A PYTHON QGIS PLUGIN
FOR TWITTER ANALYSIS DURING EMERGENCIES

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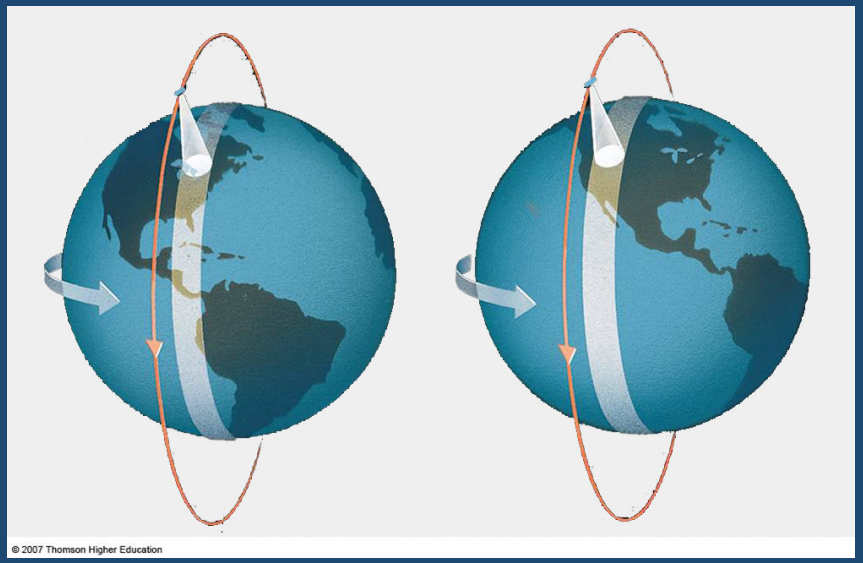
What problem were we trying to solve?

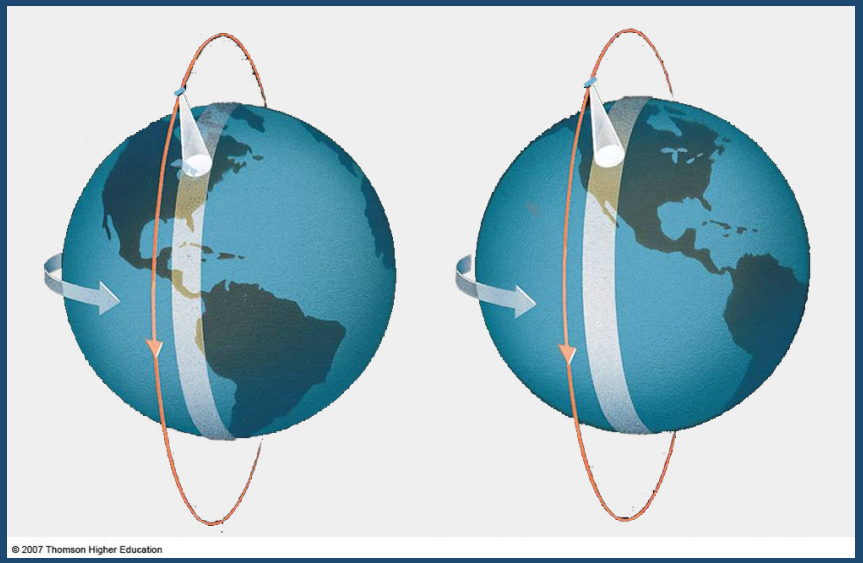
First, let’s establish some context.

Natural and man-made disasters create emergency response and damage assessment needs.



Remote sensing addresses many of these emergency response and damage assessment needs.

Unfortunately satellites are not always overhead, and planes and helicopters have limited flight times.



This means that a lot of ground truth is missed.

We are exploring augmenting remotely sensed data with Volunteered Geographic Information (VGI).

