Introduction Amazon Web Services (AWS)

Dr. Villanes

#StoryTime

General Configuration

Cluster name MyFirstHadoopCluster

Logging

S3 folder s3://aws-logs-799535928231-us-west-2/elasticmapre

Launch mode Cluster Step execution

Software configuration

Release emr-5.31.0

Applications

- Core Hadoop: Hadoop 2.10.0, Hive 2.3.7, Hue 4.7.1, Mahout 0.13.0, Pig 0.17.0, and Tez 0.9.2
- HBase: HBase 1.4.13, Hadoop 2.10.0, Hive 2.3.7, Hue 4.7.1, Phoenix 4.14.3, and ZooKeeper 3.4.14
- Presto: Presto 0.238.3 with Hadoop 2.10.0 HDFS and Hive 2.3.7 Metastore
- Spark: Spark 2.4.6 on Hadoop 2.10.0 YARN and Zeppelin 0.8.2

Use AWS Glue Data Catalog for table metadata

Hardware configuration

Instance type m5.xlarge

The selected instance type adds 64 GiB of GP2 EBS storage per instance by default. Learn more

Number of instances 3 (1 master and 2 core nodes)

General Configuration

Cluster name MyFirstHadoopCluster

Logging

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Launch mode Cluster Step execution

Software configuration

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Number of instances 1000 (1 master and 999 core nodes)

Create cluster

Class roadmap – Cloud Computing

- First two classes:
  - Why do we need Cloud Computing?
  - Introduction to AWS
  - Labs: AWS S3, AWS EC2
  - Objective: give you the tools you need to get the AWS Cloud Practitioner Certification
- Spring semester:
  - Hadoop Hive & Spark
  - AWS EMR
    - AWS EMR is not a big part of the certification
- Advanced Big Data → Dan Zaratsian (MSA alum - working at Google)

Topics we will cover today

- What is Cloud Computing?
- Cloud Computing Vendors
- AWS
- AWS Cloud Practitioner Certification
- AWS S3
- AWS EC2
- Lab #1 AWS S3

What is Cloud Computing?

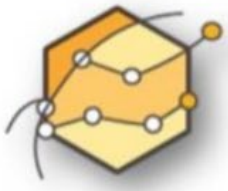
Cloud computing is the **on-demand** delivery of compute power, database, storage, applications, and other IT resources via the internet with **pay-as-you-go pricing**.

Cloud computing gives you **access to servers, storage, databases, and a broad set of application services over the Internet.** A cloud services provider such as Amazon Web Services, **owns and maintains the network-connected hardware required for these application services, while you provision and use what you need via a web application.**

Advantages of Cloud Computing

Trade capital expense for variable expense.

Benefit from massive economies of scale.



Stop guessing capacity. (Elasticity)

Increase speed and agility.

Stop spending money on running and maintaining data centers.

Go global in minutes.

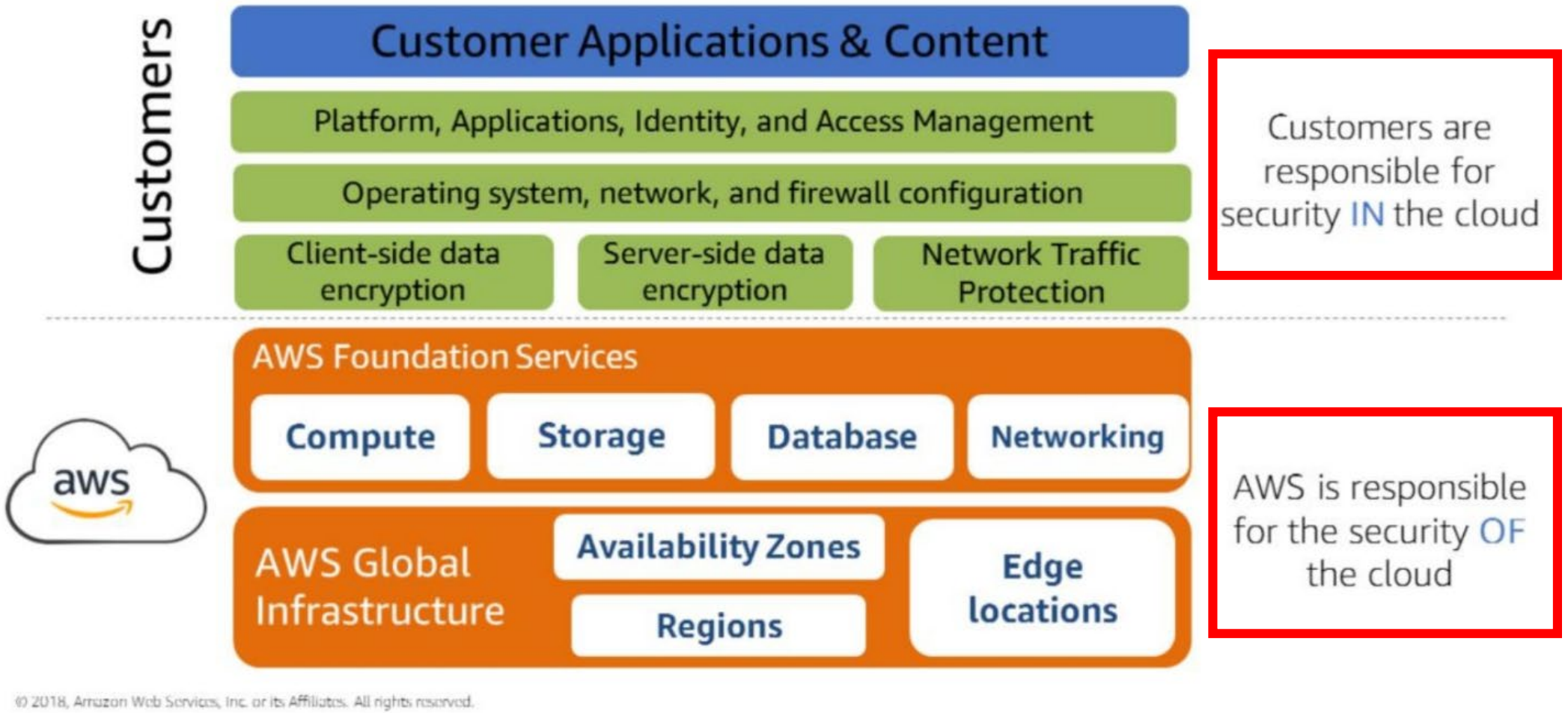
Gartner’s Infrastructure as a Service (IaaS) Magic Quadrant

Top players:

What is Amazon Web Services (AWS)?

AWS is a collection of remote computing **services** called **web services**. These web services make up a cloud computing platform offered via the internet. AWS delivers web-based cloud **services for storage, computing, networking, databases, and more**.

