Container: Lecture 8

Build Container Image Lab:

1. Install container packages-

```
[root@rhel9-test ~]#
[root@rhel9-test ~]# dnf install -y @container-tools
```

2. To get podman help, run command as shown-

```
[root@rhel9-test ~]# podman --help
```

3. Similarly to get podman create help, run below command-

```
[root@rhel9-test ~]# podman create --help
Create but do not start a container
```

4. For network related help, run below command-

```
[root@rhel9-test ~]# podman network --help
Manage networks

Description:
  Manage networks

Usage:
  podman network [command]

Available Commands:
  connect     network connect
  create      network create
  disconnect  network rm
  exists      network exists
  inspect     Inspect network
  ls          network list
  prune       network prune
  reload      Reload firewall rules for one or more containers
  rm          network rm

[root@rhel9-test ~]#
```

5. For podman build help-

```
[root@rhel9-test ~]# podman build --help
Build an image using instructions from Containerfiles

Description:
  Builds an OCI or Docker image using instructions from one or more Containerfiles and a specified build context directory.
```

Create Container using podman (Command Line Method):

6. Now pull httpd container image, we will have multiple registry to pull from if not specified a registry-

```
[root@rhel9-test ~]# podman create httpd
? Please select an image:
  ▸ registry.access.redhat.com/httpd:latest
    registry.redhat.io/httpd:latest
    docker.io/library/httpd:latest
```

7. We will select docker registry & continue-

```
[root@rhel9-test ~]# podman create httpd
✔ docker.io/library/httpd:latest
Trying to pull docker.io/library/httpd:latest...
Getting image source signatures
Copying blob ec3bbe99d2b1 done
Copying blob 6d859023da80 done
Copying blob 3f4ca61aafcd skipped: already exists
Copying blob 2e3d233b6299 done
Copying blob f856a04699cc done
Copying config 73c10eb926 done
Writing manifest to image destination
Storing signatures
009e1c74a2ac72d596d313ab7ca91c2b745bb89155e125d18242f0a8cc6a9af9
[root@rhel9-test ~]#
```

8. To verify images, we can use either of the two commands as shown-

```
[root@rhel9-test ~]# podman images
REPOSITORY                TAG         IMAGE ID      CREATED      SIZE
docker.io/library/httpd   latest      73c10eb9266e  12 days ago  150 MB
[root@rhel9-test ~]#
[root@rhel9-test ~]#
[root@rhel9-test ~]# buildah images
REPOSITORY                 TAG      IMAGE ID       CREATED       SIZE
docker.io/library/httpd    latest   73c10eb9266e   12 days ago   150 MB
[root@rhel9-test ~]#
```

9. Check for running container if any-

```
[root@rhel9-test ~]# podman ps
CONTAINER ID  IMAGE       COMMAND     CREATED     STATUS      PORTS       NAMES
[root@rhel9-test ~]#
```

Create Container using podman (Docker File Method):

10. First, create a Docker File & write some lines of code. Verify it-

```
[root@rhel9-test ~]# vim Dockerfile
[root@rhel9-test ~]#
[root@rhel9-test ~]# ls
anaconda-ks.cfg  Dockerfile  Downloads  mywebserver.tar  Public             singhubi.tar  Videos
Desktop          Documents   Music      Pictures         singhubi-container  Templates
[root@rhel9-test ~]# cat Dockerfile
FROM docker.io/redhat/ubi8
RUN yum -y install httpd
CMD ["/usr/sbin/httpd", "-D", "FOREGROUND"]
EXPOSE 80
```

Here, using this file, we will-

- Mention the registry URL to pull base image in order to create a container
- Install httpd packages while creating our own container
- Container will run using httpd binary file
- Expose the http port

11. Next, we will create the image using this file-

```
[root@rhel9-test ~]# podman build .
STEP 1/4: FROM docker.io/redhat/ubi8
Trying to pull docker.io/redhat/ubi8:latest...
Getting image source signatures
Copying blob 0e0c4af1097a done
Copying config b2276c479c done
Writing manifest to image destination
Storing signatures
STEP 2/4: RUN yum -y install httpd
```

```
Complete!
--> d1b30f992df
STEP 3/4: CMD ["/usr/sbin/httpd", "-D", "FOREGROUND"]
--> 0b1aaac5f59
STEP 4/4: EXPOSE 80
COMMIT
--> dbf68a45e3c
dbf68a45e3cec61885859f99e7aca1ec6b62dd0a72b1382ee8578afeb59527a9
[root@rhel9-test ~]#
```

