Inheritance

Course Code: CSC1102 &1103 Course Title: Introduction to Programming

Dept. of Computer Science
Faculty of Science and Technology

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Lecture Outline

- ❑ Single Inheritance
- ❑ Multilevel Inheritance
- ❑ Multiple Inheritance
- ❑ Hierarchical Inheritance
- ❑ Hybrid Inheritance

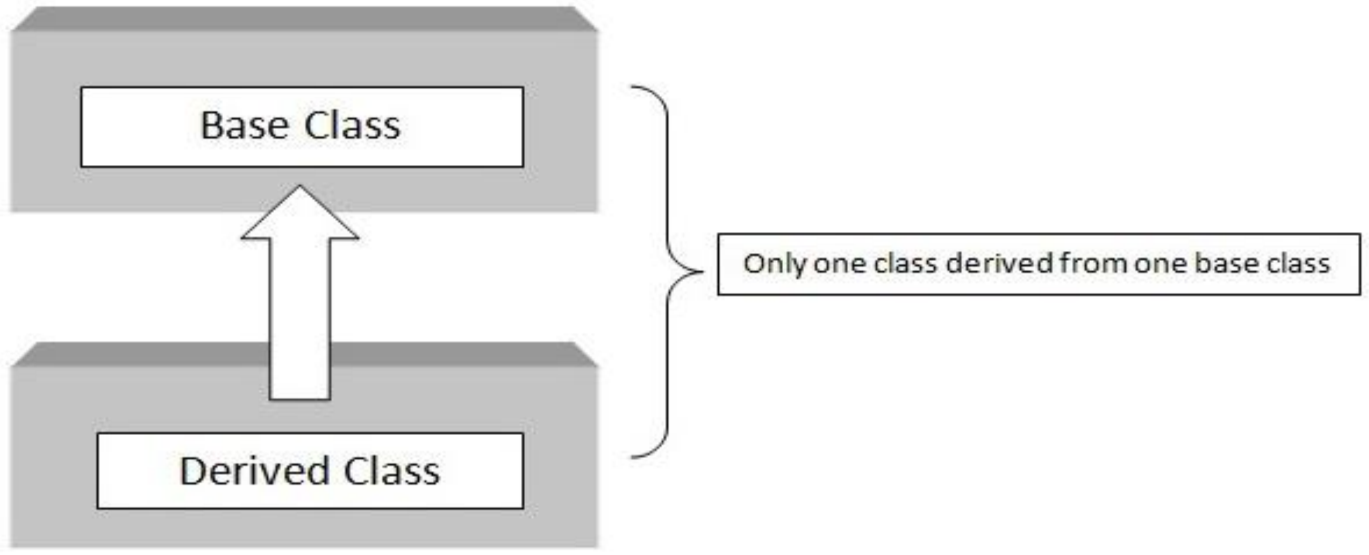
C++ Single Inheritance

Definition of Single Inheritance

- If a single class is derived from one base class then it is called *Single Inheritance*. In C++ single inheritance base and derived class exhibit one to one relation.

C++ Single Inheritance… cntd

Single Inheritance: Block Diagram



- As shown in the figure, in C++ single inheritance only one class can be derived from the base class.
- Based on the visibility mode used or access specifier used while deriving, the properties of the base class are derived. Access specifier can be private, protected or public.

C++ Single Inheritance…cntd

Single Inheritance: Syntax

```
class A   // Base class
{
    ……….
};
class B : access_specifier A   // Derived class
{
    ………..
} ;
```

