

UNEGN

The Power of Location

Trends in Geographic Information Systems

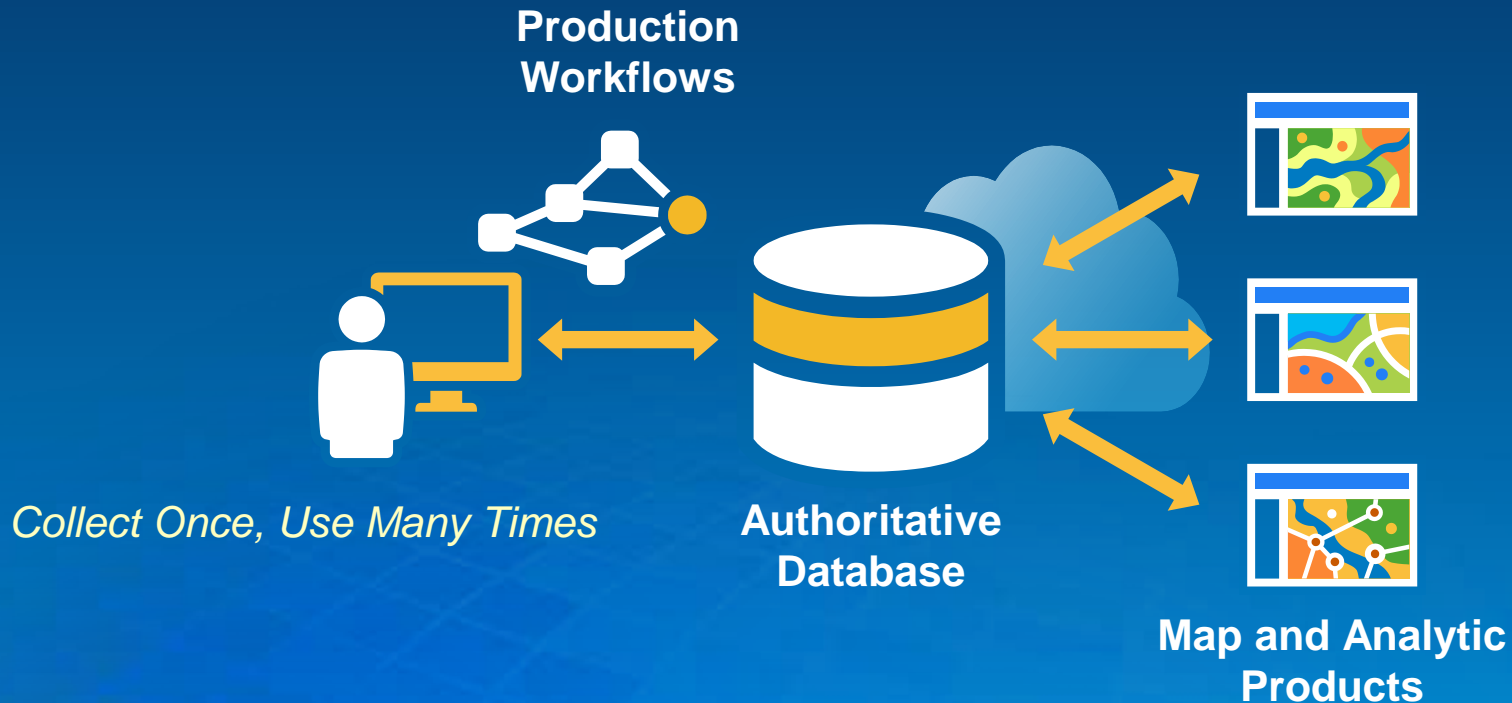
Carmelle J. Terborgh, Ph.D.
Esri



Geographic Technologies Have a Long History



GIS Technology Provides a Modern Platform For Managing and Applying Geographic Information



Leveraging a Common GeoDatabase for Products and Services

GIS

Is Increasingly Successful

Population Growth

Transportation

Water Resources

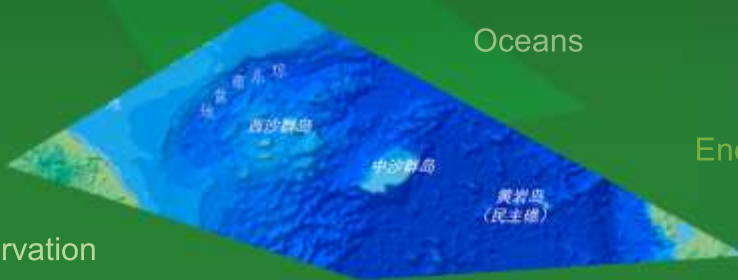
Economic Recovery

Nature Conservation

Environment

Climate Change

Oceans

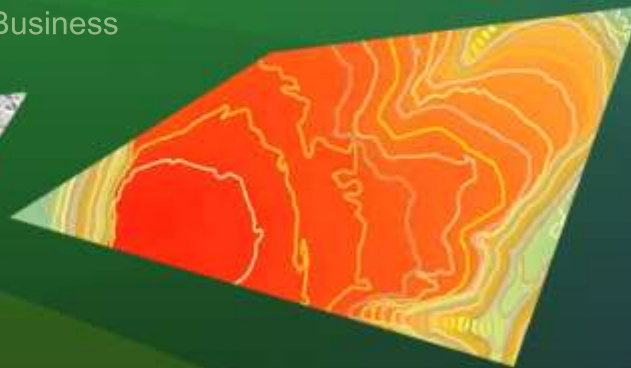
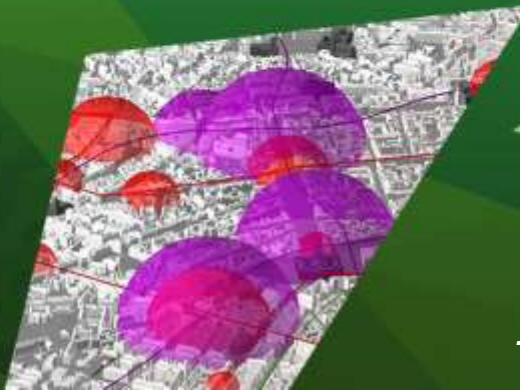


