Using the AWS command line interface to launch an EC2 server

Ronald (Ryy) Glenn Thomas

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1 Introduction

This post suggests a straightforward strategy for quickly getting a secure `AWS EC2` server up and running.

In a separate post (here) we address the same task using the interactive Elastic Compute Cloud (EC2) dashboard. While its certainly instructive to use the EC2 console interface to set up a working environment in AWS and launch a custom server, it can become a tedious process after the first few repetitions. In this post we'll present a set of bash shell scripts to perform the same task, making use of the AWS command line interface (CLI).

To get started, install and configure the awscli app using the commands (on your mac workstation):

```
> brew install awscli
>  aws configure
```

NB In this post commands issued at the shell prompt are prefaced with a right arrow ">"

The aws app will initially ask for your IAM credentials. If you don't have an IAM ID, Appendix 1 (here) provides details on obtaining IAM credentials from the AWS interface. Additional instructions from Amazon for installing the AWS command line interface can be found (here).

Instructions to install the homebrew software management system on a mac can be found (here).

2 Scripts

Nine parameters (besides the IAM ID) are required to be set for automated instance (server) generation via the aws API. The first eight are likely to be static and we suggest you "hardcode" them as environment variables in your shell configuration file.

An example follows (with z-shell syntax):

Parameters 1) and 2) vpc_id and subnet_id refer to TBD. The default vpc_id is assigned by AWS and can be found on the EC2 dashboard. The default VPC will have two subnets. Select one from the EC2 dashboard in which to launch the instance (subnet_id).

Add the following lines to your .zshrc file:

```
>       export vpc_id="vpc-14814b73"
>       export subnet_id="subnet-f02c90ab"
```

Parameters 3), 4) and 5) `ami_id`, `storage_size` and `instance_type` define the operating system and the capabilities of the server.

Add the following three lines to your `.zshrc` file:

```
        export ami_id="ami-014d05e6b24240371"
        export instance_type="t2.micro"
        export storage_size="30"
```

Parameters 6) and 7) `key_name` and `security_grp` identify the ssh key-pair and the firewall:

```
        export key_name="power1_app"
        export security_grp="sg-0fef542d93849669c"
```

Parameter 8) is the `static_ip` that identifies the server on the web:

```
        export static_ip="13.57.139.31"
```

A ninth parameter `proj_name` can also be hardcoded or supplied at the time the script is called.

Below we offer four bash scripts.

1) The first creates a key pair to allow encrypted ssh communication between the server and your workstation.
2) The second generates a security group for the virtual server, i.e. a firewall.
3) The third script generates the virtual server taking physical server location, instance characteristics, firewall, static IP and project name as parameters.
4) The fourth script installs required software following server launch.

2.1 Create security group script

Generate security group: ‘

Example:

```
> aws_create_security_group.sh -s $proj_name -g -k
```

This version of the script creates a security group with options to open ports: 22, 80, 3838, 443, 9000, and 9001 with flags -g, -i, -j, -k, -l, -m respectively.

The default, i.e. no flags set, is to open 22 and 443 only. the security group name is set as the base directory name.

```
#!/usr/bin/env bash
Help()
{
echo  The script generates a new security group
echo  the group name is given with the -n flag.
echo  ports are specificed with the -p flag. Any number of ports can be listed
echo  Anticipated incoming ports are 22 ssh, 80 http, 3838 shiny and 443 https.
echo  Script will fail if group name is already in use on EC2.
echo  reads vpc_id from the environment variables set in .zshrc
echo  example usage for ports 22, 80 and 443:
echo  aws_create_security_group.sh -n power1_app  -p 22 -p 80 -p 443
}
sg_grp_name=`basename $PWD`
while getopts ":hp:n:" opt; do
    case $opt in
        p ) ports+=("$OPTARG") ;; # use the split+glob operator
        n ) sg_grp_name=$OPTARG ;;
        h ) Help
            exit ;;
        * ) echo 'error in command line parsing. Expect options n and p' >&2
            exit 1
    esac
done
echo "sg group name = $sg_grp_name"

aws ec2 create-security-group \
    --group-name $sg_grp_name \
    --description "security group" \
    --tag-specifications \
    "ResourceType=security-group,Tags=[{Key=Name,Value=$sg_grp_name}]" \
    --vpc-id $vpc_id  > temp.txt
wait
security_grp=`jq -r .GroupId temp.txt`
wait
echo "security group ID = $security_grp"

 for i in "${ports[@]}"
 do
   aws ec2 authorize-security-group-ingress \
    --group-id $security_grp \
    --protocol tcp \
    --port ${i} \
    --cidr "0.0.0.0/0" > /dev/null
 done
```

