

Roles :

For instance you might want to give a VM an access to s3 or the other services. then you create a role for that.

IAM credential reports:

Imagine in your organization there are 10,000 users from different group log in to AWS account and we want to know whether a password, access key or MFA is enabled and how is the situation.

We can generate and download a IMA credential reports that list all the users and it shows all the below



How to do :

IAM , credential reports , download credential reports

S3 101 :

Simple Storage Services

The longest service AWS

It's a place for storing flat files , flat files are the files that do not change like text , pictures , video , etc

Databases are not flat files since they are changing over time to time

S3 is Object based storage is to store your files

Block base storage is where you save your operating system files and data bases etc (s3 is not useful for that)

S3 - The Basics

So What Is S3?

- S3 is a safe place to store your files.
- It is Object-based storage.
- The data is spread across multiple devices and facilities.



S3 - The Basics

The basics of S3 are as follows;

- S3 is **Object-based** — i.e. allows you to upload files.
- Files can be from 0 Bytes to 5 TB.
- There is unlimited storage.
- Files are stored in Buckets.

S3 - The Basics

The basics of S3 are as follows;

- **S3 is a universal namespace.** That is, names must be unique globally.
- <https://s3-eu-west-1.amazonaws.com/acloudguru>
- When you upload a file to S3, you will receive a
- **HTTP 200 code** if the upload was successful.

S3 address : the s3 service , the region , the bucket name

Since it's a form of http, then the naming should be unique

S3 is an object based and by object means files :

S3 is Object based. Think of Objects just as files.

Objects consist of the following:

- Key (This is simply the name of the object)
- Value (This is simply the data and is made up of a sequence of bytes).
- Version ID (Important for versioning)
- Metadata (Data about data you are storing)
- Subresources;

Access Control Lists

Torrent



How does data consistency work for S3?

- Read after Write consistency for PUTS of new Objects
- Eventual Consistency for overwrite PUTS and DELETES (can take some time to propagate)

What does it mean ?

In Other Words;

- If you write a new file and read it immediately afterwards, you will be able to view that data.
- If you update **AN EXISTING file** or delete a file and read it immediately, you may get the older version, or you may not. Basically changes to objects can take a little bit of time to propagate.

We can read the exact file immediately after we put it there , but consistency for the existing file to be changed or deleted (overwrite puts) may take some time . immediately we may not see the changes.

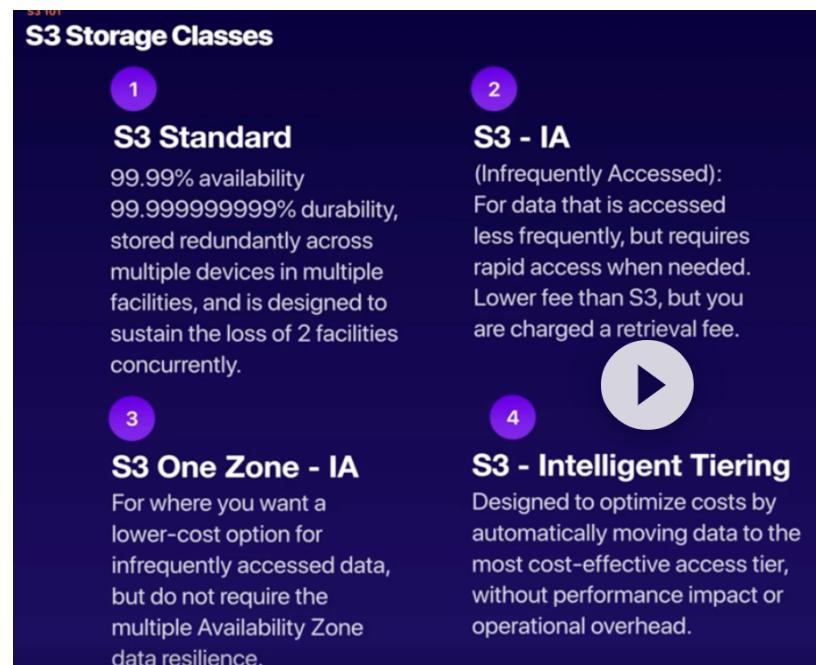
S3 guarantees :
99.99% availability

S3 has the following guarantees from Amazon;

- Built for 99.99% availability for the S3 platform.
- Amazon Guarantee 99.9% availability
- Amazon guarantees 99.999999999% durability for S3 information. (Remember 11 x 9s).

S3 features:

1. Tiered storage availability
2. Life Cycle management
 - a. Over the time you can define which tier it goes to
3. Versioning
 - a. Authorizing and setting back to the previous versions
4. Encryption
5. Secure your data using Access Control Lists and Bucket Policies
 - a. Access control list work on individual file or object level
 - b. Bucket policies work on the entire bucket



S3 intelligent tiering is using ML to store and move data based on its call request frequency.

S3 Storage Classes - Continued

5 S3 Glacier

S3 Glacier is a secure, durable, and low-cost storage class for data archiving. You can reliably store any amount of data at costs that are competitive with or cheaper than on-premises solutions. Retrieval times configurable from minutes to hours.

6 S3 Glacier Deep Archive

S3 Glacier Deep Archive is Amazon S3's lowest-cost storage class where a retrieval time of 12 hours is acceptable.

	S3 Standard	S3 Intelligent-Tiering*	S3 Standard-IA	S3 One Zone-IA†	S3 Glacier	S3 Glacier Deep Archive**
Designed for durability	99.999999999% (11 9's)					
Designed for availability	99.99%	99.9%	99.9%	99.5%	N/A	N/A
Availability SLA	99.9%	99%	99%	99%	N/A	N/A
Availability Zones	≥3	≥3	≥3	1	≥3	≥3
Minimum capacity charge per object	N/A	N/A	128KB	128KB	40KB	40KB
Minimum storage duration charge	N/A	30 days	30 days	30 days	90 days	180 days
Retrieval fee	N/A	N/A	per GB retrieved	per GB retrieved	per GB retrieved	per GB retrieved
First byte latency	milliseconds	milliseconds	milliseconds	milliseconds	select minutes or hours	select hours

For s3 you are charged for

- Storage
- Requests
- Storage Management Pricing
- Data Transfer Pricing
- Transfer Acceleration
- Cross Region Replication Pricing

Amazon S3 Transfer Acceleration enables fast, easy, and secure transfers of files over long distances between your end users and an S3 bucket.

Transfer Acceleration takes advantage of Amazon CloudFront's globally distributed edge locations. As the data arrives at an edge location, data is routed to Amazon S3 over an optimized network path.

Imagine users over the globe wants to upload a file to s3 bucket, they upload it to the edge location near themselves and then it uploaded to the s3 bucket where it is hosted.

Cross Region replication:

Having a backup bucket in another region. when you upload a file to the primary one, it is replicated and stored in the secondary one as well.

TIPS

- Remember that S3 is **Object-based**: i.e. allows you to upload files.
- Files can be from 0 Bytes to 5 TB.
- There is unlimited storage.
- Files are stored in Buckets.
- **S3 is a universal namespace.** That is, names must be unique globally.
- <https://s3-eu-west-1.amazonaws.com/acloudguru>

- **Not suitable to install an operating system on.**
- Successful uploads will generate a **HTTP 200** status code.

The Key Fundamentals of S3 Are;

- Key (This is simply the name of the object)
- Value (This is simply the data and is made up of a sequence of bytes).

- Read after Write consistency for PUTS of new Objects
- Eventual Consistency for overwrite PUTS and Deletes (can take some time to propagate)

1

S3 Standard

99.99% availability
99.99999999% durability,
stored redundantly across
multiple devices in multiple
facilities, and is designed to
sustain the loss of 2 facilities
concurrently.