AWS Shared Responsibility Model



AWS Global Infrastructure

- **Regions:**
  - Geographic locations
  - Consist of at least two Availability Zones (AZ)
- **Availability Zones:**
  - Clusters of data centers
  - Isolated from failures in other Availability Zones
  - Availability Zones in a region are connected through low-latency links
- **Edge Locations:**
  - 550+ Edge locations
  - Local points of presence that support AWS services like AWS Route 53, AWS Cloud Front, AWS Shield

AWS Global Infrastructure Map

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

AWS Services and Features

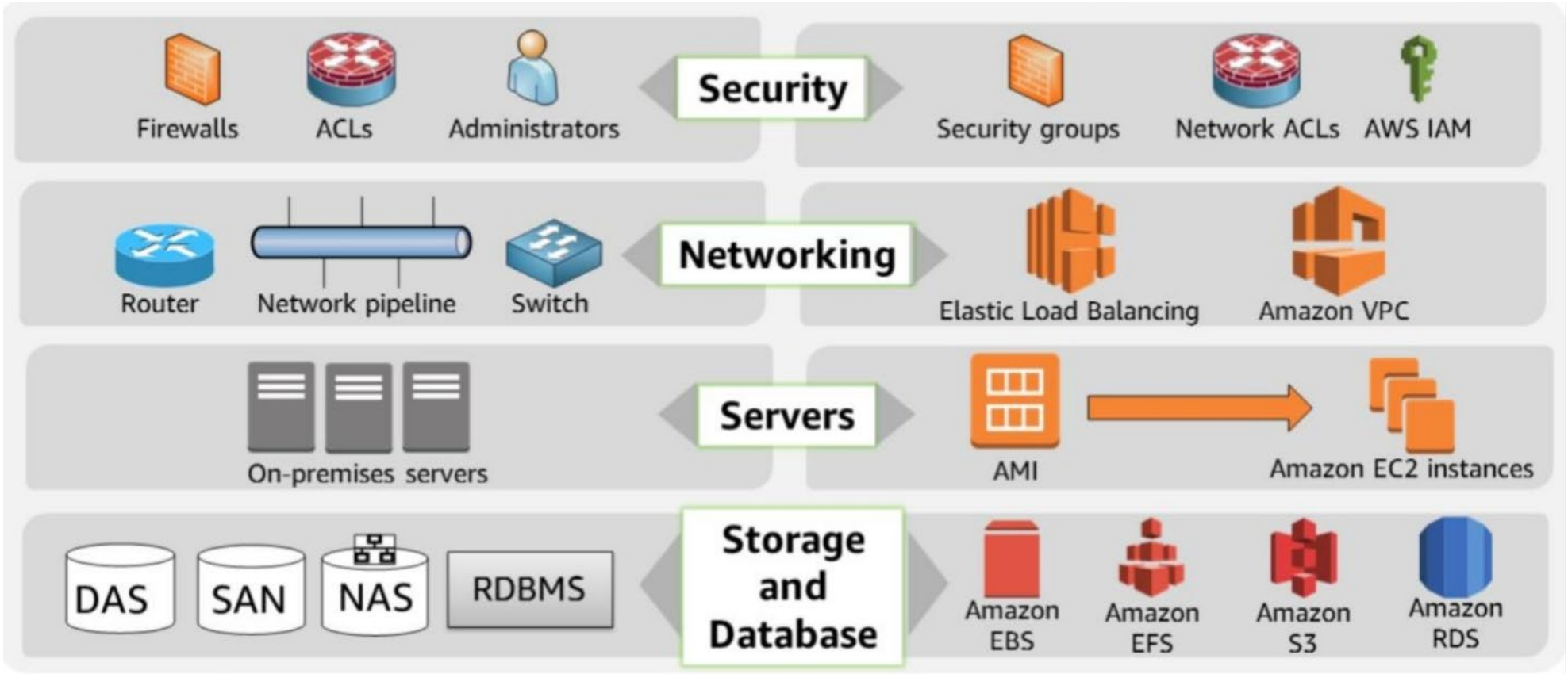
Top 25 AWS Services

1. Amazon EC2 (Elastic Compute Cloud)
2. Amazon RDS (Relational Database Services)
3. Amazon S3 (Simple Storage Service)
4. Amazon Lambda
5. Amazon CloudFront
6. Amazon Glacier
7. Amazon SNS (Simple Notification Service)
8. Amazon EBS (Elastic Block Store)
9. Amazon VPC (Virtual Private Cloud)
10. Amazon Kinesis
11. Amazon Auto-scaling
12. Amazon IAM (Identity and Access Management)
13. Amazon SQS (Simple Queue Service)
14. Amazon Elastic Beanstalk
15. Dynamo DB
16. Amazon ElastiCache

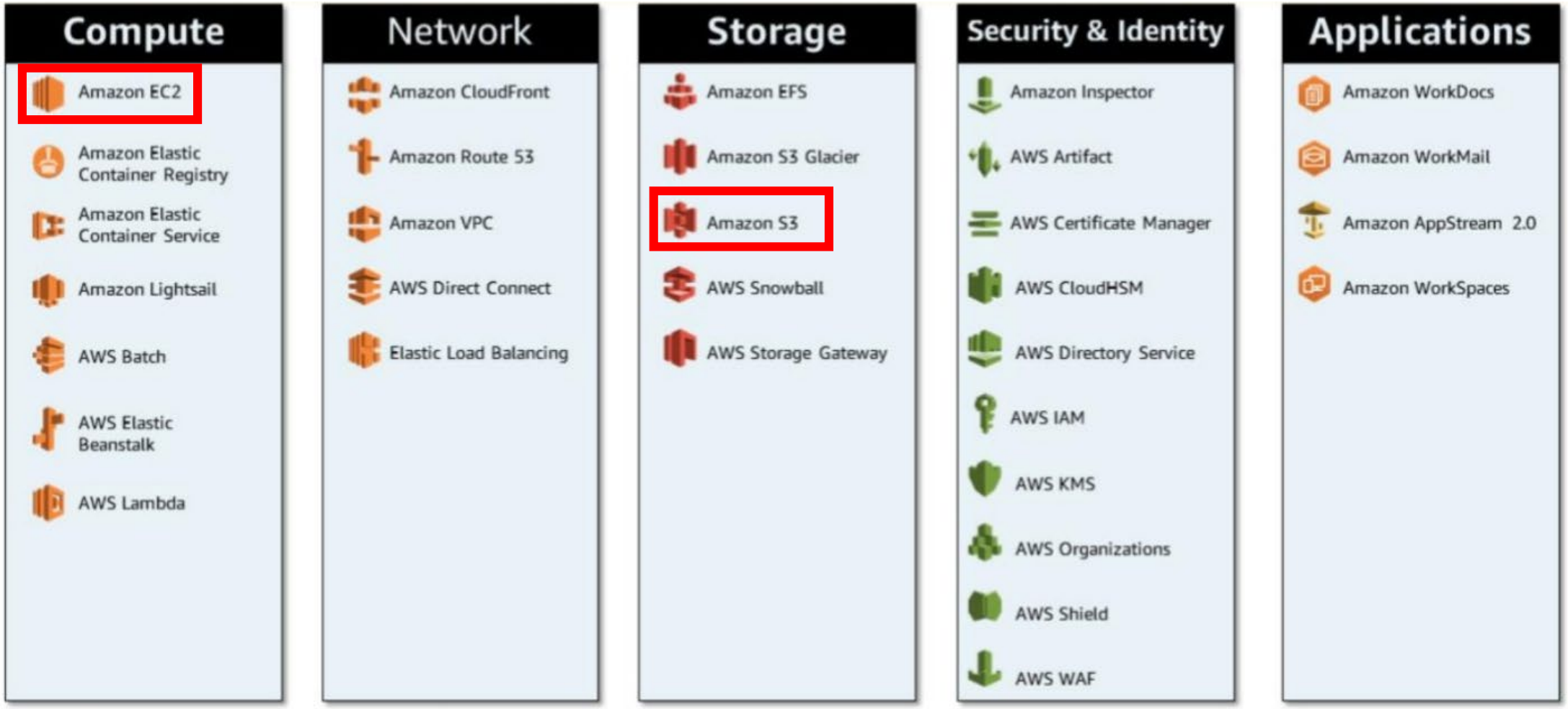
Business Continuity Plan

17. Amazon Redshift
18. Amazon Sagemaker
19. Amazon Lightsail
20. Amazon EFS (Elastic File System)
21. Amazon Cloudwatch
22. Amazon Chime
23. Amazon Cloud Directory
24. Amazon Cognito
25. Amazon Inspector

