

Using the AWS command line interface to launch an EC2 server

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Table of contents

1	Introduction	1
2	Scripts	2
2.1	Create security group script	3
2.2	Create new key pair with a project name flag . .	7
2.3	Generate instance	8
2.4	Appendix 1 Set up AWS IAM	12
3	Sample work session	13
4	Appendix 2 Undo	15

1 Introduction

The goal of this post is to provide a straightforward solution to quickly getting a secure AWS EC2 server up and running.

This post follows a separate post ([here](#)) where we discuss setting up a virtual server on Amazon Web Services (AWS) using the interactive Elastic Compute Cloud (EC2) dashboard. While its definitely instructive to use the EC2 console interface to



Photo by Nathan Waters

set up a work environment and launch a custom server, it can become a tedious process after the first few repetitions. In this post we'll present **bash** shell scripts to perform the same task, making use of the AWS command line interface (CLI).

To get started: on your **mac** workstation, install and configure the **aws cli** app via the commands: (commands issued at the shell prompt are prefaced with a right arrow **>**)

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

Instructions to install the homebrew system on a mac can be found ([here](#)) The app will open a dialog asking for your **IAM** credentials. If you don't have an **IAM ID**, Appendix 1 ([here](#)) provides details on obtaining **IAM** credentials from your **AWS** account.

Additional instructions from **Amazon** for installing the **AWS CLI** can be found ([here](#)).

2 Scripts

Nine parameters (besides the **IAM ID**) are required to be set for automated instance (server) generation. The first eight are likely to be static and we suggest you “hardcode” them in the scripts or assign them as environment variables in your shell configuration file, e.g. **.zshrc**.

An example follows:

Parameters 1) and 2) **vpc_id** and **subnet_id** are determined by user's location and can be found on the **EC2** dashboard.

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

Parameters 3), 4) and 5) **ami_id**, **storage_size** and **instance_type** define the OS and capabilities of the server

```
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"
```

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 domain 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 power1_app -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 -s flag.
    echo  ports 22, 80, 3838 and 443 are options. use flags g,i,j,k respectively.
    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 all ports 22, 80, 3838 and 443:
    echo  aws_create_security_group.sh -s power1_app -g -i -j -k
}
g_flag='false'
i_flag='false'
j_flag='false'
k_flag='false'
l_flag='false'
m_flag='false'

while getopts 'ghijklms:' flag; do
    case "${flag}" in
        h) Help
            exit;;
        g) g_flag='true' ;;
        i) i_flag='true' ;;
        j) j_flag='true' ;;
        k) k_flag='true' ;;
        l) l_flag='true' ;;
        m) m_flag='true' ;;
        s) sg_grp_name=${OPTARG};;
    esac
done

# set defaults
# if $1 (?) the number of options set is 0 then
#
#   # g_flag='true' ;;
```

```

    # k_flag='true' ;;
#
if [ "$#" -eq 0 ]; then
    echo "default settings: 22 and 443."
    Project name will be set to directory base name"
    base=`basename $PWD`
    sg_grp_name=$base
    g_flag='true'
    k_flag='true'
fi

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

if [ $g_flag == "true" ]
then
    echo "ssh access set "
    aws ec2 authorize-security-group-ingress \
        --group-id $security_grp \
        --protocol tcp \
        --port 22 \
        --cidr "0.0.0.0/0" > /dev/null 2> /dev/null
fi

if [ $k_flag == "true" ]
then
    echo "https access set"
    aws ec2 authorize-security-group-ingress \
        --group-id $security_grp \
        --protocol tcp \

```

