

Lecture 10: GeoWeb and Big Data

GEOG413/613
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Web GIS

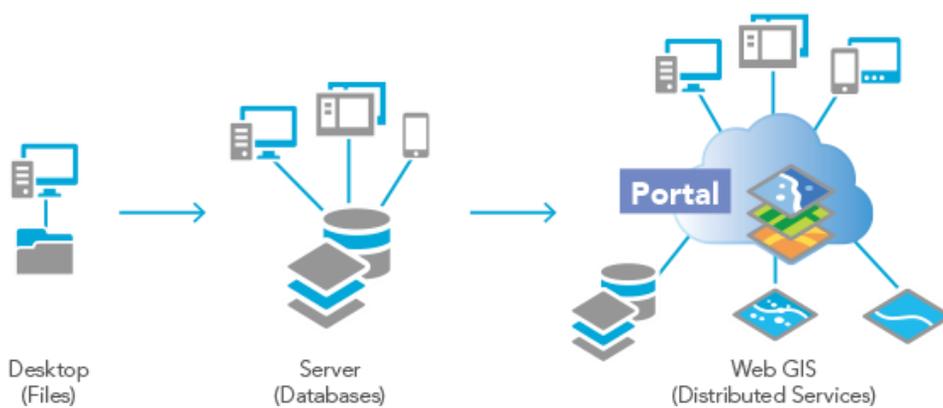
- Web GIS: any GIS that uses web service technology to communicate between a server and a client.
 - Key elements:
 - A server and a client
 - The server performs the requested GIS operations and sends responses to the client via HTTP.
 - The format of the response sent to the client can be in many formats, such as HTML, binary image, XML, JSON, etc

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Web GIS

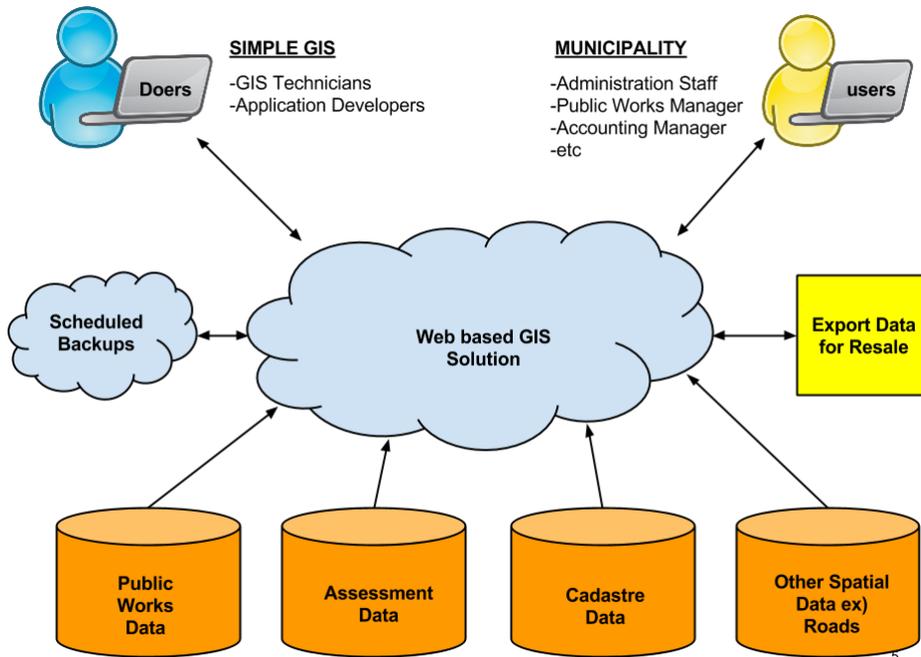
- Web GIS Key advantages:
 - A wide reach
 - A wide user base
 - Cross-platform capability
 - Low cost (relative to potential usage)
 - Easy to use
 - Unified updates
 - Numerous applications

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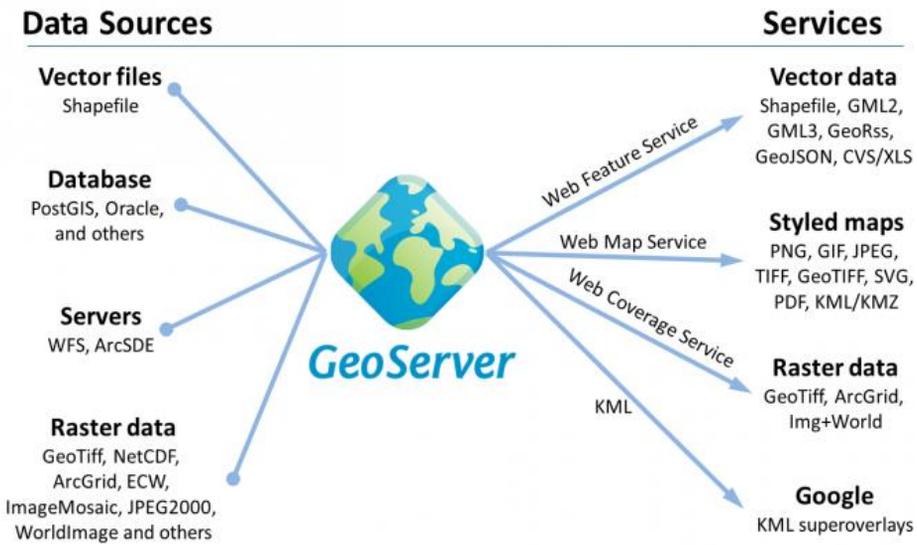


