SSA 00 – Organizational Briefing

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TU Kaiserslautern, SS2018
Lecture "Software and System Architecture (SSA)"

Organization

Contact Information

Lectures

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Exercises

Jasmin Jahic

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News

- http://wwwagse.informatik.uni-kl.de/teaching/sads/
    - The place for all kinds of information
        - Announcements
        - Lecture slides
        - Exercise slides
        - Dates
        - Etc.

- Password for Downloading Materials
    - s2@0d1s8

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Schedule Classes
Monday, 15:30 - 17:00, Room 48-453

- 2018-04-09: Hello Architecture

- 2018-04-16: Architecture Documentation

- 2018-04-23: Architecture Drivers and Decisions

- 2018-05-14: Architecture Views

- 2018-05-28: Architecture Design Process

- 2018-06-18: Architecture Evaluation

- 2018-06-25: Architecture Styles and Patterns

- 2018-07-02: Architecture in Agile Teams

- 2018-07-09: Industry-talk

- 2018-07-16: Wrap-up

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Schedule Exercises
Wednesday, 17:15 - 18:45, KMU-Center @ Fh IESE

- Dates will be announced on web site

Exercise Preparations

■ Please register NOW for the SADS exercises

   ■ Via email to: jasmin.jahic@iese.fraunhofer.de
     with subject: [Lecture SADS]: Registration Exercise

Hello,

I would like to register myself for the SADS exercise.

Complete Name:
Matriculation No.:
Email:

Best Regards,

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Exams

- Written Exam:
    - Date: 23.07.2018
    - Time: 15:30-18:30
    - Room: 01-160

- Written Exam (Nachklausur):
    - Date: 17.09.2018
    - Time: 15:30-18:30
    - Room: 01-160

- NOTE:
For the written exam, no aids are allowed. Please bring your student-id and your id-card/passport with you to the exam.

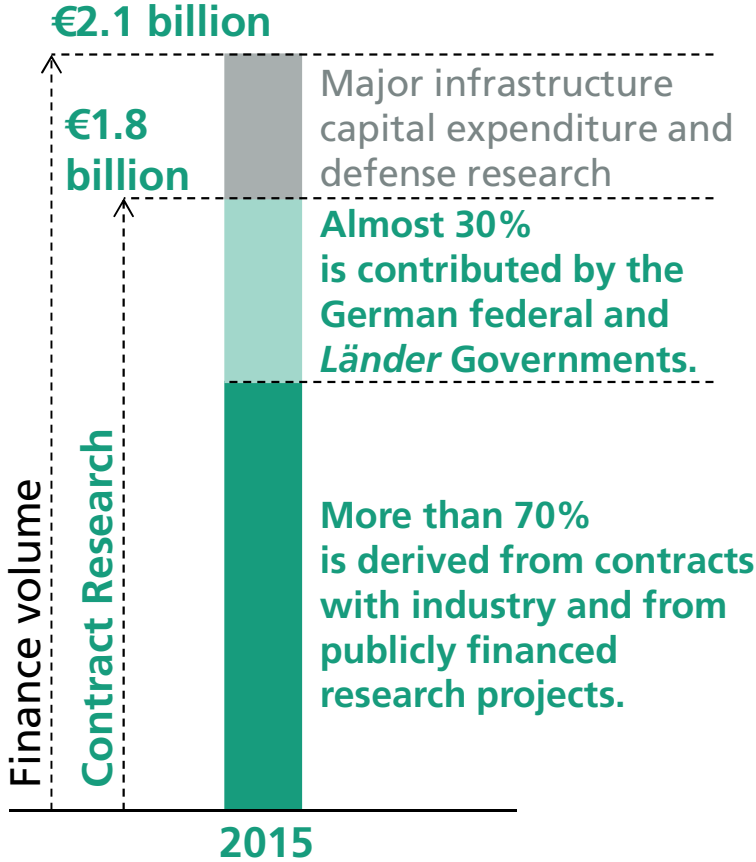Fraunhofer
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About Fraunhofer IESE

The Fraunhofer-Gesellschaft at a Glance

The Fraunhofer-Gesellschaft undertakes applied research of direct utility to private and public enterprise and of wide benefit to society.

