The Geo-Web: Enabling GIS on the Internet
IT4GIS
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In the Beginning
• GIS was independent
• The GIS analyst or manager was typically a one-person shop
• He/she created the data, analyzed the data, and printed the maps

Along Came the Internet
• The proliferation of networks and the Internet caused a chain-reaction
  – GIS data became easier to share
  – Faster networks with larger bandwidth led to increasingly larger datasets being shared
  – Yet, GIS data was stored using a self-service model on the network
Old Habits are Hard to Break

- Centralized GIS on the network
  - Clearinghouses
  - One-stop-shops
- Someone was in charge

But the One-Stop-Shop Broke

- What now?
- Re-invent the one-stop-shop
  - There are now more than 100,000 GIS clearinghouses
  - Each state, large agency, and large company
  - Why so many one-stop-shops?
    - "Data incompatibilities"
    - "Data standards"
    - (Control issues)

Control Issues and Fallacies

- Protect trade secrets
- Ensure data security
- Retain intellectual property
Prove It!

- IBM
- Boeing
- What do they have in common?
  - Mass-collaboration
  - Open structure
  - De-centralized organization
  (for more, read “Wikinomics”)

The Web 2.0

- The Next Generation
  - All about mass-collaboration
  - Mash-ups
  - Synergy
  - Distributed, de-centralized systems
  (for more, read “The Starfish and the Spider”)

Reducing Resistors is more effective than adding Drivers*

*See Kurt Lewin’s Theory of Change Management
Collaboration is New?

- Traditional collaborations were:
  - A selected team of colleagues
  - Hierarchical in structure
  - Breadth of knowledge relatively narrow

- Mass-collaboration is:
  - An open set of contributors
  - De-centralized in structure
  - Breadth of knowledge will be broad

Web 3.0

- Semantic web
  - Coined by Tim Berners-Lee, the man who invented the (first 1.0) World Wide Web.
  - Machine-readable Web pages and semantic metadata
  - Support for future AI applications
  - "Turns the Web into one big database"

- IoT, Internet of Things
  - Machine learning and sensor integration

An Interesting Aside

- Tim Berners-Lee has more recently called for a change in sovereignty of the web.
  - He sees the current Web 2.0 Giants as usurpers of the original intent of the Internet
How Might Web 3.0 Work?

**GeoEvent Server**

- **Unstructured data** is streamed into an ArcGIS GeoEvent server
- These data are filtered
  - Location
  - Place
  - Other data (keywords)
- Resulting records are mapped and can be stored in a geodatabase

1. Based on Service Level Agreement (SLA) or Licensing Agreement

**A Grand Experiment**

- Can Web 2.0 and 3.0 concepts be applied to GIS and spatial analysis... spatial problems?
- Can the GeoWeb be built and leveraged to provide real-time decision support?
- A step in this direction:
  - Esri's Insights for ArcGIS
  - Esri's GeoEvent Server
The Role of GIS

• What are we GOOD at?
  – Collect spatial data
  – Prepare maps and spatial analysis models
  – Perform spatial analyses to discover trends, patterns, and relationships

The Role of GIS (cont’d)

• Use ArcGIS and web services to make geo-spatial data available to everyone
• Transform these data into actionable information to communicate with everyone
  [Just because data is available does not make it meaningful information]
• Help build the Geo-Web

Focusing our Role in IT4GIS

• ArcGIS and web services
ArcGIS Enterprise: Architecture

- Requirements:
  - Network connectivity
  - 64-bit Windows Server OS
  - ArcGIS Desktop software
  - ArcGIS for Server software

ArcGIS Enterprise Requires...

- Server hardware
  - Sufficient hard drive space
  - Consider number of expected hits (transactions) when selecting CPU and cache

ArcGIS Enterprise: Architecture (cont’d)

- ArcGIS Pro and ArcGIS Enterprise
  - ArcGIS Pro is your desktop software
  - ArcGIS Enterprise is your server software
  - These software technologies are connected via ArcGIS Portal
ArcGIS Portal

- Server software providing a user interface
  - AGOL is an instance of Portal
- Installed and configured as part of ArcGIS Enterprise
  - (TIP: Use Esri’s Builder tool to make your first installation/setup easier)
- Designed to support the GIS demands of your enterprise

ArcGIS Server is...

- Also part of ArcGIS Enterprise
- Scalable
- Flexible (variety of SDK’s [e.g., Java and HTML5])
- Resulting services are easy for clients to use (easier than ArcGIS Desktop)
- Supports Portal for ArcGIS

ArcGIS Server can deliver...

- Image services
- Geodata services
- Map services
- Geocoding services
- Indexing/Search services
- WMS Services
- KML Services
Using a Mash-up of Services…

• Map services can be used to deliver web map applications

Image Services

Best Practices

• Serve either a:
  • Single image file (e.g., GeoTIFF), or
  • Raster mosaic dataset w/i fGDB

Raster Mosaic Datasets

• A great solution to serve raster data
• Performance
  – Response
  – Cache (no longer needed/used)
Do you understand client-side caching?
  – Overview size
  – Developing a map service from these data
Web Image Layers

- Service produced when publishing raster data from ArcGIS Pro
- AKA “Image Service”

Map Services

- Effectively, Map Services (Web Maps or Web Layers) are a type of web service to display an ArcGIS Pro map
- Advantages
  - Can include numerous layers
  - Raster and Vector (based on licensing, raster data may not be supported in your AGOL)
  - Retains symbology, scale thresholds, and other settings
    (note: images with ColorMaps, served as Image Services, will retain symbology also)

Process of creating an ArcGIS Web Map and App

1. Author a map
   - Using ArcGIS Pro
2. Share your project’s Web Map or Web Layer Service
3. Create a Web application
In IT4GIS…

- Our exercise will give you hands-on experience with:
  - Image services
  - Map services
  - And later, Web Map Applications

Web 2.0 and 3.0 Revisited

- It should be clear how the GeoWeb fits and supports the concept of Web 2.0
- How might it support the semantic web? (Web 3.0)
  - Two minute write!

Key Concepts

- GIS is everywhere
- The Internet is a great way to deliver GIS
- Today—and in the future—web enabled GIS will be increasingly important
- Students need to know the fundamentals of serving GIS data and maps on the web and the practical application of this technology