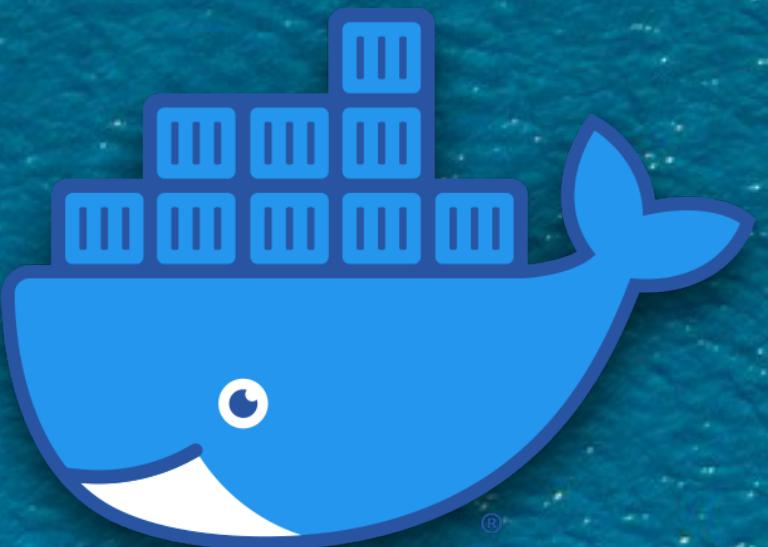




# Docker Basics

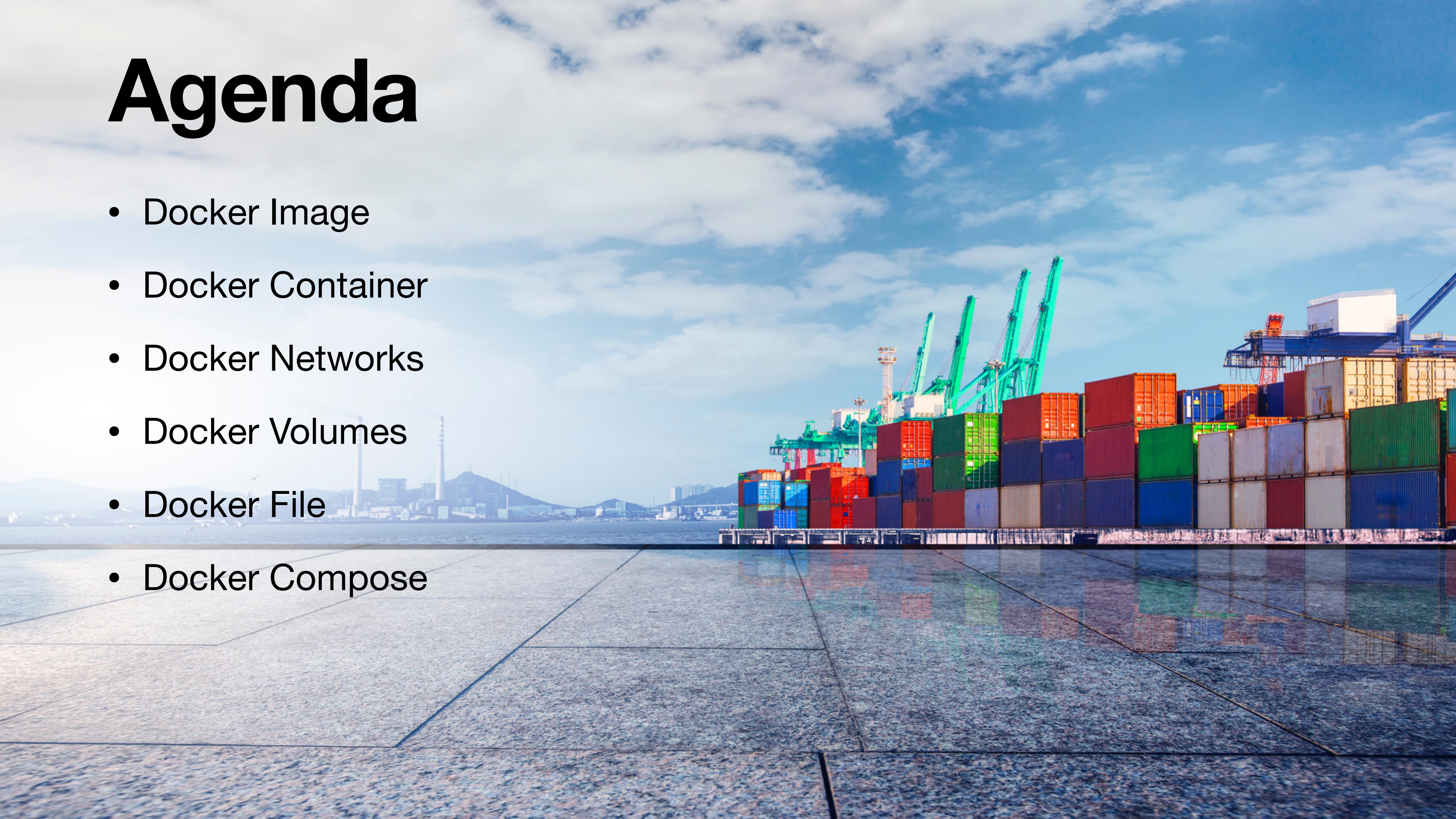
IO TECHSOFT Ltd., Part

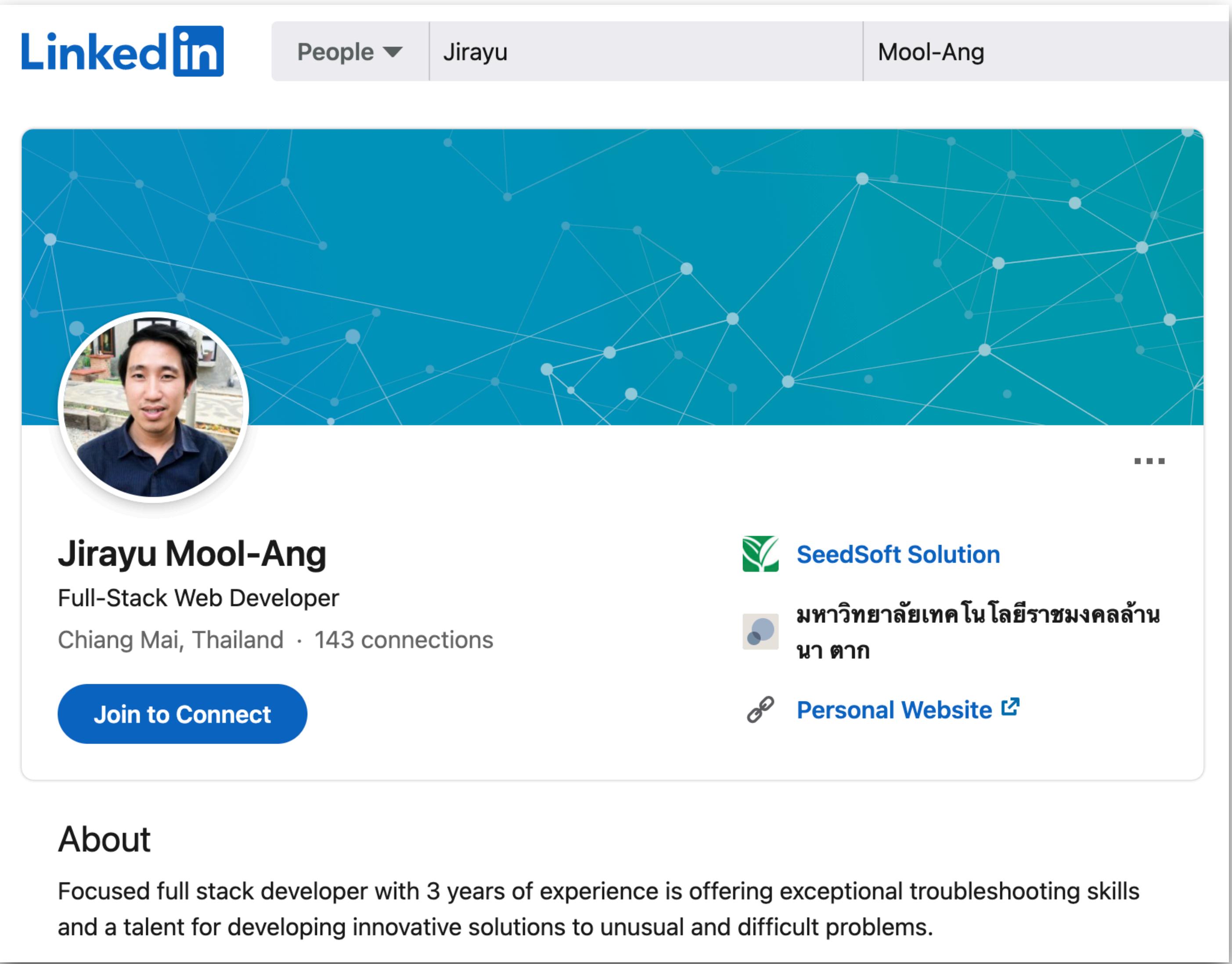
Jirayu Mool-Ang (PEEPO)



# Agenda

- Docker Image
- Docker Container
- Docker Networks
- Docker Volumes
- Docker File
- Docker Compose





The image shows a LinkedIn profile page for Jirayu Mool-Ang. At the top, the LinkedIn logo is on the left, followed by a navigation bar with 'People ▾' and 'Jirayu' on the left, and 'Mool-Ang' on the right. Below the header is a large, circular profile picture of a man with short dark hair, wearing a dark blue button-down shirt. The background of the profile area features a teal-colored network graph. To the right of the profile picture, the name 'Jirayu Mool-Ang' is displayed in bold black text, followed by the title 'Full-Stack Web Developer'. Below this, it says 'Chiang Mai, Thailand · 143 connections'. A blue 'Join to Connect' button is located at the bottom left of the profile section. On the right side of the profile, there are two listed connections: 'SeedSoft Solution' with a green leaf icon and 'มหาวิทยาลัยเทคโนโลยีราชมงคลล้านนา ตาก' with a blue square icon. Below these connections is a link to 'Personal Website' with a blue link icon.

