



**Esri | California • Hawaii • Nevada**  
**Regional User Group Conference**

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# **Imagery Across the ArcGIS Platform**

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# Agenda

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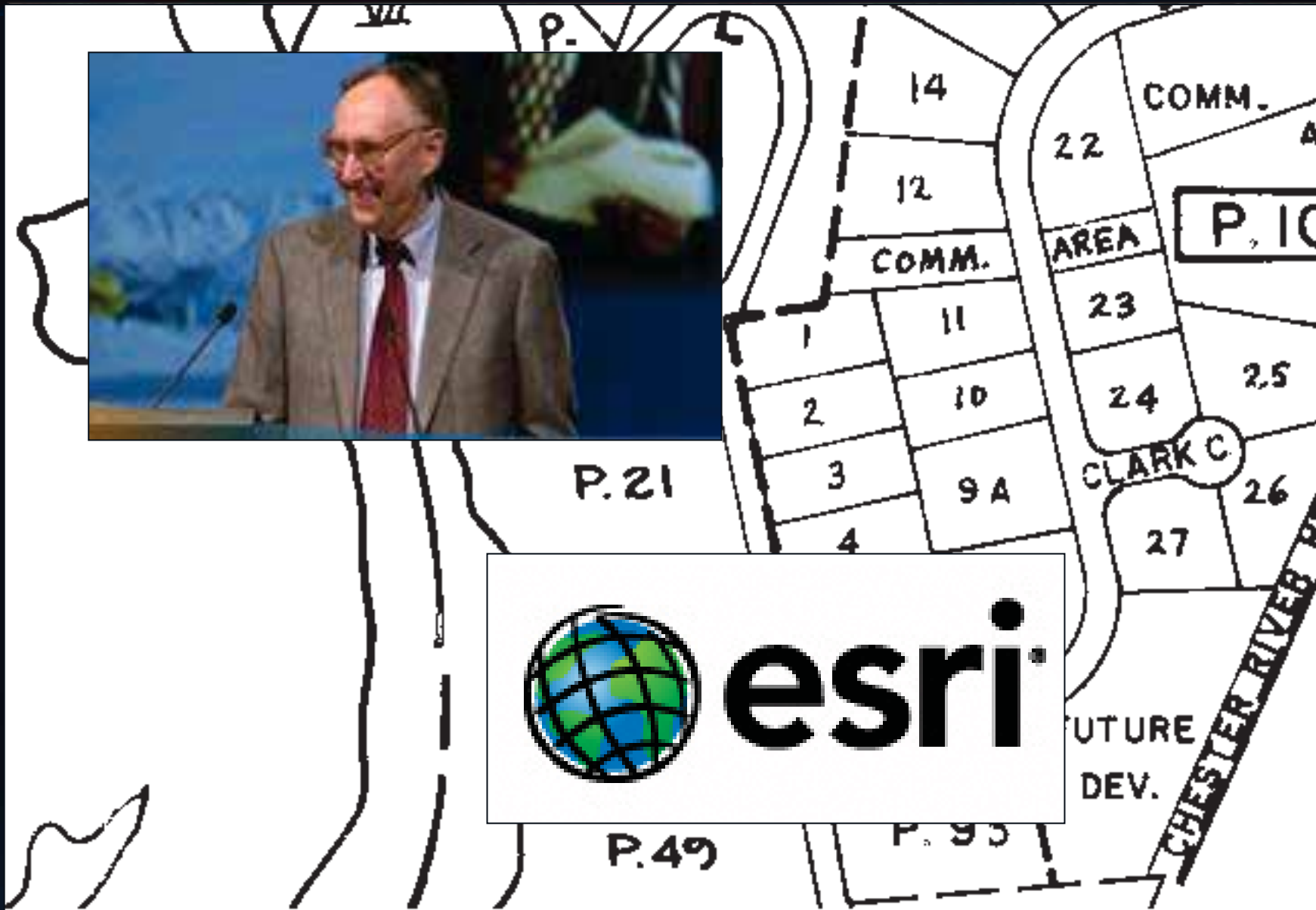
- **How imagery is used in GIS**
- **Imagery management**
  - **Visualization and analysis**
- **Disseminating imagery**
- **Implementation scenarios**
- **Steps to success**
- **Resources**

