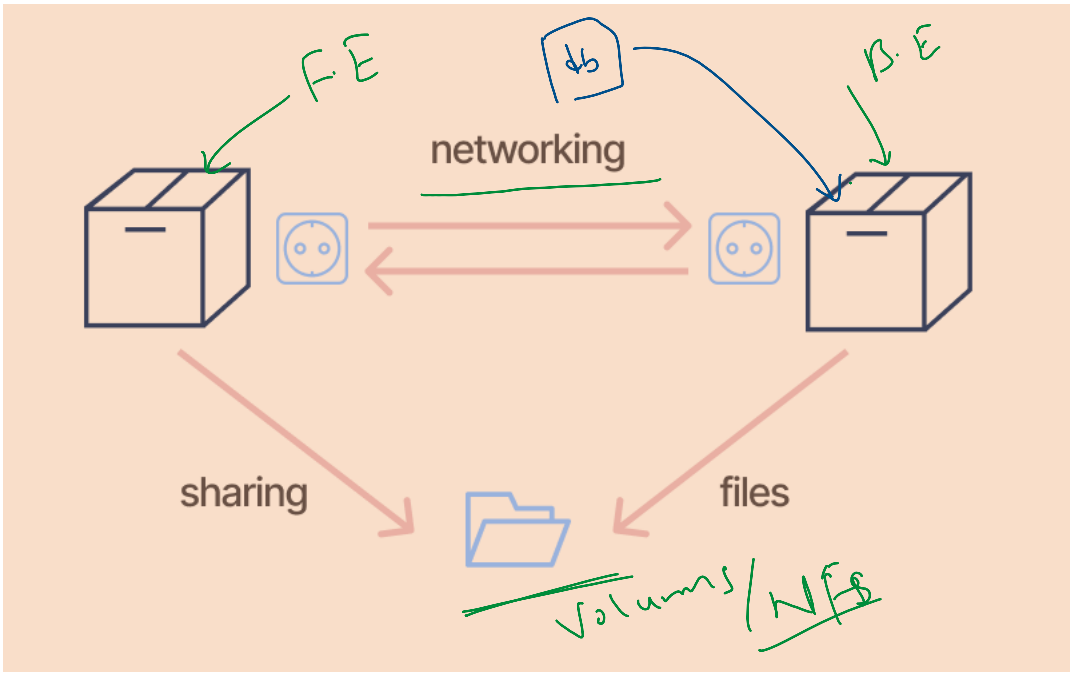
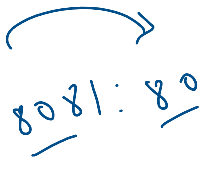
Docker Network

08:53 AM

How do containers communicate?

First, a quick overview! Although containers have a level of isolation from the environment around them, they often need to communicate with each other, and the outside world.





Networking or file sharing?

Two containers can talk to each other in one of two ways, usually:

- **Communicating through networking:** Containers are designed to be isolated. But they can send and receive requests to other applications, using networking.
  For example: a web server container might expose a port, so that it can receive requests on port 80. Or an application container might make a connection to a database container.
- **Sharing files on disk:** Some applications communicate by reading and writing files. These kinds of applications can communicate by writing their files into a **volume**, which can also be shared with other containers.
  For example: a data processing application might write a file to a shared volume which contains customer data, which is then read by another application. Or, two identical containers might even share the same files.

File sharing is great, but…. for this article, we'll look at applications that use networking as the primary way they either expose or consume services.

We'll talk about how to set up a network, which allows Docker containers on the same host to communicate with other.

Let's look at how you can use networking to connect containers together!

Communication between containers with networking

Most container-based applications talk to each other using networking. This basically means that an application running in one container will create a network connection to a port on another container.

For example, an application might call a REST or GraphQL API, or open a connection to a database.

