2018 **Esri Petroleum GIS Conference** | Houston, TX

Image Management in ArcGIS

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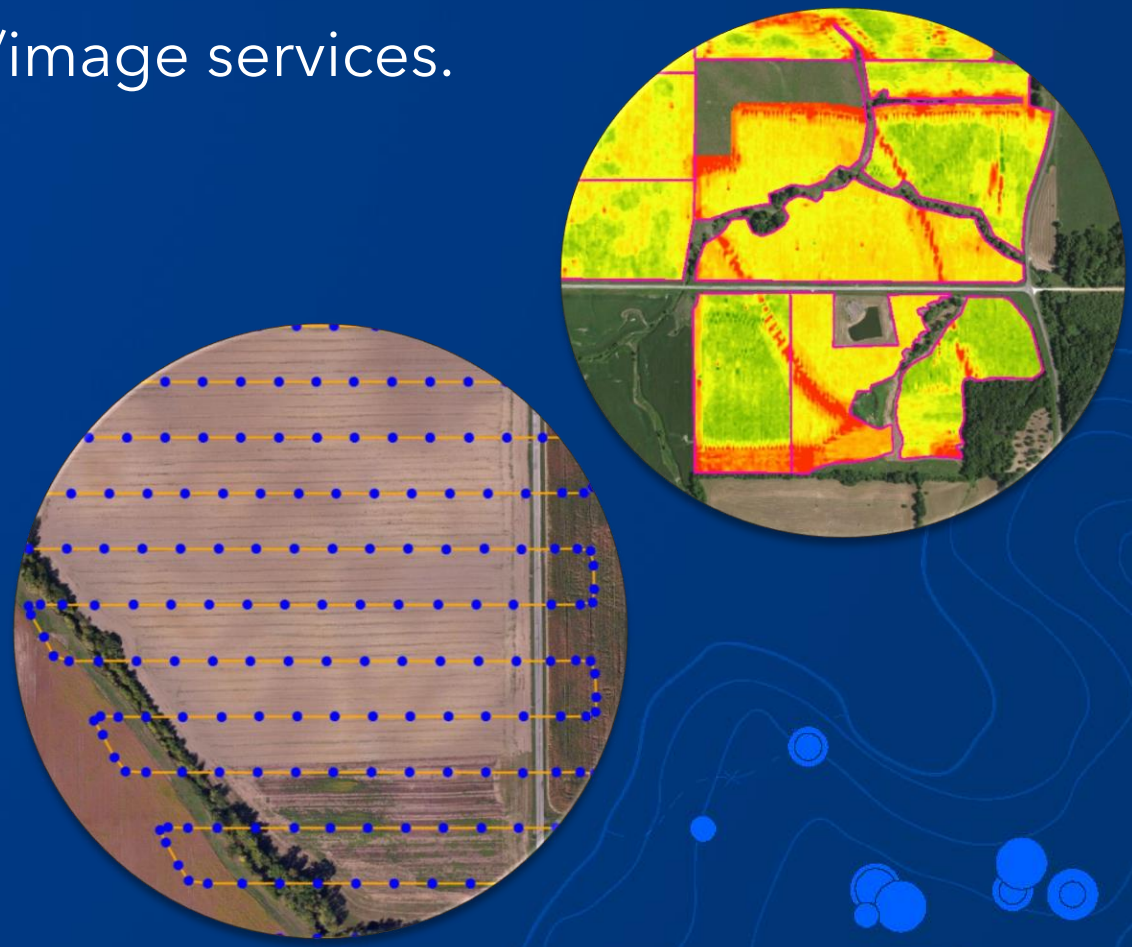
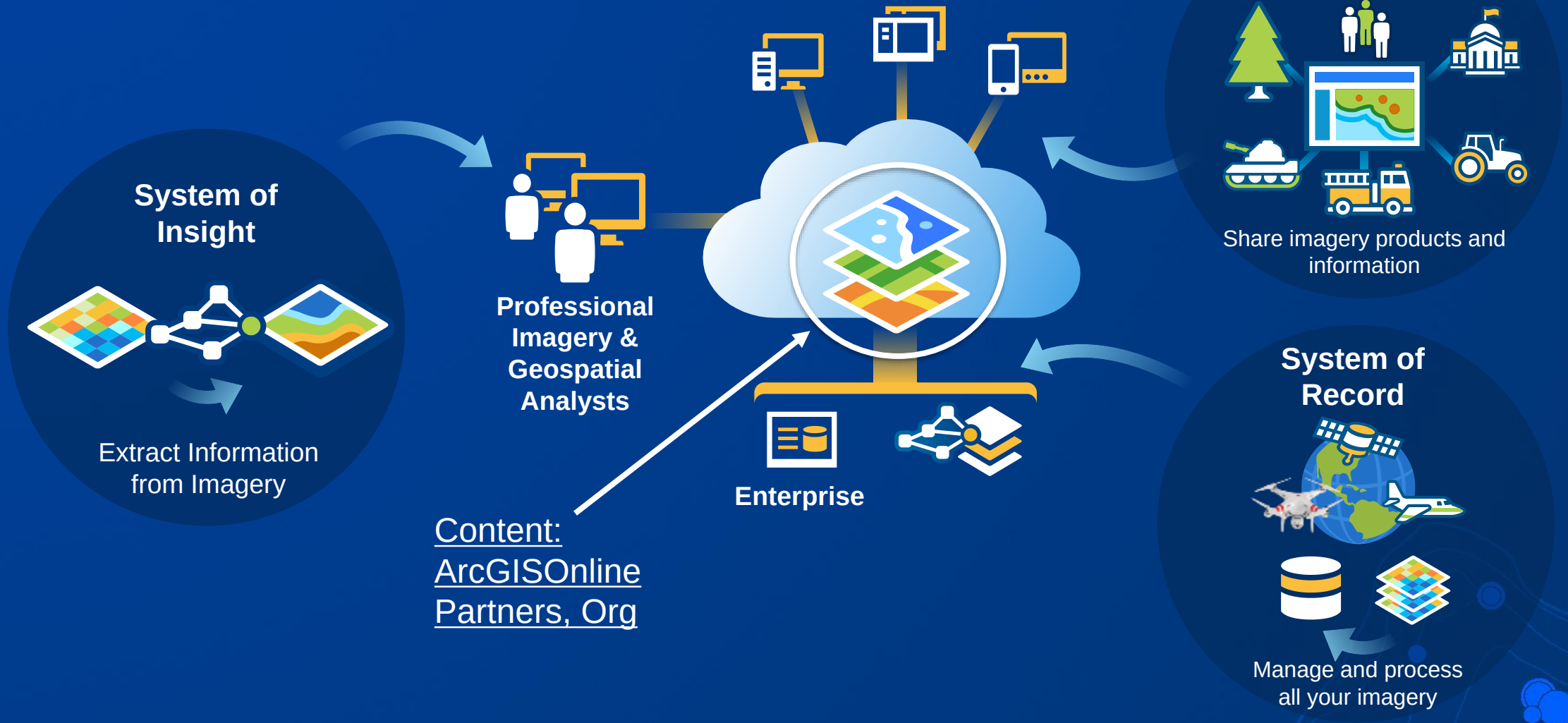
Topics covered

- Primary Imagery Management Information Model - Mosaic Dataset
- Sharing Imagery using mosaic datasets/image services.
- Image Services and Cloud resources
- Scaling up the Enterprise
- Optimization considerations
- Ortho mapping capabilities in ArcGIS
  - Drone2map
  - Ortho mapping using ArcGIS Pro



