





Building the Future

AI-infused Software Architecture

Marcel Schutte @ Java Friday
07/06/2024



Who am I?

Marcel Schutte

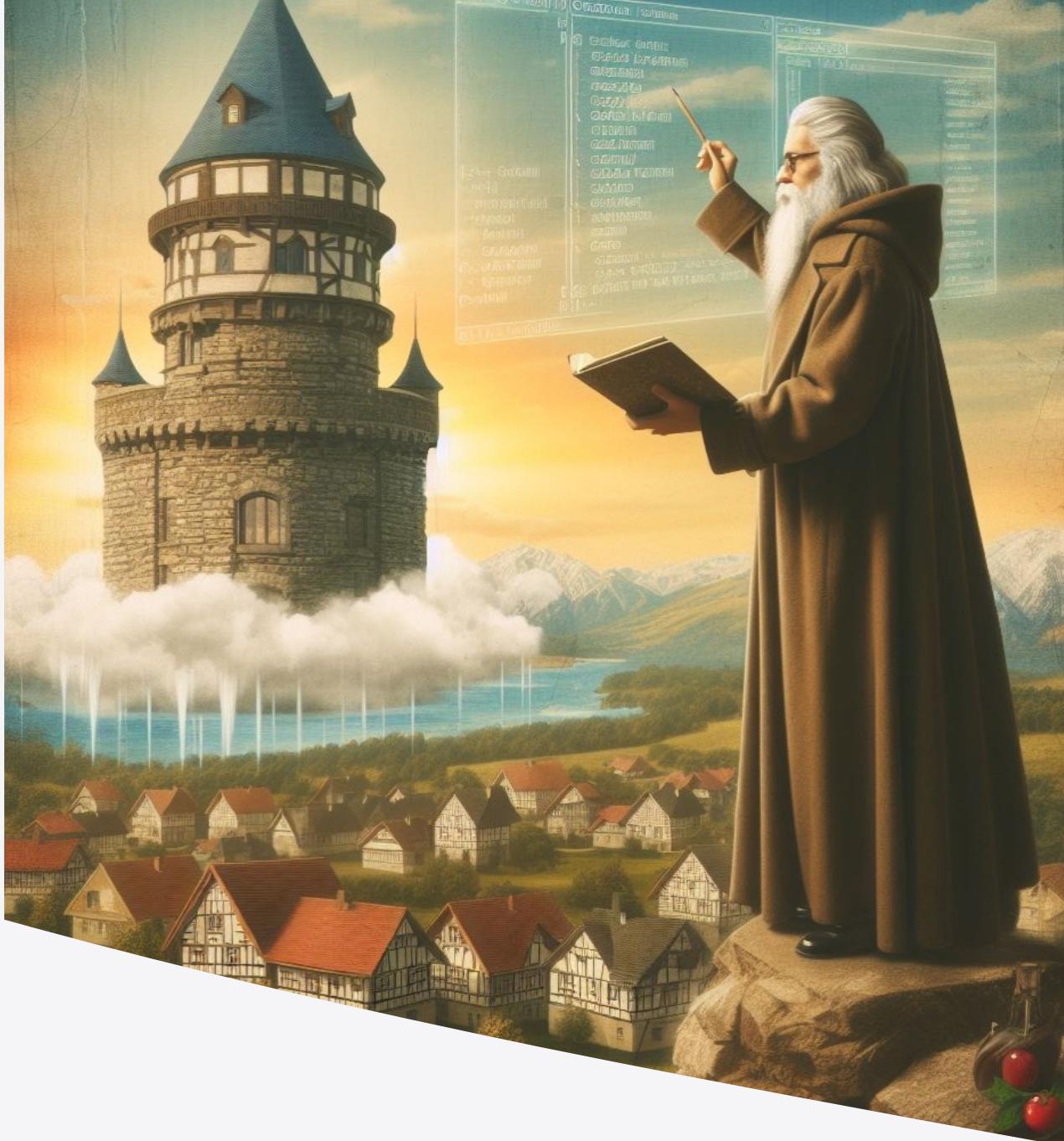
- Lead Solution Architect
- Government and Finance
 - Applicability of AI
 - Architecture modelling
- Public speaker



Ancient times

- Ivory Tower
- Big Design Upfront
- Detached from everyday development process

Times have changed...