24,000 staff

67 institutes and research units

Hauptstandorte ●
Nebenstandorte ○

Itzehoe
Rostock
Lübeck
Stade
Bremerhaven
Hamburg
Oldenburg
Bremen
Wolfsburg
Berlin
Hannover
Potsdam Teltow Wildau
Lemgo
Braunschweig
Magdeburg
Gelsenkirchen
Münster Paderborn
Goslar
Hamm
Soest
Göttingen
Cottbus
Oberhausen
Schwarz-
Dortmund
Halle
heide
Duisburg
Schmallenberg
Schkopau
Leuna
Leipzig
Willich
Köln
Kassel
Dresden
Zittau
Aachen
Sankt Augustin
Erfurt
Freiberg
Euskirchen
Gießen
Jena
Wachtberg
Hermsdorf
Chemnitz
Remagen
Frankfurt
Ilmenau
Hanau
Alzenau
Coburg
Mainz
Aschaffenburg
Bamberg
Darmstadt
Bayreuth
Kaiserslautern
Würzburg
Erlangen
Wertheim
Fürth
St. Ingbert
Mannheim
Nürnberg
Saarbrücken
Regensburg
Straubing
Karlsruhe
Pfinztal
Esslingen
Ettlingen
Deggendorf
Stuttgart
Augsburg
Freising
Garching
Freiburg
München
Weßling
Rosenheim
Efringen-
Kandern
Prien
Kirchen
Holzkirchen

€2.1 billion

€1.8 billion

Finance volume

Contract Research

Major infrastructure capital expenditure and defense research

Almost 30% is contributed by the German federal and *Länder* Governments.

More than 70% is derived from contracts with industry and from publicly financed research projects.

2015

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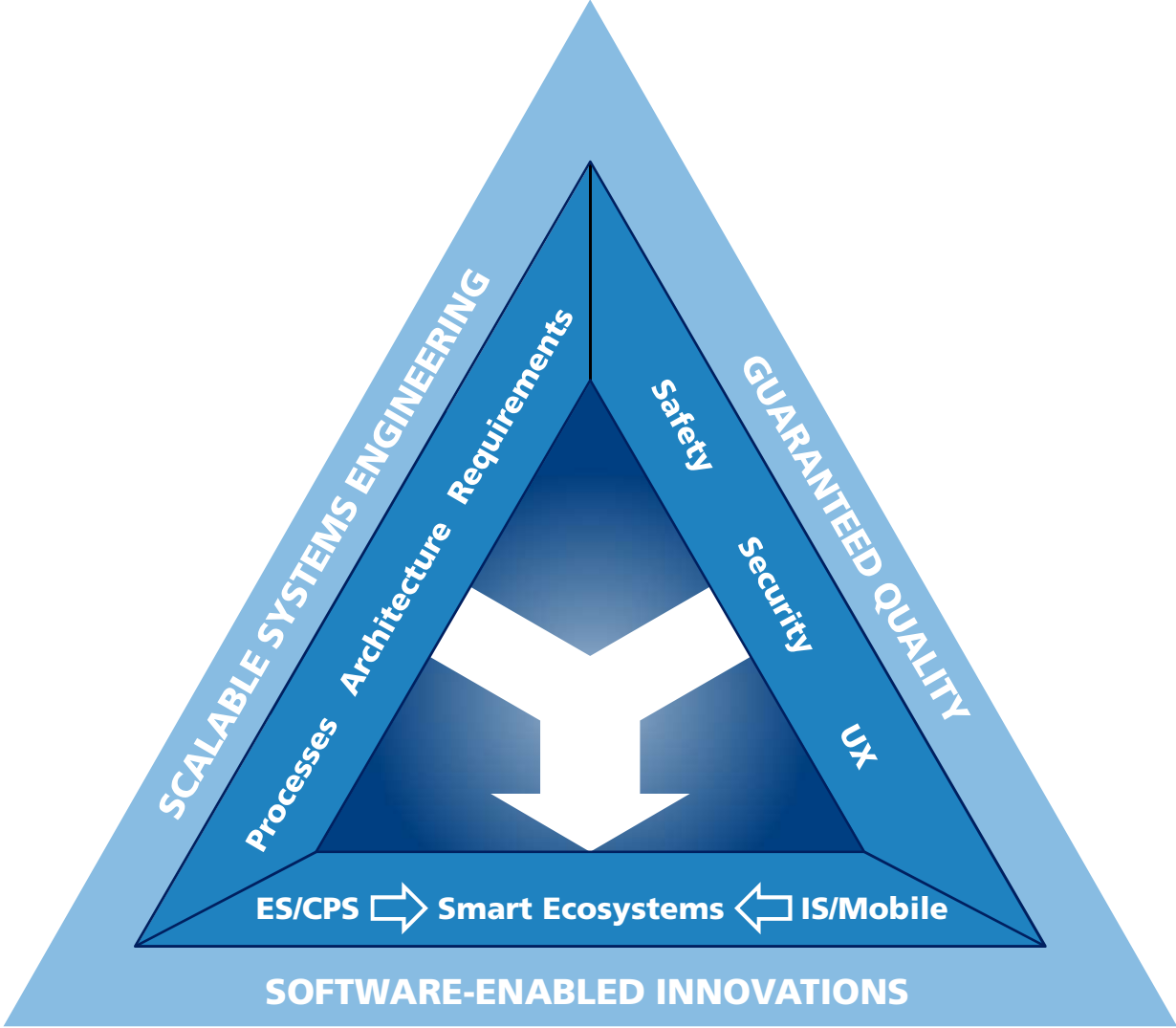## The institute for software and systems engineering

