Using Python for Data Updates to Web Services

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GIS INSPIRING WHAT'S NEXT

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

ArcGIS Server	Hosted Services
Feature Service	Feature Layer
Cached Map Service	Tile Layer
Scene Service	Scene Layer
Image Service	Imagery Layer

Content Management Options

Content Management Options

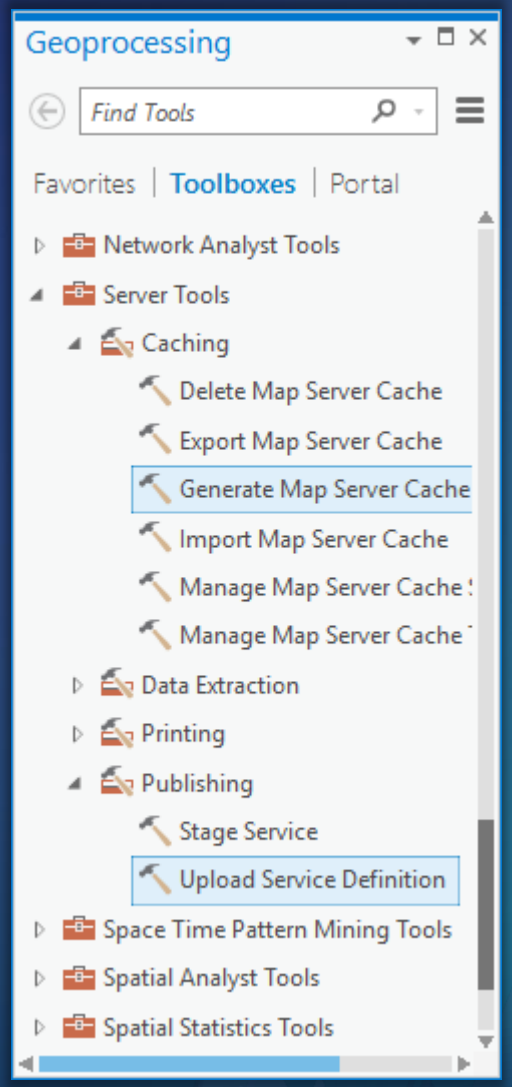
Product	Portal & Online Content	ArcGIS Server Service Content	Hosted Service Content
ArcPy w/GP tools, Desktop – Python 2.x	Publish	Yes	Limited
ArcPy w/GP tools, Pro – Python 3.x	Publish	Yes	Yes
ArcGIS API for Python – Python 3.x	Manage	Yes	Yes
ArcGIS REST API	Manage	Yes	Yes

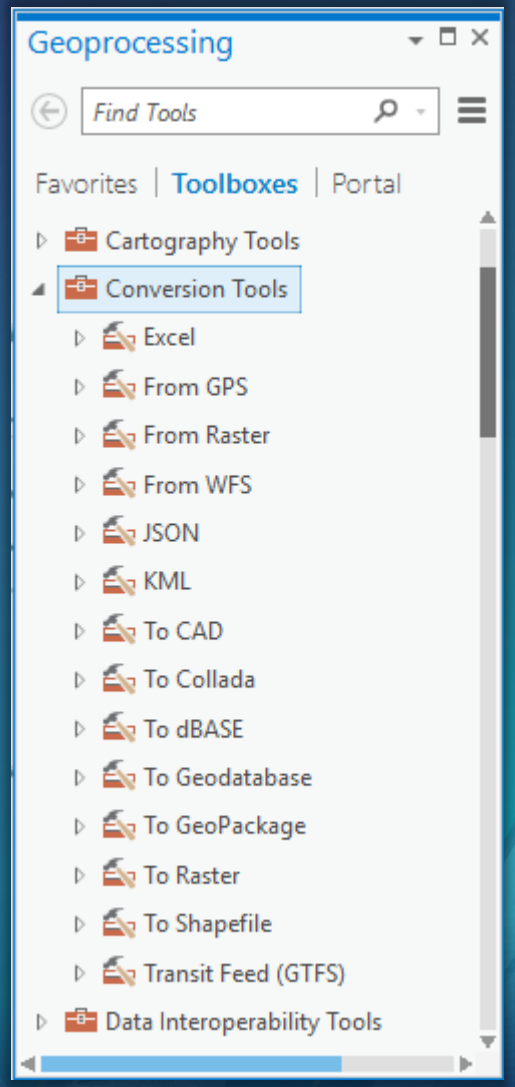
- **Combine Tools as needed**
  - **Use ArcPy to manage Service Data and add Python API to manage Portal Items**

