



# Develop faster - Run anywhere

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<http://bit.ly/3SHpELP>

# Plan (15/11/2023)

## I. Fundamentals

- Virtualization
- Networking

## II. Technology

## III. Concepts

- Image
- Container
- Registry

## IV. Practical



# Fundamentals

# Virtualization

Emulating a system, within an host system !



# Virtualization



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FROM THE DIRECTOR OF THE DARK KNIGHT

# INCEPTION

EXPERIENCE IT JULY 16 IN THEATERS AND IMAX®

PG-13 PARENTS STRONGLY caUTIONED  
Some Material May Be Inappropriate for Children Under 13.  
SEQUENCES OF VIOLENCE AND ACTION throughout

[inceptionmovie.com](http://inceptionmovie.com)

LEGENDARY PICTURES

SYNCPAD

WARNER BROS. PICTURES  
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# Containerization

Emulating a system, within an host system !



docker



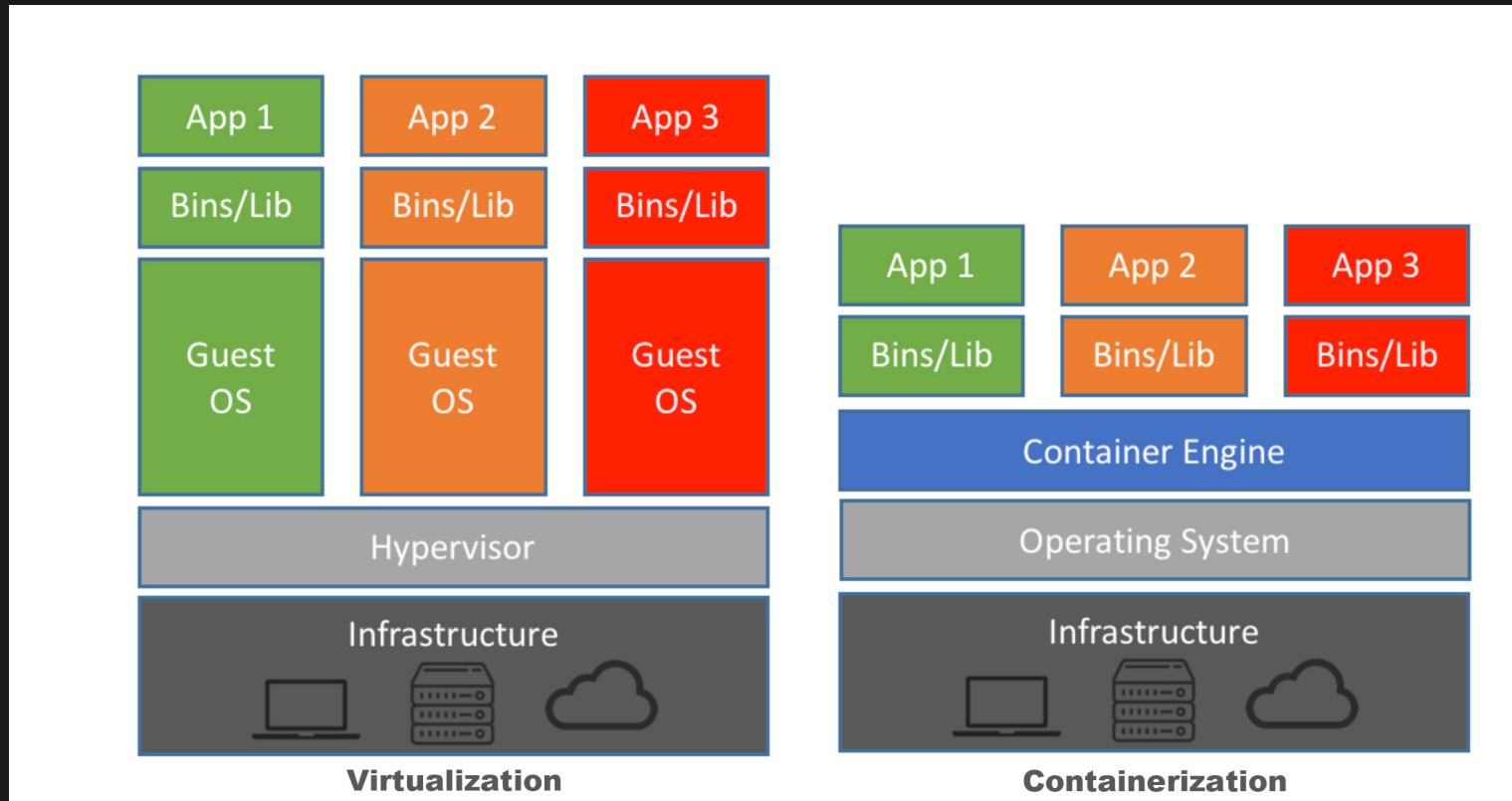
rkt

# Virtualization VS Containerization

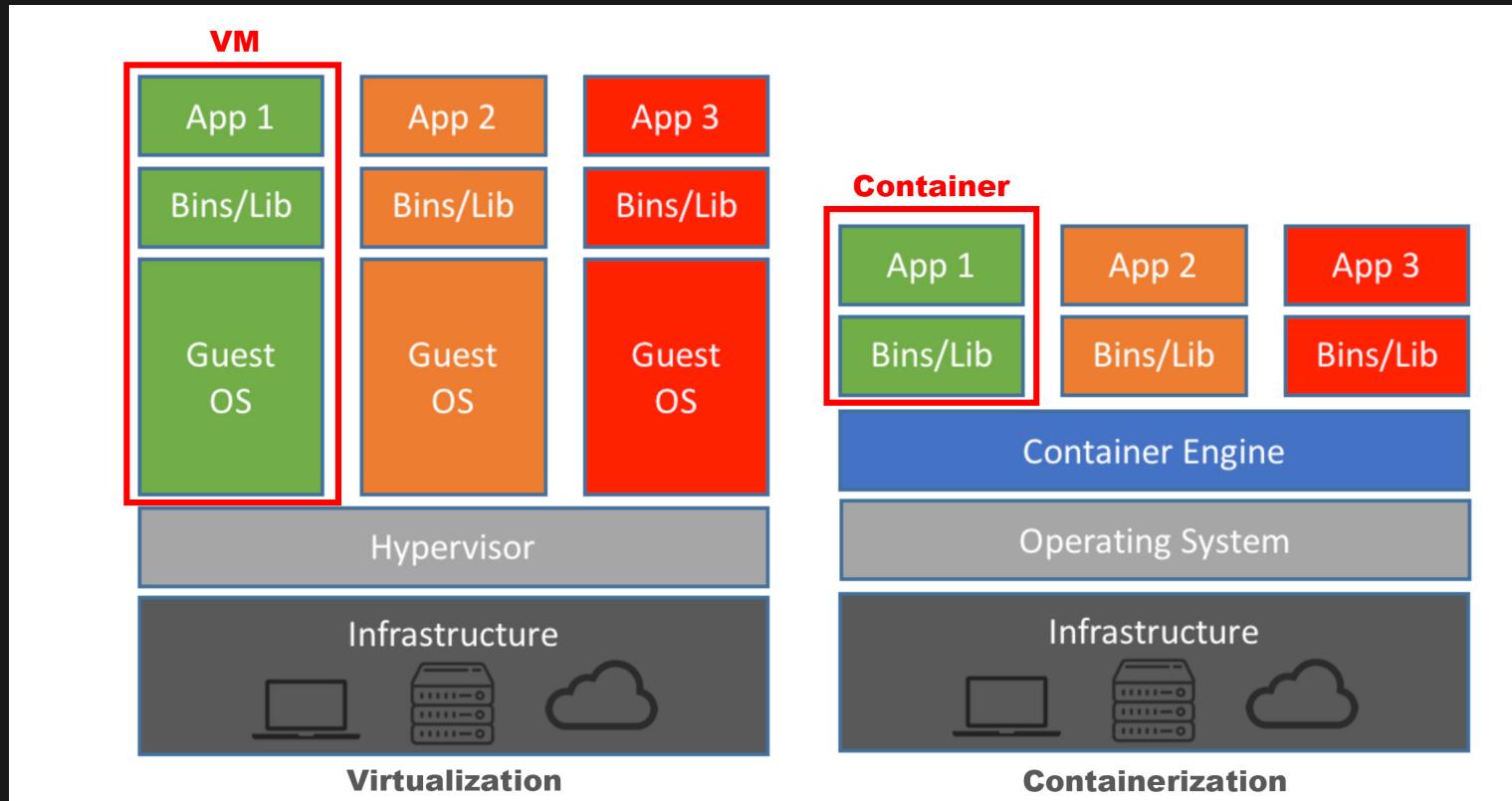


They're the same picture.

