Development of a Tablet as Input Device for Respondents in a Collaborative Approach to CAPI Interviewing

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May 19, 2014

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Chicago Maps Project

- CAPI pilot study

- Measure respondent experiences in, knowledge of, and perceptions about a large number of communities across the Chicago metropolitan area

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Trial PAPI Study

- Conducted by the client
- Paper maps of the Chicago area
  - Custom-designed by the client
    - Show only selected features including major roads, neighborhood and township boundaries
  - Two separate maps
    - Chicago neighborhoods
    - Greater Chicago area
- Respondents indicated their answers on the maps
- Used different-colored pens to respond to each question

Trial PAPI Study: Findings

- Paper maps large and unwieldy
- As interview progressed, maps became increasingly difficult to read
- Responses were difficult to modify
- Challenges in gathering and quantifying responses

- Conclusion
  - Explore using an electronic version of the maps
  - Develop Dynamic Tablet Screen Maps (DTSM)

DTSM: Required Functionality

- Electronic mapping tool to replace paper maps
- Respondents submit answers to geospatial survey questions
- Runs on a tablet device
- Wi fi connection to the interviewer laptop
- Interact with a CAPI survey instrument
  - Bi-directional data flow
    - Gather and import data from respondent into the survey instrument
    - Display data from the survey instrument

DTSM: Development Goals

- Iterative, exploratory development process
- Independent of specific survey instrument
    - Generically-defined interface
    - Set of communication protocols
    - Able to connect with any survey instrument
- Perform feasibility testing
- Continue refinement

Tablet Device Implementation

- Similar to the Viewer in WiscMoms CAPI study
  - Web application on a tablet device
  - Wi fi connection to CAPI survey instrument
  - Dynamically populated data grids with survey data as they were collected by an interviewer
  - Tablet data read-only
  - Respondents review and confirm the data

- DTSM New Functionality
  - Respondents indicate their answers on the tablet device
  - Answers load directly into the survey instrument

| Laptop	Tablet - DTSM

Laptop
- Used by the interviewer
- CAPI survey instrument
  - CASES 5.5
- Wi fi hotspot
  - Connectify program
  - Encrypted, password protected
  - Internet access restricted
- IIS Web Server
- Custom web application
- MySQL database
- Map server

Tablet - DTSM
- Used by the respondent
- Wi fi connection to laptop
- Web browser
- Display maps as web pages
- Accept respondent input
- IPad
- Safari web browser

DTSM – Map Functionality
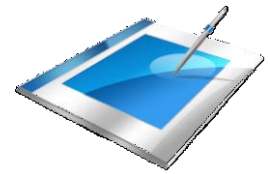
- Display map
  - Set initial zoom level, focus point, and previously given answers

- Interactive with respondent
  - Navigate and change zoom levels
  - Select and remove geographic points (pin)
  - Select pre-defined regions (highlight)
  - Display region name on selection
  - Submit responses to survey instrument

Components: DTSM – Additional Functionality
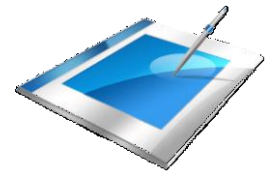
- Indicate a geographic region outside the defined area
- Review summary of prior questions and answers

- Watch for and respond to commands from the survey instrument

- Send data and commands to the survey instrument
  - Import answers into its native data structure
  - Display answers to interviewer
    - Confirm and conduct probes

Implementing DTSM: Option 1

- Web application
- Electronic Version of the paper maps
  - Map rendered as an HTML image
  - Define sub-regions respondent can tap to select
    - HTML hotspot objects
      - Circles, rectangles, or polygons
  - Build a data structure to store those region definitions

