Trends & Issues in GIS Application Development?

Perspectives from the past and present, and a look into the future

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Overview

• The web is constantly changing... let’s take a look back
  – Highlights of the last 10+ years
  – What trends lead us to where we are?
  – How long has it been...
  – Recent changes and issues are affecting what we do

• What does the future hold, some thing to pay attention to?
Starting things off...

A few questions

• What’s your favorite or most used web site and why?
  – Fancy?
  – Answers questions?
  – Constantly changing?

• Is that the site you use the most... for work or play?

• Do you remember when it first came out?

• Now let’s take a look back at some of them...
A little history...

When was the web created and by who?

- English engineer and computer scientist Tim Berners-Lee wrote a proposal in March 1989 for what would eventually become the World Wide Web.

- Berners-Lee and Belgian computer scientist Robert Cailliau proposed in 1990 to use "HyperText ... to link and access information of various kinds as a web of nodes in which the user can browse at will"
Back then, what did we use to access the web?

• People often think Mosaic was the first web browser, but actually the most popular early browser was called ViolaWWW and predated Mosaic by 2 years.

• 1st public access was on August 6, 1991

• First photo was uploaded onto the Web in 1992 by Lee...

...Just 20 years ago
Web History: 1995 - 2001

- Dot-com boom & bust (1995-2001)
- Amazon launched end of 1998
- Google BETA launched January 1999
- 2001 marked the end of the bubble
- Browsers

- 91% Market Share
- 5% Market Share
- 1% Market Share
GIS History: 1995 - 2001

- 1998 MO-IMS introduced by ESRI
  - Only worked on Windows platform
- ArcView-IMS Retired
  - First “out-of-the-box” web mapping software
- June 2000 ArcIMS 3.0 Released
- 2001 PostGIS was released
- By end of this period web technologies are “maturing”
- 2001 ArcGIS 8 released – personal GDB
Web History: 2002 - 2005

- 2002 Web 2.0 first introduced ("Web as a platform", mashups, WebBlogs, RSS feeds)
- 2002 Amazon Web Services Released
- 2003 MySpace was launched
- 2004 Facebook was launched
- 2005 YouTube was launched
- 2005 Zillo founded (first commercial apps with GIS?)
- Browsers

87% (91%) Market Share (10/2001)

8% (5%) Market Share 5/2005

2% Market Share (11/2004)
GIS History: 2002 - 2005

- ArcIMS 4.0 released April 2002
- May 2004 ArcGIS 9.0 Released (includes ArcGIS Server)
- Google Maps released February 2005
- Keyhole becomes Google Earth June 2005
- More customization of sites desired
  - Richer customization with .NET and SVG (Scalable Vector Graphics)
- External hosting and data centers begin to gain popularity

Your local hosting company since 2002
Web History: 2006 - 2007

- 2006 Twitter founded
- January 2007 Apple introduces the iPhone
- 92 million web sites exist
- 2007 1.1 billion people online
- Spam now comprises 90% of emails sent
- Browsers

83% (87%) Market Share (10/2006)  
14% (2%) Market Share (10/2006)  
0.1% (8%) Market Share (10/2007)
GIS History: 2006 - 2007

- Wikimapia launched (editable map)
- Workflow orientation of web-sites
- Configurable web sites
- ArcGIS Server 9.2 released
Web History: 2008 - 2010

- **Flex 3.0 Released** (Feb 2008)
- **Silverlight 2.0 Released**
  - Advanced presentation of data on the web
  - Rich Internal Applications are born
- **Web Collaboration and business logic integration**
- **Browsers**

