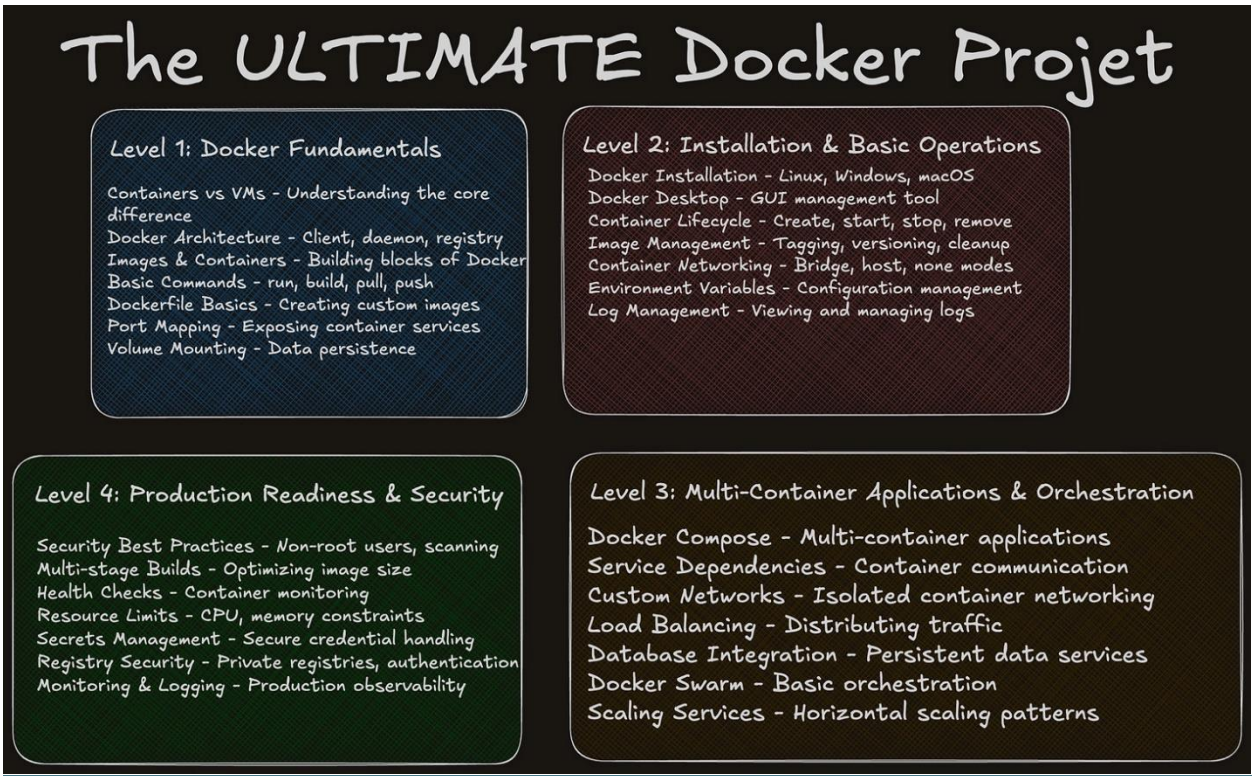


Part Two Covers:

Level 2: Installation and Basic Operations

Part Two Covers:

Level 3: Multi Container Applications & Orchestration

Part Three Covers:

Level 4: Production Readiness & Security + **The Ultimate Docker Project**

Level Two

Installation

We first need to install Docker. I'm going to be doing on this on MacOS, it will almost identical to Linux process. If you're using Windows you install WSL, i've written a guide **Here** 🔗

Step 1: Install Homebrew (if not already installed)

```
/bin/bash -c "$(curl -fsSL
https://raw.githubusercontent.com/Homebrew/install/HEAD/install.sh)"
```

