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Fundamentals of Software Architecture Software Architecture in Practice Software and Systems Architecture in Action Software Architecture Designing Software Architectures The Art of Software Architecture Software Engineering Beautiful Architecture Software Architecture in Practice Software Architecture and Design Illuminated Just Enough Software Architecture Lean Architecture Software Architecture: The Hard Parts Software Architecture for Big Data and the Cloud Economics-Driven Software Architecture Beautiful Architecture Just Enough Software Architecture Bridging the Gap between Requirements Engineering and Software Architecture Design and Use of Software Architectures Software Architecture with C++ Relating System Quality and Software Architecture Software Architecture Automotive Software Architectures The Software Architect Elevator Software Design Methodology Building Evolutionary Architectures Software Modeling and Design 97 Things Every Software Architect Should Know Software Architecture in Action Managing Trade-offs in Adaptable Software Architectures Essential Software Architecture SOFTWARE DESIGN, ARCHITECTURE AND ENGINEERING Software Architecture Knowledge Management Software Architect's Handbook Software Architecture: the Hard Parts Software Architecture A Philosophy of Software Design Pattern-Oriented Software Architecture For Dummies Large-Scale Software Architecture Aligning Enterprise, System, and Software Architectures

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What are the ingredients of robust, elegant, flexible, and maintainable software architecture? Beautiful Architecture answers this question through a collection of intriguing essays from more than a dozen of today's leading software designers and architects. In each essay, contributors present a notable software architecture, and analyze what makes it innovative and ideal for its purpose. Some of the engineers in this book reveal how they developed a specific project, including decisions they faced and tradeoffs they made. Others take a step back to investigate how certain architectural aspects have influenced computing as a whole. With this book, you'll discover: How Facebook's architecture is the basis for a data-centric application ecosystem The effect of Xen's well-designed architecture on the way operating systems evolve How community processes within the KDE project help software architectures evolve from rough sketches to beautiful systems How creeping featurism has helped GNU Emacs gain unanticipated functionality The magic behind the Jikes RVM self-optimizable, self-hosting runtime Design choices and building blocks that made Tandem the choice platform in high-availability environments for over two decades Differences and similarities between object-oriented and functional architectural views How architectures can affect the software's evolution and the developers' engagement Go behind the scenes to learn what it takes to design elegant software architecture, and how it can shape the way you approach your own projects, with Beautiful Architecture. This innovative book uncovers all the steps readers should follow in order to build successful software and systems With the help of numerous examples, Albin clearly shows how to incorporate Java, XML, SOAP, ebXML, and BizTalk when designing true distributed business systems Teaches how to easily integrate design patterns into software design Documents all architectures in UML and presents code in either Java or C++ "This book covers both theoretical

approaches and practical solutions in the processes for aligning enterprise, systems, and software architectures"--Provided by publisher. For more and more systems, software has moved from a peripheral to a central role, replacing mechanical parts and hardware and giving the product a competitive edge. Consequences of this trend are an increase in: the size of software systems, the variability in software artifacts, and the importance of software in achieving the system-level properties. Software architecture provides the necessary abstractions for managing the resulting complexity. We here introduce the Third Working IEEE/ACM Conference on Software Architecture, WICSA3. That it is already the third such conference is in itself a clear indication that software architecture continues to be an important topic in industrial software development and in software engineering research. However, becoming an established field does not mean that software architecture provides less opportunity for innovation and new directions. On the contrary, one can identify a number of interesting trends within software architecture research. The first trend is that the role of the software architecture in all phases of software development is more explicitly recognized. Whereas initially software architecture was primarily associated with the architecture design phase, we now see that the software architecture is treated explicitly during development, product derivation in software product lines, at run-time, and during system evolution. Software architecture as an artifact has been decoupled from a particular lifecycle phase. The purpose of large-scale software architecture is to capture and describe practical representations to make development teams more effective. In this book the authors show how to utilise software architecture as a tool to guide the development instead of capturing the architectural details after all the design decisions have been made. * Offers a concise description of UML usage for large-scale architecture * Discusses software architecture and design principles * Technology and vendor independent Software Design Methodology explores the theory of software architecture, with particular emphasis on general design principles rather than specific methods. This book provides in depth coverage of large scale software systems and the handling of their design problems. It will help students gain an understanding of the general theory of design methodology, and especially in analysing and evaluating software architectural designs, through the use of case studies and examples, whilst broadening their knowledge of large-scale software systems. This book shows how important factors, such as globalisation, modelling, coding, testing and maintenance, need to be addressed when creating a modern information system. Each chapter contains expected learning outcomes, a summary of key points and exercise questions to test knowledge and skills. Topics range from the basic concepts of design to software design quality; design strategies and processes; and software architectural styles. Theory and practice are reinforced with many worked examples and exercises, plus case studies on extraction of keyword vector from text; design space for user interface architecture; and document editor. Software Design Methodology is intended for IT industry professionals as well as software engineering and computer science undergraduates and graduates on Msc conversion courses. * In depth coverage of large scale software systems and the handling of their design problems * Many worked examples, exercises and case studies to reinforce theory and practice * Gain an understanding of the general theory of design methodology This book covers all you need to know to model and design software applications from use cases to software architectures in UML and shows how to apply the COMET UML-based modeling and design method to real-world problems. The author describes architectural patterns for various architectures, such as broker, discovery, and transaction patterns for service-oriented architectures, and addresses software quality attributes including maintainability, modifiability, testability, traceability, scalability, reusability, performance, availability, and security. Complete case studies illustrate design issues for different software architectures: a banking system for client/server architecture, an online shopping system for service-oriented architecture, an emergency monitoring system for component-based software architecture, and an automated guided vehicle for real-time software architecture. Organized as an introduction followed by several short, self-contained chapters, the book is perfect for senior undergraduate or graduate courses in software engineering and design, and for experienced software engineers wanting a quick reference at each stage of the

