

# WISHI Research Agenda

## Modeling Data and Interaction

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# Background and Terminology

- What do we mean by modeling Data?
  - Semantic models and structural models
  - Model the state of a system or element
  - Describe the important qualities of the data
- What do we mean by modeling Interaction?
  - Semantic models as a counterpart to Data Models
  - Model the state change of a system or element
  - Describe the important qualities of the state change
  - State changes go in both directions
  - State changes may occur at unplanned times
  - IoT interaction models are affordance models

# Interaction and Affordances

- REST is a simple interaction model that enables state changes to be orchestrated in both directions
- Connecting physical things introduces the need to model and describe physical state changes
- Broad categories of affordances to these physical state changes are modeled
  - Example: Events, Actions, Properties
- The semantics of the affordances connect to the semantics of the data
  - *set the temperature, lock the door*

# Existing Documents

- TBD
- <https://tools.ietf.org/id/draft-iab-iotsi-workshop-02.html>

# Existing SDOs and venues

- Open Connectivity Foundation
  - Resource type definitions, oneiota tool
- Zigbee Alliance
  - Publishes definitions for the ZCL/dotdot models
- Bluetooth SIG
  - New Mesh data models, published definitions
- OMA
  - LWM2M and IPSO Objects
- OneM2M
  - Semantic models for connected things

# Arch-SDOs

- Common formats to normalize existing definitions
- Liaison and community collaboration
- One Data Model
  - Collaboration of existing SDOs
  - Common device level models
- Schema.org extensions for IoT (iotschema)
  - New W3C Community Group
  - Git repo with examples
  - Focus on domain experts

# Other Activities

- Standards for describing parts of an automobile consolidating around GENIVI/VSS
- Standards for describing connected buildings and HVAC systems consolidating around Haystack and the BRICK model
- These can connect to the sensing/actuating models being developed by One Data Model and iotschema
- We don't need to model a car door as a class of device just because it has sensors and actuators

# Research Questions - Architecture

- How can we semantically connect sensing and actuation models to feature models?
- How can we express the modeled affordances in hypermedia controls?
  - How does the modeling need to accommodate the hypermedia annotation?
  - How do the hypermedia controls for data differ from those for interaction
- What do the programmatic APIs look like?
- How are models used in application workflows?



# Research Questions - Modeling

- How can Semantic Modeling be standardized?
- How do models evolve?
- How do modeling languages evolve?
- How do languages and tools promote reuse and evolution of models?
- What is the balance between normalization and adaptation?
- How do the language and tools enable the balance between normalization and adaptation

# Next steps for T2TRG

- Get ahead of the commercial efforts that address semantic interoperability – look at the gaps and opportunities – some ideas:
  - Standardized hypermedia patterns for semantic annotation – integrated interaction models with REST
  - Programmatic and reactive APIs for semantic hypermedia based systems – beyond Node-RED
  - Rich feature descriptions as part of semantic annotation
  - Discovery integration with semantic annotation – actionable semantic lookup in directories
  - Create a testbed for semantic modeling of data and interactions