# Virtualization VS Containerization

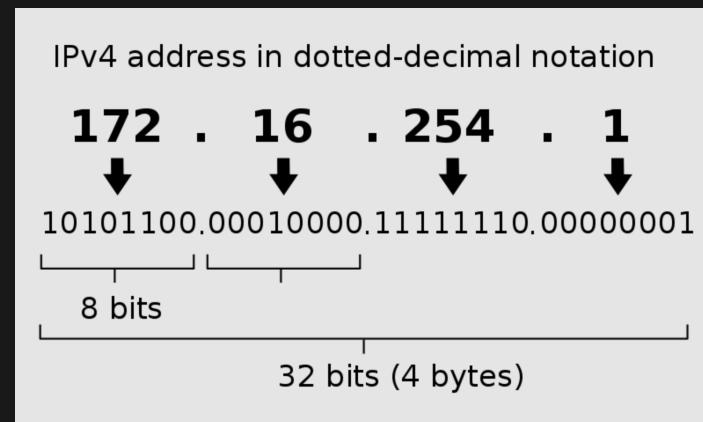


# Virtualization VS Containerization



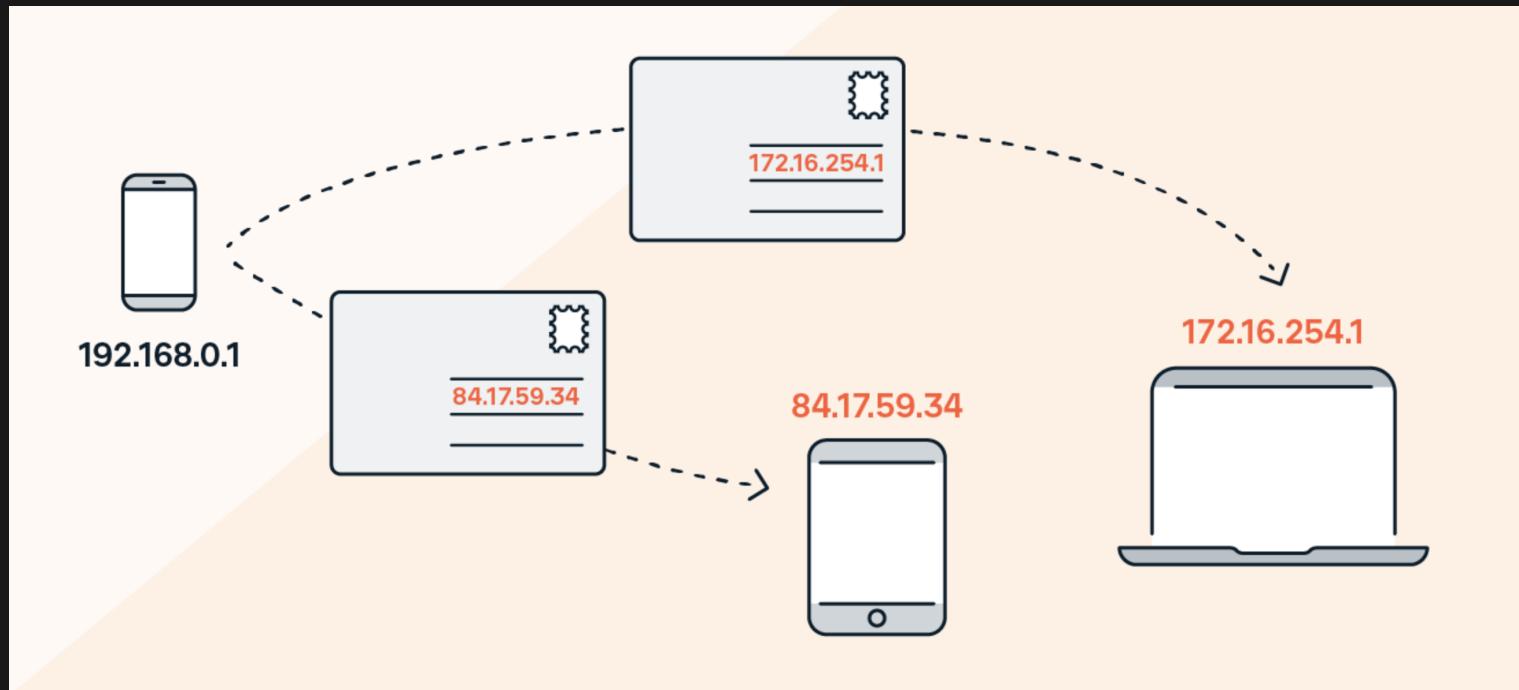
# Networking

## IP Addresses



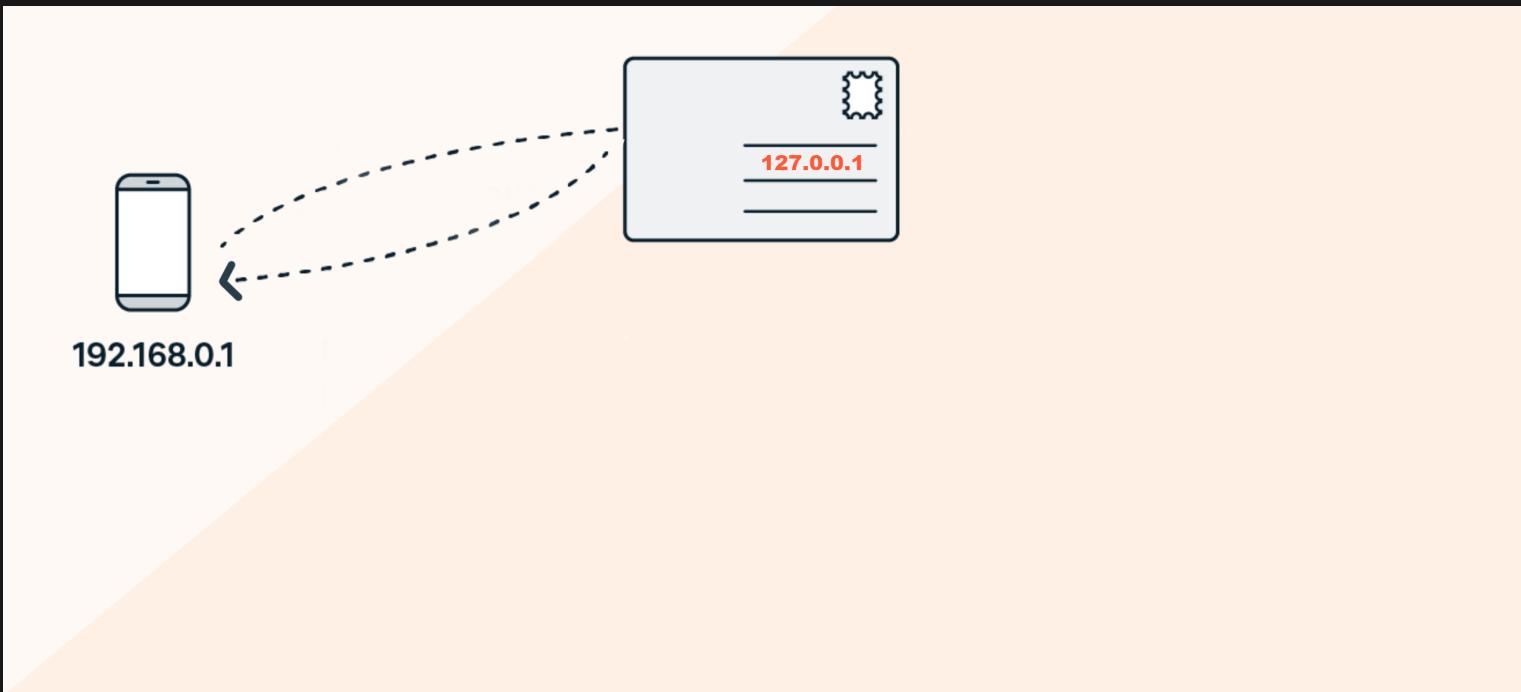
# Networking

## Messaging



# Networking

## Loopback



# Networking

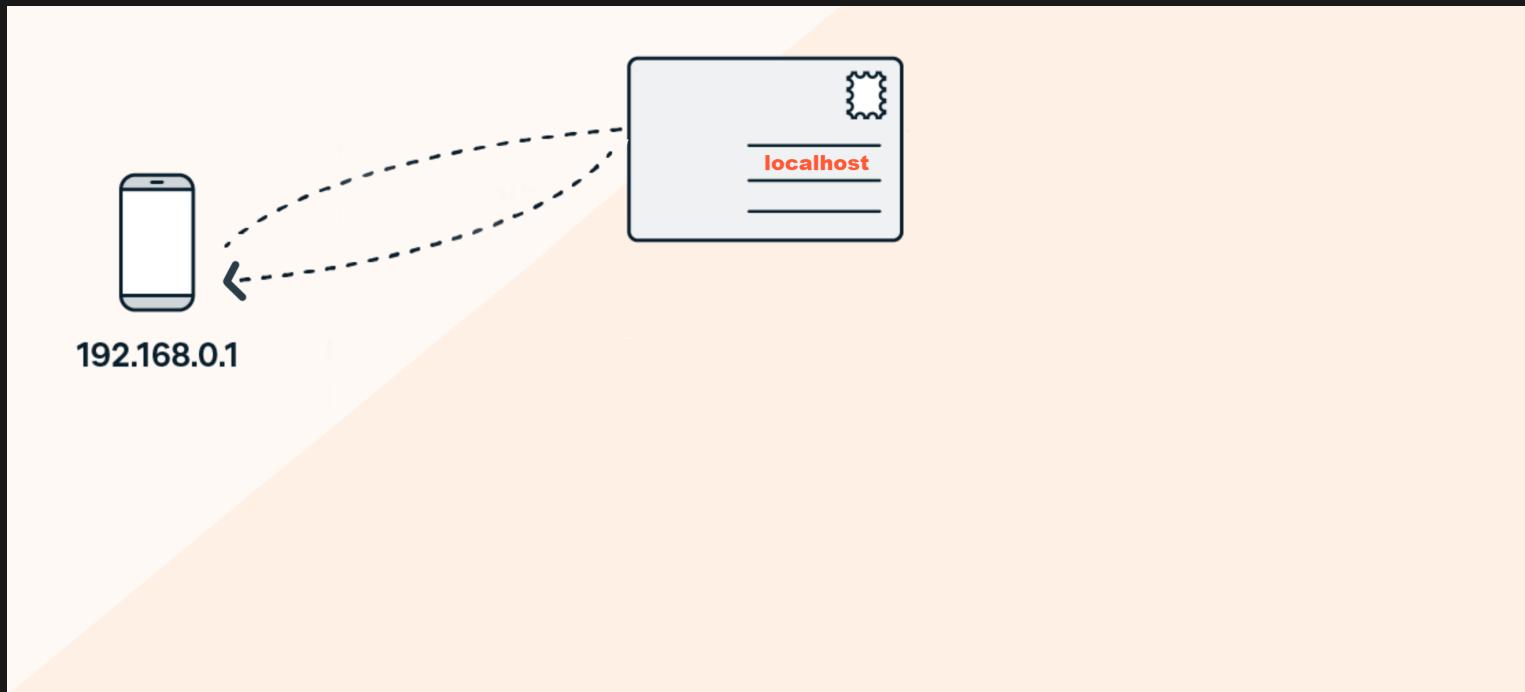
## DNS

Hierarchical and distributed naming system

Name	IP Address
localhost	127.0.0.1
google.com	142.250.179.110
mail.google.com	142.251.163.17
www.telecom-paris.fr	137.194.22.227

