GPS Data Exchange

An AJAX/GeoServer Open Source Solution

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Background

- Massachusetts Dept. of Fish and Game holds 130+ Conservation Restrictions totaling over 24,000 acres.
- The Conservation Restriction Baseline Monitoring Program is an attempt to grab a snapshot of the property to ensure that the CR is being adhered to by the fee owner.
- Consultants are hired to create a Baseline Survey. One of the survey deliverables is field data collected by GPS and coded to Dept. specifications.

The Problem

- The Dept. GIS staff currently provides:
  - 3 Different maps of each property as a pdf
  - Technical support for creating waypoints according to the schema
  - Technical support for working with GIS software
  - QA/QC on GIS deliverable.

Needs Assesment

- We need an application that can do the following:
  - Deliver maps of the property immediately after the contract has been accepted.
  - Provide a software independent means of soliciting GIS data.
  - Provide a standardized map for the final report.
  - Is easy to use.

Design Guidelines

- We needed to invest our time wisely
  - The application needed to be developed using our available skill set.
  - We needed to build on our Agency's existing IT investments
  - We needed to be able to support the application indefinitely (cost, personnel, product relevance)

Design Decisions

- We needed to invest our time wisely
  - The application needed to be developed using our available skill set.
  - Javascript, CSS, Client Side Development.

Design Decisions

- We needed to invest our time wisely
  - We needed to build on our Agency's existing IT investments
  - MassGIS currently supports an instance of GeoServer

Design Decisions

- We needed to invest our time wisely
  - We needed to be able to support the application indefinitely (cost, personnel, product relevance)
  - There are no associated software costs as all of our tools are freeware, by adhering to ogc and w3c standards we ensure continued product relevance, by utilizing a fairly common skill set we are likely to continue to have personnel to develop and extend the application.

The Application

1. Contractor can print one of three map formats to familiarize themselves with the property prior to field work.
2. Contractor emails an xml file with waypoint information to the Department after completing field work.
3. Once the xml file is loaded onto the server, the contractor imports their waypoints into an SDE feature class.
4. Feature attributes are controlled via javascript and the html form.
5. A standard map for the final report can be produced from the html page using css to create a print page.
6. The contractor can download the points as a shapefile or a kml file

Application Framework

- AJAX: Asynchronous Javascript and XML
  - An approach to building dynamic web pages that make asynchronous calls to web-based services that typically return XML.
- Sarissa
  - ECMAScript library that aids in cross browser implemention of XMLHttpRequests/XML parsing/XPath Queries
- GeoServer
  - Open source server application that support OGC standards (WMS, WFS, WFS-T)
  - Written in JAVA.

Commonwealth of Massachusetts

Department of Fish & Game

Commissioner, Mary B. Griffin

Step 1: Email gpx file to the DFG GIS program. File will be loaded onto server and an email message will be returned when it is available.

Email Waypoint File

Step 2: Create Features from GPX file.