- Founded in 1996, headquartered in Kaiserslautern

- Over 155 full-time equivalents (FTEs)

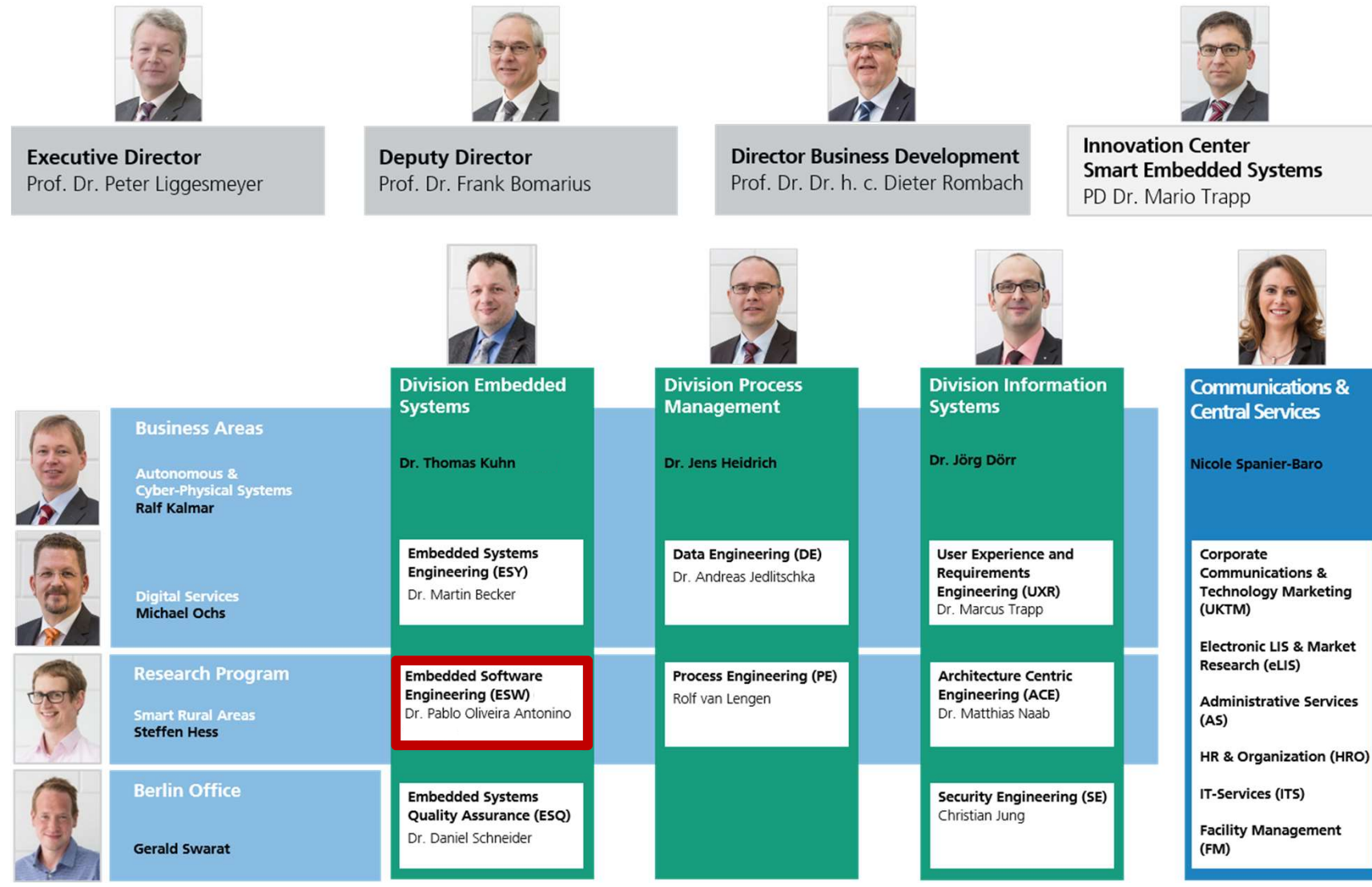- Our solutions can be scaled flexibly and are suitable for companies of any size

- Our most important business areas:

  - Automotive and Transportation Systems
  - Automation and Plant Engineering
  - Health Care

  - Information Systems
  - Energy Management
  - E-Government

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Our Competencies – for Your Benefit

IESE Organizational Chart

Executive Director Prof. Dr. Peter Liggesmeyer	**Deputy Director** Prof. Dr. Frank Bomarius	**Director Business Development** Prof. Dr. Dr. h. c. Dieter Rombach	**Innovation Center** **Smart Embedded Systems** PD Dr. Mario Trapp

Business Areas	Division Embedded Systems	Division Process Management	Division Information Systems	Communications & Central Services
Autonomous & Cyber-Physical Systems Ralf Kalmar	Dr. Thomas Kuhn	Dr. Jens Heidrich	Dr. Jörg Dörr	Nicole Spanier-Baro
Digital Services Michael Ochs	**Embedded Systems Engineering (ESY)** Dr. Martin Becker	**Data Engineering (DE)** Dr. Andreas Jedlitschka	**User Experience and Requirements Engineering (UXR)** Dr. Marcus Trapp	Corporate Communications & Technology Marketing (UKTM) Electronic LIS & Market Research (eLIS)
Research Program **Smart Rural Areas** Steffen Hess	**Embedded Software Engineering (ESW)** Dr. Pablo Oliveira Antonino	**Process Engineering (PE)** Rolf van Lengen	**Architecture Centric Engineering (ACE)** Dr. Matthias Naab	Administrative Services (AS) HR & Organization (HRO)
Berlin Office Gerald Swarat	**Embedded Systems Quality Assurance (ESQ)** Dr. Daniel Schneider		**Security Engineering (SE)** Christian Jung	IT-Services (ITS) Facility Management (FM)

