Dr. Markus Völter



Born 14 February 1974 in Heidenheim a. d. Brenz, Germany
Degrees Dipl. Ing. (FH) Physikalische Technik (Physics Engineering)
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I work as an independent engineer, consultant and coach for language engineering, domain-specific languages, model-driven software development, product lines and software architecture. I bridge the gap from industry and business domains to software systems by analysing subject matter and processes, designing user-friendly languages and supporting analyses. I implement languages, tools and IDEs, and architect efficient and reliable backends based on interpreters and generators. I also work on formalisms and meta-tools for language engineering. For 20 years, I have consulted, coached and developed in a wide range of industries, including finance, automotive, healthcare, science, manufacturing and IT. I have written several books on the subjects and presented talks at industry conferences world-wide; I have (co-)authored several peer-reviewed papers at reputable academic conferences. I have a diploma in technical physics from FH Ravensburg-Weingarten and a PhD in computer science from TU Delft.

A more detailed version of this CV with all projects and publications is at:
http://voelter.de/data/cv/cv.pdf

A list of every publication and talk, including PDFs and slides, is at:
http://voelter.de

Core Skills

Analytical. I am a quick thinker. I enjoy analyzing systems and processes, finding opportunities for improvement and ultimately develop software tools to help people be more productive. I have a demonstrated ability to assemble mental models and communicate them precisely as a foundation for discussions on their tradeoffs and consequences.

> Markus is unique in terms of understanding and precise communication. That is incredibly valuable.
> *-- Yulia Komarov, Architect at DATEV*

Leadership. I'm very good at motivating a team to reach a particular goal. I understand the various positions in a team, articulate them, facilitate discussions and shepherd the group towards a decision. I point out if discussions run in circles or people talk past each other; I summarize the problem and help resolve the situation. I take responsibility for the success of the project and will speak up about things that are going wrong (including those outside my core technical purview) based on my experience from projects in many different domains and organizations.

Technical. I am a recognized expert on language engineering, domain-specific languages and model-driven software development. I also have a comprehensive understanding and a lot of expertise in software architecture and engineering, from years of projects in different fields, from recording more than 120 SE Radio podcasts, and from participating in many industry and academic conferences.

Innovative. Pioneered several techniques in industry: Eclipse-based business applications; generative component infrastructures (which led to building the AUTOSAR PoC for BMW); GMF-style generation of graphical editors; model-driven development and textual DSLs; and using projectional editing for modular languages and multi-notation DSLs.

> I've met very few people I can respect as much as you in their breadth of conceptual and technical abilities AND their ability to communicate and provide a vision for what is possible AND a few other things.
> *-- Mitchell Shuster, Data Scientist at Accenture*

Communication. Very good skills in written and spoken English (see books and papers) especially regarding technical topics. I am able to explain complex topics in a structured way, a skill obtained partially from hundreds of interviews in podcasts and from conference talks. I understand and precisely rephrase requirements. I like to apply these skills in the context of technical PR and technical marketing. I

love public speaking, and I am known to be a competent, engaging and entertaining presenter. I have presented over 200 talks, tutorials and keynotes at conferences and recorded and published over 400 podcast episodes.

Technical Expertise

Domain Analysis and Language Design. 15 years of designing mixed-notation domain-specific languages; experience in a wide variety of domains, from embedded software, automotive and space to business, financial and government systems.

Language Implementation. 15+ years of Implementation of language structure, syntax, type systems, interpreters, transformations and IDEs based on Jetbrains MPS and Eclipse Xtext, Antlr, Langium.

Software Architecture. 20 years of experience in designing, architecting and implementing large-scale software systems in enterprise, embedded and scientific contexts (lists see below).

> Markus actively supported us in the design of a cloud/ microservice-based platform for tax declaration software and in the implementation of a suitable development process. His extensive experience with a wide variety of architectures and development approaches has made a valuable contribution to concrete architectural decisions. Markus Völter was highly appreciated as an advisor and sparring partner among software architects.
>
> *-- Sven Grasser, Software Architect at DATEV*

Programming. 25 years of experience in a range of languages including Java, Kotlin, C, C++, C# and a few more. Experience with lots of frameworks, middlewares and databases.

