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Real-time Delivery of Sensor Data Streams using IoT and OGC Standards

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In the past, many projects have evaluated and demonstrated the use of the Sensor Web Enablement (SWE) Standards of the Open Geospatial Consortium (OGC) in order to publish sensor data. Advantages of these standards included the provision of a domain-independent approach for ensuring interoperability of interfaces, data, and metadata. However, in most cases, the developed infrastructures were limited to pull-based data retrieval patterns. This means that data consumers regularly query servers for data updates which may result in high server loads due to a high-frequency of update requests or increased latencies until a consumer receives new sensor data.

Although there were relevant specifications such as the OGC Publish/Subscribe standard as well as discussion papers, the OGC SWE framework never included a widely accepted solution to handle an active push-based delivery of observation data. With the adaptation of the SensorThings API standard of the OGC in conjunction with mainstream Internet of Things protocols such as the Message Queuing Telemetry Transport (MQTT) protocol this has changed in recent years.

In 2020 we have already presented at the EGU an approach on how to use these technologies to enable the efficient collection of sensor observation data in hydrological application by bridging between sensors and data management servers (Drost et al., 2020).

As part of this contribution, we will discuss the applicability of these technologies, OGC SensorThings API as well as MQTT, to also cover the delivery of data to consumers in addition to the previously described data transmission from sensor devices to a data sink. We will put special emphasis on experiences gathered from the deployment in marine environments (e.g., live underway data and event metadata streams of research vessels), as part of the EMODnet Ingestion II project. Special consideration will be given to a discussion of potential advantages of push-based communication patterns as well as identified challenges for future work (e.g., metadata about push-based data streams, standardization of payloads, access control, best practices on how to structure provided data streams).

Furthermore, we will address the development of data visualization tools for such interoperable real-time data streams and will discuss the opportunities to transfer these technologies to further application domains such as hydrology.

References

Drost, S., Speckamp, J., Hollmann, C., Malewski, C., Rieke, J., & Jirka, S. (2020). Internet of Things Technologies for the Efficient Collection of Hydrological Measurement Data. EGU General Assembly 2020, Online. https://doi.org/10.5194/egusphere-egu2020-10452