FARABI UNIVERSITY
DEPARTMENT OF COMPUTER SCIENCE

Lecture 6.
UML Sequence Diagrams

Participants, messages and interaction scenarios

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Lecture goals and plan

Learning outcomes

Read lifelines and message order.

Distinguish synchronous calls, asynchronous messages and replies.

Model choices and repetition.

Derive a sequence diagram from a scenario.

Lecture plan

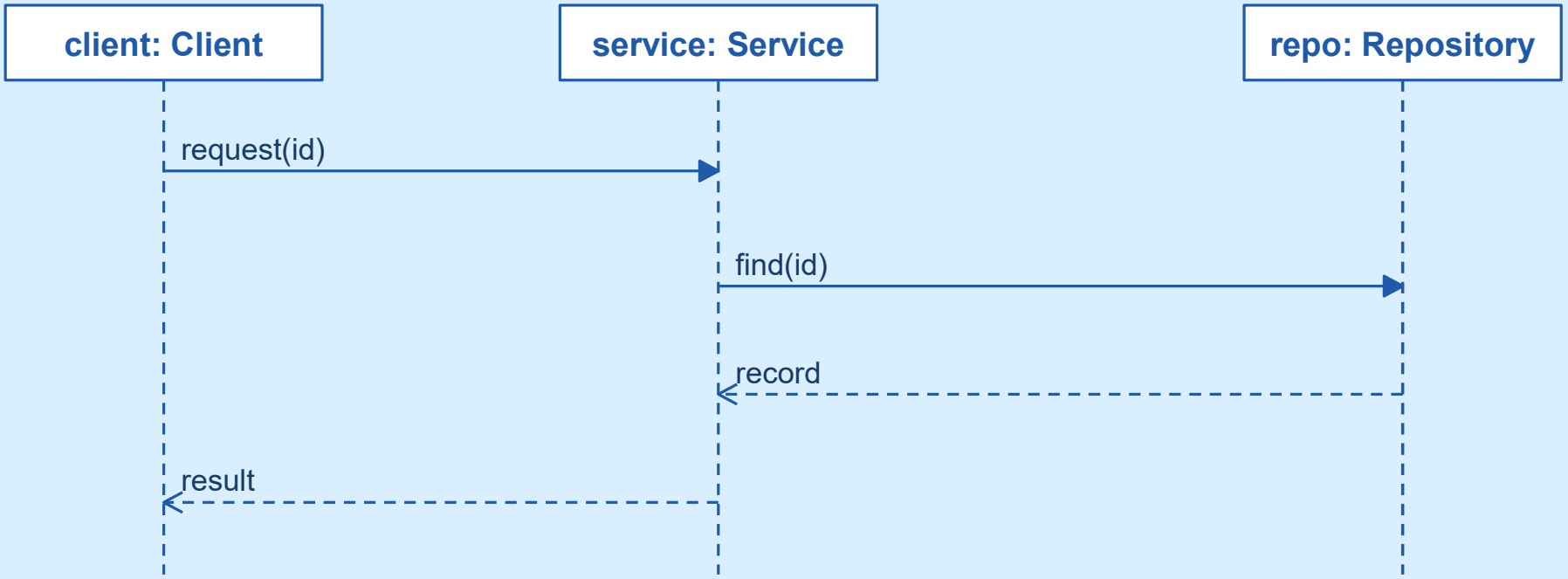
1. Lifelines and executions
2. Messages and object lifetime
3. Library-account example
4. Fragments and interaction uses
5. Review and practice

UML interaction diagrams

Diagram	Main focus
Sequence	Message exchanges and their ordering
Communication	Participant links and numbered messages
Timing	State or value changes with time constraints
Interaction overview	Control flow among interactions

