Cloud 300

Student Lab Manual

Contents

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Lab: Implement a Protocol with Spring Boot

Overview
Time: 15-30 Minutes

In this lab, you will:

- Implement Protocol with Spring Boot

Introduction

Step 1: Examine the new code of the pom.xml

We are going to modify the pom.xml in order to add some new components.

Take a look at the following:

```
        <dependencies>
                <dependency>
                        <groupId>org.springframework.boot</groupId>
                        <artifactId>spring-boot-starter-security</artifactId>
                </dependency>
                <dependency>
                        <groupId>org.springframework.security</groupId>
                        <artifactId>spring-security-test</artifactId>
                        <scope>test</scope>
                </dependency>
         </dependencies>
```

Notice that there are two new dependencies, both related to security:

1. spring-boot-starter-security
2. spring-security-test

These are going to introduce security into our applications. The way this will work is that it will force authentication.

We haven't specified a username or password. In fact, we haven't specified anything in our code. So how will it work?

The username will be "user", and the password will be an autogenerated UUID. We will get the password once we run the app.

Step 2: Copy the pom.xml to your directory

```
cp configs/1.2-pom.xml api-lab-1
```

Step 3: Re-build

Go to the command line, and type:

```
cd api-lab-1
./mvnw clean package   # Linux / Mac
```

Windows users should do the following:

```
cd api-lab-1
mvnw.cmd clean package
```

Again, we will see a lot of output.

If things went well, you should see something like this:

```
[INFO] --- spring-boot-maven-plugin:2.0.2.RELEASE:repackage (default) @ api-
lab-1 ---
[INFO] ------------------------------------------------------------------------
[INFO] BUILD SUCCESS
[INFO] ------------------------------------------------------------------------
[INFO] Total time: 11.896 s
[INFO] Finished at: 2018-06-12T22:58:35-07:00
[INFO] ------------------------------------------------------------------------
```

Step 4: Run my App

Let's again run our application. We can do that with Maven was well.

```
./mvn spring-boot:run
```

Followed by a bunch of more messages. This time, watch out for an extremely important message, which is the password.

```
Using generated security password: 594d8fc9-17e2-4b46-929b-4a9c125305a5
```

Of course, your security password will be different. Cut and paste the password. Because you will need it in the next step.

Step 5: Test my app with authentication

Let's test it! Open your browser to http://localhost:8080

You will need to login as **user**, and the password will be the generated password you saw before.

If you correctly authenticate, you will see the following:

```
Hello from Spring Boot!
```

Step 6: Use the command line

That is fantastic! But, wait a minute! Do I really have to open a browser up every time I want to authenticate? That could be a real pain.

Fortunately, no, you don't have to do that. Let's test our web service with "curl" -- or your favorite command line tool for testing web services. You will need to change your password credential to match the one you used in Step 5.

```
curl -i --user user:594d8fc9-17e2-4b46-929b-4a9c125305a5
http://localhost:8080/
```

If you correctly authenticate, you will see the following:

```
Hello from Spring Boot!
```

Lab: Open Source – REST Setup

Overview
Time: 30-45 Minutes

In this lab, you will:

- Set up development environment for RESTful calls.

Step 1: Install Anaconda

Open this URL in your browser: https://conda.io/docs/user-guide/install/index.html
Follow the instructions for your operating system.

Step 2: Check Flask

Flask should be installed in Anaconda.

Check by:

```
$   python
        > import flask
```

If not, you can install as follows:

Option 1: Anaconda environment

```
$   conda install flask
```

Option 2: Python environment

```
$ pip install flask
```

Step 3: Run Basic Flask Server

Source code for '300-Lab-Files' will be provided. Download it to your computer.

Execute the following file:

```
$ cd 300-Lab-Files

$ cd REST-labs

$ python ./simple-web-server.py
```

```
> * Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)
```

```
    > * Restarting with stat
    > * Debugger is active!

    > * Debugger PIN: 257-977-014
```

Step 4: Testing Web Server / Service

For this we are going to use various methods to test the web server.

4.1 - Browser (Simplest)

In a browser go to http://127.0.0.1:5000/

You should see `'hello world'` response.

4.2 - Command Line

This works best on Linux / Mac environments where we have good toolset installed.

url

Curl is old-school.

```
$  curl http://127.0.0.1:5000/
```

httpie

This is more modern version.

https://github.com/jakubroztocil/httpie

```
$  pip install httpie
```

Usage

```
$ http http://127.0.0.1:5000/
```

```
HTTP/1.0 200 OK
        Content-Length: 13

        Content-Type: text/html; charset=utf-8

        Date: Wed, 18 Apr 2018 18:29:49 GMT
```

```
        Server: Werkzeug/0.14.1 Python/3.6.4

        Hello, World!
```

4.3 - Rest Clients

These browser extensions are really great to test web services very easily.

You can try the following Chrome extensions:

- Advanced Rest Client
- Postman
- Rest client

To install go to this URL:

https://chrome.google.com/webstore/category/extensions

Go ahead and install one of the clients and try to go to the URL.

http://127.0.0.1:5000/

4.4: Python program

And finally, we need to be able to test our webservice from Python.

Option 1: Requests library

http://docs.python-requests.org/en/latest/

Try the following code:

```
import requests
import pprint


r = requests.get('http://127.0.0.1:5000/')
print("status ", r.status_code)
print()
print("headers \n", pprint.pformat(r.headers, indent=4))
```

```
print()
print("content:\n", r.text)
print()
print("content as JSON:\n", r.json())
print()
```

Option 2: httplib2 library

https://github.com/httplib2/httplib2

Install it as:

```
$ pip install httplib2
```

And try the following python code.

Then try going to google.com to see the response.

```
import httplib2
from pprint import pprint


h = httplib2.Http('.cache')
response, content = h.request('http://127.0.0.1:5000/')
#response, content = h.request('http://www.google.com/')
print("-----headers----")
pprint(response)
print('-----content----')
pprint(content)
```

Done!

Lab: Open Source – RESTful Time Tracker Web Service

Overview
Time: 15-30 Minutes

In this lab, you will:

- Use your setup to create and deploy web services.

We are going to build a web service that keeps track of time spent on various tasks.

We are keeping our tasks as a simple list in memory. In reality, you will store this into a database.

```
tasks = [
    {
        'id': 1,
        'name': u'fixing bug #1',
        'time_spent': 20  # in mins
    },
    {
        'id': 2,
        'name': u'customer support',
        'time_spent': 30
    }
]
```

We will build a web server and a client.

Step 1: Run Web Server

Inspect this file: **time-tracker-webservice.py**

This is our web service server.

We are going to build up the service by fixing TODO items in the code.

We are building REST api calls by using annotations as follows:

```
import flask


tasks = [
    {
        'id': 1,
        'name': u'fixing bug #1',
        'time_spent': 20  # in mins
    },
    {
        'id': 2,
        'name': u'customer support',
        'time_spent': 30
    }
]


@app.route('/tasks/list', methods=['GET'])
def get_tasks_list():
    ret_value = {'status' : 'ok',\
                 'tasks' : tasks}
    return flask.jsonify(ret_value)
```

Launch the server from a terminal, as it is a long running process.

```
$   cd 300-Lab-Files/REST-labs
$   python ./time-tracker-webservice.py
```

Go to url http://127.0.0.1:5000/ to make sure server is running.

Step 2: Client

We will use httpie for our testing.

