

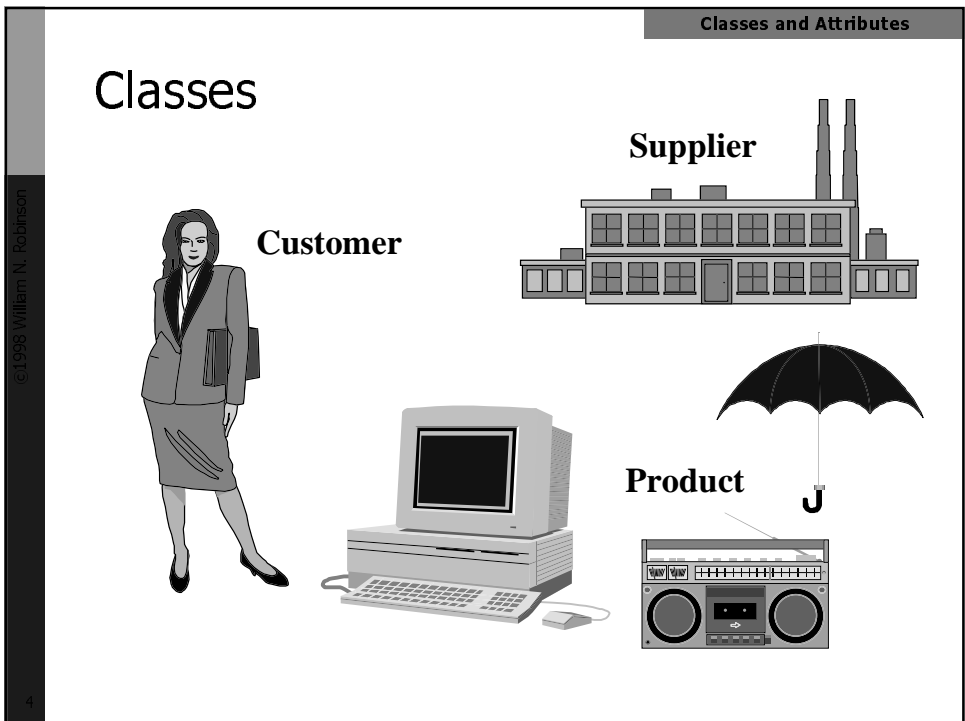
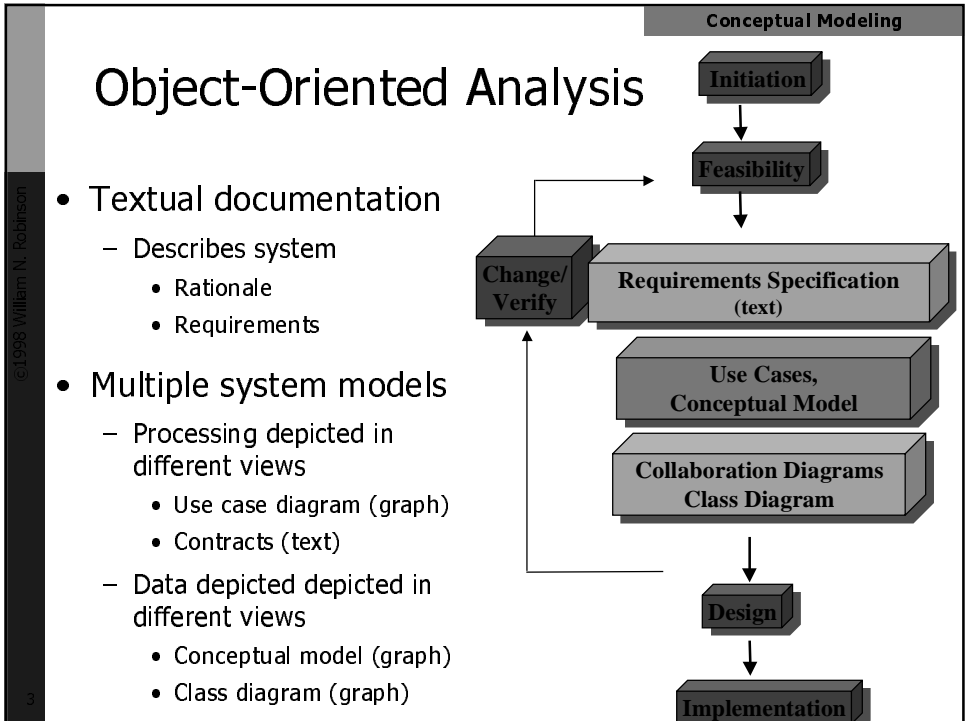
Introduction to Conceptual Modeling with UML

Classes and Attributes
Conceptual Modeling
UML Notation of Classes and Associations
Building a Conceptual Model
In Class Conceptual Modeling
Discussion Questions

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Questions Answered in This Lecture

- What are basic types or properties of requirements?
- How does a requirements document relate to a object-oriented analysis and specification?
- What are properties of a good requirements document?