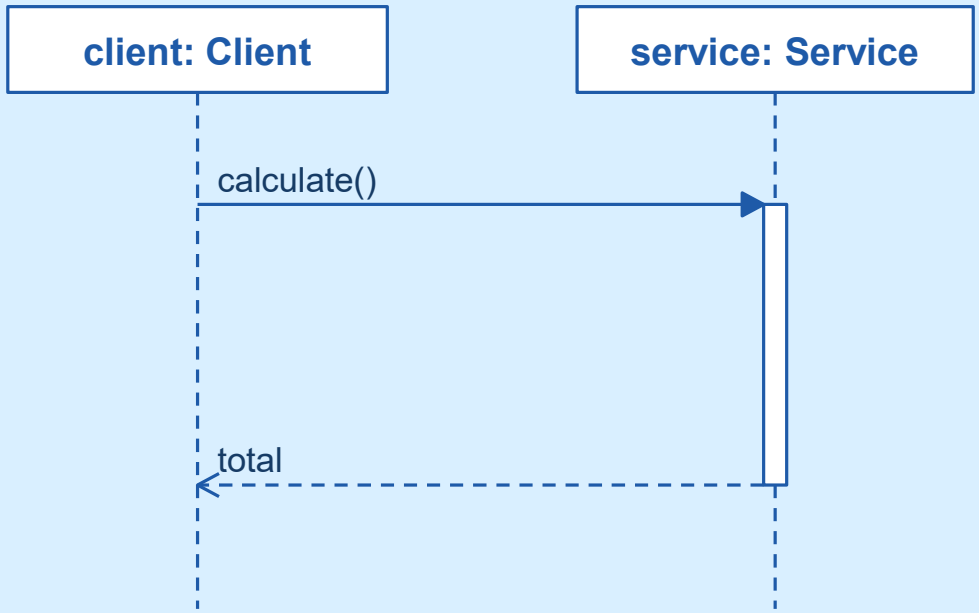
Choose the view that makes the interaction question easiest to explain.

Lifelines and event ordering



Read downward along each lifeline. Vertical spacing is not a duration scale.

Execution specifications



Meaning of the narrow bar

The participant executes behavior during this interval.

It may include waiting for a nested call.

Bar height alone gives no measured duration.

