Wired for

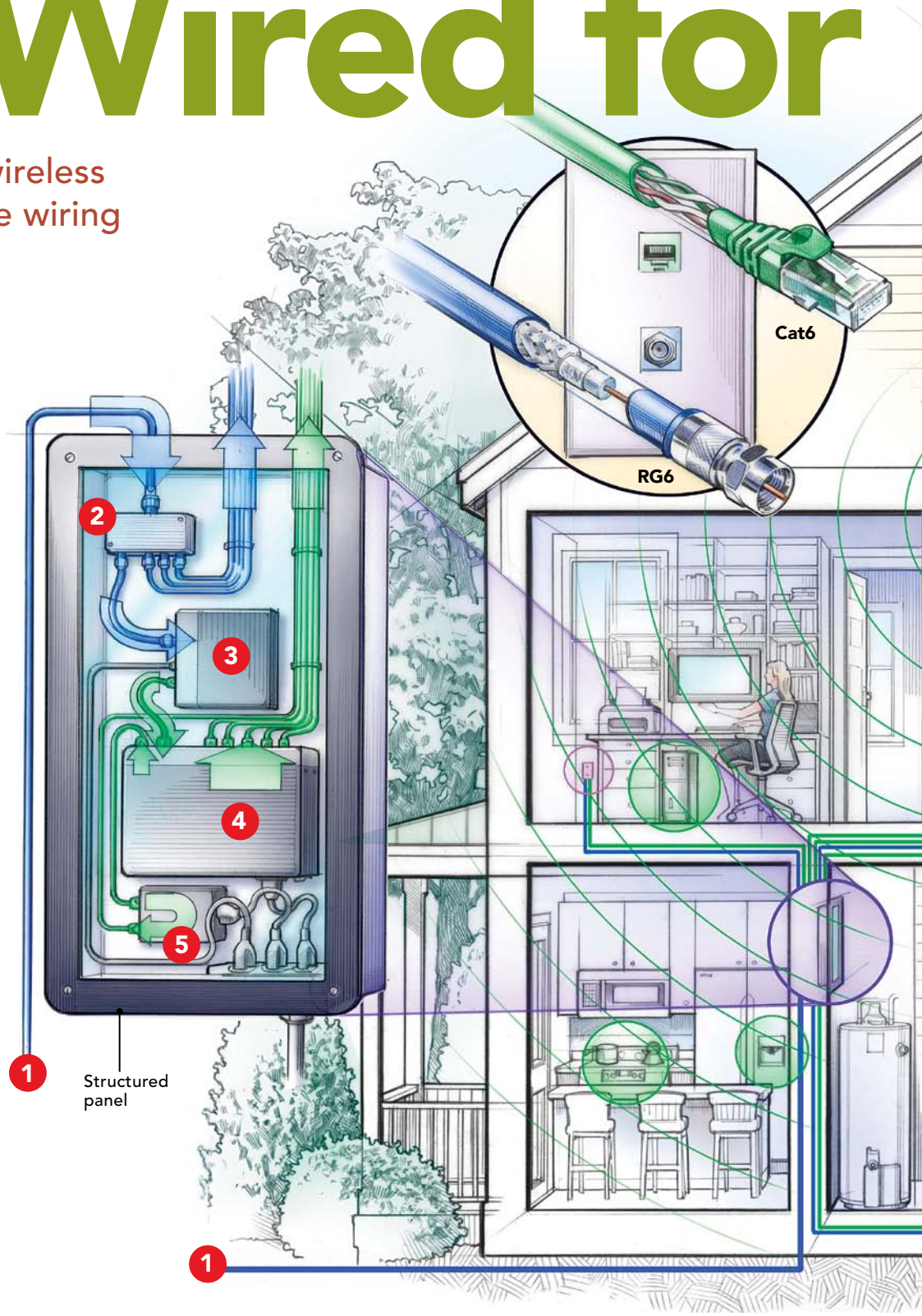
The growth in home wireless devices demands more wiring and better hardware

BY BOYCE THOMPSON

All the publicity surrounding the new generation of wireless home products creates an impression that homes are poised to become completely wireless. In fact, the opposite is true. Despite announcements of wireless home platforms from Google and Apple, that remains a daydream. "I'm sure we'll get there someday," says Greg Simmons of Eagle Sentry, the leading systems-integration firm in Las Vegas, which installs communication systems in homes of all sizes. "But we're not there yet."