2.2 Create new key pair with a project name flag

Example usage: Note run with one parameter for optional key-pair name.

```
> aws_create_keypair.sh -k $keypair_name
```

```
#!/usr/bin/env bash
Help()
{
echo  The script generates a new keypair
echo  the keypair name is given with the -k flag.
echo  Script will fail if pair name is already in use on EC2.
echo  aws_create_keypair.sh -k power1_app
}
while getopts 'hk:' flag; do
  case "${flag}" in
    h) Help
      exit;;
    k) key_pair_name=${OPTARG};;
  esac
done
base=`basename $PWD`
if [ -z "$key_pair_name" ]
then
  key_pair_name=$base
fi
echo "key_pair_name is $key_pair_name"

cd ~/.ssh
rm -f  ~/.ssh/$key_pair_name.pem
aws ec2 create-key-pair  --key-name  $key_pair_name \
   --query 'KeyMaterial' --output text > ~/.ssh/$key_pair_name.pem

wait
chmod 400 ~/.ssh/$key_pair_name.pem
```

2.3 Generate instance

start up script. `> aws_create_instance.sh -p power1_app`

```


#!/usr/bin/env bash
Help()
{
echo "Notes on currect parameters:"
echo "security group should be in place already. check on EC2.  If not,
run ./awscli_create_security.sh.  "
echo "Key pair should be in place. check on EC2 and in ~/.ssh.
If not run ./create_keypair.sh. "
echo "ami id is for ubuntu linux 22.04 LTS.
If not what is desired check EC2 list of instances."
echo "Check static IP: nslookup IPaddress.
Should point to the domain name e.g.  rgtlab.org "
echo  Usage: >aws_create_instance.sh -p power1_app
echo ""
echo "Review parameters: "
echo "---"
echo "proj_name is $proj_name"
echo "keypair_name is $keypair_name"
echo "vpc_id: $vpc_id";
echo "subnet_id: $subnet_id";
echo "ami_id: $ami_id";
echo "security_grp: $security_grp";
echo "static_ip: $static_ip";
echo "type: $type";
echo "size: $size";
}
while getopts 'hp:' flag; do
  case "${flag}" in
    h) Help
      exit;;
    p) proj_name=${OPTARG};;
  esac
done
base=`basename $PWD`
if [ -z "$proj_name" ]
then
  proj_name=$base
fi

aws ec2 run-instances \
--image-id $ami_id \
--count 1 \
--instance-type $instance_type \
--key-name $keypair_name \
--security-group-ids $security_grp \
--subnet-id $subnet_id \
--block-device-mappings "[{\"DeviceName\":\"/dev/sda1\",\"Ebs\":{\"VolumeSize\":$storage_size}
--tag-specifications "ResourceType=instance,Tags=[{Key=Name,Value=$proj_name}]"  \
--user-data file://~/Dropbox/prj/c060/aws_startup_code.sh
 iid0=`aws ec2 describe-instances --filters "Name=tag:Name,Values=$proj_name" | \
    jq -r '.Reservations[].Instances[].InstanceId'`
echo $iid0
read -p "enter instance id:" iid
echo "instance id: $iid"
aws ec2 associate-address --public-ip $static_ip --instance-id $iid
```

aws_startup.sh

```
#!/bin/bash
apt update
# Add Docker and Docker Compose support to the Ubuntu's packages list
apt-get install curl -y
apt-get install gnupg -y
apt-get install ca-certificates -y
apt-get install lsb-release -y
sudo install -m 0755 -d /etc/apt/keyrings
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | \
  sudo gpg --dearmor -o /etc/apt/keyrings/docker.gpg
sudo chmod a+r /etc/apt/keyrings/docker.gpg
echo "deb [arch="$(dpkg --print-architecture)" \
signed-by=/etc/apt/keyrings/docker.gpg] https://download.docker.com/linux/ubuntu \
"$(. /etc/os-release && echo "$VERSION_CODENAME")" stable" | \
sudo tee /etc/apt/sources.list.d/docker.list > /dev/null
apt-get update
apt-get install docker-ce docker-ce-cli containerd.io docker-compose-plugin -y
su ubuntu -
usermod -aG docker ubuntu
```

Tip 1.

For convenience, construct a `config` file in `~/.ssh` as:

```
Host rgtlab.org
HostName 13.57.139.31 # static IP
User ubuntu # default user on ubuntu server
Port 22  # the default port ssh uses
IdentityFile ~/.ssh/power1_app.pem
```

then we can ssh into the new server with

```
sh> ssh rgtlab.org
```

Change the access permissions: `sudo chmod 600 power1ssh.pem` to be more restrictive.

3 Appendix 1 Set up AWS IAM

This appendix provides details on how to initiate batch processing via the `AWS CLI` desktop application.