# ArcGIS 10 — A Complete System

Easier  
More Powerful  
and Everywhere



# What is “imagery” in GIS?

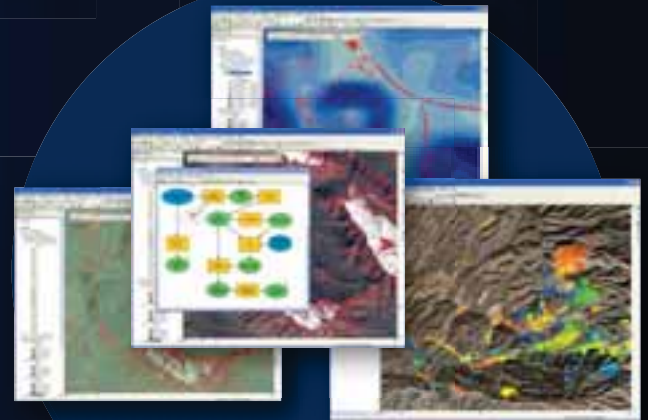


# GIS Professionals Use Imagery in Many Ways



Data Management

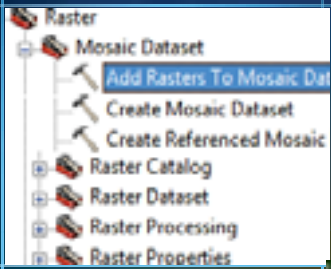
As Basemaps



In Performing Complex Analysis

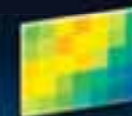
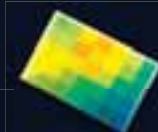
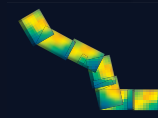
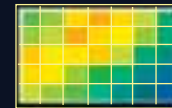
*Imagery is core to ArcGIS*

# Managing imagery data



# Imagery Management Challenges

- **Many sources**
  - Aerial photographs
  - Satellite imagery from many sensors
  - DEM and scanned maps
  - Analytical data, pictures
- **High resolution and large volume**