Create Features

Step 3: Display and edit waypoints

Edit Waypoints

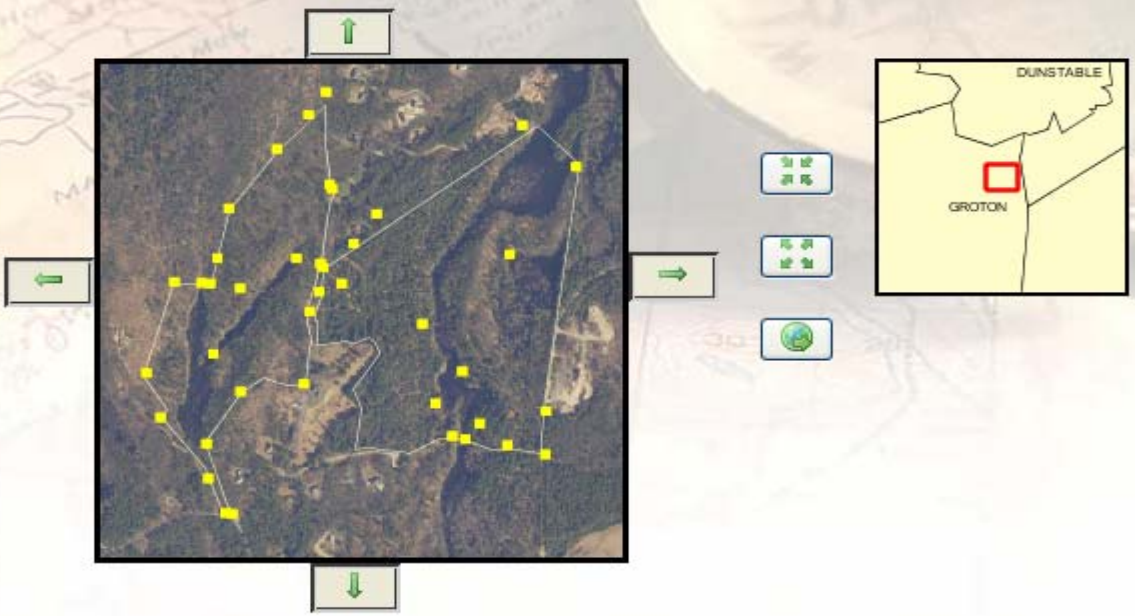
Step 4: Submit Edits.

Submit Changes

DFG CR Baseline Monitoring Program

Gamlin Crystal Spring Tree Farm Realty Trust - DFW0869

Orthophoto Map | Topographic Map | Road Map



Application Program Flow

- Contractor can print one of three map formats to familiarize themselves with the property prior to field work.
  - Behind the scenes:
    - The Application sends a WMS request as a URL to http://giswebservices.massgis.state.ma.us/geoserver/wms
    - Could instead send an a WMS request formated as XML via Sarissa implementation of the XMLHttpRequest object
    - GeoServer returns an image
    - Print page is controlled vis CSS print styles

Application Program Flow

- Contractor can email an xml file with waypoint information to the Department
  - We chose to support the GPX xml file type.
    - http://www.topografix.com/gpx.asp
    - Good software support (e.g. DNRGarmin, GPSBabel, Google Earth, MapSource)
  - In the future this step will be seemless as a server-side script will handle the gpx file upload.

Application Program Flow

- Once the xml file is loaded onto the server, the contractor can create and edit an SDE feature class
  - The application parses the GPX file and creates an xml request for GeoServer (WFS-T Insert request).
  - Conversion of coordinates from WGS84 lat/lon to NAD83 State Plane handled via ArcIMS AXL request.
  - WFS-T insert request populates existing SDE feature class
  - Application makes a WFS getfeatures request and populates the form
  - User can edit the values of the form and then only those edited values are sent as a WFS-T update request.

Application Program Flow

- Feature attributes are controlled via javascript and the html form.
  - Field domains are stored in an xml file.
  - Dependent domains are populated dynamically by reading child nodes values of the xml file into another form control

Application Program Flow

- A Standard map for the final report can be produced.
  - Map Layout is handled via CSS print request.
  - Another WMS call can be made to increase the image size and symbolize the GPS points according to field values.

Additional Benefits

- We expect to increase our use of xml for data exchange so becoming familiar with ways to send and parse xml was useful
- We see this as a model for other methods of data exchange in the Department
- The use of a data standard for field data collection will hopefully improve the quality and quantity of field data we collect. By eliminating the software hurdle we can actually make use of our ‘resources’ in terms of available field staff.

Resources

- MassGIS Wiki
  - http://lyceum.massgis.state.ma.us/wiki/doku.php
- GeoServer Documentation
  - http://geoserver.org/
- Open GeoSpatial Consortium (OGC)
  - http://www.opengeospatial.org/
- Sarissa
  - http://dev.abiss.gr/sarissa/
- W3 Schools
  - http://www.w3schools.com/default.asp