An Exploration of the Open Data Kit

MOBILE MEETS THE CLOUD

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ABSTRACT

The growth of mobile device usage in everyday life continues to sky rocket. As private business and public organizations embrace the rapid change a number of positive results are being achieved through the use of smartphone and tablet devices, particularly in the area of data collection.

The Open Data Kit (ODK) originated as a google.org initiative were research efforts focused on applying technology in developing regions to assist in health and environmental initiatives. The University of Washington's Department of Computer Science and Engineering have pioneered this project for the last four years were they have established a suite of open-source tools to assist under-served communities collect and manage important datasets for strategic initiatives. Through the use of the Google App Engine cloud service, the ODK suite neatly captures and manages data from android mobile devices.

The focus of this presentation will be to explore the Open Data Kit features and capabilities as a framework that simplifies disconnected field data capture while providing data flow and storage to the cloud. The ubiquitous presence of the data within the cloud readily feeds the geospatial and information systems of the organization.

AGENDA

+ Open Data Kit (ODK) Introduction

+ The ODK Projects

+ Just Beyond ODK

+ Practical Insights

+ Questions / Discussion

Open Data Kit

INTRODUCTION

OPEN DATA KIT INTRODUCTION

✖ What is the Open Data Kit ?

"Open Data Kit (ODK) is an open-source suite of tools that helps organizations author, field, and manage mobile data collection solutions."

✚ Open-Source suite of tools

✖ Headed by Gaetano Borriello

- ★ Some key contributors: Yaw Anokwa, Carl Hartung, Brian DeRenzi
- ★ But many others too!
- ★ Efforts continue at the University of Washington, Department of Computer Science and Engineering

✚ Mobile Data Collection

✖ Android OS - Phones, Tablets

OPEN DATA KIT INTRODUCTION

✖ How did this start ?

  ✚ Originated as a google.org initiative

  ✚ Support

    ✖ Global Health, Humanitarian and Environment Issues

    ✖ Particularly in developing regions

BERKELEY HUMAN RIGHTS CENTER CENTRAL AFRICAN REPUBLIC

Building Peace, Seeking Justice: A Population-Based Survey on Attitudes about Accountability and Social Reconstruction in the Central African Republic (August 2010)

"The **INITIATIVE FOR VULNERABLE POPULATIONS** conducts research in countries experiencing serious violations of human rights and international humanitarian law. Using empirical research methods to give voice to survivors of mass violence, the Initiative aims to ensure that the needs of survivors are recognized and acted on by governments, UN agencies, and nongovernmental organizations."

http://www.law.berkeley.edu/files/HRC/Publications_Building-Peace-Seeking-Justice_08-2010.pdf

ACADEMIC MODEL FOR THE PREVENTION AND TREATMENT OF HIV

IU-Kenya Partnership/AMPATH (July 2010)

"AMPATH believes the most powerful case finding and prevention tool is home-based counseling and testing (HCT). By offering testing in individual homes, AMPATH is more likely to diagnose early disease and provide care that is at once less expensive and more effective at keeping those who are HIV-positive from ever progressing to advanced disease and death."
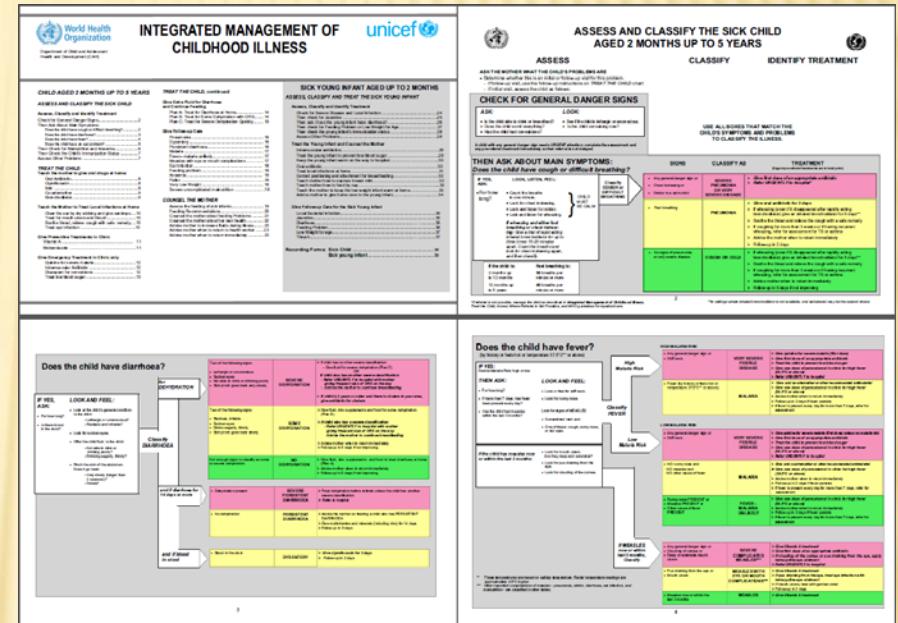
http://www.ampathkenya.org/our-programs/communicable-diseases/home-based-counseling-and-testing-(hct)/

OPEN DATA KIT INTRODUCTION

INSIGHTFUL SIDE BAR

- **Gaetano Borriello at TEDx Seattle April 2010**
  - Discusses the work of one of his graduate students in Mtwara
  - Poor coastal community located in Tanzania
- **Stats**
  - United States 430 people per doctor
  - Tanzania 50,000 people per doctor
- **Clinicians front line medical provider**
  - World Health Organization Protocols
  - Integrated Management of Childhood Illness
    - 43 page paper flowchart
    - 173 page handbook
  - Patient demand on clinicians
    - Paper flowchart not efficient
    - Rely on memory
  - Impact
    - Incomplete assessments
    - Missing the mark on diagnosis
    - Increases risk of missing urgent cases
- **Positive results**
  - Adhering to protocol
  - More complete history

http://www.youtube.com/watch?v=-X7evoDIDQU
http://homes.cs.washington.edu/~bderenzi/Papers/chi1104-bderenzi.pdf

OPEN DATA KIT INTRODUCTION

OPEN DATA KIT INTRODUCTION

× Why Open Data Kit ?

 + Technology and Numbers

 + Developing Nations

   × Have Limited Technology Infrastructure

   × Large Number of Surveys to Perform

   × Effective Spending of Limited Dollars
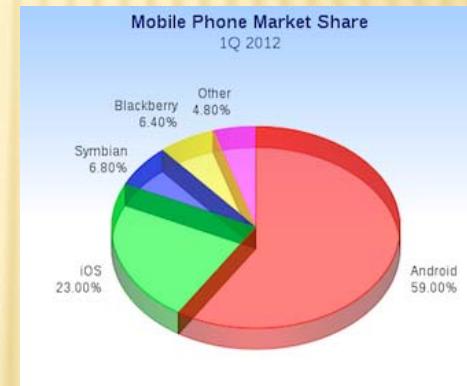
OPEN DATA KIT INTRODUCTION

- ✖ But ... Why Open Data Kit ?
  - ✚ Technology and Numbers
    - ✖ Open Source = Free
    - ✖ Open Source = Extensible
    - ✖ Open Standard (XForms*) = Good
    - ✖ The Android Market Share **
    - ✖ The Android Device
      - ✦ Low Cost
      - ✦ GPS
      - ✦ Camera
      - ✦ Microphone

Mobile Phone Market Share
1Q 2012

Other 4.80%
Blackberry 6.40%
Symbian 6.80%
iOS 23.00%
Android 59.00%

* More to come!
** http://www.huffingtonpost.com/2012/09/18/android-market-share-q3-2012_n_1893292.html

OPEN DATA KIT INTRODUCTION

✖ Other Uses for the Open Data Kit

  ✚ Emergency Response

  ✚ Damage Assessment

  ✚ Outage Management

  ✚ Municipal Management

  ✚ Campus Facilities

  ✚ Learning / Training

OPEN DATA KIT INTRODUCTION

✖ So … What is the Open Data Kit Again ?

"Open Data Kit (ODK) is an open-source suite of tools that helps organizations author, field, and manage mobile data collection solutions."

Paper Form, Survey, or Questionnaire	Design Electronic Forms	Collect the data	Gather the captured data	Visualize and Analyze the collection of information	Provide a Data Exchange

Open Data Kit as a Framework

ODK PROJECTS

ODK PROJECTS

✖ Brief Wiki

+ "XForms is an XML format for the specification of a data processing model for XML data and user interface(s) for the XML data, such as web forms."

   http://en.wikipedia.org/wiki/XForms

+ "JavaRosa is an XForms client written in Java Mobile Edition (J2ME), and supports a wide array of devices, from top-end smart phones and PDAs with large screens and abundant memory"

   http://en.wikipedia.org/wiki/XForms

+ OpenRosa consortium is a group of organizations working together to created mobile data collection standards, particularly involving XForms

ODK PROJECTS

✖ Key Projects

+ Build: HTML5 web application used to build basic XForms

+ Collect: Android application used to capture data while in the field

+ Aggregate: Web application used to distribute blank XForms and gather captured data*

+ Validate: A desktop Java application used to validate OpenRosa compliant forms
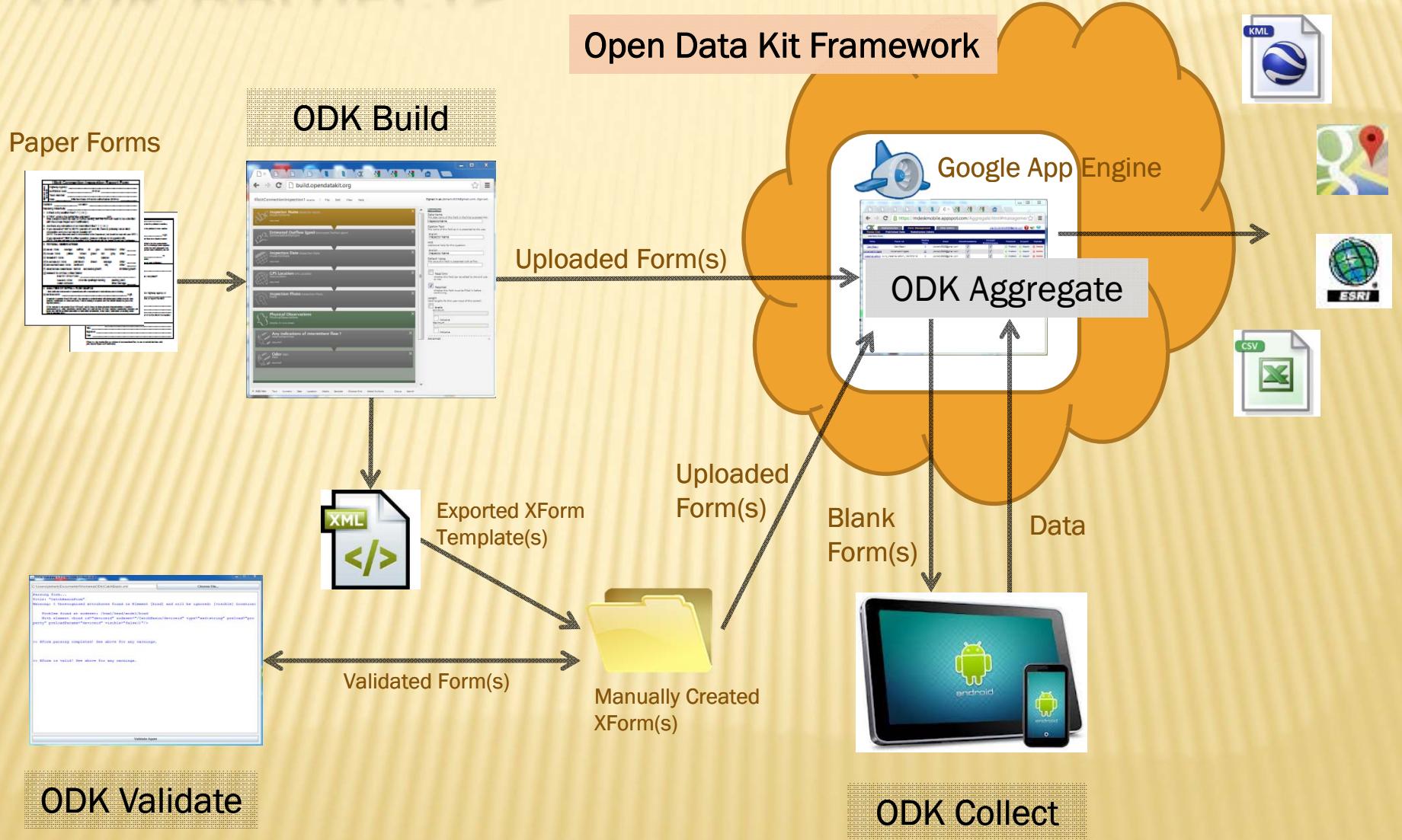
    * Assuming Google App Engine Installation, although there are other deployment options