2

S3 - IA

(Infrequently Accessed):
For data that is accessed
less frequently, but requires
rapid access when needed.
Lower fee than S3, but you
are charged a retrieval fee.

3

S3 One Zone - IA

For where you want a
lower-cost option for
infrequently accessed data,
but do not require the
multiple Availability Zone
data resilience.

4

S3 - Intelligent Tiering

Designed to optimize costs
by automatically moving
data to the most cost-
effective access tier, without
performance impact or
operational overhead.

5

S3 Glacier

S3 Glacier is a secure, durable,
and low-cost storage class for
data archiving. Retrieval times
configurable from minutes to
hours.

6

S3 Glacier Deep Archive

S3 Glacier Deep Archive is
Amazon S3's lowest-cost
storage class where a
retrieval time of 12 hours is
acceptable.

Update: 7) S3 Outposts has been introduced as a storage class to deliver object storage to on-premises AWS Outpost environments, and this is where a retrieval time of 12 hours is acceptable.

How to create a bucket

In s3 dashboard , the region changes automatically to global and it s a gloabal service

Bucket name should be unique

Buckets by default is not public unless you make it public

Lets a create a bucket and add an object to it . if we click on the object it opens the infor of the file and there is a public URLs if we click on that we get the access denied xml file , why because the file (bucket) by default is not open to the public.

There is also object management overview where we can enable versioning or some other configuration

There is also storage class where we can change it from standard to IA or one zone IA , etc .

How to make a bucket public : in the permission tab , unclick the block all public access . and then we can check the status of accessibility of the bucket.

Then we need to click on the certain object and make it public. Then if we click on the URL then the file becomes accessible to everyone. So making bucket public is not enough we have to make the object also public . click on it and action make it public.

Transfer acceleration :

Bucket properties > transfer acceleration

If you click on more, we navigate to another page where we can find the simulator saying what could have happened if we had the transfer acceleration tool on.

TIPS :

Bucket name should be unique .

You view the bucket globally but actually there are some / one individual regions.

We can replicate our buckets by cross region replication

Storage class and encryption

Standard

IA , IA one zone , intelligence , glacier , deep glacier

S3 transfer acceleration:

- How : see above using edge location
- Where : in bucket properties and transfer acceleration
- Also we can see the demo tool for that

Restricting access:

- Bucket policy : apply across the whole bucket
 - o How : permission , unclick the block access
- Object policy
 - o How : select the file and by action make it public
- IAM policies to users & Group : access to some buckets or not

How to make a whole bucket public without making every single file make public ?

- Permission > bucket policies
- Download a policy example , in text editor , we copy that one and put as our new policy and make sure to update arn with our arn in the resource section of json file. Help from <https://docs.aws.amazon.com/AmazonS3/latest/dev/example-bucket-policies.html>

How to create a website on s3 bucket ?

- After making it public
- Properties > edit static hosting website > enable
- We insert our html file and error file for the web site we would like to be static like index.htm and error.htm and we upload them as well.

**You can use S3 to host STATIC websites (such as .html).
Websites that require database connections such as
Wordpress etc cannot be hosted on S3.**

S3 Scales automatically to meet your demand. Many enterprises will put static websites on S3 when they think there is going to be a large number of requests (such as for a movie preview for example).

S# versioning : it's enough for the exam

Properties > versioning > enable

If we go back to the bucket beside action tabs we can see list versioning button.

We can always see old versions , includes all writes and even if you delete an object

Create backup tools

Versioning cannot be disabled , it can be suspended

Integrates with lifecycle

Versioning with MFA delete capability

AWS Cloud front :

What is CloudFront?

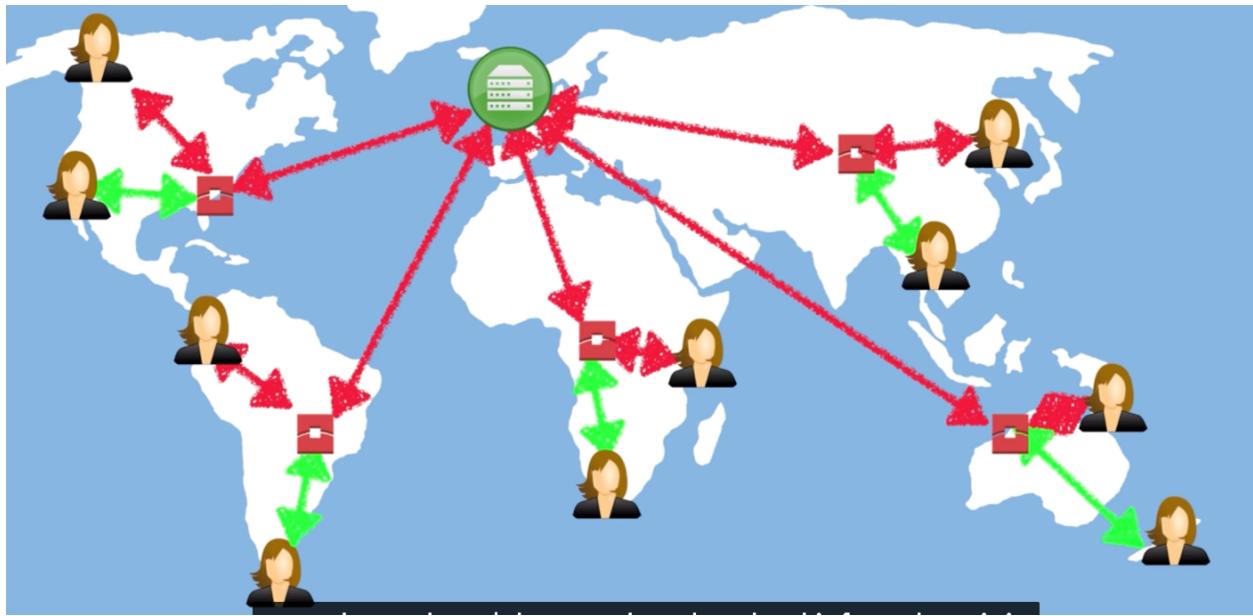
A content delivery network (CDN) is a system of distributed servers (network) that deliver webpages and other web content to a user based on the geographic locations of the user, the origin of the webpage, and a content delivery server.

Let's assume there's a video sitting on a server somewhere and people from all over the globe wants to see that video, without CDN content delivery network , it takes quite time for each of them depending on their location their connection speed and etc.

Edge location: the location where the content is cached

Origin: the origin of the file it can be s3 or ec2 or any elastic load balancer or rout 53

Distribution: this is the name given the CDN which consists of a collection of edge locations



So the first user is getting the file at alatency and the file is cashed on edge location and the second users (green) get the file from the edge
TTL , time to live is the span of time the file exists in the edge location and it is defined in seconds by default it will be sitting there for 48 hrs ,

What is CloudFront?

Amazon CloudFront can be used to deliver your entire website, including dynamic, static, streaming, and interactive content using a global network of edge locations. Requests for your content are automatically routed to the nearest edge location, so content is delivered with the best possible performance.

Cloud front distribution :

- Web Distribution : used for website
- RTMP – used for media streaming

Setting up cloud front :

- Network and content delivery > cloud front >
- giving the address of the bucket name (endpoint)
- after it's deployed , it gives the address ,
- if we put the address/object (object is a file name in the bucket) ==> it would be fetched very quickly

it takes about half an hour to be deployed

copy the link / the file in the bucket and it's being fetch fairly quick

- **Edge Location** - This is the location where content will be cached. This is separate to an AWS Region/AZ.
- **Origin** - This is the origin of all the files that the CDN will distribute. This can be either an S3 Bucket, an EC2 Instance, an Elastic Load Balancer, or Route53.
- **Distribution** - This is the name given to the CDN which consists of a collection of Edge Locations.
- **Web Distribution** - Typically used for Websites.
- **RTMP** - Used for Media Streaming.