# Networking

## DNS



# Networking

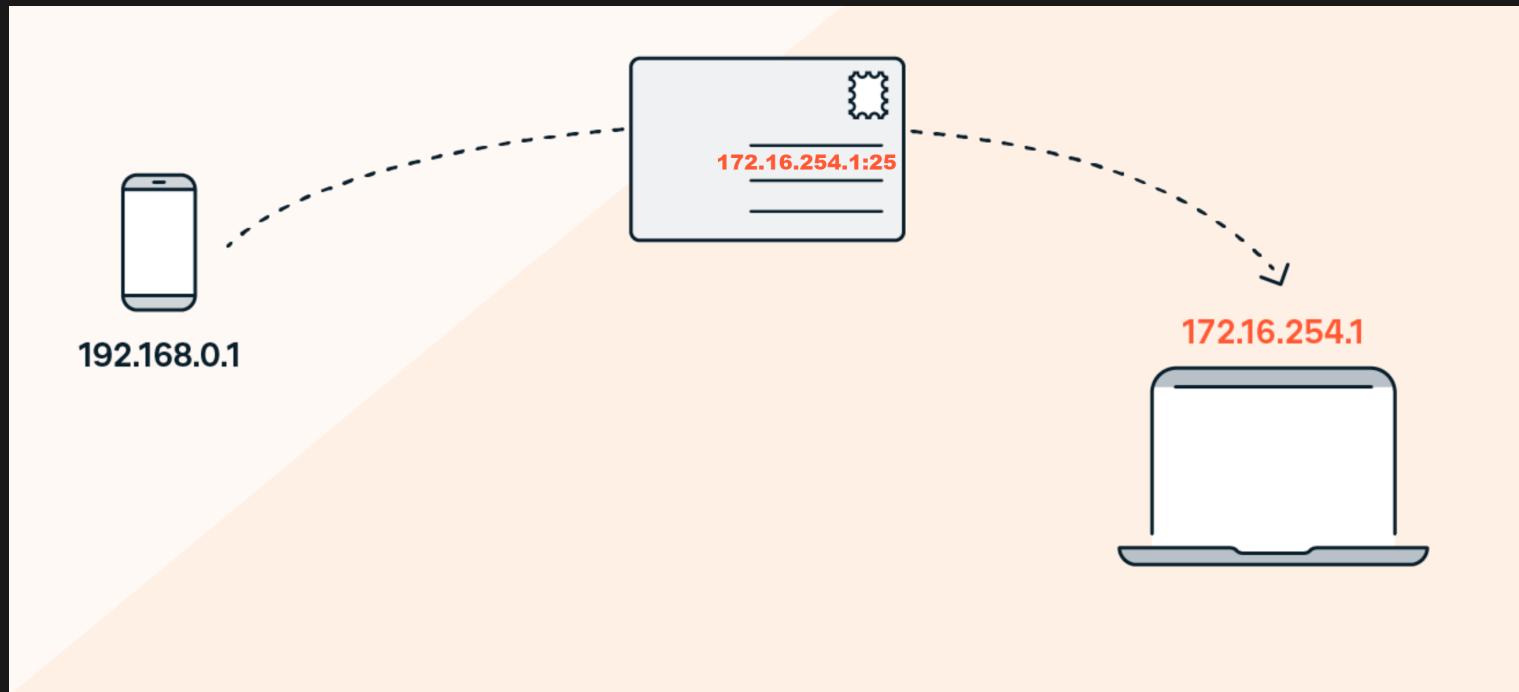
## Ports

A computer / server has multiple network endpoints dedicated to specific protocols

Number	Assignment
20	File Transfer Protocol (FTP) Data Transfer
22	Secure Shell (SSH) Secure Login
25	Simple Mail Transfer Protocol (SMTP) email delivery
53	Domain Name System (DNS) service
80	Hypertext Transfer Protocol (HTTP) used in the World Wide Web
110	Post Office Protocol (POP3)
143	Internet Message Access Protocol (IMAP) Management of digital mail
161	Simple Network Management Protocol (SNMP)
194	Internet Relay Chat (IRC)
443	HTTP Secure (HTTPS) HTTP over TLS/SSL

# Networking

## Ports





Technology

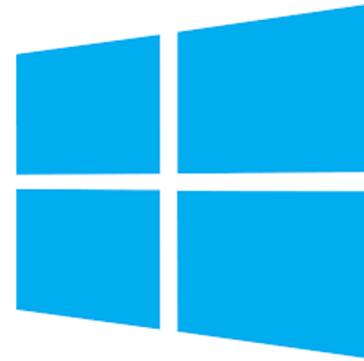
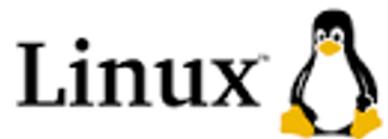
# Docker

## Technology

- Encapsulate an application in a container
- Lightweight and fast
- Easy versionning
- Centralized image library
- Allow cintainer orchestration
- Portable on any multiple environment
- Created by Solomon Hykes
- Written in Go

# MongoDB

Supported Desktop OS

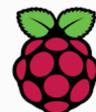


# MongoDB

Supported Server OS (Linux only)



**CentOS**



Raspberry Pi OS



Ubuntu



Concepts

# Image

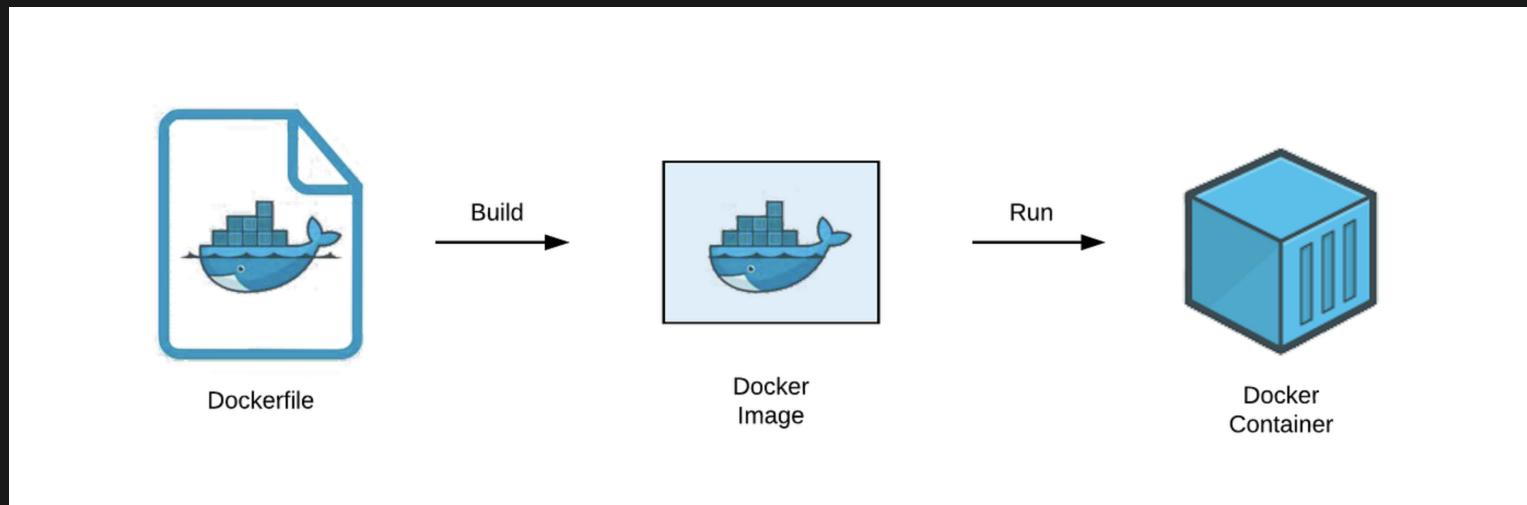
- Containerized Application Snapshot
- Layered File System
- Immutable and Versioned
- Portable and Reproducible
- Efficient Deployment and Scalability

# dokerdile

## Dockerfile - myhttpd:0.1

```
1 # A simple web app served by httpd
2 FROM httpd:2.4
3
4 LABEL AUTHOR=user@example.com
5
6 LABEL VERSION=0.1
7
8 # COPY mypage.html /usr/local/apache2/htdocs/mypage.html
9 # WORKDIR /usr/local/apache2
10
11 COPY mypage.html htdocs/mypage.html
```

# Cycle



# Container

- Runnable Instance of a Docker Image
- Isolation
- Efficient Resource Utilization
- Dynamic and Scalable
- Stateless and Immutable

# Registry

- Image Storage and Distribution
- Private and Public Registries
- Image Tagging and Versioning
- Security and Access Control
- Self-Hosted Registries

# Registry

Screenshot of the Docker Hub Registry search results for "ubuntu".

The search bar shows "ubuntu".

Filters applied:

- Products:
  - Images
  - Extensions
  - Plugins
- Trusted Content:
  - Docker Official Image ⓘ
  - Verified Publisher ⓘ
  - Sponsored OSS ⓘ
- Operating Systems:
  - Linux
  - Windows
- Architectures:
  - ARM
  - ARM 64
  - IBM POWER
  - IBM Z

Results (1 - 25 of 10 000 results for ubuntu):

Best Match

- ubuntu** Docker Official Image · 1B+ · 10K+  
Updated a month ago  
Ubuntu is a Debian-based Linux operating system based on free software.  
Linux ARM 64 PowerPC 64 LE IBM Z 386 riscv64 x86-64 ARM  
[Learn more](#)
- websphere-liberty** Docker Official Image · 10M+ · 297  
Updated a month ago  
WebSphere Liberty multi-architecture images based on Ubuntu 18.04  
Linux x86-64 PowerPC 64 LE IBM Z ARM 64 386  
[Learn more](#)
- open-liberty** Docker Official Image · 10M+ · 62  
Updated a month ago  
Open Liberty multi-architecture images based on Ubuntu 18.04  
Linux 386 x86-64 ARM 64 PowerPC 64 LE IBM Z  
[Learn more](#)

