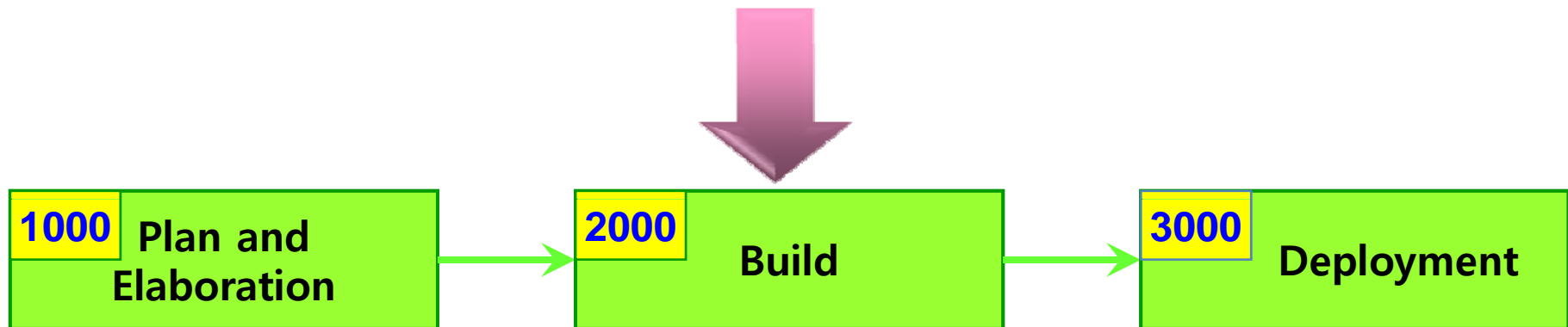


Case Study : Design

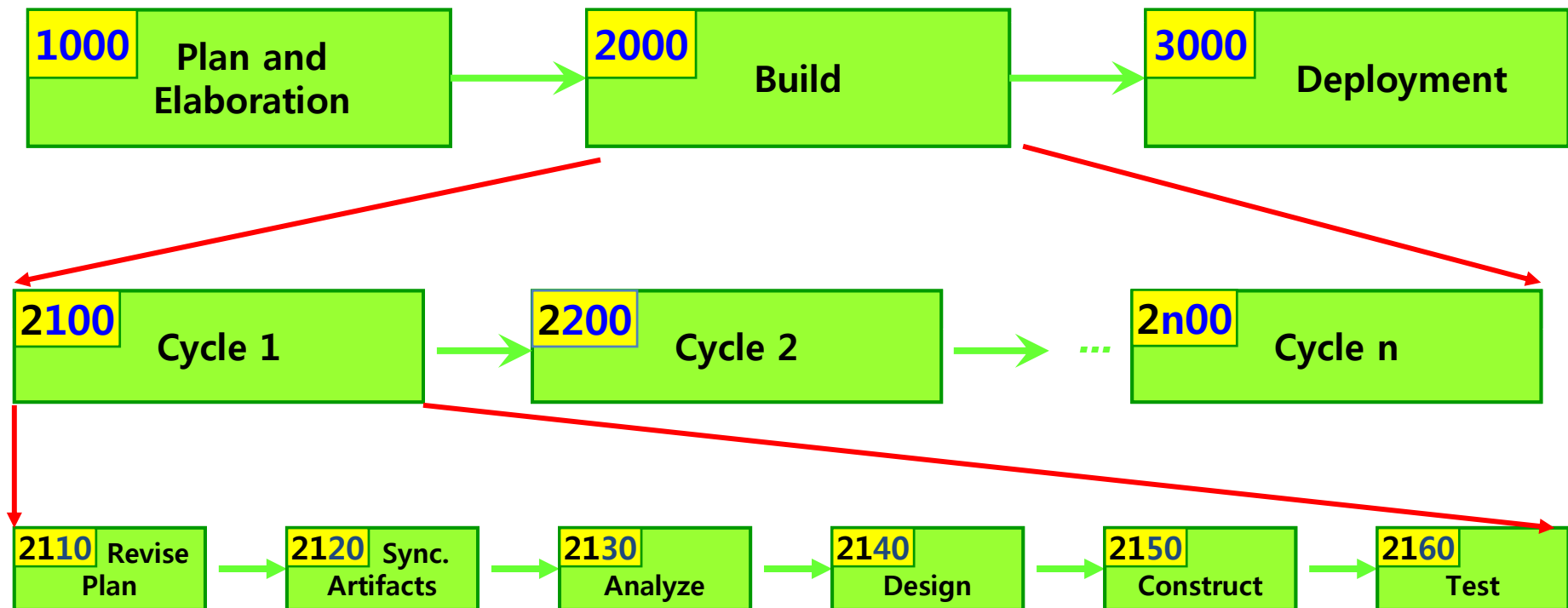
- Library Management System

Lecturer: JUNBEOM YOO
jbyoo@konkuk.ac.kr

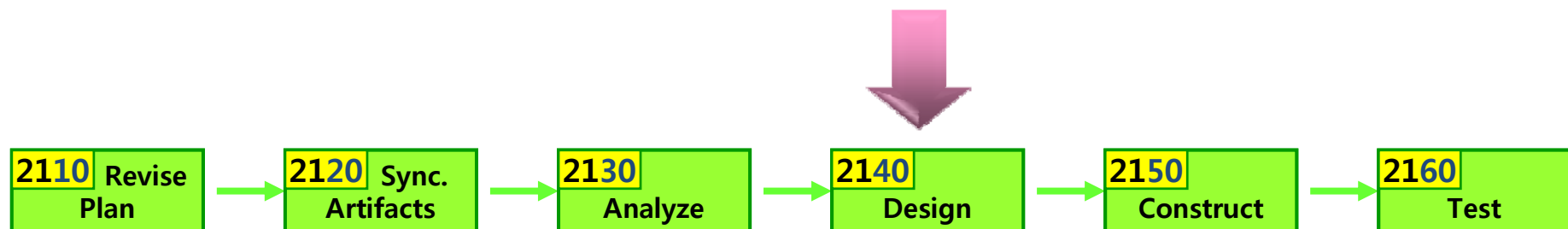
Stage 2000. Build



6 Phases of 'Build' Stage



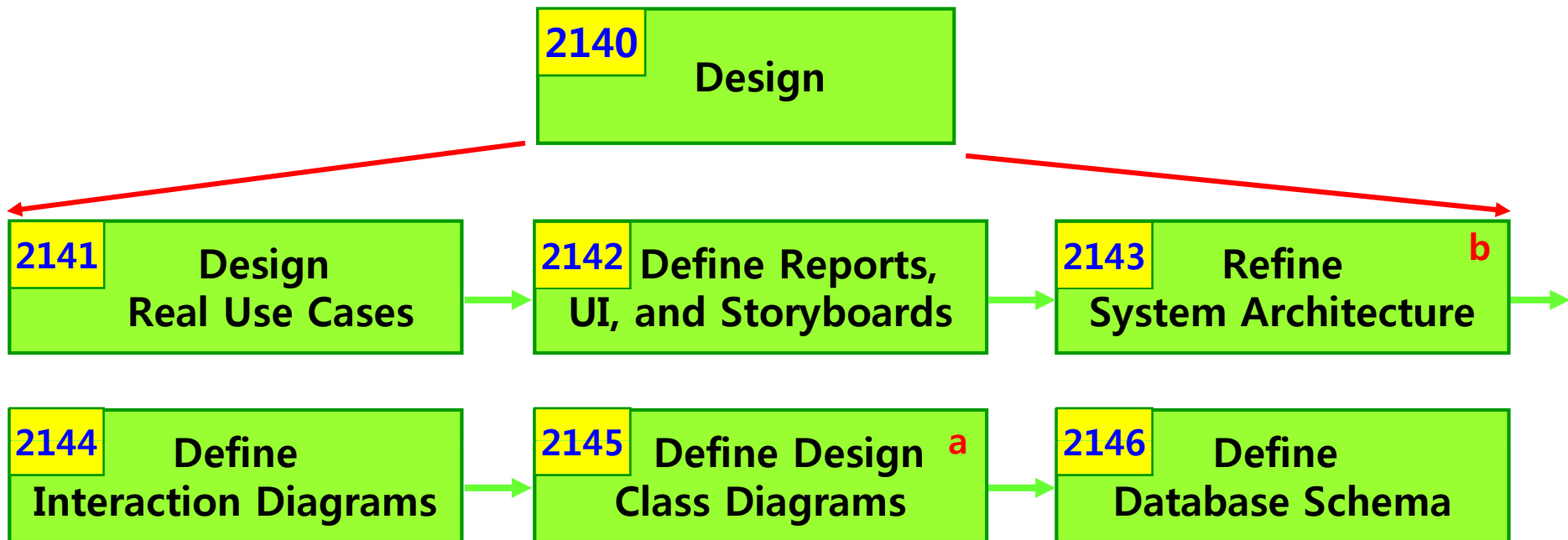
Phase 2040. Design



Phase 2040. Design

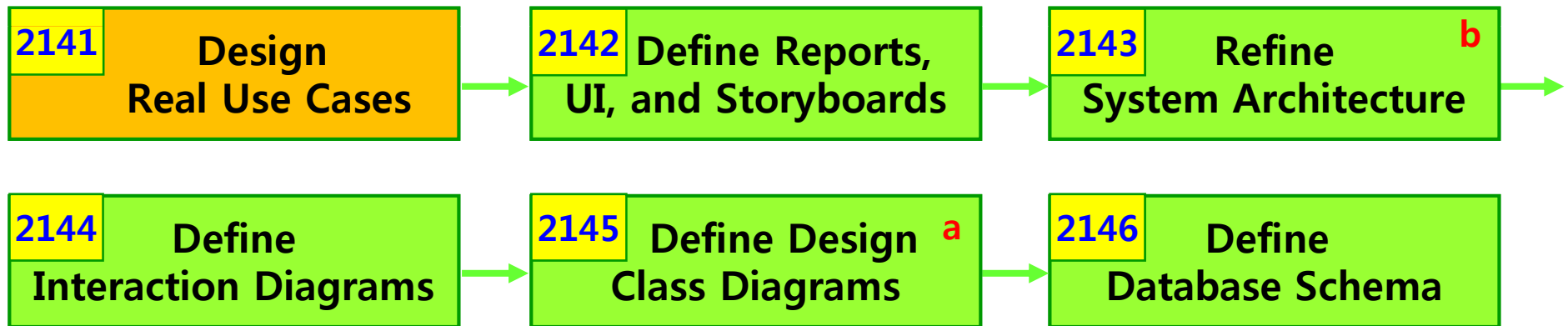
- Phase 2040 Activities

a. In parallel with interaction diagrams
b. Varied order



Activity 2041. Design Real Use Cases

a. In parallel with interaction diagrams
b. Varied order



Activity 2041. Design Real Use Cases

1. Make Reservation

Use Case	1. Make Reservation
Actor	Librarian
Purpose	Create a new reservation
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R1.1, R3.1 Use Case: "Add Borrower"
Pre-Requisites	A borrower should be registered.
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian inputs an <i>isbn</i> and <i>ssn</i> of the title 2. (S) Find a corresponding title 3. (S) Find a corresponding borrower 4. (S) Create a new reservation 5. (S) Store the new reservation 6. (S) Increase <i>reservationCount</i> in the borrower 7. (S) Increase <i>reservationCount</i> in the title
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 2: If the title does not exist, display an error message. Line 3: If the borrower does not exist, display an error message.

Activity 2041. Design Real Use Cases

2. Remove Reservation

Use Case	2. Remove Reservation
Actor	Librarian
Purpose	Remove a reservation information
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R1.2, R1.3 Use Case: "Lend Item"
Pre-Requisites	A borrower should be registered. A title should have been reserved.
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian inputs an <i>isbn</i> of the title 2. (S) Find a corresponding reservation 3. (S) Remove the reservation 4. (S) Decrease <i>reservationCount</i> of the borrower 5. (S) Decrease <i>reservationCount</i> of the title
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 2: If the reservation does not exist, display an error message.

Activity 2041. Design Real Use Cases

3. Lend Item

Use Case	3. Lent Item
Actor	Librarian
Purpose	Lend items to a borrower
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R1.3, R1.2, R3.1 Use Cases: "Remove Reservation", "Add Borrower"
Pre-Requisites	An item should exist.
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian inputs an item's <i>ID</i> and <i>ssn</i> of the borrower 2. (S) Find a corresponding borrower 3. (S) Find a corresponding item 4. (S) Create a new loan 5. (S) Store the new loan 6. (S) Set <i>validLoan</i> to true 7. (S) Increase <i>loanCount</i> of borrower 8. (S) Set <i>available</i> to false 9. (S) Decrease <i>AvailableCount</i> of the title
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 2: If the borrower does not exist, invoke "Add Borrower" use case.

Activity 2041. Design Real Use Cases

4. Return Item

Use Case	4. Return Item	
Actor	Librarian	
Purpose	Return items loaned	
Overview	(As in the business use case)	
Type	Primary and Real	
Cross Reference	System Functions: R1.4.1, R1.4.2, R1.6 Use Cases: "Calculate Late-Return-Fee", "Notify Availability"	
Pre-Requisites	An item should have been loaned.	
Typical Courses of Events	<p>(A) : Actor, (S) : System</p> <ol style="list-style-type: none"> 1. (A) A librarian inputs an item's <i>ID</i> 2. (S) Find a corresponding loan 3. (S) Get item information from the loan 4. (S) Get title information from the item 5. (S) Get <i>loanPeriod</i> from the title 6. (S) Compute <i>calculateLateReturnFee</i> 7. (S) Check <i>reservationCount</i> of the title. 	<ol style="list-style-type: none"> 8. (S) If the title is reserved, find the corresponding reservation 9. (S) Decrease <i>loanCount</i> of the loan. 10. (S) Decrease <i>loanCount</i> of the Borrower. 11. (S) Set <i>validLoan</i> of the borrower to false. 12. (S) Set <i>available</i> of the item to true. 13. (S) Increase <i>AvailbaleCount</i> of the title.
Alternative Courses of Events	N/A	
Exceptional Courses of Events	Line 2: If the loan does not exist, display an error message.	

