (e.g. picture from My Pictures folder) from your local machine to use as an object. Note: We will refer to this uploaded file as <i>the object</i> in subsequent procedures
1.1.10	Click Start Upload . You can see the progress of the upload in the Transfers pane.

Task 1-2: Working with Objects

Overview	Data for the company website will have various permissions and security associated with it. In this section, you will use the Amazon S3 Management Console to modify object attributes, including permissions, encryption, and Reduced Redundancy Storage options.
-----------------	--

Step	Instruction
1.2.1	In the S3 Console , click on the name of the object that you uploaded earlier. Note: On selecting an object, the check box next to its name turns blue.
1.2.2	Click Properties to display the properties of the object.
1.2.3	In the Properties pane, click the Link to open the object. You will receive an Access Denied error message on clicking the link. Note: Notice the lock icon next to the link. It implies that the link to the object is a private link. Objects in Amazon S3 are private by default.
1.2.4	In the S3 Console , right-click the object and click Make Public .
1.2.5	Click OK on the dialog box to confirm.
1.2.6	Let us try to access the object again. In the S3 Console , with the object selected, click Properties .
1.2.7	In the Properties pane, click the Link again. The object should open this time without any error. Note: Notice the icon next to the link implying that it is a public link.
1.2.8	In the Properties pane, expand the Details section.

1.2.9	<p>In the Details section, use the following values:</p> <ul style="list-style-type: none">• Storage Class: Reduced Redundancy The Reduced Redundancy Storage class reduces costs by storing noncritical, reproducible data at lower levels of redundancy than the Standard Storage class.• Server Side Encryption: AES-256 Encryption provides added security for the object data stored in your Amazon S3 buckets.
1.2.10	Click Save .

Task 1-3: Folders and Bucket Policies

Overview	As you are uploading the company documents, you begin to realize the need to better organize your documents and to simplify the management of security. In this section, you will use the Amazon S3 Console to organize your objects into folders. You will then create a Bucket Policy that defines permissions based on folders.
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Step	Instruction
1.3.1	In the S3 Console , make sure you are in the bucket that you created earlier. Hint: The path in the top-left corner of the S3 Console should be All Buckets / <Your S3 Bucket name>
1.3.2	Click Create Folder .
1.3.3	In the Name field type images and click the check mark.
1.3.4	Repeat this procedure to create two more folders with the names pages , and logs .
1.3.5	In the S3 Console , make sure you are in the bucket that you created earlier. Hint: The path in the top-left corner of the S3 Console should be All Buckets / <Your S3 Bucket name>
1.3.6	Click Properties .
1.3.7	In the Properties pane, expand the Permissions section.
1.3.8	Click Add bucket policy to create a new policy for your bucket. Bucket policies define the permissions structure for your Amazon S3 bucket.

1.3.9	In the Bucket Policy Editor dialog box, click the AWS Policy Generator link.
1.3.10	In the AWS Policy Generator page, use the following values: <ul style="list-style-type: none">• Select Type of Policy: S3 Bucket Policy• Effect: Allow• Principal: *• AWS Service: Amazon S3• Actions: GetObject• Amazon Resource Name (ARN): <code>arn:aws:s3:::<Your-S3-Bucket-Name>/images/*</code> <p>Note: You are creating this policy only for the images folder in your S3 bucket.</p>
1.3.11	Make sure you specified the correct bucket name in the Amazon Resource Name (ARN) field.
1.3.12	Click Add Statement .
1.3.13	Click Generate Policy to generate the policy.
1.3.14	In the Policy JSON Document dialog box, copy the generated policy text to your clipboard.
1.3.15	Click Close .
1.3.16	Go back to the S3 Management Console and in the Bucket Policy Editor dialog box, paste the policy text you copied earlier.
1.3.17	Click Save . <p>Note: If the Save button is not active, type an extra space at the end of the policy text to activate it.</p>

1.3.18	In the S3 Console , click the images folder in your bucket to view its contents.
1.3.19	Click Upload to upload a new object to your images folder.
1.3.20	In the Upload – Select Files and Folders dialog box, click Add Files .
1.3.21	Select a file (e.g. picture from My Pictures folder) from your local machine to use as an object. Note: We will refer to this uploaded file as <i>the object</i> in subsequent procedures
1.3.22	Click Start Upload . You can see the progress of the upload in the Transfers pane.
1.3.23	Select the object and click Properties to display its properties.
1.3.24	In the Properties pane, click the Link to open the object. Unlike in task 1-2, you will be able to access the object without any error because the Bucket Policy granted access to all objects in the images folder. Note: If you try to open objects in other folders, you will still get the access denied error. This is because you defined the Bucket Policy only for the images folder.

Task 1-4: Lifecycle Policies (Optional Task)

Overview	<p>Now that you have the business needs taken care of, you want to take care of the technical needs. It is important to have logs stored in an easy location, but it is also important to move them to a lower-cost location for long-term storage and then eventually remove them.</p> <p>In this section, you will use the S3 Console to define lifecycle policies for your bucket. The rules will move objects from your logs folder to Amazon Glacier storage after 30 days, and will delete them after 90 days.</p>
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Step	Instruction
1.4.1	In the S3 Console , click All Buckets .
1.4.2	Click Create Bucket to create a new bucket for storing logs.
1.4.3	<p>In the Create a Bucket – Select a Bucket Name and Region dialog box, use the following values for the new bucket:</p> <ul style="list-style-type: none"> • Bucket Name: serverlogs (add some unique identifier such as your initials at the end of the bucket name to make it unique). • Region: Check with your instructor for the region to choose. <p>Note: Amazon Glacier service is currently not available in all regions. For this lab exercise, we will use a region where this service is available. If unsure, choose Oregon.</p>
1.4.4	Click Create .
1.4.5	In the S3 Console , click the serverlogs bucket that you created.
1.4.6	Click Properties .

1.4.7	In the Properties pane, expand the Lifecycle section.
1.4.8	In the Lifecycle section, click Add rule .
1.4.9	In the Lifecycle Rules dialog box, on Step 1: Choose Rule Target , choose the following value: <ul style="list-style-type: none"> • Apply the Rule to: Whole Bucket:<Your-serverlogs-bucket>
1.4.10	Click Configure Rule .
1.4.11	On Step 2: Configure Rule , choose the following values: <ul style="list-style-type: none"> • Action on Objects: Archive and then Permanently Delete • Archive to the Glacier Storage Class: 30 days • Permanently Delete: 90 days <p>Note: If you do not have the Archive and then Permanently Delete option, then you might have created your serverlogs bucket in a Region where Amazon Glacier service is not available. Please create a new bucket in a different region, for example: Oregon.</p>
1.4.12	Select the acknowledgement check box.
1.4.13	Click Review .
1.4.14	On Step 3: Rule , use the following value: <ul style="list-style-type: none"> • Rule Name: archive-logs
1.4.15	Click Create and Activate Rule . The contents of the bucket will now automatically move from Amazon S3 to Glacier 30 days after creation, thereby lowering your storage costs. After 90 days, the objects will be automatically deleted from Amazon Glacier and Amazon S3.

