控件的定制和扩展

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课 5 概述

- ToolbarControl 框架
- 定制命令和工具
- 定制 COM 命令, 工具, 工具条, 和菜单
- 定制 COM 扩展
- 定制对话框
- ToolbarMenus

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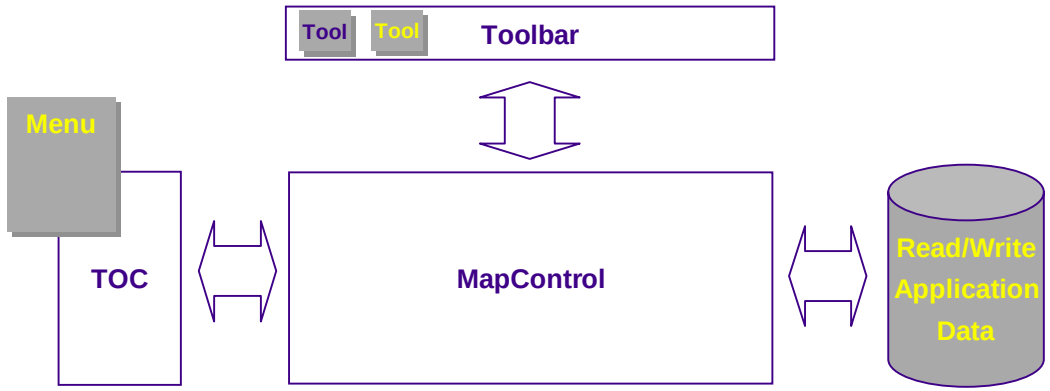
定制和扩展的类型

- 可以有多种不同定制方法
  - 允许用户在运行时增加和移除命令（通过CustomizeDialog）
  - 自动保存和加载命令到工具条上
  - 运行时创建和显示菜单
- 可以实现不同的扩展
  - 创建定制的命令,工具,菜单, 和工具条
  - 定制扩展



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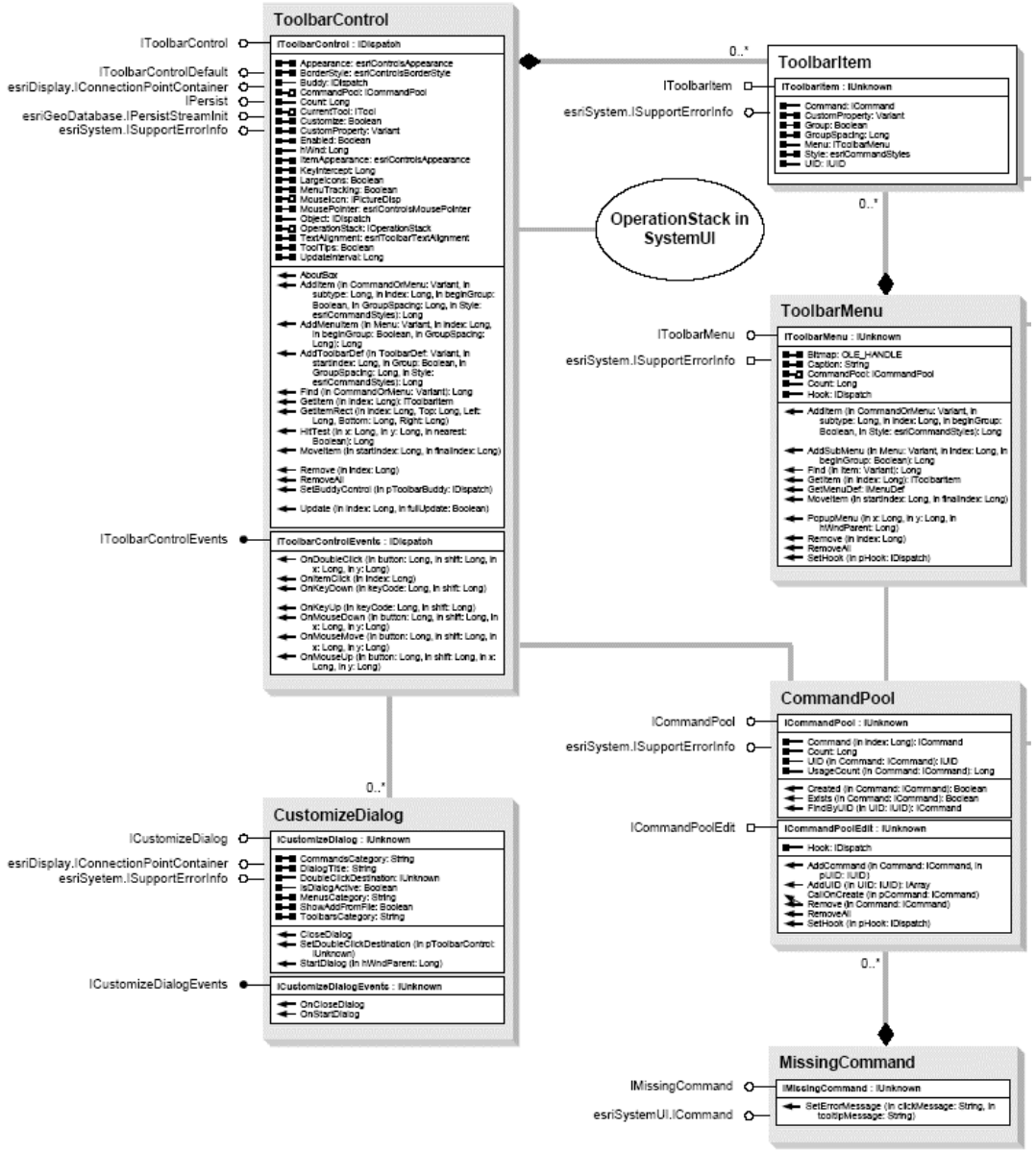
ToolbarControl 框架

- ToolbarControl
  - ToolbarItems
  - CommandPool
- ToolBarMenu
  - ToolbarItems
  - CommandPool
- CustomizeDialog



