5. USE CASE MODEL

Following are some important tips that are to be kept in mind while drawing a use casediagram:

1. A simple and complete use case diagram should be articulated.
2. A use case diagram should represent the most significant interaction among the multipleinteractions.
3. At least one module of a system should be represented by the use case diagram.
4. If the use case diagram is large and more complex, then it should be drawn moregeneralized.

1. Class diagram

The class diagram depicts a static view of an application. It represents the types of objects residing in the system and the relationships between them. A class consists of its objects, and also it may inherit from other classes. A class diagram is used to visualize, describe, document various different aspects of the system, and also construct executable software code.

It shows the attributes, classes, functions, and relationships to give an overview of the softwaresystem. It constitutes class names, attributes, and functions in a separate compartment thathelps in software development. Since it is a collection of classes, interfaces, associations, collaborations, and constraints, it is termed as a structural diagram.

Purpose of Class Diagrams

The main purpose of class diagrams is to build a static view of an application. It is the only diagram that is widely used for construction, and it can be mapped with object-oriented languages. It is one of the most popular UML diagrams. Following are the purpose of class diagrams given below:

1. It analyses and designs a static view of an application.

2. It describes the major responsibilities of a system.
3. It is a base for component and deployment diagrams.
4. It incorporates forward and reverse engineering.

Benefits of Class Diagrams

1. It can represent the object model for complex systems.
2. It reduces the maintenance time by providing an overview of how an application isstructured before coding.
3. It provides a general schematic of an application for better understanding.
4. It represents a detailed chart by highlighting the desired code, which is to beprogrammed.
5. It is helpful for the stakeholders and the developers.

Vital components of a Class Diagram

The class diagram is made up of three sections:

o **Upper Section:** The upper section encompasses the name of the class. A class is a representation of similar objects that shares the same relationships, attributes, operations, and semantics. Some of the following rules that should be taken intoaccount while representing a class are given below:

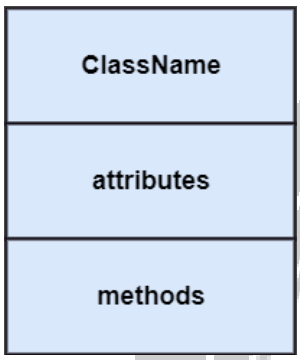
1. Capitalize the initial letter of the class name.
2. Place the class name in the center of the upper section.
3. A class name must be written in bold format.
4. The name of the abstract class should be written in italics format.

b. **Middle Section:** The middle section constitutes the attributes, which describe the quality of the class. The attributes have the following characteristics:

1. The attributes are written along with its visibility factors, which are public (+), private (-), protected (#), and package (~).
2. The accessibility of an attribute class is illustrated by the visibility factors.

3. A meaningful name should be assigned to the attribute, which will explain its usage inside the class.

b. **Lower Section:** The lower section contains methods or operations. The methods are represented in the form of a list, where each method is written in a single line. It demonstrates how a class interacts with data.



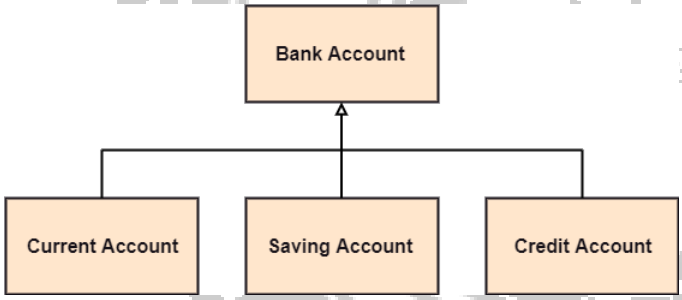
Relationships

In UML, relationships are of three types:

- **Dependency:** A dependency is a semantic relationship between two or more classes where a change in one class cause changes in another class. It forms a weaker relationship.

  In the following example, Student_Name is dependent on the Student_Id.

- **Generalization:** A generalization is a relationship between a parent class (superclass) and a child class (subclass). In this, the child class is inherited from the parent class.For example, The Current Account, Saving Account, and Credit Account are the generalized form of Bank Account.



- **Association:** It describes a static or physical connection between two or more objects.It depicts how many objects are there in the relationship. For example, a department is associated with the college.

Multiplicity: It defines a specific range of allowable instances of attributes. In case if a rangeis not specified, one is considered as a default multiplicity.

Class Diagram Example

A class diagram describing the sales order system is given below.

