SOFTWARE ENGINEERING PRACTICAL DOCUMENT

PRACTICAL NO: 4

AIM: Study and implementation of Sequence Diagrams.

SOLUTION

Sequence Diagram

The sequence diagram represents the flow of messages in the system and is also termed as an event diagram. It helps in envisioning several dynamic scenarios. It portrays the communication between any two lifelines as a time-ordered sequence of events, such that these lifelines took part at the run time. In UML, the lifeline is represented by a vertical bar, whereas the message flow is represented by a vertical dotted line that extends across the bottom of the page. It incorporates the iterations as well as branching.

Purpose of a Sequence Diagram

1) To model high-level interaction among active objects within a system.

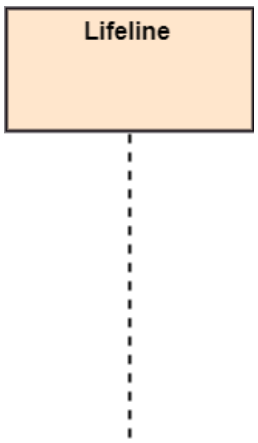
2)To model interaction among objects inside a collaboration realizing a use case.

3) It either model's generic interactions or some certain instances of interaction

Notations of a Sequence Diagram

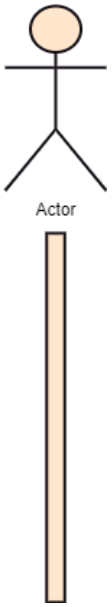
Lifeline

An individual participant in the sequence diagram is represented by a lifeline. It is positioned at the top of the diagram.



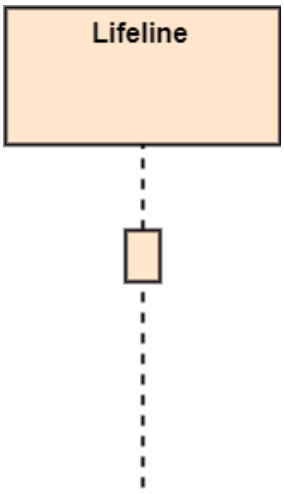
Actor

A role played by an entity that interacts with the subject is called as an actor. It is out of the scope of the system. It represents the role, which involves human users and external hardware or subjects. An actor may or may not represent a physical entity, but it purely depicts the role of an entity. Several distinct roles can be played by an actor or vice versa.



Activation

It is represented by a thin rectangle on the lifeline. It describes that time period in which an operation is performed by an element, such that the top and the bottom of the rectangle is associated with the initiation and the completion time, each respectively.

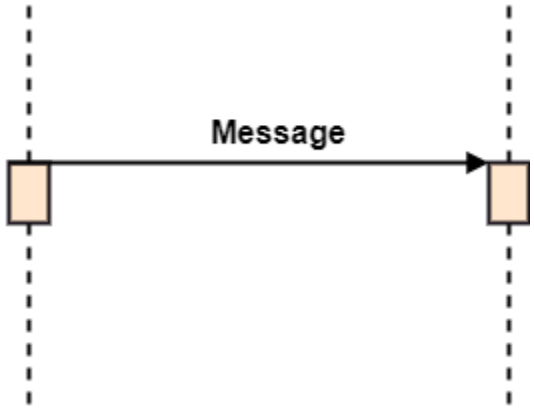


Messages

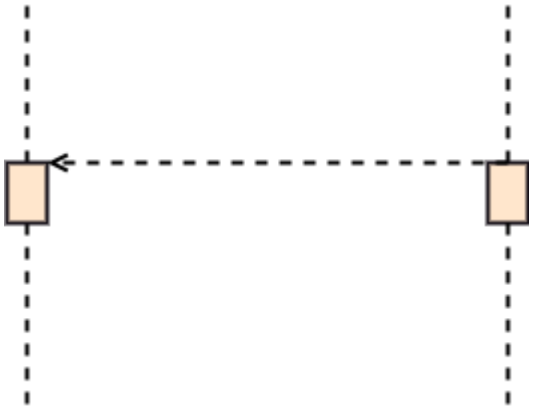
The messages depict the interaction between the objects and are represented by arrows. They are in the sequential order on the lifeline. The core of the sequence diagram is formed by messages and lifelines.

