

Smart-Home Revolution

Connectivity is at the door.
Are you ready to let it in?

BY SEAN GROOM

Not long ago I ran into a friend who had recently purchased a vacation house. When he asked if I wanted to see it and then reached for his smartphone, I assumed I'd be swiping through a digital photo album. Instead, he showed me a live video stream from a series of cameras mounted in and around the house. We even zoomed in to view a fence-company estimator walking the property line.

With his vacation house located hours away in an isolated setting, my friend was anxious about security—not to mention the possibility of a water pipe breaking and leaking, undetected, for weeks. Rather than pay a security company to monitor the house, he installed a suite of smart-home products. With a couple of cameras, some radio-enabled switches and valves, an internet router, and a smartphone, he can monitor his property visually, turn fixtures on and off, and open

and close plumbing valves. If certain conditions at the house change, he gets a text alert.

Thanks to the Internet of Things (IoT), the smart home is in our midst. If you're not familiar with that phrase, here's a quick primer: The first version of the internet was about connecting computers to each other. The second version (2.0) was about social media—people connecting to one another. The latest version (3.0) is about connecting everything else—the Internet of Things.



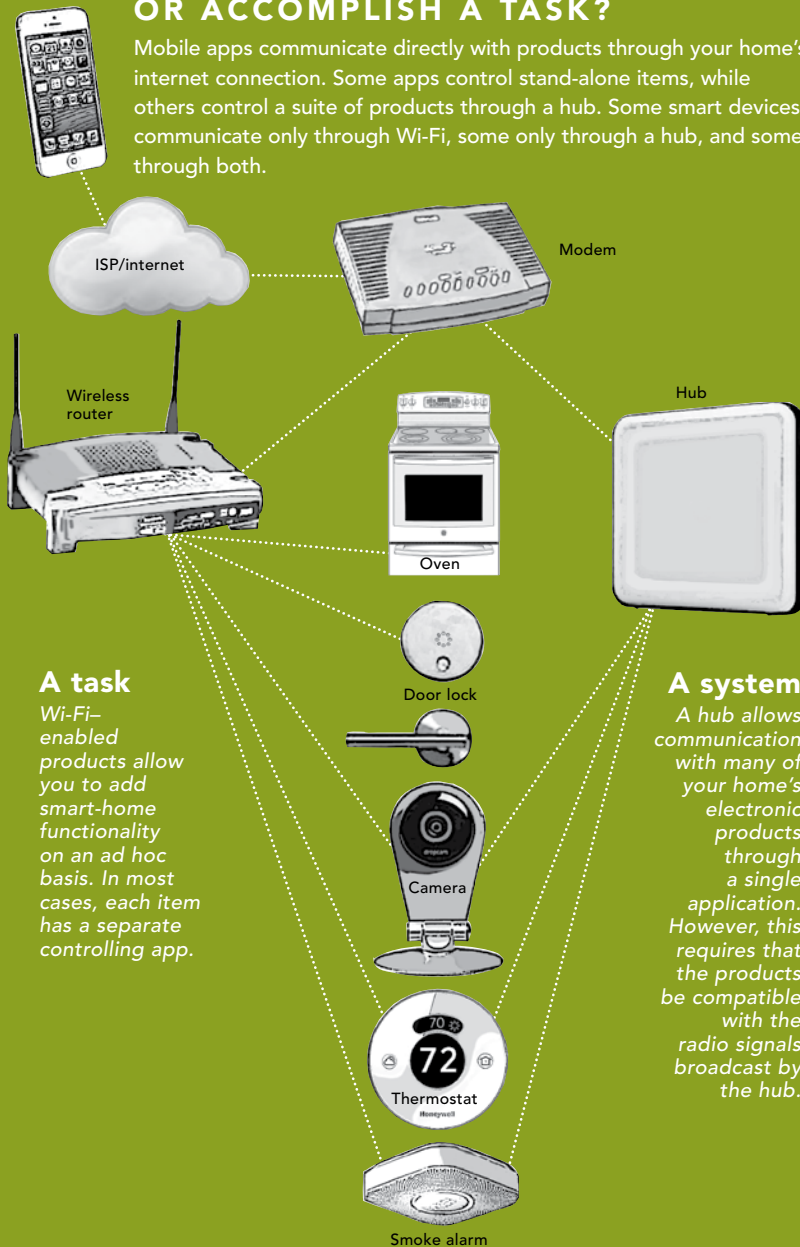
Not only did off-the-shelf home automation quiet my friend's concerns about leaving his second home unattended, but he was able to set up the system without much trouble. He is, however, a highly skilled software developer. For early adopters like him, the much-vaunted smart home has arrived. What about for the rest of us?

What makes a house smart?

At its most basic, a smart home is about connecting household products to your home's wireless

DO YOU WANT TO BUILD A SYSTEM OR ACCOMPLISH A TASK?

