# GIS - Enabling better land administration

Nick Land, ESRI Europe

FIG Com.7 Meeting, Verona, 11- 14 September 2008

# We Live in a Rapidly Changing World
*Increasingly Driven by Population Growth & Human Action*

Impacting the Natural World

- Climate
- Biodiversity
- Natural Resources
- Energy
- Economy
- Security

*Challenges Sustainability . . .*
*. . . For All of Us*

# Global Network of Survey & GIS Professionals

## ESRI User Conference 2008

- 14,000 GIS Professionals
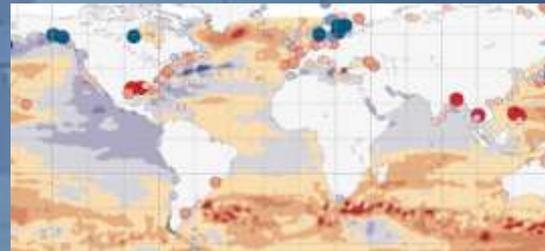- 121 Countries
- Many Disciplines & Interests

*. . . GIS in action*
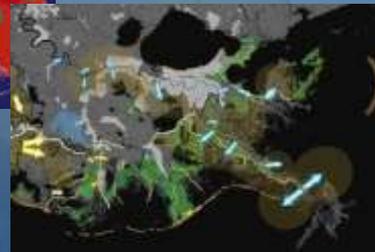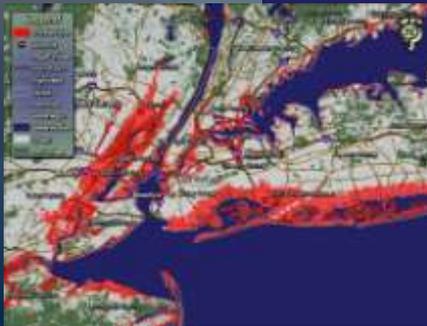
# Impacts of Global Climate Change

**Vegetation Trends**
*Arctic*

**Sea Level Change**
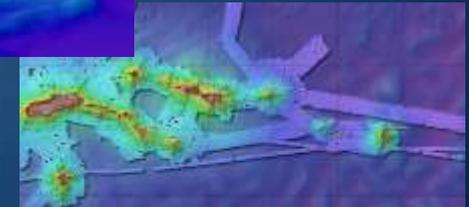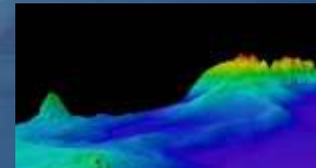*Global*

**Sea Level Rise Modeling**
*Florida*

**New York**

**Continental Shelf**
*Portugal*

**Coastal Zone Planning**
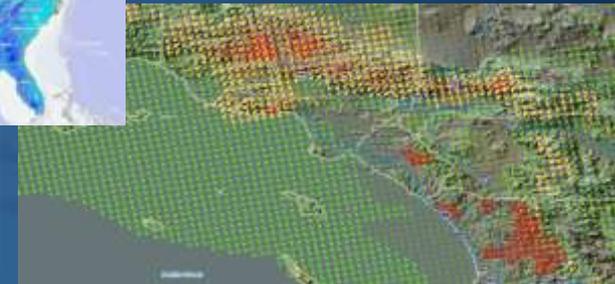*Louisiana*

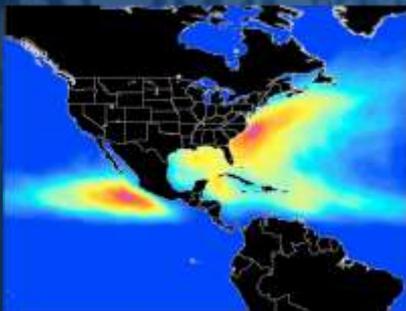**Oceanographic Studies**
*American Samoa*

