29/08/2023 Object Model

The four major elements of object oriented programming :

- Abstraction
- Encapsulation
- Modularization
- Hierarchy

The minor elements in object oriented programming :

- Typing
- Concurrency
- Persistence

Encapsulation and hierarchy helps in reusability, helping to design modularization and abstraction respectively.

Modularization : Implements Systematic decomposition

Hierarchy can be achieved via :

- Inheritance
- Aggregation

Abstraction

Multiple abstraction exists for a problem space and even in real world objects ⇒ The level of abstraction depends on the individual’s perspective.

- Our target must be ***systems of system*** and not just system because at the end of the day it will be interacting with some other systems also.

  Same will be for modules or any object specification. Relationship is must. Seeing and analyzing it as system of system.

Abstraction of an object must precede any of its implementation.

> 💡 Whenever you are trying to reduce the number of things (reduce complexity), then there will be abstraction

“Productivity is inversely proportional to complexity.”

Types of abstraction

There are two types of abstraction -

- Data abstraction/ data hiding :
    - Object shows data hiding.
    - Data of one object (whether of same type of different) cannot be accessed by other objects directly.
- Behavior abstraction/feature abstraction :
    - Achieved through class hierarchy.
    - Each class is abstraction of its sub class (Generalization and specialization relationship)

Synergy

Collaboration between objects is known as synergy.

Object itself cannot do anything. Objects collaborate to produce high level behavior.

> 💡 CRC cards : Methodology to decide the synergy between objects before starting the design and implementation

Encapsulation

- Also called information hiding; hides the secret of objects
- Abstraction → design level

  Encapsulation → implementation
- Hiding the information among different abstractions will help in clear separation of concerns

Modularization

- Quantitative approach not available, only qualitative

    - CK matrix ⇒ many papers released by Google and Microsoft
- Packaging of abstraction ⇒ so that interface becomes simple enough to understand ⇒ illusion of simplicity
- Art of partitioning the system

Typing

Let two objects of same type C, say c1 and c2. If we do c1 = c2; then compiler will know that we are assigning c2 to c1 and both are of same type. (only then it will allow the assignment). It will be static typing.

Overriding assignments (Assignment in overriding condition) will be dynamically typed.

Concurrency

- Can be of data as well as instructions
- The two types:
    - Heavy weight concurrency : Process independently managed by OS and all have independent address space.
    - Light weight concurrency : Lives and managed by simultaneously by OS and share address space.

Persistence

“Static” keyword will be used for doing persistence.

Feasibility

Before starting of any project one must do feasibility analysis about the problem domain.

There are two types of feasibility :

- Technical feasibility
- Financial feasibility