Mobile apps communicate directly with products through your home's internet connection. Some apps control stand-alone items, while others control a suite of products through a hub. Some smart devices communicate only through Wi-Fi, some only through a hub, and some through both.



A task

Wi-Fi-enabled products allow you to add smart-home functionality on an ad hoc basis. In most cases, each item has a separate controlling app.

A system

A hub allows communication with many of your home's electronic products through a single application. However, this requires that the products be compatible with the radio signals broadcast by the hub.

network so you can change settings remotely using an app loaded on your smartphone or tablet. (Most smart-home apps are optimized for mobile devices rather than computers.) Some apps communicate only with a particular fixture or suite of products; others work with a hub, a sort of router that connects all your smart products (see "Hub systems control multiple fixtures," pp. 40-41).

This technology controls new, "smart" electronics and appliances with a radio receiver built in, or old-fashioned "dumb" products plugged into a radio-enabled adapter that communicates with the app on your phone or tablet through your Wi-Fi network or through a hub.

Controlling your lights directly from your smartphone won't necessarily make your life easier, though. A step up from simply turning electrical fixtures on or off is to create combinations of these on/off settings and save them as "scenes" on your controlling device. As you sit down to watch a movie, you might pick up your tablet, open your home-automation app, and select the scene for "movie" to automatically dim the lights, lower the shades, adjust the temperature, and set the volume on the sound system. Your tablet is still acting as a simple on/off remote, but with specific actions grouped under one click.

A true smart home, though, is anticipatory, triggering specific actions based on specific conditions. A simple example of this is called geofencing, which uses the GPS signal from your device to detect proximity and to activate certain products accordingly (see "Geofencing," bottom left). Anticipatory actions can also be created with conditional operations called "robots" or "recipes" set up within an app that follows the formula "If X, then Y." This means, for example, that you can program your coffeemaker to start brewing when movement is detected in your bedroom between 6 a.m. and 7 a.m., when you normally get up. Or you can program your porch light to glow blue when there's mail in the mailbox.

Smart-home devotees have been immensely creative in this realm, and there are websites for sharing these applications. The most popular is IFTTT.com, which gets its name from the phrase "If this, then that." It offers thousands of downloadable apps for a wide variety of uses. These scenarios can link home products to each other or to events in the online world. You might use an IFTTT code to flash the lights in your house to alert you that the oven timer has gone off, or to change color if your spouse sent you an email or if your football team has scored.

Enter the age of DIY automation

For decades, we'd been told that the automated house of the future was just around the corner—and each year's new technology left us underwhelmed. Just five years ago, home-control products weren't particularly user-friendly or useful. You could have a smart house, but that typically meant paying someone to spend hours programming a complicated remote to change lighting scenes and control audiovisual equipment. One high-end homebuilder I spoke with says that several of his compa-

GEOFENCING

Geofencing applications trigger products based on location, requiring no action from the user. The geofence "tag" can be a smartphone, a fob, or a wearable device. As technologies get more advanced, geofencing will allow a smart-home network to track you through the house and adjust lights, temperature, audio, and other settings as you move from room to room. Industry watchers say that the new beacon technology in the iPhone 6 will bring in-home tracking to smart-home devices.

7 miles away A geofence application switches on your heating or cooling system to make the house comfortable for your arrival.



At the door A key fob on a child's backpack unlocks the front door and sends an email telling parents that the child is home.



In the driveway Lights turn on and the garage door opens as you approach.



APPROACHABLE PLUG-AND-PLAY PRODUCTS

Stand-alone systems focus on solving a specific problem or performing a specific task.

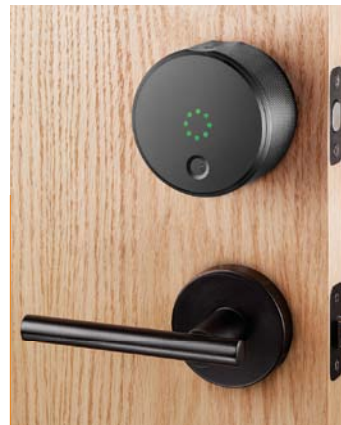


Lyric thermostat

With Honeywell's Lyric (\$225), you set target temperatures for when you're home and when the house is empty. That's it. Rather than trying to learn your family's schedule, the thermostat tracks occupants through geofencing, which relies on a phone's GPS signal to trigger product settings in the home. The Lyric lets you choose a 500-ft. (for pedestrian commuters) or a 7-mile (for car commuters) radius from the house. When all phones linked with the thermostat have left that boundary, the thermostat defaults to the "away" temperature setting. On the way home, the reverse happens. Lyric communicates with your home network via Wi-Fi, so there's no need to purchase a hub.