Review

Where you currently live

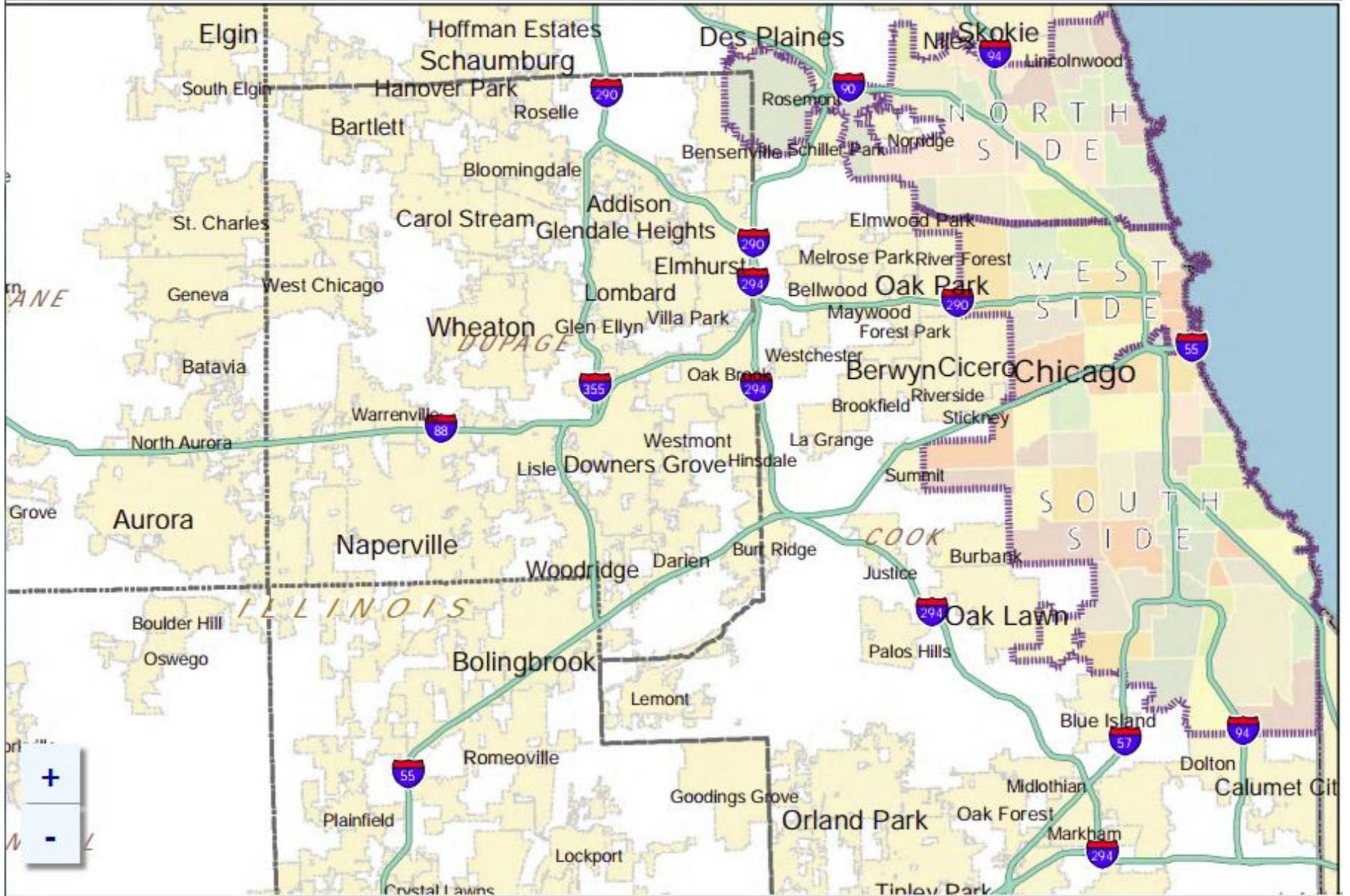**Where you previously lived**

Belmont Cragin

Hermosa

Logan Square

Montclare

Information sent.

Implementing DTSM: Option 1 - Findings

Established

- Proof-of-concept
- Core functionality was sound
- Intuitive interface

Challenges

- Time calculating the regional boundaries
- Uncertain boundary lines
- Independent from geospatial coordinates
- Considerable set-up effort to expand to other metropolitan areas
  - Creating new base maps

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Implementing DTSM: Option 2

- Online mapping technology
    - Google Maps API
    - Bing Map API
    - Map Box Streets
    - Open Streets Map
- Cartographic boundary files
    - Neighborhoods, cities, county
    - Replace manually-defined regions
    - Free to use
- Geospatial coordinates
- Less effort to expand into other metropolitan areas

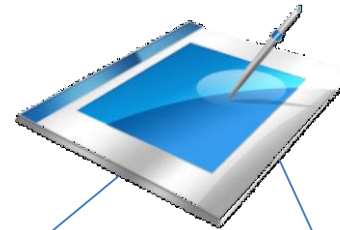UWSC
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Implementing DTSM: Option 2

