Esri Petroleum User Group Conference

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Image Management, Access, and Use in ArcGIS

Cody Benkelman

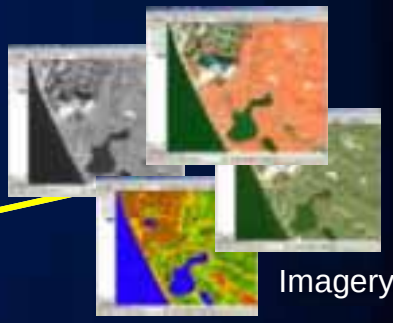
esri

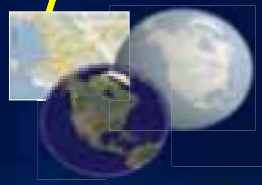
OUTLINE

- Introduction
  - ArcGIS 10 – overview and capabilities
- Managing Image Data
  - Mosaic Dataset
  - Typical usage modes and standardized workflows
- Disseminating (Accessing) Image Data
- Using Image Data
  - Visualization and Analysis
- Elevation Data (Examples)
  - Raster, Terrain, and LiDAR

Geospatial Information, Integrated & Accessible

- Geospatial workflows
- Actionable information & knowledge





Imagery is Core to GIS

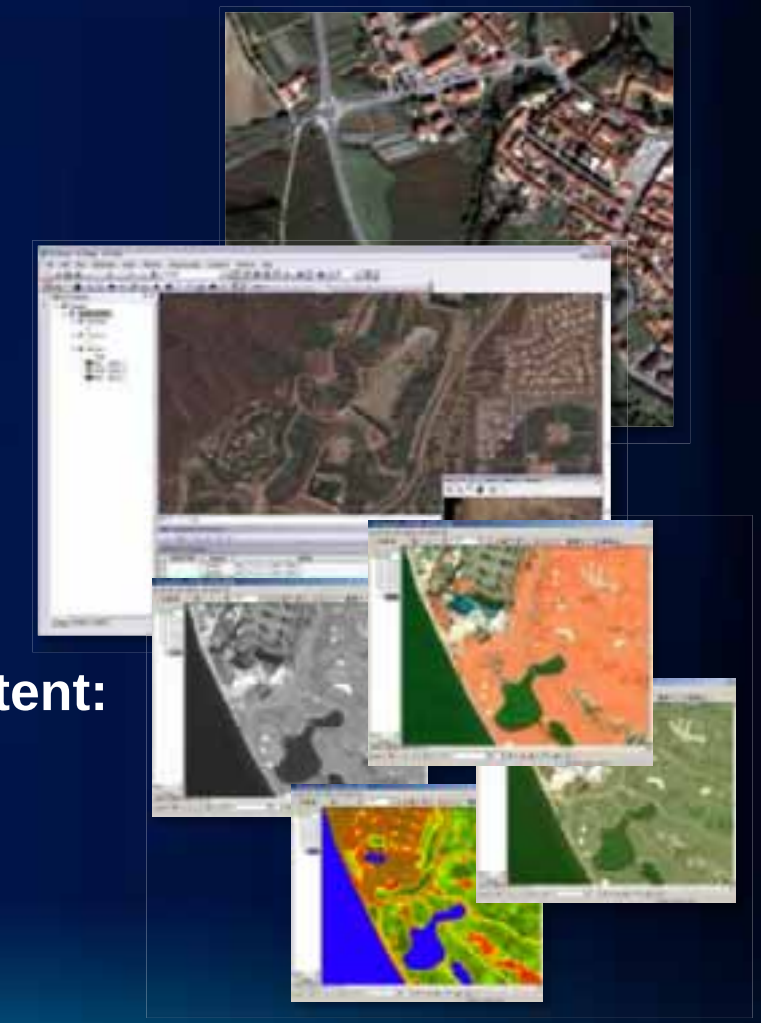
Users of Imagery

ArcGIS 10 — A Complete System

Easier
More Powerful
and Everywhere

ArcGIS – Maximizing the Value of Imagery

- **Providing Image Accessibility:**
  - Timely
  - Quickly
  - Accurately
  - Collectively
  - Simply
- **Exploiting Rich Information Content:**
  - Resolution
  - Temporal change
  - Spectral range
  - Dynamic range



Elements of a Complete GIS

- Content
  - Base data provided by ESRI
- Management
  - Storing, Organizing and Structuring
- Dissemination
  - Accessibility to data, information and knowledge
- Visualization
  - Interpretability and human understanding
- Analysis
  - Gain knowledge to make informed decisions

Content

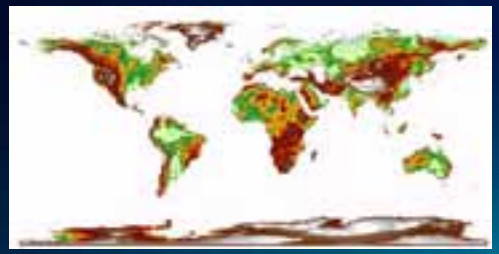
ArcGIS Online (www.ArcGIS.com)

Content

Providing Base Data

- **Worldwide Imagery at 15m Resolution**
- **United States Imagery 1m or better**
- **Community Map Program**
- **International .. expanding**
- **Landsat GLS**

