- **FROM** (used for base image)

- **RUN** (to run command)

- We can RUN in two format

1.SHELL // RUN apt update// -->> RUN CMD <options> <options>

2.EXEC // EXEC ["apt","update"] -->

**EXEC ["CMD","<options","<options>"]**

examples :

**RUN apt update**

**RUN apt install -y git curl sudo**

**EXEC ["ls", "-l", "-r", "-t"]**

­

'''

***Docker prefers EXEC format, but industry we write in SHELL format***

'''

- **COPY** (used to copy files from local to image)

Note: we need to calculate from build path, not from system path

\* Only folders and file but not compressed or links

COPY <source\_path\_from\_build\_context> <destination\_inside\_image>

examples :

1. COPY test.txt /home/test.txt

2. COPY ./demo/file1.txt /home/demo/file1.txt or /home/demo/file\_to\_container.txt

to check this alway build image first and run container

- docker build -t myub:latest .

- docker run -it -d --name mycon myub:latest

- docker exec -it mycon /bin/bash

boot etc lib media opt root sbin sys usr

root@0a5f106e3033:/# cd home

root@0a5f106e3033:/home# ls

hack.txt hack\_test\_renamed.txt ubuntu

root@0a5f106e3033:/home# read escape sequence

- **ADD** (used to copy files from local to image but)

ADD supports extra source formats

\*If the source is a compressed file then ADD will automatically uncompressed it in the destination.

\*If the source is a downloadable link then ADD will automatically download the file in the destination.

example: -

**ADD https://dlcdn.apache.org/tomcat/tomcat-9/v9.0.93/bin/apache-tomcat-9.0.93-deployer.tar.gz /home/**

- **CMD vs ENTRYPOINT**

\* Both CMD and ENTRYPOINT are used to define the default execution command of the container (the command which will be executed in the container

as main process).

\* If we use multiple CMD or ENTRYPOINT in the same Dockerfile only the last one will be considered.

\* If we use both CMD and ENTRYPOINT in the same Dockerfile, then ENTRYPOINT gets the highest priority and the command defined using CMD will be

as parameters to ENTRYPOINT.

**Difference**

- CMD can be completely overridden at the runtime (with docker run at the end

we can provide the command to override the CMD).

- ENTRYPOINT can't be overridden at the runtime but the command passed at the runtime will become parameters to ENTRYPOINT command defined in Dockerfile.

Syntax: we can define command in 2 ways

1. shell format

**CMD "ls -lrt"**

2. EXEC format

Always first element is command.

Except first element all the other elements are parameters

to command.

**CMD ["ls","-lrt"]**

**Overriding ENTRYPOINT :**

**docker run -it --name my-con --entrypoint echo my-image:latest daya**

**ENV**

* This instruction is used to set the environment variable inside the container.
* Using this instruction we can create ENV variables at build time which means in the docker images
* ENV variables should be in capital letters
  + - * EVN TEST test\_value or
      * ENV TEST=test\_value1

**ENV F\_NAME="daya"**

**ENV L\_NAME="shankar"**

**1. For individual variable**

**ENV <variable\_name> <value>**

**(OR)**

**ENV <variable\_name>=<value>**

**2. For multiple variable**

**ENV <variable\_name1>=<value1> <variable\_name2>=<value2> .....**

**ENV F\_NAME="daya" L\_NAME="shankar" FF\_NAME="mm"**

To create environment variables at run time (means in containers)

1. With the docker run command

**docker run -e <variable\_name>=<value> -e <variable\_name>=<value>**

**docker run -it --name my-con -e demo=value1 -e demo2=value2 my-image:latest**

2. With a list of variables in a file (.env file)

**docker run --env-file <file\_path> ...**

**What to do if we have more than 10 ENV variables?**

We can use .env filve / sometime .config

With a list of variables in a file (.env file)

**docker run --env-file <file\_path> …**

**docker run -it --rm --name my-con --env-file .env my-image:latest**

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**WORKDIR**

This is used to set the working directory for all the instructions that follows it. Such as RUN, CMD, ENTRYPOINT, COPY, ADD .…

**ex: WORKDIR <path\_in\_container>**

**WORKDIR /home/daya/**

**ARG**

Using this instruction we can pass parameters to Dockerfile as user inputs.

**ex: ARG <arg\_variable\_name>=<value>**

Note: <value> acts as default value to the arg\_variable means if user does not set the arg value at build time this value will be used.

