Concurrency State Models Java Programs

Looks at the concepts and techniques of concurrent programming. JR is an extension of the Java programming language with additional concurrency mechanisms based on those in the SR (Synchronizing Resources) programming language. The JR implementation executes on UNIX-based systems (Linux, Mac OS X, and Solaris) and Windows-based systems. It is available free from the JR webpage. This book describes the JR programming language and illustrates how it can be used to write concurrent programs for a variety of applications. This text presents numerous small and large example programs. The source code for all programming examples and the given parts of all programming exercises are available on the JR webpage. Dr. Ronald A. Olsson and Dr. Aaron W. Keen, the authors of this text, are the designers and implementors of JR.

Concurrency State Models and Java Programs

In today’s app-driven era, when programs are asynchronous and responsiveness is so vital, reactive programming can help you write code that’s more reliable, easier to scale, and better-performing. With this practical book, Java developers will first learn how to view problems in the reactive way, and then build programs that leverage the best features of this exciting new programming paradigm. Authors Tomasz Nurkiewicz and Ben Christensen include concrete examples that use the RxJava library to solve real-world performance issues on Android devices as well as the server. You’ll learn how RxJava leverages parallelism and concurrency to help you solve today’s problems. This book also provides a preview of the upcoming 2.0 release. Write programs that react to multiple asynchronous sources of input without descending into "callback hell" Get to that aha! moment when you understand how to solve problems in the reactive way Cope with Observables that produce data too quickly to be consumed Explore strategies to debug and to test programs written in the reactive style Efficiently exploit parallelism and concurrency in your programs Learn about the transition to RxJava version 2 Master the principles to make applications robust, scalable and responsive About This Book Implement concurrent applications using the Java 9 Concurrency API and its new components Improve the performance of your applications and process more data at the same time, taking advantage of all of your resources Construct real-world examples related to machine learning, data mining, natural language processing, and more Who This Book Is For This book is for competent Java developers who have basic understanding of concurrency, but knowledge of effective implementation of concurrent programs or usage of streams for making processes more efficient is not required What You Will Learn Master the principles that every concurrent application must follow See how to parallelize a sequential algorithm to obtain better performance without data inconsistencies and deadlocks Get the most from the Java Concurrency API components
Separate the thread management from the rest of the application with the Executor component. Execute phased-based tasks in an efficient way with the Phaser components. Solve problems using a parallelized version of the divide and conquer paradigm with the Fork / Join framework. Find out how to use parallel Streams and Reactive Streams. Implement the “map and reduce” and “map and collect” programming models. Control the concurrent data structures and synchronization mechanisms provided by the Java Concurrency API. Implement efficient solutions for some actual problems such as data mining, machine learning, and more.

In Detail
Concurrent programming allows several large tasks to be divided into smaller sub-tasks, which are further processed as individual tasks that run in parallel. Java 9 includes a comprehensive API with lots of ready-to-use components for easily implementing powerful concurrency applications, but with high flexibility so you can adapt these components to your needs. The book starts with a full description of the design principles of concurrent applications and explains how to parallelize a sequential algorithm. You will then be introduced to Threads and Runnables, which are an integral part of Java 9’s concurrency API. You will see how to use all the components of the Java concurrency API, from the basics to the most advanced techniques, and will implement them in powerful real-world concurrency applications. The book ends with a detailed description of the tools and techniques you can use to test a concurrent Java application, along with a brief insight into other concurrency mechanisms in JVM.

Style and approach
This is a complete guide that implements real-world examples of algorithms related to machine learning, data mining, and natural language processing in client/server environments. All the examples are explained using a step-by-step approach.

Summary
Functional Programming in Java teaches Java developers how to incorporate the most powerful benefits of functional programming into new and existing Java code. You’ll learn to think functionally about coding tasks in Java and use FP to make your applications easier to understand, optimize, maintain, and scale. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications.

About the Technology
Here’s a bold statement: learn functional programming and you’ll be a better Java developer. Fortunately, you don’t have to master every aspect of FP to get a big payoff. If you take in a few core principles, you’ll see an immediate boost in the scalability, readability, and maintainability of your code. And did we mention that you’ll have fewer bugs? Let’s get started! About the Book

