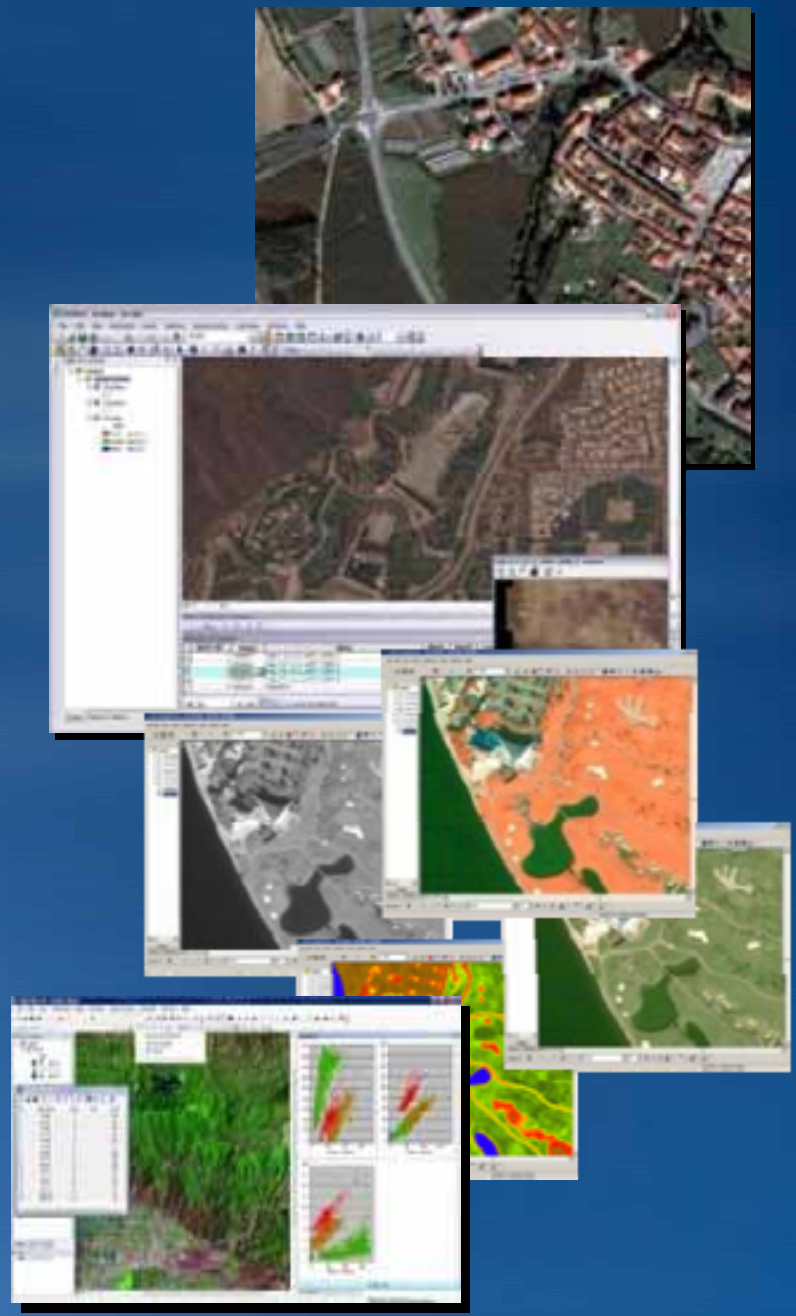
Management, Dissemination, Discovery and Exploitation of Imagery at ArcGIS10

