

Lab #1: Docker

- Install putty. Using the public ip and the key, open a terminal.
- Now, install docker with:
`sudo yum -y -q install docker`
- Searching for docker images in the hub:
`sudo docker search fedora/apache`

```
ec2-user@ip-172-31-25-13:~  
... 1 [OK]  
neroinc/fedora-apache-php-phalcon1.2 Apache, PHP and the Phalcon PHP Framework  
... 1 [OK]  
snehangshuk/fedora-apache docker  
0  
[ec2-user@ip-172-31-25-13 ~]$ sudo service docker start  
[ec2-user@ip-172-31-25-13 ~]$ sudo docker search fedora/apache  
NAME STARS OFFICIAL AUTOMATED DESCRIPTION  
fedora/apache 31 [OK]  
fedora/systemd-apache 5 [OK]  
neroinc/fedora-apache Plain and simple image with Apache httpd  
b... 1 [OK]  
neroinc/fedora-apache-php Apache and PHP based on fedora:20  
1 [OK]  
neroinc/fedora-apache-php-phalcon Apache, PHP and the Phalcon PHP Framework  
... 1 [OK]  
neroinc/fedora-apache-php-phalcon1.2 Apache, PHP and the Phalcon PHP Framework  
... 1 [OK]  
snehangshuk/fedora-apache docker  
0  
[ec2-user@ip-172-31-25-13 ~]$
```

- To download all the required related software for docker:
`docker pull fedora/apache:latest`

```
ec2-user@ip-172-31-25-13:~  
b... 1 [OK]  
neroinc/fedora-apache-php Apache and PHP based on fedora:20  
1 [OK]  
neroinc/fedora-apache-php-phalcon Apache, PHP and the Phalcon PHP Framework  
... 1 [OK]  
neroinc/fedora-apache-php-phalcon1.2 Apache, PHP and the Phalcon PHP Framework  
... 1 [OK]  
snehangshuk/fedora-apache docker  
0  
[ec2-user@ip-172-31-25-13 ~]$ docker pull fedora/apache:latest  
Pulling repository fedora/apache  
963668e7af33: Download complete  
511136ea3c5a: Download complete  
782cf93a8f16: Download complete  
6cece30db4f9: Download complete  
1c57338f5e6f: Download complete  
0fd5aa43b882: Download complete  
45575a4d1d37: Download complete  
d47855a80517: Download complete  
37916014ee38: Download complete  
359aa224a8a4: Download complete  
b3d26c48a13f: Download complete  
Status: Downloaded newer image for fedora/apache:latest  
[ec2-user@ip-172-31-25-13 ~]$
```

- To check the history of the downloads and the changes made:
docker history fedora/apache

```
ec2-user@ip-172-31-25-13:~
SIZE
963668e7af33      8 days ago      /bin/sh -c #(nop) CMD [/run-apache.sh]
0 B
b3d26c48a13f      8 days ago      /bin/sh -c chmod -v +x /run-apache.sh
261 B
359aa224a8a4      8 days ago      /bin/sh -c #(nop) ADD file:5feba8cf1592e
95279 261 B
37916014ee38      8 days ago      /bin/sh -c #(nop) EXPOSE 80/tcp
0 B
d47855a80517      8 days ago      /bin/sh -c echo "Apache" >> /var/www/htm
l/ind 7 B
45575a4d1d37      8 days ago      /bin/sh -c yum -y install httpd && yum c
lean 18.85 MB
0fd5aa43b882      8 days ago      /bin/sh -c yum -y update && yum clean al
l 248 MB
1c57338f5e6f      8 days ago      /bin/sh -c #(nop) MAINTAINER http://fedo
rapro 0 B
6cece30db4f9      3 months ago    /bin/sh -c #(nop) ADD file:a79ef7702ed35
611dl 360.3 MB
782cf93a8f16      6 months ago    /bin/sh -c #(nop) MAINTAINER Lokesh Mand
vekar 0 B
511136ea3c5a      22 months ago
0 B
[ec2-user@ip-172-31-25-13 ~]$
```

