

ArrayList Property **ArrayList.Item(index As Integer) As Object**
 get/set element at specified index

Public Overridable Function ArrayList.Add(value As Object) As Integer
 add object to the end of ArrayList

Public Overridable Sub ArrayList.AddRange(c As ICollection)
 add elements of ICollection to the end of ArrayList

Public Overridable Function ArrayList.BinarySearch(index As Integer, count As Integer, value As Object, comparer As IComparer)
Public Overridable Function ArrayList.BinarySearch(value As Object) As Integer
 search range of elements / entire sorted ArrayList for given element
 using specified comparer and return 0-based index of element
 index : 0-based starting index of range to search

Public Overridable Sub ArrayList.Clear() : remove all elements from ArrayList

Public Overridable Function ArrayList.Clone() As Object : create shallow copy of ArrayList

Public Overridable Function ArrayList.Contains(item As Object) As Boolean
 determines whether specified element in the ArrayList

Public Overridable Function ArrayList.GetRange(index As Integer, count As Integer)
 return ArrayList representing subset of elements in source ArrayList

Public Overridable Function ArrayList.IndexOf(value As Object) As Integer

Public Overridable Function ArrayList.IndexOf(value As Object, startIndex As Integer, count As Integer) As Integer
 search for specified Object and return 0-based index of first occurrence

LastIndexOf

Public Overridable Function ArrayList.IndexOf(value As Object) As Integer

Public Overridable Function ArrayList.LastIndexOf(value As Object, startIndex As Integer, count As Integer) As Integer
 search for specified Object and return 0-based index of last occurrence

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Notes

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ArrayList

Public Overridable Sub ArrayList.Insert(index As Integer, value As Object)
insert element into ArrayList at specified index

Public Overridable Sub ArrayList.InsertRange(index As Integer, c As ICollection)
insert elements of collection into ArrayList at specified index

Public Overridable Sub ArrayList.Remove(obj As Object)

remove first occurrence of specific object from ArrayList

Public Overridable Sub ArrayList.RemoveAt(index As Integer)

remove element at specified index of ArrayList

Public Overridable Sub ArrayList.RemoveRange(index As Integer, count As Integer)

remove range of elements from ArrayList

Public Overridable Sub ArrayList.Reverse()

Public Overridable Sub ArrayList.Reverse(index As Integer, count As Integer)

reverse order of elements in entire ArrayList / specified range

index : 0-based starting index of range to reverse

Public Overridable Sub ArrayList.SetRange(index As Integer, c As ICollection)

copy elements of collection over range of elements in ArrayList

Public Overridable Sub ArrayList.Sort() : sort elements in entire ArrayList

Public Overridable Sub ArrayList.Sort(comparer As IComparer)

Public Overridable Sub ArrayList.Sort(

index As Integer, count As Integer, comparer As IComparer)

sort elements in entire ArrayList / specified range using specified comparer

comparer : IComparer implementation to use when comparing elements

AS = BA or null reference to use IComparer implementation of each element

Public Overridable Function ArrayList.ToArray() As Object()

Public Overridable Function ArrayList.ToArray(type As Type) As Array

copy elements of ArrayList to new array of Object / specified element type

Public Overridable Sub ArrayList.TrimToSize()

set capacity to actual number of elements in ArrayList

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Hashtable

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Hashtable 在VB.NET中，Hashtable类表示基于密钥的散列组织的键值对的集合。

印刷量

(1,0) 散列表中每个项都包含一个键-值对，使用键访问集合中的项

$T(x, y, w, w) = \text{重量} / \text{速度} = \text{重量} / \text{速率}$

$\text{pairs} = \text{数量} / \text{速率} = \text{重量} / \text{速率}$

ReadOnly Property Hashtable.Count As Integer

get number of key / value pairs contained in Hashtable

ReadOnly Property HashtableFixedSize As Boolean

get value indicating whether Hashtable has fixed size

ReadOnly Property Hashtable.IsReadOnly As Boolean

get value indicating whether Hashtable is read-only

Property Hashtable.Item(key As Object) As Object

get / set value associated with specified key

ReadOnly Property Hashtable.Keys As ICollection

get ICollection containing keys in Hashtable

ReadOnly Property Hashtable.Values As ICollection

get ICollection containing values in Hashtable

Public Overridable Sub Hashtable.Add(key As Object, value As Object)

add element with specified key / value into Hashtable

Public Overridable Sub Hashtable.Clear() : remove all elements from Hashtable

Public Overridable Function Hashtable.Clone() As Object : create shallow copy

Public Overridable Function Hashtable.Contains(key As Object) As Boolean

Public Overridable Function Hashtable.ContainsKey(key As Object) As Boolean
 determine whether Hashtable contain specific key

