# 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

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# 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

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## Old Habits are Hard to Break

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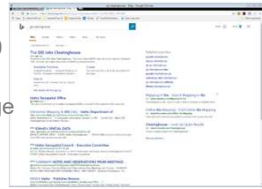  - Clearinghouses
  - One-stop-shops
- Someone was in charge

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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

--FALSE--

## Change Model: Indiana Data Sharing

**STATUS QUO**

**Drivers:**
- Statewide data has wider application
- Visibility increases perceived value
- An "bottom-up" aggregation model leverages the strengths of each level of government
- Historical data costs are set, but sharing increases the return on that investment
- "One stop shopping" access increases the usefulness of the data
- We are all on the same side

**Resistors:**
- "My Data"
- Concerns about downstream misuse
- Loss of potential perceived revenue
- Do not want to change to fit new data standard
- Looking for quid pro quo
- 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

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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 Big Tech Giants as *usurpers* of the original intent of the Internet

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## How Might Web 3.0 Work?

```
1   <!DOCTYPE html>
2   <html lang="en">
3   <head>
4       <meta charset="utf-8">
5       <meta name="generator" content="CoffeeCup HTML Editor (www.coffeecup.com)">
6       <meta name="dcterms.created" content="Tue, 17 Sep 2019 18:23:49 GMT">
7       <meta name="description" content="">
8       <meta name="keywords" content="">
9       <title></title>
10
11      <!--[if IE]>
12      <script src="http://html5shim.googlecode.com/svn/trunk/html5.js"></script>
13      <![endif]-->
14  </head>
15  <body>
16  Hello World!
17  </body>
18  </html>
```

**Application Layer**
- You know these well…
  - HTTP
  - SMTP
  - FTP

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## Esri's 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

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## A Grand Experiment

- Can the current Web 2.0 and future 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?

## 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

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## The Role of GIS (cont'd)

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

[Just because data is available does not make it meaningful information]

- Help build the Geo-Web

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## 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 s*erver* software
  - These software technologies are connected via **ArcGIS Portal**

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## 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

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## ArcGIS Server is…

- Another 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

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## ArcGIS Server can deliver…

- **Image services**
- Geodata services
- **Map services**
- Geocoding services
- Indexing/Search services
- WMS Services
- KML Services

**New Web Map**
Share this map as a new web map to your ArcGIS organization. The data layers in your map will be published as new web layers and included in the web map, along with your basemap and any existing web layers.

**New Web Layer**
Share all the data layers in this map as a new web layer to your ArcGIS organization.

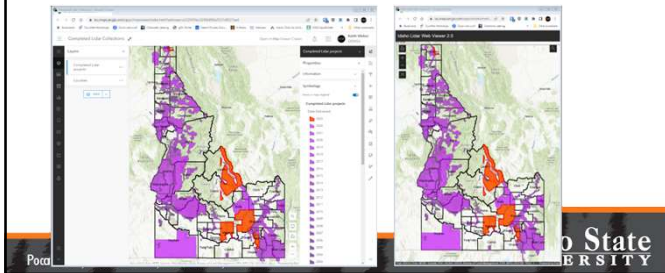Idaho State
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## Using a Mash-up of Services…

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



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## Image Services
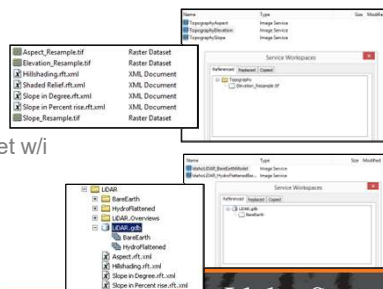
**Best Practices**

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



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## 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…

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

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## 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!

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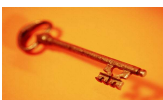
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## Key Concepts

- 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

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## Professional Hints and Tips

- Work Smarter not Harder
  - Using the command line

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## Questions…Assignment

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