ArcGIS is a Comprehensive Imagery Platform

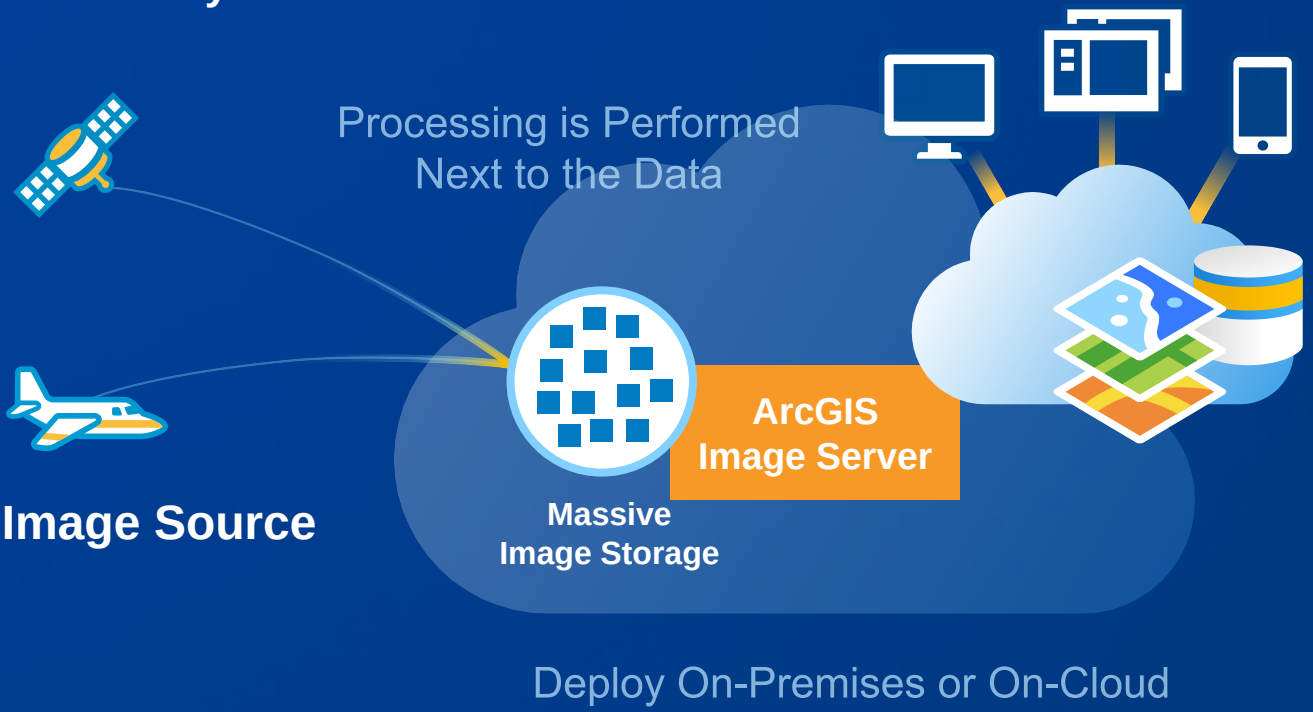
Empowering users to make informed decisions



Imagery : System of Record

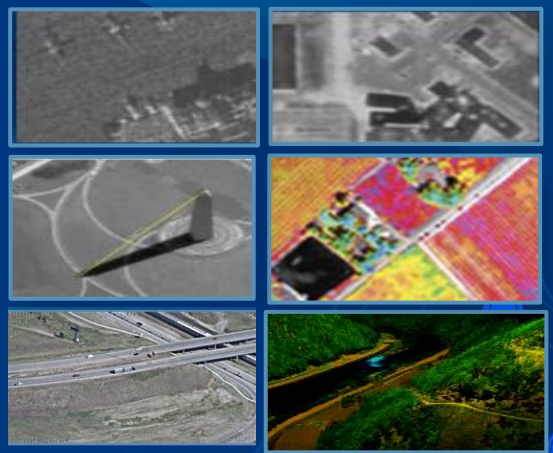
Scalable Access and Analytics

Dynamically Processed Imagery Served Directly into ArcGIS

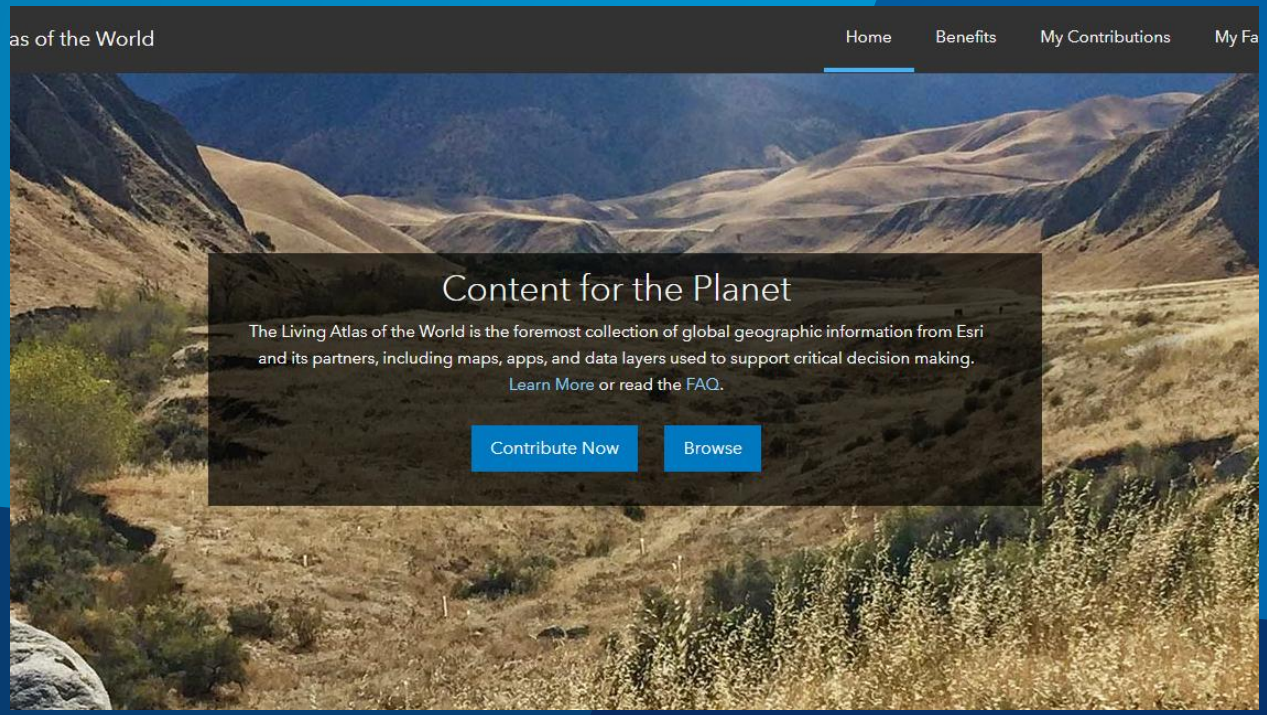


Enabling

- Image Services
- Raster Analytics
- Content Access and Management



. . . Fully Integrated with the ArcGIS Platform



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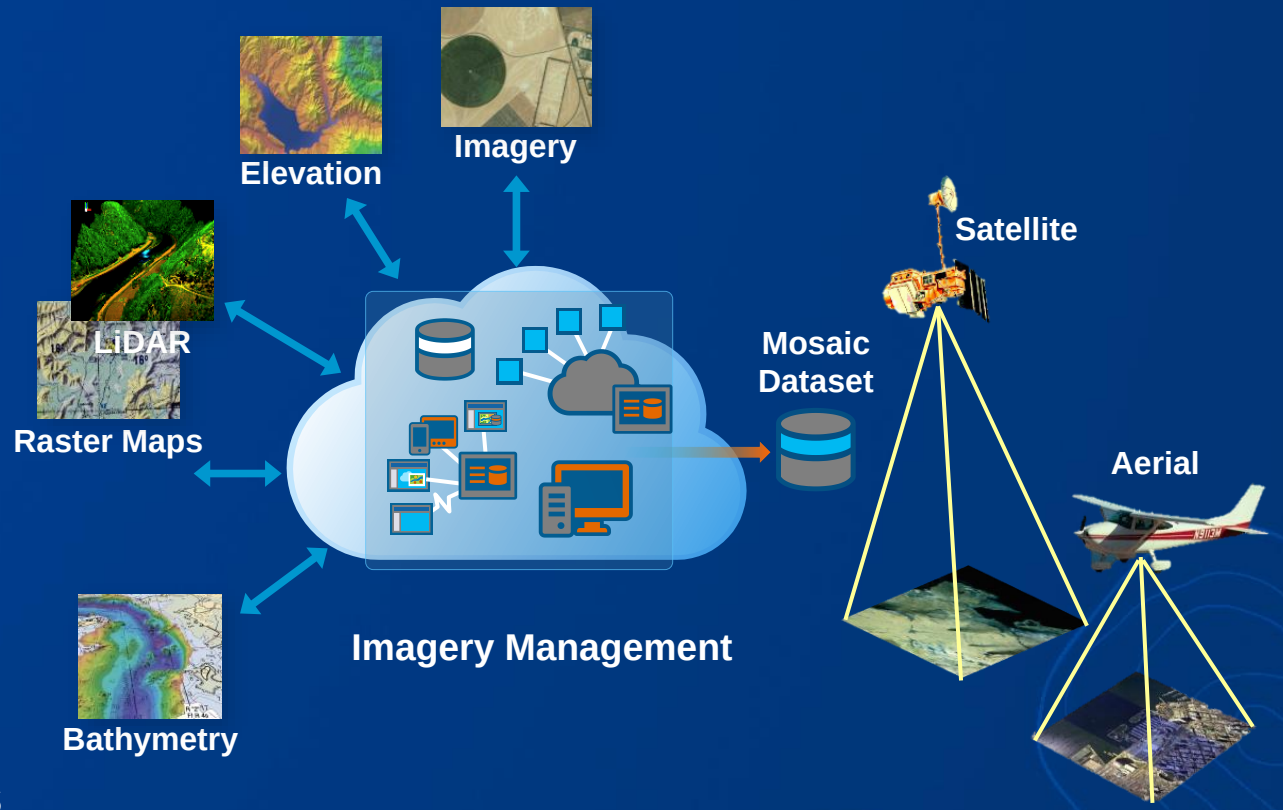
Accessing imagery content on the Living Atlas