Install httpie as follows:

```
$ pip install httpie
```

Step 3: Quick Test

Execute the following from command line:

```
$  http   http://127.0.0.1:5000
```

Step 4: List Tasks

```
$  http   http://127.0.0.1:5000/tasks/
$  http   http://127.0.0.1:5000/tasks/list
```

Step 5: GET

```
$  http   http://127.0.0.1:5000/task/1
## Get a task that doesn't exist
$  http   http://127.0.0.1:5000/task/100
## Get a task that doesn't exist
```

```
$  http   http://127.0.0.1:5000/task/xyz
```

Step 6: POST

```
$    http POST http://127.0.0.1:5000/task/new name='new task'
```

```
Step 7: UPDATE (PUT / POST)

$  http POST http://127.0.0.1:5000/task/update/1 time=10
```

Step 8: DELETE

```
$   http DELETE http://127.0.0.1:5000/task/delete/1
```

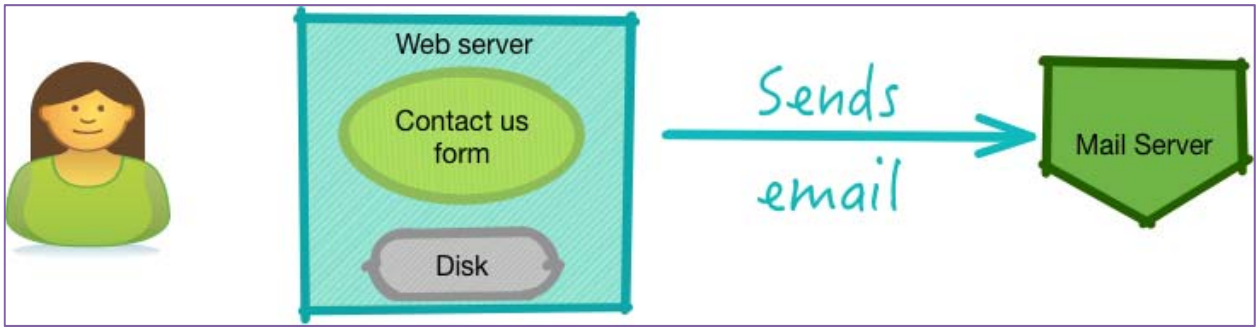
Discussion: Analyzing an Application for Resiliency

Overview
Time: 10-20 Minutes

In this exercise, we will examine an application for potential failure scenarios.

Scenario: A form mailer application.

We have the web form: **Contact US**.
Contact Us collects information and sends that information, in an email, to the company.



Step 1: What are the failure scenarios you can think of?

Here are some things to take into consideration:

- What if the remote mail server connection is refused?
- What if the web server fails?
- What if the web server disk becomes full?

Discussion: Designing a Resilience Application

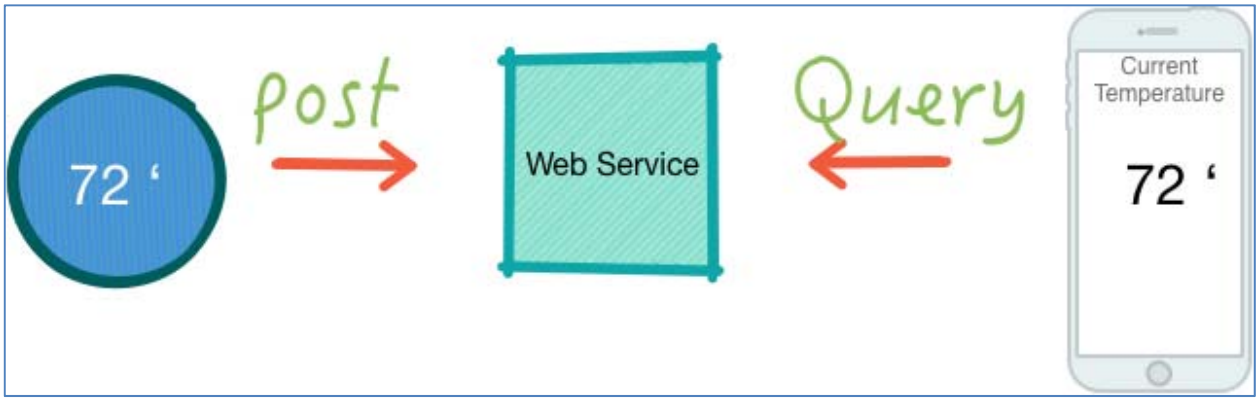
Overview
Time: 20-30 Minutes

In this exercise, we are going to design a resilience IOT (Internet of Things) application.

Scenario: Our IOT application.

Imagine we have an IOT device – a thermostat - at home.
The IOT device reports temperature data to a web service.
We also have a web service that the user can access to see the current temperature at their home, and keeps the historical temperature readings.

Here is an overview:



Step 1: Form Groups

Self-organize into 3 or 4 groups.
Sit together so you can discuss the scenario freely.

Step 2: Group Design

Design a system that is highly available and resilient.
Think of all the components that could be needed for a service of this nature.
Do we need a datastore? What kind? etc.

Step 3: Present Your Design to the Class

Each group will present their design.
We will learn together!

Lab: Limits Service

Overview
Time: 30 Minutes

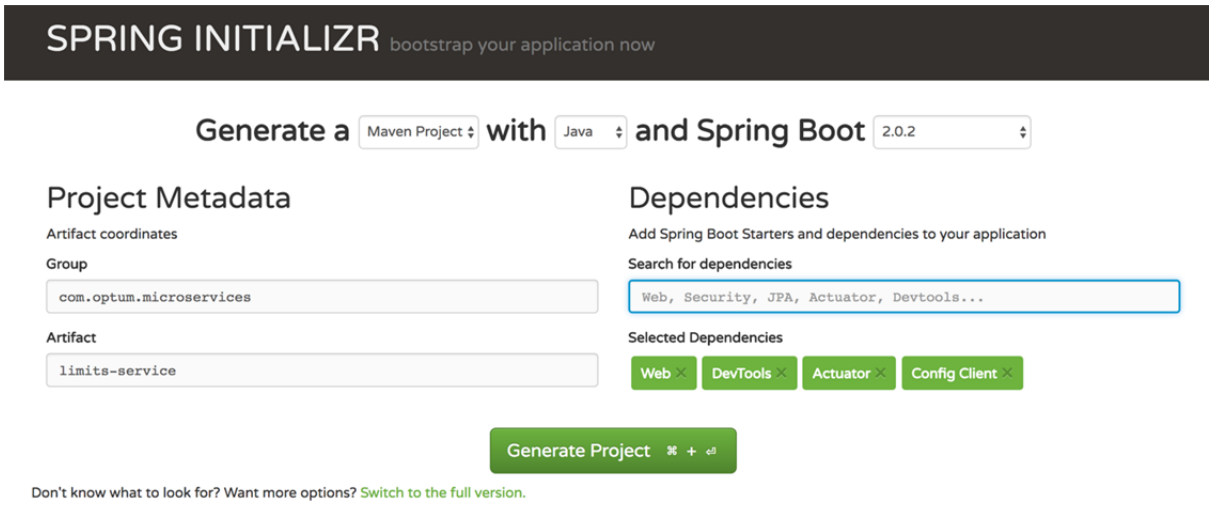
In this lab, you will:

- Develop limits service to read configuration from a properties file.

Step 1: Bootstrap Simple Rest Service

Open URL https://start.spring.io/

Pick latest boot version and add dependencies as shown below.



After clicking **Generate Project**, a zip file will be downloaded, unzip the file and keep it in a folder of your choosing.

Open this project in your favorite IDE. The first time setup takes time for Spring Boot.

