DevOps Capstone Project 1

CAPSTONE PROJECT

You have been Hired Sr. Devops Engineer in Abode Software. They want to implement Devops Lifecycle in their company. You have been asked to implement this lifecycle as fast as possible.

Abode Softwares is a product-based company, their product is available on this GitHub link.

https://github.com/hshar/website.git

Following are the specifications of the lifecycle:

1. Git Workflow has to be implemented

2. Code Build should automatically be triggered once commit is made to master branch or develop branch.

If commit is made to master branch, test and push to prod

If commit is made to develop branch, just test the product, do not push to prod

3. The Code should be containerized with the help of a Dockerfile. The Dockerfile should be built every time there is a push to Git-Hub. Use the following pre-built container for your application:

hshar/webapp

The code should reside in '/var/www/html'

4. Once the website is built, you have to design a test-case, which will basically check if the website can be opened or not. If yes, the test should pass. This test has to run in headless mode, on the test server.

5. The above tasks should be defined in a Jenkins Pipeline, with the following Jobs

Job 1 - Building Website

Job 2 - Testing Website

Job 3 - Push to Production

6. Since you are setting up the server for the first time, ensure the following file exists on both Test and Prod server in /home/ubuntu/config-management/status.txt. This file will be used by a third-party tool. This should basically have the info whether apache is installed on the system or not

The content of this file, should be based on whether git is installed or not.

If apache is installed => Apache is Installed on this System"

If apache is not installed => "Apache is not installed on this System"

7. Create a Monitoring Service for the website on the Production server

Architectural Advice:

Create 3 servers on AWS "t2.micro"

Server 1 - should have Jenkins Master, Puppet Master and Nagios Installed

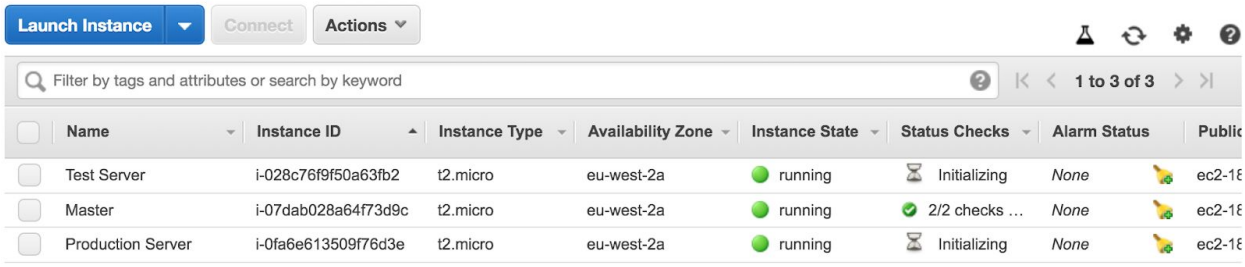
Server 2 - Testing Server, Jenkins Slave

Server 3 - Prod Server, Jenkins Slave

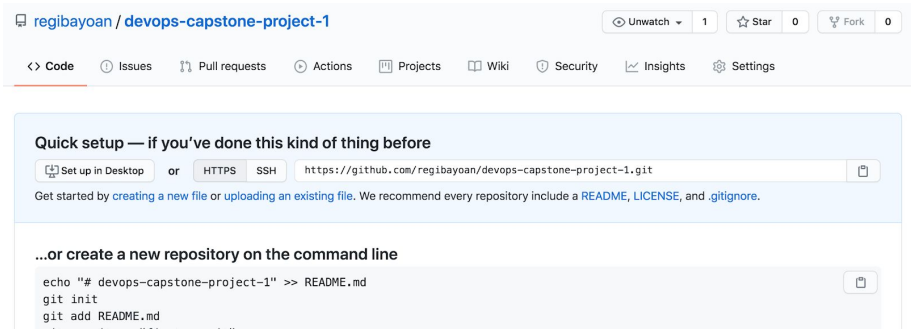
Solution:

Step 1: Setup AWS architecture

- 3 servers => “t2.micro”
- Server 1 => Jenkins Master, Puppet Master, Nagios
- Server 2 => Testing Server (jenkins-slave-1)
- Server 3 => Production Server (jenkins-slave-2)

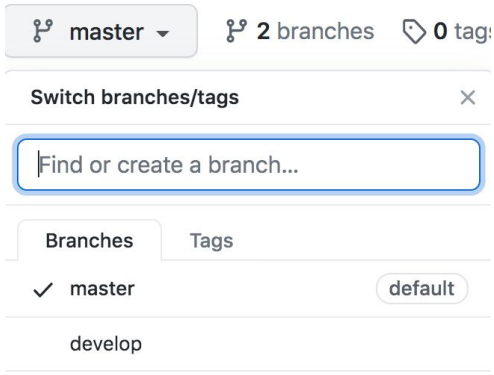


Step 2: Create a new GitHub repository and copy the files from the product repository



Step 3: Create a new **'develop'** branch

```
[➜ devops-capstone-project-1 git:(master) ✗ git checkout -b develop
Switched to a new branch 'develop'
```



Step 4: Install Jenkins on Master server

Jenkins installation Guide: https://linuxize.com/post/how-to-install-jenkins-on-ubuntu-18-04/

```
ubuntu@Master:~$ systemctl status jenkins
● jenkins.service - LSB: Start Jenkins at boot time
   Loaded: loaded (/etc/init.d/jenkins; generated)
   Active: active (exited) since Thu 2020-07-30 15:25:47 UTC; 30s ago
     Docs: man:systemd-sysv-generator(8)
    Tasks: 0 (limit: 1121)
   CGroup: /system.slice/jenkins.service
```

Step 5: Setup Jenkins Master-Slave cluster

Setup guide: https://github.com/regibayoan/jenkins-ci-cd-pipeline

The setup should look like this:

S	Name ↓	Architecture	Clock Difference	Free Disk Space	Free Swap Space	Free Temp Space	Response Time	
	master	Linux (amd64)	In sync	5.80 GB	0 B	5.80 GB	0ms	
	Slave1	Linux (amd64)	In sync	5.92 GB	0 B	5.92 GB	47ms	
	Slave2	Linux (amd64)	In sync	5.92 GB	0 B	5.92 GB	23ms	
	Data obtained	1 min 14 sec	1 min 14 sec	1 min 14 sec	1 min 14 sec	1 min 14 sec	1 min 14 sec	

Step 6: Create a pipeline for when committing to **develop** branch

- Create a **Dockerfile** to build the product. Use the pre-built image, **hshar/webapp** as a base image. This image will run an Ubuntu container with Apache installed. Then add **index.html** to **/var/www/html** inside the container.
- Push to GitHub

```
  GNU nano 2.0.6                File: Dockerfile                      Modified


FROM hshar/webapp
ADD ./index.html /var/www/html
```

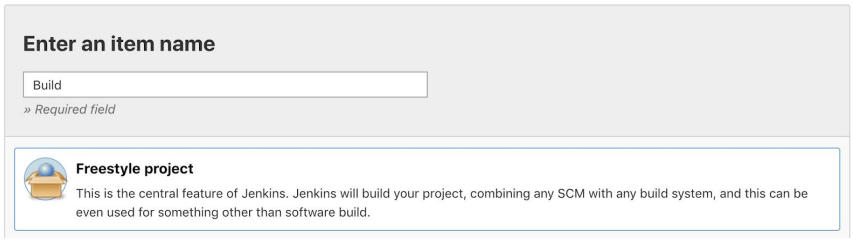
```
➜ devops-capstone-project-1 git:(develop) ✗ git status
On branch develop
Untracked files:
  (use "git add <file>..." to include in what will be committed)
        Dockerfile

nothing added to commit but untracked files present (use "git add" to track)
➜ devops-capstone-project-1 git:(develop) ✗ git add .
➜ devops-capstone-project-1 git:(develop) ✗ git commit -m "Adding Dockerfile"
[develop c1020c0] Adding Dockerfile
 1 file changed, 3 insertions(+)
 create mode 100644 Dockerfile
➜ devops-capstone-project-1 git:(develop) git push origin develop
```

- Install Docker in Slave1

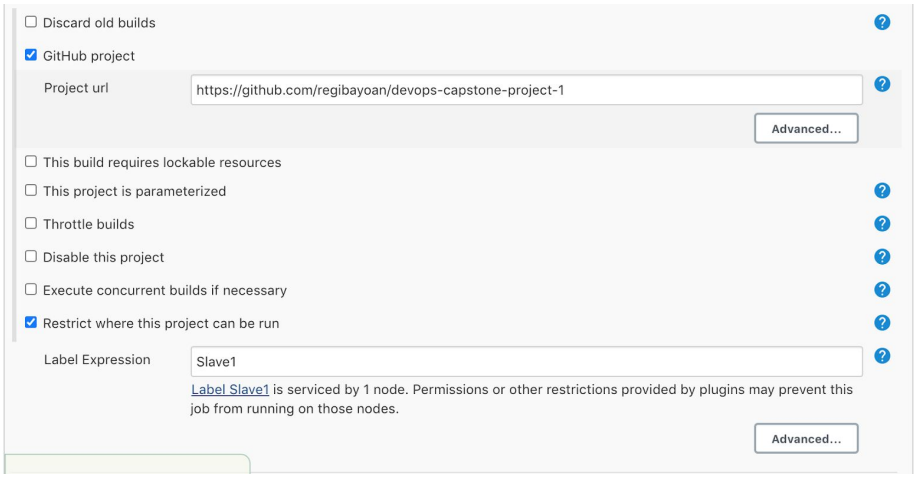
Commands: sudo apt update -> sudo apt-get remove docker docker-engine docker.io -> sudo apt install docker.io -> sudo systemctl start docker -> sudo systemctl enable docker -> sudo systemctl status docker

```
ubuntu@Slave1:~$ sudo docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED
STATUS              PORTS               NAMES
ubuntu@Slave1:~$
```

