* Using the geoprocessor managed assembly
* Using the geoprocessing assembly
* Geoanalyst processing

# GEOG 4/590: GIS Programming

## Geoprocessing

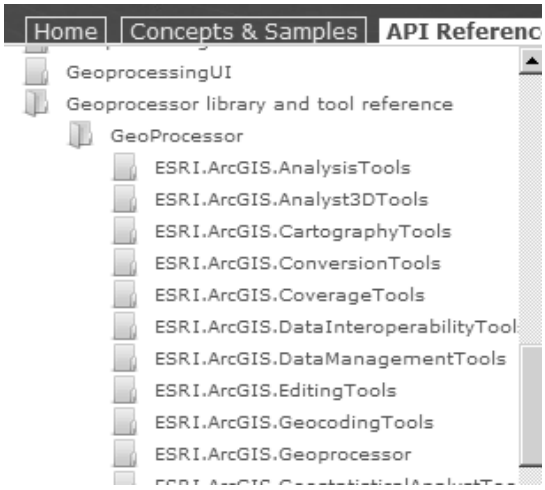
- Serves the same purpose as it does in ArcMap
  - Automate repetitive GIS tasks
  - Perform spatial analysis and modeling
  - Tools can be chained to perform a series of operations
  - Refer to ArcGIS Desktop 10.0 help for tool help

# Geoprocessor managed assembly

```
'Geoprocessor managed assembly
Private Sub GeoprocessorBuffer()
    'Create the geoprocessor
    Dim GP As ESRI.ArcGIS.Geoprocessor.Geoprocessor = New ESRI.ArcGIS.Geoprocessor.Geoprocessor()
    ' Create the tool process object.
    Dim bufferTool As ESRI.ArcGIS.AnalysisTools.Buffer = New ESRI.ArcGIS.AnalysisTools.Buffer()
    ' Create the second tool process object
    Dim copyTool As ESRI.ArcGIS.DataManagementTools.CopyFeatures = New ESRI.ArcGIS.DataManagementT
    'Create the result object
    Dim result As ESRI.ArcGIS.Geoprocessing.IGeoProcessorResult2
```

1) Create the GP object and tool(s)

# Finding the tool



# Properties and the environment

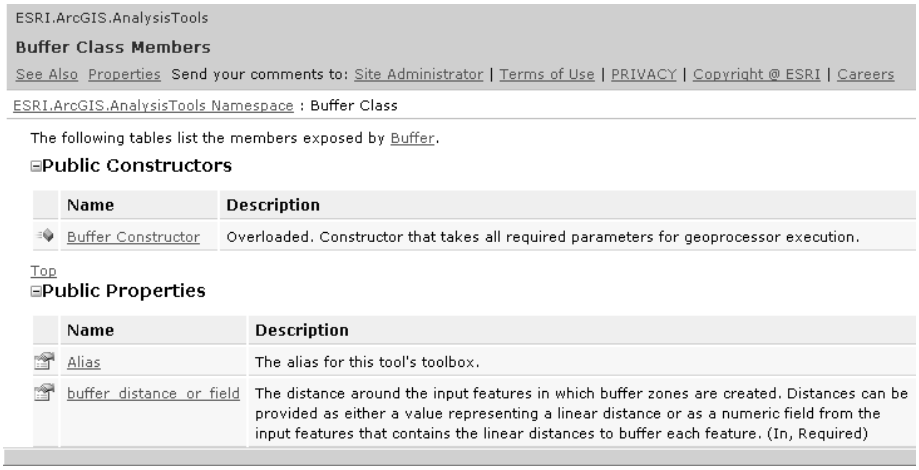
```
Try
    ' Set default workspace
    GP.SetEnvironmentValue("workspace", "C:\Docs\Lesley\GIS Programming\Slides\Week7\data")

    ' Populate the bufferTool with parameter values.
    bufferTool.in_features = "aoi_v.shp"
    bufferTool.out_feature_class = "aoi_v_buffer.shp"
    bufferTool.buffer_distance_or_field = "1000 Meters"

    ' Execute the model tool by name.
    result = GP.Execute(bufferTool, Nothing)
```

2) Set the tool and environment properties
3) Run the GP

# Finding the properties



ESRI.ArcGIS.AnalysisTools

**Buffer Class Members**

See Also Properties Send your comments to: Site Administrator | Terms of Use | PRIVACY | Copyright @ ESRI | Careers

ESRI.ArcGIS.AnalysisTools Namespace : Buffer Class

The following tables list the members exposed by Buffer.