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

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





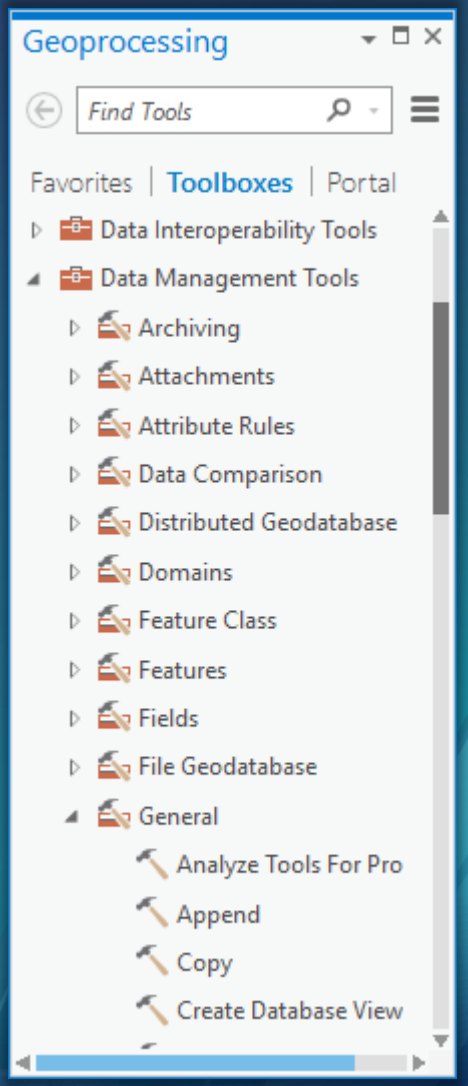
Content Management Options – *ArcPy & GP Tools* (cont)

- **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

ARCGIS

- arcgis.gis module
- arcgis.env module
- arcgis.features module
- arcgis.raster module
- arcgis.network module
- arcgis.geoanalytics module
- arcgis.geocoding module
- arcgis.geoenrichment module
- arcgis.geometry module
- arcgis.geoprocessing module
- arcgis.mapping module
- arcgis.realtime module
- arcgis.schematics module
- arcgis.widgets module
- arcgis.apps module

arcgis.gis module

The **gis** module provides an information model for GIS hosted within ArcGIS Online or ArcGIS Enterprise. This module provides functionality to manage (create, read, update and delete) GIS users, groups and content. This module is the most important and provides the entry point into the GIS.

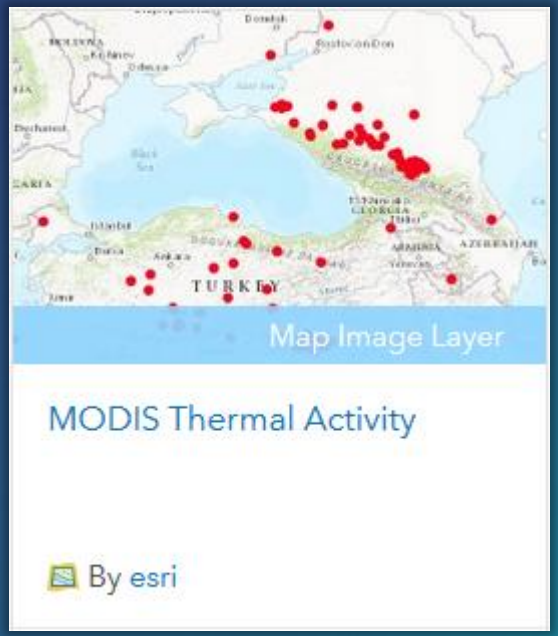
GIS

class `arcgis.gis.GIS`(*url=None, username=None, password=None, key_file=None, cert_file=None, verify_cert=True, set_active=True, client_id=None, profile=None, **kwargs*)

