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| Course/Section: CPE31S5   | Date Submitted: November 28, 2023  |
| Instructor: Engr. Roman Richard                                     | Semester and SY: 1st Sem 2023-2024 |
| Hands-on Activity 12.1 Build a Sample Web App in a Docker Container |                                    |

### Part 1: Prepare a Host Computer for Virtualization

| Description         | File Name     |
|---------------------|---------------|
| DevNet Associate VM | DEVASC_VM.OVA |

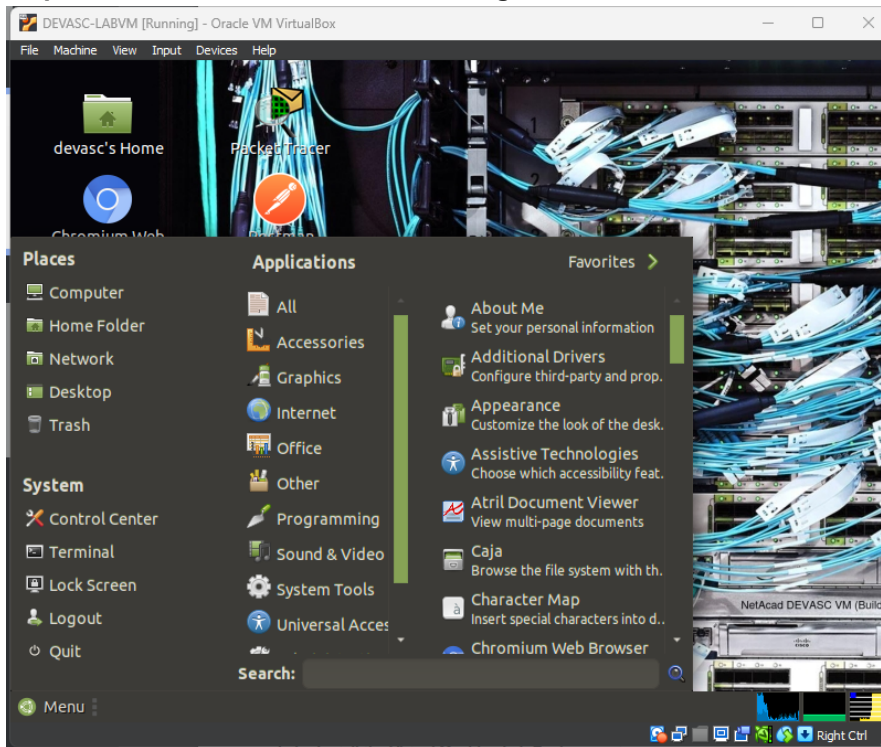
### Part 2: Import the Virtual Machine into the VirtualBox Inventory

Step 1: Import the virtual machine file into VirtualBox.



