Software Engineering I CSC-382

Lecture 17

Software Engineering I CS-382

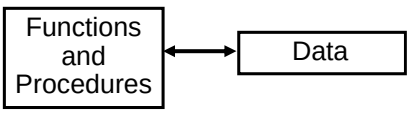
- Chapter 10
- What we will cover: (Architectural Design)
  - Second half of Chapter 10 in Pressman
  - Learn specifically how to perform an architectural decomposition and design.

Recall the Tools We Will Used for Analysis Modeling

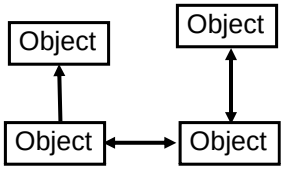
- **Structured Analysis-based Techniques**
  - Used Data Flow Diagrams for the Flow Models and State Transition Diagrams for the Behavior Models
  - Finished with process narratives (PSPECS) to define low level requirements.
- **Object Oriented Analysis-based Techniques**
  - Derived the details of Class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

Object Oriented Analysis vs. Structured Analysis

Structured Analysis Paradigm



Object-Oriented Analysis Paradigm



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

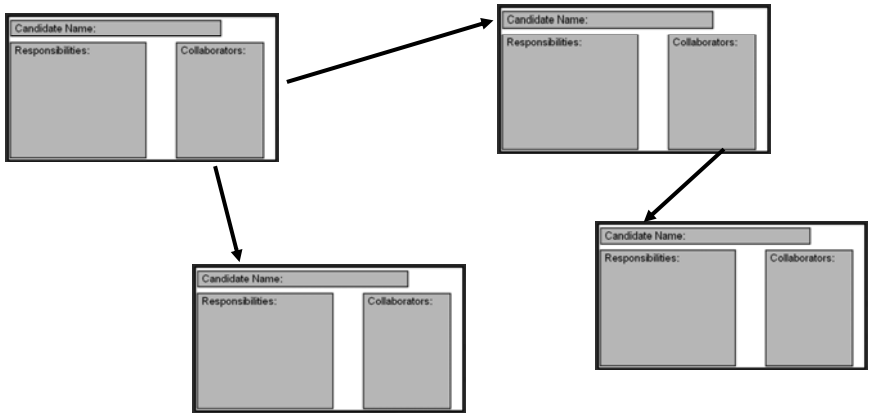
Recall Analysis Modeling via Object-Oriented Analysis

- 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

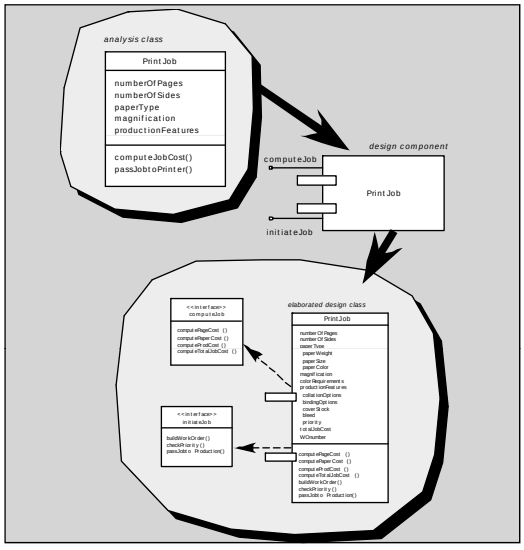
What is an Object-based Component?