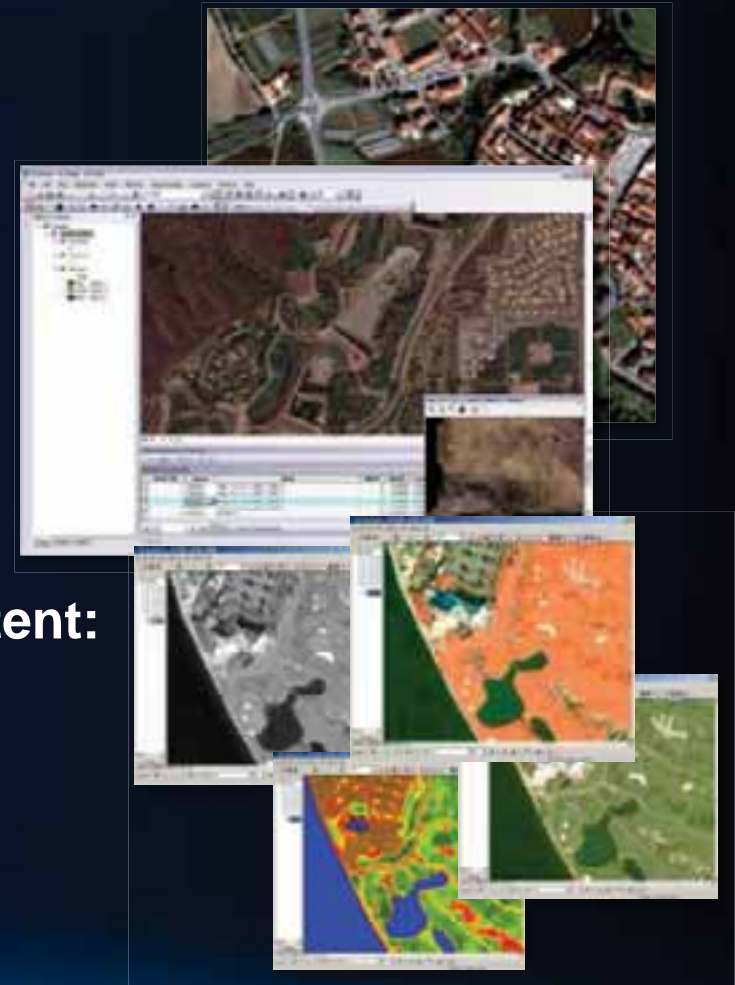


Procured as  
Background

Acquired for  
Analysis

# Goal: Maximize the Value of Imagery

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





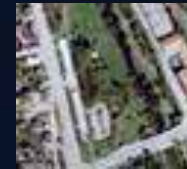
# Choosing Appropriate Software

## Considerations

- **Based on business workflows...**
  - **Do I need to serve just raster data? Maps? Tools?**
  - **What client applications should the solution support?**
  - **How often do my rasters get updated?**
  - **Is good quality raster data available as a service?**
- **...and IT capabilities:**
  - **What is my network bandwidth?**
  - **Does staff know IIS (Tomcat, etc.)? Do I have a DBA?**
  - **Will I need any custom development? Do I have programmers?**
  - **Will I do implementation in-house or will I hire a consultant?**

# Multiple storage formats through releases

- **Raster dataset (8.0)**
  - A single image
- **Raster catalog (9.0)**
  - A collection of raster datasets
- **Raster attribute (9.0)**
  - A table or feature class field containing picture attributes
- **Mosaic dataset (10.0)**
  - Enhanced raster catalog with on the fly processing capability

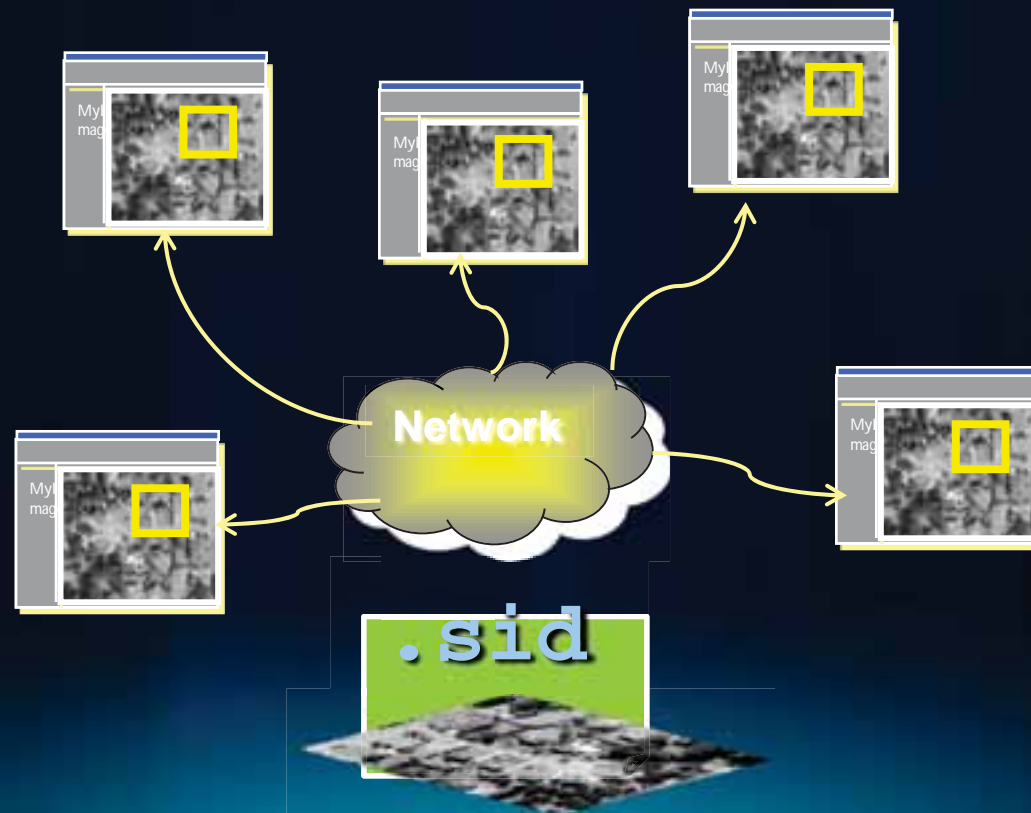


# Imagery storage options at ArcGIS 10

- **Options**
  - **Files on disk**
  - **ArcSDE geodatabase**
  - **Mosaic dataset**

