C++ Programming

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Object Oriented programming structure(oops) :-

-> It is a programing methodology to organise complex program into simple program in terms of class and objects such methodology is called as "Object Oriented programming structure"

-> It is a programing methodology to organise complex program into simple program by using the concept of Abstraction, Encapsulation and Inheritance, modularity.

->so the language which supports Abstraction, Encapsulation and Inheritance is called as Object Oriented programming language.

Major pillars of oops

- **Abstraction**
  - Getting only essential things and hiding unnecessary details is called as abstraction.
  - Abstraction always describe outer behavior of object.
  - In “C” language when we give call to function in to the main function , it represents the abstraction.
  - In CPP by Creating object and calling public member function on it we can achieve abstraction.
- **Encapsulation**
  - Binding of data and code together is called as encapsulation. By defining class we can achieve encapsulation.
  - Implementation of abstraction is called encapsulation.
  - Encapsulation always describe inner behavior of object
  - Function call is abstraction and Function definition is encapsulation.
  - Information hiding
    - Hiding information from user is called information hiding.
    - In c++ we used access Specifier to provide information hiding.
- **Modularity**
  - Dividing programs into small modules for the purpose of simplicity is called modularity.
- **Hierarchy**
  - Hierarchy is ranking or ordering of abstractions.
  - Main purpose of hierarchy is to achieve re-usability.
  - Types –> 1: **Inheritance [is-a] , 2: Association [has-a]**

Minor pillars of oops

- **Polymorphism (Typing)**
  - One interface having multiple forms is called as polymorphism.
  - Polymorphism have two types
    1. **Compile time polymorphism (**Static polymorphism / Static binding / Early binding / Weak typing / False Polymorphism **)**

       when the call to the function resolved at compile time it is called as compile time polymorphism. And it is achieved by using function overloading, operator overloading, template
    2. **Runtime polymorphism (**Dynamic polymorphism / Dynamic binding / Late binding / Strong typing / True polymorphism**)**

       when the call to the function resolved at run time it is called as run time polymorphism. And it is achieved by using function overriding.
- **Concurrency**
  - Process of executing multiple tasks simultaneously is called Concurrency**.**
  - Can be achieved by multithreading which is Used to utilize hardware resources efficiently.

- **Persistence**
  - Used to maintain state of object across time and space on secondary storage .
  - Using file handling we can achieve it. To transfer and save the state of object needs serialization and also socket programming for network.

Association

- If has-a relationship exist between two types then we should use association.
- Example : Car has-a engine (OR engine is part-of car)
- If object is part-of / component of another object then it is called association.
- If we declare object of a class as a data member inside another class then it represents association.

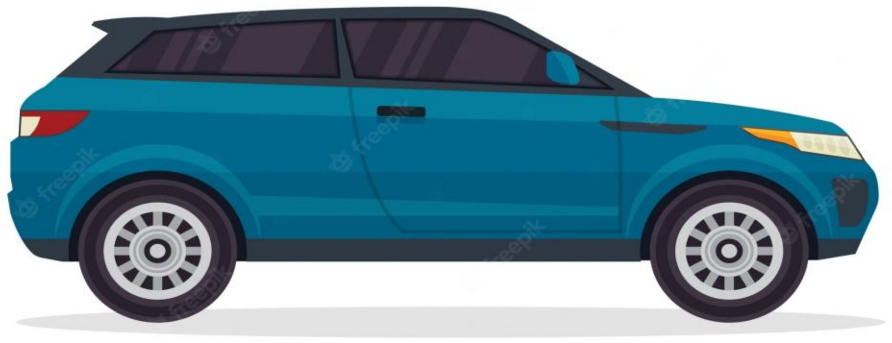
Example Association:

- ➢ Car has-a engine
- ➢ Laptop has-a hand disk
- ➢ Room has-a wall
- ➢ Bank has-a accounts

```
class Engine
{
		int cc, fuel;
};
class Car
{		private:
		Engine e;	//Association
};
```

Dependant Object : Car Object
Dependency Object : Engine Object

Example of Association



Composition and aggregation are specialized form of association

Composition

- If dependency object do not exist without Dependent object then it represents composition.
- Composition represents tight coupling.
- Example: Human has-a heart.

```
class Heart
{ };
class Human
{
   Heart hrt; //Association->Composition
};
```

Dependent Object : Human Object

Dependency Object : Heart Object

Aggregation

- If dependency object exist without Dependent object then it represents Aggregation.
- Aggregation represents loose coupling.
- Example: Department has-a Faculty.

```
class Faculty
{ };
class Department
{
   Faculty f; //Association->Aggregation
};
```