✖ Additional Projects**

+ Form Uploader

+ Briefcase

+ XLSXForm

    ** Will not be formally discussed within this presentation

ODK PROJECTS

Open Data Kit Framework

ODK Build

Paper Forms

Google App Engine

Uploaded Form(s)

ODK Aggregate

Exported XForm Template(s)

Uploaded Form(s)

Blank Form(s)

Data

Validated Form(s)

Manually Created XForm(s)

ODK Validate

ODK Collect

What information is needed ?
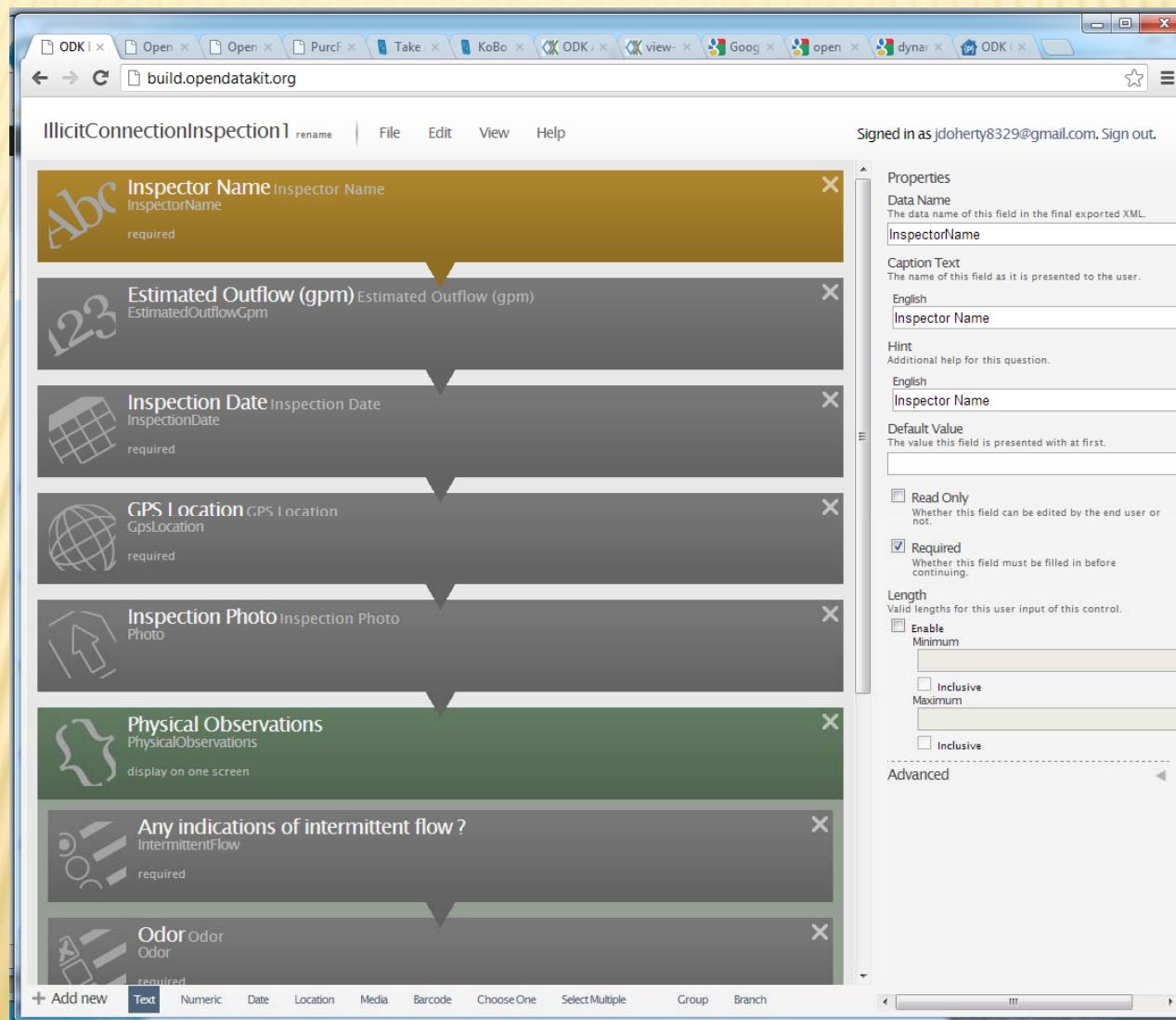
BUILD

ODK BUILD

✖ Getting Started

  ✛ Navigate to: http://build.opendatakit.org

  ✛ Create an account

  ✛ Drag-n-drop field types and configure

ODK BUILD

BASIC TYPES

✖ Text

✖ Numeric

✖ Date

✖ Location

✖ Media

　＋ Image / Video / Audio

✖ Choose One

✖ Select Multiple

✖ **Metadata**

✖ Group

ADVANCED TYPES*

✖ Date

　＋ Month – Year / Year / Time / Date - Time

✖ Location with Map

✖ Barcode **

✖ Image with Markup

✖ Sketch

✖ Signature

✖ Selection by Image

✖ Cascading Selects

✖ Skip Logic

＋ Add new　Text　Numeric　Date　Location　Media　Barcode　Choose One　Select Multiple　Metadata　Group　Branch

*　Manual Edit of XForm

**　Barcode Reader App Required

ODK BUILD
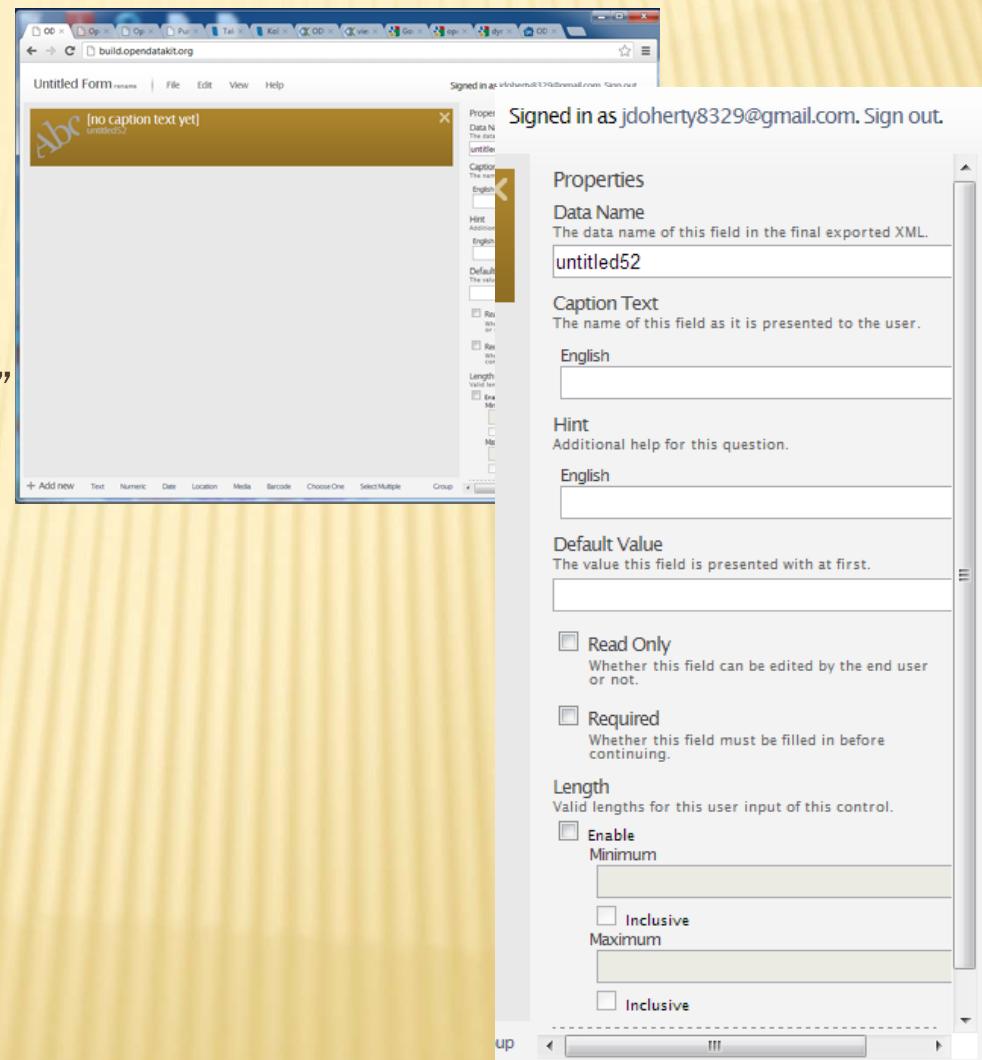
ODK BUILD

✕ Basic Types
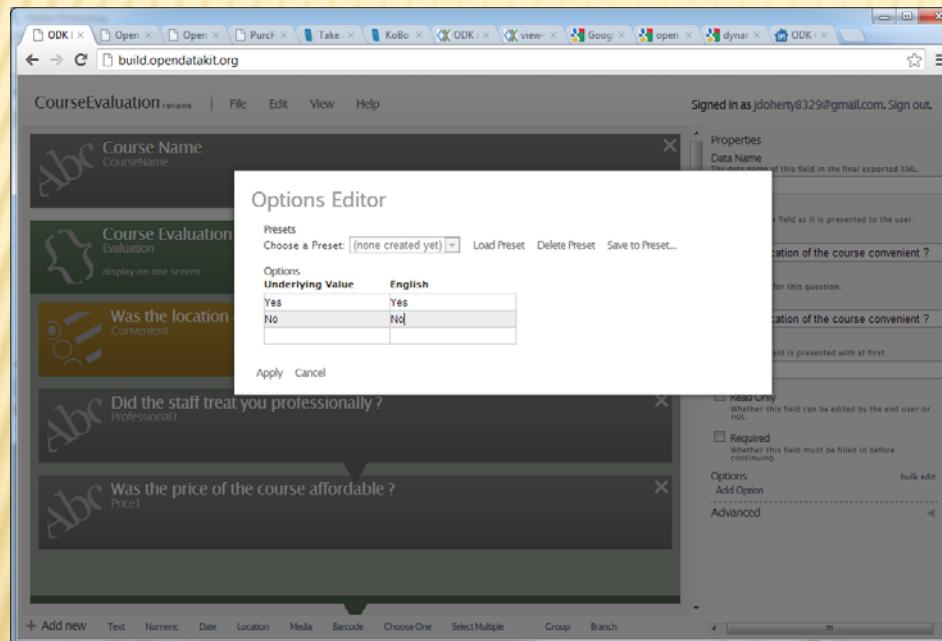
+ Text

✕ Click "Text"

