

Dr. Uwe van Heesch

Freelance Software Architect and Adviser



profile

I am looking back on more than 15 years as a software engineering professional in different application domains and team roles. As part of my self-conception as an engineer I always keep my knowledge and skills up-to-date with contemporary movements in the field, e.g. DevOps, lean software development, agile, microservices, container-based virtualisation, and internet-of-things.

I am a technical guy, passionate about software, architecture, design, and coding, but I also speak your language, understand your problems, and I am very good at explaining and transferring knowledge.

services

- Analysis and documentation of functional and non-functional requirements (e.g. use-cases, user stories, quality attribute scenarios using ISO/IEC/IEEE 25010 or FURPS+)
- Design, documentation and monitoring of software architecture (e.g. using 4+1 Views, Integrated Architecture Framework (IAF), or ISO/IEC/IEEE 42010)
- Technical project management, Scrum master, or product owner
- Architecture analysis and evaluation with ATAM (Architecture Trade-Off Analysis Method), or DCAR (Decision-centric Architecture Review)
- Agile software development using principles of software craftsmanship (Agile, Scrum, Lean, DevOps, Clean Code, TDD, automation, container-based virtualization, ContinuousX, configuration management)
- Coaching for agile methods (Scrum, Lean, DevOps) and tool stacks (e.g. Jira, Confluence, Git, SonarQube, Jenkins, Docker, continuous-integration and continuous-delivery)
- Customer support for creating and checking proposals for software engineering projects; customer-side supervision of software development orders
- Advise and technical support for digitisation, process optimization, and industry 4.0

contact

Mausgarten 37
47533 Kleve
Germany

☎ +49 (0) 176 98 33 21 00

✉ uwe@vanheesch.net

🌐 <https://vanheesch.net>

🌐 [uwevanheesch](https://www.linkedin.com/in/uwevanheesch)

languages

german mother tongue
dutch & english fluent

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work experience

- 2014- **HAN University of Applied Sciences, Arnhem, The Netherlands**
Informatica Communicatie Academie (ICA)
Senior Lecturer Computer Science
Tasks & Responsibilities:
- Coordinator Object-oriented Software Engineering and Architecture
 - Responsible for course-content, exams, and lectures
 - Course lecturer for software architecture, software engineering, Java and JEE, Clean Code, software patterns, and relational databases
 - Coordination of lecturers in this course specialization
 - Quality management for courses and exams
 - Supervision of graduates
 - Supervision of PhD students
- 07/2015– **Researcher and IT-Consultant**
11/2017 SEECE - Sustainable Electrical Energy Center of Expertise, Arnhem, The Netherlands
Tasks & Responsibilities:
- Management and implementation of research projects in the fields of renewable energy, internet-of-things, and automotive
 - Architecture consulting for Dutch companies in the energy sector
- 01/2013– **Project manager and chief software architect**
09/2014 Capgemini Germany (125.000+ employees worldwide)
Tasks & Responsibilities:
- Software development for medical devices in microbiology laboratories.
 - Overall management of a 15-person team distributed over India and Germany
 - Chief software architect responsible for functional and technical software design
 - Project controlling and reporting
 - Project audits and quality management
 - Support for sales activities
- 01/2007– **Lecturer Software Engineering**
11/2012 Fontys University of Applied Sciences, Venlo, The Netherlands
Tasks & Responsibilities:
- Course lecturer for software architecture, web technologies, Java, relational databases, and IT-security
 - Supervision of graduates
- 10/2004– **Software architect and chief developer**
12/2006 Institute for Internet-Security, Gelsenkirchen, Germany
Tasks & Responsibilities:
- Responsible software architect and chief developer for an internet early warning system developed for the German government (BSI)

selected projects

- 04/2017– **EDIFACT file processing**
09/2018 Domain: Logistics
- Description**
EDIFACT (United Nations Electronic Data Interchange for Administration, Commerce and Transport) is an international standard for data exchange in the supply chain management process. I realised a software for my customer that parses orders in EDIFACT format, extracts relevant data and automatically triggers successive business processes. Additionally, the software produces despatch advice messages in the EDIFACT format.
- Tasks**
Requirements engineering, architecture, and complete implementation.
- Used technologies**
Java, TDD, JUnit, Mockito, CSV

