Welcome
Geo-Information Technologies
“Bridging Our Gaps”

Thank You For Inviting Me

Our World Is Evolving Rapidly
• Population
• Urbanization
• Globalization
• Economic Development
• Environmental Change
• Human Conflicts
• Growing Knowledge
• Advancing Scientific and Technology

Increasingly Complex, Challenging, and Crowded
The Application Of Geo Information Is Growing

Each Of Us Belong To Different Communities
... Part of a Global Society
• Co-Existing
• Co-Evolving
• Co-Dependent

Collecting, Managing And Applying Geospatial Information

GIS Continues To Grow
• Applications
• GI Science
• Technology

... Part of a Global Society
Collecting, Managing And Applying Geospatial Information

GIS is Emerging As a New Language
Introducing New Concepts and Methods

Complex Data Modeling
Interactive Mapping
Visualization
Modeling
Geoprocessing

... Building on the Theories And Methods of Many Fields
Integrating Data

GIS Is All About Integrating Information
Key Concepts
• GeoReferencing
• Data Modeling
• Spatial Relationships
• Spatial Analysis
• Spatial Visualization

Road Networks
Geology
Topography
Survey Data
Land Use
Imagery
Environmental Biology
Social Factors

... Integrating Disciplines, Organizations and Activities
GIS Technology Is Integrating Geospatial Workflows
Increasingly Being Seen as a Framework for Creating Communities Of Interest . . .
. . . Integrating What We Know . . . Supporting Cross Cutting Collaborations

Three New Integrating GIS Advancements
- Survey Measurement And GIS Data Integration
- GIS Services / Servers
- Semantic Data Transformation (ETL)

. . . Extending GIS Integration . . . And Extending The Concepts Of SDI

Data Integration Techniques
- Feature Connectivity (Topology) 70’s/80’s
- Geo-Relational (Maps And Tabular) 70’s/80’s
- Visual Overlay (Raster / Vector) 70’s/80’s
- Data Conversion (Translators) 70’s/80’s
- Map Overlay Analysis (Raster / Vector Geoprocessing) 70’s/80’s
- Modeling 3D Objects (Softcopy Photogrammetry) 80’s/90’s
- Linear Referencing (Dynamic Topo) 80’s/90’s
- Direct Reading / Using (API’s) 90’s
- Database Integration (DBMS Extensions) 90’s
- Survey Integration (Measurement / Coordinates) 2000’s
- Semantic Transformation (ETL) 2000’s
- Intelligent Geodatabases (Rule Based Topology) 2000’s

Each New Technique Resulted In Advancing Our Methods . . . And Advancing Our Collaboration

Topology Supported Better Spatial Data Integrity And Advanced Spatial Analysis
. . . Replacing Drawings and Graphics With Spatially Intelligent Networks

There Are Many Geospatial Data Types
Reflecting Various Sciences, Technology, And Methods For Spatial Measurement . . .
- Images
- Vectors
- Topology
- Networks
- Terrain
- Surveys
- CAD Drawings
- Addresses
- Attributes
- 3D Objects
- Dimensions
- Annotation

GIS Integrates These Data
. . . . . . Building A Common Language
. . . Providing A System for Connecting, Communication and Collaboration
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Georelational Data Modeling
Integrated Maps And Data

Raster/Vector Integration

Map Overlay Modeling

New
Integration Of Survey Measurements
With GIS Data Represents A New Type Of Data Modeling

Integration Occurs At The Workflow Level And At
The Database Level

GIS Is Evolving

Supporting Visual Overlay
... And Softcopy Photogrammetry

Supported Spatial Analysis and Geoprocessing

Creating A Kind Of Bridge

Becoming Server Oriented, Networked And Available

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GIS Servers Provide The Foundation

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GIS Servers Can Operate In A Distributed Services Oriented Architecture

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Example - Web Publishing Of The National Map

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Example - Support for Tsunami

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GIS Portals/Metadata Catalogs Are Emerging

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GIS Networks Are Becoming Interoperable

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Dynamic Integration Can Be Problematic

**Distributed Geology**

... When Data Models Are Different

**Semantic Transformation** Is Necessary
Dynamically Remodeling Geographic Information

**Transforming Data Automatically**
- Format Conversion
- Schema Transformation (ETL)
- Scale Projection Changes
- Generalization
- Merge

... Eliminating Need For Re-engineering Data And Workflows

**Example - BLM Uses Web Services**
for Maintaining the National Integrated Land System (NILS)

- State Files
  - Transactually Maintained
- Interoperability Procedures
  - Format Conversion
  - Schema Reorganization (ETL)
  - Scale Projection Changes
  - Generalization
  - Merge

... Served on the Web

**Web Serving Land, Survey and Related Data**
For Browsers, Desktop and Mobile

**Example - Project Homeland**
End-to-End Federated Application Solution

- Multi-Agency Effort
- Many Local Governments
- USGS
- NGA

... Web-Enabled Nation-Wide Geospatial Intelligence

**GIS Is Expanding . . .**

**Becoming Infrastructure . . .**

Why?
- Expanding Needs
- More Awareness
- New Applications & Solutions
- Improving Tools And Enabling Technology
- Increased Interest In Enterprise GIS & NSDI
- Organizations Are Working Together

... GeoSpatial Professionals . . . Will Lead This