Activity 2041. Design Real Use Cases

5. Calculate Late-Return-Fee

Use Case	5. Calculate Late-Return-Fee
Actor	None
Purpose	Compute late-return fee for an item returned late
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R1.4.1, R1.4.2 Use Cases: "Return Item"
Pre-Requisites	Lending time of an item should have expired
Typical Courses of Events	(A) : Actor, (S) : System 1. (S) Calculate Late-Return-Fee of the item 2. (S) Display the Late-Return-Fee
Alternative Courses of Events	N/A
Exceptional Courses of Events	N/A

Activity 2041. Design Real Use Cases

6. Get Replacement-Fee

Use Case	6. Get Replacement-Fee
Actor	Librarian
Purpose	Compute replacement-fee for a lost title
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R1.5 Use Cases: -
Pre-Requisites	A title should be lost.
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian inputs an item's <i>ID</i> 1. (S) Find a corresponding loan 2. (S) Get an item from the loan 3. (S) Get a title from the item 4. (S) Get price of the title 5. (S) Compute <i>replacementFee</i> 6. (S) Set <i>validLoan</i> to false 7. (S) Update the loan 8. (S) Decrease <i>loanCount</i> of the borrower. 9. (S) Set the lost of the item to true. (?) 10. (S) Decrease <i>numOfItem</i> of the title.
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 2: If the loan doe not exist, display an error message.

Activity 2041. Design Real Use Cases

7. Notify Availability

Use Case	7. Notify Availability
Actor	None
Purpose	Notify availability of a reserved item
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R1.4.1, R1.6, R2.4 Use Cases: "Return Item", "Add Item"
Pre-Requisites	An item should have been returned or a new item should have been added.
Typical Courses of Events	(A) : Actor, (S) : System 1. (S) Print a post-card
Alternative Courses of Events	N/A
Exceptional Courses of Events	N/A

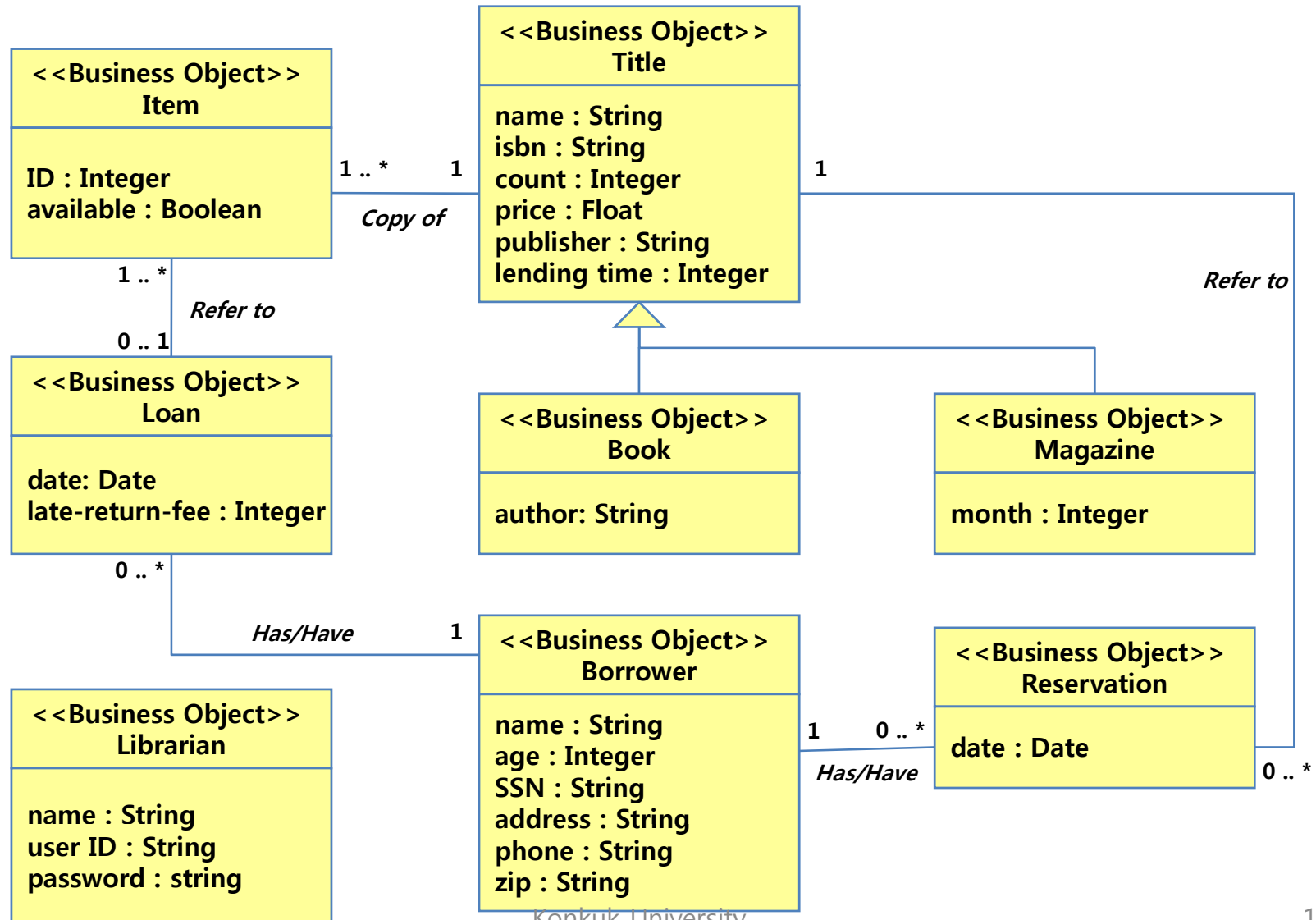
Activity 2041. Design Real Use Cases

8. Add Title

Use Case	8. Add Title
Actor	Librarian
Purpose	Register a new title
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R2.1, R2.4 Use Case: "Add Item"
Pre-Requisites	N/A
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian inputs title information such as name, isbn, price, publisher, loanPeriod (Book: author, Magazine:month, publishCycle) 2. (S) Find a corresponding title 3. (S) Create a new title 4. (S) Store the new title 5. (S) Invoke "Add Item"
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 1: If the title already exists, display an error message.

Reference

Activity 2033. Define Domain Model



Activity 2041. Design Real Use Cases

9. Remove Title

Use Case	9. Remove Title
Actor	Librarian
Purpose	Delete information of a title
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R2.2 Use Case: -
Pre-Requisites	N/A
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian inputs a title's <i>isbn</i> to remove 2. (S) Find a corresponding title 3. (S) Check if the corresponding title is reserved. 4. (S) If the title is reserved, Remove the reservation 5. (S) Check the item of the title is loaned. (and then what about items?) 6. (S) Remove the title
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 2: If the title does not exist, display an error message.

Activity 2041. Design Real Use Cases

10. Update Title

Use Case	10. Update Title
Actor	Librarian
Purpose	Update information of a title
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R2.3 Use Case: -
Pre-Requisites	N/A
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian inputs a title's <i>isbn</i> and information of the title to change 2. (S) Find a corresponding title 3. (S) Update the title (How?)
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 2: If the item does not exist, display "Not Existing Title". Error message. Line 3: If the <i>isbn</i> is changed, then update items too, (How?)

Activity 2041. Design Real Use Cases

11. Add Item

Use Case	11. Add Item
Actor	Librarian
Purpose	Add a new item
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R2.4 Use Cases: "Add Title"
Pre-Requisites	N/A
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian inputs an item's <i>id</i> 2. (S) Find a corresponding title 3. (S) Get an item's <i>ID</i> from the title 4. (S) Create a new item 5. (S) Store the new item 6. (S) Increase <i>numOfItem</i> of the title (?) 7. (S) Increase <i>availablecount</i> of the item
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 2: Line 2: If the title does not exist, display an error message.

Activity 2041. Design Real Use Cases

12. Remove Item

Use Case	12. Remove Item
Actor	Librarian
Purpose	Remove information of an item
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R2.1, R2.5 Use Case: "Remove Title"
Pre-Requisites	N/A
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian inputs an item's <i>ID</i> 2. (S) Find a corresponding item 3. (S) Check if the item is borrowed 4. (S) If the item is borrowed, decrease <i>numOfItem</i> of the title 5. (S) Decrease <i>availableCount</i> of the title 6. (S) Remove the item
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 2: If the item does not exist, display an error message. Line 3: If the item was already borrowed, display an error message

Activity 2041. Design Real Use Cases

13. Update Item

Use Case	13. Update Item
Actor	Librarian
Purpose	Update information of an item
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R2.6 Use Case: -
Pre-Requisites	N/A
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian inputs the item's <i>id</i> and information to change 2. (S) Find A corresponding item 3. (S) Update the item 4. (S) If a lost of the item is true, decrease <i>numOfItem</i> of the title. 5. (S) Decrease the availableCount of the title. 6. (S) If a lost of the item is false, increase <i>numOfItem</i> of the title. (What? Only for these cases "Update Item" are used?) 7. (S) Increase <i>availableCount</i> of the title
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 2: If the item does not exist, display an error message.

Activity 2041. Design Real Use Cases

14. Add Borrower

Use Case	14. Add Borrower
Actor	Librarian
Purpose	Register a new borrower
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R1.1, R1.3, R3.1 Use Cases: "Make Reservation", "Lend Item"
Pre-Requisites	N/A
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian inputs a borrower's name, ssn, and address. 2. (S) Find a corresponding borrower 3. (S) Create a new borrower 4. (S) Store the new borrower
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 2: If the borrower exists already, display an error message.

Activity 2041. Design Real Use Cases

15. Remove Borrower

Use Case	15. Remove Borrower
Actor	Librarian
Purpose	Remove information of a borrower
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R3.2 Use Case: -
Pre-Requisites	N/A
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian inputs the borrower's <i>ssn</i> 2. (S) Find a corresponding borrower 3. (S) Find a loan of the borrower 4. (S) If the loan is invalid, find a reservation 5. (S) Get the title of the reservation 6. (S) Decrease <i>reservationCount</i> of the title 7. (S) Remove borrower
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 2: If the borrower does not exist, display an error message. Line 3: If the loan is still valid, display an error message.

Activity 2041. Design Real Use Cases

16. Update Borrower

Use Case	16. Update Borrower
Actor	Librarian
Purpose	Update information of a borrower
Overview	(As in the business use case)
Type	Primary and Real
Cross Reference	System Functions: R3.3 Use Case: -
Pre-Requisites	N/A
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian inputs a borrower's <i>ssn</i> and information to change 2. (S) Find a corresponding borrower 3. (S) Update the borrower
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 2: If the borrower does not exist, display an error message.

Activity 2041. Design Real Use Cases

17. Log-In

Use Case	17. Log-In
Actor	Librarian
Purpose	Check access authority of a librarian
Overview	(As in the business use case)
Type	Secondary and Real
Cross Reference	System Functions: R4.1 Use Case: -
Pre-Requisites	A librarian should have user name and password.
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian inputs an <i>userID</i> and <i>password</i> 2. (S) Check if the <i>userID</i> and <i>password</i> are correct
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 2: If the <i>userID</i> and <i>password</i> are not correct, display an error message.

Activity 2041. Design Real Use Cases

18. Log-Out

Use Case	18. Log-Out
Actor	Librarian
Purpose	Exit the library management system
Overview	(As in the business use case)
Type	Secondary and Essential
Cross Reference	System Functions: R4.1 Use Case: -
Pre-Requisites	A librarian should have user name and password.
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian selects "LogOut" 2. (S) Check if the <i>userID</i> is correct and then exit the system
Alternative Courses of Events	N/A
Exceptional Courses of Events	Line 2: If the <i>userID</i> is incorrect, display an error message.

Activity 2041. Design Real Use Cases

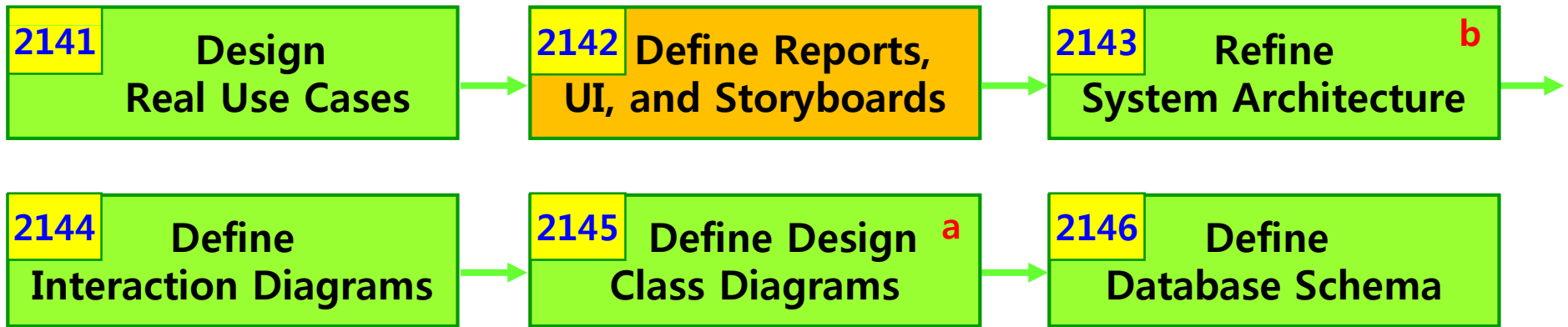
19. Count Loans

Use Case	19. Count Loans
Actor	Librarian
Purpose	Compute total count of the titles checked out
Overview	(As in the business use case)
Type	Secondary and Essential
Cross Reference	System Functions: R5.1 Use Case: -
Pre-Requisites	A librarian should have user name and password.
Typical Courses of Events	(A) : Actor, (S) : System 1. (A) A librarian requests loan count 2. (S) Get <i>numOfLoan</i> of the loan
Alternative Courses of Events	N/A
Exceptional Courses of Events	N/A (Really?)