Run com.optum.microservices.limitsservice.LimitsServiceApplication to assure service is working fine. Output results after running should be similar to the below.

```
Started LimitsServiceApplication in 8.917 seconds (JVM running for
10.546)
```

Step 2: Create a Bean to Serve Data through Rest

Create a bean to return a value from the controller.
com.optum.microservices.bean.LimitConfiguration

```
public class LimitConfiguration {

private int maximum;

private int minimum;

protected LimitConfiguration() {

}

public LimitConfiguration(int maximum, int minimum) {

this.maximum = maximum;

this.minimum = minimum;

}

public int getMaximum() {

return maximum;

}

public int getMinimum() {

return minimum;

}

}
```

Step 3: Adding Configuration to Properties

```
spring.application.name=limits-service

limits-service.minimum=1

limits-service.maximum=999
```

Step 4: Create Property Configuration Reader

Add com.optum.microservices.limitsservice.Configuration class.

Add the fields maximum and minimum, the same as was added in application.properties and generate getters/setters.

Also, add the prefix we have used in the properties "limits-service" to the annotation ConfigurationProperties.

```
@org.springframework.context.annotation.Configuration

@ConfigurationProperties("limits-service")

public class Configuration {

private int maximum;

private int minimum;

public int getMaximum() {

return maximum;

}

public void setMaximum(int maximum) {

this.maximum = maximum;

}
```

```
public int getMinimum() {

return minimum;

}

public void setMinimum(int minimum) {

this.minimum = minimum;

}

}
```

Step 5: Create Rest Controller to Handle Incoming Requests

Create a class com.optum.microservices.limitsservice.LimitsConfigurationController.

Create a public method retrieveLimitsFromConfiguration and annotate this method for GetMapping as /limits.

Annotate the class with the annotation **RestController**.

```
@RestController

public class LimitsConfigurationController {

    @GetMapping("/limits")

    public LimitConfiguration retrieveLimitsFromConfiguration() {

    }

}
```

Autowire this class with an instance of configuration reader to read the value from the properties file.

```
@RestController
```

```
public class LimitsConfigurationController {

    @Autowired

    private Configuration configuration;

    @GetMapping("/limits")

    public LimitConfiguration retrieveLimitsFromConfiguration() {

        return new LimitConfiguration(configuration.getMaximum(),
configuration.getMinimum());

    }

}
```

Restart your application and open this URL http://localhost:8080/limits

```
{"maximum":999,"minimum":1}
```

Lab: Spring Cloud Config Server

Overview
Time: 15 Minutes

In this lab, you will:

- Generate and setup Spring Cloud Config Server to hold maximum and minimum configuration properties and will run on port 8888. This service will serve limits-service with properties.

Step 1: Setup Git Local Repo with Config File

- Create a folder anywhere on your machine and perform git init.
- Add this folder as an external resource (optional step).
- Create a properties file inside this folder, since this will be your configuration server. Keep in mind that the file name has to be same as the application name. That is the application for which we are creating the configuration i.e., limits-service.properties.
- Copy the below entries from application.properties of limits-service to the new config project.Then the limits-service will get configuration from spring cloud config.

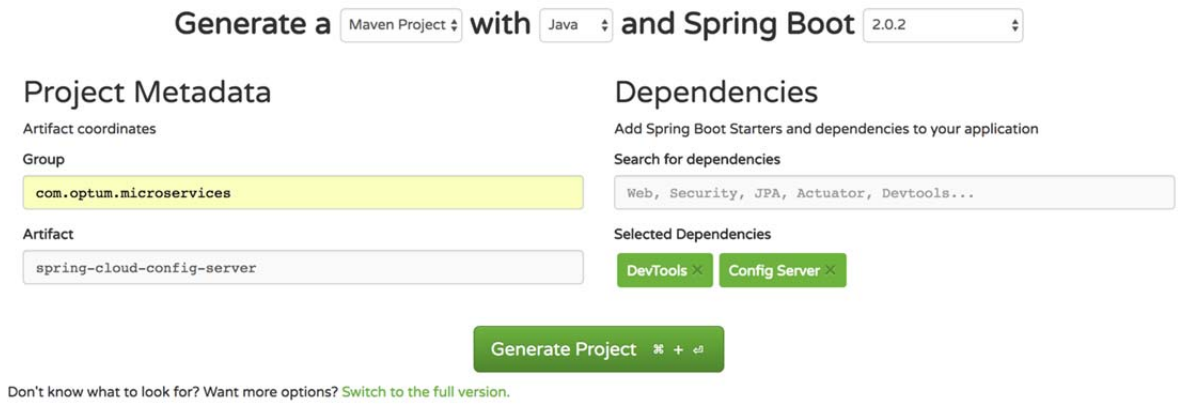
```
limits-service.minimum=1
limits-service.maximum=999
```

- Run **git init** inside the new folder and add the newly created file.
- Commit this file locally, no need to push.

Step 2: Generate and Setup Spring Cloud Config Server on Port 8888

Setup

Create a new project from https://start.spring.io/ and add Config Server as a dependency, as shown below.



- Click **Generate Project** and open with IDE.
- Make the below entries to **application.properties:**

```
spring.application.name=spring-cloud-config-server
server.port=8888
spring.cloud.config.server.git.uri=file://{git-localconfig-repo-path}
```

- Change `git-localconfig-repo-path` with full path on your machine, you can also use the github file.
- Add **@EnableConfigServer** to com.optum.microservices.springcloudconfigserver.SpringCloudConfigServerApplication

Run spring cloud config server and open URL **http://localhost:8888/limits-service/default**

```
{"name":"limits-service","profiles":["default"],"label":null,"version":"d7bbc8de7b6d61e4da2f8f20dcfea8b2
```

Step 3: Change to Limits-Service to Read from Spring Cloud Config Server

- Rename **application.properties** inside limits-service to **bootstrap.properties**
- Add spring.cloud.config.uri=**http://localhost:8888** to **bootstrap.properties**
- Run the application and now, **limit service** will read the property from spring-cloud-config-server running on port 8888.

Lab: Pulling a Container

Overview
When we run a docker container, we very rarely ever start from scratch. Docker provides us an OS kernel (such as Linux), but generally does **not** provide us with any of the other aspects of the OS we think of.

Time: 30 Minutes
In this lab, you will be able to:

- Perform multiple Docker functions.

Step 1: Do a Docker Pull

A `docker pull` will pull down a public repo from dockerhub. Think of it like a `git pull`.

We are going to use a lightweight Linux container called alpine. You can read more about it here: https://hub.docker.com/r/_/alpine/. It is only 4MB in size, making it perfect for a container.

```
docker pull alpine
```

You should get the following results:

```
Using default tag: latest
latest: Pulling from library/alpine
ff3a5c916c92: Pull complete
Digest:
sha256:7df6db5aa61ae9480f52f0b3a06a140ab98d427f86d8d5de0bedab9b8df6b1c
0
Status: Downloaded newer image for alpine:latest
```

Step 2: See the docker image we downloaded

```
docker images

REPOSITORY          TAG                 IMAGE ID            CREATED
SIZE
hello-world         latest              e38bc07ac18e        5 weeks
ago         1.85kB
alpine              latest              3fd9065eaf02        4 months
ago        4.15MB
```

There you see it, Alpine. But what do we do with it?