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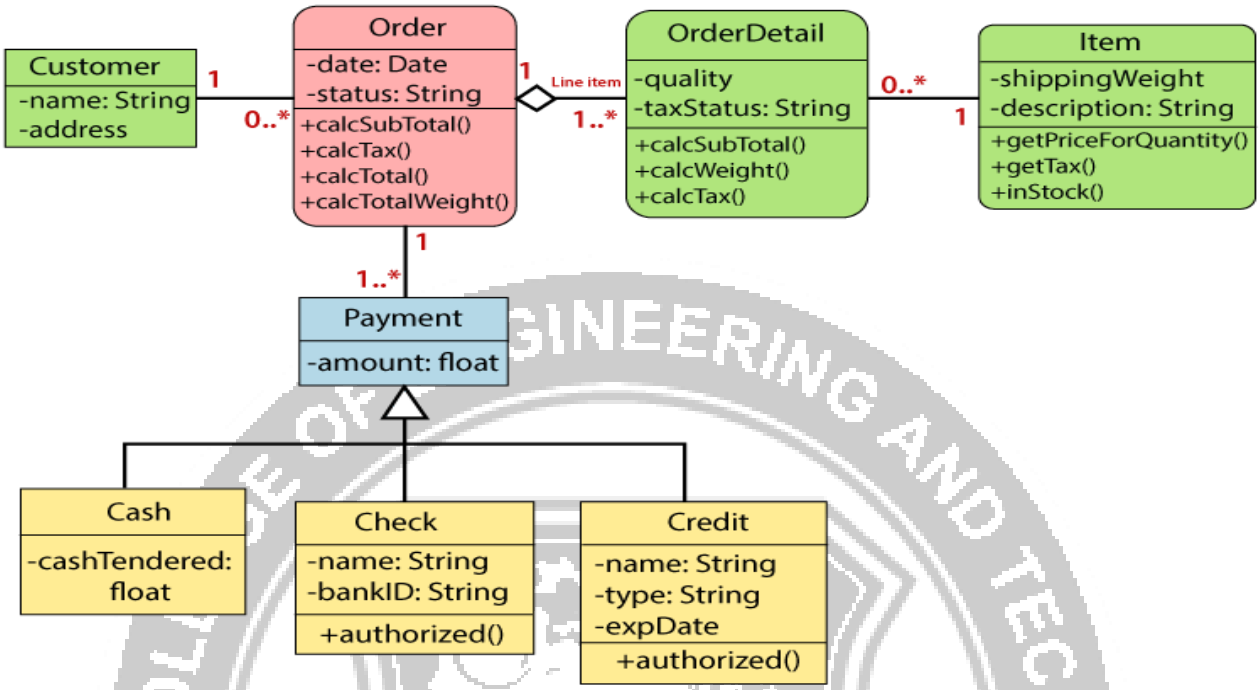

Usage of Class diagrams

The class diagram is used to represent a static view of the system. It plays an essential role in the establishment of the component and deployment diagrams. It helps to construct an executable code to perform forward and backward engineering for any system, or we can say it is mainly used for construction. It represents the mapping with object-oriented languages that are C++, Java, etc. Class diagrams can be used for the following purposes:

1. To describe the static view of a system.
2. To show the collaboration among every instance in the static view.
3. To describe the functionalities performed by the system.
4. To construct the software application using object-oriented languages.

2. INTERACTION DIAGRAM

As the name suggests, the interaction diagram portrays the interactions between distinct entities present in the model. It amalgamates both the activity and sequence diagrams. The communication is nothing but units of the behaviour of a

classifier that provides context for interactions.

A set of messages that are interchanged between the entities to achieve certain specified tasks in the system is termed as interaction. It may incorporate any feature of the classifier of which it has access. In the interaction diagram, the critical component is the messages and the lifeline.

In UML, the interaction overview diagram initiates the interaction between the objects utilizing message passing. While drawing an interaction diagram, the entire focus is to represent the relationship among different objects which are available within the system boundary and the message exchanged by them to communicate with each other.

The message exchanged among objects is either to pass some information or to request some information. And based on the information, the interaction diagram is categorized into the sequence diagram, collaboration diagram, and timing diagram.

The sequence diagram envisions the order of the flow of messages inside the system by depicting the communication between two lifelines, just like a time-ordered sequence of events.

The collaboration diagram, which is also known as the communication diagram, represents how lifelines connect within the system, whereas the timing diagram focuses on that instant when a message is passed from one element to the other.

Purpose of an Interaction Diagram

The interaction diagram helps to envision the interactive (dynamic) behavior of any system. It portrays how objects residing in the system communicates and connects to each other. It also provides us with a context of communication between the lifelines inside the system.