Activity 2042.

Define Reports, UI, and Storyboards

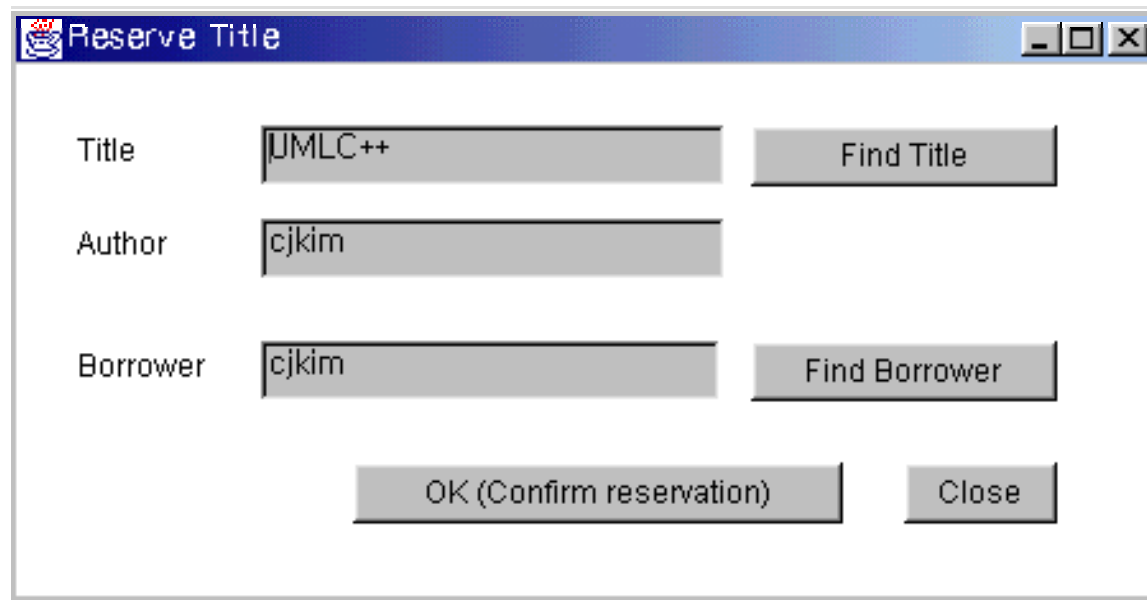
a. In parallel with interaction diagrams
b. Varied order



Activity 2042.

Define Reports, UI, and Storyboards

- Make Reservation



The image shows a screenshot of a software dialog box titled "Reserve Title". The dialog box has a blue title bar with a small icon on the left and standard window control buttons (minimize, maximize, close) on the right. The main content area contains three input fields, each with a label to its left and a button to its right. The first row has the label "Title" and the input field contains the text "UMLC++", with a "Find Title" button to its right. The second row has the label "Author" and the input field contains the text "ckim". The third row has the label "Borrower" and the input field contains the text "ckim", with a "Find Borrower" button to its right. At the bottom of the dialog box, there are two buttons: "OK (Confirm reservation)" on the left and "Close" on the right.

Activity 2042.

Define Reports, UI, and Storyboards

- Lent Item

The image shows a screenshot of a software dialog box titled "Lend Item". The dialog box has a standard Windows-style title bar with a minimize, maximize, and close button. The main content area contains the following elements:

- Title:** A text input field followed by a "Find Title" button.
- Author:** A text input field.
- Items:** A small square input field, with the text "B = Borrowed" and "F = Free" displayed to its right.
- Borrower:** A text input field followed by a "Find Borrower" button.
- Bottom:** Two buttons: "OK (Confirm Loan)" and "Cancel".

Activity 2042.

Define Reports, UI, and Storyboards

- Count Loans

The screenshot shows a 'Title Information' dialog box with the following fields and buttons:

- Title Name: UMLC++ (Find button)
- Author: cjkim (OK button)
- ISBN / Nr: 700630-1031410
- Type: Book

Below the input fields, there are two summary boxes:

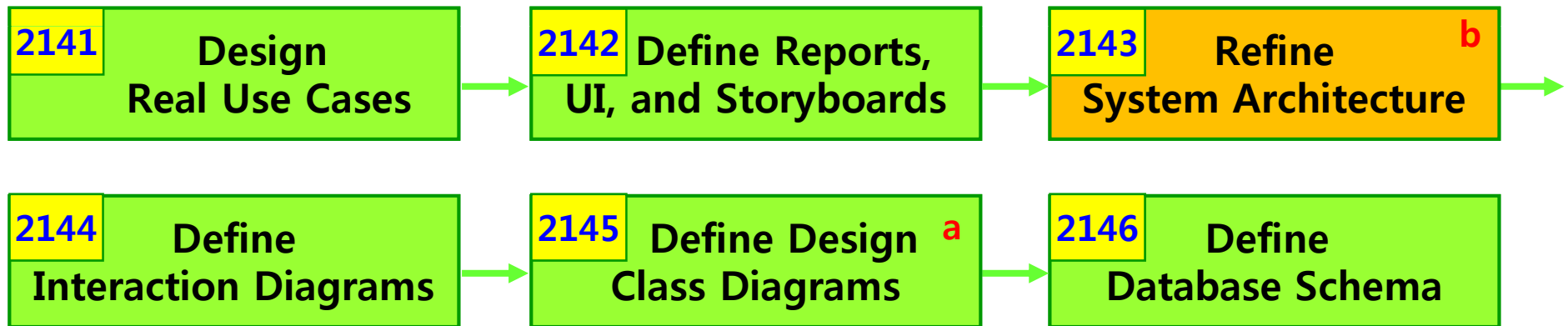
- Items Available:** (Item:1): Borrowed, (Item:2): Borrowed, (Item:3): Free
- Reservations:** 1111

At the bottom, there are two total counts:

- Total : 3, Borrowed : 2, Free : 1
- Total : 1

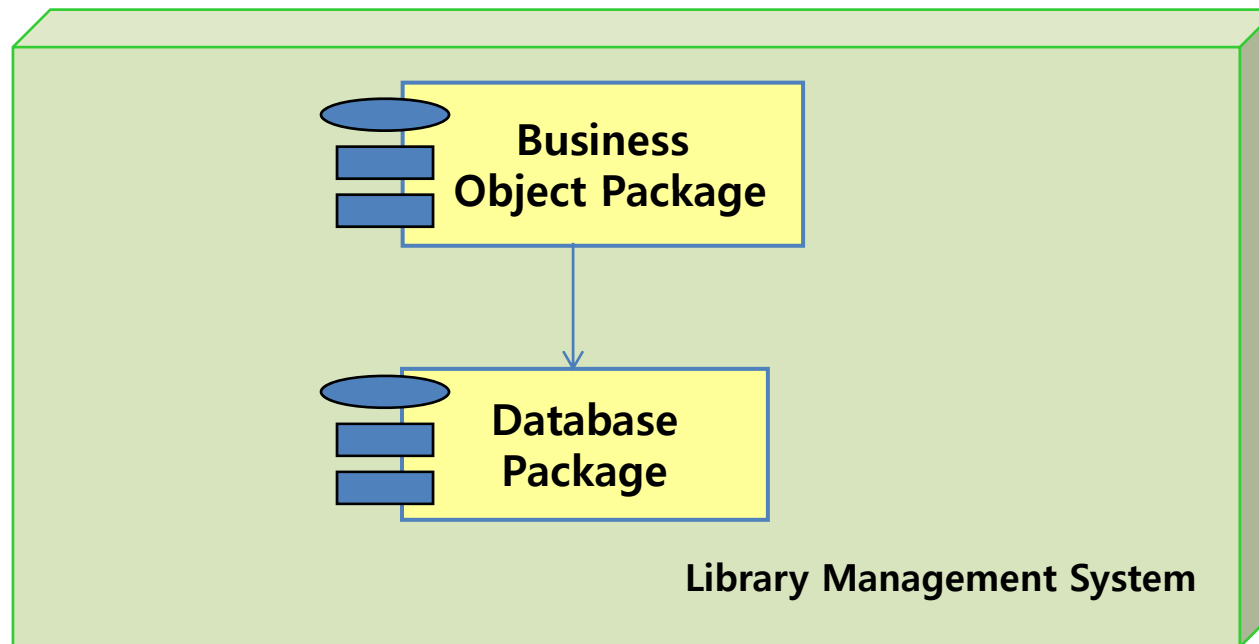
Activity 2043. Refine System Architecture

a. In parallel with interaction diagrams
b. Varied order



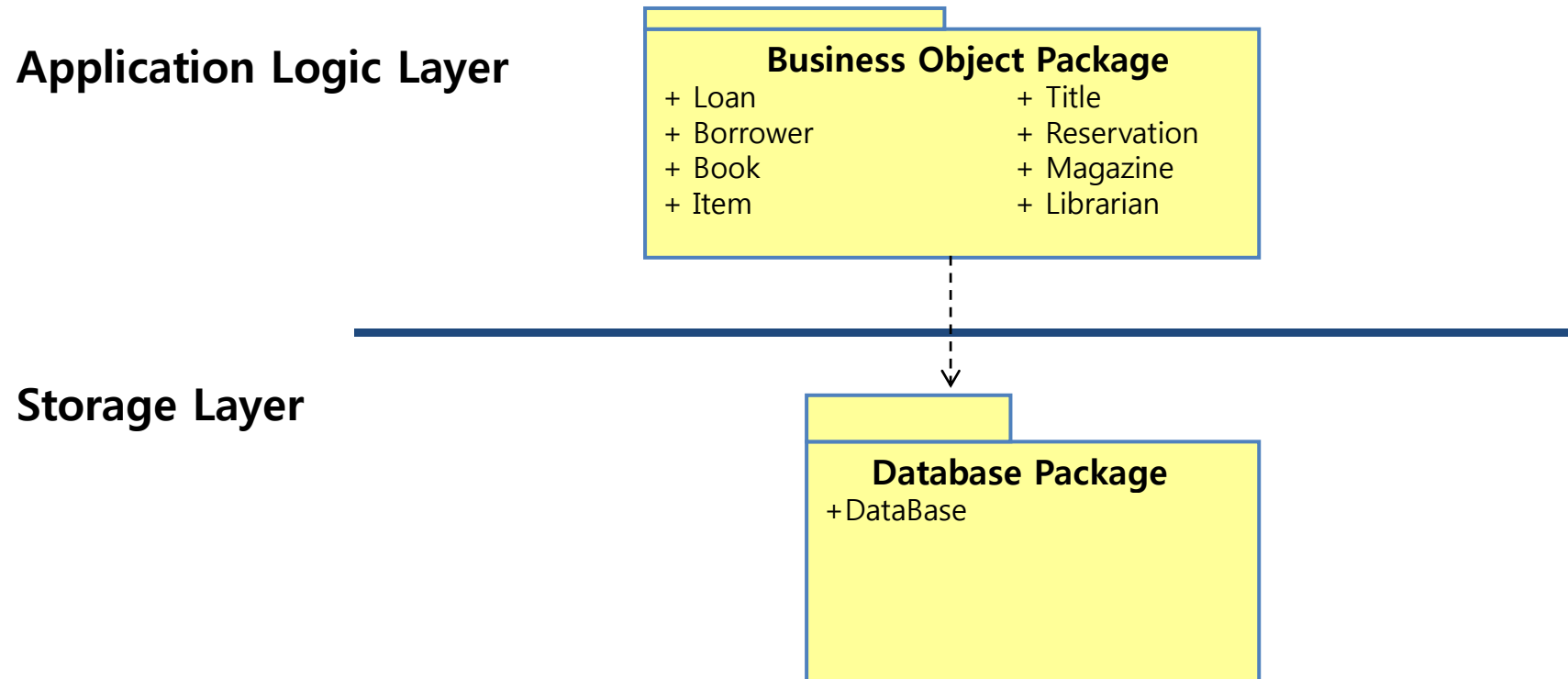
Activity 2043. Refine System Architecture

- Steps 1~3 : Drawing Deployment Diagram



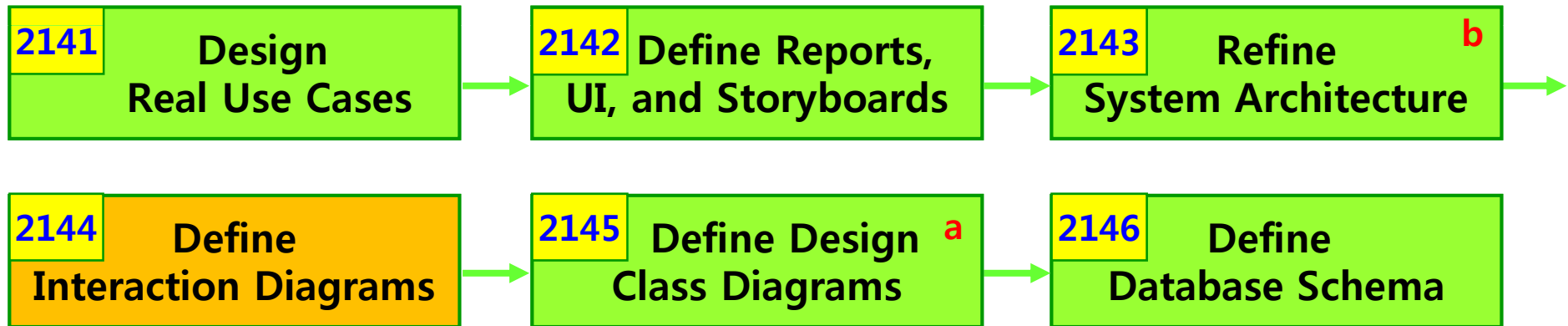
Activity 2043. Refine System Architecture

