Universal Modeling Language

Software Engineering

http://www.uml.org/

Modeling

Design applications before coding

Analogous to blueprints, site maps, elevations, etc. in the building of a skyscraper.
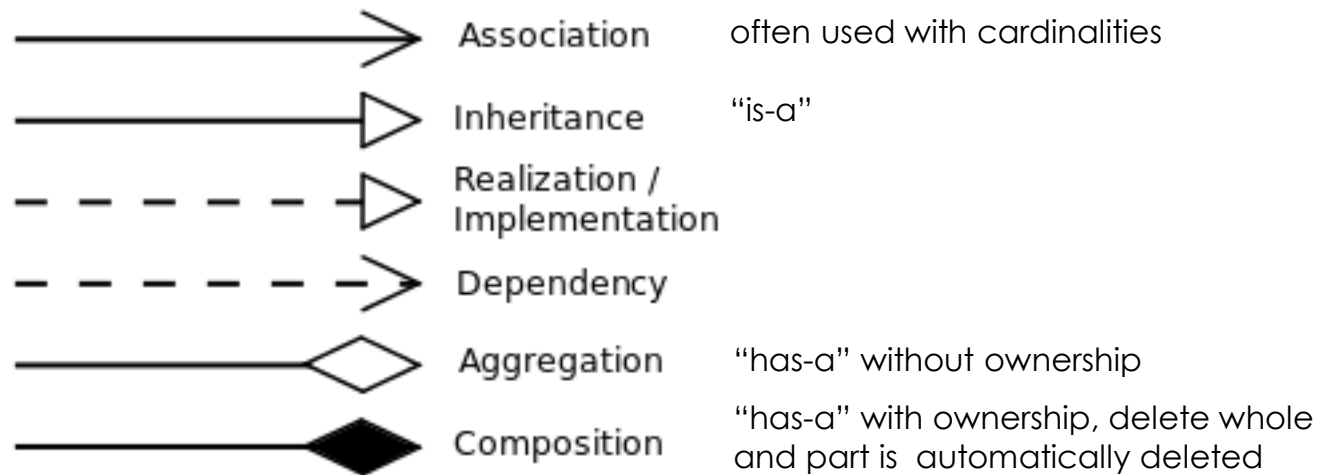
UML 2.0 – 13 Diagram Types

Structure Diagrams: Class Diagram, Object Diagram, Component Diagram, Composite Structure Diagram, Package Diagram, Deployment Diagram

Behavior Diagrams: Use Case Diagram, Activity Diagram, State Machine Diagram

Interaction Diagrams: Sequence Diagram, Communication Diagram, Timing Diagram, Interaction Overview Diagram

UML Relationships

Association	often used with cardinalities	
Inheritance	"is-a"	
Realization / Implementation		
Dependency		
Aggregation	"has-a" without ownership	
Composition	"has-a" with ownership, delete whole and part is automatically deleted	

UML relations notation

https://en.m.wikipedia.org/wiki/Class_diagram

UML Structure Diagrams

- Class Diagram
- Object Diagram
- Component Diagram
- Composite Structure Diagram
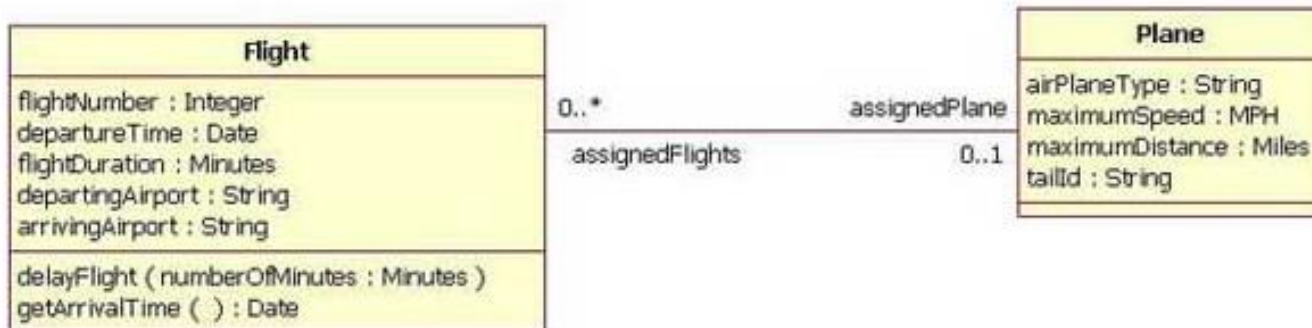- Package Diagram
- Deployment Diagram

Class Diagram

Figure 5. Figure 5: An example of inheritance using tree notation
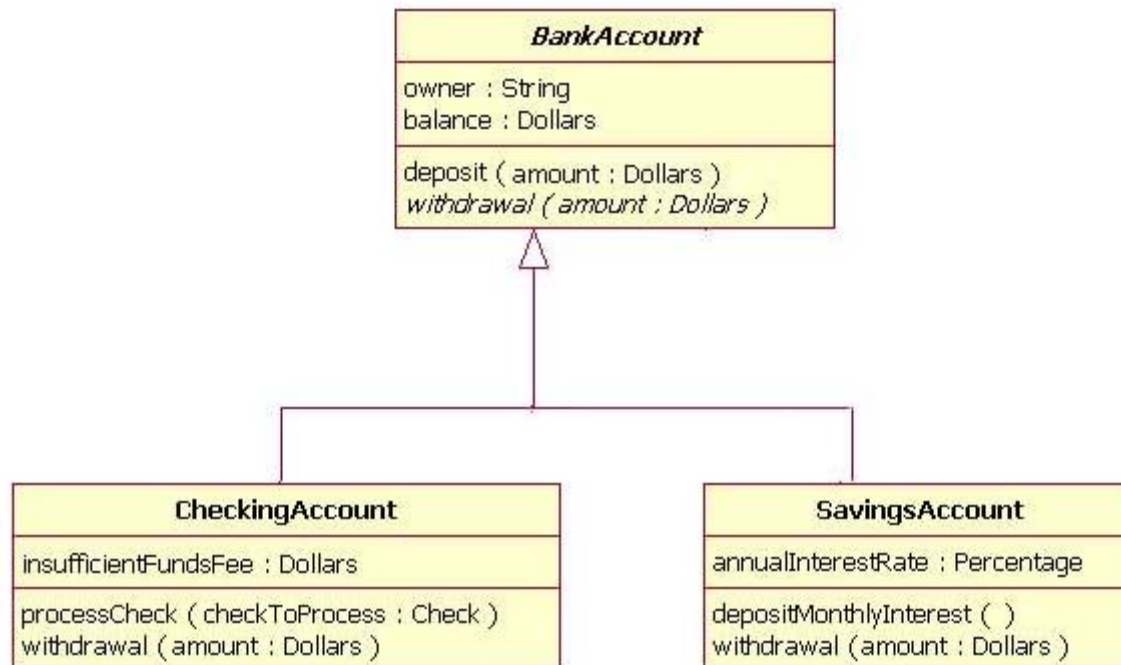
Class Diagram

