Automated Workflow Using Python Scripting to Build the SCAG Data/Map Book

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Southern California Association of Governments (SCAG)
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Nation’s largest Metropolitan Planning Organization (MPO)

6 counties and 191 cities

18.4 million people within 38,000+ square miles

GRP in 2012: $924 Billion (16th largest economy in the world)
Overview

Background

Objectives

Methodology

Conclusions
BACKGROUND
2016 RTP/SCS and Senate Bill 375

- 2016-2040 Regional Transportation Plan / Sustainable Communities Strategy (RTP/SCS)
  - A long-range transportation plan
- SB375 – California’s Sustainable Communities Strategy and Climate Protection Act
  - Integration of transportation, land use and housing planning to meet the regional GHG emission reduction targets
  - Emphasis on a substantial public participation process and local government input
SCAG’s Local Input Process for 2016 RTP/SCS

- Bottom-up local input process
  - Participation and cooperation of all 197 local government partners within the SCAG Region

- To facilitate and assist in the local review of SCAG’s land use datasets and growth forecast
  - SCAG Data/Map Book
  - One-on-one meeting
  - Collect data changes, answer questions, provide technical guidance
Key stages of the SCAG’s Local Input Process

- Stage 1 – Preliminary land use data collection and review
  - Released *SCAG Map Book* in Aug. 2013
- Stage 2 – Review of land use data and socioeconomic data
  - Released *SCAG Data/Map Book* in Nov. 2013
- Stage 3 – Land use scenario planning exercises
SCAG Data/Map Book

- Development of land use and socioeconomic datasets as required by the 2016 RTP/SCS.
  - Through a bottom-up local input and review process

- Prepared for each jurisdiction in the SCAG Region
  - To collect input and comments from local jurisdictions
  - To help local planners and public to better understand SCAG’s datasets
Contents of SCAG Data/Map Book

- Land use
  - General Plan, zoning, existing land use

- Resource areas
  - Open space, farmland, endangered species, flood areas, conservation areas

- High quality transit areas & transit priority areas

- City boundary, sphere of influence, census tract, transportation analysis zone (TAZ)

- Socioeconomic data
OBJECTIVES
Objectives

 Produce the SCAG Data/Map Books for 197 local jurisdictions in a time and labor-efficient manner

 1. Development of an automated workflow to speed up repetitive tasks for regional land use database processing

 2. Development of an automated mapping workflow to speed up repetitive tasks for generating a series of maps for 197 jurisdictions
METHODOLOGY
Automating Map Workflow

Data Driven Pages (DDP)
- New functionality in ArcGIS 10 to create a series of maps from a single map document

Python and arcpy.mapping
- Arcpy.mapping – a Python scripting module that is part of the ArcPy site package
- Can be used to automate map production
- Can be used to extend DDP

Combining DDP with Python and arcpy.mapping
Using DDP with Python and Arcpy.mapping

- DDP may not provide enough functions for complicated map books, but DDP-enabled map document can save many lines of code.
- Combine DDP with Python and arcpy.mapping module to create complicated map books in more efficient manner.
- Interact arcpy.mapping module with DDP-enabled map documents (.mxd), layer files (.lyr) and dynamic layout elements.
DDP-Enabled Map Document
DDP-Enabled Map Document Set-Up

- **Index layer** – To produce multiple output pages using a single layout
- **Map extent** – Defined by the features in the index layer
- **Layer page definition query** – Features can be filtered using current data driven pages.
- **Dynamic text** – To change page titles, labels, etc. dynamically
Python and Arcpy.mapping

```python
# Author: Jung Seo
# Date: July 29, 2013
# Project: SCAG Map Book Phase I in Preparation for 2016-2040 RTP/SCS
# Purpose: To create general plan land use map (based on 2012 SCAG GP Codes) for each jurisdiction

# Import ArcPy and os modules
import arcpy
import os
import arcpy.mapping

# Set the current workspace
arcpy.env.workspace = "F:/DataMap_Guide/SCAG_2016"

# Set the current map documents (portrait and landscape)

# Overwrite pre-existing files
arcpy.env.overwriteOutput = True

# Define current and total page
totalCount1 = md1.dataDrivenPages.pageCount
totalCount2 = md2.dataDrivenPages.pageCount
curPage1 = md1.dataDrivenPages.currentPageID
curPage2 = md2.dataDrivenPages.currentPageID

# Loop for portrait maps
for pageNum in range(1, md1.dataDrivenPages.pageCount + 1):
    md1.dataDrivenPages.currentPageID = pageNum

# Set the main data frame
df_main1 = arcpy.mapping.ListDataFrames(md1, "main")[0]
```
Python Script

- Import arcpy.mapping module
  - `import arcpy`

- Set up workplace and map document
  - `arcpy.env.workspace, arcpy.mapping.MapDocument`

- Loop for generating maps of 197 jurisdictions
  - `for pageNum in range (1, mxd.dataDrivenPages.pageCount + 1):
    
    - Manipulate layer visibility
      - `if...elif...lyr.visible = True`

- Export map to image file and combine multiple files into a single file
  - `arcpy.mapping.ExportToPDF, finalPDF.appendPages`
CONCLUSIONS
Benefits of Automated Mapping Workflow

- It makes work easier.
  - By setting up the proper sequence of tasks

- It makes mapping task faster.
  - By speeding up repetitive map production and compilation tasks

- It makes mapping task more accurate and consistent.
  - By using same sequence of tasks and consistent map document format
Thank you!

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