- Steps 4~7 : Drawing Package Diagram

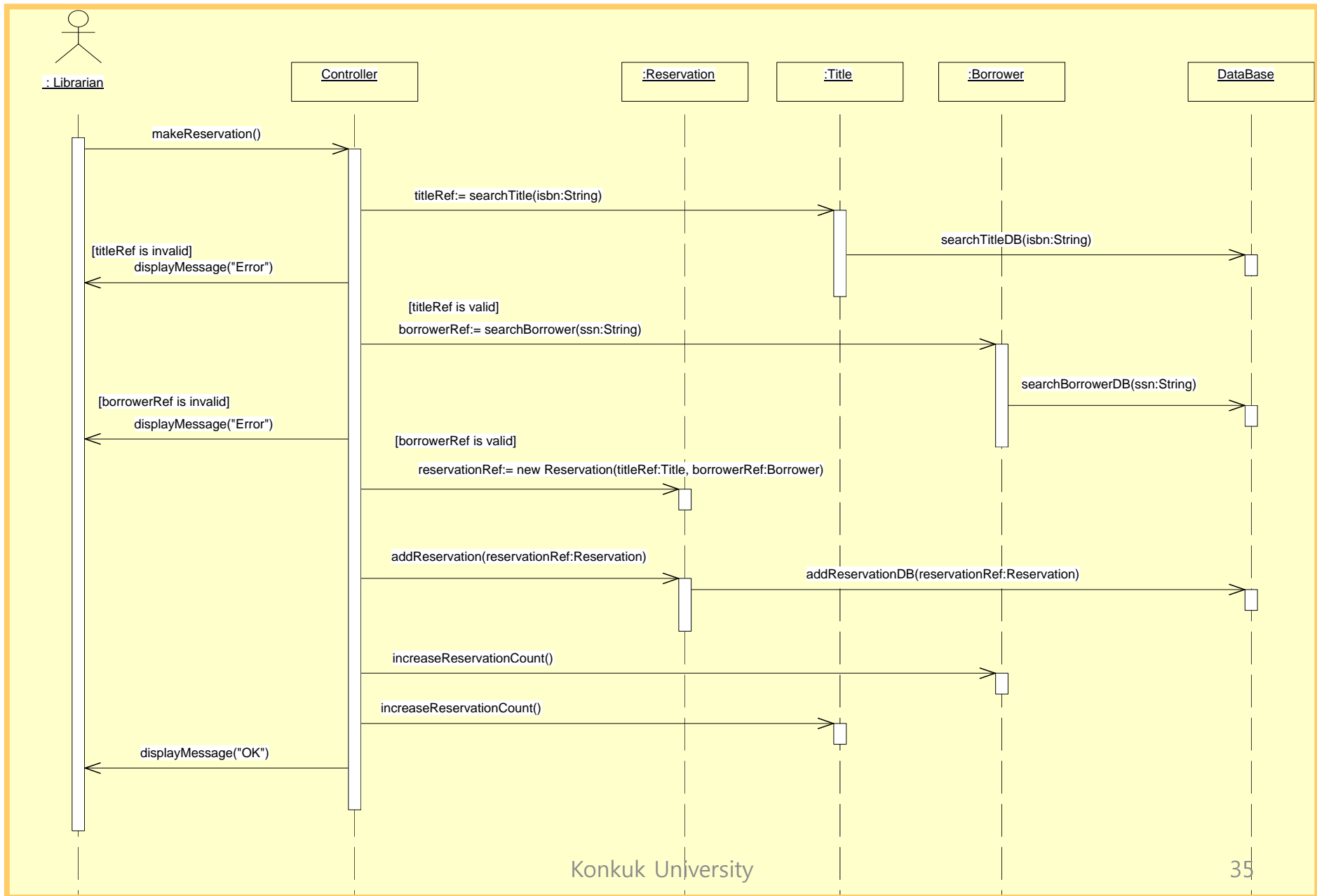


Activity 2044. Define Interaction Diagrams

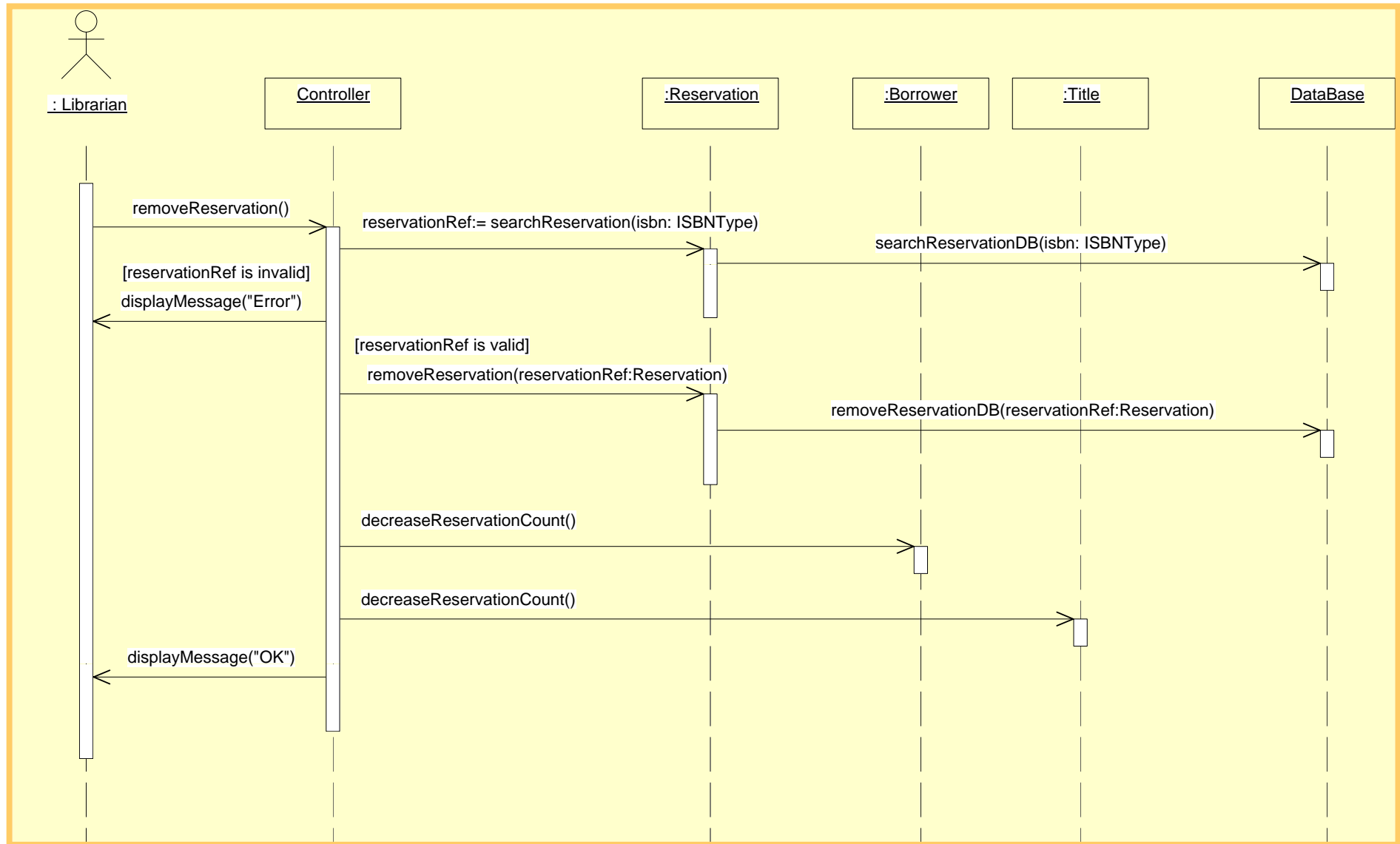
a. In parallel with interaction diagrams
b. Varied order