Containers are ideal for applications or processes which expose some sort of network service. The most well-known examples of these kinds of applications are:

- Web servers - e.g. Nginx, Apache
- Backend applications and APIs - e.g. Node, Python, JBoss, Wildfly, Spring Boot
- Databases and data stores - e.g. MongoDB, PostgreSQL

There are more examples, but these are probably the most common ones!

With Docker, container-to-container communication is usually done using a virtual network.

Building your (Virtual) Network

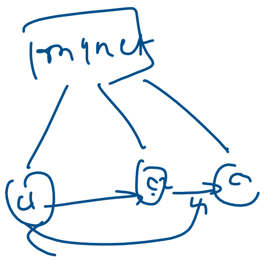
If you are running more than one container, you can let your containers communicate with each other by attaching them to the same **network**.

A Docker network lets your containers communicate with each other

Docker creates virtual networks which let your containers talk to each other. In a network, a container has an IP address, and optionally a hostname.

You can create different types of networks depending on what you would like to do. We'll cover the easiest options:

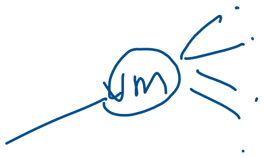
- The **default bridge network**, which allows simple container-to-container communication by IP address, and is created by default.
- A **user-defined bridge network**, which you create yourself, and allows your containers to communicate with each other, by using their container name as a hostname.



Default bridge network (easiest option)

The simplest network in Docker is the **bridge network**. It's also Docker's default networking driver.

A bridge network allows containers to communicate with each other
Source:



A bridge network gives you simple communication between containers **on the same host.**

When Docker starts up, it will create a default network called… bridge. 🤔 It should start automatically, without any configuration required by you.

From that point onwards, all containers are added into to the bridge network, unless you say otherwise.

In a bridge network, each container is assigned its own IP address. So containers can communicate with each other by IP.

So let's see an example of using the default bridge network.

How to use the default bridge network

Here's how to use the bridge network to get two Docker containers on the same host to talk to each other:

1. **Check that the bridge network is running:** You can check it's running by typing docker network ls. This should show the bridge network in the list.

```
$ docker network ls
NETWORK ID     NAME     DRIVER    SCOPE
acce5c7fd02b   bridge   bridge    local
a6998b3cf420   host     host      local
d7f563b21fc6   none     null      local
```

2. **Start your containers:** Start your containers as normal, with docker run. When you start each container, Docker will add it to the bridge network.
(If you prefer, you can be explicit about the network connection by adding --net=bridge to the docker run command.)

3. **Address another container by its IP address:** Now one container can talk to another, by using its IP address.
You'l need to know the IP address of the container - check the little box below to find out how.

How do you find out the IP address of a Docker container?

Example

Here's a complete example. I'll start an *nginx* container. Then I'll start a *busybox* container alongside *nginx*, and try to make a request to Nginx with wget:

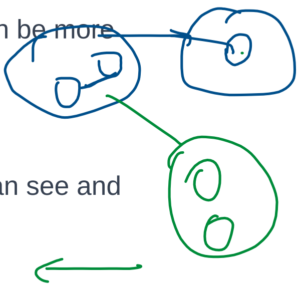
```
# Start an nginx container, give it the name 'mynginx' and run in the background$
docker run --rm--namemynginx --detachnginx
```

```
# Get the IP address of the container$ docker inspect mynginx | grep IPAddress
            "IPAddress": "172.17.0.2",



# Fetch the nginx homepage by using the container's IP addressbusybox$ wget -
q-O- 172.17.0.2:80
<!DOCTYPE html>
<html>
<head><title>Welcome to nginx!</title>
<style>

# Voila! The nginx homepage!
```

How to check if a container is in the bridge network

The default bridge is….. **fine**…. but it means every container can see every other container.

What you probably want is: a **user-defined network**, so that you can be more granular about which containers can see each other.
Let's look at that option.