# File Server

- Highly compressed data (.sid, .ecw, etc.)
- Commonly used in raster catalogs



# ArcGIS Server Basic Edition (ArcSDE)

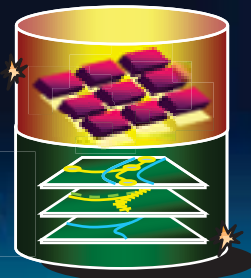
## Client Application



Network



Database



# Storing imagery in ArcSDE

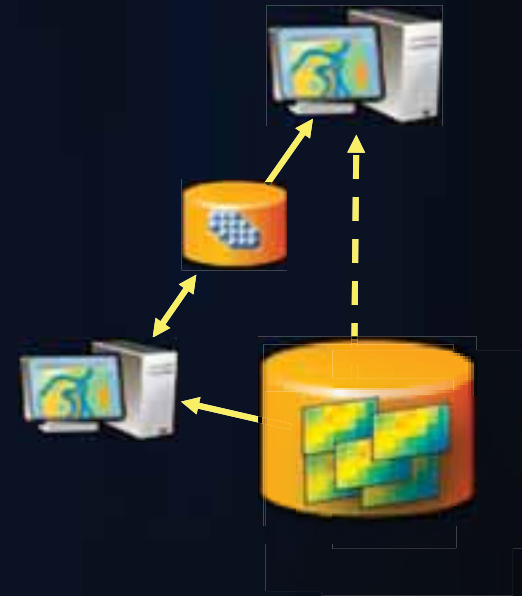
## Considerations

- Loading rasters into database takes **time**
- Duplicating data (original tiles and database)
- Provides exceptional security/scalability options
  - Options depend on specific RDBMS
- Using ArcSDE just for raster serving not recommended
  - Significant investment into infrastructure, software, and staff training

# Mosaic Dataset

## Optimum Model for Image Data Management

- **Definitions stored in a geodatabase**
  - Rasters can remain in original format
- **Ability to quickly Catalog:**
  - All raster datasets
  - Imagery from different sensors
- **Ability to define:**
  - Processing to be applied
  - Default viewing rules
- **Accessible in all ArcGIS applications**

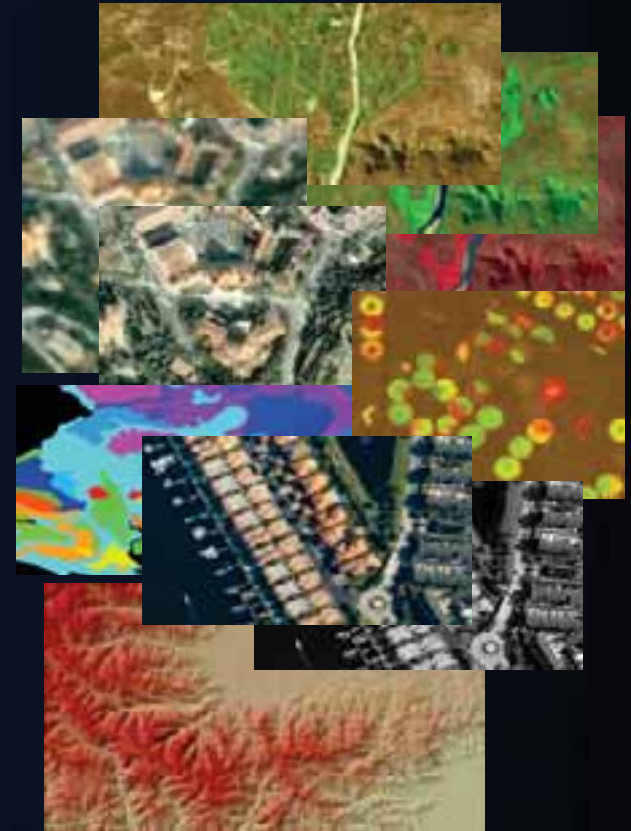


*Available with ArcEditor and ArcInfo license*

# 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



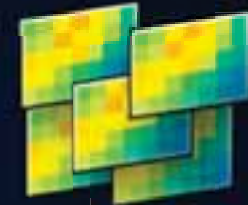
*Utilize the full image information content*



