Python – Scripting for Map Automation

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What is arcpy.mapping?

• A new map scripting environment at 10.0
• Mapping module that is part of the ArcPy site-package
• Python scripting API that allows our users to:
  - manage map documents, layer files, and their contents
    - find a layer with data source X and replace with Y
    - update a layer’s symbology in many MXDs
    - generate reports that lists document information
      - data sources, broken layers, spatial reference info, etc.
  - Automate the exporting and printing of map documents
  - Automate map production and create map books
    - extend Data Driven Pages capabilities
Who is arcpy.mapping for? Why was it built?

- An easy to use, productive scripting environment for the GIS Analyst
  - courser grained object model
  - not a complete replacement for ArcObjects
- An environment to use for basic map/layer management and map automation tasks
- A simple way to publish mapping tasks to the server environment
  - arcpy.mapping scripts can be easily published as geoprocessing tools
Demonstration:

Brief introduction to arcpy.mapping sample script tools

Samples available on the Resource Center: [http://esriurl.com/python](http://esriurl.com/python)
Tour of arcpy.mapping (cont.)

Managing Documents and Layers

CLASSES
- MapDocument
- Layer
- TableView
- LabelClass
- DataFrame
- DataFrameTime
- GraphicElement
- LegendElement
- PictureElement
- TextElement
- MapSurroundElement
- PictureElement

FUNCTIONS
- MapDocument
- Layer
- ListBrokenDataSources
- ListDataFrames
- ListLayers
- ListLayoutElements
- ListPrinterNames
- ListTableViews
- AddLayer
- AddLayerToGroup
- InsertLayer
- MoveLayer
- RemoveLayer
- UpdateLayer
Tour of arcpy.mapping (cont.)

Printing, Exporting, Server Publishing, Map Books

CLASSES
- DataDrivenPages
- PDFDocument

FUNCTIONS
- ExportToAI
- ExportToBMP
- ExportToEMF
- ExportToEPS
- ExportToGIF
- ExportToJPEG
- ExportToPDF
- ExportToPNG
- ExportToSVG
- ExportToTIFF
- PDFDocumentCreate
- PDFDocumentOpen
- PrintMap
  ...

Python Window

- Command Line becomes the Python Window
- Quick and easy access to Python and arcpy
  - Gateway for new users to learn Python
  - Intellisense for all tools, methods and properties & help window
  - Quickly and efficiently execute tools
arcpy.mapping help

- Go to Professional Library → Geoprocessing → The ArcPy site package → Mapping module
Demonstration

The Python Window and using the Desktop Help System
Referencing Map Documents (MXDs)

- Opening Map Documents (MXD) with arcpy.mapping
  - Use the `arcpy.mapping.MapDocument` function
  - Takes a path to MXD file on disk or special keyword "CURRENT"
  - Reference map on disk
    \[ mxd = arcpy.mapping.MapDocument(r"C:\some.mxd") \]
  - Get map from current ArcMap session
    \[ mxd = arcpy.mapping.MapDocument("CURRENT") \]
Referencing Map Documents (MXDs), cont.

• When using CURRENT
  - Always run in foreground (checkbox in script tool properties)
  - Be wary of open conflicts, file contention
  - May need to refresh the application
    
    ```python
    arcpy.RefreshActiveView()
    arcpy.RefreshTOC()
    ```

• Limitations and pre-authoring
  - No "New Map" function, so keep an empty MXD available
  - Can’t create new objects (e.g., north arrow, text elements)
Demonstration:
Working with Map Documents (MXDs)

- Use Python Window to change map document property info
- Evaluate relative paths, last saved, etc.
- Change the active view
- Save changes out to a new file
arcpy.mapping for Map Layers and Data Frames

• The “List” functions
  - ListLayers
  - ListDataFrames
  - Watch the list indexes (you may often forget to use [0])
    \[ df = \text{arcpy.mapping.ListDataFrames(MXD)}[0] \]

• Layer properties
  - Common properties are available (e.g., def query, visible)
  - All properties can be updated via layer (.lyr) files

• DataFrame properties and methods
  - Map Navigation
  - DataFrameTime
arcpy.mapping for Map Layers and Data Frames