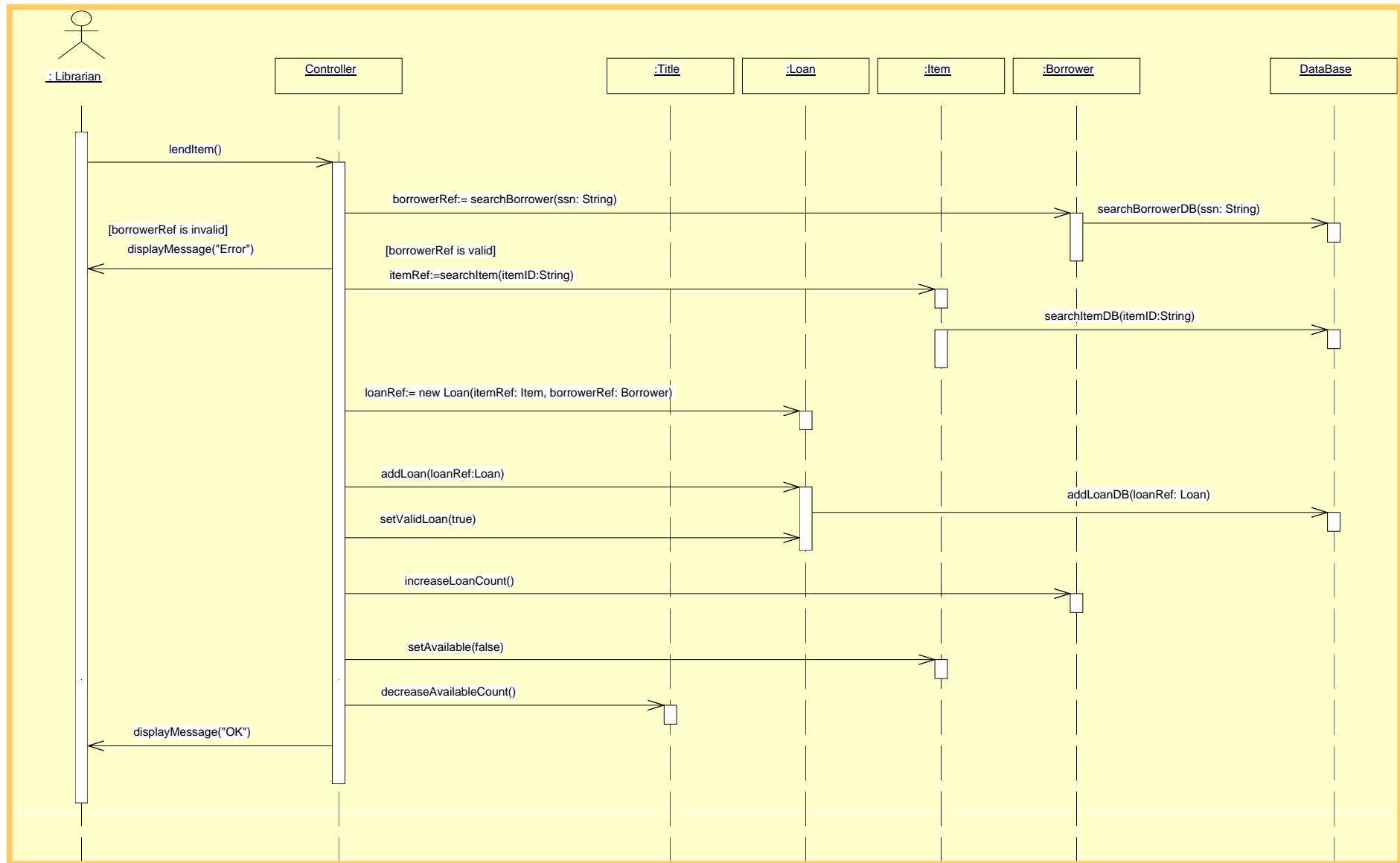
1. Make Reservation



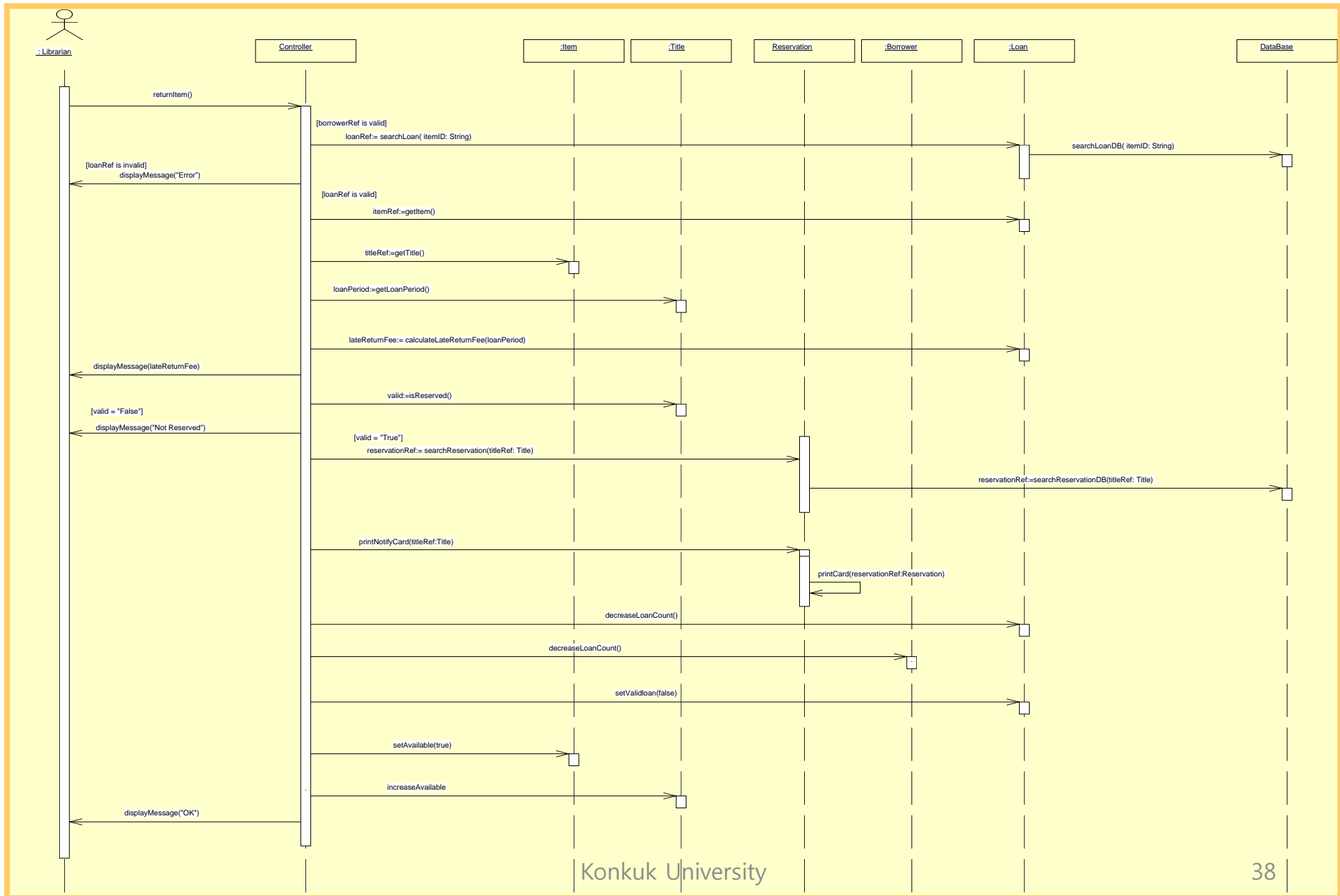
2. Remove Reservation



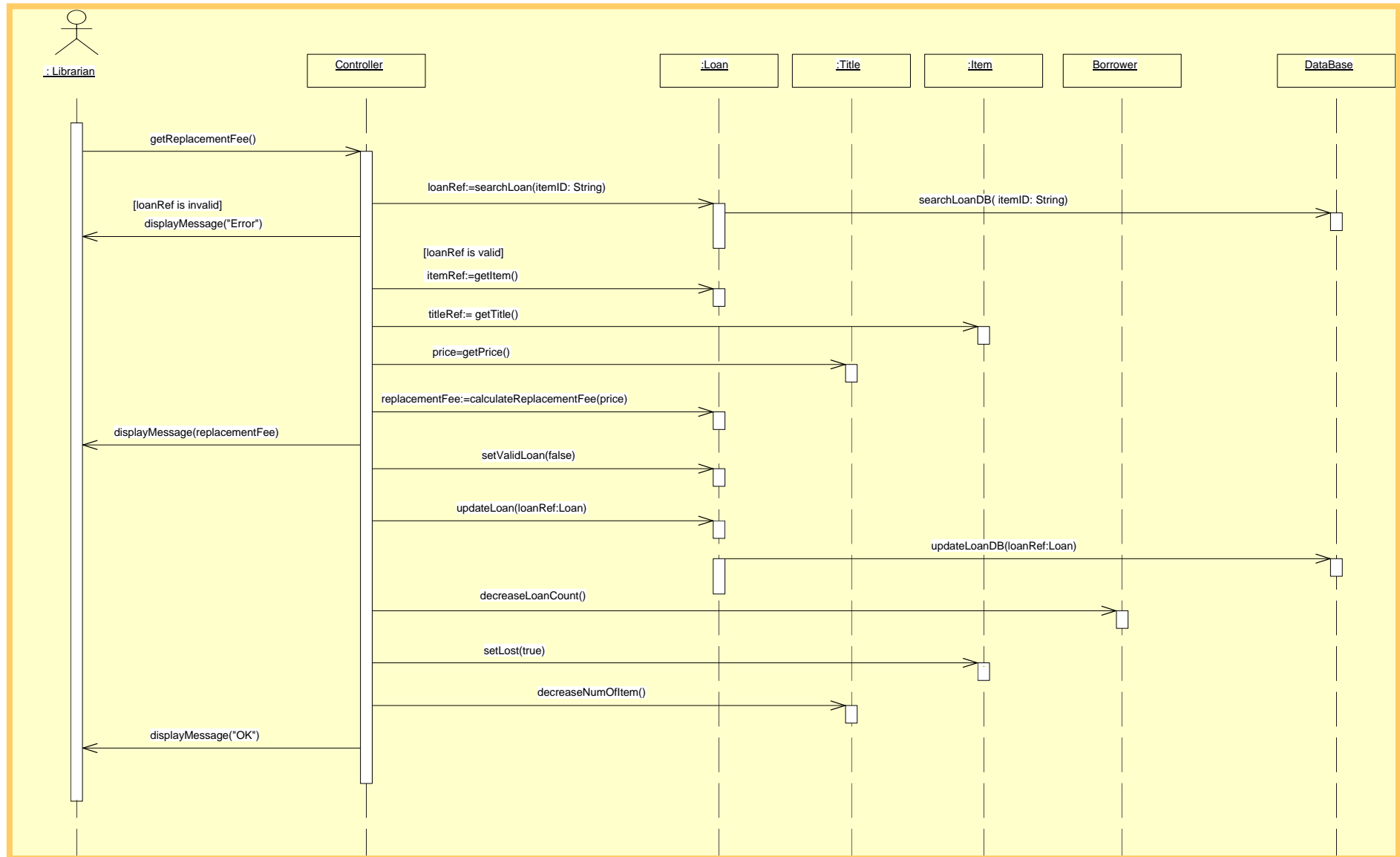
3. Lend Item



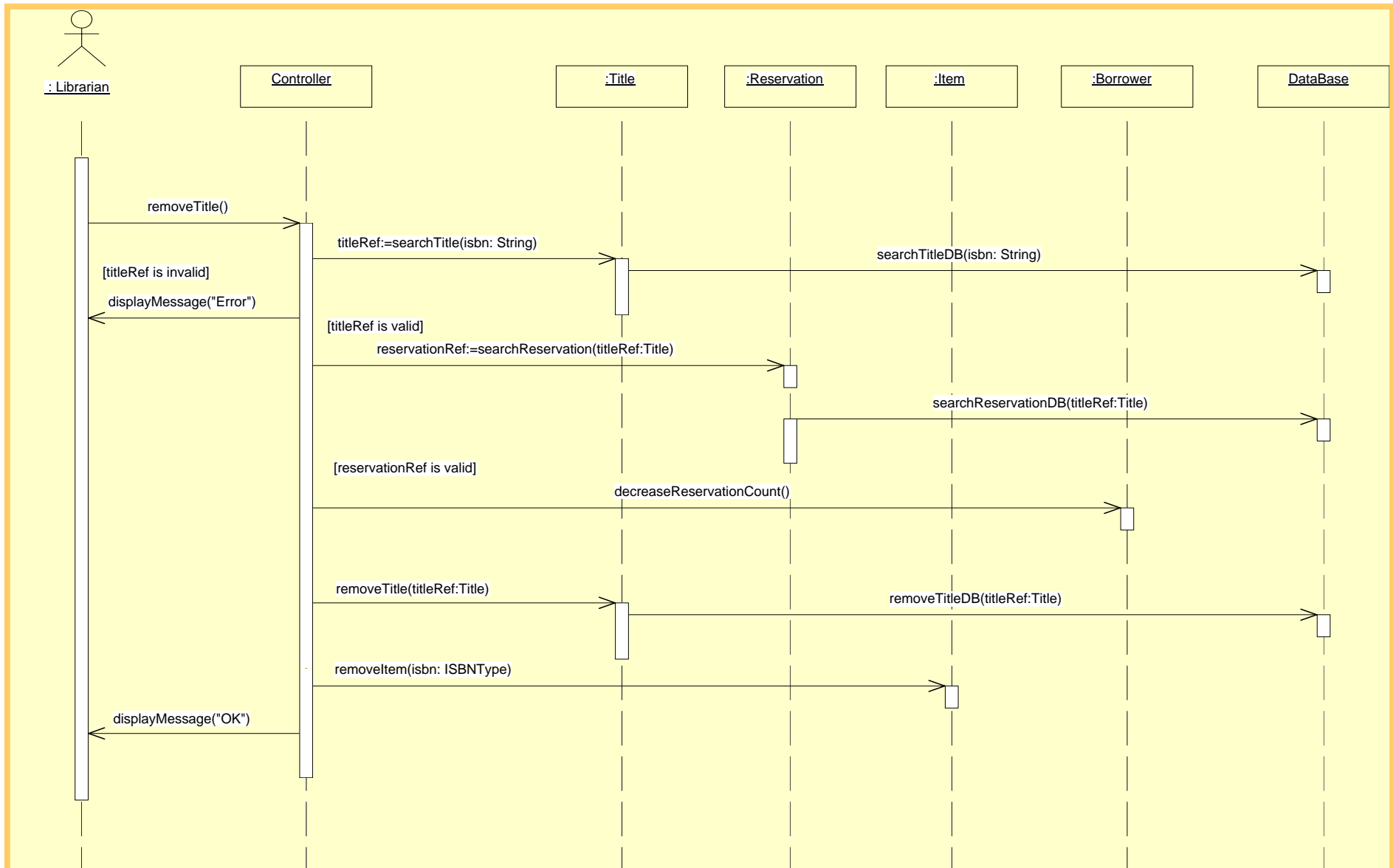
4. Return Item



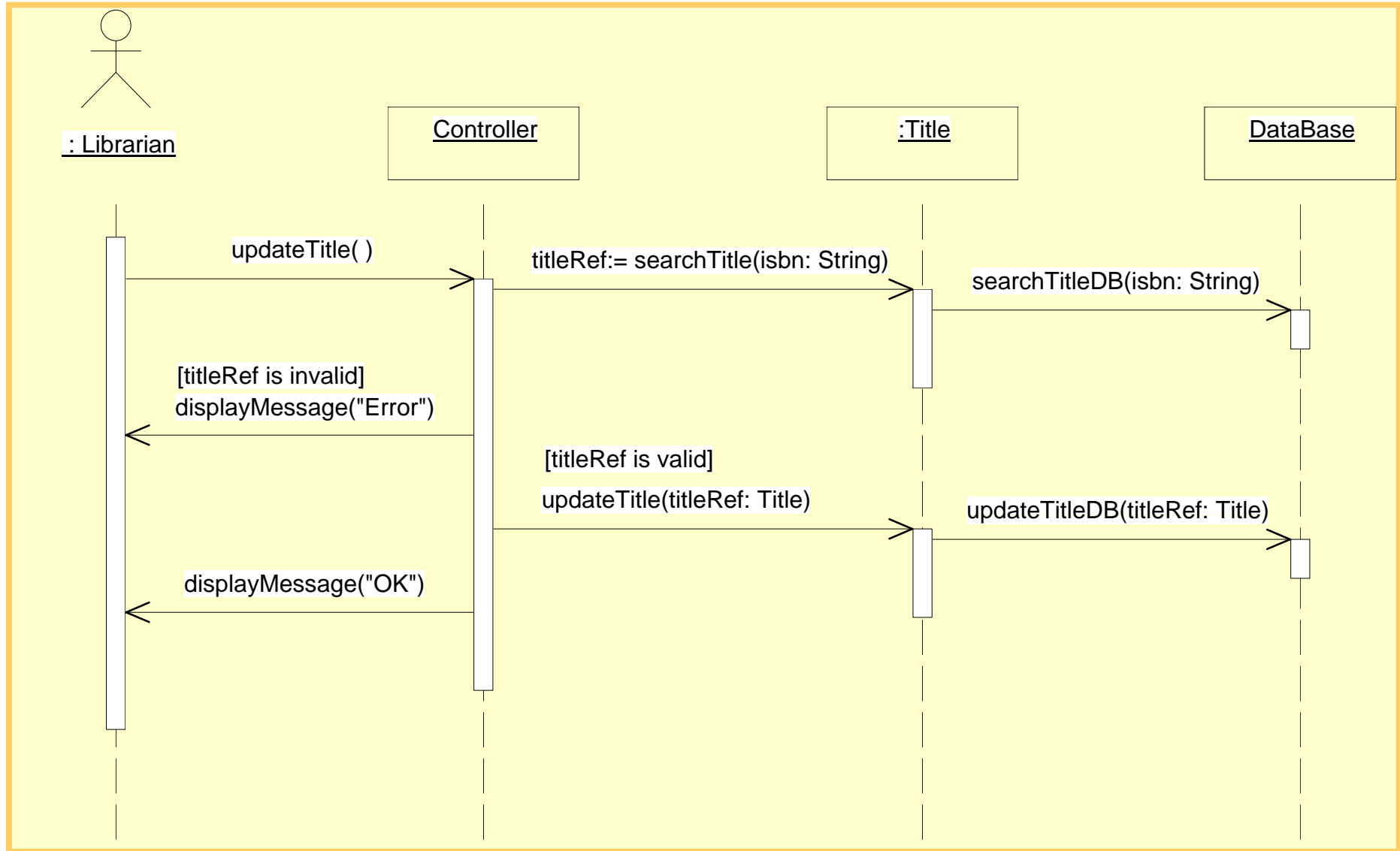
6. Get Replacement-Fee



