



## Event Detection in Water Resource Management Applications

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In water resource management the monitoring of certain, potentially critical parameters is a central requirement. This might comprise parameters such as water level, discharge, rain fall but also parameters related to water quality. Concepts such as spatial data infrastructures (i.e. the European INSPIRE directive and its Technical Guidance) and interoperable Sensor Web technologies (e.g. OGC Sensor Web Enablement and WaterML 2.0) help to build efficient systems for managing, sharing and monitoring any kind of geospatial observation data necessary for water resource management.

Until now, most of such infrastructures are still based on conventional pull-based communication models. This means that users have to explicitly request the data they are interested in and subsequently the corresponding data is delivered. However, this communication model has several drawbacks. On the one hand, users are not supplied with the latest measurements as soon as they are available. On the other hand a continuous polling of data is necessary in order to minimize the delay until a user receives the latest measurements. This may lead to high system and communication loads if many users are checking for data updates with a high frequency.

To overcome these issues, a paradigm shift from pull-based to push-based data delivery is a promising approach. This means that data is immediately actively delivered to users and applications as soon as it is available. An important technological foundation for this is the OGC Publish/Subscribe standard.

Within our contribution we will introduce the development of a new generation of event-based Sensor Web components performed as part of the WaCoDiS research project (<https://wacodis.fbg-hsbo.de/en/home-2/>). This comprises the following results:

**Eventing API:** The OGC Publish/Subscribe standard defines at the moment only a binding for rather heavyweight XML-based communication. We will introduce a complementary REST and JSON binding of the OGC Publish/Subscribe standard that has been developed as a lightweight Eventing API. This Eventing REST API provides means to subscribe to sets of so called event rules which bind receivers of notifications to user-defined conditions for specific phenomena at given measuring stations (e.g. change of gauge above/below a threshold, sensor failure).

**Event Detection:** Besides the subscription to user-defined events it is also important to analyse incoming observation data streams for matching events. For this purpose we will introduce different possible solutions. This ranges from detection based on event stream processing tools to options how event detection can even be achieved within the data store. We will introduce typical solutions and discuss experiences which technologies are suited to which kind of scenario.

In addition, we will present different approaches how user applications may benefit from this kind of technology. This ranges from new visualisation tools to triggering complex workflows in case of specific events.