Position Paper

The Android App Geohazard – Experiences with shared information on natural hazards

State of the Art and forward thinking

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Geospatial information on natural disasters is publicly made available worldwide by various organisations via Internet platforms. On one side, these are authorities who deal directly with the respective natural event to prevent catastrophes and protect the population. On the other side, these are often scientific institutions that compile and provide information through research, and act as advisors to the authorities concerned. In addition, it has turned out that effective planning of relief and rescue measures requires both information provided by these authorities and feedback of the general public. Every citizen who has been directly affected by the event on-site can give valuable information as a potential witness. This is especially useful during the events, where witnesses can provide specific statements on the current impact on man and the environment.

During the last years, the crowdsourcing approach has gained the attention of users of modern communication and information systems. The term crowdsourcing describes the interactive, decentralized, and even ad-hoc collaboration of volunteers working on a common topic via crowdsourcing platforms. This approach is extended by mobile crowdsourcing and crowd-mapping which evolved in the quickly growing community of smartphone users and the ability of location awareness by devices and software tools. So smartphone users are enabled to compose and share reports immediately at the scene of natural hazards or even disasters.

The project Collaborative, Complex, and Critical Decision-Support in Evolving Crises (TRIDEC), co-funded by the European Commission in its Seventh Framework Programme, is focused on the management of crisis situations. Part of the project is the development of an application named Geohazard for the Android smartphone platform. The App is primarily designed to immediately sent eyewitness reports on natural hazards, to an instance of the crowd mapping platform Ushahidi, which is used repeatedly since the devastating 2010 earthquake in Haiti to collect eyewitness reports in natural disasters and thus optimally supplements the conventional sensors and sensor systems used for event monitoring. Crisis reports which include geographical information with event classification, description and photos can be directly visualized in a geographic information system on a crowd-map for the benefit of the crowdsourcing community and the individual user as well as national and international authorities.

Furthermore, this application enables access to continuously updated information for current natural hazards like earthquakes and tsunamis. The Geohazard App has been developed and implemented in such a way that different data sources, such as from BGS (British Geological Survey), USGS (United States Geological Survey), NOAA (National Oceanic and Atmospheric Administration), and GDCAS (Global Disaster Alert and Coordination System) can be incorporated into a central automatism. At present, data from more than 15 providers are used for the Geohazard App in order to give app users information on earthquakes, tsunamis, floods, hurricanes and volcanic activity. Currently, the combination and uniform

presentation of data on various natural hazards from various sources in one GeoApp is unique and has pointed to several problems regarding interoperability.

An important issue is that a wide variety of data formats were offered by the different data providers. Even where same data formats have been used, i.e. RSS feeds, they have been used and extended differently, i.e. with additional data and with other formats carrying these data. Specifically a variety of metadata standards and non-standardized formats is used world-wide for these purposes without any common understanding or agreement. These circumstances were particularly challenging when developing the Android app. Several separate functions were implemented for data processing for each organisation to integrate their public data into the application. A uniform use of standards to shorten these processes and support interoperability is not only highly welcome but also a driving key factor while managing crisis events jointly with different players involved in a heterogeneous environment. This affects not only in terms of data representation but also in terms of semantics, e.g. the coordinated use of defined scales such as the Suffir-Simpson Hurricane Scale for cyclones or the European Macroseismic Scale for earthquakes.

Another issue for future developments is the ability to make use of push notifications. Currently, data is provided mainly without any push mechanisms so that applications have to pull the relevant information creating lots of additional problems such as the emerging data volume that is generated when accessing the data regularly, resulting server performance matters as well as mobile device battery consumption matters generated by each pull access.

Moreover, in TRIDEC Ushahidi is used to validate and demonstrate the feasibility of integrating and using eyewitness reports in an early warning system to make them available to the operators for an improved situation picture in case of tsunamigenic earthquake and tsunami events. Thus Ushahidi provides rapid in-situ crowd-sourced measurement by people actually experiencing the crisis event, e.g. using mobile devices, albeit with variable quality and a high noise to signal ratio which finally is filtered either by automated processing or by manual volunteer efforts. In this way proven and reliable sensors are complemented by human sensors. Whereas sensor data follows standards or undergoes standardisation for format and protocols, the data format of witness reports and the protocols used for sharing them are not subject to standardization activities. This not only affects Ushahidi being the software evangelist in this area, but it also affects imitators and extensions for already established platforms.

As a consequence the use of standards in this context has to be coordinated and should lead to systems whose architecture is flexible and adoptable and complying with common design criteria such as encapsulation of proprietary resources, loose coupling of components, location transparency of services, and separation of concerns. Following these principles it is aimed to realize robust systems which allow interoperability between arbitrary types of systems, seamless integration of various heterogeneous information resources and components, and reuse of components by accessing them via standardized services. De facto standards developed by volunteer communities and developed by consortia with members from industry, academia and authorities have to be considered as well as de jure standards created by official bodies. Standard specifications applied in the context of early warning and crisis management comprise data formats, protocols, and services having in mind existing and possible workflows and knowledge representation.