Edge locations are not just read only and we can write as well. Using the transform acceleration objects are cashed for TTL (in seconds)

You can clear cashed object, but you are charged to do that

- Network and content delivery > cloud front >
- Disable
- Delete

Note that origin can be s3 bucket, Ec2, elastic load balancer, route 53!

EC2:

What Is EC2?

Amazon Elastic Compute Cloud (Amazon EC2) is just a virtual server (or servers) in the cloud.

Amazon EC2 reduces the time required to obtain and boot new server instances to minutes, allowing you to quickly scale capacity, both up and down, as your computing requirements change.



EC2 Pricing Models

1

On Demand

Allows you to pay a fixed rate by the hour (or by the second) with no commitment.

2

Reserved

Provides you with a capacity reservation, and offer a significant discount on the hourly charge for an instance. Contract Terms are 1 Year or 3 Year Terms.

3

Spot

Enables you to bid whatever price you want for instance capacity, providing for even greater savings if your applications have flexible start and end times.

4

Dedicated Hosts

Physical EC2 server dedicated for your use. Dedicated Hosts can help you reduce costs by allowing you to use your existing server-bound software licenses.

Dedicated host are useful when you have some especial software licenses or something with specified protocols.

On Demand pricing is useful for;

- Users that want the low cost and flexibility of Amazon EC2 without any up-front payment or long-term commitment
- Applications with short term, spiky, or unpredictable workloads that cannot be interrupted
- Applications being developed or tested on Amazon EC2 for the first time

Reserved Pricing

A CLOUD

Reserved pricing is useful for;

- Applications with steady state or predictable usage
- Applications that require reserved capacity
- Users able to make upfront payments to reduce their total computing costs even further



Reserved instances :

- Standards : you can not change the instance
- Convertible : you can change from one class of instance to the other class
 - o Many classes of EC2 exist for high computation or memory performance
- Scheduled : there are available at the specific time frames

Spot pricing:

- Applications having flexible start and end time
 - o Like research labs , they can bid to have an instance , and run their job
- Applications that are feasible at a very low compute price (search , genome sequence)
- Urgent need , we can bid higher than demand and have our instance very quickly

Dedicated Hosts pricing is useful for;

- Useful for regulatory requirements that may not support multi-tenant virtualization.
- Great for licensing which does not support multi-tenancy or cloud deployments.
- Can be purchased On-Demand (hourly.)
- Can be purchased as a Reservation for up to 70% off the On-Demand price.



Fight Dr. McPxz au (Australia)

Family	Speciality	Use case
F1	Field Programmable Gate Array	Genomics research, financial analytics, real-time video processing, big data etc
I3	High Speed Storage	NoSQL DBs, Data Warehousing etc
G4	Graphics Intensive	Video Encoding/ 3D Application Streaming
H1	High Disk Throughput	MapReduce-based workloads, distributed file systems such as HDFS and MapR-FS
T4g	Lowest Cost, General Purpose	Web Servers/Small DBs
D2	Dense Storage	Fileservers/Data Warehousing/Hadoop
R6g	Memory Optimized	Memory Intensive Apps/DBs
M6g	General Purpose	Application Servers
C6g	Compute Optimized	CPU Intensive Apps/DBs
P3	Graphics/General Purpose GPU	Machine Learning, Bit Coin Mining etc
X1e	Memory Optimized	SAP HANA/Apache Spark etc
Z1D	High compute capacity and a high memory footprint.	Ideal for electronic design automation (EDA) and certain relational database workloads with high per-core licensing costs.
A1	Arm-based workloads	Scale-out workloads such as web servers
U10T01	Bare Metal	Bare metal capabilities that eliminate

What is EBS?

Amazon EBS allows you to create storage volumes and attach them to Amazon EC2 instances. Once attached, you can create a file system on top of these volumes, run a database, or use them in any other way you would use a block device. Amazon EBS volumes are placed in a specific Availability Zone, where they are automatically replicated to protect you from the failure of a single component.

EBS : virtual hardware disk for EC2 on the cloud

Your EC2 instance should be always be in the same availability zone where EBS is

SSD

General Purpose SSD (GP2) - balances price and performance for a wide variety of workloads.

Provisioned IOPS SSD (IO1) - Highest-performance SSD volume for mission-critical low-latency or high-throughput workloads

Magnetic

Throughput Optimized HDD (ST1) - Low cost HDD volume designed for frequently accessed, throughput-intensive workloads

Cold HDD (SC1) - Lowest cost HDD volume designed for less frequently accessed workloads (**File Servers**).

Magnetic - Previous Generation.

TIPs ;

EC2 Exam Tips

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, both up and down, as your computing requirements change.

Laura me mira echando humo por las orejas.
—En qué te has metido la pata!, me pregunta. ¡He dicho algunas tonterías!

Rafaela, Laura contesta:
—No. Ahora es para escribir a caro, a ver si esto va mejor
más suerte y los que lo han puesto bien enviarán una fotografía
y la muestre tan deprisa que no pueda llevar agua de círculo
mejores imágenes... ¡menos mal!

Marcos visto ponerme la ropa, dimos los últimos golpes

EC2 Exam Tips

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EC2 Exam Tips

If the Spot instance is terminated by Amazon EC2, you will not be charged for a partial hour of usage. However, if you terminate the instance yourself, you will be charged for any hour in which the instance ran.



If the price goes beyond what you prepared for , AWS terminate the instance and you are not paying for the partial hour that you use . If you terminate the instance and you ran for 58 minutes , you pay for it .

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Magnetic - Previous Generation.

Linus talks through ssh port on port 22

Windows talks through Remnute Desktop Protocols (RDP) port 3389

HTTP , port 80

HTTPS port 443

So remote computer (EC2 which is linux) talk through ssh connection

Port 22 will dictate the server (EC2) that it is a ssh connection .

Then source (local computer) can be any one or just a specific person

Meaning that if we put 0.0.0.0::0 means every one with any port can talk to the computer

However if we put it as my ip it takes just port 32 (of my local computer) and let me connect to the server to the port 22 (this way the server understand it is a ssh connection)

To let everyone in and talk to port 22 (imagine it is linux), 0.0.0.0/0 meaning that we let everyone with any IP and port be in and talk through the computer with port 22

But if we want to limit it to just ourselves as admin, we select my/IP port 32

- For web service since we want to spread out the content, we need to allow everyone to connect
- For maybe computation or admin, we may need to just lock down every one and let it be open to just our IP,
 - o If in my source I click on my IP, it allows my computer (local to connect and) and if I disconnected and get another IP I have to reset it in order to connect again

Step 6: Configure Security Group

A security group is a set of firewall rules that control the traffic for your instance. On this page, you can add rules to allow specific traffic to reach your instance. For example, if you want to set up a web server and allow Internet traffic to reach your instance, add rules that allow unrestricted access to the HTTP and HTTPS ports. You can create a new security group or select from an existing one below. [Learn more](#) about Amazon EC2 security groups.

Assign a security group: Create a new security group Select an existing security group

Security group name:	WebDMZ			
Description:	WebDMZ			
Type	Protocol	Port Range	Source	Description
SSH	TCP	22	Anywhere	e.g. SSH for Admin Desktop
HTTP	TCP	80	Anywhere	e.g. SSH for Admin Desktop

[Add Rule](#)

We have to create the key , the public key and private key .