- Locally available docker images can be listed using:
docker images

```
ec2-user@ip-172-31-25-13:~
l/ind 7 B
45575a4d1d37      8 days ago      /bin/sh -c yum -y install httpd && yum c
lean 18.85 MB
0fd5aa43b882      8 days ago      /bin/sh -c yum -y update && yum clean al
l 248 MB
1c57338f5e6f      8 days ago      /bin/sh -c #(nop) MAINTAINER http://fedo
rapro 0 B
6cece30db4f9      3 months ago    /bin/sh -c #(nop) ADD file:a79ef7702ed35
611dl 360.3 MB
782cf93a8f16      6 months ago    /bin/sh -c #(nop) MAINTAINER Lokesh Mand
vekar 0 B
511136ea3c5a      22 months ago
0 B
[ec2-user@ip-172-31-25-13 ~]$ docker images
REPOSITORY      TAG              IMAGE ID          CREATED
VIRTUAL SIZE
fedora/apache    latest          963668e7af33     8 days ago
627.1 MB
[ec2-user@ip-172-31-25-13 ~]$ sudo docker images
REPOSITORY      TAG              IMAGE ID          CREATED
VIRTUAL SIZE
fedora/apache    latest          963668e7af33     8 days ago
627.1 MB
[ec2-user@ip-172-31-25-13 ~]$
```

- To check the containers which are running:
docker ps

```

ec2-user@ip-172-31-25-13:~
0fd5aa43b882      8 days ago      /bin/sh -c yum -y update && yum clean al
1          248 MB
1c57338f5e6f      8 days ago      /bin/sh -c #(nop) MAINTAINER http://fedo
rapro 0 B
6cece30db4f9      3 months ago    /bin/sh -c #(nop) ADD file:a79ef7702ed35
611d1 360.3 MB
782cf93a8f16      6 months ago    /bin/sh -c #(nop) MAINTAINER Lokesh Mand
vekar 0 B
511136ea3c5a      22 months ago  0 B
[ec2-user@ip-172-31-25-13 ~]$ docker images
REPOSITORY      TAG              IMAGE ID          CREATED
VIRTUAL SIZE
fedora/apache    latest          963668e7af33     8 days ago
627.1 MB
[ec2-user@ip-172-31-25-13 ~]$ sudo docker images
REPOSITORY      TAG              IMAGE ID          CREATED
VIRTUAL SIZE
fedora/apache    latest          963668e7af33     8 days ago
627.1 MB
[ec2-user@ip-172-31-25-13 ~]$ docker ps
CONTAINER ID      IMAGE             COMMAND           CREATED
STATUS           PORTS            NAMES
[ec2-user@ip-172-31-25-13 ~]$

```

- To run the docker:
docker run -i -t fedora/apache /bin/echo 'hello world'

```

ec2-user@ip-172-31-25-13:~
rapro 0 B
6cece30db4f9      3 months ago    /bin/sh -c #(nop) ADD file:a79ef7702ed35
611d1 360.3 MB
782cf93a8f16      6 months ago    /bin/sh -c #(nop) MAINTAINER Lokesh Mand
vekar 0 B
511136ea3c5a      22 months ago  0 B
[ec2-user@ip-172-31-25-13 ~]$ docker images
REPOSITORY      TAG              IMAGE ID          CREATED
VIRTUAL SIZE
fedora/apache    latest          963668e7af33     8 days ago
627.1 MB
[ec2-user@ip-172-31-25-13 ~]$ sudo docker images
REPOSITORY      TAG              IMAGE ID          CREATED
VIRTUAL SIZE
fedora/apache    latest          963668e7af33     8 days ago
627.1 MB
[ec2-user@ip-172-31-25-13 ~]$ docker ps
CONTAINER ID      IMAGE             COMMAND           CREATED
STATUS           PORTS            NAMES
[ec2-user@ip-172-31-25-13 ~]$ docker run -i -t fedora/apache /bin/echo 'hello wo
rld'
hello world
[ec2-user@ip-172-31-25-13 ~]$