Functional Programming in Java teaches you how to incorporate the powerful benefits of functional programming into new and existing Java code. This book uses easy-to-grasp examples, exercises, and illustrations to teach core FP principles such as referential transparency, immutability, persistence, and laziness. Along the way, you’ll discover which of the new functionally inspired features of Java 8 will help you most. What’s Inside
Writing code that’s easier to read and reason about
Safer concurrent and parallel programming
Handling errors without exceptions
Java 8
features like lambdas, method references, and functional interfaces About the
Reader Written for Java developers with no previous FP experience. About the
Author Pierre-Yves Saumont is a seasoned Java developer with three decades of
experience designing and building enterprise software. He is an R&D engineer at
Alcatel-Lucent Submarine Networks. Table of Contents What is functional
programming? Using functions in Java Making Java more functional Recursion,
corecursion, and memoization Data handling with lists Dealing with optional data
Handling errors and exceptions Advanced list handling Working with laziness
More data handling with trees Solving real problems with advanced trees
Handling state mutation in a functional way Functional input/output Sharing
mutable state with actors Solving common problems functionally
"Clojure programming ... This functional programming language not only lets you
take advantage of Java libraries, services, and other JVM resources, it rivals
other dynamic languages such as Ruby and Python. With this comprehensive
guide, you'll learn Clojure fundamentals with examples that relate it to languages
The seven-volume set LNCS 12137, 12138, 12139, 12140, 12141, 12142, and
12143 constitutes the proceedings of the 20th International Conference on
Computational Science, ICCS 2020, held in Amsterdam, The Netherlands, in
June 2020.* The total of 101 papers and 248 workshop papers presented in this
book set were carefully reviewed and selected from 719 submissions (230
submissions to the main track and 489 submissions to the workshops). The
papers were organized in topical sections named: Part I: ICCS Main Track Part II:
ICCS Main Track Part III: Advances in High-Performance Computational Earth
Sciences: Applications and Frameworks; Agent-Based Simulations, Adaptive
Algorithms and Solvers; Applications of Computational Methods in Artificial
Intelligence and Machine Learning; Biomedical and Bioinformatics Challenges for
Computer Science Part IV: Classifier Learning from Difficult Data; Complex
Social Systems through the Lens of Computational Science; Computational
Health; Computational Methods for Emerging Problems in (Dis-)Information
Analysis Part V: Computational Optimization, Modelling and Simulation;
Computational Science in IoT and Smart Systems; Computer Graphics, Image
Processing and Artificial Intelligence Part VI: Data Driven Computational
Sciences; Machine Learning and Data Assimilation for Dynamical Systems;
Meshfree Methods in Computational Sciences; Multiscale Modelling and
Simulation; Quantum Computing Workshop Part VII: Simulations of Flow and
Transport: Modeling, Algorithms and Computation; Smart Systems: Bringing
Together Computer Vision, Sensor Networks and Machine Learning; Software
Engineering for Computational Science; Solving Problems with Uncertainties;
Teaching Computational Science; UNcErtainty QUantIficatiOn for ComputationalAl
modeLs *The conference was canceled due to the COVID-19 pandemic. Chapter
‘APE: A Command-Line Tool and API for Automated Workflow Composition’ is
available open access under a Creative Commons Attribution 4.0 International
License via link.springer.com.

Explains how to use Java’s portable platforms to program and use threads effectively and efficiently while avoiding common mistakes

Summary Akka in Action is a comprehensive tutorial on building message-oriented systems using Akka. The book takes a hands-on approach, where each new concept is followed by an example that shows you how it works, how to implement the code, and how to (unit) test it. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the Technology Akka makes it relatively easy to build applications in the cloud or on devices with many cores that efficiently use the full capacity of the computing power available. It’s a toolkit that provides an actor programming model, a runtime, and required support tools for building scalable applications. About the Book Akka in Action shows you how to build message-oriented systems with Akka. This comprehensive, hands-on tutorial introduces each concept with a working example. You’ll start with the big picture of how Akka works, and then quickly build and deploy a fully functional REST service out of actors. You’ll explore test-driven development and deploying and scaling fault-tolerant systems. After mastering the basics, you’ll discover how to model immutable messages, implement domain models, and apply techniques like event sourcing and CQRS. You’ll also find a tutorial on building streaming applications using akka-stream and akka-http. Finally, you’ll get practical advice on how to customize and extend your Akka system. What’s Inside Getting concurrency right Testing and performance tuning Clustered and cloud-based applications Covers Akka version 2.4 About the Reader This book assumes that you’re comfortable with Java and Scala. No prior experience with Akka required. About the Authors A software craftsman and architect, Raymond Roestenburg is an Akka committer. Rob Bakker specializes in concurrent back-end systems and systems integration. Rob Williams has more than 20 years of product development experience. Table of Contents Introducing Akka Up and running Test-driven development with actors Fault tolerance Futures Your first distributed Akka app Configuration, logging, and deployment Structural patterns for actors Routing messages Message channels Finite-state machines and agents System integration Streaming Clustering Actor persistence Performance tips Looking ahead Get an easy introduction to reactive streams in Java to handle concurrency, data streams, and the propagation of change in today’s applications. This compact book includes in-depth introductions to RxJava, Akka Streams, and Reactor, and integrates the latest related features from Java 9 and 11, as well as reactive streams programming with the Android SDK. Reactive Streams in Java explains how to manage the exchange of stream data across an asynchronous boundary—passing elements on to another thread or thread-pool—while ensuring that the receiving side is not forced to buffer arbitrary amounts of data which can reduce application efficiency. After reading and using this book, you’ll be proficient in programming reactive streams for Java in order to optimize application performance, and improve memory management and data exchanges. What You Will Learn Discover reactive streams and how to use them Work with the latest features in Java 9 and Java 11 Apply reactive streams using RxJava Program using Akka Streams Carry out reactive streams programming in Android Who This Book Is For Experienced Java programmers. If you have a working knowledge of Haskell, this hands-on book shows you how to use the language’s many APIs and frameworks for writing both parallel and concurrent programs. You’ll learn how parallelism exploits multicore processors to speed up computation-heavy programs, and how concurrency enables you to write programs with threads for multiple interactions. Author Simon Marlow walks you through the process with lots of code examples that you can run, experiment with, and extend. Divided into separate sections on Parallel and Concurrent Haskell, this book also includes exercises to help you become familiar with the concepts presented: Express parallelism in Haskell with the Eval monad and Evaluation
Strategies Parallelize ordinary Haskell code with the Par monad Build parallel array-based computations, using the Repa library Use the Accelerate library to run computations directly on the GPU Work with basic interfaces for writing concurrent code Build trees of threads for larger and more complex programs Learn how to build high-speed concurrent network servers Write distributed programs that run on multiple machines in a network

