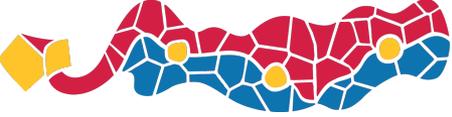# A Geospatial Data Collection System for Organisations

Neil Penman

Anueja Gopalakrishnan

Francois Tsafack

SMAP

# Project History and Objective

- Started at IBM in June 2007 with an objective to:
  - **"Improve the quality and quantity of public data in developing countries, specifically map data available on mobile phones"**
- Late 2007 loaded road data for Southern Sudan into Openstreetmaps
- Development of two tools
  - SmapSurvey
  - SmapDirect
- License: GPL3
- Web Site: http://code.google.com/p/smap-suite/

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World Vision

IBM

Approach

- Complement the **crowd sourcing** approach of Openstreetmaps by working with **organisations** to create and use map data in **developing countries**
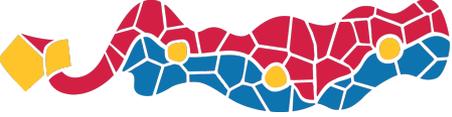
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Collaborators

- Part Time Developers
- RMIT University
  - Masters students doing a project in their final semester
  - Currently the 6th team is working on the project
- World Vision
  - Provided requirements for Smap Survey
  - Ran pilot surveys in Cambodia, Zimbabwe, Mozambique and Malawi
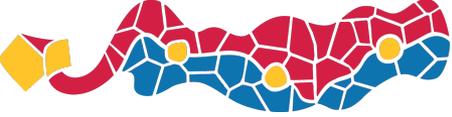 - Assessed performance and compared it to paper based surveys

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World Vision
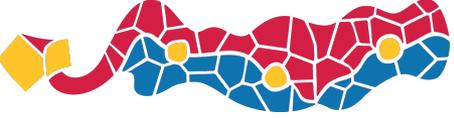
SmapSurvey

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SmapSurvey – Define the survey in a web app

GWT/Java, Tomcat, AWS

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SmapSurvey - Recording the interview

- Enumerators collect the survey data using the mobile phones
- Custom J2ME application

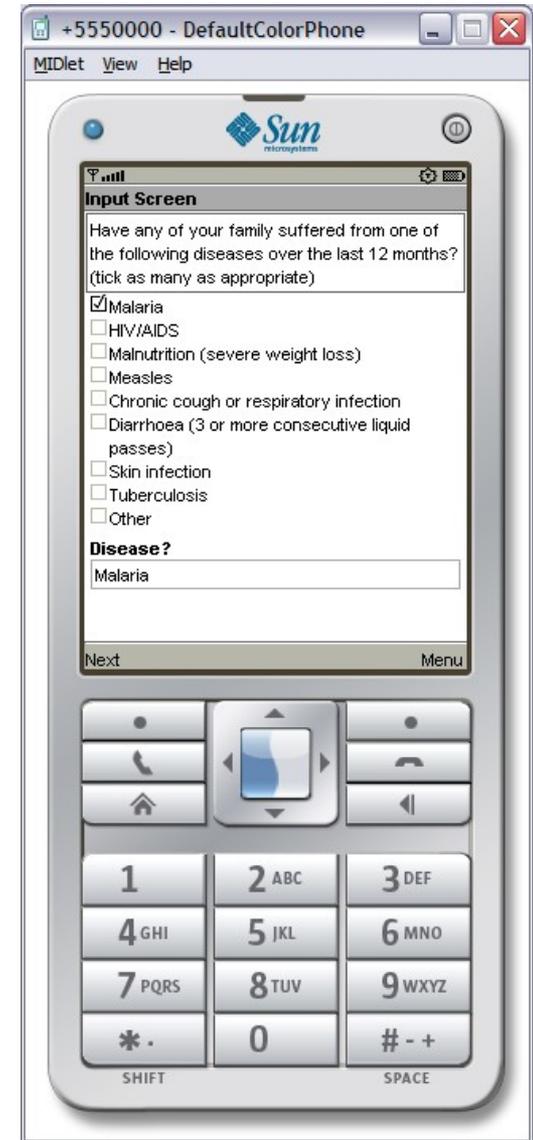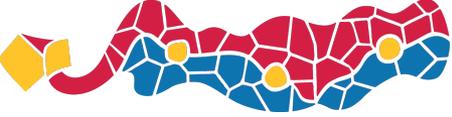**Picture from an earlier**

survey in Zimbabwe

Image of a phone emulator with

data from the Malawi Survey

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SmapSurvey - Providing Context for Collected Data

