



**HAL**  
open science

## The Cloud2SM Project

Antoine Crinière, Jean Dumoulin, Laurent Mevel, Guillermo Andrade-Barosso, Matthieu Simonin

► **To cite this version:**

Antoine Crinière, Jean Dumoulin, Laurent Mevel, Guillermo Andrade-Barosso, Matthieu Simonin. The Cloud2SM Project. EGU 2015 - European Geosciences Union General Assembly, European Geosciences Union, Apr 2015, Vienne, Austria. pp.1. hal-01144162

**HAL Id: hal-01144162**

**<https://hal.science/hal-01144162v1>**

Submitted on 25 Nov 2015

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



## The Cloud2SM Project

Antoine Crinière (1), Jean Dumoulin (1,2), Laurent Mevel (1), Guillermo Andrade-Barosso (1), and Matthieu Simonin (1)

(1) I4S team, INRIA Rennes, Campus Beaulieu 35042 Rennes France (antoine.crinier@inria.fr), (2) IFSTTAR, COSYS/SII, Route de bouaye, CS4,44340 Bouguenais, France (jean.dumoulin@ifsttar.fr)

From the past decades the monitoring of civil engineering structure became a major field of research and development process in the domains of modelling and integrated instrumentation. This increasing of interest can be attributed in part to the need of controlling the aging of such structures and on the other hand to the need to optimize maintenance costs. From this standpoint the project Cloud2SM (Cloud architecture design for Structural Monitoring with in-line Sensors and Models tasking), has been launched to develop a robust information system able to assess the long term monitoring of civil engineering structures as well as interfacing various sensors and data. The specificity of such architecture is to be based on the notion of data processing through physical or statistical models. Thus the data processing, whether material or mathematical, can be seen here as a resource of the main architecture.

The project can be divided in various items:

- The sensors and their measurement process: Those items provide data to the main architecture and can embed storage or computational resources. Dependent of onboard capacity and the amount of data generated it can be distinguished heavy and light sensors.
- The storage resources: Based on the cloud concept this resource can store at least two types of data, raw data and processed ones.
- The computational resources: This item includes embedded “pseudo real time” resources as the dedicated computer cluster or computational resources.
- The models: Used for the conversion of raw data to meaningful data. Those types of resources inform the system of their needs they can be seen as independents blocks of the system.
- The user interface: This item can be divided in various HMI to assess maintaining operation on the sensors or pop-up some information to the user.
- The demonstrators: The structures themselves.

This project follows previous research works initiated in the European project ISTIMES [1]. It includes the infrared thermal monitoring of civil engineering structures [2-3] and/or the vibration monitoring of such structures [4-5]. The chosen architecture is based on the OGC standard in order to ensure the interoperability between the various measurement systems. This concept is extended to the notion of physical models. The last but not the least main objective of this project is to explore the feasibility and the reliability to deploy mathematical models and process a large amount of data using the GPGPU capacity of a dedicated computational cluster, while studying OGC standardization to those technical concepts.

### References

- [1] M. Proto et al., « Transport Infrastructure surveillance and Monitoring by Electromagnetic Sensing: the ISTIMES project », *Journal Sensors*, Sensors 2010, 10(12), 10620-10639; doi:10.3390/s101210620, December 2010.
- [2] J. Dumoulin, A. Crinière, R. Averty ,” Detection and thermal characterization of the inner structure of the “Musmezi” bridge deck by infrared thermography monitoring “,*Journal of Geophysics and Engineering*, Volume 10, Number 2, 17 pages ,November 2013, IOP Science, doi:10.1088/1742-2132/10/6/064003.
- [3] J Dumoulin and V Boucher; "Infrared thermography system for transport infrastructures survey with inline local atmospheric parameter measurements and offline model for radiation attenuation evaluations," *J. Appl. Remote Sens.*, 8(1), 084978 (2014). doi:10.1117/1.JRS.8.084978.
- [4] V. Le Cam, M. Doehler, M. Le Pen, L. Mevel. “Embedded modal analysis algorithms on the smart wireless sensor platform PEGASE”, In Proc. 9th International Workshop on Structural Health Monitoring, Stanford, CA, USA, 2013.
- [5] M. Zghal, L. Mevel, P. Del Moral, “Modal parameter estimation using interacting Kalman filter”, *Mechanical Systems and Signal Processing*, 2014.