This concise book empowers all Java developers to master the complexity of the Java thread APIs and concurrency utilities. This knowledge aids the Java developer in writing correct and complex performing multithreaded applications. Java's thread APIs and concurrency utilities are among its most powerful and challenging APIs and language features. Java beginners typically find it very difficult to use these features to write correct multithreaded applications. Threads and the Concurrency Utilities helps all Java developers master and use these capabilities effectively. This book is divided into two parts of four chapters each. Part 1 focuses on the Thread APIs and Part 2 focuses on the concurrency utilities. In Part 1, you learn about Thread API basics and runnables, synchronization and volatility, waiting and notification, and the additional capabilities of thread groups, thread local variables, and the Timer Framework. In Part 2, you learn about concurrency utilities basics and executors, synchronizers, the Locking Framework, and the additional capabilities of concurrent collections, atomic variables, and the Fork/Join Framework. Each chapter ends with select exercises designed to challenge your grasp of the chapter's content. An appendix provides the answers to these exercises. A second appendix explores how threads are used by various standard class library APIs. Specifically, you learn about threads in the contexts of Swing, JavaFX, and Java 8's Streams API.

What You Will Learn
• How to do thread runnables, synchronization, volatility, waiting and notification, thread groups, thread local variables, and the Timer Framework
• How to create multithreaded applications that work correctly
• What are concurrency utilities basics and executors
• What are synchronizers, the Locking Framework, concurrent collections, atomic variables, and the Fork/Join Framework and how to use them
• How to leverage the concurrency utilities to write more complex multithreaded applications and achieve greater performance
• How to apply thread usage in Swing, JavaFX, and Java 8 Streams API contexts

Audience
The primary audience is Java beginners and the secondary audience is more advanced Java developers who have worked with the Thread APIs and the Concurrency Utilities.

Model checking is a computer-assisted method for the analysis of dynamical systems that can be modeled by state-transition systems. Drawing from research traditions in mathematical logic, programming languages, hardware design, and theoretical computer science, model checking is now widely used for the verification of hardware and software in industry. The editors and authors of this handbook are among the world’s leading researchers in this domain, and the 32 contributed chapters present a thorough view of the origin, theory, and application of model checking. In particular, the editors classify the advances in this domain and the chapters of the handbook in terms of two recurrent themes that have driven much of the research agenda: the algorithmic challenge, that is, designing model-checking algorithms that scale to real-life problems; and the modeling challenge, that is, extending the formalism beyond Kripke structures and temporal logic. The book will be valuable for researchers and graduate students engaged with the development of formal methods and verification tools.

“When you begin using multi-threading throughout an application, the importance of clean architecture and design is critical. . . . This places an emphasis on understanding not only the platform's capabilities but also emerging best practices. Joe does a great job interspersing best practices alongside theory throughout his book.” – From the Foreword by Craig Mundie, Chief Research and Strategy Officer, Microsoft Corporation

Author Joe Duffy has risen to the challenge of explaining how to write software that takes full advantage of concurrency and hardware parallelism. In Concurrent Programming on Windows, he explains how to design,
implement, and maintain large-scale concurrent programs, primarily using C# and C++ for Windows. Duffy aims to give application, system, and library developers the tools and techniques needed to write efficient, safe code for multicore processors. This is important not only for the kinds of problems where concurrency is inherent and easily exploitable—such as server applications, compute-intensive image manipulation, financial analysis, simulations, and AI algorithms—but also for problems that can be speeded up using parallelism but require more effort—such as math libraries, sort routines, report generation, XML manipulation, and stream processing algorithms. Concurrent Programming on Windows has four major sections: The first introduces concurrency at a high level, followed by a section that focuses on the fundamental platform features, inner workings, and API details. Next, there is a section that describes common patterns, best practices, algorithms, and data structures that emerge while writing concurrent software. The final section covers many of the common system-wide architectural and process concerns of concurrent programming. This is the only book you'll need in order to learn the best practices and common patterns for programming with concurrency on Windows and .NET.