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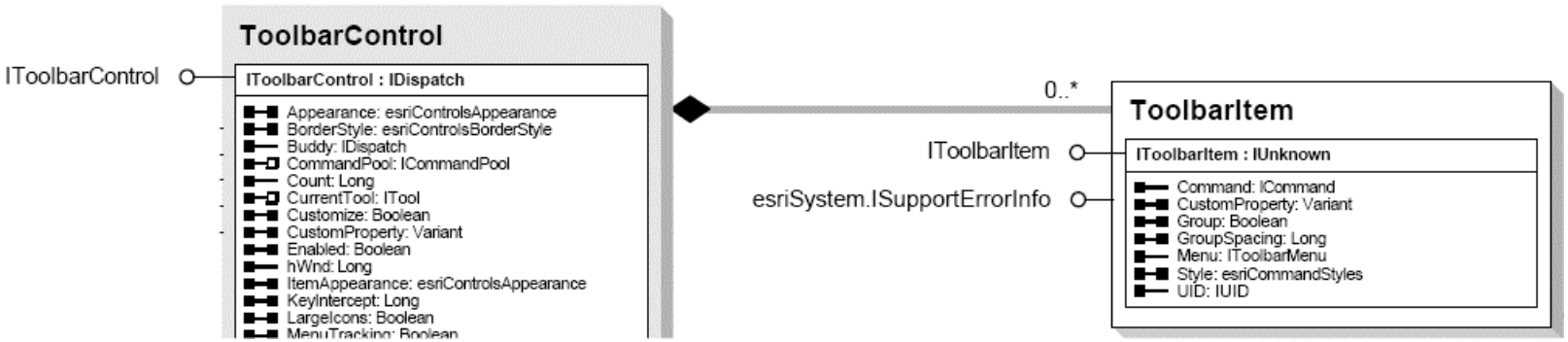
ToolbarItems工具条项目

- ToolbarControl 为每一个加载的项创建一个 ToolbarItem类
- 用于管理相应的项目
- 项目类别
  - 命令, 工具, 工具控件, 和工具条菜单



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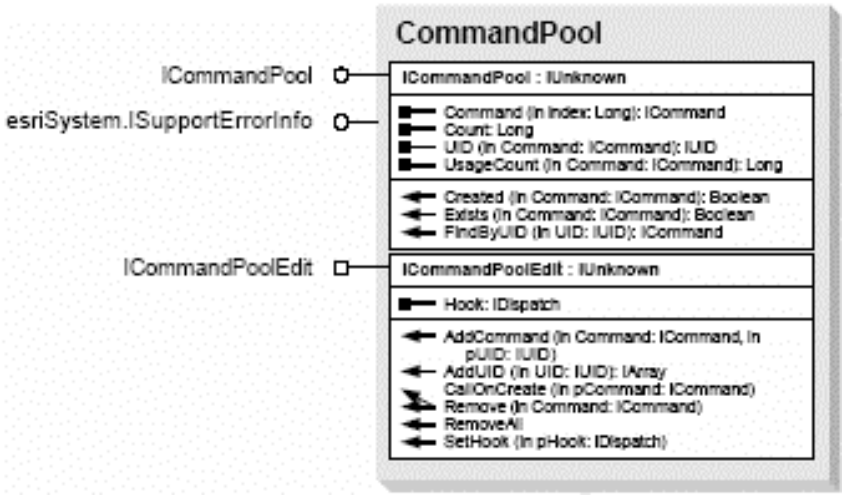
CommandPool命令池

- 管理命令的集合
- 只有两个对象直接访问命令池
  - ToolbarControl
  - ToolbarMenu
- 提供低水平的访问
  - ICommandPool::Created
  - ICommandPool::Exists
  - ICommandPoolEdit::CallOnCreate
  - ICommandPoolEdit::Hook
- 开发者通常不使用



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项目怎样被加载到命令池中

- 方法 1: 传递一个新命令对象的实例
  - New CommandItem is created for this object
  - Not shared

```
Dim command as ICommand = New esriControlCommands.ControlsMapZoomInTool
ToolbarControl1.AddItem command, 0, -1, True, , esriCommandStyleIconAndText
```

- 方法 2: 传递命令的UID
  - New CommandItem is created if it does not exist
  - All references will share the instance

```
Dim pUid As New esriSystem.UID
pUid.Value = "esriControlCommands.ControlsMapZoomInTool"
ToolbarControl1.AddItem pUid, 0, -1, True, , esriCommandStyleIconAndText
```

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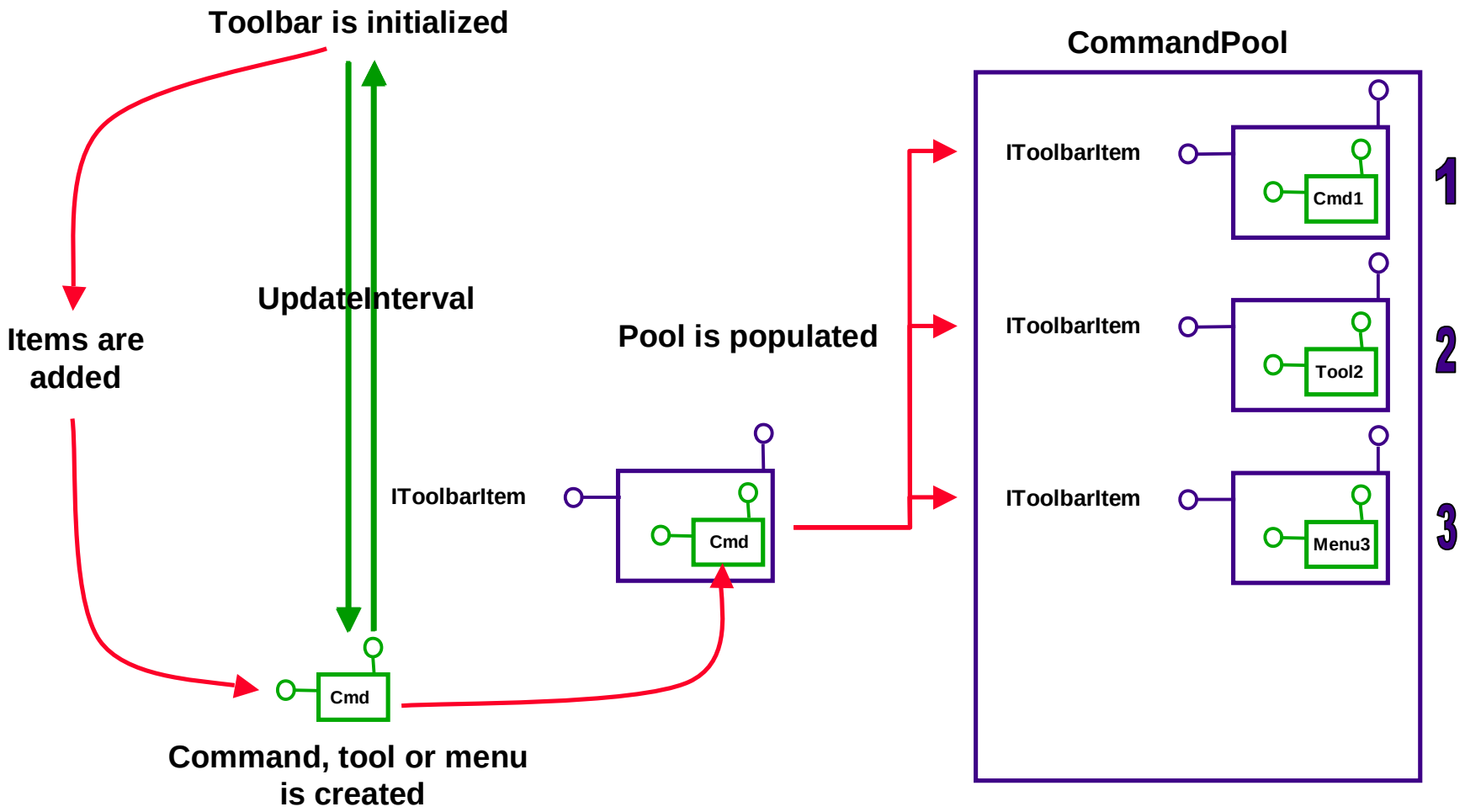
ToolbarControl 命令创建过程

