

**Lab Manual  
For  
Object Oriented Software Engineering**

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## **Objectives: Object Oriented Software Engineering Lab**

The Object Oriented Software Engineering Lab provides a deep insight into the importance of requirement modeling in the software industry. It will enable us to learn the Rational Rose tool employed in the software development life cycle, which makes the process of requirement modeling easy to understand and implement.

Requirements modeling is an information technology for making it easier to capture, communicate, track, analyze, verify, validate, view, and manage the hundreds of hierarchical and interrelated engineering requirements necessary for large and/or complex systems. It will significantly reduce the cost of systems development and will reduce the probability and severity of cost and schedule growth (overruns) by enabling the description of human readable and “computer friendly”, specifications of a system’s engineering requirements.

Rational Rose is the tool which will be used for the requirement modeling. It gives us the environment where the entire process of development can be specified to its minutest detail. It gives us the facility to design our front-end process as well as our database structure.

### **Application Tools**

- Rational Rose

## **Learning on the successful completion of the course**

### **Rose:**

1. The students shall be able to analyze and design their project.
2. The students should be able to identify the analysis elements of the project and understand the association between them.
3. They will be able to create analysis model of their project.
4. The entire database structure together with generation of schemas, tables, stored procedures etc. till the generation of the executable script can be designed and created by the students.

## **Schedule For Different Documents Submission**

The objective of the Lab work is to make the student conversant with the Rational Rose for modeling of Business Applications. During the semester a CASE STUDY “Eastern State University Course Registration Problem” will be completely solved in the lab classes with the assistance of the Instructor. Students are requested to implement this case study during the lab classes.

**Simultaneously, students are expected to solve “*Library Information Management System*” case study given in the lab manual.**

### **Guidelines for the students:**

1. The students will work individually under the guidance of the faculty.
2. They should have at least one meeting in a week with the faculty for the assessment of their work progress.
3. The students should meet the faculty with the formal documents and proper presentations prepared of their work till date.
4. Every student should always be prepared for a viva-voice or presentation of their work.
5. Regularity and sincerity will be taken into consideration while evaluating the students.

Please note that Analysis and Design follows an **iterative approach**.

Therefore, solving the Lab Exercises and the Case Studies will follow a **series of iterations to evolve into the Final System**

## **CASE STUDY**

### **Eastern State University Course Registration Problem Statement**

At the beginning of each semester, students may request a course catalog containing a list of course offerings for the semester. Information about each course, such as professor, department and prerequisites will be included to help students make informed decisions.

The new system will allow students to select four courses offering for the coming semester. In addition, each student will indicate two alternative choices in case a course offering becomes filled or canceled. No course offering will have more than ten students or fewer than three students. A course offering with fewer than three students will be cancelled. Once the registration process is completed for a student, the registration system sends information to the billing system so the student can be billed for the semester.

Professor must be able to access the online system to indicate which courses they will be teaching, and to see which students signed up for their course offerings.

For each semester, there is a period of time that students can change their schedule. Students must be able to access the system during this time to add or drop courses.



# **Lab Assignments**

## **EXERCISE 1:**

Identify and create Use cases for the problem statement.

Identify and create the Actors for the problem statement.

### **Objective:**

To understand the problem statement and analyze it.

To understand the meaning of use cases and actors.

## **EXERCISE 2:**

Define Classes in the Logical View associated with each Use Case and define their structure

### **Objective:**

1. To understand the different type of analysis classes for each use case.
2. To create the structure of the s/w in terms of analysis classes.
3. To understand the concept of stereotype.

### **EXERCISE 3:**

Draw sequence diagram for each Use Case identified in the problem statement.

#### **Objective:**

To understand how different objects are interacting with each other.

To understand which event occurs first, and what happens next.

To understand the operations of the classes.

### **EXERCISE 4:**

Draw the collaboration diagram for the problem statement.

#### **Objective:**

To understand the difference b/w sequence diagram and collaboration diagram

To learn what notations and symbols are used in a collaboration diagram.