Workflows

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

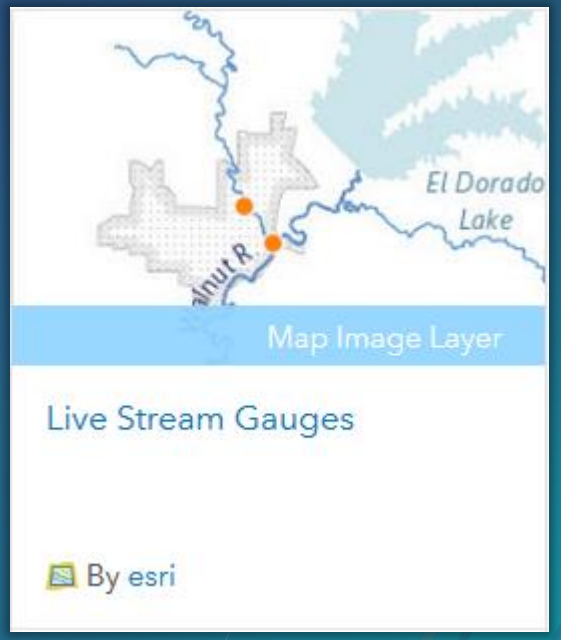


Ex: Past 24-hours of Global Thermal Hotspots reported by MODIS Satellite

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'*

Ex: Most Current METAR Weather Station Updates



