Python Map Automation –
Introduction to arcpy.mapping

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What is arcpy.mapping?

• A map scripting environment introduced at 10.0
• Python mapping module that is part of the ArcPy site-package
• An API that allows 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/4622](http://esriurl.com/4622)
Tour of arcpy.mapping

Overview
Tour of arcpy.mapping (cont.)

Managing Documents and Layers

**CLASSES**
- MapDocument
- Layer/Time
- TableView
- LabelClass
- DataFrame/Time
- StyleItems
- GraphicElement
- LegendElement
- PictureElement
- TextElement
- MapSurroundElement
- PictureElement
- GraduatedColorSym
- UniqueValueSym
- ...

**FUNCTIONS**
- MapDocument
- Layer
- ListBrokenDataSources
- ListDataFrames
- ListLayers
- ListLayoutElements
- ListTableViews
- AddLayer
- AddLayerToGroup
- InsertLayer
- MoveLayer
- RemoveLayer
- UpdateLayer
- CreateMapSDDraft
- ...

Tour of arcpy.mapping (cont.)

Printing, Exporting, Server Publishing, Map Books

**CLASSES**
- DataDrivenPages
- PDFDocument

**FUNCTIONS**
- ExportReport
- ExportToAI
- ExportToBMP
- ExportToEPS
- ExportToGIF
- ExportToJPEG
- ExportToPDF
- ExportToPNG
- ExportToSVG
- ExportToTIFF
- PDFDocumentCreate
- PDFDocumentOpen
- PrintMap
- PublishMSDToServer
  ...

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 10.x help

- Go to Geoprocessing ‡ ArcPy ‡ Mapping module
Demonstration

The Python Window and using the Desktop Help System
arcpy.mapping for Map Documents

MapDocument function

MapDocument

MapDocument class

Methods
save
saveAsCopy
UpdateDataSources
...

Properties:
author
credits
...
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
  
  ```python
  mxd = arcpy.mapping.MapDocument(r"C:\some.mxd")
  ```
- Get map from current ArcMap session
  
  ```python
  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()
    ```

• Limitations and pre-authoring
  - No "New Map" function, so keep an empty MXD available
  - Can’t create new objects (e.g., north arrow, data frame)
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
Map Layers and Data Frames

• The “List” functions
  - ListLayers
  - ListDataFrames
  - Watch the list indexes (you may often forget to use [0])
    ```python
df = 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
  - Basic map navigation and settings
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 turns 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
- PDFDocumentCreate
- PDFDocumentOpen
- PrintMap
- PublishMSDToServer
  ...

CLASSES
- DataDrivenPages
- PDFDocument
Demonstration:
Map output and map books

Map book that includes index pages using Python ReportLab
Sample: [http://esriurl.com/4629](http://esriurl.com/4629)
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/4628

• 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
  - E.g. High quality web map printing (replacing service layers with vector data)
Resources available

• ArcGIS Resource Center (web help)
  - http://esriurl.com/4623
    - Alphabetical lists of classes and functions
    - Detailed discussions
    - Multiple sample scripts for each class and function topic

• ArcGIS Resource Center (forums)
  - Map Automation: http://esriurl.com/4624
  - Python: http://esriurl.com/4625

• ArcGIS Online – arcpy.mapping / Map Automation group
  - http://esriurl.com/4626
    - Download sample scripts
Related sessions

Wednesday:
8:30 - 9:45am : Supporting High-Quality Printing with AGS: Room 15A
10:15 - 11:30am : Introduction to arcpy.mapping : Room 1 A/B
3:15 - 4:30pm : Beyond the Basics of arcpy.mapping : Room 1 A/B

Thursday:
8:30 - 09:45am : Beyond the Basics of arcpy.mapping : Room 8
10:15 - 11:30am : Building Map Books : Ballroom 6 A
Thank you…

Please fill out the session evaluation

First Offering ID: 1216
Second Offering ID: 1288

Online – www.esri.com/ucsessionsurveys
Paper – pick up and put in drop box