- The enumerators used a Garmin GPS to record
  - Villages, roads, rivers, bore holes, fields, village headmen headquarters etc
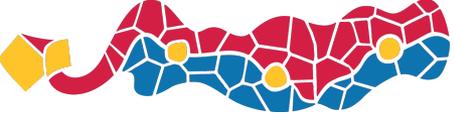- All of this data was loaded into OpenStreetMaps to produce a map of the region

Garmin 60CSx

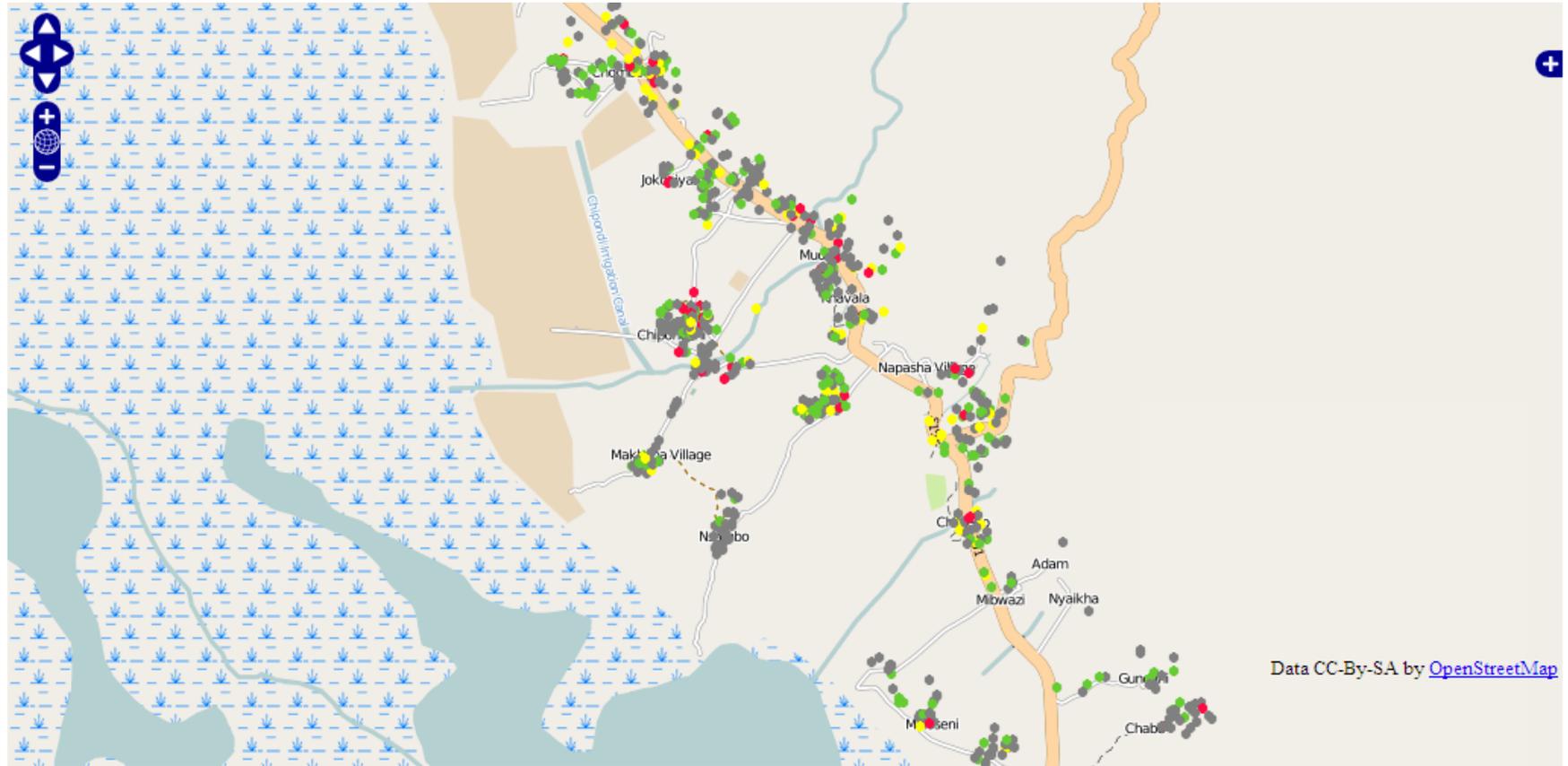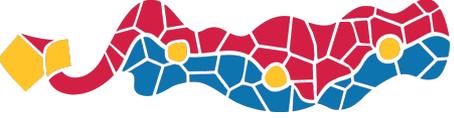http://www.openstreetmap.org/?lat=-16.4343&lon=35.1925&zoom=12&layers=M
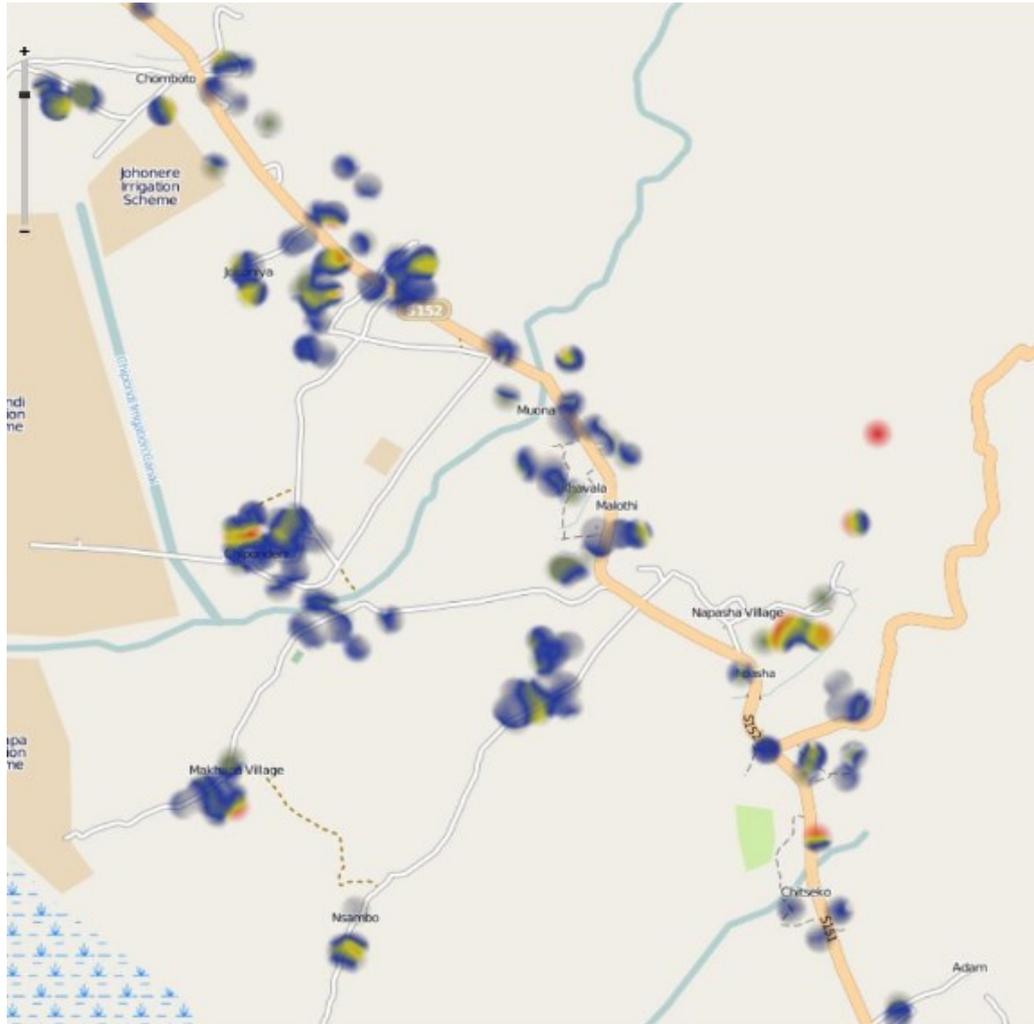
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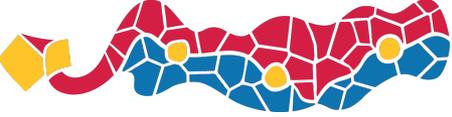
SmapSurvey -Results plotted against the Map