- 每一项被加载到命令池



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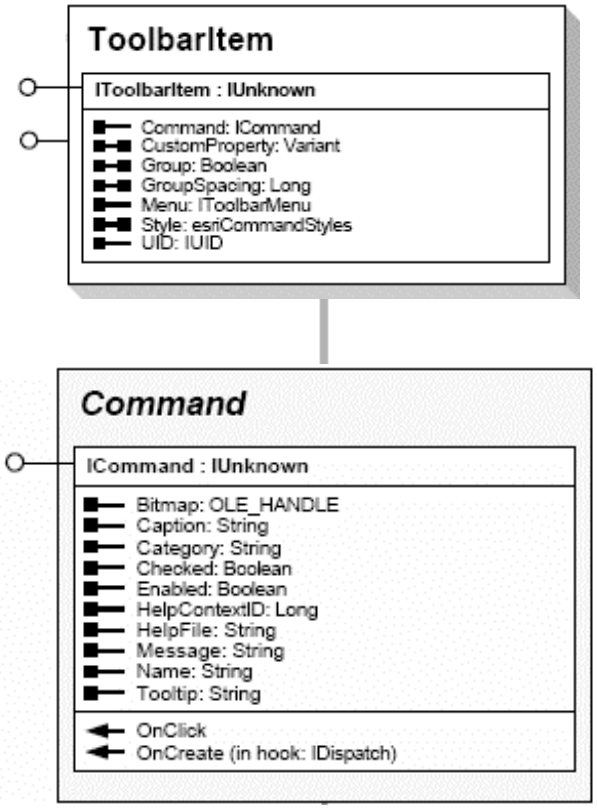
ToolbarItems 和 Commands

- ToolbarItems 封装了 commands
- IToolbarItem
  - Command: 提供对command的访问
  - Style: 控制command的风格
  - UID: command的全局唯一ID号




```
Dim toolbarItem As IToolbarItem
For i = 0 To AxToolbarControl1.Count - 1
    toolbarItem = AxToolbarControl1.GetItem(i)
           Dim command as ICommand
    command = toolbarItem.Command
    MsgBox(command.Name & toolbarItem.Style &
toolbarItem.UID.Value)
Next
```

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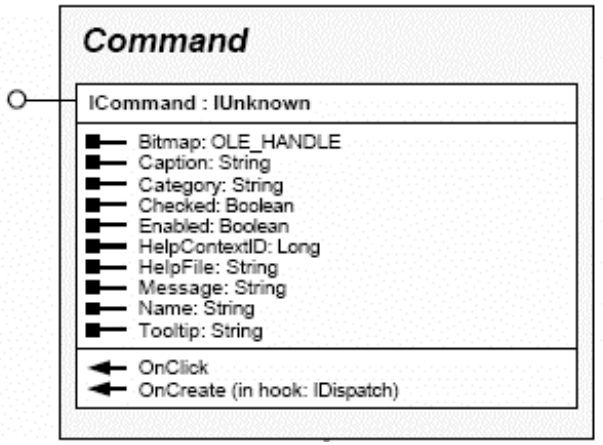
实现定制命令

- 框架提供了创建自定义command的机制
- 无缝地加载到 ToolbarControl
  - 作为一个 CommandItem 加载
  - 外观和行为和其它项一样
  - 执行任何 ArcObjects 代码
- 步骤
  1. 创建一个类
  2. 实现 ICommand
  3. 将类加载到工具条上




```
Public Class ZoomToLayerClass
    Implements ICommand
```

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定制命令: 属性设置

- 当command被创建属性就可存取属性
- ICommand
  - Name
  - Caption
  - Category
  - Tooltip
  - Message
  - Bitmap
  - HelpContext
  - HelpFile

```
 Public ReadOnly Property Bitmap() As Integer Implements
ESRI.ArcGIS.SystemUI.ICommand.Bitmap
        Get
                    return m_bitmap
        End Get
    End Property

    Public ReadOnly Property Caption() As String Implements
ESRI.ArcGIS.SystemUI.ICommand.Caption
        Get
                    return "Identify"
        End Get
    End Property

    Public ReadOnly Property Category() As String Implements
ESRI.ArcGIS.SystemUI.ICommand.Category
        Get
                    return "DAAE Commands"
        End Get
    End Property

          Public ReadOnly Property Name() As String Implements
ESRI.ArcGIS.SystemUI.ICommand.Name
        Get
                    return "DAAECustomCommand_Identify"
        End Get
    End Property
```

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定制命令: 访问 hook（钩子）对象

- Hook（钩子）是一个对创建command的对象的向后引用
- 可以是不同的对象
  - ToolbarControl, MapControl, PageLayoutControl, …
- 当command创建的时候传递进来
- ICommand
  - OnCreate

```
Private Sub ICommand_OnCreate(ByVal hook As Object)
    If (TypeOf hook Is esriToolbarControl.IToolbarControl) Then
      Dim ToolBarCon As esriToolbarControl.IToolbarControl
      Set ToolBarCon = hook
      If (TypeOf ToolBarCon.Buddy is MapControl) Then
          Dim mapControl as IMapControl
          Set MapControl = ToolBarCon.Buddy
          Set m_map = mapControl.Map
      End If
    ElseIf (TypeOf hook is IMapControl3) then
          Dim mapControl as IMapControl
          Set mapControl = hook
          Set m_map = mapControl.Map
    End If
End Sub
```

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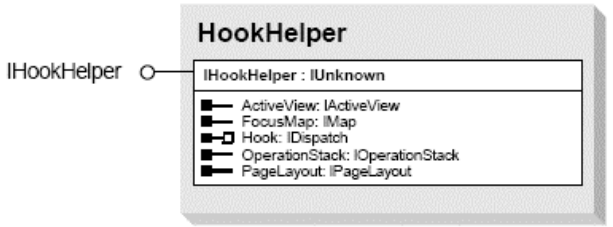
定制命令: HookHelper 类

