

Innovative Technology Serving Cadastre

New Developments at ESRI



Kevin Daugherty
FIG Commission 7
Annual Meeting
Seoul, Korea 2007

Contents

- **GIS has many applications**
- **Technology for Cadastre and Land Administration**
- **Integration Technology**
- **Modeling**
- **New Technology Results in Innovative GIS Architecture**
- **Server Based**
- **Services**

Applications Provide The Evidence

.... Of The Increasing Value of GIS

Map Books

Damage Assessment

Data Management

Ad Hoc Mapping

(Transactions Editing)

Spatial Analysis

Consistency

Integration
With CAMA

Citizen Inquiry

Visualization

Workflow Efficiency

Accountability

Automated Appraisals

Fair & Equitable Valuation

Legal Notification

Change Monitoring

Complex modeling



Integration is Becoming Understood and Easier

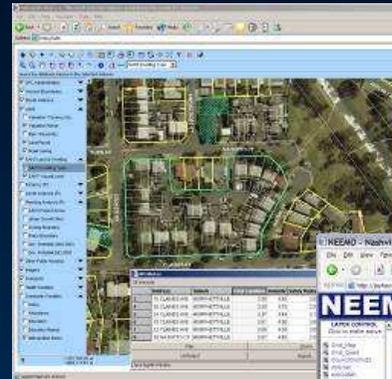
Land Information Systems

Comprehensive Land Registry



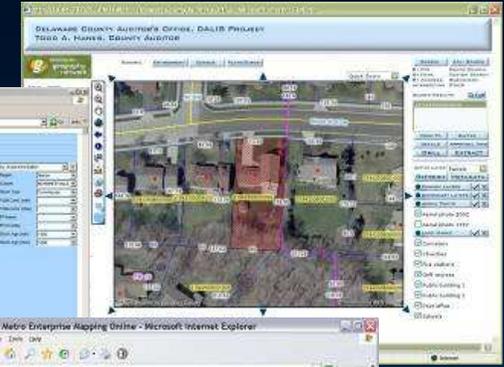
Lithuania

Cadastral Records



Adelaide

Public Access

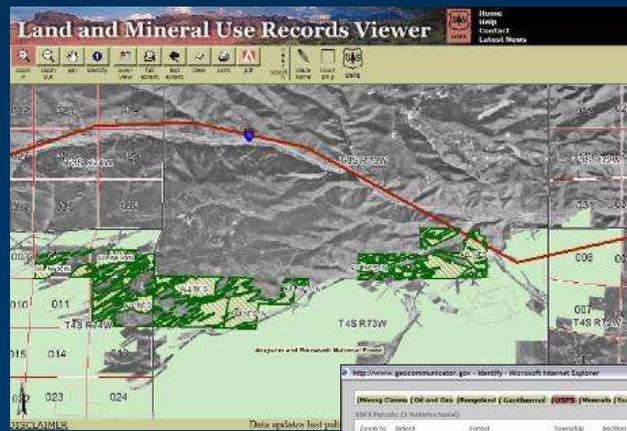


Ohio



Nashville, TN

Government Lease Management



USA



Online Search, Reporting and Map Generation

The image displays four overlapping screenshots of the Richland County GIS website, illustrating its online search, reporting, and map generation capabilities.

- Top-Left Screenshot:** Shows the main homepage of the Richland County Geographic Information Systems. The header is green with the county name and logo. A navigation menu on the left includes links for Home, Mapping, Projects, Data, Standards, Training, Contact Us, In The Know, Policies, Property Info, and FAQ. The main content area features a search bar and a list of services.
- Middle-Left Screenshot:** Shows the 'Assessed Property Inquiry' page. The header is blue with the county name and logo. The main content area includes a search bar and a list of services.
- Middle-Right Screenshot:** Shows the 'Richland County Internet Mapping Service' interface. The header is blue with the county name and logo. The main content area includes a search bar and a list of services.
- Bottom-Right Screenshot:** Shows a detailed view of the mapping service interface. The header is blue with the county name and logo. The main content area includes a map of a residential area with various layers and a 'LAYERS' panel on the right. The 'LAYERS' panel lists various data layers such as Places, Recreation, Sheriff, Infrastructure, Transportation, Property, Elevation, Hydrography/Flooding, Census Data, Boundaries/Districts, Landcover/Soils, 2004 Color Photos, 2004 Infrared Photos, 2000 Color Photos, 2000 B-W Photos, 1996 B-W Photos, USGS Shaded DRG, and Satellite Imagery. A 'Help' section provides instructions on how to use the layers.

Integration with Aerial Photos

http://tax.canyonco.org - Parcel Viewer - Microsoft Internet Explorer

Canyon County Taxation and Assessment
Web-Mapping Viewer

ACCOUNT # ADDRESS SUBDIVISION

1 Parcels Found:

Record 1

Account Number	R3439901200
Parcel Number	D4N02W353320
Section	35
Township	4N
Range	2W
Subdivision	
Site Number	7981
Street Name	TIMBERLINE
City	NA
Acreage	2.19
Legal	35-4N-2W NW TX 05111 NWNW
Tax Code	1500000
Total Value	299000

Map: 536159.83 , 4832796.84 -- Image: 369 , 249 -- ScaleFactor: 0.52

http://www.acimap.us - Currently logged in as: Guest Access level: Public - Microsoft Internet Explorer

ALLEN COUNTY, INDIANA

Turn Over/View On/Off Close Data Viewer Active Tool

Search Help ADV Search
Metadata Legend Layers
Clear Map Refresh

Processing query...
Displaying Results...

New Search - Print Results
Found 1 Matching your search
Displaying Records 1 - 1

GIS Parcel #	Address
02-08-21-279-001.000-072	100 FANGER TR

New Search - Print Results

Map: 41 deg 7 min 43 sec , 85 deg 3 min 49 sec -- State Plane: 494199.97 , 2142472.44

Oblique Imagery

Untitled - ArcMap - ArcView

File Edit View Insert Selection Tools Window Help

Editor Create New Feature

Layers
Display Source Selection

Filter: Neighborhood Community
 North South East West Other North South East

Location: Lat: 38.8798109410825 Lon: -77.1003408288406
 D:\Map034029\Neg\0b69N_030412.pii

77°39'36.62"W 38°52'10.56"N

Integration With Document Management

The screenshot displays the OnBase | GeoDocX web application interface. The browser address bar shows a URL with a long alphanumeric string. The main content area is divided into several panels:

- Document Results:** A table listing document types and their associated parcel IDs.
- House Photo:** A photograph of a two-story brick house with a snow-covered roof.
- Parcel Map:** A map showing a grid of yellow parcels, with one parcel highlighted in red.
- General Warranty Deed:** A scanned document titled "General Warranty Deed" with legal text.

The interface includes a navigation sidebar on the left with various icons, a "Layers" panel on the right with a "Refresh Map" button, and a status bar at the bottom.

Document Name	Layers
CR - General Warranty Deed	
CR - Lien	
CR - Mortgage	
LN - House Photos	

Updating Using Mobile GIS

The image displays a GIS application interface with a 'Residential Inspection Complete' form and a map. A mobile PDA device is overlaid on the map, displaying a street map with a location marker.