Pulls: 28,080,279 Last week

Pulls: 9,686 Last week

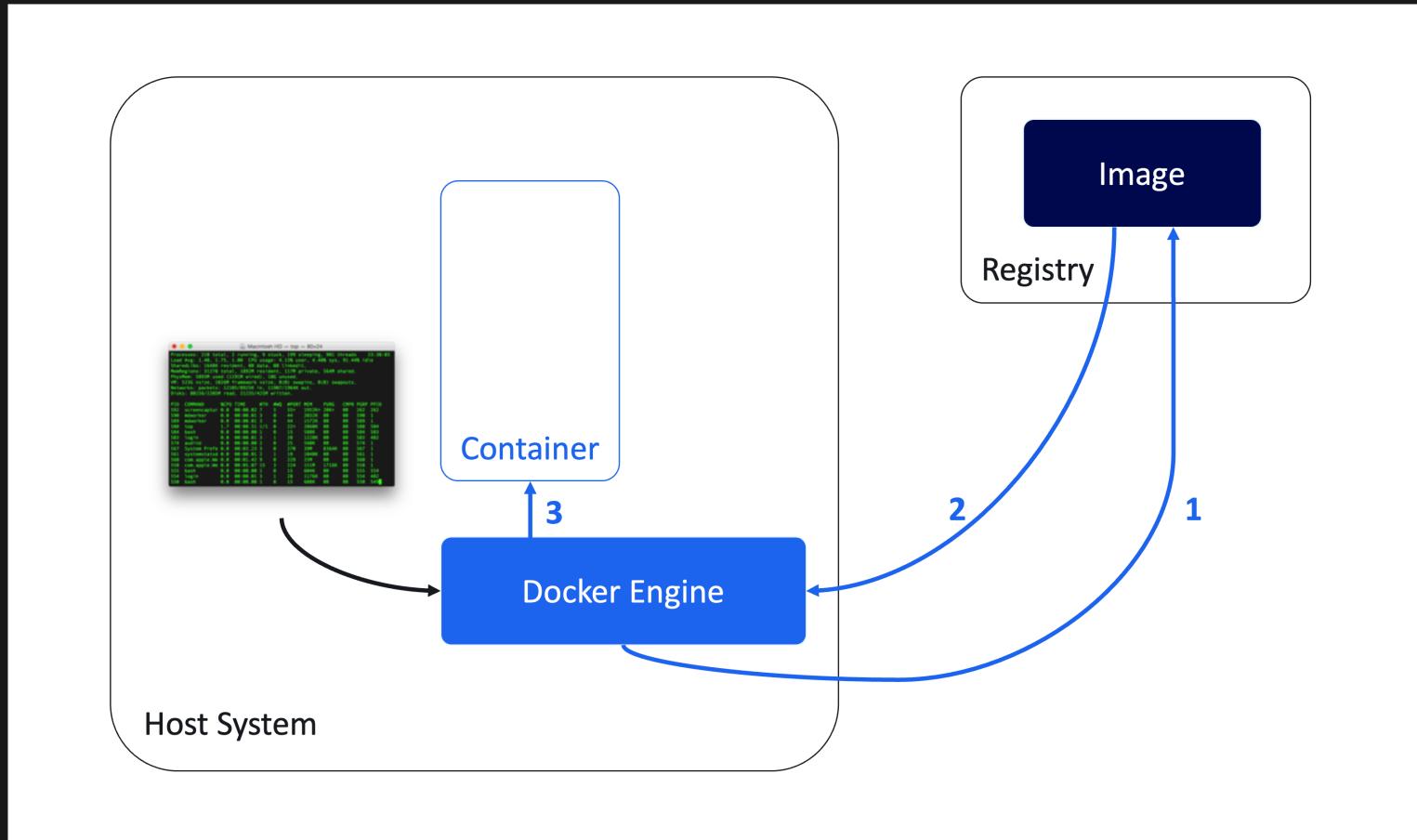
Pulls: 5,698 Last week

<https://hub.docker.com/>

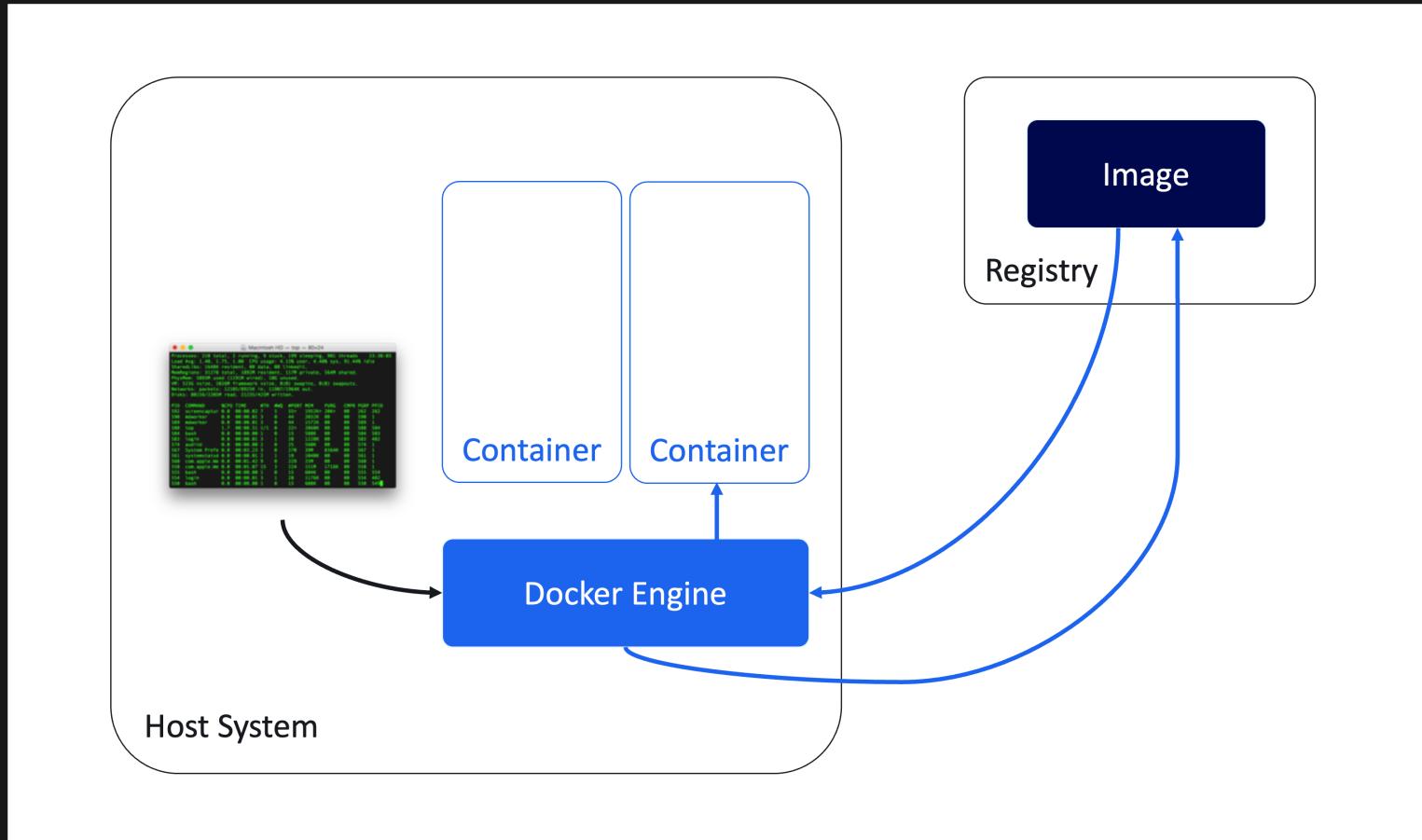


Practical

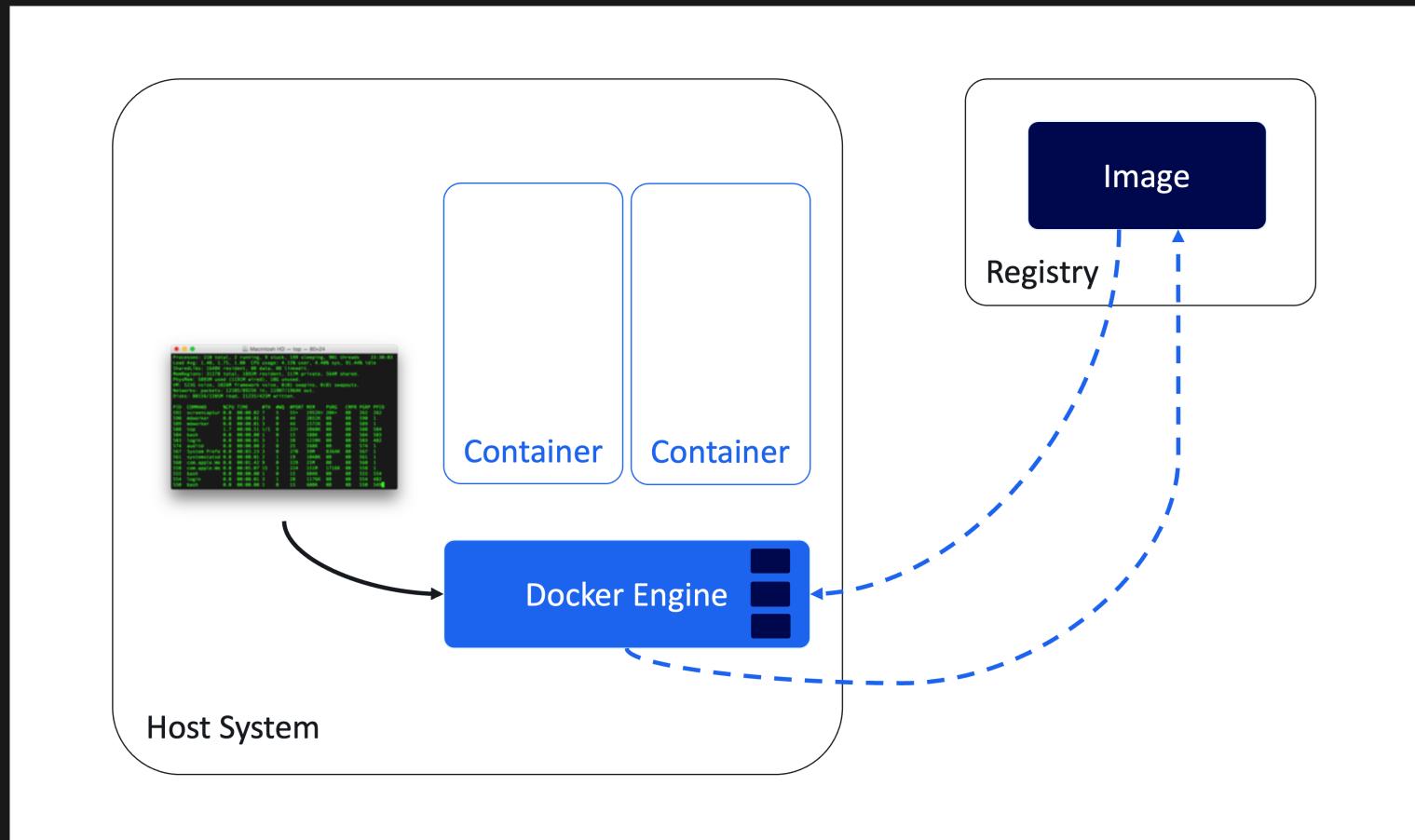
# Starting container



# Starting container



# Local registry



# Starting container

Run the following command :

```
$ docker run [OPTIONS] IMAGE [COMMAND] [ARG...]
```

with port forwarding :