To pass the value at build time

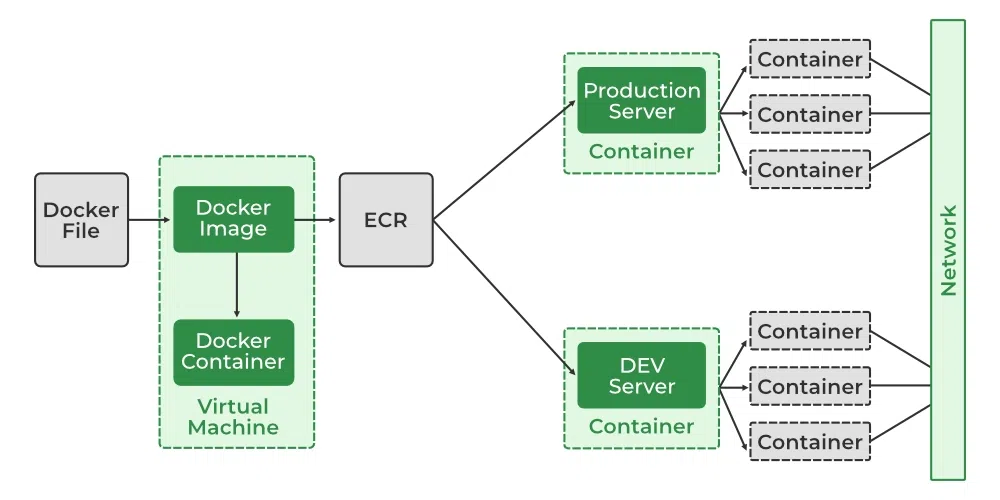
**docker build --build-arg <arg\_variable\_name>=<user\_value>**

**docker build -t myub:latest --build-arg IN=/home .**

**docker build -t myub:latest --build-arg WORK\_DIR=/home –build-arg DIR\_NAME=test\_arg .**

Docker Networks

The Docker network is a virtual network created by Docker to enable communication between Docker containers. If two containers are running on the same host they can communicate with each other without the need for ports to be exposed to the host machine.



### Network Drivers

There are several default network drivers available in Docker and some can be installed with the help of plugins, Command to see the list of containers in Docker mentioned below.

**docker network ls**

**ghost@ghost-pc:~$ docker network ls**

**NETWORK ID NAME DRIVER SCOPE**

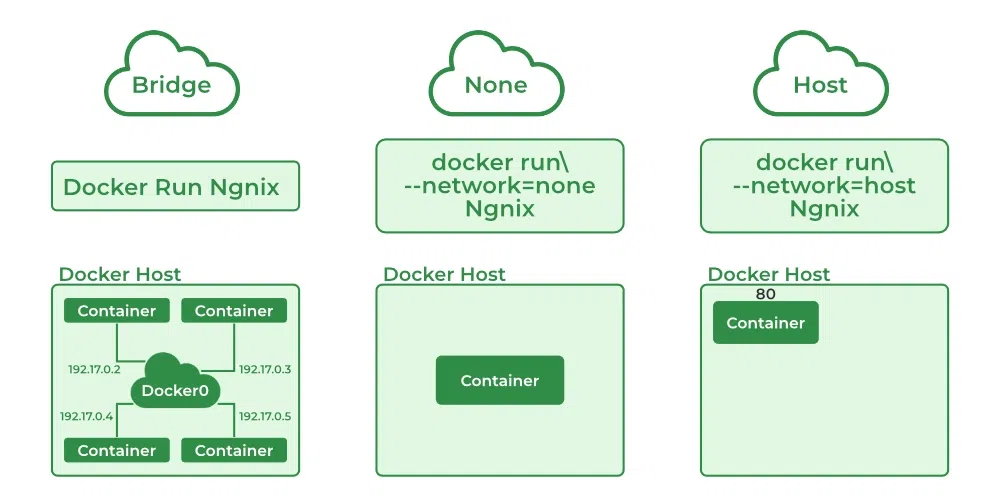
**5f3cdf4f141f bridge bridge local**

**dda80d7a9ee5 host host local**

**56c8c7f89b35 none null local**

### Types of Network Drivers

1. **bridge:** If you build a container without specifying the kind of driver, the container will only be created in the bridge network, which is the default network.
2. **host:** Containers will not have any IP address they will be directly created in the system network which will remove isolation between the docker host and containers.
3. **none:** IP addresses won’t be assigned to containers. These containers are not accessible to us from the outside or from any other container.
4. **overlay:** overlay network will enable the connection between multiple Docker demons and make different Docker swarm services communicate with each other.
5. **ipvlan:** Users have complete control over both IPv4 and IPv6 addressing by using the IPvlan driver.
6. **macvlan:** macvlan driver makes it possible to assign MAC addresses to a container.



