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Technical Workshops | 07/14/2011

Satellite and Aerial Imagery Support in ArcGIS

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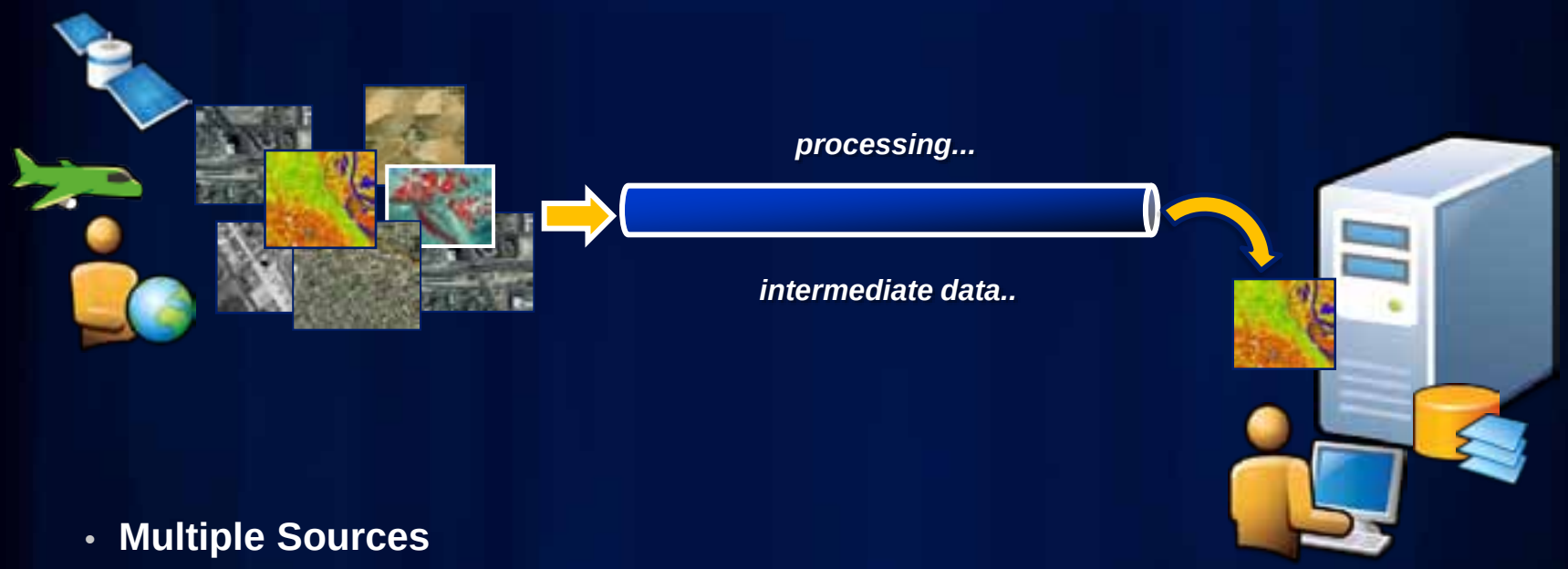
Agenda

- Data Management in ArcGIS 10 – Mosaic Datasets
- Raster Types
- Raster Functions
- Processing Aerial Imagery
- Imagery in Desktop
  - Image Analysis Window
- SDK
- Best Practices for Working with Sensor Data.
- Open Discussion / Q & A

Sensor Image Data

- **Acquisition**
  - Spaceborne, Airborne, Terrestrial
- **Composed of Many Files**
  - Pixels, Metadata, Georeferencing
- **Typically Requires Processing**
  - Georeferencing
  - 3D Tranformation (Orthorectification)
  - Pansharpening
  - Extract/Composite Bands
  - Enhancement

Data Management Issues



- Multiple Sources
- Multiple Formats
- Increasing Bit Depths and Bands
- Sensor Specific Metadata in Sensor Specific Format

- Large Collections
- Processing Requirements Vary
- Traditional Workflows Proliferate Intermediate Data
  - Quickly Escalates Storage Requirements

