

Designing Dataa Intensive Applications

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Building Machine Learning Powered Applications Emmanuel Ameisen 2020-01-21

Learn the skills necessary to design, build, and deploy applications powered by machine learning (ML). Through the course of this hands-on book, you'll build an example ML-driven application from initial idea to deployed product. Data scientists, software engineers, and product managers—including experienced practitioners and novices alike—will learn the tools, best practices, and challenges involved in building a real-world ML application step by step. Author Emmanuel Ameisen, an experienced data scientist who led an AI education program, demonstrates practical ML concepts using code snippets, illustrations, screenshots, and interviews with industry leaders. Part I teaches you how to plan an ML application and measure success. Part II explains how to build a working ML model. Part III demonstrates ways to improve the model until it fulfills your original vision. Part IV covers deployment and monitoring strategies. This book will help you: Define your product goal and set up a machine learning problem Build your first end-to-end pipeline quickly and acquire an initial dataset Train and evaluate your ML models and address performance bottlenecks Deploy and monitor your models in a production environment

Database Design and Implementation Edward Sciore 2020-02-27

This textbook examines database systems from the viewpoint of a software developer. This perspective makes it possible to investigate why database systems are the way they are. It is of course important to be able to write queries, but it is equally important to know how they are processed. We e.g. don't want to just use JDBC; we also want to know why the API contains the classes and methods that it does. We need a sense of how hard is it to write a disk cache or logging facility. And what exactly is a database driver, anyway? The first two chapters provide a brief overview of database systems and their use. Chapter 1 discusses the purpose and features of a database system and introduces the

Derby and SimpleDB systems. Chapter 2 explains how to write a database application using Java. It presents the basics of JDBC, which is the fundamental API for Java programs that interact with a database. In turn, Chapters 3-11 examine the internals of a typical database engine. Each chapter covers a different database component, starting with the lowest level of abstraction (the disk and file manager) and ending with the highest (the JDBC client interface); further, the respective chapter explains the main issues concerning the component, and considers possible design decisions. As a result, the reader can see exactly what services each component provides and how it interacts with the other components in the system. By the end of this part, s/he will have witnessed the gradual development of a simple but completely functional system. The remaining four chapters then focus on efficient query processing, and focus on the sophisticated techniques and algorithms that can replace the simple design choices described earlier. Topics include indexing, sorting, intelligent buffer usage, and query optimization. This text is intended for upper-level undergraduate or beginning graduate courses in Computer Science. It assumes that the reader is comfortable with basic Java programming; advanced Java concepts (such as RMI and JDBC) are fully explained in the text. The respective chapters are complemented by “end-of-chapter readings” that discuss interesting ideas and research directions that went unmentioned in the text, and provide references to relevant web pages, research articles, reference manuals, and books. Conceptual and programming exercises are also included at the end of each chapter. Students can apply their conceptual knowledge by examining the SimpleDB (a simple but fully functional database system created by the author and provided online) code and modifying it.

Knowledge Management in the Development of Data-Intensive Systems Ivan Mistrik
2021-06-15 Data-intensive systems are software applications that process and generate Big Data. Data-intensive systems support the use of large amounts of data strategically and efficiently to provide intelligence. For example, examining industrial sensor data or business process data can enhance production, guide proactive improvements of development processes, or optimize supply chain systems. Designing data-intensive software systems is difficult because distribution of knowledge across stakeholders creates a symmetry of ignorance, because a shared vision of the future requires the development of new knowledge that extends and synthesizes existing knowledge. Knowledge Management in the Development of Data-Intensive Systems addresses new challenges arising from knowledge management in the development of data-intensive software systems. These challenges concern requirements, architectural design, detailed design, implementation and maintenance. The book covers the current state and future directions of knowledge management in development of data-intensive software systems. The book features both academic and industrial contributions which discuss the role software engineering can play for addressing challenges that confront developing, maintaining and evolving systems; data-intensive software systems of cloud and mobile services; and the scalability requirements they imply. The book features software engineering approaches that can efficiently deal with data-intensive systems as

well as applications and use cases benefiting from data-intensive systems. Providing a comprehensive reference on the notion of data-intensive systems from a technical and non-technical perspective, the book focuses uniquely on software engineering and knowledge management in the design and maintenance of data-intensive systems. The book covers constructing, deploying, and maintaining high quality software products and software engineering in and for dynamic and flexible environments. This book provides a holistic guide for those who need to understand the impact of variability on all aspects of the software life cycle. It leverages practical experience and evidence to look ahead at the challenges faced by organizations in a fast-moving world with increasingly fast-changing customer requirements and expectations.

Building Event-Driven Microservices Adam Bellemare 2020-07-02 Organizations today often struggle to balance business requirements with ever-increasing volumes of data. Additionally, the demand for leveraging large-scale, real-time data is growing rapidly among the most competitive digital industries. Conventional system architectures may not be up to the task. With this practical guide, you'll learn how to leverage large-scale data usage across the business units in your organization using the principles of event-driven microservices. Author Adam Bellemare takes you through the process of building an event-driven microservice-powered organization. You'll reconsider how data is produced, accessed, and propagated across your organization. Learn powerful yet simple patterns for unlocking the value of this data. Incorporate event-driven design and architectural principles into your own systems. And completely rethink how your organization delivers value by unlocking near-real-time access to data at scale. You'll learn: How to leverage event-driven architectures to deliver exceptional business value The role of microservices in supporting event-driven designs Architectural patterns to ensure success both within and between teams in your organization Application patterns for developing powerful event-driven microservices Components and tooling required to get your microservice ecosystem off the ground