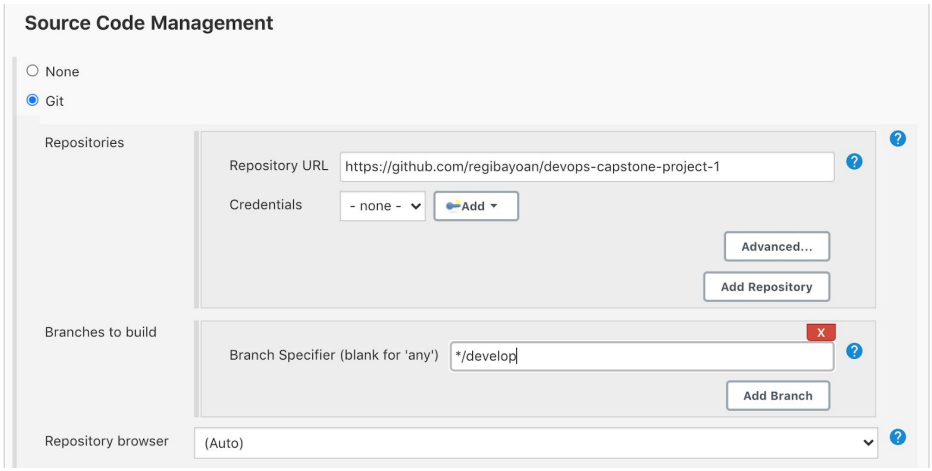
- Create a **Build** job in Jenkins



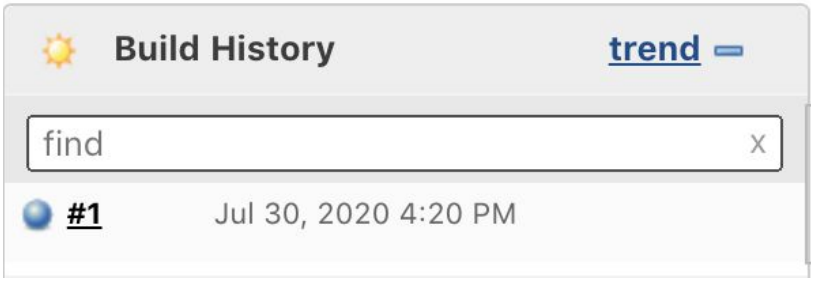
- Set the project repository
- Restrict project to **Slave1**



- Restrict project to build to **develop** branch

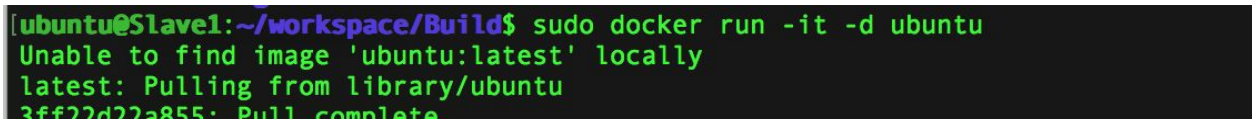


- Build the project for now and confirm if the project files are successfully transferred to Slave1

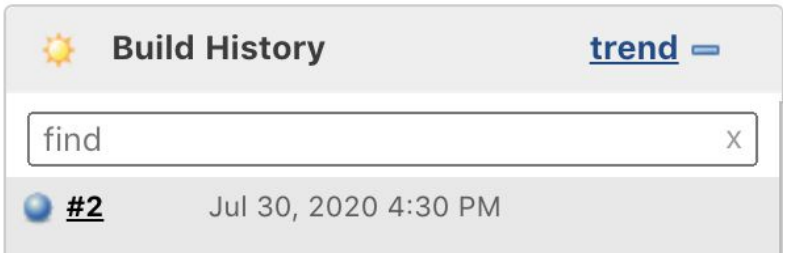


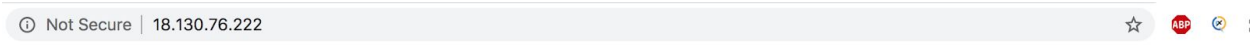
- Now, try to deploy the website
- Go back to **Build job** in Jenkins -> **Configure** -> **Build** -> **Execute Shell** -> Add commands for deploying the website

- Run an arbitrary container in Slave1



- Build project in Jenkins
- Check that the new container is successfully built
- Check in <Slave1-IPAdress>:80 to see if website is deployed

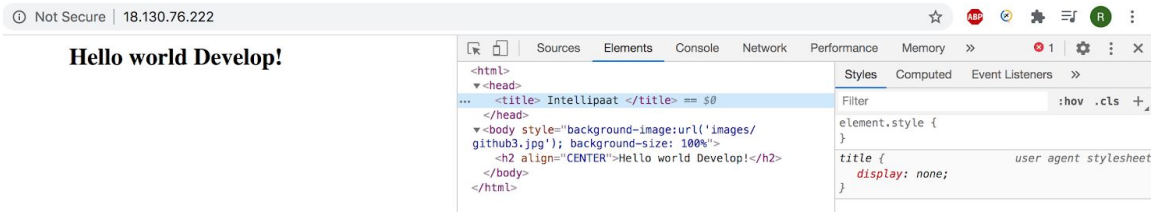




Hello world Develop!

Step 7: Next is to design a test case, which checks if the website can be opened or not

- Go to web page and **Inspect** elements



- The test case is for checking whether the title **"Intellipaat"** is present on the webpage. This should confirm that the website is up and running

- Go to Eclipse and design the test case
- Make the test headless by adding **"--headless"** as an argument to ChromeDriver
- Verify the test is working locally

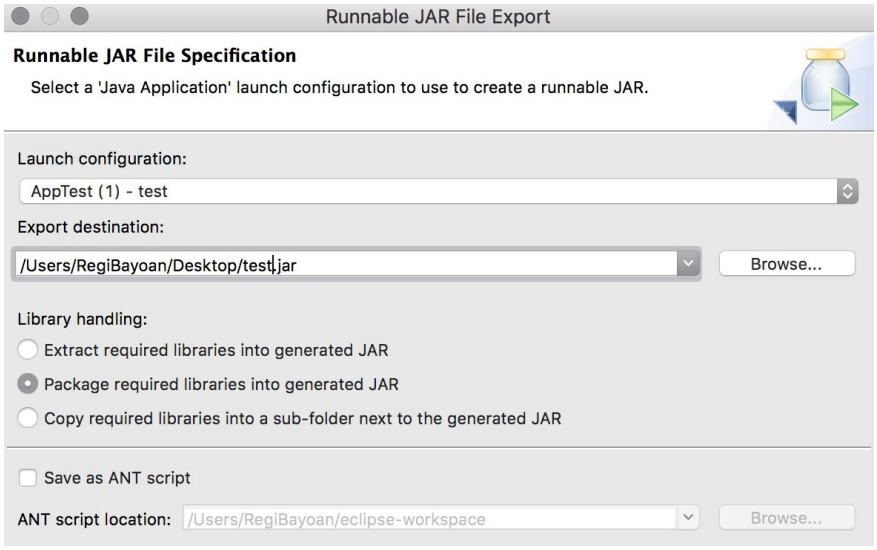
  Code:

```
String baseUrl = "http://18.130.76.222";

// "/home/ubuntu/chromedriver"
WebDriver driver;
@BeforeTest
private void launchBrowser() {
    System.setProperty("webdriver.chrome.driver", "/home/ubuntu/chromedriver");
    ChromeOptions options = new ChromeOptions();
    options.addArguments("--headless");
    driver = new ChromeDriver(options);
    driver.get(baseUrl);
}
```

```
@Test
Run | Debug
private void verifyHomePageTitle() {
    String expectedTitle = "Intellipaat";
    String actualTitle = driver.getTitle();
    Assert.assertEquals(expectedTitle, actualTitle);
    System.out.println("Title is " + actualTitle);
    System.out.println("Website can be opened");
}
```

```
INFO: Detected dialect: W3C
Title is Intellipaat
Website can be opened
Test Complete

================================================
Command line suite
Total tests run: 1, Failures: 0, Skips: 0
================================================
```

- Create a runnable jar file
- Change permissions to be executable
- Send the jar file to Slave1 through Filezilla




```
[➜  Desktop chmod +x test.jar
[➜  Desktop ls -al test.jar
-rwxr-xr-x  1 RegiBayoan  staff  11318054 30 Jul 18:02 test.jar
```

Server/Local file	Direction	Remote file	Size	Priority	Status
sftp://ubuntu@18.130.7...					
/Users/RegiBayoan/D...	-->>	/home/ubuntu/test.jar	11,318,054	Normal	Transferring
00:00:06 elapsed	00:00:06 left	56.0%	6,340,608 bytes (1.2 MiB/s)		

- Install **chromedriver** in **Slave1**

chromedriver_linux64.zip 2020-05-28 21:05:07 5.06MB beffb1bca07d8f4fd23213b292ef963b

```
ubuntu@Slave1:~$ wget https://chromedriver.storage.googleapis.com/84.0.4147.30/chrom
edriver_linux64.zip
```

```
ubuntu@Slave1:~$ unzip chromedriver_linux64.zip
Archive:  chromedriver_linux64.zip
  inflating: chromedriver
ubuntu@Slave1:~$
```

- Install **Google Chrome** browser in **Slave1** using this guide

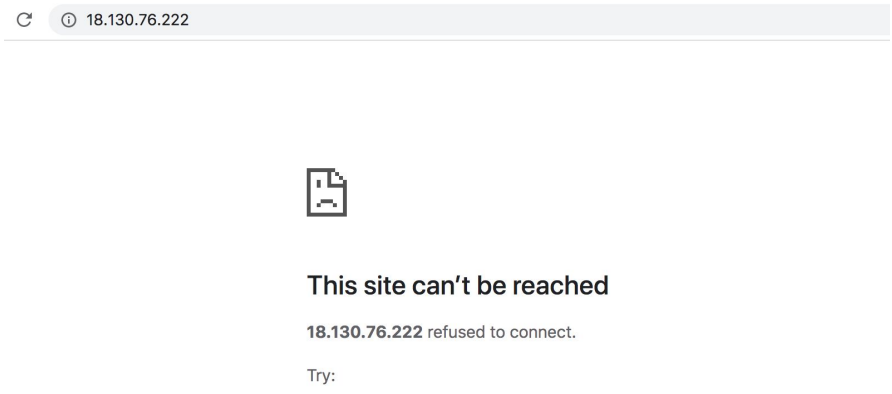
https://linuxize.com/post/how-to-install-google-chrome-web-browser-on-ubuntu-18-04/

- Run the test using **java -jar test.jar**

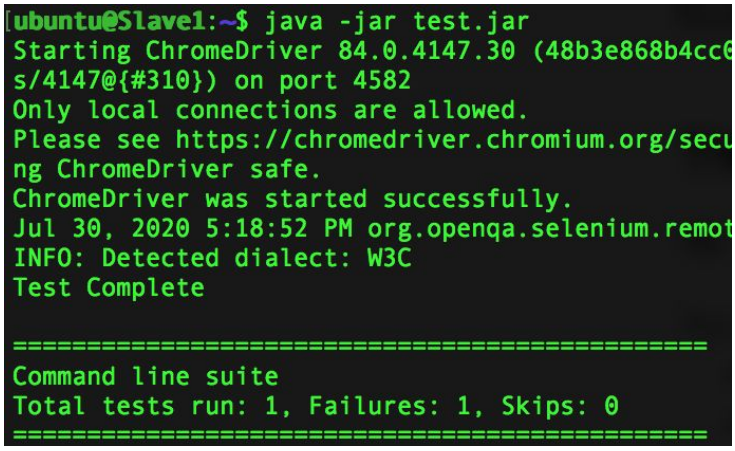
```
ubuntu@Slave1:~$ java -jar test.jar
Starting ChromeDriver 84.0.4147.30 (48b3e868b4cc0aa7e8149519690b6f6949e110a8-refs/branch-heads/4147@{#310}) on port 25697
Only local connections are allowed.
Please see https://chromedriver.chromium.org/security-considerations for suggestions on keeping ChromeDriver safe.
ChromeDriver was started successfully.
Jul 30, 2020 5:11:59 PM org.openqa.selenium.remote.ProtocolHandshake createSession
INFO: Detected dialect: W3C
Title is Intellipaat
Website can be opened
Test Complete

===============================================
Command line suite
Total tests run: 1, Failures: 0, Skips: 0
===============================================
```

- Verify the test is actually valid by disabling the website's container, which will take down the website.