12. Verify using podman images & podman ps-

```
[root@rhel9-test ~]# podman images
REPOSITORY               TAG         IMAGE ID      CREATED         SIZE
<none>                   <none>      dbf68a45e3ce  19 seconds ago  245 MB
docker.io/library/httpd  latest      73c10eb9266e  12 days ago     150 MB
docker.io/redhat/ubi8    latest      b2276c479c60  2 weeks ago     214 MB
[root@rhel9-test ~]#
[root@rhel9-test ~]#
[root@rhel9-test ~]# podman ps
CONTAINER ID  IMAGE       COMMAND     CREATED     STATUS      PORTS       NAMES
[root@rhel9-test ~]#
```

Here third image we have pulled to build our own image. Blue arrow is showing our created image. We haven't defined any name or tag for this.

13. To modify this image, we will use another method to create image. For this first create one directory & copy that file in it as shown-

```
[root@rhel9-test ~]# mkdir myweb.container
[root@rhel9-test ~]#
[root@rhel9-test ~]# cp Dockerfile myweb.container/
[root@rhel9-test ~]#
```

14. Now create the image-

```
[root@rhel9-test ~]# podman build --creds=john:password -t myweb -f myweb.container/Dockerfile
STEP 1/4: FROM docker.io/redhat/ubi8
STEP 2/4: RUN yum -y install httpd
--> Using cache d1b30f992df7fb50c977db1a4f0ed14708c775ae32111fbb30d028ba56d5ac07
--> d1b30f992df
STEP 3/4: CMD ["/usr/sbin/httpd", "-D", "FOREGROUND"]
--> Using cache 0b1aaac5f59be23e9bf6cba0bc69bc145237a98610bbc946c8bf30a35eb4701c
--> 0b1aaac5f59
STEP 4/4: EXPOSE 80
--> Using cache dbf68a45e3cec61885859f99e7aca1ec6b62dd0a72b1382ee8578afeb59527a9
COMMIT myweb
--> dbf68a45e3c
Successfully tagged localhost/myweb:latest
dbf68a45e3cec61885859f99e7aca1ec6b62dd0a72b1382ee8578afeb59527a9
[root@rhel9-test ~]#
```

Here, we specified a username & its password along with image name.

15. Verify images now-

```
[root@rhel9-test ~]# podman images
REPOSITORY                TAG         IMAGE ID      CREATED         SIZE
localhost/myweb           latest      dbf68a45e3ce  17 minutes ago  245 MB
docker.io/library/httpd   latest      73c10eb9266e  12 days ago     150 MB
docker.io/redhat/ubi8     latest      b2276c479c60  2 weeks ago     214 MB
[root@rhel9-test ~]#
[root@rhel9-test ~]#
[root@rhel9-test ~]# podman ps
CONTAINER ID  IMAGE       COMMAND     CREATED     STATUS      PORTS       NAMES
[root@rhel9-test ~]#
```

16. Now we will run this container image in background & verify the web content-

```
[root@rhel9-test ~]# podman run -d --name=web -p 80:80 localhost/myweb:latest
9eab310c0c9ac8e23f4a0a930c344bbb9deee96552604f80a6ad434f79d068b0
[root@rhel9-test ~]#
[root@rhel9-test ~]# podman ps
CONTAINER ID  IMAGE                 COMMAND              CREATED        STATUS           PORTS               NAMES
9eab310c0c9a  localhost/myweb:latest  /usr/sbin/httpd -...  3 seconds ago  Up 3 seconds ago  0.0.0.0:80->80/tcp  web
[root@rhel9-test ~]#
[root@rhel9-test ~]#
[root@rhel9-test ~]# curl localhost
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.1//EN" "http://www.w3.org/TR/xhtml11/DTD/xhtml11.dtd">
```