Mosaic Dataset

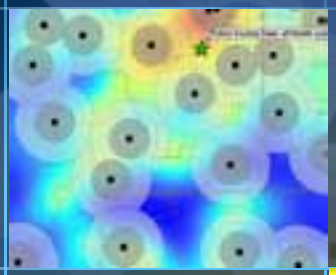
- Catalog of Imagery
  - References Source Image Data
  - Metadata
  - Stored in the Geodatabase
- Scalable (e.g. Landsat Services)
- Architectural Foundation
  - Intelligent Ingest
  - On-the-Fly Processing
  - Dynamic Mosaicking

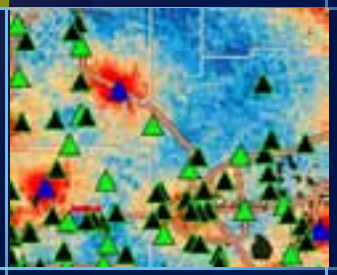
Mosaic Dataset

- Authored Using Desktop
- Automated Using GP tools and/or ArcObjects
- Accessible as:
  - Image
    - On-the-Fly Processed
    - Dynamically Mosaicked
  - Catalog
    - Footprint Geometry
    - Metadata
  - Image Service
    - Image + Catalog + REST

Demo – Image Data Management

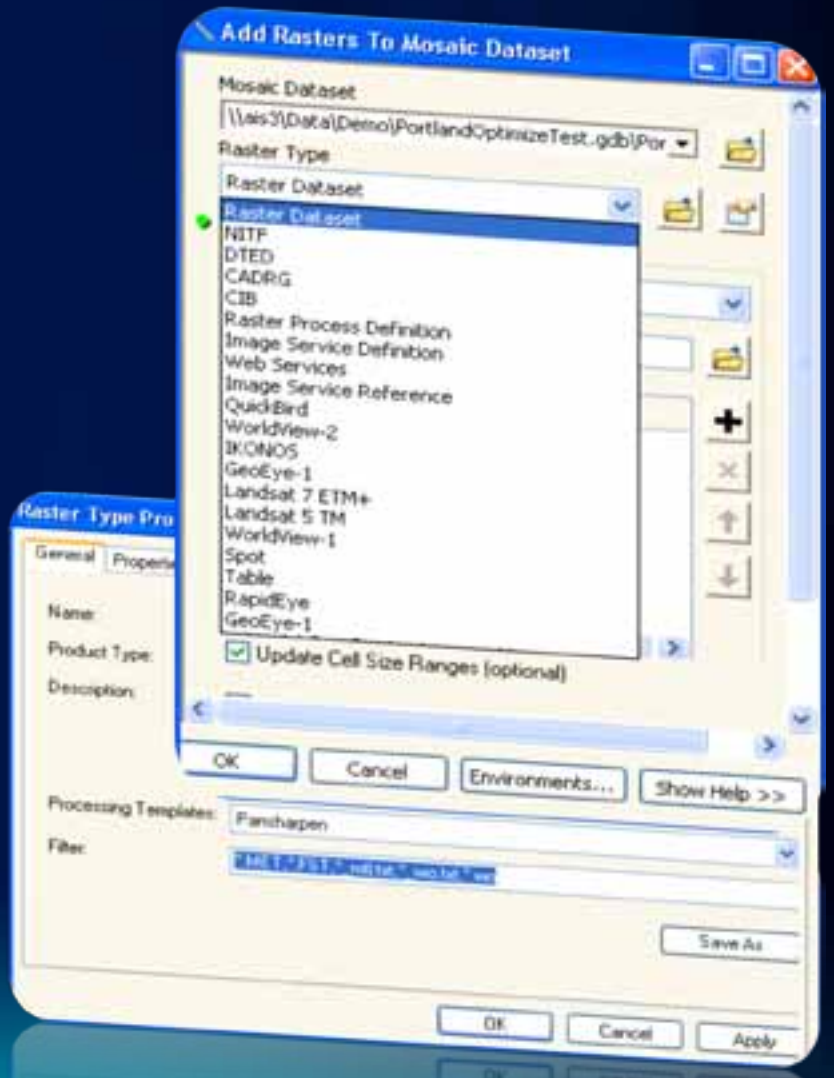
Vinay





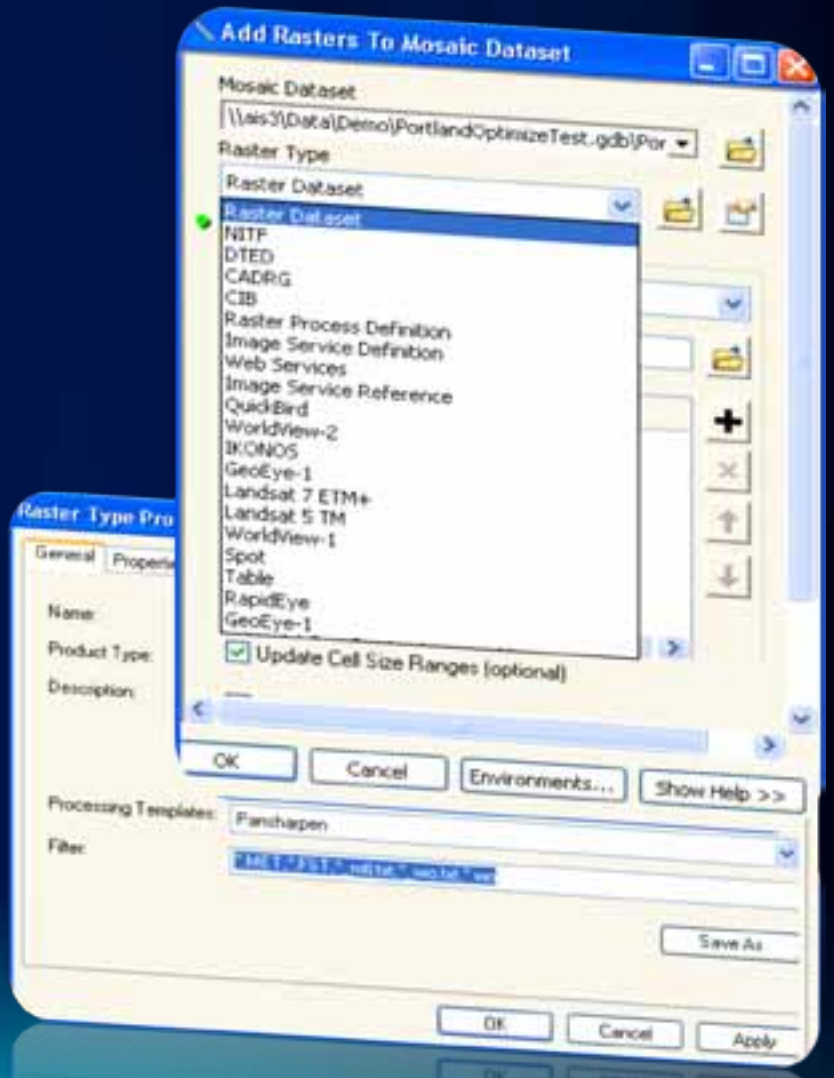
Raster Types

- Terminology
  - Raster Format = “TIFF”
  - Raster Type = “QuickBird”
- “Product” Descriptor
  - file structure
  - bit depth
  - band information
  - metadata parsing
  - georeferencing
  - more…
- Sensor Specific



