The Architect's Blueprint

Building Scalable and Maintainable Web Applications

- Matt Vaughn, Application & Solutions Architect
- AngularArchitecture.com
- GitHub: buildmotion
- X/Twitter: @AngularArch
- Presentation: https://bit.ly/architect-blueprint

Overview of the Session

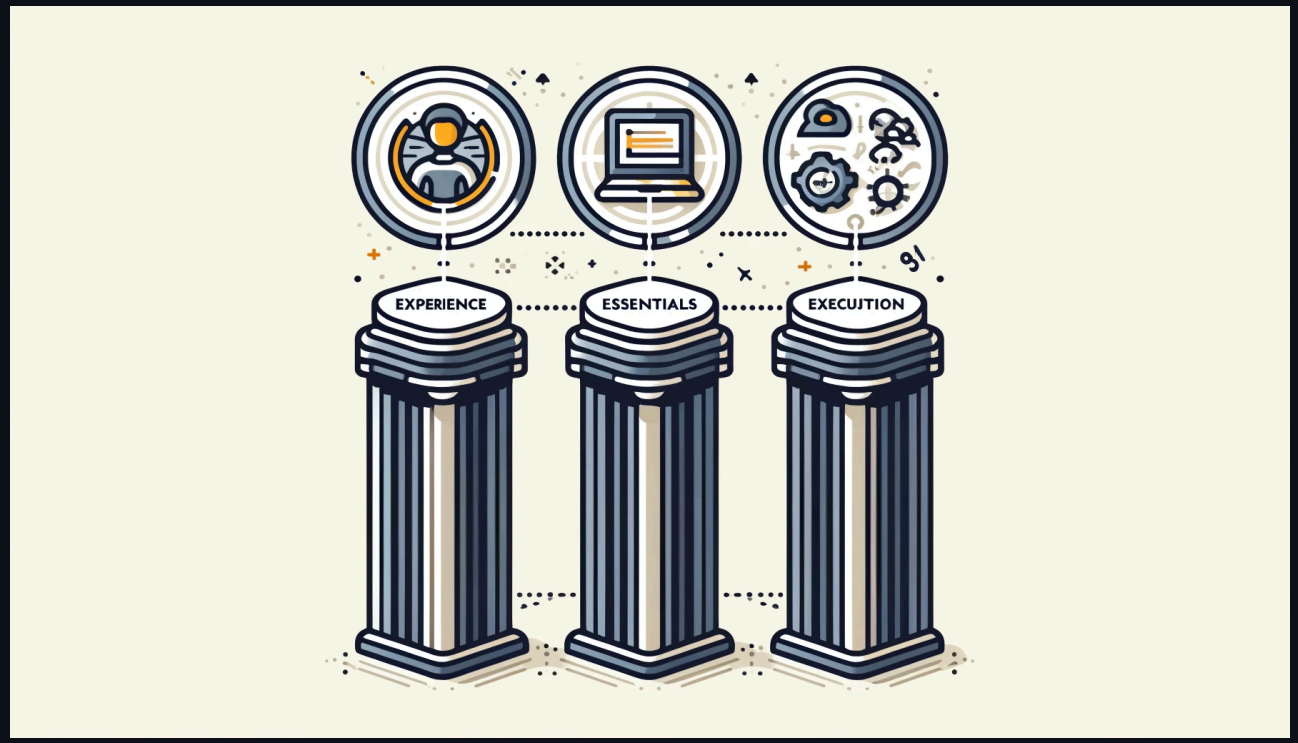
- Designing an Architecture
- Tools and Automation
- Leveraging Frameworks
- Advanced Code Generation Techniques
- Applying SOLID Principles
- Packages and Frameworks Overview

Plan?

Plan

> “The plan is to go in there and win; everybody has a plan until they get hit. Then, like a rat, they stop in fear and freeze.”

