DEVELOP & DEPLOY GenAI Application with Docker

End-to-End Tutorial

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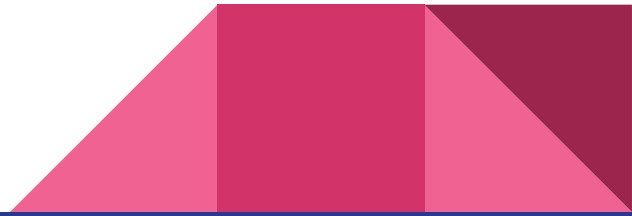
Overview

- What is Docker? (All Concepts ***SIMPLY EXPLAINED***)
- GenAI Application Code
- Dockerization and Containerization of GenAI Application
- Push our Docker Image to Docker Hub
- Pull this Image from Docker Hub and use it locally

Docker Concepts

- What and Why Docker?
- Docker Explained with Toy Robot Analogy *(Code → Image → Container)*
- Key Components
- Workflow for Docker Deployments
- Port Exposing and Port Binding
- Features of Docker
- Dockerization and Containerization of GenAI Application



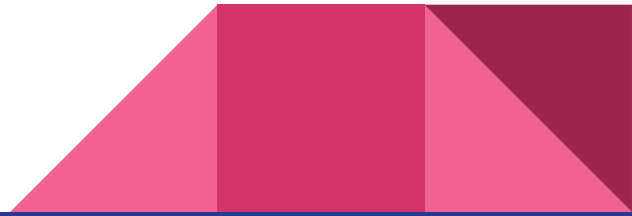
What and Why?

Docker is a tool that packages applications **(Universal Shipping Box for Software)**

- Portable, self-contained "*containers*."
- Containers bundle everything an app needs to run (code, libraries, settings) so it works identically on any machine.

Why Docker?

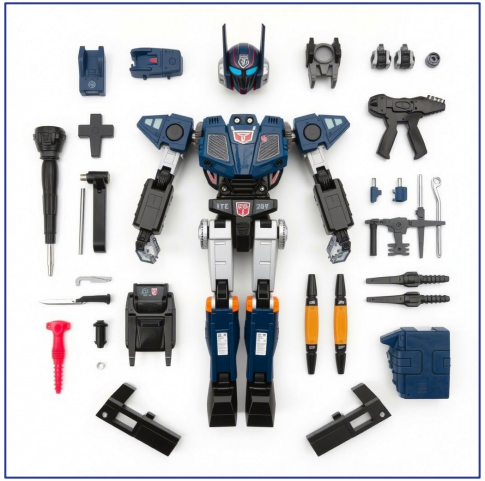
- Lightweight
- Isolation
- Speed
- Works everywhere



Docker–Explained Like Shipping a Toy

Application Code = The Toy Robot Parts

- Your app's code (e.g., Python script, HTML files) → The robot's parts (arms, legs, circuits).
- Dockerfile = The Instruction Manual.
- A simple guide that says:
  - "Use the 'ToyBase' toolbox (e.g., FROM python:3.8)."
  - "Attach the arms (e.g., COPY app.py)."
  - "Add batteries (e.g., RUN pip install flask)."



Docker–Explained Like Shipping a Toy

Docker Image = The Packed Toy Box

- ***What it is:*** A ready-to-ship box containing:
  - The assembled robot (your app).
  - Tools, batteries, and a mini instruction manual (OS, dependencies, configs).
- How it's built:
  - You shout: "**Build the box!**" → *docker build -t my-robot:1.0* . (CLI command).
  - The Docker CLI (**your voice**) tells the Docker Engine (**professional worker**) to follow the Dockerfile.

Docker–Explained Like Shipping a Toy

Docker Container = The Toy Running at Your Friend's House

- ***What it is:*** The running robot (**your app**) inside your friend's home.
- How it's started:
  - You say: "**Ship the box!**" → docker run -d -p 80:5000 my-robot:1.0.
  - The Docker Engine (**friend**) finds the box (**image**) on your desk (**Host**), copies it, and sends it to your friend's house (still your computer, but in an isolated room).