Peter Becker & Dan Zimble

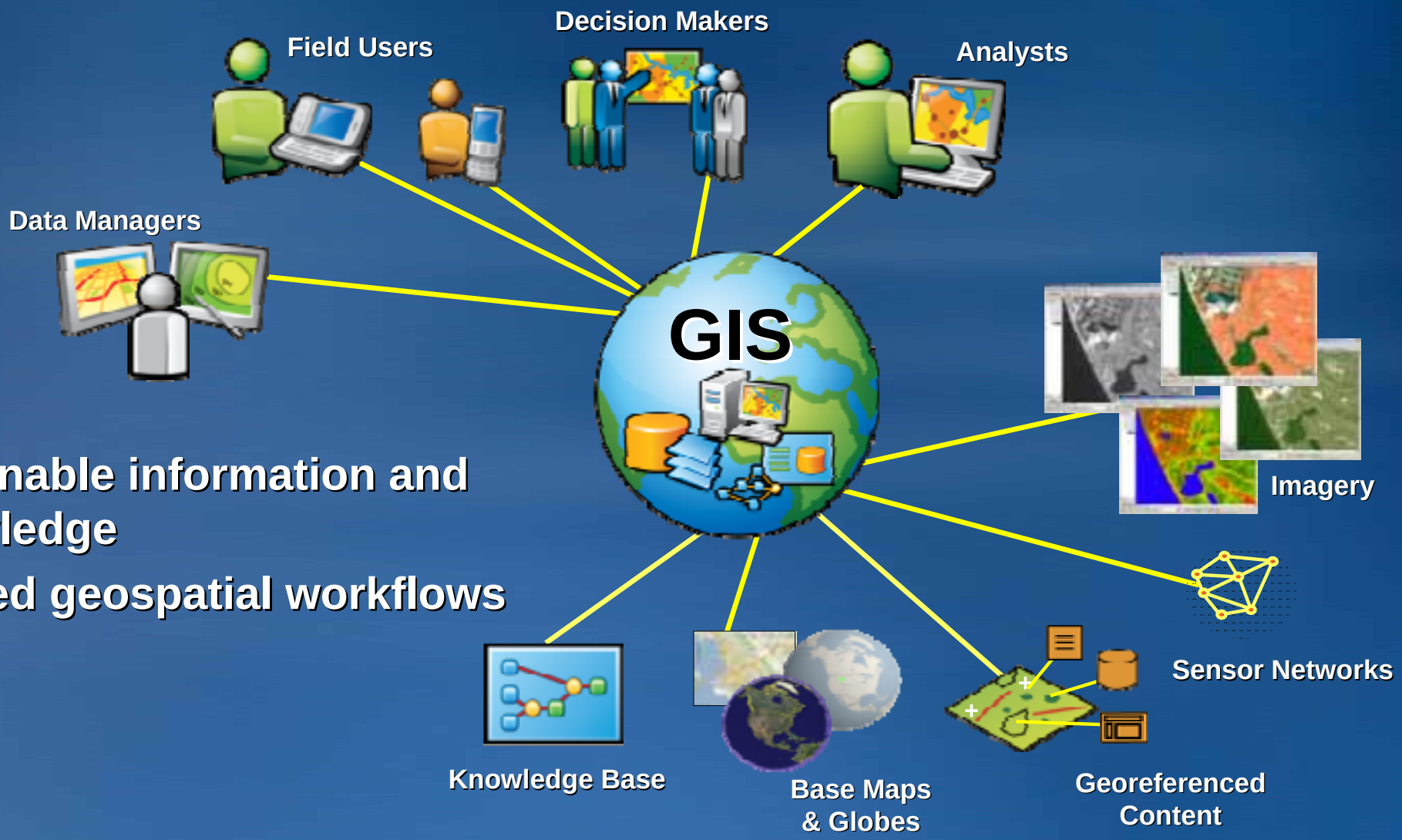
Maximizing the Value of Imagery

- Providing imagery:
  - Timely
    - Value is highest when new
  - Quickly
    - Fast display
  - Accurately
    - Correct location and metadata

- Exploiting the rich information content:
  - Resolution
    - Use full spatial content with maximum quality
  - Temporal change
    - Enable time control
  - Spectral range
    - Utilize multiple bands
  - Dynamic range
    - Utilize sensitivity for sensors



GIS and Imagery, Integrated and Accessible



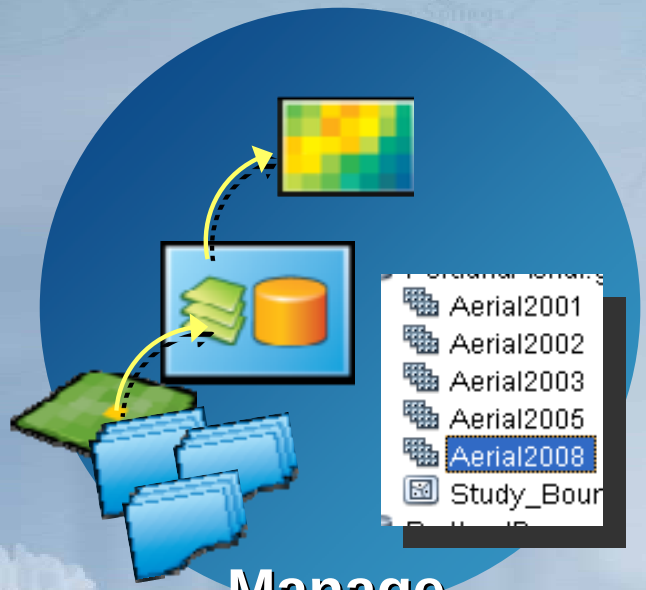
- Actionable information and knowledge
- Unified geospatial workflows

Imagery is Core to a Complete GIS

- Management
  - All forms of geospatial data
    - Vector, Image, Maps, TIN, Networks, …
  - Image Data Management
- Dissemination
  - Accessibility to data, information and knowledge
    - Services, Sharing, Standards
  - Providing image accessibility
- Visualization
  - Interpretability and human understanding
  - Imagery display in many applications
- Analysis
  - Gain knowledge to make informed decisions
  - Extracting the information from imagery