analysis, design, and development of large-scale software systems. Architects are often harried because they have no clean, easy decisions: everything is an awful tradeoff between two or more less than perfect alternatives. These are the difficult problems architects face, what this book's authors call "the hard parts." These topics have no best practices, forcing architects to understand various tradeoffs to succeed. This book discusses these hard parts by not only investigating what makes architecture so difficult, but also by providing proven ways to address these problems and make them easier. The book explores topics such as choosing an appropriate architecture, deciding on service granularity, managing workflows and orchestration, managing and decoupling contracts, managing distributed transactions, and optimizing operational characteristics such as scalability, elasticity, and performance. As practicing consultants, the authors focus on questions they commonly hear architects ask and provide techniques that enable them to discover the tradeoffs necessary to answer these questions. A comprehensive guide to exploring software architecture concepts and implementing best practices

Key Features Enhance your skills to grow your career as a software architect

Design efficient software architectures using patterns and best practices Learn how software architecture relates to an organization as well as software development methodology

Book Description The Software Architect's Handbook is a comprehensive guide to help developers, architects, and senior programmers advance their career in the software architecture domain. This book takes you through all the important concepts, right from design principles to different considerations at various stages of your career in software architecture. The book begins by covering the fundamentals, benefits, and purpose of software architecture. You will discover how software architecture relates to an organization, followed by identifying its significant quality attributes. Once you have covered the basics, you will explore design patterns, best practices, and paradigms for efficient software development. The book discusses which factors you need to consider for performance and security enhancements. You will learn to write documentation for your architectures and make appropriate decisions when considering DevOps. In addition to this, you will explore how to design legacy applications before understanding how to create software architectures that evolve as the market, business requirements, frameworks, tools, and best practices change over time. By the end of this book, you will not only have studied software architecture concepts but also built the soft skills necessary to grow in this field. What you will learn

Design software architectures using patterns and best practices Explore the different considerations for designing software architecture

Discover what it takes to continuously improve as a software architect Create loosely coupled systems that can support change

Understand DevOps and how it affects software architecture Integrate, refactor, and re-architect legacy applications

Who this book is for The Software Architect's Handbook is for you if you are a software architect, chief technical officer (CTO), or senior developer looking to gain a firm grasp of software architecture.

