Semantic Interoperability Issues and Approaches in the IoT.est Project

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Consortium

- 8 partners, 7 countries
  - Industry: PTIN, ATOS, SIE
  - SME: TT, AI
  - Research Centre: NICT
  - Higher Education: UNIS, UASO

- Project Lead: CCSR, University of Surrey

- Duration: 36 months
IoT.est – a quick snapshot

• IoT.est will develop a test-driven service creation environment (SCE) for Internet of Things enabled business services.

• The SCE will enable the acquisition of data and control/actuation of sensors, objects and actuators.

• The project will provide the means and tools to define and instantiate IoT services that exploit data across domain boundaries;

• IoT.est will facilitate run-time monitoring and will enable autonomous service adaptation to environment/context and network parameter (e.g. QoS) changes.
IoT.est: The Key issues

• IoT enabled Business Services: **Machine interpretable (semantic) descriptions**

• Service Composition: **A Knowledge based approach**

• Service Components: **Re-usable, interoperable and adaptive**

• Abstraction: **Mapping to heterogeneous platforms and large scale deployment**

• Testing (Design Time): **Automated generation of tests**

• Monitoring (Run-Time): **Context-aware service adaptation**

• **This requires**: machine interpretable description + interoperable domain knowledge + automated discovery and composition, reasoning and decision making
(1a) Semantic and data models in IoT.est

- **Service model**
  - IoT.est service model, IoT-A service model, OWL-S

- **Entity and resource models**
  - IoT models, W3C SSN

- **Test models and Test component descriptions**

- **Common models and knowledge-based to describe the domain knowledge (e.g. LOD)**
  - Linked Sensor (IoT) data approach
(1b) Applications to use and/or need for semantic modeling practices

• Linked data approach
  – using URI’s as names for things;
  – using HTTP URI’s to look up those names;
  – providing useful RDF information related to URI’s
  – including RDF statements that link to other URI’s

• Access and discovery mechanisms and interfaces
  – Logical reasoning and querying large scale data

• Ontology alignment and ontology mapping
  – Semi-automated and manual alignment
  – Developing alignment and enhancement tools
(1c) Languages (formal/non-formal), Technologies (toolkits, SW tools), protocols enabling semantic interoperability

- RDF/OWL representations
  - We are also investigating alternative representation and reasoning mechanisms for constrained environments (e.g. Binary RDF, IETF approach)

- Ontology design tools
  - Protégé

- Common Interface and access end-points
  - Standard interface and service models (e.g. OGC SoS, SPARQL end-points, etc).

- Ontology mapping and alignment
  - Ontology engineering phase
  - Automated tools
(1d) Possible contributions/inputs to AC4

• Comprehensive semantic models for IoT
  – Integrated service, entity, resource models
  – Test models and test components
• Alignment tools and reference models
• Practical uses-case and methodology to create linked IoT data.
References for semantic interoperability


IoT.est project: Internet of Things Environment for Service Creation and Testing

http://ict-iotest.eu/iotest/