Demystifying Web GIS

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

Principles
Applications
Technologies
Overview of Web GIS

- Concept and applications
- Technology advances
- Hot topics and prospects
A time of change

USPS, Washington post / News Week
Blockbuster, NetFlix

1962
CGIS
Roger Tomlinson
Father of GIS

1969
Internet

1990
WWW
Tim Berners-Lee
Father of the Web

1993
Web GIS
Xerox PARC Viewer

URL, HTTP, HTML
Definition

GIS database server  GIS server  Web server
Data tier  Logical tier (i.e., middle tier)

Client (Web browser, desktop, or mobile)

HTTP Request  HTTP Response

Internet

Presentation tier

URL
HTTP
HTML

...
An engaging and powerful tool for e-gov

- National Spatial Data Infrastructure (NSDI)
- Public information service
- Two way communication
- Operations and decision support
Web GIS  ===  Life
New business models and commodities

- Marketing & advertising
  - Geotargeting
  - Location based services

- Business operations
  - Customer relationship management
  - Enterprise resource planning

- Business analysis
Business Analysis

- Desire lines
- Market penetration
- Distance decay areas
- Cannibalization analysis
- Area ranking
- Finding areas matching a criterion

Demographic data
- Site characteristics
- Markets and territories
- Customer data
- Performance and scales data
- Competitor data
Web GIS  =  Profit
A new infrastructure for e-Science

- cloud computing
- unlimited database
- collaboration platform
An essential component for daily life

who, what, when, where (GIS!), why

Searching for restaurants, book stores...

Checking real-time traffic

The fourth R
From Web sites to Web services
~1999

system A

Web GIS server

system B

Web server

Browser
From SOAP to REST

became popular after 2005

Request: parameters in the URL, e.g.,
http://www.examplebank.com/Customers/1

Response: any structured format, such as JSON or XML (without SOAP), e.g.,

{"name": "Peter",
"balance": 2000}
From Web Services to browser side APIs

**Server side**
- Map making and processing
- Parse parameters
- Receive request
- Organize request parameters
- Monitor map and mouse operations
- Display maps

**Browser-side APIs**
- APIss act as the agent of Web services
- Send request
- Receive response
- Parse results
- Receive response
- Send response
- Organize response
- Receive request

**Scope of Web services**

**Scope of browser-side APIs**
From three tiers to n-tiers

Mashup

Web resource 1

Web resource 2

Web resource 3

Mashup
Web server 1

Web resource 4

Web browser

—Web services ecosystem
From wired to wireless

Mobile GIS: increasingly being connected to the Web
Mobile GIS development options

- **Native application based** (Object C, Java ME, .Net Mobile)
  - With data
  - Without data

- **Mobile browser based**
  - WAP (wireless application protocol)
  - Full-featured html/JavaScript (ArcGIS API for JS on IOS)
  - Plug-ins (Android supports Flash)

- **Text message based approach**
The thin, the thick, and the best practice

Very thin client
- GIS database
- Analysis
- Map, query
- Internet
- Client

Best practice
- GIS database
- Basemaps
- Query
- Analysis
- Internet
- Operational layers
- Client

Very thick client
- GIS database
- REST Web Services
- Analysis
- Map, query
- Data
- JavaScript, Flex, Silverlight APIs
- Client
Hot topics

- Volunteered Geographic Information (VGI)
- Geocollaboration
- GeoTagging
- Geoparsing
- Geotargeting
- Online Virtual Reality
- Augmented Reality
- Sensor Web, Internet of Things
- Cloud Computing and Cloud GIS
- ...
- ...
Cloud Computing and Cloud GIS

• **IaaS (Infrastructure as a Service)**
  - Amazon Simple Storage Service (S3)

• **PaaS (Platform as a Service)**
  - Microsoft Windows Azure
  - Google App Engine

• **SaaS (Software as a Service)**
  - Web services
  - Web applications (online e-mail, Google Docs)

  ArcGIS Online services
  ArcGIS.com

*Fast deployment, elastic, cheaper…*
Online virtual reality + virtual globe
Behavior Privacy and Locational Privacy

Sources: page 61 of July 5, 1993 issue of The New Yorker, (Vol.69 (LXIX) no 20)

*Personally Identifiable Information*
Challenges

- Security
- Reliability
- Scalability
- Data quality and uncertainty
- Standards and Interoperability
- Semantic interoperability
- Copyright
- Business models
- Digital divide
- ...
Prospects

1. Open geospatial Web services
2. More powerful client
3. Mobile as the pervasive client platform
4. Real time GIS
5. Cloud GIS
6. More intelligent
Toward societal GIS

Pervasive platform, ubiquitously available, seamlessly integrated into lives and jobs

Consumer Applications
- Few functions
- Large number of users

Professional Applications
- Unique
- Customizable

Variety
- Anyone, anything, anytime, anywhere
Questions?