Public Overridable Function Hashtable.ContainsValue(value As Object) As Boolean

determine whether Hashtable contain specific value

Public Overridable Sub Hashtable.CopyTo(array As Array, arrayIndex As Integer)

copy Hashtable elements to one-dimensional Array at specified index

Public Overridable Sub Hashtable.Remove(key As Object)

remove element with specified key from Hashtable

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ref - student

SortedList 在VB.NET中，SortedList类表示按key排序并通过key和index访问的key-value对集合
相当于数组与散列表的结合，元素集合始终按键值排序

at SortedList 和 使用索引访问元素时，视为ArrayList

使用键值访问元素时，视为Hashtable

from System.Collections.Generic import SortedList

Property SortedList.Capacity As Integer

get / set capacity of SortedList Object

SortedList 还包含与 Hashtable 类似的属性

ReadOnly Property SortedList.Count As Integer

ReadOnly Property SortedList.IsFixedSize As Boolean

ReadOnly Property SortedList.IsReadOnly As Boolean

Property SortedList.Item(key As Object) As Object

ReadOnly Property SortedList.Keys As ICollection

ReadOnly Property SortedList.Values As ICollection

SortedList 包含与 ArrayList 和 Hashtable 相似的方法

Public Overridable Sub SortedList.Add(key As Object, value As Object)

Public Overridable Sub SortedList.Clear()

Public Overridable Function SortedList.Clone() As Object

Public Overridable Function SortedList.Contains(key As Object) As Boolean

Public Overridable Function SortedList.ContainsKey(key As Object) As Boolean

Public Overridable Function SortedList.ContainsValue(key As Object) As Boolean

Public Overridable Sub SortedList.CopyTo(array As Array, arrayIndex As Integer)

Public Overridable Sub SortedList.Remove(key As Object)

Public Overridable Sub SortedList.RemoveAt(index As Integer)

Public Overridable Sub SortedList.TrimToSize()

Public Overridable Function SortedList.GetByIndex(index As Integer) As Object

get value at specified index of SortedList

Public Overridable Function SortedList.GetKey(index As Integer) As Object

get key at specified index of SortedList

use and do not define their own storage mechanism

don't implement their own storage mechanism

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Sorted List Public Overridable Function SortedList.GetKeyList() As IList
 get keys in SortedList object

Public Overridable Function SortedList.GetValueList() As IList
get values in SortedList object

Public Overridable Function SortedList.IndexOfKey(key As Object) As Integer
return 0-based index of specified key in SortedList object

Public Overridable Function SortedList.IndexOfValue(value As Object) As Integer
return 0-based index of first occurrence of specified value in SortedList

Public Overridable Sub SortedList.SetByIndex(index As Integer, value As Object)
replace value at specified index in SortedList

Stack 在VB.NET中, Stack类表示对象的后进先出(last-in, first-out)的集合
包含与SortedList类似的方法:

ReadOnly Property Stack.Count As Integer

Public Overridable Sub Stack.Clear()

Public Overridable Function Stack.Clone()

Public Overridable Function Stack.Contains(obj As Object) As Boolean

Public Overridable Sub Stack.CopyTo(array As Array, index As Integer)

Public Overridable Function Stack.Peek() As Object

return object at top of Stack without removing

Public Overridable Function Stack.Pop() As Object

remove and return object at top of Stack

Public Overridable Sub Stack.Push(obj As Object)

insert object at top of Stack

(obj) = A * A + B * B, [obj ... obj] = A

Public Overridable Function Stack.ToArray() As Object()

copy Stack to new array

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Queue

在VB.NET中，Queue类表示对象的先进先出(first-in, first-out)的集合

包含与Stack类相似人的属性和方法

ReadOnly Property Queue.Count As Integer

Public Overridable Sub Queue.Clear()

Public Overridable Function Queue.Clone() As Object

Public Overridable Function Queue.Contains(obj As Object) As Object

Public Overridable Sub Queue.CopyTo(array As Array, index As Integer)

Public Overridable Sub Queue.TrimToSize()

Public Overridable Function Queue.ToArray() As Object()

Public Overridable Function Queue.Peek() As Object

Public Overridable Sub Queue.Enqueue(obj As Object)

add object to end of Queue

Public Overridable Function Queue.Dequeue() As Object

remove and return object at beginning of Queue

BitArray

在VB.NET中，提供了专门用于表示位值数组的BitArray类

用于需要存储位但不知道具体位数的情形

实际上是一个Boolean数组，true表示该位为1，false表示该位为0

可以通过0-based索引访问BitArray中的特定位

BitArray类可以通过不同的构造函数实例化

BitArray(values As Boolean())

initialize new instance contain bit values copied from specified array of Boolean

BitArray(bytes As Byte())

initialize new instance contain bit value copied from specified array of Byte
each byte represent 8 consecutive bits