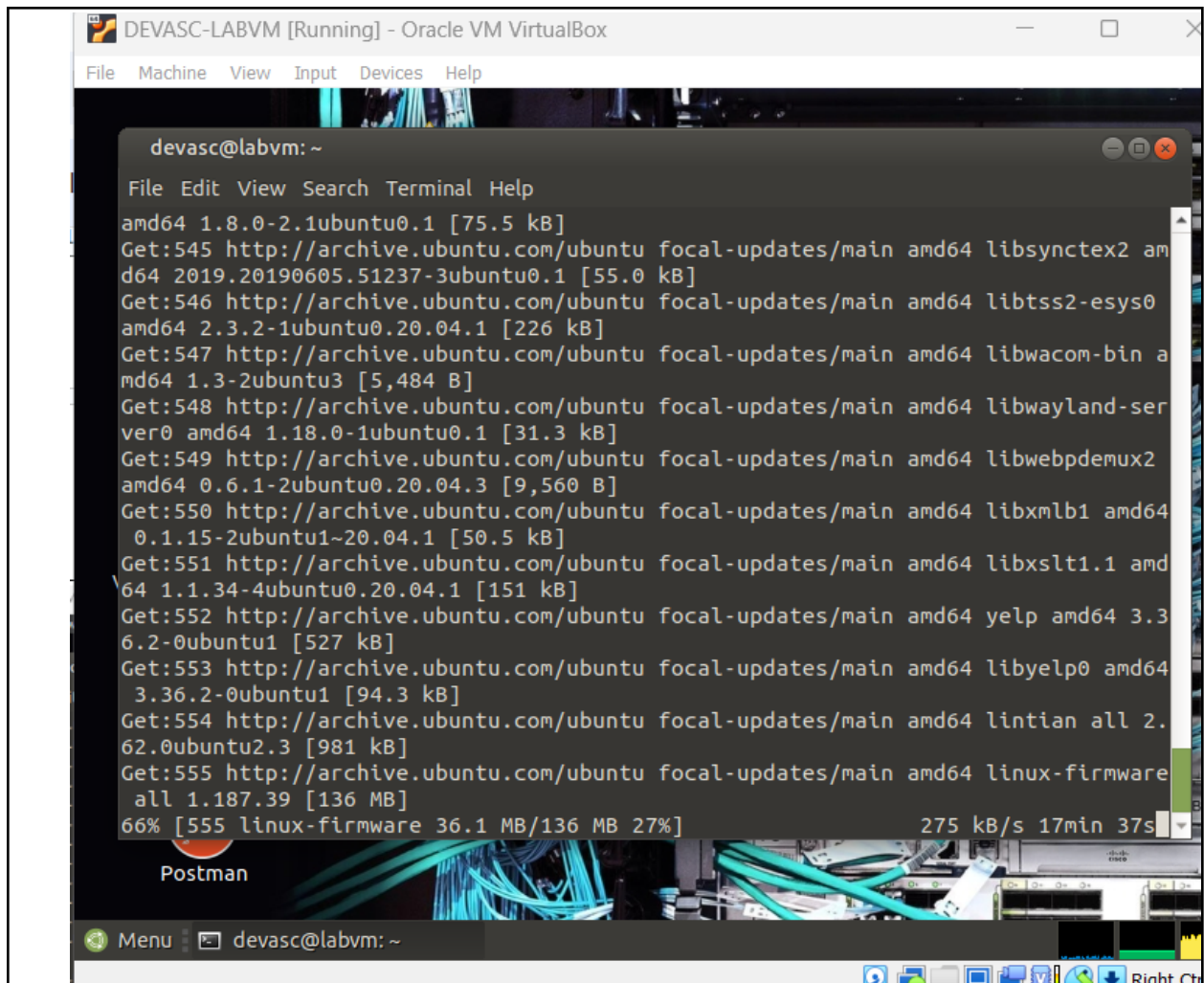
*After importing, it should appear in the list as this.*

Step 2: Start the virtual machine and log in.



*Open terminal to update the VM.*

Step 3: Explore the DEVASC VM GUI

A screenshot of a terminal window titled 'devasc@labvm: ~' running inside an Oracle VM VirtualBox. The terminal shows the output of the command 'sudo apt update'. The output lists various packages and their sizes, along with the progress of the update process. The terminal window has a menu bar with 'File', 'Edit', 'View', 'Search', 'Terminal', and 'Help'. The background of the terminal window shows a blurred image of a server rack. The terminal output is as follows:

```
devasc@labvm: ~  
File Edit View Search Terminal Help  
amd64 1.8.0-2.1ubuntu0.1 [75.5 kB]  
Get:545 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libsynctex2 am  
d64 2019.20190605.51237-3ubuntu0.1 [55.0 kB]  
Get:546 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libtss2-esys0  
amd64 2.3.2-1ubuntu0.20.04.1 [226 kB]  
Get:547 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libwacom-bin a  
md64 1.3-2ubuntu3 [5,484 B]  
Get:548 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libwayland-ser  
ver0 amd64 1.18.0-1ubuntu0.1 [31.3 kB]  
Get:549 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libwebpdenux2  
amd64 0.6.1-2ubuntu0.20.04.3 [9,560 B]  
Get:550 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libxmlb1 amd64  
0.1.15-2ubuntu1~20.04.1 [50.5 kB]  
Get:551 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libxslt1.1 amd  
64 1.1.34-4ubuntu0.20.04.1 [151 kB]  
Get:552 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 yelp amd64 3.3  
6.2-0ubuntu1 [527 kB]  
Get:553 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 libyelp0 amd64  
3.36.2-0ubuntu1 [94.3 kB]  
Get:554 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 lintian all 2.  
62.0ubuntu2.3 [981 kB]  
Get:555 http://archive.ubuntu.com/ubuntu focal-updates/main amd64 linux-firmware  
all 1.187.39 [136 MB]  
66% [555 linux-firmware 36.1 MB/136 MB 27%] 275 kB/s 17min 37s
```

