Summary of Chapter 7: Design and Implementation

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1 Introduction

- Software design and implementation is the stage where an executable software system is developed.
- Design and implementation activities are often interleaved.
- Software design involves identifying software components and their relationships based on customer requirements.
- Implementation is the process of realizing the design as a program.

2 Build or Buy

- Off-the-shelf systems (COTS) can be adapted to meet user requirements.
- Example: Medical records systems can be purchased and tailored instead of developed from scratch.
- The design process for COTS focuses on configuring the system to deliver required functionality.

3 Object-oriented Design using UML

3.1 An Object-oriented Design Process

- Structured processes involve developing multiple system models.
- Design models are crucial for communication, especially in large systems.

3.2 Process Stages

- Common activities include:
  - Define the context and modes of use.
  - Design system architecture.
  - Identify principal system objects.
  - Develop design models.
  - Specify object interfaces.

4 System Context and Interactions

- Understanding the relationship between the system and its environment is essential.
- Establishing system boundaries helps in defining system features.

5 Design Models

5.1 Types of Design Models

- Structural Models: Describe the static structure of the system.
- Dynamic Models: Describe interactions between objects.
- Examples: Subsystem models, Sequence models, State machine models, etc.

6 Implementation Issues

- Focuses on reuse, configuration management, and host-target development.
- Reuse levels include abstraction, object, component, and system levels.

7 Reuse Costs

- Costs include time spent searching, buying reusable software, adapting and configuring components, and integrating elements.

8 Configuration Management

- Manages changing software systems.
- Supports system integration, version management, and automatic building of systems.

9 Open Source Systems

- Notable examples include Linux, Java, Apache web server, and MySQL.
- Open source extends the concept of free software by utilizing the Internet to involve a larger developer community.

10 Exam Questions and Scenarios

10.1 Scenario 1: Implementing a Weather Station System

- **Question:** Describe the object classes involved in a weather station system.
- **Answer:**
  - Ground thermometer, Anemometer, Barometer (hardware objects)
  - Weather station (interface to the environment)
  - Weather data (encapsulates summarized data)

10.2 Scenario 2: Using Off-the-shelf Software

- **Question:** What are the advantages and disadvantages of using COTS?
- **Answer:**
  - Advantages: Cost-effective, faster implementation.
  - Disadvantages: Limited customization, potential integration issues.

10.3 Scenario 3: Configuration Management

- **Question:** What are the key activities in configuration management?
- **Answer:**
  - Version management: Tracking different versions.
  - System integration: Defining and using component versions.
  - Automated system building.