Esri International Developer Summit

Palm Springs, CA

Python Map Automation – Beyond the Basics of arcpy.mapping

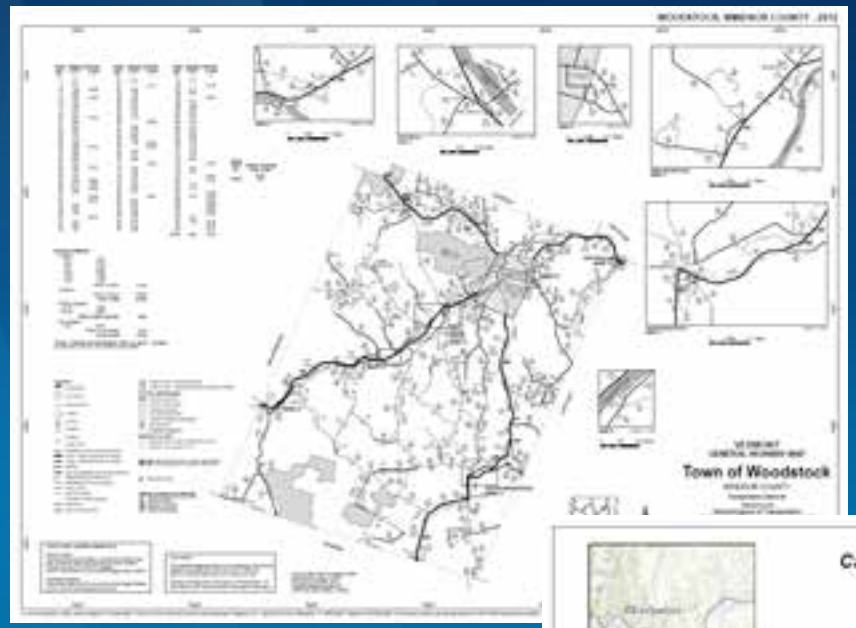
Jeff Barrette

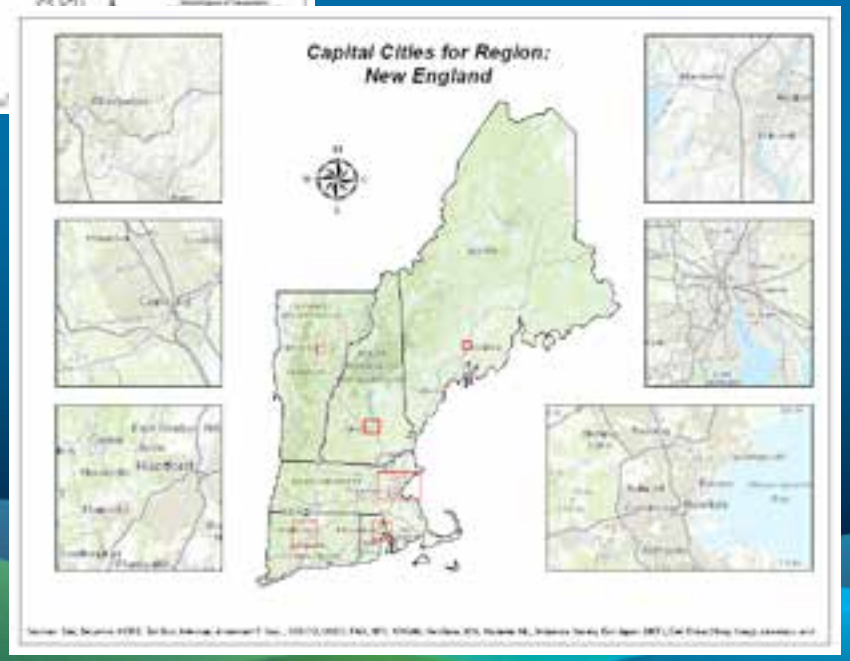
Jeff Moulds

Basic rules

- Reference an MXD using a path or “current” keyword
  - When using CURRENT
    - Always run in foreground
    - May need to refresh (e.g., RefreshActiveView)
- Uniquely name all objects (or at least the ones you want to find)
- Pre-author MXDs with all possible elements
  - Can’t create new objects (e.g., north arrow, data frames)
  - Author the extra elements off the page
  - No "New Map" function, so keep an empty MXD available
- This is not a replacement for ArcObjects –
  we are trying to draw a line in the sand