<table>
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<tr>
<th>Browser</th>
<th>Market Share</th>
<th>Date</th>
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<tbody>
<tr>
<td>I.E 8</td>
<td>56% (83%)</td>
<td>3/2009</td>
</tr>
<tr>
<td>Firefox 3</td>
<td>32% (14%)</td>
<td>10/2006</td>
</tr>
<tr>
<td>Google Chrome</td>
<td>5.5% (0.1%)</td>
<td>9/2008</td>
</tr>
<tr>
<td>Chrome 1</td>
<td>3.5% (2%)</td>
<td>6/2010</td>
</tr>
<tr>
<td>Safari 5</td>
<td>1.3%</td>
<td></td>
</tr>
<tr>
<td>Mobile</td>
<td>1.3%</td>
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GIS History: 2008 - 2010

- Flex API in ArcGIS Server
- Silverlight API in ArcGIS Server
- Java API in ArcGIS Server
- 2010 ArcGIS 10 released
Recent Web History

- **ARRA Broadband Improvement Act**
  - National Broadband Plan to “ensure every American has access to broadband capability.”
  - Program to support affordable access to 4 MB downloads to every US household

- **Web 3.0** – convergence of the virtual and physical world
  - Sites like Foursquare

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<th>Browser</th>
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</tr>
</thead>
<tbody>
<tr>
<td>I.E 8</td>
<td>39% (56%)</td>
</tr>
<tr>
<td>Firefox 3</td>
<td>26% (32%)</td>
</tr>
<tr>
<td>Chrome 1</td>
<td>20% (5.5%)</td>
</tr>
<tr>
<td>Safari 5</td>
<td>8% (3.5%)</td>
</tr>
</tbody>
</table>

- 7% (1.3%) Market Share
Recent Web History

- Tablets becoming phones – phones becoming tablets
- Web Services are free (or virtually free)
  - Amazon EC2 Micro Instance
    - 750 Hours of Linux usage (32 or 64 bit)
    - 10 GB of Elastic Block Storage
- 4G Mobile Broadband Services
Recent GIS History

- **FCC launches National Broadband Map**
  - Open Source Platform used for high profile site
  - First time a national dataset was successfully created in less than one year
  - Federal & State cooperation to build Spatial Data Infrastructure

- **ArcGIS.com /AGOL** – Sharing of maps and data like Flicker and YouTube

- **OpenStreetMap** – Crowdsourced data to improve data quality

- **Volunteered Geospatial Information (VGI) (spam?)**

- **SeeClickFix** – Integration of GIS into workflow

- **OpenSource Technology** – becoming a viable option to Commercial products
Looking forward, bigger picture

What are some of the important issues/concepts to consider?

• Open Government – Gov 2.0
• Standards versus standard practices
• Semantic web: machines to understand the meaning – or "semantics" – of information on the Web
• Mobile
• Technology Platform Choices
Looking forward, bigger picture

Open Government

- Reuse
- Unexpected use
- Or access control
Looking forward, bigger picture

Standards vs standard practices
Looking forward, bigger picture

Semantic Web

- Machines understand the meaning – or "semantics" – of information on the Web
- Describe the data in the feed, don’t standardize it
Looking forward, bigger picture

Semantic Web – How it works? Commercial application...

The Social Network DVD

- Condition
  - New
  - Used

- Price
  - Lowest
  - Highest

- Shipping
  - Fast
  - Lowest Cost

- Specifications
Looking forward, bigger picture

Semantic Web – How could it work for a GIS application?

- Parcel Data
  - Format: Shapefile, KML
  - Accuracy: 1 foot, 10 meters
  - Coordinate System: NAD83, WGS
Looking forward, bigger picture

Mobile Technology

- How many devices do you have?
Why Mobile?

• Great new and powerful devices
  – Smart Phones
  – Tablets

• Increasingly ubiquitous wireless broadband
  – 3G/4G networks
  – Hot spots and air cards for laptops

• Productivity gains for mobile workforces
  – Organizations, such as DOTs or municipalities, have large mobile workforces
Decisions, decisions, decisions

- What kind(s) of applications?
  - Mapping & business systems
  - What are your business needs for mobile?

- What kind(s) of devices and how many?