- **Next - World Elevation**



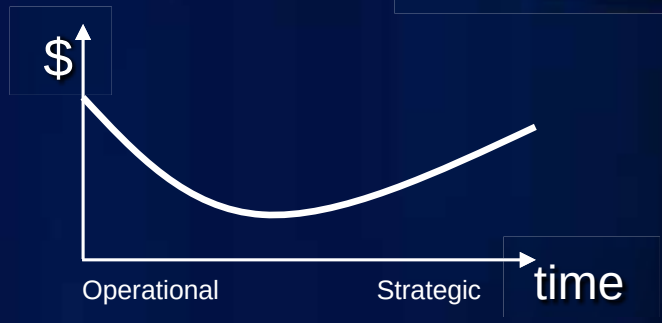
Managing Image Data

Storing, Organizing and Structuring

Three Differentiators of Imagery

- **Volume:**
  - Magnitudes larger than other data

- **Value:**
  - High operational value
  - High strategic value

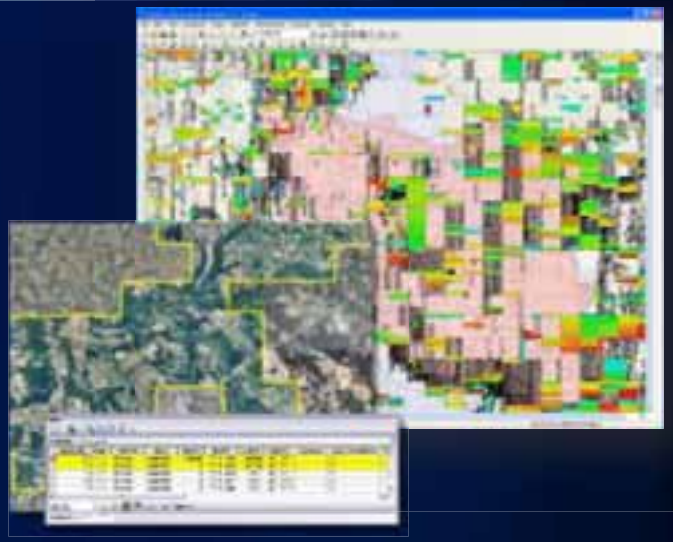


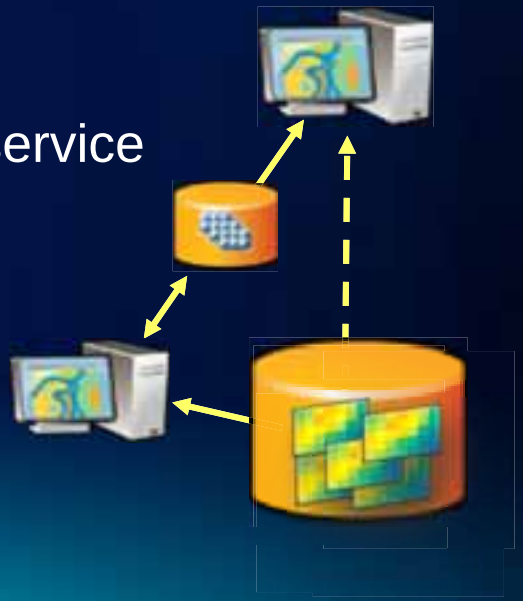
- **Fixed:**
  - A snapshot in time

Mosaic Dataset

Optimum Model for Image Data Management

- Quickly Catalog
  - All raster datasets
  - Imagery from different sensors
- Define – In Geodatabase
  - Metadata
  - Processing to be applied
  - Default viewing rules
- Access – Any ArcGIS application or as service
  - As Image
    - Dynamic Mosaic , Processed on the fly
  - As Catalog
    - Footprints, Detailed metadata





Mosaic Datasets

- **For the Image Manager**
  - Author with ArcGIS Desktop (Editor/Info)
  - Manage multiple collections, sources
  - Easily add / subtract and make available imagery
  - Shorten the time from sensor to use
  - Avoid data duplication

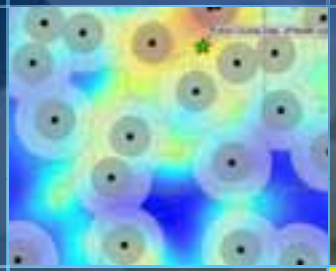
Mosaic Datasets

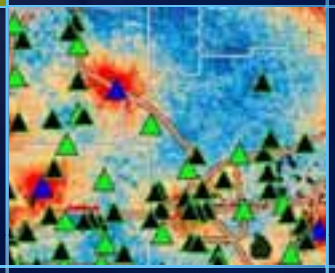
As replacement for ISDef, Raster Catalog

- Improvement over Image Service Definition (ISDef)
  - Massive scalability
  - No compile
  - NoData support
  - No extension required
  - Geoprocessing tools for authoring

- Improvement over Raster Catalogs
  - Raster Types
  - Define functions for On-the-fly processing
  - Dynamic Mosaicking
  - Overviews

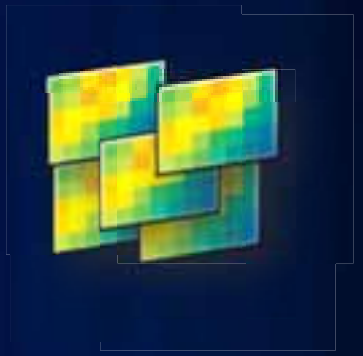
Demo: Image Management





Dynamic Mosaicking

Mosaicking Multiple Images On Demand

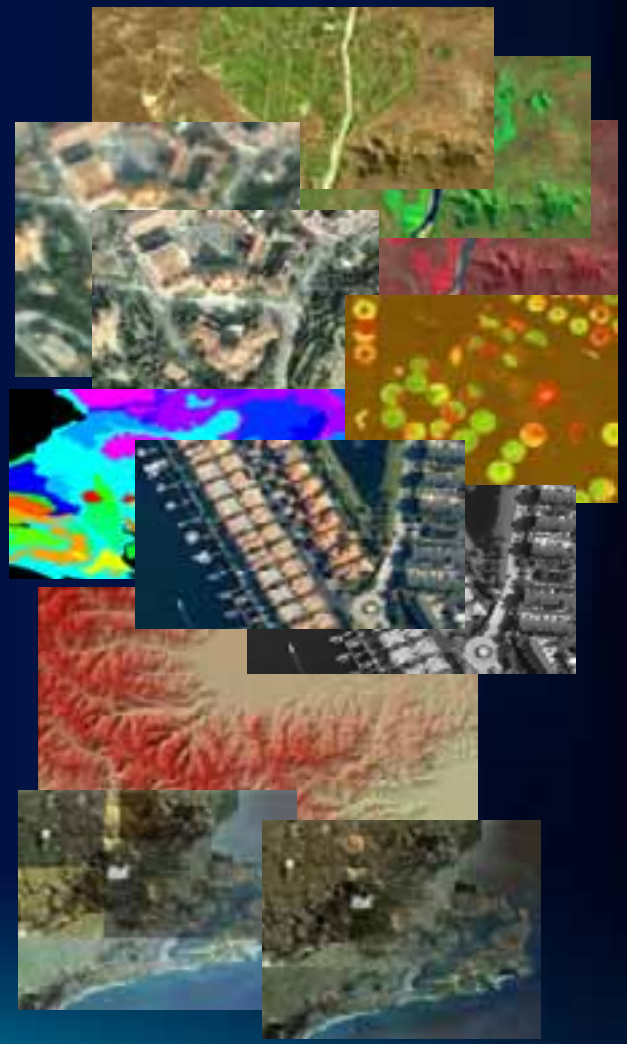


- Fuse imagery from multiple sources
- User control of Mosaic Method
  - By Date –'Latest', 'Closest to May 2001'
  - By Attribute – 'Highest Sun Angle'
  - By Viewpoint – North, South, East, West
  - Seamline – Feathered blend
- User Query – 'Landsat imagery, with no cloud, later than June 2001'
- Set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