http://esriurl.com/5907





Sample Applications

Jeff Barrette

DEMO 1

DEMO 2

http://esriurl.com/5908

Cloning elements

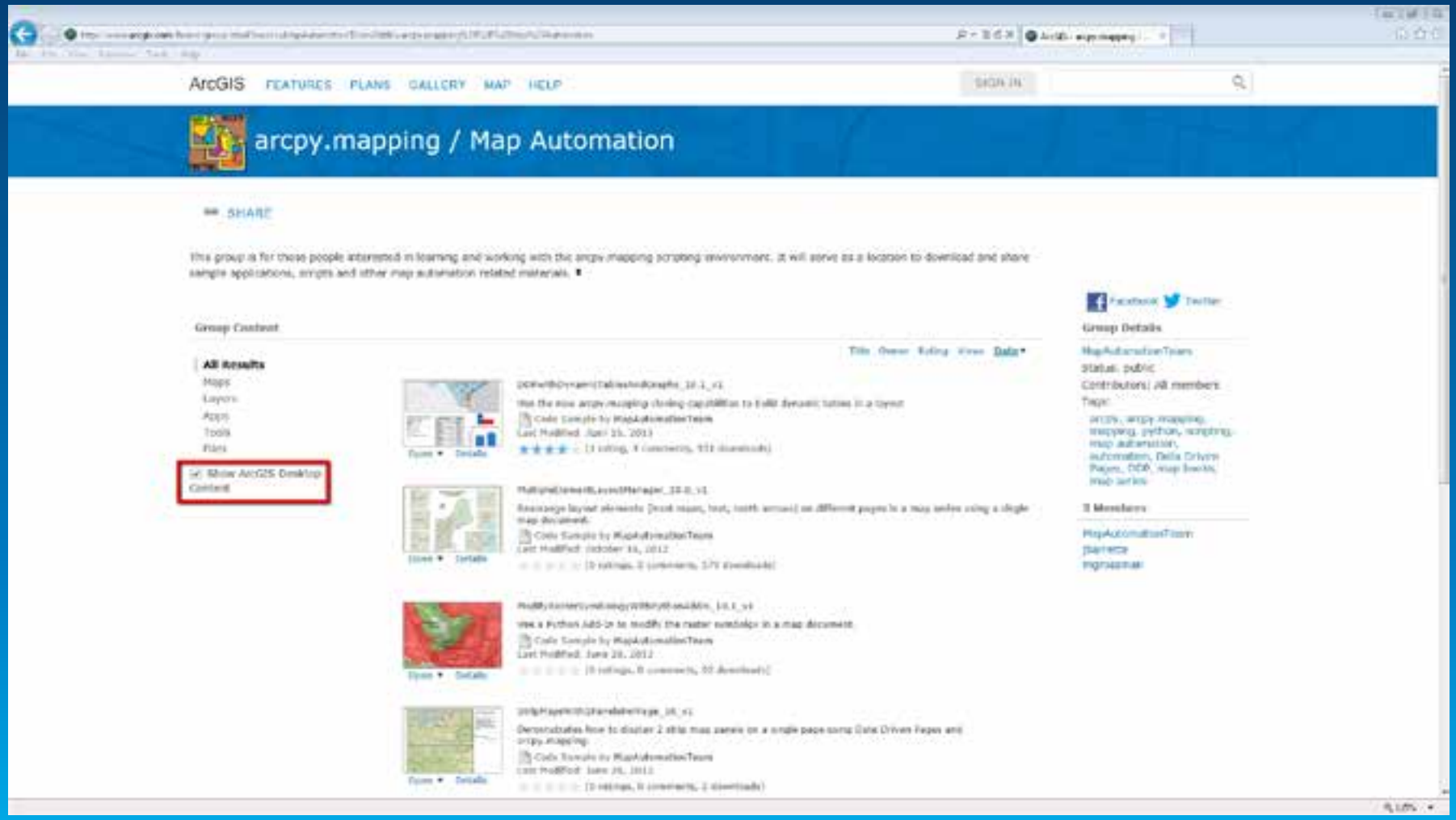
- You can now clone text and graphic elements
- This allows you to automate things like dynamic tables
- Example:

```
vertl = arcpy.mapping.ListLayoutElements(
      mxd, “GRAPHIC_ELEMENT”, “VerticalLine”)[0]
vertl.elementPositionX = xPos;
vertl.elementPositionY = 4
vert1.elementHeight = 3
for line in range(1, numColumns+1):
      vert_clone = vertLine.clone("_clone")
      xPos = xPos + colWidth
      vert_clone.elementPositionX = xPos
```