User-defined bridge: the more sensible option

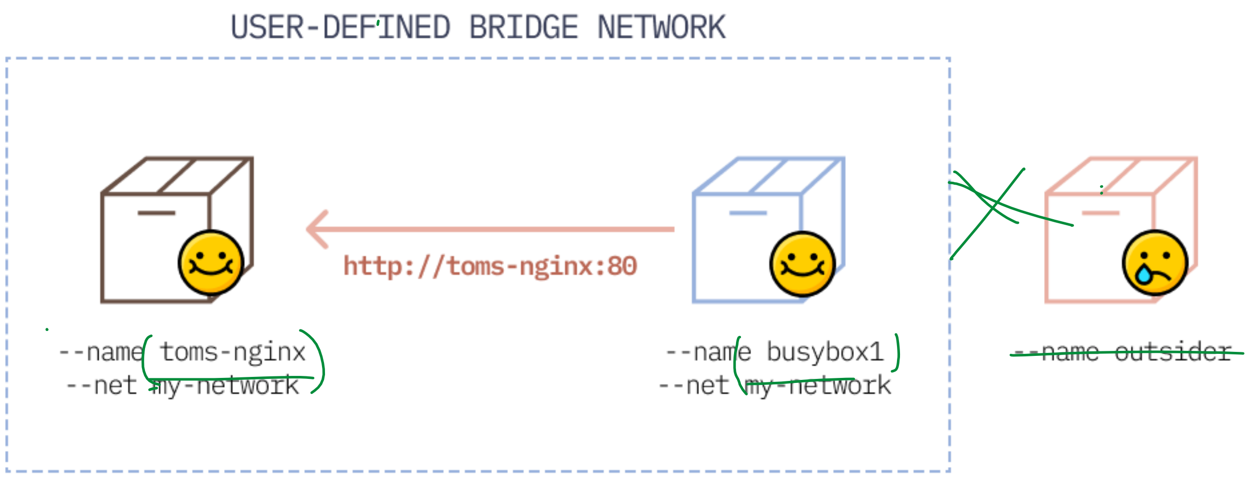
If you only use the default bridge network, then all your containers can see and access other containers' ports. This isn't always what you want!

The second option, the user-defined bridge, lets you have a bit more control.

Get more control, with a user-defined bridge

To let Docker containers communicate with each other by name, you can create a **user-defined bridge network**. I
n a user-defined bridge network, you can be more explicit about who joins the network, and you get an added bonus:

…containers can be addressed by their *name* or *alias*.



In a user-defined bridge network, you control which containers are in the network, and they can address each other by hostname

1. **Create a user-defined bridge network:** Create your own custom bridge network first using docker network create. Under the hood, Docker sets up the relevant networking tables on your operating system.
   For example, I'm going to create a network called tulip-net for applications about tulips. 🌷

docker network create tulip-net

2. **Start a ~~container and connect it to the bridge:~~** Start your container as normal. Add it to your user-defined bridge network using the --net option, e.g. --net tulip-net.
   docker run --rm --net tulip-net --name tulipnginx -d nginx

3.
4. **Address another container, using its name as the hostname:** When two containers are joined to the same user-defined bridge network, one container is able to address another by using its name (as the hostname).
   # Start a busybox container so that we can test out the network$ docker run --nettulip-net -itbusybox sh

   *# Use 'wget' inside busybox, using the container name as the hostname!*busybox$ wget -q-O- tulipnginx:80
   <!DOCTYPE html>
   <html>
   <head><title>Welcome to nginx!</title>
   ...you get the picture....

Can you connect an existing container to a network?

And that's user-defined bridge networking. It's a great way to have a custom network set up, and isolation from other containers that aren't in the network.

TL;DR

Too long, didn't read? Here's the gist:

- **For containers to communicate with other, they need to be part of the same "network".**
- Docker creates a virtual network called bridge by default, and connects your containers to it.
- In the network, containers are assigned an IP address, which they can use to address each other.
- If you want more control (and you definitely do), you can create a user-defined bridge, which will give you the added benefit of hostnames for your containers too.