### Launch a Container on the Default Network

1. **Understanding the Docker Network Command**

The Docker Network command is the main command that would allow you to create, manage, and configure your Docker Network. Let’s see what the sub-commands can be used with the Docker Network command.

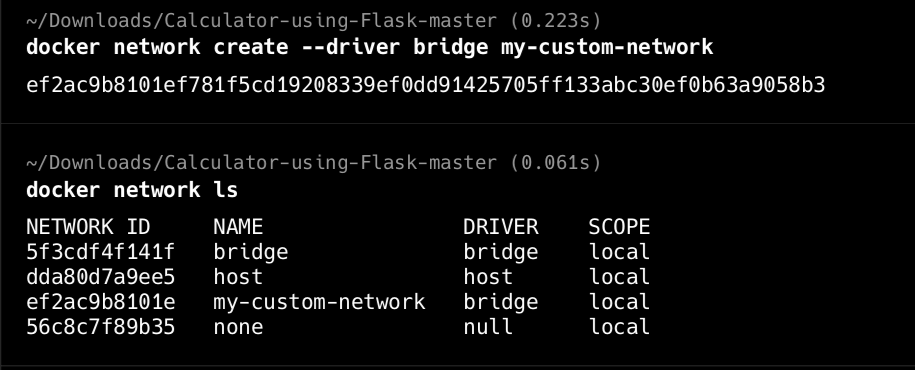
**docker network**

### 2. **Using Docker Network Create command / custom bridge**

With the help of the “Create” command, we can create our own docker network and can deploy our containers in it.

**sudo docker network create --driver <driver-name> <bridge-name>**

**docker network create --driver bridge my-custom-network**



3. **Using the Docker Network Connect command**

Using the “Connect” command, you can connect a running Docker Container to an existing Network.

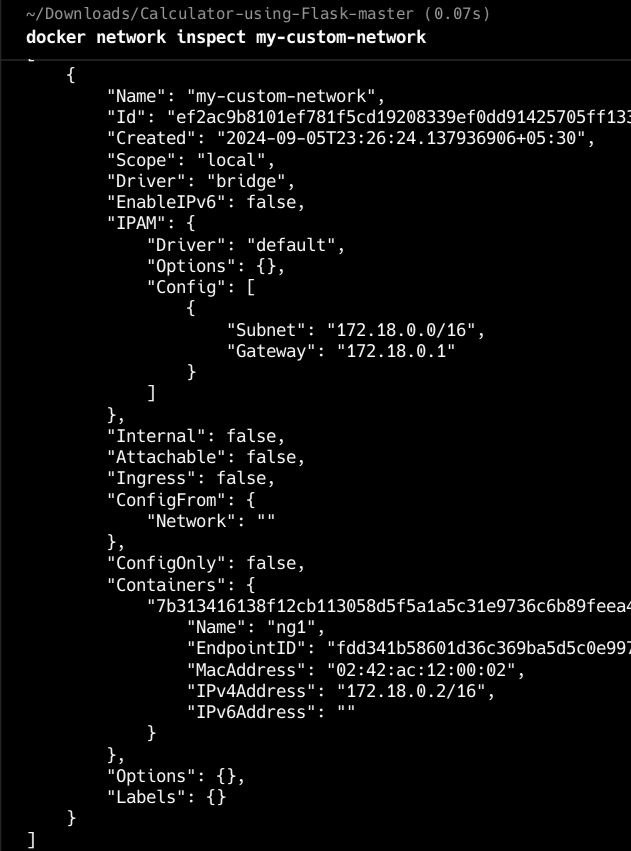
**sudo docker network connect <network-name> <container-name or id>**

**docker network connect my-custom-network ng1**

**4. Using the Docker Network Inspect command**

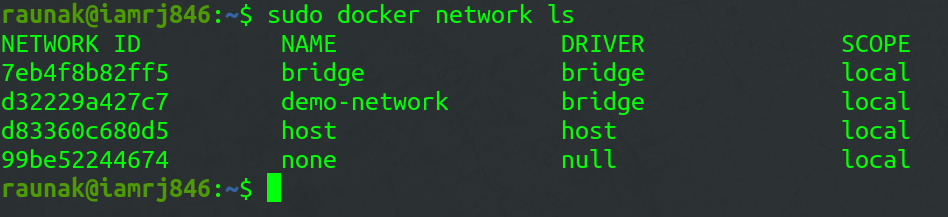
Using the Network Inspect command, you can find out the details of a Docker Network.

