

AN OPENSOURCE EBOOK

INTRODUCTION TO



docker[®]

Bobby Iliev

About the book	10
About the author	11
Sponsors	12
Ebook PDF Generation Tool	14
Book Cover	15
License	16
Chapter 1: Introduction to Docker	17
What is Docker?	18
Why Use Docker?	19
Docker Architecture	20
Containers vs. Virtual Machines	21
Basic Docker Workflow	22
Docker Components	23
Use Cases for Docker	24
Conclusion	25
Chapter 2: Installing Docker	26
Docker Editions	27
Installing Docker on Linux	28
Installing Docker on macOS	32
Installing Docker on Windows	33
Post-Installation Steps	34
Docker Desktop vs Docker Engine	35
Troubleshooting Common Installation Issues	36
Updating Docker	37

Uninstalling Docker	38
Conclusion	39
Chapter 3: Working with Docker Containers	40
Running Your First Container	41
Basic Docker Commands	42
Running Containers in Different Modes	44
Port Mapping	45
Working with Container Logs	46
Executing Commands in Running Containers	47
Practical Example: Running an Apache Container	48
Container Resource Management	49
Container Networking	50
Data Persistence with Volumes	51
Container Health Checks	52
Cleaning Up	53
Conclusion	54
Chapter 4: What are Docker Images	55
Key Concepts	56
Working with Docker Images	57
Building Custom Images	59
Image Tagging	60
Pushing Images to Docker Hub	61
Image Layers and Caching	62
Multi-stage Builds	63
Image Scanning and Security	64
Best Practices for Working with Images	65
Image Management and Cleanup	66
Conclusion	67

Chapter 5: What is a Dockerfile	68
Anatomy of a Dockerfile	69
Dockerfile Instructions	70
Best Practices for Writing Dockerfiles	74
Advanced Dockerfile Concepts	76
Conclusion	77
Chapter 6: Docker Networking	78
Docker Network Drivers	79
Working with Docker Networks	80
Deep Dive into Network Drivers	82
Network Troubleshooting	84
Best Practices	85
Advanced Topics	86
Conclusion	87
Chapter 7: Docker Volumes	88
Why Use Docker Volumes?	89
Types of Docker Volumes	90
Working with Docker Volumes	92
Volume Drivers	94
Best Practices for Using Docker Volumes	95
Advanced Volume Concepts	96
Troubleshooting Volume Issues	97
Conclusion	98
Chapter 8: Docker Compose	99
Key Benefits of Docker Compose	100
The docker-compose.yml File	101

Key Concepts in Docker Compose	102
Basic Docker Compose Commands	103
Advanced Docker Compose Features	104
Practical Examples	106
Best Practices for Docker Compose	111
Scaling Services	112
Networking in Docker Compose	113
Volumes in Docker Compose	114
Conclusion	115
Chapter 9: Docker Security Best Practices	116
1. Keep Docker Updated	117
2. Use Official Images	118
3. Scan Images for Vulnerabilities	119
4. Limit Container Resources	120
5. Use Non-Root Users	121
6. Use Secret Management	122
7. Enable Content Trust	123
8. Use Read-Only Containers	124
9. Implement Network Segmentation	125
10. Regular Security Audits	126
11. Use Security-Enhanced Linux (SELinux) or AppArmor	127
12. Implement Logging and Monitoring	128
Conclusion	129
Chapter 10: Docker in Production: Orchestration with Kubernetes	130
Key Kubernetes Concepts	131
Setting Up a Kubernetes Cluster	132
Deploying a Docker Container to Kubernetes	133
Scaling in Kubernetes	135

Rolling Updates	136
Monitoring and Logging	137
Kubernetes Dashboard	138
Persistent Storage in Kubernetes	139
Kubernetes Networking	140
Kubernetes Secrets	141
Helm: The Kubernetes Package Manager	142
Best Practices for Kubernetes in Production	143
Conclusion	144
Chapter 11: Docker Performance Optimization	145
1. Optimizing Docker Images	146
2. Container Resource Management	148
3. Networking Optimization	149
4. Storage Optimization	150
5. Logging and Monitoring	151
6. Docker Daemon Optimization	152
7. Application-Level Optimization	153
8. Benchmarking and Profiling	154
9. Orchestration-Level Optimization	155
Conclusion	156
Chapter 12: Docker Troubleshooting and Debugging	157
1. Container Lifecycle Issues	158
2. Networking Issues	159
3. Storage and Volume Issues	160
4. Resource Constraints	161
5. Image-related Issues	162
6. Docker Daemon Issues	163
7. Debugging Techniques	164