# Climate & Renewable Energy

**Wind Farm Design**
*Massachusetts*

**Wind Generation Potential**
*U.S.A.*

**Tropical Cyclones**
*National Hurricane Center*

**Wind Modeling**
*California*

**Weather Monitoring**
*U.S.A.*

**Solar Energy Potential**
*Washington*
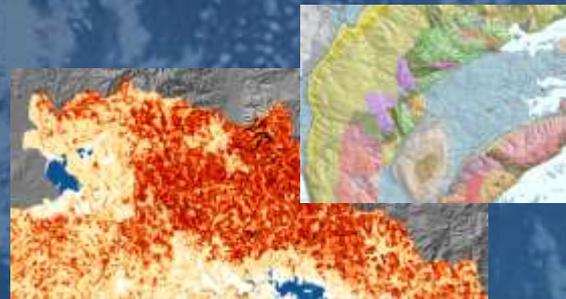
# Earth Science & Water Resources


Online Soil Information
*Australia*
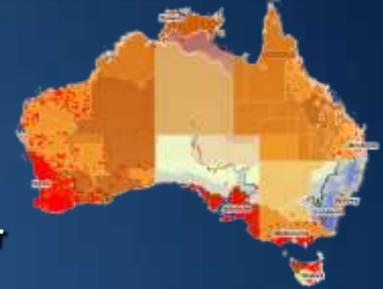

Geologic Mapping
*Canada*


Groundwater
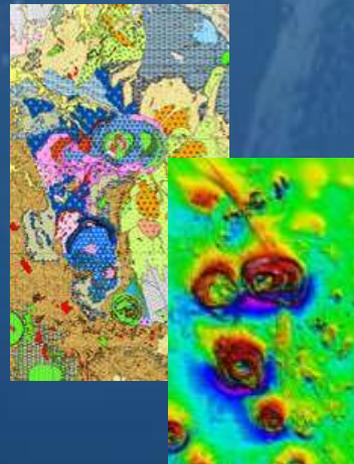*Texas*


Soil Moisture
*Michigan*


Landslide Susceptibility
*El Salvador*


Seismic Hazards
*Indonesia*


Geologic Analysis
*Madagascar*
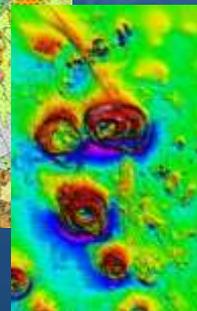

Flood Risk
*Portugal*

# Natural Resource Management



**Mining Tracks**
*Brazil*

**Diamond Mining**
*Africa*
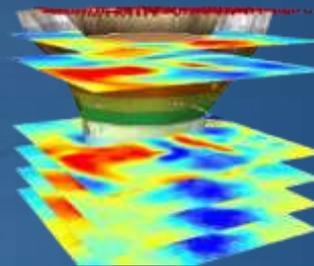
**Well Production**
*Canada*

**Oil & Gas Reserves**
*U.S.*

**Oil Production**
*Russia*

**Forest Types**
*India*
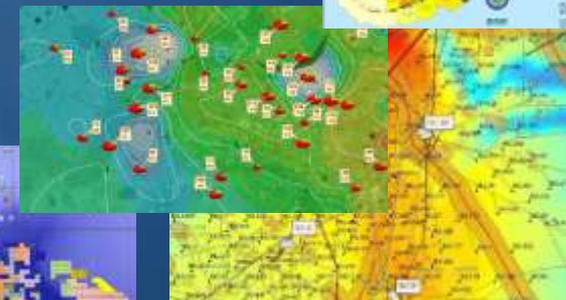
**Wells & Pipelines**
*Mexico*

**Offshore**
*Brazil*
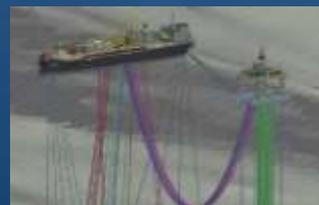
**Petroleum Resources**
*Kuwait*

**Forest Inventory**
*Lithuania*

**Oil & Gas Leases**
*Gulf of Mexico*

# Environmental Assessment



Nitrate Modeling
*Florida*
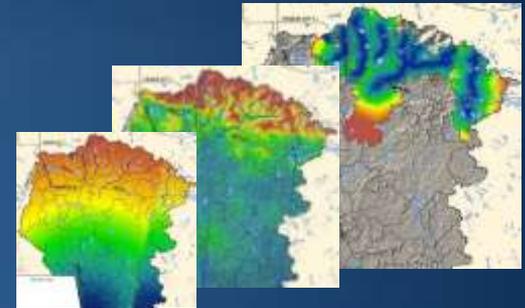
Chemical Release
*Washington*