Computer Architecture/Software Engineering This book presents a systematic model-based approach for software architecture according to three complementary viewpoints: structure, behavior, and execution. It covers a unified modeling approach and consolidates theory and practice with well-established learning outcomes. The authors cover the fundamentals of software architecture description and presents SysADL, a specialization of the OMG Standard Systems Modeling Language (SysML) with the aim of bringing together the expressive power of an Architecture Description Language (ADL) with a standard notation, widely accepted by industry and compliant with the ISO/IEC/IEEE 42010 Standard on Architecture Description in Systems and Software Engineering. The book is clearly structured in four parts: The first part focuses on the fundamentals of software architecture, exploring the concepts and constructs for modeling software architecture from differing viewpoints. Each chapter covers a specific viewpoint illustrated with examples of a real system. The second part focuses on how to design software architecture for achieving quality attributes. Each chapter covers a specific quality attribute and presents well-defined approaches to achieve it. Each architectural case study is illustrated with different examples drawn from a real-life system. The third part shows readers how to apply software architecture style to design architectures that meet the quality attributes. Each chapter covers a specific architectural style and gives insights on

how to describe substyles. Each style is illustrated by variants and examples of a real-life system. The fourth part presents how to textually represent software architecture models to complement visual notation, including different examples. Software Architecture in Action is designed for teaching the required modeling techniques to both undergraduate and graduate students, giving them the practical techniques and tools needed to design the architecture of software-intensive systems. Similarly, this book will appeal to software development architects, designers, programmers and project managers too. This textbook aims to prepare students, as well as, practitioners for software design and production. Keeping in mind theory and practice, the book keeps a balance between theoretical foundations and practical considerations. The book by and large meets the requirements of students at all levels of computer science and engineering/information technology for their Software design and Software engineering courses. The book begins with concepts of data and object. This helps in exploring the rationale that guide high level programming language (HLL) design and object oriented frameworks. Once past this post, the book moves on to expand on software design concerns. The book emphasizes the centrality of Parnas's separation of concerns in evolving software designs and architecture. The book extensively explores modelling frameworks such as Unified Modelling Language (UML) and Petri net based methods. Next, the book covers architectural principles and software engineering practices such as Agile - emphasizing software testing during development. It winds up with case studies demonstrating how systems evolve from basic concepts to final products for quality software designs.

TARGET AUDIENCE • Undergraduate/postgraduate students of Computer Science and Engineering, and Information Technology • Postgraduate students of Software Engineering/Software Systems

Salary surveys 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

The software development ecosystem is constantly changing, providing a constant stream of new tools, frameworks, techniques, and paradigms. Over the past few years, incremental developments in core engineering practices for software development have created the foundations for rethinking how architecture changes over time, along with ways to protect important architectural characteristics as it evolves. This practical guide ties those parts together with a new way to think about architecture and time.

Software Engineering: Architecture-driven Software Development is the first comprehensive guide to the underlying skills embodied in the IEEE's Software Engineering Body of Knowledge (SWEBOK) standard. Standards expert Richard Schmidt explains the traditional software engineering practices recognized for developing projects for government or corporate systems. Software engineering education often lacks standardization, with many institutions focusing on implementation rather than design as it impacts product architecture. Many graduates join the workforce with incomplete skills, leading to software projects that either fail outright or run woefully over budget and behind schedule. Additionally, software engineers need to understand system engineering and architecture—the hardware and peripherals their programs will run on. This issue will only grow in importance as more programs leverage parallel computing, requiring an understanding of the parallel capabilities of processors and hardware. This book gives both software developers and system engineers key insights into how their skillsets support and complement each other.