# Dynamic Mosaicking

## Mosaicking Multiple Images On Demand

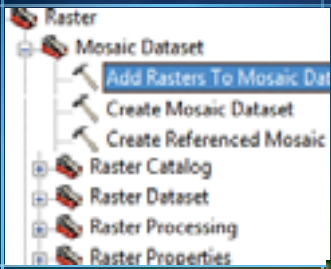
- Fuse imagery from multiple sources
- User control of Mosaic Method
  - By Date – 'Latest', 'Closest to May 2001'
  - By Attribute – 'Highest Sun Angle'
  - By Viewpoint – North, South, East, West
- **User Query** – 'Landsat imagery, with no cloud, later than June 2001'
  - Set default - Users see best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



*Utilizing information from overlapping images*

# Demonstration

## Mosaic Dataset

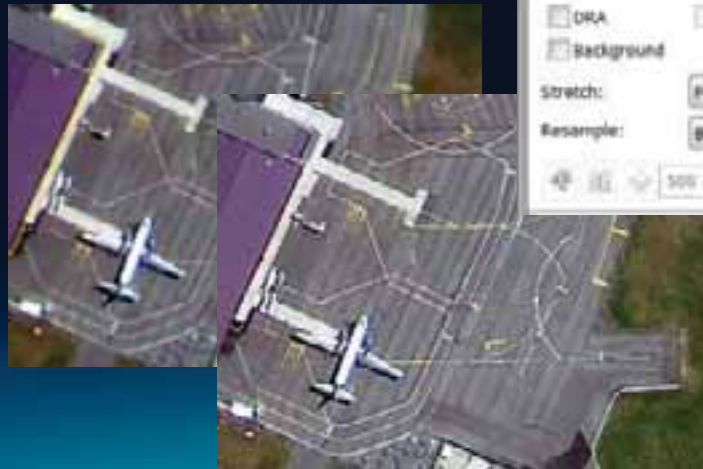


# Image Analysis Window - ArcMap

## Better Interpretation & Understanding of Imagery



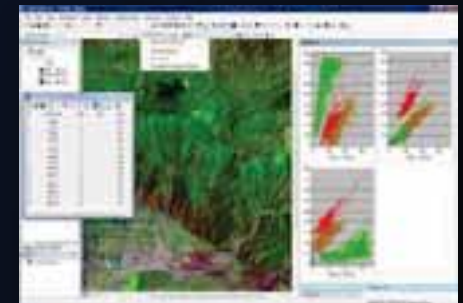
- **Single Button Access to**
  - Image Enhancements
  - Image Interpretation
  - Image Processing
- **Save functions in Layers**



# Image Classification Toolbar

## Part of Spatial Analyst Extension

- **Training Sample Manager**
  - Supervise & Unsupervised
  - Class Probability
  - Principle Component Analysis
  - Define training areas graphically
- **Generate Signature**

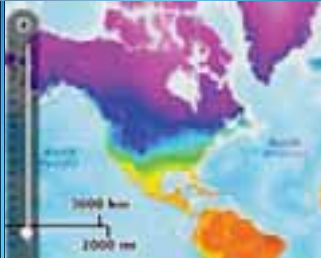


# Data Management Recommendations

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- **Use existing data model if it continues to meet your application requirements**
  - **If desired, migrate to the mosaic dataset to take advantage of its functionality**
- **Use the mosaic dataset to new applications**

# Disseminating imagery



# Disseminating imagery

- **Method depends on user needs:**
  - May need pixels for analysis
  - May want imagery as background
- **Options**
  - Access public data (e.g. ArcGIS Online)
  - Access imagery directly (in geodatabase or file)
  - Publish imagery as a **web service**