- Public key : is the you can share it around
- Private : it is needed to log in

There is a public ip address

How to connect :

Using dashboard ec2 connect :

Sudo su

Yum update -y (getting the security patched)

Using integrated terminal (mac)

1. chmod 400 mykey.pem
2. ssh -i "mykey.pem" ec2-user@ec2-54-234-161-122.compute1.amazonaws.com
3. Sudo su
4. Yum update -y (getting the security patched , like the WebMDZ)

Using potty

Exams tip :

- EC2 is a compute based service , it s not serversless , it s a server.
- You need to connect using private key
- Linus ssh port 22
- Microsoft windows RDP 3389
- HTTp : port 80
- https port 443
- when you using security group you are using virtua firewall
 - o to let every one in : 0.0.0.0/0
 - o to just on e: Ip/32

Security Groups are virtual firewalls in the cloud. You need to open ports in order to use them. Popular ports are SSH (22), HTTP (80), HTTPS (443), RDP (3389).

Always Design for failure. Have one EC2 instance in each availability zone.

EC2 Command line

If you remember using IAM we created a user and for that user we created programtic access key (public and secret key) . If you don't save that , we can make it inactivate , delete it and activate new one.

Using either connect instance or SSH

```
aws s3 mb s3://hniakan. ==> aws s3 make bucket name hniakan  
error unable to locate credentials  
ec2 instance is unable to locate credentials
```

```
----|----|----|  
https://aws.amazon.com/amazon-linux-2/  
  
ec2-user@ip-172-31-39-35 ~]$  
ec2-user@ip-172-31-39-35 ~]$ sudo su  
root@ip-172-31-39-35 ec2-user]# yum update -y  
  loaded plugins: extras_suggestions, langpacks, priorities, update-motd  
mzn2-core  
0 packages marked for update  
root@ip-172-31-39-35 ec2-user]# ls  
root@ip-172-31-39-35 ec2-user]# aws s3 mb s3://hniakan  
make_bucket failed: s3://hniakan Unable to locate credentials  
root@ip-172-31-39-35 ec2-user]#
```

As we can see below , I had to put my programmatic key to my configure
I made a mistake in putting my default region I had some error and I had to reconfig again ,
while reconfiguring whatever yo don't want to change just hit enter and correct whatever you
would like

Then ask aws s3 to create the bucket for you

Then aws s3 ls .. list all the buckets related to that user

```
[ec2-user@ip-172-31-39-35 ~]$  
[ec2-user@ip-172-31-39-35 ~]$ sudo su  
[root@ip-172-31-39-35 ec2-user]# yum update -y  
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd  
amzn2-core  
No packages marked for update  
[root@ip-172-31-39-35 ec2-user]# ls  
[root@ip-172-31-39-35 ec2-user]# aws s3 mb s3://hniakan  
make_bucket failed: s3://hniakan Unable to locate credentials  
[root@ip-172-31-39-35 ec2-user]# aws configure  
AWS Access Key ID [None]: AKIASW73B3QDPDGCGX5  
AWS Secret Access Key [None]: VeAKpToWxm2Z3DbiKvCmYxFneSoDmb7RqqXYtgP  
Default region name [None]: us-east-1  
Default output format [None]:  
[root@ip-172-31-39-35 ec2-user]# aws s3 mb s3://hniakan  
make_bucket failed: s3://hniakan Could not connect to the endpoint URL: "https://hniakan.s3.us-east-1.amazonaws.com/"  
[root@ip-172-31-39-35 ec2-user]# aws s3 mb s3://hniakan1234  
make_bucket failed: s3://hniakan1234 Could not connect to the endpoint URL: "https://hniakan1234.s3.us-east-1.amazonaws.com/"  
[root@ip-172-31-39-35 ec2-user]# aws s3 ls  
Could not connect to the endpoint URL: "https://s3.us-east-1.amazonaws.com/"  
[root@ip-172-31-39-35 ec2-user]# aws configure  
AWS Access Key ID [*****CYXS]:  
AWS Secret Access Key [*****YtgP]:  
Default region name [us-east-1]: us-east-1  
Default output format [None]:  
[root@ip-172-31-39-35 ec2-user]# aws s3 mb s3://hniakan  
make_bucket: hniakan  
[root@ip-172-31-39-35 ec2-user]# aws s3 ls  
2020-11-30 04:40:19 hamedniakan  
2020-12-06 05:05:03 hniakan  
2020-08-20 00:22:14 sagemaker-us-east-2-186782927264  
[root@ip-172-31-39-35 ec2-user]#
```

So we can create a file and upload it to s3

So basically we created a file on ec2 and upload it to s3

In home directory of ec2 there is config and credentials file

Vi credentials

```
[root@ip-172-31-39-35 ec2-user]# cd ~  
[root@ip-172-31-39-35 ~]# cd .aws  
[root@ip-172-31-39-35 .aws]# ls  
config credentials  
[root@ip-172-31-39-35 .aws]# vi credentials
```

We can see our credentials what happens if my ec2 gets hacked , they can go to the home directory and get the config .. one way to get around is after we're done with ec2 change our credential with some random stuff

By saying aws configuration and just put bad input to them

You Can Interact with AWS in 3 ways;

- Using the **console**
- Using the **Command Line Interface (CLI)**
- Using the **Software Development Kits (SDKs)**

SDK is for programming language .

ROLES

More secure way to communicate with aws services

Roles : accessibility for services in the aws (resources)

Create , select service (ec2) , attach policy (se3 full read write access) , tag , name so we have created that role but we need to attach that role to ec2 instance as well.

So in ec2 instance , action , we attach that policy

Now if we connect to ec2 again ... if we try to communicate with s3 like aws s3 ls

We'll get error

Why ? since we give it some bad input for our credential for sake of not getting hacked

So .. we can remove our .aws folder in the home directory

And then try ... this time ec2 uses the policy attached to it and it does not ask for any credential or their validity

So .. if the instance gets hacked .. yes the hacker can have a full access to our s3 since we gave our instance the full access to s3 policy . but they don't have full access to the whole aws environment .

And the soon we delete our instance their access would be gone as well. The safest is using roles instead of credentials.

Tips :

You can apply roles to EC2 instances at any time. When you do this the change takes place immediately.

You can apply roles to EC2 instances at any time. When you do this the change takes place immediately.

Roles are universal. You do not need to specify what region they are in, similar to users.