## **EXERCISE 5:**

Draw the Class Diagram for the problem statement.

### **Objective:**

Identify the entity classes.

To understand the relationships between these classes.

Identify dependency, hierarchy and associativity between these classes.

## **Case Study**

# Library Information Management System

# **Library Information Management System**

A Library Information System is to be developed for automating the various functions of the Library. Faculty, Students and Employees of the Institute can take the membership of the Library. Each member can issue a book upto specific limit and specific duration. However, the limit may vary form one type of member to the other type of member. The LIMS performs the cataloguing, managing members, Issue and Return of the Book.

You are required to submit the following:

1. Identify and create Use cases for the problem statement.
2. Identify and create the Actors for the problem statement.
3. Define Classes in the Logical View associated with each Use Case and define their structure
4. Draw sequence diagram for each Use Case identified in the problem statement.
5. Draw the collaboration diagram for the problem statement.
6. Draw the Class Diagram for the problem statement.

# **Format For The Deliverables**

## **Use Case Specification : <Use-Case Name>**

### **1. Use Case Name**

#### **1.1 Brief Description**

*[ The description should briefly convey the role and purpose of the use case. A single paragraph should suffice for this description.]*

### **2. Flow of Events**

#### **2.1 Basic Flow**

*[ This use case starts when the actor does something. An actor always initiates use Cases. The use case should describe what the actor does and what the system does in response. It should be phrased in the form of a dialog between the actor and the system.*

*The use case should describe what happens inside the system, but not how or why. If information is exchanged be specific about what is passed back and forth. For example, it is not very illuminating to say that the Actor enters customer information; it is better to say the Actor enters the customer's name and address. A Glossary of Terms is often useful to keep the complexity of the use case manageable; you may want to define things like customer information there, to keep the use case from drowning in details.*

*Simple alternatives may be presented within the text of the use case. If it only takes a few sentences to describe what happens when there is an alternative; do it directly within the flow of events section. If the alternative flows are more complex, use a separate section to describe it. For example An Alternative Flow describes how to describe more complex alternatives.*

*A picture is sometimes worth a thousand words (though there is no substitute for clean, clear prose). If it improves clarity, feel free to paste graphical depictions of user interfaces, process flows, or other figures into the use case to improve its clarity. If a flow chart is useful to present a complex decision process, by all means use it! Similarly for state-dependent behavior, a state-transition diagram often clarifies the behavior of a system better than pages upon pages of text. Use the right presentation medium for your problem, but be wary of using terminology, notation or figures that your audience may not understand. Remember that your purpose is to clarify, not obscure.]*

## **2.2 Alternative Flows**

### **2.2.1 <First Alternative Flow>**

*[More complex alternatives should be described in a separate section, which is referred to in the basic flow of events section. Think of the alternative flow sections like alternative behavior –*



*each alternative flow represents alternative behavior (many times, because of exceptions that occur in the main flow). They may be as long as necessary to describe the events associated with the alternative behavior. When an alternative flow ends, the events of the main flow of events are resumed unless otherwise stated.]*

#### 2.2.1.1 <An Alternative sub-flow>

*[Alternative flows may in turn be broken down into sub-sections if it improves clarity.]*

#### 2.2.2 <Second Alternative Flow>

*[There may be, and most likely will be, a number of alternative flows in a use case. Keep each alternative separate to improve clarity. Using alternative flows improves the readability of the use case, as well as preventing use cases from being decomposed into hierarchies of use cases. Keep in mind that use cases are just textual descriptions, and their main purpose is to document the behavior of a system in a clear, concise and understandable way.]*

### 3. **Special Requirements**

*[A Special Requirement is typically a non-functional requirement that is specific to a use case but is not easily or naturally specified in the text of the use case's event flow. Examples of special requirements include legal and regulatory requirements, application standards, and*

*quality attributes of the system to be built, including usability, reliability, performance or supportability requirements. Additionally, other requirements such as operating systems and environments, compatibility requirements, and design constraints should be captured in this section.]*