Step 2: Install Docker

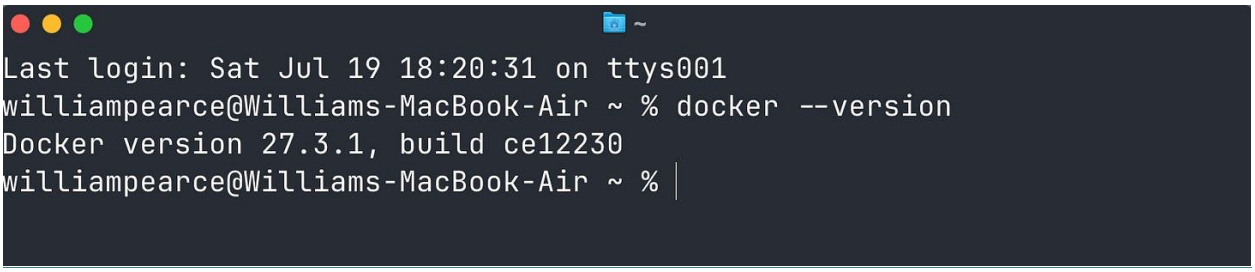
```
brew install --cask docker
```

Step 3: Start Docker Desktop

```
open /Applications/Docker.app
```

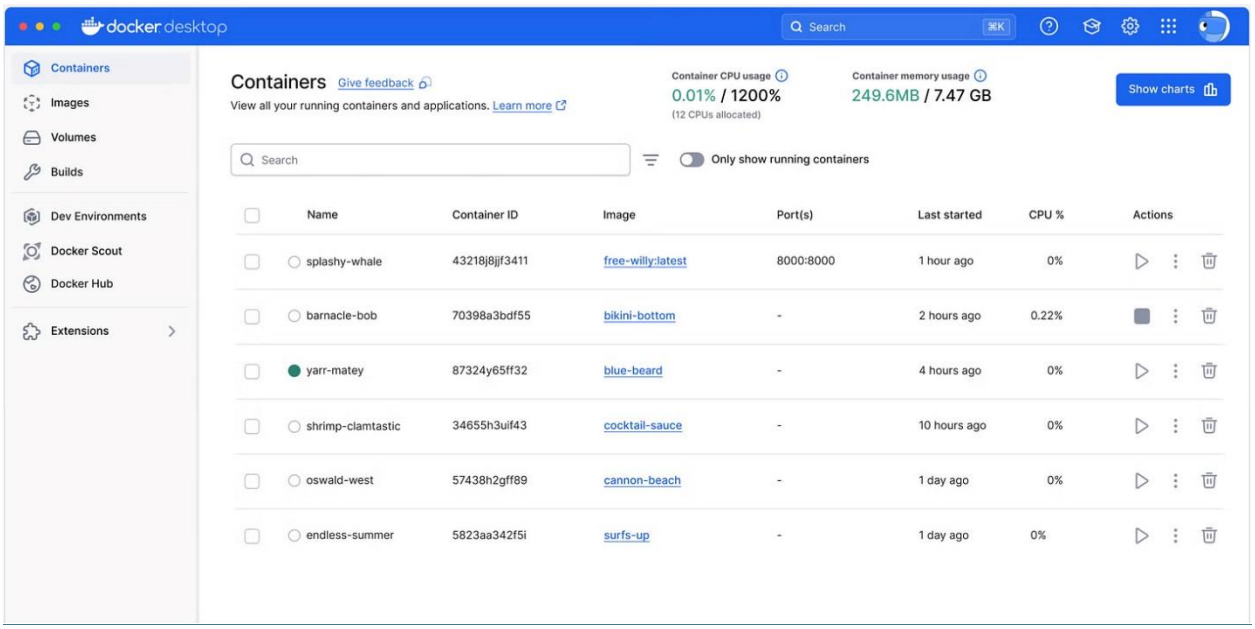
Wait for Docker to finish starting (the whale icon in your status bar should stop animating).