ArcGIS is a Complete GIS Based Image System

Management



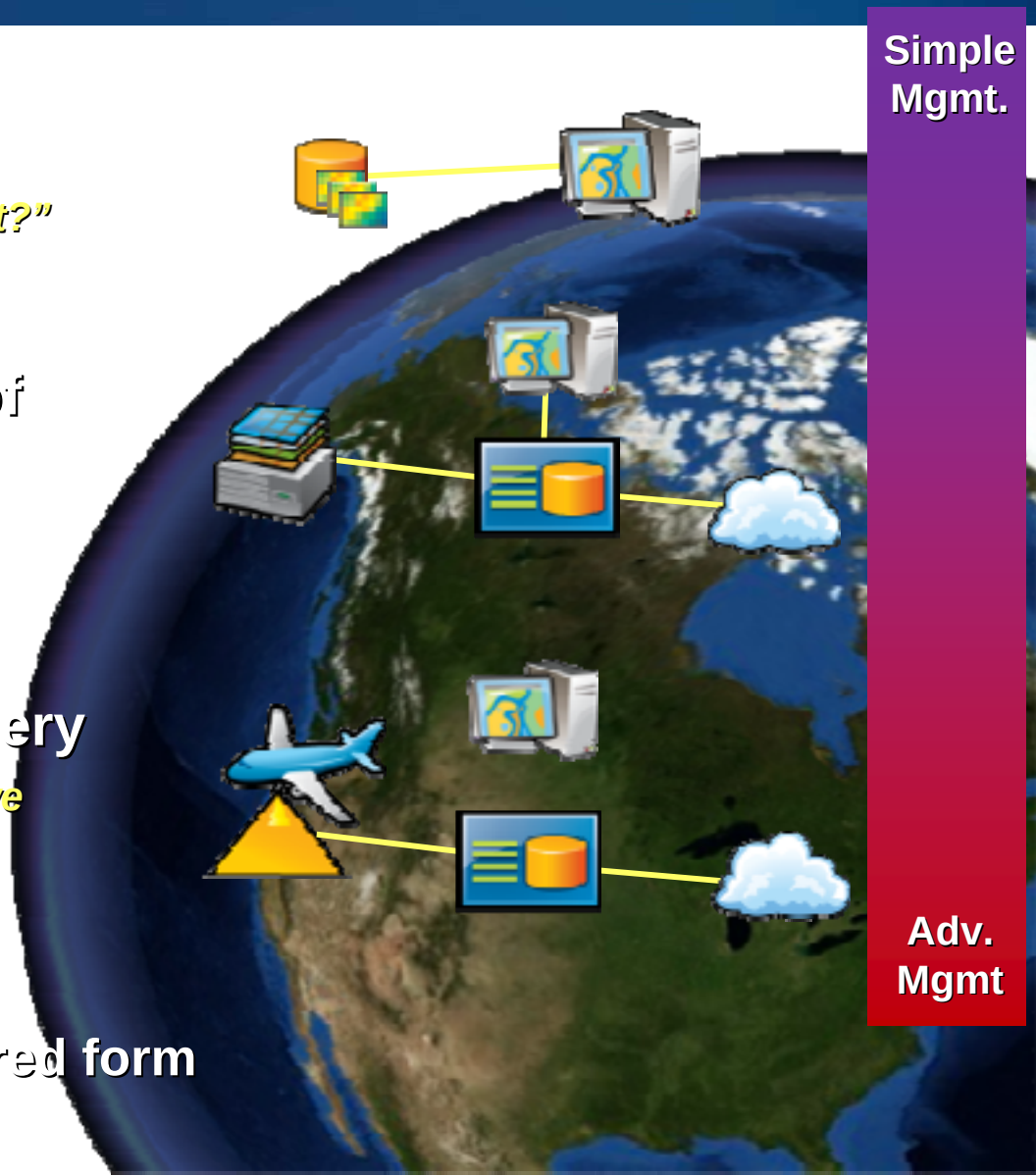
Manage

ArcGIS - For Image Data Management

Cataloging, Metadata and Processing

Wide Range of User Needs:

- **Work Station User**
  "What do I have? How can I easily work with it?"
- **Organizations with collections of existing imagery and rasters**
  "How do I serve all our orthoimages?"
- **Enterprises collecting new imagery**
  "How do I process and serve imagery that we acquire?"



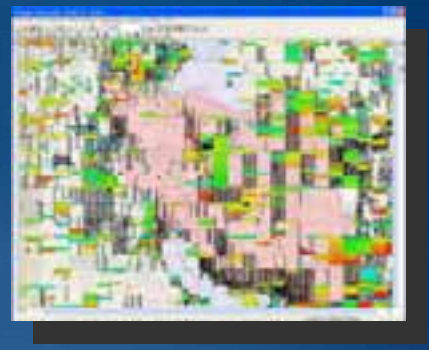
Catalog all available imagery

Make it quickly accessible in the required form

GeoDatabase - Mosaic Dataset

Management of Small to Vast Collections of Imagery

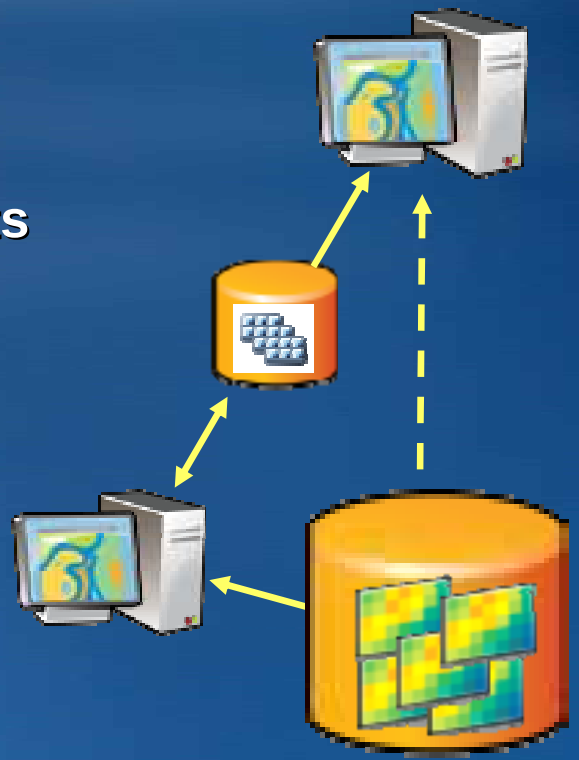
- Catalog/Library of all imagery & associated metadata
- Stored in GeoDatabase
- Massively Scalable
- References original pixels as files or database
- Define processing / functions



- Authored and Accessible directly in ArcGIS Desktop

- Automation using GeoProcessing Tools & ArcObjects

- Accessible as:
  - Image
    - Dynamically Mosaicked
    - Processed on the fly
  - Catalog
    - Table with geometry & metadata