http://ec2-204-236-208-141.compute-1.amazonaws.com/surveyKPIClient/responses.html
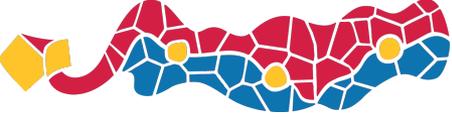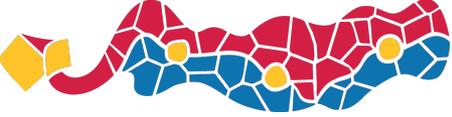
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SmapSurvey – Analysis Module

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Smap Survey – Findings from Field Testing

- Comparison of datasets revealed that data collected with mobile phones were more accurate, than paper-based due to strict data validation processes that were implemented.
- All data collected by mobile phones were readily available in electronic format and could be accessed for analysis once uploaded to the survey server. All paper surveys needed to be entered which increased entry mistakes and delayed availability of data.
- It took half a day to train enumerators to use the mobile phone system compare to 2 days for paper surveys.
- The cost of data gathering was minimal compared to paper based as there was no need to hire staff for data entry at the end of surveys.
- 90% of interviewees said using mobile phones for survey was quicker than traditional pen and paper; and 95% will be happy to be interviewed with mobile phones in the future.
- It took too much time trying to get the corrections made to the survey questions in the field onto the mobile phone system because the template on survey server was hard coded and lack dynamic functionality
  - Now fixed
- Prior to data collection, there was insufficient time allocated to testing and resolving upload and cell phone screen functionality problems.
- The Nokia N95 handsets have enough inbuilt memory to handle all data storage requirements for up to 500 surveys per handset, therefore all surveys that failed to be uploaded were securely saved automatically. However, there were embedded into the manufacture's secured components and need another piece of software to be written just to extract the data files.
  - Now fixed
- A number of challenges were encountered during field testing, relating to country's mobile network

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Smap Survey – Findings from Field Testing (Summary)

- Compared to Paper using mobile phone resulted in
  - More Accurate data
  - Faster to train enumerators
  - Faster data entry during interview
  - Substantially Lower Cost
- Problems
  - Network connectivity

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Project 2 - Smap Direct (Prototype)