DEMO

http://esriurl.com/5915

arcpy.mapping Group



DEMO1
DEMO2

Performance tips

- Don’t keep calling list functions

```
item1 = arcpy.mapping.ListLayoutElements(mxd,wildcard="Item1")
item2 = arcpy.mapping.ListLayoutElements(mxd,wildcard="Item2")
item3 = arcpy.mapping.ListLayoutElements(mxd,wildcard="Item3")
```

- Call them once instead and iterate through the items

```
for elm in arcpy.mapping.ListLayoutElements(mxd):
  if elm.name =="Item1": item1 = elm
  if elm.name =="Item2": item2 = elm
  if elm.name =="Item3": item3 = elm
```

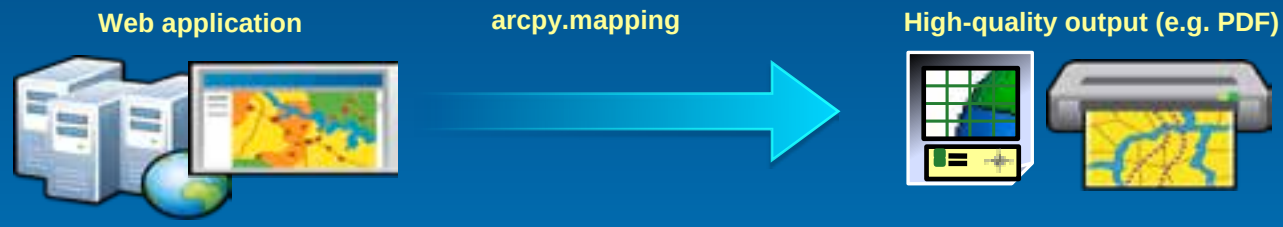
Performance tips (continued)

- Or even better, use dictionaries

```
dict = {}
  for elm in arcpy.mapping.ListLayoutElements(mxd):
    dict[elm.name] = elm

dict["Item1"].text = "Dictionaries"
dict["Item2"].text = "are really"
dict["Item3"].text = "COOL!!!"
```