GE Brillion appliances

Few of us would run out to replace an oven solely because a new model has GPS-enabled preheat functions. However, if you're already in the market for a major appliance, you may find a Wi-Fi-enabled version—which doesn't require a hub—to be compelling. One example is GE's internet-connected wall ovens in the Profile line (starting at \$1900 for a single oven), equipped with a supporting app called Brillion. With the app installed on your phone, you can preheat the oven from afar, as well as change the temperature and receive timer and temperature alerts. But the real advantage comes from the fact that you're future-proofing yourself to some degree. If better features come along, you can receive firmware updates. You also benefit on the service side: If GE notices a rash of repairs on a particular component at a certain age, the company can notify owners of a likely problem or push out a firmware update to correct it.



August Smart Lock

The August Smart Lock (\$250) is a quick way to enter the smart-home arena. This retrofit product replaces the handle while retaining your existing deadbolt and key set. The hefty aluminum replacement puck on the inside of the door contains the hardware and batteries, so there's no outward sign that you've gone wireless. The August operates on Bluetooth, and the lock can be activated via a phone app or by geofencing. On the inside, you can rotate the lock like a traditional deadbolt; LED lights on the face indicate its status. One helpful feature is that you can create multiple digital keys that can be set to work indefinitely, for a limited period of time, or at certain times on certain days—for a housecleaner, perhaps.

SmartThings security

Most people who dip a toe into the smart-home market do so to add security features, and for this, packaged kits offer a relatively trouble-free avenue. SmartThings offers three security starter kits (\$390 to \$760) that include a hub, a presence-indicator fob, and various sensors to detect motion, moisture, and whether windows and doors are open or closed. These kits include all the functionality of monitored alarm systems, plus they email or send you a text when triggered. A popular benefit to these security systems is their ability to keep tabs on kids returning to an empty house after school. Clipping the small fob in a child's backpack serves as a proximity trigger for a smart lock on the entry door. When the door is unlocked, it can trigger an email or text notifying the parents that the child has entered the house. Conversely, the system can send an alert if your child doesn't come through the door within a certain window of time. You can also add a video camera to the system to record a clip of who is entering the home. The clip can either be emailed or viewed from a cloud server.



ny's most recent homes included hardwired automation systems by specialized installers that likely cost \$100,000. With the pace of home technology today, he figures the systems were probably outdated before move-in day and were well on their way to becoming the equivalent of a 1970s home intercom.

That's because smartphones and the IoT have now brought simple, flexible, cheap, DIY home automation to the market. The ubiquity of smartphones, the advent of cloud computing, and the relatively low barriers to create and market new products and applications to control them have unleashed a flood of products that can turn virtually any home into a smart home overnight.

This onslaught of smart-home products has increased choices and lowered costs, but it isn't completely to the consumer's benefit. Depending on how you count, there are up to 15 different communication protocols available, at least five of which are employed by the most heavily marketed brands. Competing technologies have made communicating between products dodgy at times and made adding products a frustrating experience.

More products than standards

"There's a lot of fragmentation in the smart home today," says Matt Rogers, a founder of smart-thermostat maker Nest. "'Wild West' is a mild way to put it." With so many competing (and evolving) standards, innovators like Rogers must hedge their bets by designing their products to communicate with multiple signals. Which signals or specs will prevail, he says, depends on which reach critical mass in the market.

This buildup to critical mass means that early adopters have often been unpaid beta testers. There are plenty of complaints about apps with minimal features, hubs with few supported fixtures, and difficulties enrolling products in a network. Brands promise more offerings and more feature-laden apps to follow, but that requires time and wider adoption of their particular systems.

This struggle for market share—and revenue—among manufacturers has only reinforced interoperability problems. Companies that rely on revenue from selling the data they collect and that try to lock customers into their platform are reluctant to share their applications' API (underlying software code) with other companies. This creates little islands of products that don't communicate with the products in the other islands.

It's your home, but is it your data?

Smart-home equipment is about product innovation and integration, but it's also about information. These products collect a ton of data about your daily life—when you come home, when you go to work, which windows you leave locked,

and which ones you don't. This data is collected by the companies creating the products, but who owns it? And who decides what is done with it?

That's often detailed in the fine print of the licensing agreements that most of us

never read. The Wink hub's agreement, for example, assigns ownership of all data to the company.

Companies have good reasons to collect this data. One is to improve products. Revolv cofounder Mike

HUB SYSTEMS CONTROL

HUB

Connected to the internet through your home's wireless network or modem, a hub relays commands from your mobile device to products in your house via radio signals. Depending on the hub, it may use open-standards signals such as ZigBee, Z-Wave, Wi-Fi, and Bluetooth, or it may use a proprietary protocol such as Insteon. Because the hub and fixtures must share the same signal, hubs often have multiple signal types to ensure that they will work with a number of products. It's important to choose a hub whose app is compatible with your smartphone. Here are a few hubs on the market today.