Elastic Load balancer

- Load balancer routes the traffic to different availability zones

3 types of load balancer

- HTTP / HTTPS
 - Intelligence decision for routing and good for application
- TCP

- High performance with static IP (always connecting from a certain instance maybe !!!)
- Previous Generations
 - Fpr test/dev and just cheap

Under EC2 , load balancer / http/https

- Give it a name
- VPC : virtual private cloud (covers later) the default is where our instances right now is and every ec2 comes with a default one , but we want it in other availability zones
- We select all the availability zones to have VPC
- SELECT webDMZ security group this is the one we already created before when running our intsnace
 - We created earlier an instance and create index.html in it
 - Our instance had a WebDMZ patch security group
- Configure the routing
 - Giving a name
 - Heath check
 - By default it looks at the /index.htm unless something else is given
 - And then config the heathy check interval and time out
- Register the target
 - Registering the webserver behind your application load balancer
 - We are adding the webserver we earlier created and registere it behind the load balancer
 - It takes some time
- Now we need to create another web server instances (EC2) in different availability zone
 - In the new one in ythe subnet we ise another Az
 - In advance
 - Bootstrap scripts : a script that runs when your instance is run instead of doing them manually
 - #!/bin/bash : anything under this would be run when the instance boots
 - Yom update -y
 - Yum install httpd -y
 - Service httpd start
 - Checkconfig on
 - Cd /var/www/html
 - Echo “<html><body><h1>kos nane ramin this is web 2 </h1></body></html>” > index.html
 - It would create the index.html with that info in it
 - Using existing private key and launch it
- So if we see our instances we can see we have two instance up and running
 - 1. We created manyullay
 - 2 . we cretwed using bootstrap script
 - Both has WebDMZ patch .. showing that they are webservice

- They both has httpd service on
- /var/www/html this is the root to the website and by default instance look at index.htm that's why the path in the configure the routing , if it is empty it look for this path
 - So they (instances know) where they look for it
- Remember we said registering the target may take time , soo after it is registered , by default it is resolved to another ec2 instance and if we get its dsn name and put it there we can see the content pull up from the index.htm and actually sometimes it s from instance
- We earlier registered one instance to the load balancer but we need to add the new one as well , so we go to the target groups edit and add the new instance (the one we created with bootstrap scripts) to the load balancer target as well.
- Then if we use the dsn of load balancer put in a browser and refresh we see the content of html.index but actually it is sometimes from webserver 1 sometimes from 2

Below is the example of creating index.html

As we mentioned earlier the websericie by default look at the /var/www/html looking for index.html

```
(pytorch_env) (base) C02Z69GALVCG:Downloads hniakan$ chmod 400 hniakan.pem
(pytorch_env) (base) C02Z69GALVCG:Downloads hniakan$ ssh -i "hniakan.pem" ec2-user@ec2-3-18-101-84.us-east-2.compute.amazonaws.com
--| --|- )
_| ( --| /   Amazon Linux 2 AMI
---\|---|_|
https://aws.amazon.com/amazon-linux-2/
[ec2-user@ip-172-31-41-222 ~]$ ls
[ec2-user@ip-172-31-41-222 ~]$ sudo su
[root@ip-172-31-41-222 ec2-user]# yum update -y
Loaded plugins: extras_suggestions, langpacks, priorities, update-motd
amzn2-core
No packages marked for update
[root@ip-172-31-41-222 ec2-user]# yum install httpd
Complete!
[[root@ip-172-31-41-222 ec2-user]# ls
[[root@ip-172-31-41-222 ec2-user]# service httpd start
Redirecting to /bin/systemctl start httpd.service
[[root@ip-172-31-41-222 ec2-user]# ls
[[root@ip-172-31-41-222 ec2-user]# cd /var/www/html
[[root@ip-172-31-41-222 html]# ls
[[root@ip-172-31-41-222 html]# cd ~
[[root@ip-172-31-41-222 ~]# ls
[[root@ip-172-31-41-222 ~]# sudo su
[[root@ip-172-31-41-222 ~]# cd /var/www/html
[[root@ip-172-31-41-222 html]# nano index.html
[[root@ip-172-31-41-222 html]# ls
index.html
```

TIPS

Load balancers come in 3 different flavours.

Application Load Balancers, Network Load Balancers, Classic Load Balancers

Application Load Balancers - Layer 7 (Make Intelligent Decisions).
Network Load Balancers - Extreme Performance/Static IP Addresses.
Classic Load Balancers - Test & Dev, Keep Costs Low.

Application load balancer making intelligent routing decisions
When you designing load balancer we need to have the multiple instances in different availability zones

RDS

Multi az vs replica

Multi az is for disaster recovery and it is for when one of your Az is down and you have to rely on the other one

You always read and write from the primary one but you have always a back up on secondary as well

But multiple replica is for performance

Your ec2 is able to write on your database and you can have up to 5 replica of it , so if it fails you (your ec2) are not able to write or read on your database. However it can be set up to read from the replicas ... so it is optimized for performance so it can be set up that your ec2 instance write to your primary data base and read from the replicas

Each availability zone can have its own replica (I guess , we'll see)

RDS :

- SQL Servers
- Oracle
- MySQL server
- PostgreSQL
- Aurora (AMAZON SQL)
- Maria DB

RDS:

- Multiple AZ for disaster recovery
- Replica for performance

NOSQL :

- Collection ==Table
- Document == each row
- Key – value pairs = columns which could be nested (fields)

```
{  
  "_id" : "51262c865ca358946be09d77",  
  "firstname" : "John",  
  "surname" : "Smith",  
  "Age" : "23",  
  "address" : [  
    {"street" : "21 Jump Street",  
     "suburb" : "Richmond"}  
  ]  
}
```

Fieldes can be nested or flat

The columns can be varied == each record can have different number of fields

NOSQL :

- DynamoDB is the amazon solution

Online Transaction Processing VS Online Analytics Processing

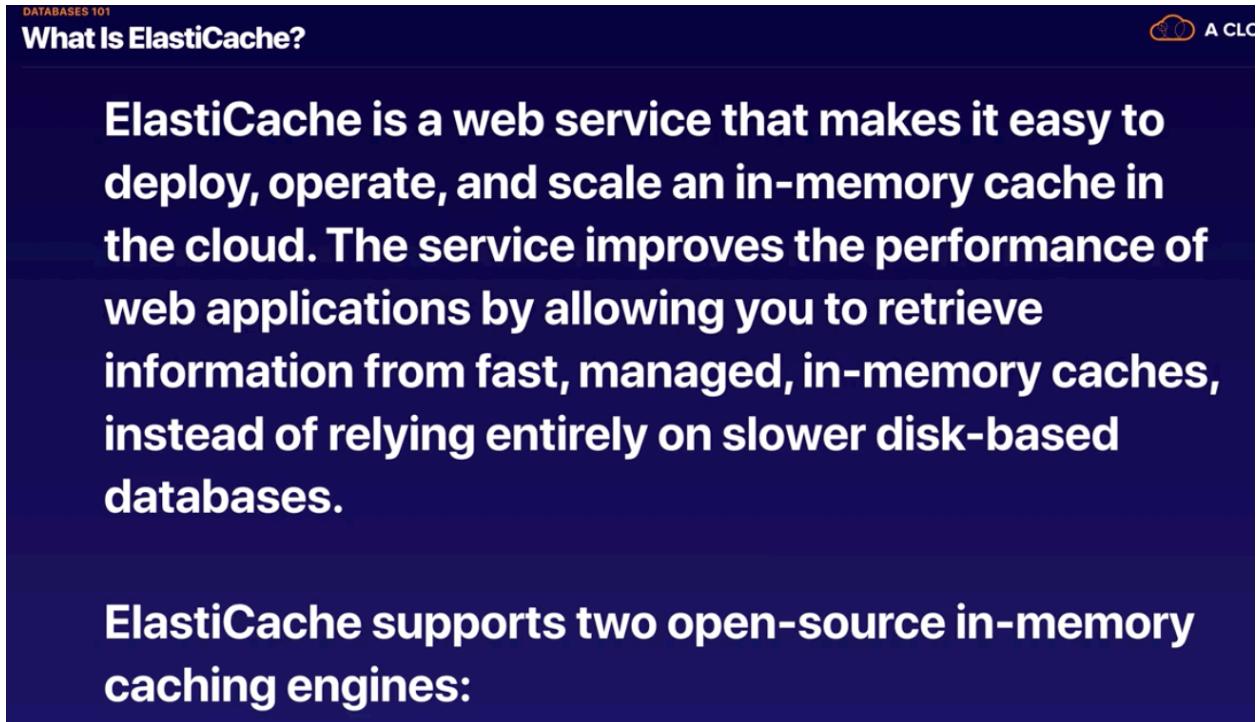
- Looking at each transaction vs analyzing the revenue , profit , business insight

For the purpose of Online Analytics since a massive load can hit the databases , datawarehouse solution comes to play . Creating different copy of different databases (no always allthe tables) in different servers for different purposes , so for instance the online analytics does not affect the production or customer services

Amazin Data Warehouse solution is

- Redshift

ElasticCache



ElastiCache is a web service that makes it easy to deploy, operate, and scale an in-memory cache in the cloud. The service improves the performance of web applications by allowing you to retrieve information from fast, managed, in-memory caches, instead of relying entirely on slower disk-based databases.