Functions in 10.1 for server publishing and printing

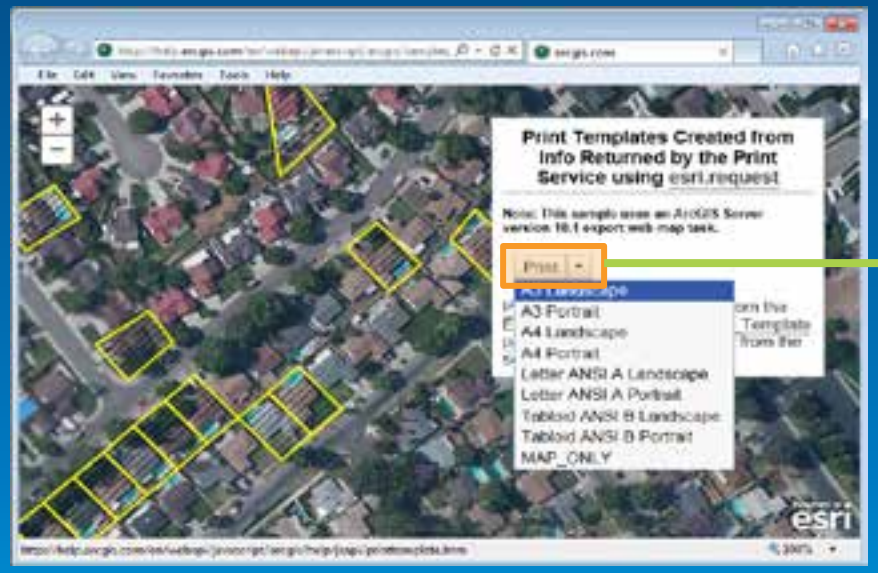
- **ConvertWebMapToMapDocument()**
  - Use with the ArcGIS web APIs for advanced web map printing workflows



- **CreateMapSDDraft()**
  - Automate publishing map documents to map services

Server printing out-of-the-box

- **ArcGIS Server 10.1 and the ArcGIS web APIs support web map printing via print services.**
  - **Out-of-the-box print service and template maps ship with Server**
  - **Print services sample: http://esriurl.com/6465**



1

```
app.printer = new esri.dijit.Print({
  "map": app.map,
  "templates": templates,
  url: app.printUrl,
}, dojo.byId("print_button"));
app.printer.startup();
```

2

```
app.printUrl = "http://gilbert:6080/arcgis/rest/services/Utilities/PrintingTools/GPServer/Export%20Web%20Map%20Task";
```

Related Session: Enabling High-Quality Printing in Web Applications with ArcGIS for Server (Wednesday @ 5:30 pm Catalina/Madera)

Advanced server printing with arcpy.mapping

- **Build web apps with customized versions of the 10.1 out-of-the-box print service**

- **New arcpy.mapping method for converting Web Maps to Map Documents: ConvertWebMapToMapDocument()**
  - `ConvertWebMapToMapDocument (webmap_json, {template_mxd}, {notes_gdb}, {extra_conversion_options})`

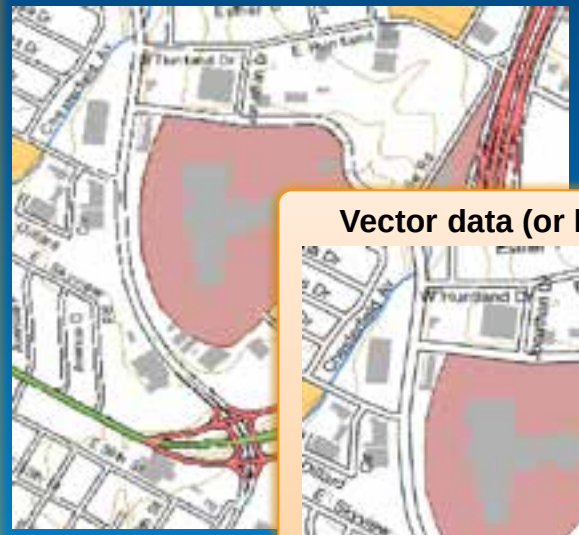
Advanced server printing with arcpy.mapping

- **Full capabilities of arcpy.mapping on the document**
  - **Swap out service layers for local vector data for *vector PDF output***
  - **Export using advanced options**
  - **Export data driven pages**
  - **Export to PDF and insert additional pages**
  - **Controlling the appearance of the legend**
- **Return a printer-friendly output file (PDF, PNG, etc.)**
- **Online help and examples** http://esriurl.com/4600