From aws web site:

Log into the `AWS` console.

Search for `IAM service`. Navigate to `IAM dashboard`.

Select User groups. Create a user group based on the Power User profile.

Call it `admin`. Include `ryy_iam` in the `admin` group.

Select `Users` in left hand panel.

Then select `Create User` button (in upper right).

Then enter a `User name` in the form, say zenn. Click `Next` (lower right)

Then `Create User`.

Click on the user name

In the page that comes up. Select `Security Credentials` tab (center of page).

Under `Access Keys` panel click `Create access key` (left side or bottom of panel).

Click `Command Line Interface CLI`

and at the bottom of the page click the checkbox "I understand...".

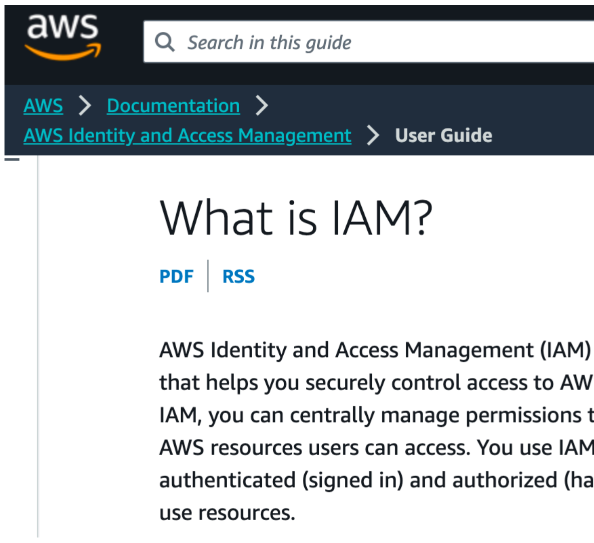
Finally select `Create access key` and

choose `Download .csv file` (lower right).

Navigate Download screen to local `~/.aws` directory.(may need shift-cmd-. on mac)

Click `Done`

Now in the terminal on your workstation, configure the aws cli app via the command.



What is IAM?

AWS Identity and Access Management (IAM)
that helps you securely control access to AW
IAM, you can centrally manage permissions t
AWS resources users can access. You use IAM
authenticated (signed in) and authorized (ha
use resources.

Figure 1: IAM description

"AWS Identity and Access Management (IAM) is a web service that helps you securely control access to AWS resources."

```
> aws configure
```

Using cut and paste enter info from the credentials file just downloaded. After entering the `AWS Access Key ID` and `AWS Secret Access Key` information you will be asked for a `Region`, (our region is `us-west-1`), and an output format (suggested output format is `JSON`).

4 Appendix. Sample work session

Start from scratch. Assume the following:

1. `aws cli` is configured.
2. no security group has been defined
3. no key pair has been generated
4. `vpc ID` and `subnet ID` are known and stored as environment variables.

5. project name is `power1_app`

Tip – In the `AWS` Console, in the navigation pane, select `your VPCs`. The `VPC` page lists the `vpc_id` and the subnets `subnet_id`.

In the following we'll spin up a ubuntu server (AMI) with type `t2-micro` (1 vCPU and 1gb memory) and 30 GB (size) hard drive.

step 1. Generate a security group named `power1_app`, and get the `security_grp` from the script output and store it as an environment variable.

```
> aws_create_security_group.sh -n power1_app -p 22 -p 80 -p 443
```

step 2. add key pair with name `power1_app`

```
aws_create_keypair.sh -k power1_app
```

step 3. get a new elastic IP address and add it to z-shell configuration file. and modify ssh config file to add the IP address and the ssh private key name. if new IP is: 204.236.167.50

```
sed -i '.bak' '/static/d' ~/.config/zsh/.zsh_export
sed -i '.bak' '/security/d' ~/.config/zsh/.zsh_export
echo "export static_ip='204.236.167.50'" >> ~/.config/zsh/.zsh_export
echo "export security_grp='sg-0fda72c2879d6b2ad'" >> ~/.config/zsh/.zsh_export
```

Generate instance:

```
aws_create_instance.sh -p power1_app
```

```
cd ~/.ssh
sed -i '.bak' '/HostName/d' config
echo "export HostName='204.236.167.50'" >> config
```

5 Appendix. Undo

- To remove the AWS instance and Gitlab elements of a project do the following:
- log into AWS/EC2 console
- Terminate instance (`Instance state` menu)
- delete security group (`Network & Security` tab, `Actions` menu)
- release IP address (`Network & Security` tab, `Actions` menu)
- delete SSH key pair (`Network & Security` tab, `Actions` menu)
- Log into Gitlab (`gitlab.com`)
- Delete project(s) (project/settings/General/advanced)