1.4.16	<p>Congratulations! You now have successfully:</p> <ul style="list-style-type: none">• Created an Amazon S3 bucket and configured its properties.• Uploaded objects and managed object-level permissions.• Accessed objects in an Amazon S3 bucket from a web browser.• Created folders and applied bucket-wide security using bucket policies.
1.4.17	Close the Amazon S3 Management Console window/tab.
1.4.18	On the qwikLABS page, click End to end your lab session.

Lab 2: Amazon EC2

Overview	<p>Amazon Elastic Compute Cloud (Amazon EC2) is a web service that provides resizable compute capacity in the cloud. Amazon EC2 reduces the time required to obtain and boot new server instances to minutes, allowing you to quickly scale capacity as your computing requirements change.</p> <p>In this lab you will launch an Amazon EC2 instance, connect to the instance, and create Elastic Block Store (EBS) volumes.</p>
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Objectives	<p>After completing this lab, you will be able to:</p> <ul style="list-style-type: none">• Create an EC2 key pair and a security group.• Launch an Amazon EC2 Windows Instance.• Activate Termination Protection for an Amazon EC2 instance.• Create EBS volumes and snapshots.
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Pre-requisites	<p>This lab requires:</p> <ul style="list-style-type: none">• Access to a notebook computer with Wi-Fi running Microsoft Windows, Mac OS X, or Linux (Ubuntu, SuSE, or Red Hat).<ul style="list-style-type: none">○ Note The <i>qwikLABS</i> lab environment is not accessible using an iPad or tablet device, but you can use these devices to access the student guide.• For Microsoft Windows users: Administrator access to the computer.• An Internet browser such as Chrome, Firefox, or Internet Explorer 9 (previous versions of Internet Explorer are not supported).
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Mac Users	This lab requires you to access a Windows instance by using Remote Desktop Connection software. Please check whether your computer has Remote Desktop Connection already installed. If not, then the software can be downloaded using this link: https://itunes.apple.com/us/app/microsoft-remote-desktop/id715768417
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Command Reference File	At various points, this lab will instruct you to copy and paste text as part of lab procedures. This text should be copied from the lab's associated command reference file , which is available on the Instructions tab of your lab in qwikLABS. It is not recommended to copy and paste text from this lab manual, as the manual's rich formatting may inject characters that cannot properly be parsed by the command line
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Scenario	As the operations-focused individual in a start-up business, you are tasked with coming up with a low cost, high availability solution for your customer-facing website. Your website will host a myriad of documents for your customers, as well as video and static content. Your global team will contribute and update the content on your site.
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Task 1-1: Amazon EC2 Key Pairs

Overview	In this lab, you are going to create a new key pair that will be used to launch your EC2 instance and also to retrieve your Windows Administrator password for the EC2 instance.
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Step	Instruction
1.1.1	Log in to your AWS Management Console . Use the instructions in Appendix A of this lab manual to log in to the AWS Management Console using the pre-configured student account.
1.1.2	In the AWS Management Console , on the Services menu, click EC2 .
1.1.3	In the navigation pane of the EC2 Management Console , click Key Pairs .
1.1.4	Click Create Key Pair .
1.1.5	In the Create Key Pair dialog box, use the following value: <ul style="list-style-type: none">• Key pair name: asperatus
1.1.6	Click Create .
1.1.7	Save the file asperatus.pem to your local computer. This file contains the 'private' half of your key pair. You do not have to open the file; just remember where you saved the file (for example, the Downloads folder), because the file will be used later.

Task 1-2: Security Groups

Overview	In preparation for launching an EC2 instance, you will now create a security group that will permit network access for web traffic and remote administration.
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Step	Instruction
1.2.1	In the navigation pane of the EC2 Management Console , click Security Groups .
1.2.2	Click Create Security Group .
1.2.3	In the Create Security Group dialog box, use the following values: <ul style="list-style-type: none"> • Security group name: Remote access • Description: Grant RDP Access • VPC: From the drop-down list, click Lab VPC if it is not already selected <p>Note: The VPC ID starts with “vpc-” with CIDR range of 10.1.0.0/16.</p>
1.2.4	In the Security group rules section, click Add Rule to add a rule to your security group.
1.2.5	For your security rule, specify the following values: <ul style="list-style-type: none"> • Type: RDP • Source: Anywhere <p>Note: It is normally a best practice to NOT enable RDP access directly to production servers. Rather, it is best to use a Bastion Server ('Jump Box') as the entry point for RDP and SSH connections. Creating a wide-open security rule in this step is done for lab purposes only.</p>
1.2.6	To add a second rule, click Add Rule .

1.2.7	<p>You will need HTTP access to the instance. Use the following values to include HTTP access:</p> <ul style="list-style-type: none">• Type: HTTP• Source: Anywhere <p>Note: Creating a wide-open security rule in this step is done for lab purposes only.</p>
1.2.8	Click Create to create the Remote access security group.
1.2.9	You have now configured a security group to permit inbound access for Remote Desktop Protocol (port 3389) and HTTP (port 80) web traffic. Later in the lab you will attach this security group to your EC2 instance so you access the instance via RDP and HTTP.

Task 1-3: Launching an Amazon EC2 Windows Instance

Overview	Now that you have created a key pair and defined a Security Group, it is time to launch your web server. In this section, you will launch an Amazon EC2 instance which will be your web server.
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Step	Instruction
1.3.1	In the navigation pane of the EC2 Management Console , click Instances .
1.3.2	Click Launch Instance .
1.3.3	On the Step 1: Choose an Amazon Machine Image (AMI) page, select the first Microsoft Windows Server 2012 R2 Base distribution in the list by clicking Select .
1.3.4	On the Step 2: Choose an Instance Type page, choose t2.medium .
1.3.5	Click Next: Configure Instance Details .
1.3.6	<p>On the Step 3: Configure Instance Details page, select the following values:</p> <ul style="list-style-type: none"> • Network: From the drop-down list, click Lab VPC • Auto-assign Public IP: Enable <p>Leave the rest as its default values.</p> <p>Note: If you see an error message, "No default subnet found. Please choose another subnet in your default VPC, or choose another VPC," click the Don't show me this again link to close this message. You can safely ignore this message for this lab environment; in an actual customer environment you would contact AWS support to resolve this issue.</p>
1.3.7	Click Next: Add Storage .