Resolves the traditional issues associated with image data management

Demo – Image Data Management

Dynamic Mosaicking

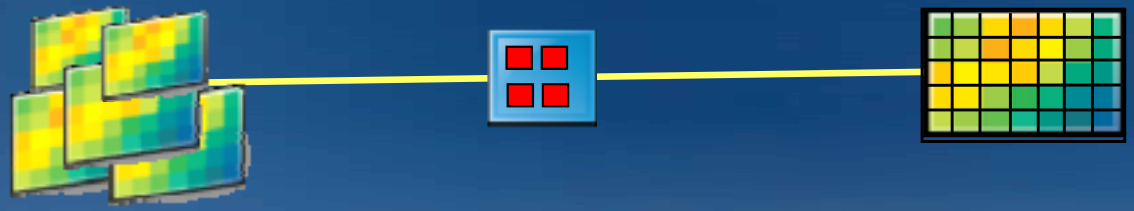
Mosaic Imagery On-demand

- Fuse of overlapping imagery from multiple sources
- User control of Image Order
  - By Date –'Latest', 'Closest to May 2001'
  - By Attribute – 'Highest Sun Angle'
  - By Viewpoint – North, South, East, West
  - Seamline – Feathered blend
  - User Query – 'Landsat imagery, with no cloud, later than June 2001'
- By default users see best available imagery

Exploit the Overlap in Imagery

Dynamic Mosaicking

Resolves Traditional Image Management Issues



Processing Time

Reduces processing

Storage

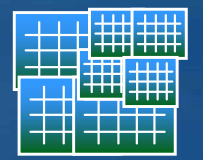
Reduces storage by removing redundancy

Overlapping Imagery

Maintain information

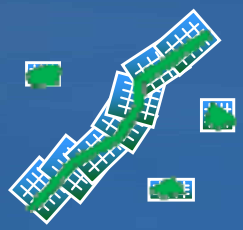
Multi-resolution Data

No need to sample up or down



Disparate Datasets

Handle large NoData areas



Maintenance

Add imagery as required

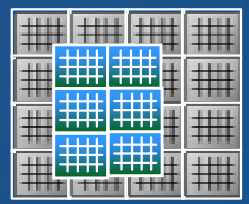


Image Quality

Reduces resampling

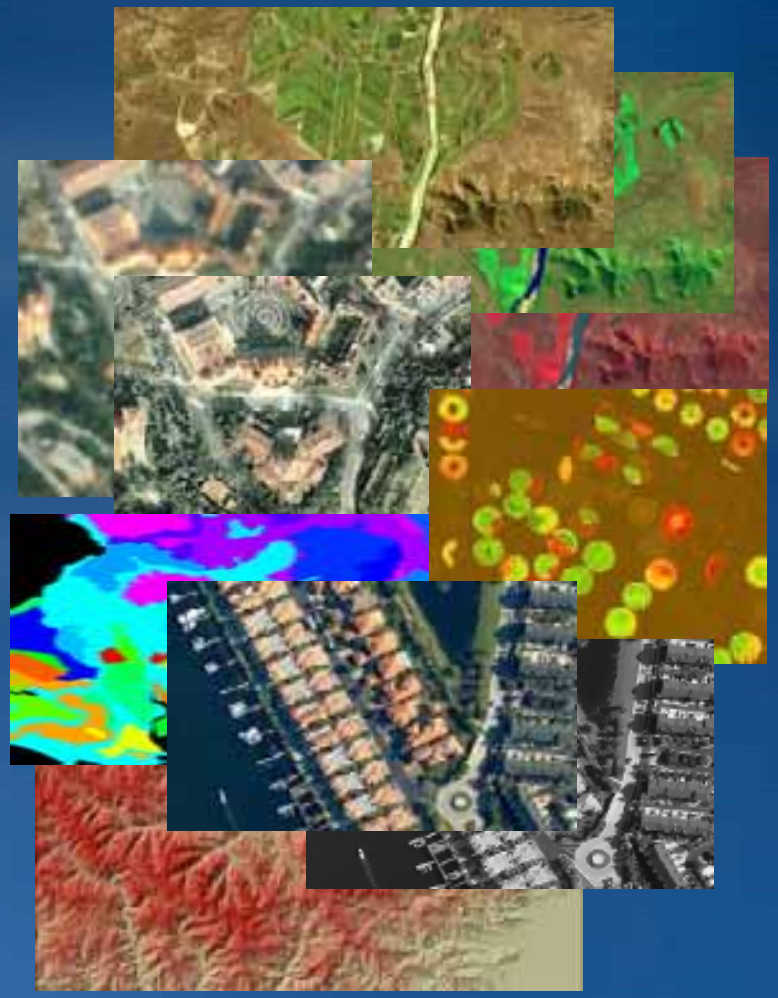
Maintain Metadata

Valuable information

On-The-Fly Processing

Create Multiple Products from a Single Source

- Define Processing functions as part of Mosaic Dataset
- Imagery Processed as Accessed
- Processes
  - Orthorectify
  - PanSharpen
  - Extract Bands
  - Vegetation Index
  - Classify
  - Shaded Relief
  - Crop to Footprint
  - Enhance
  - Color Correction
  - ...