```

- To list all the containers which have been run last:
docker ps -l

```

ec2-user@ip-172-31-25-13:~
REPOSITORY          TAG                 IMAGE ID            CREATED
VIRTUAL SIZE
fedora/apache        latest             963668e7af33       8 days ago
627.1 MB
[ec2-user@ip-172-31-25-13 ~]$ sudo docker images
REPOSITORY          TAG                 IMAGE ID            CREATED
VIRTUAL SIZE
fedora/apache        latest             963668e7af33       8 days ago
627.1 MB
[ec2-user@ip-172-31-25-13 ~]$ docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED
STATUS             PORTS              NAMES
[ec2-user@ip-172-31-25-13 ~]$ docker run -i -t fedora/apache /bin/echo 'hello wo
rld'
hello world
[ec2-user@ip-172-31-25-13 ~]$ docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED
STATUS             PORTS              NAMES
[ec2-user@ip-172-31-25-13 ~]$ docker ps -l
CONTAINER ID        IMAGE               COMMAND             CREATED
STATUS             PORTS              NAMES
98be71024343        fedora/apache:latest  "/bin/echo 'hello wo 58 seconds ago
Exited (0) 57 seconds ago          thirsty_wright
[ec2-user@ip-172-31-25-13 ~]$

```

- An image was created by running the previous command. Now, we want to run apache service and start serving web content:
docker run -d -P fedora/apache

```

ec2-user@ip-172-31-25-13:~
REPOSITORY          TAG                 IMAGE ID            CREATED
VIRTUAL SIZE
fedora/apache        latest             963668e7af33       8 days ago
627.1 MB
[ec2-user@ip-172-31-25-13 ~]$ docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED
STATUS             PORTS              NAMES
[ec2-user@ip-172-31-25-13 ~]$ docker run -i -t fedora/apache /bin/echo 'hello wo
rld'
hello world
[ec2-user@ip-172-31-25-13 ~]$ docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED
STATUS             PORTS              NAMES
[ec2-user@ip-172-31-25-13 ~]$ docker ps -l
CONTAINER ID        IMAGE               COMMAND             CREATED
STATUS             PORTS              NAMES
98be71024343        fedora/apache:latest  "/bin/echo 'hello wo 58 seconds ago
Exited (0) 57 seconds ago          thirsty_wright
[ec2-user@ip-172-31-25-13 ~]$ sudo docker pull top
Pulling repository top
FATA[0000] Error: image library/top:latest not found
[ec2-user@ip-172-31-25-13 ~]$ docker run -d -P fedora/apache
d84c640d821f6cb501e9cc8f29ed9293420b7c988d418af459ed3802e065a5de
[ec2-user@ip-172-31-25-13 ~]$

```

- To make sure that the connection between the input port to apache is intact:
curl -v 0.0.0.0:49153

```
ec2-user@ip-172-31-25-13:~
STATUS          PORTS          NAMES
d84c640d821f    fedora/apache:latest  "/run-apache.sh"  About a minute ago
o Up About a minute  0.0.0.0:49153->80/tcp  jovial_almeida
[ec2-user@ip-172-31-25-13 ~]$ curl -v 0.0.0.0:49153
* Rebuilt URL to: 0.0.0.0:49153/
* Trying 0.0.0.0...
* Connected to 0.0.0.0 (127.0.0.1) port 49153 (#0)
> GET / HTTP/1.1
> User-Agent: curl/7.40.0
> Host: 0.0.0.0:49153
> Accept: */*
>
< HTTP/1.1 200 OK
< Date: Sat, 25 Apr 2015 20:36:43 GMT
< Server: Apache/2.4.10 (Fedora)
< Last-Modified: Fri, 17 Apr 2015 11:19:57 GMT
< ETag: "7-513e9c29e1140"
< Accept-Ranges: bytes
< Content-Length: 7
< Content-Type: text/html; charset=UTF-8
<
Apache
* Connection #0 to host 0.0.0.0 left intact
[ec2-user@ip-172-31-25-13 ~]$
```

- To kill a docker image which we have started running:
docker kill jovial_almeida