Highway Impacts on Habitat
*California*
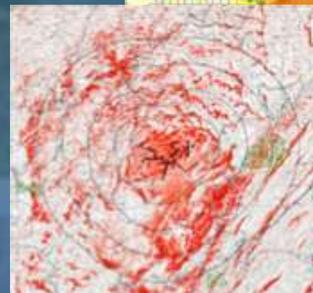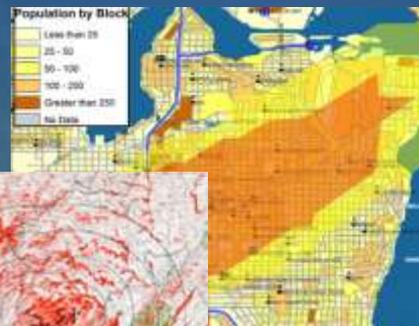
Viewshed

Oil Spill Risk
*Norway*
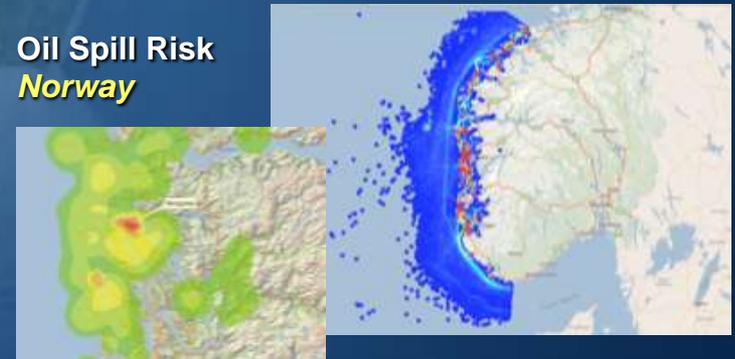
Ship Traffic
*Norway*
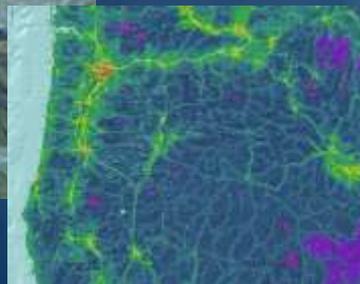
Human Footprint
*Oregon*

# Conservation

Nearshore Environmental
Management
*Oregon*

Healthy Parks & Healthy Communities
*The Trust for Public Lands*
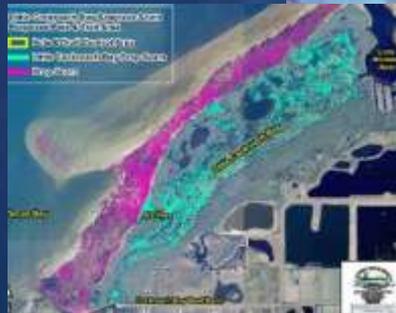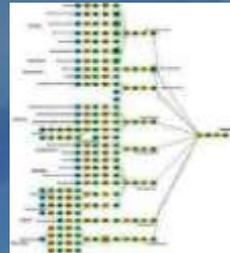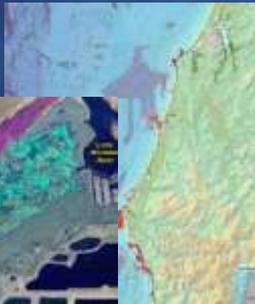
Sea Grass Management
*Florida*