With a focus on these key knowledge areas, Software Engineering offers a set of best practices that can be applied to any industry or domain involved in developing software products. A thorough, integrated compilation on the engineering of software products, addressing the majority of the standard knowledge areas and topics Offers best practices focused on those key skills common to many industries and domains that develop software Learn how software engineering relates to systems engineering for better communication with other engineering professionals within a project environment Implement programming best practices from the ground up Imagine how much easier it would be to solve a programming problem, if you had access to the best practices from all the top experts in the field, and you could follow the best design patterns that have evolved through the years. Well, now you can. This unique book offers development solutions ranging from high-level architectural patterns, to design patterns that apply to specific problems encountered after the overall structure has been designed, to idioms in specific programming languages--all in one, accessible, guide. Not only will you improve your understanding of software design, you'll also improve the programs you create and successfully take your development ideas to the next level. Pulls together the best design patterns and best practices for software design into one accessible guide to help you improve your programming projects Helps you avoid re-creating the wheel and also meet the ever-increasing pace of rev cycles, as well as the ever-increasing number of new platforms and technologies for mobile, web, and enterprise computing Fills a gap in the entry-level POSA market, as well as a need for guidance in implementing best practices from the ground up Save time and avoid headaches with your software development projects with Pattern-Oriented Software Architecture For Dummies. This is a practical guide for software developers, and different than other software architecture books. Here's why: It teaches risk-driven architecting. There is no need for meticulous designs when risks are small, nor any excuse for sloppy designs when risks threaten your success. This book describes a way to do just enough architecture. It avoids the one-size-fits-all process tar pit with advice on how to tune your design effort based on the risks you face. It democratizes architecture. This book seeks to make architecture relevant to all software developers. Developers need to understand how to use constraints as guiderails that ensure desired outcomes, and how seemingly small changes can affect a system's properties. It cultivates declarative knowledge. There is a difference between being able to hit a ball and knowing why you are able to hit it, what psychologists refer to as procedural knowledge versus declarative knowledge. This book will make you more aware of what you have been doing and provide names for the concepts. It emphasizes the engineering. This book focuses on the technical parts of software development and what developers do to ensure the system works not job titles or processes. It shows you how to build models and analyze architectures so that you can make principled design tradeoffs. It describes the techniques software designers use to reason about medium to large sized problems and points out where you can learn specialized techniques in more detail. It provides practical advice. Software design decisions influence the architecture and vice versa. The approach in this book embraces drill-down/pop-up behavior by describing models that have various levels of abstraction, from architecture to data structure design. This book introduces the concept of software architecture as one of the cornerstones of software in modern cars. Following a historical overview of the evolution of software in modern cars and a discussion of the main challenges driving that evolution, Chapter 2 describes the main architectural styles of automotive software and their use in cars' software. Chapter 3 details this further by presenting two modern architectural styles, i.e. centralized and federated software architectures. In Chapter 4, readers will find a description of the software development processes used to develop software on the car manufacturers' side. Chapter 5 then introduces AUTOSAR - an important standard in automotive software. Chapter 6 goes beyond simple architecture and describes the detailed design process for automotive software using Simulink, helping readers to understand how detailed design links to high-level design. The new chapter 7 reports on how machine learning is exploited in automotive software e.g. for image recognition and how both on-board and off-board learning are applied. Next, Chapter 8 presents a method for assessing the quality of the architecture - ATAM (Architecture Trade-off Analysis Method) - and

provides a sample assessment, while Chapter 9 presents an alternative way of assessing the architecture, namely by using quantitative measures and indicators. Subsequently Chapter 10 dives deeper into one of the specific properties discussed in Chapter 8 – safety – and details an important standard in that area, the ISO/IEC 26262 norm. Lastly, Chapter 11 presents a set of future trends that are currently emerging and have the potential to shape automotive software engineering in the coming years. This book explores the concept of software architecture for modern cars and is intended for both beginning and advanced software designers. It mainly aims at two different groups of audience – professionals working with automotive software who need to understand concepts related to automotive architectures, and students of software engineering or related fields who need to understand the specifics of automotive software to be able to construct cars or their components. Accordingly, the book also contains a wealth of real-world examples illustrating the concepts discussed and requires no prior background in the automotive domain. Compared to the first edition, besides the two new chapters 3 and 7 there are considerable updates in chapters 5 and 8 especially. The award-winning and highly influential *Software Architecture in Practice, Third Edition*, has been substantially revised to reflect the latest developments in the field. In a real-world setting, the book once again introduces the concepts and best practices of software architecture—how a software system is structured and how that system’s elements are meant to interact. Distinct from the details of implementation, algorithm, and data representation, an architecture holds the key to achieving system quality, is a reusable asset that can be applied to subsequent systems, and is crucial to a software organization’s business strategy. The authors have structured this edition around the concept of architecture influence cycles. Each cycle shows how architecture influences, and is influenced by, a particular context in which architecture plays a critical role. Contexts include technical environment, the life cycle of a project, an organization’s business profile, and the architect’s professional practices. The authors also have greatly expanded their treatment of quality attributes, which remain central to their architecture philosophy—with an entire chapter devoted to each attribute—and broadened their treatment of architectural patterns. If you design, develop, or manage large software systems (or plan to do so), you will find this book to be a valuable resource for getting up to speed on the state of the art. Totally new material covers Contexts of software architecture: technical, project, business, and professional Architecture competence: what this means both for individuals and organizations The origins of business goals and how this affects architecture Architecturally significant requirements, and how to determine them Architecture in the life cycle, including generate-and-test as a design philosophy; architecture conformance during implementation; architecture and testing; and architecture and agile development Architecture and current technologies, such as the cloud, social networks, and end-user devices Software Architecture for Big Data and the Cloud is designed to be a single resource that brings together research on how software architectures can solve the challenges imposed by building big data software systems. The challenges of big data on the software architecture can relate to scale, security, integrity, performance, concurrency, parallelism, and dependability, amongst others. Big data handling requires rethinking architectural solutions to meet functional and non-functional requirements related to volume, variety and velocity. The book's editors have varied and complementary backgrounds in requirements and architecture, specifically in software architectures for cloud and big data, as well as expertise in software engineering for cloud and big data. This book brings together work across different disciplines in software engineering, including work expanded from conference tracks and workshops led by the editors. Discusses systematic and disciplined approaches to building software architectures for cloud and big data with state-of-the-art methods and techniques Presents case studies involving enterprise, business, and government service deployment of big data applications Shares guidance on theory, frameworks, methodologies, and architecture for cloud and big data Job titles like “Technical Architect” and “Chief Architect” nowadays abound in software industry, yet many people suspect that “architecture” is one of the most overused and least understood terms in professional software development. Gorton’s book tries to resolve this dilemma. It concisely describes the essential elements of knowledge and key