We can also use the container ID to do the same.

```
ec2-user@ip-172-31-25-13:~
< Last-Modified: Fri, 17 Apr 2015 11:19:57 GMT
< ETag: "7-513e9c29e1140"
< Accept-Ranges: bytes
< Content-Length: 7
< Content-Type: text/html; charset=UTF-8
<
Apache
* Connection #0 to host 0.0.0.0 left intact
[ec2-user@ip-172-31-25-13 ~]$ docker kill elegant_pare
Error response from daemon: No such container: elegant_pare
FATA[0000] Error: failed to kill one or more containers
[ec2-user@ip-172-31-25-13 ~]$ docker kill
docker: "kill" requires a minimum of 1 argument. See 'docker kill --help'.
[ec2-user@ip-172-31-25-13 ~]$ docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED
STATUS            PORTS              NAMES
d84c640d821f       fedora/apache:latest  "/run-apache.sh"   5 minutes ago
Up 5 minutes      0.0.0.0:49153->80/tcp  jovial_almeida
[ec2-user@ip-172-31-25-13 ~]$ docker kill jovial_almeida
jovial_almeida
[ec2-user@ip-172-31-25-13 ~]$ docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED
STATUS            PORTS              NAMES
[ec2-user@ip-172-31-25-13 ~]$
```

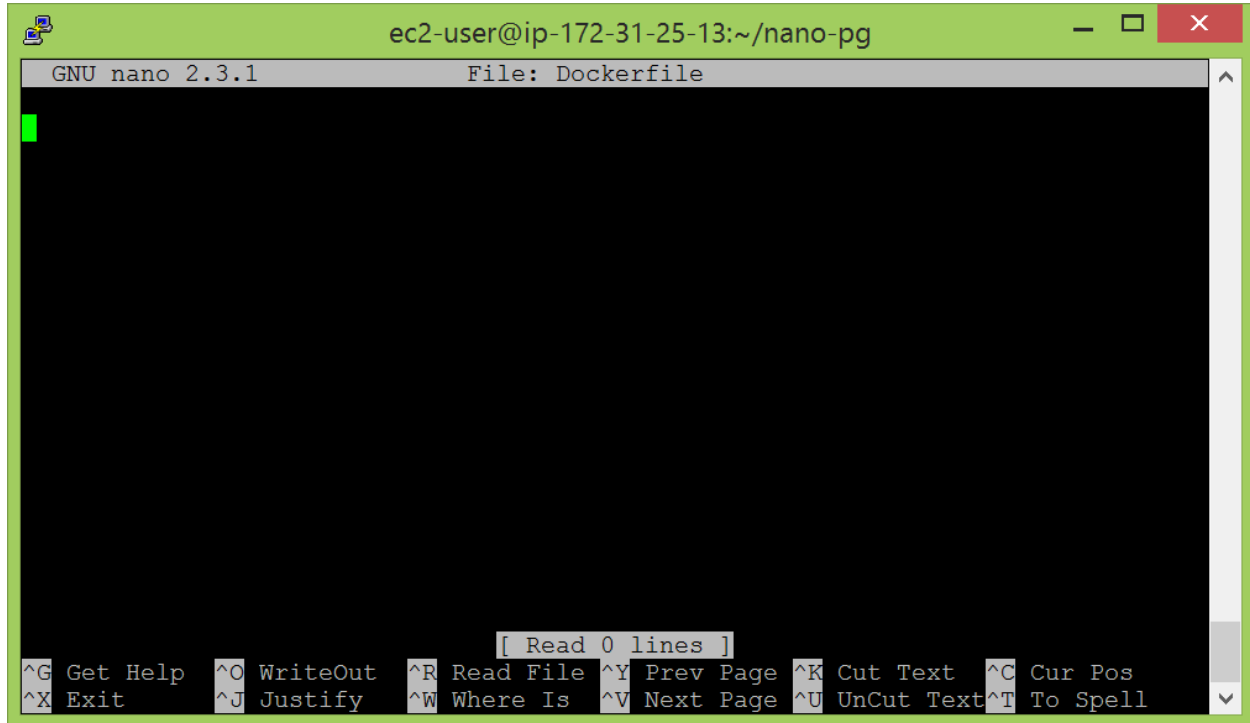
- To make my own image with the docker file:

```
$ mkdir nano-pg
```