The Modern Architect

- Heart of development
- Agile
- Communicator

We are on the cusp of yet another shocking change for architects!



The ArchItect of the Future

AI will not replace architects, but
architects who use AI will replace those
who don't.



AI for Software Architects

AI: Supercharging Software Architecture

- AI = Artificial Intelligence = Machines that think (learn, solve problems)
- Imagine software that helps you design software!



LLMs - The Architect's AI Assistant

- Large Language Models (LLMs) trained on massive text and code datasets
- Understand and generate human language exceptionally well



How LLMs Empower Architects

- Brainstorm creative architecture ideas based on requirements
- Automate documentation creation (e.g., technical specs, diagrams, ADR's)
- Generate code snippets or even components from designs



Introduction

Pizzeria "Il Sogno Italiano"

Pizzeria "Il Sogno Italiano" is a family-owned business that has been making fresh pizzas with passion for over 20 years. The restaurant is beloved in the area for its authentic recipes, fresh ingredients, and cozy atmosphere.

The pizzeria wants to optimize its online ordering process. The current website is outdated and cumbersome, resulting in customer frustration and a loss of potential orders.

The pizzeria wants a user-friendly ordering application that simplifies the ordering process and increases online orders.





Demo

Start architecture



Recap - Power of Collaboration

Process:

- I defined project goals and constraints.
- LLM analyzed my input and generated initial architecture concepts.
- Together: Explored possibilities and identified a promising architectural direction.