Demo: Web app to export vector PDF using arcpy.mapping

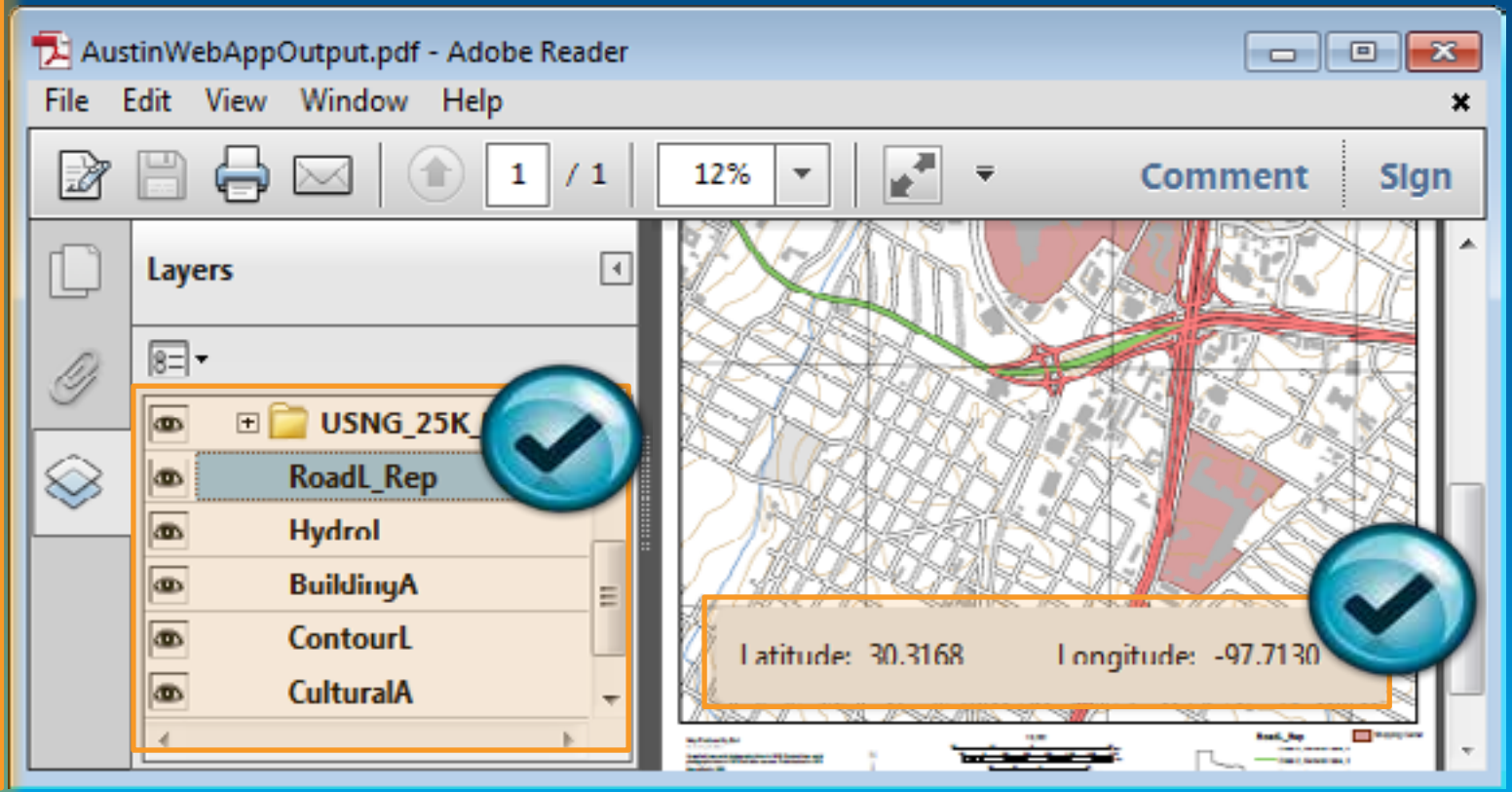
- Output or print vector layers instead of “flat” image of service layers
  - Vector layers will be staged in template map document

Map service tiled cache (low dpi)



Vector data (or high dpi image)