Double check it's installed with



Docker Desktop

Here is a link to the steps to install Docker Desktop for macOS, Linux, and Window which I also recommend you use when getting started, you can view your Containers, Images, Volumes etc



Basic Operations

Images (Templates for containers):

```
docker pull <image>          # Download an image from Docker Hub
docker images               # List all downloaded images
docker rmi <image>          # Remove an image
docker build -t <name> .    # Build image from Dockerfile in current directory
```

Containers (Running instances):

```
docker run <image>                  # Create and start a container
docker run -it <image>              # Run interactively with terminal
docker run -d <image>               # Run in background (detached)
docker run -p 8080:80 <image>       # Map host port 8080 to container port 80
docker run --name <name> <image>    # Give container a custom name

docker ps                  # List running containers
docker ps -a               # List all containers (including stopped)
docker stop <container>    # Stop a running container
docker start <container>   # Start a stopped container
docker restart <container> # Restart a container
docker rm <container>      # Remove a stopped container
```

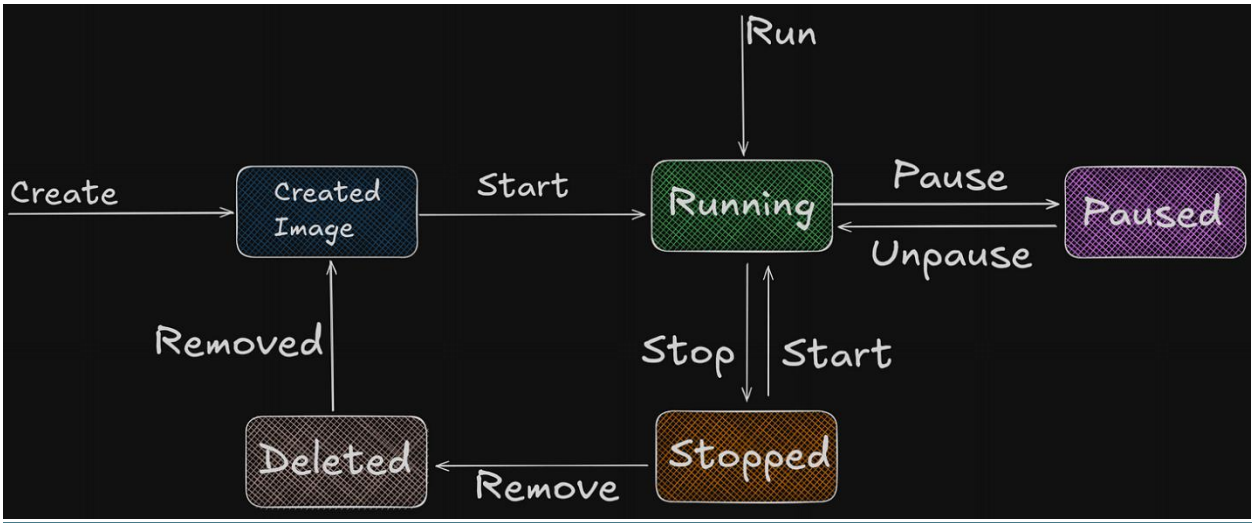
Container interaction:

```
docker exec -it <container> bash     # Open bash shell in running container
docker logs <container>             # View container logs
docker cp <file> <container>:/path  # Copy file to container
```

With Docker installed and a list of basic commands we need to get started let's take a look at we refer to as the "Container Lifecycle"