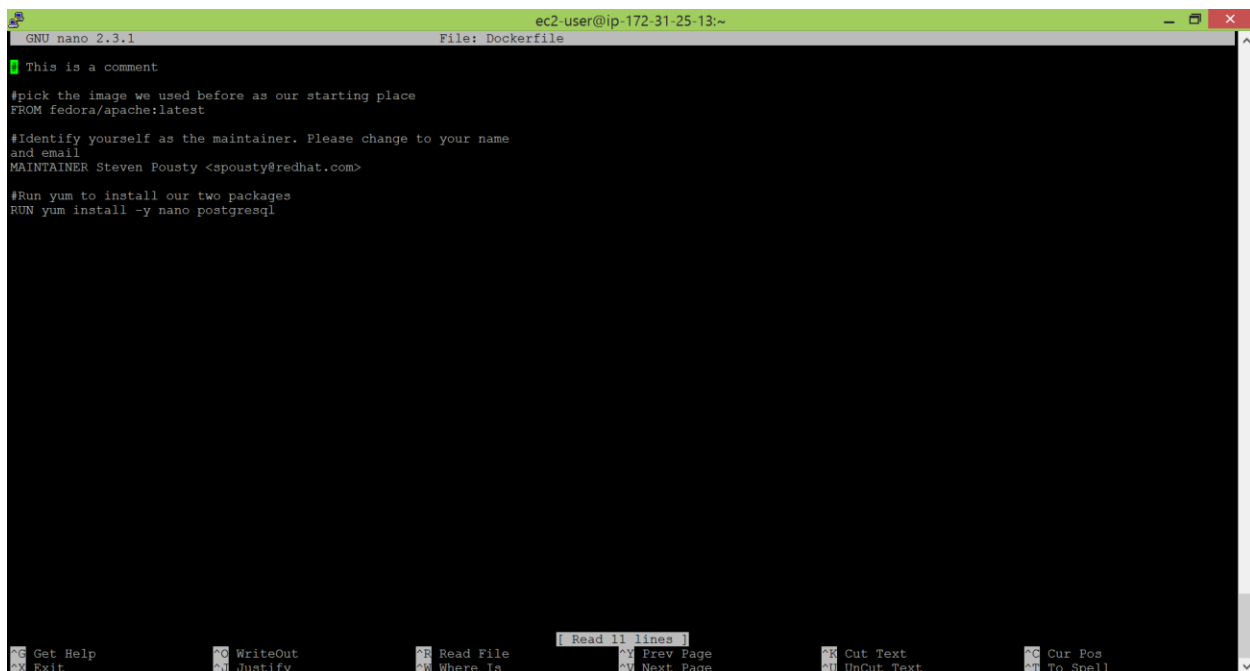
```
$ cd nano-pg
```

```
$ touch Dockerfile
```

```
$ nano Dockerfile
```



The screenshot shows a terminal window with the title bar "ec2-user@ip-172-31-25-13:~/nano-pg". The nano editor interface is open, displaying "GNU nano 2.3.1" and "File: Dockerfile". The editor area is empty, with a green cursor at the top left. The bottom status bar shows "[Read 0 lines]" and various keyboard shortcuts like ^G Get Help, ^O WriteOut, ^R Read File, ^Y Prev Page, ^K Cut Text, ^C Cur Pos, ^X Exit, ^J Justify, ^W Where Is, ^V Next Page, ^U UnCut Text, and ^T To Spell.



The screenshot shows the same terminal window, but the Dockerfile now contains the following content:

```
This is a comment

#pick the image we used before as our starting place
FROM fedora/apache:latest

#Identify yourself as the maintainer. Please change to your name
and email
MAINTAINER Steven Pousty <spousty@redhat.com>

#Run yum to install our two packages
RUN yum install -y nano postgresql
```

The bottom status bar now shows "[Read 11 lines]" and the same keyboard shortcuts as the previous screenshot.