Figure 6. Figure 6: An example of a bi-directional association between a Flight class and a Plane class
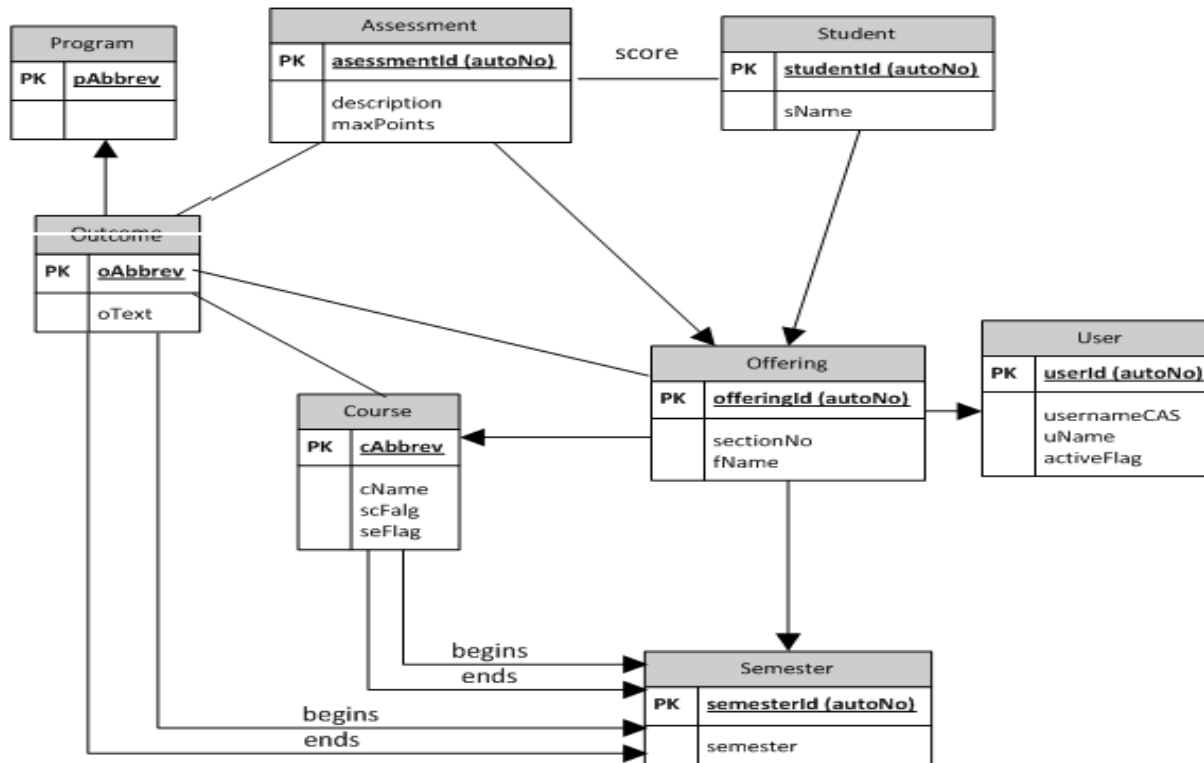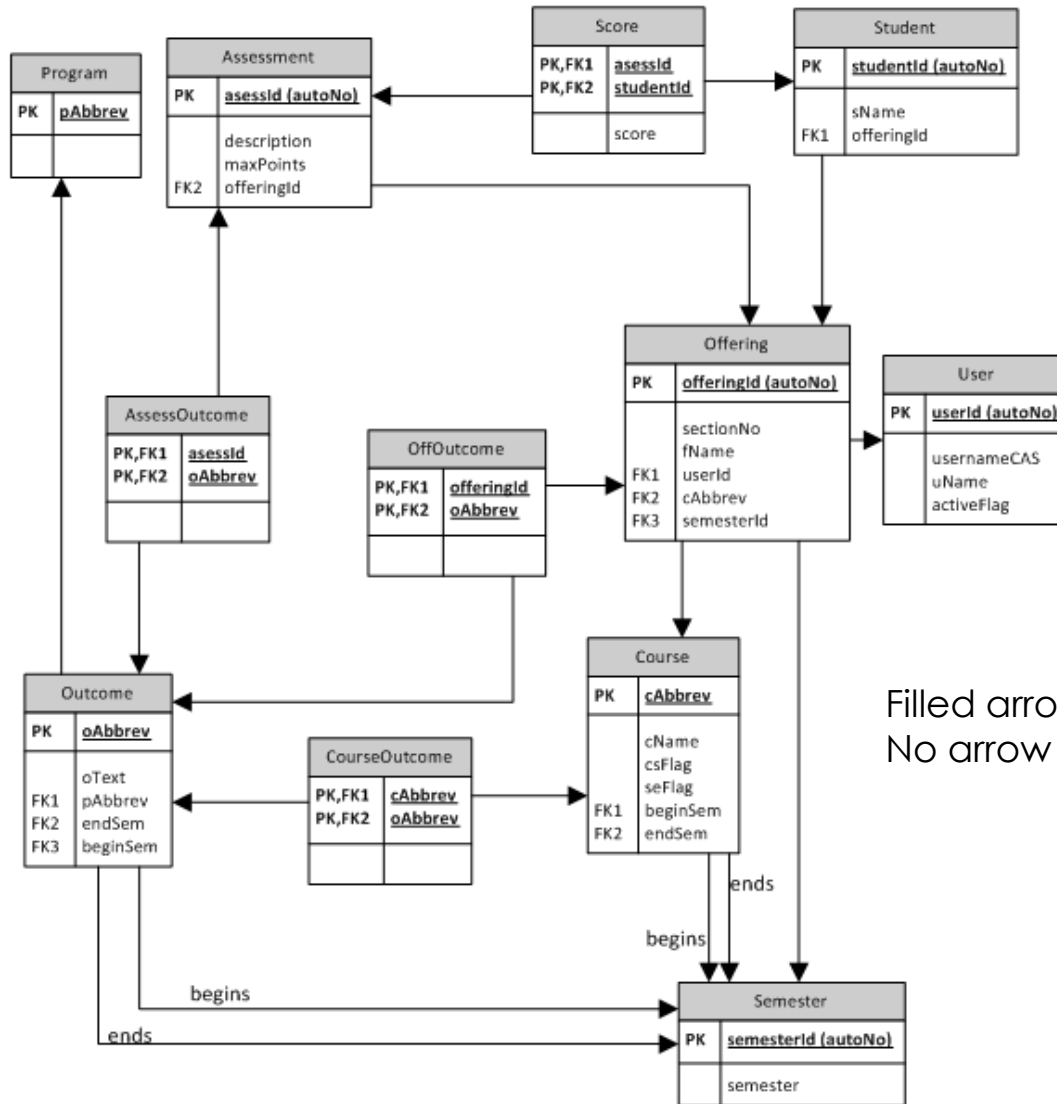
Class Diagram for DB

Filled arrow heads indicate 1..1
No arrow head indicates 0..m

AbOut DB Schema

Low Level
5/25/2012

Program
PK	pAbbrev

Assessment
PK	asessId (autoNo)
	description
	maxPoints
FK2	offeringId

Score
PK,FK1	asessId
PK,FK2	studentId
	score

Student
PK	studentId (autoNo)
	sName
FK1	offeringId

Offering
PK	offeringId (autoNo)
	sectionNo
	fName
FK1	userId
FK2	cAbbrev
FK3	semesterId

User
PK	userId (autoNo)
	usernameCAS
	uName
	activeFlag

AssessOutcome
| PK,FK1 | asessId |
| PK,FK2 | oAbbrev |

OffOutcome
| PK,FK1 | offeringId |
| PK,FK2 | oAbbrev |

Outcome
PK	oAbbrev
	oText
FK1	pAbbrev
FK2	endSem
FK3	beginSem

CourseOutcome
| PK,FK1 | cAbbrev |
| PK,FK2 | oAbbrev |

Course
PK	cAbbrev
	cName
	csFlag
	seFlag
FK1	beginSem
FK2	endSem

Semester
PK	semesterId (autoNo)
	semester

ends
begins
begins
ends
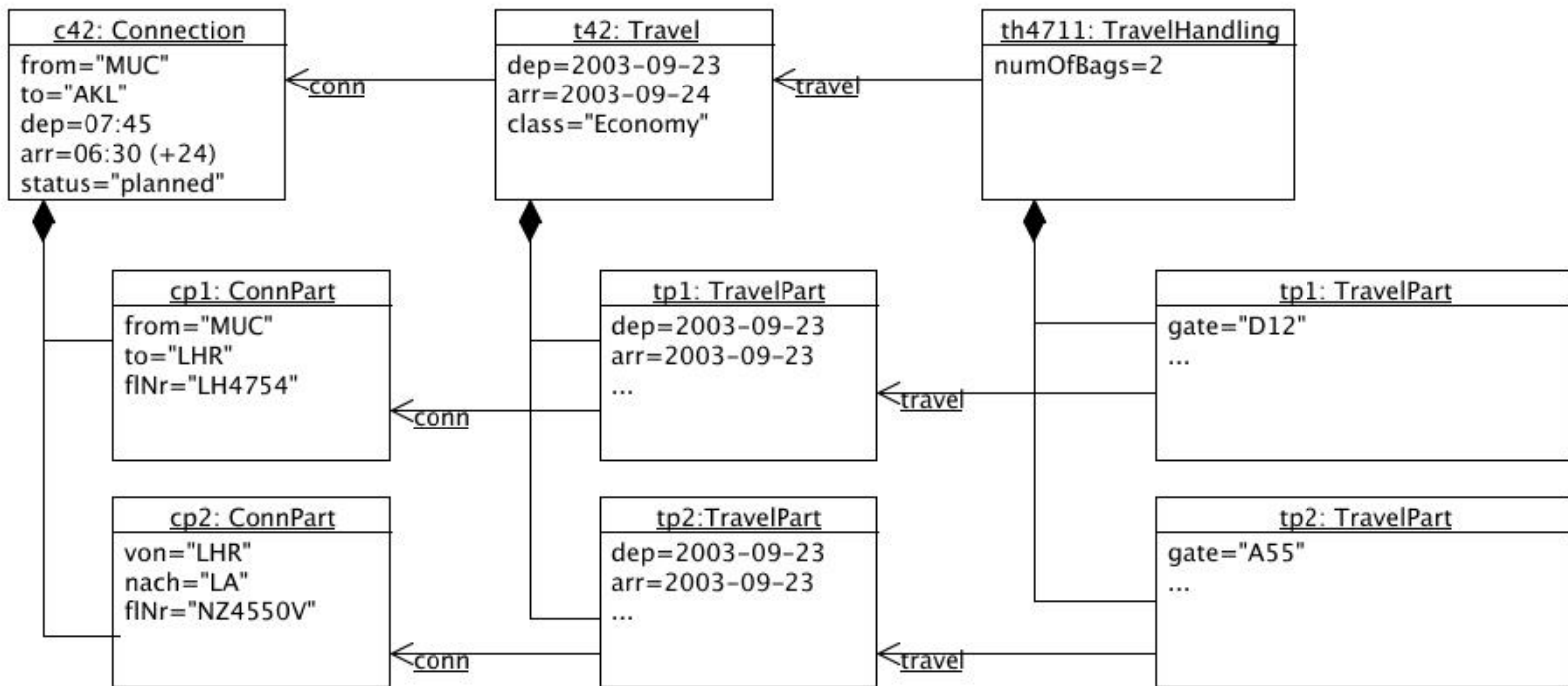
Filled arrow heads indicate 1..1
No arrow head indicates 0..m