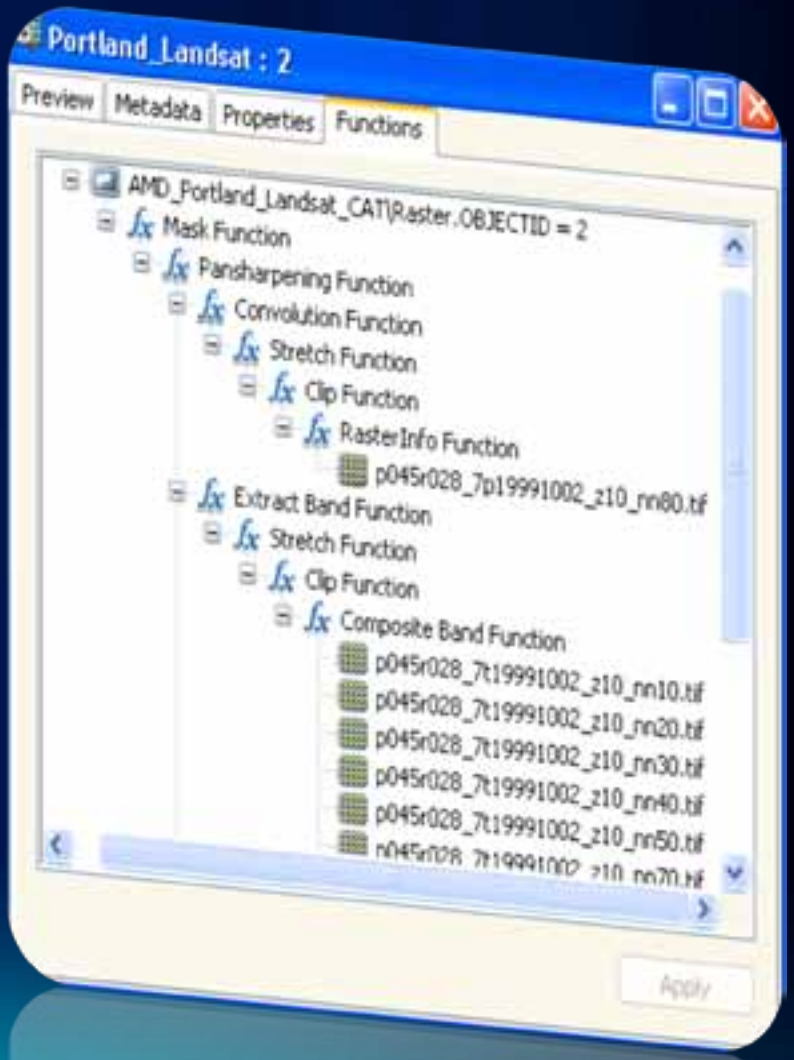
Raster Types

- Define On-the-Fly Processing Chains Applicable to Sensor
- Extendable using the SDK
- 23 in 10.0 (more coming…)



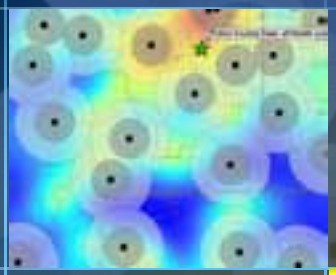
Raster Types

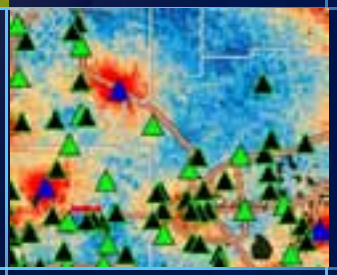
- Landsat example
  - Compose an MS Raster
  - Process the Pan Raster
  - MS + Pan = Pansharpened Raster
  - Ingest Metadata Fields
    - AquisitionData, CloudCover, …
    - Ingested from .txt, mtl.txt, …
- Raster Dataset Type
  - Used for All Supported Formats
  - Handle Processed Imagery