✕ Fill in the "Properties"

✕ Typical properties

★ Data Name

★ Caption Text

★ Hint

★ Default Value

★ Read Only (check)

★ Required (check)

ODK BUILD

- ✖ Basic Types
  - ✚ Choose One
    - ✖ Pick from list
    - ✖ Bulk Edit
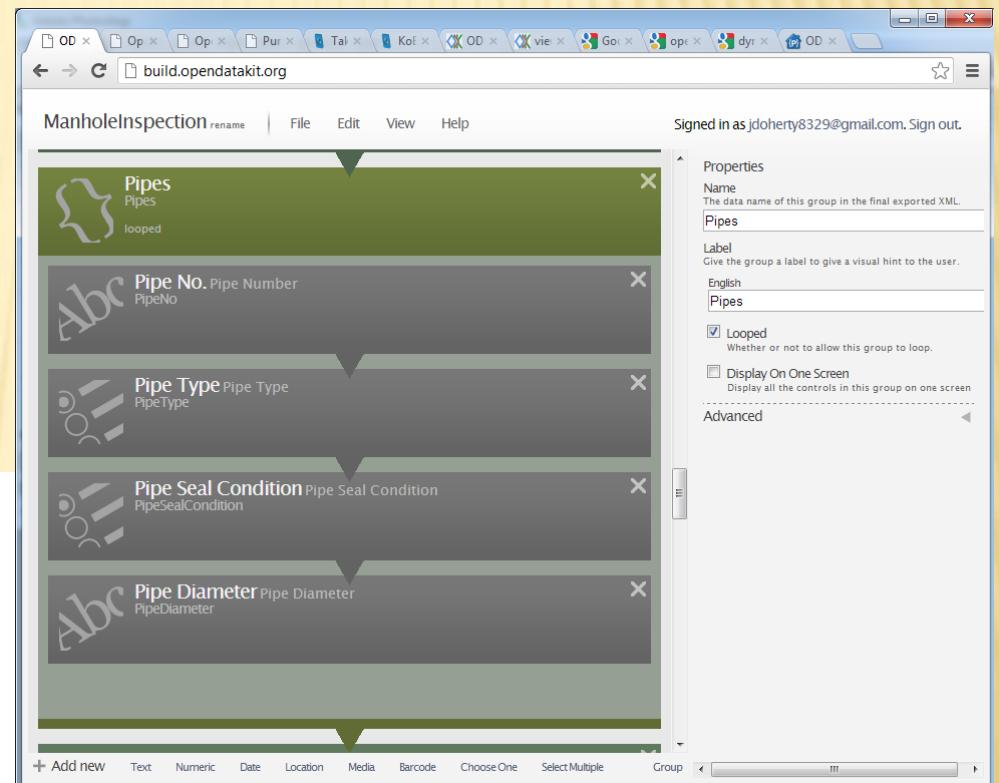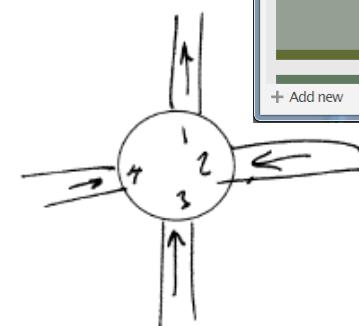
ODK BUILD

× Basic Types

+ Group

× Logically associate

× Display fields together

× Enable 1 to Many

ODK BUILD

```
1   <h:html xmlns="http://www.w3.org/2002/xforms" xmlns:h="http://www.w3.org/1999/x
2     <h:head>
3       <h:title>AdvancedWidgets</h:title>
4       <model>
5         <instance>
6           <data id="AdvancedWidgets">
7             <InspectionDate/>
8             <CurrentLocation/>
9           </data>
10        </instance>
11        <itext>
12          <translation lang="eng">
13            <text id="/data/InspectionDate:label">
14              <value>Inspection Date (Month-Year)</value>
15            </text>
16            <text id="/data/InspectionDate:hint">
17              <value>Inspection Date (Month-Year)</value>
18            </text>
19            <text id="/data/CurrentLocation:label">
20              <value>Current GPS Location (with Map)</value>
21            </text>
22            <text id="/data/CurrentLocation:hint">
23              <value>Current GPS Location (with Map)</value>
24            </text>
25          </translation>
26        </itext>
27        <bind nodeset="/data/InspectionDate" type="date" required="true()"/>
28        <bind nodeset="/data/CurrentLocation" type="geopoint" />
29      </model>
30    </h:head>
31    <h:body>
32      <input ref="/data/InspectionDate" appearance="month-year">
33        <label ref="jr:itext('/data/InspectionDate:label')"/>
34        <hint ref="jr:itext('/data/InspectionDate:hint')"/>
35      </input>
36      <input ref="/data/CurrentLocation" appearance="maps">
37        <label ref="jr:itext('/data/CurrentLocation:label')"/>
38        <hint ref="jr:itext('/data/CurrentLocation:hint')"/>
39      </input>
40    </h:body>
41  </h:html>
```

- Advanced Types
  - Examples
    - Month-Year
    - Location with Map
  - Use of "appearance"
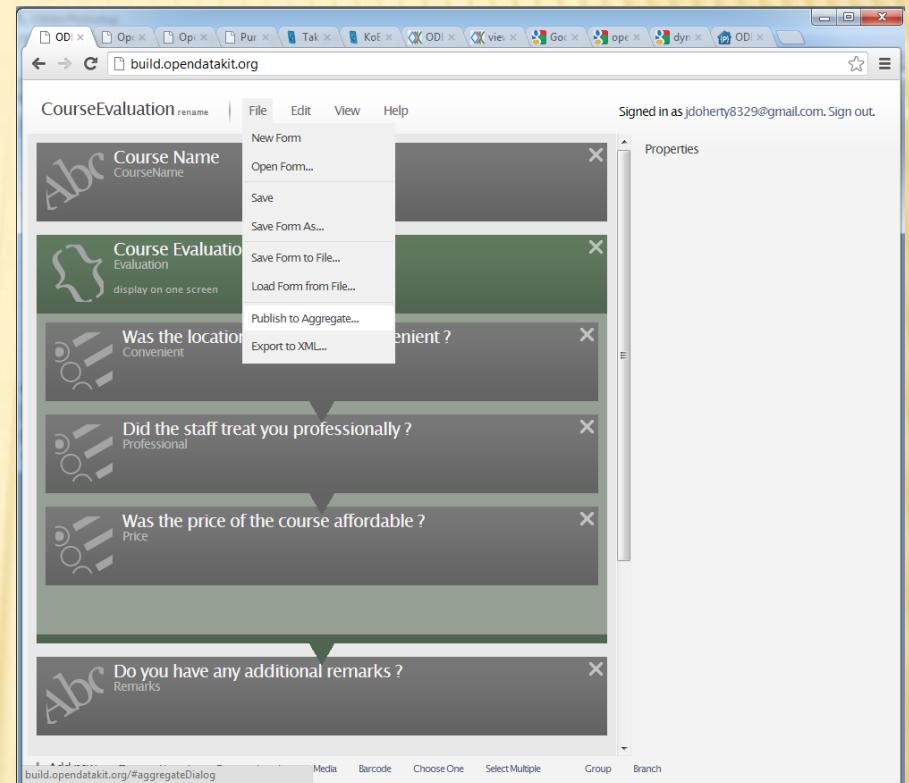
FINISHING THE FORM BUILD

- ✖ Publish to Aggregate …
  - ✚ Posts blank XForm to Aggregate Host

- ✖ Export to XML …
  - ✚ Used to extend basic Form with advanced types
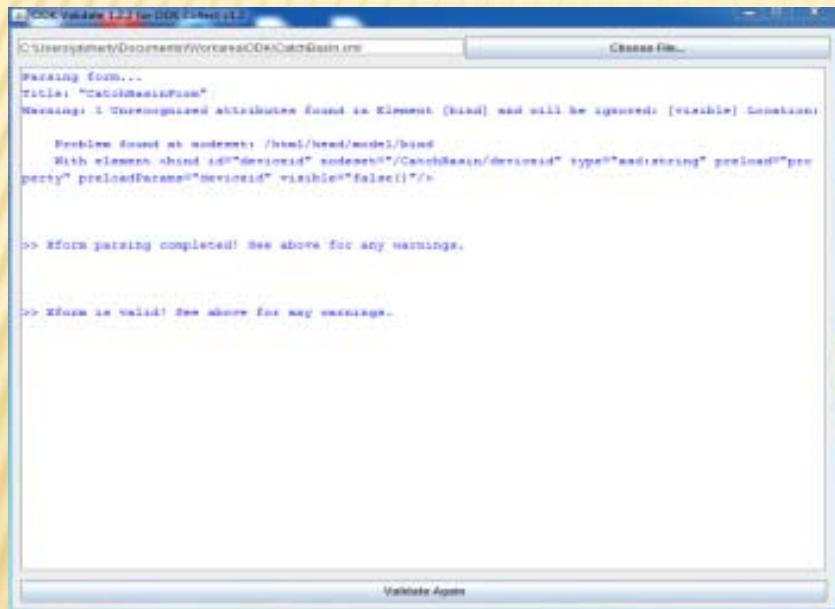
ODK BUILD

Do our form templates conform ?

VALIDATE

ODK VALIDATE

✖ **Getting Started**

  ✚ Navigate to:
    http://code.google.com/p/opendatakit/

  ✚ Under Featured Downloads

    ✖ Download

      "ODK Validate 1.2.2 for ODK Collect v1.2.jar"

✖ **On your PC run**

  "ODK Validate 1.2.2 for ODK Collect v1.2.jar" *

✖ **"Choose File …" to validate**

✖ **Correct Issues and Revalidate**

* Requires Java

How do we get the data ?

