RWTH AACHEN UNIVERSITY

E.ON Energy Research Center
ACS | Institute for Automation of Complex Power Systems

Hiwi Position:

Data Integration with Ontology on the Fiware IoT platform

Context:
Ontology is one of the driving forces behind sematic interoperability and this enables Data Integration in information systems or energy platforms. Working with context information from various sources, and different standards regarding transport and format messaging protocols means that data or information often pass through automated data streaming and data flow systems like Kafka and Nifi respectively.

Now to carry out prior analytics in achieving a platform of trust and a factual ground truth for the purpose of data quality in artificial intelligence tasks like Planning, Reasoning and Machine Learning in hybrid AC/DC Power and Energy Systems, managing data from the point of production to the point of consumption is of utmost importance. These data could be unstructured, semi-structured or structured data.

Data from this devices traverse through smart systems with components like Fiware-based Context Brokers (Orion, Scorpio or Stellio) while updating and querying data in storages like MongoDB, CrateDB, Neo4J, RDF4J or Ontology based RDF Triple Store, depending on the data being handled and the application purpose or use case scenario.

During research projects, and to provide easy Interface for Device Provisioning and Management as is typical with most IoT architecture, Automation of Complex Power System developed a Building and Grid ontology, **SARGON** [1], for semantic interoperability and **ENTIRETY** to serve as an interface to manage some of this component as shown in the figure below. Entirety with the Fiware platform will also integrate other developed Simulator

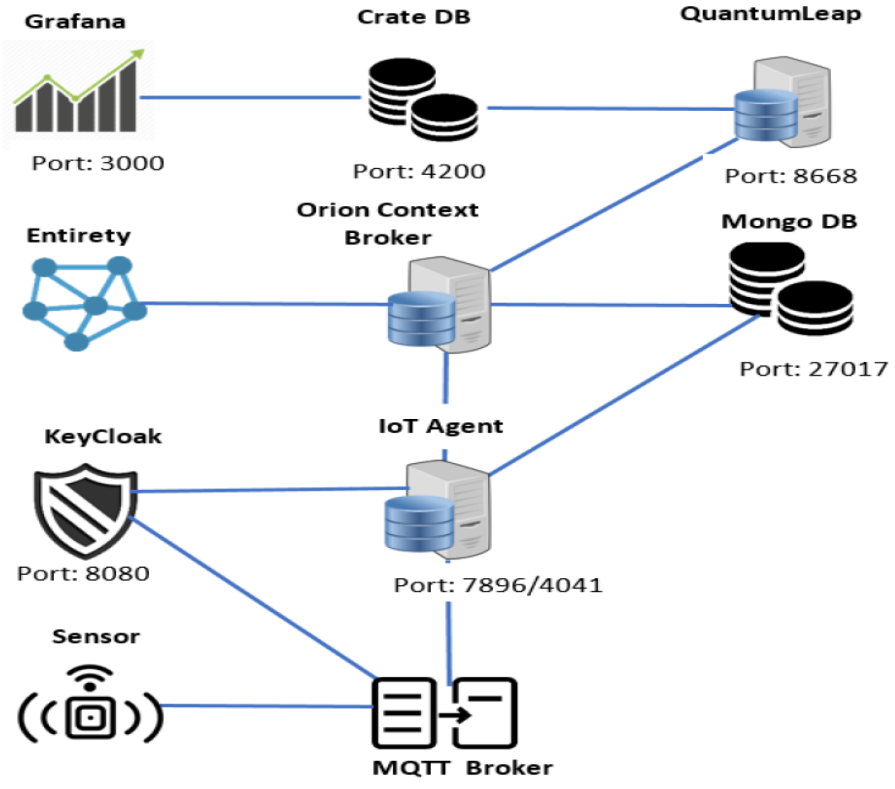

Image Source: HYPERRIDE_D5_2_FIWARE_IoA_Agent_based_Sensing_and_Monitoring_infrastructure_layer deliverable

Your Tasks:
The key elements of the work will be:

- To setup the Fiware platform with Entirety and KeyCloak on the OpenStack Cloud using the Docker Images of these components and manage them using Docker Compose, Portainer or Kubernetes.
- To integrate grid components to the above platform through the IoT Agents with mqtt (using mosquito for NGSI-V2 implementation) or Kafka (using Kafka for NGSI-LD implementation) or http with the measured data from the sensors and commands to the actuators.
- To implement the data model on the MongoDB for the Context Element and the time series data on the CrateDB in preparation of data from field devices and software simulators of the AC/DC grid.
- To harmonize the data from various field devices and software simulators of the AC/DC grid using the data model (Fiware Smart Data Model) and ontology (Sargon and Hadgo).
- To sense pilot data from the field devices and software simulators and monitor these data using Grafana.
- Prepare high-level documentation regarding the developed platform for different use case scenarios in an AC/DC power project.

Your Profile:
We are looking for a student assistant with the following qualifications:

- Above-average academic performance, quick comprehension and ability to work with minimum supervision.
- Ability to work with Containers on virtual environment like OpenStack running on Linux Ubuntu VM with Docker, Docker-Compose or Docker-Stack and managed with Portainer and yaml files.
- Familiar with IoT technology and the use of mqtt with mosquito client/broker from Eclipse with IoT Agents.
- Strong programming knowledge with either Python or Java is a must.
- Ability to work with Kafka, Apache Nifi, MongoDB and CrateDB database is necessary while ability to work with any of Fiware's Context Broker with RDF Triple store or Neo4J database is not mandatory.

Our Offer:
The position, to be filled as soon as possible, is limited to 3 months, with possibility of extension based on the student assistant's performance. The regular weekly working time is 8 hours.

Take Note:
You will be highly assisted in the "**Your Task"** item above as long as you demonstrate the skill sets in the "**Your Profile"** points above. The supervision will be done in English. If you are interested in the advertised position, please send your application documents to the email contact below including a motivation letter, CV and current grades.

References:
[1] Maliheh Haghgoo, Ilya Sychev, Antonello Monti and Frank H.P. Fitzek . 2021. "SARGON – Smart energy domain ontology" IET Smart Cities, 2020, Vol. 2 Iss. 4, pp. 191-198.
[2] https://github.com/N5GEH/n5geh.tutorials.from_sensor_to_application.

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