As of October 1, 2017

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Top Industry Customers in 2017

About the Lecture

About the Lecture

ACES –
Architecture-**C**entric **E**ngineering **S**olutions

Inputs from the Fraunhofer Approach for
Modeling Software and System Architectures

Compiled Best Practices from literature,
scaled and tailored for effective architecting in practice

More than 15 years of project experiences across domains:
Embedded Systems, Information Systems, Smart Ecosystems

About the Lecture

What it is

- Interactive
- Real world questions
- For practitioners
- Paradigm-spanning
- Using technologies

What it is NOT

- Out-of-touch architecture
- Academic and formal
- One-way lecture
- OOD/OOP course
- Technology course

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In this Lecture, We Learn About…

- … the "big picture" of architecture

- … and how to:

    - Elicit architecturally-significant requirements

    - Design architectures

    - Document architectures

    - Evaluate architectures

    - Reconstruct architectures

    - Communicate architectural decisions

    - Benefit from architectures

    - Successfully work as a software architect ☺!

- **But…**

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... You Need to Practice Afterwards!
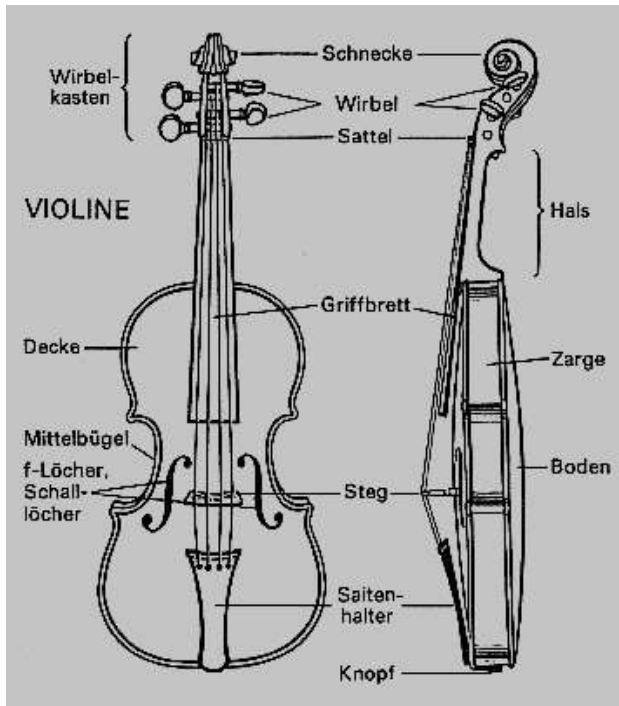
Theory

PRACTICE

Nikolaj Znaider

Professional
Violinist

http://www.eglofs.de/musikmus/Musik/Instrumente/Geige.htm

Architecture Methods of the Lecture

- Compiled best practices from proven approaches

- Can be matched to many other architecture methods

- Applied in many projects at Fraunhofer IESE, with industrial customers

- Training for industrial software engineer at the Fraunhofer Academy

- Emphasis on integrated method → the **big picture**

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INVESTMENT

STAKEHOLDER ANALYSIS

Architecting Best Practices
- Styles, Tactics, Patterns
- Guidelines, Templates
- Standards, Metamodels

Modeling Tools
- Whiteboard
- UML, SysML Tools
- Formal ADLs

Frameworks and Technologies

Engineering
- Project Management
- Requirements Engineering
- Component Engineering
- Implementation
- Build, Deployment, and Test
- ...

Operation
- Administration
- Diagnosis
- Installation
- Update, Patch, Hot Fix
- Hardware Replacement
- Procurement
- ...

Execution/Usage
- End User
- Marketing
- Sponsor
- Legal Entities
- Business Process
- Technical Process
- ...