*sudo apt update and upgrade on the system.*

### Part 3: Create a Simple Bash Script

3.1: Change your working directory to `~/labs/devnet-src/sample-app` and add a new file called `user-input.sh`.

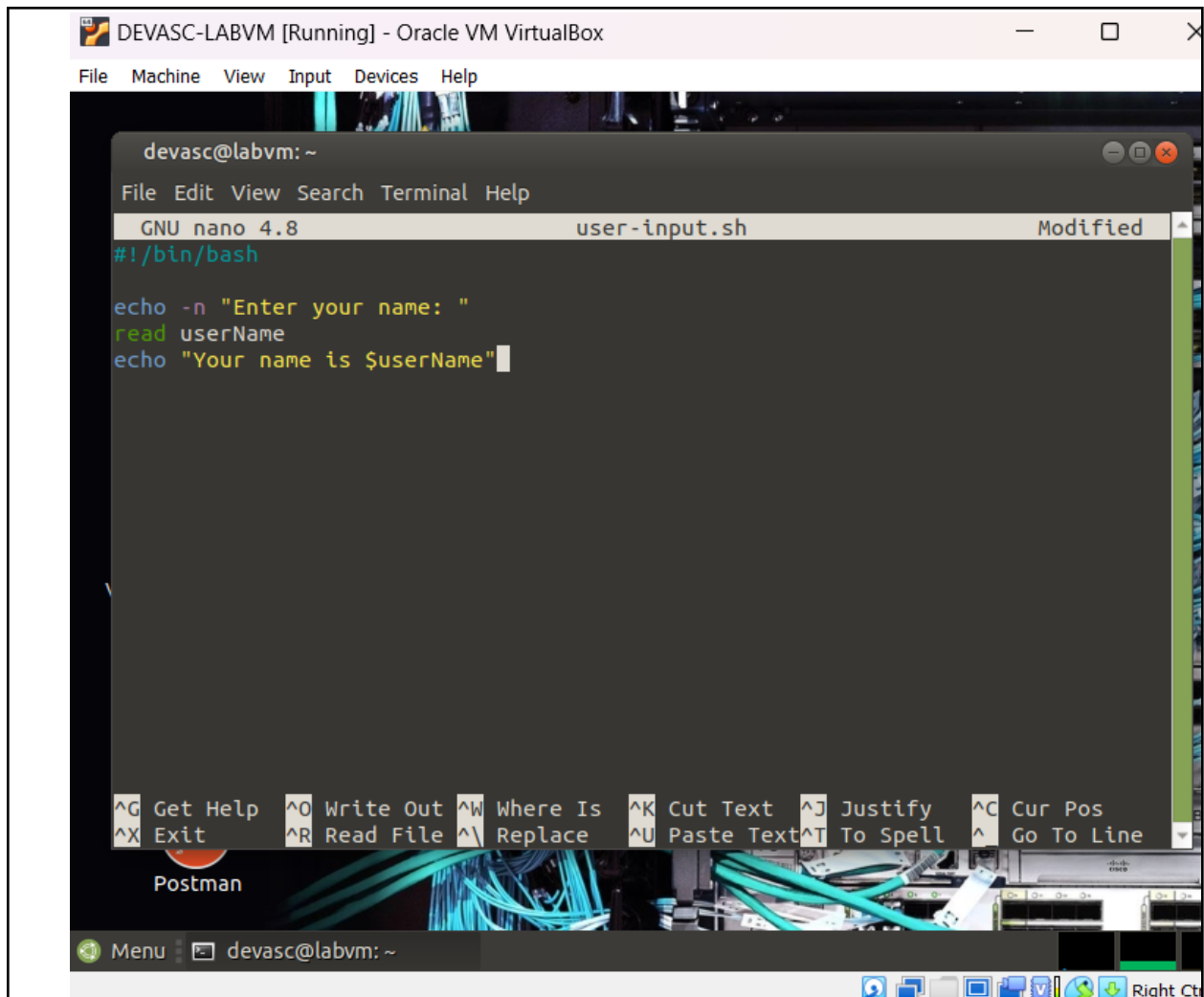
```
devasc@labvm: ~/labs/devnet-src/sample-app
File Edit View Search Terminal Help
devasc@labvm:~$ cd labs/devnet-src/sample-app/
devasc@labvm:~/labs/devnet-src/sample-app$ touch user-input.sh
devasc@labvm:~/labs/devnet-src/sample-app$ ls
sample_app.py  sample-app.sh  static  templates  user-input.sh
devasc@labvm:~/labs/devnet-src/sample-app$
```