Residential Inspection Complete Form Data:

Inspection No.	000111	Story Height	0	Total Rooms	0	Inspection	
Use	001	Basement	000	NO. OF Apts	0	Inspection Date	000000
Inspection Code	00	Upper Floor Area	1000	Basement	One Bedroom		
BOC Code	0	Upper Floor AD	00	Tenant	Long term	InsComplete	000
Year Built	1987	Appraisals	1	Agent	Easy Services		
Est Year Built	1988	Total Ad. Area	100	Comments	Residence Lot 100		
Year Remodeled	1999	Tax Map	00000000000000				

Form Controls: Flag, Flag Comments, [Save], [Print]

Table:

Foundation	Roof Type	Floor Material	Floor	Interior Finish
Concrete	Asphalt	0	0	0
Block	Asphalt	0	0	0
Brick Joint, Inpt	Asphalt	0	0	0
Flt Wood	Asphalt	0	0	0

Total Percent: 100 %

Map Data: 40° 19' 56.17239-B

Automated Notice of Valuation

Cindy Domenico
Boulder County Assessor
Mailing Address
P.O. Box 471
Boulder, CO 80306-0471
www.boulderassessor.org

2005 NOTICE OF VALUATION
Residential Property



May 1, 2005
Office Location
1325 Paul Street, 2nd Floor
Boulder, CO 80302
Phone: 303-441-4830
Fax: 303-441-4996
Office Hours: 8:00 - 5:00, Mon-Fri

*****AUTO**5-DIGIT 80303

OWNER NAME
MAILING ADDRESS
CITY STATE ZIP

Location & Legal Description
STREET ADDRESS
LOT 54 BLOCK XX KEEWAYDIN MEADOWS

STR: 04 1S 70 Tax Area: 0010 Nhd: 148

PROPERTY DESCRIPTION
Land: 1 Lot(s)
1972 1 STORY - RANCH
Bathrooms: 1-Full 2-Three Quarter 0-Half
Main living area: 1648 SF
Upper living area: 0 SF
Basement area: 1430 SF of which 1264 SF are finished

Copyrighted photos courtesy of TRES®

Account Number _____ Access PIN _____

	PROPERTY VALUE		+ or - Change
	Current Actual Value as of: 6/30/2004	Prior Actual Value as of: 6/30/2002	
Residential	\$416,200	\$391,100	\$25,100

PROPERTY TAX ESTIMATE
- The Assessor estimates the value of property. The property value is multiplied by the assessment percentage (set by law) to arrive at your assessed value. Your taxes are set when that assessed value is multiplied by a mill levy set this fall by school boards, county commissioners, city councils, and special district directors.

If no special levies or bonds are added and no exemptions are in place, we estimate your total taxes for this year (2005 payable 2006) will be approximately

Your tax bill last year (2004 payable 2005) was	\$2,186.36
	\$2,302.80

Go to www.boulderassessor.org for a more detailed description of your property and a complete listing of all the sales in your area. Use your Account Number and Access PIN to obtain information on your property. Refer to the attached Appeal Form for definitions of property characteristics.

MARKET COMPARISON GRID
- Your property has been valued using mass appraisal techniques. These three comparable properties support your 2005 actual value.
- Listed below are the most significant attributes that contribute to the value of your property.

	Your Property				
Property Address	PUEBLO PL				
Account Number	R _____	Comparable 1 _____ OMAHA PL	Comparable 2 _____ OMAHA PL	Comparable 3 _____ BLACK HAWK RD	
Sale Date		R _____ 25-Sep-2003	R _____ 08-Aug-2003	R _____ 11-Apr-2003	
Sale Price		\$387,000	\$410,000	\$426,900	
Time-Adjusted Sale Price		\$391,567	\$415,412	\$434,798	
Total Above Grade Living Area	1,648 SQ FT	1,412 SQ FT	1,479 SQ FT	1,466 SQ FT	
Year Built	1972	1972	1972	1973	
Quality	AVERAGE	AVERAGE	AVERAGE	AVERAGE	
Bathrooms	1-F 2-T	1-F 2-T	1-F 2-T	1-F 2-T	
Finished Basement Area	1264 SQ FT	736 SQ FT	882 SQ FT	682 SQ FT	

MARKET COMPARISON MAP
- The map at right shows the location of your property and the comparable sold properties listed above.
- Residential property, by law, must be valued solely by the *market approach*. Market value is based on sales prices of homes with similar location, size, age, and other amenities. Your property has been compared to similar single-family homes that sold during an 18-month period from January 1, 2003 through June 30, 2004. By law, if there were not enough sales during that time period, a 5-year period may be used.
- Sales prices within this study period were *time adjusted* to the end of the period, June 30, 2004, as if they were sold on that date. The *time adjusted sales price* reflects market conditions on that date.

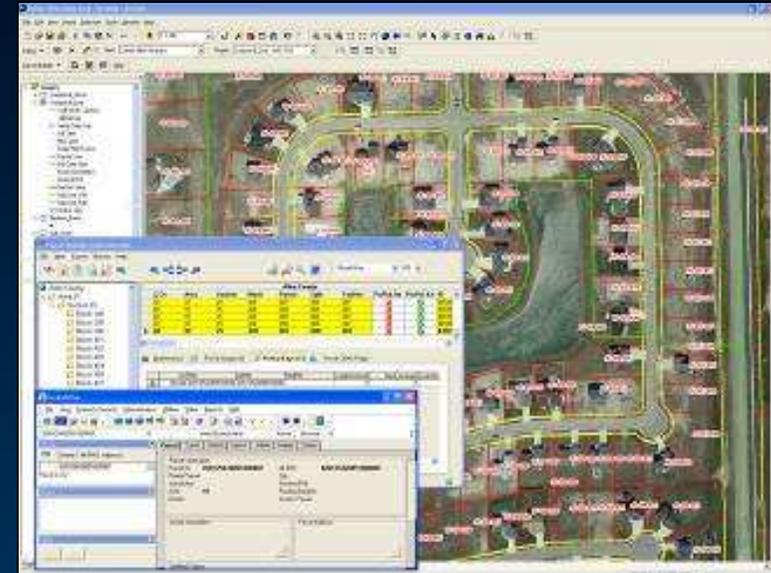
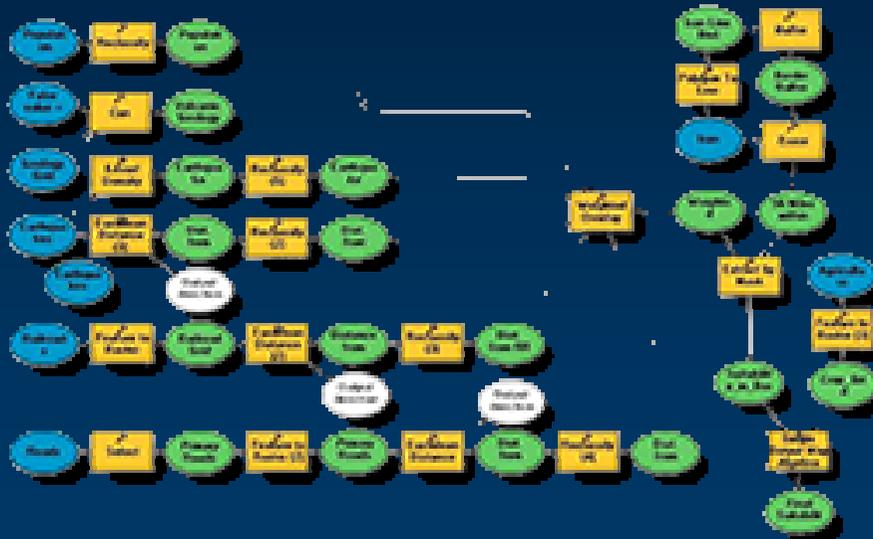


GIS Provides A Systematic Framework

*Modeling The Property Records Environment
Supporting Complex Workflows*

Providing

- An Integrative (Geospatial) Framework
- Analytic Methods
- Intuitive Visualization



*... Providing Many Tools and Methods
... And Comprehensive Information Management*

GIS Is Evolving

Web Services is Becoming A New Platform

- Many Authors & Publishers
- Lots of Communities
 - Interconnected
 - Interoperable
 - Integrative
 - Dynamic

GeoWeb

Emerging

Distributed
Collaboration

GIS Services

Today

Mapping &
Visualization
Services

Legacy

Client / Server

Supporting

- Distributed Data Management
- Collaborative Computing
- Application Integration

... Creating New Opportunities for Collaboration And Integration Of Systems

Web Services Enables Shared Data With Other Organizations

Making Cadastral Mapping Usable as a Service . . .