Software -- Programming Languages. 
Researches and developers of simulation models state that the Java programming language presents a unique and significant opportunity for important changes in the way we develop simulation models today. The most important characteristics of the Java language that are advantageous for simulation are its multi-threading capabilities, its facilities for executing programs across the Web, and its graphics facilities. It is feasible to develop compatible and reusable simulation components that will facilitate the construction of newer and more complex models. This is possible with Java development environments. Another important trend that begun very recently is web-based simulation, i.e., and the execution of simulation models using Internet browser software. This book introduces the application of the Java programming language in discrete-event simulation. In addition, the fundamental concepts and practical simulation techniques for modeling different types of systems to study their general behavior and their performance are introduced. The approaches applied are the process interaction approach to discrete-event simulation and object-oriented modeling. Java is used as the implementation language and UML as the modeling language. The first offers several advantages compared to C++, the most important being: thread handling, graphical user interfaces (QUI) and Web computing. The second language, UML (Unified Modeling Language) is the standard notation used today for modeling systems as a collection of classes, class relationships, objects, and object behavior.

This book constitutes the refereed proceedings of the 8th International Conference on Fundamental Approaches to Software Engineering, FASE 2005, held in Edinburgh, UK in April 2005 as part of ETAPS. The 25 revised full papers presented together with an invited paper were carefully reviewed and selected from 105 submissions. The papers are organized in topical sections on Web services, graph grammars and graph transformations, components, product lines, theory, code understanding and validation, UML, and automatic proofs and provers.

This book is a must-have tutorial for software developers aiming to write concurrent programs in Scala, or broaden their existing knowledge of concurrency. This book is intended for Scala programmers that have no prior knowledge about concurrent programming, as well as those seeking to broaden their existing knowledge about concurrency. Basic knowledge of the Scala programming language will be helpful. Readers with a solid knowledge in another programming language, such as Java, should find this book easily accessible.

Concurrent and Distributed Computing in Java addresses fundamental concepts in concurrent computing with Java examples. The book consists of two parts. The first part deals with techniques for programming in shared-memory based systems. The book covers concepts in
Java such as threads, synchronized methods, waits, and notify to expose students to basic concepts for multi-threaded programming. It also includes algorithms for mutual exclusion, consensus, atomic objects, and wait-free data structures. The second part of the book deals with programming in a message-passing system. This part covers resource allocation problems, logical clocks, global property detection, leader election, message ordering, agreement algorithms, checkpointing, and message logging. Primarily a textbook for upper-level undergraduates and graduate students, this thorough treatment will also be of interest to professional programmers.

Since the introduction of Hoares' Communicating Sequential Processes notation, powerful new tools have transformed CSP into a practical way of describing industrial-sized problems. This book gives you the fundamental grasp of CSP concepts you'll need to take advantage of those tools. Part I provides a detailed foundation for working with CSP, using as little mathematics as possible. It introduces the ideas behind operational, denotational and algebraic models of CSP. Parts II and III go into greater detail about theory and practice. Topics include: parallel operators, hiding and renaming, piping and enslavement, buffers and communication, termination and sequencing, and semantic theory. Three detailed practical case studies are also presented. For anyone interested in modeling sequential processes.

If you're looking to take full advantage of multi-core processors with concurrent programming, this practical book provides the knowledge and hands-on experience you need. The Art of Concurrency is one of the few resources to focus on implementing algorithms in the shared-memory model of multi-core processors, rather than just theoretical models or distributed-memory architectures. The book provides detailed explanations and usable samples to help you transform algorithms from serial to parallel code, along with advice and analysis for avoiding mistakes that programmers typically make when first attempting these computations. Written by an Intel engineer with over two decades of parallel and concurrent programming experience, this book will help you: Understand parallelism and concurrency Explore differences between programming for shared-memory and distributed-memory Learn guidelines for designing multithreaded applications, including testing and tuning Discover how to make best use of different threading libraries, including Windows threads, POSIX threads, OpenMP, and Intel Threading Building Blocks Explore how to implement concurrent algorithms that involve sorting, searching, graphs, and other practical computations The Art of Concurrency shows you how to keep algorithms scalable to take advantage of new processors with even more cores. For developing parallel code algorithms for concurrent programming, this book is a must.