8. Performance Debugging	165
9. Docker Compose Troubleshooting	166
Conclusion	167
Chapter 13: Advanced Docker Concepts and Features	168
1. Multi-stage Builds	169
2. Docker BuildKit	170
3. Custom Bridge Networks	171
4. Docker Contexts	172
5. Docker Content Trust (DCT)	173
6. Docker Secrets	174
7. Docker Health Checks	175
8. Docker Plugins	176
9. Docker Experimental Features	177
10. Container Escape Protection	178
11. Custom Dockerfile Instructions	179
12. Docker Manifest	180
13. Docker Buildx	181
14. Docker Compose Profiles	182
Conclusion	183
Chapter 14: Docker in CI/CD Pipelines	184
1. Docker in Continuous Integration	185
2. Docker in Continuous Deployment	186
3. Docker Compose in CI/CD	188
4. Security Scanning	189
5. Performance Testing	190
6. Environment-Specific Configurations	191
7. Caching in CI/CD	192
8. Blue-Green Deployments with Docker	193

9. Monitoring and Logging in CI/CD	194
Conclusion	195
Chapter 15: Docker and Microservices Architecture	196
1. Principles of Microservices	197
2. Dockerizing Microservices	198
3. Inter-service Communication	199
4. Service Discovery	201
5. API Gateway	202
6. Data Management	203
7. Monitoring Microservices	204
8. Scaling Microservices	205
9. Testing Microservices	206
10. Deployment Strategies	207
Conclusion	208
Chapter 16: Docker for Data Science and Machine Learning	209
1. Setting Up a Data Science Environment	210
2. Managing Dependencies with Docker	211
3. GPU Support for Machine Learning	212
4. Distributed Training with Docker Swarm	213
5. MLOps with Docker	214
6. Data Pipeline with Apache Airflow	215
7. Reproducible Research with Docker	216
8. Big Data Processing with Docker	217
9. Automated Machine Learning (AutoML) with Docker	218
10. Hyperparameter Tuning at Scale	219
Conclusion	220
What is Docker Swarm mode	221

Docker Services	222
Building a Swarm	223
Managing the cluster	225
Promote a worker to manager	227
Using Services	228
Scaling a service	230
Deleting a service	232
Docker Swarm Knowledge Check	233
Conclusion	234
Other eBooks	235

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This is an introduction to Docker ebook that will help you learn the basics of Docker and how to start using containers for your SysOps, DevOps, and Dev projects. No matter if you are a DevOps/SysOps engineer, developer, or just a Linux enthusiast, you will most likely have to use Docker at some point in your career.

The guide is suitable for anyone working as a developer, system administrator, or a DevOps engineer and wants to learn the basics of Docker.

My name is Bobby Iliev, and I have been working as a Linux DevOps Engineer since 2014. I am an avid Linux lover and supporter of the open-source movement philosophy. I am always doing that which I cannot do in order that I may learn how to do it, and I believe in sharing knowledge.

I think it's essential always to keep professional and surround yourself with good people, work hard, and be nice to everyone. You have to perform at a consistently higher level than others. That's the mark of a true professional.

For more information, please visit my blog at <https://bobbyiliev.com>, follow me on Twitter [@bobbyiliev_](#) and [YouTube](#).

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Docker is an open-source platform that automates the deployment, scaling, and management of applications using containerization technology. It allows developers to package applications and their dependencies into standardized units called containers, which can run consistently across different environments.

1. **Containerization:** A lightweight form of virtualization that packages applications and their dependencies together.
2. **Docker Engine:** The runtime that allows you to build and run containers.
3. **Docker Image:** A read-only template used to create containers.
4. **Docker Container:** A runnable instance of a Docker image.
5. **Docker Hub:** A cloud-based registry for storing and sharing Docker images.