```

        --port 443 \
        --cidr "0.0.0.0/0" > /dev/null 2> /dev/null

fi

if [ $i_flag == "true" ]
then
echo "http access set"
aws ec2 authorize-security-group-ingress \
    --group-id $security_grp \
    --protocol tcp \
    --port 80 \
    --cidr "0.0.0.0/0" > /dev/null 2> /dev/null

fi

if [ $j_flag == "true" ]
then
echo "shiny access set"
aws ec2 authorize-security-group-ingress \
    --group-id $security_grp \
    --protocol tcp \
    --port 3838 \
    --cidr "0.0.0.0/0" > /dev/null 2> /dev/null

fi

if [ $l_flag == "true" ]
then
echo "test port 9000 access set"
aws ec2 authorize-security-group-ingress \
    --group-id $security_grp \
    --protocol tcp \
    --port 9000 \
    --cidr "0.0.0.0/0" > /dev/null 2> /dev/null

fi

if [ $m_flag == "true" ]
then

```

```

echo "test port 9001 access set"
aws ec2 authorize-security-group-ingress \
    --group-id $security_grp \
    --protocol tcp \
    --port 9001 \
    --cidr "0.0.0.0/0" > /dev/null 2> /dev/null

fi

```

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 -p $key_name
```

```

#!/usr/bin/env bash
base=`basename $PWD`
if [ -z "$1" ]
then
    key_pair_name=$base
else
    key_pair_name="$1"
fi

echo "key_pair_name is $key_pair_name"

read -p "Continue (y/n)?" CONT
if [ "$CONT" = "y" ]; then
    echo "Here we go!";
else
    echo "too bad. bye."; exit;
fi

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 600 ~/.ssh/$key_pair_name.pem
```

2.3 Generate instance

start up script. `aws_create_instance.sh`

```
#!/usr/bin/env bash
while getopts s:t:k:p: flag
do
    case "${flag}" in
        s) size=${OPTARG};;
        t) type=${OPTARG};;
        k) key_name=${OPTARG};;
        p) proj_name=${OPTARG};;
    esac
done
base=`basename $PWD`
if [ -z "$proj_name" ]
then
    proj_name=$base
fi

if [ -z "$type" ]
then
    type="t2.micro"
fi

if [ -z "$size" ]
then
    size=30
fi

echo "Review parameters: "
echo "----"
```



```

echo "proj_name is $proj_name"
echo "key_name is $key_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";

read -p "Review Notes (y/n)?" NOTES
if [ "$NOTES" = "y" ]; then
echo "Notes on current parameters:"
echo "security group should be in place already. check on EC2.
If not, run ./awscli_create_security.sh.
Key pair should be in place. check in ~/.ssh.
If not run ./create_keypair.sh.
ami id is for ubuntu linux 22.04 LTS.
If not what is desired check EC2 list of instances.
Check static IP: nslookup IPaddress. Should point to the domain name e.g. rgtlab.org ";
else
    echo "I guess you know what you're doing";
fi

read -p "Continue (y/n)?" CONT
if [ "$CONT" = "y" ]; then
    echo "Here we go!";
else
    echo "too bad. bye."; exit;
fi

#cd ~/.ssh
#rm -f ~/.ssh/$proj_name.pem
#aws ec2 create-key-pair --key-name $proj_name \
# --query 'KeyMaterial' --output text > ~/.ssh/$proj_name.pem
#
#wait
#chmod 600 ~/.ssh/$proj_name.pem

```

```

aws ec2 run-instances \
  --image-id $ami_id \
  --count 1 \
  --instance-type $type \
  --key-name $key_name \
  --security-group-ids $security_grp \
  --subnet-id $subnet_id \
  --block-device-mappings "[{\"DeviceName\":\"/dev/sda1\",\"Ebs\":{\"VolumeSize\":$size}}]" \
  --tag-specifications "ResourceType=instance,Tags=[{Key=Name,Value=$proj_name}]" \
  --user-data file://~/Dropbox/prj/c060/aws_startup_code.sh

#
# wait
iid0=`aws ec2 describe-instances --filters "Name=tag:Name,Values=$proj_name" | \
jq -r '.Reservations[].Instances[].InstanceId'`
echo $iid0
# aws ec2 wait instance-running --instance-ids $iid
# echo "the generated instance has ID: $iid"
# running=`aws ec2 describe-instance-status --instance-id $iid
# echo "the instance status is $running"
read -p "enter instance id:" iid
echo "instance id: $iid"
aws ec2 associate-address --public-ip $static_ip --instance-id $iid
#wait
#ssh -o "StrictHostKeyChecking no" rgtlab.org \
  #'cd docker_compose_power1_app; sudo docker compose up -d'