The Elements of Architecture

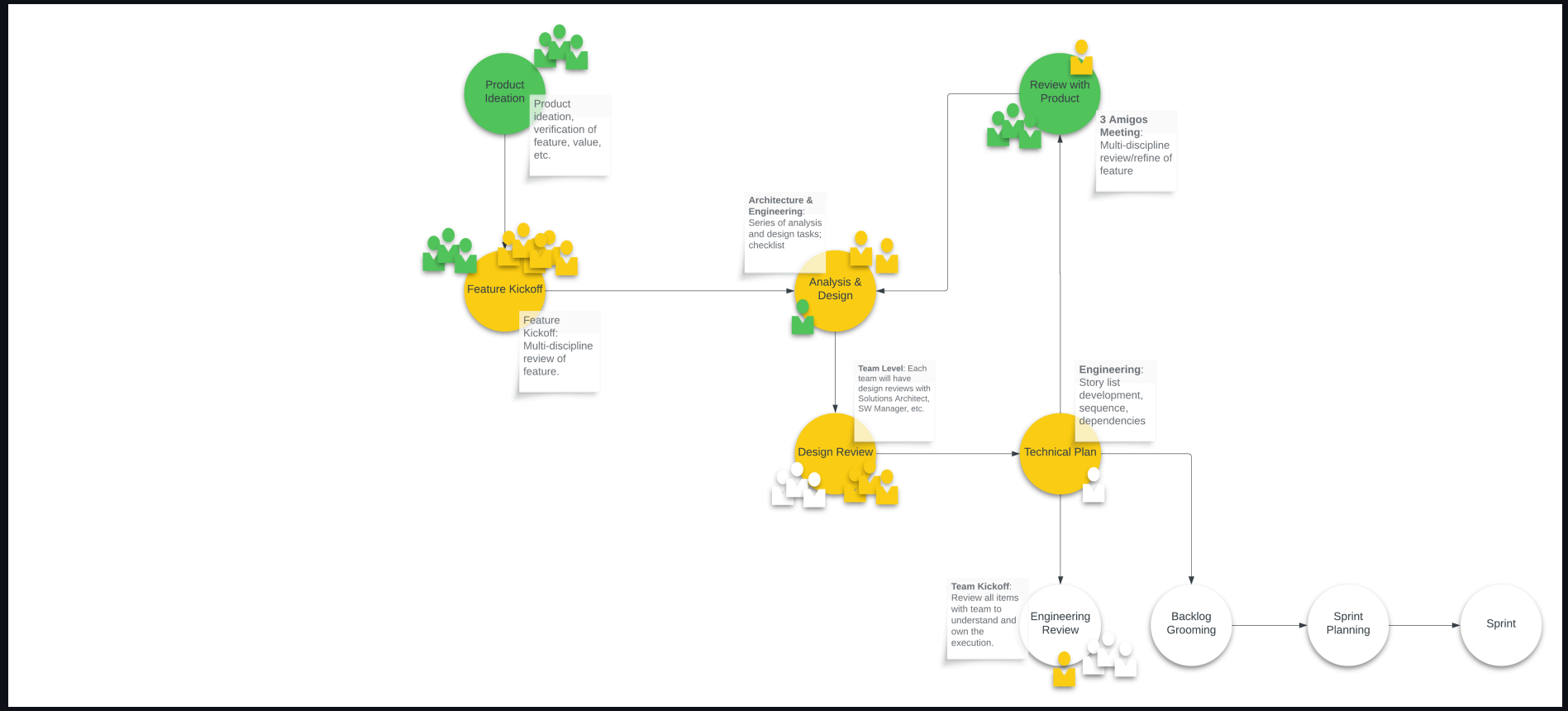


1. Experience
2. Essentials
3. Execution

Experience

- Specific knowledge of business, domain, and customers
- Defines the W's: what, who, when, where, and why?
- Involves architects, developers, DevOps, DBAs, Product, SMEs