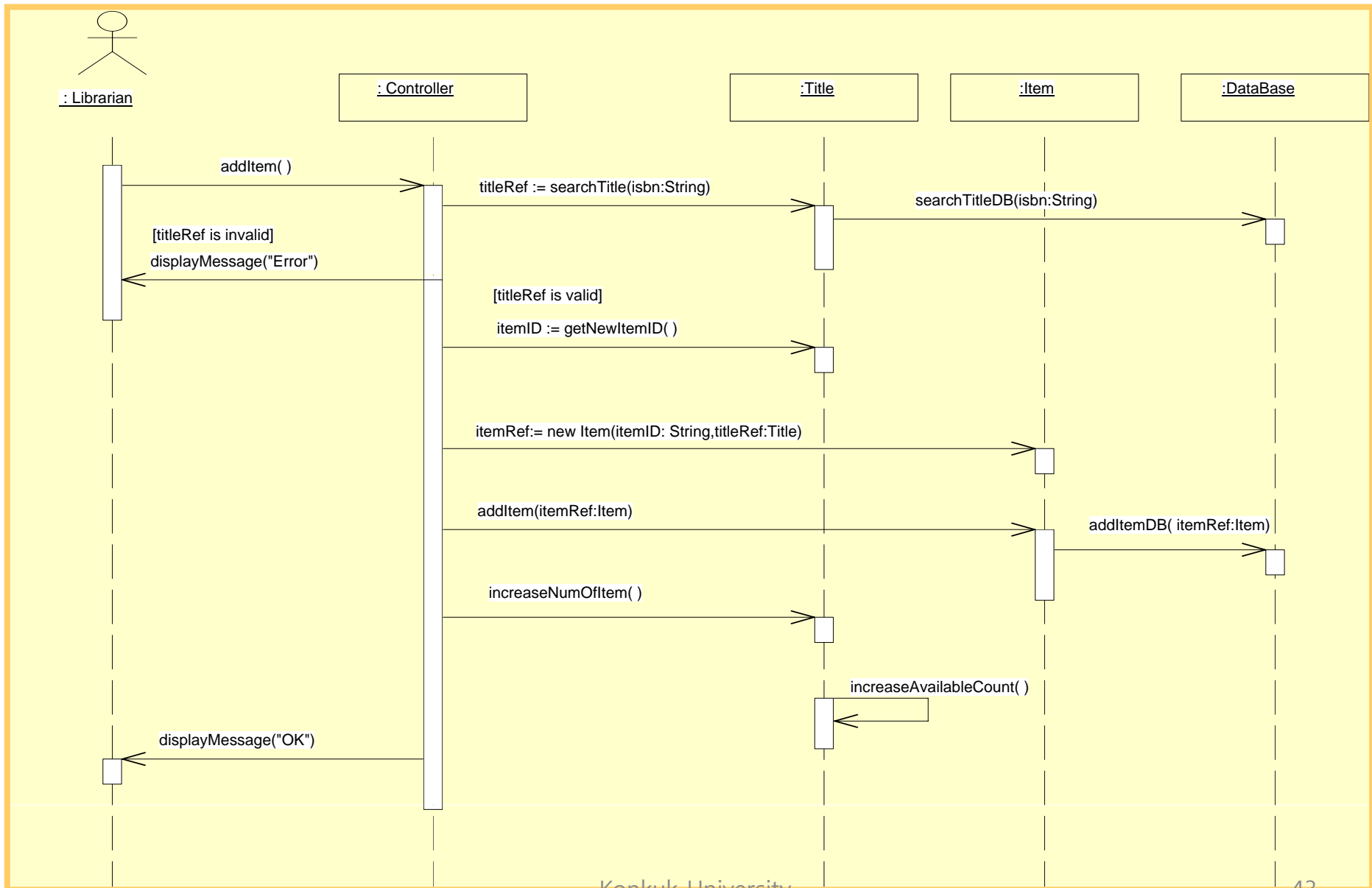
9. Remove Title



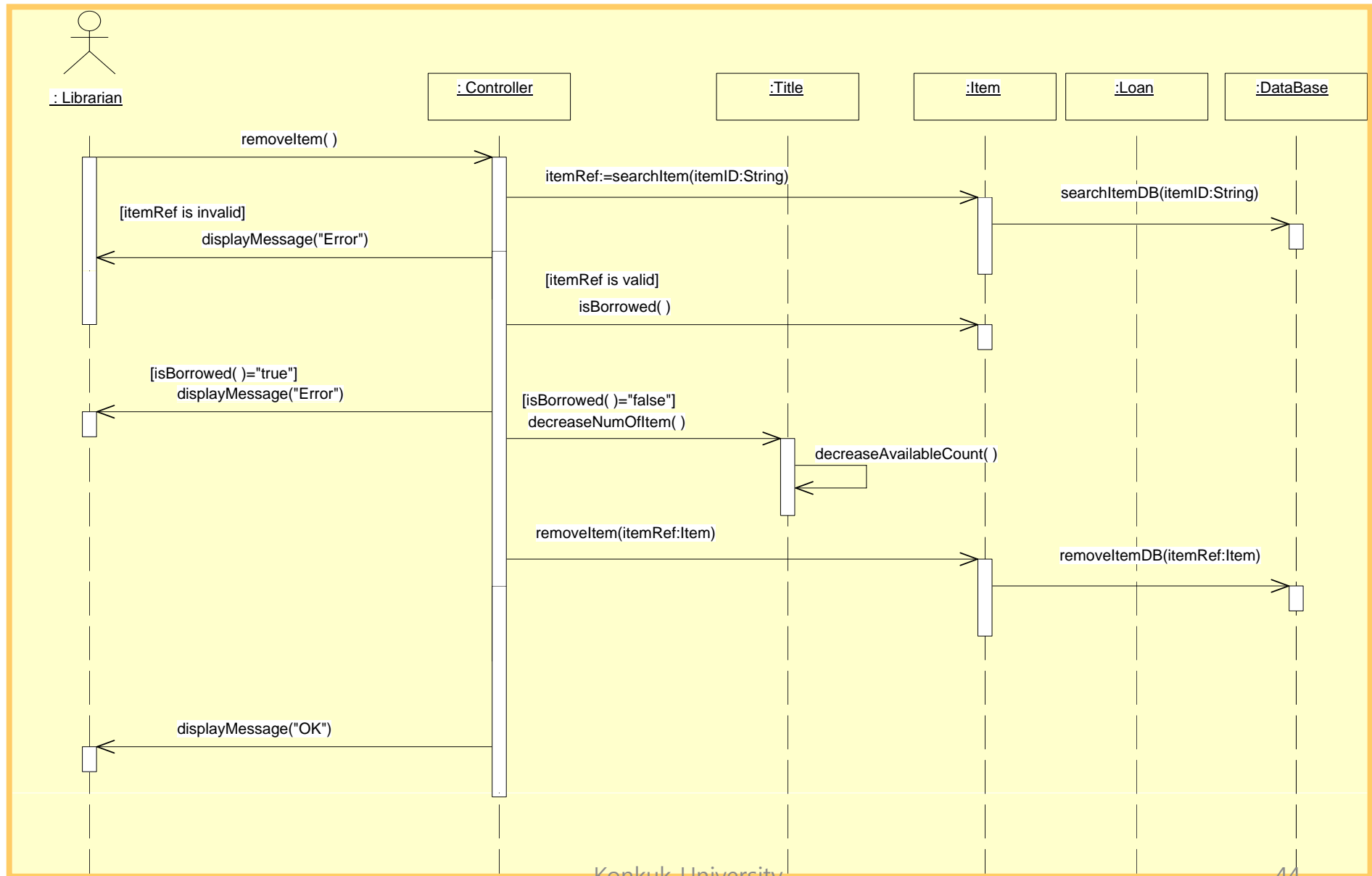
10. Update Title



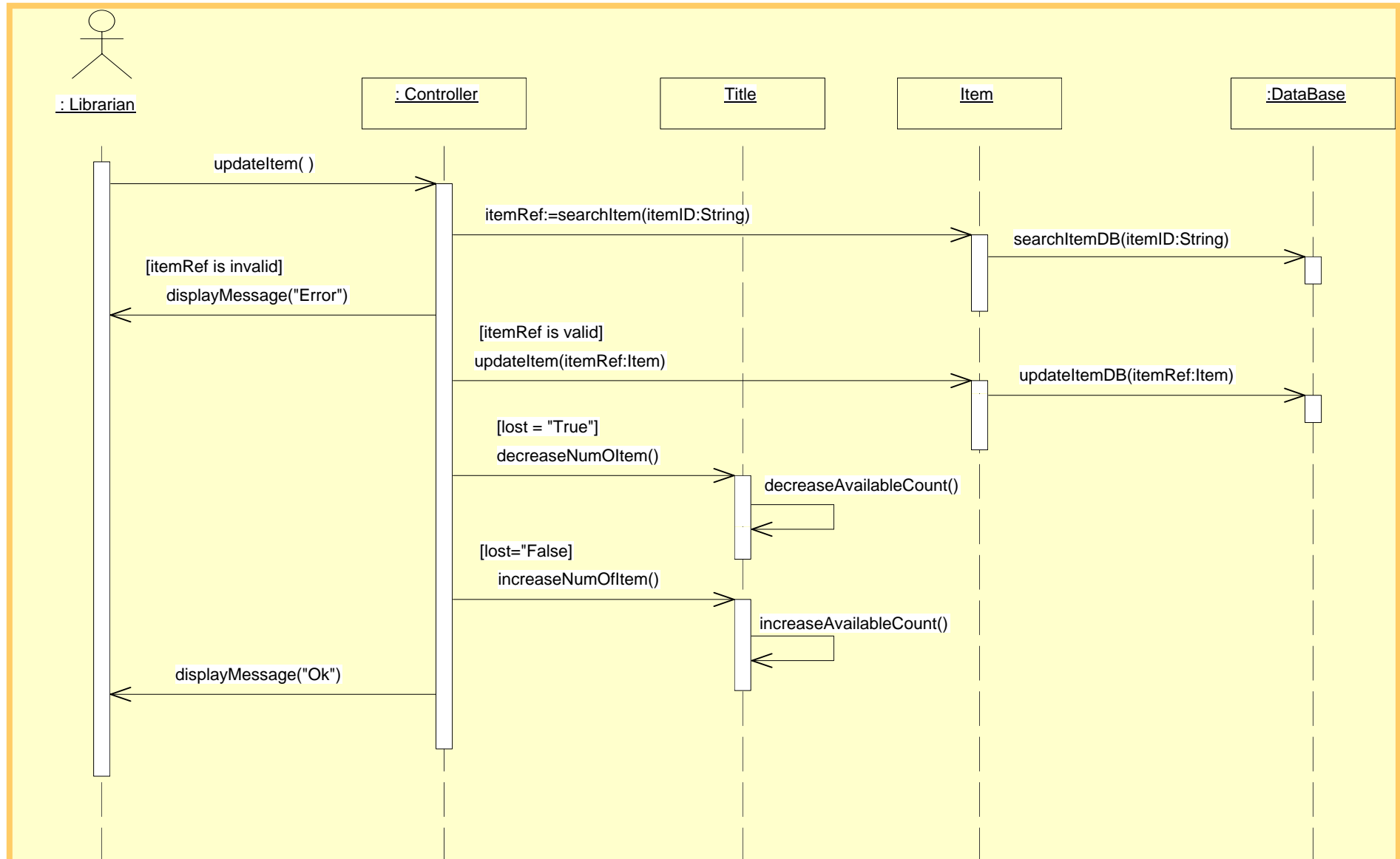
11. Add Item



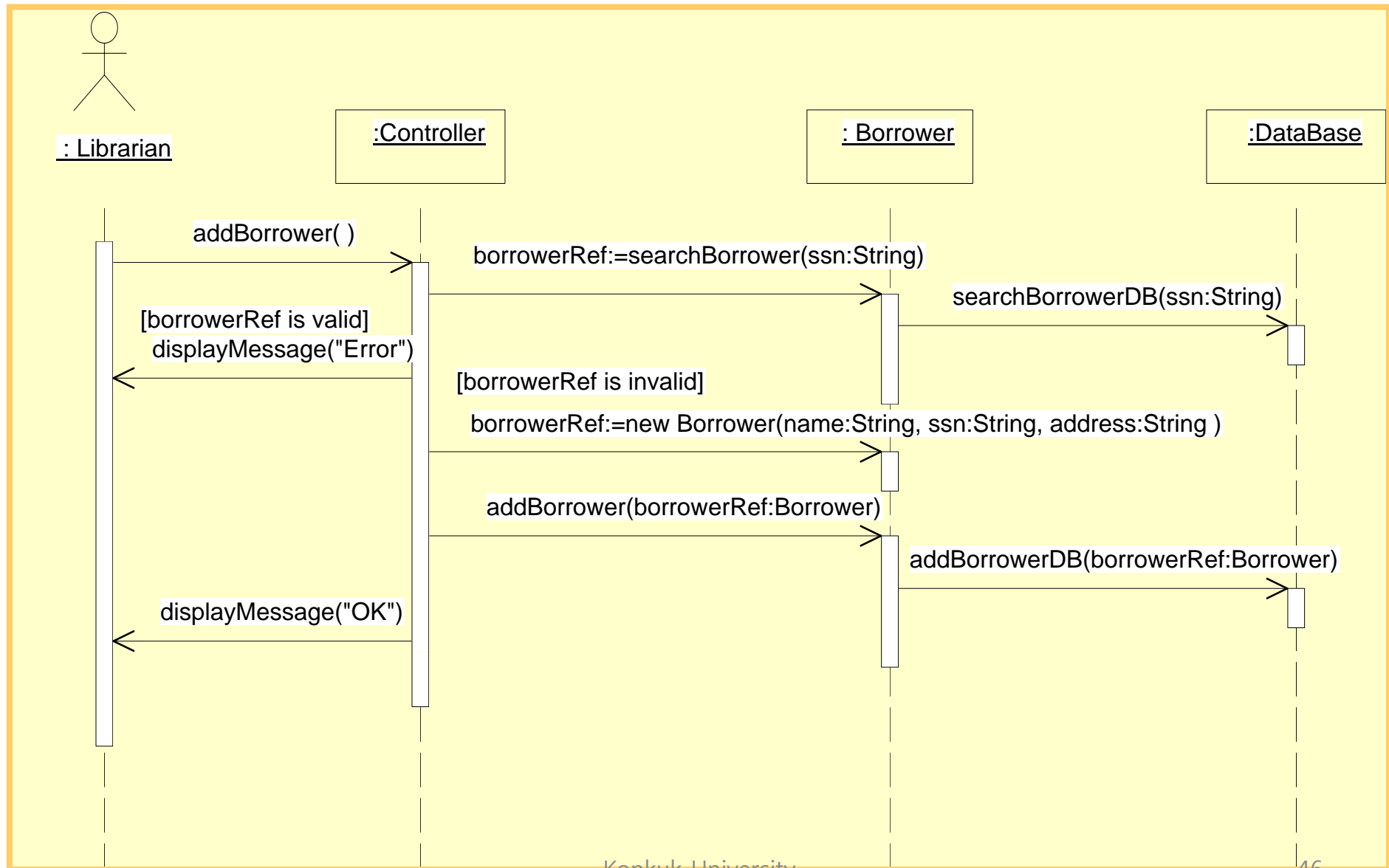
12. Remove Item



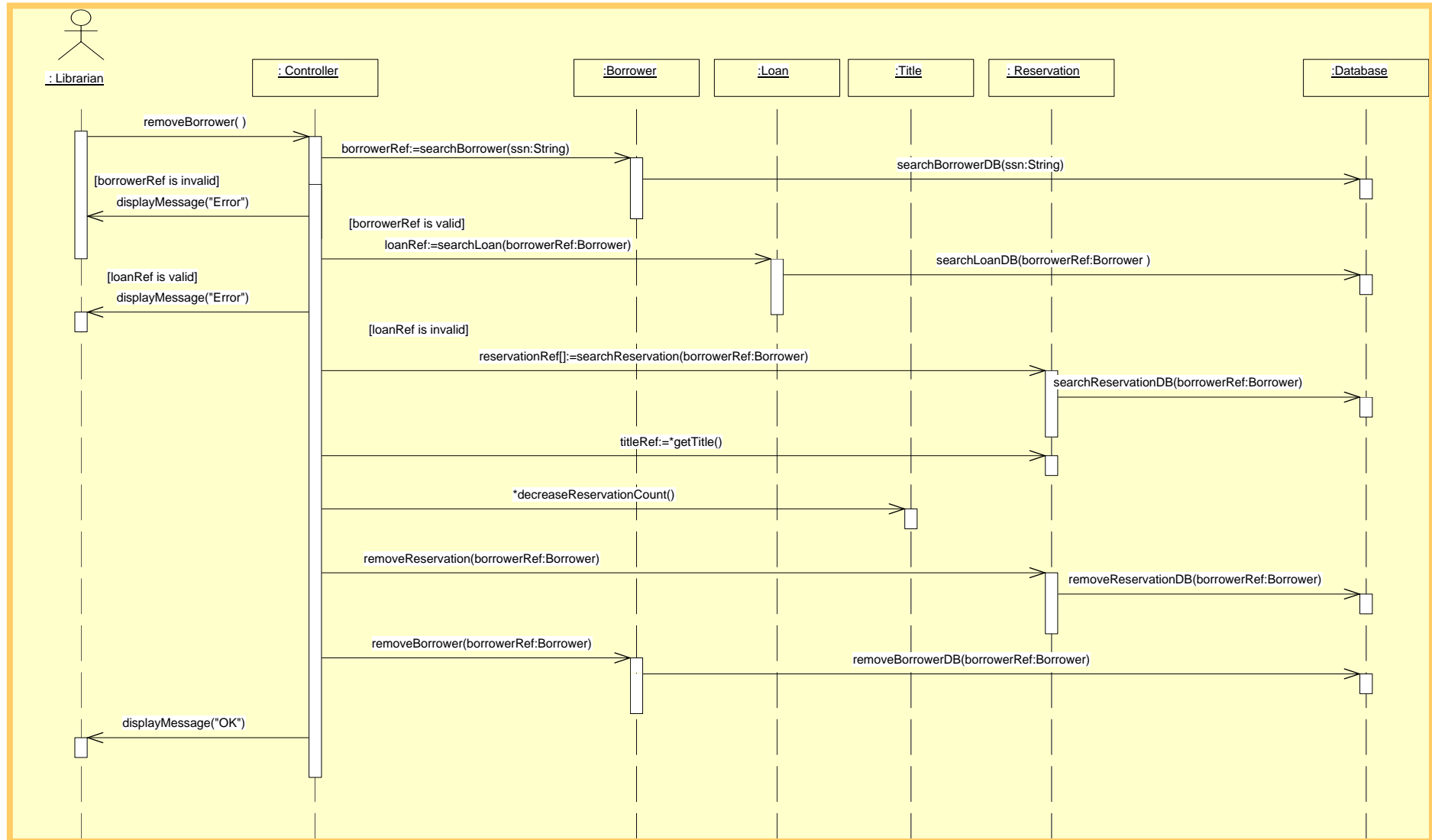
12. Update Item



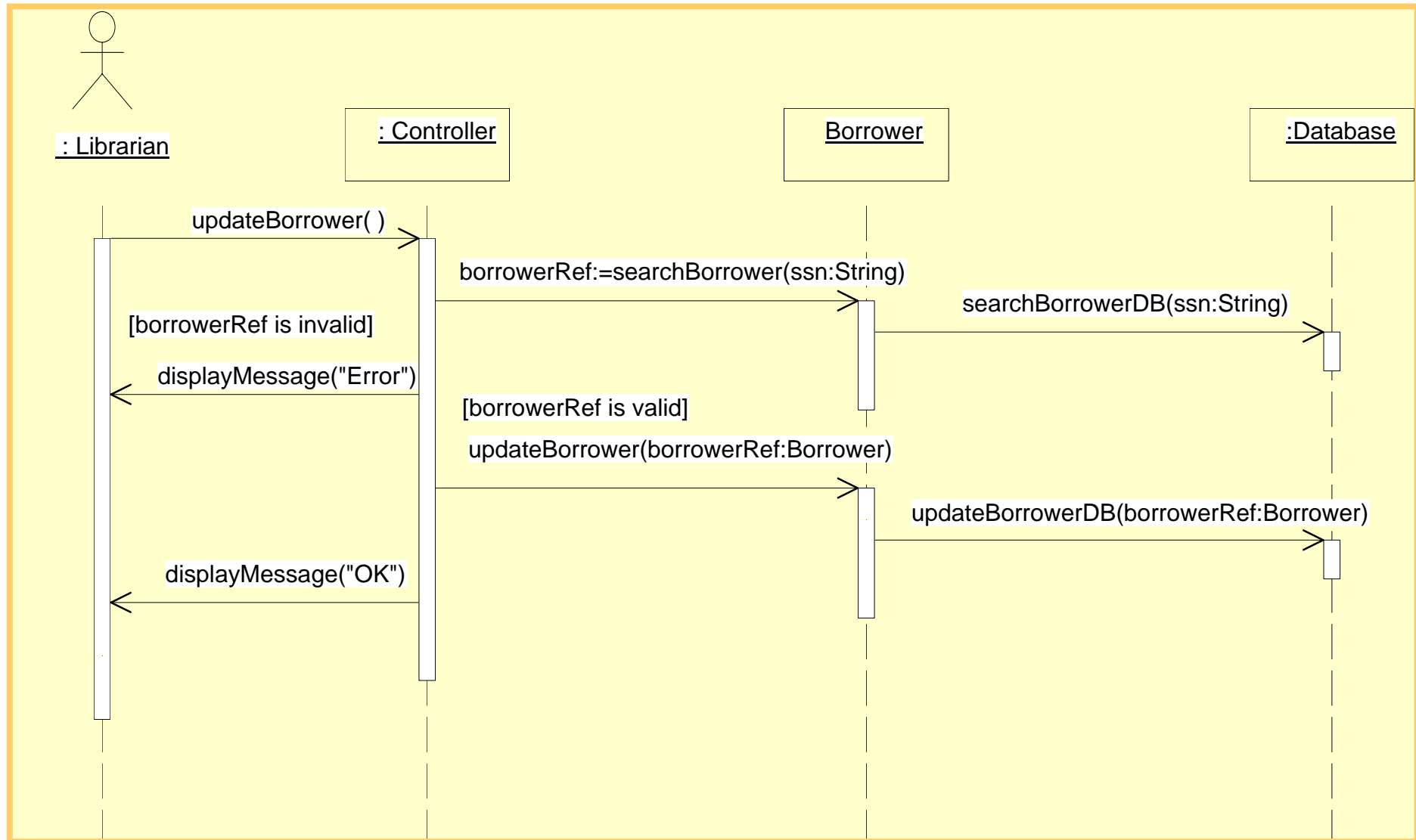