**sudo docker network inspect <network-name>**

  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
  
5. **Using the Docker Network ls command**

To list all the Docker Networks, you can use the list command.

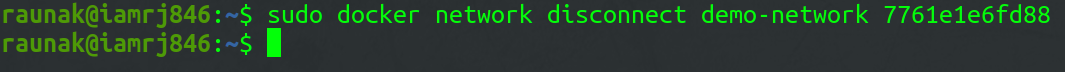
**sudo docker network ls**



6. **Using the Docker Network Disconnect command**

The disconnect command can be used to remove a Container from the Network.

**sudo docker network disconnect <network-name> <container-name>**

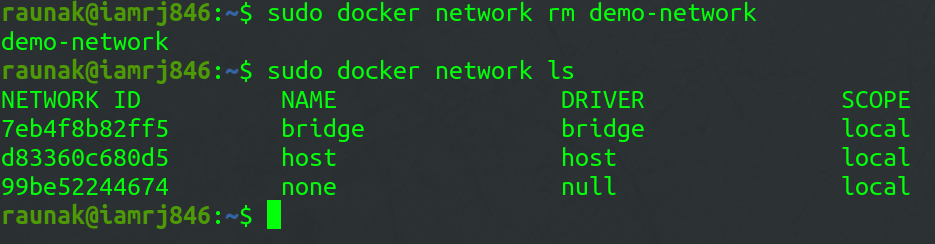


7. **Using the Docker Network rm command**

You can remove a Docker Network using the rm command.

**sudo docker network rm <network-name>**

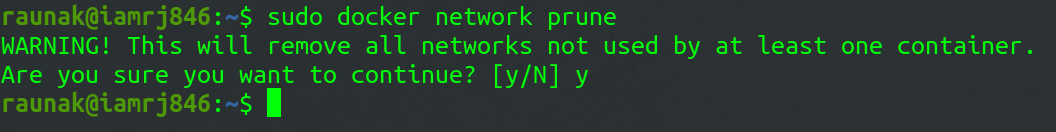
Note that if you want to remove a network, you need to make sure that no container is currently referencing the network.



8. **Using the Docker Network prune command**

To remove all the unused Docker Networks, you can use the prune command.

**sudo docker network prune**

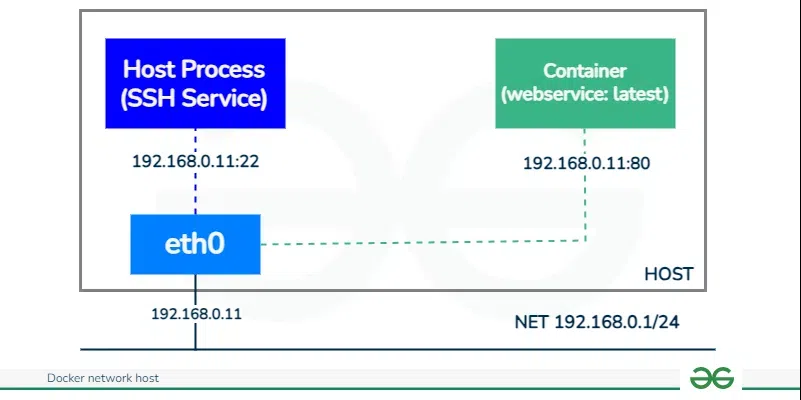


### Common Operations

1. **docker network inspects:**  We may examine the configuration information of a specific network, such as the name of the network, the containers that have linked to this network, the type of driver used to construct this network, and other characteristics, by using the “docker network inspect” command.
2. **docker network ls:** We can see all of the networks that are available on the current host by using “docker network ls”.
3. **docker network creates:** Using the command “docker network create” and the name of the driver, such as bridge, overlay, or macvlan, we can establish a new network.
4. **docker network connects:** In order to use this command, we must first confirm that the appropriate network has already been formed on the host. Then, using docker “network connect”, we may attach the container to the necessary network.