Ex: Most Current Stream Gauge Sensor Readings

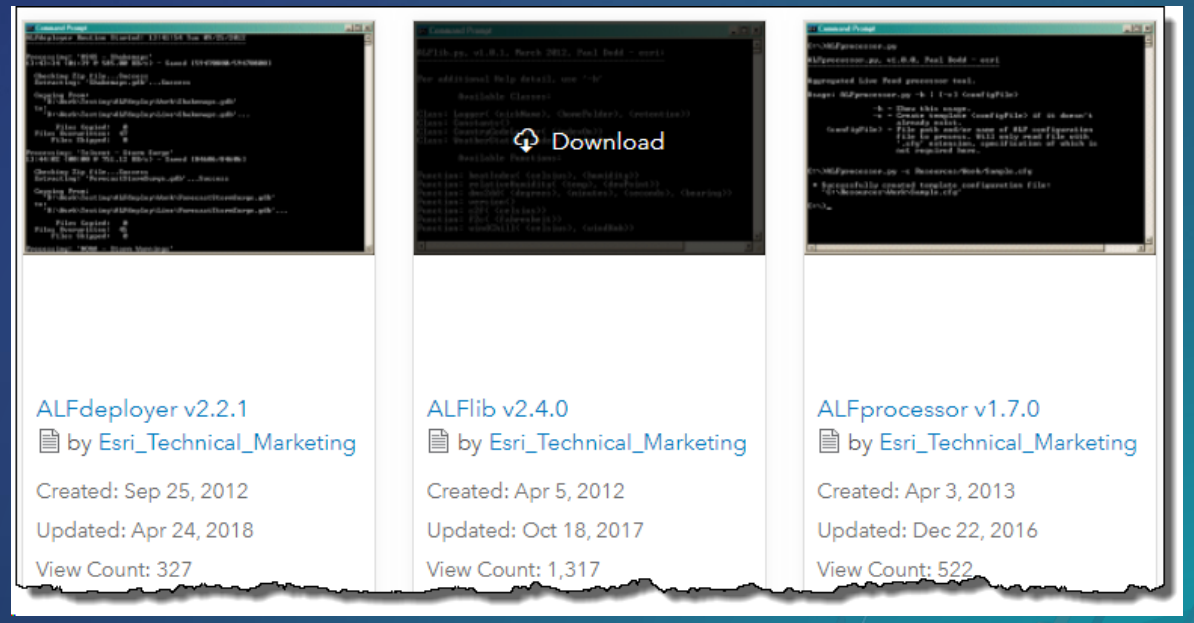
Advanced Workflows

Advanced Workflows – *Aggregated Live Feeds (ALF)*

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

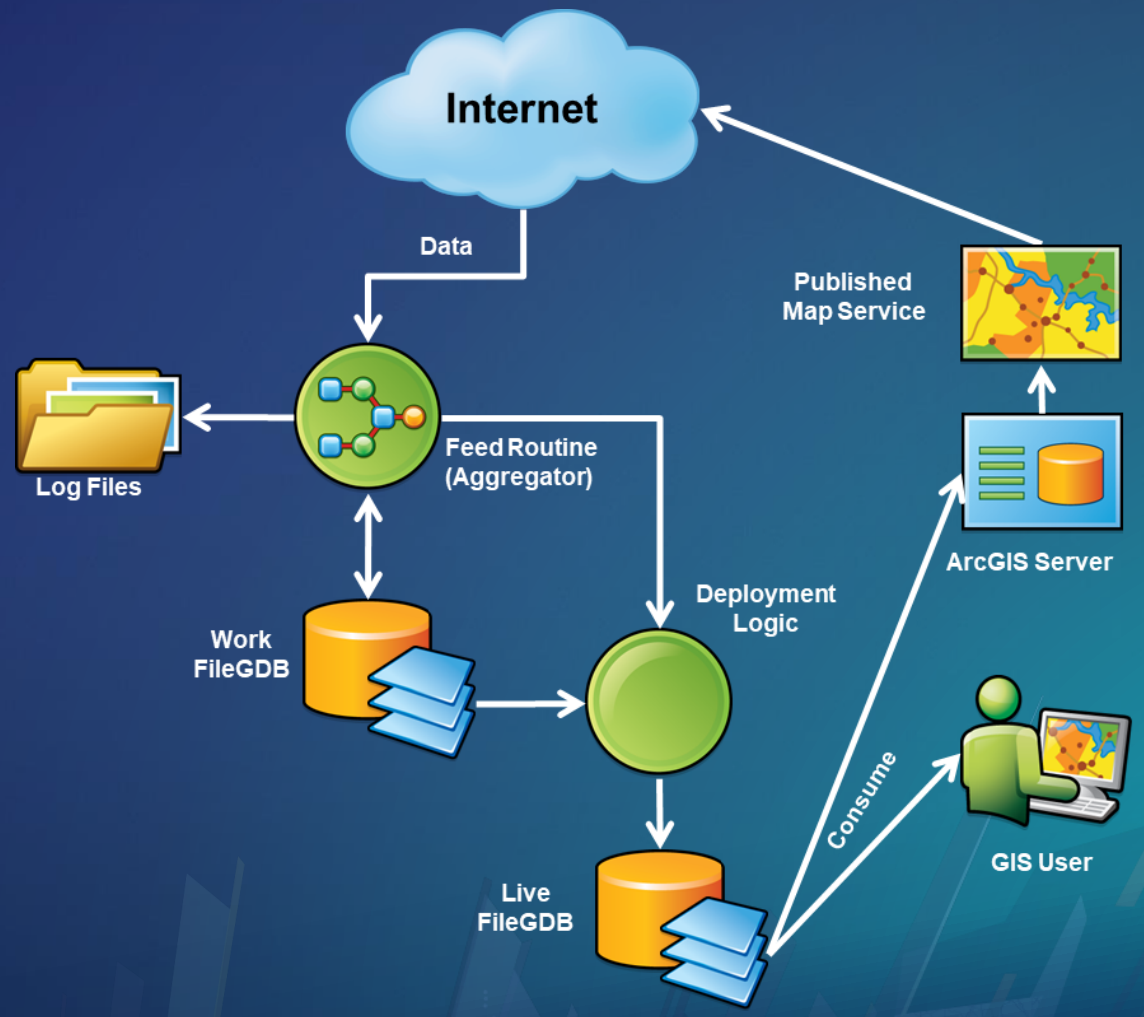
- **Methodology for Managing Data**
  - **Near Real Time Data**