Formal methods. 4 years of integrating formal methods (SMT solving, model checking and data flow analysis) with DSLs in the context of MPS.

Projects and Roles

2024 Consulting for **CARIAD**, includes work on their systems engineering methodology as well as architecture and implementation of an interactive, yFiles-based graph viewer in Java/MPS.

2023 Domain analysis, language design and software architecture consulting for **Trumpf Laser**, developing a new language for laser machining solutions. Includes implementing LionWeb M3 in C#.

> [...] all participants were enthusiastic about you. Your technical expertise, paired with the right intuition for the gaps and ambiguities in our domain, as as well your structured approach fit perfectly to our needs. Thank you for the workshops and your 100% focus on our project. You left a very good impression. Respect.
>
> *-- Rainer Thieringer, Head of Software Dev*

Consulting and prototyping for **Universitäre Psychiatrische Dienste Bern** regarding a DSL for psychological assessments in MPS.

Consulting for **Icon Solutions** in the domain of payment processing and money transfer. Covering DSL design and implementation in MPS/KernelF.

Continued work on **DATEV**'s DSL infrastructure by building a data mapping DSL including fancy support for versioning. Consulting on data modeling and semantic technologies. Design and prototyping for a DSL to create fancily layouted calculation trace reports.

Forced time off because of broken leg. Used some of the time to learn: implemented a DES Framework in Kotlin, and an integration of MPS with ChatGPT.

2022 Consulting for **HelloFlex** on a DSL-based approach for their wage and tax calculation platform.

Consulting for **Philips** on the development of a data processing pipeline DSL and runtime for medical hardware products.

Consulting for **Targenio** on the development of web-based editors for a language to customize workflow systems.

Consulting on language design for a DSL for code transformation for **OpenPixee**, plus prototyping of a DSL implementation with antlr4 and Typescript.

> Markus was a fantastic partner in designing a DSL. His experience was of course invaluable, but at the same time he was fun, flexible, and super engaged. I felt him taking ownership of the project and I would absolutely work with him again.
>
> *-- Arshan Dabirsiaghi, Chief Scientist*

2021+ Consulting and development of a DSL-based solution for clinical trial modeling for **Clario** based on MPS.

> Markus is the reason our project is successful. He brought best in the industry expertise on domain specific languages in general and comprehensive MPS expertise to the project. His experience from a remarkably wide range of domains allowed him to rapidly learn the details of our domain and craft our domain specific language and tool. The solution now includes major differentiators in areas beyond just the DSL including test automation and quality assurance, runtime interpreter, and documentation generation. He is one of the best and most productive software engineers I've ever met. These skills enable him to guide our team on everything from low level coding techniques to the way the

team should collaborate on requirements. Beyond our solution team, both the technologists and business stakeholders at our customer now look to him for guidance on any topic related to the project.

-- Mike Vogel, Solution Architect at Accenture

I enjoyed every minute of working with you, learning from you, and being inspired by your brilliance and vision for building DSLs. I already miss it. *-- Anonymous*

I just wanted to say that I think the tool is the brightest spot in [our department] right now. I appreciate your work on it -- and how you challenged us during [the analysis meetings].

-- A user of the tool

Thank you for being passionate about the project and our goals and technically detailed at the same time. I didnt expet people like you existed. I would go through the [whole painful project] again just to learn from and be mentored by you. My career is different because of you. Thank you so so much for everything you did.

-- A leading figure in the project

This is brilliant. This is far beyond what anyone could have imagined.

-- A Clario PO regarding the progress of the tool

I am delighted to wholeheartedly recommend Markus as an exceptional DSL engineer. His passion for his work is unparalleled, and he possesses the remarkable ability to grasp complex concepts effortlessly. Markus is not only thorough but also astonishingly fast in delivering top-quality results. His dedication to excellence is truly commendable. What sets Markus apart is his fun and engaging communication style. He makes work not just productive but also enjoyable. Collaborating with Markus is intellectually satisfying as he brings fresh perspectives and innovative ideas to the table. In summary, his presence in any team is a genuine asset. His passion, speed, precision, and engaging personality make him a standout professional.