Image Management Using Mosaic Datasets

The optimum model for managing large image and raster collections

Mosaic Datasets – the primary information model

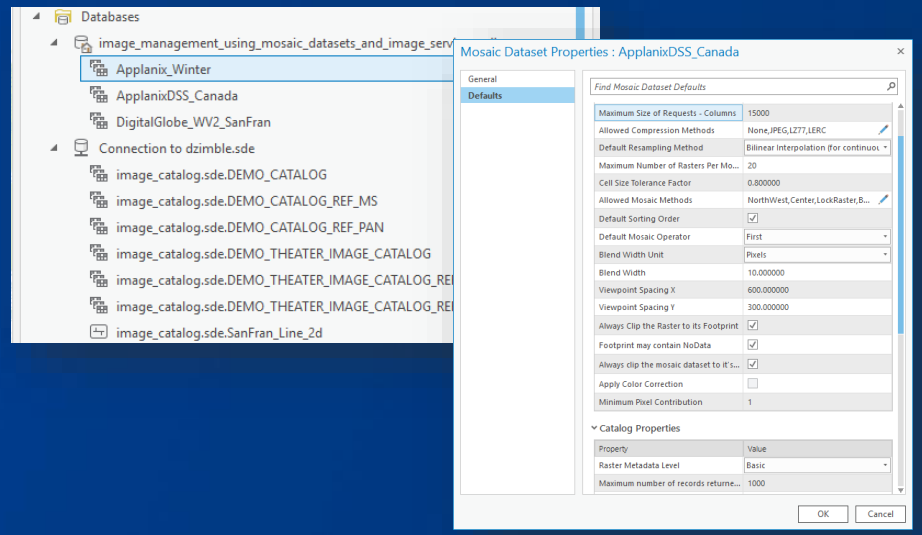
- Support multiple sources and modalities
- Support multiple metadata formats
- Support multiple formats
- Maintain Image quality
- Handle overlapping and disparate datasets
- Support over 50 Raster (Sensor) Types
- Support Rich Web services (Image Services)

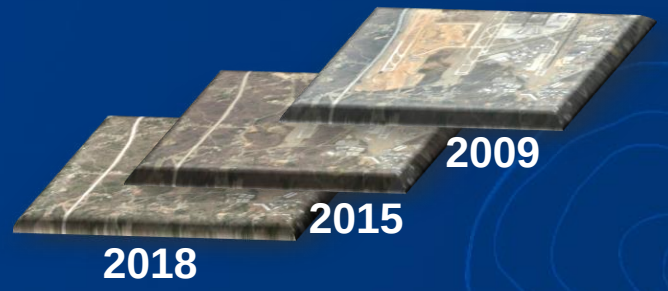


What is a Mosaic Dataset?

ArcGIS Imagery Information Model

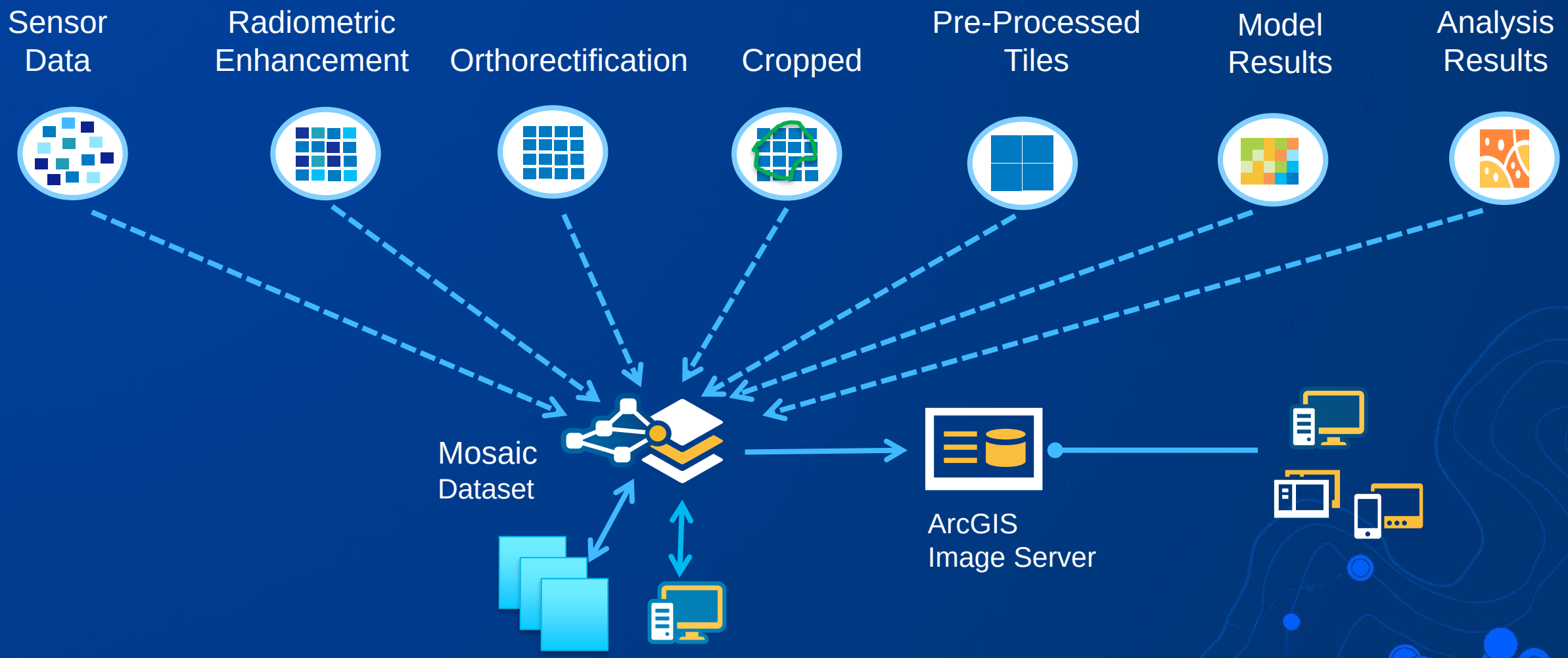
- Catalog of
  - Imagery
  - Associated metadata
  - Processing functions to be applied
- Stored in Geodatabase
- Authored using ArcGIS for Desktop
- Enables
  - Dynamic Mosaicking
  - On-the-fly processing