17. This is done using podman. Now we will stop & remove all the images-

```
[root@rhel9-test ~]# podman stop -a
009e1c74a2ac72d596d313ab7ca91c2b745bb89155e125d18242f0a8cc6a9af9
9eab310c0c9ac8e23f4a0a930c344bbb9deee96552604f80a6ad434f79d068b0
[root@rhel9-test ~]#
[root@rhel9-test ~]# podman rm -a
009e1c74a2ac72d596d313ab7ca91c2b745bb89155e125d18242f0a8cc6a9af9
9eab310c0c9ac8e23f4a0a930c344bbb9deee96552604f80a6ad434f79d068b0
[root@rhel9-test ~]#
[root@rhel9-test ~]# podman rmi -a
Untagged: docker.io/library/httpd:latest
Untagged: docker.io/redhat/ubi8:latest
Untagged: localhost/myweb:latest
Deleted: 73c10eb9266e7e3850d5368a05e4bdd823d6f4cec0fd03a2b19c0118645a49ea
Deleted: dbf68a45e3cec61885859f99e7aca1ec6b62dd0a72b1382ee8578afeb59527a9
[root@rhel9-test ~]#
[root@rhel9-test ~]#
[root@rhel9-test ~]# podman images
REPOSITORY  TAG         IMAGE ID    CREATED     SIZE
[root@rhel9-test ~]#
```

Create container using buildah (Command Line Method):

18. First verify whether buildah package is installed or not-

```
[root@rhel9-test ~]# rpm -qa | grep buildah
buildah-1.27.0-2.el9.x86_64
[root@rhel9-test ~]#
```

19. Now, we will pull fedora base image using buildah & verify it-

```
[root@rhel9-test ~]# buildah from fedora
Resolved "fedora" as an alias (/etc/containers/registries.conf.d/000-shortnames.conf)
Trying to pull registry.fedoraproject.org/fedora:latest...
Getting image source signatures
Copying blob 1842e4e4b562 done
Copying config 19c0ae4dd2 done
Writing manifest to image destination
Storing signatures
fedora-working-container
[root@rhel9-test ~]#
[root@rhel9-test ~]#
[root@rhel9-test ~]# podman images
REPOSITORY                       TAG         IMAGE ID      CREATED      SIZE
registry.fedoraproject.org/fedora  latest      19c0ae4dd222  3 weeks ago  190 MB
[root@rhel9-test ~]#
```

20. To run this container image after giving a name & then will install httpd package in order to setup web server-

```
[root@rhel9-test ~]# buildah run fedora-working-container dnf install httpd -y
Fedora 37 - x86_64                                              3.0 MB/s |  64 MB     00:21
Fedora 37 openh264 (From Cisco) - x86_64                        666  B/s | 2.5 kB     00:03
Fedora Modular 37 - x86_64                                       71 kB/s | 3.0 MB     00:43
Fedora 37 - x86_64 - Updates                                    130 kB/s |  19 MB     02:33
Fedora Modular 37 - x86_64 - Updates                            5.8 kB/s | 1.1 MB     03:11
Dependencies resolved.
================================================================================================================================================
 Package                                Architecture            Version                          Repository                 Size
================================================================================================================================================
Installing:
```

21. We will create a custom web server, for that create index.html file inside newly created directory as shown-

```
[root@rhel9-test ~]# mkdir demo-httpd
[root@rhel9-test ~]# cd demo-httpd/
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]# echo "Welcome to Cricbuzz World!" > index.html
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]# cat index.html
Welcome to Cricbuzz World!
[root@rhel9-test demo-httpd]#
```

22. We will copy this index.html to running fedora container using buildah & define the binary file in the image-

```
[root@rhel9-test demo-httpd]# buildah copy fedora-working-container index.html /var/www/html/index.html
317c0026c5437d7193b736135d2ddbff94879e1995ae72262c0bbfb86bf8e4b9
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]# buildah config --entrypoint "/usr/sbin/httpd -DFOREGROUND" fedora-working-container
WARN[0000] cmd "/bin/bash" exists but will be ignored because of entrypoint settings
[root@rhel9-test demo-httpd]#
```

23. Next, we will commit the changes & then verify available images-

```
[root@rhel9-test demo-httpd]# buildah commit fedora-working-container fedora-myhttpd
Getting image source signatures
Copying blob ab03326cd6b0 skipped: already exists
Copying blob 7224e9122558 done
Copying config 4f37b8cbd3 done
Writing manifest to image destination
Storing signatures
4f37b8cbd3a360c70da5fbc5d47f241e35abcdfb0d718f0525770cca106ff58c
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]# buildah images
REPOSITORY                          TAG      IMAGE ID       CREATED          SIZE
localhost/fedora-myhttpd            latest   4f37b8cbd3a3   14 seconds ago   452 MB
registry.fedoraproject.org/fedora   latest   19c0ae4dd222   3 weeks ago      190 MB
[root@rhel9-test demo-httpd]#
```