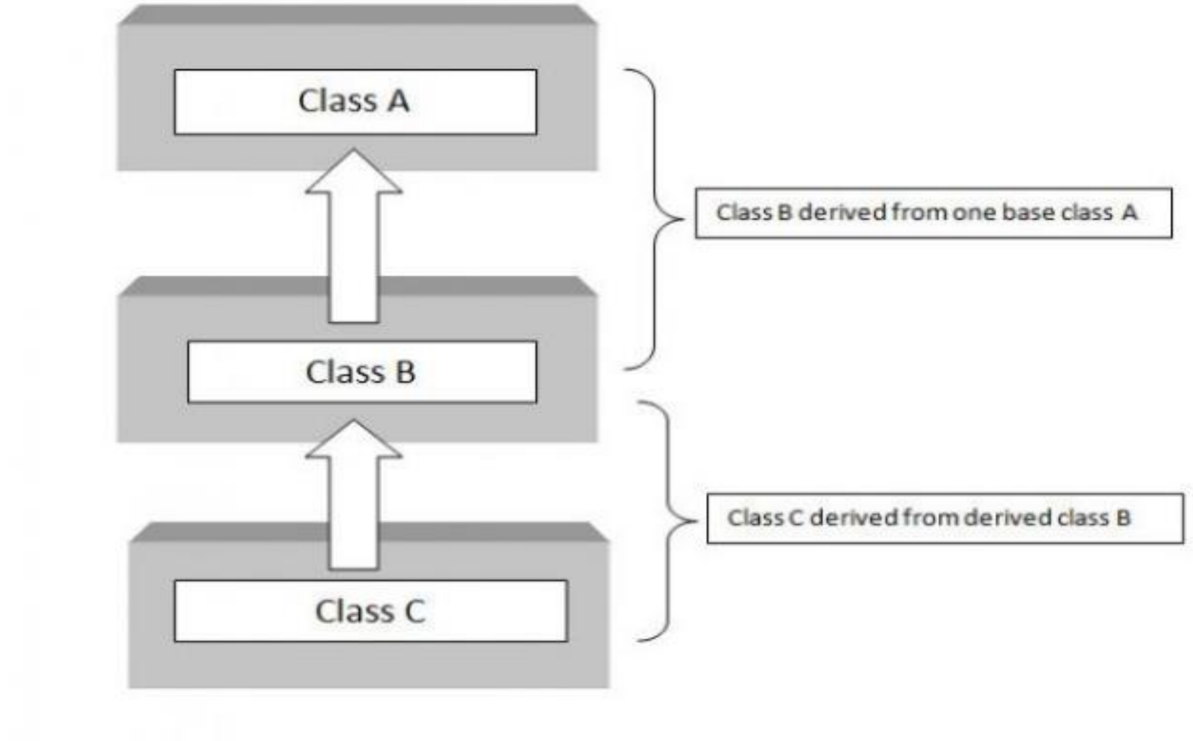
C++ Multilevel Inheritance

Definition of Multilevel Inheritance

- If a class is derived from another derived class then it is called *Multilevel Inheritance*.
- For example, if we take animals as a base class then mammals are the derived class which has features of animals and then humans are the also derived class that is derived from sub-class mammals which inherit all the features of mammals.

C++ Multilevel Inheritance… cntd

Multilevel Inheritance: Block Diagram


Class A
Class B
Class C
Class B derived from one base class A
Class C derived from derived class B

- As shown in above block diagram, class C has class B and class A as parent classes. Depending on the relation the level of inheritance can be extended to any level.
- As in other inheritance, based on the visibility mode used or access specifier used while deriving, the properties of the base class are derived. Access specifier can be private, protected or public.

C++ Multilevel Inheritance… cntd

Multilevel Inheritance: Syntax

```
class A  // Base class

{

    ...........

};

class B : access_specifier A  // Derived class

{

    ...........

 } ;
```

```
class C : access_specifier B // Derived from
                                derived class B
{
   ...........
} ;
```