- Allow an organisation to "direct" the creation of map data in real time

- For example in a disaster relief situation an organisation may plan to run an aid convoy into a remote area in 48 hours time
  - From community contributed data they know there is a road
  - Aerial photos may show problematic points on the road; subsidence, potentially damaged bridges, flooding
  - They need to determine the maximum tonnage that the road can support at each of these points
  - And they want this data to be available via routing software to other individuals or organisation
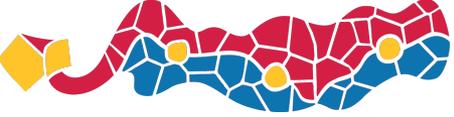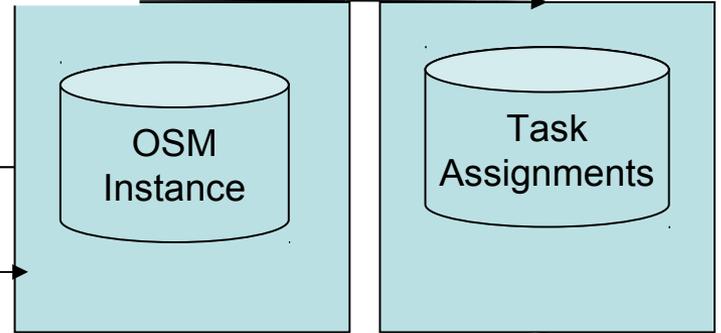
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(1) Upload Current Position and Status
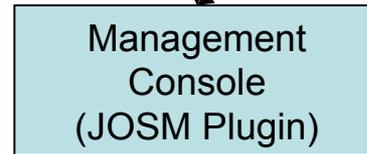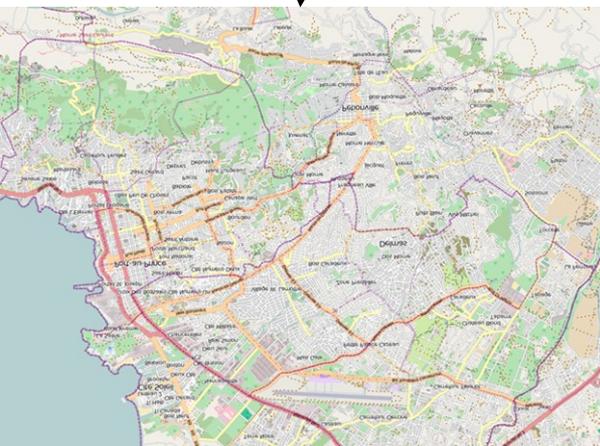(3) Download Assignments

(3) Download Tasks ———— OSM Instance   Task Assignments

Download Task

View Task List

(5) Upload Answers ————

Log out   Upload   About

(4) Complete Tasks

(6) Do Something With the Results!   (2) Create and Assign Tasks
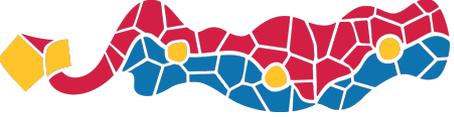
Osm2pgsql,Mapnik   Management Console (JOSM Plugin)   **Manager** Create Tasks / Monitor Progress
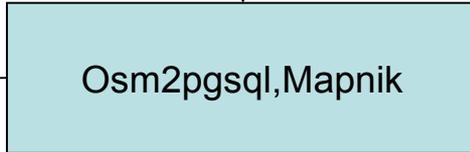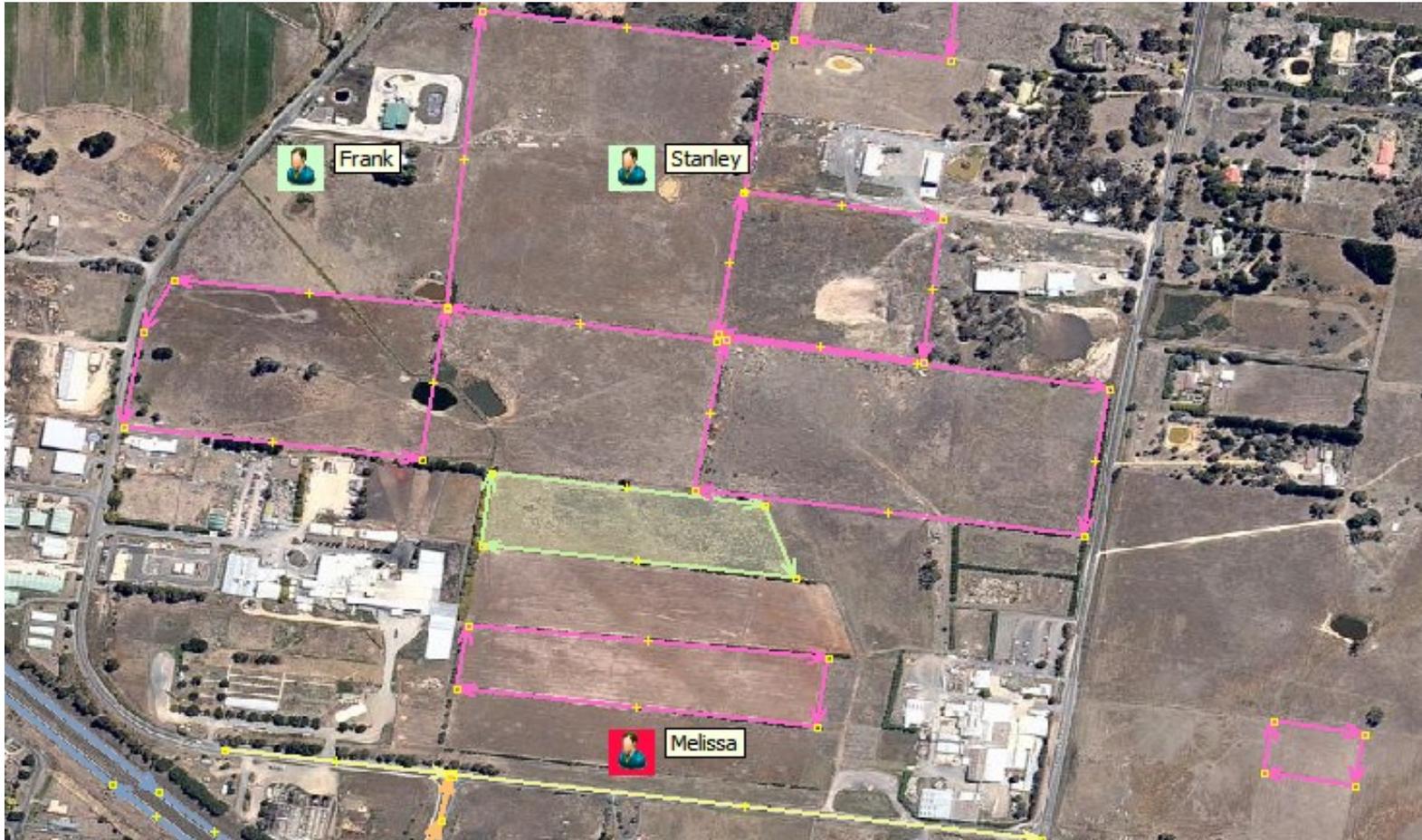
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Step 1 – Upload Current Position and Status