Object Diagram

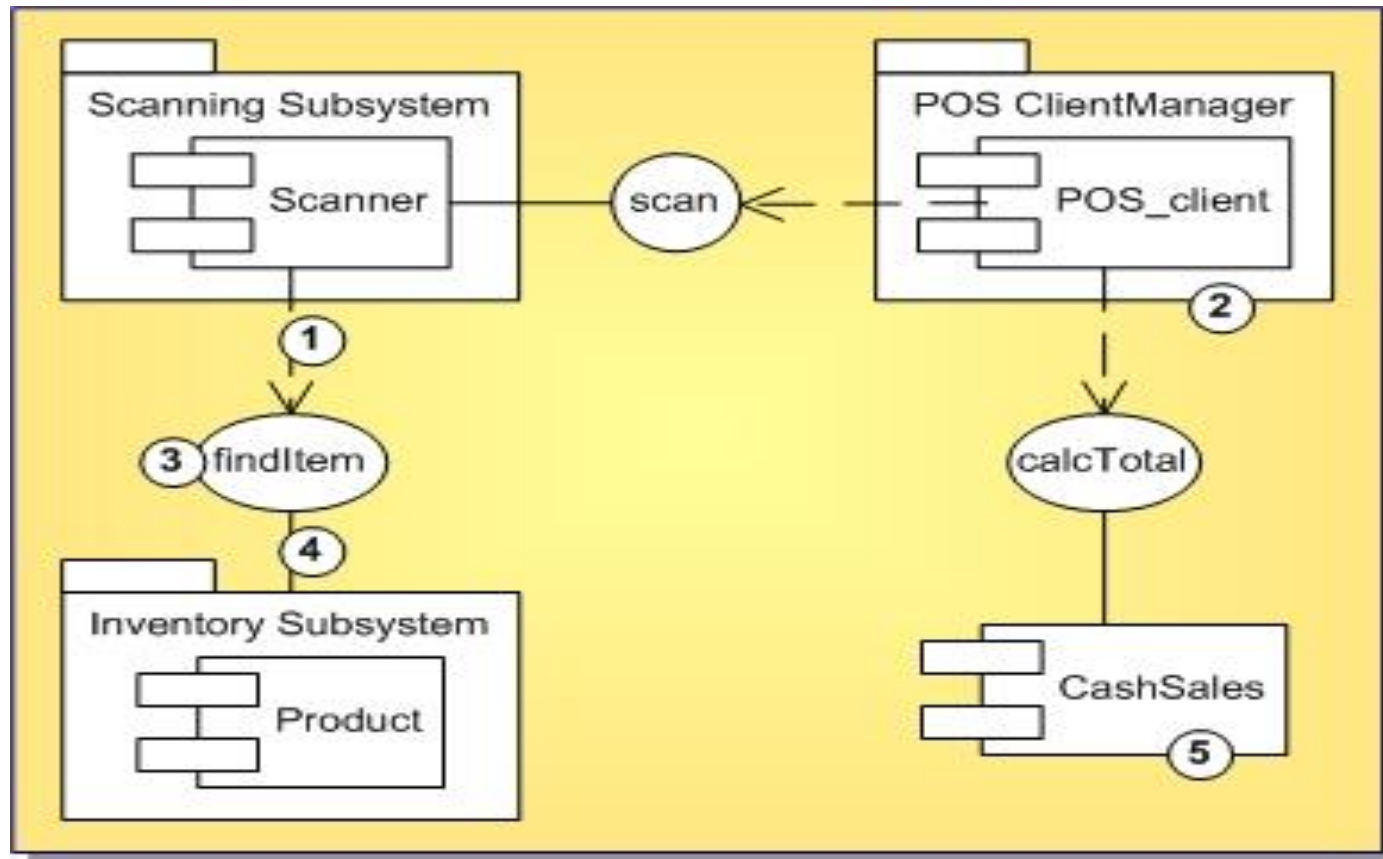

Filled diamond shows exclusive ownership (composition)
Unfilled diamond would show aggregation
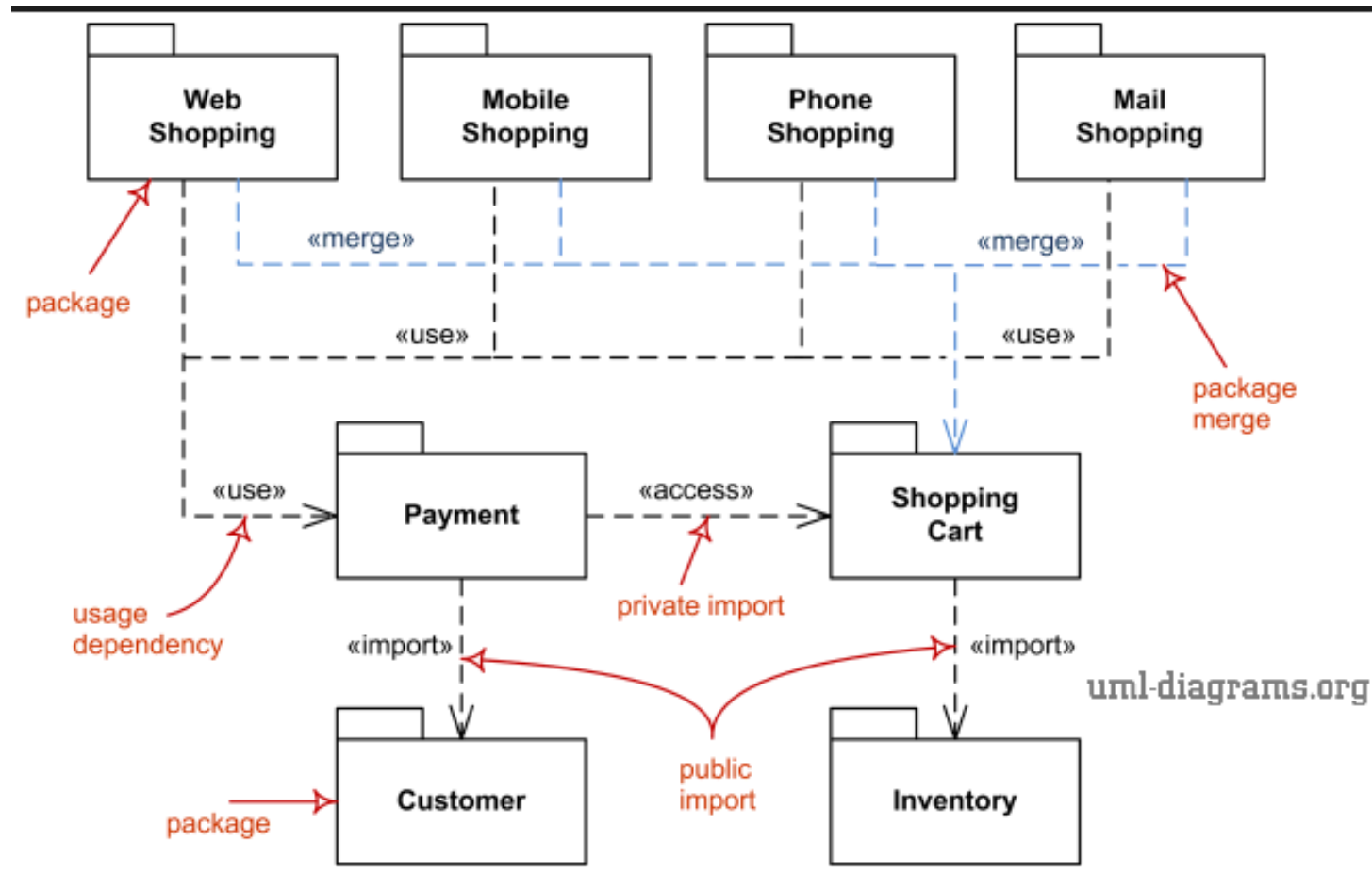Line with arrow shows association