Message types and arrowheads

Synchronous call



Asynchronous message

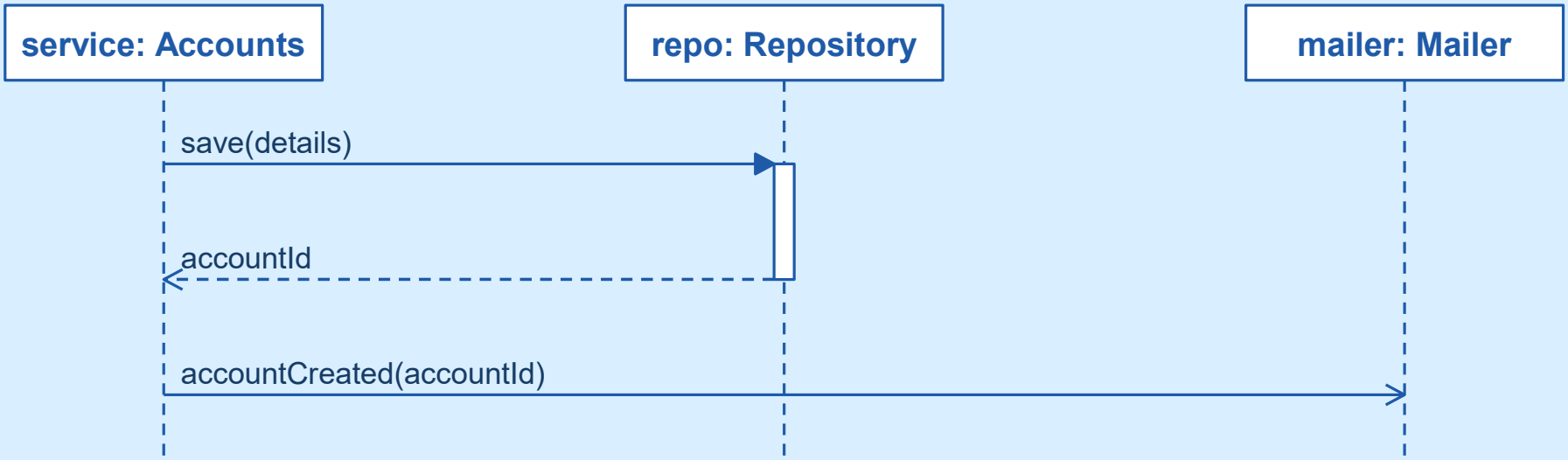


Reply



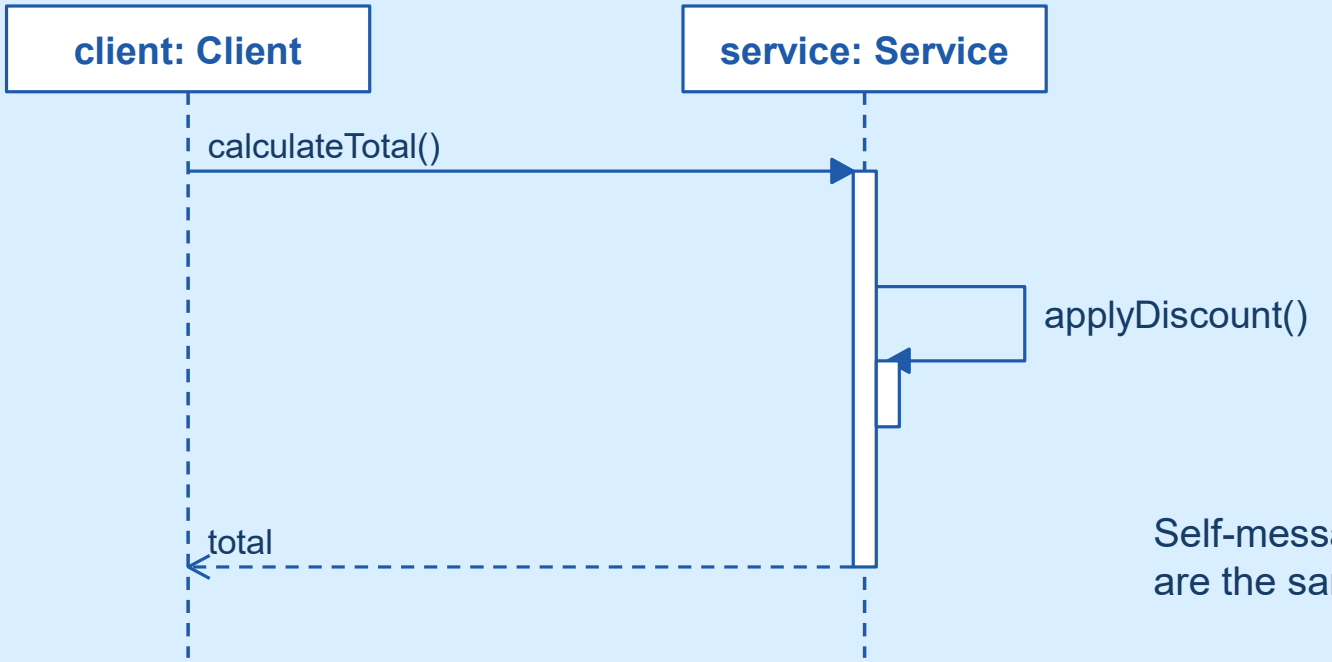
Solid filled triangle: synchronous call. Open head: asynchronous message or dashed reply.

Synchronous and asynchronous collaboration



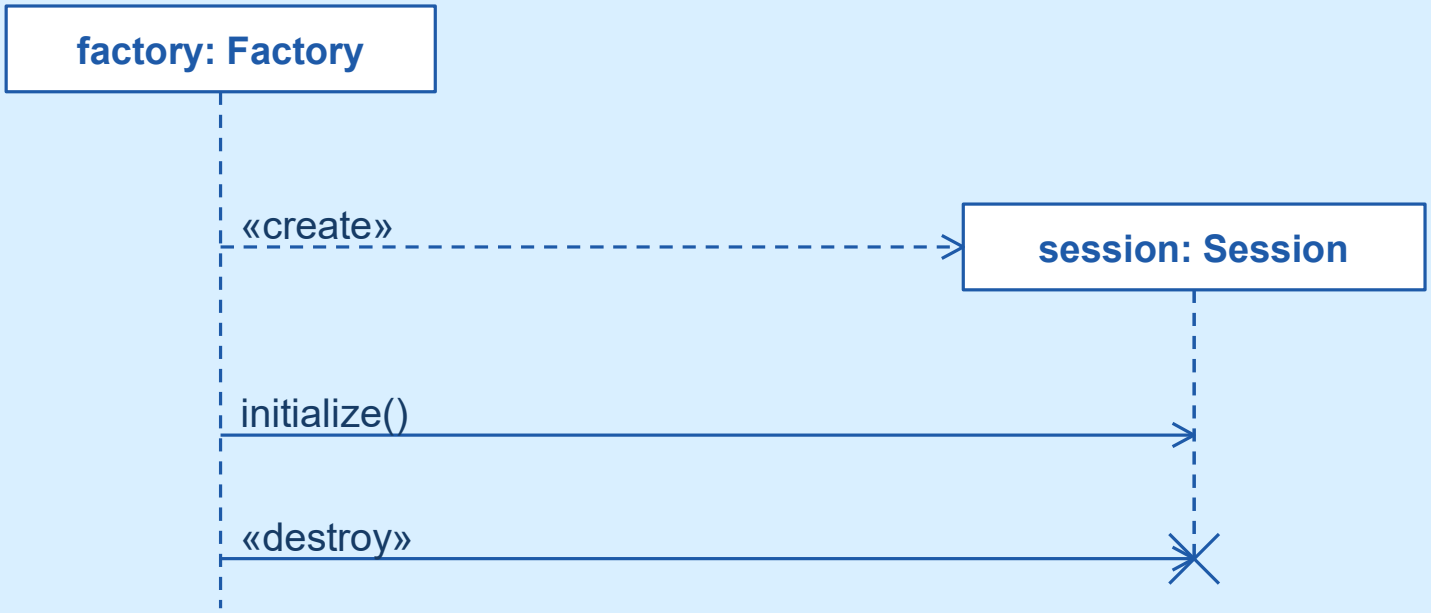
The service waits for persistence, then sends the notification.
It can continue without waiting for email processing.