API Design Patterns JJ Geewax 2021-08-17 "A concept-rich book on API design patterns. Deeply engrossing and fun to read." - Satej Sahu, Honeywell API Design Patterns lays out a set of design principles for building internal and public-facing APIs. In API Design Patterns you will learn: Guiding principles for API patterns Fundamentals of resource layout and naming Handling data types for any programming language Standard methods that ensure predictability Field masks for targeted partial updates Authentication and validation methods for secure APIs Collective operations for moving, managing, and deleting data Advanced patterns for special interactions and data transformations API Design Patterns reveals best practices for building stable, user-friendly APIs. These design patterns can be applied to solve common API problems and flexibly altered to fit specific needs. Hands-on examples and relevant cases illustrate patterns for API fundamentals, advanced functionalities, and uncommon scenarios. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the technology APIs are contracts that define how applications, services, and components communicate. API design

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patterns provide a shared set of best practices, specifications and standards that ensure APIs are reliable and simple for other developers. This book collects and explains the most important patterns from both the API design community and the experts at Google. About the book API Design Patterns lays out a set of principles for building internal and public-facing APIs. Google API expert JJ Geewax presents patterns that ensure your APIs are consistent, scalable, and flexible. You'll improve the design of the most common APIs, plus discover techniques for tricky edge cases. Precise illustrations, relevant examples, and detailed scenarios make every pattern clear and easy to understand. What's inside Guiding principles for API patterns Fundamentals of resource layout and naming Advanced patterns for special interactions and data transformations A detailed case-study on building an API and adding features About the reader For developers building web and internal APIs in any language. About the author JJ Geewax is a software engineer at Google, focusing on Google Cloud Platform, API design, and real-time payment systems. He is also the author of Manning's Google Cloud Platform in Action. Table of Contents PART 1 INTRODUCTION 1 Introduction to APIs 2 Introduction to API design patterns PART 2 DESIGN PRINCIPLES 3 Naming 4 Resource scope and hierarchy 5 Data types and defaults PART 3 FUNDAMENTALS 6 Resource identification 7 Standard methods 8 Partial updates and retrievals 9 Custom methods 10 Long-running operations 11 Rerunnable jobs PART 4 RESOURCE RELATIONSHIPS 12 Singleton sub-resources 13 Cross references 14 Association resources 15 Add and remove custom methods 16 Polymorphism PART 5 COLLECTIVE OPERATIONS 17 Copy and move 18 Batch operations 19 Criteria-based deletion 20 Anonymous writes 21 Pagination 22 Filtering 23 Importing and exporting PART 6 SAFETY AND SECURITY 24 Versioning and compatibility 25 Soft deletion 26 Request deduplication 27 Request validation 28 Resource revisions 29 Request retrieval 30 Request authentication

Morgan Kaufmann series in data management systems Stefano Ceri 2003 This text represents a breakthrough in the process underlying the design of the increasingly common and important data-driven Web applications.

Designing Cloud Data Platforms Danil Zburivsky 2021-03-17 In Designing Cloud Data Platforms, Danil Zburivsky and Lynda Partner reveal a six-layer approach that increases flexibility and reduces costs. Discover patterns for ingesting data from a variety of sources, then learn to harness pre-built services provided by cloud vendors. Summary Centralized data warehouses, the long-time defacto standard for housing data for analytics, are rapidly giving way to multi-faceted cloud data platforms. Companies that embrace modern cloud data platforms benefit from an integrated view of their business using all of their data and can take advantage of advanced analytic practices to drive predictions and as yet unimagined data services. Designing Cloud Data Platforms is a hands-on guide to envisioning and designing a modern scalable data platform that takes full advantage of the flexibility of the cloud. As you read, you'll learn the core components of a cloud data platform design, along with the role of key technologies like Spark and Kafka Streams. You'll also explore setting up processes to manage cloud-based data, keep it secure, and using advanced analytic and BI tools to analyze it. Purchase of the print book includes a free

eBook in PDF, Kindle, and ePub formats from Manning Publications. About the technology Well-designed pipelines, storage systems, and APIs eliminate the complicated scaling and maintenance required with on-prem data centers. Once you learn the patterns for designing cloud data platforms, you'll maximize performance no matter which cloud vendor you use. About the book In Designing Cloud Data Platforms, Danil Zburivsky and Lynda Partner reveal a six-layer approach that increases flexibility and reduces costs. Discover patterns for ingesting data from a variety of sources, then learn to harness pre-built services provided by cloud vendors. What's inside Best practices for structured and unstructured data sets Cloud-ready machine learning tools Metadata and real-time analytics Defensive architecture, access, and security About the reader For data professionals familiar with the basics of cloud computing, and Hadoop or Spark. About the author Danil Zburivsky has over 10 years of experience designing and supporting large-scale data infrastructure for enterprises across the globe. Lynda Partner is the VP of Analytics-as-a-Service at Pythian, and has been on the business side of data for over 20 years. Table of Contents 1 Introducing the data platform 2 Why a data platform and not just a data warehouse 3 Getting bigger and leveraging the Big 3: Amazon, Microsoft Azure, and Google 4 Getting data into the platform 5 Organizing and processing data 6 Real-time data processing and analytics 7 Metadata layer architecture 8 Schema management 9 Data access and security 10 Fueling business value with data platforms