Step 3: Run the Container

How do we run the container?

```
docker container run alpine ls
```

Running this at the root "/" directory, we see the directories there.

```
bin
dev
etc
home
lib
media
mnt
proc
root
run
sbin
srv
sys
tmp
usr
var
```

Step 4: Listing Containers

Let's try to list our container.

```
docker container ls
```

Resulting in the response below:

```
CONTAINER ID        IMAGE               COMMAND             CREATED
STATUS              PORTS               NAMES
```

Wait! Where's our container? Well, our container isn't running at the moment. The command we gave it (ls) ended already. We can see the stopped container if we want like this.

```
docker container ls -a

CONTAINER ID        IMAGE               COMMAND             CREATED
STATUS                          PORTS               NAMES
d060f9a50c7c        alpine              "ls"                About a
minute ago   Exited (0) About a minute ago
admiring_keldysh
887030cdbd7e        hello-world         "/hello"            26 minutes
ago       Exited (0) 26 minutes ago
nostalgic_lewin
```

There we go. We have two containers, both stopped. Remember hello world? That's there. Just stopped.

Wait, should we keep creating all these containers? You can stop it from being created, if you just want to perform the one-and-done command.

```
docker container --rm ls -l
```

** **TO DO**: See what containers we have. Does the new one show up?
It will display the following message:

```
unknown flag: --rm
```

See 'docker container --help'.

Step 5: Interactive shells

Wait, how do I `ssh` my container? Well, you don't usually do it that way. For one thing, your container isn't actually running right now, so if you try to `ssh` it won't respond. What you probably want is an interactive shell.

How do I do that?

```
docker container run -it --rm alpine /bin/ash
```

What does this mean?
* `-i` : interactive mode
* `-t` : terminal mode
* `--rm` : remove container after we are done
* `/bin/ash` : bash is big and needs to be installed. `ash` (almquist shell) is small. We also have old-school `sh`.

Here are the results with a few commands:

```
/ # echo hello
hello
/ # cd
~ # pwd
/root
~ # echo bye!
bye!
~ # exit
```

** **TO DO:** You try some of your own commands.

Summary

So, what's the point? That we can run a mini size linux? Well, we are about to see how we can build on what we have learned so far. This was a good place to start, and we needed some basic commands to build on.

Lab: Manipulating a Container

Overview
Time: 30 Minutes

In this lab, you will be able to:

- Manipulate our containers.

Step 1: Start up a new alpine container

```
docker container run -it alpine
```

You will find yourself a root prompt in the new container. Try executing the command "`ls /`"

```
# ls /

bin  dev  etc  home lib  media  mnt  proc
root run  sbin srv  sys  tmp  usr  var
```

Step 2: Delete all files in the container

Now, let's delete all files in the container. This is very dangerous, you must make sure you are doing this **IN THE CONTAINER**, and not on a root prompt on your local system or your cloud VM.

```
# rm -rf /
```

DO NOT TRY THIS AT HOME!!
Now, let's see if the files are gone.

```
# ls

/bin/sh ls: not found
```

Everything's gone. You've trashed your system. Congratulations!

Exit out of your container by hitting **CTRL-D.**

Now, let's see what happens if we run our container again.

```
docker container run -it alpine
```

Ok, let's see if our files are there.

```
ls -l

bin  dev  etc  home lib  media  mnt  proc
root run  sbin srv  sys  tmp  usr  var
```

** Why are all the files back after we deleted them all? **

Go ahead and exit by hitting **CTRL-D** or typing **`exit`**.

Step 3: Deleting Containers

Now, see if you can see your command:

```
docker container ls -as

CONTAINER ID   IMAGE     COMMAND        CREATED             STATUS
PORTS     NAMES              SIZE
c183852a7215   alpine    "/bin/sh"      6 minutes ago       Exited (0)
2 minutes ago             adoring_joliot      5B (virtual 4.15MB)
```

Notice the size around 5 bytes. Not exactly taking up a lot of space. The container IMAGE takes up around 4.15MB.

But, we may want to clean up our images anyway. We can use docker container `rm` for that.

```
docker container rm <container-id>
```

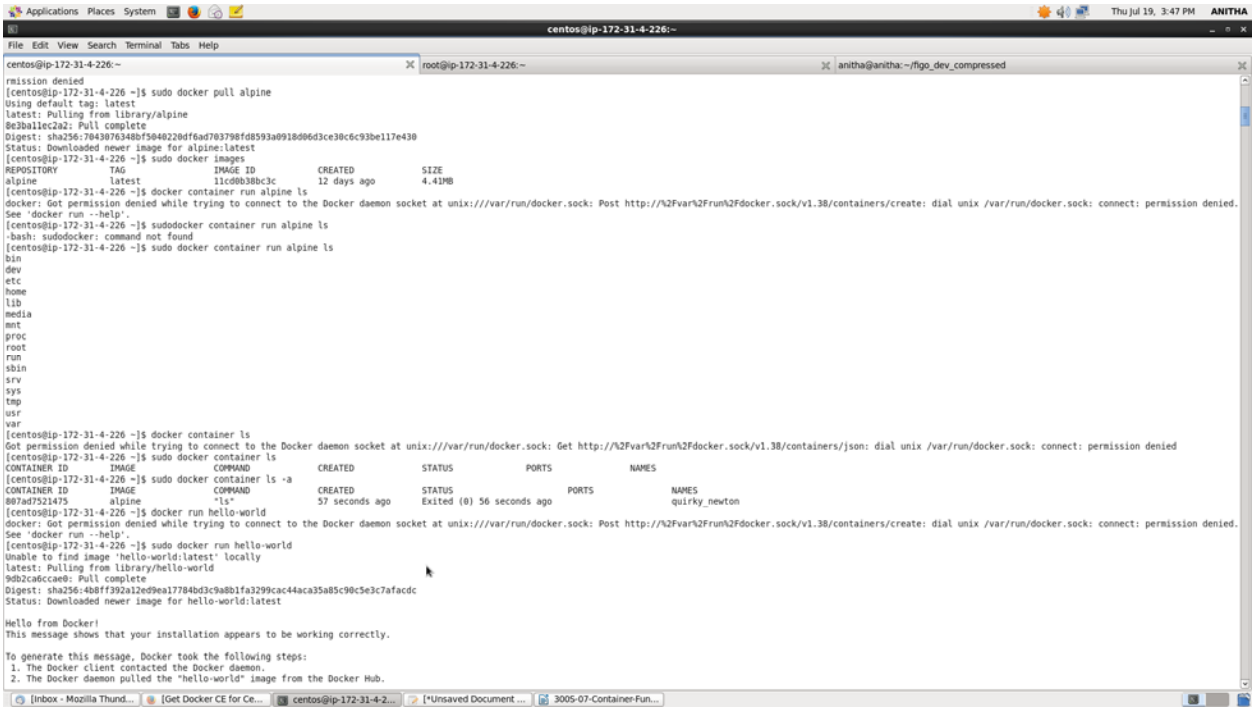
Now you can run:

```
docker container rm ls -as

CONTAINER ID   IMAGE     COMMAND        CREATED             STATUS
PORTS     NAMES              SIZE
```