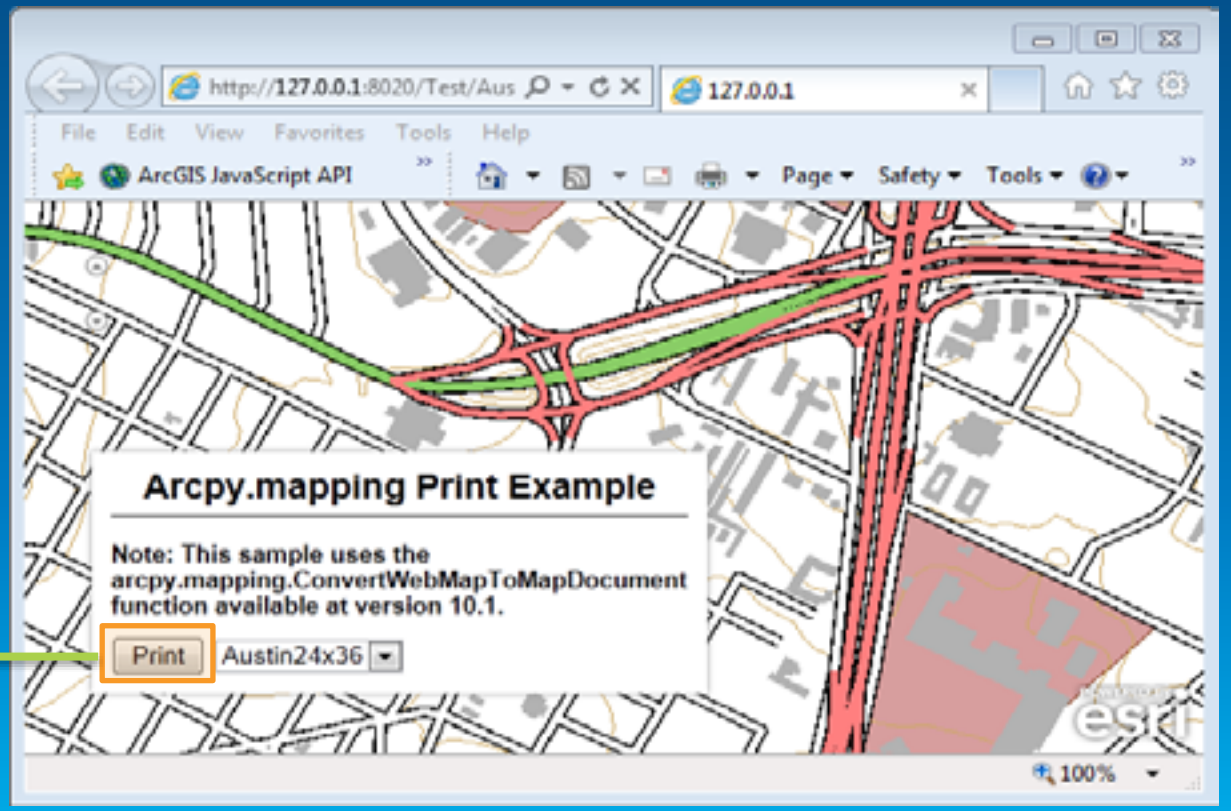
Output PDF viewed in Adobe Reader



Demo: Web app to export vector PDF using arcpy.mapping

- Reference the custom arcpy.mapping based GP service

```
var printUrl = "http://gilbert:6080/arcgis/rest/services/Austin/AustinPrint/GPServer/AustinPrint";
printTask = new esri.tasks.PrintTask(printUrl, {async: true});
```



