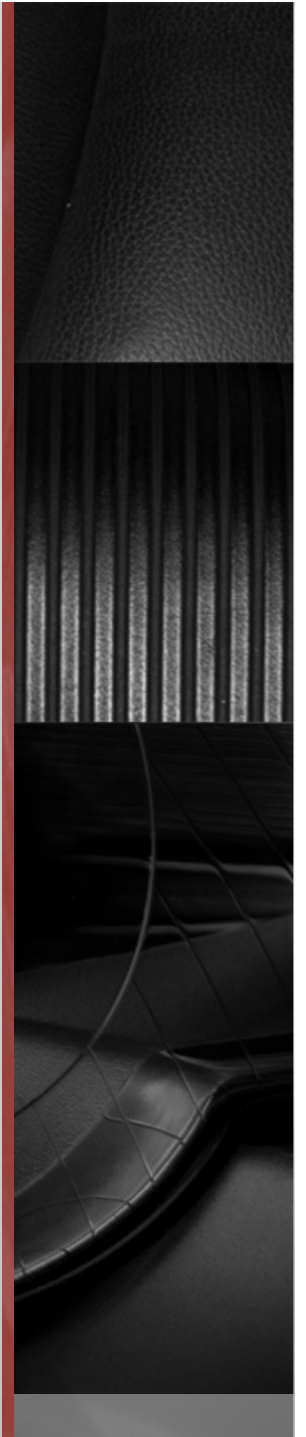# An Australian Placename Gazette

Augmenting the Flynn-Engdahl gazette in Antelope

The problem

- GA's Earthquake Hazard web page. Place names were being manually entered. How can we make it easier to generate accurate place names?

The problem

- Alert emails – not exactly useful information for emergency services.

4.8 ml - NORTHERN TERRITORY, AUSTRALIA D = 24 km, 18th Apr 2013 09:20:47, 14.988S, 135.504E

eqdetector@bom.gov.au
Sent: Thu 18/04/2013 7:30 PM
To: eqalarm

Unreviewed Automated Earthquake Report

Geoscience Australia has detected an earthquake at:
NORTHERN TERRITORY, AUSTRALIA, AUSTRALIA

Magnitude: 4.8 ml, 4 associated stations
Universal Time: 18th Apr 2013 09:20:47
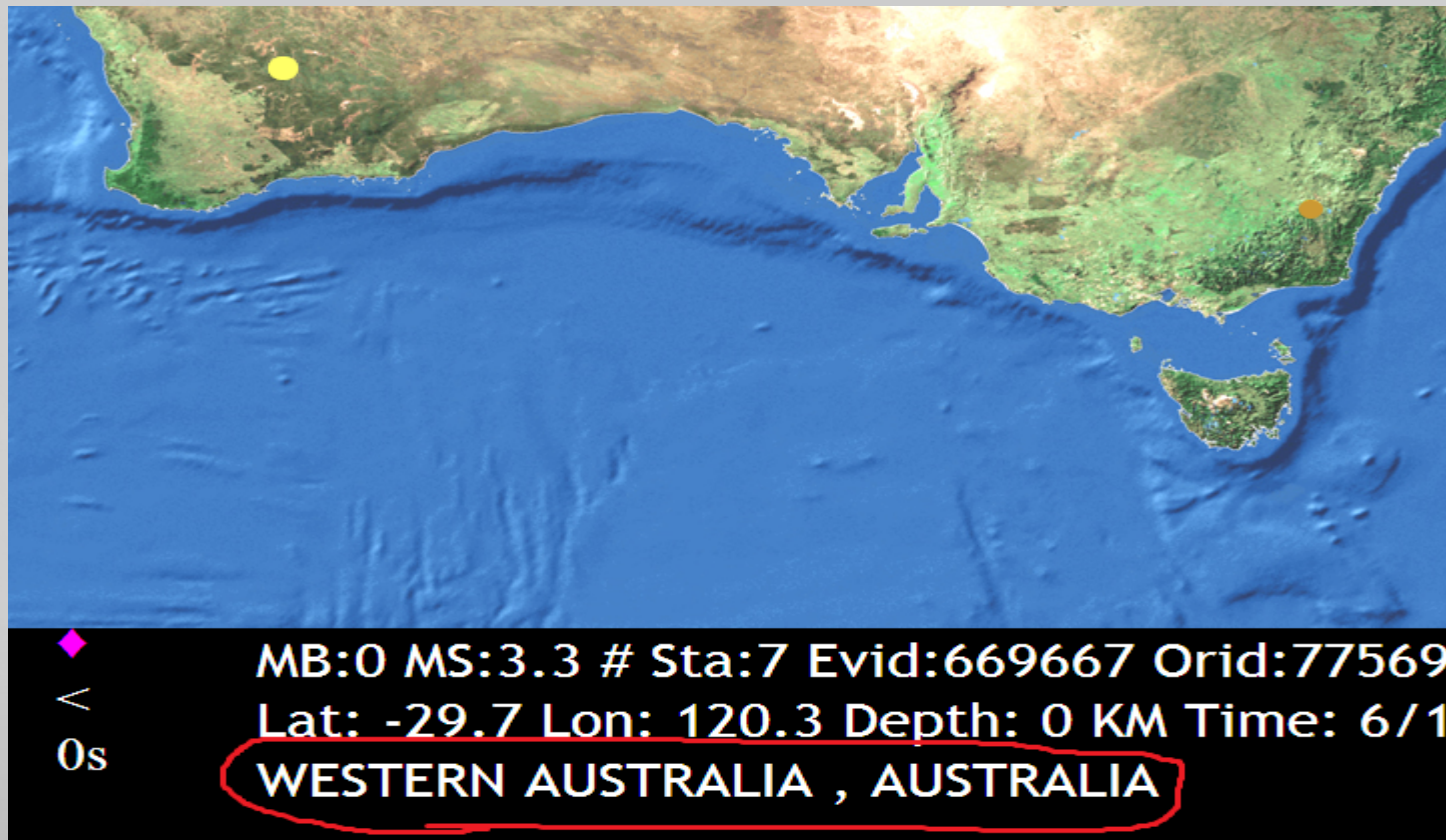Latitude, Longitude: 14.988S, 135.504E - Google Map
Depth: 24 km
Event ID: BOM443463