On-The-Fly Processing

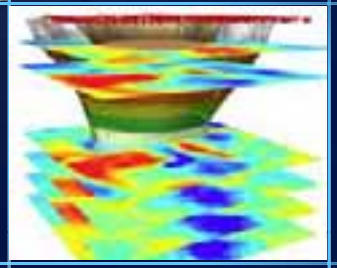
Create Multiple Products from a Single Source

- Imagery processed as accessed
- Processes
  - Stretch, Extract Bands
  - Clip, Mask
  - Reproject, Orthorectify
  - Pan Sharpen
  - Vegetation Index, Classify
  - Shaded Relief, Slope, Aspect
  - Color Correction
- Applied to
  - Individual rasters in mosaic
  - Compete Mosaic Dataset



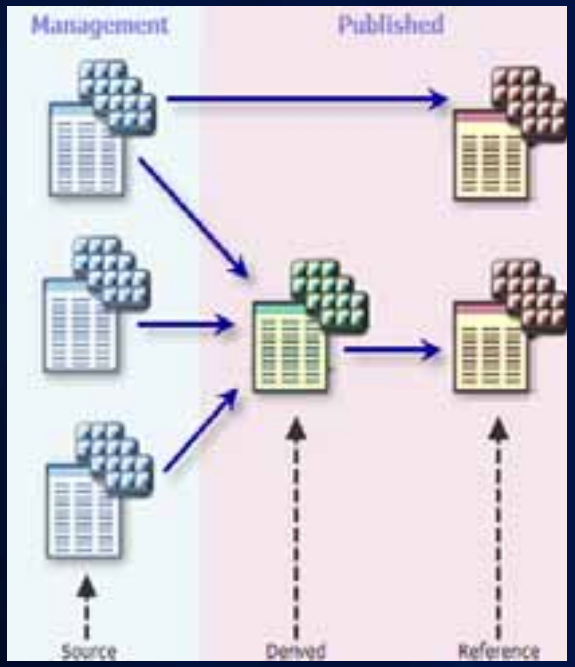
Utilizing the full image information content

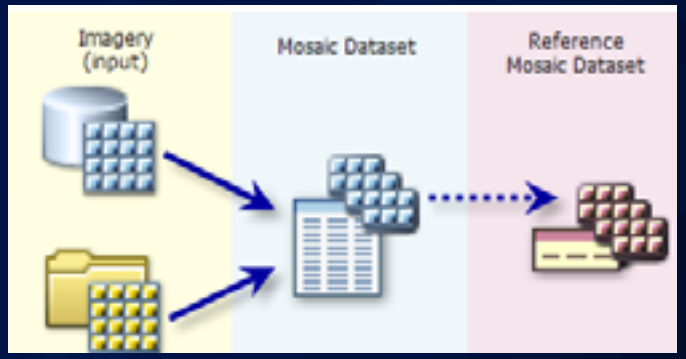
Demo: Image Management



Mosaic Datasets

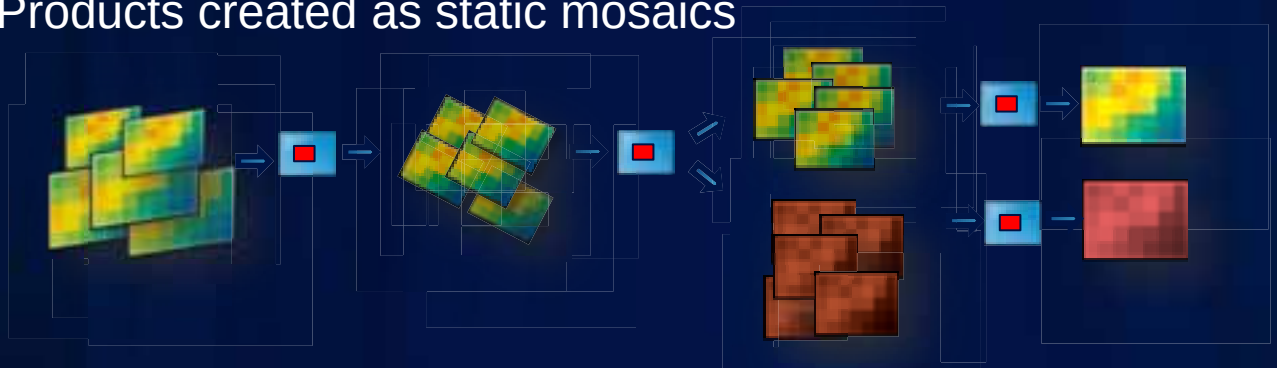
Hierarchical data management



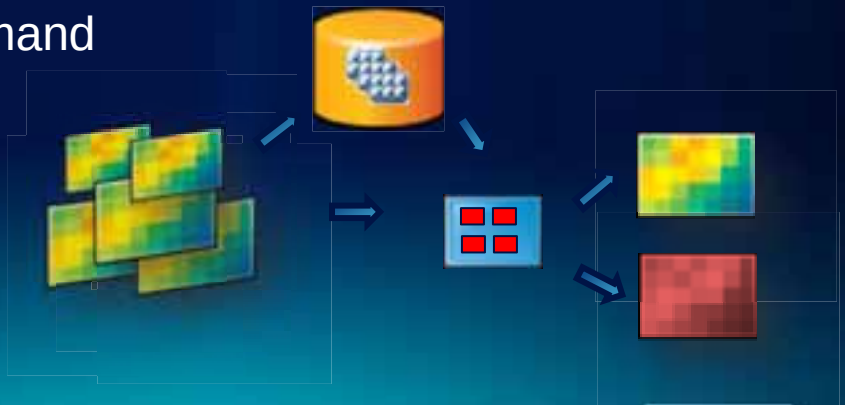


Enhancing Processing Methodologies

- Conventional Image Processing Workflows are Linear
  - Multiple processes create intermediate results
  - Products created as static mosaics