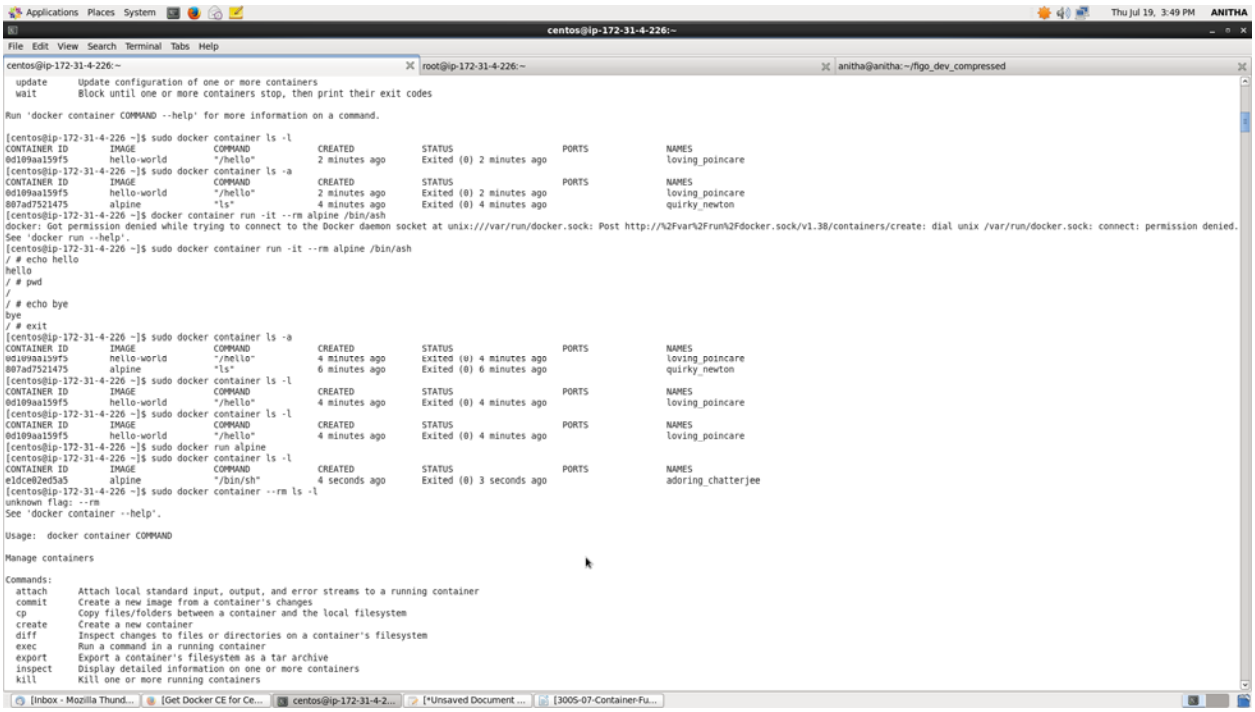
It shouldn't be there anymore.

What if you want to run the docker container and just have it auto-delete after you are done.

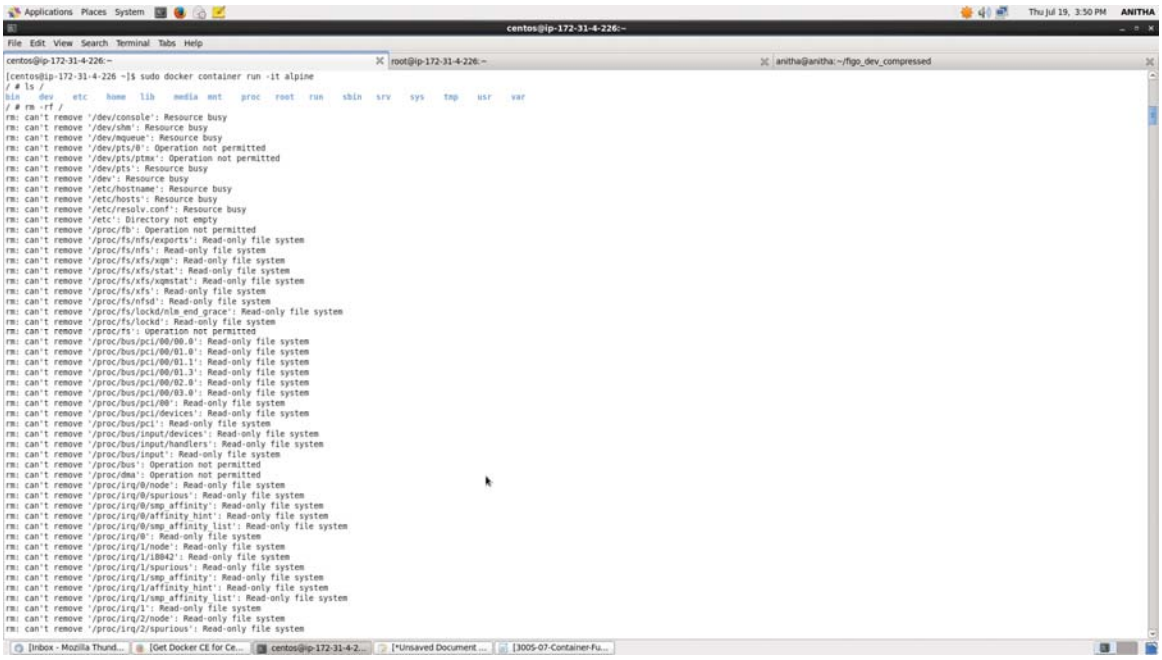


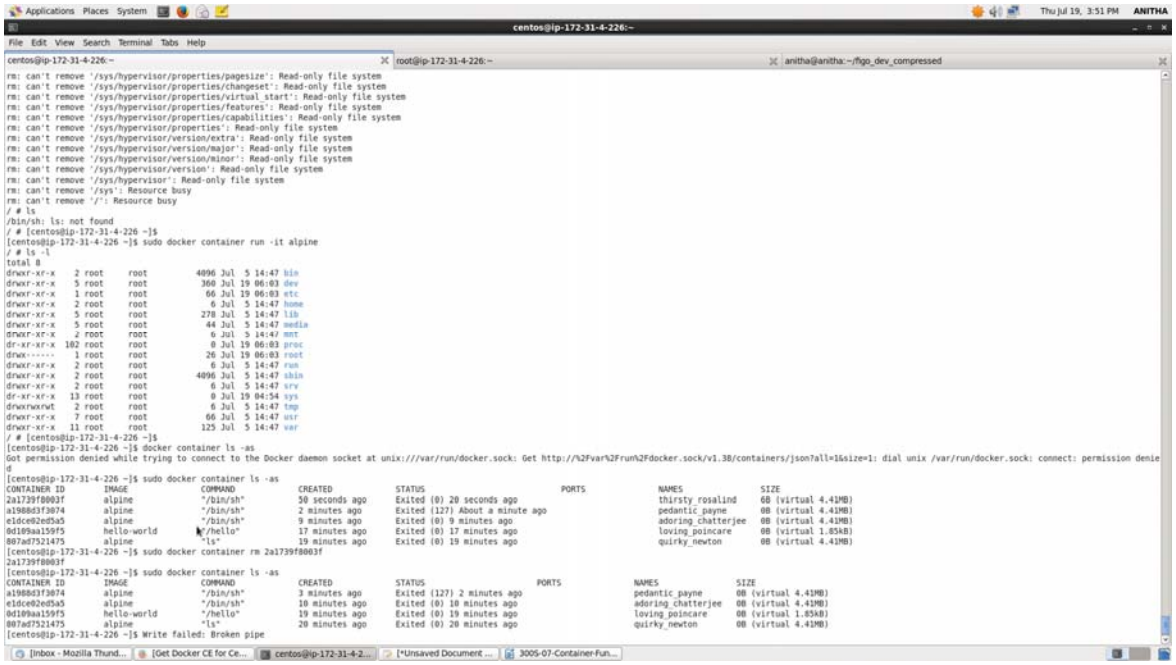
Docker pull and docker images.

Run and List the containers and Interactive Shells.



Run the Container and remove all the files in it.





Deleting the Containers.

Lab: Ports

Overview
So, we have had fun executing Linux commands on our container. How do we do networking on our container? Networking is going to be picked up by our host. So, we need to know specify what ports we want forwarded to the container.

Time: 30 Minutes
In this lab, you will be able to:

- Network with containers.

