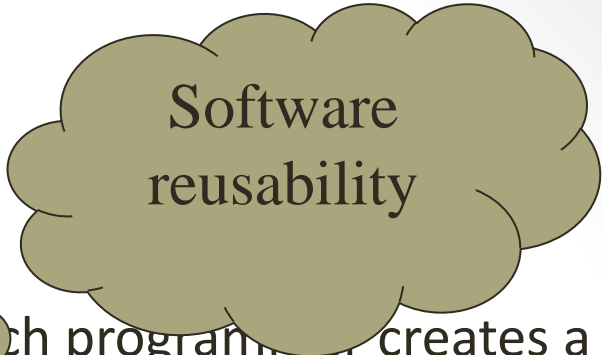


Inheritance

Lecture 16

Inheritance



Software
reusability

- It is a form of software reuse in which programmer creates a class that absorbs an existing class's data and behavior and enhances them with new capabilities.
- New class (derived) can inherit the members of existing class (base)

Example

```
class base
```

```
{ int x;
```

```
  public: int y;
```

```
  base(int i=0,int j=0) : x(i),y(j) { }
```

```
  void display() { cout<<"\n X : "<<x<<" Y : "<<y; } };
```

```
class derived : public base
```

```
{ int z;
```

```
  public:
```

```
  derived(int s) : z(s) { }
```

```
  void d() { display(); cout<<"\n Z : "<<z; } };
```

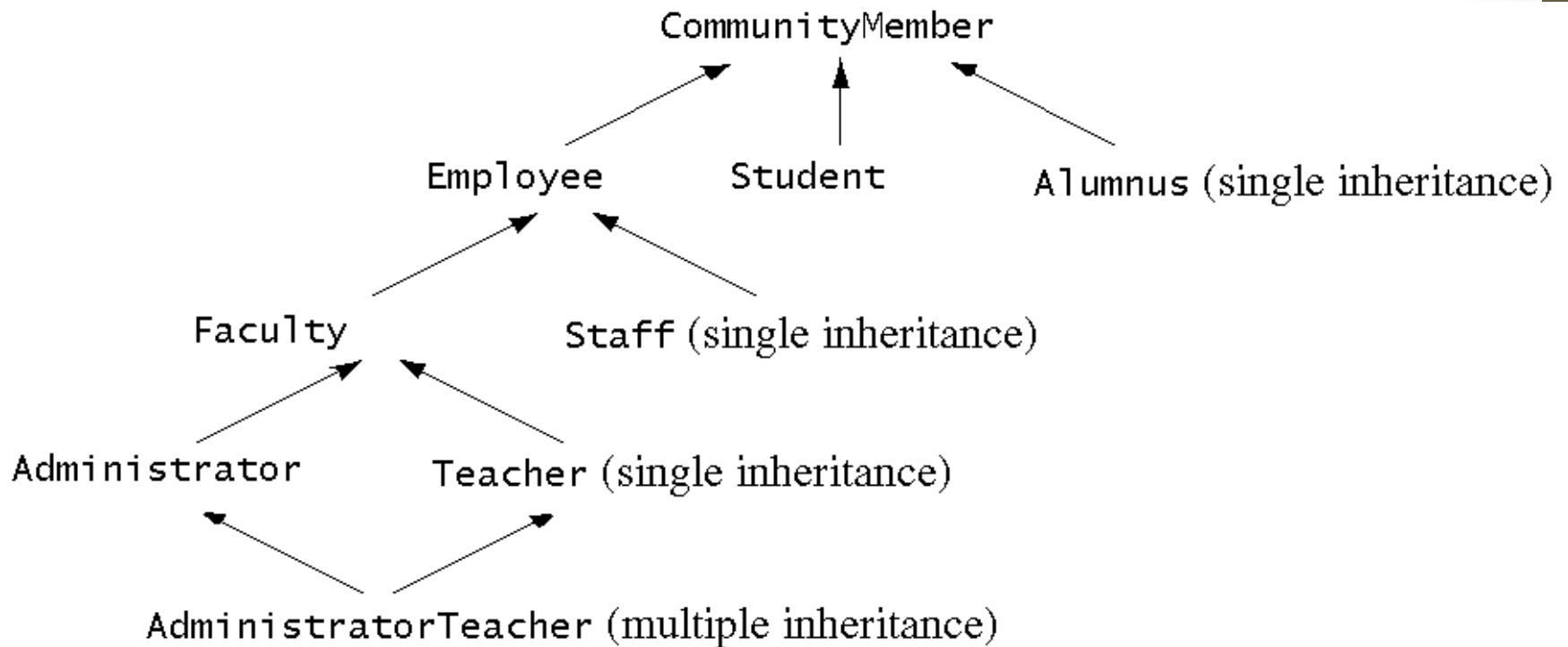
```
void main()
```

```
{ derived d(5); d.d(); d.display(); }
```

Inheritance

- Direct base class – from which derived is directly inherited from base class
- Indirect base class – inherited from two or more levels
- Single inheritance – one base class
- Multiple inheritance – multiple base classes

Example



Access specifiers

- Derived class can access the non-private members of its base class
- Though derived class can change the private members through non-private member functions of base class

Is-a relationship

- Is-a relationship represent inheritance
- Object of derived class also can be treated as an object of the base class

protected access specifier

A base class protected members can be accessed

- within the body of that base class
- by members and friends of that base class
- and by members and friends of any classes derived from that base class

Access specifiers

Base class member access specifier	Type of inheritance		
	public inheritance	protected inheritance	private inheritance
public	<p>public in derived class.</p> <p>Can be accessed directly by any non-static member functions, friend functions and non-member functions.</p>	<p>protected in derived class.</p> <p>Can be accessed directly by all non-static member functions and friend functions.</p>	<p>private in derived class.</p> <p>Can be accessed directly by all non-static member functions and friend functions.</p>
protected	<p>protected in derived class.</p> <p>Can be accessed directly by all non-static member functions and friend functions.</p>	<p>protected in derived class.</p> <p>Can be accessed directly by all non-static member functions and friend functions.</p>	<p>private in derived class.</p> <p>Can be accessed directly by all non-static member functions and friend functions.</p>
private	<p>Hidden in derived class.</p> <p>Can be accessed by non-static member functions and friend functions through public or protected member functions of the base class.</p>	<p>Hidden in derived class.</p> <p>Can be accessed by non-static member functions and friend functions through public or protected member functions of the base class.</p>	<p>Hidden in derived class.</p> <p>Can be accessed by non-static member functions and friend functions through public or protected member functions of the base class.</p>

```
class base
{
    private: int x;
    protected: int y;
    public: int z;
    base() { x=0; y=0; z=0;}
};
```

```
void main()
{ base b; derived1 d1;
  derived2 d2; derived3 d3;
  cout<<b.z;
  cout<<d1.z;
  //cout<<d2.z; ERROR
  //cout<<d3.z; ERROR
  d1.display(); d2.display();
  d3.display();
}
```

```
class derived1 : public base
{ public:
  void display()
  { cout<<"\n Public inheritance Y:"<<y<<"
    Z:"<<z; } };
```

```
class derived2 : protected base
{ public:
  void display()
  { cout<<"\n Public inheritance Y:"<<y<<"
    Z:"<<z; } };
```

```
class derived3 : private base
{ public:
  void display()
  { cout<<"\n Public inheritance Y:"<<y<<"
    Z:"<<z; } };
```

Assignment

- Explain various types of Inheritance.