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
The Web 2.0
• All about mass-collaboration
  – Mash-ups
  – Synergy
  – Distributed, de-centralized systems
  (for more, read “The Starfish and the Spider”)

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 stored¹ in a geodatabase

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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 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)
• Resulting services are easy for clients to use (easier than ArcGIS Desktop)
• Supports Portal for ArcGIS
ArcGIS Server can deliver:
- Image services
- Geodataset services
- Map services
- Geocoding services
- Indexing/Search services
- WMS Services
- KML Services

Using a Mash-up of Services...
- Web Layers are used to create Web Maps
- Web Maps 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

Professional Hints and Tips

• Work Smarter not Harder
  – Using the command line

Questions…Assignment