Layer functions

Layer
ListLayers
ListTableViews

AddLayer
AddLayerToGroup
InsertLayer
MoveLayer
RemoveLayer
UpdateLayer

Data Frame Class

Methods
panToExtent(extent)
zoomToSelectedFeatures()

Properties:
credits
description
displayUnits
elementHeight
elementPositionX
...
Demonstration:

Working with Map Layers and Data Frames

Find a layer and turn it on or off
Modify the scale/rotation of a data frame
Zoom to selected features
arcpy.mapping for the Page Layout

- When and what to pre-author for layout manipulation scenarios
  - Name your layout elements
  - Set the appropriate anchor
  - Cannot add new elements, so pre-author and hide
Demonstration:

Working with layout elements

Find a picture element and change its data source
Find and replace text in an ArcMap layout
arcpy.mapping for Printing and Exporting

- PDFDocument and DataDrivenPages classes
- Export and print functions
- Map server publishing
- Map book generation

FUNCTIONS
- ExportToAI
- ExportToBMP
- ExportToEMF
- ExportToEPS
- ExportToGIF
- ExportToJPEG
- ExportToPDF
- ExportToPNG
- ExportToSVG
- ExportToTIFF
- PDFDocument
- CreatePDFDocument
- Open
- PrintMap
- PublishMSDToServer
- AnalyzeForMSD
- ConvertToMSD

CLASSES
- DataDrivenPages
- PDFDocument
Demonstration:

Map output and map books

Map book that includes index pages using Python ReportLab

Sample: http://esriurl.com/python2

Custom thematic map application ported from AML
Updating Data Sources

- Use arcpy.mapping for migrating Map Documents and Layer files to new data sources
- Fancier scripts can help mitigate migration pain: SQL syntax changes, field name changes, etc
- A complete concept document is dedicated to this topic
  - “Updating and fixing data sources with arcpy.mapping”
  - http://esriurl.com/python3
- Many capabilities:
  - Update all layers in an MXD or specific tables and layers
  - Works with all file and GDB types
  - Update joins and relates
  - Migrate from different workspace types
arcpy.mapping on the Server

**Desktop**
- Script Tool
- Python Window
- Standalone Script: IDE, Command Line, Scheduled Task

**Server**
- Geoprocessing Service
Demonstration:

arcpy.mapping on ArcGIS Server

Exporting a Map Layout to PDF from the server

Samples: http://esriurl.com/python4
Resources available

• Desktop\Web help
  - Geoprocessing ➔ The ArcPy site package ➔ Mapping module
    - Alphabetical lists of classes and functions
    - Detailed discussions
    - Multiple sample scripts for each class and function topic

• ArcGIS Resource Center
  - [http://resources.esri.com/content/geoprocessing](http://resources.esri.com/content/geoprocessing)
    - Download sample script tools from the Model and Script Tool Gallery
    - Watch video demonstrations
    - Monitor user forums and blog discussions
arcpy.mapping 10.1 Road Ahead

• Symbology
  - automate layer symbology (renderer) properties
    - Feature Layers: graduated colors, graduated symbols, unique values
    - Raster Layers: raster classified

• Export Report
  - automate the generation of reports without having to open ArcMap.

• Layer time
  - access a layer’s time properties
  - enable time on layers

• Miscellaneous improvements to the API
  - reading bookmarks, setting text size, setting relative paths, reading page size, etc.
Related workshops

• Tuesday
  - 1:30 – 2:45 Building Map Books
  - 4:00-4:45 Using arcpy.mapping with ArcGIS Server to Generate High Quality PDF Map Documents Over the Web (Demo Theatre)
  - 4:00 – 5:00 Road Ahead – Map Books and Map Scripting

• Wednesday
  - 1:55 – 2:15 Managing Layer Data Sources (Demo Theatre)
  - 3:15 – 4:30 Road Ahead – ArcGIS Desktop 10.1

• Thursday
  - 1:00 – 1:30 Building the Legislative District Atlas using Data Driven Pages (Demo Theatre)
  - 3:15 – 4:30 Building Map Books
  - 4:05 – 4:25 Road Ahead – Python Scripting Abilities
Questions?

Please complete a session evaluation. Thank You!

www.esri.com/sessionevals