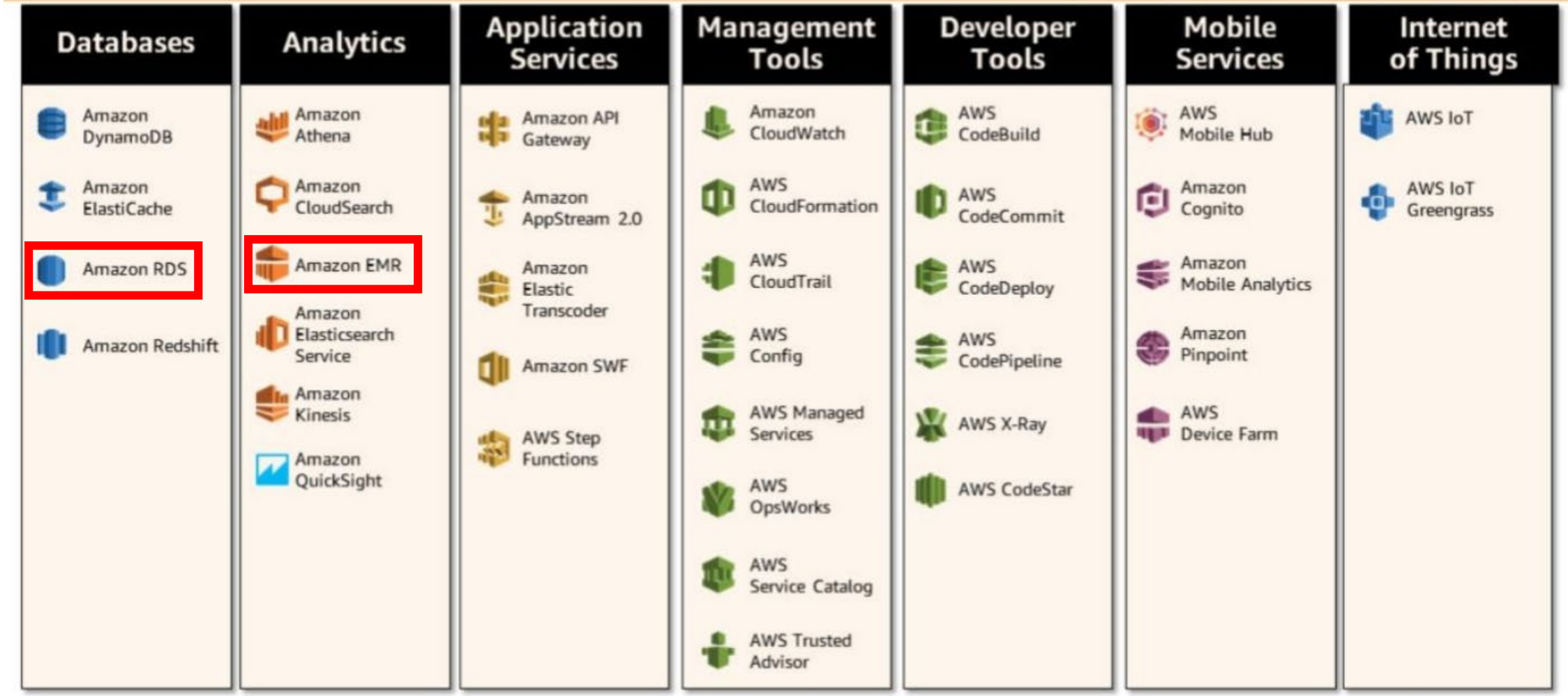
AWS Core Infrastructure and Services



AWS Foundational Services

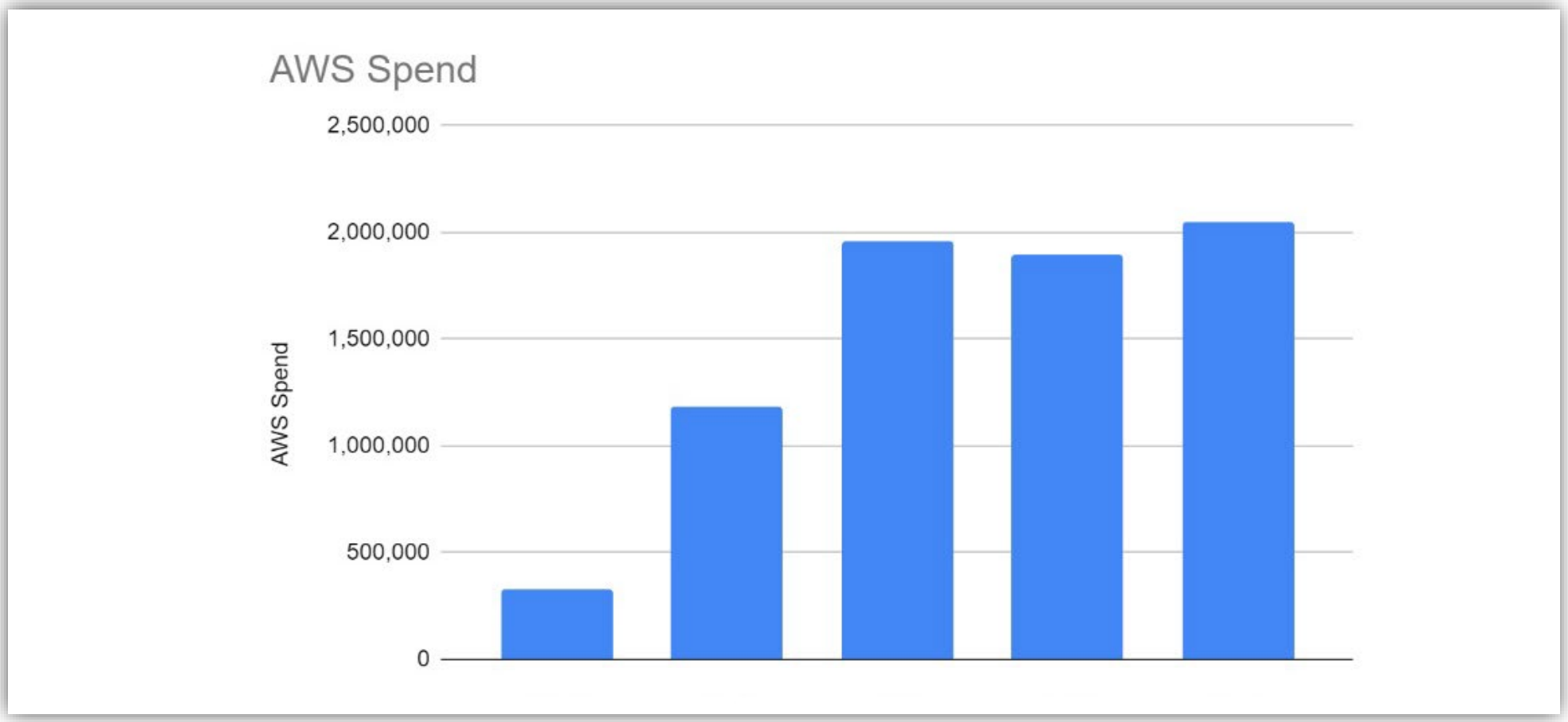


AWS Platform Services



Are companies using AWS? **Yes**

Annual AWS Spend for a publicly traded e-commerce company



Let’s talk about the AWS Certification…

AWS Cloud Practitioner Certification

- Define **what the AWS Cloud is and the basic global infrastructure**
- Describe basic **AWS Cloud architectural principles**
- Describe the **AWS Cloud value proposition**
- Describe **key services on the AWS platform and their common use cases** (for example, compute and analytics)
- Describe **basic security and compliance aspects of the AWS platform and the shared security model**
- Define the **billing, account management, and pricing models**
- Identify **sources of documentation or technical assistance** (for example, whitepapers or support tickets)
- Describe **basic/core characteristics of deploying and operating in the AWS Cloud**