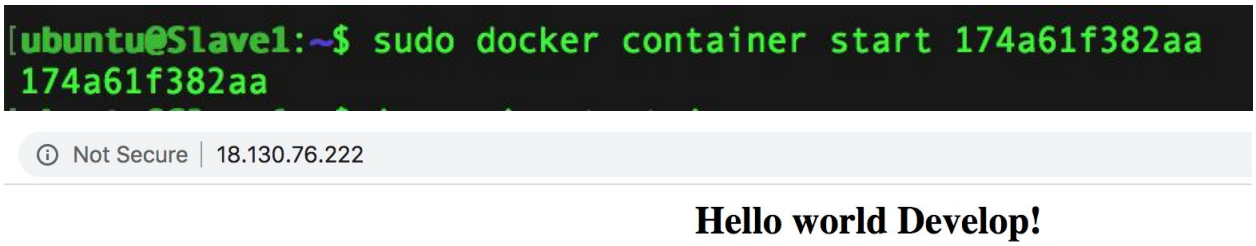
```
ubuntu@Slave1:~$ sudo docker container stop 174a61f382aa
174a61f382aa
```



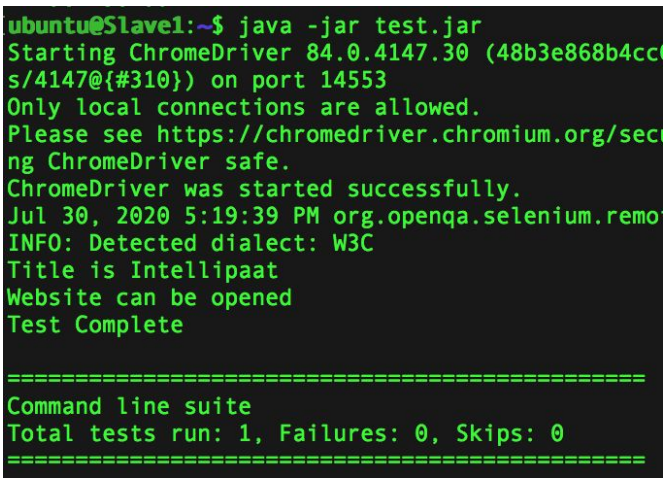
- Run the test again. The test should fail since the website will not be up anymore



- Now restart the container. The website should be back and running

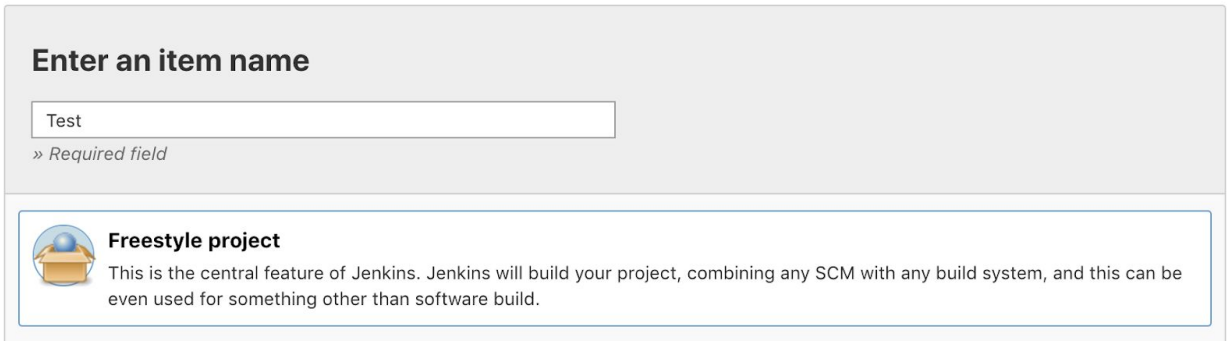


- Run the test again

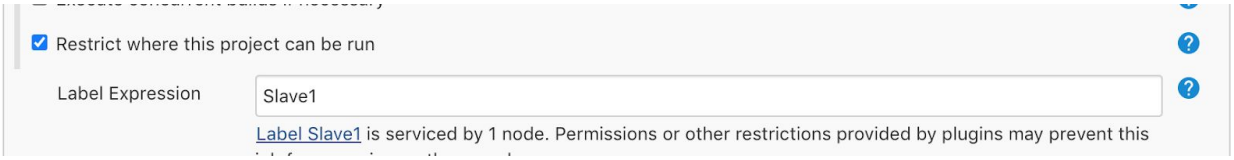


- This verifies that the test is valid

Step 8: In Jenkins, create a **Test** job for testing the website

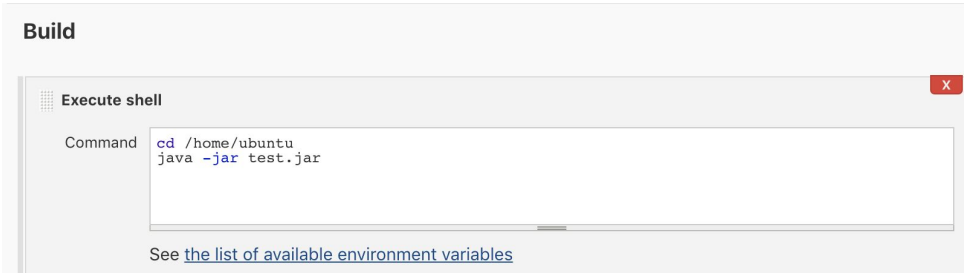


- Restrict to Slave1

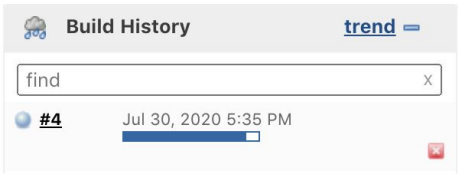


- Restrict to **develop** branch

- Add commands in **Build** -> **Save**



- Build **Test**




```
INFO: Detected dialect: W3C
Title is Intellipaat
Website can be opened
Test Complete

===============================================
Command line suite
Total tests run: 1, Failures: 0, Skips: 0
===============================================

Finished: SUCCESS
```

- Problem encountered is that even when the test is failed, the Jenkins job is still **"success"**
- We want the job to fail as well if the test fails
- Modify the test code in Eclipse by adding a try-catch block. The catch block will return a value of 1 if the test fails. As a result, the Jenkins job will also fail. This is what we want so the pipeline will not continue to the next job if the **Test** job fails **(Ex: In production)**

```
@Test
Run | Debug
private void verifyHomePageTitle() {
    String expectedTitle = "Intellipaat";
    String actualTitle = driver.getTitle();
    try {
        Assert.assertEquals(expectedTitle, actualTitle);
    }
        catch(AssertionError e){
            System.out.println("Website not present");
            System.exit(1);
        }
    System.out.println("Title is " + actualTitle);
    System.out.println("Website can be opened");

}
```

- Verify this works by exporting a new jar file -> **testModified.jar** -> send to Slave 1 through Filezilla -> Verify if transferred in Slave1 -> Change permissions to be executable

```
[ubuntu@Slave1:~$ chmod +x testModified.jar
```

- Modify the **Build** section in **Test** job

- Build **Test** Job when website is up

```
+ java -jar testModified.jar
Starting ChromeDriver 84.0.4147.30 (48b3e868b4cc0aa7e8149519690b6f6949e110a8-refs/branch-heads/4147@{#310}) on port 1103
Only local connections are allowed.
Please see https://chromedriver.chromium.org/security-considerations for suggestions on keeping ChromeDriver safe.
ChromeDriver was started successfully.
Jul 30, 2020 6:35:25 PM org.openqa.selenium.remote.ProtocolHandshake createSession
INFO: Detected dialect: W3C
Title is Intellipaat
Website can be opened

===============================================
Command line suite
Total tests run: 1, Failures: 0, Skips: 0
===============================================

Finished: SUCCESS
```

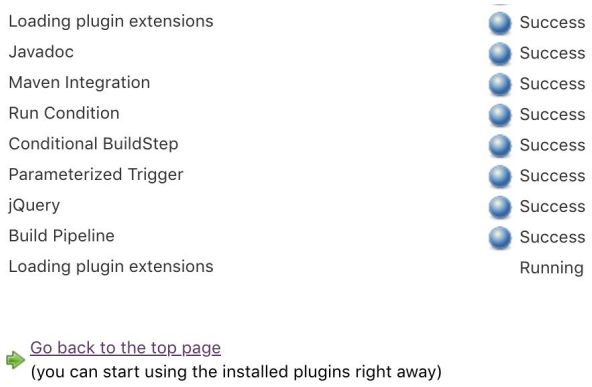
- Now stop the container again so the website is down. The Jenkins build should fail

```
+ java -jar testModified.jar
Starting ChromeDriver 84.0.4147.30 (48b3e868b4cc0aa7e8149519690b6f6949e110a8-refs/branch
Only local connections are allowed.
Please see https://chromedriver.chromium.org/security-considerations for suggestions on
ChromeDriver was started successfully.
Jul 30, 2020 6:36:02 PM org.openqa.selenium.remote.ProtocolHandshake createSession
INFO: Detected dialect: W3C
Website not present
Build step 'Execute shell' marked build as failure
Finished: FAILURE
```