Benthic Habitats
*NOAA*

Priority Conservation Lands
*Quinault Indian Nation*

Land Cover
*Guam*

Fish Passage Barriers
*US Fish & Wildlife*

# Social Issues & Human Health



Opium Cultivation
*Afghanistan*
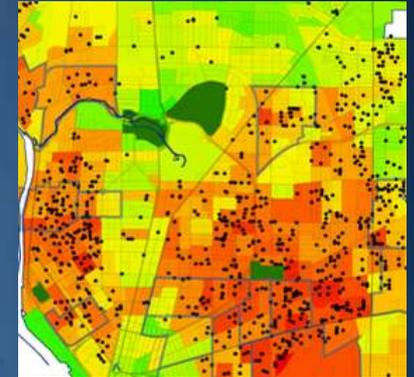
Reconstruction
*Iraq*

Lead Hazards
*Buffalo,  New York*

Humanitarian Aid
*Darfur*

Children Out Of School
*Ethiopia*
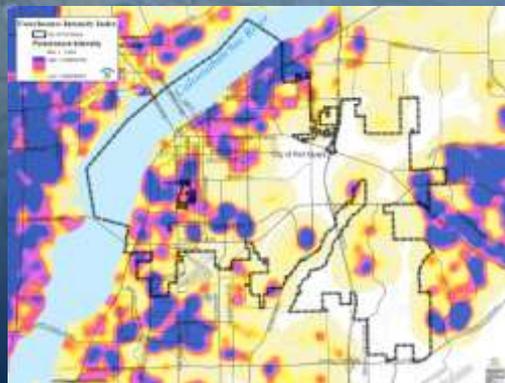
Housing Foreclosures
*Florida*
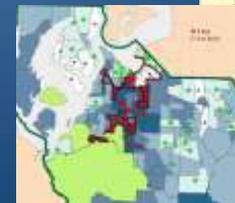
Teenage Births
*King County, Washington*

# Managing Natural Disasters



Flood Mapping
*Iowa*

Floods
*Bihar, India*

Wenchuan Earthquake
*China*
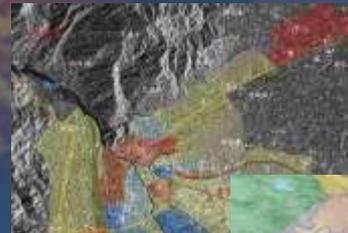
Wildfire
*Idaho*
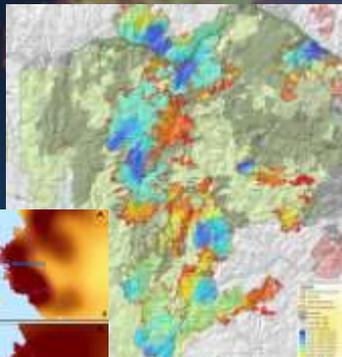
Aftershocks

Floods Simulation
*Houston*

Hurricane Risk
*Texas*
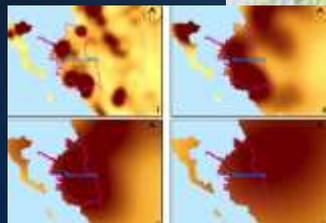
Fire History
*Greece*

Earthquake Damage
*Japan*
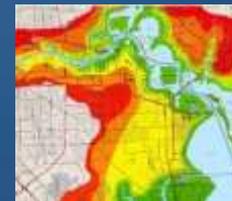
Tornado
*Alabama*

Cyclone
*Myanmar (Burma)*

# Planning

Land Use Suitability
*Montana*

Urban Planning
*California*

Urban Design
*San Jose, California*

Web Based Suitability
*North Carolina*

3D Zoning
*Portland, Oregon*

Urban Redevelopment
*Bakersfield, California*

Virtual City
*Bangkok*

Online Community Planning
*U.K.*

Regional Planning
*Puerto Rico*

*Arizona*

# Land Administration

**Property Valuation**
*Germany*

**Analyzing Transactions**
*Philadelphia*

**Integrated Land Management**
*BLM*

*Canada*

**Adapx Pen-Based Sketching**
*USAID-Timor Leste*

**Tax Mapping**
*Connecticut*

**Native Land Selection**
*Alaska*
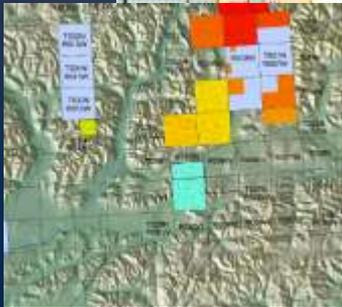
*Encinitas*

# Land Administration – a number of challenges

- Meeting rising user expectations
- Financial
- Building synergies & partnerships
    - People & organisations
    - Data & services
    - NSDIs
- Standards (& data models)
- Data quality, reducing data redundancy
- Each country, each implementation, has its specific challenges

