7.1 Learning Objectives

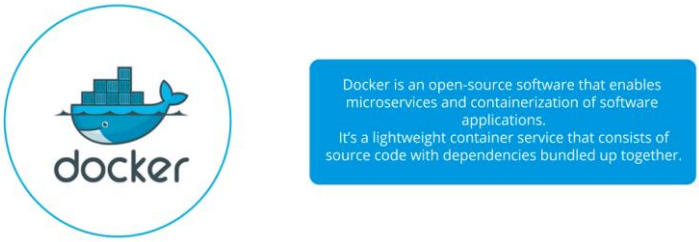
Configuration Management

By the end of this lesson, you will be able to:

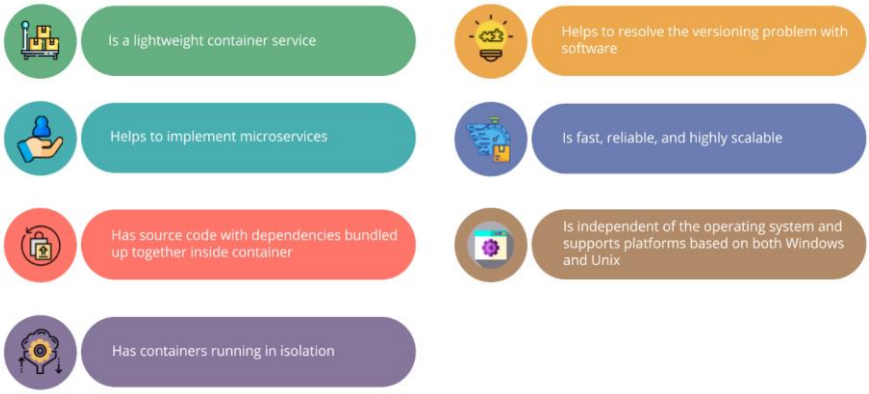
- Describe the importance of Docker over virtual machines
- Demonstrate Docker images, containers, and Docker Registry
- Demonstrate Docker Compose and Docker Hub
- Describe the importance of Docker networking