Urbanization & Development

Energy

Education

Business

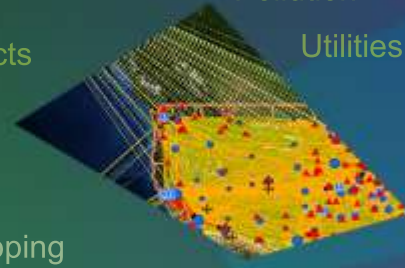


Government

Social Conflicts

Pollution

Utilities



Mapping

Science & Technology

Natural Disasters

Agriculture

Human Health

Infrastructure

Defense & Security



... Creating Understanding and Solving Problems

Automating Mapping and Charting

Topography



Czech Republic

Aeronautical



US-FAA

Nautical Charting



US-NOAA



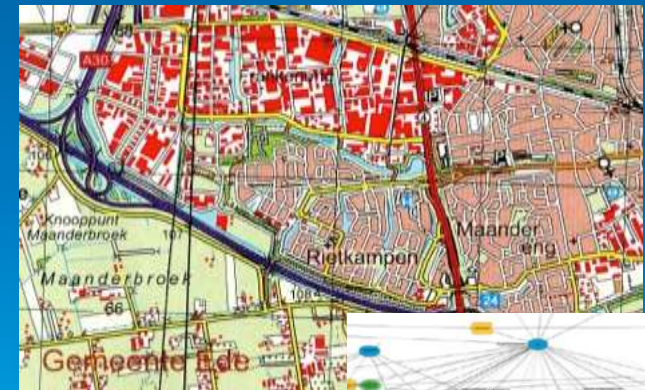
Swisstopo

Military Cartography



NATO

Automated Map Production



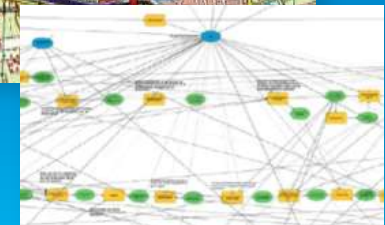
Netherlands

Lidar Mapping



Winnebago

USGS



Integrating New Data Sources

Request for Service



Web Sports Voting



Spain

Social Networking



Singapore

Citizen Science



Minnesota

Crowdsourcing

History

Funding

Disaster Reporting



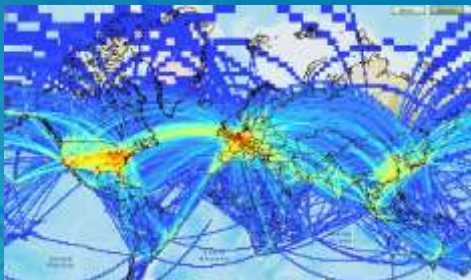
Los Angeles, California

Real Time Traffic Heat Maps



Los Angeles, California

Air Traffic



Global

Ship Traffic



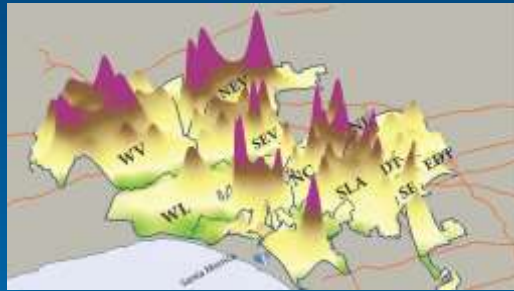
Generating 3-D Visualization

Visualizing Forests



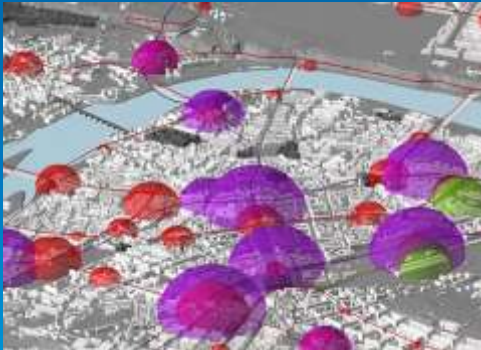
North Vancouver Island

Wasteshed Modeling



Los Angeles, California

Public Transit Usage



Prague, Czech Republic

Particle Deposition

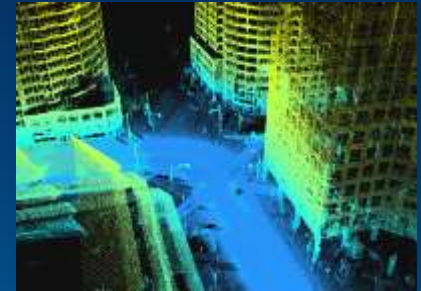


Lake Perris, California

Solar Energy



Lidar

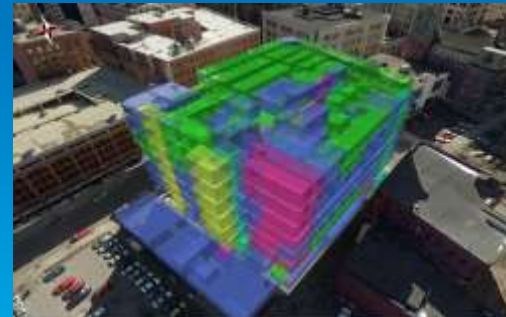


Industrial Infrastructure



Switzerland

Interior Space Modeling



New York

Advancing Geographic Science

Spatial Auto Correlation



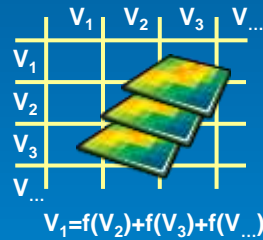
Grouping Analysis



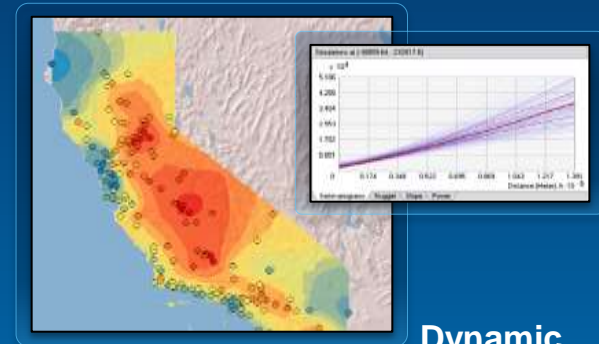
Space/Time Cluster



Exploratory Regression



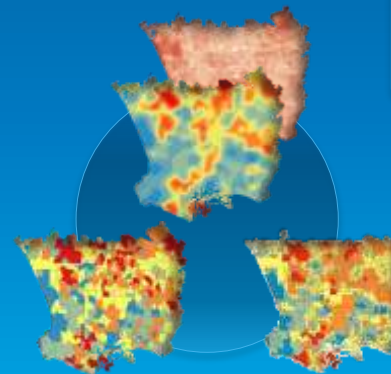
Empirical Bayesian Kriging



Dynamic Analysis



Areal Interpolation



... Creating Better Understanding

Organizing Geospatial Data Access - Portals

Citizen Access



Columbus, Ohio

USDA



Manaus, Brazil

Government Infrastructure



US Geospatial Platform

INSPIRE Geoportal

Open Data



Geology and Minerals, Peru



NOAA

Internal



Barrick

Verizon



The World Bank

... Realizing SDI

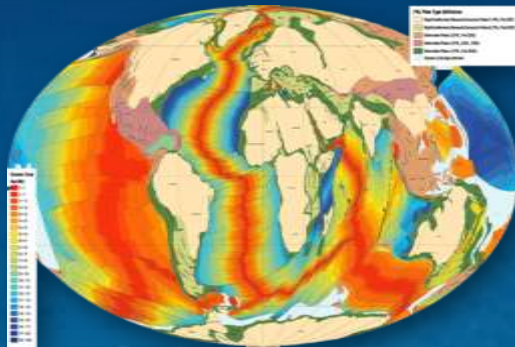
Our Countries are Facing Serious Challenges