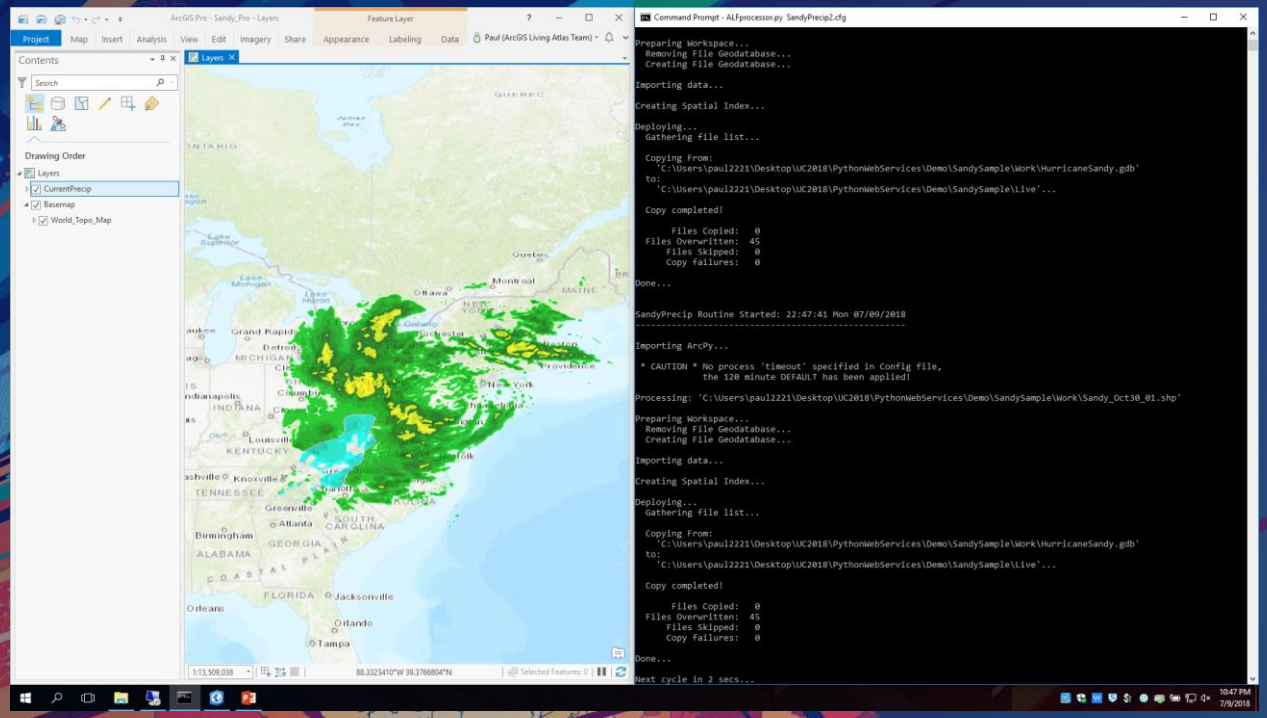
- **Scalable**
  - **Single User**
  - **Distributed Server Environment**



Advanced Workflows – *Aggregated Live Feeds* (cont)

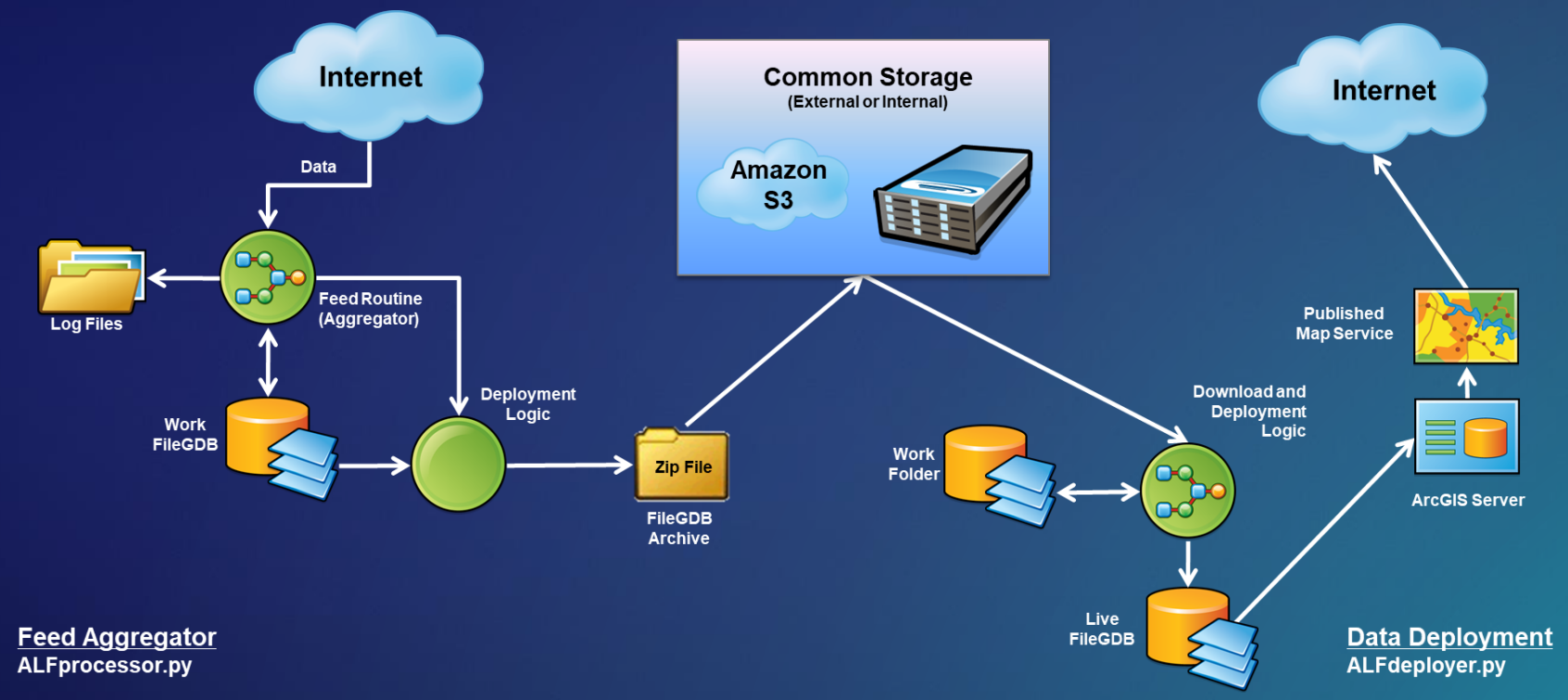
- Single User Consumption
  - Download Source Data
  - Process as needed
  - Generate Local fGDB
- Overwrite Live Data
  - Instant Client Access
- Weather Data Example
  - Functioning Sample