PREDICTION

Views & Perspectives

Scenarios (Realization)

Scenarios (Specification)

Design, Modeling, and Reconstruction

Architecture Driver Elicitation

Architecture Repository

Confidence Building

Quality Attributes
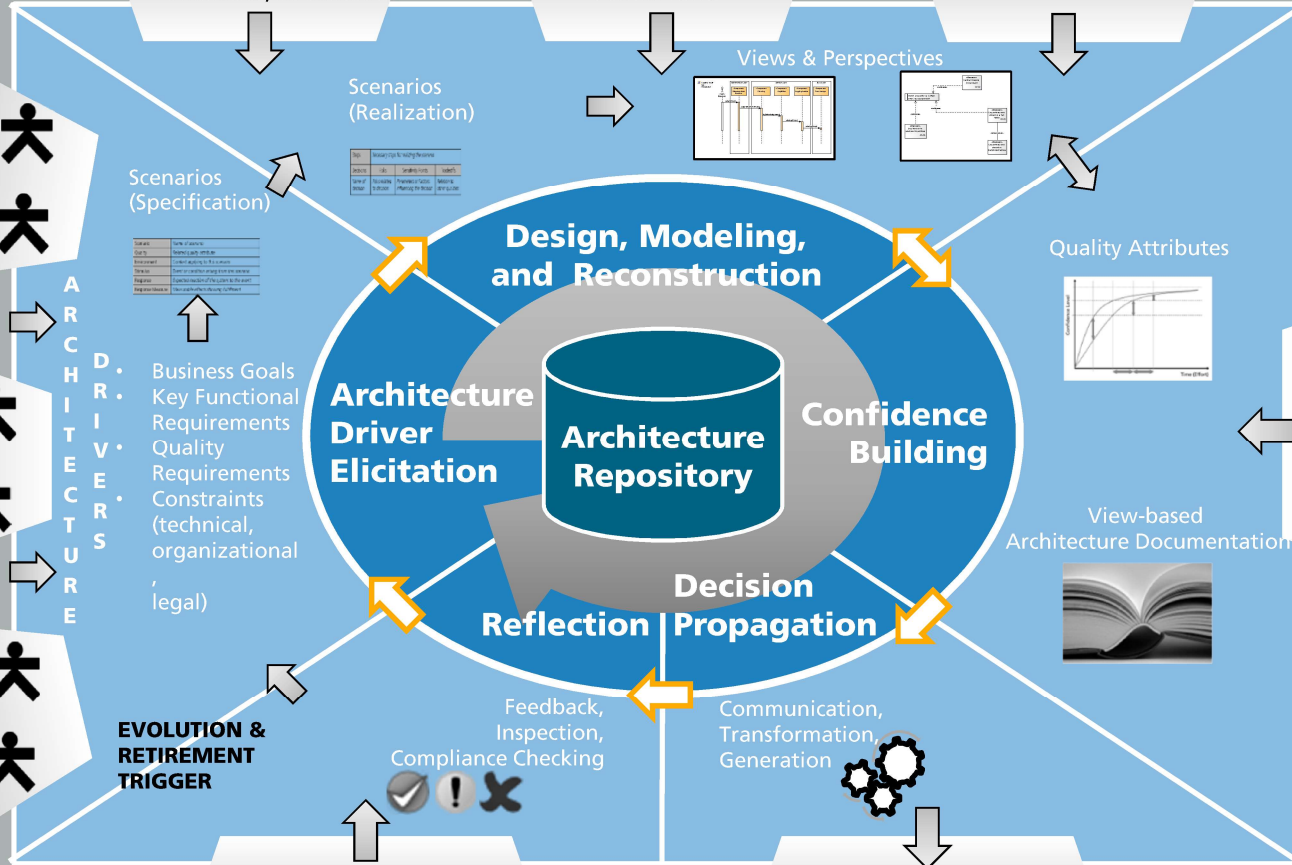
Confidence Level
- Trust
- Expert–based
- Walkthrough
- Simulation
- Prototypes
- Evidence (Facts by Measurement)
- ...