- 09/2017–
04/2018 **Packing algorithm for 3-dimensional placing of plants on standardised containers.**
Domain: Logistics
Description
The software was developed for a medium-sized producer of plants. The task of the algorithm is the placement of plants with different dimensions on CC-containers, which have shelves at variable heights. During the commissioning process of the plants, workers read the position from labels placed on each plant and place the plants accordingly.
The main goal of the algorithm was saving CC-volume to reduce cost and CO2-footprint during transportation. Additionally, plants had to be placed varietal if possible, and the gravity centers and dimensions had to be taken into consideration. The software was realised as a standalone Java service, so that it could be integrated in the customer's existing software landscape seamlessly.
Tasks
Requirements engineering, architecture, and complete implementation.
Used technologies
Java, TDD, JUnit, Mockito, CSV
- 06/2017–
09/2017 **Roadmap for an architecture feasibility study for a micro-grid system to be implemented on a Dutch industrial campus**
Domain: power industry, SmartGrid management, renewable energy
Description
Development of a roadmap for an architecture feasibility study. The focus of the concept is multi-stakeholder concern analysis for exploiting renewable energy (wind, solar, gas) and circular economy for achieving a completely off-grid power management and supply on a Dutch industrial campus.
Tasks
Development and documentation of the roadmap, consulting the customer in matters of software architecture, as well as project management and planning.
- 10/2016–
12/2017 **Scalable sensor network, dashboard, Android app**
Domain: power industry
Description
Planning, design and realisation of a scalable sensor network for measuring and analysis of energy- and room-climate-related data in large organisations (e.g. hospitals, schools, and universities). Among others, the network measures room temperature, humidity, heat emitted by radiators, status of doors and windows, energy consumption using SmartMeter data, and the number of people in specific locations using Wifi-tracking technologie. Additionally, we developed an Android app used by human energy agents to provide individual feedback on experienced climate. We used a Grafana dashboard for visualising and analysing data.
Tasks
Requirements engineering, architecture, project management for a 5-person team, lead-developer for hardware and software, configuration management.
Used technologies
Arduino Pro Mini, Raspberry Pi, iBeacons, MySensors, InfluxDB, Grafana, Linux, LXC, Proxmox, Ansible, Bash, Python, MySQL, Redis, Spring Boot, Java, TDD, JUnit, Mockito, RESTful Webservices, JSON, Android.
- 04/2017–
07/2017 **Real estate management software**
Domain: real estate industry
Description
Planning, design and realisation of a multi-tenant web application for a real estate management company. The application covers management of master data, as well as coordination of craftsmen-tasks, and accounting. Additionally, the software handles payments using the European SEPA system.
Tasks
Requirements engineering, software architecture, project management for a 6-person team, development, configuration management.
Used technologies
Spring Boot, Java, TDD, JUnit, Mockito, RESTful Webservices, JSON, MySQL, H2, Angular4, Linux, Cron

