AGORA | A Geospatial Open collaboRative Architecture for Building Resilience against Disasters and Extreme Events

Integration of Provenance-enabled Crowdsourced Information with Traditional Disaster Management Information using Linked Open Data

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ABSTRACT

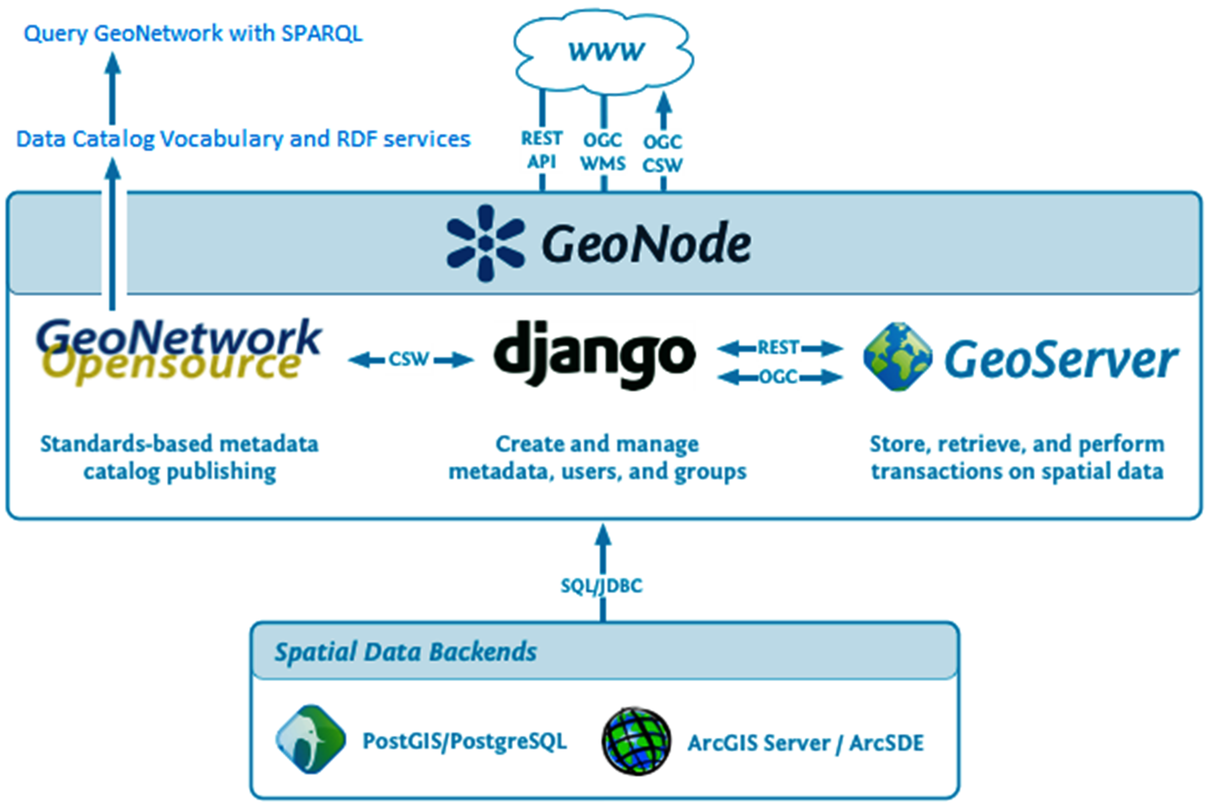
In early stages of a disaster, details of infrastructures are frequently not available. Volunteers throughout the world used fresh satellite imagery to rebuild missing maps of the changed reality.

Former research concluded, that the Principle of Linked Open Data (LOD), with the help of Management of a Crisis Vocabulary, does support the integration of crowdsourced information into traditional disaster management information.

MOAC, a Management of a Crisis Vocabulary, were developed to address the Integration of Crowdsourced Information with Traditional Crisis and Disaster Management Information.

However, information about reporting and approval are particularly important in the context of disaster data management. In this study, we developed a solution that allows VGI-data-publishers to add provenance metadata to their datasets and applied it for our National Center for Natural Disaster Monitoring and Alert, CEMADEN.

KEYWORDS: Interoperability, Provenance, Crisis Mapping, OpenStreetMap, Linked Open Data, MOAC



METHOD

In order to get a local replication of data sets from the Web of Data the simplest way is to download a file containing the data set. The triple/quad dump import does exactly this, with the difference that LDIF (Linked Data Integration Framework) generates a provenance graph for a triple dump import, whereas it takes the given graphs from a quad dump import as provenance graphs (RDF/XML, N-Triples, N-Quads or Turtle).

PROOF OF CONCEPT USE CASE

Data initially collected within an improvised VGI-campaign (proof of concept use case "floodings") has been converted from spreadsheet tables into RDF using MOAC vocabulary. This conversion was realized by ontology mapping between use-case related categories and MOAC classes. After that, the data has been manually enriched, using OpenStreetMap extracted links, to spatial objects.

RESULTS

The MOAC classes and properties were self explanatory and the vocabulary itself was easy to understand. Part or the content of our use case was domain-specific (flooding) and required the use of dedicated vocabularies to express the semantics of the reports. The MOAC vocabulary helped to encode into RDF the semantics of pleas for help. In addition, MOAC can easily be extended with new classes if they were needed for a particular deployment, e.g. related to domain specific particularities or provenance related information.

CONCLUSION

Crises and their complex dynamics are not directly amenable to modelling. This is made worse by their time-continuous nature as opposed to the discrete one assumed by most enterprise modelling methods. Besides the dynamic component, crisis management also involves a static one, e.g. the main players involved in a crisis are relatively well-defined. These structures are amenable to semantic modelling aiming at the creation of uniform vocabularies. Relevant research has resulted in a number of ontologies such as MOAC. Regarding the dynamic component of crises, process models, ideally combined with semantic models, can be used.

FUTURE CHALLENGES

- An open source prototype for Data Catalogue Vocabulary services based on DCAT is being implemented in GeoNetwork, and would eventually provide support to harvest, search and link catalogue contents with other interlinked resources.
- The GeoNetwork catalog (OGC CSW) allow searching for geospatial datasets and services based on metadata (ISO 19115 and 19139) and provides an RDF interface for published metadata. Nevertheless the current version of this RDF interface does not provide the lineage information as Linked Data, although this information is stored in the GeoNetwork database .

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