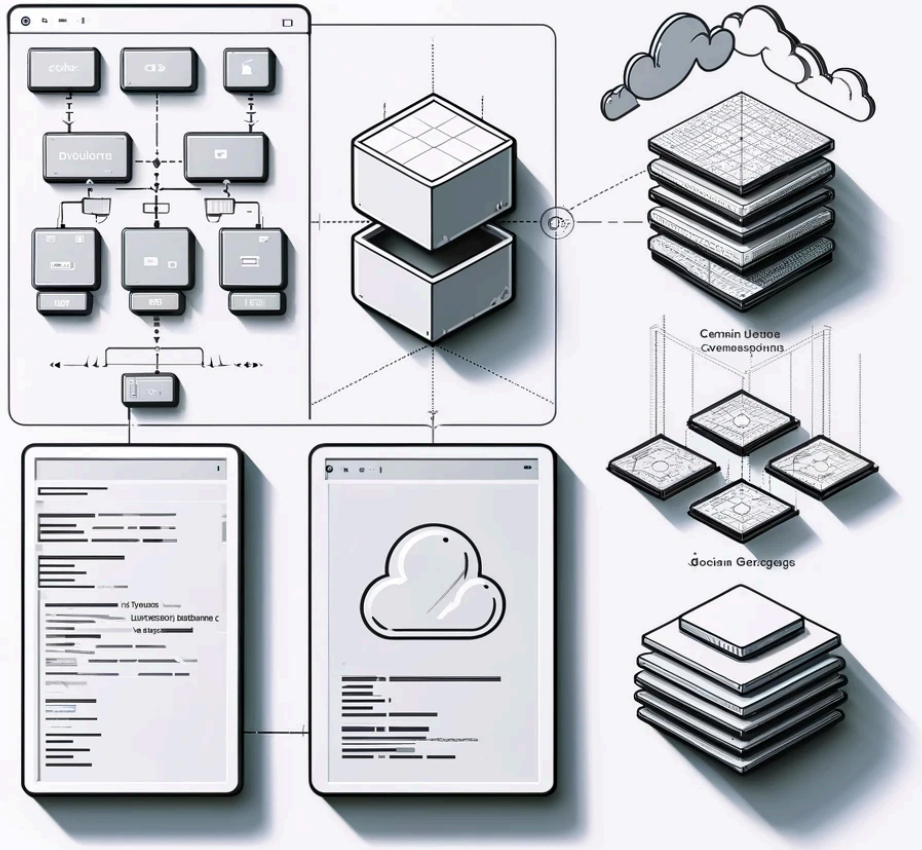
Experience :: Communication Workflow



Analysis and Design

- actors and personas (who)
- use cases and/or workflows
    - simple, detailed
- domain storytelling