Traditional Image Processing Chain

Mosaic Dataset



Information Flow in an Image Service

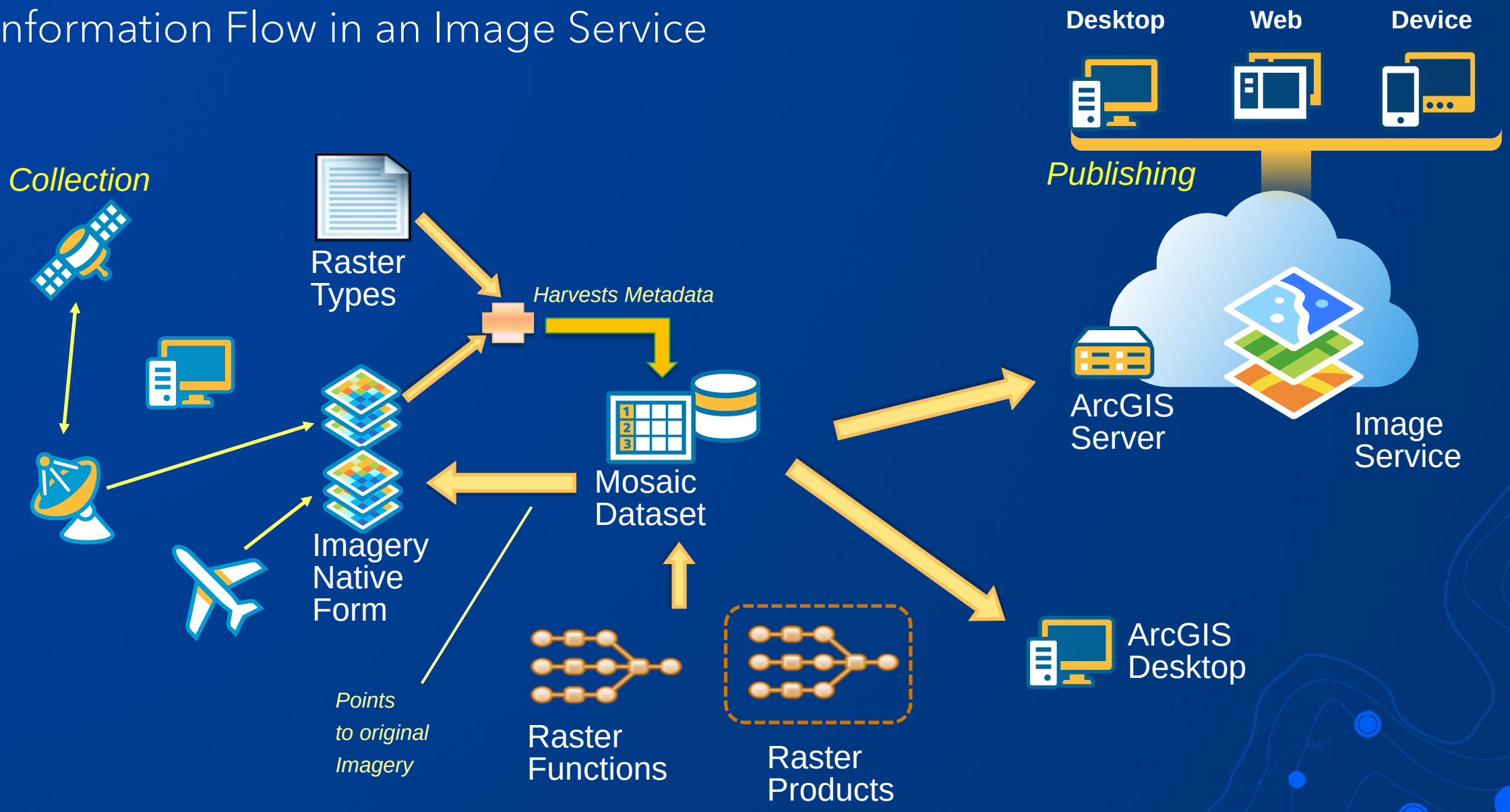
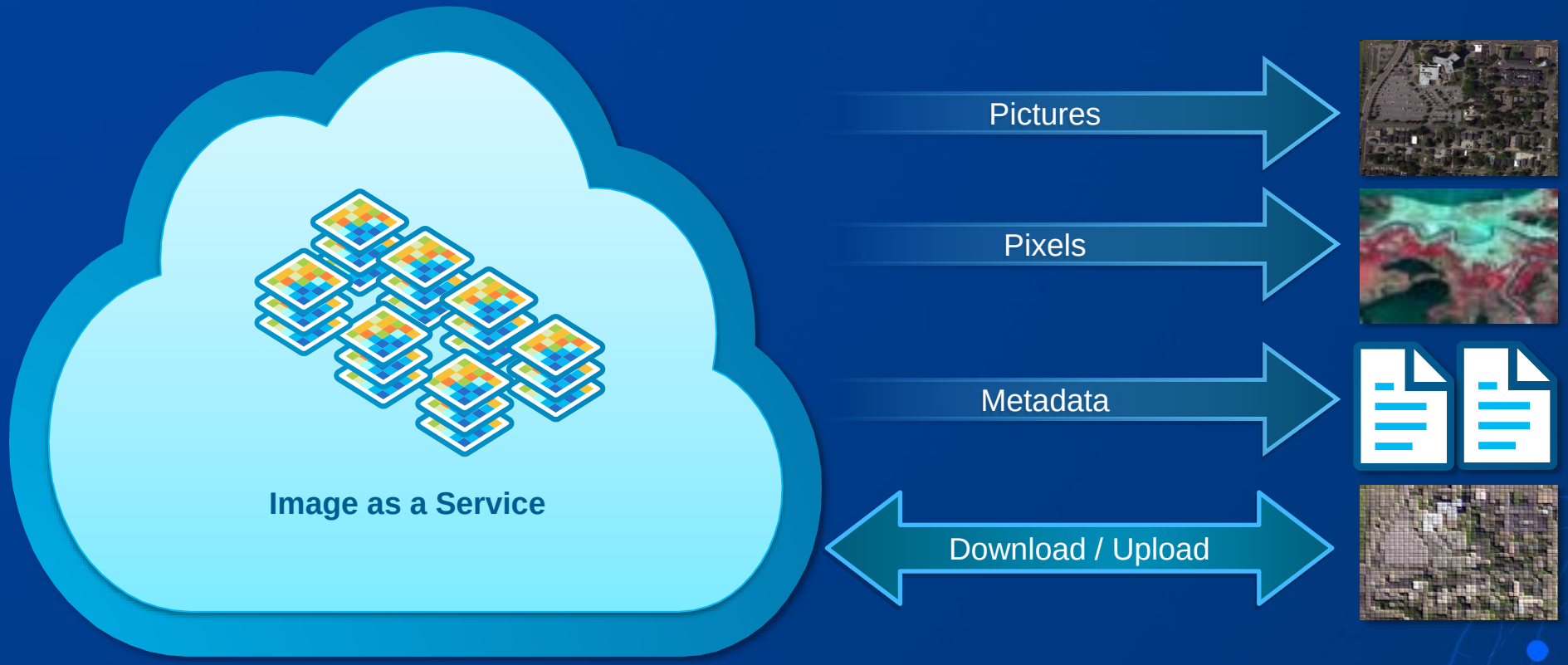
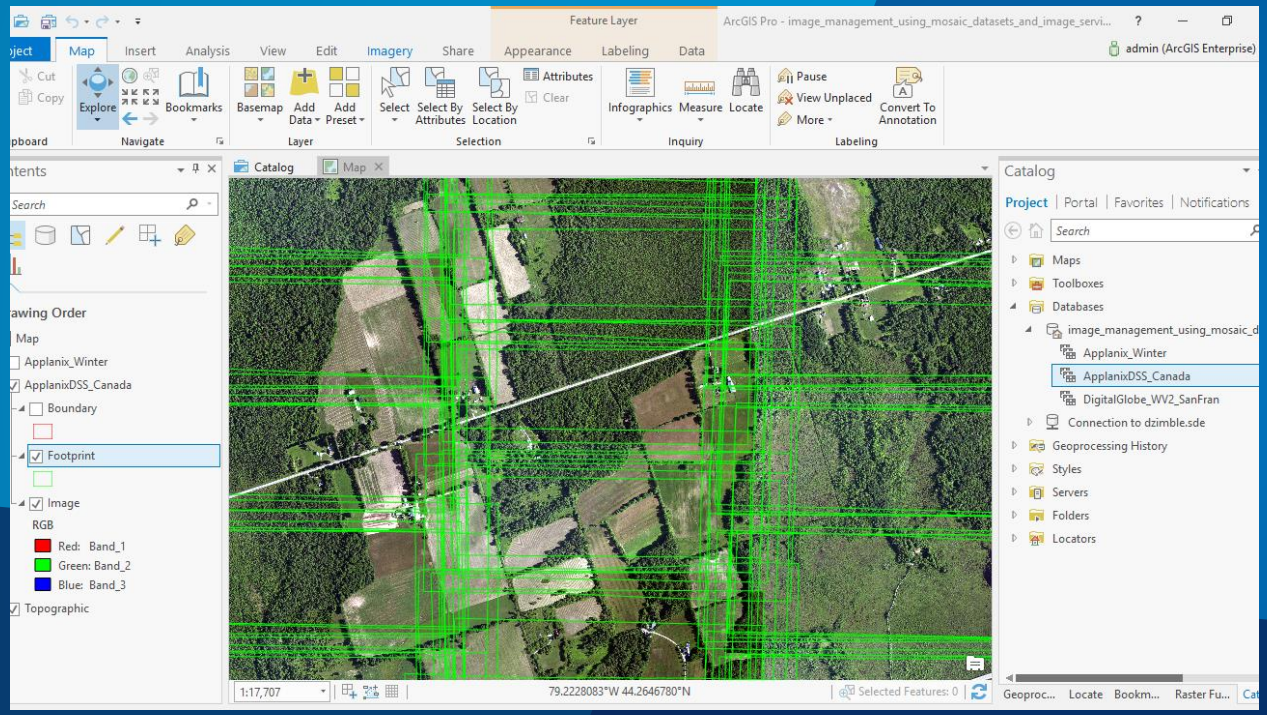