ElastiCache supports two open-source in-memory caching engines:

So imagine a scenario where in each second we have many people using amazon for shopping. Amazon always wants to suggest the popular products in each department; kitchen , bay, hardware . So, this is the most common queries for those department which is pulled and held in your elasticcache and uncommon queries goes to databases . So basically there is a copy of data related to popular ones always in elasticcache and for those products it hits the elastic cache for anything other than this it goes to databases.

Elastic Cache /:

- Memcahched
- Redis

Tips :

RDS:

- SQL
- MySQL
- PostgreSQL
- Oracle
- Aurora
- MariaDB

DynamoDB: solution for no sql

Red Shift OLAP: solution for Data Warehouse

- Having different databases for different purposes to take off the unnecessary load from the primary one and each will be serving for some different purposes (if the business wants to run the heavy analytical queries they need to query redshift)

ElasticCache :

- In memory caching solution in the clause and it takes off some heavy loads from your production servers
- Memcached
- Redis

Business intelligence go for data warehouse solution or redshift

Elastic speed up performance of existing databases for frequent identical queries

LAB (not tested in the exam)

- Provisioning an RDS instance
- Open My SQL port to the WEB_DMZ SG
 - o Let our instance to talk (receive) request from our web server (the one has WEB_DMZ SG (security group))
- Create a we bserver (ec2 instance)
- Install wordpress using boot strap scripting
- Register the EC2 to the target group
- Upload the DNS (loadbalancer) named ALB
- Take a snapshot

Important note :

After creating our instance in RDS (under Databases) we have to open up the port to web server sg

- Open the database , under connectivity and security , click on security ,
- We can see also the end point to the database
- Under the sg , we have to open ports for it
- We can add mysql and auro port 3306 and the source gonna be any instance with sg webDMZ

Boot strap script

```
#!/bin/bash
yum install httpd php php-mysql -y
amazon-linux-extras install -y php7.2
cd /var/www/html
wget https://wordpress.org/wordpress-5.4.1.tar.gz
tar -xzf wordpress-5.4.1.tar.gz
cp -r wordpress/* /var/www/html/
rm -rf wordpress
rm -rf wordpress-5.4.1.tar.gz
chmod -R 755 wp-content
chown -R apache:apache wp-content
service httpd start
chkconfig httpd on
```

we can have sql servers on our local ec2 but it wont be replicated unless we replicate the ec2 as well

we can take an image from our instance and then replicate it

AMI : Amazon Machine Image

So

In ec2 , we can take an image from our machine and then terminated it

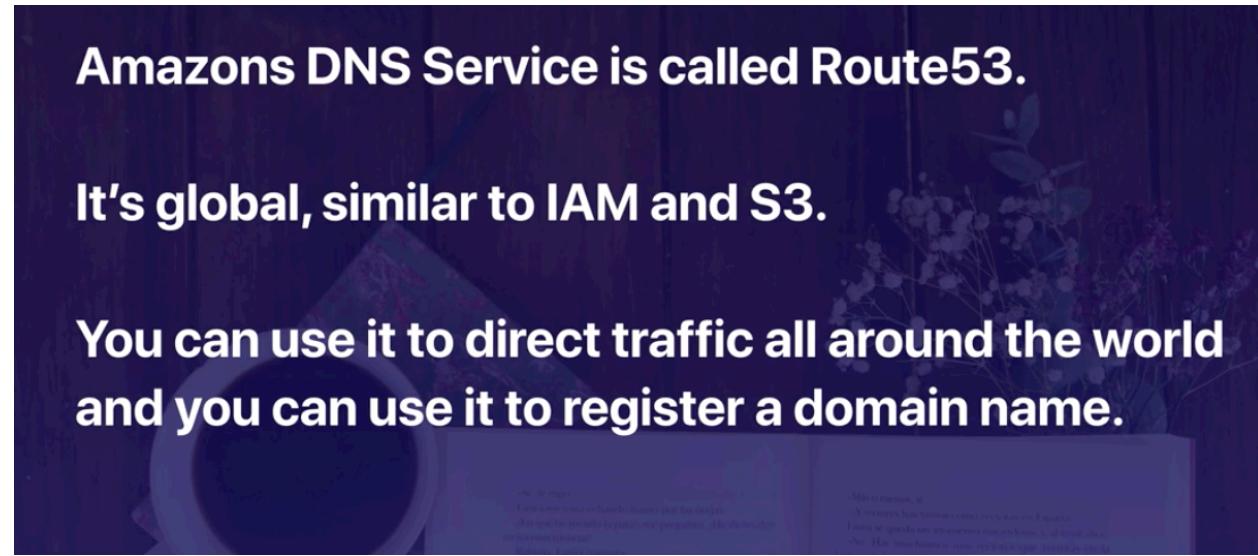
In autoscaling

- Launch configuration
 - o Using the AMI instead of booting a machine with boot starp or manually
 - o So in the configure details we can just put yum update -y to make sure the machine update itself immediately after it launches
- Auto scaling group
 - o Select the name
 - o Select the config name (from previous step)
 - o Add all the availability zone
 - It knows if an instance is initiated somewhere the next one should be in another availability zone
 - When we create the auto scaling , we attach it to our target group in load balancer

How we can buy a domain ?

DNS : Domain Name system , map a name to the IP address

- Using Amazon route 53 , amazon DNS service
- For that make sure the s3 bucket with that name you need to created and that s3 bucket shouldn't have been taken !
-



Elastic Beanstalk

So we create instance with all boost starp script , security group , load balancer , target ...
It will do that all by one click.

Deploying your application on the cloud and we don't need to set up instance and install php or anything else depending on our application on it. It takes care of it all by itself.

With Elastic Beanstalk, you can quickly deploy and manage applications in the AWS Cloud without worrying about the infrastructure that runs those applications. You simply upload your application, and Elastic Beanstalk automatically handles the details of capacity provisioning, load balancing, scaling, and application health monitoring.

CloudFormation :

Under Management and governance in console

It contains stacks maybe

- An ec2 instance
- As well as RDS
- Security groups
- Lambda
- Etc .
-
- It has a stack designer that design the stack for us all about the connectivity and different instances we need

AWS CloudFormation is a service that helps you model and set up your Amazon Web Services resources so that you can spend less time managing those resources and more time focusing on your applications that run in AWS. You create a template that describes all the AWS resources that you want (like Amazon EC2 instances or Amazon RDS DB instances), and AWS CloudFormation takes care of provisioning and configuring those resources for you. You don't need to individually create and configure AWS resources and figure out what's dependent on what; AWS CloudFormation handles all of that.

Elastic Beanstalk and CloudFormation are both FREE services, however the resources they provision (such as EC2 instances) are not free.

Elastic Beanstalk is limited in what it can provision and is not programmable. CloudFormation can provision almost any AWS service and is completely programmable.

