ArcGIS is a Comprehensive Imagery System
Integrating All Types, Sources, and Sensor Models
ArcGIS is a Comprehensive Imagery System

- Comes With Imagery
- Provides Advanced Imagery Tools
- Manages Massive Image Collections
ArcGIS Comes with Imagery

• Esri Curated
  - World Imagery
  - World Landsat 8
  - USA NAIP
  - World Elevation

• From Imagery Providers
• From ArcGIS Users
ArcGIS Provides Advanced Imagery Tools
Visualization, Processing and Analysis

- Color Balance
- Mosaicking
- Change Analysis
- 3D Measurement
- Classification
- Automatic Alignment
- Pan Sharpen
- Ortho-Rectification

- Fast
- Dynamic
- Massively Scalable
- Both Desktop and Web

Open and Leveraged by Partners
ArcGIS Manages Massive Image Collections
Providing Accessibility to all Forms of Imagery and Rasters

Wide Range of Sensors & Sources:
• Satellite, Aerial, Scanned, Processed
• Nadir, Oblique, FMV, Lidar, Radar
• Pan, Multispectral, Float, Categorical

Levels of Imagery:
• Static Cache (Backdrop)
• Preprocessed (GIS Ready)
• Raw (Unprocessed)
Image Management Workflow Using Mosaic Datasets

Highly Scalable, From Small to Massive Volumes of Imagery

Create Catalog of Imagery
- Reference Sources
- Ingest & Define Metadata
- Define Processing to be Applied

Apply:
- On-the-fly Processing
- Dynamic Mosaicking

Access as Image or Catalog
Empowering imagery

• Dynamic mosaicking
  - Fuse imagery from multiple sources
  - User defined ordering (mosaic method)

• On-The-Fly processing
  - Process imagery as accessed
  - Create multiple products direct from source
    - Pan sharpened, NDVI
    - Hillshade, Slope, Aspect
Image Dissemination ArcGIS Online
Integrating with / and in The Cloud

- Register With ArcGIS Online
- Massive Accessibility
- Content Management

ArcGIS Online
ArcGIS Server on Premise or in the Cloud

Portal

Desktop, Web & Mobile Users

Mosaic Dataset
Large Image Collections
ArcGIS Enables Tools For The Two Key User Groups

- **Imagery Managers**
  - Large Collections of Imagery
  - Manage
  - Disseminate

- **Imagery Users**
  - Simple Accessibility
  - Content
  - Visualization & Analysis
Modes of Sharing Imagery
Four Ways to Provide Image Accessibility

- Download
  - Traditional Approach
Four Ways to Provide Image Accessibility

- Download
  - Traditional Approach
- Tile Cache Services
  - Simple Background Imagery
Four Ways to Provide Image Accessibility

- **Download**
  - Traditional Approach
- **Tile Cache Services**
  - Simple Background Imagery
- **Dynamic Image Services**
  - Full information content
Four Ways to Provide Image Accessibility

- Download
  - Traditional Approach
- Tile Cache Services
  - Simple Background Imagery
- Dynamic Image Services
  - Full information content
- Geoprocessing Services
  - Get Answers from Imagery
World Elevation
Geoprocessing Services
Drone Imagery
Simplified UAS imagery workflow

- **ArcGIS platform support for Project & Flight planning**
  - ArcGIS Online data layers
    - World Elevation
    - Aeronautical charts
    - Cadastral layers
    - Weather
    - Spatial Analysis

- ArcGIS platform support for later phases - More to come…
Imaging modes and data: UAV data collection

- **Single image frames**
  - Geotagged, or may include full orientation metadata
  - May be nadir or oblique (low / high)

- **Aerial video**
  - Typically geotagged (GPS only)
  - May have MISB (orientation) metadata

- **Lidar**
  - Rare today from UAV, but coming…

- **Other sensors & modes possible**
  - Atmospheric, chemical, *in situ* sample & return, etc.
Data Products from UAV data collection

- Accurate orthophotos
  - Resolution typically in cm
- Oriented oblique photos
  - Multiple view angles
- 3D point clouds
- 3D models
- Geotagged video
- Bare earth DEM, first return DSM
Imaging modes and data: UAV data collection

- Nadir imagery
- Oblique imagery
- Lidar
- Aerial Frame Camera
- Preprocessed Orthos
- Elevation
- Full Motion Video
- Full Motion Video
- Lidar & Elevation
Imaging modes and data: UAV data collection

- Nadir imagery
- Oblique imagery

Photogrammetry workflows:

- Preprocessed Orthos
- Elevation
- Aerial Frame Camera
Imaging modes and data: UAV data collection

- Nadir imagery
- Oblique imagery
- Close range imagery (inspection)

Aerial Frame Camera
**Typical Imagery Data Products: UAV data collection**

- Available rapidly following mission
  - Single image frames (unrectified)
  - Geotagged aerial video

- Derived from image data through post-processing
  - Orthorectified image mosaics
  - Photogrammetric point clouds
  - Digital surface models (DSM)
  - Single orthorectified image frames
Imaging modes and data: UAV data collection

Nadir imagery

Oblique imagery

Photogrammetry workflows

Orthomosaics
Orthorectified tiles
Single orthorectified frames

Preprocessed Orthos
Imaging modes and data: UAV data collection

- Nadir imagery
- Oblique imagery

Photogrammetry workflows

- DSMs
- Point Clouds

Preprocessed Orthos

Elevation
Imaging modes and data: UAV data collection

- Nadir imagery
- Oblique imagery

Photogrammetry workflows

- Interior & Exterior orientation
- Preprocessed Orthos
  - Elevation
  - Aerial Frame Camera

Close range imagery (inspection)
Typical Imagery Data Products: UAV data collection

- Available rapidly following mission
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  - Digital surface models (DSM)
  - Single orthorectified image frames

Vector 

Recommendations for key products (nadir & low oblique imagery)

- Publish orthomosaic
  - Drape on DSM for 3D view
- Publish original images for viewing/measurement
- Publish DSM as elevation surface

→ Interior & Exterior orientation
Imagery Products from Drones

Demo

Data from UAS Professionals, Inc.
Managing Large Image Collections

- Source / Derived Mosaic Dataset model
- Recommended “best practice” for large data collections
- Supports any of the image access modes
- Scalable
- Maintainable
- Automation recommended
Source Mosaic Datasets

Source Imagery  →  Source Mosaic Datasets

March 2015

April 2015

May 2015
Combine into Derived Mosaic Dataset

Source Imagery → Source Mosaic Datasets → Derived Mosaic Dataset

Advantage: All image data * available in a single location

Use TABLE Raster Type

* “All data” that is similar/appropriate; e.g. do not mix Imagery with DEMs
On-the-fly Products using Server Raster Functions

Source Imagery → Source Mosaic Datasets → Derived Mosaic Dataset → Single image service with multiple server functions

- Full Image Service
- Color Infrared
- True Color
- Pan Sharpened
- NDVI
- ...many other functions
On-the-fly Products using Server Raster Functions

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- ...many other functions

When the Derived parent is updated, all services synchronize automatically
Demo: Large Image Collections
Landsat Look, Landsat 8
Data from USGS
Image Management Workflows

Best Practice Workflows for Image Management

- Resource Center landing page [http://esriurl.com/6005](http://esriurl.com/6005)
- ArcGIS Online Group [http://esriurl.com/6539](http://esriurl.com/6539)
  - Downloadable scripts & sample data
- Recorded webinar [http://esriurl.com/LTSImgMgmt](http://esriurl.com/LTSImgMgmt)
- Source code on GitHub [http://esriurl.com/MDCS](http://esriurl.com/MDCS)