Emergency Management Pilot in BRISEIDE

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1 ABSTRACT

BRISEIDE aims to build spatio-temporal services needed by Civil Protection and Risk managers for the decision making processes.

Usually, existing GI services used for the management of critical situations don't fully consider the harmonization from different sources and don't use the defined standards. In addition, current guidelines and implementing rules don't provide the requested support for the spatio-temporal services planned in the project.

For this reason, when necessary, the project proposes practical solutions in order to reach the required level of integration between the standards used by the different providers. These solutions will be implemented as new services, hosted on the project web-site and built by means of open source frameworks.

This document has been prepared in the context of Work Package 1 - Inter-domain interoperability and user requirement analysis, whose goal is to identify BRISEIDE user and system requirements and to define accordingly the architecture of the final Pilot.

The existing base-maps and thematic datasets, relevant to BRISEIDE Database Model, as well as available services identified throughout T.1.5 will be analyzed with the purposes of defining any adaptation or processing required to deliver a harmonized and seamless infrastructures.

The present report is therefore, the result of this task consolidated into the D.1.05 - "Analysis of Adaptation of Existing Data / Services".

The deliverable analyses the information prepared in other tasks from WP1, User Requirements and Use cases and Services requirements as target BRISEIDE models, as well as Survey of existing GI and Services as source BRISEIDE model provided by BRISEIDE stakeholder.

The process of harmonization is addressed to make the information provided by the different data providers in the BRISEIDE project interoperable. Several projects have been working deeply in the process of harmonization of Data following INSPIRE Directive principles, with the aim to meet its objectives of creating, maintaining, and sharing information (e.g. Humboldt, Medisolae, NATURE SDIplus, EURADIN). However, the need of services adaptation has not been usually considered except to determine a minimum WS to be built for sharing harmonized data among all project partners (e.g. EURADIN, NATURE SDIplus, etc.)

At the beginning of the project every data provider reported the information available within this project. The analysis of the information provided, stated a high level of heterogeneity and different type of information that will be used for pilots deployment. In order to fulfill the project goals is necessary to deliver a harmonized and seamless infrastructure, making the adaptation analysis one of the basic steps during the project.

2 BACKGROUND

The explosion of Geographic Information Systems and of the environmental databases has highlighted the problem of the real use of this huge amount of data. Surely the web can be a valid support to make the data available to researchers and everyone who wants to use spatial information by means of applications that can be easily understood and used. But unfortunately, in most of the cases, these databases are not equally structured and harmonized. This circumstance leads to a real loss of their potential informative load; this fact could be avoided organizing GIS and Alphanumeric databases following standard protocols and procedures.

Briseide's main goal is to create value added web-services in the fields of environmental monitoring and emergencies management. The services will be based on the data sources shared by the same end-users. The knowledge of the dataset properties is very important in the first phase of the project. An incorrect evaluation of the processing steps needed on these dataset could negatively influence the quality of the project services.

3 SCENARIO NAVARRE

The purpose of the pilot through the Navarre Agency for Emergencies (Agencia Navarra de Emergencias, ANE) is to assist in the coordination of responses to a wide variety of emergencies and urgencies that occur in Navarre. This coordination extends along the whole life of the emergency, from the call taking to the closing of the incident, and includes incident classification, resource assignment and dispatching, and resource management. The dispatching is done according to predefined coverage areas and actual availability of the resources.

3.1 As-is-Analysis

Currently the control centre staff is assisted by a GIS that shows relevant static information (street and transportation networks, cadastre, hydrography, orthophoto…) and also dynamic information such as callers' and incidents' location and resources' status and position. The position of the resources is provided by an Automated Vehicle Location system (AVL) that uses TETRA radio as communication system. The status of the resources is also transmitted to the control centre via TETRA radio.