- 04/2016–
06/2016 **Collection and prediction of power production by solar panels in the Netherlands**
Domain: Dutch energy sector
Description
Re-engineering and expansion of a software system for a Dutch power grid provider. The primary goal of the project was an architectural re-design for solving performance, scalability and adaptability problems. As part of the solution, we achieved an easy extension of the system for solar converters of different vendors. To achieve this, we conducted a technological study and integrated multiple converters into the system.
Tasks
Requirements engineering and documentation, software architecture, technology study, technical consulting, quality management of source code and specifications.
Used technologies
Spring Boot, Java, TDD, JUnit, Mockito, RESTful Webservices, JSON, MySQL, H2, Docker, Kubernetes, Amazon AWS, Servlets & JSPs
- 01/2016–
12/2016 **Monitoring of hydrogen cars**
Domain: automotive
Description
Measurement, analysis, and visualisation of data in hydrogen cars for a global automotive manufacturer. Data (e.g. location, velocity, hydrogen-level) are measured by a CAN-bus logger during the ride and transmitted to a central NoSQL datastore via GSM. The visualisation and analysis of data was done using a Grafana dashboard.
Tasks
Software architecture, technical supervision during the implementation
Used technologies
CAN, Matlab, Python, InfluxDB, Grafana
- 11/2015–
07/2016 **Monitoring of wind turbines, status and production data visualisation**
Domain: Dutch energy sector
Description
Realtime monitoring of wind turbines using data from SCADA-systems. Communication with several proprietary SCADA-systems, ETL process for data processing and persistence, issue management and data visualisation.
Tasks
Architecture (focus on scalability, reliability, and extendability), technological consulting, requirements engineering, data modelling, supervision of a 5-person team, quality management for source code and specification.
Used technologies
Spring Boot, Spring MVC, Java, TDD, JUnit, Mockito, RESTful Webservices, JSON, SCADA, MSSQL, Linux, Cron.
- 01/2013–
10/2015 **Automation software for gene analysis**
Domain: bio technology
Description
Analysis- and control software for an industrial pipetting robot. The project was done for a global player in molecular biology. Apart from a sophisticated expert user interface for planning and executing batch jobs on the robot, the project entailed control software, hardware simulation, as well as algorithms for path optimisation of the robot arm and heuristics for optimising waste volume in reagent tubes.
Tasks
Requirements engineering, functional and technical software architecture, project planning, controlling and reporting, chief architect, and project manager
Used technologies
Microsoft .NET, Unity, PRISM, WCF, LUA, C#, C++

01/2012–
12/2012 **Design space exploration and architectural concept for a new software platform for mobile applications and backend systems in a large industrial context**

Domain: industrial process automation and industry 4.0

Description

Problem and solution space analysis for mobile applications and backend systems for configuration and monitoring of industrial factory and process automation systems. Among others, the project entailed the specification of architectural alternatives, multiple stakeholder-group concern analysis, prototypic realisation of architectural alternatives, as well as consulting about process and specification.

Tasks

Support for conducting a large requirements and architecture study; technological consulting, architecture specification and architecture decision documentation; consulting

Used methods

Platform Design Space Exploration, Architecture Decision Views, DCAR, Technical Action Research

04/2011–
10/2011 **Architecture evaluation of industrial factory and process automation systems**

Domain: industrial factory and process automation, distributed machine control systems

Description

Multiple architecture evaluation sessions for industrial process automation systems (e.g. power plants and paper factories) for a Finnish global player.

Tasks

Leader of an international 5-person review team, execution of workshops with the system architects, reporting

Used methods

Decision-Centric Architecture Review (DCAR)

10/2004–
12/2006 **Internet early warning and analysis system**

Domain: internet- and network security

Description

Planning, design, and realisation of an internet early warning and analysis system for the German government (BSI). The system called IAS can analyse typical use profiles in IP and application layers of german autonomous systems on the internet. The system comprises so called probes, hardware boxes that non-invasively capture network traffic in internet exchange points, as well as a distributed backend system storing and analysing traffic partially in real-time. The system is used by the CERT of the german government.

Tasks

Chief architect, chief developer, software development team lead for a 7-person team, creation of data privacy assessment reports and configuration management.