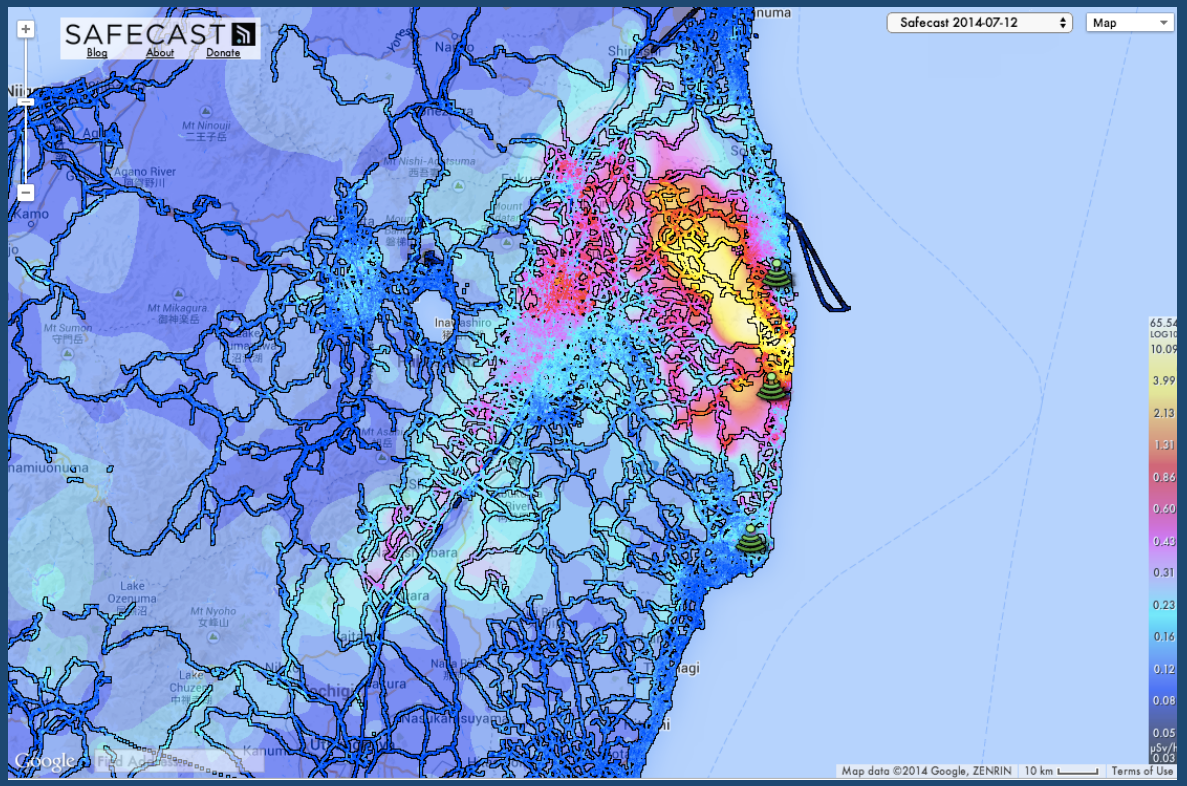
“People as Sensors” –

‘Citizens as Sensors’ Goodchilde (2007)

Georeferenced tweets can provide situational awareness.

Other social media can also be used, such as Instagram, Google Plus, or Facebook.