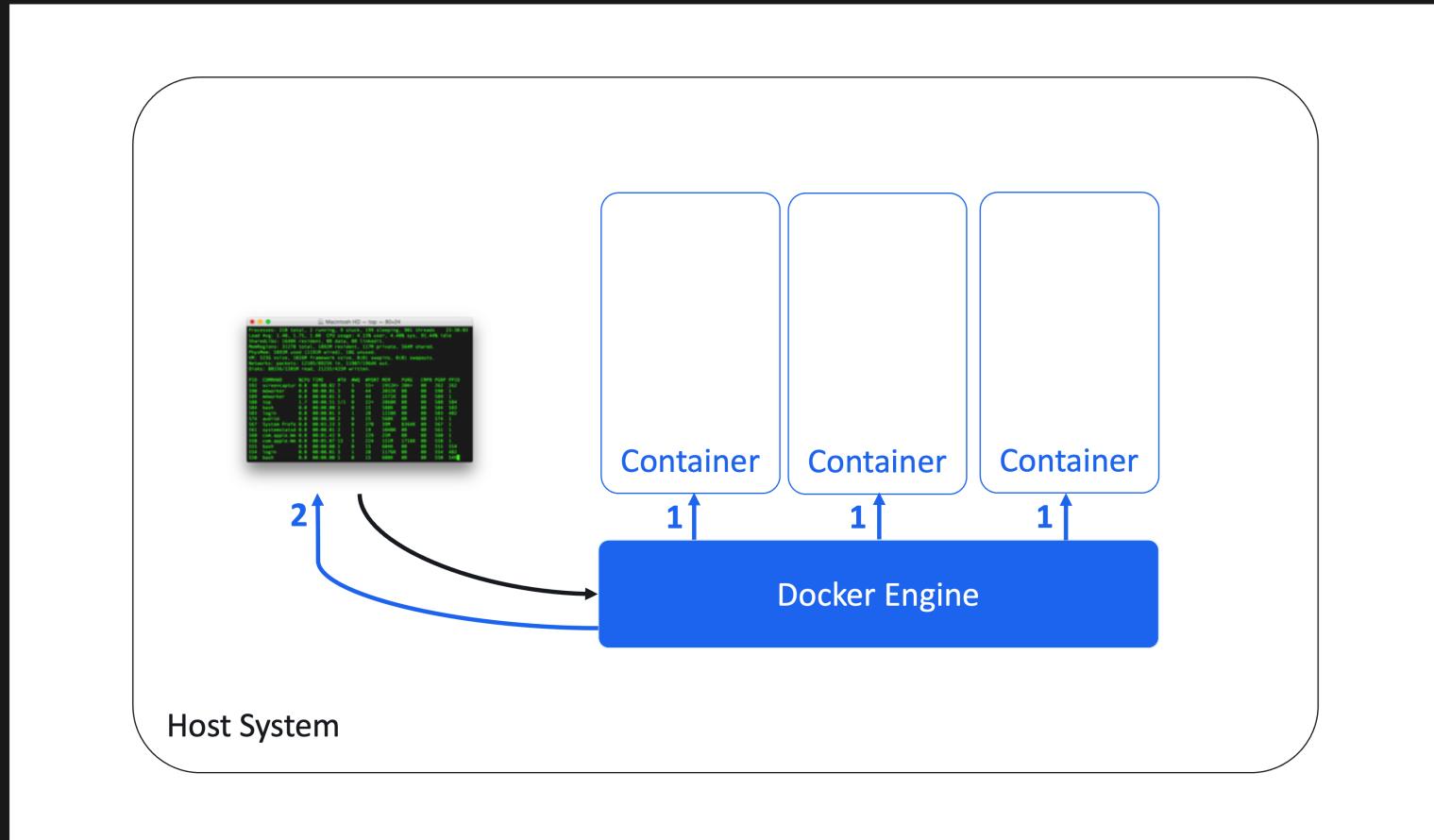
```
$ docker run -p 8080:80 IMAGE
```

[documentation](#)

# Starting container

```
thoma> docker run -it ubuntu /bin/bash
Unable to find image 'ubuntu:latest' locally
latest: Pulling from library/ubuntu
35c102085707: Pull complete
251f5509d51d: Pull complete
8e829fe70a46: Pull complete
6001e1789921: Pull complete
Digest: sha256:d1d454df0f579c6be4d8161d227462d69e163a8ff9d20a847533989cf0c94d90
Status: Downloaded newer image for ubuntu:latest
root@c83ff57ebb1b:/# ls
bin  dev  home  lib64  mnt  proc  run  srv  tmp  var
boot  etc  lib  media  opt  root  sbin  sys  usr
root@c83ff57ebb1b:/#
```

# List current containers



# List current containers

Run the following command :

```
$ docker stats [OPTIONS] [CONTAINER...]
```

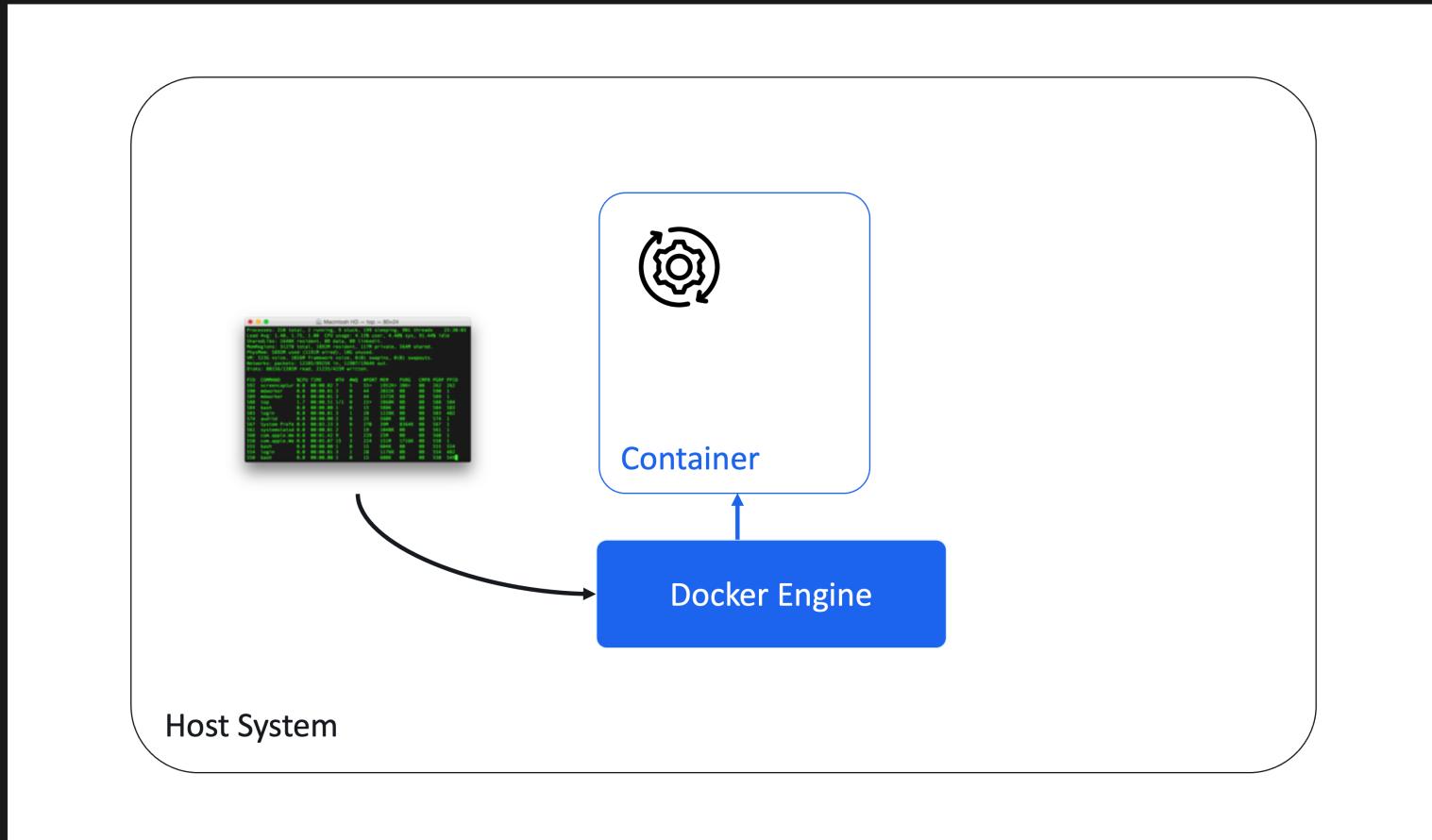
[documentation](#)

# List current containers

```
$ docker stats
```

CONTAINER ID	NAME	CPU %	MEM USAGE /
b95a83497c91	awesome_brattain	0.28%	5.629MiB /
67b2525d8ad1	foobar	0.00%	1.727MiB /
e5c383697914	test-1951.1.kay7x1lh1twk9c0oig50sd5tr	0.00%	196KiB / 1.
4bda148efbc0	random.1.vnc8on831idyr42slu578u3cr	0.00%	1.672MiB /

# Execute commands



# Execute commands

Run the following command :

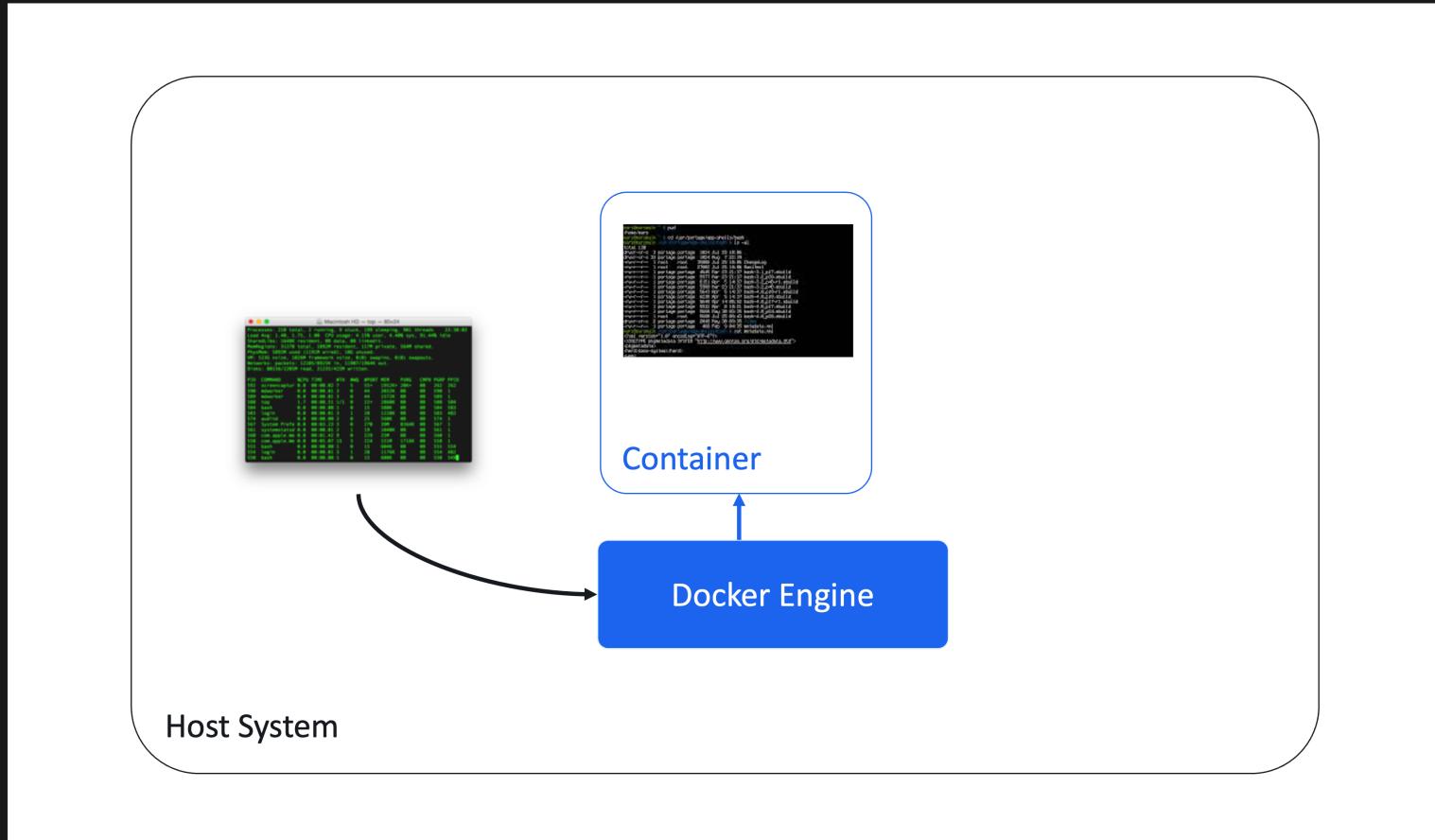
```
$ docker exec [OPTIONS] CONTAINER COMMAND [ARG...]
```

