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Towards an Information Infrastructure for Environmental Risk Management in Europe

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The European Commission has been funding research and technological development since the 1980's through its multiannual Framework Programmes (FP) for RTD. During FP6 (from 2002-2006) a large number of projects were funded addressing information and communication technologies (ICT) for environmental risk management and emergency response. These projects cover one or more of the following topics: service oriented information infrastructures, environmental monitoring and early warning, emergency management and public safety communication. Although this presentation will focus predominantly on the first topic, it is imperative that future developments be capable of integrating with the others in order to achieve full interoperability in the field of disaster prevention and emergency response.

Information Infrastructure

Searching the web for relevant documents has become commonplace, however, the search for data and databases, models and systems, often residing on different and distributed platforms, remains an inherently difficult task. Effective environmental applications needs to draw on information owned by different institutions, often situated in different countries, given that surface water, air pollution, and disasters do not chose to respect national borders. It is therefore urgent to tackle the general problem of data exchange, or data interoperability. Previous research has demonstrated the feasibility of a general exchange mechanism based on a set of technologies, namely, XML to separate semantic content from syntactic formatting, ontologies to define domain-specific vocabularies to represent real world concepts and their relationship to each other, hence allowing the re-use of (raw) data for multiple and unforeseen purposes.

The short term objective is to promote the development of web services drawing infor-

mation from different data providers while minimizing the constraints to make such information available. The long term objective is to develop the capacity to actively search the web for data, models and services in the same way we search for documents today. This is the focus of two Integrated Projects: WIN, which focuses on on-demand data retrieval, service chaining and service tracking, and ORCHESTRA which focuses on enabling the establishment of information architecture for improved data and service discovery, risk assessment, scenario analysis, and management. Three additional projects, namely, INTAMAP, INTERRISK and STREAM complete this picture, thereby addressing different technical challenges and application areas, including oil-spills, forest fires, floods, algae blooms, radioactivity, air pollution, humanitarian assistance, and demining. A new reference model architecture proposed by the ORCHESTRA consortium, has been submitted to the Open Geospatial Consortium (OGC) for standardization, and may become a reference model for INSPIRE, GMES and even GEOSS.

Environmental Monitoring and Early Warning

European projects are developing standard interfaces and encodings that will enable real-time integration of heterogeneous sensor webs into the information infrastructure. Developers will use these specifications in creating applications, platforms, and products involving web-connected devices such as flood gauges, air pollution monitors, stress gauges on bridges, robots as well as space and airborne earth imaging devices. These sensor webs will be used to better monitor environmental changes. During emergencies they will contribute to providing real-time information necessary to feed decision support and early warning systems. The added ability to process in-situ sensors the same way as satellite EO sensors, will allow rapid data fusion, and in some instances, provide automatic "ground truthing". Combined with automated workflow management, it will help produce value-added products and foster the uptake of GMES services. There are currently nine European projects populating this concept (OSIRIS, SANY, DYVINE, EU-FIRE, INTAMAP, SCIER, WARMER, WINSOC and DEWS). They will explore ICT issues related to the integration and optimisation of existing monitoring networks, easy plug-in of new sensors on board diverse fixed and mobile platforms, sensor cooperation, network customisation and control, and interfaces with Spatial Data Infrastructures and Web services.

Emergency Management and Public Safety Communication

The complexity of managing disasters dictates that "first responders" and in-field emergency management personnel should be able to collaborate efficiently by having access to secure robust and reliable information. This is the concept of "Network Enable Disaster Management", which is at the heart of the current European research

projects. It will enable first responders to operate more effectively in future disasters through the more efficient sharing and exploitation of information as well as raw sensor data. It will feature better situational awareness, refreshed in (near) real-time, facilitating operative decision making. A number of projects are dealing with various aspects related to the topic, including: ICT for improved Command Control Coordination allowing different entities from different countries to work together efficiently; information systems for monitoring the transportation of dangerous goods; the transmission of "early warnings" to authorities, wide (all media) alerts to citizens, and the ability to manage real-time rescue operations; building resilience into existing commercial networks (rather than deploying specific PPDR networks), ultra wide band techniques to ensure communication and positioning even inside collapsed buildings and plants, rapidly deployable backhaul communication systems using satellite to be used during humanitarian crises abroad.

Conclusion

ICT can and must play a significant role towards enabling automated data capture, seamless data exchange and collaborative working in the field of disaster risk reduction and emergency management. Additional efforts will be required to stimulate the take up of such applied research results towards building a true operational capacity in Europe.