Requires

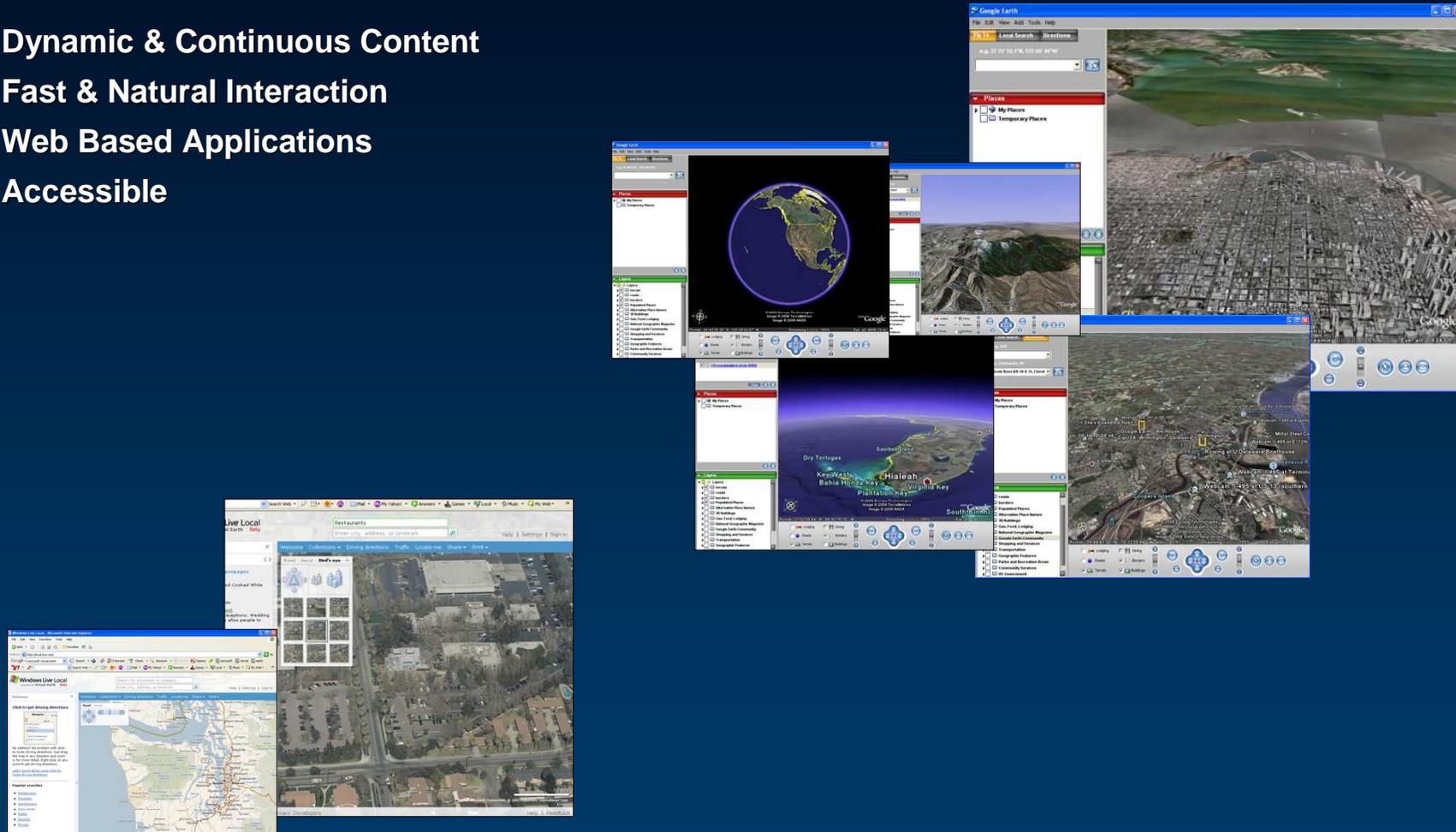
- Geographic Framework
- Collaboration
- Sharing Content
- **Interoperability**
- **Enabling Technology**

*. . . Dynamically Integrating
Property Data with Other Information*

Google and Microsoft Are Already Changing Things

Introducing a New Way of Interacting with Geographic Information on the Web

- Dynamic & Continuous Content
- Fast & Natural Interaction
- Web Based Applications
- Accessible