The core issue for Simmons and other integrators is the ever-increasing number of wireless devices (e.g., printers, digital-media players, garage-door openers, smartphones, tablets, appliances) competing for bandwidth. This can be likened to a loss of water pressure when too many people are showering at the same time. Wireless signals can weaken or get dropped without the right structured cabling and communications equipment in place.

Structured cabling is a general term that refers to a whole-house network of cables dedicated to audio, video, data, telephone, television, security, and home-automation signals. Ironically, the demand for stronger, more reliable wireless connections has fostered a par-

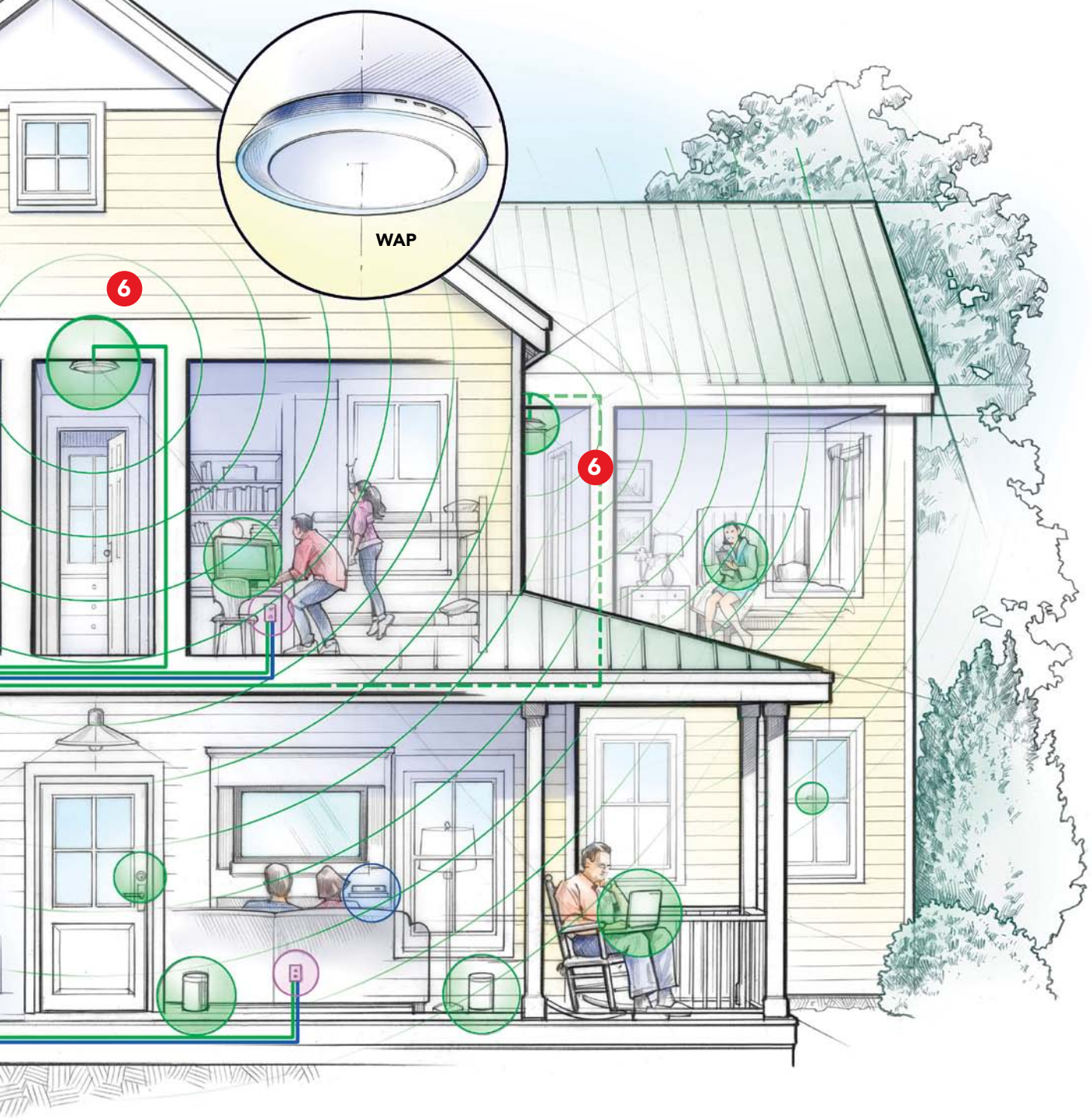


WHAT GOES WHERE

1. Incoming RG6 coaxial cable carries data signal from internet service provider (ISP). RG6 is used for broadband and cable television.
2. Splitter divides ISP signal to modem and various rooms for cable TV via RG6.
3. Modem is configured to communicate with ISP; connects to router with Cat6 cable.

Drawing: Bruce Morser

Wireless



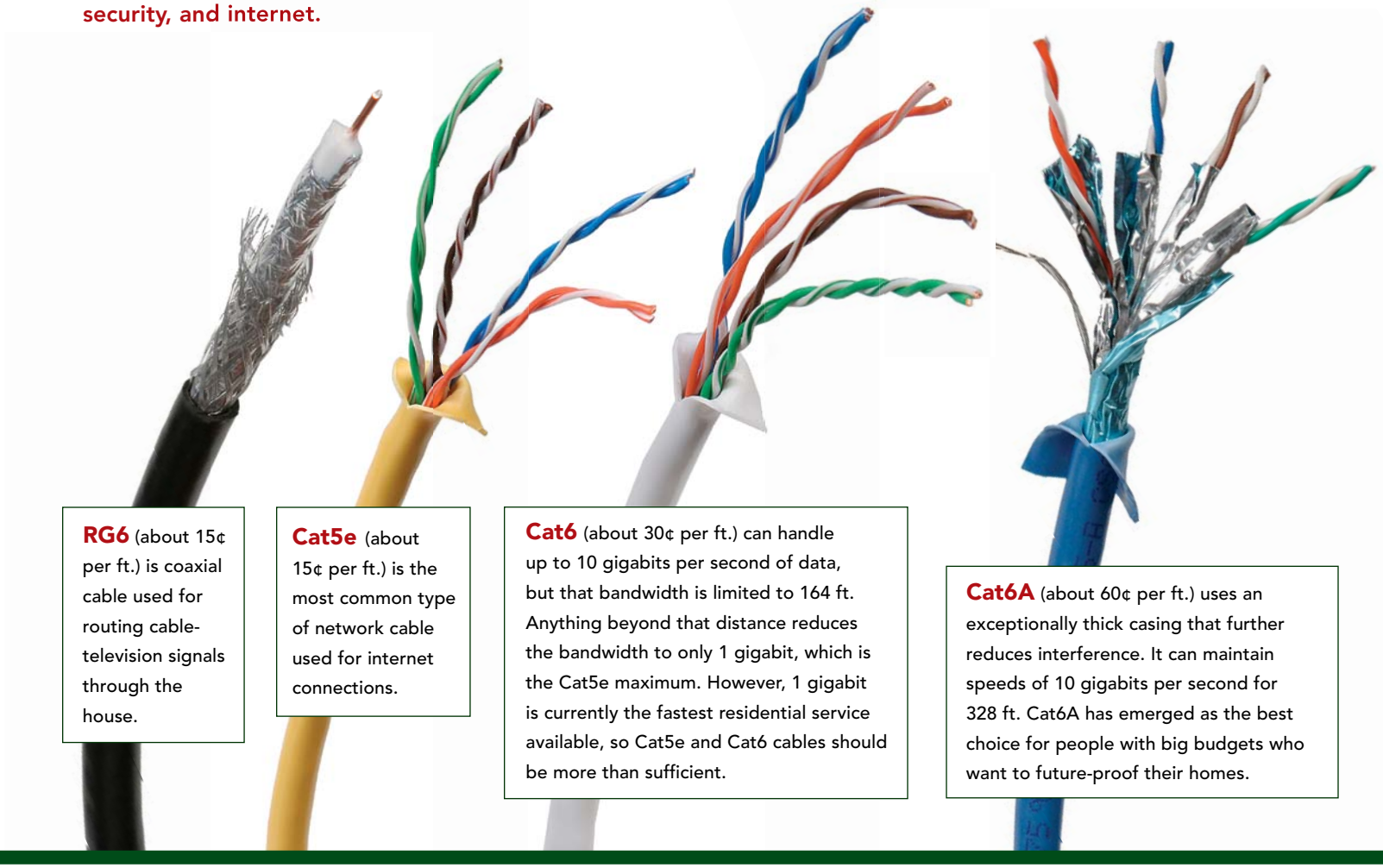
4 Router delivers internet to rooms and power-over-Ethernet (PoE) adapter through Cat6 cables.