1.3.8	On the Step 4: Add Storage page, leave the default selections and click Next: Tag Instance .
1.3.9	On the Step 5: Tag Instance page, specify a new name value for your instance as follows: <ul style="list-style-type: none"> • Key: Name • Value: Web Server
1.3.10	Click Next: Configure Security Group .
1.3.11	On the Step 6: Configure Security Group page, use the following values: <ul style="list-style-type: none"> • Assign a security group: Select an existing security group • Security group name: Remote access
1.3.12	Click Review and Launch .
1.3.13	On the Step 7: Review Instance Launch page, review the configuration for your instance. When done, click Launch .
1.3.14	In the Select an existing key pair or create a new key pair dialog box, use the following values: <ul style="list-style-type: none"> • First dropdown (unlabeled): Choose an existing key pair • Select a key pair: Select the asperatus key pair • I acknowledge that I have access to...: Enable this checkbox <p>Note: Make sure you selected the asperatus key pair that you created previously.</p>
1.3.15	Click Launch Instances .
1.3.16	On the Launch Status page, click View Instances . Observe the Status Checks field of your Web Server instance until it shows that both status checks have completed successfully. Ignore the Alarm Status field in this lab environment.

Task 1-4: Termination Protection

Overview	Now that you have launched your Amazon EC2 instance, it is worth knowing how to keep the instance from being deleted accidentally. In this section, you will enable termination protection for your instance which will protect it from accidental terminations.
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Step	Instruction
1.4.1	In the navigation pane of the EC2 Management Console , click Instances .
1.4.2	Select the Web Server instance that you just created. Note: On selecting an instance, the check box next to its name turns blue.
1.4.3	In the Actions menu, go to Instance Settings and click Change Termination Protection .
1.4.4	In the Enable Termination Protection dialog box, click Yes, Enable . This will protect the instance from accidental termination.
1.4.5	To verify termination protection, in the Actions menu, go to Instance State and click Terminate .
1.4.6	In the Terminate Instances dialog box, you will notice that the Yes, Termination option is inactive.
1.4.7	Click Cancel .

Task 1-5: Creating an EBS Volume

Overview	<p>In this section, you will use the Amazon EC2 Management Console and the Windows disk management utility to create, attach, and manipulate an Elastic Block Store (EBS) volume.</p> <p>EBS volumes must be created in the same Availability Zone as the Amazon EC2 instance to which they connect.</p>
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Step	Instruction
1.5.1	In the navigation pane of the EC2 Management Console , click Instances .
1.5.2	<p>Make a note of the Availability Zone in which your Web Server instance is running.</p> <p>Hint: Look at the Availability Zone field value for your Web Server instance.</p>
1.5.3	In the navigation pane, click Volumes .
1.5.4	Click Create Volume to create a new volume.
1.5.5	<p>In the Create Volume dialog box, use the following values for the new volume:</p> <ul style="list-style-type: none"> • Type: General Purpose (SSD) • Size (GiB): 10 • Availability Zone: Select the same availability zone that you identified in step 1.5.2 <p>Note: Make sure you selected the size of the new volume to be 10GiB.</p>
1.5.6	Click Create . An empty 10GiB volume is created.

1.5.7	You can give a name to the new volume to identify it more easily. Select the 10GiB volume that you just created. Hint: Click the  icon to refresh the pane and get the latest status. Note: Make sure only the 10GiB volume is selected.
1.5.8	In the Actions menu, click Add/Edit Tags .
1.5.9	In the Add/Edit Tags dialog box, click Create Tag .
1.5.10	Use the following values to create a new tag for the 10GiB volume: <ul style="list-style-type: none">• Key: Name• Value: Small Volume
1.5.11	Click Save . The name of the volume will now appear in the Name column of the 10GiB volume.
1.5.12	You can now attach the new EBS volume to your Amazon EC2 instance. Select the Small Volume that you just created. Note: Make sure only the Small Volume is selected.
1.5.13	In the Actions menu, click Attach Volume .
1.5.14	In the Attach Volume dialog box, click in the Instance field and select your Web Server instance.
1.5.15	Click Attach . This will attach the Small Volume to the Web Server instance. We will verify this by connecting to the Web Server instance in the next section.

Task 1-6: Connection to your Amazon EC2 Instance

Overview	The Web Server instance that you created previously is now running and has an additional EBS volume that you attached in the previous procedure. Since this Amazon EC2 instance is running Microsoft Windows, you can now connect to it by using the Remote Desktop Connection application. In order to do this, you will require the IP address and password of your instance. A random Administrator password has been created for your instance. To retrieve it, you will need to use the asperatus.pem file, the ‘private’ half of your asperatus key pair, you saved earlier.
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Step	Instruction
1.6.1	In the navigation pane of the EC2 Management Console , click Instances .
1.6.2	Select your Web Server instance.
1.6.3	In the Description tab, copy the Public IP value to a text editor like Notepad. You will need this IP address to establish a Remote Desktop Connection to the Web Server.
1.6.4	On the Actions menu, click Get Windows Password .
1.6.5	On the Retrieve Default Windows Administrator Password page, click Browse , and select the asperatus.pem file that you downloaded in step 1.1.7.
1.6.6	Click Decrypt Password .
1.6.7	Copy the Password to a text editor as you will need this to login to your Web Server instance.

1.6.8	In the Retrieve Default Windows Administrator Password dialog box, click Close to close the dialog box.
1.6.9	Launch a Remote Desktop Connection (RDP) to your Web Server using the Public IP of your Web Server instance and the Password you obtained in the previous steps. Make sure to login as the Administrator . Note: If you are using Mac to remote desktop into the Web Server instance, check if your machine has Remote Desktop Connection already installed. If not, you can download this software using this link: https://itunes.apple.com/us/app/microsoft-remote-desktop/id715768417
1.6.10	Do NOT close the RDP session as you will use it in the next section of the lab.

Task 1-7: Using EBS Volumes

Overview	You can use the Windows Server Management tool to format your EBS volume. In this section, you will configure and use the EBS volume from your Web Server instance.
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Step	Instruction
1.7.1	In the RDP session to the Web Server, click the Server Manager icon in the taskbar 
1.7.2	In the Server Manager window, on the Tools menu, click Computer Management .
1.7.3	In the Computer Management window, in the left navigation pane, click Disk Management .
1.7.4	You will notice the 10GiB EBS volume is already attached to your Web Server and is in an offline state. In order to use this disk, you will first need to bring it online. Right-click Disk 1 and click Online . 