Replies and self-messages



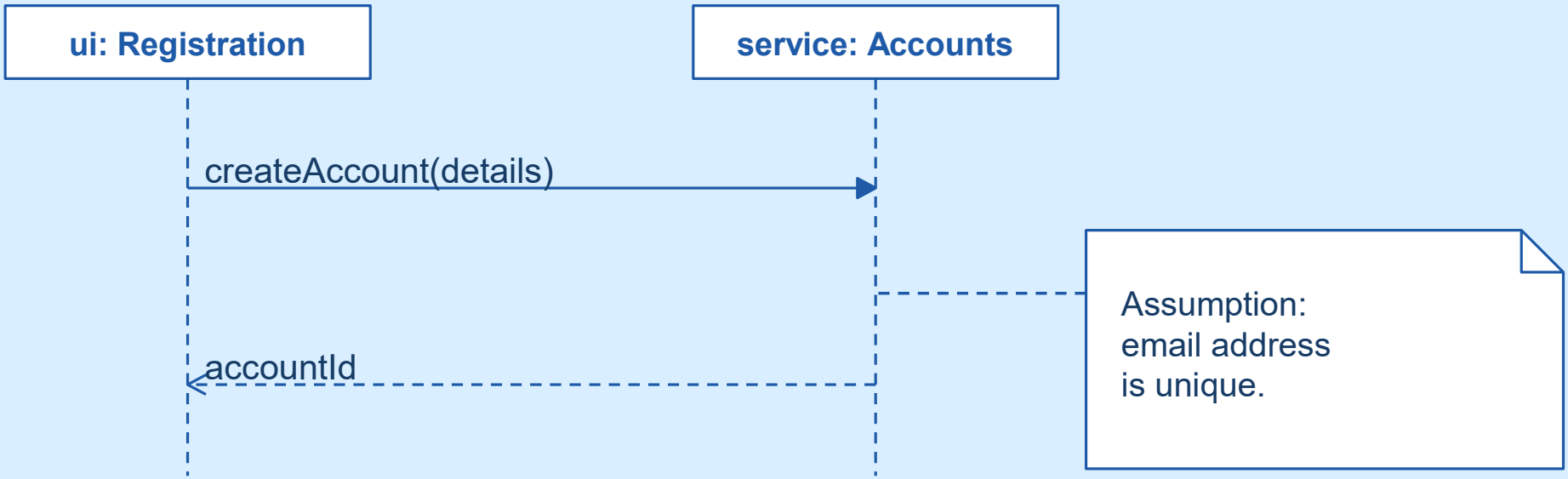
Self-message: the sender and receiver are the same participant.

Participant creation and destruction



The new lifeline starts at creation.
The X marks the destruction occurrence.

Message labels and comments



Use clear operation or signal names. Comments explain assumptions and constraints.