**Jirayu Mool-Ang**

Full-Stack Web Developer  
Chiang Mai, Thailand · 143 connections

[Join to Connect](#)

**About**

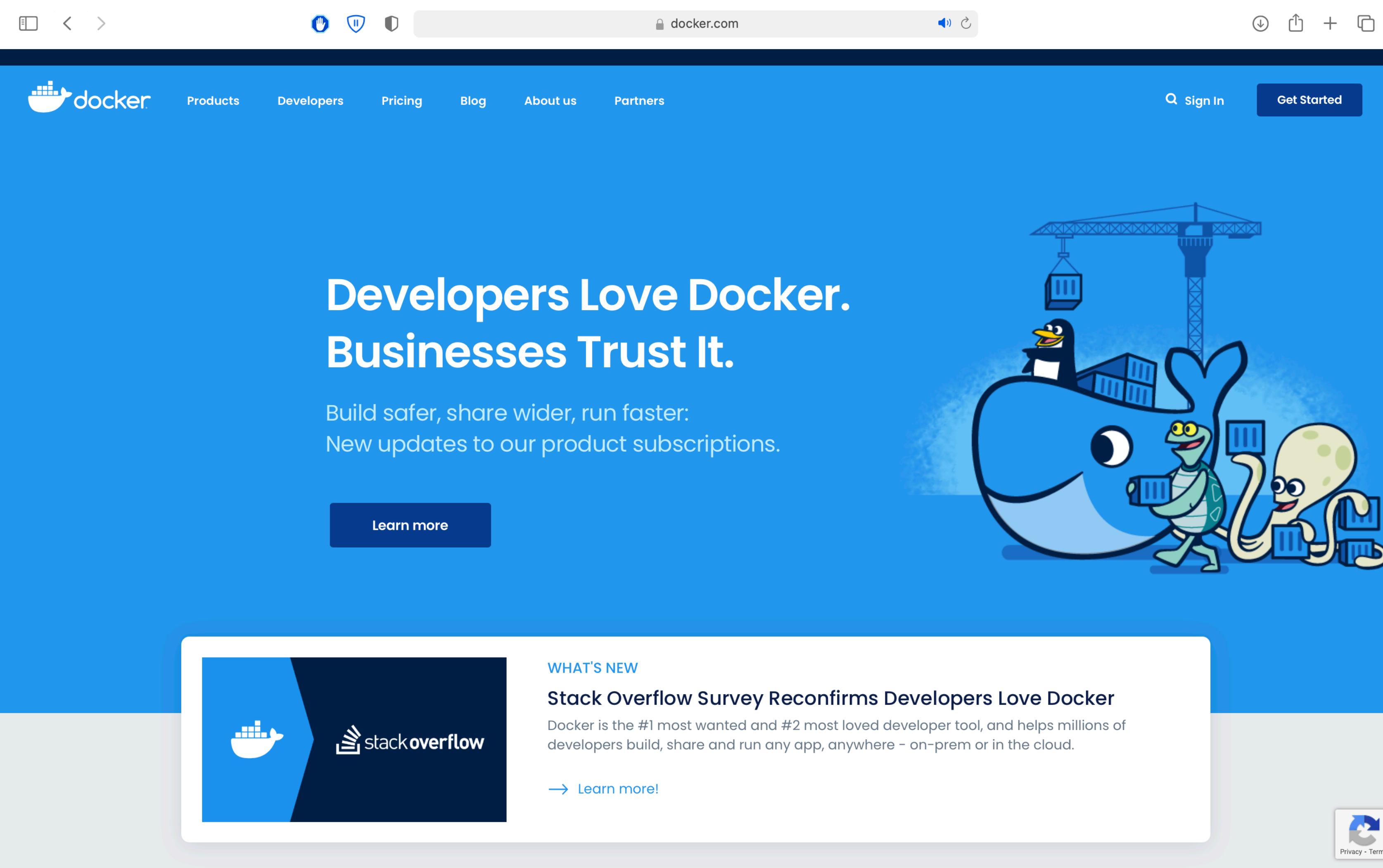
Focused full stack developer with 3 years of experience is offering exceptional troubleshooting skills and a talent for developing innovative solutions to unusual and difficult problems.

**Facebook:** Jirayu Mool-Ang

**Phone Number / Line:** 0875670106

**Email:** jirayu.moolang@iotechsoft.com

**<https://github.com/iots1/course-docker>**



The screenshot shows the Docker website homepage. At the top, there's a navigation bar with links for Products, Developers, Pricing, Blog, About us, Partners, Sign In, and Get Started. The main headline reads "Developers Love Docker. Businesses Trust It." Below it, a sub-headline says "Build safer, share wider, run faster: New updates to our product subscriptions." A "Learn more" button is present. To the right of the text is a colorful cartoon illustration featuring a large blue whale, a black penguin standing on a shipping container, a green frog holding a coffee cup, and a yellow octopus. A construction crane is also visible in the background. On the left side of the main content area, there's a graphic with the Docker logo and the Stack Overflow logo, followed by the text "WHAT'S NEW" and a link to "Stack Overflow Survey Reconfirms Developers Love Docker". A small "Privacy - Terms" link is located in the bottom right corner of the main content area.

docker.com

Products Developers Pricing Blog About us Partners

Sign In Get Started

# Developers Love Docker. Businesses Trust It.

Build safer, share wider, run faster:  
New updates to our product subscriptions.

Learn more

WHAT'S NEW

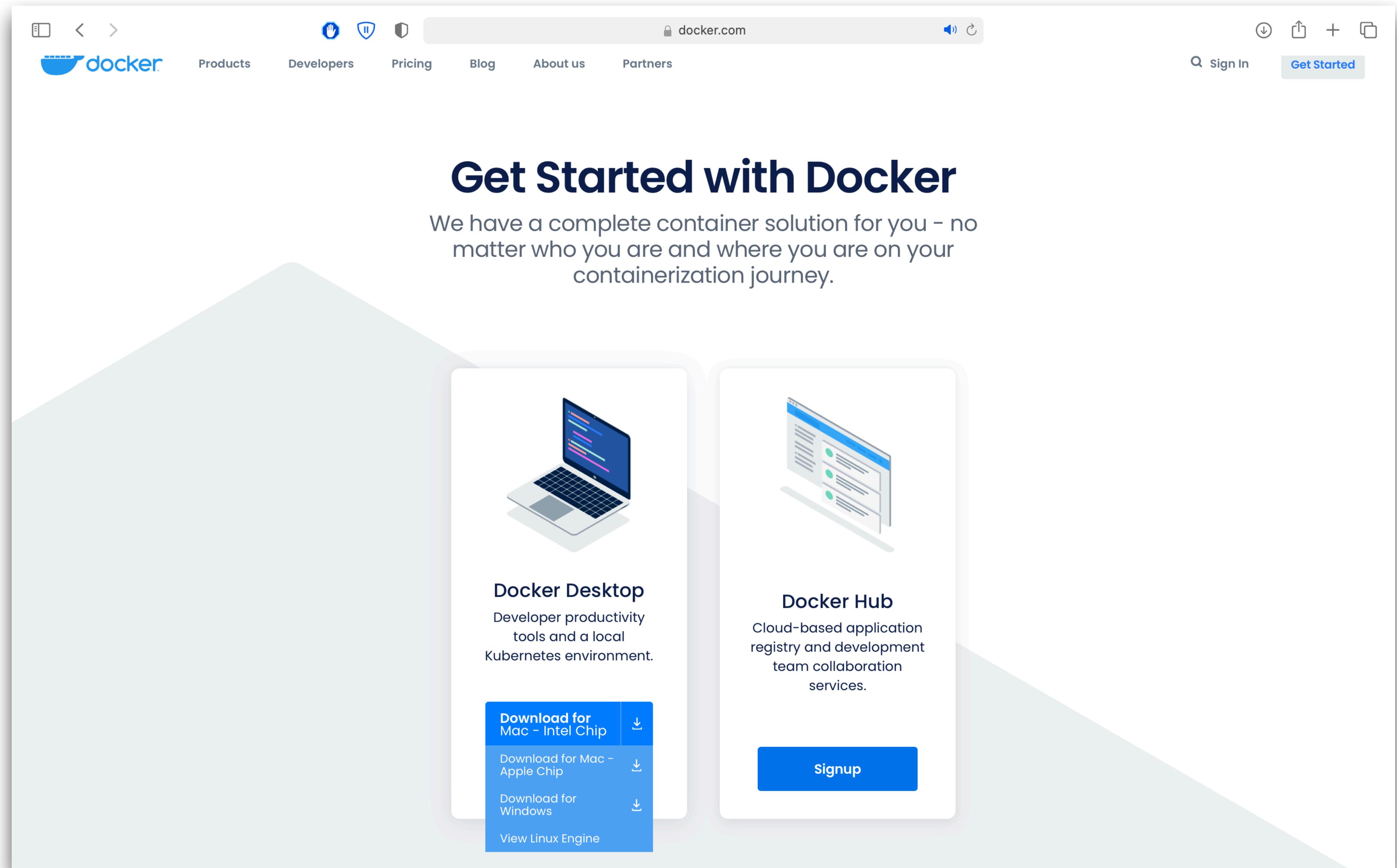
## Stack Overflow Survey Reconfirms Developers Love Docker

Docker is the #1 most wanted and #2 most loved developer tool, and helps millions of developers build, share and run any app, anywhere – on-prem or in the cloud.

→ Learn more!

Privacy - Terms

www.docker.com

A screenshot of a web browser displaying the "Get Started with Docker" page on the official Docker website ([docker.com/get-started](https://www.docker.com/get-started)). The page features a large title "Get Started with Docker" and a subtitle: "We have a complete container solution for you – no matter who you are and where you are on your containerization journey." Below this, there are two main call-to-action sections. The first section, "Docker Desktop", shows an icon of a laptop displaying code, and a description: "Developer productivity tools and a local Kubernetes environment." It includes a "Download for Mac - Intel Chip" button with a dropdown menu for Mac - Apple Chip, Windows, and View Linux Engine. The second section, "Docker Hub", shows an icon of a web interface with a list, and a description: "Cloud-based application registry and development team collaboration services." It features a prominent blue "Signup" button.

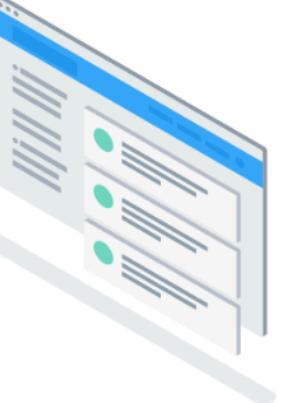
# Get Started with Docker

We have a complete container solution for you – no matter who you are and where you are on your containerization journey.



**Docker Desktop**  
Developer productivity tools and a local Kubernetes environment.

[Download for Mac - Intel Chip](#)   
[Download for Mac - Apple Chip](#)   
[Download for Windows](#)   
[View Linux Engine](#)



**Docker Hub**  
Cloud-based application registry and development team collaboration services.

[Signup](#)

# Developer Roadmap

The screenshot shows the homepage of [roadmap.sh](https://roadmap.sh). At the top, there's a yellow banner with the text "We now have a YouTube Channel. Subscribe for the video content." Below it is a dark header bar with the logo "roadmap.sh" and navigation links for "Roadmaps", "Guides", "Videos", "Thanks", and a red "Subscribe" button.

The main content area starts with a greeting "Hey there! 🙋". It explains that roadmap.sh is a community effort to create roadmaps, guides, and other educational content to help guide developers in their learning journey. It also mentions a [YouTube channel](#).

Below this, there are six cards arranged in a grid:

- Frontend**: Step by step guide to becoming a frontend developer in 2021.
- Backend**: Step by step guide to becoming a backend developer in 2021.
- DevOps**: Step by step guide for DevOps or operations role in 2021.
- React**: Step by step guide to become a React Developer in 2021.
- DBA**: Step by step guide to become a PostgreSQL DBA in 2021.
- Android**: Step by step guide to becoming an Android Developer in 2021.