skills required to be a software architect. The explanations encompass the essentials of architecture thinking, practices, and supporting technologies. They range from a general understanding of structure and quality attributes through technical issues like middleware components and service-oriented architectures to recent technologies like model-driven architecture, software product lines, aspect-oriented design, and the Semantic Web, which will presumably influence future software systems. This second edition contains new material covering enterprise architecture, agile development, enterprise service bus technologies, RESTful Web services, and a case study on how to use the MeDICi integration framework. All approaches are illustrated by an ongoing real-world example. So if you work as an architect or senior designer (or want to someday), or if you are a student in software engineering, here is a valuable and yet approachable knowledge source for you. What are the ingredients of robust, elegant, flexible, and maintainable software architecture? Beautiful Architecture answers this question through a collection of intriguing essays from more than a dozen of today's leading software designers and architects. In each essay, contributors present a notable software architecture, and analyze what makes it innovative and ideal for its purpose. Some of the engineers in this book reveal how they developed a specific project, including decisions they faced and tradeoffs they made. Others take a step back to investigate how certain architectural aspects have influenced computing as a whole. With this book, you'll discover: How Facebook's architecture is the basis for a data-centric application ecosystem The effect of Xen's well-designed architecture on the way operating systems evolve How community processes within the KDE project help software architectures evolve from rough sketches to beautiful systems How creeping featurism has helped GNU Emacs gain unanticipated functionality The magic behind the Jikes RVM self-optimizable, self-hosting runtime Design choices and building blocks that made Tandem the choice platform in high-availability environments for over two decades Differences and similarities between object-oriented and functional architectural views How architectures can affect the software's evolution and the developers' engagement Go behind the scenes to learn what it takes to design elegant software architecture, and how it can shape the way you approach your own projects, with Beautiful Architecture. Designing Software Architectures will teach you how to design any software architecture in a systematic, predictable, repeatable, and cost-effective way. This book introduces a practical methodology for architecture design that any professional software engineer can use, provides structured methods supported by reusable chunks of design knowledge, and includes rich case studies that demonstrate how to use the methods. Using realistic examples, you'll master the powerful new version of the proven Attribute-Driven Design (ADD) 3.0 method and will learn how to use it to address key drivers, including quality attributes, such as modifiability, usability, and availability, along with functional requirements and architectural concerns. Drawing on their extensive experience, Humberto Cervantes and Rick Kazman guide you through crafting practical designs that support the full software life cycle, from requirements to maintenance and evolution. You'll learn how to successfully integrate design in your organizational context, and how to design systems that will be built with agile methods. Comprehensive coverage includes Understanding what architecture design involves, and where it fits in the full software development life cycle Mastering core design concepts, principles, and processes Understanding how to perform the steps of the ADD method Scaling design and analysis up or down, including design for pre-sale processes or lightweight architecture reviews Recognizing and optimizing critical relationships between analysis and design Utilizing proven, reusable design primitives and adapting them to specific problems and contexts Solving design problems in new domains, such as cloud, mobile, or big data A software architecture manifests the major early design decisions, which determine the system's development, deployment and evolution. Thus, making better architectural decisions is one of the large challenges in software engineering. Software architecture knowledge management is about capturing practical experience and translating it into generalized architectural knowledge, and using this knowledge in the communication with stakeholders during all phases of the software lifecycle. This book presents a concise description of knowledge management in the software architecture discipline. It explains the importance of sound knowledge