Attributes

- An attribute is a property of a class that an organization chooses to record
- Attributes for customer entity:
 - Name
 - Address
 - Contact
 - Phone
 - Fax



Attribute Values

- An *attribute value* is a value assigned to an attribute for an class instance (object)
- An *instance* is a specific collection of assigned values for a class that represents a specific class member
- Attributes of customer *instance* Sally Smith:
 - Name: smith, sally
 - Address: 101 decatur street,
Atlanta, GA 30303
 - Contact: smith, john
 - Phone: 303.456.7890
 - Fax: 303.987.6543

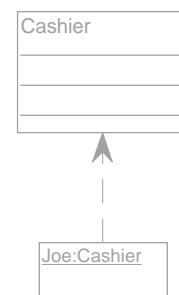


Conceptual Modeling

- Conceptual Model
 - a representation of concepts in a problem domain
 - static structure of concepts in which no operations are defined
 - concepts
 - associations between concepts
 - attributes of concepts
 - a class diagram can be derived from the conceptual model, but a class diagram is not a conceptual model
 - a class diagram includes concepts from the solution domain

Objects and Classes

- Object Class
 - (a.k.a. Class)
 - Description of objects with:
 - similar properties (attributes)
 - common behavior (operations)
 - common relationships to other objects
- Object Instance
 - (a.k.a. Instance, or Object)



Attributes and Operations

- Attributes

- A data value held by objects in a class

- E.g., Name, Price

- syntax

- <name> : <type> = <default value>

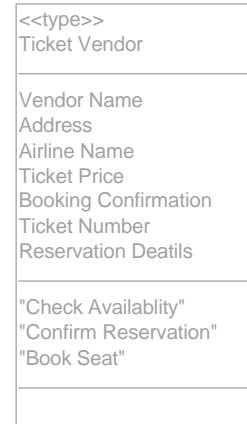
- Operations

- A function that may be applied to objects in a class

- E.g., Check Availability

- syntax

- <name> (<args>) : <result types>



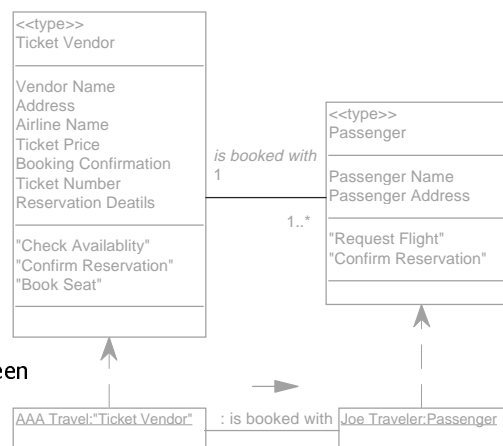
Associations and Links

- Association

- a description of a link with a common structure and semantics

- Link

- a description of a physical or conceptual connection between object instances

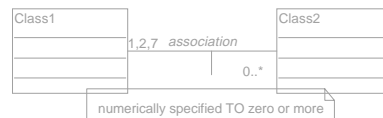
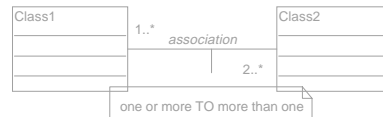
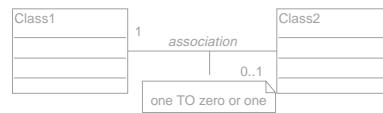
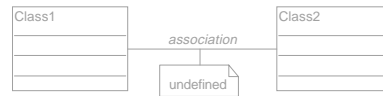


Types of Associations

- A is a physical part of B: wing - airplane
- A is a logical part of B: flight leg - route
- A is a description for B: item descr - item
- A is a member of B: pilot - airline
- A uses or manages B: pilot - aircraft
- A communicates with B: agent - passenger

Multiplicity of Associations

- Undefined
- 1 TO optional (zero or one)
- One or more TO > 1
- Numerically specified

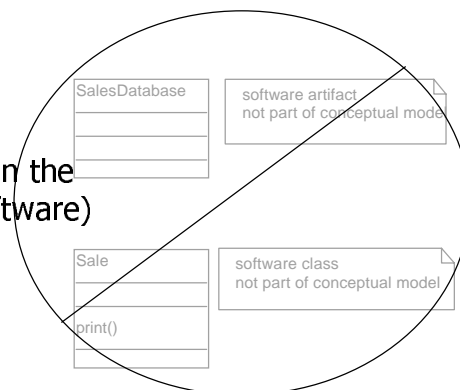


Building a Conceptual Model

- Look for key concepts in
 - Requirements
 - Use Cases
 - Pre-defined category lists
- If in doubt, create a concept rather than an attribute or association
 - Needed especially where multiple object instances can occur
- Add Associations later
- Add Attributes toward the end
 - However, attributes help clarify the meaning (intension) of the concept
- Concepts are the key
 - Devote more time to concept building than attribute or association definition

Avoid Software Descriptions

- Problem Domain
 - Concepts that exist independent of any (software) solution description
- Solution Domain
 - Concepts that exist only in the artificial world of the (software) solution description



Discussion Questions

- What form should the *names* of concepts, attributes, associations take?
- What kind of concepts, attributes, and associations should be included?
- What is “design creep”?