5 PoE adapter makes it possible to transfer power and internet to wireless access point (WAP) through Cat6 cable.

6 WAP broadcasts a dual-band wireless signal.

Coming to terms

Several wiring, hardware, and networking terms are important to grasp when you're wiring a home for the distribution of audio, video, home automation, security, and internet.



RG6 (about 15¢ per ft.) is coaxial cable used for routing cable-television signals through the house.

Cat5e (about 15¢ per ft.) is the most common type of network cable used for internet connections.

Cat6 (about 30¢ per ft.) can handle up to 10 gigabits per second of data, but that bandwidth is limited to 164 ft. Anything beyond that distance reduces the bandwidth to only 1 gigabit, which is the Cat5e maximum. However, 1 gigabit is currently the fastest residential service available, so Cat5e and Cat6 cables should be more than sufficient.

Cat6A (about 60¢ per ft.) uses an exceptionally thick casing that further reduces interference. It can maintain speeds of 10 gigabits per second for 328 ft. Cat6A has emerged as the best choice for people with big budgets who want to future-proof their homes.

allel need for more-powerful hardware with more-robust wiring.

Most people have no idea just how many devices in their homes depend on strong wireless signals. Greg Calvimontes, a Pittsburgh integrator, had a client complain of dropped signals. "He said he wasn't running many wireless devices in the house," recalls Calvimontes. But Calvimontes pulled up Fing, a network-scanning app, on his smartphone and saw that the homeowner had 40 devices on his network. "DirecTV boxes, the Nest thermostat, the router—the list went on and on," Calvimontes says.

Many home applications—especially streaming video, online multiplayer gaming, cloud storage, and video calling—simply perform better with a cabled internet connection, says Avi Benaim, managing director of A.B.E. Networks in Silver Spring, Md., who works with many of the major builders in the Washington, D.C., area. Benaim keeps track of how many wireless devices his clients use at home. The average is 35, and it's grown rapidly in the last two years.

Many homeowners foot the bill to bring more bandwidth into their home, but then they connect the incoming service to a cheap modem or wireless router, which effectively bottlenecks it. Further compounding signal-quality problems, the router is often left at the wall where the service enters, creating dead zones at the opposite end of the house. A good wireless router is omnidirectional, which means that it broadcasts a signal in a 360° balloon, so it's best put in the center of the desired coverage area.