Source: ESRI

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Source: <http://www.simplegis.ca>



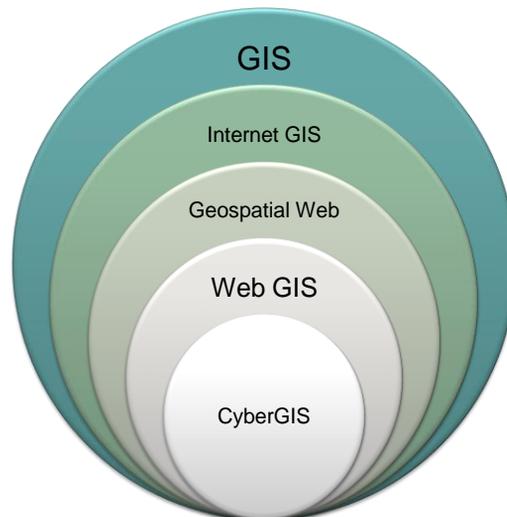
Source: <http://eatlas.org.au>

Web GIS

- Essential elements of a web GIS application
 - A web application
 - Software to visualize and interact with geographic information
 - Digital basemaps
 - Geographic context for each application e.g. Transportation, Topographic, Terrain, Imagery
 - Operational layers
 - Additional layers for the operation e.g. sensor feeds, editing layers
 - Tasks and tools in the web GIS application
 - Client tasks, server tasks
 - One or more geospatial databases

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Web GIS, GeoWeb, Internet GIS



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Internet GIS

- GIS that uses internet services not just the web
 - Thus it's conceptually broader than Web GIS
- However, Web GIS is more pervasive than internet GIS
 - Web is most attractive element of internet

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CyberGIS

- CyberGIS
 - Largely for academic and research centers
 - Computationally intensive
 - Large geospatial datasets
 - software for a seamless integration of infrastructure, GIS, and spatial analysis/modeling functions

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GeoWeb

- The Geospatial Web (GeoWeb)
 - Sometimes referred to as the Spatial Web
 - Can allow for the integration of sensors, servers
- Users can share geospatial data
- Data can be dynamic and near real-time, and fully interoperable

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GeoWeb

- GeoWeb
 - Allows different systems to exchange/use geospatial information
 - Interoperability
 - Interoperability drives costs down and productivity up
 - Spatial Data Infrastructures (SDI) use rely on the GeoWeb to provide access and publish data, services and metadata
 - Interoperability with other SDI systems

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GeoWeb

- Geobrowsers/Virtual globes
 - OpenStreetMap
 - GoogleMaps
 - MapQuest
 - MapBox

- What3Words

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Volunteered geographic information (VGI)

- User-generated content
 - Draws on community intelligence/knowledge
 - Relies on crowdsourcing
- Relies on and empowers citizens who are
 - Untrained but interested
 - Citizens as scientists
 - Unpaid for their time
 - Data
 - May contain errors
 - Not authoritative but may be asserted

[Example: Community Mapping Network](https://princegeorgetrails.ca/)
<https://princegeorgetrails.ca/>

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Big Data

- "Big Data represents the Information assets characterized by such a High Volume, Velocity and Variety to require specific Technology and Analytical Methods for its transformation into Value" De Mauro et al 2016
 - The 3Vs
 - Volume: Scale of the data
 - Velocity: Speed of generation
 - Variety: Different forms
 - Other Vs

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Big Data

- Characteristics of Big Data
 - Volume
 - The quantity of generated and stored data. The size determines the value whether it is big data or not.
 - Tracking what is happening (as opposed to sampling a process)
 - Variety
 - The type and nature of the data. Fusion of text, image, audio, video sources
 - Velocity
 - Speed at which it is generated
 - Speed of processing to meet the demand

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Big Data

- Variability
 - Inconsistencies in the data can hamper processing
 - Relates to missing data
- Veracity
 - The quality of captured data can vary greatly, affecting
 - Relates to validity/accuracy

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4 Broad Themes of Big Data

- Information
 - Data are created, shared and utilised extensively in recent times
 - The proliferation of personal mobile devices
 - connected to the Internet
 - equipped with digital sensors
 - Expanding variety in form
- Pervasive (Wide impact)
 - Many fields
 - Examples: Elections; Google searches linked to epidemiology and economics

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4 Broad Themes of Big Data

- Technology
 - Needs intensive computational and storage specs
 - Hadoop
 - Open source parallel computing.
 - Google, Yahoo, FaceBook
- Methods of Analysis
 - cluster analysis; genetic algorithms; natural language processing; machine learning; neural networks; predictive modelling; regression models; social network analysis; sentiment analysis; signal processing and data visualisation¹⁹

Geospatial Big Data

- Is there an emergence of a data-driven geography?
 - From a “data-scarce to a data-rich” environment
 - But not revolutionary for geographers
 - Geodemographics
 - Longstanding problems in geography
 - large data volumes,
 - messy data,
 - Black box algorithms
 - Justification through the market

Geospatial Big Data

- Surveillance and location data
 - Applications
 - Marketing (e.g. RFID)
 - Crime deterrence (e.g. CCTV)
 - Anxiety
 - Intrusive
 - Transparency in collection and flow of personal spatial data (eg facebook and privacy settings)

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References

- De Mauro et al (2016). "A Formal definition of Big Data based on its essential Features". Library Review. 65: 122–135.
- Fu and Sun (2001), Web GIS: Principles and Applications. ESRI Press
- Miller and Goodchild (2015). Data Driven Geography GeoJournal 80(4) 449-461