Under the heading "Visual Guides", there's a list of articles with their publication dates:

- Async and Defer Script Loading - September 10, 2021
- What are Web Vitals? - September 5, 2021
- SLIs, SLOs and SLAs - August 31, 2021
- Proxy Servers - July 24, 2020
- What is CI and CD? - July 9, 2020
- SSO — Single Sign On - July 1, 2020
- OAuth — Open Authorization - June 28, 2020
- JWT Authentication - June 20, 2020
- Token Based Authentication - June 2, 2020
- Session Based Authentication - May 26, 2020

A green "VIEW ALL GUIDES →" button is located at the bottom of this list.

Under the heading "Video Explanations", there's a list of video topics with their durations:

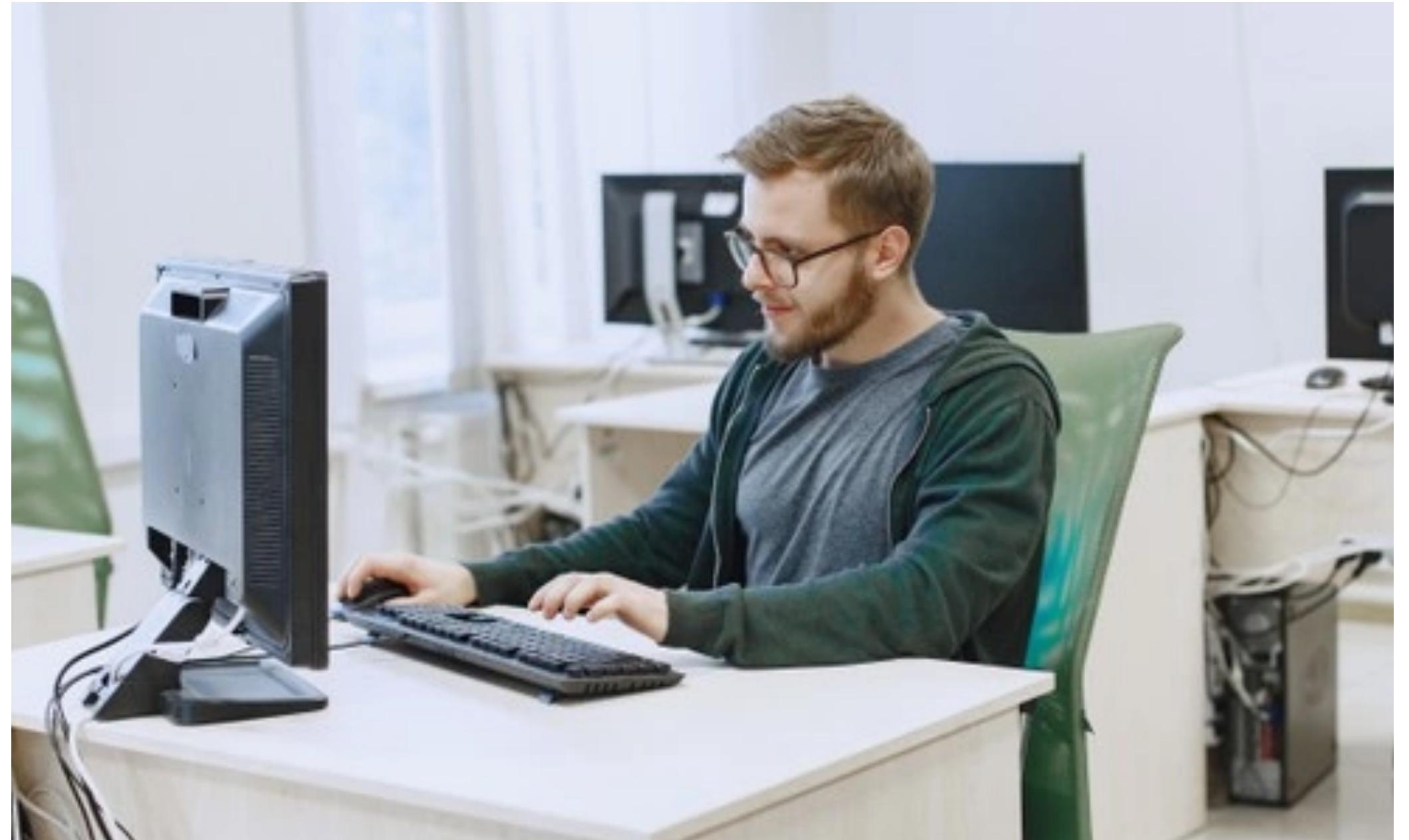
- Transport Protocols: TCP vs UDP - 10 minutes
- TCP/IP Model Explained - 5 minutes
- OSI Model Explained - 7 minutes
- Freeze and Seal in JavaScript - 6 minutes
- All about HTTP Caching - 13 minutes
- Content Delivery Networks - 4 minutes

To the right of the video list, there's a sponsored sidebar with a blue circular logo and the text: "He Went from ZERO TO \$74,000 as a Full Time Developer in 7 Weeks". Below this, it says "SPONSORED BY".

[www.roadmap.sh](https://www.roadmap.sh)

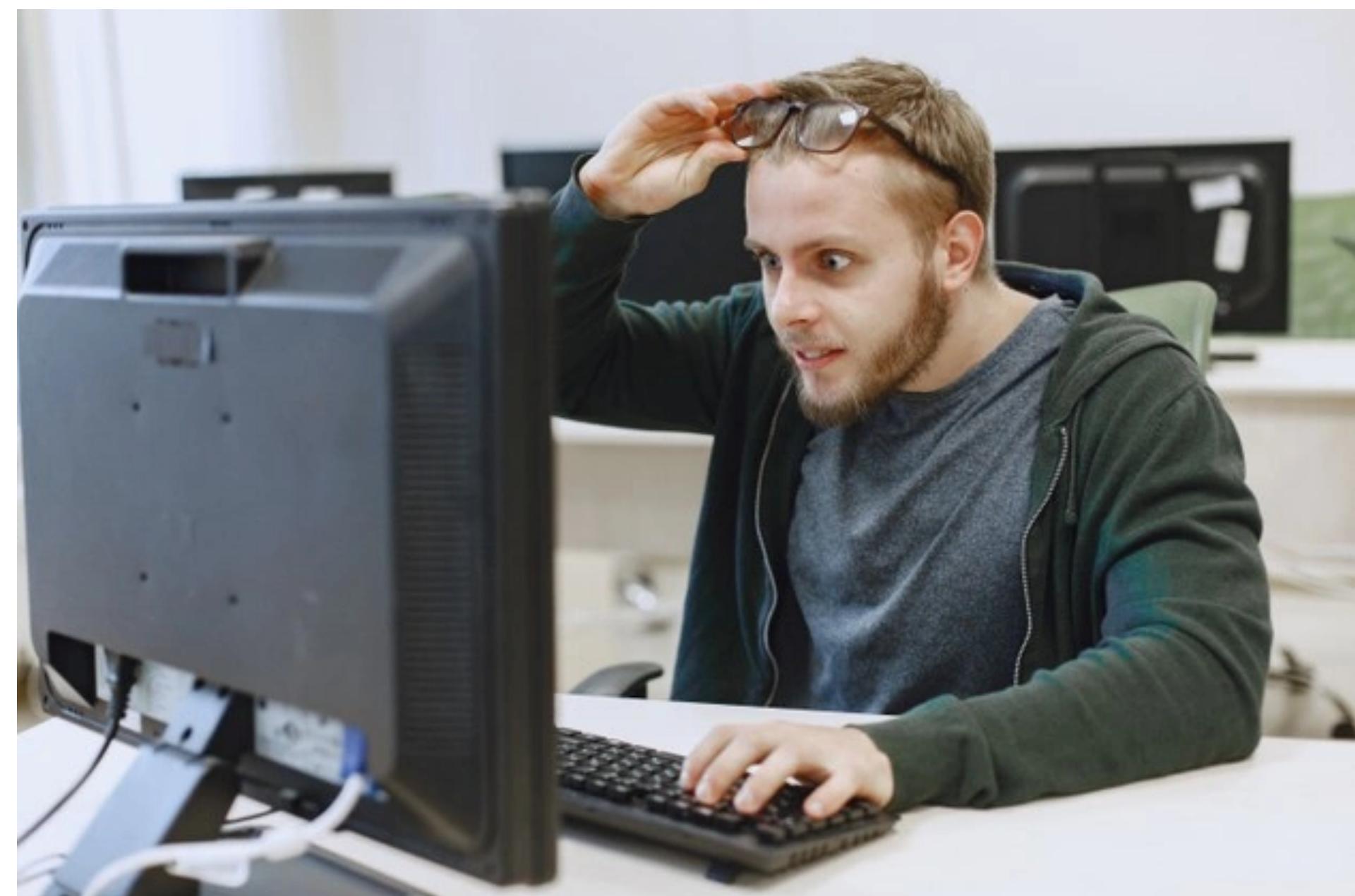
credit by Kamran Ahmed

# **Problem !**



It worked on my computer.

Running to server.



