Cloud-based serviced-orientated data systems for ocean observational data – an example from the coral reef community

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The advent of new observing systems, such as sensor networks, have dramatically increased our ability to collect marine data; the issue now is not data drought but data deluge. The challenge now is to extract data representing events of interest from the background data, that is how to deliver information and potentially knowledge from an increasing large store of base observations. Given that each potential user will have differing definitions of 'interesting' and that this is often defined by other events and data, systems need to deliver information or knowledge in a form and context defined by the user.

This paper reports on a series of coral reef sensor networks set up under the Coral Reef Environmental Observation Network (CREON). CREON is a community of interest group deploying coral reef sensor networks with the goal of increasing capacity in coral reef observation, especially into developing areas. Issues such as coral bleaching, terrestrial runoff, human impacts and climate change are impacting reefs with one assessment indicating a quarter of the worlds reefs being severely degraded with another quarter under immediate threat. Increasing our ability to collect scientifically valid observations is fundamental to understanding these systems and ultimately in preserving and sustaining them.

A cloud based data management system was used to store the base sensor data from each agency involved using service based agents to push the data from individual field sensors to the cloud. The system supports a range of service based outputs such as on-line graphs, a smart-phone application and simple event detection. A more complex event detection system was written that takes input from the cloud services and outputs natural language 'tweets' to Twitter as events occur. It therefore becomes possible to distil the entire data set down to a series of Twitter entries that interested parties can subscribe to. The next step is to allow users to define their own events and to deliver results, in context, to their preferred medium.

The paper contrasts what has been achieved within a small community with well defined issues with what it would take to build equivalent systems to hold a wide range of cross community observational data addressing a wider range of potential issues. The role of discoverability, quality control, uncertainly, conformity and metadata are investigated along with a brief discussion of existing and emerging standards in this area. The elements of such as system are described along with the role of modelling and scenario tools in delivering a higher level of outputs linking what may have already occurred (event detection) with what may potentially occur (scenarios).

The development of service based cloud computing open data systems coupled with complex event detection systems delivering through social media and other channels linked into model and scenario systems represents one vision for delivering value from the increasing store of ocean observations, most of which lie unknown, unused and unloved.