# CAP444
# OBJECT ORIENTED PROGRAMMING USING C++

## Unit3


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# Unit-3

**Run-time polymorphism and virtual functions** :

- virtual base classes,
- abstract classes,
- pointer to object,
- this pointer,
- pointer to derived class,
- virtual function,
- pure virtual function,
- early vs late binding

Student

Exam

Project

Result

# virtual base class introduce

# virtual base classes

Student

Virtual

Exam

name

regno

Project

Result

# virtual base classes

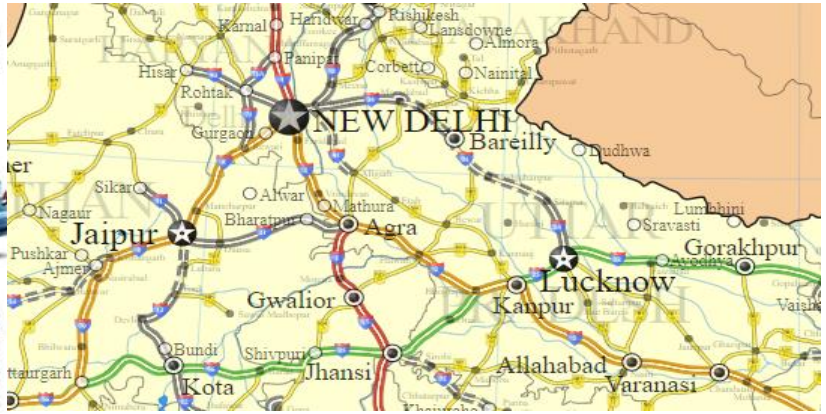
- It means we are making base class as virtual
- But why ???
- In situation???

Let's assume

- virtual base class:

Example: [cplusplus/virtualBaseClassEx at master · vishalamc/cplusplus (github.com)]

# Real Life Example




Punjab Transport Department

PB081234

Himachal Road Transport Corporation

HP014567

Karnataka State Road Transport Corporation

KA023333

Transport Department
Government of Bihar

BR012345

Transportation:
Vehicle_Registration()

Punjab_Transport
Vehicle_Registration()

PB081234

Himachal_Transport
Vehicle_Registration()

HP014567

Karnataka_Transport
Vehicle_Registration()