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Step 2 – Create and Assign Tasks

- The task is defined within the OSM database (What is to be done)
  - Create a relation of type "task"
  - Add tags containing the task instructions
    - q=<the question>
    - tag=<name of the tag to be updated>
    - answerType=<text|choice>
    - options=<list of valid answers>
  - Add members which are the elements you want the question answered for
- The management of that task, assignment, task priority etc is stored in a separate task management database (How the task is to be completed)
- Storing the task (Not actually map data) in the OSM database is potentially controversial
  - Contrasts with approach taken by Openstreetbugs
  - Was quick and easy approach
  - Keeps the task with the elements to be updated

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Create and Assign Tasks (Example)

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Step 3 – Download Tasks (Example)
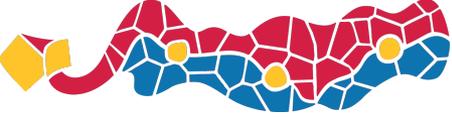
```
<taskAssignments>
<member id="21" taskId="1707" serverType="OSM" server="http://smap.org/api" />
</taskAssignments>
```

```
<relation id='1707' visible='true'>
    <tag k='type' v='task' />
    <tag k='q' v='What type of crop is growing in this field?' />
     <tag k='qType' v='choice' />
    <tag k='options' v='wheat:barley:rice' />
    <tag k='tag' v='crop' />
    <member type='way' ref='272' role='' />
 </relation>
```
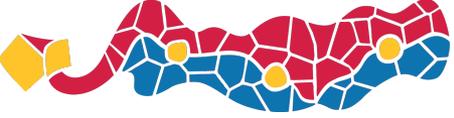
Steps 4 and 5 - Complete the Task and upload the answers