More than ever, learning to program concurrency is critical to creating faster, responsive applications. Speedy and affordable multicore hardware is driving the demand for high-performing applications, and you can leverage the Java platform to bring these applications to life. Concurrency on the Java platform has evolved, from the synchronization model of JDK to software transactional memory (STM) and actor-based concurrency. This book is the first to show you all these concurrency styles so you can compare and choose what works best for your applications. You'll learn the benefits of each of these models, when and how to use them, and what their limitations are. Through hands-on exercises, you'll learn how to avoid shared mutable state and how to write good, elegant, explicit synchronization-free programs so you can create easy and safe concurrent applications. The techniques you learn in this book will take you from dreading concurrency to mastering and enjoying it. Best of all, you can work with Java or a JVM language of your choice - Clojure, JRuby, Groovy, or Scala - to reap the growing power of multicore hardware. If you are a Java programmer, you'd need JDK 1.5 or later and the Akka 1.0 library. In addition, if you program in Scala, Clojure, Groovy or JRuby you'd need the latest version of your preferred language. Groovy programmers will also need GPars.
Threads are a fundamental part of the Java platform. As multicore processors become the norm, using concurrency effectively becomes essential for building high-performance applications. Java SE 5 and 6 are a huge step forward for the development of concurrent applications, with improvements to the Java Virtual Machine to support high-performance, highly scalable concurrent classes and a rich set of new concurrency building blocks. In Java Concurrency in Practice, the creators of these new facilities explain not only how they work and how to use them, but also the motivation and design patterns behind them. However, developing, testing, and debugging multithreaded programs can still be very difficult; it is all too easy to create concurrent programs that appear to work, but fail when it matters most: in production, under heavy load. Java Concurrency in Practice arms readers with both the theoretical underpinnings and concrete techniques for building reliable, scalable, maintainable concurrent applications. Rather than simply offering an inventory of concurrency APIs and mechanisms, it provides design rules, patterns, and mental models that make it easier to build concurrent programs that are both correct and performant. This book covers: Basic concepts of concurrency and thread safety Techniques for building and composing thread-safe classes Using the concurrency building blocks in java.util.concurrent Performance optimization dos and don'ts Testing concurrent programs Advanced topics such as atomic variables, nonblocking algorithms, and the Java Memory Model

"Multithreaded Programming with Java Technology is the first complete guide to multithreaded development with the Java 2 platform. Multithreading experts Bil Lewis and Daniel J. Berg cover the underlying structures upon which threads are built; thread construction; and thread lifecycles, including birth, life, death, and cancellation. Next, using extensive code examples, they cover everything developers need to know to make the most of multithreading."

This book assumes familiarity with threads (in a language such as Ada, C#, or Java) and introduces the entity-life modeling (ELM) design approach for certain kinds of multithreaded software. ELM focuses on "reactive systems," which continuously interact with the problem environment. These "reactive systems" include embedded systems, as well as such interactive systems as cruise controllers and automated teller machines. Part I covers two fundamentals: program-language thread support and state diagramming. These are necessary for understanding ELM and are provided primarily for reference. Part II covers ELM from different angles. Part III positions ELM relative to other design approaches.

Software development today is embracing functional programming (FP), whether it's for writing concurrent programs or for managing Big Data. Where does that leave Java developers? This concise book offers a pragmatic, approachable introduction to FP for Java developers or anyone who uses an object-oriented language. Dean Wampler, Java expert and author of Programming Scala (O'Reilly), shows you how to apply FP principles such as immutability, avoidance of side-effects, and higher-order functions to your Java code. Each chapter provides exercises to help you practice what you've learned. Once you grasp the benefits of functional programming, you'll discover that it improves all of the code you write. Learn basic FP principles and apply them to object-oriented programming Discover how FP is more concise and modular than OOP Get useful FP lessons for your Java type design—such as avoiding nulls Design data structures and algorithms using functional programming principles Write
concurrent programs using the Actor model and software transactional memory. Use functional libraries and frameworks for Java—and learn where to go next to deepen your functional programming skills.

This book is an in-depth introduction to Erlang, a programming language ideal for any situation where concurrency, fault tolerance, and fast response is essential. Erlang is gaining widespread adoption with the advent of multi-core processors and their new scalable approach to concurrency. With this guide you'll learn how to write complex concurrent programs in Erlang, regardless of your programming background or experience. Written by leaders of the international Erlang community -- and based on their training material -- Erlang Programming focuses on the language's syntax and semantics, and explains pattern matching, proper lists, recursion, debugging, networking, and concurrency. This book helps you: Understand the strengths of Erlang and why its designers included specific features Learn the concepts behind concurrency and Erlang's way of handling it Write efficient Erlang programs while keeping code neat and readable Discover how Erlang fills the requirements for distributed systems Add simple graphical user interfaces with little effort Learn Erlang's tracing mechanisms for debugging concurrent and distributed systems Use the built-in Mnesia database and other table storage features.

Erlang Programming provides exercises at the end of each chapter and simple examples throughout the book. Concurrency provides a thoroughly updated approach to the basic concepts and techniques behind concurrent programming. Concurrent programming is complex and demands a much more formal approach than sequential programming.

Offers information on how to exploit the parallel architectures in a computer's GPU to improve code performance, scalability, and resilience.

