

* ArcObjects: Table and Attribute Data

GEOG 4/590: GIS Programming

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Accessing GIS Data in ArcObjects

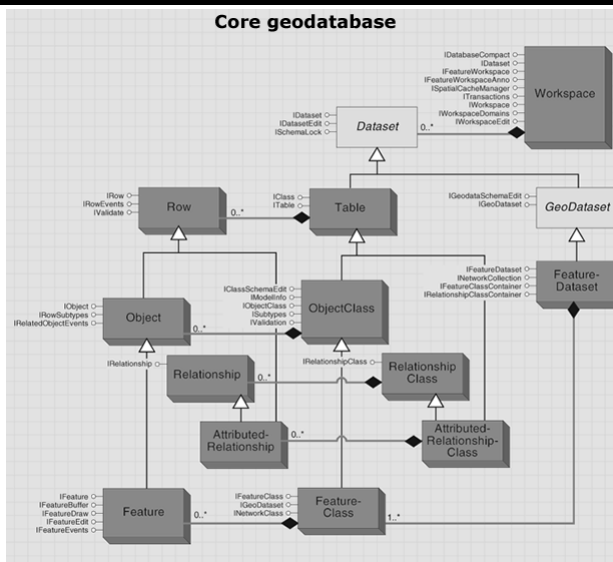
- Layer
 - FeatureLayer
 - RasterLayer

- Dataset (Geodataset)
 - FeatureDataset – FeatureClass - Feature
 - RasterDataset – Raster – (Rasterband) - PixelBlock
 - Table – Fields – Field - Row

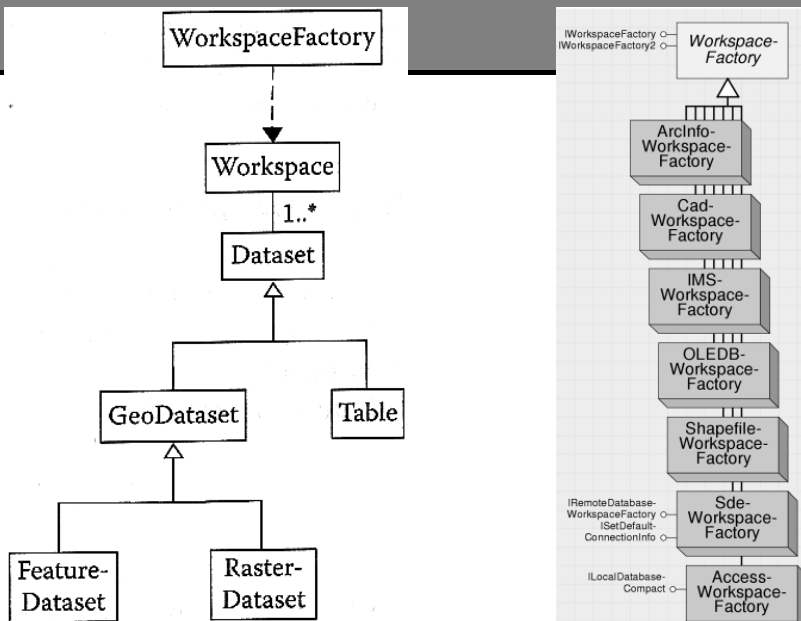
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ArcObjects Geodatabase

