Semantic technologies for the IoT
– an Inter-IoT perspective –

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The Internet of Things
IoT silos problem

source: www.digikey.com
“the extent by which two implementations of systems or components from different manufacturers can co-exist and work together by merely relying on each other's services as specified by a common standard.”

Tanenbaum, Van Steen
"Distributed Systems", 2001
Semantics

- **Tagging vs ontologies**
  - *tag* – marker, id, e.g., RFID
  - *ontology* – “formal specification of shared conceptualization”

- **Semantic data representation and processing**
  - semantic *annotations*
  - semantic *linking*
  - knowledge *inference*
The quest for the holy grail...
Inter-IoT Project

interiot

interoperability of heterogeneous IoT platforms
Semantic interoperability

- **Aims and means**
  - meaningful & actionable data
  - querying, reasoning & knowledge extraction

- **Benefits**
  - shared understanding
  - effective data access
  - resource/service discovery
  - seamless integration
Semantics sensors

- **W3C SSN ontology**
  - needs units, location & feature ontologies

- **OpenIoT ontology**
  - W3C SSN extension
  - Linked Sensor Data
  - mobile sensors covered
  - cloud integration
  - data privacy & security
(m/e)-Health

- Main applications of e-Health
  - medical data management
  - medication management
  - patient monitoring
  - telemedicine services

- m-Health
  - utilization of mobile devices
Notable semantic contributions

- vocabularies & taxonomies: SNOMED CT, ICDx
- standards & ontologies
  - Open Biomodical Ontologies
  - OpenEHR
  - CEN/ISO EN13606
- data interoperability
  - HL7: v3, SAIF, FHIR
Transportation & logistics

- **OTN** (Ontology of Transportation Networks)
  - top-level, describing general notions
  - based on Geografic Data Format OWL ontology
- **InterLogGrid** (Logistic Grid Ontology)
  - developed within LOGICAL project
  - service-oriented approach to logistics
- **LogiCO** (Logistics Core Ontology)
  - developed within iCargo and CASSANDRA projects
  - extensions: LogiServ & LogiTrans
Summary

• **Interoperability** between *heterogeneous* IoT platforms
  – needs semantic approach

• **Semantic technologies** still used rather sparingly
  – more promising than in the case of WEB

• **Inter-IoT**: two main application domains
  – (m/e)-Health & transportation and logistics
  – several standards and ontologies worth noting
  – semantic interoperability