COLLECT
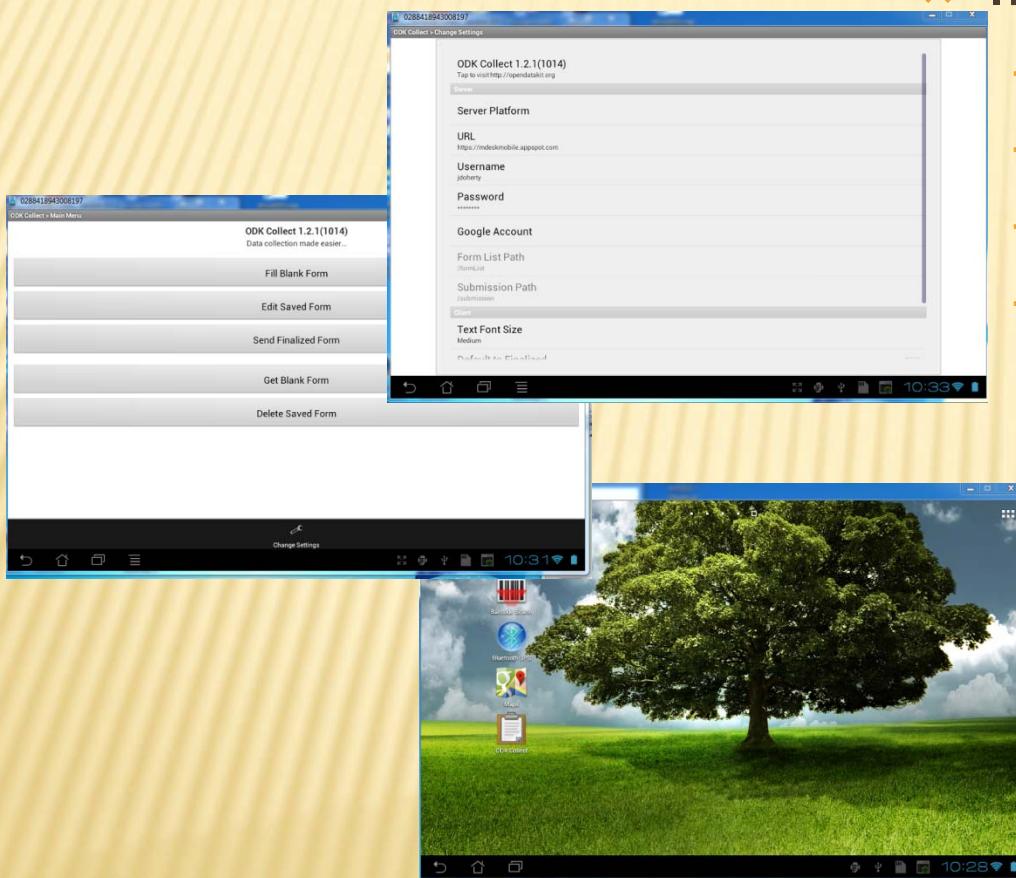
ODK COLLECT

✖ Getting Started*

   ➕ From Android Device use the Browser App to navigate to: http://code.google.com/p/opendatakit/downloads/list

   ➕ Download "ODK Collect v1.2.1 rev 1014.apk"

   ➕ Install the APK on the Android Device

   ➕ Perform Initial Setup / Configuration

   ➕ Download Forms

   ➕ Capture Data

   ➕ Post Captured Data

   * Connection to internet required at times via WiFi, 3G, 4GLTE etc …

ODK COLLECT
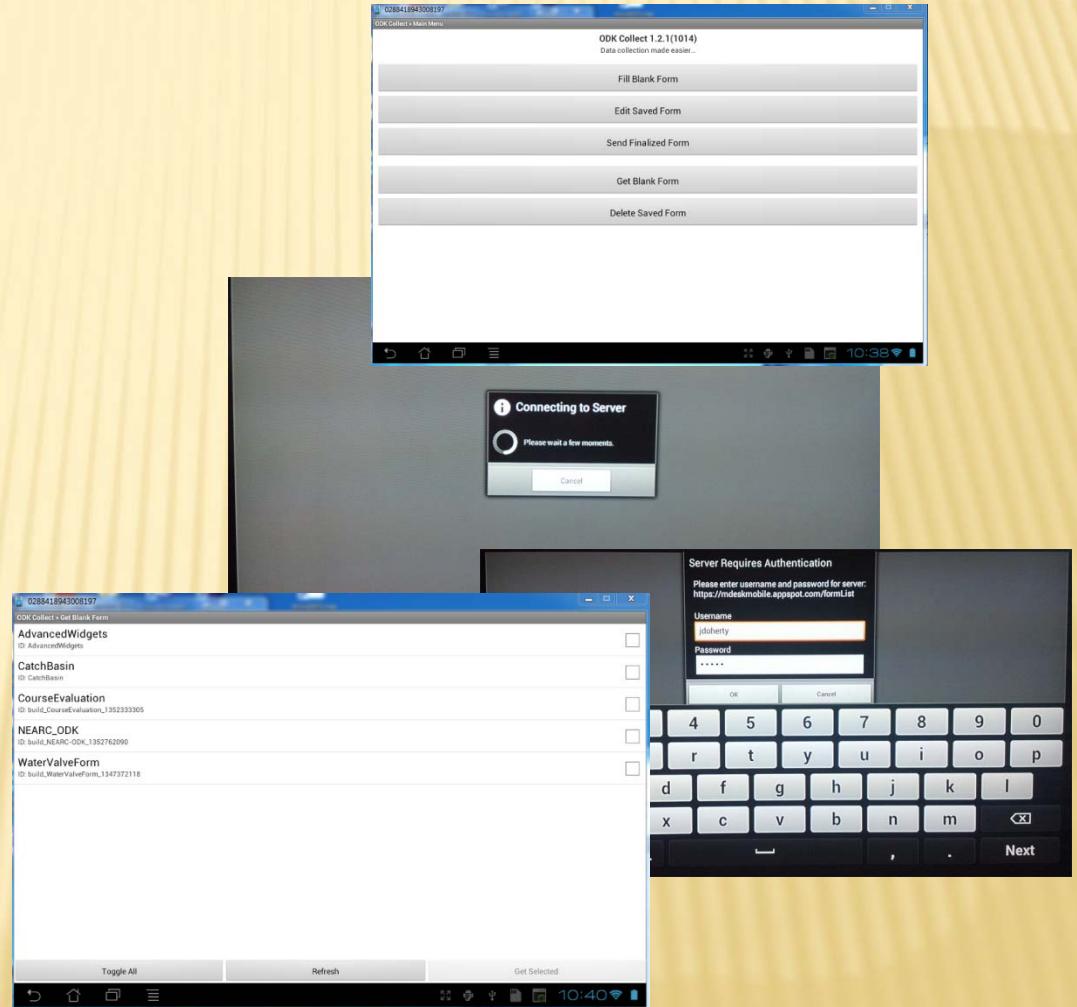
Initial Setup/Configuration

+ Open ODK Collect App

+ Navigate into Change Settings

+ Set the URL

+ Set the Username / Password
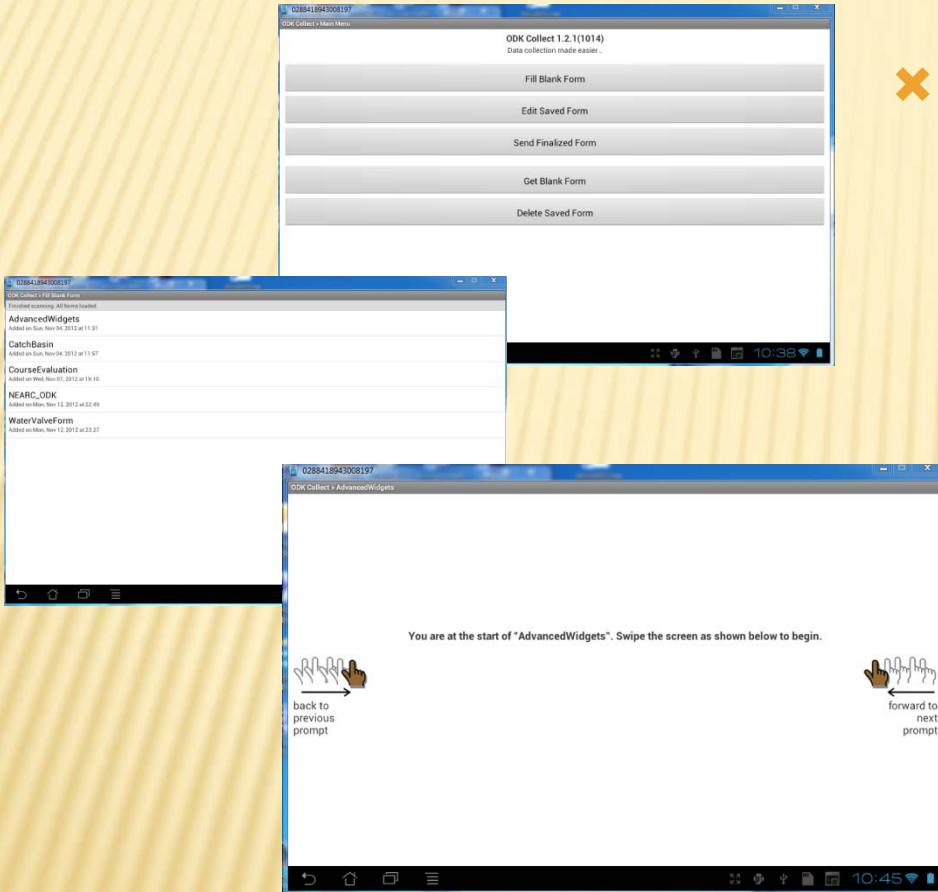
ODK COLLECT

✖ Download Forms

+ Tap "Get Blank Form"

+ Complete Login

+ Check Form(s)

+ Tap "Get Selected"

ODK COLLECT

✖ Capture Data

╋ Tap "Fill Blank Form"

╋ Tap a Form in the list

╋ Swipe Through Each Question
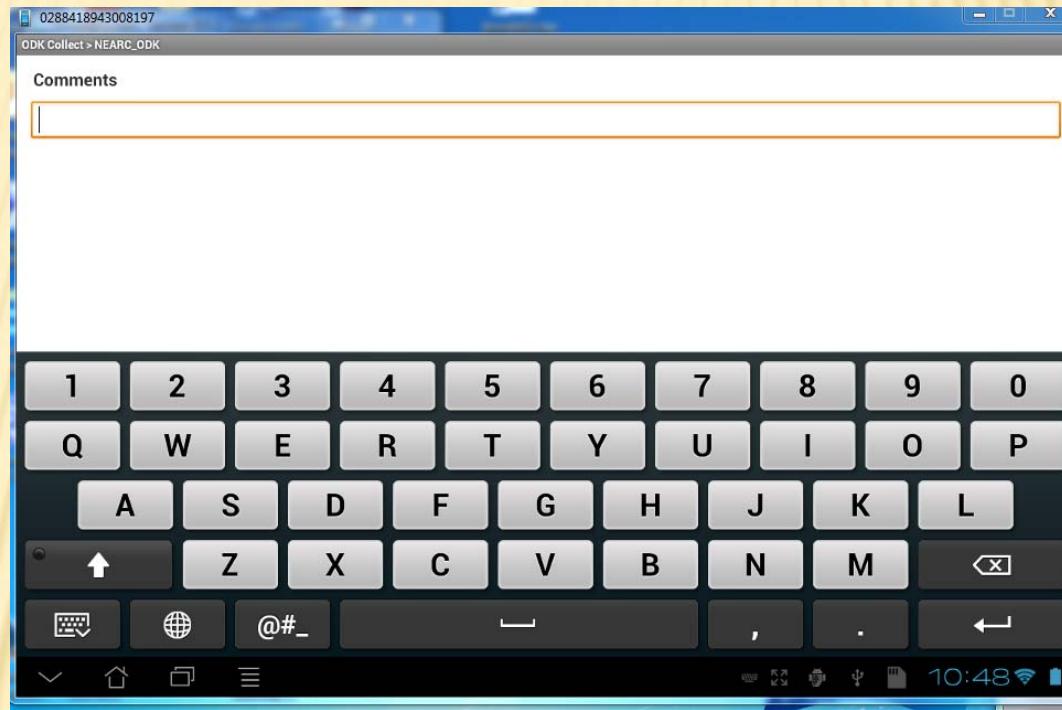
ODK COLLECT