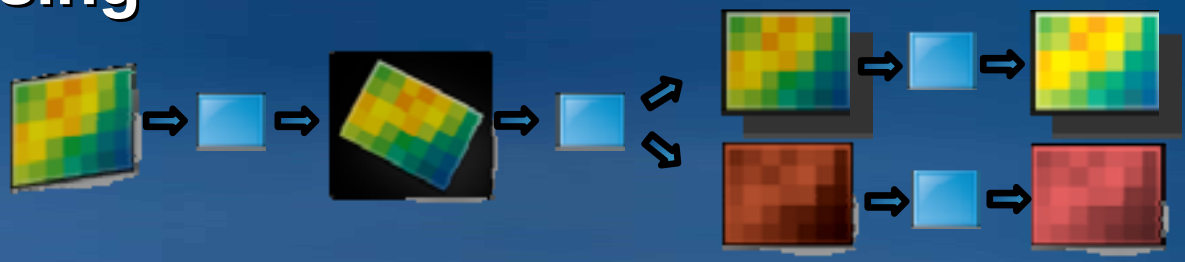


Utilize the image information content

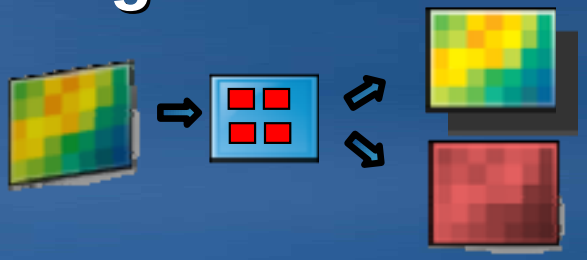
On-The-Fly Processing

Resolves Issues with Traditional Image Processing

- Traditional Processing



- On-The-Fly Processing



- Resolves:
  - Processing time
  - Multiple intermediate products
  - Additional storage
  - Loss of information
  - Difficulty making changes or maintenance
  - High risk of delays