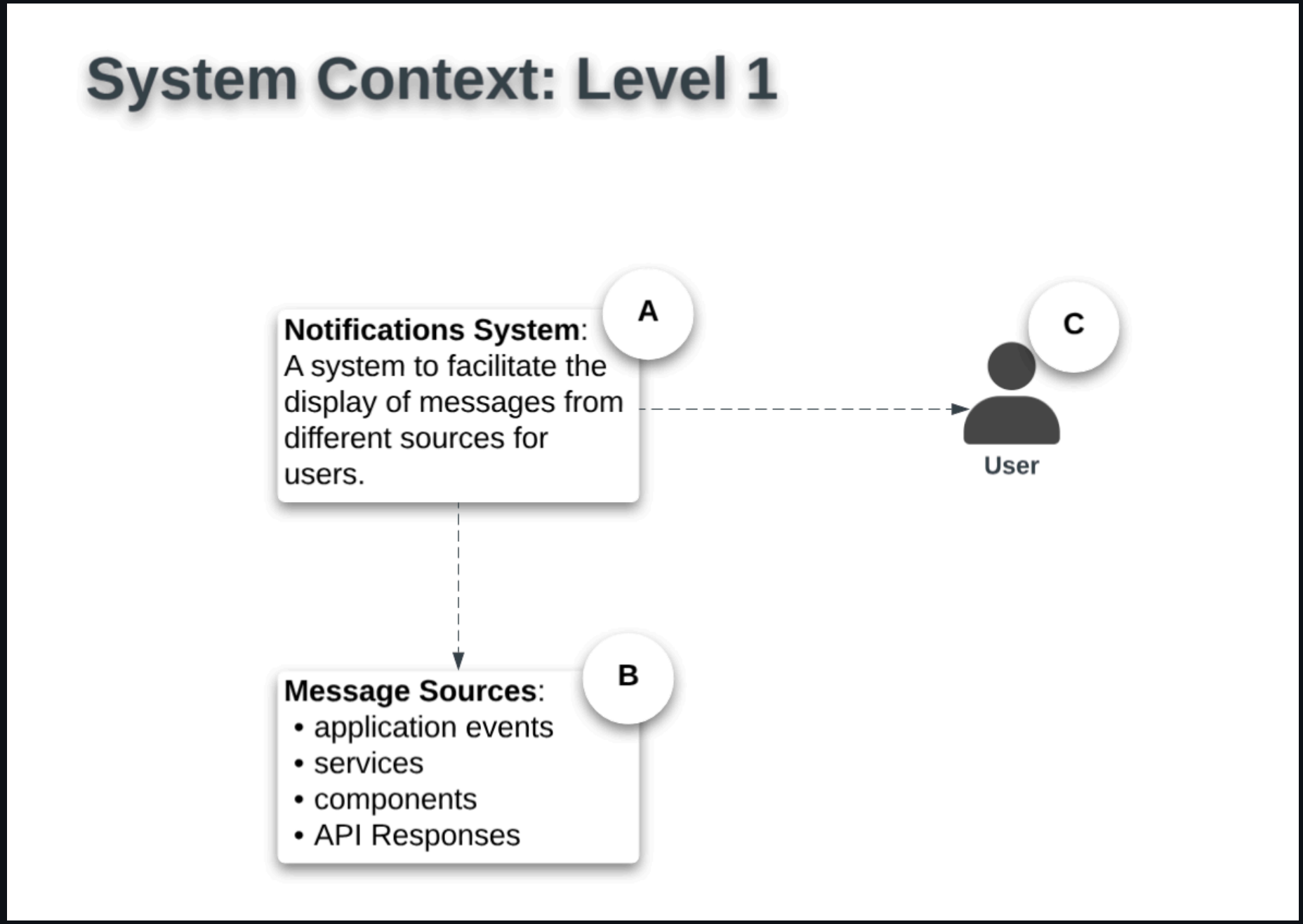
Design