Component Diagram

Composite Structure Diagram

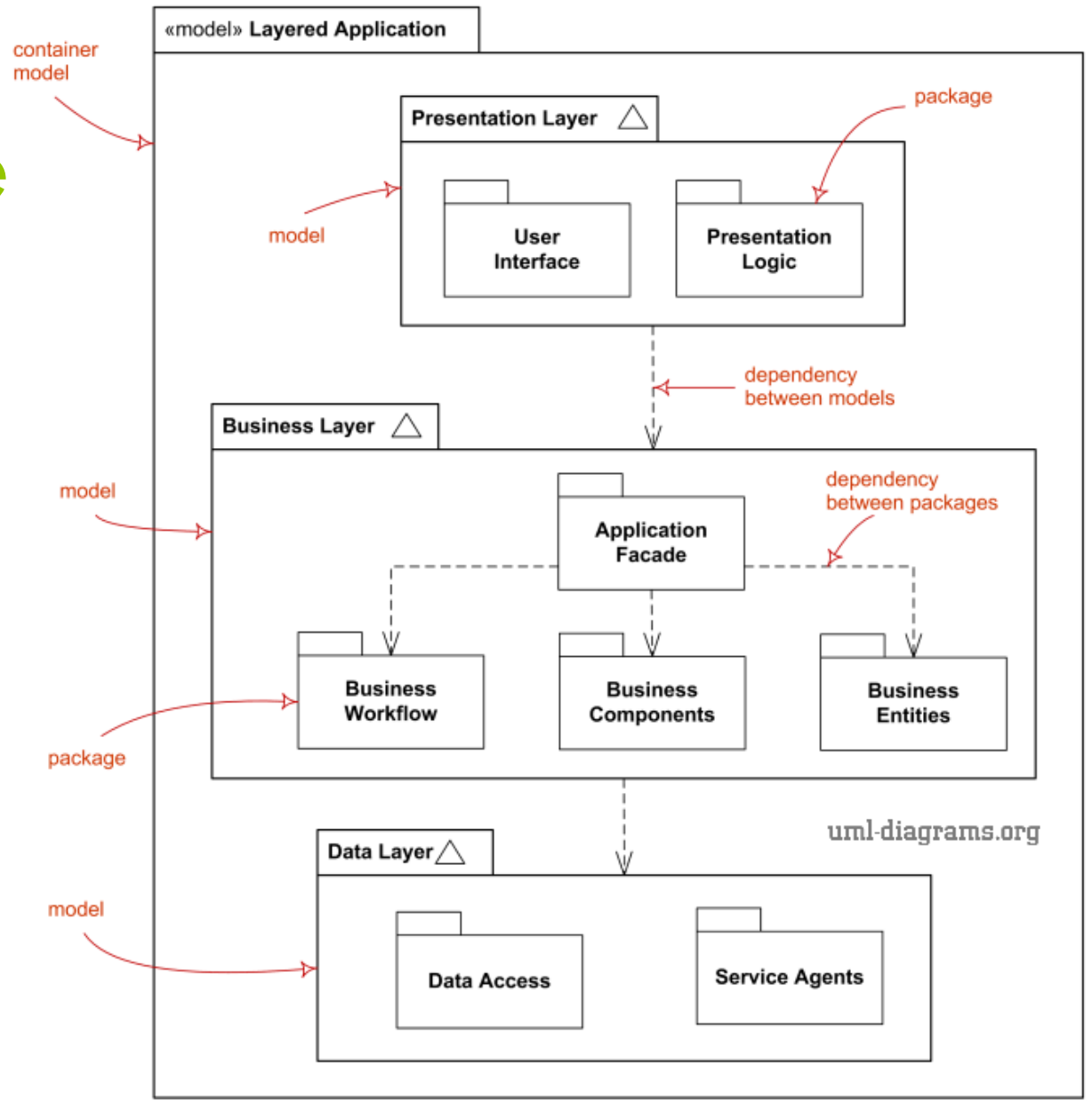# Package Diagram

«model» **Layered Application**

container model

Presentation Layer △

package

model

User Interface

Presentation Logic

dependency between models

Business Layer △

model

Application Facade

dependency between packages

Business Workflow

Business Components

Business Entities

package

Data Layer △

model

Data Access

Service Agents

uml-diagrams.org

Deployment Diagram
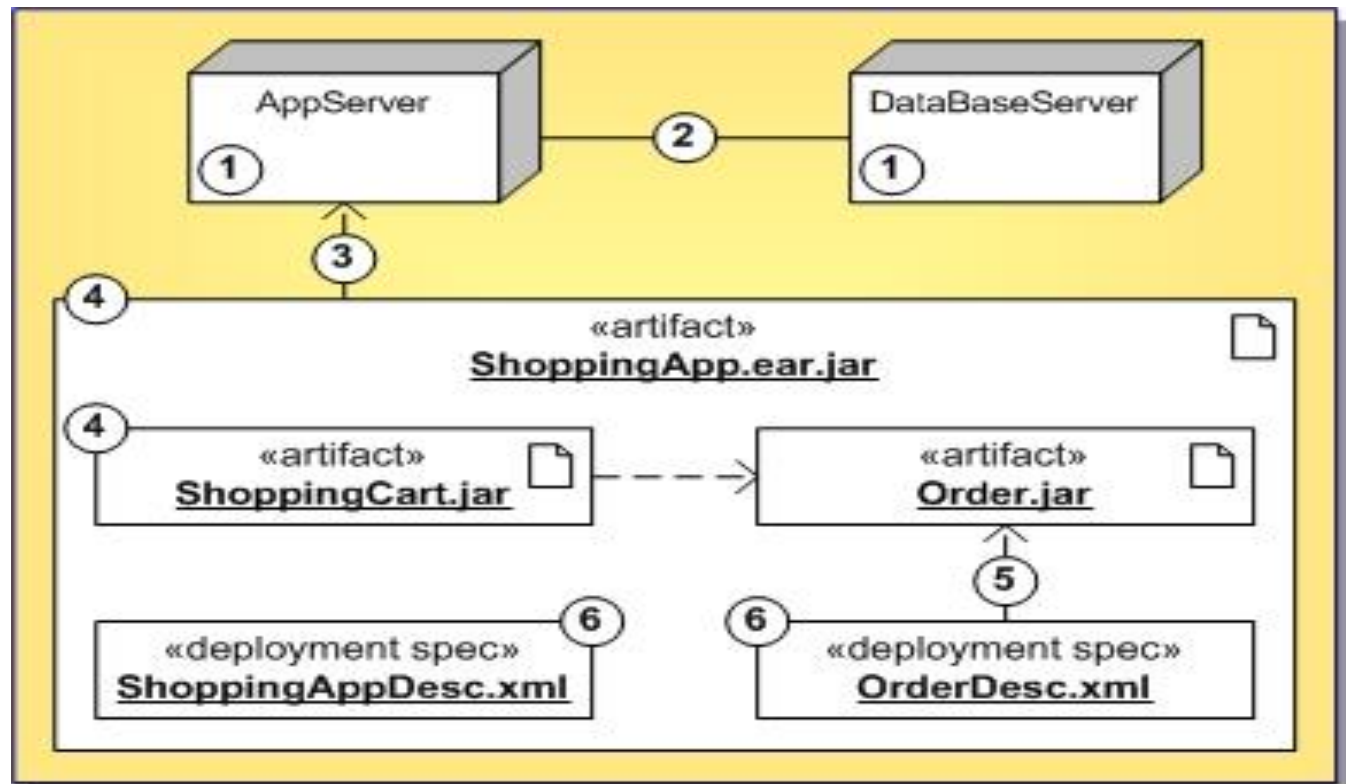
1 Nodes
2 Communicaiton Path
3 Deplolyment
4 Artifacts
5 Dependency
6 Deployment Specifications