Go Port  
3000

NodeJS  
Port 3000

MySQL  
Port 3306

MariaDB  
Port 3306

Apache  
Port 80

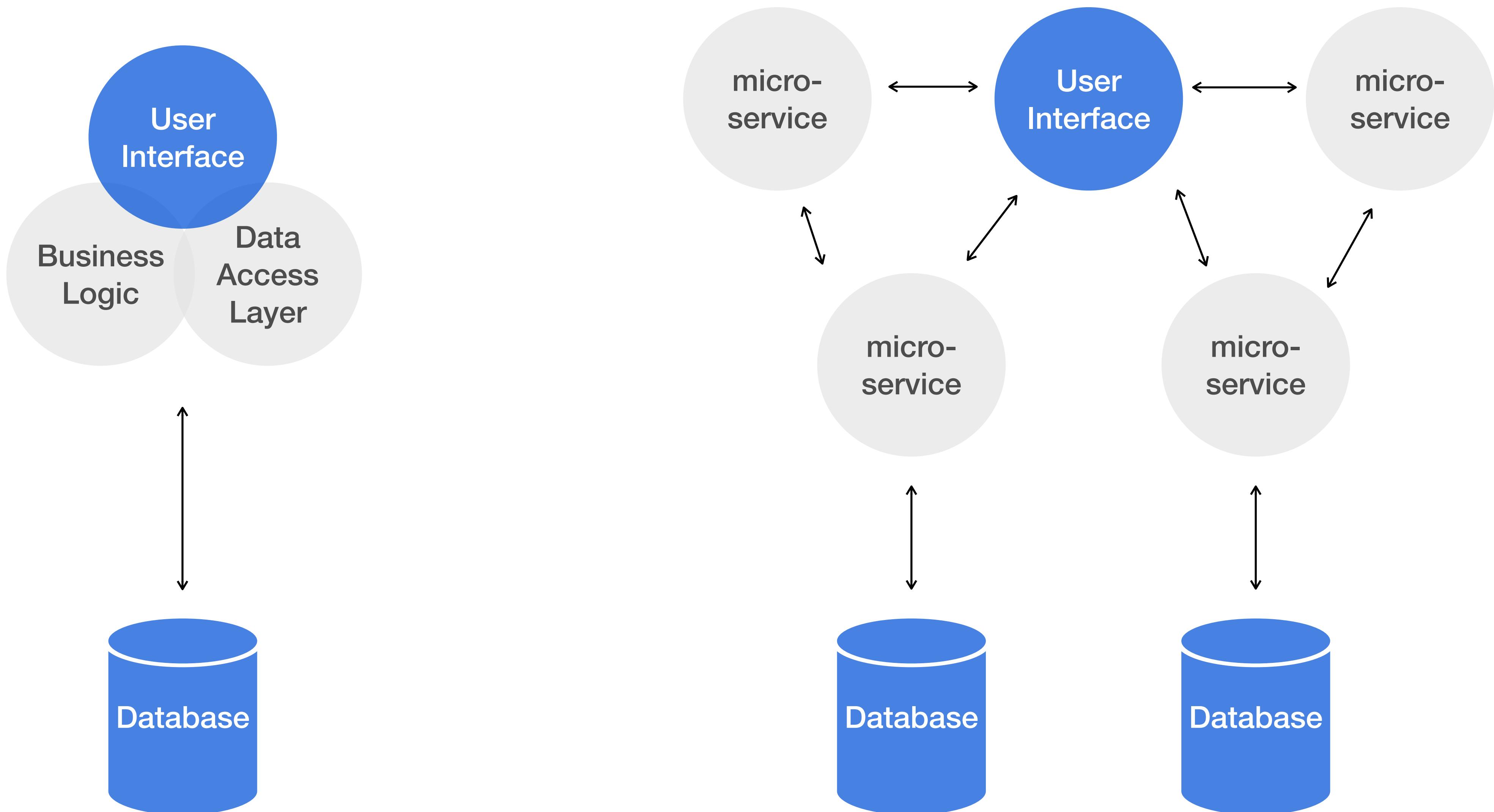
Nginx Port  
80



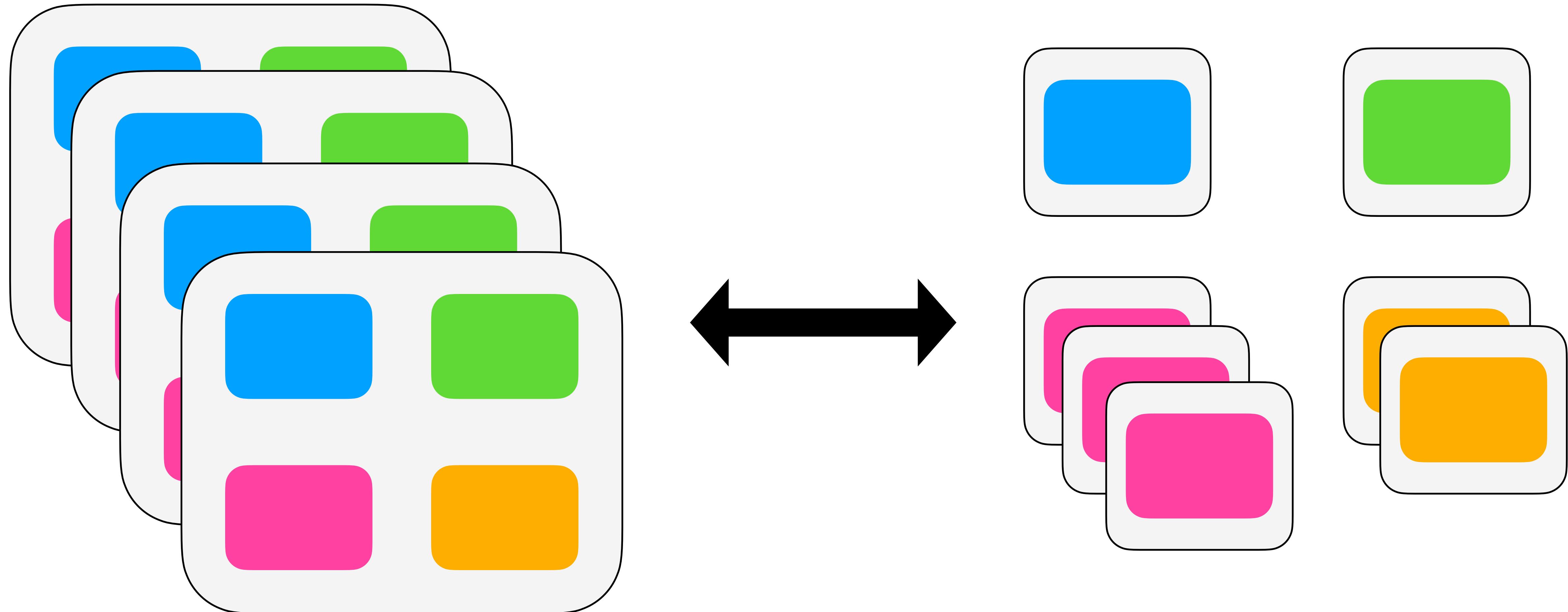
# Docker Benefits

- Application-centric
- Portability
- Versioning
- Automation
- Sharing
- Reusability

# Monolithic vs Microservices



# Scalability



Title	Monolithic	Microservices
Development / Cost	Strengths	Weaknesses
Test	Weaknesses	Strengths
Deployment	Weaknesses	Strengths
Maintanance	Strengths	Weaknesses
Scalability	Weaknesses	Strengths
Communication	Strengths	Weaknesses