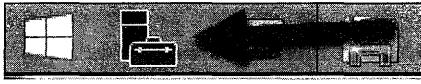
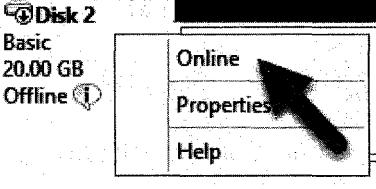
1.7.5	Next the disk needs to be initialized. Right-click Disk 1 and click Initialize Disk .
1.7.6	In the Initialize Disk dialog box, accept the default values and click OK .
1.7.7	Right-click the unallocated volume and click New Simple Volume...
1.7.8	In the New Simple Volume Wizard , accept the defaults for all steps (click Next four times) and click Finish . The disk will now be formatted and added as a new drive (D:)
1.7.9	Close the Computer Management window and the Server Manager window.
1.7.10	In the RDP session, launch Windows Explorer and navigate to the new drive (D:) that you just added.
1.7.11	Create a new folder on the drive (D:) called Asperatus .
1.7.12	Keep the RDP session open as you will use it in the next section of the lab.

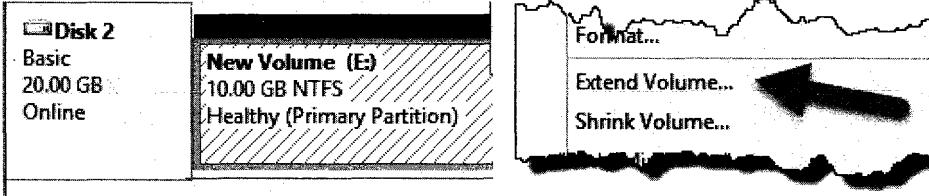
Task 1-8: EBS Snapshots

Overview	<p>While performing your work for Asperatus, you realize that a larger EBS volume is required. In this section, you will create a new, larger EBS volume by taking a snapshot of your existing Small Volume.</p> <p>An EBS snapshot is a backup copy of an EBS volume. Snapshots are stored in Amazon S3 to ensure high durability. New EBS volumes can then be created from EBS snapshots.</p>
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Step	Instruction
1.8.1	In the navigation pane of the EC2 Management Console , click Volumes .
1.8.2	Select the Small Volume that is currently attached to your Web Server instance.
1.8.3	In the Actions menu, click Create Snapshot .
1.8.4	In the Create Snapshot dialog box, use the following values: <ul style="list-style-type: none"> • Name: Asperatus data
1.8.5	Click Create to create a snapshot of the Small Volume.
1.8.6	In the Create Snapshot dialog box, click Close . You can now use this snapshot to create a new, larger EBS volume.
1.8.7	In the navigation pane of the EC2 Management Console , click Snapshots . This will display all your EBS snapshots.
1.8.8	Select the Asperatus data snapshot that you created previously.

1.8.9	In the Actions menu, click Create Volume .
1.8.10	In the Create Volume dialog box, use the following values: <ul style="list-style-type: none">• Type: General Purpose (SSD)• Size (GiB): 20• Availability Zone: Select the same availability zone that you identified in step 1.5.2 <p>Note: You are now creating a 20GiB volume using the Asperatus data snapshot. You might remember that the original source volume (Small Volume) is only 10GiB.</p>
1.8.11	Click Create to create the new volume from the Snapshot.
1.8.12	In the Create Volume dialog box, click Close . The new, larger volume can now be attached to an EC2 instance.
1.8.13	First name the new volume so it is easy to identify. In the navigation pane of the EC2 Management Console , click Volumes .
1.8.14	Select the new 20GiB volume .
1.8.15	In the Actions menu, select Add/Edit Tags .
1.8.16	In the Add/Edit Tags dialog box, click Create Tag .
1.8.17	Use the following values to create a new tag for the 20GiB volume: <ul style="list-style-type: none">• Key: Name• Value: Large Volume
1.8.18	Click Save . The name Large Volume will now appear in the Name column of the 20GiB volume.

1.8.19	<p>You can now attach the new EBS volume to your Amazon EC2 instance. Select the Large Volume that you just created.</p> <p>Note: Make sure only the 20GiB volume is selected.</p>
1.8.20	In the Actions menu, click Attach Volume .
1.8.21	In the Attach Volume dialog box, click in the Instance field and select your Web Server instance.
1.8.22	Click Attach . This will attach the Large Volume to the Web Server instance.
1.8.23	Return to the Remote Desktop Connection session to the Web Server instance that you previously established.
1.8.24	In the RDP session, click the Server Manager icon in the taskbar.
	
1.8.25	In the Server Manager window, in the Tools menu, click Computer Management .
1.8.26	In the Computer Management window, in the left navigation pane, click Disk Management .
1.8.27	You will notice the 20GiB EBS volume is added as Disk 2 and is in an offline state. In order to use this disk, you will first need to bring it online. Right-click Disk 2 and click Online .
	

1.8.28	<p>You will notice that Disk 2 (Large Volume) was added only as a 10GB volume and the remaining 10GB is unallocated. This is normal behavior. To help Windows recognize the entire 20GB volume, you must extend the volume. Right-click New Volume (E:) and click Extend Volume...</p> 
1.8.29	<p>In the Extend Volume Wizard, accept the default values (click Next two times) and click Finish.</p> <p>Disk 2 is now available as a new drive (E:) of 20GB size.</p>
1.8.30	<p>Close the Computer Management window and the Server Manager window.</p>
1.8.31	<p>Launch Windows Explorer and navigate to the new drive (E:) that you just added.</p> 
1.8.32	<p>You will notice that the new drive (E:) contains the Asperatus folder you created earlier on the Small Volume (D:). This folder was copied into the snapshot, and then restored when you created the Large Volume from that snapshot.</p>
1.8.33	<p>Close the Remote Desktop Connection session to the Web Server instance.</p>

1.8.34	<p>Congratulations! You now have successfully:</p> <ul style="list-style-type: none">Created an EC2 key pair and a security group to allow remote access to an Amazon EC2 instance.Launched an Amazon EC2 Windows Instance.Activated Termination Protection for an Amazon EC2 instance.Created EBS volumes and snapshots.
1.8.35	Close the AWS Management Console window or tab.
1.8.36	On the qwikLABS page, click End to end your lab session.