Earlier this year, Simmons did a demonstration project for Pardee Homes in Las Vegas that promised buyers a "commercial-grade wireless" experience in a 2500-sq.-ft. home. Pardee wanted to make sure that buyers could take a video call from Europe by the pool, run video on multiple iPads, and watch a movie on Netflix—all at the same time. "If millennials can't get online, it's literally the end of the world," jokes Simmons.

To create this ultimate wireless experience, Simmons ran Cat6 cabling (about 30¢ per ft.) and RG6 (about 15¢ per ft.) for cable television (see "Coming to terms," above) to most rooms in the house and to a centralized wireless access point (WAP). He used home runs, a method of wiring in which dedicated cables run back to a structured panel. In Simmons's mind, nearly every home system runs better with a cabled connection because it minimizes bandwidth losses.

Other than the use of Cat6 cable, the big difference between this setup and ones Simmons was installing five years ago is the hardware. Commercial-grade, dual-band WAPs have become a standard for state-of-

Splitter A splitter divides the ISP signal for cable television or data to a router for internet access. The number of ports can vary from two to 16, but to lessen signal degradation, it's best to use only the minimum needed.

Modem A modem connects computers or a router to an ISP's broadband network, typically DSL or cable, by turning digital data into an electrical signal and vice versa for sending and receiving. The current standard for cable service is DOCSIS 3.0; for DSL service, it's ADSL2+.

WAP A wireless access point (WAP) is connected to a router and transmits a wireless signal; 802.11ac is the most recent wireless communication standard. Dual-band WAPs can communicate with both 2.4-GHz and 5-GHz devices at once, which means less interference and a more reliable signal.

Router A router connects to a modem to allow internet access. A wireless router doubles as a WAP and may have one or more omnidirectional antennas.

PoE A power-over-Ethernet (PoE) adapter allows Cat6 cable to transfer data as well as power to a WAP or other device.

the-art wireless homes. They have a wide range of options and are priced from $200 to thousands of dollars.

Dual band means you can have devices that communicate at both 2.4 and 5 gigahertz (GHz). That makes sense for several reasons, says Jeff Curtis, president of Luxul, an equipment maker that recently crossed over from the commercial to the residential market. For one, the 5-GHz band provides a faster connection to wireless devices. "Most new devices support 5 GHz," Curtis says. "But many only run on 2.4 GHz, so you need both." While 5 GHz is twice as fast, it only goes half the distance, which makes it even more important to place the WAP in the middle of the house, where it can fan out to provide maximum coverage. There's also less interference on the 5-GHz band because there are 24 nonoverlapping channels versus the three there are with 2.4 GHz.

For the system in the Pardee home, a quality modem is connected to a Luxul router ($220) in a structured panel, and Cat6 cable runs to a Luxul dual-band WAP ($375) that delivers data at rates up to a hasty 1900 Mbps. "That's real-world wireless speed," says Curtis. The home is small enough that it only needs a single WAP. Homes that are larger than 3000 sq. ft. may need a second WAP so that devices can transition freely as they move out of range of one access point and into range of another. However, each WAP needs a home run to the router, rather than being run in a chain, so that the router can switch devices between access points.

Wireless devices and home networks are improving every day. Calvimontes recommends getting a cable speed of at least 50 Mbps, if it's available. In some new communities, much faster service is available. The Pardee home is located in a new community with 1-gigabit service available to each home. Several telephone and cable companies are working on prototype fiber networks that deliver even more bandwidth than that, but it will be some time before technology can fully utilize what's possible.

Contrary to what many industry experts forecasted 10 years ago, the wireless home is not without wiring; however, the speed and quality of experience for the wide variety of wireless devices available today is just what those same experts predicted. And the pace of change continues to accelerate. Even integrators who pride themselves in staying ahead of the tech curve have trouble keeping up. "It's moving even faster than we are," says Benaim. □

Boyce Thompson is the author of *The New New Home* (The Taunton Press, 2014). Photos by Dan Thornton.