*. . . Leverage GIS & our professional knowledge to address these challenges …….*

# 1. ROI, Workflow, Requirments

- Understand the costs (investment) & benefits (value)
- Analyse & improve the workflow



Cadastral Workflow and Operation
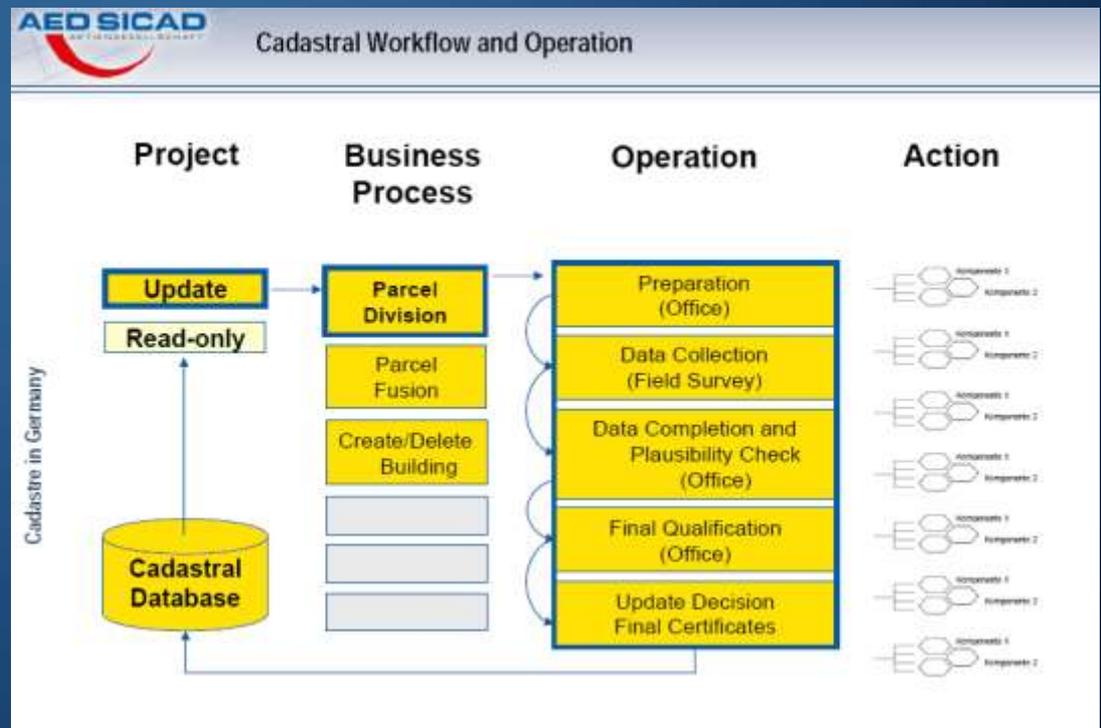
# 2. From cadastral survey to public access

| Desktop | Server | Mobile | Online |
|---------|--------|--------|--------|

*A Complete Integrated System*

**Desktop**
- ArcReader
- ArcView
- ArcEditor
- ArcInfo
- Engine

**Server**
- Work Group
- Enterprise

**Mobile**
- ArcGIS Mobile
- ArcPad

**Online**
- Content
- Resource Centers

EXPLORER

MOBILE

WEB

DESKTOP

ONLINE

SERVER

# 3. Specialised capabilities

- Workflow management
- Spatial Analysis
- 3D Analysis & Visualization
- Publishing
- Interoperability
- Survey