Lab 3: Elastic Load Balancing

Overview	<p>Elastic Load Balancing is used to distribute incoming application traffic across multiple Amazon EC2 instances. It enables you to achieve even greater fault tolerance in your applications, seamlessly providing the amount of load balancing capacity needed in response to incoming application traffic.</p> <p>In this lab you will create an elastic load balancer for HTTP traffic.</p>
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Objectives	<p>After completing this lab, you will be able to:</p> <ul style="list-style-type: none">• Create a load balancer for HTTP traffic.• Test the load balancer configuration.
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Pre-requisites	<p>This lab requires:</p> <ul style="list-style-type: none">• Access to a notebook computer with Wi-Fi running Microsoft Windows, Mac OS X, or Linux (Ubuntu, SuSE, or Red Hat).<ul style="list-style-type: none">◦ Note The qwikLABS lab environment is not accessible using an iPad or tablet device, but you can use these devices to access the student guide.• For Microsoft Windows users: Administrator access to the computer.• An Internet browser such as Chrome, Firefox, or Internet Explorer 9 (previous versions of Internet Explorer are not supported).
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Command Reference File	At various points, this lab will instruct you to copy and paste text as part of lab procedures. This text should be copied from the lab's associated command reference file , which is available on the Instructions tab of your lab in qwikLABS. It is not recommended to copy and paste text from this lab manual, as the manual's rich formatting may inject characters that cannot properly be parsed by the command line
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Scenario	As the operations-focused individual in the start-up business, you previously configured some Amazon S3 buckets and a pair of EC2 instances in preparation for your website. Now, it is time to tie your Amazon EC2 instances together using the Elastic Load Balancing service for traffic distribution and high availability.
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Task 1-1: Elastic Load Balancing Basics

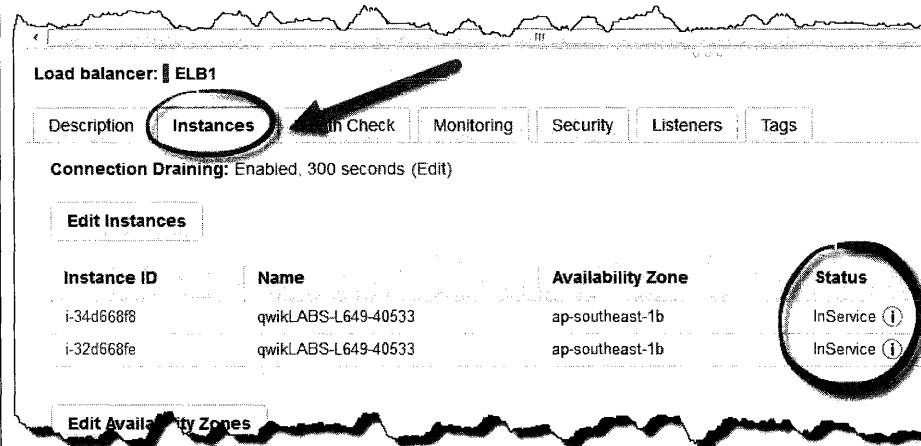
Overview	Two web servers are already running in Asperatus Tech's environment. In this procedure you will create and configure a load balancer to serve traffic to these two web servers.
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Step	Instruction
1.1.1	Log in to your AWS Management Console . Use the instructions in Appendix A of this lab manual to log in to the AWS Management Console using the pre-configured student account.
1.1.2	In the AWS Management Console , in the Services menu, click EC2 .
1.1.3	In the navigation pane of the EC2 Management Console , click Load Balancers .
1.1.4	Click Create Load Balancer .
1.1.5	In the Create Load Balancer wizard, on the Step 1: Define Load Balancer page, use the following values: <ul style="list-style-type: none">• Load Balancer name: ELB1
1.1.6	Click Next: Assign Security Groups .
1.1.7	On the Step 2: Assign Security Groups page, use the following values: <ul style="list-style-type: none">• Assign a security group: Create a new security group• Security group name: HTTP Only• Type: HTTP• Source: Anywhere
1.1.8	Click Next: Configure Security Settings .

1.1.9	On the Step 3: Configure Security Settings page, click Next: Configure Health Check .
1.1.10	On the Step 4: Configure Health Check page, use the following values: <ul style="list-style-type: none">• Ping Protocol: TCP• Health Check Interval: 6• Healthy Threshold: 2
1.1.11	Click Next: Add EC2 Instances .
1.1.12	On the Step 5: Add EC2 Instances page, select both the EC2 instances. Note: Make sure you selected both the instances to add to the load balancer.
1.1.13	Click Next: Add Tags .
1.1.14	On the Step 6: Add Tags page, click Review and Create .
1.1.15	On the Step 7: Review page, review the settings. To create the load balancer, click Create .
1.1.16	Once your load balancer is created successfully, in the Load Balancer Creation Status page, click Close . Your load balancer will now appear in the console.
1.1.17	Select ELB1 in the list.

- 1.1.18 In the bottom pane, click **Instances** tab to view the status of the instances.
You must now wait until the instances have a status of **InService**.

Hint: Click the  icon to refresh the pane and get the latest status.



Note: If the instances have a status of **OutOfService**, point to the ⓘ icon to see the details:

- An *Instance registration is still in progress* message implies that the load balancer is still starting. Wait until the status changes.
- If you receive a *health check message*, check your Health Check configuration or ask your instructor for assistance.

- 1.1.19 Click the **Description** tab.

- 1.1.20 In the **Description** tab, copy the **DNS Name** value to a text editor such as Notepad.

- 1.1.21 In the text editor, delete **(A Record)** at the end of the DNS Name.

Note: Your DNS Name should now end with **amazonaws.com**.

1.1.22	<p>Copy the modified DNS name from the text editor and browse to it using a web browser.</p> <p>Note: Make sure you are using the modified DNS name, ending with amazonaws.com. If the page returns a DNS error and does not display, this is likely because the DNS name for the load balancer is not registered yet in the global DNS system. Wait a few minutes, and then refresh the page.</p> <p>You should see a Web page being served from one of the instances. The page will display details about the instance that is serving the request, including its public IP address and the instance ID.</p>
1.1.23	<p>Congratulations! You now have successfully:</p> <ul style="list-style-type: none">• Created a load balancer to load balance HTTP traffic to your application.• Tested the load balancer configuration.
1.1.24	Close the AWS Management Console window/page.
1.1.25	On the qwikLABS page, click End to end your lab session.

Lab 4: Amazon RDS Driven Application

Overview

Amazon Relational Database Service (Amazon RDS) is a web service that makes it easy to set up, operate and scale a relational database in the cloud.

In this lab you will be using Amazon RDS to launch a MediaWiki application. This is a free software open source wiki package written in PHP, originally for use on Wikipedia.

Objectives

After completing this lab, you will be able to:

- Create an Amazon RDS instance.
- Install an application on an Amazon EC2 instance.
- Create an Amazon EC2 Security Group.
- Create and use an Amazon S3 bucket for the application.
- Launch the application.