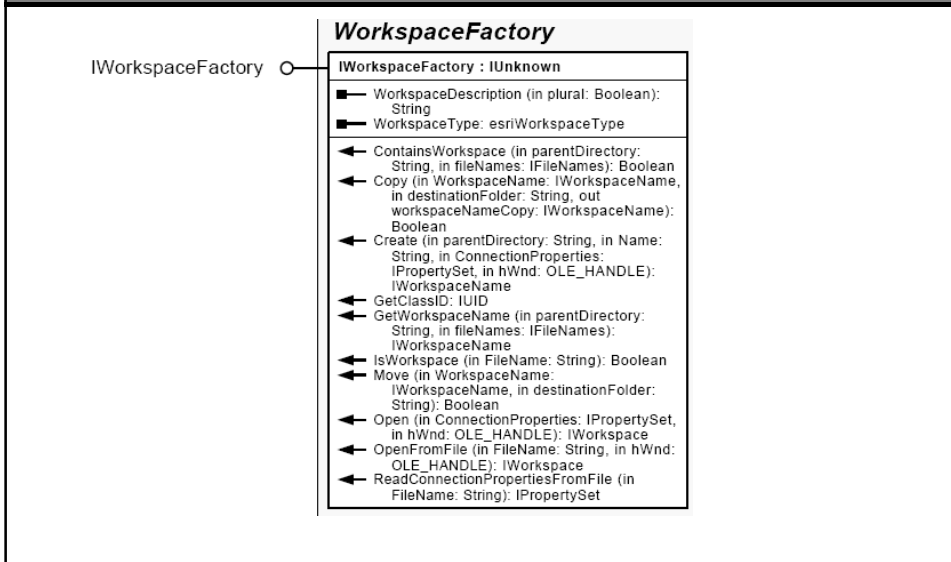
- Workspace
 - ArcInfo workspace
 - Shapefile folder
 - Geodatabase
- Dataset
 - Coverage
 - Feature dataset
- Geodataset
 - Shapefile
 - Feature class
 - Grid



WorkspaceFactory and Workspace



WorkspaceFactory Interface



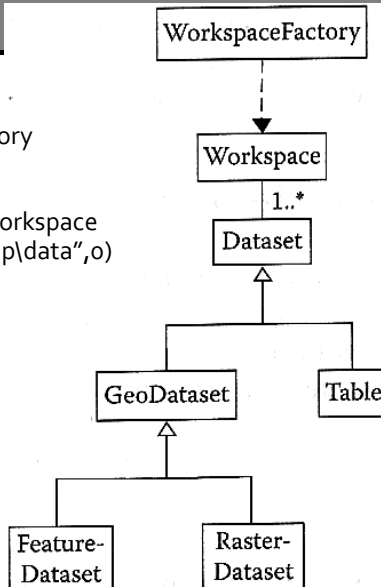
ArcObjects Datasets (Namespace: GeoDatabase)

```

Dim pWkspFactory As IWorkspaceFactory
pWkspFactory = New ShapefileWorkspaceFactory

Dim pWksp As IFeatureWorkspace
'implicit casting from IWorkspace to IFeatureWorkspace
pWksp = pWkspFactory.OpenFromFile("C:\temp\data", o)

Dim pFClass As IFeatureClass
pFClass = pWksp.OpenFeatureClass("streets")
    
```



Add a Geodataset to ArcMap (Vector)

```

Dim pWkspFactory As IWorkspaceFactory = New ShapefileWorkspaceFactory

Dim pWksp As IFeatureWorkspace
pWksp = pWkspFactory.OpenFromFile("C:\temp\data", 0)

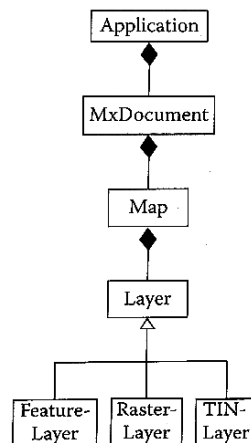
Dim pFClass As IFeatureClass
pFClass = pWksp.OpenFeatureClass("aoi_streams.shp")

Dim pFLayer As IFeatureLayer = New FeatureLayer
pFLayer.FeatureClass = pFClass

Dim pMxDoc As IMxDocument = My.ArcMap.Document
Dim pMap As IMap = pMxDoc.FocusMap

pMap.AddLayer(pFLayer)
pMxDoc.ActiveView.Refresh()