- Additional developer
  - Implement online mapping
- Utilize existing web application codebase
  - Expand to work with new mapping technology
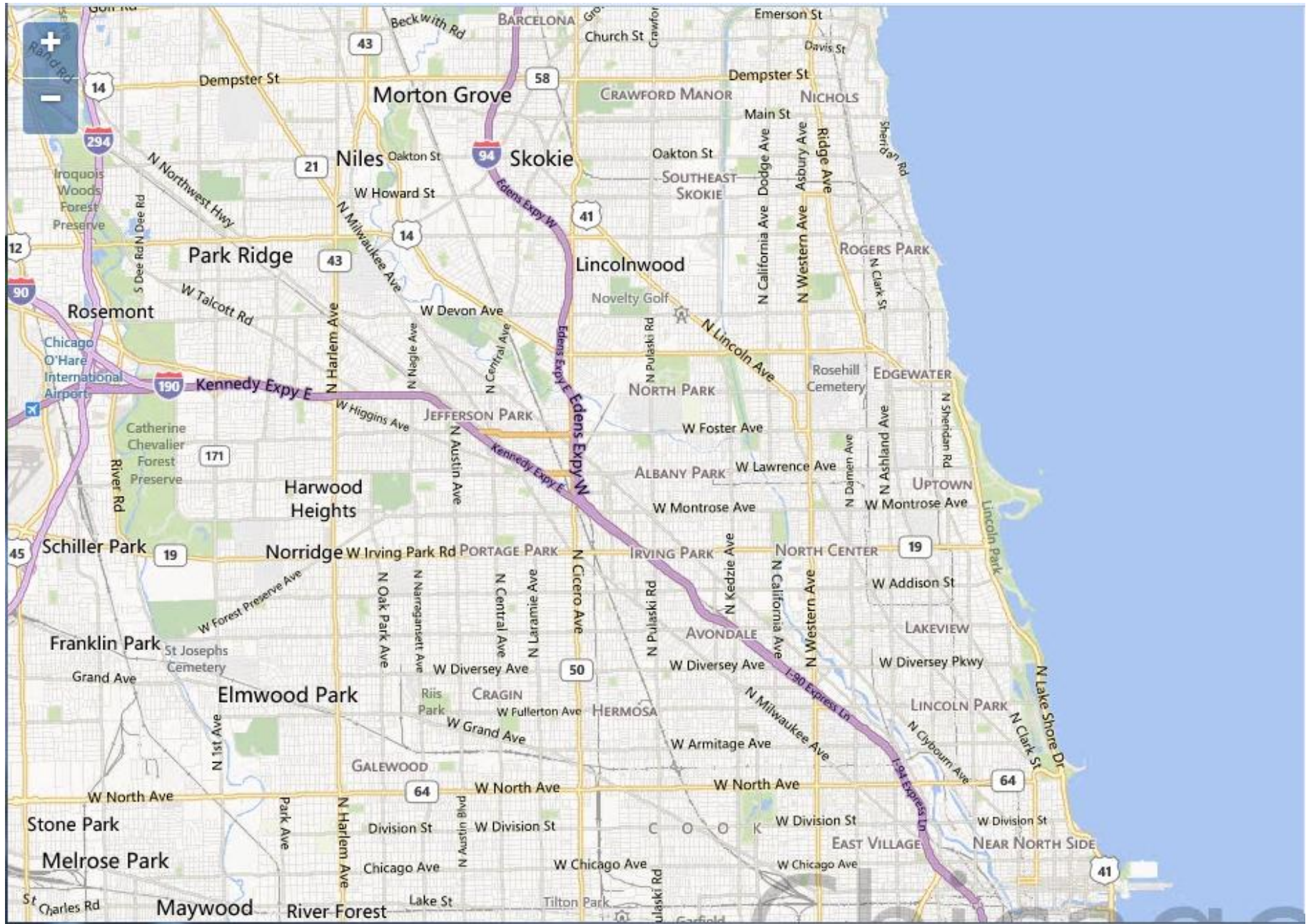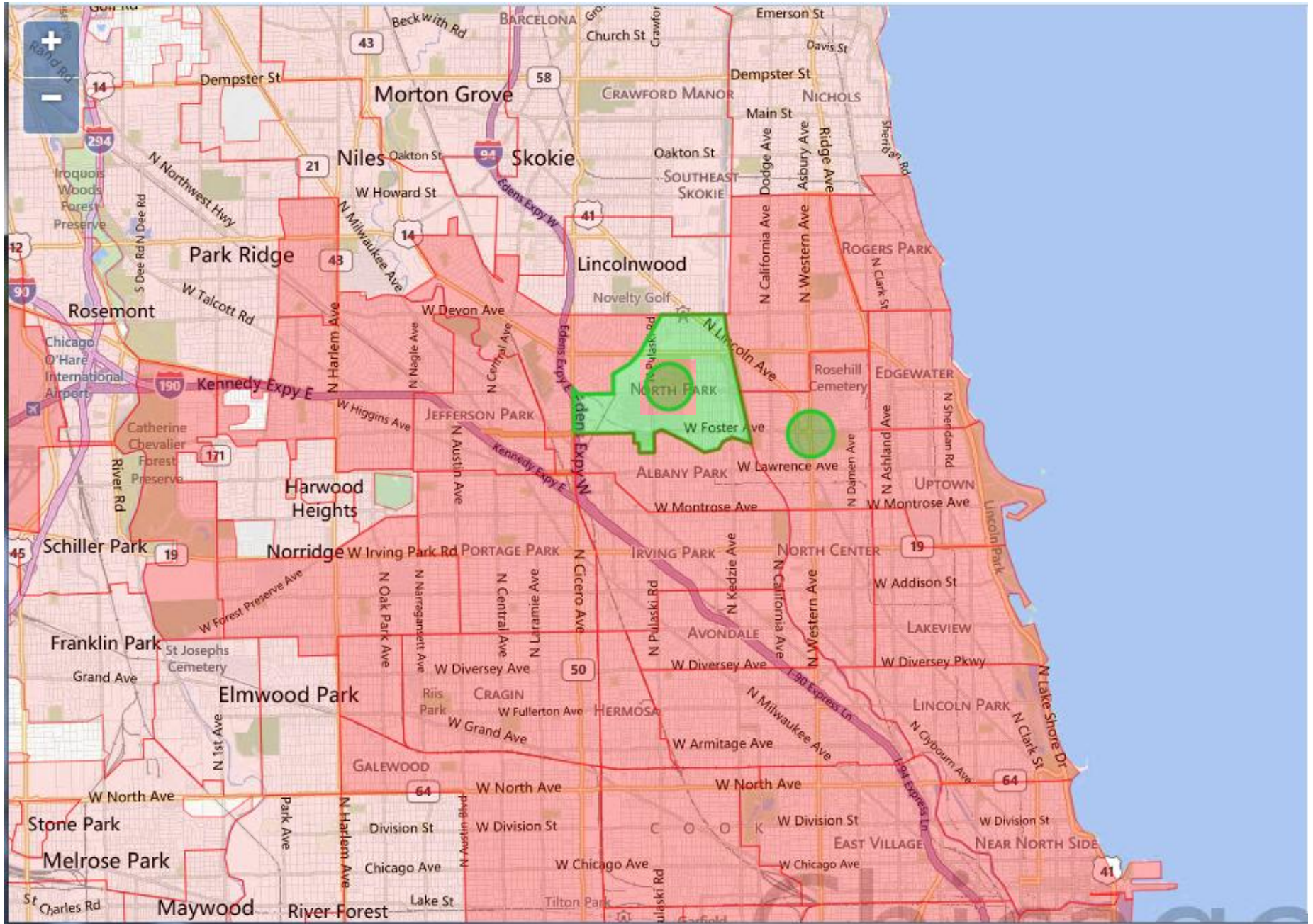
Laptop