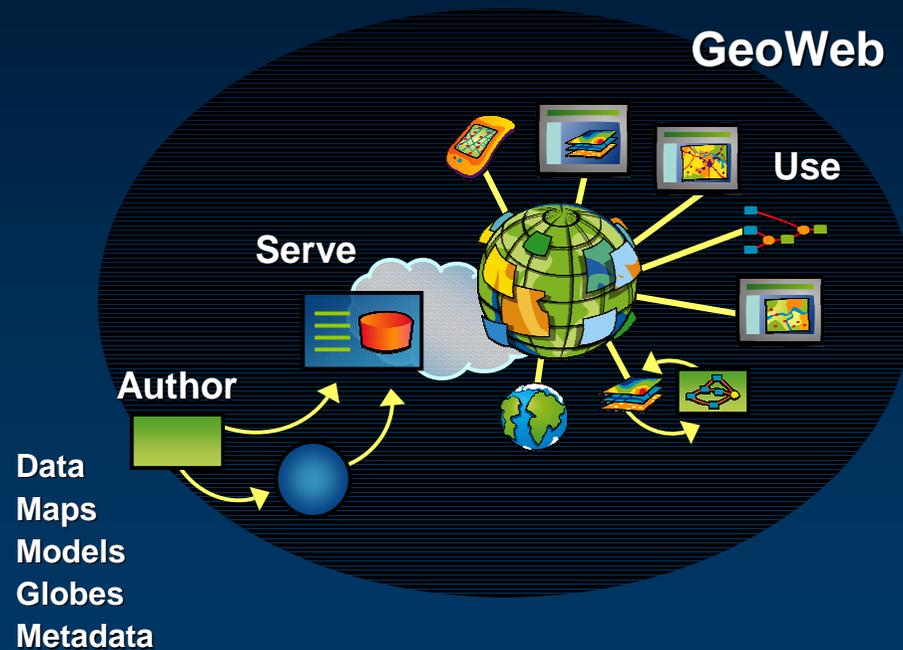


... Opening the World's Eyes To a Whole New Way of Seeing

GIS on The Web Provides Many Additional Possibilities

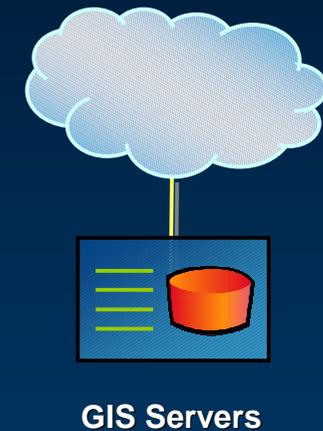
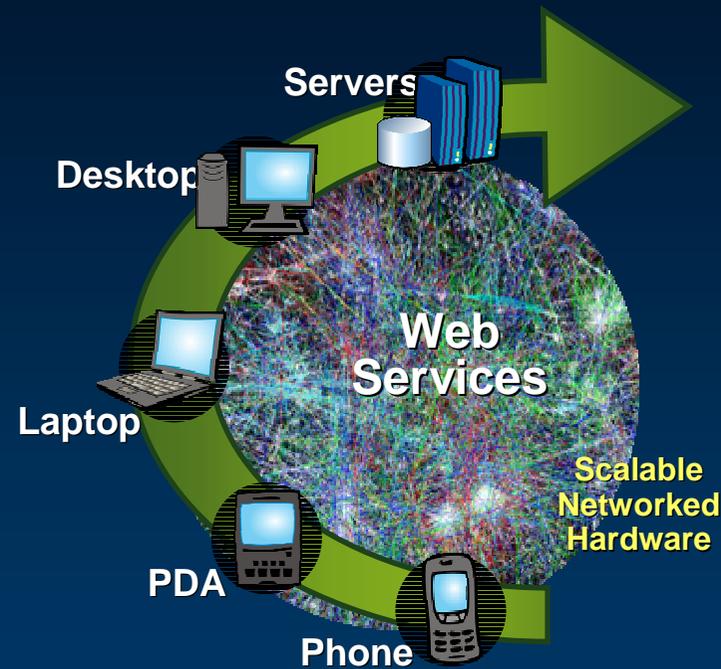
For Sharing, Integrating and Analyzing Geographic Knowledge

Connecting Professionals And Users



Enabling Technology

- **Faster Processing**
 - Multi-core
 - Blades
- **Increased Bandwidth**
- **Larger Storage**
- **Web Services Standards**
- **Mobile Technologies**
- **Real Time Networks**
- **GIS Software**



... Improving Our Ability To Share and Distribute

GIS Technology Is Advancing -

Many New Capabilities & Innovations

- Mapping
- Visualization
- Modeling
- Query & Reporting
- Spatial Analysis
- Data Management



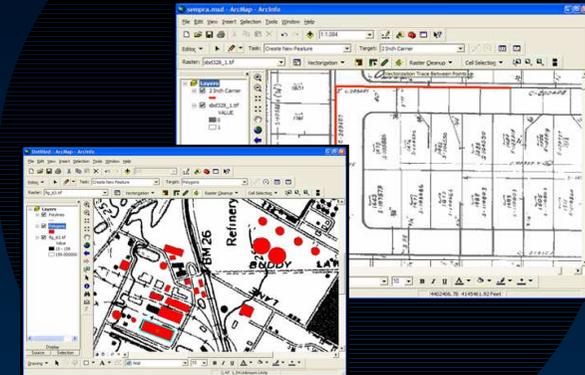
Deployed On Desktop, Server, Mobile . . .