# 4. Quality improvement – Creating Accurate Parcel Data



**Simple Workflow**

- Enter Subdivision Plan
- Build Parcels
- Apply Least Squares Adjustment

**Cadastral Fabric**

**Continuous Parcel Data Model**

**Geodatabase**

**Improves Accuracy Over Time (Parcels & GIS)**
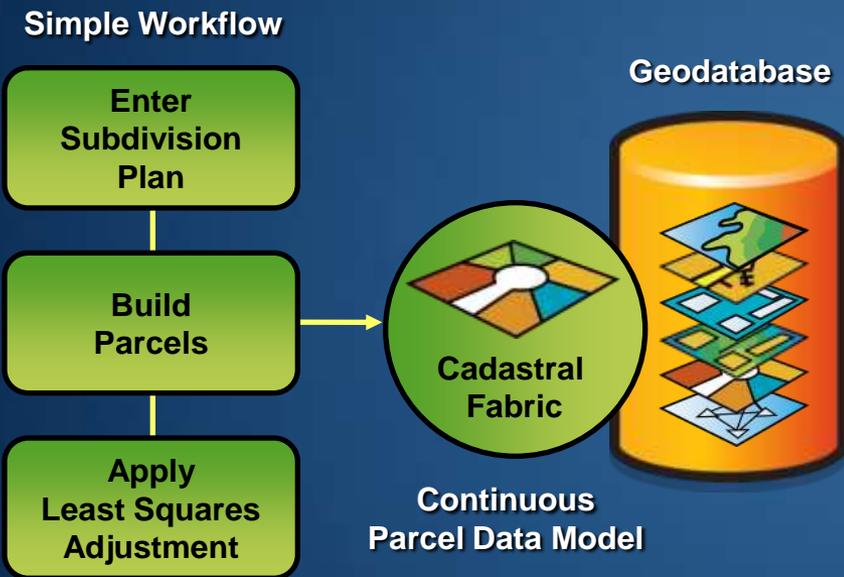
*. . . Building On Your Existing Parcel Management*