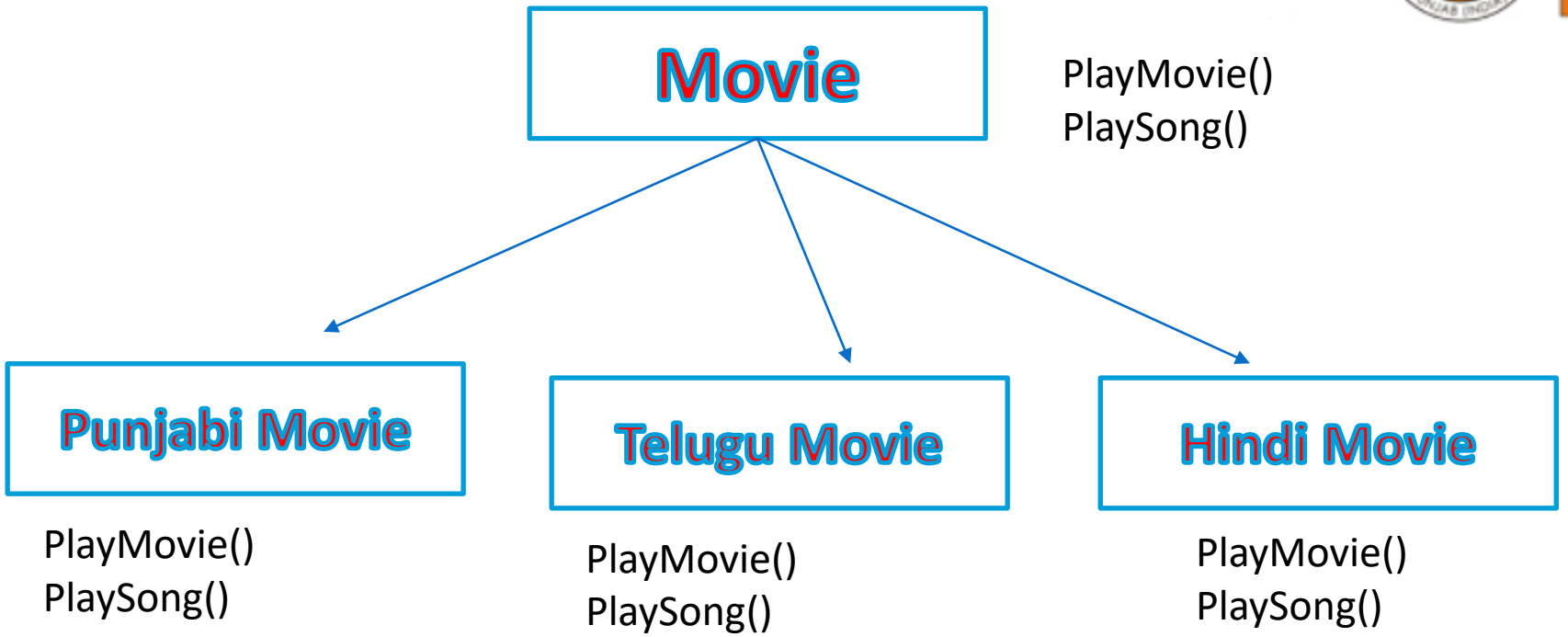
KA023333

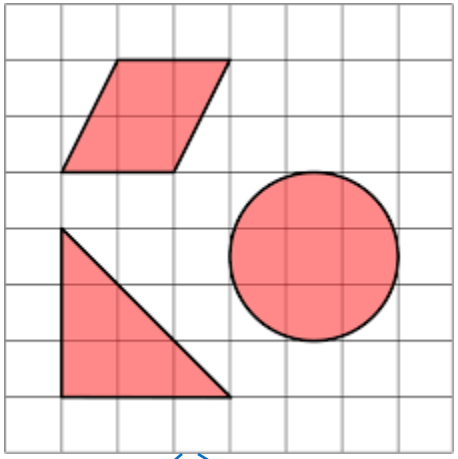
Bihar_Transport
Vehicle_Registration()

BR012345

# List of Movies




Movie
PlayMovie()
PlaySong()
Punjabi Movie
PlayMovie()
PlaySong()
Telugu Movie
PlayMovie()
PlaySong()
Hindi Movie
PlayMovie()
PlaySong()



**Area**

getArea()

getArea()

Area = w × h
w = width
h = height

getArea()

Area = $\pi \times r^2$

# Abstract Class

- *Sometimes implementation of function is not required in a base class such a class is called abstract class.*
- *In such cases we have to make function as abstract function by using virtual keyword that is also called pure virtual function.*
- *A pure virtual function is declared by assigning 0 in declaration.*

*Example:* cplusplus/abstractClassEx at master · vishalamc/cplusplus (github.com)

Which is also called as abstract class?

a) virtual function

b) pure virtual function

c) derived class

d) base class

# Important points:

- *A class is abstract if it has at least one pure virtual function.*
- *If we do not override the pure virtual function in derived class, then derived class also becomes abstract class.*
- *An abstract class can have constructors.*
- *We cannot create objects of abstract classes.*

Pick the correct statement.

a) Pure virtual functions and virtual functions are the same
b) Both Pure virtual function and virtual function have an implementation in the base class
c) Pure virtual function has no implementation in the base class whereas virtual function may have an implementation in the base class
d) The base class has no pure virtual function

# Real Life Example: polymorphism (Run Time)



Preparing food according to hotel menu

Compile time)

During competition preparing food

(Run-time)



WINAMP
00:05
Fear (3:12) *** 2. At the Gates - E
192 kbps 44 kHz
mono stereo
EQ PL
SHUFFLE
WINAMP EQUALIZER
ON AUTO
PRESETS
+12 db
+0 db
-12 db
PREAMP 60 170 310 600 1K 3K 6K 12K 14K 16K
WINAMP PLAYLIST
1. DJ Mike Llama - Llama Whippin' Intro 0:05
2. At the Gates - Blinded by Fear 3:12
3. At the Gates - Slaughter Of The Soul 3:02
4. At the Gates - Cold 3:28
ADD REM SEL MISC
3:12/9:47+
00:05
LIST OPTS


