Object Oriented Programming

Basic, Encapsulation and Data Abstraction

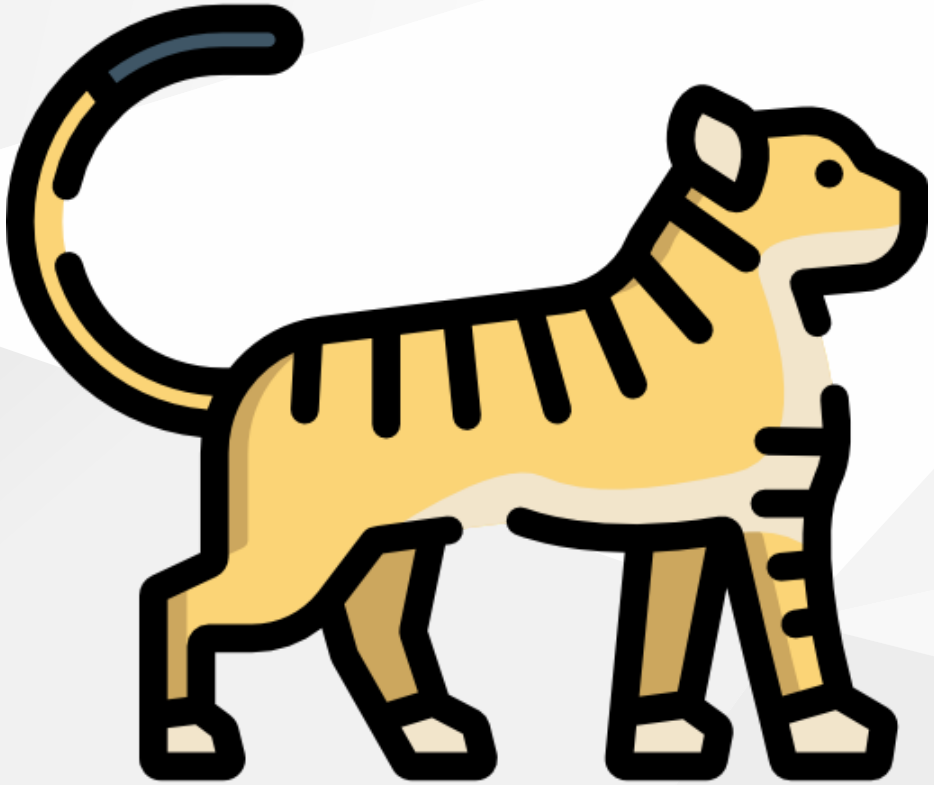
“ Programming paradigm which provides a means of structuring program so that **properties** and **behaviour** are bundled into individual **objects**. ”

Properties

- Color
- Length
- Width

Behavior

- Accelerate
- Break



Properties

- Fur
- Leg
- Tail

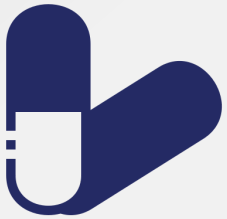
Behavior

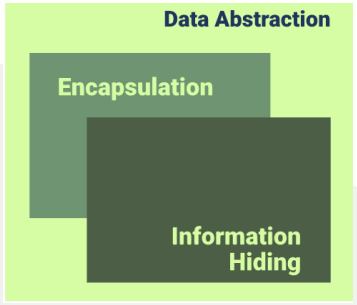
- Make Sound
- Eat
- Jump

“ **Properties** determined by the values of its attributes ”

“ **Behavior** determined by how the objects acts or reacts to requests ”

OOP Fundamental Concept





Woof!

Meow!

Quack!

Encapsulation

Basic encapsulation analogy:

- Class
- Attributes
- Method

Encapsulation - Class

Class is a *"template"* or *"blueprint"* that is used to create object.
"Special code" template in Java to make object:

- Contain of:
  - Properties
  - Method
- Has an init method to initiate object

```
public class Cat { // Define class name using CamelCase
    private String name;
    private String color;
}
```

Make instance of Object

```
public class Cat {
    private String name;
    private String color;

    // Constructor block
    public Cat(String name, String color) {
        this.name = name;
        this.color = color;
    }

    // Setter getter method
}

public static void main(String[] args) {
    Cat cat = new Cat("Peter", "White");
    cat.getName(); // Peter
    cat.getColor(); // White
}
```

Cont...

An instance is a unique copy of a **Class** that representing an **Object**.

- All **classes** create **object**, and all **object** contain **characteristic** called **attribbutes**
- Use `new Object()` for creating new object in Java.

Note: You will never have to call the `new Object()` method; it gets called automatically when you create a new Cat object.

Attributes Type

```
public class Cat {
    private String name;
    private String color;

    // Constructor block
    public Cat(String name, String color) {
        this.name = name;
        this.color = color;
    }

    // Setter getter method
}
```

Cont...

Modifier	Class	Package	Subclass	World
public				
protected				
Modifier	Class	Package	Subclass	World

Method and Function

```
public class Cat {
    private String name;
    private String color;

    public Cat(String name, String color) {
        this.name = name;
        this.color = color;
    }

    public void setName(String name) {
        this.name = name;
    }

    public String getName() {
        return this.name;
    }
}
```

Cont...