-- Gregoire Faurobert, Product Manager, Clario

2020-22 Consulting and development for a major modernization project at **DATEV** Tax based on DSLs: language design and implementation, architecture consulting, platform strategy, general "reasonable brain" in project.

Markus' expertise in the area of DSL is exceptional. Nevertheless, he is a practitioner in the best sense of the word and always has the solution and its benefits in mind. Particularly noteworthy is Markus' enthusiasm and energy with which he argues the efficiency gain through the use of DSL and communicates it in a results-oriented manner. In this way, he has succeeded in inspiring even colleagues who were initially rather skeptical about the new solution. In addition to his core activities around domain analysis and DSL language design, his consulting on project management is also of high value: He is able to quickly grasp complex problems, and concisely summarizes his findings, which makes for pleasantly economical and goal-oriented discussions. In summary, Markus has made a very valuable contribution to the portfolio change of DATEV's tax products being on a good track today.

-- Michael Adler, Product Owner, DATEV

2019+ Development of a DSL for tax calculation for **DATEV**. **(Presentation Slides)**

2019 Integration of DSLs with formal methods for **ClosedLoopMedicine**.

2018 Design and development of a DSL for salary calculation for **DATEV**. **(Book Chapter)**

2017 Development of a reusable and embeddable **functional language** KernelF. This is now the basis of many DSLs built for a variety of customers, including DATEV, CARIAD, Clario, and many others.

2017 Consolidation and documentation of **formal methods** activities. Co-leading a project to develop a **web-based projectional language workbench** at itemis.

2016 Architecture and design of a DSL for **medical algorithm specification** for Voluntis –substantially speeds up development, test and certification of software medical devices. Responsible for language design and a reliably generation process. **(Paper)**

While I was the CTO at Voluntis, a pioneer in Digital Therapeutics, I had the opportunity and great pleasure to work closely with Markus on a quite complex software engineering project within our oncology software product line. Markus led the inception, architecture and design in the technology stream. While being very tech savvy, Markus proved to be an outstanding communicator and facilitator between business and software developers, making our brainstorming sessions truly productive. Markus demonstrated his natural leadership, while being a great team player. Thanks to Markus our ideas became implementable, as he took leadership during inception, prototyping, specification, implementation, and continuous improvements once the product was launched. Markus is really a doer! I highly recommend Markus, not only for his solid software engineering expertise, his pragmatism, and his great communication skills, but foremost for his exceptional ability to turn concepts and ideas into industrial grade software solutions.

-- Patrick Alff, CTO, Voluntis

Architecture and design of a DSL for **cloud applications** for Workday to revamp their customization experience for consultants and end users.

2015 Consulting for Prosoz on a DSL-based approach for describing their business logic independent from the implementation technology to substantially increase app development speed in the **social insurance domain.**

2014 Supporting i2s in Portugal with a DSL for describing **insurance products** to increase the efficiency of insurance product definition.

Consulting for the Dutch Tax Agency in a project to reimplement and evolve **their tax rule definition language.**

Design and implementation of a prototype DSL for product configuration of **industrial engine**

controllers for Dynagen Technlogies to increase the speed and flexibility of product configuration.

2013 Consulting for Rohde&Schwarz SIT on a project for **next-gen network crypto device**; helped with requirements engineering and the DSL-based development process.

2007 As a senior independent consultant for Intentional Software, helped design a DSL for **insurance product specification** for Achmea insurance in the Netherlands.

2005 Helped with architecting T-Mobile's next generation model-driven **service-oriented middleware.**

2002 Consulting for European Southern Observatory's **ALMA telescope project**, on component architecture and development process.

Architecture and component model for Himalaya II (dvg, German Sparkassen-EDV), one of the **biggest J2EE projects worldwide** in the financial industry at the time.