This earthquake is currently being reviewed and a Preliminary Earthquake Alert/Notification may follow.

The problem

- Heads up display – again not very useful.

The problem

- It was annoying people, including the CEO!

- Never a good idea to be annoying the CEO.

- So there was considerable pressure to fix the problem.

Early thoughts

- One of our watchstanders has experience with GIS and ArcGIS, why not get him to develop a new database of place/region names for Australia.

- How broad should the Gazette be? Do we want to replace the Flynn-Engdahl Gazette completely? Or continue to rely on it for locations outside of Australia?

- How do we integrate it with Antelope? Do we use the existing F-E database format? If not, how do we tell Antelope to read any other format?

- How can we improve the place descriptions in general? What about generating a distance string from a reference place in a region?

- How do we test and review the new Gazette to make sure it produces sensible and correct placename strings?

Developing the Gazette in ArcGIS
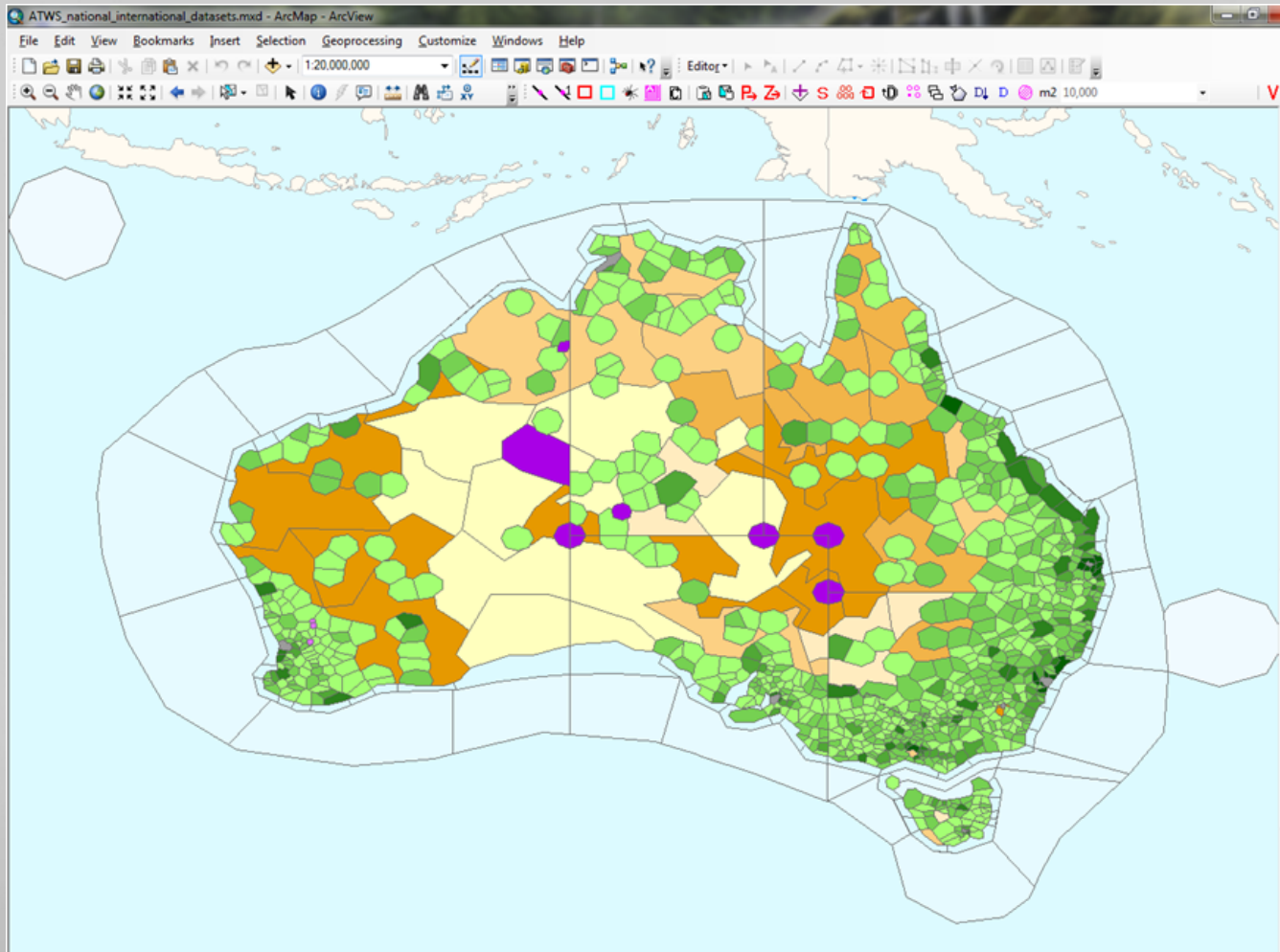
Developing the Gazette in ArcGIS