Patterns to Manage Imagery

Generally want to minimize number of Mosaic Datasets

- **Simple Collection**

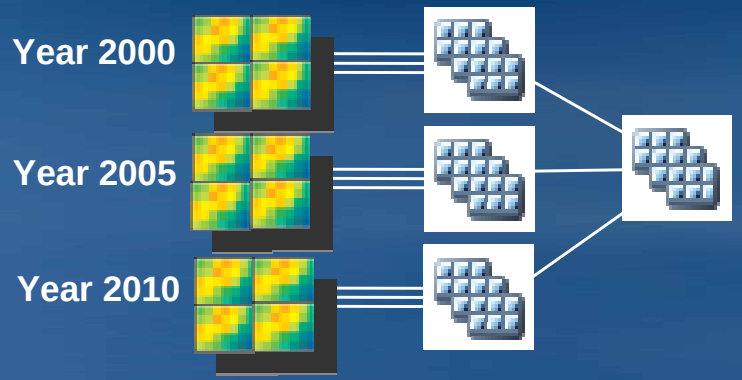
Multiple
-Files
-Format
-Projections

Patterns to Manage Imagery

Generally want to minimize number of Mosaic Datasets

- **Simple Collection**

- **Cascaded Mosaic**



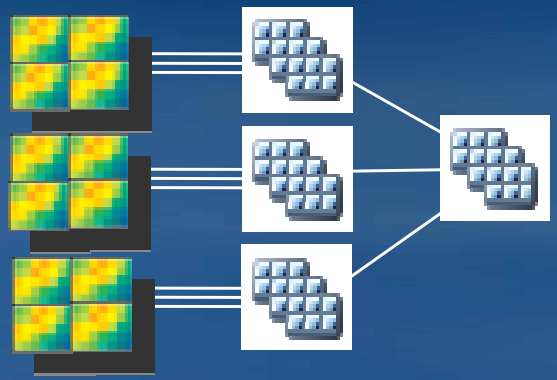
Consider each Mosaic as a RasterDataset

Patterns to Manage Imagery

Generally want to minimize number of Mosaic Datasets

- **Simple Collection**

- **Cascaded Mosaic**



- **Multi-Source Collection**

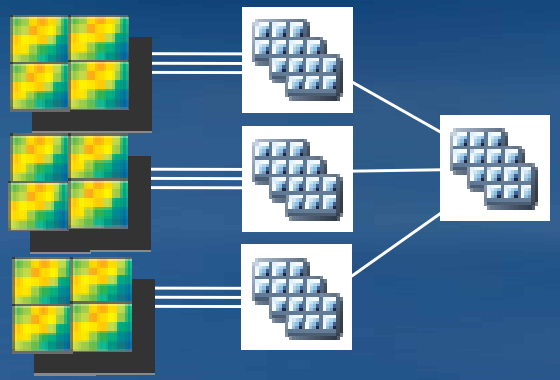
Single Mosaic of many Sources

Patterns to Manage Imagery

Generally want to minimize number of Mosaic Datasets

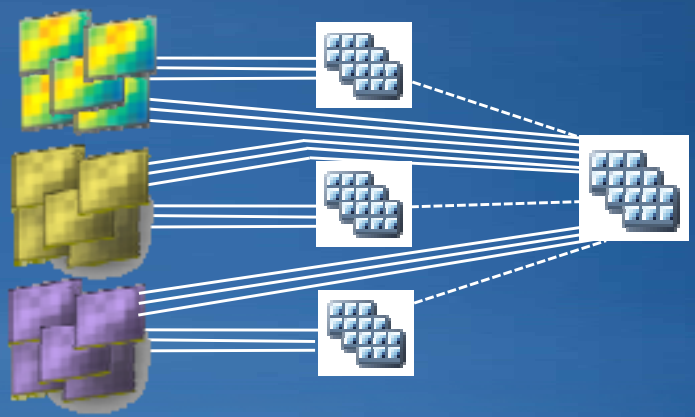
- **Simple Collection**

- **Cascaded Mosaic**



- **Multi-Source Collection**

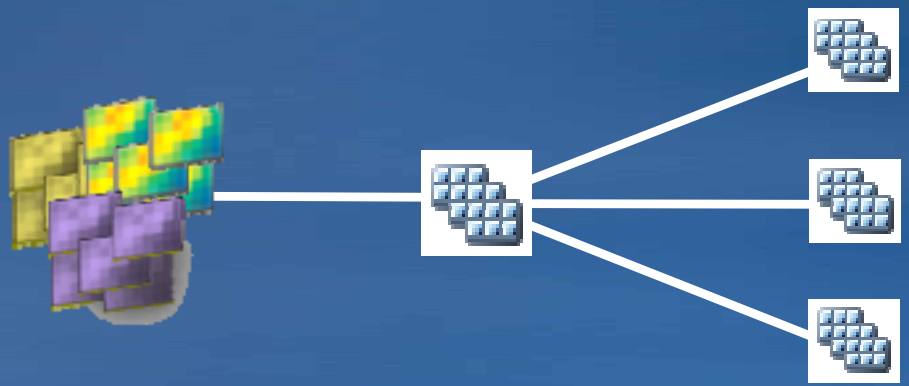
- **Merged Mosaics**



Mosaic of Mosaics, each managed separately

Reference Mosaics

- Mosaics derived from Mosaics
  - Additional processes
  - Queries
  - Properties
- Simplify derived product
- Reduces redundancy



Add NDVI Process

Where Sensor = QuickBird

Where Sensor = Landsat
and Cloud <10%
and Intersect with Spain

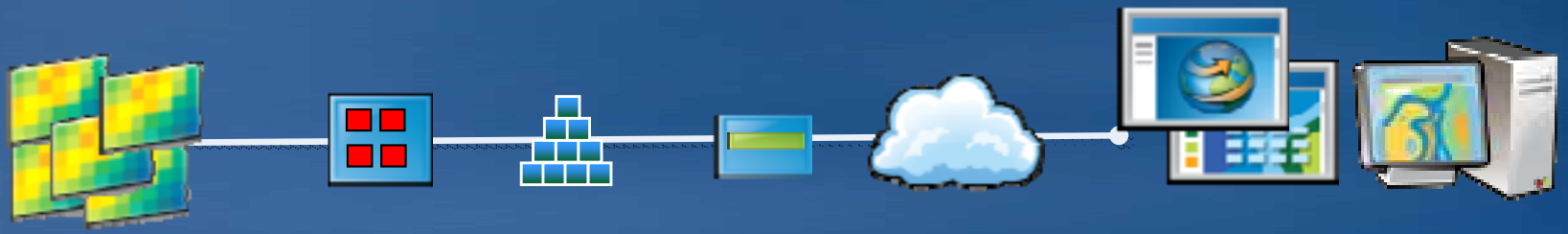
Dissemination

Providing Image Accessibility

Three Patterns for Image Access

Direct

Static



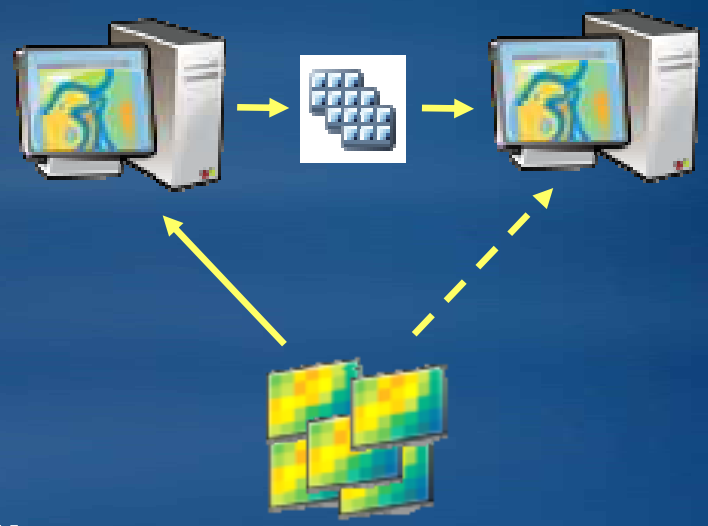
Dynamic

ArcGIS is unique in providing all three

Direct Access to Imagery

Traditional Workstation Access

- Raster Datasets
  - Nearly all image formats
    - TIF, IMG, NITF, JPEG2000, ...
- Raster Types
  - Common Imagery Sensors
    - QuickBird, Ikonos, SPOT, Aerial Frame, …
- Mosaic Dataset
  - References to rasters, metadata and processing