Image Service

ArcGIS Imagery Information Model

- **The Image Service is the primary information model component which web enables imagery**
- **It's role is to provide *Imagery as a Service* (one aspect of GIS as a Service)**





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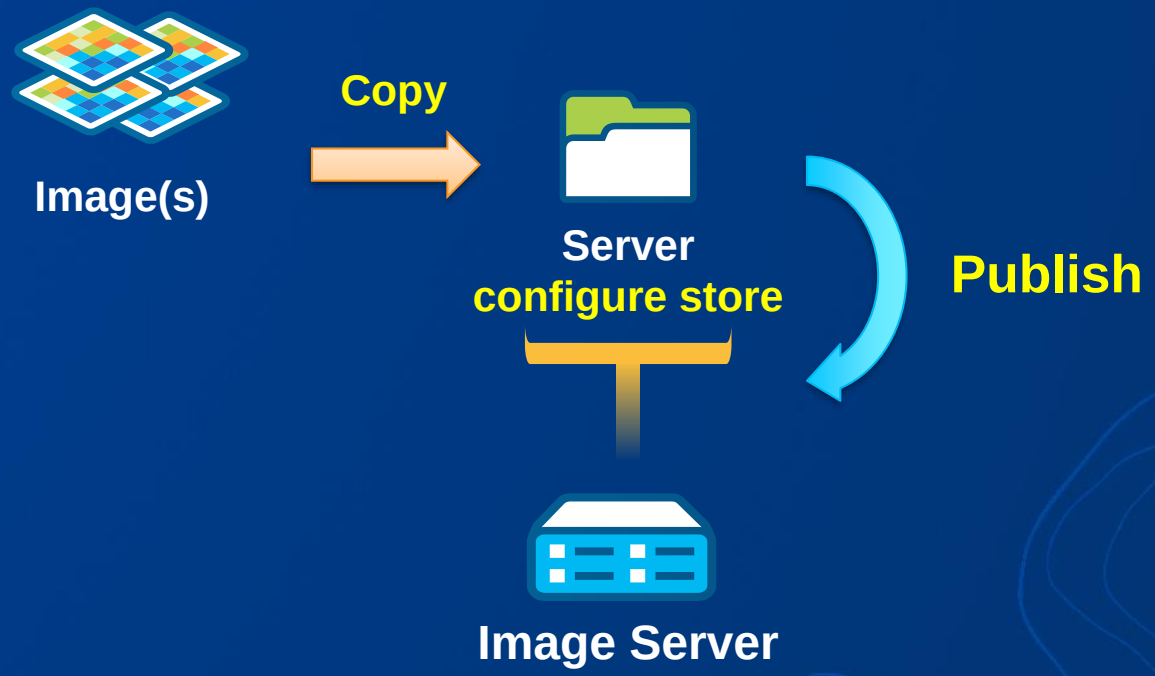
Anatomy of a mosaic dataset
Creating and managing a mosaic dataset