Strengths

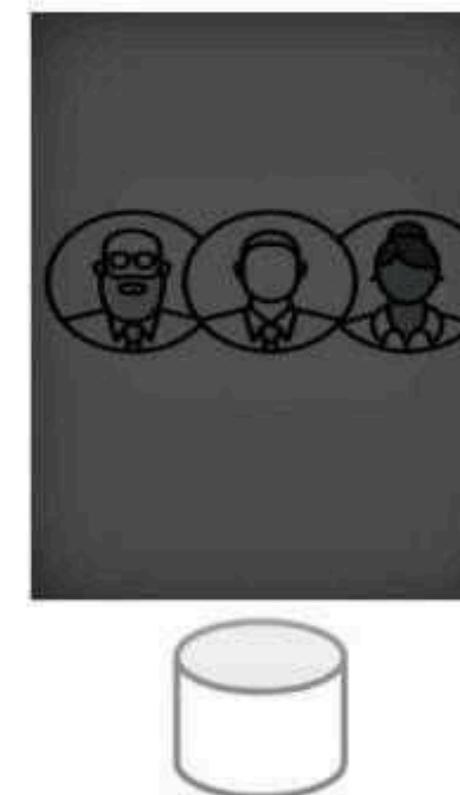


Weaknesses

# Microservices

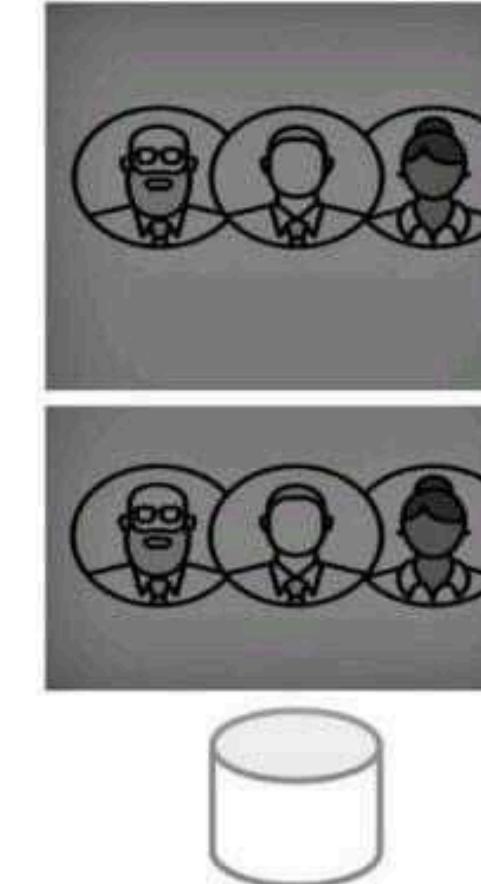
Past

The  
Monolith



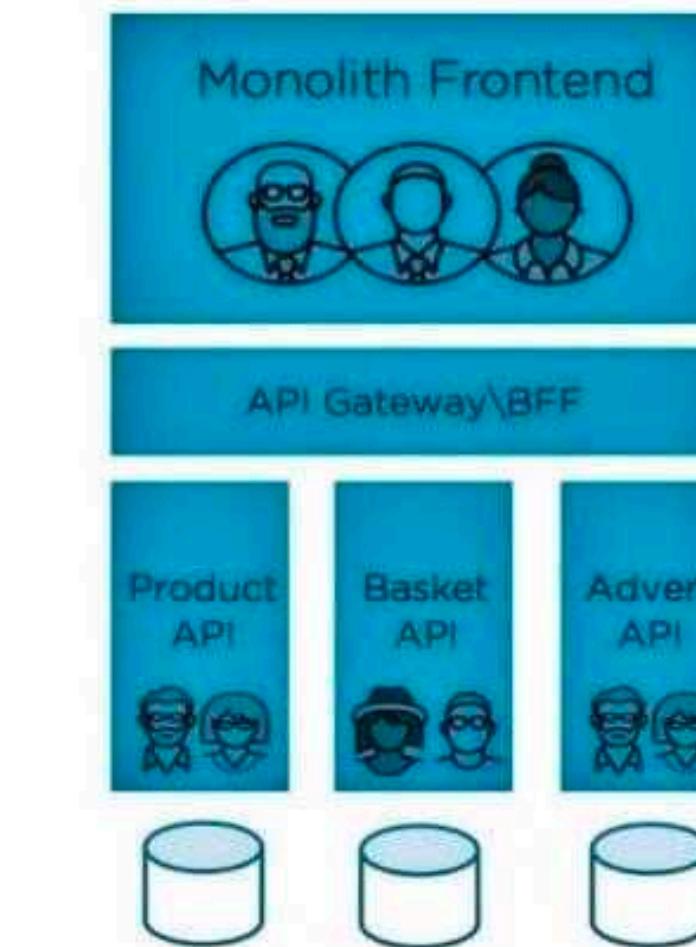
Yesterday

Frontend  
+  
Backend



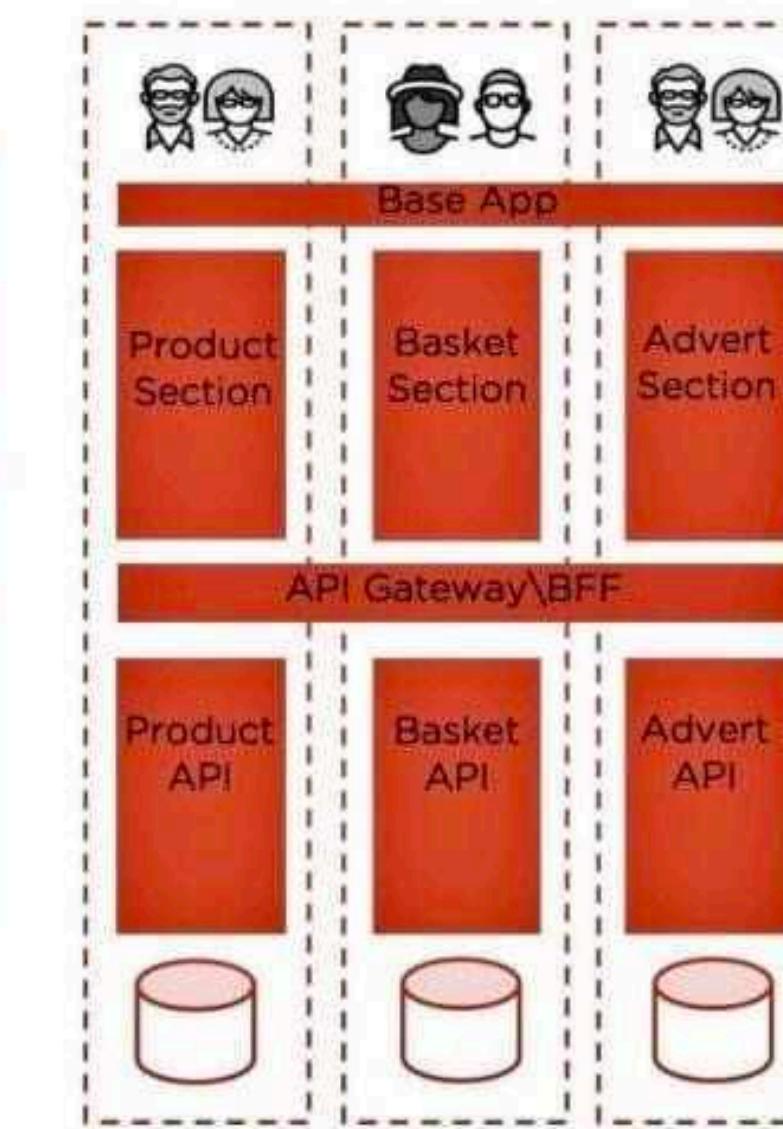
Present

Microservices



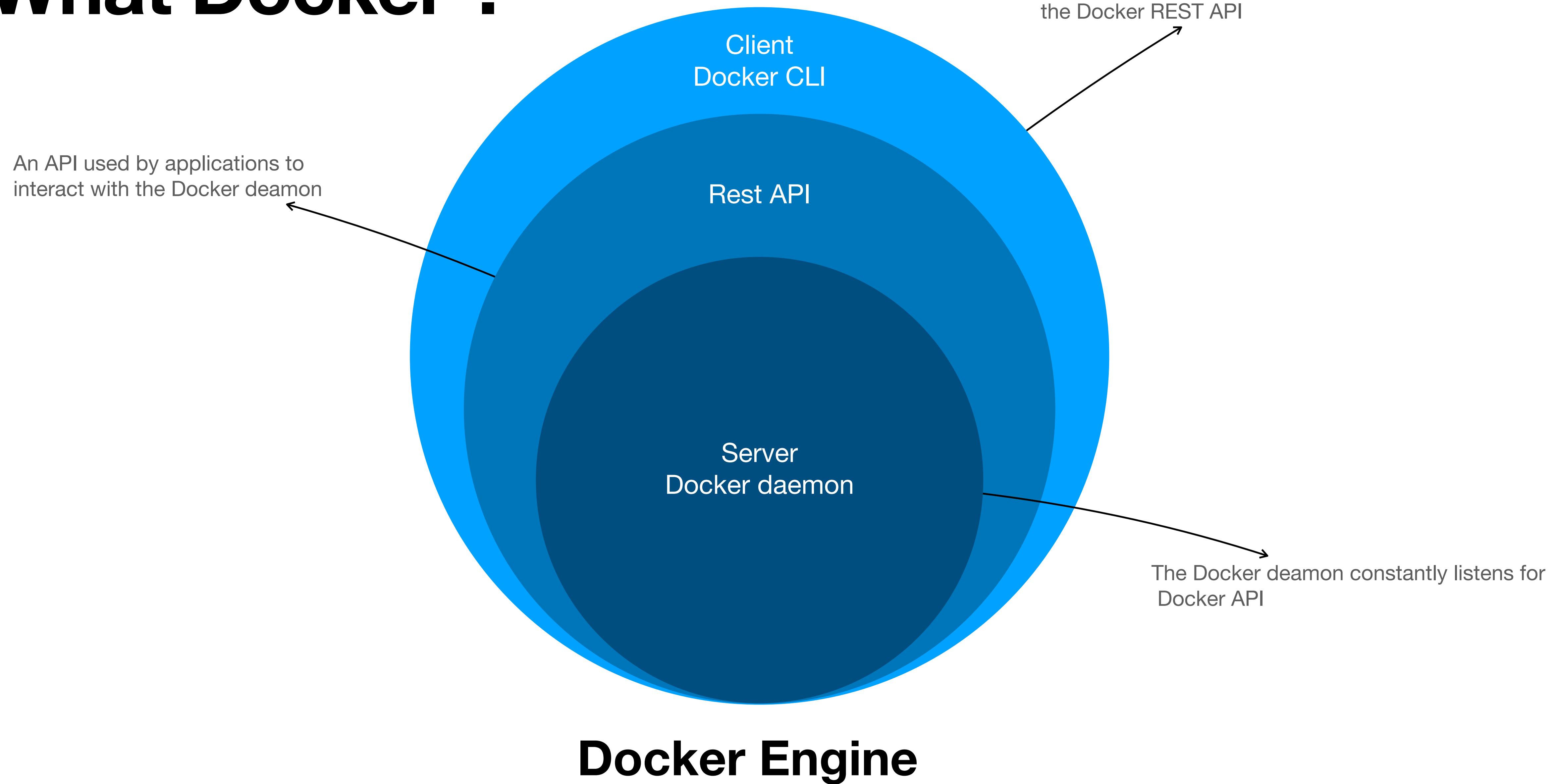
Future

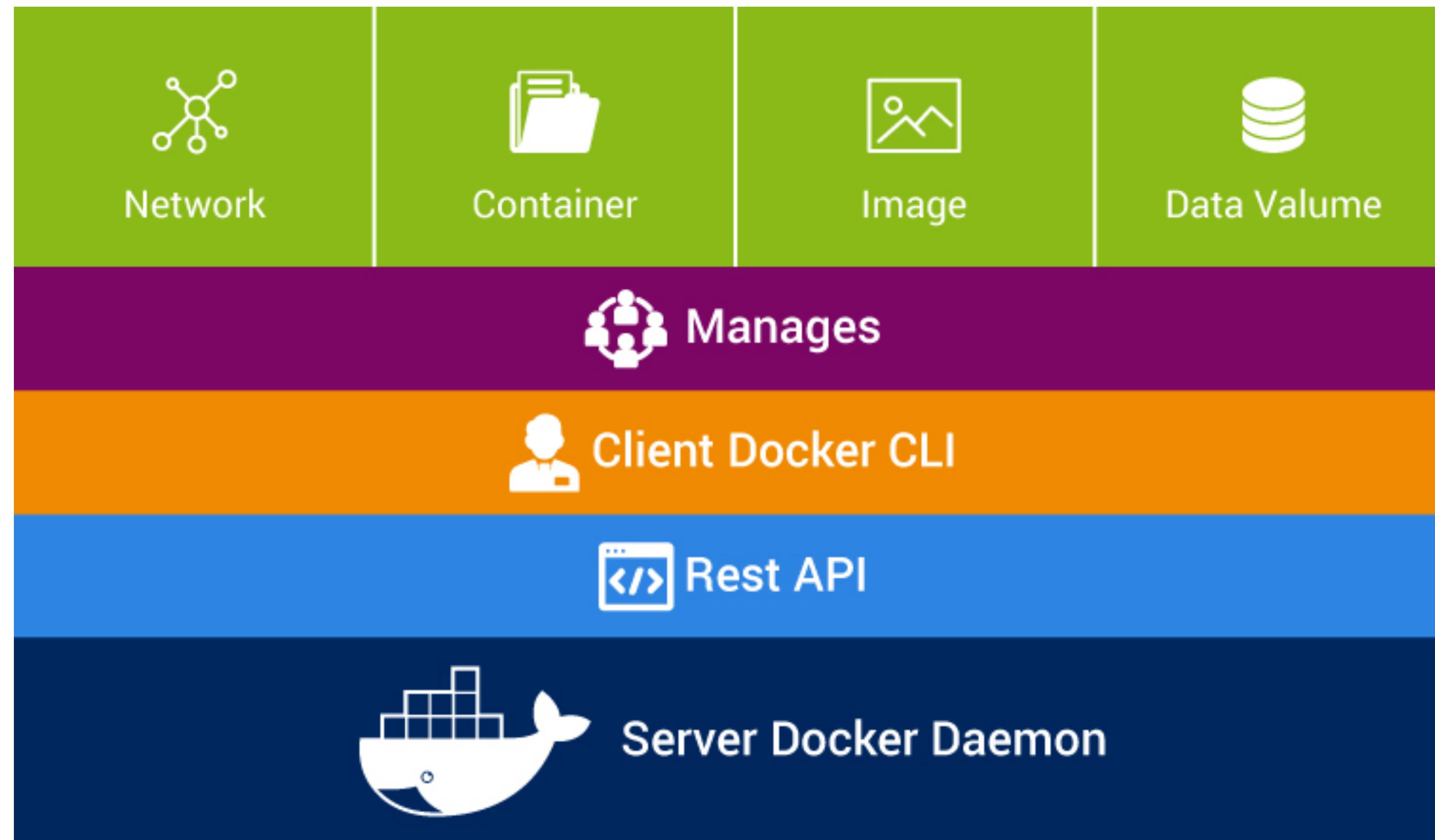
Micro Frontends  
+  
Microservices



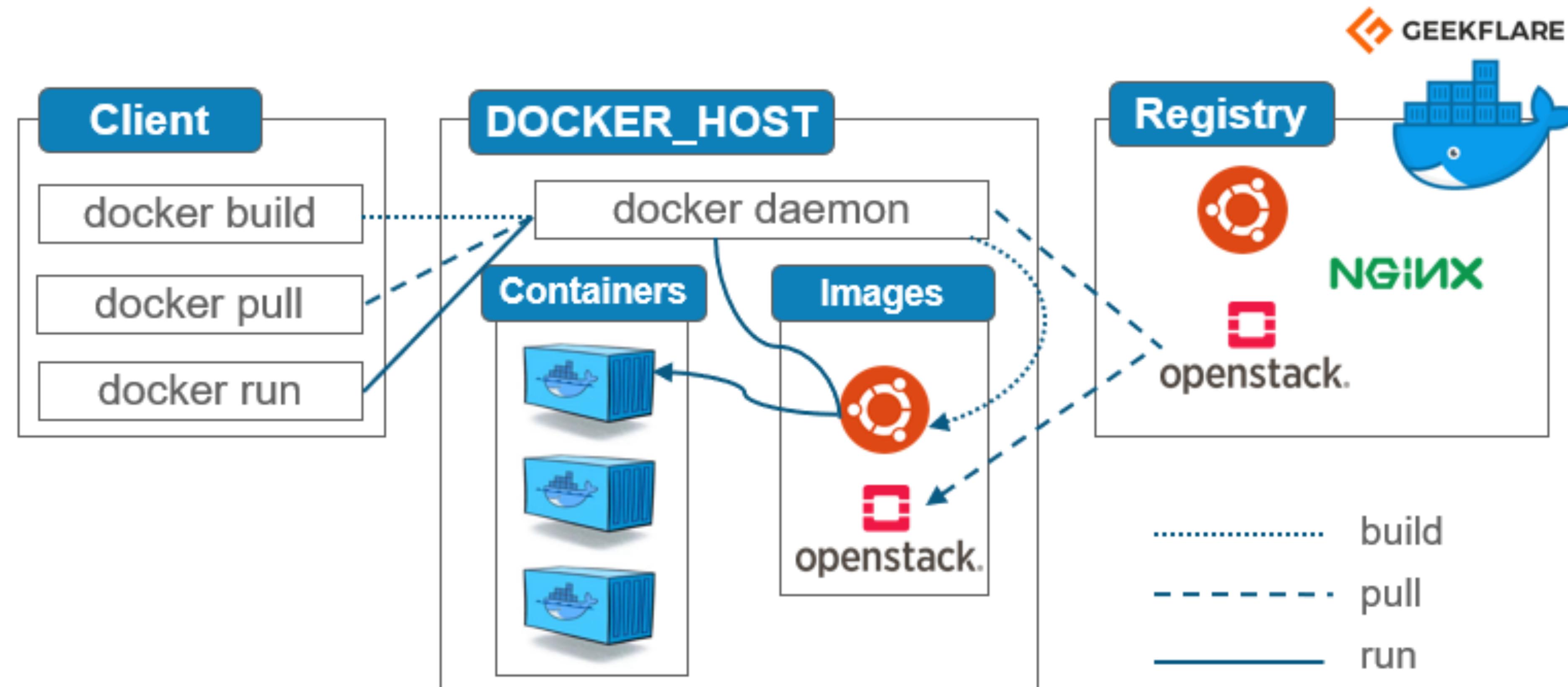
## Architecture

# What Docker ?





# Docker Architecture



# Community Hub

The image displays two side-by-side screenshots of the Docker Hub search interface. Both screenshots show a search bar at the top with the query 'nginx' on the left and 'go' on the right. The interface includes a header with the Docker Hub logo, navigation links (Explore, Repositories, Organizations, Help), an Upgrade button, and a user profile icon.

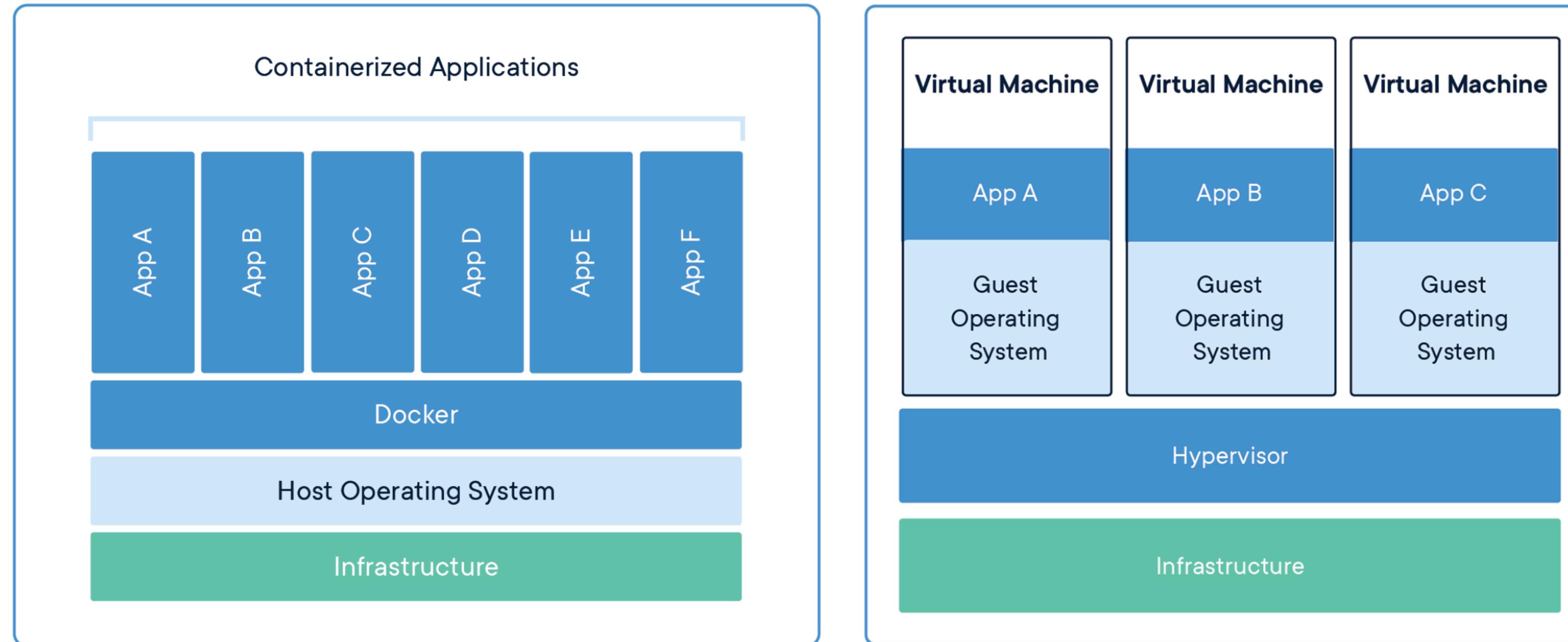
**Left Screenshot (Search for 'nginx'):**

- Filters:** Includes sections for Images (Verified Publisher, Official Images), Categories (Analytics, Application Frameworks, Application Infrastructure, Application Services, Base Images, Databases, DevOps Tools, Featured Images, Messaging Services, Monitoring, Operating Systems, Programming Languages, Security), and a general search bar.
- Results:** Shows 1 - 25 of 88,533 results for 'nginx'. The first result is 'nginx' (Official Image) by NGINX, updated a few seconds ago, with 1B+ downloads and 10K+ stars. Below it are 'bitnami/nginx-ingress-controller' (Verified Publisher) by Bitnami and 'rancher/nginx-ingress-controller' (Verified Publisher) by rancher.

**Right Screenshot (Search for 'go'):**

- Filters:** Similar to the left, with sections for Images (Verified Publisher, Official Images), Categories, and a search bar.
- Results:** Shows 1 - 25 of 134,919 results for 'go'. The first result is 'golang' (Official Image) by Go, updated 2 minutes ago, with 1B+ downloads and 3.8K stars. Below it are 'caddy' (Official Image) by Caddy and 'GoAnywhere MFT' (Verified Publisher) by HelpSystems.

# Container vs Virtual machine



# \$docker --help

```
jirayumoon-ang@Jirayus-MacBook-Pro: ~
jirayumoon-ang ~
docker --help