Scenario: create a library account

Participants

Librarian

Account service

User repository

Email service

Successful scenario

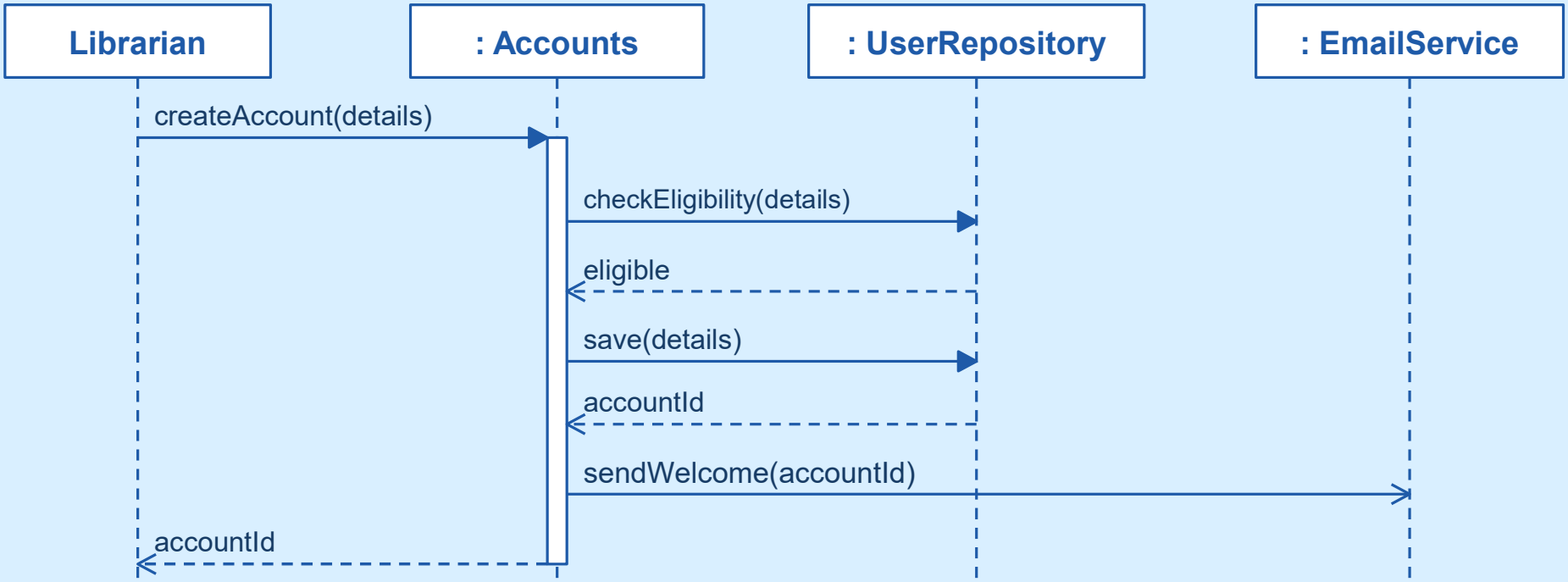
Submit account type and user details.

Check that the user can register.