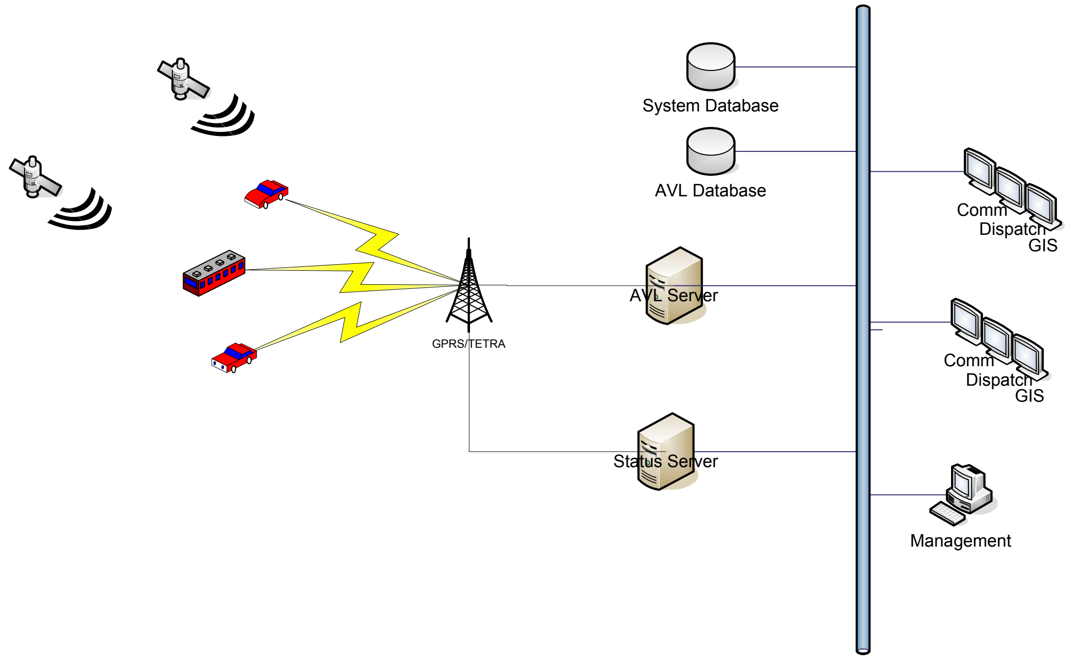

Figure 5 Simplified ALV Schema

Although this solution allows certain resource managing it would be desirable to have more sophisticated tools in order to perform more complex management tasks.

3.2 Gap Analysis

These are some of the lacks we find:

- Low correlation between status and actual location of the resources
- Difficulty in interpreting AVL information
- Lack of route-distance based tools to analyze response time
- Lack of resource 'behaviour' analysis tools

Our objectives are grouped in two categories:

- Service Analysis and Planning
  - Response time analysis
  - Resources' bad practices detection
  - Re-zoning and resource geographic redistribution
  - Resource tracks interpretation and translation of coordinates into addresses

- Resource Management
    - Resource estimated time of arrival (ETA) calculation
    - Real location-based recommendation
    - Automatic status updating using the current location.
    - Alerts System to detect out of assignation zone or 'lost' resources, outdated statuses…
    - Resource tracks interpretation and translation of coordinates into addresses (Geocoding)

As mentioned before the ANE already works with a GIS. The solution presented will be integrated with this GIS which leads to some constraints in the design of the architecture.

- The current architecture is based on the client-server model and makes use of SQL Server database.
- Part of the information exchange and the synchronization between clients and servers relies on a proprietary communication bus.
- Certain features of the platform are developed using Secure Web Services (SOA). Especially those consumed by clients in remote locations. In order to make the new solution re-usable and normalized the new features will adhere to this paradigm.
- Due to the sensible nature of the information it is not expected to be made public, nevertheless the use of SOA would eventually allow to share it with other agencies or administrations.
- Geographical data is currently stored as ESRI shapefiles, but the GIS is able to work with a large number of vector file formats (dgn, bin, mdt, dwg, kml, xyz file…), geodatabases (ArcSDE, Access…), raster (SOAP, WMS…)
- Status and AVL data coming through TETRA radio are stored in SQL Server

3.3 Architecture

The proposed architecture of the system is shown in Figure 2 and it is composed by an Automatic Vehicle Location system (AVL) that uses TETRA radio as communication system, a relational database where the resource information are stored and the user level that access to the data through a GIS system.

The BRISEIDE architecture will be connected to the repository of resources data and provide the mobile information as a services to the BRISIEDE client. The specific processing services as reported in the Services Requirements document will be provided as WPS and OLS in the pilot specific node.