- 提供了一个访问内部对象的普通方法
- 简化了编码
- IHookHelper
  - ActiveView
  - FocusMap
  - Hook
  - OperationStack
  - PageLayout
- Globe 和 Scene 有属于自己的 hook helper classes




```
Private m_hookHelper as IHookHelper
Private m_map as IMap
Private m_pageLayout as IPageLayout

Private Sub ICommand_OnCreate(ByVal hook As Object)

  Set m_hookHelper = New HookHelper
  Set m_hookHelper.hook = hook

  Set m_map = m_hookHelper.FocusMap
  Set m_pageLayout = m_hookHelper.PageLayout

End Sub
```

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定制命令: 控制可用性

- 使用属性限制command的可用性
- ICommand
  - Enabled: 设置command的可用与不可用
  - Checked: 设置按钮的选中状态
- ToolbarControl 会频繁调用这些属性
  - UpdateInterval: 在IToolbarControl上定义更新间隔值

```
Private Property Get ICommand_Enabled() As Boolean
   ICommand_Enabled = IIF(TypeOf m_pHookHelper.Hook Is MapControl, True, False)
End Property

Private Property Get ICommand_Checked() As Boolean
   ICommand_Checked = IIF(TypeOf m_pHookHelper.Hook Is MapControl, True, False)
End Property
```

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定制命令: Base classes

- Base classes可以用来定制命令
- 需要重载某些成员 (如 OnCreate)
- .NET
  - ESRI.ArcGIS.Utility.BaseClasses.BaseCommand
- Java 目前9.0不支持Base Classes

```
Public Class ZoomToLayerClass
    Inherits BaseCommand

   Public Sub New()
        MyBase.New()

            MyBase.m_caption = "ZoomToLayer"
            MyBase.m_category = "DAAE Commands"
            MyBase.m_message = "Zoom To the extent of the layer"
            MyBase.m_name = "DaaeCustomCommands_ZoomToLayer"
            MyBase.m_toolTip = "ZoomToLayer"
   End Sub
```

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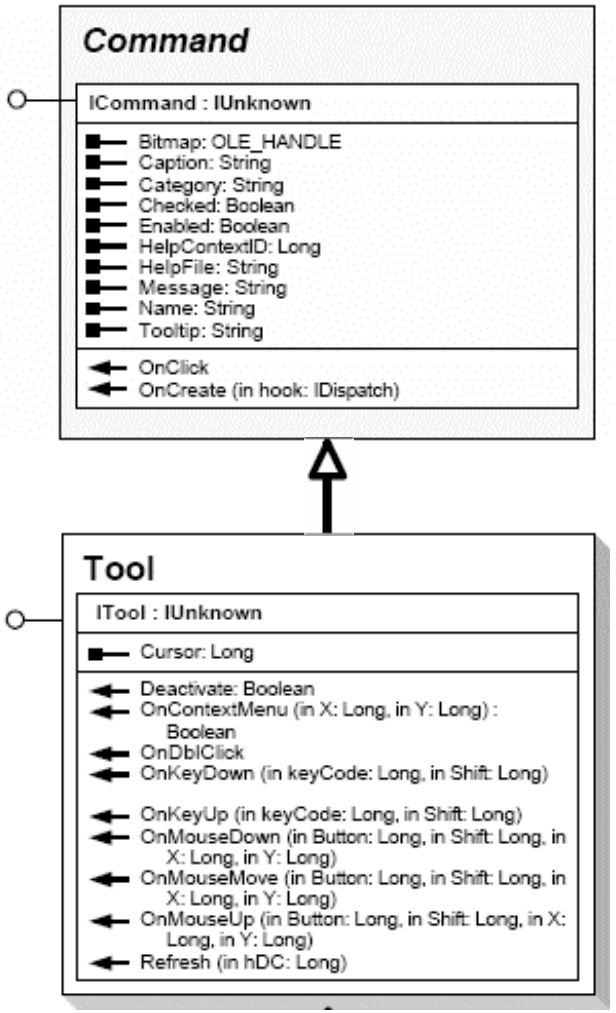
实现定制工具

- 框架提供了创建自定义tools的机制
- 无缝地加载到 ToolbarControl
  - 作为 CommandItems加载
  - 允许与界面的交互
- 步骤
  1. 创建一个类
  2. 实现 ICommand 和 ITool
  3. 把类加载到工具条




```
Public Class ZoomToLayerClass
    Implements ICommand, ITool
```

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定制工具: 实现成员

- ITool
  - OnMouseDown
  - OnMouseMove
  - OnMouseUp
  - OnKeyDown
  - OnKeyUp
  - OnContextMenu
  - Deactivate
  - Cursor

```
Public Sub OnMouseDown(ByVal button As Integer, ByVal shift
  As Integer, ByVal x As Integer, ByVal y As Integer)
  Implements ESRI.ArcGIS.SystemUI.ITool.OnMouseDown
       If button = 1 Then
           Dim point As IPoint
           point = MapControl1.ToMapPoint(x, y)
           StatusBar.Message(0) = point.X.ToString() & "," &
  point.Y.ToString()
       End If
   End Sub

   Public Sub OnMouseMove(ByVal button As Integer, ByVal
  shift As Integer, ByVal x As Integer, ByVal y As Integer)
  Implements ESRI.ArcGIS.SystemUI.ITool.OnMouseMove
         StatusBar.Message(0) = "OnMouseMove"
   End Sub

   Public Sub OnMouseUp(ByVal button As Integer, ByVal shift
  As Integer, ByVal x As Integer, ByVal y As Integer)
  Implements ESRI.ArcGIS.SystemUI.ITool.OnMouseUp
         StatusBar.Message(0) = "OnMouseUp"
   End Sub
```

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定制工具: 保持一个选中图层

- 有些工具需要访问在TOC中选中的图层
- 当图层被选中, 图层被保存在控件中
  - 例子: IMapControl3::CustomProperty

```
Private Sub AxTOCControl1_OnMouseDown(ByVal sender As Object, ByVal e As
  ESRI.ArcGIS.TOCControl.ITOCControlEvents_OnMouseDownEvent) Handles
  AxTOCControl1.OnMouseDown

      Try
          Dim map As IMap
          Dim layer As ILayer
          Dim other As Object
          Dim item As esriTOCControlItem
          Dim index As Object
          Dim tocControl As ITOCControl

          tocControl = AxTOCControl1.Object
          tocControl.HitTest(e.x, e.y, item, map, layer, other, index)

          If item = esriTOCControlItem.esriTOCControlItemLayer Then
              AxMapControl1.CustomProperty = layer
              statusBar.Text = "Layer: " & layer.Name
...
```

