arc42 by Example

Software architecture documentation in practice

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Acknowledgements

Dr. Gernot Starke

Long ago, on a winter's day in 2004, I sat together with Peter Hruschka, a long-time friend of mine and discussed one of our mutual favorite subjects – the structure and concepts of software systems. We reflected on an issue we had both encountered often within our work, independent of client, domain, or technology: developers know their way around implementation/technologies; managers know their way around budgets and risk management. But when forced to communicate (or even document) the architecture of systems, they often start inventing their own specific ways of articulating structures, designs, concepts, and decisions.

Peter talked about his experience in requirements engineering: he introduced me to a template for requirements, a prestructured cabinet (or document) called VOLERE, which contains placeholders for everything that might be important for a specific requirements document. When working on requirements, engineers, therefore, didn't need to think long before they dumped their results in the right place – and others would be able to retrieve them later on (as long as they knew about VOLERE's structure). This requirements template had been used in the industry for several years – there even was a book available on its usage and underlying methodology.

"If we only had a similar template for software architecture," Peter complained, and continued, "countless IT projects could save big time and money." My developer soul added a silent wish: "If this was great, it could even take the ugliness out of documentation." We both looked at each other, and in that second decided to create exactly that: a template for software architecture documentation (and communication) that was highly practical, allowed for simple and efficient documentation, was usable for all kinds of stakeholders, and could facilitate software architecture documentation. And, of course, it had to be open source – completely free for organizations to use.

That's how the arc42 journey started. Since then, Peter and I have used arc42 in dozens of different IT systems within various domains. It has found significant acceptance within small, medium, and large organizations throughout the world. We have written many articles about it, taught it to more than 1,000 (!) IT professionals, and included it in several of our software architecture-related books. Thanks, Peter for starting this wild ride with me. And, of course, for your lectures on cooking. Thanks to my customers and clients – I have learned an incredible amount from working together with you on your complex, huge, difficult, interesting, and sometimes stressful problems. Due to all those nondisclosure agreements I have signed in my life, I'm not officially allowed to mention you all by name.

Thanks to my wife, Cheffe Uli, and my kids, Lynn and Per, for allowing dad to (once more) sit on the big red chair and ponder another book project... You're the best, and I call myself incredibly lucky to have you! Thanks to my parents, who, back in 1985, when computer stuff was regarded as something somewhere between crime and witchcraft, encouraged me to buy one (an Apple II, by the way) and didn't even object when I wanted to study computer science instead of something (at that time) more serious. You're great!

Michael Simons

I met Dr. Gernot and Peter (Hruschka) as instructors on a training course at the end of 2015. The training course was called "Mastering Software Architectures" and I learned an awful lot from both of them; not only the knowledge they shared, but how they both shared it. By the end of the training, I could call myself a "Certified Professional for Software Architecture," but what I really took home was the wish to structure, document, and communicate my own projects as Peter and Dr. Gernot proposed, and that's why the current documentation of my pet project, *biking2*, was created.

Since then, I have used arc42-based documentation several times: for in-house products and also for projects and consultancy gigs. The best feedback I've had was something along the lines of: "Wow, now we've got an actual idea about what is going on in this module." What helped that special project a lot was the fact that we were fully set on Asciidoctor and the "Code as documentation and documentation as code" approach I described in depth in my blog. So, here's to Dr. Gernot and Peter: thanks for your inspiration and the idea for arc42.

Stefan Zörner

Originally, DokChess was a case study from my German book on documenting software architecture. Dr. Gernot encouraged me to write it after I told him about the chess example at a conference in Munich in 2011. Thank you especially for that, Dr. Gernot (besides many valuable discussions and good times since then in Cologne, Zurich)! Thanks to my Embarc colleague, Harm Gnoyke, for trying to save my miserable English. All mistakes are my fault, of course.

Ralf D. Müller

Quite a while ago, I discovered the arc42 template as an MS Word document. It didn't take long to see how useful it is and I started to use it in my projects. Soon, I discovered that MS Word wasn't the best format for me as a developing architect. I started to experiment with various text-based formats, such as Markdown and AsciiDoc, but also with wikis. The JAX conference was the chance to exchange my ideas with Dr. Gernot. He told me that Jürgen Krey had already created an AsciiDoc version of the arc42 template. We started to consider this template as the golden master (this is now 5 years ago – in 2014) and tried to generate all other formats needed (at that time, mainly MS Word and Confluence) from this template. The arc42-generator was born, and a wonderful journey was about to start. The current peak of this journey is docToolchain – the evolution of arc42-generator. Read more about its architecture in this book.

On this journey, I have met many people who helped me along the way – it's impossible to name all of them. However my biggest "Thanks!" goes out to Dr. Gernot who always encouraged me to take my next step and helped me along the way. Thank you, Peter and Dr. Gernot, for pushing my architectural skills to the next level through your superb training workshops. Thanks to Jakub Jabłoński and Peter for their review of the architecture – you gave great feedback! Last but not least, I have to thank my family for their patience while I spent too much time with my notebook!