Following are types of messages enlisted below:

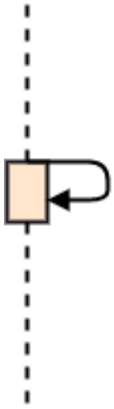
Call Message: It defines a particular communication between the lifelines of an interaction, which represents that the target lifeline has invoked an operation.



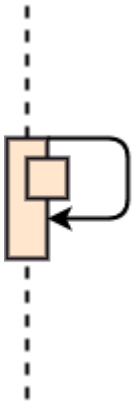
Return Message: It defines a particular communication between the lifelines of interaction that represent the flow of information from the receiver of the corresponding caller message.



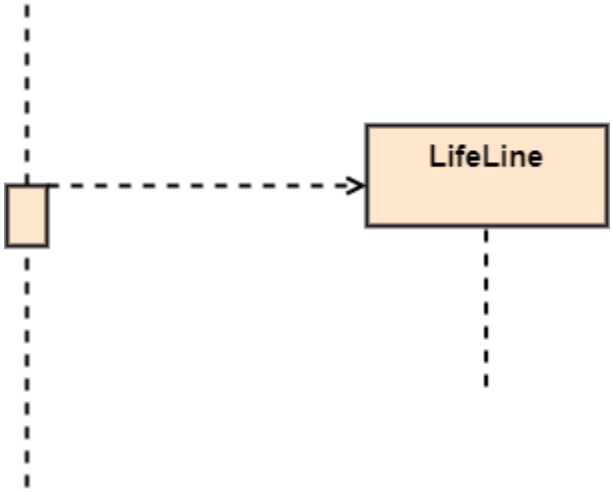
Self-Message: It describes a communication, particularly between the lifelines of an interaction that represents a message of the same lifeline, has been invoked.



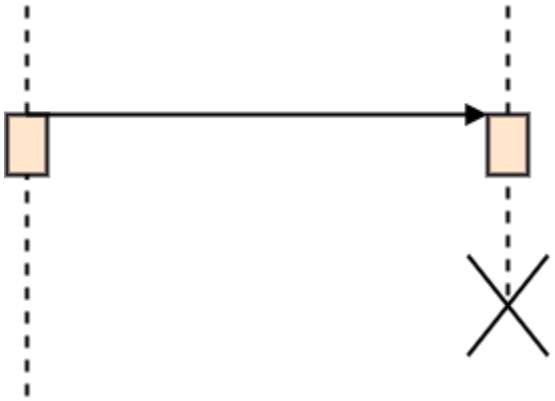
Recursive Message: A self-message sent for recursive purpose is called a recursive message. In other words, it can be said that the recursive message is a special case of the self-message as it represents the recursive calls.



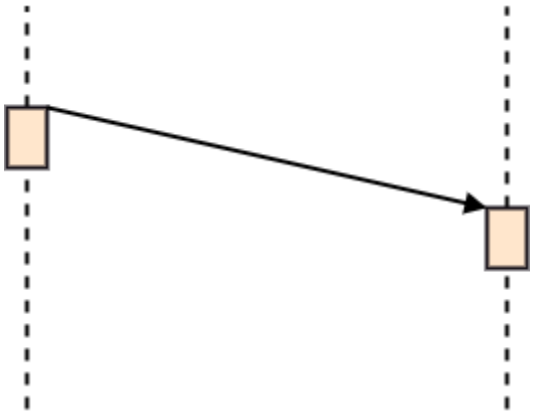
Create Message: It describes a communication, particularly between the lifelines of an interaction describing that the target (lifeline) has been instantiated.



Destroy Message: It describes a communication, particularly between the lifelines of an interaction that depicts a request to destroy the lifecycle of the target.



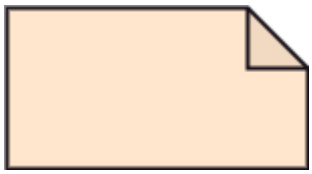
Duration Message: It describes a communication particularly between the lifelines of an interaction, which portrays the time passage of the message while modelling a system.