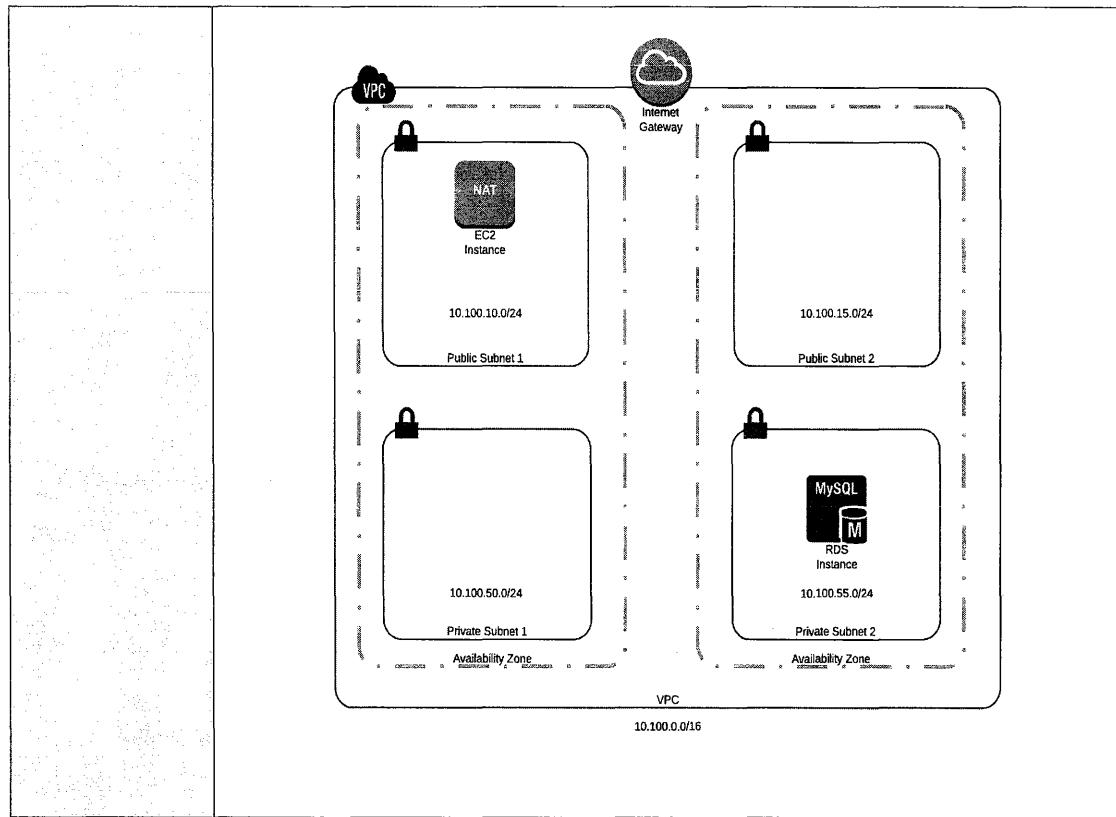
Pre-requisites

This lab requires:

- Access to a notebook computer with Wi-Fi running Microsoft Windows, Mac OS X, or Linux (Ubuntu, SuSE, or Red Hat).
 - **Note** The *qwikLABS* lab environment is not accessible using an iPad or tablet device, but you can use these devices to access the student guide.
- For Microsoft Windows users: Administrator access to the computer.
- An Internet browser such as Chrome, Firefox, or Internet Explorer 9 (previous versions of Internet Explorer are not supported).

Command Reference File	<p>At various points, this lab will instruct you to copy and paste text as part of lab procedures. This text should be copied from the lab's associated command reference file, which is available on the Instructions tab of your lab in qwikLABS.</p> <p>It is not recommended to copy and paste text from this lab manual, as the manual's rich formatting may inject characters that cannot properly be parsed by the command line</p>
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Scenario	<p>Your company wants to launch a public Wiki page to keep your customers informed and to give them the ability to edit, share, and voice their opinion and feedback. You have an application and some graphics you want to use and will be leveraging Amazon RDS, Amazon EC2, and Amazon S3 to get this new Wiki page up and running.</p> <p>The lab already has the script you need to get started as well as an Amazon EC2 and RDS instance. Below is a diagram showing the current state of your lab environment.</p>
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Task 1-1: Amazon RDS Instance

Overview	In this section you will open the Amazon RDS instance that was created as part of the lab setup and copy the endpoint so you can use it for launching your MediaWiki application.
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Step	Instruction
1.1.1	Log in to your AWS Management Console . Use the instructions in Appendix A of this lab manual to log in to the AWS Management Console using the pre-configured student account.
1.1.2	In the AWS Management Console , in the Services menu, click RDS .
1.1.3	In the navigation pane of the RDS Console , click Instances .
1.1.4	Click the DB Instance name to get more details about the instance.
1.1.5	In the details pane, copy the Endpoint to a text editor such as Notepad. The endpoint you copy should look similar to this: qrmtnn51rjf0.cuf6s0ky2hzw.ap-southeast-1.rds.amazonaws.com:3306 Note: If your Endpoint says “Not available yet”, please wait for a few minutes and then refresh the page until the Endpoint is displayed.
1.1.6	In the text editor, delete the :3306 at the end of the endpoint. Your endpoint should now end with rds.amazonaws.com . The modified endpoint should look similar to this: qrmtnn51rjf0.cuf6s0ky2hzw.ap-southeast-1.rds.amazonaws.com

1.1.7	Save the text file using the name Modified RDS Endpoint on your local machine.
1.1.8	Copy the entire contents of the Command Reference File for this lab to a text editor such as Notepad. In subsequent procedures, we will refer to this text as <i>the user data text</i> .
1.1.9	In the user data text, replace <RDS ENDPOINT> with the modified RDS endpoint from Step 1.1.6. Note: Make sure to delete the brackets around the endpoint.
1.1.10	In the user data text, your RDS_ENDPOINT variable should look similar to this: <code>RDS_ENDPOINT="qrmtnn51rjfjf0.cuf6s0ky2hzw.ap-southeast-1.rds.amazonaws.com"</code> Note: Make sure there is no :3306 at the end of the endpoint, and the endpoint is enclosed in double quotes ("...").
1.1.11	In the user data text, do NOT edit anything else other than the RDS_ENDPOINT variable.
1.1.12	Keep the text editor window open as you will use this modified user data text in the next lab procedure.

