Advandes Software Architecture

Prof. Dr.-Ing. Andreas Heil
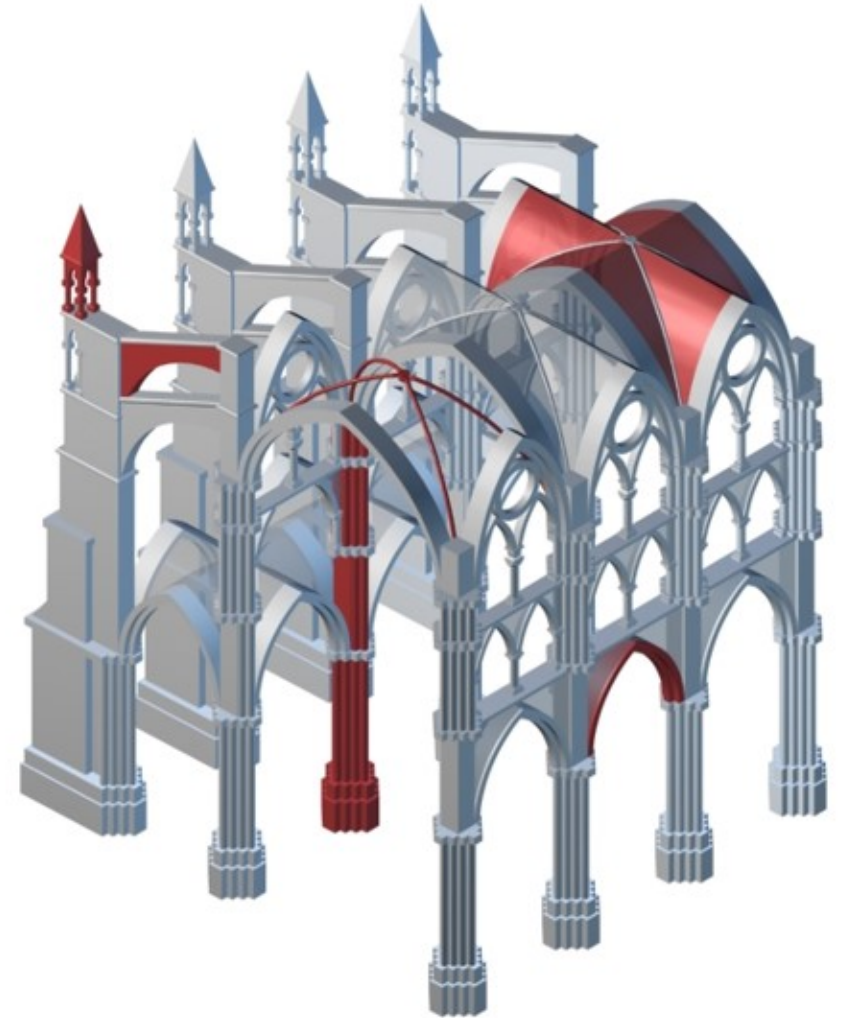
v1.0.0

Software Architecture

Introduction

What is an Architectural Style

What is an »architectural style«?

h:200 h:200 h:200

Architctural Style Example

- An example: Gothic style
- Gothic style provides the following features:
  - cross-ribbed vault
  - two instead of fuor roman archs
  - high, broken-up walls
  - rose windows
  - pointed archs
  - gothic buttress

Architctural Style Example

- An example: Instance of Gothic style
- Gothic style provides the following features:
  - cross-ribbed vault
  - two instead of fuor roman archs
  - high, broken-up walls
  - rose windows
  - pointed archs
  - gothic buttress

Software Architecture vs Software Design

Software Architecture

Technopedia says[2]:

> Software architecture is a structured framework used to **conceptualize software elements, relationships and properties**. This term also references software architecture documentation, which facilitates stakeholder communication while **documenting early and high-level decisions regarding design and design component and pattern reuse for different projects. The software architecture process works through the abstraction and separation of these concerns to reduce complexity.

7

Software Design

Ian Simmerville, Software Engineering, 10. Edition:

> Architectural design is concerned with understanding how a system should be organized and designing the overall structure of that system. In the model of the software development process, [...], architectural design is the first stage in the software design process. It is the critical link between design and requirements engineering, as it identifies the main structural components in a system and the relationships between them. The output of the architectural design process is an architectural model that describes how the system is organized as a set of communicating components.

Software Architecture Design

The Process of Describing Software Architectures

From Boxes...

- Software architecture based on the process: »software architect design«

- Software architecture design is a process where data structures, algorithms and software components are oganized in a way to achieve the desired behavior of a system

- Requirements are mapped to software components

... and Lines

- Relationships between components usually consist of
  - control flows
  - data flows
  - dependencies
- The collaboration of the components is described using these relationships

control flow   data flow   dependency

How to Choose Architectures

Practical tips

- The is not the »one an only« architecture for a requirement
- Requirements can be fulfilled using various architectures
- New technologies might require an architectural change
- Architectures are often based on the experience, external factors (e.g. company guidelines) or even the personal preferences of an architect

Let me tell you something a true story about someone who wanted to call himself an »Architect«...