**3.2: Open the file in the nano text editor.**  
**Use the nano command to open the nano text editor.**

```
devasc@labvm: ~/labs/devnet-src/sample-app
File Edit View Search Terminal Help
GNU nano 4.8 user-input.sh

[ Read 0 lines ]
^G Get Help  ^O Write Out  ^W Where Is   ^K Cut Text   ^J Justify    ^C Cur Pos
^X Exit      ^R Read File  ^\ Replace    ^U Paste Text ^T To Spell   ^_ Go To Line
```

**Step 3.4 and Step 3.4:**



Step 3.5 and 3.6:

```
Processing triggers for libc-bin (2.30-0ubuntu1) ...
Processing triggers for dbus (1.12.16-2ubuntu2.3) ...
devasc@labvm:~$ sudo nano user-input.sh
devasc@labvm:~$ bash user-input.sh
Enter your name: christian
Your name is christian
devasc@labvm:~$
```

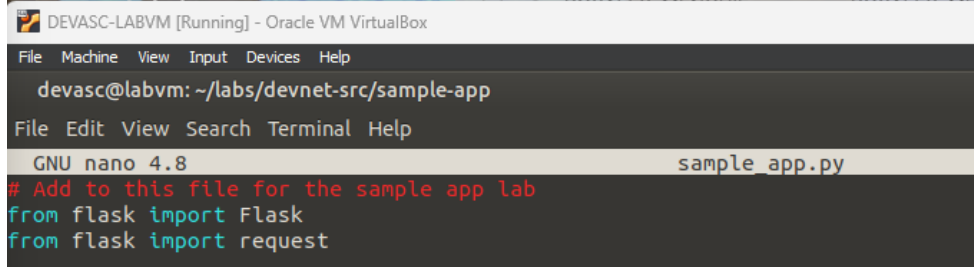
The name was inputted by using the echo command inside the nano

Step 3.7-10:

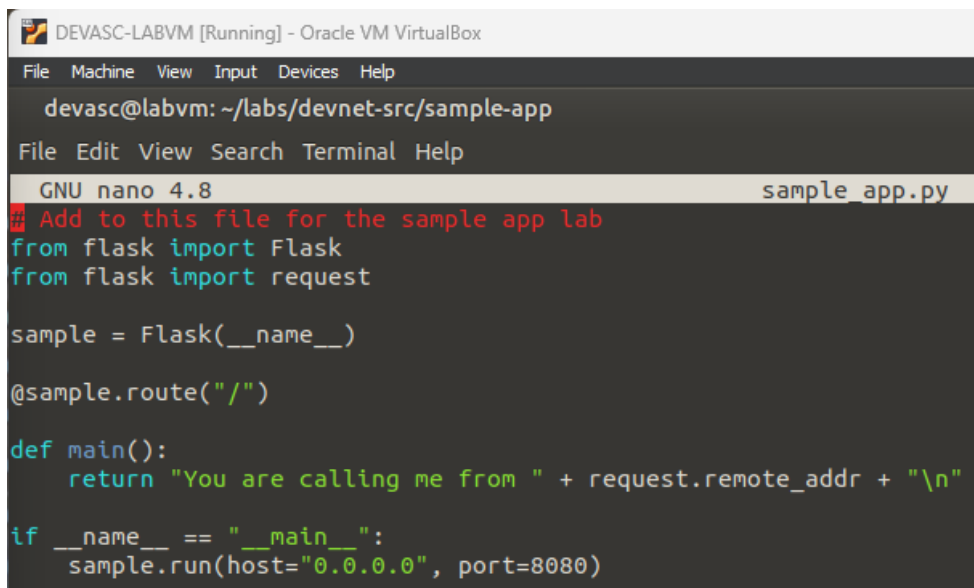
```
devasc@labvm:~/labs/devnet-src/sample-app$ ls -l user-input.sh
-rw-rw-r-- 1 devasc devasc 87 Nov 28 14:10 user-input.sh
devasc@labvm:~/labs/devnet-src/sample-app$ chmod a+x user-input.sh
devasc@labvm:~/labs/devnet-src/sample-app$ ls -l user-input.sh
-rwxrwxr-x 1 devasc devasc 87 Nov 28 14:10 user-input.sh
devasc@labvm:~/labs/devnet-src/sample-app$ mv user-input.sh user-input
devasc@labvm:~/labs/devnet-src/sample-app$ ./user-input
Enter your name: Dave
Your name is Dave
devasc@labvm:~/labs/devnet-src/sample-app$
```

Part 4: Create a Sample Web App

```
devasc@labvm:~/labs/devnet-src/sample-app$ pip3 install flask
Requirement already satisfied: flask in /home/devasc/.local/lib/python3.8/site-packages (1.1.2)
Requirement already satisfied: click>=5.1 in /home/devasc/.local/lib/python3.8/site-packages (from flask) (7.1.2)
Requirement already satisfied: Werkzeug>=0.15 in /home/devasc/.local/lib/python3.8/site-packages (from flask) (1.0.1)
Requirement already satisfied: itsdangerous>=0.24 in /home/devasc/.local/lib/python3.8/site-packages (from flask) (1.1.0)
Requirement already satisfied: Jinja2>=2.10.1 in /home/devasc/.local/lib/python3.8/site-packages (from flask) (2.11.2)
Requirement already satisfied: MarkupSafe>=0.23 in /home/devasc/.local/lib/python3.8/site-packages (from Jinja2>=2.10.1->flask) (1.1.1)
```



```
DEVASC-LABVM [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
devasc@labvm: ~/labs/devnet-src/sample-app
File Edit View Search Terminal Help
GNU nano 4.8 sample_app.py
# Add to this file for the sample app lab
from flask import Flask
from flask import request
```



```
DEVASC-LABVM [Running] - Oracle VM VirtualBox
File Machine View Input Devices Help
devasc@labvm: ~/labs/devnet-src/sample-app
File Edit View Search Terminal Help
GNU nano 4.8 sample_app.py
# Add to this file for the sample app lab
from flask import Flask
from flask import request

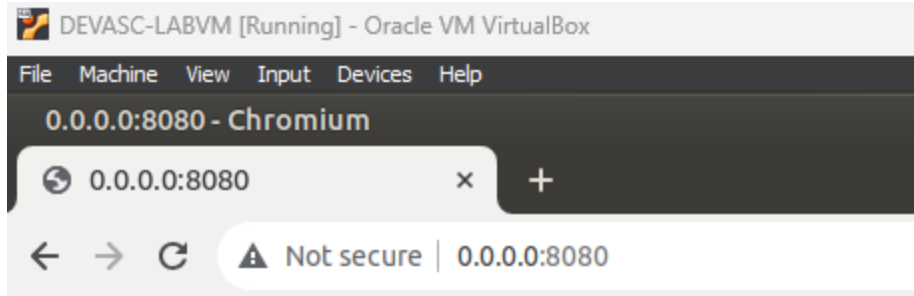
sample = Flask(__name__)

@sample.route("/")

def main():
    return "You are calling me from " + request.remote_addr + "\n"

if __name__ == "__main__":
    sample.run(host="0.0.0.0", port=8080)
```

```
devasc@labvm:~/labs/devnet-src/sample-app$ python3 sample_app.py
* Serving Flask app "sample_app" (lazy loading)
* Environment: production
  WARNING: This is a development server. Do not use it in a production deployment.
  Use a production WSGI server instead.
* Debug mode: off
* Running on http://0.0.0.0:8080/ (Press CTRL+C to quit)
```