Important things when creating **Method** or **Function**:

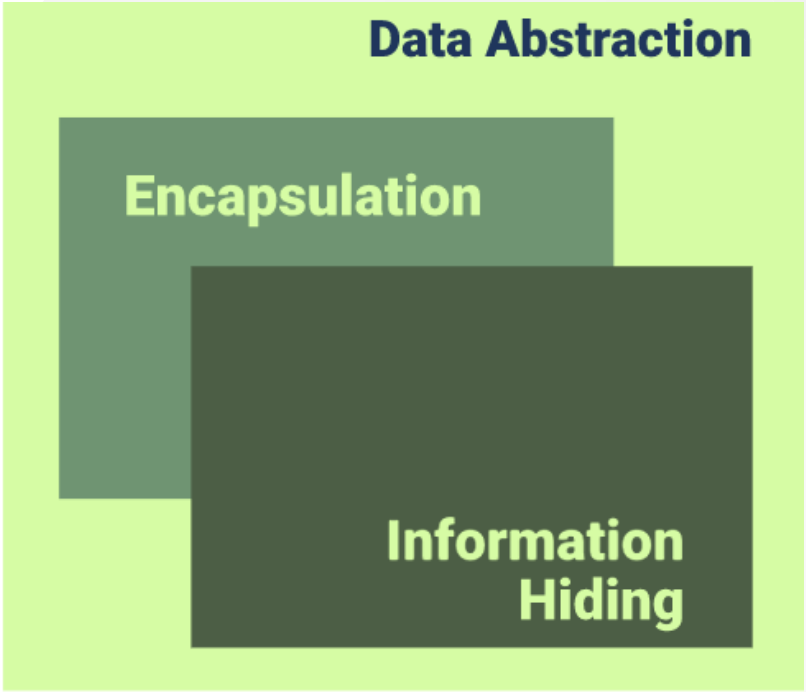
- Method name
- Parameters
- Returns

Data Abstraction

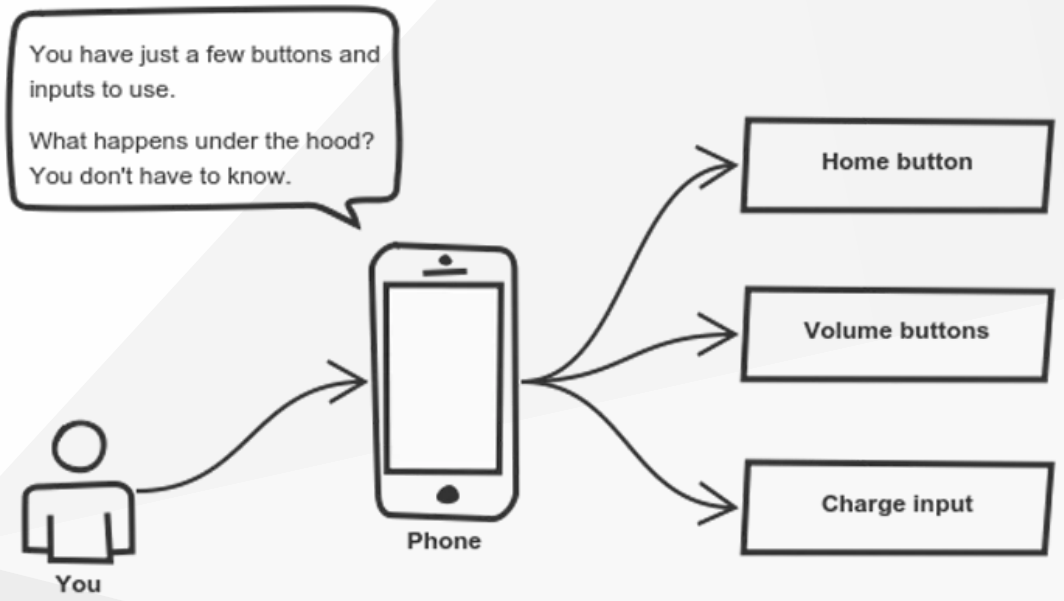
"Hiding background process from user"

Main Goal:

- Handle complexity by hiding unnecessary detail
- It should only reveal operations relevant for the other objects



Data Abstraction Analogy



Data Abstraction - Setter Getter

```
public interface Motorcycle {
    void startEngine();
}

public class Vario implements Motorcycle {
    @Override
    public void startEngine() {
        System.out.println("Use electric starter!");
    }
}

public class RXKing implements Motorcycle {
    @Override
    public void startEngine() {
        System.out.println("Use kick starter!");
    }
}
```

Cont...

Setter & Getter make complex calculation in 1 function / method.

- Hide all unnecessary process in object calling itself
- Make simple calling from object variable
- Think of it as a small set of public methods which any other class can call without **"knowing"** how they work

Task

Define 5 classes freely related to the type of animal, plant or vehicle. Use encapsulation concepts such as public, protected and private according to analogy examples in the real world.

Example:
`Cat, Fish, Flower, Car, etc.`

Add instance variables and methods in each class created. Then create code to prove **encapsulation** is running as expected.

For example, can `Frog` access these `public`, `protected` or `private` variables? or other things that produce returns as expected.