Web GIS: Principles and Applications

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Web GIS: Principles and Applications
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Web GIS course
Henan University, China
Contents

• Introduction
• Technical evolutions
• Applications
The Web has changed everything

USPS
Washington Post / Newsweek
Blockbuster v.s. Netflix
...

New and more efficient business models have emerged, making previous models increasingly obsolete.

How does it affect you?
GIS is no exception

1962
CGIS
Roger Tomlinson
Father of GIS

1969
Internet

1990
WWW
Tim Berners-Lee
Father of the Web

1993
Web GIS
Xerox PARC Viewer

Global reach; large number of users; better cross-platform; low cost; easy to use; diverse applications

URL, HTTP, HTML
Basic System Architecture

GIS database server → GIS server → Web server

Data tier
Logical tier (i.e., middle tier)
Presentation tier

Client (Web browser, desktop, or mobile)

Internet

HTTP Request
HTTP Response

URL
HTTP
HTML

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Evolutions

- From Web sites to Web services
- From SOAP to REST
- Web Services extended by browser side APIs
- From 3 tiers to n-tiers
- From local to the cloud
- From one way to two ways
- From wired to wireless
- More than just mapping
From Web sites to Web services

ArcGIS Server

2D Map  3D maps  Image  Geometry  Feature  Search  Tracking  Routing  Geoprocessing  Catalog

Internet
From web services to browser side APIs

**Server side**
- Map making and other processes
- Receive requests and send responses

**Scope of Web services**

Internet

**Browser side**
- Send requests and receive responses
- Display maps, interact with users

**Scope of browser-side APIs**

ArcGIS API for JavaScript, Flex, Silverlight
From 3 tiers to n-tiers

Most of today’s Web GIS applications are mashups

Impacts on NSDI, app dev, research
Highway incidents

Highway speed and photos

Hospital status

Baseline

Helicopter and ground vehicle locations

Web application

Server

Processed to GeoRSS format

Internet

Geocode Service

Find Incidents Service

Mashup on smart-phones using ArcGIS Mobile

Mashup in Web browsers using ArcGIS JavaScript API and AJAX

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Geoparsing, screenscraping

The internet is your geodatabase
Design pattern

Web GIS application =
  basemaps +
  operational layers +
  tools
Geoportal & Cloud GIS, hubs of today’s Web GIS

Featured Maps and Apps

- Maps
- Web Apps
- Mobile Apps

- Forests in Europe
- Great Britain Basemap
- Global Wetlands (1993)
- Our Far South - Expedition Map
- Carbon Dioxide Emissions on
- Global Climate Observing

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Cloud GIS

Upload data to ArcGIS Online

Locate the file you want to import. You can import a zipped shapefile (ZIP), a comma or tab delimited text file (CSV or TXT), or GPS data file (GPX) with up to 1000 features in it.

File: C:\Student\WebGIS\eqs7day-M2.5.txt

Tip: You can also drag and drop a CSV or GPX file from your desktop onto your map.
Cloud GIS

Publish to ArcGIS Online
Lots of applications

- e-Government
  - Public information service
  - Two way communication
  - Operation and decision support
Public information service

Online, not in line
Demos

- Environmental Public Health Tracking prototype
Reverse information flow & VGI

**Mapping** the spatial-temporal patterns of VGI, tweets, YouTube, Flickr ....
ePlanning and incident reporting

Demo: MWRD
From wired to wireless
Post PC era

Mobile GIS

Important client for Web GIS

Web GIS

Application dev paths
• Native application based
• Browser based
Browser-based approach

- ArcGIS API for JavaScript
  - iOS

Still have access to GPS & other positioning technologies via HTML 5
Native application based approach

**Esri products**

- **ArcGIS Mobile**
  - ArcPad
  - Windows Mobile
  - .NET Mobile

- **iOS**
  - Objective C

- **Android**
  - Silverlight
  - Java

- **Microsoft Windows Phone**

Applications & SDKs
More than just mapping

Pennsylvania Radio Network Outage Management
Map algebra
If one or more towers are down, Where & who will be affected?
Demos

- Geospatial analysis online
  - Publish a geoprocessing service
  - Use it via JavaScript and ArcGIS Flex Viewer
User Experience Design Principles

1. **Make it fast.**
   “Don’t make me wait”
2. **Make it simple.**
   “Don’t make think”
3. **Make it enjoyable.**
   “Let me have fun!”

ArcGIS APIs for JavaScript Flex and Silverlight
ArcGIS Explorer
Technologies

ArcGIS.com Catalog

Geoportal

Server

Client

Connect and use

Publish

Author with ArcGIS Desktop

ArcGIS Server, ArcGIS.com Cloud

No programming

ArcGIS.com, ArcGIS Explorer, ArcGIS Flex Viewer, ArcGIS for iOS/Android...

Web APIs, Mobile APIs, ...

Search and discover

Search

Metadata
# Web GIS Course

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Technologies covered

1. ArcGIS.com (with free account)
Challenges, science, research areas

- Security
- Reliability
- Scalability
- Privacy
- Data quality and uncertainty
- Standards and Interoperability
- Semantic interoperability
- Copyright
- Business models
- Dynamic Demography
- …
Questions?

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Adding Web GIS to your curriculum!