You are calling me from 127.0.0.1

```
devasc@labvm:~/labs/devnet-src/sample-app$ python3 sample_app.py
* Serving Flask app "sample_app" (lazy loading)
* Environment: production
  WARNING: This is a development server. Do not use it in a production deployment.
  Use a production WSGI server instead.
* Debug mode: off
* Running on http://0.0.0.0:8080/ (Press CTRL+C to quit)
127.0.0.1 - - [28/Nov/2023 14:54:11] "GET / HTTP/1.1" 200 -
127.0.0.1 - - [28/Nov/2023 14:54:11] "GET /favicon.ico HTTP/1.1" 404 -
^Cdevasc@labvm:~/labs/devnet-src/sample-app$
```

After it was all input the website was working by showing it designs and detecting the ip address

#### Part 5: Configure the Web App to use Website Files

```
devasc@labvm:~/labs/devnet-src/sample-app$ cat templates/index.html
<html>
<head>
  <title>Sample app</title>
  <link rel="stylesheet" href="/static/style.css" />
</head>
<body>
  <h1>You are calling me from {{request.remote_addr}}</h1>
</body>
</html>
devasc@labvm:~/labs/devnet-src/sample-app$ cat static/style.css
body {background: lightsteelblue;}
devasc@labvm:~/labs/devnet-src/sample-app$
```

