Using Python for Data Updates to Web Services

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Overview

• Refresher Course
  - ArcGIS Server and Web Services

• Content Management Options
  - Which Tools Do What

• Workflows
  - Data Collection
  - Row Updates

• Advanced Workflows
Refresher Course
ArcGIS Server and Web Services

- **Enterprise ArcGIS Server**
  - IT Managed Assets and Resources
  - Un-Federated Server (non-integrated)
    - Services Registered with Portal or Online
  - Federated Server (integrated)
    - Authenticated by Portal
    - Services Shared with Organization
  - Hosting Server (fully integrated)
    - Portal Managed Server
    - Hosted Services – Relational Data Store

- **ArcGIS Online**
  - Esri Managed Assets
  - Hosted Services - Azure

<table>
<thead>
<tr>
<th>ArcGIS Server</th>
<th>Hosted Services</th>
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</thead>
<tbody>
<tr>
<td>Feature Service</td>
<td>Feature Layer</td>
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<tr>
<td>Cached Map Service</td>
<td>Tile Layer</td>
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<tr>
<td>Scene Service</td>
<td>Scene Layer</td>
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<tr>
<td>Image Service</td>
<td>Imagery Layer</td>
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</table>
Content Management Options
Content Management Options

- **Combine Tools as needed**
  - Use ArcPy to manage Service Data and add Python API to manage Portal Items

- **Standalone**
  - Use REST or Python API to manage Service Data

<table>
<thead>
<tr>
<th>Product</th>
<th>Portal &amp; Online Content</th>
<th>ArcGIS Server Service Content</th>
<th>Hosted Service Content</th>
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<tbody>
<tr>
<td>ArcPy w/GP tools, Desktop – Python 2.x</td>
<td>Publish</td>
<td>Yes</td>
<td>Limited</td>
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<tr>
<td>ArcPy w/GP tools, Pro – Python 3.x</td>
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<td>ArcGIS API for Python – Python 3.x</td>
<td>Manage</td>
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</table>
Content Management Options – *ArcPy & GP Tools*

- Publish Services
- Manage Caching
- GIS Data Processing and Conversion
- Manage Raster Storage
- Manage Data Driving Services
  - Local File / Enterprise GeoDatabases
Content Management Options – ArcPy & GP Tools (cont)

• Adding Data
  - ‘Append’ Tool
  - Data Access – ‘Insert Cursor’

• Removing Data
  - ‘Make Feature Layer’ Tool
    - ‘Select By Attribute’ Tool
    - ‘Delete Features’ Tool
  - Remove All Row
    - ‘Truncate Table’ Tool

• Updating Data
  - Data Access – ‘Update Cursor’
  - ‘Calculate Field’ Tool
Content Management Options – *ArcGIS REST API*

- Directly Access ArcGIS Server & Online
  - Administer Sites and Services

- Use Python ‘urllib’ or ‘http’ Modules

- Make REST Calls and Process Response
  - Manage Data Response with JSON Module

- Manage Data Though Service
Content Management Options – ArcGIS REST API (cont)

• Feature Services

• Adding Data
  - Service ‘append’
    - Auto-Manage Update or Insert
    - Use Feature Collection or File Item ID
    - Highly Performant and Large Capacity!
    - Summary Response Only
  - Service ‘addFeatures’ or ‘applyEdits’
    - Simple Insert using Feature Collection
    - Row Level Outcome Response

• Removing Data
  - Service ‘deleteFeatures’
    - Where Clause
  - Service ‘applyEdits’
    - Delete by OID or GUID
  - Hosted Feature Service ‘truncate’
    - Quickly Drop All Rows
Content Management Options – ArcGIS REST API (cont)

- **Changing Data**
  - See ‘Adding Data’
    - Service ‘append’ and ‘applyEdits’
  - Service ‘updateFeatures’
    - Simple Update Using Feature Collection
    - Only Include Fields Needing Change
    - Very Lean!

- **Synchronize Edits**
  - Edit Data Offline
  - Service ‘synchronizeReplica’
Content Management Options – *ArcGIS API for Python 3.x*

- **Leverages ArcGIS REST API**
  - Pythonified!
    - Classes and Methods
  - Python 2.x – ‘arcrest’ GitHub

- **Manage Portal Items**

- **Work with Services and Data**

- **Portal and Online Security Model**
Workflows – Data Collection

- Feature Service Layer
- Data Grows Over Time
- Possible Historical Data Set
  - Time Series?
- Use ‘append’, ‘addFeatures’, or ‘applyEdits’
- Periodically Trim Expired Rows

Ex: Past 24-hours of Global Thermal Hotspots reported by MODIS Satellite
Workflows – Row Updates

• Feature Service Layer

• Periodic Updates
  - Partial or Full Refresh

• Known ID – Update with ‘append’
  - Maintain a local copy of Unique rows
  - Link ObjectID or GUID to each row
  - Update local copy first!

• Few updates, use ‘applyEdits’ or ‘updateFeatures’
Advanced Workflows
Advanced Workflows – *Aggregated Live Feeds (ALF)*

- **Python Framework**
  - Production Minded
  - Multi-Processing Support
  - Logging & Alerting
  - ArcPy & Other Components

- **Methodology for Managing Data**
  - Near Real Time Data

- **Scalable**
  - Single User
  - Distributed Server Environment
Advanced Workflows – *Aggregated Live Feeds* (cont)

- **Single User Consumption**
  - Download Source Data
  - Process as needed
  - Generate Local fGDB

- **Overwrite Live Data**
  - Instant Client Access

- **Weather Data Example**
  - Functioning Sample
Weather Demo
Advanced Workflows – Aggregated Live Feeds (cont)

• Back Office – Feed Aggregator
  - Process Updates
  - Upload to Common Storage

• Server Side – Data Deployer
  - Download / Extract to Work Area
  - Overwrite Production Data
Advanced Workflows – National Water Model Example

• Stream Flow Forecast
  - Updating 2.46 Billion Rows Daily!
  - Time Enabled Map Services
  - eGDB Managed via SQL
  - Local fGDB & eGDB
  - ALF Methodology

• Hourly Update – 48.6 Million Rows
  - 2.7 Million Rows x 18, 1hr Forecasts

• 4 Hour Update – 216 Million Rows
  - 2.7 Million Rows x 80, 3hr Forecasts out 10 Days
Advanced Workflows – National Water Model Example (cont)

- Check & Download Updates
- Process Forecasts
  - Re-Structure Data
  - Dissolve Features
  - Store Updates
- Package & Distribute to S3
- Deploy Server Side
  - Import CSV to eGDB using SQL
  - Replace fGDB

NWC FTP site
NWM - Demo
Thank You

- ArcGIS ArcPy Reference:  

- ArcGIS REST API Reference:  

- ArcGIS API for Python:  
  - https://developers.arcgis.com/python/

- Aggregated Live Feeds Community on ArcGIS Online:  
  - http://www.esriurl.com/LiveFeed
Please Take Our Survey on the App

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