Dependent Object : Department Object

Dependency Object : Faculty Object

Inheritance

- If "is-a" relationship exist between two types then we should use inheritance.
- Inheritance is also called as " journey from Generalization to Specialization".
- Example: emp is-a person
- During inheritance, members of base class inherit into derived class.
- If we create object of derived class then non static data members declared in base class get space inside it.
- Size of object of derived class = sum of size of non static data members declared in base class plus derived class.
- If we use private/protected/public keyword to control visibility of members of class by using access Specifier.
- If we use private/protected/public keywords to do inheritance then it is called mode of inheritance.
- Default mode of inheritance is private.
  - Example: class Employee : person //is treated as class Employee : private Person
- Example: class Employee : public Person
- In all types of mode, private members inherit into derived class but we can not access it inside member function of derived class.

Syntax of inheritance in C++

class Person //Parent class
{ };
class Employee : public Person // Child class
{ };
	In C++ Parent class is called as Base class and child class is called as derived class. To create derived class we should use colon(:) operator. As shown in this code, public is mode of inheritance.

class Person //Parent class
{ **char name[30]; int age;** };
class Employee : public Person //Child class
{ **int empid; float salary;** };
int main(void)
{
Person p;
cout<<**sizeof(p)<<endl;**
Employee emp;
cout<<**sizeof(emp)<<endl;**
return 0;
}
	If we create object of derived class, then all the non- static data member declared in base class & derived class get space inside it i.e. non-static. static data members of base class inherit into the derived class.

Except following functions, including nested class, all the members of base class, inherit into the derived class

- Constructor
- Destructor
- Copy constructor
- Assignment operator
- Friend function.