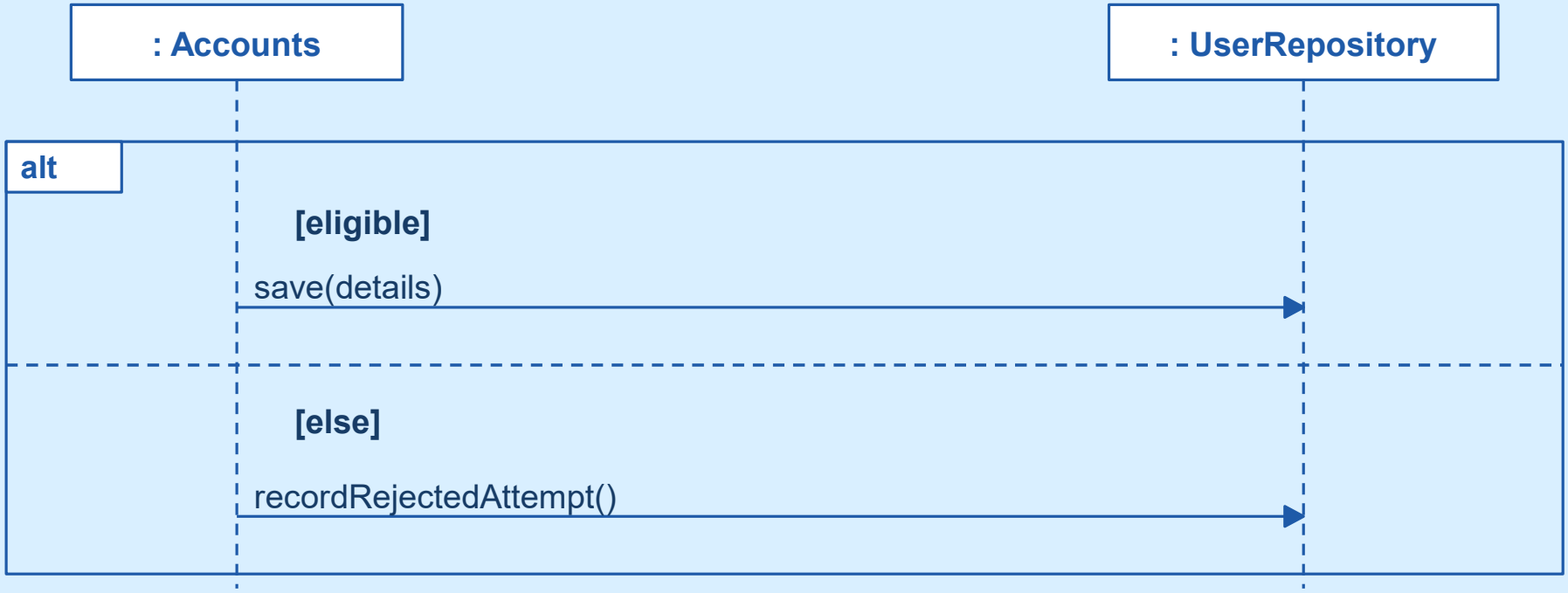
Persist the new account.

Request a welcome email and report success.