The Art of Multiprocessor Programming, Second Edition, provides users with an authoritative guide to multicore programming. This updated edition introduces higher level software development skills relative to those needed for efficient single-core programming, and includes comprehensive coverage of the new principles, algorithms, and tools necessary for effective multiprocessor programming. The book is an ideal resource for students and professionals alike who will benefit from its thorough coverage of key multiprocessor programming issues. Features new exercises developed for instructors using the text, with more algorithms, new examples, and other updates throughout the book. Presents the fundamentals of programming multiple threads for accessing shared memory. Explores mainstream concurrent data structures and the key elements of their design, as well as synchronization techniques, from simple locks to transactional memory systems.

A multi-user game, web site, cloud application, or networked database can have thousands of users all interacting at the same time. You need a powerful, industrial-strength tool to handle the really hard problems inherent in parallel, concurrent environments. You need Erlang. In this second edition of the bestselling Programming Erlang, you'll learn how to write parallel programs that scale effortlessly on multicore systems. Using Erlang, you'll be surprised at how easy it becomes to deal with parallel problems, and how much faster and more efficiently your programs run. That's because Erlang uses sets of parallel processes—not a single sequential process, as found in most programming languages. Joe Armstrong, creator of Erlang, introduces this powerful language in small steps, giving you a complete overview of Erlang and how to use it in common scenarios. You'll start with sequential programming, move to parallel programming and handling errors in parallel programs, and learn to work confidently with distributed programming and the standard Erlang/Open Telecom Platform (OTP) frameworks. You need no previous knowledge of functional or parallel programming. The chapters are packed with hands-on, real-world tutorial examples and insider tips.
and advice, and finish with exercises for both beginning and advanced users. The second edition has been extensively rewritten. New to this edition are seven chapters covering the latest Erlang features: maps, the type system and the Dialyzer, WebSockets, programming idioms, and a new stand-alone execution environment. You'll write programs that dynamically detect and correct errors, and that can be upgraded without stopping the system. There's also coverage of rebar (the de facto Erlang build system), and information on how to share and use Erlang projects on github, illustrated with examples from cowboy and bitcask. Erlang will change your view of the world, and of how you program. What You Need The Erlang/OTP system. Download it from erlang.org.

CSP notation has been used extensively for teaching and applying concurrency theory, ever since the publication of the text Communicating Sequential Processes by C.A.R. Hoare in 1985. Both a programming language and a specification language, the theory of CSP helps users to understand concurrent systems, and to decide whether a program meets its specification. As a member of the family of process algebras, the concepts of communication and interaction are presented in an algebraic style. An invaluable reference on the state of the art in CSP, Understanding Concurrent Systems also serves as a comprehensive introduction to the field, in addition to providing material for a number of more advanced courses. A first point of reference for anyone wanting to use CSP or learn about its theory, the book also introduces other views of concurrency, using CSP to model and explain these. The text is fully integrated with CSP-based tools such as FDR, and describes how to create new tools based on FDR. Most of the book relies on no theoretical background other than a basic knowledge of sets and sequences. Sophisticated mathematical arguments are avoided whenever possible. Topics and features: presents a comprehensive introduction to CSP; discusses the latest advances in CSP, covering topics of operational semantics, denotational models, finite observation models and infinite-behaviour models, and algebraic semantics; explores the practical application of CSP, including timed modelling, discrete modelling, parameterised verifications and the state explosion problem, and advanced topics in the use of FDR; examines the ability of CSP to describe and enable reasoning about parallel systems modelled in other paradigms; covers a broad variety of concurrent systems, including combinatorial, timed, priority-based, mobile, shared variable, statecharts, buffered and asynchronous systems; contains exercises and case studies to support the text; supplies further tools and information at the associated website: http://www.comlab.ox.ac.uk/ucs/. From undergraduate students of computer science in need of an introduction to the area, to researchers and practitioners desiring a more in-depth understanding of theory and practice of concurrent systems, this broad-ranging text/reference is essential reading for anyone interested in Hoare's CSP.

A definitive guide to mastering and implementing concurrency patterns in your applications Key Features Build scalable apps with patterns in multithreading, synchronization, and functional programming Explore the parallel programming and multithreading techniques to make the code run faster Efficiently use the techniques outlined to build reliable applications Book Description Selecting the correct concurrency architecture has a significant impact on the design and performance of your applications. This book explains how to leverage the different characteristics of
parallel architecture to make your code faster and more efficient. To start with, you'll understand the basic concurrency concepts and explore patterns around explicit locking, lock free programming, futures & actors. Then, you'll get insights into different concurrency models and parallel algorithms and put them to practice in different scenarios to realize your application's true potential. We'll take you through multithreading design patterns, such as master, slave, leader, follower, map-reduce, and monitor, also helping you to learn hands-on coding using these patterns. Once you've grasped all of this, you'll move on to solving problems using synchronizer patterns. You'll discover the rationale for these patterns in distributed & parallel applications, followed by studying how future composition, immutability and the monadic flow help create more robust code. Toward the end of the book, you'll learn about the actor paradigm and actor patterns - the message passing concurrency paradigm. What you will learn Explore parallel architecture Get acquainted with concurrency models Internalize design themes by implementing multithreading patterns Get insights into concurrent design patterns Discover design principles behind many java threading abstractions Work with functional concurrency patterns Who this book is for This is a must-have guide for developers who want to learn patterns to build scalable and high-performing apps. It's assumed that you already have a decent level of programming knowledge.

