IT4490 - SOFTWARE DESIGN AND CONSTRUCTION

4. OVERVIEW OF ANALYSIS & DESIGN

Some slides extracted from IBM coursewares

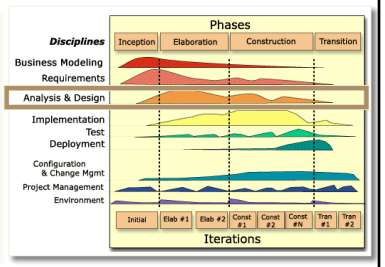
Objectives: Analysis and Design Overview

- Review the key Analysis and Design terms and concepts
- Introduce the Analysis and Design process, including roles, artifacts and workflow
- Explain the difference between Analysis and Design

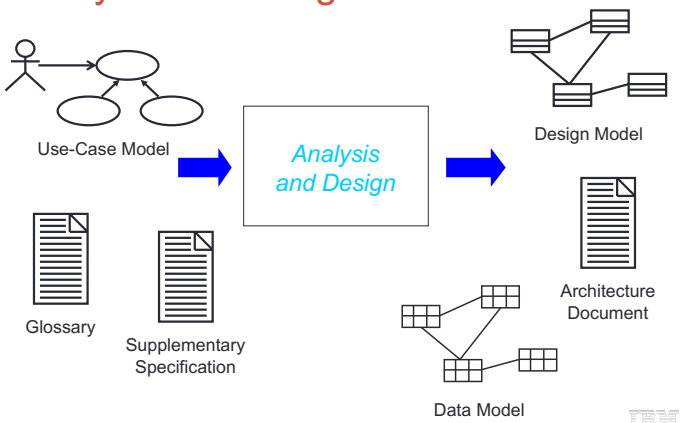
Analysis and Design in Context

The purposes of Analysis and Design are to:

- **Transform the requirements into a design of the system-to-be.**
- **Evolve a robust architecture for the system.**
- **Adapt the design to match the implementation environment, designing it for performance.**



Analysis and Design Overview



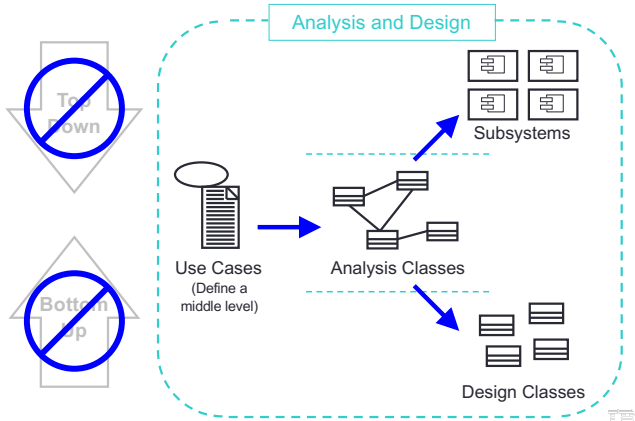
5

Analysis Versus Design

Analysis	Design
▪ Focus on understanding the problem ▪ Idealized design ▪ Behavior ▪ System structure ▪ Functional requirements ▪ A small model	▪ Focus on understanding the solution ▪ Operations and attributes ▪ Performance ▪ Close to real code ▪ Object lifecycles ▪ Nonfunctional requirements ▪ A large model

6

Analysis and Design Are Not Top-Down or Bottom-Up



7

What Is Software Architecture?