Library account: successful interaction

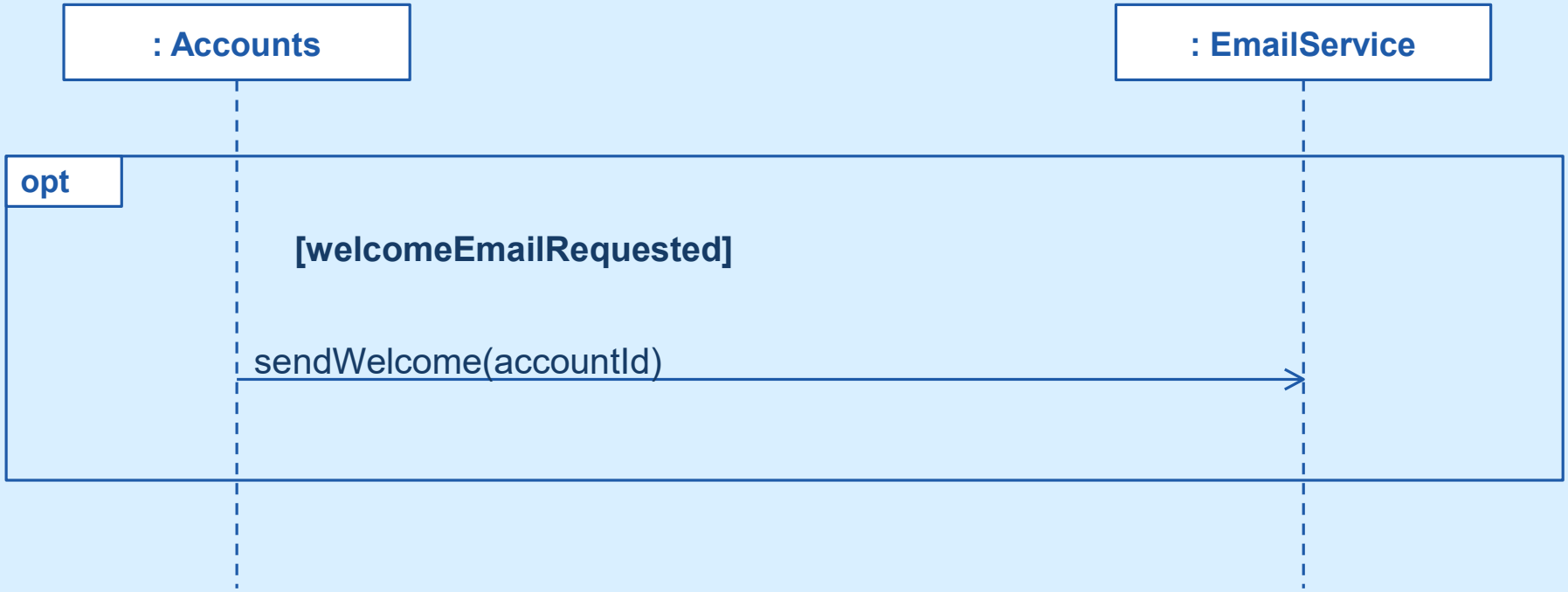


Alternative paths with alt



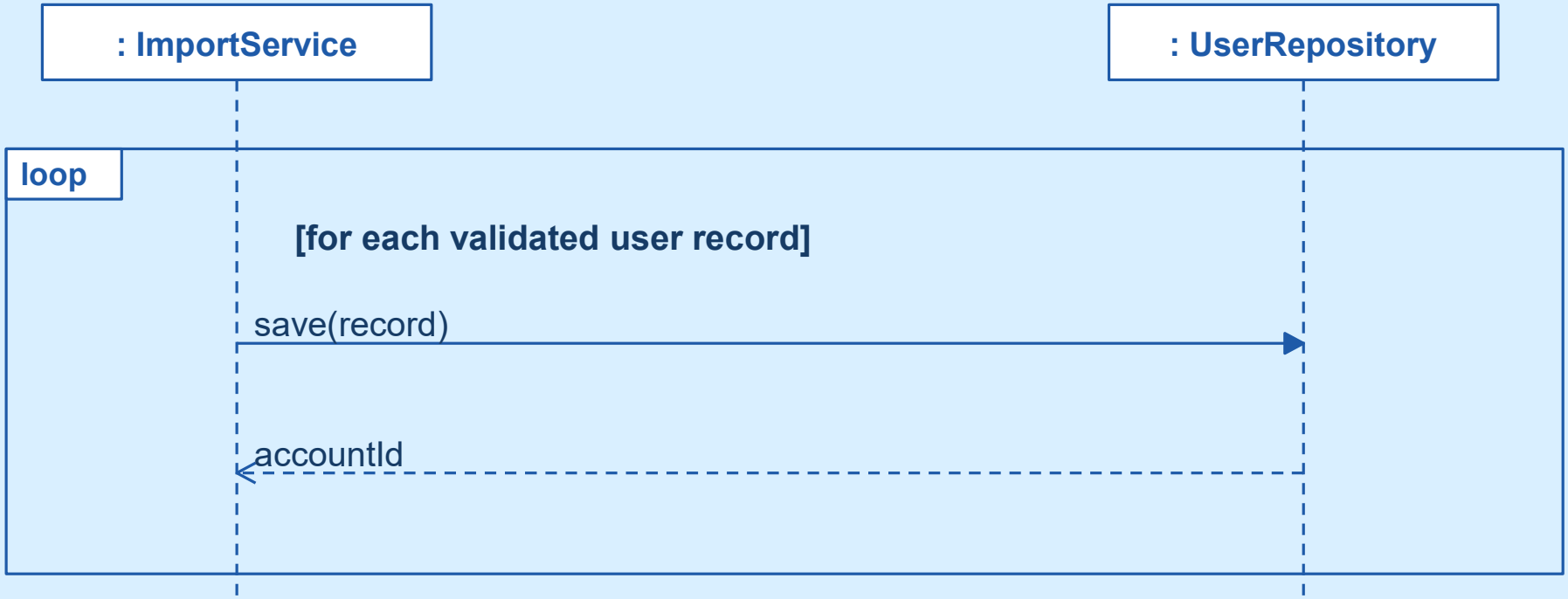
Each operand describes one guarded alternative.