Global AWS services

- IAM
- Route 53 : register domain name
- Cloud front : setting up a cloud front CDN is a global service
- roles
- SNS & SES

Some services gives global views but they are regional

- S3 : they are physically located somewhere but they have a global view

What services can be used on Premise ?

- Snowball : gigantic disk and they are shipped to your co , you upload everything there and send it back and amazon load it to s3

- Snowbell edge : using lambda function on your premise ,
 - When you don't have aws connectivity , somewhere in antarctica
 -
- Storage Gateway :
 - Stays on premise all time it could be storage or ec2 or can be virtual
 - Caching your files in your data center and replicate them in s3
 - If you were to lose internet connection your data still is available
- Code deploy
 - You can deploy code in your aws or on premise
- Opsworks
 - Is for deployment and automating your application code
- IoT Greengrass

Cloud watch :

- Monitoring services to monitor resources and your application
- Compute
 - EC2 instances
 - Autoscaling load balancer
 - Route 53 health check
- Storage and content delivery
 - EBS volume
 - Storage gateway
 - CloudFront
- Host Level metrics
 - CPU
 - Network
 - Disk
 - Status Check
 - We can create custom metrics

Remember;

- CloudWatch is used for monitoring performance.
- CloudWatch can monitor most of AWS as well as your applications that run on AWS.
- CloudWatch with EC2 will monitor events every 5 minutes by default.
- You can have 1 minute intervals by turning on detailed monitoring.
- You can create CloudWatch alarms which trigger notifications.
- CloudWatch is all about performance.

AWS System manager :

- Allows you to manage your EC2 instances at scale
- What if instead of two instance we have a fleet of ec2 and we want to update them all by Yum update -y or ssh into eachj of them and odoing something them
- What we can do is when we deploy our instances , we install a software on it that it connects the instance to AWS system manager
- AWS system manager can run commands and it would be deployed on every instance
-

Remember;

- CloudWatch is used for monitoring performance.
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- You can create CloudWatch alarms which trigger notifications.
- CloudWatch is all about performance.

Service Health Dashboard :

- Checking the health of each services in each region
- So it deos not talk about the services you are using , it s about all the services on AWS in each region
- Just google it
- Don't confuse with personal health dashboard

Personal Health dashboard :

- Which services I am using and what is the heath status of them
- Relevenat and up-to date info
- Provide prtoactive notification if any activity is scheduled
- You can make rules to notify you

S3 vs EBS vs EFS :

- S3 :
 - o Secure , durable and highly scalable object storage and stored across multiple Az
- EBS :
 - o Block Storage on the Cloud

- Elastic Block Store (EBS)
 - Good for OS
 - The data can be saved there but hard to make it public
 - Still we get some replication and availability but in the same AZ
 - Can be attached to multiple instances
- EFS :
- Elastic File System
 - It grows as the size of data grow
 - Centralize file system , content management system , data bases (it is not recommended)
 - Can be attached to multiple instances
 - Difference with EBS : EFS is elastic and the size is not fixed

Remember;

- Systems Manager can be used to manage fleets of EC2 instances & virtual machines.
- A piece of software is installed on each VM.
- Can be both inside AWS and on premise.
- Run Command is used to install, patch, uninstall software.
- Integrates with CloudWatch to give you a dashboard of your entire estate.

AWS Accelerator:

- Service that creates accelerators to improve the performance, scalability and availability of your applications

Uses Amazon's Dedicated Network

Global Accelerator sends your user's traffic through Amazon Web Service's global network infrastructure, improving your internet user performance by up to 60%. When the internet is congested, Global Accelerator's automatic routing optimizations will help keep your packet loss, jitter, and latency consistently low.

It uses the amazon network as backbone !

Uses Amazon's Dedicated Network

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QUESTION 5

True or False: To restrict access to an entire bucket, you use bucket control lists; and to restrict access to an individual object, you use object policies.



False



True

Good work!

To restrict access to an entire bucket, you use bucket policies; and to restrict access to an individual object, you use access control lists.

[Next question](#)

Rate this question

Amazon S3 access control lists (ACLs) enable you to manage access to buckets and objects. Each bucket and object has an ACL attached to it as a subresource. It defines which AWS accounts or groups are granted access and the type of access. When a request is received against a resource, Amazon S3 checks the corresponding ACL to verify that the requester has the necessary access permissions.

QUESTION 9

Which of the following Route 53 policies allow you to a) route data to a second resource if the first is unhealthy, and b) route data to resources that have better performance?

- Failover Routing and Latency-based Routing
- Geolocation Routing and Latency-based Routing
- Geoproximity Routing and Geolocation Routing
- Failover Routing and Simple Routing

Sorry!

Correct Answer

Failover Routing and Latency-based Routing are the only two correct options, as they consider routing data based on whether the resource is healthy or whether one set of resources is more performant than another. Any answer containing location based routing (Geoproximity and Geolocation) cannot be correct in this case, as these types only consider where the client or resources are located before routing the data. They do not take into account whether a resource is online or slow. Simple Routing can also be discounted as it does not take into account the state of the resources.

[Next question](#)

  Rate this question

QUESTION 10

Amazon Lightsail is an example of which of the following?

Software as a Service

Platform as a Service

Functions as a Service

Infrastructure as a Service

Sorry!

Correct Answer

Lightsail is AWS' Platform-as-a-Service offering.

Next question

Rate this question

QUESTION 19

Which of the following are Support Levels offered by AWS?

Choose 3

Start-up

Developer

Individual

Basic

Business

Sorry!

Correct Answer

The AWS Support levels are Basic, Developer, Business, and Enterprise.

Next question

Rate this question

QUESTION 22

Which of the following are characteristics of cloud computing?

Choose 3

Services are delivered via the Internet.

On-demand delivery

Pay-as-you-go pricing

Cloud charges are capital expenditures.

Sorry!

Correct Answer

Services incurred from a cloud services provider are operating expenses, not capital expenses. The other answers are correct.

Next question

Rate this question

QUESTION 24

True or False: Access Control Lists are used to make entire buckets (like one hosting an S3 website) public.

 True

 False

Sorry!

Correct Answer

Bucket Policies are used to make entire buckets (like one hosting an S3 website) public.

Next question

  Rate this question

QUESTION 27

True or False: A Distribution is what we call a series of Edge Locations that make up CDN.

 True

 False

Sorry!

Correct Answer

The collection of a CDN's Edge Locations is called a Distribution.

Next question

  Rate this question

QUESTION 28

Mark which statements are true regarding Lambda.

Choose 3

The resources section is the only required field in Lambda templates.

You can use JSON or YAML for Lambda templates.

Lambda can be used for Infrastructure as Code.

Lambda functions have a timeout of 5 minutes.

Good work!

True. The resources section is the only required field in Lambda templates.

True. You can use JSON or YAML for Lambda templates.

True. Lambda can be used for Infrastructure as Code.

[Next question](#)

  Rate this question

QUESTION 29

Which of the following are advantages of cloud computing?

Choose 4

- The ability to 'go global' in minutes
- Increased speed and agility
- Variable expense
- Elasticity - you need not worry about capacity.
- The capital expenditure (CapEx) funding model

Good work!

The 'pay-as-you-go' nature of cloud computing ensures that a large up-front capital expense is not required.

Next question

Rate this question

QUESTION 31

Which of the following is correct?

Number of Edge Locations is greater than the Number of Availability Zones. The number of Availability Zones are greater than the Number of Regions

Number of Availability Zones is greater than the Number of Regions. The Number of Regions is greater than the Number of Edge Locations

Number of Regions is greater than the Number of Availability Zones. The Number of Availability Zones is greater than Number of Edge Locations

Number of Availability Zones is greater than the Number of Edge Locations. The Number of Edge locations is greater than the Number of Regions

Sorry!

