Table of Contents

Preface	1
Chapter 1: Getting Started with Docker	g
The key drivers for Dockerization	10
Differentiating between containerization and virtualization	12
The latest additions to the Docker platform	14
Windows containers	15
Installing the Docker Engine	17
Installing Docker on Ubuntu	17
Installing Docker using an automated script	19
Installing Docker on the Mac	19
Installing Docker on Windows	22
Understanding the Docker setup	24
Client-server communication	26
Downloading the first Docker image	26
Running the first Docker container	27
Troubleshooting Docker containers	27
Summary	28
Chapter 2: Handling Docker Containers	29
Clarifying Docker terms	29
Docker images	30
Docker containers	31
Docker Registry	32
Working with Docker images	33
The Docker Hub	35
Searching Docker images	36
Working with an interactive container	38
Tracking changes inside containers	40
Controlling Docker containers	42
Housekeeping containers	45
Building images from containers	47
Launching a container as a daemon	49
Summary	50
Chapter 3: Building Images	51

	Docker's integrated image building system	51
	A quick overview of the Dockerfile's syntax	54
	The comment line	55
	The parser directives	55
	The Dockerfile build instructions	56
	The FROM instruction	56
	The MAINTAINER instruction	57
	The COPY instruction	58
	The ADD instruction	58
	The ENV instruction	60
	The ARG instruction	60
	The environment variables	61
	The USER instruction	61
	The WORKDIR instruction	62
	The VOLUME instruction	62
	The EXPOSE instruction	63
	The LABEL instruction	63
	The RUN instruction	64
	The CMD instruction	66
	The ENTRYPOINT instruction	68
	The HEALTHCHECK instruction	70
	The ONBUILD instruction	71
	The STOPSIGNAL instruction	71
	The SHELL instruction	72
	The .dockerignore file	72
	A brief on the Docker image management	73
	Best practices for writing a Dockerfile	75
	Summary	75
Chap	ter 4: Publishing Images	77
7	Understanding Docker Hub	78
	Pushing images to Docker Hub	81
	Automating the build process for images	88
	Private repositories on Docker Hub	91
	Organizations and teams on Docker Hub	93
	The REST API for Docker Hub	94
	Summary	96
Chap	ter 5: Running Your Private Docker Infrastructure	97
	Docker Registry	98

Docker Registry use cases	101
Running Docker Registry and pushing the image	103
Running the Docker Registry on localhost with an SSL certificate	106
Running Docker Registry with restrictions	109
Managing Docker Registry with Docker Compose	110
Load balancing consideration	111
Webhook notifications	112
Docker Registry HTTP API support	113
Summary	117
Chapter 6: Running Services in a Container	119
A brief overview of container networking	120
Envisaging container as a service	126
Building an HTTP server image	126
Running the HTTP server image as a service	128
Connecting to the HTTP service	129
Exposing container services	130
Publishing a container's port – the -p option	131
NAT for containers	132
Retrieving the container port	133
Binding a container to a specific IP address	135
Autogenerating the Docker host port	136
Port binding using EXPOSE and -P option	138
Summary	141
Chapter 7: Sharing Data with Containers	143
Data volume	144
The volume management command	148
Sharing host data	149
The practicality of host data sharing	154
Sharing data between containers	156
Data-only containers	156
Mounting data volume from other containers	157
The practicality of data sharing between containers	159
Avoiding common pitfalls	162
Directory leaks	162
The undesirable effect of data volume	163
Summary	165
Chapter 8: Orchestrating Containers	167
Docker inbuilt service discovery	168

	Linking containers	170
	Orchestration of containers	178
	Orchestrating containers using docker-compose	181
	Installing docker-compose	181
	The docker-compose file	183
	The docker-compose command	185
	Common usage	186
	Summary	192
Chap	oter 9: Testing with Docker	193
	A brief overview of TDD	194
	Testing your code inside Docker	194
	Running the test inside a container	199
	Using a Docker container as a runtime environment	201
	Integrating Docker testing into Jenkins	203
	Preparing the Jenkins environment	203
	Automating the Docker testing process	208
	Summary	214
Chap	oter 10: Debugging Containers	217
	Process-level isolation for Docker containers	218
	Control groups	222
	Debugging a containerized application	223
	The docker exec command	224
	The docker ps command	225
	The docker top command	226
	The docker stats command	227
	The Docker events command	227
	The docker logs command	228
	The docker attach command	228
	Debugging a Dockerfile	229
	Summary	231
Chap	oter 11: Securing Docker Containers	233
	The security scenario in the containerization domain	233
	The security ramifications of Docker containers	235
	The security facets – virtual machines versus Docker containers	236
	The prominent security-fulfilment features of containers	239
	Immutable infrastructure	240
	Resource isolation	240
	Resource accounting and control	241

The root privilege – impacts and best practices	242
The trusted user control	242
Non-root containers	242
SELinux for container security	244
Loading the Docker images and the security implications	246
Image signing and verification using TUF	248
The emerging security approaches	249
The best practices for container security	250
Secure deployment guidelines for Docker containers	253
The future of Docker security	254
Summary	255
Chapter 12: The Docker Platform – Distinct Capabilities and Use Case	S 257
Describing containers	258
Distinguishing Docker containers	258
Briefing the Docker platform	261
The evolving Docker platform components	262
Implications of the Docker technology	263
Modern enterprise development	263
MSA and Docker containers	264
Case study	265
Infrastructure optimization	266
Case study	267
Enabling DevOps	267
Continuous integration and continuous deployment	268
Continuous delivery Accurate testing	269 270
Facilitating CaaS	270
Accelerating workload modernization	271
Docker for stateful applications	272
Containers for edge computing	272
Devices networking, service enablement, and clustering Device service registry for discovery	273 273
Fault tolerance	273 274
Caching	274
The Docker use cases	274
Integrating containers into workflows	275
Docker for HPC and TC applications	275
Containers for telecom applications	276
Summary	277
Index	279