# 5. Data management

## *Organising, Managing, Securing land & geographic information*

**Comprehensive Information Model
(Any Type of Data)**

**ArcGIS**

- **Any DBMS**
- **Files**

**Geodatabase**

**Scalable Storage Environments**

**3D Objects**

**Networks**

**Attributes**

**Topology**

**Cartography**

**Vectors**

**Terrain**

**Schematics**

**Surveys**

**Annotation**

**Cadastral**

**Dimensions**

**Addresses**

**Images**
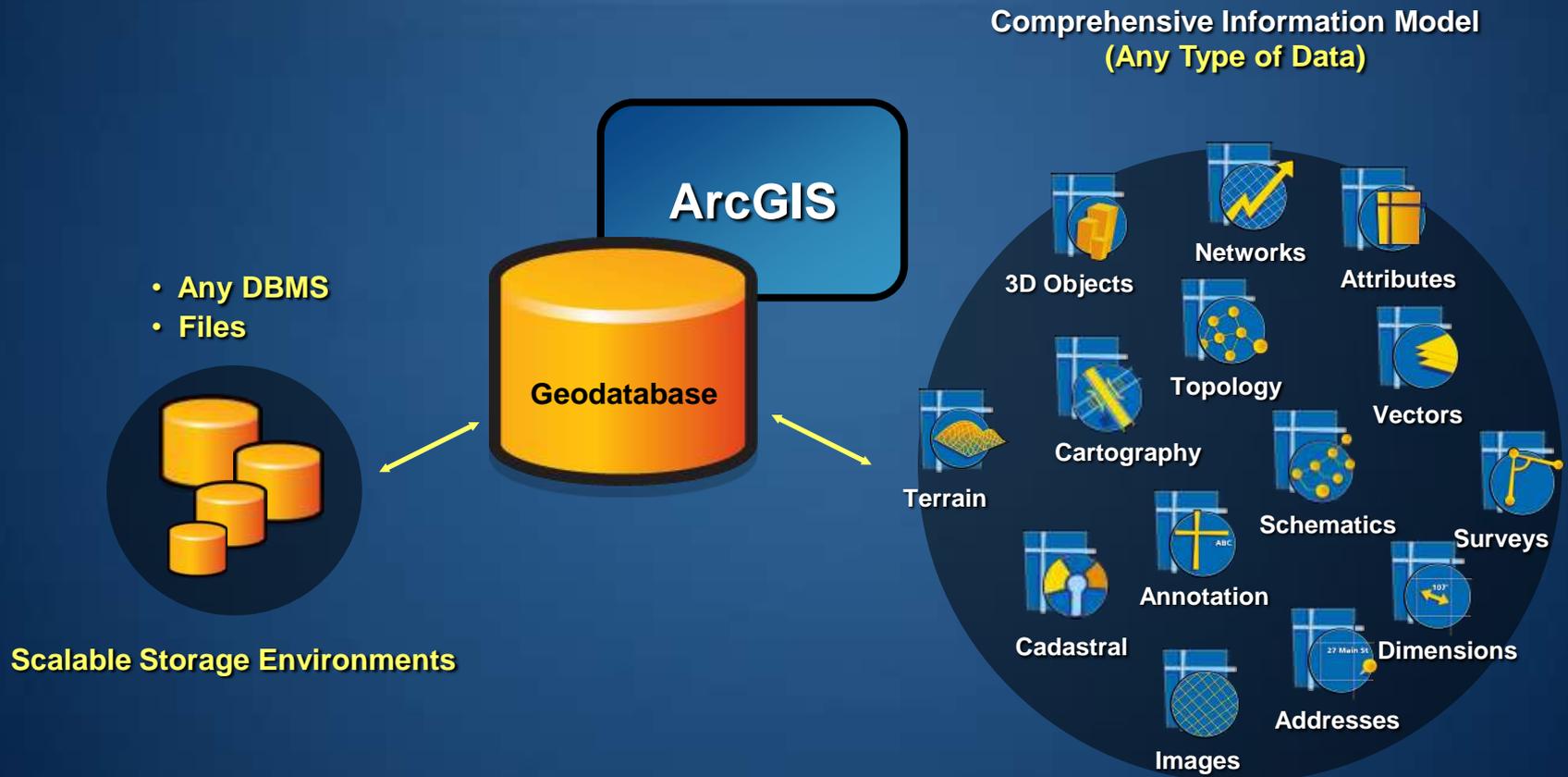
# 6. Performance & Scalability

**Easier Web Development**

Flex  SilverLight  Web 2.0

JavaScript

REST

**Better Caching**

**Improved Web Map & ADF**

- Printing
- Map Navigation
- Map Tips

**Metadata Services**

GeoPortal Toolkit

**Backwards Compatibility**

9.3 Client  9.0

9.1

9.3  9.2

9.2 Client

**Image Integration**

Image Service

**Dynamic Processing**

**Mobile App**

- SQL Server 2008
- PostgreSQL
- DB2 ZOS

**More DBMS's**

**Security & Logging**

**Standards Support**

SOAP
WMS  CSW
SQL  WCS
GML
WFS-T  KML
REST  CAD

Any Client/
Any System

*. . . Open & Interoperable*

# 7. GIS On The Web Is Just Beginning

WEB GIS

*Harnessing the Web . . .*
*. . . And the Power of GIS*

**GIS**
**The Web**

*Going Far Beyond Mapping & Visualization . . .*
*. . . Ultimately Becoming Essential Infrastructure*

# 7. ArcGIS Server Patterns



Distributed (SDI)

Departments

Replication

Enterprise

Mobile

Mapping

Enterprise Integration

Web GIS

Applications

IT System

Fusion Center

Mashups

# 8. Cadastre as a key part of the Spatial Data Infrastructure

1. Coordinate reference systems
2. Geographical grid systems
3. Geographical names
4. Administrative units
5. Addresses
6. **Cadastral parcels**
7. Transport networks
8. Hydrography
9. Protected sites

1. Elevation
2. Land cover
3. Orthoimagery
4. Geology

# Thank you for your attention!

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