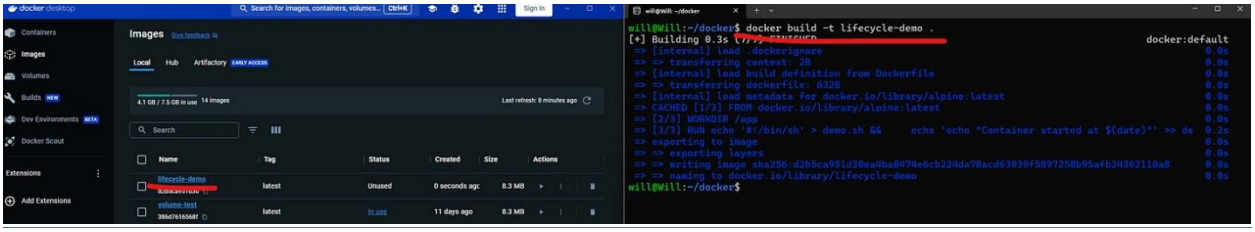
Container Lifecycle

The Journey of a Container can be broken down into six key part

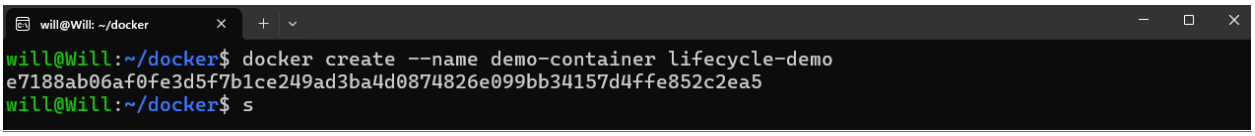


Follow along here if you like:

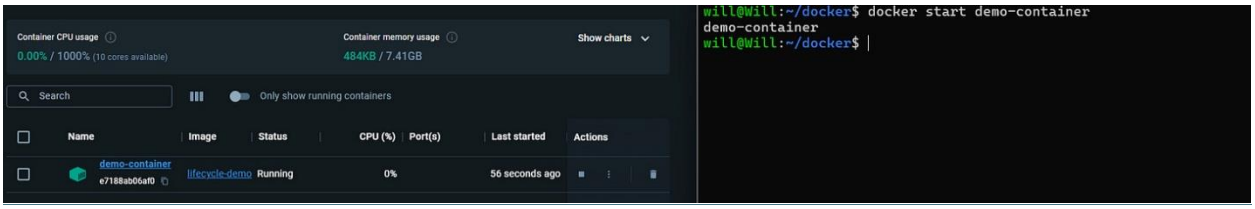
1. **Image**: The blueprint



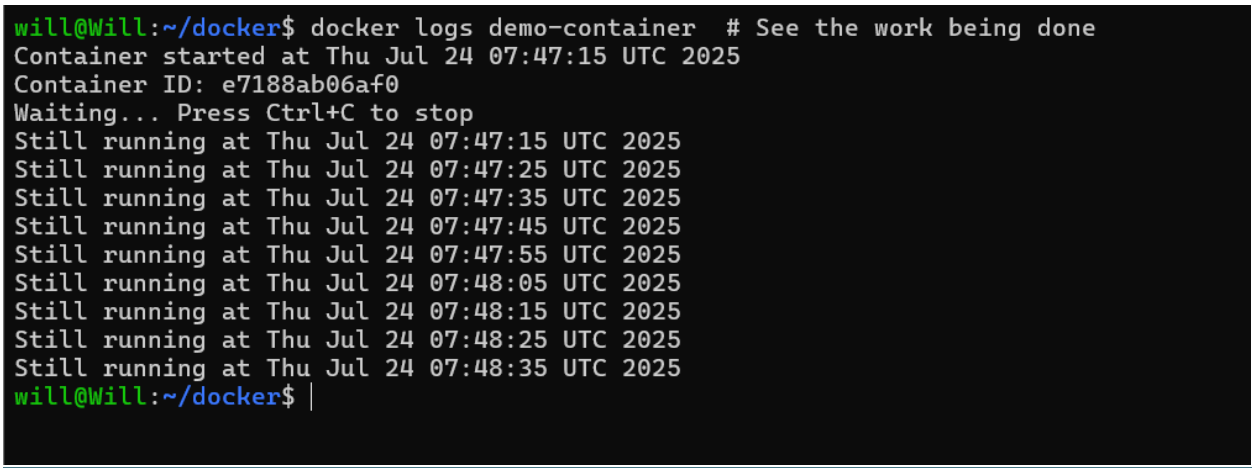
2. **Create**: Docker makes a container from the image