Plus many **shorter term consulting projects** mainly around DSLs and their impact on business processes for companies like Audi, Apple, BMW, BOSCH, Daimler, Siemens, Peugeot, ZF, Contintental, Huawei.

Management and Leadership

Except for my 2-year stint at the **Mathema Ulm** office, I have never acted as a line manager. However, I have successfully led many development projects and teams. The most relevant examples are also the most recent:

Between 2011 and 2014 I acted as **the principal investigator for the mbeddr project**. Together with Bernd Kolb, I led the development team through the milestones: my original idea, a successful research grant, a successful conclusion of the project, mbeddr a successful open source project and its use in various industry projects.

Between 2013 and 2014 I was **leading the 8 person itemis/fortiss team** that developed the ESD tool for Siemens PLM on top of mbeddr. My responsibilities included architectural guidance, feature negotiations with the customer and management of the day-to-day activities of the developers.

Between 2015 and 2018 my main focus has been the **strategic and technical leadership of the MPS team** at itemis; grown to 16 people running DSL projects in domains such as automotive, aerospace, medicine and finance & insurance. I essentially acted as **programme manager**: I guided several teams and projects around language engineering and MPS. These include the evolution of mbeddr, development of Siemens ESD, a DSL project in the insurance industry plus a number of smaller MPS-based projects. It also includes working with the MPS team at JetBrains to improve the state of the art in language engineering and the MPS tool itself.

Research and Publications

PhD with Eelco Visser at TU Delft: The thesis, *Generic Tools, Specific Languages*, introduces the approach of capturing a domain's core in DSLs on top of a language workbench. The thesis focuses on mbeddr, an extensible set of integrated languages for embedded software engineering built with Jetbrains MPS that was developed as part of a research project I co-ran as part of my work for itemis.

Books. I published my newest book, *How to Understand Almost Anything – a Practitioner's Guide to Domain Analysis* in spring 2023.

> This is such an insightful read. Lots of stuff I already knew but didn't know I knew. I like the chatty, almost story-telling style. Congrats on a great book, Markus!
> *-- Michal Měchura*

Before that, I co-authored 8 full books, including well-received books on *Model-Driven Software Development* (dPunkt 2005/2007 and Wiley 2006) as well as on *DSL Engineering* (CreateSpace, 2013).

> Markus is the thought leader in the design of DSLs. This book is a must read for any language engineer.
> *-- Greg Lusk*

I also co-wrote two books as part of the Wiley pattern series. Also wrote two books on science, engineering and modeling outside of software. **http://voelter.de/books.html**

Publications: h-index 41, i10-index 88 (Google Scholar). Co-authored 6 journal papers (J-ASE, IEEE Software), 19 conference papers (OOPSLA, ASE, SLE, FSE), 19 workshop papers, and 15 pattern papers; all peer-reviewed. I have also published 75+ articles in German and international industry magazines. **http://voelter.de/publications.html**

Grants. I have participated in several, and significantly contributed to two, research project proposals (as well as the projects' subsequent execution): The BMBF KMU-Innovativ project *Language Workbenches for Embedded Systems* (FKZ 01 IS 11014) and the BMBF KMU-Innovativ project *Integrated Specification Environments for Specifying Technical Systems* (FKZ 01 IS 15037).

Six Most Important Publications.

1. [Journal] M. Voelter, B. Kolb, K. Birken, F. Tomassetti, P. Alff, L. Wiart, A. Wortmann, A. Nordmann, *Using Language Workbenches and Domain-Specific Languages for Safety-critical Software Development*, International Journal on Software and Systems Modeling (SOSYM), -Online-, 25 pages, https://link.springer.com/article/10.1007/s10270-018-0679-0, 2018 [SoSym Best Paper Award 2018]
2. [Book] M. Voelter, T. Stahl. *Model-Driven Software Development – Technology, Engineering, Management*. Updated translation of the German MDSD book, Wiley, 2006
3. [Book] M. Voelter et al. *DSL Engineering - Designing, Implementing and Using Domain-Specific Languages*. CreateSpace Publishing (self-published), *dslbook.org*, 2013
4. [Conference] M. Voelter, A. van Deursen, B. Kolb, S. Eberle. *Using C Language Extensions for Developing Embedded Software: A Case Study*. OOPSLA 2015, 20 pages, 2015
5. [Journal] M. Voelter, B. Kolb, T. Szabo, D. Ratiu, A. van Deursen. Lessons learned from building mbeddr – a case study in language engineering. International Journal on Software and Systems Modeling (SOSYM), January 2017, 46 pages, http://rdcu.be/oo3W, 2017; http://rdcu.be/oo3W, 2017; selected as one of the best SOSYM papers of the year, and presented at MODELS 2017
6. [Conference Paper] Z. Molotnikov, M. Voelter, D. Ratiu. *Automated Domain-Specific C Verification with mbeddr*. ASE 2014, 20 pages, 2014