All of us

Thanks to our thorough reviewers, who helped us improve the examples – especially Jerry Preissler, Roland Schimmack, and Markus Schmitz.

Disclaimer

We like to add a few words of caution before we dive into arc42 examples:

> **Note**
>
> We show you quite pragmatic approaches to software and system architecture documentation, based upon the (also pragmatic) arc42 template. Although fine for many kinds of systems, this pragmatism is not appropriate for critical or high-risk systems, developed or operated under strict safety-, security- or similar requirements. If you're working on safety-critical or otherwise potentially dangerous systems, the methods or techniques demonstrated in this book might not be appropriate for you. We, the authors, cannot take any responsibility if you decide to use arc42 or any other approach shown in this book.

The content of this book has been created with care and to the best of our knowledge. However, we cannot assume any liability for the up-to-date, completeness, accuracy or suitability to specific situations of any of the pages.

Preface

About

This section briefly introduces the authors and what the book covers.

About the Book

When developers document the architecture of their systems, they often invent their own specific ways of articulating structures, designs, concepts, and decisions. What they need is a template that enables simple and efficient software architecture documentation. *arc42 by Example* shows how this is done through several real-world examples.

Each example in the book, whether it is a chess engine, a huge CRM system, or a cool web system, starts with a brief description of the problem domain and the quality requirements. Then, you'll discover the system context with all the external interfaces. You'll dive into an overview of the solution strategy to implement the building blocks and runtime scenarios. The later chapters also explain various crosscutting concerns and how they affect other aspects of a program.

About the Authors

Dr. Gernot Starke is an INNOQ Fellow and is the cofounder and a longstanding user of the arc42 documentation template. For more than 20 years, he has been working as a software architect, coach, and consultant, conquering the challenges of creating effective software architectures for clients from various industries. Dr. Gernot cofounded the International Software Architecture Qualification Board (iSAQB e.V.) and the open source Architecture Improvement Method. Dr. Gernot has authored several (German) books on software architecture and related topics.

Michael Simons works as a senior software engineer for Neo4j. Previously, he worked at Enerko Informatik, an Aachen-based company dealing with GIS systems. He has a background focused on geographic information systems for utilities and price calculation for the energy market. In his brief time at INNOQ, he helped customers modernize their application systems. Michael is known for having a certain passion for SQL and Spring. He took his apprenticeship at the FZ Jülich and studied at FH Aachen, Campus Jülich. He is a PRINCE2 ® registered practitioner and sometimes gets torn between the roles of an architect and project manager. Michael is a dedicated blogger and is engaged in various open source projects; you'll find his stuff at michael-simons.eu. He is also a father of two, husband, geek, and passionate cyclist.

Stefan Zörner has 20 years of experience in IT and always looks to the future with excitement. He supports clients in solving architecture and implementation problems. In interesting workshops, he demonstrates how to use practical design tools, as well as spreading enthusiasm for real-life architectural work.

Ralf D. Müller is a solutions architect and an ambitious Grails developer. He is continually trying to simplify his work. Currently, his main concern is improving the holistic documentation of projects. He achieves this especially with the help of the arc42 template and docs-as-code approach. He is the founder of the *docToolchain* project.

Learning Objectives

By the end of this book, you will be able to:

- Utilize arc42 to document a system's physical infrastructure
- Learn how to identify a system's scope and boundaries
- Break a system down into building blocks and illustrate the relationships between them
- Discover how to describe the runtime behavior of a system
- Know how to document design decisions and their reasons
- Explore the risks and technical debt of your system

Audience

This book is for software developers and solutions architects who are looking for an easy, open source tool to document their systems. It is a useful reference for those who are already using arc42. If you are new to arc42, this book is a great learning resource. Those of you who want to write better technical documentation will benefit from the general concepts covered in this book.

Approach

This book follows a teach-by-example approach. It clearly explains how to create comprehensive and easy-to-read documentation using the arc42 template. The book uses real-world applications as case studies and demonstrates how to write documentation for them.

Conventions

New terms and important words are shown like this: "In the preceding diagram, the **mandator** represents an arbitrary company or organization serving mass market customers."

Chapter and Section Numbering

We use Roman numeral chapter numbers (I, II, III, and so on), so we have the Arabic numbers within chapters in alignment with the arc42 sections. In the sections within chapters, we add the chapter prefix only for the top-level sections. That leads to the following structure:

Chapter II: HTML Sanity Checking

II.1 Introduction and Goals

II.2 Constraints

II.3 Context

…

Chapter III: Mass Market CRM

III.1 Introduction and Goals

III.2 Constraints

III.3 Context

…

> **Note**
>
> The first example (HTML Sanity Checking) contains short explanations on the arc42 sections, formatted like this one.

In this book, we keep these explanations to a bare minimum, as there are other books that extensively cover the arc42 background and foundations.