7.2 Overview of Docker

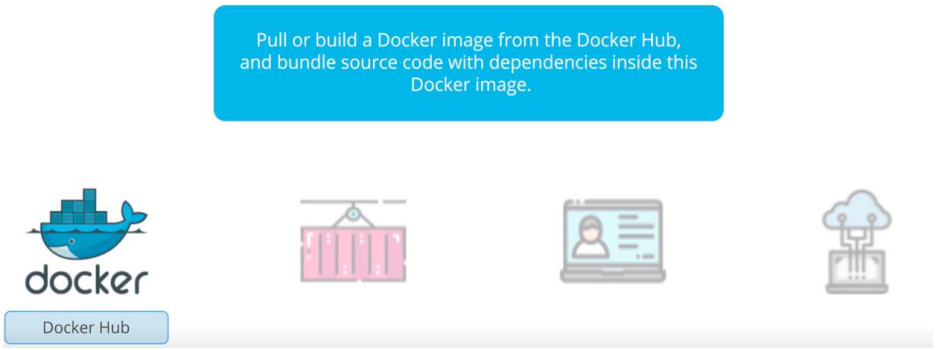
Docker

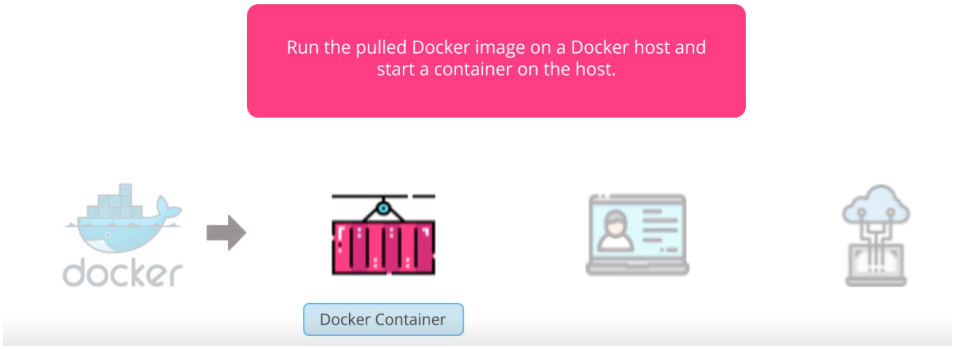


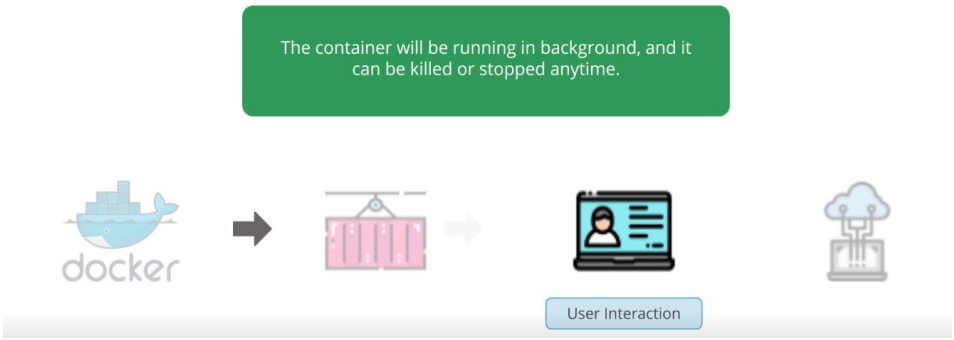
Docker Features

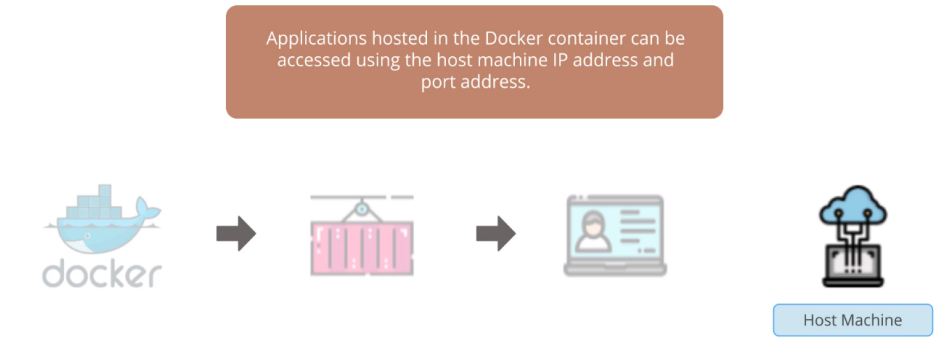


Docker Workflow

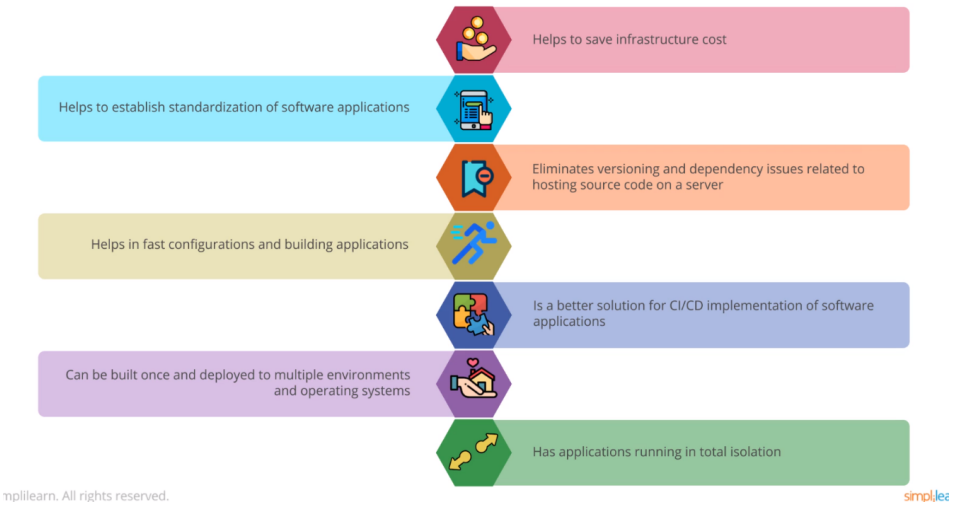






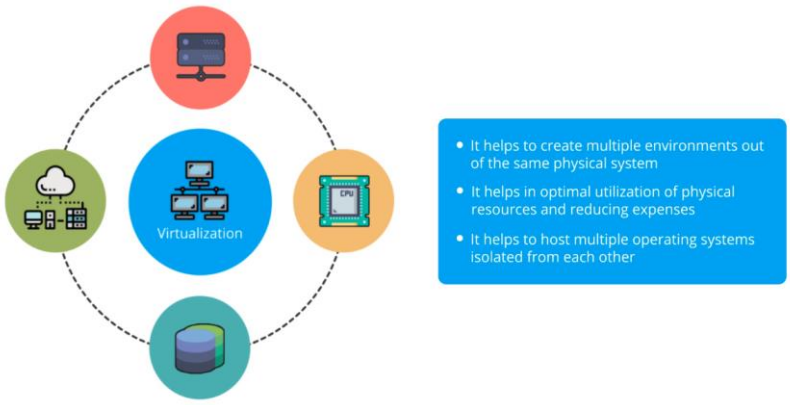


Docker Benefits

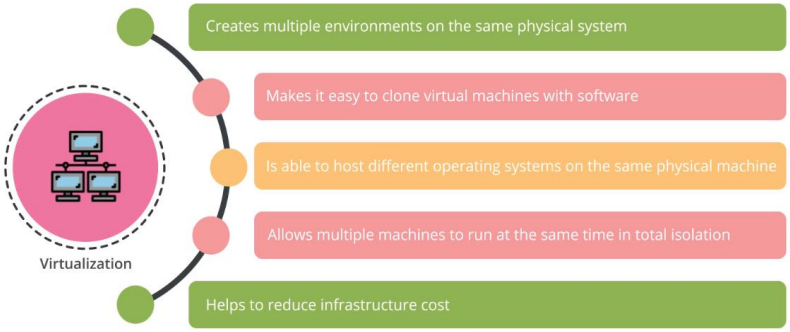


7.3 Overview of Virtualization

Virtualization

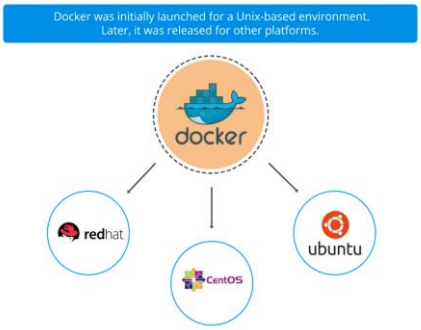


Advantages of Virtualization



7.4 Docker Installation on Multiple OS

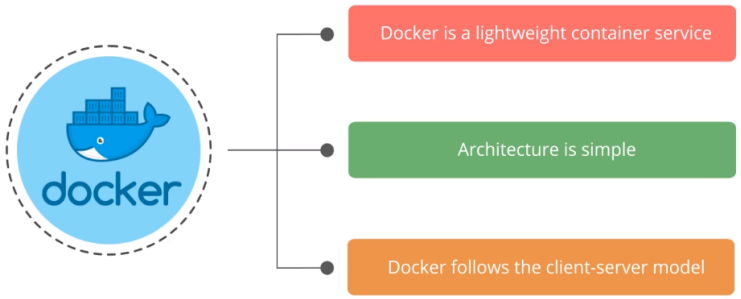