. . . Increasingly On The Web

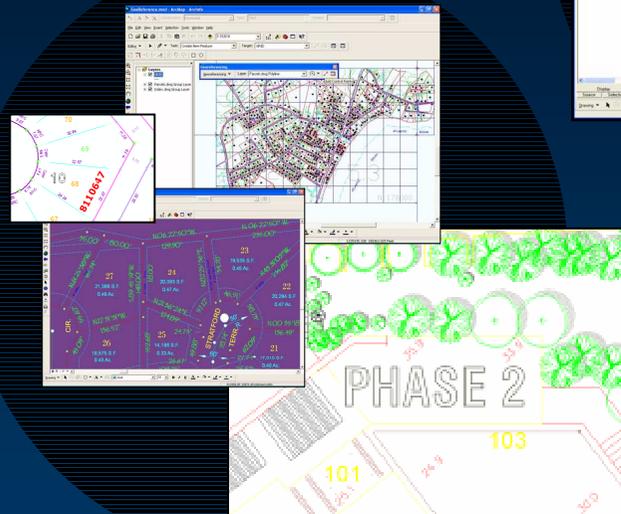
Improved Data Compilation and Editing

Adding New Techniques and Methods

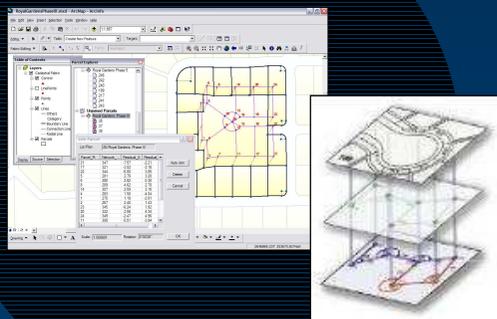
Automated Scanning



CAD Integration



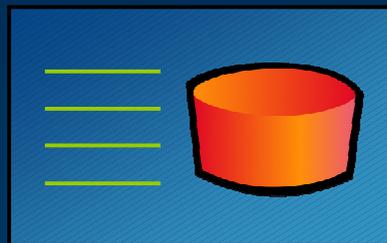
Integrating Survey Measurements



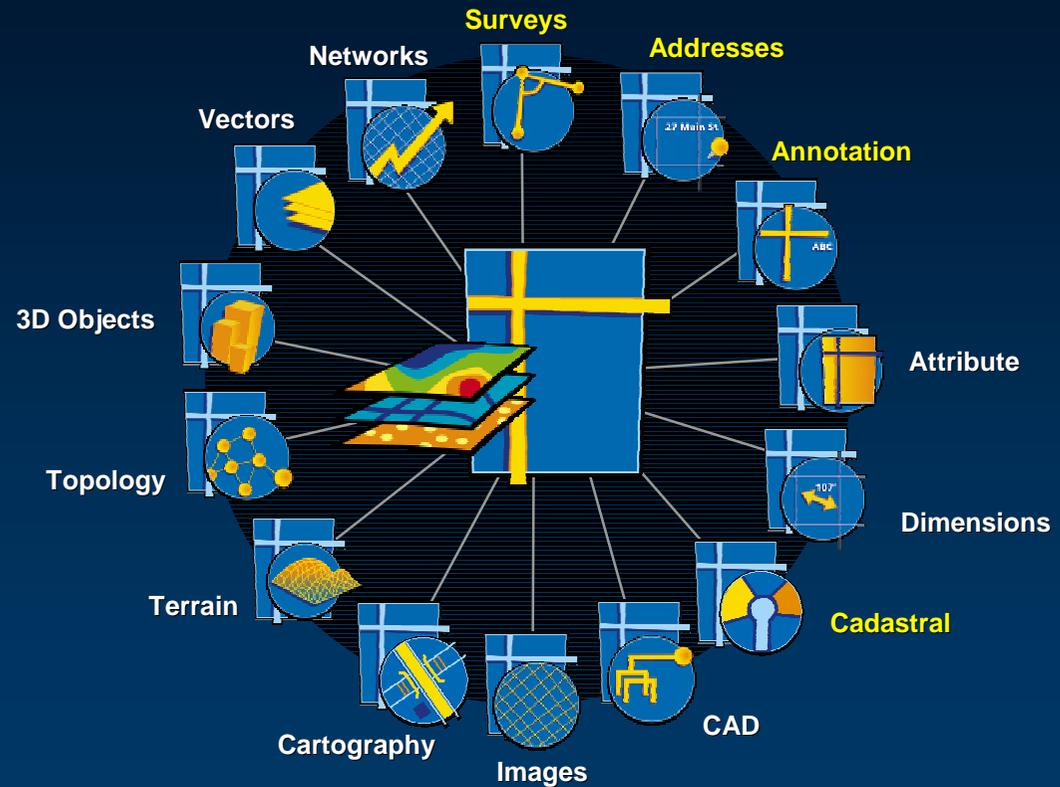
Enhanced Interoperability

Extended Data Modeling

Abstracting Various Sciences, Technology and Methods for Spatial Measurement



Geodatabase

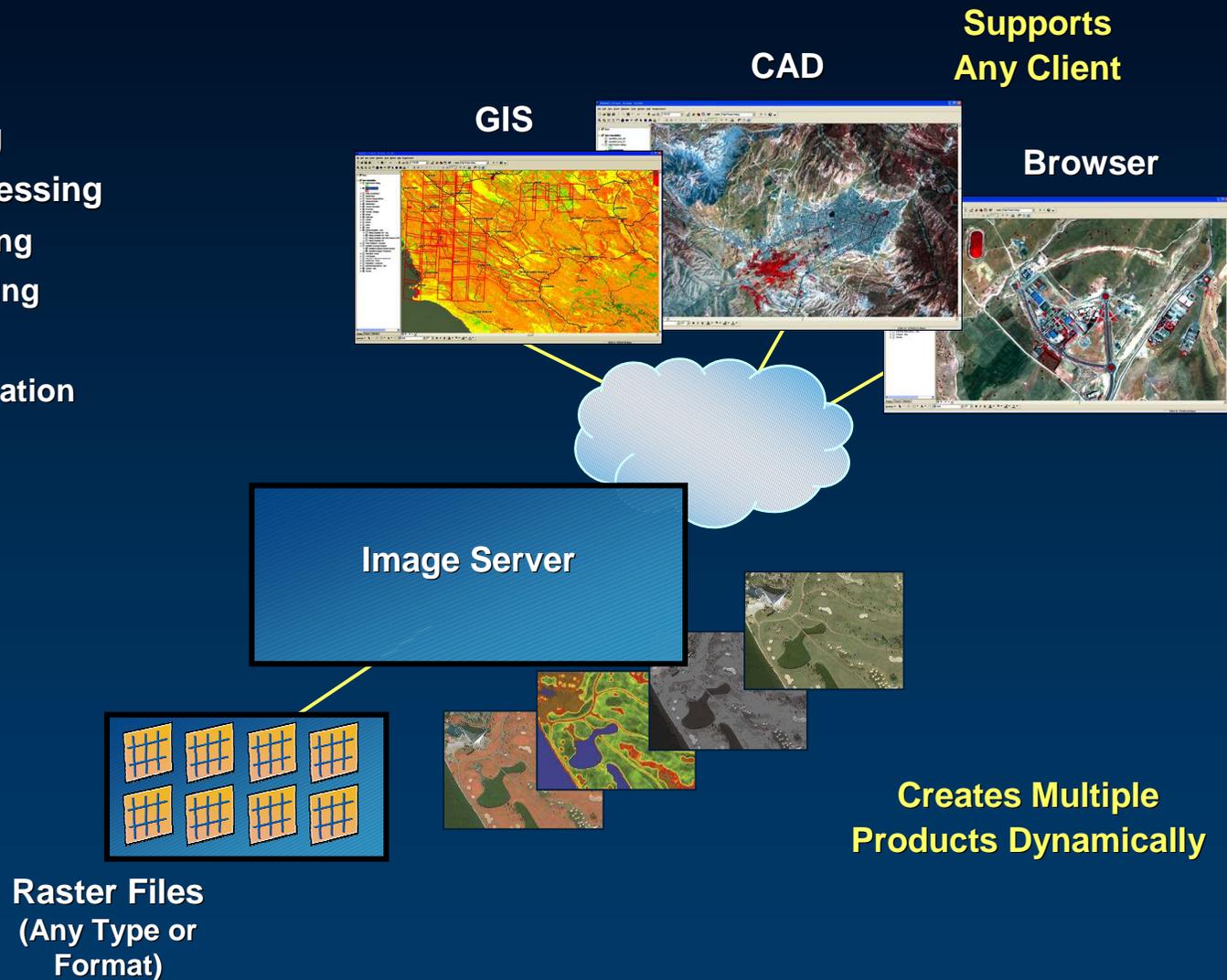


Managing all Types of Geospatial Data

Image Serving

A New Way to Rapidly Access to Large Imagery Collections

- Fast
- Easy Publishing
- On-the-Fly Processing
 - Georeferencing
 - Pan Sharpening
 - Mosaicing
 - Ortho-rectification
 - . . .

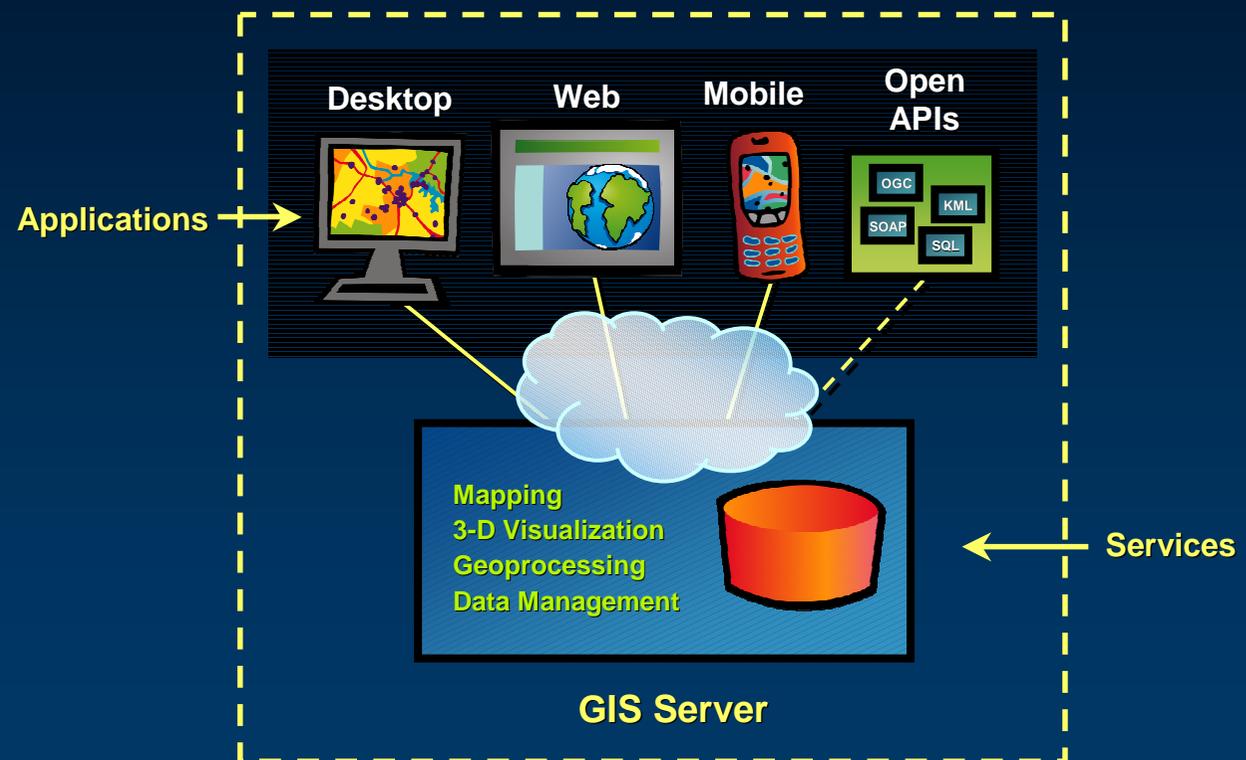


. . . Reducing Time Between Acquisition and Use

GIS Server Architecture Provides a **New Platform** *Comprehensive Functionality*