```



Add a Geodataset to ArcMap (Raster)

```

Dim pWkspFactory As IWorkspaceFactory = New RasterWorkspaceFactory

Dim pWksp As IRasterWorkspace2
pWksp = pWkspFactory.OpenFromFile("C:\temp\data", 0)

Dim pRDataset As IRasterDataset
pRDataset = pWksp.OpenRasterDataset("covden5")

Dim pRLayer As IRasterLayer = New RasterLayer
pRLayer.CreateFromDataset(pRDataset)

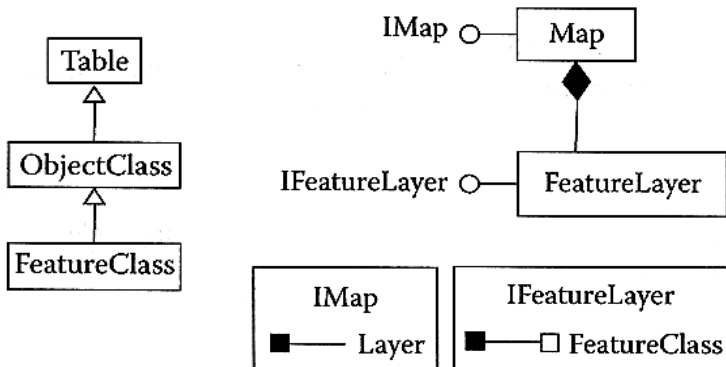
Dim pMxDoc As IMxDocument = My.ArcMap.Document
Dim pMap As IMap = pMxDoc.FocusMap

pMap.AddLayer(pRLayer)
pMxDoc.ActiveView.Refresh()

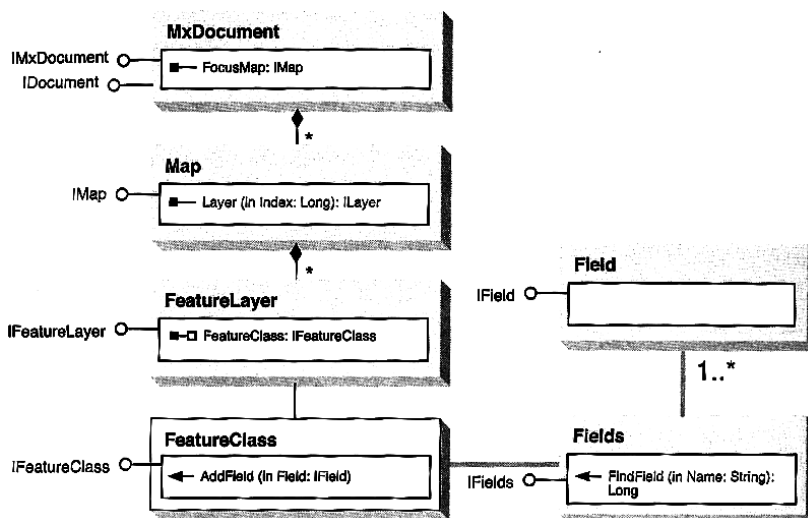
```

