Object Oriented Programming Using Python

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1. Introduction to Object Oriented Programming in Python

Object Oriented Programming is a way of computer programming using the idea of "objects" to represents data and methods. It is also, an approach used for creating neat and reusable code instead of a redundant one.

2. Difference between Object-Oriented and Procedural Oriented Programming

Object-Oriented Programming (OOP)	Procedural-Oriented Programming (Pop)
It is a bottom-up approach	It is a top-down approach
Program is divided into objects	Program is divided into functions
Makes use of Access modifiers ‘public’, private’, protected’	Doesn’t use Access modifiers
It is more secure	It is less secure
Object can move freely within member functions	Data can move freely from function to function within programs
It supports inheritance	It does not support inheritance

3. What are Classes and Objects?

A class is a collection of objects or you can say it is a blueprint of objects defining the common attributes and behavior. Now the question arises, how do you do that?

Class is defined under a "Class" Keyword.

Example:

```
class class1(): // class 1 is the name of the class
```

Creating an Object and Class in python:

Example:

```
class employee():
    def___init__(self,name,age,id,salary):   //creating a function
        self.name = name // self is an instance of a class
        self.age = age
        self.salary = salary
        self.id = id

emp1 = employee("harshit",22,1000,1234) //creating objects
emp2 = employee("arjun",23,2000,2234)
print(emp1.__dict__)//Prints dictionary
```

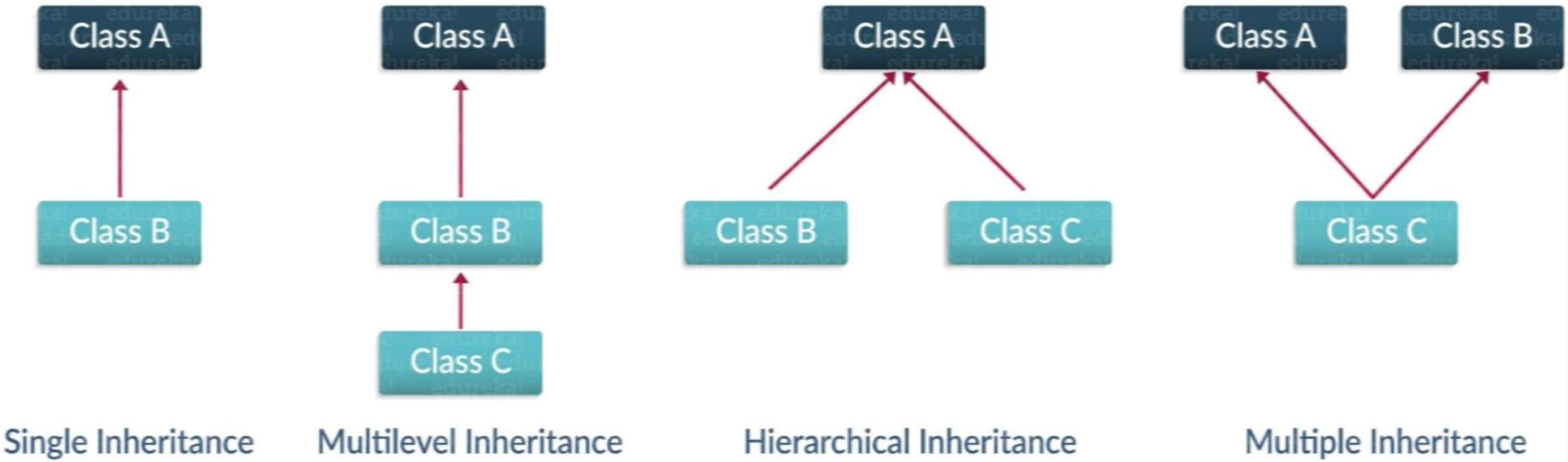
4. Object-Oriented Programming methodologies:

- ❑ Inheritance
- ❑ Polymorphism
- ❑ Encapsulation
- ❑ Abstraction

Inheritance:

Ever heard of this dialogue from relatives "you look exactly like your father/mother" the reason behind this is called 'inheritance'. From the Programming aspect, It generally means "inheriting or transfer of characteristics from parent to child class without any modification". The new class is called the derived/child class and the one from which it is derived is called a parent/base class.