- Centrally Managed
- Many Clients
- Easy to Install & Manage
- Scalable
- High Performance
- Interoperable
- Affordable

Empowering the Non-GIS Professional



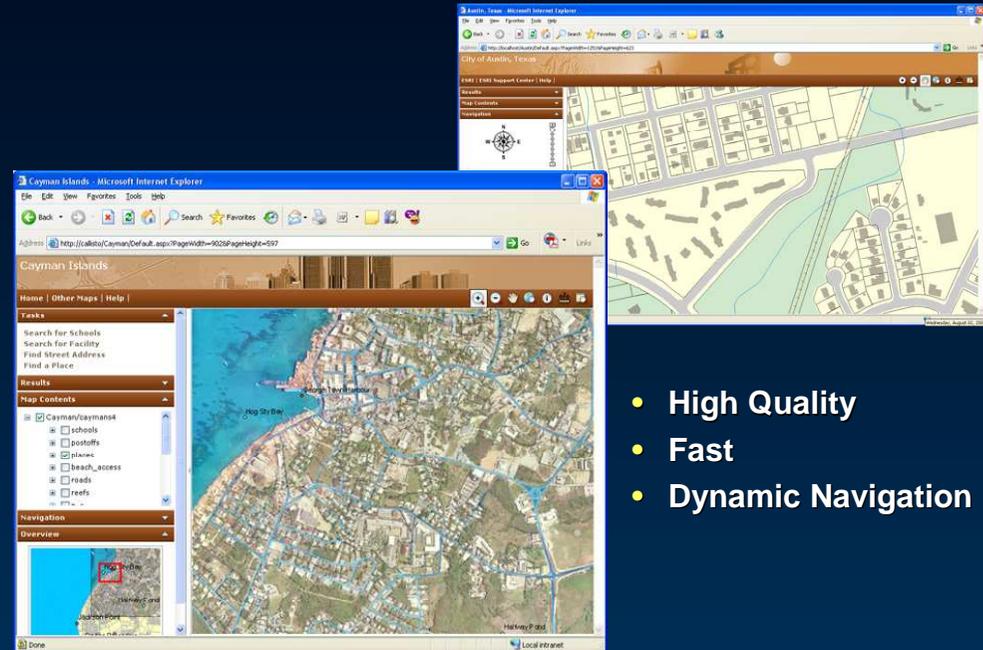
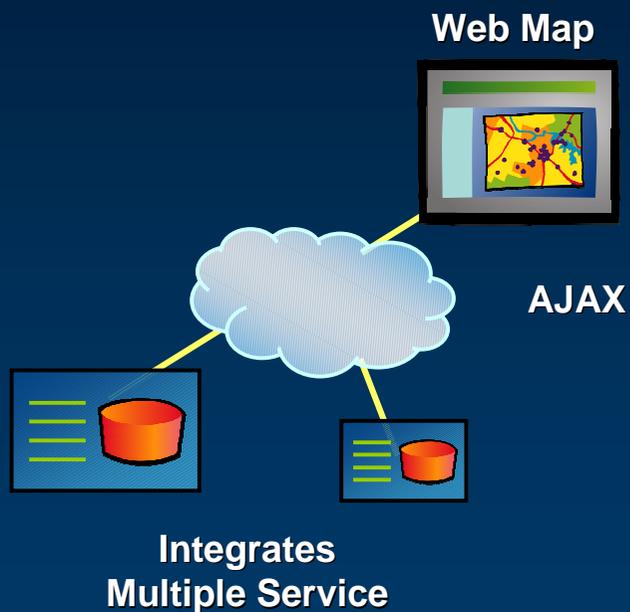
... Enabling Enterprise GIS

Web Clients

Browser Based GIS Application

Supporting

- Mapping
- Editing
- Geoprocessing
- Geocoding
- Data Management



- High Quality
- Fast
- Dynamic Navigation

... Easy Access to GIS Services

Browser-based Editing

- Add, modify, and remove features
- Update attribute data
- Useful for focused applications



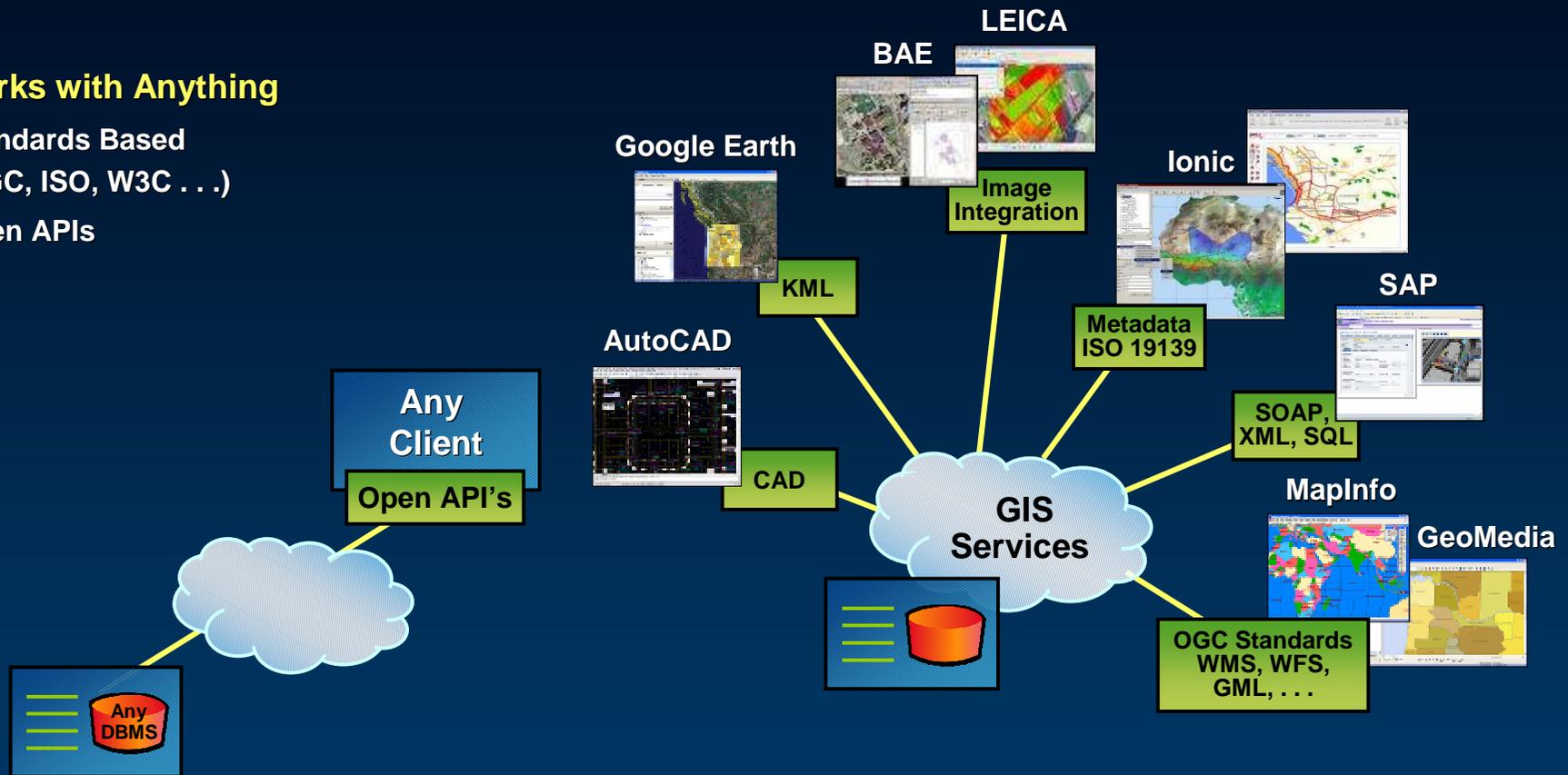
... Server Based Rules Insuring Integrity