Exam Details

Format
Multiple choice, multiple answer

Type
Foundational

Delivery Method
Testing center or online proctored exam

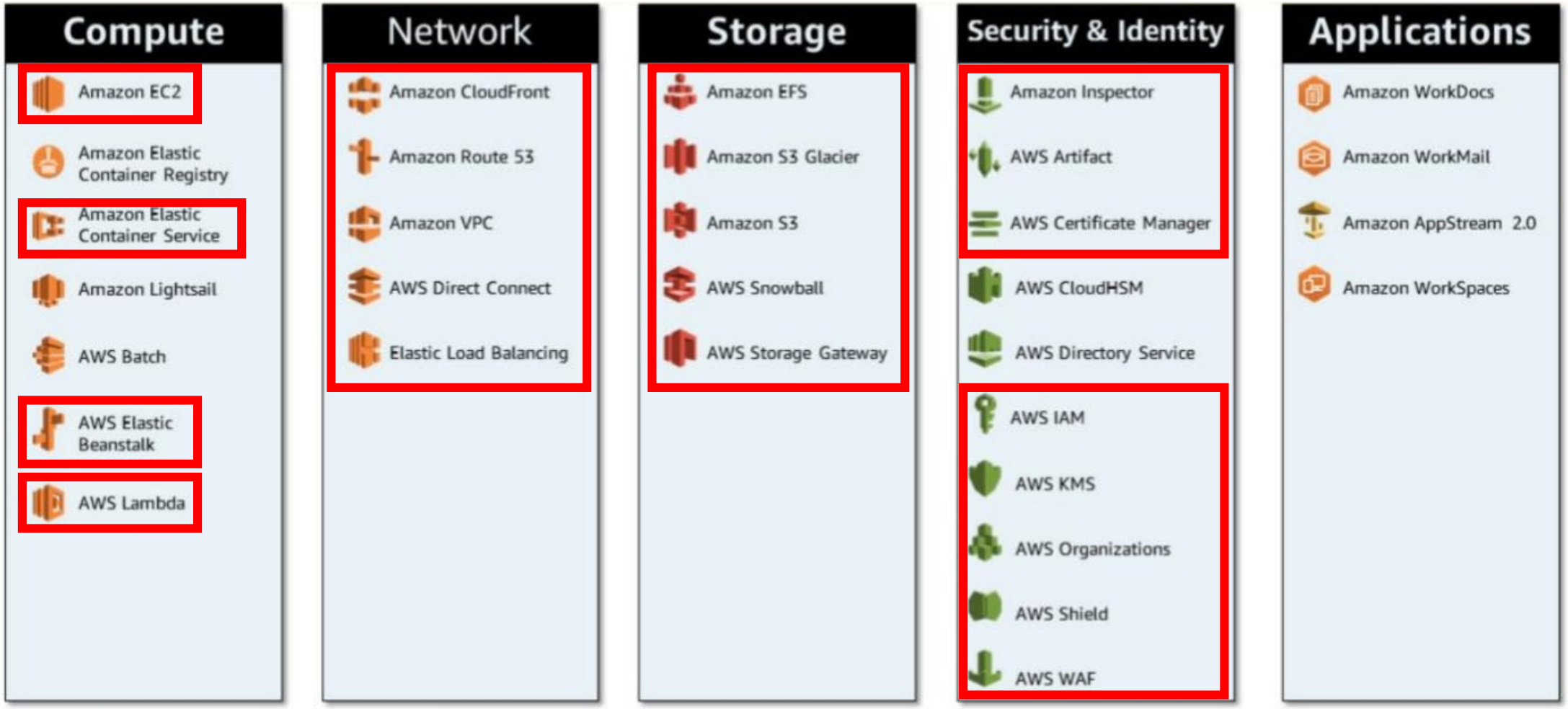
Time
90 minutes to complete the exam

Cost
100 USD (Practice Exam: 20 USD)

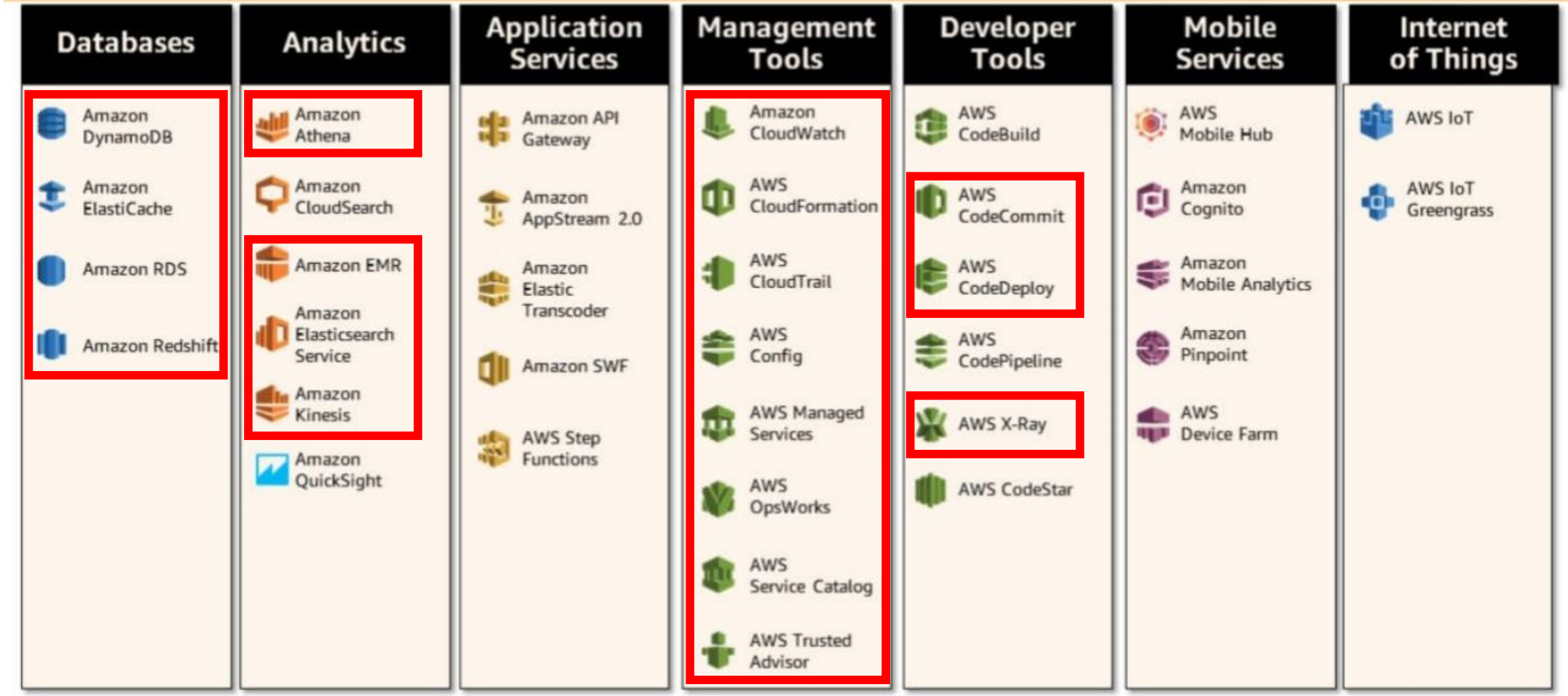
Language
Available in English, Indonesian (Bahasa), Japanese, Korean, and Simplified Chinese