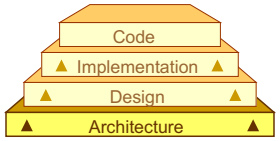
- Software architecture encompasses a set of significant decisions about the organization of a software.
  - Selection of the structural elements and their interfaces by which a software is composed
  - Behavior as specified in collaborations among those elements
  - Composition of these structural and behavioral elements into larger subsystems
  - Architectural style that guides this organization

Grady Booch, Philippe Kruchten, Rich Reitman, Kurt Bittner; Rational
(derived from Mary Shaw)

8

Architecture Constrains Design and Implementation

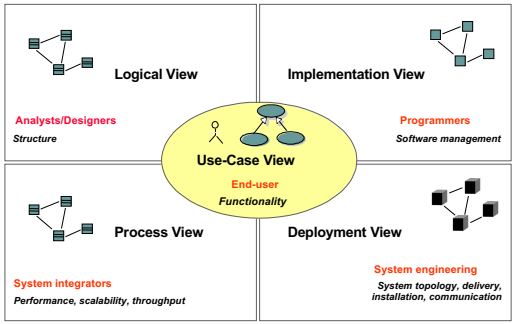
- Architecture involves a set of strategic design decisions, rules or patterns that constrain design and construction.



Architecture decisions are the most fundamental decisions, and changing them will have significant effects.

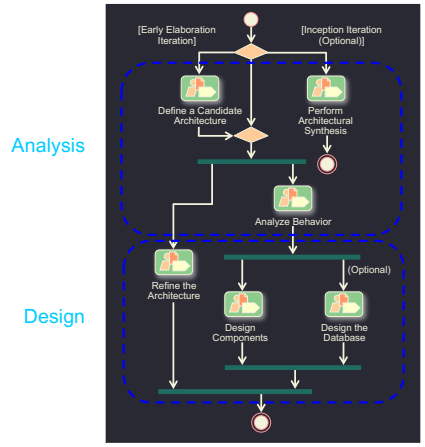
9

Software Architecture: The "4+1 View" Model



10

Analysis and Design Workflow



11

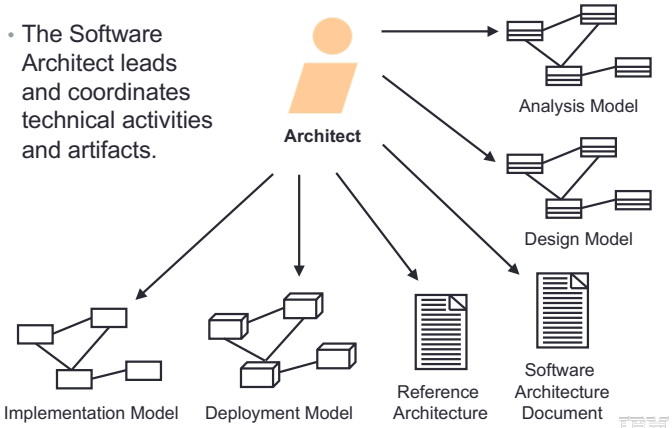
Analysis and Design Steps

Activity	Step	Description	Doer
Define a candidate architecture	1. Architectural Analysis	• Once at early Elaboration • Skip if architectural risk is low	Architect
Analyze behavior	**2. Use case Analysis**	• **Per Use case**	**Designer**
Refine the architecture	**3. Identify Design Elements**	• **Coupling and cohesion** • **Reusability**	**Architect**
	4. Identify Design Mechanisms	• Design patterns	
	5. Describe Run-time Architecture	• Skip if not multi-threading • Process View	
	6. Describe Distribution	• Physical Architecture	
Design components	**7. Use case Design**	• **Per Use case**	**Designer**
	8. Subsystem Design		
	9. Class Design		
Design DB	**10. Database Design**		

12

Software Architect's Responsibilities

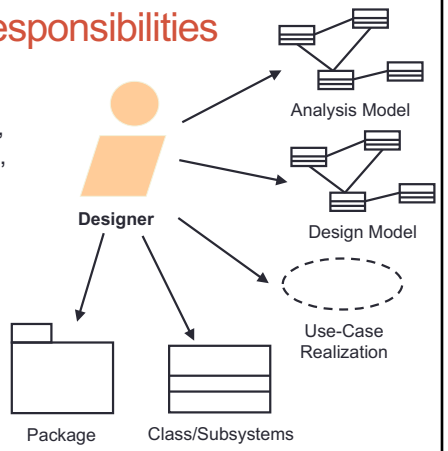
- The Software Architect leads and coordinates technical activities and artifacts.