Iris
(\$100)



Insteon (\$130)

Belkin WeMo (switch, \$50)



Wink
(\$50)

MULTIPLE FIXTURES

COMPATIBILITY	DESCRIPTION
<p>Signal</p> <ul style="list-style-type: none"> Wi-Fi Z-Wave ZigBee <p>Operating system</p> <ul style="list-style-type: none"> Android 2.2 iOS 5.0 Mac PC (various) 	<p>The Iris works with or without a contract-free \$10-per-month subscription, which adds cloud storage of video and more customized control of settings such as creating your own if-then conditionals. Lowe's sells Iris-branded products, but Honeywell thermostats and some Schlage and Kwikset locks are also compatible. Unlike some other hubs, Iris can be controlled through a web browser, which can alleviate conflicts with device compatibility.</p>
<p>Signal</p> <ul style="list-style-type: none"> Insteon <p>Operating system</p> <ul style="list-style-type: none"> Android 2.3 iOS Windows Phone Windows 8 	<p>Insteon released its first product using its own proprietary communication protocol in 2005, long before other companies on this list. It has a reputation for reliability and is the only dual-band technology, broadcasting over both radio waves and the home's electric wires. It, too, can be controlled through either an app on your device or a web browser on your computer.</p>
<p>Signal</p> <ul style="list-style-type: none"> Wi-Fi <p>Operating system</p> <ul style="list-style-type: none"> Android 4.0 iOS 6.0 Kindle Fire 	<p>Belkin believes that hubs won't have a place in smart homes as the market matures, so it makes products that connect directly to the internet via Wi-Fi. Belkin offers video cameras, energy monitors, sensors, and WeMo switches (adapters that plug into an outlet for on/off control) and has partnerships with companies (including the Crock-Pot and Mr. Coffee brands) for WeMo-enabled products as well. IFTTT recipes are required for triggers.</p>
<p>Signal</p> <ul style="list-style-type: none"> Bluetooth Kidde Lutron Wi-Fi ZigBee Z-Wave <p>Operating system</p> <ul style="list-style-type: none"> Android 2.2 iOS 6.0 	<p>Wink, which has a marketing partnership with Home Depot, publishes on its website a list of certified Wink-enabled products and also lists products it works with but perhaps without full functionality. Wink connects to the router with Wi-Fi, so you don't need an open Ethernet port on your router. Online consumer reviews cite difficulties with pairing products to the hub, but the app experience has been well reviewed.</p>

In the last year, Apple and Google threw their hats in the ring. Google spent \$3.2 billion to buy Nest, which subsequently paid \$555 million for wireless security video-camera maker Dropcam and an undisclosed amount for Revolv before shuttering its hub manufacturing. Apple and Google are joined by Home Depot and Lowe's, which are marketing Wink and Iris hubs, respectively. There's hope that these market heavyweights will speed up the adoption of communication standards and open APIs. If that doesn't happen, we might be stuck with a home-automation marketplace bifurcated in a way similar to the iPhone/Android or Mac/Windows worlds we have with smartphones and computers. During a panel discussion at the 2014 International Consumer Electronics Show, the consensus of executives from Belkin, Nest, GE, Philips, and Revolv was that mass adoption of smart-home gear is still about a decade away.

Have a goal, and go for it

For the time being, the best strategy for navigating the smart-home market may be knowing exactly what you want to accomplish (see "Approachable plug-and-play products," p. 39). My friend, for example, wanted to make his vacation home more secure. Home-security products—including door locks, carbon-monoxide and fire detectors, video cameras, and motion sensors—are a typical first foray into the connected-home market, and these products have the largest market share. Several companies offer starter kits that bundle a handful of these security products and a hub together. These kits are a good entry point because all the products work together.

Another popular focus for those entering the market is conserving energy and controlling a home's HVAC system. Not only can a connected thermostat automatically adjust conditions based on your presence, it (and other appliances) can show real-time energy usage and cost, which studies have shown encourages conservation.

If, on the other hand, you're intrigued by home automation's gee-whiz capabilities and want to get creative, a hub that supports multiple standards lets you set up a network and embrace a new relationship with your home—as long as you're ready to spend time working out a few glitches. □

Sean Groom is a contributing editor. Photos courtesy of the manufacturers.

Soucie (who is a developer for the hub maker's new owner, Nest) says that he believes the data belongs to the customers. He adds, however, "If you really want [a hub] to add a benefit to your life, you're going to have to allow us to look

at the data—maybe not at a personal level, but in aggregate."

Revolv's hub was pretty pricey; it was not intended as a loss leader for other products and services. But in a market with three potential revenue streams—

hardware (hubs and fixtures), subscription fees, and the sale of data—data sales are a significant revenue source for many companies, particularly on the software (apps) side. Apps may be free. They do, however, come with a price.