

Abstract

Cyber-Physical Systems (CPS) have become one of the greatest research topics today; because they pose a new complex discipline, which addresses big existing and future systems as the Internet, the Internet of Things, sensors networks and smart grids. As a recent discipline, there are many possibilities to improve the state of the art, interoperability being one of the most relevant.

Thus, this thesis has been created within the framework of interoperability for CPS, by using the SOS (Sensor Observation Service) standard, which belongs to the SWE (Sensor Web Enablement) framework of the OGC (Open Geospatial Consortium). It has been developed to give rise to a new line of research within the Distributed Real-Time Systems and Applications group (SATRD for its acronym in Spanish) from the Communications Department of the Polytechnic University of Valencia (UPV for its acronym in Valencian).

The approach, with which the interoperability in the CPS has been addressed, is of synthetic type (from parts to whole), starting from a verifiable and workable solution for interoperability in sensor networks, one of the most significant CPSs because it is integrated in many other CPSs, next adapting and testing the solution in more complex CPS, such as the Internet of Things.

In this way, an interoperability solution in sensor networks is proposed based on the SOS, but adapted to some requirements that makes of this mechanism a lighter version of the standard, which facilitates the deployment of future implementations due to the possibility of using limited devices for this purpose. This theoretical solution is brought to a first implementation, called SOSLite, which is tested to determine its characteristic behavior and to verify the fulfillment of its purpose.

Analogously, and starting from the same theoretical solution, a second implementation is projected called SOSFul, which proposes an update to the SOS standard so that it is lighter, more efficient and easier to use. The SOSFul, has a more ambitious projection by addressing the Internet of Things, a more complex CPS than sensors networks. As in the case of the SOSLite, tests are performed and validation is made through a use case.

So, both the SOSLite and the SOSFul are projected as interoperability solutions in the CPS. Both implementations are based on the theoretical proposal of a light SOS and are available for free and under open source licensing so that it can be used by the research community to continue its development and increase its use.