



UPGRADING DATA COLLECTION FOR THE MOBILE WORLD

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Table of Contents

1	TxDOT TPP Mapping Group	3
2	Current Data Collection Projects	4-5
3	Application and Technical Specs	6-8
4	Initial Testing Results	9-13
5	Best Practices	14
6	Benefits	15
7	Future Improvements	16

TxDOT TPP Mapping Group

- § The Transportation Planning & Programming Division administers planning funds, prepares maps, collects data and programs projects.
- § The Mapping Group is the central hub for TxDOT's GIS data systems. The group creates, maintains, analyzes, and publishes the GIS data utilized by the various TxDOT divisions and the public.
 - 73,000 on-system miles
 - 160,000 off-system miles (County Roads and Functionally Classified City Streets)
 - 3,000 federal miles
 - 69,000 local miles



Current Data Collection Projects



Current Data Collection Projects

- § Regional Data Collection effort utilizes man-power from local TxDOT District offices to collect data on a mass scale within a minimal time-frame effort
 - Juno SB Handheld with preloaded Data Dictionary
 - On-System Centerlines
 - Roadbed Realignments
 - Mile Markers (approx. every 2 miles)
 - Roadway termini and other point data



Application and Technical Specs

§ Goal: Create an easily accessible application which can utilize readily available smart device hardware for mass, mapping grade, data collection efforts