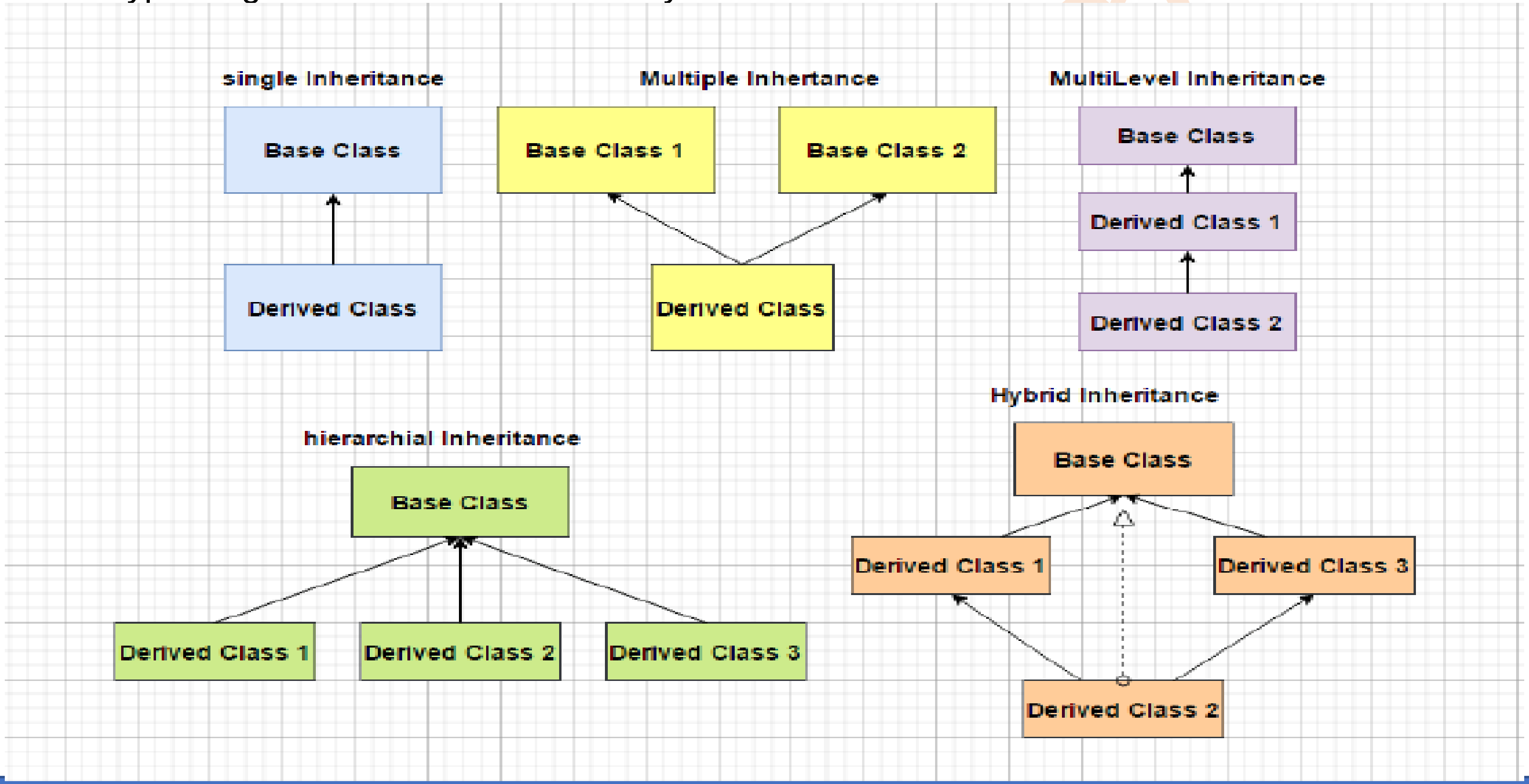
Protected Data member

- The protected access specifier allows the base class members to access onto derived class.
- However, protected members are not accessible from outside the class and global functions like main().
- Protected members in a class are similar to private members as they cannot be accessed from outside the class.
- But they can be accessed by derived classes or child classes while private members cannot.