- Rather than basing the Gazette around closeness to points, we chose to develop explicit polygons instead.

- There are several polygon "types" which affect how the placenames are generated, e.g. Offshore, Oceanic, Town, Regional, Desert.

- Most polygons have an associated "parent", which is a significant town or place that can be used as a reference point for a distance string.

- Each polygon also has a Name, Region and State.

- Dan, who developed the Gazette in ArcGIS, also defined a series of rules to generate the strings based on the polygon type.

- We decided to produce both long and short strings to meet various needs.

Early integration with Antelope

- ArcGIS exported the Gazette as two CSV's

  - Vertices, which contained a in-order list of all the points of each polygon as lat/lons.

  - Centrepoints, which contained the detailed information about each polygon.

  - About 12,000 lines in vertices, and 1000 in centrepoints.

- So how do we look up a polygon for a given lat/lon. Existing options?

  - winding.pl – Contrib module written in Perl, slow and limited to Perl.

  - Inwhichpolygons – Contrib program, execution overhead and uses limited schema.

  - Cgeom – C library for computational geometry, no Perl/Python bindings yet.

- Decided to go with cgeom for performance and flexibility.

  - Created new schema to store centrepoints/vertices information.

  - Wrote rudimentry Python bindings to cgeom using ctypes.

Testing and reviewing the Gazette
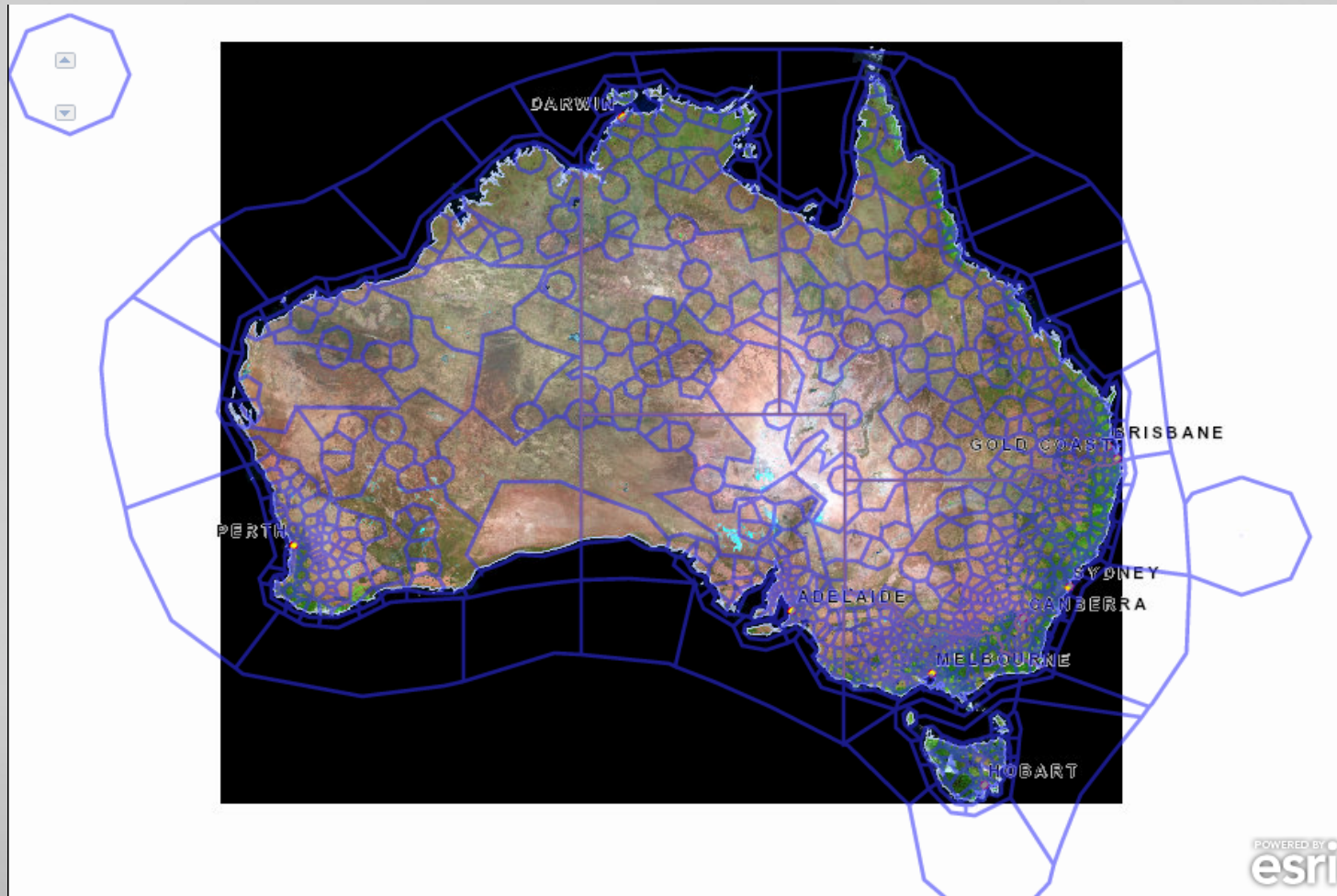
Testing and reviewing the Gazette