Levels of Abstraction

- To fuilly describe an architecture you probalby need various levels of abstraction

- Examples

  - Static view (system components)

  - Dynamic view (processes, programm sequence)

  - Developer view (classes, packages)

  - Phyiscal view (infrastructure, physical components)

  - Deployment view (virtual machines, containers)

- Use different views based on your needs

- **Good bet: Do not put everything on one single view - been there, seen it!**
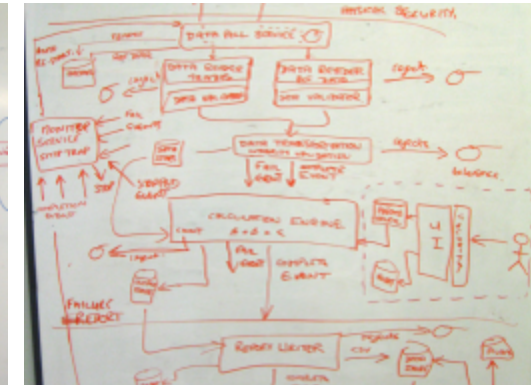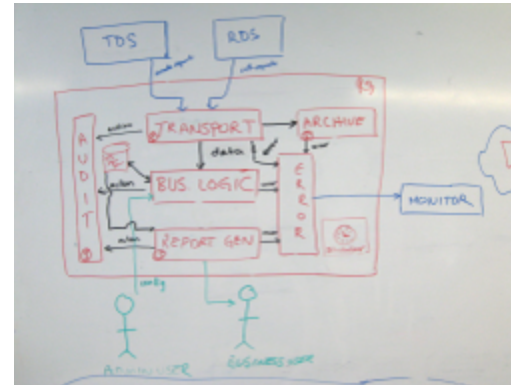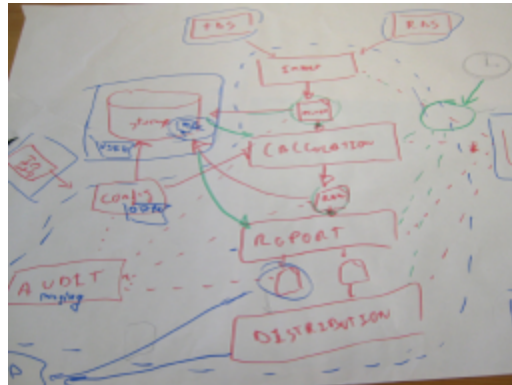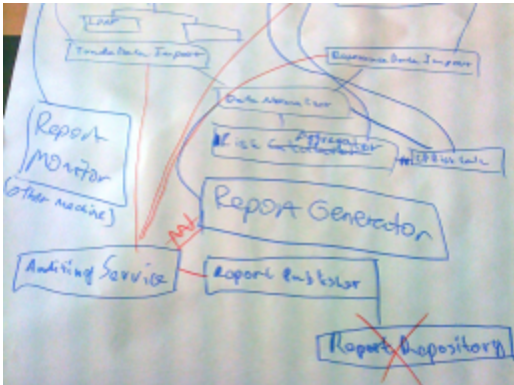
Documentation Approaches

- There are various approaches how to docment software architectures

- Architectural description languages (ADL): Formal languages which allow you to talk about architectures

- Various research projects do exists^2

- UML-based approaches: ArchMate, SysML

- Problem 1: No or little acceptance within the industry

- Problem 2: Formal approaches are neglected in favor for the much simpler boxes and lines