× Capture
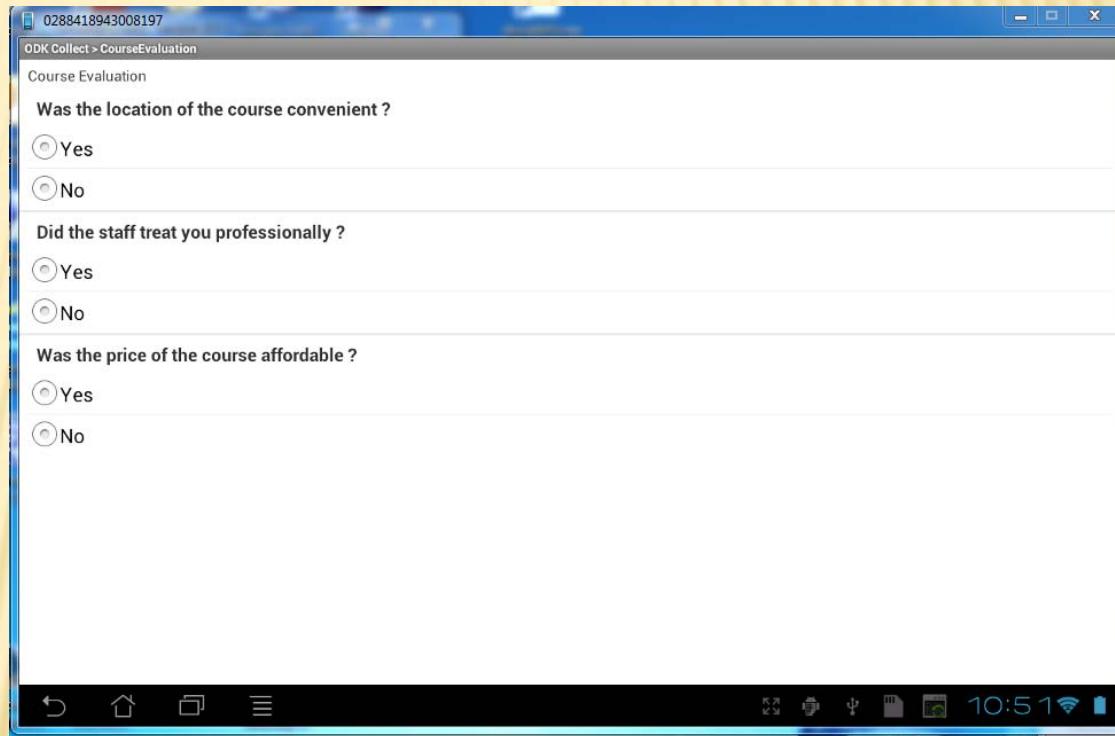
+ Text

× Key Touch Entry

× Mic has mixed results
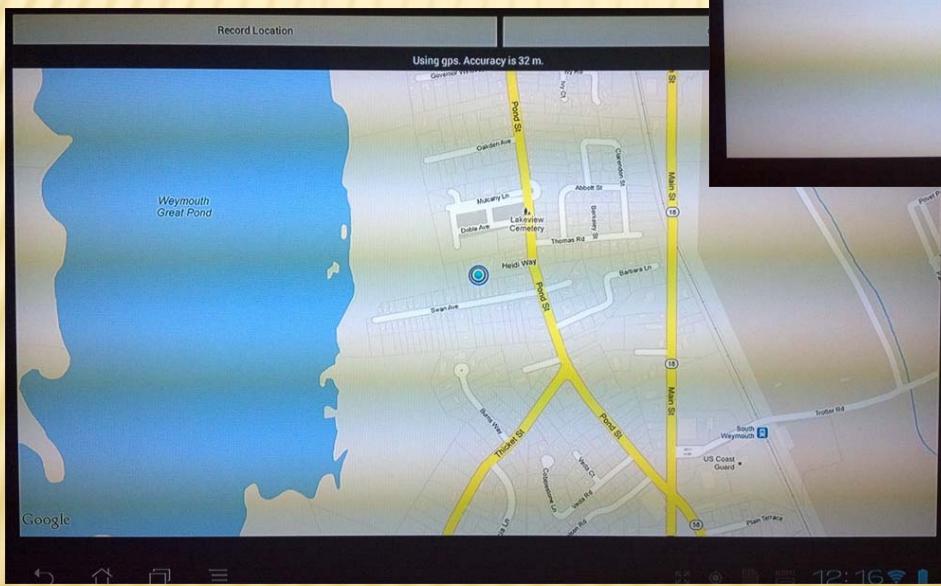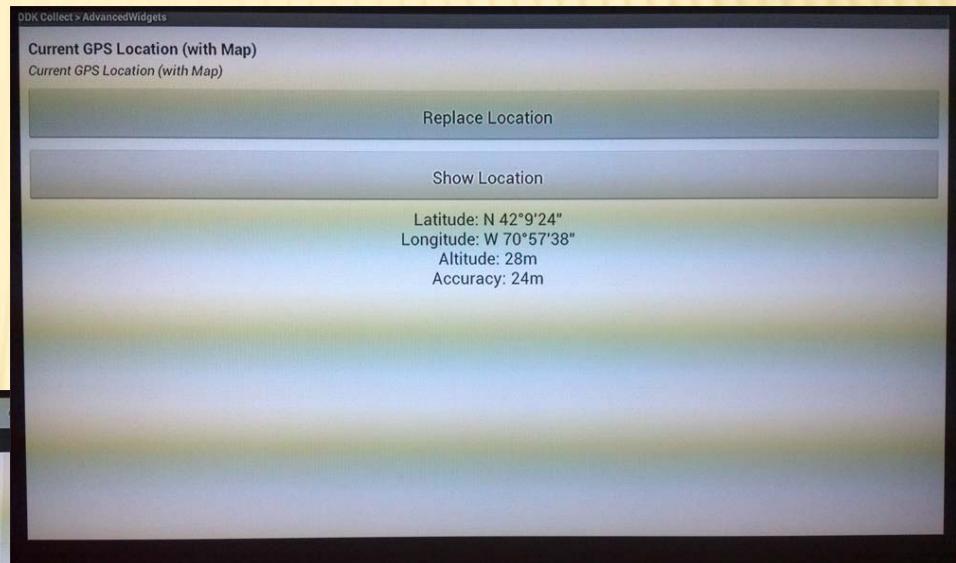
ODK COLLECT
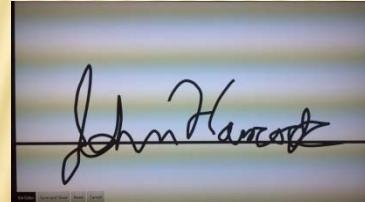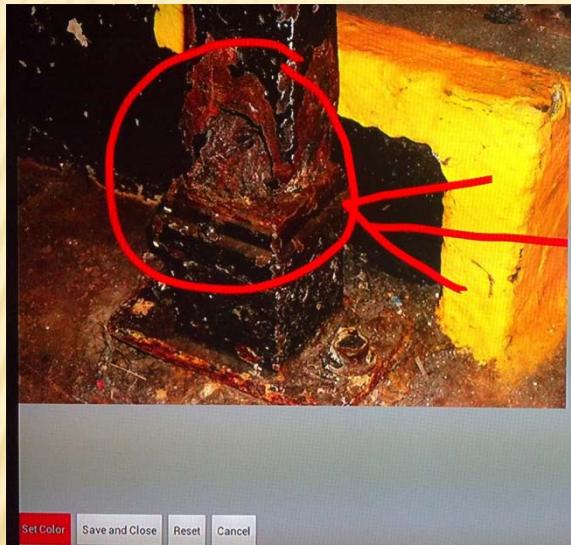
✖ Capture

　+ Choose One

　+ Group – Show Together

ODK COLLECT

✖ Capture

   ✚ Location – with Map
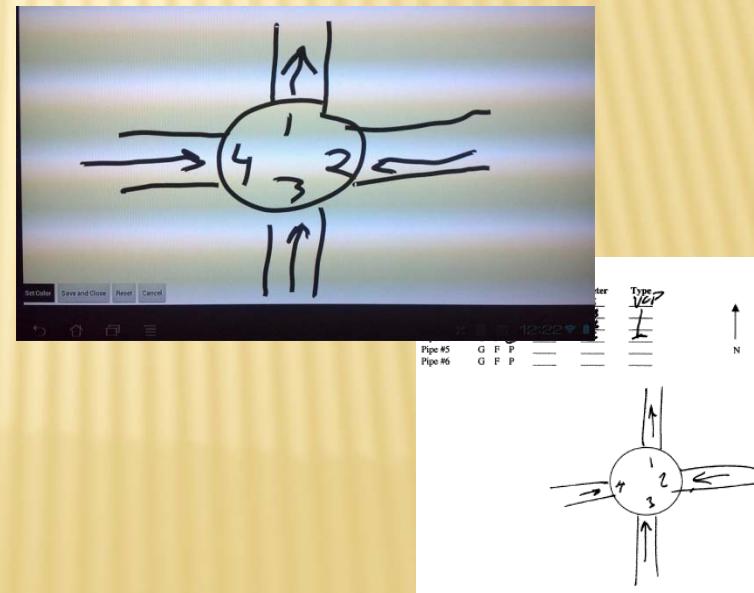
ODK COLLECT
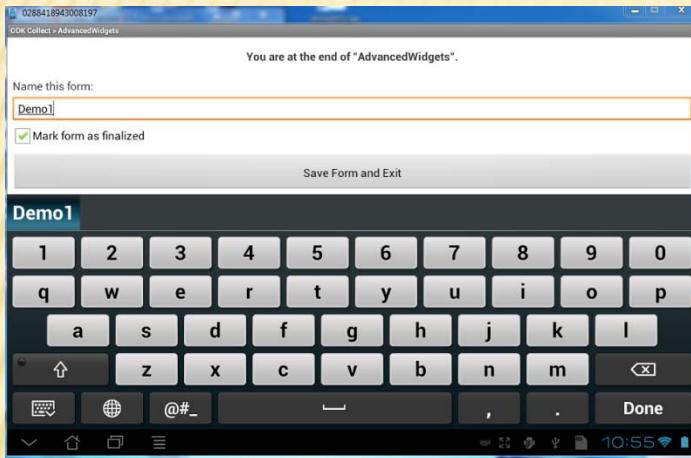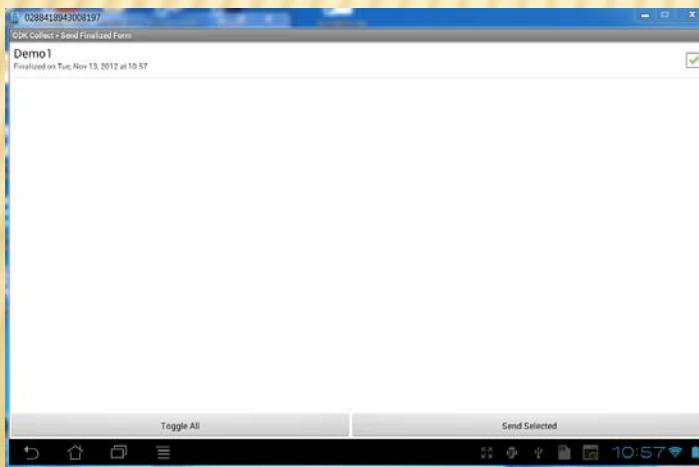
* Capture
  + Image with Markup
  + Sketch
  + Signature

ODK COLLECT

- **Complete Capture**

- **Post Captured Data**

Can we bring it all together ?