- To test the strings that were being produced, each watchstander was given a state to test thoroughly, checking both the short and long strings.

- Many improvements to the placenames were made as a result.

lat: -38.124 lon: 143.593
Polygon ID: 1273
Type: Town
Times: 0.346s load, 0.231s calc
Short string: Colac, Barwon Region, Victoria
Long string:
24km North of Colac
Barwon Region
Victoria

Real integration with Antelope

- Until now, the scripts were only being used to drive the test webpage.

- Not directly usable by production programs that currently used the grname()/srname() routines to produce F-E placenames.

- Also was too slow, a new solution was required.

- All existing scripts that generated placenames written in Perl. No desire to rewrite them in Python just yet (although will eventually).

- Couple of options:

    - libuser – can override the user_grname/srname functions with Antelope-wide effect. No change to scripts (in theory).

    - Write custom Perl bindings/library and use them instead of grname/srname in scripts.

- Went with the second option.

    - Seemed less dangerous than messing with deep Antelope internals.

    - And needed to generate the Long string aswell, which grname interface did not support.

Real integration with Antelope

- Wrote a new C library, libgazette, that read the vertices table and built a polygon partition using libcgeom.

- About 100x faster than the pure Python/ctypes version.

- Wrote Perl XS module ATWS::Gazette that wraps libgazette for loading vertices and searching for polygon. Falls back on F-E if no polygon found.

```perl
use ATWS::Gazette;

my $gdb = "$ENV{ATWS}/data/regions/Australian_Gazette";
my $gaz = ATWS::Gazette->new($gdb);
my $result = $gaz->region_names($gdb,$lat,$lon);
```

- Replaced calls to grname/srname in Perl scripts with code like above.

- All the logic for generating the strings based on rules written in Pure perl. Too much string handling to do it in C. Downside is will need to be rewritten in Python at some stage. Libgazette can be reused to load polygons though.

Release and results

- Change was relatively minor, about 4 scripts needed to be updated, and just to replace calls to grname/srname.

- Went in to production a couple of months ago (roughly).

- Now have emails that look like this. Much better for responders!

3.0 ml - GEELONG, MELBOURNE SURROUNDS, VICTORIA D = 0 km, 1st May 2013 16:41:46, 38.200S, 144.450E

eqdetector@ga.gov.au
Sent: Thu 2/05/2013 3:34 AM
To: **eqnotify**

Preliminary Earthquake Notification

Geoscience Australia has detected an earthquake at:
 10km South-East of Geelong
 Melbourne Surrounds
 Victoria

- Also watchstanders report easier time making short strings for webpage.

Final thoughts

- Interesting project that brought together people from different areas (GIS, Antelope) and presented new implementation challenges.

- Experience may be of interest to others who face similar issues with the F-E gazette for their local region.

- Might be nice to see a more high-level framework in Antelope for augmenting the built-in gazette in future.

- Questions?