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定制工具: 访问选中图层

- 现在工具可以从控件访问选中图层

```
Public Overrides Sub OnCreate(ByVal hook As Object)
    'Create an IHookHelper object
    m_hookHelper = New HookHelper
    m_hookHelper.Hook = hook
    If TypeOf m_hookHelper.Hook Is MapControl Then
        m_mapControl3 = m_hookHelper.Hook
    ElseIf TypeOf m_hookHelper.Hook Is ToolbarControl Then
        Dim toolbarControl As IToolbarControl
        toolbarControl = m_hookHelper.Hook
        m_mapControl3 = toolbarControl.Buddy
    End If
End Sub


Public Overrides Sub OnClick()
    Dim layer As ILayer
    layer = m_mapControl3.CustomProperty
    If (TypeOf layer Is IGeoDataset) Then
        Dim pGeoDataset As IGeoDataset
        pGeoDataset = layer
        m_hookHelper.ActiveView.Extent = pGeoDataset.Extent
        m_hookHelper.ActiveView.Refresh()
    End If
End Sub
```

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实现定制COM 组件

- 框架可以通过写自定义COM组件来扩展
- 类型
  - Commands, tools, menus, toolbars, and extensions
- 通常的步骤
  1. 创建工程 (VB, VC++, .NET, …)
  2. 定义类型库和类的名称
  3. 引用相应的 ArcGIS Engine 库
  4. 实现接口
  5. 编译并注册
  6. 注册组件类别

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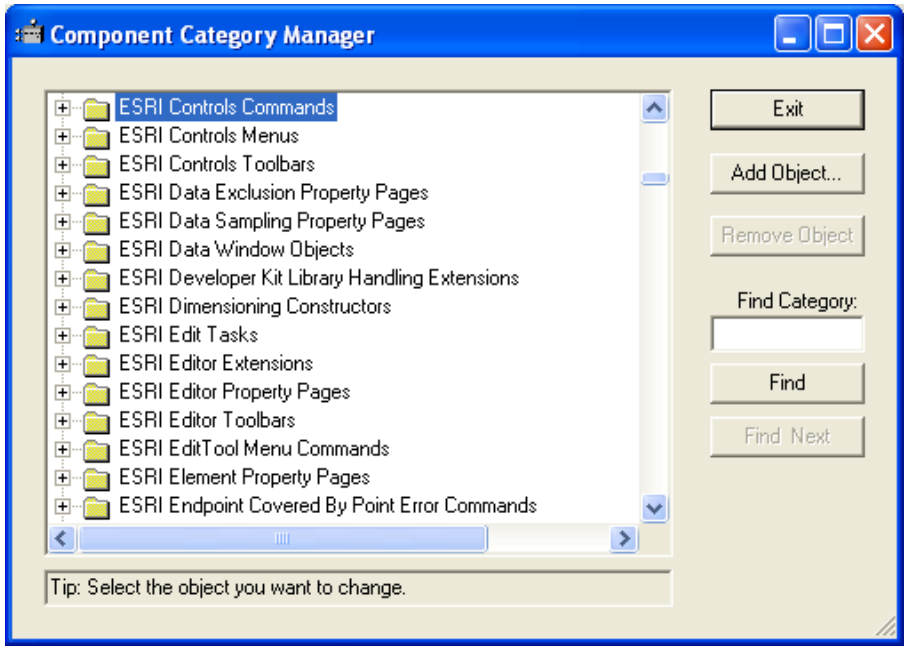
注册定制COM 组件

- 所有定制的 COM 组件应该被注册为相应的 ArcGIS Engine 组件类别
- Components will be available for other Engine classes
- 三种类别:
  - ESRI Controls Commands
  - ESRI Controls Menus
  - ESRI Controls Toolbars
- 多种方法可以注册
  - Categories.exe
  - ESRI Add-ins
  - Registration scripts (.reg)



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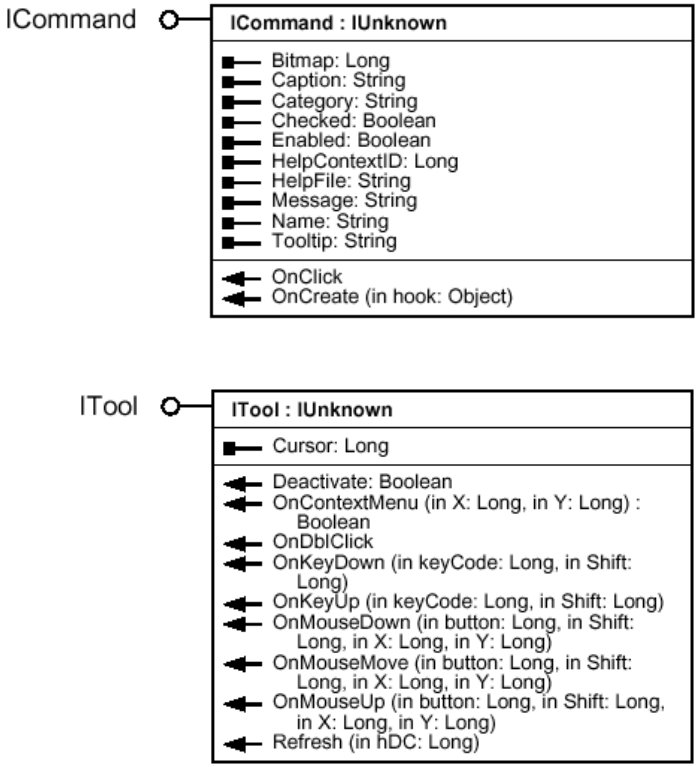
实现 COM 命令和工具

- 模仿 ESRI 命令
- 接口: ICommand 和 ITool
- 类型库: esriSystemUI
- 组件类别
  - ESRI Controls Commands
- 其它相关接口和对象
  - ToolbarItem
  - IToolbarDef 和 IMenuDef
- 具体的实现方式与本地类、COM类是一样的



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双用途 COM commands

- 创建基于ArcGIS Engine和Desktop的COM commands 是可能的
- 需要使用 HookHelper来侦测 hook（钩子）
- 不能引入 Desktop types 到 Engine 机器上

```
Private Sub ICommand_OnCreate(ByVal hook As Object)
    If TypeOf hook Is esriToolbarControl.IToolbarControl Then
      Dim ToolBarCon As esriToolbarControl.IToolbarControl
      Set ToolBarCon = hook
      If (TypeOf ToolBarCon.Buddy is MapControl) Then
          Dim mapControl as IMapControl
          Set MapControl = ToolBarCon.Buddy
          Set m_map = mapControl.Map
      End If
    ElseIf (TypeOf hook is IMxApplication) then
        Dim application as IApplication
        Set application = hook
        Dim mxDoc as IMxDocument
        Set mxDoc = application.Document
        Set m_map = mxDoc.FocusMap
    End If
End Sub
```