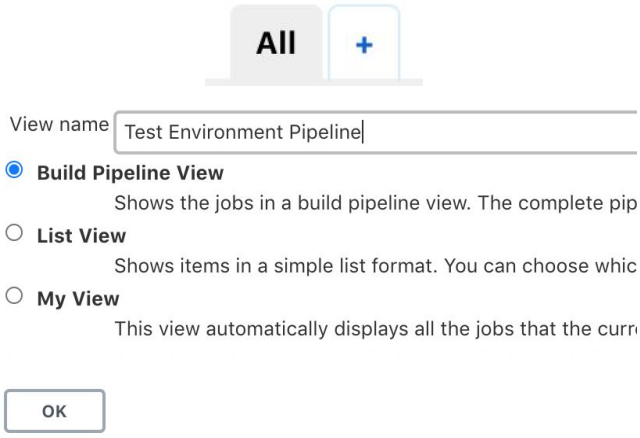
Step 9: Next, we will setup our pipeline to where **Test** job is only triggered if **Build** job is successful

- Go to **Build** job -> **Configure** -> Add **Post-Build Actions** -> **Build Other Projects** -> Project to Build = **Test** -> Select **Trigger only if build is stable** -> **Save**

- Go to **Manage Jenkins -> Manage Plugins -> Available ->** Search for **Build Pipeline -> Install without restart**

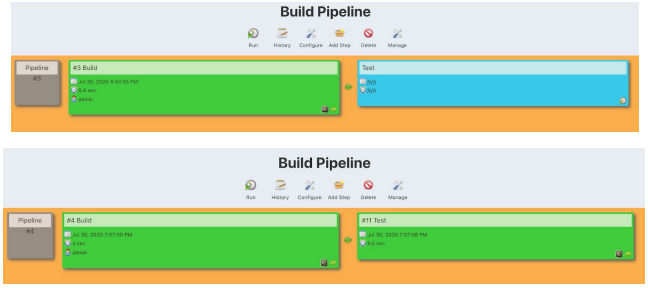


- Go back to Jenkins Dashboard and click the **+** sign -> Enter view name -> **Build Pipeline View** -> **OK**



- There add the Build Pipeline View title **->** Select **Initial Job** as **Build -> OK**

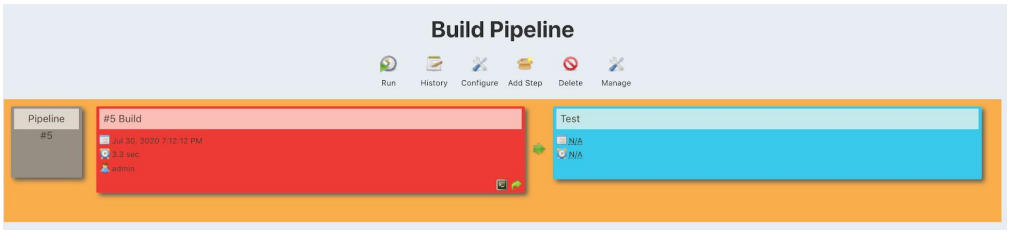
- **Run** pipeline



- Verify if pipeline will not continue to **Test** job if the **Build** job fails
- We do this by modifying the Dockerfile to build from a non-existent base image

```
 GNU nano 2.0.6                File: Dockerfile


FROM hsha/webapp
ADD ./index.html /var/www/html
```

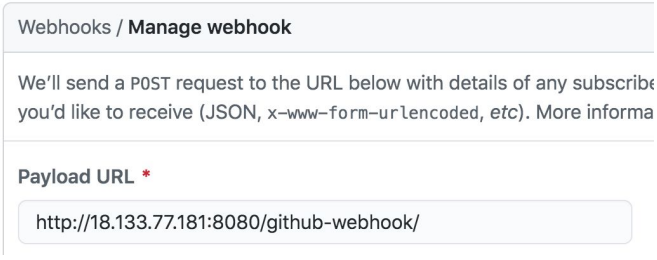
- Push this to **develop** branch
- Run pipeline. The pipeline should fail because the container will not be created successfully




```
Step 1/2 : FROM hsha/webapp
pull access denied for hsha/webapp, repository does not e
resource is denied
Build step 'Execute shell' marked build as failure
Finished: FAILURE
```

Step 10: Now we configure **GitHub Webhook** so the pipeline will automatically build the application when there is a commit to **develop** branch

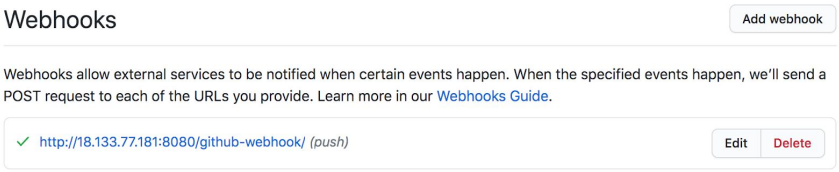
- Go to Jenkins Dashboard -> **Build** -> **Configure** -> **Build Triggers** -> Check the **GitHub hook trigger for GITScm polling** -> **Save**
- Next in **GitHub -> Settings ->** Click on **Webhooks -> Add Webhooks ->** Insert Jenkins server address as shown **JenkinsServerIPAdress:8080/github-webhook/**



- Go to the master terminal to trigger a build

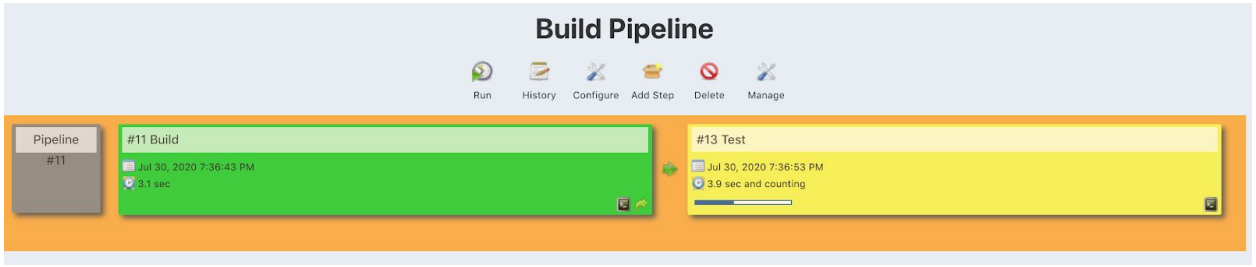
```
ubuntu@Master:~$ git clone https://github.com/regibayoan/devops-capstone-project
-1.git
Cloning into 'devops-capstone-project-1'...
remote: Enumerating objects: 15, done.
remote: Counting objects: 100% (15/15), done.
remote: Compressing objects: 100% (13/13), done.
```

- Check webhook status again , there should be a check mark



- Now try to commit to **develop** branch and verify if pipeline will start automatically
- First, edit the i**ndex.html** file

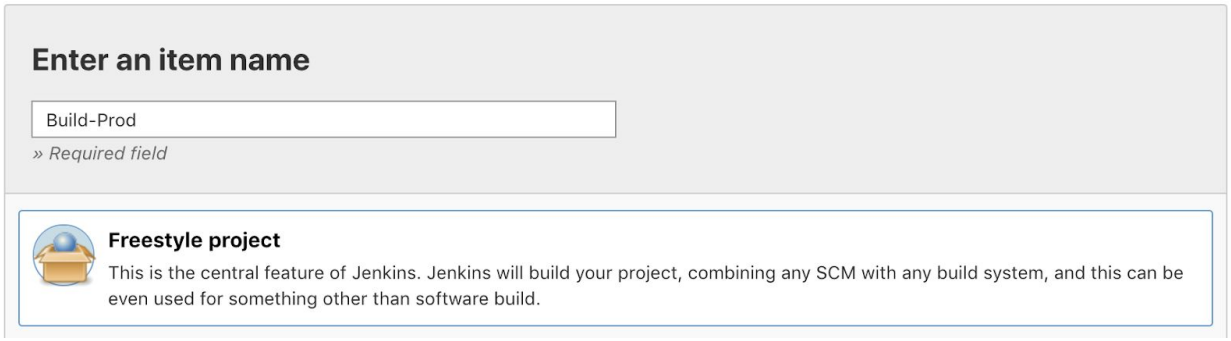
- Build Pipeline should automatically start once changes is committed to GitHub



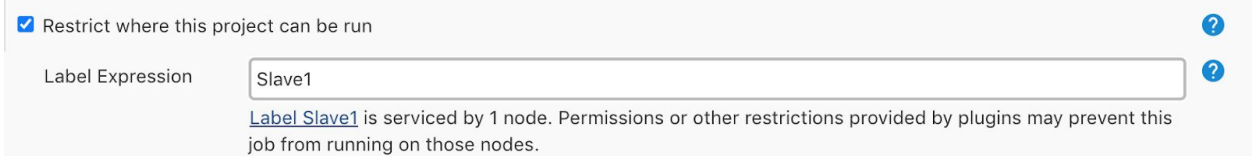
- Verify the web page has changed

Step 11: Now, we create the pipeline for when pushing to **master** branch

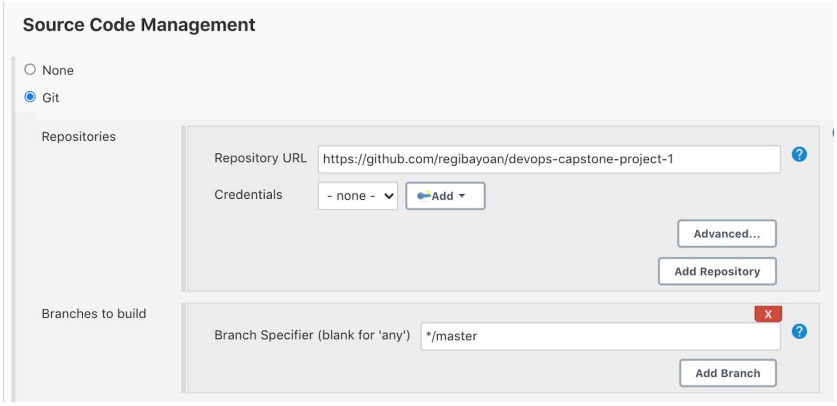
- Create a new job -> **Build-Prod**



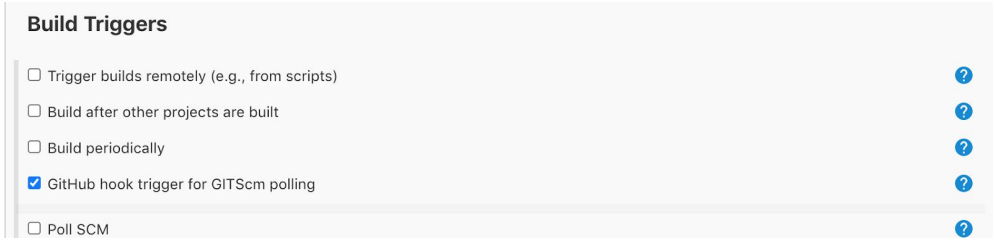
- Restrict to **Slave1** again since we want to do our tests in the **Test** server