**Public Constructors**

| Name | Description |
|---|---|
| Buffer Constructor | Overloaded. Constructor that takes all required parameters for geoprocessor execution. |

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**Public Properties**

| Name | Description |
|---|---|
| Alias | The alias for this tool's toolbox. |
| buffer_distance_or_field | The distance around the input features in which buffer zones are created. Distances can be provided as either a value representing a linear distance or as a numeric field from the input features that contains the linear distances to buffer each feature. (In, Required) |

# Environment values

- Default values for common parameters may be obtained from the geoprocessing environment
- Geoprocessor object possesses all default environment values
- Environment variables may be retrieved and changed
- Environment names are not case-sensitive in .NET

# Listing environment variables

```
' Informational function to dump the GP environment settings to the console
Public Sub BA_ListGPEnvironmentSettings()
    'Create the geoprocessor
    Dim GP As ESRI.ArcGIS.Geoprocessor.Geoprocessor = New ESRI.ArcGIS.Geoprocessor.Geoprocessor()
    ' list all the Environments, hold the return of the method in an Enumeration
    Dim gpEnumEnv As IGpEnumList = GP.ListEnvironments("*")
    Dim strEnv As String = gpEnumEnv.Next
    While strEnv.Length > 0
        Dim strVal As String = TryCast(GP.GetEnvironmentValue(strEnv), String)
        Debug.WriteLine(strEnv & ": " & strVal)
        strEnv = gpEnumEnv.Next
    End While
End Sub
```

# Exception handling

```
Catch ex As Exception
    For Counter As Integer = 0 To gp.MessageCount - 1
        Debug.Print("GP error: " & gp.GetMessage(Counter))
    Next
Finally
    gp = Nothing
    parameters = Nothing
    result = Nothing
    GC.WaitForPendingFinalizers()
    GC.Collect()
End Try
```

4) Handle the exceptions

# Exception results

```
A first chance exception of type 'System.Runtime….' occurred in Week5.dll
GP error: Executing: Buffer "C:\Docs\Lesley\GIS
Programming\Slides\Week7\..."
GP error: Start Time: Fri Feb 04 09:32:24 2011
GP error: Failed to execute. Parameters are not valid.
GP error: ERROR 000725: Output Feature Class: … already exists.
GP error: Failed to execute (Buffer).
GP error: Failed at Fri Feb 04 09:32:24 2011 (Elapsed Time: 0.00 seconds)
```

# Geoprocessing messages

- Accessible from GP or IGeoprocessorResult2
- Informative messages
  - severity value = 0
- Warning messages
  - severity value = 1
  - problem during execution or output may not be what you expect
- Error messages
  - severity value = 2
  - critical error that prevents the tool from executing

# Chaining tools (IGeoprocessorResult2)

```
' Execute the model tool by name.
result = GP.Execute(bufferTool, Nothing)

' If the job succeeded, retrieve the feature result.
If result IsNot Nothing Then
    Dim outVal As IGPValue = result.GetOutput(0)
    copyTool.in_features = outVal
    copyTool.out_feature_class = "C:\Docs\Lesley\GIS Programming\Slides\Week7\data\aoi_v_buf
    GP.Execute(copyTool, Nothing)
End If
```

## IGeoprocessorResult2

- May be returned by gp.Execute()
- However…
  - Result object NOT returned if local failure occurs
  - Use only if you are chaining
  - Remote failures (ArcGIS Server) always return a result object that can be checked
- http://help.arcgis.com/en/sdk/10.0/arcobjects_net/conceptualhelp/index.html#/Working_with_result_objects/00010000002s0000000/

## ExecuteAsAsync

- Executes a geoprocessing tool in the background
- New in ArcGIS 10.0
- ArcMap remains responsive while tool is running
- http://help.arcgis.com/en/sdk/10.0/arcobjects_net/conceptualhelp/index.html#/Running_a_geoprocessing_tool_using_background_geoprocessing/00010000015z000000/

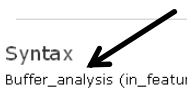
# Geoprocessing assembly

```
'Using the geoprocessing library
Private Sub GeoprocessingBuffer()
    'Create the geoprocessor
    Dim gp As IGeoProcessor2 = New GeoProcessor
    'Create an IVariantArray to hold the parameter values.
    Dim parameters As IVariantArray = New VarArray
    'Create the result object
    Dim result As ESRI.ArcGIS.Geoprocessing.IGeoProcessorResult2

    Try
        ' Populate the variant array with parameter values.
        parameters.Add("C:\Docs\Lesley\GIS Programming\Slides\Week7\data\aoi_v.shp")
        parameters.Add("C:\Docs\Lesley\GIS Programming\Slides\Week7\data\aoi_v_buffer.shp")
        parameters.Add("1000 Meters")

        ' Execute the model tool by name.
        result = gp.Execute("Buffer_analysis", parameters, Nothing)
```

1) Create the GP object and parameters
2) Set the parameters and environment properties
3) Run the GP

# Finding the tool name

- Convention
  - Tool name = [toolname]_[toolboxname]
- ArcGIS Desktop 10.0 Help
  - Buffer help