Task 1-2: Launching an Amazon EC2 Instance

Overview	In this procedure, you will create a new Amazon EC2 instance to install and run your MediaWiki application. As part of the instance creation, you will download and install the application, create a database on RDS, and configure your application to use the database.
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Step	Instruction
1.2.1	In the AWS Management Console , in the Services menu, click EC2 .
1.2.2	In the navigation pane of the EC2 Management Console , click Instances .
1.2.3	Click Launch Instance .
1.2.4	On the Step 1: Choose an Amazon Machine Image (AMI) page, select the first Amazon Linux AMI in the list by clicking Select .
1.2.5	On the Step 2: Choose an Instance Type page, make sure that t2.micro is selected.
1.2.6	Click Next: Configure Instance Details .
1.2.7	<p>On the Step 3: Configure Instance Details page, use the following values:</p> <ul style="list-style-type: none"> • Network: Select the VPC named Lab VPC. • Subnet: Select a subnet that starts with the name Public Subnet. • Auto-assign Public IP: Enable <p>This will create your EC2 instance in the VPC called Lab VPC, which was built for you as part of your lab environment.</p>
1.2.8	Scroll down the page and click Advanced Details .

1.2.9	<p>Next, you will supply a user data field to the Amazon EC2 instance. In the User data section:</p> <ul style="list-style-type: none"> • Verify that the As text radio button is checked. • Paste the modified user data text, from step 1.1.12, in the user data textbox. <p>This text installs any necessary updates for the operating system; installs Apache, PHP, and MySQL client; downloads and installs the MediaWiki application; creates a database in RDS; and configures the database for your application.</p>
1.2.10	<p>Make sure you copied the modified user data text from step 1.1.12. The RDS_ENDPOINT variable in the text should look similar to this:</p> <pre>RDS_ENDPOINT="qrmttn51rjf0.cuf6s0ky2hzw.ap-southeast-1.rds.amazonaws.com"</pre> <p>Note: Make sure there is no :3306 at the end of the endpoint, and the endpoint is enclosed in double quotes ("...").</p>
1.2.11	<p>Click Next: Add Storage.</p>
1.2.12	<p>On the Step 4: Add Storage page, keep the default values and click Next: Tag Instance.</p>
1.2.13	<p>On the Step 5: Tag Instance page, use the following values to create a new tag:</p> <ul style="list-style-type: none"> • Key: Name • Value: Wiki
1.2.14	<p>Click Next: Configure Security Group.</p>
1.2.15	<p>In this step, you will configure a security group to allow you to access the Wiki EC2 instance using a Secure Shell (SSH) connection.</p> <p>On the Step 6: Configure Security Group page, use the following values:</p> <ul style="list-style-type: none"> • Assign a security group: Select Create a new security group • Security group name: Wiki Security Group

1.2.16	<p>Leave the default SSH rule as is. This will create a rule that allows Secure Shell (SSH) access from any location.</p> <p>Note: This security configuration is being used for lab purposes only, and is not recommended for use in a production environment. It is highly recommended that you restrict terminal access to the ranges of IP addresses (e.g., IPs assigned to machines within your company) that have a legitimate business need to administrate your Amazon EC2 instance.</p>
1.2.17	Click Add Rule to add a second rule.
1.2.18	<p>Specify the following values to add a rule enabling HTTP access to your instance:</p> <ul style="list-style-type: none">• Type: HTTP• Source: Anywhere <p>This rule will allow HTTP requests from anywhere on the Internet. Since we want our Wiki server to be accessible to the general public, we can leave this rule as is without any further configuration.</p>
1.2.19	Make sure the Security Group has two rules: one for SSH and one for HTTP.
1.2.20	Click Review and Launch .
1.2.21	On the Step 7: Review Instance Launch page, review the configuration for your instance. When done, click Launch .
1.2.22	<p>You will now see a dialog named Select an existing key pair or create a new key pair. Whenever you create a new Amazon EC2 instance, you associate a key pair with the instance. You use the private key portion of your key pair in order to gain secure access to your instance using SSH/RDP.</p> <p>A key pair has already been created for you as part of your qwikLABS environment. To associate it with your new instance, use the following values:</p> <ul style="list-style-type: none">• First dropdown (unlabeled): Select Choose an existing key pair.• Select a key pair: Select the key pair that begins with the string <code>qwikLABS-</code>.• I acknowledge that I have access to...: Enable this checkbox.

1.2.23	Click Launch Instances .
1.2.24	<p>On the Launch Status page, click View Instances (you might need to scroll down to find it). Observe the Status Checks field of your Wiki instance until it shows that both status checks have completed successfully.</p> <p>Hint: Click the  icon to refresh the pane and get the latest status.</p>
1.2.25	Make sure your Wiki instance has launched completely before you move to the next lab procedure i.e. the two status checks for the instance must have completed successfully.

Task 1-3: Viewing Your Application

Overview	In this procedure, you will access your MediaWiki application that is running in the Amazon EC2 instance, Wiki.
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Step	Instruction
1.3.1	In the navigation pane of the EC2 Management console , click Instances .
1.3.2	Select the Wiki instance that you created previously. Note: Make sure only the Wiki instance is selected.
1.3.3	In the Description tab, copy the Public IP value to a text editor.
1.3.4	In the text editor, add /mediawiki to the end of the Public IP address. Note: Your URL should look similar to this: 11.22.33.44/mediawiki
1.3.5	Copy the URL from the text editor and browse to it using a web browser. Note: Your URL should look similar to this: 11.22.33.44/mediawiki
1.3.6	You will now see your MediaWiki application launched. In the next lab procedure, you will modify this webpage to use images from an Amazon S3 bucket. Note: Do not close the MediaWiki webpage as you will use it later.

Task 1-4: Create an Amazon S3 Bucket and Upload an Object (Optional)

Overview	<p>If you have time and want to take this lab to the next step, follow the directions below to modify the User Interface of your application (MediaWiki) by adding a custom graphic. You can store graphics and other content for your application in an Amazon S3 bucket.</p> <p>In this procedure, you will create an Amazon S3 bucket to host your application graphics. Then, you will upload an image to this bucket and make it accessible to your application. In the next task, you will access this image from your MediaWiki site.</p> <p>Note: If you would like to skip this task and use an image that is already available in our training bucket skip to Task 1-5.</p>
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Step	Instruction
1.4.1	In the AWS Management Console , in the Services menu, click S3 .
1.4.2	Click Create Bucket to create a new bucket.
1.4.3	<p>In the Create a Bucket – Select a Bucket Name and Region dialog box, enter the following values:</p> <ul style="list-style-type: none"> • Bucket Name: Type a bucket name that will be unique across Amazon S3. We recommend that you name your bucket with your initials and today's date to ensure uniqueness. This value will be referred to as <i>s3-bucket-name</i> in subsequent procedures. • Region: Choose a region closest to your location. If unsure, choose Oregon.
1.4.4	Click Create .
1.4.5	In the S3 Console , click the name of your bucket to view its contents. You will receive a message indicating that the bucket is empty.