- Mosaic Datasets enable Transactional Workflows
  - Processes applied on demand
  - Products created on demand



Standardized workflows

Motivation for standard workflows

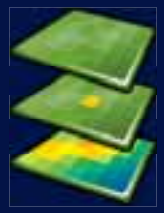
List of workflows

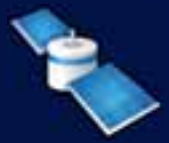
Other topics common to all workflows

Standard components of each workflow

Workflows and Common Requirements

- **Workflows**
  - Elevation Data
  - Preprocessed Orthos
  - High resolution satellite
  - Medium resolution satellite
  - Low resolution satellite



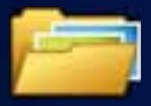


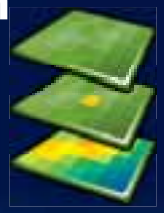
  - Aerial (standard frame) imagery
  - Historical Aerial Data
  - Oblique Aerial Data
  - Scanned Maps
  - Thematic Data
  - Browse Image

- **Common Requirements**
  - Imagery and Raster Formats
  - Caching imagery
  - Storage and HW architecture
  - Cataloguing and Data Discovery

Workflow – Standardized Outline

- Usage
- Requirements
- Services and layers
- Data Sources
- Data Structures
- Metadata
- Pre-Processing
- Mosaic Dataset Design
- Data Ingest
- NoData
- Mosaic Dataset Properties





- Overviews
- Reference Mosaic Datasets
- Refine Geometry & Radiometry
- Seamline Generation
- Variations
- Optimization
- Publishing
- Maintenance
- Applications
- Appendix

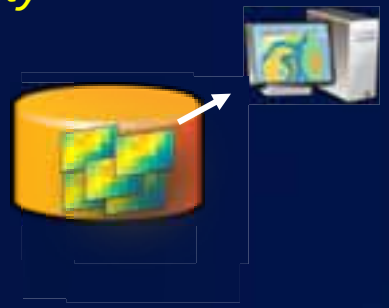
Dissemination

Accessability

Image Accessibility

Providing Image Accessibility

- Direct Access
  - Raster
  - Mosaic Dataset



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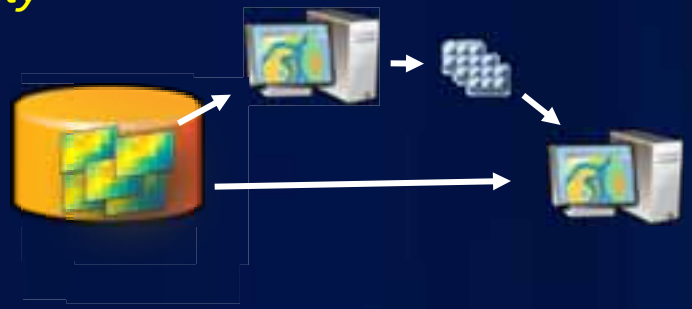

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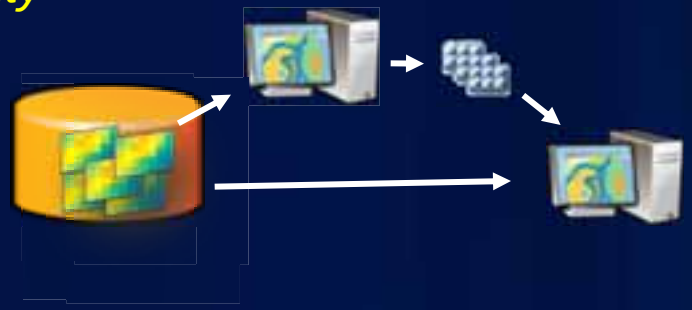
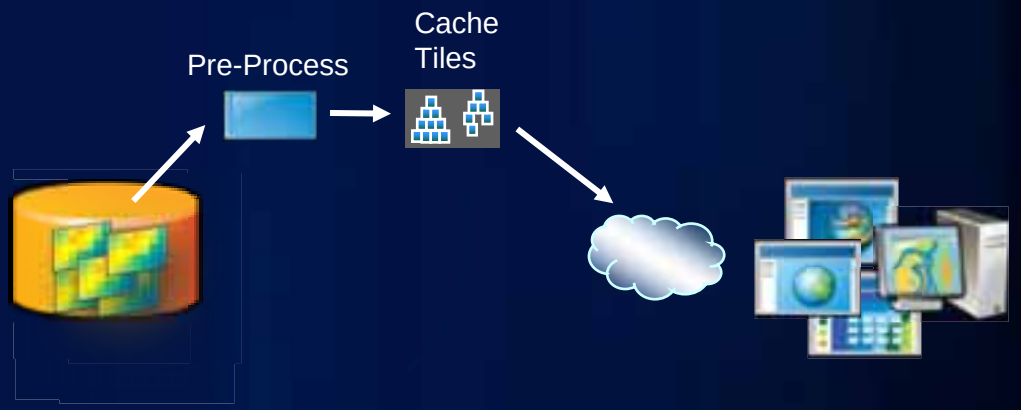


- Static Web Services
  - Map Cache



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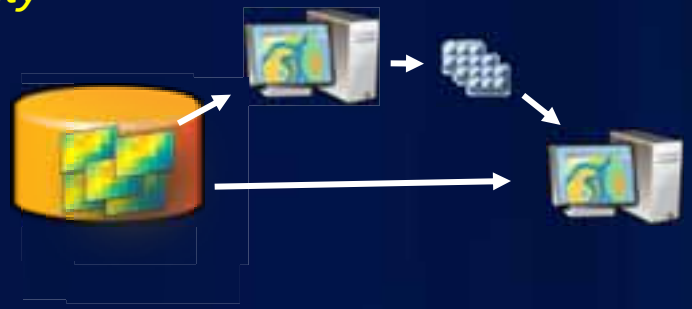