Collectively We Need to Create a Better Future

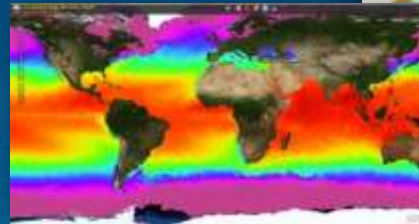


Monitoring Environmental Change

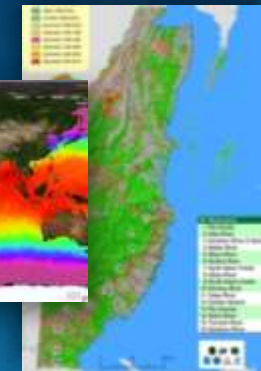
Ocean Health Index



Ocean Temperature

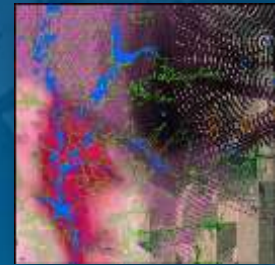


Deforestation



South America

Habitat



Missouri

Micro Climate Change



Fish and Wildlife Service

Historic Drought



Horn of Africa

Coastal Erosion



USDOI

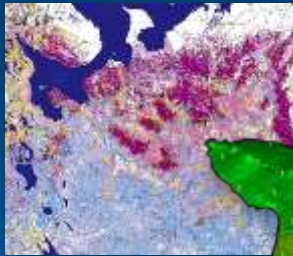
Beach Erosion



Willapa National Wildlife Refuge

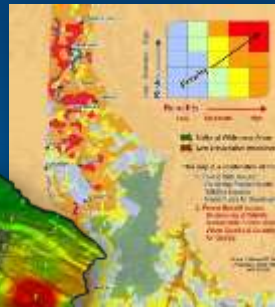
Managing Natural Resources

Agriculture
Inventory



Russia

Forest Health

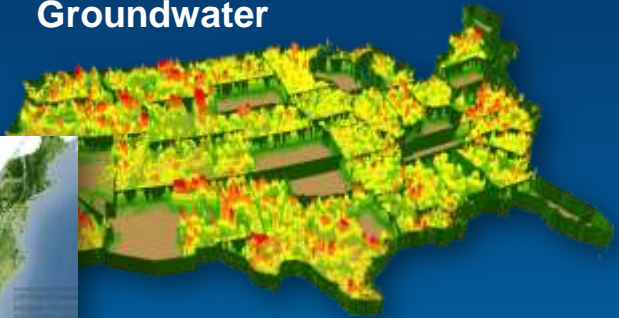


Idaho

Biomass
Inventory

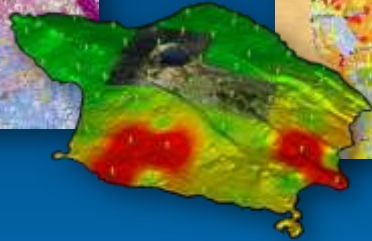


Groundwater



USA

Forest
Disease

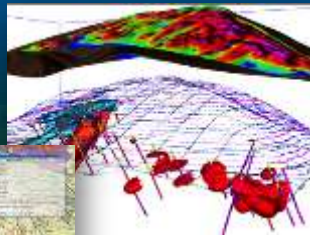


Carbon
Accounting

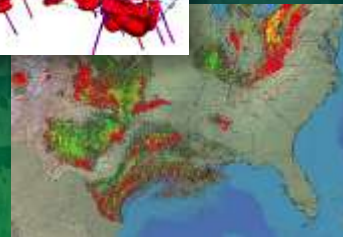


Indonesia

Geologic
Exploration



Oil and
Gas



Geology



Czech Republic

Caribou
Habitat



Newfoundland

Ecosystem
Habitat



Nigeria

Developing Energy

Geothermal



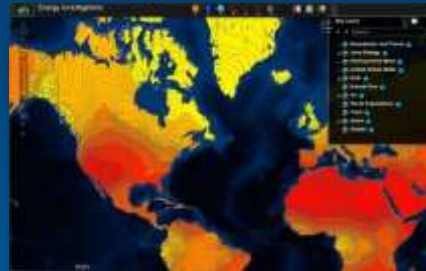
Korea

Oil & Gas



South Asia

Solar Potential



Germany

Pipeline



North America

Renewable Energy



Wind Power

Germany

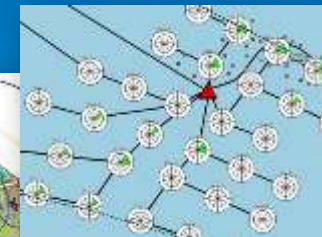


Wind Turbine



Massachusetts

Wind Farm Management



Denmark

Managing Land Information

Cadastre and Registration



Portugal

Property Boundaries



Nigeria

Parcel Mapping



Illinois



Colorado

Public Inquiries



France

Legal Notification



Belgium

Tax Assessment



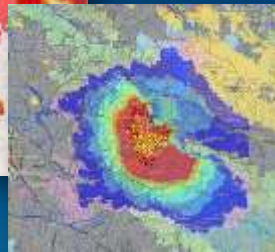
Planning for and Responding to Natural Disasters

