Sahana GIS
Agenda

● Maps
● Layers
● Locations
● Technology Architecture
● Decision Tree for how to display data
● Future Plans
Maps

- **Main Map**
  - shows all Catalogue Layers
- **Map tab of Summary View**
  - shows a single resource with filters
- **Location Selector**
  - When creating/updating geolocated resources
  - e.g. cap/alert/x/area
- **Custom pages**
  - e.g. SAMBRO’s home page
    ```python
    map = gis.show_map()
    ```
Map Profiles

Core configuration is in the table: `gis_config`

- **URL**: `/eden/gis/config`
- **Default Location**
  - for Location Selector
- **Default Viewport**
  - Lat / Lon / Zoom
- **Projection**
  - normally Spherical Mercator
- **Bounds**
  - reduce chance for entering incorrect data e.g. mixed Lat/Lon
Map Profiles

Profiles can be created for different

- Events
- Locations
- Organisations (/ Branches)
- Teams
- Individuals

or saved for Sharing
Map Layers

URL: /eden/gis/catalog

- gis_layer_feature (Internal Sahana resources)
- gis_layer_bing
- gis_layer_google
- gis_layer_openstreetmap
- gis_layer_openweathermap
- gis_layer_tms
- gis_layer_wms
- gis_layer_wfs
- gis_layer_kml
- gis_layer_xyz
- gis_layer_geojson
Map Layers

gis_layer_config is used to show

- which Layers are available for a given map
- whether they are enabled
- what folder they should appear in

### Map Profile

<table>
<thead>
<tr>
<th>Name:</th>
<th>Default</th>
</tr>
</thead>
<tbody>
<tr>
<td>Context:</td>
<td>Default</td>
</tr>
</tbody>
</table>

#### Layers

<table>
<thead>
<tr>
<th>Layer</th>
<th>Available in Viewer?</th>
<th>On by default?</th>
<th>Folder</th>
<th>Default Base Layer?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Alerts (Feature Layer)</td>
<td>No</td>
<td>No</td>
<td>-</td>
<td>No</td>
</tr>
<tr>
<td>All Alerts (Feature Layer)</td>
<td>No</td>
<td>No</td>
<td>-</td>
<td>No</td>
</tr>
<tr>
<td>OpenStreetMap (Humanitarian) (OpenStreetMap Layer)</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
<td>No</td>
</tr>
</tbody>
</table>
Map Styles

gis_style is used to style vector layers.

URL: /eden/gis/style

Layers can be styled differently for different Maps (e.g. different Symbologies) or even for individual Features.

For Point layers, a style can simply be a Marker. Can also set options for Clustering & the format of the onHover Popup.

For Polygons or more complex Point requirements can define a style in JSON
Map Styles