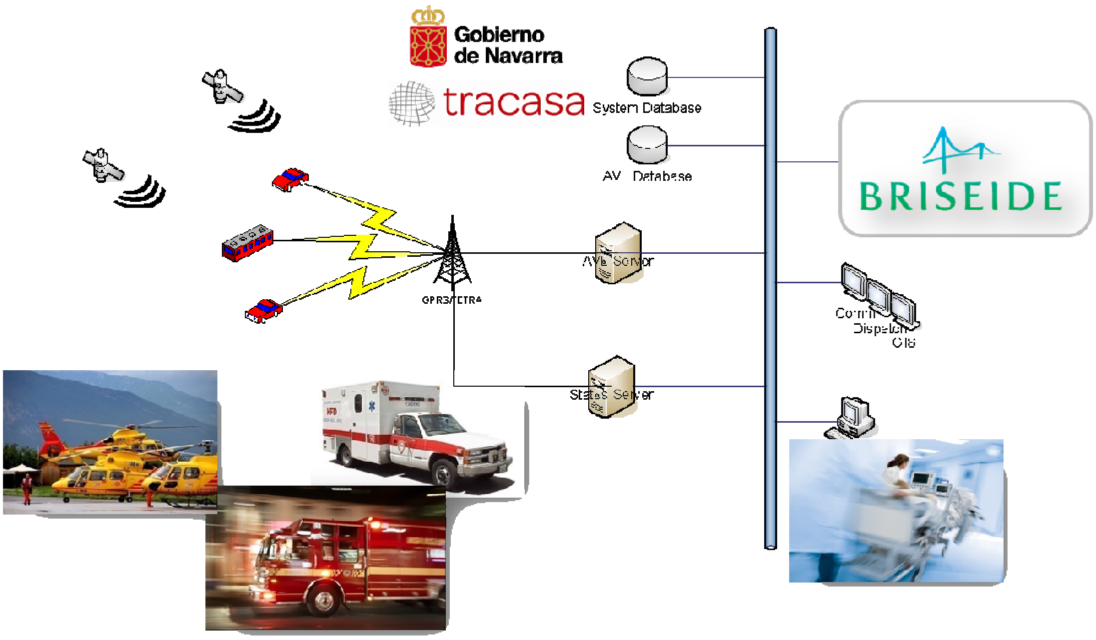

Figure 6 Architecture schema of Emergency Management System

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4 EXPECTED RESULTS

The solution proposed will have three groups of users:

- Service managers working back office which plan the zoning, resource distribution and routes. They must have a strategic vision of the emergency world and should have high level knowledge of the possibilities and potentials that Geographic Information offers.
- Resource managers, located at the control centre, which have to make decisions based on the live information they are provided with by the system. They must know the GIS at user level.
- Field resources which add/get information through mobile devices. Since their priority is quickness, their interaction with the system has to be as much automated as possible. Besides these users are very variable so specialized formation should be avoided reducing it to basic end user knowledge.

4.1 User Perspective

These are the different tasks that the system will perform from the point of view of the users:

- As a service planner,
  - I can analyze the response time of the resources mobilized for a specific area. The input data are the historical resource locations and incident positions and the output are the statistics/graphics that present the response time.
  - I can analyze the behaviour patterns of any resource. The input data are the historical resource locations and the assigned zones and the output are the statistics/graphics that present the behaviour patterns.
  - I can redesign the zoning and distribution of the resources. The input data are the current zoning and the historical response times. The output is the new zoning.
  - I can obtain the route of any resource at any time in a format than can be easily understood and communicated. The input data are the historical resource positions, the streets layer, transportation network, cadastre… and the output is an interpreted version of the route including road names, street names...
- As a resource manager,
  - I can obtain the ETA for any resource heading to an incident. The input data are the current position of the resource, the location of the incident and the historical response times. The output information is the resource ETA.
  - I can know the most recommendable resource to dispatch based on their real position. The input data are the current position of the resources, the location of the incidents and the historical response times. The output information is an ordered list of resources.
  - I get an alert when a resource is out of its assigned area. The input data are the current position of the resources and the zoning. The output information is an alert.
  - I get an alert when a resource is not updating its location. The input data are the real time positions of the resources. The output information is an alert.
  - I get an alert when a resource is not updating its status. The input data are the real time positions of the resources and their statuses. The output information is an alert.
  - I can obtain the route of any resource at any time in a format than can be easily understood and communicated. The input data are the real time resource positions, the streets layer, transportation network, cadastre… and the output is an interpreted version of the route including road names, street names...

- As a resource,
    - I can update my status automatically depending on my real location. The input data are the current position and status of the resources, and the location of the incidents. The output information is the new status.

The spatio-temporal operators used will include:

- Location-temporal operator: returns the spatial representation of an object at a given time. It will be used to determine the location or the resources at a given time (real time or historical).
- Topological-temporal operators: return the topological relationships between objects at a given time. They will be used to determine the relationship between the resources position at a given time and the zoning areas, the incident locations…
- Metric-temporal operators: return the distances between objects at a given time. They will be used to determine the distances between the resources position at a given time and the zoning areas, the incident locations…

5 CONCLUSION

Harmonization of datasets and standarization of procedures and services is required to fullfill the Emergency Services increasing needs of updated data.

BRISEIDE approaches this matter by using normalized webservices that emphasize the temporal dimension of geographical data.

The pilot to be deployed in the Navarre Agency for Emergencies will make use of BRISEIDE's infrastructure to improve coordination and efficiency of the emergency responders through the integration of live and historical Automatic Vehicle Location and resources status data.

6 REFERENCES

URL: http://www.hlandata.eu