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BUILDING INTELLIGENCE — THE FIRST THINGS THAT MATTER IN THE INTERNET OF THINGS

By James H. Smith

The Internet of Things and, in particular, the availability of home automation, is beginning to affect each of us. In addition to managing high energy consumption for heating and cooling, access control, security, and life safety in both commercial and residential applications, connected widgets are having a dramatic impact on our lives, starting with our local indoor environments (homes, schools, offices, factories, etc.). Smart devices include baby monitors for infants, latchkey monitors for children, and systems that help the disabled and elderly continue to live in their own homes, with higher quality of life and less need for assistance from caregivers.

Home automation has been developing since 1885, when Albert Butz patented the furnace regulator and alarm — which became the company Honeywell. These systems evolved slowly over the next century but predominately remained as single purpose, stand-alone, dedicated control and reporting systems that were hardwired between fixed monitoring and control locations. As the Internet (and the concept of generalized connectivity) entered the picture in the 1980s and 90s, followed by the widespread adoption of mobility (i.e., smartphones, PDAs, tablets, laptops) in the 2000s, home automation systems began to slowly adopt IP-based communications, while also introducing the mobile handset as a tool for monitoring and controlling these systems. Today we are witnessing the interconnection and coordination of these systems.

The use of IP-based communications within each of these (previously) dedicated systems means that the coordination of systems is only a few lines of code and a quick modification to a firewall away from integrating information and control across these individual domains into a cohesive system.

My experience with smart buildings includes a beach house originally built in 1873 that now is bursting at the seams with IP-based networks such as GigE, Wi-Fi, Bluetooth, Z-Wave, and General Packet Radio Service (GPRS), the data service on GMS phones. For the first 137 years of its existence, the most sophisticated control system this house contained was a modern derivative of the furnace regulator developed by Butz — a two to four wire control system that closed an electrical circuit when the temperature dropped below a set level at a central monitoring point (called the thermostat) and closed a switch that activated the furnace. Access to the home was managed with the old style skeleton key in a mortised lock until it was replaced by a deadbolt in the 1970s. Remote

access control and monitoring were accomplished by neighbors or in-person visits from rental agencies and home watch companies well into the 2000s.

In the current decade, rapid changes have occurred. A residential home monitoring and control system from 2GIG provides HVAC control, access control, fire and burglar monitoring, and lighting control. It also monitors for unexpected events such as out-of-range temperatures (indicating the furnace is malfunctioning) and flooding (indicating a pipe has burst). The classic wired central station monitoring has been replaced by a cellular GPRS data connection that is accessible by the user not only at a dedicated control panel within the house but also from any web browser or smartphone. Calls from the central station have been replaced by SMS messages. In order to monitor these previously disparate systems, the control panel has interfaces not only for the conventional "wired" sensors but also for Z-Wave locks, lights, and thermostats; for ISM-band wireless security (doors and windows, motion, glass break, flood, etc.) sensors; and for cellular data (GPRS).

Visits by home watch companies have been replaced by a 2GIG system, monitoring various sensors within the house and an outdoor IP-based camera (which does double duty monitoring for storm damage and providing a view of the ocean to my desktop in Virginia). The rental agent distributing a physical key to the occupants has been replaced by a Z-Wave door lock and an access code. Instructions to turn the heat down and the A/C off when the occupants leave have been replaced by a set of Z-Wave thermostats interconnected with the alarm system so that temperatures adjust automatically depending upon the occupancy of the house. Simple coordination functions such as disabling the circulation fans within the HVAC system if a fire is detected within the house are also implemented. All of these control systems can operate independently (including battery backup) on the premises but they also report to a cloud-managed service over a GPRS cellular modem. The cloud service manages the rules that interconnect these systems and provides remote monitoring and access from web browsers and mobile devices.

Although most people only interface with a remotely managed system like this for a week's vacation, these systems are becoming ubiquitous and will have dramatic effects on all of us as we and our loved ones age.

Members of the Intelligence Community (IC), need to ask themselves how to prepare both defensively and offensively for the coming adoption of Building Intelligence. Classic "INT"s such as MASINT or SIGINT overlap the area of Building Intelligence. However, a new term such as BuildINT or IoTINT (for Internet of Things) would be more appropriate. Significant intelligence on patterns of life can be derived from access to the information flowing among these systems. Even if the information is protected by encryption, the timing, volume, and header information of these packets can be used to provide meaningful insights on patterns of life. Moreover, these systems are migrating towards cloud management, where the data is no longer confined to the premise, and the potential economical and societal benefits of centralized management need to be tempered by the security implications of the Cloud.

Perhaps some of these systems are already helping to manage your household or care for loved ones, giving you the opportunity to contemplate the future implications of this technology. My next venture into automated systems will start with a trip to the Apple Store for their new line of IP-connected light bulbs that change color based on the colors in photographs on your iPhone. I have no idea (today) of what real value a light bulb with an IP address has (except the cool factor), but perhaps you can start to imagine the intelligence applications of mauve vs. amber lighting changes. That's up to the reader. For now, I'm going to stare at the ocean feed at my desk and ignore the IP packets around me. Q

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