Seven Databases in Seven Weeks Luc Perkins 2018-04-05 Data is getting bigger and more complex by the day, and so are your choices in handling it. Explore some of the most cutting-edge databases available - from a traditional relational database to newer NoSQL approaches - and make informed decisions about challenging data storage problems. This is the only comprehensive guide to the world of NoSQL databases, with in-depth practical and conceptual introductions to seven different technologies: Redis, Neo4J, CouchDB, MongoDB, HBase, Postgres, and DynamoDB. This second edition includes a new chapter on DynamoDB and updated content for each chapter. While relational databases such as MySQL remain as relevant as ever, the alternative, NoSQL paradigm has opened up new horizons in performance and scalability and changed the way we approach data-centric problems. This book presents the essential concepts behind each database alongside hands-on examples that make each technology come alive. With each database, tackle a real-world problem that highlights the concepts and features that make it shine. Along the way, explore five database models - relational, key/value, columnar, document, and graph - from the perspective of challenges faced by real applications. Learn how MongoDB and CouchDB are strikingly different, make your applications faster with Redis and more connected with Neo4J, build a cluster of HBase servers using cloud services such as Amazon's Elastic MapReduce, and more. This new edition brings a brand new chapter on DynamoDB, updated code samples and exercises, and a more up-to-date account of each database's feature set. Whether you're a programmer building the next big thing, a data scientist seeking solutions to thorny problems, or a technology enthusiast venturing into new territory, you will find something to inspire you in this book. What You Need: You'll need a *nix

shell (Mac OS or Linux preferred, Windows users will need Cygwin), Java 6 (or greater), and Ruby 1.8.7 (or greater). Each chapter will list the downloads required for that database.

Event Streams in Action Valentin Crettaz 2019-05-10 Summary Event Streams in Action is a foundational book introducing the ULP paradigm and presenting techniques to use it effectively in data-rich environments. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the Technology Many high-profile applications, like LinkedIn and Netflix, deliver nimble, responsive performance by reacting to user and system events as they occur. In large-scale systems, this requires efficiently monitoring, managing, and reacting to multiple event streams. Tools like Kafka, along with innovative patterns like unified log processing, help create a coherent data processing architecture for event-based applications. About the Book Event Streams in Action teaches you techniques for aggregating, storing, and processing event streams using the unified log processing pattern. In this hands-on guide, you'll discover important application designs like the lambda architecture, stream aggregation, and event reprocessing. You'll also explore scaling, resiliency, advanced stream patterns, and much more! By the time you're finished, you'll be designing large-scale data-driven applications that are easier to build, deploy, and maintain. What's inside Validating and monitoring event streams Event analytics Methods for event modeling Examples using Apache Kafka and Amazon Kinesis About the Reader For readers with experience coding in Java, Scala, or Python. About the Author Alexander Dean developed Snowplow, an open source event processing and analytics platform. Valentin Crettaz is an independent IT consultant with 25 years of experience. Table of Contents PART 1 - EVENT STREAMS AND UNIFIED LOGS Introducing event streams The unified log 24 Event stream processing with Apache Kafka Event stream processing with Amazon Kinesis Stateful stream processing PART 2- DATA ENGINEERING WITH STREAMS Schemas Archiving events Railway-oriented processing Commands PART 3 - EVENT ANALYTICS Analytics-on-read Analytics-on-write

Designing Data-Intensive Applications Martin Kleppmann 2017-03-16 Data is at the center of many challenges in system design today. Difficult issues need to be figured out, such as scalability, consistency, reliability, efficiency, and maintainability. In addition, we have an overwhelming variety of tools, including relational databases, NoSQL datastores, stream or batch processors, and message brokers. What are the right choices for your application? How do you make sense of all these buzzwords? In this practical and comprehensive guide, author Martin Kleppmann helps you navigate this diverse landscape by examining the pros and cons of various technologies for processing and storing data. Software keeps changing, but the fundamental principles remain the same. With this book, software engineers and architects will learn how to apply those ideas in practice, and how to make full use of data in modern applications. Peer under the hood of the systems you already use, and learn how to use and operate them more effectively Make informed decisions by identifying the strengths and weaknesses of different tools Navigate the trade-offs around consistency, scalability, fault tolerance, and complexity Understand the

distributed systems research upon which modern databases are built Peek behind the scenes of major online services, and learn from their architectures

Data-Intensive Computing Ian Gorton 2013 Describes principles of the emerging field of data-intensive computing, along with methods for designing, managing and analyzing the big data sets of today.

Understanding Distributed Systems Roberto Vitillo 2021 Learning to build distributed systems is hard, especially if they are large scale. It's not that there is a lack of information out there. You can find academic papers, engineering blogs, and even books on the subject. The problem is that the available information is spread out all over the place, and if you were to put it on a spectrum from theory to practice, you would find a lot of material at the two ends, but not much in the middle. That is why I decided to write a book to teach the fundamentals of distributed systems so that you don't have to spend countless hours scratching your head to understand how everything fits together. This is the guide I wished existed when I first started out, and it's based on my experience building large distributed systems that scale to millions of requests per second and billions of devices. If you develop the back-end of web or mobile applications (or would like to!), this book is for you. When building distributed systems, you need to be familiar with the network stack, data consistency models, scalability and reliability patterns, and much more. Although you can build applications without knowing any of that, you will end up spending hours debugging and re-designing their architecture, learning lessons that you could have acquired in a much faster and less painful way.