13

Designer's Responsibilities

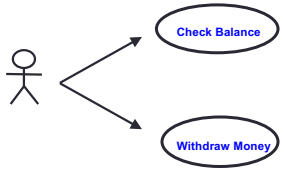
- Must know use-case modeling techniques, system requirements, and software design techniques
- Use case realization



14

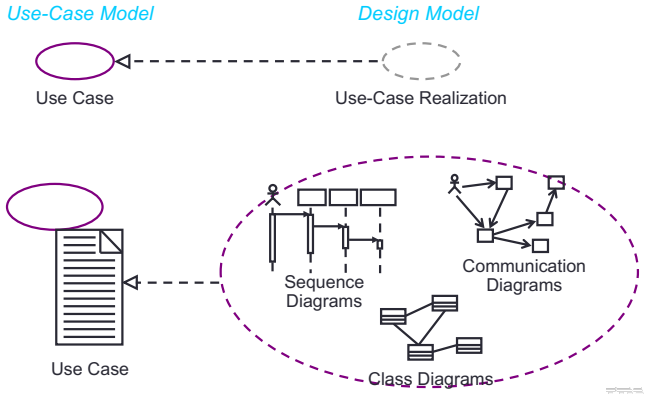
Analysis and Design Is Use-Case Driven

- Use cases defined for a system are the basis for the entire development process.
- Benefits of use cases:
  - Concise, simple, and understandable by a wide range of stakeholders.
  - Help synchronize the content of different models.



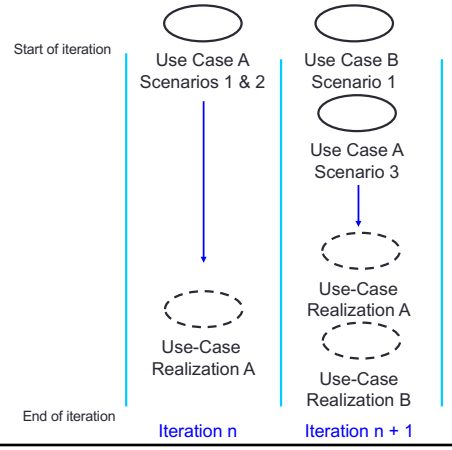
15

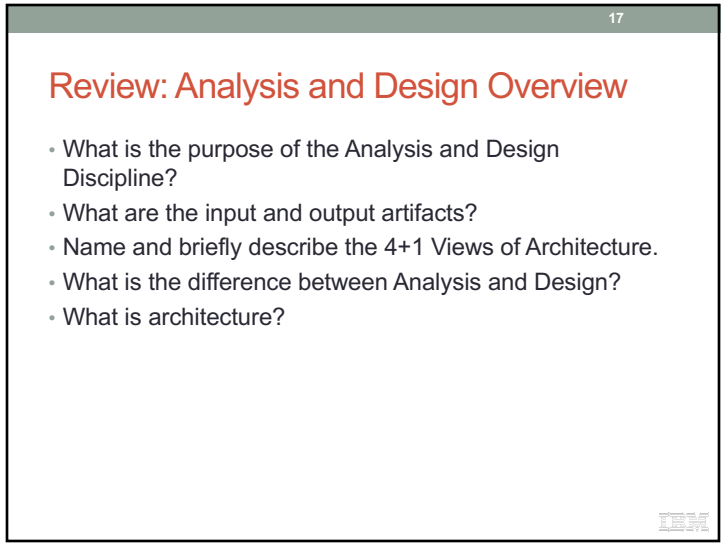
What Is a Use-Case Realization?



16

Analysis and Design in an Iterative Process




17
Review: Analysis and Design Overview
• What is the purpose of the Analysis and Design Discipline?
• What are the input and output artifacts?
• Name and briefly describe the 4+1 Views of Architecture.
• What is the difference between Analysis and Design?
• What is architecture?
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