Demo: Web app to export vector PDF using arcpy.mapping

Arcpy.mapping code used in custom geoprocessing service

Get web map JSON

Get template MXD

Create new MXD based on web map

Remove service layers

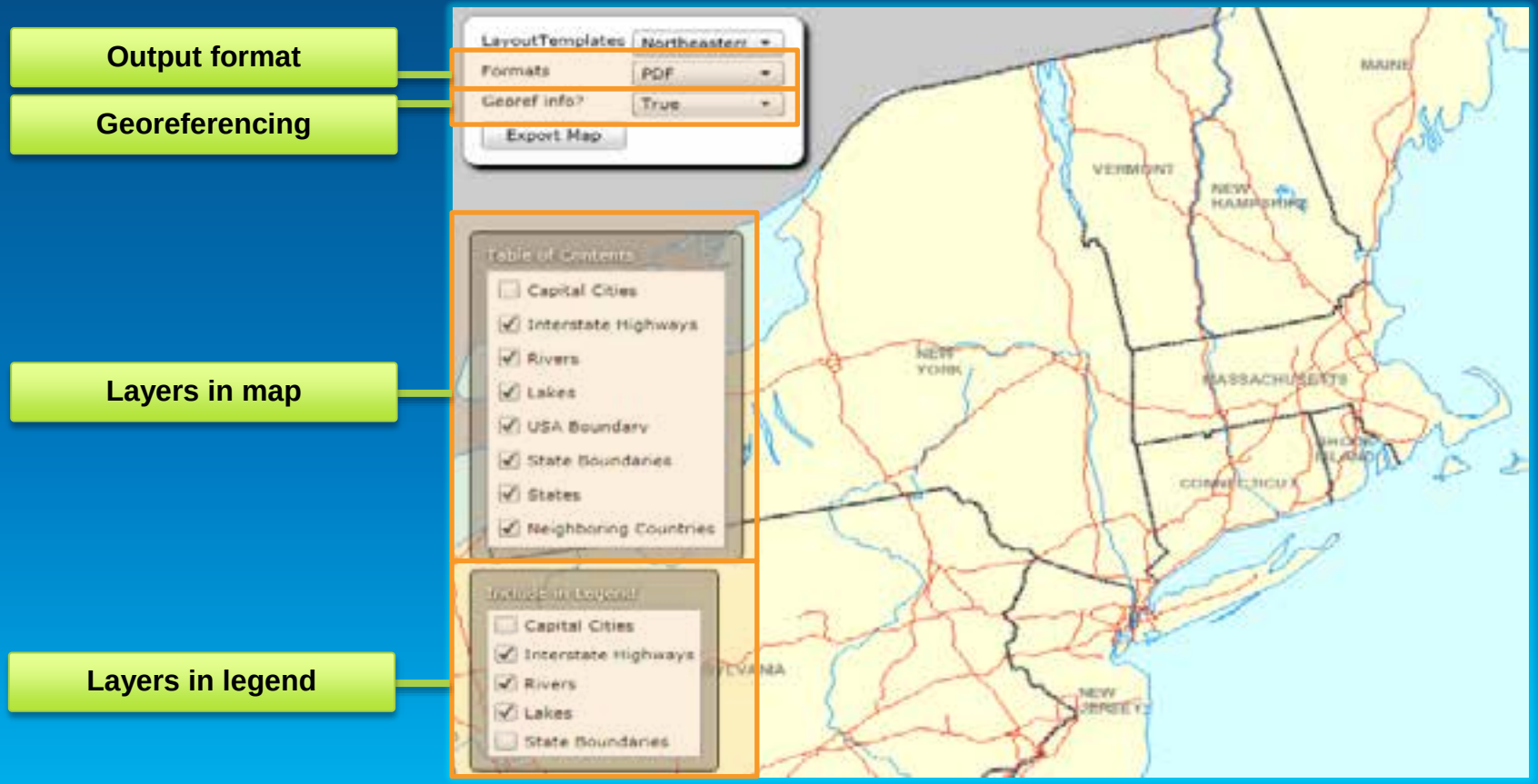
Export PDF

Output file of job

```
import arcpy, os, uuid

# Input WebMap json
Web_Map_as_JSON = arcpy.GetParameterAsText(0)

# Input Layout template
Layout_Template = arcpy.GetParameterAsText(1)

# The template location in the server registered folder
templatePath = '//gilbert/Austin/Templates'
templateMxd = os.path.join(templatePath, Layout_Template + '.mxd')

# Convert the WebMap to a map document
result = arcpy.mapping.ConvertWebMapToMapDocument(Web_Map_as_JSON, templateMxd)
mxd = result.mapDocument
df = arcpy.mapping.ListDataFrames(mxd, 'Webmap')[0]

# Remove the service layer
# This will just leave the vector layers from the template
for lyr in arcpy.mapping.ListLayers(mxd, data_frame=df):
    if lyr.isServiceLayer:
        arcpy.mapping.RemoveLayer(df, lyr)

# Export the web map to PDF
output = 'WebMap_{}.pdf'.format(str(uuid.uuid1()))
Output_File = os.path.join(arcpy.env.scratchFolder, output)
arcpy.mapping.ExportToPDF(mxd, Output_File, georef_info=True)

# Set the output parameter to be the output file of the server job
arcpy.SetParameterAsText(3, Output_File)
```

Web app to export vector PDF using arcpy.mapping

- **Two tutorials in the help:**
  - **Basic vector web map printing: http://esriurl.com/4601**
  - **Advanced web map printing: http://esriurl.com/4602**



Publishing map services with arcpy.mapping

- New method: arcpy.mapping.CreateMapSDDraft(map_document, out_sddraft, service_name, {server_type}, {connection_file_path}, {copy_data_to_server}, {folder_name}, {summary}, {tags})
- Workflow to convert map document to map service.
- Use python scripts for:
  - Scheduled service updates. E.g. nightly.
  - Publishing automated analysis results.
  - Batch publishing. E.g. migration from 10.0 to 10.1.

Publishing map services with arcpy.mapping