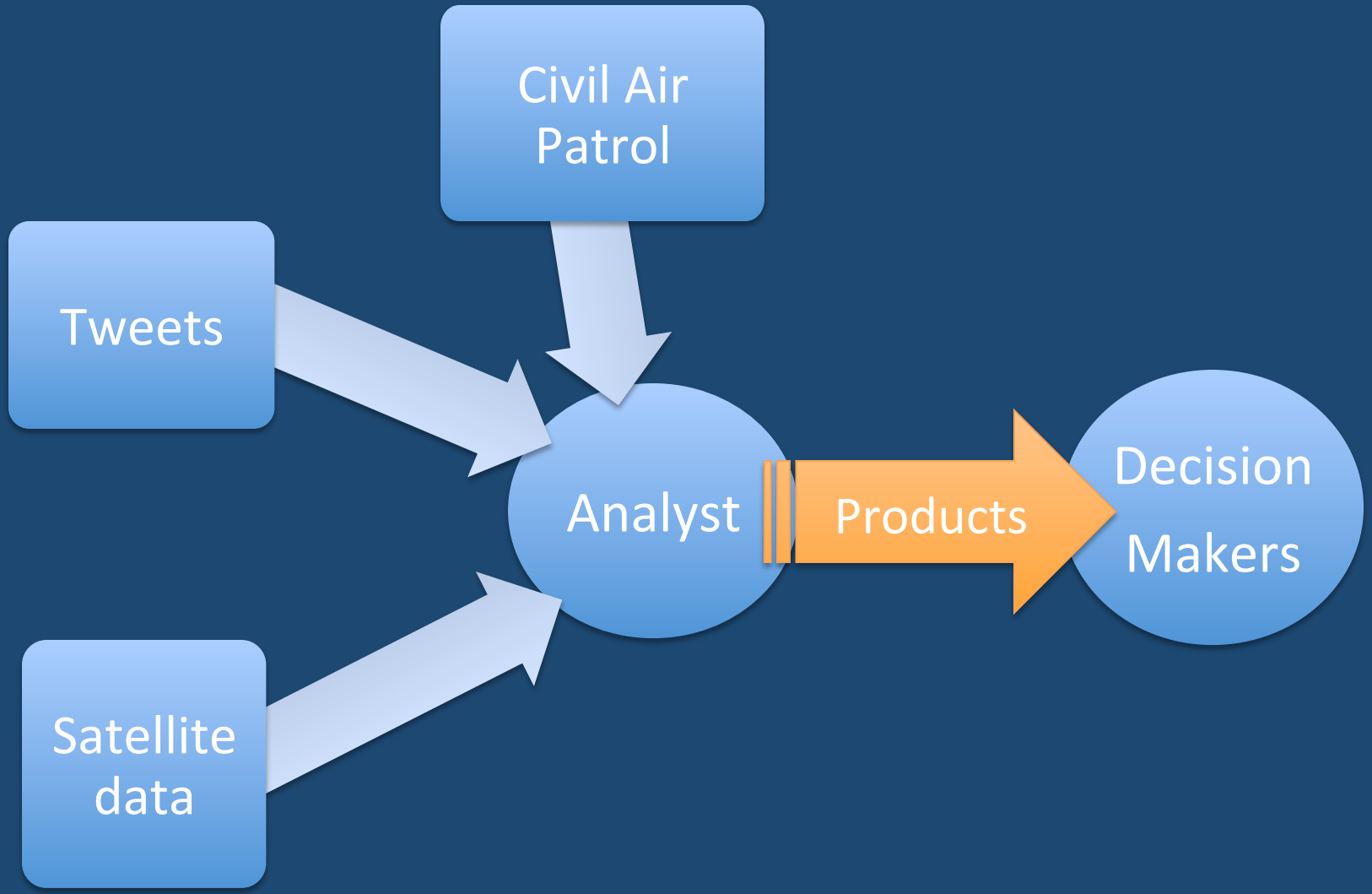
Safecast is an example of citizens explicitly sharing radiation and pollution observations.



(Image from www.safecast.org)

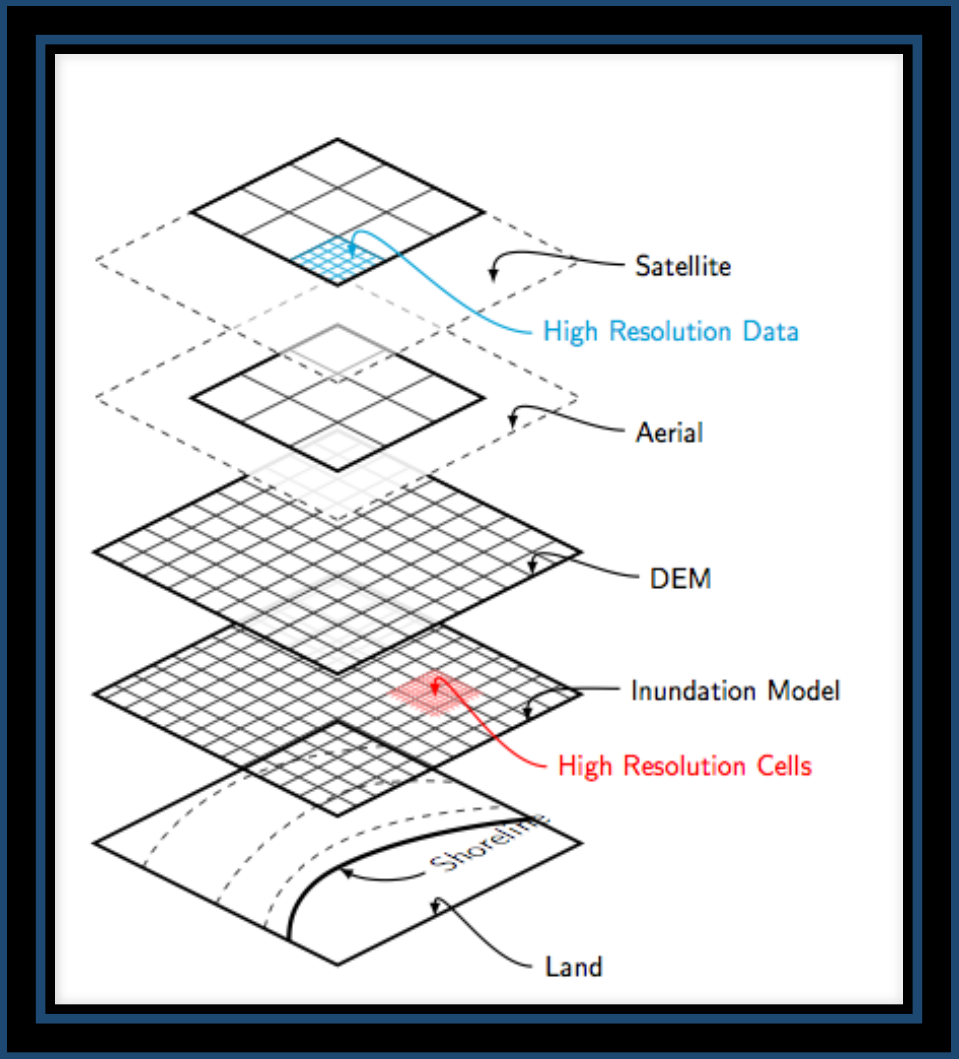
So how to best use VGI?

