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The Australian National Map

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1. Introduction

This paper explores the implementation of the NationalMap spatial data infrastructure in Australia (www.nationalmap.gov.au). Built on open source technologies such as Cesium and Leaflet, the NationalMap platform allows the Australian Government to simplify public access to the tremendous variety of geospatial data it possesses. The platform is an intuitive web interface in which spatial data can be visualised without the need for external software. The platform has proved popular and is being adopted by several Australian State Governments.

NICTA has developed NationalMap for the Australian Government's Department of Communications. NationalMap draws on the open data policies designed at both Federal and State level including: The Government's Plan for the Digital Economy & e-Government (Liberal Party of Australia 2013); Open public sector information: from principles to practice (OAIC) (Australian Government - Office of the Australian Information Commissioner 2013); The Open Data Network; NSW Open Data Policy (NSW Government - Dept. of Finance); and the ACT Open Data Policy (ACT Government) among others. A full list of open data policies and documentation is available (Australian Government - Dept. of Finance).

The Australian Minister for Communications launched NationalMap in his opening speech of the Locate15 Spatial Conference (Malcolm Turnbull 2015). According to the Minister "the inclusion of open government data from all levels of Australian government provides for the first time a demonstration of how seamless open data exploitation can be achieved".

Based on the tenets of open data, the NationalMap platform provides an improved data infrastructure and visualisation capability for Australia. It brings together dispersed information from all levels of Government, into an easily searchable, viewable and fully customisable map-based view. The map is designed and organised through the collaboration between a technical development team and a user experience team to create a geospatial web platform which meets the needs of a broad range of users.

2. Use of open source, standards, and data

NationalMap was designed as a fully open framework. The web front-end connects directly to specific data custodian repositories using open protocols, including Open Geospatial Consortium (OGC) Web Map and Feature Services (WMS, WFS), open data formats such as OGC Keyhole Markup Language (KML) and GPS Exchange Format (GPX). The National Map also enables the

Federal government open data platform Data.gov.au to make its spatial data easily accessible, by directly accessing their Comprehensive Knowledge Archive Network (CKAN) catalogue.

Relying on the strong geospatial visualisation skills at NICTA, the spatial data infrastructure (SDI) is built with Cesium, an open source WebGL virtual globe and map engine that runs in a web browser without plugins. Cesium is a project which NICTA is co-developing with an international community of software engineers and the original developers, Analytical Graphics, Inc. (AGI). NICTA has developed upon the National Map project and produced an open source product named TerriaJS (Terria 2015), which is now the basis of the National Map and several other NICTA projects.

The National Map platform adds an intuitive data layer menu with interactive layer visualisation controls, presenting a powerful and user-friendly interface. The interface supports adding arbitrary WMS and WFS layers, as well as supporting drag and drop of common file formats straight into the browser window. To lower the barrier to producing useful spatial visualisations of ad hoc data, it is possible to use Comma Separated Value (CSV) files, with columns referring to latitude and longitude, postcode, state, or any of a number of different geographical division systems. These CSV files are then easily imported into the system using drag and drop or a file loading interface, and are displayed on the map with automatic legends and information retrieval popups.

The National Map platform also uses Cesium Language (CZML), a simple but extremely powerful JavaScript Object Notation (JSON) based data format developed for Cesium. CZML makes it relatively easy to visualise feature based data, but in particular, it is useful for displaying time-varying feature data.

3. Motivation, benefits, barriers and challenges

The motivation for the creation of National Map came from the difficulties imposed on users of Data.gov.au in exploring geospatial data provided to them in a meaningful way, and in evaluating the relationships between these datasets. Furthermore, it is believed that by providing a powerful interface to explore geospatial data, the production and release of new datasets to the public would be accelerated. By making it simple for data custodians to explore their own data on the NationalMap before making it public, via internal services or drag and drop, they are encouraged to open their data to the public.

Several business sectors rely on geospatial data in order to make informed decisions about the future of their business, particularly in the Renewable Energy sector. NICTA is developing the Australian Renewable Energy Mapping Infrastructure (AREMI, www.nationalmap.gov.au/renewables) platform for the Australian Renewable Energy Agency (ARENA). The aim of AREMI is to lower the cost and effort of sourcing early stage geospatial data when developing and prospecting for new renewable energy projects. The AREMI platform is based on TerriaJS and is now provided as an official Australian Government service together with the NationalMap. Through this project, previously non-public datasets and several datasets produced as a result of ARENA funded projects will be available on the AREMI platform. The availability of these datasets in one location is an excellent example of how NationalMap is

accelerating the release of new geospatial datasets. This project has been made possible by the open source nature of the NationalMap project.

One of the greatest barriers so far in creating AREMI is working with potentially sensitive data sources. Datasets which reveal fine grained population and census data, electricity infrastructure, and defence lands and infrastructure etc. can have commercial, privacy or national security implications. These must be addressed before the data can become publicly available.

Occasionally, data custodian organisations lack the expertise required to produce high quality datasets and web based services, which poses another challenge. In some instances, NICTA provides assistance to custodians to produce these datasets and services, with the intention that the custodians can subsequently update and maintain them.

4. Recommendations

As work continues on the National Map platform, there are still many obstacles to overcome. Our goal is to develop a sustainable platform which allows for ease of addition, and exploration of, new and current geospatial datasets. We aim to provide a platform which allows data custodians to be in charge of their own data, so that it can be kept as up to date as possible. In future projects, we will work with data custodians as early as possible, to ensure that they are headed in a direction which makes integration into open standard platforms as easy as possible. We believe that using open standards is a must for making these datasets available, but we also believe that it is important to encourage custodians to make the raw data freely accessible in simple formats so that it can be processed programmatically, to produce new tools which combine various datasets.

It is important to work alongside stakeholders to demonstrate the value of making their data available. To make this easier in the future, we will need to discover and develop ways of anonymising and aggregating data which might be sensitive in nature, so that we can produce useful tools without revealing personal or commercially sensitive data.

5. Conclusion

The National Map platform provides an improved data infrastructure and visualisation capability for Australian Government data. Its aim is to bring together dispersed information from all levels of Government, into an easily searchable, viewable and fully customisable map-based view.

Our goal is to develop a sustainable platform which allows for ease of addition and exploration of new and current geospatial datasets. We aim to provide a platform which allows data custodians maintain ownership of their own data, so that it can be kept as up to date as possible.

Since its inception, the NationalMap spatial data infrastructure has shown that opening government data and maximising its use is highly dependent on the ease of access. This includes the combination of technology (a simple web browser), content (various and numerous datasets

in one place) and promotion. By making vast amounts of geospatial data accessible to anyone through a modern web browser, we have made open geospatial data available to everyone.

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