ARCHITECTURE DRIVERS

Business Goals
Key Functional Requirements
Quality Requirements
Constraints (technical, organizational, legal)

Decision Propagation

Reflection

View-based Architecture Documentation

EVOLUTION & RETIREMENT TRIGGER

Feedback, Inspection, Compliance Checking

Communication, Transformation, Generation

Analysis Tools
- among Teams
- in Source Code
- in Deployment Descriptors
- in Runtime Traces

Derived System Artifacts
- Artifacts
- Documentation
- Code Skeletons
- Binaries
- ...

GOVERNANCE

DERIVATION

Architecting in Practice Needs the Proper Package[1]

- Experience
  - Novice
  - Fundamental
  - Advanced
  - Professional
  - Expert

- Method & Best Practices
- Notation & Language
- Communication & Credibility
- Tools & Technologies

[1] inspired by H. Kargl @ SparxSystems „Modeling Principles – A survey of current modeling approaches in industry and where the journey may go", ECSA 2014

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Formality of Methods
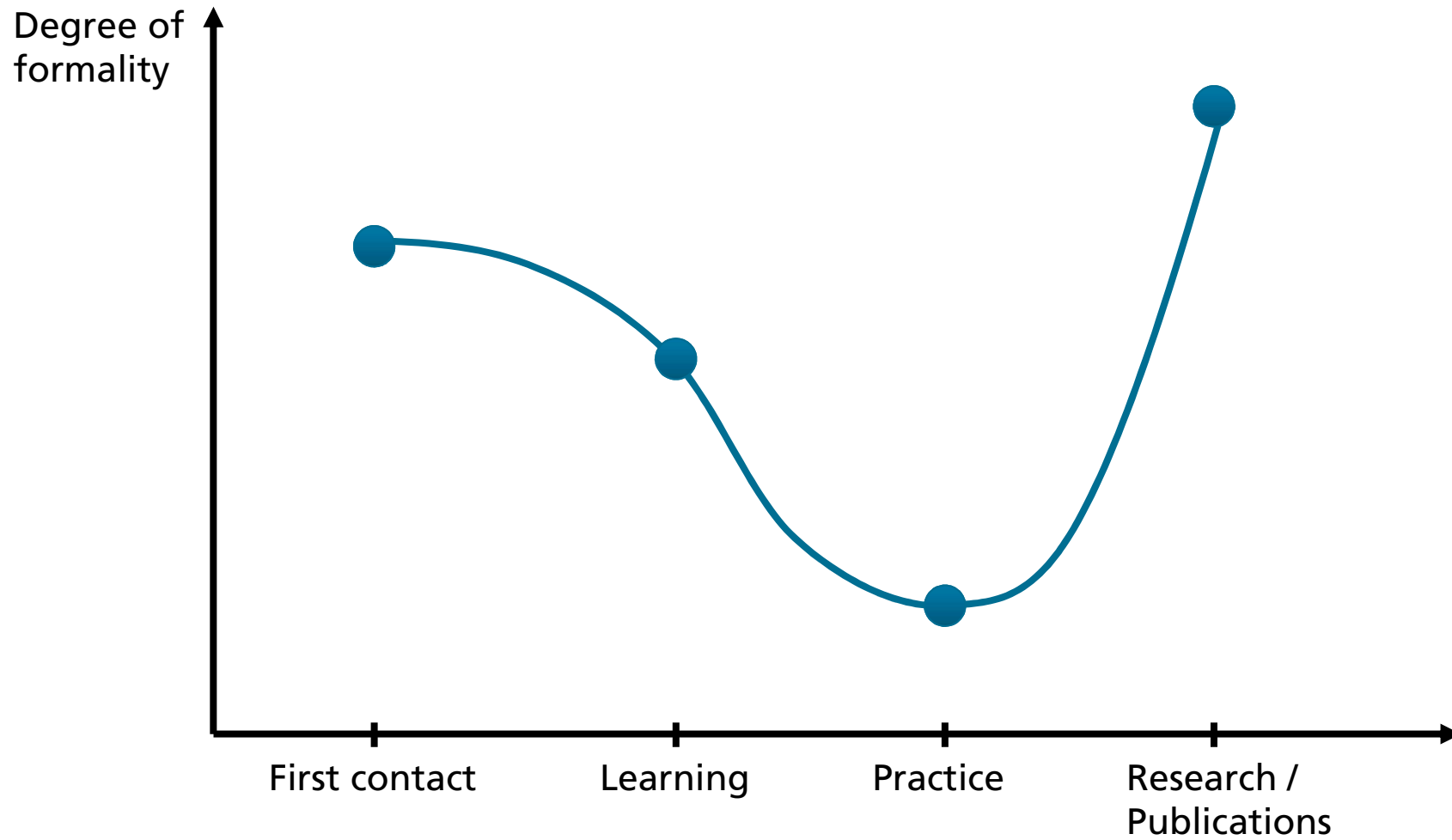
The Term
"Software Architecture"

