Lab guide for Devops Hands On with Github, Packer, Terraform, Ansible and Jenkins

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Harman Connected Services

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Document Revision History

Version	Date	Author	Reviewed By	Comments
0.1	28.05.2019	Deepthi Manjunath	Rahul Chaudhari	Initial draft
1.0	30.05.2019	Soham Roy	Rahul Chaudhari	Added Jenkins and other minor amendments

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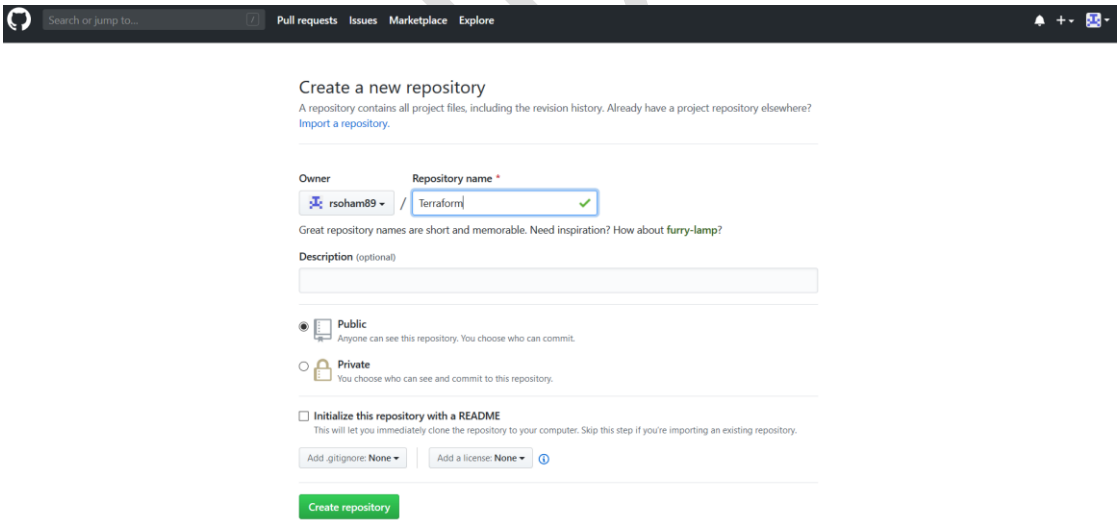
Assignment 1: Create a small web project and Push to Github Repository **(15 min)**

Pre-requisite: Git is installed in your desktop and configured

1. Create a new folder (which serves as your local git repo) and add file with the following contents and save it as **index.html**

```
<!DOCTYPE html>
<html>
  <body>
    <h1>Welcome to The World Of Devops</h1>
    <p>My First Project in Harman</p>
  </body>
</html>
```

2. Create a github repository by logging into your personal github account (https://github.com/) Go to 'Repository -> New -> Repository Name (ex: terraform)



3. Push the local index.html to the remote repository using below commands

```
$ git init
$ git add .
$ git status
$ git commit -m "your comment"
$git status
$ git remote add origin https://<your repository url>
$git push origin master
```

*N.B. You may or may not need to provide your git credentials based on your configuration

Summary of the exercise:

You have learnt

- Step by step procedure to create a local repository and add files to the remote repository
- Remember to keep checking the git status at any interval

Assignment 2: Use packer to create image on AWS **(30 mins)**

Pre-requisite: Download Ubuntu 18.04 LTS from Microsoft Store in your desktop and have it up and running.

1. Open Ubuntu and use the below commands to install packer

```
$ export VER="1.4.1"
$ wget
https://releases.hashicorp.com/packer/${VER}/packer_${VER}_linux_amd64.zip
$ Unzip packer_${ver}_linux_amd64.zip
$ sudo mv packer /usr/local/bin
```

2. Verify the installation by running below command

```
$ packer -v
```

The output will give you the version number:

```
root@HIBOCL72613:/home/sroy2# packer -v
1.4.1
```

3. Create a file **packer.json** and copy the following contents:

```
{
  "variables": {
    "aws_access_key": "",
    "aws_secret_key": "",
    "region":       "eu-central-1"
  },
  "builders": [
    {
      "access_key": "{{user `aws_access_key`}}",
      "ami_name": " miniprj _xxxxx_ami",
      "instance_type": "t2.micro",
      "region": "eu-central-1",
      "secret_key": "{{user `aws_secret_key`}}",
      "source_ami_filter": {
       "filters": {
       "virtualization-type": "hvm",
       "name": "ubuntu/images/*ubuntu-xenial-16.04-amd64-server-*",
       "root-device-type": "ebs"
       },
       "owners": ["099720109477"],
       "most_recent": true
      },
      "ssh_username": "ubuntu",
      "type": "amazon-ebs"
    }
  ],
  "provisioners": [

    {
      "type": "shell",
      "script": "./install-tools.sh"
    }

  ]
}
```

****N.B.** In below packer.json, add your AWS account credentials in "aws_access_key" and "aws_secret_key" Give the "ami_name" replace xxxxx with your name to uniquely identify each ami.

You can see inside packer json there are two parts: builders and provisioners. Builders section is used to form the metadata of the ami while provisioners section is used to install packages and run other commands for creating the objects of the ami. Here in this case we are running the **install-tools.sh** command to install ansible, Jenkins and awscli inside the image.