[documentation](#)

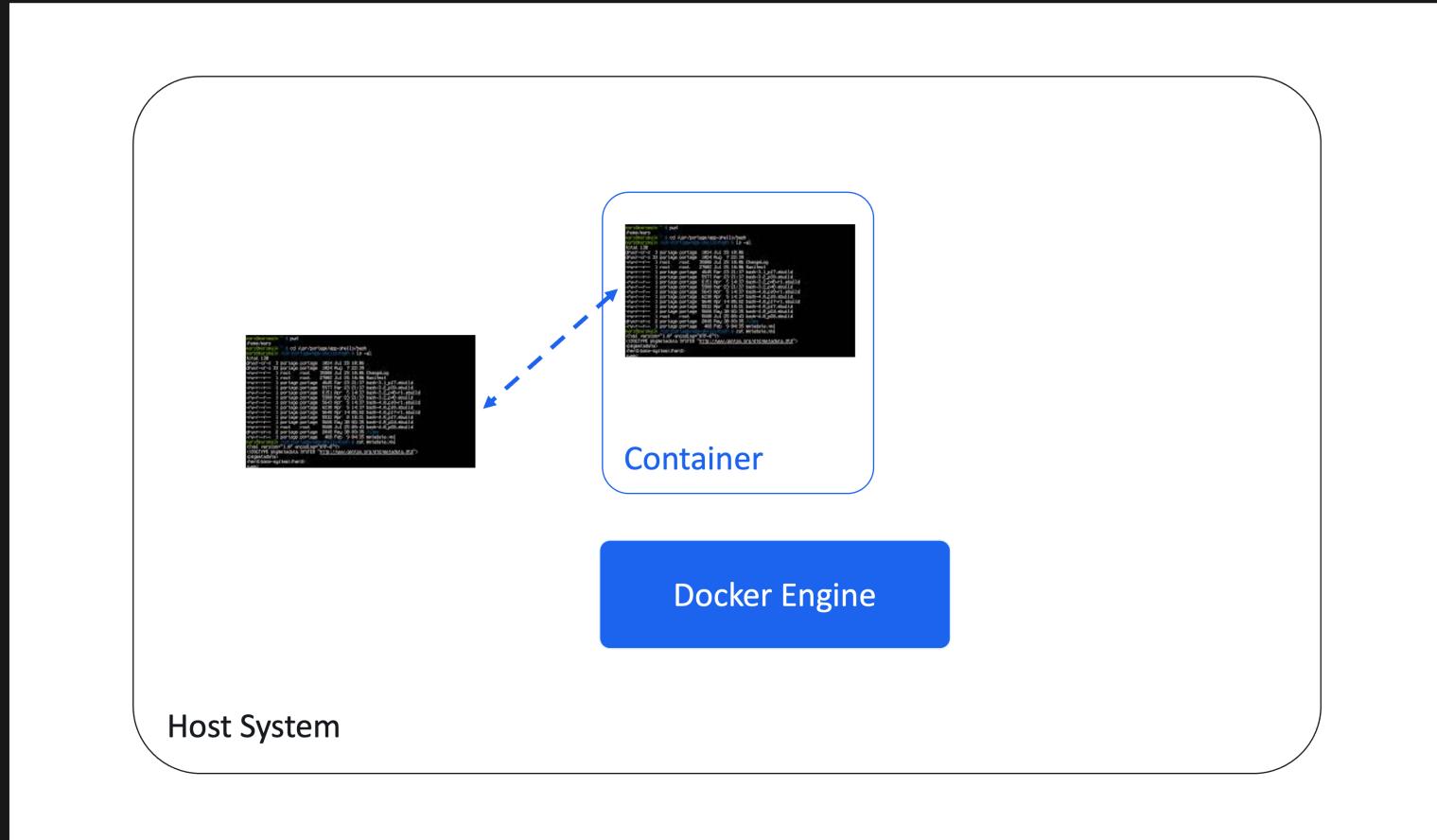
# Execute commands

```
$ docker exec -e VAR_A=1 -e VAR_B=2 mycontainer env  
PATH=/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin  
HOSTNAME=f64a4851eb71  
VAR_A=1  
VAR_B=2  
HOME=/root
```

# Execute shell



# Execute shell

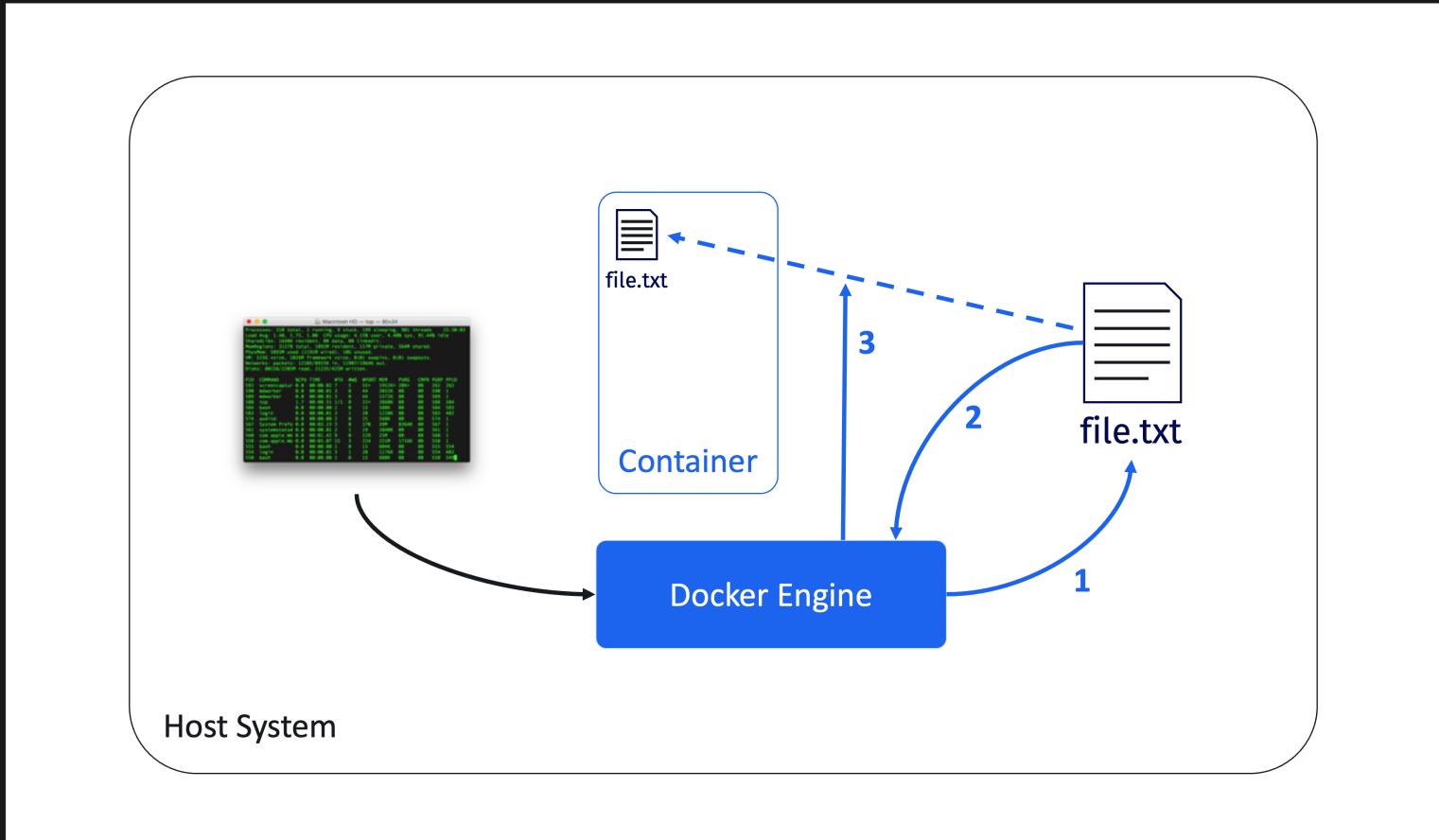


# Execute shell

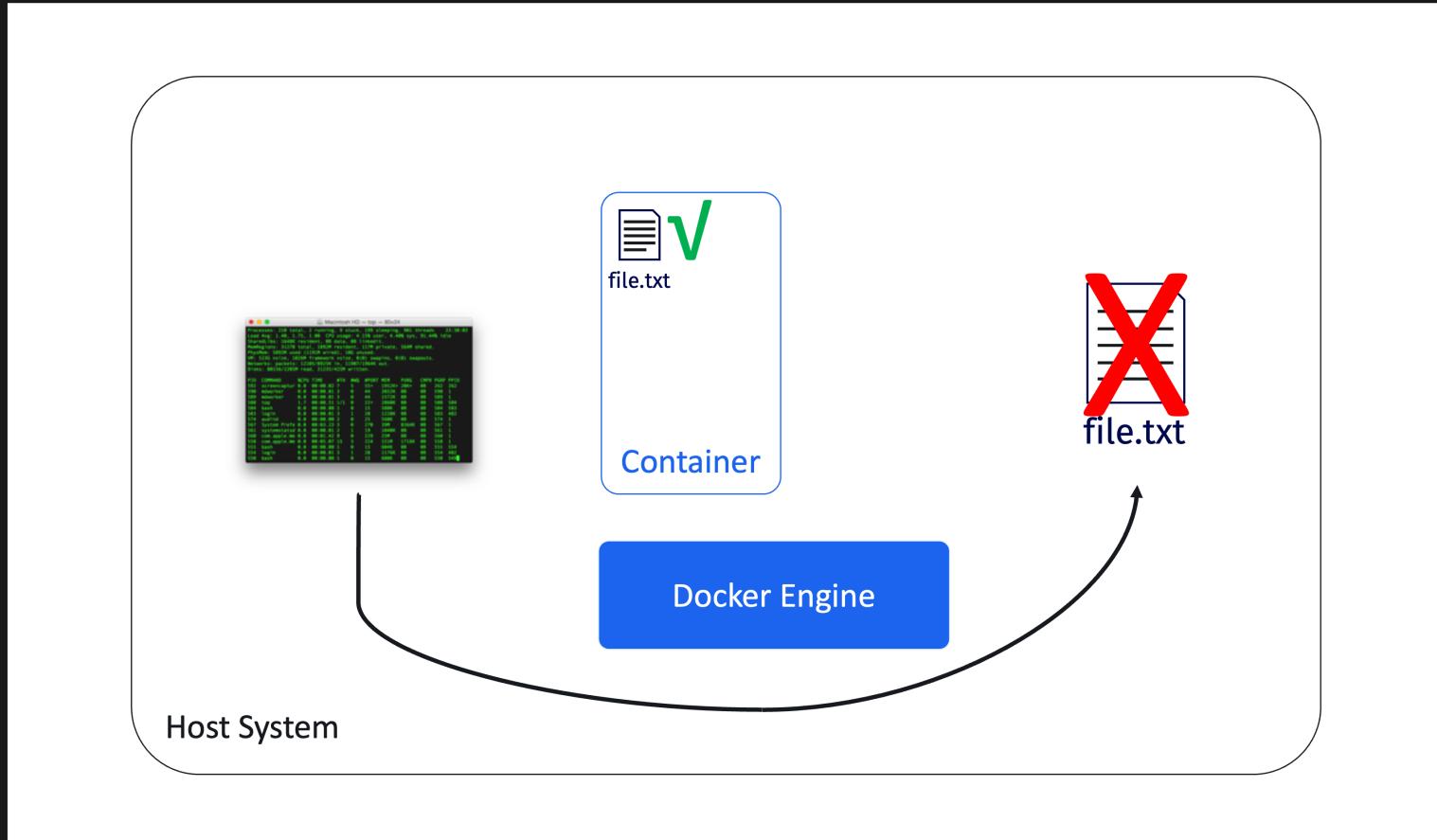
Run the following command :

```
$ docker exec -it CONTAINER /bin/ash
```

