

A Semantically Enriched Hypercat-enabled Internet of Things Data Hub

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Abstract. A huge amount of information is generated from the rapidly increasing number of sensor networks and smart devices, generating and publishing information in multiple formats, thus highlighting interoperability as one of the key prerequisites for the success of the Internet of Things (IoT). The *BT Hypercat Data Hub* provides a focal point for the sharing and consumption of available datasets from a wide range of sources. In this work, we present a semantic enrichment of the data hub, using a number of widely-used Semantic Web standards and tools.

1 BT Hypercat Data Hub

Developing successful IoT solutions requires the collection and maintenance of a wide range of heterogeneous IoT data. In this work, we describe the basic components of the *BT Hypercat Data Hub*, which aggregates and catalogues multiple IoT data sources and exposes them via a uniform RESTful API. For more details readers are referred to [1]. Figure 1 presents a high level hierarchy of the developed system, more specifically:

- The *BT Hypercat Ontology* enables the publication of an RDF-based Hypercat catalogue [2] as well as the translation of data stored in a relational database into RDF format.
- *RDF Adapters* provide internally stored data in N-Triples format following a systematic generation of URIs.
- A *SPARQL to SQL* endpoint enables the dynamic translation of SPARQL queries into SQL queries, using Ontop³.
- The *BT SPARQL Endpoint* queries internally available *SPARQL to SQL* endpoints and combines SPARQL results, using Apache Jena⁴.
- Federated querying is enabled by providing a Jena endpoint that allows federated queries over the *BT SPARQL Endpoint* and SPARQL endpoints that are available through the Linked Open Data cloud.

³ <http://ontop.inf.unibz.it/>

⁴ <https://jena.apache.org/index.html>

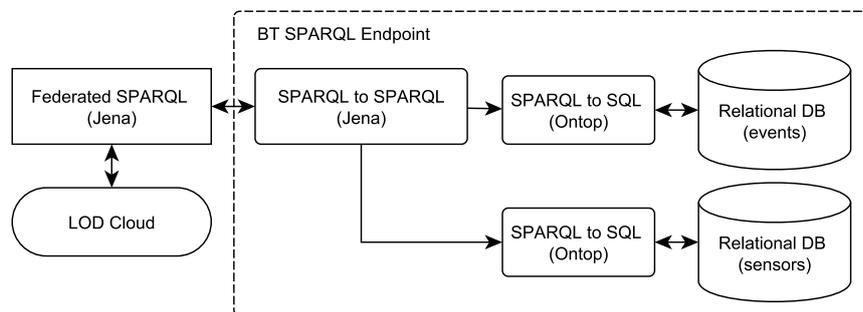


Fig. 1. High Level Hierarchy.

The system has been successfully deployed as part of two use cases. The *SimplifAI* project is aimed at urban traffic management and control in order to reduce traffic and improve air quality. The *BT Hypercat Data Hub* was utilized for automated semantic enrichment of imported IoT data. In addition, *City Concierge* is a use case of the *CityVerve* project aiming to increase uptake of walking and cycling as a preferred travel mode in Greater Manchester. The data hub provides the required infrastructure and functionality in order to enable the City Concierge through the aggregation and exposure of city IoT information.

2 Conclusion

The semantic enrichment of the *BT Hypercat Data Hub* has been presented. Future work includes further semantic enrichment by enabling GeoSPARQL queries. In addition, spatiotemporal reasoning is a prominent direction that could provide richer knowledge by combining data coming from both the *BT Hypercat Data Hub* and the LOD cloud.

References

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2. Ilias Tachmazidis, John Davies, Sotiris Batsakis, Grigoris Antoniou, Alistair Duke, and Sandra Stincic Clarke. Hypercat RDF: Semantic Enrichment for IoT. In *Semantic Technology - 6th Joint International Conference, JIST 2016, Singapore, Singapore, November 2-4, 2016, Revised Selected Papers*, pages 273–286, 2016.