Let's look at might be a work flow for a typical analyst.


Civil Air Patrol
Tweets
Analyst
Products
Decision Makers
Satellite data

These products will typically include maps.

Naturally the analyst will use a Geographic Information System (GIS) to create these maps, among other products.

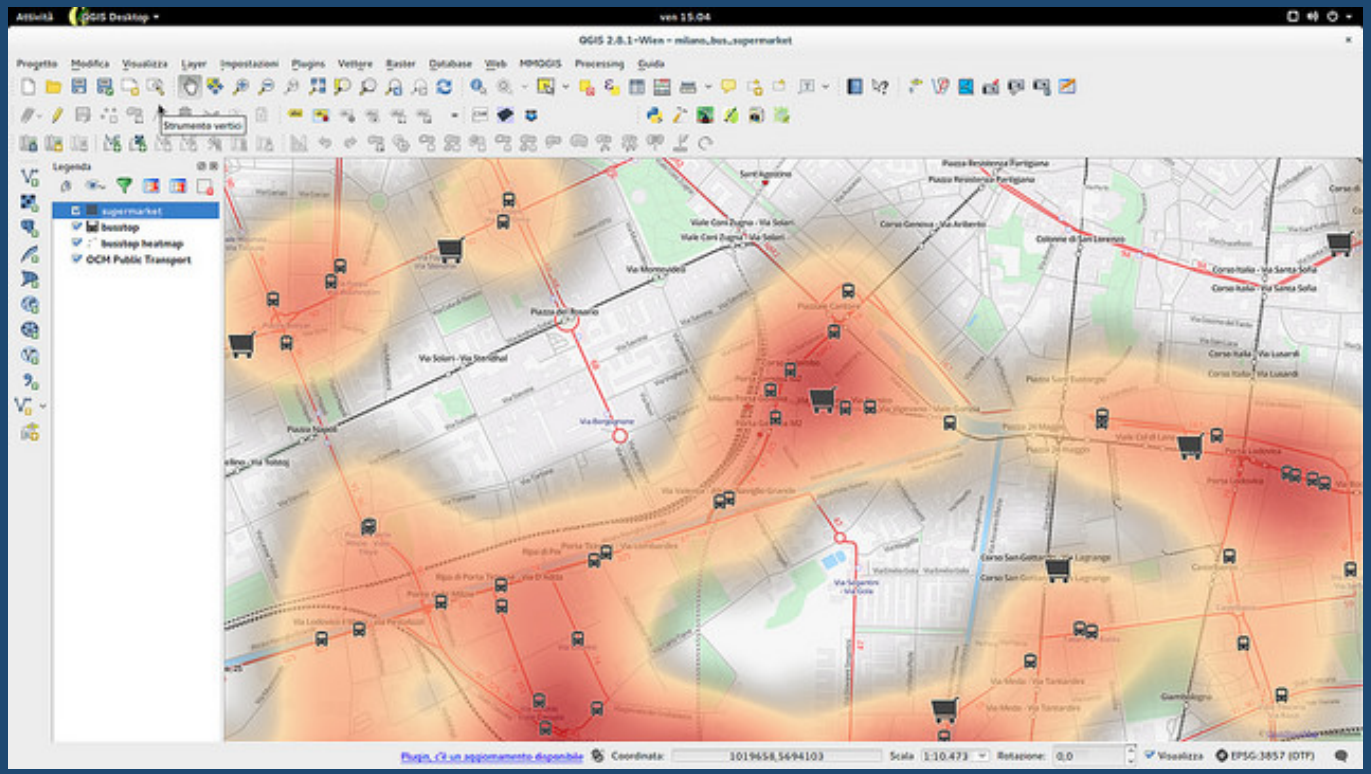


Bringing in remotely sensed data into a GIS is easy, but VGI may not be so convenient.