Fire



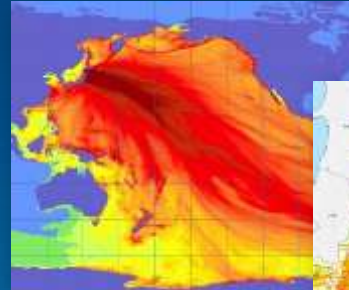
Texas

Fire Simulation



California

Tsunami Forecast, Earthquake Damage Assessment



Tohoku, Japan

Drought Status



USACE

Situational Awareness



Flooding



North Dakota

Quake Tracking



Severe Weather



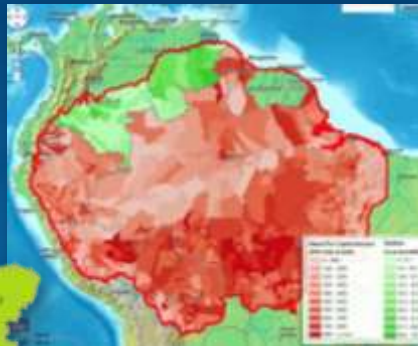
Recovery Planning



International Committee of the Red Cross

Understanding Demographics and Human Health

Population and Environment



Amazon

Density



Europe

Election Tracking



Spain

HIV Distribution



U.S. Dept of State

Spread of Disease

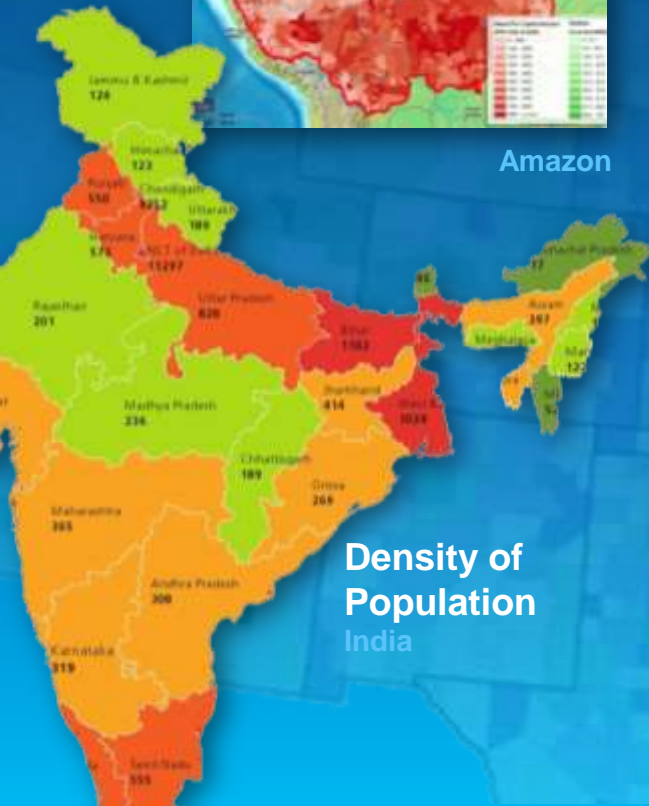


Ethnicity



Afghanistan

Density of Population India



Polio Cases



Lack of consist geographic names and/or addressing

- Limits revenue collection strategies (taxation and billing, location based services activities)
- Discourages foreign direct investments
- Negatively impacts on regional and global economy
- Affects the ability to conduct a demographic census
- Results in poor performance of emergency and security services
- Increases transaction costs
- Upholds poor governance
- Wastes time and resources
- etc.

Is our definition of “place” changing?

Figure 2. An informal settlement on the urban edge



Source: Coetzee, *Address Data Exchange in South Africa*, 2008.

GIS is Already Helping Us to Understand

An aerial view of a geographical area, likely a river delta or coastal region, rendered in a GIS style with various colors representing different land uses or data layers. The colors include shades of green, yellow, and brown for land, and blue for water. In the foreground, the silhouettes of three people are visible against the map. One person in the center is pointing towards the map with their right hand. The background is a dark blue gradient.