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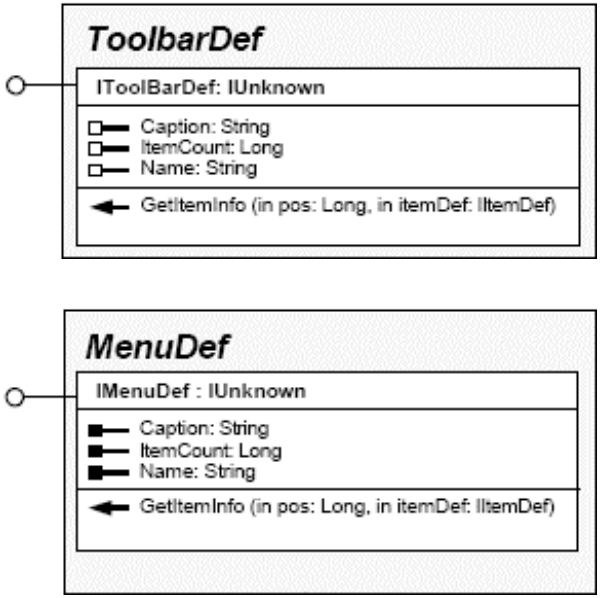
实现 COM 工具条和菜单

- 模仿 ESRI 工具条和菜单
- 接口: IToolBarDef, IMenuDef
- 类型库: esriSystemUI
- 组件类别
  - ESRI Controls Menus
  - ESRI Controls Toolbars
- 其它相关接口和对象
  - IMenuDef and IToolbarMenu
  - ICommandPool, Icommand, and ITool



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创建自定义 COM 工具条

```
Implements IToolbarDef

Private Property Get IToolbarDef_Caption() As String
  IToolbarDef_Caption = "Navigation"
End Property

Private Sub IToolbarDef_GetItemInfo(ByVal pos As Long, ByVal itemDef As
   esriSystemUI.IItemDef)
  Select Case pos 'Commands for the menu
    Case 0
      itemDef.ID = "esriControlCommands.ControlsMapZoomInFixedCommand"
    Case 1
      itemDef.ID = "esriControlCommands.ControlsMapZoomOutFixedCommand"
    Case 2
      itemDef.ID = "esriControlCommands.ControlsMapFullExtentCommand"
    Case 3
      itemDef.ID = "MyLibrary.MyCommand"
    End Select
End Sub

Private Property Get IToolbarDef_ItemCount() As Long
  IToolbarDef_ItemCount = 3
End Property

Private Property Get IToolbarDef_Name() As String
  IToolbarDef_Name = "Navigation"
End Property
```

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创建自定义 COM 菜单

```
Implements IMenuDef

Private Property Get IMenuDef_Caption() As String
  IMenuDef_Caption = "Navigation"
End Property

Private Sub IMenuDef_GetItemInfo(ByVal pos As Long, ByVal itemDef As
   esriSystemUI.IItemDef)
  Select Case pos 'Commands for the menu
    Case 0
      itemDef.ID = "esriControlCommands.ControlsMapZoomInFixedCommand"
    Case 1
      itemDef.ID = "esriControlCommands.ControlsMapZoomOutFixedCommand"
    Case 2
      itemDef.ID = "esriControlCommands.ControlsMapFullExtentCommand"
    Case 3
      itemDef.ID = "MyLibrary.MyCommand"
  End Select
End Sub

Private Property Get IMenuDef_ItemCount() As Long
  IMenuDef_ItemCount = 3
End Property

Private Property Get IMenuDef_Name() As String
  IMenuDef_Name = "Navigation"
End Property
```

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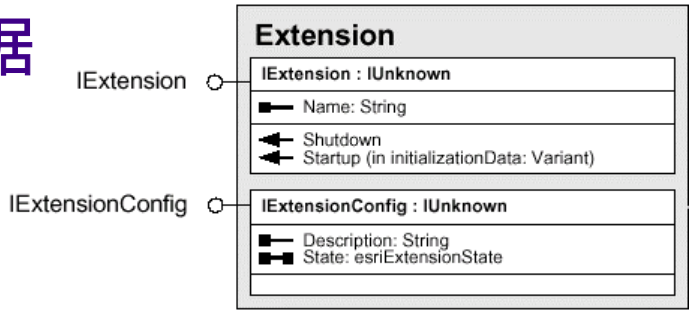
实现 COM 扩展（Extensions）

- 扩展可以被用来在软件组件间共享数据
- 模仿 ESRI 扩展
- 接口: IExtension, IExtensionConfig
- 类型库: esriSystem
- Details
  - 扩展管理器是独立的
  - 扩展类可以被任何进程中的组件访问
  - 易于共享数据




```
Public Class ZoomExtension
   Implements IExtension
   Implements IExtensionConfig
```

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实现 COM 扩展: IExtension

- **Name: 用来查询扩展**
- **Startup: 在应用程序间传递初始化数据**
- **Shutdown: 终止**

```
 Dim m_Form as Form

 Private ReadOnly Property IExtension_Name() As String Implements
ESRI.ArcGIS.esriSystem.IExtension.Name
     Get
         Return "Zoom Factor Extension"
     End Get
 End Property

 Private Sub IExtension_Startup(ByRef initializationData As Object) Implements
ESRI.ArcGIS.esriSystem.IExtension.Startup
       m_Form = initializationData
       m_zoomFactor = 2
       m_extensionState = esriExtensionState.esriESDisabled
 End Sub

 Private Sub IExtension_Shutdown() Implements
ESRI.ArcGIS.esriSystem.IExtension.Shutdown
     'Not implemented
 End Sub
```

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实现 COM 扩展: IExtensionConfig

- IExtensionConfig: 控制允许状态
- Custom interface may be required to access data
  - Example: ZoomFactor

```
Implements IExtensionConfig
…

Private Property Let IExtensionConfig_State(ByVal RHS As
   esriSystem.esriExtensionState)
  m_extensionState = RHS
End Property

Private Property Get IExtensionConfig_State() As esriSystem.esriExtensionState
  IExtensionConfig_State = m_extensionState
End Property

' Custom interface and property to get and set ZoomFactor
Private Property Let IZoomExtension_ZoomFactor(ZoomFactor As Double)
  m_zoomFactor = ZoomFactor
End Property

Private Property Get IZoomExtension_ZoomFactor() As Double
    IZoomExtension_ZoomFactor = m_zoomFactor
End Property
```