Demo – Advanced Data Management

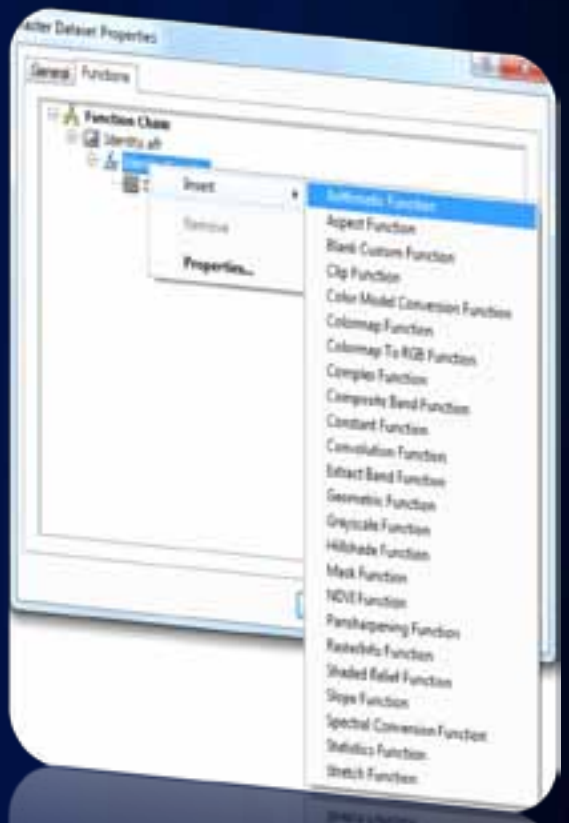
Vinay





Raster Functions

- Operation to be performed on one or more rasters
- Execution is On-the-Fly
- Can be chained together
- Can be applied at different levels
  - Mosaic Dataset
  - Raster(s) in a Mosaic Datasets
  - Raster(s) in Desktop
- Extendable using the SDK
- 24 in 10.0 (more coming…)



Raster Functions cont..

Radiometric Processing (value)

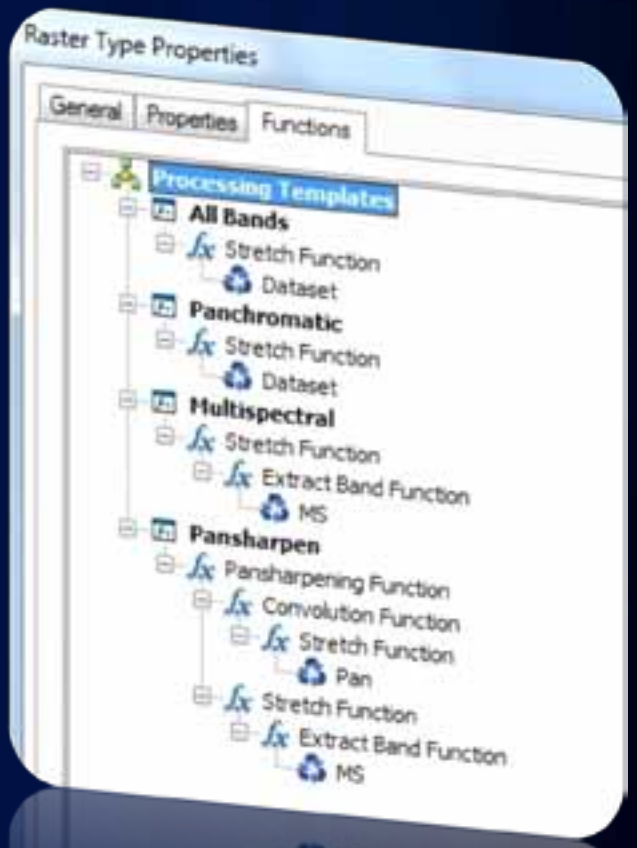
- Enhancement
  - Stretch, Convolution, Pansharpening,…
- Visualize
  - Hillshade, Shaded relief, Aspect, Slope,…
- Composite
  - Extract/Composite Bands

Geometric Processing (location)

- Reproject, Warp, …
- Orthorectification
  - RPC, Standard Frame

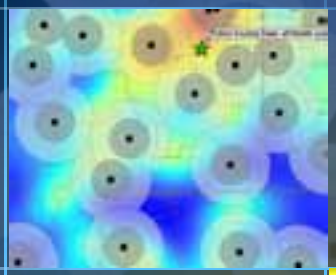
Raster Function Template

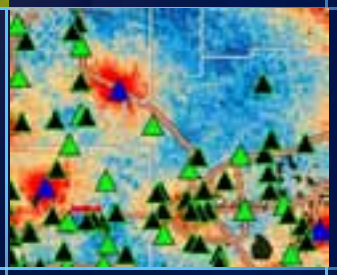
- Processing template that can be applied to multiple rasters
- Defines a chain of functions and a set of variables
- Raster Types utilize them to create different products from the same source data
- Easy to edit in Desktop



Demo – Raster Functions

Vinay





Frame Camera Support

- Issues
  - Increasing number of sensors
  - Huge number of frames
  - Huge volumes of data
  - Need to make data quickly accessible

- Mosaic Dataset provides
  - Reduced latency – Quickly serve
  - Reduced processing – Directly from Source
  - Graded product – Refined parameters over time
  - Reduced storage – processing on the fly