AGGREGATE

ODK AGGREGATE
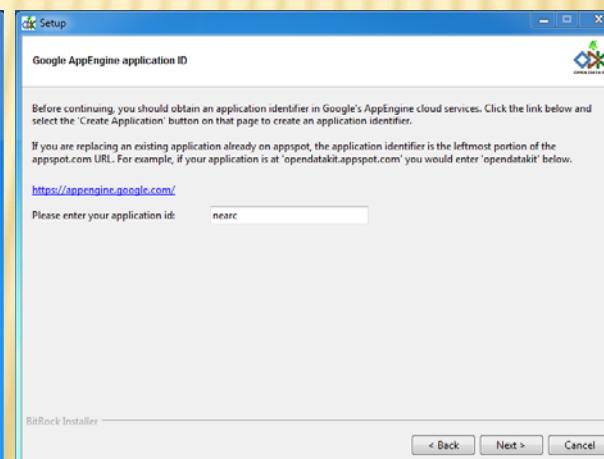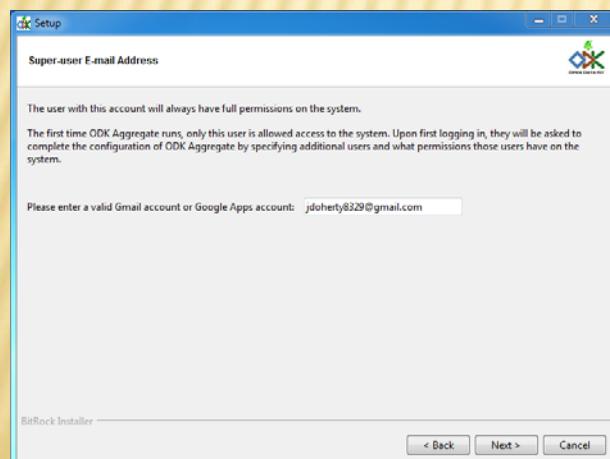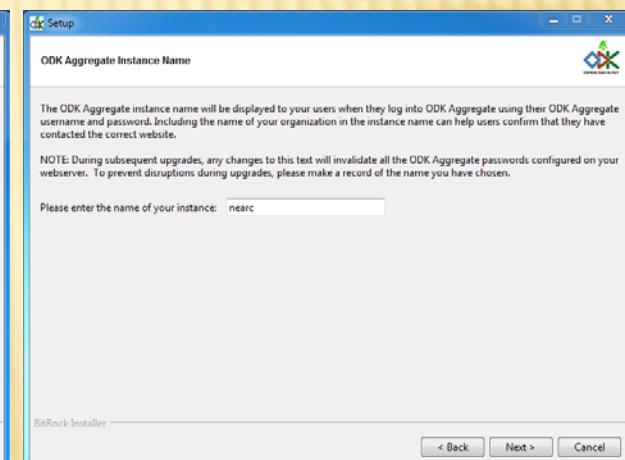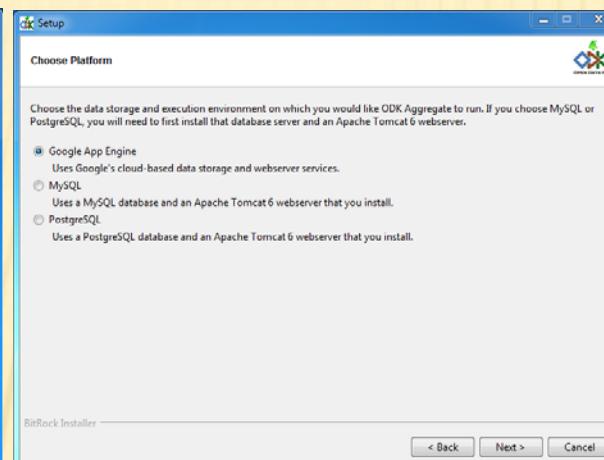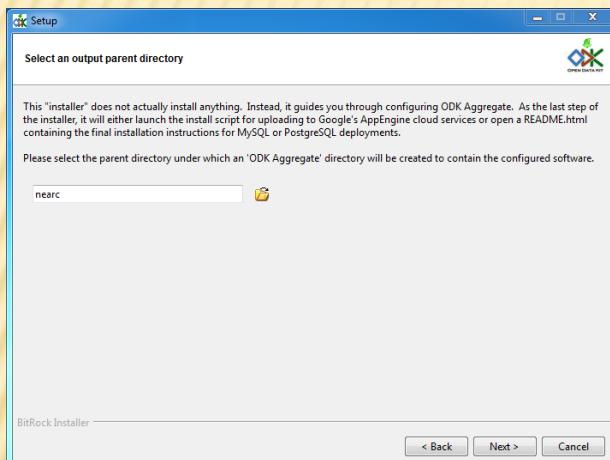
✖ **Getting Started**

➕ Install the App Engine

  ✖ Navigate to: http://appengine.google.com

  ✖ Setup a Google App Engine Account

  ✖ Use the "Create Application" button and provide an application identifier

  ✖ Application identifier determines URL (e.g. http://calgis.appspot.com)

➕ Prepare the ODK Aggregate Install Wizard

  ✖ Navigate to: http://code.google.com/p/opendatakit/downloads/list

  ✖ Download and Run "ODK Aggregate v1.2.0 windows-installer.exe"

➕ Configure New ODK Aggregate Server Instance

ODK AGGREGATE

Installation Wizard
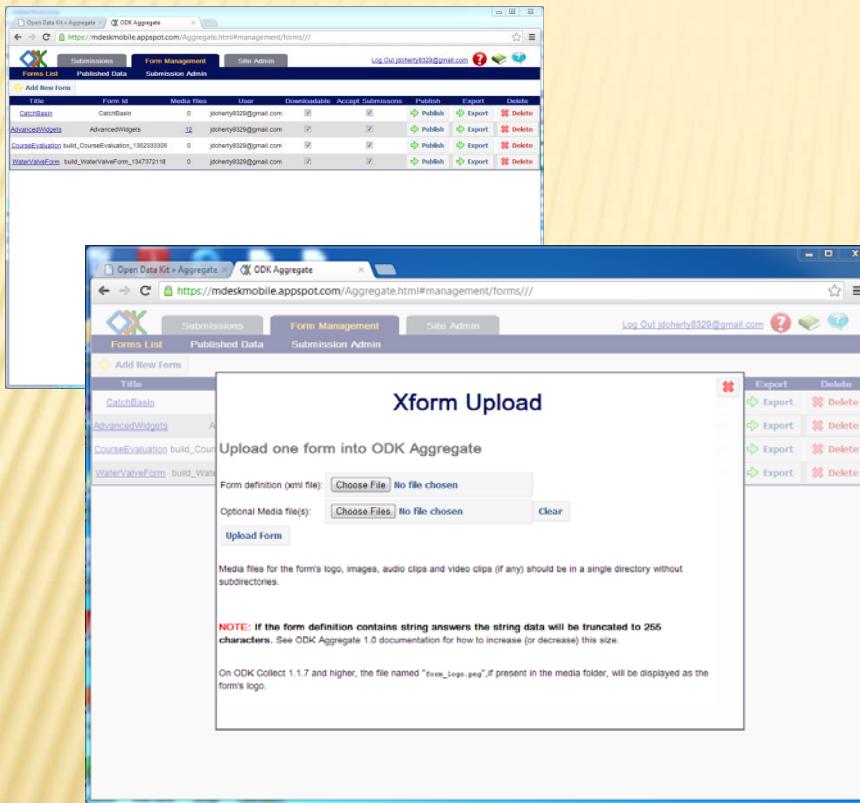
ODK AGGREGATE

* Configure New ODK Aggregate Instance
  + Navigate to App Engine instance (e.g. http://calgis.appspot.com)
  + "Sign in with Google"
* Site Admin
  + Configure Site Access
    * Google Accounts .vs. ODK Accounts
    * Rights
      * Data Collector
      * Data Viewer
      * Form Manager
      * Site Administrator

ODK AGGREGATE

- ✖ Form Management
  - ✚ Panels
    - ✖ Forms List
    - ✖ Published Data
    - ✖ Submission Admin
  - ✚ New Forms via
    - ✖ ODK Build
    - ✖ "Add New Form"
  - ✚ Remove Forms
    - ✖ ... and Submitted Data

ODK AGGREGATE

✖ Form Management

　➕ Export

　　✖ File Types

　　　✱ CSV / KML / JSON

　　✖ Batch Job -> Exported Submissions

　➕ Publish To

　　✖ Google Fusion Tables

　　✖ Google Spreadsheet

ODK AGGREGATE

✕ Submissions

+ Filter Submissions Panel

✕ List of uploaded data

✕ Form Selection / Filter

✕ Visualize

✴ Simple Chart

✴ Map

✕ Export

✕ Publish

ODK AGGREGATE

- **Submissions**
  - **Exported Submissions Panel**
    - Link to export file download

How can the information used ?