Streaming Systems Tyler Akidau 2018-07-16 Streaming data is a big deal in big data these days. As more and more businesses seek to tame the massive unbounded data sets that pervade our world, streaming systems have finally reached a level of maturity sufficient for mainstream adoption. With this practical guide, data engineers, data scientists, and developers will learn how to work with streaming data in a conceptual and platform-agnostic way. Expanded from Tyler Akidau's popular blog posts "Streaming 101" and "Streaming 102", this book takes you from an introductory level to a nuanced understanding of the what, where, when, and how of processing real-time data streams. You'll also dive deep into watermarks and exactly-once processing with co-authors Slava Chernyak and Reuven Lax. You'll explore: How streaming and batch data processing patterns compare The core principles and concepts behind robust out-of-order data processing How watermarks track progress and completeness in infinite datasets How exactly-once data processing techniques ensure correctness How the concepts of streams and tables form the foundations of both batch and streaming data processing The practical motivations behind a powerful persistent state mechanism, driven by a real-world example How time-varying relations provide a link between stream processing and the world of SQL and relational algebra

Fundamentals of Software Architecture Mark Richards 2020-01-28 Salary surveys

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worldwide regularly place software architect in the top 10 best jobs, yet no real guide exists to help developers become architects. Until now. This book provides the first comprehensive overview of software architecture's many aspects. Aspiring and existing architects alike will examine architectural characteristics, architectural patterns, component determination, diagramming and presenting architecture, evolutionary architecture, and many other topics. Mark Richards and Neal Ford—hands-on practitioners who have taught software architecture classes professionally for years—focus on architecture principles that apply across all technology stacks. You'll explore software architecture in a modern light, taking into account all the innovations of the past decade. This book examines: Architecture patterns: The technical basis for many architectural decisions Components: Identification, coupling, cohesion, partitioning, and granularity Soft skills: Effective team management, meetings, negotiation, presentations, and more Modernity: Engineering practices and operational approaches that have changed radically in the past few years Architecture as an engineering discipline: Repeatable results, metrics, and concrete valuations that add rigor to software architecture

Data Pipelines Pocket Reference James Densmore 2021-02-10 Data pipelines are the foundation for success in data analytics. Moving data from numerous diverse sources and transforming it to provide context is the difference between having data and actually gaining value from it. This pocket reference defines data pipelines and explains how they work in today's modern data stack. You'll learn common considerations and key decision points when implementing pipelines, such as batch versus streaming data ingestion and build versus buy. This book addresses the most common decisions made by data professionals and discusses foundational concepts that apply to open source frameworks, commercial products, and homegrown solutions. You'll learn: What a data pipeline is and how it works How data is moved and processed on modern data infrastructure, including cloud platforms Common tools and products used by data engineers to build pipelines How pipelines support analytics and reporting needs Considerations for pipeline maintenance, testing, and alerting

The Future Of Fusion Energy Jason Parisi 2019-01-02 'The text provides an interesting history of previous and anticipated accomplishments, ending with a chapter on the relationship of fusion power to nuclear weaponry. They conclude on an optimistic note, well worth being understood by the general public.' CHOICE The gap between the state of fusion energy research and public understanding is vast. In an entertaining and engaging narrative, this popular science book gives readers the basic tools to understand how fusion works, its potential, and contemporary research problems. Written by two young researchers in the field, *The Future of Fusion Energy* explains how physical laws and the Earth's energy resources motivate the current fusion program – a program that is approaching a critical point. The world's largest science project and biggest ever fusion reactor, ITER, is nearing completion. Its success could trigger a worldwide race to build a power plant, but failure could delay fusion by decades. To these ends, this book details how ITER's results could be used to design an economically competitive power plant as well as some of the many

alternative fusion concepts.

Design Patterns Erich Gamma 1995 Software -- Software Engineering.

Data-intensive Systems Tomasz Wiktorski 2019-01-01 Data-intensive systems are a technological building block supporting Big Data and Data Science applications. This book familiarizes readers with core concepts that they should be aware of before continuing with independent work and the more advanced technical reference literature that dominates the current landscape. The material in the book is structured following a problem-based approach. This means that the content in the chapters is focused on developing solutions to simplified, but still realistic problems using data-intensive technologies and approaches. The reader follows one reference scenario through the whole book, that uses an open Apache dataset. The origins of this volume are in lectures from a master's course in Data-intensive Systems, given at the University of Stavanger. Some chapters were also a base for guest lectures at Purdue University and Lodz University of Technology.

Software Engineering at Google Titus Winters 2020-02-28 Today, software engineers need to know not only how to program effectively but also how to develop proper engineering practices to make their codebase sustainable and healthy. This book emphasizes this difference between programming and software engineering. How can software engineers manage a living codebase that evolves and responds to changing requirements and demands over the length of its life? Based on their experience at Google, software engineers Titus Winters and Hyrum Wright, along with technical writer Tom Manshreck, present a candid and insightful look at how some of the world's leading practitioners construct and maintain software. This book covers Google's unique engineering culture, processes, and tools and how these aspects contribute to the effectiveness of an engineering organization. You'll explore three fundamental principles that software organizations should keep in mind when designing, architecting, writing, and maintaining code: How time affects the sustainability of software and how to make your code resilient over time How scale affects the viability of software practices within an engineering organization What trade-offs a typical engineer needs to make when evaluating design and development decisions

Architecting Data Intensive Applications Anuj Kumar 2018-07-31 Architect and design data-intensive applications and, in the process, learn how to collect, process, store, govern, and expose data for a variety of use cases Key Features Integrate the data-intensive approach into your application architecture Create a robust application layout with effective messaging and data querying architecture Enable smooth data flow and make the data of your application intensive and fast Book Description Are you an architect or a developer who looks at your own applications gingerly while browsing through Facebook and applauding it silently for its data-intensive, yet fluent and efficient, behaviour? This book is your gateway to build smart data-intensive systems by incorporating the core data-intensive architectural principles, patterns, and techniques directly into your application architecture. This book starts by