4. Create the file install-tool.sh

```
#!/bin/bash
sudo apt-get update
sudo apt-get install software-properties-common -y
sudo apt-add-repository ppa:ansible/ansible
sudo apt-get update
sudo apt-get install ansible -y
sudo apt-get install openjdk-8-jdk -y
wget -q -O - https://pkg.jenkins.io/debian/jenkins.io.key | sudo apt-key add -
sudo sh -c 'echo deb http://pkg.jenkins.io/debian-stable binary/ >
/etc/apt/sources.list.d/jenkins.list'
sudo sh -c 'echo deb http://pkg.jenkins.io/debian-stable binary/ >
/etc/apt/sources.list.d/jenkins.list'
sudo apt-get update
sudo apt-get install jenkins -y
sudo apt-get install awscli -y
```

5. Vaildate the packer.json file

```
$ packer validate packer.json
```

You should see the output:

```
root@HIBOCL72613:/home/sroy2# packer validate packer.json
Template validated successfully.
```

This indicates that the packer file is valid and you are good to go to create the ami.

6. Run the following command to create the ami

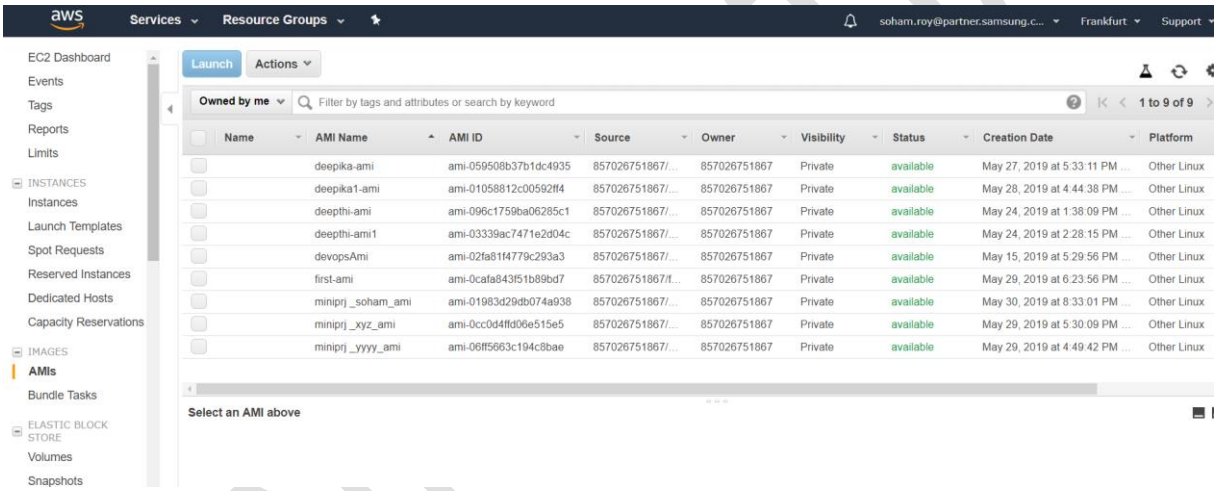
```
$ packer build packer.json
```

This will create a new image under the AMIs section of your EC2 service. You'll see an output ending like this:

```
    amazon-ebs: Preparing to unpack .../jenkins_2.164.3_all.deb ...
    amazon-ebs: Unpacking jenkins (2.164.3) ...
    amazon-ebs: Processing triggers for man-db (2.7.5-1) ...
    amazon-ebs: Processing triggers for ureadahead (0.100.0-19.1) ...
    amazon-ebs: Processing triggers for systemd (229-4ubuntu21.21) ...
    amazon-ebs: Setting up daemon (0.6.4-1) ...
    amazon-ebs: Setting up jenkins (2.164.3) ...
    amazon-ebs: Processing triggers for ureadahead (0.100.0-19.1) ...
    amazon-ebs: Processing triggers for systemd (229-4ubuntu21.21) ...
==> amazon-ebs: Stopping the source instance...
    amazon-ebs: Stopping instance
==> amazon-ebs: Waiting for the instance to stop...
==> amazon-ebs: Creating AMI  miniprj _soham_ami from instance i-0ecff67a5770bf2ea
    amazon-ebs: AMI: ami-01983d29db074a938
==> amazon-ebs: Waiting for AMI to become ready...
==> amazon-ebs: Terminating the source AWS instance...
==> amazon-ebs: Cleaning up any extra volumes...
==> amazon-ebs: No volumes to clean up, skipping
==> amazon-ebs: Deleting temporary security group...
==> amazon-ebs: Deleting temporary keypair...
Build 'amazon-ebs' finished.

==> Builds finished. The artifacts of successful builds are:
--> amazon-ebs: AMIs were created:
eu-central-1: ami-01983d29db074a938
```

7. Check your image on the AWS console



Summary of the exercise:

You have learnt

- Step by step procedure to install packer
- Create an ubuntu image with packer

Assignment 3: Use terraform to create server using custom AMI **(30 mins)**

1. Install terraform on your local Ubuntu

$ sudo apt-get install terraform

2. Generate a key-pair using the below command and provide a filename (ex: ./new-key-pair.pem):

$ ssh-keygen -t rsa

The output should look like this:

```
root@HIBOCL72613:/home/sroy2# ssh-keygen -t rsa
Generating public/private rsa key pair.
Enter file in which to save the key (/root/.ssh/id_rsa): ./new_key_2.pem
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in ./new_key_2.pem.
Your public key has been saved in ./new_key_2.pem.pub.
The key fingerprint is:
SHA256:[redacted]Dw root@HIBOCL72613
The key's randomart image is:
+---[RSA 2048]----+
| .oB=o .o        |
| .*o+ o+ E       |
| ..+ + o@ .      |
|o * o +* +       |
|.*.o.+. S        |
|o...ooo+         |
| . o.++o.        |
|  . ..o..        |
|       .         |
+----[SHA256]-----+
```