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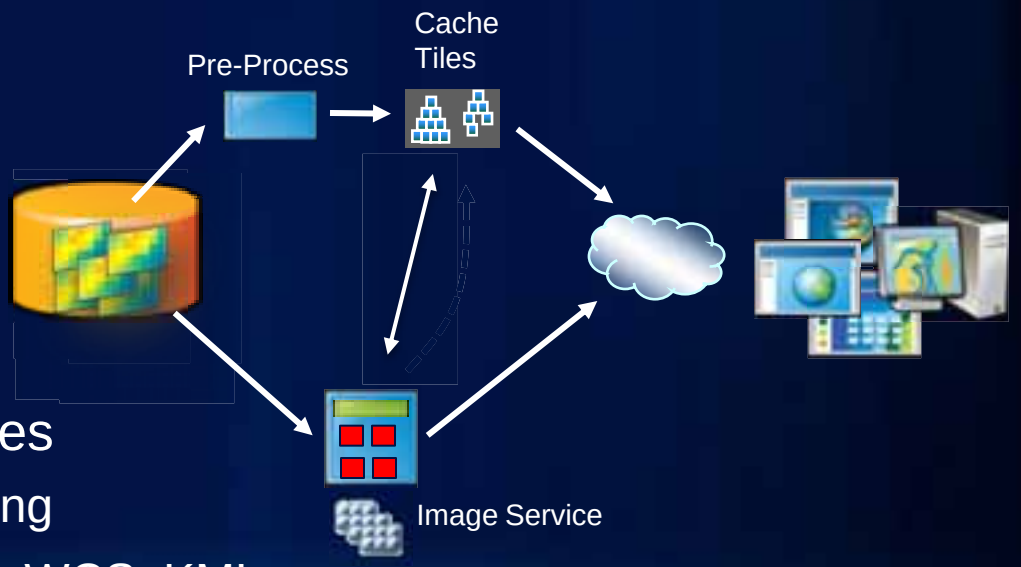
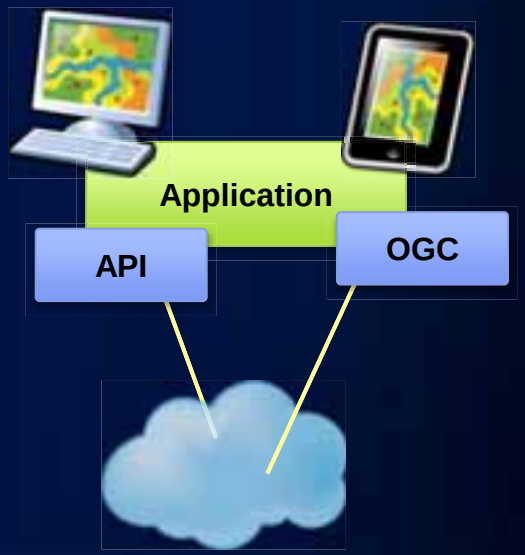


- Dynamic Image Services
  - Server based processing
  - Image Services, WMS, WCS, KML
  - SOAP, REST interfaces

ArcGIS provides image accessibility

Image Service Client Applications

- ArcGIS Desktop
- ArcGIS Explorer
- 3rd Party Apps – Microstation, AutoCAD
- OGC Standards – WMS, WCS, KML
- Enhanced Web APIs
  - SOAP, REST
    - Service Description
    - Mosaic Methods
    - Sampling Method
    - Changeable compression
    - Query – Where ..
    - Identify – Feature, Pixel Size,…
    - Export, Download



Using Image Data

Visualization and Analysis

Mosaic Datasets

- **For the user**
  - Provide search and discovery
  - Collections of imagery behave as one data element
  - Define and access “best imagery”
  - Dynamically order my imagery
  - An improved user experience