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taking you through the primary design challenges involved with architecting data-intensive applications. You will learn how to implement data curation and data dissemination, depending on the volume of your data. You will then implement your application architecture one step at a time. You will get to grips with implementing the correct message delivery protocols and creating a data layer that doesn't fail when running high traffic. This book will show you how you can divide your application into layers, each of which adheres to the single responsibility principle. By the end of this book, you will learn to streamline your thoughts and make the right choice in terms of technologies and architectural principles based on the problem at hand. What you will learn

- Understand how to envision a data-intensive system
- Identify and compare the non-functional requirements of a data collection component
- Understand patterns involving data processing, as well as technologies that help to speed up the development of data processing systems
- Understand how to implement Data Governance policies at design time using various Open Source Tools
- Recognize the anti-patterns to avoid while designing a data store for applications
- Understand the different data dissemination technologies available to query the data in an efficient manner
- Implement a simple data governance policy that can be extended using Apache Falcon

Who this book is for This book is for developers and data architects who have to code, test, deploy, and/or maintain large-scale, high data volume applications. It is also useful for system architects who need to understand various non-functional aspects revolving around Data Intensive Systems.

Data-intensive Text Processing with MapReduce Jimmy Lin 2010 Our world is being revolutionized by data-driven methods: access to large amounts of data has generated new insights and opened exciting new opportunities in commerce, science, and computing applications. Processing the enormous quantities of data necessary for these advances requires large clusters, making distributed computing paradigms more crucial than ever. MapReduce is a programming model for expressing distributed computations on massive datasets and an execution framework for large-scale data processing on clusters of commodity servers. The programming model provides an easy-to-understand abstraction for designing scalable algorithms, while the execution framework transparently handles many system-level details, ranging from scheduling to synchronization to fault tolerance. This book focuses on MapReduce algorithm design, with an emphasis on text processing algorithms common in natural language processing, information retrieval, and machine learning. We introduce the notion of MapReduce design patterns, which represent general reusable solutions to commonly occurring problems across a variety of problem domains. This book not only intends to help the reader "think in MapReduce", but also discusses limitations of the programming model as well. This volume is a printed version of a work that appears in the Synthesis Digital Library of Engineering and Computer Science. Synthesis Lectures provide concise, original presentations of important research and development topics, published quickly, in digital and print formats. For more information visit www.morganclaypool.com

maintaining a database, understanding its internals is essential. But with so many distributed databases and tools available today, it's often difficult to understand what each one offers and how they differ. With this practical guide, Alex Petrov guides developers through the concepts behind modern database and storage engine internals. Throughout the book, you'll explore relevant material gleaned from numerous books, papers, blog posts, and the source code of several open source databases. These resources are listed at the end of parts one and two. You'll discover that the most significant distinctions among many modern databases reside in subsystems that determine how storage is organized and how data is distributed. This book examines:

- Storage engines: Explore storage classification and taxonomy, and dive into B-Tree-based and immutable Log Structured storage engines, with differences and use-cases for each
- Storage building blocks: Learn how database files are organized to build efficient storage, using auxiliary data structures such as Page Cache, Buffer Pool and Write-Ahead Log
- Distributed systems: Learn step-by-step how nodes and processes connect and build complex communication patterns
- Database clusters: Which consistency models are commonly used by modern databases and how distributed storage systems achieve consistency

Kafka: The Definitive Guide Neha Narkhede 2017-08-31 Every enterprise application creates data, whether it's log messages, metrics, user activity, outgoing messages, or something else. And how to move all of this data becomes nearly as important as the data itself. If you're an application architect, developer, or production engineer new to Apache Kafka, this practical guide shows you how to use this open source streaming platform to handle real-time data feeds. Engineers from Confluent and LinkedIn who are responsible for developing Kafka explain how to deploy production Kafka clusters, write reliable event-driven microservices, and build scalable stream-processing applications with this platform. Through detailed examples, you'll learn Kafka's design principles, reliability guarantees, key APIs, and architecture details, including the replication protocol, the controller, and the storage layer. Understand publish-subscribe messaging and how it fits in the big data ecosystem. Explore Kafka producers and consumers for writing and reading messages Understand Kafka patterns and use-case requirements to ensure reliable data delivery Get best practices for building data pipelines and applications with Kafka Manage Kafka in production, and learn to perform monitoring, tuning, and maintenance tasks Learn the most critical metrics among Kafka's operational measurements Explore how Kafka's stream delivery capabilities make it a perfect source for stream processing systems

Java Concurrency in Practice Tim Peierls 2006-05-09 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

Reactive Design Patterns Jamie Allen 2017-02-21 Summary Reactive Design Patterns is a clearly written guide for building message-driven distributed systems that are resilient, responsive, and elastic. In this book you'll find patterns for messaging, flow control, resource management, and concurrency, along with practical issues like test-friendly designs. All patterns include concrete examples using Scala and Akka. Foreword by Jonas Bonér. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the Technology Modern web applications serve potentially vast numbers of users - and they need to keep working as servers fail and new ones come online, users overwhelm limited resources, and information is distributed globally. A Reactive application adjusts to partial failures and varying loads, remaining responsive in an ever-changing distributed environment. The secret is message-driven architecture - and design patterns to organize it. About the Book Reactive Design Patterns presents the principles, patterns, and best practices of Reactive application design. You'll learn how to keep one slow component from bogging down others with the Circuit Breaker pattern, how to shepherd a many-staged transaction to completion with the Saga pattern, how to divide datasets by Sharding, and more. You'll even see how to keep your source code readable and the system testable despite many potential interactions and points of failure. What's Inside The definitive guide to the Reactive Manifesto Patterns for flow control, delimited consistency, fault tolerance, and much more Hard-won lessons about what doesn't work Architectures that scale under tremendous load About the Reader Most examples use Scala, Java, and Akka. Readers should be familiar with distributed systems. About the Author Dr. Roland Kuhn led the Akka team at Lightbend and coauthored the Reactive Manifesto. Brian Hanafée and Jamie Allen are experienced distributed systems architects. Table of Contents PART 1 - INTRODUCTION Why Reactive? A walk-through of the Reactive Manifesto Tools of the trade PART 2 - THE PHILOSOPHY IN A NUTSHELL Message passing Location transparency Divide and conquer Principled failure handling Delimited consistency Nondeterminism by need Message flow PART 3 - PATTERNS Testing reactive applications Fault tolerance and recovery patterns Replication patterns Resource-management patterns Message flow patterns Flow control