Demo

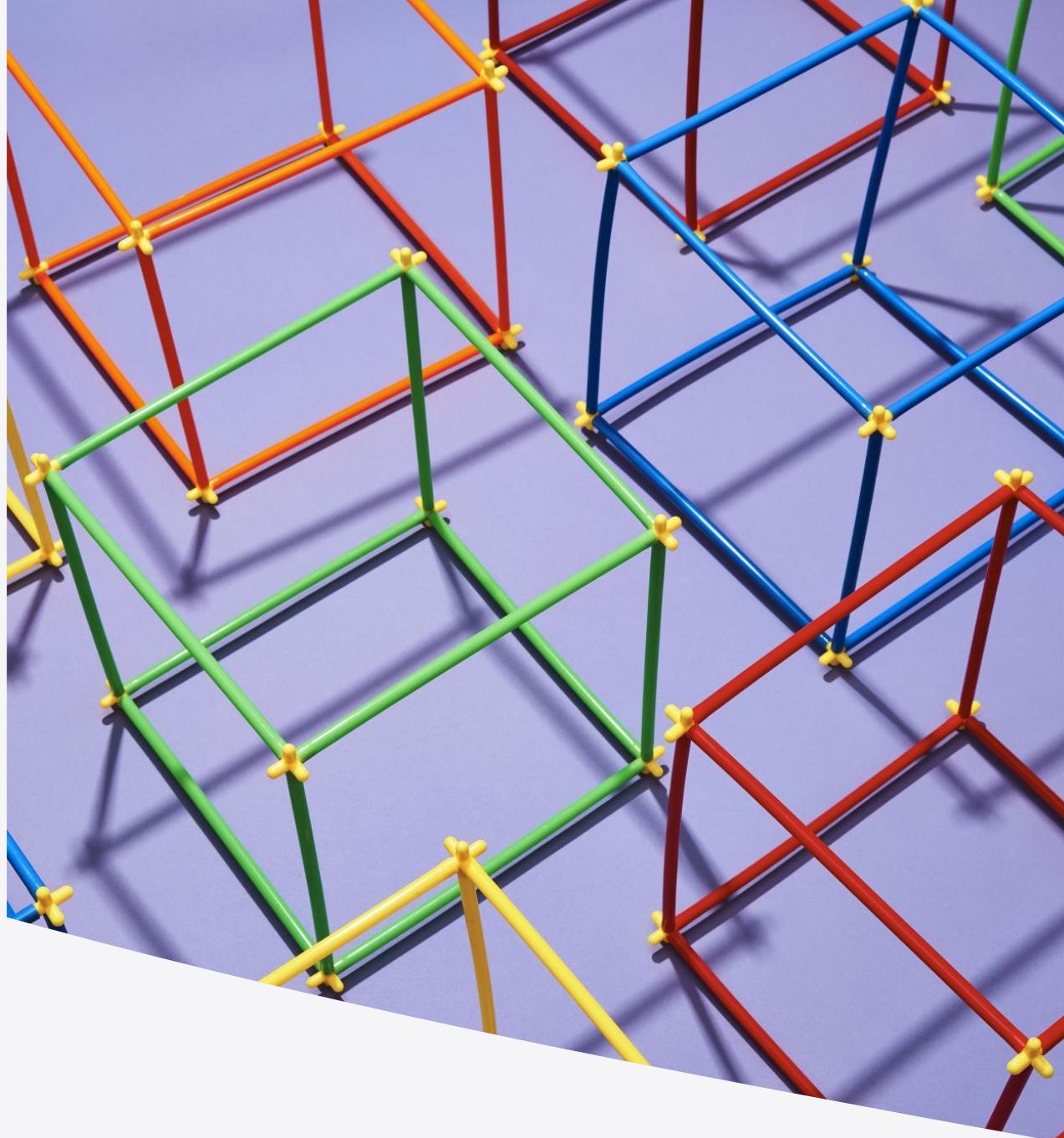
Decision support



Collaborative Decision Making

Process:

- Define goals
- Explore options with LLM
- Evaluate & decide



Architecture Decision Records

Documenting Your Architectural Journey:

- Capture key architectural decisions for future reference.
- Promote transparency and collaboration within the development team.
- Facilitate knowledge transfer and avoid future confusion.



Crafting Effective ADRs

Key Components:

- Context: Clearly define the problem or challenge addressed by the decision.
- Decision: Outline the chosen solution and any alternative options considered.
- Rationale: Explain the reasoning behind the chosen solution, including its advantages and trade-offs.



The Benefits of Using ADRs

Building a strong foundation:

- Improve communication and collaboration within the team.
- Facilitate knowledge transfer for new team members or future projects.
- Reduce the risk of architectural drift and inconsistencies.
- Enable informed decision-making based on past experiences.





Demo

Architecture Decision Record



Streamlining ADR's with LLMs

Boost Efficiency and Clarity:

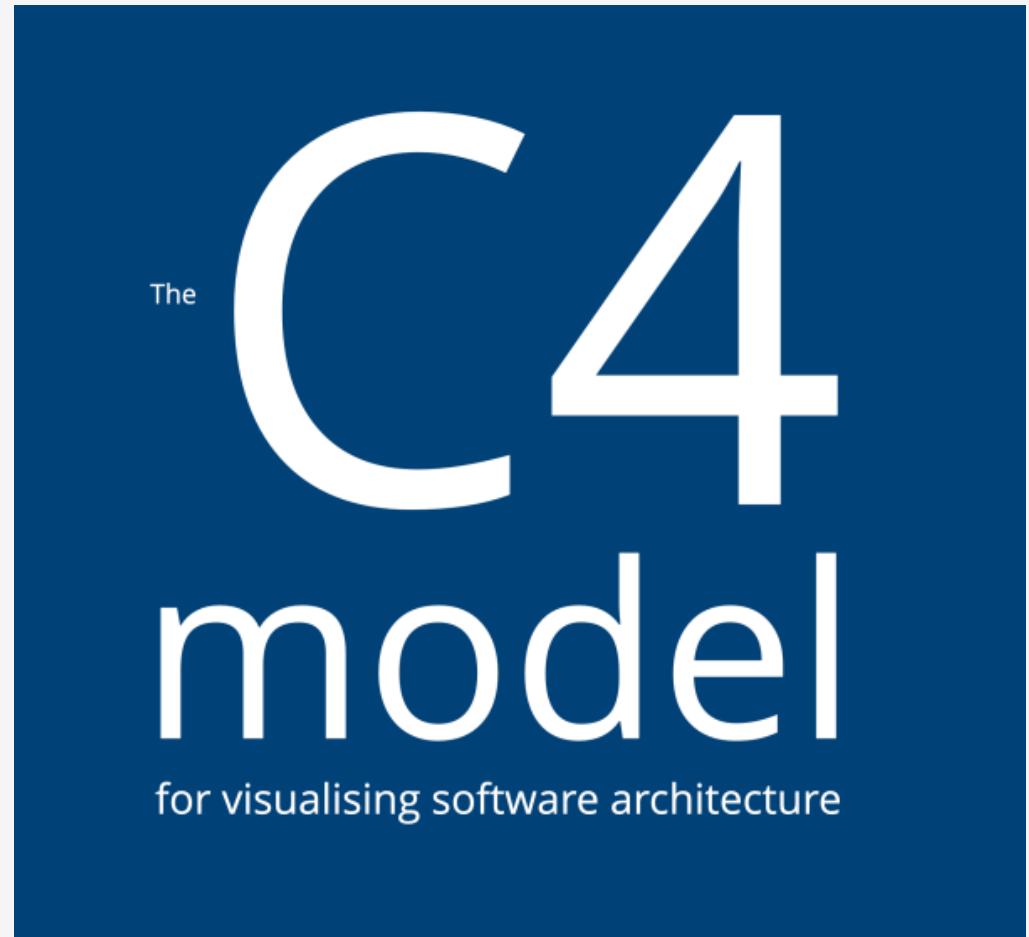
- Leverage LLM to capture context and decision details.
- Generate clear and concise rationales with LLM support.
- Automate formatting and ensure consistency with LLM assistance.