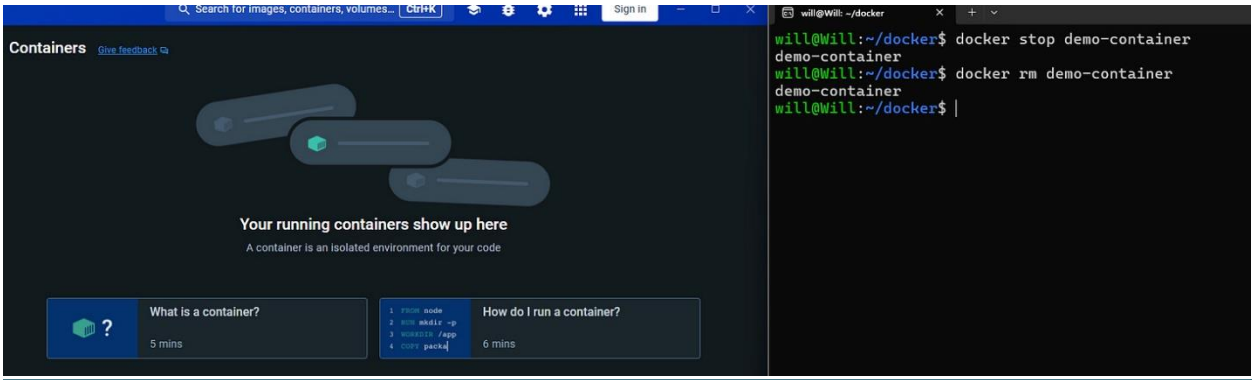
3. **Start**: Container begins running



4. **Running**: Container is actively doing work



5. **Stop:** Container pauses but data remains
6. **Remove**: Container is deleted permanently



Think of it like this:

- **Image** = Recipe
- **Container** = Cake made from recipe
- **Running** = People eating the cake
- **Stopped** = Cake sitting on counter
- **Removed** = Cake thrown away

Important: When you remove a container, any data inside it is lost unless you use volumes to save it, check part one here for more on volumes

Most beginners just use docker run (which creates and starts) then docker stop and docker rm when done.

Image Management

When you start using Docker it's pretty simple to manage what containers you have locally but in an organisation (or even a large homelab) things can get messy pretty quickly. That's why proper image management is essential. This is done through:

Tagging

```
docker tag myapp:latest myapp:v1.2.3        # Create version tag
docker tag myapp:latest myregistry.com/myapp # Tag for registry
docker build -t myapp:production .          # Tag during build
```

Tags help you identify different versions and environments (dev, staging, prod).

See how it looks like its created a new image, you're not creating a new image; you're pointing a new tag (v1.2.3) to the same underlying image as latest.

```
will@Will:~/docker$ docker tag substack-image:latest myapp:v1.2.3
will@Will:~/docker$ docker image ls
REPOSITORY                    TAG       IMAGE ID       CREATED          SIZE
myapp                         v1.2.3    3a78443545b4   24 seconds ago   8.31MB
substack-image                latest    3a78443545b4   24 seconds ago   8.31MB
```

Versioning

```
docker pull nginx:1.21          # Specific version
docker pull nginx:latest        # Latest version (default)
docker pull nginx:alpine        # Variant (smaller, Alpine-based)
```

Much the same as tags but when pulling images, always use specific versions in production instead of latest to avoid surprises. Maybe a specific versions is known to have vulnerabilities

Docker Registry:

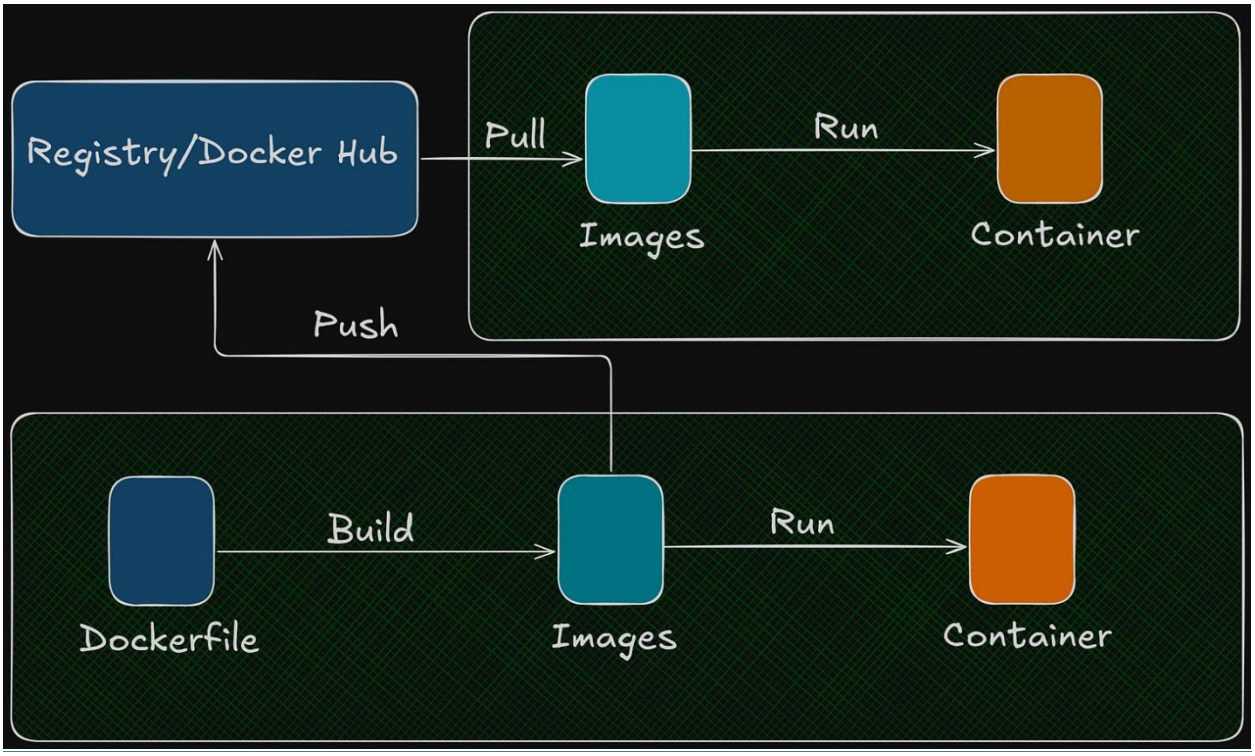
We haven't really spoken about registries, I did think about including it in part one but wanted to lay the groundwork first.

```
docker push myregistry.com/myapp:v1.2.3     # Upload to registry
docker pull myregistry.com/myapp:v1.2.3     # Download from registry
```

Once you've built your Docker image, you'll likely want to store it somewhere safe and accessible, that's where Docker registries come in.

Think of a registry like a cloud based library for your images. Docker Hub is the most common one, but platforms like GitHub Container Registry or AWS ECR are also popular. You can "push" your image to the registry using simple commands, then "pull" it back down on any machine or server.

This makes it easy to share your work, deploy to production, or just back things up. It's also how teams collaborate, tagging versions like v1.0.0 helps everyone stay on the same page.



Cleanup:

```
docker system prune        # Remove unused containers, networks, images
docker container prune     # Remove all stopped containers
docker image prune         # Remove unused images
docker image prune -a      # Remove ALL unused images (not just dangling)
```

Container Networking

Let's keep this simple, like anything with networking the complexity comes as scale but the fundamentals remain the same.