Integrative

Visual

Qualitative

Systematic

Comprehensive

*Providing the Practical Means
for Transforming Our World*

GIS is Changing How We Think and Act

Integrating Geographic Science into What We Do

Measure

Predict

Analyze

Prepare

Plan

*We Need to Integrate Geographic Science
into Everything We Do*

Manage

Act

Decide

Evaluate

Design



GIS is Being Transformed

Into a Web GIS



Making GIS Easier, Always Available, and More Social

Web GIS Makes Geography Accessible

Extending The Reach of Geo-Sciences



Web GIS Integrates All Data Types

As Web Maps and Web Services



Providing a New Medium for GIS

Web GIS Provides a New Pattern For Data Management

Using Web Maps and Web Services

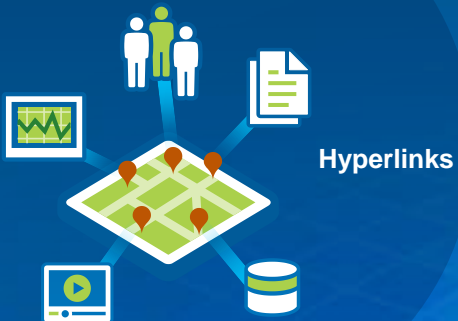


Enabling a Flexible and Agile Approach

Web GIS Can Integrate Anything

Linking and Combining Information

Dynamic
Linking



Visual
Overlay



Spatial
Analysis



Helping to Discover Patterns and Relationships

Web GIS Also Integrates Organizations and People

Breaking Down the Barriers



Creating New Relationships



*Creating Easy Opportunities
....for Sharing and Collaboration*

Web GIS Connects Everyone

Knowledge
Workers



Executive
Access



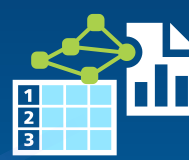
Public
Engagement



Work
Anywhere



Enterprise
Integration



Geospatial
Professionals