JUST BEYOND ODK

DATA AND VISUALIZATION OUTSIDE THE ODK

× ODK Aggregate

➡ × CSV

➡ × ESRI Maps for Office

➡ × ESRI Desktop and Server

➡ × Google Earth / Maps

➡ × Google Spreadsheet

➡ × Google Fusion Table
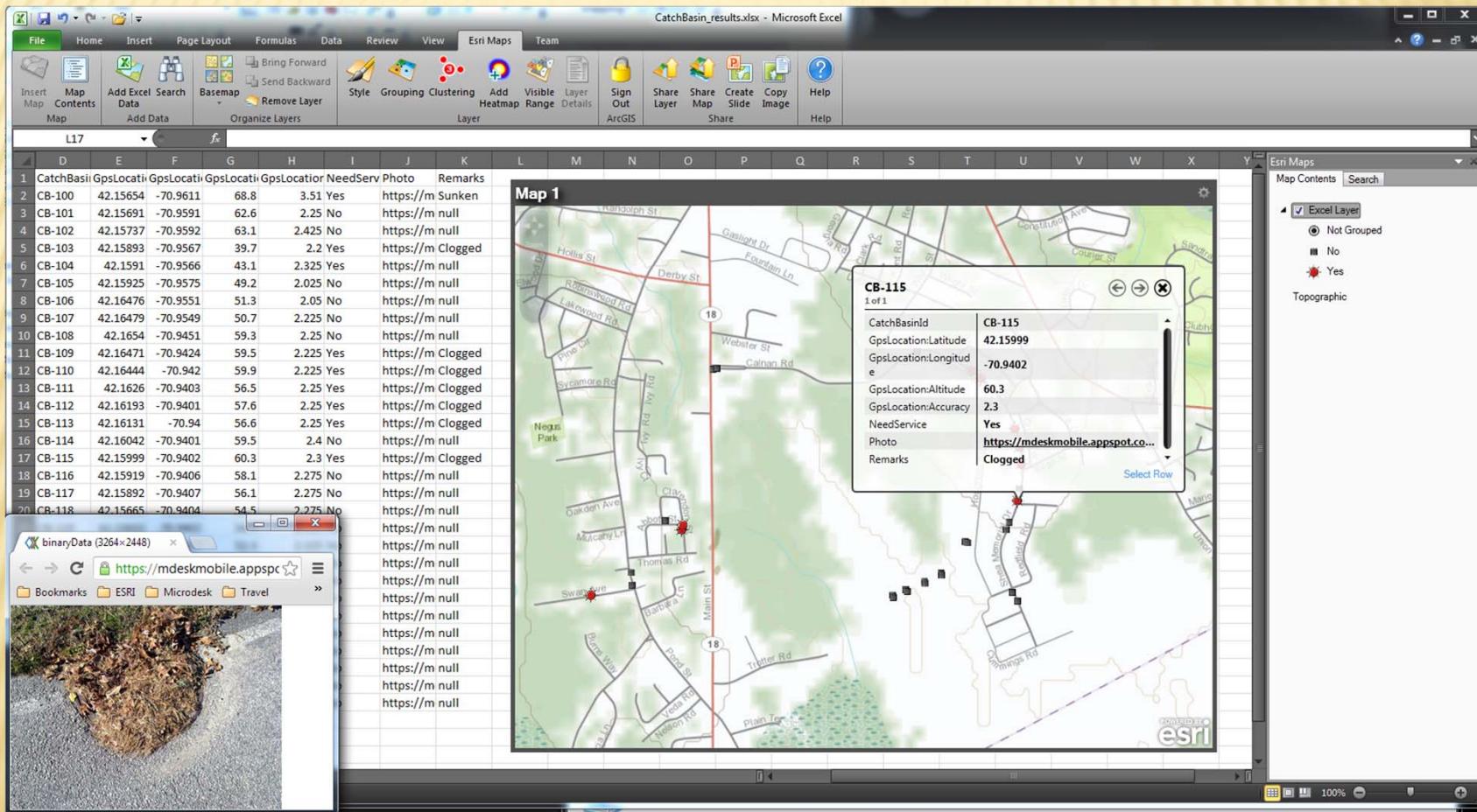
JUST BEYOND ODK

JUST BEYOND ODK

CSV file
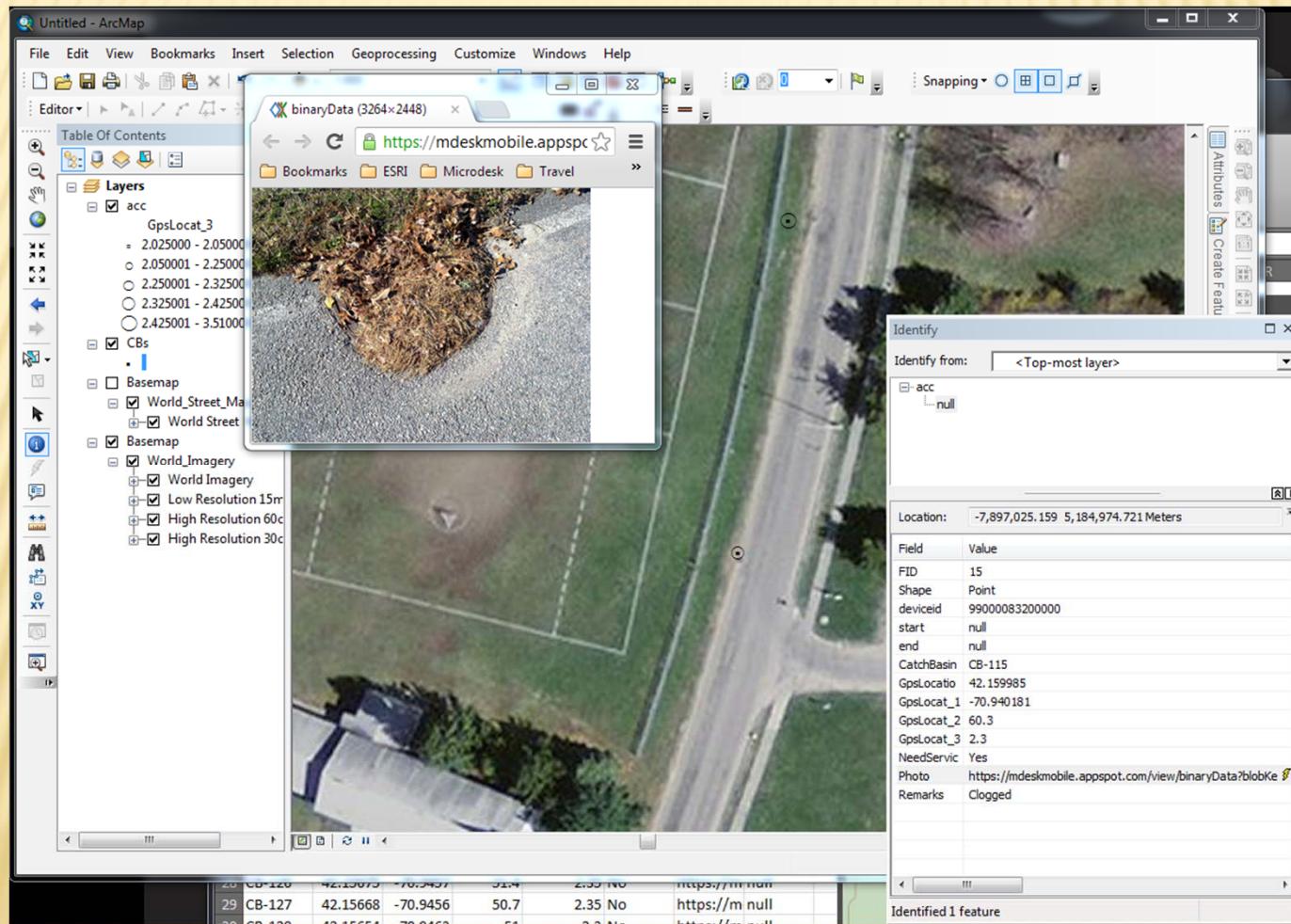
JUST BEYOND ODK

ESRI Maps for Office
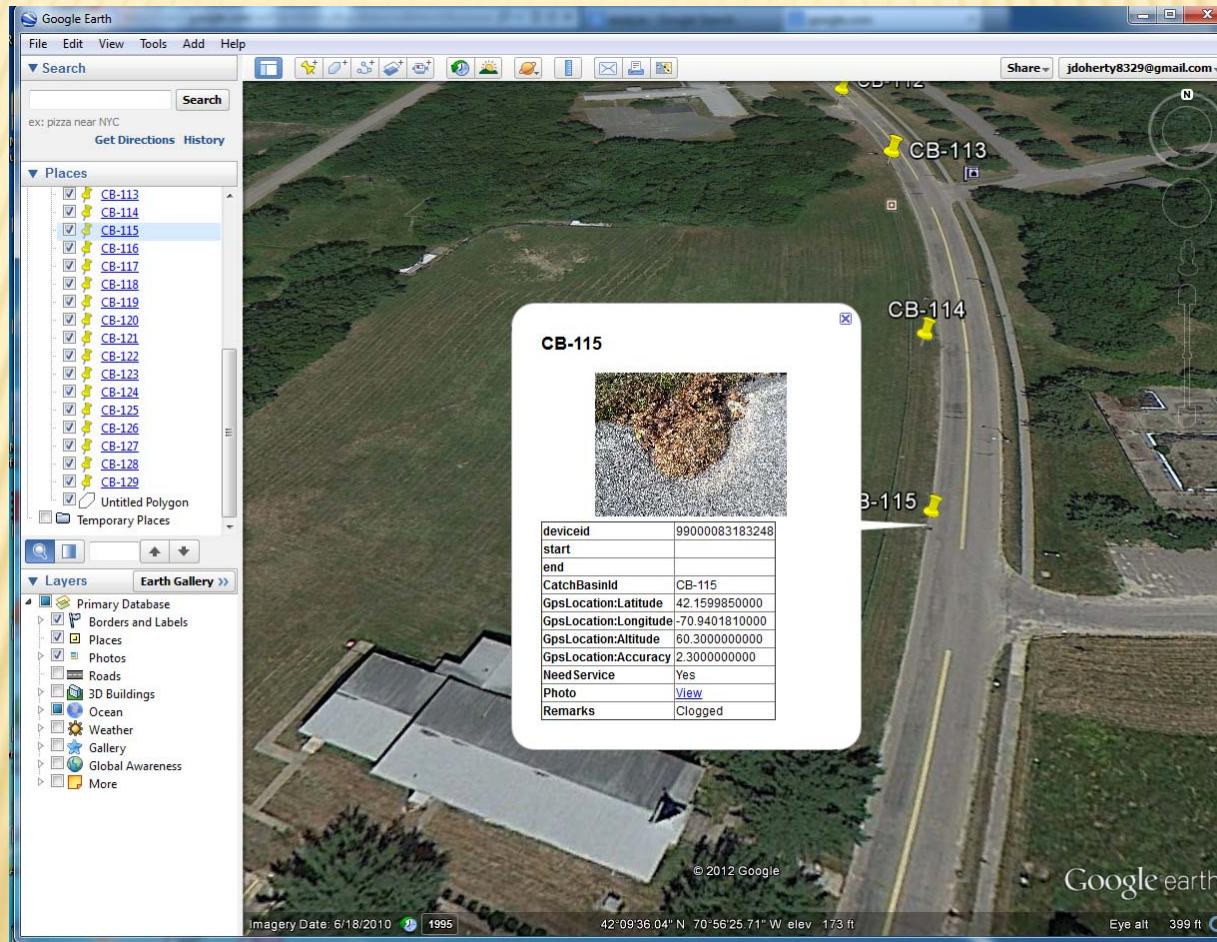
JUST BEYOND ODK

ESRI ArcMAP

JUST BEYOND ODK

Google Earth
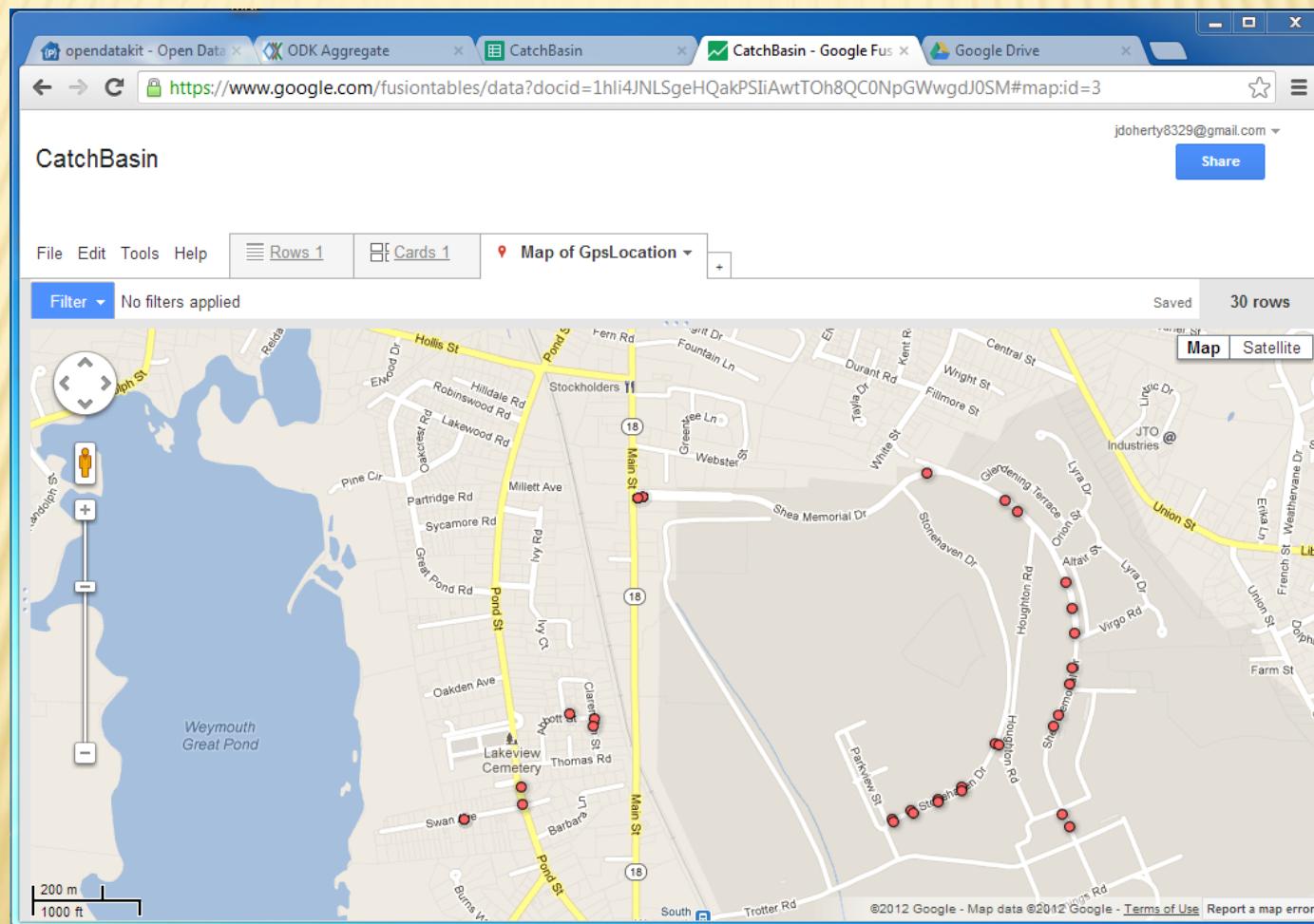
JUST BEYOND ODK

Google Spreadsheet

JUST BEYOND ODK

Google Fusion Table
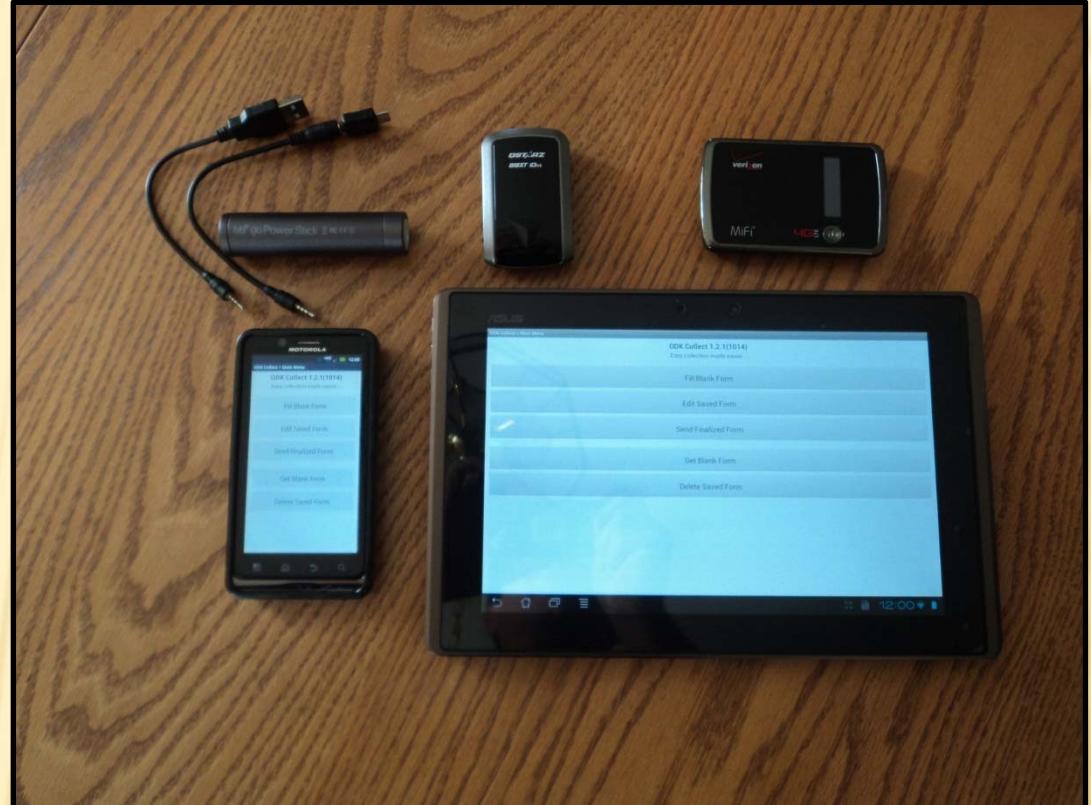
You may find this helpful

PRACTICAL INSIGHTS

MY GADGETS

- Asus Transformer Tablet TF101
    - Android 4.0.3 (Ice Cream Sandwich)
    - ODK Collect 1.2.1(1014)
    - Bluetooth GPS 1.1.1
    - Barcode Scanner 4.3.1
- Motorola Droid Bionic Smartphone
    - Android 2.3.4 (Gingerbread)
    - Android 4.0.4 (Ice Cream Sandwich)
    - ODK Collect 1.2.1(1014)
    - Bluetooth GPS 1.1.1
    - Barcode Scanner 4.3.1
- Verizon MiFi 4GLTE
- QSTARZ 818XT Bluetooth GPS
- Bti goPower Stick
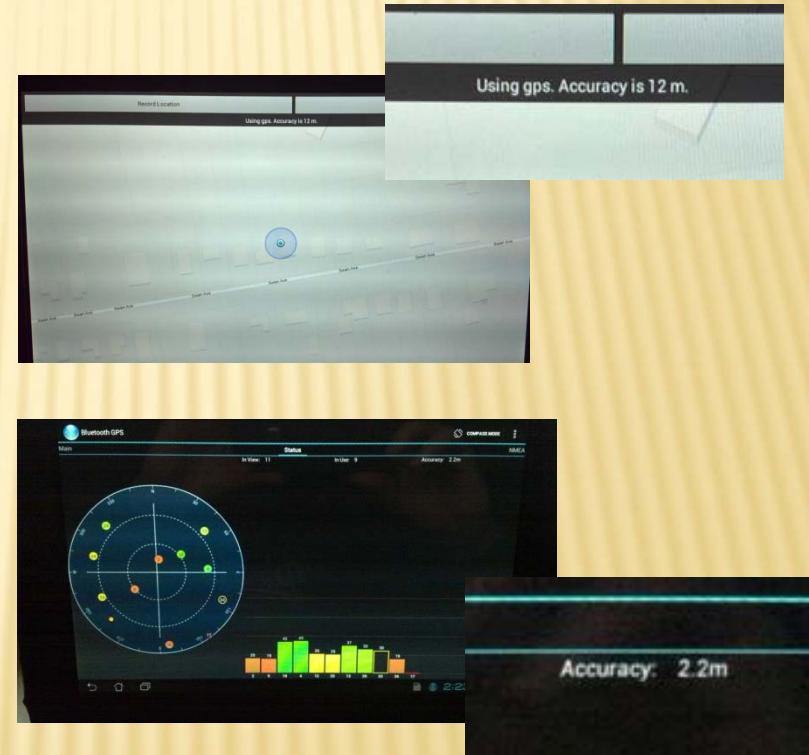
PRACTICAL INSIGHTS

PRACTICAL INSIGHTS

GPS Accuracy
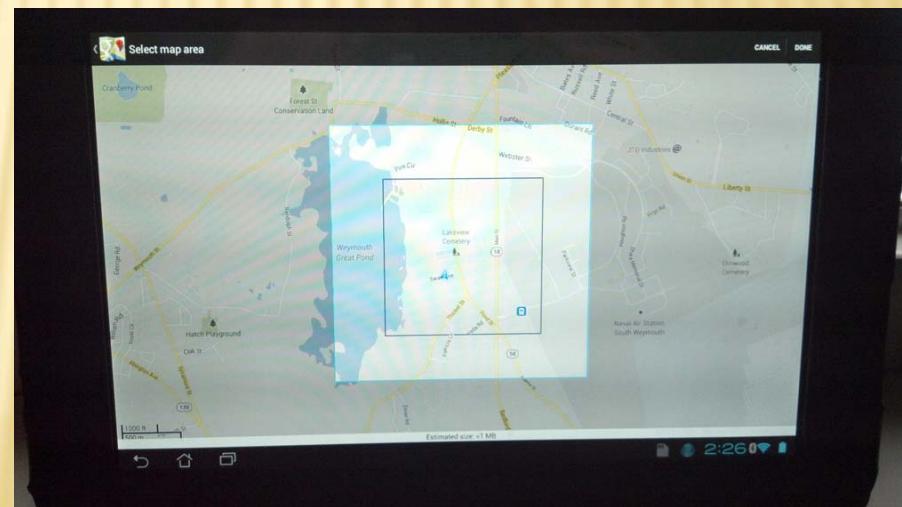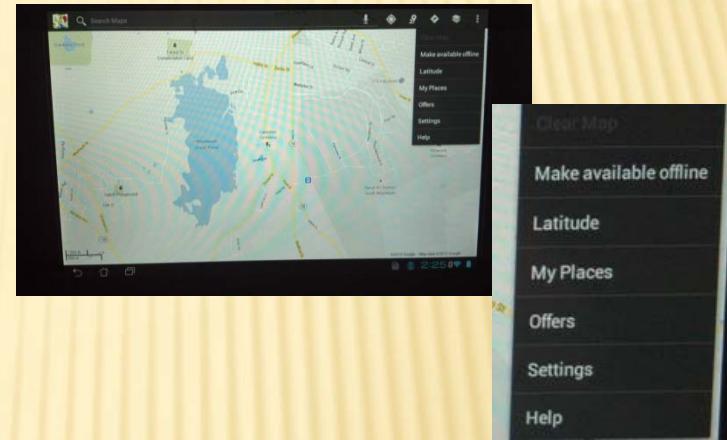