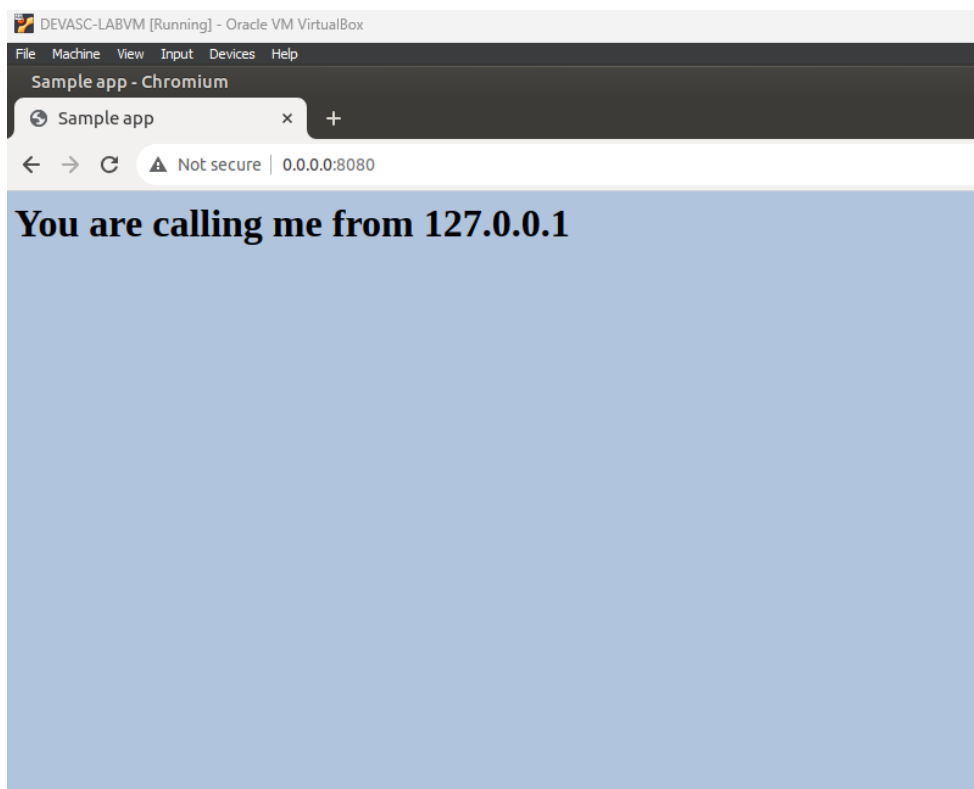
```
GNU nano 4.8
# Add to this file for the sample app lab
from flask import Flask
from flask import request
from flask import render_template

sample = Flask(__name__)

@sample.route("/")

def main():
    return render_template("index.html")

if __name__ == "__main__":
    sample.run(host="0.0.0.0", port=8080)
```



After putting all the commands for the website it shows that the ip was working shows that it is calling

**Part 6: Create a Bash Script to Build and Run a Docker Container**

```
GNU nano 4.8 sample-app.sh
#!/bin/bash

mkdir tmpdir
mkdir tmpdir/templates
mkdir tmpdir/static

cp sample_app.py tmpdir/.
cp -r templates/* tmpdir/templates/.
cp -r static/* tmpdir/static/.

cd tmpdir
docker build -t sampleapp .

echo "FROM PYTHON" >> tmpdir/Dockerfile
echo "RUN pip install flask" >> tmpdir/Dockerfile
echo "COPY ./static /home/myapp/static/" >> tmpdir/Dockerfile
echo "COPY ./templates /home/myapp/templates/" >> tmpdir/Dockerfile
echo "COPY sample_app.py /home/myapp/" >> tmpdir/Dockerfile
echo "EXPOSE 8080" >> tmpdir/Dockerfile
echo "CMD python3 /home/myapp/sample_app.py" >> tmpdir/Dockerfile

docker run -t -d -p 8080:8080 --name samplerunning sampleapp
```

```
devasc@labvm:~/labs/devnet-src/sample-app$ bash ./sample-app.sh
DEPRECATED: The legacy builder is deprecated and will be removed in a future release.
             Install the buildx component to build images with BuildKit:
             https://docs.docker.com/go/buildx/

Sending build context to Docker daemon  6.144kB
Step 1/7 : FROM python
latest: Pulling from library/python
90e5e7d8b87a: Pull complete
27e1a8ca91d3: Pull complete
d3a767d1d12e: Pull complete
711be5dc5044: Extracting [=====>]  92.47MB/211.1MB
7ad48fee4003: Download complete
a319993f7bdd: Download complete
c5bc2fe650d8: Download complete
0303a8131ddc: Download complete
```

```
Removing intermediate container 951cd76d6ff6
--> 2373ac152275
Step 3/7 : COPY ./static /home/myapp/static/
--> a727a395e031
Step 4/7 : COPY ./templates /home/myapp/templates/
--> f70feab783db
Step 5/7 : COPY sample_app.py /home/myapp/
--> 69a2ff750204
Step 6/7 : EXPOSE 8080
--> Running in 738ef43dc44c
Removing intermediate container 738ef43dc44c
--> 2855c8aa489b
Step 7/7 : CMD python3 /home/myapp/sample_app.py
--> Running in a2c14a15c66b
Removing intermediate container a2c14a15c66b
--> 86b0e955a935
Successfully built 86b0e955a935
Successfully tagged sampleapp:latest
b85581984f66e97ab50ef38f4c0a05a2cfa41e3193516f5634cd00d08a3c419c
CONTAINER ID   IMAGE      COMMAND                  CREATED        STATUS        PORTS
b85581984f66   sampleapp  "/bin/sh -c 'python3..." Less than a second ago   Up Less than a second   0.0.0.0:8080->8080/tcp
...8080->8080/tcp    samplerunning
```

```
devasc@labvm:~/labs/devnet-src/sample-app$ docker ps -a
CONTAINER ID   IMAGE      COMMAND                  CREATED        STATUS        PORTS        NAMES
```