14. Add Borrower



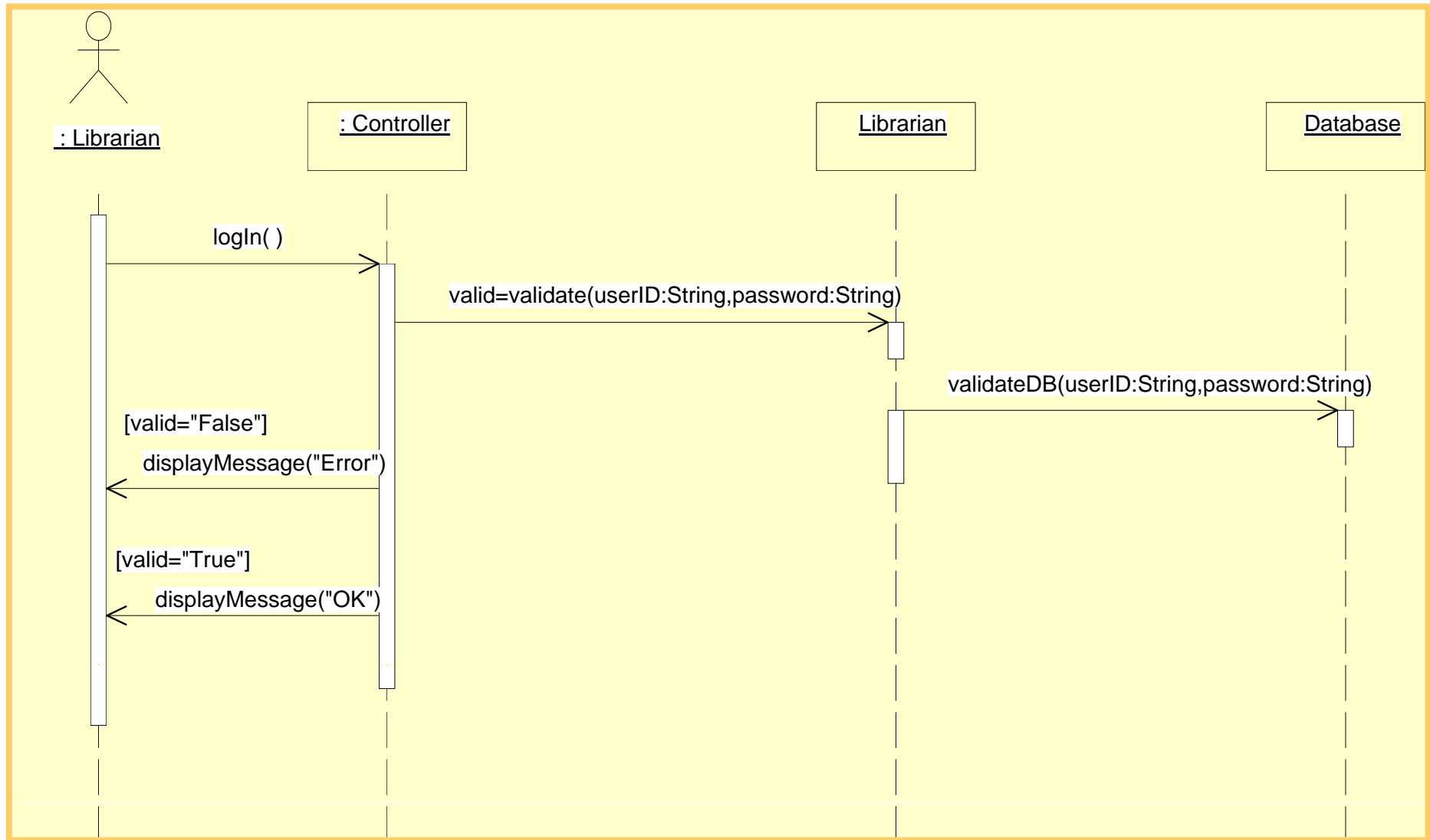
15. Remove Borrower



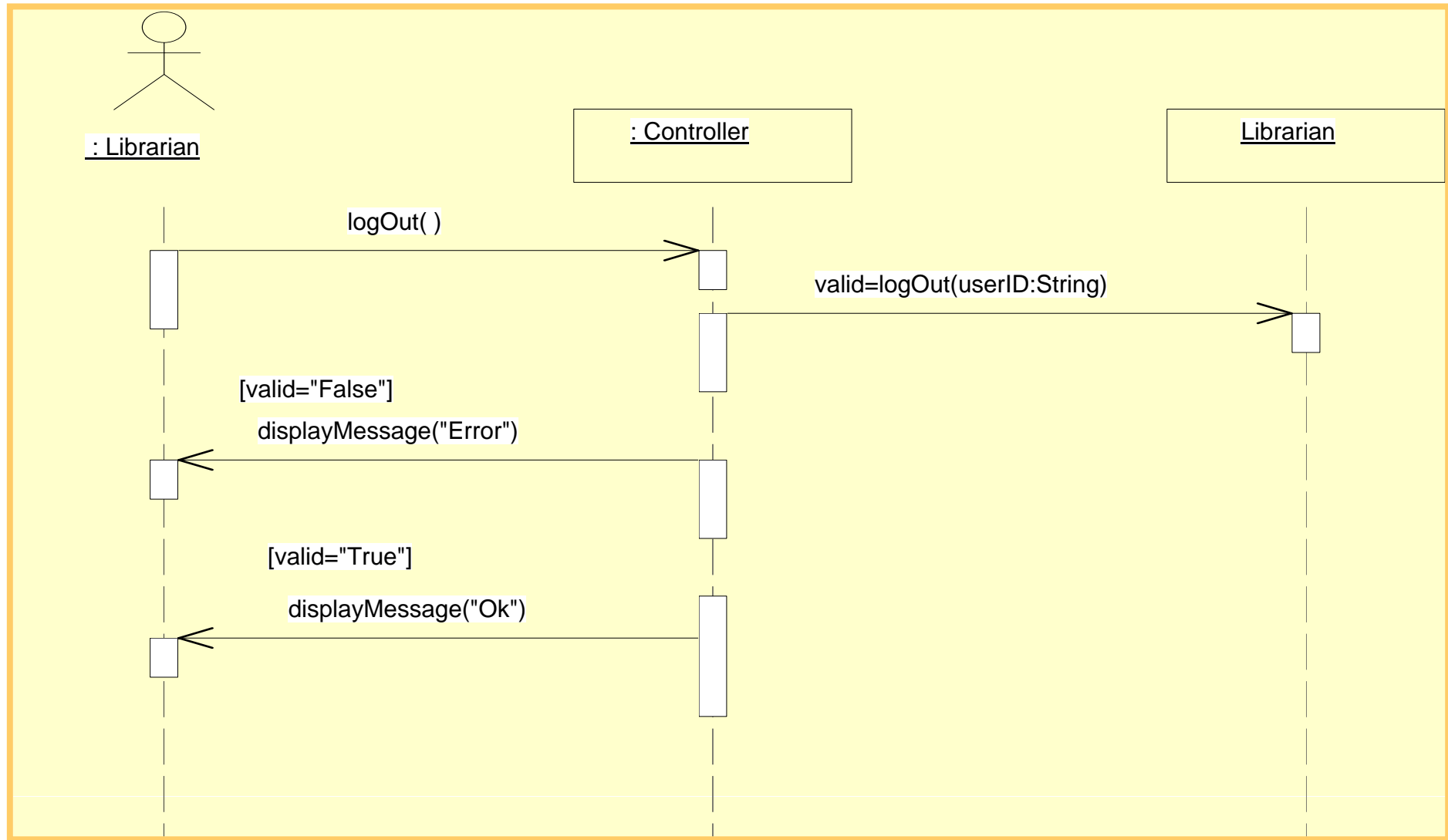
16. Update Borrower



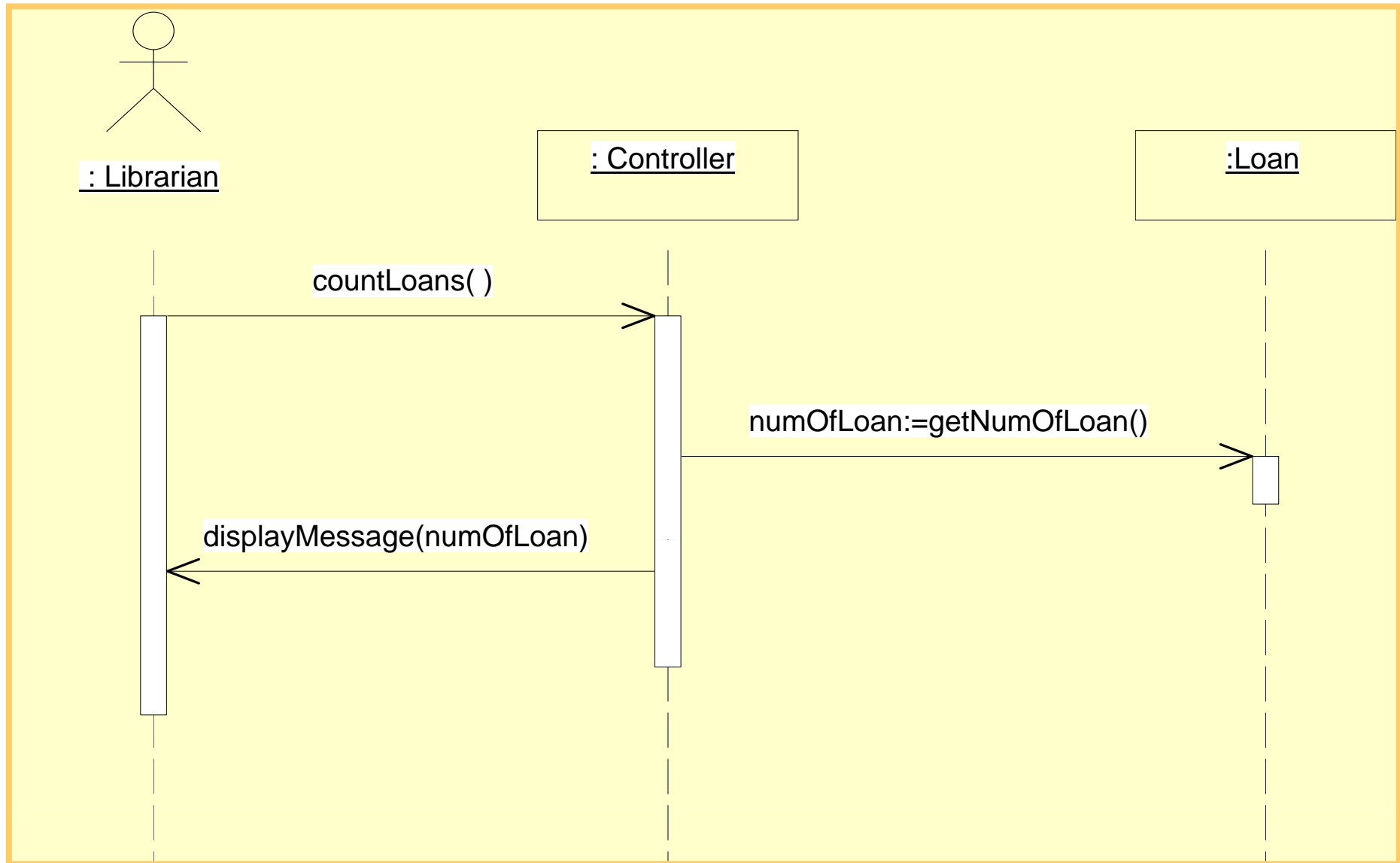
17. Log-In



18. Log-Out

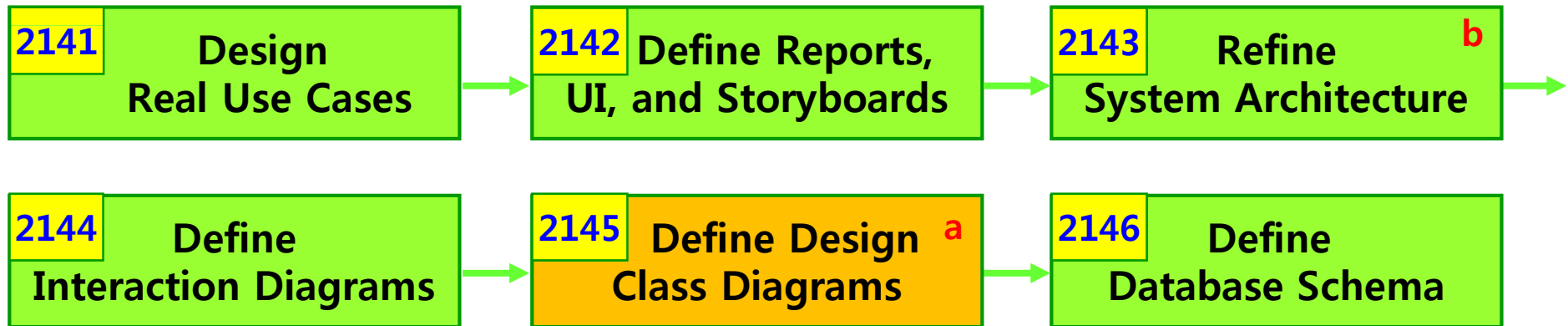


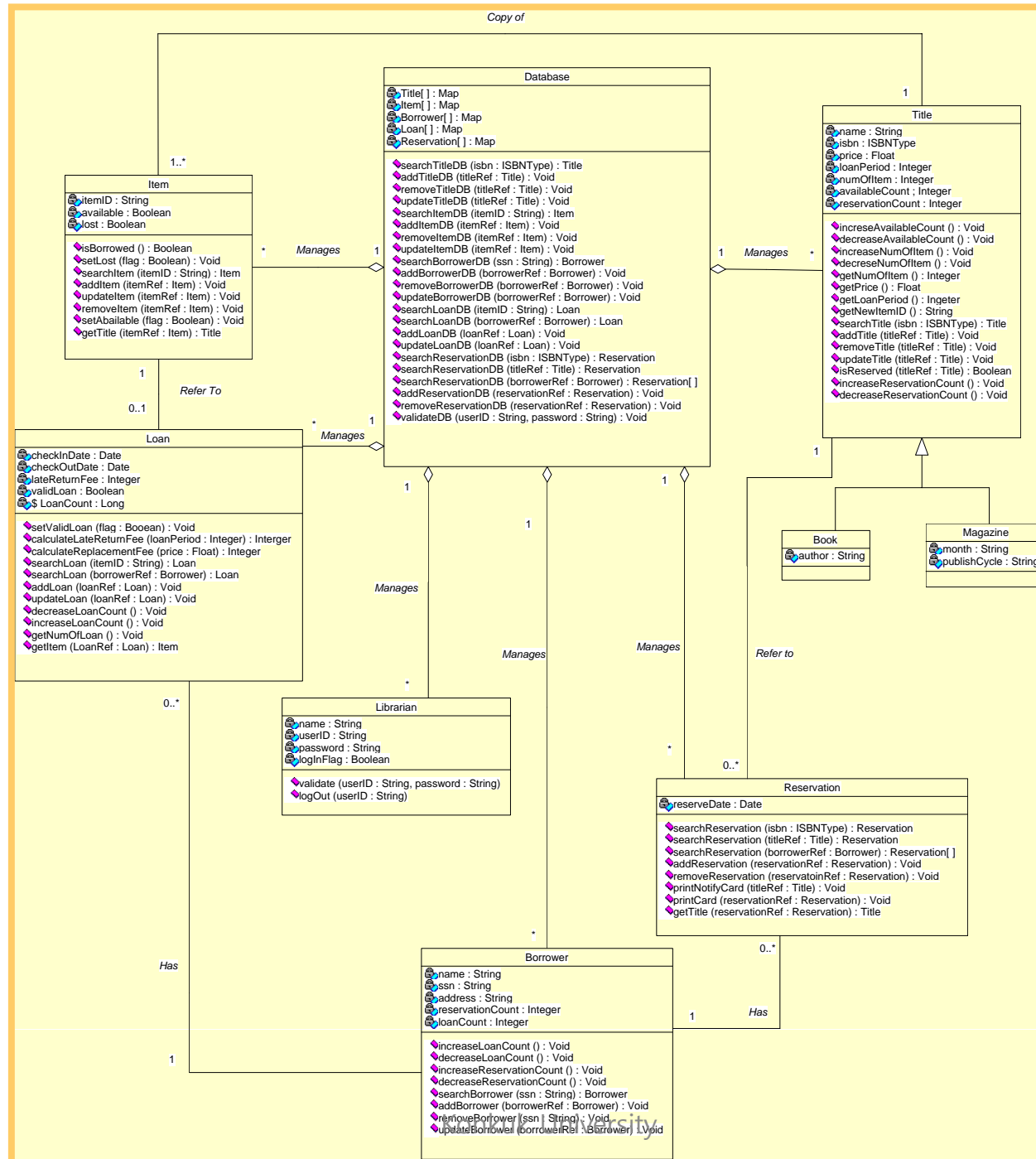
19. Count Loans