GIS Servers Support Open And Interoperable Access

Supporting Many Clients and DBMS's

It Works with Anything

- Standards Based (OGC, ISO, W3C . . .)
- Open APIs

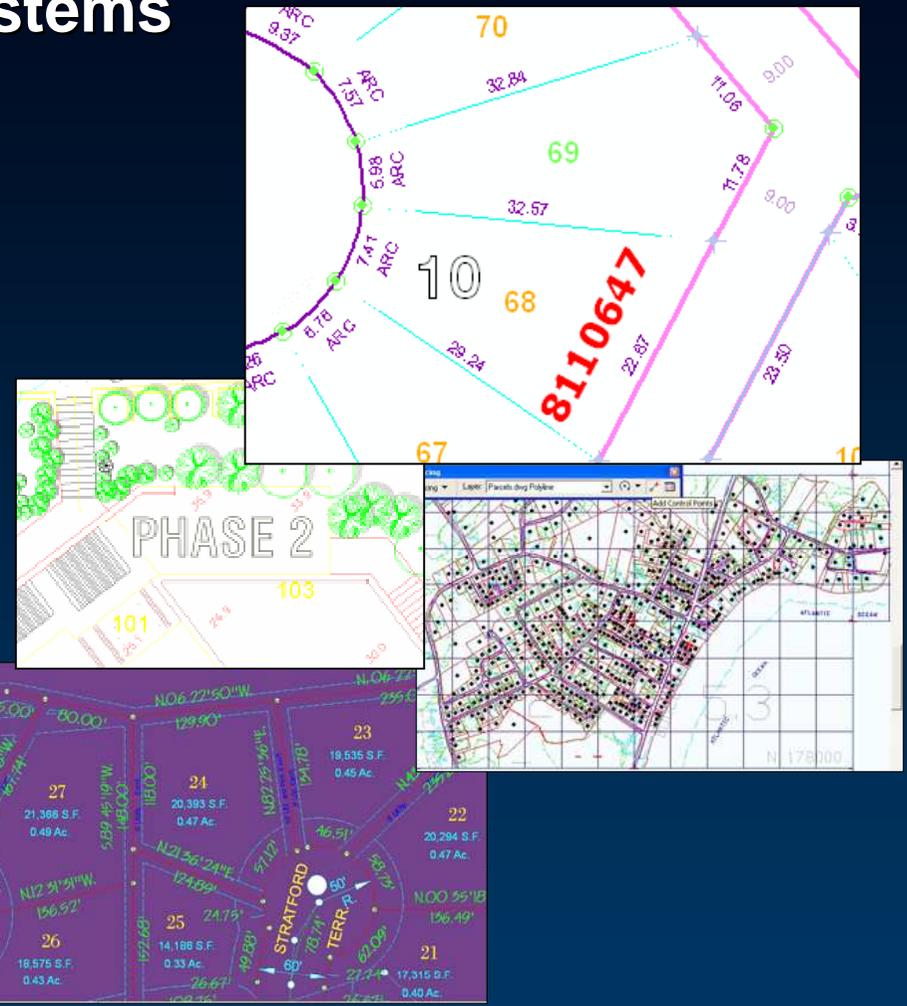
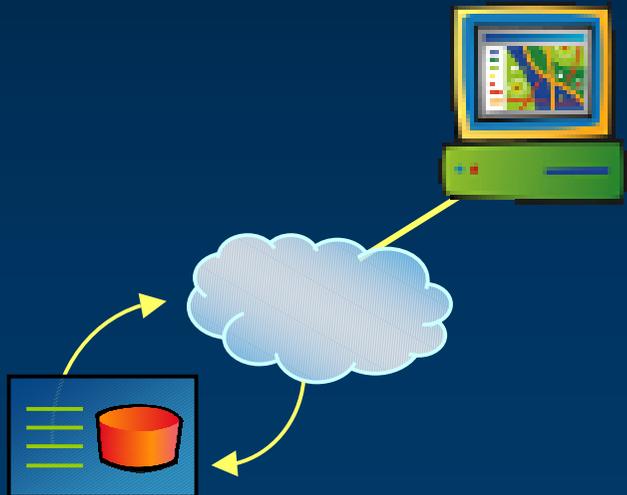


*. . . Ensuring That Cadastral Data Investments Can Be Leveraged
. . . Providing a New Platform for Geospatial Integration*

GIS as a Service for CAD Systems

Complete CAD/GIS Integration

- Supporting
 - Data Management
 - Mapping
 - Editing
 - Spatial Analysis



Enhancing Interoperability

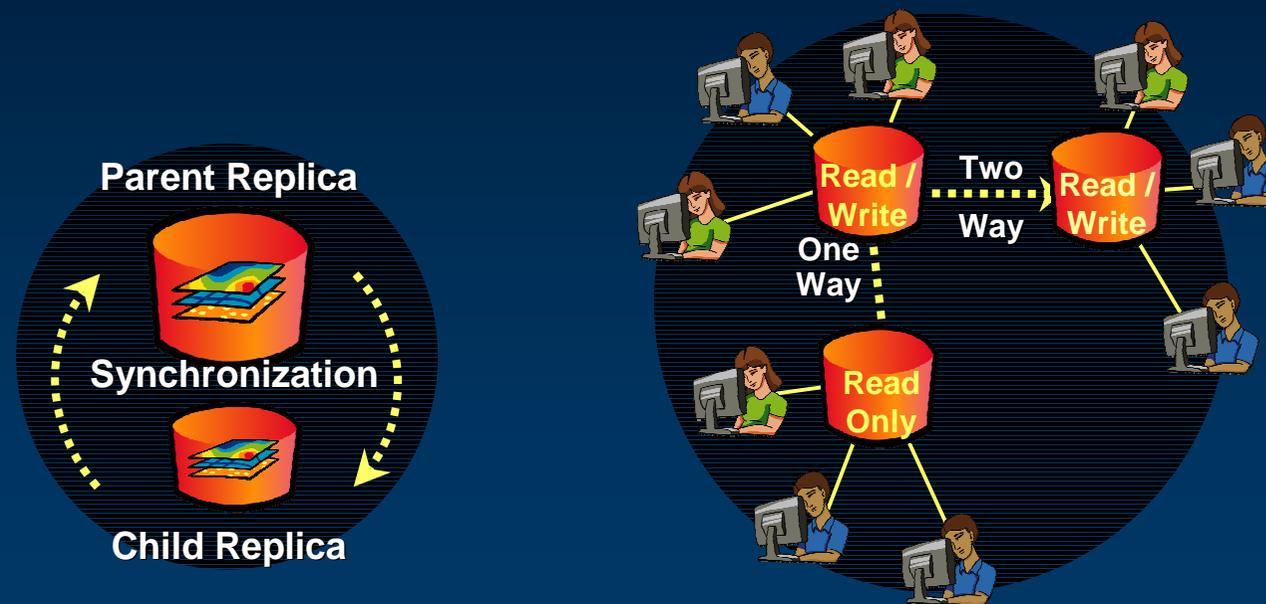
GIS Servers Can Manage Distributed Geospatial Data