UML Behavior Diagrams

- Use Case Diagram
- Activity Diagram
- State Machine Diagram

Use Case Diagram – Chemical Tracking System
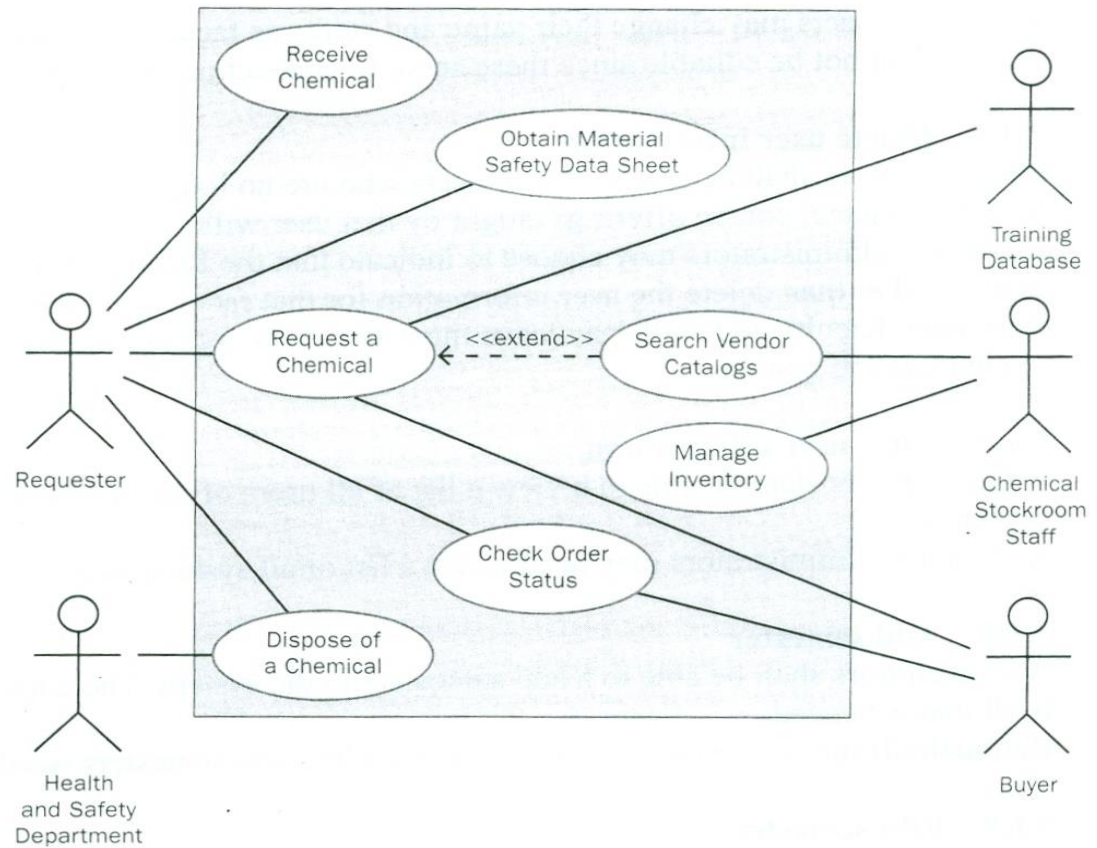
Figure 8-1 Partial use-case diagram for the Chemical Tracking System.

UML Activity Diagram

Normal Course   **Alternative Course**
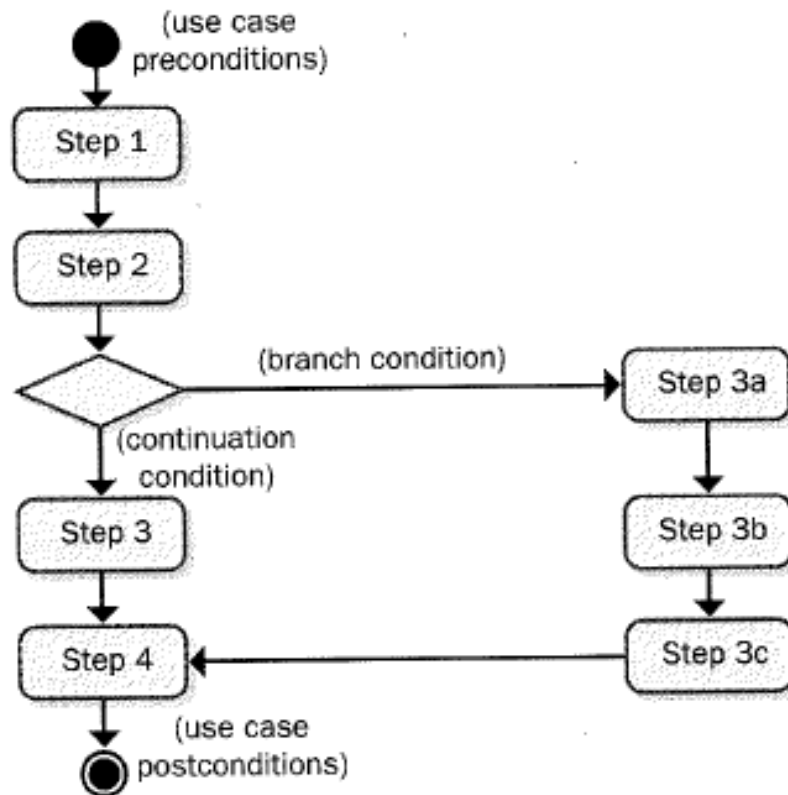
Figure 8-2 UML activity diagram illustrating the dialog flow in the normal and alternative courses of a use case.

STATE MACHINE/TRANSITION Diagram
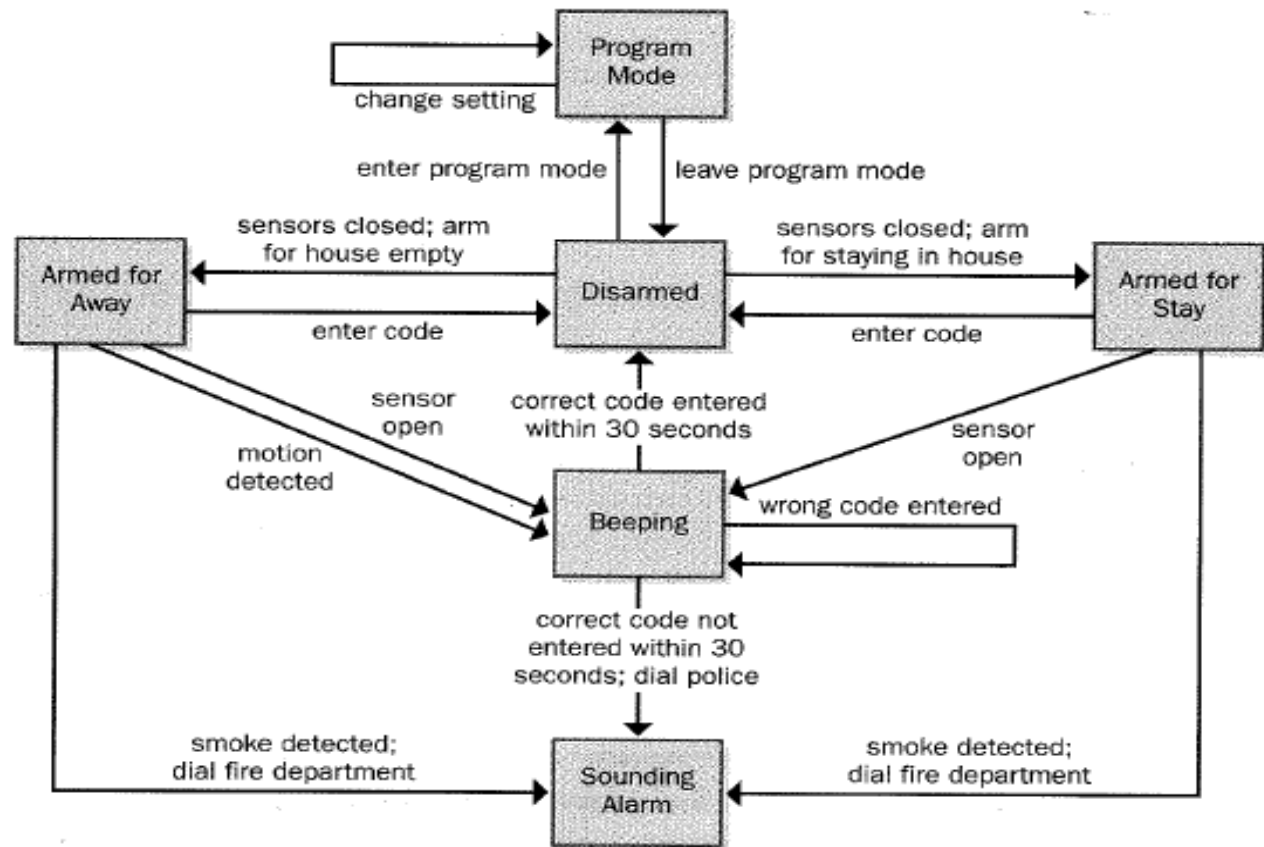
**Figure 11-3** Partial state-transition diagram for a home security system.