### **3.1 <First special requirement>**

## **4. Preconditions**

*[A precondition (of a use case) is the state of the system that must be present prior to a use case being performed.]*

### **4.1 <Precondition One>**

## **5. Post Conditions**

*[A post condition (of a use case) is a list of possible states the system can be in immediately after a use case has finished.]*

### **5.1 <Post condition one>**

## **6. Extension Points**

*[Extension points of the use case.]*

### **6.1 <Name of extension point>**

*[Definition of the location of the extension point in the flow of events.]*

## **Class Analysis Document**

The class analysis document should contain the following information:

- A brief description on what does one understand by Class Analysis
- A brief description on types of Analysis Classes.
- Identify all the Analysis Classes for your problem statement and briefly describe their purpose.

## **Sequence Diagram Document**

The Sequence Diagram Document should contain the following information:

- A sequence diagram for each Use case of your system.
- A brief description on the symbols used in the sequence diagram explaining the reason for the usage of that particular symbol.
- A brief description on the flow of each event in each sequence diagram.

## **Collaboration Diagram Document**

The Collaboration Diagram Document should contain the following information:

- A collaboration diagram for each Use case of your system.
- A brief description on the symbols used in the collaboration diagram explaining the reason for the usage of that particular symbol.
- A brief description on the flow of each event in each collaboration diagram.

## **Class Diagram Document**

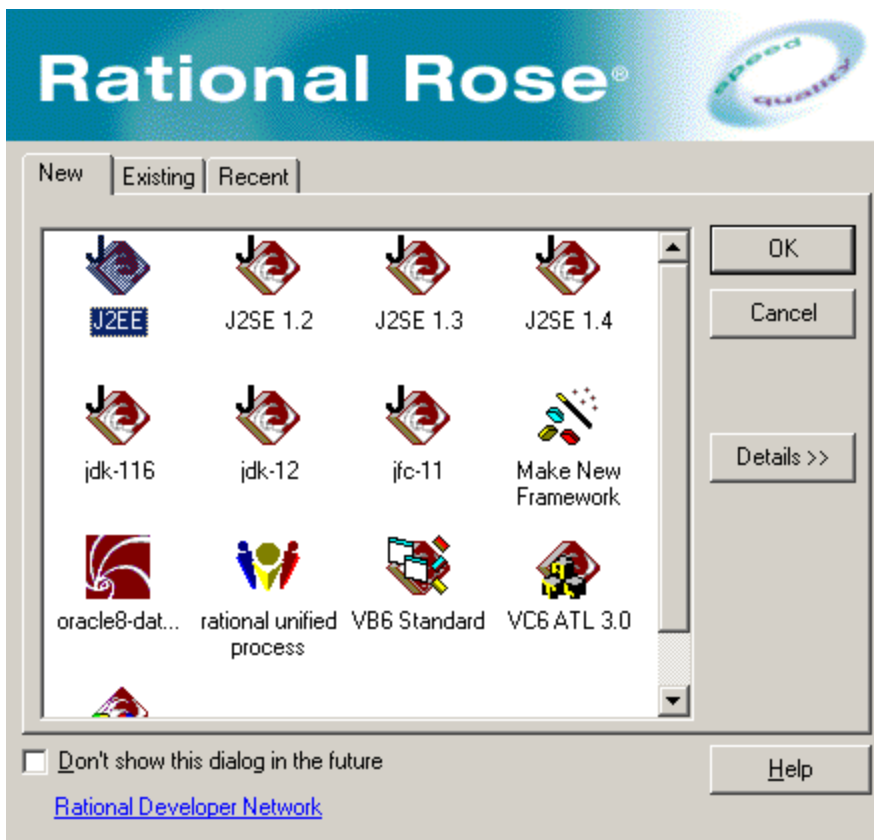
The Class Diagram Document should contain the following information:

- A Class diagram for each Use case of your system.
- A brief description on the symbols used in the Class diagram explaining the reason for the usage of that particular symbol.
- A brief description on the flow of each event in each Class diagram.