### What is Docker Network Host?

A container which shares its network namespace with the Docker host machine runs in the Docker network host, also known as Docker host networking. In this option, the container utilizes the network interfaces, IP addresses, and ports of the Docker host directly rather than having its own isolated network stack. Due to this, the container acts as if it were running directly on the host computer, facilitating easy access to host resources and services without the need for network address translation (NAT) or port mapping. Applications that need to interact closely with services running on the Docker host or require high-performance networking usually utilize this networking alternative.

  
  
  
  
  
  
  
  
  
  
  
  
  
  
**Host network driver**

Below is an example Docker command to run a container in host networking mode:

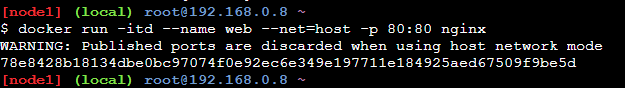
**docker run -itd --name <ContainerName> --network=host -p <HostPort>:<ContainerPort> <image-name>**

**docker run:** A Docker container is run in this command.

**--network host**: By selecting this option, the container will not create its own different network namespace; instead, it’s going to use the host’s network stack.

**-p: HostPort** is the port on the host machine to which you want to map the container’s port. **ContainerPort** the port inside the container that you want to expose.

**nginx:** Its Docker image containing your web server application is known as this.

  
  
**What are the Use Cases of Docker Network Host?**

Why would you use Docker host networking mode? A Docker network host can provide performance improvements and better performance over other Docker network options, e.g., “none” and “bridge” options. Additionally, Docker host networking does not require network address translation (NAT), making it easy to use multiple ports at the same time. However, users working in Docker host networking mode should be careful to avoid port conflicts.

**- Simplified Networking:** It allows Docker containers to directly use the network settings of the Docker host, without any network isolation. This makes networking configuration simpler and more transparent.

**- Performance Optimization:** Containers running in host network mode can achieve better network performance because they bypass the additional overhead of Docker’s network virtualization.

**- Access to Host Services:** Containers can easily access services running on the Docker host without needing to publish or expose ports explicitly. This simplifies communication between containers and host services.

## Docker Network Host vs Bridge

| **Feature** | **Host Network** | **Bridge Network** |
| --- | --- | --- |
| Network Namespace | Shares network namespace with Docker host | Each container has its own network namespace |
| IP Addressing | Uses host’s IP address(es) | Containers have unique IP addresses within bridge network |
| Network Performance | Higher, as there’s no overhead from NAT or routing through a bridge | Slightly lower due to NAT and routing through bridge |
| Port Conflicts | Possible if multiple containers bind to the same port | Avoided, each container has its own isolated network stack |
| Use Cases | Applications requiring high network performance, or need direct access to host’s network interfaces | Most common choice for running multiple containers on a single host, offers network isolation and avoids port conflicts |
| Default | Not the default, must be explicitly specified | Default network mode in Docker |

### Docker Network Host – FAQs

**How does host networking impact container isolation?**

Host networking mode reduces the network separation between the container and the host. Unlike a bridge network, where containers have their own network, containers using a host network share the same network namespace as the host. This may mean safety and may not be suitable for sites that require strict separation between containers.

**Can multiple containers use host networking simultaneously?**

No, any container host using host networking mode has direct access to the network stack, and port conflicts can occur if multiple containers try to bind to the same port on the host Host networking ensures no port conflicts does not exist when running containers Let’s do it.

**Are there any specific security considerations when using host networking mode?**

Using host networking mode can expose packing containers to security risks, on the grounds that they proportion the internet namespace with the host.

It’s vital to ensure that a containerized utility is secure, observe high-quality practices for box protection, and pay near attention to whether or not host networking is necessary on your use case.