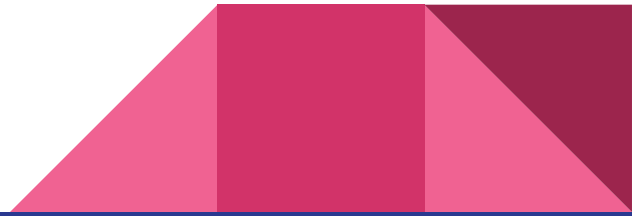
Docker–Key Players

Code → Image → Container = Parts → Box → Running Robot.

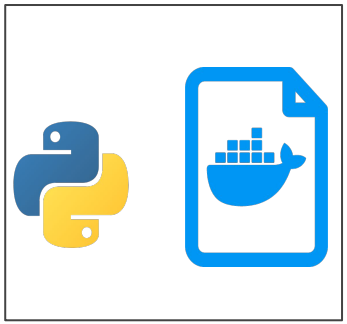
- Docker CLI = Your voice.
- Docker Engine = The professional worker.
- Registry = The warehouse.
- Host = The desk where magic happens.

Docker–Features

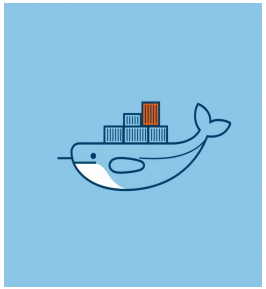
1. Containerization
2. Scalability (with Orchestration Tools–K8s)
3. Version Control
4. Efficiency
5. Portability
6. Docker Hub



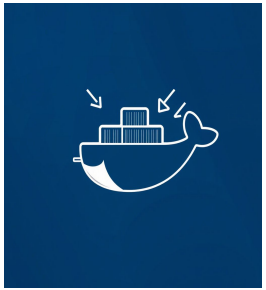
Docker–Workflow



BUILD



RUN



Code + Dockerfile

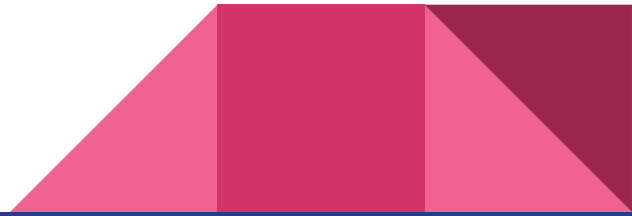
Docker Image

Docker Container

Docker–Ports

Docker containers are like isolated rooms. By default, they're closed off, but you can open "windows" (ports) to let traffic in/out:

1. ***Exposing a Port*** (Dockerfile):
    a. "This room has a window (e.g., port 80)."
    b. Done with EXPOSE 80 in the Dockerfile. It's a declaration, not an open window.
2. ***Binding a Port*** (docker run -p):
    a. "Connect the room's window (port 80) to a door on your house (host port 8080)."
    b. Run with -p 8080:80 → Traffic to your machine's port 8080 flows to the container's port 80.

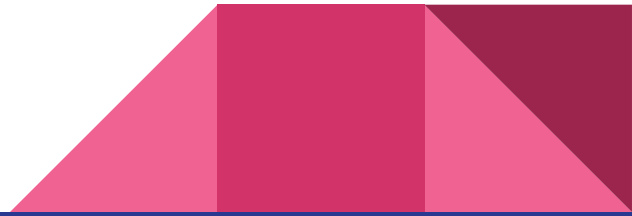


GenAI App–AI Doctor 2.0

- Usage
- Technical Architecture
- Tools and Technologies
  - Langchain & LangGraph
  - OpenAI Whisper
  - ElevenLabs
  - Gradio
  - Groq
  - Meta Llama vision
  - TTS, STT AI models
  - Multi-modal Model

Containerization of GenAI App

1. Write application code
    a. Clone already written code from Github
2. Create a Dockerfile for instructions
    a. Use official lightweight base image
    b. Copy application code there
    c. Set working directory
    d. Install required dependencies
    e. Expose the required port
    f. Start the code INSIDE the docker container
3. Build the Docker Image
4. Push the Docker Image to DockerHub
5. Pull the Docker Image from DockerHub and use it!



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