Weather Demo

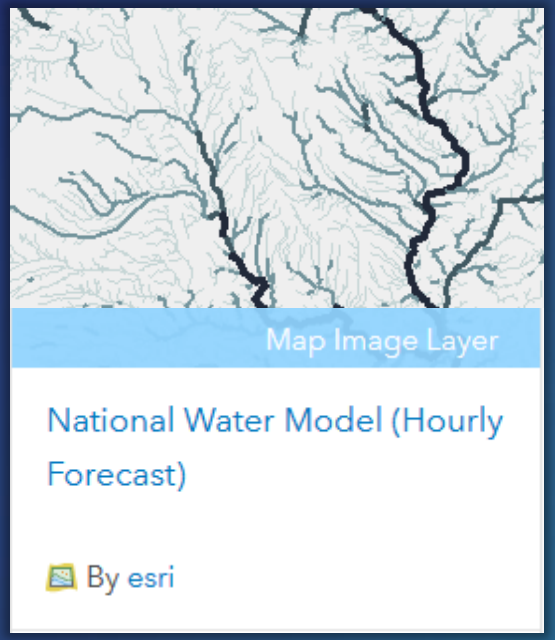
Advanced Workflows – *Aggregated Live Feeds* (cont)



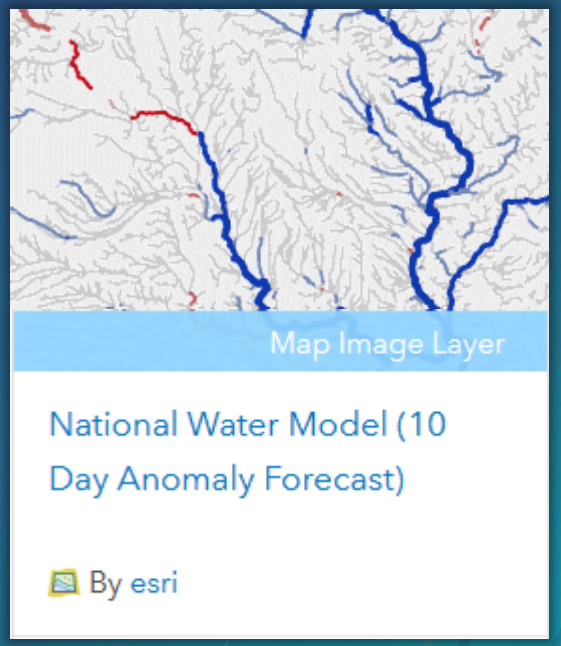
- **Back Office – *Feed Aggregator***
  - **Process Updates**
  - **Upload to Common Storage**
- **Server Side – *Data Deployer***
  - **Download / Extract to Work Area**
  - **Overwrite Production Data**

