



1ST EDITION

Cloud-Native Development and Migration to Jakarta EE

Transform your legacy Java EE project
into a cloud-native application

RON VEEN | DAVID VLIJMINCX



Cloud-Native Development and Migration to Jakarta EE

Transform your legacy Java EE project
into a cloud-native application

Ron Veen

David Vlijmincx



BIRMINGHAM—MUMBAI

Cloud-Native Development and Migration to Jakarta EE

Copyright © 2023 Packt Publishing

All rights reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, without the prior written permission of the publisher, except in the case of brief quotations embedded in critical articles or reviews.

Every effort has been made in the preparation of this book to ensure the accuracy of the information presented. However, the information contained in this book is sold without warranty, either express or implied. Neither the authors, nor Packt Publishing or its dealers and distributors, will be held liable for any damages caused or alleged to have been caused directly or indirectly by this book.

Packt Publishing has endeavored to provide trademark information about all of the companies and products mentioned in this book by the appropriate use of capitals. However, Packt Publishing cannot guarantee the accuracy of this information.

Group Product Manager: Gebin George

Publishing Product Manager: Kunal Sawant

Senior Editor: Nithya Sadanandan

Technical Editor: Jubit Pincy

Copy Editor: Safis Editing

Project Coordinator: Deeksha Thakkar

Proofreader: Safis Editing

Indexer: Hemangini Bari

Production Designer: Ponraj Dhandapani

Marketing Coordinator: Sonia Chauhan

Business Development Executive: Samriddhi Murarka

First published: November 2023

Production reference: 3231023

Published by Packt Publishing Ltd.

Grosvenor House

11 St Paul's Square

Birmingham

B3 1R.

ISBN 978-1-83763-962-5

www.packtpub.com

For my loved ones, whose sacrifices made it possible for me to work on this book.

– Ron Veen

For Mariska and my parents, Bernadette and Frits.

– David Vlijmincx

Contributors

About the authors

Ron Veen is a highly experienced software engineer, navigating the spectrum from Midrange Systems to Micro Services. Driven by his passion for software engineering and software architecture, he has amassed more than 15 years of experience working on the JVM and the Java ecosystem. Ron has seen all the frameworks and libraries from Apache to ZK and has worked with many versions of Java EE and later, Jakarta EE. An avid fan of alternative JVM languages like Groovy, Scala, Clojure, and his personal favorite Kotlin, Ron is also an Oracle Certified Java Programmer (OCP) and Sun Certified Business Component Developer (SCBCD/OCPBCD). Ron is also a regular speaker at international conferences.

David Vlijmincx is a software developer with 8 years of experience in the field. He has a strong background in software development, with a focus on building scalable, high-quality applications using the Java programming language. David's expertise spans through a variety of projects, ranging from small, standalone applications to large, complex systems, which needed to be migrated to newer versions of the EE specification or the cloud. David is an Oracle Certified Java Programmer (OCP) and is an avid blogger and speaker at industry conferences.

About the reviewer

Edwin Derks, a distinguished Java Champion hailing from The Netherlands, excels in unraveling intricate and strategic IT challenges as a dedicated Consultant. He is passionate about gathering and sharing knowledge on various facets of the Java ecosystem, composable architectures, and cloud-driven development. He actively contributes to MicroProfile and Jakarta EE and often speaks at conferences, passionately sharing his knowledge and experience.

In his spare time, he is a loving husband and a father of three. He can often be found in the gym or having a good time at dance parties or heavy metal concerts.

Table of Contents

Preface

xiii

Part 1: History of Java EE and Jakarta EE

1

The History of Enterprise Java 3

What is Java EE, and why was it created?	3	The history of key features added in Java EE since version 5	8
Web servers versus application servers	4	Java EE 6	9
Web servers	5	Java EE 7	9
Application servers	5	Java EE 8	9
Profiles to the rescue	6	Summary	9
Java EE 5, the first user-friendly version	8		

2

Introducing the Cargo Tracker Application 11

Technical requirements	12	Administration Interface	16
What is the Cargo Tracker application?	12	Mobile Event Logger	20
Why we chose the Cargo Tracker application	12	Java EE features used in the Cargo Tracker application	22
Installing and running the Cargo Tracker application	13	Enterprise Java Beans	22
Features of the Cargo Tracker application	14	Persistence (JPA)	23
Public Tracking Interface	14	Messaging (JMS)	23
		Context and Dependency Injection	24
		Java Service Faces (JSF)	25