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访问应用程序的扩展

- 所有的应用程序都要手工加载扩展到ExtensionManager（扩展管理器）中
- 传入启动参数
  - UID: 扩展类的GUID
  - initializationData: Any object needed to initialize the extension
- 下面的代码创建一个扩展对象的实例

```
Private m_pExtensionManagerAdmin As IExtensionManagerAdmin

Private Sub Form1_Load(ByVal eventSender As System.Object, ByVal eventArgs As
   System.EventArgs) Handles MyBase.Load

  m_pExtensionManagerAdmin = New ExtensionManager

  Dim pUID As New UID
  pUID.Value = "ZoomFactorExtension.ZoomExtension"
  m_pExtensionManagerAdmin.AddExtension(pUID, Form1)

End Sub
```

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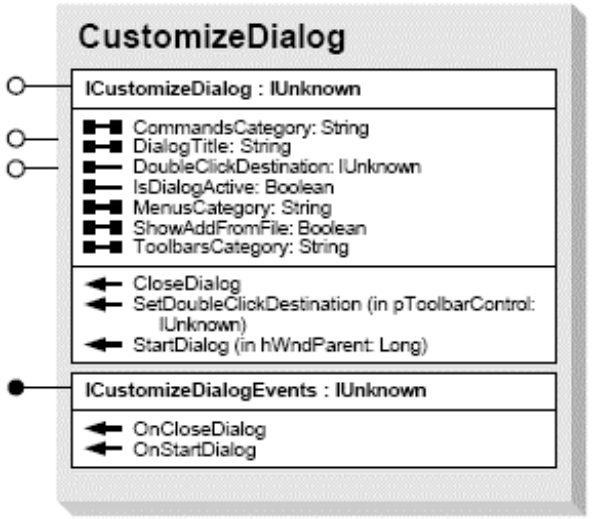
CustomizeDialog定制对话框

- 非模态对话框允许你:
  - 在运行时往工具条上增加和移除命令
  - 浏览已经存在的 ESRI 命令,工具, 菜单, 和工具条
  - 浏览自定义的命令,工具, 菜单, 和工具条
  - 托放工具条项目
  - 点击右键删除
- 必须是可编程的



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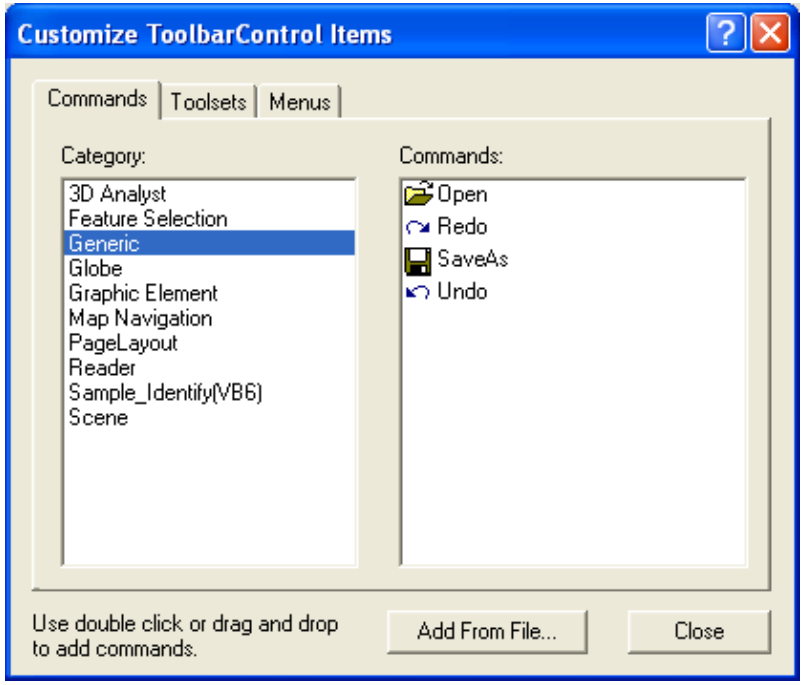
从组件类别中加载项

- 所有的项必须被注册到正确的类别
- 组件类别名
  - **Commands = ESRI Controls Command**
  - **Toolsets = ESRI Controls Toolbars**
  - **Menus = ESRI Controls Menus**
- **Add From File**
  - 浏览选择 COM DLLs
  - 自动注册 DLL
  - 更新组件类别



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显示定制对话框

- 创建对话框
- 接收事件
- 设置状态

```
Private WithEvents pCustDialogEvents As CustomizeDialog
Private pCustDialog As ICustomizeDialog

Private Sub ToolbarControl1_OnMouseDown(ByVal button As
   Long, ByVal shift As Long, ByVal x As Long, ByVal y As
   Long)
   If (button = vbRightButton) Then
      Set pCustDialog = New CustomizeDialog
      pCustDialog.SetDoubleClickDestination ToolbarControl1
      pCustDialog.DialogTitle = "Customize"
      pCustDialog.StartDialog ToolbarControl1.hWnd
      Set pCustDialogEvents = pCustDialog
   End If
End Sub

Private Sub pCustDialogEvents_OnCloseDialog()
  ToolbarControl1.Customize = False
End Sub

Private Sub pCustDialogEvents_OnStartDialog()
  ToolbarControl1.Customize = True
End Sub
```

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保存工具条项目

- 当应用程序关闭时，可以把所有的工具条项写到一个文件中
- 保存用户当前的状态
- 对每一个命令项, 保存:
  - Order
  - Style
  - UID

```
Private Sub WriteTextFile(ByVal WriteFileName As String)
        Dim objStreamWriter As StreamWriter
        Dim i As Integer
        Dim toolbarItem As IToolbarItem
        objStreamWriter = New StreamWriter(WriteFileName)
        For i = 0 To AxToolbarControl1.Count - 1
            toolbarItem = AxToolbarControl1.GetItem(i)
            If Not toolbarItem.UID Is Nothing Then
                objStreamWriter.WriteLine(toolbarItem.Style)
                objStreamWriter.WriteLine(toolbarItem.UID.Value)
            End If
        Next
        objStreamWriter.Close()
    End Sub
```

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读取工具条项

- 也可以在应用程序启动的时候从一个文件中读取所有的工具条项目
- 对每一个命令项，恢复：
  - Order
  - Style
  - UID

```
Private Sub ReadTextFile(ByVal ReadFileName As String)
        Dim objStreamReader As StreamReader
        Dim strLine As String
        Dim strStyle As String
        objStreamReader = New StreamReader(ReadFileName)
        strStyle = objStreamReader.ReadLine
        Do While Not strStyle Is Nothing
            If strStyle <> "" Then ' Read each item and apply the style
                strLine = objStreamReader.ReadLine
      AxToolbarControl1.AddItem(strLine, , -1, False, , CInt(strStyle))
            End If
            strStyle = objStreamReader.ReadLine
        Loop
        objStreamReader.Close()
    End Sub
```

