YANG, CoMI, COOL: Managing IoT in a mostly RESTful way

Managing the IoT

- Dichotomy “managed” and “unmanaged”
  - “managed” = enterprise, “unmanaged” = home
  - i.e., do you have a sysadmin?
- Both need to be managed…

The car shop analogy

- People used to fix their cars themselves
    - Car shops were only used for the heavy lifting
- Home IoT environments always need heavy lifting
- Rent seeking by IoT vendors (who gets to receive the recurring income and “own the customer”)
- Design for choice (technologies, operators)

Mediating Management

- Much management will be from smartphone apps
- Can vendor A product be managed from vendor B app?
  - What is A's **incentive** to enable this?
- (Bonus problem: firmware updates.)
  - (Add in safety liability.)

How can B manage A?

- Standardization of all things management
- Powerful discovery
    - Talk about security some more tomorrow

What are the obstacles?

- Management requires swarm of things alike
  - Complex set of properties may need to be managed in unison
- Management always has used SMI/YANG
- Dynamic discovery can be slow
- Reducing pre-knowledge requires bits in the air

COMI approach

- Use RESTCONF with optimizations:
  - Use CBOR to represent the management information (as opposed to XML or JSON)
  - Use compact identifiers

Compact Identifiers

- RESTCONF original: text labels
- COMI approach: hash the labels into 30 bits
  - needs collision handling (mostly client complexity)
- COOL approach: “manage” the label IDs
  - “SID”, Structure Identifier,
    amenable to delta compression
  - Use automation to generate numeric SID from spec
  - Needs registry-like mechanism, at least for generic YANG specs

Collection interfaces

- Management items come in large sets
- Retrieve as a collection, with values inside
- Collection URIs vs. member URIs — client-side arithmetic?
- Observe?
    - Would be nice to have a delta or PATCH observe

Data formats for efficient dynamicity

- HTML manages links as well as embedded content (to some extent)

- Can we do something similar for the Things?