- Android vs iOS vs Windows

§ The Idea: Simplicity is golden

- HTML5

- Geolocation API

- Local Storage

- GPS doesn't require cell service

- Use 'Form' type options to create text based attributes

- Upload collected data directly to a database for immediate use

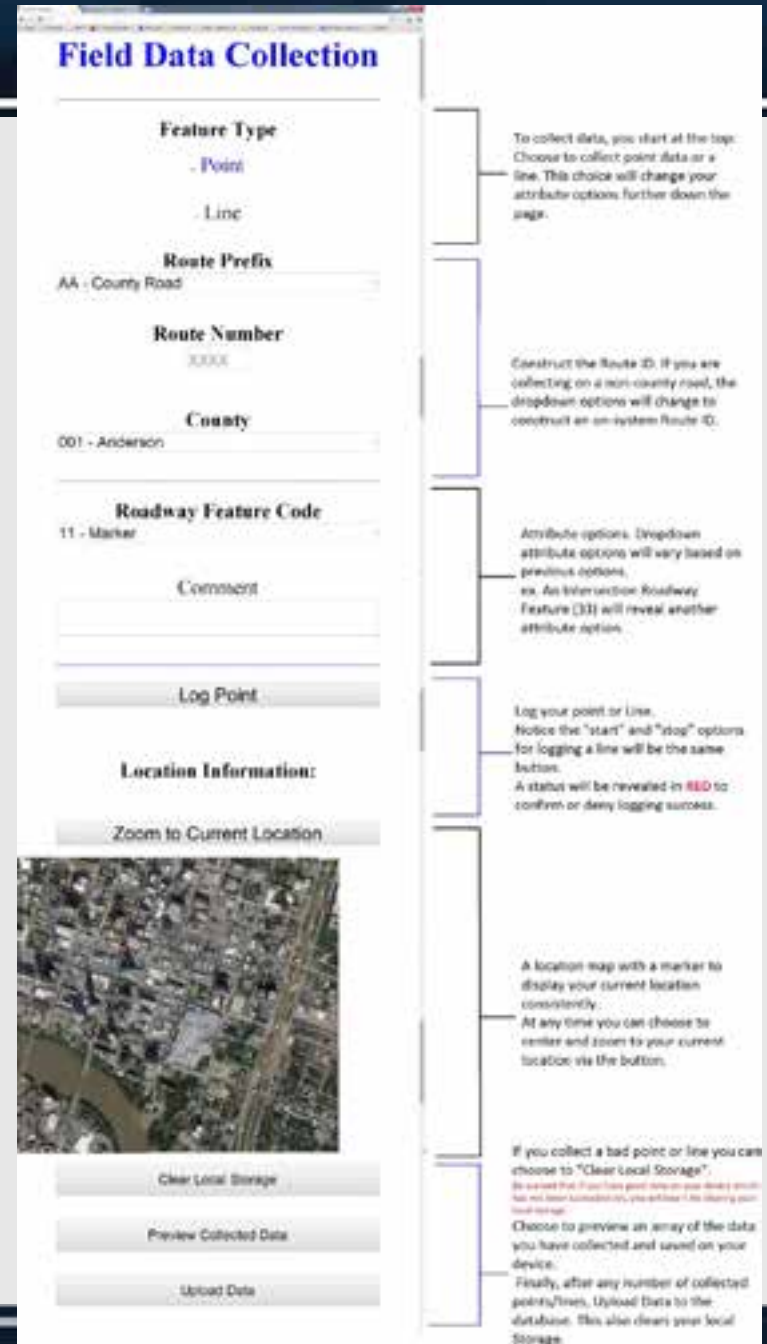


The image shows the HTML5 Form logo on the left, which consists of the text "HTML" in black above a red shield containing a white "5", with the word "Form" in a red script font below it. To the right is a screenshot of a web form interface. The form has a "Name" field with a placeholder "First and last name" and a "Please fill out this field" error message. Below are fields for "Create a username", "Create a password", and "Confirm your password". There is also a "Birthday" section with dropdowns for "Month", "Day", and "Year". At the bottom, there is a "Mobile phone" field with a placeholder "phone number" and a blue "Sign me up!" button.

Application and Technical Specs

We did it!

- § Primitive layout established for testing
- § Design Customization (Project Specific)
- § Points vs Lines
- § Make attribute options dependent
- § Geolocation Better-Than Accuracy Rating
- § Associated Map
- § How to get the data uploaded?



The screenshot shows a web application titled "Field Data Collection" with the following sections and annotations:

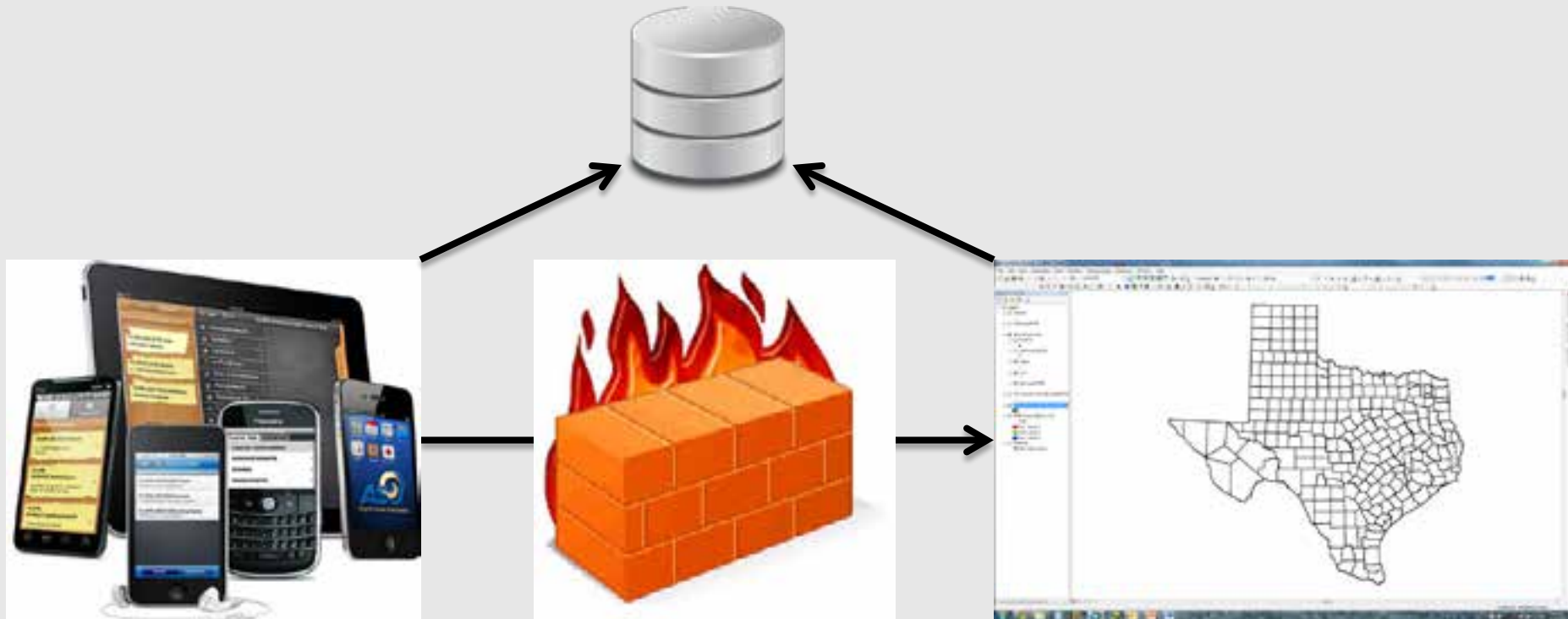
- Feature Type:** Radio buttons for "Point" and "Line".
 - Annotation: "To collect data, you start at the top. Choose to collect point data or a line. This choice will change your attribute options further down the page."
- Route Prefix:** Dropdown menu with "AA - County Road" selected.
- Route Number:** Text input field with "XXXX" entered.
- County:** Dropdown menu with "001 - Anderson" selected.
 - Annotation: "Construct the Route ID. If you are collecting on a non-county road, the dropdown options will change to reconstruct an on-system Route ID."
- Roadway Feature Code:** Dropdown menu with "11 - Marker" selected.
 - Annotation: "Attribute options. Dropdown attribute options will vary based on previous options. ex. An Intersection Roadway Feature (33) will reveal another attribute option."
- Comment:** Text input field.
- Log Point:** Button.
- Location Information:** Section header.
- Zoom to Current Location:** Button.
- Map:** Aerial satellite view of a road intersection with a red marker.
 - Annotation: "Log your point or line. Notice the 'start' and 'end' options for logging a line will be the same button. A status will be revealed in RED to confirm or deny logging success."
 - Annotation: "A location map with a marker to display your current location consistently. At any time you can choose to center and zoom to your current location via the button."
- Clear Local Storage:** Button.
- Preview Collected Data:** Button.
- Upload Data:** Button.
 - Annotation: "If you collect a bad point or line you can choose to 'Clear Local Storage'. Be aware that this will delete any data you have not been submitted to the server. It is clearing your local storage. Choose to preview an array of the data you have collected and saved on your device. Finally, after any number of collected points/lines, Upload Data to the database. This also clears your local Storage."

Application and Technical Specs

§ Initial Firewall Issues

§ Post to non-network server to format and retrieve later

§ PostgreSQL database with PostGIS



Initial Testing Results

- § Tested application on multiple iPhones, iPads, and several Android devices
- § Collected data simultaneously on the Trimble Pathfinder and Trimble SB units
- § Results compared in ArcMap at the roadway digitization standard scale 1:3000
- § Factors tested:
 - Linework at various speeds
 - Points at various speeds
 - Signal Reliability
 - Storage Capacity
 - Device specific issues