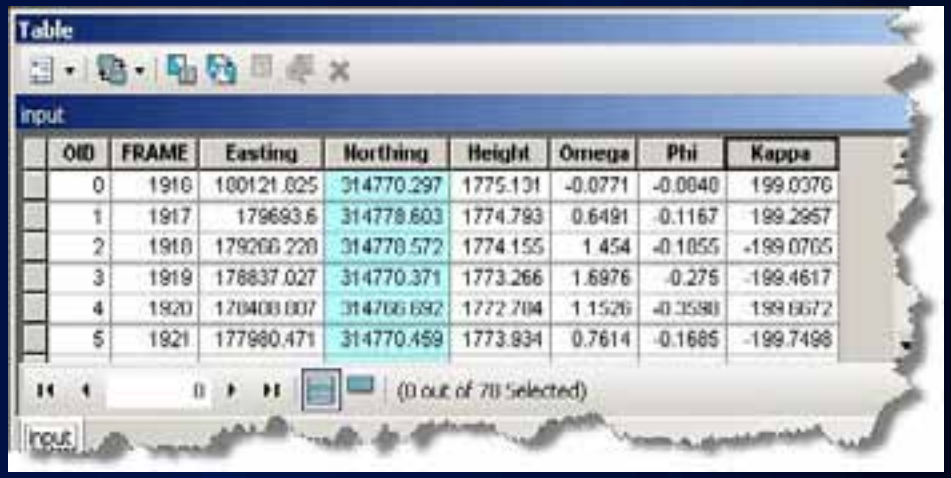
Frame Camera Support - Workflows

- Out of the box support
  - Photogrammetric Suites (MATCH-AT, ISAT,…)
  - Applanix DSS

- Custom Aerial Camera Support
  - “Table” Raster Type (Pictometry, UltraCam,..)
    - Table
    - Xml

Frame Camera Support – Table Contents

- **Table - Containing Variable parameters**
  - **Exterior Orientation Parameters**
    X,Y,Z, Omega, Phi, Kappa
  - **Metadata**



Table

input

OID	FRAME	Easting	Northing	Height	Omega	Phi	Kappa
0	1916	180121.025	314770.297	1775.131	-0.0771	-0.0040	199.0376
1	1917	179693.6	314778.603	1774.793	0.6491	-0.1167	199.2957
2	1918	179266.220	314770.572	1774.155	1.454	-0.1855	-199.0705
3	1919	178837.027	314770.371	1773.266	1.6976	-0.275	-199.4617
4	1920	178408.037	314766.692	1772.204	1.1526	-0.3598	199.9672
5	1921	177980.471	314770.459	1773.934	0.7614	-0.1685	-199.7498

0 (0 out of 70 Selected)

input

Frame Camera Support – XML Contents

- XML Contents
  - Raster Source
  - Spatial Reference
  - Camera Calibration

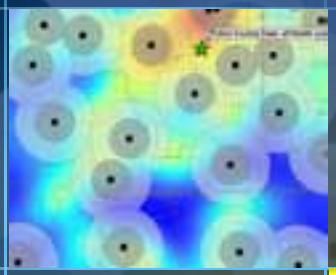
    Principal Point, Focal Length, Konrady
  - Orientation Parameters

    Variables Pointing to Fields in the Table
  - Processing information

    Orthorectification, Pansharpening, Enhancement,…

Demo – Frame Camera Support

Vinay



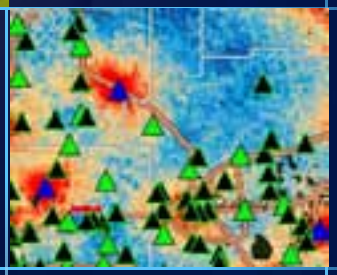
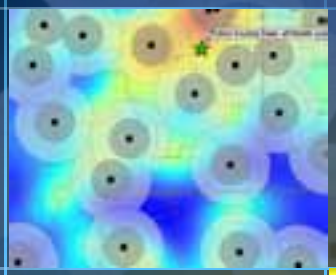