BitArray(lengths As Integer) / BitArray(lengths As Integer, defaultValue As Boolean)

initialize new instance can hold specified number of bit values

initially set to false / specified value

BitArray(values As Integer())

initialize new instance contain bit value copied from specified array of Integer

each Integer represent 32 consecutive bits

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BitArray

包含与 ArrayList 类似的属性和方法

ReadOnly Property BitArray.Count As Integer

ReadOnly Property BitArray.IsReadOnly As Boolean

Property BitArray.Item(index As Integer) As Boolean

Property BitArray.Length As Integer

Public Overridable Function BitArray.Clone() As Object

Public Overridable Sub BitArray.CopyTo(Carray As Array, index As Integer)

Public Overridable Function BitArray.Get(index As Integer) As Boolean

get value of bit at specific position in BitArray

Public Overridable Sub BitArray.Set(index As Integer, value As Boolean)

Set value of bit at specific position in BitArray

Public Overridable Sub BitArray.SetAll(value As Boolean)

set all bits in BitArray to specified value

Public Overridable Function BitArray.And(value As BitArray) As BitArray

Public Overridable Function BitArray.Or(value As BitArray) As BitArray

Public Overridable Function BitArray.Xor(value As BitArray) As BitArray

perform bitwise AND/OR/XOR operation

between elements of current BitArray object

value must be against corresponding elements in specified BitArray

current BitArray modified to store result of bitwise operation

Public Overridable Function BitArray.Not() As BitArray

invert all bit values in current BitArray

Dim b1 As Byte() = {111} Dim Dim b2 As Byte() = {50}

Dim ba1 As BitArray = New BitArray(bys1) → TFTFFFFF

Dim ba2 As BitArray = New BitArray(bys2) → FTFFTTFF

ba1.And(ba2) → FFFFFFFF

{111};"Not", "Not", ba1, Not() → TFTTTTTT

{50}; "Or", "Or", ba1, Or() → FTFFTTFF

特别注意：0-based 索引是从低位到高位存储的

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0029 - 程序设计

过程 在 VB.NET 中，过程是一组调用时一起执行任务的语句。在执行该过程后，控制返回到调用过程的语句。

- > Function : 返回一个值
- > Sub, procedure / Sub : 不返回值

函数 在 VB.NET 中，函数语句用于声明函数的名字、参数和主体。

基本语法结构为：

[<Modifier>]* Function <function name> ([<parameter list>]) As <return type>
 |<statements>

End Function

Modifier : specify access level of function

Public / Private / Protected / Friend / Protected Friend /
and information regarding overloading / overriding

/ sharing / shadowing

在 VB.NET 中，函数可以通过两种方式向调用代码返回一个值。

如 Public Function findMax (ByVal v1 As Integer, ByVal v2 As Integer)

If v1 > v2 Then

 Return v1] 通过 Return 关键字返回值

Else

 findMax = v2] 通过将值分配给函数名

End If

End Function

在 VB.NET 中提供了参数数组 (parameter array) 用于不确定传递的参数个数的情形。

通过 ParamArray 关键字指定

As Integer

如 Public Function mySum (ByVal t As Integer, ParamArray arr As Integer())

 Dim s As Integer = 0

 For i = 0 To arr.Length - 1

 s += arr(i)

 Next

 Return s * t

End Function

则有 mySum (1, 2, 3, 4, 5) → 14

mySum (2, 3, 4, 5) → 24

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子程序 (Sub procedure) 在 VB.NET 中，子程序是不返回任何值的过程
基本语法结构为：[<Modifier>]* Sub <sub name> [<parameter list>])

[<statements>]

End Sub

Modifier 与函数定义过程中一样，用于指定过程的访问级别

Public / Private / Protected / Friend / Protected Friend

/ information regarding overloading / overriding / sharing / shadowing

与函数不同的是，不可以用 As <return type> 定义返回值类型

过程中也不可出现向过程名赋值

但允许使用不带参数的 Return 关键字

如 Public Sub someSub() = X

在方法中调用 Return] 包含 Return 之后的语句

End Sub

在 VB.NET 中，通过 ByVal 关键字声明按值传递参数

当调用过程时，为每个值参数创建一个新的存储位置

实际参数的值会复制到该位置，则过程中对参数的更改不会影响原本的参数

按值传递参数是将参数传递给过程的默认机制

在 VB.NET 中，通过 ByRef 关键字声明按引用传递参数

引用参数是对变量存储位置的引用，通过引用传递参数时不会为参数创建新的存储位置

引用参数表示与提供给过程的实际参数相同的存储位置

在过程中对参数的更改会影响原本的参数

如 Public Sub someSub(ByVal i1 As Integer, ByRef i2 As Integer)

i1 = 100

i2 = 200

Return

End Sub

Dim i1 As Integer = 1

Dim i2 As Integer = 2

someSub(i1, i2)