https://aws.amazon.com/certification/certified-cloud-practitioner/

AWS Foundational Services

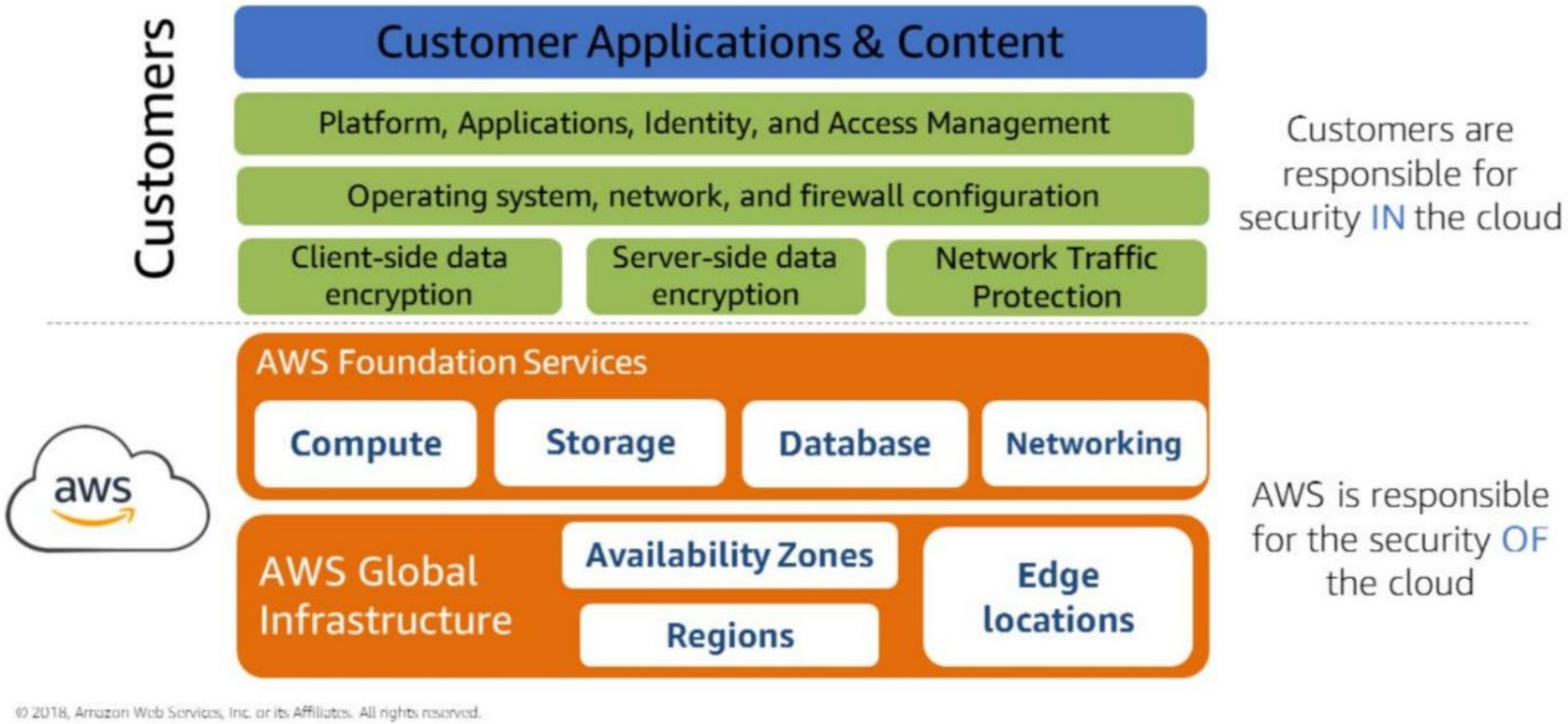


AWS Platform Services



… and more….

AWS Shared Responsibility Model



	Developer	Business	Enterprise
	Recommended if you are experimenting or testing in AWS.	*Recommended if you have production workloads in AWS.*	*Recommended if you have business and/or mission critical workloads in AWS.*
AWS Trusted Advisor Best Practice Checks	7 Core checks	Full set of checks	Full set of checks
Enhanced Technical Support	Business hours** email access to Support Engineers Unlimited cases / 1 primary contact	24x7 phone, email, and chat access to Support Engineers Unlimited cases / unlimited contacts (IAM supported)	24x7 phone, email, and chat access to Support Engineers Unlimited cases / unlimited contacts (IAM supported)
Case Severity / Response Times*	General guidance: < 24 business hours System impaired: < 12 business hours	General guidance: < 24 hours System impaired: < 12 hours Production system impaired: < 4 hours Production system down: < 1 hour	General guidance: < 24 hours System impaired: < 12 hours Production system impaired: < 4 hours Production system down: < 1 hour Business-critical system down: < 15 minutes
Architectural Guidance	General	Contextual to your use-cases	Consultative review and guidance based on your applications
Programmatic Case Management		AWS Support API	AWS Support API
Third-Party Software Support		Interoperability & configuration guidance and troubleshooting	Interoperability & configuration guidance and troubleshooting
Proactive Programs		Access to Infrastructure Event Management for additional fee.	Infrastructure Event Management Well-Architected Reviews Operations Reviews Technical Account Manager (TAM) coordinates access to programs and other AWS experts as needed.
Technical Account Management			Designated Technical Account Manager (TAM) to proactively monitor your environment and assist with optimization.
Training			Access to online self-paced labs
Account Assistance			Concierge Support Team

Simple Monthly Calculator

Whether you are running a single instance or dozens of individual services, you can estimate your monthly bill using your monthly bill using AWS Simple Monthly Calculator. The calculator allows you to estimate individual or multiple prices and use templates to appraise complete solutions.

AWS Simple Monthly Calculator

TCO Calculator

The AWS TCO calculator gives you the option to evaluate the savings from using AWS and comparing against on premises and co-location environments. The TCO calculator matches your current infrastructure to the most cost effective AWS offering. This tool takes into consideration all the costs to run a solution, including physical facilities, power and cooling, providing a realistic end-to-end comparison of your costs.

AWS TCO Calculator

For updated pricing guide: https://aws.amazon.com/premiumsupport/plans/

I will walk you through on **how to prepare** for the AWS Cloud Practitioner Certification on **Wednesday**…

Let’s go back to the Foundation Services:
AWS S3 and AWS EC2

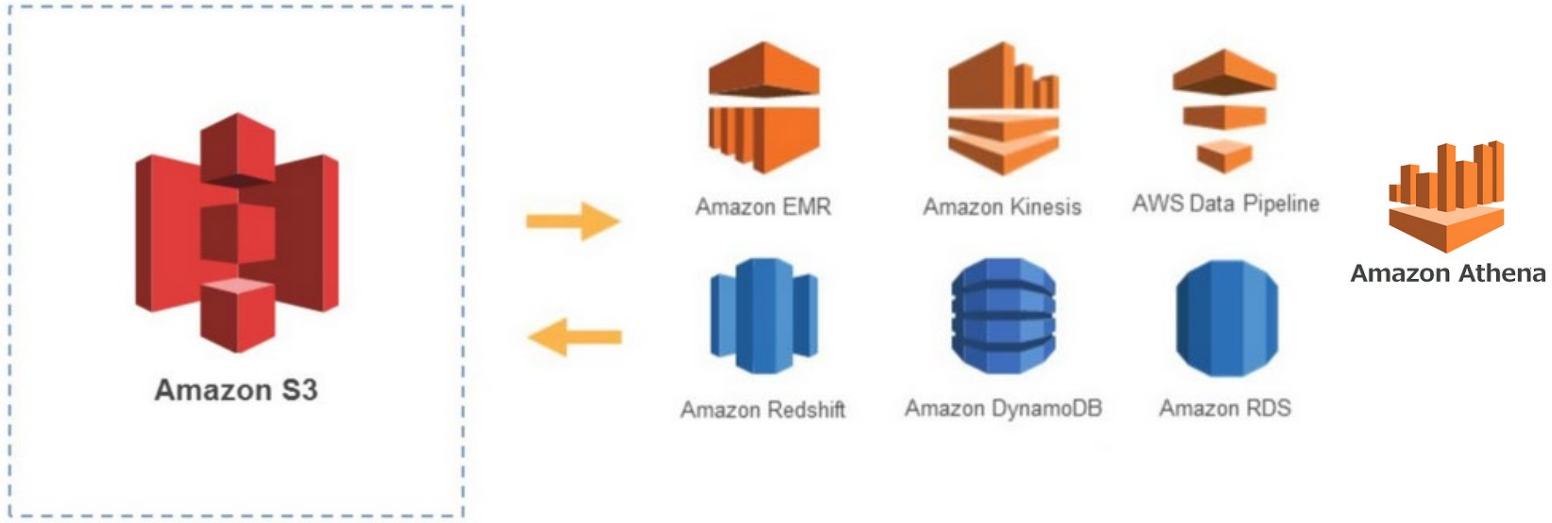
Amazon Simple Storage Service (S3)

- S3 is an online storage solution from Amazon
- Objects are stored in **buckets**.
- Natively online, **HTTP access.**
- Every object in Amazon S3 can be **uniquely addressed through the combination of the web service endpoint, bucket name, key, and optionally, a version.**
- **Store and retrieve any amount of data,** any time, from anywhere on the web.
- Amazon S3 is **highly scalable, reliable, and low cost.**
- Data **can be stored as-is**: there is no need to convert it to a predefined schema.