Part 7: Build, Run, and Verify the Docker Container



```
devasc@labvm:~/labs/devnet-src/sample-app$ cat tempdir/Dockerfile
FROM python
RUN pip install flask
COPY ./static /home/myapp/static/
COPY ./templates /home/myapp/templates/
COPY sample_app.py /home/myapp/
EXPOSE 8080
CMD python3 /home/myapp/sample_app.py
```

```
devasc@labvm:~/labs/devnet-src/sample-app$ curl http://172.17.0.1:8080
<html>
<head>
  <title>Sample app</title>
  <link rel="stylesheet" href="/static/style.css" />
</head>
<body>
  <h1>You are calling me from 172.17.0.1</h1>
</body>
</html>devasc@labvm:~/labs/devnet-src/sample-app$ ip address
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 scope host lo
        valid_lft forever preferred_lft forever
    inet6 ::1/128 scope host
        valid_lft forever preferred_lft forever
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP group default qlen 1000
    link/ether 08:00:27:e9:3d:e6 brd ff:ff:ff:ff:ff:ff
    inet 10.0.2.15/24 brd 10.0.2.255 scope global dynamic enp0s3
        valid_lft 80878sec preferred_lft 80878sec
    inet6 fe80::a00:27ff:fee9:3de6/64 scope link
        valid_lft forever preferred_lft forever
3: dummy0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc noqueue state UNKNOWN group default qlen 1000
    link/ether c6:d9:7b:37:33:9b brd ff:ff:ff:ff:ff:ff
    inet 192.0.2.1/32 scope global dummy0
        valid_lft forever preferred_lft forever
    inet 192.0.2.2/32 scope global dummy0
        valid_lft forever preferred_lft forever
```

```
devasc@labvm:~/labs/devnet-src/sample-app$ docker exec -it samplerunning
"docker exec" requires at least 2 arguments.
See 'docker exec --help'.

Usage:  docker exec [OPTIONS] CONTAINER COMMAND [ARG...]

Execute a command in a running container
devasc@labvm:~/labs/devnet-src/sample-app$ docker exec -it samplerunning /bin/bash
root@b85581984f66:/# ls
bin boot dev etc home lib lib32 lib64 libx32 media mnt opt proc root run sbin srv sys tmp usr var
root@b85581984f66:/# ls home/myapp/
sample_app.py  static  templates
```

```
devasc@labvm:~/labs/devnet-src/sample-app$
devasc@labvm:~/labs/devnet-src/sample-app$ docker ps -a
CONTAINER ID   IMAGE     COMMAND                  CREATED        STATUS        PORTS          NAMES
b85581984f66   sampleapp "/bin/sh -c 'python3..." 4 minutes ago Exited (137) 7 seconds ago
devasc@labvm:~/labs/devnet-src/sample-app$ docker start samplerunning
samplerunning
devasc@labvm:~/labs/devnet-src/sample-app$ docker stop samplerunning
samplerunning
devasc@labvm:~/labs/devnet-src/sample-app$ docker rm samplerunning
samplerunning
```

After running all the commands the docker was checked by using the code docker stop, start rm and ps this shows the code was executed properly