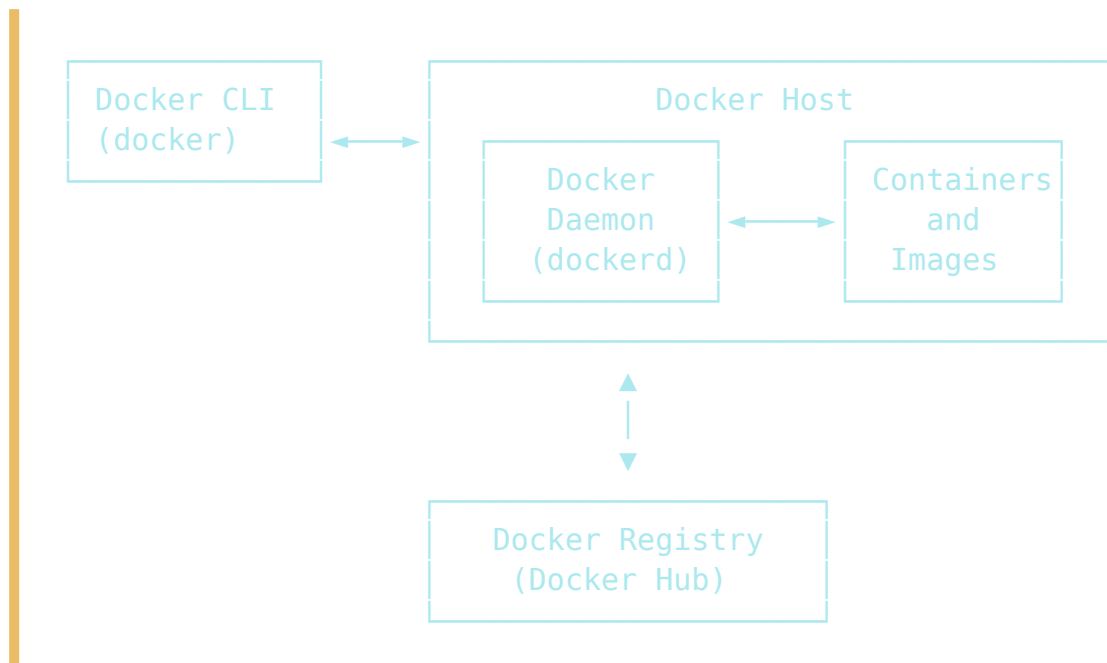
Docker offers numerous advantages for developers and operations teams:

1. **Consistency:** Ensures applications run the same way in development, testing, and production environments.
2. **Isolation:** Containers are isolated from each other and the host system, improving security and reducing conflicts.
3. **Portability:** Containers can run on any system that supports Docker, regardless of the underlying infrastructure.
4. **Efficiency:** Containers share the host system's OS kernel, making them more lightweight than traditional virtual machines.
5. **Scalability:** Easy to scale applications horizontally by running multiple containers.
6. **Version Control:** Docker images can be versioned, allowing for easy rollbacks and updates.

Docker uses a client-server architecture:

1. **Docker Client:** The primary way users interact with Docker through the command line interface (CLI).
2. **Docker Host:** The machine running the Docker daemon (dockerd).
3. **Docker Daemon:** Manages Docker objects like images, containers, networks, and volumes.
4. **Docker Registry:** Stores Docker images (e.g., Docker Hub).

Here's a simplified diagram of the Docker architecture:



While both containers and virtual machines (VMs) are used for isolating applications, they differ in several key aspects:

Aspect	Containers	Virtual Machines
OS	Share host OS kernel	Run full OS and kernel
Resource Usage	Lightweight, minimal overhead	Higher resource usage
Boot Time	Seconds	Minutes
Isolation	Process-level isolation	Full isolation
Portability	Highly portable across different OSes	Less portable, OS-dependent
Performance	Near-native performance	Slight performance overhead
Storage	Typically smaller (MBs)	Larger (GBs)

1. **Build:** Create a Dockerfile that defines your application and its dependencies.
2. **Ship:** Push your Docker image to a registry like Docker Hub.
3. **Run:** Pull the image and run it as a container on any Docker-enabled host.

