

Software Design and Architecture

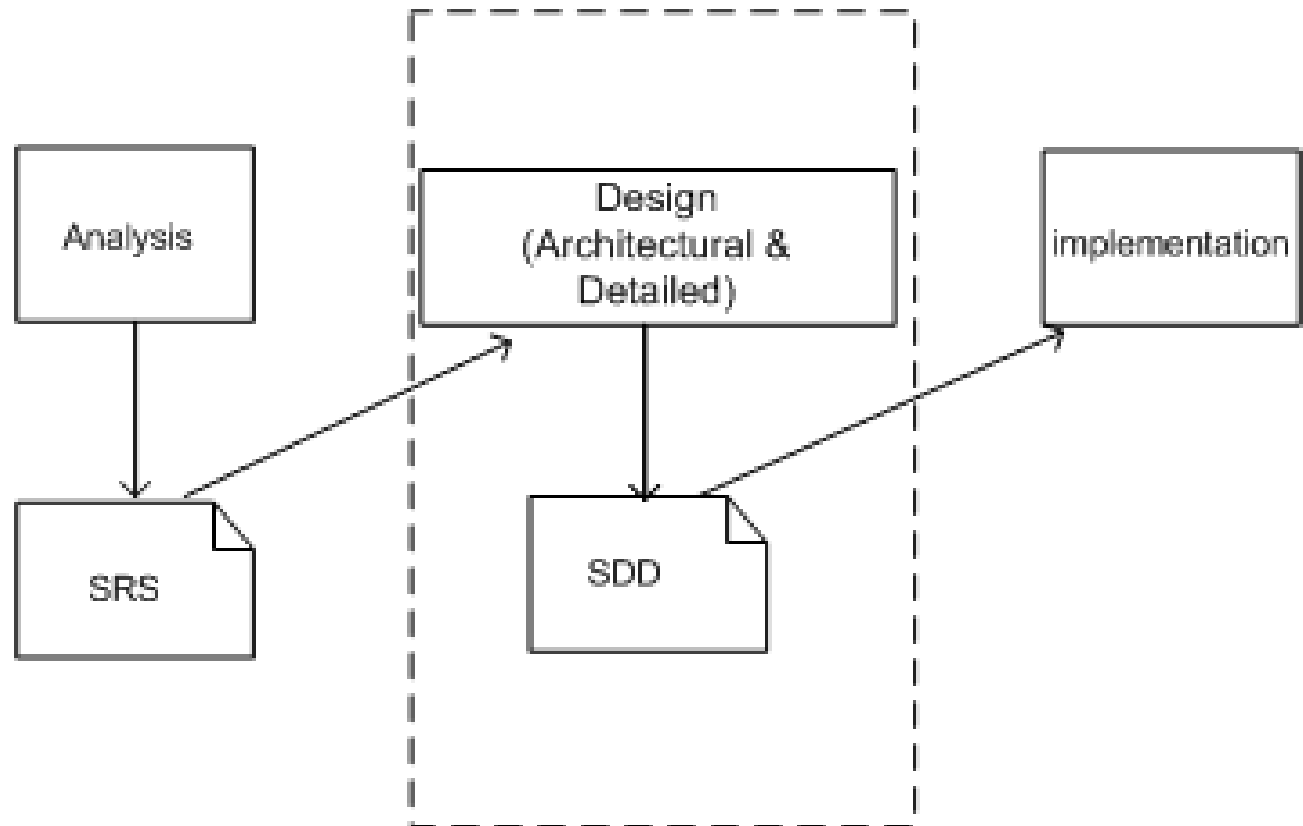
INTRODUCTION TO SOFTWARE ARCHITECTURE

Introduction

- ▶ The input of software design is a Software Requirements Specification (SRS).
- ▶ The SRS is the result of requirement analysis; it records the functional and non-functional requirements that must be met by the software system.
- ▶ The output of software design is a document called Software Design Description (SDD).
- ▶ The SDD describes the software architecture or high-level design and the detailed design of the system.

Introduction

- ▶ It serves as the blueprint for the implementation phase.
- ▶ The SDD describes the components of a system, the modules that comprise each component, and the detailed information (such as data attributes, operations, and algorithms) of each module.
- ▶ From the SDD, the system is then implemented using programming language, which is followed by debugging, testing, and maintenance.



A Simplified Software Development Life Cycle

Sample outline of SDD

Sample outline of SDD based on IEEE Std 1016.