Consequence: simple boxes and lines are the most common approach for documenting and communicating architectures
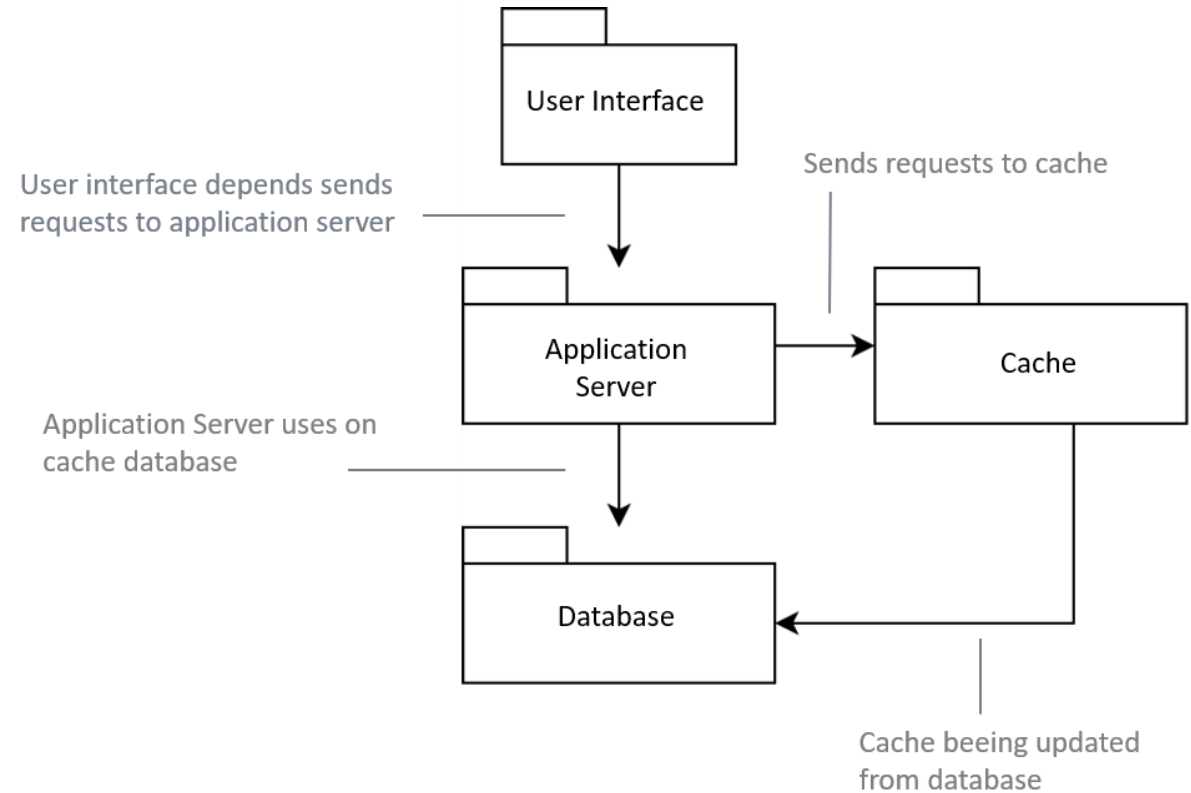
Software Architecture Challenge

- These are real world examples^3
- Would you be able to build the drawn system based on those architectural drawings?
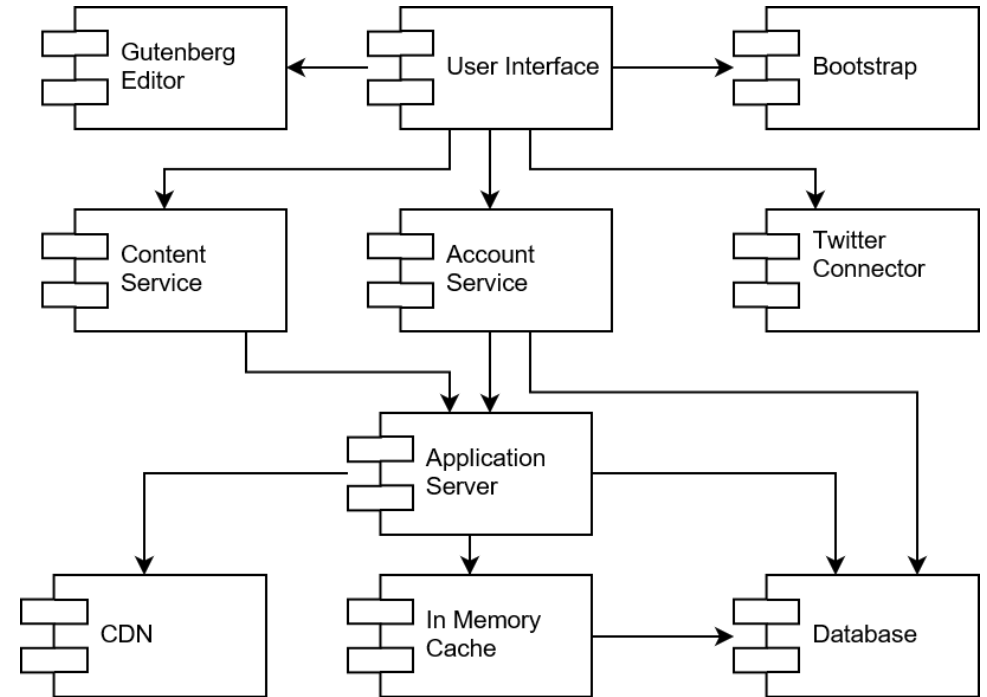
Usage of UML (1)

- Usage of UML package structures
- Bear in mind, there is only *one* view on the architecture
- But you see various levels ob abstractions

User Interface

User interface depends sends requests to application server

Sends requests to cache

Application Server

Cache

Application Server uses on cache database

Database

Cache beeing updated from database

Usage of UML (2)

- Usage of UML component structure
- This is *another* view on the previous architecture
- Still different levels of abstractions

Acknowledgments

Photographs used under public domain or fair usage. No copyright infringement intended. If used accidently under wrong license please contact to be removed.