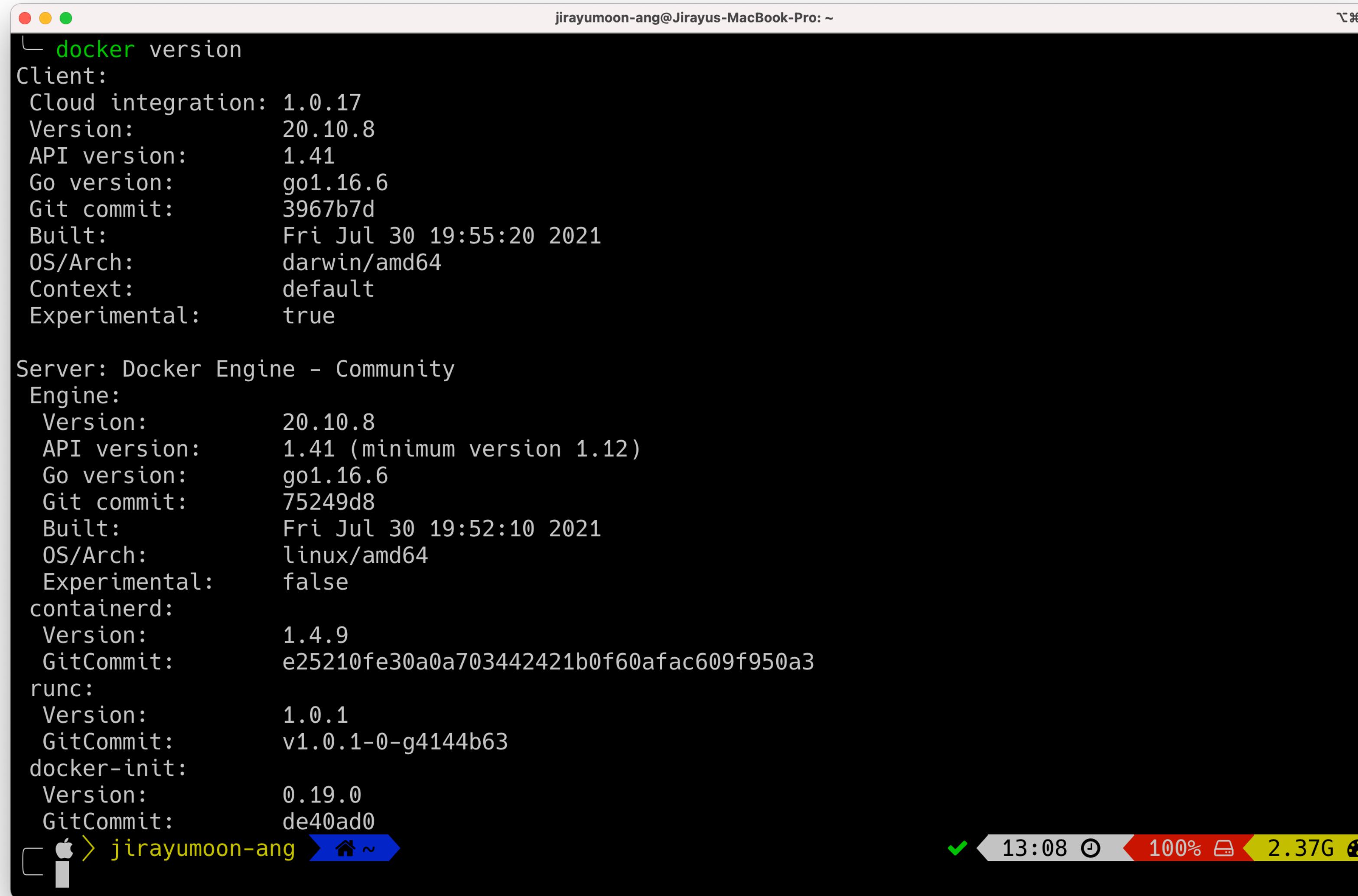
Usage: docker [OPTIONS] COMMAND
A self-sufficient runtime for containers

Options:
  --config string      Location of client config files (default "/Users/jirayumoon-ang/.docker")
  -c, --context string Name of the context to use to connect to the daemon (overrides DOCKER_HOST env var and default context set with "docker context use")
  -D, --debug          Enable debug mode
  -H, --host list      Daemon socket(s) to connect to
  -l, --log-level string Set the logging level ("debug"|"info"|"warn"|"error"|"fatal") (default "info")
  --tls                Use TLS; implied by --tlsverify
  --tlscacert string   Trust certs signed only by this CA (default "/Users/jirayumoon-ang/.docker/ca.pem")
  --tlscert string     Path to TLS certificate file (default "/Users/jirayumoon-ang/.docker/cert.pem")
  --tlskey string      Path to TLS key file (default "/Users/jirayumoon-ang/.docker/key.pem")
  --tlsverify          Use TLS and verify the remote
  -v, --version         Print version information and quit

Management Commands:
  builder      Manage builds
  buildx*     Build with BuildKit (Docker Inc., v0.6.1-docker)
  compose*    Docker Compose (Docker Inc., v2.0.0-rc.1)
  config       Manage Docker configs
  container   Manage containers
  context     Manage contexts
  image       Manage images
  manifest   Manage Docker image manifests and manifest lists
  network    Manage networks
  node        Manage Swarm nodes
  plugin     Manage plugins
  scan*      Docker Scan (Docker Inc., v0.8.0)
  secret     Manage Docker secrets
  service    Manage services
  stack      Manage Docker stacks
  swarm      Manage Swarm
  system    Manage Docker
  trust      Manage trust on Docker images
  volume    Manage volumes

Commands:
  attach     Attach local standard input, output, and error streams to a running container
  build      Build an image from a Dockerfile
  commit    Create a new image from a container's changes
  cp        Copy files/folders between a container and the local filesystem
  create    Create a new container
  diff      Inspect changes to files or directories on a container's filesystem
  events   Get real time events from the server
```

