Visual C# .Net using framework 4.5

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Lecture 05

Indexer

An indexer allows an object to be indexed like an array. When you define an indexer for a class, this class behaves like a virtual array. You can then access the instance of this class using the array access operator ([ ])
Declaration of behavior of an indexer is to some extent similar to a property. Like properties, you use get and set accessors for defining an indexer.
Indexers are not defined with names, but with the this keyword, which refers to the object instance.

Indexer

```
class IndexedNames
{
        private string[] namelist;
        private int size;
        public IndexedNames(int s)
        {
                size = s;
                namelist = new string[size];
                for (int i = 0; i < size; i++)
                        namelist[i] = "N. A.";
        }
```

Indexer

```
public string this[int index]
{
        get
        {
                string tmp;
                if( index >= 0 && index <= size-1 )
                {
                        tmp = namelist[index];
                }
                else
                {
                        tmp = "";
                }
                return ( tmp );
        }//end the get
```

Indexer

```
        set
        {
                if( index >= 0 && index <= size-1 )
                {
                        namelist[index] = value;
                }
        }//end the set
}//end the Indexer
```

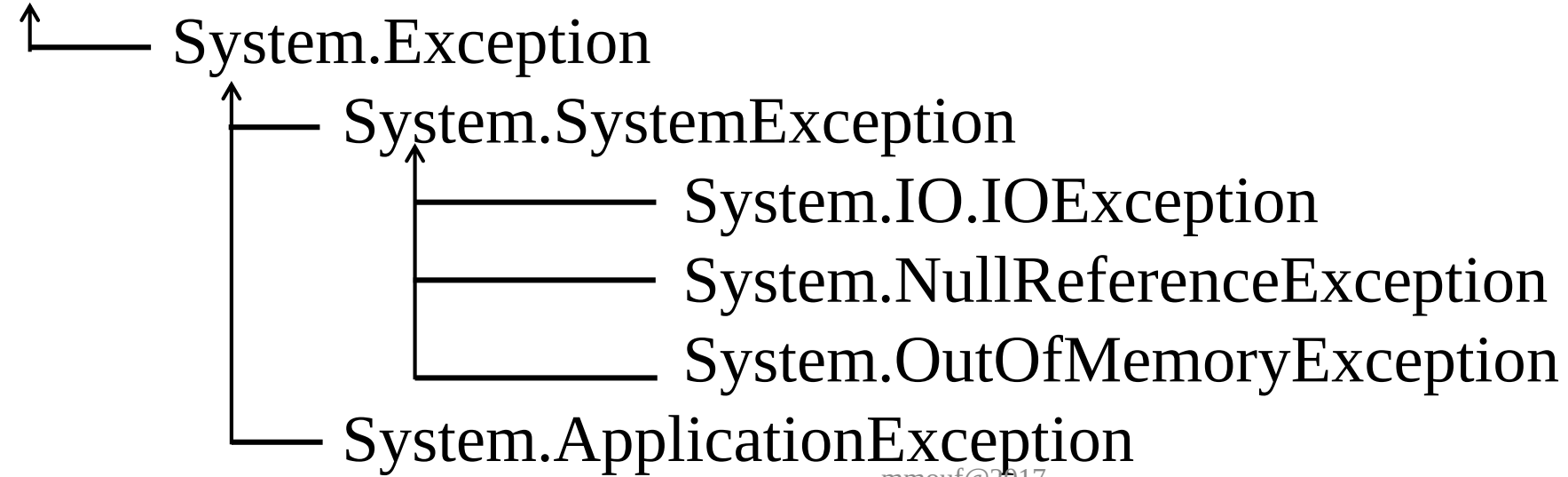
Indexer

```
        public static void Main(string[] args)
        {
                IndexedNames names = new IndexedNames(7);
                names[0] = “Aly";
                names[1] = “Amr";
                names[2] = “Ahmed";
                names[3] = “Mohamed";
                names[4] = “Tarek";
                names[5] = “Ziad";
                names[6] = “Waleed";
                for ( int i = 0; i < IndexedNames.size; i++ )
                        Console.WriteLine(names[i]);
        } //end Main
} //end the class
```

Exception Handling

Exceptions are errors that occur in run time (Run time error), it may happen or it may not happen

To begin to understand how to program using exception, we must first know that exceptions are objects. All System and user-defined exceptions are derived from System.Exception (which in turn is derived from System.Object).



Exception Handling

The idea is to physically separate the core program statements from the error handling statements. So, the core code that might throw exceptions are placed in a try block and the code for handling exception is put in the catch block.

```
try
{ … }
catch(exception_class obj)
{ …}
```

The try block is a section of code that is on the lookout for any exception that may be encountered during the flow of execution.

If the exception occurs, the runtime stops the normal execution, terminates the try block and start searching for a catch block that can catch the pending exception depending on its type.

Exception Handling

If the appropriate catch object is found:

- It will catch the exception
- It will handle the exception (execute the block of code in catch)
- Continue executing the program

If the appropriate catch object is not found:

- The runtime will unwind the call stack, searching for the calling function
- Re-throw the exception from this function
- Search for a catch block in

and repeat till it found an appropriate catch block or reach the Main

If it happens, the exception will be considered as uncaught and raise the default action

Exception Handling

A try block contains more than one statement. Each could raise one or more exception object. So, the try block can raise more than one exception.
The catch block catches only one exception depending on its parameter.
Then, the try block can have multiple catch blocks.