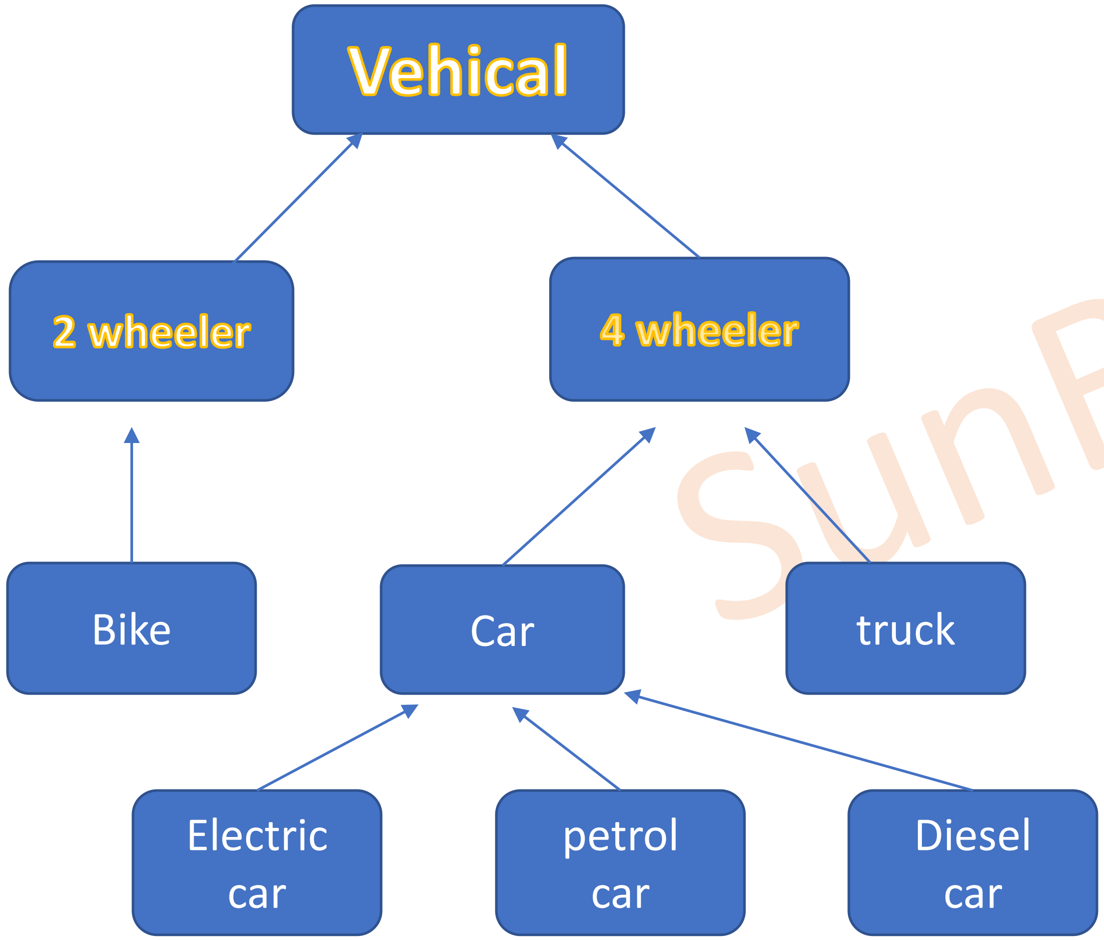
Types of Inheritance

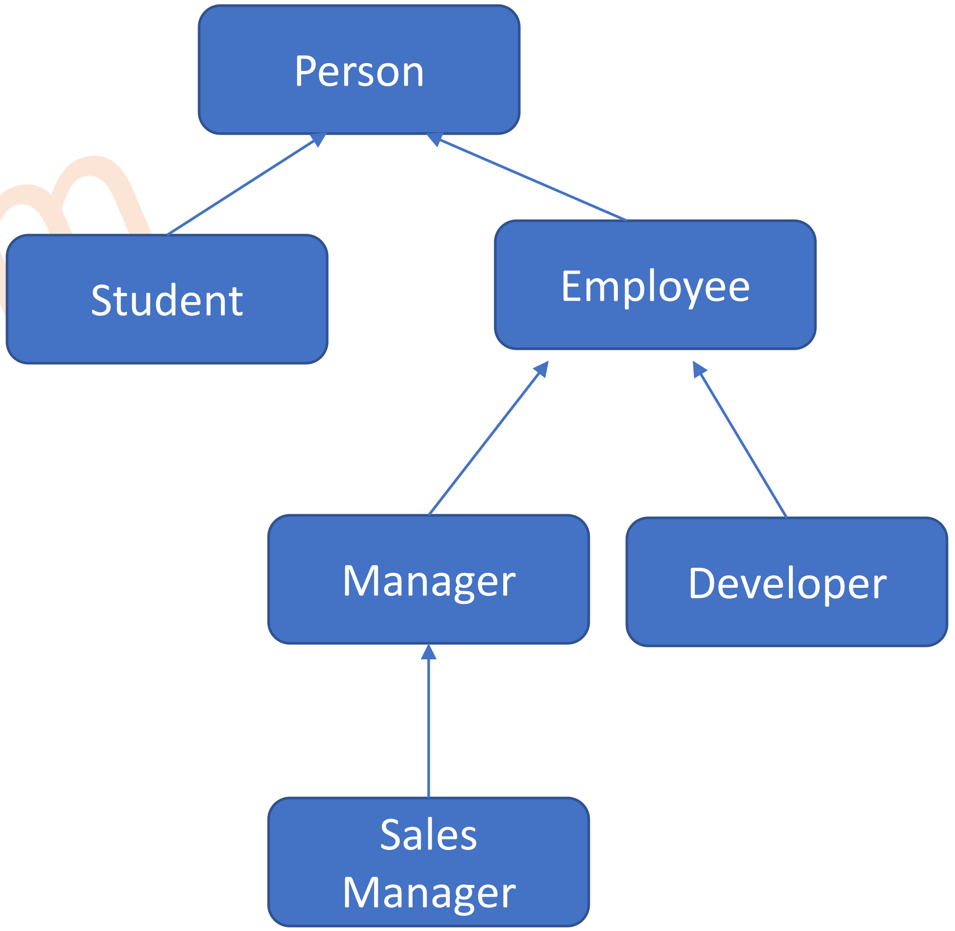
- Single inheritance
- Multiple inheritance
- Hierarchical inheritance
- Multilevel inheritance

If we combine any two or more types together then it is called as hybrid inheritance.



Inheritance is also called as " journey from Generalization to Specialization".





BOOK	Inheritance	Product
Library	Association	Book
Rice	Inheritance	Food
Bowler	Inheritance	player
Mobile	Association	Charger

Mode of inheritance

- If we use private, protected and public keyword to manage visibility of the members of class then it is called as access specifier.
- But if we use these keywords to extends the class then it is called as mode of inheritance.
- C++ supports private, protected and public mode of inheritance. If we do not specify any mode, then default mode of inheritance is private.

Mode of inheritance

Mode of inheritance (read "--->" as becomes)

	Base		Derived
public mode:			
	Public	--->	Public
	protected	--->	Protected
	private	--->	NA
protected mode:			
	Public	--->	Protected
	protected	--->	Protected
	private	--->	NA
private mode:			
	Public	--->	private
	protected	--->	private
	private	--->	NA

Thank You