# \$docker version



A screenshot of a macOS terminal window titled "jirayumoon-ang@Jirayus-MacBook-Pro: ~". The window displays the output of the "docker version" command. The output is divided into two main sections: "Client" and "Server".

**Client:**

```
Cloud integration: 1.0.17
Version: 20.10.8
API version: 1.41
Go version: go1.16.6
Git commit: 3967b7d
Built: Fri Jul 30 19:55:20 2021
OS/Arch: darwin/amd64
Context: default
Experimental: true
```

**Server: Docker Engine - Community**

**Engine:**

```
Version: 20.10.8
API version: 1.41 (minimum version 1.12)
Go version: go1.16.6
Git commit: 75249d8
Built: Fri Jul 30 19:52:10 2021
OS/Arch: linux/amd64
Experimental: false
```

**containerd:**

```
Version: 1.4.9
GitCommit: e25210fe30a0a703442421b0f60afac609f950a3
```

**runc:**

```
Version: 1.0.1
GitCommit: v1.0.1-0-g4144b63
```

**docker-init:**

```
Version: 0.19.0
GitCommit: de40ad0
```

The terminal window also shows the user's name "jirayumoon-ang" and the current directory "~". At the bottom right, there is a system status bar with icons for battery level (100%), signal strength, and network speed (2.37G).

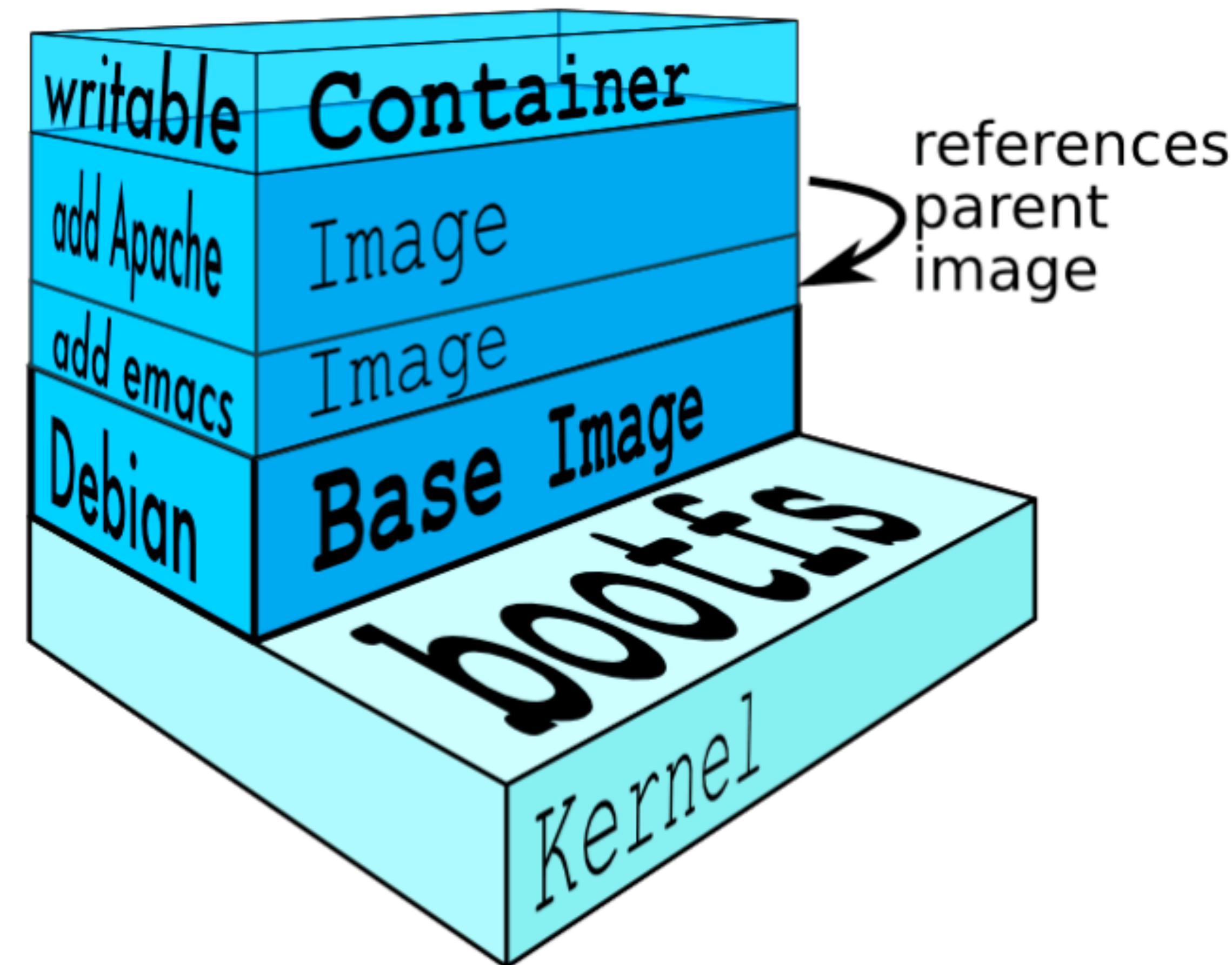
# **Docker Commands**

## **Management commands**

- docker image
- docker container
- docker network
- docker volume
- docker system

# Docker Image & Container

# Docker Image



# \$docker search

NAME	DESCRIPTION	STARS	OFFICIAL	AUTOMATED
nginx	Official build of Nginx.	15480	[OK]	
jwilder/nginx-proxy	Automated Nginx reverse proxy for docker con...	2066	[OK]	
richarvey/nginx-php-fpm	Container running Nginx + PHP-FPM capable of...	818	[OK]	
jc21/nginx-proxy-manager	Docker container for managing Nginx proxy ho...	242		
linuxserver/nginx	An Nginx container, brought to you by LinuxS...	152		
tiangolo/nginx-rtmp	Docker image with Nginx using the nginx-rtmp...	141	[OK]	
jlesage/nginx-proxy-manager	Docker container for Nginx Proxy Manager	135	[OK]	
alfg/nginx-rtmp	NGINX, nginx-rtmp-module and FFmpeg from sou...	107	[OK]	
jasonrivers/nginx-rtmp	Docker images to host RTMP streams using NGI...	93	[OK]	
nginxdemos/hello	NGINX webserver that serves a simple page co...	72	[OK]	
privatebin/nginx-fpm-alpine	PrivateBin running on an Nginx, php-fpm & Al...	57	[OK]	
nginx/nginx-ingress	NGINX and NGINX Plus Ingress Controllers fo...	55		
nginxinc/nginx-unprivileged	Unprivileged NGINX Dockerfiles	51		
staticfloat/nginx-certbot	Opinionated setup for automatic TLS certs lo...	24	[OK]	
nginxproxy/nginx-proxy	Automated Nginx reverse proxy for docker con...	20		
nginx/nginx-prometheus-exporter	NGINX Prometheus Exporter for NGINX and NGIN...	19		
schmunk42/nginx-redirect	A very simple container to redirect HTTP tra...	19	[OK]	
centos/nginx-112-centos7	Platform for running nginx 1.12 or building ...	15		
raulr/nginx-wordpress	Nginx front-end for the official wordpress:f...	13	[OK]	
centos/nginx-18-centos7	Platform for running nginx 1.8 or building n...	13		
flashspys/nginx-static	Super Lightweight Nginx Image	10	[OK]	
mailu/nginx	Mailu nginx frontend	9	[OK]	
sophos/nginx-vts-exporter	Simple server that scrapes Nginx vts stats a...	7	[OK]	
ansibleplaybookbundle/nginx-apb	An APB to deploy NGINX	2	[OK]	
wodby/nginx	Generic nginx	1	[OK]	

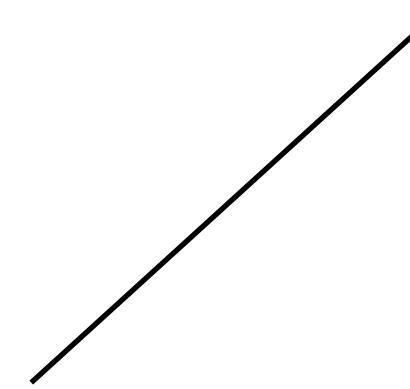
# Foreground

```
$ docker container run jpetazzo/clock
```

# Background

```
$docker container run -d -p 80:80 nginx
```

```
$docker container run -d -p 80:80 nginx:latest
```



Default tag is **latest**

**-d** is **detach**  
**-p** is **publish**

# Run options

- -- detach, -d
- -- publish, -p
- -- env, -e
- -- volume, -v
- -- memory, -m
- -- name
- -- restart
- -- help more....