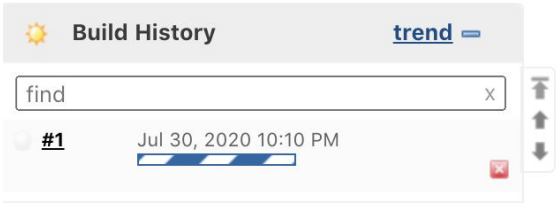
- Restrict to **master** branch this time



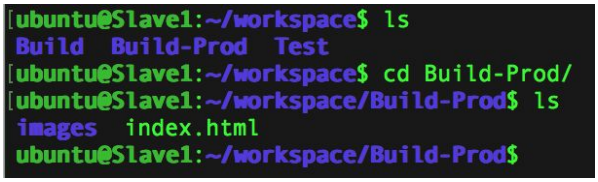
- Select **GitSCM polling** in **Build Triggers** -> **Save**



- Build project just to confirm if the **Build-Prod** workspace is created in **Slave1**



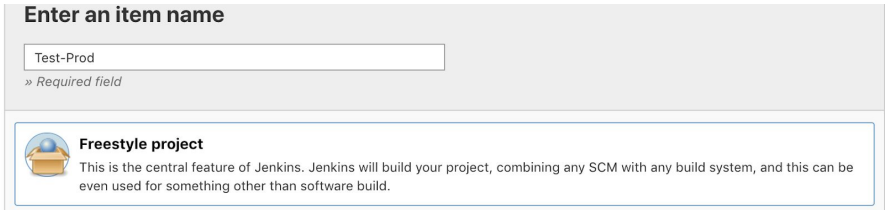
- The items in the **Build-Prod** workspace are correct. The Dockerfile is not present since we only pushed the Dockerfile to '**develop'** branch. This time it's for the **master** branch



- Next, we go back to the **Build-Prod** project -> **Configure** -> **Build** -> Add commands

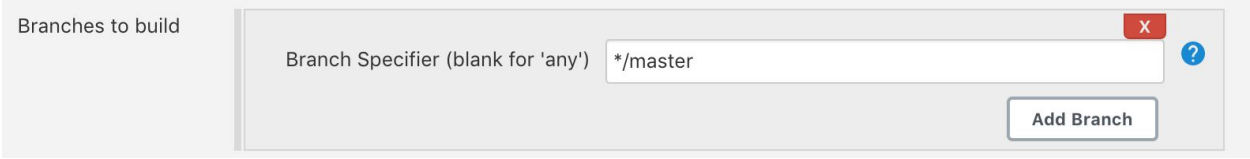
- Set **Post-build Actions** -> **Test-Prod** -> Select **Trigger only if build is stable** -> **Save**

Step 12: Create a new job -> **Test-Prod**

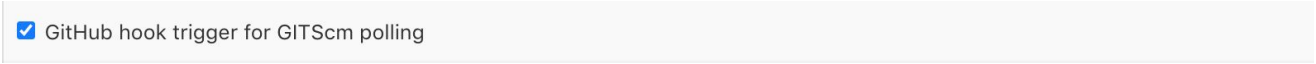


- Restrict where project can be run to **Slave1**

- Branches to build **-> master**

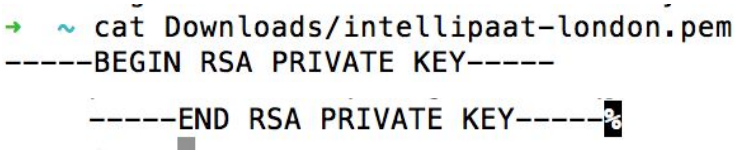


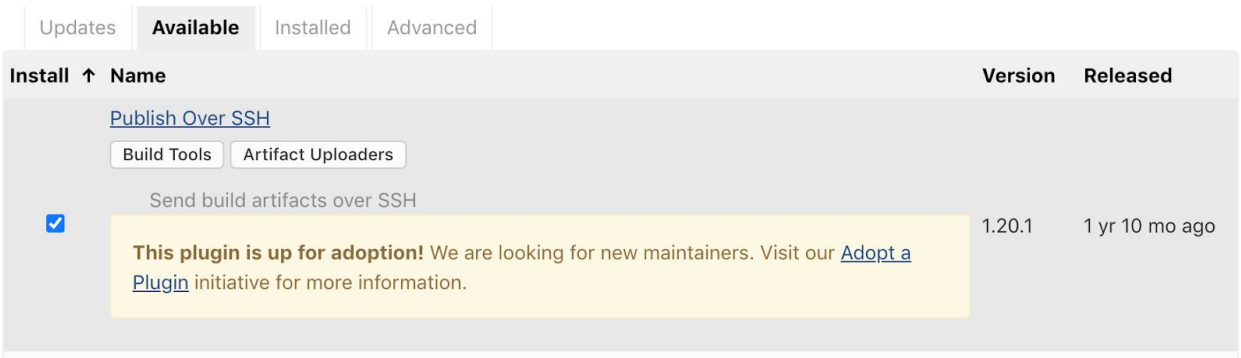
- Select **Build Trigger**

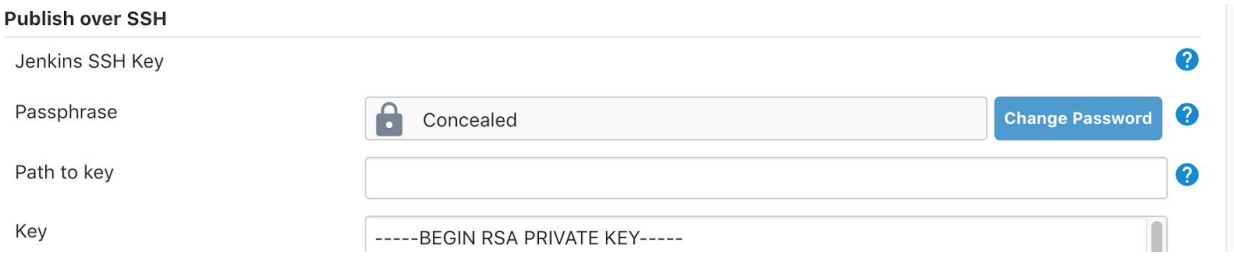


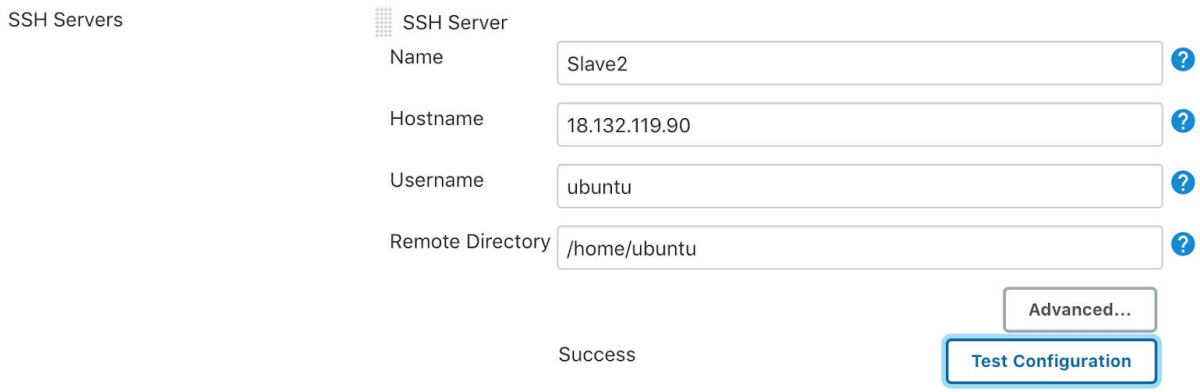
- Add commands in **Build** -> **Execute Shell** -> **Save**

- Install **Publish over SSH** plugin
- Go to **Manage Jenkins** -> **Configure System** -> Go down to **Publish over SSH** -> Add details
- We need the private key that we use to SSH into Slave2. This is usually provided by AWS or by ssh-keygen.
- Finding this will depend on where you saved your .pem file. Copy from the beginning to the end of the key file.