Amazon Simple Storage Service (S3) - Facts

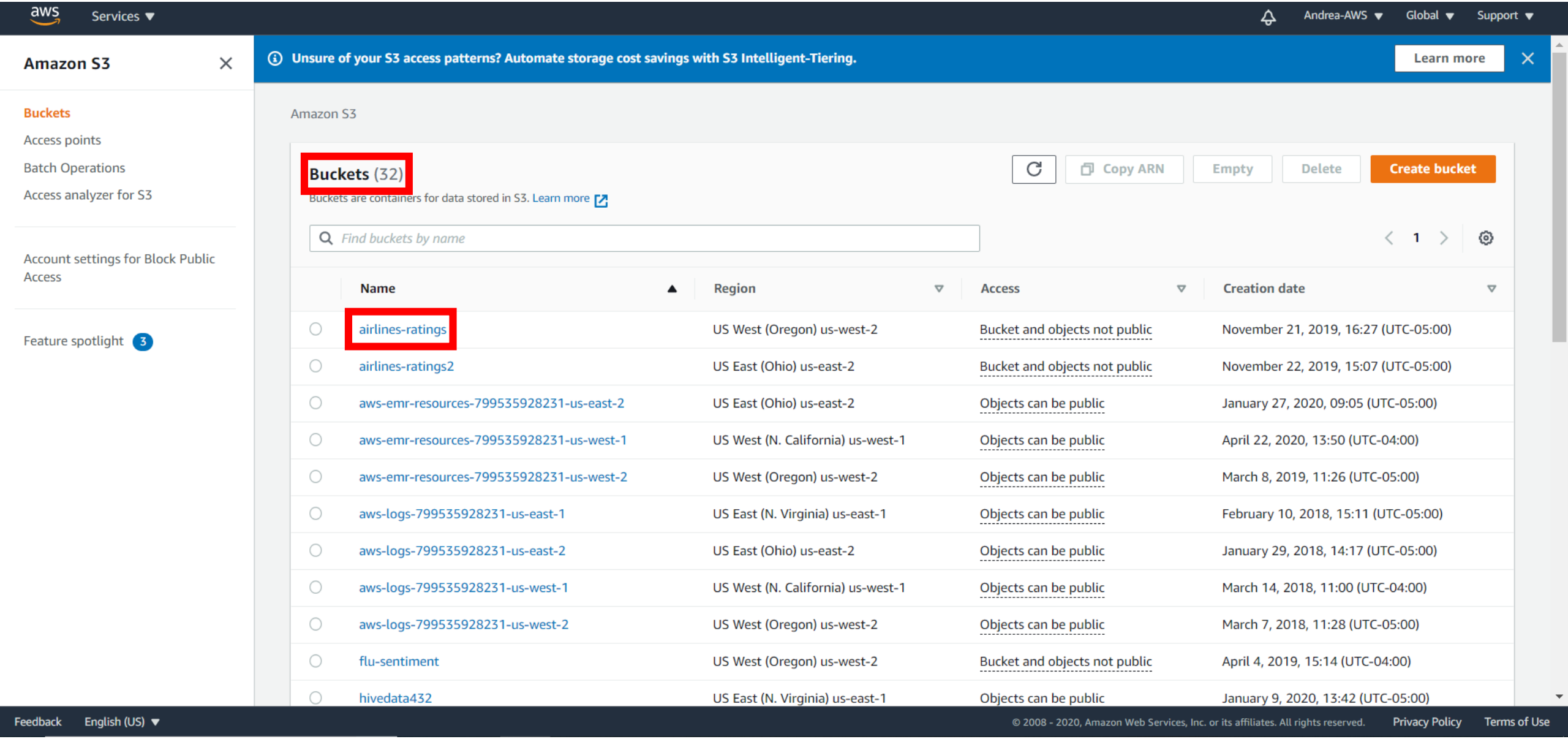
- You can have **up to 100 buckets** in each account
- Can store an **unlimited** number of objects in a bucket
- Objects can be up to **5 TB**; no bucket size limit
- Designed for **99.999999999% (11 9's) of durability**, and **99.99% availability** in a given year
- You can **control access** to the bucket and its objects
- **Pay** only for **what you use / No fee**
- Data **can be stored as-is**: there is no need to convert it to a predefined schema.
- Allows organizations to **use S3 as their data lake for analytics**.

AWS Recommendation for Big Data: Aggregate ALL data in an AWS S3



Amazon S3: durable, available, high performance, easy to use, scalable, integrated
Direct integration with EMR: read/write from/to S3
AWS S3: Scalability on demand

AWS S3 Example


aws
Services
Andrea-AWS
Global
Support
Amazon S3
Unsure of your S3 access patterns? Automate storage cost savings with S3 Intelligent-Tiering.
Learn more
Buckets
Access points
Batch Operations
Access analyzer for S3
Account settings for Block Public Access
Feature spotlight 3
Amazon S3
Buckets (32)
Buckets are containers for data stored in S3. Learn more
Copy ARN
Empty
Delete
Create bucket
Find buckets by name
1
Name
Region
Access
Creation date
airlines-ratings US West (Oregon) us-west-2 Bucket and objects not public November 21, 2019, 16:27 (UTC-05:00)
airlines-ratings2 US East (Ohio) us-east-2 Bucket and objects not public November 22, 2019, 15:07 (UTC-05:00)
aws-emr-resources-799535928231-us-east-2 US East (Ohio) us-east-2 Objects can be public January 27, 2020, 09:05 (UTC-05:00)
aws-emr-resources-799535928231-us-west-1 US West (N. California) us-west-1 Objects can be public April 22, 2020, 13:50 (UTC-04:00)
aws-emr-resources-799535928231-us-west-2 US West (Oregon) us-west-2 Objects can be public March 8, 2019, 11:26 (UTC-05:00)
aws-logs-799535928231-us-east-1 US East (N. Virginia) us-east-1 Objects can be public February 10, 2018, 15:11 (UTC-05:00)
aws-logs-799535928231-us-east-2 US East (Ohio) us-east-2 Objects can be public January 29, 2018, 14:17 (UTC-05:00)
aws-logs-799535928231-us-west-1 US West (N. California) us-west-1 Objects can be public March 14, 2018, 11:00 (UTC-04:00)
aws-logs-799535928231-us-west-2 US West (Oregon) us-west-2 Objects can be public March 7, 2018, 11:28 (UTC-05:00)
flu-sentiment US West (Oregon) us-west-2 Bucket and objects not public April 4, 2019, 15:14 (UTC-04:00)
hivedata432 US East (N. Virginia) us-east-1 Objects can be public January 9, 2020, 13:42 (UTC-05:00)
Feedback
English (US)
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Amazon S3

Buckets
Access points
Batch Operations
Access analyzer for S3

Account settings for Block Public Access

Feature spotlight 3

data/

Folder overview

Region	S3 URI	Amazon resource name (ARN)
US West (Oregon) us-west-2	s3://airlines-ratings/data/	arn:aws:s3:::airlines-ratings/data/

Drag and drop files and folders you want to upload here, or choose **Upload**.

