GEOG 413/613

LECTURE 8

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GeoWeb

- Traditionally, a GIS was in a fixed place,
  - user's desktop machine
  - Server
- But today all the parts–the data and the software–can be accessed remotely
  - This was the vision for the GeoWeb
  - Substantially realised
  - Varied parts are able to operate together
- Internet becomes a massive GIS that is accessible anywhere, at any time, from any device.
  - real-time feeds of data from sensors and the ability to integrate these with other data (IOT)
- The Cloud provides a versatile, powerful, economical and possibly open GIS

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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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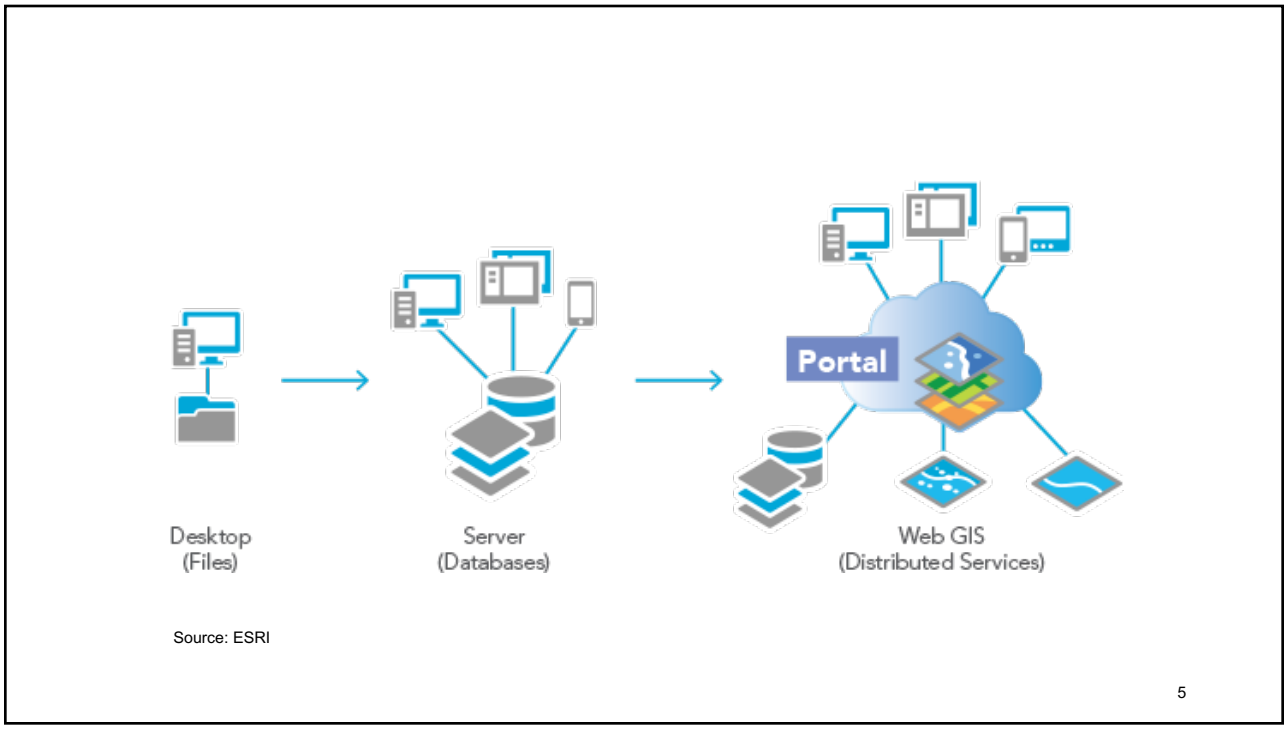
Portal
Desktop
(Files)
Server
(Databases)
Web GIS
(Distributed Services)
Source: ESRI
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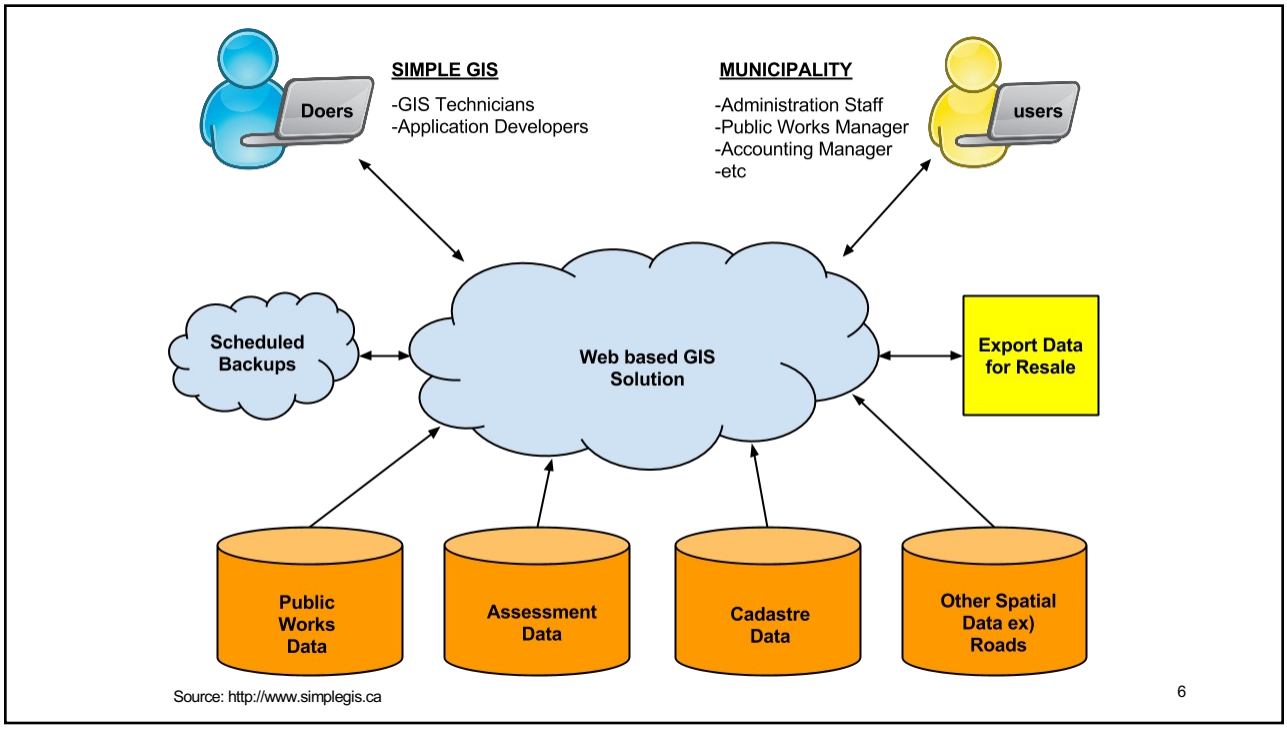
Doers
SIMPLE GIS
-GIS Technicians
-Application Developers
MUNICIPALITY
-Administration Staff
-Public Works Manager
-Accounting Manager
-etc
users
Scheduled Backups
Web based GIS Solution
Export Data for Resale
Public Works Data
Assessment Data
Cadastre Data
Other Spatial Data ex) Roads
Source: http://www.simplegis.ca
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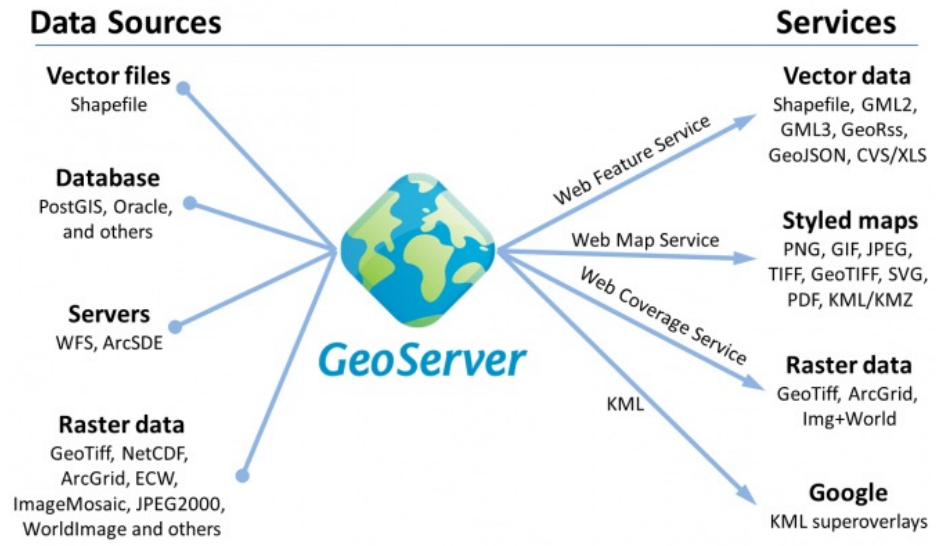