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patterns State management and persistence patterns

Designing Data-Intensive Applications Martin Kleppmann 2017

Cloud Native Patterns Cornelia Davis 2019-05-12 Summary Cloud Native Patterns is your guide to developing strong applications that thrive in the dynamic, distributed, virtual world of the cloud. This book presents a mental model for cloud-native applications, along with the patterns, practices, and tooling that set them apart. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the Technology Cloud platforms promise the holy grail: near-zero downtime, infinite scalability, short feedback cycles, fault-tolerance, and cost control. But how do you get there? By applying cloud-native designs, developers can build resilient, easily adaptable, web-scale distributed applications that handle massive user traffic and data loads. Learn these fundamental patterns and practices, and you'll be ready to thrive in the dynamic, distributed, virtual world of the cloud. About the Book With 25 years of experience under her belt, Cornelia Davis teaches you the practices and patterns that set cloud-native applications apart. With realistic examples and expert advice for working with apps, data, services, routing, and more, she shows you how to design and build software that functions beautifully on modern cloud platforms. As you read, you will start to appreciate that cloud-native computing is more about the how and why rather than the where. What's inside The lifecycle of cloud-native apps Cloud-scale configuration management Zero downtime upgrades, versioned services, and parallel deploys Service discovery and dynamic routing Managing interactions between services, including retries and circuit breakers About the Reader Requires basic software design skills and an ability to read Java or a similar language. About the Author Cornelia Davis is Vice President of Technology at Pivotal Software. A teacher at heart, she's spent the last 25 years making good software and great software developers. Table of Contents PART 1 - THE CLOUD-NATIVE CONTEXT You keep using that word: Defining "cloud-native" Running cloud-native applications in production The platform for cloud-native software PART 2 - CLOUD-NATIVE PATTERNS Event-driven microservices: It's not just request/response App redundancy: Scale-out and statelessness Application configuration: Not just environment variables The application lifecycle: Accounting for constant change Accessing apps: Services, routing, and service discovery Interaction redundancy: Retries and other control loops Fronting services: Circuit breakers and API gateways Troubleshooting: Finding the needle in the haystack Cloud-native data: Breaking the data monolith

Architecture Patterns with Python Harry Percival 2020-03-05 As Python continues to grow in popularity, projects are becoming larger and more complex. Many Python developers are now taking an interest in high-level software design patterns such as hexagonal/clean architecture, event-driven architecture, and the strategic patterns prescribed by domain-driven design (DDD). But translating those patterns into Python isn't always straightforward. With this hands-on guide, Harry Percival and Bob Gregory from MADE.com introduce proven architectural design patterns to help Python developers manage application

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complexity—and get the most value out of their test suites. Each pattern is illustrated with concrete examples in beautiful, idiomatic Python, avoiding some of the verbosity of Java and C# syntax. Patterns include: Dependency inversion and its links to ports and adapters (hexagonal/clean architecture) Domain-driven design's distinction between entities, value objects, and aggregates Repository and Unit of Work patterns for persistent storage Events, commands, and the message bus Command-query responsibility segregation (CQRS) Event-driven architecture and reactive microservices

System Design Interview - An Insider's Guide Alex Xu 2020-06-12 The system design interview is considered to be the most complex and most difficult technical job interview by many. Those questions are intimidating, but don't worry. It's just that nobody has taken the time to prepare you systematically. We take the time. We go slow. We draw lots of diagrams and use lots of examples. You'll learn step-by-step, one question at a time. Don't miss out. What's inside? - An insider's take on what interviewers really look for and why. - A 4-step framework for solving any system design interview question. - 16 real system design interview questions with detailed solutions. - 188 diagrams to visually explain how different systems work.

Data Intensive Distributed Computing: Challenges and Solutions for Large-scale Information Management Kosar, Tevfik 2012-01-31 "This book focuses on the challenges of distributed systems imposed by the data intensive applications, and on the different state-of-the-art solutions proposed to overcome these challenges" -- Provided by publisher.

Redis in Action Josiah Carlson 2013-06-17 Summary Redis in Action introduces Redis and walks you through examples that demonstrate how to use it effectively. You'll begin by getting Redis set up properly and then exploring the key-value model. Then, you'll dive into real use cases including simple caching, distributed ad targeting, and more. You'll learn how to scale Redis from small jobs to massive datasets. Experienced developers will appreciate chapters on clustering and internal scripting to make Redis easier to use. About the Technology When you need near-real-time access to a fast-moving data stream, key-value stores like Redis are the way to go. Redis expands on the key-value pattern by accepting a wide variety of data types, including hashes, strings, lists, and other structures. It provides lightning-fast operations on in-memory datasets, and also makes it easy to persist to disk on the fly. Plus, it's free and open source. About this book Redis in Action introduces Redis and the key-value model. You'll quickly dive into real use cases including simple caching, distributed ad targeting, and more. You'll learn how to scale Redis from small jobs to massive datasets and discover how to integrate with traditional RDBMS or other NoSQL stores. Experienced developers will appreciate the in-depth chapters on clustering and internal scripting. Written for developers familiar with database concepts. No prior exposure to NoSQL database concepts nor to Redis itself is required. Appropriate for systems administrators comfortable with programming. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning

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Publications. What's Inside Redis from the ground up Preprocessing real-time data Managing in-memory datasets Pub/sub and configuration Persisting to disk About the Author Dr. Josiah L. Carlson is a seasoned database professional and an active contributor to the Redis community. Table of Contents PART 1 GETTING STARTED Getting to know Redis Anatomy of a Redis web application PART 2 CORE CONCEPTS Commands in Redis Keeping data safe and ensuring performance Using Redis for application support Application components in Redis Search-based applications Building a simple social network PART 3 NEXT STEPS Reducing memory use Scaling Redis Scripting Redis with Lua

Foundations of Data Intensive Applications Supun Kamburugamuve 2021-08-11 PEEK "UNDER THE HOOD" OF BIG DATA ANALYTICS The world of big data analytics grows ever more complex. And while many people can work superficially with specific frameworks, far fewer understand the fundamental principles of large-scale, distributed data processing systems and how they operate. In Foundations of Data Intensive Applications: Large Scale Data Analytics under the Hood, renowned big-data experts and computer scientists Drs. Supun Kamburugamuve and Saliya Ekanayake deliver a practical guide to applying the principles of big data to software development for optimal performance. The authors discuss foundational components of large-scale data systems and walk readers through the major software design decisions that define performance, application type, and usability. You'll learn how to recognize problems in your applications resulting in performance and distributed operation issues, diagnose them, and effectively eliminate them by relying on the bedrock big data principles explained within. Moving beyond individual frameworks and APIs for data processing, this book unlocks the theoretical ideas that operate under the hood of every big data processing system. Ideal for data scientists, data architects, dev-ops engineers, and developers, Foundations of Data Intensive Applications: Large Scale Data Analytics under the Hood shows readers how to: Identify the foundations of large-scale, distributed data processing systems Make major software design decisions that optimize performance Diagnose performance problems and distributed operation issues Understand state-of-the-art research in big data Explain and use the major big data frameworks and understand what underpins them Use big data analytics in the real world to solve practical problems

Hands-On Enterprise Application Development with Python Saurabh Badhwar 2018-12-28 Architect scalable, reliable, and maintainable applications for enterprises with Python Key Features Explore various Python design patterns used for enterprise software development Apply best practices for testing and performance optimization to build stable applications Learn about different attacking strategies used on enterprise applications and how to avoid them Book Description Dynamically typed languages like Python are continuously improving. With the addition of exciting new features and a wide selection of modern libraries and frameworks, Python has emerged as an ideal language for developing enterprise applications. Hands-On Enterprise Application Development with Python will show you how to build effective applications that are stable, secure, and easily scalable. The book is a detailed guide to building an end-

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to-end enterprise-grade application in Python. You will learn how to effectively implement Python features and design patterns that will positively impact your application lifecycle. The book also covers advanced concurrency techniques that will help you build a RESTful application with an optimized frontend. Given that security and stability are the foundation for an enterprise application, you'll be trained on effective testing, performance analysis, and security practices, and understand how to embed them in your codebase during the initial phase. You'll also be guided in how to move on from a monolithic architecture to one that is service oriented, leveraging microservices and serverless deployment techniques. By the end of the book, you will have become proficient at building efficient enterprise applications in Python. What you will learn

Understand the purpose of design patterns and their impact on application lifecycle
Build applications that can handle large amounts of data-intensive operations
Uncover advanced concurrency techniques and discover how to handle a large number of requests in production
Optimize frontends to improve the client-side experience of your application
Effective testing and performance profiling techniques to detect issues in applications early in the development cycle
Build applications with a focus on security
Implement large applications as microservices to improve scalability

Who this book is for
If you're a developer who wants to build enterprise-grade applications, this book is for you. Basic to intermediate-level of programming experience with Python and database systems is required to understand the concepts covered in this book.

Designing Data-Intensive Applications Martin Kleppmann 2017-03-16 Data is at the center of many challenges in system design today. Difficult issues need to be figured out, such as scalability, consistency, reliability, efficiency, and maintainability. In addition, we have an overwhelming variety of tools, including relational databases, NoSQL datastores, stream or batch processors, and message brokers. What are the right choices for your application? How do you make sense of all these buzzwords? In this practical and comprehensive guide, author Martin Kleppmann helps you navigate this diverse landscape by examining the pros and cons of various technologies for processing and storing data. Software keeps changing, but the fundamental principles remain the same. With this book, software engineers and architects will learn how to apply those ideas in practice, and how to make full use of data in modern applications. Peer under the hood of the systems you already use, and learn how to use and operate them more effectively Make informed decisions by identifying the strengths and weaknesses of different tools Navigate the trade-offs around consistency, scalability, fault tolerance, and complexity Understand the distributed systems research upon which modern databases are built Peek behind the scenes of major online services, and learn from their architectures

Monolith to Microservices Sam Newman 2019-11-14 How do you detangle a monolithic system and migrate it to a microservice architecture? How do you do it while maintaining business-as-usual? As a companion to Sam Newman's extremely popular Building Microservices, this new book details a proven method for transitioning an existing monolithic system to a microservice architecture.