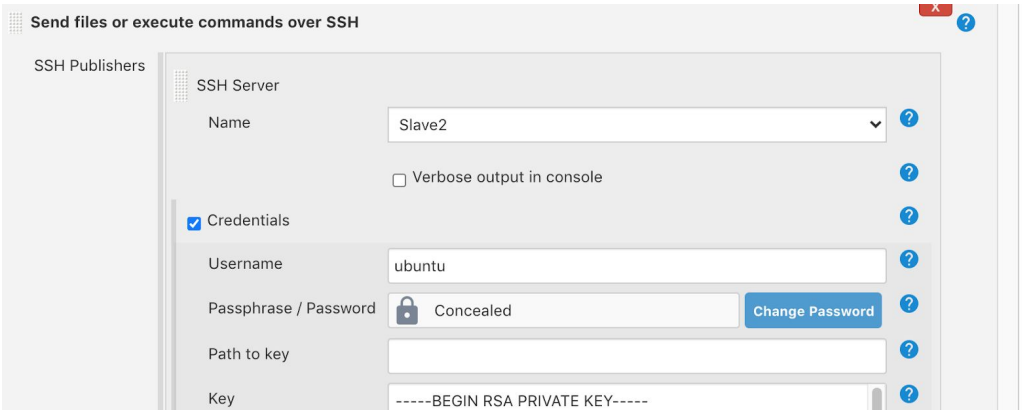




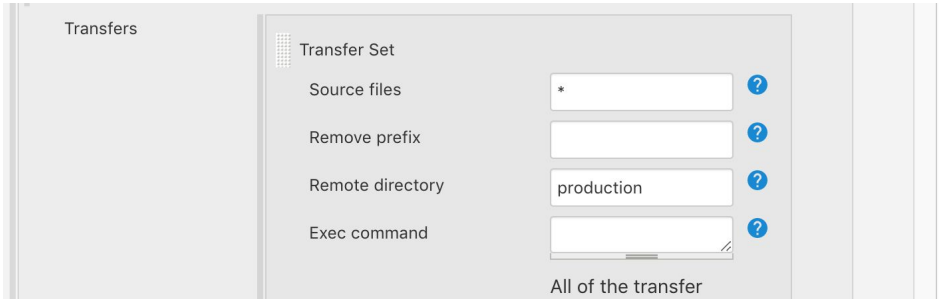




- Create another **Build** step -> **Send files or execute commands over SSH**
- Add the SSH credentials for Slave2

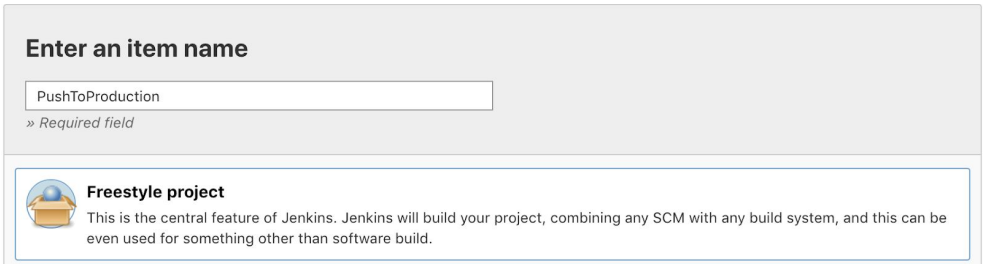


- For the **transfers** -> the files will only transfer using relative paths. Using absolute paths somehow does not work.
- Source files = * (Copy all files in /home/ubuntu/workspace/Test-Build) which is the Dockerfile and index.html
- Remote directory = where you want the files to be transferred. In this case, we create a new folder called **production**

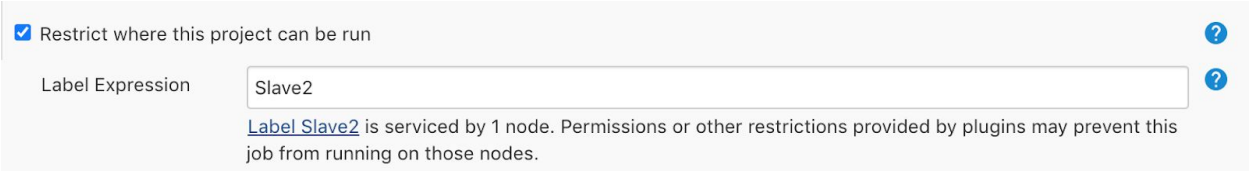


- Set **Post-build Actions** -> **PushToProduction** -> Select **Trigger only if build is stable** -> **Save**

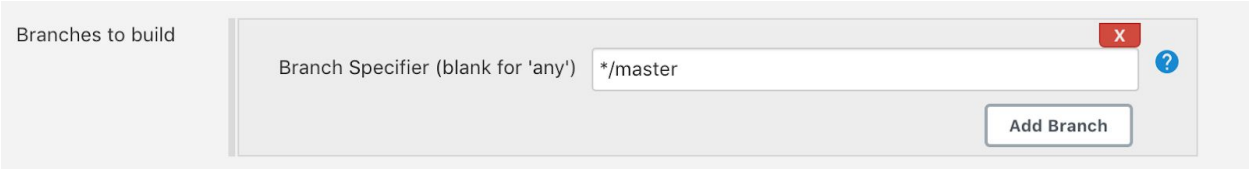
Step 13: Create a new job -> **PushToProduction**



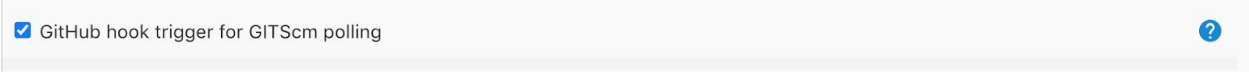
- Restrict where this project can be run -> **Slave2**



- Branches to build -> **master**



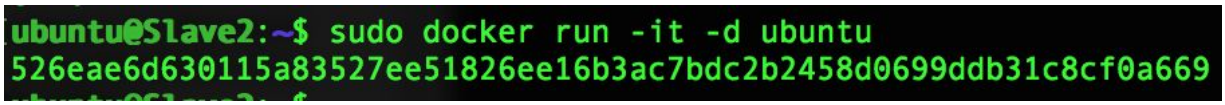
- Set build trigger



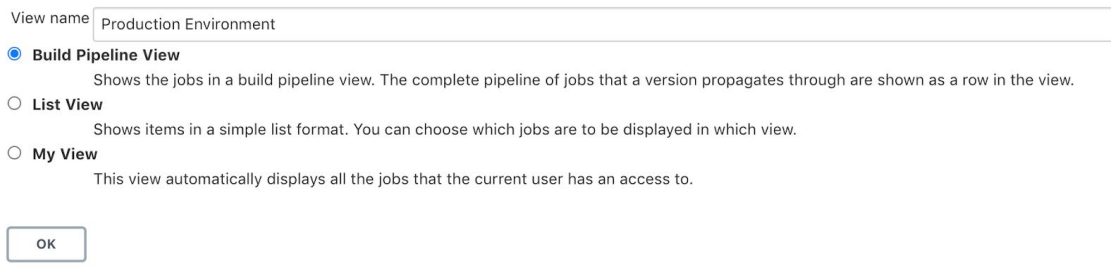
- **Build** -> **Execute Shell** -> Add commands

- Install Docker in **Slave2**
- Run an arbitrary container in **Slave2**

Commands: sudo apt update -> sudo apt-get remove docker docker-engine docker.io -> sudo apt install docker.io -> sudo systemctl start docker -> sudo systemctl enable docker -> sudo systemctl status docker



Step 14: Create a new Build Pipeline



Step 15: First, make a commit to **develop** -> Merge with **master** -> Test if **Test** and **Production** pipelines run separately

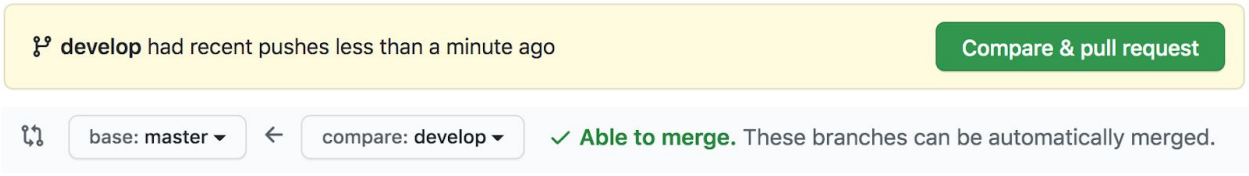
```
  GNU nano 2.0.6                File: index.html

<html>
<head>
<title> Intellipaat </title>
</head>
<body style = "background-image:url('images/github3.jpg'); background-size: 100$
<h2 ALIGN=CENTER>Hello World Congratulations! You've pushed the website to prod$
</body>
</html>
```

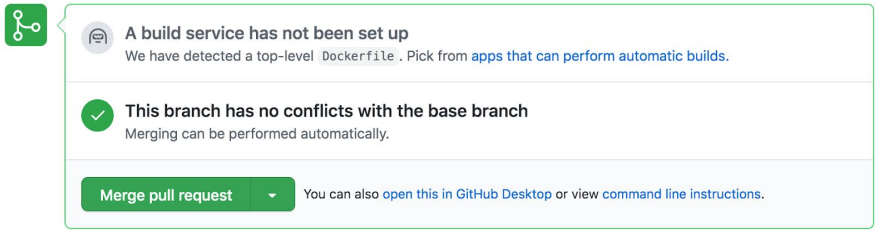
```
➜  devops-capstone-project-1 git:(develop) ✗ git add .
➜  devops-capstone-project-1 git:(develop) ✗ git commit -m "Commit to dev first"

[develop 19b8028] Commit to dev first
 1 file changed, 1 insertion(+), 1 deletion(-)
➜  devops-capstone-project-1 git:(develop) git push origin develop
```

- Confirm the **Test Environment Pipeline** runs and a new image is built

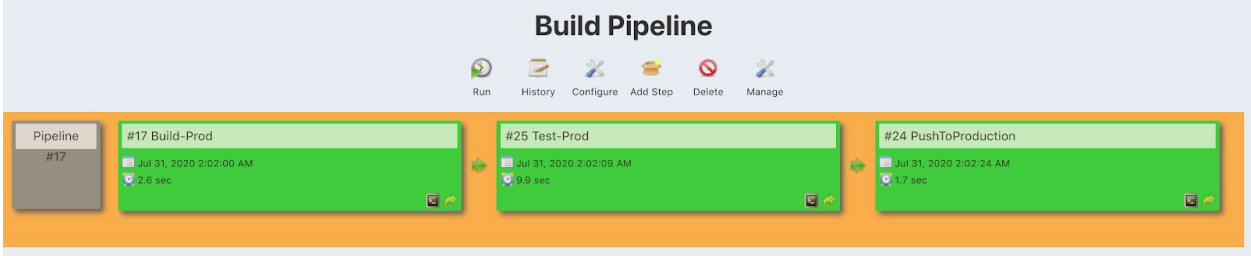
```
ubuntu@slave1:~/Workspace/Test-Prod$ sudo docker image ls
REPOSITORY          TAG                 IMAGE ID            CREATED
SIZE
build               latest              321e43206ec9        5 minutes ago
```

- Now, merge the **develop** branch to **master** branch. This should trigger the **Production Environment Pipeline** and push the application to **Production** server

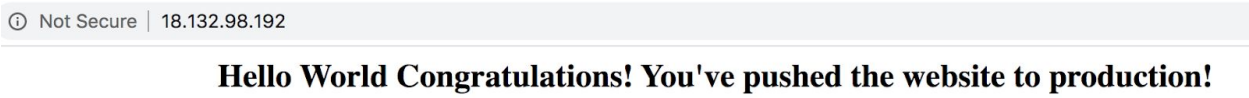




- The pipeline runs successfully



- Confirm by visiting **<Slave2-IP-Address>:80**



Step 16: Once I finished **Points 1-5** of the project, I decided to take the entire architecture down and started again with Configuration Management and Monitoring **(Points 6 & 7).**