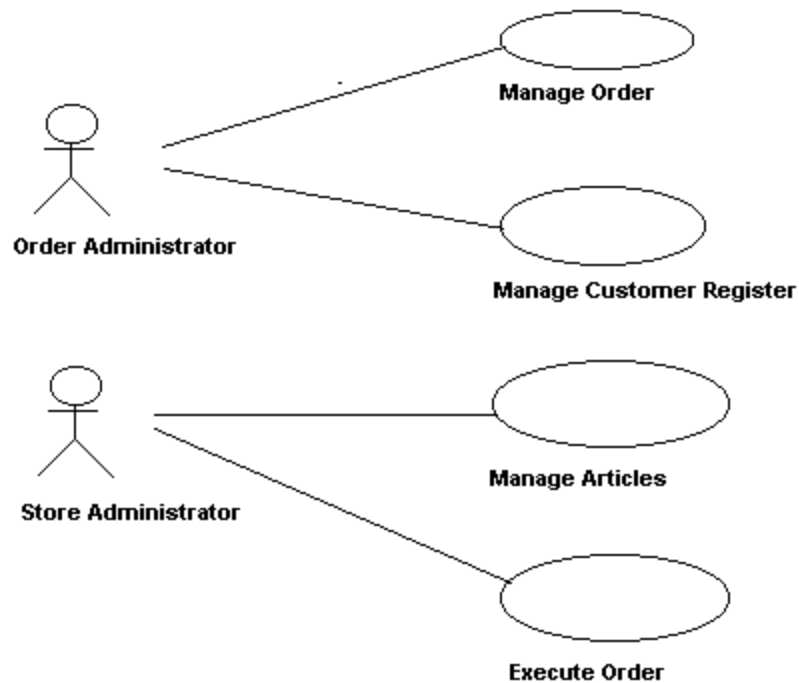
# **Tutorial on Rational Rose**

## **Analysis and Design Methodology**

**Framework:** A framework in Rational Rose is a set of predefined model elements that are needed to model a certain kind of system. The purpose of a specific framework can be to define the architecture of systems of a certain kind or to provide a set of reusable components. Frameworks are used as templates when creating a new model. Each framework is stored in a separate folder in the \Framework\Frameworks folder (the framework library) in your Rational Rose installation folder.



**Use Case Diagram :** Depicts interaction between Actors and Use Cases.



**Use Case:** A use case is a sequence of actions a system performs that yields an observable result of value to a particular actor.

**Actor:** An actor represents many things that interact with the system.

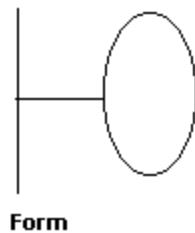
**Stereotype:** Representing one model element in the form of another model element.

Classes are stereotyped depending on the following categories:

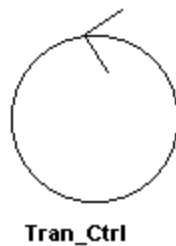


**Boundary Class:** A boundary class is used to model interaction between the systems surroundings and its inner workings. They are of following types:

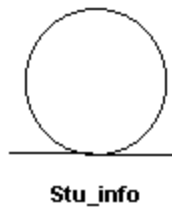
- User Interface Classes: Intermediate communication with human users of the system.
- System Interface Classes: Intermediate communication with other system.
- Device Interface Classes: Intermediate communication with external devices.



**Control Class:** A control class provides coordinating behavior in the system.



**Entity Class:** An entity class stores and manages information in the system.



**Sequence Diagram:** A sequence diagram is a graphical view of a scenario that shows object interaction in a time-based sequence—what happens first, what happens next. They help define operations of the classes.

**Collaboration Diagram:** A collaboration diagram is an interaction diagram that shows the order of messages that implement an operation or a transaction.

Sequence diagrams are closely related to collaboration diagrams and both are alternate representations of an interaction.