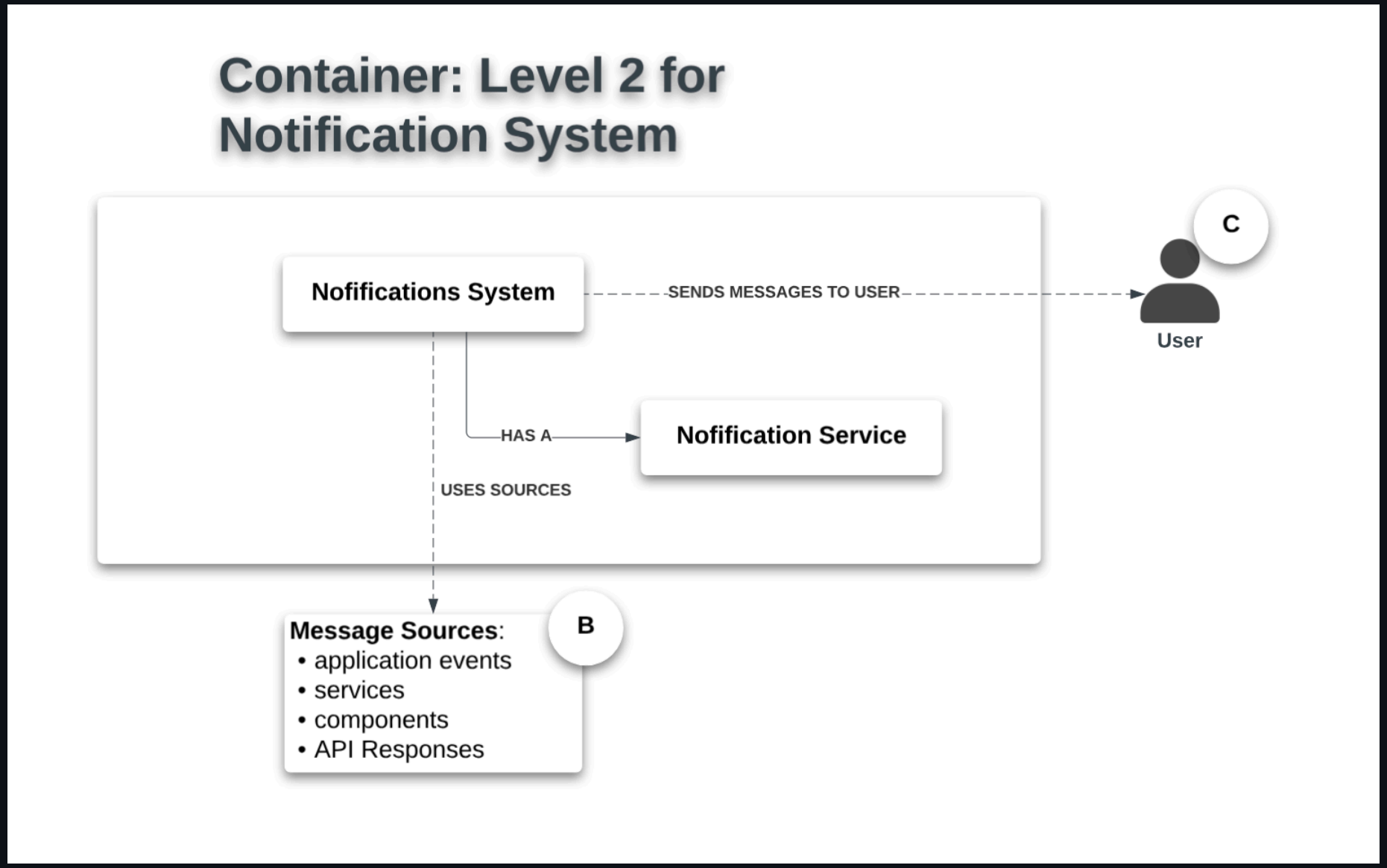
Design - How?