You should see two files (1 pem file and 1 pem.pub file).

```
root@HIBOCL72613:/home/sroy2# ls -lrth new_key*
-rw------- 1 root root 1.7K May 30 23:19 new_key_2.pem
-rw-r--r-- 1 root root  398 May 30 23:19 new_key_2.pem.pub
```

3. Create a file terraform.tf

```
provider "aws" {
        access_key = "<your access key>"
        secret_key = "< your secret access key>"
        region = "eu-central-1"
}
resource "aws_key_pair" "new_key" {
  key_name="<key_pair_name>"
  public_key="<content of you public key> "
}

resource "aws_instance" "first_instance" {
        ami = "< ami id of the mage you created with packer>"
        instance_type = "t2.micro"
        key_name = "${aws_key_pair.new_key.key_name}"
        tags {
         Name = "<name of the instance>"
        }
}
```

4. Use the below command to check for validation of the tf file

```
$ terraform plan
```

This should give you the total number of resources to be created in the AWS cloud (in this case 1 instance and 1 key file).

The command output should end like this:

```
Plan: 2 to add, 0 to change, 2 to destroy.

------------------------------------------------------------------------

Note: You didn't specify an "-out" parameter to save this plan, so Terraform
can't guarantee that exactly these actions will be performed if
"terraform apply" is subsequently run.
```

5. Now you are good to go to create your first server on AWS cloud via terraform. Use the below command to perform the same:

```
$ terraform plan
```

You will need to press yes to continue

The final output will look like this:

```
aws_key_pair.new_key: Creation complete after 0s (ID: new_key_2)
aws_instance.first_instance: Creating...
  ami:                          "" => "ami-01983d29db074a938"
  arn:                          "" => "<computed>"
  associate_public_ip_address:  "" => "<computed>"
  availability_zone:            "" => "<computed>"
  cpu_core_count:               "" => "<computed>"
  cpu_threads_per_core:         "" => "<computed>"
  ebs_block_device.#:           "" => "<computed>"
  ephemeral_block_device.#:     "" => "<computed>"
  get_password_data:            "" => "false"
  host_id:                      "" => "<computed>"
  instance_state:               "" => "<computed>"
  instance_type:                "" => "t2.micro"
  ipv6_address_count:           "" => "<computed>"
  ipv6_addresses.#:             "" => "<computed>"
  key_name:                     "" => "new_key_2"
  network_interface.#:          "" => "<computed>"
  network_interface_id:         "" => "<computed>"
  password_data:                "" => "<computed>"
  placement_group:              "" => "<computed>"
  primary_network_interface_id: "" => "<computed>"
  private_dns:                  "" => "<computed>"
  private_ip:                   "" => "<computed>"
  public_dns:                   "" => "<computed>"
  public_ip:                    "" => "<computed>"
  root_block_device.#:          "" => "<computed>"
  security_groups.#:            "" => "<computed>"
  source_dest_check:            "" => "true"
  subnet_id:                    "" => "<computed>"
  tags.%:                       "" => "1"
  tags.Name:                    "" => "terraform-soham-instance"
  tenancy:                      "" => "<computed>"
  volume_tags.%:                "" => "<computed>"
  vpc_security_group_ids.#:     "" => "<computed>"
aws_instance.first_instance: Still creating... (10s elapsed)
aws_instance.first_instance: Still creating... (20s elapsed)
aws_instance.first_instance: Still creating... (30s elapsed)
aws_instance.first_instance: Creation complete after 34s (ID: i-048480db98e91e00b)

Apply complete! Resources: 2 added, 0 changed, 2 destroyed.
```

You might not see any resource destroyed in your case.

6. Once the instance is created, log in to that instance and check if Jenkins, aws cli, Ansible are installed.

```
$ ssh -i "<your key name>" ubuntu@<public ip or dns>
```

7. Now you are inside the server use the command one by one to check whether ansible and Jenkins have been installed or not:

```
$ ansible –version

$sudo systemctl status Jenkins
```

You will be able to see ansible version and Jenkins status active.

```
ubuntu@ip-172-31-40-218:~$ ansible --version
ansible 2.8.0
  config file = /etc/ansible/ansible.cfg
  configured module search path = [u'/home/ubuntu/.ansible/plugins/modules', u'/usr/share/ansible/plugins/modules']
  ansible python module location = /usr/lib/python2.7/dist-packages/ansible
  executable location = /usr/bin/ansible
  python version = 2.7.12 (default, Nov 12 2018, 14:36:49) [GCC 5.4.0 20160609]
ubuntu@ip-172-31-40-218:~$
ubuntu@ip-172-31-40-218:~$
ubuntu@ip-172-31-40-218:~$
ubuntu@ip-172-31-40-218:~$ sudo systemctl status jenkins
● jenkins.service - LSB: Start Jenkins at boot time
   Loaded: loaded (/etc/init.d/jenkins; bad; vendor preset: enabled)
   Active: active (exited) since Thu 2019-05-30 18:39:56 UTC; 7min ago
     Docs: man:systemd-sysv-generator(8)
  Process: 1263 ExecStart=/etc/init.d/jenkins start (code=exited, status=0/SUCCESS)
    Tasks: 0
   Memory: 0B
      CPU: 0

May 30 18:39:53 ip-172-31-40-218 systemd[1]: Starting LSB: Start Jenkins at boot time...
May 30 18:39:55 ip-172-31-40-218 jenkins[1263]: Correct java version found
May 30 18:39:55 ip-172-31-40-218 jenkins[1263]:  * Starting Jenkins Automation Server jenkins
May 30 18:39:55 ip-172-31-40-218 su[1390]: Successful su for jenkins by root
May 30 18:39:55 ip-172-31-40-218 su[1390]: + ??? root:jenkins
May 30 18:39:55 ip-172-31-40-218 su[1390]: pam_unix(su:session): session opened for user jenkins by (uid=0)
May 30 18:39:56 ip-172-31-40-218 jenkins[1263]:    ...done.
May 30 18:39:56 ip-172-31-40-218 systemd[1]: Started LSB: Start Jenkins at boot time.
ubuntu@ip-172-31-40-218:~$
```

