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The SISMA Project: A pre-operative seismic hazard monitoring system.

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Galileian Plus is currently leading the development, in collaboration with several Italian Universities, of the SISMA (Seismic Information System for Monitoring and Alert) Pilot Project financed by the Italian Space Agency. The system is devoted to the continuous monitoring of the seismic risk and is addressed to support the Italian Civil Protection decisional process. Completion of the Pilot Project is planned at the beginning of 2010. Main scientific paradigm of SISMA is an innovative deterministic approach integrating geophysical models, geodesy and active tectonics.

This paper will give a general overview of project along with its progress status and a particular focus will be put on the architectural design details and to the software implementation choices.

SISMA is built on top of a software infrastructure developed by Galileian Plus to integrate the scientific programs devoted to the update of seismic risk maps.

The main characteristics of the system may be resumed as follow:

1. automatic download of input data;
2. integration of scientific programs;
3. definition and scheduling of chains of processes;
4. monitoring and control of the system through a graphical user interface (GUI);
5. compatibility of the products with ESRI ArcGIS, by mean of post-processing conversion.

a) automatic download of input data

SISMA needs input data such as GNSS observations, updated seismic catalogue, SAR satellites orbits, etc. that are periodically updated and made available from remote servers through FTP and HTTP. This task is accomplished by a dedicated user configurable component.

b) integration of scientific programs

SISMA integrates many scientific programs written in different languages (Fortran, C, C++, Perl and Bash) and running into different operating systems. This design requirements lead to the development of a distributed system which is platform independent and is able to run any terminal-based program following few simple predefined rules.

c) definition and scheduling of chains of processes

Processes are bound each other, in the sense that the output of process “A” should be passed as input to process “B”. In this case the process “B” must run automatically as soon as the required input is ready. In SISMA this issue is handled with the “data-driven” activation concept allowing specifying that a process should be started as soon as the needed input datum has been made available in the archive.

Moreover SISMA may run processes on a “time-driven” base. The infrastructure of SISMA provides a configurable scheduler allowing the user to define the start time and the periodicity of such processes.

d) monitoring and control

The operator of the system needs to monitor and control every process running in the system. The SISMA infrastructure allows, through its GUI, the user to:

- view log messages of running and old processes;
- stop running processes;
- monitor processes executions;
- monitor resource status (available ram, network reachability, and available disk space) for every machine in the system.

e) compatibility with ESRI Shapefiles

Nearly all the SISMA data has some geographic information, and it is useful to integrate it in a Geographic Information System (GIS). Processors output are georeferred, but they are generated as ASCII files in a proprietary format, and thus cannot directly loaded in a GIS. The infrastructures provides a simple framework for adding filters that reads the data in the proprietary format and converts it to ESRI Shapefile format.