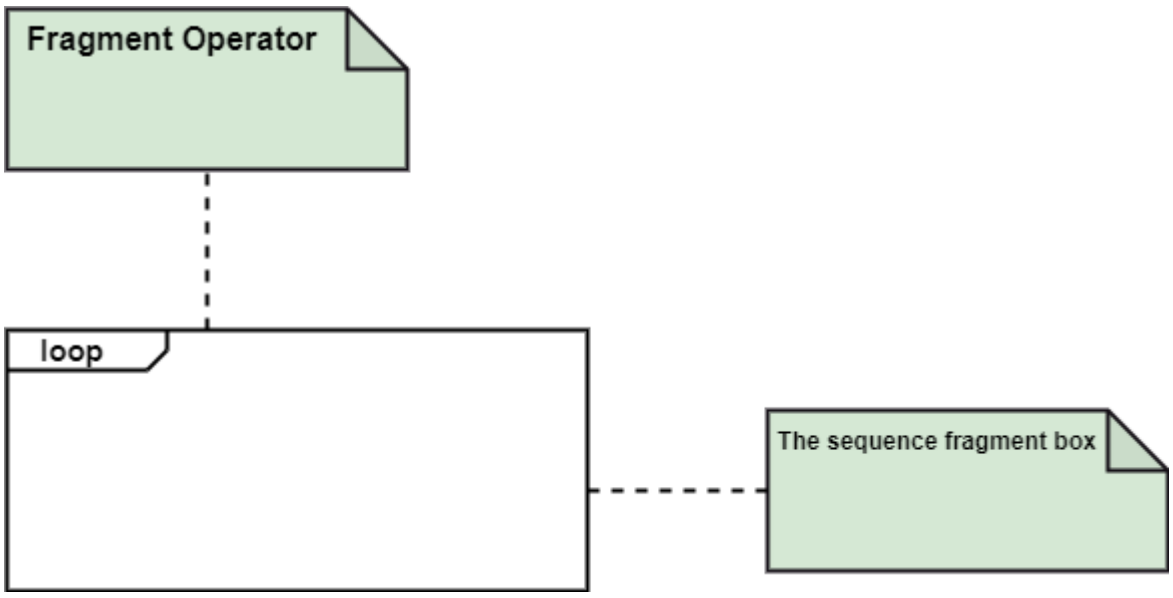
Note

A note is the capability of attaching several remarks to the element. It basically carries useful information for the Sequence Fragments

modelers.



1. Sequence fragments have been introduced by UML 2.0, which makes it quite easy for the creation and maintenance of an accurate sequence diagram.
2. It is represented by a box called a combined fragment, encloses a part of interaction inside a sequence diagram.
3. The type of fragment is shown by a fragment operator.