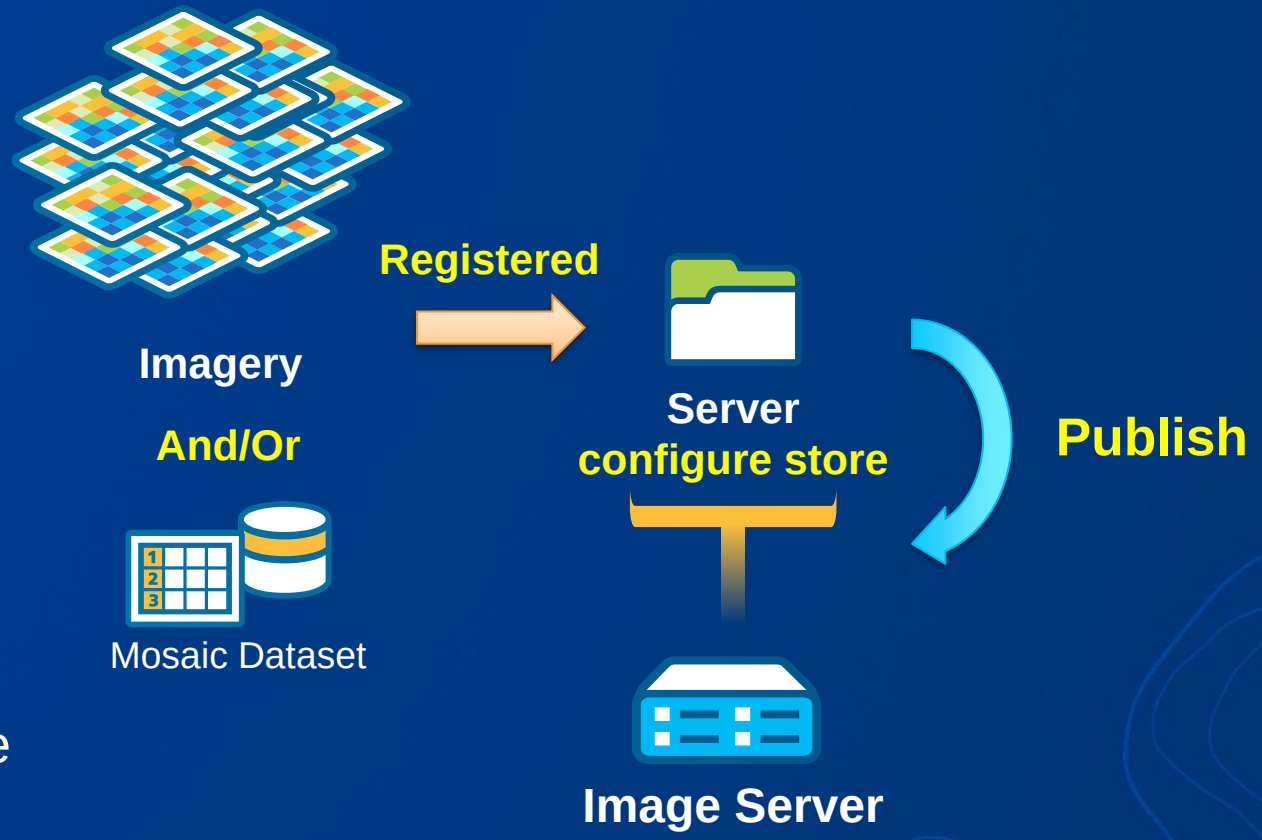
Sharing Imagery

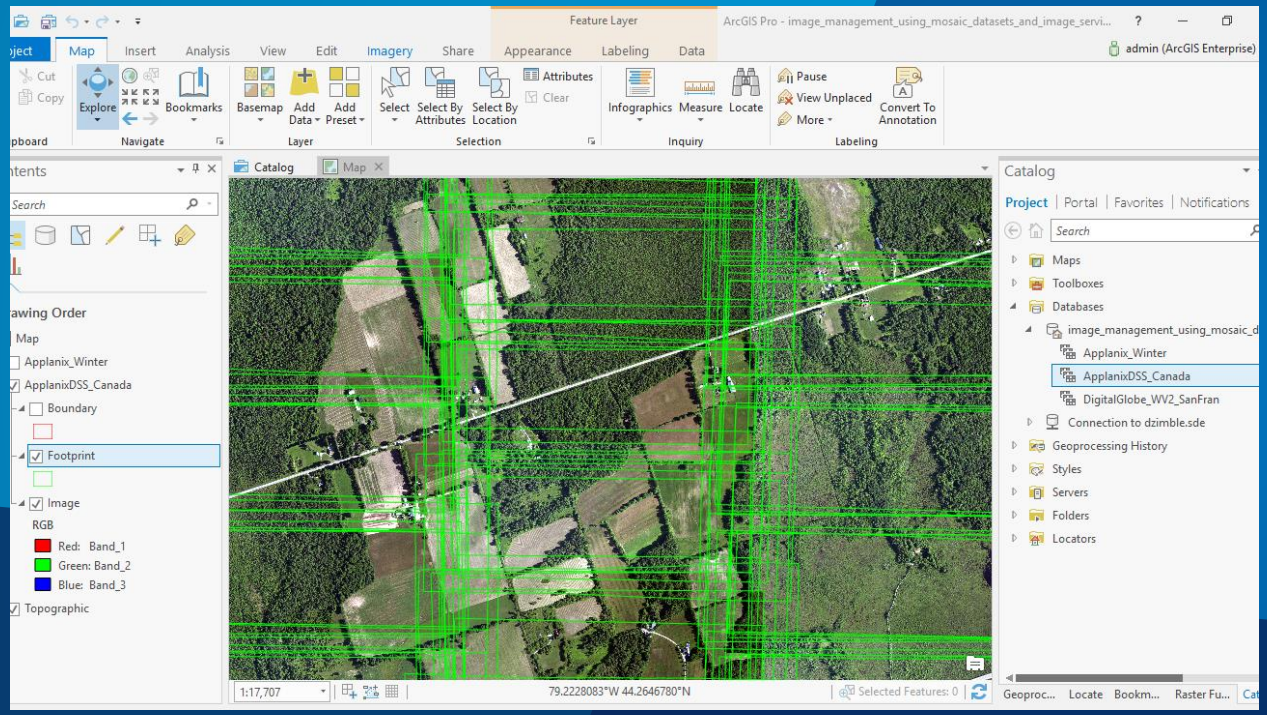
- Share by Value
  - Imagery is copied to the ArcGIS Server configuration store
    (e.g. C:\arcgisserver\config-store\services)
  - Data will be converted into File Geodatabase
  - NOT recommended for large image collections



Sharing Imagery

- Share by reference
  - Register a file share and/or enterprise geodatabase(s) with the server data store
  - Data is not moved
  - Recommended for publishing mosaic dataset or large single images or large single raster data





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Dynamic Mosaicking and On-the-fly processing
Sharing Mosaic Datasets

The Cloud

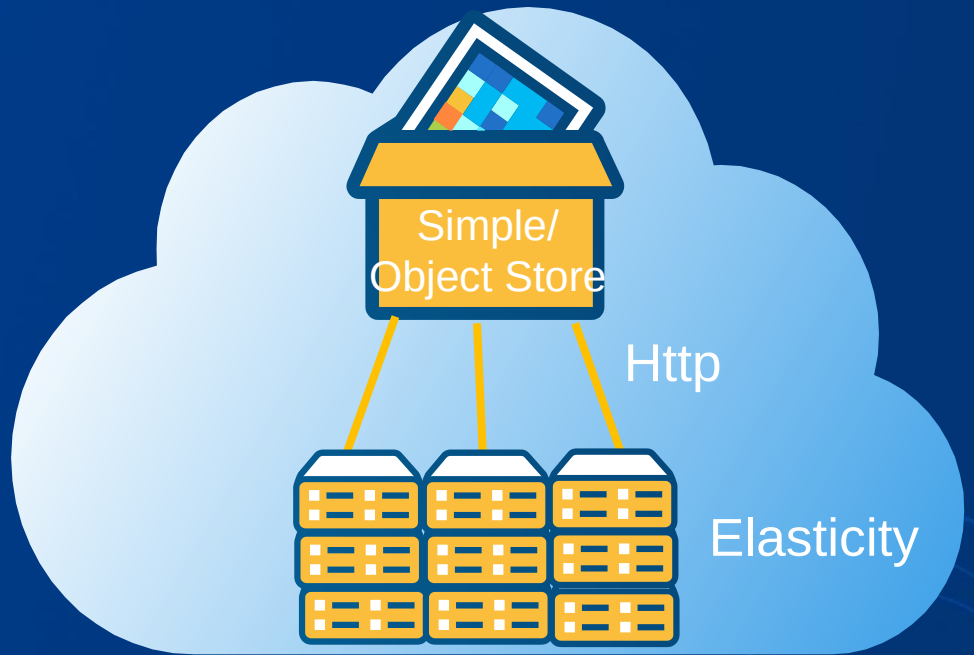
Working with Mosaic Datasets in the Cloud

Running ArcGIS Image Server in the Cloud

- Advantages
  - Lower cost resilient storage
  - Lower cost enterprise compute
  - Simpler install
  - Simpler scalability

- Disadvantages
  - Data needs to be uploaded
  - Different storage types
  - Infrastructure changes
  - Potential security concerns
  - Potential for complex data access policies

Standalone
Direct access



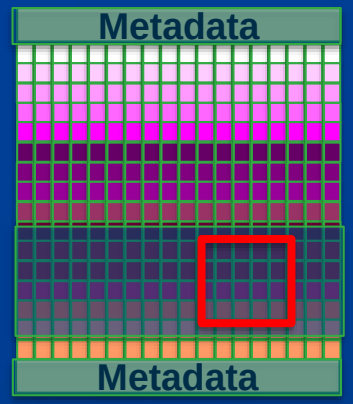
Cloud

File Format Considerations / Optimization

- Tiling of imagery – Enables partial access
- Compression – Reduce storage and transfer – Weigh against additional compute
- Data access complexity – Reduce subsequent requests
- Pyramids

Bad

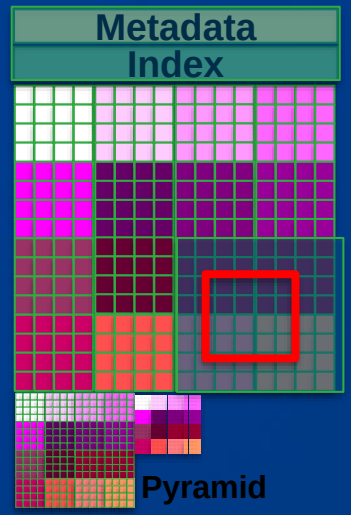
Striped TIF



Non optimum access

Good

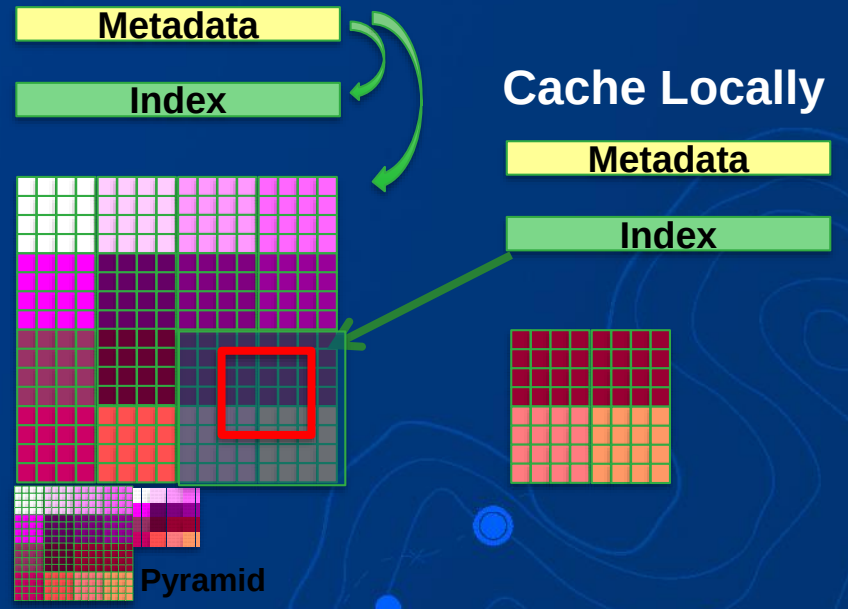
Tiled TIF



Enables partial access

Optimum

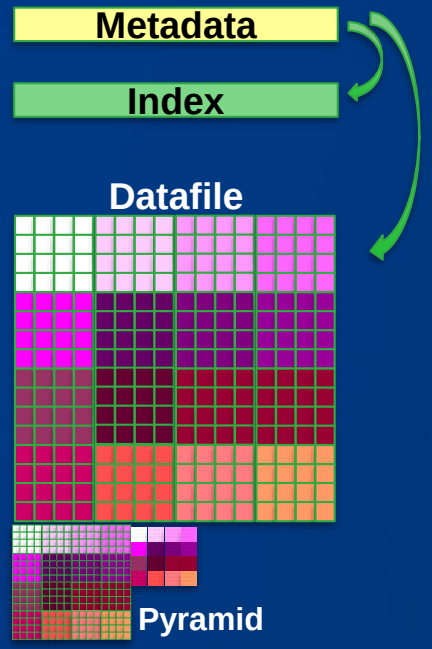
MRF



Enable separate caching of metadata and index

MRF (Meta Raster) Format

- NASA designed format
- Split raster into three (or more) files
  - MRF – Small XML, with links to Index and DataFile
  - Index – Simple index to tiles
  - DataFile – Data file
  - Auxiliary files – e.g. Aux.xml
- Open Source Implemented in GDAL 2.1+
- Multiple compression options
- Supported for read and write in ArcGIS
- Multiple implementation modes
  - Metadata, Index and data file can be on different volumes
  - MRF file and index is small and can easily be on a local file system
  - Data can be on slower storage

