FIESTA-IoT: Federated Interoperable Semantic Internet of Things (IoT) Testbeds and Applications

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Abstract. The EU FIESTA-IoT (Federated Interoperable Semantic IoT Testbeds and Applications) project works towards the integration of Internet of Things (IoT) data platforms, testbeds and associated silo applications and addresses semantic interoperability issues at hardware, data, model, query, reasoning, service/application and applicative domain levels. FIESTA-IoT is reusing previous and ongoing EU project outcomes already integrating semantic web technologies.

1 FIESTA-IoT Activities and Goals

The EU FIESTA-IoT[1] project comprises 14 partners and integrates previous and ongoing EU projects already using semantic web technologies such as OpenIoT, Citypulse, VITAL, Spitfire, IoT-est, IoT-A, IoT6, iCore, Sensei, etc. FIESTA-IoT is also based on the outcome non-semantics-based IoT projects such as the SmartSantander EU project which deploys 20 000 sensors.

FIESTA-IoT addresses semantic interoperability issues at seven levels. **Hardware level** provides semantics-based middleware (e.g, EU OpenIoT project[2]) to handle heterogeneous hardware devices. **Data level** unifies data produced by devices from different cities and projects by semantically annotating data. **Model level** aligns existing IoT ontologies to ensure better interoperability. **Query level** queries unified knowledge bases (ontologies and datasets). **Reasoning level** unifies the way to deduce meaningful information from sensor data to avoid redundancy of "if then else" rules constantly redesigned in all IoT applications [1]. **Service/Application level** brings the innovative idea of "Experimentation-as-a-Service (Eaas)" from the Cloud Computing Stack [2]. EaaS is built on top of "Linked Open Services" inspired from the Linked Data approach and is currently extended to the IoT domain [3]. **Applicative domain level** builds cross-domain applications/vertical applications [4] to interconnect and reuse current domain-specific/horizontal applications (e.g., smart home).

[2] http://www.openiot.eu/

Based on the lessons learnt to overcome semantic interoperability issues, a methodology to has been designed, called SEG 3.0 methodology, [3] and is being applied to FIESTA-IoT. A semantic engine following this methodology has been designed for IoT and related topics such as Web of Things [5] [4]. This methodology is generic enough to be reused in other domains than IoT and by other EU projects addressing interoperability issues from data to application levels. To ensure that the methodology is correctly supported, a validation process is currently designed [6].

FIESTA-IoT is starting the second year and demos[3] will be provided illustrating the way it addresses the interoperability issues explained above. FIESTA-IoT is also disseminating the outcomes in standardization such as ETSI M2M, oneM2M, W3C Web of Things and W3C Semantic Sensor Networks (SSN). W3C SSN has been designed by the semantic web community but it is not enough exploited within the IoT community. Sharing the IoT experience and the difficulties encountered to use semantic web technologies (e.g., the W3C SSN ontology) would benefit the semantic web community. The FIESTA-IoT project will benefit from this event by learning new semantic web tools and methodologies that could be applied or extended within the project.

References

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₃ http://fiesta-iot-tools.appspot.com/