Right, container networking basics. Here are the key fundamentals for beginners.

Things you should know:

- Containers automatically join Docker's default bridge network
- They get internal IP addresses (like 172.17.0.2)
- Containers can talk to each other using these IPs

- -p host_port:container_port exposes container services
- Example: -p 8080:80 maps host port 8080 to container port 80

Container Name Resolution

- Containers can find each other by name on custom networks
- docker network create mynetwork creates isolated networks
- --network mynetwork connects containers to it

Key Commands

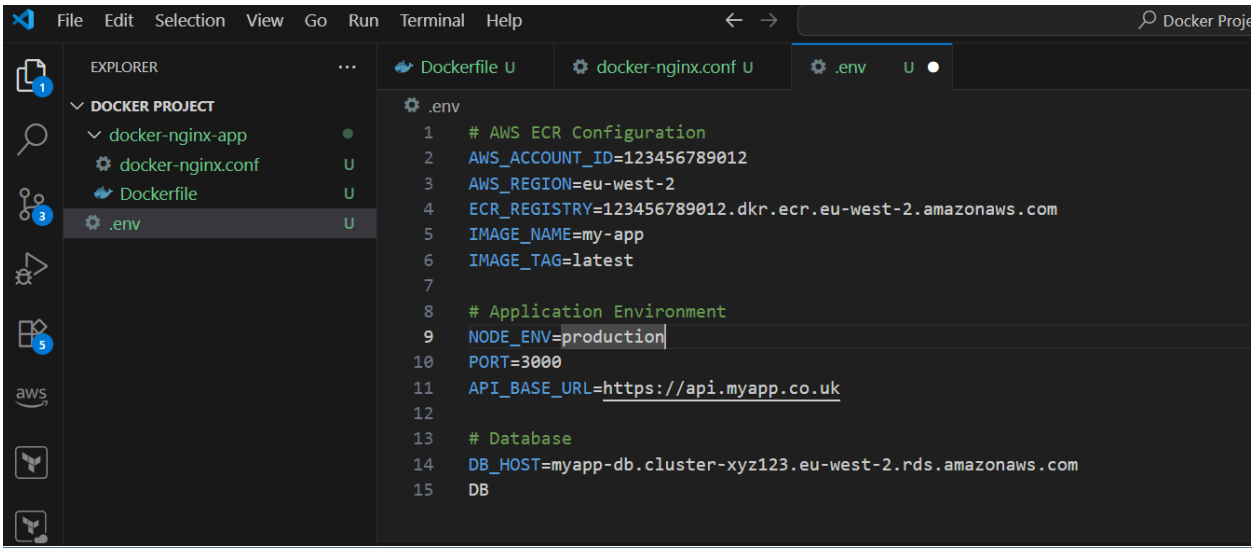
- docker network ls - list networks
- docker network inspect bridge - see network details
- docker port container_name - check port mappings

The main point: containers are isolated by default but can communicate through networks and port mapping.

I'm going to dive deeper into this in the final project part 😉

Environment Variables

Environment variables let you pass bits of configuration into your Docker containers without hardcoding them into your app.



Think things like API keys, database passwords, or different settings for dev and production. Instead of baking these values into your image, you can supply them when you run the container using the -e flag (-e PORT=3000). This keeps your images cleaner, more secure, and easier to reuse.