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



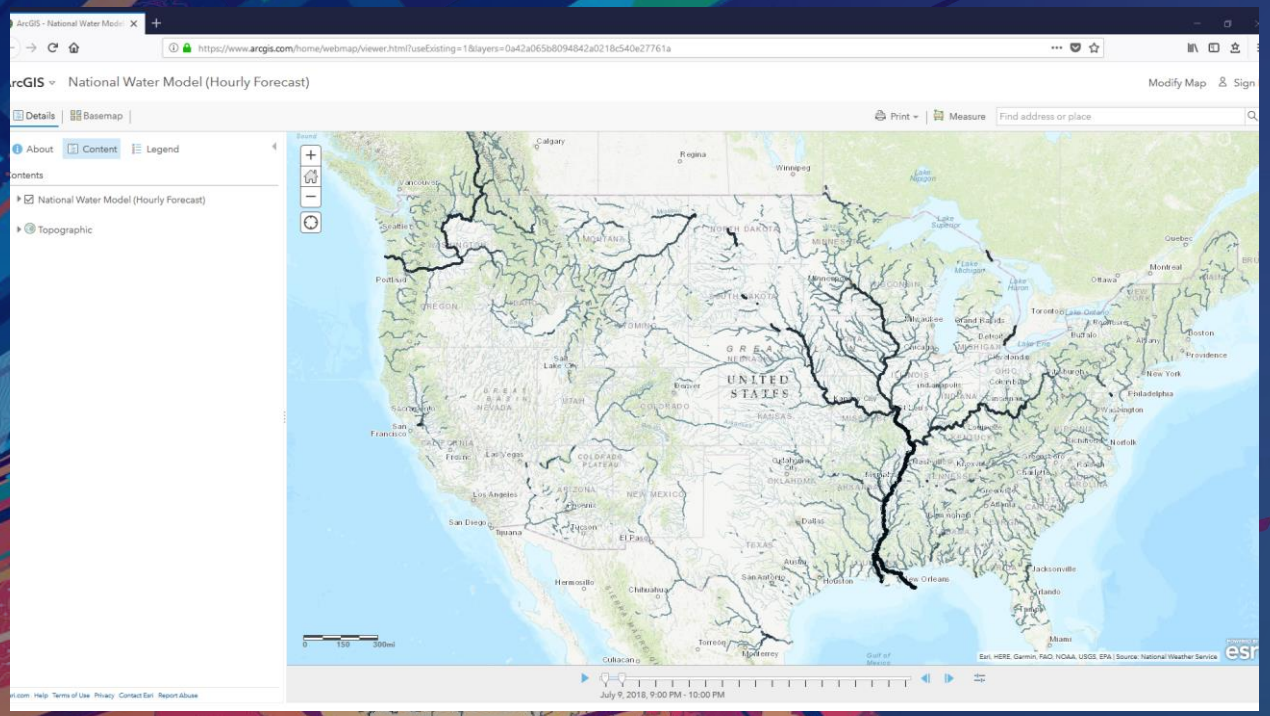
Ex: Hourly Stream Flow Forecast



Ex: 10-Day Anomaly Forecast

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


National Water Model (Hourly Forecast)
Modify Map
Sign
Details
Basemap
Print
Measure
Find address or place
About
Content
Legend
National Water Model (Hourly Forecast)
Topographic
UNITED STATES
July 9, 2018, 9:00 PM - 10:00 PM

NWM - Demo

Thank You

- **ArcGIS ArcPy Reference:**
  - http://pro.arcgis.com/en/pro-app/arcpy/main/arcgis-pro-arcpy-reference.htm
- **ArcGIS REST API Reference:**
  - https://developers.arcgis.com/rest/services-reference/get-started-with-the-services-directory.htm
- **ArcGIS API for Python:**
  - https://developers.arcgis.com/python/
- **Aggregated Live Feeds Community on ArcGIS Online:**
  - http://www.esriurl.com/LiveFeed

