

Systems Analysis & Design

CS183 Spring Semester 2008

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Course Textbook:

Systems Analysis and Design With UML 2.0
An Object-Oriented Approach, Second Edition

Chapter 7:

Behavioural Modelling

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Key Ideas

- Behavioral models describe the internal dynamic aspects of an information system that supports business processes in an organization
- Key UML behavioral models are: sequence diagrams and behavioural state machines

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Objectives

- Understand the rules and style guidelines for sequence diagrams and behavioral state machines.
- Understand the processes used to create sequence diagrams and behavioral state machines.
- Be able to create sequence diagrams and behavioral state machines.
- Understand the relationship between the behavioral models and the structural and functional models.

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BEHAVIORAL MODELS

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Purpose of Behavioral Models

- Show how objects collaborate to support each use case in the structural model
- Depict the internal view of the business process
- To show the effects of varied processes on the system

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Interaction Diagram Components

- **Objects**
 - Instance of a class
- **Operations**
 - Send and receive messages
- **Messages**
 - Tell object to execute a behavior

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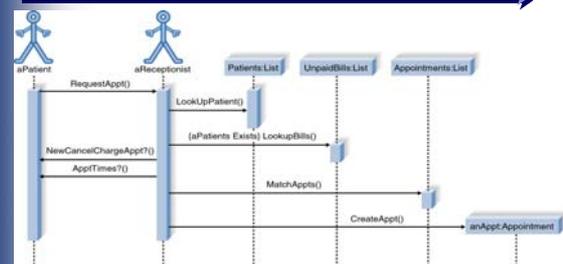
Sequence Diagrams

- Illustrate the **objects** that participate in a use-case
- Show the **messages** that pass between objects for a **particular use-case**

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Example Sequence Diagram Make Appointment



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Sequence Diagram Syntax

ACTOR	
OBJECT	
LIFELINE	
EXECUTION OCCURRENCE (FOCUS OF CONTROL)	
MESSAGE	
OBJECT DESTRUCTION	

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Building a Sequence Diagram

1. Determine the **context** of the sequence diagram
2. Identify the participating **objects**
3. Set the **lifeline** for each object
4. Add **messages**
5. Place the **execution occurrence (focus of control)** on each object's lifeline
6. **Validate** the sequence diagram

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CD Selections

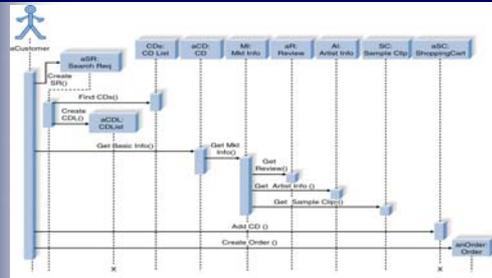
Normal Flow of Events:

1. **Customer** submits a search request to the system.
2. The system provides the **customer** a list of recommended CDs.
3. The **customer** chooses one of the CDs to find additional information.
4. The system provides the **customer** with basic information & CD Reviews
5. The **customer** calls the **maintain order use case**.
6. The **customer** iterates over 3 through 5 until finished shopping.
7. The **customer** executes the **checkout use case**.
8. The **customer** leaves the website.

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CD Selections



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Behavioral State Machines (State Chart Diagrams)

- The behavioral state machine is a **dynamic** model that shows the different **states** of the object and what **events** cause the object to change from one state to another, along with its responses and actions.

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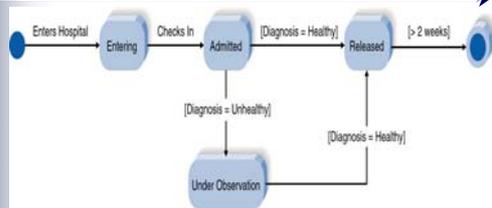
Elements of a Behavioral State Machine

- States (idle conditions)
- Events (triggers)
- Transitions (changes in state)
- Actions (cause transitions)
- Activities (groups of actions)

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Example Behavioral State Machine Diagram



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Behavioral State Machine Diagram Syntax

A STATE	
AN INITIAL STATE	
A FINAL STATE	
AN EVENT	
A TRANSITION	
A Frame	

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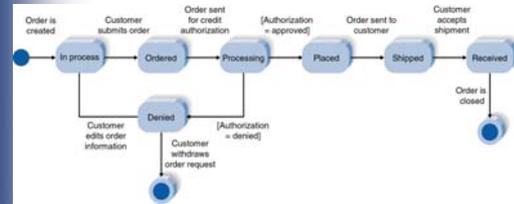
Building Behavioral State Machine Diagrams

- Set the context
- Identify the initial final, and stable states of the object
- Determine the order in which the object will pass through stable states
- Identify the events, actions, and guard conditions associated with the transitions
- Validate the state machine diagram

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CD Selections



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Summary

- *Sequence diagrams* illustrate the classes that participate in a use case and the messages that pass between them.
- *Behavioral State Machine diagrams* show the different states that a single class passes through in response to events.

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