Teaching

Full Courses. Uni Stuttgart 2015 & 2016 (Prof. S. Wagner), Uni Nantes 2010 (Prof. J. Bezivin), Uni Leipzig 2006 (Prof. U. Eisenecker), FH Ulm 2002 & 2003 (Prof. S. Wagner). **Guest Lectures.** Over 20 guest lectures at universities throughout Europe. **Student Supervision:** Tamas Szabo PhD Thesis on Incremental Program Analysis, TU Darmstadt/Delft/Mainz, ongoing, Four more, with Uni Stuttgart, TU Darmstadt, HS Reutlingen, HdM Stuttgart.

Public Speaking

Keynotes. I have delivered keynotes at over 10 academic and industrial events, including SPLC 2018, ICMT 2018, ITSLE 2016, the DSLRob and Modevva Workshops, ECSA, JAX London and CodeGeneration.

Invited Talks. I have been personally invited to give talks at 15+ international events including SPLASH-I, Curry-On, the IFIP WG 2.16, ECSEE, ICALEPCS and at CERN. I have also participated (and delivered talks at) several Dagstuhl and Leibnitz Center seminars and summer schools.

Conference Talks and Tutorials. I (co-)presented over 200 talks and tutorials at national and international conferences, including OOP, JAX, EclipseCon, Öredev, JAOO, ECOOP, MODELS, OOPSLA/SPLASH, ECMDA, AOSD, GPCE, TOOLS, ICSE, QCon, SPLC, SE, Embedded Software Kongress, CodeGeneration.

A full list is here: http://voelter.de/talks.html

Podcasting

Podcasting is a wonderful educational vehicle: the dialog between two people, one asking intelligent questions, and the other one explaining expertly, is vastly underrated as a means of explaining complex topics.

In 2006 I founded Software Engineering Radio (http://se-radio.net), one of the premier podcasts on software engineering to this day. Some episodes have up to 50,000 downloads. I acted as the interviewer for ca. 120 episodes. In addition to being an educational resource for the listeners, it has also helped me better understand many aspects of software engineering. In 2012 I handed SE Radio over to IEEE Software, because the current editing and interviewing team was running out of steam.

In 2008 I co-founded the omega tau podcast (http://omegataupodcast.net) which covers a wide range of topics from science and engineering. I had to give up SE Radio to be able to focus on omega tau. Together with my partner Nora Ludewig, we have since published around 400 episodes (running for over a month total playing time) on topics such as particle physics, astronomy, biochemistry, space, aviation and economy.

English

Fluent in written and spoken English as demonstrated through books, talks, podcasts and a Level 6 English language proficiency certificate for aviation (Level 6 “expert” is the highest level available).

Community Activities and Memberships

Co-Initiator of the Language Workbench Challenge. Reviewer for Journal of Software and Systems Modeling (SoSyM), Reviewer for IEEE Software, IEEE Software SI on Software Patterns Guest Editor, Ex-IEEE Software Industry Advisory Board member. Program/Track chair at several international conferences. Former Member of IFIP Working Group 2.16 on Programming Language Design, ACM and Hillside Europe.

Other Interests

In addition to software engineering and podcasting, I have been flying gliders for decades and more recently, powered aircraft. I am also an avid photographer.