



# Communicating the Semantics of Resources in Networked Control Systems

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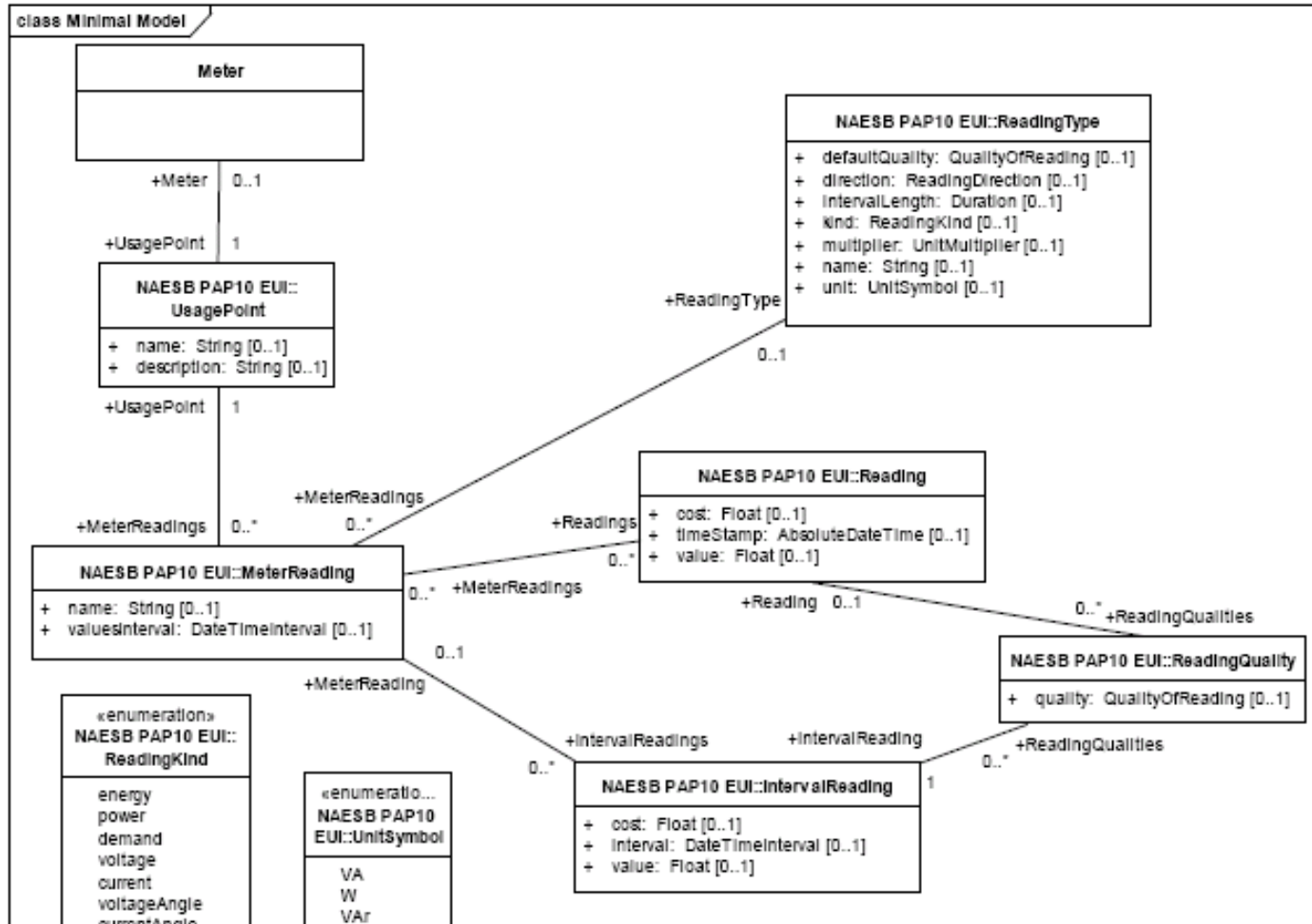
- Integration of previously unconnected systems
  - Example: energy service provider to customer's energy management system or to individual systems/devices
- Within the Customer domain...
  - Customer's energy management system communicates with various customer-owned control systems and devices

- A “large” customer could have numerous control systems that affect energy consumption:
  - HVAC control system
  - Lighting control system
  - Process control system
  - Central plant control system
  - IT systems
  - Future: PEV charger control system?

- Need to facilitate the configuration of interfaces between systems
  - Often difficult and expensive!

- Semantic interoperability requires that communicating parties share an understanding of the meaning of the data being communicated
  - Example: Power
    - (Net? Forward? Reverse? Peak? Apparent? Reactive? ...)

- Abstract information models are a means for achieving semantic interoperability
  - May be designed to satisfy a set of requirements
- Some examples of standard models:
  - Common Information Model (CIM)
  - Facility Smart Grid Information Model (under development by ASHRAE and NEMA)
  - Weather Exchange Model (WXXM)



From ASHRAE 201 Draft Standard Rev. 740

- How can we apply information models to in order to facilitate the configuration of interfaces between systems?
  - Implement information model components and definitions within control network protocols
  - Develop methods for describing the data in existing control systems with reference to information models



- Many existing control network protocols lack (sufficient) metadata functionality
  - Example: Modbus
- Information model of an installed system may be difficult to determine

- Within a control network protocol:
  - Semantic tags that decorate data
  - Object types that directly correspond to model components
  - Semantic directories
- Outside of a control network protocol:
  - Structured document that attaches semantics to protocol data items

- Accompanying paper:
  - “Communicating the Semantics of Resources in Networked Control Systems” by Jim Butler

- GridWise Architecture Council, "GridWise Interoperability Context-Setting Framework, v. 1.1," 2008.  
[http://www.gridwiseac.org/pdfs/interopframework\\_v1\\_1.pdf](http://www.gridwiseac.org/pdfs/interopframework_v1_1.pdf)
- Bushby, Steven T., "Information Model Standard for Integrating Facilities with Smart Grid", ASHRAE Journal, November 2011, pp. B18-B22.  
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