Objects (1)

Objects are the fundamental entities stored in Amazon S3. For others to access your objects, you'll need to explicitly grant them permissions. Learn more

Delete | Actions ▼ | Create folder | Upload

Find objects by prefix

1

Name	Type	Last modified	Size	Storage class
airlines_ratings.csv	csv	November 21, 2019, 16:40 (UTC-05:00)	51.2 KB	Standard

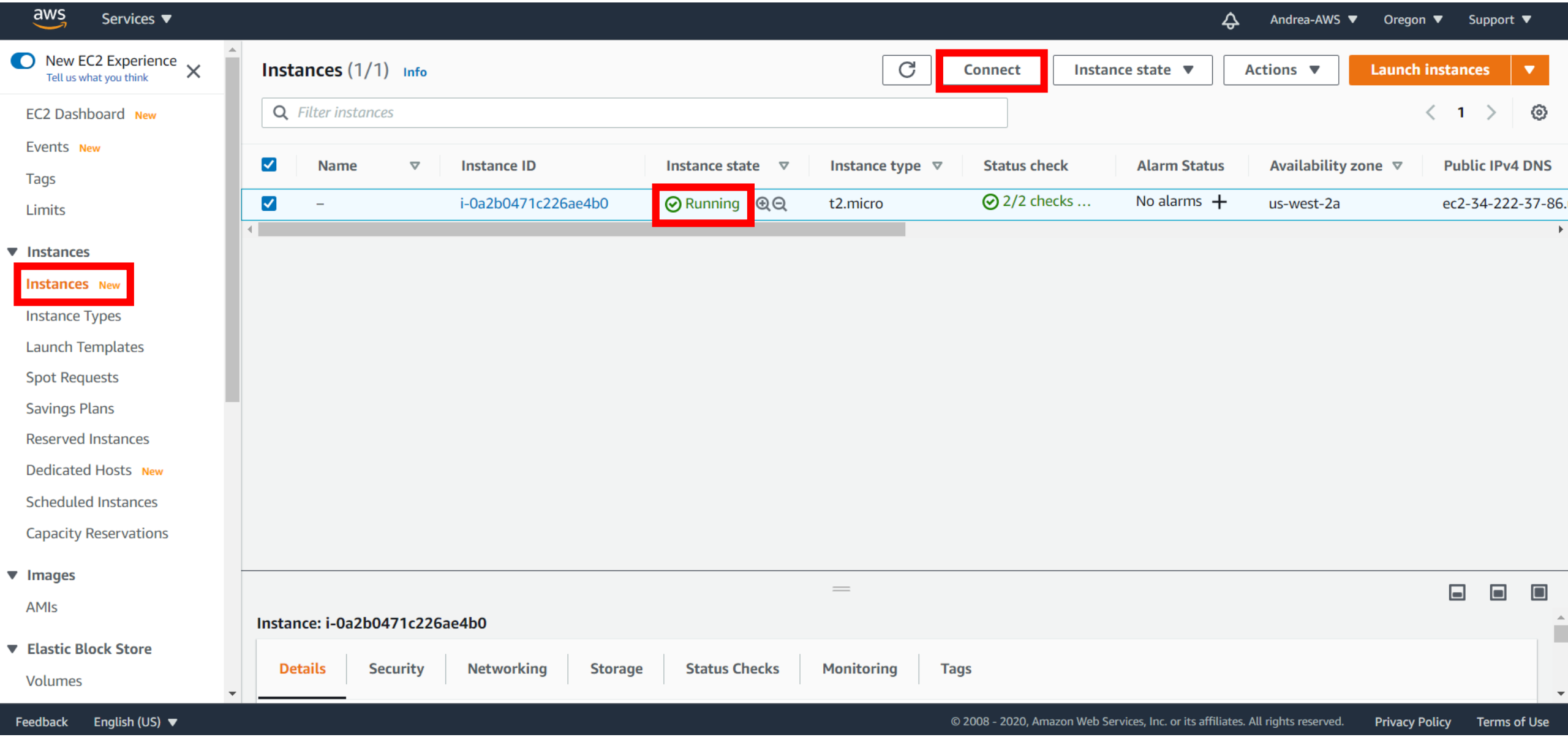
Amazon Elastic Compute Cloud (EC2)

- An Amazon EC2 **instance** is a **virtualized computer** that runs in an Amazon's data center
- Allows users to **rent** virtual computers on which they run computer applications
- Virtual computing environments, known as **instances**
- Central part of AWS: provides **scalable** deployment
- ***Elastic:*** a user can create, launch, and terminate instances as needed, paying by the second for active servers.
- Various configurations of CPU, memory, storage, and networking capacity for your instances, known as ***instance types***
- Secure login information for your instances using ***key pairs***

Amazon Elastic Compute Cloud (EC2) - Facts

- **Pay only for capacity that you actually use**
- Choose **Linux or Windows**
- Consider the following when choosing your instances:
  - Core count
  - Memory size
  - Storage size and type
  - Network performance
  - CPU technologies
- Launch an instance from a **pre-configured Amazon Machine Image (AMI) – template for root volume for the instance (O.S., applications); launch permissions; volumes to attach.**

AWS EC2 Example


aws
Services
Andrea-AWS
Oregon
Support
New EC2 Experience
Tell us what you think
EC2 Dashboard New
Events New
Tags
Limits
Instances
Instances New
Instance Types
Launch Templates
Spot Requests
Savings Plans
Reserved Instances
Dedicated Hosts New
Scheduled Instances
Capacity Reservations
Images
AMIs
Elastic Block Store
Volumes
Instances (1/1) Info
Connect
Instance state
Actions
Launch instances
Filter instances
1
Name
Instance ID
Instance state
Instance type
Status check
Alarm Status
Availability zone
Public IPv4 DNS
–
i-0a2b0471c226ae4b0
Running
t2.micro
2/2 checks ...
No alarms
us-west-2a
ec2-34-222-37-86.
Instance: i-0a2b0471c226ae4b0
Details
Security
Networking
Storage
Status Checks
Monitoring
Tags
Feedback
English (US)
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Connect to instance Info

Connect to your instance i-0a2b0471c226ae4b0 using any of these options

Session Manager | RDP client

You can connect to your Windows instance using a remote desktop client of your choice, and by downloading and running the RDP shortcut file below:

Download remote desktop file

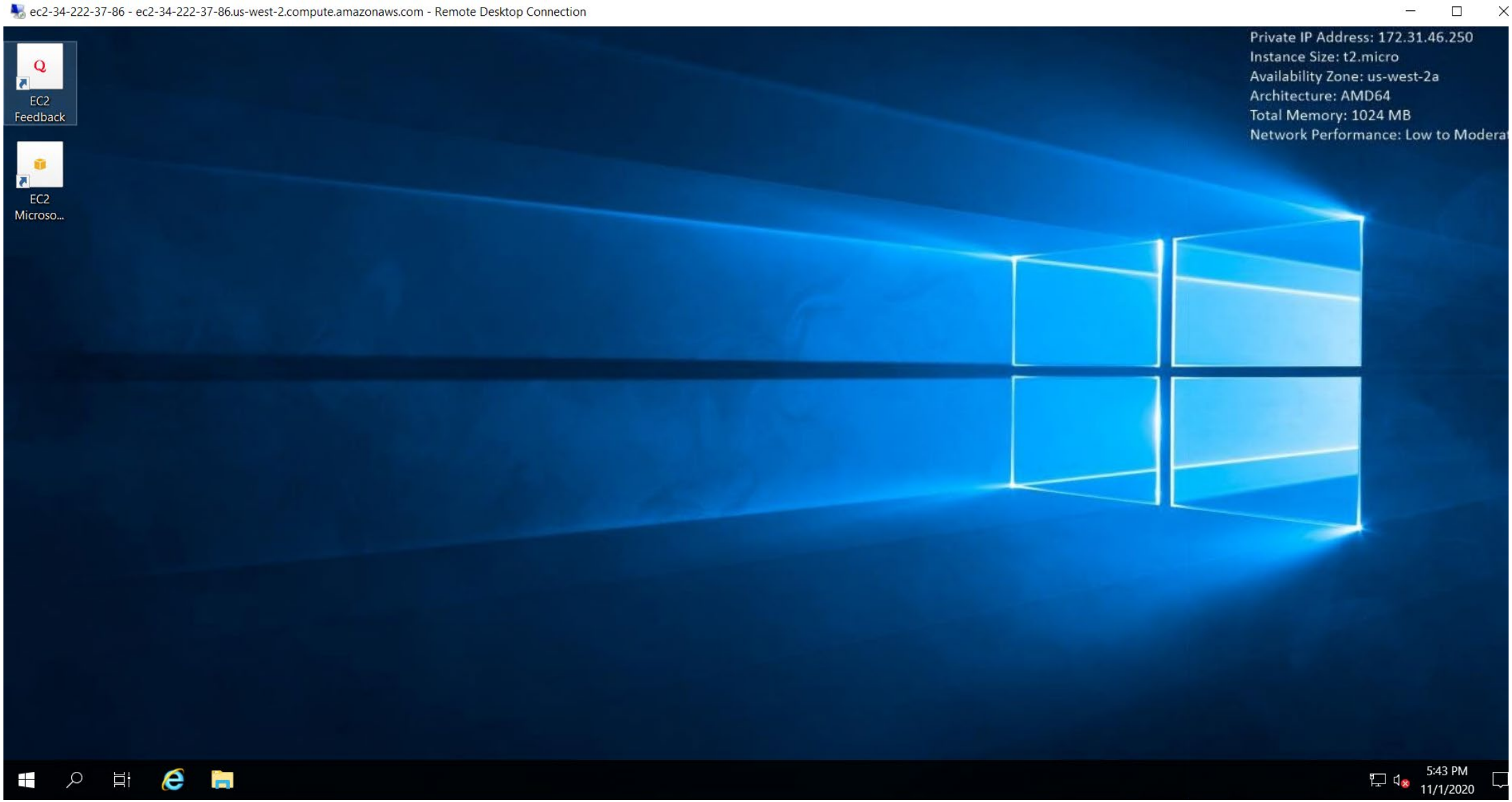
When prompted, connect to your instance using the following details:

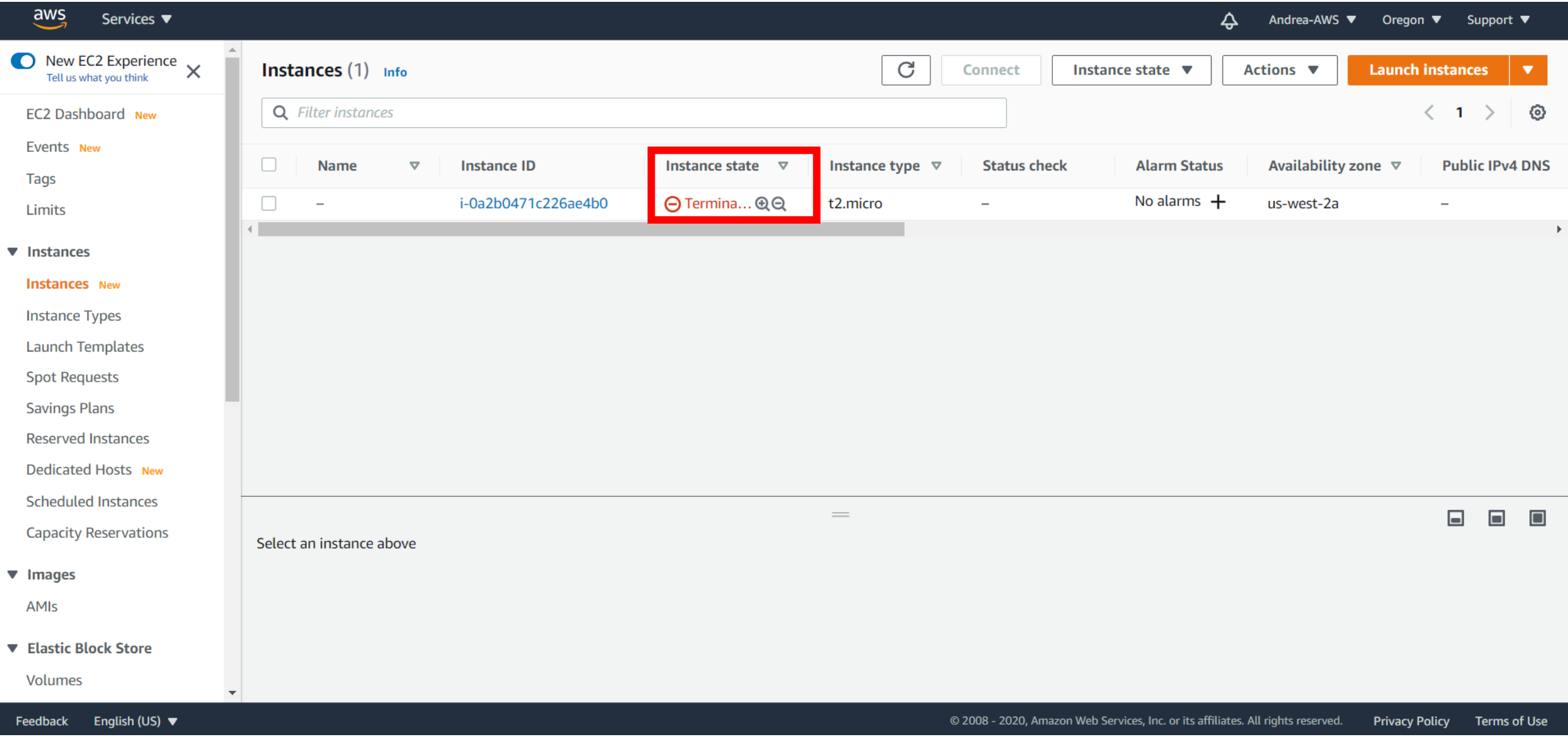
Public DNS	User name
ec2-34-222-37-86.us-west-2.compute.amazonaws.com	Administrator

Password **Get password**

If you've joined your instance to a directory, you can use your directory credentials to connect to your instance.

Cancel


ec2-34-222-37-86 - ec2-34-222-37-86.us-west-2.compute.amazonaws.com - Remote Desktop Connection
EC2 Feedback
EC2 Microso...
Private IP Address: 172.31.46.250
Instance Size: t2.micro
Availability Zone: us-west-2a
Architecture: AMD64
Total Memory: 1024 MB
Network Performance: Low to Moderat
5:43 PM
11/1/2020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EC2 Dashboard New
Events New
Tags
Limits
Instances
Instances New
Instance Types
Launch Templates
Spot Requests
Savings Plans
Reserved Instances
Dedicated Hosts New
Scheduled Instances
Capacity Reservations
Images
AMIs
Elastic Block Store
Volumes
Instances (1) Info
Connect
Instance state
Actions
Launch instances
Filter instances
1
Name
Instance ID
Instance state
Instance type
Status check
Alarm Status
Availability zone
Public IPv4 DNS
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i-0a2b0471c226ae4b0
Termina...
t2.micro
–
No alarms
us-west-2a
–
Select an instance above
Feedback
English (US)
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Lab #1 – AWS S3