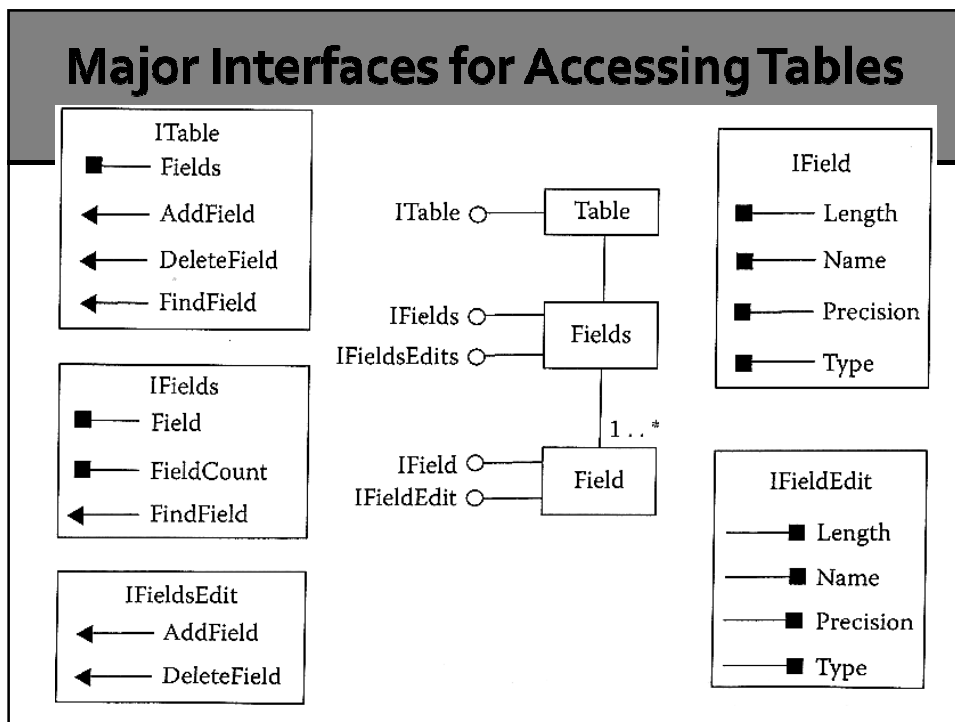
Types of Tables

- Standalone tables (.dbf, excel)
- Featureclass tables



Fields & Field





Field.Type Constants

esriFieldTypeBlob	8
esriFieldTypeDate	5
esriFieldTypeDouble	3
esriFieldTypeGeometry	7
esriFieldTypeGlobalID	11
esriFieldTypeGUID	10
esriFieldTypeInteger	1
esriFieldTypeOID	6
esriFieldTypeRaster	9
esriFieldTypeSingle	2
esriFieldTypeSmallInteger	0
esriFieldTypeString	4

Open a standalone table (.dbf file)

```

Dim bObjectSelected As Boolean
Dim pGxDialog As IGxDialog = New GxDialog
Dim pGxObject As IEnumGxObject = New GxObjectArray
Dim pFilter As IGxObjectFilter = New GxFilterdBASEFiles

'initialize and open mini browser
With pGxDialog
    'set other properties of the GxDialog here
    .ObjectFilter = pFilter
    bObjectSelected = .DoModalOpen(My.ArcMap.Application.hWnd, pGxObject)
End With

If bObjectSelected = True Then
    Dim pGxTable As IGxObject = pGxObject.Next

    'open the dbf table
    Dim pWkspFactory As IWorkspaceFactory = New ShapefileWorkspaceFactory
    Dim pWksp As IFeatureWorkspace = _
        pWkspFactory.OpenFromFile(pGxDialog.FinalLocation.FullName, o)
    Dim pTable As ITable = pWksp.OpenTable(pGxTable.Name)
    Dim pFields As IFields = pTable.Fields
  
```

Open Attribute Table of a Layer or a Feature Class

```

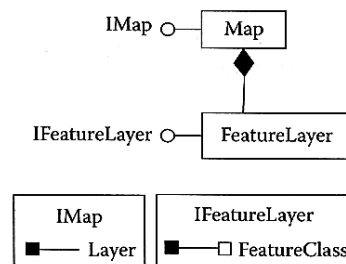
Dim pMap As IMap = My.ArcMap.Document.FocusMap
Dim pFLayer As IFeatureLayer = CType(pMap.Layer(o), IFeatureLayer)

Dim pFields As IFields = pFLayer.FeatureClass.Fields
'Dim pFields As IFields = pTable.Fields
Dim fieldlist As String = ""

For i As Integer = 0 To pFields.FieldCount - 1
    fieldlist = fieldlist & vbCrLf & _
        pFields.Field(i).Name & ", " & pFields.Field(i).Type.ToString
Next
MsgBox(fieldlist)

'FindField returns -1 if field isn't found
Dim fn As String = "GRID_CODE"
Dim n As Integer = pFields.FindField(fn)

If n < 0 Then
    MsgBox(fn & " field doesn't exist")
Else
    Dim aField As IField = pFields.Field(n)
    MsgBox(fn & " field exists")
End If
  