Optional behavior with opt



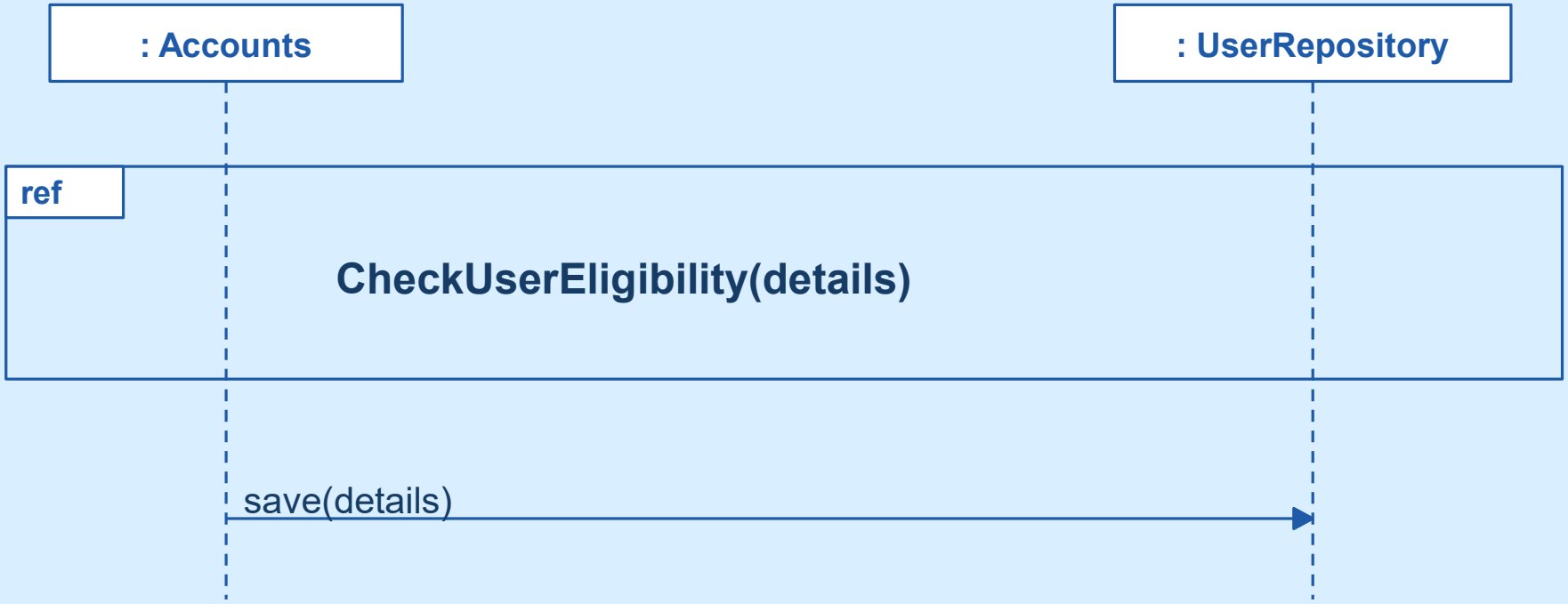
The operand executes when its guard is true. Otherwise the interaction skips it.

Repeated behavior with loop



State the repetition condition or bounds clearly. Keep the repeated messages inside the frame.

Interaction reuse with ref



ref denotes an interaction use that refers to another interaction.

A workflow for modeling an interaction

Step	Question
1. Select a scenario	What trigger, outcome and boundary matter?
2. Identify participants	Who sends and receives each message?
3. Order the messages	What must happen before the next step?
4. Choose message kinds	Does the caller wait for completion?
5. Add control logic	Which guards, loops or alternatives apply?
6. Check consistency	Do names and operations match the design?

Additional scenarios for sequence modeling

Scenario	Core interaction	Alternative to consider
Online exam	Submit answers and score	Submission after deadline
School management	Record and view results	User lacks permission
Movie ticket booking	Reserve seat and pay	Payment fails or hold expires

Model one focused scenario at a time, with an explicit outcome.

Review and classroom practice

Common errors to check

Messages start from the wrong sender.

Arrowheads conflict with waiting behavior.

Guards are missing or ambiguous.

Labels overlap lines or use outdated operation names.

Practice: ticket booking

Use Customer, BookingService, SeatStore and PaymentService.

Draw the successful booking path.

Add alt for payment success or failure.

Show when the seat reservation is released.

Reading and references

Core reading

Dennis, A., Wixom, B. H., & Tegarden, D. (2021).
Systems Analysis and Design: An Object-Oriented Approach
with UML, 6th ed. Wiley. ISBN 9781119559917.

UML notation reference

Object Management Group (2017). Unified Modeling Language,
Version 2.5.1. Chapter 17: Interactions.

Source tutorial: Creately, The Ultimate Sequence Diagram Tutorial (supplied PDF).