- C4, 4+1 Models
- UI mockup (low/high Fidelity)
- Domain modeling
    - Class/sequence diagrams
- Sequence; order of operation

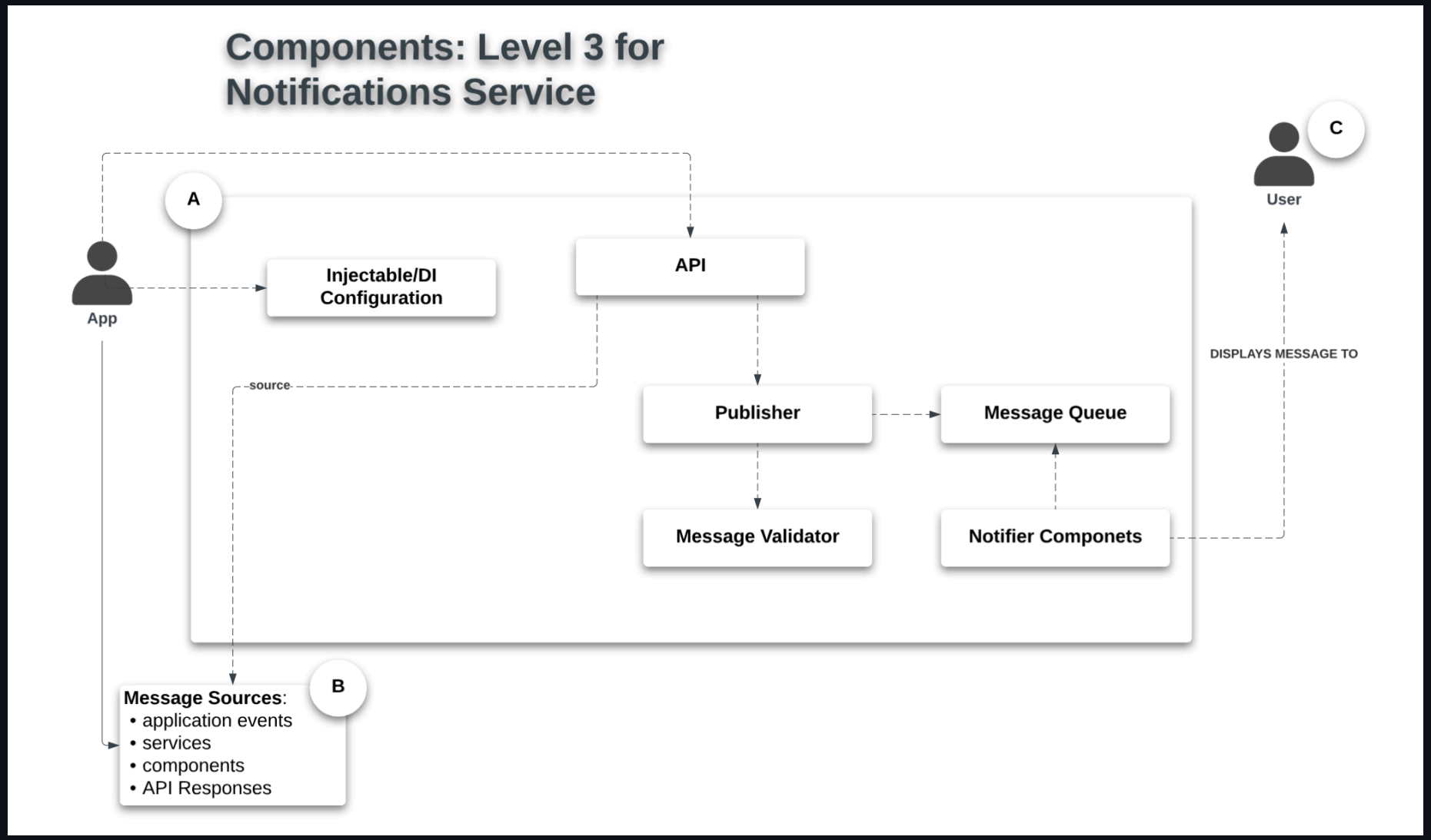
Design - C4 Model Context Level 1



Design - C4 Model Container Level 2



Design - C4 Model Component Level 3



Essentials

- Tools and Materials
- Hosting Environments
- CI/CD Automation

Execution

- Development workflow and developer experience
- Ensuring code quality and reliability
- Continuous evaluation and discipline

Designing an Architecture

> “Software architecture is the high-level structure of a software system, defining its parts, their interactions, and the guiding principles and patterns for design and evolution.”

- Definition and Principles
- Benefits
- Case Study
- Best Practices

Definition and Principles of CLEAN Architecture

- Separation of Concerns
- Dependency Rule
- Entities, Use Cases, Interfaces, and Frameworks

Separation of Concerns

- Features (Vertical/Horizontal):
  - UI/UX
  - business logic
  - Data access or API access
- How?: code organization...

Dependency Rule

- IoC/dependency injection
- Providers and interfaces
- side effects
    - testing maintenance, extensibility, abstraction

Benefits of CLEAN Architecture

- Enhanced Maintainability
- Scalability
- Improved Testability
- Flexibility

Case Study: Implementation in a Real-World Project

- Initial State vs. Post-Implementation
- Key Changes and Their Impact

Best Practices for Maintaining CLEAN Architecture

- Regular Refactoring
- Code Reviews, Frequent Commits/Pushes
- Documentation, training, playbook
- mentality/accountability

Tools and Automation for Streamlining Development

- Importance of Automation
- Tools for Enforcing Coding Standards
- CI/CD
- Automated Testing Frameworks

Importance of Automation in Development

- Consistency
- Efficiency
- Error Reduction

Tools for Enforcing Coding Standards

- Soell Chickeng
- ESLint. Prettier
- Code Access

Continuous Integration and Continuous Deployment (CI/CD)

- GitHub Actions
- Jenkins

Automated Testing Frameworks

- Unit/specification
- End to end testing
- Integration testing

Leveraging Frameworks for Robust Systems

- Front-End Frameworks
- Back-End Frameworks
- Seamless Communication
- UI Control Suites
- Logging and Monitoring Tools
- Performance and Analytical Tools
- Profiling Tools
- Quality and Reliability Strategy

Front-End Frameworks: Angular, React, Vue.js

- Key Features and Use Cases
- Performance Optimization Techniques

Back-End Frameworks: NestJS, Express.js

- Microservices Architecture
- API Design and Management

Seamless Communication between Front-End and Back-End

- API response schema
- RESTful APIs vs. GraphQL

Selection of UI Control Suites

- Kendo UI
- DevExtreme
- PrimeNG

Logging and Monitoring Tools

- DataDog, New Relic
- Azure Application Insights

Performance and Analytical Tools

- Lighthouse
- WebPageTest

Profiling Tools

- Chrome DevTools
- Angular Profiler
- React Profiler

Quality and Reliability Strategy

- Using Jest for Specification Tests
- Strategy for Ensuring Quality and Reliability