JSON Style example (for cap_alert):

```json
[{
    "prop": "priority",
    "cat": "Urgent",
    "fill": "FF0000",
    "fillOpacity": 0.5
},
{
    "prop": "priority",
    "cat": "High",
    "fill": "FFA500",
    "fillOpacity": 0.5
},
{
    "prop": "priority",
    "cat": "Low",
    "fill": "FFFF00",
    "fillOpacity": 0.5
},
{
    "prop": "priority",
    "cat": "-",
    "fill": "000000",
    "fillOpacity": 0.5
}]

"-" = "Unknown"
Locations

- Spatial data for internal resources (‘Feature Layers’) are held in the table: `gis_location`
- URL: `/eden/gis/location`
- Name, Address, Postcode
- Admin Hierarchy
  - L0: Country
  - L1: State / Province
  - L2: County / District
  - L3: City / Town / Village
  - L4: Village / Suburb
- Points: Latitude / Longitude
- Polygons: WKT (Well-Known Text)
- Start Date, End Date
Location Hierarchy

- Stored in table: **gis_hierarchy**
- URL: /**eden/gis/hierarchy**
- Which Levels are used & their Labels
  - L0: Country
  - L1: State / Province
  - L2: County / District
  - L3: City / Town / Village
  - L4: Village / Suburb

- If a location is recorded as being within a certain Lx and we have the geodata for that Lx, then this will be used for mapping the feature
Technology Architecture

- **OpenLayers** client
  - with GeoExt/GXP UI elements
- **Sahana** server
  - serve Internal Features via GeoJSON
- **GeoServer** co-app
  - serve raster data as WMS
- **MapProxy** co-app
  - reproject remote WMS data & cache tiles
Sahana
GeoServer
MapProxy

GeoTIFF

WMS (WGS84)

WMS (900913)

GeoJSON

OpenLayers client

WMS Server

WMS

WMS
Desktop Tools: QGIS, GDAL

Windows Installer for free/open GIS software:

- [http://trac.osgeo.org/osgeo4w/](http://trac.osgeo.org/osgeo4w/)

Advanced Install

<table>
<thead>
<tr>
<th>Package</th>
<th>Size (b)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>gsbabel</td>
<td>589k</td>
<td>QGIS Desktop GUI Frontend</td>
</tr>
<tr>
<td>grass</td>
<td>32,023k</td>
<td>GRASS GIS - stable release</td>
</tr>
<tr>
<td>osg-bin</td>
<td>160k</td>
<td>OpenSceneGraph (executables)</td>
</tr>
<tr>
<td>osgearth-bin</td>
<td>718k</td>
<td>OSG Earth (executables)</td>
</tr>
<tr>
<td>qgis</td>
<td>19,824k</td>
<td>QGIS Desktop</td>
</tr>
<tr>
<td>qgis-dev</td>
<td>34,346k</td>
<td>QGIS nightly build of the master</td>
</tr>
<tr>
<td>qgis-full</td>
<td>1k</td>
<td>QGIS Full Desktop (meta package for express install)</td>
</tr>
<tr>
<td>saga</td>
<td>8,168k</td>
<td>SAGA System for Automated Geographical Analyses</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Package</th>
<th>Size (b)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>curl</td>
<td>358k</td>
<td>The CURL HTTP/FTP library and commandline utility</td>
</tr>
<tr>
<td>expat</td>
<td>77k</td>
<td>The Expat XML Parser library</td>
</tr>
<tr>
<td>fcgi</td>
<td>38k</td>
<td>The FastCGI Library</td>
</tr>
<tr>
<td>fftw</td>
<td>680k</td>
<td>The Fast Fourier transformation library (Development)</td>
</tr>
<tr>
<td>freetype-devel</td>
<td>723k</td>
<td>FreeType library (MinGW built)</td>
</tr>
<tr>
<td>freexl</td>
<td>28k</td>
<td>The FreeXL library for accessing Excel (.xls) spreadsheet.</td>
</tr>
<tr>
<td>gdal</td>
<td>5,634k</td>
<td>The GDAL/OGR library and commandline tools</td>
</tr>
<tr>
<td>gdal-autotest</td>
<td>3,684k</td>
<td>The GDAL/OGR AutoTest suite</td>
</tr>
<tr>
<td>gdal-ecw</td>
<td>2,756k</td>
<td>ECW Raster Plugin for GDAL</td>
</tr>
<tr>
<td>gdal-filegdb</td>
<td>1,293k</td>
<td>OGR FileGDB Driver</td>
</tr>
</tbody>
</table>
Decision Tree: Raster

Hosted Externally?
- WMS
- TMS / XYZ tiles

Need to host internally?
- GeoTIFF on GeoServer -> WMS
  in future maybe vectorise & display internally
Decision Tree: Vector

Hosted Externally?

- WFS, KML, GeoRSS, or GeoJSON

Need to host internally?

- gis_layer_feature
  - Data that we manage internally: Offices / Staff / Volunteers / Projects

- gis_layer_theme
  - Statistics data linked to Lx Locations

- gis_layer_shapefile
  - Shapefile linked to random points/polygons
Location Hierarchy

For some countries, we already have data available in the correct format:


If not, can download Shapefiles from COD or GADM:

- [http://cod.humanitarianresponse.info](http://cod.humanitarianresponse.info)
- [http://gadm.org](http://gadm.org)

Convert Shapefiles to CSV using GDAL:

```
ogr2ogr -f CSV CSV filename.shp -lco GEOMETRY=AS_WKT
```
Location Hierarchy

Convert CSV file column headings:

**SY_L0.csv**

- L0, ISO2, L0 KV: ISO3, WKT
- Syrian Arab Republic, SY, SYR, "MULTIPOLOYGON(...)"

**SY_L1.csv**

- L0, L1, "L1 L10n:ar", "L1 KV: PCode", WKT
- SY, Idlib, إدلب, SY07, "MULTIPOLOYGON(...)"
Location Hierarchy

Import into Sahana:

/eden/gis/location/import
Census Data

COD has a little:
e.g. Unemployed

syr_pop_2011.xls

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Damascus</td>
<td>54,026</td>
<td>58,842</td>
<td>Damascus Rural</td>
<td>48,246</td>
<td>67,239</td>
</tr>
<tr>
<td>Aleppo</td>
<td>53,538</td>
<td>92,876</td>
<td>Homs</td>
<td>34,408</td>
<td>84,392</td>
</tr>
<tr>
<td>Damascus Rural</td>
<td>48,246</td>
<td>67,239</td>
<td>Hama</td>
<td>27,086</td>
<td>47,537</td>
</tr>
<tr>
<td>Lattakia</td>
<td>54,560</td>
<td>69,699</td>
<td>Idleb</td>
<td>23,801</td>
<td>57,900</td>
</tr>
<tr>
<td>Al-Hasakeh</td>
<td>53,633</td>
<td>170,135</td>
<td>Deir-ez-Zor</td>
<td>33,947</td>
<td>63,095</td>
</tr>
<tr>
<td>Tartous</td>
<td>40,722</td>
<td>49,621</td>
<td>AL- Rafka</td>
<td>14,546</td>
<td>45,611</td>
</tr>
<tr>
<td>AL- Sweida</td>
<td>13,871</td>
<td>25,904</td>
<td>Dar'a</td>
<td>19,864</td>
<td>29,813</td>
</tr>
<tr>
<td>Quneitra</td>
<td>4,096</td>
<td>36,20</td>
<td>Total</td>
<td>476,343</td>
<td>866,285</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Count</th>
<th>%</th>
<th>Count</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>476343</td>
<td>8.6</td>
<td>866285</td>
<td>14.9</td>
</tr>
</tbody>
</table>
Census Data

Convert to CSV file:
layer_theme.csv
Name,Description,Date,Style,Folder,Config,Enabled,Visible
Unemployed,Syria % Unemployed 2011,2011,,Demographics,,True,

theme_data.csv*
Layer,Country,L1,L2,L3,L4,L5,Value
Unemployed,SY,Damascus,,,,,11.2
Unemployed,SY,Aleppo,,,,,7.6

* ensure Location Names match (or else deduplicate later!)
Census Data

Import into Sahana:
/eden/gis/layer_theme
Census Data: Style

http://colorbrewer2.org
Census Data: Style

Generate a style with 5 quantiles and a sequential theme:

```
/eden/gis/layer_theme/1/style

[{
  'low': 0, 'high': 11.2, 'fill': '98E600'},
  {'low': 11.2, 'high': 15.6, 'fill': 'FFFF00'},
  {'low': 15.6, 'high': 17.8, 'fill': 'FFAA00'},
  {'low': 17.8, 'high': 22.15, 'fill': 'FF5500'},
  {'low': 22.15, 'high': 100, 'fill': 'FF0000'}
]```
Census Data: WMS

If you have a lot of detailed data then it is better to serve from GeoServer as WMS as client responsiveness is bad for many, complex vectors.
Census Data: WMS

Load Shapefile data into PostGIS database:

su postgres

cd /data/SY

shp2pgsql -s 4326 -I Census.shp public.Census | psql -d gis

Server SSH access required!
Census Data: WMS

Add Layer to GeoServer:
http://sambro.geoinfo.ait.ac.th:8080/geoserver
l: admin, p: geoserver

New Layer

Add a new layer

Add layer from ifrc:gis

You can create a new feature type by manually configuring the attribute names and types. Create new feature type...
On databases you can also create a new feature type by configuring a native SQL statement. Configure new SQL view...
Here is a list of resources contained in the store 'gis'. Click on the layer you wish to configure

<table>
<thead>
<tr>
<th>Published</th>
<th>Layer name</th>
<th>action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sucos_unsafe_water_sources</td>
<td>Publish again</td>
</tr>
<tr>
<td></td>
<td>tis_dist_adm1_py</td>
<td>Publish again</td>
</tr>
<tr>
<td></td>
<td>census</td>
<td>Publish</td>
</tr>
</tbody>
</table>
Census Data: WMS

Set Bounding Box:

<table>
<thead>
<tr>
<th>Bounding Boxes</th>
<th>Min X</th>
<th>Min Y</th>
<th>Max X</th>
<th>Max Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Bounding Box</td>
<td>35.613939285000</td>
<td>32.31644249</td>
<td>42.385042191000</td>
<td>37.31913948</td>
</tr>
<tr>
<td>Lat/Lon Bounding Box</td>
<td>35.613939285000</td>
<td>32.31644249</td>
<td>42.385042191000</td>
<td>37.31913948</td>
</tr>
</tbody>
</table>

Compute from data

Compute from native bounds
Census Data: WMS

Add Style:
- Copy from Existing
- Import SLD
- Validate

New style

Type a new SLD definition, or use an existing one as a template, or upload a ready made style from your file system. Once the style is a valid SLD document:

Name:
Unemployment

Copy from existing style
Sucos_unsafe_water_simple

SLD file:
Choose File
No file chosen
Upload...
Census Data: WMS

Apply Style:

- Legend Image used by Sahana
- Can have same data with multiple styles
Census Data: WMS

Add Layer to Sahana:

/eden/gis/layer_wms

- Transparent Overlay => PNG
  - Opacity setting
- Base layer better as JPEG
- Can select alternate Style
- Can select (Sub-)Folder: Syria/Census
- Can restrict to a specific Role
Future Plans

- Styler User Interface
- Filters on Main Map
- Tighter integration with GeoServer
  - upload shapefile to Sahana & configure both it & GeoServer through the same interface
- Time slider
- Heat Maps
- Routing
- ...?