With many illustrative examples, insightful migration patterns, and a bevy of practical advice to transition your monolith enterprise into a microservice operation, this practical guide covers multiple scenarios and strategies for a successful migration, from initial planning all the way through application and database decomposition. You'll learn several tried and tested patterns and techniques that you can use as you migrate your existing architecture. Ideal for organizations looking to transition to microservices, rather than rebuild. Helps companies determine whether to migrate, when to migrate, and where to begin. Addresses communication, integration, and the migration of legacy systems. Discusses multiple migration patterns and where they apply. Provides database migration examples, along with synchronization strategies. Explores application decomposition, including several architectural refactoring patterns. Delves into details of database decomposition, including the impact of breaking referential and transactional integrity, new failure modes, and more.

Release It! Michael T. Nygard 2018-01-08 A single dramatic software failure can cost a company millions of dollars - but can be avoided with simple changes to design and architecture. This new edition of the best-selling industry standard shows you how to create systems that run longer, with fewer failures, and recover better when bad things happen. New coverage includes DevOps, microservices, and cloud-native architecture. Stability antipatterns have grown to include systemic problems in large-scale systems. This is a must-have pragmatic guide to engineering for production systems. If you're a software developer, and you don't want to get alerts every night for the rest of your life, help is here. With a combination of case studies about huge losses - lost revenue, lost reputation, lost time, lost opportunity - and practical, down-to-earth advice that was all gained through painful experience, this book helps you avoid the pitfalls that cost companies millions of dollars in downtime and reputation. Eighty percent of project life-cycle cost is in production, yet few books address this topic. This updated edition deals with the production of today's systems - larger, more complex, and heavily virtualized - and includes information on chaos engineering, the discipline of applying randomness and deliberate stress to reveal systematic problems. Build systems that survive the real world, avoid downtime, implement zero-downtime upgrades and continuous delivery, and make cloud-native applications resilient. Examine ways to architect, design, and build software - particularly distributed systems - that stands up to the typhoon winds of a flash mob, a Slashdotting, or a link on Reddit. Take a hard look at software that failed the test and find ways to make sure your software survives. To skip the pain and get the experience...get this book.

Web Scalability for Startup Engineers Artur Ejsmont 2015-07-03 This invaluable roadmap for startup engineers reveals how to successfully handle web application scalability challenges to meet increasing product and traffic demands. Web Scalability for Startup Engineers shows engineers working at startups and small companies how to plan and implement a comprehensive scalability strategy. It presents broad and holistic view of infrastructure and architecture of a scalable web application. Successful startups often face the

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challenge of scalability, and the core concepts driving a scalable architecture are language and platform agnostic. The book covers scalability of HTTP-based systems (websites, REST APIs, SaaS, and mobile application backends), starting with a high-level perspective before taking a deep dive into common challenges and issues. This approach builds a holistic view of the problem, helping you see the big picture, and then introduces different technologies and best practices for solving the problem at hand. The book is enriched with the author's real-world experience and expert advice, saving you precious time and effort by learning from others' mistakes and successes. Language-agnostic approach addresses universally challenging concepts in Web development/scalability—does not require knowledge of a particular language
Fills the gap for engineers in startups and smaller companies who have limited means for getting to the next level in terms of accomplishing scalability
Strategies presented help to decrease time to market and increase the efficiency of web applications

Building Microservices Sam Newman 2015-02-02 Annotation Over the past 10 years, distributed systems have become more fine-grained. From the large multi-million line long monolithic applications, we are now seeing the benefits of smaller self-contained services. Rather than heavy-weight, hard to change Service Oriented Architectures, we are now seeing systems consisting of collaborating microservices. Easier to change, deploy, and if required retire, organizations which are in the right position to take advantage of them are yielding significant benefits. This book takes an holistic view of the things you need to be cognizant of in order to pull this off. It covers just enough understanding of technology, architecture, operations and organization to show you how to move towards finer-grained systems.

Designing Distributed Systems Brendan Burns 2018-02-20 Without established design patterns to guide them, developers have had to build distributed systems from scratch, and most of these systems are very unique indeed. Today, the increasing use of containers has paved the way for core distributed system patterns and reusable containerized components. This practical guide presents a collection of repeatable, generic patterns to help make the development of reliable distributed systems far more approachable and efficient. Author Brendan Burns—Director of Engineering at Microsoft Azure—demonstrates how you can adapt existing software design patterns for designing and building reliable distributed applications. Systems engineers and application developers will learn how these long-established patterns provide a common language and framework for dramatically increasing the quality of your system. Understand how patterns and reusable components enable the rapid development of reliable distributed systems Use the side-car, adapter, and ambassador patterns to split your application into a group of containers on a single machine Explore loosely coupled multi-node distributed patterns for replication, scaling, and communication between the components Learn distributed system patterns for large-scale batch data processing covering work-queues, event-based processing, and coordinated workflows

Spark: The Definitive Guide Bill Chambers 2018-02-08 Learn how to use, deploy, and maintain Apache Spark with this comprehensive guide, written by the creators of the open-source cluster-computing framework. With an emphasis on improvements and new features in Spark 2.0, authors Bill Chambers and Matei Zaharia break down Spark topics into distinct sections, each with unique goals. You'll explore the basic operations and common functions of Spark's structured APIs, as well as Structured Streaming, a new high-level API for building end-to-end streaming applications. Developers and system administrators will learn the fundamentals of monitoring, tuning, and debugging Spark, and explore machine learning techniques and scenarios for employing MLlib, Spark's scalable machine-learning library. Get a gentle overview of big data and Spark Learn about DataFrames, SQL, and Datasets—Spark's core APIs—through worked examples Dive into Spark's low-level APIs, RDDs, and execution of SQL and DataFrames Understand how Spark runs on a cluster Debug, monitor, and tune Spark clusters and applications Learn the power of Structured Streaming, Spark's stream-processing engine Learn how you can apply MLlib to a variety of problems, including classification or recommendation