STATE MACHINE Diagram
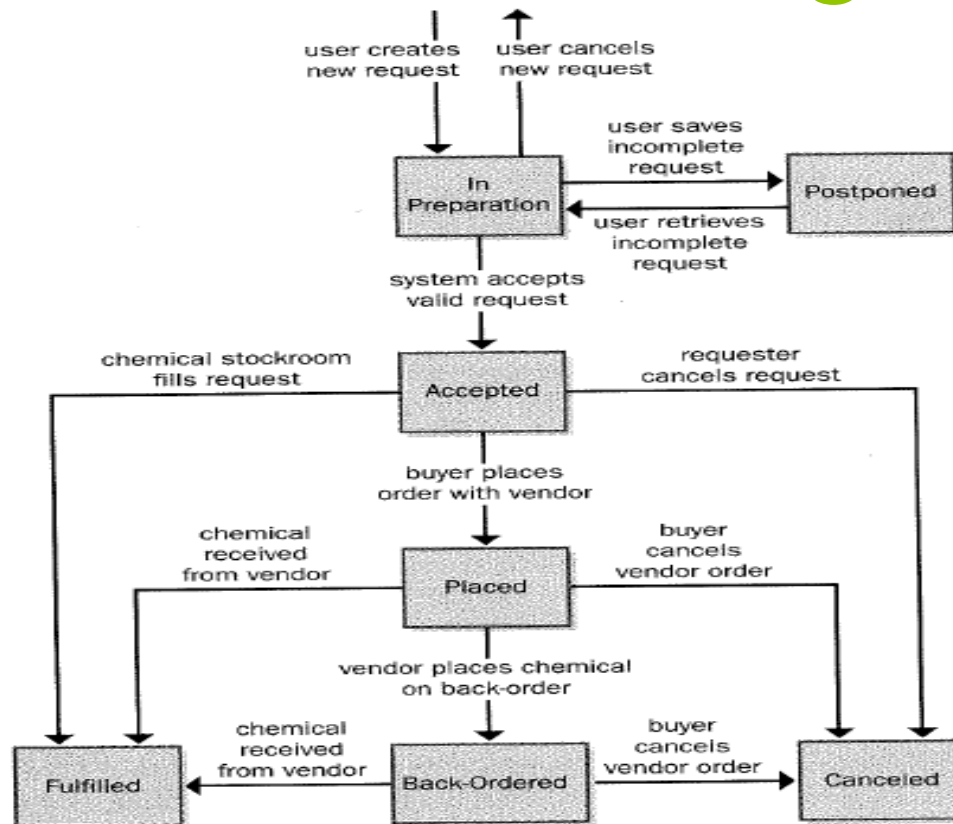
Figure 11-4   State-transition diagram for a chemical request in the Chemical Tracking System.
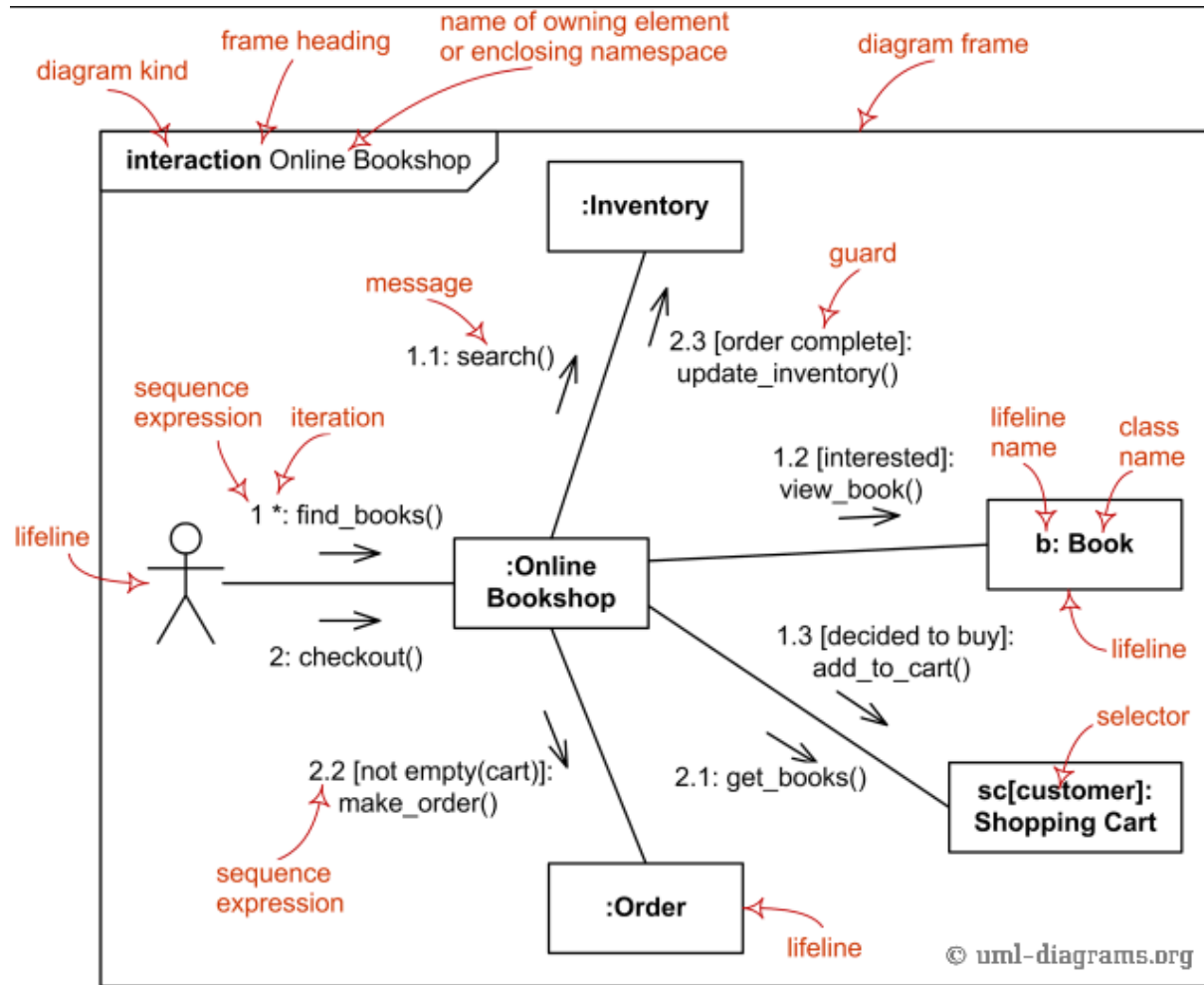
UML Interaction Diagrams

- Sequence Diagram
- Communication Diagram
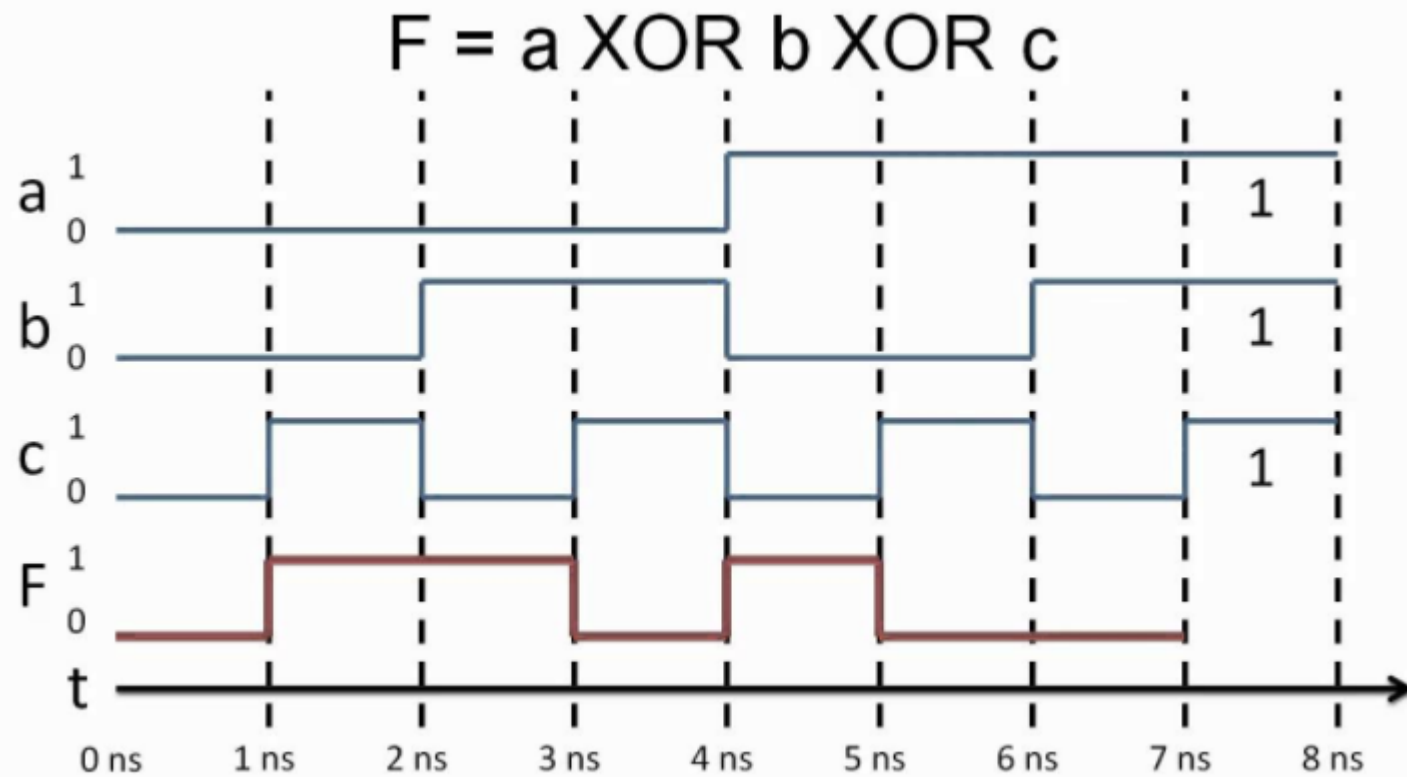- Timing Diagram
- Interaction Overview Diagram