Sample script: CreateMapSDDraft (arcpy.mapping)

- **Reference MXD**
- **Server connection, service properties, etc.**
- **Create and analyze sddraft for errors, warnings, etc.**
- **Stage and publish Map Service**
- **Don't publish if errors exist**

```
import arcpy

# define local variables
wrkspc = 'C:/Project/'
mapDoc = arcpy.mapping.MapDocument(wrkspc + 'counties.mxd')
con = 'GIS Servers/arcgis on MyServer_6080 (publisher).ags'
service = 'Counties'
sddraft = wrkspc + service + '.sddraft'
sd = wrkspc + service + '.sd'
summary = 'Population Density by County'
tags = 'county, counties, population, density, census'

# create service definition draft
arcpy.mapping.CreateMapSDDraft(mapDoc, sddraft, service, 'ARCGIS_SERVER',
                               con, True, None, summary, tags)
# analyze the service definition draft
analysis = arcpy.mapping.AnalyzeForSD(sddraft)

# stage and upload the service if the sddraft analysis did not contain errors
if analysis['errors'] == {}:
    # Execute StageService
    arcpy.StageService_server(sddraft, sd)
    # Execute UploadServiceDefinition
    arcpy.UploadServiceDefinition_server(sd, con)
else:
    # if the sddraft analysis contained errors, display them
    print analysis['errors']
```

[Online help and samples: http://esriurl.com/4598](http://esriurl.com/4598)

Publishing other service types with python

- 10.1:
  - `arcpy.mapping.CreateMapSDDraft()`
- 10.1 sp1:
  - `arcpy.CreateGPSDDraft()`
    - Create geoprocessing services
  - `arcpy.CreateImageSDDraft()`
    - Create image services
- 10.2:
  - `arcpy.CreateGeocodeSDDraft()`
    - Create geocoding services

ArcGIS Pro

- Help Topic: Migrating arcpy.mapping from 10x to ArcGIS Pro
  - ArcGIS project file (.aprx)
  - Stand-alone functions have moved to appropriate classes
    - .exportToPDF
    - .addLayer, insertLayer, etc
  - Layer files have changed
  - DataFrame replace by Map, MapFrame, and MapViewer
  - New Layout object
  - Application always refreshes when using CURRENT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