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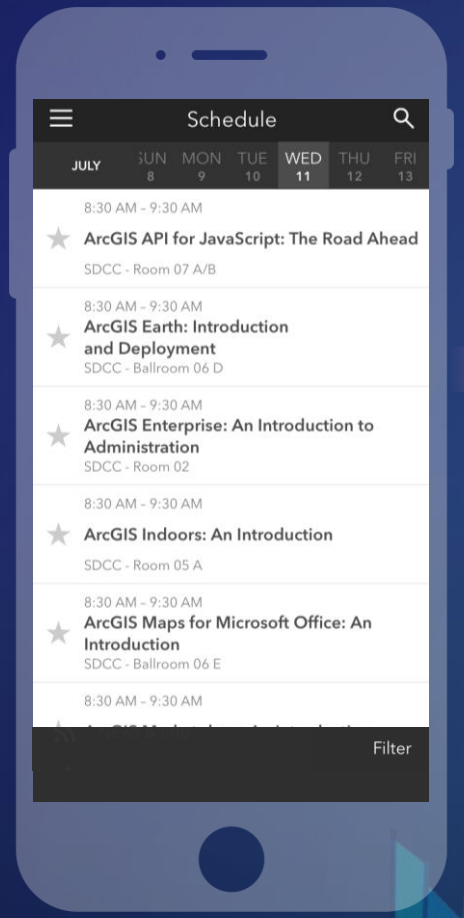
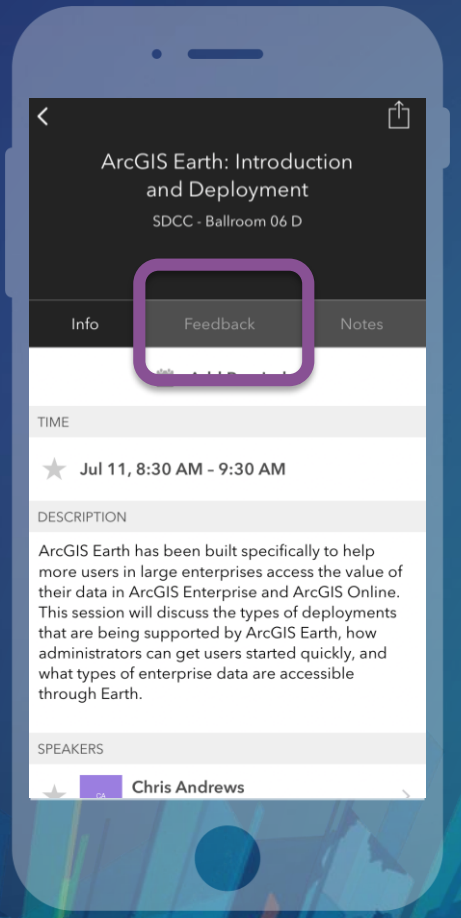
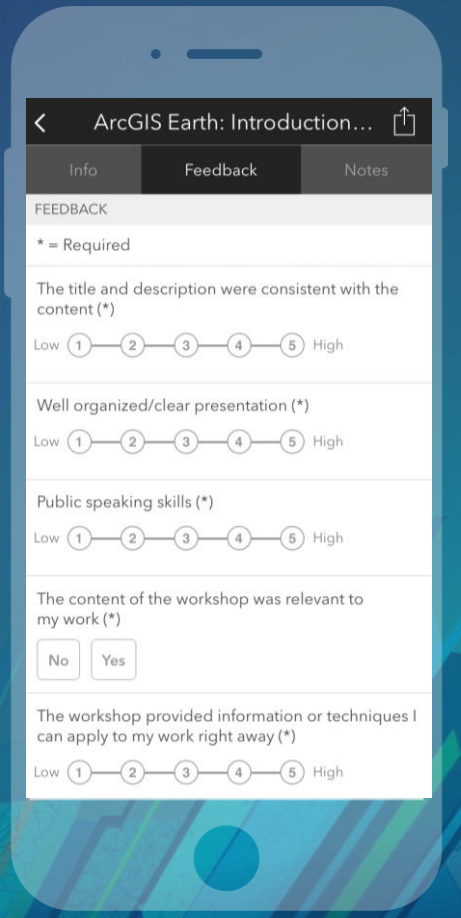


Scroll down to find the feedback section



Complete answers and select “Submit”



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