Static Web Services

Imagery Optimized for Web Delivery

- Map Cache
  - Most scalable web delivery
  - Created and served using ArcGIS Server
  - Can utilize Mosaic Datasets as the source
- Accessible
  - ArcMap
  - ArcGIS Explorer
  - WebAPIs/Mashups
- ArcGIS Online Provides
  - World Imagery
  - Ikonos 1m 700+ metro. Areas
  - User submitted content

www.argisonline.com

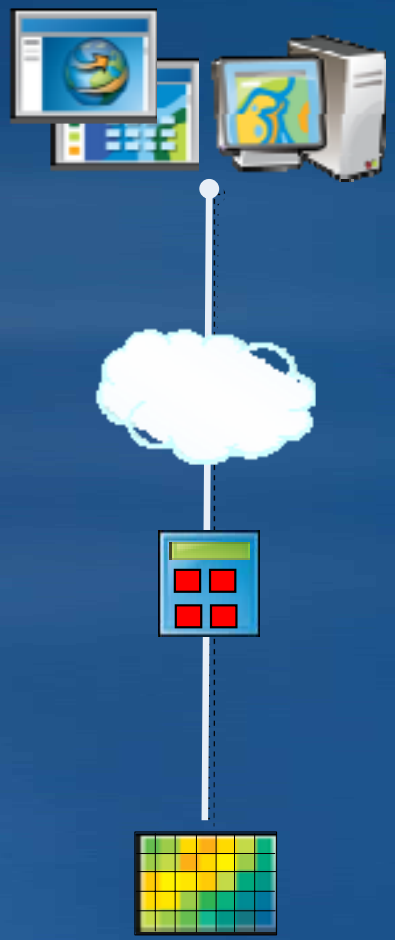
Imagery as a very fast background

ArcGIS Image Services

Extensive Web Based Image Functionality

- Dynamic Image Service
  - User defined projection and rendering
- Directly from source raster dataset
- Changeable Compression
- Return image or pixel values

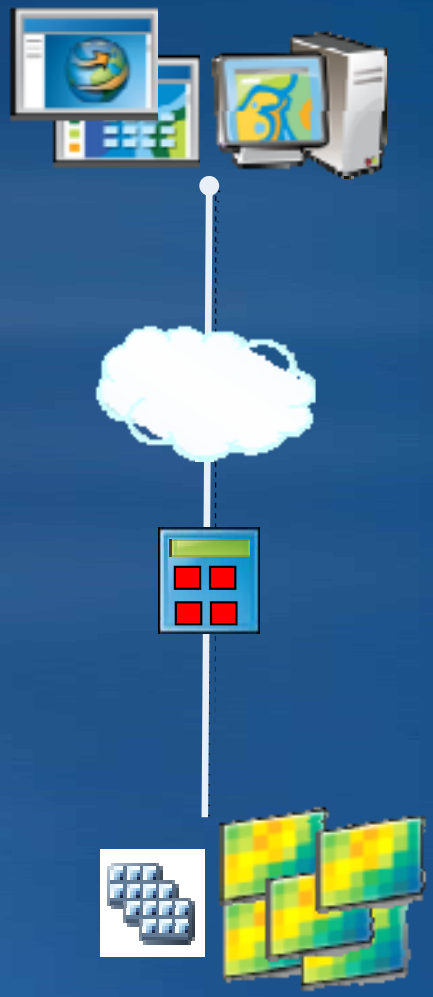
- Accessible
  - ArcMap
  - ArcGIS Explorer
  - WebAPIs (Silverlight, Flex, JavaScript)
  - OCG WMS, WCS, KML
  - 3rd Party Applications



ArcGIS Server Image Extension

Serving Large Imagery Collections

- Serve Mosaic Dataset
- Image Services Accessible as:
  - Image
    - Dynamic Mosaicking
    - On-the-fly processing
    - Identify
    - Export
  - Catalog
    - Query
    - Selection
    - Download, with clipping