# ArcGIS Online imagery

- **Ready-to-use Maps and Globes**
  - Use in Desktop and Server
- **Content also available behind firewall**
  - Data Appliance
- **United States Imagery 1m or better**
  - New sub-meter Imagery in Metro Areas
- **Elevation data**
  - **GTOPO, SRTM, USGS NED (1 & 1/3 arcsecond)**
  - Hillshade, slope, aspect, shaded relief services
  - Profile, viewshed, contour tasks





# Community Basemaps

Authoritative Content Developed and Shared by the GIS Community

Topographic



Streets



Imagery



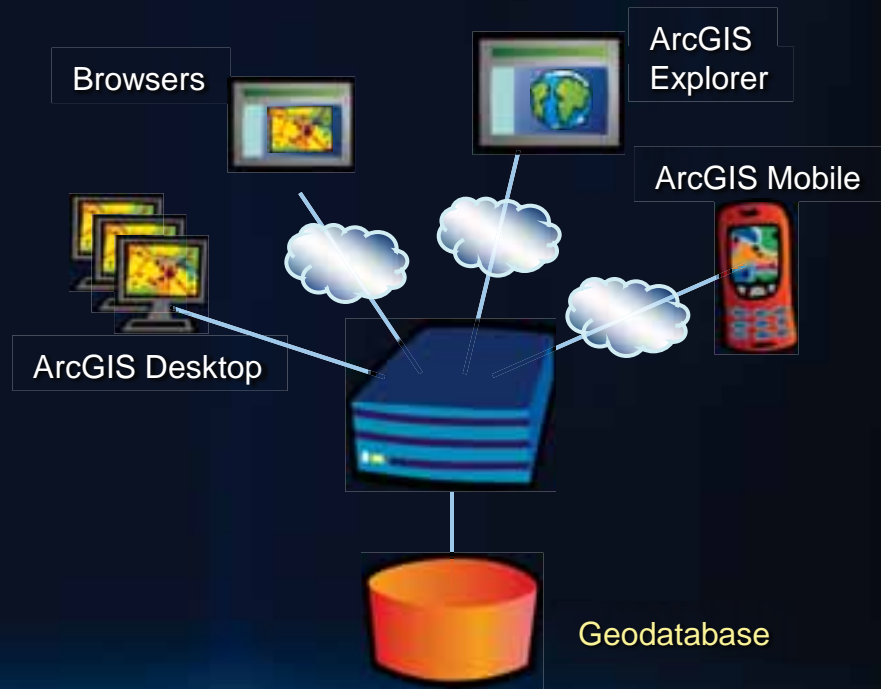
## Serving your own data

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- **ArcGIS Server map service**
- **ArcGIS Image service**
- **ArcGIS Image extension**

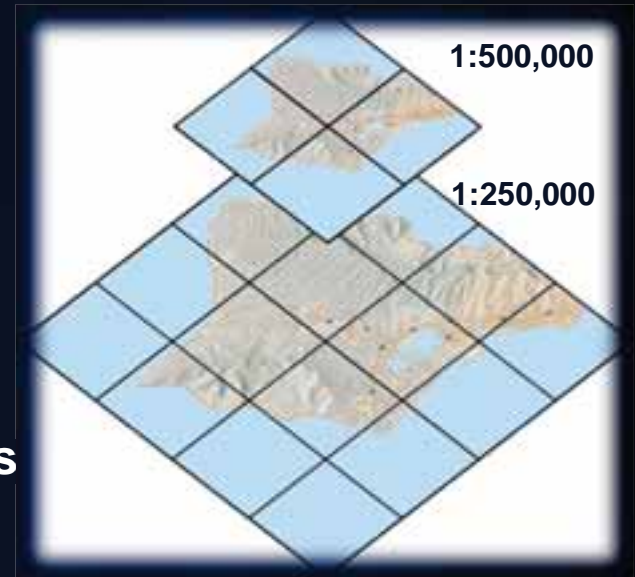
# ArcGIS Server map service

- **Serve raster and vector data**
  - Consume in ArcMap and Web applications
- **Ability to **cache** data**



# Cached Versus Dynamic Services

- **Dynamic Layers contain rapidly changing data**
  - View of most recent work orders
- **Cached Layers contain more slowly changing data**
  - Parcel map, streets, topographic maps
- **The classification is subjective and application specific**