# Copy File/Directory



# Copy File/Directory



# Copy File/Directory

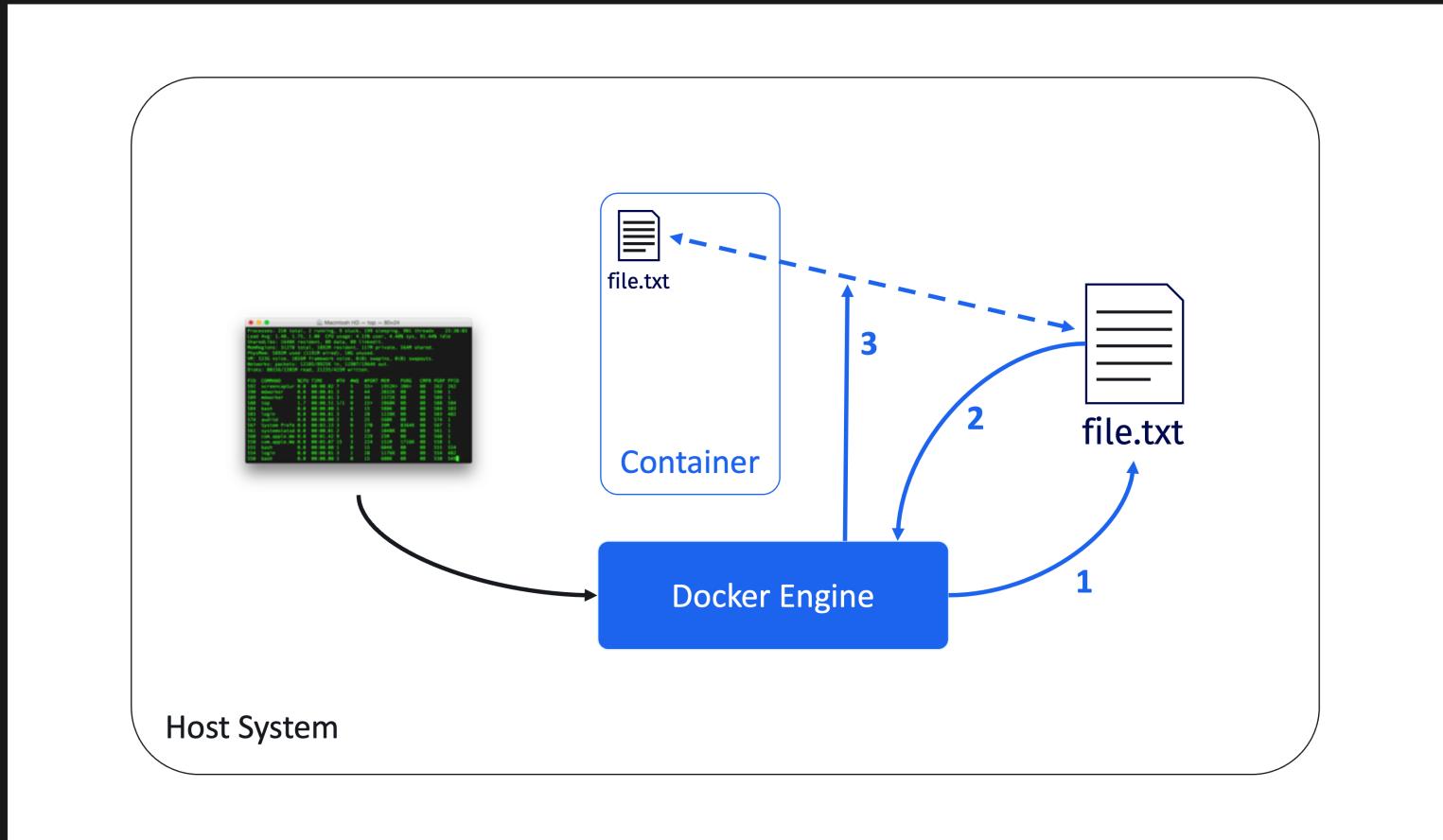
Run the following command :

```
$ docker cp [OPTIONS] CONTAINER:SRC_PATH DEST_PATH|-
```

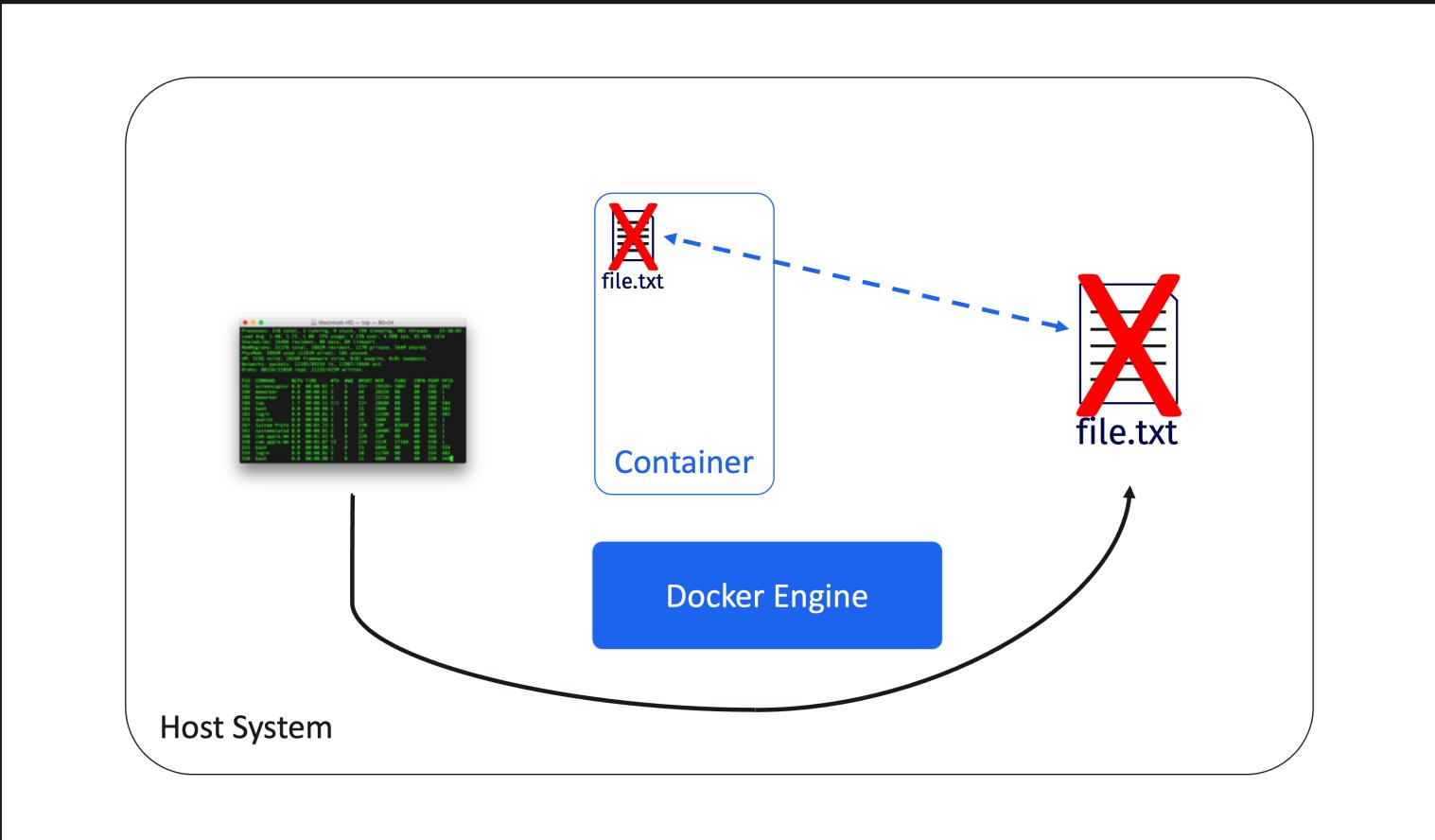
```
$ docker cp [OPTIONS] SRC_PATH|- CONTAINER:DEST_PATH
```

[documentation](#)