Main difference between sequence and collaboration diagrams: sequence diagrams show time-based object interaction while collaboration diagrams show how objects associate with each other.

**State Chart Diagram:** State chart diagrams model the dynamic behavior of individual classes or any other kind of object. They show the sequences of

states that an object goes through, the events that cause a transition from one state to another, and the actions that result from a state change.

**Activity Diagram:** An activity diagram is basically a special case of a state machine in which most of the states are activities and most of the transitions are implicitly triggered by completion of the actions in the source activities.

**Object Model Diagram:** The object model is built and graphically represented in the Class Diagram. You can use an object model for two purposes. First, you can use the object model as an application object model. An application object model captures a conceptual view of the application and can be assigned to a component language like Java, Visual Basic, or Analysis.

Second, you can use the object model as a logical data model. A logical data model captures a conceptual view of a database. You can use the Analysis language as the component language if you want to create a database-independent logical data model. However, to implement the model you are required to transform it to a data model and assign it to a supported DBMS.

Regardless of its purpose, you design an object model by creating Logical View packages. Each package must contain persistent classes with attributes assigned to the classes. The classes relate to one another by associations or aggregations. You add roles and multiplicity to provide additional context to your associations and model design. Object models use UML terminology and notation to express a complete model. Elements in an object model map to elements in a data model.

**Data Model Diagram:** Data Model Diagrams use the UML profile notation for representing data model entities. When you have an existing data model, you can drag-and drop data model elements from the browser to the Data Model Diagram or you can use the Add Tables sub-menu on the Query menu to populate the diagram. When you are creating a new data model, you can use the toolbox or the Create sub-menu on the Tools menu to create data model elements in the Data Model Diagram.

### **Object Model Elements**

Class  
Operation  
Attribute  
Package  
Component  
Association or Aggregation  
Composite Aggregation  
Role  
Multiplicity

### **Data Model Elements**

Table  
Constraint  
Column  
Schema  
Database  
Non-Identifying Relationship  
Identifying Relationship  
Role  
Cardinality

## **Creating Use Cases**

### **Creating Actors in Rational Rose**

Right-click on the Use Case View package in the browser to make the shortcut menu visible.

Select the New: Actor menu option. A new actor called New Class is placed in the browser.

With the actor called New Class selected, enter the desired name of the actor.

### **Documenting Actors in Rational Rose**

1. If the documentation window is not visible, open the documentation window by selecting the Documentation menu choice from the View menu.
2. Click to select the actor in the browser.
3. Position the cursor in the documentation window and enter the documentation.

### **Creating Use Cases in Rational Rose**

Right-click on the Use Case View in the browser to make the shortcut menu visible.

Select the New: Use Case menu option. A new unnamed use case is placed in the browser.

With the use case selected, enter the desired name of the use case.

## **Creating a Use Case brief Description in Rational Rose**

1. Click to select the use case in the browser.
2. Position the cursor in the documentation window and enter the brief description for the use case. If the documentation window is not visible, select the View: Documentation menu choice to make the window visible.

## **Linking Flow of Events Documents to use cases in Rational Rose**

1. Right-click on the use case in the browser to make the shortcut menu visible.
2. Select the Open Specification menu option.
3. Select the Files tab.
4. Right-click to make the shortcut menu visible.
5. Select the Insert File menu option.
6. Browse to the appropriate directory and select the desired file.
7. Click the Open button
8. Click the OK button to close the specification

## **Creating the main use case Diagram in Rational Rose**

1. Double-click on the Main diagram in the Use Case View in the browser to open the diagram.
2. Click to select an actor in the browser and drag the actor onto the diagram.
3. Repeat step 2 for each additional actor needed in the diagram
4. Click to select a use case in the browser and drag the use case onto the diagram.
5. Repeat step 4 for each additional use case needed in the diagram.