24. Now run it in background & verify the container running status as well as web content-

```
[root@rhel9-test demo-httpd]# podman run -d --name=fedora-web -p 80:80 fedora-myhttpd
44bd0fb281a3435e8b130adc3f8e336a0bdd0dd35fcbbf9a27b725705e962472
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]# podman ps
CONTAINER ID  IMAGE                           COMMAND     CREATED         STATUS         PORTS               NAMES
44bd0fb281a3  localhost/fedora-myhttpd:latest  /bin/bash   9 seconds ago   Up 9 seconds ago  0.0.0.0:80->80/tcp  fedora-web
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]# curl localhost
Welcome to Cricbuzz World!
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]# curl 192.168.111.128
Welcome to Cricbuzz World!
[root@rhel9-test demo-httpd]#
```

25. Now we will stop running images & remove it-

```
[root@rhel9-test demo-httpd]# podman stop -a
44bd0fb281a3435e8b130adc3f8e336a0bdd0dd35fcbbf9a27b725705e962472
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]# podman rm -a
44bd0fb281a3435e8b130adc3f8e336a0bdd0dd35fcbbf9a27b725705e962472
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]# podman rmi -a
Untagged: localhost/fedora-myhttpd:latest
Deleted: 4f37b8cbd3a360c70da5fbc5d47f241e35abcdfb0d718f0525770cca106ff58c
Error: image used by 998666bc4d51a2266d5697a0c3f6a802951fb06d0681404e18ccc5a6f900353b: image is in use by a container
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]# podman images
REPOSITORY                       TAG         IMAGE ID      CREATED      SIZE
registry.fedoraproject.org/fedora  latest      19c0ae4dd222  3 weeks ago  190 MB
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]# podman rmi -a -f
Untagged: registry.fedoraproject.org/fedora:latest
Deleted: 19c0ae4dd222b7c3b590fb11d7578105944c314ed90a6f125cf98d399fd14c4a
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]#
[root@rhel9-test demo-httpd]# podman images
REPOSITORY  TAG         IMAGE ID    CREATED     SIZE
[root@rhel9-test demo-httpd]#
```

Create container using buildah (Docker File Method):

26. We will switch to a standard user-

```
[root@rhel9-test demo-httpd]# su - john
[john@rhel9-test ~]$
```

27. Now, create a Docker File & write some lines of code. Verify it-

```
[john@rhel9-test ~]$ vim Dockerfile

[john@rhel9-test ~]$
[john@rhel9-test ~]$ cat Dockerfile
# CoreOS Base
FROM fedora:latest
# INstall httpd
RUN echo "Installing httpd"; yum -y install httpd
# Expose the default httpd port 80
EXPOSE 80
# Run httpd
CMD ["/usr/sbin/httpd", "-DFOREGROUND"]
[john@rhel9-test ~]$
```

28. We will use bud (build-using-dockerfile) command & give image name-

```
[john@rhel9-test ~]$ buildah bud -t fedora-httpd
STEP 1/4: FROM fedora:latest
Resolved "fedora" as an alias (/etc/containers/registries.conf.d/000-shortnames.conf)
Trying to pull registry.fedoraproject.org/fedora:latest...
Getting image source signatures
Copying blob 1842e4e4b562 done
Copying config 19c0ae4dd2 done
Writing manifest to image destination
Storing signatures
STEP 2/4: RUN echo "Installing httpd"; yum -y install httpd
Installing httpd
Fedora 37 - x86_64                              4.3 MB/s |  64 MB     00:14
Fedora 37 openh264 (From Cisco) - x86_64        844  B/s | 2.5 kB     00:03
Fedora Modular 37 - x86_64                       73 kB/s | 3.0 MB     00:42
Fedora 37 - x86_64 - Updates                    236 kB/s |  19 MB     01:24
Fedora Modular 37 - x86_64 - Updates             15 kB/s | 1.1 MB     01:16
Last metadata expiration check: 0:00:01 ago on Mon Jan  2 11:56:34 2023.
Dependencies resolved.
================================================================================
 Package                      Arch      Version              Repository  Size
================================================================================
Installing:
```

```
Complete!
STEP 3/4: EXPOSE 80
STEP 4/4: CMD ["/usr/sbin/httpd", "-DFOREGROUND"]
COMMIT fedora-httpd
Getting image source signatures
Copying blob ab03326cd6b0 skipped: already exists
Copying blob 3006eaf98dbc done
Copying config 24831a8a9e done
Writing manifest to image destination
Storing signatures
--> 24831a8a9eb
Successfully tagged localhost/fedora-httpd:latest
24831a8a9eb65f133c92ae6ae1eaf4588a65515a682286190caa9b0030adb3fb
[john@rhel9-test ~]$
```

This will –

- Pull fedora base image,
- Install httpd package,
- Expose port 80 & then
- Container will run using httpd binary file.