Source: http://eatlas.org.au

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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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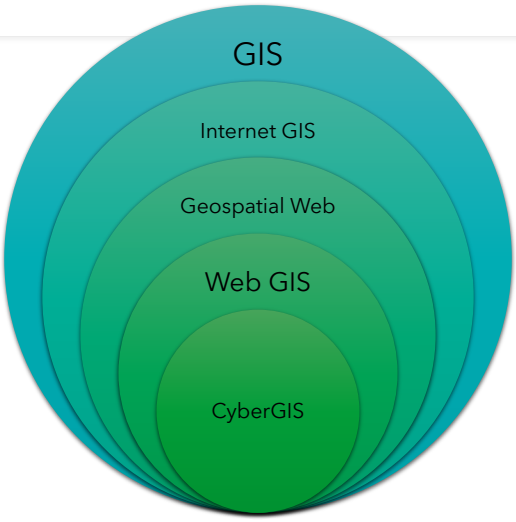
Web GIS, GeoWeb, Internet GIS



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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 (and similar services)

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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/

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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 results; 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 visualisation

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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

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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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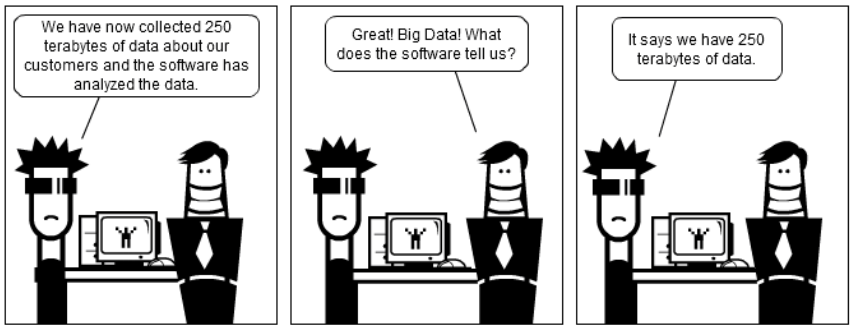
The Big Data Challenge

View more social media cartoons at
www.socmedsean.com



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R and Internet Data

- Direct Access
  - Read a table directly from the URL
- Using RCurl
  - RCurl is a package that provides extra functionality for data access
- Working with APIs
- Creating Mushups

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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

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