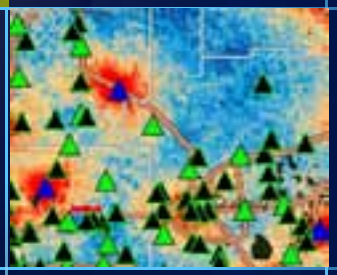
Image Analysis Window

- One click access to common tools
- Process raster layers
- Enhancement tools
- Interpretation tools
- On-The-Fly processing
- Supported layers
  - Raster Dataset
  - Mosaic Dataset
  - Image Service
  - WCS

Demo – Image Management and IAW

Vinay



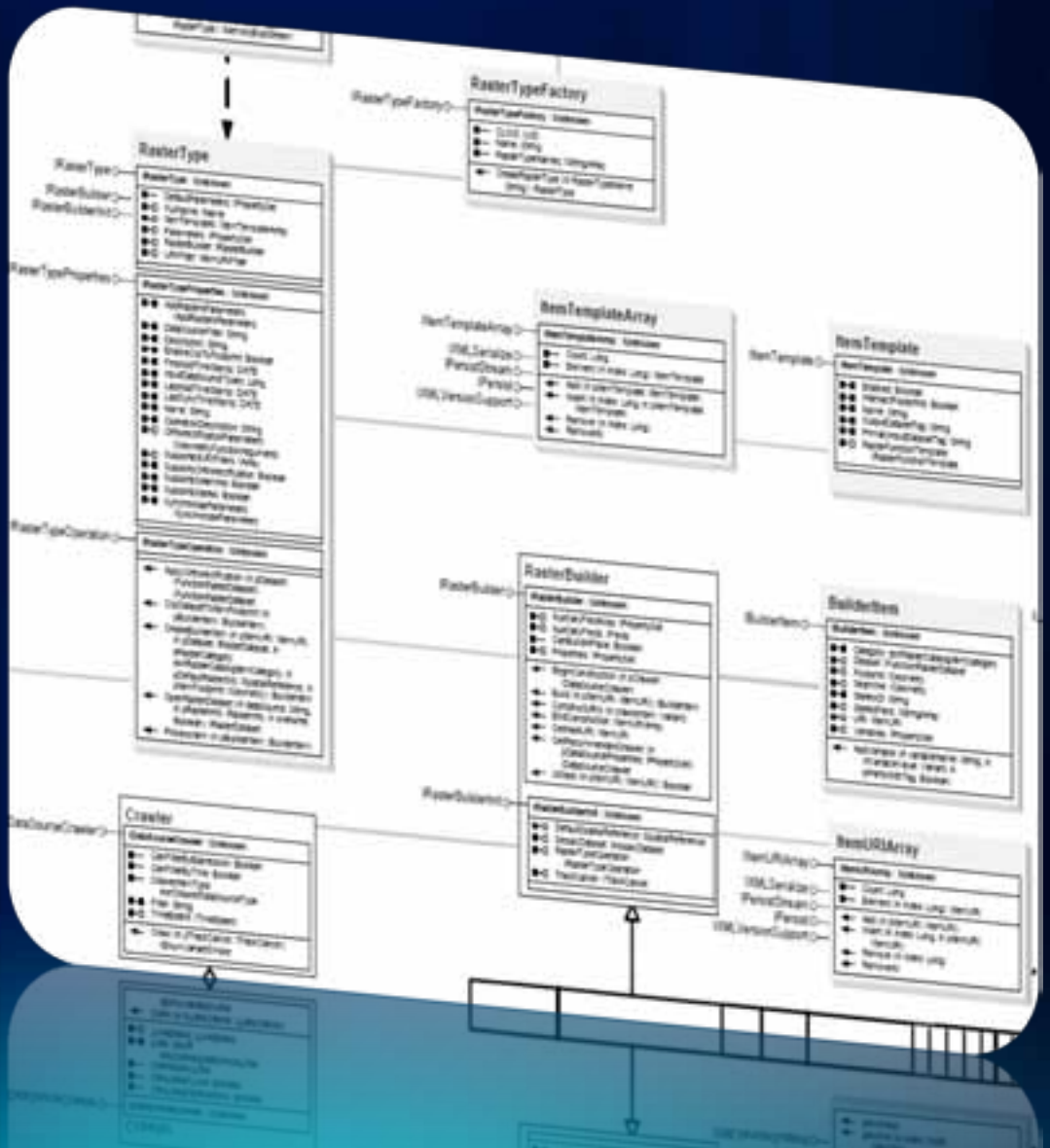


Customizing using the SDK

- Need for customization
  - New or Missing Sensor Support
  - New or Missing Processing
- ArcObjects SDK
- Resource Center