- Mobile phone user downloads the OSM relation that describes the task
- The application highlights elements (lines, points) that need to be updated with additional data
- The user travels to the location and answers the question
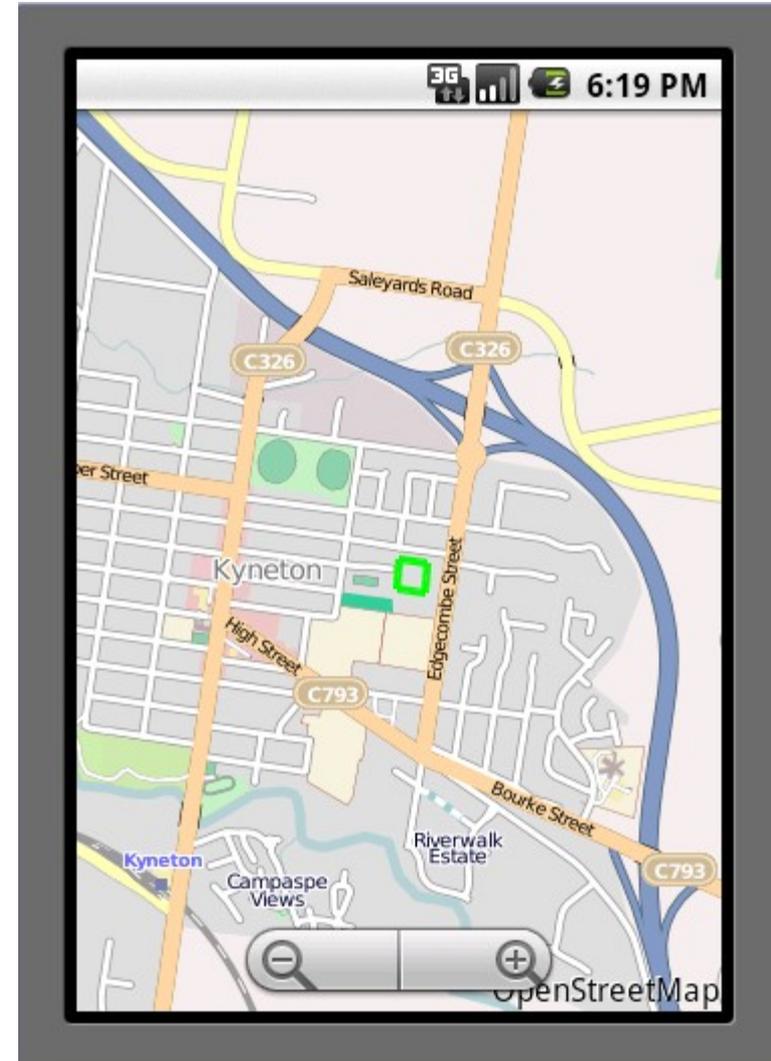
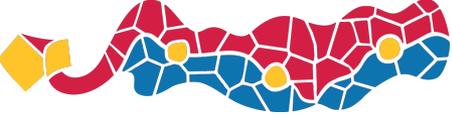
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6 – Do Something with the Results

Key
  Red - Rice
  Orange - Barley
  Yellow - Wheat

http://ec2-204-236-208-141.compute-1.amazonaws.com/deWebClient/myMaps.html

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Next Steps

- SmapSurvey
  - Provide an open source geo-spatial analysis capability for World Vision
  - Move from J2ME to Android
    - $600 per year to Verisign so the app doesn't ask for permission every time it reads from the sdcard.
    - Restricted set of Java Classes – its different
    - Likely to adopt ODK as the mobile platform
- Smap Direct
  - Attempt to deploy a production, or pilot, system
  - Create a Web Version of the Management Console
  - Additional Functionality
    - Rules Engine that can automatically request further information on elements based on previously updated data. This could allow for interactive Q&A with mobile phone user

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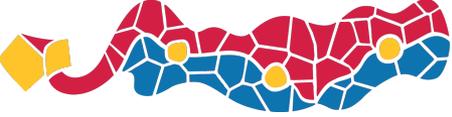
Questions

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- For more information please contact
  - Neil Penman (neilpenman@gmail.com)
  - Anueja Gopalakrishan (Anueja.Gopalakrishnan@worldvision.com.au)
  - Francois Tsafack (francois.tsafack@worldvision.com.au)

- Or go tto the web site: http://code.google.com/p/smap-suite/

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