Docker on Linux

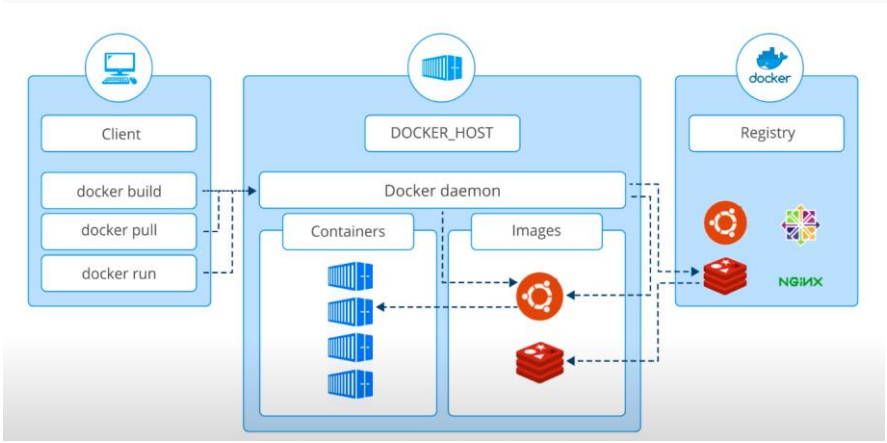



```
Reading state information... Done
20 packages can be upgraded. Run 'apt list --upgradab
root@docker:~# apt install docker.io
Reading package lists... Done
```

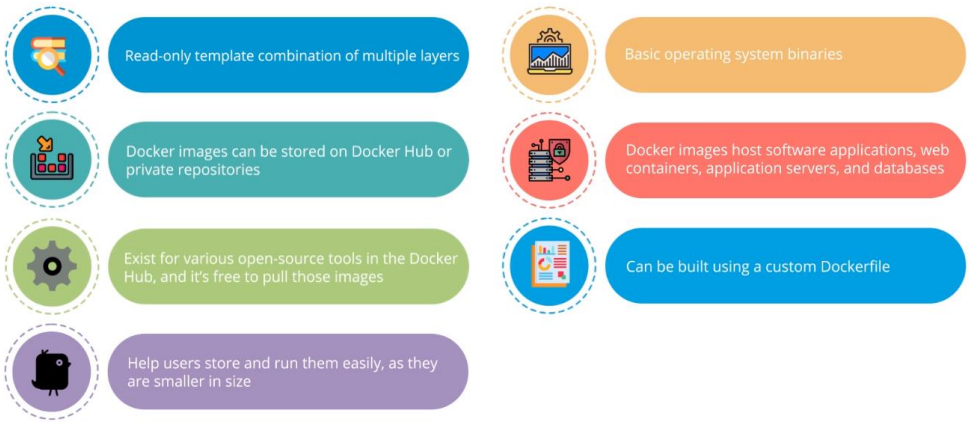
Docker on Desktop

Docker Architecture

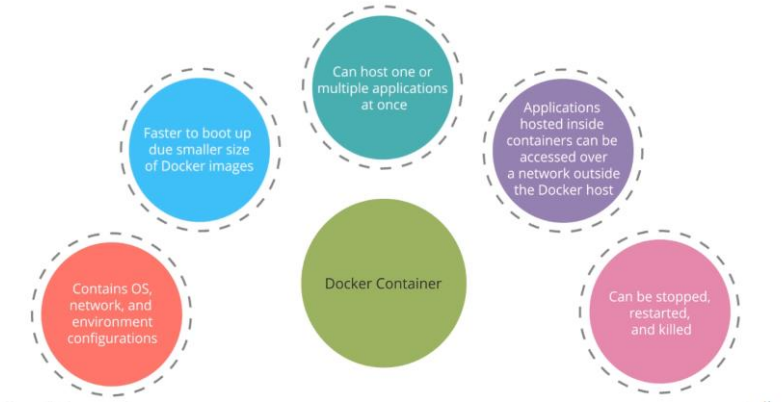




Docker Images



Docker Containers



Execution of Docker Images

You can check all existing Docker images on Docker hosts using the command:	docker images
You can pull a Docker image from either the Docker Hub or a private repository using the command:	docker pull <image_name>:<tag>
You can get the image name from Docker Hub, or you can also search it using the command:	docker search <image_name>
You can remove a Docker image using the command:	Docker rmi <image_name>:<tag>
You can also export Docker images to a tar file so that they can be transferred from one server to another using the command:	docker save <image_name>:<tag> -o <tar_filename>
You can import a Docker image with all the layers from a tar file using the command:	docker load –I <tar_filename>