Summary Scala in Action is a comprehensive tutorial that introduces Scala through clear explanations and numerous hands-on examples. Because Scala is a rich and deep language, it can be daunting to absorb all the new concepts at once. This book takes a "how-to" approach, explaining language concepts as you explore familiar programming challenges that you face in your day-to-day work. About the Technology Scala runs on the JVM and combines object-orientation with functional programming. It's designed to produce succinct, type-safe code, which is crucial for enterprise applications. Scala implements Actor-based concurrency through the amazing Akka framework, so you can avoid Java's messy threading while interacting seamlessly with Java. About this Book Scala in Action is a comprehensive tutorial that introduces the language through clear explanations and numerous hands-on examples. It takes a "how to" approach, explaining language concepts as you explore familiar programming tasks. You'll tackle concurrent programming in Akka, learn to work with Scala and Spring, and learn how to build DSLs and other productivity tools. You'll learn both the language and how to use it. Experience with Java is helpful but not required. Ruby and Python programmers will also find this book accessible. What's Inside A Scala tutorial How to use Java and Scala open source libraries How to use SBT Test-driven development Debugging Updated for Scala 2.10 Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the Author Nilanjan Raychaudhuri is a skilled developer, speaker, and an avid polyglot programmer who works with Scala on production systems. Table of Contents PART 1 SCALA: THE BASICS Why Scala? Getting started OOP in Scala Having fun with functional data structures Functional programming PART 2 WORKING WITH SCALA Building web applications in functional style Connecting to a database Building scalable and extensible components Concurrency programming in Scala Building confidence with testing PART 3 ADVANCED STEPS Interoperability between Scala and Java Scalable and distributed applications using Akka
Master the principles and techniques of multithreaded programming with the Java 8 Concurrency API About This Book Implement concurrent applications using the Java 8 Concurrency API and its new components Improve the performance of your applications or process more data at the same time, taking advantage of all of your resources. Construct real-world examples related to machine learning, data mining, image processing, and client/server environments Who This Book Is For If you are a competent Java developer with a good understanding of concurrency but have no knowledge of how to effectively implement concurrent programs or use streams to make processes more efficient, then this book is for you. What You Will Learn Design concurrent applications by converting a sequential algorithm into a concurrent one Discover how to avoid all the possible problems you can get in concurrent algorithms Use the Executor framework to manage concurrent tasks without creating threads Extend and modify Executors to adapt their behavior to your needs Solve problems using the divide and conquer technique and the Fork/Join framework Process massive data sets with parallel streams and Map/Reduce implementation Control data-race conditions using concurrent data structures and synchronization mechanisms Test and monitor concurrent applications In Detail Concurrency programming allows several large tasks to be divided into smaller sub-tasks, which are further processed as individual tasks that run in parallel. All the sub-tasks are combined together once the required results are achieved; they are then merged to get the final output. The whole process is very complex. This process goes from the design of concurrent algorithms to the testing phase where concurrent applications need extra attention. Java includes a comprehensive API with a lot of ready-to-use components to implement powerful concurrency applications in an easy way, but with a high flexibility to adapt these components to your needs. The book starts with a full description of design principles of concurrent applications and how to parallelize a sequential algorithm. We'll show you how to use all the components of the Java Concurrency API from basics to the most advanced techniques to implement them in powerful concurrency applications in Java. You will be using real-world examples of complex algorithms related to machine learning, data mining, natural language processing, image processing in client/server environments. Next, you will learn how to use the most important components of the Java 8 Concurrency API: the Executor framework to execute multiple tasks in your applications, the phaser class to implement concurrent tasks divided into phases, and the Fork/Join framework to implement concurrent tasks that can be split into smaller problems (using the divide and conquer technique). Toward the end, we will cover the new inclusions in Java 8 API, the Map and Reduce model, and the Map and Collect model. The book will also teach you about the data structures and synchronization utilities to avoid data-race conditions and other critical problems. Finally, the book ends with a detailed description of the tools and techniques that you can use to test a Java concurrent application. Style and approach A complete guide implementing real-world examples with algorithms related to machine learning, data mining, and natural language processing in client/server environments. All the examples are explained in a step-by-step approach. Summary Concurrency in .NET teaches you how to build concurrent and scalable programs in .NET using the functional paradigm. This intermediate-level guide is aimed at developers, architects, and passionate computer programmers who are interested in