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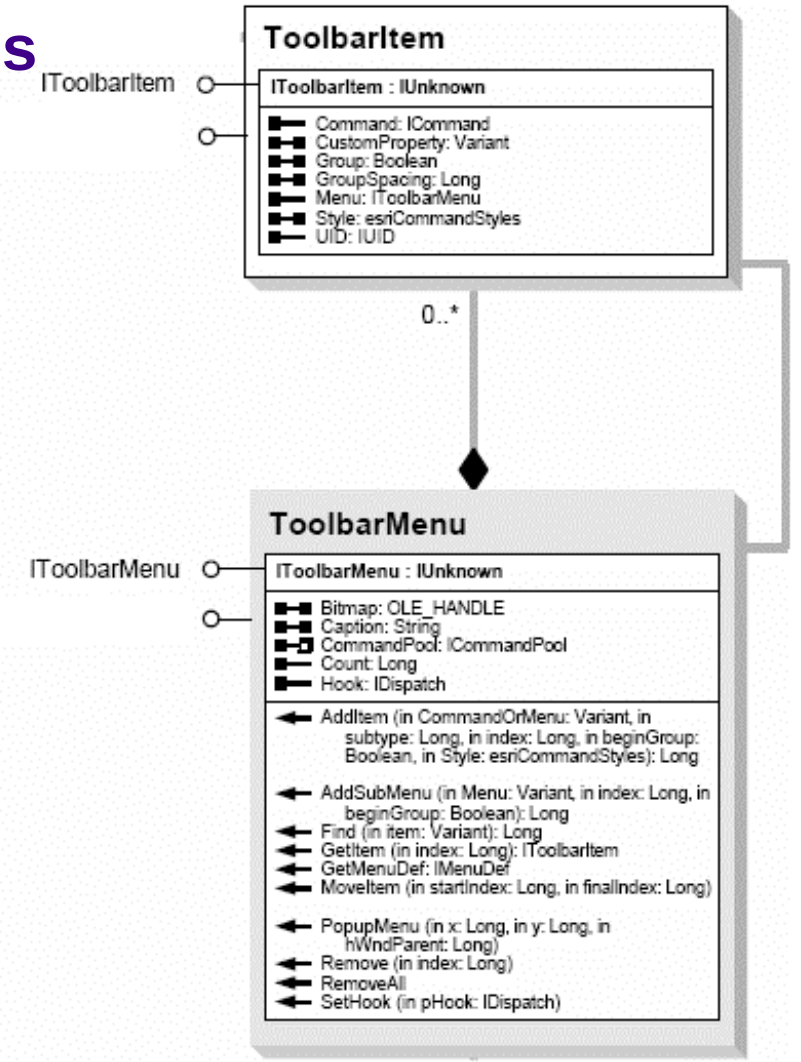
ToolbarMenus（工具条菜单）

- 使用ToolbarMenu 作为commands 和 menus的宿主
- 两种创建方法
  - 增加菜单到 工具条控件
  - 手工组装命令项
- Different styles
  - Pop-up menu（弹出式菜单）
  - Toolbar menu（工具条菜单）
  - Submenu（子菜单）



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在MapControl中显示 ToolbarMenus

- 新菜单需要把hook（钩子）传递进来
- Hook可以是 ToolbarControl 或任何其它控件

```
Private m_pToolbarMenu As IToolbarMenu

Private Sub Form_Load()

  'Create a MenuDef object
  Dim pMenuDef As esriSystemUI.IMenuDef
  Set pMenuDef = New NavigationMenu
  Set m_pToolbarMenu = New ToolbarMenu
  m_pToolbarMenu.AddItem pMenuDef
  m_pToolbarMenu.SetHook ToolbarControl1.Object

End Sub

Private Sub MapControl1_OnMouseDown(ByVal button As Long, ByVal shift As Long, ByVal x
   As Long, ByVal y As Long, ByVal mapX As Double, ByVal mapY As Double)
  If button = vbRightButton Then
    'Popup the menu
    m_pToolbarMenu.PopupMenu x, y, MapControl1.hWnd
  End If
End Sub
```

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在TOCControl中显示ToolbarMenus

- 类似的方法

```
Private Sub TOCControl1_OnMouseDown(ByVal button As Long, ByVal shift As
   Long, ByVal x As Long, ByVal y As Long)
  If (button = vbRightButton) Then
    Dim pMap As IMap
    Dim pLayer As ILayer
    Dim pOther As IUnknown
    Dim pItem As esriTOCControlItem
    Dim pIndex As Variant

   TOCControl1.HitTest x, y, pItem, pMap, pLayer, pOther, pIndex

    If pItem = esriTOCControlItemLayer Then
      Dim pToolbarMenu As IToolbarMenu
        Set pToolbarMenu = New ToolbarMenu
        pToolbarMenu.AddItem New ControlsMapViewMenu
        pToolbarMenu.SetHook MapControl1.Object
        pToolbarMenu.PopupMenu x, y, TOCControl1.hWnd
    End If
  End If
End Sub
```

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增加子菜单到已存在的ToolbarMenus

- 查找一个已存在的或者创建一个新的ToolbarMenu
- 增加一个子菜单到ToolbarMenu

```
Private Sub cmdAddSubMenu_Click()

  'Create a MenuDef object
  Dim pMenuDef As esriSystemUI.IMenuDef
  Set pMenuDef = New ToolbarSubMenu

  'Get the menu, which is the 6th item on the toolbar (indexing from 0)
  Dim pToolbarItem As IToolbarItem
  Set pToolbarItem = ToolbarControl1.GetItem(5)
  Dim pToolbarMenu As IToolbarMenu
  Set pToolbarMenu = pToolbarItem.Menu

  'Add the sub-menu as the third item on the Navigation menu, making it
  'start a new group
  pToolbarMenu.AddSubMenu pMenuDef, 2, True

  cmdAddSubMenu.Enabled = False
End Sub
```

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练习 5 综述

- 激活定制对话框（CustomizeDialog）
- 保存和加载条目到文件中
- 创建一个放大到图层的定制命令
- 使用控件的CustomProperty 属性
- 创建工具条菜单
- Work with a COM command

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课 5 回顾

- 介绍CustomizeDialog 是怎样工作的?
- 怎样扩展Engine框架?
- HookHelper 能用来做什么?
- 介绍 ToolbarItem 的加载.
- 实现本地和COM命令的优势和不足是什么?
- 你用什么类来显示菜单和子菜单?

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