Here's how we do port forwarding.

```
docker container run -p HOSTPORT:CONTAINERPORT
```

Step 1: Run

We run this, and this means port 8002 on the host is pointed to port 8002, which is mapped to port 80 on the container.

```
docker container run -p 8000:80 nginx
```

```
docker container run -p 8002:80 nginx
Unable to find image 'nginx:latest' locally
latest: Pulling from library/nginx
f2aa67a397c4: Pull complete
3c091c23e29d: Pull complete
4a99993b8636: Pull complete
Digest:
sha256:0fb320e2a1b1620b4905facb3447e3d84ad36da0b2c8aa8fe3a5a81d1187b88
4
Status: Downloaded newer image for nginx:latest
172.17.0.1 - - [24/May/2018:04:25:57 +0000] "GET / HTTP/1.1" 200 612
"-" "Mozilla/5.0 (X11; Linux x86_64) AppleWebKit/537.36 (KHTML, like
Gecko) Chrome/65.0.3325.181 Safari/537.36" "-"
2018/05/24 04:25:57 [error] 6#6: *1 open()
"/usr/share/nginx/html/favicon.ico" failed (2: No such file or
directory), client: 172.17.0.1, server: localhost, request: "GET
/favicon.ico HTTP/1.1", host: "localhost:8002", referrer:
"http://localhost:8002/"
172.17.0.1 - - [24/May/2018:04:25:57 +0000] "GET /favicon.ico
HTTP/1.1" 404 572 "http://localhost:8002/" "Mozilla/5.0 (X11; Linux
x86_64) AppleWebKit/537.36 (KHTML, like Gecko) Chrome/65.0.3325.181
Safari/537.36" "-"
```

Step 2: Go to Browser

Open up a browser and go to the following url:

```
http://localhost:8002
```

If you are running locally.

If you are running in the cloud, go to your IP address:

```
http://YOURIPADDRESS:8002
```

You should see the following:

```
Welcome to nginx!

If you see this page...

Thank you for using nginx.
```

Step 3: Stop the container

Press **Ctrl-C** to stop the container.
Now, try going back to the browser and re-loading. Do you see the page?
The page doesn't work while the container is stopped!

Step 4: Run the container in the background

```
docker container run -p 8002:80 -d nginx
```

You will see the new container id copied to the screen, as this runs in the background.

```
ffcee5395fc4fc4ca97c48b03b3510ec973c6fa8601e9b299e306a6d36f6ff74
```

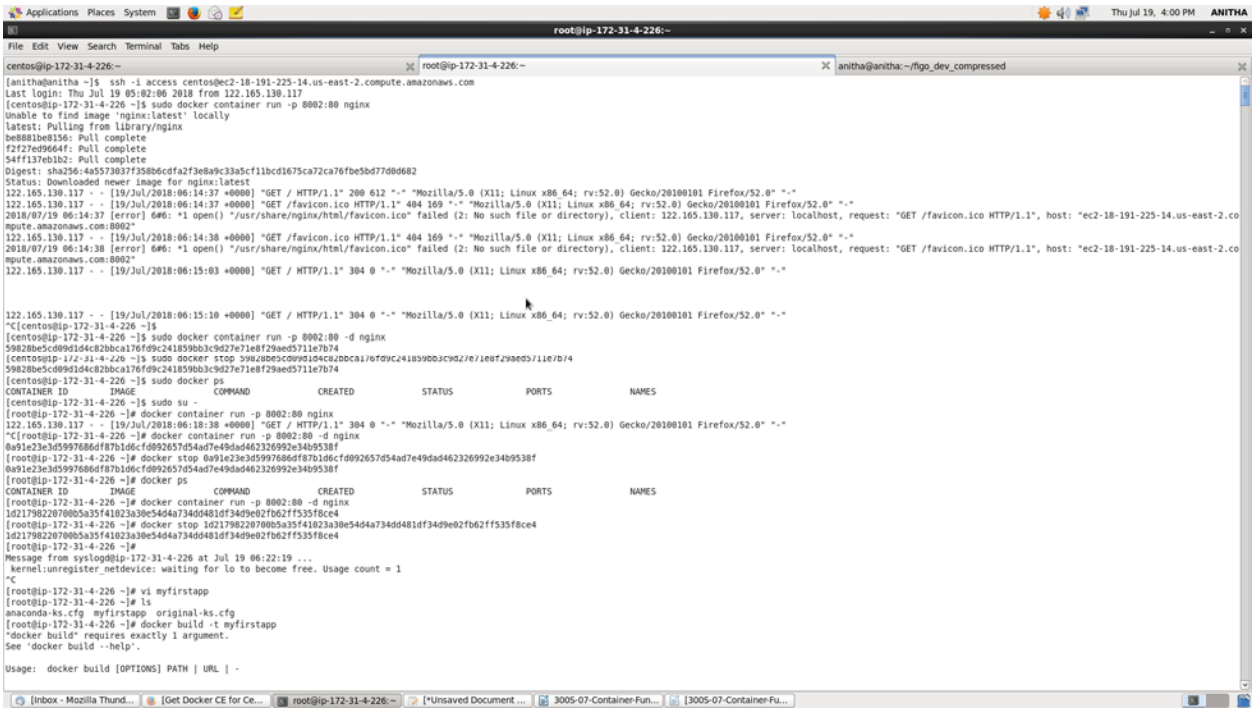
Step 5: Go back to the page

As in step 2, go back to the page. You should see nginx running again.

Step 6: Stop the container

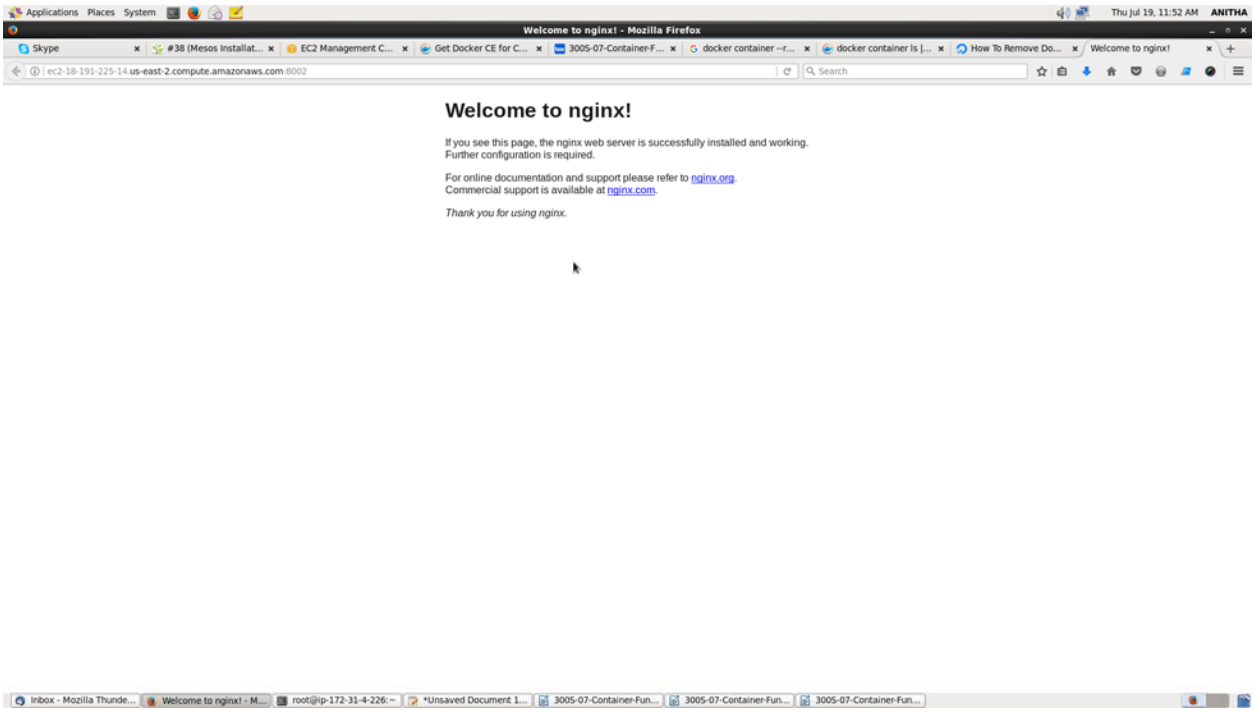
```
docker stop <paste-container-id-here>
```

It should stop your container. If it doesn't recognize the container id you can pasted "`sudo docker ps`" to get the list of container ids.