# ArcGIS Server Standard/Advanced

## Considerations

- Caching *highly* recommended for raster data
  - Caching takes time and disk space
  - In a web application, zoom limited to predetermined scale levels
  - In desktop applications, resampling occurs
- Can be used to overlay vector and raster data

# ArcGIS Server image services

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- Core capability of ArcGIS Server
- Serve **raster datasets**
- Functionality:
  - Can include functions
  - Client defined properties
  - Compression for Transmission over slow networks
  - Export – User defined projection and extents

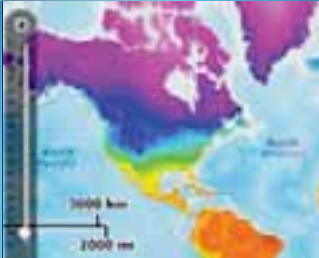
# ArcGIS Server Image Extension

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- Extends Image Service to serve **mosaic datasets**
  - Can serve more than one raster

# Demonstration

Disseminating imagery





# Implementation scenarios


# Implementation Scenario

- **Organization:**
  - Small Port Authority
  - About 10 square miles of area (800 MB of data)
- **Business Needs:**
  - Enable non-GIS users to make a map of work area
- **Data Needs:**
  - One raster layer (does not change)
  - Several background vector layers ( change quarterly)
  - One layer with dynamic data (permitting)
- **IT Capabilities:**
  - GIS staff of one; no DBA
  - One server

# Implementation Suggestion

- **Web application for non-GIS users with minimal functionality**
- **Cached raster data (background)**
- **Dynamic vector data (permitting layer)**
- **Vector data stored and edited in ArcSDE**
- **Software Solution: ArcGIS Server Standard Workgroup**
  - **Does not require DBA for data management**
  - **Best performance over the network with cached rasters**
  - **Easy-to-use web application interface for non-GIS professionals**

# Implementation Scenario

- **Organization:**
  - Engineering firm
  - Many projects over a large area
- **Business Needs:**
  - Create derivatives from DEM data (aspect, slope, hillshade, etc.)
  - Expose authoritative data for each area, to internal users
- **Data Needs:**
  - DEM data from several sources
  - Constantly looking for new, better data
- **Capabilities:**
  - Robust knowledge of servers
  - Existing user of Esri server technology

## Implementation Suggestion

- Need to create multiple elevation derivatives
- Potentially large number of outputs is hard to store and manage
- Software Solution: **ArcGIS Server Image Extension**
  - Virtual products created “on-the-fly”
  - No duplication of data

# Implementation Scenario

- **Organization:**
  - Conservation Organization
  - Large service area, small project areas
- **Business Needs:**
  - Deploy raster data fast with minimal administration
- **Data:**
  - Image tiles of service area
- **IT Capabilities:**
  - Limited IT support

# Implementation Suggestion

- **Implementation Suggestion 1: ArcGIS Online**
  - Cached web services for USA include imagery, street, political maps
  - Very good data available for free
- **Implementation Suggestion 2: Mosaic dataset**
  - Requires almost no processing time
  - Accessible to ArcView users
- **Implementation Suggestion 3: File server**
  - Requires almost no processing time
  - Esri & 3rd party clients can access data
  - Performance issues – use highly compressed format

# Implementation Scenario

- **Organization:**
  - **Large Utility in “Hurricane Alley”**
- **Business Needs:**
  - **Large amounts of imagery need to be deployed enterprise-wide monthly and more often during emergencies**
  - **Imagery needs to be accessible to variety of client applications, including web applications, CAD, and GIS clients**
- **IT Capabilities:**
  - **Robust network infrastructure**



# Implementation Suggestion

- **Avoid loading imagery into database or caching**
  - Too much data (takes too long to load)
  - Changes too fast (short lifespan once loaded)
- **Expose imagery to non-Esri clients**
- **Implementation Suggestion: ArcGIS Server Image Extension**
  - No data loading (still need to build service overviews)
  - No data pre-processing
  - Accessible by multiple client applications
    - ArcIMS, ArcGIS Server, AutoCAD, Microstation, Desktop