management practices for improving software architecture processes and products, and makes clear the role of knowledge management in software architecture and software development processes. It presents many approaches that are in use in software companies today, approaches that have been used in other domains, and approaches under development in academia. After an initial introduction by the editors, the contributions are grouped in three parts on "Architecture Knowledge Management", "Strategies and Approaches for Managing Architectural Knowledge", and "Tools and Techniques for Managing Architectural Knowledge". The presentation aims at information technology and software engineering professionals, in particular software architects and software architecture researchers. For the industrial audience, the book gives a broad and concise understanding of the importance of knowledge management for improving software architecture process and building capabilities in designing and evaluating better architectures for their mission- and business-critical systems. For researchers, the book will help to understand the applications of various knowledge management approaches in an industrial setting and to identify research challenges and opportunities.

Introduction. Architectural styles. Case studies. Shared information systems. Architectural design guidance. Formal models and specifications. Linguistics issues. Tools for architectural design. Education of software architects. A practical guide to designing and implementing software architectures. There are no easy decisions in software architecture. Instead, there are many hard parts--difficult problems or issues with no best practices--that force you to choose among various compromises. With this book, you'll learn how to think critically about the trade-offs involved with distributed architectures. Architecture veterans and practicing consultants Neal Ford, Mark Richards, Pramod Sadalage, and Zhamak Dehghani discuss strategies for choosing an appropriate architecture. By interweaving a story about a fictional group of technology professionals--the Sysops Squad--they examine everything from how to determine service granularity, manage workflows and orchestration, manage and decouple contracts, and manage distributed transactions to how to optimize operational characteristics, such as scalability, elasticity, and performance. By focusing on commonly asked questions, this book provides techniques to help you discover and weigh the trade-offs as you confront the issues you face as an architect. Analyze trade-offs and effectively document your decisions Make better decisions regarding service granularity Understand the complexities of breaking apart monolithic applications Manage and decouple contracts between services Handle data in a highly distributed architecture Learn patterns to manage workflow and transactions when breaking apart applications More and more Agile projects are seeking architectural roots as they struggle with complexity and scale - and they're seeking lightweight ways to do it Still seeking? In this book the authors help you to find your own path Taking cues from Lean development, they can help steer your project toward practices with longstanding track records Up-front architecture? Sure. You can deliver an architecture as code that compiles and that concretely guides development without bogging it down in a mass of documents and guesses about the implementation Documentation? Even a whiteboard diagram, or a CRC card, is documentation: the goal isn't to avoid documentation, but to document just the right things in just the right amount Process? This all works within the frameworks of Scrum, XP, and other Agile approaches This is the eagerly-anticipated revision to one of the seminal books in the field of software architecture which clearly defines and explains the topic. As the digital economy changes the rules of the game for enterprises, the role of software and IT architects is also transforming. Rather than focus on technical decisions alone, architects and senior technologists need to combine organizational and technical knowledge to effect change in their company's structure and processes. To accomplish that, they need to connect the IT engine room to the penthouse, where the business strategy is defined. In this guide, author Gregor Hohpe shares real-world advice and hard-learned lessons from actual IT transformations. His anecdotes help architects, senior developers, and other IT professionals prepare for a more complex but rewarding role in the enterprise. This book is ideal for:

- Software architects and senior developers looking to shape the company's technology direction or assist in an organizational transformation
- Enterprise architects and senior technologists searching for practical advice on how to navigate technical and organizational topics
- CTOs and senior