Used Technologies

Java, JEE, C++, MySQL, Linux, JBoss AS, Eclipse Equinox, OSGI, JaaS, EJB, JMS, JMX, Hibernate, Lucene, Struts, Swing, MDI

education

10/2008– **Doctoral studies (PhD)**

12/2012 Faculty of mathematics and natural sciences, University of Groningen, The Netherlands

Details

- Research group Software Engineering and Architecture (SEARCH)
- Titel of the dissertation: 'Architecture Decisions: The next step. Understanding, modeling, supporting, and reviewing architecture decisions'
- Promotor: Prof. Dr. Paris Avgeriou, University of Groningen
- Reading committee:
 - Prof. Dr. Philippe Kruchten, University of British Columbia, Canada
 - Prof. Dr. Claes Wohlin, Blekinge Institute of Technology, Sweden
 - Prof. Dr. Hans van Vliet, Vrije Universiteit Amsterdam, The Netherlands
- Field of research: Architectural Knowledge Management, Architecture Evaluation, Architectural Software Patterns and Tactics, Rational Architecting Processes.

08/2001– **Computer science (Diplom Informatiker)**

03/2006 University of Applied Sciences Gelsenkirchen, Germany

Details

- Computer science, major 'Industrial information systems'
- Thesis: A software framework for internet analysis tools (in German)
- Final mark: 1.0 (top grade), overall average grade: 1.6

10/1999– **Study of law**

03/2001 Rheinische Friedrich-Wilhelms-Universität Bonn, Germany
Foundation Courses

technical skills

software architecture frameworks and specification

- ★★★★★ ISO/IEEE 42010 ♥
- ★★★★★ 4+1 Views ♥
- ★★★★★ FURPS+
- ★★★★★ Decision Views ♥
- ★★★★★ Quality Attribute Scenarios
- ★★★★★ UML
- ★★★★★ Use Cases
- ★★★★★ ISO/IEEE 25010
- ★★★★★ RUP
- ★★★★☆ Agile UP
- ★★★★☆☆ Togaf
- ★★★★☆☆ IAF
- ★★★★★ C4 Framework ♥
- ★★★★★ User Stories

software architecture patterns and styles

- ★★★★★ Arch. Patterns
- ★★★★★ Microservices ♥
- ★★★★★ Layers
- ★★★★★ Pipes & Filters
- ★★★★☆☆ SOA
- ★★★★★ Master-Slave
- ★★★★★ Enterprise Patterns
- ★★★★☆☆ Analysis Pattern
- ★★★★★ Architectural Tactics
- ★★★★★ Microkernel
- ★★★★★ Shared Repository
- ★★★★★ Multi-Tier
- ★★★★★ Broker
- ★★★★★ MVC
- ★★★★★ Publish-Subscribe
- ★★★★★ Design Patterns
- ★★★★☆☆ Reliability Patterns

software architecture analysis and evaluation

- ★★★★★ Architecture Trade-Off Analysis Method (ATAM)
- ★★★★★ Decision-centric Architecture Reviews (DCAR) ♥

programming languages

- ★★★★★ Java ♥
- ★★★★★ JEE (Java Enterprise Edition) ♥
- ★★★★☆☆ Python
- ★★★★☆☆ HTML5
- ★★★★★ L^AT_EX ♥
- ★★★★☆☆ Shell / Bash
- ★★★☆☆ JavaScript
- ★★★★☆☆ PHP
- ★★★★☆☆ CSS 3

frameworks, libraries and other technologies

- ★★★★☆☆ Spring Framework ♥
- ★★★★☆☆ Spring Boot ♥
- ★★★★★ EJB 3.1 ♥
- ★★★★☆☆ Apache Lucene & Filters
- ★★★★☆☆ JSF 2.0
- ★★★★★ Hibernate
- ★★★★★ Web Services
- ★★★★☆☆ Jersey
- ★★★★☆☆ Bootstrap
- ★★★★☆☆ Arduino
- ★★★★★ RaspberryPi ♥
- ★★★★☆☆ iBeacon
- ★★★★★ RESTful Services ♥
- ★★★★★ Swing
- ★★★★★ CDI ♥
- ★★★★★ JPA 2 ♥
- ★★★★☆☆ JMS
- ★★★★☆☆ Apache Solr
- ★★★★★ Servlet und JSP
- ★★★★★ JAX-RS ♥
- ★★★★★ JSON ♥
- ★★★★☆☆ JaaS
- ★★★★☆☆ Redis
- ★★★★☆☆ MySensors
- ★★★★☆☆ NRF24L01
- ★★★★☆☆ Angular 5
- ★★★★☆☆ Equinox (OSGI)
- ★★★★★ Linux ♥