8. We will use Jenkins later so we'll configure the aws credentials in 'jenkins' user:

$ sudo su - jenkins

$ aws configure

You'll be needed to ask the access and secret access key is here. Please provide the same:

```
ubuntu@ip-172-31-40-218:~$ aws configure
AWS Access Key ID [None]: [redacted]
AWS Secret Access Key [None]: [redacted]
Default region name [None]: eu-central-1
Default output format [None]: json
```

Summary of the exercise:

You have learnt

- Step by step procedure to install terraform
- Use terraform to create server on AWS
- Configuring aws keys on server

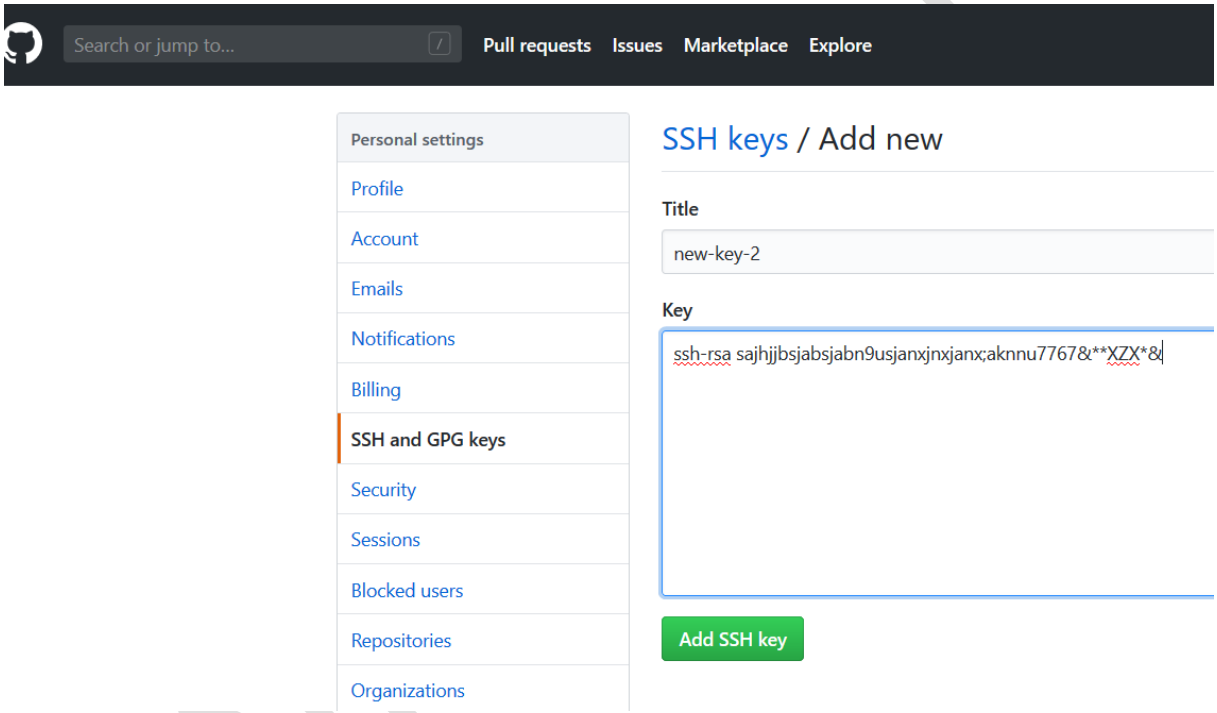
Assignment 4: Use ansible-pull to download the index.html from Github **(10 mins)**

Pre-requisite: Create the following directory in your instance.

/var/projects/ansible-git/

1. First of all you need to create a key-based authentication between github and your server.

Go to github.com -> settings -> SSH and GPG keys -> New SSH Key -> paste the public key here



2. Store the private key in your server (ex: new_key_2.pem).
3. Go back to the instance and run the following commands:

```
$ url='your git url'

$ checkout='master'

$ directory='/var/projects/ansible-git'

$ logfile='/var/log/ansible.log'

$ ssh_file='<your key name>'

$ sudo ansible-pull -o -C ${checkout} -d ${directory} -i localhost:${directory}/inventory -U ${url} --accept-host-key $ssh_file 2>&1
```

Go to /var/projects/ansible-git' and list the files to see "**index.html**" in it.