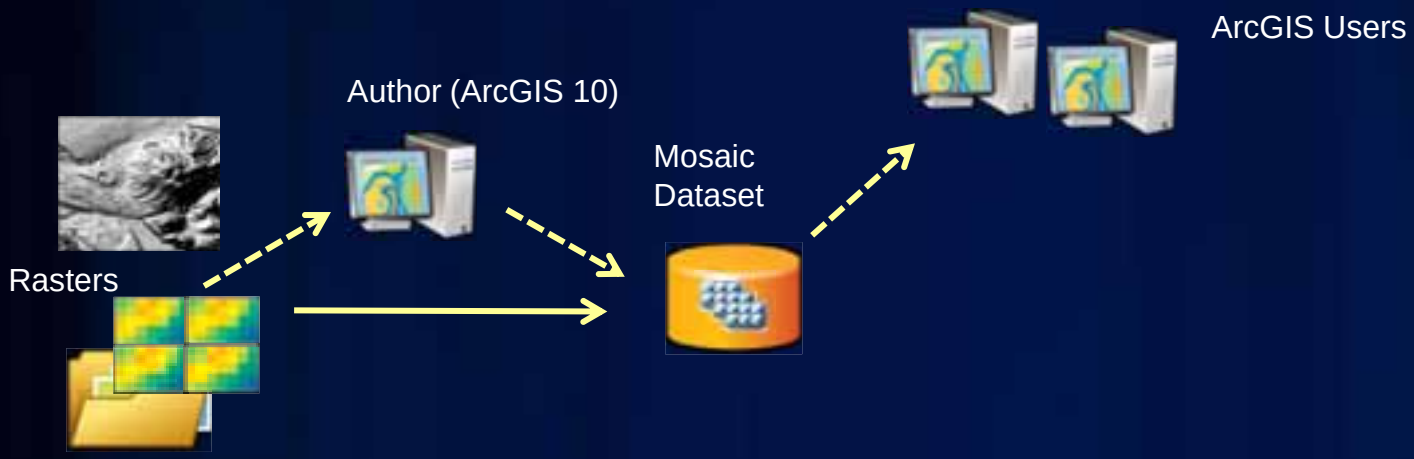
Primary modes of usage

Mode 1: Visualization **$**

Mode 2: Authored analysis (Repetitive Application) **$$**

Mode 3: Unique and/or site-specific analysis **$$$**

Optimizing services according to usage mode



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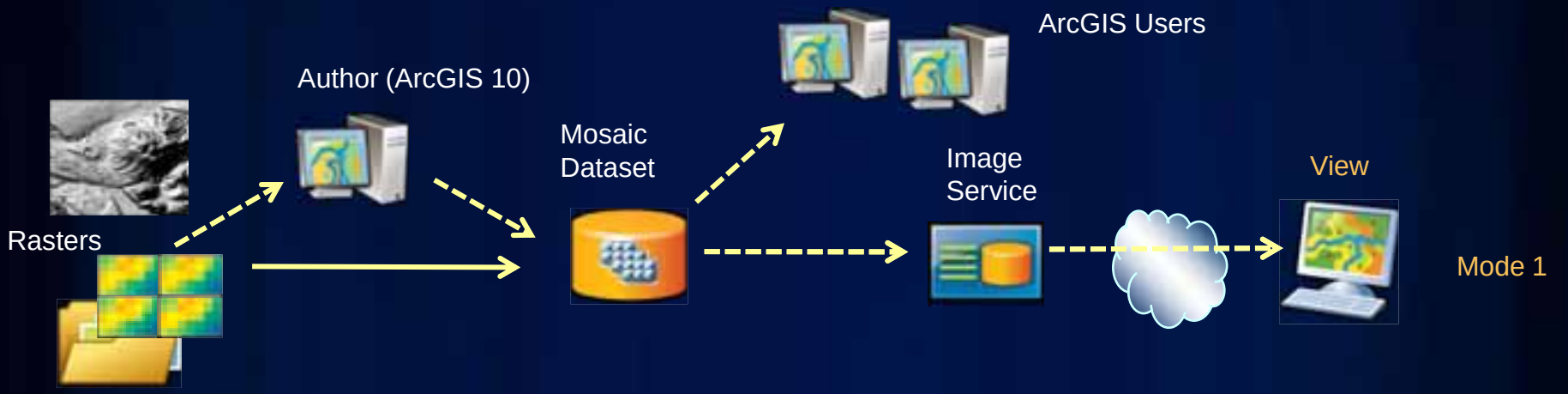

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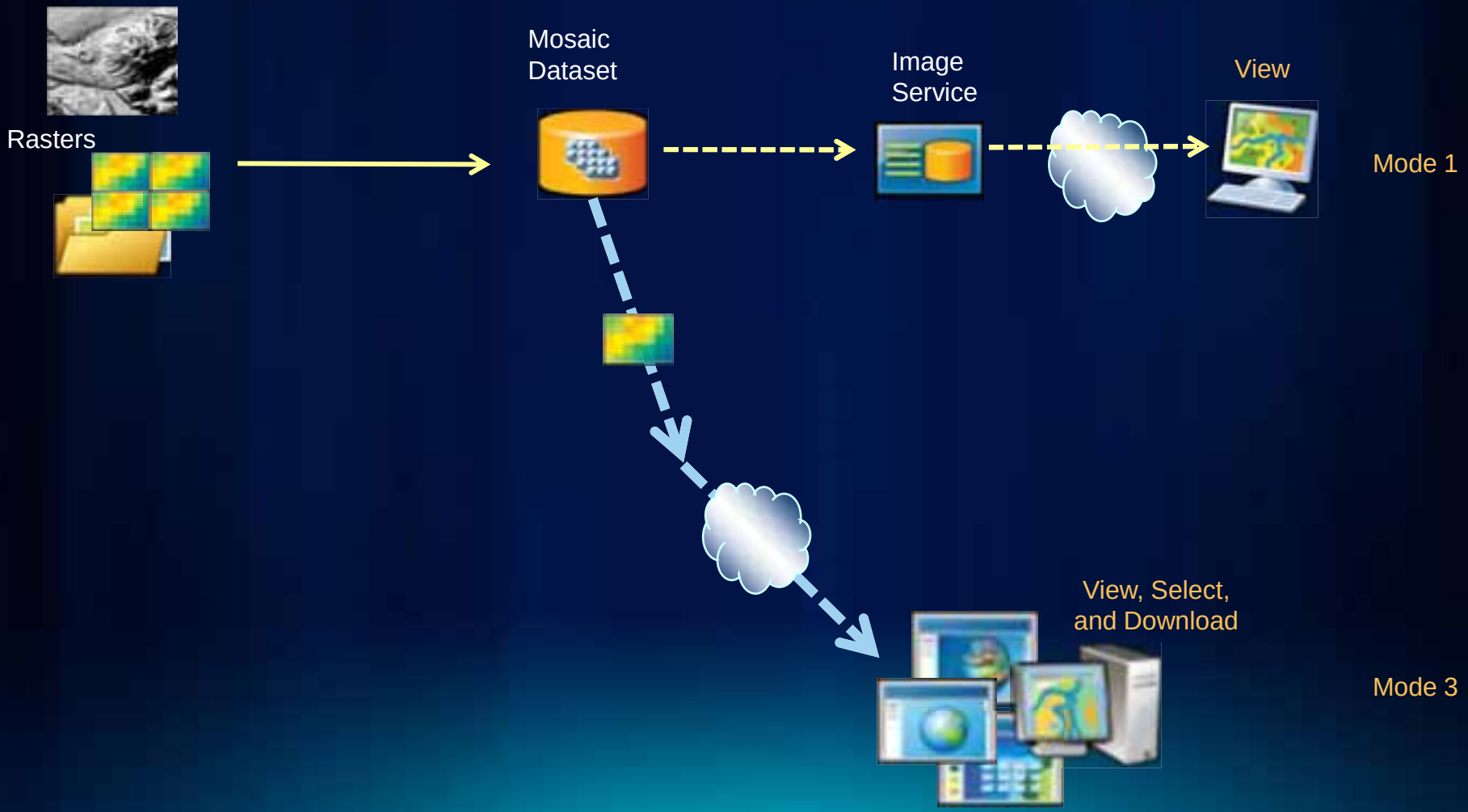