# Implementation Scenario

- **Organization**
  - **County Government**
- **Business Needs**
  - **Access to “better” (more detailed) elevation data via ArcGIS Explorer**
- **IT Capabilities**
  - **Existing ArcGIS Server Standard Enterprise implementation**
  - **ArcGIS Server web services currently used in internal and external web applications**
  - **Knowledgeable DBA, web administrator**

# Implementation Suggestion

- Leverage existing technology
- Elevation data does not change often
- Implementation Suggestion: **ArcGIS Server Globe Service**
  - Leverage existing software
  - Improve performance of elevation service by caching

# Implementation Scenario

- **Organization**
  - Large city
- **Business needs**
  - Make imagery available to ArcGIS Desktop users and web applications
- **IT capabilities**
  - Existing Esri users, including of server technology
  - Requirement to store **all data** inside Oracle database

# Implementation Suggestion

- **Consider IT restrictions**
  - Leverage DBA skills
- **Consider two types of users**
- **Implementation Suggestion**
- **For storage: ArcSDE**
  - Comply with database requirement
- **For the web application: ArcGIS Server**
  - Cache the rasters

# Steps to Success

## Test, Test, Test

- **Begin with needs assessment**
  - Esri offers Professional Services to help get started
- **Whatever solution you choose, test it**
- **Testing includes**
  - **Functionality testing**
  - **Performance testing**

# Functionality vs Performance testing

- **Functionality testing**
  - Is web browser app really going to meet my business needs?
- **Performance testing**
  - Shapefiles were slow, but is ArcSDE really any faster for me?
- **Esri offers special (=cheaper) licenses for development and testing environments**
  - Talk to your account manager

# Steps to Success

## Plan for Success

- **Have a plan for urgent situations**
  - Identify support channels for new workflows
    - Internal Help Desk? External tech support?
- **Services Available from Esri**
  - Help Desk Setup Assistance
  - Premium Support Services (PSS)
  - Professional Services
  - EEAP (Esri Enterprise Advantage Program)
- Remember, **Failing to Plan is Planning to Fail**



# Resources



# Training

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- Training is **mission-critical**
- By investing in staff training, you:
  - Speed up implementation
  - Save time
  - Saving **time** means saving **money**
- People ultimately bring life to GIS and insure a successful implementation

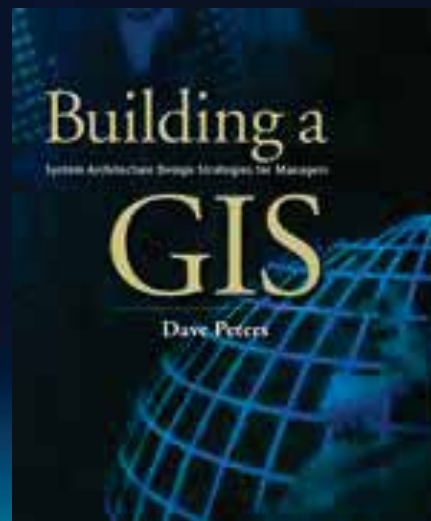
# Esri Training

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- **Esri offers a variety of training options**
  - **Free or low cost Virtual Campus Training**
  - **Instructor-led virtual and classroom training**
  - **Client-site training**
  - **Custom training**
- **Multiple options for developing a training plan**
  - **Work with your Training Consultant (Carol Dargatz) and your account manager**

# System Architecture Design

- **Many Resources Available**
  - **Enterprise GIS Resource Center**
    - **Contains benchmarks**
  - **Building a GIS book with On-line Resource center**



# Esri Enterprise Advantage Program

- **Subscription program designed to provide ongoing advisory**
  - **Great for ongoing project and software support**
  - **Pre-paid subscription to be used throughout the year as needs arise**
- **Includes**
  - **Technical Advisor**
  - **GIS environment review**
  - **Credits to be used for Professional Services or Training**
  - **Annual account and GIS strategy review**

# Resources

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- **Imagery Resource Center:**
- <http://resources.arcgis.com/content/imagery>
- **Imagery Blog:**
- <http://blogs.Esri.com/Dev/blogs/imagery/default.aspx>



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