Customizing Raster Types

- Raster Type Factory
- Raster Builder
- Processing Templates



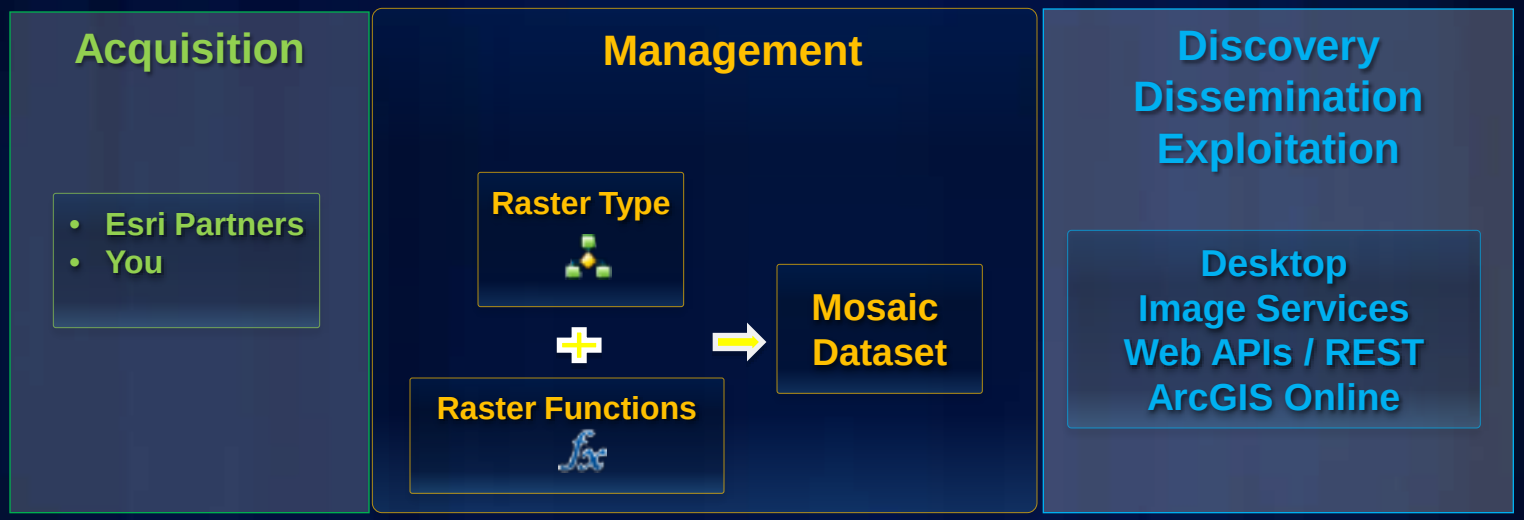
Customizing Raster Functions

- Raster Function
  - Main processing algorithm
- Raster Function Arguments
  - Function parameters
- Raster Function UI
  - UI for function parameters
  - Optional

Data Management Recommendations

- Single elevation service for Orthorectification
- Preprocessing
  - Calculate Pyramids
  - Calculate Statistics
- Consider Optimized Delivery Formats
  - TIFF w/JPEG 80
- Organize Imagery Into Collections of Similar Sensor
  - Homogeneous Mosaic Dataset
- Organize services
  - Color imagery, False color , NDVI, Master
- Imagery: Data management patterns and recommendations

Summary



- Data Management Solution in ArcGIS 10 – Mosaic Datasets
- Sensor Support via Raster Types
- On-the-Fly Processing using Raster Functions
- Frame Camera Support in ArcGIS 10
- Image Analysis Window in Desktop
- Best practices when working with sensor data.

Questions

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