JAX-RS	26	Batch	29
JSON binding	27	Summary	29
Transactions	28		

Part 2: Modern Jakarta EE

3

Moving from Java EE to Jakarta EE 33

Technical requirements	33	Migrating dependencies	40
It's all about namespaces	34	Upgrading the project	40
Migrating strategies	35	Upgrading the Payara application server	41
Using an open source multiplatform editor	36	Upgrading PrimeFaces	42
Sed	37	Red Hat MTA	44
Using a specialized plugin for your IDE	37	Upgrading your application server	49
Upgrading your pom.xml file	40	Summary	50

4

Modernizing Your Application with the Latest Features 51

Technical requirements	51	Adding metrics to your system	61
The most significant changes to Jakarta EE 10	52	Using Prometheus and Grafana to visualize the monitoring process	64
Core Profile	52	Setting up Prometheus	64
Using UUIDs as keys	54	Setting up Docker Compose	65
Multi-part form parameters	54	Setting up the Prometheus settings	65
Pure Java Jakarta Faces views	55	Setting up Grafana	68
Authenticating with OpenID	56	Setting up docker-compose	68
Improved concurrency	56	Setting up the auto data source	70
Adding the first cloud-native feature – resilience	57	Setting up the dashboard so that it loads automatically	71
Adding the second cloud-native feature – monitoring	59	Showing Grafana Docker	72
Looking at the default metrics of a running system	60	Showing the complete Docker file	73
		Summary	73

5

Making Your Application Testable **75**

Technical requirements	76	Creating a unit test	80
The impact of testing on your migration	76	How to create integration tests	82
Measuring code coverage of the project	76	What are integration tests?	82
A word about TDD	78	What is Testcontainers?	83
How to create unit tests	79	Setting up Testcontainers	83
Tools and libraries required for unit testing	79	Creating an integration test	87
		Summary	90

Part 3: Embracing the Cloud

6

Introduction to Containers and Docker **95**

Technical requirements	95	How are containers created?	96
What are containers?	96		

A brief introduction to Docker **97**

Installing Docker	98	Running the container in detached mode	102
Running a Docker container	99	Stopping a running container	102
Creating a Docker container	99	Using Docker Compose	103
Building a container	100	Summary	105
Running a container	101		

7

Meet Kubernetes **107**

Technical requirements	107	Self-healing	109
In the beginning	108	Load-balancing and networking	110
What is container orchestration?	108	Persistent storage and volumes	111
Why would you need Kubernetes?	109	General	112
		Pods versus containers	112

Some Kubernetes lingo	112	Using a hosted service	115
Extending Kubernetes	113	A simple example	116
Kubernetes architecture	113	kubectl get service.	118
Where to run Kubernetes	115	Summary	118
Use your own hardware	115		

8

What Is Cloud Native? 119

Technical requirements	119	Backing services	125
What is cloud native?	119	Build, release, run	126
Cloud-native principles	120	Processes	126
Microservices	120	Port binding	127
Containers and orchestration	121	Concurrency	127
DevOps	122	Disposability	128
CI/CD	122	Dev/prod parity	128
Introducing the 12-factor app	123	Logs	129
Code base	124	Admin processes	129
Dependencies	124	How to start the transformation	130
Config	125	Summary	131

9

Deploying Jakarta EE Applications in the Cloud 133

Technical requirements	133	Creating a container instance	141
Deploying to Azure	134	Metrics of containers in the cloud	146
Creating a container registry	134	Summary	148
Uploading an image to the registry	139		

10

Introducing MicroProfile	149		
Technical requirements	149	@Gauge	160
A brief history of MicroProfile	149	@Metric	161
MicroProfile Config	151	@Timed	161
MicroProfile Health	153	Telemetry Tracing	161
MicroProfile Fault Tolerance	155	Automatic instrumentation	162
@Asynchronous	155	Manual instrumentation	163
@Retry	156	Other specifications	164
@Timeout	157	OpenAPI	164
@Bulkhead	157	RestClient	165
@CircuitBreaker	158	JSON Web Token Authentication	165
@Fallback	158	Jakarta EE 10 Core Profile	166
Final remarks	159	Summary	166
MicroProfile Metrics	160		
@Counted	160		

Appendix A

Java EE to Jakarta EE names	165
------------------------------------	------------

Appendix B

As a Service	167
Index	171
Other Books You May Enjoy	178



Lituz.com

**To'liq qismini
Shu tugmani
bosish orqali
sotib oling!**