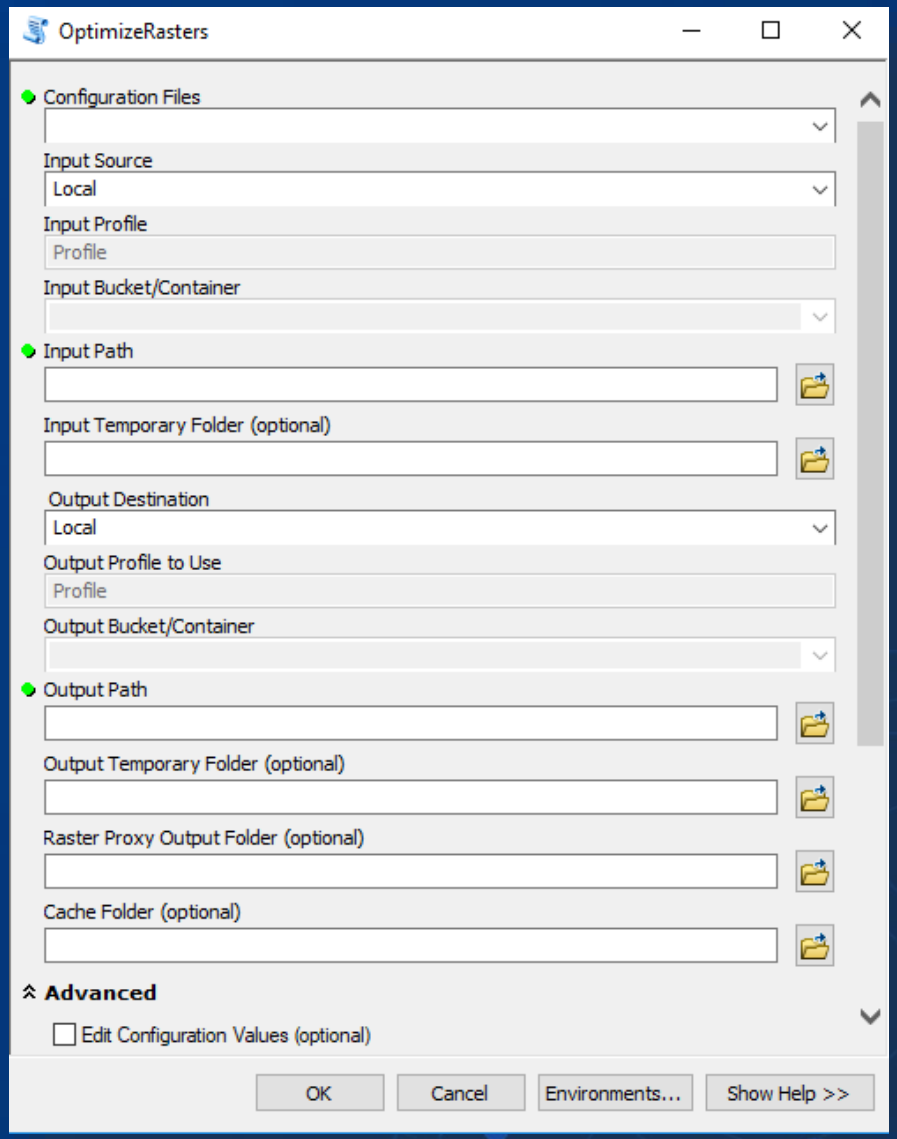


Converting Data to MRF

Using OptimizeRasters

- Python Tool box and CLI
- Python Script
- All GDAL supported formats
- Predefined Templates
- Easy to modify set parameters to define compression, tilesize etc of output.
- Includes data upload and download options
- Works with multiple Storage types (S3,Azure, GoogleCloud + local storage)
- Can run independent of ArcGIS.
- Can be scheduled to run periodically for new data.
- Logging support

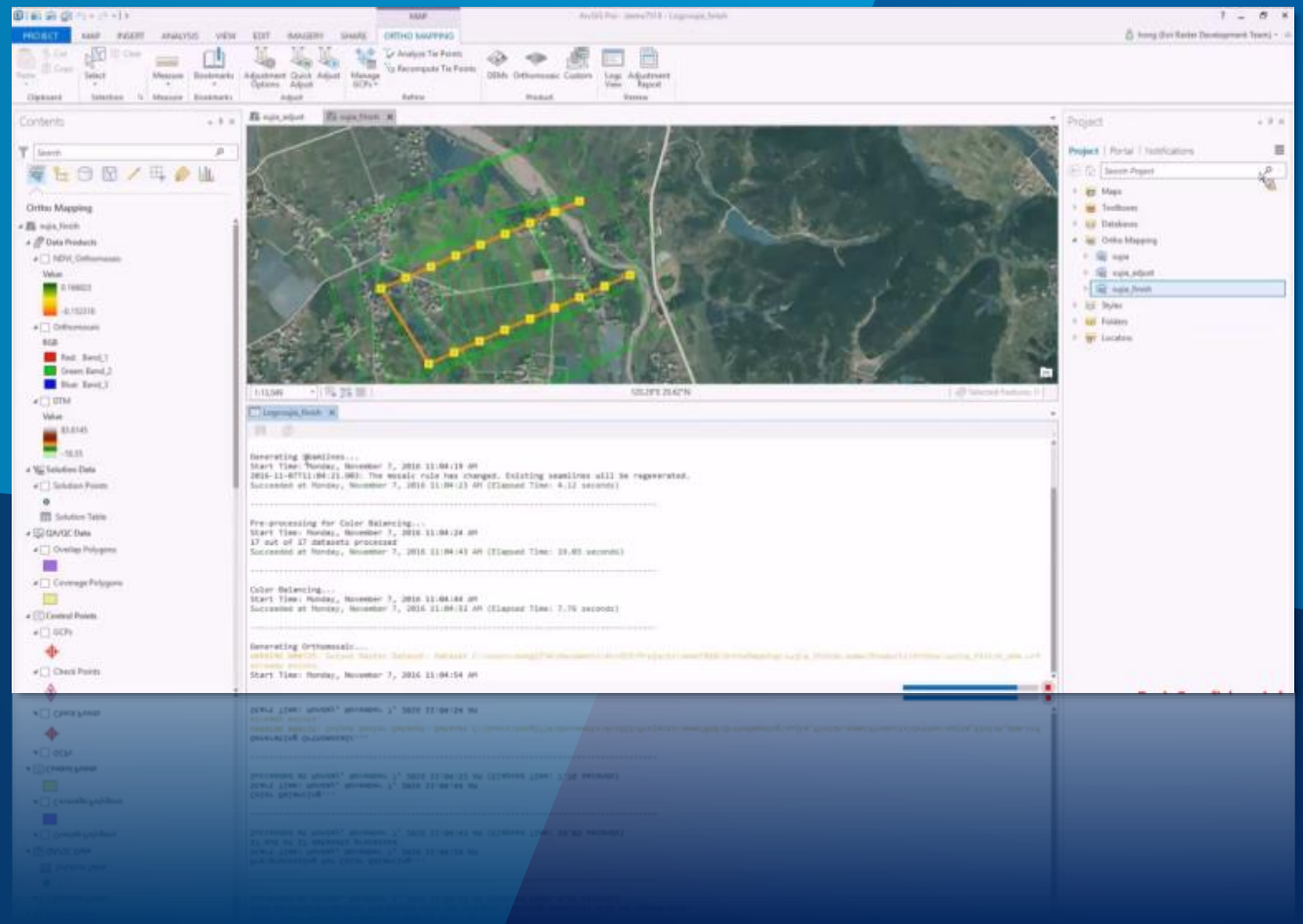
https://github.com/Esri/OptimizeRasters



Optimizations

- Use Inexpensive Scalable Storage
  - Minimize Number of requests
  - Minimize Size of requests
  - Minimize Repeat requests