Execution of Docker Containers

An instance of Docker image can be created using the "run" command below:

```
docker run -it <image_name> bash
```

- -i or --interactive keeps STDIN open
- -t or --tty allocates a pseudo TTY

A Docker image can also be run in the detached mode using flag "d":

```
docker run –d <image_name>
```

A Docker container can be easily removed from the Docker host using the command below:

```
docker rm <container_id> -f
```

A Docker container can be stopped, killed, and restarted using the commands below:

```
docker stop <container_id>
docker restart <container_id>
docker kill <container_id>
```

Users can connect back to a Docker container running in detached mode using the command below:

```
docker exec –it <container_id> bash
```

- -i or --interactive keeps STDIN open
- -t or --tty allocates a pseudo TTY

A Docker container can be paused and unpaused using the commands:

```
docker pause <container_id>
docker unpause <container_id>
```

7.5 MySQL Database in Docker Container

Praxisbeispiel

- Login to your Ubuntu Lab, and open the terminal.
- Create a folder to store all the files generated during the demonstration.
- Clone the repository from Git and navigate inside the directory.
- Grant the read, write, and execute permissions to the “runserver_first” file.
- Execute the client and log the data in the database.
- Execute the MySQL database command and enter the login password to use it.
- Explore the MySQL database and confirm that it works efficiently.
- Exit the MySQL Client.

7.6. Docker Installation on Multiple OS

Docker Automated Build

Docker File

- Dockerfile is used to build custom Docker images. You can add the application source code, or configure and install any application software into a Docker image.
- There are a few attributes that can be used in Dockerfile:

- FROM → Used to define base image information
- MAINTAINER → Used to display the name and email ID of build owner
- SHELL → Used to set the default shell
- COPY → Used to transfer the local file to Docker container

- ADD --------> It's similar to COPY, but you can use a URL instead of a local file. Archived files get unarchived automatically once transferred inside container to a specific folder
- RUN --------> Used to execute command inside a Docker image
- ENV --------> Used to create environment variables inside Docker image
- COMMAND --------> Defines the executable to be executed while running Docker image
- WORKDIR --------> Used to configure working DIR during executing Docker build command
- EXPOSE --------> Exposes a port on which application will be hosted

Docker File Build

- Dockerfile is used to create a custom Docker image using Docker build command.
- Docker build command follows the syntax below:

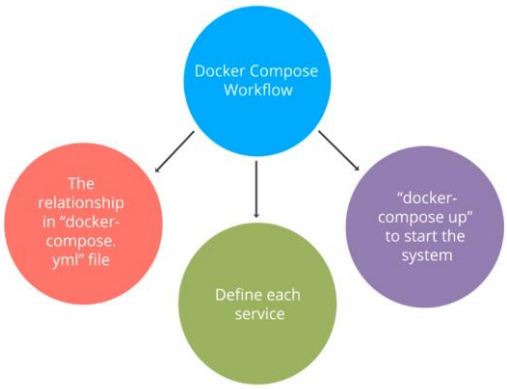
```
docker build -t <image_name>:<tag>
```

- This command creates an intermediate container, and that container will automatically be removed once image build is complete.

```
root@docker:~# cat Dockerfile
FROM ubuntu:18.04

MAINTAINER Simplilearn

RUN apt-get update && apt-get install -y apache2 && apt-get clean && rm -rf /var/lib/apt/lists/*

ENV APACHE_RUN_USER www-data
ENV APACHE_RUN_GROUP www-data
ENV APACHE_LOG_DIR /var/log/apache2

WORKDIR /var/www/html

COPY index.html /var/www/html
ADD *.html /var/www/html

EXPOSE 80

SHELL ["/bin/sh", "-c"]
CMD ["/usr/sbin/apache2", "-D", "FOREGROUND"]
root@docker:~#
```

Docker Compose

- Docker Compose is used to define and run complex applications in Docker.
- The main functions of Docker Compose are building images, scaling containers, and rerunning containers that have stopped.
- It has a similar set of commands like Docker.
- Entire configuration can be stored and versioned along with the project.