Developed a proof of concept system that would make it more convenient to read tweets.

We chose to use QuantumGIS as our prototype platform.

QuantumGIS is a free, open-source geographic information system.



QuantumGIS (qgis) is:

- Open source, free
- Was started in 2002
- Version 1.0 was released in 2007
- Current version (as of 3/25/2015) is 2.8.1
- Runs on Windows, Macs, *nix, and even Android tablets

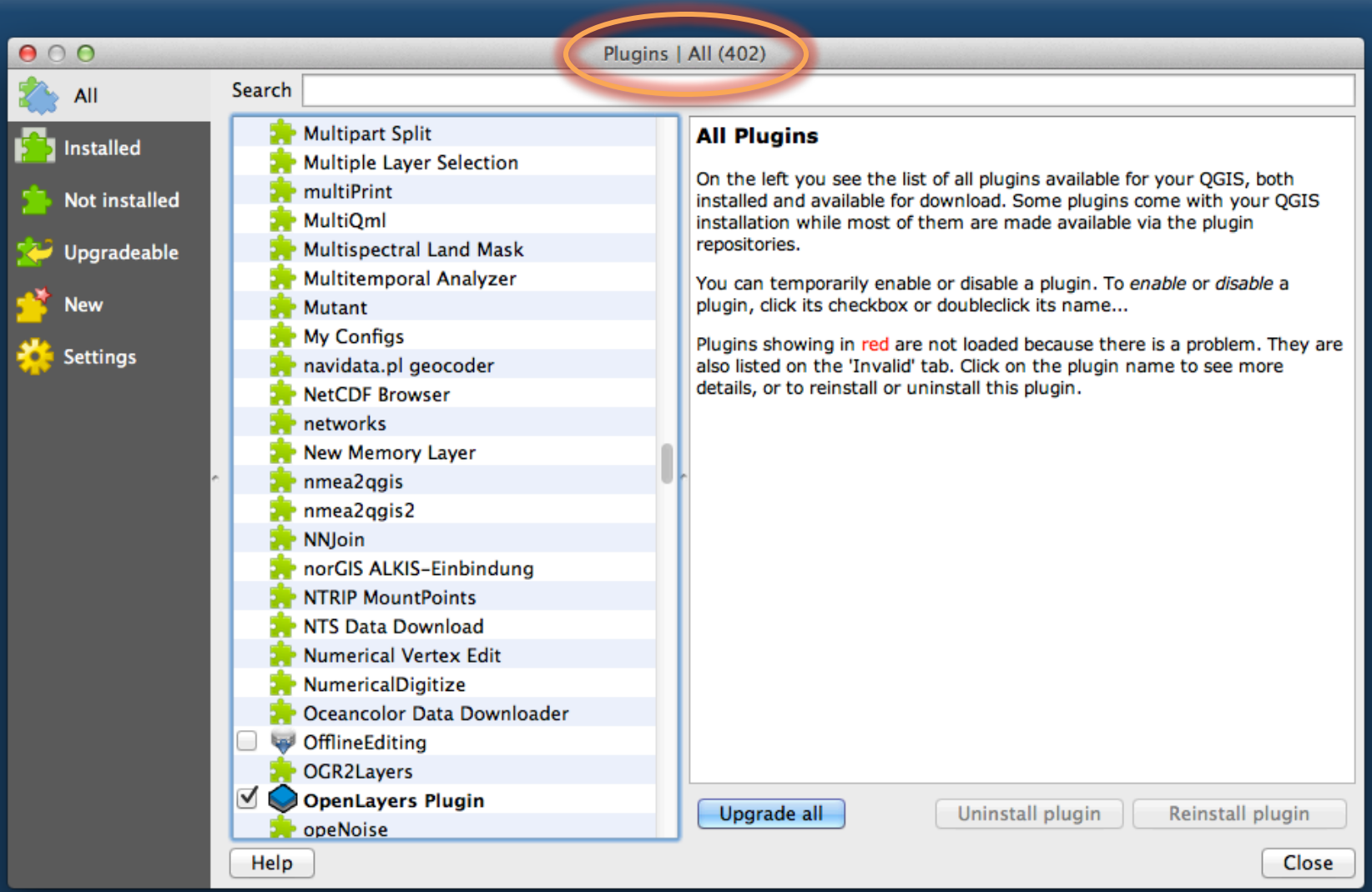
http://www.qgis.org/en/site/

qgis also supports python (2.7.4).