Tablet - DTSM

Web Application

- Non-map functions
- Bi-directional communication protocols
- Reusable codebase for future projects

Map Application

- Display maps
- Interact with respondent
- Submit data

Implementing Map Application

- Programmed using
  - Javascript and HTML
  - PHP
- GeoJSON as a communication standard

- Map Box Streets
  - Preferred look and feel
  - Offline version of mapping tiles
    - Eliminate the need for an active internet connection during the interview
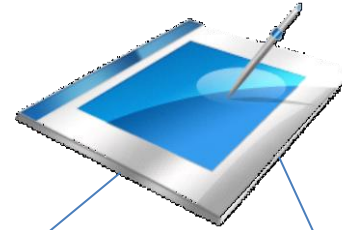
Implementing Web Application

- Programmed using
  - Javascript and HTML
  - PHP
- GeoJSON as a communication standard
- Communication processes
  - Text files
    - Initiate actions
    - Between survey instrument and web application
  - Data exchange layouts
    - Transfer data and map behavior settings
    - Between web application and the map application

Laptop   Tablet - DTSM

- **Interviewer initiates CAPI Instrument**
- **Create text file command**
- **100031|3a**

Web Application   Map Application

- Listen and retrieve text file changes
- Query database
  - Related geographic data points
  - Map behavior settings
- Create data exchange command

Web Application Data Exchange Structure

- Define data flow from Web Application to Map Application

- Layout
  - Map Settings
    - Initial focus and zoom level
  - Display associated geographic data
    - Non-editable reference points/regions
    - Editable answers to current question

Web Application Data Exchange Structure

- Layout (cont.)
  - Map Behavior Settings
    - Configured by question
      - Disable navigation
      - Disable zoom
      - Select either points or regions
      - Single or multi-select points/regions

Web Application Data Exchange Structure

- Design Decisions for Map Behavior Settings
  - Question matrix
  - Programmed behaviors not questions
  - Abstracted all possible behaviors
    - Document behaviors by question
    - MySQL database table
  - Flexibility during feasibility testing
   - Add or remove questions
    - Modify behaviors

3a|Residential History|{"type":"FeatureCollection","features":[{"type":"Feature","properties":{"NAME":"LOOP","AREA_DESC":"community"},"geometry":{"type":"Point","coordinates":[-9754520.1292357,5141274.2707373]}}]}|6|0|{"type":"FeatureCollection","features":[{"type":"Feature","properties":{"NAME":"LOOP","AREA_DESC":"community"},"geometry":{"type":"Point","coordinates":[-9754520.1292357,5141274.2707373]}}]}||point|1|1|1|0

Laptop

Tablet - DTSM
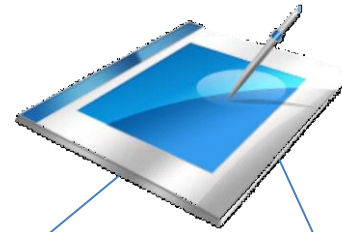
- **Interviewer triggers survey instrument**
- **Perl script**
- **Query database**
- **Load response**
- **Display data in the instrument**