writing code with improved speed and effectiveness by adopting a declarative and pain-free programming style. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the Technology Unlock the incredible performance built into your multi-processor machines. Concurrent applications run faster because they spread work across processor cores, performing several tasks at the same time. Modern tools and techniques on the .NET platform, including parallel LINQ, functional programming, asynchronous programming, and the Task Parallel Library, offer powerful alternatives to traditional thread-based concurrency. About the Book Concurrency in .NET teaches you to write code that delivers the speed you need for performance-sensitive applications. Featuring examples in both C# and F#, this book guides you through concurrent and parallel designs that emphasize functional programming in theory and practice. You'll start with the foundations of concurrency and master essential techniques and design practices to optimize code running on modern multiprocessor systems. What's Inside The most important concurrency abstractions Employing the agent programming model Implementing real-time event-stream processing Executing unbounded asynchronous operations Best concurrent practices and patterns that apply to all platforms About the Reader For readers skilled with C# or F#. About the Book Riccardo Terrell is a seasoned software engineer and Microsoft MVP who is passionate about functional programming. He has over 20 years’ experience delivering cost-effective technology solutions in a competitive business environment. Table of Contents PART 1 - Benefits of functional programming applicable to concurrent programs Functional concurrency foundations Functional programming techniques for concurrency Functional data structures and immutability PART 2 - How to approach the different parts of a concurrent program The basics of processing big data: data parallelism, part 1 PLINQ and MapReduce: data parallelism, part 2 Real-time event streams: functional reactive programming Task-based functional parallelism Task asynchronicity for the win Asynchronous functional programming in F# Functional combinators for fluent concurrent programming Applying reactive programming everywhere with agents Parallel workflow and agent programming with TPL Dataflow PART 3 - Modern patterns of concurrent programming applied Recipes and design patterns for successful concurrent programming Building a scalable mobile app with concurrent functional programming Summary This bestseller has been updated and revised to cover all the latest changes to C++ 14 and 17! C++ Concurrency in Action, Second Edition teaches you everything you need to write robust and elegant multithreaded applications in C++17. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the Technology You choose C++ when your applications need to run fast. Well-designed concurrency makes them go even faster. C++ 17 delivers strong support for the multithreaded, multiprocessor programming required for fast graphic processing, machine learning, and other performance-sensitive tasks. This exceptional book unpacks the features, patterns, and best practices of production-grade C++ concurrency. About the Book C++ Concurrency in Action, Second Edition is the definitive guide to writing elegant multithreaded applications in C++. Updated for C++ 17, it carefully addresses every aspect of concurrent development, from starting new threads to designing fully functional multithreaded algorithms and data structures.
Concurrency master Anthony Williams presents examples and practical tasks in every chapter, including insights that will delight even the most experienced developer. What's inside Full coverage of new C++ 17 features Starting and managing threads Synchronizing concurrent operations Designing concurrent code Debugging multithreaded applications About the Reader Written for intermediate C and C++ developers. No prior experience with concurrency required. About the Author Anthony Williams has been an active member of the BSI C++ Panel since 2001 and is the developer of the just::thread Pro extensions to the C++ 11 thread library. Table of Contents Hello, world of concurrency in C++! Managing threads Sharing data between threads Synchronizing concurrent operations The C++ memory model and operations on atomic types Designing lock-based concurrent data structures Designing lock-free concurrent data structures Designing concurrent code Advanced thread management Parallel algorithms Testing and debugging multithreaded applications Think in the Clojure way! Once you're familiar with Clojure, take the next step with extended lessons on the best practices and most critical decisions you'll need to make while developing. Learn how to model your domain with data, transform it with pure functions, manage state, spread your work across cores, and structure apps with components. Discover how to use Clojure in the real world, and unlock the speed and power of this beautiful language on the Java Virtual Machine. Clojure Applied gives you the practical, realistic advice and depth of field that's been missing from your development practice. You want to develop software in the most effective, efficient way possible. This book gives you the answers you've been looking for in friendly, clear language. Dive into the core concepts of Clojure: immutable collections, concurrency, pure functions, and state management. You'll finally get the complete picture you've been looking for, rather than dozens of puzzle pieces you must assemble yourself. First, explore the core concepts of Clojure development: learn how to model your domain with immutable data; choose the ideal collection; and write simple, pure functions for efficient transformation. Next you'll apply those core concepts to build applications: discover how Clojure manages state and identity; spread your work for concurrent programming; and create and assemble components. Finally, see how to manage external integration and deployment concerns by developing a testing strategy, connecting with other data sources, and getting your libraries and applications out the door. Go beyond the toy box and into Clojure's way of thinking. By the end of this book, you'll have the tools and information to put Clojure's strengths to work. What You Need: To follow along with the examples in the book, you will need Clojure 1.6, Leinegen 2, and Java 6 or higher.

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