Unveiling the C4 Model

A Clear View of Your Software Architecture:

- Provides a structured approach to documenting software architecture.
- Focuses on four key levels: Context, Container, Component, and Code.
- Improves communication and collaboration among stakeholders.



bron: c4model.com

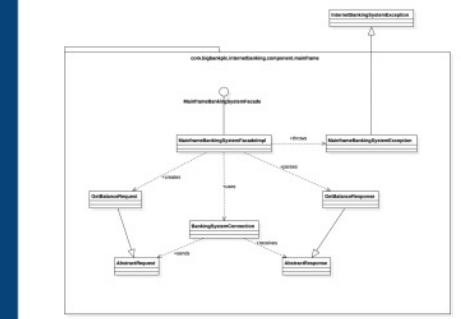
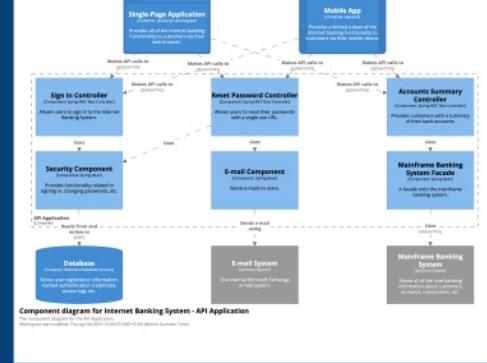
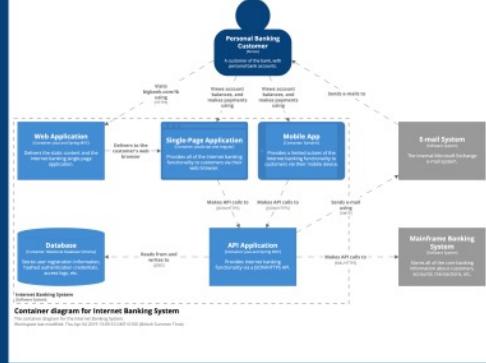
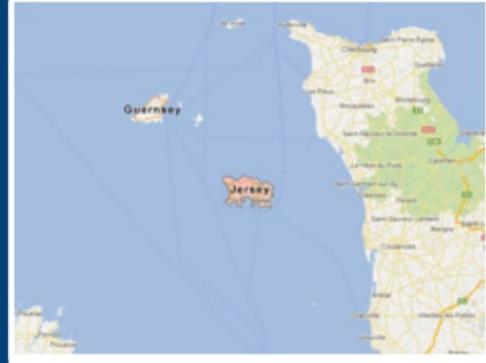
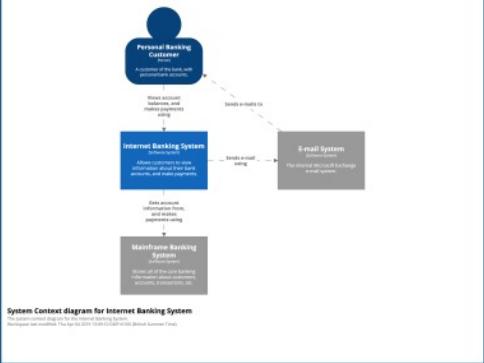
C4 Model

4 layers of abstraction

- Context
- Container
- Component
- Code



bron: c4model.com



Diagrams are maps that help software developers navigate a large and/or complex codebase

source: <https://simonbrown.je/>

C4 Model

4 layers of abstraction

- Context
- Container
- Component
- Code



bron: c4model.com

Benefits of the C4 Model -

A Roadmap for Success:

- Improved communication and collaboration among stakeholders.
- Enhanced system understanding for developers and non-technical audiences.
- Facilitates impact analysis of architectural decisions.
- Promotes maintainability and promotes scalability of the system.