Activity 2045. Define Design Class Diagram

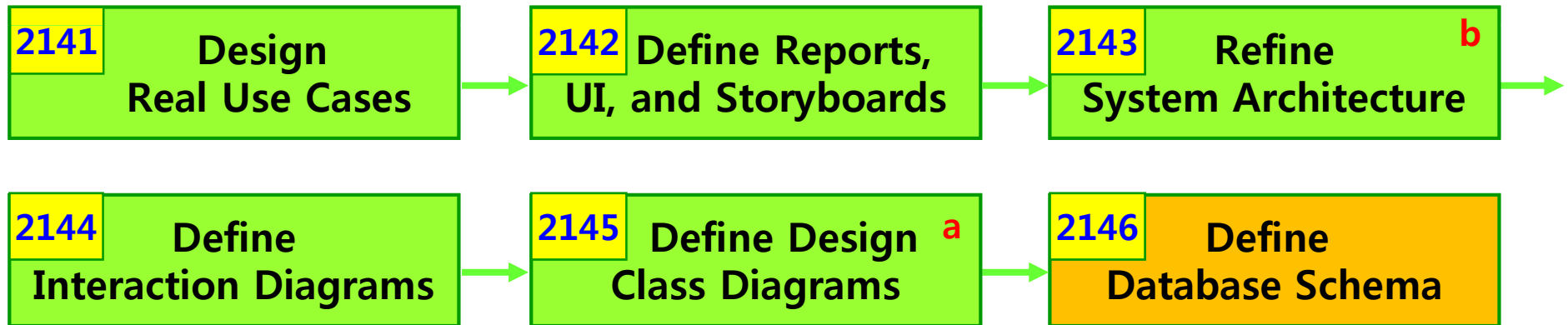
a. In parallel with interaction diagrams
b. Varied order





Activity 2046. Define Database Schema

a. In parallel with interaction diagrams
b. Varied order



Phase 2040. Design

- Phase 2040 Activities

a. In parallel with interaction diagrams
b. Varied order