**Note:** Actors and use cases may also be created directly on a use case diagram by using the toolbar.

## **Creating Communicate Associations in Rational Rose**

1. Click to select the Association icon or the Unidirectional Association icon from the diagram toolbar. Note: If the Association icon is not present on the toolbar, it may be added by right-clicking on the toolbar, selecting the Customize menu choice from the shortcut menu, and adding the icon to the toolbar.
2. Click on an actor initiating a communication and drag the association line to the desired use case.

To add the communicate stereotype (optional):

1. Double-click on the association line to make the Specification visible.
2. Click the arrow in the Stereotype field to make the drop-down menu visible, and select communicate.
3. Click the OK button to close the Specification.
4. Repeat the preceding steps for each additional communicate relationship.

## **Creating Include Relationships in Rational Rose**

1. Click to select the Dependency icon from the toolbar.
2. Click on the base use case and drag the Dependency icon to the used use case.
3. Double-click on the dependency arrow to make the Specification visible.
4. Click the arrow in the Stereotype field to make the drop-down menu visible, and select include.

5. Click the OK button to close the Specification.

### **Creating Extend Relationships in Rational Rose**

1. Click to select the Dependency icon from the toolbar.
2. Click on the use case containing the extended functionality and drag the Dependency icon to the base use case.
3. Double-click on the dependency arrow to make the Specification visible.
4. Click the arrow in the Stereotype field to make the drop-down menu visible and select extend.
5. Click the OK button to close the Specification.

### **Creating Additional Use Case Diagrams in Rational Rose**

1. Right-click on the Use Case View in the browser to make the shortcut menu visible.
2. Select the New: Use Case Diagram menu option.
3. While the use case diagram is selected, enter the name of the actor.
4. Open the diagram and add actors, use cases, and interactions to the diagram as needed.

### **Creating Activity Diagrams in Rational Rose**

1. Right-click on the Use Case View in the browser to make the shortcut menu visible.



2. Select the New: Activity Diagram menu choice. This will add an activity diagram called New Diagram to the browser.
3. While the new diagram is still selected, enter the name of the diagram.
4. Double-click on the activity diagram in the browser to open the diagram.

### **Creating Activities in Rational Rose**

1. Click to select the Activity icon from the toolbar.
2. Click on the activity diagram window to place the activity.
3. While the activity is still selected, enter the name of the activity.

### **Creating Transitions in Rational Rose**

Click to select the state transition icon from the toolbar.

Click on the originating activity and drag the transition arrow to the successor activity.

### **Creating Decision Points in Rational Rose**

Click to select the Decision icon from the toolbar.

Click on the activity diagram window to place the decision.

While the decision is still selected, enter the name of the decision.

Click to select the Transition icon the toolbar.

Click on the originating activity and drag the transition to the decision icon.

## **Creating Guarded Transitions in Rational Rose**

Click to select the State Transition icon from the toolbar.

Click on the decision and drag the transition to the successor activity. (Note: Rational Rose may place the transition on top of an existing transition. To separate the transition, select the transition and drag it onto the activity diagram window.)

Double-click on the transition arrow to make the Specification visible.

Select the Detail tab.

Enter the guard condition in the Guard Condition field.

Click the OK button to close the Specification.

## **Creating Rectilinear Lines in Rational Rose**

Click to select the line that should be rectilinear (multi-select may be accomplished by first selecting the Shift button).

Select the Format: Line Style: Rectilinear menu choice.

Relocate the lines as needed by selecting the line and dragging it to the desired location on the activity diagram window.

## **Creating Synchronization Bars in Rational Rose**

Click to select the Horizontal Synchronization or the Vertical Synchronization icon from the toolbar.

Click on the activity diagram window to place the synchronization bar.

Click to select the State Transition icon on the toolbar and add any needed incoming the outgoing transitions to the synchronization bar.

## **Creating Swimlanes in Rational Rose**

Click to select the Swimlane icon from the toolbar.

Click on the activity diagram window to place the swimlane. This will add a swimlane called NewSwimlane to the diagram.

Double-click on the NewSwimlane (the words) to open the Specification.

Enter the name of the swimlane in the Name field.