- Enable Elasticity
- Enable Caching (to ephemeral/temporary storage)
- Optimize data structures



Demo

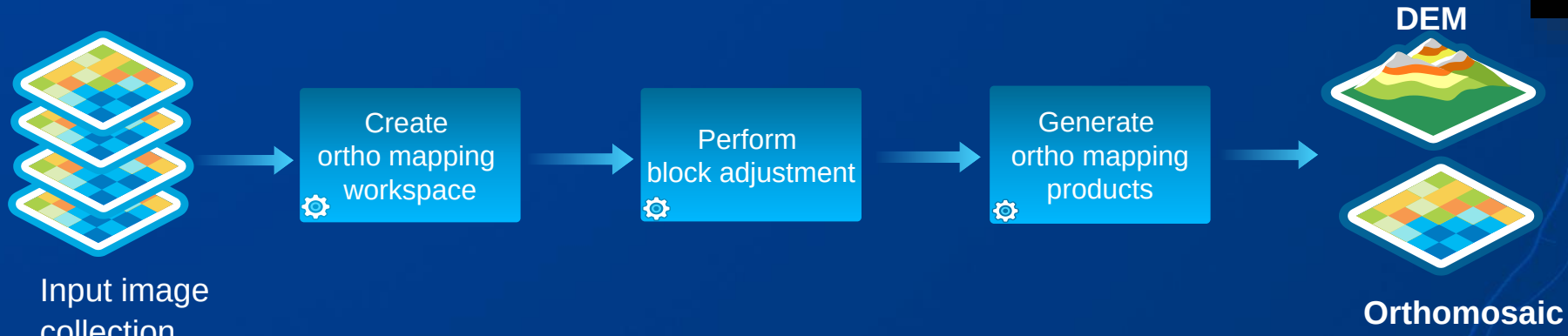
Scripts/resources/workflows

Ortho Mapping in ArcGIS

Ortho Mapping in ArcGIS

Introduction

- Part of ArcGIS Pro – low learning curve
- Multiple sources - drones, satellite, aerial
- Rapid processing – field mode – rough accuracy
- Core Products – seamless color-balanced Orthomosaics + DSM / DTM
- Integrate ArcGIS capabilities – generate information products - Gain insights, and share readily
- Streamlined!
- Adjust Satellite imagery to the world imagery basemap using ArcGIS Pro

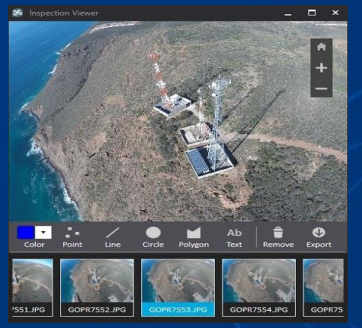


Drone2Map in ArcGIS

- Streamlines processing drone-captured imagery
- Generate Products for visualization and analysis in ArcGIS
- Automation/batch processing routines
- Share products as maps, scenes, products in ArcGIS Pro
- Multiple derived 2D and 3D products
  - DTM
  - DSM
  - Contours
  - Point Cloud
  - Textured mesh
  - Orthomosaics

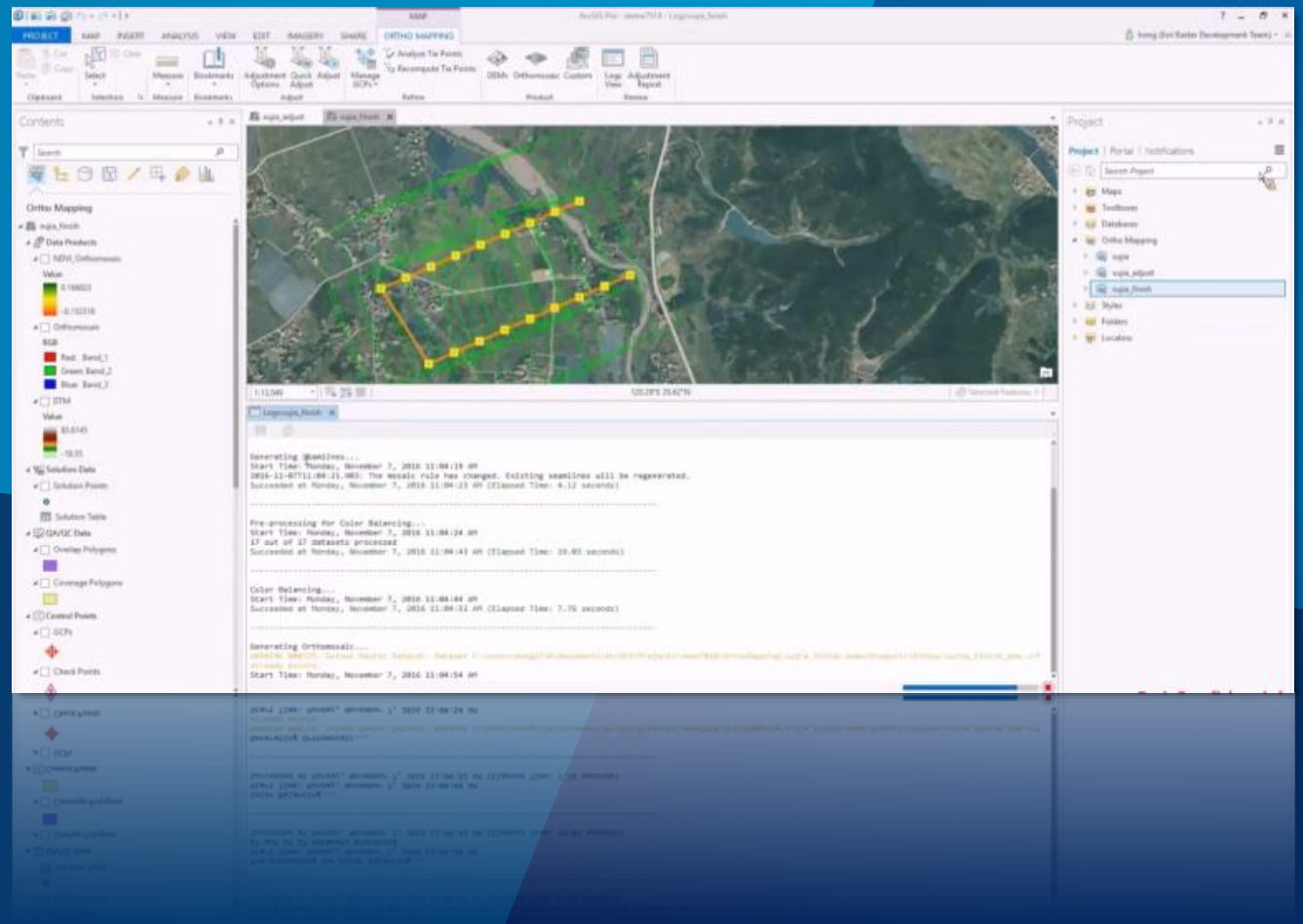
Point Clouds and Meshes

Orthomosaics



Smart Inspection

Digital Surface Models



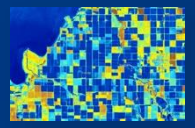
Demo

Ortho Mapping in ArcGIS Pro

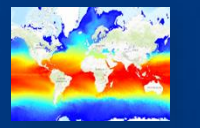
Summarizing….

- Mosaic Datasets – Primary information model to manage imagery
- Dynamic mosaicking and on-the-fly processing capabilities
- Reduce latency, increase pixel fidelity, no intermediate data storage
- Accessible across the platform as web services
- Running ArcGIS on the cloud to make Imagery Accessible
- Store massive volumes of imagery on inexpensive cloud storage
- Optimize data for performance
- Use elastic compute for ArcGIS image services
- Ortho Mapping to process drone, aerial and satellite imagery

Image Services


Landsat

Sentinel-2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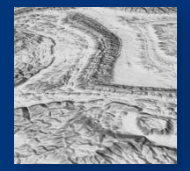
Airbus Global Elevation

NAIP

DigitalGlobe
Imagery+Analytics

Change Analysis

. . . Fully Integrated with the Platform

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