```



Add New Fields

```
'FindField returns -1 if field isn't found
Dim fn As String = "Length"
Dim n As Integer = pFields.FindField(fn)

If n < 0 Then
  Dim aField As IFieldEdit = New Field

  With aField
    .Name_2 = fn
    .Type_2 = esriFieldType.esriFieldTypeDouble
    .Length_2 = 8
  End With

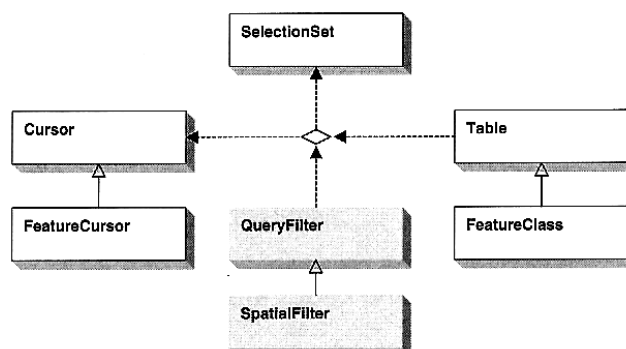
  pFLayer.FeatureClass.AddField(aField)
  MsgBox(fn & " was added")

End If
```

Cursor & FeatureCursor

- A system that manages a group of records organized in rows


```
Dim pQFilter As IQueryFilter = New QueryFilter
Dim pCursor As ICursor = pTable.Search(Nothing, True)
Dim pFCursor As IFeatureCursor = pFeatureClass.Search(pQFilter, False)
Dim pFCursor As IFeatureCursor = pFeatureClass.Update(pQFilter, False)
```



IQueryFilter.WhereClause Property

- Numeric field
 - pQFilter.WhereClause = "GRID_CODE = 1"
 - pQFilter.WhereClause = "GRID_CODE > 1"

- String (text) field
 - pQFilter.WhereClause = "CODESTR = 'One'"
 - pQFilter.WhereClause = "UPPER('"'CODESTR"'") = 'TWO'"
 - pQFilter.WhereClause = "UPPER(CODESTR) = 'TWO'"
 - pQFilter.WhereClause = "CODESTR Like 'T%'"

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Cursor & FeatureCursor Interfaces

```
Dim pMap As IMap = My.ArcMap.Document.FocusMap
Dim pFLayer As IFeatureLayer = CType(pMap.Layer(o), IFeatureLayer)
Dim pFClass As IFeatureClass = pFLayer.FeatureClass
```

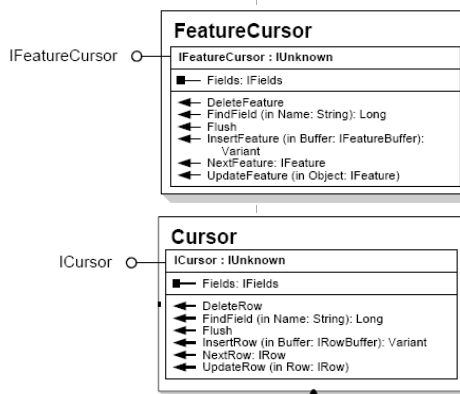
```
Dim pQFilter As IQueryFilter = New QueryFilter
pQFilter.WhereClause = "GRID_CODE < 2"
```

```
Dim pFCursor1 As IFeatureCursor = pFClass.Search(Nothing, False)
Dim pFCursor2 As IFeatureCursor = pFClass.Search(pQFilter, False)
```

```
Dim i As Long = 0, j As Long = 0
Dim fn As Integer = pFClass.FindField("GRID_CODE")
```

```
'count number of features in FCursor1
Dim pFeature As IFeature = pFCursor1.NextFeature
Do While (pFeature IsNot Nothing)
  i += 1
  Debug.Print(pFeature.Value(fn))
  pFeature = pFCursor1.NextFeature
Loop
```

```
'count number of features in FCursor2
pFeature = pFCursor2.NextFeature
Do While (pFeature IsNot Nothing)
  j += 1
  Debug.Print(pFeature.Value(fn))
  pFeature = pFCursor2.NextFeature
Loop
```