- *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

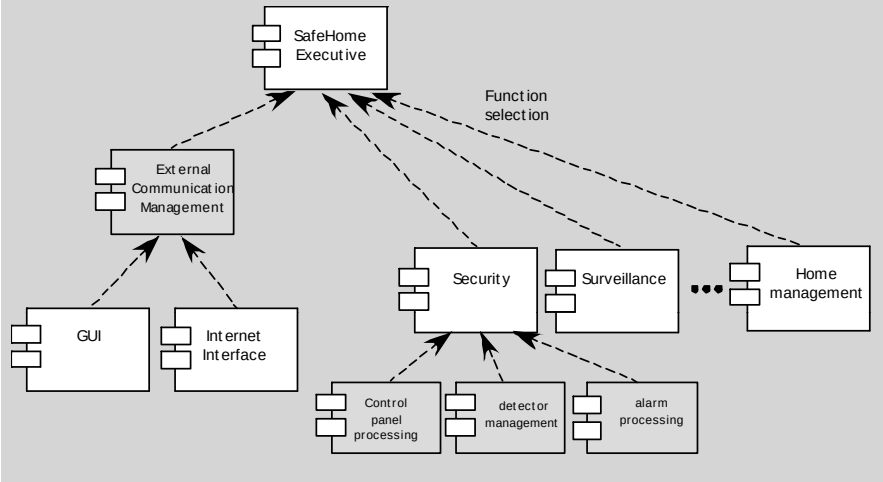
Collaboration Diagram



OO Component



Component Structure



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

Steps for OO Analysis Based Architectural Design II

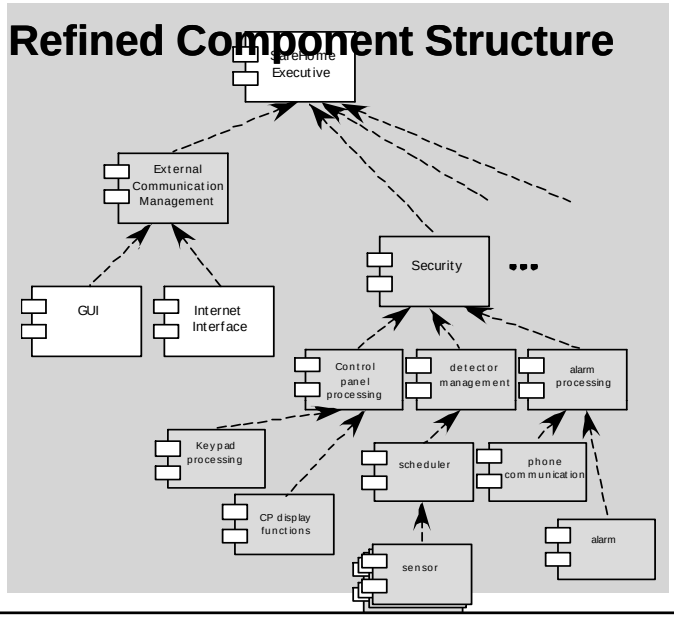
3. Define any infrastructure or controller classes that may be required
   - We have focused primarily on the functional classes in the analysis modeling

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.

Refined Component Structure



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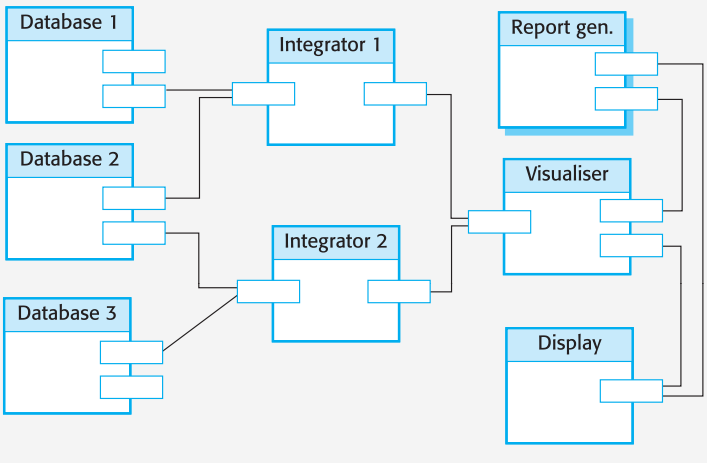
Another application showing a non-hierarchical architecture (data mining)



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In-class OO Architectural Design

For Next Class

- Chapter 11 – Component-level Design