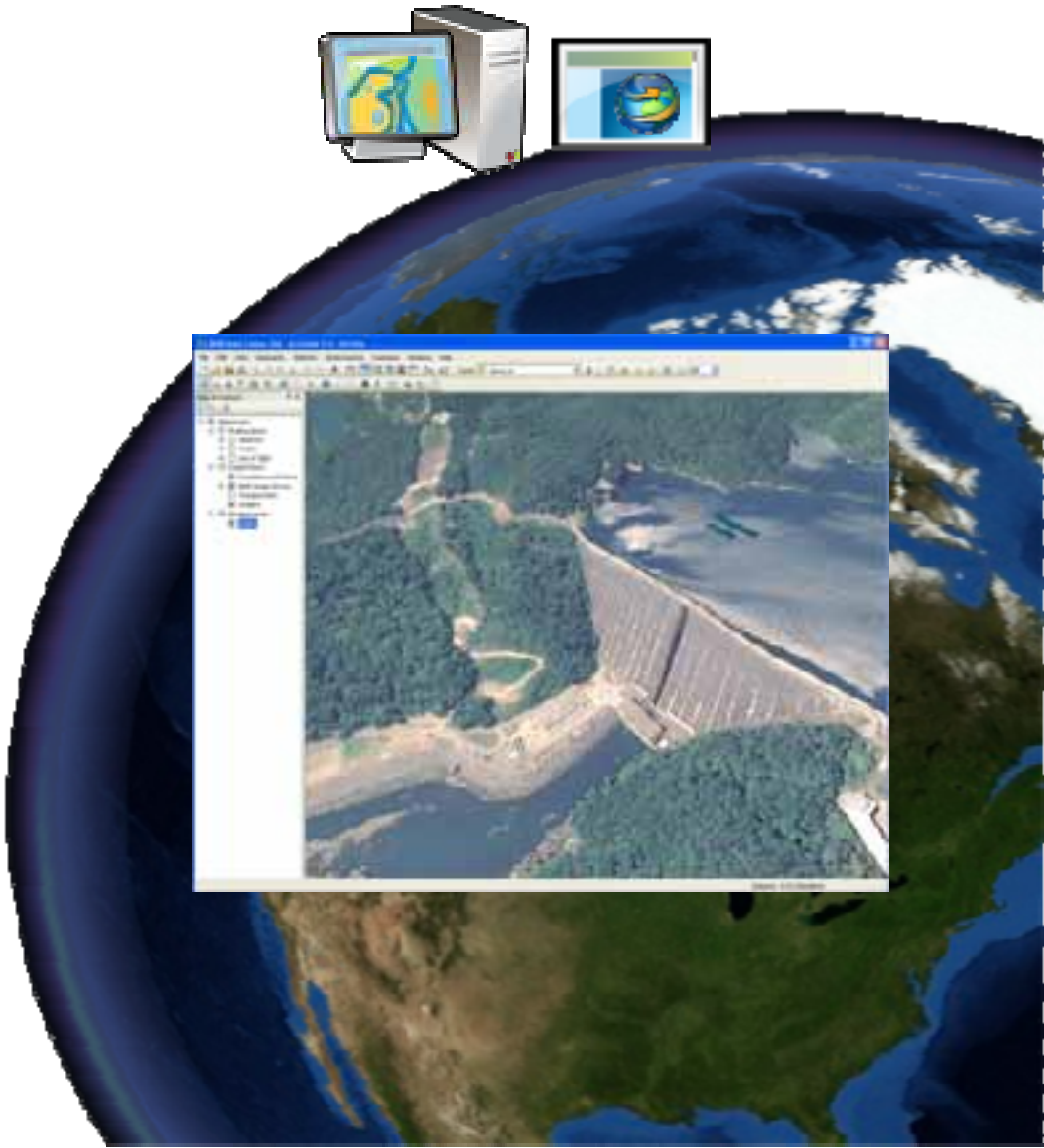
Demo – Image Dissemination

Visualization

ArcGIS - For Image Visualization

Better Interpretation and Understanding of Imagery

- Quick Access
- Improved Quality
- Fast / Accelerated Display
- Image Enhancement
- Multiple Applications
  - ArcGIS Desktop
  - ArcGIS Explorer
  - Web APIs
  - 3rd Party Applications



Demo – Image Visualization

Analyze

ArcGIS – For Image Analysis

Exploiting the Value of Imagery

- Search and Discovery
  - Query for imagery
- Image Analysis Window
  - Enhancement
  - Interpretation
  - On-The-Fly Processing
- Image Classification Tools
  - Traditional Image Classification

Demo – Image Analysis

ArcGIS – A Platform for Complete Imagery Solutions

Information Centric Workflows Enable Efficiency and Interoperability

- ESRI works closely with its Partners
- ArcGIS provides a platform
- Partners provide domain expertise

- Automated Feature Extraction
- Multispectral Analysis
- Hyperspectral Analysis
- Radar
- Specialized Sensor Support
- Stereo Display
- …

DigitalGlobe
GeoEye
Trimble (Applanix)
SPOT
RapidEye
Microsoft (Vexcel)
Pictometry

i-cubed
PCI Geomatics
Trimble (Inpho)
MDA Federal

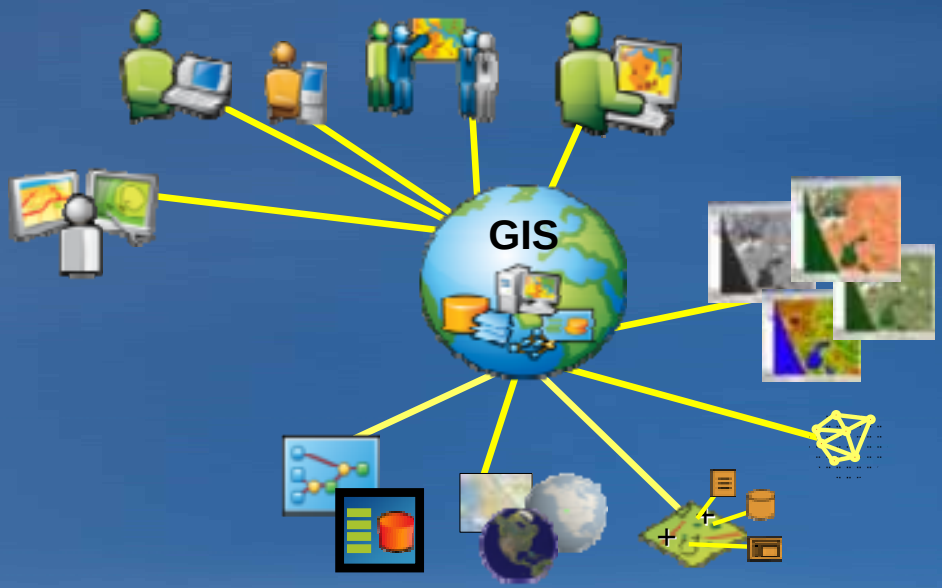
ITT VIS
BAE SYSTEMS
Overwatch

DAT/EM
PurVIEW
Qcoherent
Definiens

ArcGIS

The Platform for Fully Integrated GIS and Imagery

- Integrating Imagery as core to GIS
- Management, Dissemination, Visualization and Analysis
- Solution for wide range of user requirements
- Maximizes the value of imagery



Other Imagery Specific Technical Workshops at FedUC

- ArcGIS Image Services and the Image Extension – Friday 8:30 – 10:00, Room150A
- Image Services for Elevation Data – Friday 10:30 – Noon, Room150A

Learn More

http://www.esri.com/training

- Instructor-Led Training
  - Introduction to ArcGIS Server Image Extension
  - ArcGIS Server: Web Administration Using the Microsoft .NET Framework
- Free Web Training Seminar
  - Serving and Managing Imagery with ArcGIS

ESRI Training…keep critical skills up to date

Questions?

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