29. Verify the images using both podman & buildah-

```
[john@rhel9-test ~]$ podman images
REPOSITORY                          TAG         IMAGE ID      CREATED         SIZE
localhost/fedora-httpd              latest      24831a8a9eb6  18 seconds ago  452 MB
registry.fedoraproject.org/fedora   latest      19c0ae4dd222  3 weeks ago     190 MB
[john@rhel9-test ~]$
[john@rhel9-test ~]$
[john@rhel9-test ~]$ buildah images
REPOSITORY                          TAG      IMAGE ID       CREATED          SIZE
localhost/fedora-httpd              latest   24831a8a9eb6   45 seconds ago   452 MB
registry.fedoraproject.org/fedora   latest   19c0ae4dd222   3 weeks ago      190 MB
[john@rhel9-test ~]$
```

30. Run this in background with port no greater than 1024 (As we are running the container in standard user i.e root less) & verify it-

```
[john@rhel9-test ~]$ podman run -d --name=webserver -p 8080:80 localhost/fedora-httpd:latest
9ea529101d6c4529dc1f4d78a37a3062dabb9d741a683d941952147779843f90
[john@rhel9-test ~]$
[john@rhel9-test ~]$
[john@rhel9-test ~]$ podman ps
CONTAINER ID  IMAGE                          COMMAND               CREATED         STATUS         PORTS                   NAMES
9ea529101d6c  localhost/fedora-httpd:latest  /usr/sbin/httpd -...  11 seconds ago  Up 11 seconds  0.0.0.0:8080->80/tcp    webserver
[john@rhel9-test ~]$
```

31. Verify web content once image runs-

```
[john@rhel9-test ~]$ curl localhost
curl: (7) Failed to connect to localhost port 80: Connection refused
[john@rhel9-test ~]$
[john@rhel9-test ~]$ curl localhost:8080
<!doctype html>
<html>
```

32. Check the container status-

```
[john@rhel9-test ~]$ podman ps
CONTAINER ID  IMAGE                          COMMAND               CREATED         STATUS         PORTS                   NAMES
9ea529101d6c  localhost/fedora-httpd:latest  /usr/sbin/httpd -...  2 minutes ago   Up 2 minutes   0.0.0.0:8080->80/tcp    webserver
[john@rhel9-test ~]$
```

33. At last, stop the container & remove all the images-

```
[john@rhel9-test ~]$ podman stop 9ea529101d6c
9ea529101d6c
[john@rhel9-test ~]$
[john@rhel9-test ~]$
[john@rhel9-test ~]$ podman ps
CONTAINER ID  IMAGE       COMMAND     CREATED     STATUS      PORTS       NAMES
[john@rhel9-test ~]$
[john@rhel9-test ~]$
[john@rhel9-test ~]$ podman rm -a
9ea529101d6c4529dc1f4d78a37a3062dabb9d741a683d94195214777984 3f90
[john@rhel9-test ~]$
[john@rhel9-test ~]$ podman rmi -a
Untagged: registry.fedoraproject.org/fedora:latest
Untagged: localhost/fedora-httpd:latest
Deleted: 19c0ae4dd222b7c3b590fb11d7578105944c314ed90a6f125cf98d399fd14c4a
Deleted: 24831a8a9eb65f133c92ae6ae1eaf4588a65515a682286190caa9b0030adb3fb
[john@rhel9-test ~]$
[john@rhel9-test ~]$ podman images
REPOSITORY  TAG         IMAGE ID    CREATED     SIZE
[john@rhel9-test ~]$
[john@rhel9-test ~]$
[john@rhel9-test ~]$ podman ps -a
CONTAINER ID  IMAGE       COMMAND     CREATED     STATUS      PORTS       NAMES
[john@rhel9-test ~]$
```

This is it about our last lecture 8!!!