The Geo-Web: Enabling GIS on the Internet

IT4GIS
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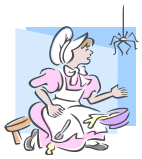
In the Beginning

- 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

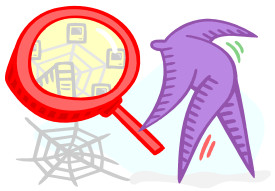
Along Came the Internet

- 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



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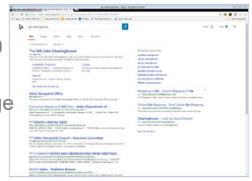
But the One-Stop-Shop Broke

- 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)



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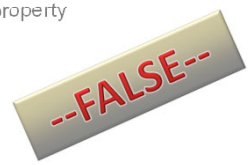
Control Issues and Fallacies

- Protect trade secrets
- Ensure data security
- Retain intellectual property



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Change Model: Indiana Data Sharing

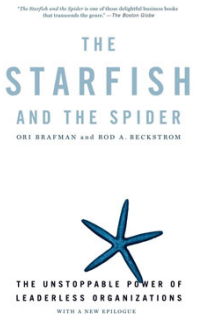
Drivers:	STATUS QUO	Resistors:
Statewide data has wider application	→	← "My Data"
Visibility increases perceived value	→	← Concerns about downstream misuse
An "bottom-up" aggregation model leverages the strengths of each level of government	→	← Loss of potential perceived revenue
Historical data costs are set, but sharing increases the return on that investment	→	← Do not want to change to fit new data standard
"One stop shopping" access increases the usefulness of the data	→	← Looking for quid pro quo
We are all on the same side	→	← Mistrust (local vs state)
	→	← Imperfect data
	→	← Sharing requires too much effort

Reducing Resistors is more effective than adding Drivers*

*See Kurt Lewin's Theory of Change Management

The Web 2.0

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



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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

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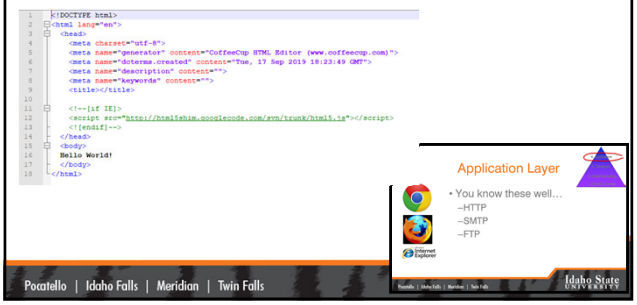
An Interesting Aside

- 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?



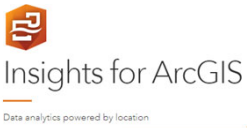
GeoEvent Server

- **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[1] 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)

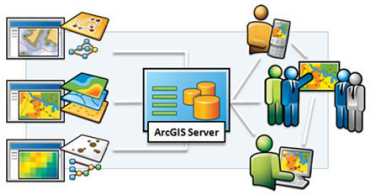
- Use ArcGIS and web services to make geo-spatial data available to **everyone**
- Transform these data into *actionable information* to communicate with **everyone**

[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



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ArcGIS Enterprise: Architecture

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

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ArcGIS Enterprise Requires…

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

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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…

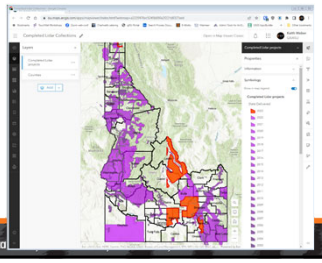
- Also part of ArcGIS Enterprise
- Scalable
- Flexible (variety of SDK's, e.g., Java)
- Resulting services are easy for clients to use (*easier* than ArcGIS Desktop)
- Supports Portal for ArcGIS

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…

- **Web Layers** are used to create **Web Maps**
- **Web Maps** can be used to deliver **Web Map Applications**



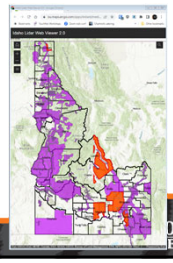
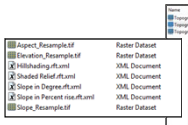
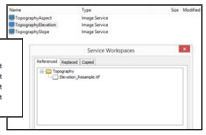


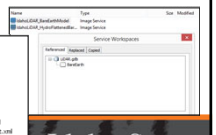
Image Services

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

Author a map
- Using ArcGIS Pro

Share *your* project's Web Map or Web Layer Service

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