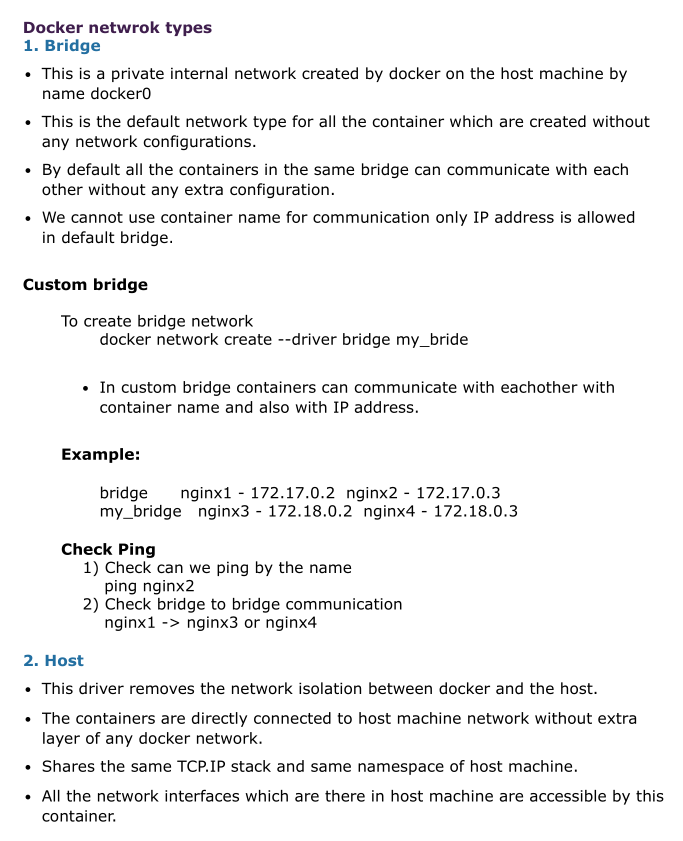
**Can I use Docker Compose with host networking?**

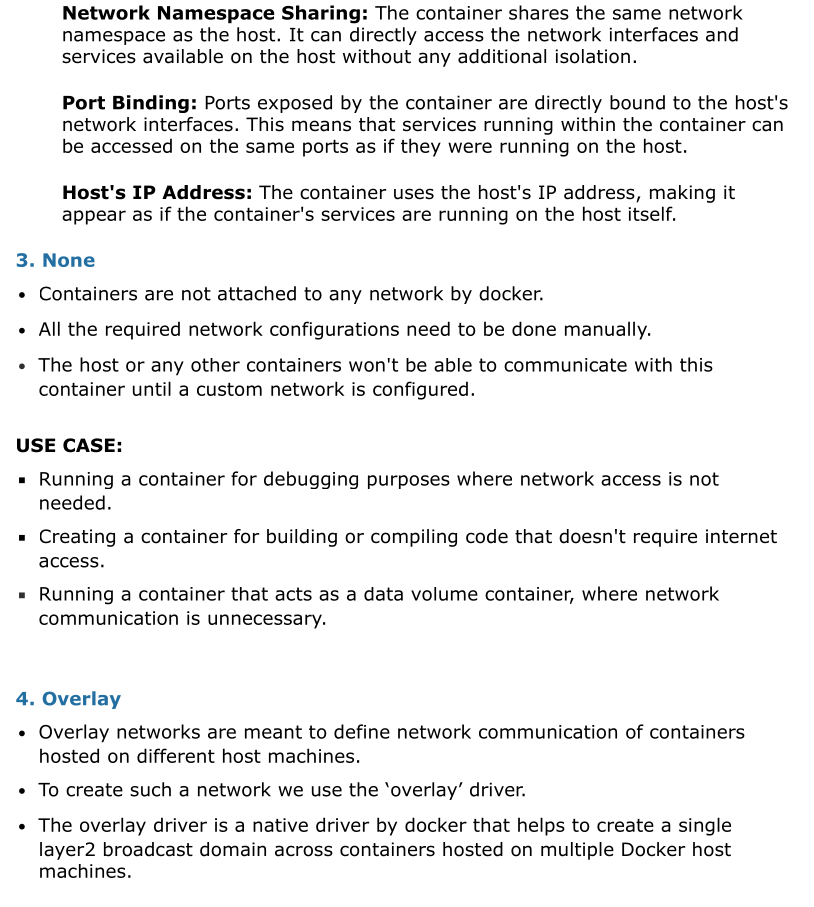
Docker Compose does not directly support the –network host option. If you want to use the host network with Docker Compose, you can configure the services to use the host network in the docker-compose.yml file.

However, keep in mind that not all features of Docker Compose can work well with host networking, and experimentation is recommended.

**What is the host network IP address of Docker container?**

The host network IP address of a Docker container is the same as the IP address of the Docker host itself, as the container shares the network namespace with the host. It uses the host’s network stack directly.





**How to have communication b/w containers which are in 2 different bridge network. How to**

**create image from a container ? What is docker save, load, export and import ?**