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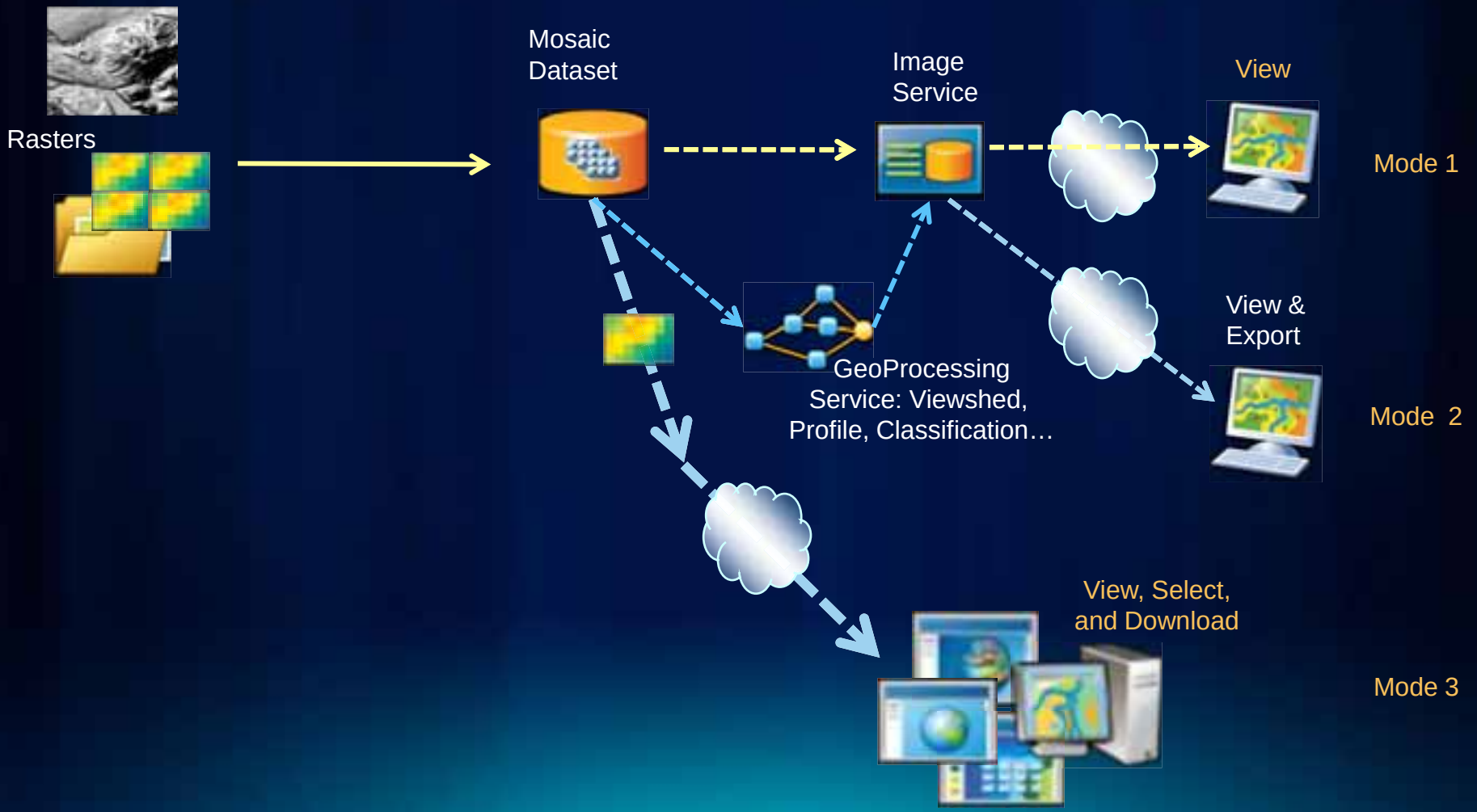

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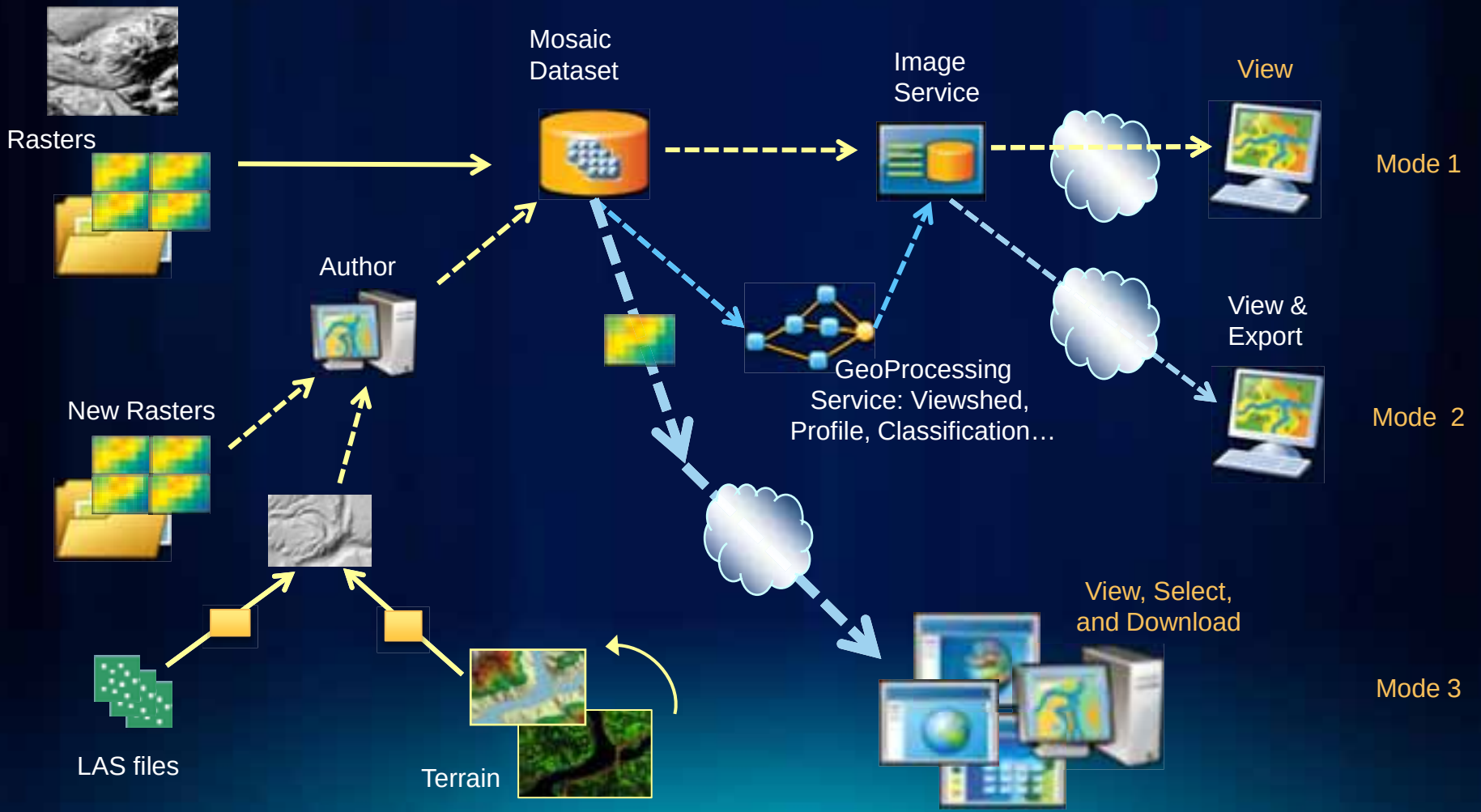