Step 17: Create 3 new instances, same setup

Step 18: Install **Puppet** on Master using the commands below

```
On Master :
sudo apt-get update
sudo apt-get install wget
wget https://apt.puppetlabs.com/puppet-release-bionic.deb
sudo dpkg -i puppet-release-bionic.deb
sudo apt-get install puppetmaster
```

- Check if puppet is installed

```
ubuntu@master:~$ apt policy puppetmaster
puppetmaster:
  Installed: 5.4.0-2ubuntu3
  Candidate: 5.4.0-2ubuntu3
  Version table:
 *** 5.4.0-2ubuntu3 500
        500 http://eu-west-2.ec2.archive.ubuntu.com/ubuntu bionic/universe amd64 Packa
ges
        100 /var/lib/dpkg/status
ubuntu@master:~$
```

- Check status of puppet service

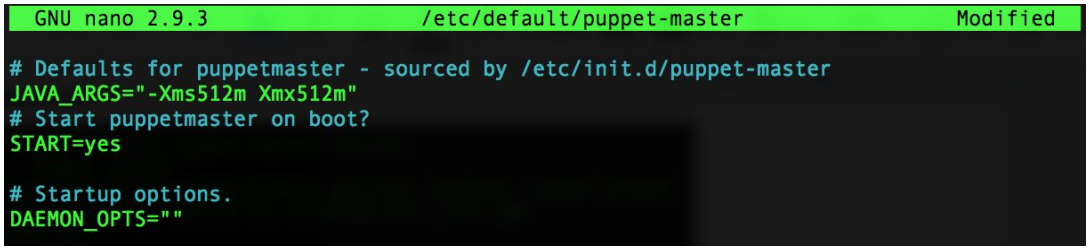
```
ubuntu@master:~$ sudo systemctl status puppet-master.service
● puppet-master.service - Puppet master
   Loaded: loaded (/lib/systemd/system/puppet-master.service; enabled; vendor preset:
   Active: active (running) since Fri 2020-07-31 16:46:48 UTC; 7min ago
     Docs: man:puppet-master(8)
 Main PID: 3015 (puppet)
    Tasks: 3 (limit: 1121)
```

- Next is to fine tune some settings. Edit the **/etc/default/puppet-master** file

```
$ sudo nano /etc/default/puppet-master
```

- Add this line. The reason for this is our Puppet master by default uses 1GB of memory. But since our system also has 1GB of memory, we're going to mention that the Puppet master could only use 512 MB of the memory. Puppet master can work in a 512MB memory as well if we're dealing with less amounts of nodes. For this particular setup, it should be enough.

JAVA_ARGS="-Xms512m Xmx512m"



- To apply the defaults, we restart the puppet master

- We open Port **8140** which is the the port where Puppet communicates with the slaves

```
sudo ufw allow 8140/tcp
```

- Puppet master is now set

Step 19: Now setup the slaves as well

- First edit the **/etc/hosts** file. Add the Puppet Master IP address and name it **"puppet"**. Do this for the Master and all the slaves as well

- Now start the puppet agent

```
sudo apt-get update
sudo apt-get install wget
wget https://apt.puppetlabs.com/puppet-release-bionic.deb
sudo dpkg -i puppet-release-bionic.deb
sudo apt-get install puppet

sudo systemctl start puppet
sudo systemctl enable puppet
```

Step 20: On **Master**, list all the certificates

- **Sudo puppet cert list**

```
ubuntu@master:~$ sudo puppet cert list
  "slave1.eu-west-2.compute.internal" (SHA256) E4:C2:32:52:A7:15:EA:9F:82:
BB:FB:E2:A2:81:4F:0A:C8:9D:22:62:23:E9:8D:AB:F9:6D:63:E7:F6:39:E3:74
  "slave2.eu-west-2.compute.internal" (SHA256) 9A:31:79:0C:15:22:14:56:78:
8F:D6:85:6B:71:E7:D6:0C:91:2B:86:B7:57:4C:82:C9:F7:0F:B4:B8:A2:31:78
ubuntu@master:~$
```

- Sign all the certificates -> **sudo puppet cert sign --all**

```
ubuntu@master:~$ sudo puppet cert sign --all
Signing Certificate Request for:
  "slave2.eu-west-2.compute.internal" (SHA256) 9A:31:79:0C:15:22:14:56:78:8
F:D6:85:6B:71:E7:D6:0C:91:2B:86:B7:57:4C:82:C9:F7:0F:B4:B8:A2:31:78
Notice: Signed certificate request for slave2.eu-west-2.compute.internal
Notice: Removing file Puppet::SSL::CertificateRequest slave2.eu-west-2.comp
ute.internal at '/var/lib/puppet/ssl/ca/requests/slave2.eu-west-2.compute.i
nternal.pem'
Signing Certificate Request for:
  "slave1.eu-west-2.compute.internal" (SHA256) E4:C2:32:52:A7:15:EA:9F:82:B
B:FB:E2:A2:81:4F:0A:C8:9D:22:62:23:E9:8D:AB:F9:6D:63:E7:F6:39:E3:74
Notice: Signed certificate request for slave1.eu-west-2.compute.internal
Notice: Removing file Puppet::SSL::CertificateRequest slave1.eu-west-2.comp
ute.internal at '/var/lib/puppet/ssl/ca/requests/slave1.eu-west-2.compute.i
nternal.pem'
```

- Our master and slaves can now interact with each other

Step 21: To verify that slaves can communicate with the master, we will create a **Manifest**

- First we create a path on the **master**

```
sudo mkdir -p /etc/puppet/code/environments/production/manifests/
```

- We edit the **Manifest** file on the **master**

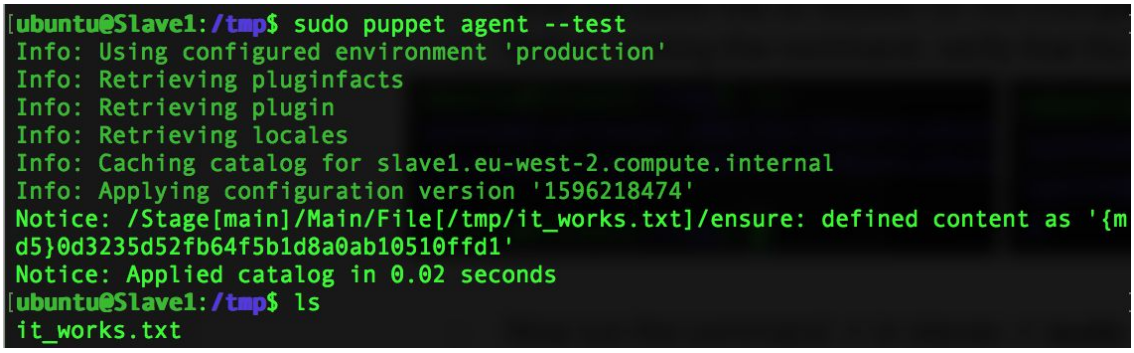
```
sudo nano /etc/puppet/code/environments/production/manifests/site.pp
```

- Add the content of the file. This code will ensure that a file **'/tmp/it_works.txt'** is present
- This will also set the file permission to **0644**

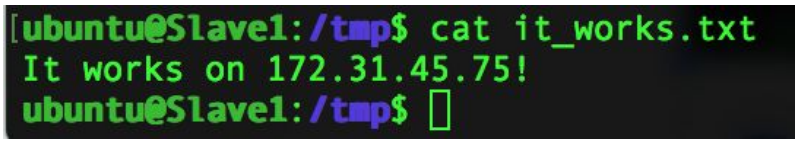
```
file {'/tmp/it_works.txt':                          # resource type file and filer
  ensure  => present,                               # make sure it exists
  mode    => '0644',                                # file permissions
  content => "It works on ${ipaddress_eth0}!\n",    # Print the eth0 IP fact
}
```

- **Save** -> Restart puppet master -> **sudo systemctl restart puppet-master**
- Now the slave has to request for the changes
- Before running the command, verify that the file **“it_works.txt”** is not inside **/tmp**

- Now run the command in slaves -> **sudo puppet agent --test**



- View the contents inside of the file



- Verify the permissions are right too

Step 22: Next, we modify the **site.pp** file to where we check if Apache is installed in the system or not.

Code:

- **node default** => any node that requests the change from **master**
- **file** => creates a new directory **'config-management'** since the directory is not present by default.
- **exec** => separate the two conditions using **onlyif** and **unless**

```
  GNU nano 2.9.3                        site.pp                          Modified

node default {

file { '/home/ubuntu/config-management/':
  ensure  => 'directory',
  mode    => '0644',
  content => " ",
}

exec{'Conditions1':
command=> '/bin/echo "Apache is installed on this system" > /home/ubuntu/config-management/status.txt',
onlyif=> '/bin/which apache2',
}
exec{'Conditions2':
command=> '/bin/echo "Apache is not installed on this system" > /home/ubuntu/config-management/status.txt',
unless=> '/bin/which apache2',
}
}
```

- Run the command in slaves -> **sudo puppet agent --test**
- Since the servers are new, they will not have Apache installed therefore we're expecting **"Apache is not installed on this system"** to be in **status.txt**

```
ubuntu@Slave1:~$ sudo puppet agent --test
Info: Using configured environment 'production'
Info: Retrieving pluginfacts
Info: Retrieving plugin
Info: Retrieving locales
Info: Caching catalog for slave1.eu-west-2.compute.internal
Info: Applying configuration version '1596221122'
Notice: /Stage[main]/Main/Node[default]/File[/home/ubuntu/config-management/]/ensure: created
Notice: /Stage[main]/Main/Node[default]/Exec[Conditions2]/returns: executed successfully
Notice: Applied catalog in 0.04 seconds
ubuntu@Slave1:~$ ls
config-management  puppet-release-bionic.deb
ubuntu@Slave1:~$ cd config-management/
ubuntu@Slave1:~/config-management$ ls
status.txt
ubuntu@Slave1:~/config-management$ cat status.txt
Apache is not installed on this system
```