Syntax

Buffer_analysis (in_features, out_feature_class, buffer_distance_or_field, {line_side}, {line_end_type}, {dissolve_option}, {dissolve_field})

| Parameter | Explanation | Data Type |
|---|---|---|
| in_features | The input point, line, or polygon features to be buffered. | Feature Layer |
| out_feature_class | The feature class containing the output feature buffers. | Feature Class |

# Finding the properties

| Parameter | Explanation | Data Type |
|---|---|---|
| in_features | The input point, line, or polygon features to be buffered. | Feature Layer |
| out_feature_class | The feature class containing the output feature buffers. | Feature Class |
| buffer_distance_or_field | The distance around the input features in which buffer zones are created. Distances can be provided as either a value representing a linear distance or as a numeric field from the input features that contains the linear distances to buffer each feature.<br>If the Distance linear units are not specified or are entered as Unknown, the linear unit of the input features' spatial reference is used. | Linear unit ; Field |
| line_side<br>(Optional) | The side(s) of the input features that will be buffered.<br>• FULL —For line input features, buffers will be generated on both sides of the line. For polygon input features, buffers will be generated around the polygon and will contain and overlap the area of the input features. For point input features, buffers will be generated around the point. This is the default. | String |

# Help with properties

- Order matters!

**Buffer Example (Python Window)**

The following Python Window script demonstrates how to use the Buffer tool:

```
import arcpy
arcpy.env.workspace = "C:/data"
arcpy.Buffer_analysis("roads", "C:/output/majorrdsBuffered" "100 Feet", "FULL", "ROUND", "LIST", "Distan
```

# Chaining tools (IGeoprocessorResult2)

```
' Execute the model tool by name.
result = gp.Execute("Buffer_analysis", parameters, Nothing)

' If the job succeeded, retrieve the feature result.
If result IsNot Nothing Then
    Dim outVal As IGPValue = result.GetOutput(0)
    parameters.RemoveAll()
    parameters.Add(outVal)
    parameters.Add("C:\Docs\Lesley\GIS Programming\Slides\Week7\data\aoi_v_buffer_copy.shp")
    gp.Execute("CopyFeatures", parameters, Nothing)
End If
```

# Very similar

- These functions are the same with either approach:
  - Environment settings
  - Working with IGeoprocessorResult objects
  - Exception handling
  - Background processing

# Advanced topics

- Creating custom tools in custom toolboxes and running them in ArcObjects

  http://help.arcgis.com/en/sdk/10.0/arcobjects_net/conceptualhelp/index.html#/How_to_run_a_geoprocessing_tool/000100000003rr000000/
- Opening a geoprocessing tool's dialog box in .NET

  http://help.arcgis.com/en/sdk/10.0/arcobjects_net/conceptualhelp/index.html#/Opening_a_geoprocessing_tool_s_dialog_box_in_NET/0001000001rz000000/

# Geoanalyst processing

- Set of geoprocessing tools from Spatial and 3D Analyst (license required)
- Raster datasets only
- Output NOT automatically added to display
- Intended to be more efficient

# IReclassOp

```
Private Sub Geoanalyze()
    Dim pReclassOp As IReclassOp
    Dim pSliceRaster As IGeoDataset2
    Dim pSourceRasterLayer As IRasterLayer
    Dim pSliceRasterLayer As IRasterLayer
    Dim pSourceRaster As IRaster
    Try
        ' Get current document
        Dim pMxDoc As IMxDocument = My.Document
        Dim pMap As IMap = pMxDoc.FocusMap
        ' Get raster layer from map
        pSourceRasterLayer = pMap.Layer(0)
        ' Get raster from rasterLaer
        pSourceRaster = pSourceRasterLayer.Raster
        pReclassOp = New RasterReclassOp
        ' execute slice
        Dim slices As Integer = 5
        pSliceRaster = pReclassOp.Slice(pSourceRaster, esriGeoAnalysisSliceEnum.esriG
```

# IRasterAnalysisEnvironment

- Controls properties (cell size, extent, mask, spatial reference, and workspace)
- No affect on input data but impacts output
- Environment parameters are inherited by operator objects when they are created
- See Geoanalyst reading for sample code

# IRasterAnalysisEnvironment API

*ArcObjects Library Reference (GeoAnalyst)*

IRasterAnalysisEnvironment Interface

Provides access to members that control the environment for raster analysis.

**Product Availability**

Available with ArcGIS Engine, ArcGIS Desktop, and ArcGIS Server.

**Members**

| | All | Description |
|---|---|---|
| | DefaultOutputRasterPrefix | The default output raster prefix. |
| | DefaultOutputVectorPrefix | The default output vector prefix. |
| | GetCellSize | Gets the type and value of cell size in the RasterAnalysis. |
| | GetExtent | Gets the type and values of extent in the RasterAnalysis. |
| | Mask | Mask allows processing to occur only for a selected set of cells. |
| | OutSpatialReference | The output spatial reference of GeoAnalysis. |
| | OutWorkspace | The output workspace of GeoAnalysis. |