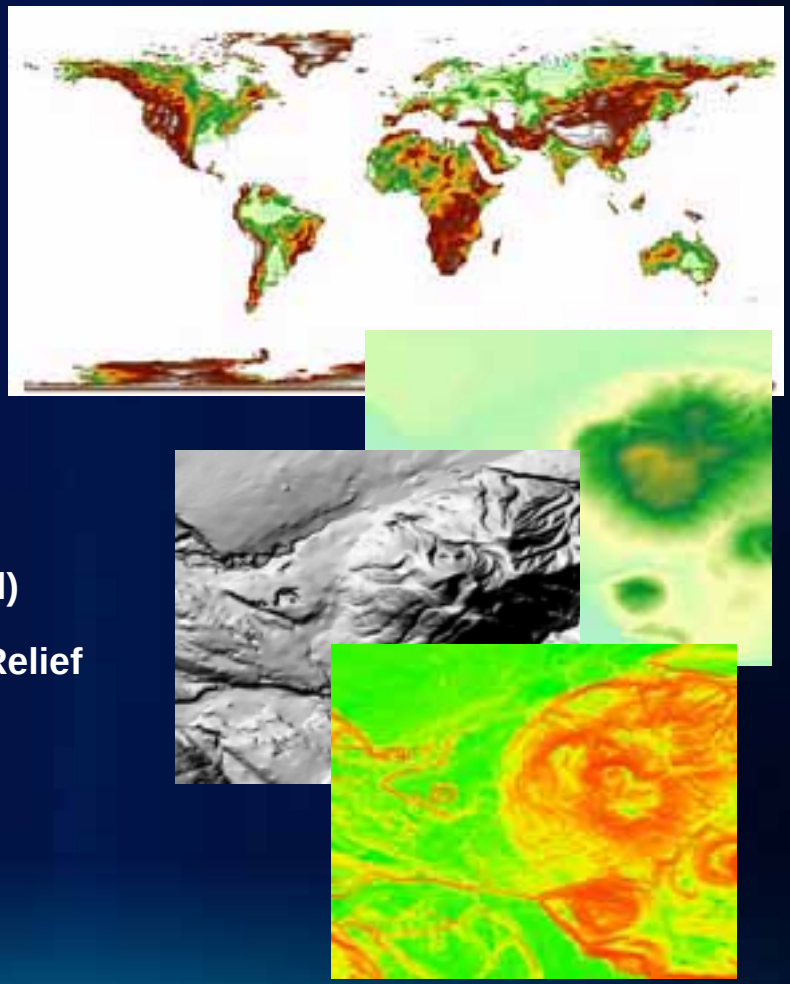
Elevation Data

Raster, LiDAR, and Terrain

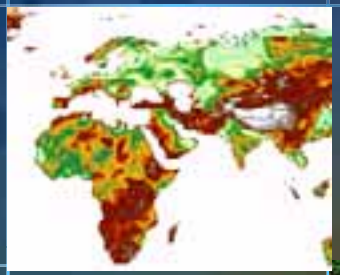
Example: World Elevation

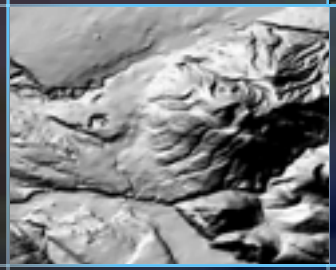
Elevation for the complete globe

- **Multi Source**
  - **GTOPO, SRTM,**
  - **USGS NED (1 and 1/3 arcsecond)**
  - **Lidar for sample areas**
  - **EGM2008 Geoid model**
- **Services**
  - **Elevation (Orthometric & Ellipsoidal)**
  - **Hill Shade, Slope, Aspect, Shaded Relief**
- **Tasks**
  - **Profile, Viewshed, Contour**



Demo: World Elevation Service





Summary

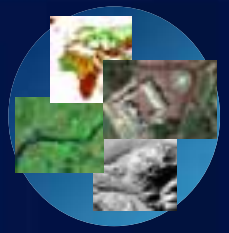
ArcGIS – A Platform for Complete Imagery Solutions

- ArcGIS provides a Platform

- Partners provide Domain Expertise
  - Sensor platforms and data sources
  - Advanced Processing & Analysis
  - Advanced Interfaces
  - Systems Integration
  - Applications / Solutions

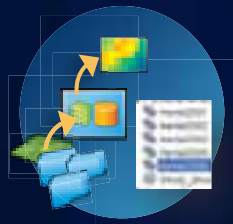
ArcGIS with Imagery

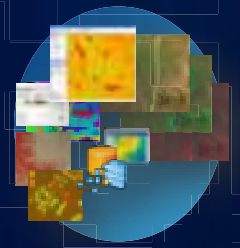
- Imagery is Core to GIS



- ArcGIS Enables the:

  Management, Dissemination, Visualization and Analysis



  of all forms of imagery

- Maximizing the Value of Imagery
- Mosaic Datasets are the optimum model of managing and serving imagery and rasters
- Platform for complete Imagery Solutions

Cody Benkelman, cbenkelman@esri.com