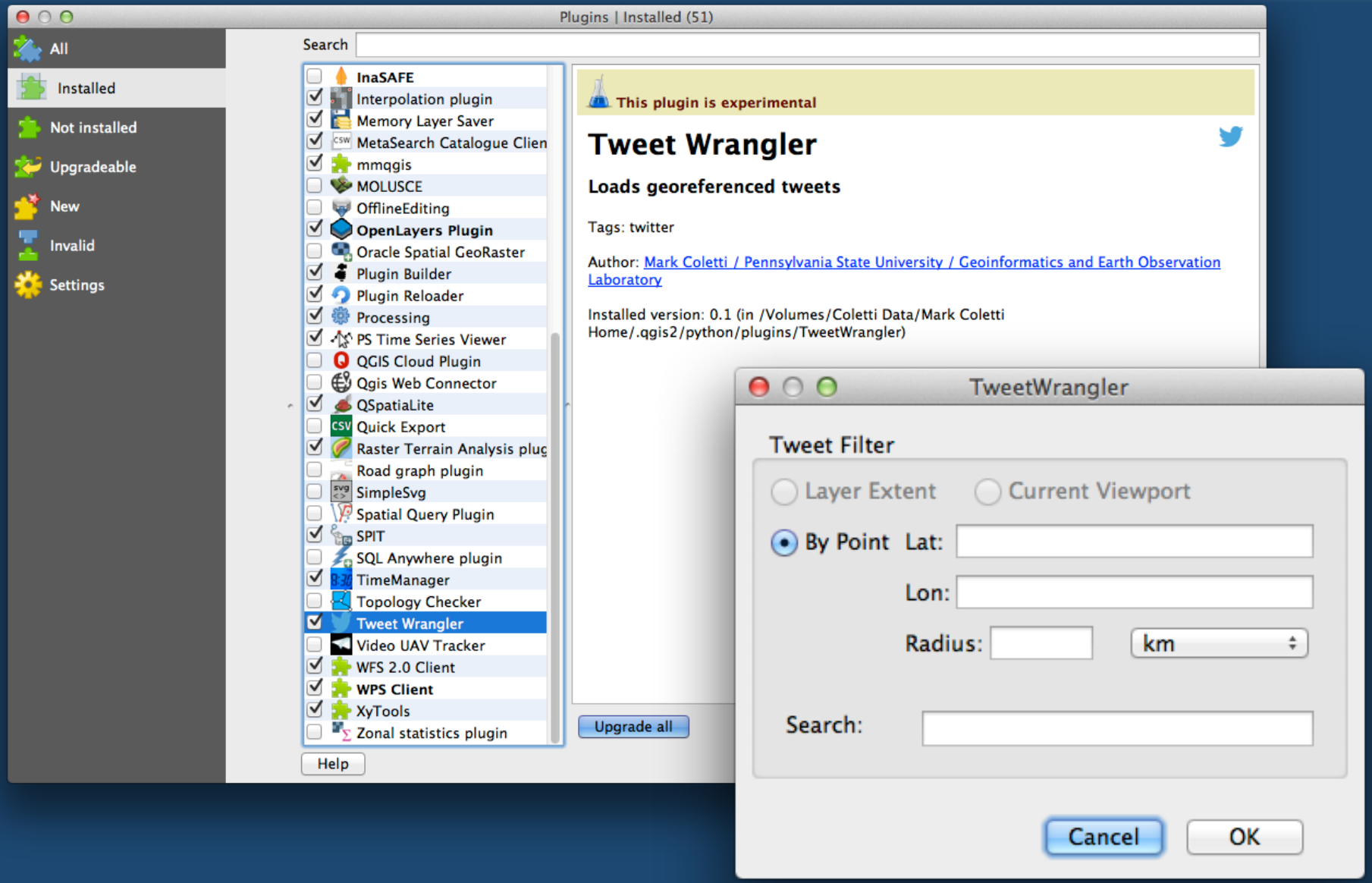
It has a built-in python console so that users can interact programmatically with qgis.

However, it supports user-added plugins written in C++ or python.

Most qgis plugins are in python.