technical architects who are devising an IT strategy that impacts the way the organization works IT managers who want to learn what's worked and what hasn't in large-scale transformation This book teaches risk-driven architecting and describes a way to do just enough architecture. It avoids the one-size-fits all process tarp pit with advice on how to tune your design effort based on the risks you face. This book seeks to make architecture relevant to all software developers. Developers need to understand how to use constraints as guiderails that ensure desired outcomes. This book focuses on the technical parts of software development and what developers do to ensure the system works-not the job titles or processes. It shows you how to build models and analyze architectures so that you can make principled design tradeoffs. It describes the techniques software designers use to reason about medium to large sized problems and points out where you learn specialized techniques in more detail. The approach in this book embraces drill-down/pop-up behavior by describing models that have various levels of abstraction, from architecture to data structure design. In this truly unique technical book, today's leading software architects present valuable principles on key development issues that go way beyond technology. More than four dozen architects -- including Neal Ford, Michael Nygard, and Bill de hOra -- offer advice for communicating with stakeholders, eliminating complexity, empowering developers, and many more practical lessons they've learned from years of experience. Among the 97 principles in this book, you'll find useful advice such as: Don't Put Your Resume Ahead of the Requirements (Nitin Borwankar) Chances Are, Your Biggest Problem Isn't Technical (Mark Ramm) Communication Is King; Clarity and Leadership, Its Humble Servants (Mark Richards) Simplicity Before Generality, Use Before Reuse (Kevlin Henney) For the End User, the Interface Is the System (Vinayak Hegde) It's Never Too Early to Think About Performance (Rebecca Parsons) To be successful as a software architect, you need to master both business and technology. This book tells you what top software architects think is important and how they approach a project. If you want to enhance your career, 97 Things Every Software Architect Should Know is essential reading. System Quality and Software Architecture collects state-of-the-art knowledge on how to intertwine software quality requirements with software architecture and how quality attributes are exhibited by the architecture of the system. Contributions from leading researchers and industry evangelists detail the techniques required to achieve quality management in software architecting, and the best way to apply these techniques effectively in various application domains (especially in cloud, mobile and ultra-large-scale/internet-scale architecture) Taken together, these approaches show how to assess the value of total quality management in a software development process, with an emphasis on architecture. The book explains how to improve system quality with focus on attributes such as usability, maintainability, flexibility, reliability, reusability, agility, interoperability, performance, and more. It discusses the importance of clear requirements, describes patterns and tradeoffs that can influence quality, and metrics for quality assessment and overall system analysis. The last section of the book leverages practical experience and evidence to look ahead at the challenges faced by organizations in capturing and realizing quality requirements, and explores the basis of future work in this area. Explains how design decisions and method selection influence overall system quality, and lessons learned from theories and frameworks on architectural quality Shows how to align enterprise, system, and software architecture for total quality Includes case studies, experiments, empirical validation, and systematic comparisons with other approaches already in practice. Apply business requirements to IT infrastructure and deliver a high-quality product by understanding architectures such as microservices, DevOps, and cloud-native using modern C++ standards and features Key FeaturesDesign scalable large-scale applications with the C++ programming languageArchitect software solutions in a cloud-based environment with continuous integration and continuous delivery (CI/CD)Achieve architectural goals by leveraging design patterns, language features, and useful toolsBook Description Software architecture refers to the high-level design of complex applications. It is evolving just like the languages we use, but there are architectural concepts and patterns that you can learn to write high-performance apps in a high-level language without sacrificing readability and maintainability. If you're working with modern C++, this practical guide will help you put your

knowledge to work and design distributed, large-scale apps. You'll start by getting up to speed with architectural concepts, including established patterns and rising trends, then move on to understanding what software architecture actually is and start exploring its components. Next, you'll discover the design concepts involved in application architecture and the patterns in software development, before going on to learn how to build, package, integrate, and deploy your components. In the concluding chapters, you'll explore different architectural qualities, such as maintainability, reusability, testability, performance, scalability, and security. Finally, you will get an overview of distributed systems, such as service-oriented architecture, microservices, and cloud-native, and understand how to apply them in application development. By the end of this book, you'll be able to build distributed services using modern C++ and associated tools to deliver solutions as per your clients' requirements. What you will learn

Understand how to apply the principles of software architecture
Apply design patterns and best practices to meet your architectural goals
Write elegant, safe, and performant code using the latest C++ features
Build applications that are easy to maintain and deploy
Explore the different architectural approaches and learn to apply them as per your requirement
Simplify development and operations using application containers
Discover various techniques to solve common problems in software design and development