(i1 = 1, i2 = 2) → i1 = 1, i2 = 200

Xintian jia! X1 X2 X3 X = 9

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Smile

class - Example

类

在VB.NET中，定义类可以为数据类型定义蓝图，构成类的变量和方法称为成员，对象是类的实例。

通过 Class 关键字定义类，基本的定义语法为

[<attributelist>] [<access modifier>] [Shadows]

[MustInherit | NotInheritable] [Partial]

Class <class name> [<Of <typelist>>]

[Inherits <class name>]

[Implements <interface names>]

[<members>]

End Class

attribute list (属性列表)：可选的适用于类的属性列表

optional list of attributes apply to class

access modifier：定义类的访问级别 (access level)，可选的

Public / Protected / Friend / Protected Friend / Private

Shadows：表示变量在基类中重新声明和隐藏一个同名元素或一组重载元素

(只在类中) indicate variable re-declare and hide

identically named element / set of overloaded element in base class

MustInherit：指定该类只能作为基类，并且不能直接从该类创建对象

即 C# 中的抽象类 (abstract class)

NotInheritable：指定该类不能用作基类

Partial：表示类的部分定义 (partial definition)

Inherits：指定该类所继承的基类

Implements：指定该类所实现的接口

如 Public Must Inherit Class ParentClass]

base class

End Class

Public Interface IMyInterface]

interface

End Interface

Public NotInheritable Class someClass]

Inherits ParentClass]

Implements IMyInterface]

derived class

End Class

注意：类、接口和派生类不能同时使用

P39 - primitives

类 在VB.NET中，类构造函数为当创建类的新对象时执行的类的特殊成员
 构造函数统一使用函数名 New，且没有任何返回值类型

即实际上构造函数在VB.NET中是子程序

默认构造函数不传入任何参数

也可以定义传入参数的参数化构造函数，用于创建对象进行初始化

但是注意当定义参数化构造函数后，默认构造函数不再隐式地提供

在VB.NET中，析构函数为当类的对象离开其作用域时执行的类的特殊成员

析构函数统一使用函数名 Finalize，即不接受任何参数也不返回任何值

特别地有：析构函数不能被继承或重载

```
如 Public Class SomeClass
    ' 非参数化构造函数
    Public Sub New()
        Console.WriteLine("construct new object")
    End Sub

    ' 参数化构造函数
    Public Sub New(ByVal i As Integer)
        Console.WriteLine("construct new object with parameter {0}", i)
    End Sub

    ' 析构函数
    Public Sub Finalize()
        Console.WriteLine("deconstruct object")
    End Sub
End Class
```

在VB.NET中，通过 Shared 关键字将类成员定义为静态成员，与 C# / Java 中的 static 类似
 当类成员声明为 Shared 时，则不论创建多少对象，该成员仅有一个副本
 共享变量可以在类定义中初始化，也可以在类定义 / 成员函数之外初始化
 声明为 Shared 的成员函数只能访问共享变量

```
如 Public Class SomeClass
    Dim sc1 As SomeClass()
    Public Shared count As Integer = 0
    Dim sc2 As SomeClass()
    Public Sub New()
        Dim sc3 As SomeClass()
        count += 1
        Console.WriteLine("SomeClass.count")
    End Sub
End Class
```

继承

在VB.NET中，继承允许根据一个基类来定义一个派生类。
与C#类似，VB.NET也不允许对基类的多重继承。

但是多重继承可以通过接口来实现。

基本控制

在VB.NET中，对象是通过工具箱控件在Visual Basic窗体上创建的用户界面元素。

object is type of user interface element

(“”) created on Visual Basic form by using tool box control

Visual Basic 控件由三个重要元素组成

Properties：描述对象的属性

Methods：导致对象的行为

Events：当对象做某事时发生的事件

"When Click"

控制属性是由Visual Basic持有的值/特性

可以通过设置对象属性来移动/调整大小/自定义

属性可以在设计时通过属性窗口/运行时通过程序代码语句设置

基本语法结构为：`<object>. <property> = <value>`

控制方法是作为类的成员创建的过程，用于使对象做出行为/访问操作对象或变量的特性

方法：使用工具箱控件提供的控件时，可以调用其任何公共方法

如果没有现有方法可以执行所需任务，可以向类添加一个方法

控制事件是通知应用程序已发生重要事件的信号

有与窗体相关联的各种类型的事件，如点击/双击/关闭/加载/调整大小

如用户点击表单上的控件时，表单可以引发 Click 事件并调用处理事件的过程

在 System.Windows.Forms 中提供了各种控件

Forms：表单

Check Box：复选框

TextBox：文本框

Picture Box：图片框

Label：标签

Progress Bar：进度条

Button：按钮

ScrollBar：滚动条

List Box：列表框

DateTime Picker：日期输入框

ComboBox：组合框

TreeView：树状图

RadioButton：单选按钮

ListView：列表显示