- We can make some changes in the file and customize it to create our own docker image. Then, to build the image from the file, we use:

- Usually to build an image from a file:
docker build -t "spousty/myfedora:1.0" .

```

ec2-user@ip-172-31-25-13:~
--> Package postgresql-libs.x86_64 0:9.3.6-1.fc20 will be installed
--> Finished Dependency Resolution

Dependencies Resolved

=====
Package           Arch      Version      Repository    Size
-----
Installing:
nano              x86_64    2.3.2-5.fc20 updates      463 k
postgresql        x86_64    9.3.6-1.fc20 updates     3.1 M
Installing for dependencies:
postgresql-libs   x86_64    9.3.6-1.fc20 updates     230 k
=====

Transaction Summary
-----
Install 2 Packages (+1 Dependent package)

Total download size: 3.8 M
Installed size: 19 M
Downloading packages:
-----
Total                                     1.3 MB/s | 3.8 MB  00:02
Running transaction check
Running transaction test
Transaction test succeeded
Running transaction
  Installing : postgresql-libs-9.3.6-1.fc20.x86_64      1/3
  Installing : postgresql-9.3.6-1.fc20.x86_64          2/3
  Installing : nano-2.3.2-5.fc20.x86_64                3/3
  Verifying  : postgresql-libs-9.3.6-1.fc20.x86_64     1/3
  Verifying  : postgresql-9.3.6-1.fc20.x86_64         2/3
  Verifying  : nano-2.3.2-5.fc20.x86_64                3/3

Installed:
  nano.x86_64 0:2.3.2-5.fc20          postgresql.x86_64 0:9.3.6-1.fc20

Dependency Installed:
  postgresql-libs.x86_64 0:9.3.6-1.fc20

Complete!
--> 78de210e56d8
Removing intermediate container 4a9ecabf90ca
Successfully built 78de210e56d8
[ec2-user@ip-172-31-25-13 ~]$

```

- Image is built. Now, it has to be run. So, we use:
docker run -i -t spousty/myfedora:1.0 /bin/nano

```

ec2-user@ip-172-31-25-13:~
[ec2-user@ip-172-31-25-13 ~]$ docker run -i -t spousty/myfedora:1.0 /bin/nano
Unable to find image 'spousty/myfedora:1.0' locally
Pulling repository spousty/myfedora
FATA[0000] Error: image spousty/myfedora:1.0 not found
[ec2-user@ip-172-31-25-13 ~]$ docker run -i -t spousty/myfedora:1.0 /bin/bash
Unable to find image 'spousty/myfedora:1.0' locally
Pulling repository spousty/myfedora
FATA[0000] Error: image spousty/myfedora:1.0 not found
[ec2-user@ip-172-31-25-13 ~]$ docker pull spousty/myfedora:1.0
Pulling repository spousty/myfedora
FATA[0000] Error: image spousty/myfedora:1.0 not found
[ec2-user@ip-172-31-25-13 ~]$ docker images
REPOSITORY          TAG          IMAGE ID          CREATED
VIRTUAL SIZE
spousty/myfedora    1.0         78de210e56d8     8 minutes ago
857.5 MB
fedora/apache       latest      963668e7af33     8 days ago
627.1 MB
[ec2-user@ip-172-31-25-13 ~]$ docker ps
CONTAINER ID      IMAGE          COMMAND           CREATED
STATUS           PORTS         NAMES
5dafb849b29f     fedora/apache:latest  "/run-apache.sh"  44 minutes ago
Up 44 minutes    0.0.0.0:49154->80/tcp  romantic_yonath
[ec2-user@ip-172-31-25-13 ~]$

```

- I used the image ID to run the image than using the name as I encountered issues with using the name of the image which can be seen in the screenshot above.

```
docker run -i -t spousty/myfedora:1.0 /bin/bash
```