- Verify if the **onlyif** block works by installing Apache in the servers

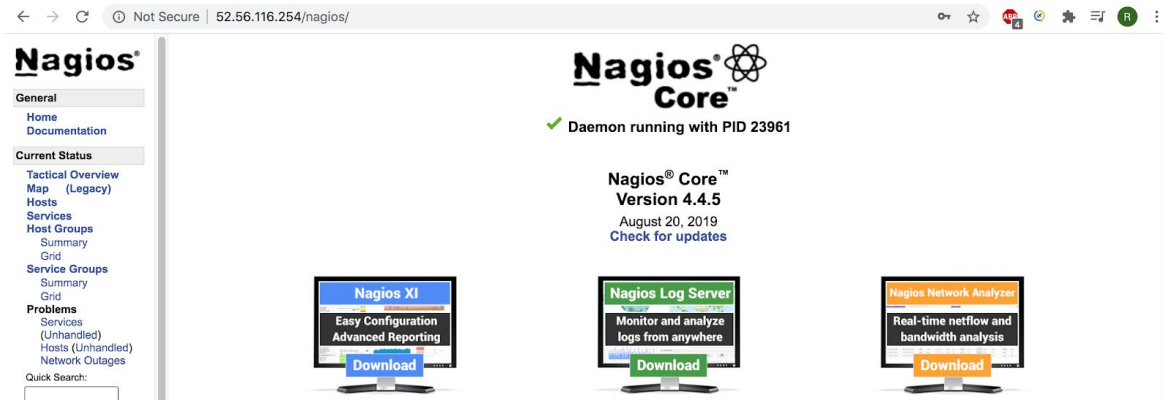
```
ubuntu@Slave1:~$ sudo systemctl status apache2
● apache2.service - The Apache HTTP Server
   Loaded: loaded (/lib/systemd/system/apache2.service; enabled; vendor preset: enabled)
  Drop-In: /lib/systemd/system/apache2.service.d
           └─apache2-systemd.conf
   Active: active (running) since Fri 2020-07-31 19:01:08 UTC; 21s ago
```

- We should see the **status.txt** change once we send a request again

```
ubuntu@Slave1:~$ sudo puppet agent --test
Info: Using configured environment 'production'
Info: Retrieving pluginfacts
Info: Retrieving plugin
Info: Retrieving locales
Info: Caching catalog for slave1.eu-west-2.compute.internal
Info: Applying configuration version '1596222214'
Notice: /Stage[main]/Main/Node[default]/Exec[Conditions1]/returns: executed successfully
Notice: Applied catalog in 0.04 seconds
ubuntu@Slave1:~$ cat config-management/status.txt
Apache is installed on this system
```

Step 23: Now we set up a Nagios monitoring service on our **Production** server

- Setup the master
  Installation guide: https://www.itzgeek.com/post/how-to-install-nagios-on-ubuntu-20-04/
- Confirm master is set up successfully by visiting **<Master-IP-Address>/nagios**
- We should see the login prompt -> Nagios home page



Step 24: Next is to add the host

- In **Slave2** (Production server):
  - **sudo apt update** -> **sudo apt install nagios-nrpe-server nagios-plugins**
- Edit **nrpe.cfg**
  - **sudo nano /etc/nagios/nrpe.cfg**
  - Uncomment **server_address** and add the address of your Nagios **master**

```
 GNU nano 2.9.3                  /etc/nagios/nrpe.cfg                    Modified


server_port=5666



# SERVER ADDRESS
# Address that nrpe should bind to in case there are more than one interface
# and you do not want nrpe to bind on all interfaces.
# NOTE: This option is ignored if NRPE is running under either inetd or xinetd

server_address=18.132.119.90
```

  - Restart the NRPE server -> **sudo /etc/init.d/nagios-nrpe-server restart**

Step 25: Now we need to setup the **Master** to interact with the client

- In **Master**:
  - **cd /usr/local/nagios/etc/objects**
  - **ls**
  - Open **localhost.cfg**
  - **sudo nano localhost.cfg**
  - Copy the **"define host"** section and we will use it to define a new host

```
# Define a host for the local machine

define host {

    use                     linux-server            ; Name of host template to $
                                                    ; This host definition will$
                                                    ; in (or inherited by) the $

    host_name               localhost
    alias                   localhost
    address                 127.0.0.1
}
```

- Now we'll create a new file
  - **sudo nano host1.cfg**
  - We paste the code we just copied, and we edit it a little bit like below:
  - Change the **host_name** and **alias**
  - Make sure to add the **address** to whatever your host address is

```
  GNU nano 2.9.3                        host1.cfg                          Modified

define host {

    use                     linux-server            ; Name of host template to use
                                                    ; This host definition will inherit$
                                                    ; in (or inherited by) the linux-se$

    host_name               Production-Server
    alias                   nagios-nrpe
    address                 18.132.119.90
}
```

- Next is to edit the **nagios.cfg** file by going back one directory
  - **cd ..**
  - **sudo nano nagios.cfg**
  - Scroll down and add a **cfg file**
  - Add the line **cfg_file=/usr/local/nagios/etc/objects/host1.cfg**

```
 GNU nano 2.9.3                    nagios.cfg                         Modified

# You can split your object definitions across several config files
# if you wish (as shown below), or keep them all in a single config file.

# You can specify individual object config files as shown below:
cfg_file=/usr/local/nagios/etc/objects/commands.cfg
cfg_file=/usr/local/nagios/etc/objects/contacts.cfg
cfg_file=/usr/local/nagios/etc/objects/timeperiods.cfg
cfg_file=/usr/local/nagios/etc/objects/templates.cfg
cfg_file=/usr/local/nagios/etc/objects/host1.cfg
# Definitions for monitoring the local (Linux) host
cfg_file=/usr/local/nagios/etc/objects/localhost.cfg
```

- Restart the Nagios server
    - **sudo systemctl restart nagios**

- Check in Nagios Dashboard -> **Hosts** -> **Production-Server** should be included

Host Status Details For All Host Groups

Limit Results: 100

Host	Status	Last Check	Duration	Status Information
Production-Server	UP	07-31-2020 19:36:33	0d 0h 0m 26s+	PING OK - Packet loss = 0%, RTA = 0.57 ms
localhost	UP	07-31-2020 19:35:09	0d 0h 21m 12s	PING OK - Packet loss = 0%, RTA = 0.05 ms

Step 26: Create a monitoring service

- I've recreated my infrastructure like and the website is up and running

- Now we will create a monitoring service that will check if this IP address can be pinged at Port 80
- We go to our Nagios server and go to **localhost.cfg** and let's copy the **service** section of the configuration file

```
ubuntu@master:~$ sudo nano /usr/local/nagios/etc/objects/localhost.cfg
```

```
define service {

    use                     local-service         ; Name of service template to use
    host_name               localhost
    service_description     PING
    check_command           check_ping!100.0,20%!500.0,60%
}
```

- We'll edit to monitor the **http** service
- We go back and add the **service** code block to **host1.cfg**
- We use the template **generic-service**
- **host_name** would be the same name for your host **(Production-Server)**
- **service_description** - the description of the service that we will see in the GUI

- Command for this particular service is **check_http.** This is the official command for checking Port 80 for any computer.

```
 GNU nano 2.9.3                        host1.cfg                          Modified

define host {

    use                     linux-server            ; Name of host template to use
                                                    ; This host definition will inherit$
                                                    ; in (or inherited by) the linux-se$

    host_name               Production-Server
    alias                   nagios-nrpe
    address                 18.132.119.90
}

define service {

    use                     generic-service          ; Name of service template to use
    host_name               Production-Server
    service_description     Check Apache
    check_command           check_http
}
```

- Now we save and exit
- Restart the server - **sudo systemctl restart nagios**
- We should see that there is a new service called **Check Apache** for **Production-Server** in the pending state from the GUI

Limit Results: 100

Host	Service	Status	Last Check	Duration	Attempt	Status Information
Production-Server	Check Apache	PENDING	N/A	0d 0h 0m 4s+	1/3	Service check scheduled for Fri Jul 31 21:05:35 UTC 2020
localhost	Current Load	OK	07-31-2020 21:01:24	0d 1h 48m 1s	1/4	OK - load average: 0.00, 0.00, 0.01
	Current Users	OK	07-31-2020 21:02:02	0d 1h 47m 23s	1/4	USERS OK - 1 users currently logged in
	HTTP	OK	07-31-2020 21:02:39	0d 1h 46m 46s	1/4	HTTP OK: HTTP/1.1 200 OK - 11192 bytes in 0.001 second response time

- Wait a few minutes, the status should be **OK** since the website is up and running on **Production** server

Host	Service	Status	Last Check	Duration	Attempt	Status Information
Production-Server	Check Apache	OK	07-31-2020 21:05:35	0d 0h 3m 8s+	1/3	HTTP OK: HTTP/1.1 200 OK - 484 bytes in 0.003 second response time

- By default, **check_http** command takes around 10mins to retry therefore will take a long time to update the status on the GUI
- To modify that, we go to **host1.cfg** in our server
- Add the **retry_interval** and **check_interval** commands. 1 means **“1 minute”**. The result should be that the GUI will update much faster.

```
define service {

    use                     generic-service          ; Name of service template to use
    host_name               Production-Server
    service_description     Check Apache
    check_command           check_http
    retry_interval           1
    check_interval           1

}
```

- Then restart server - **sudo systemctl restart nagios**

- We can see these additional commands from **templates.cfg**

Step 26: Verify that the monitoring service we've created is working properly by stopping the container running our website

```
ubuntu@Slave2:~$ sudo docker container stop 52e97bc50fdf
52e97bc50fdf
```

18.132.119.90

This site can't be reached

18.132.119.90 refused to connect.

- We should see that the status of **Check Apache** is **CRITICAL**

Host	Service	Status	Last Check	Duration	Attempt	Status Information
Production-Server	Check Apache	CRITICAL	07-31-2020 21:14:42	0d 0h 0m 13s	1/3	connect to address 18.132.119.90 and port 80: Connection refused

- Now try running the container again, the **Check Apache** status should go back to **OK**

Not Secure | 18.132.119.90

You've pushed the website to prod

Host	Service	Status	Last Check	Duration	Attempt	Status Information
Production-Server	Check Apache	OK	07-31-2020 21:17:42	0d 0h 2m 35s	1/3	HTTP OK: HTTP/1.1 200 OK - 484 bytes in 0.002 second response time

Step 27: Finally, push to **develop** branch one more time -> Test server builds and tests the application -> Merge **develop** to **master** -> Test server builds and tests the application, then deploys to Production server -> Production server displays the website -> Production server is monitored using Nagios

18.132.119.90

Capstone Project 1