Following are the purpose of an interaction diagram given below:

5. To visualize the dynamic behavior of the system.
6. To envision the interaction and the message flow in the system.
7. To portray the structural aspects of the entities within the system.
8. To represent the order of the sequenced interaction in the system.
9. To visualize the real-time data and represent the architecture of an object-orientedsystem.

How to draw an Interaction Diagram?

Since the main purpose of an interaction diagram is to visualize the dynamic behavior of the system, it is important to understand what a dynamic aspect really is and how we can visualize it. The dynamic aspect is nothing but a screenshot of the system at the run time.

Before drawing an interaction diagram, the first step is to discover the scenario for which the diagram will be made. Next, we will identify various lifelines that will be invoked in the communication, and then we will classify each lifeline. After that, the connections are investigated and how the lifelines are interrelated to each other.

Following are some things that are needed:

1. A total no of lifeline which will take part in the communication.

2. The sequence of the message flow among several entities within the system.
3. No operators used to ease out the functionality of the diagram.
4. Several distinct messages that depict the interactions in a precise and clear way.
5. The organization and structure of a system.
6. The order of the sequence of the flow of messages.
7. Total no of time constructs of an object.

Use of an Interaction Diagram

The interaction diagram can be used for:

1. The sequence diagram is employed to investigate a new application.
2. The interaction diagram explores and compares the use of the collaboration diagramsequence diagram and the timing diagram.
3. The interaction diagram represents the interactive (dynamic) behaviour of the system.
4. The sequence diagram portrays the order of control flow from one element to the other elements inside the system, whereas the collaboration diagrams are employed to get an overview of the object architecture of the system.
5. The interaction diagram models the system as a time-ordered sequence of a system.
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7. The interaction diagram systemizes the structure of the interactive elements.

3. ACTIVITY DIAGRAM

In UML, the activity diagram is used to demonstrate the flow of control within the system rather than the implementation. It models the concurrent and sequential activities.

The activity diagram helps in envisioning the workflow from one activity to another. It put emphasis on the condition of flow and the order in which it occurs.

The flow can be sequential, branched, or concurrent, and to deal with such kinds of flows, the activity diagram has come up with a fork, join, etc.

It is also termed as an object-oriented flowchart. It encompasses activities composed of a set of actions or operations that are applied to model the behavioural diagram.

Components of an Activity Diagram

Following are the component of an activity diagram:

Activities

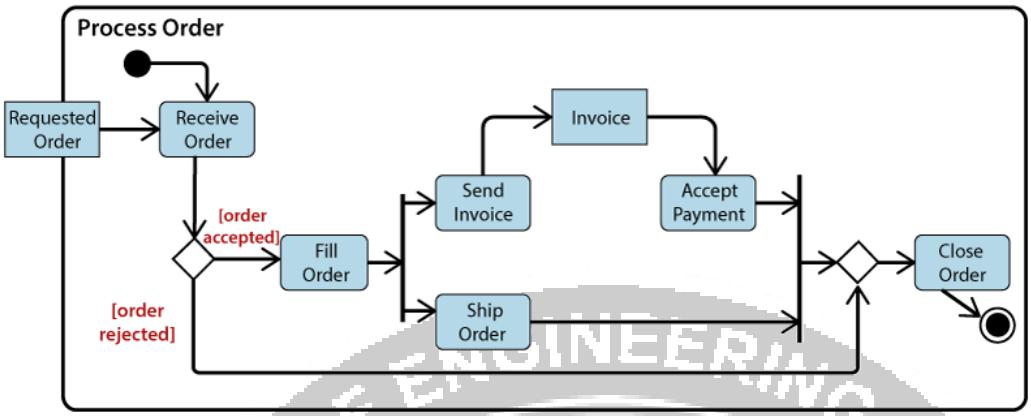
The categorization of behaviour into one or more actions is termed as an activity. In other words, it can be said that an activity is a network of nodes that are connected by edges. The edges depict the flow of execution. It may contain action nodes, control nodes, or object nodes.

The control flow of activity is represented by control nodes and object nodes that illustrates the objects used within an activity. The activities are initiated at the initial node and are terminated at the final node.

Example of an Activity Diagram

An example of an activity diagram showing the business flow activity of order processing is given below.

Here the input parameter is the Requested order, and once the order is accepted, all of the required information is then filled, payment is also accepted, and then the order is shipped. It permits order shipment before an invoice is sent or payment is completed.



When to use an Activity Diagram?

An activity diagram can be used to portray business processes and workflows. Also, it used for modeling business as well as the software. An activity diagram is utilized for the followings:

1. To graphically model the workflow in an easier and understandable way.
2. To model the execution flow among several activities.
3. To model comprehensive information of a function or an algorithm employed withinthe system.

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