Click the OK button to close the Specification.

To resize the swimlane, click on the swimlane border and drag the swimlane to the desired location.

Drag all needed activities and transitions into the swimlane, (Note: You may also create new activities and transitions in the swimlane.)

## **Creating Starting and Ending Activities in Rational Rose**

Click to select the Start State or the End State icon from the toolbar.

Click on the activity diagram window to place the start or end state.

If you added a start state, click on the state Transition icon, click on the start state, and drag the transitions to the first activity in the workflow.

If you added an end state, click on the State Transition icon, click on the successor activity, and drag the transition to the end state.

## **Finding Classes**

### **Creating Classes in the Rose Browser**

Right-click to select the Logical View in the browser.

Select the New: Class menu choice. A class called New Class is placed in the browser.

While the new class is still selected, enter the name of the class.

### **Creating Stereotypes for Classes in Rational Rose**

Right-click to select the class in the browser and make the shortcut menu visible.

Select the Open Specification menu choice.

Select the General tab.

Click the arrow in the Stereotype field to make the drop-down menu visible and select the desired stereotype or, to create a new stereotype, enter the name of the stereotype in the Stereotype field.

Click the OK button to close the Specification.

### **Creating Packages in the Rose Browser**

Right-click to select the Logical View in the browser.

Select the New: Package menu choice.

While the package is still selected, enter the name of the package.

## **Relocating Classes in the Rose Browser**

Click to select the class in the browser.

Drag the class to the desired package.

Repeat the steps for each class that is to be relocated.

## **The Main Class Diagram in Rational Rose**

Rose automatically creates the Main class diagram in the Logical View of the model.

To add packages to the Main class diagram:

Double-click on the Main diagram in the browser to open the diagram.

Click to select the package in the browser.

Drag the package onto the diagram.

Repeat the preceding steps for each package that is to be added to the diagram.

## **Creating a Package Main Class Diagram in Rational Rose**

1. Double-click on the package on a class diagram.
2. Rose will “open” the package and create (or display) the main class diagram for the package.
3. Click to select a class in the browser and drag the class onto the diagram.  
(Note: The stereotype display of a class may be set using the Format: Stereotype display menu choice.)
4. Repeat step 3 for each additional class that is to be placed on the diagram.

## **To Set Visibility Display in Rational Rose**

To set the default visibility display:

1. Select the Tools: Options menu choice.
2. Select the Diagram tab.
3. Select the Show Visibility checkbox to set the default to show the visibility of all classes.

To set the visibility for a selected class:

1. Right-click to select the class on a diagram and make the shortcut menu visible.
2. Click to select or deselect the Options: Show Visibility menu choice.

## **Discovering Object Interaction**

### **Creating A Logical View Use Case Diagram in Rational Rose**

1. Right-click to select the Logical View package in the browser and make the shortcut menu visible.
2. Select the New: Use Case Diagram menu choice. This will add a new use case diagram called NewDiagram to the browser.
3. While the NewDiagram is still selected, enter the name Realizations:

### **Creating Use Case Realizations in Rational Rose**

1. Double-click on the Realizations use case diagram in the browser to open the diagram.
2. Click to select the Use Case icon from the toolbar.
3. Click on the use case diagram window to place the use case. This will place the new use case on the diagram and also add it to the browser.
4. Double-click on the use case to open the Use Case Specification.
5. Enter the name of the use case (same name as the use case in the Use Case View) in the Name field. (Note: You must enter the name in the Specification or in the Browser to invoke Rational Rose's namespace support. If you enter the name on the use case diagram, Rational Rose will assume that the use case is the same use case that is in the Use Case View.)
6. Click the arrow in the Stereotype field to make the drop-down menu visible.
7. Select use-case realization.
8. Click the OK button to close the Use Case Specification.

## **Creating A Sequence Diagram in Rational Rose**

1. Right-click to select the use case realization in the Logical View of the browser and make the shortcut menu visible.
2. Select the New: Sequence Diagram menu choice. An unnamed sequence diagram is added to the browser.
3. With the new sequence diagram selected, enter the name of the sequence diagram.