# Mount File/Directory



# Mount File/Directory



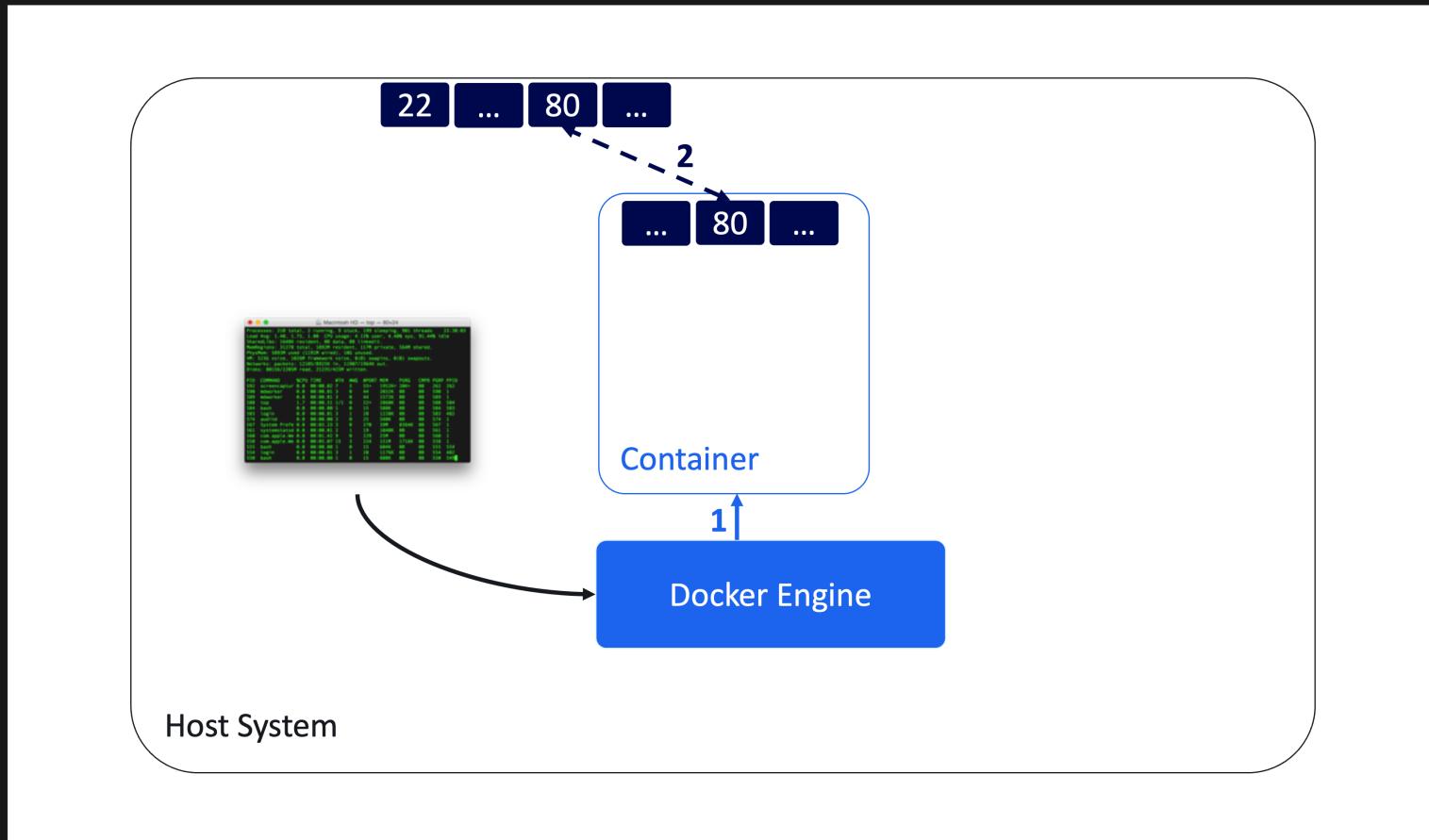
# Mount File/Directory

Run the following command :

```
$ docker run --mount source=<hostDir>,target=<targetDir> CONTAINER
```

[documentation](#)

# Port Forwarding



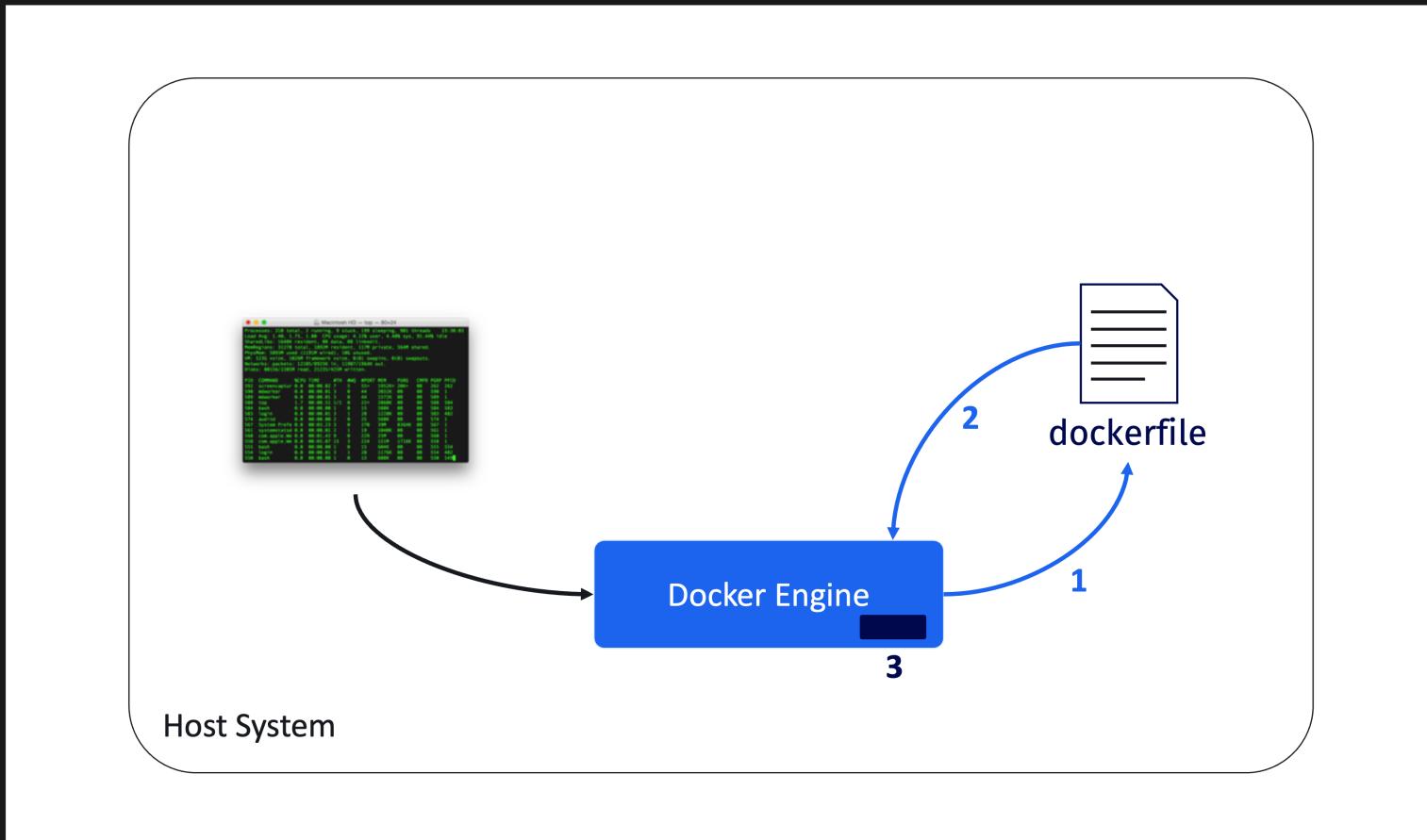
# Port Forwarding

Run the following command :

```
$ docker run -p 80:80 CONTAINER
```

[documentation](#)

# Create Image



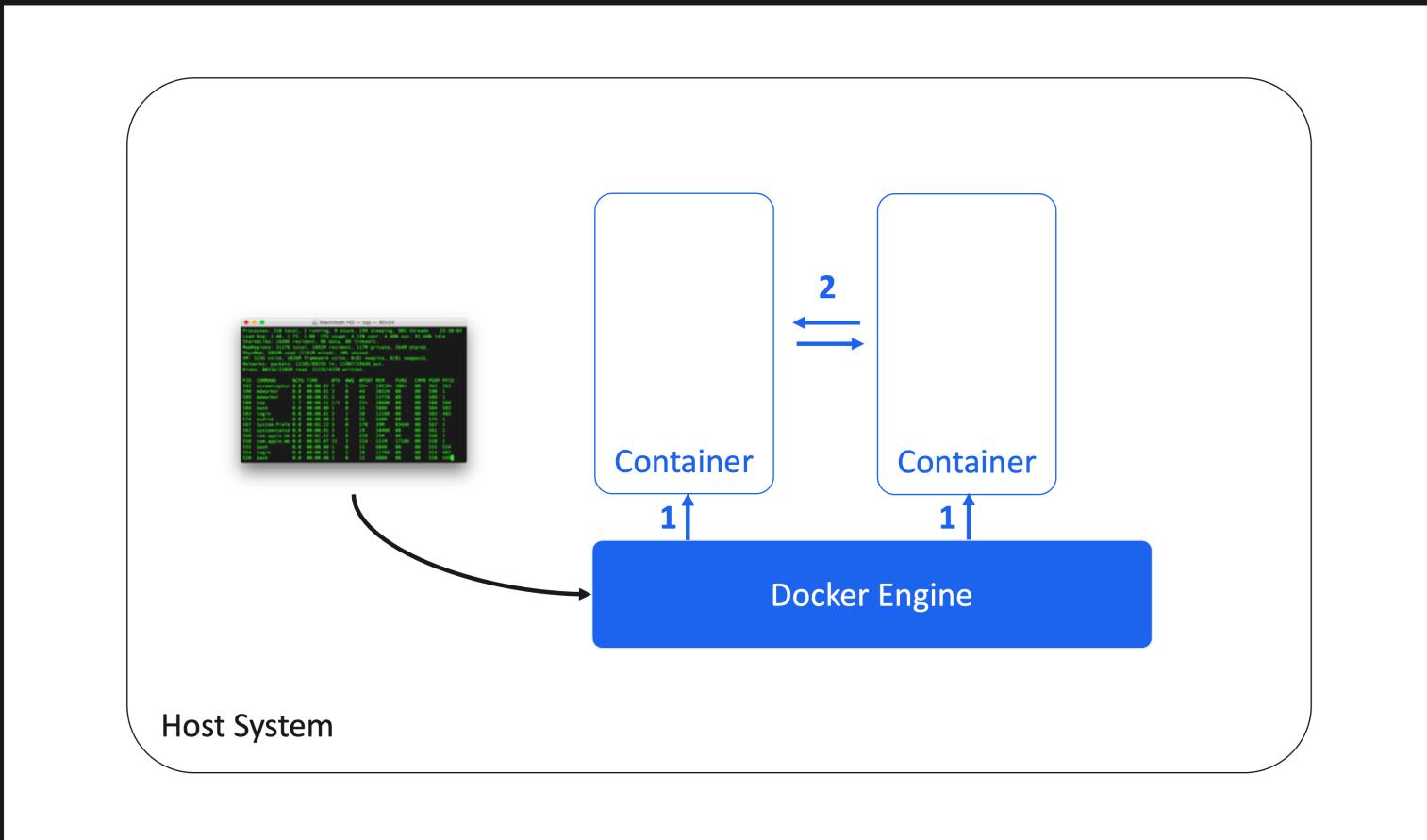
# Execute commands

Run the following command :

```
$ docker build [OPTIONS] PATH | URL | -
```

[documentation](#)

# Composition



# Composition

Run the following command :

```
$ docker docker compose
```

[documentation](#)

Try it !