7.7 Using Docker Compose to Manage a Container

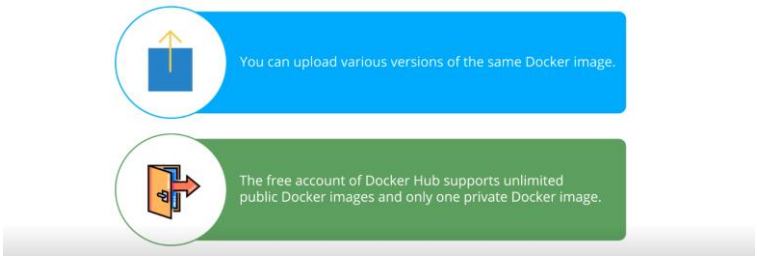
Praxisbeispiel

- Login to your Ubuntu Lab, and open the terminal.
- Create a Dockerfile and build the Docker image with it.
- Run the image and connect to the SSH server.
- Exit the container once you confirm that you have logged in.
- Create a "docker-compose.yml" file and connect to the server.
- Stop the server and exit the container.

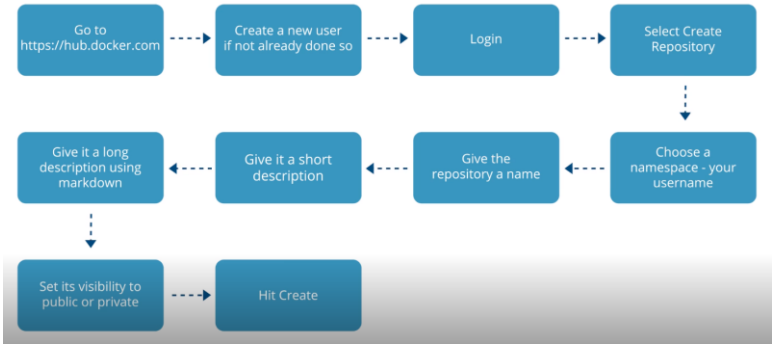
7.8 Docker Registry

Docker Registry

- Docker Registry helps you share Docker images.
- You can also have different collaborators to a single Docker image.
- Both public and private Docker images can be uploaded to Docker Hub.
- Docker store consists of enterprise and trusted Docker images.

