

Transfer-of-Ownership Considerations for “Things”

Standardization & Industry Department

Barry Leiba

www.huawei.com

HUAWEI TECHNOLOGIES CO., LTD.



Terminology, for a second...

- What prompted this discussion came up in the IRTF Thing-to-Thing Research Group (T2TRG). So, “T2T”.
- W3C has the Web of Things Working Group. So, “WoT”.
- We’ve called this stuff the Internet of Things for some time in many contexts. So, “IoT”.
- In the IETF we have “Constrained Environments”. So, well...
- Heck with it: Henceforth, “**IoT**”, just to pick a consistent term.

The Issue: Transfer of Ownership

- The T2TRG session in Chicago had a breakout discussion about what the IoT issues are in selling a house – a smart house – with lots of devices/”things”
- The discussion got less into the issues themselves and more into figuring out how much more complicated the question is than it appears on the surface
- So, let’s look first at some scenarios and then at the issues those scenarios raise, and figure out the complications that arise...
- ...and then ask the question: Do we have the concepts, abstractions, and structures to deal with these sorts of questions?

Starting Point: A “Smart House”

- With Smart Owners, perhaps? Let's assume they at least have devices such as smart phones, smart watches, tablets, etc.
- Let's assume there are some smart cars involved.
- Populate the house with smart appliances and such:
 - Thermostat, light bulbs [and what else?]
 - Refrigerator, television [and what else?]
 - Toaster, coffee maker, alarm clock [and what else?]
 - Alarm system...

What Scenarios?

- Simple house sale: I sell my smart house to you, and I move somewhere else.
- My son Bob goes away to college.
- Bob finishes college, but his graduation is instead a wedding, and the couple moves back in with us.
- Lots of other scenarios possible:
 - We sell one of our cars (or our refrigerator, or...)
 - I get a new phone and give the old one to a friend.
 - ...and so on.

Why Is It Complicated? It Sounds Easy...

- Many Things involved
- Some Things are smarter than others (phone vs light bulb)
- Initial provisioning has to be easy for the homeowner... and handling these routing scenarios does too
- But some devices stay with the house, while others move way, so relationships among devices have to change
- And it all has to be relatively automatic, or at least automatic enough that my mother is likely to get it right when she sells her house

Simple House Sale

- What stays:
 - Thermostat, light bulbs, refrigerator
- What goes:
 - People, so phones, cars, watches, alarm clocks
 - Toasters, coffee makers
- Mutual assurance:
 - The seller has to be comfortable that the house has no access to him
 - The buyer has to be comfortable that the seller has no access to the house any more

Access?

- My phone can open the doors and control the lights, etc
- My car can open the garage and communicate with the house
- Alarm clock controls the coffee maker and the thermostat
- Refrigerator updates the grocery list on my phone
- Refrigerator display serves as a family bulletin board and collects calendar information
- Various things control and are connected to the alarm system
- How can we be sure all the tendrils are untwined?

Bob Goes to College

- Bob's alarm clock is no longer relevant to the house
- But his smart phone is: he still has to get into the house when he comes home with his laundry
- If he takes a car, maybe the car still opens the garage, but other communication with the car is no longer relevant
- In other words, Bob has been only partially disconnected from the house (as opposed to full disconnection via sale)
- So there are at least two levels of disconnection, which adds complication

Bob Gets Married...

- ...and Bob and his husband, Evan, move back here.
- We could partially disconnect Bob before, so it ought to be easy to reconnect those bits, but...
- ...now we have to add Evan to the house, and probably without disconnecting him from his parents' house
- And maybe we need to partially add Bob to Evan's parents' house too, so he can get in and maybe control some things

We Need a Control Panel?

- It's starting to look like what we need is a control panel
 - List all the Things and what they're connected to – which can control what and what is controlled by which
 - Do we think “edges and graphs”, or ordered lists of rules? Or something else?
- No, no, really: that is far too complex. My mother couldn't possibly deal with that.
- So what do we do? What abstractions are needed to start to think about programming this? What concepts? What actions? What data structures?

Are We Prepared?

- Discuss...

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