Sequence Diagram

Collaboration "Rent Item", scenario "unavailable"
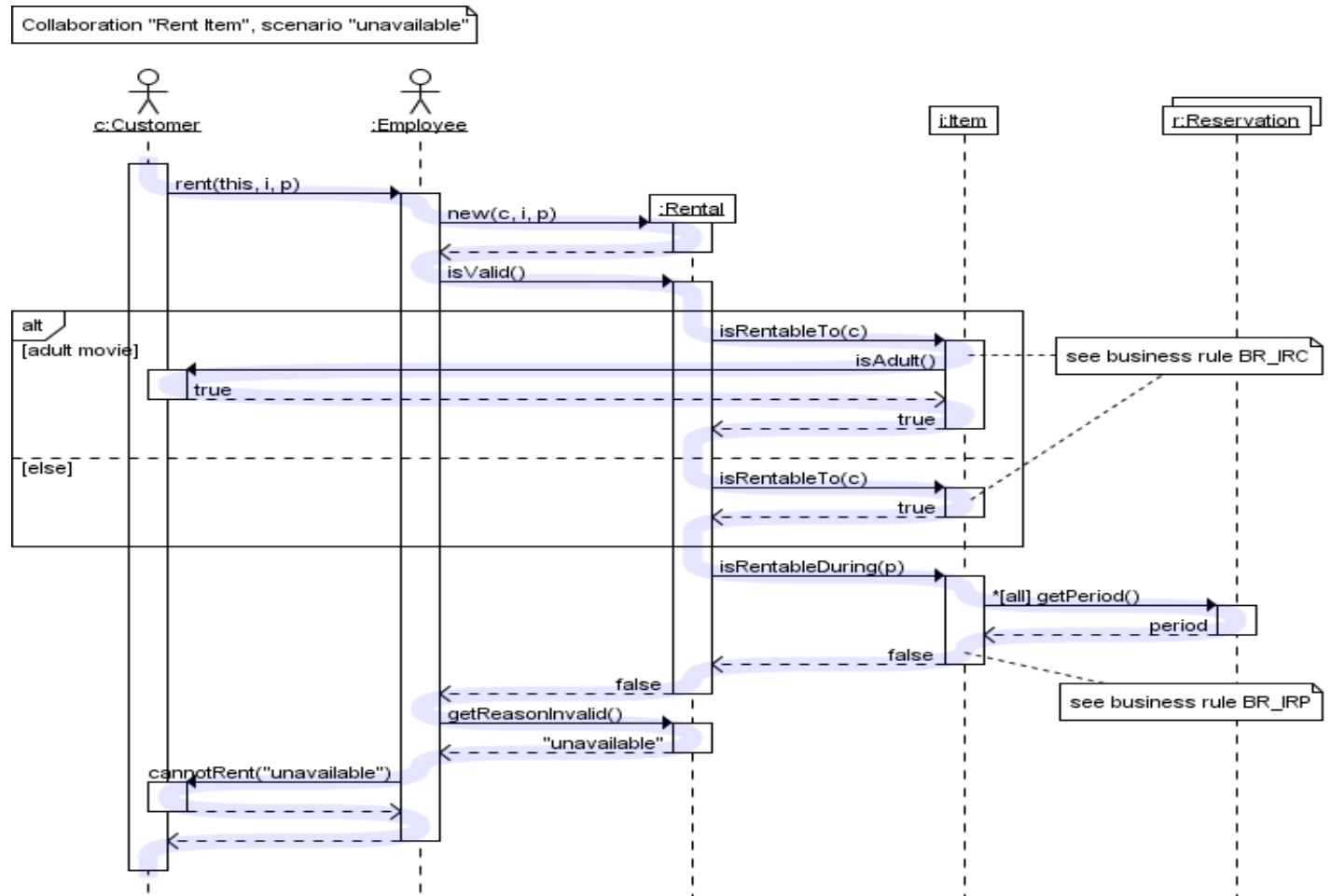
Communications/Collaboration Diagram
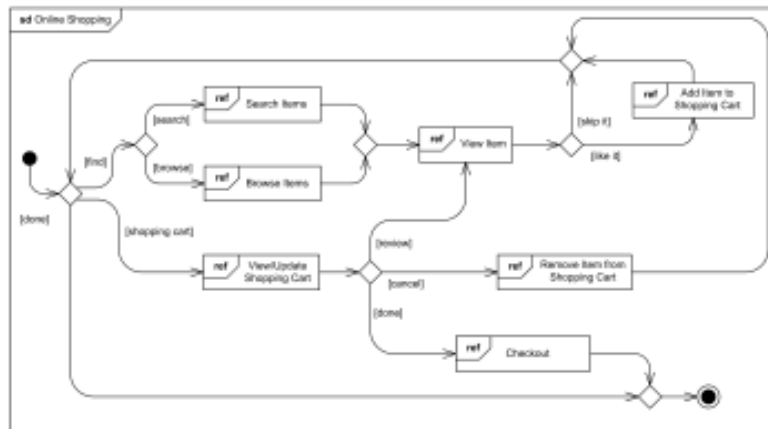
Timing Diagram

F = a XOR b XOR c

Interaction Overview Diagram

●→▭ **Online shopping interaction overview diagram**

Purpose: An example of UML interaction overview diagram for online shopping.

Summary: Customer may search or browse items, add or remove items from shopping cart, do checkout.
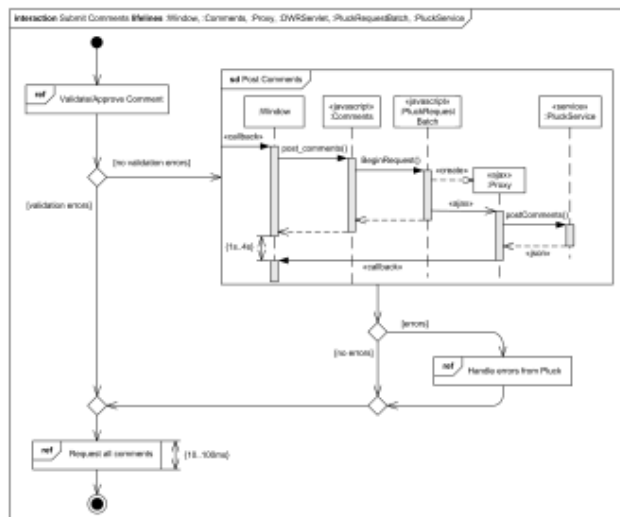
Interaction Overview Diagram

Submit comments to Pluck using DWR, AJAX, JSON

Purpose: *An example of **interaction overview diagram** which shows how user comments on some article are submitted to **Pluck** using various **AJAX** technologies.*