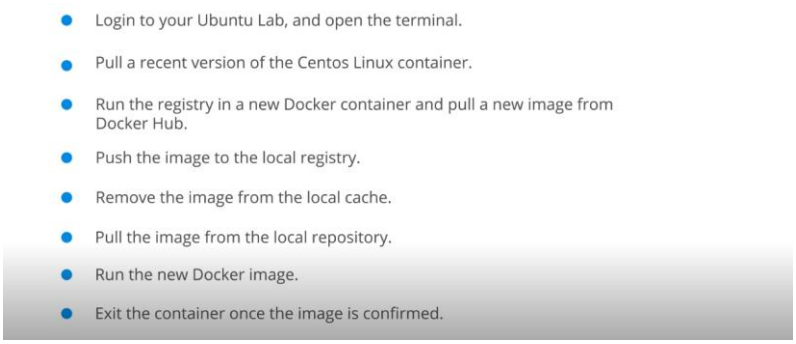


Docker Hub Configuration: Step-by-Step Procedure



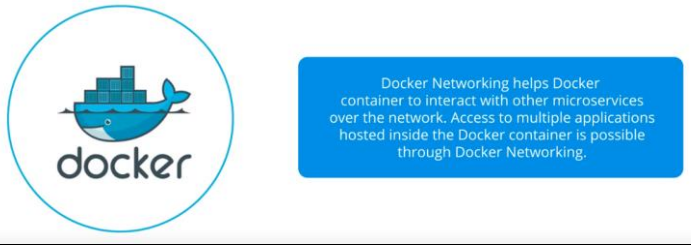
7.9 Run Docker Registry with Centos

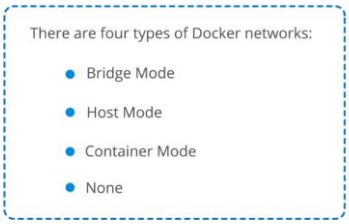
Praxisbeispiel

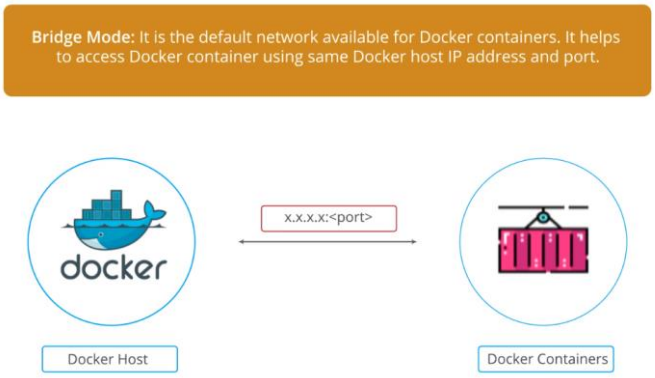


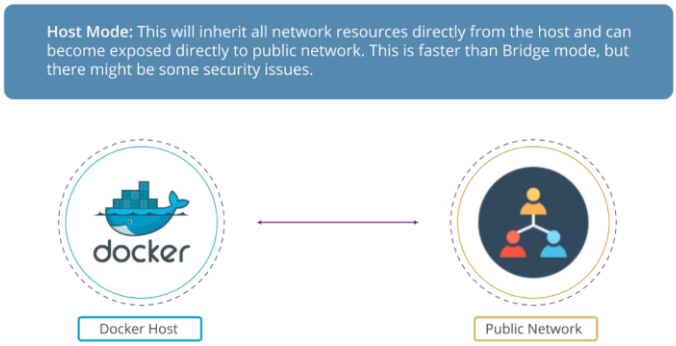
7.10 Docker Networking

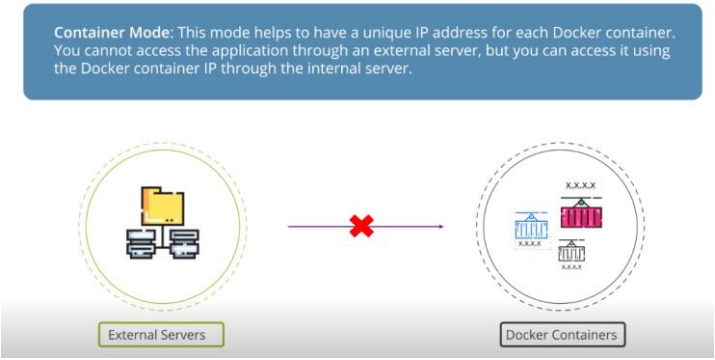
Docker Networking

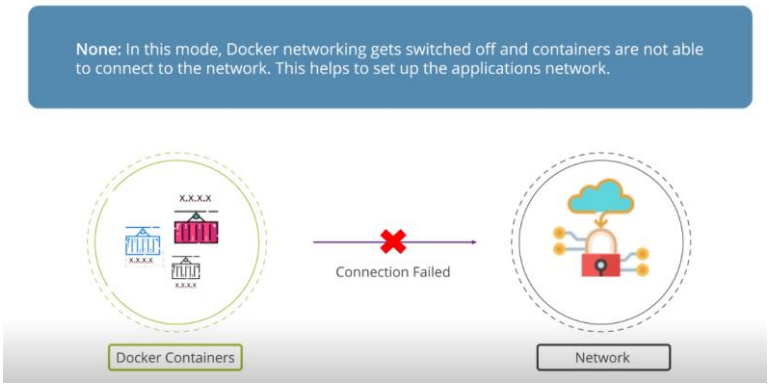












7.11 Demonstrate Docker Networking with Two SSHs

Praxisbeispiel

- Login to your Ubuntu Lab, and open the terminal.
- Create a Centos container and install the net tools.
- Confirm the IP address, hostname, and exit the container.
- Commit the container to an image.
- Create a bridge network and find its IP range.
- Connect the network from the second SSH window.
- Confirm the IP addresses and hostnames.
- Disconnect the connection and exit the container.