Plugins | All (402)
All
Installed
Not installed
Upgradeable
New
Settings
Search
Multipart Split
Multiple Layer Selection
multiPrint
MultiQml
Multispectral Land Mask
Multitemporal Analyzer
Mutant
My Configs
navidata.pl geocoder
NetCDF Browser
networks
New Memory Layer
nmea2qgis
nmea2qgis2
NNJoin
norGIS ALKIS-Einbindung
NTRIP MountPoints
NTS Data Download
Numerical Vertex Edit
NumericalDigitize
Oceancolor Data Downloader
OfflineEditing
OGR2Layers
OpenLayers Plugin
opeNoise
All Plugins
On the left you see the list of all plugins available for your QGIS, both installed and available for download. Some plugins come with your QGIS installation while most of them are made available via the plugin repositories.
You can temporarily enable or disable a plugin. To enable or disable a plugin, click its checkbox or doubleclick its name...
Plugins showing in red are not loaded because there is a problem. They are also listed on the 'Invalid' tab. Click on the plugin name to see more details, or to reinstall or uninstall this plugin.
Upgrade all
Uninstall plugin
Reinstall plugin
Help
Close

So let’s talk about the plugin we developed, TweetWrangler.


Plugins | Installed (51)
All
Installed
Not installed
Upgradeable
New
Invalid
Settings
Search
InaSAFE
Interpolation plugin
Memory Layer Saver
MetaSearch Catalogue Clien
mmqgis
MOLUSCE
OfflineEditing
OpenLayers Plugin
Oracle Spatial GeoRaster
Plugin Builder
Plugin Reloader
Processing
PS Time Series Viewer
QGIS Cloud Plugin
Qgis Web Connector
QSpatiaLite
Quick Export
Raster Terrain Analysis plug
Road graph plugin
SimpleSvg
Spatial Query Plugin
SPIT
SQL Anywhere plugin
TimeManager
Topology Checker
Tweet Wrangler
Video UAV Tracker
WFS 2.0 Client
WPS Client
XyTools
Zonal statistics plugin
Help
This plugin is experimental
Tweet Wrangler
Loads georeferenced tweets
Tags: twitter
Author: Mark Coletti / Pennsylvania State University / Geoinformatics and Earth Observation Laboratory
Installed version: 0.1 (in /Volumes/Coletti Data/Mark Coletti Home/.qgis2/python/plugins/TweetWrangler)
Upgrade all
TweetWrangler
Tweet Filter
Layer Extent
Current Viewport
By Point
Lat:
Lon:
Radius:
km
Search:
Cancel
OK

Screen Name	Tweet	Tweeted At
lameyhopf	arts fest preparations @ State College Municipal Building http://t.co/26HBFDQGeG	2014-07-08 18:48:06
gpioppi	Currently in charge of 10 14 year olds..... What is my life	2014-07-08 18:45:33
__shoes	@analisa_seader HAHAHAHAH	2014-07-08 18:42:37
Kristinaa_Bee	I'd rather get shot in the leg but thanks coach http://t.co/AKfZcWi0t0	2014-07-08 18:40:46
mackslenoo	@azs5238 http://t.co/UECOzgU9KI	2014-07-08 18:40:23
BEChorner	@kaylav__	2014-07-08 18:35:34

Let’s dive into some of the details of what makes up a qgis plugin.

Qgis plugins live here:

$HOME/.qgis2/python/plugins/

This directory contains directories for each plugin:

- python code for the plugin
- resource files for the toolbar icon
- a Qt user interface description file

Generally a plugin has the following parts:

- `__init__.py`, invoked at qgis start up to initialize plugin
- a main class that initializes the dialog, and has a `run()` method to invoke it when the user selects the plugin
- a dialog class that inherits from `QtGui.QDialog` and a Qt class generated from the UI file

Qt is a C++ cross-platform development toolkit

This is what enables qgis to run on Windows, *nix, and MacOS.

It uses an easy to learn "slot and signal" system to connect UI events to class methods.

Qt provides "QtDesigner" to allow for visual building of GUIs.