- “Phone apps” vs “Phone web apps”

- Existing Infrastructure

-Disconnected vs connected editing
  - Data check-in/check-out?
What kind(s) of applications?

On a phone, GIS/mapping may on the periphery

• Business systems?
  – Email
  – Timesheets
  – Work orders

• Mapping?
  – Direction finding
  – Field inspections
  – Access to asset information
  – Feature locating
  – Finding reported issues
What kind(s) of devices?

• Phones
  – Are you prepared/able to standardize?
  – iPhone, Android, RIM, WinPhone

• Tablets
  – iPad
  – Android

• Laptops & GPS Devices
“Phone apps” vs “Phone web apps”

• **Pure phone**, e.g., “iPhone app”
  – Takes better advantage of phone hardware
    • Camera, GPS, accelerometer, etc.
  – But, requires standardization on a single phone
    • Or, building a different app for each phone
“Phone apps” vs “Phone web apps”

- **Phone-based web-app**
  - Relies on the phone’s browser app
  - Web pages, HTML5, JavaScript
    - Can be optimized for small screens
    - “Adaptive design”
  - Good access to GPS; camera not yet directly supported (but coming)

- Examples of “minified web pages”
  - [http://Maps.google.com](http://Maps.google.com)
  - [http://Touch.Facebook.com](http://Touch.Facebook.com)
Disconnected vs connected editing

- **Connected** = direct edits to the server
- **Disconnected** = “synching” with server

- Will you always be connected to the internet?
  - If so, then web-based forms are possible
  - If not, need a mechanism to work while disconnected, and then synch with server “later”
  - Support for connection disruption (i.e., “mostly connected”)

- Support for fully disconnected editing
  - Data check-out/check-in
  - Synchronization upon return to the office
  - Non-trivial and Esri provides some good tools
Mobile apps require a solid server and data management foundation

• In short, to effectively take your data into the field you need to have your back-end in order

• Mobile applications should interface with your “enterprise infrastructure”
  – Enterprise GIS
    • Base maps
    • Business layers and their attributes (e.g., parcels, utilities)
    • Web services (both cached and dynamic)
  – Business systems
    • For example, work orders, asset management, CAMA, etc.
Some observations from a recent project for MnDOT

- Mobile application development is different than enterprise application development
  - Need for flexibility and agility
  - Need to deploy rapidly
    - You may have a field crew (or interns) waiting for the tool
  - Need to be able to readily make adjustments to the app
    - You learn how the app needs to change once you’re in the field
Mobile technology is a major driver for simplicity

There’s literally no room for complexity

Data input forms

Menus to access functions
Looking forward
Technology Platform Choices

Windows vs. Linux

ESRI vs. Open Source

Flex/Silverlight vs. HTML5
How do you choose?

– Protect yourself with standards
– Try and choose the ubiquitous, long-lived ones
  • Others can come and go
  • Remember the Internet was founded using HTML
– Think carefully about the value of flashiness
  • Ex: Flex, Silverlight: robust and fancy but require plug-ins
  • Ex: HTML5: same rich content without plug-ins
– What is Google Maps built with?
  • HTML, JavaScript, Ajax
Some final thoughts...

Good design is essential to maintaining simplicity

- Design begins by identifying the questions that the application must answer
  - Where are the three closest fire hydrants?
  - Who lives next door?
  - What is the shortest path?
  - Which is the least expensive?
Good design is essential to maintaining simplicity

- People are less interested in open ended browsing, less GIS on the web
  - If a function is not used, it’s just cluttering the interface
  - If the application isn’t quick and efficient, it won’t get used
So what should you look for or watch out for?

• Enable users to easily use GIS technology, not learn GIS technology
• Use the latest web-mapping technologies
• Improve information sharing for your end users
• Provide access to your best data, not all your data
• Publish data as services so others can use it
• Automate common workflows & business processes
Thank You

If you have any questions:

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