java application server

- ★★★★★ Tomcat
- ★★★★★ TomEE ♥
- ★★★★☆☆ Glassfish
- ★★★★☆☆ JBoss AS / Wildfly

continuous integration

★★★★★ Maven ♥	★★★★★ JUnit ♥
★★★★★ Ansible ♥	★★★★★ Mockito ♥
★★★★☆ Docker ♥	★★★★☆☆ Selenium
★★★★☆ Teamcity	★★★★★ Jenkins ♥
★★★★☆ LXC ♥	★★★★☆☆ Proxmox
★★★☆☆ Kubernetes	★★★★★ Git ♥
★★★★★ Subversion	★★★★★ Bitbucket (Stash)
★★★★★ Sonar / SonarQube	★★★★★ Pit (Java Mutation Testing)

databases (SQL and NoSQL)

★★★★★ SQL ♥	★★★★☆☆ PostgreSQL
★★★★★ MySQL ♥	★★★★☆☆ H2
★★★★☆ Oracle	★★★★☆☆ Hsqldb
★★★★★ MS-SQL	★★★★☆☆ MongoDB
★★★★☆☆ InfluxDB (Timeseries DB) ♥	★★★★★ Grafana (Dashboards)

other tools

★★★★★ IntelliJ IDEA ♥	★★★★★ Astah UML
★★★★★ Eclipse	★★★★★ BalsamiQ
★★★★★ Arduino IDE	★★★★★ PyCharm
★★★★★ NetBeans	★★★★★ Pencil
★★★★★ Enterprise Architect ♥	★★★★★ Jira ♥
★★★★★ Visual Paradigm for UML	★★★★★ Confluence ♥
★★★★★ Webstorm	★★★★★ PHPStorm

selected publications

1. van Heesch, U., et al. (2017). Software specification in continuous software development - A Focus Group Report. In Proceedings of the 22nd European Conference on Pattern Languages of Programs. ACM.
2. Theunissen, T., & van Heesch, U. (2017). Specification in Continuous Software Development. In Proceedings of the 22nd European Conference on Pattern Languages of Programs. ACM.
3. van Heesch, U., Jansen, A., Pei-Breivold, H., Avgeriou, P., & Manteuffel, C. (2017). Platform design space exploration using architecture decision viewpoints-A longitudinal study. *Journal of Systems and Software*, 124(C), 56-81.
4. Theunissen, T., & van Heesch, U. (2016). The Disappearance of Technical Specifications in Web and Mobile Applications. In 10th European Conference on Software Architecture, ECSA 2016, Copenhagen, Denmark. Springer International Publishing.
5. van Heesch, U. (2015). Collaboration patterns for offshore software development. In Proceedings of the 20th European Conference on Pattern Languages of Programs. ACM.
6. Hoppenbrouwers, S., van Heesch, U., & Köppe, C. (2015). Using Work Agreements as Operation-time System Requirements for Emergent Work Community Support Systems. In Proceedings of the 1st Workshop on Continuous Requirements Engineering (CRE) 2015.
7. van Heesch, U., Eloranta, V. P., Avgeriou, P., Koskimies, K., & Harrison, N. (2014). Decision-Centric Architecture Reviews. *IEEE Software*, 31(1), 69-76.
8. van Heesch, U., Avgeriou, P., & Hilliard, R. (2012). Forces on Architecture Decisions-A Viewpoint. In Proceedings of the 2012 Joint Working IEEE/IFIP Conference on Software Architecture and European Conference on Software Architecture (pp. 101-110). IEEE Computer Society.
9. van Heesch, U., Avgeriou, P., & Hilliard, R. (2012). A documentation framework for architecture decisions. *Journal of Systems and Software*, 85(4), 795-820.