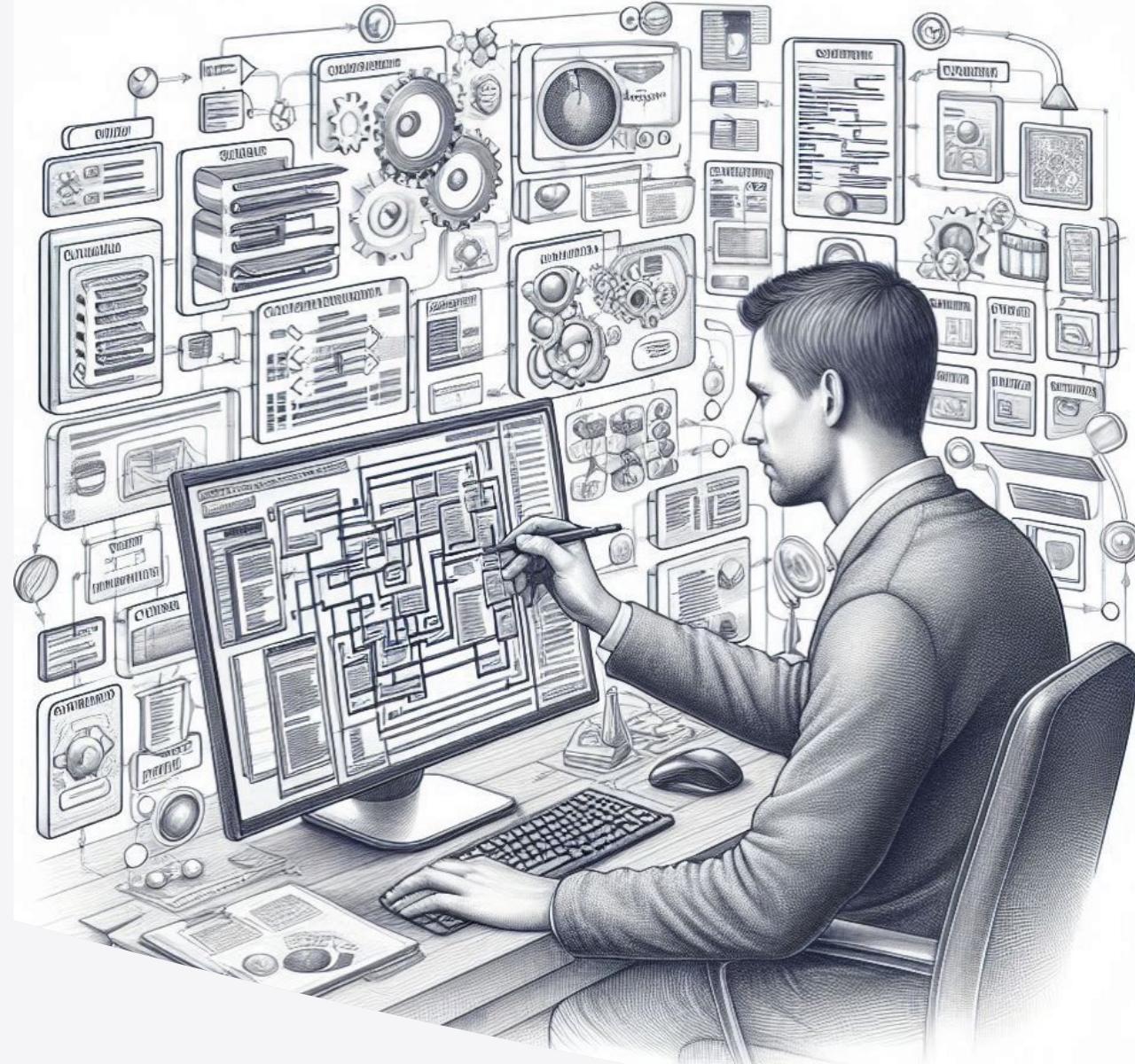


Demo

C4 Context / Container diagrams

C4 Diagrams with LLM Support

- Leverage LLM to brainstorm context elements and identify stakeholders.
- Generate initial component structures and interactions with LLM assistance.
- Refine and document diagrams with LLM support.



