Nasleđivanje u C#

Programiranje korisničkih interfejsa

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Extending Base Classes

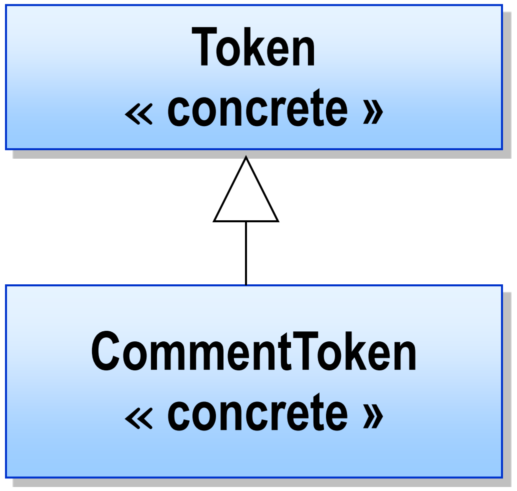
- Syntax for deriving a class from a base class

Derived class

Base class

```
class Token
{
    ...
}
class CommentToken: Token
{
    ...
}
```

Colon



- A derived class inherits most elements of its base class
- A derived class cannot be more accessible than its base class

Access Modifiers

- public - Visible to all.
- protected - Visible only from derived classes.
- private - Visible only within the given class.
- internal - Visible only within the same assembly.
- protected internal - Visible only to the current assembly or types derived from the containing class.

Accessing Base Class Members

```
class Token
{   ...
    protected string name;
}
class CommentToken: Token
{   ...
    public string Name( )
    {
        return name;  ✓
    }
}
```

```
class Outside
{
    void Fails(Token t)
    {
        ...
         t.name  ✗
        ...
    }
}
```

- Inherited protected members are implicitly protected in the derived class
- Methods of a derived class can access only their inherited protected members (different -> Java protected = C# internal+protected)
- Protected access modifiers cannot be used in a struct

Calling Base Class Constructors

- **Constructor declarations must use the base keyword**

```
class Token
{
    protected Token(string name) { ... }
    ...
}
class CommentToken: Token
{
    public CommentToken(string name) : base(name) { }
    ...
}
```

- **A private base class constructor cannot be accessed by a derived class**
- **Use the base keyword to qualify identifier scope**

Implementacija metoda

Defining Virtual Methods

- **Syntax: Declare as virtual**

```
class Token
{
    ...
    public int LineNumber( )
    { ...
    }
    public virtual string Name( )
    { ...
    }
}
```

- **Virtual methods are polymorphic**

Working with Virtual Methods

- **To use virtual methods:**
  - You cannot declare virtual methods as static
  - You cannot declare virtual methods as private

Overriding Methods

- **Syntax: Use the override keyword**

```
class Token
{   ...
    public virtual string Name( ) { ... }
}
class CommentToken: Token
{   ...
    public override string Name( ) { ... }
}
```

Working with Override Methods

- You can only override identical inherited virtual methods

```
class Token
{   ...
    public int LineNumber( )  { ... }
    public virtual string Name( ) { ... }
}
class CommentToken: Token
{   ...
    public override int LineNumber( ) { ... }   ✗
    public override string Name( ) { ... }      ✓
}
```

- You must match an override method with its associated virtual method
- You can override an override method
- You cannot explicitly declare an override method as virtual
- You cannot declare an override method as static or private

Using new to Hide Methods

- **Syntax: Use the new keyword to hide a method**

```
class Token
{   ...
    public int LineNumber( )  { ... }
}
class CommentToken: Token
{   ...
    new public int LineNumber( )  { ... }

}
```

Using new to Hide Methods

```
Token a = new Token();
Token b = new CommentToken();
a.LineNumber(); // - Token.LineNumber();
b.LineNumber(); // - Token.LineNumber();
```

Working with the new Keyword

- Hide both virtual and non-virtual methods

```
class Token
{   ...
    public int LineNumber( )  { ... }
    public virtual string Name( ) { ... }
}
class CommentToken: Token
{   ...
    new public int LineNumber( )  { ... }
    public override string Name( ) { ... }
}
```

- Resolve name clashes in code
- Hide methods that have identical signatures

Using Sealed Classes

- You cannot derive from a sealed class
- You can use sealed classes for optimizing operations at run time
- Many .NET Framework classes are sealed: String, StringBuilder, and so on
- Syntax: Use the sealed keyword

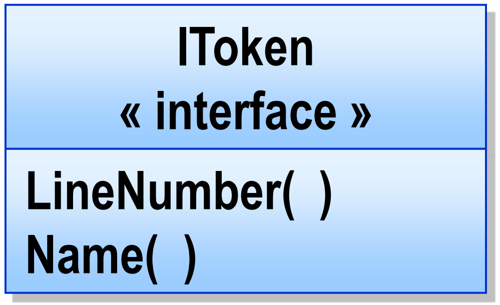
```
namespace System
{
    public sealed class String
    {
        ...
    }
}
namespace Mine
{
    class FancyString: String { ... } ✗
}
```

Declaring Interfaces

- Syntax: Use the interface keyword to declare methods

Interface names should begin with a capital "I"

```
interface IToken
{
    int LineNumber( );
    string Name( );
}
```