History
Origin of the Field „Software Architectures"

- 1992 – Dwayne Perry and Alexander Wolf
  „Foundations for the Study of Software Architectures"
  in Software Engineering Notes

- 1993 – David Garlan and Mary Shaw
  „An Introduction to Software Architecture" in Advances in Software
  Engineering and Knowledge Engineering

- 1994 – Special Issue on Software Architecture
  in IEEE Transactions on Software Engineering

- 1995 – Special Issue on Software Architecture
  in IEEE Software Magazine

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History
Special Issue of IEEE Software in 1995

- The Artistry of Software Architecture
  Maarten Boasson

- Architectural Mismatch: Why Reuse is so Hard
  David Garlan, Robert Allen, and John Ockerbloom

- Comparing Architectural Design Styles
  Mary Shaw

- The 4+1 View Model of Architecture
  Philippe Kruchten

- Creating Architecture With Building Blocks
  Frank van der Linden, Jürgen Müller

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Today
Very Active and Established Field

- Available Resources

  - \> 200 million hits for "software architecture" [Google, April 2013]

  - \> 800 books found wrt. "Software Architecture" [Amazon, April 2013]

- Academic Community

  - Dedicated conferences

    - **ICSA** (International Conference on Software Architecture)

    - **ECSA** (European Conference on Software Architecture)

    - Special workshops associated with most software engineering conferences

  - Permanent Section on Architecture in the
    Journal of Software and System Engineering (JSS)

  - Major buzzwords and trends related to the architectural field:
    MDA, EAI, SOA, MicroServices, CQRS, …

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Literature
Recommended Readings

Recommended Books

- George Fairbanks
  Just Enough Software Architecture
  Marshall & Brainerd, 2010

- Richard N. Taylor, Nenad Medvidovic, Eric M. Dashofy
  Software Architecture: Foundations, Theory, and Practice
  Wiley, 2009

- Eoin Woods, Nick Rozanski
  Software Systems Architecture
  Addison Wesley, 2005

- Len Bass, Paul Clements, Rick Kazman
  Software Architecture in Practice (third edition)
  Addison Wesley, 2012

- Paul Clements, Felix Bachmann, Len Bass, David Garlan, James Ivers, Reed Little, Robert Nord, Judith Stafford
  Documenting Software Architectures - Views and Beyond (second edition)
  Addison-Wesley, 2010

- Douglas Schmidt, Michael Stal, Hans Rohnert, Frank Buschmann
  Pattern-Oriented Software Architecture, Volume 2: Patterns for Concurrent and Networked Objects
  Wiley, 2001

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Recommended Books per Domain

■ **Information Systems**

  ■ Eric Evans
  Domain-Driven Design

  ■ Martin Fowler
  Patterns of Enterprise Application Architecture

  ■ Johannes Siedersleben
  Moderne Softwarearchitektur

■ **Embedded Systems**

  ■ Oliver Alt
  Modellbasierte Systementwicklung mit SysML

  ■ B. P. Douglass
  Real-Time Design Patterns

Wrap Up