Types Of Inheritance



Single Inheritance:

Single level inheritance enables a derived class to inherit characteristics from a single parent class.

Example:

```
class employee1()://This is a parent class
    def___init__(self, name, age, salary):
        self.name = name
        self.age = age
        self.salary = salary

class childemployee(employee1)://This is a child class
    def___init__(self, name, age, salary,id):
        self.name = name
        self.age = age
        self.salary = salary
        self.id = id
emp1 = employee1('harshit',22,1000)
print(emp1.age)
```

Output: 22

Multilevel Inheritance:

Multi-level inheritance enables a derived class to inherit properties from an immediate parent class which in turn inherits properties from his parent class.

Example:

```
class employee()://Super class
    def___init__(self,name,age,salary):
        self.name = name
        self.age = age
        self.salary = salary
class childemployee1(employee)://First child class
    def___init__(self,name,age,salary):
        self.name = name
        self.age = age
        self.salary = salary
```

```
class childemployee2(childemployee1)://Second child class
    def___init__(self, name, age, salary):
        self.name = name
        self.age = age
        self.salary = salary
emp1 = employee('harshit',22,1000)
emp2 = childemployee1('arjun',23,2000)

print(emp1.age)
print(emp2.age)
```

Output: 22,23

Hierarchical Inheritance:

Hierarchical level inheritance enables more than one derived class to inherit properties from a parent class.

Example:

```
class employee():
    def___init__(self, name, age, salary):     //Hierarchical Inheritance
        self.name = name
        self.age = age
        self.salary = salary
```

```
class childemployee1(employee):
    def___init__(self,name,age,salary):
        self.name = name
        self.age = age
        self.salary = salary

class childemployee2(employee):
    def___init__(self, name, age, salary):
        self.name = name
        self.age = age
        self.salary = salary
emp1 = employee('harshit',22,1000)
emp2 = employee('arjun',23,2000)
```

Multiple Inheritance:

Multiple level inheritance enables one derived class to inherit properties from more than one base class.

Example:

```
class employee1(): //Parent class
    def___init__(self, name, age, salary):
        self.name = name
        self.age = age
        self.salary = salary
```