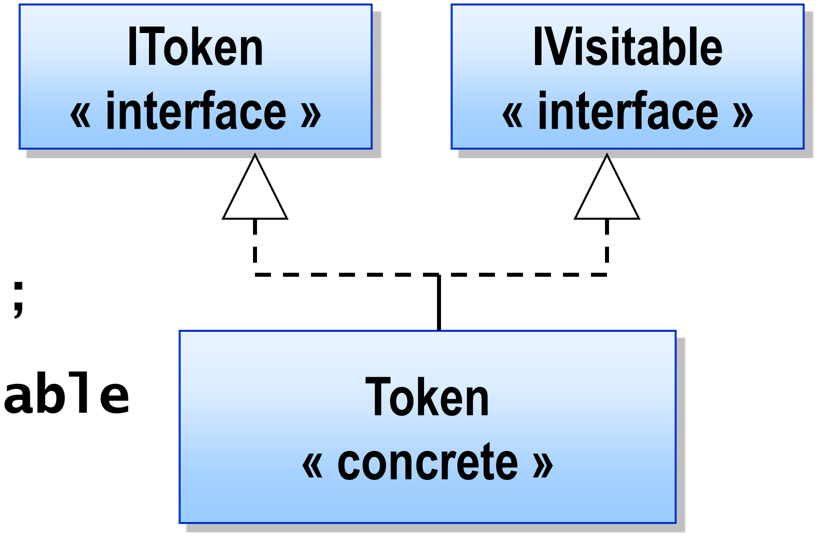
No access specifiers

No method bodies

Implementing Multiple Interfaces

- A class can implement zero or more interfaces

```
interface IToken
{
    string Name( );
}
interface IVisitable
{
    void Accept(IVisitor v);
}
class Token: IToken, IVisitable
{ ...
}
```



- An interface can extend zero or more interfaces
- A class must implement all inherited interface methods

Implementing Interface Methods

- The implementing method must be the same as the interface method
- The implementing method can be virtual or non-virtual

```
class Token: IToken, IVisitable
{
    public virtual string Name( )
    { ...
    }
    public void Accept(IVisitor v)
    { ...
    }
}
```

Same access
Same return type
Same name
Same parameters

Implementing Interface Methods Explicitly

- **Use the fully qualified interface method name**

```
class ArtisticCowboy: IArtist, ICowboy
{
   void IArtist.Draw( )
   {
   ...
   }
   void ICowboy.Draw( )
   {
   ...
   }
}
```

- **Restrictions of explicit interface method implementation**
  - You can only access methods through the interface

Apstraktne klase

Declaring Abstract Classes

- Use the abstract keyword

```
abstract class Token
{
    ...
}
class Test
{
    static void Main( )
    {
        new Token( );
    }
}
```

Token
{ abstract }

An abstract class cannot be instantiated

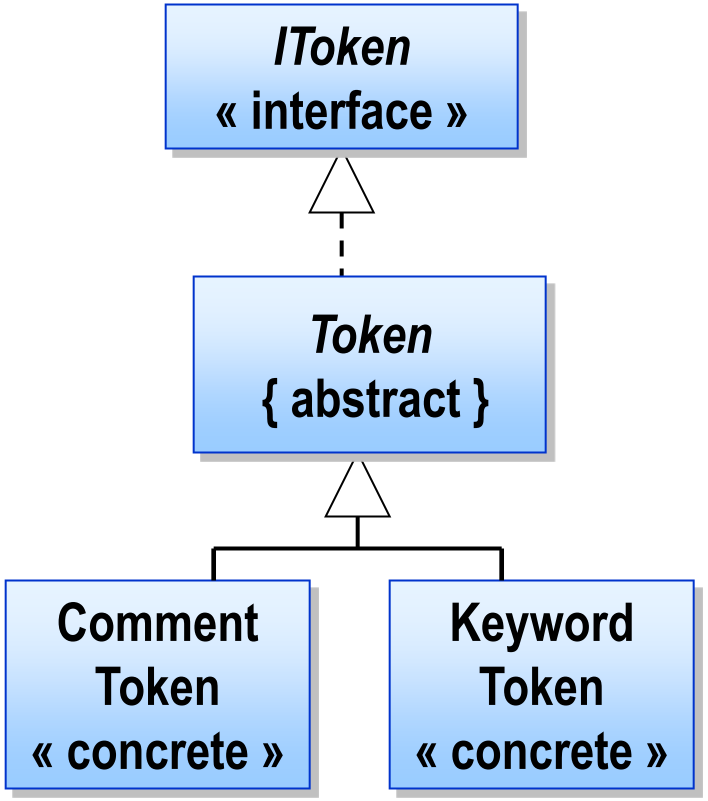
Using Abstract Classes in a Class Hierarchy

- Example 1

```
interface IToken
{
    string Name( );
}

abstract class Token: IToken
{
    string IToken.Name( )
    {   ...
    }
    ...
}

class CommentToken: Token
{   ...
}
class KeywordToken: Token
{   ...
}
```



Comparing Abstract Classes to Interfaces

- **Similarities**
  - Neither can be instantiated
  - Neither can be sealed
- **Differences**
  - Interfaces cannot contain any implementation
  - Interfaces cannot declare non-public members
  - Interfaces cannot extend non-interfaces

Implementing Abstract Methods

- **Syntax: Use the abstract keyword**

```
abstract class Token
{
    public virtual string Name( ) { ... }
    public abstract int Length( );
}
class CommentToken: Token
{
    public override string Name( ) { ... }
    public override int Length( ) { ... }
}
```

- **Only abstract classes can declare abstract methods**
- **Abstract methods cannot contain a method body**