http://www.qt.io/developers/

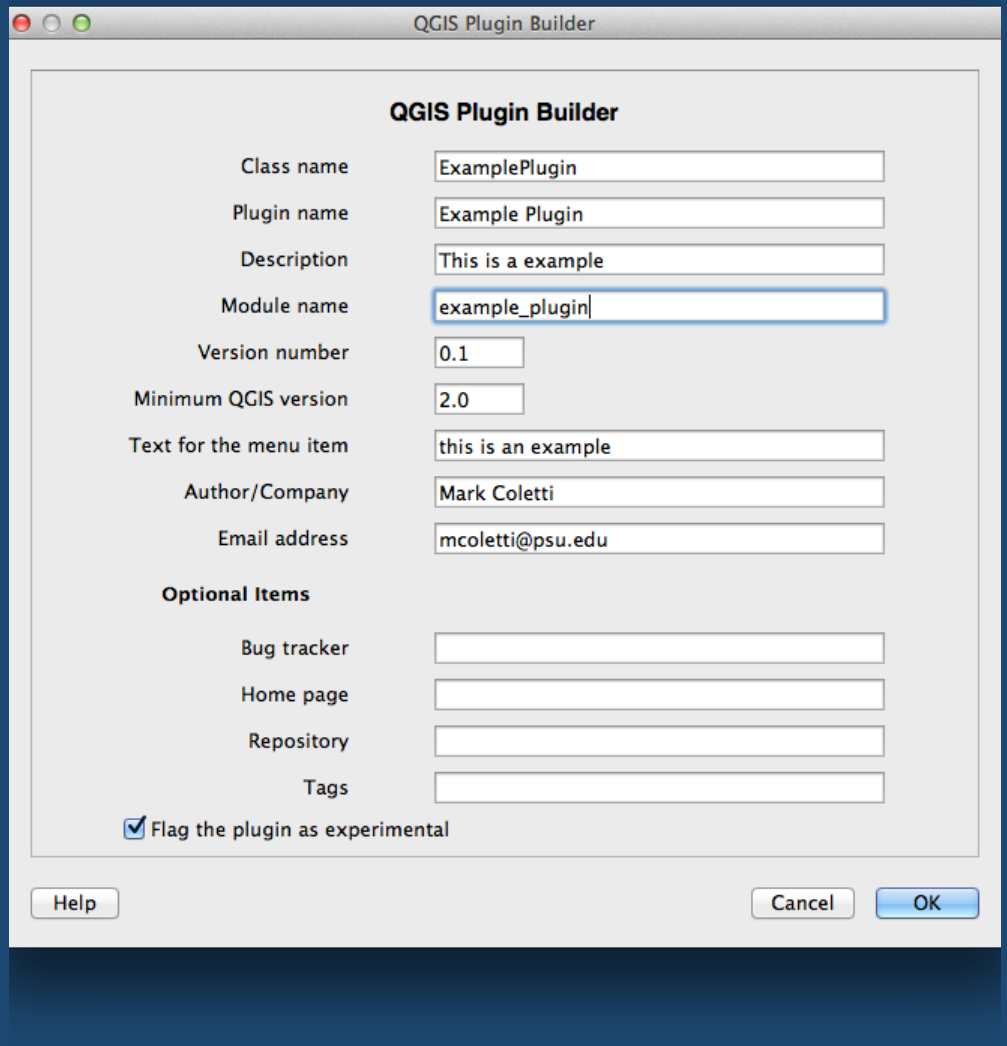
PyQt provides python bindings to Qt.

The python plugins use PyQt to create and interact with their dialogs.

http://www.riverbankcomputing.co.uk/software/pyqt/intro

If this sounds a little complicated, qgis comes with a “meta-plugin,” PluginBuilder.

PluginBuilder creates and populates a directory with all the files necessary to start plugin development.



That covers general plugin development.

Let's talk about some of the details behind the twitter plugin, as well as a couple other similar plugins.

TweetWrangler is written using twython.

(https://twython.readthedocs.org/en/latest/)

Uses Twitter REST API and Outh 2 authentication.

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At qgis startup:

1. `__init__.py` is invoked with connection to internal qgis interface
2. Creates `TweetWrangler` object passing along internal interface
3. `TweetWrangler` establishes connection via Twython to Twitter
4. creates, but does not show, the dialog
5. initializes other internal state

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When plugin is invoked from qgis:

1. `TweetWrangler.run()` invoked
2. shows the dialog
3. user enters search criteria into dialog
4. when the dialog is closed, return value is checked to see if user selected “Ok” or “Cancel”
5. if former gets search information from dialog
6. uses twitter connection to get tweets
7. adds points to “tweets” layer corresponding to new tweets

We also developed a qgis plugin that uses the Arizona State University's TweetTracker.

This uses the Twitter Streaming API.

A user can create a TweetTracker account to begin saving a stream that matches search criteria.

The qgis plugin uses the TweetTracker API to gather these tweets.

http://tweettracker.fulton.asu.edu/

Safecast also provides an API, and we similarly developed a plugin that will read those observations.

https://api.safecast.org/

We feel that our plugins show that the proof of concept has merit:

Developing plugins is a viable approach for getting certain types of VGI to to analysts.

First stop for qgis plugin development:

https://plugins.qgis.org/

The qgis plugin developer's cookbook:

http://docs.qgis.org/testing/en/docs/pyqgis_developer_cookbook/

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