Here's a simple example of this workflow:

```
# Build an image
docker build -t myapp:v1 .

# Ship the image to Docker Hub
docker push username/myapp:v1

# Run the container
docker run -d -p 8080:80 username/myapp:v1
```

1. **Dockerfile:** A text file containing instructions to build a Docker image.
2. **Docker Compose:** A tool for defining and running multi-container Docker applications.
3. **Docker Swarm:** Docker's native clustering and orchestration solution.
4. **Docker Network:** Facilitates communication between Docker containers.
5. **Docker Volume:** Provides persistent storage for container data.

1. **Microservices Architecture:** Deploy and scale individual services independently.
2. **Continuous Integration/Continuous Deployment (CI/CD):** Streamline development and deployment processes.
3. **Development Environments:** Create consistent development environments across teams.
4. **Application Isolation:** Run multiple versions of an application on the same host.
5. **Legacy Application Migration:** Containerize legacy applications for easier management and deployment.

Docker has revolutionized how applications are developed, shipped, and run. By providing a standardized way to package and deploy applications, Docker addresses many of the challenges faced in modern software development and operations. As we progress through this book, we'll dive deeper into each aspect of Docker, providing you with the knowledge and skills to leverage this powerful technology effectively.

Installing Docker is the first step in your journey with containerization. This chapter will guide you through the process of installing Docker on various operating systems, troubleshooting common issues, and verifying your installation.

Before we begin, it's important to understand the different Docker editions available:

1. **Docker Engine - Community:** Free, open-source Docker platform suitable for developers and small teams.
2. **Docker Engine - Enterprise:** Designed for enterprise development and IT teams building, running, and operating business-critical applications at scale.
3. **Docker Desktop:** An easy-to-install application for Mac or Windows environments that includes Docker Engine, Docker CLI client, Docker Compose, Docker Content Trust, Kubernetes, and Credential Helper.

For most users, Docker Engine - Community or Docker Desktop will be sufficient.

Docker runs natively on Linux, making it the ideal platform for Docker containers. There are two main methods to install Docker on Linux: using the convenience script or manual installation for specific distributions.

Docker provides a convenient script that automatically detects your Linux distribution and installs Docker for you. This method is quick and works across many Linux distributions:

1. Run the following command to download and execute the Docker installation script:

```
wget -q0- https://get.docker.com | sh
```

2. Once the installation is complete, start the Docker service:

```
sudo systemctl start docker
```

3. Enable Docker to start on boot:

```
sudo systemctl enable docker
```

This method is ideal for quick setups and testing environments. However, for production environments, you might want to consider the manual installation method for more control over the process.

For more control over the installation process or if you prefer to follow distribution-specific steps, you can manually install Docker. Here are instructions for popular Linux distributions:

Docker runs natively on Linux, making it the ideal platform for Docker containers. Here's how to install Docker on popular Linux distributions:

1. Update your package index:

```
sudo apt-get update
```

2. Install prerequisites:

```
sudo apt-get install apt-transport-https ca-certificates  
curl software-properties-common
```

3. Add Docker's official GPG key:

```
curl -fsSL https://download.docker.com/linux/ubuntu/gpg |  
sudo apt-key add -
```

4. Set up the stable repository:

```
sudo add-apt-repository "deb [arch=amd64]  
https://download.docker.com/linux/ubuntu $(lsb_release -  
cs) stable"
```

5. Update the package index again:

```
sudo apt-get update
```

6. Install Docker:

```
sudo apt-get install docker-ce docker-ce-cli containerd.io
```

1. Install required packages:

```
sudo yum install -y yum-utils device-mapper-persistent-  
data lvm2
```

2. Add Docker repository:

```
sudo yum-config-manager --add-repo  
https://download.docker.com/linux/centos/docker-ce.repo
```

3. Install Docker:

```
sudo yum install docker-ce docker-ce-cli containerd.io
```

4. Start and enable Docker:

```
sudo systemctl start docker  
sudo systemctl enable docker
```

This is a sample from "Introduction to Docker" by Bobby Iliev.

For more information, [Click here](#).