Summary: *Comments submitted by a web user are first validated by the web site which is hosting commented article. **DWR** technology (**AJAX** for Java) is used to convert user comments HTML form data into Java object and possible validation errors - back into JavaScript callbacks for errors. Comments that look Ok are submitted to Pluck server hosting all comments to all articles.*
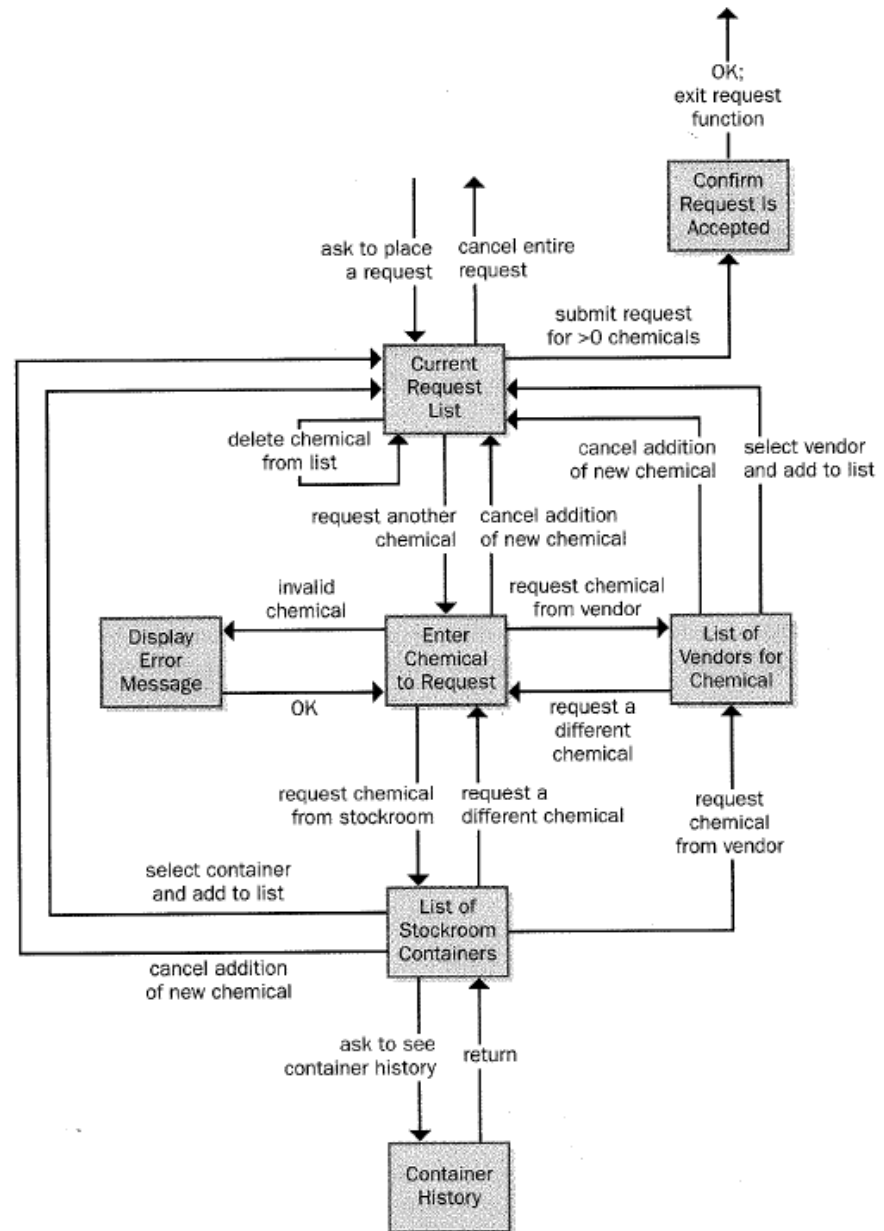
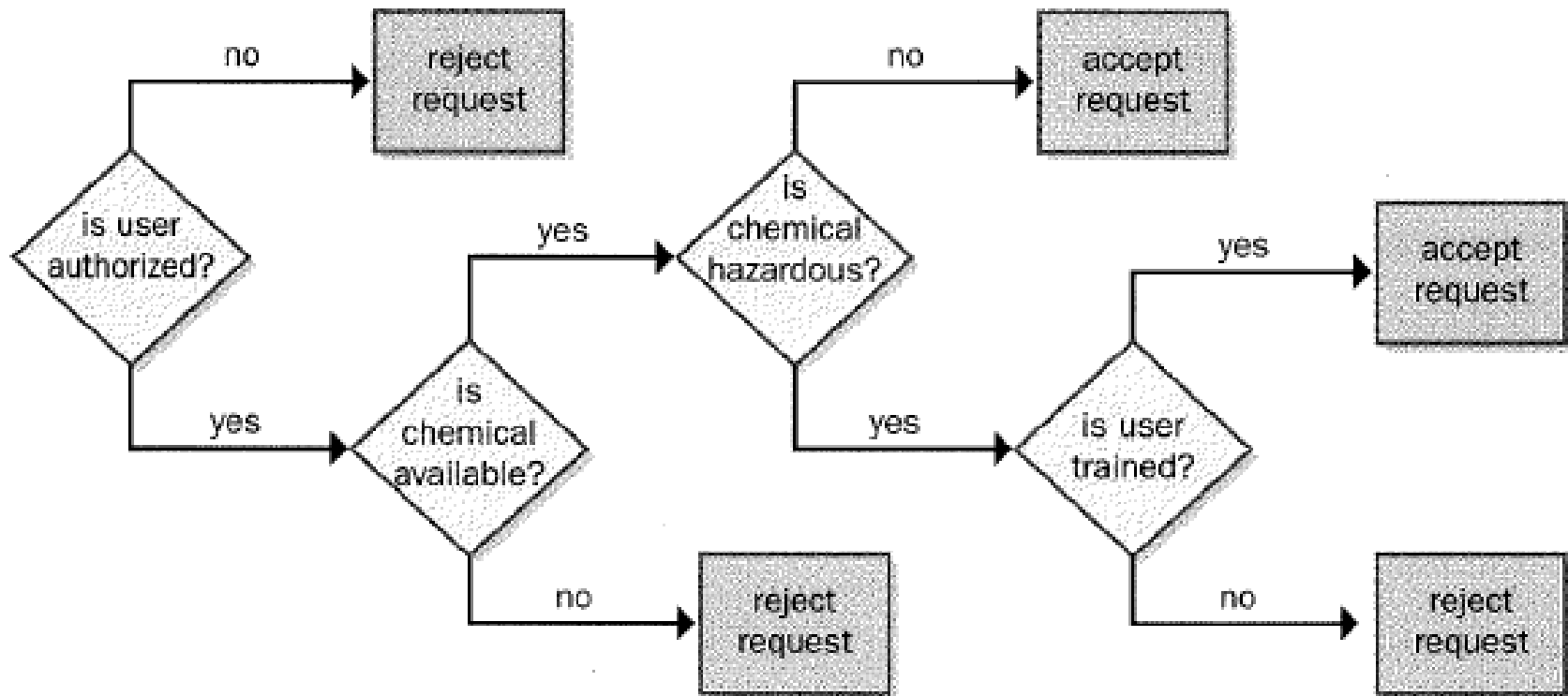# Interaction Overview Diagram
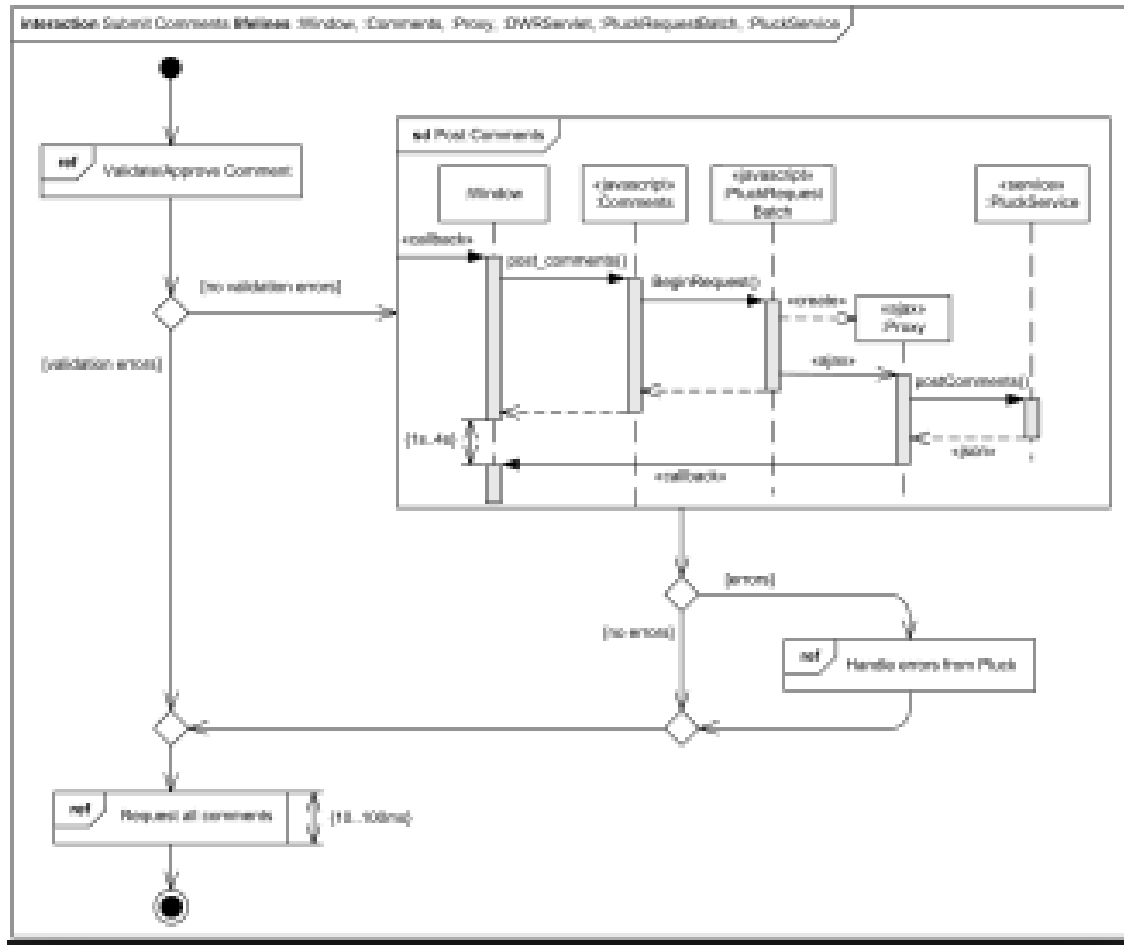
OTHER Diagrams

Dialog Map

Figure 11-5 Dialog map for the "Request a Chemical" use case from the Chemical Tracking System.

Decision Tree

Figure 11-7 Sample decision tree for the Chemical Tracking System.