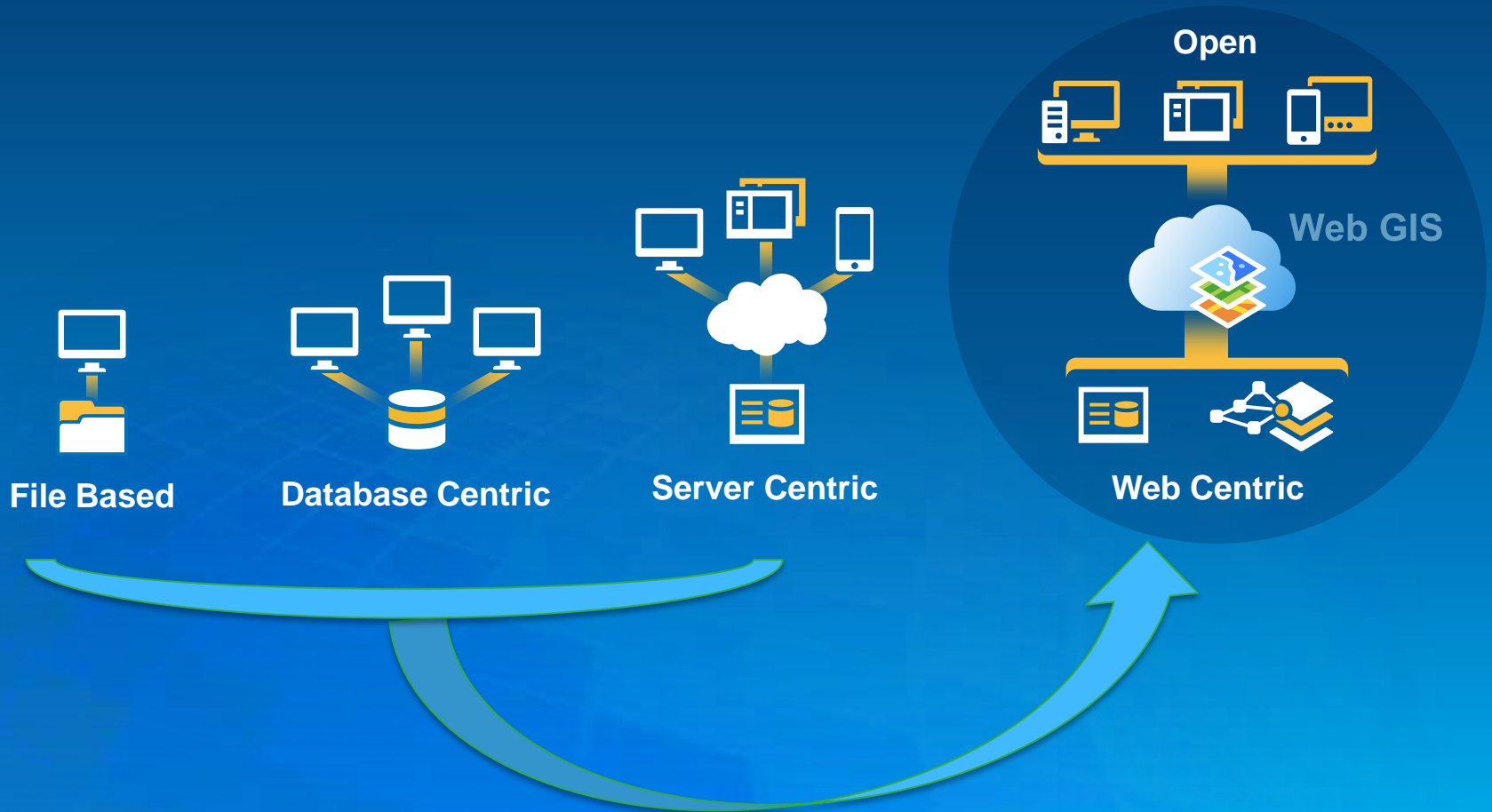
Web GIS

**Making Mapping and GIS
Available Across Organizations**

Transforming the Role of GIS

Web GIS Is a New Architecture

Integrating All The Common Computing Patterns



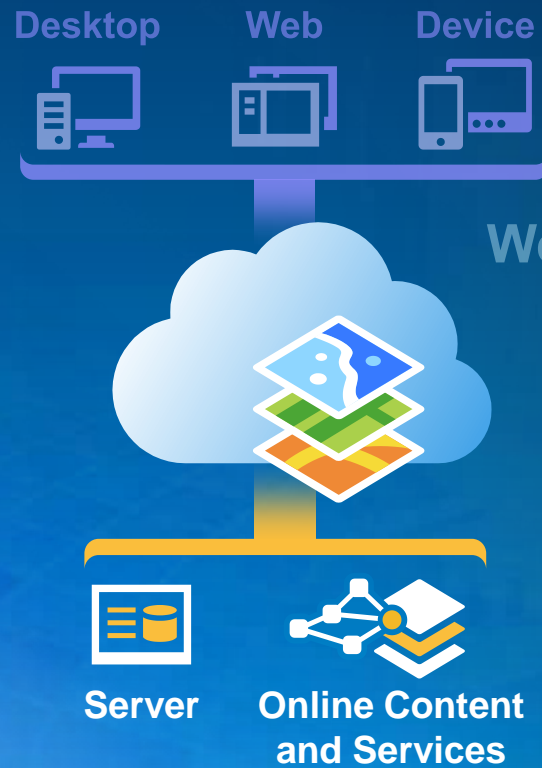
Web GIS – Accessible from Any Client

Simple
Integrated
Open



Web GIS – Powered by Services

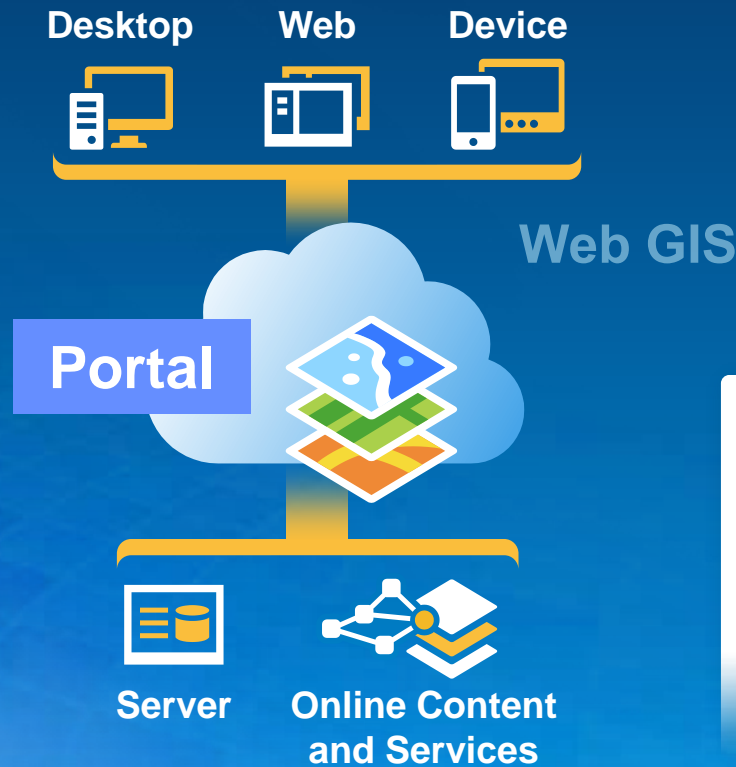
Simple
Integrated
Open



GIS Is a Platform

Organizing Content and Managing Access

Simple
Integrated
Open



*Available in the Cloud . . .
. . . and On-Premises*

Online Basemaps

Oceans

Topographic

Canvas

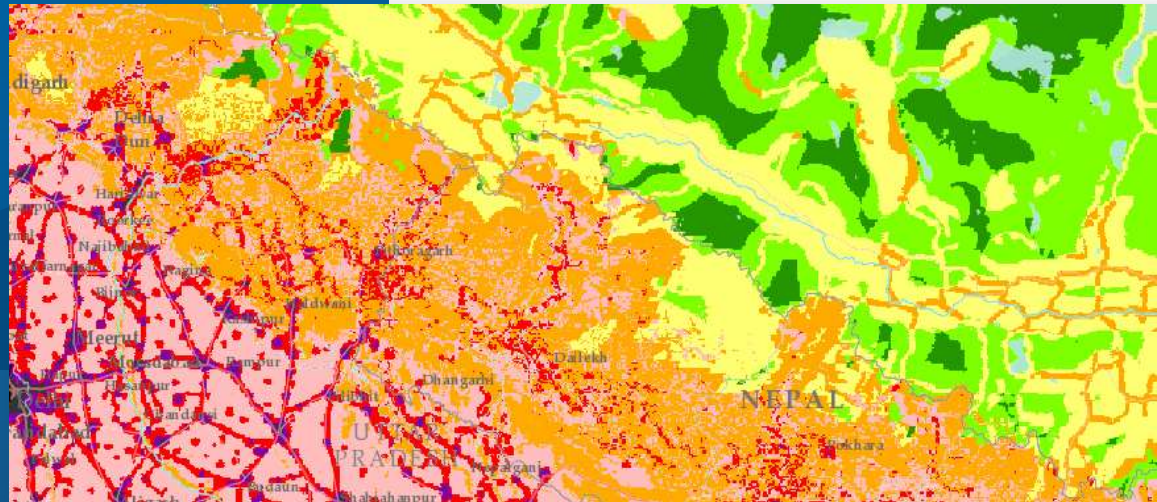
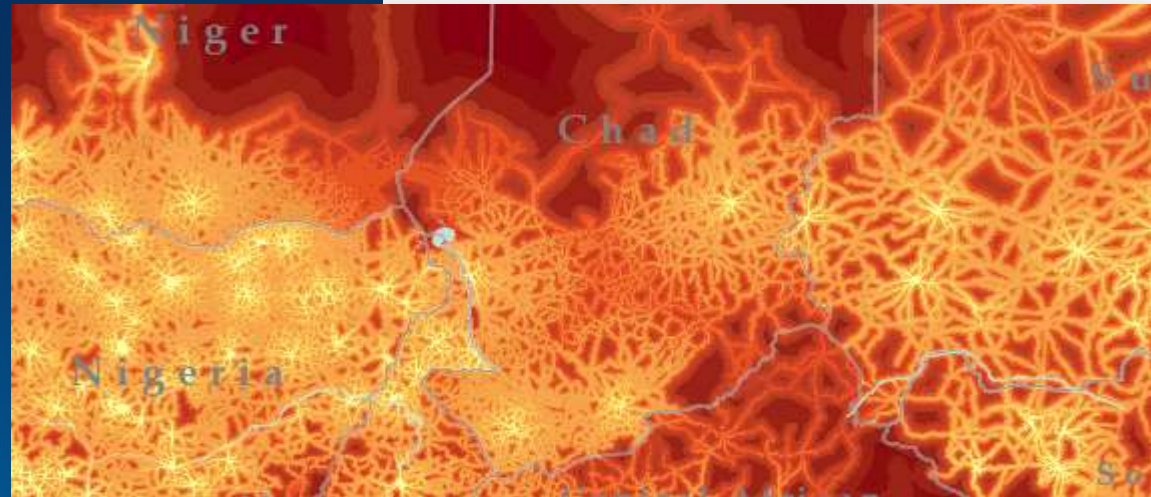
Imagery

