



Comprehensive Risk Assessment of Basic Services and Transport Infrastructure

101004830 - CRISIS - UCPM-2020-PP-AG

Cross-border database platform for risk and emergency management

Architecture of the WBP

Work package:	WP-5
Deliverable Number:	D.5.1
Lead Beneficiary:	EUCENTRE
Coordinator:	EUCENTRE
Contributing Beneficiaries:	IZIIS, UPT-FCE, CMC
Dissemination Level:	Confidential
Version:	01
Due Date:	June 30, 2021
Submission Date:	June 30, 2021



**Comprehensive Risk Assessment of
Basic Services and Transport Infrastructure (CRISIS)**

101004830 - CRISIS - UCPM-2020-PP-AG



**Cross-border database platform for risk and emergency
management**

Architecture of the WBP

WP-5 | D.5.1

Contributing Authors Davide Quaroni (EUCENTRE)
 Barbara Borzi (EUCENTRE)
 Antonella Di Meo (EUCENTRE)

June 30, 2021

TABLE OF CONTENTS

1 INTRODUCTION 5

2 PRELIMINARY RESEARCH..... 6

2.1 RESEARCH ON GIS ARCHITECTURE..... 6

2.2 IDENTIFICATION OF THE GEOGRAPHIC STANDARDS FOR DATA EXCHANGE 6

2.3 STUDY OF LIBRARIES FOR THE GRAPHICAL USER INTERFACE (GUI) WEBGIS..... 7

2.4 STUDY OF THE FORMAT FOR UPDATING GEOGRAPHIC DATA..... 7

3 SOFTWARE COMPONENTS..... 8

4 INTEGRATION OF THE CALCULATION ENGINE 9

LIST OF TABLES

Table 2.1 Adopted standards 6
Table 2.2 Adopted libraries 7
Table 2.3 Data update formats 7

1 Introduction

This deliverable deals with the specifications related to the website and the WebGIS platform to be developed in the CRISIS project, considering updated data from previous Working packages. The web-based approach was chosen to integrate the ease of use and accessibility of a web browser and the capabilities of geographic databases.

In this period the IT industry dedicated to the publication and the processing of geographic data (Geographic Information Systems, GIS) is in great expansion for what concerns both the production instruments and the publication of geographic information, especially via Internet (WebGIS). All that is possible thanks to the dissemination of instruments that are able to provide maps in an easy and cheap way, such as Google Maps.

For this reason, nowadays, the availability of tools and software solutions is particularly high, both on the side of traders and on the side of research institutions and open source development community. In spite of that, it is important to underline that not all available products are at the right level of the required technique and/or they can represent a suitable platform of development for the geographic services.

It has been necessary to carry out a study activity and a selection of the IT offer concerning the GIS systems by paying particular attention to the tools developed for the use of geographic information in the web and on their publishing. Specifically, the latter should be performed according to standards that are not tied to a particular software platform (Web Services) in order to ensure the widest availability and integration of geographic data.

In Section 2 we outline the available system architectures and the one we have selected for the CRISIS project. In Section 3 the software components are listed and, finally, guidelines on how to integrate the calculation routines can be found in Section 4.

2 Preliminary research

2.1 Research on GIS architecture

A study on the state of the art of GIS architecture and up-to date GIS has been carried out and an architectural model has been identified as a reference for the future development of the system.

The architectural adopted model is an evolution of WebGIS, known as "Spatial Data Infrastructure" (SDI). The system that EUCENTRE will develop will represent a node of it. EUCENTRE is the leader of the Work Package 5 (WP5, Cross-border database platform for risk and emergency management) and is responsible for the software development in coordination with the needs of other partners in the Working Package.

The main components that belong to this architecture have been identified and they are: (i) Geo Database (GD), (ii) Web Services Standards (WSS), (iii) Web Map Viewers (WMV), and (iv) Map Desktop Clients (MDC).

The system architecture provides the virtualization of computing machines that make up the system (i.e., frontend server, database, map server, computing server).

The entire system will be provided by a VMware virtual architecture, which is set up to scale transparently, both horizontally (by adding more servers in the cluster of VMware machines) and vertically (by increasing the endowment of the available physical machines).

In addition, the partitioning of the various tasks of the system among the different virtual machines allows to act precisely on each single component that could reveal itself as a bottleneck in terms of resource consumption or calculation times in the future production use.

2.2 Identification of the geographic standards for data exchange

The geographic information contained in the various geographic databases will become GIS products.

We identified and adopted the standards proposed by the "Open Geospatial Consortium" (OGC): the latter deals with the development and the dissemination of international standards for the publication of geographic information and geolocation services.

Table 2.1 Adopted standards

Shortcut	Name
WFS	Web Feature Service
WMS	Web Map Service
WCS	Web Coverage Service
GML	Geographic Markup Language
CSW-ebRIM	Catalogue Service
SF/SQL	Catalogue Service

2.3 Study of libraries for the Graphical User Interface (GUI) WebGIS

An important aspect of the WebGIS architecture is represented by the user interface, which is built inside a web browser and can be used by end-users.

Such task has involved a study for the identification and evaluation of java-script libraries and of GIS framework, which are useful to build the dynamic HTML pages to be able to offer the ability to view, query, and manipulate geographic data.

The usable libraries have been two: Openlayers and JQuery, whose characteristics are summarized in Table 2.2.

Table 2.2 Adopted libraries

Library	Technical Characteristics	Notes
Openlayers	opensource javascript library	It is widespread for the presentation of maps and geographic layers inside HTML pages while it is less suitable to build interfaces to manipulate.
JQuery	opensource javascript library	General-purpose utility library for the management of DOM objects

2.4 Study of the format for updating geographic data

We performed a research to identify the mechanisms and the available formats for implementing a feature to change notifications or update the geographic data.

We identified two formats of data exchange. They are widespread in the geographical context and they have a growing support from the different programming languages and popular WebGIS frameworks.

These two formats will be implemented in the CRISIS geographical portal and they are listed in Table 2.3.

Table 2.3 Data update formats

Format	Technical Characteristics	Notes
GeoRSS	XML specification that allows to provide geographic data expressed in standard GML, such as RSS feeds.	It is a good way to notify geographic data through the architecture of RSS feeds. It is widespread and used by both browser and automated interfaces.
GeoJSON	Format to encode the different geographic entities through textual data structures.	It is a format that derives from JavaScript. For this reason, it is easily integrated in graphical interfaces that use JavaScript (e.g., Openlayers).

3 Software components

In the following we list the software components of the WebGIS platform that will be implemented in CRISIS:

- Web Server: Apache HTTPS;
- Geographic Database: POSTGRES with POSTGIS extension;
- Application Server: Apache Tomcat;
- Development languages - server side: Java;
- Languages - client side: Javascript, Openlayers, JQuery.

4 Integration of the calculation engine

The calculation routines available through the platform will be developed server-side by programming codes such as Java.

The engine will be ready to be deployed as a separate application on the same Tomcat server of the WebGIS or on a different one, depending on the volume of calculations to be performed.

The calculation routines will be integrated within the code that exposes its functionality through HTTP calls, according to the paradigm of web services that are the ones based on the JSON-RPC.

These services will be linked to the features of the portal and they will be accessible from the WebGIS interface.