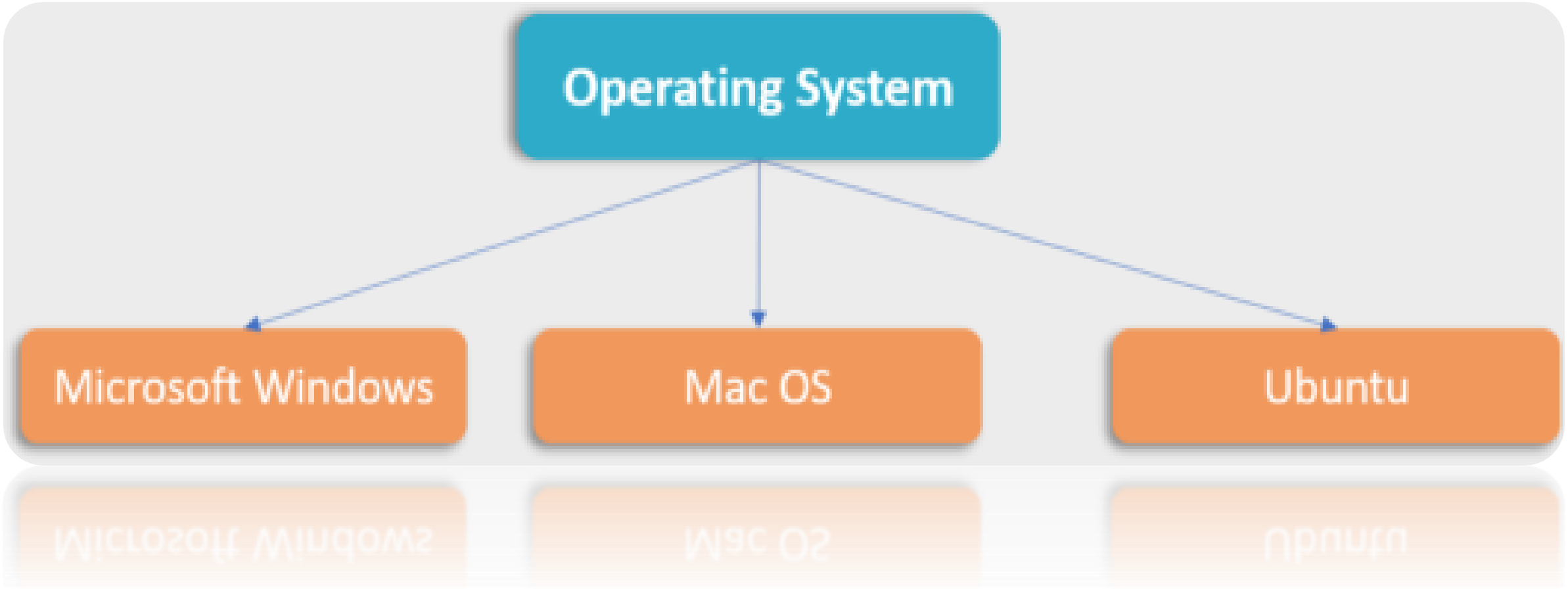
```
class employee2(): //Parent class
    def___init__(self,name,age,salary,id):
     self.name = name
     self.age = age
     self.salary = salary
     self.id = id

class childemployee(employee1,employee2):
    def___init__(self, name, age, salary,id):
    self.name = name
     self.age = age
     self.salary = salary
     self.id = id

emp1 = employee1('harshit',22,1000)
emp2 = employee2('arjun',23,2000,1234)
```

Polymorphism:

You all must have used GPS for navigating the route, Isn't it amazing how many different routes you come across for the same destination depending on the traffic, from a programming point of view this is called 'polymorphism'. It is one such OOP methodology where one task can be performed in several different ways. To put it in simple words, it is a property of an object which allows it to take multiple forms.


Operating System
Microsoft Windows
Mac OS
Ubuntu

Polymorphism is of two types:

- Compile-time Polymorphism
- Run-time Polymorphism

Compile-time Polymorphism:

A compile-time polymorphism also called as static polymorphism which gets resolved during the compilation time of the program. One common example is "method overloading"

Example:

```
class employee1():
    def name(self):
        print("Harshit is his name")
    def salary(self):
        print("3000 is his salary")
    def age(self):
        print("22 is his age")

class employee2():
    def name(self):
        print("Rahul is his name")
    def salary(self):
        print("4000 is his salary")
    def age(self):
        print("23 is his age")
```

```
def func(obj)://Method Overloading
    obj.name()
    obj.salary()
    obj.age()

obj_emp1 = employee1()
obj_emp2 = employee2()
func(obj_emp1)
func(obj_emp2)
```

Output:

```
Harshit is his name
3000 is his salary
22 is his age
Rahul is his name
4000 is his salary
23 is his age
```

Run-time Polymorphism:

A run-time Polymorphism is also, called as dynamic polymorphism where it gets resolved into the run time. One common example of Run-time polymorphism is "method overriding".

Example:

```
class employee():
    def___init__(self,name,age,id,salary):
        self.name = name
        self.age = age
        self.salary = salary
        self.id = id
    def earn(self):
        pass

class childemployee1(employee):
    def earn(self): //Run-time polymorphism
        print("no money")
```

```
class childemployee2(employee):
    def earn(self):
        print("has money")

c = childemployee1
c.earn(employee)
d = childemployee2
d.earn(employee)
```

Output: no money, has money

Abstraction:

Suppose you booked a movie ticket from bookmyshow using net banking or any other process. You don’t know the procedure of how the pin is generated or how the verification is done. This is called ‘abstraction’ from the programming aspect, it basically means you only show the implementation details of a particular process and hide the details from the user.