Object-Oriented Programming (OOP)

Information Hiding

- Information is stored within the object
- It is hidden from the outside world
- It can only be manipulated by the object itself

Example – Information Hiding

- Ali's name is stored within his brain
- We can't access his name directly
- Rather we can ask him to tell his name

Example – Information Hiding

- A phone stores several phone numbers
- We can't read the numbers directly from the SIM card
- Rather phone-set reads this information for us

Information Hiding Advantages

- Simplifies the model by hiding implementation details
- It is a barrier against change propagation

Encapsulation

- Data and behaviour are tightly coupled inside an object
- Both the information structure and implementation details of its operations are hidden from the outer world

Example – Encapsulation

- Ali stores his personal information and knows how to translate it to the desired language

- We don't know
  - How the data is stored
  - How Ali translates this information

Example – Encapsulation

- A Phone stores phone numbers in digital format and knows how to convert it into human-readable characters

- We don't know
  - How the data is stored
  - How it is converted to human-readable characters

Encapsulation – Advantages

- Simplicity and clarity
- Low complexity
- Better understanding

Object has an Interface

- An object encapsulates data and behaviour
- So how objects interact with each other?
- Each object provides an interface (operations)
- Other objects communicate through this interface

Example – Interface of a Car

- Steer Wheels
- Accelerate
- Change Gear
- Apply Brakes
- Turn Lights On/Off

Example – Interface of a Phone

- Input Number
- Place Call
- Disconnect Call
- Add number to address book
- Remove number
- Update number

Implementation

- Provides services offered by the object interface
- This includes
  - Data structures to hold object state
  - Functionality that provides required services

Example – Implementation of Gear Box

- Data Structure
  - Mechanical structure of gear box
- Functionality
  - Mechanism to change gear

Example – Implementation of Address Book in a Phone

- Data Structure
  - SIM card
- Functionality
  - Read/write circuitry

Separation of Interface & Implementation

- Means change in implementation does not effect object interface
- This is achieved via principles of information hiding and encapsulation

Example – Separation of Interface & Implementation

- A driver can drive a car independent of engine type (petrol, diesel)
- Because interface does not change with the implementation

Example – Separation of Interface & Implementation

- A driver can apply brakes independent of brakes type (simple, disk)
- Again, reason is the same interface

Advantages of Separation

- Users need not to worry about a change until the interface is same
- Low Complexity
- Direct access to information structure of an object can produce errors

Messages

- Objects communicate through messages
- They send messages (stimuli) by invoking appropriate operations on the target object
- The number and kind of messages that can be sent to an object depends upon its interface

Examples – Messages

- A Person sends message (stimulus) “stop” to a Car by applying brakes
- A Person sends message “place call” to a Phone by pressing appropriate button