Using Replication Services

- Change Only Updates
- Periodically Synchronized
- Updates Over the Web or Courier

Supporting

- Collaboration
- Co-Data Production
- Mobile Users



Supporting Collaborative Data Management

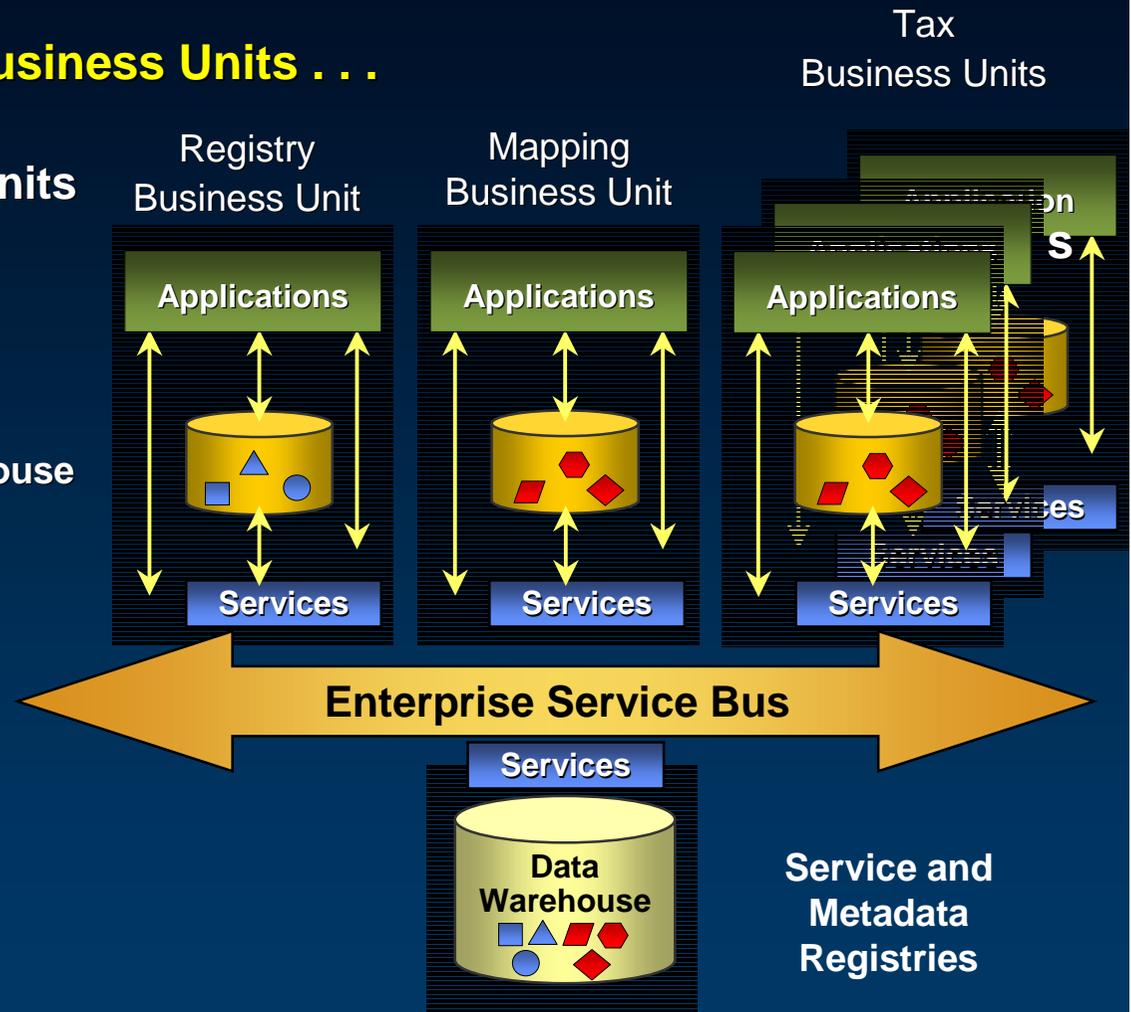
GIS Can Be Implemented Across the Enterprise Using A Service Oriented Architecture

Modernizing and Integrating Business Units . . .

- **Organized Around Business Units**

- Tailor Applications and Data to Mission Needs
- Manage Operational Database
- Share Data
 - Publishing to the Data Warehouse
 - Directly as Services

- **Business Units Are Service Providers and Consumers**



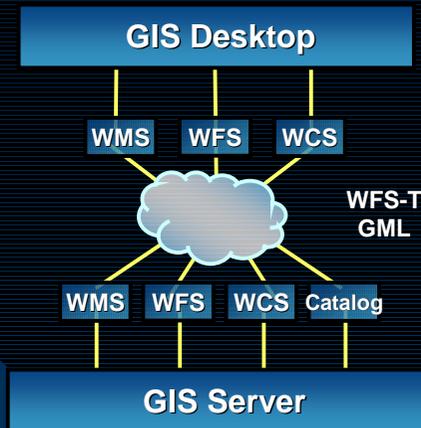
. . . A Framework For Incrementally Growing an Enterprise Services Architecture

Standards Based Interoperability Is Important

Multiple Approaches

Technology Standards

- Web Services
- OGC/ISO
- DXF, KML . . .



Content Standards

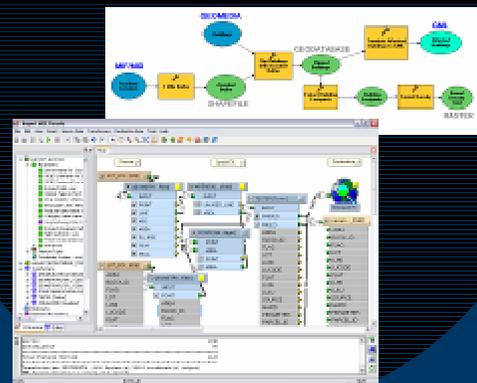
- Data Models
- Metadata (19139)



Transformation Procedures (ETL)

- Formats
- Schema
- Semantic

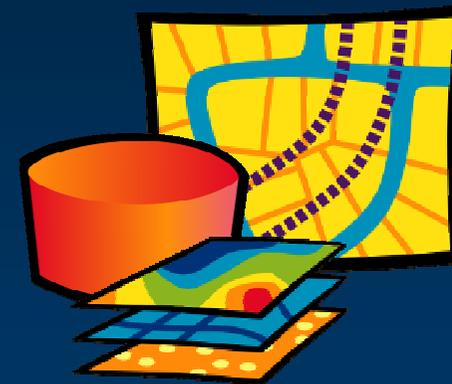
ETL = Extract, Transform & Load Data



... Providing An Open & Standards-based Environment
 ... And Enabling Successful Collaborative Systems

Implementing Enterprise GIS Requires More Than Technology

- Vision and Leadership
- Management Support
- Understanding of Business Processes
- Planning
 - Technical Architecture
 - Data Models
 - Organization
 - Implementation Work
- Good People



... And a Spirit Of Collaboration

Thank you for your attention!