Shuffle is On

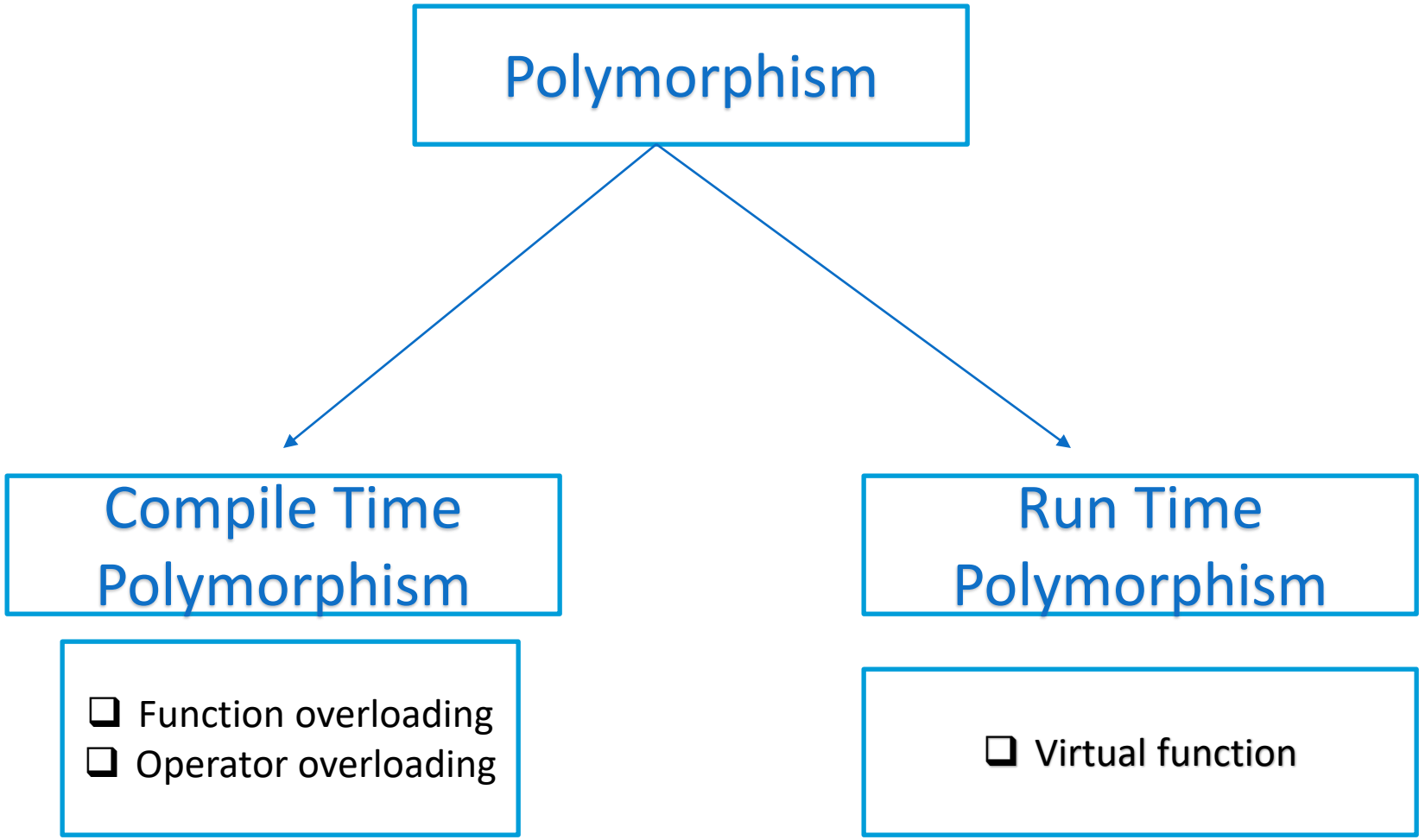
..... binding means that an object is bound to its function call at compile time.

A) late

B) static

C) dynamic

D) fixed


Polymorphism
Compile Time Polymorphism
Run Time Polymorphism
❑ Function overloading
❑ Operator overloading
❑ Virtual function

- Problems in function overriding
  - Overriding using base class pointer compiler don't know about pointer which address is pointing because address will be decided at run time when memory will be allocated.
  - To over come this problem we use virtual function
  - With the help of virtual function, we can override function at run time

  Example: Virtual function: cplusplus/VirtualFunctionExample at master · vishalamc/cplusplus (github.com)

Run time polymorphism is achieved only when a …….. is accessed through a pointer to the base class.

A) member function

B) virtual function

C) static function

D) real function

# pointer to object

- A variable that holds an address value is called a pointer variable
- Object can also have an address , so there is also a pointer that can point to the address of an object.

Example:

[cplusplus/pointerToObjectEx at master · vishalamc/cplusplus (github.com)]

# pointer to derived class

Example:-

cplusplus/PointertoDerivedClassEx at master · vishalamc/cplusplus (github.com)

## Any Query?

Unit-3 End