



Java Lambdas and Parallel Streams

Michael Müller

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*To my wife Claudia and my kids:
Thank you for your patience during night-
writing and other long sessions.*

I love you.

*To the many people I conversed with at
conferences as well as attendees of my
talks:*

*Thank you for the informative and
interesting conversations. From that, I
recognized how important the matter of
Java Lambdas and Streams is for you and
how much information demand exists.
Without you, this book would not have
been written.*

To you, my dear reader:

*Thank you for your interest in this book.
I hope I wrote an understandable and
valuable book, which helps you to achieve
success.*

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About the Author



Michael Müller is an IT professional with more than 30 years of experience including, about 25 years in the health care sector. During this time, he has worked in different areas, especially project and product management, consulting, and software development. During a couple of software development projects, he also gained intensive international experience.

Currently, Michael is the head of software development at the German DRG institute inek.org. In this role, he is responsible for Web applications as well as other Java and .NET projects. Web projects are preferably built with Java technologies such as JSF (JavaServer Faces) with the help of supporting languages like JavaScript.

Michael has strong experience using lambda statements the .Net environment (LINQ with C#). Beginning with Java 8, he can finally use similar powerful features with Java.

Michael is a JSF professional user and a member of the Java Specification Request (JSR) 344 and JSR 372 (JSF) expert groups. His first book, *Web Development with Java and JSF* consequently deals with this Java web technology.

He frequently reads books and writes reviews as well as technical papers, which are mostly published in German print magazines and on his web site.

About the Technical Reviewer



Kishori Sharan works as a software architect at Up and Running, Inc. He has earned a master of science degree in Computer Information Systems from Troy State University, Troy, Alabama. He is a Sun-certified Java 2 programmer. He has over 18 years of experience in developing enterprise applications and providing training to professional developers in the Java platform.

Foreword

Whenever I have spoken about Java Lambdas and Streams at conferences and roundtable events, there has been strong interest and lively discussions with the attendees. Typically, the unfamiliar syntax forms a significant hurdle even (or especially?) for experienced programmers. However, once a developer masters the syntax, she or he usually doesn't want to revert to the pre-lambda style.

Realizing that the new syntax is an impediment for many developers, I decided to share my experience and insights in a format that can be used as a reference. The aim of this concise book is to help you to overcome the learning curve and to master the new world of Lambdas and Streams.

Following Leanpub's motto "Publish Early, Publish Often", I published a previous edition in an early but complete state. This edition published by Apress contains additional information on how to create your own parallel collectors.

I hope that you enjoy reading it and achieve sustained success with Java Lambdas and Parallel Streams.

—Michael Müller
Brühl, Germany

Introduction

Lambdas and (Parallel) Streams

Some of the new features introduced in Java 8, such as the new Date and Time API (application program interfaces), feel quite familiar and can be used immediately by an experienced Java developer. But some of the most important enhancements, including Lambdas and Streams, require the developer to learn some new concepts. Lambda statements in particular introduce a syntax that is quite unusual for object-oriented programmers. These language constructs are known only to developers who used functional programming languages or enhancements like Microsoft's Linq (Language Integrated Query). This special syntax takes some getting used to, and some developers may even be a little frightened at first glance. However, these enhancements are extremely powerful, and it is certainly worth taking the time to understand how they can help you to write code that is not only concise but also faster to write and more reusable.

Electronic supplementary material The online version of this chapter (doi:[10.1007/978-1-4842-2487-8_1](https://doi.org/10.1007/978-1-4842-2487-8_1)) contains supplementary material, which is available to authorized users.

In this book, I start with an explanation of Lambda expressions; show how they can be used with Streams; and finally, discuss how both Lambdas and Streams can be combined to implement effective parallel processing.

The following task will run like a golden thread through the book:

The Challenge

- Analyze a bigger amount of data according to varying criteria
- Parallelize this task without explicit use of thread management, synchronization, Executor, or ForkJoin

The Solution

Use `parallelStream()` instead of `stream()`!

A First Explanation

You may well ask, “what the hell are the `stream()` and `parallelStream()` methods?” Here is the quick overview; a more detailed description is given in later chapters.

You may imagine a Stream as a continuous flow of data, comparable to something like an `InputStream`. The data might be emitted by different sources, such as a collection, a file, a generator, or some other source. However, the content of this stream is not simply bytes or characters; instead, the stream emits arbitrary objects(see Figure 1-1).