Exception Handling

```
try
{
        Console.WriteLine(“Enter first Number”);
        int I = int.Parse(Console.ReadLine());
        Console.WriteLine(“Enter second number”);
        int j = int.Parse(Console.ReadLine());
        int k = I / j;
}
catch(OverflowException e)
{
        Console.WriteLine(e);
}
catch(DivideByZeroException e)
{
        Console.WriteLine(e);
}
```

Exception Handling

The general catch block

The general catch block, is the catch block that can catch any exception regardless of its class. There are 2 ways to define the general catch block.

•catch
{
……
}
•catch(System.Exception e)
{
……
}

Any try can have only one general catch block and if it exist, it must be the last catch.

Exception Handling

The finally statement

Sometimes, throwing an exception and unwinding the stack can create a problem.

In the event, however, that there is some action you must take regardless of whether an exception is thrown such as closing a file.

When finally is executed:

If the try block executes successfully, the finally block executes immediately after the try block terminates.

If an exception occurs in the try block, the finally block executes immediately after a catch handler completes exception handling.

If the exception is not caught by a catch handler associated with that try block or if a catch handler associated with that try block throws an exception, the finally block executes, then the exception is processed by the next enclosing try block

Example:

```
class Test
{       int I;
        private static void Welcome()
        {       WriteLine("Welcome to Our Test Class");     }
        private static void GoodBye()
        {       WriteLine("This is the end of our Class");     }
        public static void PrintMessage()
        {       WriteLine("This Message from Test Class");
                Welcome();
        }
        public static void Main()
        {       I = int.Parse(Console.ReadLine());
                PrintMessage();
        }
}
```

Creating and Using Delegates

In the Last example: assume we want the PrintMessage() to call either the Welcome() or the GoodBye() dependent on the value of I (if I < 5, call the Welcome otherwise call GoodBye).

This means that we don't know actually which function to be called when the Print Message execute.

So, Here, we need to pass the function (Welcome or GoodBye) to PrintMessage().

But, How to Pass the function?

The function itself couldn't be passed, But, we know that the function is loaded into the memory(have an address). So, if we can pass the address to the function that will be great.

This is done through the Delegate which allows the programmer to encapsulate a reference to a method inside a delegate object.

Creating and Using Delegates

```
public delegate void MyDelegate();
class Test
{
        int I;
        private static void Welcome()
        {               WriteLine("Welcome to Our Test Class");     }
        private static void GoodBye()
        {               WriteLine("This is the end of our Class");     }
        public static void PrintMessage(MyDelegate m)
        {
                WriteLine("This Message from Test Class");
                m();
        }
```

Creating and Using Delegates

```
        public static void Main()
        {
                I = int.Parse(Console.ReadLine());
                if(I < 5)
                {
                        MyDelegate m_Delegate = new MyDelegate(Test.Welcome);
                        PrintMessage(m_Delegate);
                }
                else
                {
                        MyDelegate m_Delegate = new MyDelegate(Test.GoodBye);
                        PrintMessage(m_Delegate);
                }
        }
}//end class
```

Creating and Using Delegates

Note:

We can create a delegate object that is not attached at any function, and then we can attach the function

We can assign more than one function to the same delegate, and when invoking this delegate, it will execute all the functions assigned to it in the same order that it was added.

Both are done through the += operator

We can also, delete a function from the delegate object by using the -= operator

Events

An event in C# is a way for a class (Sender) to provide notifications to clients (Listener) of that class when some interesting thing happens to an object. The most familiar use for events is in graphical user interfaces

The ideal case that we have 2 classes:

1)Sender, which must contains the events. The event itself didn't know what function will be executed, he knows what is the Signature of the function to be executed and its return type (delegate). In the event declaration, it must specify the delegate. Also, the Sender Class must contains the code that fire the event.

2)Listener, contains the relation of the events with the method that will be executed when the event fire. This is done through the delegate. It also contains the implementation of the methods to be executed when the event fire.

Example:

Write a program that read a number from the user, this number is between 1 and 100. If the number is Less than 1, it print a message on the screen "Less than 1" and if it is greater than 100, it prints "Out of Range"

Events

1) The Sender

```
public delegate void ValueHandler(string msg);
public class Sender
{
        public int I;
        //The Sender class can send these 2 events
        public event ValueHandler Low;
        public event ValueHandler High;
        public void ReadData()
        {
                I = int.Parse(Console.ReadLine());
                If(I < 1)
                {
                        if(Low != null)
                        {
                                Low("Out of Range, Number is too small");
                        }
                }
```

Events

1) The Sender

```
                else
                {
                        if(I > 100)
                        {
                                if(High !=null)
                                {
                                        High("Out of Range, Number is too large");
                                }
                        }
                }
        }//End Read Data
}//End Sender Class
```

Events

2) The Listening to the incoming Event

```
public class EventApp
{       public static int Main()
        {       Sender s = new Sender();
                //Hooks into events
                s.Low  += new ValueHandler(OnLow);
                s.High += new ValueHandler(OnHigh);
                //Call the Read Data
                s.ReadData();
        }
        public void OnLow(string str)
        {
                Console.WriteLine(”{0}”, str);
        }
        public void OnHigh(string str)
        {
                Console.WriteLine(”{0}”, str);
        }
}
```