## **Creating Objects and Messages in Sequence Diagrams in Rational Rose**

1. Double-click on the sequence diagram in the browser to open the diagram.
2. Click to select the actor in the browser.
3. Drag the actor onto the sequence diagram.
4. Click to select the Object icon from the toolbar.
5. Click on the sequence diagram window to place the object.
6. While the object is still selected, enter the name of the object.
7. Repeat the preceding steps for each object and actor in the scenario.
8. Click on the actor or Object Message icon from the toolbar.
9. Click on the actor or object sending the message and drag the message line to the actor or object receiving the message.
10. While the message line is still selected, enter the name of the message.
11. Repeat steps 7 through 9 for each message in the scenario.

## **Assigning Objects in a Sequence Diagram to Classes in Rational Rose**

1. Click to select the class in the browser.
2. Drag the class onto the object in the sequence diagram. Rose will add the class name preceded by a colon (:) to the object name. If the object is unnamed, the name is set to : ClassName. If the stereotype display for a class is set to icon, and if an icon exists, then the icon will be used in the sequence diagram.

## **Linking Diagrams in Rational Rose**

1. Select the Note icon from the toolbar.
2. Click on the diagram to place the note.
3. Select the diagram that you wish to link in the browser and drag the diagram onto the note.
4. To navigate to the linked diagram, double-click on the note.

## **Creating Collaboration Diagrams from Sequence Diagrams in Rational Rose**

1. Double-click on the sequence diagram in the browser to open the diagram.
2. Choose the Browse: Create Collaboration Diagram menu choice or press the F5 key.
3. Rearranging the objects and messages on the diagram as needed.

## **Creating a View of Participating Classes in Rational Rose**

1. Right-click on the use case realization in the browser to make the shortcut menu visible.
2. Select the New: Class Diagram menu choice.
3. While the diagram is still selected, enter the name of the class diagram.
4. Double-click on the diagram in the browser to open the diagram.
5. Click to select a class in the logical view of the browser and drag the class onto the diagram.

6. Repeat step 5 for each additional class that is to be placed onto the diagram.

## **Specifying Relationships**

### **Creating an Association Relationship in Rational Rose**

1. Click to select the Association icon from the toolbar. The association icon may be added to the toolbar by right-clicking on the toolbar and selecting the Customize menu command.
2. Click on one of the associated classes in a class diagram
3. Drag the association line to the other associated class

### **Creating an Aggregation Relationship in Rational Rose**

1. Select the Aggregation icon from the toolbar. The Aggregation icon may be added to the toolbar by right-clicking on the toolbar and selecting the Customize menu command.
2. Click on the class playing the role of the “whole” in a class diagram and drag the aggregation line to the class playing the role of the “part”.

### **Naming Relationships in Rational Rose**

1. Click to select the relationship line on a class diagram.
2. Enter the name of the relationship.

### **Creating Role Names in Rational Rose**

1. Right-click on the relationship line near the class that is modified to make the shortcut menu visible.
2. Select the Role Name menu choice.
3. Enter the name of the role.

### **Creating Multiplicity in Rational Rose**

1. Double-click on the relationship line to make the Specification visible.
2. Select the Detail tab for the role being modified (Role A Detail or Role B Detail).
3. Enter the desired multiplicity in the Cardinality field.
4. Click the OK button to close the Specification.

### **Creating a Reflexive Relationship in Rational Rose**

1. Select the Association (or Aggregation) icon from the toolbar.
2. Click on the class and drag the association (or aggregation) line outside the class.
3. Release the mouse button.
4. Click and drag the association (or aggregation) line back to the class.
5. Enter the role names and multiplicity for each end of the reflexive association (or aggregation).

## **Creating Package Relationships in Rational Rose**

1. Select the dependency relationship icon from the toolbar.
2. Click on the client package and drag the arrow to the supplier package.