Run the container.

In the browser.


Applications Places System
Thu Jul 19, 11:52 AM ANITHA
Welcome to nginx! - Mozilla Firefox
Skype
#38 (Mesos Installat...
EC2 Management C...
Get Docker CE for C...
3005-07-Container-F...
docker container --r...
docker container ls |...
How To Remove Do...
Welcome to nginx!
ec2-18-191-225-14.us-east-2.compute.amazonaws.com:8002
Search
Welcome to nginx!
If you see this page, the nginx web server is successfully installed and working.
Further configuration is required.
For online documentation and support please refer to nginx.org.
Commercial support is available at nginx.com.
Thank you for using nginx.
Inbox - Mozilla Thunde...
Welcome to nginx! - M...
root@ip-172-31-4-226:~
*Unsaved Document 1...
3005-07-Container-Fun...
3005-07-Container-Fun...
3005-07-Container-Fun...

Lab: Dockerfile

Overview
Time: 30 Minutes

In this lab, you will be able to:

- Create a Python app using flask, and deploy it using docker.

Instructions:

Here is the Dockerfile we are going to use:

```
# Use an official Python runtime as a parent image
FROM python:2.7-slim
# Set the working directory to /app
WORKDIR /app
# Copy the current directory contents into the container at /app
ADD . /app
# Install any needed packages specified in requirements.txt
RUN pip install --trusted-host pypi.python.org -r requirements.txt
# Make port 80 available to the world outside this container
EXPOSE 80
# Define environment variable
ENV NAME World
# Run app.py when the container launches
CMD ["python", "app.py"]
```

Then create file “requirements.txt” and place the following contents into it.

```
Flask
Redis
```

Also create file “app.py” and place the following contents into it.

```
from flask import Flask
from redis import Redis, RedisError
import os
import socket
# Connect to Redis
redis = Redis(host="redis", db=0, socket_connect_timeout=2,
socket_timeout=2)
app = Flask(__name__)
```

```
@app.route("/")
def hello():
    try:
        visits = redis.incr("counter")
    except RedisError:
        visits = "<i>cannot connect to Redis, counter disabled</i>"
    html = "<h3>Hello {name}!</h3>" \
           "<b>Hostname:</b> {hostname}<br/>" \
           "<b>Visits:</b> {visits}"
    return html.format(name=os.getenv("NAME", "world"),
hostname=socket.gethostname(), visits=visits)
if __name__ == "__main__":
    app.run(host='0.0.0.0', port=80)
```

Create a directory “newapp” and these 3 files are placed into this directory.
Note what we're about to do. We are going to start with building the file and give it the name “mypythonnew”.

```
cd newapp
docker build -t mypythonnew
```

You will get a very long output, which will be Docker loading all of your Dockerfile commands onto your container.

You should look at your Dockerfile

```
Sending build context to Docker daemon   5.12kB
Step 1/7: FROM python:2.7-slim
2.7-slim: Pulling from library/python
be8881be8156: Already exists
e87541f2e904: Pull complete
Digest:
sha256:a3ae315a6bc8cd58b4b60bda9eac6640795359b4970230fc5bf4eef3de6a802
2
Status: Downloaded newer image for python:2.7-slim
 ---> 42967d04ddc5
Step 2/7: WORKDIR /app
 ---> Running in f848e7c9eef8
```

```
Removing intermediate container f848e7c9eef8
 ---> 5d5ce4911ed9
Step 3/7: ADD . /app
 ---> a3408e25d84f
Step 4/7 : RUN pip install --trusted-host pypi.python.org -r
requirements.txt
 ---> Running in a9c9057ac5c3
Collecting Flask (from -r requirements.txt (line 1))
  Downloading
https://files.pythonhosted.org/packages/7f/e7/08578774ed4536d3242b14da
cb4696386634607af824ea997202cd0edb4b/Flask-1.0.2-py2.py3-none-any.whl
(91kB)
```

I've snipped this for clarity but pay attention to what's going on.

List your containers

```
docker image ls
REPOSITORY          TAG                 IMAGE ID            CREATED
SIZE
mypythonnew         latest              cc01dd8497dd        36 seconds
ago      132MB
```

Run the container

```
docker container run -p 4000:80  mypythonnew
```

This will run our app. console output should look like the following

```
* Running on http://0.0.0.0:4000/ (Press CTRL+C to quit)
172.17.0.1 - - [24/May/2018 15:55:11] "GET / HTTP/1.1" 200 -
172.17.0.1 - - [24/May/2018 15:55:13] "GET /favicon.ico HTTP/1.1" 404
-
```

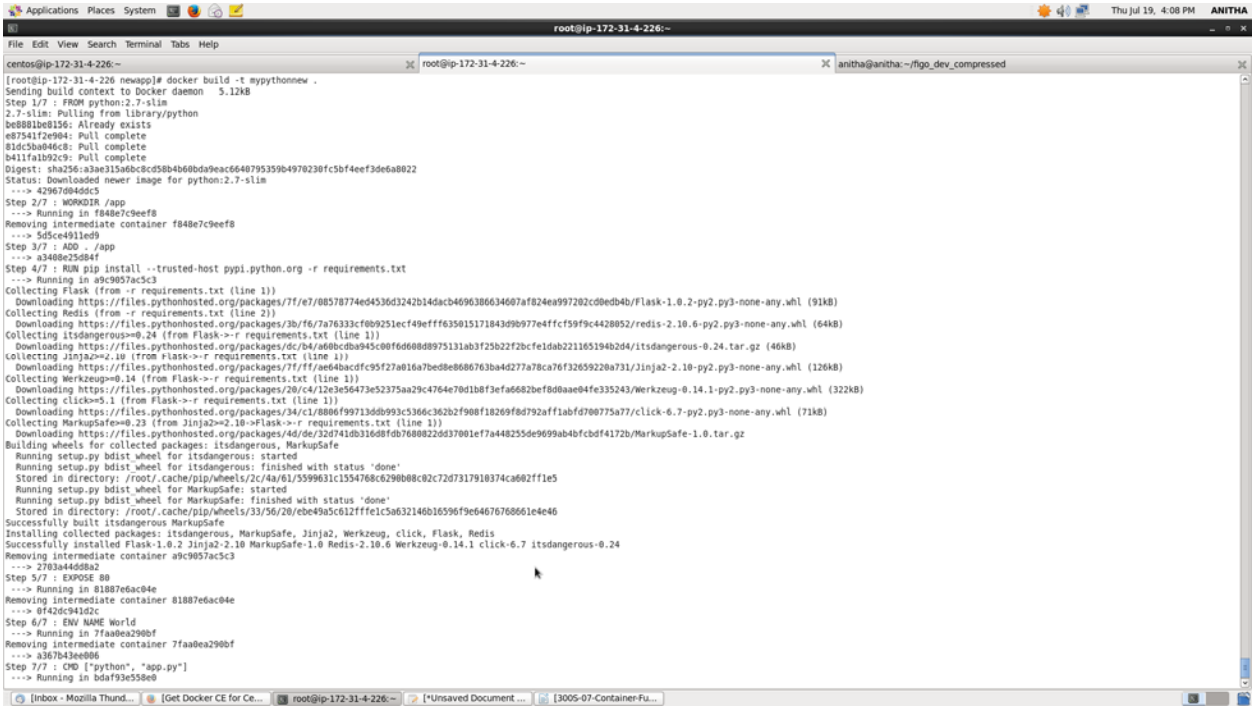
Go to browser

Open your browser and go to YOURMACHINE:4000. If you are running on localhost, then go to localhost:5000
You should see something like the following in your browser:

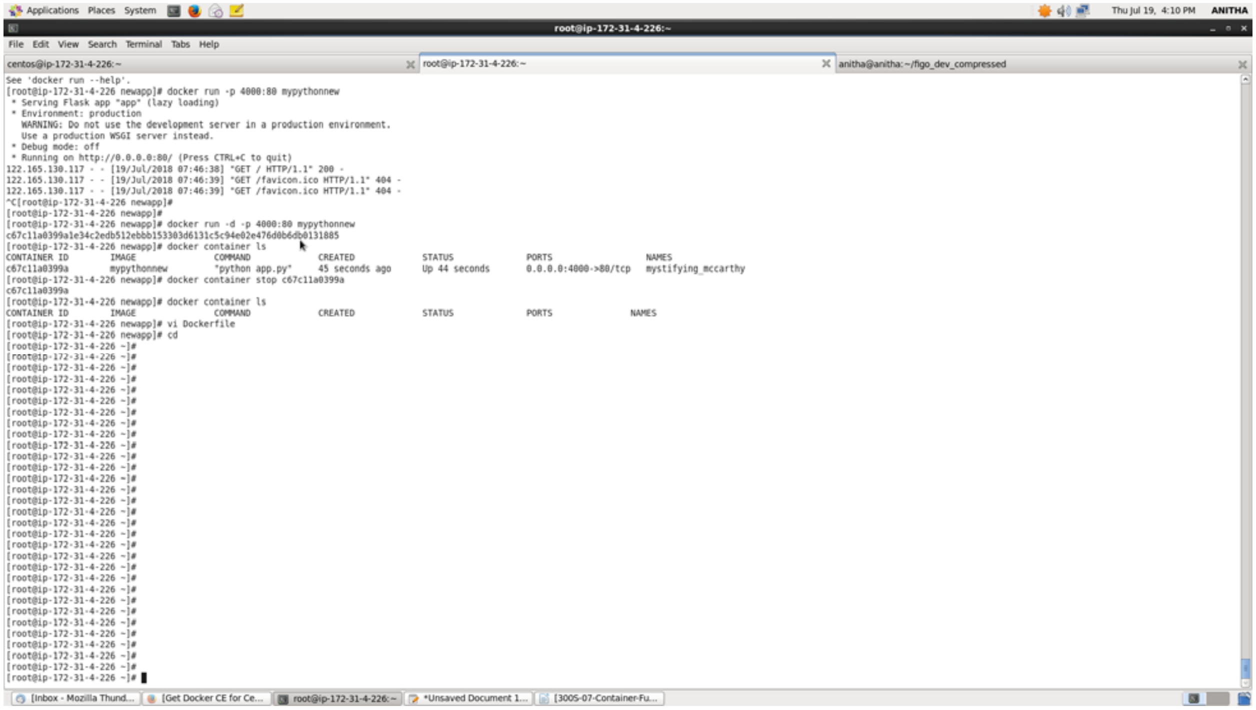
```
Hello World!
Hostname: c67c11a0399a
Visits: cannot connect to Redis, counter disabled
```

This indicates your Flask app is running properly. You can now close your container by typing control-c

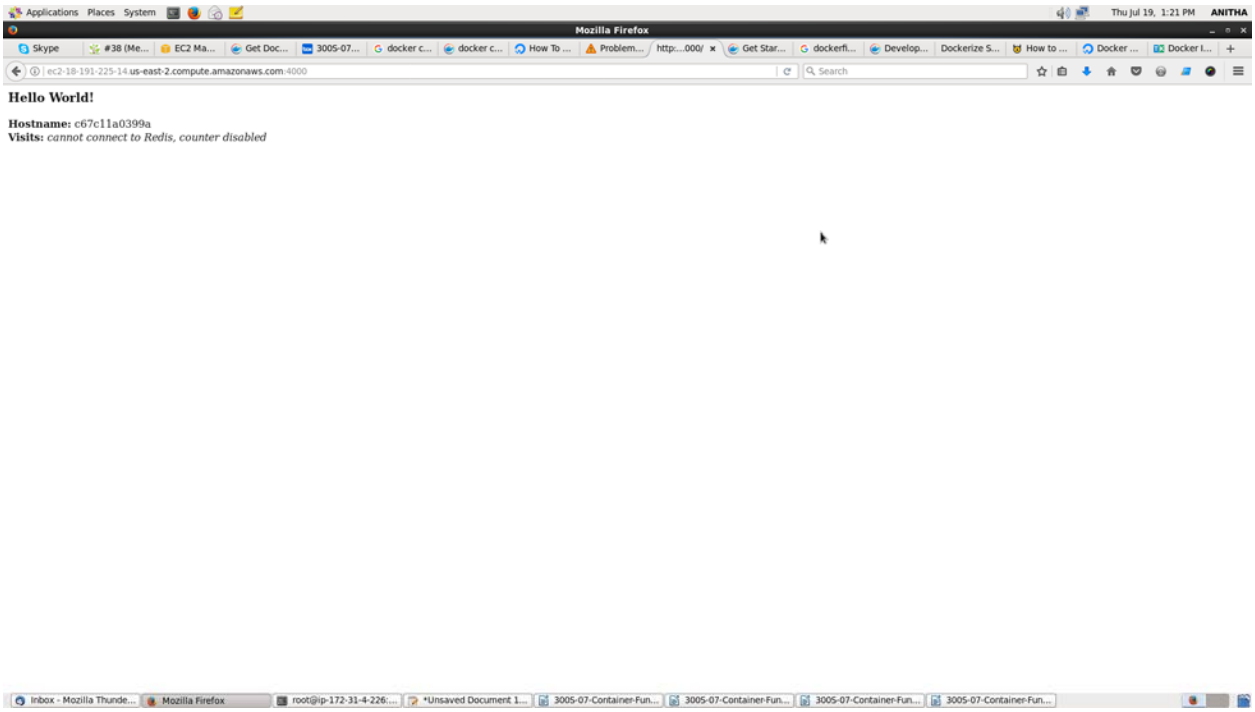
Docker Build



Run the Container



In the Browser


Applications Places System
Thu Jul 19, 1:21 PM ANITHA
Mozilla Firefox
Skype
#38 (Me...
EC2 Ma...
Get Doc...
3005-07...
docker c...
docker c...
How To ...
Problem...
http:...000/
Get Star...
dockerfi...
Develop...
Dockerize S...
How to ...
Docker ...
Docker I...
ec2-18-191-225-14.us-east-2.compute.amazonaws.com:4000
Search
Hello World!
Hostname: c67c11a0399a
Visits: cannot connect to Redis, counter disabled
Inbox - Mozilla Thunde...
Mozilla Firefox
root@ip-172-31-4-226:...
*Unsaved Document 1...
3005-07-Container-Fun...
3005-07-Container-Fun...
3005-07-Container-Fun...
3005-07-Container-Fun...