Enforcing Architecture Rules

Introducing ArchUnit:

- A library for enforcing software architecture rules.
- Improves code maintainability and reduces technical debt.
- Detects architectural violations at compile time.



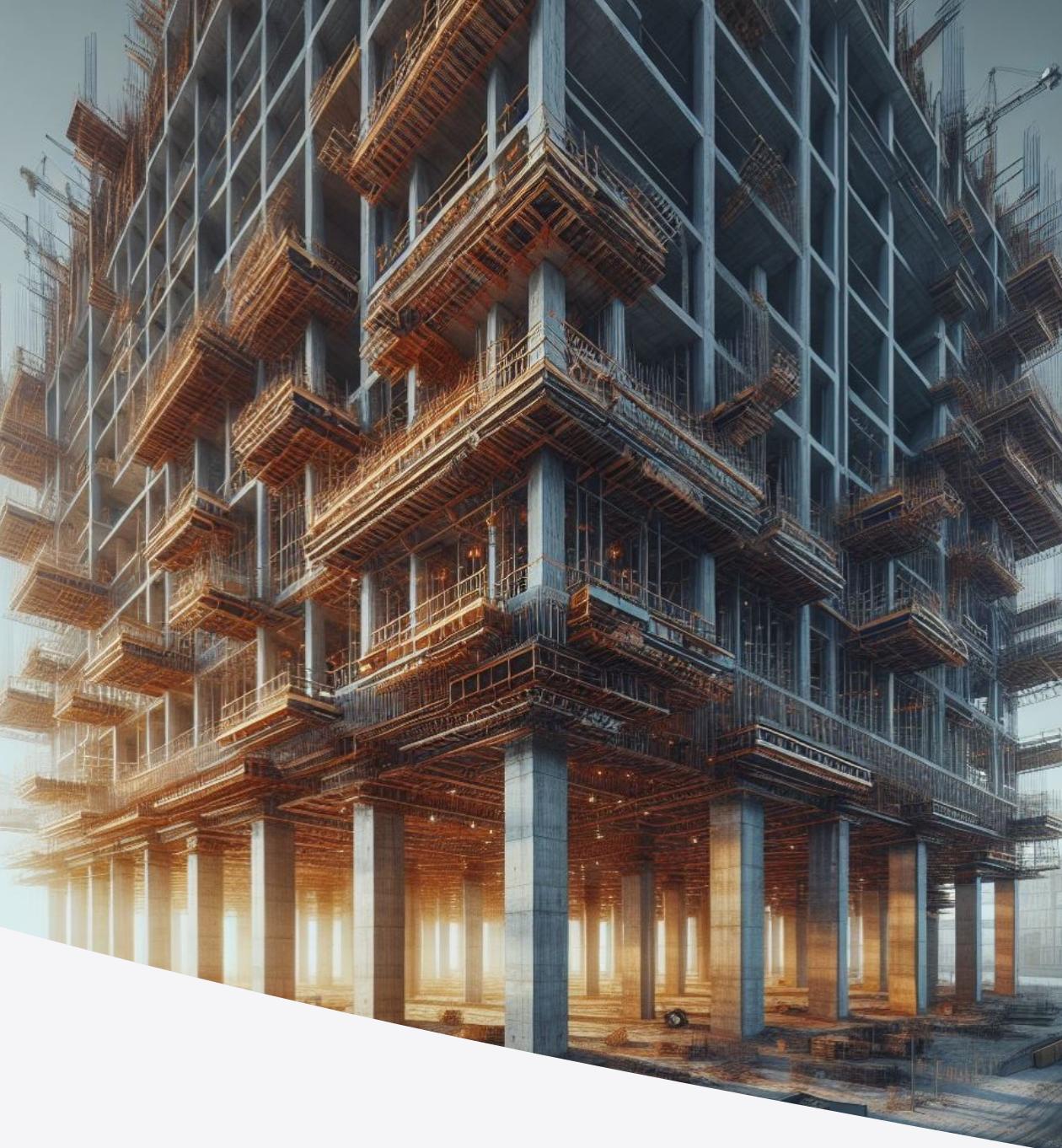
ArchUnit: What Can it Do?