Terrain



Demo

Web GIS



Web GIS Enables Spatial Analytics

Leverage Cloud Infrastructure

Find Hot Spots



Merge Layers



Summarize Within



Field Calculator
Extract Data

Overlay Layers



Summarize
Nearby



Enrich Layer

Create Buffers

Dissolve Boundaries

Find Nearest

Aggregate Points



Drive-Time Areas



Enabling New Approaches for GiScience

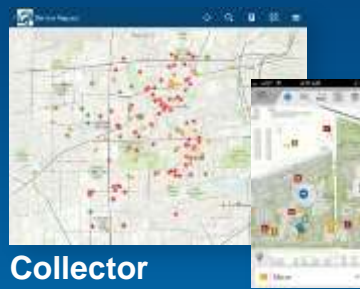
Web GIS Apps Empower Everyone

Focused and Easy to Use on Any Device

View / Query



Editing / Collection

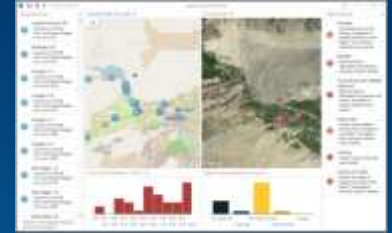


Collector

Mapping



Awareness



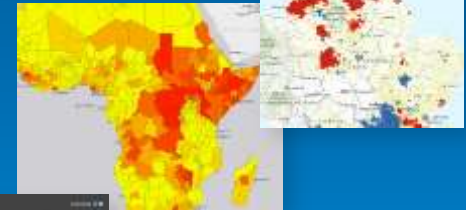
Dashboard

Location Analytics



Office

Analysis



Story Maps



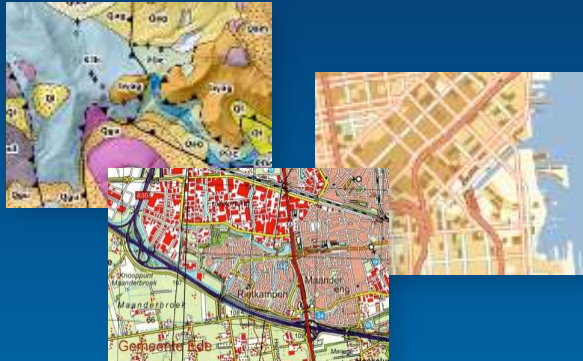
Visualization



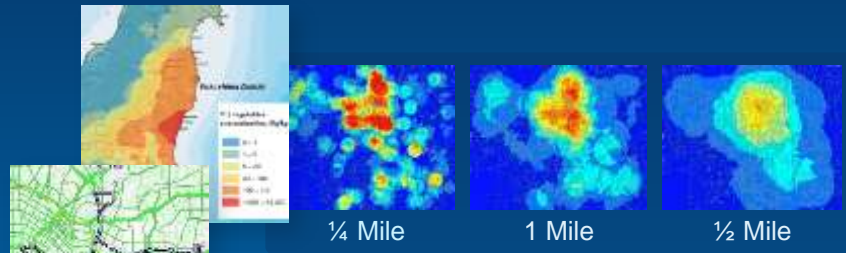
Enabling You to Extend the Power of GIS

Web GIS Also Fully Integrates Desktop Applications

Supporting GIS Professionals



Advanced Cartography



Modeling & Spatial Analysis

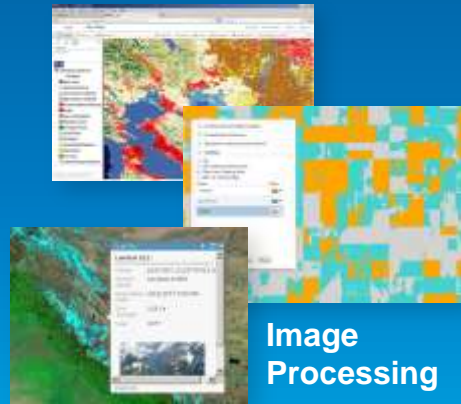


Image Processing



Editing and Data Management



3D Visualization

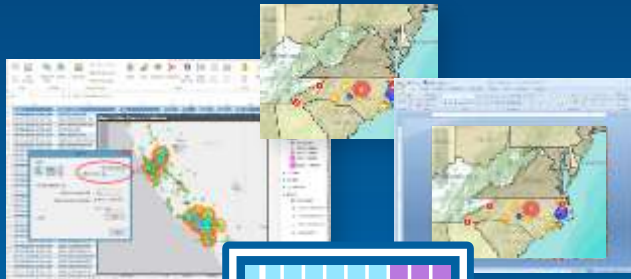
CityEngine

To Managing Data, Performing Analysis and Authoring Cartography and Visualizations

Web GIS Geo-Enables Business Intelligence Systems

Providing Mapping, Spatial Analysis, and Reporting

Microsoft Office



Spreadsheets

Enterprise Systems



Integrating

- Office
- IBM Cognos
- SharePoint
- MicroStrategy
- SAP
- Salesforce
- Dynamics

Supporting Location Analytics Everywhere

Web GIS Is Open

Empowering a New Community



```
-(void)mapViewDidLoad:(AGSMapView *)mapView  
{  
    // Add data as a Feature Layer  
    NSURL *featureLayerURL = [NSURL URLWithString:@"http://services.arcgis.com/049612c0000000000000000000000000/arcgis/rest/services/World_Cities/FeatureServer"];  
    self.featureLayer = [AGSFeatureLayer featureServiceLayerWithURL:featureLayerURL accessToken:nil];  
    self.featureLayer.queryDelegate = self;  
    [self.mapView addMapLayer:self.featureLayer];  
}  
  
-(void)getCitiesForCountry:(NSString *)countryName  
{  
    // Query features by country or state/region  
    AGSQuery *countryQuery = [AGSQuery query];  
    countryQuery.where = [NSString stringWithFormat:@"country = '%s'", countryName];  
    [self.featureLayer queryFeatures:countryQuery];  
}
```

Silverlight

Web

REST

Objective-C

JavaScript

WPF

HTML5

.NET

Flex

iOS



Web GIS is an Evolutionary Step

Providing a Road Map for a Smarter Society



*Leveraging Our Collective Geospatial Investments . . .
. . . Making Maps and GIS Available to Everyone*

Location

The Power to Transform Our World

Understanding the Technology

Evolving With the Pattern

Sharing Methods and Data

Facilitating Collaboration

Your Work Is Essential