# Show process

\$docker container **ps**

\$docker container **ps -a**

# Docker logs

```
$ docker container logs <id/name>
```

```
$ docker container logs <id/name> -f
```

# Start / Stop Container

```
$docker container stop <id/name>
```

```
$docker container start <id/name>
```

# Stop all container

```
$docker container stop $(docker container ps -q)
```

**-q** is Only display container IDs

# Remove commands

- \$docker container rm
- \$docker image rmi
- \$docker container prune
- \$docker image prune

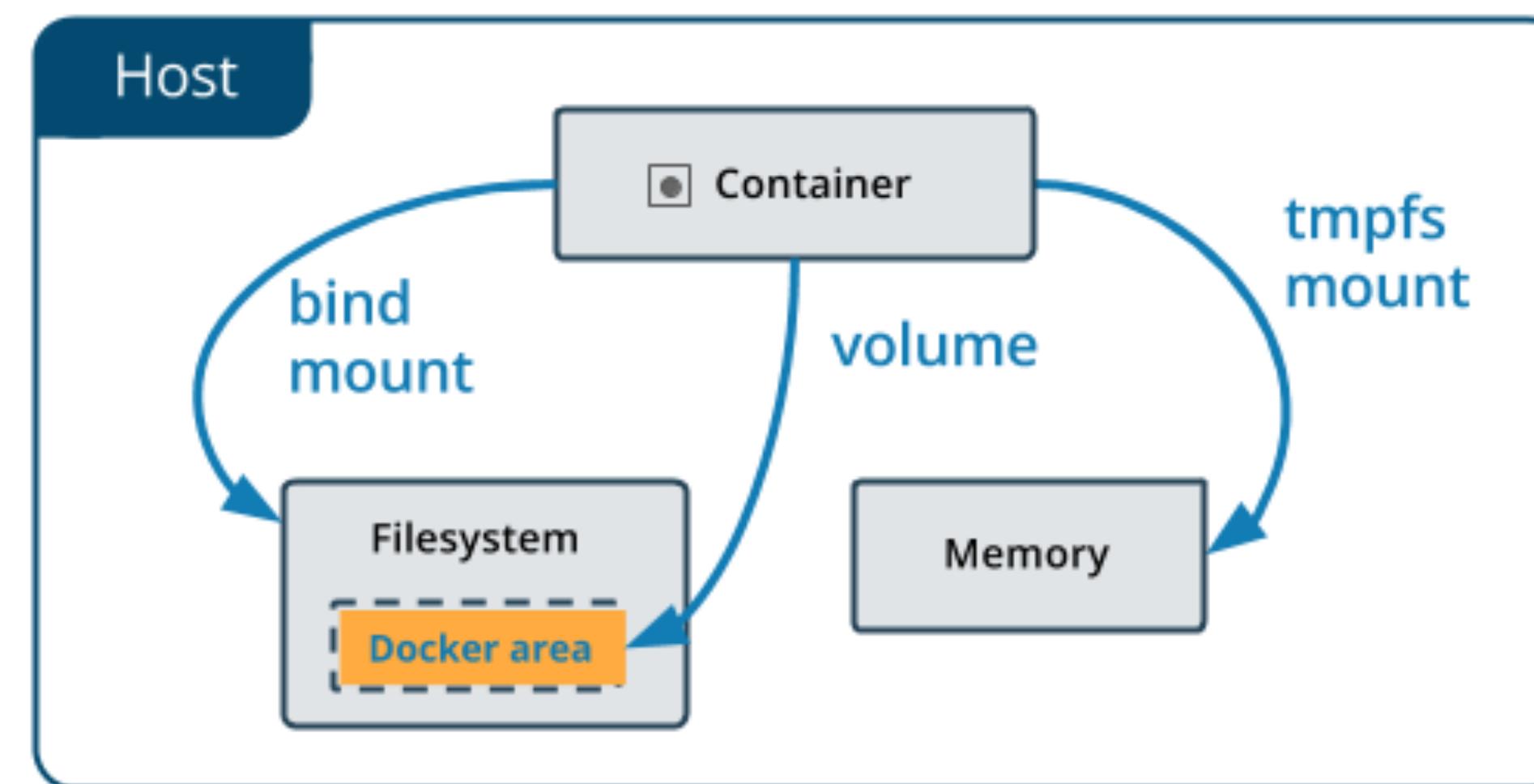
# Access to container

```
$ docker exec -it <id/name> <bash/sh>
```

# Docker Volumes

# Docker volumes

Data volumes provide several use full features for persistent or shared data



# Create a new volume & run

\$docker volume **create** <name>

\$docker container **run** -v <name> host:guest

## Current path

Window \$PWD

Linux \$(pwd)

# Use volumes

1. Create folder **mywebsite** and **index.html**
2. Insert code to **index.html** “`<h1>My Website NGINX</h1>`”
3. \$docker container **run -d -p 80:80 \**  
**--name web1 \**  
**-v \$(pwd)/mywebsite:/usr/share/nginx/html nginx:1.21.3-alpine**

# Check mounts path

\$docker container **inspect** <id/name>

```
"Mounts": [
  {
    "Type": "bind",
    "Source": "/Users/jirayumoon-ang/Projects/DockerWorkshop/mywebsite",
    "Destination": "/usr/shared/nginx/html",
    "Mode": "",
    "RW": true,
    "Propagation": "rprivate"
  }
],
```

# Run container and define volume

- MySQL
- Deploy php5
- Deploy php7
- NodeJS
- WordPress

# Docker Networks

# Networks

- None Network
- Bridge Network
- Host Network
- Overlay Network (Docker Swarm)

Container A  
(Private Network)

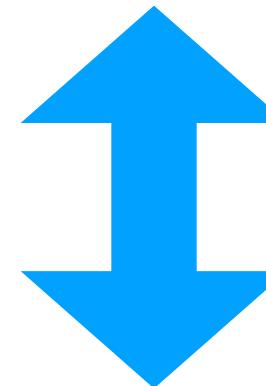
Container B  
(Private Network)

Container C  
(Private Network)



Bridge (Docker 0)

Host



# Docker Networks

- \$docker network create <name>
- \$docker network create --subnet=10.0.0.0/24 --gateway=10.0.0.1
- \$docker network ls
- \$docker network inspect <id/name>
- \$docker docker container exec -it <id/name> ping -c 5 <ip>

# Dockerfile

Dockerfile instructs on how to build the image automatically

# Instructions

- FROM The base image for the instructions
  - MAINTAINER Author information
  - RUN Executes any commands
  - CMD Set a command to be executed when running a container.
  - EXPOSE About network port.
  - ENV Set environment variable.
  - ADD Copy files to the destination .
  - WORKDIR Set the working directory.

# Docker Compose

Compose is a tool for defining and running complex applications with Docker.

Manage multi container application in a single file.

# Using Compose is basically

- Define your app's environment with a **Dockerfile** so it can be reproduced anywhere
- Define the services that make up your app in **docker-compose.yml** so they can be run together in an isolated environment.
- Run **docker-compose up**

# Monitor Portainer

portainer.io

Home

PRIMARY

- Dashboard
- App Templates
- Stacks
- Services
- Containers
- Images
- Networks
- Volumes
- Configs
- Secrets
- Swarm

SETTINGS

- Users
- Endpoints
- Registries
- Settings

A new version is available

portainer.io 2.1.1

Home

Endpoints

Latest News From Portainer

Check out our latest release, Portainer CE 2.6.0. Now with support for Git repository deployment, and single sign-on for OAuth. Discover the highlights [in this blog post](#), as well as the release notes, and tips and tricks for upgrading.



Endpoints

Refresh

Search by name, group, tag, status, URL...

primary  2021-09-19 17:01:10	Group: Unassigned
9 stacks 12 services 13 containers -  13  0 /  0  0	Swarm 20.10.5 +  Agent
No tags	tasks.agent:9001

Items per page 10

admin

my account

 portainer.io

PRIMARY

- Home
- Dashboard
- App Templates
- Stacks
- Services
- Containers
- Images
- Networks
- Volumes
- Configs
- Secrets
- Swarm

SETTINGS

- Users
- Endpoints
- Registries
- Settings

A new version is available

portainer.io 2.1.1

## Dashboard

Endpoint summary

admin [my account](#) [log out](#)

**Cluster information**

**Nodes in the cluster** 1

[Go to cluster visualizer](#)

 **10** Stacks

 **12** Services

 **13** Containers

0 healthy 13 running  
0 unhealthy 0 stopped

 **18** Images

6.9 GB

 **9** Volumes

 **15** Networks

portainer.io

Node: ubuntu-s-1vcpu-1gb-intel-sgp1-01

Pull the image

Images

Search...

	Tags	Size	Created
<input type="checkbox"/> sha256:f55fb7cb2f36d945c3cb38d86768a...	mariadb:<none>	409.1 MB	202
<input type="checkbox"/> sha256:0bcbeb494bed17f8d46fbf05569d7b...	mongo:<none>	684.2 MB	202
<input type="checkbox"/> sha256:30b3be246e3953807bd3ec956b05f6...	mongo:<none>	449.1 MB	202
<input type="checkbox"/> sha256:f03be0dc25f8732caef29f051c91ce...	mongo:latest	447.6 MB	202
<input type="checkbox"/> sha256:5a4e492065c722ec8cc7413552bafc...	mysql:<none>	513.8 MB	202
<input type="checkbox"/> sha256:c0cdc95609f1fc1daf2c7cae05ebd6...	mysql:<none>	555.7 MB	202
<input type="checkbox"/> sha256:eb92914541647c706309e60f35ac23...	nginx:<none>	22.6 MB	202
<input type="checkbox"/> sha256:c81206f03f4ab591bc8db5782d2a45...	portainer/agent:<none>	94.8 MB	202
<input type="checkbox"/> sha256:96a1c6cc3d158fac0b5be75382b9b2...	portainer/portainer-ce:<none>	208.6 MB	202
<input type="checkbox"/> sha256:ed41ea0d7a3b2e9209ecc5d66643a5...	registry.gitlab.com/kmochimeru/hh-backoffice-api:<none>	599.3 MB	202

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Container list

Containers

Start Stop Kill Restart Pause Resume Remove + Add container

Search...

Name	State	Quick actions	Stack	Image
stack-mms_service-mms-api.1.b...	running	Stop Kill Restart Pause Resume Remove	stack-mms	registry.gitlab.com/kmochimeru/mms-api:late...
stack-mms_service-mms-ng.1.b4...	running	Stop Kill Restart Pause Resume Remove	stack-mms	registry.gitlab.com/kmochimeru/mms-ng:late...
stack-youtube-ranking_youtube...	running	Stop Kill Restart Pause Resume Remove	stack-youtube-ranking	registry.gitlab.com/kmochimeru/youtube-ran...
stack-hh-backoffice_hh-backof...	running	Stop Kill Restart Pause Resume Remove	stack-hh-backoffice	registry.gitlab.com/kmochimeru/hh-backoffic...
stack-hh-backoffice_hh-backof...	running	Stop Kill Restart Pause Resume Remove	stack-hh-backoffice	registry.gitlab.com/kmochimeru/hh-backoffic...
stack-youtube-ranking_youtube...	running	Stop Kill Restart Pause Resume Remove	stack-youtube-ranking	registry.gitlab.com/kmochimeru/youtube-ran...
stack-maria-backoffice_db.1.s...	running	Stop Kill Restart Pause Resume Remove	stack-maria-backoffice	mariadb:latest
portainer_portainer.1.y9xih8r...	running	Stop Kill Restart Pause Resume Remove	portainer	portainer/portainer-ce:latest
stack-mysql_mysql-db.1.h9eps6...	running	Stop Kill Restart Pause Resume Remove	stack-mysql	mysql:latest
portainer_agent.or72ciz5g5g96...	running	Stop Kill Restart Pause Resume Remove	portainer	portainer/agent:latest
stack-mongodb-mms_service-mon...	running	Stop Kill Restart Pause Resume Remove	stack-mongodb-mms	mongo:latest
stack-nginx_nginx.1.bu0nt8koo...	running	Stop Kill Restart Pause Resume Remove	stack-nginx	nginx:1.19.7-alpine
mongodb	running	Stop Kill Restart Pause Resume Remove	mongodb	mongo:latest

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