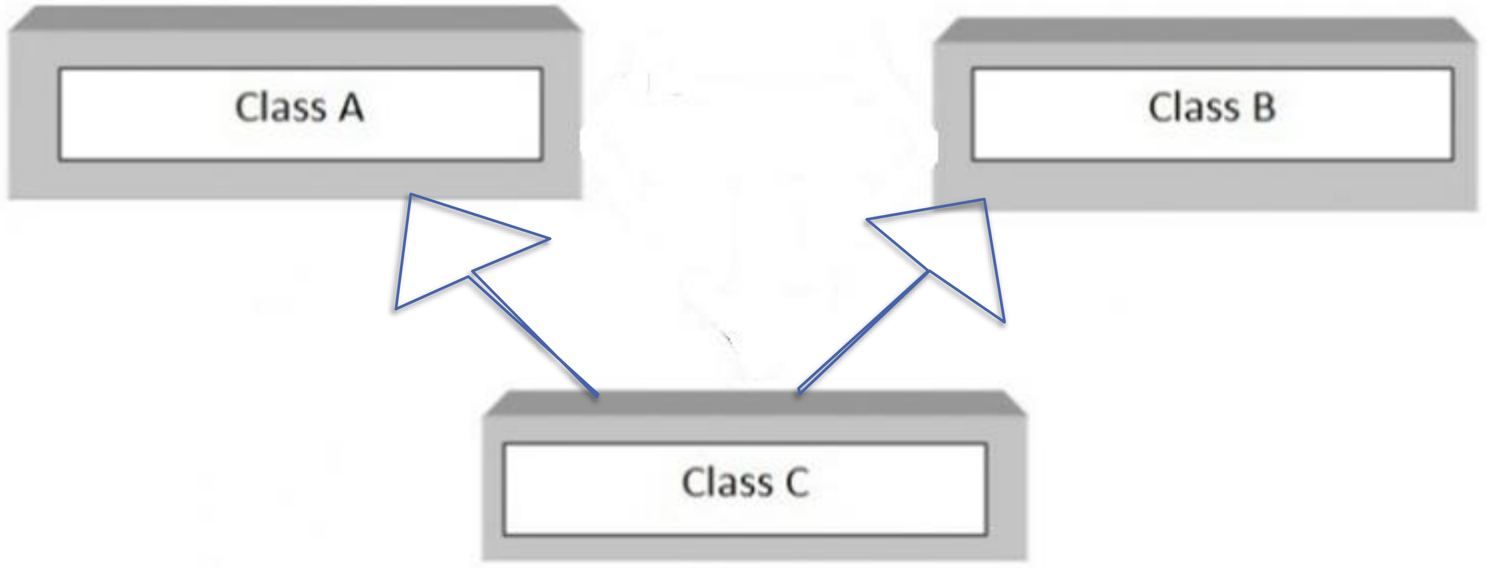
C++ Multiple Inheritance

Definition of Multiple Inheritance

- If a class is derived from two or more base classes then it is called *Multiple Inheritance*. In C++ multiple inheritance a derived class has more than one base class.

C++ Multiple Inheritance… cntd

Multiple Inheritance: Block Diagram



- As shown in above block diagram, class C is derived from two base classes A and B.
- As in other inheritance, based on the visibility mode used or access specifier used while deriving, the properties of the base class are derived. Access specifier can be private, protected or public.

C++ Multiple Inheritance… cntd

Multiple Inheritance: Block Diagram

```
class A

{

  ..........

};

class B

{

  ...........

 } ;
```

```
class C : access_specifier A, access_specifier A   // Derived class from A and B
{
  ...........
} ;
```