```

aws_startup.sh

```

#!/bin/bash
apt update
# apt upgrade
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

```

```

### Add Docker and docker compose support to the Ubuntu's packages list

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
### Install docker and docker compose on Ubuntu
apt-get install docker-ce docker-ce-cli containerd.io docker-compose-plugin -y
apt install neovim -y
apt install exa trash-cli ripgrep -y
apt install zsh -y
curl -fLo ~/.vim/autoload/plug.vim --create-dirs \
  https://raw.githubusercontent.com/junegunn/vim-plug/master/plug.vim
su ubuntu -
usermod -aG docker ubuntu
sudo chsh -s $(which zsh)
# install oh my zsh, with zsh-z and zsh-autosuggestions plugins
sh -c "$(curl -fsSL
https://raw.githubusercontent.com/ohmyzsh/ohmyzsh/master/tools/install.sh)" \
"" --unattended
echo "alias lt='exa -lrFha -sold'" >> .zshrc
echo "alias tp='trash-put -v'" >> .zshrc

git clone https://github.com/zsh-users/zsh-autosuggestions \
${ZSH_CUSTOM:-- ~/.oh-my-zsh/custom}/plugins/zsh-autosuggestions
git clone https://github.com/MichaelAquilina/zsh-you-should-use.git \
${ZSH_CUSTOM}/plugins/you-should-use

```

💡 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.

2.4 Appendix 1 Set up AWS IAM

This appendix provides details on how to initiate batch processing via the AWS CLI desktop application. Start by launching the `aws configure` program.

From aws web site:

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

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 **poweruser**. Include **zenn** in the **poweruser** 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

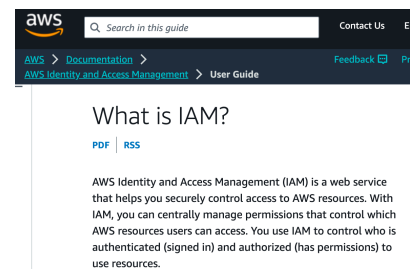


Figure 1: IAM description

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.

```
> 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 are asked for a **Region**, (my region is `us-west-1`), and an output format (suggested output format is `JSON`).

3 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` known and stored as environment variables.
5. project name is `power1_app`

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 security group named `power1_app`, and get the SG ID from the script output and store it as an environment variable.

```
Note
2023-10-24 17:25:06
compare code from
aws_create_security_group.sh
and
aws_create_security_group_rapid.sh

> aws_create_security_group.sh
> echo "export subnet_id='sg-0fda72c2879d6b2ad'" >> ~/.zshrc
```

step 2. add key pair with name `power1_app`

```
aws_create_keypair.sh 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

```
echo "export static_ip='204.236.167.50'" >> ~/.zshrc
```

Generate instance: `aws_create_instance.sh -p power1_app`

```
sed -i '.bak' '/HostName/d' config
sed -i '.bak' '/IdentityFile/d' config
echo "HostName 204.236.167.50" >> ~/.ssh/config
echo "IdentityFile ~/.ssh/power1_app.pem" >> ~/.ssh/config

scp -i "~/.ssh/power1_app.pem" -r ~/prj/c060/docker_compose_power1_app/ \
  ubuntu@rgtlab.org:~
ssh rgtlab.org
cd docker_compose_power1_app/
sudo docker-compose up -d
```

4 Appendix 2 Undo

- To remove the AWS instance and Gitlab elements of project do the following:
-
- log into AWS/EC2 console
-
- Terminate instance
-
- delete security group
-
- release IP address
-
- delete SSH key pair
-
- Log into Gitlab
-
- Delete project(s) settings/General/advanced