Who this book is for
This software architecture C++ programming book is for experienced C++ developers looking to become software architects or develop enterprise-grade applications. Software architecture is foundational to the development of large, practical software-intensive applications. This brand-new text covers all facets of software architecture and how it serves as the intellectual centerpiece of software development and evolution. Critically, this text focuses on supporting creation of real implemented systems. Hence the text details not only modeling techniques, but design, implementation, deployment, and system adaptation -- as well as a host of other topics -- putting the elements in context and comparing and contrasting them with one another. Rather than focusing on one method, notation, tool, or process, this new text/reference widely surveys software architecture techniques, enabling the instructor and practitioner to choose the right tool for the job at hand. Software Architecture is intended for upper-division undergraduate and graduate courses in software architecture, software design, component-based software engineering, and distributed systems; the text may also be used in introductory as well as advanced software engineering courses. This book systematically identifies the lack of methodological support for development of requirements and software architecture in the state-of-the-art. To overcome this deficiency, the QuaDRA framework is proposed as a problem-oriented approach. It provides an instantiation of the Twin Peaks model for supporting the intertwining relationship of requirements and software architecture. QuaDRA includes several structured methods which guide software engineers in quality- and pattern-based co-development of requirements and early design alternatives in an iterative and concurrent manner. Modern-day projects require software and systems engineers to work together in realizing architectures of large and complex software-intensive systems. To date, the two have used their own tools and methods to deal with similar issues when it comes to the requirements, design, testing, maintenance, and evolution of these architectures. Software and Systems Architecture in Action explores practices that can be helpful in the development of architectures of large-scale systems in which software is a major component. Examining the synergies that exist between the disciplines of software and systems engineering, it presents concepts, techniques, and methods for creating and documenting architectures. The book describes an approach to architecture design that is driven from systemic quality attributes determined from both the business and technical goals of the system, rather than just its functional requirements. This architecture-centric design approach utilizes analytically derived patterns and tactics for quality attributes that inform the architect's design choices and help shape the architecture of a given system. The book includes coverage of techniques used to assess the impact of architecture-centric design on the structural complexity of a system. After reading the book, you will understand how to create architectures of systems and assess their ability to meet the business goals of your organization. Ideal for anyone involved with large and complex software-intensive systems, the book details powerful methods for engaging the

software and systems engineers on your team. The book is also suitable for use in undergraduate and graduate-level courses on software and systems architecture as it exposes students to the concepts and techniques used to create and manage architectures of software-intensive systems. Economics-driven Software Architecture presents a guide for engineers and architects who need to understand the economic impact of architecture design decisions: the long term and strategic viability, cost-effectiveness, and sustainability of applications and systems. Economics-driven software development can increase quality, productivity, and profitability, but comprehensive knowledge is needed to understand the architectural challenges involved in dealing with the development of large, architecturally challenging systems in an economic way. This book covers how to apply economic considerations during the software architecting activities of a project. Architecture-centric approaches to development and systematic evolution, where managing complexity, cost reduction, risk mitigation, evolvability, strategic planning and long-term value creation are among the major drivers for adopting such approaches. It assists the objective assessment of the lifetime costs and benefits of evolving systems, and the identification of legacy situations, where architecture or a component is indispensable but can no longer be evolved to meet changing needs at economic cost. Such consideration will form the scientific foundation for reasoning about the economics of nonfunctional requirements in the context of architectures and architecting. Familiarizes readers with essential considerations in economic-informed and value-driven software design and analysis Introduces techniques for making value-based software architecting decisions Provides readers a better understanding of the methods of economics-driven architecting Managing Trade-Offs in Adaptable Software Architectures explores the latest research on adapting large complex systems to changing requirements. To be able to adapt a system, engineers must evaluate different quality attributes, including trade-offs to balance functional and quality requirements to maintain a well-functioning system throughout the lifetime of the system. This comprehensive resource brings together research focusing on how to manage trade-offs and architect adaptive systems in different business contexts. It presents state-of-the-art techniques, methodologies, tools, best practices, and guidelines for developing adaptive systems, and offers guidance for future software engineering research and practice. Each contributed chapter considers the practical application of the topic through case studies, experiments, empirical validation, or systematic comparisons with other approaches already in practice. Topics of interest include, but are not limited to, how to architect a system for adaptability, software architecture for self-adaptive systems, understanding and balancing the trade-offs involved, architectural patterns for self-adaptive systems, how quality attributes are exhibited by the architecture of the system, how to connect the quality of a software architecture to system architecture or other system considerations, and more. Explains software architectural processes and metrics supporting highly adaptive and complex engineering Covers validation, verification, security, and quality assurance in system design Discusses domain-specific software engineering issues for cloud-based, mobile, context-sensitive, cyber-physical, ultra-large-scale/internet-scale systems, mash-up, and autonomic systems Includes practical case studies of complex, adaptive, and context-critical systems