You can also load lots of variables at once from a .env file, this is way more common that passing them in at run time

DON'T PUSH THIS FILE TO GITHUB

Or do, it keeps me in the job 😉

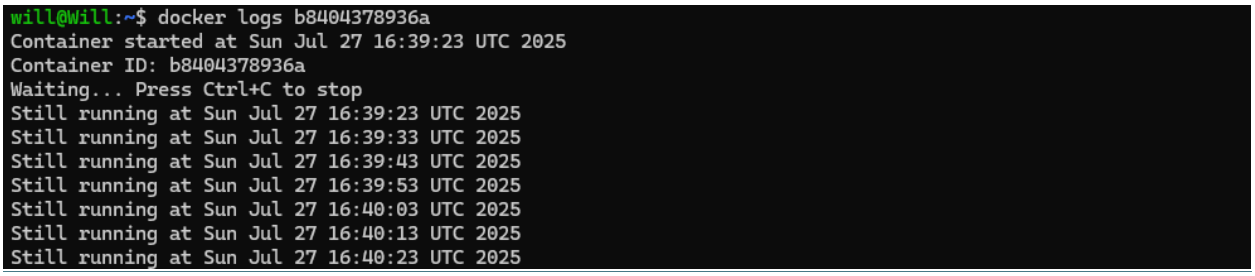
Log Management

Container log management in Docker is straightforward once you understand the basics.

Docker automatically captures anything your application writes to stdout or stderr and stores it using the json-file driver by default. You can view these logs using

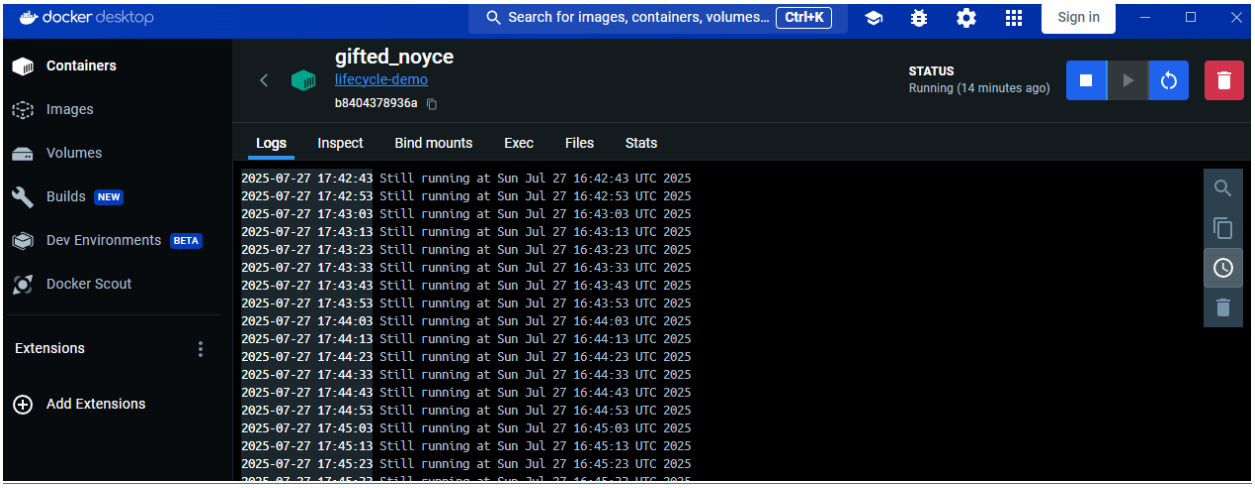
```
docker logs container_id
```

add -f to follow them in real-time, or use options like --tail 50 to see just the last 50 lines.



The key thing you need to know is that Docker handles log collection automatically, but without proper configuration, these logs will grow indefinitely and fill up your disk.

Neat trick, you can also view them in Docker Desktop



You can prevent this by setting log rotation limits with --log-opt max-size=10m --log-opt max-file=3 when running containers, which keeps only the last 3 files of 10MB each.

The golden rule is simple: make sure your applications log to stdout/stderr rather than writing to files inside the container, and Docker will take care of collecting and managing those logs for you.

Are you enjoying these broken-down ***"Ultimate Projects"*** or do you prefer short and to the point tutorials? I'm trying to find the right balance at the moment. Let me know what you think - we're going to continue in part three and wrap it up with a project in part four.