+ Varies among smartphones and tablets

+ Can be improved via more accurate Bluetooth GPS Receivers

+ Use Bluetooth GPS 1.1.1

+ Check "Enable Mock GPS Provider"

PRACTICAL INSIGHTS

Plan ahead …

Use Offline Maps with

Google Maps

Open Data Kit

QUESTIONS / DISCUSSION

WEB SITES

- http://opendatakit.org
- http://google.org
- http://code.google.com/p/opendatakit/
- http://www.w3.org/
- https://bitbucket.org/javarosa/javarosa/wiki/Home
- http://openrosa.org/
- http://appengine.google.com

PAPERS

Carl Hartung, Yaw Anokwa, Waylon Brunette, Adam Lerer, Clint Tseng, Gaetano Borriello, **Open Data Kit: Tools to Build Information Services for Developing Regions**

2010 International Conference on Information and Communicaiton Technologies and Development

----

Yaw Anokwa, Carl Hartung, Waylon Brunette, Jeff Beorse, Gaetano Borriello, **Dynamic Data Collection for Participatory Science in Open Data Kit**

2011 ACM CHI Conference on Human Factors in Computing Systems

----

Yaw Anokwa, Carl Hartung, Waylon Brunette, Adam Lerer, Gaetano Borriello, **Open Source Data Collection in the Developing World**

IEEE Computer. October 2009

REFERENCES

LINKS

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