- ▶ Design overview, purpose, scope
- ▶ Decomposition description (module, data, process)
- ▶ Dependency and connection description (between modules, data, processes)
- ▶ Attributes
- ▶ User interface description
- ▶ Detailed design (module and data)

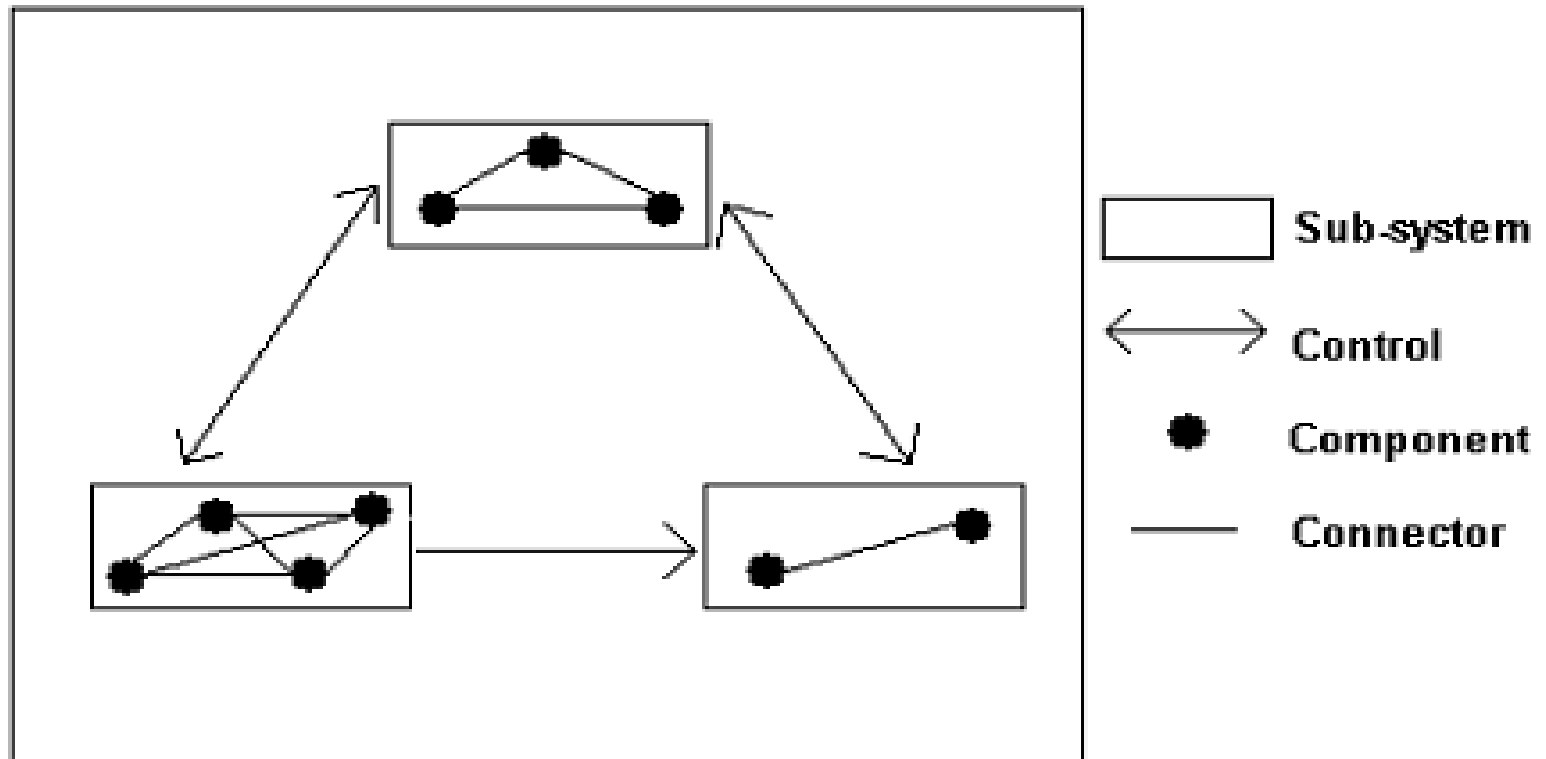
Architectural Design vs Detailed Design

- ▶ The software design stage can be further split into two steps: the architectural design step and the detailed design step.
- ▶ During the architectural design step we describe user accessible components and the interconnections among them that are visible to stakeholders.
- ▶ During the detailed design step we specify the internal details of each component and we might introduce new invisible components – to the stakeholder, into the design.

Software Architecture: Bridging Requirements and Implementation

- ▶ Software architecture plays a very important role in software development.
- ▶ The actual design is a blueprint and a guideline for developing a software system based on the software requirement analysis specification.
- ▶ The architectural design embodies earliest decisions that have a decisive impact on the ultimate success of the software product.

- ▶ It shows how the system is structured in terms of components, and how its components work together.
- ▶ As the description of software construction structure, an architectural design must cover the software functional requirements and non-functional requirements as well.
- ▶ It serves as an evaluation and implementation plan for software development and for software evolution.



Box and line diagram showing sub systems

Software Architecture

- ▶ IEEE Std 1471 defines the system architecture as “the fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution.”
- ▶ Shaw and Garlan (1996) regard software architecture as *the description of elements that comprise a system, the interactions and patterns of these elements, the principles that guide their composition, and the constraints on these elements.*

A complete software architecture specification must describe not only the elements and connections between elements but also the constraints and runtime behaviors so that developers know what must be implemented and how it should be implemented.

Summary

- Describe the relationship between software requirements and architecture
- Describe SDD
- Box and Line Diagram