Code Generation Techniques

- Introduction to Code Generation
- Tools for Code Generation: Nx, Yeoman
- Automating Boilerplate Code Production

Introduction to Code Generation

- Benefits
- Common Use Cases

Tools for Code Generation: Nx, Yeoman

- Key Features and Capabilities

Automating Boilerplate Code Production

- Examples
- Best Practices

Examples and Demonstrations

- Creating Custom Nx Plugins
- Generating Angular Components and Services

Applying SOLID Principles in Front-End Development

- Overview of SOLID Principles
- Practical Examples in Angular
- Angular Dependency Injection and IoC
- Benefits of SOLID

Overview of SOLID Principles

- Single Responsibility Principle (SRP)
- Open/Closed Principle (OCP)
- Liskov Substitution Principle (LSP)
- Interface Segregation Principle (ISP)
- Dependency Inversion Principle (DIP)

Practical Examples in Angular

- Modular Architecture
- Service-Oriented Design

Angular Dependency Injection

- Explanation of Dependency Injection (DI)
- How DI in Angular Relates to Inversion of Control (IoC)
- Practical Examples of DI in Angular

Benefits of SOLID in Long-Term Maintenance and Scalability

- Improved Code Quality
- Easier Refactoring
- Enhanced Collaboration

Packages and Frameworks Overview

- Front-End Frameworks
- Back-End Frameworks
- UI Control Suites
- Logging and Monitoring Tools
- Performance and Analytical Tools
- Profiling Tools

Front-End Frameworks

Angular

- Strengths: Strong typing, built-in RxJS support, CLI tools
- Alternatives: React, Vue.js

React

- Strengths: Flexibility, large ecosystem, JSX
- Alternatives: Angular, Svelte

Vue.js

- Strengths: Easy to learn, flexible, performant
- Alternatives: React, Svelte

Back-End Frameworks

NestJS

- Strengths: Modular architecture, TypeScript, built-in support for microservices
- Alternatives: Express.js, Koa.js

Express.js

- Strengths: Minimalist, flexible, widely used
- Alternatives: NestJS, Hapi.js

Spring Boot (if Java is considered)

- Strengths: Convention over configuration, large ecosystem, integrated security
- Alternatives: NestJS, Django

UI Control Suites

Kendo UI

- Strengths: Comprehensive, robust performance, extensive features
- Alternatives: DevExtreme, PrimeNG

DevExtreme

- Strengths: Wide range of controls, responsive design
- Alternatives: Kendo UI, Syncfusion

PrimeNG

- Strengths: Rich set of UI components, easy to integrate
- Alternatives: Kendo UI, DevExtreme

Logging and Monitoring Tools

LogRocket

- Strengths: Session replay, performance monitoring
- Alternatives: Sentry, Datadog

Sentry

- Strengths: Error tracking, performance monitoring
- Alternatives: LogRocket, Rollbar

ELK Stack

- Strengths: Full-stack logging, search capabilities
- Alternatives: Splunk, Graylog

Performance and Analytical Tools

Lighthouse

- Strengths: Performance audits, SEO checks
- Alternatives: WebPageTest, GTmetrix

New Relic

- Strengths: Full-stack monitoring, analytics
- Alternatives: Datadog, AppDynamics

Datadog

- Strengths: Cloud monitoring, metrics collection
- Alternatives: New Relic, Splunk

Profiling Tools

Chrome DevTools

- Strengths: Built-in browser tool, real-time performance insights
- Alternatives: Firefox Developer Tools, Safari Web Inspector

Angular Profiler

- Strengths: Angular-specific performance insights
- Alternatives: Chrome DevTools, React Profiler

React Profiler

- Strengths: Visualizes component render times
- Alternatives: Chrome DevTools, Vue Devtools

Conclusion

- Recap of Key Points
- Q&A Session
- Final Thoughts and Takeaways

    - c4model.com
    - Visualizing software architecture with the C4 model - Simon Brown, Agile on the Beach 2019
- Object Thinking
- Domain Storytelling
    - Domain Storytelling
- Design Patterns
    - Head First Design Patterns
        - Head First Design Patterns
    - Enterprise Patterns
        - Patterns of Enterprise Application Architecture
- SOLID Principles
    - SOLID Principles
- Code Generation
    - Nx: Nx.dev
        - Topic: Generators