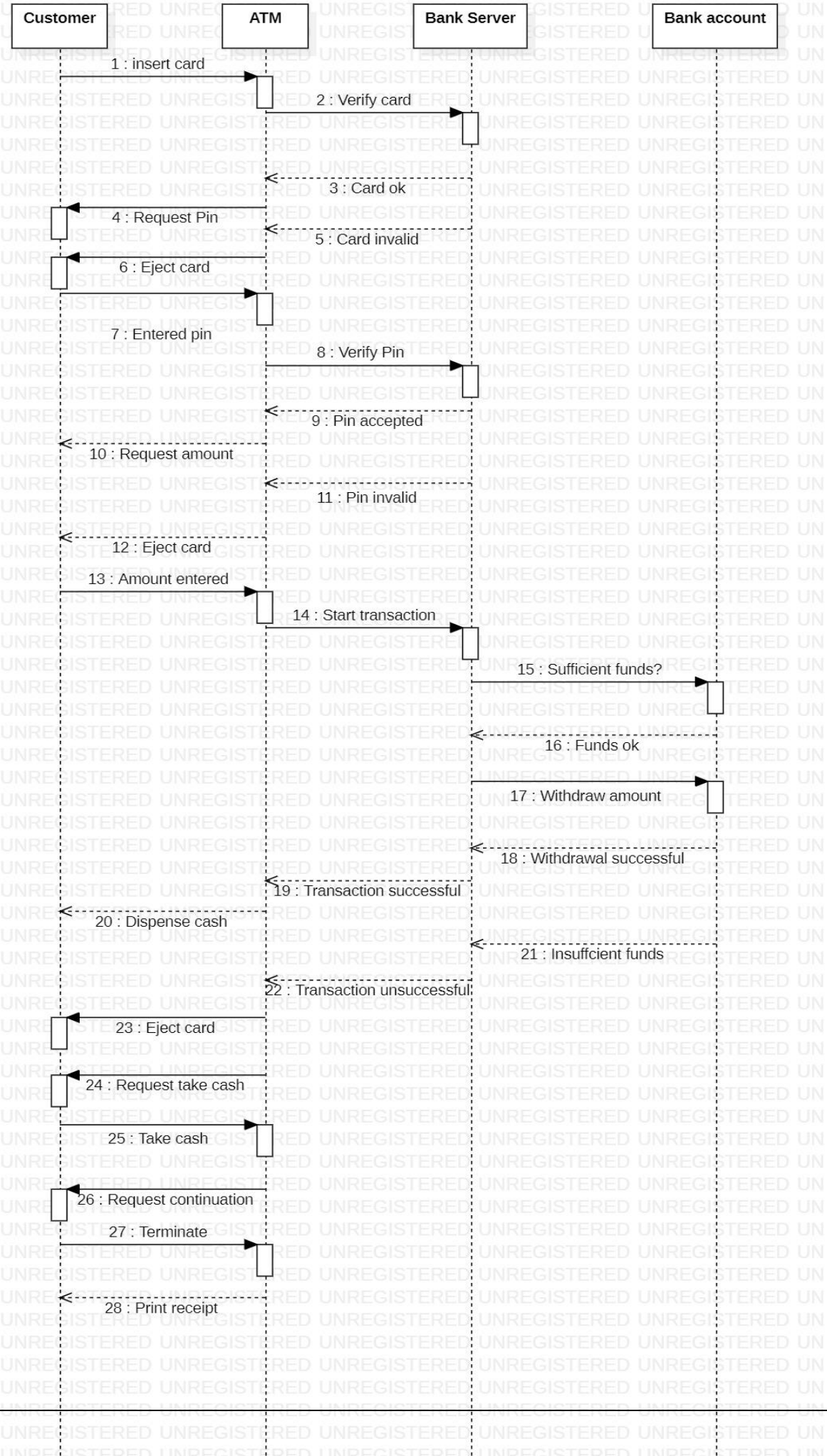
Types of fragments

Following are the types of fragments enlisted below;

Operator	Fragment Type
alt	Alternative multiple fragments: The only fragment for which the condition is true, will execute.
opt	Optional: If the supplied condition is true, only then the fragments will execute. It is similar to alt with only one trace.
par	Parallel: Parallel executes fragments.
loop	Loop: Fragments are run multiple times, and the basis of interaction is shown by the guard.
region	Critical region: Only one thread can execute a fragment at once.
neg	Negative: A worthless communication is shown by the fragment.
ref	Reference: An interaction portrayed in another diagram. In this, a frame is drawn so as to cover the lifelines involved in the communication. The parameter and return value can be explained.
sd	Sequence Diagram: It is used to surround the whole sequence diagram.

Example of a Sequence Diagram

Automated Teller Machines (ATMs) are essential part of any banking system. ATMs are used to perform various transactions and account related functionalities at bank. Customer can login to ATM using Debit Card, logout, check balance, print transaction receipt and deposit checks etc. All these activities ultimately tied to his or her bank account. These interactions between customer and bank can be translated into sequence diagram such as following.


Customer
ATM
Bank Server
Bank account
1 : insert card
2 : Verify card
3 : Card ok
4 : Request Pin
5 : Card invalid
6 : Eject card
7 : Entered pin
8 : Verify Pin
9 : Pin accepted
10 : Request amount
11 : Pin invalid
12 : Eject card
13 : Amount entered
14 : Start transaction
15 : Sufficient funds?
16 : Funds ok
17 : Withdraw amount
18 : Withdrawal successful
19 : Transaction successful
20 : Dispense cash
21 : Insuffcient funds
22 : Transaction unsuccessful
23 : Eject card
24 : Request take cash
25 : Take cash
26 : Request continuation
27 : Terminate
28 : Print receipt