Update Records in a Table

```

Dim pMap As IMap = My.ArcMap.Document.FocusMap
Dim pFLayer As IFeatureLayer = CType(pMap.Layer(o), IFeatureLayer)
Dim pFClass As IFeatureClass = pFLayer.FeatureClass

Dim pQFilter As IQueryFilter = New QueryFilter
pQFilter.WhereClause = "UPPER(''CODESTR''') = 'TWO'"

Dim pFCursor As IFeatureCursor = pFClass.Update(pQFilter, False)
Dim n As Long = pFClass.FeatureCount(pQFilter)

Dim fIndex As Integer = pFClass.FindField("CODESTR")

Dim pFeature As IFeature
For i As Long = 1 To n
    pFeature = pFCursor.NextFeature
    pFeature.Value(fIndex) = "Twenty"
    pFCursor.UpdateFeature(pFeature)
Next

MsgBox(n & " features updated")

```

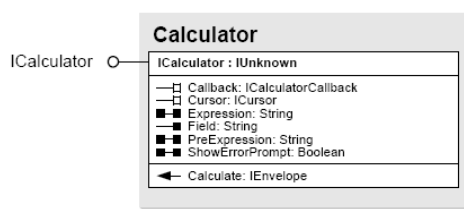
Calculator Interface (GeodatabaseUI)

```

Dim pFCursor As IFeatureCursor = pFClass.Update(Nothing, False)

'calculate the value of length * 3.2808 and assign it to length2
Dim pCalc As ICalculator = New Calculator
With pCalc
    .Cursor = pFCursor
    .Expression = "[Length] * 3.2808"
    .Field = "Length2"
    .ShowErrorPrompt = True
    .Calculate()
End With

```



Cursor Recycling:

True: single record process, reuse the same memory space

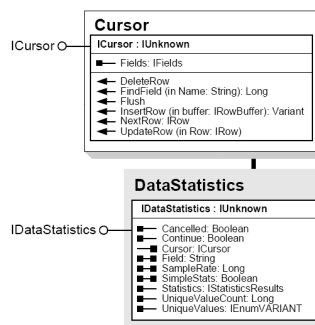
False: multiple record process, each record has its own memory space

IDataStatistics & IStatisticsResults (ESRI.ArcGIS.esriSystem)

```
Dim pFCursor As IFeatureCursor =
pFClass.Search(Nothing, False)
Dim pData As IDataStatistics = New DataStatistics
pData.Cursor = CType(pFCursor, ICursor)
pData.Field = "Length"
```

```
Dim pResults As IStatisticsResults = pData.Statistics
```

```
With pResults
    Debug.Print(.Count)
    Debug.Print(.Minimum)
    Debug.Print(.Maximum)
    Debug.Print(.Sum)
    Debug.Print(.Mean)
    Debug.Print(.StandardDeviation)
End With
```



References

- **“Geodatabase”**
 - http://help.arcgis.com/en/sdk/10.0/arcobjects_net/componenthelp/index.html#/002500000n8v000000
 - Read Core Geodatabase, Workspace, Datasets, “Table, ObjectClass, and FeatureClass objects”, and Raster sections
- **“Querying geodatabase tables”**
 - http://help.arcgis.com/en/sdk/10.0/arcobjects_net/conceptualhelp/index.html#/d/000100000146000000.htm
- **Updating attributes of existing features**
 - http://help.arcgis.com/en/sdk/10.0/arcobjects_net/conceptualhelp/index.html#/d/0001000001mm000000.htm