

Software Engineering I CSC-382



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- Chapter 10
- What we will cover: (Architectural Design)
 - Second half of Chapter 10 in Pressman
 - Learn specifically how to perform an architectural decomposition and design.

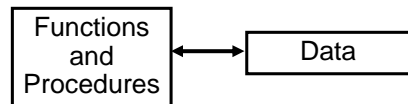
Recall the Tools We Will Used for Analysis Modeling

- **Structured Analysis-based Techniques**
 - Used Data Flow Diagrams for the Flow Models and State Transition Diagrams for the Behavior Models
 - Finished with process narratives (PSPECS) to define low level requirements.
- **Object Oriented Analysis-based Techniques**
 - Derived the details of Class Models (started with CRC Cards) and their relationships (Class Diagrams), and behavior (sequence charts and State Diagrams)

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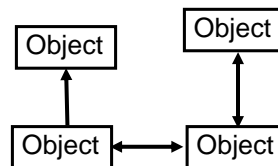
Object Oriented Analysis vs. Structured Analysis

Structured Analysis Paradigm



In the structured analysis model the data and the functions that operate on them are artificially separated.

Object-Oriented Analysis Paradigm



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Recall Analysis Modeling via Object-Oriented Analysis

- We developed the class analysis model
- Key concepts:
 - Classes and objects
 - Attributes and operations
 - Encapsulation
 - Inheritance/Aggregation
- In the design phase we now introduce the concept of Components

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What is an Object-based Component?

- *OMG Unified Modeling Language Specification* [OMG01] defines a component as
 - "... a modular, deployable, and replaceable part of a system that encapsulates implementation and exposes a set of interfaces."
- OO view: a component contains a set of collaborating classes
 - Recall from our CRC card efforts we defined the collaborations and also the collaboration diagram

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Collaboration Diagram

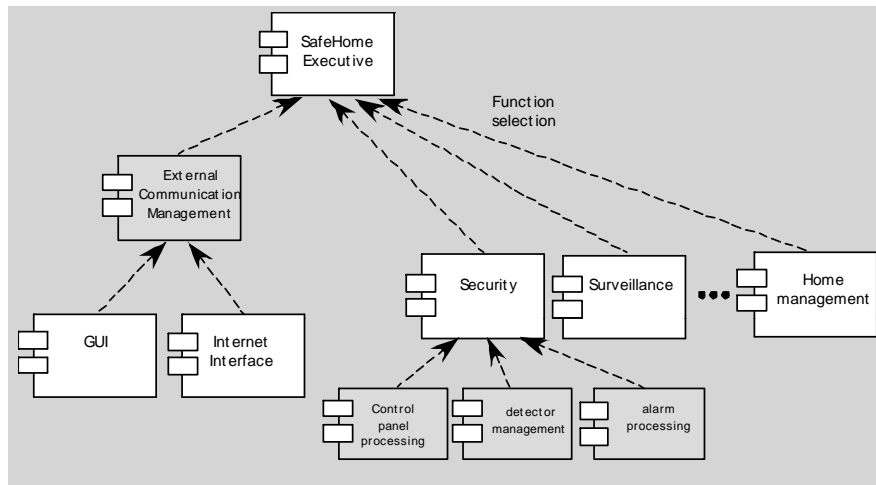
The diagram illustrates a sequence of three collaboration diagrams, each representing a state of a system. Each diagram is a rectangle divided into three sections: a top section for 'Candidate Name', a bottom-left section for 'Responsibilities', and a bottom-right section for 'Collaborators'.

- Diagram 1 (Top Left):** The 'Candidate Name' field is empty. The 'Responsibilities' and 'Collaborators' sections are empty.
- Diagram 2 (Top Right):** An arrow points from Diagram 1 to this diagram. The 'Candidate Name' field is filled with a gray box. The 'Responsibilities' and 'Collaborators' sections are empty.
- Diagram 3 (Bottom Left):** An arrow points from Diagram 1 to this diagram. The 'Candidate Name' field is filled with a gray box. The 'Responsibilities' section is filled with a gray box. The 'Collaborators' section is empty.
- Diagram 4 (Bottom Right):** An arrow points from Diagram 2 to this diagram. The 'Candidate Name' field is filled with a gray box. The 'Responsibilities' section is filled with a gray box. The 'Collaborators' section is empty.

The arrows indicate a sequence of changes or interactions between these states.

[illegible]

Component Structure



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Steps for OO Analysis Based Architectural Design

1. Review the system model
 - Be sure all I/O well defined in the software context diagram
2. Refine the class models
 - Recall again we stopped at a level we felt defined the requirements
 - Now we will continue analyzing the classes and further divide them if they have too many responsibilities

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Steps for OO Analysis Based Architectural Design II

3. Define any infrastructure or controller classes that may be required
 - We have focused primarily on the functional classes in the analysis modeling

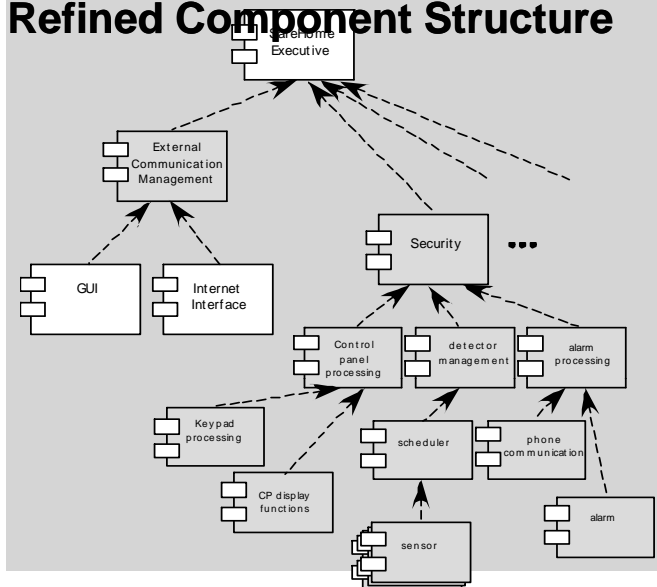
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Steps for OO Analysis Based Architectural Design

4. Perform 1st level factoring (book calls it refine component structure)
 - The basic idea is to devise the highest level groupings of your object classes into possible components
 - We should really try a few groupings at this level each with a different architecture in mind.
5. Refine using all the rules for software quality
 - Ensure good cohesiveness, minimize coupling, etc.

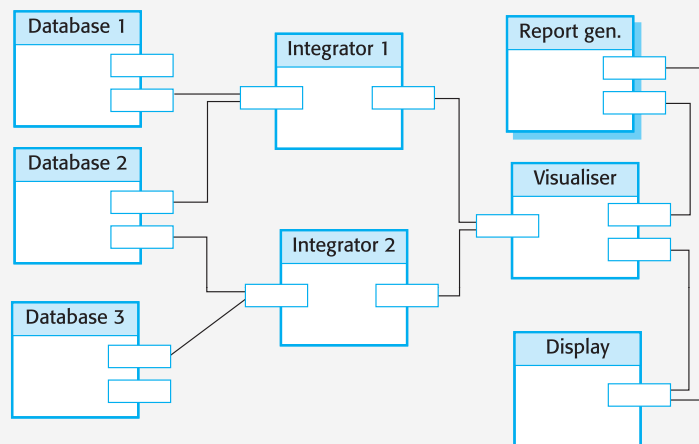
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Refined Component Structure



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Another application showing a non-hierarchical architecture (data mining)



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In-class OO Architectural Design

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For Next Class

- Chapter 11 – Component-level Design

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