- Making own docker images by making changes in the container:

```
docker run -i -t 78de210e56d8 /bin/bash
```

```

/containers, from Docker: -v /container)
--volumes-from=[]      Mount volumes from the specified container(s)
-w, --workdir=""       Working directory inside the container
[ec2-user@ip-172-31-25-13 ~]$ docker run -i -t spousty/myfedora:1.0 /bin/nano
Unable to find image 'spousty/myfedora:1.0' locally
Pulling repository spousty/myfedora
FATA[0000] Error: image spousty/myfedora:1.0 not found
[ec2-user@ip-172-31-25-13 ~]$ docker images
REPOSITORY          TAG          IMAGE ID          CREATED
VIRTUAL SIZE
spousty/myfedora    1.0         78de210e56d8     11 minutes ago
857.5 MB
fedora/apache       latest      963668e7af33     8 days ago
627.1 MB
[ec2-user@ip-172-31-25-13 ~]$ docker run -i -t 78de210e56d8 /bin/nano
[ec2-user@ip-172-31-25-13 ~]$ docker run -i -t spousty/myfedora:1.0 /bin/bash
Unable to find image 'spousty/myfedora:1.0' locally
Pulling repository spousty/myfedora
FATA[0000] Error: image spousty/myfedora:1.0 not found
[ec2-user@ip-172-31-25-13 ~]$ docker run -i -t 78de210e56d8 /bin/bash
[root@6211706781c6 /]# nano /var/www/html/index.html
[root@6211706781c6 /]# exit
exit
[ec2-user@ip-172-31-25-13 ~]$

```

- Using nano we make changes to a file and then follow the above steps to get an image running. The changes are to be then committed.

- To enable inter container communication, the following steps are to be implemented. To spin up an image for the database, we use:

```
docker run -d -P --name db training/postgres
```

- To make the connection:

```
sudo docker run -i -t --name web --link db:postdb
```

- To check the environment variables:

```
env | grep POSTDB
```


- To test the connection:
`psql -h postdb -p $POSTDB_PORT_5432_TCP_PORT -V`
`psql -h postdb -p $POSTDB_PORT_5432_TCP_PORT -U docker`
`docker=# \db`

```

@48bb6d9954e0/
[ec2-user@ip-172-31-25-13 ~]$ docker ps
CONTAINER ID        IMAGE               COMMAND             CREATED
STATUS            PORTS              NAMES
f3fd0ffd409e       training/postgres:latest "su postgres -c '/us 6 seconds
ago                Up 6 seconds       0.0.0.0:49156->5432/tcp db
4034eab2d198       spousty/myfedora:1.0 "/run-apache.sh"    5 minutes
ago                Up 5 minutes       0.0.0.0:49155->80/tcp angry_carson
5dafb849b29f       fedora/apache:latest "/run-apache.sh"    About an h
our ago           Up About an hour   0.0.0.0:49154->80/tcp romantic_yonath
[ec2-user@ip-172-31-25-13 ~]$ env |grep POSTDB
[ec2-user@ip-172-31-25-13 ~]$ sudo docker run -i -t --name web --link db:postdb
docker: "run" requires a minimum of 1 argument. See 'docker run --help'.
[ec2-user@ip-172-31-25-13 ~]$ sudo docker run -i -t --name web --link db:postdb
spousty/myfedora /bin/bash
Unable to find image 'spousty/myfedora:latest' locally
Pulling repository spousty/myfedora
FATA[0000] Error: image spousty/myfedora:latest not found
[ec2-user@ip-172-31-25-13 ~]$ sudo docker run -i -t --name web --link db:postdb
78de210e56d8 /bin/bash
[root@48bb6d9954e0 /]# env |grep POSTDB
POSTDB_NAME=/web/postdb
POSTDB_PORT=tcp://172.17.0.12:5432
POSTDB_PORT_5432_TCP_ADDR=172.17.0.12
POSTDB_ENV_PG_VERSION=9.3
POSTDB_PORT_5432_TCP_PORT=5432
POSTDB_PORT_5432_TCP=tcp://172.17.0.12:5432
POSTDB_PORT_5432_TCP_PROTO=tcp
[root@48bb6d9954e0 /]# cat /etc/hosts |grep postdb
172.17.0.12    postdb
[root@48bb6d9954e0 /]# psql -h postdb -p $POSTDB_PORT_5432_TCP_PORT -V
psql (PostgreSQL) 9.3.6
[root@48bb6d9954e0 /]# psql -h postdb -p $POSTDB_PORT_5432_TCP_PORT -U docker
psql (9.3.6, server 9.3.4)
SSL connection (cipher: DHE-RSA-AES256-SHA, bits: 256)
Type "help" for help.

docker=# \db
      List of tablespaces
   Name   | Owner  | Location
-----+-----+-----
 pg_default | postgres |
 pg_global | postgres |
(2 rows)

docker=#

```