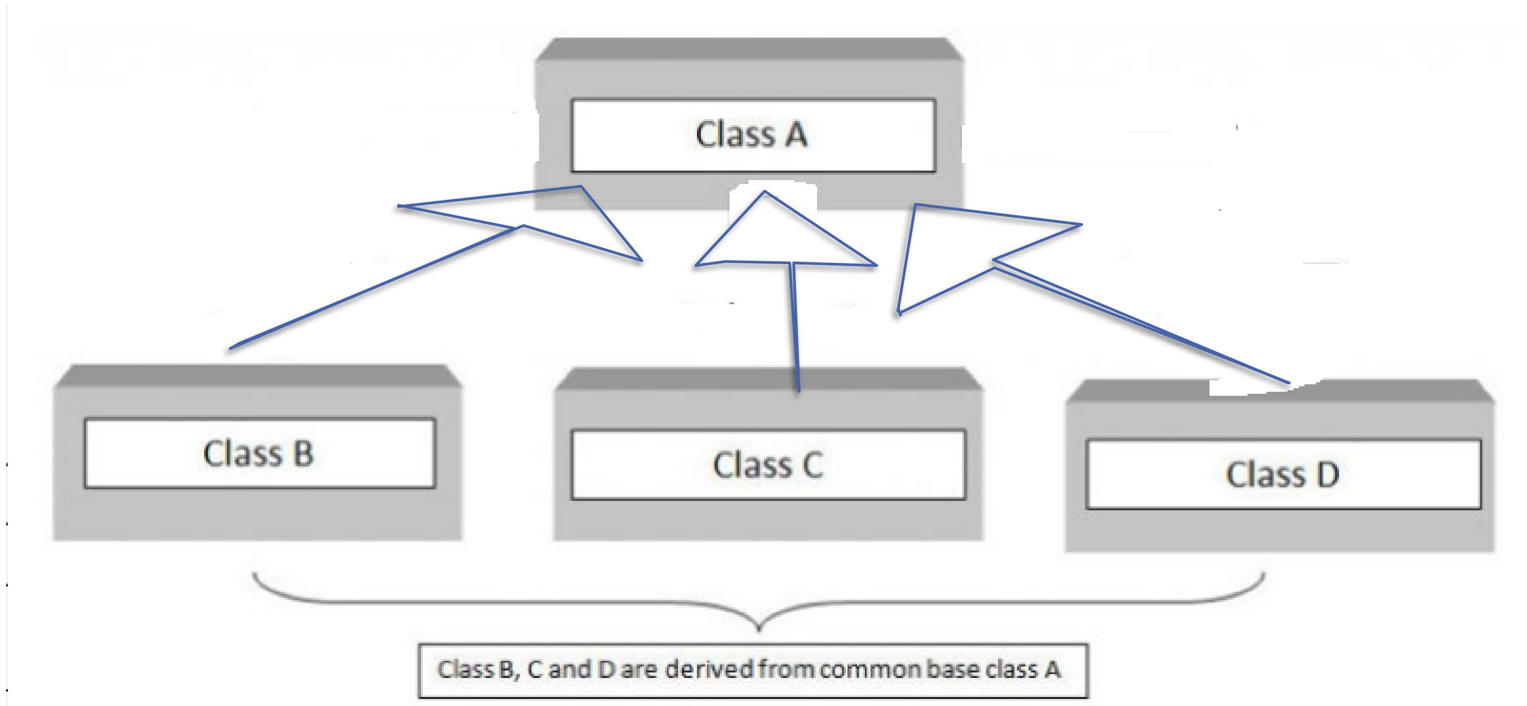
C++ Hierarchical Inheritance

Definition of Hierarchical Inheritance

- When several classes are derived from common base class it is called *Hierarchical Inheritance.*
- In C++ hierarchical inheritance, the feature of the base class is inherited onto more than one sub-class.
- For example, a car is a common class from which Audi, Ferrari, Maruti etc. can be derived.

C++ Hierarchical Inheritance… cntd

Hierarchical Inheritance: Block Diagram



- As shown in above block diagram, in C++ hierarchical inheritance all the derived classes have common base class. The base class includes all the features that are common to derived classes.
- As in other inheritance, based on the visibility mode used or access specifier used while deriving, the properties of the base class are derived. Access specifier can be private, protected or public.