Initial Testing Results

§ Linework



Initial Testing Results

§ More Linework



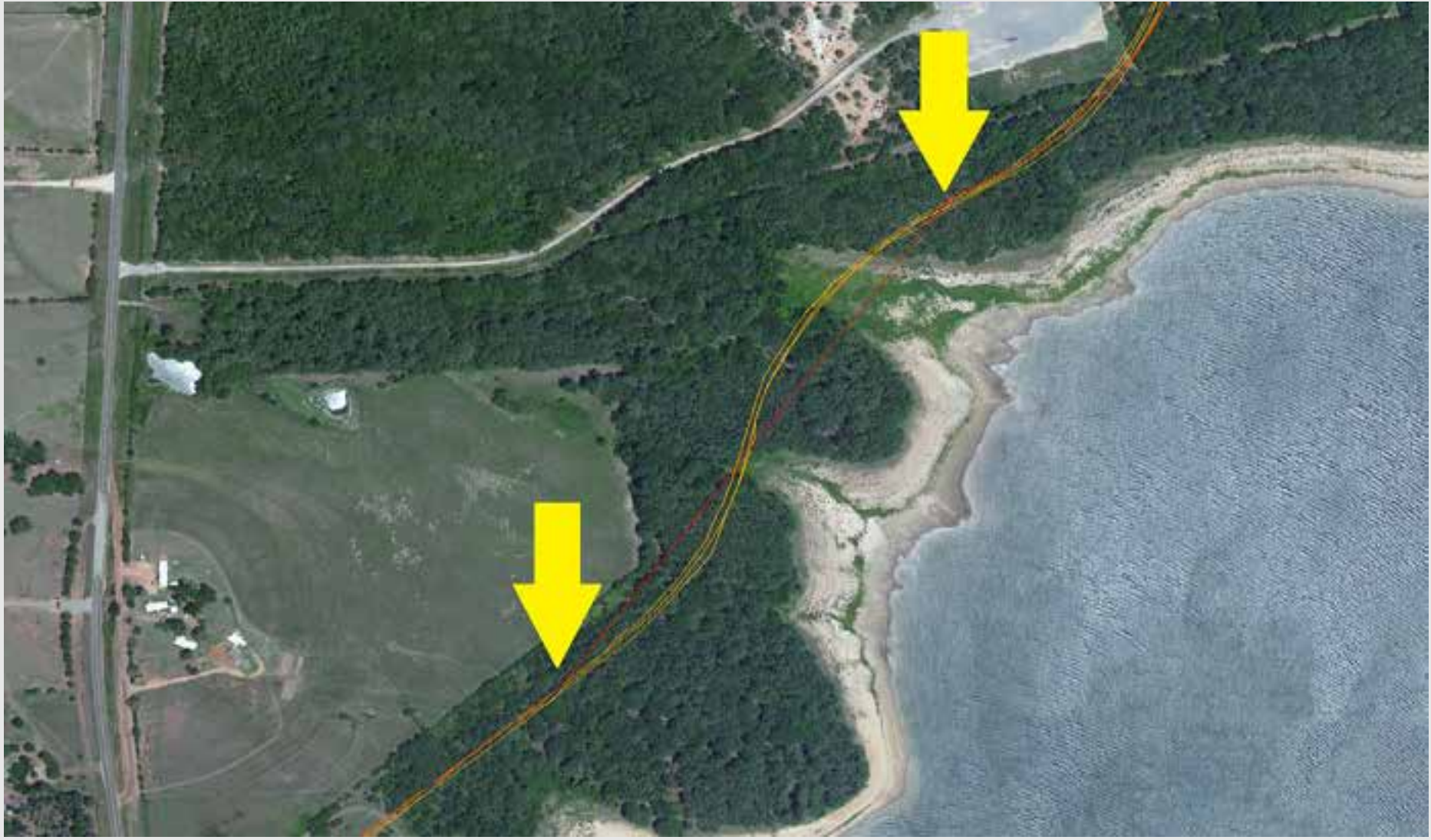
Initial Testing Results

§ Points



Initial Testing Results

§ Signal Loss Issues



Best Practices



- § Default browser most efficient
- § "Private Browsing" causes issues
- § Consistent speed while collecting data
- § Stay awake



Benefits

- § Cost
- § Hardware Reduction
- § Less Training and Less Error
- § Battery Requirements
- § Utilized by more people simultaneously
- § Instant upload and office use
- § Points collection simultaneous to lines



Future Improvements

- § Security (login and password)
- § General layout positioning
- § Hide/Show Tracking Map with alternative basemaps
- § Smart Device and User Metadata
- § 'Idle' device prevention
- § Stand-still recognition for point collection
- § RTK (Real Time Kinematic) Position Network connection
- § Collected data review

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