1.4.6	Click Upload to add a new file object to your bucket.
1.4.7	In the Upload – Select Files and Folders dialog box, click Add Files .
1.4.8	Select a picture (e.g. picture from My Pictures folder) from your local machine. You will make this picture available on your MediaWiki webpage. Note: We will refer to this uploaded file as <i>the object</i> in subsequent procedures
1.4.9	Click Start Upload . You can see the progress of the upload in the Transfers pane.
1.4.10	In the S3 Console , right-click the object and click Make Public . Note: Objects in S3 are Private by default.
1.4.11	Click OK on the dialog box to confirm.
1.4.12	Click Properties .
1.4.13	In the Object Properties pane, copy the Link to a text editor like Notepad. Using this URL, you can access this object from anywhere on the Internet. Note: Make sure the URL does NOT have a Lock icon next to it. You will use this URL in the next lab procedure to add this picture to your MediaWiki webpage.

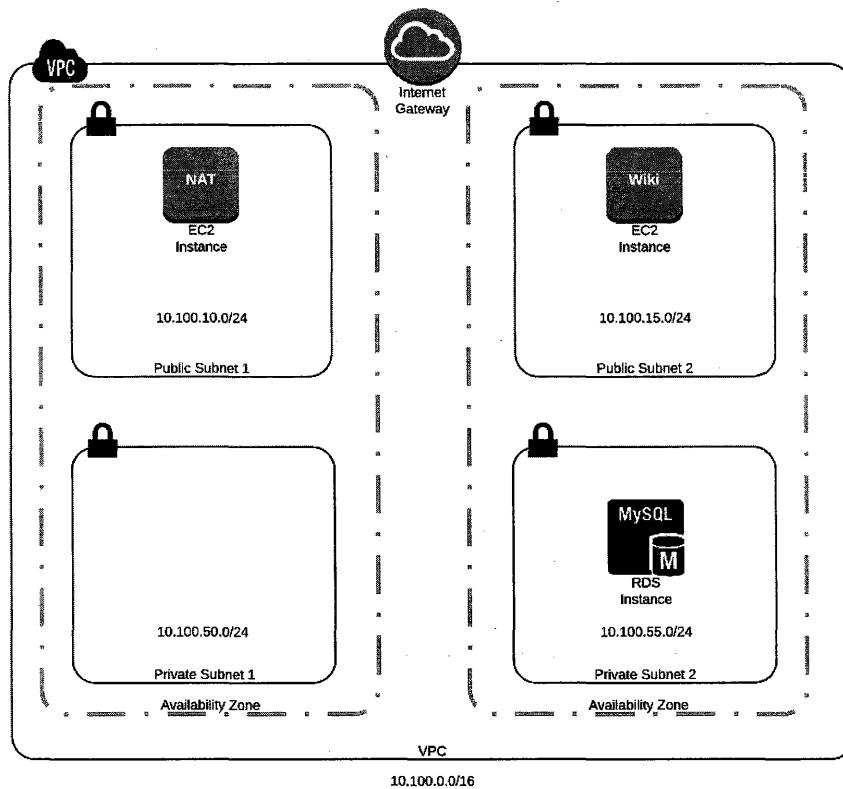
Task 1-5: Modifying Your Application

Overview	Once you have your Amazon S3 URL for the graphic, you can modify your MediaWiki application to include that.
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Step	Instruction
1.5.1	<p>Make sure you have your Amazon S3 URL for the graphic you would like to add to your application.</p> <p>Note: If you did not complete Task 1-4, you can use an image that is already available in our training bucket. Copy the following URL for the image:</p> <p>https://d2lrzjb0vjvpn5.cloudfront.net/tech-essentials/v3.6-en/lab-4-rds/static/aws-training-and-certification.png</p>
1.5.2	<p>On your Wiki page, click Edit.</p>  <p>Note: If you need to open the Wiki page again, refer to Task 1-3.</p>
1.5.3	In the Editing Main Page section, paste the Amazon S3 URL at the bottom of the text box.
1.5.4	Click Save page to save your changes.
1.5.5	<p>You should now see your customized MediaWiki page with the picture from your S3 bucket.</p> <p>Congratulations! You have successfully launched your MediaWiki application using Amazon RDS and Amazon S3.</p>

1.5.6

Below is a diagram of your lab environment at the completion of the lab procedures.



1.5.7

Close the **AWS Management Console** window/tab.

1.5.8

On the **qwikLABS** page, click **End** to end your lab session.

Appendix A: Logging in to the AWS Management Console

Introduction

In this appendix, you will learn how to log in to the student account created for you as part of this course.

About Student Accounts

Each lab in this course has a corresponding lab environment that is launched from the [qwikLABS](#) page. (Your instructor should have already supplied you with instructions for creating a [qwikLABS](#) account.) Whenever you launch a new lab, the [qwikLABS](#) environment creates a new AWS account for you. Within this AWS account, it creates an IAM user named **awsstudent**. When you terminate your lab, this account is recycled, and all resources associated with it are terminated.

Each time you start a new lab in this course, you will need to log in to your new lab environment as the user **awsstudent**, using the automatically-generated password provided for you on the [qwikLABS](#) page for that specific lab.

Step	Instruction
1	<p>From the Class Lab page in qwikLABS, find the current lab, and click Start Lab.</p>
2	<p>On the lab page, wait until the text Create in Progress... disappears from the screen. For some labs, this may happen instantly; for other labs, it may take anywhere from five to 10 minutes for your lab to initialize.</p> <p>Note: Make sure to wait until the lab creation process has completed before you move on to the next step.</p>
3	<p>Near the bottom of the screen, find the Lab Connection section of the page. Below the text AWS Management Console, you will see the fields User Name and Password. These are your AWS account credentials. Select and copy the Password field.</p>
4	<p>Click Open Console. This will open the AWS Management Console, pre-populating it with the AWS account ID created for you by qwikLABS.</p> <p>Note: You can right-click on this button and use your Web browser's "open in new tab" function to prevent this page from opening in a separate window.</p>
5	<p>On the new window or tab containing the AWS Management Console, you should see the Account ID already filled in. In the Username field, type awsstudent. In the Password field, paste the password that you copied from Step 3. Finally, click the Sign In button.</p> <p>Note: On rare occasions, the Account ID on your signing page may be blank. Consult your instructor for assistance on how to locate your qwikLABS account ID.</p>