C++ Hierarchical Inheritance… cntd

Hierarchical Inheritance: Syntax

```
class A  // Base class

{

    ..............

};

class B : access_specifier A  // Derived
                                class from A


{

    ...........

 } ;
```

```
class C : access_specifier A  //Derived class
                                from A


{

   ...........
 } ;
class D : access_specifier A  // Derived class
                                from A


 {

    ...........
 } ;
```

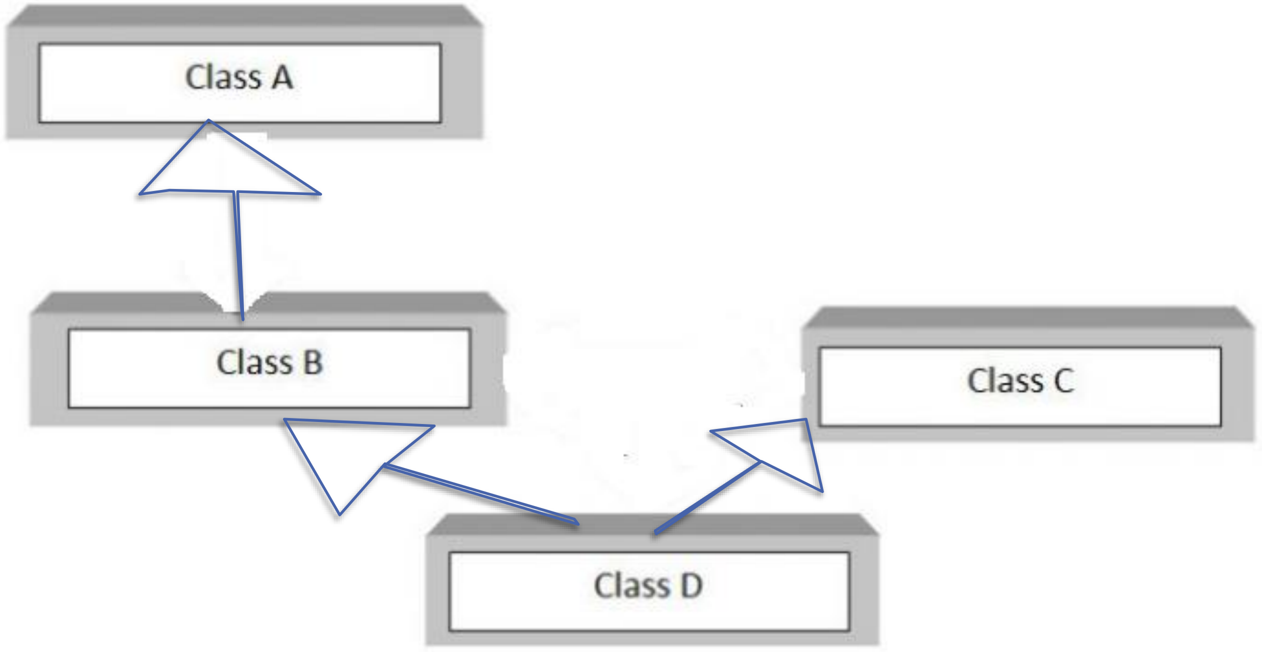
C++ Hybrid Inheritance

Definition of Hybrid Inheritance

- The inheritance in which the derivation of a class involves more than one form of any inheritance is called *Hybrid Inheritance*.
- Basically C++ hybrid inheritance is combination of two or more types of inheritance. It can also be called multi path inheritance.

C++ Hybrid Inheritance… cntd

Hybrid Inheritance: Block Diagram



- Above block diagram shows the hybrid combination of single inheritance and multiple inheritance. Hybrid inheritance is used in a situation where we need to apply more than one inheritance in a program.

- As in other inheritance, based on the visibility mode used or access specifier used while deriving, the properties of the base class are derived. Access specifier can be private, protected or public.

C++ Hybrid Inheritance

Hybrid Inheritance: Syntax

```
class A

{

    .........

};

class B : public A

{

    ..........

} ;

class C
{
    ...........
};
 class D : public B, public C
{
    ...........
};
```