The number of Availability Zones is not the largest among these.

Correct Answer

The number of edge locations is greater than the number of Availability Zones, which is greater than the number of regions.

Next question

Rate this question

Pricing:

White paper is a must read .

https://d0.awsstatic.com/whitepapers/aws_pricing_overview.pdf

Conclusion

While the number and types of services offered by AWS have increased dramatically, our philosophy on pricing has not changed. You pay as you go, pay for what you use, pay less as you use more, and pay even less when you reserve capacity. Projecting costs for a use case, such as web application hosting, can be challenging, because a solution typically uses multiple features across multiple AWS products, which in turn means there are more factors and purchase options to consider.

Capex vs OPex :

Capex vs Opex

- Capex stands for Capital Expenditure which where you pay up front. It's a fixed, sunk cost.
- Opex stands for Operational Expenditure which is where you pay for what you use. Think of Utility billing such as electricity, gas, water etc.



The basic pricing policies are as follows :

- Pay as you go
- Pay less when you reserve
- Pay even less per unit by using more services
- Pay even less as AWS grows

To the best practice of pricing:

- Understand the fundamental of pricing
 - Compute
 - Storage
 - Data Outbound : data leaving your aws env
- Start early with cost optimization
 -
 -

When it comes to understanding pricing and optimizing your costs, it's never too early to start. It's easiest to put cost visibility and control mechanisms in place before the environment grows large and complex. Managing cost-effectively from the start ensures that managing cloud investments doesn't become an obstruction as you grow and scale.



When it comes to understanding pricing and optimizing your costs, it's never too early to start. It's easiest to put cost visibility and control mechanisms in place before the environment grows large and complex. Managing cost-effectively from the start ensures that managing cloud investments doesn't become an obstruction as you grow and scale.



- Maximize the power of flexibility

Maximize the power of flexibility

A CLOUD GURU

AWS services are priced independently and transparently, so you can choose and pay for exactly what you need and no more. No minimum commitments or long-term contracts are required unless you choose to save money through a reservation model. By paying for services on an as-needed basis, you can redirect your focus to innovation and invention, reducing procurement complexity and enabling your business to be fully elastic.



Maximize the power of flexibility

One of the key advantages of cloud-based resources is that you don't pay for them when they're not running. By turning off instances you don't use, you can reduce costs by 70 percent or more compared to using them 24/7. This enables you to be cost-efficient and, at the same time, have all the power you need when workloads are active.



- Use the right pricing principal model for the job
 - o On demand / dedicated / spot / reservations ; seems it is applicable to all instances not just s3

To help new AWS customers get started in the cloud, AWS offers a free usage tier. If you're a new AWS customer, you can run a free Amazon EC2 Micro Instance for a year while also leveraging a free usage tier for Amazon S3, Amazon Elastic Block Store, Amazon Elastic Load Balancing, AWS data transfer and other AWS services.

- o 100 % free :
 - AMAZON VPC : virtula data center in the cloud
 - That s where the little virtual machines live
 - Elastic Beanstalk :
 - If you don't know about the aws architecture , You don't need to be worry about the infrastructure just submit your application and it takes care of instances needed itself .
 - Cloud formation
 - If you are aware of the architecture , model it schematically and it creates everything for you
 - IAM
 - Auto Scaling
 - OPSworks
 - ???
 - Consolidating billing
- o What determines price ?
 - Clock hourse of instance
 - Instance type
 - Pridcing model
 - Spot./reserved/ etc
 - Number of instances
 - Load balancing
 - Network load balancing vs instance laod mbalancing
 - Detailed monitoring
 - Auto Scailing
 - ELASTIC IP Address
 - Operatuing systems and software packages
 - Windows is slightly more expensive than linux
- o EC2 pricing model
 - On demand
 - RESERVED
 - The more you pay upfront or longer contract the more discount
 - Spot
 - Dedicated

Lambda Pricing :

- Serverless
- It is like s3
- You pay for the execution time
- Request Pricing :
 - o Free tier : 1 million free request per month
 - o 20 cents per million request thereafter
- Duration pricing :

400 1865868

- o ,000GB second per month free up to 3.2 million seconds of compute time
- o 0.000016 for every gb-second used thereafter

- Additional charges :
 - o If lambda uses the other instances
 - o Or transfer data : read / write data to s3 for instance

EBS pricing :

- Elastic Block Storage
- Volume (per GB)
- Snapshots (GB)
- Data transfers

S3 pricing :

- Standard/ IA , 1 ZA IA etc
- Storage
- Request (get .., put , copy)
- Data Transfer

Glaciers pricing

- Storage
- Data retrieval time (the longer retrieval time the higher price)

Snowball :

- A large PB-Scale data transport solution used to securely transfer data in and out of the cloud
- Gigantic disk
- Service fee per job
 - o 50 tb
 - o 80 tb
- Daily charge
 - o First 10 days is free after that 15 per day
- Data transfer in to s3 is free. But out is not .
 - o They want to encourage you to stay on AWS .

RDS PRICING

- CLOCK HOURS OF server run: how many hours it runs
- Data Base Characteristics :
 - o Sql , my sql , aurora
- DataBase purchase type

- How large
- The number of database instances
- Provision storage
 - How big data bases are
- Additional instances
- Request
- Deployment type
- Data transfers

No sql (Dynamo Db) pricing :

- Provisioned through put write
- Provisioned through put read
- Data storage

Cloud Front : (CDN for AWS)

- Traffic distribution
- # of requests
- Data transfer out

Conclusion

While the number and types of services offered by AWS have increased dramatically, our philosophy on pricing has not changed. You pay as you go, pay for what you use, pay less as you use more, and pay even less when you reserve capacity. Projecting costs for a use case, such as web application hosting, can be challenging, because a solution typically uses multiple features across multiple AWS products, which in turn means there are more factors and purchase options to consider.

Tips :

Exam Tips

Capex vs Opex

- Capex stands for Capital Expenditure which where you pay up front. It's a fixed, sunk cost.
- Opex stands for Operational Expenditure which is where you pay for what you use. Think of Utility billing such as electricity, gas, water etc.

1

On Demand

Allows you to pay a fixed rate by the hour (or by the second) with no commitment.

2

Reserved

Provides you with a capacity reservation, and offer a significant discount on the hourly charge for an instance. Contract Terms are 1 Year or 3 Year Terms.

3

Spot

Enables you to bid whatever price you want for instance capacity, providing for even greater savings if your applications have flexible start and end times.

4

Dedicated Hosts

Physical EC2 server dedicated for your use. Dedicated Hosts can help you reduce costs by allowing you to use your existing server-bound software licenses.

Remember The Free Services

- **Amazon VPC**
- **Elastic Beanstalk**
- **CloudFormation**
- **Identity Access Management (IAM)**
- **Auto Scaling**
- **Opsworks**
- **Consolidated Billing**

—Sí, le digo.
Luisa me mira echando humo por las orejas.
—De qué hablando tú —me pregunta. Aludió a que
no tiene conciencia.
Roberto: Luisa contesta:
—No. Ahora es para escribir a uno, a ver si esa vez tengo
más suerte (los que lo han puesto —me enseñó una foto copia
y se murió; han dejado que no pueda leer que dice: son
muy malos imbéciles...) —dice a mi hermano.
Marcos y yo ponemos la antennita, dispuestos a apuntar sus
propiedades del cielo —en mi diario.
—Resalta que solo llamarás a Toto para hacerle las peticiones. El encuentro que nos acercó los dos, cuando estábamos