Web Application

Map Application

- Update database
- Create text file command
- 100031|3a

- Respondent taps Submit icon
- Create data exchange command
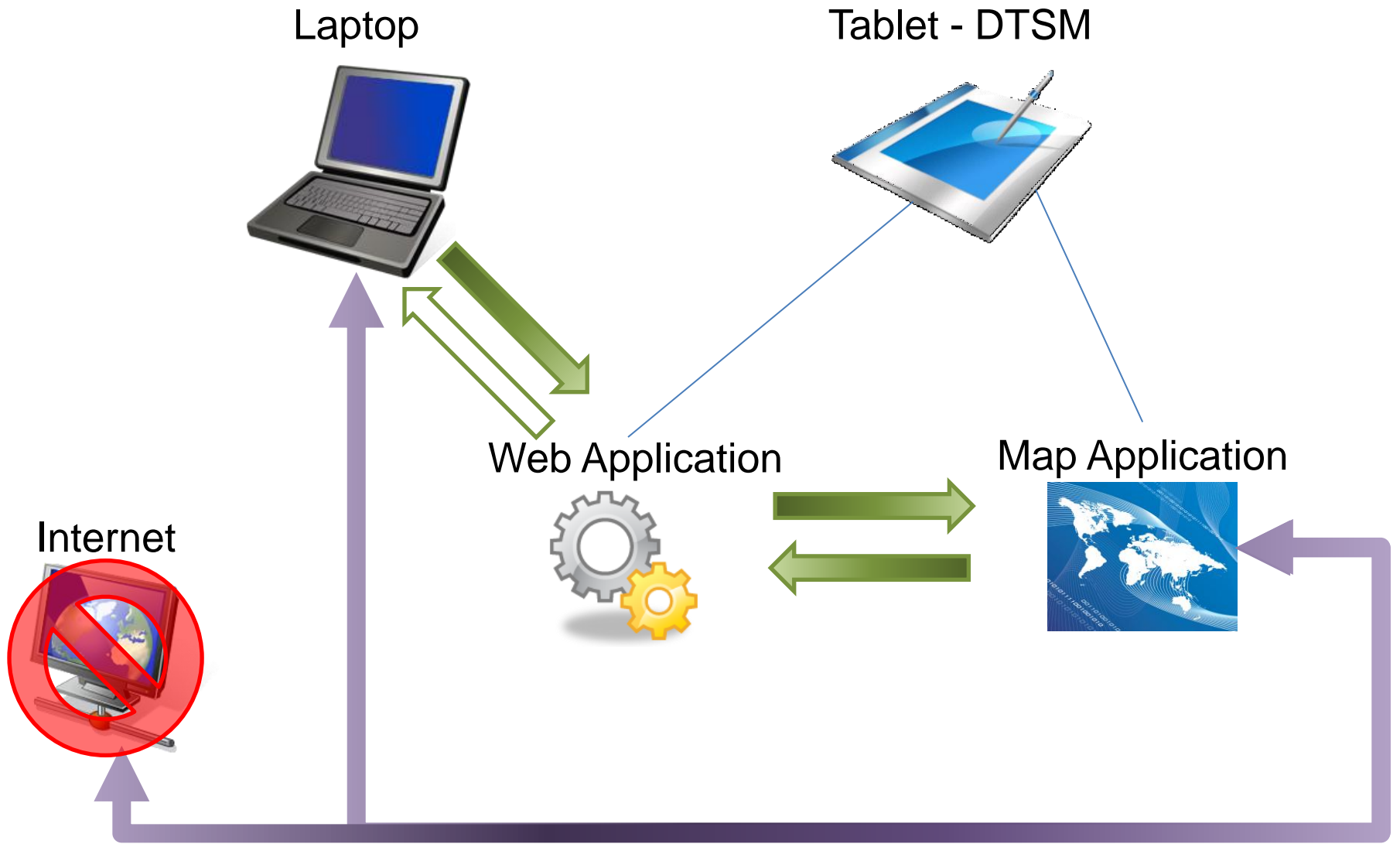
Map Application Data Exchange Structure

- Define data flow from Map Application to Web Application

- Layout
  - Question variable
  - Respondent-selected points/regions in GeoJSON format
  - Timestamps when each point/region was selected
  - Zoom levels when each point/region was selected
  - Center point of the map when each point/region was selected

Map Application Data Exchange Example

1|{"type":"FeatureCollection","features":[{"type":"Feature","properties":{"NAME":"LOOP","AREA_DESC":"community"},"geometry":{"type":"Point","coordinates":[-9754520.1292357,5141274.2707373]}}]}|1280296860145|6||{"type":"FeatureCollection","features":[{"type":"Feature","properties":{"NAME":"LOOP","AREA_DESC":"community"},"geometry":{"type":"Point","coordinates":[-9754520.1292357,5141274.2707373]}}]}

Laptop

Tablet - DTSM

Web Application

Map Application

Internet

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Implementing DTSM: Option 2 - Findings

Challenges

- Split functionality increases software complexity
- Coordinate software development effort
- Establish data communication protocols
- Boundary Layer File customization
  - Regional names more visible
- Off-line map server

Benefits

- Experienced map developer
- Standard look and feel to the maps
- Expandable to new regions
- Geospatial data results

- Adaptable to future projects

Chicago Maps: Summary

- Continue developing use of tablet device within CAPI studies
- Receive and import data from the respondent

- Future Steps
  - Complete integration between the DTSM components
  - Implement the offline map tiles
  - Finalize and program survey instrument
  - Perform feasibility testing and adapt the software tools

Acknowledgements

- Dr. Michael Bader
- Steve Bochte
- Dr. Kyle Crowder
- Brendan Day
- Kerryann DiLoreto
- Dr. Matthew Dunbar
- Dr. Jen Dykema
- Kelly Elver
- Andrea Fischer
- Dr. Maria Krysan
- Dr. Nora Cate Schaeffer

- John Stevenson
- Eric White

Thank you!

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