- Validates package and class dependency structures.
- Enforces common architecture principles.
- Identifies cyclic dependencies and code smells.
- Offers flexibility for custom rule creation.
- Validates codebase with PlantUML architecture model



Benefits of Using ArchUnit

- Improved code maintainability and reduced technical debt.
- Early detection of architectural violations.
- Promotes better communication and code collaboration.
- Increases developer confidence in the codebase.

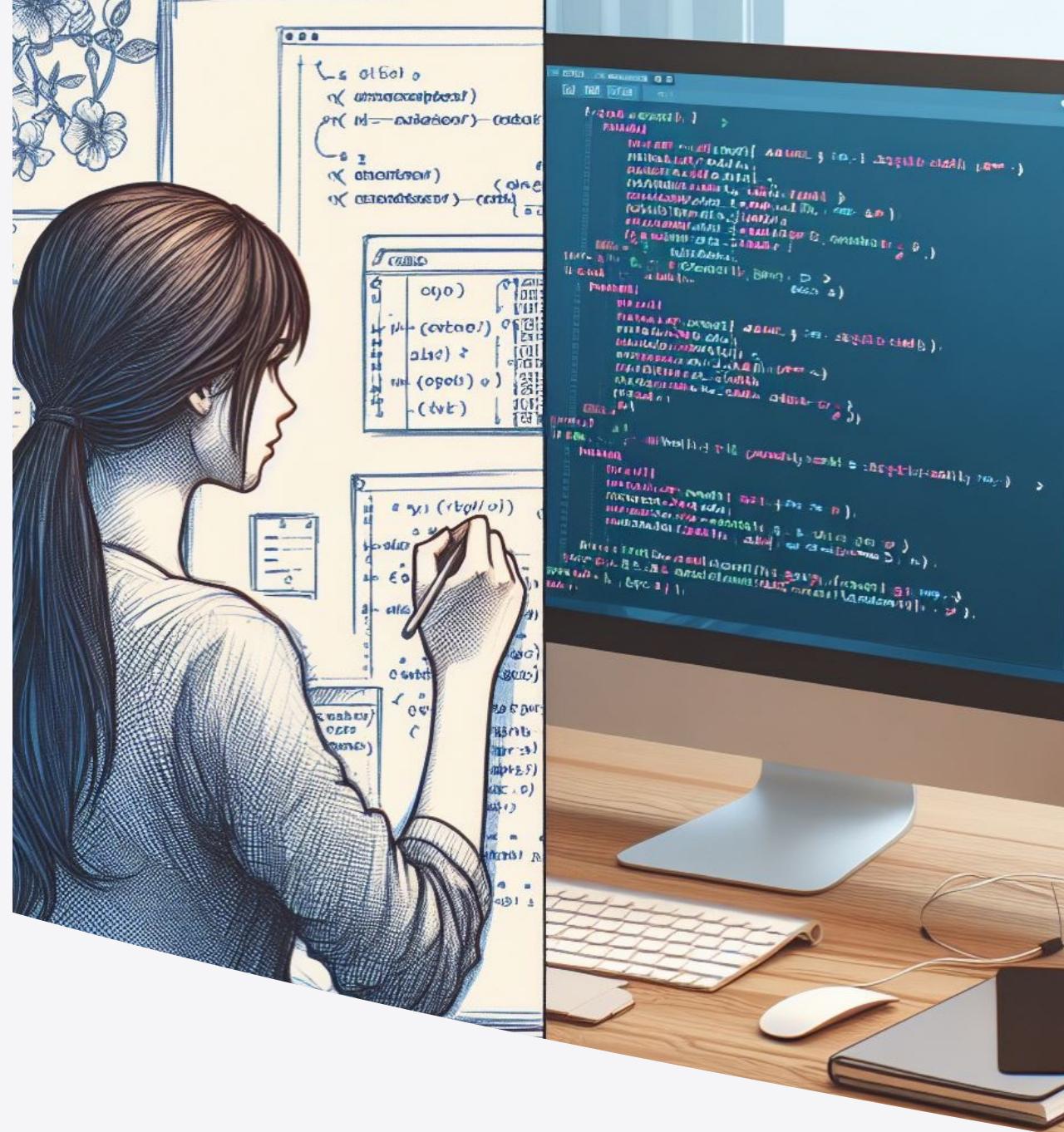




Demo
ArchUnit

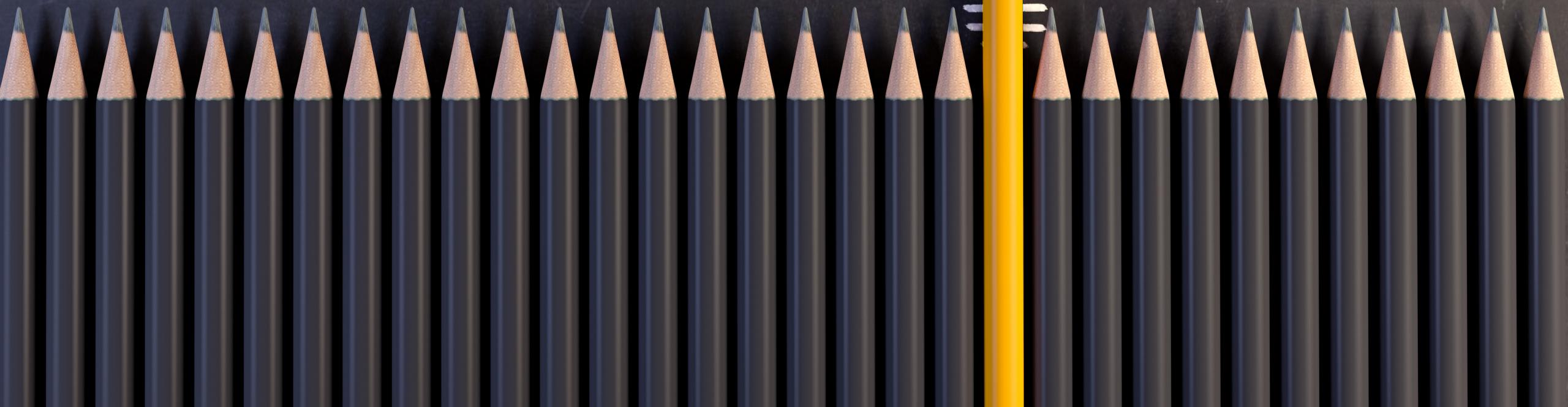
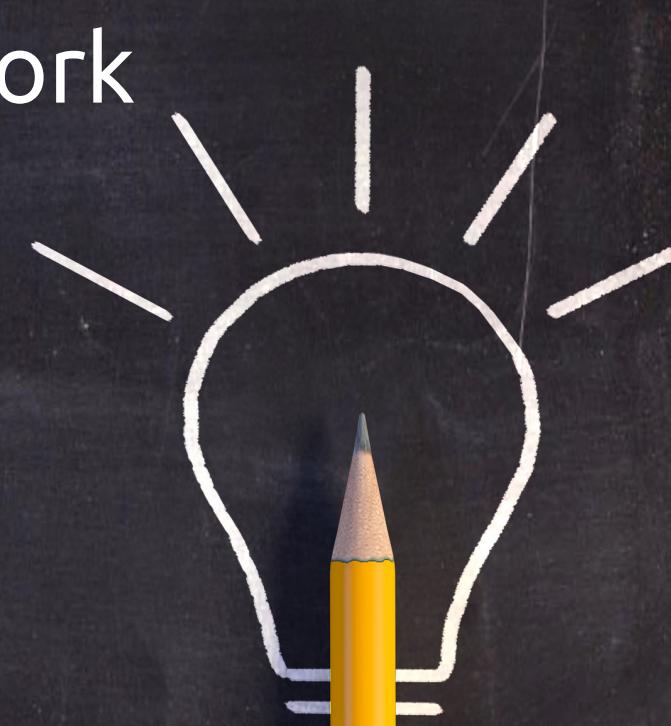
Streamlining ArchUnit Tests

- Leverage LLM to identify architectural constraints and potential violations.
- Generate initial test structures and assertions with LLM assistance.
- Refine and customize tests for specific architectural rules.



Crafting AI Prompts Framework

craftingaiprompts.org



The Human Touch Endures

- AI is a powerful tool, but architects remain crucial
- Use LLMs to free up time and gain fresh design perspectives



“AI will not replace architects,
but architects who use AI will replace those who don’t.”



Thank you for your attention!



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<https://github.com/marceljschutte/slidedecks>

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