**what is static and dynamic binding?**

**Static Binding (Early Binding)**

* **Definition**: Static binding, also known as early binding, occurs when method calls or property accesses are resolved at **compile time**. The compiler knows the exact method or property to call based on the type of the object.
* **Characteristics**:
  + Happens at compile time.
  + It's used for methods, properties, or variables that are **resolved based on the compile-time type** of the object.
  + It applies to **non-virtual methods**, **static methods**, and **overloaded methods** (where the method signature is determined at compile time).

**Example:**

public class Example

{

public void Print()

{

Console.WriteLine("Static binding (early binding)");

}

}

public class Program

{

public static void Main()

{

Example obj = new Example();

obj.Print(); // The method is resolved at compile time.

}

}

**Dynamic Binding (Late Binding)**

* **Definition**: Dynamic binding, also known as late binding, occurs when method calls are resolved at **runtime**. The exact method to call is determined based on the **runtime type** of the object, and it's mainly used for **virtual** or **overridden** methods.
* **Characteristics**:
  + Happens at runtime.
  + It's used when the method or property depends on the **actual runtime type** of the object, not just the compile-time type.
  + Typically used in **polymorphism** with **virtual**, **abstract**, or **overridden methods**.

**Example:**

public class Animal

{

public virtual void Speak()

{

Console.WriteLine("Animal speaks");

}

}

public class Dog : Animal

{

public override void Speak()

{

Console.WriteLine("Dog barks");

}

}

public class Program

{

public static void Main()

{

Animal animal = new Dog();

animal.Speak(); // The method is resolved at runtime (Dog's Speak method).

}

}

 **Static Binding (Early Binding)**:

* Occurs at **compile time**.
* Used for **non-virtual methods**, **static methods**, and **overloaded methods**.
* Faster execution as the method is known during compilation.

 **Dynamic Binding (Late Binding)**:

* Occurs at **runtime**.
* Used for **virtual**, **abstract**, or **overridden methods**.
* More flexible and supports polymorphism, but slightly slower due to runtime method resolution.