Summary of the exercise:

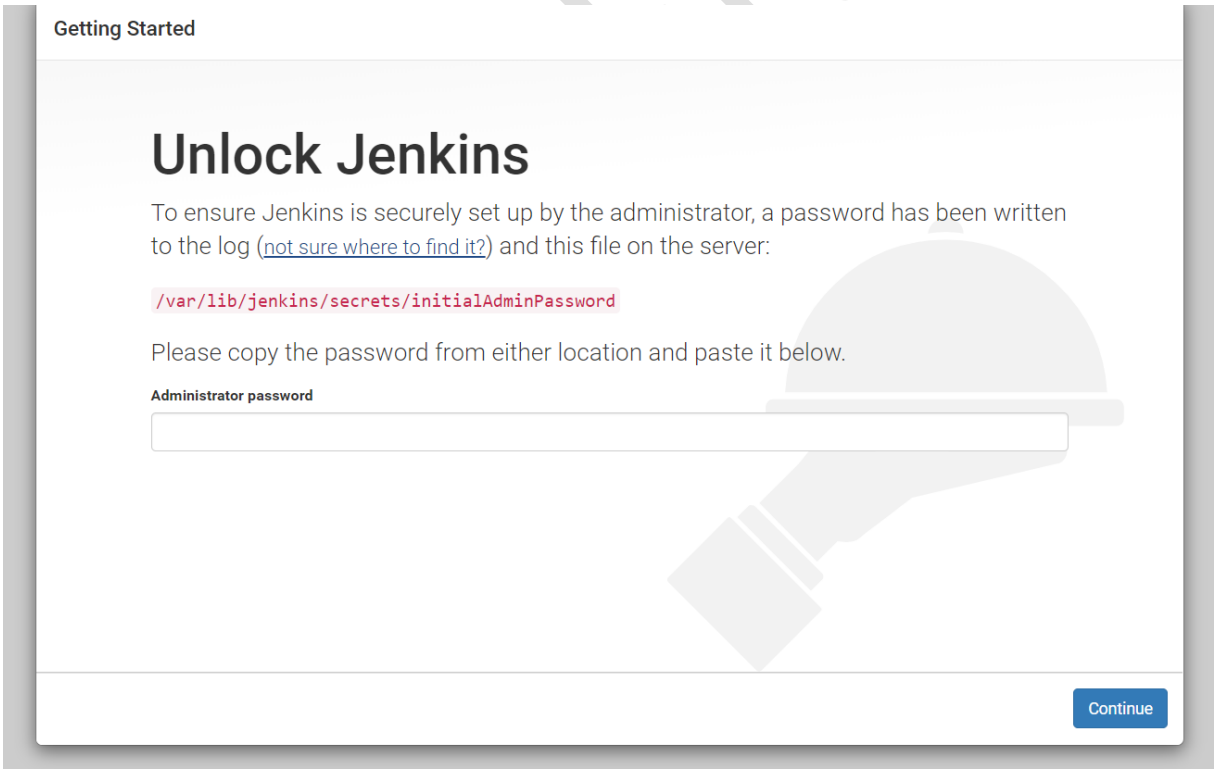
You have learnt

- How to connect from server to github.
- Use ansible-pull to install file from github.

Assignment 5: Use Jenkins to copy the file to S3 **(20 mins)**

Pre-requisite: S3 bucket is present to push the file

1. Open the url :: http://<ip or dns>:8080 (Jenkins by default is hosted on port 8080)
This will show you a page like the below snippet:

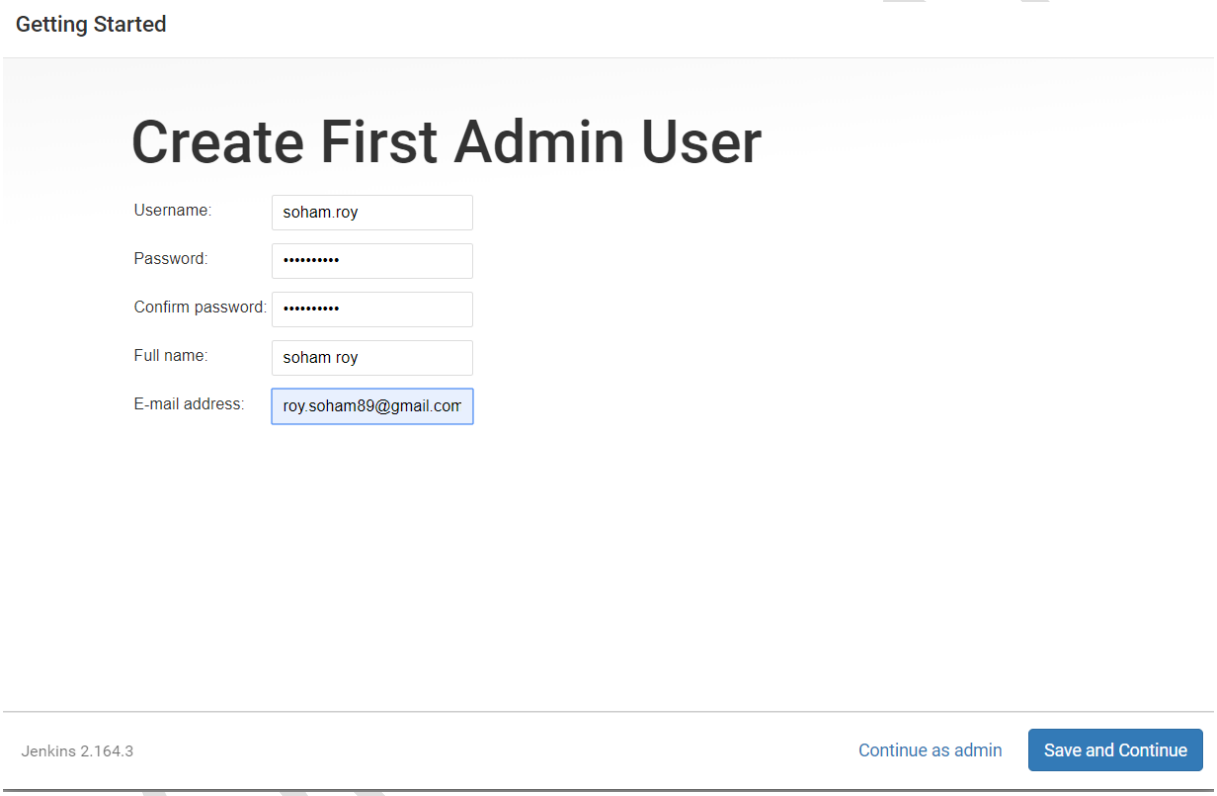


2. Go to your server to fetch the password:

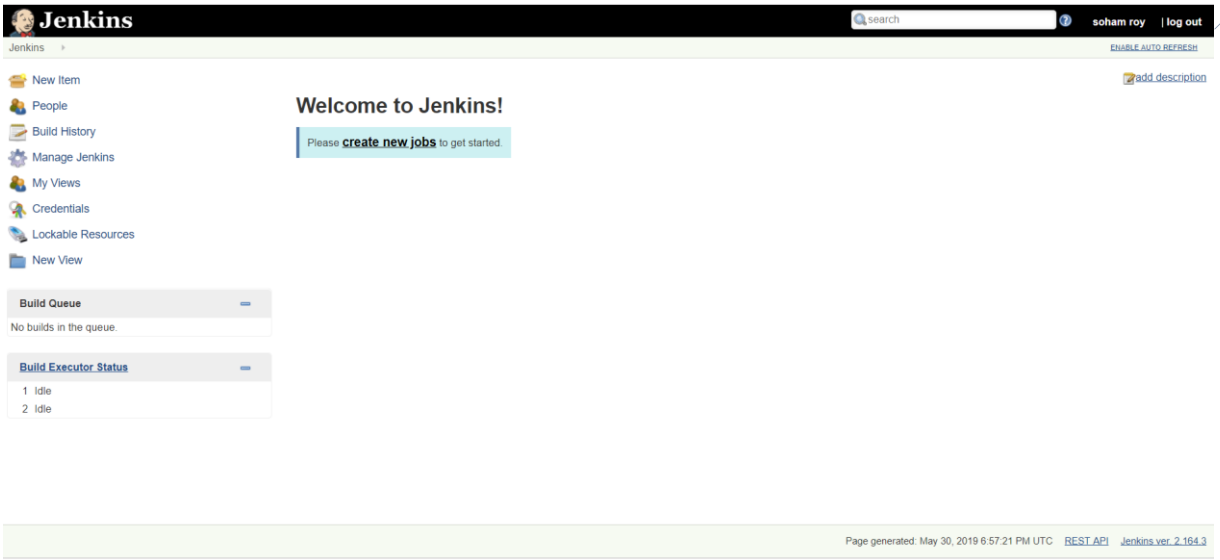
```
$sudo cat /var/lib/jenkins/secrets/initialAdminPassword
```

Insert the password and click continue.

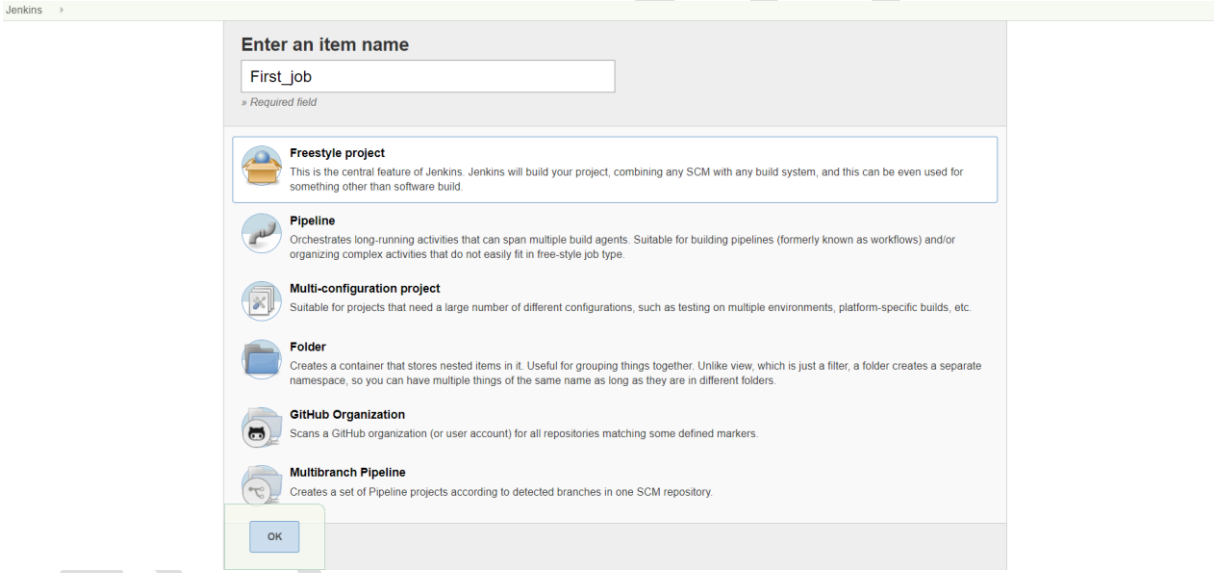
3. As of now on the next page you can select install suggested plugin, later at any point of time you can add any plugin. This will take some time.
Create admin user:



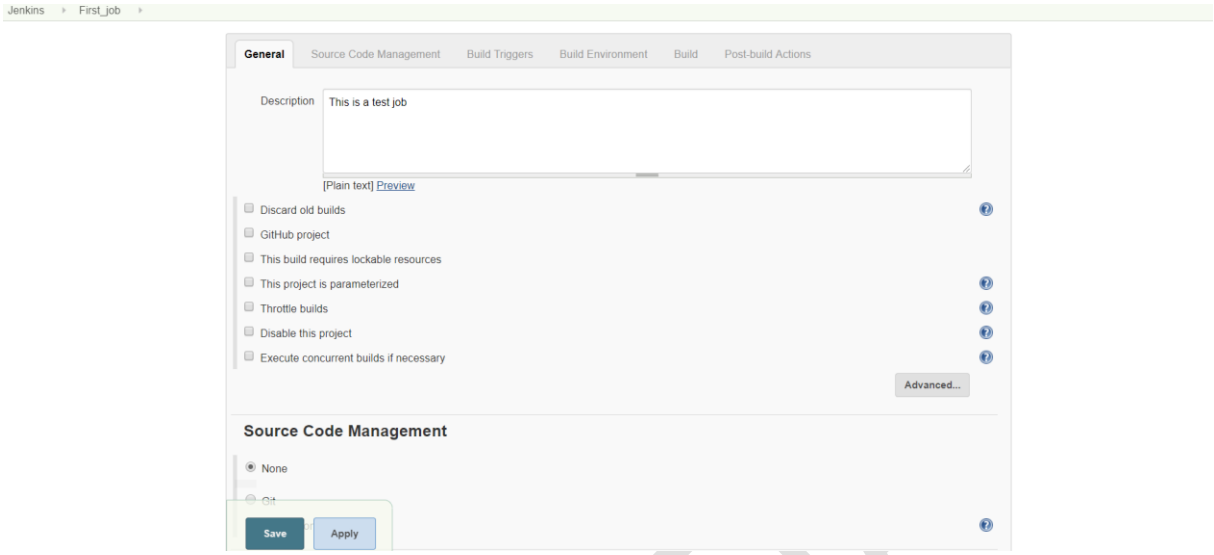
The next pages will show your Jenkins url and then you are ready to use Jenkins.



4. Create a new job. Give a job name and select Freestyle project:



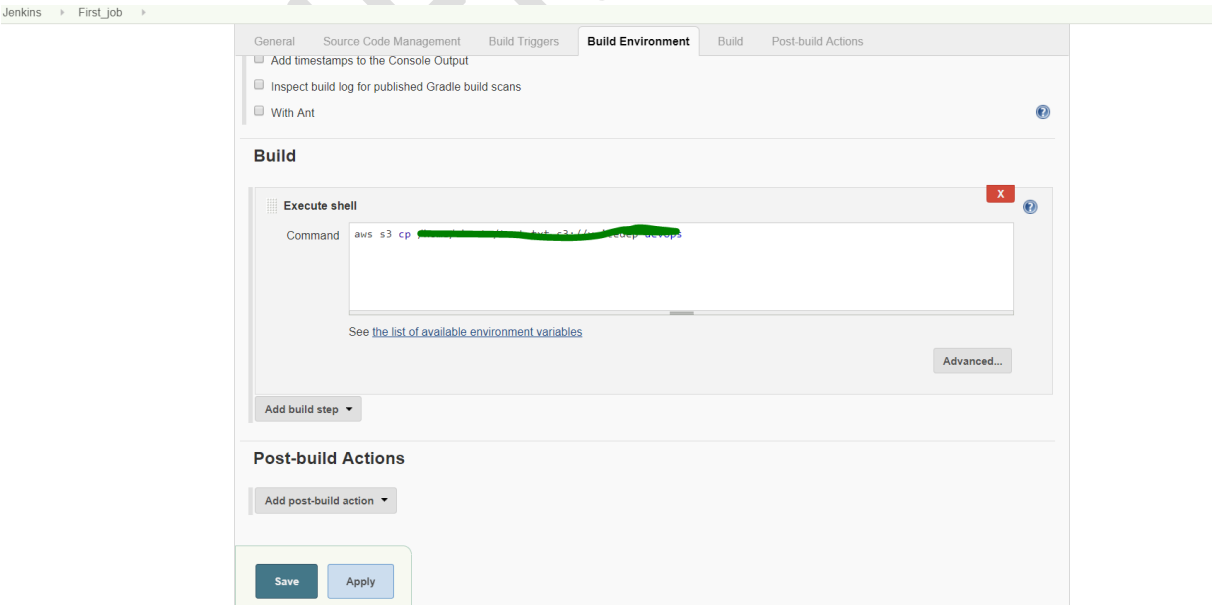
5. Add a description:



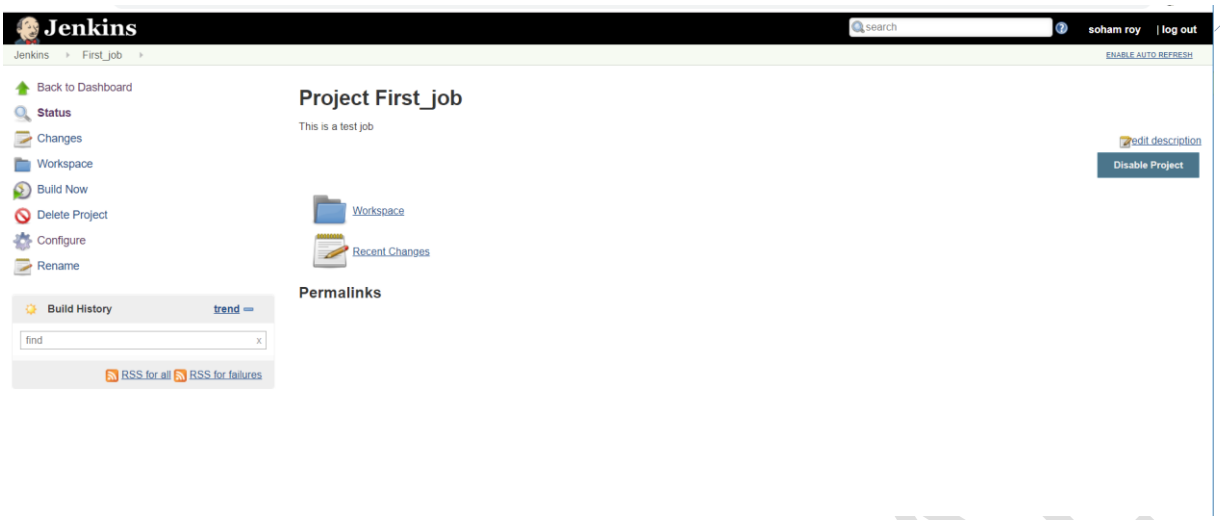
I have already created a bucket s3://voicedep-devops. If needed you can create a new one.

Go below, in the build section select execute shell and add the command:

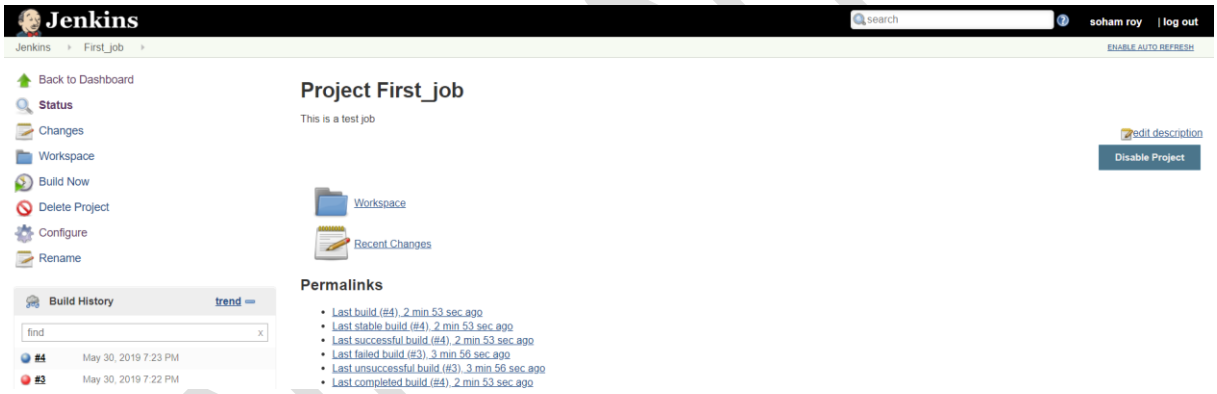
```
aws s3 cp <path-to-file in server>  <s3 url ( ex s3://voicedep-devops) >
```



Click on save. You are now ready to run your first jenkins job.

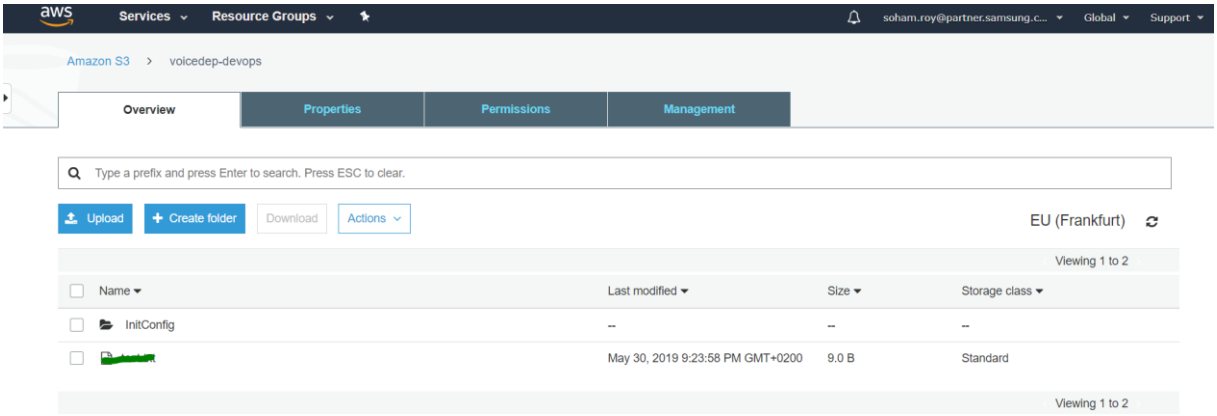


6. Click on build now, the build number will come below:



7. Click on the latest build number and click on console output. You can check your status there **Finished: SUCCESS**

8. To double check you can see your file on S3 as well.



Summary of the exercise:

You have learnt

- How to configure and create user in jenkins.
- Create and execute job in Jenkins.